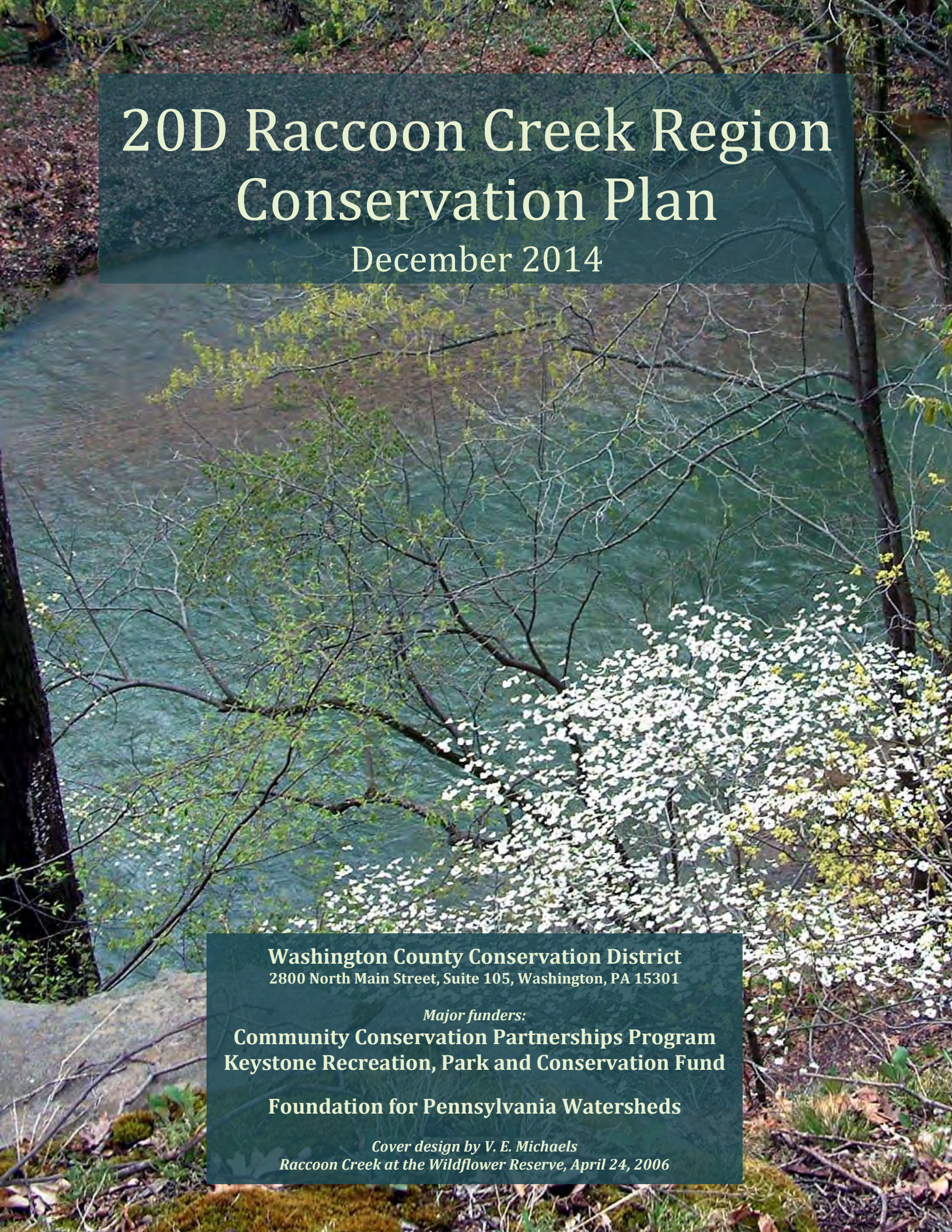

20D Raccoon Creek Region Conservation Plan

December 2014

Washington County Conservation District
2800 North Main Street, Suite 105, Washington, PA 15301

Major funders:
Community Conservation Partnerships Program
Keystone Recreation, Park and Conservation Fund

Foundation for Pennsylvania Watersheds

Cover design by V. E. Michaels
Raccoon Creek at the Wildflower Reserve, April 24, 2006

The Pennsylvania Rivers Conservation Program

20D Raccoon Creek Region Conservation Plan

December 2014

In service to:

The People of the Greater Raccoon Creek Region
Independence Conservancy
Cross Creek Watershed Association
Raccoon Creek Watershed Association

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

Foundation for Pennsylvania Watersheds

Location:

Raccoon Creek Sub-basin, Pennsylvania State Water Plan 20D
Ohio River Basin
Beaver, Washington and Allegheny Counties

Project Sponsor:
Washington County Conservation District
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All photographs illustrating the 20D Raccoon Creek Region Conservation Plan were taken by Victoria E. Michaels unless otherwise credited in the photo captions.

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Disclaimer

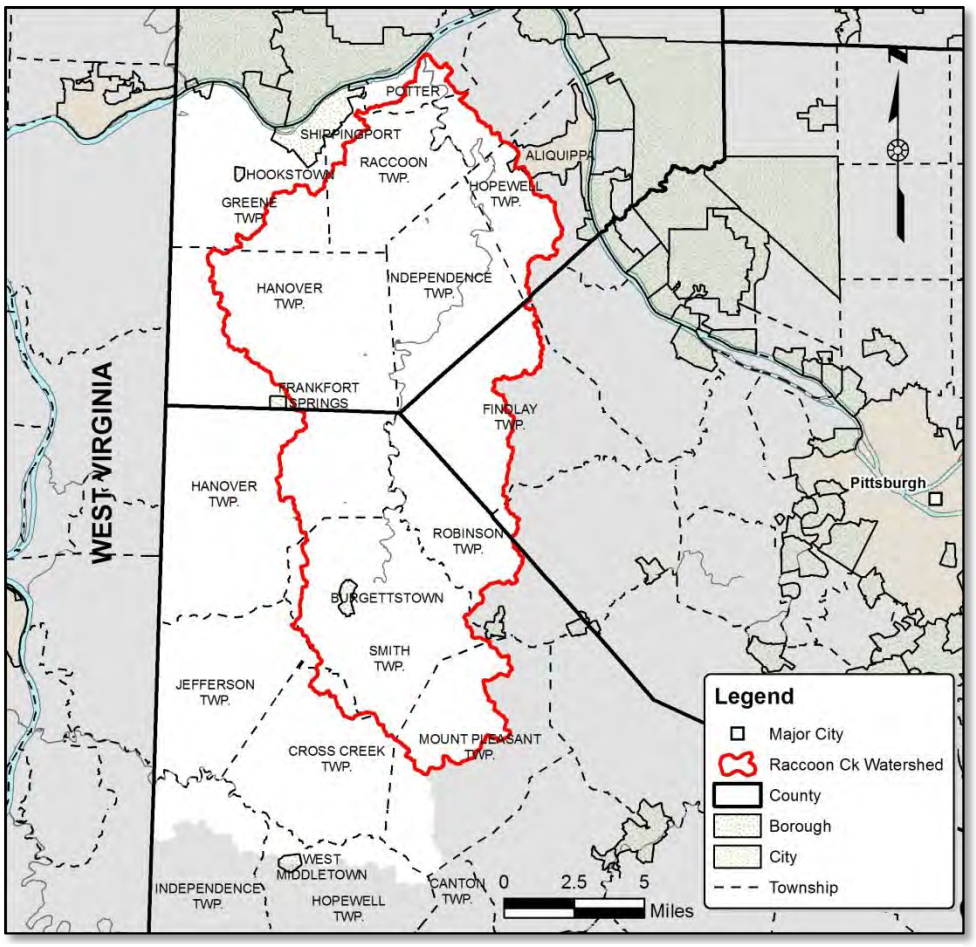
The 20D Raccoon Creek Region Conservation Plan has not been compiled for regulatory purposes. This Plan represents the collaborative efforts of many people to compile existing information regarding the land, water, biological and cultural resources of the greater Raccoon Creek Region. This is an on-going effort; significant changes are expected to the information contained in this Plan.

Project Summary

Introduction to the Raccoon Creek Region

The Raccoon Creek Watershed is located in Pennsylvania's rolling hills between Pittsburgh and the West Virginia state line. The area is identified by the State Water Plan as the "20D Sub-basin", which includes not only the drainage area of Raccoon Creek and its tributaries, but also the streams west of the Raccoon basin – Mill Creek, King's Creek, Harmon Creek and Cross Creek. It is home to about 35,000 people.

Throughout this document, the land within State Water Plan 20D will be referred to as "the Raccoon Creek Region" or just "the Region" for simplicity's sake. This roughly rectangular area covers 330 square miles, includes 10 major streams and is part of the Ohio River Basin of western Pennsylvania.



The Raccoon Creek Watershed is outlined in red; the greater 20D Region is depicted in white.

Graced with navigable waterways and rich in supplies of coal, oil, gravel, gas, timber, and fertile soils, the Raccoon Creek Region has played an important part in U.S. and world history. Its rocky cliffs sheltered the oldest known human inhabitants of North America at Meadowcroft 16,000 years ago; its Pittsburgh Coal Seam fueled the industrial might that transformed the nation into a global superpower; its determined people built and operated a petrochemical plant at Kobuta that secured synthetic rubber production throughout World War II; its Shippingport Atomic Power station marked the first peacetime use of nuclear power; and the tragic crash of US Air Flight 427 near Aliquippa resulted in sweeping changes to commercial air transportation safety.

Purpose of the 20D Raccoon Creek Region Conservation Plan

Though mostly rural, agrarian and sparsely populated, the 20D Region faces major land-use changes and challenges ranging from the burgeoning Marcellus Shale industry and chronic abandoned mine discharges in the south; to First Energy's need to expand flyash disposal facilities in the northwest; to residential expansion in the east; to lack of public access to traditionally popular creek-side recreation areas in the northeast. The possibility that Royal Dutch Shell may build a multibillion-dollar petrochemical plant at the mouth of Raccoon Creek comes with the prospect of far-reaching effects on the local environment, infrastructure, economy and social fabric of the Region and beyond.

The 20D Raccoon Creek Region Conservation Plan is intended to proactively address some of these impending changes and challenges. The Plan documents the current state of the Region and proposes strategies to find balance between the interests of agriculture, industry, housing, recreation, resource extraction and conservation while emphasizing opportunities for economic growth.

Work began on the 20D Raccoon Creek Region Conservation Plan with an April 2011 application by the Washington County Conservation District to the Pennsylvania Department of Conservation and Natural Resources (DCNR) for funding through the Community Conservation Partnerships Program (C2P2). With receipt of the C2P2 grant in 2012 and generous support from the Foundation for Pennsylvania Watersheds, representatives from local communities, businesses, conservation groups, state agencies and residents formed a Steering Committee to provide guidance in developing the 20D Raccoon Creek Region Conservation Plan with the following purpose:

Mission Statement

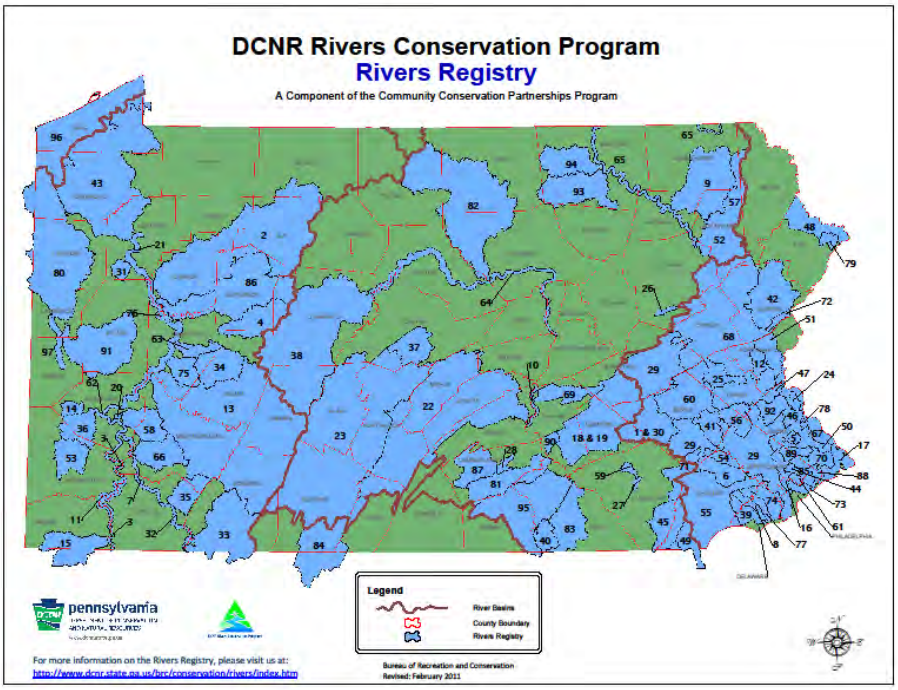
The 20D Raccoon Creek Region Conservation Plan will provide the general public, municipalities, watershed community, government agencies and local businesses, including the resource extraction industry, with a concise, easily-read and useful repository of the Region's natural, historical, cultural and recreational resources while emphasizing opportunities for stewardship and economic growth.

Goals

To accomplish the project's mission, the following goals were established, all of which focus on wise use of the natural, historical, cultural and recreational resources within the greater Raccoon Creek Region:

- Create a user friendly "one-stop-shop" for watershed data including natural, historical, cultural and recreational resources; statistical data and mapping; secondary data sources.
- Engage local residents, businesses, industries and municipalities in creating a conservation plan that reflects their concerns and their vision for the future of the Region.
- Increase public awareness about key aspects of the Region through a community outreach program that includes an interactive website for gathering information as well as posting the Plan as it is developed.
- Identify economic growth opportunities for the Region based on natural, historical, cultural and recreational resources.
- Identify positive ways to encourage and to support stewardship of natural, historical, cultural and recreational resources.
- Provide guidance to the resource extraction industry to lessen cumulative environmental impacts within the Region.

Another goal was to complement other plans completed throughout Pennsylvania which connect communities to their rivers and watersheds. If the DCNR concurs that the 20D Raccoon Creek Region Conservation Plan meets this goal, and meets the standards of the Community Conservation Partnerships Program, the streams of the 20D Sub-basin will be eligible for the River Registry along with the 107 rivers/streams currently listed in 2014.



The map above depicts the areas of Pennsylvania covered by DCNR Rivers/Watershed Conservation Plans. This map and accompanying information is available on DCNR's website: http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_009628.pdf.

Methods

The Steering Committee believed it was vital to include in the project's scope of work the watersheds in Pennsylvania to west and south of the Raccoon Creek drainage basin – Mill Creek, King's Creek, Harmon Creek and Cross Creek – all of which comprise the 20D Sub-basin of the State Water Plan. These watersheds are part of the Raccoon Creek Region by virtue of their common history, economy, culture and emerging issues. Because of long distances across the 20D Region, the study area was divided into four focus areas based on generalized land use. Stakeholder input was sought through two series of public meetings in the various focus areas.

Beyond public meetings in the focus areas, stakeholders were given ample opportunities to share their concerns and vision for the future of the Raccoon Creek Region through online surveys, printed questionnaires, telephone and email surveys, face-to-face interviews, and interactive displays at public events. The information gathered was used to compile a list of specific issues of interest as expressed by the stakeholders, including, but not limited to:

- Healing our lands and waters from the damage caused by historic coal mining
- Maintaining the green, quiet, scenic, agricultural aspects of our region
- Wise development of the energy industry to protect natural resources and quality of life
- More recreational access to our waterways through multi-use land and water trails
- Stewarding and protecting our region's parks and natural places

20D Raccoon Creek Region Conservation Plan Overview

Based on stakeholder input, information compiled from municipal and county comprehensive plans, and extensive research, the 20D Raccoon Creek Region Conservation Plan presents a user-friendly guide to sustainable growth. The completed Plan is hosted on Independence Conservancy's website, www.independenceconservancy.org. The Plan's authors encourage local groups, residents, government officials, businesses and industries, planners, agencies and developers to use the document to support future community-based projects.

The 20D Raccoon Creek Region Conservation Plan is divided into eight major sections:

Section 1: Project Area Characteristics
Section 2: Issues, Concerns and Constraints
Section 3: Land Resources
Section 4: Water Resources
Section 5: Biological Resources
Section 6: Cultural Resources
Section 7: Achievements
Section 8: Management Recommendations

Summary of Findings

The following provides a summary of the findings of each of the eight major sections of the 20D Raccoon Creek Region Conservation Plan.

Project Area Characteristics

"Section 1: Project Area Characteristics" is a generalized overview of the study area.

- The Raccoon Creek Watershed, identified by the State Water Plan as 20D, includes not only the drainage area of Raccoon Creek and its tributaries, but also the streams between the Raccoon basin and the West Virginia state line – Mill Creek, King's Creek, Harmon Creek and Cross Creek.
- Throughout this document, the land within State Water Plan 20D will be referred to as "the Raccoon Creek Region" or just "the Region" for simplicity's sake.
- The 20D Region is a roughly rectangular area covering 330 square miles and 211,496 acres. It includes 10 major streams and is part of the Ohio River Basin of western Pennsylvania.
- The Region contains all or part of 17 townships, 6 boroughs and a small portion of one city. Five percent of the watershed lies in western Allegheny County, 41% in southern Beaver County and 54% in northern Washington County.
- The Region is located in the Pittsburgh Low Plateau and the Waynesburg Hills sections of the Appalachian Plateau physiographic province.
- Existing land uses are 58% forested, 21% agricultural and 13% urban built-up.
- The total estimated population of the 20D Raccoon Creek Region is 35,000 people. Estimates by county are: Allegheny, 550 people; Beaver, 19,000 people; Washington, 15,450 people.
- The Region's population is markedly rural. Between 2000 and 2010, the population declined by an estimated 3.2% overall.
- Major employers include petrochemical manufacturers, electrical generation and transmission, the shale gas industry, construction, metallurgy, agriculture, a major concert venue and a rehabilitation clinic.
- Nine public school districts and five private schools (primary and secondary) serve the Region.

Issues, Concerns and Constraints

"Section 2: Issues, Concerns and Constraints" was developed from stakeholder surveys focusing on land use, water quality issues, recreation, valued aspects of the Region, natural conditions, areas for improvement and issues of concern. Findings are summarized as follows:

- Many people expressed thoughtful concern for the long-term, unforeseen impacts of the developing shale gas industry on the environment and quality of life for residents.
- People seem to be more concerned about the Marcellus Shale industry's long-term impacts in the downstream/northern reaches of the watershed than they are in the southern/headwaters region where the industry is already well-underway.

- The 'green and quiet' aspect of the Raccoon Creek Region is highly valued throughout the watershed, as is the beautiful scenery, rural character, local history and recreational potential; people do not want this spoiled by development or pollution.
- Abandoned mine drainage is a greater concern in the southern headwaters (historic mined areas of the Pittsburgh Coal Seam) than farther downstream.
- Water quality improvement, resource extraction industries, open space preservation, illegal dumping, and invasive species are issues of greatest importance to citizens.
- Sewage management, stormwater runoff and flooding, and industrial development by the shale gas industry are key concerns among municipal officials.
- Hiking, paddling/floating, and visiting public lands are the most popular recreation opportunities in the Region; outdoor team sports, shopping and off-road motor sports are least favored by survey respondents.
- Common themes emerged among interviewees: the need to recruit younger conservation leaders, pursuing partnership opportunities with industries, and continuing the overall trend of improving the Region.

Land Resources

"Section 3: Land Resources" provides an overview with mapping that includes physiography, ecoregions, geology, soils and energy resources.

- About 26,000 acres of prime farmland and 62,000 acres of farmland of statewide importance are found in the Region.
- Deciduous forest is the Region's predominant land use.
- About 93% of the 211,496-acre Region is privately owned with about 7% held as public lands, primarily for recreational purposes.
- The Region's coal, petrochemical and nuclear power industries were crucial to the nation's development and defense.
- The Region contains more than 200 inventoried abandoned coal mine sites with an estimated 90 million tons of coal waster, much of it reusable, in piles and lagoons.
- Land resource issues that need to be addressed include streambank erosion, flooding, illegal dumping, reclamation of abandoned mine lands, and update of AML inventories.
- Development of the shale gas industry is likely to last for many decades; the Marcellus, Upper Devonian and Utica/Point Pleasant shales may constitute the largest known natural gas field on earth.

Water Resources

"Section 4: Water Resources" provides an overview with mapping that includes the sub-watersheds of the Region, designated stream uses and water resources.

- Major sub-watersheds and tributaries are identified and described.
- Public water supplies and sewage treatment systems are described.
- PA DEP stream use designations are given for individual streams; four streams are classified as High Quality Cold Water Fisheries – Traverse Creek and Service Creek from

their headwaters to JC Bacon Dam, Cross Creek from its source to the Avella water intake, and the entirety of King's Creek within Pennsylvania.

- Wetlands comprise 3910 acres, or 1.85% of the Region.
- Ambridge Reservoir, a public water supply, is the largest lake at 406 acres; Cross Creek County Park's 258-acre lake is the Region's largest lake open for public recreation.
- There are 3 active USGS gaging stations in the Region – one on Raccoon Creek, one above and one below Montgomery Dam on the Ohio River.
- 179 miles of streams are impaired; 56%, or 99 miles, are impacted by abandoned mine drainage.
- The Region has five environmentally-friendly (passive) systems treating 2.496 billion gallons of abandoned mine drainage water annually.
- The Ohio River serves as the Region's northern boundary; its water quality and aquatic diversity have been steadily recovering over the past 30 years.

Biological Resources

"Section 5: Biological Resources" describes biodiversity including native and invasive species, provides mapping and descriptions of natural heritage areas, and describes changes brought about by human inhabitants of the Region.

- Native vegetation and wildlife are discussed; guidelines are offered for wildlife viewing etiquette.
- Invasive plants, animals and microbes are discussed; pest management strategies are suggested.
- Plant and animal species of conservation concern, both terrestrial and aquatic, are listed; species believed to be extirpated from the Region are included.
- Important habitats and natural heritage areas are mapped and described; much of the Region is an Important Birding Area as defined by the National Audubon Society.
- Land cover is mapped and described.

Cultural Resources

"Section 6: Cultural Resources" focuses on archaeological, historical, cultural and recreational features of the Region.

- Meadowcroft Rockshelter is the site of the oldest known human habitation in North America, dating back 16,000 years.
- Early inhabitants were the Monongahela People in pre-history; then Native Americans of the Lenape and Sioux tribes. European settlers of the western Pennsylvania "frontier" were at first predominantly northern European; later immigrants from southern and eastern Europe were drawn by work in the mines, railroads and factories of the Region.
- Within the Region are 3 state gamelands, 2 state parks, 23 municipal parks and one county park; features and amenities of these public lands are summarized.

- The Region has 4 linear parks - the Panhandle Trail and the Montour Trail on land; and the Ohio River Water Trail and Raccoon Creek Canoe Trail (both under development) on waterways.
- There are 5 privately-owned campgrounds, 7 golf courses, one indoor and one outdoor concert venue in the Region.
- Fourteen sportsmen's clubs own land in the Region; five granges are active including Hookstown which sponsors the Region's only agricultural fair.
- Three watershed associations serve the Region – the Washington County Watershed Alliance, Cross Creek Watershed Association and Raccoon Creek Watershed Association; Independence Conservancy is a watershed-based land trust and the only land trust headquartered in the Region.
- Numerous historical features of the Region are detailed, including 11 National Register Historic Places, 11 National Register Eligible Places, and various sites of importance in military, industrial or transportation history.
- A sampling of notable agri-businesses, fairs, festivals and cultural events is presented.

Achievements

"Section 7: Achievements" highlights the success of reclamation, restoration and improvement efforts, both completed and on-going:

- 14,460 acres of publicly-accessible open space, including state game lands, municipal, private and state parks, comprise about 7% of the Region's total area.
- Five Passive AMD Treatment Systems are operational; their collective impact on water quality is:
  - 2.5 billion gallons of AMD water treated annually
  - 603 tons/year of iron removed
  - 62 tons/year of aluminum removed
  - 6 tons/year of manganese removed
  - 1505 tons/year of acidity removed
- Datashed, a web-based database for monitoring and sharing information about AMD restoration sites, is available at www.datashed.org.
- Educational and interpretive programs are offered at state, local and private parks and recreational facilities.
- Five Natural Stream Channel Restoration Projects have been completed on the Region's waterways.
- Dozens of tracts of Agriculture Security Areas have been established throughout the Region, totaling 33,891 acres; 2115 acres of farmland are permanently preserved.

Management Recommendations

"Section 8: Management Recommendations" includes options based on the results of the stakeholder surveys as well as common themes in municipal and county planning documents drafted by others for the study area. Goals were developed for each of the four resource

categories – land, water, biological and cultural. In turn, various objectives were set forth with accompanying action items as potential means to achieve the goals. Each set of goals and objectives identifies potential responsible parties and key partners.

Several action items recur throughout the goals for each resource category:

- Reclaim Abandoned Mine Lands, including coal waste piles.
- Operate, maintain and repair existing Abandoned Mine Discharge treatment systems.
- Expand/connect green corridors along major streams, park lands and conserved areas.
- Fund land conservation efforts of local land trusts and watershed organizations.
- Direct new development away from pristine natural areas, previously undisturbed areas and farm lands; re-develop/re-purpose previously disturbed areas.
- Eliminate illegal dumping; remove illegal dump sites.
- Cluster/consolidate/centralize earth disturbances; minimize forest fragmentation.
- Expand/connect existing land and water recreational trails; increase public recreational access to major waterways.
- Support farm preservation efforts; facilitate establishment of new farms by young farmers; facilitate access to locally grown fresh food.
- Maintain and upgrade county, municipal and state parks and public spaces.
- Increase environmental education opportunities for people of all ages.

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Section 1: Project Area Characteristics

Location

The Raccoon Creek Watershed lies within the 154,185-sq. mi. Ohio River Basin which drains much of the eastern United States. The Ohio River flows through or borders six states - Illinois, Indiana, Kentucky, Ohio, West Virginia and Pennsylvania. The Ohio River Basin, or drainage area, which includes the Allegheny, Upper Ohio, and Monongahela Sub-basins, is the second largest of six drainage basins in Pennsylvania. These basins are the Ohio, the Genesee, the Susquehanna (the largest), the Delaware, the Erie and the Potomac. The Raccoon Creek Watershed lies within the upper headwaters of the Upper Ohio River Sub-basin in southwestern Pennsylvania and is home to about 35,000 people.

A **watershed** is the area of land where all rainfall drains to one location - a creek, river, pond, lake, etc. A watershed is a drainage area. It carries all the moisture that is "shed" from the land after rain or snowfall.

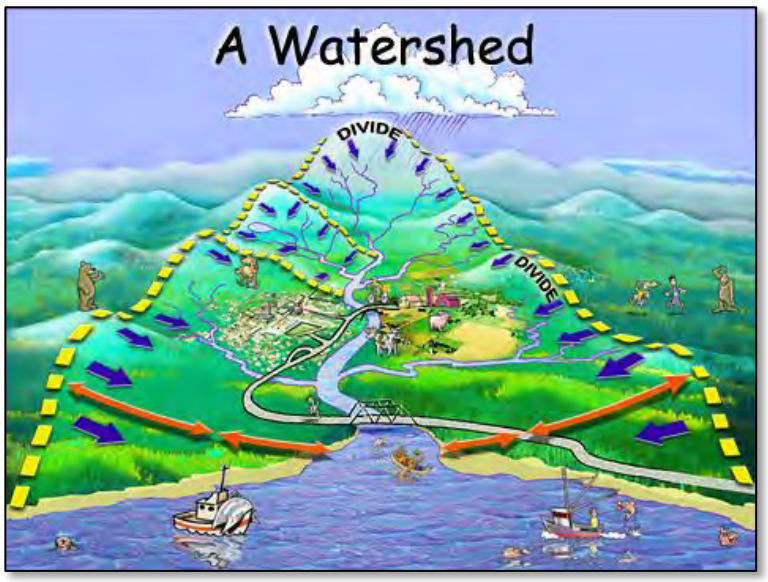


Figure 1.1: Pictograph Example of a Watershed from terrapinadventures.com website.

Watersheds are defined by the contours of the land. Their boundaries are high ridges. The Continental Divide in Pennsylvania's Allegheny Mountains is an example: all water to the west of the Continental Divide flows into the Ohio River, on to the Mississippi and ultimately into the Gulf of Mexico. All water to the east drains into Chesapeake Bay.

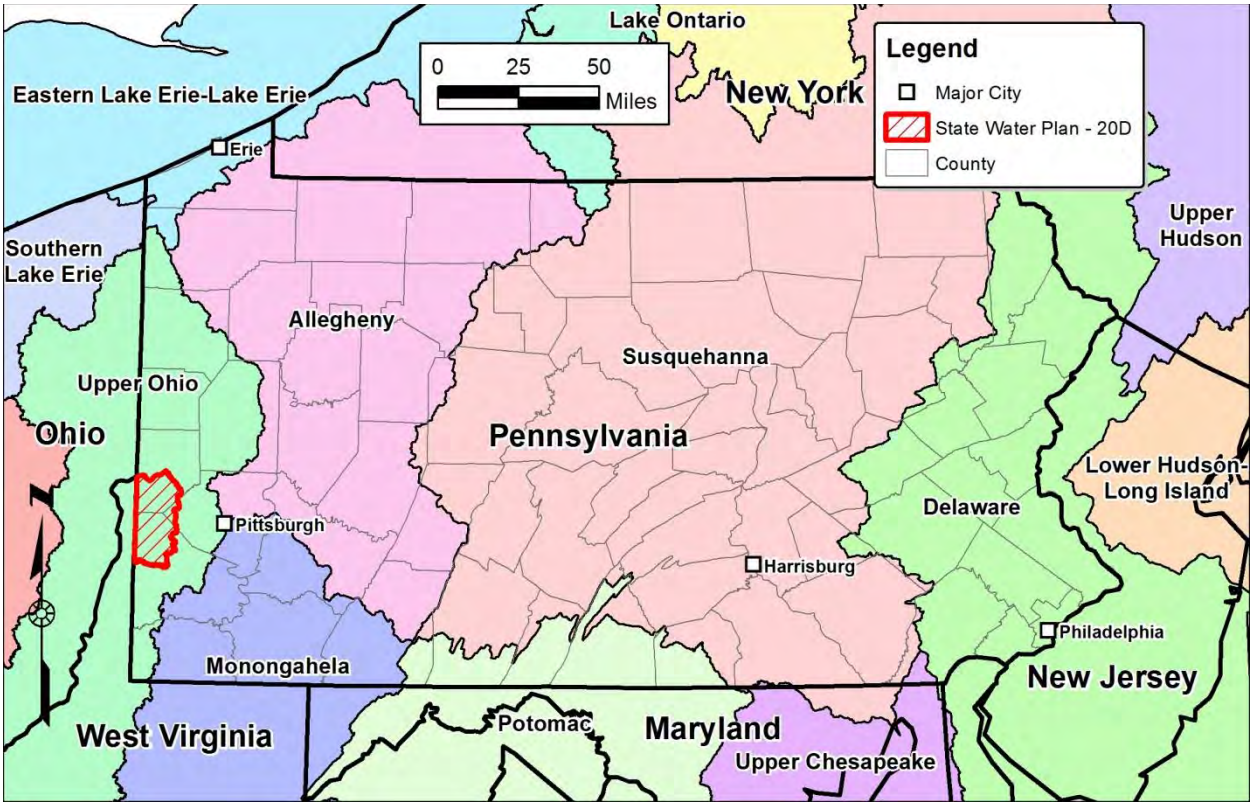
Large watersheds like the Ohio River are formed by the confluence of many smaller ones like the Beaver River, the Allegheny River and all the little creeks and streams that feed them.

No matter where you are on earth, you are always in a watershed!

The 3084-sq. mi. Upper Ohio River Sub-basin (a.k.a. Sub-basin #20) includes the Pennsylvania portion of the Ohio River from its beginning at the confluence of the Allegheny and Monongahela Rivers in Pittsburgh to the state border with Ohio and West Virginia.

Pennsylvania's State Water Plan, created in the 1970s, further divides the state into major watershed basins. Raccoon Creek is part of the 20D Sub-basin, a total area of 330 square miles, which includes the small watersheds that flow westward across the West Virginia panhandle to the Ohio River. As depicted in the following figure, the 330-square mile Raccoon Creek Watershed is designated "Watershed 20D".

Figure 1.2: Pennsylvania's Major Watersheds, State Water Plan 20D Raccoon Creek Watershed Region highlighted in red



Size

The 20D Raccoon Creek Watershed Region is a roughly rectangular area covering 330.1 square miles and 211,202 acres. The Region contains all or part of seventeen townships, six boroughs and a small portion of one city. Five percent of the watershed lies in western Allegheny County, 41% in southern Beaver County and 54% in northern Washington County.

For planning purposes, the 20D Raccoon Creek Watershed Conservation Plan covers not only the drainage area of Raccoon Creek and its tributaries, but also the streams between the Raccoon basin and the West Virginia state line. Throughout this document, the land within State Water Plan 20D will be referred to as "the Raccoon Creek Region" or just "the Region" for simplicity's sake.

Figure 1.3: Counties & Municipalities within the 20D Raccoon Creek Region

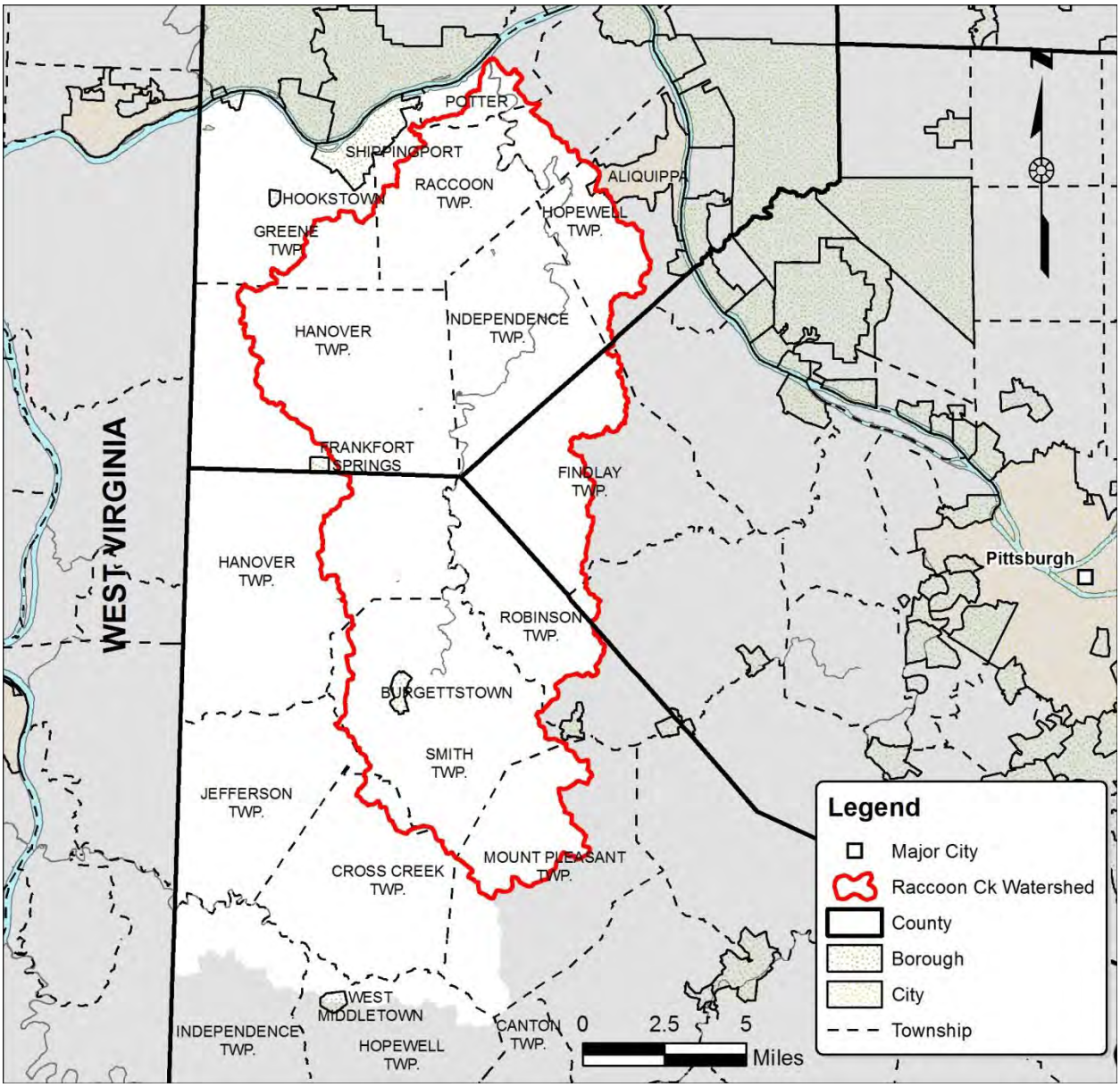


Table 1.1: 20D Raccoon Creek Watershed Region Drainage Area by Municipality[1]

County: # of municipalities	Municipality: City/Borough/Township	Drainage Area: Square Miles	% of 20D Region Land Mass
Allegheny (2)	Findlay Township	16.95	5.12
	North Fayette Township	0.61	0.01
Total Area		**17.56**	**5.13%**
Beaver (12)	City of Aliquippa	0.15	0.05
	Center Township	3.50	1.06
	Frankfort Springs Borough	0.26	0.08
	Georgetown Borough	0.20	0.06
	Greene Township	26.15	7.91
	Hanover Township	44.88	13.58
	Hookstown Borough	0.14	0.04
	Hopewell Township	9.02	2.73
	Independence Township	23.45	7.10
	Potter Township	4.46	1.26
	Raccoon Township	19.42	5.86
	Shippingport Borough	3.62	1.10
Total Area		**135.25**	**40.83%**
Washington (10)	Burgettstown Borough	0.55	0.17
	Cross Creek Township	26.14	8.00
	Hanover Township	48.15	14.57
	Hopewell Township	4.78	1.45
	Independence Township	7.23	2.19
	Jefferson Township	24.36	7.37
	Mount Pleasant Township	17.25	5.22
	Robinson Township	14.67	4.44
	Smith Township	33.74	10.21
	West Middletown Borough	0.21	0.06
Total Area		**177.08**	**53.68%**
Combined Total Area			**99.64%**

[1] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

Major Sub-Watersheds

The 20D Raccoon Creek Region is made up of many smaller watersheds, each with interesting histories, outstanding characteristics, widely-ranging land uses and industrial legacy impacts. "Plate 4.1 Sub-watersheds" illustrates all the tributaries and sub-watersheds of the Raccoon Creek Region.

The following is a brief description of some of the major watersheds of 20D, beginning in the north and moving upstream toward the headwaters in the south of the Region. Detailed management recommendations for addressing environmental issues in each of these sub-watersheds are found in "Section 8: Management Recommendations."

Mill Creek

Mill Creek flows north through Greene Township. It features some of the finest farm land in the Region. The stream is shallow and slow-moving for most of its course, sometimes flooding parts of the Hookstown Fair Grounds. Nearer to its mouth the creek drops through a deep, rocky valley approaching the village of Georgetown. According to the Pennsylvania Natural Heritage Program (PNHP), the Mill Creek Valley Biodiversity Area is notable for its mature forest and high diversity of habitats.

Figure 1.4: Becky Dunbaugh and Barb Rupert put the finishing touches on the Mill Creek Restoration Cooperative Project, June 2, 2005.

Little Blue Run, a major tributary immediately to the west of Mill Creek, was impounded in the early 1970s about a mile from its mouth at the Ohio River to create a vast flyash disposal lagoon for the coal-fired Bruce Mansfield Power Plant in nearby Shippingport. Formerly a startling azure-blue, the Little Blue Reservoir is visible to astronauts in space.

Service Creek

Service Creek flows east through Raccoon Township to its confluence with Raccoon Creek in Independence Township. This watershed is primarily wooded with scattered residential areas along the main roads. Designated by the Department of Environmental Protection as a High-Quality Cold Water Fishery, Service Creek and its Reservoir is the source of water for Ambridge Water Authority. Construction of the reservoir in the early 1950s displaced many families, some

of whom had farmed the land for generations. Historic Service United Presbyterian Church on the shore of the reservoir was the site of the Service Theological Seminary, the second divinity school in America, founded in 1794.

Traverse Creek

Traverse Creek also flows east toward the main stem of Raccoon Creek at the Hanover-Independence Township line in Beaver County. It is also a High-Quality, Cold Water Fishery. A very rural watershed, Traverse Creek is home to Raccoon Creek State Park and Wildflower Reserve. Residential areas are few. Viewed from the air, the Traverse Creek Watershed features a dense green canopy. It is also one of the better places for viewing the night sky as major light pollution sources are several miles distant. The establishment of Raccoon Creek State Park displaced many farm families as their lands were purchased and reforested during the 1930s and 1940s.

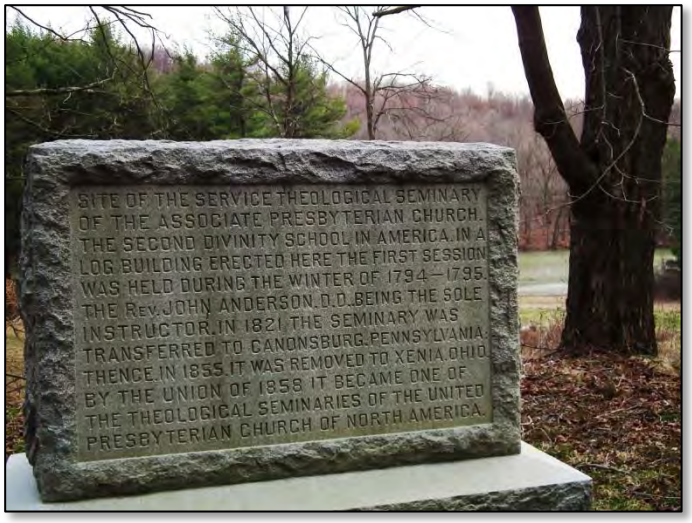


Figure 1.5: Marker commemorating the Service Theological Seminary, the second divinity school in America, built here in 1794; Service Creek Reservoir in the background.

King's Creek

King's Creek and the Aunt Clara Fork of King's Creek feature some of the quietest and most rural scenery in the Raccoon Creek Region. The Pennsylvania Natural Heritage Program cites lower Aunt Clara Fork in northern Washington County as a continuously forested floodplain containing several exemplary natural communities. Sparsely populated with few roads, the King's Creek Watershed is abundantly green and quiet. Its streams flow westward to the Ohio River near Weirton, West Virginia. King's Creek Cemetery, now a part of Raccoon Creek State Park, contains the graves of several Revolutionary War veterans and earliest European settlers

Figure 1.6: Graves in King's Creek Cemetery date back to the late 1700s. At left, Samuel Harper, Private, PA Militia, 1756-1814; at right, John Boyd, Private, Continental Line, 1747-1840; two of seven Revolutionary War veterans resting here.

of the area.

Harmon Creek

Harmon Creek Watershed marks the northern-most extent of the Pittsburgh Coal Seam. From the late 19th through the mid-twentieth century the Harmon Creek Watershed was extensively strip mined and deep mined for its rich bituminous coal. Because no regulations were in place requiring restoration of the land or treatment of resulting pollution, Harmon Creek is rife with coal waste piles, un-naturally contoured hills, barren waste areas and abandoned mine discharges varying from small seeps to multiple-hundred gallons per minute flows.

Figure 1.8: This coal waste pile off Sarish Lane west of Burgettstown contains an estimated 350,000 tons of acidic material. April 2005.

Small "coal patch" towns are the primary residential areas in this watershed which flows westward through Hanover Township, Washington County, toward the Ohio River. The Harmon Creek watershed is very sparsely populated with many large tracts of land still owned by surface coal mining companies. The recently completed Panhandle Trail is a 27-mile recreational rail-trail on the former Panhandle Railroad which moved coal to Pittsburgh and Weirton.

Cross Creek

The Cross Creek Watershed in Jefferson and Cross Creek Townships also bears the scars of unregulated mining. Every patch town along the main stem of Cross Creek has its un-reclaimed coal waste piles, oozing seeps of orange acid mine drainage and barren disturbed areas. Revitalizing these communities and treating the myriad mine discharges is a challenge of tremendous proportions.

Figure 1.9: Acid mine drainage seeps, too many to count, trickle through yards, gardens and ditches in Browntown near Avella, April 2005.

Despite the damage, the Cross Creek Watershed has a wide variety of land uses and many beautiful areas, unspoiled or recovering from past industrial abuse. The South Fork of Cross Creek and the headwaters of the

main stem along Route 50 from the Avella Sportsmen's Club eastward is a High Quality Warm Water Fishery as determined by the DEP. Cross Creek County Park with its large lake is enjoyed by thousands of local people. Closer to the state line, in the massive outcroppings of sandstone cliffs above Cross Creek is the Meadowcroft Rockshelter, the oldest-known human habitation in North America, dating back some 16,000 years. The Cross Creek Watershed is mostly agricultural and heavily wooded to the west of Avella.

The Scott Run tributary to Cross Creek has provided the highest yield of macroinvertebrates of any watershed in Washington County in terms of diversity and numbers. Although Scott Run was heavily strip mined, its discharges are alkaline, allowing sensitive aquatic insects to flourish.

Burgetts Fork

The Burgetts Fork of Raccoon Creek flows north, parallel to Raccoon's main stem, to their confluence just east of Burgettstown. The narrow valley of Burgetts Fork is lined with coal patch villages – Slovan, Atlasburg, Langeloth and the largest, the borough of Burgettstown. Relatively speaking, Burgetts Fork is the most densely populated watershed in the 20D Region. Heavily industrialized and severely disturbed, Burgetts Fork runs orange and is devoid of aquatic life. Burgettstown High School's Blue Devils football field sits atop the Erie Mine, only a few feet below the turf. The Pennsylvania Department of Environmental Protection has estimated costs up to $58 million to remediate the former American Zinc and Chemical Company plant in Langeloth.[2] On the bright side, one of the worst acid mine discharges in the Raccoon Creek Region, the Langeloth Bore Hole, has been successfully treated by a passive iron-settling system which removes over one hundred tons of iron per year from Burgetts Fork.

Figure 1.10: Other-worldly terrain of the former American Zinc and Chemical Company in Langeloth, April 2005.

Potato Garden Run

Potato Garden Run drains western Findlay Township and flows northwest toward the triangular intersection of Beaver, Washington and Allegheny Counties. Also located at the northern limit of the Pittsburgh Coal Seam, the Potato Garden Run Watershed was extensively deep-mined from the 1920s through the 1950s, severely affecting groundwater and surface water quality.

[2] US Geological Survey, *Historical Zinc Smelting in New Jersey, Pennsylvania, Virginia, West Virginia, and Washington, D.C., with Estimates of Atmospheric Zinc Emissions and Other Materials*, available at http://pubs.usgs.gov/of/2010/1131/pdf/OF10-1131.pdf; accessed 4/20/2014

Wells, springs and streams show low pH and high concentrations of iron, acid, manganese and aluminum.[3] Potato Garden Run supports a large beaver population that provides a degree of AMD treatment by building their beaver ponds, damming the flow and settling some of the suspended pollutants.

Figure 1.11: Eastern half of the massive twin coal waste piles flanking Potato Garden Run. The east and west piles collectively hold an estimated 2.5 million tons of re-useable fuel. April 2005.

Over the past twenty years, much of the watershed has been re-mined with larger, more efficient equipment. By closing the old mine openings and mixing the more alkaline overburden with the backfill, water quality has improved somewhat, but remains impaired. Nowhere is this more evident than along Potato Garden Run Road where twin ridges of coal waste ooze colorful slime onto the road and into the creek valley below. Few people live in this watershed as it was largely depopulated by the coal companies as they strip mined the land in the 1940s and 1950s.

The headwaters of Potato Garden Run are home to Republic Service's Imperial Landfill, whose maximum height is limited so as not to interfere with the approach of aircraft landing at the Pittsburgh International Airport.

Another large-scale feature in the headwaters of Potato Garden Run is the 400-acre Champion coal waste pile, the largest coal refuse pile east of the Mississippi River, containing over 37 million tons of re-useable coal waste.

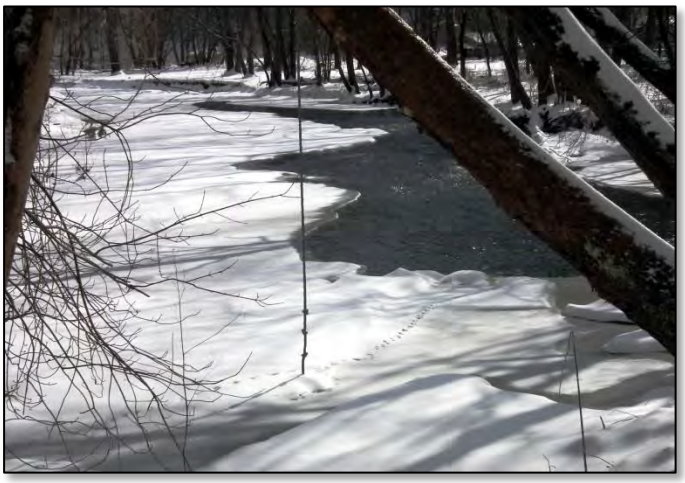


Figure 1.12: A rope swing awaits summer fun at Rocky Bottom near the Potter-Raccoon Township line.

[3]Potato Garden Run Watershed Final TMDL, Allegheny County , prepared for PA DEP, February 25, 2003, available at: http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/PotatoGardenRun/PotatoGardenRunReport.pdf; accessed 4/20/2014.

Main Stem of Raccoon Creek

At its origin near Atlasburg and Hickory, the upper Raccoon Creek watershed is mostly agricultural. Raccoon Creek and Cross Creek's headwaters contain some of the most productive farmland in Washington County.

Traveling downstream towards the north, Raccoon Creek's main stem has several areas of notable ecological significance and quiet beauty. North and south of U.S. Route 22, the Raccoon Creek Floodplain Biodiversity Areas are forested swamps and notable habitats, home to multiple plant and animal species of concern. Farther downstream, the Wildflower Reserve Valley and School Slopes Biological Diversity Areas in southern Beaver County have mature hardwood forests lined with wildflowers, including several species of concern. Approaching the mouth of Raccoon Creek, the Creek Bend Slopes and Lower Raccoon Creek Biological Diversity Areas in Center and Potter Townships are ecologically significant because steep terrain makes much of this stretch inaccessible and undisturbed. Few roads penetrate this sparsely populated area, vast tracts of which are owned by corporations with factories along the Ohio River.

The lower Raccoon Creek valley has been a magnet for generations of families who come to swim, fish, paddle, or simply enjoy the cool green shade on hot summer days. Meeting the public's demand for access to popular areas of Raccoon Creek must be balanced with care for the irreplaceable features of the valley which make it so attractive.

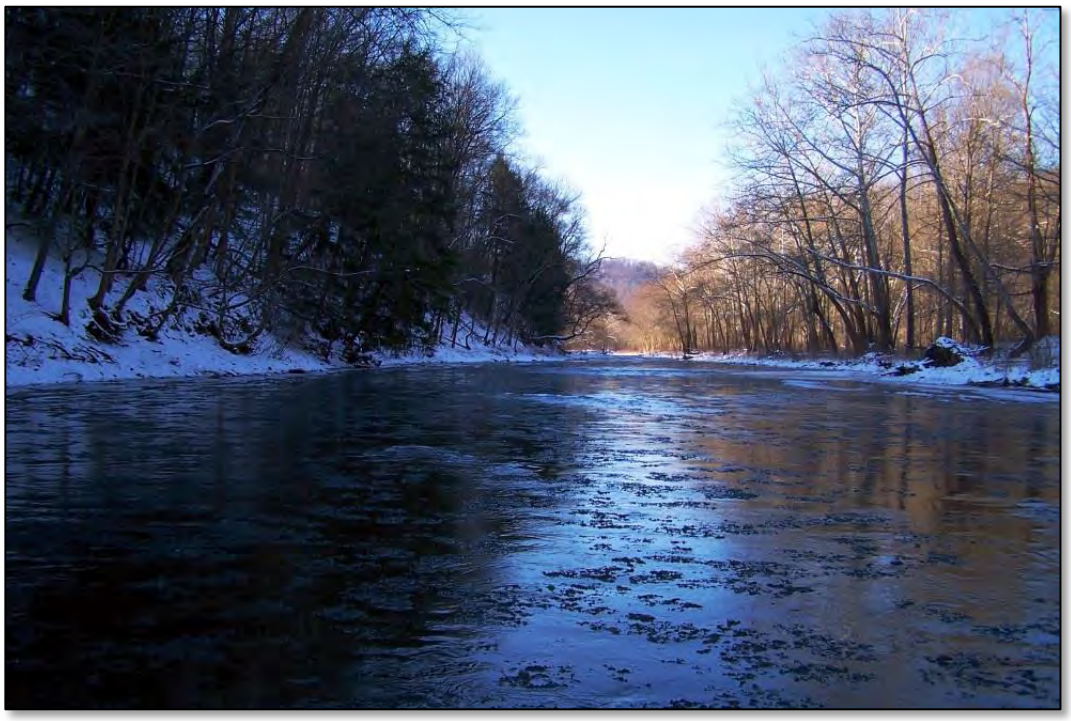


Figure 1.13: Looking upstream at Independence Conservancy's Rocky Bottom Natural Area, 2/10/2012. Photo by John Davidson.

Table 1.2: 20D Raccoon Creek Sub-basin Major Watersheds[4]

Major Stream	Stream Order at Mouth	Length in Miles
Raccoon Creek	5th	47.7
Cross Creek	5th	16.0
Traverse Creek	4th	9.5
Service Creek	4th	9.4
Aunt Clara Fork Kings Creek	4th	9.1
North Fork Kings Creek	4th	8.5
Mill Creek	4th	7.9
Kings Creek	4th	6.6
Little Raccoon Run	4th	6.4
Raredon Run	4th	5.2

Major Region Focus Areas

The diversity and sheer size of the 20D Raccoon Creek Region – about 24 miles north to south and 12 miles east to west – necessitated dividing the area into four Focus Areas based on predominant historic and current land use. Defining these focus areas simplified the logistics of gathering regional input via a series of public meetings. Please see "Section 2: Issues, Concerns, Constraints" for a more detailed description of the key features of the focus areas and discussion of the results of the stakeholder meetings held therein.

Focus Area #1 is the southernmost part of the 20D Region. It is defined by the Cross Creek Watershed and lies mostly in Jefferson, Cross Creek and Mount Pleasant Townships in Washington County.

Focus Area #2 lies to the north and east of Focus Area #1. It consists of the headwaters of the main stem of Raccoon Creek flowing north, as well as Harmon Creek flowing to the west. It lies within Mount Pleasant, Smith, Hanover and Robinson Townships in Washington County and Findlay and North Fayette Townships in Allegheny County.

Focus Area #3 lies to the north of Focus Area #2. It comprises most of southern Beaver County. It is bounded on the north by the Ohio River; to the east, bounded roughly by I-376, and to the west by the state line.

Focus Area #4 consists of three small but heavily industrialized sites along the southern bank of the Ohio River in Potter and Greene Townships.

Please see Plate 2.1, Focus Area Map, at the end of Section 2 for further information.

[4] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

Table 1.3: 20D Major Sub-Watersheds by Focus Area[5]

Sub-Watershed Focus Areas	Stream Name	Drainage Area in Square Miles	County
#1	Coal Hollow	1.96	Washington
	Cross Creek	53.80	
	Scott Run	6.90	
Total Square Miles		**62.66**	
#2	Bigger Run	1.85	Allegheny & Washington
	Brush Run	1.32	
	Burgetts Fork	18.29	
	Chamberlain Run	0.60	
	Cherry Run	3.07	
	Dilloe Run	2.17	
	Harmon Creek	15.90	
	Little Raccoon Run	10.89	
	Paris Run	1.84	
	Potato Garden Run	9.77	
	Raccoon Creek	26.31	
	St. Patrick's Run	5.16	
	Ward Run	2.97	
Total Square Miles		**105.14**	
#3	Aunt Clara Fork Kings Creek	13.46	Beaver
	Fishpot Run	2.14	
	Frames Run	0.96	
	Gums Run	1.54	
	Haden Run	1.89	
	Kings Creek	15.21	
	Lawrence Run	2.62	
	Little Service Run	4.97	
	Little Traverse & Traverse Creek	23.06	
	Mill Creek	12.41	
	Ohio River	3.68	
	Peggs Run	3.69	
	Raccoon Creek	33.04	
	Raredon Run	9.52	
	Service Creek	17.75	
	Smith's Run	0.55	
	South Fork	3.32	
	Squirrel Run	0.62	
	Trampmill Run	3.79	
	Wingfield Run	2.75	
Total Square Miles		**156.95**	
#4	Haden Run	0.41	Beaver
	Little Blue Run	1.98	
	Ohio River	0.80	
	Peggs Run	0.19	
	Raccoon Creek	0.32	
Total Square Miles		**3.70**	

[5] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

Topography and Physiography

The entire 330 square-mile 20D Region is located in the Appalachian Plateau Province, which extends northeastward from Alabama into New York. This is the largest physiographic province in Pennsylvania, occupying more than 26,000 square miles, almost 60% of the state, including all or parts of 41 of the 67 counties.[6] A review of the physiographic province in which the Raccoon Creek Watershed is located further characterizes its physical features, or landforms, which were shaped by geologic history.

The Appalachian Plateau Province in Pennsylvania is further divided into ten sections based on the distribution patterns of rock strata, glacial material, erosion, deformation, specific landforms and other geologic features. The 20D Region is located within the Pittsburgh Low Plateau Section and Waynesburg Hills Section.[7] The Pittsburgh Low Plateau Section consists of a smooth, rolling, upland surface with many narrow, relatively shallow valleys. The Waynesburg Hills Section is very hilly with narrow hilltops and steep-sloped, narrow valleys. Some of the land surface of the Section is very susceptible to landslides. Refer also to "Section 3: Land Resources," for additional description of the Pittsburgh Low Plateau and Waynesburg Hills Sections.

At the end of this section are Plates which illustrate some of the physical characteristics of the Raccoon Creek Region. Plate 1.1 was created from historical 15-minute USGS topographic maps drafted by hand in the early 1900s. These maps show topography, latitude & longitude, streams, buildings, roads and other natural and man-made features describing the general configuration and elevation of the land surface within the 20D Raccoon Creek Watershed Region. The 20D Region is located on a total of six of these quadrangle maps. A red line defines the boundary of the Raccoon Creek Watershed; the balance of 20D is fully-colored; the terrain beyond 20D is grayed-out. Please see the discussion of Public Roads later in this section for further explanation of Plate 1.1.

"Plate 1.2: Terrain" depicts the terrain of the 20D Region utilizing the shaded relief of a Digital Elevation Model and the National Elevation Dataset. Not only is the general "lay of the land" depicted, but specific information can also be derived from the mapping. For instance, elevation of the hills within the watershed ranges from 1457 feet (444 meters) in Washington County, Mount Pleasant Township in the headwaters of Raccoon Creek and the lowest point being 663 feet (202 meters) at the confluence of Mill Creek and the Ohio River in Beaver County, Greene Township. Elevation is 682 feet (208 meters) at the mouth of Raccoon Creek.

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[6] Shultz, Charles H. Pennsylvania Department of Conservation and Natural Resources. Special Publication 1:The Geology of Pennsylvania. 1999.

[7] Pennsylvania Department of Conservation and Natural Resources. Northwestern Glaciated Plateau Section Appalachian Plateaus Province. n.d. (accessed on May 7, 2014); available at http://www.dcnr.state.pa.us/topogeo/field/map13/13whs/index.htm

While these maps provide a general idea of the terrain, more accurate topography exists today that can provide detailed base mapping for many local watershed restoration projects. PAMAP, a program of the Department of Conservation and Natural Resources, created a new high-resolution digital elevation map of Pennsylvania using a technology called LiDAR, or Light Detection and Ranging. LiDAR uses lasers attached to aircraft to measure the distance to objects. Combined with a Global Positioning System (GPS) and inertial measurement unit (IMU), LiDAR is able to accurately create the digital elevation maps. The bare earth surface vertical accuracy of the data is 0.61 feet (18.5 cm). More information can be found at http://www.dcnr.state.pa.us/topogeo/pamap/lidar/index.htm.

Existing Land Use

Existing land use in the 20D Raccoon Creek Watershed Region was identified using data generated from the Southwestern Pennsylvania Commission's (SPC) Unified GIS LULC (Land Use/Land Cover) 2006 Inventory. According to the SPC, the classification system used in the inventory closely resembles the US Geological Survey's (USGS) Anderson Classification Levels I and II. For purposes of this study, Level I Classifications were utilized in mapping and analyzing land use in the 20D Sub-basin, as illustrated in Plate 1.3 and depicted on Table 1.4. These Level I land uses are defined below and ranked according to total land use within the Raccoon Creek Watershed Region.

Forest

Forest land is land stocked with trees capable of producing timber or other wood products. Forested areas influence climate and the "water regime". The water regime of a freshwater ecosystem is the prevailing pattern of water flow over a given time. More specifically, it refers to the duration and timing of flooding resulting from surface water flowing overland, precipitation and ground water inflow. This land use category includes deciduous forest land, evergreen forest land and mixed forest land. Land covered in forest which would otherwise be classified as Wetlands is not included.

Forests are the primary land use in the Raccoon Creek Watershed Region, accounting for nearly 58% of the land.

Agricultural

Agricultural land is land used chiefly for the production of food and fiber. It includes cropland and pasture; orchards, groves, vineyards, nurseries, and ornamental horticultural areas; confined feeding operations; and other agricultural land.

Agricultural land ranks second in the watershed, with over 21% of land in this use.

Urban Built-Up

Urban or built-up land is occupied by intensive use and primarily covered by man-made structures. It includes residential; commercial and services; industrial; transportation, communications, and utilities; industrial and commercial complexes; mixed urban or built-up land; and other urban or built-up land.

The third most prevalent land use in the watershed, urban built-up land accounts for nearly 13% of the total area.

Rangeland

This is land upon which the native vegetation is predominantly grasses, grass like plants, forbs, or shrubs. It includes herbaceous rangeland, shrub and brush rangeland and mixed rangeland. "Rangeland" is a specific category in the USGS uniform land use classification. The historical connotation of Rangeland is expanded in this classification to include those areas in the Eastern States which commonly are called "brushlands."[8]

Close to 5% of the watershed is comprised of rangeland.

Barren Land

This is land primarily composed of thin soil, sand or rocks. It includes dry salt flats; beaches; sandy areas other than beaches; bare exposed rock; strip mines, quarries, and gravel pits; transitional areas; and mixed barren land.

2.5% of the watershed can be classified as barren land.

Water

Areas within the land mass that are persistently covered by water including streams and canals, lakes, reservoirs, bays and estuaries and wetlands.

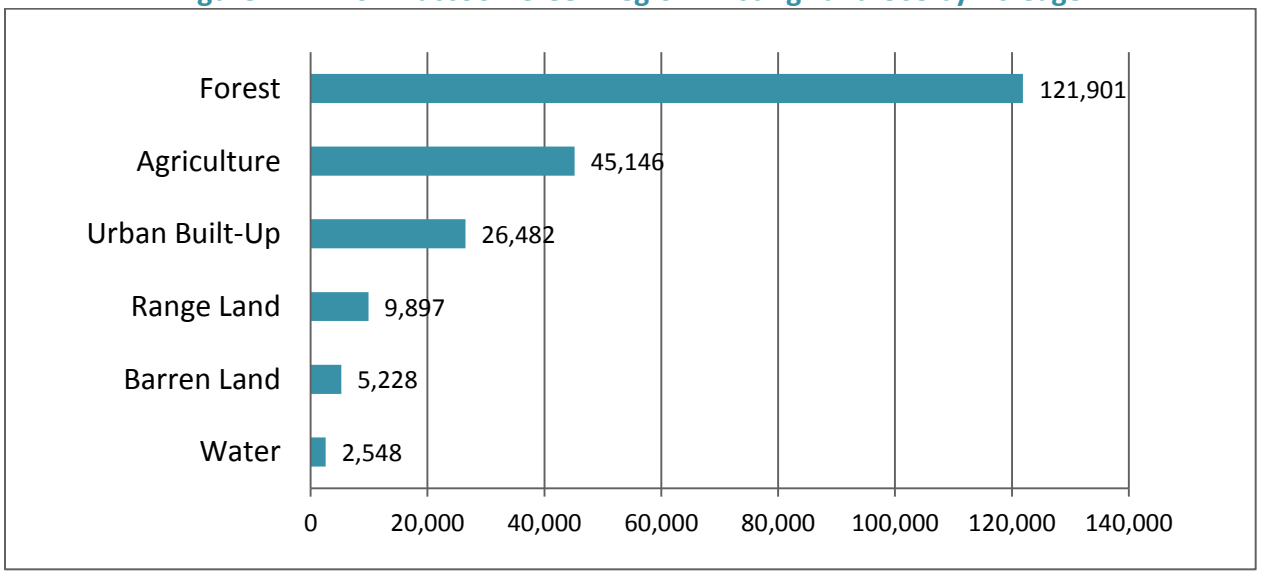
Water accounts for just over 1% of the land area in the 20D sub-basin.

[8] US Geological Survey, Landcover of the US, available at http://landcover.usgs.gov/pdf/anderson.pdf accessed 4/7/2014.

Table 1.4: 20D Raccoon Creek Region Existing Land Use Statistics

Level I Classification	Acres	Square Miles	% Total Land Area
Agriculture	45,146	70.5	21.4
Barren Land	5,228	8.2	2.5
Forest	121,901	190.5	57.7
Rangeland	9,897	15.5	4.7
Urban Built-Up	26,482	41.4	12.5
Water	2,548	4.0	1.2
Totals	**211,202**	**330.1**	**100**

Figure 1.14: 20D Raccoon Creek Region Existing Land Use by Acreage



By analyzing land cover as opposed to land use, the top five land covers in the 20D Raccoon Creek Watershed Region are Deciduous Forest at nearly 64%, Hay/Pasture at almost 15%, Developed Open Space at nearly 8%, Cultivated Crops at just over 7% and Low Intensity Development at almost 2%. Results are summarized in Table 1.5 below.

Figure 1.15: First-cutting hay in Greene Township, 6/19/2006.

Table 1.5: 20D Raccoon Creek Region Land Cover by Acreage[9]

Land Cover Type	Acreage	% of Total Land Cover
Developed, Open Space	16,083	7.7%
Developed, Low Intensity	3,818	1.7%
Developed, Medium Intensity	1,192	0.5%
Developed, High Intensity	667	0.2%
Forest, Deciduous	133,331	63.7%
Forest, Evergreen	1,597	0.8%
Forest, Mixed	88	< 1%
Scrub, Shrub	38	< 1%
Grassland, Herbaceous	4,415	< 1%
Pasture, Hay	30,872	14.8%
Cultivated Crops	15,064	7.2%
Woody Wetlands	27	< 1%
Emergent Herbaceous Wetlands	39	< 1%
Open Water	2,857	< 1%
Barren Land	1,421	< 1%

Land Use Regulations

Comprehensive Plans

Land use in Pennsylvania is generally governed at the municipal level through the use of both zoning and subdivision ordinances. These regulations serve to direct and guide the development and use of land within a civil division (township, borough, city, etc.). Ideally, the regulations align with the community's goals and values as established in a comprehensive plan. The Pennsylvania Municipalities Planning Code (MPC) is the enabling legislation which grants the right to regulate the use of land to communities in the commonwealth.

Table 1.6 provides an inventory of land use regulations in the 20D Raccoon Creek Region, based upon information provided by the municipal survey respondents and a review of readily available municipal publications and information sources.

Subdivision and Floodplain Ordinances

A comprehensive plan serves as a road-map for the development of a community. It typically addresses social and economic characteristics, housing, transportation, community facilities, and natural, historic and cultural resources within a jurisdiction. Comprehensive plans should represent the common goals of residents as they relate to future growth, community character and overall quality of life. While a comprehensive plan is not a regulatory tool, it lends credence to land use regulations which comply with the goals of the plan.

[9] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA

County governments in Pennsylvania are required to prepare a comprehensive plan and update the plan every ten years. Local municipalities are encouraged, but not required, to have a comprehensive plan. Communities with no plan are guided by their county's plan.

Within the 20D Raccoon Creek Region, all three counties have comprehensive plans. In addition, at least 19 municipalities have comprehensive plans, 12 of which are included in one of three joint municipal plans.

Land Development Ordinances

Land development ordinances are regulations enacted to specify standards and criteria which guide the use of land. The most common land use ordinances are zoning, subdivision and floodplain ordinances.

Zoning ordinances

Zoning ordinances govern the use of land based on classification and are typically enacted at the municipal level. A zoning ordinance basically divides an area into districts or zones and regulates how the land, along with any improvements thereon, may be used within each distinct district. Examples of zones or districts include agricultural, residential, commercial, industrial and institutional, and typically include sub-categories to represent density and intensity of use.

At least 19 of the 24 municipalities within the Raccoon Creek Watershed have zoning ordinances.

Subdivision ordinances

Subdivision ordinances govern the division of land into distinct parcels, typically for a higher-density use. They address specific criteria to ensure that the resulting changes are compatible with surrounding properties, such as proper street alignment, accommodation for public utilities and the impact on adjacent properties.

In the Raccoon Creek Watershed, all three counties and at least 15 municipalities have subdivision ordinances. Municipalities without are bound by their county's subdivision ordinance.

Floodplain ordinances

Floodplain ordinances also regulate the use of land, specifically that which directly impacts water bodies. They are designed to maintain streams in their natural state – or close to it – in order to protect both property and the public from flood loss. This is generally accomplished by restricting activity on the land located within a floodplain.

All three counties and at least five municipalities within the 20D Raccoon Creek Watershed Region have floodplain ordinances.

Table 1.6: Municipal Comprehensive Plans & Ordinances in the 20D Raccoon Creek Region

County/Municipality	Comprehensive Plan	Zoning Ordinance	Subdivision Ordinance	Floodplain Ordinance
Allegheny County	Yes	No	Yes	Yes
Findlay Twp	Yes	Yes	Yes	Yes
North Fayette Twp	Yes	Yes	Yes	n/a
Beaver County	Proposed	No	Yes	Yes
City of Aliquippa	Yes	Yes	Yes	n/a
Center Twp	Yes	Yes	Yes	Yes
Frankfort Springs Boro	No	n/a	n/a	n/a
Georgetown Boro	No	n/a	n/a	n/a
Greene Twp	Yes*	Yes	Yes	Yes
Hanover Twp	Yes	Yes	n/a	n/a
Hookstown	No	n/a	n/a	n/a
Hopewell Twp	Yes	Yes	Yes	n/a
Independence Twp	Yes*	Yes	Yes	n/a
Potter Twp	Yes*	Yes	Yes	Yes
Raccoon Twp	Yes*	Yes	Yes	n/a
Shippingport Boro	No	Yes	n/a	n/a
Washington County	Yes	No	Yes	Yes
Burgettstown Boro	Yes**	n/a	n/a	n/a
Cross Creek Twp	Yes***	Yes	Yes	No
Hanover Twp	Yes**	Yes	Yes	?
Hopewell Twp	Yes***	Yes	n/a	n/a
Independence Twp	Yes***	Yes	n/a	Yes
Jefferson Twp	Yes**	n/a	n/a	n/a
Mt. Pleasant Twp	Yes***	Yes	Yes	n/a
Robinson Twp	Yes	Yes	Yes	n/a
Smith Twp	Yes**	Yes	Yes	n/a
West Middletown Boro	n/a	Yes	Yes	n/a

*multi-municipal comprehensive plan; **Raccoon Valley Comprehensive Plan; ***Cross Creek Region Comprehensive Plan; n/a = no answer.

Preservation Easements/Agreements

Additional tools which can be used to guide land development include preservation easements and agreements, such as agricultural easements, conservation easements and land trust agreements. Typically entered into between private parties, these are non-regulatory but are enforceable. Land easements within the watershed are discussed in more detail in Section 3 of this plan.

Other Guidance Documents

The comprehensive plan represents the overall community vision, but other guidance documents can exist to address specific community assets which serve as economic generators and/or preserve common values. While not regulatory, these documents can help direct or

influence how certain parcels of land are used. Examples include greenway and open space plans, main street or corridor plans and watershed conservation plans. While other guidance documents were not specifically inventoried for purposes of this study, it is worth mentioning all three counties in the Raccoon Creek Watershed have adopted Greenway Plans.

Social/Economic Profile

A general snapshot of current social and economic conditions present in the 20D Sub-basin is provided below. Specific areas discussed include population, income, employment and education.

Population Centers

The Raccoon Creek Watershed Region is markedly rural. Suburban population is located mainly along the major roadways. Small "coal patch" towns are found near the creeks and former rail lines in the southern part of the Region. The largest concentrations of people live in the northeast corner of the Region at Hopewell Township, Center Township and the City of Aliquippa in Beaver County. North Fayette Township, Allegheny County contains a sizeable population, but not within the study area. Smith, Mount Pleasant and Hanover are the most populous townships in Washington County. Generally speaking, the Washington County portion of the Raccoon Creek Region is more rural than in Beaver County.

Table 1.7: 20D Raccoon Creek Region Population Centers

County	Population Center	Residents
Allegheny	Findlay Township	5,060
	North Fayette Township	13,934
Beaver	Aliquippa Borough	9,438
	Center Township	11,795
	Hopewell Township	12,593
Washington	Smith Township	4,476

Population

Since the Raccoon Creek Watershed Region is encompassed in part by three counties, population was examined at the municipal level as depicted in Table 1.8 below. Not all municipalities lie completely within the 20D Sub-basin, but were included as long as a portion thereof was situated in the watershed. Therefore, the total population figures should be considered estimates based on project staff's knowledge of the Region.

Between 2000 and 2010, the population in the Region declined by an estimated 3.2 percent overall. The areas experiencing both the greatest increase and greatest decline are only partially contained in the watershed – North Fayette Township in Allegheny County and the City of Aliquippa in Beaver County. Only four of the 24 municipalities experienced population increases, and just one of those – Hanover Township in Beaver County – is wholly contained in the watershed.

Table 1.8: 20D Raccoon Creek Region Population of Counties and Municipalities[10]

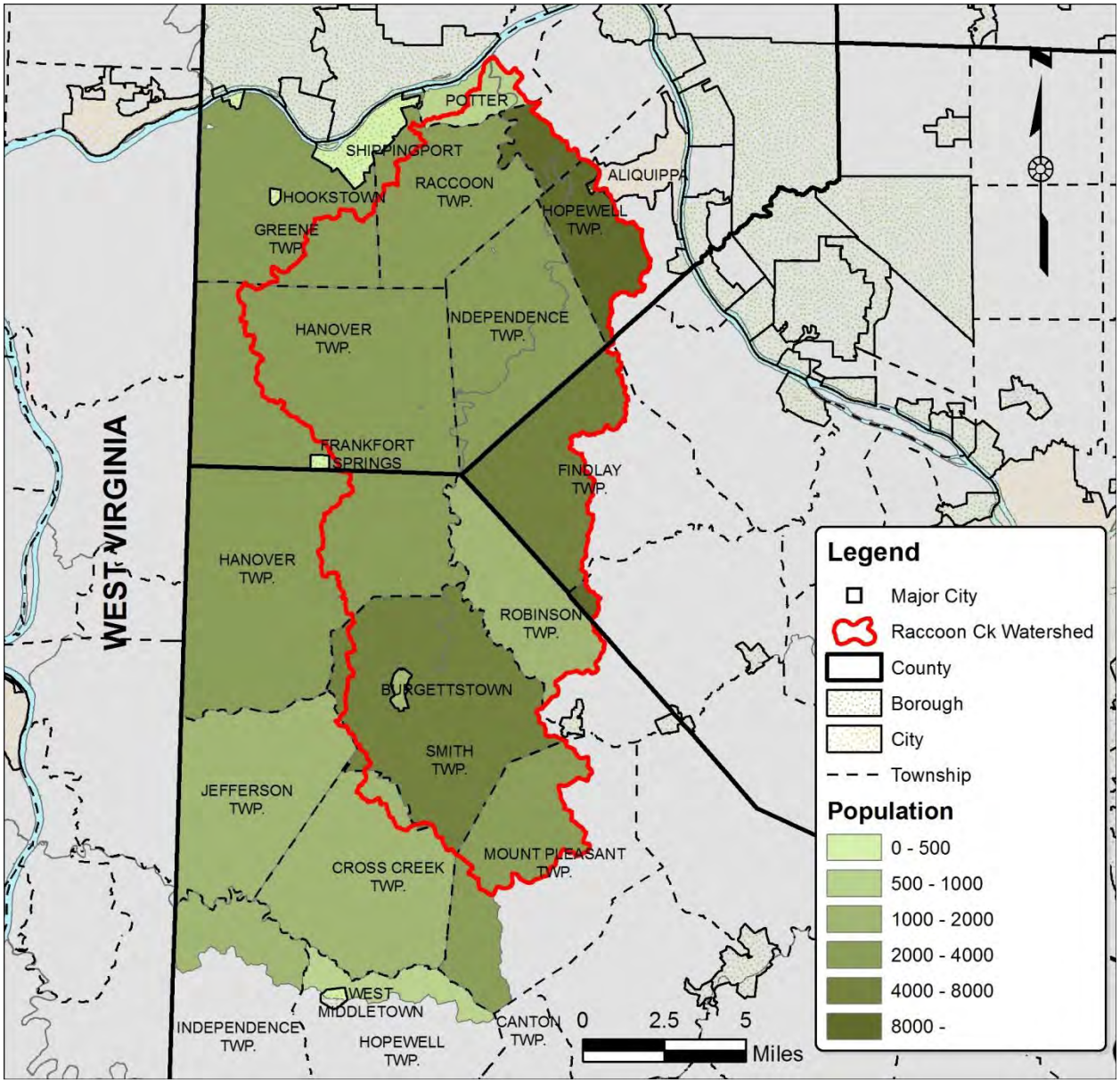
County	Municipality	Population		
		2010	2000	% Change
Allegheny	Findlay Twp	5060	5145	-1.7
	North Fayette Twp	13934	12254	13.7
Beaver	City of Aliquippa	9438	11734	-19.6
	Center Twp	11795	11492	2.6
	Frankfort Springs Boro	130	130	0
	Georgetown Boro	174	182	-4.4
	Greene Twp	2356	2705	-12.9
	Hanover Twp	3690	3529	4.6
	Hookstown	147	152	-3.3
	Hopewell Twp	12593	13254	-5.0
	Independence Twp	2503	2802	-10.7
	Potter Twp	548	580	-5.5
	Raccoon Twp	3064	3397	-9.8
	Shippingport Boro	214	237	-9.7
Washington	Burgettstown Boro	1388	1576	-11.9
	Cross Creek Twp	1556	1685	-7.7
	Hanover Twp	2673	2795	-4.4
	Hopewell Twp	957	992	-3.5
	Independence Twp	1557	1676	-7.1
	Jefferson Twp	1162	1218	-4.6
	Mt. Pleasant Twp	3515	3422	2.7
	Robinson Twp	1931	2193	-11.9
	Smith Twp	4476	4576	-2.0
	West Middletown Boro	139	144	-3.5
Totals		**87,010**	**89,870**	**-3.2**

The total <u>estimated</u> population of the 20D Raccoon Creek Region is 35,000 people; by county as follows:

Allegheny County:	**550**
Beaver County:	**19,000**
Washington County:	**<u>15,450</u>**
	35,000

[10] PA Municipalities – Total Population: 2000-2010, PA State Data Center Municipal Level Data, http://pasdc.hbg.psu.edu/Data/Census2010/tabid/1489/Default.aspx, accessed 04/23/14.

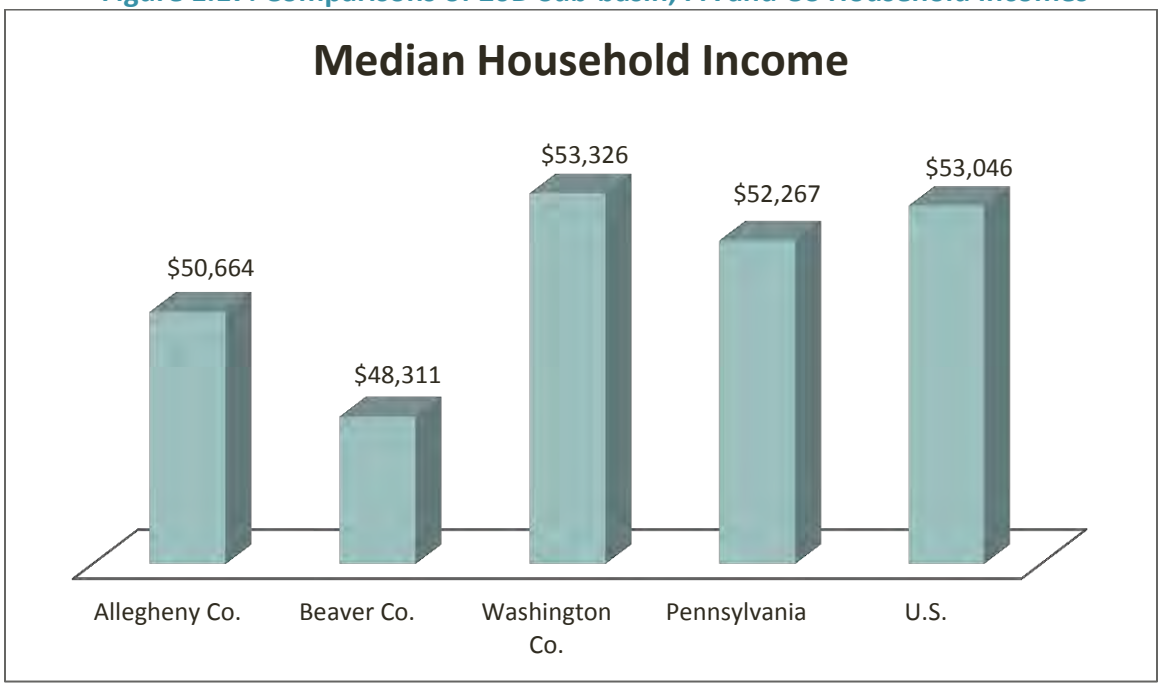
Figure 1.16: 20D Raccoon Creek Region Population by Municipality



Household Income

Household income in the watershed can be analyzed using county level data for purposes of general comparison. Overall, household incomes in the watershed are slightly lower than the state average by about three percent. Figure 1.16 reveals incomes in the northern half of the sub-basin are about eight percent lower, while those in the southern half are about two percent higher than the state average.

Figure 1.17: Comparisons of 20D Sub-basin, PA and US Household Incomes[11]



More detailed comparisons can be made using both household income and poverty data at the municipal level. As shown in Table 1.9, while household incomes in most municipalities within the Raccoon Creek Region are at or above the median income for Pennsylvania, four are significantly lower: Aliquippa, Frankfort Springs, Hookstown and Shippingport, all in Beaver County.

A similar picture evolves when examining individuals below poverty level. According to the U.S. Census Bureau's 2008-2012 American Community Survey, 14.9% of individuals nationwide and 13.1% statewide are considered below poverty level. For most municipalities in the 20D Region, the percentages are significantly lower. However, four are significantly higher with one approaching double, two at more than double and one almost triple the state and national

[11] U.S. Census Bureau, 2008-2012 American Community Survey.

figures. These communities are Aliquippa, Frankfort Springs and Georgetown in Beaver County and West Middletown in Washington County.

Table 1.9: 20D Sub-basin Household Income Comparison and Poverty Level by Municipality

County	Municipality	Median Household Income	PA Median Household Income Comparison	Individuals Below Poverty Level
Allegheny	Findlay Twp	$75,139	+44%	3.6%
	North Fayette Twp	$62,080	+19%	8.2%
Beaver	Aliquippa	$32,146	-38%	19.8%
	Center Twp	$64,608	+24%	7.9%
	Frankfort Springs	$33,125	-37%	43.1%
	Georgetown	$50,694	-03%	31.6%
	Greene Twp	$65,362	+25%	10.5%
	Hanover Twp	$65,104	+25%	7.1%
	Hookstown	$28,750	-45%	3.4%
	Hopewell Twp	$60,714	+16%	5.4%
	Independence Twp	$54,928	+05%	7.8%
	Potter Twp	$52,292	0%	10.7%
	Raccoon Twp	$57,094	+09%	8.7%
	Shippingport	$37,250	-29%	4.8%
Washington	Burgettstown	$48,854	-07%	9.5%
	Cross Creek Twp	$52,240	0%	9.4%
	Hanover Twp	$53,300	0%	8.2%
	Hopewell Twp	$61,500	+18%	8.1%
	Independence Twp	$57,708	+10%	10.0%
	Jefferson Twp	$61,667	+18%	7.8%
	Mt. Pleasant Twp	$64,620	+24%	3.2%
	Robinson Twp	$47,361	-09%	8.7%
	Smith Twp	$49,698	-05%	10.7%
	West Middletown	$47,969	-08%	38.0%

Employment

Major employers within the Raccoon Creek Watershed were determined by identifying those with 100 or more employees as recorded with the Pennsylvania Department of Labor & Industry, and supplemented with GIS data from the Southwest Pennsylvania Commission (SPC). Manufacturing dominates among the major employers in the watershed, fifteen of which were identified within the 20D sub-basin as detailed in Table 1.10.

Table 1.10: 20D Raccoon Creek Region Major Employers

County	Employer	Location	Industry	Employees
Beaver[12]	Ardex	Center Twp.	Concrete products manufacturer	100-249
	BASF	Potter Twp.	Chemical polymers	100-249
	Beaver Valley Power Station	Shippingport	Electric power generation	100-249
	Duquesne Light Co[13]	Center Twp.	Electric power distribution	110
	Gateway Rehabilitation	Center Twp.	Substance abuse treatment and rehabilitation services	100-249
	Giant Eagle Green Garden Plaza	Hopewell Twp.	Grocery store	100-249
	Moderne Glass	Hopewell Twp.	Custom decorated drinkware	250-499
	NOVA Chemicals	Potter Twp.	Polystyrene resins and foam resins	250-499
Washington[14]	C&K Industrial Services Inc	Smith Twp.	Industrial cleaning, dewatering and storage	100-249
	CBS Radio Quicksilver	Bulger	Radio station and broadcasting company	100-249
	First Niagara Pavilion	Smith Twp.	Outdoor concert venue	500-999
	Langeloth Metallurgical Co. LLC	Langeloth	Metal-bearing materials recycler	100-249
	Quicksilver Golf Club	Midway	Golf course	100-249
	Union Electric Steel Corp	Smith Twp.	Iron & steel forging and castings	100-249

Other significant employers in the Region include Republic Services Imperial Landfill, Janoski's Farm and Greenhouse, and Janoski's Country Restaurant - all in Findlay Township; First Energy's Bruce Mansfield Plant in Shippingport; Raccoon Creek State Park in Hanover Township, Beaver County; Alex E. Paris Contracting in Atlasburg; Range Resources at various locations in Washington County and the several school districts throughout the Region.

[12] Pennsylvania Department of Labor & Industry Labor Market Facts for Beaver County, https://paworkstats.geosolinc.com/faqinfo.asp?session=faq&geo=4204000007&faqq=8, accessed 5/21/14.
[13] From SPC data
[14] Pennsylvania Department of Labor & Industry Labor Market Facts for Washington County, https://paworkstats.geosolinc.com/faqinfo.asp?session=faq&geo=4204000125&faqq=8, accessed 5/21/14.

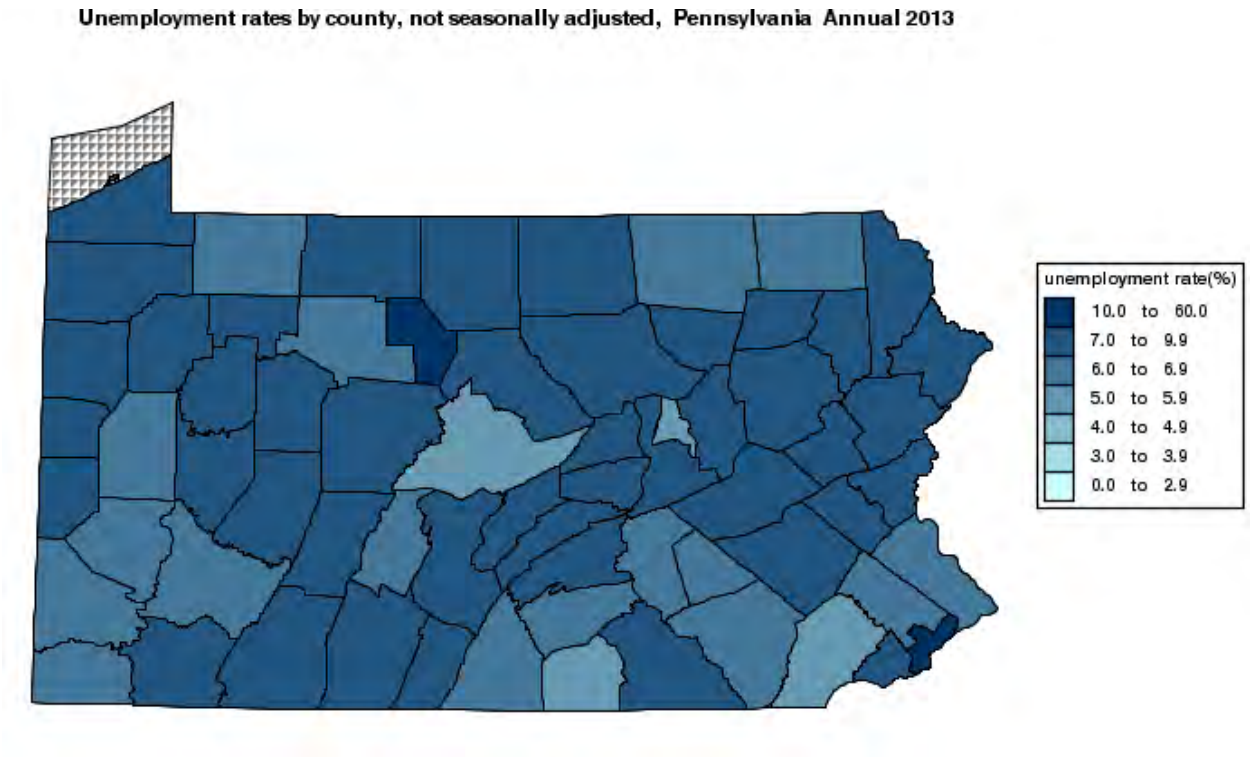
Unemployment

An examination of the most recent available annual unemployment figures reveals that, although rates are fairly high in the counties of the 20D Region, the watershed is doing better than Pennsylvania as a whole. The statewide average unemployment rate in 2013 was 7.4% according to the U.S. Department of Labor's Bureau of Labor Statistics. Table 1.11 shows the average unemployment rate in the counties of the watershed at 6.9% for the same year, with Beaver County exhibiting the highest rate and Allegheny County the lowest. Figure 1.17 illustrates that most counties in Pennsylvania are experiencing similar unemployment.

Table 1.11: 20D Raccoon Creek Region Unemployment[15]

County	Unemployment Rate
Allegheny	6.5%
Beaver	7.2%
Washington	6.9%
Average	**6.9%**

Figure 1.18: Unemployment Rates in Pennsylvania by County



U.S. Department of Labor, Bureau of Labor Statistics

[15] 2013 Annual Unemployment, U.S. Department of Labor, Bureau of Labor Statistics.

Education

The Raccoon Creek Watershed Region is served by nine public school districts as shown in Table 1.12 and Plate 1.6. In addition, there are five private schools within the watershed as illustrated in Table 1.13. The Region is also served by three county vocational technical schools: Western Area Career & Technology Center in Canonsburg, Washington County; Beaver County Career & Technology Center in Center Township, Beaver County; and Parkway West Career and Technology Center in Oakdale, Allegheny County. There are no colleges or universities in the Region.

Table 1.12: Public Schools (K-12) Serving Raccoon Creek Region Communities, 2014[12]

School District	Total Enrollment[16]	County	Municipality
Aliquippa	1,199	Beaver	City of Aliquippa
Avella Area	633	Washington	Avella Borough Cross Creek Twp
Burgettstown Area	1,370	Washington	Burgettstown Borough Jefferson Twp Hanover Twp Smith Twp
Central Valley	2,405	Beaver	Center Twp Potter Twp
Fort Cherry	1,112	Washington	Robinson Twp Mt Pleasant Twp
Hopewell Area	2,503	Beaver	Hopewell Twp Independence Twp Raccoon Twp
Southside Area	1,235	Beaver	Hookstown Borough Greene Twp Hanover Twp
Trinity Area	3,387	Washington	Hopewell Twp Independence Twp
West Allegheny	3,262	Allegheny	Findlay Twp North Fayette Twp
Total	**17,106**		

Table 1.13: Private Schools (Primary & Secondary) within the Raccoon Creek Region, 2014[17]

School	Grade Levels	County	Municipality
Cornerstone Mennonite School	1-10	Washington	Burgettstown
Hickory Christian School	---	Washington	Hickory
Our Lady of Lourdes School	K-8	Washington	Burgettstown
Pleasant Hill Wesleyan Academy	1-11	Beaver	Hookstown
Tristate Christian Academy	K-9	Washington	Burgettstown

[16] Greatschools.org search of individual school districts, 04/26/14
[17] Greatschools.org search of private schools by municipality, 04/26/14

Outdoor Education Opportunities

The Raccoon Creek Region offers plenty of outdoor education opportunities. Several facilities are described here.

Beaver County Conservation District Environmental Center

Founded by the Beaver County Conservation District in 1994 as Independence Marsh Environmental Education Center, the former Pete Maslek Farm off Cowpath Road in Independence Township is Beaver County Conservation District's headquarters. This 77-acre property features the Beaver County Conservation District Environmental Center, housing the District's administrative offices and hosting over 1,500 students yearly for guided tours of Independence Marsh.[18] A ¾-mile loop walking trail around the shallow wetland ponds offers visitors plenty of opportunity to see great blue herons, osprey, migrating songbirds and a host of wildlife. Benches are placed along the path, some overlooking Raccoon Creek.

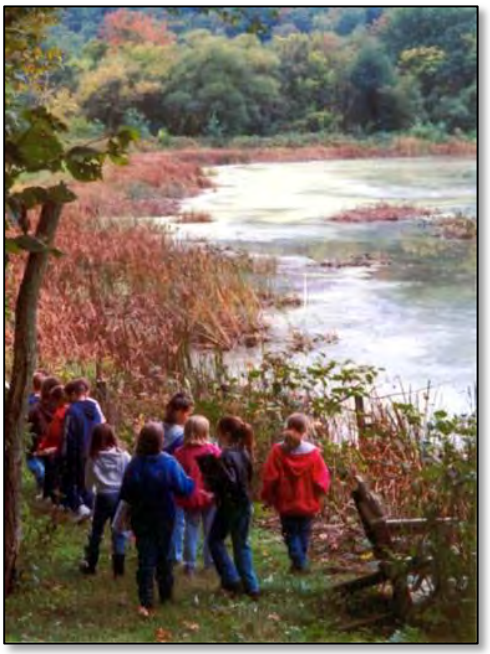


Figure 1.19: Students from Independence Elementary School tour Independence Marsh in October, 2000.

Cross Creek County Park

Cross Creek County Park was constructed in the 1980's through the cooperative efforts of municipalities in the Cross Creek Watershed. The Park features a 258 acre lake open for fishing and swimming. Throughout the year, a wide variety of guided tours and programs offer adventures like family campout, prowling for owls, spring peepers or morel mushrooms, canoe/kayak instruction with the PA Fish & Boat Commission, fall hayrides and more.

Linsly Outdoor Center

Linsly Outdoor Center (LOC) is a branch facility of the Linsly School, a private, independent college preparatory school for grades 5 through 12, founded in 1814 and located in Wheeling, West Virginia.[19] Linsly students participate in at least one five-day program at LOC during their school year.

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[18] Beaver County Conservation District's website, available at http://beavercountyconservationdistrict.org/main.asp?page=%7BDFD93558-0DB6-40BC-B67C-180DB3BDF92E%7D; accessed 4/18/2014.

[19] Linsly Environmental Center's website available at https://www.linsly.org/Page/About-Linsly/Welcome-to-Linsly ; accessed 4/18/2014.

Built on the site of one of the original Civilian Conservation Corps Camps (CCC) of Raccoon Creek State Park, the 30-acre Linsly Outdoor Center campus off PA Route 168 offers adventure, environmental and outdoor skills education. All of Linsley's buildings are modern and include two dormitories, a dining room, administrative building and the LOC Nature Center.[20]

Meadowcroft Museum of Rural Life

Please see "Section 6: Cultural Resources," for a detailed description of the globally-significant Meadowcroft Rockshelter and Meadowcroft Museum of Rural Life, located near Avella in the Cross Creek Watershed.

Raccoon Creek State Park

Raccoon Creek State Park is arguably the most popular destination and the crown jewel of the entire 20D Raccoon Creek Region. From the park's beginning as a Recreational Demonstration Area operated by the National Park Service in the 1930s, it has developed into one of the largest and most beautiful state parks in Pennsylvania. Facilities are a mix from the early Civilian Conservation Corps (CCC) camp buildings to modern amenities. The 7,572-acre park contains large tracts of undeveloped land and features the beautiful 101-acre Raccoon Lake.[21]

The park offers a wide variety of environmental education and interpretive programs. Thousands of people yearly take part in guided walks, seasonal specialty programs, hands-on activities and evening programs. Participants gain appreciation, understanding and develop a sense of stewardship toward natural and cultural resources.

Raccoon Creek State Park's 314-acre Wildflower Reserve contains one of the most diverse stands of wildflowers in western Pennsylvania with more than 700 species of plants identified. Teacher workshops and curriculum-based environmental education programs are available year-round to schools and youth groups. The Wildflower Reserve Interpretive Center features changing exhibits and brochures on natural history and historic areas of the park. [22]

Figure 1.20: *Trillium erectum*, commonly called wake-robin. 4/29/2011.

[20] https://www.linsly.org/Page/Student-Life/Outdoor-Center/Outdoor-Center-Overview accessed 4/18/2014
[21] http://www.dcnr.state.pa.us/stateparks/findapark/raccooncreek/ accessed 4/19/2014
[22] Ibid.

Figure 1.21: Frankfort Mineral Springs Museum, May, 1973.
Photo courtesy of Raccoon Creek State Park Archives.

Infrastructure

Transportation

A historian said that Henry Ford 'freed the common man from the limits of his geography.' Nowhere is this truer than in the rural countryside of the U.S. In 1900 the average American traveled about 1200 miles in a lifetime, mostly on foot, seldom far from the place he or she was born. By the end of the twentieth century, the typical American adult would travel 12,000 miles by automobile alone, in just one year.[23]

Plate 1.1 at the end of this section was created by compiling USGS topographic maps of the 20D Raccoon Creek Watershed Region published between 1905 and 1909. Locating a familiar place on Plate 1.1 is a challenge to even the most astute geography buff. Without the accustomed

[23] http://www.engineering.unl.edu/publications/ENonline/Winter01/Feature3.html accessed 4/18/2014

overlay of roads and highways to guide us, we must mark our way by the features of the land, its waterways and hills, much as did the people who lived here before us.
The following is a brief guide to the history and greater context of the roads and other transportation features we usually take for granted in our daily lives.

Public Roads

Interstate 376 East and West (formerly PA Route 60 North and South)

Interstate 376, formerly PA Route 60, is the major north-south highway artery in or near the Raccoon Creek Region. This highway was renumbered in 2009 to eliminate confusion for westbound travelers leaving Pittsburgh. Renumbering was no doubt helpful between the Pittsburgh International Airport and the city itself. Confusion now occurs for travelers using the highway north of Clinton, as they must translate its "east-west" signage to the road's literal north-south orientation. I-376 connects I-80 in the north near West Middlesex in Mercer County to the Pennsylvania Turnpike near Monroeville.

Figure 1.22: Interstate 376
http://en.wikipedia.org/wiki/Interstate_376

Regular commuters on I-376 endure some of the worst congestion in the nation, but eastbound travelers emerging from the Fort Pitt Tunnel are rewarded with one of the most spectacular urban panoramas anywhere – Pittsburgh's Golden Triangle and the Three Rivers that frame it.

Interstate 576 East and West

Interstate 576, known as the "Southern Beltway" or the "Findlay Connector," is 6.5 miles of a partially completed beltway intended to connect the western Pittsburgh suburbs with the Steel Valley of the Monongahela River. In the spring of 2014, construction will begin on the next phase of the Beltway, connecting US Route 22 to Interstate 79 near the National Cemetery of the Alleghenies. Interstate 576 is built and maintained by the Pennsylvania Turnpike Commission.

US Route 30 East and West

U.S. Route 30, the "Lincoln Highway" was our nation's first coast-to-coast highway, making family vacations and transcontinental auto adventures possible. Early motorists traveled to see where history was made, to experience the beautiful countryside, to learn about regional differences and to have fun outdoors - the same reasons people take auto vacations today![24]

[24]Lincoln Highway Historic Corridor website, available at http://www.lhhc.org/ accessed 4/17/2014.

Figure 1.23: 1916 Lincoln Highway Route from the 1916 Lincoln Highway Official Road Guide, 2nd Edition - the Lincoln Highway National Museum & Archives website.

Route 30 remains a scenic alternative to the Pennsylvania Turnpike, passing through Raccoon Creek State Park in the western countryside, through downtown Pittsburgh, over the rolling Laurel Highlands to the "Ship of the Alleghenies" where one could gaze from the deck, south across Pennsylvania into the blue hills of Maryland, West Virginia and northern Virginia. Unfortunately the wooden ship-shaped hotel was destroyed by fire in 2001,[25] but PA's historic attractions still abound along Route 30 in Lancaster, York, Gettysburg, Chambersburg and Philadelphia. Route 30 ends in the east near the Trump Taj Mahal in Atlantic City; in the west at Lands' End Park in San Francisco, just south of the Golden Gate Bridge.

US Route 22 East and West

U.S. Route 22, the "William Penn Highway," is a major east-west artery passing through the Raccoon Creek Region to connect Pittsburgh with Weirton, West Virginia. Route 22 is part of the network of original highways planned by the federal government in 1926 to replace the earliest dirt or brick roads linking population centers. Construction of the U.S. highway system employed many people during the Great Depression. Completion of these routes was vital to the U.S. victory in World War II, as they supplemented the railways in moving soldiers, raw materials and finished products to the Atlantic and Pacific Coasts.[26] Route 22's western terminus is Cincinnati, Ohio; in the east, it ends in Newark, New Jersey near the Newark Airport. In the Raccoon Creek Region, Route 22 is the major route through coal country. Farther east in Indiana and Cambria Counties, it again passes by towns and villages whose lifeblood once was coal and the railroads built to haul it – Blairsville, Hollidaysburg, Cresson, Ebensburg, Armaugh, Vintondale and Nanty Glo.

[25] Lincoln Highway website, available at https://www.lincolnhighwayassoc.org/ca/traveler/2002-01/ship_hotel.shtml; accessed 4/17/2014.
[26] US Highways website available at http://www.us-highways.com/ ; accessed 4/17/2014.

PA Route 18 North and South

At a length of 205 miles, PA Route 18 is the longest state route in Pennsylvania and is one of the few state routes to traverse the entire state in any direction.[27] PA 18 is a meandering, scenic and mostly rural route, serving as the main street in quaint towns like Greenville, Conneaut Lake and Albion to the north; Frankfort Springs, Slovan and Ninevah to the south. Route 18's northern extent is Lake City, a borough in western Erie County near the Lake Erie Community Park. In the south, 18 rolls through the hills of Greene County to cross the Mason-Dixon Line and become West Virginia Route 69 on its way to the town of Hundred.

Figure 1.24: The main street of Frankfort Springs, present-day PA Route 18. At right, note the horse-drawn buggy with a man seated inside; narrow buggy tracks in the dirt; wooden sidewalks; telegraph pole without wires. Photo courtesy of Raccoon Creek State Park archives.

[27] Wikipedia, available at http://en.wikipedia.org/wiki/Pennsylvania_Route_18; accessed 4/18/2014

PA Route 50 North and South

PA Route 50 is a 33-mile long, east-west state highway that rides the ridge between Cross Creek and the Dutch Fork of Wheeling Creek near the PA-West Virginia state line. The western terminus of Route 50 is in the village of Independence, Washington County. In the east, Route 50 ends at its intersection with PA Route 60 in Crafton Heights, just east of Pittsburgh.

PA Route 151 East and West

PA Route 151 is a 13-mile-long state highway running east and west across part of southern Beaver County. At its western end is Southside School District's campus at the intersection with U.S. Route 30. The eastern end of PA 151 is near the Ohio River in South Heights where it joins PA Route 51. A long, straight section of Route 151 in Independence Township, known as the Bocktown Stretch, was popular for drag racing when gasoline and tires were cheap.

PA Route 168 North and South

PA Route 168 runs for 55 miles between Frankfort Springs at the south and Volant in the north. In the Raccoon Creek Region, it is the main street in Hookstown. It forms the western boundary of much of Raccoon Creek State Park. At the intersection of Route 168 and U.S. Route 30, Laughlin's Corners is one of the very few places to buy gasoline in southern Beaver County. Just south of this intersection, Route 168 climbs Mill Creek hill, at the top of which is historic Mill Creek Cemetery. Burials here date to the earliest European pioneer families who settled the area in the late 1700s. Route 168 crosses the Ohio River between the imposing cooling towers of the coal-fired Bruce Mansfield Plant and the nuclear Beaver Valley Power Station. From the hills above Midland, a southbound traveler on 168 can look out across Midland, over the Ohio to the river bluffs of the Raccoon Creek Region on the opposite side.

Airports

Miller Airport

Miller Airport served the Burgettstown area. Its unlighted turf runway extended 2505 feet, oriented northwest to southeast along the eastern side of PA Route 18 in Hanover Township, Washington County.[28] The runway closed several years ago due to rising costs and increasingly complex regulations; the hangar building is now repurposed as the Miller Business Park and is home to the Mesa Creative Arts Center.[29] Recently, the runway was used as a staging area for companies building pipelines for the shale gas industry in Washington County.

[28] Online Highways, Miller Airport, available at http://www.ohwy.com/pa/p/p64.htm; accessed 4/18/2014.
[29] Mesa Creative Arts website, available at http://www.mesacreativearts.com/html/driving_directions.html; accessed 4/18/2014.

Pittsburgh International Airport

The Pittsburgh International Airport is situated at the eastern edge of the 20D Raccoon Creek Watershed. A small section of Airport property drains into Raredon Run, a tributary of Raccoon Creek. Spurred by the need for air defense of Pittsburgh's steel mills during World War II, Allegheny County began building runways for the military in 1942 on the rich farmlands of Moon and Findlay Townships. 1952 saw the completion of the passenger airport terminal, a modern marvel in its time, featuring an indoor shopping mall, an outdoor fountain with color-changing lights and an Alexander Calder mobile in the lobby. To keep pace with regional air traffic and trans-Atlantic flights, a new terminal was opened in 1992 and the original building demolished.

The Pittsburgh Airport complex is also home to two military bases - the Air Force Reserve's 911th Airlift Wing and the Pennsylvania Air National Guard's 171st Air Refueling Wing, whose KC-135 Stratotanker aircraft[30] are often seen on maneuvers in the skies over the Region.

Figure 1.25: an F-15 Eagle fighter jet receives fuel from a KC-135 Stratotanker assigned to the Pennsylvania Air National Guard's 171st Air Refueling Wing over Washington, D.C. U.S. Air Force photo by Staff Sgt. Samuel Rogers, courtesy of 171st ANG website.

[30] 171st Air Refueling Wing website, available at http://www.171arw.ang.af.mil/photos/mediagallery.asp?galleryID=6273; accessed 4/18/2014

Railroads

Today, railroads are relatively sparse in the 20D Raccoon Creek Watershed Region. Most of the railways in the Region are inactive, abandoned or are being converted to recreational rail-trails. Railroads were built in the late 19th and early 20th centuries primarily to service coal mining operations in the southern reaches of the Raccoon Creek Watershed. The Montour Railroad hauled coal from the productive mines of the Pittsburgh coal seam in northern Washington and western Allegheny Counties to steel mills that once lined the Ohio River near Weirton, East Liverpool, Coraopolis and Pittsburgh.

At the very northern boundary of the Raccoon Creek Region, a rail line connects the industrial complexes along the southern bank of the Ohio River. This reach of rail is currently inactive (see Figure 1.26 below). However, new industrial development near the mouth of Raccoon Creek may require the construction of more rail lines and reactivation of presently unused spurs.

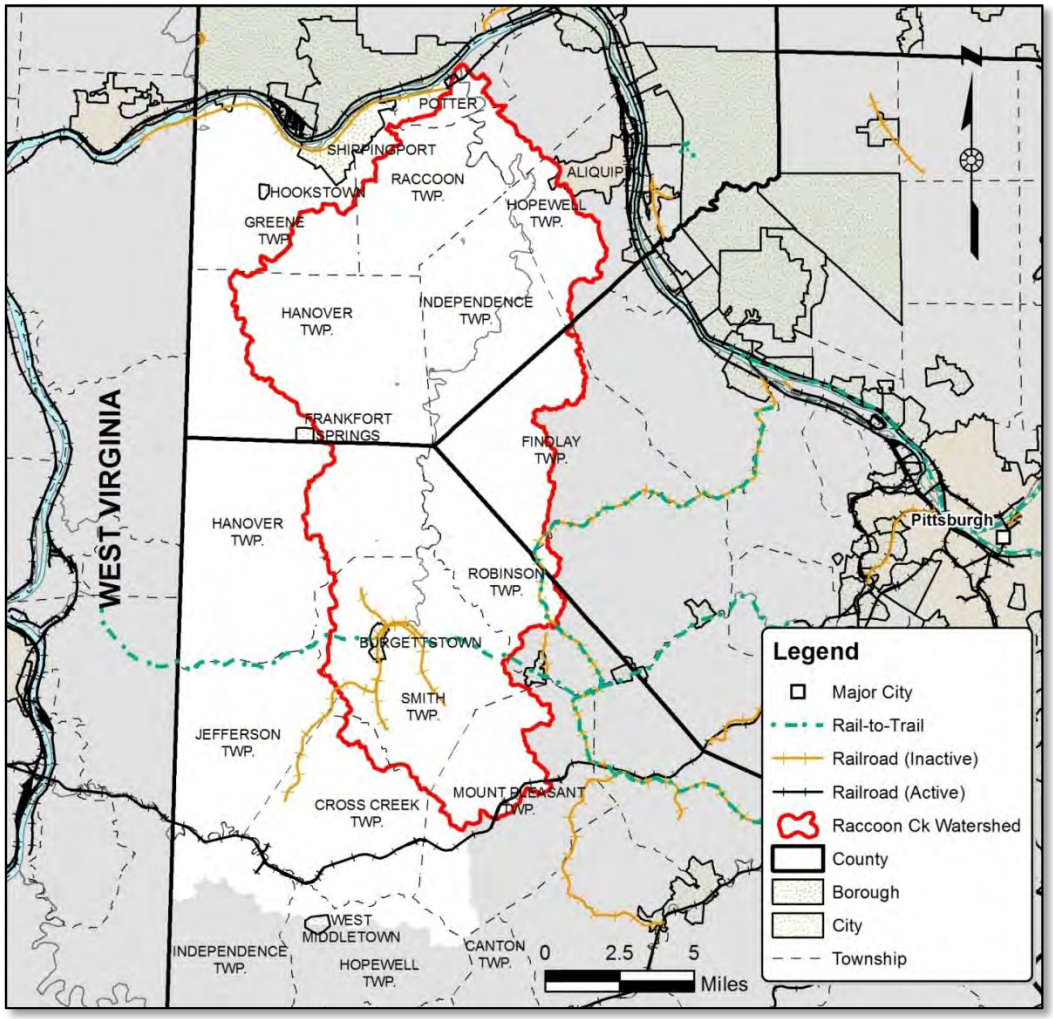

Figure 1.26: Railroads of the 20D Raccoon Creek Region: Active, Inactive and Rails-to-Trails.

Figure 1.27: A steam-powered locomotive of the Pittsburgh & West Virginia Railway Company travels across the Rex Smith farm on Avella Road (PA Route 50) in Cross Creek Township in 1941. Photo courtesy of Rachel Blosser, Manager, Cross Creek Township.

Recently, the Wheeling and Lake Erie line in the Cross Creek Watershed has seen a great increase in traffic as the result of natural gas production in the southern reaches of the Raccoon Creek Region. Gas is shipped via tanker cars from Mark West Midstream's processing plant outside of Westland to markets in the midwestern United States. At least four trainloads of coal and tanker cars of gas travel the Wheeling and Lake Erie line daily.

Montgomery Lock & Dam

Moving freight on America's rivers is the cleanest, quietest and most energy- efficient mode of surface transportation. A standard dry cargo barge can move as much material as seventy trucks or sixteen rail cars. Fifteen barges, a commonly-sized tow, carry as much cargo as 1050 tractor trailers at a fraction of the fuel consumption. One loaded tank barge carries enough gasoline to satisfy the annual demand of about 2,500 people. Water transportation has fewer fatalities and injuries than other modes. There is only one inland marine injury for every 2172 accidents in the highway transportation sector.[31] Before engines were invented, our towns and cities were founded along waterways because goods and people could be moved more easily on water than over land.

[31] US Department of Transportation, Maritime Administration – Waterways Working for America, available at http://www.marad.dot.gov/documents/water_works_REV.pdf accessed 4/14/2014

The Montgomery Locks and Dam were constructed on the Ohio River by the U.S. Army Corps of Engineers from 1932 to 1936. Montgomery is about five miles downriver from Beaver, PA, just below the mouth of Raccoon Creek. Opened in June 1936 and renovated in 1988, this facility replaced the original wooden wicket dams of Locks and Dams 4, 5 and 6 built in the 1890s.

Montgomery Locks and Dam have a gated dam, built to control the water level in the navigation pool upriver of the dam. Machinery mounted on tall concrete piers moves large chains which lift gates that are raised or lowered to control the amount of water flowing under them. The upstream, or "Montgomery Pool," is maintained at a relatively constant depth of at least nine feet throughout its length. About 300 commercial vessels pass through Montgomery every month, plus another 150 lockages of pleasure craft during the busy summer boating season.[32]

Figure 1.28: Workers lash a tow of barges together after locking through at Montgomery Dam on the bitter cold morning of January 24, 2014. Photo courtesy of the Beaver County Times.

Heavy Industry

Although the 20D Raccoon Creek Watershed Region is mostly rural, heavy industry dominates two stretches of the south shore of the Ohio River – the relatively flat lands where Raccoon Creek empties into the Ohio River, and the next place downstream with similar terrain, the area around Shippingport.

Flat land near the mouth of Raccoon Creek has been attractive to humans since prehistoric times. The Monongahela People lived throughout the watershed and were the last of the prehistoric dwellers near the mouth of the creek. Later, this area was home to Lenape tribes and overseen by the Iroquois Federation.

Brutal conflicts with European settlers resulted in driving the First Americans from the flat banks of the Ohio River. European newcomers built farms and port villages, assembling barges and packet boats for transportation on the wide, shallow Ohio River. The advent of World War II brought the most drastic changes to the mouth of Raccoon Creek. The beautiful, productive family farms of 18th century settlers gave way to chemical factories and worker housing for the war effort.

[32] US Army Corps of Engineers, Pittsburgh District – Montgomery Locks and Dam, available at http://www.lrp.usace.army.mil/Missions/Navigation/LocksandDams/MontgomeryLocksDam.aspx accessed 4/13/2014

After the Second World War, the village of Shippingport was dwarfed by the Beaver Valley Nuclear Power Station, the world's first full-scale atomic electric power plant devoted exclusively to peacetime uses.[33]

This section details several of the most notable heavy industries in the 20D Raccoon Creek Region. More information about the industrial history of the Region can be found in "Section 6: Cultural Resources."

AES Beaver Valley Cogeneration

Since 1988, AES has been the largest independent electric power producer in the U.S. with two plants operating in Texas and one on the Ohio River in Potter Township.[34]

AES Beaver Valley power plant was built during World War II by the Koppers Corporation. In the early 1940s several defense facilities were constructed on the level, fertile farm lands at the mouth of Raccoon Creek. This general area was chosen because of ready access to river and rail transport and proximity to steel mills and factories farther upstream on the Ohio, Allegheny and Monongahela Rivers.

Figure 1.29: AES Beaver Valley's 125-megawatt power generating plant, formerly the boiler and powerhouse of "Kobuta."

Potter Township became the synthetic rubber producing center of the "Arsenal of Democracy" in the Pittsburgh region. Under contract with the U.S. Defense Plant Corporation, the Koppers United Company built a plant to produce Butadiene and Styrene, the main ingredients in synthetic rubber. The Potter Township plant and surrounding area came to be known as "Kobuta," a mesh of the words "Koppers" and "Butadiene."

Constructed in less than one year, the power plant was, at the time of its completion in 1943, the largest poured concrete building in the world. Individual structures at the plant were built to withstand a direct hit from a 500-lb. bomb in the event of an attack on the U.S. mainland. Lighting of the entire plant could be blacked out to avoid detection by enemy reconnaissance.

[33] http://www.nrc.gov/about-nrc/emerg-preparedness/history.html accessed 4/14/2014
[34] http://www.aes.com/Aboutus/History accessed 4/13/2014

At the peak of construction, over 7,000 people were involved in building Kobuta.[35] Several wartime housing units remained standing along Route 18 in Potter Township for decades.

BASF

BASF is an international chemical manufacturing company with U.S. headquarters in Florham Park, New Jersey. BASF's "Monaca Plant" in Potter Township is located along the Ohio River on the opposite bank of Raccoon Creek from AES Beaver Valley.

The Monaca Plant began production in 1954. Its products include polymers for paper coatings and binders, adhesives, textile coatings, paints, primers, sealants and construction chemicals. The facility also produces polymers used in manufacturing the backing of carpet and vinyl flooring.

According to its website,[36] the Monaca plant employs 129 people with an annual payroll of $10.1 million and $200,000 paid in state and local taxes. Plant officials are active in many facets of community relations including RECAP, the Route 18 Community Advisory Panel, a working group of business, government, education, health care and non-profit leaders focused on the Route 18 corridor in Beaver County.

Horsehead

Horsehead Corporation's "Monaca Plant" is located just outside of the eastern edge of the 20D Raccoon Creek Watershed boundary. A description of it is included in this Plan because Horsehead Corporation owns acreage surrounding the plant along both sides of Raccoon Creek near its confluence with the Ohio River in Potter Township.

Horsehead's Monaca plant was built in 1930 by the St. Joseph Lead Company to produce zinc metal and zinc oxide from ore brought in by barge or rail from mines in the

Figure 1.30: The power plant at Horsehead Corporation is being demolished to make way for a petrochemcial plant proposed by Royal Dutch Shell. 4/10/2014.

[35] The Story of Kobuta-AES Beaver Valley Plant History brochure, produced for Potter Township's Centennial, 2012
[36] BASF website, available at http://www.basf.com/group/corporate/en_GB/function/conversions:/publish/content/about-basf/worldwide/north-america/USA/about-basf/fact-sheets/pdfs/Monaca.pdf; accessed 4/13/2014

Adirondack Mountains of New York.[37] The facility passed through several ownerships, the most recent being Horsehead Corporation. In 2014 the Monaca Plant ceased operations due to construction of a new facility in North Carolina.

In March of 2012, Horsehead entered into an agreement granting Shell Chemical LP an option to purchase the site of its Monaca Plant to evaluate it for a potential petrochemical complex.[38] Shell officials are not expected to make a final decision about building the proposed plant until sometime in 2015.[39] Should a new petrochemical refinery be built at the mouth of Raccoon Creek, its effects on the local environment, economy, infrastructure, social fabric and character of the region will be profound and far-reaching.

FirstEnergy

FirstEnergy Corporation is a diversified power generating company headquartered in Akron, Ohio. Its subsidiaries and affiliates generate, transmit and distribute electricity to six million customers in Ohio, Pennsylvania, West Virginia, Virginia, Maryland, New Jersey and New York. Its ten electric utility operating companies comprise the nation's largest investor-owned utility.[40] FirstEnergy operates two power generating plants in the 20D Raccoon Creek Watershed Region, the coal-fired Bruce Mansfield Plant and the Beaver Valley Nuclear Power Station, both located along the Ohio River in Shippingport.

The Bruce Mansfield Plant

First Energy's 2490-megawatt Bruce Mansfield Plant is the largest electric power plant in Pennsylvania and one of the largest in the U.S. The plant employs approximately 500 people, plus 500 more during annual maintenance outages. The plant pays more than $1.2 million annually in property taxes and approximately $4 million per year in state and local taxes. The plant's three generating units produce enough electricity to power more than 1.5 million homes. The Bruce Mansfield Plant was the first power plant built in North America with sulfur dioxide (SO_2) scrubbers as original equipment.[41]

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[37] YouTube, available at https://www.youtube.com/watch?v=426BYtzPY_A; accessed 4/13/2014: "Zinc, It's Mining, Milling and Smelting," film library of the U.S. Bureau of Mines, U.S. Department of the Interior, Washington, D.C., 1948.

[38] http://pittsburgh.citybizlist.com/article/horsehead-enters-option-agreement-shell-0; accessed 4/13/2014

[39] Beaver County Times Online, available at http://www.timesonline.com/news/energy/local-officials-comment-on-meeting-with-shell/youtube_dae778f4-0c8e-53a8-8ccd-aeb21515eb6b.html; accessed 4/13/2014

[40] Wikipedia, available at http://en.wikipedia.org/wiki/FirstEnergy; accessed 4/13/2014

[41] FirstEnergy website, available at https://www.firstenergycorp.com/environmental/environmental_stewardship/by-product-disposal/LittleBlueRunInfo/facts_and_history.html; accessed 4/13/2014.

As part of the power-generation process, coal combustion byproducts, commonly known as flyash, are created.[42] Since 1974 the flyash has been stored at a residual waste disposal impoundment in Greene Township known as "Little Blue." The impoundment was created by building an earthen dam of nine million cubic yards of earth and rock fill across the valley of Little Blue Run near its confluence with the Ohio River. The Bruce Mansfield Plant is connected

Figure 1.31: Little Blue Impoundment as seen from 18,000 feet. Google Earth image date 5/16/2012.

to Little Blue by a seven-mile underground pipe that carries 625,000 tons of wet fly ash and bottom ash to the reservoir each year.[43] The un-lined, 1700-acre impoundment is the largest flyash disposal site in the U.S.[44]

In addition to disposal at Little Blue, more than 450,000 tons per year of gypsum are produced from recycled flyash at the National Gypsum Company (NGC) wallboard factory across PA Route 168. NGC employs approximately 100 people.[45]

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[42] FirstEnergy website, available at https://www.firstenergycorp.com/environmental/environmental_stewardship/by-product-disposal/LittleBlueRunInfo/facts_and_history.html; accessed 4/13/2014.

[43] Pittsburgh Post-Gazette Online, available at http://www.post-gazette.com/local/neighborhoods/2009/01/11/Massive-coal-ash-reservoir-holding-up-in-Beaver-County/stories/200901110218; accessed 4/13/2014.

[44] National Geographic News, available at http://news.nationalgeographic.com/news/energy/2012/08/120809-little-blue-run-coal-ash-pond-to-close/; accessed 4/13/2014.

[45] FirstEnergy website, available at https://www.firstenergycorp.com/environmental/environmental_stewardship/by-product-disposal/LittleBlueRunInfo/facts_and_history.html; accessed 4/13/2014.

In December 2012, a Consent Decree between FirstEnergy Generation Corporation and the Pennsylvania Department of Environmental Protection (DEP) was finalized, setting December 31, 2016, as the last date wet scrubber material can be placed in the Little Blue Run impoundment. In March 2013, as required by the Consent Decree, FirstEnergy submitted a proposed closure plan for Little Blue Run to DEP for its review.[46] Hailed by some environmentalists as a victory, the closure of Little Blue does not resolve the larger issue of environmentally responsible storage of un-recycled coal-combustion byproducts.

Beaver Valley Nuclear Power Station

First Energy's Beaver Valley Nuclear Power Station is also located in Shippingport, considered the "birthplace" of commercial nuclear power. The Shippingport Atomic Power Station began generating electricity there in 1957. The facility was built in just thirty-two months. It is "the world's first full-scale atomic electric power plant devoted exclusively to peacetime uses."[47] After more than 25 years of safe operation, it became the first nuclear power plant to be decommissioned. Today, electricity is still produced at the site by its successor, Beaver Valley Nuclear Power Station.

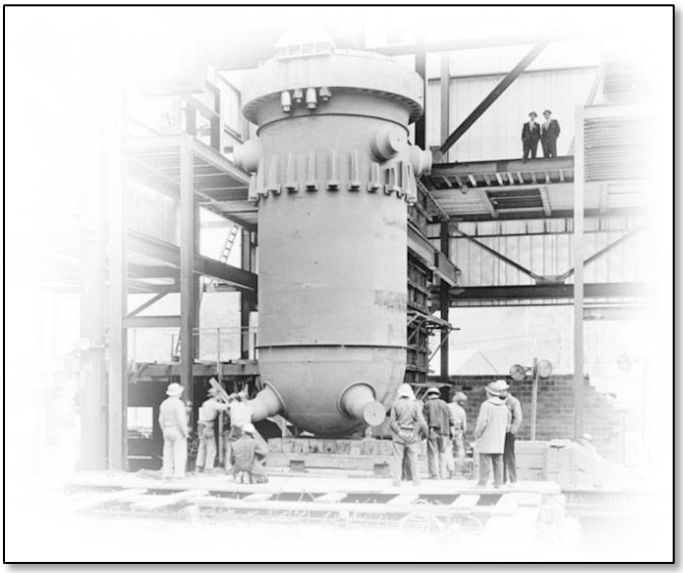


Figure 1.32: The reactor vessel is lowered into place at Shippingport Atomic Power Station in October, 1957. Photo from First Energy Archives.

Beaver Valley's two power generating units create a net 1800 megawatts - enough electricity to power more than one million homes daily. The plant is one of the largest employers in Beaver County, providing over 1,000 jobs and contributing more than $4 million annually in property, payroll and utility taxes. Licenses for Units One and Two expire in 2036 and 2047 respectively.[48]

[46] FirstEnergy website, available at https://www.firstenergycorp.com/content/fecorp/environmental/environmental_stewardship/by-product-disposal/LittleBlueRunInfo.html accessed 4/13/2014.
[47] US Nuclear Regulatory Commission website, available at http://www.nrc.gov/about-nrc/emerg-preparedness/history.html; accessed 4/14/2014.
[48] FirstEnergy website, available at https://www.firstenergycorp.com/content/fecorp/about/generation_system/FENOC/beaver_valley.html; accessed 4/14/2014.

NOVA Chemicals

NOVA Chemicals' Beaver Valley plant is located on the Ohio River in Potter Township. Its plant, like that of Horsehead, lays just beyond the boundary of the 20D Raccoon Creek Watershed. NOVA, however, owns significant acreage along the lower reaches of Raccoon Creek and the bluffs of the Ohio River within 20D.

NOVA's Beaver Valley plant manufactures expandable polystyrene resins and foam resins used in the automotive and recreational industries, protective material packaging, insulation and high-end electronics. This site also houses a Styrenics Technology Center which contains an applications lab and a pilot plant for testing and customer demonstrations.

Originally a part of the historic Kobuta complex, NOVA's Beaver Valley Plant was built by the U.S. government in 1942 to produce synthetic rubber raw materials as part of the United States Synthetic Rubber Program during World War II. Site ownership transitioned over the years through the U.S. government, Koppers Company, Sinclair Oil Company, ARCO Chemical Company, to NOVA Chemicals, which is part of the International Petroleum Investment Company (IPIC) of Abu Dhabi.[49]

Figure 1.33: Union Electric Steel's 5000-ton hydraulic forge press at its Harmon Creek Plant near Burgettstown.
Photo courtesy of UES website.

Union Electric Steel

Union Electric Steel (UES) is one of the world's leading producers of forged hardened steel, cast iron and cast steel rolls. Headquartered in Carnegie, PA, UES is one of the world's largest producers of rolls for the ferrous and non-ferrous rolling industries.[50]

UES's Harmon Creek Plant is located on 84 acres in the Burgetts Fork Watershed along PA Route 18 north of Burgettstown in Smith Township. The plant's operations include forging, annealing and rough machining. The Melt Shop features an electric arc furnace producing bottom poured ingots.[51] In 2010 the plant added a 5,000 ton open hydraulic forge press and manipulator to produce rolls for

[49] NOVA Chemicals website, available at http://www.novachem.com/Pages/company/monaca-pennsylvania.aspx; accessed 4/13/2014.
[50] Union Electric Steel website, available at http://www.uniones.com/about-ues/this-is-union-electric-steel; accessed 4/13/2014.
[51] Union Electric Steel website, available at http://www.uniones.com/about-ues/this-is-union-electric-steel/facilities; accessed 4/13/2014.

the metals industry.[52]

Public Water Supplies

For the most part, homeowners in the 20D Raccoon Creek Region rely on wells drilled on their own property for domestic water supply. However, there are a few public water providers in the Region. Table 1.14 lists these providers and the source of their water, either surface or groundwater, and/or interconnected to another system.

Figure 1.34: Ambridge Water Authority's Service Creek Reservoir seen from John Anderson Memorial Cemetery at Service United Presbyterian Church, Raccoon Twp. 4/16/2014

Ironically, the largest public water reservoir in the Region does not supply water to local residents. The Ambridge Water Authority's Service Creek Reservoir, pictured at right, was built in 1950-1951 to supply the borough of Ambridge on the other side of the Ohio River. In the 1930s and 1940s, Ambridge's wells along the river suffered from poor quantity and quality due to acid mine drainage and heavy industrial pollution loading. Today, water from the impoundment of Service Creek in Raccoon Township provides abundant clean water for 30,000 people in nine communities including and surrounding Ambridge on the east side of the River.[53]

[52] Union Electric Steel website, available at http://www.uniones.com/press-room/47-press-room-new-forging-press; accessed 4/13/2014.
[53] Ambridge Water Authority website, available at http://www.ambwater.org/about-us/history/ ; accessed 4/13/2014.

Table 1.14: Public Water Supplies in the 20D Raccoon Creek Region[54]

Public Water Supply	Ownership	County	Source
Findlay Twp. Municipal Authority	Authority	Allegheny	Interconnected
Moon Twp. Municipal Authority	Authority	Allegheny	Surface water; Interconnected
Western Allegheny Co. Mun. Authority	Authority	Allegheny	Interconnected
Aliquippa Water Authority	Authority	Beaver	Surface water; Interconnected
Ankrom Acres Mobile Home Park	Mobile Home Park	Beaver	Groundwater
Center Twp. Water Authority	Authority	Beaver	Groundwater
Creswell Heights Joint Authority	Authority	Beaver	Surface
Harshbarger's Mobile Home Park	Mobile Home Park	Beaver	Groundwater; Surface water
Independence Park	Mobile Home Park	Beaver	Groundwater
Raccoon Creek State Park	PA DCNR	Beaver	Surface water
Shippingport Borough	Municipal	Beaver	Groundwater
Sunrise Mobile Home Park	Mobile Home Park	Beaver	Groundwater
PA American Water Co. Pgh. District	Private Investor	Washington	Surface water; Interconnected

Sanitary Sewer Systems

The Commonwealth of Pennsylvania requires municipalities to prepare a Sewage Facilities Plan as authorized under Pennsylvania Act 537. The presence or absence of public sewage treatment facilities can have a considerable impact on land development. Areas without public sewage are limited to on-lot treatment systems which can fail and cause pollution if not properly maintained by the owners or users. Extending sanitary sewer lines to new areas is a substantial public investment. County Comprehensive Plans integrate public sewage treatment into their land use policies.

Table 1.15 lists public sewage treatment systems in the 20D Region.

Table 1.15: Sanitary Sewer Systems in the 20D Raccoon Creek Region[55]

Sewage Treatment Provider Name	County
Findlay Township Municipal Authority	Allegheny
Aliquippa Municipal Water Authority	Beaver
Center Township Sewer Authority	Beaver
Hopewell Township Sewer Authority	Beaver
Raccoon Creek State Park (DCNR)	Beaver
Burgettstown-Smith Joint Sewage Authority	Washington
Cross Creek-Independence Joint Sewer Authority	Washington

[54] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[55] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

"Plate 1.4: Public Utilities" shows the service areas of public water and sewer supplies in the Raccoon Creek Region. The vast majority of residents of the Region have no access to public wastewater treatment facilities, relying instead on on-lot systems such as sand mounds, septic tanks and leach fields.

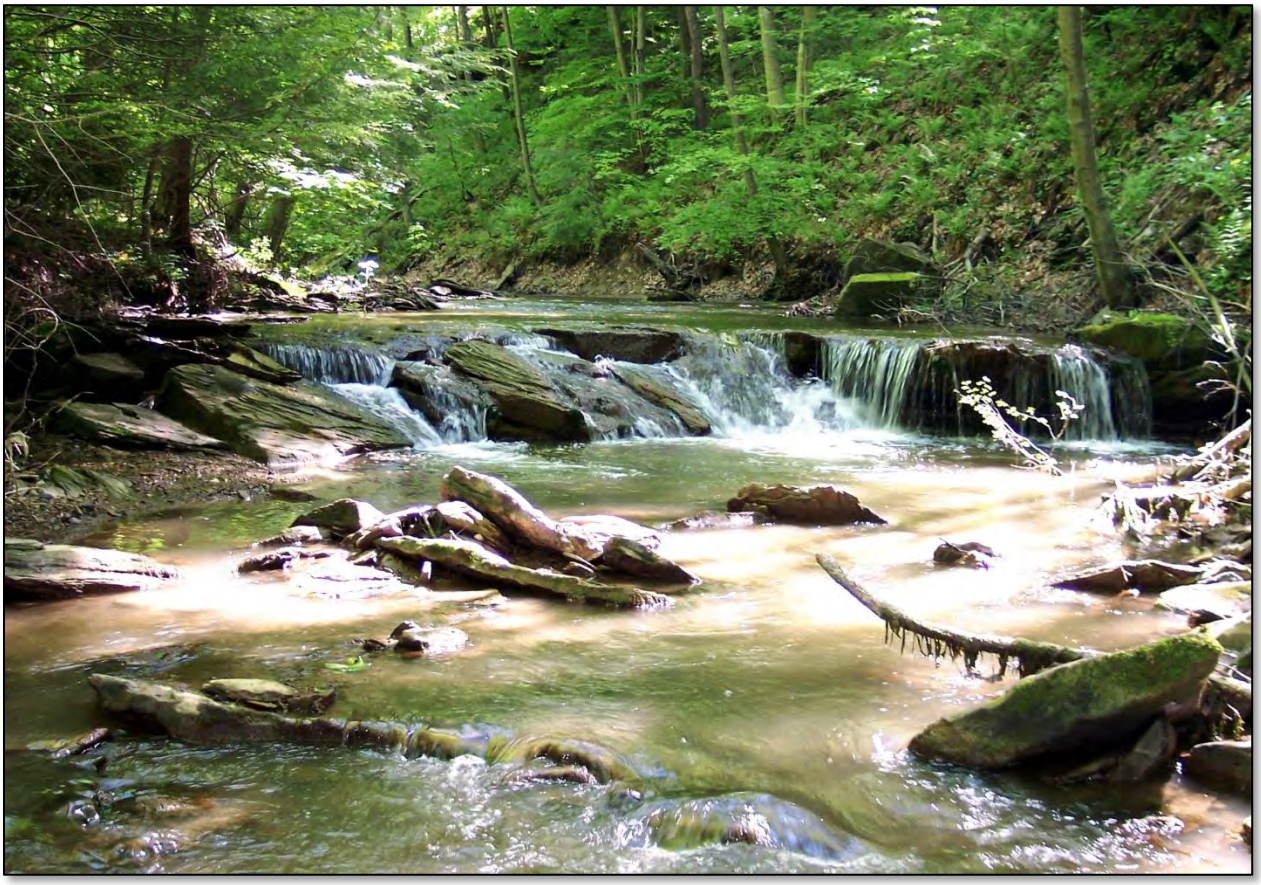
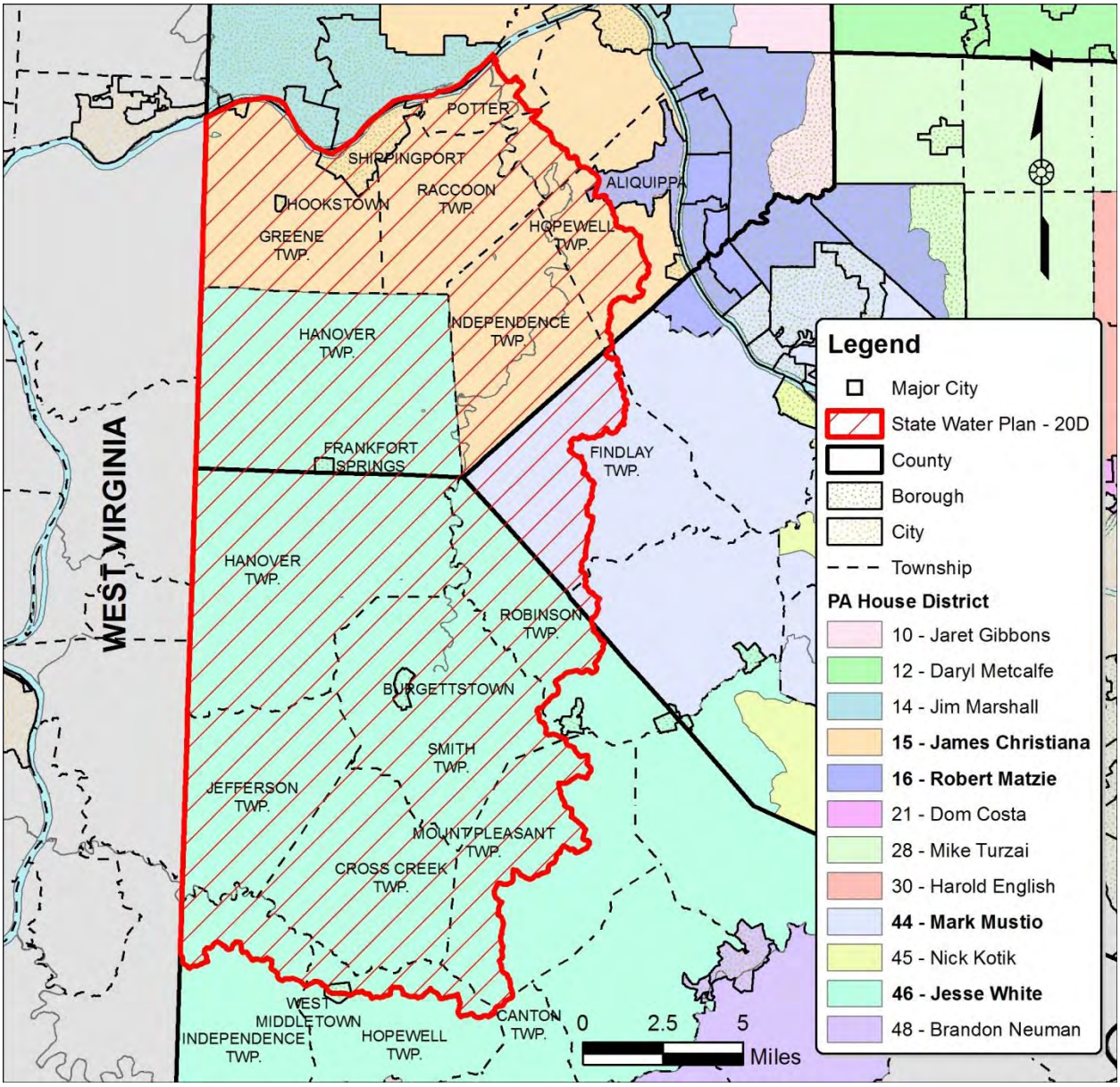
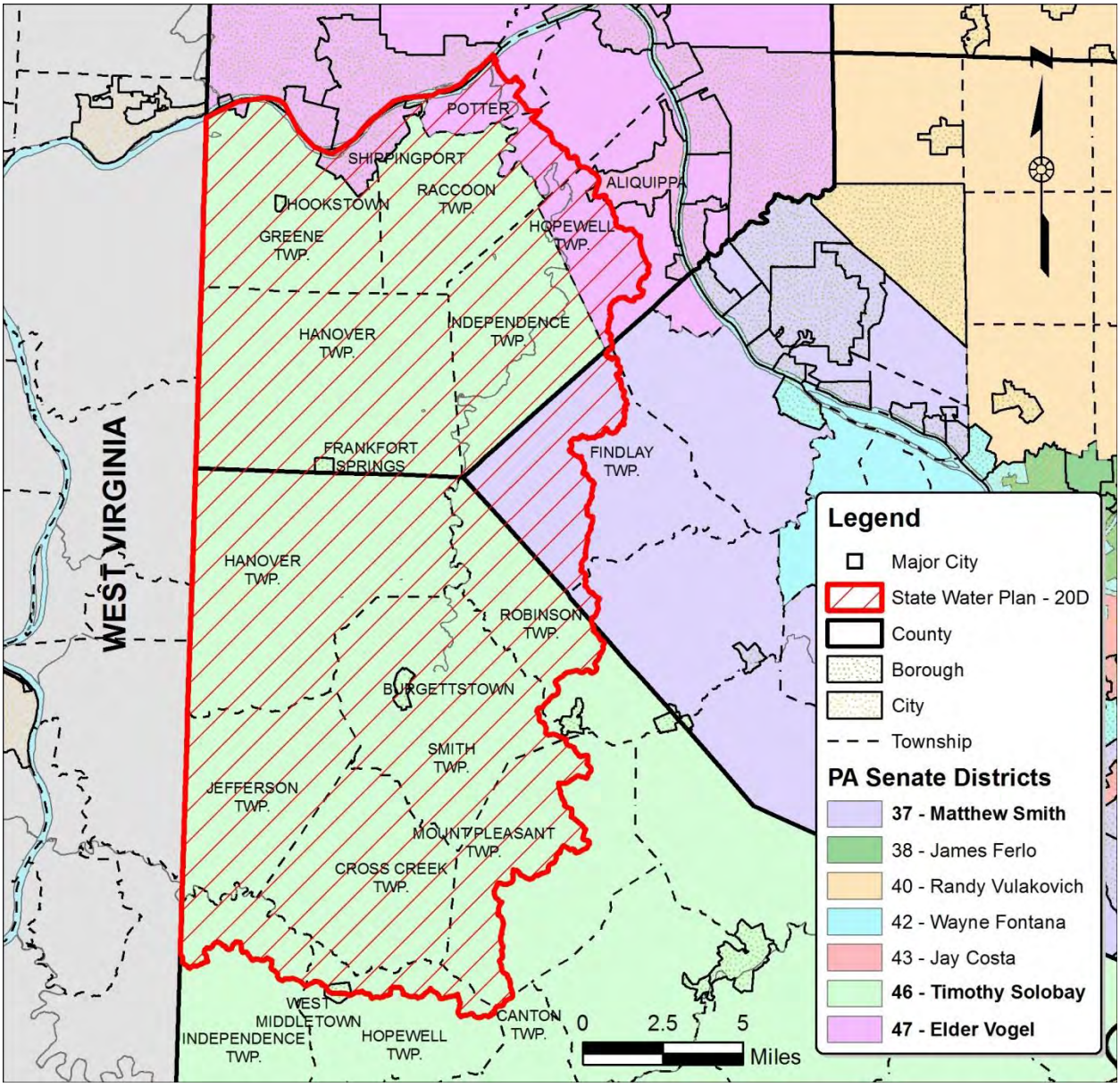


Figure 1.35: Scott Run, a tributary to Cross Creek in Jefferson Township, has a greater quantity and diversity of macroinvertebrates than any watershed in Washington County. Although heavily strip mined, its discharges are alkaline, allowing sensitive aquatic insects to flourish. Photo 5/26/05, courtesy of Washington County Conservation District.

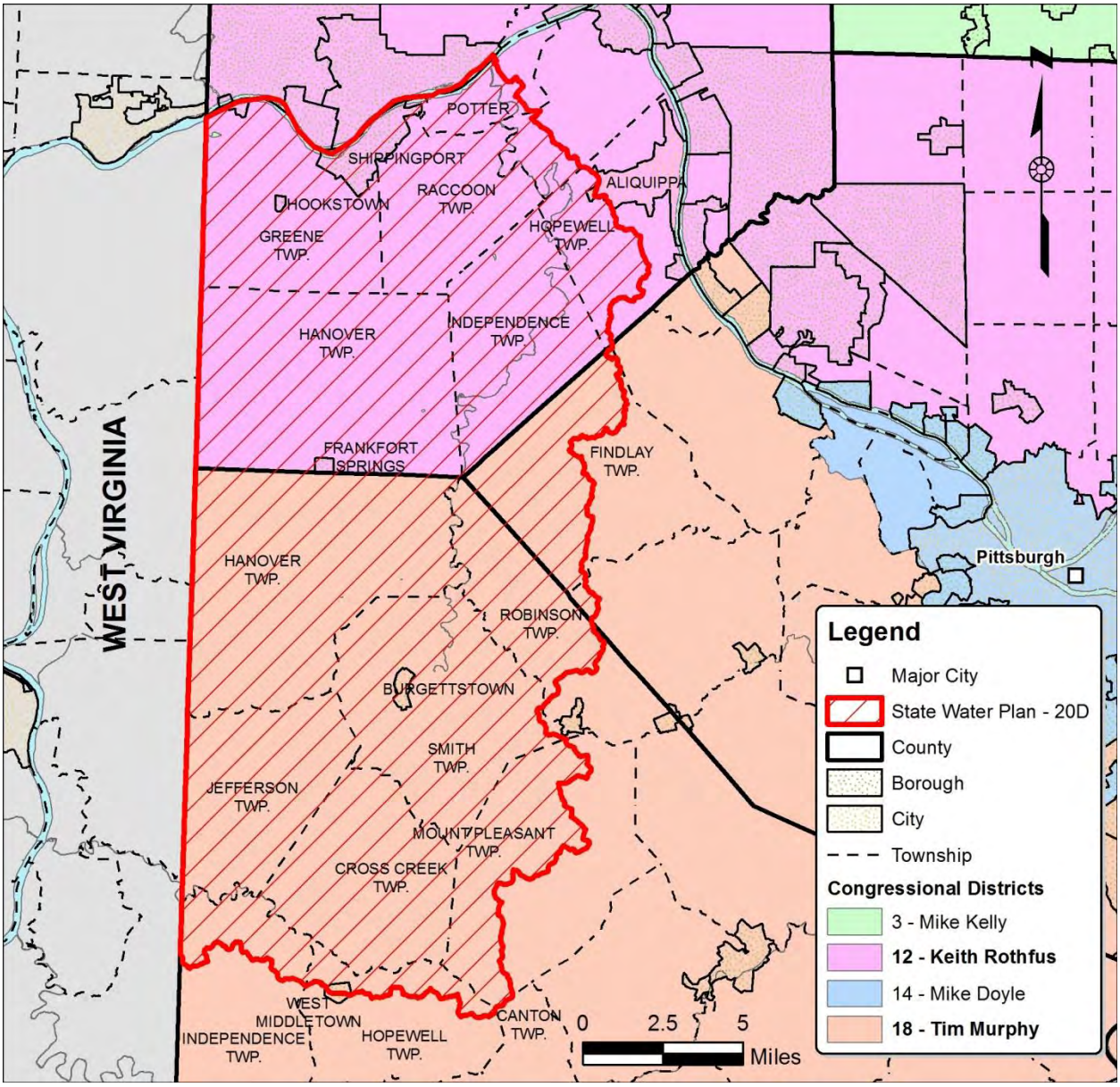
Appendix 1.1: Pennsylvania House of Representatives Districts



Appendix 1.2: Pennsylvania Senate Districts



Appendix 1.3: United States Congressional Districts



Section 1: Plates

OHIO

BEAVER CO.

WEST VIRGINIA

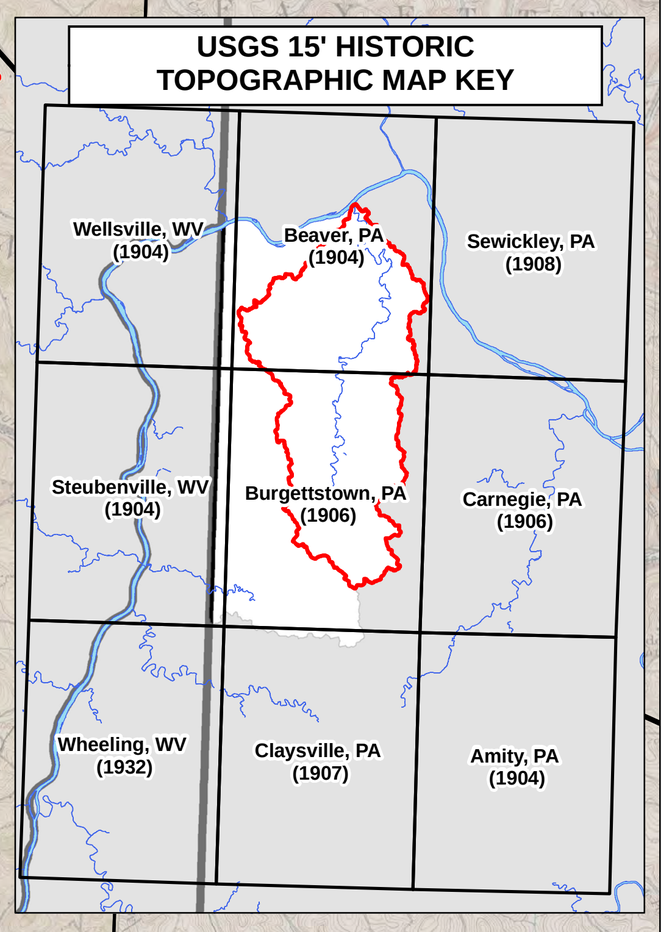
ALLEGHENY CO.

WASHINGTON CO.

N

0 1 2 Miles

USGS 15' HISTORIC TOPOGRAPHIC MAP KEY



Legend

Raccoon Ck Watershed

PLATE 1.1 - HISTORIC TOPOGRAPHIC MAPS

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BRIGHTON TWP.

OHIOVILLE

INDUSTRY

EAST LIVERPOOL

MIDLAND

Georgetown

Shippingport

POTTER

Holt

McCleary

RACCOON TWP.

Hookstown

GREENE TWP.

BEAVER CO.

Mechanicsburg

Harshaville

Kendall

HANOVER TWP.

INDEPENDENCE TWP.

Bocktown

Gringo

Independence

Five Points

Davidson Heights

New Sheffield

Crestmont Village

HOPEWELL TWP.

ALIQUIPPA

AMBRIDGE

HARMONY

BADEN

CONWAY

CENTER TWP.

FREEDOM

MONACA

BEAVER

VANPORT

EAST ROCHESTER

NEW SEWICKLEY TWP.

ECONOMY

BELL ACRES

LEET

LEETSDALE

SEWICKLEY HEIGHTS

CRESCENT

EDGEWORTH

SEWICKLEY

OSBORNE

CORAOPOLIS

MOON TWP.

McAlisters Crossroads

Pittsburgh International Airport

Clinton

FINDLAY TWP.

ALLEGHENY CO.

Imperial

Robinson

HILLMAN STATE PARK

RACCOON CREEK STATE PARK

Comettsburg

Frankfort Springs

Murdocksville

Florence

Bavington

Santiago

Champion

ROBINSON TWP.

Paris

Dinsmore

Burgettstown

Joffre

Bulger

Candor

SMITH TWP.

Hanlin Station

Langeloth

Slovan

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

WASHINGTON CO.

MOUNT PLEASANT TWP.

Studa

CROSS CREEK TWP.

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

West Middletown

INDEPENDENCE TWP.

WEST MIDDLETOWN

HOPEWELL TWP.

CANTON TWP.

MIDWAY

MCDON

Ohio River

Miles 0 1 2

Legend

- Community
- Lock & Dam
- Raccoon Ck Watershed
- County

Terrain

- High : 1565 ft (477m)
- Low : 623 ft (190m)

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

PLATE 1.2 - TERRAIN MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

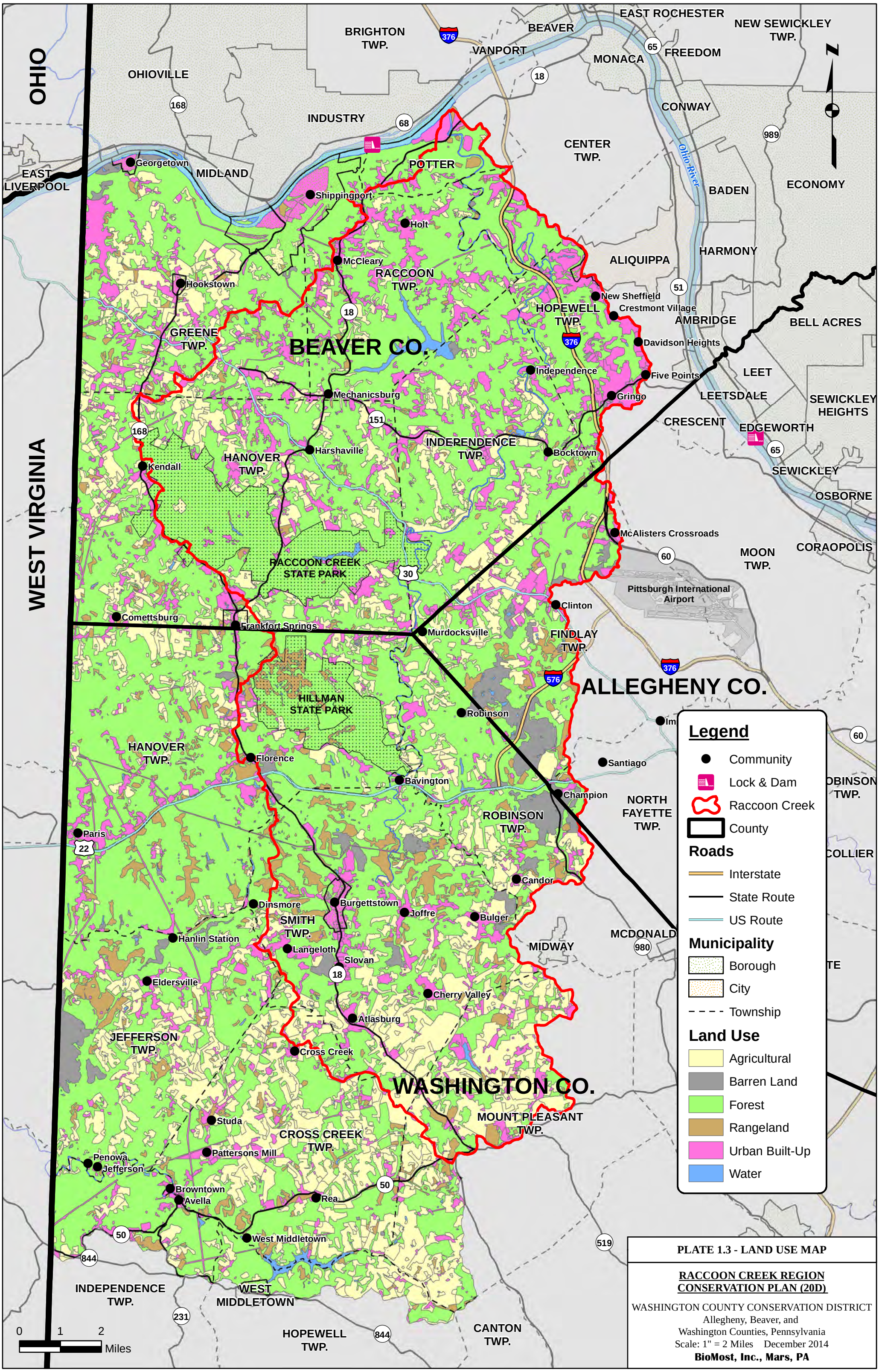
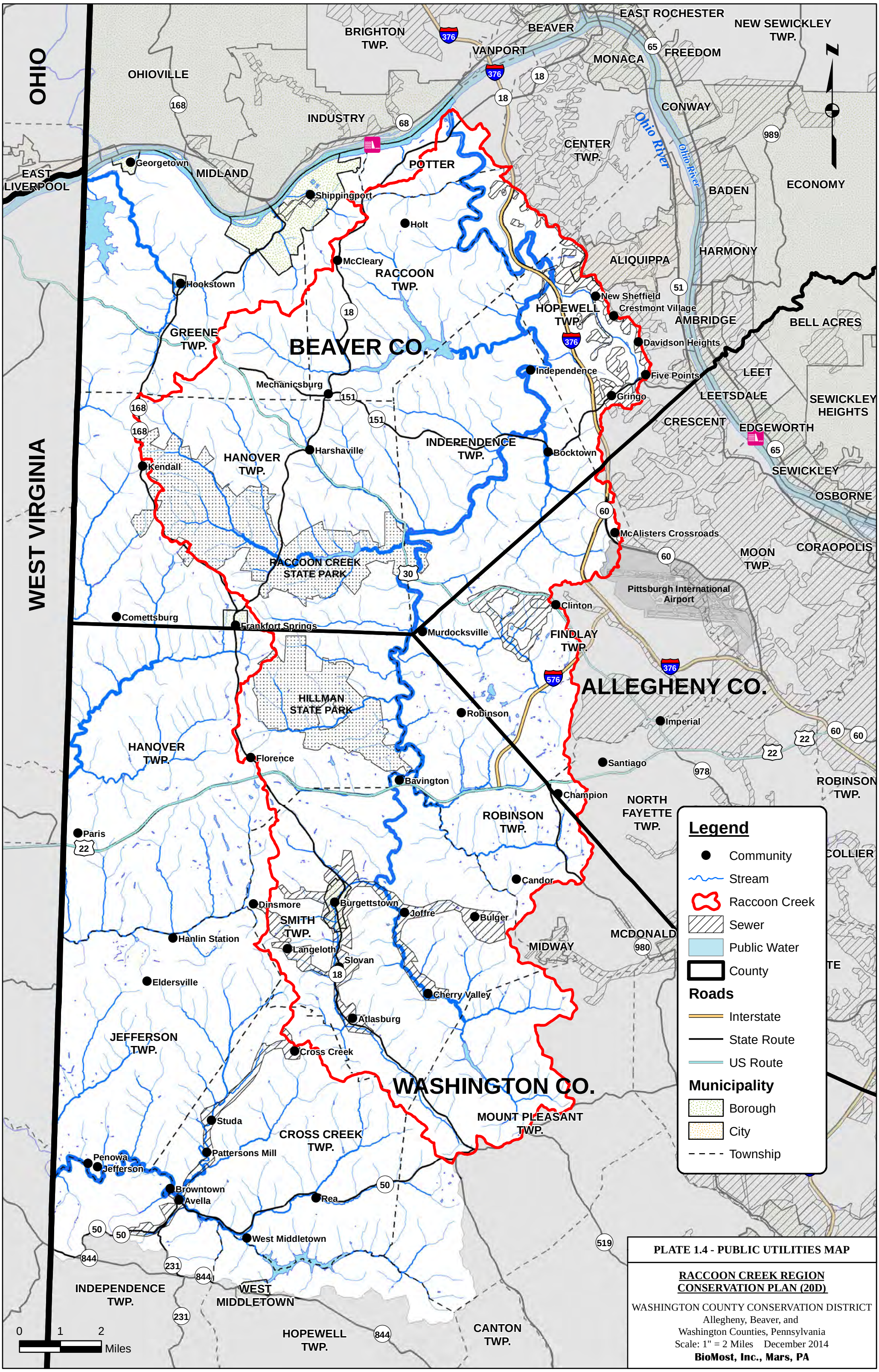
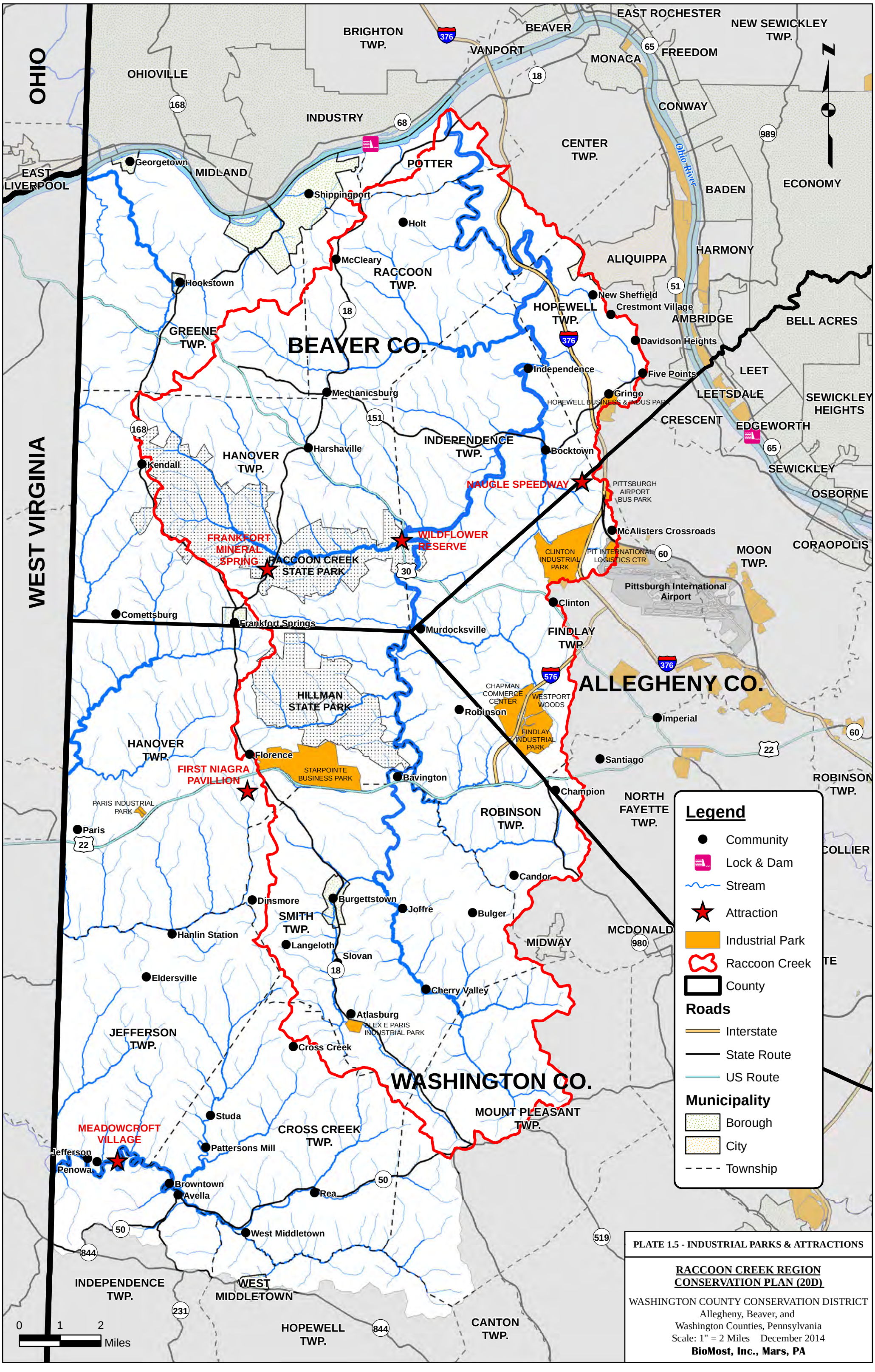


PLATE 1.3 - LAND USE MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BEAVER CO.
ALLEGHENY CO.
WASHINGTON CO.
EAST ROCHESTER
NEW SEWICKLEY TWP.
BRIGHTON TWP.
BEAVER
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
CENTER TWP.
Ohio River
BADEN
ECONOMY
EAST LIVERPOOL
Georgetown
MIDLAND
POTTER
Shippingport
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
HANOVER TWP.
Kendall
SEWICKLEY
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
HILLMAN STATE PARK
Robinson
Imperial
Santiago
ROBINSON TWP.
Florence
Bavington
Champion
NORTH FAYETTE TWP.
Paris
ROBINSON TWP.
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
MCDONALD
Hanlin Station
Langeloth
MIDWAY
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
Studa
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Penowa
Jefferson
Pattersons Mill
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
COLLIER
Legend
Community
Stream
Raccoon Creek
Sewer
Public Water
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
0 1 2
Miles
PLATE 1.4 - PUBLIC UTILITIES MAP
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
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Ohio River
BADEN
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EAST LIVERPOOL
Georgetown
MIDLAND
POTTER
Shippingport
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
BEAVER CO.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
HOPEWELL BUSINESS & INDUS PARK
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
INDEPENDENCE TWP.
Harshaville
Bocktown
HANOVER TWP.
Kendall
SEWICKLEY
NAUGLE SPEEDWAY
PITTSBURGH AIRPORT BUS PARK
OSBORNE
McAlisters Crossroads
FRANKFORT MINERAL SPRING
WILDFLOWER RESERVE
RACCOON CREEK STATE PARK
CLINTON INDUSTRIAL PARK
PIT INTERNATIONAL LOGISTICS CTR
MOON TWP.
CORAOPOLIS
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
ALLEGHENY CO.
CHAPMAN COMMERCE CENTER
WESTPORT WOODS
HILLMAN STATE PARK
Robinson
Imperial
FINDLAY INDUSTRIAL PARK
Santiago
HANOVER TWP.
Florence
STARPOINTE BUSINESS PARK
FIRST NIAGRA PAVILLION
Bavington
Champion
ROBINSON TWP.
NORTH FAYETTE TWP.
PARIS INDUSTRIAL PARK
Paris
Legend
Community
Lock & Dam
Stream
Attraction
Industrial Park
Raccoon Creek
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
MIDWAY
MCDONALD
Hanlin Station
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
ALEX E PARIS INDUSTRIAL PARK
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
Studa
MEADOWCROFT VILLAGE
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Jefferson
Penowa
Pattersons Mill
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
0 1 2 Miles
PLATE 1.5 - INDUSTRIAL PARKS & ATTRACTIONS
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BEAVER CO.

WASHINGTON CO.

ALLEGH

BRIGHTON TWP.

EAST ROCHESTER

NEW SEWICKLEY TWP.

BEAVER

VANPORT

MONACA

FREEDOM

OHIOVILLE

CONWAY

INDUSTRY

CENTER TWP.

POTTER

Ohio River

EAST LIVERPOOL

Georgetown

MIDLAND

Shippingport

BADEN

ECONOMY

Holt

McCleary

RACCOON TWP.

ALIQUIPPA

HARMONY

Hookstown

New Sheffield

Crestmont Village

HOPEWELL TWP.

AMBRIDGE

BELL ACRES

GREENE TWP.

Davidson Heights

Independence

Five Points

LEET

Mechanicsburg

Gringo

LEETSDALE

SEWICKLEY HEIGHTS

CRESCENT

EDGEWORTH

Harshaville

INDEPENDENCE TWP.

Bocktown

Kendall

HANOVER TWP.

SEWICKLEY

OSBORNE

McAlisters Crossroads

CORAOPOLIS

MOON TWP.

RACCOON CREEK STATE PARK

Pittsburgh Air

Clinton

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

HILLMAN STATE PARK

Robinson

HANOVER TWP.

Florence

Santiago

Bavington

Champion

NORTH FAYETTE TWP.

ROBINSON TWP.

Paris

Candor

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Hanlin Station

MCDONALD

Langeloth

Slovan

MIDWAY

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

Studa

CROSS CREEK TWP.

MOUNT PLEASANT TWP.

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

West Middletown

INDEPENDENCE TWP.

WEST MIDDLETOWN

HOPEWELL TWP.

CANTON TWP.

0 1 2 Miles

School Districts

- Aliquippa
- Avella Area
- Burgettstown Area
- Central Valley
- Fort Cherry
- Hopewell Area
- South Side Area
- West Allegheny

Legend

- Community
- Lock & Dam
- Schools
- Stream
- Raccoon Creek
- County

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

PLATE 1.6 - SCHOOL DISTRICT MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

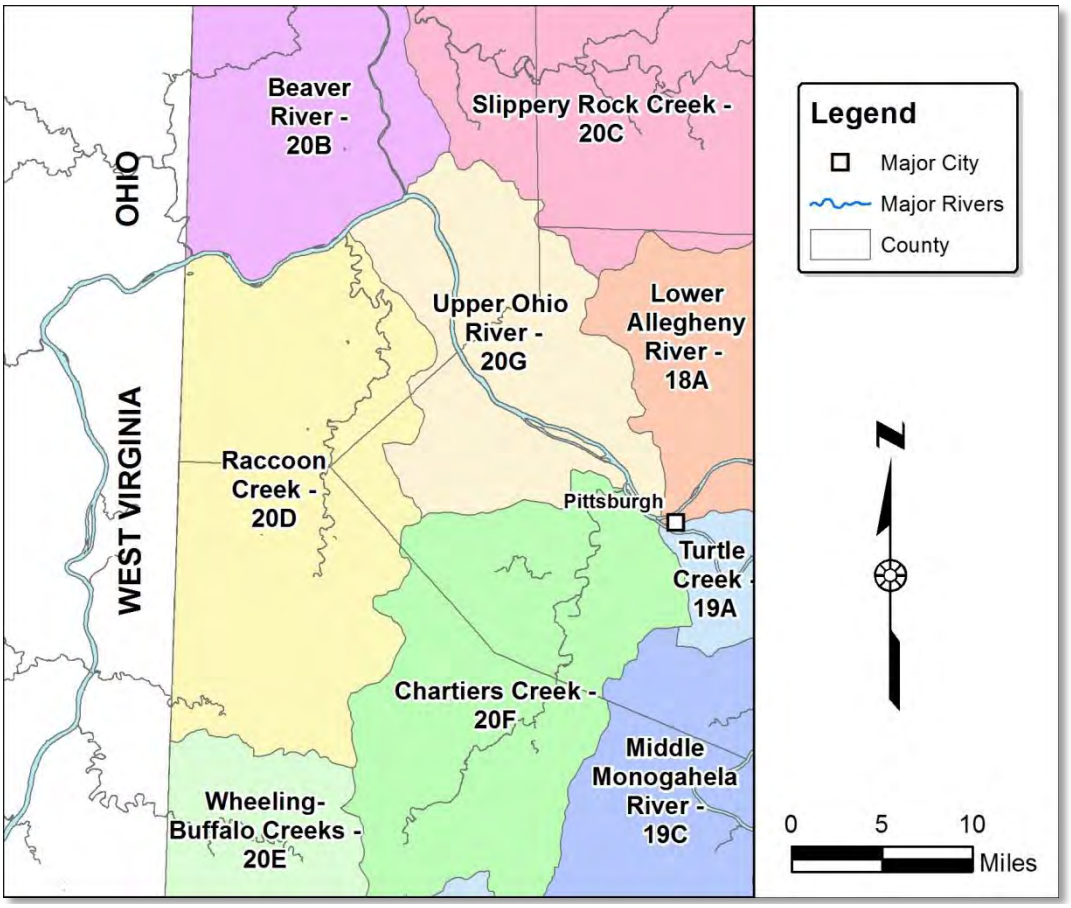
Section 2: Issues, Concerns, Constraints

Introduction

Stakeholder input was vital to developing the 20D Raccoon Creek Region Conservation Plan. A stakeholder is someone who is involved in or affected by a course of action. The Issues, Concerns and Constraints Section of this Plan consists of input from those who live, work or play in the Raccoon Creek Region and therefore have a vested interest in its future.

The Raccoon Creek Region is defined in this Plan as the entire 20D Sub-basin of the Pennsylvania State Water Plan (see Figure 2.1 and Plate 4.1). This 330.5 square mile region includes not only the Raccoon Creek Watershed itself, but also the part of Pennsylvania drained by smaller tributaries of the Ohio River that lie between the West Virginia state line and the Raccoon Creek Watershed. The 20D Region covers southern Beaver County, northern Washington County, and a small part of northwestern Allegheny County. It includes seventeen townships, six boroughs and a small section of one city. Over 64,000 people live in the 20D Sub-basin. In Figure 2.1 below, the Raccoon Creek Region is depicted in pale yellow.

Figure 2.1: Pennsylvania's State Water Plan Sub-Basins



The following methods were used to identify issues of concern to stakeholders in the Raccoon Creek Region:

- Research conducted by the 20D Raccoon Creek Region Conservation Plan Steering Committee, Independence Conservancy, Raccoon Creek and Cross Creek Watershed Associations and Stream Restoration Inc. (a 501c3 non-profit organization).
- Distribution of surveys at community events.
- Meetings with organizations and individuals.
- Coordination and meetings with municipalities.
- Coordination with regulatory agencies.
- Email communications to local groups, notices in local newspapers and the Independence Conservancy website.
- Online survey offered on Survey Monkey.

In addition, an extensive effort to seek public input for plan preparation was made by the 20D Raccoon Creek Region Conservation Plan Project Facilitator, including:

- Coordinating Steering Committee meetings.
- Coordination and meetings with municipalities.
- Conducting personal interviews.
- Coordination and meetings with local organizations.
- Exhibiting informational displays at community and regional events.
- Media coordination.
- Publishing information in newsletters of local organizations and partner groups.
- Placing information and updates on the Independence Conservancy website and e-newsletter.

Thank you to the local residents, elected officials, agency representatives and community leaders who took time to complete Raccoon Creek Watershed surveys!

Public Outreach

Initial Meetings with Municipalities

The Pennsylvania Department of Conservation and Natural Resources (DNCR) application for the Watershed Conservation Plan required that each county and municipality in the 20D Raccoon Creek Watershed Region be notified about the Plan in writing by the Project Facilitator. Table 2.1 lists the municipalities and planning commissions in the 20D Region that provided letters of support for the development of the 20D Raccoon Creek Region Conservation Plan.

Table 2.1: Municipal Support for the 20D Raccoon Creek Region Conservation Plan

County	Municipality	Address	Phone	Letter Dated
Allegheny	Allegheny County Economic Development, Planning Division	425 Sixth Ave., Suite 800 Pittsburgh, PA 15219	412-350-1000	4/18/2011
	Township of Findlay	PO Box W Clinton, PA 15026	724-695-0500	1/27/2011
Beaver	Beaver County Planning Commission	810 Third Street Beaver, PA 15009	724-728-5700	2/15/2011
	City of Aliquippa	581 Franklin Ave. Aliquippa, PA 15001	724-375-5188	1/19/2011
	Township of Center	224 Center Grange Rd. Aliquippa, PA 15001	724-774-0271	1/19/2011
	Township of Greene	PO Box 181 Hookstown, PA 15050	724-573-1111	2/8/2011
	Township of Hopewell	1700 Clark Blvd. Aliquippa, PA 15001	724-378-1460	3/10/2011
	Township of Potter	206 Mowry Rd. Monaca, PA 15061	724-495-6220	4/13/2011
	Borough of Shippingport	PO Box 76 Shippingport, PA 15077	724-643-4333	4/6/2011
Washington	Washington County Planning Commission	100 W. Beau St., Suite 701 Washington, PA 15301	724-228-6811	1/19/2011
	Township of Cross Creek	28 Clark Ave. Avella, PA 15312	724-587-3442	3/15/2011
	Township of Hanover	11 Municipal Dr. Burgettstown, PA 15021	724-947-9109	3/21/2011
	Township of Mount Pleasant	31 McCarrell Rd. Hickory, PA 15340	724-356-7974	No Date
	Township of North Fayette	400 North Branch Rd. Oakdale, PA 15071	724-788-4888	4/5/2011
	Township of Smith	PO Box 94 Slovan, PA 15078	724-947-9456	3/14/2011

Public Meetings and Focus Areas

Stakeholders were given the opportunity to make their voices heard at three sets of public meetings conducted during the development of the 20D Raccoon Creek Region Conservation Plan. Extensively advertised public meetings were held at the project's kick-off, after completion of the draft Plan and upon completion of the final Plan.

The sheer size and diversity of the 20D Region – about 24 miles north to south and 12 miles east to west – necessitated dividing the area into four Focus Areas based on predominant historic and current land use (see "Plate 2.1 Focus Area Map").

Focus Area #1 is the southernmost part of the 20D Region. It is defined by the Cross Creek Watershed and lies mostly in Jefferson, Cross Creek and Mount Pleasant Townships. Along the main stem of Cross Creek are many small "coal patch" towns, each with its eroding coal waste piles and abandoned mine drainage seeps. Despite these legacy effects on the main stem, water quality is very good in the headwaters of Cross Creek. Focus Area #1 contains the greatest concentration of shale gas wells in the 20D Region and many productive farms.

Focus Area #2 lies to the north and east of Focus Area #1. It consists of the headwaters of the main stem of Raccoon Creek flowing north, as well as Harmon Creek flowing to the west. It lies within Mount Pleasant, Smith, Hanover, Robinson and Findlay Townships. From the late 19th to mid-20th century, this northern-most extent of the Pittsburgh Coal Seam was largely de-populated, heavily deep mined and strip mined. In many places, streams run orange and are devoid of aquatic life. More populated parts of Focus Area #2 are its coal patch towns and villages, located along Raccoon Creek and near the entrances of the early 20th-century drift mines.

Focus Area #3 lies to the north of Focus Area #2. It comprises most of southern Beaver County, bounded on the north by the Ohio River, and to the east, bounded roughly by I-376. This area is predominantly rural residential, woodland and farmland. It is also home to Raccoon Creek State Park and Wildflower Reserve. Overall water quality is much better than that of Focus Area #2. Many productive farms are found in the northwest of Focus Area #3.

Focus Area #4 consists of three small, lightly populated but heavily industrialized sites along the southern bank of the Ohio River in Potter and Greene Townships. These former farmlands were transformed into petrochemical factories critical to national defense during World War II, and into power generating facilities vital to post-war development. Part of Focus Area #4 is being considered for a new, multi-billion-dollar plant that will refine ethane from locally produced shale gas.

In July of 2013, the first of three sets of stakeholder meetings was held in Focus Areas #1, #2 and #3 (see Table 2.2). The purpose of these meetings was to introduce the 20D Raccoon Creek Region Conservation Planning process to interested residents of the Region and seek their opinions about how they perceive and value various aspects of their watershed. Promotional literature invited people to share their vision for the future of the Raccoon Creek Region.

Figure 2.3: Stakeholder meeting for Focus Area #3, Raccoon Township Municipal Building, 7/25/13. Photo by Michael Harcher.

Several members of the 20D Plan Steering Committee were on hand to lead discussion, answer questions about mapping displayed around the room, and provide Citizen Surveys for attendees to complete. Turn-out was light at all three meetings, despite substantial efforts at advertising. The first meeting of the first round was no doubt hampered by a severe thunderstorm. The second and third meetings, however, were held on beautiful summer evenings, which may have been a distraction in itself.

The second set of advertised meetings was held in June of 2014 to present a draft version of the 20D Plan to stakeholders for discussion and comment. Based on low turn-out at the first round of public meetings, draft plan presentations were held in Focus Areas #1 and #3 only, i.e., the southern and northern areas of 20D where participants had been more numerous.

Seven people attended the June 11, 2014 public meeting at Cross Creek Township Municipal Building in Focus Area #1. Highlights of the Draft Plan were presented, as well as dozens of maps and figures illustrating various features of the Region. Discussion centered mainly on thoughtful concern for the long-term, unforeseen impacts of the shale gas industry on the environment and quality of life for residents. Each attendee was given a copy of the draft plan and asked to return an enclosed comment form.

On June 16, 2014, eighteen people attended the public meeting at the Raccoon Township Municipal Building in Focus Area #3. Group discussion touched on these topics, among others:

- The need for bicycle trails in our greenways, especially along Raccoon Creek Road – so few bicycle routes exist in Beaver County.
- The idea of connecting Beaver County's Raccoon Creek green corridor with green corridors in Washington County, connecting Raccoon and Hillman State Parks, perhaps connecting with Tomlinson Run State Park in West Virginia and over to the Ohio River.
- How to approach landowners about conservation easements to establish greenways.
- The long-term fate of Horsehead's flyash landfill on Raccoon Creek in Potter Township.
- Successes and failures of various land preservation efforts in the past.
- Protecting water quality in the Ohio River.

Again, each attendee was given a copy of the draft plan and asked to return an enclosed comment form in a timely fashion. No written comments were received in response to the material presented at the June 11 or June 16, 2014 public meetings.

"Appendix 2.1: Public Comments" lists stakeholder comments about the draft 20D Raccoon Creek Region Conservation Plan as received verbally, via email, or in print.

Table 2.2: 20D Raccoon Creek Region Public Meeting Locations and Dates

Location	Project Kick-off	Draft Plan Completion	Final Plan Presentation
Cross Creek Township Municipal Building	7/23/2013	6/11/2014	----------
Raccoon Township Municipal Building	7/25/2013	6/16/2014	----------
Pepsi Cola Road House Smith Township	7/30/2013	----------	----------
Recreation Hall Raccoon Creek State Park	----------	----------	

Dot Exercises

Because turn-out at public meetings was poor and the number of completed Citizen and Municipal Surveys was low, the Project Facilitator conducted five "dot exercises" at public events to offer a quick, easy way for people to share their perceptions of the Raccoon Creek Watershed Region.

The Project Facilitator set up two printed charts, one asking the question, **"How important to you are the following things in the Raccoon Creek Watershed?"** The other chart's question read, **"What water quality issues concern you the most in the Raccoon Creek Watershed?"** These questions were taken directly from the Citizen Survey. Every participant was given two self-stick dots with which to vote for ideas listed on the charts.

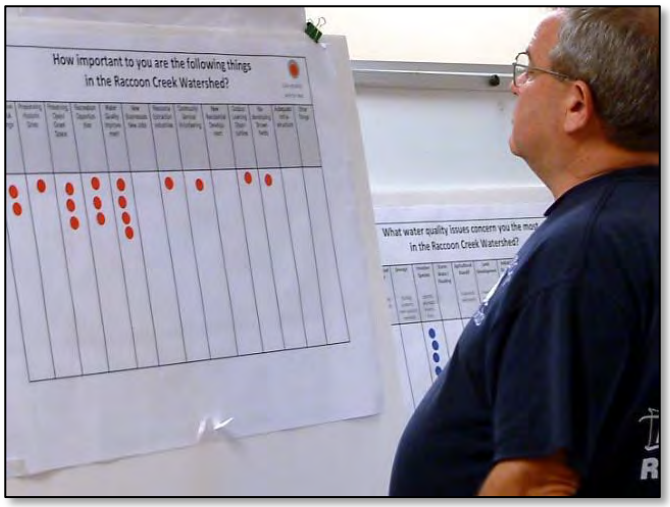


Figure 2.4: A resident works on the "dot exercises" at the Focus Area #3 meeting, 7/25/13.

Due to space limitations of the display area on the Ohio River Watershed Celebration Cruise, only the chart dealing with overall aspects of the region was set out for casting votes. The following figures, 2.5 and 2.6, summarize the results of the dot exercises at all five venues.

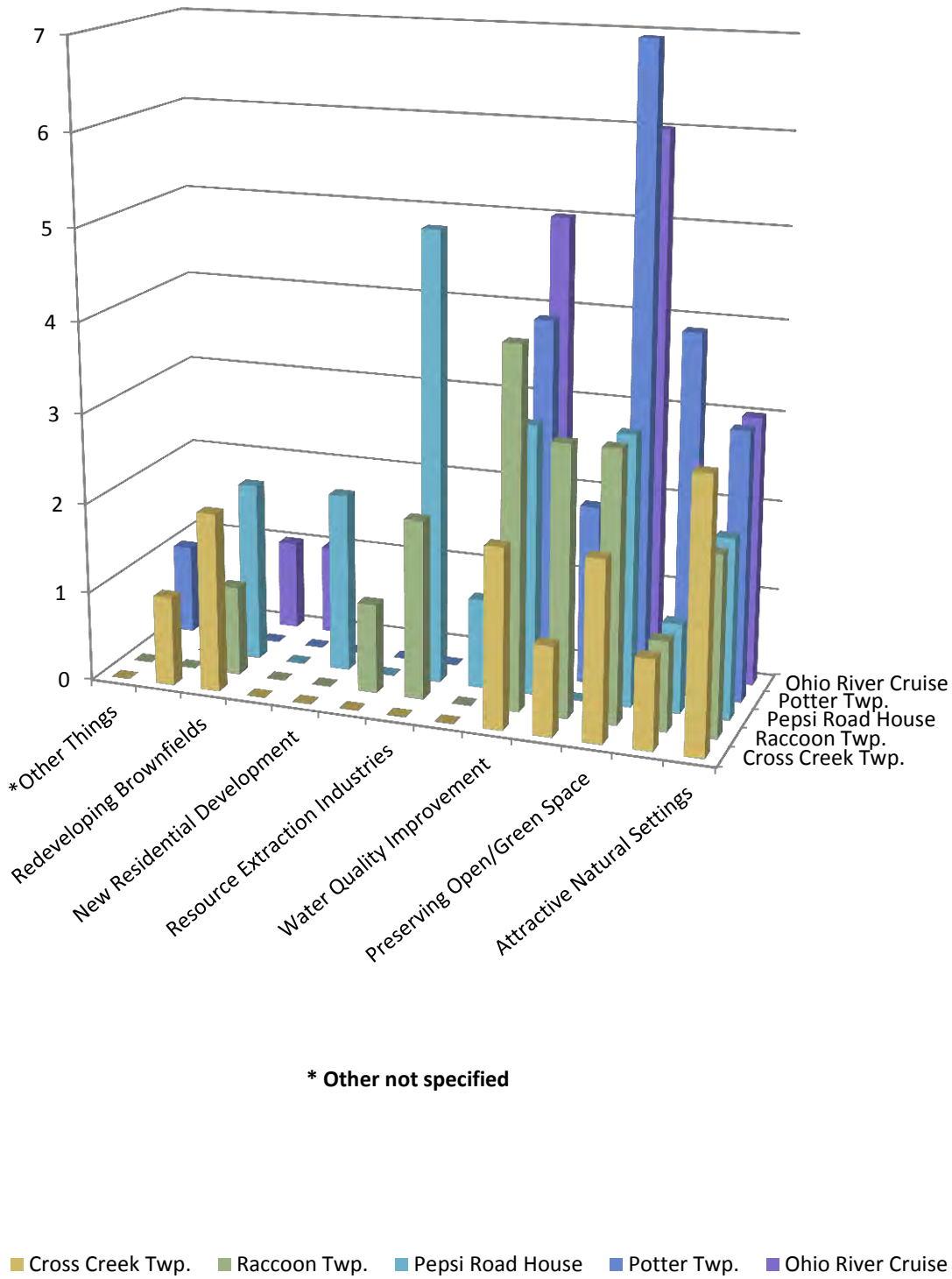
General trends appeared through the series of dot exercises. These are the highlights:

- People indicated that they were more concerned about the Marcellus Shale industry's long-term impacts in the downstream/northern reaches of the watershed (Focus Areas #2 and #3) than they are in the southern/headwaters region (Focus Area #1) where the industry is already well-underway.

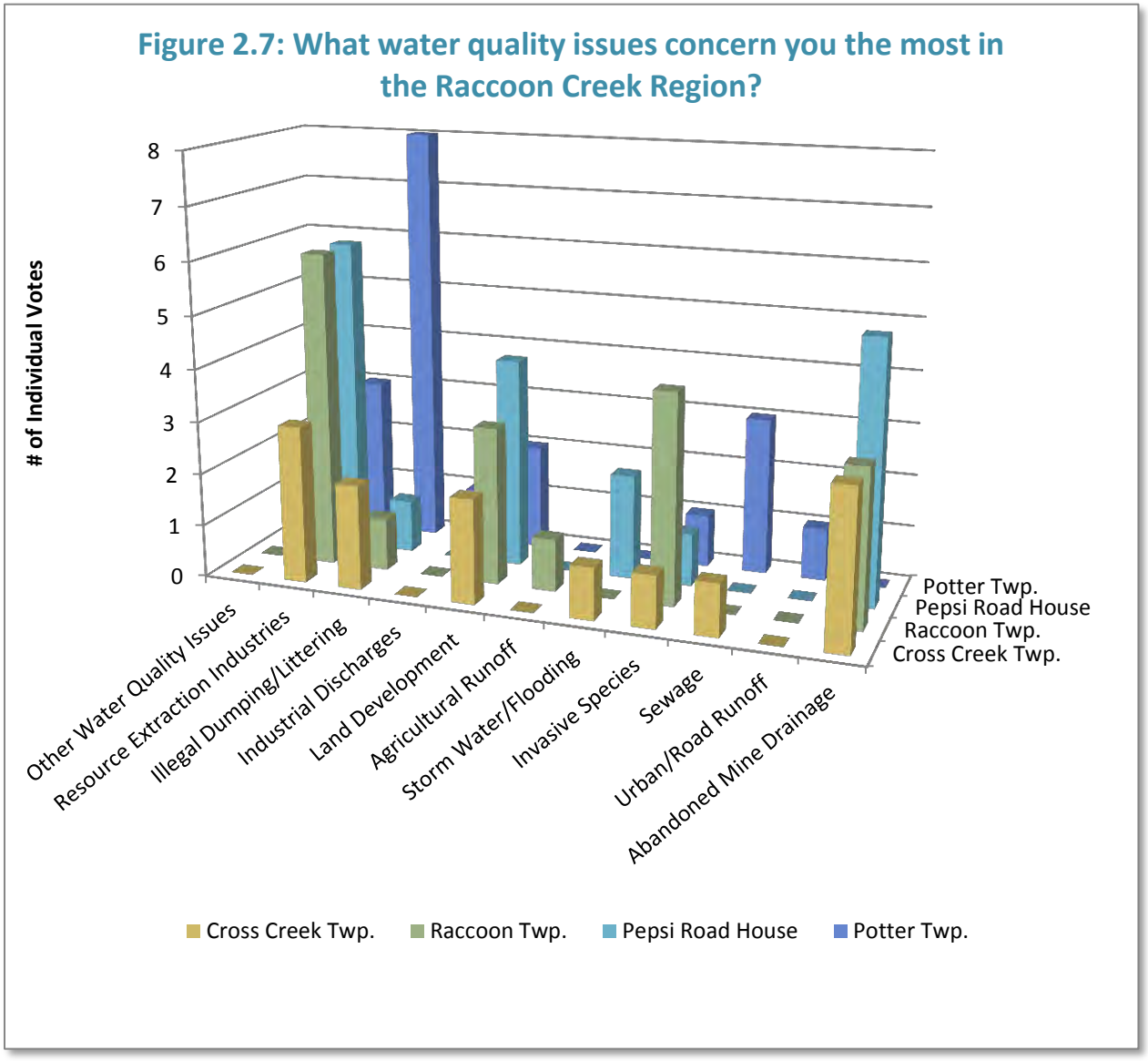
- The 'green and quiet' aspect of the Raccoon Creek Region is highly valued in all focus areas of the watershed, as is the beautiful scenery, rural character and recreational potential; people do not want this spoiled by development or pollution.
- Abandoned mine drainage is a greater concern in the headwaters (historic mined areas of the Pittsburgh Coal Seam) than farther downstream.
- Historic resource extraction industries have had a tremendous impact on the region; new resource extraction industries will bring changes we cannot even imagine at this time.

Figure 2.5: Civilian Conservation Corps workers use a pulley-rigged crane to help build the dam at the upper lake, ca. 1935. Notice the light covering of snow on the job site. Photo courtesy of Raccoon Creek State Park Archives.

Figure 2.6: How important to you are the following things in the Raccoon Creek Region?



*** Other not specified**



Multi-Media Publicity

The 20D Raccoon Creek Region Conservation Plan Project Facilitator coordinated efforts to publicize the Plan's development through various printed and digital media. Each publication offered opportunities for stakeholders to share their views and concerns for the future of the Raccoon Creek Region. Table 2.3 details publication dates in various local media.

Table 2.3: 20D Raccoon Creek Region Conservation Plan Multi-Media Publication Dates

Date	Publication Details
May 2013	"Tomorrow" Washington County Conservation District hardcopy newsletter – 20D surveys mentioned among watershed activities
6/1/2013	Friends of Raccoon Creek State Park survey invitation and link posted on website www.friendsofraccoon.org
7/1/2013	Independence Conservancy's website, www.independenceconservancy.org, link to Citizen Survey
7/11/2013	"Farm & Dairy" hardcopy regional newspaper – small article announcing July 2013 round of public meetings and inviting participation in Citizen Survey online
7/19/2013	"PA Environment Digest" online newsletter – announcing opportunities for public input http://www.paenvironmentdigest.com/newsletter/default.asp?NewsletterArticleID=26048
7/20/2013	"Beaver County Times" hardcopy newspaper – small article announcing 20D RCWCP and series of three public meetings; paid advertisement published same day – 3 column x 6"
7/22/2013	Beaver County Conservation District website - http://beavercountyconservationdistrict.org/ and FaceBook page https://www.facebook.com/BeaverCountyConservationDistrict
7/25-30/2013	Electronic billboard at Pepsi Cola Roadhouse on Route 18 near Burgettstown – announcing July 30th public informational meeting
7/25/2013	Survey link posted on Washington County Conservation website http://www.pawccd.org
Sept. 2013	"Tomorrow," Washington County Conservation District Newsletter - prominent reprints of Citizen Survey invitation advertising (full page)
10/3/2013	Independence Conservancy "News & Notes" e-newsletter promoting Municipal Official Survey http://archive.constantcontact.com/fs103/1115032642974/archive/1115139245777.html
10/6/2013	Independence Conservancy email invitation to municipal officials requesting participation in municipal survey and/or request a public presentation about the 20D RCWCP http://archive.constantcontact.com/fs103/1115032642974/archive/1115179806810.html
10/28/2013	Independence Conservancy "News & Views" e-newsletter http://archive.constantcontact.com/fs103/1115032642974/archive/1115436794880.html
11/1/2013	Re-sent 10/6/2013 invitation to Municipal Officials for survey and public presentation offer
Jan. 2014	"Tomorrow," Washington County Conservation District Newsletter - 20D surveys mentioned among "Watershed Activities"
May 2014	"Tomorrow,"- 20D public meetings for June announced among "Watershed Activities"
6/2/2014	Independence Conservancy email invitation to municipal officials announcing second round of public meetings 6/11/14 at Cross Creek Twp. and 6/16/14 at Raccoon Twp. http://archive.constantcontact.com/fs103/1115032642974/archive/1115168304184.html
6/3/2014	Independence Conservancy email invitation to general public announcing second round of public meetings 6/11/14 at Cross Creek Twp. and 6/16/14 at Raccoon Twp. http://archive.constantcontact.com/fs103/1115032642974/archive/1115168304184.html
6/6/2014	Feature article in Beaver County Times, "Input sought on watershed; meeting planned for Raccoon."
6/11/2014	News brief in Washington Observer-Reporter, "Hearing Set on Raccoon Creek Plan"
Sept. 2014	"Tomorrow" article requesting public comment on Draft 20D Plan via Independence Conservancy's web link.

6/30/2014	Independence Conservancy "News & Views" e-newsletter requesting public comment on draft 20 D Plan http://archive.constantcontact.com/fs103/1115032642974/archive/1117790456051.html
9/24/2014	Independence Conservancy "News & Views" e-newsletter requesting public comment on draft 20D Plan http://archive.constantcontact.com/fs103/1115032642974/archive/1118605521793.html

Surveys and Interviews

Residents, municipal officials and key persons completed surveys whose purpose was to identify how stakeholders use and perceive the Raccoon Creek Region and its resources. Survey participants were encouraged to share their vision for the future of the area. The results of Citizen Surveys, Municipal Official Surveys and Key Person Interviews are summarized in this section of the 20D Plan.

Surveys were made available at public events (refer to Table 2.4) and advertised in local papers and newsletters. Invitations were e-mailed with a link to Independence Conservancy's website (http://www.independenceconservancy.org/news-projects) where stakeholders could complete the surveys online. Printed surveys were also mailed by request. Many surveys were hand-delivered to requesters by the Project Facilitator. Most participants elected to complete the survey as "anonymous." Results were tabulated and included in this section.

Survey participation was light, particularly among municipal officials, despite the Project Facilitator making numerous phone calls, sending many direct emails and making personal visits to municipal officials. As a result, the Project Facilitator attempted to obtain additional public input by conducting "dot exercises" at various public venues. The results of the dot exercises are also summarized later in this section of the Plan.

The expressed views and opinions represent those of the stakeholders and do not necessarily reflect the views of the 20D Raccoon Creek Region Conservation Plan Steering Committee, of the Washington County Conservation District, of Independence Conservancy, of Stream Restoration, Inc., or of any other contributors to, or partners in, the 20D Plan.

Table 2.4: 20D Plan Displays and Survey Forms Distributed at Public and Private Events

Date	Event or venue manned by Project Facilitator
8/15/2012	Washington County Conservation District booth at Washington County Fair
8/18/2012	Potter Township Centennial Celebration at Potter Municipal Building and Park
9/27/2012	Ohio River Watershed Celebration Cruise on the Gateway Clipper Majestic
1/15/2013	Marcellus Shale Impacts seminar at Washington County Conservation District
1/30/2013	Washington County Watershed Alliance Banquet at Julian's Banquet Hall in Washington, PA
2/26/2013	Monthly meeting of the Raccoon Creek Watershed Association at Raccoon

	Creek State Park
8/16/2013	Washington County Conservation District booth at Washington County Fair
8/17/ 2013	Potter Township Picnic at Potter Township Municipal Building and Park
8/18/2013	Baden Borough 175th Anniversary Celebration at Baden Municipal Complex
8/28/2013	Beaver County Sportsmen's Conservation League booth at Big Knob Fair in New Sewickley Township
9/19/2013	Ohio River Watershed Celebration Cruise on the Gateway Clipper Empress
9/21/2013	Independence Conservancy Community Tire Collection at Brighton Township Public Works
9/24/2013	Monthly meeting of the Raccoon Creek Watershed Association at Raccoon Creek State Park
9/28/2013	Independence Conservancy Community Tire Collection at Economy Borough Municipal Building
10/3/2013	Beaver County Sportsmen's Conservation League monthly meeting at Green Valley Sportsmen's Club in Potter Township
10/18/2013	Independence Conservancy Community Tire Collection at Hookstown Fair Grounds
10/19/2013	Independence Conservancy Community Tire Collection at Brighton Township Public Works
11/20/2013	Route 18 Community & Economic Advisory Panel (RECAP) bi-monthly meeting at Bocktown Grille in Beaver Valley Mall
1/14/2014	Route 18 Community & Economic Advisory Panel (RECAP) bi-monthly meeting at Beaver County Community College
3/19/2014	Washington County Watershed Alliance Banquet at Julian's Banquet Hall in Washington, PA
5/15/2014	Speaking engagement at Geneva College, undergraduate science course, "The Worth of Water"
9/18/2014	Ohio River Watershed Celebration at North Park

Citizen Surveys

Citizen Surveys were offered to watershed stakeholders at each public event and municipal meeting attended by the Project Facilitator. Citizen Surveys were also made available at the offices of the Beaver and Washington County Conservation Districts, the Penn State Cooperative Extension Office in Beaver; the Potter Township, Cross Creek Township and Greene Township Municipal Buildings, at Raccoon Creek State Park's main office and interpretive center at the Wildflower Reserve. A list of meetings and events are provided in Tables 2.2 & 2.4.

A total of 66 Citizen Surveys were completed, either online or on paper. Respondents were asked to name the municipality and sub-watershed in which they reside. If they were unsure, a sub-watershed map was provided for guidance and education (see Plate 4.1).

Most Citizen Survey respondents live in Beaver County and reside near the main stem of Raccoon Creek, or not at all in 20D. Non-resident participation tends to show that people are interested in the welfare of the Raccoon Creek Region even though they may not live within its boundaries. Harmon Creek and Mill Creek were also included as selections for the residence question, although no one chose either of these sub-watersheds as their home.

Figure 2.8: In Which County Do You Reside?

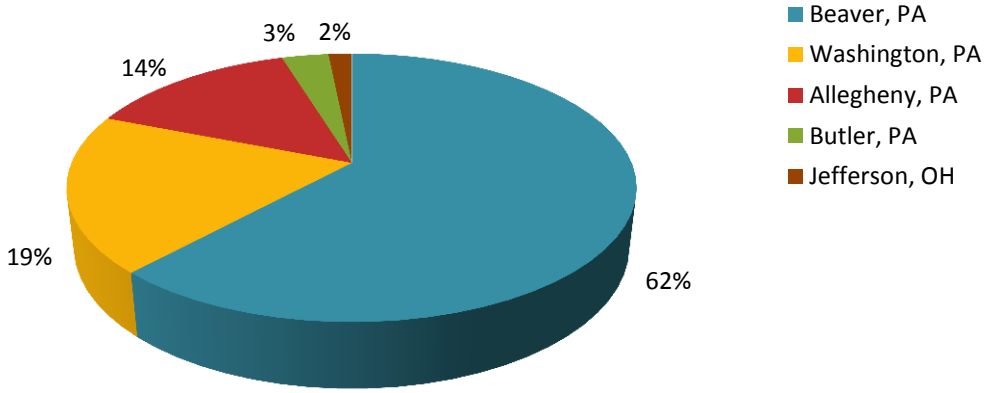


Figure 2.9: In Which Sub-Watershed Do You Reside?

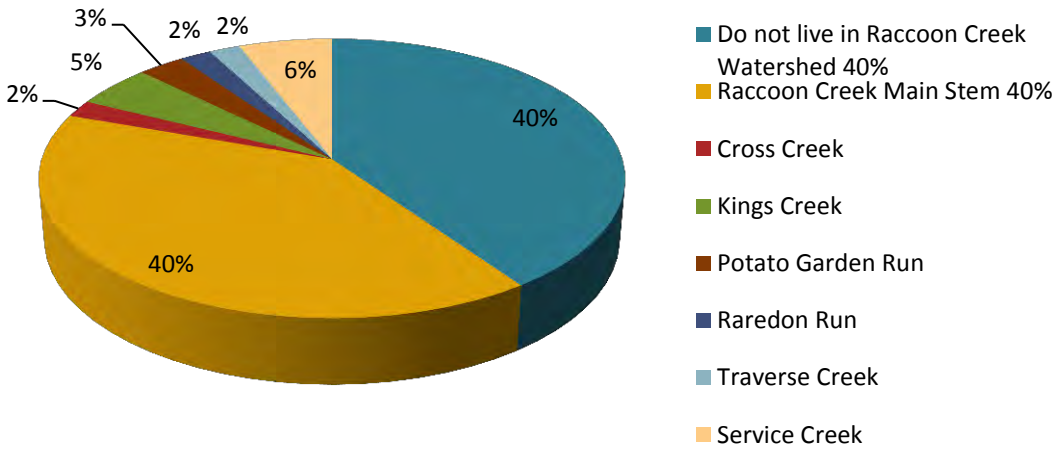
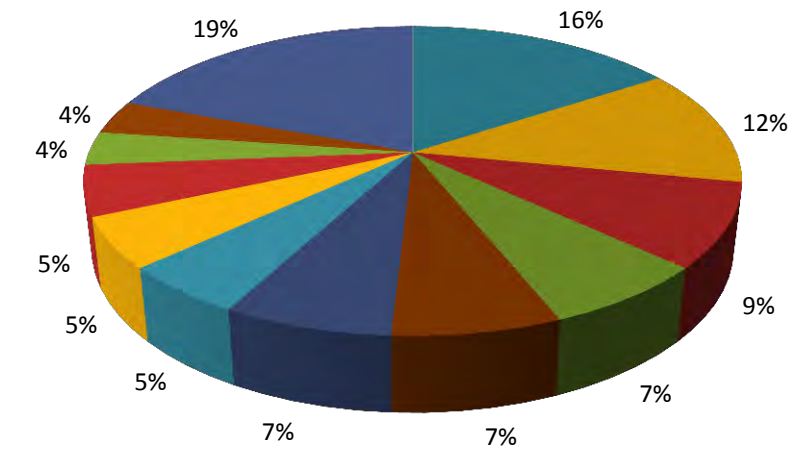


Figure 2.10: In Which Municipality Do You Reside?



- Raccoon (9)
- Independence (Beaver Co.) (7)
- Hopewell (Beaver Co.) (5)
- Center (4)
- Potter (4)
- Robinson (4)
- Hanover (Beaver Co.) (3)
- Findlay (3)
- Pittsburgh (3)
- McDonald (2)

Other includes: Ambridge, Beaver Borough, Cecil, Clinton, Cross Creek, Economy, Hanover (Washington Co.), Harmony (Butler Co.), Industry, New Sewickley and Steubenville (Jefferson Co.)

Compiled Citizen Survey Results

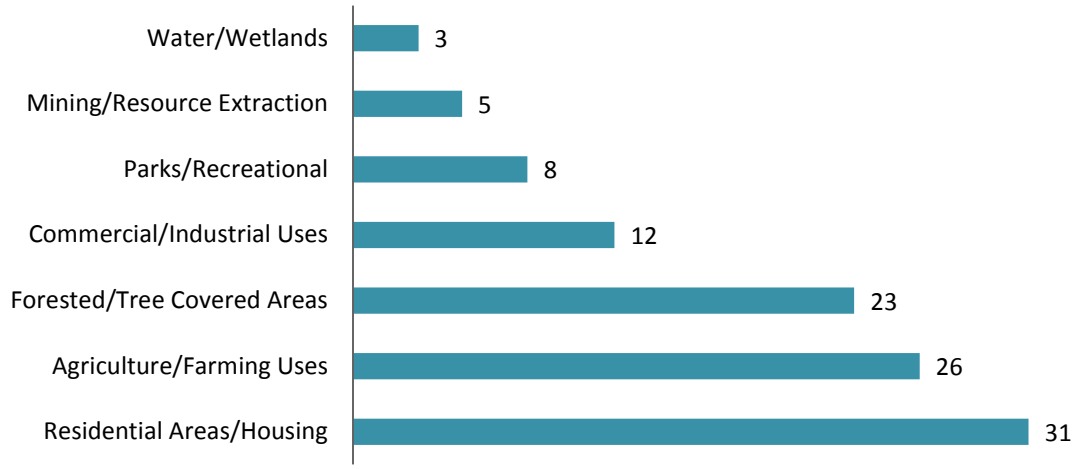
The Citizen Survey was designed to identify how stakeholders use and perceive the Raccoon Creek Region, its features and its resources. Survey questions relate to land use, water quality, important attributes, recreational opportunities, flooding, favorite places and things to do, quality of life, places worthy of permanent preservation and other comments. The following sections summarize the responses.

Land Use

As shown in Figure 2.11, many people mistakenly believe residential areas to be the most prevalent land use, acre-for-acre, in the Raccoon Creek Region. In actuality, residential areas occupy less than ten percent of the region's land cover. (Refer to "Section 1: Project Area Characteristics.") This may indicate a disconnection between how people perceive the use of land and how the land is actually used. However, participants did recognize that agriculture and forested/tree covered areas make up a substantial portion of the Raccoon Creek Region.

Most people in the watershed do indeed live in either a residential or agricultural area.

Figure 2.11: Citizen Perception of Most Prevalent Land Uses, Acre-for-Acre



Water Quality

The greatest water quality issues identified in the Citizen Surveys were abandoned mine drainage or AMD, followed by illegal dumping/littering and resource extraction activities like shale gas, coal mining, quarries and logging. The results are seen in Figure 2.12. They appear to be reflective of several factors:

- obviousness of AMD in the watershed
- effectiveness of educational outreach by the many entities working to clean up AMD discharges, illegal dump sites and fugitive tires
- northward expansion of the shale gas extraction industry

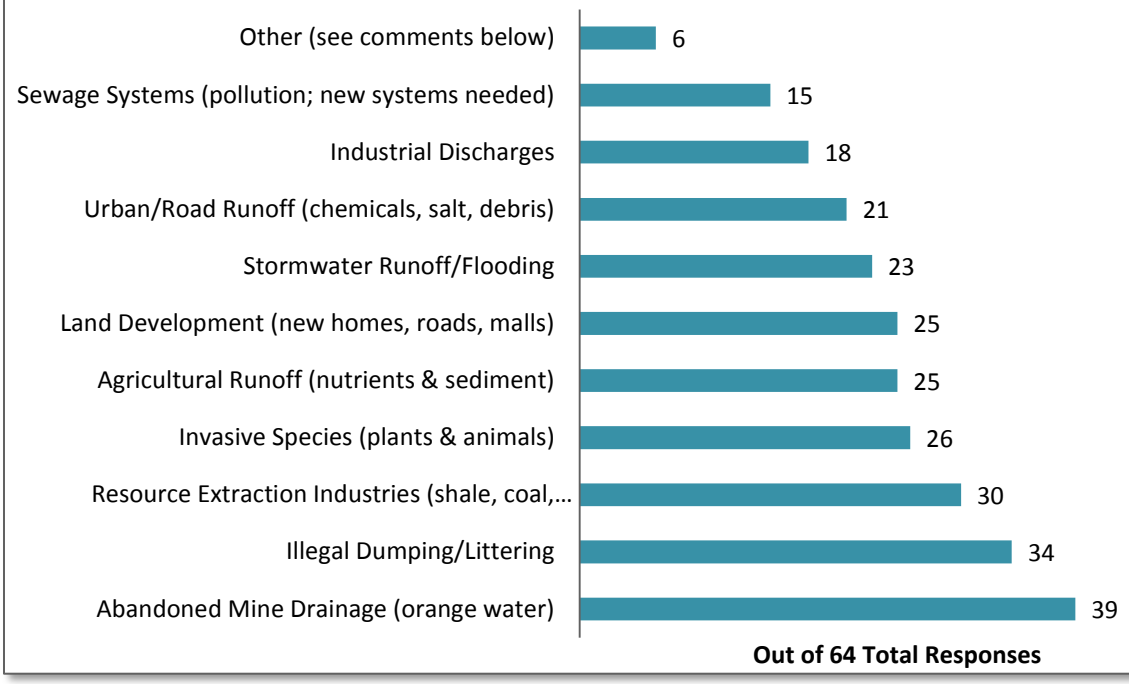
Major progress has been made in cleaning up the Raccoon Creek Watershed!

Since 1999, public-private partnership efforts have resulted in construction of five passive systems that treat about 2.5 billion gallons of abandoned mine drainage annually in the headwaters of Raccoon Creek.

Volunteers have cleaned over 250 tons of illegally dumped trash from dozens of remote areas.

Community tire collections, ongoing since 2004, have netted over 33,000 scrap tires and wheels for proper disposal.

Figure 2.12: Water Quality Issues of Greatest Concern to Citizens



Water quality issues of greatest concern to citizens -other comments:
Poor riparian area protection on farms and in development projects--most of the time the head-water streams are disturbed, dug up, covered over, or devoid of vegetation.
Zoning should be pro-active, not re-active. Zoning should protect pristine areas now before they are lost forever.
All of these issues are very important and should be addressed one by one.

Watershed Attributes

The Citizen Survey asked people to rank the importance of twelve aspects or attributes of the Raccoon Creek Region, rating each item on a scale of 1 (lowest) to 5 (highest). Respondents placed the greatest importance on attractive natural settings, preserving open, green space, water quality improvement and preserving historical sites – in that order.

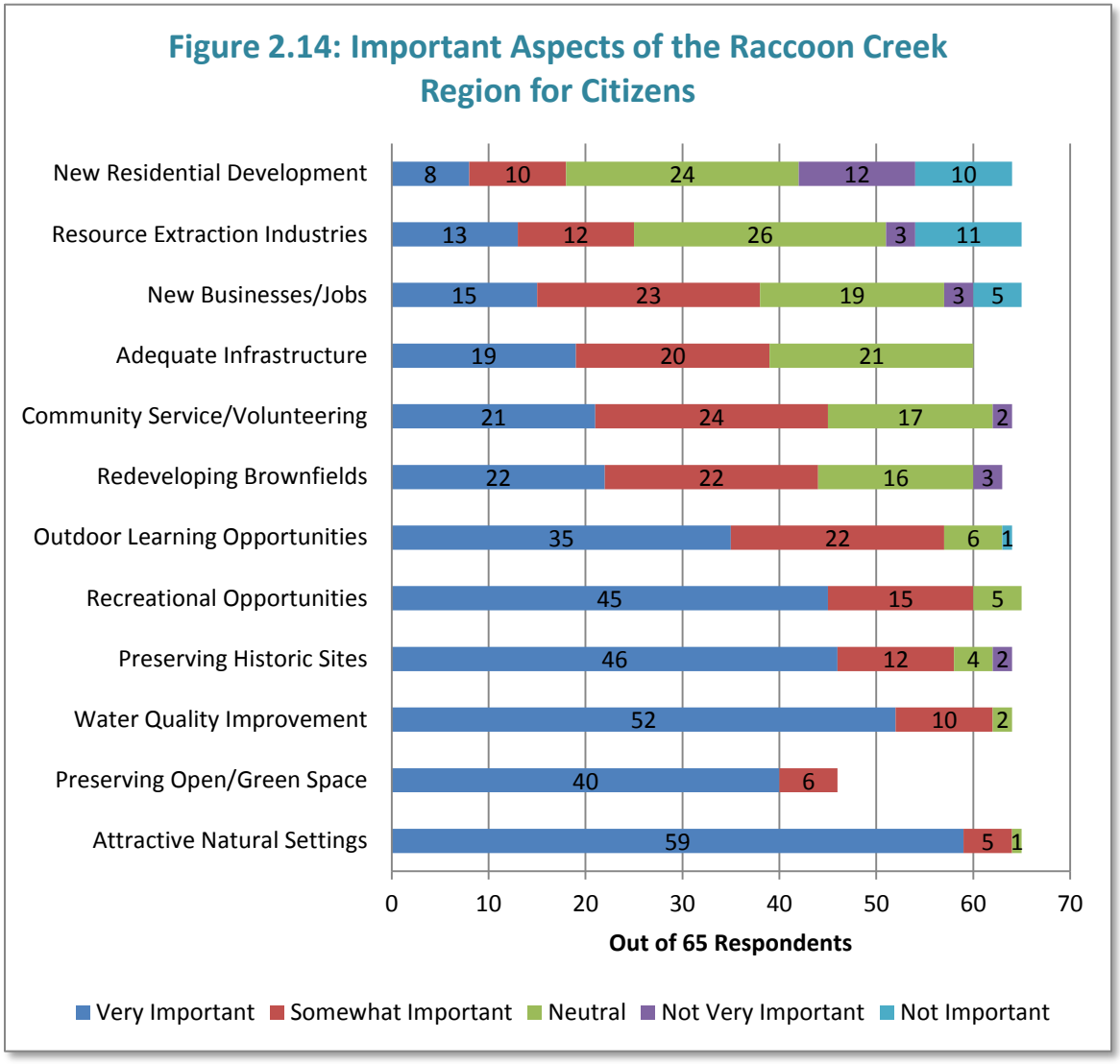
Citizens surveyed deemed new businesses, new jobs and resource extraction industries much less important than attractive natural settings and open green space. New residential development

was ranked least important of the twelve aspects. This result warrants commentary. The shale gas industry has the potential to grow exponentially in the 20D Region. Unless the industry stagnates, the need for new worker housing and adequate infrastructure will become critical. Meeting the needs and adapting to the changes of the new industry without destroying the most highly valued features of the region – its attractive natural settings, open space and rural character – will require thoughtful planning on a regional scale and better communication among sectors where there is normally scant dialogue and a vast imbalance of power.

Figure 2.28 summarizes the lack of open/green space planning on the part of individual municipalities. Open space planning is now conducted, if at all, only on the county level and is not binding upon townships and boroughs.

Please see “Section7: Management Options” for recommendations regarding the impacts of the developing shale gas industry in the 20D Region.

Figure 2.13: A new hotel is shoe-horned into a sliver of land between North Branch Presbyterian Church's cemetery and the intersection of PA 18 and Brodhead Road, Center Township - one mile from the proposed Shell ethane cracker plant. 4/28/14.



Recreational Opportunities

The Citizen Survey asked people how they feel about recreational opportunities in the Raccoon Creek Region by rating various opportunities on a scale of 1 (lowest priority) to 5 (highest priority). Hiking was rated the highest, followed closely by kayaking/canoeing and visiting public lands. Lowest ranked activities were outdoor team sports, shopping and Off-Road Motor Sports such as ATV riding. In general, the stakeholders preferred relatively low-impact, fairly quiet outdoor activities not involving teams or built environments.

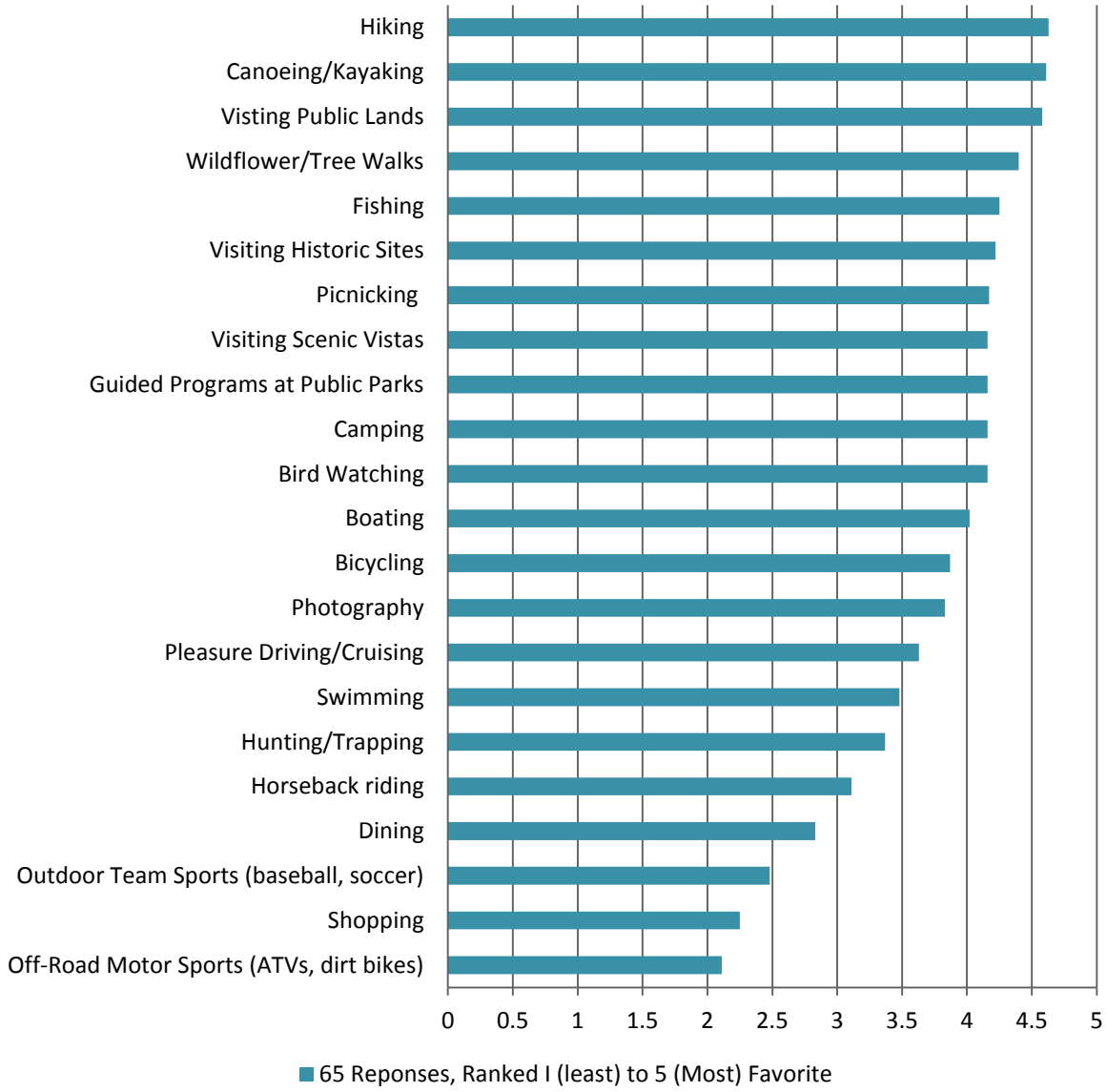
Raccoon Creek State Park is usually the first thing that comes to mind in any discussion of recreational opportunities in the 20D Region. Raccoon Creek and "Raccoon Park," as it is locally known are almost synonymous in many people's minds – hardly surprising, given that Raccoon and neighboring Hillman State Park together cover more than 10,000 acres of southern Beaver

and northern Washington Counties. Citizen Survey results showed a great fondness and affinity for many aspects of the Park. For the sake of objectivity, the Project Facilitator often reminded survey respondents and interviewees to 'think beyond the Park' to other, more subtle aspects of the 20D Region.

"Section 6: Cultural Resources" describes in detail the various recreational opportunities available in the 20D Region. Figure 2.16 ranks the most popular recreational opportunities as indicated by the Citizen Survey.

Figure 2.15: Paul Cusack and Myron Elliot enjoy the day at Hookstown Fair, 8/24/2013. Photo courtesy of the Beaver County Times.

Figure 2.16: Most Popular Recreation Opportunities in the Raccoon Creek Region



Flooding

The Citizen Survey asked people if flooding was a problem in their area. Forty-nine people responded to the question; seventeen did not. Some respondents did not live within the 20D Region but their answers reflect larger regional issues and therefore are included herein.

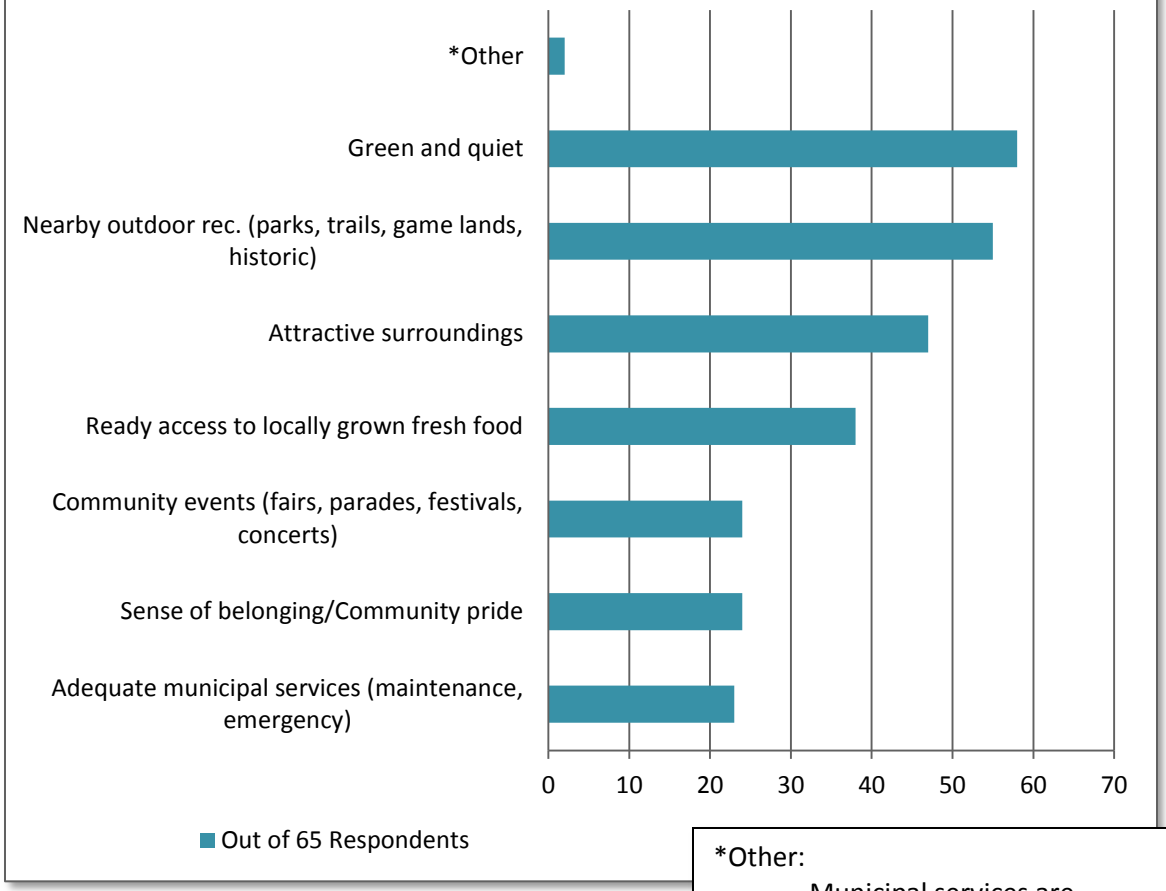
Is flooding a problem in your area? If so, please explain.
No – 22 respondents.
I live in Pittsburgh's Northside, where flooding doesn't happen much. But elsewhere in the city and in adjacent low-lying communities, it's a huge problem.
Yes, and each time the creek bed changes due to high water and erosion, I'm concerned about land flooding and damage to structures and houses.
In my area it is not a problem, but I am familiar with the Rocky Bottom Natural Area along Raccoon Creek and flooding there is an issue during major rain events.
We live in the Elkhorn Run flood plain. Upstream housing development has increased storm water run-off.
Sometimes - if it rains continually. We live in the Elkhorn flood plain in Center Township.
No. At extremely high elevation. Only in extreme situations do the roads flood temporarily.
Not at my home directly (I'm on a hill) but I live near Campbell's Run road, and once in the 1.5 years I've lived here, part of the road was closed due to flooding.
Sometimes - depends on the amount of rain or snow.
Yes, a combination of the Ohio River rising up and backing up Raccoon Creek, and other streams flooding and trying to empty into Raccoon Creek. The road ends up under water and residents become stranded.
Somewhat controlled.
Yes, during unusually wet seasons or unusually heavy rainfall like we've had this summer.
No, but I was born and raised in Potter Twp. -PA. This area you are referring is beautiful area. I live two miles away and I enjoy taking hikes and driving through this area. Let's make it right so everyone can enjoy the beauty of Raccoon Creek Watershed.
Only into basement w/lots of rain over several days due to clay soil despite 2 acres lined w/dozens of trees.
Yes, lower section of town floods every 10 -20 years.
YES--stream waters are running higher and faster during rains.
Not usually. We have two USDA flood control dams that were built by the USDA. These two dams provide fairly good protection from major floods for the local towns.
Yes - toilet paper in the rivers after every rain.
Yes - probably due to impervious surfaces upstream.
Yes, Connoquenessing Creek often crests its banks.
Yes, as we are located near Raccoon Creek and in a floodplain area; when heavy rains occur the creek will crest its banks and flood the property.
Yes, floods happen about every 10 years along Robinson Run that damages businesses and

homes along the creek.
Yes, the wetland at our office can become very flooded if it's rains exceptionally hard for a period of time. The neighboring farms get very flooded as a result of our flood-prone area as well.
Yes. Potato Garden Run floods sections of the roadway on a regular basis.

What do you like about the Raccoon Creek Region?

The Citizen Survey asked people what they liked about the Raccoon Creek Region, offering them the opportunity to check any or all of eight attributes. “Green and Quiet” was the resounding favorite. Sixty-five people responded to this question; one did not; two provided additional comments.

Figure 2.17: Citizens' Most Valued Raccoon Creek Region Attributes



*Other:
Municipal services are adequate.
Good fishing in Raccoon Creek.

What is your favorite place in the Raccoon Creek Watershed?

The Citizen Survey asked people an open-ended question, "What is your favorite place in the Raccoon Creek Watershed?" Sixty-one people responded; five skipped the question. Their answers are summarized into general categories where possible; more detailed answers are quoted below.

Citizen Survey respondents' favorite places in the Raccoon Creek Watershed:
My own back yard (15 respondents; 3 of which listed their farm or family farm)
Raccoon Creek State Park (11 respondents)
Raccoon Creek State Park's hiking trails (9 respondents)
Raccoon Creek State Park's Wildflower Reserve (6 respondents)
Raccoon Creek State Park's lake and/or beach area (4 respondents)
Heavily wooded/forested areas (3 respondents)
Rocky Bottom Natural Area (2 respondents)
The wetlands in independence (2 respondents)
Raccoon Creek, downstream of the State Park, also Hillman State Park/Bavington
The area from Service Creek to Ohio River-appreciate the natural surroundings and wildlife.
I-376 (former PA 60) the bend in Raccoon Creek near Green Garden - the fall colors. And - a tie - Frankfort Springs grotto lit up with tiki torches at night, reflecting on the falling water.
Independence Township Community Park
Sandy Beach area (Raccoon Creek Road, Raccoon Township)
Fishpot Run as it empties into Raccoon Creek and the downstream area.
Bridge by St Joe's Boat dock
Hozak's is a favorite too...
Hunting on my property
The rural areas along the main stem of Raccoon Creek, and the established estuary along Creek Road.
Meadowcroft Museum of Rural Life and Rock Shelter.
Stream at gun club; boat launch near Ohio River
Raccoon Creek downstream from the state park
All areas downstream of Moffet Mill bridge to Route 18
St. Joe Boat Club
From wild flower reserve to Independence wetlands
Both the uplands an creek bottoms in the state game lands in and Raccoon Creek State Park
Frankfort Mineral Springs in Raccoon Creek park. The path used to be really nice but a few years back after a bad round of storms a good deal of it was washed out. I would love to see it restored.
The Tank Farm in Potter Township
Cherry Valley Reservoir, Hillman State Park, First Niagara Pavilion, and Harmon Creek Lake at Starpointe.

What is your favorite thing to do outdoors?

The Citizen Survey asked people an open-ended question, *"What is your favorite thing to do outdoors in the Raccoon Creek Watershed?"* Sixty-one people responded; five skipped the question. Where possible, their answers are summarized into general categories. More detailed answers are quoted below.

Citizen Survey Respondents' favorite things to do outdoors in the Raccoon Creek Watershed:
Hiking/walking on trails (25 respondents, 16 of which mentioned Raccoon Creek State Park)
Fishing/fly fishing/fishing from watercraft/wading fishing (17 respondents)
Canoeing/kayaking (8 respondents)
Nature watching/bird or wildlife watching (6 respondents)
Bicycling/mountain biking (6 respondents)
Hunting (6 respondents)
Visiting public parks (4 respondents)
Cruising/pleasure driving (4 respondents)
Living here (3 respondents)
Camping (3 respondents)
Swimming (3 respondents)
Photography (3 respondents)
Visiting historic sites (3 respondents)
Boating (2 respondents)
Picnicking (2 respondents)
Attending local fairs (2 respondents)
Play outdoors with my dog (2 respondents)
Too many to mention
Hunting and fishing in Raccoon Creek State Park and Rocky Bottom Conservation Area
Love visiting Raccoon Creek State Park, enjoy Cross Creek County Park, bike riding on the Montour Trail, bird and nature watching
Help to run the Sportsmen's Youth Conservation Camp at Raccoon Park in the summer. In the fall, drive along Route 60 and see the colorful leaves.
Driving through the Park and seeing everything.
Hike with my young kiddo at Frankfort Mineral springs
Canoeing Independence Township
Car cruises at the Midway Bar & Grill
Working around our property at home
Covered Bridge Festival
Doak Field programs at Raccoon Creek State Park, hiking the trails at RCSP, medicinal plants workshop at RCSP, walks at the Wildflower Reserve
Primitive Skills Workshop at Raccoon Creek State Park
Breathe fresh air and see stars at night
Farming

Enjoy the beautiful areas along the rural watershed.
Ride my motorcycle
Hiking at Raccoon Creek State Park; fishing for smallmouth bass in Raccoon Creek
Duck hunt from canoe
It was fishing
Sit by the creek and quietly relax, or drive around the country roads and just look at the scenery.
Walking with the dog and playing in the water with him. Also bird watching.
Mountain Biking at Hillman State Park. Fishing at Harmon Creek Lake at Starpointe.

Q: What is your favorite thing to do in the Raccoon Creek Watershed?

A: Breathe fresh air and see stars at night

Quality of Life Improvements

The Citizen Survey proposed ten different quality-of-life scenarios with the following question: "**Would you favor these things to improve the quality of life for everyone in the Raccoon Creek Region?"** Respondents could vote yes or no to the suggested ideas. Sixty-five people answered this question; one skipped it.

More outdoor recreation opportunities (parks, game lands, trails) garnered the most "yes" votes and the fewest "no" votes. Strong support was also shown for mandatory trash/refuse collection, directing new development away from pristine natural areas, better maintenance of existing parks/recreation facilities. These preferences outranked better roads and bridges, more family sustaining jobs and improved municipal services.

Opinion was closely split on the issue of consolidating municipal services such as police, fire, schools, water and sewage. Thirty-five people favored consolidation; twenty-seven opposed it.

High-speed internet access was another divided issue with thirty-six people favoring it and twenty-four opposing it. Survey results may indicate lack of awareness that the best connective technology offered in suburban and urban areas is not universally available in rural areas. The internet continues to gain importance in communication, commerce, education and nearly every aspect of life. In rural areas like the Raccoon Creek Region, dial-up and satellite may sometimes be the only connectivity options. Without broadband or high-speed cable internet connections, rural residents suffer a distinct disadvantage.

Regardless of public perception, the "digital divide" does exist and is well documented[1]. Internet usage is much less among the elderly, the less-educated, those with lower incomes and those who live in rural locales. The Federal Communications Commission (FCC) states that about 15 million Americans, most of them living in rural areas, lack access to broadband and the link it provides to jobs, education and economic prosperity[2].

Figure 2.18:
20D Plan Project Facilitator Vicky Michaels expresses frustration with her rural internet access. Photo: Cynthia M. Leonard, Bayer Center for Nonprofit Management

Places Worthy of Permanent Preservation from Development or Disturbance

The Citizen Survey asked people, "**Are there places in the Raccoon Creek Watershed, other than state parks and game lands, which you believe should be permanently protected from development or disturbance? If so, please describe:"** Thirty-nine people answered the question; twenty-seven skipped it.

One person thought there were no places worthy of permanent preservation in the Raccoon Creek Region. Two people named Raccoon Creek State Park, despite instruction to the contrary.

[1] Pew Research Internet Project – How Americans Go Online, available at http://www.pewinternet.org/2013/09/25/how-americans-go-online/; accessed 3/18/2014.
[2] AG Professional - FCC aims to offer high-speed internet to rural America, available at http://www.agprofessional.com/news/208715731.html; accessed 3/18/2014.

One comment about conservation easements seemed to indicate a misunderstanding of the voluntary nature of land protection, whether achieved through conservation easements or outright purchase of land for permanent preservation. This suggests a need for public education about land preservation methods by land trusts, farmland preservation boards, watershed groups and conservation districts.

Where possible, the answers are summarized into general categories. Most responses were rather detailed and are quoted below.

Citizen Survey responses to places worthy of permanent preservation from development or disturbance
Farmlands, historic farms, agriculture security areas (7 respondents)
Riparian areas, stream banks (6 respondents)
Waterways, headwaters, small feeder streams (5 respondents)
Great Blue Heron rookeries on Raccoon Creek and its tributaries (3 respondents)
Rocky Bottom Natural Area (3 respondents)
The sub-watershed of Aunt Clara's Fork (2 respondents)
Independence Twp. Park Area… Extend State Park to Park Road area.
YES... conservation easements should be protected regardless of proposed use. Temporary impacts can be mitigated for - but new developments should be directed AWAY from conservation areas.
Any location within a reasonably designated area of existing homes.
Rocky Bottom Natural Area It is a naturally diverse area occurring at the lower reaches of Raccoon Creek where diversity is the greatest among aquatic organisms and also is an area where terrestrial organisms thrive.
1) Streamside buffer zone along the creek - water trail from Sandy Beach area to Rocky Bottom - loop off of I-376 in Center Township section. 2) Meadowcroft Village. 3) King's Creek & Aunt Clara Fork Watersheds - hands off!
Any undeveloped areas along Raccoon Creek
Areas near schools and areas directly next to state parks
I'm not too familiar with the Raccoon Creek Watershed outside of Raccoon Creek State Park, but I'm sure there are plenty of places that I don't know about that would merit protection. What happens in one part of the watershed affects the entire watershed, so if you ask me, the whole thing should be of special concern!
Rocky bottom area and old tank farm
Conservation areas along the major tributaries, wetlands and estuaries within the watershed. Responsible development is key to enriching an area without destroying it.
Kings Creek Watershed should be preserved as the link and loop. Greenspace connection for raccoon creek park wildlife and the Ohio river. A trail system that loops to and forms a portage with both watersheds and the river as a resource to the park and its future preservation.
I'd like to see much of the farmland and open space in the Raccoon Creek Watershed

maintained.
No drilling for gas in residential areas
All riparian areas should be protected in some way regardless of who owns the land.
Floodways and wetlands along streams
The blue heron rookery along Creek Road in Robinson Twp., the areas identified by municipalities that are conservation areas and the old Bigger Homestead/Farm/barns on Bigger Road.
The historic farms of the area
The stream itself and public access to it for water trails
Downstream of Moffet Mill bridge to Route 18; maybe from I-376 near cement plant and downstream. Other places such as headwaters would be benefited by protection, i.e., water quality and quantity.
Farm lands and undeveloped forests, such as those found in Independence Township
Conservation easements or purchases should be the choice of the landowners
Beaver County needs more walking trails.
The Ohio River slopes; the Kings Creek Watershed; Peggs Run Watershed; Gums Run Watershed; undisturbed areas surrounding Raccoon Creek State Park; Potter Township's Tank Farm and the entire lower Raccoon Creek Biological Diversity Area.
The lake at Starpointe Business Park should never be developed with houses around it. Too much wildlife in that area.

Additional Comments about the 20D Raccoon Creek Watershed Conservation Plan

The Citizen Survey offered people the chance to comment on issues not addressed anywhere else in the Plan. Seventeen people responded, of which five stated they had no additional comments. The remaining responses are quoted below. Predominantly, they point out the need for vigilance, education and wise development of the shale gas industry to protect the natural resources of the Raccoon Creek Region. They also call for correcting the legacy effects of the coal mining industry, namely coal waste piles.

Citizen Survey Respondents' additional comments about the 20D Plan:
Pipelines for gas wells need to be better managed/located. Very destructive and unsightly.
Gas related activities have heavily impacted the watershed in the last 3 years. Yes, the pipelines are temporary - as well as the drill pad impacts - however there have been so many spills, problems and illegal dumping at individual sites - it is unclear as to the level of regulatory inspection and PROPER cleanup for long term health of groundwater, surface waters, and habitat. I worry about the previous problems coming back in years to come and discovering spills and leaks were not PROPERLY taken care of… Gas activities should be addressed in the plan... as they impact most of the watershed now.
More environmental monitoring of gas development

I am newly married and moved to this area 6 months ago. My husband has been a long time resident of this area.
Increased education for the public about this plan to gain involvement.
The watershed is a vast watershed - if development is conducted away from the conservation areas it still impacts the watershed - increased runoff, sewage and water issues, traffic, etc. Improve what is already developed instead of continuing to cut into undeveloped areas and cause unavoidable loss both directly and in-directly. No need to keep disturbing areas... no need to keep developing area when areas of development sit and are not maintained.
The ag area & its protection
Focus areas should be: long term remediation of mine drainage and mined lands, access to the creek and public lands for consumptive (hunting & fishing) and passive (hiking, canoeing) recreation, wetland conservation for water quality and flood control, brownfield redevelopment, focus development in existing communities, maintenance of infrastructure vs. expansion (road, sewer, water, housing)
Beaver county needs more walking trails.
Ambridge Reservoir
BAN HYDRO_FRACKING GLOBALLY
We need to clean up our coal waste piles. There are hundreds in the watershed. We missed a golden opportunity to do so when the proposed Champion Power Plant was shot down by imported environmental wacko NIMBYs and big power companies who didn't want any local competition.
The watershed was greatly disadvantaged when local activists fought again a proposed high-tech waste coal burning power plant in Robinson Township.

Familiarity with Local Watershed/ Outdoor/Conservation Organizations

The Citizen Survey asked people, **"How familiar are you with these local watershed/outdoor/conservation organizations?"** The organizations listed in the question are very active and successful in a wide variety of regional projects such as:

- Building passive systems to treat abandoned mine drainage (AMD)
- Stabilizing stream banks and establishing riparian buffers
- Reducing non-point pollution sources
- Securing funding for recreational improvements and environmental remediation projects
- Cleaning up illegally dumped trash and tires
- Promoting recreational enjoyment of our streams, lakes and public lands
- Preserving and enhancing open space, green corridors and prime wildlife habitat
- Providing outdoor learning opportunities for people of all ages

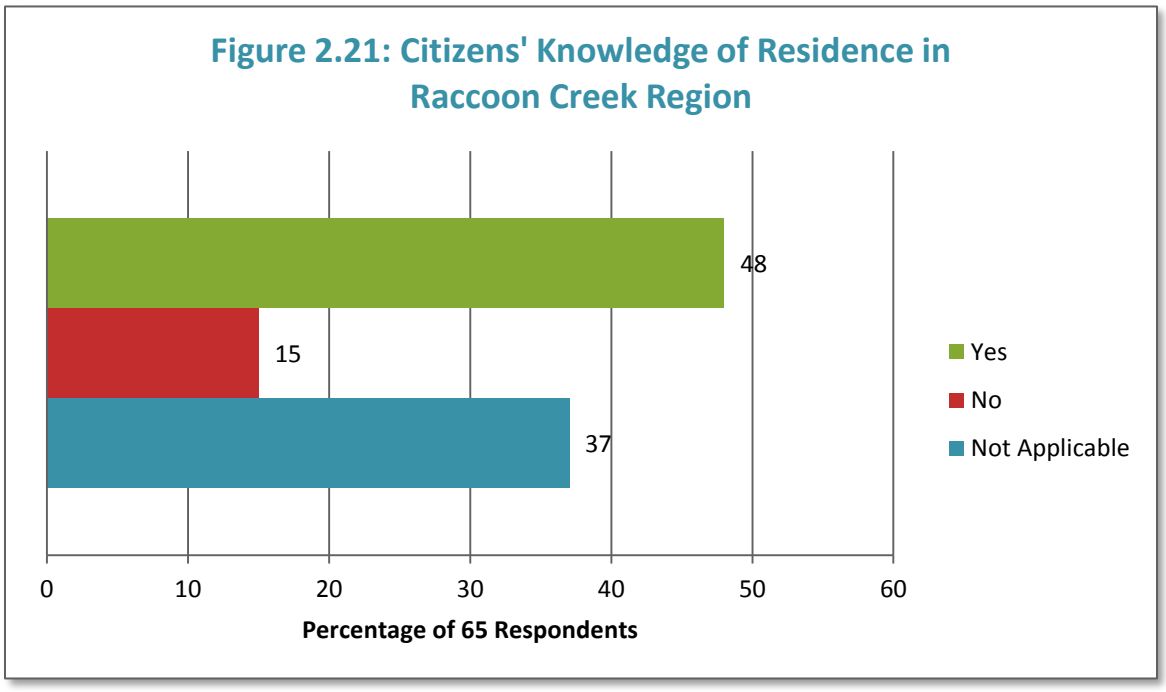
Not surprisingly, the larger, more regional entities showed better name recognition than the smaller local groups. Results may be somewhat skewed by the fact that many respondents were reached through the membership bases of the 20D Plan's sponsoring organizations.

However, it may also reflect these groups' success at education and outreach in the Raccoon Creek Region. Results are summarized in Figure 2.21 below.

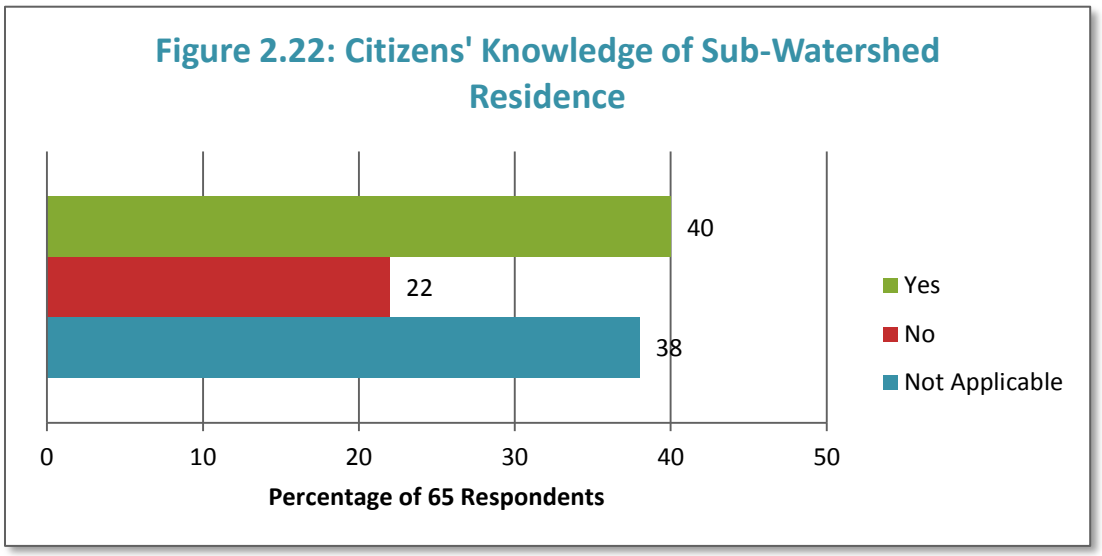
Knowledge of Residence within the 20D Raccoon Creek Watershed

The Citizen Survey concluded by asking people if, before completing the survey, they were aware of the watershed in which they reside. Many respondents lived outside of the Raccoon Creek Region. The results indicate a slightly greater awareness of Raccoon Creek than of the smaller sub-watersheds. Sixty-five people answered the question; one did not.

"Before participating in this survey, did you know you lived in the Raccoon Creek Watershed?"



"Before participating in this survey, did you know what Raccoon Creek Sub-Watershed you live in?"



Municipal Official Surveys

Municipal Official Surveys were designed by the 20D Plan Steering Committee to gauge elected and appointed officials' perceptions, opinions and needs related to various issues in the Raccoon Creek Region. Similar to the Citizen Surveys, they contained questions relating to land use, infrastructure, water quality, recreation, economics, values, etc.

The Project Facilitator mailed multiple copies of the Municipal Official Survey with an introductory letter to each municipal office in the 20D Region. Only six people responded to the mailed Survey. The Project Facilitator also e-mailed the Survey to every township, borough office or individual for which an e-mail address was known. Despite hand-delivery of Surveys to offices, repeated mailings and phone requests, e-newsletter appeals and a QR Code (Quick-Response Code) link to the Survey online, only six Municipal Official Surveys were completed and returned to the Project Facilitator. Table 2.5 shows Municipal Official Survey respondents by municipality.

Compiled Municipal Official Survey Results

Table 2.5: Municipal Official Survey Respondents by Municipality

County	Municipality	# of Respondents
Beaver	Greene	1
	Potter	2
	County of Beaver	1
Washington	Cross Creek	2

Table 2.6: In What Sub-Watershed/s is Your Municipality Located?

Sub-Watershed Name	# Respondents
Raccoon Creek Main Stem	3
Cross Creek Sub-Watershed	2
Harmon Creek Sub-Watershed	0
King's Creek Sub-Watershed	0
Potato Garden Run Sub-Watershed	0
Raredon Run Sub-Watershed	1
Traverse Creek Sub-Watershed	1
Service Creek Sub-Watershed	1
Mill Creek Sub-Watershed	2

Table 2.7: What are the two most prevalent/widespread land uses in your watershed, acre-for-acre? In other words, with what is the bulk of the land in your municipality now covered?

Perceived Predominant Land Use	# of Respondents
Residential Areas/Housing	0
Commercial/Industrial Uses	1
Water/Wetlands	0
Mining/Resource Extraction Activities	2
Forested/Tree-Covered Areas	1
Agriculture/Farming Uses	4
Parks/Recreational Uses	0

Figure 2.23: How important are these community aspects to you as an elected official?

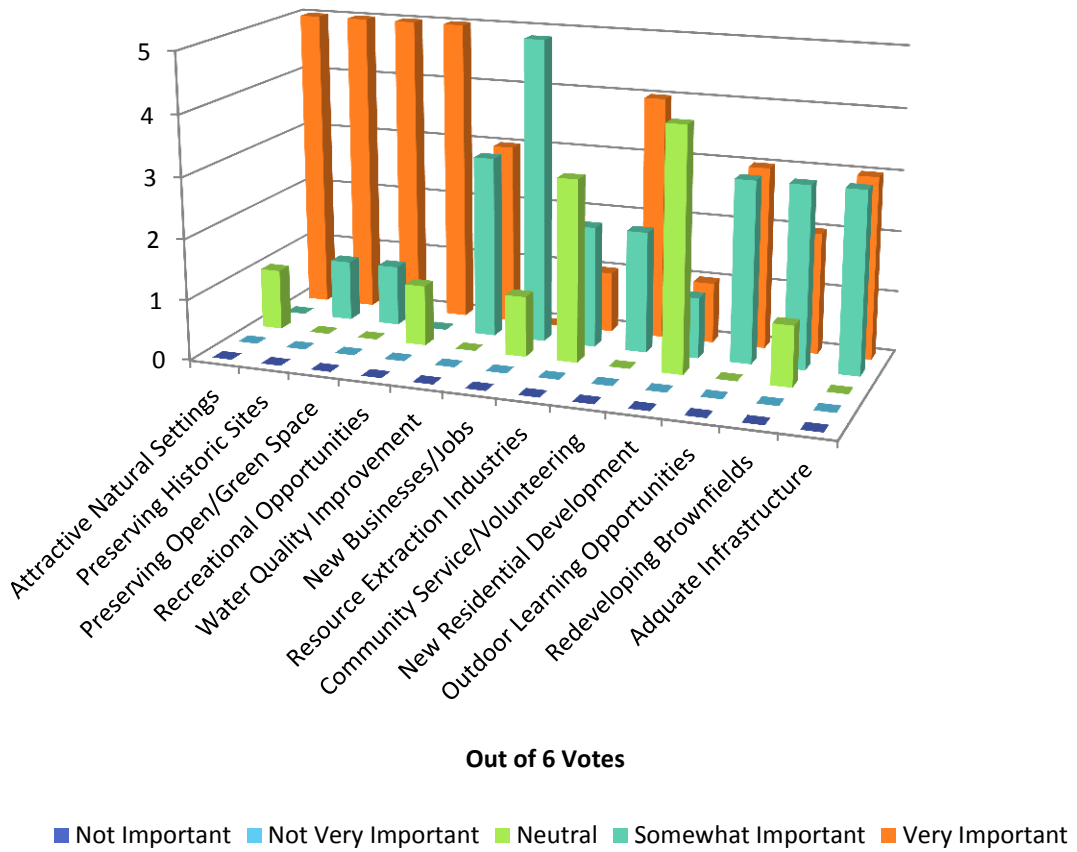
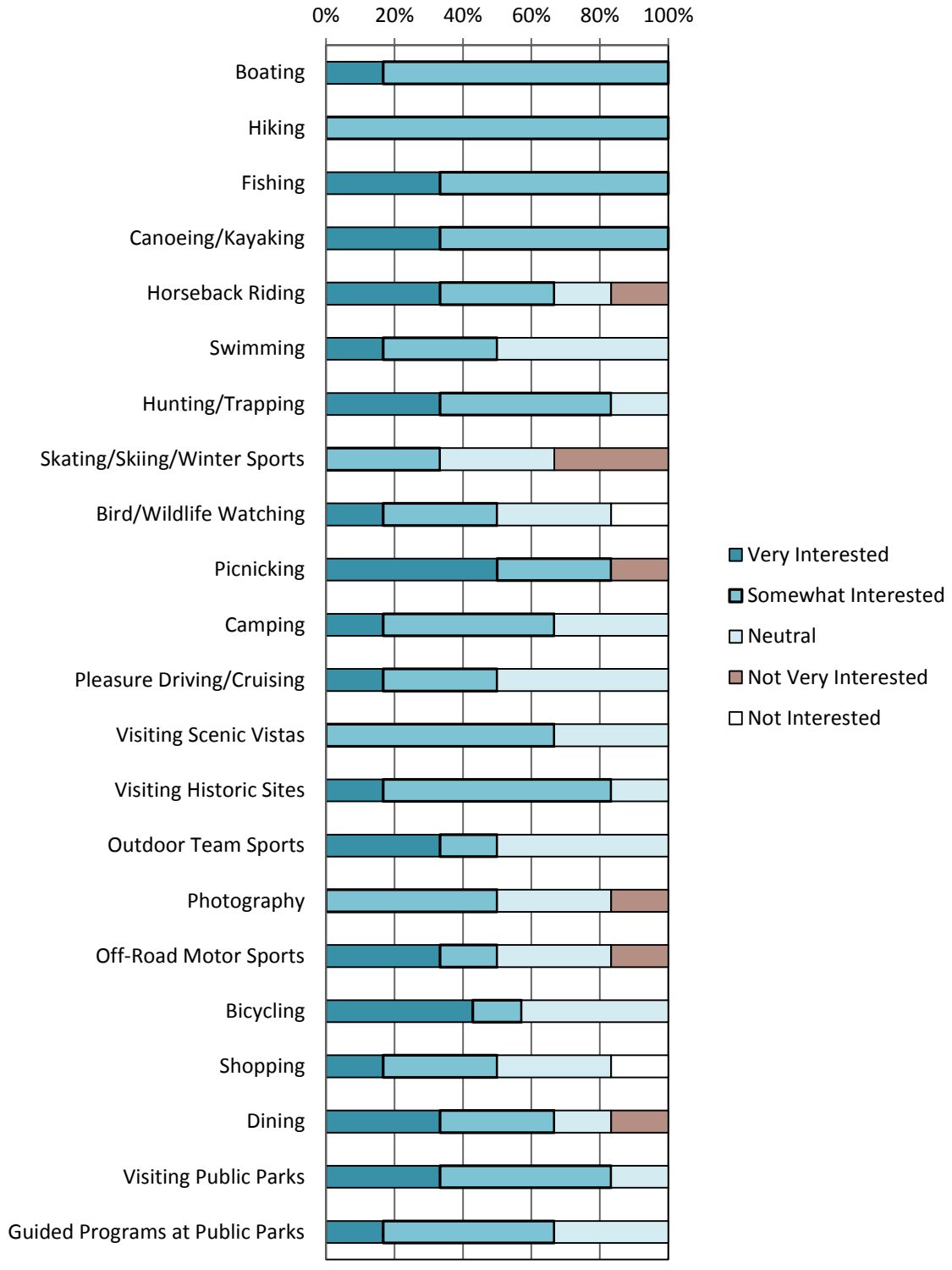


Figure 2.24: How do you think your constituents feel about these recreational opportunities in the entire Raccoon Creek Region?



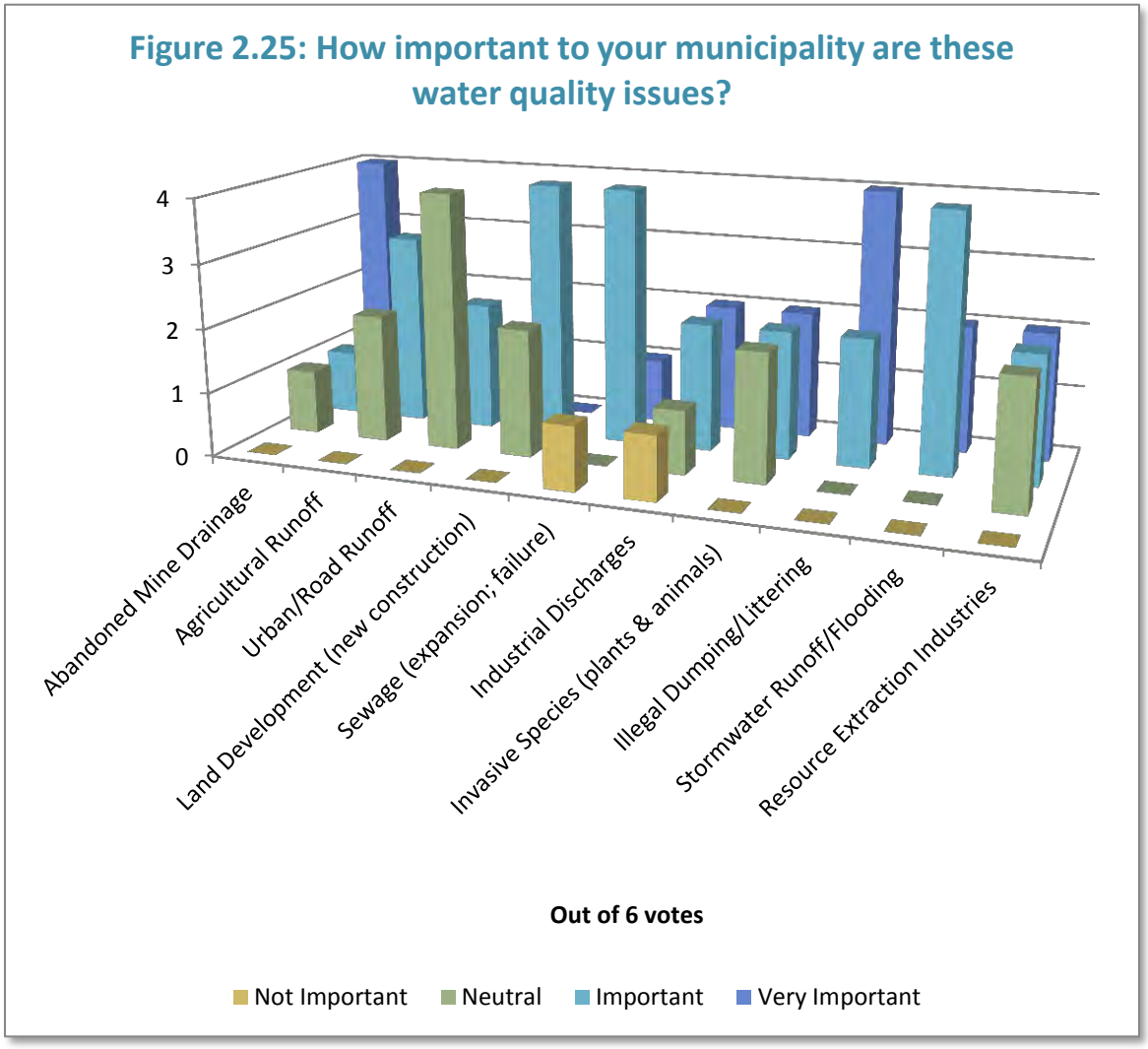
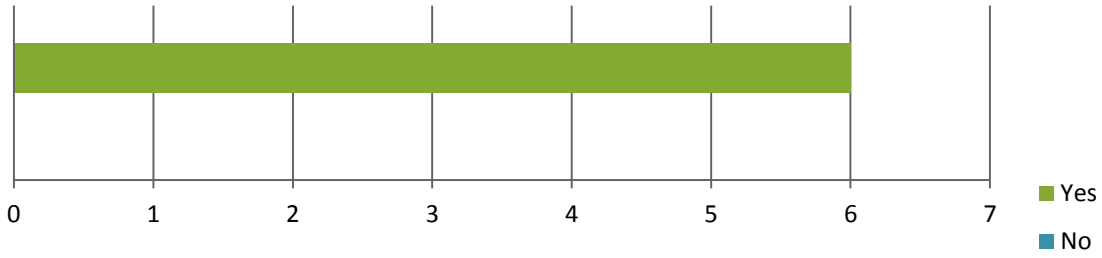


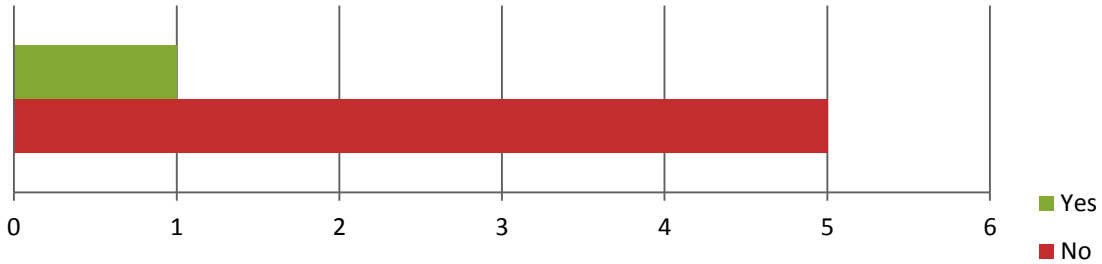
Figure 2.26: Barb Rupert, Hubie Miller & John Davidson take a break at one of Independence Conservancy's tire dump cleanups in Greene Township - August, 2005.

Figure 2.27: Does your municipality have a comprehensive plan? What is the name of the plan and when was it adopted?



Comprehensive Plan for Greene, Independence, Raccoon and Potter - 2005.
Cross Creek Region Comprehensive Plan - May 2006.
Beaver County Comprehensive Plan - 2010.

Figure 2.28: Does your municipality have a greenways or open space plan? What is the name of the plan and when was it adopted?



Greenways and Trails Plan for Beaver County - 2008.

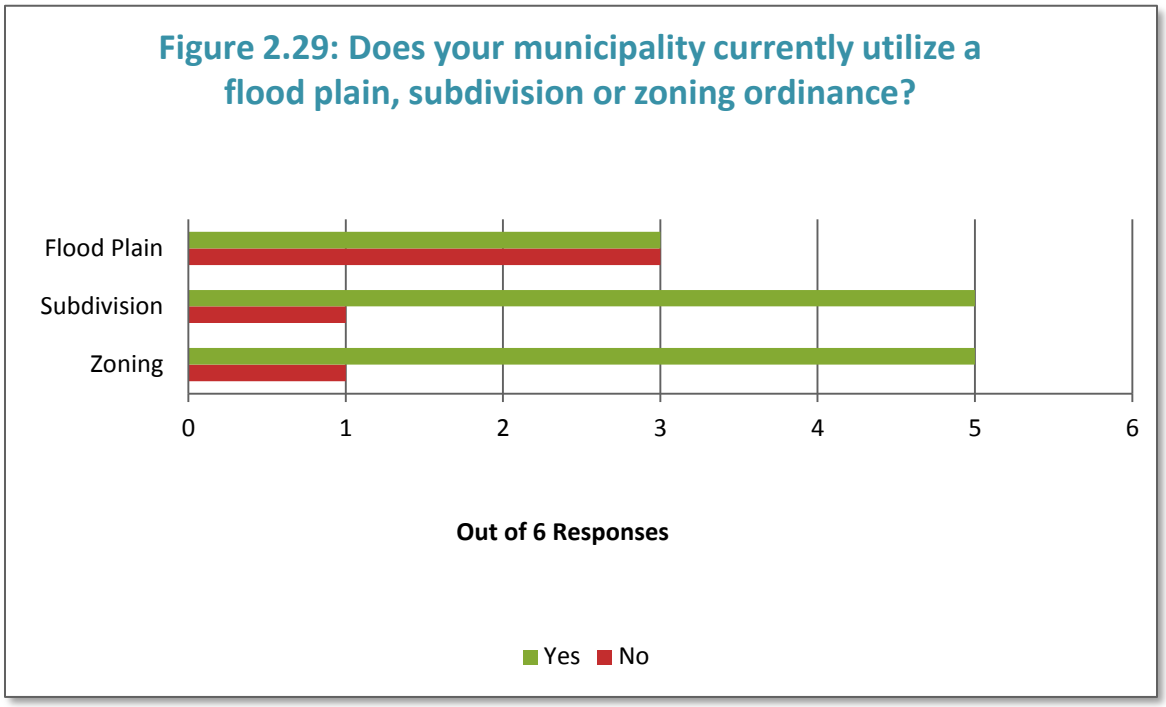


Table 2.8: What are the three most critical needs or challenges in your county or municipality that affect the Raccoon Creek Region?

Most critical needs or challenges affecting the Raccoon Creek Region
1. Sewage management 2. Storm water management 3. Animal waste management
1. Dealing with Marcellus gas extraction activities 2. Road maintenance and repair 3. Extending public sewer and water systems
1. Abandoned mine drainage 2. Flooding 3. Illegal dumping
1. Industrialization with Shell cracker plant, plant services, customers 2. Encroaching residential development 3. Abandoned mine drainage
1. Storm water run-off and flooding 2. Under-education and apathy among corporate neighbors 3. Lack of funding

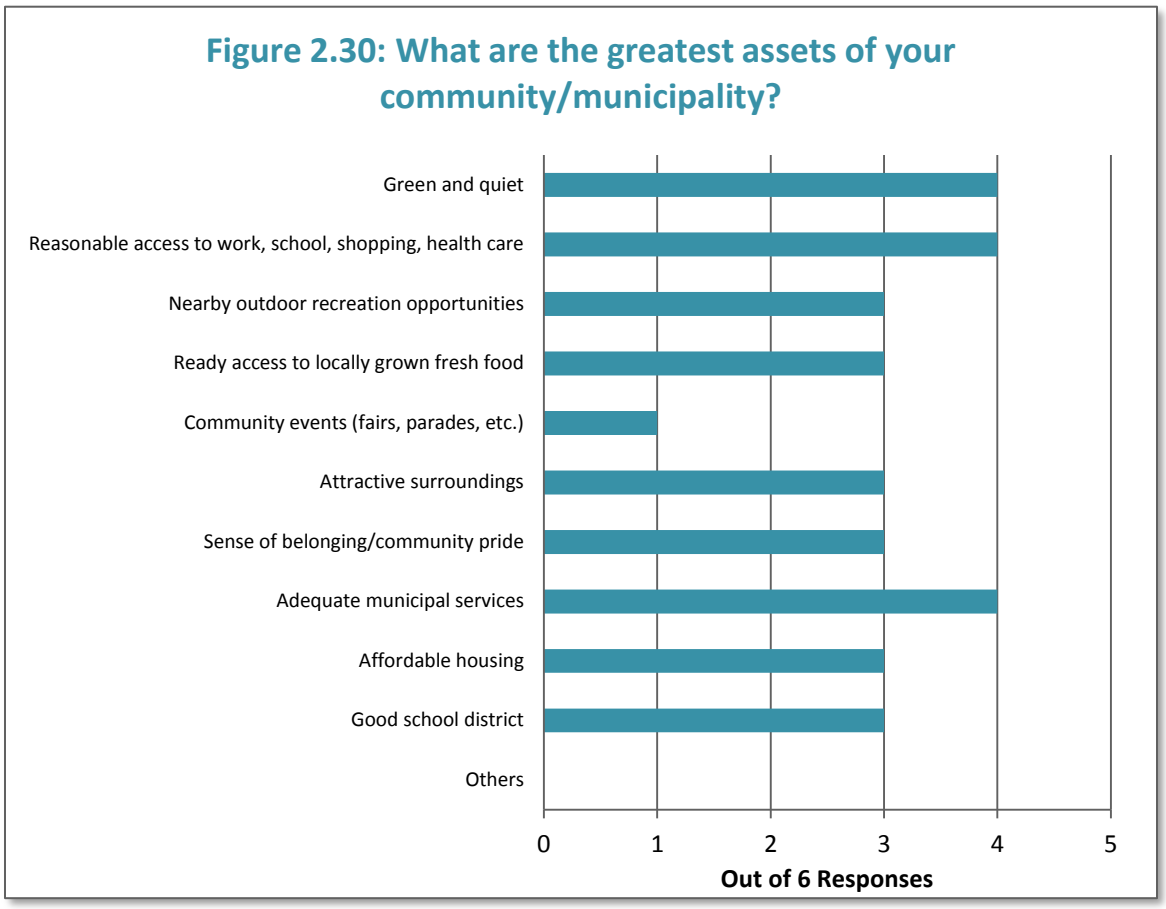
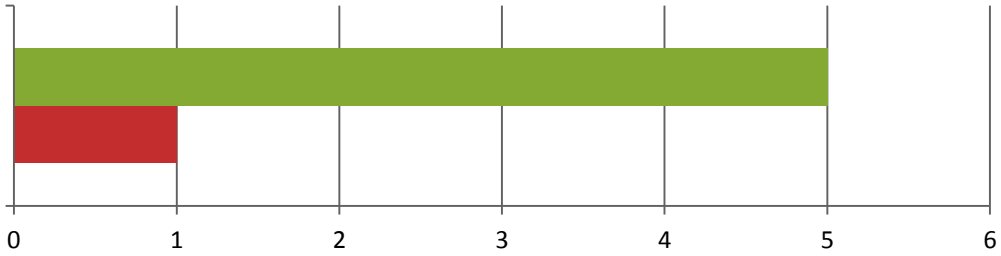


Figure 2.31: Peyton Bradley tries to lift a pumpkin at Hozak's Farm, Hanover Township, Beaver County, 10/26/2013. Photo courtesy of the Beaver County Times.

Figure 2.32: Are there places in the Raccoon Creek Region, other than state parks and game lands, which you believe should be permanently protected from development?



Entire length of Raccoon Creek from Raccoon Township line to Ohio River.
In Potter Township from Fishpot Run to Route 18 along Raccoon Creek Road.
Meadowcroft Museum of Rural Life and Rock Shelter; Devils' Den area; Scott Run; King's Creek Watershed.

Yes No

Figure 2.33: Does your municipality have public water service in the Raccoon Creek Region? Do you foresee need to upgrade within 10 years?

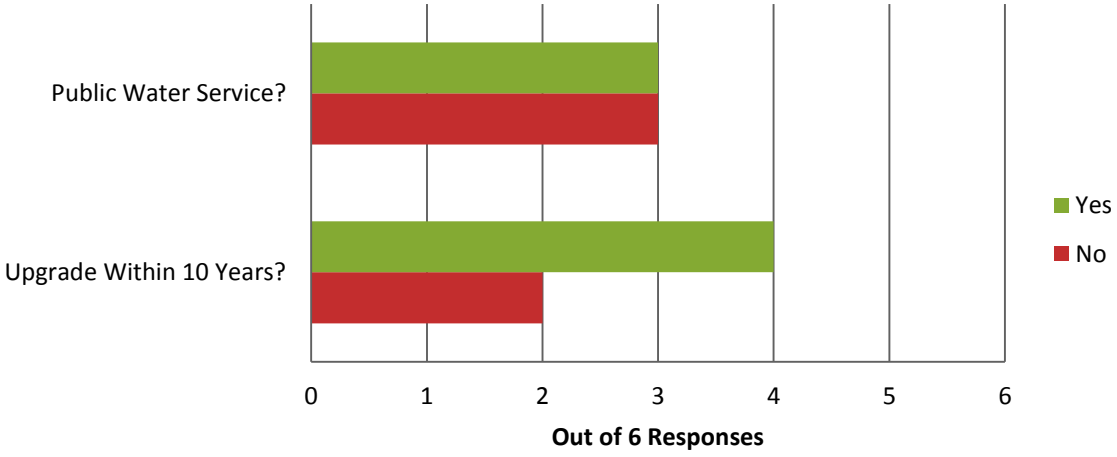


Figure 2.34: Does your municipality have a public sewage system in the Raccoon Creek Region? Do you foresee need to establish/expand within 10 years?

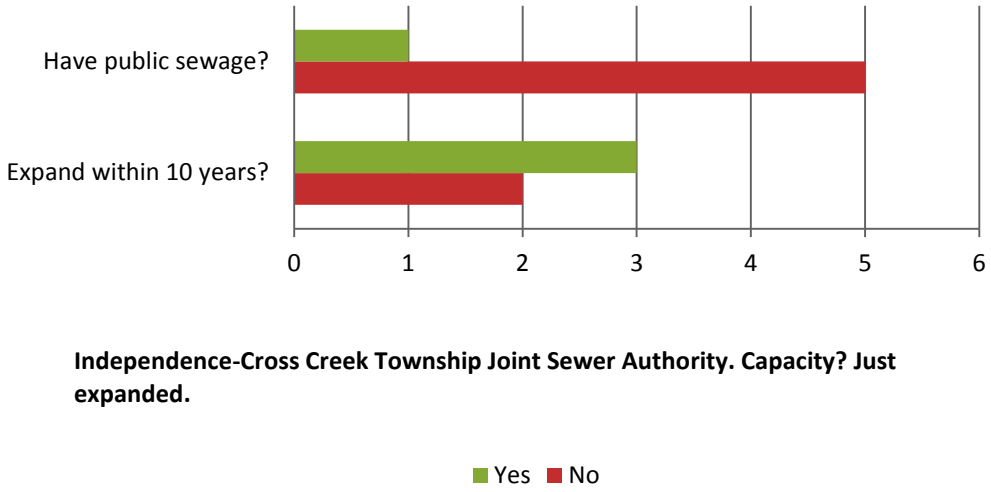


Figure 2.35: A gentleman admires the newly completed Independence-Cross Creek Township Joint Sewer Authority Treatment System plant expansion - January, 2012. Photo courtesy of Rachel Blosser, Manager, Cross Creek Township.

Figure 2.36: Does your municipality have, or is it interested in, projects in any of these categories? Please describe.

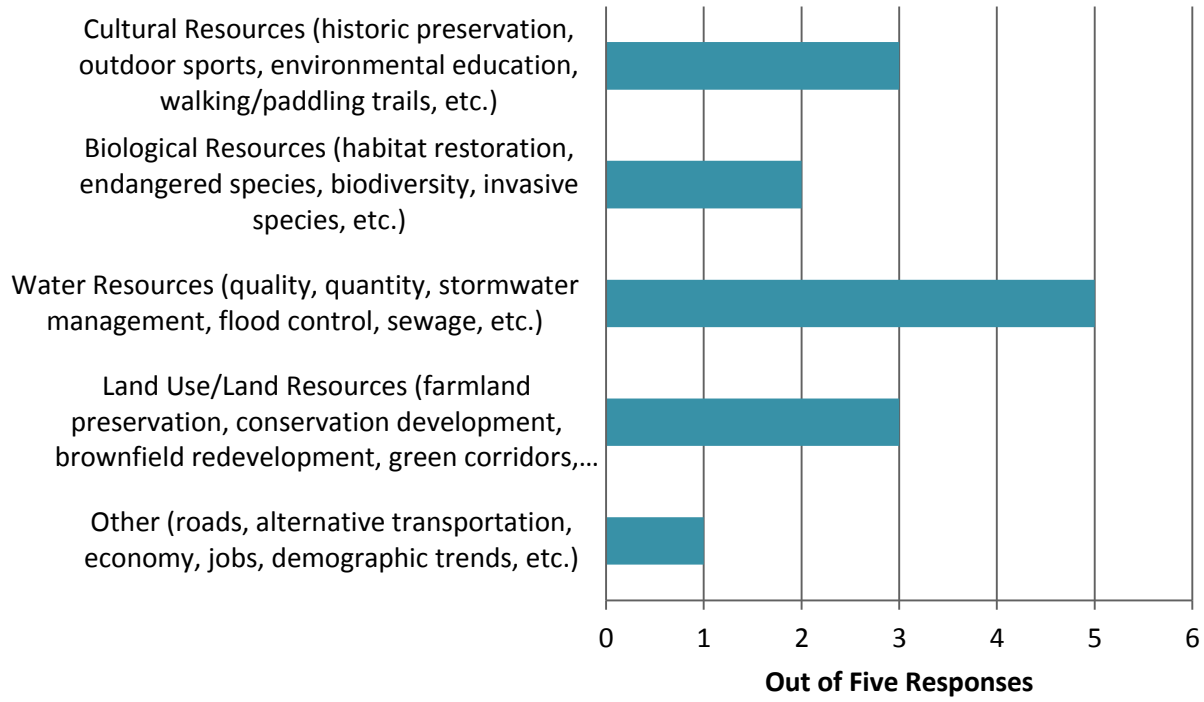


Table 2.9: Do you have any projects, or is your municipality interested in developing any projects related to cultural resources, biological resources, water resources, land use or any other natural resource? If so, please describe.

Municipal interest in watershed projects
"Interested in developing the Tank Farm as a Township Park - it will need water and sewage. Interested in green corridor from Tank Farm to St. Joe Boat Club. Interested in water quality; invasive species control; historic preservation."
"We are working with state grants and other sources of funding to upgrade out township park (Cedar Grove Park) to build a pavilion with restrooms and a food preparation area. We also plan to eventually build a basketball court on the site."
"None pending, but interested in open space planning and green corridors, water quality, flood control, outdoor classrooms, walking & biking trails and road projects."
"Biological resources development or protection would depend on stronger environmental education among residents."

Figure 2.37: Municipal official familiarity with local environmental/outdoor/conservation organizations

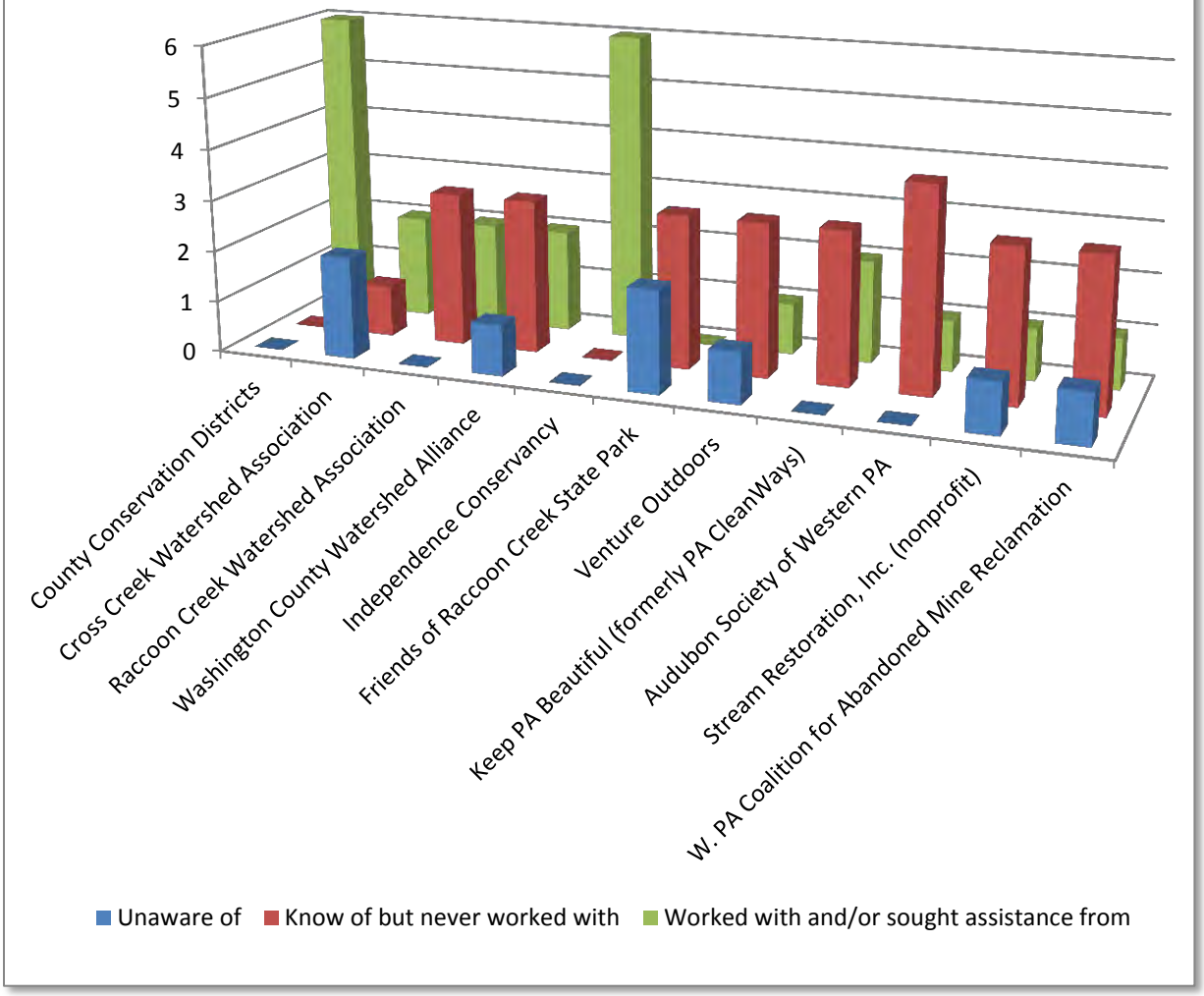


Table 2.10: Do you have any other comments about the Raccoon Creek Watershed or the Raccoon Creek Watershed Conservation Plan not previously addressed?

Other comments
"It will be helpful to residents and those interested in watershed conservation to have an entity they can identify with it, such as Independence Conservancy or Raccoon Creek Watershed Association. Names and faces would help the issues and opportunities resonate."
"Some of the questions should have had a Not Applicable box (16-19)."

Key Person Surveys

The 20D Raccoon Creek Watershed Conservation Plan Steering Committee compiled a list of "Key Persons" with extensive knowledge of the history of the region, its assets, challenges and changes. The Project Facilitator interviewed as many of these Key People as were gracious enough to share their perspectives about the greater Raccoon Creek region. The 20D RCWCP Steering Committee is grateful for their participation."

Although many people were asked to give a Key Person interview, responses were relatively few. Those who provided Key Person Interviews were:

Jeremiah Allen, Waterways Conservation Officer for the PA Fish & Boat Commission; patrolling the Raccoon Creek Watershed for the past three years, addressing fishing and boating violations.

Joseph E. Petrella, Jr., Chairman/Administrator of the Beaver County Agricultural Land Preservation Board since 1994; farming in the Raccoon Creek Watershed for over 40 years.

Kevin A. Gurchak, Manager of Environmental Compliance, Allegheny County Airport Authority, Pittsburgh International Airport; 20 year resident and sportsman.

Patrick Adams, Environmental Education Specialist, PA Department of Conservation & Natural Resources, Raccoon Creek State Park; working within the watershed for the past 22 years.

David Schofield, Director, Meadowcroft Rockshelter and Historic Village; working at Meadowcroft for 20 years. Meadowcroft is not only a tourism attraction; it owns 275 acres near Avella, devoted to conservation and interpretation of historic and modern resources on the property.

John W. Davidson, retired Mine Conservation Inspector, PA Department of Environmental Protection; member of the Raccoon Creek Watershed Association; sportsman who fishes the stream; interested in preservation of undeveloped land with Independence Conservancy.

Matthew Kramer, Wildlife Conservation Officer, PA Game Commission, assigned to Beaver County for the past five years.

Albert F. Moran, Chairman, Independence Conservancy; sportsman for sixty-plus years; hunter safety instructor for over 25 years; student president of Aliquippa High School Conservation, Fishing & Hunting Club in 1949; has been cleaning up the creek for years.

Victoria Carlton, Fire Chief, Potter Township Volunteer Fire Department; resident and fire officer who occasionally uses the stream's water for fire-fighting purposes.

Philip and Rebecca Floyd, owners of Douds-Floyd family vegetable farm in Potter Township; Phil has lived above Raccoon Creek all his life.

Barbara Rupert, educator specializing in Environmental and Agricultural Education. Barb has taught lessons concerning the watershed and enjoys recreation in the region. She is active with the Southside Historical Village in Hookstown.

Compiled Key Person Survey Results

Questions and answers for the Key Person Survey are listed below. Individual responses to the questions have been randomized. Not everyone answered every question in the survey.

Q: Have you noticed good changes in the Raccoon Creek Watershed over time?

"In the 50's and 60's Raccoon Creek had a pH below 4.0 and was devoid of aquatic life from the headwaters to the mouth. Now it supports a diverse aquatic community from the mouth upstream of the Beaver-Washington County line."

"Return of native fish populations (smallmouth bass); increase in waterfowl populations (wood ducks)."

"Mine drainage discharges have been cleaned up; the water is a thousand times better than when it was orange; most places where litter and illegal dumps were removed have remained clean."

"The water used to be milky white with dead fish floating in it and an awful smell. Absolutely good changes!"

"We swam in the creek in the 50's and 60's when the bottom was slimy and yellow but that didn't keep us out. The water is beautiful now."

"The driving cross overs at Todd Road and Gums Run Road were removed years ago to help prevent flooding by allowing water to flow smoother. The Green Garden Road Bridge was replaced after a major flood and raised to also allow the water to flow better."

"Improvements in water quality. Stream bank stabilization and stream restoration improvement projects."

"As a kid, when we would make hay, our arms and clothes would be black by the time we were done. It wasn't soil – it wasn't brown. It was black from chemicals from the factories along the river. There's a lot of cadmium in the soil but no longer all that black coming out of the factories."

"In the short time I have been assigned to Beaver County, I haven't noticed many changes, but the St. Joe Boat Club seems to be busier – more people around."

"Certainly the Cross Creek water quality has improved with the addition of a sewage treatment facility in Avella and the remediation of acid mine drainage in the Avella area. A major change over the last five years would be the development of the Marcellus Shale play throughout the watershed."

"I have experienced both good changes - that being in the water quality itself - and bad changes - in the area near Boggs in Washington County where it still runs orange. I feel that the Independence Marsh and the treatment areas in Washington and Allegheny counties have helped the water quality and reduced the effects of flooding."

"Industrial attitudes and regulations have changed and improved. The cadmium in the soil from St. Joe Lead (Horsehead) is worse than anything we're going to get from Shell."

Q: Have you noticed bad changes in the Raccoon Creek Watershed over time?

"None - general improvement all the way."

"Increase in litter and fires."

"Continued loss of agricultural land for development."

"Don't know where the gas pipelines are going to run or what natural areas they will ruin; lack of money to finish building all the mine discharge treatment systems the creek needs."

"During Hurricane Ivan flooding, the path of Raccoon Creek along Service Creek Road has been rerouted so bad that it may cause more flooding."

"I am concerned about the drilling for natural gas, I am afraid we are trading energy source production for water. I know I can live without natural gas but I know I cannot live without good water."

"I haven't noticed many changes in the short time I have been assigned to Beaver County."

"The fly ash dump for St. Joe Lead/Horsehead took some of the best farmland in Beaver Co. We don't have that much good farmland. It was a big loss to cover that land with flyash."

Q: What do you believe are the three biggest assets of the Raccoon Creek Watershed?

1. "Its ability to support an aquatic community to provide recreational fishing."
2. "Its undeveloped riparian zones for much of its length."
3. "It's large enough for canoes and kayaks much of the year."

1. "Recreation potential"
2. "Wildlife habitat"
3. "Natural beauty"

1. "Recreational assets: Raccoon Creek, Cross Creek Park, Panhandle Trail, Montour Trail."
2. "Rural aspect to majority of the region."
3. "Historic & archaeological resources: Krepps, Hanover-McClurg and Pinebank Covered Bridges; Meadowcroft Rockshelter."

1. "You can get to the creek and enjoy it - just watch you don't get run over by quads! It's great for canoeing, kayaking and edible fish."
2. "It's nature like it should be - it has a back-country feel."
3. "It's wonderful to have Raccoon Creek State Park so close."

"Raccoon Creek provides fishing for young and old anglers, canoeing for all, and water for fire departments due lack of city water in rural areas."

"The recreational assets followed by the individuals like yourself [Vicky Michaels] and John Davidson who work diligently to improve the watershed. Why? Many people use the watershed for recreational purposes."

1. "Public access - allows the public access to a good fishery."
2. "Good fishery – many different and large species of fish are often caught in Raccoon Creek."
3. "Big fishery – large in size with many different types of waters (pools, riffles and runs)."

1. "Access for canoes/kayaks, fishing, swimming; i.e., recreation."
2. "Diversity of wildlife and plants"
3. "Areas of quiet and solitude."

1. "Recreation is the greatest asset to this area. We know that quality of life draws people to the area, having places to fish, swim, boat, and hike keep people healthy and excited about where they live."
2. "Another way to keep people healthy is to have clean water to drink and to use for all of our most basic needs so that is a most pressing need."
3. "Water is not only OUR need but needed for the plants & animals that live in the watershed and downstream. Without the BEAUTY of this green, growing bounty, we would be poor indeed."

Q: What do you believe are the three biggest needs of the Raccoon Creek Watershed?

1. "Continue to improve water quality in the headwaters through the construction of passive treatment systems to treat abandoned mine drainage."
2. "Preserve undeveloped land for future generations."

3. "Minimize the impact of pipelines to prevent forest fragmentation."

1. "Continued monitoring of Acid Mine Drainage."
2. "Identification of species of special concern."
3. "Regulation of shale drilling within the watershed."

1. "We need the watershed protected from those who abuse and pollute - people who put their needs and enjoyment above their knowledge and understanding concerning the negative effects that their actions can have."
2. "It would be beneficial to have more qualified people who could enforce the laws concerning pollution and activities such as ATVs which can cause major erosions problems including unsightly trails and disruption to the flora and fauna."
3. "Having residents and individuals who care about and understand the environmental impact of our human activities who can band together is a powerful weapon against those who are uncaring and under educated."

1. "Continue to improve water quality."
2. "Continue to preserve recreational, rural and historic/archaeological resources of the region."
3. "Manage growth in a way that balances progress with the retention of the rural aspect to the region."

1. "We need more trails and public access to the creek - there need to be places where kids can have fun - more canoe launches if they were taken care of and not left without maintenance."
2. "We need better information about Marcellus Shale activities - where the well pads and pipelines are going to be."
3. "New workers will need housing but we don't need trailer parks infringing on the creek."

1. "Better education to landowners on keeping the water clean and uncontaminated."
2. "Straightening out the bad bends and flood hazards."

1. "Like many watershed groups you need to somehow engage the younger generations; someone will need to carry the ball when you are not able to."
2. "Funding for maintaining existing projects. Money is hard to find, but is it possible to engage the drilling and midstream companies."
3. "To get the PADEP to “buy into the idea” that AMD Projects should be considered mitigation. If this were true companies would look to do more AMD Projects and receive stream credits."

1. "More public access – draws anglers and boaters."
2. "Public boat access – lacks a public boat ramp for motorboats."
3. "Kayak/Canoe portage areas – kayaking is becoming a popular outdoor activity."

1. "Stopping ATV and dirt bike trespass on private property. These people and their machines are destroying land, causing erosion and damaging peoples' property. The police need to enforce trespassing laws."
2. "Stopping ATV trespassers from abusing new places after construction starts on the Shell cracker plant."
3. "We need sensible FDA food regulations for production and marketing, especially regarding manure."

1. "Controlling water quality."
2. "Protecting the natural beauty of the creek."
3. "Controlling building and development near the creek area."

Q: Are you, or is your agency/business, currently involved in any projects or programs that will benefit the Raccoon Creek Watershed? Can you suggest any?

"PA Game Commission has participated in nest box construction along the creek. This program is designed to benefit wildlife through the placement of nest box structures."

"Not directly, but we [Potter Township Volunteer Fire Department] support efforts of our township supervisors."

"The Agricultural Land Preservation Program preserves open space, which in turn keeps ground open for water absorption, rather than developments that cause flooding due to excessive runoff during storms."

"We [Allegheny County Airport Authority] are currently exploring one stream restoration project, but are always open minded to other potential projects."

"None that I am aware of besides law enforcement."

"Meadowcroft preserves and interprets the national historic landmark Meadowcroft Rockshelter and the Pine Bank Covered Bridge. The purpose of the museum is to tell the big story of 16,000 years of a human presence in the upper Ohio Valley and how people have used the natural resources found here to survive and build a better life for their families."

"Independence Conservancy has worked with the local people to clean up tons of tires and garbage from almost every tributary of Raccoon Creek. We also have plans to improve public access to the creek at Rocky Bottom in Potter Township. Our Community Tire Collection Program has been going since 2004 - we've collected and properly disposed over 35,000 tires that could have been thrown over the hills."

"Though I have been highly involved in the past, my involvement currently limited to keeping the garbage off of local roads. All of this trash eventually ends up in our waterways but before

that, it is an eye sore at best. I am also lightly involved with some organizations who advocate for the environment."

"Yes. Independence Conservancy is interested in land preservation and continued access to the stream. Raccoon Creek Watershed Association is interested in water quality improvement through construction of passive treatment systems."

Q: What is your vision for the future of the Raccoon Creek Watershed?

A prosperous, viable region where residents possess a sense of pride and ownership in our natural, cultural and historic resources. Where progress and quality of life are not mutually exclusive.

"I hope to see it preserved for future generations to enjoy, not to be abused."

"Continue the improvement of water quality so the entire watershed can support aquatic life. Preserve as much of the undeveloped land as possible along the main stem."

"Continued growth and renewal."

"That it be the best creek for canoeing; that the farmers can keep farming; that the cracker plant and the Marcellus industry bring good jobs but be careful about places they shouldn't touch with pipelines or well pads or compressor stations."

"With continued education, all of the above listed positives can be kept together for generations."

"Any bottom land, especially Allegheny Loam soils, should remain in agriculture."

"A healthier stream where more areas can be stocked. More canoe launches so that people can see the beauty of the stream. Young people involved with restoring and protecting the watershed."

"Have the foresight to develop new housing without scattering out all the houses so there are no woods to play in. We need to preserve the green spaces – lots of them-we need them everywhere-children need to be able to play in green places as they grow up.
A great fishery that is open to the public for their enjoyment, with parking and access near the creek. Clean water is the key."

Q: What topics should be included in the Raccoon Creek Watershed Conservation Plan to make it most useful and relevant?

"Water quality issues; land preservation; commonsense development."

"Water quality; erosion; no business development along the banks."

"Identify all the illegal dumps and places that still need to be cleaned up."
"Identify sites for public recreation in addition to the state park - tourist-friendly places where people can eat or shop or buy gas."
"Identify places that should be preserved and not developed or messed with."

"Education, education, education cannot be stressed enough. The public needs to be more mindful."

"Protection issues, how to protect what we have. Maybe having regular walks or walkers to monitor delicate areas would help."

"Tell people how they can get involved in helping the volunteer groups like yours [Independence Conservancy and Raccoon Creek Watershed Association]. People are looking for ways to get involved. Help them connect. How many more rocks could you move if you had just three more people? Try to get the big corporations like CONSOL and MarkWest involved as partners for mitigation projects."

"A map of legal public access to the creek would be helpful – showing where you can park, whose property is open to the public and what's off limits to the public. It would be very helpful."

"Of great relevance is addressing Marcellus Shale drilling activity."

Q: How can we best engage the public in developing the Raccoon Creek Watershed Plan

"Public meetings; ask for comments on the Independence Conservancy and Raccoon Creek Watershed Association websites."
"Public meetings; direct mail asking for opinions."

"This is a problem in any endeavor you try to do for the public. People want things changed for the better, but no one wants to help. Lots of people have great ideas, but won't help implement them."

"Post information on your website [Independence Conservancy]; have information available at Raccoon Creek State Park; contact sporting clubs and schools."

"Maps/literature with goals and success stories of the Raccoon Creek watershed."

"Perhaps interview those folks who currently use the area."

"Provide progress updates via e-mail, social media and traditional media with opportunity for the public to provide feedback along the way."

"This can be a difficult question but think the best way is to make recreational areas that are highly used and available, picnic areas, open playing fields, trails to hike, creeks to fish and boat."

"The Raccoon Creek could be a wonderful canoeing and kayaking waterway. I am wary of it because of limited access and the many trees that have fallen into the water way causing hazards. I don't know who is responsible for clearing those hazards but I would like to see it made safer."

"When people are invested in using an area they are more likely to help care for it."

Q: Do you have any other comments for the record?

"We need more information up front from the [Marcellus] gas people - not just wait to find out what ends up being built after it's too late to suggest alternatives."

"I would love to see churches involved in stewardship issues; that care for God's creation should be a big part of our worldview."

"How realistic is it to keep farming in Beaver County? Is it fair to make your family live like paupers just so you can farm, especially if your kids attend Central Valley where the kids have everything? Except for hobby farming and people who have other sources of income, farming is dead in this area."

"For the size of your organizations [Raccoon Creek Watershed Association & Independence Conservancy] you guys have done an amazing job on making improvements to the watershed. It speaks to the dedication of the people involved. Why don’t schools want to jump in? Hang out with the watershed association volunteers and learn what needs to be done. Finding people in the younger generations who want to help is like pulling teeth. Kids could help through their senior projects."

"When I moved here, more than 30 years ago, I was amazed that with all of the water features, especially the Ohio River, there was no access for residents or sportsmen to utilize it! This has gotten better, but I am still awed by the number of industries that corner the market on river access."

"There are still more threats to the waters and its quality with more industry adding to the brown fields we already had. The hazardous waste plant, WTI, the proposed Shell plant and all of the 'fracking' being done. The economy always seems to upstage protection of our natural resources - consumerism wins the day."

"I'm a happy transplant to this area…grew up in southeastern PA…still awed by the Ohio River. We thrill to hear the spring peepers, dimly the first night, but louder and louder as they ascend the hill from the creek to our farm."

Figure 2.38: The McDonald Family work together to bale hay on their farm along PA Route 151 in Independence Township. David McDonald watches his father David catch a bale as it pops out of the baler, run by Grandpa Wayne McDonald. 6/20/2013. Photo courtesy of the Beaver County Times.

Appendix 2.1: Public Comments Received

The following is a compilation of quotes received from stakeholders in response to the draft version of the 20D Raccoon Creek Region Conservation Plan. Input was gathered by various means: at public presentations by the Project Facilitator, from phone calls or conversations with the Project Facilitator or Steering Committee members, or from written or emailed comments received through Independence Conservancy's website.

Connect Raccoon Creek State Park and Hillman State Park by preserving the closed Paris landfill near Clinton-Frankfort Road.
Provide a green corridor for wildlife movement within the Starpointe Industrial Park by preserving the stream corridor feeding Harmon Creek Lake, connecting it to State Game Lands 117.
Wonderful maps – very well done!
I haven't had time to read it all but what I've seen is a great job.
This is so comprehensive and well-researched. Thank you for all your hard work!
I must say I am overall very impressed by the amazing amount of information and consideration that went into this effort, even if the response from the general public and public officials was disappointing.
I enjoyed reading it – and I learned a lot!
I love the thorough discussion of AMD! How about a map of the affected areas? Something which highlights the streams considered impaired by AMD. I don't know how up to date or complete this information is.
Overall this is a great report! Thank you!
I would include a little discussion of the American Chestnut reintroduction program using trees that are 971/2% American 21/2 % Chinese.
Ponds you remark are typically man made after discussing Lakes. Actually all your Lakes are man-made -- really reservoirs. I believe the only natural lakes in PA are the result of something a glacier did and we are too far south. A natural lake has it warm and cold water turn over in the fall at least in temperate areas.
I think DEP/DCNR will confirm that statewide the biggest loss of wetlands is to flooding! This is somewhat distorted by the Poconos where so many swamps have been turned into ponds and lakes for vacation home developments or to enhance individual dream homes. Even here many farm ponds replaced "useless wetland areas". And many wetland replacement projects have much more open water than the wet meadows, seep areas shrub swamps they were supposedly replacing - the popular Padot Mayview Wetlands being a prime example.
These may pale compared to AMD in your area, but my memory is there is a huge backlog of leaking abandoned oil and gas wells, and progress on plugging them is very slow with only the most dangerous relative few getting done each year. Couldn't this be expanded a bit, or is this mostly to the north of you. A Hopewell teen huffed himself to death at an abandoned well not long ago.

Worthwhile project indeed. I look forward to digging into the details of the history over the winter when I have more time. Well done Vicky, thanks.
I don't know much about conservation plans, their purpose, who they pertain to , etc. I just have a very general knowledge. As I understand it, it's an admirable and important (vital even?) pursuit. I think the folks who've spent good portions of their lives here take it for granted that "of course we want this place to stay the way it is" and maybe don't see all the threats and encroachments to that. Seems like we're naturally a people who want to be left alone and have things left alone

Section 2: PLATES

Plate 2.1: Focus Area Map of the 20D Raccoon Creek Region

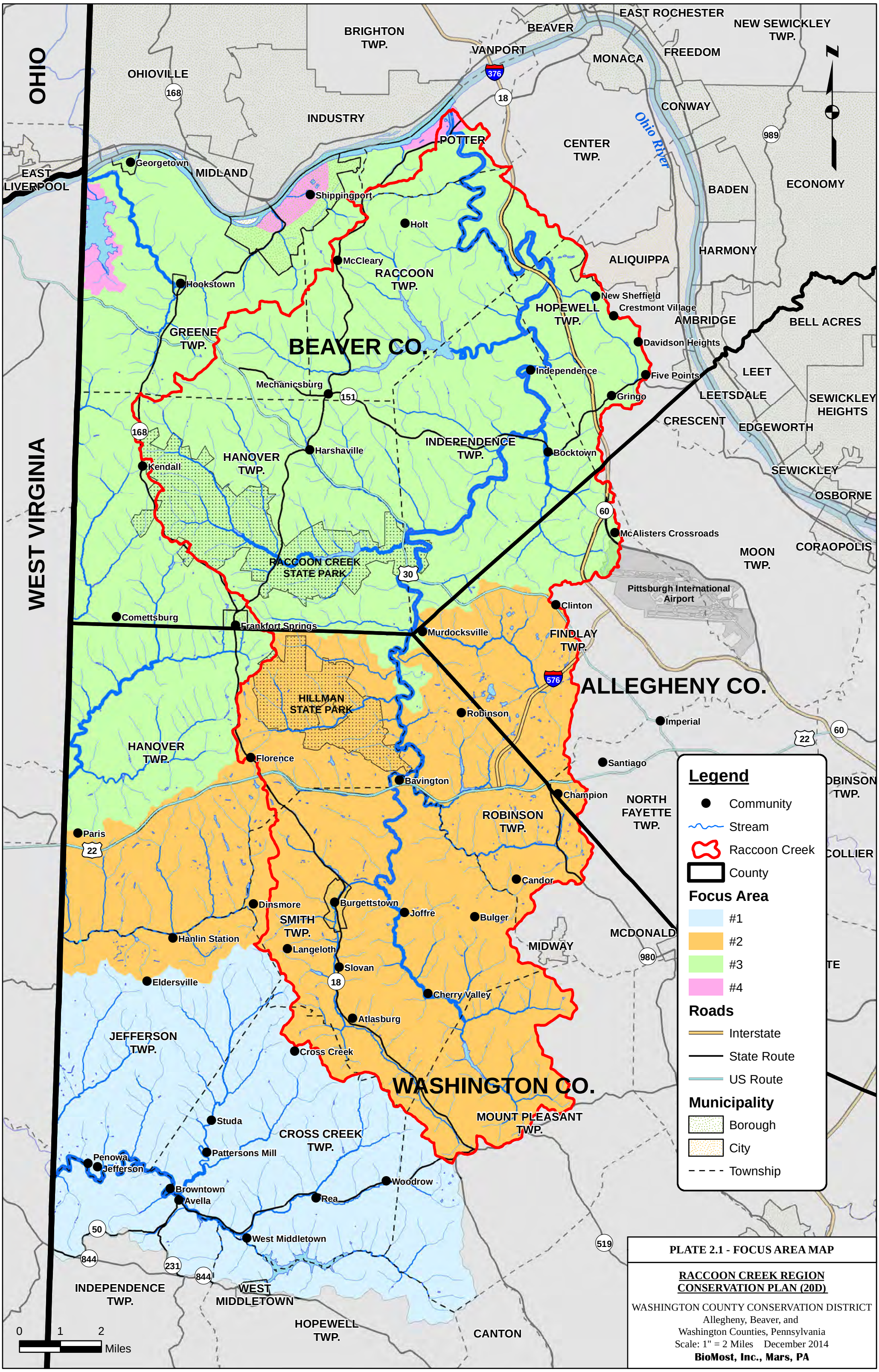


PLATE 2.1 - FOCUS AREA MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

Section 3: Land Resources

Introduction

The 20D Raccoon Creek Region is rich in resources: choice farmland, abundant timber, reserves of coal, sand & gravel, gas and oil. In the 19th Century these natural resources helped to build the industrial might of the greater Pittsburgh area. During the Second World War, coal, zinc, synthetic rubber and petrochemicals produced in the Raccoon Creek Region were crucial to the Arsenal of Democracy and the ultimate victory of the Allies.

This section of the 20D Raccoon Creek Region Conservation Plan provides a comprehensive overview of available information relating to the geology, soils, ecoregions, land use, property ownership, hazardous areas and energy resources in the 330-square mile Region. Although the text provides explanations, the reader is urged to study the eleven plates which are found at the end of this section. They provide a graphic guide to the land features of the Region. “Plate 3.11: Energy Resources” illuminates our industrial history, shows development trends in unconventional gas extraction and possible future impacts to our economy, environment and landscape.

Much of the economy and overall sustainability of the communities in the Raccoon Creek Region is still based on land resources. The advent of the shale gas extraction industry is bringing new development, opportunities and challenges to the Region. As new industries develop, it is imperative that we avoid repeating mistakes of the past by using resources wisely, protecting ecologically sensitive areas and consolidating disturbances to preserve the quiet rural character our residents have clearly stated they cherish.

We must also address the legacy effects of abandoned mines, oil and gas wells from the era before regulations were enacted to protect our environment. Pollution from these sites significantly degrades both land and water resources in much of the Raccoon Creek Region.

Geology

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

Physiographic Provinces and Sections

As noted in “Section 1: Project Area Characteristics,” Pennsylvania has six physiographic provinces which display distinctive landscapes and geologic features. These physiographic provinces have been divided into twenty-three sections with similar geologic features and climate on a smaller regional scale. According to the Department of Conservation & Natural

Resources (DCNR) classification system, the 20D Raccoon Creek Region is located in the Appalachian Plateau Province and covers two sections, the Pittsburgh Low Plateau Section and the Waynesburg Hills Section. These are illustrated in Figure 3.1.

Pittsburgh Low Plateau Section

The majority (230.8 square miles) of the 20D Raccoon Creek Region lies in the Pittsburgh Low Plateau Section.[1] This physiographic section was not glaciated and is characterized by a smooth undulating (rolling) upland surface cut by numerous, narrow, relatively shallow valleys. The uplands are developed on rocks containing the bulk of the significant bituminous coal in Pennsylvania. The landscape reflects this by the presence of some operating surface mines, many abandoned strip mines and reclaimed stripped areas. Local relief, the variation between valley bottoms and upland surfaces, may be as much as 600 feet. Valley sides are usually moderately steep except in the upper reaches of streams where the side slopes are fairly gentle. Elevations range from 660 to 1,700 feet. Some of the land surface in the southwestern part of the Section is very susceptible to landslides.[2]

Figure 3.1: A sugar maple tree clings to a sandstone and shale outcropping along the Raccoon Creek floodplain at the Wildflower Reserve, 4/24/2006.

Waynesburg Hills Section

The remaining 99.7 square miles of the 20D Region lies within the Waynesburg Hills Section.[3] Topography in this section is very hilly with narrow hilltops and steep-sloped, narrow valleys. The local relief is typically 600 to 1000 feet. Elevations range from about 800 to 1,700 feet. Some of the land surface of the Waynesburg Hills Section is very susceptible to landslides.[4]

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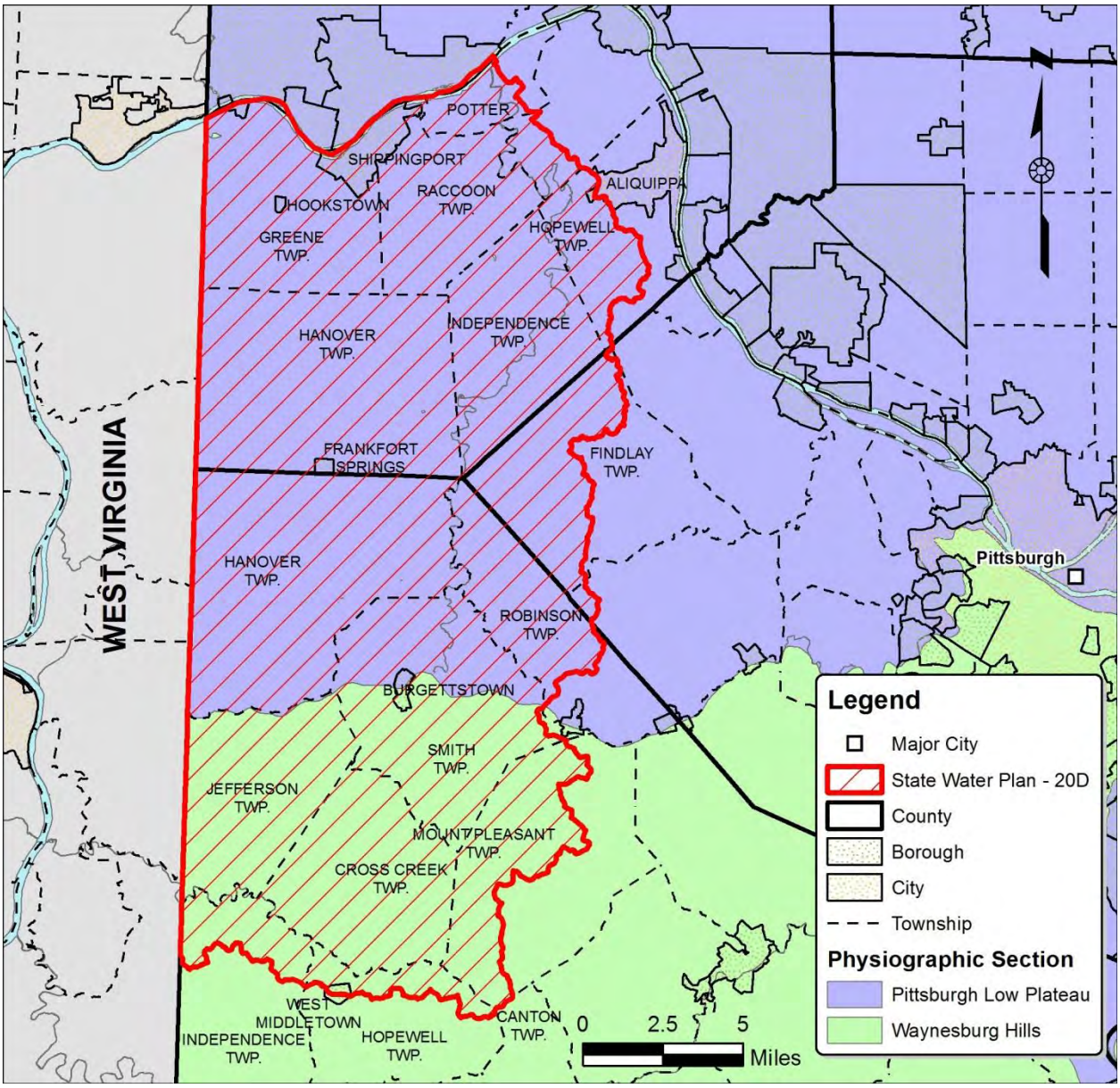
[1] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[2] DCNR, Pittsburgh Low Plateau Section, Appalachian Plateaus Province, available at http://www.dcnr.state.pa.us/topogeo/field/map13/13plps/index.htm; accessed 7/13/2014.
[3] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[4] DCNR, Waynesburg Hills Section, Appalachian Plateau Province, available at http://www.dcnr.state.pa.us/topogeo/field/map13/13whs/index.htm; accessed 7/13/2014.

An outstanding scenic geological feature of the Waynesburg Hills Section is Meadowcroft Rockshelter near Avella. Please see "Section 6: Cultural Resources" for detailed description of this site - the oldest-known human habitation in North America, dating back 16,000 years.

Figure 3.2: Physiographic Sections of Pennsylvania



Bedrock

Bedrock is the "solid" rock material that underlies the soil. In western Pennsylvania, the bedrock near the surface is composed of sedimentary rocks. Sedimentary rocks are formed from the deposition (or settling) and accumulation of sediments, chemical precipitates (solids from chemical reactions), and/or organic (plant or animal) matter in an ocean, lake or river. Over long periods of time and under great pressure these layers of sediments compact and cement together, turning into layers of rock. The most common sedimentary rocks found in Western Pennsylvania are shale, mudstone, claystone, siltstone, sandstone, conglomerate, limestone and coal.

Rock layers, also known as beds, are characterized and named using a complex system which first divides the rocks into units of time on the geologic time scale (please see Table 3.1) when they were first formed. These units of time include a supereon, eons, periods or systems, series or epochs, and ages. In general, and especially when talking about sedimentary rocks, the younger rocks are on top of older rocks because newly created sediments are deposited upon older sediments. Often the rock layers within a period or system are further classified into groups, formations and then finally individual layers called beds. Names for these layers are often based upon their rock type - sandstone, limestone or coal – and by the name of a place such as Pittsburgh where the rock layer was first identified or has the best exposure.

In the Raccoon Creek Region, rock layers of the near-surface bedrock were generally deposited during one of two geologic time periods - the Carboniferous Period or the slightly more recent Permian Period. Much of the Region's bedrock was deposited during the Pennsylvania subperiod (about 300 to 320 million years ago) of the Carboniferous period (about 300-360 million years ago). In the southern part of the watershed, a smaller portion of the near-surface bedrock was deposited during the slightly younger Permian Period (about 250 to 300 million years ago). Major geologic time periods in Pennsylvania are charted on the Geologic Time Scale in Table 3.1. Geographic locations of surface rock layers are shown on the map in Figure 3.3.

The Carboniferous and Permian Periods are both part of the Paleozoic era, about 250 to 540 million years ago. The Paleozoic era is part of the Phanerozoic eon, the current geologic eon spanning the last 540+ million years. All geologic time prior to the Phanerozic eon is often referred to as the Precambrian eon. The Precambrian consists of the Proterozoic, Archean and Pre-Archean Eons. It makes up nine-tenths of the estimated time span of Earth's history. [5]

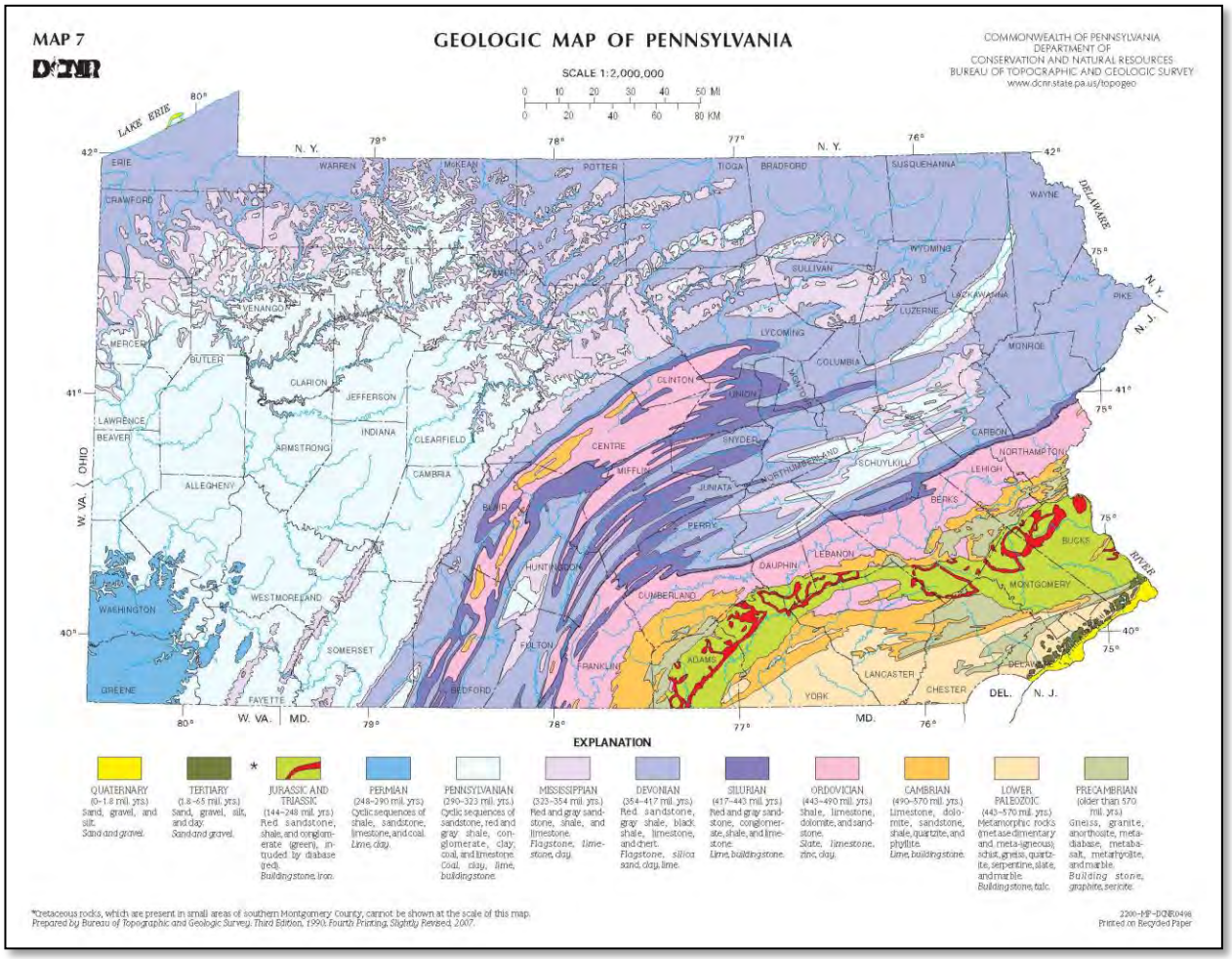
[5]Orndorff, Randall C., U.S. Geological Survey, *Divisions of Geologic Time—Major Chronostratigraphic and Geochronologic Units: Fact Sheet*, 2010 (accessed August 23, 2014); available from http://pubs.usgs.gov/fs/2010/3059/pdf/FS10-3059.pdf

Table 3.1: Geologic Time Scale in Pennsylvania

GEOLOGIC TIME SCALE in PENNSYLVANIA					
Years Ago	**Era or Eon**	**Period**	**Activity Affecting Pennsylvania**	**Main Rock Types or Deposits in PA**	**Dominant Life Forms in Pennsylvania**
0 to 1.8 million	**Cenozoic Era**	**Quaternary**	Glaciation; periglacial erosion and deposition	Sand, silt, clay, gravel	Mammals, including humans
1.8 million to 66 million		**Tertiary**	Weathering and erosion; creation of present landscape	Sand, silt, gravel	Mammals, grasses
66 million to 146 million	**Mesozoic Era**	**Cretaceous**	Erosion and weathering	Clay, sand	Dinosaurs, mammals, birds
146 million to 200 million		**Jurassic**	Diabase intrusions; opening of Atlantic Ocean	Diabase	Dinosaurs, mammals, birds
200 million to 251 million		**Triassic**	Separation of North America from Africa; sedimentation in rift valley	Shale, sandstone, diabase	Dinosaurs, early mammals and birds
251 million to 299 million	**Paleozoic**	**Permian**	ALLEGHANIAN OROGENY: Collision of Africa and North America; mountain building, thrust faulting and folding; much erosion	Sandstone, shale	Insects, amphibians, reptiles
299 million to 359 million		**Pennsylvanian and Mississippian (Carboniferous)**	Alluvial deposition; eastward advance of shoreline followed by development of low, flat alluvial plain	Sandstone, siltstone, shale, coal, limestone	Trees, ferns, amphibians, air breathing mollusks, insects
359 million to 416 million		**Devonian**	ACADIAN OROGENY: Collision of Avalonia, Europe and North America; formation of Catskill Delta	Conglomerate, sandstone, shale	Fish, amphibians, insects, land plants
416 million to 444 million		**Silurian**	Erosion of mountains; deposition of sand and mud	Conglomerate, sandstone, limestone	Corals, fish
444 million to 488 million		**Ordovician**	TACONIC OROGENY: Thrusting of volcanic arc; development of Appalachian Basin	Shale, limestone, dolomite	Molluscs, bryozoan, graptolites
488 million to 542 million		**Cambrian**	Transgression of the sea; carbonate deposition	Limestone, dolomite, quartzite	Trilobites, brachiopods
542 million to 2.5 billion	**Proterozoic Eon**		Accretion of microplates to form Laurentia	Schist, slate, marble	Blue-green algae, jellyfish, worms
2.5 billion to 4 billion	**Archean Eon**		Bombardment by meteorites and comets; creation of continental crust	None identified	Bacteria
4 billion to 4.5 billion	**Pre-Archean Eon**		Formation of Earth and solar system	None identified	None identified

Modified from Barnes, J. H., and Sevon, W. D., 2002, The Geological Story of Pennsylvania (3rd edition): Pennsylvania Geological Survey, 4th series, Educational Series 4, 44 pages.

Figure 3.3: Geologic Map of Pennsylvania[6]



During the Pennsylvanian period, what is now western Pennsylvania was actually situated near a giant sea or ocean approximately 5-10 degrees south of the equator. The warm, moist, tropical climate provided ideal conditions for vigorous plant growth which produced an enormous amount of biomass. At times, the area contained wetlands such as swamps, bogs, and fens. Because the soils drained poorly in these wetlands, dead plant matter accumulated, up to tens of feet in thickness, in an anoxic (no oxygen) environment. This dead plant matter gradually turned into peat.

At other times, the same land area was covered by the sea. The shoreline of the sea underwent cycles of transgression (sea level rise) and regression (sea level fall) across what is now western Pennsylvania. These cycles changed the depositional environment and determined whether layers of peat, sand, silt, clay, or seashells, etc., were being deposited. Passing time and

[6] Pennsylvania Department of Conservation and Natural Resources, Map 7, Geologic Map of Pennsylvania, 2007; accessed August 5, 2014; available from http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016205.pdf

increasing pressure from the subsequent layers of sand, silt and clay forced volatile compounds to vaporize from the peat. As the process continued, carbon left behind in the peat was concentrated, transforming it into the rich coal reserves found in the Raccoon Creek Region today.

Over geologic time, the remains of sea shells, clams, coral, etc. and chemical precipitates of calcite and dolomite became limestone. Large and small siliciclastic sediments such as sand, silt and clay were cemented into the layers of sandstone, siltstone, clyastone and shales.[7] Please refer to "Plate 3.1: Bedrock Geology" for a detailed map of bedrock formations in the Raccoon Creek Region.

By the end of the Pennsylvanian subperiod, the marine sea was completely regressed from western Pennsylvania. During the Permian Period, a dramatic change occurred when North America and Africa collided, resulting in the creation of mountains we know today as the Alleghenies. This mountain-forming process is called the Alleghanian Orogeny. As the Allegheny Mountains eroded, large amounts of sediments were carried away and deposited in what is now Western Pennsylvania. Little evidence remains of these sediments as most were also eroded away. However, some rock layers of the Permian Period do still remain in southwestern Pennsylvania.

Geologists describe layers of rock to identify the locations of coal, road building materials and other resources in the subsurface. Sequences of rock layers that are distinctive to a specific depositional environment, that extend over a substantial area, and that can be mapped are called "formations." In the Raccoon Creek Region, eight distinct geologic formations are found. Depending on the elevation and orientation of the rocks, these formations lie just below the soil, or are exposed in outcrops at the ground surface. As with individual rock beds, each formation is typically named for the geographic area with the best exposure or where the formation was first described.

Raccoon Creek's eight geologic formations are, from youngest to oldest: Greene, Washington, Waynesburg, Uniontown, Pittsburgh, Casselman, Glenshaw and Allegheny. The Allegheny Formation is sometimes divided into the Freeport, Kittanning and Clarion Formations. The Uniontown and Pittsburgh Formations are sometimes combined and referred to as the Monongahela Group. Because the bedrock dips or "tilts" very generally to the southwest, the youngest formations (Greene, Washington and Waynesburg) crop out in the southernmost portions of the Raccoon Creek Region and the oldest formation (Allegheny) crops out in the northernmost portion. The various formations and their orientations are depicted in "Plate 3.1: Bedrock Geology." Major features of the formations are summarized in Table 3.2 on page 9.

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

Table 3.2: Geologic Groups and Formations of the 20D Raccoon Creek Region[8]

Group Name	Formation Name	Thickness (in feet)	Major Features	Approx. % Coverage of 20D Region
Dunkard Group	Greene Formation	700-800	Poorly developed coals and limestone. Stratigraphic details and continuity of individual beds are presently not well understood.	< 1%
	Washington Formation	160-270	Distinguished by three widespread limestone units at top, middle and base of the formation: Upper, Middle & Lower Washington limestones. Contains the Washington coal.	~5%
	Waynesburg Formation	85-210	Thickness of the formation increases from northwestern Washington County southward into Greene County. Contains the Waynesburgh coal.	~8%
Monongahela Group	Uniontown Formation	270-400	Consists mostly of thin-bedded sandstones, but also contains siltstones and shales that may grade laterally into bedded limestones or cherty limestone. Contains the Little Waynesburg and Uniontown coals.	~25%
	Pittsburgh Formation		Upper portions consist mostly of inter-layered beds of limestone and calcarious mudstone. The Pittsburgh sandstone sits above the Pittsburgh coal and can be up to 80 feet thick. At the base is the Pittsburgh coal seam which can range from 4 to 10 feet thick; is uniquely persistent with consistently high quality and low sulfur content; is one of the most valuable coal beds in the world; has been widely used for metallurgical purposes. Also contains the Sewickley, Redstone, and Fishpot coals.	
Conemaugh Group	Casselman Formation	230-485	Bottom portion is of marine origin and represents the last known coverage of the ancient sea during the Paleozoic Era. Above the marine zone, rocks are exclusively freshwater deposits of claystone, limestone, sandstone, shale and coal. Red beds are scattered throughout the formation. Casselman is one of the least studied formations of the Pennsylvanian period because it lacks economically important rocks and significant fossil zones.	~39%
	Glenshaw Formation	280-400	Characterized by a cyclic sequence of shale, sandstone, red beds, with thin limestone and coal. The Pittsburgh red beds are a 40-60 foot rock layer composed of mostly reddish, greenish and grayish claystones that easily weather and are known to be unstable. They are often a major cause of landslides.	~19%
Allegheny Group	Allegheny Formation	270- 330	Characterized by repetitive cycles of sandstone, shale, claystone and coal with occasional limestone. Home to six major valuable coalbeds: Upper & Lower Freeport, Upper, Middle & Lower Kittanning, and Brookville-Clarion at the base of the formation. Contains commercially valuable claystones mined for bricks and pottery; contains the Vanport limestone. Coal and limestone beds are generally too deep to be economically mined in most of watershed.	~3%

[8] Shultz, Charles H, ed. The Geology of Pennsylvania. Harrisburg, PA: Pennsylvania Geological Survey, 1999; and Berg, T. M., et. al., Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Geological Survey: Digital Bedrock Geology, 1980 (accessed June 14, 2010); available from http://www.dcnr.state.pa.us/topogeo/map1/bedmap.aspx

The Geographic Information System (GIS) data used to create "Plate 3.1: Bedrock Geology" was obtained from the Pennsylvania Bureau of Topographic and Geologic Survey of the Department of Conservation and Natural Resources (DCNR). According to the meta-data associated with the file, the data for the geologic units was primarily digitized from the 1980 Geologic map of Pennsylvania that was developed by the Pennsylvania Geological Society along with other source material. The meta-data advises against creating maps at scales finer than 1:250,000. Therefore, the depiction of bedrock geology in Plate 3.1 is provided as a generalized overview of the geology of the Raccoon Creek Region and should not be used as a definitive location of specific rock sequences. Field verification of specific beds is always recommended.

Surficial Material

In layman's terms, surficial material is the dirt or soil that we walk on, dig in, build on, and farm. Surficial material sustains all life on Earth! Scientifically, surficial material is defined as the unconsolidated material lying on top of the bedrock and consisting of residual, alluvial, glacial, or human influenced deposits. It is typically unstratified (lacks layers) and is the most recently deposited material in terms of geologic time. Based upon current understanding of geology in Pennsylvania, the Raccoon Creek Region does not have any surficial glacial deposits.

Surficial material of the Raccoon Creek Region consists of soil, alluvium, colluvium and human influenced material. Alluvium is a general term for clay, silt, sand, gravel, cobbles, etc. that was deposited relatively recently, in respect to geologic time, by flowing water (streams). Alluvial material is typically found lining stream beds and in floodplains. Loose rocks, rounded cobbles and clay in the bed and banks of streams are examples of alluvial material. Colluvium is a general term for a mass of soil or rock fragments that have collected at the base of a hill due to weathering or gravity. Of course, there is also man-made or human-influenced surficial material. This would include roads, pavement, concrete, mine spoil, coal refuse and other miscellaneous materials.

Overview of Soils

Soils are more than just dirt! The nature of soils determines what types of plants can grow in a given area. Plants, in turn, determine the types of insects and animals that the environment can support. Soils play five key roles in any ecosystem:

- First, soils support plant growth by providing a medium and a source of elements essential to plant growth.
- Second, soil properties affect the loss, utilization, contamination and purification of water.
- Third, soils recycle dead plant and animal matter, making the nutrients available to other organisms.
- Fourth, soils provide a habitat for a wide range of organisms from microscopic bacteria to large mammals.

- Fifth, soils are an important engineering medium for humans, supporting activities like the construction of roads, buildings, ponds and other structures. As soils play a key role in the ecosystem function, soils can be utilized to help determine the appropriate land use.[9]

General Soils Associations

Soils are formed from the weathering of the underlying bedrock and the breakdown of surficial materials – alluvial and/or abandoned mine spoil.[10] 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." Soils are classified and named based on their physical and chemical properties. There are five major factors in the soil formation process: parent material (bedrock, glacial material, etc.), climate, biota, topography and time. Each plays an important role in soil formation. Soil, therefore, is site-specific or region-specific as each variable will change from one area to the next.

Soil Limitations and Suitability

Soils play an important role in determining how a landscape can be used. Every soil type has a different set of chemical and physical properties that can help determine the most suitable uses for the site - not only for farming but also development of residential subdivisions, industrial parks, roadways, etc. By examining the limitations and suitabilities of soils, better decisions can be reached regarding appropriate uses of land.

The USDA NRCS has published soil surveys for most of the United States. A soil survey is a detailed report on the soils of an area. It has maps with soil boundaries and photos, descriptions and tables of soil properties and features. Soil surveys are used by farmers, real estate agents, land use planners, engineers and others who desire information about soils.[11]

The USDA NRCS soil surveys can be accessed online at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, or by visiting the nearest county NRCS office. In the Raccoon Creek region, the USDA Local Service Center is located at 2800 North Main Street, Washington PA; phone 724-222-3060 ext 107. Rennie Stoy is the District Conservationist.

"Plate 3.5: Building Suitability" maps the Region according to building suitability based on soils. It is worth noting that very few places in the Region are "not limited." Know your soil before you build!

[9] Brady, Nile C., & Weil, Ray R., The Nature and Properties of Soils (Alexandria, VA: Prentice Hall, 2001).
[10] Soil Science Society of America, Glossary of Soil Science Terms, n.d., available from https://www.soils.org/publications/soils-glossary#; accessed on 7/13/2014.
[11] USDA NRCS Web Soil Survey, available at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, accessed 7/13/2014.

Unstable Soils

Soil stability is dependent on a number of factors including slope, relative wetness or dryness, vegetation cover and soil texture. Organic matter in the soil acts as a "glue" and helps enhance stability, while clay in the soil reduces stability due to expansion and contraction when wetted or dried. Generally speaking, the more water present and the greater the slope, the less stable the soil. As rainfall and soil moisture vary from place to place, slope can provide a quick determination of soil stability. Some indicators can be observed in the field which will point to unstable soils: pistol-butted trees (trunks greatly curved near the ground), tipped trees, or tension cracks in the soil.[12]

Although most of the known landslides in western Pennsylvania have occurred since World War II, sliding certainly is nothing new in the area. The Monongahela River is named for the Native American word "Menaungehilla" which means "river with the sliding banks" or "high banks, which break off and fall down."[13]

"Plate 3.6: Erodible Land" maps the Raccoon Creek Region based on the erosion potential of soils. Note that, because of terrain, much of the Region is considered moderately to severely erodible. The Ohio River Slopes in Potter and Greene Townships are clearly indicated as the only areas in the Region being very severely prone to erosion, more so than any other place in the entire 330-square mile Region. Earth disturbances or vegetation removal on these slopes should be avoided.

Soil pH

Soil pH is a measure of acidity or alkalinity present within the soil. Soil pH is one of the characteristics that are important in selecting crops and other plants, evaluating soil amendments for fertility and stabilization, and determining the risk of corrosion to certain materials.[14]

"Plate 3.7: Soil pH" clearly shows that soils become increasingly acidic moving northward and downstream through the Raccoon Creek Region. This is due to the chemical composition of the rocks underlying the area.

Hydric Soils

According to the Natural Resources Conservation Service (NRCS), a hydric soil is one that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic (airless) conditions in the upper part. The concept of hydric soils includes soils developed under sufficiently wet conditions to support the growth and

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[12] Rossiter, D. G. University of Twente - The Netherlands: Dept. of Geo-Information Science and Earth Observation, Chapter 10 - Slope Stabilization, n.d. ,available from ttp://www.itc.nl/~rossiter/Docs/FM5-410/FM5-410_Ch10.pdf; accessed 7/13/2014.

[13] The Pittsburgh Geological Society, Landsliding in Western Pennsylvania, available at http://pittsburghgeologicalsociety.org/landslide.pdf; accessed 7/13/2014.

[14] USDA NRCS, Web Soil Survey, available at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm; accessed 7/13/2014.

regeneration of hydrophytic (water-loving) vegetation. Soils that are wet because of artificial measures are included in the concept of hydric soils.

The national list of hydric soils is maintained in the National Soil Information System (NASIS) database developed by the National Technical Committee for Hydric Soils. Hydric soil lists have a number of agricultural and nonagricultural applications. These include assistance in land-use planning, conservation planning and assessment of potential wildlife habitat.

A combination of hydric soil, hydrophytic vegetation and hydrology (water moving through the soil) must all be present in an area for it to be correctly classified as a jurisdictional wetland, a wetland over which the PA DEP or the US Army Corps of Engineers has authority.[15] Please see "Plate 3.8: Hydric Soils."

Figure 3.4: A vernal pool at the Wildflower Reserve, 5/6/2010.

Drainage Class

Drainage class is the natural, undisturbed drainage condition of the soil. Drainage class refers to the frequency, duration and amount of water in soils. There are seven drainage classes that range from excessively drained to very poorly drained.[16] Drainage classes indicate, among other things, whether crops can be grown or if an area is likely to be a wetland. Please refer to "Plate 3.9: Soil Drainage Class."

Ecoregions of the 20D Raccoon Creek Watershed

An ecoregion, or ecological region, is typically a large area of land or water with similar ecological and geographical characteristics throughout. The plants, animals and ecosystems that exist in a particular ecoregion are distinct from those of other ecoregions. As can be expected in the natural world, defining ecoregions is not an exact science. Ecoregions do not usually have distinct edges and therefore can blend together as they transition from one to another. Transition zones between ecoregions are sometimes referred to as "ecotones."

Various ecoregion classification systems exist, created by different organizations for different purposes. Many of these classification systems overlap one another, have similar names,

[15] USDA NRCS, Hydric Soils, available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/hydric/?cid=nrcs142p2_053961; accessed on 7/13/2014.
[16] ESRI, ArcGis Resources, Soil Hydrology, available at http://resources.arcgis.com/en/communities/soils/02ms00000008000000.htm; accessed 7/13/2014.

and/or provide essentially the same information, but with some differences resulting from the scale and geography of the areas described.
Three ecoregion classification systems will be used to characterize the 20D Raccoon Creek Region using information from the following organizations:

- US Forest Service (USFS)
- World Wide Fund for Nature (WWF), formerly known as World Wildlife Fund
- US Environmental Protection Agency (USEPA)

The USFS and WWF classifications will be summarized briefly; the USEPA classification will be described and illustrated in greater detail.

US Forest Service: Ecoregion 221, Eastern Broadleaf Forest (Oceanic) Province

The US Forest Service ecoregion classification divides the land into regions called Domains based upon generalized climate conditions. Domains are then subdivided into Divisions and Provinces based upon dominant vegetation and other characteristics. [17]

According to the USFS system, the Raccoon Creek Region lies within the 221 Eastern Broadleaf Forest (Oceanic) Province of the 220 Hot Continental Division, of the Humid Temperate Domain. This ecoregion covers 104,500 square miles and includes the Appalachian Plateaus, New England lowlands, mid-Atlantic coastal plain and Piedmont Plateau.

Major components of the USFS Ecoregion 221 description include:

- Topography of diverse nature and origin with hilly, mountainous, dissected landforms.
- Altitudes range from 1,000 to 3,000 feet.
- Strong annual temperature cycle with cold winters and warm summers.
- Average annual precipitation is between 35 and 60 inches.
- Small water deficit incurred in summer; large water surplus normally develops in spring.
- Characteristic vegetation is temperate deciduous forest; dominant species include American beech, tuliptree (or yellow-poplar), several basswoods, sugar maple, sweet buckeye, red oak, white oak and eastern hemlock.
- Deciduous forest soils are acidic with a thick humus layer; younger soils are found on plateaus; older, more developed soils at lower altitudes.
- Important mammals include whitetail deer, black bear, bobcat, gray fox, raccoon, gray squirrel, fox squirrel, eastern chipmunk, white-footed mouse, pine vole, shorttail shrew and cotton mouse.
- Large bird populations include turkey, ruffed grouse, bobwhite, mourning dove, cardinal, tufted titmouse, wood thrush, summer tanager, red-eyed vireo, blue-gray gnatcatcher and Carolina wren.
- Characteristic reptiles include the box turtle, common garter snake, and timber rattlesnake.

[17] US Forest Service website www.fs.fed.us/land/ecosysmgmt/index.html accessed August 2014

World Wildlife Fund for Nature: Appalachian Mixed Mesophytic Forests Ecoregion

The World Wildlife Fund's ecoregion classification system divides the terrestrial world into eight biogeographic realms, 14 biomes and 867 ecoregions. WWF is a nonprofit organization that conserves ecologically important areas, especially those that are biologically diverse and contain threatened or endangered species. Therefore, WWF's descriptions tend to focus on natural elements that make an ecoregion unique, and on perceived threats to those unique characteristics.

According to WWF's classification system, the Raccoon Creek Region is in the Narctic realm, the Temperate Broadleaf & Mixed Forests biome, and the Appalachian Mixed Mesophytic Forests ecoregion (Scientific Code NA0402).

The following information about the 74,200 square mile Appalachian Mixed Mesophytic Forests is condensed from the WWF website: [18]

The Mixed Mesophytic Forest ecoregion represents one of the most biologically diverse temperate regions of the world. Forest communities often support more than 30 canopy tree species at a single site, and rich understories of ferns, fungi, herbaceous plants, shrubs, small trees and diverse animal communities. Songbirds, salamanders, land snails and beetles are examples of some particularly diverse taxa. The ecoregion harbors some of the richest and most endemic land snail, amphibian and herbaceous plant biotas in the U.S. and Canada. The ecoregion's freshwater communities are the richest temperate freshwater ecosystems in the world, with globally high richness and endemism in mussels, fish, crayfish, and other invertebrates.*

Over 95 percent of this habitat, perhaps more, has been converted or degraded at some point in the last 200 years. Only a few very small and scattered fragments of undisturbed or old-growth forests still remain. Forests were converted for agriculture, coal mining, logging for charcoal, dams and road building. Most of the agricultural lands are being abandoned, with an increase in the growth of secondary, or pioneer, forests. These regrowing forests lack many of the features and much of the diversity of undisturbed, or old-growth forests, namely large trees, variable age classes of trees, structural complexity such as multiple canopy layers, and diverse and abundant flora and fauna. Much of the existing forest, whether old growth or regrowth forests, is still distributed in a highly fragmented mosaic throughout the region, broken by agriculture, roads, power lines, towns and other forms of development. Fragmentation is highest in the northern part of the ecoregion, primarily in southwestern Pennsylvania and Ohio.

*endemism is the ecological state of a species being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type.

[18] World Wide Fund for Nature Ecoregion info obtained from www.worldwildlife.org/ecoregions/na0402

US EPA: Ecoregion 70, Allegheny Plateau

The US Environmental Protection Agency system is based upon James Omernik's work entitled "Ecoregions of the Conterminous United States" completed in 1987. It is based on the idea that ecoregions can be defined by biotic and abiotic characteristics that affect or reflect differences in the quality and integrity of the ecosystem. These characteristics include geology, physiography, vegetation, climate, soils, land use, wildlife and hydrology.

EPA's classification system uses Roman-numeral levels. Each successive level divides the country into more specific ecoregions. For example, Level I divides North America into 15 broad regions while Level III divides the continent into 182 regions. [19]

According to the US EPA Ecoregion classification system, the Raccoon Creek Region is in the Level I Eastern Temperate Forests, the Level II Ozark, Outachita-Appalachian Forests and the Level III Western Allegheny Plateau. The Western Allegheny Plateau is further divided into three Level IV ecoregions. As can be seen in Figure 3.5, the Raccoon Creek Region falls within two Level IV ecoregions, the70b Monongahela Transition Zone and the 70c Pittsburgh Low Plateau. [20]

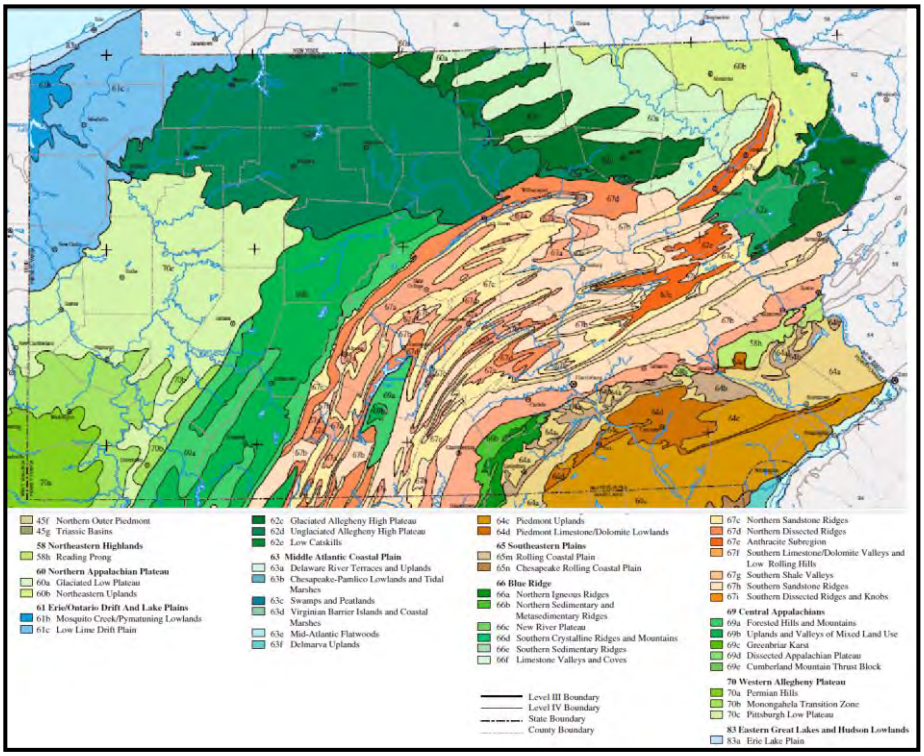


Figure 3.5: Level III and Level IV Ecoregions of Pennsylvania, available at http://www.epa.gov/wed/pages/ecoregions/reg3_eco.htm

[19] http://www.epa.gov/wed/pages/ecoregions.htm

[20] Woods, A.J., Omernik J.M., Brown D.D. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, 1999. US EPA (accessed 7/30/14) available http://www.epa.gov/wed/pages/ecoregions/reg3_eco.htm

The following descriptions of the Western Allegheny Plateau, Monongahela Transition Zone and the Pittsburgh Low Plateau ecoregions are taken and condensed from the Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia and West Virginia located on the EPA's website. Please visit the site for more detailed information. Some of the information provided may not be applicable to the Raccoon Creek Region, as these ecoregions cover much larger geographical areas.

Ecoregion 70 is a mostly unglaciated plateau composed of beds of sedimentary rock that have been severely eroded resulting in a hilly to mountainous terrain. Soils have developed primarily from the erosion and weathering of bedrock and support a potential natural vegetation of Appalachian Oak Forest. The region receives a moderate amount of precipitation.

The land use and land cover is a mosaic of forests, urban-suburban-industrial activity, general farms, dairy and livestock farms, pastures, coal mines and oil-gas fields. Urban and industrial activity is common in valleys along the major rivers. Bituminous coal mining is widespread and has diminished water quality and reduced fish diversity; recent stream quality improvements have occurred in some streams and rivers including the Allegheny, Monongahela, Youghiogheny, and Ohio.

The boundary of the Western Allegheny Plateau (70) with the less rugged, more agricultural Erie/Ontario Hills and Lake Plain (61) approximates the furthest extent of the Wisconsin ice sheet (glacier) in Pennsylvania. Its boundary with the North Central Appalachians (62) approximates breaks in land use/land cover and elevation in which Ecoregion 70 is less forested, warmer, and lower in elevation than Ecoregion 62. Its border with the Central Appalachians (69) approximates the break in elevation and forest density that occurs near the limit of the Pennsylvanian Allegheny Group where Ecoregion 70 is lower, warmer, less steep, and less densely forested than Ecoregion 69 and is underlain by less resistant rock.

On the ecoregion map (Figure 3.5), the Western Allegheny Plateau (70) is composed of three level IV ecoregions: the Permian Hills (70a), the Monongahela Transition Zone (70b), and the Pittsburgh Low Plateau (70c). The Raccoon Creek Watershed lies within only the Monongahela Transition Zone and Pittsburgh Low Plateau. Descriptions of the individual characteristics of these two ecoregions follow.

70 b: Monongahela Transition Zone

The unglaciated hills, knobs and ridges of the Monongahela Transition Zone (70b) are typically underlain by limestone, shale, sandstone and coal of the Monongahela Group. Today, forests are extensive. Urban, suburban and industrial activity are found in the river valleys which also serve as transportation corridors. Bituminous coal mining is common and some oil production occurs. There is also some general farming although it is less prevalent than in Ecoregion 70c. Acid mine drainage, siltation and industrial pollution have degraded stream habitat and have affected fish and invertebrates. Water quality has improved recently and some species have reappeared upstream from Pittsburgh.

70 c: Pittsburgh Low Plateau

Ecoregion 70c is unglaciated and is characterized by rounded hills, narrow valleys, fluvial terraces, entrenched rivers, general farming, landslides and bituminous coal mining. The average annual growing season varies inversely with elevation and ranges from about 170 days in the southwest to 120 days in the northeast.

Today, farming is more common than woodland. General farming and dairy operations predominate but are often handicapped by sloping terrain, soil wetness, low soil fertility and a short growing season. Industry and population are concentrated in the Beaver, lower Allegheny and Ohio River valleys.

Widespread coal mining has left some land barren or reverting to woodland. Other areas have been reclaimed but their soils are not always satisfactory for cultivation. Extensive acidic mine drainage and industrial pollution have degraded stream habitat and caused the loss of at least sixteen fish species from the Ohio River watershed.

Figure 3.6: Overburden is blasted away to expose the Pittsburgh Coal Seam for re-mining near Burgettstown in the 70c Pittsburgh Low Plateau Ecoregion, 7/17/2007.

Land Use

Agricultural Lands

Food does not grow on grocery store shelves! Fertile soils produce the crops upon which all life depends. Soil characteristics determine what lands are most suitable for raising food, livestock and other agricultural activities.

Agriculture is the largest industry in Pennsylvania, producing over $50 billion annually and providing approximately 1 in 7 jobs in agriculture and ag-related business.[21] However, farmers are facing a tough challenge to keep their land profitable through agriculture.[22] If enough farmland in an area is converted to non-farm use, the farming communities lose the critical mass necessary to keep local farm-related businesses and hence the whole farm economy alive. Between 1982 and 2007, America lost 23,163,500 acres of farmland to development.[23]

Figure 3.7: Janoski's Farm Market, Greenhouse and Country Restaurant on Route 30 in Findlay Township are landmark family businesses. 4/10/2014.

Prime Farmland

According to the USDA National Soil Survey Handbook, "Prime farmland…has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. The land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water. The soils are of the highest quality and can economically produce sustained high yields of crops when treated and managed according to acceptable farming methods."

"Very specific technical criteria were established by Congress to identify prime farmland soils. In general, the criteria reflects adequate natural moisture content; specific soil temperature

[21] Growing Greener Coalition, Farmland Preservation, available at http://pagrowinggreener.org/issues/farmland-preservation/; accessed 7/20/2014.
[22] PA Department of Agriculture, Bureau of Farmland Preservation, Easement Purchase Program, available at: http://www.agriculture.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_24476_10297_0_43/AgWebsite/ProgramDetail.aspx%3Fname%3DEasement-Purchase-%26navid%3D12%26parentnavid%3D0%26palid%3D11%26; accessed 7/20/2014.
[23] Growing Greener Coalition, Farmland Preservation, available at http://pagrowinggreener.org/issues/farmland-preservation/; accessed 7/20/2014.

range; pH between 4.5 and 8.4 in the rooting zone; low susceptibility to flooding; low risk to wind and water erosion; minimum permeability rates; and low rock fragment content."[24]

Prime agricultural soils play an important role in the economy of the Raccoon Creek Region as agriculture is one of the leading industries in western Pennsylvania. There are 27 prime agricultural soils in the watershed that total 25,857 acres or 12.23% of the watershed.[25] Please refer to "Plate 3.3: Farmland Classification" and "Plate 3.4: Farmland Map" of the Raccoon Creek Region.

Farmland of Statewide Importance

Farmlands of Statewide Importance are designated by Natural Resources Conservation Service (NRCS) district conservationists. These lands can be very productive under the right conditions, but the soils do not meet the physical and chemical guidelines needed to be recognized as prime agricultural soils. These areas may also include tracts of land that have been designated for agriculture by local or state law. There are 44 soils designated as supporting farmland of statewide importance in the Raccoon Creek Region, totaling 61,743 acres or 21.19% of the watershed.[26] "Please refer to Plate 3.3: Farmland Classification."

Table 3.3: Agricultural Soils of the 20D Region[27]

Farm Soil Classification	Acres	Square Miles	Percentage of Region
Prime Farmland	25,857	40.4	12.23%
Farmland of Statewide Importance	61,743	96.5	29.19%
Not Prime Farmland	123,896	193.6	58.58%
Totals	**211,496**	**330.5**	**100%**

Agricultural Security Areas

Pennsylvania's Bureau of Farmland Preservation administers the Agricultural Security Area Program at the state level. Ag Security Areas (ASAs) are a tool for strengthening and protecting our quality farmland from the urbanization of rural areas.[28]
Enrolling land in an ASA is a voluntary choice for farmers and landowners. The benefits of enrollment are:

- Prerequisite for applying to the county farmland preservation program
- Protection against local nuisance ordinances related to farming activity (noise, smell, etc.)
- Oversight in certain cases of eminent domain.

[24] UDSA Natural Resources Conservation Service, Prime Farmlands, available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ak/soils/surveys/?cid=nrcs142p2_035988; accessed 7/13/2014.
[25] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[26] Ibid.
[27] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[28] Pennsylvania Department of Agriculture, Agriculture Security Areas, available at http://www.agriculture.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_24476_10297_0_43/AgWebsite/ProgramDetail.aspx?palid=10&; accessed 7/13/2014.

The ASA program is administered on the county level by local Ag Preservation Boards. Detailed guidance and application assistance for residents of the Raccoon Creek Region is available from these local Agriculture Land Preservation Boards:[29]

Allegheny County Ag Land Preservation Board
Chris Goswick, Program Administrator
412-350-1025
christine.goswick@alleghenycounty.us
www.alleghenyfarmland.com

Beaver County Ag Land Preservation Board
Joseph Petrella, Chairman
724-770-4429
jpetrella@beavercountypa.gov
www.beavercountypa.gov

Washington County Ag Land Preservation Board
Caroline Sinchar, Planning Administrator
724-228-6811
sincharc@co.washington.pa.us
www.co.washington.pa.us

Figure 3.8: Vultures perch on a hay wagon in Findlay Township, 7/25/2013.

Farmland Preservation Program[30]

Pennsylvania's Bureau of Farmland Preservation administers the Easement Purchase program, developed in 1988 to help slow the conversion of farmland to non-agricultural uses and curb the loss of prime farmland soils. The program enables state, county and local governments to purchase voluntary conservation easements, sometimes called development rights, from owners of quality farmland.

Pennsylvania counties participating in the program appoint agricultural land preservation boards overseen by a state board. The state board is responsible for distribution of state funds, approval and monitoring of county programs and specific easement purchases.

Farm owners who wish to preserve their land for future farming uses may apply to the Ag Preservation Board in their county. Applications are ranked and then forwarded to the state board for approval after offers to purchase development rights have been made. Farmers may choose to receive the proceeds from easement sales in a lump sum payment, installments up to

[29] PA Farmland Preservation Association, Statewide County Program Contact Information, 4/11/2013, available at http://www.pafarmland.com/MembershipDirectory.pdf; accessed 10/3/2014.
[30] PA Department of Agriculture, Bureau of Farmland Preservation, Easement Purchase Program, available at: http://www.agriculture.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_24476_10297_0_43/AgWebsite/ProgramDetail.aspx%3Fname%3DEasement-Purchase-%26navid%3D12%26parentnavid%3D0%26palid%3D11%26; accessed 7/20/2014.

five years, or on a long-term installment basis. Many farmers use the proceeds from easement sales to reduce debt loads, expand operations and pass their farms on to the next generation.

To date, more than 500,000 acres on over 4,500 family farms have been permanently protected. Pennsylvania leads the nation in farmland preservation. Cigarette tax revenue is the most significant source of dedicated funding for farmland preservation in Pennsylvania, generating an annual amount of approximately $20.5 million.[31]

Within the Raccoon Creek Region, there are approximately 33,891 acres designated as agricultural security areas and 2077 acres of farmland conserved through the state Farmland Preservation Program.[32] In addition, 38 acres of farmland are privately conserved by Independence Conservancy.[33] Sixteen percent of the acreage in the watershed is conserved for agricultural purposes. Please refer to "Plate 3.4: Farmland Map" which shows Ag Security Areas and conserved farms.

More information about farmland preservation in Pennsylvania is available from the PA Farmland Preservation Association, or PFPA. PFPA is a non-profit, nonpartisan statewide incorporated association of conservation easement professionals, dedicated to promoting and enhancing the interests of agricultural land preservation in Pennsylvania.[34]

Figure 3.9: Oak logs await transport from a timber harvest operation in Greene Township, 6/19/2006.

Forestry

The name "Pennsylvania" literally means "Penn's Woods." In 1681, William Penn advised his settlers to leave one acre of trees for every five cleared.[35] By the early 1900s, only 30% of Pennsylvania remained tree-covered due to the demand for timber by our growing nation. Today, our forests have rebounded – 60% of the Commonwealth is covered by high-quality hardwood forest, perhaps unequaled elsewhere on earth. Penn's Woods support a $5.5 billion forest industry employing 100,000 people. Our forests protect over 25,000 miles of streams used for drinking

[31] Growing Greener Coalition, Farmland Preservation, available at http://pagrowinggreener.org/issues/farmland-preservation/; accessed 7/20/2014.
[32] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[33] Independence Conservancy, Preserved Lands, Red Oak Farm Conservation Easement, available at http://www.independenceconservancy.org/services/land-conservation/preserved-lands; accessed 8/1/2014.
[34] Pennsylvania Farmland Preservation Association website, available at http://pafarmland.org/; accessed 10/3/2014.
[35] The Pennsylvania Forestry Association, About Us, available at http://www.paforestry.org/about-us/; accessed 7/23/2014.

water and recreation. They shelter dozens of rare and endangered species of plants, animals and fish while providing recreation opportunities that are vital to Pennsylvania's tourism industry.[36]

The majority of Pennsylvania's forests, about 70%, are privately owned, including 5% held by forest products companies. Approximately 30% of the forests are owned by the state or federal government.[37]

Forests are the predominant land use in the Raccoon Creek Region at 58%. Nearly all of this acreage is deciduous forest with less than 1% evergreen.[38] More information about forest land cover is available in "Section 1: Project Area Characteristics." Forest habitats are discussed in "Section 5: Biological Resources."

Land Ownership

About 93% (about 197,036 acres or about 308 square miles) of the 211,496-acre (330.5-square mile) 20D Raccoon Creek Region is privately owned with about 7% (about 14,460 acres or about 23 square miles) held as public lands primarily for recreational purposes.[39]

Public Lands

Within the Raccoon Creek Region there are three state gamelands, two state parks, twenty-two municipal parks and one county park.[40] Tracts held by the federal government are used for military or navigation purposes and are not open to the public. For the purposes of the Plan, public lands do not reflect public property held for non-recreational purposes such as township buildings, schools, etc. Please refer to "Section 6: Cultural Resources" for detailed discussion of recreational opportunities in the Raccoon Creek Region.

Private Lands

A cursory review of property ownership indicates that private lands are typically owned by individuals, families and local businesses. Parcel sizes range from less than an acre to a few hundred acres. Except where streams flow through or border on state lands (for example, Traverse Creek through Raccoon Creek State Park) tracts along Raccoon Creek and other major tributaries are privately owned. Parcels fronting the Ohio River are, for the most part, owned by businesses and industries and are not, therefore, accessible to the public.

[36] PA DCNR Bureau of Forestry Strategic Plan, Sustaining Penn's Woods, available at http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20026631.pdf; accessed 7/23/2014.
[37] Pennsylvania Forest Products Association, Quick Facts, available at http://paforestproducts.org/quickfacts.cfm; accessed 7/23/2014.
[38] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[39] Ibid.
[40] Ibid.

Rocky Bottom Natural Area along Raccoon Creek Road in Potter Township is privately owned by Independence Conservancy but is open to the public for low-impact, non-motorized public recreation including access to the main stem of Raccoon Creek for fishing, wading and paddling. Please see "Section 8: Management Recommendations" for more information about public access improvements planned for Rocky Bottom.

Table 3.4: Land Ownership in the 20D Raccoon Creek Region[41]

Land Ownership	Acres	Square Miles	Percentage of Region
Privately owned	197,036	307.87	93.16%
Publicly owned-dedicated to public recreation	14,460	22.59	6.84%
Totals	**211,496**	**330.46**	**100%**

Land Preservation

Why protect open space? Open, green space provides public values benefiting everyone. Tourism, agriculture, timber production, hunting & fishing, wildlife watching and outdoor recreation pump billions of dollars into Pennsylvania's economy every year. Municipalities and schools districts save money by curbing sprawl and the demands it places on infrastructure and public services. Protecting working farms and forests saves money, preserves the fabric of communities and ensures fresh, local food supply. [42]

There can be no greater issue than that of conservation in this country.

Theodore Roosevelt, 1912

The Case for Conservation

According to a statewide opinion poll conducted by the Center for Research at Penn State Harrisburg, 97.4% of Pennsylvanians support the continued dedication of state funds for preserving farmlands and open space, creating parks and trails and protecting our water. 82.6% of Pennsylvanians support increasing state funds for conservation and recreation – and would be willing to pay $10 more annually toward such an increase.[43]

[41] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[42] Independence Conservancy, Land Conservation Tools, available at http://www.independenceconservancy.org/services/land-conservation/land-conservation-tools; accessed 7/21/2014.
[43] ConserveLand, a Publication of the Pennsylvania Land Trust Association, Summer 2014.

Land Conservation Tools

Land trusts and conservancies are 501c3 non-profit entities organized specifically to work with land owners who voluntarily choose to preserve the natural values of their farms, woodlands and open spaces. Land trusts typically protect open space by acquiring conservation easements or by fee acquisition (ownership) of land parcels.

A land trust is a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by stewardship of such land or easements. By effectively saving land, land trusts enhance the economic, environmental and social values of their communities. They provide clean water, fresh air, safe food, places for recreation and a connection to the land that sustains us all. Please see "Section 6: Cultural Resources" for a listing of land trusts active in or near the Raccoon Creek Region.

Easement Agreements

A conservation easement is a voluntary agreement between a private landowner and a qualified organization, such as a land trust, that protects the natural, cultural and/or historic resources of the land in perpetuity. The easement agreement allows a land owner to retain ownership and use of his/her property while limiting certain uses that may be harmful to the resources being protected. It is tailored to the conservation goals of the land owner and the land trust, and to the features of the property itself.

Eased properties may or may not be open to the public, depending on the owner's wishes. Easements can provide access for trail corridors, fishing and boating, or riparian buffers. Easement agreements apply to the current and future owners of the land.

Fee Simple Acquisition

Fee simple acquisition is legal terminology for purchasing the deed to a parcel of land. Land trusts can become the owners and permanent stewards of ecologically valuable properties through bequests, gifts, bargain sales or fair-market purchases of land. Fee simple ownership by a land trust can provide the strongest guarantee of long-term conservation of a tract of land.

A wealth of information on open space preservation is available from the national Land Trust Alliance and the Pennsylvania Land Trust Association.

Critical Areas

For the purposes of the 20D Raccoon Creek Watershed Conservation Plan, critical areas associated with land resources include not only problematic areas, such as floodplains or unstable slopes, but also areas that have great value because of geologic resources or agricultural soils. Critical areas discussed in this section will include floodplains, stream bank erosion, farmlands and geologic resources.

Floodplains

Flooding is a natural and recurring event for a river or stream. Flooding happens when heavy or continuous rainfall exceeds the soil's capacity to absorb water and the flow capacity of a river or creek is exceeded. This causes a watercourse to overflow its banks onto adjacent lands.

Generally, floodplains are those lands adjacent to rivers and streams, most subject to recurring floods. Floodplains are therefore "flood-prone" and not usually suitable for development.[44]

Figure 3.10: Eroded stream banks on Raredon Run, damaged by Hurricane Ivan and not helped by lawn mowing to the water's edge. Photo by John Burglund of Wallace & Pancher, Inc. 2/16/2014.

Flooding is an issue of concern for many residents of the Raccoon Creek Region. Please see "Section 2: Issues, Concerns & Constraints" for stakeholder comments about flooding.

The Federal Emergency Management Agency, or FEMA, maintains an inventory of digital floodplain maps to help communities gain a better understanding of flood risk and its potential impacts. According to its website, "…FEMA is currently working on updating flood risk identification using state of the art technology and through partnerships with communities. The map products of this effort are called Digital Flood Insurance Rate Maps (DFIRMs)… these new DFIRMS are used to calculate the cost of insurance premiums, to establish flood risk zones and base flood elevations to mitigate against potential future flood damages to properties." More information is available from FEMA's online Map Service Center[45] or by contacting your county Conservation District or Planning Commission.

Streambank Erosion

Streambank erosion is another serious concern of landowners in the Raccoon Creek Region. After the hurricanes of September 2004, many property owners suffered damage similar or worse than is depicted in Figure 3.10.

It is common practice to mow to the edge of a creek's banks to maintain a view of the water or be able to walk to it easily. But removing the natural buffer of well-rooted woody plants, shrubs

[44] Organization of American States, Primer on Natural Hazard Management in Integrated Regional Development Planning, 1991, available at https://www.oas.org/dsd/publications/Unit/oea66e/ch08.htm; accessed 7/22/2014.
[45] FEMA Map Service Center, available at http://www.fema.gov/national-flood-insurance-program/map-service-center#1; accessed 7/22/2014.

and trees makes stream banks more susceptible to erosion by flood waters. Densely vegetated streambanks, or riparian buffers, not only resist erosion, they help to filter out pollutants, keep water temperatures cooler so that fish can thrive, and provide green corridors for wildlife habitat. Riparian buffers save soil, preserve useable property and reduce sediment loading in our waterways.

Farmlands

Modern civilization depends on farms and the food, fiber and livestock they produce. The 20D Raccoon Creek Region is predominantly rural with many scenic and productive family farms. The origins of many of these farms can be traced to the late 1700s when "depreciation lands" were granted to veterans as payment for service in the Revolutionary War. The McConnell farm and orchards in Independence Township, Beaver County, dating to 1787, is the oldest property continually farmed by one family in Western Pennsylvania.[46]

Figure 3.11: The Campbell Farm on Covered Bridge Road in Smith Township is one of the many picturesque and productive farms in the Raccoon Creek Region. 6/18/2014.

According to the USDA National Agricultural Statistics Service, Washington County is ranked first in Pennsylvania in total production of sheep and lambs; second in the total number of beef, sheep and goat farms; third in the total number of mules, burros and donkeys; first in the number of llamas; third in the total number of farms of all types; and fourth in the production of all types of forage. Washington County also has a tremendous horse industry, both pleasure and professional, ranking 4th in the state for number of horses.[47]

In Beaver County, the rich bottom-land soils of the Jodikinos farm along Park Road in Independence Township set records for bushels-per-acre corn yield for many years in the 1970s through early 2000s.[48]

[46] Times Online, Obituaries, Anna Marie McConnell, July 14, 2014, available at http://www.timesonline.com/community/obituaries/anna-marie-mcconnell/article_6a775b89-e499-52b3-8cb9-0ed0f19dc066.html; accessed 7/14/2014.
[47] Washington County Conservation District website, Agricultural Division, available at http://pawccd.org/ag.html; accessed 7/23/2014.
[48] Penn State Extension, Results from Corn Club programs, available at http://extension.psu.edu/plants/crops/grains/corn/club/past-results; accessed 7/24/2014.

As noted in "Section 1: Project Area Characteristics," active farming occurs on about 21% of the Raccoon Creek Region. Farming is conducted not only on prime agricultural soils which cover about 25,857 acres (about 12%) of the Region but also on other suitable soils. Needless to say, farmland, the second largest land use in the study area, is critical to the sustainability of agricultural activities.

Geologic Resources

Significant reserves of sand & gravel, bituminous coal, and oil & gas remain in the 20D Raccoon Creek Region. Each industry will be discussed in this section.

Sand & Gravel

Sand and gravel are non-renewable resources – non-renewable because they form over geologic time – hundreds of thousands to millions of years. The Ohio River, which borders the 20D Region to the north, is a rich source of gravel formed by glaciers retreating from the Ohio Valley more than 12,000 years ago. Glaciers advancing and retreating from far north in Canada tore apart billions of tons of stone, tumbling it like a giant rock polisher and depositing it as they melted. Glacier-fed streams cut through the ice and gravel, carrying it to the Ohio River's broad, migrating channel.

Figure 3.12: An array of beautiful colors and interesting textures in a pile of river gravel, 7/26/2014.

The harder the stone, the longer it takes to make it smooth. Igneous and metamorphic rocks become the most colorful rounded pebbles - particularly granite, diorite, gabbro, gneiss, quartzite and amphibolite. Sedimentary rocks, like limestone and chert, tend to be white and gray, while sandstone can be almost any color. Even when rounded, sandstone is gritty to the touch. Not all rocks will form pebbles – shale turns to mud.[49]

Gravel is commercially valuable for its durability and its ability to drain water rapidly. It is used as aggregate in concrete, for landscaping applications like French drains or decorative placement in plantings, or as a component in on-lot sewage systems. Hard glacial gravel is preferred in highway construction for the traction it affords to cars on pavement.

Commercial dredging of the Ohio River began over 100 years ago, first for the sand used in glass-making, later for gravel and sand for road and building construction. In recent years dredging has been confined to the Montgomery pool of the Ohio River between Baden and

[49] Indiana Department of Natural Resources, Origin of Our River Rock, available at http://www.fallsoftheohio.org/Ohio_River_Rock.html; accessed 7/26/2014.

Midland to protect recovering fragile freshwater mussel and clam beds.[50] Environmental impacts of dredging are discussed in "Section 4: Water Resources."
Tri-State River Products Inc. of Beaver operates a dredge barge in the Montgomery pool. Georgetown Sand & Gravel, located in Georgetown and Greene Township, is one of the few remaining river-oriented businesses for which Georgetown was once famous. Please see "Section 6: Cultural Resources" for more information about historic Georgetown.

Coal

Today's coal mining is an important part of the economy of the Raccoon Creek Region. The PA DEP's Bureau of Mining Programs administers the environmental regulatory program for all mining activities in Pennsylvania. The bureau develops and implements policy, scientific analysis, statistical reporting and technical guidance in support of DEP's mine permitting, licensing and compliance operations.[51]

Figure 3.13: Youngsters from the Beaver County Sportsmen's Conservation League Youth Camp tour a re-mining operation in Smith Township, 7/17/2007.

Coal is a solid brown or black carbon-rich material that most often occurs in stratified sedimentary deposits. It is one of the world's most important fossil fuels. Coal contains more than fifty percent by weight, or seventy percent by volume, carbonaceous matter produced by the compaction and hardening of ancient plant remains.

Coal has many important uses worldwide, most significantly in generating electricity, producing steel, manufacturing cement and as a liquid fuel. Forty percent of the world's electric power is generated by burning coal. Since 2000, global coal consumption has grown faster than any other fuel. The five largest coal users - China, USA, India, Russia and Japan - account for seventy-six percent of total global coal use.[52]

[50] Post-Gazette.com, Commercial Dredging to end on Allegheny River, 6/16/2013, available at http://www.post-gazette.com/local/region/2013/06/16/Commercial-dredging-to-end-on-Allegheny-River/stories/201306160172; accessed 7/26/2014.
[51] PA DEP Bureau of Mining Programs, available at http://www.portal.state.pa.us/portal/server.pt/community/bureau_of_mining_programs/20865; accessed 7/26/2014.
[52] World Coal Association, Uses of Coal, available at http://www.worldcoal.org/coal/uses-of-coal/; accessed 7/26/2014.

The Pittsburgh coal seam is the thickest and most extensive coal bed in the Appalachian Basin.[53] It is the most economically important coal deposit in the eastern United States.[54] The first reference to the Pittsburgh coal bed was made by H.D. Rodgers of the First Geological Survey of Pennsylvania on a 1751 map.[55] The northern extent of the Pittsburgh coal seam underlies the headwaters of the Raccoon Creek Region in northern Washington and western Allegheny Counties.

To the north of the Pittsburgh coal seam in Beaver County, several other smaller coal seams are located beneath Greene, Hanover, Independence, Raccoon and Hopewell Townships. These include the Bakerstown, Harlem/Platt, Elk Lick, Lower/Upper Freeport, and the Lower/Middle/Upper Kittanning.[56] Rosebud Mining Company of Kittanning PA operates a deep mine near Shippingport in Greene Township, marketing coal from the Upper Freeport Seam for electric power generation.

An important aspect of the modern coal mining industry in the Raccoon Creek Region is re-mining, or "the practice of surface mining of abandoned surface or underground mines or reprocessing of coal refuse piles where preexisting pollution discharges will be affected."[57] Modern mining machinery is able to do a better, more efficient job of reaching and extracting coal than the equipment used decades ago.

In the Raccoon Creek Region, and in Pennsylvania as a whole, re-mining has proven to be a very successful means of addressing Abandoned Mine Lands and AMD problems. By allowing coal operators to extract remaining coal for its value in exchange for reclamation of the re-mined sites, a win-win situation is created. The coal operator has an opportunity to mine coal that would normally go untouched because of potential liabilities; the citizens gain no-cost or little-cost land reclamation, often accompanied by improved water quality.[58]

Natural Gas

Natural gas is a non-renewable hydrocarbon fuel formed over geologic time. Its energy comes from the decomposition of microscopic plants and animals that lived in the ocean millions of years ago. When these plants and animals lived, they absorbed energy from the sun, storing it as carbon molecules in their bodies. When they died, they sank to the bottom of the sea. Over

[53] Susan J. Tewalt, Leslie F. Ruppert, Linda J. Bragg, Richard W. Carlton, David K. Brezinski, Rachel N. Wallack, and David T. Butler, 2000. Chapter C - A Digital Resource Model of the Upper Pennsylvanian Pittsburgh Coal Bed, Monongahela Group, Northern Appalachian Basin Coal Region. U.S. Geological Survey Professional Paper 1625–C, 106 p.; available at http://pubs.usgs.gov/pp/p1625c/CHAPTER_C/CHAPTER_C.pdf; accessed 7/26/2014.
[54] Encylopedia Britannica, Coal, available at http://www.britannica.com/EBchecked/topic/122863/coal; accessed 7/26/2014.
[55] Eavenson, H.N., 1938, The Pittsburgh coal bed; its early history and development: American Institute of Mining and Metallurgical Engineers Transactions, v. 130, p. 1–55
[56] Coal Resources of Western Pennsylvania, Geological Survey Bulletin 1143-A, Elmer D. Patterson, United States Government Printing Office, Washington: 1963, available at http://pubs.usgs.gov/bul/1143a/report.pdf; accessed 7/26/2014.
[57] AMR Clearinghouse.org, Remining, available at http://www.amrclearinghouse.org/Sub/landreclamation/remining/; accessed 7/26/2014.
[58] Ibid.

millions of years, heat and pressure began to rise. The amount of pressure and the degree of heat, along with the type of biomass, determined if the material became oil or natural gas. Very high heat or biomass made predominantly of plant material produced natural gas. Oil and natural gas deposits migrated and became trapped under impermeable layers of rock or clay. These trapped deposits are where we find oil and natural gas today.[59]

As of 2012, natural gas meets 28 percent of U.S. energy demand. Natural gas heats 51% of U.S. households. It is also used for cooling homes and as fuel for cooking. Because natural gas burns cleaner than gasoline or diesel, many municipalities and companies are deploying fleets of natural gas-powered vehicles to reduce emissions. There are approximately 142,000 natural gas powered cars, trucks and buses operating on American roads.[60]

Marcellus Shale Gas

This section about the Marcellus Shale Gas industry was contributed by Matt Pitzarella, Director, Corporate Communications and Public Affairs for Range Resources Corporation.

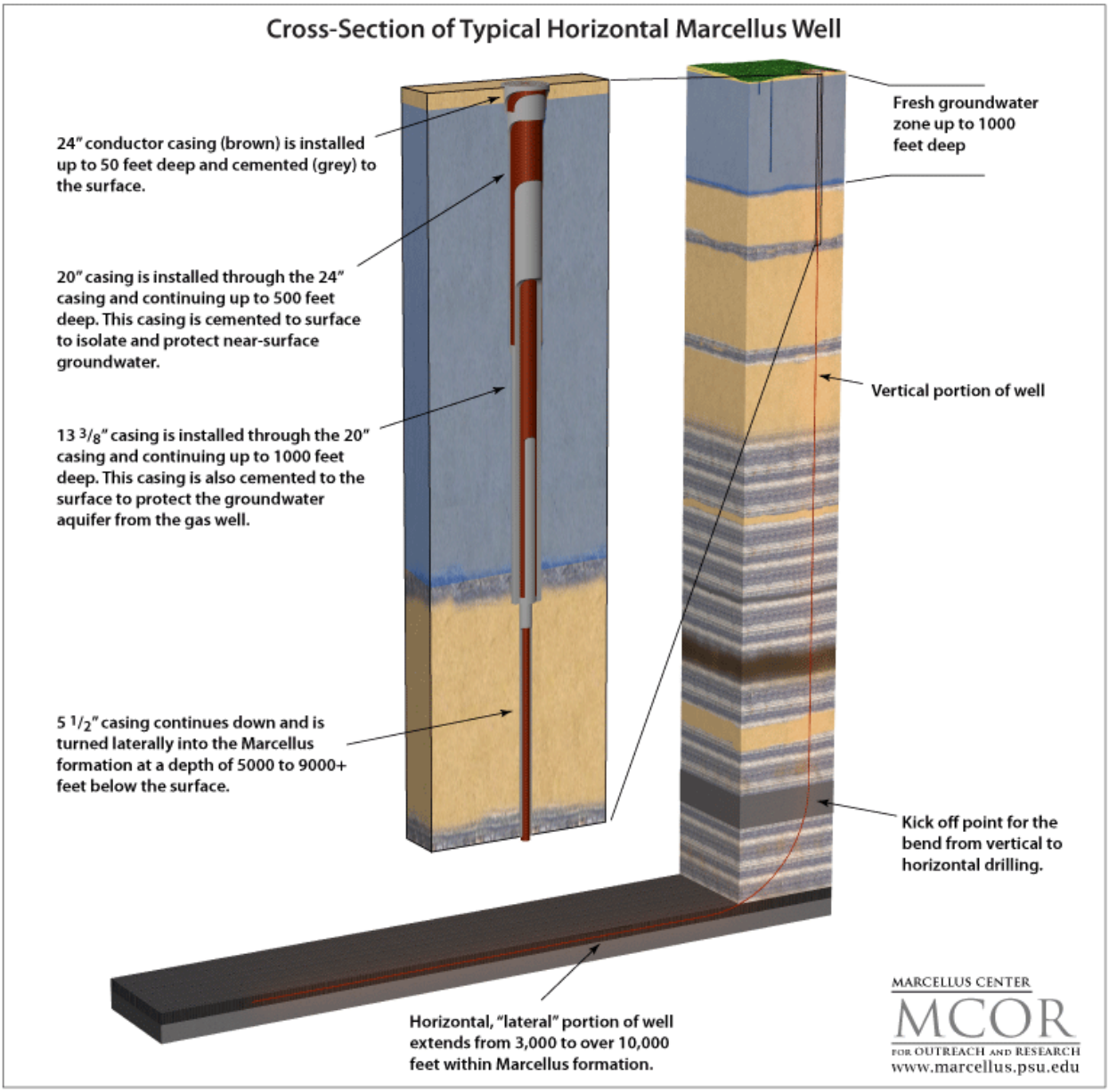
Pennsylvania has long been home to various forms of energy development, from oil, gas, coal and to wind and solar. Today, modern natural gas development supports more than 240,000 Pennsylvania jobs in developing gas from organic shales found more than one mile beneath the surface.

The Marcellus Shale is now the largest producing gas field in the nation and was pioneered and discovered by Range Resources in 2004. The company also pioneered the Upper Devonian and Utica/Point Pleasant Shales in 2009 found above and beneath the Marcellus. These three layers combined could one day combine to make the largest known natural gas field on the planet.

Developing shale gas utilizes state-of-the-art technologies – horizontal drilling and hydraulic fracturing – that were first developed 65 years ago and applied together at a large scale over the last 30 years. The industry has drilled more than 7,000 horizontal shale wells across the Commonwealth. All told, more than 55,000 wells are now producing natural gas in Pennsylvania. PA has the second highest number of gas wells in the country and is the second largest producer of gas by volume. Development will last for generations and perhaps much, much longer.

[59] American Petroleum Institute, Natural Gas Overview, Natural Gas and its Uses, available at http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/natural-gas/natural-gas-uses; accessed 8/1/2014.
[60] Ibid.

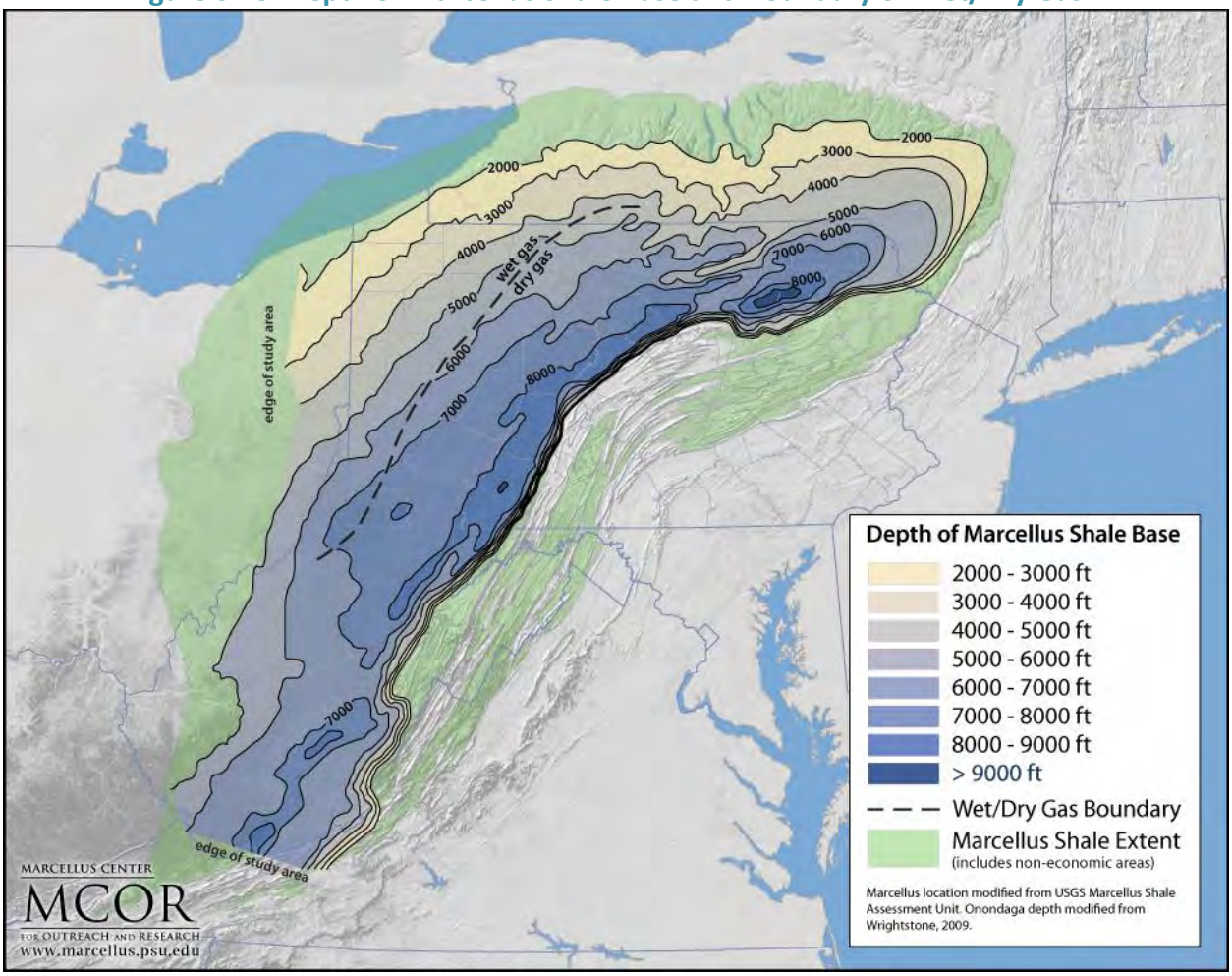
Figure 3.14: Cross-Section of a Typical Horizontal Marcellus Well[61]



[61] Penn State University, Marcellus Center for Outreach and Research, available at http://www.marcellus.psu.edu/images/horizontal_well.gif; accessed 7/26/2014.

Natural gas is known as being dry or wet, with dry gas being more thermally mature and wet gas less thermally mature. Thermal maturity is a crude indication of the maximum temperature rock has experienced and of the organic changes progressing within the rock.[62] Dry gas consists primarily of methane, whereas wet gas may contain natural gas liquids including ethane, butane, propane and pentane. These liquids need to be separated from the methane to ensure a consistent BTU content for consumers. Wet gas is currently considered to be more valuable as the natural gas liquids are also marketable commodities.[63]

Figure 3.15: Depth of Marcellus Shale Base and Boundary of Wet/Dry Gas[64]



Please see "Plate 3.11: Energy Resources" for mapping of unconventional vertical and horizontal wells in the 20D Raccoon Creek Region.

[62] Monash University, Faculty of Science, Heat Flow, Chapter 5: Thermal Maturity, available at http://monash.edu/science/about/schools/geosciences/heatflow/chapter5.html; accessed 7/26/2014.
[63] Penn State University, Marcellus Center for Outreach and Research Available at http://www.marcellus.psu.edu/resources/maps.php; accessed 7/26/2014.
[64] Penn State University, Marcellus Center for Outreach and Research, available at http://www.marcellus.psu.edu/images/Wet-Dry_Line_with_Depth.gif; accessed 7/26/2014.

Hazardous Areas

A variety of hazardous areas exist within the Raccoon Creek Region. These include some types of waste disposal areas, abandoned mine features and sink holes. Most, if not all, of these areas have the potential to be restored to a valuable land use. In some cases, funding is available to help reclaim these sites. Hazardous area features are shown on "Plate 3.10: Waste Sites" and "Plate 3.11: Energy Resources Map."

Waste Sites

For the purposes of the 20D Raccoon Creek Region Conservation Plan, the following are considered waste sites: municipal waste sites, residual waste sites, illegal dumpsites, brownfields and superfund sites. Please see "Plate 3.10: Waste Sites" for the locations of various types of waste sites.

Municipal Waste Sites

PA DEP's Bureau of Waste Management administers statewide hazardous, municipal and residual waste programs. The office also oversees implementation of municipal waste planning and recycling, waste transportation, and the Covered Device Recycling Act. The Covered Device Recycling Act (CDRA), Act 108 of 2010, requires manufacturers to provide recycling programs for desktop computers, laptop computers, computer monitors, computer peripherals and televisions sold to consumers in Pennsylvania beginning in January 2012. As of January 24, 2013, all such devices and any components thereof may no longer be disposed in Pennsylvania with municipal waste.

DEP regulates municipal waste operations through the Municipal Waste Program. Regulated operations include Municipal Composting Sites, Land Applications, Abandoned Landfills, Landfills, Processing Facilities, Resource Recovery Sites and Transfer Stations. A brief description of each type of site or facility follows:

Municipal Composting Sites
Facilities where organic waste decomposes under controlled aerobic or anaerobic conditions (with/without air), yielding a humus-like product, better known as compost.

Land Application Sites
Sewage sludge of an acceptable quality is applied at a specified rate as fertilizer on mine reclamation sites, agricultural lands or soils low in nutrients.

Abandoned Landfills
The Abandoned Landfill Inventory Project collects geospatial and descriptive data for closed and abandoned landfills throughout Pennsylvania.

Permitted Landfill or Sanitary Landfill
A facility with a DEP-approved permit that uses land for the disposal of municipal waste. Sanitary landfills are sites where municipal solid waste is buried in a manner to reduce the environmental impacts. Imperial Landfill in Findlay Township is located partially within the

boundaries of the 20D Sub-watershed. It is the only active municipal waste disposal landfill in the Raccoon Creek Region.

Processing Facility
A transfer station, composting facility, resource recovery facility, or a facility that reduces the volume or bulk of municipal waste for offsite re-use.

Resource Recovery Facility
Provides for the extraction and utilization of materials or energy from municipal waste. The resource recovery facility can be a mechanical extraction facility or a combustion facility (incinerator).

Transfer Station
A processing facility that receives and processes or temporarily stores municipal waste or recyclables at a location other than the generation site.

Residual Waste Sites

Residual waste is waste generated at an industrial, mining, or wastewater treatment facility. PA DEP's Bureau of Waste Management has jurisdiction over residual waste sites. The Raccoon Creek Region has several of these sites, most notable of which is the 1700-acre Little Blue Reservoir in Greene Township, the largest unlined flyash disposal site in the United States. Little Blue is covered in detail in "Section 1: Project Area Characteristics." Please see "Plate 3:10 Waste Sites" for locations of residual waste sites in the 20D Region.

Illegal Dump Sites

Illegal dumping is a matter of great concern to many stakeholders in the 20D Raccoon Creek Region. By no means a rural problem exclusively, illegal dumping is a widespread, chronic, hazardous practice that degrades our environment, poses harm to people and animals and consumes limited public resources. Illegal dumping is a deliberate act, done out of ignorance, habit or to hide other criminal activity. Dump sites often contain tires, appliances, furniture, auto parts, construction/demolition debris and other heavy objects.

In the Raccoon Creek Region, as in every rural area, secluded roadside pull-offs are a favorite target for illegal dumpers. Our natural terrain of steep slopes and deep valleys – and our abandoned strip mines - compounds the difficulty and expense of cleaning up trash-strewn hillsides. Often, heavy equipment and specialized skills are needed to remove debris from such places. Even with volunteer labor, illegal dump cleanups can cost between $1,000 and $2,000 per ton of material retrieved and properly disposed.[65]

[65] Independence Conservancy, Our Projects, available at http://www.independenceconservancy.org/our-projects; accessed 7/24/2014.

Figure 3.16: Al Moran and John Davidson of Independence Conservancy retrieve a load of scrap metal and tires from an illegal dump on Kennedy Hill in Greene Township, 7/10/2006.

In 1999, an informal coalition of volunteer groups and government bodies agreed to do something about illegal garbage and tire dumps in the valleys of the Raccoon Creek Watershed. The cleanup partners - composed of the Townships of Greene, Potter and Raccoon, the Raccoon Creek Watershed Association, PA CleanWays of Beaver County (now Keep PA Beautiful), Beaver County Department of Waste Management and the Independence Conservancy identified and prioritized several highly visible dumpsites located along public roads. Many targeted sites contained a share of the over 100,000 tires which had been collected from auto shops and illegally dumped into remote areas of the Raccoon Creek Watershed in the late 1980's and early 1990's. Cleanup campaigns at the most critical sites throughout the watershed netted 22,000 fugitive tires and 300 tons of illegally dumped residential garbage.[66]

Independence Conservancy's Community Tire Collection Program was developed in 2004 as an outgrowth of the Raccoon Creek cleanups. Since the program's inception, over 35,000 worn out tires and wheels have been properly disposed by residents of Beaver, Allegheny and Washington Counties. Program details and schedules can be viewed at the Conservancy's website: http://www.independenceconservancy.org/services/community-tire-collection-program.

Keep Pennsylvania Beautiful (KPB) is a nonprofit organization that empowers people to eliminate illegal dumping and littering in Pennsylvania through various education and environmental programs. KPB has conducted illegal dump surveys of Allegheny, Beaver and Washington Counties by driving public roads and recording observations.[67] The results of these surveys are mapped on "Plate 3:10 Waste Sites." However, these findings only represent a small fraction of the number of illegal dump sites within the Raccoon Creek Region.

Please see "Section 2: Issues, Concerns & Constraints" for stakeholder comments about illegal dumping.

[66] Independence Conservancy, Stewardship in Action, Raccoon Creek Cleanups, available at http://www.independenceconservancy.org/services/watershed-stewardship; accessed 7/24/2014.
[67] Keep Pennsylvania Beautiful, Illegal Dump Surveys, available at http://www.keeppabeautiful.org/IllegalDumpSurveys.aspx; accessed 7/24/2014.

Brownfields

The US EPA defines brownfields as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off greenspaces and working lands. Cleaning up previously contaminated properties for reuse can help reinvigorate communities, preserve green space, and prevent sprawl. Revitalized land can be used in many ways—from the creation of public parks and the restoration of ecological systems, to the construction of community development projects and the establishment of new businesses."[68]

Superfund Sites

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

A review of US EPA's Pennsylvania Superfund Sites shows none within the Raccoon Creek Region.[69]

Pennsylvania's Hazardous Sites Cleanup Act

Pennsylvania's Hazardous Sites Cleanup Act (HSCA) provides DEP with the funding and authority to conduct cleanup actions at sites where hazardous substances have been released. HSCA also provides DEP with enforcement authority to force the persons who are responsible for releases of hazardous substances to conduct cleanup actions or to repay public funds spent on a DEP-funded cleanup. HSCA also allows the Commonwealth to participate fully in the cleanup of Pennsylvania sites under the Federal Superfund program.[70]

Additional information about HSCA is provided at DEP's Hazardous Sites Cleanup Program website:
http://www.portal.state.pa.us/portal/server.pt/community/hazardous_sites_cleanup_program/20600

[68] US EPA, Brownfields and Land Revitalization, available at http://www.epa.gov/brownfields/; accessed 7/24/2014.
[69] US Environmental Protection Agency, Pennsylvania Superfund Sites, available at http://www.epa.gov/reg3hwmd/super/pa.htm; accessed 7/24/2014.
[70] PA DEP Hazardous Sites Cleanup Program, available at http://www.portal.state.pa.us/portal/server.pt/community/hazardous_sites_cleanup_program/20600; accessed 7/24/2014.

Abandoned Geologic Extraction Sites

Coal, oil and natural gas have been extracted commercially for over 150 years in the Raccoon Creek Region. Until the latter part of the 20th century these industries operated with little regard for the damage they cause to our lands and waterways. Substantial degradation continues to this day as a result of unregulated practices of the past.

Abandoned Oil & Gas Wells

Abandoned oil and gas wells can pose human and environmental health hazards if the well casings rust or break, allowing water or fluids to leak into the groundwater. PA DEP's Abandoned and Orphaned Well Plugging Program was created to plug abandoned wells that have the potential to cause health, safety or environmental concerns.

Since 1859, thousands of oil and gas wells were drilled in Pennsylvania. Active wells with known operators are responsible for plugging them when they reach the end of their productive life. Abandoned wells without a known responsible party are addressed by the Well Plugging Program. More information about this program is available on DEP's website: http://www.portal.state.pa.us/portal/server.pt/community/abandoned_orphan_well_program/20292.

Figure 3.17: A Bucyrus-Erie cable tool drilling rig in Smith Township bears witness to the Region's industrial past. 6/18/2014.

"Plate 3.11: Energy Resources of the 20D Region" shows the locations of historic wells and conventional oil and gas wells. Note that many historic wells are located near, or in some cases beneath, present day lakes, impoundments and water features.

Abandoned Mine Lands

Abandoned Mine Lands (AML) are the most pervasive issue from the Raccoon Creek Region's historic mining legacy. The southern half of the Region, under which lies the Pittsburgh Coal Seam, bears the scars of 100+ years of unregulated mining with very few pre-1950s attempts to restore the land.

PA DEP has identified seven primary Abandoned Mine Discharge (AMD) sources, remediation of which is crucial to improving water quality in the Region. "Section 4: Water Quality" contains an extensive discussion of abandoned mines, lists the primary discharges and details the accomplishments and challenges involved in their treatment.

The US Department of the Interior Office of Surface Mining Reclamation and Enforcement (OSMRE) has established levels of priority for reclaiming abandoned mine features, based on inherent hazards and problems of sites. An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the federal Surface Mining Control and Reclamation Act of 1977 (SMCRA), re-authorized by Congress in 2006. The inventory contains information on the location, type and extent of AML impacts, as well as information on costs associated with reclaiming those problems.[71]

Figure 3.18: Slope entry to the Langeloth Mine, built in 1914. 4/13/2005.
Never enter a mine – stay out – stay alive!

"Figure 3:11: Energy Resources" maps OSMRE Priority 1, 2 and 3 areas in the Raccoon Creek Region. For the most part, the Region's sites are Priority 3. Priority 1 and 2 sites are those posing a threat to health, safety and general welfare of people. Priority 3 sites are those impacting the environment.[72] OSMRE's criteria for prioritizing abandoned mine sites by their features and impacts are listed in Table 3.5. This table lists OSMRE priorities, problem descriptions and site counts within the 20D Region. Note that, of 207 sites in 20D identified and prioritized by OSMRE, only twelve, or 5.8%, are listed as having been reclaimed. "Appendix 3.1: OSMRE Abandoned Mine Lands Problem Type Definitions" further explains the nature of Priority 1 and Priority 2 problems.

Table 3.5: OSMRE Priority 1, 2 and 3 Problem Listings[73]

OSMRE Priority	Problem Types
Priority 1 and Priority 2	CS Clogged Streams; CSL Clogged Stream Lands; DH Dangerous Highwalls; DI Dangerous Impoundments; DPE Dangerous Piles & Embankments; DS Dangerous Slides; GHE Gases Hazardous/Explosive; HEF Hazardous Equipment & Facilities; HWB Hazardous Water Bodies; IRW Industrial/Residential Waste; P Portals; PWAI Polluted Water Agricultural & Industrial; PWHC Polluted Water Human Consumption; S Subsidence; SB Surface Burning; UMF Underground Mine Fires; VO Vertical Openings
Priority 3	BE Bench; DP Industrial/Residential Waste; EF Equipment/Facility; GO Gob; H Highwall; HR Haul Road; MO Mine Opening; PI Pits; SA Spoil Area; SL Slurry; SP Slump; WA Water Problems; WS Water Supplies

[71] Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, available at http://www.osmre.gov/programs/AMLIS/description.shtm; accessed 7/25/2014.
[72] Ibid.
[73] Ibid.

Table 3.6: OSMRE Abandoned Mine Lands Priority 1, 2, 3: Problems Existing and Reclaimed[74]

OSMRE Priority	Description	# of Sites in 20D	# of Sites Reclaimed
1	Underground mine fire	1	0
2	Burning refuse pile	4	0
	Dry strip mine	17	3
	Flooded strip mine	11	3
	Refuse pile	4	0
	Subsidence prone areas	2	0
	Underground mine fire	1	0
	Vertical mine shaft	1	0
3	Coal processing settling basin	2	2
	Dry strip mine	69	3
	Flooded strip mine	9	0
	Refuse pile	7	0
	Spoil pile	74	0
	Subsidence prone area	1	0
	Suspected subsidence prone area	2	1
	Underground mine fire	2	0
Totals		**207**	**12**

The PA DEP Bureau of Abandoned Mine Reclamation (BAMR) also maintains an inventory of AML features. A summary of these sites in the 20D Raccoon Creek Watershed Region is listed in Table 3.7 below.

Table 3.7: BAMR Abandoned Mine Lands Inventory in 20D[75]

AML Description	# of Sites in 20D
Open Shaft/Mine Entry	19
Erosion-prone Area	1
AMD Discharge Area	123
Flooded strip mine	1
Mine Entry	6
Vertical Mine Shaft	5
Mine Slope	1
Abandoned Structure	4
Untreated Discharge	4
Treated Discharge	1
Total Sites	**165**

[74] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA; OSMRE data compiled from BAMR inventories.
[75] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA; data compiled from BAMR inventories.

During the course of researching the Abandoned Mine Lands topic for inclusion in the 20D Raccoon Creek Region Conservation Plan, it became apparent that state and federal AML databases can be out-of date by several years to decades. The data presented in this Plan is the most current available from official sources. However, it differs from first-hand knowledge of the 20D Region by individuals involved in preparing this Plan. Many problem sites have been eliminated in the course of re-mining areas originally mined in the early 20th century. The OSMRE Priority 1 undergound mine fire is one such issue that has been resolved by re-mining. Also, several AMD discharges have been addressed by the construction of passive treatment systems. These systems are described in detail in "Section 4: Water Resources."

Coal Waste Piles

In past times, as coal was removed from underground mines, unwanted material would be brought to the surface with the coal. Separating the coal from its accompanying refuse material was a necessary part of the process. As a result, large piles of refuse material grew as mining operations progressed. Because the separation process was inefficient, coal itself is generally a major component of these piles.

Coal waste piles are known variously as gob piles, slate dumps or boney piles. Almost every coal patch village has a pile – a reminder of long-gone mining days. Far from benign, coal waste piles are safety hazards, eyesores, and are responsible for environmental degradation, including the sometimes prolific production of AMD. Generally they are bare or sparsely vegetated and are easily identified by their steep, eroded, unstable, dark gray banks. If the material had burned, the pile will have a pink-ish color called "red dog."

Figure 3.19: The Champion #1 coal washer in operation, June 27, 1946, serviced by the Montour Railroad. Photograph courtesy of the Archives Service Center, University of Pittsburgh.

Within the 20D Raccoon Creek Region are dozens – if not hundreds – of coal waste piles. Many are marked as OSMRE

Priority 3 reclamation sites on "Figure 3:11: Energy Resources." They are included in this Plan as energy resources because many of them contain a high percentage of combustible coal and are suitable for re-use as fuel.

The Raccoon Creek Region contains the largest coal waste pile east of the Mississippi River.[76] Near the intersection of Routes 22 and 980 in Robinson Township, Washington County, the 440-acre Champion coal refuse pile is the lingering remnant of the Pittsburgh Coal Company's Champion #1 coal washer operations. In the 1950s, the plant replaced rail transport with a two-mile long conveyor system to move bony from the washer to a disposal site across the roadway.[77] As decades passed, the disposal site became a huge mountain of waste. Today, runoff from the Champion coal waste pile is channeled into a series of treatment ponds where it is dosed with lime to reduce acidity and settle iron, a costly process that must continue until the pile is reclaimed or re-used as fuel.

A relatively new technology enabling the removal and re-use of millions of tons of coal refuse is called Circulating Fluidized Bed (CFB) Combustion. CFB, more than any other method, is the greatest hope of reclaiming the Champion pile and other coal refuse piles in Pennsylvania. CFB is an advanced power-generating process, utilizing advanced pollution control equipment to meet the strictest air quality emission standards in producing electricity. The byproduct ash produced has proven very useful in reclaiming abandoned mine lands polluted with acids and metals - including the very coal refuse sites that fuel the plants![78]

Figure 3.20: A view from the top of the Champion coal waste pile looking toward Imperial Landfill. On a clear day the skyscrapers of downtown Pittsburgh - fifteen miles distant - are visible from this vantage point. 6/10/2005.

In 2005, a private study assessed available fuel supplies for the Beech Hollow Power Plant, a 300 megawatt CFB power generating plant proposed to re-use the Champion coal waste pile. Within a 15 mile radius of

[76] Post-Gazette.com, Local News, October 20. 2002, available at http://old.post-gazette.com/neigh_washington/20021020wacover2.asp; accessed 7/25/2014.
[77] SitNews, Stories in the News, Recycling for Profit and Preservation by Bob Ciminel, June 29, 2005, available at http://www.sitnews.us/BobCiminel/062905_focb.html; accessed 7/25/2014.
[78] AMR Clearinghouse.org, Circulating Fluidized Bed (CFB) Reactor Power Plants, available at www.amrclearinghouse.org/Sub/landreclamation/cfb/; accessed 7/25/2014.

the plant's location, piles containing 33 million tons were located, mostly within the Raccoon Creek Watershed.[79] Combined with the estimated 60 million tons of coal in the Champion pile itself, the Beech Hollow Plant could generate electricity for 25 years.[80]

Development of Environmental Regulations for Coal Mining & Reclamation Efforts in PA

Citizens of Pennsylvania have long recognized the impact of early mining practices on the environment, but only in recent decades have we begun to address this legacy. Interestingly, during World War II (1941 to 1945) the demand for coal was high, but, to conserve diesel fuel for the war effort, mine land reclamation was discouraged. After the war, surface mining became regulated. By the 1960s, reclamation efforts began on a wide scale. Today's surface mining industry integrates land reclamation as a regular part of its operations.

A brief overview of the laws, regulations and programs relating to the coal mining industry since the end of World War II is provided in Table 3.8.

Figure 3.21: Lifeless Burgetts Fork flows through a man-made channel past the Climax-Langeloth coal waste pile in Smith Township, 4/13/2005.

[79] Michaels, Victoria E., 2005, Inventory of Coal Waste Piles Within a 15-Mile Radius of Champion, Washington County, PA, prepared for Robinson Power Company, LLC.
[80] Post-Gazette.com Local News, October 20, 2002, available at http://old.post-gazette.com/neigh_washington/20021020wacover2.asp; accessed 7/26/2014.

Table 3.8: Timeline of Selected Mining Regulations & Reclamation Efforts in PA

Year	Description
1945	PA Clean Streams Law (passed in 1937) amended to include acid mine drainage
1945	PA Surface Mining Conservation and Reclamation Act passed to regulate surface coal mining
1965	PA Clean Streams Law amended to define acid mine drainage as industrial waste, requiring all mines to treat drainage to specified standards
1968	Operation Scarlift with $200 million (from $500 million bond issue) to finance abandoned mine land reclamation
1968	PA Coal Refuse Disposal Control Act passed to help control pollution from coal refuse piles
1977	Federal Surface Mining Control and Reclamation Act passed to require active coal mines to restore lands, in most instances, to approximate original contour and to treat drainage to specified standards for perpetuity, if necessary
1980	PA Surface Mining Conservation and Reclamation Act amended to be equal to or more stringent than the Federal Surface Mining Control and Reclamation Act
1984	PA Noncoal Surface Mining and Conservation Act passed to regulate quarries and other industrial mineral mines
1992	PA Surface Mining Conservation and Reclamation Act amended to better protect water supplies and to provide incentives for remaining previously abandoned areas
1994	PA Mine Subsidence and Land Conservation Act amended to include better protection of water supplies affected by underground coal mining
1994	PA Coal Refuse Disposal Control Act passed to include siting of coal refuse disposal areas on previously affected mine lands
1996	PA Surface Mining Conservation and Reclamation Act amended to encourage private reclamation of abandoned mine lands through remining
1998	Reclaim PA initiated to form partnerships with stakeholders to reclaim abandoned mine lands and to treat abandoned mine drainage
1999	PA Growing Greener initiated to provide grants to stakeholders that included reclamation of abandoned mine lands and treatment of abandoned mine drainage
1999	PA Good Samaritan Act intended to encourage landowners and others to reclaim abandoned mineral extraction lands and abate water pollution caused by abandoned mines, and oil and gas wells. The Environmental Good Samaritan Act protects landowners, groups and individuals who volunteer to do such projects from civil and environmental liability.
2006	Federal Surface Mining Control and Reclamation Act re-authorized by Congress to include mandatory payouts to states to conduct reclamation activities.
2012	PA Act 13 establishes the Marcellus Legacy Fund and allocates funds to the Commonwealth Financing Authority for abandoned mine drainage, abatement, and treatment with the Abandoned Mine Drainage Abatement and Treatment Program (AMDATP).

The Pennsylvania Department of Environmental Protection has established Abandoned Mine Land Reclamation Priority Sites in the 20D Sub-basin. These are listed in Table 4.11 of "Section 4: Water Resources."

Sinkholes

A sinkhole is a feature of the landscape in which there is downward movement of surface material due to physical and chemical weathering of carbonate bedrock. Most carbonate rock formations are found in the central and eastern parts of Pennsylvania. There are no sinkholes known to exist within the 20D Raccoon Creek Region.

Figure 3.22: One of several pump jacks in the Bonnymeade vicinity of Smith Township. Widely used throughout the U.S. to extract shallow reserves of gas and oil, basic pump jack design has changed little since 1859. Some rural Pennsylvania pump jacks, or "gas donkeys," have been on the job for one hundred years or more. 6/18/2014.

Appendix 3.1: OSMRE Abandoned Mine Lands Problem Type Definitions[81]

BE Bench: A ledge that forms a single level operation along which mineral or waste materials are excavated.

CS Clogged Stream: Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem.

CSL Clogged Stream Lands: Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem. Any AML-related surface mining spoil pile and bank, mine waste and earth material disturbed by mining activity which would be eroded and carried downstream by surface runoff, and deposited in a stream bed (thus causing a clogged stream). This silt erosion contributes to stream sedimentation and causes local flooding resulting in property damage and a human health, safety and general welfare threat. Clogged stream lands are measured in acres of land affected by spoil, mine waste and earth material that are directly contributing to the clogged stream.

DP Industrial/Residential Waste Dump: An AML area used to dispose of any kind of industrial or residential waste not related to mining or processing.

DPE Dangerous Pile or Embankment: An AML-related mine waste pile or bank located within close distance to a populated area, public road, or other area of intense visitation, and posing a danger to public health, safety and general welfare by adverse effect resulting from an unstable steep slope or wind-blown particulate matter.

DH Dangerous Highwall: Any AML-related unprotected unreclaimed highwall located in close proximity to a populated area, public road, or other area of intense visitation, and posing a threat to public health, safety and general welfare by falling from a highwall or from being hit by falling rock.

DI Dangerous Impoundment: Any AML-related large-volume water impoundment such as a mine waste embankment, sedimentation pond, or underground mine water pool which poses a threat of flooding and catastrophic destruction to downstream property and human health, safety, and general welfare in the event of rupture or breach of the water retention structure.

[81] Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, e-AMLIS Priority 1 and 2, available at http://www.osmre.gov/programs/AMLIS/priority1_2.shtm; accessed 8/1/2014.

The description of a DI must give evidence of a weak, unstable, or otherwise inadequate impounding structure, such as lack of an emergency spillway or improper primary spillway.

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

EF Equipment/Facility: Any equipment or buildings used to mine, process, or transport coal or mineral ores.

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

GO Gob: The refuse or waste removed from a mine. This includes mine waste, rock, pyrites, slate, or other unmarketable materials which are separated during the cleaning process.

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

HR Haul Road: A road built and used for transporting mined material by truck. The road can be from a mine head or pit to a loading dock, tipple ramp, or preparation plant.

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

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

MO Mine Opening: Any surface entrance or opening related to an underground mine.

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

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

PWAI Polluted Water: Agricultural/Industrial: Any surface or subsurface water used for agricultural or industrial purposes which does not meet standards (especially those for suspended solids, acid or alkaline conditions, heavy metals concentrations, or radioactivity) because of AML-related impact

PWHC Polluted Water: Human Consumption: Any surface or subsurface water used for human consumption or recreational waters used for swimming that does not meet standards (especially those for suspended solids, acid or alkaline conditions, heavy metals concentrations, or radioactivity) because of AML-related impact.

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

SA Spoil Area/Spoil Bank: The overburden material removed in gaining access to a coal seam or mineral deposit.

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

SL Slurry: Fine particle material from coal or mineral processing collected in a pond. Solid must be separated from the water in order to have clear effluent for reuse or discharge.

SP Slump: Surface expressions resulting from the caving in of underground mine voids. Slumps are differentiated from subsidence because they are normally in undeveloped areas. The area has infrequent public visitation, recreational use, farming, livestock use, etc. In all likelihood slumps will not cause loss of life, serious injury or economic loss.

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

VO Vertical Opening: Any AML-related vertical or steeply-inclined shaft or opening which is not sealed or barricaded, or a subsidence-caused opening that is more than 5 years old and has

become a hazard, regardless of proximity to populated areas, public road or other area of intense visitation, posing a threat to the public health, safety and general welfare.

WA Water Problems: Water leaving the AML and causing environmental impacts because of its pH, sediments load, or other pollutants, or because of its effect on other lands due to poor drainage conditions (i.e. agricultural flooding).

WS Water Supplies: Water supplies adversely affected by coal mining that are replaced through the repair, replacement, construction, or enhancement of facilities, including water distribution facilities and treatment plants.

Appendix 3.2: Further Reading

A wealth of information exists about modern coal, oil and gas extraction industries, abandoned mines and wells, technologies used to treat these problems and efforts to do so by businesses, governments, non-profits groups and citizen volunteers. The following is a brief list of selected resources for further information.

AMRClearinghouse.org: an information resource for watershed organizations working on Abandoned Mine Land issues.

DataShed: a collaborative effort of Stream Restoration Incorporated, PA DEP and others to provide the tools needed to actively monitor and maintain passive AMD treatment systems.

Independence Conservancy: a non-profit land trust based in Industry PA; works for clean water, open green space and recreational access in the Raccoon Creek Watershed.

PA DEP Bureau of Abandoned Mine Reclamation: BAMR is responsible for resolving problems such as mine fires, mine subsidence, dangerous highwalls, open shafts and portals, mining-impacted water supplies and other hazards which have resulted from pre-1977 coal mining practices.

Penn State Center for Marcellus Outreach & Research: MCOR is Penn State's education and research initiative on unconventional gas plays; committed to expanding research and to providing science-based programming while protecting the Commonwealth's water resources, forests and transportation infrastructure.

Pennsylvania Spatial Data Access: PASDA serves as a comprehensive geospatial data digital library by providing free, universal access to geospatial data and information by, for, and about the Commonwealth of Pennsylvania.

Raccoon Creek Watershed Association: RCWA works to restore and protect the wetlands, streams and lakes of the Raccoon Creek Watershed.

Stream Restoration, Inc.: SRI is a non-profit organization based in Mars, PA, specializing in restoration of AMD-impacted waterways.

US Department of the Interior, Office of Surface Mining and Reclamation Enforcement: OSMRE protects the environment and people while regulating surface coal mining in the United States; funds the restoration of abandoned coal mines.

Western PA Coalition for Abandoned Mine Reclamation: WPCAMR works with watershed volunteers, technical remediation experts and government agencies to reclaim lands and streams polluted by historic coal mining in Western Pennsylvania.

Section 3: Plates

PLATE 3.1 - BEDROCK GEOLOGY

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

Legend

- Community
- Lock & Dam
- Stream
- Raccoon Creek
- County

Bedrock Formation

- Allegheny
- Casselman
- Glenshaw
- Greene
- Monongahela
- Washington
- Waynesburg

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

0 1 2 Miles

OHIO
WEST VIRGINIA
BEAVER CO.
WASHINGTON CO.
ALLEGHENY CO.
Ohio River
OHIOVILLE
EAST LIVERPOOL
BRIGHTON TWP.
VANPORT
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
MONACA
FREEDOM
CONWAY
INDUSTRY
CENTER TWP.
POTTER
MIDLAND
Georgetown
Shippingport
Holt
McCleary
RACCOON TWP.
Hookstown
GREENE TWP.
BADEN
ECONOMY
ALIQUIPPA
HARMONY
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
Davidson Heights
Independence
Five Points
Gringo
LEET
LEETSDALE
SEWICKLEY HEIGHTS
Mechanicsburg
CRESCENT
EDGEWORTH
SEWICKLEY
OSBORNE
Harshaville
INDEPENDENCE TWP.
Bocktown
HANOVER TWP.
Kendall
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
HILLMAN STATE PARK
Robinson
Florence
Bavington
Santiago
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
MCDONALD
MIDWAY
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
Studa
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
168
68
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65
989
376
51
30
60
576
50
844
231
151
22
519
980

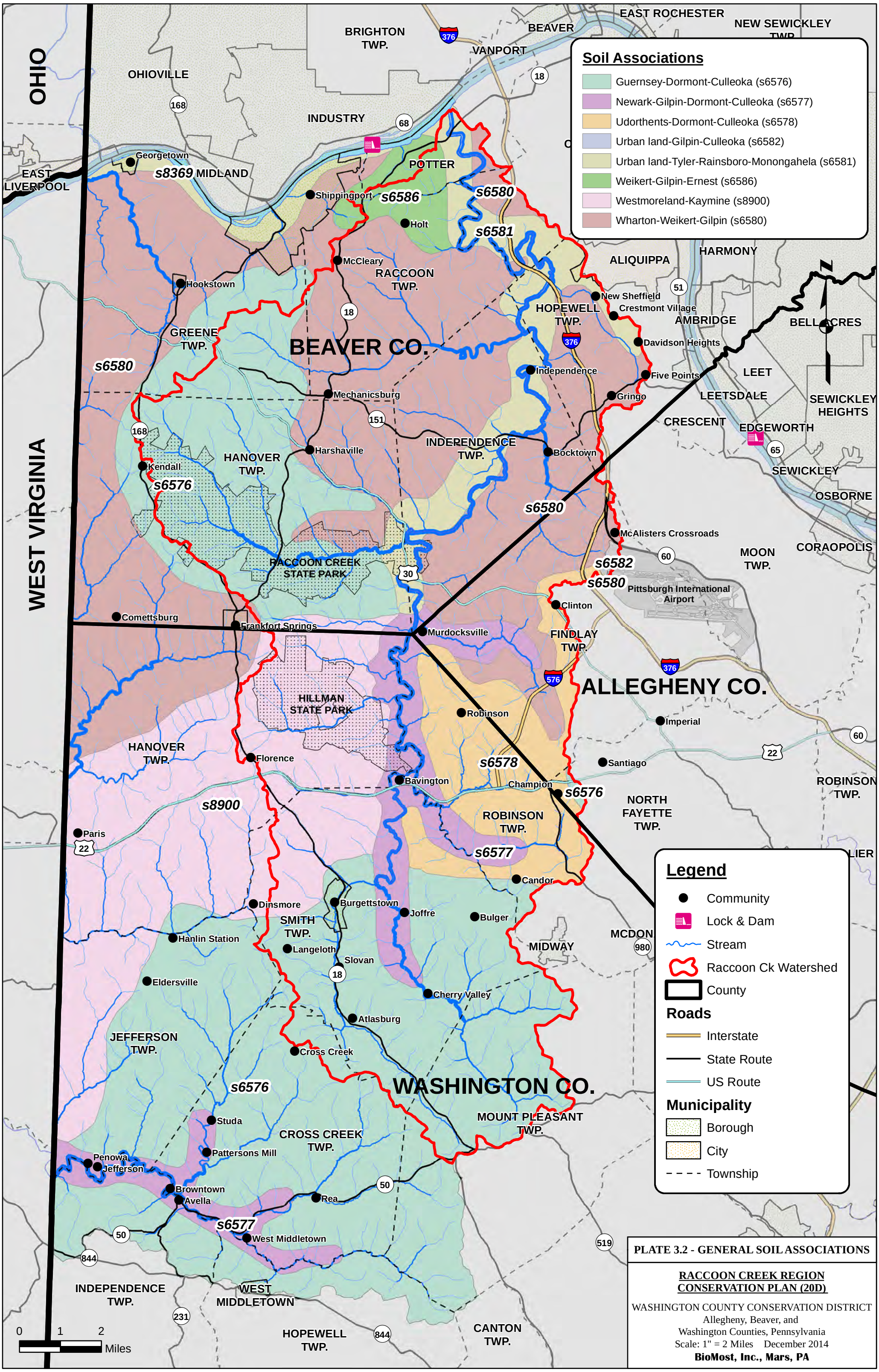


PLATE 3.2 - GENERAL SOIL ASSOCIATIONS

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

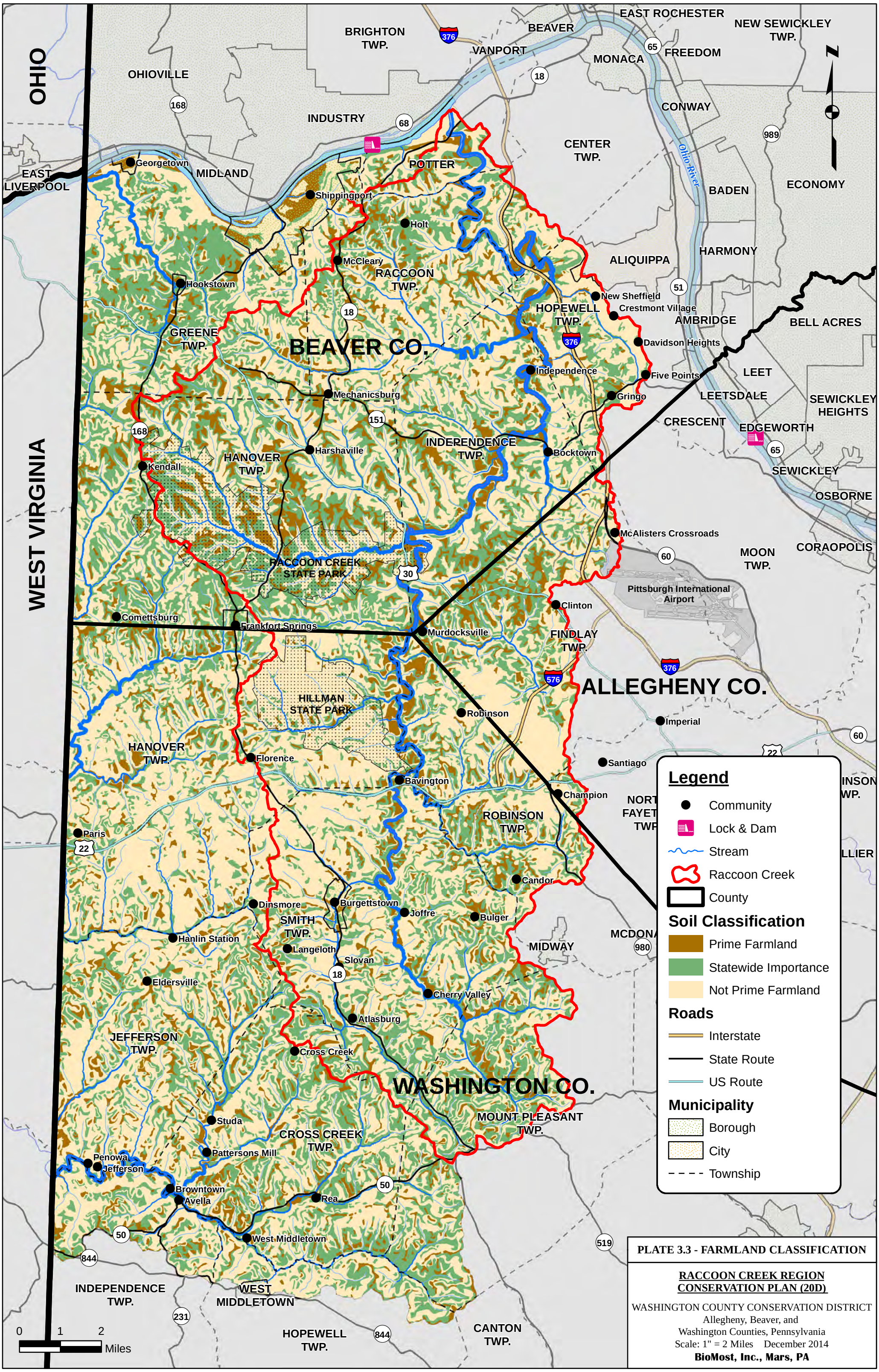
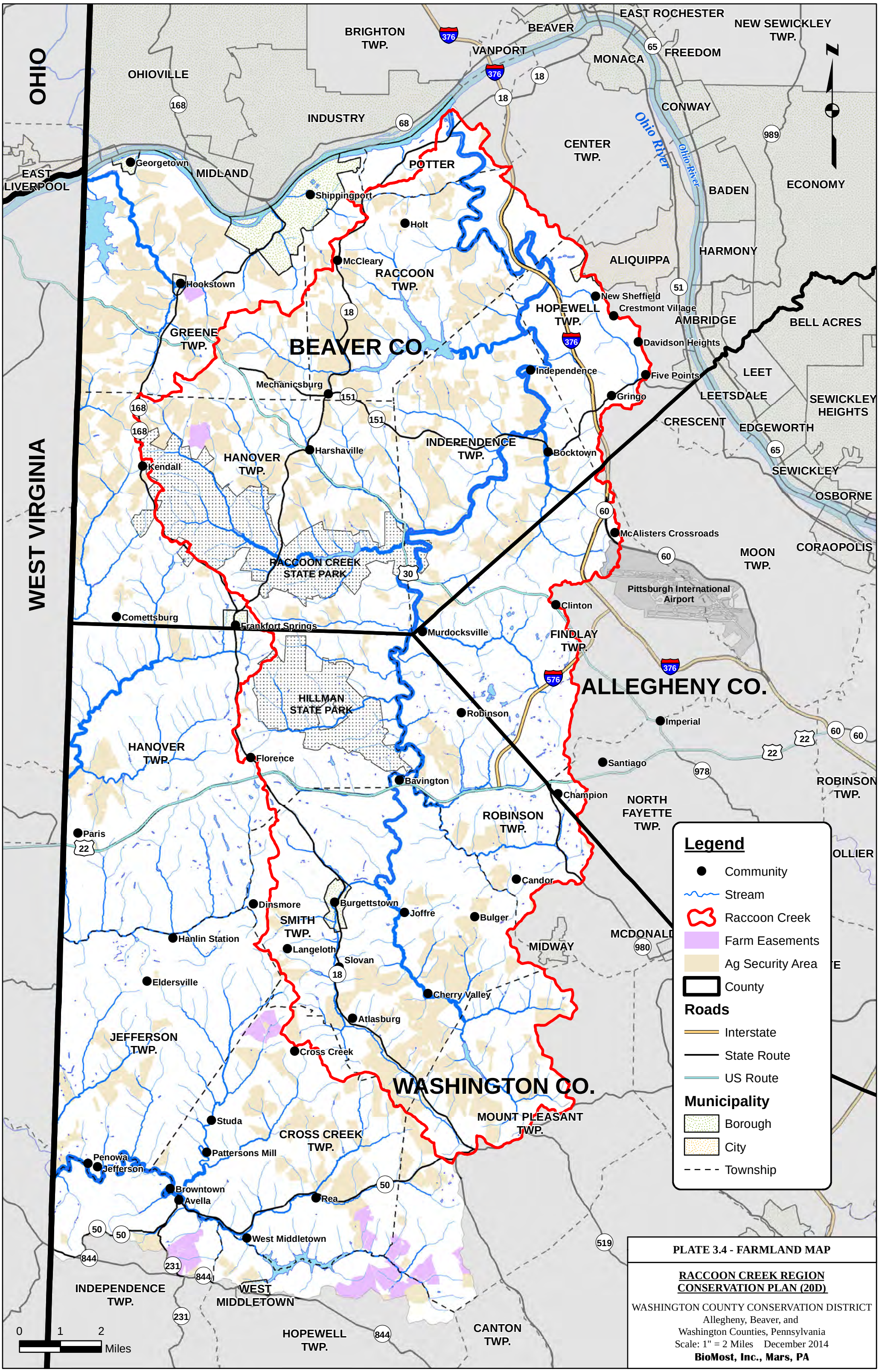
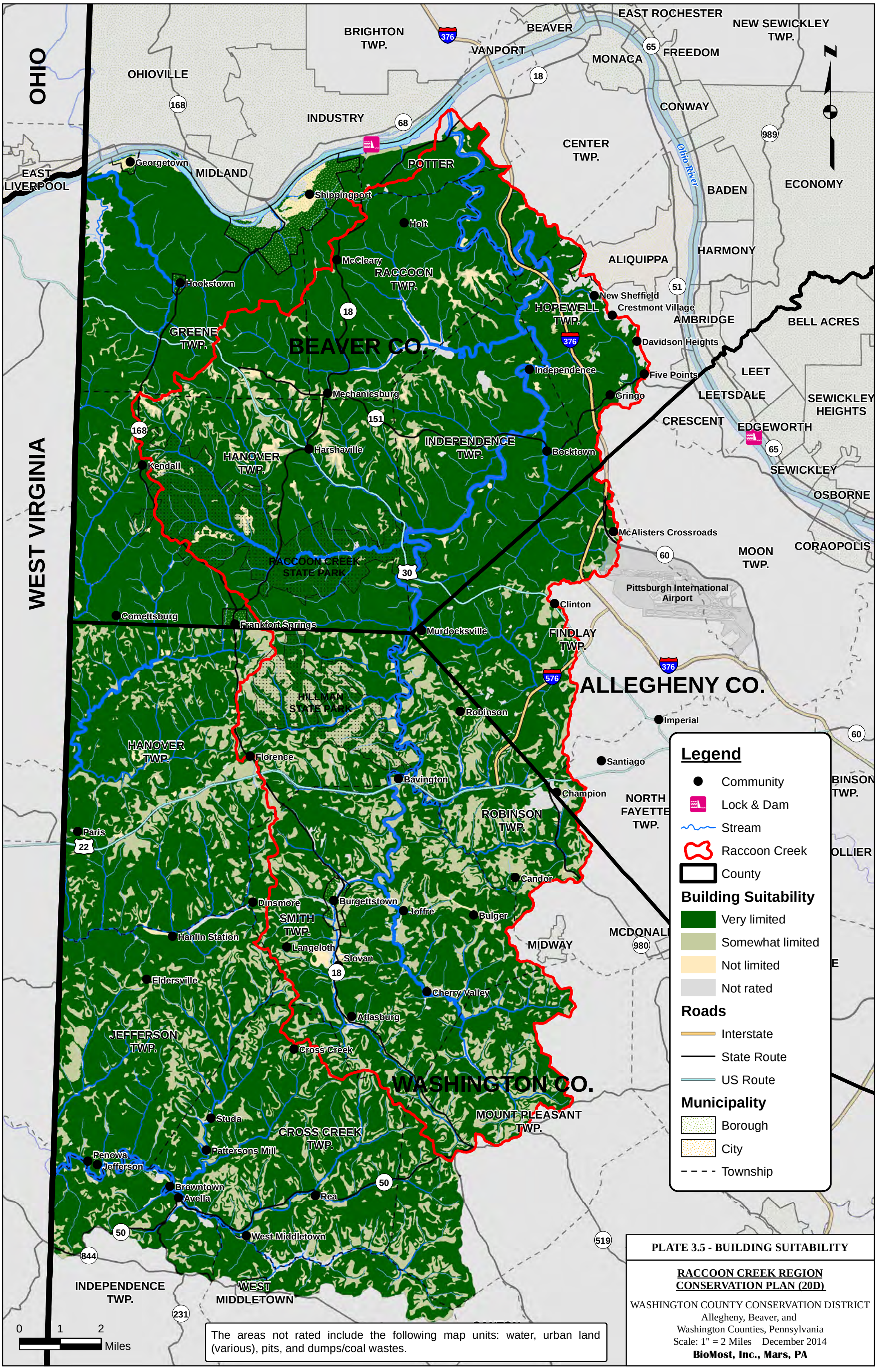


PLATE 3.3 - FARMLAND CLASSIFICATION

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
Ohio River
CENTER TWP.
EAST LIVERPOOL
Georgetown
MIDLAND
POTTER
Shippingport
BADEN
ECONOMY
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
BEAVER CO.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
SEWICKLEY
Kendall
HANOVER TWP.
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
ALLEGHENY CO.
HILLMAN STATE PARK
Robinson
Imperial
Santiago
ROBINSON TWP.
Florence
Bavington
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
MCDONALD
MIDWAY
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
MOUNT PLEASANT TWP.
Studa
CROSS CREEK TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
0 1 2
Miles
Legend
Community
Stream
Raccoon Creek
Farm Easements
Ag Security Area
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
PLATE 3.4 - FARMLAND MAP
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
CENTER TWP.
Ohio River
EAST LIVERPOOL
MIDLAND
Georgetown
POTTER
Shippingport
Holt
BADEN
ECONOMY
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
BEAVER CO.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
HANOVER TWP.
Kendall
SEWICKLEY
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
ALLEGHENY CO.
HILLMAN STATE PARK
Robinson
Imperial
HANOVER TWP.
Florence
Santiago
Bavington
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
MIDWAY
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
MOUNT PLEASANT TWP.
Studa
CROSS CREEK TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
Legend
Community
Lock & Dam
Stream
Raccoon Creek
County
Building Suitability
Very limited
Somewhat limited
Not limited
Not rated
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
0 1 2
Miles
The areas not rated include the following map units: water, urban land (various), pits, and dumps/coal wastes.
PLATE 3.5 - BUILDING SUITABILITY
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

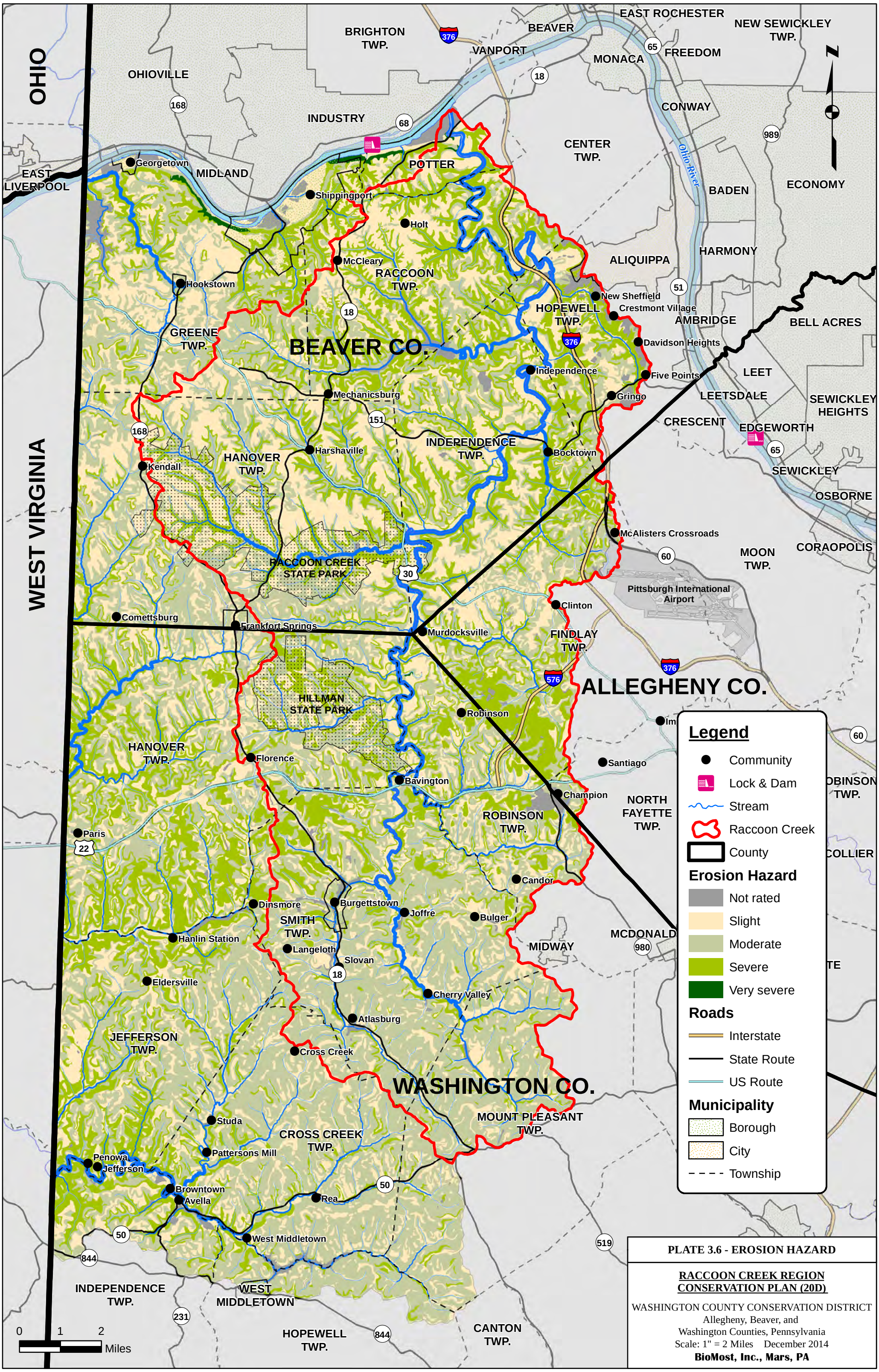


PLATE 3.6 - EROSION HAZARD

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

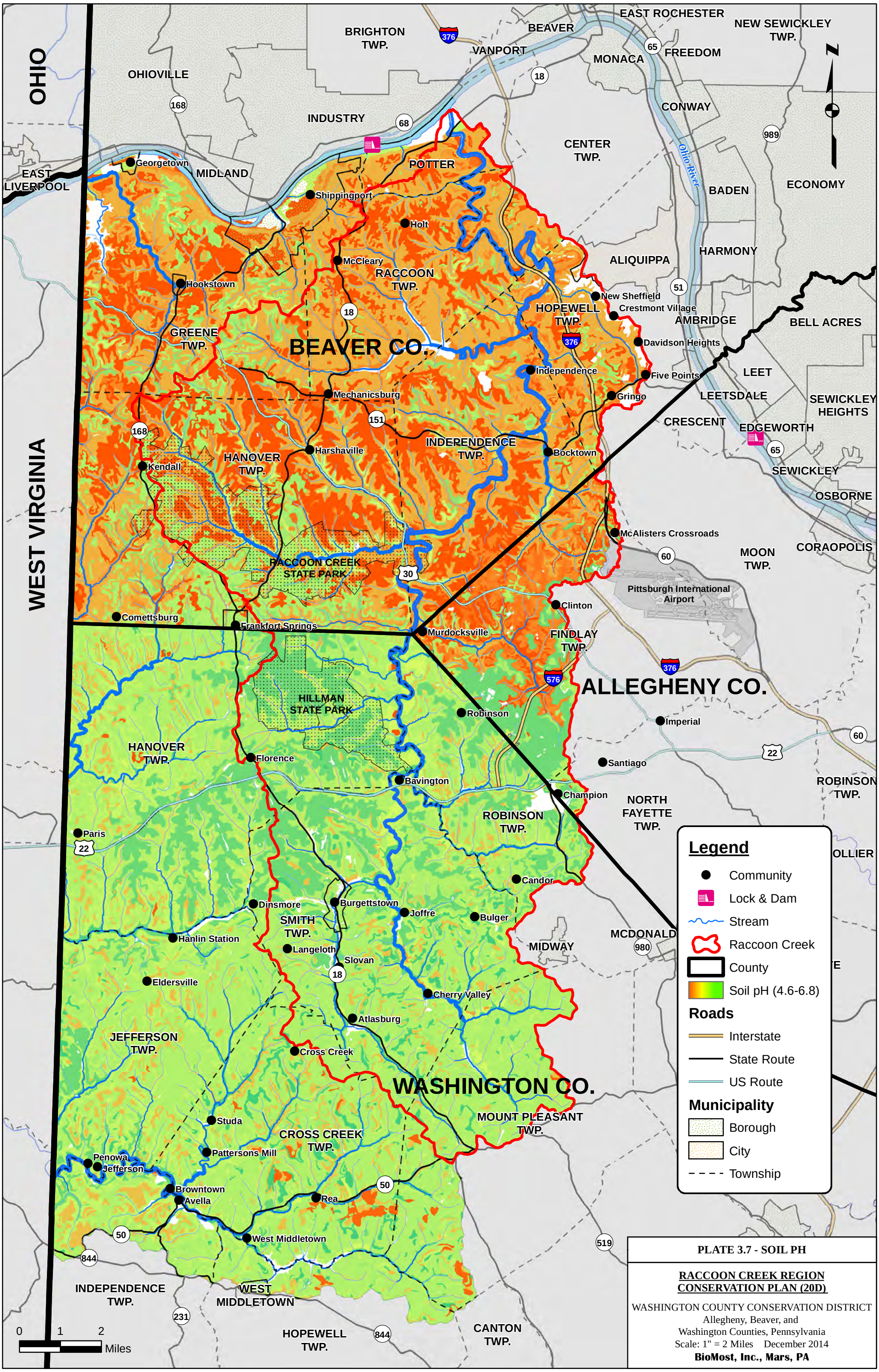


PLATE 3.7 - SOIL PH

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

OHIO
WEST VIRGINIA
BEAVER CO.
ALLEGHENY CO.
WASHINGTON CO.
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
CENTER TWP.
POTTER
Ohio River
BADEN
ECONOMY
Georgetown
MIDLAND
EAST LIVERPOOL
Shippingport
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
Kendall
HANOVER TWP.
SEWICKLEY
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
HILLMAN STATE PARK
Robinson
Imperial
Florence
Santiago
Bavington
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
OBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
MCDONALD
Hanlin Station
Langeloth
MIDWAY
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
Studa
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Penowa
Jefferson
Pattersons Mill
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
COLLIER
168
376
65
18
68
989
30
60
51
22
151
844
231
519
980
576
0 1 2 Miles

Legend

- Community
- Lock & Dam
- Stream
- Raccoon Creek
- County

Hydric Soil

- Major
- Minor
- None

Roads

- Interstate
- State Route
- US Route

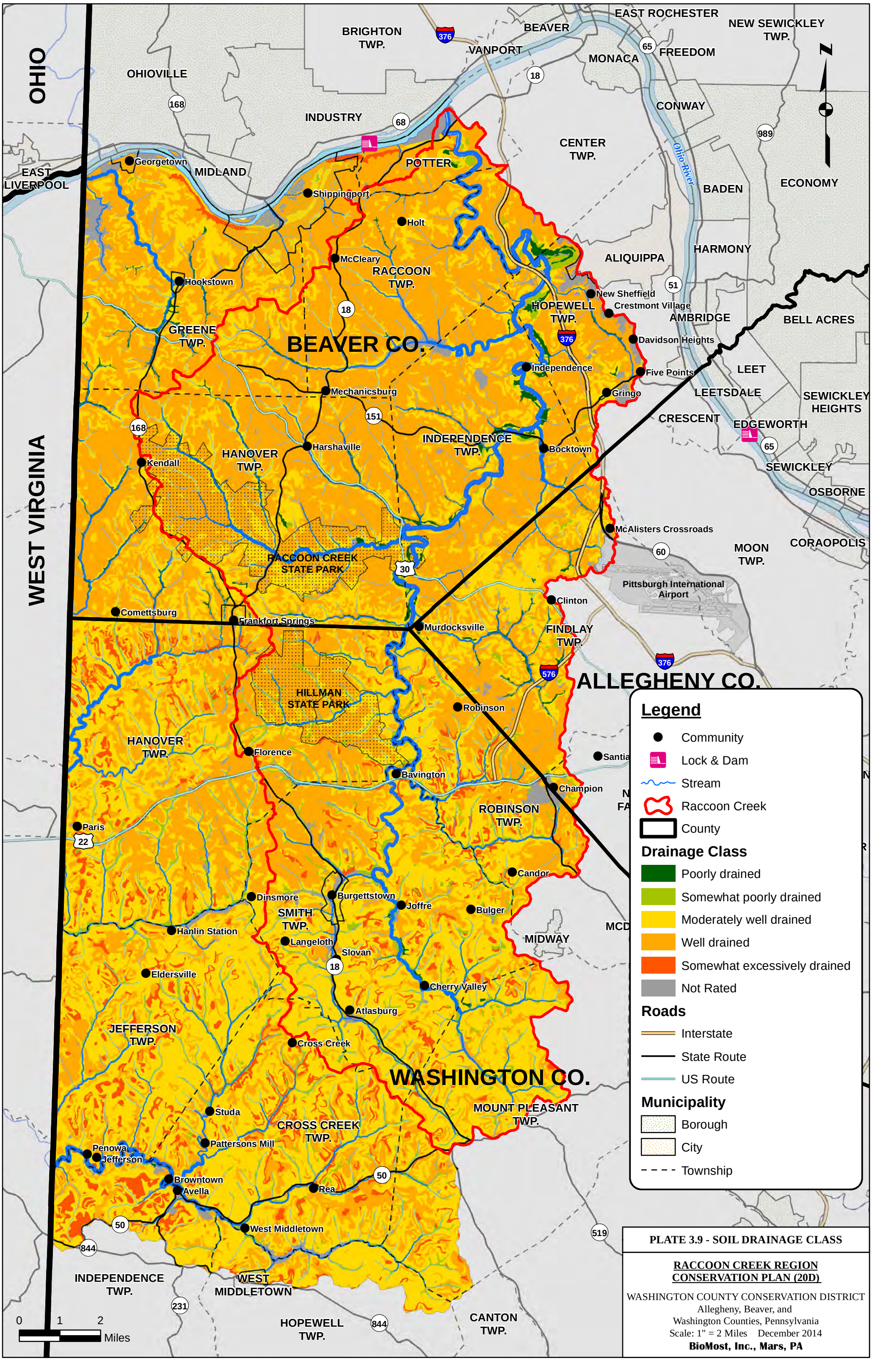
Municipality

- Borough
- City
- Township

PLATE 3.8 - HYDRIC SOILS

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BRIGHTON TWP.
BEAVER
VANPORT
EAST ROCHESTER
NEW SEWICKLEY TWP.
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
CENTER TWP.
Ohio River
BADEN
ECONOMY
EAST LIVERPOOL
MIDLAND
POTTER
Georgetown
Shippingport
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
BEAVER CO.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
HANOVER TWP.
Kendall
SEWICKLEY
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
ALLEGHENY CO.
HILLMAN STATE PARK
Robinson
HANOVER TWP.
Florence
Bavington
Champion
ROBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
Langeloth
Slovan
MIDWAY
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
MOUNT PLEASANT TWP.
Studa
CROSS CREEK TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
0 1 2 Miles
Legend
Community
Lock & Dam
Stream
Raccoon Creek
County
Drainage Class
Poorly drained
Somewhat poorly drained
Moderately well drained
Well drained
Somewhat excessively drained
Not Rated
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
PLATE 3.9 - SOIL DRAINAGE CLASS
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BRIGHTON TWP.

OHIOVILLE

INDUSTRY

BEAVER

VANPORT

EAST ROCHESTER

NEW SEWICKLEY TWP.

MONACA

FREEDOM

CONWAY

CENTER TWP.

Ohio River

BADEN

ECONOMY

EAST LIVERPOOL

Georgetown

MIDLAND

POTTER

Shippingport

Holt

McCleary

RACCOON TWP.

Hookstown

GREENE TWP.

BEAVER CO.

ALIQUIP

New Sheffiel

Crestmo

HOPEWELL TWP.

Independence

Gringo

Mechanicsburg

Harshaville

INDEPENDENCE TWP.

Bocktown

HANOVER TWP.

Kendall

RACCOON CREEK STATE PARK

McAliste

Pittsburgh International Airport

Clinton

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

ALLEGHENY CO.

HILLMAN STATE PARK

Robinson

Imperial

Santiago

ROBINSON TWP.

HANOVER TWP.

Florence

Bavington

Champion

NORTH FAYETTE TWP.

ROBINSON TWP.

Paris

Candor

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Hanlin Station

Langeloth

Slovan

MIDWAY

MCDONA

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

WASHINGTON CO.

MOUNT PLEASANT TWP.

Studa

CROSS CREEK TWP.

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

West Middletown

INDEPENDENCE TWP.

WEST MIDDLETOWN

HOPEWELL TWP.

CANTON TWP.

0 1 2 Miles

Waste Sites

- Illegal Dump
- Land Recycling Cleanup Site

Residual Waste Operation

- Generator
- Impoundment
- Land Application
- Landfill
- Processing Facility
- Transfer Station

Municipal Waste Operation

- Biosolid Land Application
- Landfill
- Landfill - Abandoned
- Processing Facility

Legend

- Community
- Lock & Dam
- Stream
- Raccoon Ck Watershed
- County

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

PLATE 3.10 - WASTE SITES

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BEAVER CO.

ALLEGHENY CO.

WASHINGTON CO.

BRIGHTON TWP.

VANPORT TWP.

MONACA BORO

FREEDOM BORO

NEW SEWICKLEY TWP.

OHIOVILLE BORO

INDUSTRY BORO

CONWAY BORO

EAST LIVERPOOL

MIDLAND BORO

POTTER TWP.

CENTER TWP.

Ohio River

BADEN BORO

ECONOMY BORO

Legionville Trail

Georgetown

Shippingport

Holt

McCleary

ALIQUIPPA

HARMONY TWP.

RACCOON TWP.

Hookstown

New Sheffield

Crestmont Village

HOPEWELL TWP.

AMBRIDGE BORO

BELL ACRES BORO

GREENE TWP.

Ambridge Reservoir

Davidson Heights

SOUTH HEIGHTS BORO

LEET TWP.

Independence

Five Points

Gringo

LEETSDALE BORO

CRESCENT TWP.

EDGEWORTH BORO

Mechanicsburg

Harshaville

INDEPENDENCE TWP.

Rocktown

SEWICKLEY BORO

Kendall

HANOVER TWP.

Upper Lake

Raccoon Lake

RACCOON CREEK STATE PARK

McAlisters Crossroads

MOON TWP.

Pittsburgh International Airport

Clinton

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

HILLMAN STATE PARK

Robinson

Imperial

ROBINSON TWP.

Florence

Bavington

Champion

NORTH FAYETTE TWP.

Santiago

Paris

Panhandle Trail - WV

Panhandle Trail

Great Allegheny Passage - Montour Trail

OAKDALE BORO

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Hanlin Station

Langeloth

MIDWAY BORO

Slovan

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

Cherry Valley Reservoir

Studa

CROSS CREEK TWP.

MOUNT PLEASANT TWP.

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

Woodrow

West Middletown

INDEPENDENCE TWP.

WEST MIDDLETOWN BORO

HOPEWELL TWP.

CANTON TWP.

CHARTIERS TWP.

Legend

- Community
- Pond
- Stream
- Raccoon Creek Watershed
- Mined Out Area
- Surface Mine Permits
- Historic Oil/Gas Wells
- Conventional Wells

Unconventional Wells

- Horizontal Well
- Vertical Well

Water Sources (Drilling)

- Interconnection
- Surface Water Withdrawal

OSM Priority Points

- OSM Priority 2
- OSM Prority 3
- Undetermined

Abandoned Mine Land

- OSM Prority 1
- OSM Prority 2
- OSM Prority 3

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

0 1 2 Miles

PLATE 3.11 - ENERGY RESOURCES MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BEAVER CO.

ALLEGHENY CO.

WASHINGTON CO.

BRIGHTON TWP.

VANPORT TWP.

MONACA BORO

FREEDOM BORO

NEW SEWICKLEY TWP.

OHIOVILLE BORO

INDUSTRY BORO

CONWAY BORO

Ohio River

EAST LIVERPOOL

MIDLAND BORO

Georgetown

POTTER TWP.

CENTER TWP.

BADEN BORO

ECONOMY BORO

Shippingport

Holt

McCleary

ALIQUIPPA

HARMONY TWP.

RACCOON TWP.

Hookstown

New Sheffield

Crestmont Village

AMBRIDGE BORO

HOPEWELL TWP.

BELL ACRES BORO

GREENE TWP.

Ambridge Reservoir

Davidson Heights

SOUTH HEIGHTS BORO

LEET TWP.

Independence

Five Points

INDEPENDENCE TWP.

Mechanicsburg

Gringo

LEETSDALE BORO

CRESCENT TWP.

EDGEWORTH BORO

Harshaville

Kendall

Bocktown

SEWICKLEY BORO

HANOVER TWP.

Upper Lake

Raccoon Lake

McAlisters Crossroads

MOON TWP.

Clinton

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

Robinson

Imperial

ROBINSON TW

HANOVER TWP.

Florence

Bavington

Santiago

Champion

NORTH FAYETTE TWP.

ROBINSON TWP.

Paris

OAKDALE BORO

Candor

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Hanlin Station

Langeloth

MIDWAY BORO

Slovan

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

Cherry Valley Reservoir

Studa

CROSS CREEK TWP.

MOUNT PLEASANT TWP.

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

Woodrow

West Middletown

Cross Creek Lake

INDEPENDENCE TWP.

WEST MIDDLETOWN BORO

HOPEWELL TWP.

CANTON TWP.

CHARTIERS TWP.

0 1 2 Miles

Legend

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Unconventional Wells

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- Vertical Well

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- Undetermined

Abandoned Mine Land

- OSM Prority 1
- OSM Prority 2
- OSM Prority 3

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

PLATE 3.11 - ENERGY RESOURCES MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014
BioMost, Inc., Mars, PA

Section 4: Water Resources

Introduction

Fresh, clean water is vital to all life on Earth. The Raccoon Creek Region is blessed with abundant supplies of water in the many miles of major creeks and smaller tributaries that feed into Raccoon Creek or flow westward into West Virginia toward the Ohio River. Throughout the development of the Raccoon Creek Region Conservation Plan, residents and stakeholders made it very clear that clean water and recreational access to waterways are among their chief concerns.

This section of the Plan will detail the major streams in the Region and their protected uses; describe key water features, dams and impoundments; explore water quality challenges, particularly Abandoned Mine Drainage and its treatment; and briefly describe public water uses and supplies.

Pennsylvania Watershed Designations

The Pennsylvania Department of Environmental Protection (DEP) divides the Waters of the Commonwealth into six major drainage basins: Great Lakes, Ohio, Upper/Middle Susquehanna, Lower Susquehanna, Potomac and Delaware. The Ohio River basin in Pennsylvania has a total drainage area of 3084 square miles and encompasses all of Beaver and Lawrence Counties, much of Mercer, Butler, Allegheny, and Washington Counties, and small portions of Crawford, Venango and Greene Counties.

The Raccoon Creek Watershed is located in the Ohio River Basin which is listed by the DEP as Basin Number 20. Within Basin Number 20, the Raccoon Creek Watershed is designated as Sub-basin 20D. 20D includes not only Raccoon Creek at its tributaries, but also the watersheds between it and the state line which flow westward toward the Ohio River through the West Virginia panhandle. The 20D Region covers 330.5 square miles in Beaver, Allegheny and Washington Counties. [1] It is illustrated in "Plate 4.1: State Water Plan 20D Sub-basins and Watersheds" found at the end of this section.

Watershed Address

Much like the US Postal Service uses zip+4 codes to locate cities, towns and individual streets; the US Geological Survey (USGS) has developed a system for cataloging and describing the location of surface water resources in the United States. USGS divides the continental United States into eighteen major geographic regions, further dividing those regions into sub-regions, then into accounting units and finally into cataloging units. The end result is blissfully unknown

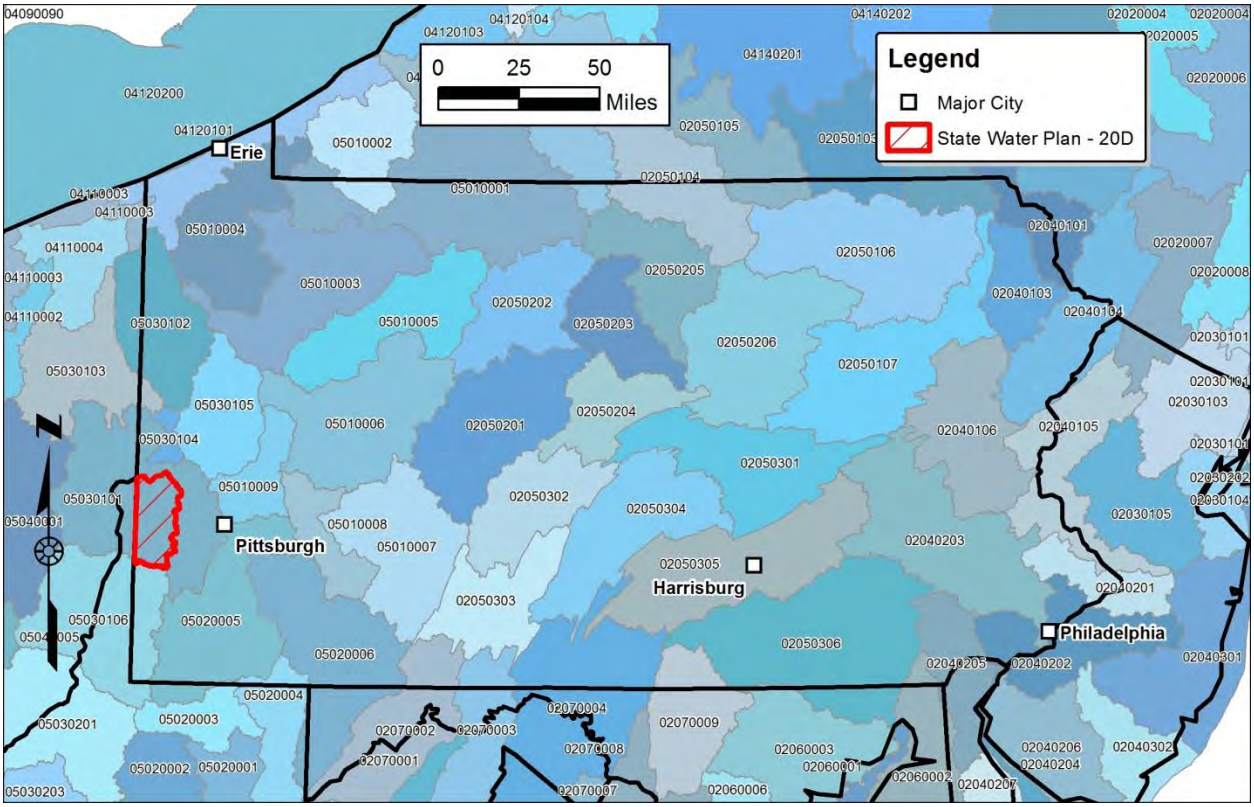
[1] Pennsylvania Department of Environmental Protection, Watershed Notebook, available at http://www.dep.state.pa.us/redirector/?varURL=http://www.epa.gov/surf2/hucs/05030105/, accessed 7/3/2014.

to the streams themselves, but is called a Hydrologic Unit Code, or HUC. The HUC Code can be considered a watershed's "address."

The Raccoon Creek Watershed Region's HUC code, 05030101,[2] is depicted in Figure 4.1 and decoded as follows:

Region 05:	All waterways draining into the Ohio River Basin (excluding the Tennessee River Basin)
Sub-region 03:	Upper Ohio
Accounting Unit 01:	Upper Ohio-Beaver
Cataloging Unit 01:	Raccoon

Figure 4.1: Pennsylvania Hydrologic Unit Codes (HUC)



[2] USGS Water Resources, Hydrologic Unit Maps, available at http://water.usgs.gov/GIS/huc.html, accessed 7/3/2014.

Major Streams in Sub-basin 20D Raccoon Creek

Within the 330.5 square-mile Raccoon Creek Region are numerous major streams, each having named and un-named tributaries. Details of these major streams, also provided in "Section 1: Project Characteristics," are listed in Table 4.1 and depicted on "Plate 4.1: Water Resources" found at the end of this Section.

Table 4.1: Major Streams of the 20D Raccoon Creek Sub-basin[3]

Major Stream Name	Stream Order at Mouth*	Stream Length (miles)	County or Counties	Receiving Waterway
Raccoon Creek, Main Stem	5	47.70	Bvr. & Wash.	Ohio River
Cross Creek	5	16.02	Washington	Ohio River
Aunt Clara Fork, King's Creek	4	9.09	Bvr. & Wash.	Ohio River
King's Creek	4	6.64	Washington	Ohio River
Little Raccoon Run	4	6.40	Washington	Raccoon Creek
Mill Creek	4	7.90	Beaver	Ohio River
North Fork, Cross Creek	4	8.49	Washington	Ohio River
Raredon Run	4	5.24	Alleg. & Bvr.	Raccoon Creek
Service Creek	4	9.40	Beaver	Raccoon Creek
Traverse Creek	4	9.45	Beaver	Raccoon Creek
Brush Run	3	5.00	Washington	Raccoon Creek
Burgetts Fork	3	9.87	Washington	Raccoon Creek
Cherry Run	3	2.87	Washington	Raccoon Creek
Harmon Creek	3	8.87	Washington	Raccoon Creek
Little Traverse Creek	3	5.57	Beaver	Raccoon Creek
Middle/North Forks, Cross Creek	3	4.59	Washington	Ohio River
North Fork, King's Creek	3	5.33	Beaver	Ohio River
Pegg's Run	3	3.09	Beaver	Ohio River
Potato Garden Run	3	6.23	Allegheny	Raccoon Creek
Scott Run	3	3.49	Washington	Ohio River
South Fork	3	1.55	Beaver	Ohio River
South Fork, Cross Creek	3	7.00	Washington	Ohio River
St. Patrick's Run	3	3.56	Washington	Ohio River

**Stream ordering is a method of assigning a numeric order to links in a stream network. Stream order identifies and classifies types of streams based on their numbers of tributaries. Upstream segments (headwater links) are always assigned an order of 1. The stream order increases when streams of the same order intersect. Therefore, the intersection of two first-order links will create a second-order link, the intersection of two second-order links will create a third-order link, and so on. However, the intersection of a first-order and a second-order link will not create a third-order link but will retain the order of the highest-ordered link. [4] The Strahler method, developed by Arthur Strahler in 1952, is the most common stream ordering method and was used in the development of Table 4.1.*

[3] Geographic Information Systems compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

[4] ArcGIS Resource Center, How Stream Order Works, available at http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#//009z000000z3000000.htm, accessed 7/4/2014.

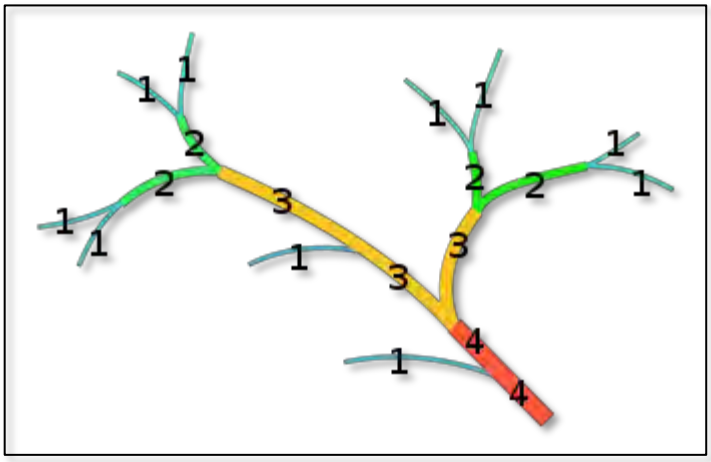


Figure 4.2: Illustration of the Strahler stream order, used to define stream size based on a hierarchy of tributaries.

Stream Designations & Water Quality Standards

The Pennsylvania Department of Environmental Protection (DEP) has established water quality standards for all surface waters in the Commonwealth of Pennsylvania: our streams, rivers, and lakes. These standards establish designated uses and criteria to protect those uses.[5]

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

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

Protected Use: Aquatic Life

PA Code Title 25, Chapter 93 provides a list of designated water uses and criteria to determine those uses. Water quality standards are in-stream water quality goals that are implemented by specific regulatory requirements, such as effluent limits on individual sources of potential pollution.[6] Designated water uses for streams in the Raccoon Creek Watershed are briefly described below:

[5] Pennsylvania Department of Environmental Protection, available at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/stream_redesignations/553982; accessed 7/3/2014.
[6] Pennsylvania Code, Pennsylvania Department of Environmental Protection, Chapter 93 Water Quality Standards. n.d.; available at http://www.pacode.com/secure/data/025/chapter93/chap93toc.html; accessed 7/3/2014.

Cold Water Fisheries (CWF) support maintenance and propagation of fish species and additional flora and fauna which are indigenous (native) to a cold water habitat.

Warm Water Fisheries (WWF) support maintenance and propagation of fish species and additional flora and fauna which are indigenous (native) to a warm water habitat.

Trout Stocked Fisheries (TSF) support maintenance of stocked trout from February 15 to July 31; maintenance and propagation of fish species and additional flora and fauna which are indigenous (native) to a warm water habitat.

Protected Use: Special Protection

High Quality Waters (HQ) are of excellent quality and have environmental or other features that require special water quality protection. Based on at least one year of data, the surface waters exceed quality levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water.

Exceptional Value Waters (EV) are also of excellent quality in terms of temperature, pH, dissolved oxygen and absence of pollutants. Biologically, the water meets at least one of these criteria: it supports a high-quality aquatic community of sensitive macroinvertebrates; it is a Class A wild trout stream; the water is within a National wildlife refuge, a State game propagation and protection area, 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.[7]

[7] Pennsylvania Code, Pennsylvania Department of Environmental Protection, Chapter 93 Water Quality Standards. n.d.; available at http://www.pacode.com/secure/data/025/chapter93/s93.4b.html; accessed 7/3/2014.

Table 4.2: PA Department of Environmental Protection (DEP) Stream Designations in the 20D Raccoon Creek Sub-basin[8]

Stream Name	Zone	County	Protected Water Use	Exceptions
Raccoon Creek	Basin, Source to Traverse Creek	Beaver	WWF	None
Traverse Creek	Basin, Source to Raccoon Creek State Park Dam	Beaver	HQ-CWF	None
Traverse Creek	Basin, State Park Dam to Mouth	Beaver	TSF	None
Raccoon Creek	Basin, Main Stem, Traverse Creek to Mouth	Beaver	WWF	None
Unnamed Tributaries to Raccoon Creek	Basins, Traverse Creek to Mouth	Beaver	WWF	None
Little Traverse Run	Basin	Beaver	WWF	None
Raredon Run	Basin	Beaver	WWF	None
Service Creek	Basin, Source to J.C. Bacon Dam	Beaver	HQ-CWF	None
Service Creek	Basin, J.C. Bacon Dam to Mouth	Beaver	WWF	None
Frames Run	Basin	Beaver	WWF	None
Trampmill Run	Basin	Beaver	WWF	None
Gums Run	Basin	Beaver	WWF	None
Fishpot Run	Basin	Beaver	WWF	None
Squirrel Run	Basin	Beaver	WWF	None
Haden Run	Basin	Beaver	WWF	None
Peggs Run	Basin	Beaver	WWF	None
Smiths Run	Basin	Beaver	WWF	None
Mill Creek	Basin, (all sections in PA)	Beaver	TSF	None
North & South Forks, Tomlinson Run	Basin, (all sections in PA)	Beaver	WWF	None
Kings Creek	Basin, (all sections in PA)	Washington	CWF	None
Harmon Creek	Basin, (all sections in PA)	Washington	WWF	None
Cross Creek	Basin, Source to Avella Water Intake	Washington	HQ-WWF	None
Cross Creek	Basin, (all sections in PA), Avella Water Intake to PA/WV State Border	Washington	WWF	None

[8] The Pennsylvania Code, § 93.9w. Drainage List W., Ohio River Basin in Pennsylvania, available at http://www.pacode.com/secure/data/025/chapter93/s93.9w.html; accessed 7/10/2014.

Wetlands

In ordinary, everyday terms, wetlands are swamps or marshes. They might also be called bogs, fens or vernal pools, depending on various site conditions in which they are found. Wetlands perform many valuable functions in nature. Please see "Section 5: Biological Resources" for an in-depth discussion of wetland habitats.

> ***Wetlands provide a multitude of ecological, economic and social benefits. They provide habitat for fish, wildlife and a variety of plants. Wetlands are also important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, recycle nutrients, and provide recreation and wildlife viewing opportunities for millions of people.***
>
> ***US Fish & Wildlife Service***

PA Department of Environmental Protection (DEP) Wetland Description

Wetlands are defined by the Commonwealth of Pennsylvania as, "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions..." Wetlands are regulated by DEP through PA Code Title 25, Chapter 105, as well as by the US Army Corps of Engineers through Section 404 of the Clean Water Act.

US Fish & Wildlife Service (USFWS) Wetland Description

The US Fish & Wildlife Service (USFWS) provides information on wetlands nationwide through the National Wetlands Inventory (NWI). There are two general categories of wetlands: coastal which include estuaries and inland which include rivers, lakes and riparian areas. In the Raccoon Creek Region, only inland wetlands are present.

Wetlands in the Raccoon Creek Region:

Wetlands cover about 2.5% of Pennsylvania.[9] Varying types of wetlands evolve in response to site characteristics such as topography, hydrology, climate, vegetation and water chemistry[10]. Based on the Cowardin classification system used by the US Fish and Wildlife Service, the following types of wetlands can be found in the Raccoon Creek Region:

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

[10] Gray, Ayesha. Brooks, Robert P., et all. Penn State Cooperative Wetlands Center *Pennsylvania's Adopt-a-Wetland Program Wetland Education and Monitoring Module.* 2001 (accessed on May 27, 2010); available at http://old.geog.psu.edu/wetlands/manual/toc.html#top

Table 4.3: Wetland Systems in the 20D Raccoon Creek Region[11]

Type of Wetland	20D Acreage	Description
Lacustrine	1252	Wetlands and deep-water habitats situated in a topographic depression or a dammed river channel; lakes and reservoirs; intermittent lakes; larger than 20 acres; lacking trees, shrubs, or persistent emergents.
Palustrine	1574	Non-tidal wetlands dominated by trees, shrubs, emergents, mosses or lichens; includes marshes, swamps, bogs and wet meadows, bottom-land hardwood forests, vernal pools; majority of vegetated freshwater wetlands in U.S. are palustrine.
Riverine	1084	Deep-water habitats, mostly nonvegetated wetlands contained in natural or artificial channels containing flowing water, or which form a connecting link between the two bodies of standing water; includes freshwater rivers, creeks, washes, ditches, stream channels and immediately adjacent wetlands
Total Wetland Acreage in 20D	**3910**	**1.85% of total acreage in the 20D Region is wetlands**

Figure 4.3: A Palustrine wetland formed by a beaver dam, Hillman State Park, 4/28/2011. Photo by Kevin Kisow.

[11] Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page.
http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm

Wetlands are particularly important in the Raccoon Creek Region because of their ability to passively filter out and settle water-borne contaminants. One of the best examples is the Potato Garden Run valley, lined on both sides with massive, linear coal waste piles that leach Abandoned Mine Drainage into the stream. Through the natural action of beavers damming the waterway and creating wetlands, a significant amount of pollution treatment takes place without any human effort.

Figure 4.4: Apparently undaunted by foul water, beavers build lodges like this one and maintain many dams on Potato Garden Run, providing a degree of treatment for seepage from coal waste piles lining both sides of the creek. 4/2/2005.

The Unites States Environmental Protection Service (USEPA) conducted the country's first nation-wide land-cover mapping project, creating the National Land Cover Database (NLCD). The NLCD defines woody wetlands into further classifications.[12]

[12] US Environmental Protection Agency, National Land Cover Class Definitions 2001, available at http://www.epa.gov/mrlc/definitions.html; accessed 7/4/2014.

Table 4.4: US EPA National Land Cover Data
Forested Wetland Types in the 20D Raccoon Creek Region

Wetland Type	Acres	Characteristics
Palustrine Emergent	555	Dominated by persistent emergent vascular plants, emergent mosses or lichens; plants generally remain standing until the next growing season.
Palustrine Forested	430	Dominated by woody vegetation taller than 12 feet; total vegetation coverage is greater than 20 percent.
Palustrine Scrub Shrub	84	Dominated by woody vegetation less than 12 feet in height; total vegetation coverage is greater than 20 percent; species present could be true shrubs, young trees and shrubs or trees that are small or stunted due to environmental conditions.
Palustrine Unconsolidated Bottom	505	Unconsolidated bottoms are characterized by the lack of large stable surfaces for plant and animal attachment; usually found in areas with lower energy than rock bottoms; may be very unstable.[13]
Total Acres	**1574**[14]	

Floodplains

Flooding is part of a waterway's natural cycle. Before dams and other types of containment were built, rivers and creeks would spread out during a flood, spilling onto adjacent lowlands, which are call "floodplains." The flood waters would settle and be absorbed, the flora and fauna would be refreshed and renewed, and the soil would be enriched by nutrients carried in organic matter, silt and sediment. Even having wetland coverage of 4 percent to 5 percent in a watershed can reduce peak floods by half![15]

The federal Watershed Protection & Flood Prevention Act of 1954 provides for cooperation between the Federal government and the States and their political subdivisions in a program to

[13] Ecology Dictionary.org, Environmental Engineering Dictionary, available at http://www.ecologydictionary.org/WETLANDS,_PALUSTRINE; accessed 7/4/2014.
[14] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.
[15] Bucco, Gloria. Pennsylvania Department of Conservation and Natural Resources. Floodplains: Don't Mess with Mother Nature. 2008; available at: http://www.dnr.state.ne.us/floodplain/PDF_Files/MotherNature_Part1.pdf, accessed on May 29, 2010.

prevent erosion, floodwater, and sediment damage; to further the conservation, development, utilization, and disposal of water; and to further the conservation and proper utilization of land.[16]

Statewide Flood Management Studies

The Pennsylvania Emergency Management Agency (PEMA) maintains Flood Study maps and data for use by local emergency management agencies, geographic information systems (GIS) and planning departments, watershed organizations, and other interested parties for hazard identification and risk assessment, mitigation planning and flood response training activities. PEMA Flood Study data estimates potential damages and locations by using the Federal Emergency Management Agency's Hazus flood analysis model. The maps and supporting analysis can be overlaid on other GIS maps (county, local roads, street maps, municipal maps, etc.) to show the location and extent of potential flood damages in a 100-year flood. They do not include all possible flood risk areas and are not based on actual past flood events.[17]

Figure 4.5: Flood damage on Raccoon Creek at Independence Marsh. 11/4/2004.

County Flood Management Studies

FEMA has completed Flood Management Studies for Allegheny, Beaver and Washington Counties. These studies show the main flooding problem for all waterways is the potential for flash flooding as a result of intense, localized thunderstorms. The main flooding season is usually from April to September; however, flooding can occur at any time of the year. Digital Flood Insurance Rate Mapping (DFIRM) for all Pennsylvania counties is available on FEMA's website, http://www.rampp-team.com/pa.htm; phone number 1-800-621-3362, TDD: 1-800-462-7585. The US Army Corps of Engineers has additional information regarding Flood Risk Management at http://www.usace.army.mil/CECW/PlanningCOP/Pages/flood.aspx.[18]

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[16] USDA Natural Resource Conservation Service, Watershed and Flood Prevention Operations Program, available at http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/; accessed 7/5/2014.
[17] FEMA, Pennsylvania Emergency Management Completes Statewide Flood Study Using HAZUS-Multi Hazard, available at https://www.fema.gov/hazus/pennsylvania-emergency-management-completes-statewide-flood-study-using-hazus-multi-hazard; accessed 7/5/2014
[18] FEMA, Pennsylvania Mapping Status, available at https://www.rampp-team.com/pa.htm; accessed 7/5/2014.

Lakes and Ponds

There are several differences between lakes and ponds. The differences are listed in Table 4.6 and include size, creation, depth, chemistry and influence on climate. The primary difference is size – Relatively speaking, lakes are large while ponds are much smaller. Ponds often have the same temperature from top to bottom, whereas lakes can have dramatically different temperatures from the surface to the bottom waters.[19]

Table 4.5: General Comparison of Lakes and Ponds[20]

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

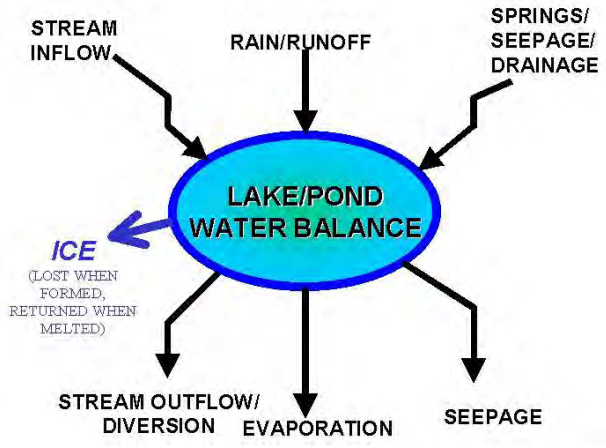
Water enters a lake or pond in a variety of ways: directly from precipitation falling on the surface of the lake, or indirectly from streams, rivers, springs, seeps or other drainage.

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

Freshwater contained in lakes and ponds is one of our most treasured natural resources. The Commonwealth of Pennsylvania contains 146,813 acres of lakes and ponds, much of which is used for recreation.[21] The 20D Raccoon Creek Watershed Region contains approximately 2,548 acres of lakes and ponds, comprising about 1.2% of the Region's total area.[22]

[19] United States Environmental Protection Agency. Lakes Ponds and Reservoirs, available at http://www.epa.gov/bioiweb1/aquatic/lake-r.html; accessed 7/5/2014.
[20] Ibid.
[21] USGS National Hydrography Dataset, available at http://nhd.usgs.gov/; accessed 7/5/2014.
[22] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.

Figure 4.6: Water Intake/Out-take of a Lake[23]



Lakes available for public use in the Raccoon Creek Region include:

Cross Creek Lake – Cross Creek County Park's 258 acre lake has been open to the public since 1984. The lake's amenities include boat launches, a handicapped fishing pier, restrooms, pavilions and a playground. Work began on a second boat launch at Thompson Hill Road in May, 2014. Cross Creek Lake is a Big Bass and a Panfish Enhancement Lake. Special Regulations and Laws are provided by the Pennsylvania Fish & Boat Commission. Sailboating and motor boating by permit. Information is available at: http://www.co.washington.pa.us/DocumentCenter/View/1195.

Upper Lake – the original lake of Raccoon Creek State Park is open for fishing but not swimming. Located on the west side of the Park below the Group Camps, this 12-acre secluded lake is reverting from open water to wetlands and is a haven for wildlife.

Raccoon Lake – the main lake on the east side of Raccoon Creek State Park is one of its biggest attractions. This 101-acre lake features a 500' sand/turf beach with modern bath house and concession stand. Please read and follow posted beach rules; swim at your own risk. Canoes, kayaks and paddle boats are available for rental. Both of the Park's lakes are stocked with brook and rainbow trout. The main lake features an ADA-accessible fishing pier.

Harmon Creek Lake – please see page 16 for more information about this historic lake.

[23] Ecology of Lakes & Ponds for Anglers and Other Fish-ites, The Water Balance, available at http://www.combat-fishing.com/lakepondbalance.htm; accessed 7/5/2014.

Bennett Acres Campground – features two fishing lakes for guests with "prime fishing holes." No swimming. Located south of US Route 22 near First Niagara Pavilion. Information can be viewed at: http://www.bennettacres.com/.

Several other privately-owned lakes and nearly 600 ponds are also located in the 20D Raccoon Creek Region.[24] Please refer to "Plate 4.2: Water Resources" for locations.

Table 4.6: USGS-Recognized Named Lakes in the 20D Raccoon Creek Region[25]

Name	Size (acres)	Purpose	Municipality	County
Ambridge Reservoir	405.5	Municipal water supply; closed to the public.	Raccoon Township	Beaver
Cherry Valley Reservoir	51.6	Former municipal water supply; now private recreational lake.	Mount Pleasant Township	Washington
Upper Lake (Raccoon Creek State Park)	7.7	Fishing, wildlife observation; original main lake of Raccoon Creek State Park.	Hanover Township	Beaver
Raccoon Lake	74.9	Fishing, paddling, swimming; water supply for Raccoon Creek State Park (treated).	Hanover Township	Beaver
Zinc Dam Reservoir	10.6	Former municipal water supply for Burgettstown; dam is breached; closed to the public.	Smith Township	Washington

Harmon Creek Lake: A Hidden Treasure

Text and photos for this section were contributed by Kevin Kisow, a student at Indiana University of Pennsylvania, majoring in Criminology and minoring in Geographic Information Systems (GIS).

Just across Steubenville Pike from Hillman State Park lies the clearest water around Northern Washington County - Harmon Creek Lake. Built in the 1940's on a former strip mine owned by the Harmon Creek Coal Corporation, the 12-acre lake and its surroundings served as a retreat for company employees.

Harmon Creek Coal's owner, James Hillman, pioneered strip mine reclamation in the Burgettstown area at a time when the coal industry had very little government regulation imposed on it. Harmon Creek Coal's land reclamation practices were outstanding compared to other coal companies of that time. By building Harmon Creek Lake on a strip mine, Hillman

[24] United States Geological Survey National Hydrography Data set (USGS); available at http://nhd.usgs.gov
[25] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.

proved that such land could be properly reclaimed for public recreation and wildlife habitat. This helped lead to new state regulations for the coal industry.

Harmon Creek Coal did not remove every highwall from the lands they stripped, but the efforts they did make went far beyond what any other coal company of that era provided. Multiple articles appeared in Pittsburgh and Washington newspapers showcasing the lake and other reclamation efforts nearby.

Harmon Creek Lake was strategically placed for the clean springs that supply water to it. In the lake's earliest days it once had four fishing piers and a large wooden suspension bridge that spanned across the left finger. Remnants of the bridge and an old brick stove can be found on the western shores.

A mid-1950's advertisement by Harmon Creek Coal Company read, in part:

> *"Harmon Creek Coal Corporation believes that when something of value is taken from the land, something of value must be returned. That's the philosophy behind our reclamation and reforestation program at our Burgettstown, Pa., mine, the largest strip mine operation in Western Pennsylvania.*
>
> *As the coal is mined, the land is restored to a greater value than originally…*
>
> *Ugly spoil banks have been replaced with a game preserve, recreation park, swimming pool, fishing lake and forests.*
>
> *We mine excellent coal from the land and we return the value in the coin of conservation…it's good business."*

Today, the lake still provides the Raccoon Creek Watershed a pristine body of water as intended by the Harmon Creek Coal Corporation and the Hillman Family. Over the last 60 years the lake has seen a lot of visitors, as it was once a part of State Game Lands 117.

Now owned by the Washington County Economic Development Partnership, Harmon Creek Lake and surrounding forest land is part of the Starpointe Business Park. In 2011 the dam underwent its first major restoration project. Contractor BKG Industries of Imperial, PA, was hired by Fourth River Development (developer of Starpointe Business Park) to clear vegetation, install a spillway, riprap, new manholes and improved drainage along the roadway.

I documented the entire restoration process for BKG. Background history including newspaper articles; historic aerial photos and literature cited are available at https://kkisow.squarespace.com/harmon-creek-lake/.

Harmon Creek Lake needs your help. Please be a good steward. Help keep the Raccoon Creek Watershed clean and pristine by lending a hand to remove litter from the lake area.

Figure 4.8: Winter snow reveals some of the strip mined terrain surrounding Harmon Creek Lake in Hanover Township, Washington County. Photo by Kevin Kisow, 1/2/2013.

"Harmon Creek Lake, a Hidden Treasure," Works Cited

"Awards Won By Harmon Creek Coal." *The Washington Reporter* [Washington, PA] 21 Jan. 1958: 41. Print.

"Free Park To Be Give To Burgettstown On Fourth." *Pittsburgh Post Gazette* [Pittsburgh, PA] 3 July 1945: 1. Print.

"Game Refuge To Be Created." *The Washington Reporter* [Washington, PA] 21 Jan. 1937: 14. Print.

"A Philanthropist And Conservationist." *Observer Reporter* [Washington, PA] 18 Jan. 1969, sec. A: 4. Print.

USGS Data Monitoring Stations

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

floods, the data are transmitted, on average, every 15 minutes. Numerous agencies use the data to initiate evacuations and manage emergency response.

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

High water terms used by the National Weather Service include bankfull stage, action stage, and flood stage. These are defined as follows:[26]

> **Bankfull Stage** - an established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank.
>
> **Action Stage** - the stage which, when reached by a rising stream, represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity (i.e., flooding). Gage data should be closely monitored by any affected people if the stage is above action stage.
>
> **Flood Stage** - an established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood advisories or warnings is linked to flood stage. Not necessarily the same as bankfull stage.

There is only one USGS gaging station on Raccoon Creek - Moffett Mill in Potter Township. Action stage for Raccoon Creek at Moffett Mill is 10.4 feet; flood stage is 13 feet. Two other gages are located on the Ohio River, upstream and downstream of Montgomery Dam.

Table 4.7: USGS Gaging Stations in the 20D Raccoon Creek Region[27]

Gaging Station with General Location	**Site #**	**County**	**Municipality**	**Drainage Area (sq. mi.)**
Raccoon Creek at Moffett Mill* Bridge	03198000	Beaver	Potter Twp.	178
Ohio River at Montgomery Dam, upper pool	03108490	Beaver	Industry Boro.	21,714
Ohio River at Montgomery Dam, lower pool	03108500	Beaver	Potter Twp.	22,960

**USGS spells the name of this station "Moffatts Mill." Locally, the road upon which the gaging station is located is spelled "Moffett Mill."*

[26] National Weather Service, Alaska-Pacific River Forecast Center, available at http://aprfc.arh.noaa.gov/resources/docs/floodterms.php; accessed 7/5/2014.
[27] USGS Current Conditions for Pennsylvania: Stream Flow, available at http://waterdata.usgs.gov/pa/nwis/current/?type=flow; accessed 7/5/2014.

The Moffett Mill gaging station is located 4.2 miles upstream from the mouth of Raccoon Creek at the Moffett Mill Bridge. This gage was put in service in May of 1915. Moffett Mill transmits data to the internet via satellite telemetry. Hour-by-hour readings are available on the web at the USGS website: http://waterdata.usgs.gov/pa/nwis/uv/?site_no=03108000&PARAmeter_cd=00065,00060,00010.

As evidenced by the graph below, annual peak flows in Raccoon Creek have maintained a fairly steady pattern over the past 98 years. Ice-jam floods in March of 1920 and April of 1922 reached 9.8 feet and 10,000 cubic feet per second.[28] However, Hurricane Ivan on September 17, 2004, dumped over five inches of rainfall on the Region, causing devastating flooding and shattering all previous records. On September 18, 2004, Moffett Mill recorded 14.29 feet on the gage with a peak flow rate of 21,200 cubic feet per second.[29] That is roughly equal to the space occupied by a dozen Class A motorhomes!

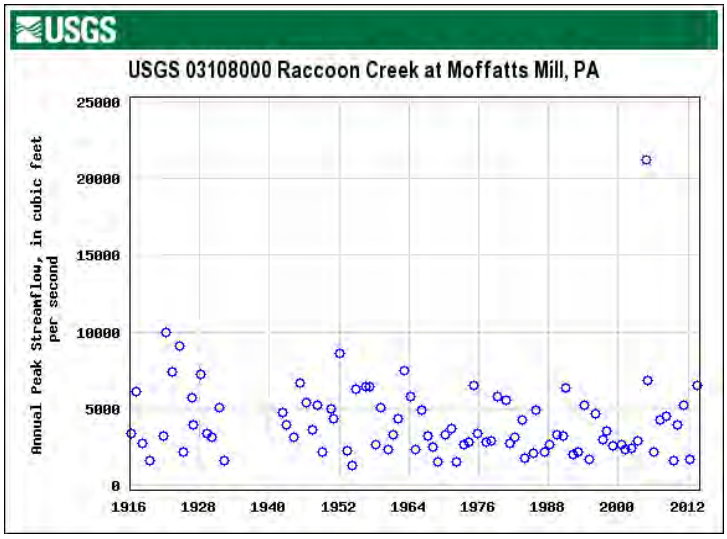


Figure 4.9: Annual peak flows for Raccoon Creek at the Moffett Mill Gage, 1916 through 2013, showing the magnitude of Hurricane Ivan's destruction in 2004.

[28] USGS, National Water Information System Web Interface, available at http://waterdata.usgs.gov/pa/nwis/uv/?site_no=03108000&PARAmeter_cd=00065,00060,00010; accessed 7/5/2014.
[29] USGS, Peak Stream Flow for the Nation, available at http://nwis.waterdata.usgs.gov/nwis/peak?site_no=03108000&agency_cd=USGS&format=html; accessed 7/5/2014.

Dams and Impoundments

The following is a summary of the Raccoon Creek Region's dams and impoundments, regulated by the PA Department of Environmental Protection.

Table 4.8: Impoundments with DEP-Regulated Dams in the 20D Raccoon Creek Region[30]

Name of Dam	County	Stream	Owner	Purpose	Year Built	Surface Area in Acres
PA-661	W	Cross Creek	Washington County Commissioners	Flood Control Recreation Water Supply	1979	260
Dinsmore No.2	W	Harmon Creek	Cherry Valley Lake Development Co.	Water Supply	1909	10
PA-481	W	Harmon Creek	Wash. Co. Comm.	Flood Control	1984	11
Little Blue Run	B	Little Blue Run	Pennsylvania Power Company	Tailings	1977	770
PA-486 Harmon Creek	W	Paris Run	Wash. Co. Comm.	Flood Control	1979	4
Cherry Valley	W	Raccoon Creek	Cherry Valley Lake Development Co.	Water Supply	1947	55
J.C. Bacon Dam	B	Service Creek	Ambridge Water Authority	Water Supply	1956	418
Emerald Lake (old dam)	W	St. Patricks Run	John Boschuk, Jr.	Recreation	1912	18
Harmon Creek PA-479	W	Tr. Harmon Creek	Wash. Co. Comm.	Flood Control	1969	4
Harmon Creek PA-484	W	Tr. Harmon Creek	Wash. Co. Comm.	Flood Control	1971	2
PA-480	W	Tr. Harmon Creek	Wash. Co. Comm.	Flood Control	1979	4
PA-482	W	Tr. Harmon Creek	Wash. Co. Comm.	Flood Control	1970	6
PA-485	W	Tr. Harmon Creek	Wash. Co. Comm.	Flood Control	1977	6
Bald Knob	A	Tr. Potato Garden Run	Aloe Coal Company	Other	1974	4
Duck Pond Dam	W	Tr. Raccoon Creek	Champion Processing, Inc.	Tailings	Blank	440
Ashton South Dam	W	Tr. Ralston Run	James A. Ashton	Recreation	Blank	1
PA-662	W	Tr. South Fork Cross Creek	Washington County Commissioners	Flood Control	1983	13
Group Camp	B	Traverse Creek	DCNR - Bureau of State Parks	Recreation	1938	8
Raccoon Creek	B	Traverse Creek	DCNR - Bureau of State Parks	Recreation	1948	80
PA-483	W	Ward Run	Wash. Co. Comm.	Flood Control	1973	4
Marshall Reservation No. 2	W	W. Br. St. Patricks Run	Paul J. Koepfer	Recreation	1928	15
East High Dissolved Solids Imp.	B	Wtrshd Ohio River	Pennsylvania Power Co.	Other	Blank	3
North Low Dissolved Solids Imp.	B	Wtrshd Ohio River	Pennsylvania Power Co.	Other	1974	3
South Low Dissolved Solids Imp.	B	Wtrshd Ohio River	Pennsylvania Power Co.	Other	1974	3
West High Dissolved Solids Imp.	B	Wtrshd Ohio River	Pennsylvania Power Co.	Other	1974	3
*Montgomery Dam	B	Ohio River	United States	Navigation	1936	-

*Operated and regulated by the US Army Corps of Engineers.
A = Allegheny County; B = Beaver County; W = Washington County

[30] US Army Corps of Engineers, National Inventory of Dams, available at http://geo.usace.army.mil/pgis/f?p=397:6:0::NO; accessed 7/11/2014.

Run-of-the-River Dams

According to the Pennsylvania Fish & Boat Commission's website, a "Run-of-the-River dam" is a manmade structure which:

1. is regulated or permitted by the Department of Environmental Protection (DEP) pursuant to the act of November 26,1978 (P.L.1375, No.325), known as the Dam Safety and Encroachments Act;
2. is built across a river or stream for the purposes of impounding water where the impoundment at normal flow levels is completely within the banks and all flow passes directly over the entire dam structure within the banks, excluding abutments, to a natural channel downstream; and
3. DEP determines to have hydraulic characteristics such that at certain flows persons entering the area immediately below the dam may be caught in the backwash.[31]

Figure 4.10: A cliff swallow flies to its nest in a drain on the spillway of the main lake at Raccoon Creek State Park. Photo courtesy of the Beaver County Times, 4/19/2012.

Historically, run-of-the-river dams were built to harness a stream's power to mill grain or power machinery. Today, these dams are often removed for habitat restoration and for safety reasons.

American Rivers is a national nonprofit organization which advocates for the removal of run-of-the-river dams. Lisa Hollingsworth-Segedy, Associate Director of River Restoration for American Rivers, can be contacted for further information at 412-727-6130 or by email at LHollingsworth-Segedy@americanrivers.org.

American Rivers' online Map of US Dam Removals 1936-2013 lists no dams removed in the 20D Raccoon Creek Region.[32] Likewise, the PA Fish & Boat Commission's online inventory of run-of-the-river dams shows none in the 20D Raccoon Creek Region.[33]

[31] Pennsylvania Fish & Boat Commission, Run of the River Dams, available at http://www.fish.state.pa.us/rrdam.htm; accessed 7/11/2014.
[32] American Rivers, Map of US Dam Removals 1936-2013, available at http://www.americanrivers.org/initiatives/dams/dam-removals-map/; accessed 7/11/2014.
[33] Pennsylvania Fish & Boat Commission, Run of the River Dams, available at http://www.fish.state.pa.us/rrdam.htm; accessed 7/11/2014.

Water Quality

Clean water for drinking, household use and recreation are very important to the residents of the Raccoon Creek Region. Along with preserving open green space, stakeholders are most concerned that water quality should continue to improve throughout the region. Since the late 1990s, great strides have been made by building Abandoned Mine Discharge treatment systems and improving public sewer systems. Residents are hopeful that new resource extraction industries will develop in ways that protect surface and ground water quality. Please see "Section 2: Issues, Concerns, Constraints" for further information.

In Pennsylvania, the Department of Environmental Protection (DEP) is charged with establishing standards for water quality, assessing the quality of waters statewide, and enforcing laws and regulations designed to protect our wetlands, floodplains, lakes and ponds. In 1997, DEP first implemented the Statewide Surface Waters Assessment Program and completed assessment of all "wadeable" sections of streams and rivers in 2006.

Figure 4.11: Iron and aluminum stain an unnamed tributary to Cross Creek near Browntown, 4/27/2005.

DEP establishes appropriate designated uses for aquatic life, water supply, recreation and fish consumption based on numerical or narrative measurements of levels of substances in streams. Please see "Plate 4.3: Designated Stream Uses" for mapping of the Region's streams according to their water quality designations.

Section 305(b) of the federal Clean Water Act requires periodic reports on the quality of waters in Pennsylvania.[34] Section 303(d) of the Clean Water Act requires states to list all impaired waters not supporting uses even after appropriate and required water pollution control measures have been taken. The source of impairment is listed, which may be one or more **point sources** (like industrial or sewage discharges), or **non-point sources** (such as abandoned

[34] Pennsylvania Department of Environmental Protection, *Assessment and Listing Methodology for Integrated Water Quality Monitoring and Assessment Reporting Clean Water Act Sections 305 (b)/303(d), 2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report* http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/integrated_water_quality_report_-_2012/1127203; accessed 7/6/2014.

mine lands or agricultural runoff).[35] "Plate 4.2: Water Resources" shows the Raccoon Creek Region's degraded streams with cause of impairment.

For aquatic life, negative impacts are identified primarily through stream biological community assessments. For streams that are used for water supplies, negative impacts are identified by evaluating the chemical quality of raw water monitored by water purveyors and by analyzing edible portions of fish. Recreational use impairments are identified using bacteriological data.[36]

The 2012 PA Integrated Water Quality Monitoring and Assessment Report can be accessed at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/integrated_water_quality_report_-_2012/1127203. The US EPA and DEP websites also provide information.

Table 4.9: PA DEP-Listed Causes of Impairment to Streams in the 20D Raccoon Creek Region shows causes of degradation to streams, or segments of streams, within the Raccoon Creek Region as identified by the Department of Environmental Protection.

Figure 4.12: Cliff Denholm and Margaret Dunn of BioMost sample drainage at the Francis Mine discharge, 11/23/2009. Photo courtesy of BioMost, Inc.

"Plate 4.2: Water Resources Map" shows these degraded streams segments with cause of impairment. A color-coded key lists various types of pollution loading. Impaired stream sections are color-coded for their respective impairments. Note that some streams may be deemed impaired in their headwaters, but become cleaner in their lower reaches and are not color-coded as impaired. A good example of this is the main stem of Raccoon Creek itself.

[35] US EPA, *A Primer on Using Biological Assessments to Support Water Quality Management, October 2011, available at* http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/biocriteria/upload/primer_update.pdf; accessed 7/6/2014.
[36] Ibid.

Table 4.9: PA DEP-Listed Causes of Impairment to Streams in the 20D Raccoon Creek Region[37]

Source of Impairment	Miles
Abandoned Mine Drainage - Metals	**38.7**
Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	**32.4**
Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - Siltation	**4.9**
Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage – Suspended Solids	**15.0**
Abandoned Mine Drainage – Siltation; Abandoned Mine Drainage – Metals	**8.1**
Agriculture – Siltation; Road Runoff - Siltation	**9.1**
Erosion from Derelict Land - Siltation	**2.1**
Grazing Related Agriculture - Siltation ; Removal of Vegetation - Siltation	**23.7**
Habitat Modification - Siltation	**5.9**
Highway, Road, Bridge Construction – Siltation; Road Runoff - Siltation	**2.6**
Other - pH	**0.1**
Other - Siltation	**3.3**
Removal of Vegetation – Siltation; Road Runoff - Siltation	**1.2**
Road Runoff - Siltation	**0.7**
Small Residential Runoff – Organic Enrichment/Low Dissolved Oxygen; Road Runoff – Siltation	**2.5**
Source Unknown – Dioxins; Source Unknown - PCB	**0.4**
Source Unknown - Mercury	**6.2**
Source Unknown – Pathogens	**15.5**
Source Unknown – PCB; Source Unknown - Dioxins	**3.6**
Urban Runoff/Storm Sewers - Siltation	**0.03**
Total Miles of Impaired Streams	**177.9**

Point vs Nonpoint Sources of Water Pollution

Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. The term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.[38] That definition states:

The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.[39]

[37] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.
[38] US EPA, What is Nonpoint Source Pollution? available at http://water.epa.gov/polwaste/nps/whatis.cfm; accessed 7/6/2014.
[39] Ibid.

Unlike pollution from industrial and sewage treatment plants, nonpoint source (NPS) pollution comes from many sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters.

Nonpoint source pollution can include:[40]

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas
- Oil, grease and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems
- Atmospheric deposition and hydromodification

Figure 4.13: A point source discharge from the Erie Mine stains the banks of Burgetts Fork near Burgettstown Blue Devils Stadium, 4/15/2004.

According to the US Environmental Protection Agency, nonpoint source pollution remains the leading cause of water quality problems nationwide, with harmful effects on drinking water supplies, recreation, fisheries and wildlife.[41]

National Pollution Discharge Elimination System (NPDES) Permits for Point Sources

National Pollutant Discharge Elimination System (NPDES) permits are issued by either the US EPA or an authorized state, such as Pennsylvania, to control point source discharges through the federal Clean Water Act. Each permit must contain industry-specific, technology-based and/or water-quality-based limits, and establish monitoring and reporting requirements.[42] Any facility that intends to discharge into waters of the United States must obtain a permit prior to initiating a discharge from pipes, spillways, ditches or any other point source. The

[40] Ibid.
[41] Ibid.
[42] US EPA, Water Quality Standards Handbook: Second Edition, March 2012, Available at http://water.epa.gov/scitech/swguidance/standards/handbook/; accessed 7/6/2014.

permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. Once the permit is approved, conditions are established under which a facility may discharge, along with effluent limits. The NPDES permit may also include discharge limits based on federal and state water quality criteria or standards designated to protect uses of surface waters. According to the USEPA, these standards, unlike the technology-based standards, generally do not take into account technological feasibility or project costs involved. [43]

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

Types of Regulated Pollutants

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

Conventional Pollutant— in sanitary wastes of households, businesses, and industries, including human wastes, ground-up food from sink disposals, laundry and bath waters

Fecal Coliform—bacteria in digestive tracts of humans and animals; indicates potential presence of pathogenic organisms

Oil and Grease—organic substances that may include hydrocarbons, fats, oils, waxes, and high-molecular fatty acids; often producing sludge solids difficult to process and properly treat

Toxic Pollutants—particularly harmful to human, animal or plant life; organics, the primary group, includes pesticides, solvents, polychlorinated biphenyls (PCBs), dioxins; metals includes lead, silver, mercury, copper, chromium, zinc, nickel, and cadmium

Nonconventional Pollutants— not conventional or toxic that may require regulation, including nutrients such as nitrogen and phosphorus

[43] United States Environmental Protection Agency, Aquaculture, available at http://www.epa.gov/agriculture/anaqulaw.html; accessed on 7/6/2014.

Total Maximum Daily Loads (TMDLs) for Point and Non-Point Pollution Sources

Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.[44] In the Raccoon Creek Region, Harmon Creek, Raccoon Creek and the Ohio River have established TMDLs as shown in Figure 4.13 and Table 4.10.

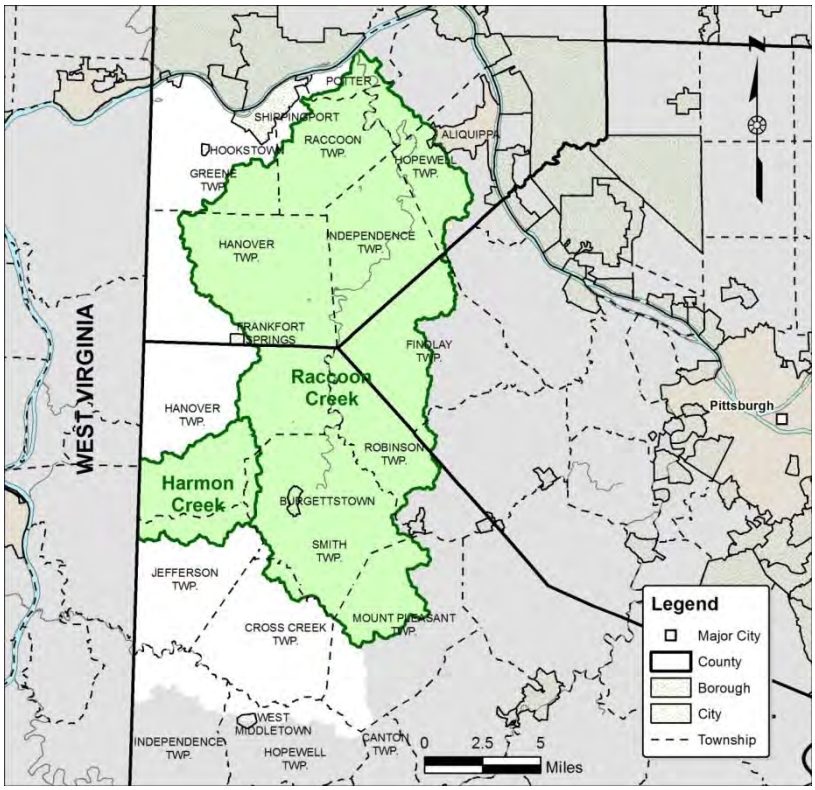
Table 4.10: 20D Region Streams with Established Total Maximum Daily Loads (TMDLs)[45]

Stream Name	County	Category	Cause	EPA Approval (date)	Online Report Hot-Link
Harmon Creek	Washington	AMD	Metals, pH, Siltation, Suspended Solids	4/4/2007	**TMDL:** Harmon Creek Watershed TMDL
Raccoon Creek	Allegheny, Beaver & Washington	AMD	Metals, pH, Siltation, Suspended Solids	4/7/2005	**TMDL:** Raccoon Creek Watershed TMDL
Ohio River	Beaver County	Fish Consumption	Chlordane, PCB	4/9/2001	**TMDL:** Ohio River Watershed TMDL

Figure 4.14: A look into the inlet pipe at the Langeloth Bore Hole Passive Treatment System in Langeloth, 12/10/2009. Photo courtesy of BioMost, Inc.

[44] EPA, Water: Total Maximum Daily Loads (303d), available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/; accessed 7/6/2014.
[45] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.

Figure 4.15: 20D Region Streams with Established Total Maximum Daily Loads (TMDLs)[46]



Abandoned Mine Drainage

Drainage from abandoned coal mines is the largest source of nonpoint source pollution in Pennsylvania. Many of the waterways in the Commonwealth are impaired by the legacy effects of unregulated mining practices of the 19th through the mid-20th centuries. For over a hundred years, orange-running streams were considered signs of prosperity and the price of progress.

According to the draft 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, over 5,500 miles of streams are degraded by Abandoned Mine Drainage (AMD).[47] In addition, 45 of Pennsylvania's 67 counties are impacted and there are over 250,000 acres of un-reclaimed mine lands, including 2.6 billion cubic yards of coal refuse piles.[48] Pennsylvania also has approximately 7,800 abandoned or inactive underground mines. In many cases, entire watersheds are nearly devoid of aquatic life. Today, we face a tremendous and expensive challenge to fix the mistakes of the past and secure a clean, healthy future for our waterways.

[46] Geographic Information Systems compiled from data collected by the Southwest PA Commission and PASDA.

[47] Pennsylvania Department of Environmental Protection. draft Pennsylvania Integrated Water Quality Monitoring and Assessment Report. 2014; available at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/draft_integrated_water_quality_report_-_2014/1702856; accessed 7/9/2014.

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

AMD is the major impairment in the Raccoon Creek Region with more than 200 mine sites and 10,000 acres of surface mined lands. Forty miles of main stem Raccoon Creek and 30 to 40 miles of tributaries are degraded by AMD. Discharges are either highly alkaline or acidic; both types have very high concentrations of iron. Extensive impairment from abandoned deep mines is found in the Cherry Valley, Joffre and Burgettstown areas. Extensive limestone strata result in high base flow alkalinity. The major impairments, therefore, are iron hydroxide precipitate and sediment. Harmon Creek and Cross Creek are also impaired by metals and suspended solids from abandoned mine drainage.[49]

Coal Mining History of the Raccoon Creek Region

Most of the Raccoon Creek Region's coal mining has occurred in Washington County. Coal mining in the Region began in the late 18th century with the earliest known outcrop mine started in 1781. Because Washington County's coal was easy to access and of good quality, numerous small mines opened to provide coal for home heating and powering of small, localized industrial activity. After 1820, the need for coal for home heating grew as more homes were built.

By 1840, the early Pittsburgh iron and steel industrial complex became another consumer of the region's abundant coal resources. Soon, railroads, locks and dams were built to facilitate the transportation of coal to Pittsburgh. Circa 1880, Washington County delivered 700,000 tons of coal to market. From 1880 to 1923, coal production steadily increased to satisfy the booming industries on the Ohio and Monongahela Rivers. By 1923 a record 24.5 million tons of coal were produced In Washington County, much of it from the Raccoon Creek Region. Decreases in coal production occurred after 1923 until the 1960's when large steel companies created a certain amount of industry stability by owning seven of the nine major mines. In 1966, 14.1 million tons of coal was produced in 1966 in Washington County. But only one year later (1967), coal production in the Raccoon Creek Watershed was estimated to be less than 100,000 tons.[50]

Despite the fact that coal production has decreased since 1923, Washington County ranks number two among Pennsylvania's coal-producing counties. Besides the current active mining operations, the watershed contains millions of tons of coal refuse from abandoned and/or historic mining/waste sites. Un-reclaimed coal waste piles are the source of many water quality/environmental problems in the Raccoon Creek Region. [51]

The Raccoon Creek Watershed is known to have at least 175 to 200 AMD discharges. Of these, seven have been identified by the PA DEP as "primary AMD discharges" as detailed in Table

[49] Watershed Restoration Action Strategy (WRAS) Pennsylvania State Water Plan Subbasin 20D Raccoon Creek (Ohio River) Allegheny, Beaver and Washington Counties. 9/2003.
[50] PA DEP, *Final Raccoon Creek Watershed TMDL, Allegheny, Beaver, And Washington Counties for Acid Mine Drainage Affected Segments, Watershed History*, available at http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/RaccoonCreek_FINAL_TMDL.pdf; accessed 7/9/2014.
[51] Ibid.

4.11. Remediation of these primary discharges is crucial to improving water quality in the Region. Treatment systems have been built for some of these discharges; they are described later in this Section.

Table 4.11: Primary AMD Discharges of the 20D Raccoon Creek Region[52]

Name of Discharge	PA DEP Designation	Receiving Stream	Municipality	County	Treat-ed?
Langeloth Borehole	L2	Burgetts Fork	Smith Twp.	Washington	Yes
East Plum Run	P6	Plum Run/ Burgetts Fork	Smith Twp.	Washington	No
West Plum Run	P7		Smith Twp.		No
Erie Mine	E1	Burgetts Fork	Smith Twp.	Washington	No
Joffre Branch 1	JB1	Raccoon Creek	Smith Twp.	Washington	Partial
Joffre Branch 2	JB2	Raccoon Creek	Smith Twp.	Washington	Yes
Hamilton Farm	H3	Potato Garden Run	Findlay Twp.	Allegheny	Partial

General Characteristics of Abandoned Mine Drainage (AMD)

The formation of mine drainage is essentially a weathering process that is a function of the geology, chemistry, biology, hydrology and mining methods at the site. Although the specific process may vary, AMD forms through a series of complex geochemical and, at times, microbial reactions that occur when water and oxygen contact sulfide minerals such as pyrite (FeS_2) which is typically present within coal and/or surrounding rock. Iron sulfide minerals break down in the presence of water and oxygen, not unlike a nail rusting, which in turn releases iron and forms sulfuric acid. Without the presence of water, oxygen, and sulfide minerals, AMD will most likely not form. When the iron is further oxidized and hydrolyzed (a reaction associated with water), iron compounds form and settle in ponds, wetlands, and streams.[53]

Because of the yellow, orange, and/or red color of these iron solids, they are often called "Yellowboy." Although there are a number of steps in the process, the reactions that form Yellowboy can be represented by the following general chemical equation:

$$4\ FeS_2 + 15\ O_2 + 14\ H_2O \rightarrow 4\ Fe(OH)_3 + 8\ H_2SO_4$$

In plain English, this reaction is:

Pyrite + Oxygen + Water → "Yellowboy" + Sulfuric Acid

[52] PA DEP, *Final Raccoon Creek Watershed TMDL, Allegheny, Beaver, And Washington Counties for Acid Mine Drainage Affected Segments, Watershed History*, available at http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/RaccoonCreek_FINAL_TMDL.pdf; accessed 7/9/2014.

[53] BioMost, Inc. *McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan.* 2010.

The iron and sulfuric acid then react with other surrounding material to dissolve and release iron, aluminum, manganese and other metals that might be present, such as zinc, nickel, cadmium, calcium, magnesium, etc. As the water becomes oxygenated and/or gains alkalinity some of the metals form solids (called "precipitates") that can also accumulate in ponds, wetlands and streams. When streambeds become coated with yellowboy, the habitat of aquatic insects may be smothered and destroyed. As benthic macroinvertebrates are critical to the food chain, loss of this habitat may prevent fish from living and/or reproducing in the stream. In addition, AMD often causes the stream to be acidic with a low pH which many organisms cannot tolerate.[54]

Figure 4.16: The Francis Mine Discharge along the Panhandle Trail, Smith Township, Washington County, 4/5/2005.

To choose the best method of treating an AMD discharge, the chemistry of the water is analyzed to characterize the AMD. The following parameters are typically measured:

pH indicates whether a solution is acidic, neutral, or basic (alkaline) based on hydronium (H_3O+) ions [a.k.a., hydrogen(H+) ion] concentration; the pH scale ranges from 0-14 with 0 most acidic, 7 neutral, 14 most basic.

Alkalinity is typically defined as the acid neutralizing or buffering capacity of a given volume of water. This refers to the ability of water, such as a stream, to neutralize acid. Depending on how much alkalinity is present, when acid is added, pH decreases or remains the same.

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

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

[54] Ibid. BioMost, Inc. *McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan.* 2010.

Sulfate concentrations greater than 50 mg/L usually indicate coal mine drainage in Western Pennsylvania.

Specific Conductivity measures ability of water to carry an electrical current associated with presence of ions; readings are automatically normalized to 25^0C to eliminate variability.

Temperature affects various physical as well as chemical processes.

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

Total Suspended Solids (TSS) are the amount of solids retained from a given volume of water when passed through a certain pore-size filter, typically 0.45 µm (micrometers).

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

Total Solids include both TSS and TDS; these are usually measured by evaporating a water sample, then drying and weighing the remaining residue.

Metals iron **(Fe)**, manganese **(Mn)** and aluminum **(Al)** are most commonly monitored in mine drainage.

Passive Treatment Systems for AMD

The conventional treatment of mine drainage is labor and energy intensive and typically uses harsh chemicals. In contrast, passive systems use no electricity, require limited maintenance and use environmentally-friendly materials such as limestone aggregate and spent mushroom compost in a series of constructed ponds, beds, ditches and wetlands. Passive AMD treatment systems are a cost-effective way to add alkalinity to neutralize acidity while providing an environment suitable for beneficial chemical reactions and biological activity. For instance, dissolving limestone neutralizes acidity and raises pH, after which dissolved metals - through chemical, biological and physical processes - form particulates (solids) that are then retained in settling ponds and constructed wetlands. In some cases, where sufficient alkalinity is naturally present in AMD, only settling ponds and constructed wetlands are needed.[55]

When designing a passive system, the goal is to include components that provide long-term effective treatment, are economical to install and require minimal maintenance. There are several main types of passive treatment components that can be used, often in series and/or in parallel, to treat degraded mine drainage. These components are chosen based upon the AMD

[55] BioMost, Inc. *McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan.* 2010.

characteristics (quality and flow rate), preferred chemical or biological process and available construction space.[56]

Passive Treatment Systems in the 20D Raccoon Creek Region

Great improvements are happening in Pennsylvania's streams! About three hundred passive treatment systems have been installed throughout the state, greatly reducing the total load of pollutants[57]. In the Raccoon Creek Region, a cooperative group of local nonprofits, various government agencies, local businesses and landowners have been actively working to restore the severely degraded headwaters since 1999. Their collective efforts have resulted in the construction and ongoing maintenance of five passive treatment systems that remove about half of the total AMD loading into Raccoon Creek.[58]

Raccoon Creek's five passive systems are currently treating about 2.5 billion gallons of mine drainage per year, eliminating about 600 tons of iron, 62 tons of aluminum and over 1500 tons of acidity annually from Raccoon Creek and its tributaries. This reduction in pollution loading has significantly improved several miles of streams that until recently, no living person had ever seen any color but orange. Table 4.12 lists the AMD Treatment Systems in the Raccoon Creek Region and their effectiveness at reducing water pollution.

> ***Pennsylvania's AMD treatment systems are doing a tremendous job, treating over 77 billion gallons of water per year, removing over 8300 tons of iron, 1700 tons of aluminum, 720 tons of manganese and 9000 tons of acidity from our waterways yearly!***
>
> ***Datashed.org[59]***

Much of the work completed in the Raccoon Creek Watershed to date has been based upon background data collected by the DEP Greensburg District Mining Office and by Skelley and Loy as published in the year 2000 Raccoon Creek Watershed Survey and Restoration Plan. In 2007, BioMost, Inc. and Stream Restoration, Inc. published the *Raccoon Creek Operation and Maintenance Plan* for the four passive treatment systems in existence at that time.

[56] BioMost, Inc. *McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan.* 2010.
[57] Stream Restoration Inc., and Datashed. *Datashed Homepage*. 2014. (accessed on July 9, 2014); available at http://www.datashed.org.
[58] Raccoon Creek Watershed Association, About Us; available at http://www.independenceconservancy.org/about-raccoon-creek; accessed 7/9/2014.
[59] Datashed, Restoration Tote Board, available at http://www2.datashed.org/; accessed on 7/9/2014.

Even though great strides have been made to restore water resources affected by historical mining activities, much more funding is needed for ongoing maintenance of existing systems and construction of additional treatment systems at critical discharges.

Table 4.12: Effectiveness of AMD Treatment Systems in the Raccoon Creek Region[60]

Name of Treatment System	AMD Treated Gal./Yr.	Iron Removed Tons/Yr.	Aluminum Removed Tons/Yr.	Manganese Removed Tons/Yr.	Acidity Removed Tons/Yr.	Year Built	Owner
Hamilton Farm	210 million	165	1.5	2.4	181	2003	Private
JB1	1.952 billion	168	51	-	1027	2007	Private
JB2	137 million	62	8	-	170	2004	Independence Conservancy
Langeloth Bore Hole	55 million	112	63 lbs.	1	88	1999	Private
Solar Mine	142 million	96	2.3	3.2	40	2005	Independence Conservancy
Yearly Totals	**2.496 billion**	**603**	**62**	**6**	**1505**		

Figure 4.17: Tim Danehy of BioMost rolls up a flexible hose after testing the Erie Mine Discharge under Billy Boy's Pizza in Slovan, 3/26/2010. Photo courtesy of BioMost, Inc.

[60] Datashed, various, available at http://ww2.datashed.org/; accessed 7/9/2014.

Hamilton Farm AMD Treatment System

Figure 4.18: Upper settling basin of the Hamilton AMD Treatment System off Washington Rd. in Findlay Twp. The Burns-Hamilton Farmhouse is visible at far right. This National Register-eligible brick and cut stone home, built in 1841, was demolished in 2012. Photo 1/15/2004.

Solar Mine AMD Treatment System

Figure 4.19: The upper two of a series of settling basins & wetlands that treat the Solar Mine Discharge, located near Bald Knob along I-576 in Findlay Twp. Initial treatment of this discharge takes place in a massive limestone-filled channel under the highway. Photo 6/7/2012.

Joffre Branch 1 (JB1)

Figure 4.20: Former DEP Secretary David Hess (second from right) tours the JB1 Passive Treatment System under construction near Slak Lane in Smith Twp. L to R: Wayne Fuchs of Quality Aggregates, Margaret Dunn of Stream Restoration Inc., Hess, and Shaun Busler, also of SRI. Photo 12/12/2006.

Joffre Branch 2 (JB2)

Figure 4.21: Vicky Michaels and Al Moran of Independence Conservancy install the sign at JB2 on Joffre-Cherry Valley Road in Smith Twp. Listed are all the partners who made construction of this system possible. Photo 12/21/2007.

Langeloth Bore Hole

Figure 4.22: Split-rail fence and native wildflowers lend beauty to the Langeloth Bore Hole Passive Treatment System off Bologna Industrial Road near Slovan. Photo 6/26/2003.

Untreated AMD Discharges in the 20D Raccoon Creek Region

Abandoned underground mines in the Pittsburgh coal bed continue to be a source of pollution to over 30 miles of streams in the Raccoon Creek Watershed.[61] Of the seven "primary" Abandoned Mine Drainage discharges identified by the PA Department of Environmental Protection (see page 30), two are substantially treated with functioning passive systems in need of major maintenance; two are partially treated by systems that need renovation, expansion and upgrades; three are not treated at all.

In 2006, scientists with the nonprofit Stream Restoration, Inc., advanced an innovative treatment concept known as the "ELF," an acronym for Erie-Langeloth-Francis mines. The "ELF" proposes to move mine water via abandoned underground workings from the Francis Mine through the Langeloth Mine and then by siphon into the Erie Mine from where the water is to be conveyed through the in-mine workings and discharged to the east via horizontal bores.[62]

The "ELF" system would consolidate the discharges E1 (Erie Mine), L2 (Langeloth Mine), and P7A (Francis-Patterson Mines, aka Plum Run) in Slovan and Burgettstown by "inter-mine pool transfer" to a single discharge point for treatment by a single system located in a less populated

[61] "ELF" Inter-Mine Pool Transfer, Abatement, Treatment or Reuse Final Report, Smith Township, Washington County, PA June 2010, Burgetts Fork-Raccoon Creek-Ohio River Stream Restoration Inc.
[62] Ibid.

area to the east on the main stem of the already degraded Raccoon Creek. A single, consolidated treatment system would result in lower construction and maintenance costs compared to building separate systems for each discharge.[63]

Injection and withdrawal tests conducted in the winter of 2010 indicate that the Erie Mine discharge (E1), averaging 80-200 gallons per minute, can be successfully relocated by implementation of the "ELF" system. Withdrawing water from the Langeloth Mine Shaft with injection into the Erie Mine may substantially decrease the flow from the Francis Mine which is the major source of drainage issuing from the Patterson Mine, averaging 300-500 gpm. The physical feasibility of the "ELF" system to decrease or eliminate the flow at the Patterson Mine requires additional confirmation.[64]

Figure 4.23: A crew from BioMost, Inc. installs temporary piping to conduct a flow test from Raccoon Creek to Erie Mine, part of the feasibility study for the "ELF," the proposed treatment system for Erie, Langeloth and Francis Mines in Burgettstown, 2/4/2010. Photo courtesy of BioMost, Inc.

[63] "ELF" Inter-Mine Pool Transfer, Abatement, Treatment or Reuse Final Report, Smith Township, Washington County, PA June 2010, Burgetts Fork-Raccoon Creek-Ohio River Stream Restoration Inc.
[64] Ibid.

Water Supplies

Public Water Supplies

Please see "Section 1: Project Area Characteristics" for a detailed discussion of public water supplies and municipal water suppliers. "Plate 1.4: Public Utilities Map" shows the extent of public water service in the Raccoon Creek Region.

Private Water Wells

Most homeowners in the Raccoon Creek Region do not have municipal water and must rely on their own water sources. Many homes utilize groundwater through private water wells ranging from a few dozen to three hundred or more feet deep. Some residents use water supplies gathered from surface waters like springs, cisterns or ponds - or even water flowing from abandoned coal mines!

More than one million private water systems exist in Pennsylvania; 20,000 new wells are drilled in the state each year.[65] Pennsylvania has no statewide regulations for private water systems. Proper management is entirely voluntary.

Penn State Cooperative Extension offers a wide variety of educational resources to help people operate private water systems safely. Extension's Water Quality Website "…provides expert information and programs related to drinking water, water conservation, pond management, on-lot septic, non-point source pollution, water policy and watershed education."[66]

Extension's Master Well Owner Network is "a network of trained volunteers dedicated to promoting the proper construction and maintenance of private water systems in Pennsylvania and throughout the Mid-Atlantic Region."[67] To date, over 400 residents in 61 Pennsylvania counties have been trained as Master Well Owner Volunteers. To date, these volunteers have assisted over 25,000 homeowners with private water systems.[68]

[65] Penn State Extension, Water Quality, Drinking Water, available at http://extension.psu.edu/natural-resources/water/drinking-water; accessed 7/12/2014.
[66] Ibid.
[67] Penn State Extension, Water Quality, Master Well Owners Network, available at http://extension.psu.edu/natural-resources/water/mwon; accessed 7/12/2014.
[68] Ibid.

Section 4: Plates

Plate 4.1: State Water Plan 20D Sub-basins and Watersheds

Plate 4.2: Water Resources Map of the 20D Raccoon Creek Region

Plate 4.3: Designated Stream Use Map of the 20D Raccoon Creek Region

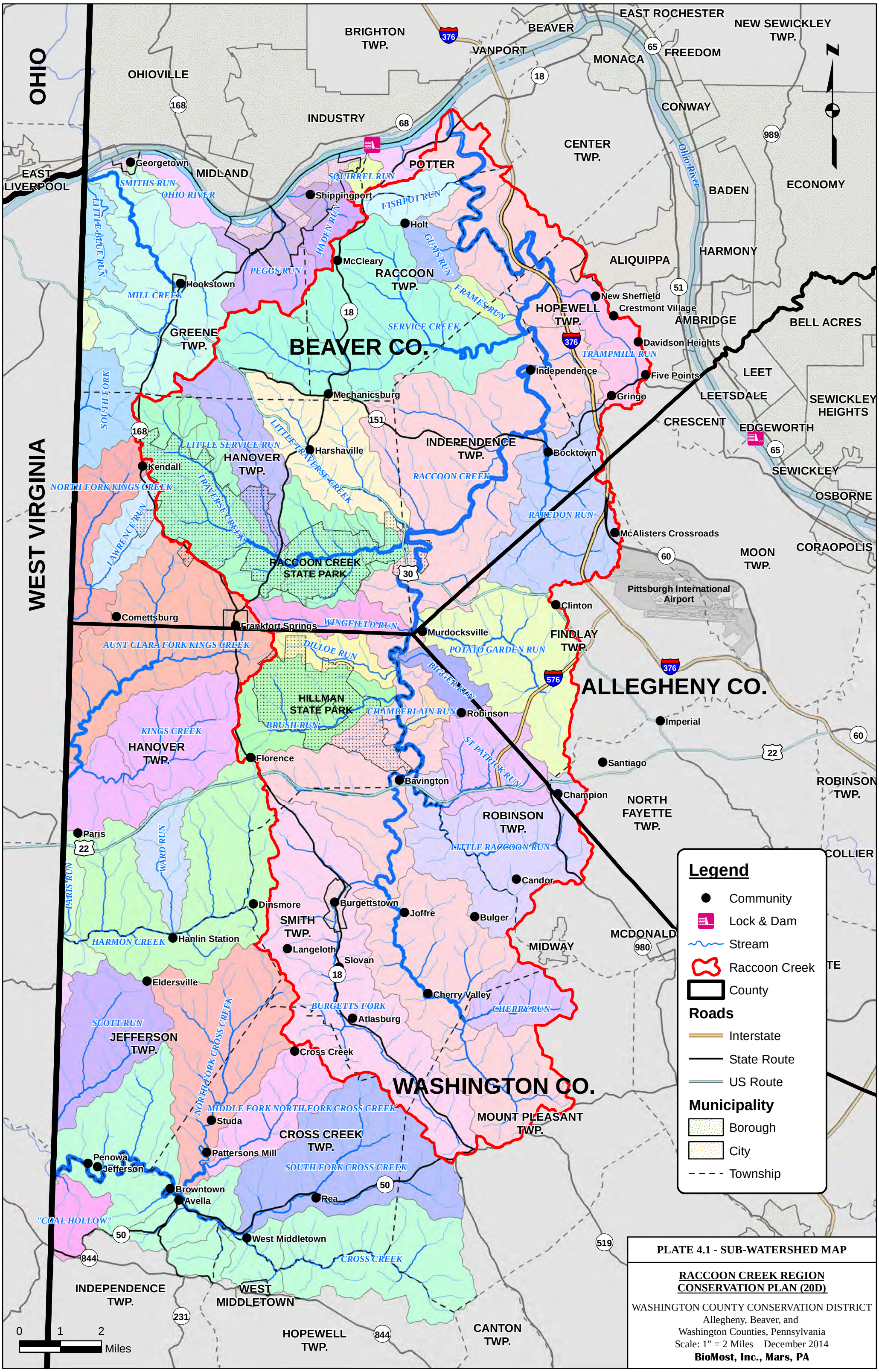

OHIO
WEST VIRGINIA
BEAVER CO.
WASHINGTON CO.
ALLEGHENY CO.
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
INDUSTRY
CONWAY
CENTER TWP.
POTTER
MIDLAND
EAST LIVERPOOL
Georgetown
Shippingport
Holt
McCleary
Hookstown
RACCOON TWP.
ALIQUIPPA
HARMONY
BADEN
ECONOMY
Ohio River
SMITHS RUN
OHIO RIVER
SQUIRREL RUN
FISHPOT RUN
HADEN RUN
GUMS RUN
LITTLE BLUE RUN
PEGGS RUN
MILL CREEK
FRAMES RUN
SERVICE CREEK
GREENE TWP.
HOPEWELL TWP.
New Sheffield
Crestmont Village
AMBRIDGE
BELL ACRES
Davidson Heights
TRAMPMILL RUN
Independence
Five Points
LEET
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
SEWICKLEY
OSBORNE
Mechanicsburg
Harshaville
INDEPENDENCE TWP.
Bocktown
RACCOON CREEK
LITTLE TRAVERSE CREEK
LITTLE SERVICE RUN
HANOVER TWP.
Kendall
NORTH FORK KINGS CREEK
TRAVERSE CREEK
LAWRENCE RUN
RAREDON RUN
McAlisters Crossroads
MOON TWP.
CORAOPOLIS
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
WINGFIELD RUN
Murdocksville
FINDLAY TWP.
AUNT CLARA FORK KINGS CREEK
DILLOE RUN
POTATO GARDEN RUN
BIGGER RUN
HILLMAN STATE PARK
CHAMBERLAIN RUN
Robinson
Imperial
BRUSH RUN
KINGS CREEK
HANOVER TWP.
Florence
Bavington
ST PATRICK RUN
Santiago
ROBINSON TWP.
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
LITTLE RACCOON RUN
COLLIER
Paris
PARIS RUN
WARD RUN
Dinsmore
Burgettstown
Joffre
Bulger
Candor
SMITH TWP.
HARMON CREEK
Hanlin Station
Langeloth
Slovan
MCDONALD
MIDWAY
Eldersville
Cherry Valley
BURGETTS FORK
CHERRY RUN
SCOTT RUN
JEFFERSON TWP.
NORTH FORK CROSS CREEK
Atlasburg
Cross Creek
MIDDLE FORK NORTH FORK CROSS CREEK
Studa
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Pattersons Mill
Penowa
Jefferson
SOUTH FORK CROSS CREEK
Browntown
Avella
Rea
"COAL HOLLOW"
West Middletown
CROSS CREEK
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
0 1 2 Miles
Legend
Community
Lock & Dam
Stream
Raccoon Creek
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
PLATE 4.1 - SUB-WATERSHED MAP
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

PLATE 4.2 - WATER RESOURCES MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014
BioMost, Inc., Mars, PA

Legend

- Community
- USGS Monitoring Station
- USGS Gaging Station
- Passive Treatment System
- Pond
- Lock & Dam
- Dam
- Stream
- Raccoon Creek
- State Park
- Subwatershed
- Floodplain

Wetland

- Emergent Wetland
- Forested/Shrub Wetland

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

Impaired (Non-Attaining) Streams

- Abandoned Mine Drainage - Metals & Siltation
- Agriculture - Siltation ; Road Runoff - Siltation
- Erosion from Derelict Land - Siltation
- Grazing Related Agric - Siltation ; Removal of Vegetation - Siltation
- Habitat Modification - Siltation
- Highway, Road, Bridge Construction - Siltation ; Road Runoff - Siltation
- Other - Siltation
- Other - pH
- Removal of Vegetation - Siltation ; Road Runoff - Siltation
- Small Residential Runoff - Organic Enrichment/Low D.O. ; Road Runoff - Siltation
- Source Unknown - Dioxins, Mercury, PCB, Pathogens
- Urban Runoff/Storm Sewers - Siltation

0 1 2 Miles

BEAVER CO.

ALLEGHENY CO.

WASHINGTON CO.

OHIO

WEST VIRGINIA

BRIGHTON TWP.

VANPORT TWP.

MONACA BORO

FREEDOM BORO

NEW SEWICKLEY TWP.

OHIOVILLE BORO

INDUSTRY BORO

CONWAY BORO

CENTER TWP.

Ohio River

BADEN BORO

ECONOMY BORO

EAST LIVERPOOL

MIDLAND BORO

POTTER TWP.

ALIQUIPPA

HARMONY TWP.

AMBRIDGE BORO

BELL ACRES BORO

RACCOON TWP.

HOPEWELL TWP.

SOUTH HEIGHTS BORO

LEET TWP.

LEETSDALE BORO

GREENE TWP.

INDEPENDENCE TWP.

CRESCENT TWP.

EDGEWORTH BORO

SEWICKLEY BORO

HANOVER TWP.

MOON TWP.

FINDLAY TWP.

NORTH FAYETTE TWP.

ROBINSON TWP.

OAKDALE BORO

SMITH TWP.

MIDWAY BORO

MCDONALD BORO

JEFFERSON TWP.

CROSS CREEK TWP.

MOUNT PLEASANT TWP.

CHARTIERS TWP.

WEST MIDDLETOWN BORO

HOPEWELL TWP.

CANTON TWP.

Georgetown

Shippingport

Holt

McCleary

Hookstown

New Sheffield

Crestmont Village

Davidson Heights

Independence

Five Points

Gringo

Mechanicsburg

Harshaville

Kendall

Bocktown

McAlisters Crossroads

Clinton

Comettsburg

Frankfort Springs

Murdocksville

Hamilton

Robinson

Imperial

Solar

Florence

Bavington

Santiago

Champion

Paris

Dinsmore

Burgettstown

Joffre

Bulger

Hanlin Station

Eldersville

Langeloth

Slovan

Cherry Valley

Atlasburg

Candor

Studa

Pattersons Mill

Penowa

Jefferson

Browntown

Avella

Rea

Woodrow

West Middletown

LITTLE BLUE RUN

3109525

3109524

SMITHS RUN

OHIO RIVER

Mill Creek

LITTLE BLUE RUN

PEGES RUN

MILL CREEK

SQUIRREL RUN

SOUTH LOW DISSOLVED SOLIDS IMP.

NORTH LOW DISSOLVED SOLIDS IMP.

WEST HIGH DISSOLVED SOLIDS IMP.

FISHPOT RUN

3108000

HADEN RUN

GUMS RUN

FRAMES RUN

SERVICE CREEK

Service Creek

Ambridge Reservoir

16 BACON DAM

TRAMPMILL RUN

3107800

SOUTH FORK

LITTLE SERVICE RUN

LITTLE TRAVERSE CREEK

RACCOON CREEK

Raredon Run

NORTH FORK KINGS CREEK

TRAVERSE CREEK

RAREDON RUN

3107712

Upper Lake

GROUP CAMP

LAWRENCE RUN

Raccoon Lake

RACCOON CREEK

3107700

3110825

WINGFIELD RUN

Raccoon Creek

AUNT CLARA FORK KINGS CREEK

DILLOE RUN

POTATO GARDEN RUN

BIGGER RUN

CHAMBERLAIN RUN

BALD KNOB

BRUSH RUN

KINGS CREEK

Kings Creek

ST PATRICK RUN

3110812

MARSHALL RESERVATION NO. 2

EMERALD LAKE (OLD DAM)

3107650

DUCK POND DAM

WARD RUN

PA-482

PA-483

PA-481

HARMON CREEK

PARIS RUN

DINSMORE NO.2

3110900

3107600

PA-486

PA-485

HARMON CREEK PA-484

3110910

3110920

HARMON CREEK PA-479

PA-480

JB2

JB1 Phase I

Langeloth Borehole

BURGETTS FORK

ASHTON SOUTH DAM

CHERRY RUN

CHERRY VALLEY

Cherry Valley Reservoir

3107690

SCOTT RUN

NORTH FORK CROSS CREEK

MIDDLE FORK NORTH FORK CROSS CREEK

SOUTH FORK CROSS CREEK

PA-662

"COAL HOLLOW"

Cross Creek

PA-661

Cross Creek Lake

3111003

3111001

CROSS CREEK

3111005

LITTLE RACCOON RUN

Legend

- Community
- USGS Monitoring Station
- USGS Gaging Station
- Passive Treatment System
- Pond
- Lock & Dam
- Dam
- Stream
- Raccoon Creek
- State Park
- Subwatershed
- Floodplain

Wetland

- Emergent Wetland
- Forested/Shrub Wetland

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

Impaired (Non-Attaining) Streams

- Abandoned Mine Drainage - Metals & Siltation
- Agriculture - Siltation ; Road Runoff - Siltation
- Erosion from Derelict Land - Siltation
- Grazing Related Agric - Siltation ; Removal of Vegetation - Siltation
- Habitat Modification - Siltation
- Highway, Road, Bridge Construction - Siltation ; Road Runoff - Siltation
- Other - Siltation
- Other - pH
- Removal of Vegetation - Siltation ; Road Runoff - Siltation
- Small Residential Runoff - Organic Enrichment/Low D.O. ; Road Runoff - Siltation
- Source Unknown - Dioxins, Mercury, PCB, Pathogens
- Urban Runoff/Storm Sewers - Siltation

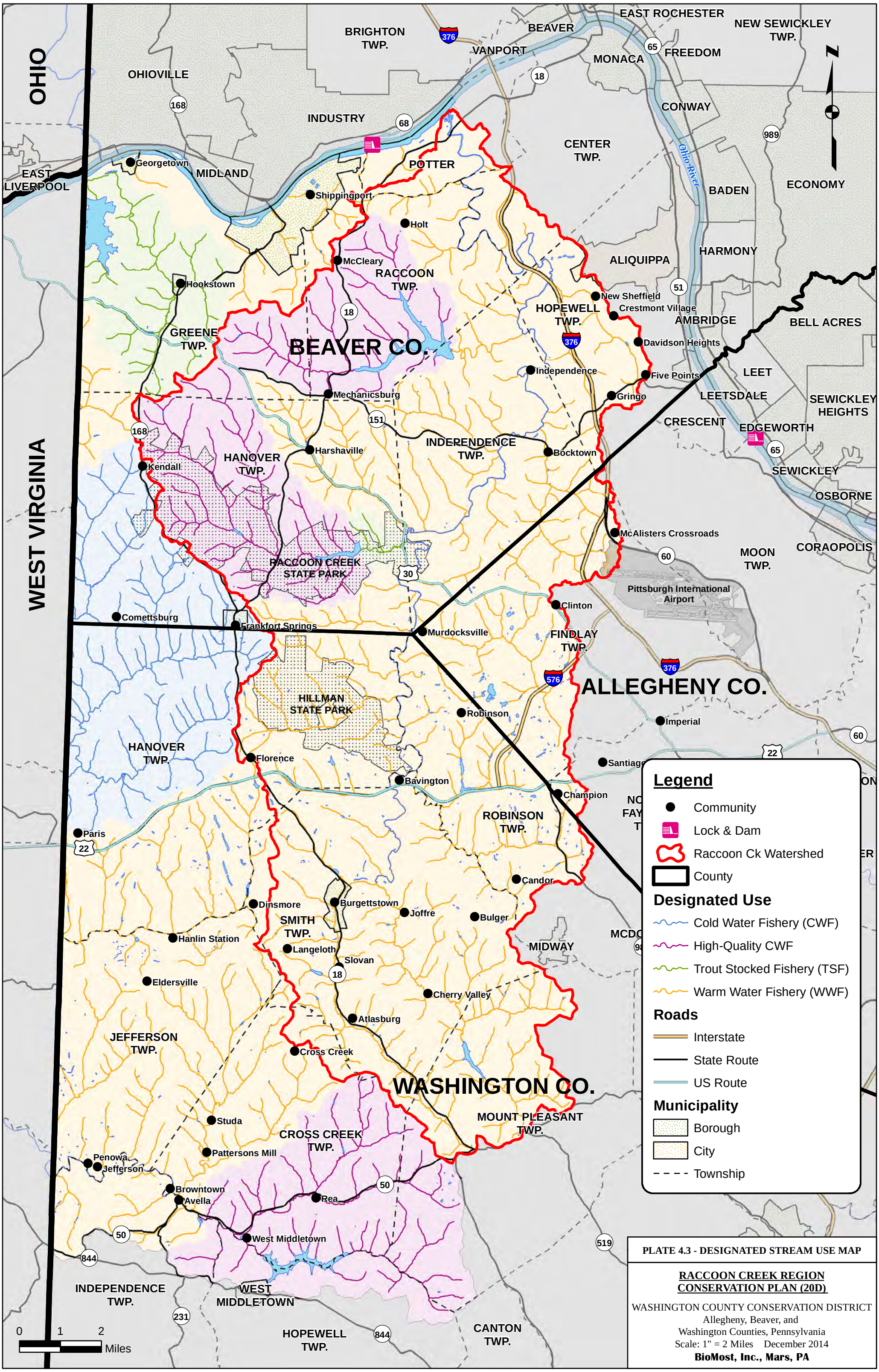
0 1 2 Miles

PLATE 4.2 - WATER RESOURCES MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014

BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BRIGHTON TWP.
BEAVER
EAST ROCHESTER
NEW SEWICKLEY TWP.
VANPORT
MONACA
FREEDOM
OHIOVILLE
CONWAY
INDUSTRY
CENTER TWP.
Ohio River
EAST LIVERPOOL
Georgetown
MIDLAND
POTTER
BADEN
ECONOMY
Shippingport
Holt
McCleary
RACCOON TWP.
ALIQUIPPA
HARMONY
Hookstown
New Sheffield
Crestmont Village
HOPEWELL TWP.
AMBRIDGE
BELL ACRES
GREENE TWP.
BEAVER CO.
Davidson Heights
Independence
Five Points
LEET
Mechanicsburg
Gringo
LEETSDALE
SEWICKLEY HEIGHTS
CRESCENT
EDGEWORTH
Harshaville
INDEPENDENCE TWP.
Bocktown
HANOVER TWP.
Kendall
SEWICKLEY
OSBORNE
McAlisters Crossroads
CORAOPOLIS
MOON TWP.
RACCOON CREEK STATE PARK
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
ALLEGHENY CO.
HILLMAN STATE PARK
Robinson
Imperial
HANOVER TWP.
Florence
Bavington
Champion
ROBINSON TWP.
Paris
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
Langeloth
MIDWAY
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
Studa
MOUNT PLEASANT TWP.
CROSS CREEK TWP.
Penowa
Jefferson
Pattersons Mill
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
0 1 2
Miles
Legend
Community
Lock & Dam
Raccoon Ck Watershed
County
Designated Use
Cold Water Fishery (CWF)
High-Quality CWF
Trout Stocked Fishery (TSF)
Warm Water Fishery (WWF)
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
PLATE 4.3 - DESIGNATED STREAM USE MAP
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

Section 5: Biological Resources

Introduction

Decades before there was a United States, a young George Washington, sent to survey Pennsylvania's western frontier, recognized the rich abundance of the land south of the Ohio River and claimed it all for himself. Although it is doubtful he ever praised the "biological resources" of the Raccoon Creek Region as such, he certainly saw economic potential in its tall timber, fur-bearing animals and fertile soil.

Indeed, the Raccoon Creek Region supports a wealth of biological resources. In dry, scientific terms, these are all the plants and animals, the natural communities and the physical environment of the Region. In more human terms, the biological resources are what we, like George Washington and the First Americans before him, value most highly: cool, shady forests; rich farmland soils; clean, healthy waters; abundant wild creatures of the land, water and air.

A measure of the ecological health of the Watershed is the variety of all its life forms, or "biodiversity." Biodiversity relates to the number of species present, the genetic variation within these individual species and the natural systems within which the organisms live. Human beings are an inseparable part of these ecosystems.

Biodiversity is critically important to the quality of life enjoyed by people in the Raccoon Creek Region. Besides the abundance of game animals like white-tail deer, turkey and sport fish, a healthy watershed provides many services that are often taken for granted. Flood control, water purification, temperature regulation, pollination, oxygen production, photosynthesis, waste decomposition and pest control are difficult to quantify. These services are typically provided quietly, efficiently and without cost.

Somewhat easier to measure is the worth of biodiversity in products that are harvested, sold and used for food, fuel, fiber or medicine. Biodiversity also equates with beauty. Appreciation for that beauty is the economic stimulus for outdoor recreational opportunities such as hiking, biking, hunting and fishing, paddling and eco-tourism.

We stand a significant risk of losing biodiversity and its valuable services, products and opportunities when we carelessly ignore or manipulate the components of our natural world. We also jeopardize the chance to gain future benefits if previously damaged ecosystems are not restored or reclaimed when we have the opportunity.

Historical Changes

Today, we can only imagine what the Raccoon Creek Region might have looked like before the advent of European settlers and the changes they brought about on the landscape. In contrast, prehistoric peoples and the Native Americans survived by living sustainably, in harmony with the land. Indeed, our long-ago predecessors knew no other way of life and lacked the tools or technology to upset nature's balance as did our European-descended ancestors.

Climate-Induced Changes

Earth's climate goes through natural cycles of extremes in cold, warmth, drought and precipitation. But in addition to these normal, long-term changes, recent human population growth has altered climate on a global scale.

Figure 5.1: A hazy sun rises over Little Blue Reservoir. 8/29/2007.

During the past 1,000 years, the number of people on earth has grown from about 250 million to over six billion.[1] The consumption of natural resources required to sustain this population has brought about worldwide climate change. Industrialization, deforestation and pollution have greatly increased atmospheric concentrations of water vapor, carbon dioxide, methane and nitrous oxide - greenhouse gases that trap heat near the earth's surface. Humans are pouring carbon dioxide into the atmosphere much faster than plants and oceans can absorb it.[2] As world population continues to climb, severe weather and its consequences will have an increasing impact on society and the environment.

In the Raccoon Creek Region, floods resulting from heavy rains and melting snow cause erosion which can damage property, relocate stream channels, aggravate pollution and damage roadways. Residents of the Region identified flooding as one of their biggest concerns (see Section 2: Issues, Concerns & Constraints). Periods of drought and excessive heat are costly as well, resulting in lost crops, forced sale of livestock, higher utility bills and power outages.

[1] NOAA Satellite and Information Service, available at http://www.ncdc.noaa.gov/paleo.ctl/1000.html, accessed 6/4/2014
[2] National Geographic News, Global Warming Fast Facts, available at http://news.nationalgeographic.com/news/2004/12/1206_041206_global_warming_2.html, accessed 6/4/2014

Human-Induced Changes

More obvious and less debatable than global warming are the changes people bring to the land itself. The human pursuit of food, fuel and shelter has drastically altered much of the landscape of the 'civilized' world. Nowhere in the Raccoon Creek Region is this more evident than in the fields of the Pittsburgh Coal Seam. Here the legacy effects of unregulated strip mining and shallow drift mining are legion - hundreds of piles of coal waste, miles of lifeless or impaired streams and farmlands forever lost. An extensive discussion of the Raccoon Creek Region's historic resource extraction industries, their place in US industrial history and environmental impact is found in Section 3: Land Resources.

In citizen surveys conducted to prepare the Raccoon Creek Watershed Conservation Plan, many people expressed concern that new resource extraction industries should be developed carefully, learning from mistakes made in the past. Without a doubt, the energy industry will have a tremendous, far-reaching effect on the natural features of the Raccoon Creek Region and on every aspect of life for its residents.

Forest fragmentation: pipelines, power corridors and roadways

Underground pipe lines and above ground power corridors are built to move fuels and electricity from the places they are produced to places they are consumed. Although pipelines are buried, their construction, monitoring and maintenance require open corridors, kept free of woody vegetation. Electric power transmission lines, although suspended on towers well above ground, also need right-of-way maintenance that causes fragmentation of forest land cover. Roadways and transportation corridors have become a defining feature of our landscape as our modern way of life centers around automobiles.

Figure 5.2: High-tension towers march across the rolling terrain of Hopewell and Center Townships. Note the deer grazing at lower left. 4/13/2014.

Although the widths of pipelines, power lines and roadways vary, they have the common effect of fragmenting large tracts of forest into smaller ones. While pipelines and power lines can be planted with wild game food grasses, the loss of continuous woodland tracts causes serious disruption to birds, animals and plants that depend on the shade and shelter of larger forest areas. Undivided blocks of tree-covered land are especially valuable and should be maintained or

restored wherever possible. Deep forests provide many benefits:

- Habitat for wide-ranging, rare and endangered species
- Resistance to invasive plants, animals and microbes
- Less timber damage from wind and ice storms
- Water filtration and carbon storage[3]
- Recreation and tourism opportunities

As forest fragmentation occurs, some species benefit from it while others are harmed. Winners tend to be habitat generalists that tolerate disturbance and can coexist with people. These include the raccoon, opossum, white-footed mouse, blue jay and American crow. Wildlife losers include species such as forest hawks that tend to be intolerant of disturbance; salamanders that have poor dispersal abilities and forest-interior songbirds. Other losers are species that are already rare or have very limited ranges, such as the timber rattlesnake, Allegheny wood rat and the northern flying squirrel. This shift in species composition is troublesome because species of conservation concern tend to be lost, replaced with species that tend to be wide-ranging and common both in Pennsylvania and elsewhere. [4]

Penn State University's online Marcellus Field Guide addresses the question of forest fragmentation and potential benefits of new habitats for wild game species:

> *"A question that often comes up is whether the edges and new habitats created through fragmentation can be beneficial for some of our game species such as white-tailed deer and wild turkey. The answer will depend on the type of edge habitat and how it is managed. Whether an edge habitat is good or bad for a species depends on characteristics of both the species in question and the type of edge. If the edge or the new habitat provides a resource that is used by the species and is either not available or is in low supply within the forest, it can be beneficial. For example, depending on how it is configured and seeded, a pipeline or a restored pad could provide foraging habitat for turkey and deer. On the other hand, a pad covered in stone would not provide any resources for most wildlife species so would not be beneficial. Large and expanded roads also would not provide a beneficial edge. In some situations, animals may be attracted to an area because of the type of habitat provided, but either their survival or the survival of their nests or young is poor in these areas because of the predators that are also attracted there. This is termed an ecological trap. One of the goals of management is to manage pipelines and restored pads so they provide habitat*

[3] Johnson, Nels, et al, Natural Gas Pipelines, Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment, December 16, 2011, The Nature Conservancy, Pennsylvania Chapter , available at http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/pennsylvania/ng-pipelines.pdf, accessed 6/4/2014

[4] Brittingham, Margaret, Penn State Marcellus Shale Electronic Field Guide, available at http://www.marcellusfieldguide.org/index.php/guide/ecological_concepts/habitat_fragmentation/, accessed 6/4/2014

without becoming ecological traps. This means that there are opportunities for positive benefits for some species depending on when and how the areas are reclaimed and managed and the level of human disturbance in the area."[5]

Light pollution

An often-overlooked factor in the alteration of our natural world is light pollution. The International Astronomical Union defines light pollution as "artificial light that shines where it is neither wanted, nor needed."[6] When artificial outdoor lighting becomes inefficient, annoying and unnecessary, it is known as light pollution.

Increased development leads to more artificial illumination at night. In rural areas where the only night lights used to be the moon and stars, suburban sprawl has brought glaring exterior lighting to roads, private yards and commercial centers. The collective impact of stray outdoor lighting can blot out even the brightest stars.

The National Institute of Environmental Health Science relates this story:

> *"…when a 1994 earthquake knocked out the power in Los Angeles, many anxious residents called local emergency centers to report seeing a strange "giant, silvery cloud" in the dark sky. What they were really seeing—for the first time—was the Milky Way, long obliterated by the urban sky glow."*[7]

Figure 5.3: Night-lights imagery by NASA's Earth Observatory, 2012, showing dark skies between Routes 30 and 22; also south of Avella. Note light pollution tracing the Ohio River and Route 18 south of Route 22.

Many researchers consider light pollution to be one of the fastest growing and most pervasive forms of environmental pollution. A growing body of scientific research suggests that light pollution can have lasting adverse effects on both human and wildlife health. Turning off the lights not only saves energy, it can help save wildlife as well. The luminous orange glow that haloes cities and suburbs threatens wildlife by

[5] Ibid.
[6] International Astronomical Union, Controlling Light Pollution, available at http://www.iau.org/public/themes/light_pollution/, accessed 6/5/2014
[7] Chepesiuk, Ron, National Institute of Environmental Health Science, Environmental Health Perspectives, Missing the Dark: Health Effects of Light Pollution, available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/, accessed 6/5/2014

disrupting biological rhythms and interfering with the foraging and breeding behavior of nocturnal animals.[8]

Fireflies are particularly sensitive to nighttime light conditions. Fireflies typically will not make an appearance where there is bright ambient light, such as full moon evenings. If artificial light interrupts fireflies' ability to signal each other, it could disrupt mating, meaning fewer fireflies will be born each year.[9]

Residents of the more rural areas of the Raccoon Creek Region are fortunate to enjoy darker skies than those living closer to urbanized areas. Southwestern Beaver County and northwestern Washington County are often graced with clear views of the Milky Way, shooting stars and constellations – nature's free nighttime light show.

Native Wildlife

Wildlife is the most dynamic and engaging part of our natural world. Human interactions with wildlife can be exciting, absorbing, enriching and rewarding – sometimes dangerous, costly or aggravating – but never boring. Even for those who do not consider themselves "outdoorsy," spotting a grazing fawn, hearing a coyote howl at night or passing under the shadow of a soaring hawk reminds us that we share with these creatures a much larger world than the routine confines of our homes and workplaces.

The Raccoon Creek Region is blessed with a natural abundance of native wildlife in the form of mammals, birds, fish, amphibians and reptiles. Every species has a critical role in the web of life that sustains and enriches us. Every species has its own needs for food, shelter and specialized habitat. It is our duty to understand these needs so that we can preserve and enhance the natural areas our wild companions need in order to survive and flourish.

Figure 5.4: A tom turkey dances with a hen on a sunny spring day, 4/1/2014.

A diversity of wildlife and fisheries lends great recreation potential to the Region. Hunting, fishing, wildlife watching, birding, hiking, paddling and camping are perennial favorite

[8] Guynup, Sharon, (4/17/2013) National Geographic News, Light Pollution Taking Toll on Wildlife, Eco-Groups Say, available at http://news.nationalgeographic.com/news/2003/04/0417_030417_tvlightpollution.html, accessed 6/5/2014

[9] Firefly.org, About Light Pollution, available at http://www.firefly.org/light-pollution.html, accessed 6/5/2014

activities of Pennsylvanians and tourists who spend over $21 billion per year in outdoor recreation pursuits statewide.[10] Outdoor tourism and recreation has long been one of the PA's top economic generators. Protecting our natural wildlife and the food, water, cover and space they require is a wise investment for all.

Wildlife is a renewable resource of great interest to the residents of the Raccoon Creek Region. This section of the 20D Raccoon Creek Region Conservation Plan highlights a sampling of some of the wildlife resources that are native to the area. Threatened, endangered and invasive species are described later in this section.

Terrestrial Wildlife

Terrestrial wildlife describes animals that live primarily on the land within the Region: birds, mammals, amphibians and reptiles. Before the advent of European immigrants, the Raccoon Creek Region teemed with wildlife we seldom see now. White settlers considered many species to be nuisances, driving them away or hunting them to the point of extirpation (removal or destruction) or total extinction. Bears, wolves, mountain lions, weasels, crows, hawks, owls, venomous snakes were feared and misunderstood to be dangerous, destructive or vicious predators of people. Otter, beaver and other furbearers were ravaged by market hunting and trapping. Even white-tail deer populations were depleted to the point of scarcity. Passenger pigeons, once so bountiful that clouds of them darkened the skies, were driven to extinction in 1912.

Figure 5.5: A hillside in what is now Raccoon Creek State Park is denuded to cut timber props to hold up the roofs of coal mines, ca. 1930s. Photo courtesy of Park archives.

Throughout the 1800s, habitat was irreversibly altered or lost completely by clear cutting for agriculture, fuel, building construction and timber props for coal mines. Streams became so polluted with silt, manure, sewage, offal and mine drainage that fish and aquatic organisms could not survive in many headwaters.

By the latter part of the 19th Century, attitudes began to change, leading to the founding of the PA Fish Commission (now the PA Fish & Boat Commission) in 1866 and the Pennsylvania Game Commission in 1895. Decades of work by these and other state agencies, sportsmen and enlightened citizen partners led to large-scale improvements in habitat, pollution control and species re-introduction. Today, the biologists, resource managers and law enforcement

[10] Pennsylvania's Return on Investment in the Keystone Recreation, Park and Conservation Fund: The Trust for Public Land, 2010, available at http://cloud.tpl.org/pubs/benefits-pa-keystone-roi-report.pdf accessed 6/10/2014

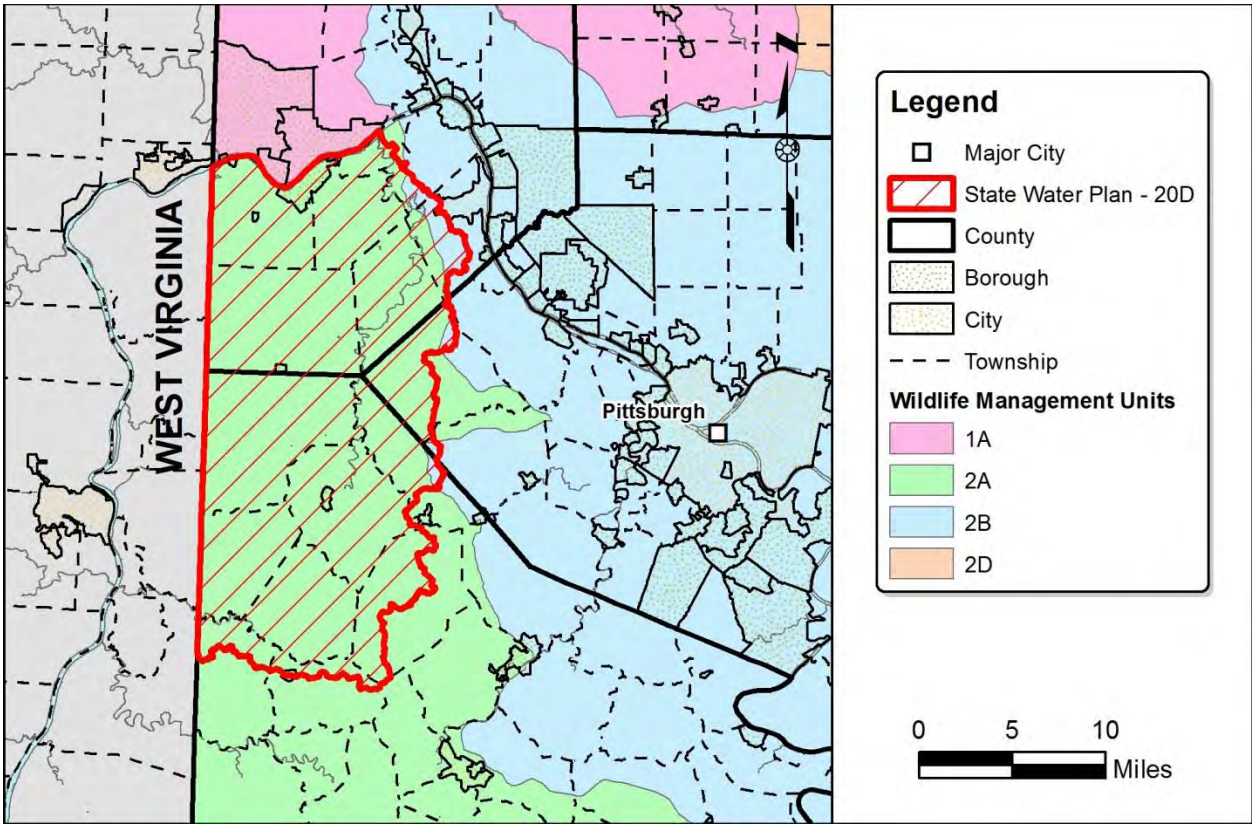
professionals of these agencies perform a wide variety of duties ranging from protection of threatened and endangered species, harvest management, habitat enhancement, pollution prevention, research, education, public relations and more.

Mammals

Native mammals include some of the Region's most well-known wildlife: white-tailed deer, raccoons, opossums, skunks, squirrels, woodchucks, muskrats and hares are common sights, even in suburbia. Many carnivorous (meat-eating) species, especially large and/or solitary predators like bobcats and fishers, need larger tracts of territory to reproduce and thrive than do herbivores (plant eaters). Survival of these species is threatened by shrinking and increasingly fragmented habitat.

To aid in the management of wildlife, the PA Game Commission has divided the state into Wildlife Management Units (WMU). These WMUs are based on land use, habitat, public land ownership, human density and physical features. Figure 5.4 defines the WMUs within the Raccoon Creek Region. Nearly the entire Region lies within WMU 2A; two small sections of WMU 2B are located along the eastern boundary of the watershed.

Figure 5.6: PA Game Commission Wildlife Management Units (WMUs) in the 20D Sub-basin



Bats are the only mammals that fly. Often feared and misunderstood, bats help to control insect populations by consuming up to one-quarter of their body weight in a single feeding. All of Pennsylvania's bats are nocturnal – active mostly from early evening to early morning. Next to humans, the greatest threat to bats is White Nose Syndrome, a disease covered in greater detail in the "Invasive Microbes" discussion.

Birds

This section about birds of the Raccoon Creek Region was contributed by Michael Fialkovich, Bird Reports Editor, Three Rivers Birding Club, and Vice President, Pennsylvania Society for Ornithology.

The Raccoon Creek Watershed provides habitat for a wide variety of birds at all seasons. The various habitats ranging from marsh to forest attracts and supports birds that breed, migrate and winter in the region. Some of the most colorful neotropical migrants in North America use the area for nesting, while others use the habitats as stopover sites to rest and refuel before continuing their migration.

Figure 5.7: A Belted Kingfisher, Megaceryle alcyon, watches intently for its next meal at Raccoon Creek State Park's upper lake, 7-1-2013.

Streamside areas are the home of Yellow-throated Warblers, Yellow Warblers, Song Sparrows and Warbling Vireos. Yellow-throated Warblers prefer sycamores which grow along the watercourses for foraging and nesting while Yellow Warblers, Common Yellowthroats and Song Sparrows nest in brushy vegetation. Cerulean Warblers (a species in decline) continue to nest in the area.

Wetlands with emergent vegetation such as cattails are the home of Red-winged Blackbirds, Swamp Sparrows and Tree Swallows. Many wetlands are manmade as part of the reclamation process for area surface mines, so they pull double duty as water purification systems and avian habitat. Rusty Blackbirds use the wetlands during their migration from the southern states where they winter to the bogs of northern Canada where they nest. This is a species currently under intensive study due to its alarming decline over the last decade. Stopover habitats during migration are monitored by the Pennsylvania Game Commission in an effort to determine this species' movements through the state as one important part of the puzzle to determine what can be done to reverse the downward trend in the population.

The wetlands also attract a surprising variety of migrant waterbirds. Virginia Rail, Sora, Common Gallinule and American Bittern were discovered using the marshes as stopover sites during migration. Shallow ponds with muddy margins in the grasslands in Findlay Township

have been the only consistent location in the area to attract an impressive variety of migrating shorebirds, some representing rare species for the state such as phalaropes, Buff-breasted Sandpiper, Snowy Plover, American Avocet, Long-billed Dowitcher, Willet and Whimbrel. Spotted Sandpipers and Killdeer use the pond margins for nesting. In all, 31 species of shorebirds have been recorded. A large Great Blue Heron nesting rookery has been active along Raccoon Creek for many years. Wood Ducks and Hooded Mergansers use standing dead trees with cavities for nesting.

Figure 5.8: Canada geese take flight on the Findlay Grasslands, a reclaimed strip mine turned important bird habitat, 4-5-2005.

Extensive reclaimed surface mines attract grassland dependent species. Short-eared Owl, Northern Harrier, Vesper Sparrow, Savannah Sparrow, Henslow's Sparrow, Grasshopper Sparrow, Eastern Meadowlark and Bobolink have all bred in the grasslands. Rough-legged Hawks that breed in the arctic spend the winter in the area. Shrub borders adjacent to the grasslands and roadsides attract nesting Brown Thrashers, White-eyed Vireos, Yellow-breasted Chats, Blue-winged Warblers and Prairie Warblers during the summer and American Tree Sparrows in the winter. Game species including Wild Turkey, Ruffed Grouse and American Woodcock are widespread. Woodcocks and turkeys use the grasslands for feeding and courtship displays, and shrub areas for nesting, so they rely on a variety of habitat types to survive.

Great Horned Owls, Eastern Screech-Owls, Black and Yellow-billed Cuckoos, Wood Thrushes and Hooded Warblers use wooded sites. A pair of Long-eared Owls nested just outside the area during the late 1980s, one of only six confirmed nesting pairs discovered during the first Pennsylvania Breeding Bird Atlas Project, 1983-1989. Others have been occasionally detected during migration within the watershed. Due to extremely elusive behavior, their current status is unknown and they are listed as Threatened by the Pennsylvania Game Commission.

Birds and all wildlife are impacted by development, pollution and disturbance. This has been the case where development is in progress. The new interstate (I-576) that was completed a few years ago impacted the grassland birds and continued development of light industry is reducing habitat. Short-eared Owls no longer nest in the area (although they continue to winter here) and the population of Vesper and Henslow's Sparrows is in decline. It's a dilemma because the original disturbance of surface mining resulted in grassland habitat through the reclamation process that eventually attracted birds not found in the surrounding area. Water pollution from mines is treated using wetlands that now attract wetland dependent birds;

however the water still contains iron oxide, evidenced by the orange coloration. Preserved areas like Raccoon Creek State Park and provides safe haven for a variety of birds however it does not cover all habitat types. The State Game Lands / Hillman State Park in Bavington contain a good variety of habitats. Hopefully some of the specialized habitats such as grasslands and wetlands can be preserved for the future.

References:

Pennsylvania Birds, The Journal of the Pennsylvania Society for Ornithology
http://www.pabirds.org/PABIRDS/BackIssues/PBV19N1.pdf

Pennsylvania Game Commission Website
http://www.portal.state.pa.us/portal/server.pt?open=514&objID=621014&mode=2

Amphibians and Reptiles

Pennsylvania possesses a diversity of native amphibians and reptiles, collectively known as herptiles, or casually as "herps." Herp species are found in PA almost equally: thirty-six species of amphibians and thirty-seven species of reptiles. Herptiles are further divided into five main groups: salamanders, frogs, lizards, turtles and snakes.[11]

Figure 5.9: Gray tree frog, *Hyla versicolor*, a small creature with a mighty voice, joins the night-time heralds of spring, 5/26/2005.

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

Herptiles are under the jurisdiction of the PA Fish and Boat Commission (PFBC). More information about individual species can be found at the PFBC webpage on Amphibians and Reptiles.

[11] Shaffer, Larry. Pa Amphibian & Reptiles, 7th edition (Pennsylvania Fish & Boat Commission, 1991), page no. 12.

Compared to birds, mammals and other groups of organisms, much less is known about Pennsylvania's reptile and amphibian species. In 2013, the Pennsylvania Amphibian and Reptile Survey (PARS) was launched to determine the distribution and status of all herptiles throughout Pennsylvania, building upon previous study efforts and combining modern technology with an army of citizen scientists known as "herpers." The project is a joint venture between the PA Fish & Boat Commission (PFBC) and the Mid-Atlantic Center for Herpetology and Conservation (MACHAC), funded by the PFBC (via the US Fish & Wildlife Service's State Wildlife Grants Program), the PA Department of Conservation and Natural Resources (Wildlife Resources Conservation Program), and MACHAC.[12] The PARS study is already showing encouraging results: several species of herps not seen for over 50 years thought to be extirpated (locally extinct) from Pennsylvania have been rediscovered!

Figure 5.10: Youngsters meet an Eastern Box Turtle (*Terrapine carolina carolina*) at Raccoon Creek State Park, 7/18/2007.

Aquatic Wildlife

Aquatic wildlife, for the purposes of the 20D Raccoon Creek Watershed Conservation Plan, are those animals and plants that live in streams, ponds and lakes within the Region.

Throughout Pennsylvania, a "designated use" classification system has been developed to protect aquatic life under the federal Clean Water Act. Aquatic life is propagated and maintained based on the designated use of a stream. Within the Raccoon Creek Region the designated uses for streams are Cold Water Fishes (CWF) and Warm Water Fishes (WWF) for aquatic life and High Quality Waters (HQ) and Exceptional Value Waters (EV) for special protection. Please refer to Section 4, Water Resources, Table 4.2 for additional information on designated uses of streams in the Raccoon Creek Region.

The Pennsylvania Natural Heritage Program's Aquatic Community Classification (ACC) project "describes patterns in aquatic biodiversity to help conservation activities and aquatic resource management in the region." Simply put, the ACC was designed to gather information about

[12] PA Amphibian & Reptile Survey, 2014 First Anniversary Newsletter, available at http://paherpsurvey.org/doc/PARS-July-2014-Newsletter.pdf; accessed 8/9/2014.

existing conditions in PA's streams, identify high-quality waterways for preservation and select lower quality waters for restoration. The Aquatic Community Classification website provides interactive mapping and a wealth of information about aquatic biodiversity and aquatic resource management.[13]

The ACC defines and details three major communities of aquatic organisms: mussels, macroinvertebrates and fish.

Mussels

Mussels are "filter feeders," which means that they pull water through their gills to extract particles of food. They require relatively clean water to survive, and are particularly sensitive to Abandoned Mine Drainage (AMD), industrial discharge, urban runoff pollution and commercial dredging. Mussels prefer gravelly, sandy or muddy habitats where they can burrow into the stream bottom. Typically, they are found in larger streams and in rivers that contain sufficient nutrient levels to supply them with food.[14]

Freshwater mussels are the most imperiled taxonomic group in North America. The lower main stem of Raccoon Creek and the Ohio River near the mouth of the creek are waterways showing recovery in native mussel populations. The PA Fish & Boat Commission has documented the presence seven rare mussel species in the Montgomery Pool of the Ohio River near the mouth of Raccoon Creek.[15] Please see Table 5.5 for a listing of these species and further discussion of their status.

Macroinvertebrates

Macroinvertebrates are aquatic animals without a backbone. These include aquatic insects, worms and crustaceans (like crayfish or scuds), which generally occupy the lower levels of food webs in aquatic systems. Macroinvertebrate communities are key indicators of overall stream health because they usually respond to environmental stress in predicable ways, based on their levels of tolerance to different stressors like pollutants and low dissolved oxygen levels.[16] Indicators of good stream health in the Raccoon Creek Region include various species of stonefly, mayfly, dobsonfly, and casemaking caddisfly.[17]

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[13] Pennsylvania Natural Heritage Program, Aquatic Community Classification Project, available at http://www.naturalheritage.state.pa.us/aquaticsIntro.aspx; accessed 8/9/2014.
[14] Pennsylvania Natural Heritage Program, Aquatic Community Classification Project, Aquatic Communities of Pennsylvania, available at http://www.naturalheritage.state.pa.us/aquaticsCommunity.aspx; accessed 8/9/2014.
[15] PAFBC Species Impact Review #42038, Christopher A. Urban, Chief, Natural Diversity Section; letter dated 2/26/2014.
[16] Pennsylvania Natural Heritage Program, Aquatic Community Classification Project, Aquatic Communities of Pennsylvania, available at http://www.naturalheritage.state.pa.us/aquaticsCommunity.aspx; accessed 8/9/2014.
[17] Pennsylvania Department of Environmental Protection, Watershed Snapshot, 2009; available at http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/watersnapshot/participation.htm; accessed 8/9/2014.

Fish

Macroinvertebrates are an important food source for many fish. Just like macroinvertebrates, fish are influenced by water quality and the overall condition of the watershed in which they live. For example, mud and sediment entering a waterway from a mismanaged construction site may smother the habitats that developing fish require, preventing them from reaching adult life stages.[18]

Different species of fish need different food resources. They also have different spawning and habitat needs and requirements. The Pennsylvania Fish & Boat Commission (PFBC) works to improve habitat in a variety of ways, from assisting volunteer groups with conservation projects to improve fish habitat in local lakes and streams, coordinating the removal of dams and other blockages to natural fish movement and providing technical guidance on designing riparian buffers. The PFBC's Habitat Improvement website provides detailed information on building fish habitat enhancement structures, establishing riparian buffers on waterways and other methods to improve aquatic habitats.[19]

Figure 5.11: Boys enjoy a morning's fishing at Southside Sportsmen's Club in Greene Township, 7/16/2007.

Fishing is named as a popular pastime by residents and visitors to the Raccoon Creek Region (please see "Section 2: Issues, Concerns and Constraints"). Pan and sport fish are plentiful in Raccoon Creek State Park's main lake and Cross Creek County Park's lake. The PFBC stocks trout in Mill Creek in Greene Township and Traverse Creek in Hanover Township, Beaver County. The lower reaches of the main stem of Raccoon Creek are also popular for fishing although public access to the creek is scant. Fishing in the upper reaches of Raccoon Creek and many headwater tributaries is limited due to Abandoned Mine Drainage.

[18] Pennsylvania Natural Heritage Program, Aquatic Community Classification Project, Aquatic Communities of Pennsylvania, available at http://www.naturalheritage.state.pa.us/aquaticsCommunity.aspx; accessed 8/9/2014.
[19] PA Fish & Boat Commission, Habitat Improvement, available at http://fishandboat.com/habitat.htm; accessed 8/9/2014.

Wildlife Viewing Etiquette

Watching and photographing wildlife is an increasingly popular recreational activity. Watching, however, should not add to the stress many species are already experiencing from human activities, pollution, loss of habitat, etc. Observing a few simple rules will help preserve the well-being of our wild companions.

Be respectful

Learn and obey the rules for using public lands like state parks and game lands. Do not trespass on private property. Be tactful and courteous in seeking the landowner's permission before entering. Even if it is 'just' the woods, every parcel of land has an owner, regardless of whether there are houses nearby.

Be unobtrusive

Observe animals from a distance with binoculars or a spotting scope. Avoid crowds. Be quiet. Tread lightly. Leave the electronic gizmos behind. Listen and watch without distracting wildlife, other observers or yourself.

Figure 5.12: Amelia Boser and her grandmother Betsy Woodling watch a nesting pair of Bald Eagles at an undisclosed location in the Raccoon Creek Region. 5/10/2014.

Control your pets; be mindful of your youngsters

Keep pets on a leash or leave them at home. Be sure your little ones do not stray into harm's way. Teach them to appreciate wild creatures. Help them grow up to be good stewards of our natural world.

Take only pictures; leave only footprints

Leave no litter, cigarette butts, candy wrappers, food containers, etc. Do not drive your car, truck or ATV off-road in places it is clearly forbidden. Do not drive over soft, wet soils. Stay on established trails; do not trample fragile plant communities, nesting areas or sensitive habitats, especially wetlands.

Do not feed wildlife in state parks or forests

Wildlife watching is your chance to learn how animals live naturally. Do not create artificial situations by offering food to attract wild creatures. They are often sickened by human food or can become so dependent they forget how to find food on their own. People can be injured by too-close encounters with wild animals seeking food. Remember to let wildlife be wild![20]

[20] Korber, Kathy and Hal, Pennsylvania Wildlife: A Viewer's Guide, (1994), Northwoods Publications, Inc., Lemoyne, PA.

Native Vegetation

Plants native to the Raccoon Creek Region are those which evolved here or became naturalized to this area over geologic time (thousands of years). Native plants can also be called "endemic" or "indigenous" to this area. Their presence in our region is the result of only natural processes with no human intervention. In North America a plant is often considered native if it was present before European colonization.

Figure 5.13: Ants pollinate Dutchman's breeches (*Dicentra cucullaria*). Note the ant inside the fourth flower from left. 4/24/2006.

Non-native plants are those which evolved elsewhere – in other regions of North America or on other continents. Many of our most popular and common landscape trees, shrubs and flowers are not native. While most non-native species cause little harm in residential landscapes, some have become problematic due to their ability to choke out native vegetation. These are called invasive plants, or exotic invasives, meaning they evolved elsewhere and were introduced to this area, either deliberately or accidentally. Invasive plants often cause ecological harm and economic damage. An extensive discussion of invasive plants is included later in Section 5.

Invasive plants are usually introduced by people either accidentally or on purpose, into a region far from their native habitat. They are problematic because they grow quickly and aggressively, spreading and displacing other plants. They commonly appear on disturbed ground around construction sites, in farm fields or abandoned areas. Plants listed in the Invasive Plants section of this Plan should not be used in home landscaping because they can escape cultivation and spread rapidly through surrounding ecosystems.

Despite their detrimental effects, many invasive plants are universally available in garden catalogs and home improvement stores. Norway Maple is one of the most widely planted street trees in the United States. But its dense shade, tolerance of poor soil, multitude of seeds and early spring leafing-out chokes native trees in its shadow.

English Ivy is the plant of "Ivy League" fame. But its rapid climbing ability and smothering foliage can kill a tree, branch by branch, or bring it down by the sheer weight of the ivy vine.

Older vines can reach a foot in diameter.[21] English Ivy shoots can force their way through window frames, between siding boards and through cracks in masonry, growing through darkness, causing bricks to shift and leading to costly structural damage.[22]

Native plants are much better choices for landscaping because they are adapted to a specific environmental niche and have natural controls that keep them in balance. They often require less fertilizer, watering or pruning and therefore cost less to maintain than non-natives. A native plant is one which grew within this region before Europeans settled here. Native plants include ferns and clubmosses; grasses, sedges and rushes; perennial and annual wildflowers; and the woody trees, shrubs, and vines which covered "Penn's Woods" when settlers first arrived. There are over 2,100 native plant species known in Pennsylvania.[23] Many garden centers and nurseries now offer native plants for use in residential and commercial landscaping.

Figure 5.14: English Ivy, *Hedera helix*. Photo: Kew Royal Botanic Gardens website.

Figure 5.15: Tender new leaves of a native American beech tree (*Fagus grandifolia*) unfurl in the spring sunshine. 5/6/2010.

[21] http://www.nps.gov/plants/alien/fact/hehe1.htm accessed 4/9/2014
[22] http://www.toledogarden.org/the-truth-about-english-ivy/ accessed 4/9/2014
[23] http://www.dcnr.state.pa.us/forestry/plants/nativeplants/ accessed 4/8/2014

Trees

Trees, and the forests they form, are the most obvious and readily-appreciated feature of our native plant communities. The Raccoon Creek Region is part of the oak-hickory forest which covers most of southwestern Pennsylvania and the Ohio River basin. When an oak-hickory forest reaches maturity, its dominant tree species are the oaks: white (*Quercus alba*), northern red (*Q. rubra*) and black (*Q. velutina*); and the hickories: shagbark (*Carya ovata*) and bitternut (*C. cordiformis*). In forests with adequate moisture, sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*) can be plentiful.

Growing to lesser heights than the oaks and hickories are the native trees of the sub-canopy: white flowering dogwood (*Cornus florida*), eastern redbud (*Cercis canadensis*), pawpaw (*Asimina triloba*), serviceberry (*Amelanchier arborea*) and eastern hophornbeam (*Ostrya virginiana*). In areas with steady moisture, spicebush (*Lindera benzoin*) can be common.[24]

Figure 5.16: Five people stand at the trunk of a perishing American chestnut tree, ca. 1925. Photo courtesy of State University of New York, College of Environmental Science and Forestry website.

In the Raccoon Creek Region, the oak-hickory forest was once dominated by the American chestnut tree. This magnificent species reigned over 200 million acres of Appalachian woodlands until succumbing to a lethal fungus infestation known as the chestnut blight during the early 1900s. Chestnut blight wiped out an estimated 4 billion American chestnut trees – one-quarter of all the hardwoods in the eastern United States.[25]

The American chestnut tree was an essential part of the entire eastern US ecosystem. Late-flowering, reliable and productive, it was unaffected by seasonal frosts. Chestnuts were the single most important food source for a wide variety of wildlife from bears to birds. Rural people depended upon the annual chestnut harvest as a cash crop. The chestnut lumber industry was vital to rural economies. Because chestnut wood is straight-grained, easily worked and highly rot-resistant, it was ideal for fence posts, railroad ties, barn beams, log cabins and all aspects of home construction. [26]

[24] Leopold, Donald J., Native Plants of the Northeast, (2005), Timber Press, Inc., Portland, OR.
[25] The American Chestnut Foundation, available at http://www.acf.org/history.php, accessed 6/13/2014.
[26] Ibid.

Although blight reduced the American chestnut from the dominant tree species in the eastern forest to little more than an early-succession-stage shrub, hope still remains. American chestnuts have survived by sending up stump sprouts that grow vigorously but inevitably succumb to the blight and die back to the ground. USDA Forest Service surveys indicate that there are millions of sprout clumps in Appalachian forests, a rich gene pool for restoration efforts.[27]

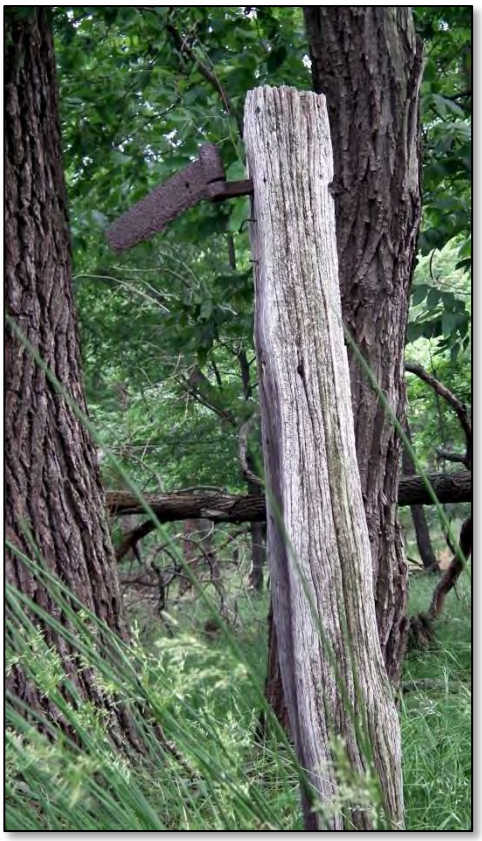

Figure 5.17: A chestnut gate post with a rusted hinge marks a farmers' property line. 6/13/2014.

Despite the passage of time, chestnut wood products continue to serve us. Thousands of weathered fence posts remain on the job in farmers' fields; barn beams and house timbers still shelter livestock and people; reclaimed chestnut lumber fetches a steep price for upscale flooring in new homes; fine furniture and musical instruments made of chestnut are prized possessions yet today.

Grasses

It is doubtful that much, if any, acreage of native grassland has survived in an undisturbed state since European settlement began in the Raccoon Creek Region. Our original grasslands were fertile places well-suited to raising crops and livestock. Today, native grasses are being reintroduced for their value in saving soil and as wildlife forage and habitat. Programs such as the Conservation Reserve Program (CRP) and the Conservation Reserve Enhancement Program (CREP) administered by the USDA Farm Service Agency can help landowners restore stands of these once-common native grasses.

Native grasses are tall, weedy-looking and grow in clumps. They provide excellent year round cover and forage for wildlife, yet retain enough bare ground for animals to move through in search of food. Native grass species include Indiangrass (*Sorghastrum* spp.), switchgrass (*Panicum virgatum*), big and little bluestems (*Andropogon* spp.), broom sedge (*Andropogon virginicus*), Canada wild rye (*Elymus canadensis*) and Virginia wild rye (*Elymus virginicus*). These species are warm season grasses, meaning they mature later in the growing season. They can be mown after the peak nesting times of birds and small animals. Mowing in late summer also allows these grasses to build up energy reserves for hearty regrowth in spring.

[27] State University of New York: American Chestnut Research and Restoration Project, available at http://www.esf.edu/chestnut/background.htm, accessed 6/13/2014.

To maintain a stand of native grass, occasional disturbance by mowing, burning, spraying, or disking is needed. Without any disturbances, succession will take place, meaning the grassland will eventually be replaced by woody vegetation. As a result, wildlife requiring grassy or meadow habitat will attract more common woodland wildlife. Mowing or burning in cycles creates habitat with different-aged, diverse vegetation and deters the growth of trees and shrubs, thus preserving the native grassland.[28]

Figure 5.18: Broom sedge (*Andropogon virginicus*) establishes itself in an unmown farm field. 6/13/2014.

Wetland Plants

Many native plant species can grow only in wetlands. Others are adapted to tolerate seasonally wet conditions. Common wetland plants in the Raccoon Creek Region are more than just cattails. They include trees, shrubs, vines, wildflowers, grasses and ferns. Notable species are American sycamore (*Plantanus occidentalis*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), highbush blueberry (*Vaccinium corymbosum*), spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), American wisteria (*Wisteria frutescens*), skunk cabbage (*Symplocarpus foetidus*), mayapple (*Podophyllum peltatum*), great blue lobelia (*Lobelia siphilitica*), cardinal flower (*Lobelia cardinalis*), purple Joe-pye weed (*Eupatorium purpureum*), cattail (*Typha* spp.), softrush (*Juncus effusus*), sweetflag (*Acorus calamus*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*) and scouring rush (*Equisetum hyemale*).[29] Wetland habitats are discussed in greater detail in the following section.

Natural Habitats

Natural habitats are the varied places that plants and animals normally occur. Habitats provide food, water and shelter, room to grow and reproduce. With the passage of time, different kinds of habitats evolve and change in response to climate, topography and soils formed by the decay of underlying bedrock. Bedrock geology of the Raccoon Creek Watershed is discussed in Section 3: Land Resources.

As mentioned in “Section 1: Project Area Characteristics,” the predominant land cover in the Raccoon Creek Region is deciduous forest at 64% and grasslands at 15% of the total acreage.

[28] Pennsylvania Game Commission, Mowing and Wildlife: Managing Open Space for Wildlife Species, available at http://www.portal.state.pa.us/portal/server.pt?open=514&objID=699845&mode=2, accessed 6/13/2014.
[29] Leopold, Donald J., Native Plants of the Northeast, (2005), Timber Press, Inc., Portland, OR.

Table 5.1 details land cover of the Region as determined by the US Geological Survey using satellite imagery to create a National Land Cover Database (NLCD).

Table 5.1: 20D Raccoon Creek Region Land Cover by Acreage[30]

Land Cover Type	Acreage	% of Total Land Cover
Developed, Open Space	16,083	7.7%
Developed, Low Intensity	3,818	1.7%
Developed, Medium Intensity	1,192	0.5%
Developed, High Intensity	667	0.2%
Forest, Deciduous	133,331	63.7%
Forest, Evergreen	1,597	0.8%
Forest, Mixed	88	< 1%
Scrub, Shrub	38	< 1%
Grassland, Herbaceous	4,415	< 1%
Pasture, Hay	30,872	14.8%
Cultivated Crops	15,064	7.2%
Woody Wetlands	27	< 1%
Emergent Herbaceous Wetlands	39	< 1%
Open Water	2,857	< 1%
Barren Land	1,421	< 1%

The Pennsylvania Natural Heritage Program's interactive online map http://www.gis.dcnr.state.pa.us/maps/index.html?nha=true provides locations and detailed descriptions of significant habitats of all types in the Raccoon Creek Region. These and other areas of biological importance are detailed later in this section, beginning on page 21. Plate 5.3: Natural Heritage Inventories, also names and locates Biological Diversity Areas, or BDAs, as defined by the Pennsylvania Natural Heritage Program.

Forest Habitats

Forests are important regulators of global climate change and air quality. As plants "breathe," they utilize carbon dioxide from the air and water from the soil, produce sugar to grow, store carbon in their tissues and return oxygen into the atmosphere. When plants die and decompose, their stored carbon is released to the soil. Preserving and restoring forests helps to maintain the natural balance of this carbon cycle by reducing levels of atmospheric carbon dioxide that contribute to global warming.

[30] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA

It is particularly important to preserve forest tracts in the Raccoon Creek Region as industrial development and housing pressure increase with new energy extraction activities. Most of the large forest blocks in the Region are already fragmented by roads, utility lines, housing and agriculture. It is vital to protect what remains of our forest tracts and woodlots for the continued health, livability and community appeal of the area. Indeed, the characteristic local residents value most about the Region is "green and quiet."

Figure 5.19: Betsy Woodling and Al Moran visit a massive, hollow sycamore tree near Ridge Road in Independence Township, Beaver Co. Notice the seedling buckeye tree at their feet. 4/22/2014.

Trees and timber are a renewable resource of great value. Logging is often seen as a source of quick cash, but, if done improperly, can cause much harm to a forest ecosystem. Timber harvests should be planned with the aid of a certified forester who can ensure that good quality trees are left to re-seed an area and grow subsequent crops of marketable timber.

When a forest is disturbed by logging or by a natural event such as a fire or tornado, or when occupied areas are abandoned, a process called succession occurs. Succession is the gradual, natural process of forest regrowth. Succession has early, middle and late stages, leading finally to a mature forest. Succession can happen on a small scale, as when a large tree topples, leaving a gap in the forest canopy. Or it can take place on a much larger scale when farm fields are no longer cultivated or grazed.

Early successional habitat is characterized by grasses, shrubs, brambles and dense, twiggy growth. This type of habitat is home to a variety of wildlife such as rabbits, warblers, American woodcock and pheasant. Wildlife seek out these areas for the excellent cover and quality of food they provide. Songbirds, turkey, grouse, deer, rabbit, bear, fox, native bees and many species of small mammals, reptiles and insects are drawn to old fields, thickets, and young forest where food and prey are abundant. Even black bears can benefit from small fruits and berries found in an early successional plot.[31]

[31] Natural Resources Conservation Service, What is Early Successional Habitat?, available at file:///C:/Users/User/Downloads/Early_Successional_Info_Sheet_2012%20(1).pdf, accessed 6/14/2014.

In the middle-successional stage of forest regeneration, small trees begin to dominate the habitat, competing with each other for light. Shade-tolerant shrubs and plants remain in the dense understory. In the Raccoon Creek Region, trees in this stage of forest may contain poplar, birch, sassafras, ash, locust or red maple, yielding later to the dominant oaks and hickories of the mature forest.

Mature forest habitat includes the dead snags of smaller, less competitive trees that could not survive the shade produced by faster-growing, longer-lived species. Cavities and perches on these snags offer nesting sites for owls, woodpeckers, raccoons and bats. Mature forests offer nuts, acorns and fruits that sustain white-tail deer, wild turkey, black-capped chickadee and eastern box turtles. One hundred years may pass before a forest habitat fully matures.[32]

Grassland Habitats

According to the National Land Cover Database (NLCD), the Raccoon Creek Watershed Region is about 15% pasture and hay, about 7% cultivated crops and less than one percent non-agricultural grassland.

Fallow grasslands can be important nesting and hunting areas for many birds including the chipping sparrow, eastern meadowlark, ring-neck pheasant, great horned owl, red tailed hawk, and the state bird of Pennsylvania, the ruffed grouse. Grassland habitats are also home to the eastern garter snake, the meadow vole, red fox and white-tailed deer.[33]

Figure 5.20: The wide-open spaces of the Findlay Grasslands are a haven for native birds. However, much of this reclaimed strip mine is slated for development. Photo 4/5/2005.

As mentioned earlier, warm-season native grasses are being reintroduced in many areas for soil conservation and wildlife habitat restoration. These bunch-forming grasses provide food, nesting sites and cover for many small mammals and birds.

[32] Forest Succession and Wildlife, Pennsylvania Envirothon, available at http://www.envirothonpa.org/documents/ForestSuccession.pdf, accessed 6/14/2014.
[33] Ibid.

The most significant grassland habitat in the Raccoon Creek Region is the Findlay Grasslands (or Imperial Grasslands) west of the borough of Imperial in Findlay Township. This reclaimed strip mine features thousands of acres of native grasses, shallow ponds and very little human activity. It is a haven for shore birds, raptors, songbirds and a stop-over for many migratory species.

Wetland Habitats

Wetlands are habitats of great importance in any ecosystem because of the many important functions they provide. In the Raccoon Creek Region, wetlands:

- Remove sediment from surface waters
- Filter pollution from mine drainage, sewage and road run-off
- Produce oxygen
- Recycle nutrients
- Absorb floodwaters
- Recharge groundwater supplies
- Control erosion
- Provide aesthetic appeal
- Produce timber
- Offer opportunities for hunting, fishing, paddling and wildlife watching
- Provide habitat for a diverse array of aquatic, amphibian, terrestrial and avian wildlife.[34]

Technically, wetlands have these characteristics: hydric (waterlogged) or anaerobic (without air) soils, wetland vegetation and wetland hydrology - meaning the area is flooded seasonally or continually. Biologically, wetlands are hotbeds of life, brimming with nesting waterfowl, wading birds and songbirds. They are rich with aquatic microorganisms that form the basis of the food chain for larger insects, fish, reptiles, amphibians and

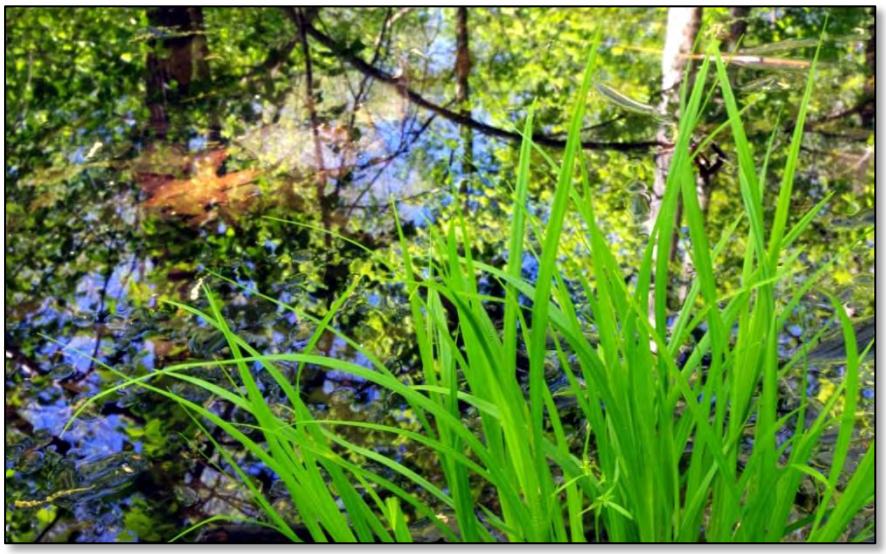

Figure 5.21: Color, shadow and reflection make vivid patterns in a vernal pool at the Wildflower Reserve. Photo 5/6/2010.

[34] US Fish & Wildlife Service, National Wetlands Inventory, available at http://www.fws.gov/wetlands/, accessed 6/14/2014.

mammals. Streams, lakes, ponds and wetlands are spawning grounds and nurseries for fish.

As important as wetlands are to the well-being of our natural world, most of the wetlands in the contiguous United States have been drained, filled in, paved over or otherwise destroyed in the past three hundred years. In the 1600s, an estimated 220 million acres of wetlands existed in the lower 48 states; by 2009 this acreage had been reduced to 110 million. Between the 1780s and 1980s, Pennsylvania lost 56% of its wetlands while bordering Ohio lost 90%.[35]

"Plate 4.2: Water Resources" maps the emergent wetlands (i.e., cattail marshes) and the forested/scrub/shrub wetlands of the Raccoon Creek Region. Predominantly, these wetlands are found along stream banks and in headwaters of streams. Due to widespread coal mining activity, wetlands exist in many abandoned mine features and perform the valuable function of helping to treat acid mine drainage and returning nutrients to the soil.

Stream Habitats

Stream habitats are another important part of the ecology of the Raccoon Creek Region. According to the Pennsylvania Department of Environmental Protection's designation for stream uses, the waters in the Region are considered Warm Water Fisheries, Cold Water Fisheries or High Quality Cold Water Fisheries. Please see "Plate 4.3: Designated Stream Use" for a detailed map of these streams and their watersheds.

Most of the streams in the 20D Region are Warm Water Fisheries, defined as waters which maintain and propagate fish species, flora and fauna that are native to a warm water habitat. The main stem of Raccoon Creek is a Warm Water Fishery.

King's Creek and its tributaries are classed as Cold Water Fisheries, defined as "maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat."

Figure 5.22: Aluminum and iron lend surreal colors to a polluted headwater stream on Shades of Death Road near Avella. Photo 3/21/2005.

[35] US EPA, Wetlands – Status and Trends, available at http://water.epa.gov/type/wetlands/vital_status.cfm, accessed 6/14/2014.

High Quality Warm Water Fisheries in the 20D Region are Service Creek, Traverse Creek, Little Service Run, Little Traverse Creek, the South Fork of Cross Creek and the main stem of Cross Creek, ending just upstream of Avella and Browntown.[36]

There are 126 miles of major streams (4th and 5th order) and 620 miles of smaller (1st, 2nd and 3rd order) perennial streams in the Region.[37] In addition, there are hundreds of miles of seasonal, intermittent streams. Healthy streams are important in the watershed not only for recreational pursuits such as fishing, paddling and swimming, but also for public water supplied to over 30,000 people by the Ambridge Water Authority's Service Creek Reservoir in Raccoon Township. (Refer to "Public Water Supplies" in Section 1).

Until recently, fish had not been seen in some of the Region's headwater streams during the lifetimes of residents in their 80s and 90s. Generations of people grew up knowing creeks to run nothing but orange. Fortunately, conditions have improved greatly over the past fifteen years as a result of building passive mine discharge treatment systems at five of the worst pollution sources. These systems treat over 2.5 billion gallons of abandoned coal mine drainage annually, removing over 2200 tons of iron, aluminum, manganese and acidity from the headwaters of Raccoon Creek in Washington and Allegheny Counties.[38] Nonetheless, the Raccoon Creek Region, like many other watersheds in PA, needs further work to address the legacy of historical mining. Please refer to Section 3: Land Resources for additional information about mining in the Region.

Backyard and Urban Habitats

The landscapes of suburban yards and city streets hold many opportunities to enhance habitat for wild creatures. The benefit is mutual: native trees, flowers and shrubs revive the food chain and attract songbirds, butterflies and other wildlife. These visitors reduce pests and are delightful to watch after a stressful workday. Choosing native plants for landscaping saves time, money and effort because natives are adapted to local soil and weather conditions, requiring less watering and maintenance.

Well-sited trees and shrubs can shelter homes from winter winds and give refreshing shade in summer, reducing both heating and cooling bills. Attractive landscapes increase property values and contribute to a sense of neighborhood pride. Street trees cool sidewalks, provide resting places for

Figure 5.23: Great Blue Lobelia (*Lobelia siphilitica*) is a sturdy native perennial wildflower suitable for shady spots in home landscaping. 8/10/2014.

[36] The Pennsylvania Code, Chapter 93, Water Quality Resources, available at http://www.pacode.com/secure/data/025/chapter93/chap93toc.html, accessed 6/15/2014.
[37] GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
[38] Datashed, available at http://www2.datashed.org/, accessed 6/15/2014.

people and wildlife, and make our communities more livable and inviting.

Backyard forests of any size are healthy, safe places for youngsters to explore nature and learn about themselves in the process. Children who spend time outdoors, engaged in good-old-fashioned fun like building forts, moving dirt piles, splashing in puddles and climbing trees have better attention spans, are more creative and are less likely to be overweight. People of all ages are happier and feel more alive when they spend time in nature.

> ***"I've been arguing for a while that connection to nature should be thought of as a human right."***
>
> ***Richard Louv, author of* Last Child in the Woods *(2005)***

Homeowners can help reduce erosion and flooding by mowing less lawn, especially near the banks of streams. Removing woody plants up to the water's edge leaves no roots to hold the earth from washing away. Leaving a shady buffer of trees, bushes and streamside plants cools the water, stabilizes the soil, filters out pollutants and maintains green corridors for wild creatures' habitat.

The Ohio River and its Habitats

Shaped by advance and retreat of the Wisconsin Glacier, the Ohio River was once a pristine waterway inhabited by a great variety of aquatic species. In the early 1900s the Ohio, as well as the Allegheny and Monongahela Rivers that join to form it, became the lifeblood of American iron and steel manufacturing. Operated with little or no regard for the pollution they released into the air and water, the industries that built, powered and defended our nation wiped out nearly all aquatic life in the Ohio River. Untreated sewage from thousands of homes in towns built along the rivers contributed to the destruction.

Because the Ohio River was – and is – a major inland waterway, the system of navigation locks and dams built to enable barge transportation has altered the river's natural depths and slowed its currents. Many river associated habitats such as floodplains, riffle communities and islands were eliminated by raising the water level. Another activity that has greatly impacted the Ohio is dredging the bottom to remove sediment to ease transportation within the navigational channel, as well as to extract sand, gravel and cobblestone for commercial use. Dredging removes the natural riverbed. Additionally, the sediment that is stirred up inhibits feeding and complicates physiological functions in fish, mussels, and aquatic insects. Dredging also alters river hydrology, causes bank and shoal erosion, and creates deep, cold anoxic holes nearly devoid of life.

Recent decades have seen improvement in water quality in the Ohio River. The decline of the domestic steel industry, more stringent pollution regulations and better treatment of sewage have enabled some native fish and mussel species to return. Fish composition in the Ohio is

changing from predominantly pollution tolerant species such as carp (*Cyprinus carpio*) and gizzard shad (*Dorosoma cepedianum*), to more pollution-sensitive species such as walleye (*Stizostedion vitreum*), sauger (*Stizostedion canadense*), river redhorse (*Moxostoma carinatum*) and bass (*Micropterus spp*.). [39]

Further evidence of the Ohio River's rebounding quality is the popularity and success of sport fishing. In July of 2005 the Bassmaster Classic, a professional fishing tournament, was held in Pittsburgh at the confluence of the Allegheny and Monongahela Rivers where the Ohio begins.

Several species of freshwater mussels classified as rare are now found in the Ohio River near the mouth of Raccoon Creek. These waters also hold threatened, endangered and rare species of fish. Please see "Section 4: Water Resources" for a listing of these species.

Along the banks of the Ohio River, the steep forested hillsides and deep secluded valleys are rich habitats, integral to the recovering river ecosystem. Forest communities on these slopes should be allowed to mature without timber harvesting or earth disturbance to aid in natural restoration and reintroduction of threatened, rare and endangered species.

Figure 5.24: An excavator between two barges dredges for gravel on the Montgomery Pool of the Ohio River, 8/5/2014. Note the crewman standing at the corner of the left barge.

[39] Pennsylvania Natural Heritage Program, the Ohio River, available at http://www.naturalheritage.state.pa.us/cnhi/cnhi/Ohio%20River.pdf, accessed 7/3/2014.

Important Mammal Areas

The Important Mammal Areas Project, or IMAP, was the first program of its kind in the United States. Modeled after the Important Bird Areas Project, or IBAP, IMAP was launched in 2001 to promote the conservation of mammals by identifying sites or regions that hold habitats critical to their survival. Both IMAP and IBAP originated in Pennsylvania as cooperative projects of PA's state agencies, conservationists and biologists.[40]

The Important Mammal Area designation affords no legal protection, but it focuses public awareness on mammals and provides information to make land use decisions to better protect mammals and their habitats. There are no Important Mammal Areas in the 20D Raccoon Creek Region, but there are several to the north and east.

Important Bird Areas

An area that supports critical habitat for a diversity of bird species or species of special concern is designated as an Important Bird Area, or IBA, by the National Audubon Society's Pennsylvania Chapter. In 1996, Pennsylvania was the first US state to develop an IBA program.

Pennsylvania's Ornithological Technical Committee to date has identified 87 IBA sites encompassing over two million acres of the state's public and private lands.[41] The areas include locations for prime breeding sites for land and water birds, winter roosts and migratory staging areas. Criteria used to select IBA sites are:

- Any site having exceptional concentration and/or diversity of bird life, defined as 2,000 waterfowl at one time (excluding resident Canada Geese), 100 shorebirds together at one time, 50 breeding pairs of wading birds, or 10,000 migrant raptors per season.
- Support a significant population of state or federally-listed threatened or endangered avian species.
- Support a significant population of one or more avian species on Pennsylvania's "special concern" list.
- Contain representative, rare, threatened, endangered, or unique habitats with birds characteristic of those habitats.
- Sites where long-term (i.e., years) avian research or monitoring is in progress.

Once a site is officially identified as an IBA, volunteer monitoring begins. During the nesting season, volunteers track the numbers and varieties of birds breeding in that particular habitat. But the monitoring also extends to the land itself, focusing attention on the main threats to Pennsylvania's IBA habitats: fragmentation, suburban sprawl and over-browsing by deer. Most of the 20D Raccoon Creek Region is defined as an Important Birding Area as illustrated in "Plate 5.2" found at the end of this section.

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[40] The Pennsylvania Wildlife Federation, Important Mammal Areas, available at http://www.pawildlife.org/?page_id=38, accessed 6/15/2014.

[41] Wilhelm, Dr. Gene, Bartramian Audubon Society Sanctuaries: Including Important Bird Areas in the Eco-Region (New Castle, PA: Commercial Printing Company, 2008), page 4.

County Natural Heritage Inventories

County-by-county Natural Heritage Inventories are a project of the Pennsylvania Natural Heritage Program (PNHP). According to its website, "County Natural Heritage Inventories are designed to inform the residents of a county about their living heritage and give them a tool to use in planning the future of their communities…Through detailed mapping and discussion these projects present important places within a county, prioritize them based upon their attributes, and provide recommendations regarding their management and protection."

At the time of publication of this Plan, the Natural Heritage Inventories (NHIs) publicly available for Allegheny, Beaver and Washington Counties are bound paper documents dating from 1994, 1993 and 1994 respectively. Beaver's updated NHI is due for release in 2015. To provide consistently-formatted information for all three counties in the 20D Raccoon Creek Region, the NHI descriptions and mapping presented herein follow the convention available on the PNHP website as of November 30, 2014.

The PNHP website, http://www.naturalheritage.state.pa.us/, offers a wealth of information about Biological Diversity Areas (BDAs), Landscape Conservation Areas (LCAs) and Dedicated Areas (DAs). The significance of these areas and the methods of ranking them are explained in this section of the 20D Plan

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 communities with exceptional native diversity.
- Typically small areas containing a buffer that protects the natural community or habitat needed to support the site.

Landscape Conservation Area (LCA)

- An area of land larger than a Biological Diversity Area.
- Contains minimal human disturbance and allows ecosystems to function on a landscape level.
- LCAs often contain multiple BDAs.

Dedicated Area (DA)

- An area of land that is to be protected by the specific intentions of a property owner.
- May become a future BDA or a high-quality area within an already designated BDA.
- Numerous sites within the watershed could become DAs through landowner agreements, special programs, or other methods like conservation easements.

"Plate 5.3: Natural Heritage Inventory" maps the Biological Diversity Areas (BDAs) in the 20D Raccoon Creek Region, numbering each and color-coding them according to their significance ranking. "Table 5.2: Biological Diversity Areas of the Raccoon Creek Region" provides site-by-site details about specific values of these critical areas and threats to their well-being. Descriptions of the Ohioview Peninsula and the Fourmile Run Valley are included. Although these BDAs are located on the north shore of the Ohio River and technically are not within the boundaries of 20D, they are significant adjacent habitats, ecologically inseparable from the Raccoon Creek Region.

Table 5.2: Biological Diversity Areas of the 20D Raccoon Creek Region

Color-coding of each Biological Diversity Area in the following table corresponds to color-coding on "Plate 5.3: Natural Heritage Areas" found at the conclusion of Section 5.

Plate 5.3 ID#	Name of BDA & Watershed	Ranking	Acreage	Values	Threats & Stresses	Recommendations
1	**Mill Creek** (Mill Creek)	Notable	1798.0	Recovering floodplain forest natural community; high habitat diversity; diverse topography; diverse forest bird species	Gravel dredging; ATVs; Japanese knotweed	Needs further investigation; control knotweed
2	**Georgetown Island** (includes south shoreline of Ohio River; Site #3 of Ohio River Islands National Refuge)	Exceptional	437.8	Unique natural communities and aquatic habitat support three species of concern; 17 acre Georgetown Island recovering floodplain forest	Erosion at head of island; dense infestation of Japanese knotweed	Control knotweed; stabilize shorelines; restrict human activity
3	**Ohio River** (includes south shore)	High	1404.7	Recovering river system that provides habitat for numerous species of concern.	River alterations due to effluent discharges, point source discharges, navigational locks & dams, river bed dredging	Improve water quality; carefully monitor & enforce all regulated activities along river
4	**Phillis Island** (Site #2 of Ohio River Islands National Refuge)	Exceptional	344.6	Aquatic & riparian habitats support seven species of concern	Erosion of bank slopes on main channel side	Control knotweed; limit human activity; stabilize shorelines
5	**Lower Raccoon Creek** (Main stem of Raccoon Creek)	High	2994.0	Extensive area with high diversity of natural features & communities; habitat for species of concern	Timber harvesting; ATVs; destruction of wetlands; bank erosion; knotweed; residential & industrial dev't. pressure	Avoid timber harvesting; stabilize banks; control knotweed; restrict ATV traffic; plan development sensitively

Table 5.2: Biological Diversity Areas of the 20D Raccoon Creek Region (continued)

Plate 5.3 ID#	Name of BDA & Watershed	Ranking	Acreage	Values	Threats & Stresses	Recommendations
6	**Ohioview Peninsula** (north shore of Ohio River; Site #1 of Ohio River Islands National Refuge)	Exceptional	115.6	Unique natural community & habitat for terrestrial & aquatic species of concern; shallow water embayment & wetlands are among last such features on Ohio River	Off-road vehicles; land-clearing for camping; illegal dumping; development of any type; water pollution; changes in Montgomery pool elevation	Restrict vehicular traffic; limit human usage; avoid timber harvesting; remove debris; maintain Montgomery pool elevation & safety zone
7	**Fourmile Run Valley** (Fourmile Run)	Notable	1247.4	Roadless Ohio River tributary valley; relatively intact with disturbance near mouth; large contiguous forest; northern conifer forest at confluence of tributaries	Residential development pressure; gas pipeline siting; ATVs; timber harvesting; advent of invasive species on newly fragmented edges	Co-locate future pipelines & utilities in existing corridors; control invasive species; plan upland development sensitively; perform additional site investigation
8	**Creek Bend Slopes** (Main stem of Raccoon Creek)	Notable	464.4	Uncommon northern hardwoods natural community, recovering from timber harvest; tributary streams add to diversity	Timber harvesting; fragmentation; residential development pressure at top of slopes	Avoid timber harvesting; avoid clearing for utility rights-of way; increase buffer areas above & below slopes
9	**School Road Slopes** (Main stem of Raccoon Creek)	High	931.9	Northern hardwood-conifer forest community nearing maturity; habitat for plant species of concern	Gas pipeline siting; energy industry pressure; timber harvest; residential development pressure	Allow previously agricultural areas to revert to forest; avoid timber harvesting; co-locate future pipelines & utilities in existing corridors; plan upland development sensitively

Table 5.2: Biological Diversity Areas of the 20D Raccoon Creek Region (continued)

Plate 5.3 ID#	Name of BDA & Watershed	Ranking	Acreage	Values	Threats & Stresses	Recommendations
10	**Clinton Wetlands** (Potato Garden Run)	High	81.9 (mostly within Montour Run Water-shed)	Robust emergent marsh community, one of few in Allegheny County; diverse wetland plants	Runoff of lawn chemicals & fertilizers; multiflora rose at disturbed edges; acid mine drainage; commercial development at Greater Pgh. In'tl Airport	Minimize disturbances to assure natural succession; increase buffer area in mown residential back yards
11	**Imperial Mine Grassland** (Potato Garden Run)	High	2.2 (mostly within Montour Run Water-shed)	Large reclaimed strip mine w/ extensive grassland, ponds, wetlands & dense shrub habitat; attracts grassland sparrows, raptors, brush-loving birds, shorebirds & waterfowl. [42]	Development pressure along I-576; drainage of wet areas; road & highway construction; proposals to build industrial parks	Plan development to preserve ponds & varied habitat types; minimize disturbance of critical areas
12	**Raccoon Creek Floodplain** (Main stem of Raccoon Creek)	Exceptional	4745.8	Large, diverse floodplain areas containing floodplain forest & floodplain swamp communities; two plant & one animal species of special concern in Pennsylvania.	Residential development pressure; fragmentation by roads, pipelines & well pads; timber harvesting; erosion at roadway drainage pipes	No timber harvest; no further development; limit use of pesticides; consolidate energy disturbances
13	**Raccoon Creek Floodplain Forest** (Main stem of Raccoon Creek)	Exceptional	160.2	Large, diverse floodplain areas, floodplain forest, floodplain swamp communities; two plant & one animal species of concern	Residential development pressure; fragmentation by roads, pipelines & well pads; timber harvesting; erosion at roadways	No timber harvest; no further development; consolidate energy disturbances

[42] Three Rivers Birding Club , Southwestern Pennsylvania, Imperial Grasslands, available at http://www.3rbc.org/documents/imperial.html, accessed 6/28/2014.

Table 5.2: Biological Diversity Areas of the 20D Raccoon Creek Region (continued)

Plate 5.3 ID#	Name of BDA & Watershed	Ranking	Acreage	Values	Threats & Stresses	Recommendations
14	**Valley Picnic Area** (Traverse Creek)	Notable	186.9	Habitat for one plant species of special concern; maturing, second growth mesic central forest	Manipulation of picnic area field	Enlarge buffer zone to protect plants & encourage expansion of population
15	**Aunt Clara Fork Floodplain** (Aunt Clara Fork of King's Creek)	Notable	557.0	Recovering floodplain forest ; associated northern hardwood forest on adjacent slope	Residential development pressure; fragmentation by roads, pipelines & well pads; timber harvesting	Limit development; no timber harvest; consolidate energy disturbances

Aquatic Community Classifications[43]

The Pennsylvania Natural Heritage Program's Aquatic Community Classification (ACC) project describes patterns in aquatic biodiversity to help conservation activities and aquatic resource management in the region. ACC was designed to systematically identify Pennsylvania's stream communities and habitat types for the freshwater mussels, macroinvertebrates and fish that live in our waters. ACC's data provides a baseline for conserving flowing water systems and can be used to help assess the status of streams and rivers, prioritize high quality aquatic habitats for preservation, and select low quality habitats for restoration.

Within the 20D Raccoon Creek Region, streams are classified by the ACC as either Watershed Restoration Areas or Watershed Enhancement Areas as illustrated in Figure 5.25 and defined below.

Watershed Enhancement Areas are watersheds that do not qualify as "Conservation" or "Restoration" priorities. Enhancement watersheds are likely not in pristine condition, but are prime candidates for light restoration efforts because they are not as severely degraded as Restoration watersheds.

> **Tier 1 Enhancement Watersheds** are likely to be in good condition but face some threats to water quality.
>
> **Tier 2 Enhancement Watersheds** have significant water quality issues and could benefit greatly from restoration action.

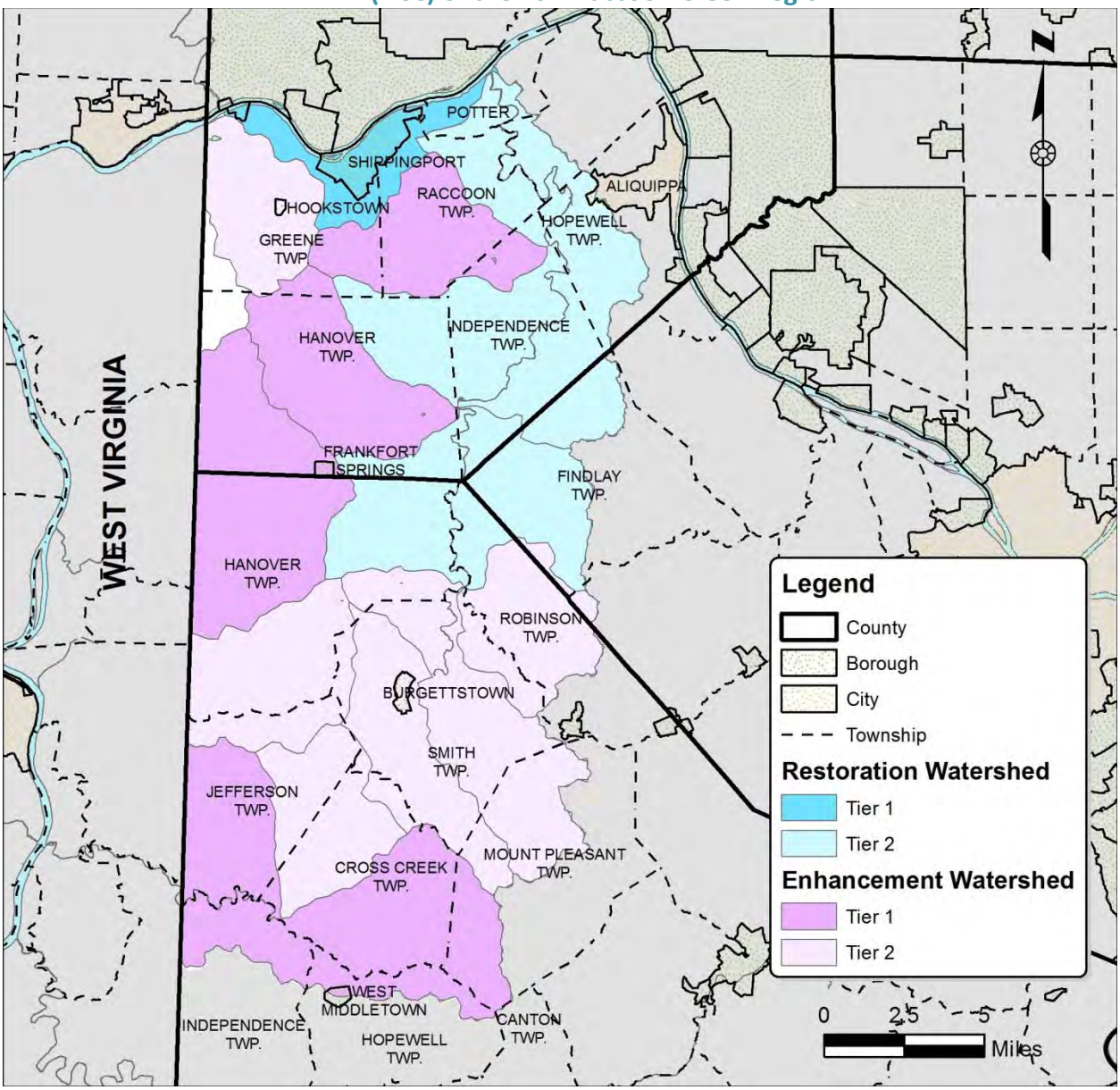
[43] Pennsylvania Natural Heritage Program, Aquatic Community Classification, available at http://www.naturalheritage.state.pa.us/aquaticsintro.aspx; accessed 12/12/2014.

Watershed Restoration Areas are shown by ACC's analysis to be in the worst condition and are a priority for habitat restoration.

Tier 1 Restoration Watersheds are the most disturbed, with much physical alteration. Instream habitat supports only the most pollution-tolerant organisms.

Tier 2 Restoration Watersheds are also impaired, but the need for restoration action may not be as immediate as Tier 1.

Figure 5.25: Pennsylvania Natural Heritage Program Aquatic Community Classification (ACC) of the 20D Raccoon Creek Region



More information, including a complete set of downloadable GIS data that corresponds with all ACC information, is available statewide or by watershed through the GIS Data Download Page at http://www.naturalheritage.state.pa.us/Aquatic_GIS.aspx. [44]

Greenways

A greenway is a corridor of open, undeveloped space. Greenways may be narrow ribbons that run through urban or suburban areas, or they may be wider bands that incorporate diverse natural, cultural and scenic features. They can incorporate both public and private property; they can be land-or water-based. Greenways may follow old railways, abandoned roads or canals; they may follow stream corridors, shorelines or wetlands.

Figure 5.26: The refurbished Robinson Trestle carries the Montour Trail toward the Raccoon Creek Region. Photo 6/22/2005.

Some greenways are recreational corridors or scenic byways that can accommodate motorized and non-motorized vehicles. They may even include "blueways" - water trails for paddlers and non-motorized craft. Other greenways function almost exclusively for environmental protection and are not designed or intended for human passage.

Greenways are an important conservation and recreational planning tool. By establishing greenways and blueways, communities can provide places for people to actively experience the outdoors, often close to home. Greenways can offer alternative transportation routes for bicyclists, walkers and hikers. Or, greenways may serve to preserve and restore important environmental assets like forests, wetlands and stream banks – and the plants and animals that live there.

[44] Pennsylvania Natural Heritage Program, Aquatic Community Classification Map, available at http://www.naturalheritage.state.pa.us/acc/acc.htm; accessed 12/12/2014.

Washington County's Greenways Plan adopted in 2007 characterizes a variety of greenways by suggested and/or current usage and by conservation values:

- Primary recreation greenways
  - Montour Trail Corridor
  - Panhandle Trail Corridor
- Secondary Greenways
  - Natural Areas
    - Raccoon Creek Natural Area
    - Cross Creek Natural Area
  - Recreation Greenways
    - Cross Creek Water Corridor
    - Raccoon Creek Water Corridor
  - Conservation Greenways
    - King's Creek Greenway
    - Aunt Clara Fork Greenway[45]

More information and detailed mapping of Washington County's greenways, corridors and natural areas is available at: http://www.co.washington.pa.us/index.aspx?NID=175.

Similarly, the motto of Beaver County's 2008 Greenways and Trails Plan is "Connecting Beaver County's People and Natural Assets through Greenways and Trails." This plan identifies the main stem of Raccoon Creek as well as the Ohio River, Mill Creek, Service Creek and Traverse Creek waterways as "exceptional priority potential conservation corridors."[46] More information and detailed mapping is available at http://files.beavercountypa.gov/PublicServices/PlanningCommission/PDFs/Greenway_trail_plan.pdf.

Species of Conservation Concern

Many native species of plants, mammals, birds, invertebrates, amphibians, reptiles, fish and mussels have become scarce or threatened by habitat loss or other human-induced pressure. To help document the status of species of concern, the Pennsylvania Natural Heritage Program (PNHP) was formed through the cooperative partnership of several state agencies which collect, store and share data about native biodiversity.

[45] Washington County Planning Commission, Greenways Plan (2007), available at http://www.co.washington.pa.us/index.aspx?NID=175; accessed 10/29/2014.
[46] Beaver County Greenways & Trails Plan, (2008), page 43, available at http://files.beavercountypa.gov/PublicServices/PlanningCommission/PDFs/Greenway_trail_plan.pdf, accessed 6/15/2014.

The PNHP website, http://www.naturalheritage.state.pa.us/, contains a wealth of information and interactive mapping accessible to the public. PNHP's purpose "…is to provide current, reliable, objective information to help inform environmental decisions."[47]

The environmental review tool of the PNHP is the Pennsylvania Natural Diversity Index, or PNDI. The following tables show the results of PNDI queries for species of conservation concern to the PA Department of Conservation and Natural Resources (DCNR), the PA Fish & Boat Commission PFBC) and the PA Game Commission in the Raccoon Creek Region. The Pennsylvania Natural Diversity Index (PNDI) uses abbreviations for the status of species. For simplicity's sake, only the acronyms used in this Plan are explained here.

DCNR Plant Status Codes and Definitions[48]

Pennsylvania Endangered (PE) - Plant species which are in danger of extinction throughout most of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.

Pennsylvania Threatened (PT) - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.

Pennsylvania Rare (PR) - Plant species which are uncommon within this Commonwealth. All species of the native wild plants classified as Disjunct (separated or isolated from others), Endemic (habitat restricted to biologically isolated areas), Limit of Range and Restricted are included within the Pennsylvania Rare classification.

Tentatively Undetermined (TU) - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.
No current legal status (N) - Plant species under review for future listing.

[47] Pennsylvania Natural Heritage Program, available at http://www.naturalheritage.state.pa.us/; accessed 7/1/2014.
[48] PA Natural Heritage Program, DCNR Plant Status Codes and Definitions, available at http://www.naturalheritage.state.pa.us/RankStatusDef.aspx; accessed 11/2/2014.

NatureServe Rankings[49]

More thorough definitions and explanations of NatureServe's rankings of threatened species and ecosystems are available at http://www.natureserve.org/conservation-tools/conservation-status-assessment.

***Global Rank:**

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100 sightings.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

†State Rank:

SU = Possibly in peril in state but status uncertain; need more information.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

PA Game Commission Wild Birds and Mammals Status Codes and Definitions[50]

Pennsylvania Endangered (PE) - Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate.

Pennsylvania Threatened (PT) - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated.

[49] PA Natural Heritage Program, NatureServe Rankings, available at http://www.naturalheritage.state.pa.us/RankStatusDef.aspx; accessed 11/2/2014.
[50] PA Natural Heritage Program, PA Game Commission Status Codes and Definitions, available at: http://www.naturalheritage.state.pa.us/RankStatusDef.aspx; accessed 11/2/2014.

PA Fish & Boat Commission Fish, Amphibians, Reptiles, and Aquatic Organisms Status Codes and Definitions[51]

Pennsylvania Endangered (PE) - 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.

Pennsylvania Threatened (PT) - 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.

Table 5.3: Butterfly and Moth Species of Concern in the 20D Raccoon Creek Region[52]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
Falcate Orangetip	*Anthocharis midea*	G4G5	S3			2010
Silvery Checkerspot	*Chlosyne nycteis*	G5	S3S4			2010
Royal Walnut Moth; Hickory Horned Devil	*Citheronia regalis*	G5	SU			2004
Harvester	*Feniseca tarquinius*	G4	S3			2006
Leonard's Skipper	*Hesperia leonardus*	G4	S3			2007
West Virginia White	*Pieris virginiensis*	G3?	S2S3			2013
Gray Comma	*Polygonia progne*	G4G5	S3			2011
Coral Hairstreak	*Satyrium titus*	G4G5	S3			2010
*Regal Fritillary	*Speyeria idalia*	G3	S1			1974

***Species listed in pale blue were at one time present in the Raccoon Creek Region but are now locally extinct (extirpated).**

[51] PA Natural Heritage Program, PA Fish & Boat Commission Codes, available at http://www.naturalheritage.state.pa.us/RankStatusDef.aspx; accessed 11/2/2014.
[52] Pennsylvania Natural Heritage Program Database, accessed October 2014.

Table 5.4: Plant Species of Concern in the 20D Raccoon Creek Region[53]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
*Roundleaf Serviceberry	*Amelanchier sanguinea*	G5	S2	TU	PE	1924
Great Indian-plantain	*Arnoglossum reniforme*	G4	S1	N	PE	1946
Blue False-indigo	*Baptisia australis*	G5	S2	N	PT	1951
Sedge	*Carex shortiana*	G5	S3	N	PR	2012
Cattail Sedge	*Carex typhina*	G5	S2	PE	PT	1924
Vase-vine Leather-flower	*Clematis viorna*	G5	S1	PE	PE	2012
Smartweed Dodder	*Cuscuta polygonorum*	G5	S2	TU	PT	1962
Tall Larkspur	*Delphinium exaltatum*	G3	S1	PE	PE	1963
Tall Tick-trefoil	*Desmodium glabellum*	G5	S1	TU	PE	1974
Four-angled Spike-rush	*Eleocharis quadrangulata*	G4	S1	PE	PE	1951
White Trout-lily	*Erythronium albidum*	G5	S3	N	TU	2014
Purple Rocket	*Iodanthus pinnatifidus*	G5	S1	PE	PE	2013
Torrey's Rush	*Juncus torreyi*	G5	S3	PT	PR	1993
Oblique Milkvine	*Matelea obliqua*	G4?	S1	PE	PE	1933
Heartleaf Meehania	*Meehania cordata*	G5	S1	TU	PE	2006
Prickly-pear Cactus	*Opuntia humifusa*	G5	S3	PR	PR	1943
Beard-tongue	*Penstemon laevigatus*	G5	S3	N	TU	1954
Tennessee Pondweed	*Potamogeton tennesseensis*	G2	S1	PE	PE	1952
Yellow Water-crowfoot	*Ranunculus flabellaris*	G5	S2	N	PT	2013
Meadow Rose	*Rosa blanda*	G5	SU	N	TU	1952
Virginia Rose	*Rosa virginiana*	G5	S1	TU	TU	1951
Carolina Willow	*Salix caroliniana*	G5	S1	N	PE	1908
Stalked Bulrush	*Scirpus pedicellatus*	G4	S1	PT	PT	1993
Hairy Heart-leaved Aster	*Symphyotrichum drummondii*	G5	S1	N	PE	2010
White Heath Aster	*Symphyotrichum ericoides*	G5	S3	TU	PT	1924
Declined Trillium	*Trillium flexipes x erectum*	G5	S2	TU	PT	2012
Snow Trillium	*Trillium nivale*	G4	S3	PR	PR	2013

***Species listed in pale blue were at one time present in the Raccoon Creek Region but are now locally extinct (extirpated).**

[53] Pennsylvania Natural Heritage Program Database, accessed October 2014.

Table 5.5: Bird Species of Conservation Concern in the 20D Raccoon Creek Region[54]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
Great Blue Heron	*Ardea herodias*	G5	S3S4B,S4N			2013
Short-eared Owl	*Asio flammeus*	G5	S1B,S3N	PE	PE	2001
Northern Harrier	*Circus cyaneus*	G5	S2B,S4N	PT	PT	2012
Bald Eagle	*Haliaeetus leucocephalus*	G5	S3B	DL	PT	2014
Osprey	*Pandion haliaetus*	G5	S3B	PT	PT	2011
Pied-billed Grebe	*Podilymbus podiceps*	G5	S3B,S4N		CR	2005
Sora	*Porzana carolina*	G5	S3B		CR	2012
*Appalachian Bewick's Wren	*Thryomanes bewickii altus*	G5T2Q	SH		PX	1924
Barn Owl	*Tyto alba*	G5	S2S3B,S2S3N		CA	1986

Table 5.6: Reptile Species of Conservation Concern in the 20D Raccoon Creek Region[55] [56]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
Wood Turtle	*Glyptemys insculpta*	G3	S3S4			2013
Queen Snake	*Regina septemvittata*	G5	S3			2013

Table 5.7: Fish Species of Conservation Concern in the 20D Raccoon Creek Region[57] [58]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
Black Bullhead	Ameiurus melas	G5	S1	PE	PE	1983
Bluebreast Darter	Etheostoma camurum	G4	S4	PT	PT	1997
Longear Sunfish	Lepomis megalotis	G5	S1	PE	PE	1984
Silver Chub	Macrhybopsis storeriana	G5	S3S4		DL	1986
River Redhorse	Moxostoma carinatum	G4	S3S4		DL	1984
Southern Redbelly Dace	Phoxinus erythrogaster	G5	S1	PT	PT	2014

*** Species listed in pale blue were at one time present in the Raccoon Creek Region but are now locally extinct (extirpated).**

[54] Pennsylvania Natural Heritage Program Database, accessed October 2014.
[55] PAFBC Species Impact Review #42038, Christopher A. Urban, Chief, Natural Diversity Section; letter dated 2/26/2014.
[56] Pennsylvania Natural Heritage Program Database, accessed October 2014.
[57] PAFBC Species Impact Review #42038, Christopher A. Urban, Chief, Natural Diversity Section; letter dated 2/26/2014.
[58] Pennsylvania Natural Heritage Program Database, accessed October 2014.

Table 5.8: Mussel Species of Conservation Concern for the 20D Raccoon Creek Region[59] [60]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
*Purple Wartyback	*Cyclonaias tuberculata*	G5	SX		PX	before 1919
Fanshell	*Cyprogenia stegaria*	G1Q	SX		PX	before 1919
Butterfly Mussel	*Ellipsaria lineolata*	G4G5	S1S2		CU	1908
Elephant Ear	*Elliptio crassidens*	G5	SX		CU	1908
Snuffbox	*Epioblasma triquetra*	G3	S1	PE	PE	before 1919
Wabash Pigtoe	*Fusconaia flava*	G5	S2		PE	1907
Long-solid	*Fusconaia subrotunda*	G3	S1		PE	before 1919
Pink Mucket	*Lampsilis abrupta*	G2	SX		PX	1908
Fragile Papershell	*Leptodea fragilis*	G5	S2		CR	2005
Threehorn Wartyback	*Obliquaria reflexa*	G5	SH		PX	2005
Hickorynut	*Obovaria olivaria*	G4	SX		PX	1908
Ring Pink	*Obovaria retusa*	G1	SX		PX	1908
Orange-foot Pimpleback	*Plethobasus cooperianus*	G1	SX		PX	1908
Sheepnose Mussel	*Plethobasus cyphyus*	G3	S1	PT	PE	before 1919
Clubshell	*Pleurobema clava*	G1G2	S1S2	PE	PE	before 1919
Ohio Pigtoe	*Pleurobema cordatum*	G4	S1		PE	1908
Rough Pigtoe	*Pleurobema plenum*	G1	SX		PX	before 1919
Pyramid Pigtoe	*Pleurobema rubrum*	G2G3	SX		PX	before 1919
Pink Heelsplitter	*Potamilus alatus*	G5	S2		CR	2005
Rabbitsfoot	*Quadrula cylindrica*	G3G4	S1	PE	PE	before 1919
Monkeyface	*Quadrula metanevra*	G4	SX		PX	1908
Pimpleback	*Quadrula pustulosa*	G5	S1		PX	1908
Mapleleaf	*Quadrula quadrula*	G5	S1S2		PT	2005
Pistolgrip Mussel	*Quadrula verrucosa*	G4G5	S1	PE	PE	before 1919
Fawnsfoot	*Truncilla donaciformis*	G5	S1		CU	2005
Deertoe	*Truncilla truncata*	G5	S1		PX	1908
Paper Pondshell	*Utterbackia imbecillis*	G5	S3S4		CU	2005

* **Species listed in pale blue were at one time present in the Raccoon Creek Region but are now locally extinct (extirpated).**

[59] PAFBC Species Impact Review #42038, C. A. Urban, Chief, Natural Diversity Section; letter dated 2/26/2014.
[60] Pennsylvania Natural Heritage Program Database, accessed October 2014.

According to the PA Fish and Boat Commission (PFBC), freshwater mussels are the most imperiled taxonomic group in North America. Nearly 20% of the species historically known to occur in Pennsylvania are now extirpated (locally extinct). Additionally, 60% of Pennsylvania's remaining mussel species are of conservation concern. According to mussel experts, many of the remaining mussel species are of such limited distribution and abundance that they too should be listed as threatened or endangered, at least at the state level. The status of freshwater mussel species of Pennsylvania is currently under review.

Table 5.9: Dragonfly, Damselfly, and Other Aquatic Invertebrate Species of Conservation Concern in the 20D Raccoon Creek Region[61]

Common Name	Scientific Name	Global Conservation Rank	State Conservation Rank	PA Legal Status	PA Proposed Status	Last Observed Date
Blue-tipped Dancer	*Argia tibialis*	G5	S2			2013
Dusky Dancer	*Argia translata*	G5	S3S4			2013
Arrowhead Spiketail	*Cordulegaster obliqua*	G4	S3			2013
Rapids Clubtail	*Gomphus quadricolor*	G3G4	S1S2			2012
Monongahela Blue Crayfish	*Cambarus monongalensis*	G5	S1S2			2013

Table 5.9: PA Game Commission Species PNDI for the 20D Raccoon Creek Region[62]

Common Name	Scientific Name	Pennsylvania Status
Short-eared Owl	*Asio flammeus*	Endangered
Osprey	*Pandion haliaetus*	Threatened
Northern Harrier	*Circus Cyaneus*	Threatened
Pied-billed Grebe	*Podilymbus podiceps*	Special Concern
Great Blue Heron	*Ardea herodias*	Special Concern
Prothonotary Warbler	*Protonotaria citrea*	Special Concern

Invasive (non-native) Plants, Animals and Microbes

Assistance with the following sections describing Invasive Plants, Invasive Animals and Invasive Microbes was contributed by Shane Miller, Environmental Education Specialist for Raccoon Creek State Park and Hillman State Park. References cited appear at the end of the discussion; others are footnoted.

Non-native species described in this text are labeled as invasive species "of concern to the Raccoon Creek Region." Many are already present within the study area; some are likely to be

[61] Pennsylvania Natural Heritage Program Database, accessed October 2014.
[62] PAGC Large Project PNDI Review, Olivia N. Mowery, Environmental Planner, Bureau of Wildlife Habitat Management; letter dated 2/5/2014.

found here in the future; therefore, all are species of concern from a biological and economic standpoint.

Overview of Invasive Species

The movement of species by humans into new areas can be beneficial (good), benign (harmless), or detrimental (harmful). To understand invasive species, we will briefly discuss the definition, characteristics, detrimental attributes, transport routes and management of invasive species. The last section will discuss in detail noteworthy invasive species within and nearby the 20D Raccoon Creek Watershed Region.

Figure 5.27: Brown Marmorated Stink Bug. Photo by Steven Jacobs, the Pennsylvania State University.

Definition of Invasive Species

Invasive species are microbes, plants and animals that are non-native to an ecosystem, and their presence is detrimental to the environment, economy, or to human health. The key to understanding this definition is the word "non-native." A non-native is any organism found outside of its original range and habitat. Importation of species in North America began at the time of European colonization. Today, we have nearly 50,000 non-native species within the U.S.[63] It is important to note that only a small fraction of those non-native species have become detrimental, but the damage they cause and the cost to control them are around $120 billion per year in the U.S. [64]

Characteristics of Invasive Species

Why do only a small fraction of non-native species become detrimental? It is because only a few are able to survive and even fewer are able to reproduce and spread. Additionally, the lack of significant natural controls (diseases, parasites, herbivores and/or predators) plays an important role in maximizing their survival, reproduction and spread.

Detrimental Attributes of Invasive Species

Invasive species have far-reaching influences in many aspects of our society. Their detrimental effects fall into three categories: environmental, economic and human.

Environmental problems occur when an invasive species degrades a natural area. Examples of this include Japanese Knotweed, Purple Loosestrife, and Tree-of-Heaven, Feral Pig, Hemlock

[63] Pimentel, D., L. Lach, R. Zuniga, and D. Morrison. 2000. Environmental and economic costs of nonindigenous species in the United States. BioScience 50:53-65.
[64] Pimentel, D., Zuniga, R., and D. Morrison. 2005. Update on the environmental and economic cost associated with alien-invasive species in the United States. Ecological Economics 52. pp 273-288.

Woolly Adelgid and Emerald Ash Borer. Each of these invasive species changes the natural area it invades, causing native microbes, plants, and/ or animals to decrease in number and diversity, leading to changes in the food web. In some circumstances, native species may become extirpated from an area.

Economic problems arise when invasive species increase the cost of operating a business or maintaining property. For example, Zebra Mussel and Quagga Mussel raise the cost of operating water treatment plants and power plants by clogging up water intake pipes. Emerald Ash Borer and Dutch Elm Disease have cost home owners, municipal governments and power companies millions of dollars to remove dead Ash and Elm trees to prevent property damage and downed power lines.

Human health problems happen on a smaller scale than economic or environmental problems. Giant Hogweed and West Nile Virus are two invasive species that can affect human health. Giant Hogweed causes painful blisters when sap comes in contact with skin and possible blindness if sap comes in contact with eyes. West Nile Virus is a mosquito-borne viral disease that can cause encephalitis and meningitis.

Transport Routes

Invasive species have two transport routes: intentional and unintentional introductions. Many plant and animal species were intentionally transported for human survival or to improve everyday life while others were brought for aesthetic reasons or to remind settlers or immigrants of home. Historically, and even today, many invasive species are stowaways in items shipped to the United States and are unintentionally transported into new areas.

Management of Invasive Species

An Integrated Pest Management (IMP) approach is utilized to deal with the growing problem of invasive species. IPM selects the appropriate method or methods to deal with a specific invasive species in an area, and at the same time, it minimizes the cost and harmful effects to people and the environment. IPM control methods fall into four categories:

Physical Controls are any activity in which an invasive plant or animal is physically removed. Common methods are mowing, weed wrenching, hand pulling, cutting, digging, weed-whacking and trapping.

Chemical Controls are pesticides (fungicides, herbicides, insecticides, bactericides, etc.) that are applied to destroy invasive species.

Biological Controls are organisms such as a microbe, an herbivore (a plant-eating animal), or a predator found in the invasive species' original habitat. Introduction of these organisms can reduce the population of a specific invasive species. However, care must be taken to select biological controls that will not, in themselves, become a problem.

Cultural Management modifies an infested area so the survival rate or the spread of an invasive species is decreased. Examples of this include changing water levels, conducting controlled burns, rotating crops and/or selecting disease resistant crops.

How you can help control invasive species

Everyone can help to control the spread of invasive species! A few simple things are:

- Use native plants in landscaping
- Do not release exotic pets (fish, snakes, birds, turtles or other animals) into the wild
- Buy locally-harvested firewood
- Eliminate water from decoys, boats, motors & other equipment at the site rather than at home.
- Do not release live bait fish; do not move life fish from one water body to another

Invasive Animals, Terrestrial & Aquatic, of Concern to the Raccoon Creek Region

Table 5.10: Noteworthy Invasive Animals of Concern to the 20D Raccoon Creek Region

The letters in superscript, following each common name, denote the government agency or organization that recognizes specific invasive species. The superscript agency/organization codes used are as follows:

U for United State Department of Agriculture,
F for Pennsylvania Fish and Boat Commission,
D for Pennsylvania Department of Conservation and Natural Resources,
N for National Park Service & United States Fish and Wildlife,
H for Pennsylvania Natural Heritage Program, and
P for Pennsylvania Invasive Species Council.

Figure 5.28: Color variations of the Multicolored Asian Ladybird Beetle. Photo by Purdue University.

Figure 5.29: Emerald Ash Borer galleries-tunnels carved by larvae through the ash tree's vascular system, resulting in death of the tree. 5/24/2012

Table 5.10: Noteworthy Invasive Animals of Concern to the 20D Raccoon Creek Region

Invasive Animal-Common Name	Species (scientific name)
Asian Carps (Bighead Carp, Black Carp, Grass Carp, & Silver Carp) [U,F,P]	*Hypophthalmichthys nobilis, Mylopharyngodon piceus, Ctenopharyngodon idella and Hypophthalmichthys molitrix*
Asian Clam [U,F,H,P]	*Corbicula fluminea*
Asian Long-Horned Beetle [U,P]	*Anoplophora glabripennis*
Brown Marmorated Stink Bug [U,P]	*Halyomorpha halys*
Common Pine Shoot Beetle [U,H,P]	*Tomicus piniperda*
Emerald Ash Borer [U,H,P]	*Agrilus planipennis*
European Rudd [F,P]	*Scardinius erythropthalmus*
European Starling [U,H,P]	*Sturnus vulgaris*
Feral Cat [H]	*Felis catus*
Feral Swine [U,H,P]	*Sus scrofa*
Gypsy Moth [U,H,P]	*Lymantria dispar*
Hemlock Woolly Adelgid [U,H,P]	*Adelges tsugae*
House Mouse [H,P]	*Mus musculus*
House Sparrow [H,P]	*Passer domesticus*
Kudzu Bug [U]	*Megacopta cribraria*
Multicolored Asian Ladybird Beetle [H]	*Harmonia axyridis*
Mute Swan [H,P]	*Cygnus olor*
New Zealand Mudsnail [U]	*Potamopyrgus antipodarum*
Norway Rat [H,P]	*Rattus norvegicus*
Nutria [U,P]	*Myocastor coypus*
Quagga mussel [U,F,H,P]	*Dreissena bugensis*
Red-Eared Slider [F,P]	*Trachemys scripta elegans*
Rusty Crayfish [U,F,H,P]	*Orconectes rusticus*
Sirex Woodwasp [U,H,P]	*Sirex noctilio*
Spiny Waterflea [U,F,P]	*Bythotrephes longimanus*
Viburnum Leaf Beetle [H]	*Pyrrhalta viburni*
Zebra Mussel [U,F,H,P]	*Dreissena polymorpha*

Descriptions of Invasive Animals of Concern to the Raccoon Creek Region

Asian Carps

- **Bighead Carp *(Hypophthalmichthys nobilis)***
  Freshwater fish introduced in 1972 to improve water quality in fish production ponds in Arkansas. Originated China. More research is needed to determine the effects of this species. Bighead Carp feed on plankton; they may negatively affect native species of larval fish, native mussels and several species of adult fish who feed on plankton.

- **Black Carp (*Mylopharyngodon piceus)***
  Freshwater fish introduced accidently in the 1970s in shipments of Grass Carp. Originated in China. In the 1980s it was produced intentionally as a food fish and biological control agent for Yellow Grub in aquaculture facilities. Black Carp feed on snails and mussels. They have the potential to reduce the abundance and biodiversity of native mussels and snails, many of which are already threatened and endangered.

- **Grass Carp (*Ctenopharyngodon idella)***
  Freshwater fish introduced as a biological control agent for vegetation at aquaculture facilities in Alabama and Arkansas during 1963. This species originated in China. Grass Carp decrease the abundance and biodiversity of aquatic plants, decrease refugia for fish, impede native fish reproduction, change the abundance of phytoplankton and invertebrates in aquatic communities, and compete with invertebrates and other fish for food.

- **Silver Carp (*Hypophthalmichthys molitrix)***
  Freshwater fish used as food; introduced to control phytoplankton in eutrophic water bodies (rich in organic and mineral nutrients; supporting abundant plant life). It was imported in 1973 to Arkansas. It originated from China. Silver Carp have the potential to decrease numbers and biodiversity of native fish species because they feed on plankton, which is the same food source for larval fish. They may also pose a threat to native mussels.

Asian Clam *(Corbicula fluminea)*

Freshwater clam introduced in 1924 as a food source by immigrants along the U.S. west coast; originated in southeast Asia and Africa. Asian Clams compete with native mussels, larval fish and other plankton-feeders. Consequently, abundance and biodiversity of these native species have started to decrease. Asian Clams damage boat motors and clog intake systems for power plants and water treatment plants.

Asian Long-horned Beetle *(Anoplophora glabripennis)*

Wood-boring beetle native to Asia; introduced accidently from cargo shipped from Asia. In 1996, the first population of breeding individuals was documented in New York. Asian Long-horned Beetles feed on maples, birches, elms, buckeyes and willows, all of which play paramount roles with our native animal and fungus species. Their feeding habits kill infected

trees within a few years. This insect poses a significant threat to timber production, nursery trade and maple syrup production.

Brown Marmorated Stink Bug *(Halyomorpha halys)*
Insect introduced accidently to U.S. via packing materials. First documented in Allentown, PA in 1996; originated in Asia. Brown Marmorated Stink Bugs feed on fruit and vegetable crops, causing major economic damage through unmarketable produce. They also become a nuisance by invading and reproducing in residential living spaces.

Common Pine Shoot Beetle *(Tomicus piniperda)*
Bark and wood-boring beetle introduced accidently from packing materials. First documented in northern Ohio in 1992; originated in Eurasia and northern Africa. Common Pine Shoot Beetles are able to damage and kill pine trees in certain locations, but more research is needed to ascertain the destructive potential of this species.

Emerald Ash Borer *(Agrilus planipennis)*
Wood-boring insect introduced accidently during 1992 from wood packing materials; originated in Asia. Emerald Ash Borer feeds on the sapwood of ash trees, generally killing infected trees within 3 to 4 years. This insect causes significant mortality among ash trees in street, landscape and woodland settings, resulting in costly removal of dead and dying trees to prevent damage to utility lines, structures and roadways. Ash is one of our most popular shade trees; ash wood is an important commercial lumber used to make baseball bats and tool handles.

European Grapevine Moth *(Lobesia botrana)*
Moth first documented in 2009 in California. Manner of introduction unknown; originated in Italy. European Grapevine Moth larvae feed on both flowers and fruit of grapes, leading to secondary infections which make the grapes unusable for fresh marketing or processing into raisins or wine.

European Rudd *(Scardinius erythropthalmus)*
Freshwater fish introduced accidently in the early 1990s from bait bucket releases. This species originated in Europe. European Rudd degrades habitat for muskellunge, yellow perch and northern pike by eating the aquatic plants near the shore, reducing available habitat for spawning and shelter for juvenile fish.

European Starling *(Sturnus vulgaris)*
Cavity-nesting bird imported in the 1890s by a New York City group who sought to introduce non-native birds that were mentioned in Shakespeare's writings. European Starlings originated in Eurasia. Compete with native birds for food and habitat; are known to destroy crops.

Feral and Free-range Cat *(Felis catus)*
Domesticated carnivorous mammal first introduced by European settlers as pets and to control rodent populations during early colonization of North America. This species originated in the Middle East. Feral and free-range cats pose a significant threat to native birds, reptiles,

amphibians and small mammals by their hunting habits. Even when feral and free-range cats are fed, they often continue to hunt wildlife.

Feral Swine *(Sus scrofa)*
Omnivorous mammal introduced as a source of food during the 1500s. Dominant individuals escaped. This species originated in Eurasia. Rooting and wallowing behaviors ruin crops and destroy native vegetation. Feral swine carry and transmit several significant diseases (swine brucellosis, E. coli, trichinosis, and pseudorabies) to livestock and/or humans.

Gypsy Moth *(Lymantria dispar)*
Moth introduced to aid U.S. silk production; escaped in 1869; originated in Europe. Gypsy Moths have killed millions of trees by defoliation. Prefers oak trees, but will also feed on aspen, basswood, birch, hemlock, larch, pine, spruce, alder and apple.

Hemlock Woolly Adelgid *(Adelges tsugae)*
Sap-sucking insect introduced accidently on nursery stock in 1950s in Virginia; originated in Japan. Hemlock Woolly Adelgid sucks the sap from young branches, resulting in tree mortality. Within the past few decades, Hemlock Woolly Adelgid has killed millions of Eastern Hemlocks and has changed the forest structure of the eastern U.S.

House Mouse *(Mus musculus)*
Rodent introduced accidently as Europeans began exploring and colonializing North America during the 1600s; originated in central Asia. House mice consume and contaminate stored human and livestock foods; damage crops such as grains, corn and legumes; damage home and automobile wiring; and transmit diseases such as leptospirosis, plague, salmonella, lymphocytic choriomeningitis and toxoplasmosis to humans, pets and livestock.

House Sparrow *(Passer domesticus)*
Small bird introduced in the 1850s to reduce insect pests and to remind European immigrants of home; originated in Eurasia and northern Africa. House Sparrows compete with native birds for nesting sites and food which may lead to reduced numbers of native birds.

Kudzu Bug *(Megacopta cribraria)*
Insect first documented in Georgia in 2009. Method of introduction is unknown; originated in Asia. Kudzu bugs eat kudzu, soybeans and other legumes produced in agriculture which may lead to large crop reductions in the near future.

Multicolored Asian Ladybird Beetle *(Harmonia axyridis)*
Beetle introduced in 1916 as a biological control for harmful insects in agricultural settings; however, the first documented population was not found in the U.S. until 1988; originated in Asia. Multicolored Asian Ladybird Beetles have become a nuisance by infesting our homes by the hundreds or thousands as winter approaches. On warm days during the winter and spring they emerge and make their presence known.

Mute Swan *(Cygnus olor)*
Swan introduced in the late 1800s to add beauty and elegance to an area; originated in Eurasia. Mute Swans displace native wildlife and destroy native aquatic and wetland vegetation.

New Zealand Mudsnail *(Potamopyrgus antipodarum)*
Snail first documented in 1987 in Idaho; may have been introduced via ballast water or on imported game fish; originated in New Zealand. May pose a risk to native invertebrates through displacement and resource competition; more research is needed to understand their detrimental aspects.

Norway Rat *(Rattus norvegicus)*
Rodent introduced accidently during the 1700s on ships arriving to the colonies; originated in Asia. Norway rats contaminate food supplies and are vectors for several highly detrimental diseases of humans and livestock.

Nutria *(Myocastor coypus)*
Rodent introduced in 1899 for commercial fur production. Later, some escaped and others were released into the wild; originated in South America. Nutria are voracious herbivores that consume native vegetation, severely degrading wetland habitats.

Quagga mussel *(Dreissena bugensis)*
Mussel introduced accidently through ballast water on ships in late 1980s; originated in the Ukraine. Quagga mussels clog intake pipes for water treatment plants, power plants and other industrial facilities. They also remove plankton and modify the foodweb. Species depending on plankton and plankton feeders are negatively affected.

Red-eared Slider *(Trachemys scripta elegans)*
Turtle introduced post-1930s by the pet trade; originated in central and south-central U.S. New populations developed outside the natural range after pet emancipations and escapes. In PA, Red-eared Slider is an aquatic invasive species that competes with native turtles for food, basking sites and nesting sites. More research is needed to determine how damaging this species may be.

Rusty Crayfish *(Orconectes rusticus)*
Crayfish introduced accidently by bait bucket releases; was first documented outside of its range in the 1960s; originated in the lower Ohio River drainage basin of western Ohio, Indiana and Kentucky. Rusty Crayfish compete with native crayfish species, reducing their number and diversity.

Sirex Woodwasp *(Sirex noctilio)*
Insect introduced accidently on wood products imported to the U.S. First documented in New York in 2004; originated in Eurasia. Is a serious threat to many species of pines. When the female Sirex Woodwasp lays eggs inside a pine tree, it also infects the tree with a fungus, *Amylostereum aveolatum,* which kills the tree. This species has the potential to cause economic loss on pine plantations and ecological harm in pine forests.

Spiny Waterflea *(Bythotrephes longimanus)*
Small crustacean introduced accidently in 1984 to the Great Lakes from dumping of ballast water; originated in Europe. Spiny Waterflea decreases zooplankton populations. They may compete with perch and with other small crustaceans for resources.

Viburnum Leaf Beetle *(Pyrrhalta viburni)*
Beetle introduced accidently to Canada in 1978; has recently spread to PA; originated in Eurasia. Viburnum Leaf Beetle feeds on several native and non-native species of viburnum. If multiple consecutive defoliations occur over a 2-3 year period, the viburnum will die. Viburnum decline may negatively affect birds and other wildlife that use the fruits as food.

Zebra Mussel *(Dreissena polymorpha)*
Mussel introduced accidently in 1988 from dumping of ship ballast water; originated in Eurasia. Zebra Mussels cover boat hulls, clog intake pipes for industry, power plants and water treatment plants; decrease native populations of mussels and alter fisheries. The economic impact of Zebra Mussel damage in the near future will be considerable.

Invasive Plants of Concern to the Raccoon Creek Region

Table 5.11: Noteworthy Invasive Plants of Concern to the 20D Raccoon Creek Region
The letters in superscript, following the common name of each invasive plant, denote the government agency or organization that recognizes specific invasive species. The superscript agency/organization code is:

- **U** for United State Department of Agriculture
- **F** for Pennsylvania Fish and Boat Commission
- **D** for Pennsylvania Department of Conservation and Natural Resources
- **N** for National Park Service & United States Fish and Wildlife Service
- **H** for Pennsylvania Natural Heritage Program and
- **P** for Pennsylvania Invasive Species Council.

Invasive Plant - Common Name	Species (scientific name)
Autumn Olive [U,D,H,N]	*Elaeagnus umbellata*
Brazilian waterweed [U,P]	*Egeria densa*
Bull Thistles [D,H]	*Cirsium vulgare*
Bush Honeysuckles [D,H,N]	*Lonicera tatarica, L. morrowii, L. x bella,* and *L. maackii*
Callery Pear [D,N]	*Pyrus calleryana*
Canada Thistle [U,D,H,N,P]	*Cirsium arvense*
Cheatgrass [U,D]	*Bromus tectorum*

Invasive Plants of Concern to the Raccoon Creek Region *(continued)*	
Common Buckthorns [U,D]	*Rhamnus cathartica*
Common Daylily [N]	*Hemerocallis fulva*
Creeping Euonymus [D,N]	*Euonymus fortunei*
Curly Pondweed [D,H,P]	*Potamogeton crispus*
Dame's Rocket [D,N]	*Hesperis matronalis*
English Ivy [D,N]	*Hedera helix*
Eurasian Watermilfoil [U,F,D,H,N,P]	*Myriophyllum spicatum*
Garlic Mustard [U,D,H,N,P]	*Alliaria petiolata*
Giant Hogweed [U,D,P]	*Heracleum mantegazzianum*
Giant Knotweed [D,H,P]	*Polygonum sachalinense*
Glossy Buckthorn [D]	*Rhamnus frangula*
Goatsrue [D,P]	*Galega officinalis*
Hydrilla [U,F,D,N,P]	*Hydrilla verticillata*
Japanese Angelica Tree [D]	*Aralia elata*
Japanese Barberry [U,D,H,N]	*Berberis thunbergii*
Japanese Honeysuckle [U,D,H,N]	*Lonicera japonica*
Japanese Hop [D,N,P]	*Humulus japonicus*
Japanese Knotweed [U,D,H,N,P]	*Polygonum cuspidatum*
Japanese Spiraea [U,D,N]	*Spiraea japonica*
Japanese Stiltgrass [U,D,N]	*Microstegium vimineum*
Jetbead [D,H]	*Rhodotypos scandens*
Jimsonweed [D]	*Datura stramonium*
Kudzu [U,D,N,P]	*Pueraria lobata*
Lesser Celandine [D]	*Ranunculus ficaria*
Mile-a-minute [U,D,H,N,P]	*Polygonum perfoliatum*
Moneywort [D]	*Lysimachia nummularia*
Multiflora Rose [U,D,H,N,P]	*Rosa multiflora*
Narrow-Leaved Cattail [D,P]	*Typha angustifolia*
Nodding Musk Thistle [U,D,H]	*Carduus nutans*
Norway Maple [U,D,N]	*Acer platanoides*
Oriental Bittersweet [U,D,H,N,P]	*Celastrus orbiculatus*
Parrot Feather Watermilfoil [D,N,P]	*Myriophyllum aquaticum*
Phragmites or Common Reed [U,D,H,N,P]	*Phragmites australis*

Invasive Plants of Concern to the Raccoon Creek Region *(continued)*	
Poison Hemlock [D]	*Conium maculatum*
Porcelainberry [D,N]	*Ampelopsis brevipedunculata*
Poverty Brome [D]	*Bromus sterilis*
Privets [D,H,N]	*Ligustrum japonicum, L. obtusifolium, L. sinense, and L. vulgare.*
Purple Loosestrife [U,F,D,H,N,P]	*Lythrum salicaria*
Shrubby bushclover [D]	*Lespedeza bicolor*
Spotted Knapweed [U,D,H,N]	*Centaurea stoebe*
Star-of Bethlehem [D,N]	*Ornithogalum nutans/ O. umbellatum*
Tree-of-heaven [U,D,H,N,P]	*Ailanthus altissima*
Water Chestnut [U,D,N,P]	*Trapa natans*
Water Hyacinth [U]	*Eichhornia crassipes*
Water Lettuce [U]	*Pistia stratiotes*
Winged Burning Bush [D,H,N]	*Euonymus alatus*

Descriptions of Invasive Plants of Concern to the Raccoon Creek Region

Autumn Olive *(Elaeagnus umbellata)*

Deciduous shrub with highly fragrant flowers introduced in the 1830s. It was imported for landscaping and wildlife habitat enhancement. It originated in East Asia. Autumn Olive prevents succession by choking out native shrubs and smaller plants, preventing sapling germination.

Brazilian Waterweed *(Egeria densa)*

Aquatic plant likely introduced by the aquarium trade and research profession. First documented in 1893, but introduction was likely before this time. It originated in South America. It forms large masses in waterways that interfere with water recreation activities. Brazilian Waterweed also displaces native aquatic plants.

Bull Thistle *(Cirsium vulgare)*

Spiny biennial forb introduced during colonial times. It originated in Europe, western Asia and Northern Africa. Bull Thistle forms large stands that choke out native vegetation. It is unpalatable to wildlife and livestock.

Bush Honeysuckles *(Lonicera tatarica, L. morrowii, L. x bella, and L. maackii)*

Deciduous shrubs introduced for use in landscaping, to enhance wildlife habitat, and/or erosion control during the 1800s. They originated in Japan, Europe, and Asia. Bush Honeysuckles displace native shrubs and smaller vegetation. Their berries are a poor nutritional source for birds when compared to native shrubs' berries.

Callery Pear *(Pyrus calleryana)*

Deciduous tree introduced in 1909 for use in landscaping and as root stock for the common fruit-tree pear. It originated in China and Vietnam. Callery Pear forms dense stands that choke out native vegetation. A commonly planted street-tree cultivar is 'Bradford' Pear.

Figure 5.30: Bradford Pear trees in a commercial landscape. 4/22/2014.

Canada Thistle *(Cirsium arvense)*

Herbaceous perennial forb introduced accidently in the 1600s. It originated in Europe and Asia. Canada thistle now grows in about thirty-seven countries around the world and is widespread throughout the United States and Canada. This spiny agricultural weed is considered a noxious weed in 43 states. In natural settings, it forms large dense stands that displace native vegetation in sunny locations. The fine bristles of this plant can irritate the skin if handled or brushed against. Canada thistle's creeping roots can extend up to 17 feet horizontally and 20 feet deep.[65]

Cheatgrass *(Bromus tectorum)*

Annual grass introduced accidently before 1860 from contaminated ship ballast soil and contaminated seeds. It originated in Europe. Cheatgrass forms dense stands that out-compete native vegetation.

Common Buckthorn *(Rhamnus cathartica)*

Deciduous shrub introduced around 1850 for landscaping, wildlife habitat enhancement and farm windbreaks. It originated in Eurasia. Common Buckthorns form dense thickets that choke out native vegetation, stop succession and increase bird predation. They also act as the alternate host of Oat Crown Rust, a disease which decreases quality and quantity of oat yields.

Common Daylily *(Hemerocallis fulva)*

Herbaceous forb originally from Asia, introduced for gardening and landscaping during the late 19th century, has become ubiquitous along PA's roadsides. Also known as Tiger Lily, Common Daylily or Ditch Lily. It produces stands that choke out native vegetation.

Creeping Euonymus *(Euonymus fortunei)*

Evergreen perennial vine introduced in 1907 as a groundcover for landscaping. It originated in Asia. Creeping Euonymus displaces native species along forest margins and at forest openings by growing over and shading out native vegetation. It can climb up to 70 feet, clinging by means of aerial roots.

[65] http://extension.psu.edu/pests/weeds/weed-id/canada-thistle accessed 4/17/2014

Curly Pondweed *(Potamogeton crispus)*
Aquatic plant introduced accidently by the aquarium trade around 1850. It originated in Eurasia, Africa and Australia. Curly Pondweed forms thick mats that displace native aquatic plants and hinder recreational activities.

Dame's Rocket *(Hesperis matronalis)*
Biennial forb introduced for use in landscaping during European colonization of America. It originated in Europe. Dame's Rocket displaces native plants in open habitats.

English Ivy *(Hedera helix)*
Evergreen perennial vine introduced as a groundcover for landscaping in 1727. It originated in Europe, Western Asia and North Africa. English Ivy is detrimental from ground level to the canopy because it chokes out native vegetation from the shade produced as it climbs up other plants. It also carries Bacterial Leaf Scorch, a plant pathogen harmful to many tree species.

Eurasian Watermilfoil *(Myriophyllum spicatum)*
Aquatic plant introduced accidently in the 1940s. It originated in Eurasia and Africa. In disturbed bodies of water, Eurasian Watermilfoil forms dense mats that impede native plants and hinder traffic on waterways.

Garlic Mustard *(Alliaria petiolata)*
Biennial forb introduced by settlers for food and medicine. It was first documented in 1868, but introduction was likely earlier. It originated in Europe. Garlic mustard has played a key role in displacement of native spring wildflowers and the butterfly species that feed on them. The rare West Virginia White Butterfly and Falcate Orange-Tip Butterfly have been harmed by the invasion of Garlic Mustard.

Figure 5.31: Garlic Mustard, *Alliaria petiolata*. White spots on the leaves are flower petals washed down by rain. 5/10/2014.

Giant Hogweed *(Heracleum mantegazzianum)*
Biennial forb introduced for use in landscaping in 1917. It originated in Europe and Asia. Giant Hogweed produces sap that is a health hazard. If the sap comes in contact with skin or eyes when sunlight is present, severe dermatitis and/or blindness can result. Seek medical attention promptly.

Giant Knotweed *(Polygonum sachalinense)*
Herbaceous perennial forb introduced for use in landscaping and erosion control during the late 1800s. It originated in Japan. Giant Knotweed forms dense stands that increase erosion, choke out native vegetation and clog small waterways.

Glossy Buckthorn *(Rhamnus frangula)*

Deciduous shrub introduced for use in landscaping and to enhance wildlife habitat during the 1850s. It originated in Eurasia. Glossy Buckthorn produces thickets that choke out shrubs and smaller native vegetation.

Goatsrue *(Galega officinalis)*

Herbaceous perennial forb introduced as a forage crop during the 1890s, but later determined to be toxic to goats, sheep, and cattle. It originated in Middle East, northern Africa and Europe.

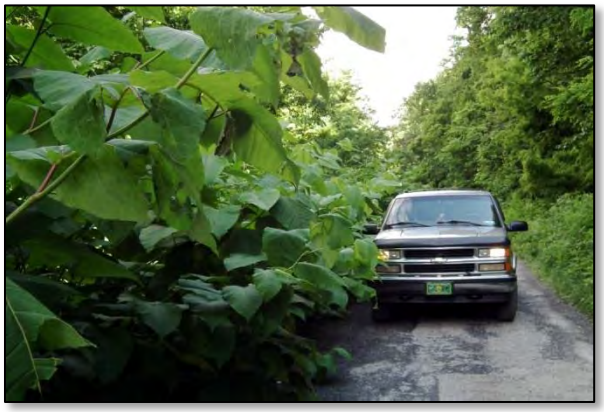


Figure 5.32: Giant knotweed overtaking Dam Road in Greene Township. 6/5/2014.

Hydrilla *(Hydrilla verticillata)*

Aquatic plant introduced by the aquarium trade in the 1960s. It originated in central Africa. Hydrilla fills waterways quickly and chokes out native aquatic plants. It also reduces recreational use of waterways.

Japanese Angelica Tree *(Aralia elata)*

Deciduous tree introduced for use in landscaping in 1830. It originated in Japan, Korea and eastern Russia. Japanese Angelica Tree forms dense stands that choke out native vegetation smaller than itself.

Japanese Barberry *(Berberis thunbergii)*

Deciduous shrub native to Japan. It was introduced in 1875 for landscaping and to replace European Barberry which acted as an alternate host for Black Stem Rust, a fungal disease very destructive to wheat crops. This shrub forms dense thickets that choke out native shrubs and smaller vegetation.

Japanese Honeysuckle *(Lonicera japonica)*

Deciduous perennial vine introduced in 1806 for use in landscaping, to enhance wildlife habitat and provide erosion control. It originated in Eastern Asia. Japanese Honeysuckle covers native plants and smothers them in the shade produced. It can also girdle small trees. It is semi-evergreen or evergreen in the northeast U.S., giving it a constant advantage over native plants.

Figure 5.33: Invasive species such as this Japanese Barberry are easily spotted in early spring, as they bear the only green leaves in the woods. 4/17/2014

Japanese Hop *(Humulus japonicas)*
Annual vine introduced for landscaping and medical purposes in the latter half of the 1800s. It originated in Japan, Korea and eastern China. Japanese Hops covers native plants and smothers them in its shade.

Japanese Knotweed *(Polygonum cuspidatum)*
Herbaceous perennial forb introduced for landscaping and erosion control in the late 1800s. It originated in eastern Asia. Japanese Knotweed forms dense thickets that choke out native vegetation. It is particularly difficult to eradicate because new plants can grow from broken pieces of the rhizomes or winged seeds washed downstream. Japanese Knotweed is present in all but nine of the fifty United States.[66]

Japanese Spiraea *(Spiraea japonica)*
Deciduous shrub introduced for landscaping from 1870 to 1890. It originated in Japan, Korea and China. Japanese Spiraea forms dense thickets that shade out native shrubs and smaller native vegetation. It aggressively invades disturbed areas and forms dense stands that out-compete native species. It often spreads locally when its hardy seeds are transported along watercourses or in fill dirt.

Japanese Stiltgrass *(Microstegium vimineum)*
Annual grass introduced accidently from packing material in 1919. It originated in Japan, Korea, China and India. Japanese Stiltgrass forms dense stands in both shade and sun that choke out native summer and fall vegetation.

Jetbead *(Rhodotypos scandens)*
Deciduous shrub introduced in 1866 for landscaping. It originated in central China, Japan and Korea. Jetbead forms thickets that choke out native shrubs and smaller native vegetation.

Kudzu *(Pueraria lobata)*
Herbaceous perennial vine introduced in the late 1800s for landscaping, livestock feed and erosion control. It originated in Asia. Kudzu covers all vegetation and smothers trees, shrubs, and forbs in the shade produced. It can also girdle trees and shrubs.

Lesser Celandine *(Ranunculus ficaria)*
Herbaceous perennial forb introduced for use in landscaping. Date of introduction is unknown, but it originated in Eurasia. Lesser Celandine grows in thick stands in moist places. It starts growing before other native spring ephemerals which are unable to compete with it. The reduction of native spring ephemerals adversely affects pollinators that depend on these native plants as principle food source.

Mile-A-Minute *(Polygonum perfoliatum)*
Annual vine introduced accidently as a weed in nursery stock during the late 1800s to 1930s. It originated in Philippines. Mile-a-minute covers and smothers native small trees, shrubs and

[66] http://plants.usda.gov/core/profile?symbol=pocu6 accessed 4/17/2014

forbs in its shade. It also grows into trees, lessening light to the forest floor and decreasing plant biodiversity. This plant is a nuisance on tree farms and in crop fields that have limited tilling practices.

Moneywort *(Lysimachia nummularia)*

Annual vine introduced as a groundcover for landscaping. Date of introduction unknown. It originated in Europe and Southwest Asia. Moneywort decreases habitat for native vegetation in wetland areas.

Multiflora Rose *(Rosa multiflora)*

Deciduous shrub introduced in 1866 for use as rootstock. Later, it was widely used as an erosion control agent, living fences for livestock, habitat enhancement agent for wildlife and crash barrier along roadways. It originated in Japan. Multiflora Rose forms dense thickets smothering and choking out native shrubs and smaller vegetation. Leaf litter produced decreases quantity and quality of macro-invertebrates in streams.

Narrow-Leaved Cattail *(Typha angustifolia)*

Herbaceous perennial forb introduced accidently from contaminated ship ballast soil. Date of introduction unknown. It originated in Europe. Narrow-Leaved Cattail spreads quickly in aquatic and wetland areas forming large stands that displace native vegetation almost completely.

Nodding Musk Thistle *(Carduus nutans)*

Biennial forb introduced accidently in the early 1800s. It originated in Europe and Asia. Nodding Musk Thistle forms dense stands displacing native vegetation. The plant is unpalatable to wildlife and livestock.

Norway Maple *(Acer platanoides)*

Deciduous tree introduced for use in landscaping in 1756. It originated in Europe and is one of the most widely planted street and yard trees in the U.S. Norway Maples reduce biodiversity of native wildflowers and native maples.

Oriental Bittersweet *(Celastrus orbiculatus)*

Deciduous perennial vine introduced for use in landscaping and erosion control in the 1860s. It originated from eastern Asia. Oriental Bittersweet girdles trees, covers and smothers native vegetation

Figure 5.34: A young Oriental Bittersweet vine strangles a much older one; the entire mass is heavily entangled in a sassafras tree. 4/10/2014.

from shade produced. It also hybridizes with native bittersweet, polluting native genetic diversity.

Parrot Feather Watermilfoil *(Myriophyllum aquaticum)*
Aquatic plant introduced for aquarium and aquatic landscaping uses during the 1890s. It originated in South America. Parrot Feather Watermilfoil fills waterways quickly and chokes out native aquatic plants, reducing the recreational use of waterways.

Phragmites or Common Reed *(Phragmites australis subsp. australis)*
Perennial grass introduced accidently in contaminated ballast material in the 1800s. It originated in Europe. Phragmites or Common Reed forms large stands in wetlands, destroying wildlife habitat and choking out native vegetation.

Poison Hemlock *(Conium maculatum)*
Biennial forb introduced for use in landscaping in the 1800s. It originated in Europe, West Asia and northern Africa. Poison Hemlock displaces native vegetation at recently disturbed sites. All parts of this plant are poisonous if ingested by humans or livestock.

Porcelainberry *(Ampelopsis brevipedunculata)*
Deciduous woody vine introduced for use in landscaping in the 1870s. It originated in Japan and northern China. Porcelainberry covers and smothers native vegetation from shade produced.

Poverty Brome *(Bromus sterilis)*
Annual grass introduced from Eurasia. Date of introduction unknown. Poverty Brome forms dense stands that out-compete native vegetation.

Privets *(Ligustrum japonicum, L. obtusifolium, L. sinense, and L. vulgare)*
Deciduous or semi-evergreen shrubs introduced for landscaping purposes in the 1860s. These originated in Asia, Japan and Europe. Privets commonly escape from yards and form dense thickets that shade out native shrubs and smaller vegetation in fields and woodlands.

Purple Loosestrife *(Lythrum salicaria)*
Perennial forb introduced intentionally for landscaping and accidently from contaminated ship ballast during the 1800s. It originated in Eurasia. Purple Loosestrife forms dense stands that take over entire wetlands. While considered beautiful by many, this plant impedes nutrient cycling, reduces waterfowl habit, and significantly decreases native plant biodiversity.

Shrubby Bushclover *(Lespedeza bicolor)*
Deciduous shrub introduced to enhance wildlife habitat in the late 1800s. It originated in Asia. Shrubby Bushclover chokes out native shrubs and smaller vegetation in meadows and along forest edges.

Spotted Knapweed *(Centaurea stoebe)*

Herbaceous perennial forb accidently introduced from contaminated ship ballast soil and contaminated alfalfa seeds and clover seeds during the late 1800s. It originated in Europe and western Asia. Spotted Knapweed invades open areas such as meadows, old farm fields and open forests. In these areas, it displaces native vegetation and reduces food for wildlife and foraging animals.

Star-of Bethlehem *(Ornithogalum nutans/ O. umbellatum)*

Herbaceous perennial forb introduced for gardening. Date of introduction unknown. These species originated in north Africa, Europe and Asia. Star-of Bethlehem displaces native spring ephemerals in forested areas.

Tree-of-Heaven *(Ailanthus altissima)*

Deciduous tree introduced to the U.S. for landscaping in 1748. It originated in northeastern and central China. Tree-of-Heaven causes damage to sewer lines, forms stands that choke out native vegetation and releases chemicals from its roots that act like herbicide on surrounding vegetation. Ailanthus grows very rapidly to heights of 75 feet or more, and all parts of tree are foul-smelling. It colonizes disturbed areas before native vegetation can gain a foothold. Tree-of-Heaven was featured in the novel "A Tree Grows in Brooklyn."

Figure 5.35: A dirty duo of invasive plants: tree of heaven and Japanese knotweed. 5/29/2014

Water Chestnut *(Trapa natans)*

Floating aquatic plant introduced for water gardening during the 1800s. It originated in Eurasia and Africa. Water Chestnut forms thick mats that decrease light to aquatic plants, reducing native aquatic vegetation and oxygen production. The decrease in oxygen increases the potential for fish kills. The dense mats formed by Water Chestnut impede water recreation activities and the seeds can cause painful wounds in feet.

Water Hyacinth *(Eichhornia crassipes)*

Floating aquatic plant introduced for water gardening in 1884. It originated in South America. Water Hyacinth forms thick mats that decrease light to aquatic plants, reducing native aquatic vegetation. It also impedes water recreation activities.

Winged Burning Bush *(Euonymus alatus)*
Deciduous shrub introduced for landscaping during the 1860s. It originated in Japan, Central China and northeastern Asia. Winged Burning Bush forms dense thickets that shade out native shrubs and smaller vegetation.

Noxious Weeds of Pennsylvania

Plants listed on Pennsylvania's Noxious Weed Control List are illegal to sell, transport, plant, or propagate within Pennsylvania, except when a permit is obtained from the Secretary of the Pennsylvania Department of Agriculture for research or horticultural use. Modifications to this list are done by members of the Noxious Weed Control Committee when a plant is determined to be injurious to public health, agricultural land, crops, livestock or other property.

Table 5.12: Pennsylvania's Noxious Weed Control List

Noxious Weed-Common Name	Species (scientific name)
Marijuana	*Cannabis sativa*
Musk Thistle	*Carduus nutans*
Canada Thistle	*Cirsium arvense*
Bull Thistle	*Cirsium vulgare*
Jimsonweed	*Datura stramonium*
Goatsrue	*Galega officinalis*
Giant Hogweed	*Heracleum mantegazzianum*
Purple Loosestrife	*Lythrum salicaria**
Mile-a-minute	*Polygonum perfoliatum*
Kudzu	*Pueraria montana*
Multiflora Rose	*Rosa multiflora*

* includes any non-native members of the genus *Lythrum*

Invasive Microbes of Concern to the Raccoon Creek Region

Table 5.13: Noteworthy Invasive Microbes of Concern to the 20D Raccoon Creek Region
The letters in superscript, following each common name, denote government agency or organization that recognizes specific invasive microbe species. The superscript agency/organization code is:

U for United State Department of Agriculture
D for Pennsylvania Department of Conservation and Natural Resources
F for Pennsylvania Fish and Boat Commission
P for Pennsylvania Invasive Species Council.

Table 5.13: Noteworthy Invasive Microbes of Concern to the 20D Raccoon Creek Region

Invasive Microbe - Common Name	Species (scientific name)
Beech Bark Disease [U, P]	*Nectria coccinea* var. *faginata /Cryptococcus fagisuga*
Butternut Canker Disease [U]	*Sirococcus clavigignenti-juglandacearum*
Chestnut Blight [U]	*Cryphonectria parasitica*
Didymo [U,F,D, P]	*Didymosphenia geminata*
Dutch Elm Disease [U,P]	*Ophiostoma ulmi* and *Ophiostoma novo-ulmi*
Oak Wilt [*]	*Ceratocystis fagacearum*
Sudden Oak Death [U,P]	*Phytophthora ramorum*
Thousand Cankers Black Walnut Disease [U]	*Geosmithia morbida*
Viral Hemorrhagic Septicemia [U,F,P]	*Novirhabdovirus* sp.
White-Nose Syndrome [U]	*Geomyces destructans*
West Nile Virus [U,P]	*Flavivirus*

*Recent research on Oak Wilt demonstrates that its likely origin was outside the United States (Juzwik et al., 2008), making it a new candidate for an invasive species because of its non-native origin and highly destructive effect on red oaks.

Descriptions of Invasive Microbes of Concern to the Raccoon Creek Region

Beech Bark Disease *(Cryptococcus fagisuga + Nectria ssp.)*

This disease was introduced during the late 1800s to Nova Scotia from Europe and spread to the United States by 1930. Beech Bark Disease is caused by an association between the Beech Scale (Cryptococcus fagisuga), a non-native sap sucking insect, and Nectria fungus (Nectria coccinea var. faginata, N. ochroleuca, or N. galligena). Once Beech Scale infests an American Beech, tiny holes are left open in the bark from the sap extraction. These holes allow Nectria fungus to invade, and the resulting infection kills the living tissue of the tree. Within a few years, the infected tree will die due to girdling, or it will break off in the wind. It is important to note that Beech Scale is the mechanism that allows the Nectria Fungus to invade, and only Nectria coccinea var. faginata is non-native. The impact of this disease will also affect the wildlife that use the American Beech as a food source.

Butternut Canker Disease *(Sirococcus clavigignenti-juglandacearum)*

A fungal disease first document in 1967 in Wisconsin has spread the entire range of the Butternut. The introduction route is unknown. Genetic research has demonstrated Butternut Canker Disease originated outside of the United States, but its exact origins are unknown. Once a Butternut tree becomes infected with this fungal disease, cankers form and destroy the living tissue of the tree and girdle it. It is spread by beetles that associate with Butternuts or by

spores entering trees through open wounds. Mortality may happen quickly or take up to 30 years. Prior to this disease, Butternuts were a prized food sources for humans and wildlife.

Chestnut Blight *(Cryphonectria parasitica)*

Fungal disease introduced accidently on imported nursery stock in 1904. It originated in Asia. Within 50 years, four billion American Chestnut trees were killed. Once an American Chestnut is infected, the fungus destroys the living tissue above ground by forming cankers. Root tissue harbors the disease but is not killed by it. The roots send up new shoots which can reach several inches in diameter before succumbing to Chestnut Blight. Before this disease struck, American Chestnuts accounted for one in four trees in eastern forests.[67] They were a dominant climax forest species, a primary source of rot-resistant hardwood timber and an important food source for wildlife and humans.

Didymo *(Didymosphenia geminata)*

A freshwater diatom originally found in the northern hemisphere in cool waterways and cold alpine lakes. Also known as "Rock Snot," Didymo has adapted to a wider range of water conditions than in the past, allowing it to spread to new areas and aquatic habitats. It can be easily transported areas via fishing equipment. Once it invades, it covers plants, rocks and other items in streams, rivers and lakes, forming a blanket up to eight inches thick.[68] Overtime, it will decrease aquatic invertebrate and plant biodiversity, reduce fish populations and impede recreational use of waterways.

Dutch Elm Disease *(Ophiostoma ulmi and Ophiostoma novo-ulmi)*

Fungal diseases introduced accidently during the 1930s and then again in the 1940s. The first Dutch Elm Disease (*Ophiostoma ulmi*) arrived on elm logs imported from Europe. The second species of Dutch Elm Disease (*Ophiostoma novo-ulmi*) arrived in the 1940s , possibly from Asia or Europe. Dutch Elm Disease targets any species of elm found in the United States, especially American Elm. Both species of Dutch Elm Disease clog the vascular tissues that move water and nutrients up the trunk, which, over time, kills the tree. Most American Elms have been wiped out by these diseases which are spread by beetles that feed on elms. The fungus can also be introduced to a healthy tree by saws and pruning equipment. Historically, American Elms were an extremely important landscaping tree, lining streets in many cities. Today, you are lucky to find a few trees growing in a forested wetland.

Oak Wilt *(Ceratocystis fagacearum)*

Fungal disease first documented in Wisconsin in 1942. Its origins and mechanism for introduction are unknown, but recent genetic research suggests Oak Wilt is non-native. This fungal disease targets oaks, particularly red oaks; white oaks are more resistant. Oak wilt can be spread by contaminated tools, chewing animals or insects. It can also spread by root grafting, a process where the roots of nearby trees of related species grow together, allowing disease to transfer from one tree to many others. Oak Wilt clogs the vascular tissues, preventing the transport of water and nutrients. Infected trees will die from the top down within two growing

[67] http://www.acf.org/ accessed 4/8/2014
[68] http://www.paseagrant.org/wp-content/uploads/2013/10/Didymo2013_reduced.pdf accessed 4/8/2014

seasons.[69] Large-scale oak die-off will hurt lumber production and decrease food sources for wildlife.

Thousand Cankers Black Walnut Disease *(Geosmithia morbida)*
Fungal disease first observed in western U.S. during the 1990s. Its origins and mechanism for introduction are unknown. Thousand Cankers Black Walnut Disease is spread by Walnut Twig Beetles (*Pityophthorus juglandis*) when they bore into a Black Walnut tree. The Walnut Twig Beetle is native to the western U.S. Once a Black Walnut is infected, within a couple of years, the fungus will girdle the tree and it will die. The impact of Thousand Canker Black Walnut Disease will be loss of an important food source for wildlife, high quality lumber and an important landscaping tree.

Viral Hemorrhagic Septicemia *(Novirhabdovirus sp.)*
Viral disease introduced to the U.S. from migrating fish or via ballast water from ships. Viral Hemorrhagic Septicemia was first documented in Europe in the 1930s. It was first found in the U.S. in 1988, then in the Great Lakes in 2005. This is a fish virus that can kill twenty-five different species, nineteen of which are sportfish. The virus enters through the gills, weakening blood vessels and causing hemorrhaging throughout the fish, usually leading to death. This virus will cause decreased fish populations, disrupt aquatic food webs and interfere with recreational fishing.

White-Nose Syndrome *(Geomyces destructans)*
Fungal disease introduced possibly by visitors to a cave in New York. It was noticed in 2006 in a cave near Albany. Presently, it is found in many locations in the eastern U.S. White-Nose Syndrome likely originated in Europe, but more research is needed. This disease is named for the white fungus that infects the skin of the muzzle, ears and wings of hibernating bats. Bats infected with this disease burn through energy reserves while hibernating and starve to death. Mortality rates in infected bat colonies average 80%. Since the winter of 2007-2008, millions of insect-eating bats have perished from White-Nose Syndrome.[70]

West Nile Virus *(Flavivirus)*
Viral disease introduced accidently in 1999 in New York City. Its origins are unknown, but West Nile Virus has been historically found in Africa, the Middle East, Eastern Europe and western Asia. West Nile Encephalitis is transmitted by mosquitos to humans, horses and birds. Most people infected with this disease show no symptoms, or may experience mild illness such as fever, headache, body aches, mild skin rash, or swollen lymph glands.[71]

[69] http://extension.psu.edu/pests/plant-diseases/all-fact-sheets/oak-wilt accessed 4/9/2014
[70] http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/ accessed 4/9/2014
[71] Penn State Extension, Pesticide Education, West Nile Virus, available at http://extension.psu.edu/pests/pesticide-education/applicators/pest-management/wnv; accessed 4/9/2014.

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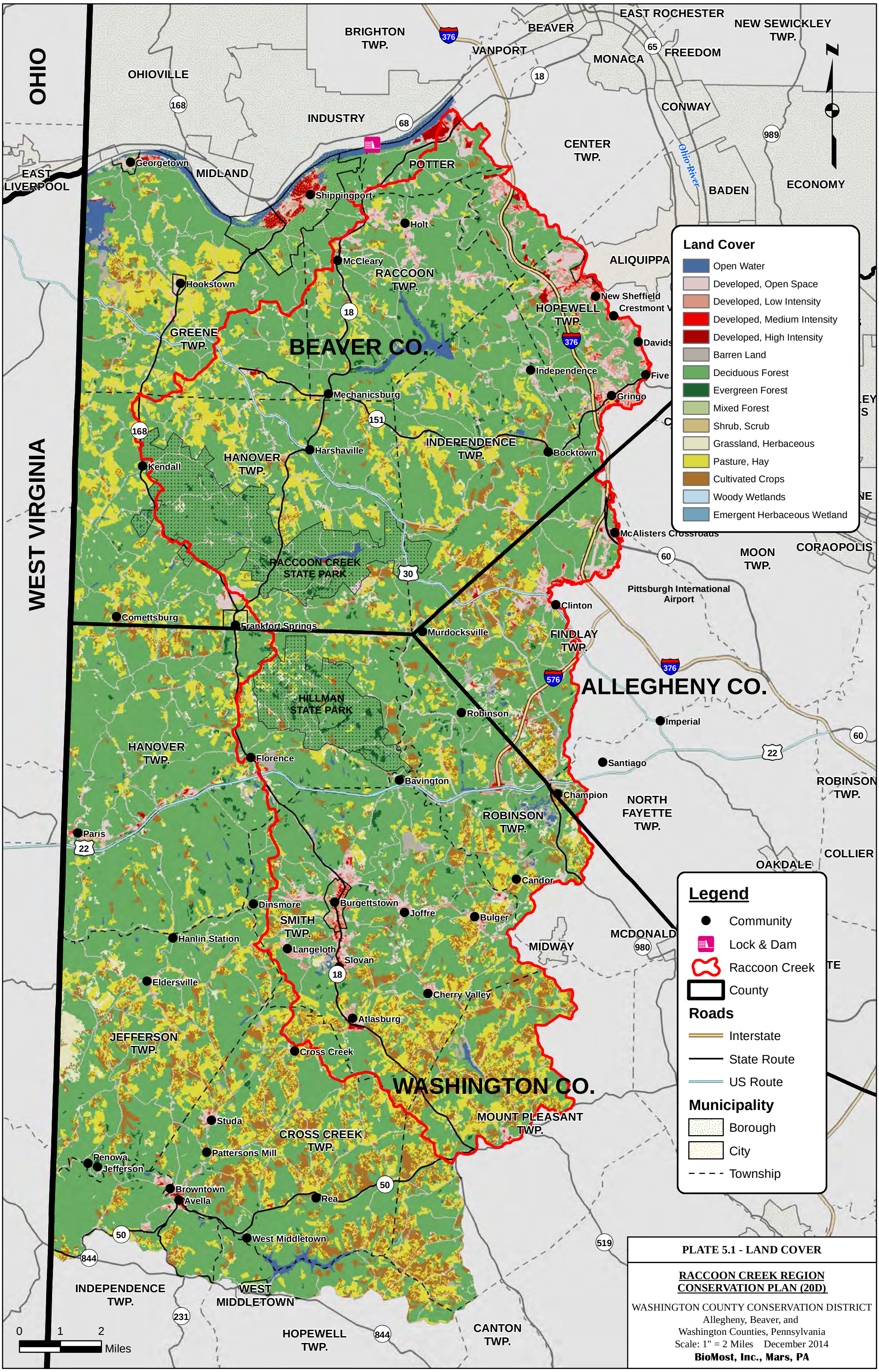
Figure 5.36: Turk's cap lily, *Lilium superbum*, native woodland and wetland wildflower. Photo by Alison Hofer-Richards.

Section 5: PLATES

Plate 5.1: Land Cover Map of the 20D Raccoon Creek Region

Plate 5.2: Important Birding Areas of the 20D Raccoon Creek Region

Plate 5.3: Natural Heritage Inventory of the 20D Raccoon Creek Region


OHIO
WEST VIRGINIA
BRIGHTON TWP.
OHIOVILLE
INDUSTRY
EAST LIVERPOOL
MIDLAND
Georgetown
Shippingport
POTTER
Holt
McCleary
RACCOON TWP.
Hookstown
GREENE TWP.
BEAVER CO.
Mechanicsburg
Harshaville
HANOVER TWP.
Kendall
INDEPENDENCE TWP.
Bocktown
RACCOON CREEK STATE PARK
Comettsburg
Frankfort Springs
Murdocksville
HILLMAN STATE PARK
Robinson
HANOVER TWP.
Florence
Bavington
Paris
ROBINSON TWP.
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
Hanlin Station
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
WASHINGTON CO.
Studa
CROSS CREEK TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
Candor
MIDWAY
MCDONALD
EAST ROCHESTER
NEW SEWICKLEY TWP.
BEAVER
VANPORT
MONACA
FREEDOM
CONWAY
CENTER TWP.
Ohio River
BADEN
ECONOMY
ALIQUIPPA
New Sheffield
Crestmont V
HOPEWELL TWP.
Davids
Independence
Five
Gringo
McAlisters Crossroads
MOON TWP.
CORAOPOLIS
Pittsburgh International Airport
Clinton
FINDLAY TWP.
ALLEGHENY CO.
Imperial
Santiago
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
COLLIER
OAKDALE
MOUNT PLEASANT TWP.
168
18
68
376
65
989
30
60
22
50
844
231
519
980
576
Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub, Scrub
Grassland, Herbaceous
Pasture, Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetland
Legend
Community
Lock & Dam
Raccoon Creek
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
0 1 2
Miles
PLATE 5.1 - LAND COVER
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

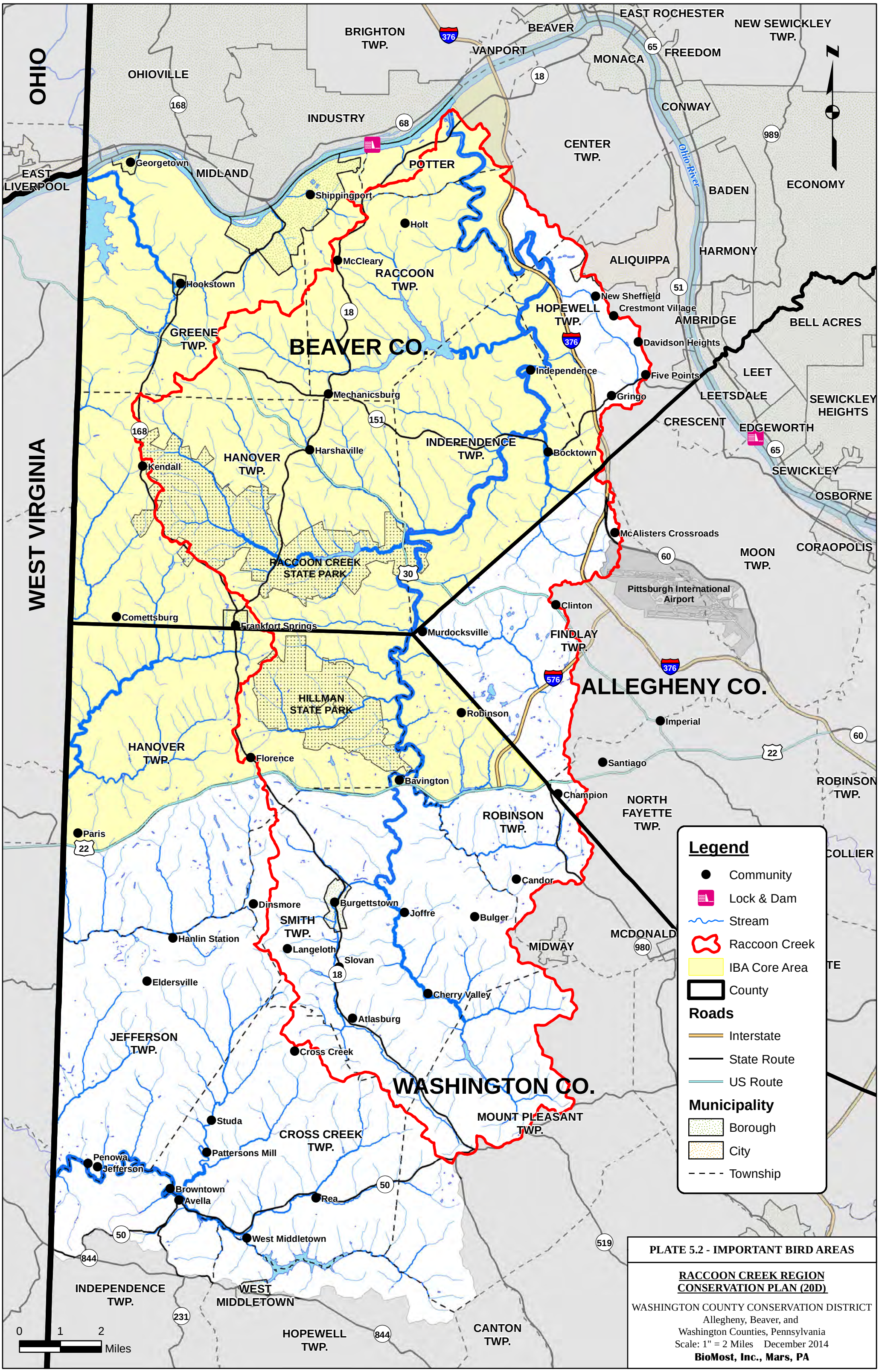


PLATE 5.2 - IMPORTANT BIRD AREAS

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

EAST ROCHESTER

ID	SITE NAME	SIGNIFICANCE	Acres
1	Mill Creek	Notable	1798.0
2	Georgetown Island	Exceptional	437.8
3	Ohio River	High	1404.7
4	Phillis Island	Exceptional	344.6
5	Lower Raccoon Creek	High	2994.0
6	Ohioview Peninsula	Exceptional	115.6
7	Fourmile Run Valley	Notable	2.8
8	Creek Bend Slopes	Notable	464.8
9	School Road Slopes	High	931.9
10	Clinton Wetlands	High	81.9
11	Imperial Mine Grassland	High	2.2
12	Raccoon Creek Floodplain	Exceptional	4745.8
13	Raccoon Creek Floodplain Forest	Exceptional	160.2
14	Valley Picnic Area	Notable	186.9
15	Aunt Clara Fork Floodplain	Notable	557.0
16	Lower Aunt Clara Fork	Exceptional	1110.8
17	Cross Creek Valley	High	475.3

OHIO

WEST VIRGINIA

BRIGHTON TWP.

BEAVER

VANPORT

OHIOVILLE

INDUSTRY

CENTER TWP.

POTTER

MIDLAND

EAST LIVERPOOL

Georgetown

Shippingport

Holt

McCleary

RACCOON TWP.

Hookstown

ALIQUIPPA

HARMONY

New Sheffield

Crestmont Village

HOPEWELL TWP.

AMBRIDGE

BELL ACRES

Davidson Heights

Independence

Five Points

LEET

LEETSDALE

Gringo

SEWICKLEY HEIGHTS

CRESCENT

EDGEWORTH

SEWICKLEY

OSBORNE

GREENE TWP.

BEAVER CO.

Mechanicsburg

Harshaville

Kendall

HANOVER TWP.

INDEPENDENCE TWP.

Bocktown

McAlisters Crossroads

MOON TWP.

CORAOPOLIS

RACCOON CREEK STATE PARK

Pittsburgh International Airport

Clinton

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

ALLEGHENY CO.

HILLMAN STATE PARK

Robinson

Imperial

Florence

Bavington

Santiago

Champion

ROBINSON TWP.

Paris

Candor

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Hanlin Station

Langeloth

Slovan

MIDWAY

Eldersville

Cherry Valley

Atlasburg

JEFFERSON TWP.

Cross Creek

WASHINGTON CO.

MOUNT PLEASANT TWP.

Studa

CROSS CREEK TWP.

Renowa

Jefferson

Pattersons Mill

Browntown

Avella

Rea

West Middletown

INDEPENDENCE TWP.

WEST MIDDLETOWN

HOPEWELL TWP.

CANTON TWP.

BDA 1

BDA 2

BDA 3

BDA 4

BDA 5

BDA 6

BDA 7

BDA 8

BDA 9

BDA 10

BDA 11

BDA 12

BDA 13

BDA 14

BDA 15

BDA 16

BDA 17

0 1 2 Miles

Legend

- Community
- Lock & Dam
- Stream
- Raccoon Creek
- County

Biological Diversity Area

- Exceptional
- High
- Notable

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

PLATE 5.3 - NATURAL HERITAGE INVENTORY

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014

BioMost, Inc., Mars, PA

Section 6: Cultural Resources

Introduction

Cultural resources contribute to the identity of a place. People in every culture identify with their communities through sense of place. The cultural landscape helps to define an area's heritage and create its distinctive nature. Cultural resources also serve as a catalyst for attracting outsiders to visit, which in turn can help fuel an area's economy. Tourism not only contributes to a community by providing employment, income and cultural benefits, it can also generate visibility, tax revenue and help to diversify the economic base.

For purposes of the 20D Raccoon Creek Region Conservation Plan, cultural resources will include the recreational opportunities and the archaeological and historic sites within the study area. This section will provide an inventory and analysis of the recreational resources by facilities and use, and the archaeological and historical resources by type and importance.

Recreation, Sports & Entertainment

Recreation is one of Pennsylvania's most important industries, generating substantial economic benefits. Raccoon Creek State Park alone accounted for over $14 million in visitor spending in 2010.[1] The greater Raccoon Creek Region abounds with opportunities for residents and visitors to enjoy indoor and outdoor concerts, hunting and fishing, swimming, paddling, cycling, hiking, golfing, wildlife-watching, camping, festivals, fairs and a host of educational activities at museums, historic sites and interpretive areas.

Parks

According to the National Parks and Recreation Association, parks and recreation boost the local economy, increase property values, remove air pollutants, improve youth safety, reduce juvenile crime and enhance health, wellness and longevity among the local population.[2]

Although parks are often classified according to their size, service area radius and population served, for purposes of this Plan, parks will be classified by ownership as State (state parks and game lands), Municipal (county, township or borough) or Private. Privately-owned parks will be discussed later in this section. Recreational trails on land or water will be considered Linear Parks. Linear parks are substantially longer than they are wide. They may be composed of a combination of privately owned and publicly owned segments or sites. Within the 20D Raccoon Creek Region, parks may be summarized by ownership as follows:

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[1] The Economic Significance and Impact of Pennsylvania State Parks: An Updated Assessment of 2010 Park Visitor Spending on the State and Local Economy PA Department of Conservation & Natural Resources, available at http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_007019.pdf; accessed 10/24/2014.

[2] National Parks & Recreation Association Fact Sheet, available at https://www.nrpa.org/uploadedFiles/nrpa.org/About_NRPA/Press_Room/Press_Kit/2012%20NRPA%20Parks%20%20Recreation%20Fact%20Sheet%202012.pdf; accessed 10/24/2014.

Table 6.1: 20D Region Public and Linear Parks Overview

Ownership/Type	Facility Name or Number	Location	County
State Parks (public)	Hillman State Park	Hanover Twp.	Washington
	Raccoon Creek State Park	Hanover Twp.	Beaver
State Game Lands (public)	SGL 117	Hanover Twp. & Smith Twp.	Washington
	SGL 189	Independence Twp. & Hanover Twp.	Beaver
	SGL 303	Jefferson Twp.	Washington
County Parks (public)	Cross Creek County Park	Cross Creek Twp. & Hopewell Twp.	Washington
Municipal Parks (public)	Clinton Community Park	Findlay Twp.	Allegheny
	Municipal Center Park	Findlay Twp.	Allegheny
	--	Frankfort Springs Borough	Beaver
	--	Georgetown Borough	Beaver
	Millcreek Community Park	Greene Twp.	Beaver
	Greenfields Complex	Greene Twp.	Beaver
	Ralph K. Davidson Park	Hanover Twp.	Beaver
	--	Hookstown Borough	Beaver
	Hopewell Township Community Park	Hopewell Twp.	Beaver
	Independence Township Community Park	Independence Twp.	Beaver
	Mowry Road Park	Potter Twp.	Beaver
	Tank Farm Park (future)	Potter Twp.	Beaver
	Raccoon Township Municipal Park	Raccoon Twp.	Beaver
	Shippingport Park	Shippingport Borough	Beaver
	Raccoon Valley Park	Burgettstown Borough	Washington
	Stottlemeyer Park	Burgettstown Borough	Washington
	Charlie's Park	Burgettstown Borough	Washington
	Cedar Grove Park	Cross Creek Twp.	Washington
	Hanover Township Park	Hanover Twp.	Washington
	--	Jefferson Twp.	Washington
	Cherry Valley Park	Smith Twp.	Washington
	Francis Mine Park	Smith Twp.	Washington
	Slovan Park	Smith Twp.	Washington
Linear Parks (combination of private and public segments)	Montour Trail	Findlay Twp. & Robinson Twp.	Allegheny & Washington
	Panhandle Trail	Robinson Twp., Smith Twp. & Burgettstown Borough	Washington
	Ohio River Water Trail	Potter, Raccoon, Shippingport, Greene & Georgetown	Beaver
	Raccoon Creek Canoe Trail (future)	Hanover, Independence, Hopewell, Center, Raccoon & Potter	Beaver

Table 6.2 below provides further detail about the features of the various municipal parks including buildings, special-purpose equipment, trails, ponds/lakes, etc. It also summarizes, where applicable, the upgrades or improvements needed in various municipal parks as identified through interviews with local officials as quoted herein.

Table 6.2: Municipal Parks: Features and Upgrades Needed

	Municipality	Parks and/or playgrounds in 20D Region	Features	In need of upgrades? What kind?
Allegheny County	**Findlay Township**	Clinton Community Park	• Pavilions (5) • Permanent restrooms • Playgrounds (2) • Walking trail • Ball fields • Amphitheater • Agriculture building	Currently replanting 100 trees. Findlay's park system is up to date. More staff hours or an additional staffer would benefit operations. Emerging trend--some younger park users want all features in one park location--not feasible.
		Municipal Center Park	• Pavilion • Permanent restroom • Playground • Walking trail • Ball field • Basketball court	Up to date
Beaver County	**City of Aliquippa**	None w/in 20D		--
	Center Twp.	None w/in 20D		--
	Frankfort Springs Borough	Yes	• Playground	--
	Georgetown Borough	Yes	• Playground	--
	Greene Township	Millcreek Community Park	• Pavilions (2) • Permanent composting • Playground • Walking trail • Ball fields (3) • Batting cages	Yes: applied for two grants to refurbish former road department garage for restrooms; also to build new pavilion.
		Greenfields Complex	• North Mile Trail	No
	Hanover Township	Ralph K. Davidson Municipal Park	• Portable toilets • Playground • Ball field	Yes: looking to apply for grants to upgrade playground, and possibly add a pavilion and restroom facility; Also fencing our aggregate stockpiles next to the park to prevent children from playing on these piles.
	Hookstown Borough	Yes	• Basketball court	--
	Hopewell Township	Hopewell Twp. Community Park (formerly Lakewood Park)	• Pavilions (4) • Permanent restrooms • Playgrounds (2) • Walking trails (5) incl. one sensory awareness & one fitness w/stations • Larry Blaney Nature Center • Concession stand • Two-acre stocked lake w/ accessible fishing pier & paddle boat rental	Hopewell Twp. received a DCNR grant in 2012 to expand the park on 17 acres across Laird Road. Plans include more parking, another pavilion, an outdoor exercise area and a multi-sports court. Also need to repair lake shore near boat dock.
	Independence Township	Independence Township Community Park	• Pavilion • Portable toilet • Playground • Canoe access to Raccoon Creek	Yes: Independence Twp. has a complete Township Community Park Master Plan. Due to limited funding, only a very small portion of the park has been completed.

	Municipality	Parks and/or playgrounds in 20D Region	Features	In need of upgrades? What kind?
	Potter Township	Potter Township Municipal Park (Mowry Rd. Park)	• Pavilion rental includes use of municipal building restrooms • Playgrounds (2) • Basketball court	No plans for upgrades. New park development efforts will focus on the Tank Farm.
		Tank Farm (as yet undeveloped)	Tank Farm is planned as a low-impact recreation area featuring natural elements and historic artifacts – no playgrounds or ball fields planned. Pressing infrastructure needs include a new, secure entrance with security monitoring & gate; interior roadway for visitors and police patrols; parking; restrooms; electric service. Small stone cottage can be repurposed to interpret township and site history which is important to the Ohio River region's heritage. Cottage is receiving a new roof and asbestos removal so that it may be remodeled for public use. Two steel-framed barns need extensive repairs and roofs to be repurposed as picnic shelters. Residents place high priority on establishment of walking trail to link Tank Farm with neighboring parcels along the creek for a coherent land use and conservation purpose. Canoe/kayak launch area and primitive camping sites would broaden passive recreation opportunities on site. Educational space for historic interpretation of site is desired and possible in existing structures once refurbished.	
	Raccoon Township	Raccoon Township Municipal Park	• Pavilions (5) • Permanent restrooms • Playgrounds (2) • Walking trail • Ball fields (6) • Volleyball court • Basketball court • Football field	Walking trail needs major refurbishing of the surface, vegetation removal, signage, everything – but no grants applied for as yet. Raccoon Twp. has a parks plan.
	Shippingport Borough	Shippingport Park	• Pavilions (2) • Permanent restrooms • Playground • Ball field • Tennis court	Tennis courts need resurfacing
Washington Co.	**Burgettstown Borough**	Raccoon Valley Park	• Pavilions (2) • Permanent restrooms • Playground • Basketball court • Gazebo	Space is biggest limitation. We have cleaned off many vacant lots to build parks within past 12 years. Facilities are up-to-date. Lack of space is biggest limitation – never enough room!
		Stottlemeyer Pk. & Charlie's Park	• Ornamental plantings	These are small, ornamental parks
	Cross Creek Township	Cedar Grove Park	• Portable toilets • Playground • ADA compliant perimeter pathway around park	Phase 2 improvements going out to bid include pavilion, restrooms & concession stand. Multipurpose court was cut from Phase 2 due to insufficient funding. Cedar Grove Park property includes a beautiful spring and creek-it would be nice to have a walking trail and footbridge to these areas. Also, visitors to nearby Cross Creek Park lack a place to camp overnight.
	Hanover Township	Hanover Township Park	• Pavilions (3) • Permanent restrooms (2) • Playground	Sidewalks & specialty wooden play structures need repair; would like to add a 3rd playground area
	Hopewell Twp.	None w/in 20D		--
	Independence Township	None w/in 20D		--
	Jefferson Township	Yes	• Playground on land leased from fire department	--
	Mt. Pleasant Township	None w/in 20D		--

Municipality	Parks and/or playgrounds in 20D Region	Features	In need of upgrades? What kind?
Robinson Twp.	None w/in 20D		--
Smith Township	Cherry Valley	• Portable toilet • Soccer field • Tennis court • Basketball court	Tennis and basketball courts need refinishing
	Slovan	• Pavilion • Basketball court	Basketball court needs refinishing
	Francis Mine	• Basketball court	Basketball court needs refinishing
W. Middletown Borough	None w/in 20D		--

Cross Creek County Park

Cross Creek County Park was constructed in the 1980s through the cooperative efforts of municipalities in the Cross Creek Watershed. One of three parks operated and maintained by Washington County Department of Parks and Recreation, the 3,500-acre Cross Creek County Park is a landmark in western Washington County. It is located in Hopewell Township between the village of Rea on PA Route 50 and the Borough of West Middletown on PA 844.

Open year-round, Cross Creek County Park has a multitude of outdoor recreational offerings. Picnic tables are available on a first come-first served basis; three shelters may be reserved by application. Near the park office is a playground, restrooms and a handicapped-accessible fishing pier. Hunting and fishing are offered according to requirements of the PA Game Commission and the PA Fish & Boat Commission, respectively.

A wide variety of guided nature interpretive programs are offered at Cross Creek County Park, including fall group hayrides, pond life investigations, hikes to hear owls and woodcock, spring wildlife appreciation, morel mushroom hunting, and canoeing and kayaking lessons with PA Fish & Boat Commission instructors.[3]

The heart of Cross Creek County Park is its 244-acre Cross Creek Lake, formed by impounding Cross Creek. Sixty feet deep near the dam, the lake was the very first water body in the Commonwealth of Pennsylvania to be managed with the PA Fish & Boat Commission's Conservation Regulations for creel limits and minimum fish size. A non-motorized boat launch is located at the east end of the lake on Lynn Portal Road. At County Park Road on the north side of the lake is a paved, motor-boat launch. Boaters are required to obtain a permit to use the

[3] 2014 Washington County Parks & Recreation Calendar of Events, available at http://www.co.washington.pa.us/DocumentCenter/View/1214; accessed 11/8/2014.

launch. Motor boats are limited to 10 horsepower. Ample parking and docks are provided for launching and loading. [4]

According to the PA Fish & Boat Commission, Cross Creek Lake is fairly turbid (cloudy with suspended material), relatively deep and fertile which contributes to maintaining one of the densest largemouth bass populations in the Commonwealth. Numerous submerged stumps, large woody debris, as well as submerged and floating aquatic vegetation provides excellent habitat for warm water game fish and panfish species including saugeye, yellow perch, channel catfish, and brown and yellow bullheads.[5]

Cross Creek County Park is located in the midst of the region's burgeoning shale gas industry. Range Resources, which has Marcellus Shale wells within Cross Creek County Park, intends to construct a three-mile loop trail as part of the new Thompson Hill Boat Launch project which began in May, 2014. The new launch on the south shore of the lake will feature a textured-concrete ramp and adjacent fishing pier, playground, parking area, shelter and restroom facilities.[6] Since 2009, Washington County has earned $10 million since it permitted drilling at Cross Creek County Park.[7] Oil and gas revenues from leases on county lands are helping to fund improvements at all three county parks and the Panhandle Trail which is also operated and maintained by Washington County Parks and Recreation.

Hillman State Park

By Kevin Kisow, Student at Indiana University of PA and member of the Board of Directors of Independence Conservancy. Works cited are listed at the end of the article.

Northern Washington County is home to thousands of acres of recreational land. From State Game Lands 117 to Hillman State Park, hunters, mountain bikers and model airplane enthusiasts enjoy these lands daily. This is because of the vision of the Harmon Creek Coal Company and its president, James F. Hillman, to restore and conserve the land they strip mined. Impressively, and almost unheard of at the time, Harmon Creek Coal Company conducted a massive reforestation and conservation effort over the decades they mined coal from Burgettstown to Bavington in possibly the largest strip mine in Western Pennsylvania. After the coal was removed, the strip cuts were used for disposal of waste materials. A company advertisement in 1966 sums up the reclamation process:

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[4] Washington County Parks & Recreation website, Cross Creek Park Map, available at http://www.co.washington.pa.us/DocumentCenter/View/1195; accessed 11/8/2014.
[5] PA Fish & Game Commission Biologist Reports, Cross Creek Lake, April & May, 2007, available at http://fishandboat.com/images/fisheries/afm/2007/8x07_12cross.htm; accessed 11/8/2014.
[6] Observer-Reporter.com, Work on Thompson Hill boat launch, playground at Cross Creek to begin soon, published April 2, 2014; available at http://www.observer-reporter.com/article/20140402/NEWS01/140409882#.VF7cWPnF8g0; accessed 11/8/2014.
[7] Observer-Reporter.com, County negotiating Mingo Park gas leases, by Scott Beveridge, published March 4, 2014; available at http://www.observer-reporter.com/article/20140304/NEWS01/140309767/1003#.VF7YavnF8g0; accessed 11/8/2014.

A new concept in land reclamation holds significant opportunity for populous Pennsylvania and other coal producing states. We refer to the use of strip mine pits for the disposal of waste materials, a procedure which hastens the return of strip mined land to productive use and scenic appeal. This reclamation process uses potential blight to create beauty. It thus supplies a practical and substantial solution for two modern problems in one operation.

In 1937 one of the first articles was published about conservation efforts in Burgettstown. The local newspaper, the Washington Reporter, stated that a 2,300 acre Game Land designated 117 in Smith and Hanover Townships was nearing completion. The Commonwealth had purchased this land from Harmon Creek Coal Company in hopes of transforming the strip mines into an ideal hunting area improved with food plots and a game preserve annually stocked with pheasants. By 1937 more than 8,000 trees had been planted on the Game Lands.

A few years later on July 4th, 1945, James Hillman donated 72 acres of land for the Burgettstown Community Park. Located near the present day Burgettstown High School, the park included outdoor ovens, fire pits, picnic shelters, a swimming pool, swings, slides, shuffleboard courts, tennis courts, basketball courts and a baseball field with dugouts and a clubhouse.

Figure 6.1: A stand of pine trees planted by Harmon Creek Coal Company at Hillman State Park. Photo by Kevin Kisow, 12/19/2012.

In 1949, Mr. Hillman was approached by a University of Pittsburgh student who was in need of a place for his club to fly model airplanes. Mr. Hillman created a 20 acre fenced-in area with an asphalt runway, public address system and other amenities for the flyers. The field was called “Hillman’s Model Wing Airport” and enthusiasts from all over the tri-state area came to test their skills on Burgettstown’s new airfield.

By 1958, Harmon Creek Coal Company had reclaimed over 1,300 acres of strip-mined land, planted almost 2 million trees, created a community park, provided hunting areas, and stocked a lake for fishing (see “Harmon Creek Lake: A Hidden Treasure” in “Section 4: Water Resources”) while actively mining 425,000 tons of coal per year. Harmon Creek and Mr. Hillman’s efforts were recognized with several conservation and nursery awards over the years. Furthermore, Harmon Creek’s Florence Mine, employing a 16 cubic yard dragline, won a safety award for producing 10,660,860 tons of coal without a fatal accident.

In January of 1969, James F. Hillman donated 3,654 acres to the Commonwealth for the creation of Hillman State Park. At the time, the land was valued at $1 million and was believed to be one of the largest single land gifts for state park purposes in U.S. history. An article from the Washington Observer-Reporter relates:

Nearly all of the land involved in this gift to the State was stripped of its coal by Hillman. This would normally conjure up pictures of raw, open, scarred land of little use or value. Not so with this land. Hillman not only stripped it of its coal but he restored it. Hillman fought a long battle for a strong strip mine law in Pennsylvania from the unusual position of a coal operator.

Governor Raymond Shafer appointed the manager of Raccoon Creek State Park to oversee Hillman State Park so it could be immediately opened up to the public. On Sunday October 4, 1970, a new model airplane landing strip costing over $80,000 was opened. With no other amenities in the 3,654 acre park, some residents were unhappy about the state catering to a select few model airplane enthusiasts.

On July 1, 1975, an acid mine drainage treatment project began in Hillman State Park. Strip mine waste areas were filled and graded, riprap erosion protection was installed, the soil was treated with fly ash and seedlings were planted.

In 1977 a new model airplane landing strip was built in the northern end of the park near the Beaver County line. The old airfield needed to be moved because of noise complaints and to make way for a proposed park headquarters. The new airfield was named after former State Representative K. Leroy Irvis, the first African-American speaker of the Pennsylvania House of Representatives, who helped obtain funding for the project.

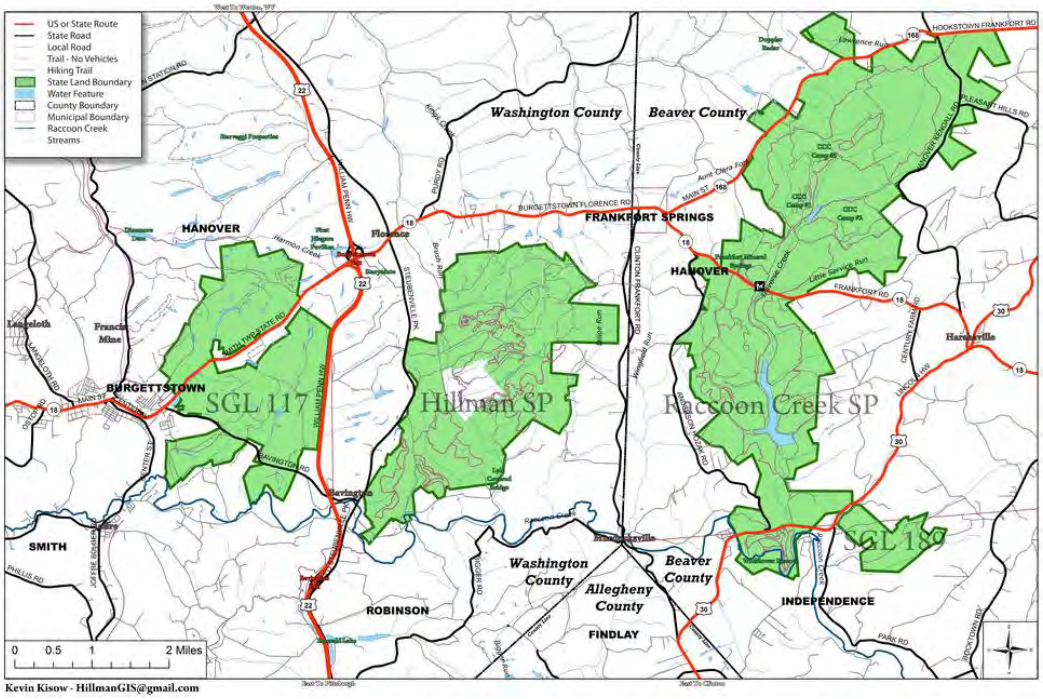

Figure 6.2: State parks and game lands in northern Washington and southern Beaver Counties. Map by Kevin Kisow, July 2014.

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"DER to Spend $200,000 to Move Model Airplane Strip." News Dispatch [Jeanette, PA] 17 Mar. 1977: 15. Print.

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Hobar, Mary. "A Model Airport for Model Planes." Post-Gazette Tri-State Magazine [Pittsburgh, PA] 17 Apr. 1949: 14. Print.

"New Mini Airport to be Dedicated for Model Planes." Pittsburgh Post-Gazette [Pittsburgh, PA] 1 Oct. 1970: 25. Print.

"New Model Air Park to Open." Observer Reporter [Washington, PA] 30 Sept. 1970, sec. C: 8. Print.

"A Philanthropist and Conservationist." Observer Reporter [Washington, PA] 18 Jan. 1969, sec. A: 4. Print.

Raccoon Creek State Park and Vicinity[8]

In 1935 the National Park Service created the Raccoon Creek National Recreation Demonstration Area. Men employed by the Civilian Conservation Corps (CCC) and the Works Progress Administration (WPA) built the Park's original lake, roadways, recreational areas and planted thousands of tree seedlings in former farm fields. Raccoon Creek State Park has evolved into one of the largest and most beautiful parks in the Commonwealth. It is one of Pennsylvania's twenty "must see" state parks as chosen by the Department of Conservation and Natural Resources.

The majority of Raccoon Creek State Park's 7,572 acres are situated in the Traverse Creek Watershed in Hanover and Independence Townships in Beaver County. Contrary to popular misconception, both of the Park's lakes were created by impounding the waters of Traverse

[8] A Pennsylvania Recreational Guide for Raccoon Creek State Park, PA Department of Conservation and Natural Resources, 2010, printed brochure, one page.

Creek, not Raccoon Creek. The main stem of Raccoon Creek flows between the Park and its adjacent Wildflower Reserve located off US Route 30.

Raccoon Creek State Park features the 101-acre Raccoon Lake, open for year-round fishing. Common game fish are bullhead catfish, bluegill, yellow perch, crappie, walleye, muskellunge, and both large and smallmouth bass. Traverse Creek is stocked with brook and rainbow trout by the Pennsylvania Fish and Boat Commission. Raccoon Lake has a 500-foot sand and turf beach with a bathhouse and refreshment stand. Boating is permitted with electric motors. Canoes, rowboats, paddle boats and kayaks are available for rental. In winter, the lake is open for ice skating and ice fishing.

Overnight accommodations at Raccoon Creek State Park range from heated modern cabins available year-round (some with air conditioning), to modern or rustic camp sites, to Adirondack shelters and group tenting areas. Three group cabin camping areas are offered for rental to organized adult and youth groups. Lakeside Lodge is a three-bedroom cottage that sleeps ten people. The lodge can be rented by the week during the summer season and with a two-night minimum during the off-season. The lodge has a full kitchen, dining room, one and one-half bathrooms, living room with a fireplace, laundry facilities, and central heat and air conditioning. It also has a large patio area with an outdoor gas grill. Pets are prohibited in the lodge.

Figure 6.3: Boys being boys at Raccoon Lake, Columbus Day, 2008. Photo courtesy of the Beaver County Times.

Hunting, trapping and dog training is permitted on over 6,000 acres of Raccoon Creek State Park. Hunters are expected to follow the rules and regulations of the Pennsylvania Game Commission. The common game species are ruffed grouse, squirrels, turkey, pheasants, white-tailed deer and rabbits.

Raccoon Creek State Park offers miles of marked trails for hiking, cross-country skiing, backpacking and trail-biking. Equestrian trailhead parking is provided on PA Route 168 on the western boundary of the Park. These designated trails offer a variety of terrain and thousands of acres of wilderness experience. Park staff conduct many hands-on environmental education and interpretive programs including curriculum-based instruction for school groups and teacher workshops.

Figure 6.4: The Duncan Farm in Hanover Township, Beaver County, one of many farms acquired to build what would become Raccoon Creek State Park. Photo courtesy of Raccoon Creek State Park Archives.

Figure 6.5: The Mary Wolanski Farm, ca. 1935, acquired to build the Raccoon National Recreation Demonstration Area, later to become Raccoon Creek State Park. Note the lady and the little girl standing at the back porch, looking uphill. Photo courtesy of Raccoon Creek State Park Archives.

Figure 6.6: Teacher Clara Swearingen and her class pose on the porch of Doak School on April 23, 1917. Her students are, back row, left to right: Leopold Johnen, Herbert Lane, Raymond Fish and Louis Johnen; front row, left to right: Jonathan Vern Wilcoxen, Hughie McConnell and Earl Fish. The site of the school is now part of Raccoon Creek State Park. Photo courtesy of Raccoon Creek State Park Archives.

CCC Camps

Upon taking office in 1933, newly-elected President Franklin D. Roosevelt proposed a flurry of government programs designed to lift the country out of the Great Depression that followed the stock market crash of 1929. One of these programs was the Civilian Conservation Corps (CCC). The CCC offered young men employment, job training, clothing, housing, three meals a day, camaraderie and a sense of accomplishment.

Figure 6.7: Work entrance to Raccoon Creek State Park, looking east from PA Route 18, ca. 1935. Photo courtesy of Raccoon Creek State Park Archives.

Among the undertakings of the CCC was to provide labor for the National Park Service to build five Recreational Demonstration Areas (RDAs) in

Pennsylvania. Located near big cities to provide open-air recreation for urban dwellers, the RDAs were Blue Knob, Hickory Run, French Creek, Laurel Hill and Raccoon Creek. In 1945, these parks were given to the Commonwealth of Pennsylvania and became state parks.[9]

Raccoon Creek State Park's earliest buildings, constructed by the CCC in 1935, are split among four areas: three group camps and a headquarters/maintenance complex. Built in the National Park Service Rustic style, these buildings were added to the National Register of Historic Places in 1987 as a historic district. Besides their distinctive architecture and their origin in the National Recreational Demonstration Area, the buildings reflect the federal government's attempts to resolve the poverty of the Depression by putting people to work on projects of public benefit.[10]

Many CCC-constructed buildings are still in use at Raccoon Creek State Park today, including the large Recreation Hall between Group Camps One and Three. Group Camp One, Unit 1, offers a particularly rustic camping experience with its cozy log cabins, wash house and small recreation building arranged along a ridge-top lane.

Figure 6.8: Beginning construction of Raccoon Lake, ca. 1948-49. Photo courtesy of Raccoon Creek State Park Archives.

[9] PA DCNR, the CCC Years, available at http://www.dcnr.state.pa.us/stateparks/thingstoknow/history/cccyears/index.htm; accessed 11/5/2014.
[10] Wikipedia, Raccoon Creek State Park, available at http://en.wikipedia.org/wiki/Raccoon_Creek_State_Park; accessed 11/5/2014.

Frankfort Mineral Springs and Resort Complex[11]

The natural formation known as Frankfort Mineral Springs is located in the headwaters of Traverse Creek, just north of the village of Frankfort Springs in Hanover Township, Beaver County. The springs are located at the upper end of thickly wooded ravine within a U-shaped shale and sandstone grotto formation. The stream carved the small grotto out of the solid rock over thousands of years. This same stream now forms a picturesque waterfall as it spills over the rim of the ravine. The actual springs are located opposite the falls, emerging directly from the shale and sandstone formation. The waters of the stream and the waters of the springs are of two separate sources. The stream water originates from surface drainage, while the spring water comes from an underground reservoir. The stream may dry completely whereas the spring flows year-round.

The area around Frankfort Springs was settled by Levi Dungan of Philadelphia, first European homesteader of Beaver County. He claimed a thousand acres in 1772 and established his home, a crude log cabin, at the head of Kings Creek less than a mile southwest of the Springs. His land was near the present borough of Frankfort Springs, in the headwaters of Traverse Creek and the Mineral Springs.

In 1778, Isaac Stephens purchased four hundred acres from Dungan, which included the mineral springs, for a mere ten dollars! In 1827, Stephens sold the mineral springs as part of a 12-acre parcel to Edward McGinnis for three hundred dollars. McGinnis found the mineral waters 'healing to his ailment.' This appears to be the first mention of the reputed medicinal quality of the water. To capitalize upon his investment, McGinnis started construction of a hotel, later called the Frankfort Springs Hotel. This was the first of many structures built at the soon-to-be-famous health spa and resort. Popularity came rapidly to the area, and McGinnis had as many as two hundred guests at a time staying at his inn.

The Frankfort Springs Hotel was undoubtedly a magnificent structure for its time. It was three stories high with a cut stone foundation, four large brick chimneys and wood frame construction. Its design had many similarities to a boat, perhaps reflecting McGinnis's early occupation as a keelboat man. A large double-decker porch extended the length of the building. There were no interior hallways and all of the guest rooms opened onto the large porch. The first floor served as a combination dining hall, parlor and ballroom. The second floor contained the guest rooms. A double-roomed pantry and kitchen extended to the rear of the hotel.

In summer, the resort held parties, dances and other social functions. Even in later years, the hotel had reasonable rates and excellent meals. In the late 1800's, rooms were available at 25 cents per night with meals at an additional 25 cents per plate. Behind the hotel were vegetable

[11] Frankfort Mineral Springs printed pamphlet, 9 pages, published by the Department of Conservation & Natural Resources, Raccoon Creek State Park, 3000 State Route 18, Hookstown, PA 15050; Historical revisions and updates compiled December 2010 by Patrick Adams, Environmental Educator, Raccoon Creek State Park.

gardens, ball fields, two dirt tennis courts and croquet green. Swings, hammocks and lawn chairs adorned the grounds for the comfort of the guests.
The resort complex also included a dance pavilion with a boardwalk overlooking the springs and the ravine below, a large livery stable that sheltered horses and carriages of the resort and its guests, an icehouse with a cool, stonewalled cellar, and a three-story guest cottage. Of all the original resort buildings, only the first floor of the guest cottage remains. Built of native cut stone quarried nearby, the cottage served various purposes over the years - from manager's residence, store, bottling plant for the mineral water, to even a barbershop.

Since 1966 the Frankfort Mineral Springs historic area has been part of Raccoon Creek State Park. A scale model of the springs resort is on permanent display in the interpretive center at the Wildflower Reserve. Please see "Section 1: Project Area Characteristics" for a photo of the guest cottage in use as a museum in 1973.

Figure 6.9: Guests pose for a photographer in the heyday of the Frankfort Mineral Springs. Photo courtesy of Raccoon Creek State Park Archives.

King's Creek Cemetery

Located on Raccoon Creek State Park's southwestern boundary off PA Route 168, King's Creek Cemetery is owned and maintained by DCNR as part of the Park. This wooded burial ground is the final resting place of many pioneer families and contains the graves of several Revolutionary War veterans. Please refer to "Section One: Project Area Characteristics" for more details about King's Creek Cemetery.

Wildflower Reserve

The 314-acre Wildflower Reserve is home to one of the most diverse stands of native wildflowers in western Pennsylvania. This vicinity was acquired and preserved by the Hickory Club, a local outdoor organization, in the 1920s. Membership in the Hickory Club declined, leading to sale of the property to the Western Pennsylvania Conservancy (WPC) in the early 1960s. The WPC purchased adjacent property, added the trail system, restored the historic Botany House and Hungerford Cabin, and constructed a large pavilion for outdoor educational programing. In 1972, the wildflower area became part of Raccoon Creek State Park. Botany House is now the Park Manager's residence; the large pavilion is now the Interpretive Center. The Wildflower Reserve boasts over 700 species of flowering plants along five miles of designated trails. Because of the fragile nature of this area, the Reserve is closed to all activities other than hiking. The Reserve's Interpretive Center is the focal point for environmental education with hands-on instruction, exhibits and brochures on the cultural and natural history of the Park and surrounding area.

Figure 6.10: Hungerford Cabin at the Wildflower Reserve, ca. 1970. Photo courtesy of Raccoon Creek State Park Archives.

State Game Lands

State Game Lands are public lands managed by the Pennsylvania Game Commission to further its mission, "Managing wildlife and its habitat for current and future generations."[12] Recreational hunting, especially for white-tailed deer and wild turkey, are very popular pastimes in the Raccoon Creek Region. As hunting may be prohibited on private property, State Game Lands provide public hunting opportunities for those who obtain a license for the current season. A wealth of information about State Game Lands, hunting, safety and licensing is

[12] Pennsylvania Game Commission, available at http://www.pgc.state.pa.us/portal/server.pt/community/pgc/9106; accessed 10/24/2014.

available from the Pennsylvania Game Commission's website at http://www.portal.state.pa.us/portal/server.pt/community/state_game_lands/11363.

Table 6.3: State Game Lands of the 20D Raccoon Creek Region[13]

SGL Number	Acres	Township/s	County	Sub-watershed/s
117	2892	Smith, Hanover	Washington	Main Stem of Raccoon Creek Burgetts Fork Harmon Creek
189	411	Independence, Hanover	Beaver	Main Stem of Raccoon Creek Little Traverse Creek
303	222	Jefferson	Washington	Cross Creek
Total acres	**3525**			

The U.S. Census Bureau has documented a significant trend in outdoor recreation activities with definite economic impact on Pennsylvania. As shown in Table 6.4 below, the number of people who venture outdoors to observe wildlife, and the money they spend in their pursuit, has eclipsed hunters and fishermen.

Table 6.4: Activities in Pennsylvania by Residents and Nonresidents[14]

Activity	# of Participants	Total Expenditures	Average Spent per Person	Average Trip Expenditure per Day
Fishing	1.1 million	$485 million	$409	$23
Hunting	775 thousand	$971 million	$1207	$9
Wildlife Watching	3.6 million	$1.3 billion	$308	$28

Recreational Trails

The Raccoon Creek Region is fortunate to have several land and water trails in various stages of development. Relics and remnants along the Region's rail-trails provide a fascinating look into our rich transportation and industrial history.

Montour Trail

The Montour Trail is a multi-use non-motorized recreational rail-trail that follows a portion of the old Montour Railroad. Both the trail and the railroad are named for the creek they parallel, Montour Run. The Montour Railroad was built between 1877 and 1914 to link the Pittsburgh

[13] GIS compiled by the Southwest PA Commission and PASDA.
[14] US Fish & Wildlife Service and US Census Bureau, 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation - Pennsylvania, available at http://www.census.gov/prod/2013pubs/fhw11-pa.pdf; accessed 7/22/2014.

and Lake Erie Railroad with the Raccoon Creek Region's many coal mines. The Montour Railroad also connected other railroads, including the Pennsylvania, the Pittsburgh & West Virginia, the Baltimore & Ohio, and the Union. When completed, the Montour Trail will ultimately extend 46 miles from Moon Township near Coraopolis to Clairton on the Monongahela River. The Montour Trail connects to the Great Allegheny Passage, a trail system that stretches over 330 miles from Pittsburgh to Washington, DC. Currently, multiple sections of the Montour Trail totaling over 40 miles are completed, though a few gaps remain in the southern portion. The Montour Trail forms a semi-circle around Pittsburgh.[15] The Montour Trail is mapped through the 20D Raccoon Creek Region in "Plate 6.1: Recreation Map."

Panhandle Trail

The Panhandle Trail is named after the Panhandle Division of the Pennsylvania Railroad, the abandoned rail line upon which it is built. The Panhandle Trail stretches for 29 miles from Walkers Mill in Collier Township, PA to Colliers, WV. As of August 2008, the entire trail is complete.[16] The Panhandle Trail connects to the Montour Trail between the village of Primrose and the town of McDonald and ultimately links to Washington, D.C., via the Great Allegheny Passage and C&O Canal Towpath. Recognized as a valuable resource and landmark for residents, the Panhandle Trail was the 100th successful rail-trail project in Pennsylvania. Officials from Washington and Allegheny counties, the West Virginia Rail Authority, PennDot, the U.S. Surface Transportation Board, the Pennsylvania Department of Conservation and Natural Resources and the Southwestern Pennsylvania Commission continue to work to preserve the historic corridor and develop the trail.[17] The Panhandle Trail is mapped through the 20D Raccoon Creek Region in "Plate 6.1: Recreation Map." A detailed map of the Panhandle Trail, billed as "Washington County's 17-Mile Park," is available from Washington County Department of Parks and Recreation, or by following this link: http://www.co.washington.pa.us/DocumentCenter/View/195.

Ohio River Water Trail

The Ohio River Water Trail (ORWT) is stewarded by the Ohio River Trail Council. An official Pennsylvania State Water Trail, the 56-mile ORWT includes 33 miles of the river from Dashields Dam at milepost 13, downstream to Newell, WV at milepost 46. [18] Four miles of Raccoon Creek are pending for inclusion in the ORWT, awaiting the completion of public access at Independence Conservancy's Rocky Bottom Natural Area. ORWT is a "blueway" or a "blue

[15] Trail Link by Rails to Trails Conservancy, available at http://www.traillink.com/trail/montour-trail.aspx; accessed 10/23/2014.
[16] Collier Friends of the Panhandle Trail, available at http://www.panhandletrail.org/; accessed 10/23/2014.
[17] Trail Link by Rails to Trail Conservancy, available at http://www.traillink.com/trail/panhandle-trail.aspx; accessed 10/23/2014.
[18] Ohio River Trail Council, Ohio River Water Trail, available at http://water2.ohiorivertrail.org/index.php/en/; accessed 10/23/2014.

trail." Blueways connect communities through alternative transportation routes while providing healthy recreation and tourism opportunities. Active stewardship of blueways promotes clean water and wildlife habitat enhancement. More information about the Ohio River Water Trail is available at http://water2.ohiorivertrail.org/index.php/en/.

Raccoon Creek Canoe Trail

Raccoon Creek is normally canoe-able/floatable downstream of the Washington-Beaver County line. The Raccoon Creek Canoe Trail is a work in progress. Presently, it consists of very few access points in varying states of usability. Only one proper public access point is presently in service. This site is on Route 30 at the eastern entrance to Raccoon Creek State Park. Other access areas, although used by the public, currently lack one or more of the following critical elements: formal permission from the landowner, proper parking, signage, and/or ready access to the water's edge.[19] Further development of the Raccoon Creek Canoe Trail is discussed in "Section 8: Management Recommendations."

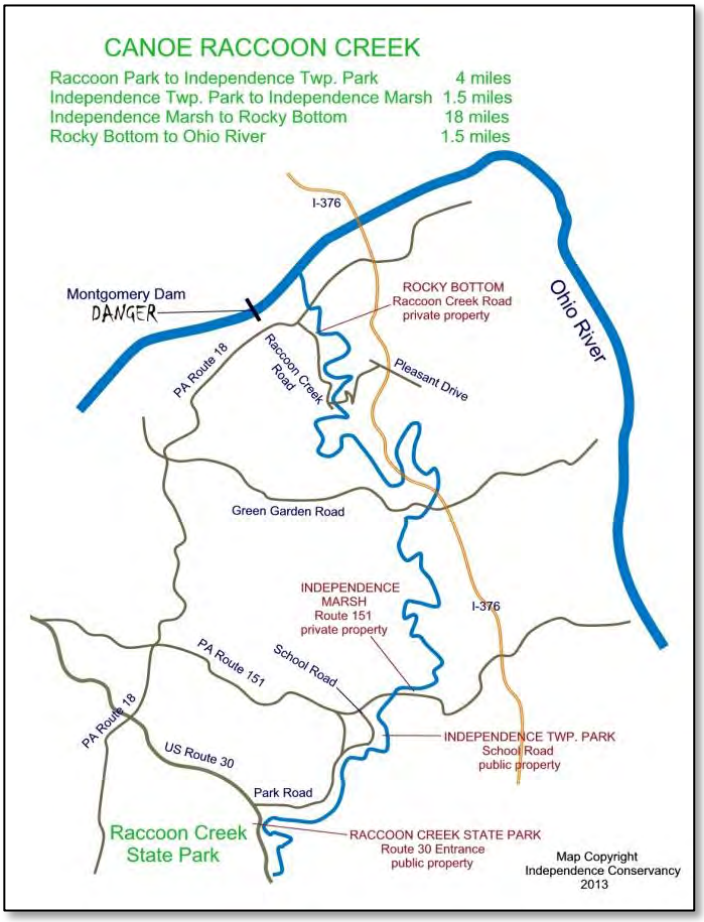

Figure 6.11: Canoe Raccoon Creek map courtesy of Independence Conservancy, © 2013.

[19] Independence Conservancy, Canoe Raccoon Creek, available at http://www.independenceconservancy.org/canoe-raccoon-creek; accessed 10/23/2014.

Privately Owned Campgrounds and Recreational Facilities

Bennett Acres Campground

Bennett Acres Campground is a privately owned campground on the west side of PA Route 18 in the Brush Run Watershed in Hanover Township, Washington County, near Hillman State Park. Bennett Acres is the nearest campground to First Niagara Pavilion, only 2 miles distant on Route 18. The facility offers tent camping areas, full RV hookups, rental cabins, showers and stocked fishing lakes.[20] Bennett Acres is located in the King's Creek Watershed.

Camp Agape

Camp Agapé is an outdoor ministry of the Lutheran Church, located in Mount Pleasant Township in the Cross Creek Watershed. Camp Agapé provides summer camping programs and retreat facilities on a campus of 250-plus acres of rolling fields and forests. Activities include reading and math camps, as well as traditional outdoor offerings like swimming, hiking, cook-outs and crafts. Agape Retreat and Learning Center features a large indoor meeting space for up to 50 participants. Programs are open to everyone regardless of religious affiliation.[21]

Linsley Outdoor Center

Linsly Outdoor Center is a branch facility of the Linsly School, a private, independent college preparatory school for grades 5 through 12, founded in 1814 and located in Wheeling, West Virginia.[22] Linsly students participate in at least one five-day program at Linsley during their school year. Linsly is located on PA Route 168 in Hanover Township, Beaver County in the Traverse Creek Watershed.

Saint Joe Boat Club

Saint Joe Boat Club was established in 1963 as a corporately-owned club for employees of St. Joseph Lead Company. Built on company land near the mouth of Raccoon Creek in Potter Township, the Boat Club was one of several recreational facilities including a shooting range and ball fields built by St. Joe for their workers. The club is now privately owned, and currently has over two hundred members. The club's location is Raccoon Creek's only access for deep-water motor boats. In addition to the paved boat launch and docks, members can also rent a pavilion and camp overnight with electric hookup provided. Membership information is available by calling 724-

[20] Bennett Acres, available at http://www.bennettacres.com/; accessed 10/16/2014.
[21] Camp Agape, available at http://www.campagape.org/; accessed 10/21/2014.
[22] Linsly Environmental Center's website available at https://www.linsly.org/Page/About-Linsly/Welcome-to-Linsly; accessed 4/18/2014.

622-3872 or 724-622-1895.[23]

Tri-State Holiness Association

Clinton Camp Meeting is a ministry of the Tri-State Holiness Association. Clinton Camp Meeting is the grounds for an annual, old-fashioned, holiness camp meeting for spiritual renewal and revival. It is not a recreational campground. Clinton Camp Meeting begins the third Thursday of July each year and runs for ten days. In 2014, it celebrated its 90th year.[24] Clinton Camp Meeting is located on Route 30 in Findlay Township near Clinton in the Raredon Run Watershed.

Golf Courses and Driving Ranges

Highland Springs Golf Course

Highland Springs Golf Course spans the Pennsylvania-West Virginia state line near Wellsburg, WV, in the Cross Creek Watershed. Opened in 1961, Highland Springs Golf Course features 6,853 yards of golf from the longest tee for a par of 72. The course rating is 72.4 and has a slope rating of 118. Players "tee off in West Virginia and put out in Pennsylvania."[25]

Indian Run Golf Club

Indian Run Golf Club is located on Avella Road (PA Route 844) near Avella in the Cross Creek Watershed. Opened in 1998, this 18-hole course features 5,720 yards of golf from the longest tees for a par of 72. The course rating is 70.7 and it has a slope rating of 129.[26]

Marada Golf Course

Marada Golf Course is located on US Route 30 in Findlay Township near Clinton in the Raredon Run and Potato Garden Run Watersheds. Marada is a public course featuring 9 holes over 3,090 yards with a par of 35. This family-friendly course "may be the biggest nine-hole golf course east of the Mississippi."[27]

Miller Golf Center

Miller Golf Center is a driving range with carpeted putting greens, a designated chipping area and grass tees. Only woods are allowed. The facility is located on PA Route 18 in Hanover Township, Washington County near Hillman State Park.[28]

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[23] Interview with Edwin H. Becker, owner/operator of Saint Joe Boat Club; 10/22.2014.
[24] Clinton Camp Meeting, available at http://clintoncamp.org/; accessed 10/21/2014.
[25] Highland Springs Golf Course, available at http://www.highlandspringsgolf.com/index.php; accessed 10/16/2014.
[26] GolfLink.com, available at http://www.golflink.com/golf-courses/course.aspx?course=1613256; accessed 10/16/2014.
[27] Marada, available at http://maradagolf.com/; accessed 10/16/2014.
[28] Frugal Man's Golf, Miller Golf Center, available at http://frugalmansgolf.wordpress.com/reviews/golf-course-reviews/miller-golf-center/

Ponderosa Golf Course

Ponderosa Golf Course and Restaurant are located near the intersection of PA Routes 168 and 18 just north of Frankfort Springs in Hanover Township, Beaver County. The golf course spans the headwaters of the Aunt Clara Fork of Kings Creek and the Traverse Creek Watersheds. Ponderosa is a public course featuring 18 holes over 6,625 yards with a par of 71.[29]

Quicksilver Golf Club

Quicksilver Golf Club is located on Quicksilver Road in Robinson Township north of Midway. The northern part of Quicksilver's course extends into Little Raccoon Run Watershed. Quicksilver is a public course with 18 holes over 7,083 yards and a par of 72. Its course rating is 74.6 and slope rating is 137.[30] Quicksilver has hosted the Senior PGA Tour and the Ben Hogan Tour. Its banquet and special events facilities can host up to 300 people.[31]

Shadow Lakes Golf Course

Shadow Lakes Golf Course and the Club at Shadow Lakes are located off Golf Course Road in Hopewell Township, Beaver County. The course is situated in a meandering bend of the main stem of Raccoon Creek. It features 18 holes over 6,550 yards with a par of 72. The site's original golf course and club house were built in the 1950s for management employees of the former Jones & Laughlin Steel Corporation's Aliquippa Works. Today, Shadow Lake's modern ballroom and restaurant can accommodate up to 400 guests for weddings and other special events.[32]

Entertainment Venues

First Niagara Pavilion

The First Niagara Pavilion, originally known as the Coca-Cola Star Lake Amphitheater and then the Post-Gazette Pavilion, is an outdoor concert venue in Hanover Township, Washington County. It is located on reclaimed strip-mined land just south of the intersection of US Route 22 and PA Route 18. Owned and operated by LiveNation, First Niagara Pavilion has a maximum capacity of approximately 23,000 fans, with 7,100 in a reserved seated open-air pavilion and the remaining 16,000 on a general admission lawn. The first concert at the former Star Lake was sold-out, back-to-back performances by Billy Joel in June of 1990. Over the years, the facility has hosted many nationally-renowned country and rock acts as well as music festivals of various genres. Jimmy Buffett and the Coral Reefer Band have played nearly every summer

[29] GolfLink.com, available at http://www.golflink.com/golf-courses/searchresults.aspx?coursekeyword=Ponderosa+&coursecity=&coursestate=PA&coursename=&coursezip=15021&within=20&p=1; accessed 10/16/2014.
[30] Quicksilver Golf Club, available at http://quicksilvergolf.com/QS/Quicksilver-Golf-Midway-PA.htm; accessed 10/16/2014.
[31] Quicksilver Golf Club, available at http://quicksilvergolf.com/QS/Quicksilver-Golf-Midway-PA.htm; accessed 10/16/2014.
[32] The Club at Shadow Lakes, available at http://www.clubatshadowlakes.com/; accessed 10/16/2014.

since the amphitheater's opening.[33] More information is available at http://www.firstniagarapavilion.net/.

Pepsi-Cola Road House

Pepsi-Cola Roadhouse is an air-conditioned indoor dining and entertainment venue. Seating for about 1000 people is arranged in tables of four with no seat further than 65 feet from the stage. Not a dinner club, the Pepsi-Cola Roadhouse has a casual atmosphere with no need to dress up. Performances feature area favorites to national headliners including Willie Nelson, Keith Urban, Lonestar, Montgomery Gentry, Dwight Yoakam and many more. Private bookings and catering are available for weddings, corporate events, banquets and fundraisers. The Pepsi-Cola Roadhouse is located on PA Route 18 just south of US Route 22 in Hanover Township, Washington County. More information is available at http://www.pepsiroadhouse.com/index.html or by calling 724-947-1900.[34]

Farm Markets and Notable Agri-businesses

Farming, agriculture, forestry and related enterprises are a major part of the economy of Pennsylvania, especially in the 20D Raccoon Creek Region. As mentioned in "Section 5: Land Resources," the Region's farmlands and forests are not only crucial to the local economy, but have defined the appealing rural character of the area for over two hundred years. Below are brief descriptions of several well-known agri-businesses of the 20D Region. The list is by no means inclusive of every agribusiness in the Raccoon Creek Region.

More information about farm-related businesses may be found at AgMap, an online searchable directory of America's agricultural businesses including producers, processors and service providers: http://agmap.psu.edu/. AgMap contains listings of not only traditional agricultural businesses, but also those in forestry, turf grass, landscaping, nursery, and much more. In Pennsylvania, AgMap is a cooperative project of Penn State University and the PA Department of Agriculture.[35]

Avella Farmers Market

The Avella Farmers Market is a service project of the Avella Area Community Association. It is held on Sunday mornings from 10 AM to 1 PM from June through October at the parking lot of the Avella Fire Hall. Offerings include eggs, home baked goods, vegetables, fruit, bedding plants, perennials, herbs, hanging baskets, cut flowers, honey, jams and jellies, leather goods, alpaca crafts and herbal soaps.[36]

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[33] First Niagara Pavilion, available at http://www.firstniagarapavilion.net/; accessed on 10/22/2014.
[34] Pepsi-Cola Roadhouse, available at http://www.pepsiroadhouse.com/index.html; accessed 10/22/2014.
[35] AgMap, available at http://agmap.psu.edu/; accessed 10/24/2014.
[36] AgMap, Avella Farmer's Market, available at http://agmap.psu.edu/businesses/index.cfm?fid=4078; accessed 10/26/2014.

Bedillion Honey Farm

Bedillion Honey Farm is located on Burgettstown Road in Mt. Pleasant Township near Hickory. The family produces honey from hives on their farm and markets it year-round. From May through October, the Bedillions set up an observation bee hive in their roadside market. They also feature locally-grown fresh fruits & vegetables, milk, brown eggs, jams, hand-dipped ice cream cones, farm fresh freezer beef & pork, honey and beekeeping supplies for hobbyists.[37]

Figure 6.12: Honeybees travel to and from their hives, all in a day's work at Bedillion Farm & Apiary. Photo Courtesy of Mark and Sara Bedillion.

Brunton's Dairy

Brunton's Dairy is a seventh-generation, 200-acre farm in Independence Township, Beaver County, established in 1832. Brunton's still delivers glass-bottled milk by truck to residential customers. Their dairy products, including ice cream, are also available at various retail outlets and at the farm store on Ridge Road. According to a 2007 review by Colleen VanTassell of the Pittsburgh City Paper, "Brunton Dairy Farm's chocolate milk can end the war, halt global warming, fend off the IRS, make dogs like cats, kids eat liverwurst and ward off an onslaught of ocelots. It's also delicious."[38]

Douds-Floyd Farm

Douds-Floyd Farm is a 100-plus year old family farm located high on a hilltop above Raccoon Creek in Potter Township, Beaver County. The farm specializes in vegetables, featuring many varieties of peppers, squash, tomatoes as well as herbs, pumpkins, sweet corn and cut flowers.[39] The Floyds sell produce at local farm markets, and a visit to their Amish-restored roadside wagon shed market on Pleasant Drive is always very interesting and rewarding.

Hozak Farms

Hozak Farms and Christmas Barn are located on Anderson-Hozak Road in Hanover Township, Beaver County, near Raccoon Creek State Park. This family-owned business features many acres of cut-your-own Christmas trees of several species, as well as balled-and-burlapped live trees for after-Christmas planting. The Christmas

Figure 6.13: Customers at Hozak's Fall Festival load up on the hay wagon to leave the pumpkin patch, 10/26/2013. Photo courtesy of the Beaver County Times.

[37] Bedillion Honey Farm, available at http://bedillionhoneyfarm.com/; accessed 10/25/2014.
[38] Brunton's Dairy, available at http://bruntondairy.com/; accessed 10/24/2014.
[39] Doudsfloydfarm Blogspot, available at http://doudsfloydfarm.blogspot.com/; accessed 10/24/2014.

Barn offers gifts, ornaments, collectibles and antiques, hot cocoa and home-baked goodies. In the fall, the farm holds a fall festival with hayrides through the woods and to the pumpkin patch; refreshments, entertainment and plenty of pumpkins from which to choose.[40]

Ianetti's Garden Center

Ianetti's Garden Center is a one-stop lawn & garden landscape improvement business located on Steubenville Pike (old US Route 22) in Hanover Township, Washington County. Ianetti's sells shade trees and ornamental shrubs, annuals and perennials, herbs, power equipment, a wide variety of garden supplies and decorative mulches. Their services include lawn and landscape design, installation and maintenance.[41]

Inches Nursery

Inches Nursery is a family-owned business whose retail garden center is on McGovern Boulevard in Moon Township, Allegheny County. They are a full-service lawn, landscape, bulk materials and retaining-wall construction company whose slogan is "Yards by Inches." [42] The Inches family has a large wholesale shade and ornamental tree nursery in the Raccoon Creek valley's rich bottom land along Independence Road in Hopewell Township, Beaver County.

Janoski's Farm, Greenhouse & Country Restaurant

Located on US Route 30 in Findlay Township since 1962, Janoski Farms, Inc. operates thirty-five greenhouses, a retail farm market, a farm bakery, a garden center, a gift shop and the Country Restaurant. Over 200 acres of vegetables are in production. Each October, Janoski's hosts Pumpkinland, a family-friendly, old-fashioned fun experience. In 2013, Janoski's launched their annual Harvest Wine Festival featuring samplings of local wines, a buffet, antique tractor display, and live entertainment. Staff includes eight family members and thirty seasonal employees.[43]

Figure 6.14: Janoski's Garden Center in Findlay Township, 10/10/2013.

Kauffman Family Marketplace

The Kauffman Family Marketplace was launched by the several members of the extended Kauffman family in 2001. Located on Smith Township State Road (PA Route 18) just south of

[40] Hozak Farms, available at http://www.hozakfarms.com/home.html; accessed 10/24/2014.
[41] Ianetti's Garden Center, available at http://www.iannettis.com/index.html; accessed 10/24/2014.
[42] Inches Nursery, available at http://www.inchesnursery.com/index.htm; accessed 10/25/2014.
[43] Janoski's Farm and Greenhouse, available at http://www.janoskis.com/; accessed 10/26/2014.

Burgettstown, the business has grown and expanded its offerings of Pennsylvania Dutch-style products. The Marketplace features a bulk food line including organics and natural foods, a deli with Amish meats and cheeses, and a wide selection of both wooden and recycled polyethylene outdoor furniture, swing sets and play sets made by Mennonite and Amish craftsmen.[44]

McConnell's Orchard

McConnells' Farm, "Home of Sweet Peaches and Sour People," has been owned and operated by the McConnell family since 1787. It may be the oldest farm west of the Allegheny Mountains operated by a single family - worked by nine generations. Located on New Bethlehem Church Road in Independence Township, Beaver County, the original property was made in payment for service of Capt. John B. McConnell who commanded a militia outside Chambersburg during the Revolutionary War. The farm now comprises about 200 acres, much of which is planted in peaches: over 4,000 trees in fifty-plus varieties. Other offerings include apples, pick-your own berries, fresh-pressed cider, sweet corn and other vegetables.[45]

Raccoon Creek Winery at Kramer's Greenhouse

Raccoon Creek Winery at Kramer's Greenhouse was opened in 2009, specializing in fresh fruit wines made from locally grown fruit. Located on Steubenville Pike in Smith Township, the family owned and operated winery and greenhouse also offer freshly-baked pies on hand or made-to-order.

Community Supported Agriculture Farms – CSAs

Community-supported agriculture (CSA) is a concept designed to encourage relationships between consumers and growers. Consumers benefit by having access to fresh, local food while becoming more knowledgeable about the way their food is grown. Farmers benefit by having arrangements with consumers who pay for a share of the farm's production prior to each growing season. Community Supported Agriculture addresses the concern that the average distance that food travels from farm to consumer in the United States is approximately 1,300 miles. Another advantage of obtaining food locally is that the money stays within the local community.[46]

Within the Raccoon Creek Region, there are several CSA farm operations, all in Washington County. They are listed in Table 6.7.

[44] Kauffman Family Marketplace, available at http://www.kauffmanmarketplace.com/about; accessed 10/25/2014.
[45] McConnell's Farm, available at http://mcconnells-farm.com/; accessed 10/26/2014.
[46] PA Retail Farm Market Association, available at http://pafarm.com/csa.php; accessed 10/26/2014.

Table 6.5: Community Supported Agriculture Farms in the Raccoon Creek Region[47]

CSA Farm Name	Offerings	Location
Cherry Valley Organics	Fruit, Herbs, Vegetables, Pumpkins, Gourds, Flowers, Specialty Items	Number Three Hill Road, Burgettstown Smith Township
Conover Organic Farm	Fruit, Herbs, Vegetables, Pumpkins, Gourds, Specialty Items	Lee Road, Burgettstown Smith Township
Left Bower Farm	Herbs, Vegetables, Pumpkins, Gourds	Manchester Lane, Avella Cross Creek Township
Oak Hill Farm, LLC	Fruit, Herbs, Vegetables, Beef, Flowers	Old Trails Road, Avella

Other Notable Places

Andy's Candies

Located on Steubenville Pike (old US Route 22) near Bavington in Smith Township, Andy's Candies is a regional favorite for handmade chocolates and sweet treats. This old-fashioned candy store includes the chocolate factory and an ice cream counter. It is a popular stop for travelers and locals.

Bert's Hot Dog Shop

Founded and still operated by the Bertolotti Family of Burgettstown, Bert's Hot Dog Shop has been a local landmark along Route 18 in Atlasburg for over sixty years. The tiny roadside building with virtually no dining room is a favorite of truckers, bikers and travelers. Bert's special "World Famous" hot dog lives up to its name through a world-wide following among former residents and visitors to the Burgettstown area.

Local Groups-Environmental, Recreational, Historic, Cultural

Within the Raccoon Creek Region are many groups and individuals who have joined together to work on various causes for the betterment of their communities. These associations range from clubs, fraternal organizations, societies and friends groups to incorporated nonprofits. All share a common goal of making the Region a better place to live, work or play – and they rely on public participation and financial support for their accomplishments and success. The following section is a list of some of the environmental, recreational, historic and cultural organizations active in the Raccoon Creek Region.

[47] PA Retail Farm Market Association, CSAs by County, available at http://www.pafarm.com/csa_county_lists/all_counties_csas_12-1-13.pdf; accessed 10/26/2014.

Sportsmen's Clubs

Wildlife has always been a key part of Pennsylvania's cultural heritage. The fields, streams and forests of the Raccoon Creek Region have yielded an abundance of wild game for the earliest human hunter-gatherers to today's sportsmen and women.

Sportsmen are often called the country's original conservationists, recognizing and acting on the need to protect wildlife and wild resources from deforestation, pollution and unregulated hunting and trapping. Pennsylvania's Game Commission and Fish & Boat Commission were established to protect and conserve the wildlife we treasure. These agencies rely on the partnership of local sportsmen's clubs and organizations to help manage the wild game populations that make our region a popular hunting destination.

Figure 6.15: A youngster tries skeet shooting at Five Points Hunting Club during the Beaver County Sportsmen's Conservation League Youth Camp, 7/18/2007.

Within the Raccoon Creek Region are numerous sportsmen's clubs. For purposes of this Plan, land owned by sportsmen's organizations within the study area are mapped on "Plate 6:1: Recreation Map" and are summarized briefly in Table 6.6.

Table 6.6: Sportsmen's Clubs of the 20D Raccoon Creek Region[48]

County	Club	Acreage	Location	Watershed
Allegheny	Point Park Rod & Gun Club	182	Potato Garden Run Road in Findlay Township	Potato Garden Run
	Imperial Beagle Club	66	Beagle Club Road in North Fayette Township	Little Raccoon Run
Beaver	Green Valley Sportsmans Club	65	Fishpot Road in Potter and Raccoon Townships	Fishpot Run
	Southside Sportsman's Club	78	Temple Road in Hanover Township	Traverse Creek
	Chartiers City Rod & Gun Club	104	Chartiers Drive in Hanover Township	Aunt Clara Fork of Kings Creek
	Coraopolis Beagle Club	113	Bocktown Cork Road in Independence Township and Findlay Township	Raccoon Creek Main Stem and Raredon Run
	Five Points Hunting Club	104	Bocktown-Cork Road in Independence Township	Raredon Run

[48] GIS data summarized from PASDA and the Southwest Pennsylvania Commission.

Table 6.5: Sportsmen's Clubs of the 20D Raccoon Creek Region (cont.)[49]

Washington	Avella Sportsmens Club	12	Avella Road in Cross Creek Township	Cross Creek
	Indian Springs Rod & Gun Club	32	Cross Creek Road in Cross Creek Township	Cross Creek
	Cherry Valley Sportsmens Association	2	Joffre-Cherry Valley Road in Smith Township	Raccoon Creek
	Tri-Valley Sportsmens Association	83	Burgettstown Smith Township	Harmon Creek
	Goodwill Hill Fish & Hunt Club	70	Goodwill Hill Road in Hanover Township	Harmon Creek
	Paris Sportsmens Club	922	Devils Den Road in Hanover Township	Kings Creek
	Raccoon Valley Sportsman Association	130	Atlasburg Road Cross Creek Township	Cross Creek

Granges

The Grange, officially referred to as the National Grange of the Order of Patrons of Husbandry, is a nationwide fraternal organization that encourages families to band together to promote agriculture and the economic and political well-being of their communities. One of the major accomplishments attributed to Grange advocacy is the establishment of free rural mail delivery.[50]

The Grange movement has its roots in the aftermath of the Civil War. In 1866, Oliver Hudson Kelley, regarded as the father of the Grange, was serving as a staff member of the Department of Agriculture in Washington, DC. Sent to the South to make a survey of farm conditions following the Civil War, Kelley conceived the idea that a fraternal organization, composed of farmers from all over the country, would help heal scars caused by the war while improving the economic and social position of the farm population. Upon returning to Washington, Kelley and several friends in government service framed an organization based on seven degrees and a constitution. Caroline Hall, Kelley's niece, was the first to suggest that women be admitted to membership on an equal basis with men. The Pennsylvania State Grange was organized in 1873. Today there are 235 local granges with over 10,000 members in Pennsylvania.[51]

Grange halls are fixtures in the social fabric of rural communities, serving as polling places, centers for charitable functions, family gatherings and local events. During the third week of August each year, Hookstown Grange in Greene Township holds the Hookstown Fair, the only

[49] GIS data summarized from PASDA and the Southwest Pennsylvania Commission.
[50] Wikipedia, The National Grange of the Order of Patrons of Husbandry, available at http://en.wikipedia.org/wiki/The_National_Grange_of_the_Order_of_Patrons_of_Husbandry; accessed 10/16/2014.
[51] Pennsylvania State Grange, available at http://www.pagrange.org/default.asp; accessed 10/16/2014.

agricultural fair within the boundaries of the Raccoon Creek Region. Hookstown Fair Grounds includes the Southside Historical Village; both the Fairgrounds and the Village are covered later in this section. FirstEnergy's nearby Bruce Mansfield Plant has been a major supporter of Hookstown Fair and Southside Historical Village by donating pavilions, building materials and other assistance.

Table 6.7: Granges of the 20D Raccoon Creek Region[52]

County	Grange Name	#	Location	Meeting
Allegheny	Montour Valley	2005	24 Clinton Park Drive Clinton, PA 15026 Findlay Township	2nd Monday @ 7:30 PM
Beaver	Frankfort Springs	1989	1476 State Route 18 Burgettstown, PA 15021 Hanover Twp., Wash. Co.	2nd Monday @ 7:30 PM
	Hookstown	1980	1198 State Route 18 Hookstown, PA 15050 Greene Township	2nd Thursday @ 7:30 PM
Washington	Burgettstown (Bavington)	1502	643 Creek Road Bulger, PA 15019 Smith Township	Nov-Apr: 3rd Tues 1 PM May-Oct: 3rd Tues 7 PM
	Cross Creek	1751	Homes of Members	Last Thursday of month @ 12 Noon

Watershed Associations

Watershed associations are grassroots organizations of people who seek to better their communities by working to enhance the quality of the natural environment within a given watershed boundary. In the 20D Raccoon Creek Region there are currently two watershed associations, one umbrella organization and one watershed-based land trust. These entities are described below.

Cross Creek Watershed Association

Cross Creek Watershed Association serves the Cross Creek Watershed in west-central Washington County. Its most recently completed project was natural stream channel stabilization on the main stem of Cross Creek at the Meadowcroft Rockshelter. In keeping with the historic nature of the site, all new vegetation planted was authenticated to be native to the area 16,000 years ago when people first lived in the Rockshelter. Contact information for Cross Creek Watershed Association is phone: 724-263-4056; 386 Atlasburg Road, Burgettstown, PA 15021.

Figure 6.16: Volunteers plant native trees and shrubs near a newly-completed rock cross-vane below the Meadowcroft Rockshelter, winter 2005. Photo courtesy of Washington Co. Watershed Alliance.

[52] Pennsylvania State Grange, available at http://www.pagrange.org/default.asp; accessed 10/16/2014.

Raccoon Creek Watershed Association

The Raccoon Creek Watershed Association serves the Raccoon Creek Watershed, home to 32,000 people in fifteen municipalities in Beaver, Washington and Allegheny Counties. Working in partnership with Independence Conservancy, the Washington County Conservation District and many other partners, the RCWA has focused on treating abandoned mine discharge at five sites in Raccoon Creek's headwaters. Contact information is phone 724-947-3895; P.O. Box 251, Clinton, PA 15026.

Washington County Watershed Alliance

The Washington County Watershed Alliance is a 501c3 non-profit umbrella organization which serves as the fiscal agent for grants and coordinates the county-wide efforts of its member watershed associations. Member organizations within the 20D Region include the Washington County Conservation District, Cross Creek Watershed Association and Raccoon Creek Watershed Association. The Alliance seeks to give back to the community through educational outreach. It holds a display at the Washington County Fair, conducts special workshops and community presentations. Among the educational tools available are the Watershed Model, the Water Cycle Presentation and the Washington County Watershed Roadmap. Alliance meetings are held at the Conservation District office on the first Tuesday at 7:00pm in January, March, May, July, September and November.

Land Trusts

Land trusts are private, nonprofit organizations that work cooperatively with landowners to protect and conserve land for its natural, recreational, scenic, historic, or productive value – values that sustain life on earth. More information about land trusts and their work is available in "Section 5: Land Resources."

Independence Conservancy

The Independence Conservancy is a 501c3 watershed-based land trust founded in 1999 in Aliquippa, PA. This all-volunteer group works for clean water and permanent preservation of beautiful vistas and special places in the Raccoon Creek Watershed. The Conservancy is a key partner in water quality improvement in Raccoon Creek. It owns, operates and maintains passive treatment systems at Solar Mine in the St. Patrick's Run Watershed in Findlay Township and at JB2 near the main stem of Raccoon Creek in Smith Township. The Conservancy offers a variety of educational programs and watershed stewardship activities, most notably the Community Tire Collection Program, now in its eleventh year. The Conservancy's Rocky Bottom Natural Area is the only frontage on Raccoon Creek open to the public aside from Raccoon Creek State Park. Independence Conservancy is

the only land trust based in the 20D Region. More information is available at http://www.independenceconservancy.org/.

Pine Creek Land Conservation Trust

The Pine Creek Land Conservation Trust is based in north-central Allegheny County. It encourages property owners and developers in the 14 municipalities of the 65-square mile Pine Creek Watershed to preserve undeveloped land as open space. All but one of PCLCT's conserved properties lie within the Pine Creek Watershed in Allegheny County. *(Pine Creek is not in the 20D Region.)* The sole exception is the Flight 427 Memorial Property near the main stem of Raccoon Creek in Hopewell Township, Beaver County. It is the site of the US Airways 427 plane crash on September 8, 1994. The Pine Creek Land Conservation Trust oversees the conservation of this hallowed property. More information about this historic incident and its far-reaching consequences is available in "Section 1: Project Area Characteristics."

Other Groups

Friends of Raccoon Creek State Park

The Friends of Raccoon Creek State Park is a 501c3 non-profit organization of dedicated volunteers whose purpose is to promote environmental education programs, outdoor recreation, maintenance of historical attributes and conservation of park assets. The Friends encourage people to use the Park for recreational activities. Volunteers perform trail maintenance, remove invasive plants, tend wildflower gardens, coordinate Eagle Scout projects and many other tasks. More information is available by calling 724-899-3611 or at http://www.friendsofraccoon.org/.[53]

Meadowcroft Rocksheleter and Historic Village Advisory Board

The mission statement of the Meadowcroft Advisory Board is *"Since prehistoric times, people have adapted to the land and shaped their environment in order to survive and build a better life. This story of human history in Western Pennsylvania is explored at Meadowcroft through archaeology, living history, and museum programs utilizing the unique resources of the site."* Meadowcroft Rockshelter near Avella is one of the Heinz History Center's network of regional museums.

[53] Friends of Raccoon Creek State Park, available at http://www.friendsofraccoon.org/; accessed 10/23/2014.

Montour Trail Council

The Montour Trail Council is a non-profit all-volunteer group which builds, operates and maintains the trail. It is a registered 501(c)3 charitable organization, relying on corporate, foundation and government grants as well as private donations for funding. Montour Trail Council also stewards the length of the Panhandle Trail located in Allegheny County. More information is available at http://www.montourtrail.org/about/index.asp.[54]

Washington County Historical Society

Headquartered in the LeMoyne House in Washington, PA, the Washington County Historical Society is dedicated to the ongoing administration and operations of the F. Julius LeMoyne House, LeMoyne Crematory, Frontier History Center and the Norma K. Grimes Research Library. Outreach programs of the WCHS include presentations on 18th century trades, early Indians of Pennsylvania, early towns and frontier forts of Washington County, settling the Pennsylvania frontier and the Whiskey Rebellion.[55] More information is available at http://www.wchspa.org/outreach.html.

Archaeological & Historical Resources

Introduction

The Raccoon Creek Region is rich in human history. From the 16,000 year old artifacts of early life at the Meadowcroft Rockshelter, to the graves of Revolutionary War veterans in the secluded pioneer cemeteries, to the world's first peacetime use of nuclear power at Shippingport, an entire book could be written about the Raccoon Creek Region's significance in North American and world history.

The archaeological and historical resources of the Raccoon Creek Region narrate history and add to residents' sense of place by serving as visible reminders of their common cultural heritage. Historic sites are also an interesting draw for out-of-town visitors. People who travel to experience the places and activities that authentically represent the stories and people of the past and present are referred to as "heritage tourists." Heritage tourists tend to stay longer and spend more money than other types of travelers.[56] Investing in conservation and preservation of archaeological and historical resources not only advances pride of place but also boosts the Region's economy. For more information about heritage tourism in Pennsylvania, please contact the PA Historical and Museum Commission at http://www.phmc.state.pa.us.

[54] Montour Trail Council, available at http://www.montourtrail.org/about/index.asp; accessed 10/23/2014.
[55] Washington County Historical Society, available at http://www.wchspa.org/outreach.html; accessed 11/5/2014.
[56] Advisory Council on Historic Preservation Report of Proceedings, Washington, DC, November 14, 2002; available at http://www.achp.gov/heritagetourismsummit.pdf; accessed 109/30/2014.

Archaeological Resources

The Raccoon Creek Region is fortunate to hold a world-renowned archaeological site containing the oldest-known human habitation in North America! The following description of the history and significance of this treasure was provided by David Scofield, Director, Meadowcroft Rockshelter and Historic Village.

Meadowcroft Rockshelter & Historic Village[57]

Meadowcroft Rockshelter and Historic Village is located on 275 acres west of Avella in Washington County in the Cross Creek Watershed. Meadowcroft operates in association with the Senator John Heinz History Center, an affiliate of the Smithsonian Institution and Pennsylvania's largest history museum. The John Heinz History Center's museum system also includes the Western Pennsylvania Sports Museum and the Fort Pitt Museum.

Meadowcroft was founded by Albert and Delvin Miller, two brothers dedicated to preserving the heritage of Western Pennsylvania's countryside. Delvin Miller (1913-1996), a breeder, trainer and driver of Standardbred horses, established himself as one of harness racing's most successful competitors in a career that spanned eight decades. Albert Miller (1911-1999) successfully worked the land that had been in the Miller family since 1795. In addition to his pursuits in agriculture and conservation, Albert held an avid interest in archaeology and local history. It was Albert who, in 1955, discovered the Meadowcroft Rockshelter in the cliffs above Cross Creek.

Figure 6.17: The enclosure protecting the archaeological excavation at the Meadowcroft Rockshelter National Historic Landmark, the oldest site of human use in North America. This cliff of Morgantown Connellsville sandstone was undercut by flood waters to create the overhang which provided a sheltered campsite for people over the course of 16,000 years. Photo copyright 2008 Ed Massery.

In 1969 the Millers established the Meadowcroft Foundation to steward the site and opened their new museum to the public as "Meadowcroft Village". Four years later, Albert's archaeological discovery was professionally excavated during a University of Pittsburgh field school under the direction of Dr. James Adovasio. The site gained international attention as

[57] Heinz History Center, Meadowcroft, available at http://www.heinzhistorycenter.org/meadowcroft.aspx; accessed 10/30/2014.

Smithsonian Institution radiocarbon dating placed human occupation of Meadowcroft at least 16,000 years ago, changing the long-held scientific understanding of when people arrived in North America.

In 1993 the Meadowcroft Foundation approached the Historical Society of Western Pennsylvania (HSWP) for technical and financial assistance. HSWP conducted an assessment of Meadowcroft's resources, collections, programs and finances with a team of staff and consultants lead by Dr. Thomas Schlereth, Professor of American Studies at the University of Notre Dame. Based upon the recommendations of this team, HSWP and the Meadowcroft Foundation agreed to work jointly to develop exhibits and programs utilizing all of Meadowcroft's resources and collections. This relationship led to merger of the two organizations in 2000.

In 2005 Meadowcroft Rockshelter was designated a National Historic Landmark by the U.S. Secretary of the Interior. Today visitors can explore the oldest site of human use in North America from inside a new enclosure which provides a perspective of the excavation that was

Figure 6.18: J.M. Adovasio, principal investigator of the Meadowcroft Rockshelter excavation that began in 1973, explains the stratigraphy of the site and how he uncovered evidence of prehistoric people dating back 16,000 years. Photo copyright 2008 Ed Massery.

not previously possible. Visitors stand at the spot where the first Americans gathered around a campfire 16,000 years ago. Museum guests may also explore a recreated 16th century Monongahela Indian village to get a glimpse of life in the Raccoon Creek Region before the arrival of European settlers; visit an 18th century frontier area and see some of the changes that came with the arrival of European settlers; and stroll through the recreated 19th century rural village with its covered bridge, one-room schoolhouse, blacksmith shop, church, and two log houses.
Meadowcroft also provides educational programs to thousands of school children from the Pennsylvania, Ohio and West Virginia tri-state area annually. The museum is open from May through October, attracting visitors from all over the globe.

The People of the Raccoon Creek Watershed: From Prehistory to the Frontier

By David Scofield, Director, Meadowcroft Rockshelter and Historic Village

For at least the past 16,000 years, people have lived in the region around the Raccoon Creek Watershed. From the Paleoindians who first ventured into the upper Ohio Valley to make use of the region's natural resources for their survival; to the 18th century Indians, pushed westward by European expansion; to the European settlers who cleared the virgin forests and opened up the land for extensive agriculture; all were attracted by the rich, abundant natural resources found here.

Based on archaeological evidence from the Meadowcroft Rockshelter, the first people arrived in the region at least 16,000 years ago. It is not known who these ancient people were or how they got to this part of the continent. However, without question, the so-called Paleoindians were here and they left behind evidence of their presence.

Living a hunter-gatherer type of existence, the Paleoindians were constantly on the move through the dark and unending virgin forests. Making temporary camps at places like Meadowcroft, along the banks of Cross Creek in present day Washington County, they stayed up to a couple of weeks in one locale until the supply of food was exhausted and then they moved on. Food remains recovered at Meadowcroft indicate the diet of these prehistoric people included game animals such as elk, white-tailed deer, turkey, ruffed grouse, and the now extinct passenger pigeon. They also ate fish, fresh water mussels, snails, and the very large (up to 20 inches long) aquatic salamander known as the hellbender (Cryptobranchus alleganiensis). Other sources of food included walnuts, hickory nuts, and acorns as well as blackberries, raspberries, cherries, hackberries, grapes and paw paw.

For over four-hundred generations, these prehistoric people continued this hunter-gatherer lifestyle until, about 5,000 years ago, when a revolutionary idea began the long, slow process that eventually changed the way future generations would live. Intentionally planting seeds with the idea of returning to the same location for harvest was the genesis of agriculture, a simple act which eventually led to selecting the best seeds to plant and ultimately to domesticated varieties of plants. Around A.D. 900 a global warming trend known as the Medieval Optimum provided a boost to native agriculture. Corn, beans, and squash became

staples in the diet of Eastern Woodland Indians. This agricultural revolution brought about the ability for native people to renew their own food supply and to settle in villages year-round, storing crops for the long winter months. The oldest known evidence of corn in the eastern United States was recovered at Meadowcroft. The earliest of these carbonized cob fragments are approximately 2,500 years old.

From the time of the Medieval Optimum until about 1635, the prehistoric cultural group now referred to as the Monongahela culture, were predominant in western Pennsylvania. With the first evidence of this people group being found along the banks of the Monongahela River, archaeologists have ever since referred to them by that name. No written documents were left by these prehistoric people and no one knows what they called themselves but, the extensive archaeological evidence from the region, including the Raccoon Creek Watershed, has revealed much about this people group.

The Monongahela culture disappeared from Western Pennsylvania before the arrival of Europeans. While there is an element of mystery about what happened to these people, well-reasoned theories suggest that disease, introduced by contact with Indians from the east, may have taken a heavy toll on the Monongahela. Warfare with other Indians, specifically the Seneca from present day New York State, over trade and territory was likely their death knell and by 1635 they were gone.

For nearly a century following the demise of the Monongahela culture, the dense forests of Western Pennsylvania were virtually empty of human inhabitants. It wasn't until the early 18th century that other Indians from the east began migrating further west toward the Ohio River. By the 1720s, groups of Lenape and Shawnee from eastern Pennsylvania started to arrive west of the Allegheny Mountains. A few decades later, by the middle of the 18th century, European settlers and fur traders, as well as military personnel occupying the forks of the Ohio River, began interacting with these Indians who were now calling Western Pennsylvania their home.

While some of the interaction between the Indians and the Europeans was beneficial to both cultures, some inevitable conflict also took place. This conflict was exacerbated by the global dispute for territory between the French and the British with both sides vying for the allegiance of the various Indian nations. Even after the resolution of the British, French and Indian war in 1763, tension and periodic eruptions of violence continued between the European settlers and the Indians.

The 1768 treaty of Ft. Stanwix, between the British and the Iroquois, opened up the land east and south of the Ohio River for settlement by Virginia. Some native people in the region, including the Delaware, Seneca-Cayuga, and Shawnee, were disagreeable to the terms of the treaty and made attempts to drive British colonists from the area. The resulting military response in 1774 by the royal governor of Virginia, known as Lord Dunmore's War, sought to bring an end to the conflict. Following the major battle near Point Pleasant, West Virginia, the native warriors were pushed back across the Ohio by the British and agreed to terms ceding lands and captives, with promises not to attack travelers on the river.

In 1842, English settler Spencer Records penned the recollection of his experience and hardship on the 18th century Western Pennsylvania frontier. His father built a grist mill on Raccoon Creek in 1776. According to Records, in the summer of 1777 when Indian hostilities commenced: "[a] few families forted at the mill". Due to more danger of attack in 1778, Records father "obtained a guard of men, to be stationed at his mill; and men would go in companies armed, and get grinding done." The practice of "forting" was a necessity among area settlers. Like Records, Joseph Doddridge was a boy living in the region during the 1770s. Doddridge also later recalled how his father's farm, near present-day Avella in Washington County, served as a fort during threat of Indian attack. It was common practice among settlers even to go work in the fields with some of the work party designated as guards during times of potential hostilities. Among several examples of Indian raids, Records relates the details of a 1779 Indian attack on a Raccoon Creek camp near the mouth of Raredon Run where maple sugar was being processed. Five young men were killed with five young women and a boy taken captive.

The frontier period in western Pennsylvania finally came to a close by 1794 following the Battle of Fallen Timbers in Ohio. The Indians were defeated in this conflict and, with the Treaty of Greenville the following year, the long struggle between the Europeans and the Indians for control of the upper Ohio Valley effectively came to an end. The abundant natural resources that made this region attractive to people since the Paleoindians first arrived, would now be used to support expanding settlement by primarily English and Scots-Irish immigrants.

For further reading:

J.M. Adovasio and Jake Page, The First Americans: In Pursuit of Archaeology's Greatest Mystery (New York: Modern Library, 2003)

John Boback, "The First Western Pennsylvanians" in Western Pennsylvania History, Vol. 96, No.1 (Pittsburgh: Senator John Heinz History Center, 2013) 36-47.

John Boback, "Forting on the Western Pennsylvania Frontier" in Western Pennsylvania History, Vol. 94, No.1 (Pittsburgh: Senator John Heinz History Center, 2011) 6-7.

Joseph Doddridge, Notes on the Settlement and Indian Wars (Parsons, WV: Reprint of 1912 edition, McClain Printing Company, 2010)

Naomi Mullendore Hougham, Edited by Donald F. Carmony, "Spencer Records' Memoir of the Ohio Valley Frontier, 1766-1795" in Indiana Magazine of History, Vol. LV, No. 4 (Bloomington, Indiana: Indiana University, 1959)

Daniel K. Richter, Native American's Pennsylvania, Pennsylvania History Studies Series, No. 28 (University Park, PA: The Pennsylvania Historical Association, 2005)

David Scofield, "The Peopling of America" in Western Pennsylvania History, Vol. 94, No.2 (Pittsburgh: Senator John Heinz History Center, 2011) 6-7.

David Scofield, "The Real Paleo Diet: What's for Prehistoric Dinner" in Western Pennsylvania History, Vol. 96, No.4 (Pittsburgh: Senator John Heinz History Center, 2013) 4-5.

R.S. Stephenson, Clash of Empires: The British, French & Indian War 1754-1763, a special edition of Western Pennsylvania History, Vol. 88, No. 1&2 (Pittsburgh: Senator John Heinz History Center, 2005)

Historical Resources

The Raccoon Creek Region has played many important roles on the stage of U.S. and world history. Within its boundaries is the oldest known human habitation in North America at Meadowcroft Rockshelter, dating back 16,000 years; the world's first peace-time atomic energy project, generating electricity at the Shippingport Atomic Power Station; the world's largest welded steel tanks at the former Department of Defense Monaca Tank Farm in Potter Township; the crash site of US Air Flight 427 in Hopewell Township which led to the 1996 Federal Family Assistance Plan for Aviation Disasters; and many other notable places of historic, cultural, natural, industrial or military importance.

Glimpses into the Past

In the early to mid-1700s, Native Americans of the Shawnee tribe inhabited villages along the banks of the Ohio River. As European settlers pushed westward from the East in the late 1700's, the Delaware (or Lenape) people moved into Western Pennsylvania. When the French and English began to explore the Ohio Valley, rivalries and conflicts resulted. These sparked the French and Indian War of 1754-1763 in which the French were defeated. After the British overcame the allied Native American tribes in Pontiac's Rebellion of 1763, the lands south of the Ohio River became relatively free of conflict. Settlers began homesteading this area, including the Raccoon Creek Region, in the early 1770s.

As European settlers mass-migrated west in the late 1700s, they often headed cross-country from Pittsburgh toward Wheeling by following the creek valleys at times when the Ohio River was too low for boat travel. In the process, many families found the lands south of the Ohio to their liking and put down deep roots. These settlers were of predominantly English, Scottish or Irish descent. Even today, many places in the Raccoon Creek Region bear the familiar names of these pioneers and their descendants.

Figure 6.20 is a detail from a larger map contained in the "Warrantee Atlas of Allegheny County, Pennsylvania" which was constructed from records on file and surveys made on the ground during 1909, 1910, 1912. The image in Figure 6.20 is taken from "Plate no. 28 – Findlay Township" – the western half of which lies within the Raccoon Creek Watershed. Note the family names of many late 1700s landowners, recognizable today in place names of Meeks Run, Raredon Run, Bigger Run, Ewings Mill Road, Beers School Road and Tomlinson Run, among others.

Also note the colorful titles of the properties given to them by their owners – "Brotherhood," "Rose Gills," "Bachelor's Hall," "Pear Point," "Horse Neck," "Bear's Forest," "A Summer Retreat," "Pumpton" and "Delay." It also bears mentioning that, within the confines of the image in Figure 6.20, only one parcel is deeded to a woman, "Fruitfield," belonging to Elizabeth McCandless. The balance of this map may be viewed at the University of Pittsburgh's Digital Library, available at http://images.library.pitt.edu/cgi-bin/i/image/image-idx?view=entry&cc=maps&entryid=x-14warp28.

Picturesque property names notwithstanding, 18th Century life in the Raccoon Creek Region was not for the faint of heart. In his 1882 "History of Washington County, Pennsylvania with Biographical Sketches of Many of Its Pioneers and Prominent Men," Boyd Crumrine writes about one of Cross Creek's early settlers, John Marques:

> *John Marques, the third son of Thomas and Mary Marques, was born June 10, 1750…was the first of his family to emigrate west of the mountains, settling on Cross Creek about 1774, on a tract of land for which he obtained a warrant Feb. 23, 1786, and afterwards received a patent. This tract was called "Marquesata," and contained four hundred and twenty-one acres… For some time, on account of the Indian raids, he was obliged to keep his family in Vance's Fort, while he went back and forward to his farm. On one of these trips, while in his cabin, he heard the report of a rifle close at hand, and going out he saw a party of Indians killing his hogs. On seeing him they immediately gave chase. It was a race for life, and although the Indians were so close at the start he could hear the sound of their footsteps as they ran in the trail behind him, he soon distanced them and succeeded in getting safely into Vance's Fort.*
>
> *He was noted among the scouts' and backwoodsmen as a fleet runner, an accomplishment which was a good deal cultivated, as a man's life not unfrequently depended upon his speed. He was a man of strong and decided character, and was for many years an elder in Cross Creek Church. He died Feb. 25, 1822, He raised a family of nine children, all of whom grew to man and womanhood, married and raised families.*[58]

Another poignant excerpt from Boyd Crumrine's "History of Washington County:"

> *Grace Fuller, a female slave, who was the property of Thomas Armor, lived to be one hundred and seventeen years of age. She remembered being in Dillow's Fort when about seventeen years of age, at the time of an attack by the Indians, about the year 1778. She later was owned by a man of the name of Pierce. A daughter was born to her on Raccoon Creek, who was sold when about ten years of age to Daniel Swearingen, who lived about four miles from Paris. She lived to be upwards of eighty years of age. Her mother had been married to three different husbands, all slaves, two of whom were sold and sent South and one died. She was the mother of eight children.*[59]

Circumstances may have improved in the Raccoon Creek Region by the 19th and early 20th Centuries, but rural life was, nonetheless, fraught with challenges and difficulties. Donald Bryan Smith relates memories of life on "Southside" Beaver County in his May, 1975 interview with

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[58] Boyd Crumrine, "History of Washington County, Pennsylvania with Biographical Sketches of Many of Its Pioneers and Prominent Men" (Philadelphia: L. H. Leverts & Co., 1882).
Transcribed by John E. Mellick of [TBD] in April 1998. Published in May 1998 on the Washington County, PA USGenWeb pages at http://www.chartiers.com; accessed 11/8/2014.

[59] Ibid.

his father, the Rev. Harold C. Smith, as published in the Spring 1984 edition of Milestones, the Journal of Beaver County History:

> *…even the most fortunate inhabitants of the Southside accepted without question deprivations which seem quite shocking. There was no such thing as continuous medical care; a doctor was called in only when someone was seriously ill; and often not then. For years, the whole area was dependent on two physicians, old Dr. Shane and young Dr. Ewing who had to shoulder an increasing burden as the years went by and literally worked himself to death, jouncing on the dusty or muddy, rutted country roads from crisis to crisis. Two of my father's siblings died in infancy and there were many families similarly afflicted; Service Church cemetery was, he said, "awfully full of little gravestones." Diphtheria was the great killer of children, typhoid of adults while smallpox was no longer the scourge it had once been, though pock-marked faces were not uncommon.*
>
> *It doesn't require great insight to recognize that this was a society whose consumption of material goods (no indoor plumbing, electricity, rapid private transportation) and services (limited educational opportunity, minimal health care and mass entertainment) was at a much lower level than ours. Less obvious but of equal importance was its limited consumption of information, its detachment from what we now consider to have been the main currents of history in the early 20th century. Rural isolation, in this context, doesn't seem to apply to a situation within the community but describes the relation of the community to the "outside" world.*[60]

Figure 6.19: At one time the best option, the outhouse now serves as a picturesque reminder of the "good old days." 5/3/2013.

[60] "Farming Life on the Southside" 1900-1920, by Donald Bryan Smith, published in Milestones, the Journal of Beaver County History Vol. 9, No. 2--Spring 1984, available at http://www.bchistory.org/beavercounty/BeaverCountyTopical/Agriculture/SouthsideFarming/SouthsideFarmingMSP84.html; accessed 11/8/2014.

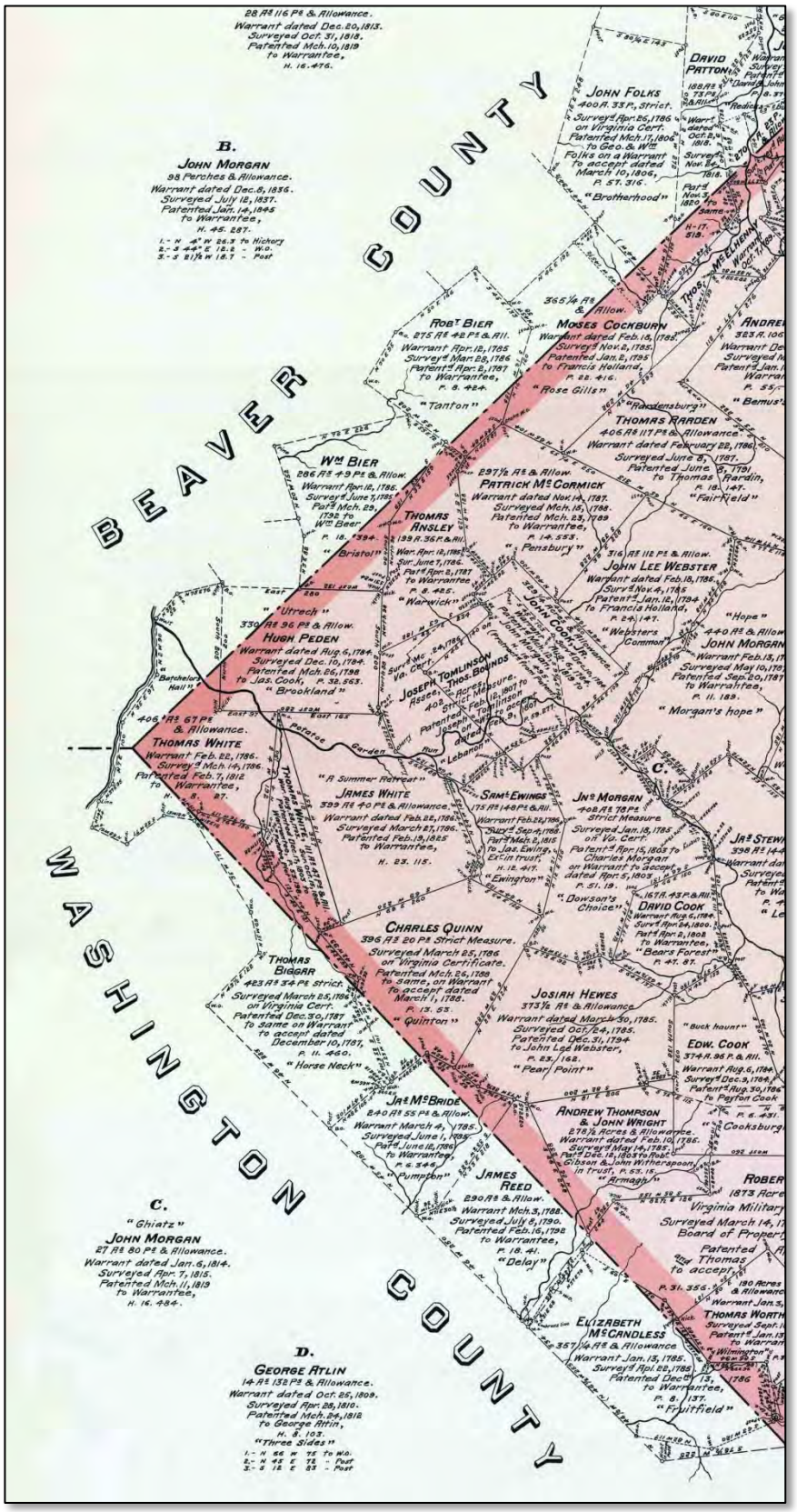

Figure 6.20: Detail of the Warranty Atlas of Allegheny County, Pennsylvania, Plate no. 28: Findlay Township, ca. 1912.

Image courtesy of the Archives Service Center, University of Pittsburgh.

National Register Properties

The National Register of Historic Places was established by the National Historic Preservation Act of 1966, and is maintained by the National Park Service. In Pennsylvania, the Bureau for Historic Preservation manages the National Register program. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering and culture. Listing in the National Register often changes the way communities perceive their historic resources, lending credibility to efforts to preserve these resources as irreplaceable parts of our communities.[61]

"Plate 6.2: Historic Resources" maps the locations of National Register listed properties as well as sites that are eligible for listing.

Table 6.8: National Register of Historic Places within the 20D Raccoon Creek Region[62] [63]

Municipality	Description	Year Built	Location
Jefferson Twp., Washington Co.	Pine Bank Covered Bridge	1871	Moved from Greene County to Meadowcroft Museum of Rural Life in 1962
Hanover Twp., Washington Co.	Lyle Covered Bridge	1887	Kramer Road over Brush Run
Mt. Pleasant Twp., Wash. Co.	Krepps Covered Bridge	Unknown	Covered Bridge Road over Cherry Run
Hanover Twp., Washington Co.	Ralston Freeman Covered Bridge	1915	Ralston Road over Aunt Clara Fork of Kings Creek
Hanover Twp., Washington Co.	Jackson's Mill Covered Bridge	Rebuilt 2003	King's Creek Road over King's Creek
Hanover Twp., Washington Co.	McClurg/Devil's Den Covered Bridge	1880 Restored 1987	Relocated south of Steubenville Pike in 1987
Multiple Municipalities, Washington Co.	Wilson's Mill Covered Bridge	1887 Damaged by arson 2002	Oak Leaf Road over Cross Creek
W. Middletown Boro., Wash. Co.	West Middletown Historic District	Oldest known structure 1798	Main Street, PA 844, West Middletown Borough
Independence Twp., Wash. Co.	Isaac Manchester Farmstead	Farm 1797 House 1815	6 structures at 52 Manchester Lane, Avella
Hanover Twp., Beaver Co.	David Littell House	1851	PA Route 18 just south of PA 151
Hanover Twp., Beaver Co.	Raccoon Creek Recreational Demonstration Area	ca. 1935	140 structures within Raccoon Creek State Park

[61] PA Historical and Museum Commission, National Register of Historic Places in PA, available at http://www.portal.state.pa.us/portal/server.pt/community/national_register_of_historic_places_in_pennsylvania/3780; accessed 11/4/2014.
[62] GIS data provided by PASDA and the Southwest PA Commission
[63] Bridgehunter.com available at http://bridgehunter.com/; accessed 11/3/2014

Figure 6.21: Krepps Covered Bridge over Cherry Run in Mount Pleasant Township, a National Register Historic Place, 6/18/2014.

Figure 6.22: The shadow of Keys Road Bridge falls on polluted Raccoon Creek, 1/5/2002. Keys Bridge is a National Register eligible structure.

National Register Eligible Properties

To be considered for listing in the National Register of Historic Places, a property must meet a set of criteria defined by the National Park Service and set forth on their website.[64] Sites listed in Table 6.9 are identified by the PA Historical and Museum Commission as eligible for listing in the National Register.

Table 6.9: Properties Eligible for the National Register of Historic Places within the 20D Raccoon Creek Region[65] [66] [67] [68] [69] [70]

Municipality	Description	Year Built	Location
Washington Co.	Pittsburgh & Steubenville Railroad (the Panhandle Railway) (Pittsburgh to WV line)	Completed 1865	Northern Washington Co. & western Allegheny Co.
Washington Co.	Wabash-Pittsburgh Terminal Railway (Pittsburgh to West Virginia state line)	Opened 1904	Northern Washington Co. & western Allegheny Co.
Potter Twp. & Industry Boro., Beaver Co.	Montgomery Locks and Dam	1932-1936	100 Montgomery Dam Rd.
Independence Twp., Wash. Co.	Plantation Plenty Boundary Increase (Isaac Manchester Farmstead)		52 Manchester Lane
Robinson Twp., Washington Co.	Geary Farm Property	1895	1421 Beech Hollow Road
Washington Co.	Montour Railroad (Champion to Primose)	Opened 1877	Robinson & Hanover Twps.
Robinson Twp., Washington Co.	Hugh McCandless/Edward Doborowolski Farmstead		53 Ridge Road
Findlay Twp., Allegheny Co.	Clinton United Presbyterian Church & Cemetery	1797	Wilson Drive near Clinton
Findlay Twp., Allegheny Co.	David Moody Farmstead		US Route 30 near Clinton
Findlay Twp. Allegheny Co.	John Burns/James Hamilton Farmstead	1841 Demolished 2012	Washington Road near Clinton
Washington Co.	Montour Railroad (Coraopolis to Snowden)	Opened 1877	

[64] PA Historical and Museum Commission, the National Register Process in Pennsylvania, available at http://www.portal.state.pa.us/portal/server.pt/community/national_register_of_historic_places_in_pennsylvania/3780/process/417976; accessed 11/4/2014.
[65] GIS data compiled from PASDA and the Southwest PA Commission.
[66] Wikipedia, Pittsburgh, Cincinnati, Chicago and St. Louis Railroad, available at http://en.wikipedia.org/wiki/Pittsburgh,_Cincinnati,_Chicago_and_St._Louis_Railroad, accessed 11/4/2014
[67] Brookline Connection, the Wabash-Pittsburgh Terminal Railway, available at http://www.brooklineconnection.com/history/Facts/WabashBridge.html, accessed 11/4/2014.
[68] Wikipedia, Montour Railroad, available at http://en.wikipedia.org/wiki/Montour_Railroad, accessed 11/4/2014.
[69] US Army Corps of Engineers, Montgomery Locks and Dam, available at http://www.lrp.usace.army.mil/Missions/Navigation/LocksandDams/MontgomeryLocksDam.aspx, accessed 11/4/2014.
[70] Historic Bridges.org, Bridge Browser, available at http://www.historicbridges.org/b_a_county.php?county=Washington%20County,%20Pennsylvania, accessed 11/4/2014.

Table 6.9: Properties Eligible for the National Register of Historic Places within the 20D Raccoon Creek Region (cont.)

Hanover Twp., Washington Co.	McClaren Bridge		Kramer Road over Raccoon Creek in Bavington
Hanover Twp., Washington Co.	Witherspoon Bridge	1894	Witherspoon Road over Raccoon Creek
Smith Twp., Washington Co.	Keys Bridge	1903	Keys Road over Raccoon Creek
Smith Twp., Washington Co.	Dunbar Bridge	1889	Harmon Creek Road over Raccoon Creek
Independence Twp., Washington Co.	Pittsburgh & West Virginia Railway: Avella Station		Seneca Place, Avella

Figure 6.23: Ruins of the John Burns Farmstead, "Hopewell," deeded in 1786; later known as the Hamilton Farm. The elegant cut stone, brick and timber frame house, built in 1841, was demolished in 2012. Photo taken 9/9/2003.

Pennsylvania Historical Marker Program

The Pennsylvania Historical and Museum Commission (PHMC) administers the historical marker program to commemorate important people, places and events that have shaped Pennsylvania's history. Citizens may nominate a person, place or thing to the PHMC for consideration. More information about the nomination and selection process is available at the PHMC website: http://www.votespa.com/portal/server.pt/community/national_register_of_historic_places_in_pennsylvania/3780.

Table 6.10: Pennsylvania Historical Markers of the 20D Raccoon Creek Region[71]

Name	County	Location	Date Dedicated	Marker Text
Pennsylvania	Beaver	US 30, .4 miles from state line (missing)	3/25/1949	Founded 1681 by William Penn as a Quaker Commonwealth. Birthplace of THE DECLARATION OF INDEPENDENCE and THE CONSTITUTION OF THE UNITED STATES.
Cross Creek Church	Washington	SR 4029 at Cross Creek, E of Pa. 18	10/16/1950	Founded by Scotch-Irish Presbyterians who began to hold services in 1775 at Vance's Fort, 1 mile north. Original church built here and first pastor called in 1779. The present church building was erected 1864.
David Reed	Washington	Pa. 50, 3 miles west of Pa. 980, near Venice	5/9/1950	Opposite was the log home of David Reed, leader of the Covenanter squatters on lands owned by George Washington. Here 13 of the Scotch-Irish pioneers met with him on Sept. 20, 1784, defying his effort to remove them.
Elisha McCurdy	Washington	SR 4004 (old U.S. 22) near Pa. 18, Florence	5/28/1947	The great Presbyterian revivalist is buried here where he served as pastor 46 years. At Cross Roads and Upper Buffalo he led, in Nov., 1802, the Great Revival meetings attended by many thousands from near and far.
Meadowcroft Rockshelter	Washington	401 Meadowcroft Rd., Avella	9/19/1999	A deeply stratified archaeological site, its deposits span nearly 16,000 years. Discovered in 1973 by Albert Miller and excavated by University of Pittsburgh archaeologists. Meadowcroft revealed North America's earliest known evidence of human presence and the the New World's longest sequence of human occupation. All of eastern North America's major cultural stages appear in its remarkably complete archaeological record.
Ralston Thresher	Washington	Pa. 844 at West Middletown	5/28/1947	Nearby was the site of the Robert McClure factory of pre-Civil War days. It pioneered in making Andrew Ralston's machine cleaning and threshing grain in a single operation, patented in 1842.

[71] GIS data compiled from data collected by PASDA and the Southwest PA Commission.

Regional History Museums

Here are but a few of the many fascinating places where the rich history of the Raccoon Creek Region is showcased.

Meadowcroft Historic Villages[72]

As mentioned earlier in the Archaeological Resources section of this Plan, the Meadowcroft Historic Villages are part of the Heinz History Center's Meadowcroft Rockshelter museum complex.

The 19th Century Village allows visitors to take a trip back in time to experience everyday life in a western Pennsylvania village. A blacksmith's shop, a one-room school, a post office and a covered bridge are but a few of the 19th century structures relocated to Meadowcroft and restored to illustrate rural life in the Raccoon Creek Region.

The 16th Century Indian Village is based on archaeological evidence from the Region. Inside the walled village, visitors can explore the inside of a wigwam, see carefully recreated historic artifacts and try their hand at using an atlatl, a type of prehistoric spear thrower. The 16th Century Village also includes a traditional garden and a hunting camp filled with furs, hunting tools and fishing equipment. A self-guided trail provides visitors with a new walking trail loop through the woods surrounding Meadowcroft. The trail teaches how the forest served as the supermarket, pharmacy, clothing store and much more to the First Americans.

Figure 6.24: The 1871 Pine Bank Covered Bridge is a tangible connection to our rural past preserved and accessible to the public at Meadowcroft Rockshelter and Historic Village. Photo courtesy of Meadowcroft Rockshelter and Historic Village.

Southside Historical Village and Association

Southside Historical Village is located along PA Route 168 at the Hookstown Fair Grounds in Greene Township, just south of Hookstown. Established in 1995, the purpose of the Village and the mission of its supporting Association are to collect, preserve and interpret early American life, including the story of the local First Americans. The Village continues to grow with buildings donated, relocated and restored by the Association's volunteers. The Village features the Mercer One Room School House, the 1880's J.L. Porter Blacksmithing Shop, a walk-through

[72] Heinz History Center, Meadowcroft Rockshelter and Museum of Rural Life, available at http://www.heinzhistorycenter.org/meadowcroft.aspx; accessed 11/5/2014.

covered bridge that was originally a corn crib, the Chapman Oil Derrick, the Nelson's Doctor's Office, the Johnson Log Cabin and the FirstEnergy-Glenn Barn. Relocated from the nearby Glenn Farm, this 1858 hewn-timber frame barn was restored with the help of Amish craftsmen, many volunteers and local businesses. Generous donations from FirstEnergy's Bruce Mansfield Plant made a new foundation, roof, siding and windows possible. The Southside Historical Village Association is dedicated to tourism, education and community by bringing early American History to life.[73] More information is available at http://www.sshva.iwarp.com/video.html or by calling 724-573-4569.

Figure 6.25: The FirstEnergy/Glenn Barn is the jewel of Southside Historical Village at Hookstown Fair Grounds. Photo courtesy of Southside Historical Village Association.

Industrial Heritage Sites

Historic Coal Companies

The bituminous coal industry played a predominant role in the socioeconomic and environmental history of the Raccoon Creek Region and the greater Pittsburgh area. Coal extraction, abandoned mines and the legacy of unregulated mining are covered extensively in multiple sections of this Plan, particularly "Section 3: Land Resources," "Section 4: Water Resources" and "Section 8: Management Recommendations."

Among the many companies who had strip mine and drift mine operations in the 20D Raccoon Creek Region are Midway Coal Company, Aloe Coal Company, Bologna Coal Company, Pennweir Construction Company, Mulligan Mining, Rosebud Mining Company, Pegg's Run Coal Company, Robinson Coal Company, Pittsburgh Coal Company, Pennbalt and Harmon Creek Coal Company (covered in Section 6 under Hillman State Park.)

Kobuta[74]

As mentioned in "Section 1: Project Area Characteristics," the Raccoon Creek Region and its factories played a crucial role in the U.S. war effort during World War II. In 1941 and 1942 the Japanese invaded Indonesia and gained control of 90% of the world's supply of natural rubber.

[73] Southside Historical Village Association, available at http://www.sshva.iwarp.com/index.html; accessed 10/23/2014.
[74] Kobuta--A History of the Land by Alpine MacArthur, published in Milestones Vol. 3 No 2. Spring, 1977, Beaver County Historical Research and Landmarks Foundation, available at http://www.bchistory.org/beavercounty/BeaverCountyTopical/CommunitiesandTowns/KobutaMSS1977/KobutaMSSp77.html; accessed 11/10/2014.

In 1942 the U.S. Government's Defense Plant Corporation contracted with the Koppers Company of Pittsburgh to build a synthetic rubber manufacturing plant on the Ohio River near the mouth of Raccoon Creek. The name of the plant and the worker housing built around it was "Kobuta," a name derived from butadiene and styrene, two main ingredients in synthetic rubber. Kobuta produced butadiene and styrene by 'cracking' them from ethyl alcohol through catalytic conversion. The plant was built under extremely challenging circumstances over an 18 month period in 1942 and 1943, and reportedly supplied 75% of the entire nation's butadiene in 1944. Kobuta's powerhouse was built to be bombproof (see discussion of Kobuta in "Section 1: Project Area Characteristics"). Synthetic rubber production was so successful that the Allied war effort never suffered a shortage during the combat years.

A former wartime worker at Kobuta, Evelyn Michaels of Monaca, recounts her experience at the plant:

> *When I started with Koppers Engineering at Kobuta in 1942, I left a job at a red brick office building in Ambridge to encounter a wooden barracks-type building in the boonies just off the Raccoon Bridge in Potter Township - like taking a step back in time. Due to lack of space for parking, or for security reasons, I drove from my home in Beaver to a pickup point in Monaca where a station wagon driver would transport a group of us along the scenic Rag Run through Bellowsville to a gravel driveway through a thicket.*
>
> *It seemed like everybody was from out of town. Few of the people were locals. I settled into working in a dead-air vault with a key to the adjoining washroom – may I repeat, security was tight. I filed precious papers in the vault. Everybody was always in a hurry. It wasn't a very cheerful place to work and I certainly didn't care for the dead air in the vault. We were not supposed to talk with each other about what we did. Or talk with anyone else about it.*
>
> *Rust Engineering had their office boat tied up close by alongside the high rock cliff at the mouth of Raccoon Creek. Where did their bathrooms go? In the creek?*
>
> *Kobuta produced Butadiene and Styrene, so naturally the two Rottweiler pups we had at the office were so named – office mascots or potential protection, perhaps.*
>
> *I didn't work at Kobuta for very long. On my last day, the Ohio River rose precariously high. Bridgewater was flooded from the deck of the Beaver Bridge to the steps of the Presbyterian Church near the railroad underpass into Beaver. After leaving my '39 Plymouth, "Betsy," at Conway's Corners in Rochester, I stepped into a two-man row boat as we paddled past second-floor windows buffeted by strong side-street currents. I walked twelve blocks home thanking my lucky stars for terra firma.*
>
> *Three days later I was employed out East learning the four million parts that go into making an airplane that was – so the joke went – put together by the lowest bidder. Life is good.*

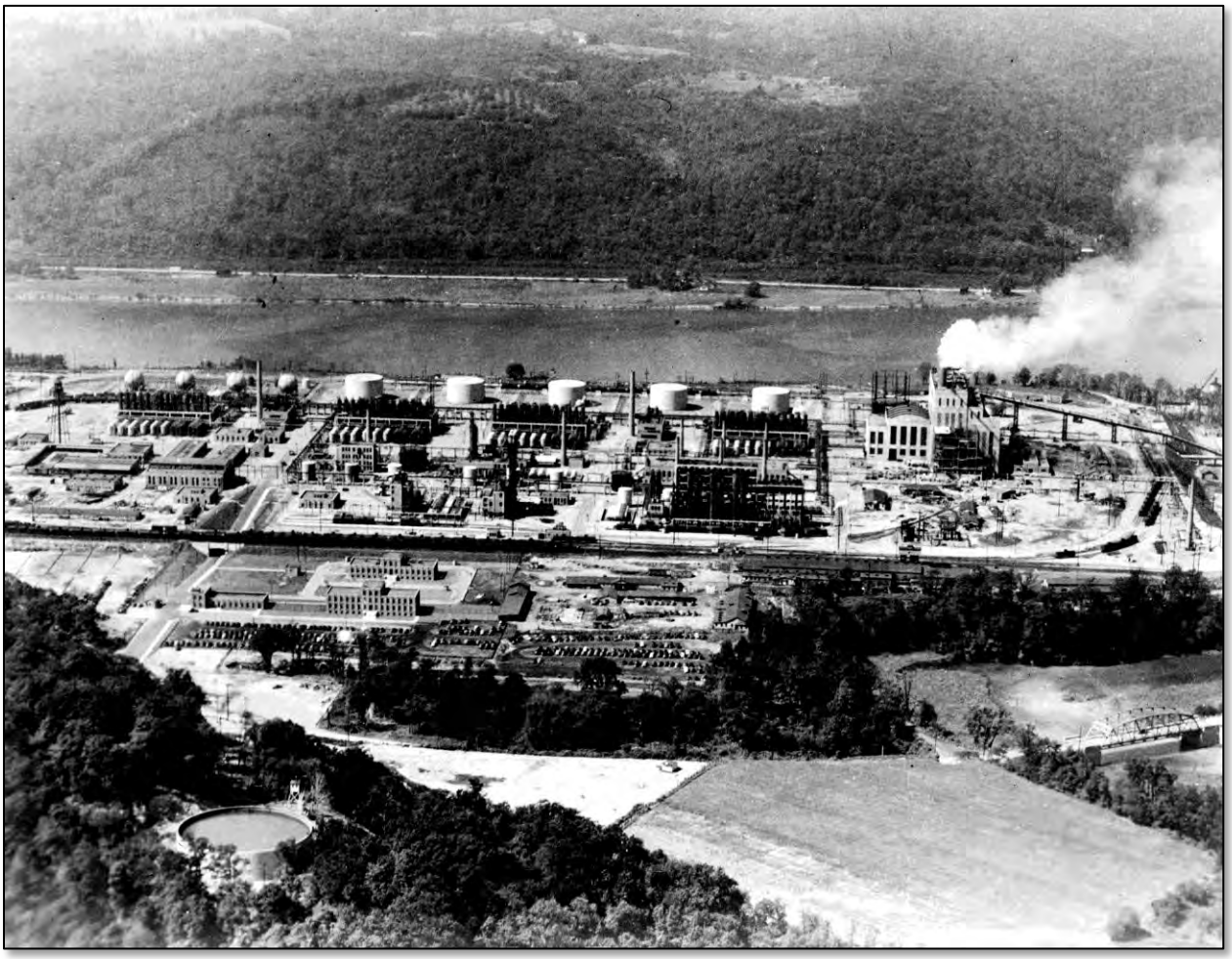

Figure 6.26: The Kobuta Complex, 10/16/1952, looking north across the Ohio River. At lower left is the Route 18 Bridge over Raccoon Creek. Photo courtesy of University of Pittsburgh Archives Center.

Shipbuilding in Georgetown

River commerce, shipbuilding and repairing have been the lifeblood of this small Ohio River village for over two hundred years. Once a bustling center of river trade, the Georgetown area still has several maritime businesses located along its shores, including Campbell Transportation, Georgetown Sand & Gravel, C&C Marine Maintenance and Phil's Towing Company.

A marker placed in town by the Beaver County Historical Research and Landmarks Foundation reads, "Georgetown. Most residents of the village of Georgetown worked on the riverboats. In 1803 Meriweather Lewis and the Corps of Discovery stopped here to buy a canoe to replace a leaky boat. Lewis later discovered the canoe also leaked. The visit was celebrated in 2003."

Shippingport Atomic Power Station[75] [76]

The Shippingport Atomic Power Station was the world's first full-scale atomic electric power plant devoted exclusively to peacetime uses. Located on the banks of the Ohio River in the village of Shippingport, it was built on the site of what is now FirstEnergy's Beaver Valley Power Stations #1 and #2.

Shippingport's construction and operation was guided by Admiral Hyman G. Rickover and the U.S. Atomic Energy Commission. Groundbreaking began on September 6, 1954; the reactor reached criticality on December 2, 1957, and remained operational until October of 1982. The first electrical power was sent through Duquesne Light's distribution grid on December 18, 1957.

Shippingport Atomic Power Station was notable for its experimental thermal breeder reactor and its ability to transmute inexpensive thorium fuel to uranium-233, the fissile material that fueled the reaction within the reactor core. It was capable of an output of 60 megawatts of electricity. The reactor was designed with two purposes in mind - for powering military ships and serving as a prototype for other commercial electrical power generation facilities. Over its 25-year service life, the Shippingport Atomic Power Station operated for more than 80,000 hours, producing over 7 billion kilowatt hours of electricity.
More information about the Shippingport Atomic Power Station is presented in "Section 1: Project Area Characteristics."

Military History Sites

Forts[77]

"Forting" was a necessary practice for the welfare of the Raccoon Creek Region's European settlers in the late 18th century. A community of families would live in a fort consisting of cabins, blockhouses and stockades. A range of cabins, separated by log partitions, commonly formed at least one side of the fort. Outside walls were ten to twelve feet high with inward-sloping roofs. Walls were furnished with port-holes at proper heights and distances, and were made completely bullet-proof. All components were assembled without nails or spikes because such things were not to be had. Sometimes a fort would consist of one large, strong, fortified residence. Compared to military garrisons, the settler forts were very uncomfortable and seemed not very formidable but they served their purpose well. Because the Indians had no artillery they seldom attacked the forts successfully and few were ever taken.

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[75] A guide to Historic Landmarks in Beaver County Pennsylvania, compiled and edited by Charles W. Townsend III, Bob Bauder and Denver Walton, Published 2002 by the Beaver County Historical Research and Landmarks Foundation, 111 pp., print.
[76] Wikipedia, Shippingport Atomic Power Station, available at http://en.wikipedia.org/wiki/Shippingport_Atomic_Power_Station; accessed 11/9/2014.
[77] Report of the Commission to Locate the Site of the Frontier Forts of Pennsylvania, Volume Two, by Clarence M. Busch, State Printer of Pennsylvania, 1896, pages 399-436; available at http://www.usgwarchives.net/pa/1pa/1picts/frontierforts/ff33.html; accessed 11/11/2014.

The following is a list of some of the forts of the southern Raccoon Creek Region:

- **Allen's Fort**, located on the Smith-Robinson Township line
- **Bayon's Blockhouse**, **Marshall's Blockhouse**, **Reynold's Blockhouse** , **Wells Fort** and **Vance's Fort**, all in Cross Creek Township
- **Burgett's Fort** in Burgettstown
- **Dillow's Fort** in Hanover Township
- **Beeler's (**or **Beelor's) Fort** in Robinson Township at Candor
- **Hoagland's Fort** in Smith Township. According to tradition, the women of Hoagland's Fort repulsed an attack by pouring boiling water from the stockade onto the Indians below.

Monaca Tank Farm[78]

Throughout 1941, the Unites States' entry into the Second World War became increasingly inevitable. Seeking to create a large, strategically located, well-concealed aviation fuel depot, the United States Department of Defense purchased the William and Ida Jeffreys farm on Raccoon Creek in Potter Township to build such a facility. By 1942, six 1.75 million-gallon welded-steel storage tanks had been fabricated on-site and were connected by a series of pipe networks and pump houses to depots located on Route 18 and the Ohio River.

The land around the tanks was re-graded to surround them and cover them with seven feet of earth, rendering them bomb-proof against the weapons of the era. Above ground, all supporting structures (generator station, wash house, gasoline-blending plants, pump and valve houses, etc.) were built to appear from aerial surveillance as farm buildings in the same configuration as the Jeffreys Farm originals (see Figures 6.27 and 6.28).

Known during its operational years as the Monaca Tank Farm, the site remained an operational U.S. military installation after the end of World War II and well into the Cold War era. During its time as a military facility, the Tank Farm was never used to store fuel. Once military operations ceased on the site, the Tank Farm was deactivated in 1963, and the entire 300-acre property was sold as surplus. After passing through various government and industrial ownerships and numerous subdivisions, Potter Township gained ownership of the 63-acre Tank Farm parcel through eminent domain, removing it from the bankrupt estate of Horsehead Industries in 2007. From the inception of these actions, Potter Township has intended to ultimately transform the Tank Farm into a community recreational asset.

In 2012 and 2013 the US Army Corps of Engineers removed five of the six 1.75 million-gallon underground storage tanks on the Tank Farm through their FUDS (Formerly Used Defense Site) Program. Because Tank #5 had been used briefly during the 1970s to store fuel oil for non-military purposes, the Department of Defense was not obligated to remove it under the FUDS Program. Tank #5 is empty and remains fully covered under approximately seven feet of earth. It is the largest welded steel tank on earth.

[78] KU Resources, Inc., Tank Farm Site Analysis and Recommendations, Potter Township, June 2014.

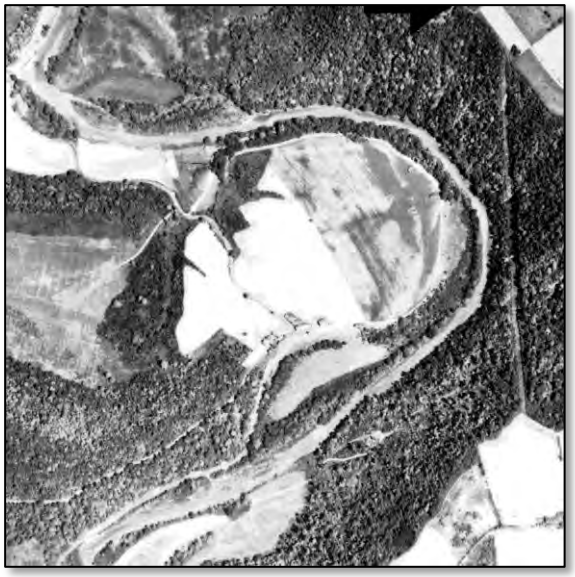

Figure 6.27: Aerial view of Jeffreys farm, May 24, 1939; detail of USDA agricultural Adjustment Administration photo by Abrams Aerial Survey Corporation; 1:20,000 scale. Photo courtesy of www.pennpilot.psu.edu.

Figure 6.28: Aerial view of the "Monaca Tank Farm," the US military site name. Note similar location of structures. USDA Commodity Stabilization Service photo by Wolz Studios, June 3, 1958. Photo courtesy of www.pennpilot.psu.edu.

Figure 6.29: The Monaca Tank Farm's Blending Barn #1 awaits a new purpose; 3/11/2011.

Transportation History Sites

Cook's Ferry (Shippingport Ferry)

Established by George Washington Cook in 1859, the ferry was operated by the Cook family until 1919.It provided a crossing of the Ohio River near the site of the present Shippingport Bridge. The ferry made its last trip in 1964, and was the last ferry to operate in Beaver County. The south shore landing is still visible at the bottom of Ferry Street in Shippingport.[79] [*Author's note: As a small child I distinctly remember making trips across the Ohio River on Cook's Ferry, standing on the deck as we crossed the murky green water with waves sometimes lapping up by my feet; too young to be afraid of how low the loaded vessel rode in the water.*]

Georgetown to Catfish Camp Trail[80]

Along the general path of present-day PA Routes 168 and 18 was the Georgetown to Catfish Camp Trail. Catfish Camp, named for the Indian chief Catfish (Tingooqua) is better known today as Washington, PA, the county seat. At times when the Ohio River was too low or too dangerous for boat travel, a well-used alternate route between Pittsburgh and Wheeling was upstream on Chartiers Creek, then downstream on Cross Creek, Buffalo Creek or Wheeling Creek. Catfish Camp was a frequent stop on the overland route, connected to the northern frontier by the Indian trail to the Ohio River port of Georgetown.

Flight 427 Crash Site

On Thursday, September 8, 1994, one of the worst disasters in U.S. aviation history occurred when USAir Flight 427 from Chicago to Pittsburgh crashed into a wooded hillside above PA Route 60 (now I-376) instantly killing all 132 on board, narrowly missing the busy highway and Green Garden Shopping Center along Raccoon Creek in Hopewell Township.[81] After the most extensive investigation in its history, the National Transportation Safety Board (NTSB) determined that the probable cause of the accident was a malfunction of the main rudder power control unit.[82]

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[79] "A Guide to Historic Landmarks in Beaver County, Pennsylvania" compiled & edited by Charles W. Townsend III, Bob Bauder and Denver Walton; published 2002 by the Beaver County Historical Research and Landmarks Foundation, 111 pages, print.

[80] Beaver County Historical Research and Landmarks Foundation, Beaver County Landmarks Map No. 7A and 7B, published in Milestones Vol. 2 No. 2-Spring 1976 by Denver Walton, Gladys Hoover and Ruth Ann Smith; available at http://www.bchistory.org/beavercounty/BeaverCountyTopical/Maps/LandmarksMap7.html/LandmarksMap7M1976.html; accessed 11/10/2014.

[81] Wikipedia, available at http://en.wikipedia.org/wiki/USAir_Flight_427 accessed 4/18/2014

[82] Airsafe.com website – US Air Flight 427 Accident Investigation, available at http://www.airsafe.com/events/flt427.htm; accessed 4/18/2014

Despite the terrible loss of life, Flight 427's greatest legacy may be the revelation of a flaw in the rudder mechanism of the Boeing 737. Investigators discovered that a servo valve in the rudder control unit, about the size of a soup can, sometimes jammed. The NTSB theorized that such a servo valve jam caused Flight 427 to roll left and spiral to the ground on approach to Pittsburgh International Airport.[83]

In 1996, President Clinton signed into law the Federal Family Assistance Plan for Aviation Disasters. The "Families Bill" established within the NTSB a Family Advocate, a third party, not connected with the airline, to notify family members in a timely fashion in the event of a crash and to assist in the subsequent handling of sensitive family issues.[84]

The Flight 427 crash site is permanently protected from disturbance by the Pine Creek Land Conservation Trust and the Flight 427 Air Disaster Support League.

Figure 6.30: Flight 427 Crash Site Memorial on private property above Raccoon Creek in Hopewell Township, Beaver County. Photo courtesy of Pine Creek Land Conservation Trust website.

Link's Bridge[85]

Link's Bridge is actually the tale of two bridges – Link's Bridge in Independence Township and the Potter Bridge in Potter Township. Link's Bridge carries Hookstown Grade Road over the main stem of Raccoon Creek in Independence Township near the Allegheny County line at a place once known as "Link's Ford." The first Link's Bridge was a bow string arch bridge, a covered wooden structure built in 1887 and pictured in Figure 6.31. In 1938, Beaver County replaced the wooden bridge with a steel bridge by dismantling and reassembling the Potter Bridge, another county structure located twenty meandering miles downstream.

The first Potter Bridge, pictured in Figure 6.33, was a covered wooden span carrying the Frankfort Road (PA Route 18) over Raccoon Creek at what is now the Saint Joe Boat Club. It was built in 1865 for a cost of $7,000 and served until its collapse on August 5, 1923. In 1924, at a cost of $17,000, the county built a metal through truss bridge on the same cut-stone abutments as the wooden bridge. These sturdy abutments still stand and can be seen at the Saint Joe Boat Club.

[83] International Aviation Safety Association, available at http://www.iasa.com.au/folders/Safety_Issues/FAA_Inaction/usair427.html accessed 4/18/2014
[84] Flight 427 Air Disaster Support League – Family Assistance Act, available at http://flight427adsl.wordpress.com/family-assistance-act/ accessed 4/18/2014
[85] Interview with James G. Camp III, Director, Beaver County Department of Public Works; conducted 11/13/2014.

In the late 1930s, as manufacturing industries expanded near the mouth of Raccoon Creek, the present-day Route 18 Bridge was built to carry the heavier and more frequent traffic. The road we travel today was re-routed to climb the Frankfort slopes more directly, paralleling the Ohio River above Kobuta. In 1938 the outmoded through truss bridge pictured in Figure 6.32 was disassembled and rebuilt twenty miles upstream to replace the Link's covered bridge. In 2007, Beaver County replaced the recycled Potter-Link's Bridge with a modern steel and concrete structure.

Figure 6.31: Link's Bridge over Raccoon Creek in Independence Township, Beaver County, built in 1887. This wooden structure was replaced in 1938 by relocating the metal Potter Bridge from twenty miles downstream. Photo courtesy of Raccoon Creek State Park Archives.

Figure 6.32: Potter Bridge in Potter Twp. pre-1936; moved in 1938 to Independence Twp. to serve as Link's Bridge until 2006. Note the "new" car on the bridge and the photographer's vantage point, now under several feet of water due to the higher pool of Montgomery Dam. Photo courtesy of James G. Camp III, Director, Beaver County Department of Public Works.

Figure 6.33: The Potter Bridge, a covered wooden span built in 1865, carrying the Frankfort Road over Raccoon Creek near its mouth; collapsed on Sunday, August 5, 1923. Photo courtesy of James G. Camp III, Director, Beaver County Department of Public Works.

Lock 6 and Lock 7, Ohio River[86]

Before dams were built on the Ohio River it was often possible to walk from shore to shore in periods of dry weather. Boat travel on the river was often impossible. In 1824 the Federal Government became involved in managing the Ohio for commercial navigation by ordering the Corps of Engineers to remove sandbars and snags. To accommodate coal barge traffic, the River and Harbor Act of 1910 authorized a 9-foot slack-water navigation project for the Ohio River, consisting of forty-nine movable wicket dams, each with a single lock chamber 600 feet by 100 feet.

Figure 6.34: Buildings of the former Lock 7, south shore of the Ohio River in Greene Township, 6/10/2014.

At the northern boundary of the 20D Raccoon Creek Region, two wicket dams were constructed. Lock 6 was located at Merrill, immediately downstream of the mouth of Raccoon Creek. Completed in 1904, Merrill Dam raised the navigational pool of the Ohio River by several feet, and that of Raccoon Creek as well. Farther

[86] East Liverpool Historical Society, Wicket Dams, available at http://www.eastliverpoolhistoricalsociety.org/wicketdams.htm; accessed 11/4/2014.

downstream, Lock 7 was built below Phillis Island about seven miles distant from Lock 6. Lock 7 opened to navigation in 1914. As heavy industry developed on the Ohio River, the wicket dams and their locks soon became outmoded. In 1936 Montgomery Dam was built between old Locks 6 and 7. Today the wicket dams are only history, but their sturdy lock houses remain, well worthy of restoration and constructive re-use.

Montgomery Locks and Dam

At about 2:30 AM on January 9, 2005, the towboat "Elizabeth M" was swept over Montgomery Dam by raging floodwaters. Three of her seven crewmen drowned in the worst accident in the history of the twenty-three locks and dams of the Army Corps of Engineers' Pittsburgh District.[87] Rescue and recovery efforts were deeply traumatic for everyone involved and for the people of the surrounding communities.

Figure 6.35: Towboat "Elizabeth M" remains trapped in the icy Ohio River at Montgomery Dam three weeks after being swept over backwards by floodwaters on January 9, 2005. Photo taken 1/28/2005.

A Sampling of Notable Historic Places

These are but a very few of the hundreds of fascinating places that contribute to the long history of the Raccoon Creek Region. Many others are mentioned in various sections of this Plan. The reader is encouraged to get out and explore the waterways and byways where these and other places await rediscovery and renewed appreciation.

Frankfort Springs Presbyterian Church

Originally called King's Creek Church, this congregation was organized in 1790 by the Rev. John Anderson. The brick church pictured here was built in 1876 and is the third house of worship for

[87] Pittsburgh Post-Gazette.com, January 10, 2005, available at http://www.post-gazette.com/frontpage/2005/01/10/3-dead-1-missing-as-towboat-goes-over-dam-sinks-in-Ohio-River/stories/200501100163 accessed 4/13/2014

this congregation.[88] The bell in the foreground was cast by A. Fulton's Son and Company, Pittsburgh, PA, A.D. 1871. Very shortly after this photo was taken, the bell was stolen.

Figure 6.36: Frankfort Springs Presbyterian Church, PA Rt. 18, Frankfort Springs, 5/11/2013.

Miles Standish Houses

On the Beaver-Washington County line, not far from West Virginia, the Aunt Clara Fork of the King's Creek Watershed remains very rural, quiet, sparsely populated and rich in rural agricultural history. In the Commettsburg area there are reputed to be three houses built by descendants of the famed Pilgrim, Miles Standish. One such house was featured in an April 30, 1963 article in the Beaver County Times, which cited numerous 'Standishes' in the property's deed records. The owners interviewed in 1963, Mr. and Mrs. Clair McCurdy, "…are not quite sure whether they fell in love with the house and got the surrounding woodland and historical value as a bonus, or whether they simply must live in this woodland area. Mrs. McCurdy says "To be away more than one night is out of the question with us.""[89] Fifty-odd years later the appeal of this place remains, as does the beautiful cut-stone 'Standish' house on Johnan Road near the county line.

Figure 6.37: The Alfred and Joy Plance Farmhouse on Johnan Road near Commettsburg, built ca. 1823, reputedly by a descendent of Miles Standish. 7/4/2013.

[88] "A Guide to Historic Landmarks in Beaver County, Pennsylvania" compiled and edited by Charles W. Townsend III, Bob Bauder and Denver Walton; published 2002 by the Beaver County Historical Research and Landmarks Foundation, 111 pages, print.

[89] Beaver County Times, "A Miles Standish Built This House," April 30, 1963, available at http://news.google.com/newspapers?nid=2002&dat=19630430&id=cvQuAAAAIBAJ&sjid=UdsFAAAAIBAJ&pg=2256,5439434; accessed 11/6/2014.

Robinson Church (Robinson United Presbyterian Church)[90]

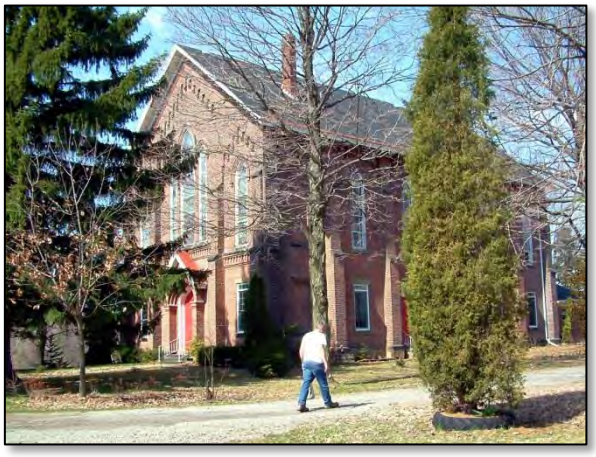


Figure 6.38: Robinson United Presbyterian Church, Washington Road, Robinson Township, 4/5/2005.

Located near the Allegheny-Washington County line, Robinson Church was founded in the early 1830s by Presbyterian families of Findlay and Robinson Townships who felt the need to establish a congregation more local than the nearest churches in Clinton or Burgettstown. Robinson Church was built on land donated by Alexander McBride, Matthew Bigger, and William McBride. The land for the cemetery was donated by Matthew Bigger. A child, Maria Wilson, was the first person buried there on May 22, 1833. The first sermon was preached by the Rev. Joseph Banks, from a carpenter's bench, before the original church was completed. The present building was erected in 1874.

Robinson Church is significant in that it survived the depopulation of the surrounding area when much of the countryside was stripped of its coal in the mid-twentieth century. It stands almost alone amid thousands of acres. Many of Robinson Church's congregants still bear the names of the old pioneer families. The cemetery is surrounded by an ornate wrought iron fence along Washington Road.

Figure 6.39: River Hotel in Georgetown, 6/5/2014.

River Hotel

Located at Market and Water Streets in Georgetown, the River Hotel is believed to be the oldest public building in Beaver County. It was built in 1802 by Thomas Foster who received a license to run a tavern here in 1805. Smith's

[90] Boyd Crumrine, "History of Washington County, Pennsylvania with Biographical Sketches of Many of Its Pioneers and Prominent Men" (Philadelphia: L. H. Leverts & Co., 1882); available at http://www.chartiers.com/crumrine/twp-robinson.html; accessed 11/11/2014.

Ferry, established as Dawson's Ferry in 1817, crossed the Ohio River nearby. The building is now a private residence.[91]

Seventy-Six Post Office

Demolished not long after this photo was taken, the former Reed House near Raccoon Creek on Independence Road in the village of Independence once served as the "76" Post Office for rural residents of Hopewell Township, Beaver County, until Independence Township was formed in 1848. The last covered bridge in Beaver County was located nearby until it collapsed in 1948.[92]

Figure 6.40: The "76" Post Office on Independence Road in Independence Twp., Beaver Co., not long before its demolition. Photo taken 10/10/2013.

St. Luke's Episcopal Church

Located on Market Street in Georgetown, the oldest Episcopal Church in Beaver County stands on the site of an earlier log structure. The marker placed by the Beaver County Historical Research and Landmarks Foundation reads, "St. Luke's Episcopal Church. First services held on a flat boat on the Ohio River around 1800. Admitted into union with the Diocese of Pennsylvania in 1825. Present structure built 1833."[93]

Figure 6.41: St. Luke's Anglican Church, Georgetown, 6/5/2014.

[91] "A Guide to Historic Landmarks in Beaver County, Pennsylvania" compiled & edited by Charles W. Townsend III, Bob Bauder and Denver Walton; published 2002 by the Beaver County Historical Research and Landmarks Foundation, 111 pages, print.
[92] Ibid.
[93] Ibid.

Fairs, Festival and Cultural Events

The Raccoon Creek Region offers many opportunities to experience local color and learn about the rich history of the area. Listed herein are but a few of the fairs, festivals and cultural events of the Region. More information is available from the tourist promotion agencies in Allegheny, Beaver and Washington Counties.

American Indian Heritage Weekend at Meadowcroft Rockshelter

Discover what traditional life was like for native people of the upper Ohio Valley, watch demonstrations of everyday survival skills and explore Meadowcroft's Rockshelter, the oldest-known human habitation in North America, dating back 16,000 years. Held in late September, the American Indian Heritage Weekend will be in its seventh year in 2015.[94] More information is available at the Meadowcroft Museum's website: http://www.heinzhistorycenter.org/meadowcroft.aspx. Also, Meadowcroft Rockshelter and Museum are covered in detail in the Archaeological Resources discussion, earlier in this section of the Raccoon Creek Region Conservation Plan.

Clinton Park Light-Up Celebration

The Christmas Light Up Celebration at Clinton Park in Findlay Township is billed as "the best kept holiday secret in Pittsburgh." The grounds feature over a mile of lights and displays in a beautiful woodland setting. On special days, only walking traffic is permitted. Visitors can also enjoy hayrides and strolling carolers.[95] More information is available at: http://www.christmaslightup.com/.

Covered Bridge Festival

Held the third weekend of September each year, the Washington-Greene County Covered Bridge Festival will be in its 45th year in 2015. Each of 10 festival locations offers a country atmosphere and an array of family-friendly activities including hand-made arts & crafts, home-style food, historic re-enactments, demonstrations, children's activities and live entertainment.[96] More information is available from Visit Washington County PA at: http://visitwashingtoncountypa.com/CustomPage.aspx?Name=44thcoveredbridgefestival.aspx.

Eldersville Christmas in the Village

Eldersville Christmas in the Village Craft Festival is an annual holiday celebration in the quaint village of Eldersville, west of Burgettstown in the Cross Creek Watershed. This festival, now in its 27th year, features the work of dozens of local artisans. Activities also include a light-up night service at the Eldersville Methodist Church, horse and carriage rides, breakfast with Santa and a

[94] Heinz History Center, Meadowcroft Rockshelter, available at http://www.heinzhistorycenter.org/meadowcroft.aspx; accessed 11/3/2014.
[95] Christmas Light-up Celebration, available at http://www.christmaslightup.com/; accessed 11/3/2014.
[96] Visit Washington County PA, Covered Bridge Festival, available at http://visitwashingtoncountypa.com/CustomPage.aspx?Name=44thcoveredbridgefestival.aspx; accessed 11/3/2014.

Christmas parade, stopping at the war memorial to honor local veterans. [97] More information is available at the Festival's website, http://www.christmasinthevillagepa.com/index2.html.

Hookstown Fair

Hookstown Fair, sponsored by Hookstown Grange #1980, is the only agricultural fair held within the 20D Raccoon Creek Region. Usually taking place during the third week of August, Hookstown Fair features plenty of classic attractions – tractor and truck pulls, demolition derby, carnival rides, a wide variety of food, commercial exhibits, 4-H livestock exhibits and judging, etc. Camping is available on-site.[98] The Fairgrounds also include the Southside Historical Village, covered earlier in this section under "Historical Resources." More information is available at Hookstown Fair's website: http://www.hookstownfair.com/index.shtml.

Figure 6.42: The grandstand is packed at the Hookstown Fair on August 22, 2013. Photo courtesy of the Beaver County Times.

Hopewell Parkfest

Usually held the second week of July, Hopewell Community Park's Parkfest features games, food, entertainment, music, fireworks and fun for the entire family.[99] More information is available at Hopewell Township Parks & Recreation website: http://www.hopewelltwp.com/parks-recreation/.

Hickory Apple Festival

The Hickory Apple Festival is the largest fundraiser for the Mt. Pleasant Fire Department. Held every fall at harvest season, the Festival features homemade apple butter demonstrations, antique tractor and farm machinery exhibits, a pie-eating contest, musical entertainment and a worship service. In 2015, the Hickory Apple Festival will be in its 45th year.[100] More information is available at: http://hickoryapplefest.com/.

Meadowcroft Atlatl Competition

Held at Meadowcroft Rockshelter and Museum near Avella in Cross Creek Township, the annual Meadowcroft Atlatl Competition poses the question, "Would you survive in pre-history?" Visitors can try using the atlatl, a spear-thrower used by prehistoric hunters, and/or watch

[97] Eldersville Christmas in the Village, available at http://www.christmasinthevillagepa.com/index2.html; accessed 10/22/2014.
[98] Hookstown Fair, available at http://www.hookstownfair.com/index.shtml; accessed 11/3/2014.
[99] Hopewell Township Parks & Recreation Department, available at http://www.hopewelltwp.com/parks-recreation/; accessed 11/3/2014.
[100] Hickory Apple Festival, available at http://hickoryapplefest.com/; accessed 11/3/2014.

skilled experts compete in the world Atlatl Association competition.[101] More information is available at: http://www.heinzhistorycenter.org/meadowcroft.aspx.

Tour the Montour

Held annually on the Montour Trail, this event features bike rides of 6-62 miles, including rest stops with food and drinks and a hot lunch upon return.[102] More information is available from the Montour Trail Council's website: http://www.montourtrail.org/.

VersiTech Christmas Light Show

VersiTech, located on Frankfort Road in Potter Township, is a light industrial facility providing services in insulation, heat tracing, painting and fireproofing. Since 2010, VersiTech has set up a computer-controlled Christmas light show along Frankfort Road as one of its many involvements in the local community. Over the years the show has expanded to include an FM radio broadcast of Christmas music synchronized to the ever-growing light show.[103] More information is available at VersiTech's website: http://www.versitech.com/community.htm.

Figure 6.43: A stone arch bridge built in 1936 carries Clinton-Frankfort Road over Potato Garden Run in Independence Township near the Beaver-Allegheny-Washington County lines. Photo 10/3/2013, courtesy of Washington County Conservation District.

[101] Heinz History Center, available at http://www.heinzhistorycenter.org/meadowcroft.aspx; accessed 11/3/2014.
[102] Montour Trail Council, available at http://www.montourtrail.org/; accessed 11/3/2014.
[103] VersiTech, available at http://www.versitech.com/community.htm; accessed 11/3/2014.

Figure 6.44: Beaver County Bridge Docket for the "New Little Blue Bridge," built in 1908 to carry the Hookstown to Chester Road over Little Blue Run about two miles west of Hookstown. Remarks from 1918 note the "stream OK." Images courtesy of James G. Camp III, Director, Beaver County Department of Public Works.

109.

NAME Little Blue No. 2.

LOCAL NAME "New Bridge over Little Blue"

TOWNSHIP Greene Tp. ROAD Hookstown to Chester

X LOCATION ON STREAM FROM MOUTH UP

* CRONOLOGICAL

X No.	Place	Kind	Length	Road Clearance	Water Clearance	When Built	*No.
2.	About 2 miles from Hookstown	Reinforced Concrete girder	29 feet center of road	16 feet	26 feet wide 8 feet 6 high	1908. R 387 Contract let	2.

COURT RECORD
No. 7
Term March S,
Year 1908.

SEE MINUTES
Date June 25 1908.
Vol. 3
Page 220
Concrete 387 per cu yd.
Stone work 4.48 " " "
I Beams 1.40 per lineal foot
Railing 1.35 " " "

Oct 3-1916.

Remarks Side steel girders or I Beams need painting. Bridge has galvanized iron guard rails

Stream OK

Abutments (Stone) OK

Section 6: PLATES

Plate 6.1: Recreational Resources Map of the 20D Raccoon Creek Region

Plate 6.2: Historic Resources Map of the 20D Raccoon Creek Region

Local Parks

ID	Park Name	Acres
1	Clinton Community Park	63.60
2	Burgettstown Community Park	11.26
3	Burgettstown Middle/High School	29.02
4	Langeloth Ballfield	4.91
5	Paris Ballfields	16.16
6	Smith Township Ballfield	10.82
7	Old Hickory Elementary School	5.60
8	Racoon Valley Park	1.09
9	Avella Area Junior Senior High School	40.80
10	Cedar Grove Park	5.93
11	Cross Creek County Park	2847.17
12	Eldersville Elementary School	2.46
13	Hanover Township Park	22.45
14	Hopewell Elementary	9.70
15	Independence Elementary	7.42
16	Margaret Ross Elementary	17.28
17	South Side High School	35.85
18	Ballfield Complex	14.44
19	Lakewood Park	62.68
20	Mill Creek Ballpark #1	11.53
21	Raccoon Township Municipal Park	46.96
22	Serbian Park	2.19
23	Shippingport Ballfield	6.63
24	Mowry Road Park	2.25
25	Hanover Park	16.67
26	Independence Township Park	56.63

Sportsmen Clubs

ID	Sportsmen Club Name	Acres
1	Avella Sportsmen Club Inc.	11.71
2	Chartiers City Rod & Gun Club	103.82
3	Cherry Valley Sportsmens Association	2.05
4	Coraopolis Beagle Club	112.88
5	Goodwill Hill Fish & Hunt Club	70.47
6	Green Valley Sportsman's Club	65.68
7	Imperial Beagle Club	65.72
8	Indian Springs Rod & Gun Club	31.63
9	McDonald Rod & Gun Club	133.89
10	Paris Sportsman's Club Inc.	922.03
11	Point Park Rod & Gun Club	182.56
12	Southside Sportsmens Club	77.37
13	Tri-Vally Sportsmens Association	83.06
14	Raccoon Valley Sportmen's Club	126.40

Legend

- Community
- Pond
- Stream
- Approved Trout Stream
- Boat Ramp
- Paddle Access
- Covered Bridge
- Trail
- Railroad (Active)
- Railroad (Inactive)
- Raccoon Creek Watershed
- Sportsmen Club
- Golf Course
- State Park
- Local Parks
- State Game Lands
- Campgrounds
- Hookstown Fairgrounds

Independence Conservancy

- Easement
- Own

Roads

- Interstate
- State Route
- US Route
- Local Road

Municipality

- Borough
- City
- Township

0 1 2 Miles

PLATE 6.1 - RECREATION MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 1 Mile December 2014
BioMost, Inc., Mars, PA

OHIO

WEST VIRGINIA

BEAVER CO.

ALLEGHENY CO.

WASHINGTON CO.

BRIGHTON TWP.

EAST ROCHESTER

NEW SEWICKLEY TWP.

BEAVER

VANPORT

MONACA

FREEDOM

OHIOVILLE

INDUSTRY

CONWAY

CENTER TWP.

Ohio River

ECONOMY

BADEN

Montgomery Locks and Dam

Georgetown

MIDLAND

EAST LIVERPOOL

POTTER

Shippingport

Holt

McCleary

RACCOON TWP.

ALIQUIPPA

HARMONY

Hookstown

New Sheffield

Crestmont Village

HOPEWELL TWP.

AMBRIDGE

BELL ACRES

GREENE TWP.

Davidson Heights

Independence

Five Points

LEET

Mechanicsburg

David Littell House

Gringo

LEETSDALE

SEWICKLEY HEIGHTS

CRESCENT

EDGEWORTH

Harshaville

INDEPENDENCE TWP.

Bocktown

HANOVER TWP.

Kendall

SEWICKLEY

OSBORNE

Raccoon Creek Recreational Development Area

McAlisters Crossroads

MOON TWP.

CORAOPOLIS

RACCOON CREEK STATE PARK

Clinton United Presbyterian Church & Cemetery

Pittsburgh International Airport

Clinton

David Moody Farmstead

Comettsburg

Frankfort Springs

Murdocksville

FINDLAY TWP.

Unnamed Bridge

Lyle Covered Bridge

Witherspoon Bridge

HILLMAN STATE PARK

Ralston Freeman Covered Bridge

Robinson

Imperial

HANOVER TWP.

Devel's Den

Florence

Elisha McCurdy

Mcclaren Bridge

Hugh McCandless Farmstead

Jackson's Mill Covered Bridge

Bavington

Santiago

Champion

NORTH FAYETTE TWP.

ROBINSON TWP.

Paris

Dunbar Bridge

Geary Farm Property

Candor

Dinsmore

Burgettstown

Joffre

Bulger

SMITH TWP.

Keys Bridge

MCDONALD

MIDWAY

Hanlin Station

Langeloth

Slovan

Eldersville

Cherry Valley

Atlasburg

Krepps Covered Bridge

JEFFERSON TWP.

Cross Creek Church

Cross Creek

Studa

CROSS CREEK TWP.

MOUNT PLEASANT TWP.

Renowa

Jefferson

Pine Bank Covered Bridge

Meadowcroft Rockshelter

Pattersons Mill

Browntown

Avella

Rea

Pittsburgh & WV Railway: Avella Station

West Middletown

Plantation Plenty

Isaac Manchester House

Wilson's Mill Covered Bridge

INDEPENDENCE TWP.

WEST MIDDLETOWN

HOPEWELL TWP.

CANTON TWP.

0 1 2 Miles

Legend

- Community
- Lock & Dam
- Historical Marker
- Raccoon Creek
- County
- Railroad (Inactive)
- Railroad (Active)

Roads

- Interstate
- State Route
- US Route

Municipality

- Borough
- City
- Township

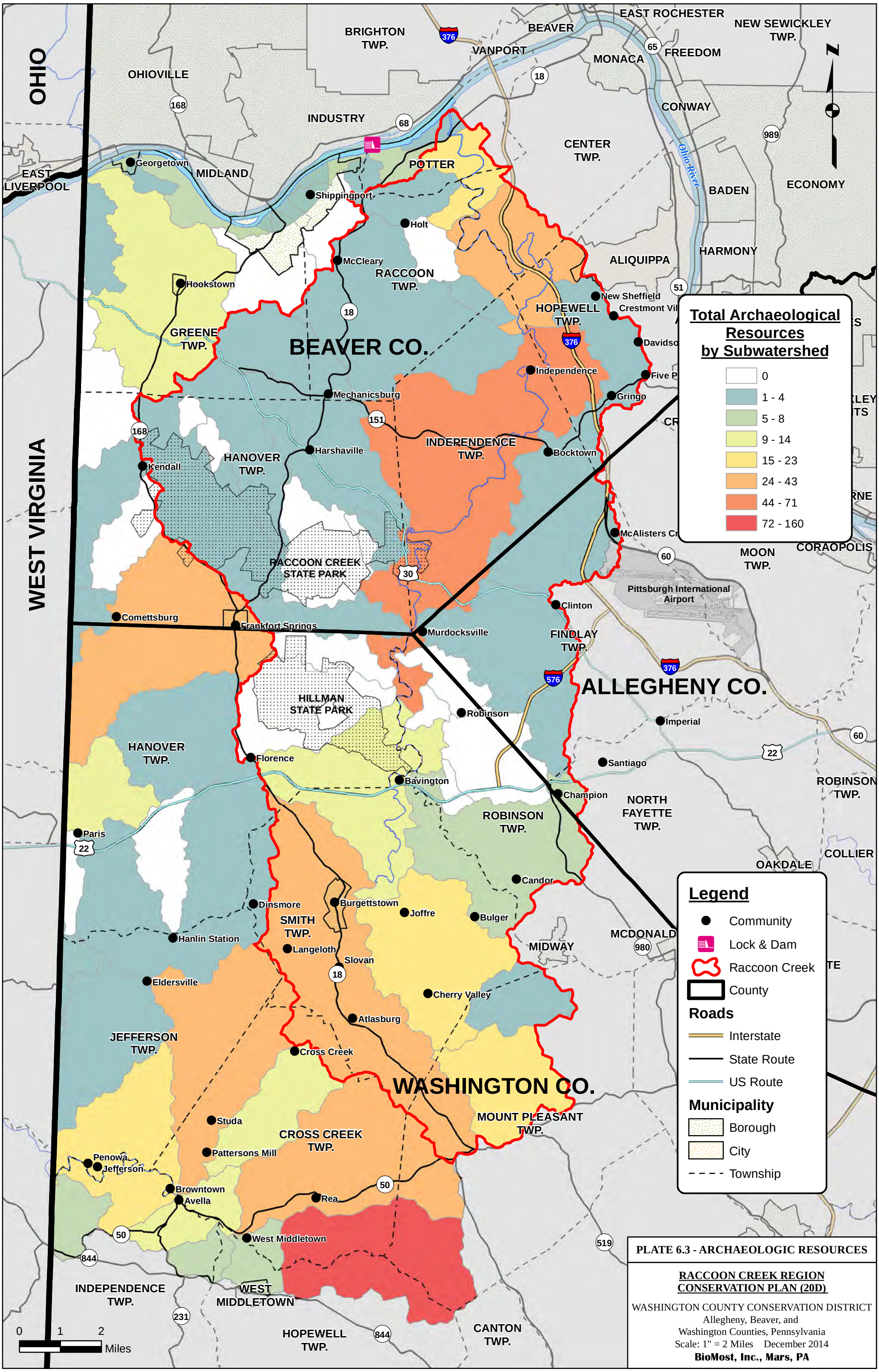
Historic Resource

- Listed
- Eligible

PLATE 6.2 - HISTORIC RESOURCES MAP

RACCOON CREEK REGION CONSERVATION PLAN (20D)

WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA


OHIO
WEST VIRGINIA
BEAVER CO.
ALLEGHENY CO.
WASHINGTON CO.
BRIGHTON TWP.
OHIOVILLE
INDUSTRY
EAST ROCHESTER
NEW SEWICKLEY TWP.
BEAVER
VANPORT
MONACA
FREEDOM
CONWAY
CENTER TWP.
Ohio River
BADEN
ECONOMY
HARMONY
ALIQUIPPA
EAST LIVERPOOL
Georgetown
MIDLAND
POTTER
Shippingport
Holt
McCleary
RACCOON TWP.
Hookstown
GREENE TWP.
HOPEWELL TWP.
New Sheffield
Crestmont Vil
Davidso
Independence
Five P
Gringo
Mechanicsburg
INDEPENDENCE TWP.
Harshaville
Bocktown
HANOVER TWP.
Kendall
RACCOON CREEK STATE PARK
McAlisters Cr
MOON TWP.
CORAOPOLIS
Pittsburgh International Airport
Clinton
Comettsburg
Frankfort Springs
Murdocksville
FINDLAY TWP.
HILLMAN STATE PARK
Robinson
Imperial
Santiago
Florence
Bavington
Champion
NORTH FAYETTE TWP.
ROBINSON TWP.
Paris
ROBINSON TWP.
Candor
Dinsmore
Burgettstown
Joffre
Bulger
SMITH TWP.
MCDONALD
MIDWAY
Hanlin Station
Langeloth
Slovan
Eldersville
Cherry Valley
Atlasburg
JEFFERSON TWP.
Cross Creek
Studa
CROSS CREEK TWP.
MOUNT PLEASANT TWP.
Pattersons Mill
Penowa
Jefferson
Browntown
Avella
Rea
West Middletown
INDEPENDENCE TWP.
WEST MIDDLETOWN
HOPEWELL TWP.
CANTON TWP.
OAKDALE
COLLIER
Total Archaeological Resources by Subwatershed
0
1 - 4
5 - 8
9 - 14
15 - 23
24 - 43
44 - 71
72 - 160
Legend
Community
Lock & Dam
Raccoon Creek
County
Roads
Interstate
State Route
US Route
Municipality
Borough
City
Township
0 1 2 Miles
PLATE 6.3 - ARCHAEOLOGIC RESOURCES
RACCOON CREEK REGION CONSERVATION PLAN (20D)
WASHINGTON COUNTY CONSERVATION DISTRICT
Allegheny, Beaver, and
Washington Counties, Pennsylvania
Scale: 1" = 2 Miles December 2014
BioMost, Inc., Mars, PA

Section 7: Achievements

Introduction

This section provides a "snapshot" of the achievements and continuing efforts of non-profit groups, governments, businesses and individuals working together to better the Raccoon Creek Region. Many improvement projects have been completed or are currently underway at the time of publication of this Plan. The following descriptions are by no means a complete or comprehensive list.

"Section 8: Management Recommendations" builds on these accomplishments by setting goals for the restoration and enhancement of land, water, biological and cultural resources in the Raccoon Creek Region. Section 8 also suggests a broad spectrum of work, both general and specific, to attain these ambitious goals. But much has already been accomplished! Read on…

Summary of Selected Achievements and Initiatives

- Five Passive AMD Treatment Systems built or rebuilt from 1999 through 2009 by the Washington County Conservation District, Independence Conservancy, the Raccoon Creek Watershed Association, Stream Restoration Inc., and various government agency partners. Collective impact of these systems on water quality:
  - 2.5 billion gallons of AMD water treated annually
  - 603 tons/year of iron removed
  - 62 tons/year of aluminum removed
  - 6 tons/year of manganese removed
  - 1505 tons/year of acidity removed

- Five Natural Stream Channel Restoration Projects completed by the Cross Creek Watershed Association, Beaver County Conservation District, Independence Conservancy and the PA Fish & Boat Commission, rebuilding and stabilizing:
  - 140 feet of Cross Creek, protecting the Meadowcroft Rock Shelter
  - 1100 feet of Raccoon Creek, protecting Independence Marsh
  - 1900 feet of Raredon Run, protecting homes and productive farmland
  - 2500 feet of Traverse Creek, slowing water flow to improve fish habitat

- Two floating wetland islands constructed in Raccoon Creek State Park's lakes to remove excess nutrients in the lake water.

- 14,460 acres of publicly-accessible open space including state game lands plus state, municipal and private parks, equating to about 7% of the total 20D Region's area.

- More than twenty tracts of open space, wetlands, farmlands and a historic site conserved by the Pennsylvania Agricultural Land Preservation Program, Independence Conservancy and Pine Creek Land Conservation Trust.

- Dozens of tracts of Agriculture Security Areas throughout the 20D Region, totaling 33,891 acres; 2115 acres of farmland preserved through the Pennsylvania Farmland Preservation Program and Independence Conservancy.

- Numerous agricultural Best Management Practices (BMPs) installed on local farms through Growing Greener Grants to the County Conservation Districts:
  - nutrient management plans
  - roof runoff management systems
  - subsurface drainage
  - spring developments
  - milk house waste filter areas
  - manure storage facilities
  - stream bank fencing
  - stabilized animal walkways

- Printed and online newsletters published by local conservation organizations:
  - Beaver Co. Conservation District's "Beaver Tales" quarterly – 1500 addresses
  - Washington Co. Conservation District's "Tomorrow" quarterly – 2200 addresses
  - Independence Conservancy's "News & Notes" online monthly – 500 addresses

- Deployment of Datashed, a web-based database for monitoring and sharing information about AMD restoration sites - www.datashed.org.

- Education and interpretive programs offered by:
  - DCNR at Raccoon Creek State Park and Hillman State Park
  - Heinz History Center at Meadowcroft Rockshelter and Historic Village
  - Findlay Township Parks Department
  - Washington County Parks Department
  - Conservation Districts in Allegheny, Beaver and Washington Counties
  - PA Game Commission at various locations upon request
  - PA Fish Commission at various locations upon request
  - Linsly Outdoor Center
  - Southside Historical Village
  - Independence Conservancy
  - Washington County Watershed Alliance
  - Cross Creek Watershed Association
  - Keep PA Beautiful – Washington County Affiliate
  - Bavington Grange
  - Hookstown Grange

- Community Tire Collection Program in Allegheny, Beaver and Washington Counties offered by Independence Conservancy in cooperation with multiple non-profit, municipal and corporate partners - properly disposed of more than 35,000 worn-out tires and wheels since 2004.

- Raccoon Creek Watershed cooperative cleanups since 1999 – over 250 tons of illegally-dumped trash and more than 16,000 fugitive tires properly disposed by numerous nonprofit, business and governmental partners.

- Conservation, recreation and reclamation plans:
  - Washington County Greenways Plan (2007)
  - Beaver County Greenways and Trails Plan (2008)
  - Raccoon Creek Operation and Maintenance Plan (for AMD Treatment Systems; 2007)
  - ELF Inter-Mine Pool Transfer Study (Erie, Langeloth, Francis Mine discharges; 2006)
  - Cross Creek Watershed Restoration and Protection Plan (2003)
  - Raccoon Creek Watershed AMD Survey and Preliminary Restoration Plan (2000)

- Illegal Dump Surveys of Allegheny, Beaver and Washington Counties by Keep PA Beautiful (formerly PA CleanWays). Follow-up cleanups by the Washington County Affiliate of KPB netted over 1000 fugitive tires and 7 tons of trash in the 20D Raccoon Creek Region.

- Establishment of the Panhandle and Montour rail-to-trail projects with over 20 miles of multi-use trails in the 20D Region, leading to connections with the Great Allegheny Passage, a trail system that stretches over 330 miles from Pittsburgh to Washington, DC.

- Establishment of watershed, conservation and outdoor recreational organizations:
  - Cross Creek Watershed Association in 1998
  - Raccoon Creek Watershed Association in 1998
  - Independence Conservancy in 1999
  - Washington County Watershed Alliance
  - Friends of Raccoon Creek State Park
  - Montour Trail Council
  - Ohio River Trail Council in 2009

Summary of Selected Projects Currently Underway

The following are but a very few of the many projects now in progress that will benefit commerce, recreation and quality of life for all stakeholders in the 20D Raccoon Creek Region.

Cross Creek County Park, Thompson Hill Boat Launch

Washington County Parks & Recreation Department is expanding public access to Cross Creek Lake. The state Department of Conservation and Natural Resources has approved the county's request to construct a second boat launch on the lake, this one on the PA Route 844 side of the park near West Middletown.

In early May, 2014, construction began on the textured-concrete boat launch and adjacent fishing pier, playground, parking area, shelter and restroom facilities. The southern Thompson Hill Boat Launch will complement an existing launch on the northern Route 50 side of the park.

DCNR, which committed $320,857 in grant money for the project, has given the county a deadline of December 31, 2015, to finish the project. Matching funds for the DCNR grant will come from gas and oil royalties from county wells.

The project includes construction of a "loop trail" on the Route 844 side of the park to access the new Thompson Hill boat launch area. Range Resources is building the loop trail in accordance with an agreement that resulted from negotiations related to a MarkWest transmission line from Range's wells at Cross Creek County Park.

Figure 7.1: Storage tanks and piping at one of the natural gas wells in Cross Creek County Park. Copyright ©, Pittsburgh Post-Gazette, 2014, all rights reserved. Reprinted with permission. Story: 12/13/2013.

Georgetown Sand & Gravel Improvements

In the fall of 2014, PennDot awarded a state Multimodal Transportation Funding Grant of $994,555 to Georgetown Sand & Gravel in Georgetown Borough on the Ohio River. The company will add eighteen quad tie cells to the riverside to enhance barge fleeting, clear a portion of the 75-acre property to trans-load additional products, and develop a barge repair and cleaning facility.

Independence Township (Washington County) Community Park Master Plan Implementation

Independence Township, Washington County, is moving forward with multiple phases of its 2013 Community Park Master Plan. Overall development of the park is planned in six phases based on reasonable expectations for future grants and availability of matching funds and in-kind contributions from project supporters.

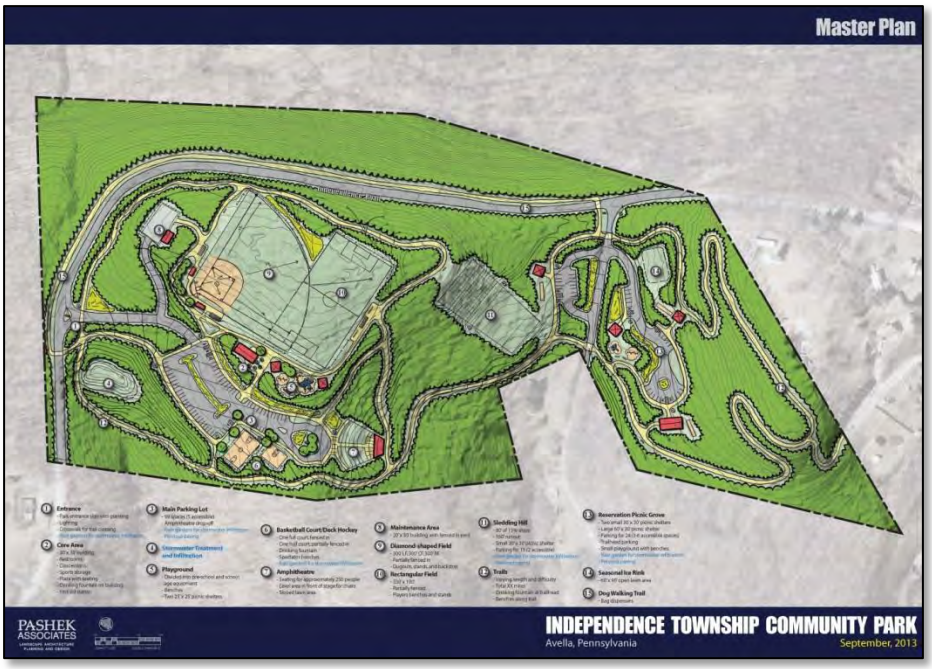


Figure 7.2: Independence Township Community Park Master Plan, courtesy of Pashek Associates, September 2013.

Phase One of the development of Independence Township Community Park was partially funded by a DCNR Community Conservation Partnership (C2P2) Grant in 2014. This $76,000 grant enabled excavating for both entryways; excavating for parking areas #3 and #13, the ice rink #14; the eastern portion of trail #12; and pavilions on the eastern side of the park. Independence Township has applied to the PA Department of Community and Economic Development (DCED) for $300,000 from local share assessment of gaming funds to complete Phase One and accomplish Phase Two. Scope of work includes paving the roadways, completing the parking area and trail surfaces, constructing the ice rink and the pavilions.

Raccoon Creek Water Trail

The Ohio River Trail Council, in partnership with the Port of Pittsburgh Commission, National Park Service and the Pennsylvania Environmental Council, is expanding a water trail system in Beaver County to connect with the Three Rivers Water Trail in Allegheny County, PA. The Ohio River Water Trail Project's goal is to provide safe access to our waterways while connecting us to our history, ecology, geology, heritage and wildlife.

The Ohio River Water Trail Project plans for the expansion of canoe, kayak and rowing access along the Ohio River and its tributaries, including Raccoon Creek, to add them to the Pennsylvania Water Trails System. Plans call for two or more access or launch points spaced no more than five miles apart along the entire blue-way.

The 56-mile Ohio River Water Trail includes thirty-three miles of the Ohio River from Dashields Dam at milepost 13, downstream to Newell, WV at milepost 46; sixteen miles of the Little Beaver Creek to Beaver Creek State Park in Ohio; three-miles of the Beaver River to the Townsend Dam in Fallston; and four miles of Raccoon Creek to the vicinity of Rocky Bottom.

In the spring of 2014, the Ohio River Trail Council published the Ohio River Water Trail Map & Guide. Raccoon Creek was not included in the first edition of the guide because only one proper public access point is presently in service. This point is on Route 30 at the eastern entrance to Raccoon Creek State Park. Other access points, although used by the public, currently lack one or more of the following critical elements: formal permission from the landowner, proper parking, signage, and/or ready access to the water's edge.

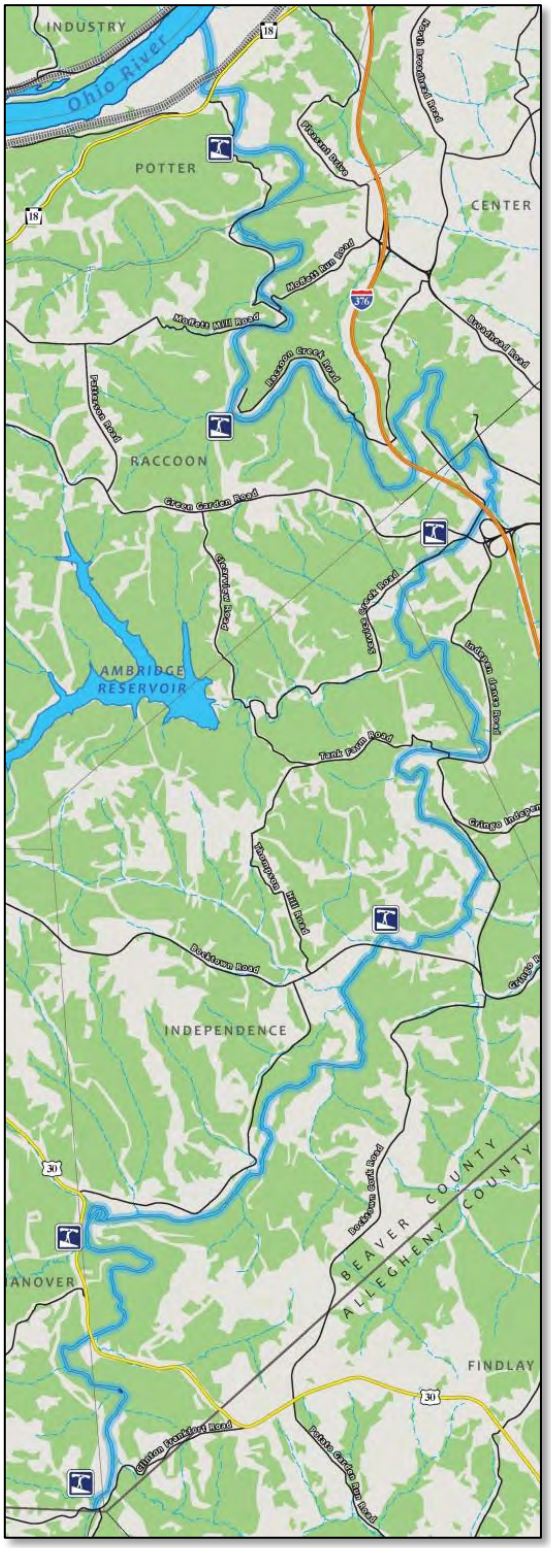


Figure 7.2: Draft Raccoon Creek Birding & Wildlife Water Trail map donated by Pashek Associates to Ohio River Trail Council, courtesy of ORTC website, accessed 5/26/2014.

Rocky Bottom Public Access Project

Independence Conservancy has undertaken the Rocky Bottom Public Access Project as a feature of the Raccoon Creek Greenway which is described in Beaver County's 2008 Greenways & Trails Plan and 2010 Comprehensive Plan.

Generations of visitors to Rocky Bottom, a popular section of Raccoon Creek in Potter Township, have loved its beautiful scenery and cool, green shade. Thanks to recent water quality improvements upstream, people can now enjoy clean water fit for swimming, paddling, fishing and quiet relaxation.

Figure 7.3: Conceptual rendering of Rocky Bottom Public Access by KU Resources, Inc., April 2014.

Popular as it is, Rocky Bottom lacks some critical amenities – there is no place to park cars or bikes, no public restrooms, no picnic tables or shelters, no control over destructive off-road vehicle trespassing and no access for people with mobility challenges. Independence Conservancy seeks to address these issues through the Rocky Bottom Public Access Project. Some of its major goals are:

- To increase recreational opportunities by providing free public access to the bed and banks of Raccoon Creek at parcel #73-172-0203.007 in accordance with the property's deed restriction;
- To provide on-site parking for about twelve vehicles, compliant with the standards of the Americans with Disabilities Act (ADA);
- To connect the parking area to the western bank of Raccoon Creek in an ADA-compliant fashion, accounting for limitations of the site due to seasonal flooding.

In May, 2014, Independence Conservancy awarded the job of designing, permitting and supervising construction of the Rocky Bottom Public Access project to KU Resources, Inc. of

Duquesne, PA. KU was selected from firms who responded to a publicly-advertised bidding process held earlier in the year. KU and the Conservancy are seeking corporate support and funds from public and private sources to advance this project to its target completion date in 2016.

Starpointe Wetland and Stream Mitigation Plan

Washington County Council on Economic Development received a $293,250 Commonwealth Financing Authority Grant in October, 2014, for its Starpointe Wetland and Stream Mitigation Project near Florence in Hanover Township. The project will create 2.89 acres of vegetative buffers and a rain garden, restoring about 1.5 miles of an unnamed tributary to Raccoon Creek. Resulting water quality improvement will benefit 32 miles of Raccoon Creek downstream of the project. The new project provides permanent protection to a tributary of Raccoon Creek located in the approximate middle of Starpointe Business Park, adjacent to an earlier wetland mitigation project.

Figure 7.4: Starpointe Business Park entrance at the intersection of PA Route 18 and US Route 22, Hanover Township, Washington County, 5/9/2013.

Section 8: Management Recommendations

Introduction

This section offers recommendations intended to improve quality of life for those who live, work and play in the Raccoon Creek Region. These recommendations are derived from the input of local citizens and experts in various fields, gathered through public meetings, workshops, surveys, correspondence and interviews. They define a collective vision for the Region.

As one resident so eloquently said, his vision for the future of the Raccoon Creek Watershed is…

> ***A prosperous, viable region where residents possess a sense of pride and ownership in our natural, cultural and historic resources. Where progress and quality of life are not mutually exclusive.***

Toward that end, the 20D Raccoon Creek Watershed Conservation Plan sets forth goals for the wise use of land, water, biological and cultural resources of the Region. Each goal is followed by suggested methods to achieve the goal, listing responsible parties and potential partners. Highest priority objectives for each goal are listed first.

Watershed planning is inherently holistic. This Plan views the Raccoon Creek Region as a whole - an integrated system of land, water, living things, human history and culture. The actions of people affect not only the land but everything to which the land is connected.

The 20D Plan is not regulatory. Any citizen, group, business, agency or unit of government is at liberty – and is encouraged – to undertake projects recommended in this Plan according to their interests and abilities. Groups listed as responsible parties and potential partners to achieve various goals are suggestions only, based on capacity, expertise and mission. New partners are a welcome and vital part of any successful collaboration.

This Plan recommends significant participation by units of government, the energy development industry and various non-profit organizations. Following the Action Item tables are listings of suggested involvement for each of these entities:

- The Pennsylvania State Legislature
- County Planning Commissions and County Governments
- Local Governments and Local Planning Commissions
- County Conservation Districts, Watershed Organizations, Land Trusts and other land/resource conservation organizations
- The Energy Development Industry

The developers of the 20D Raccoon Creek Watershed Conservation Plan trust that each of the groups named in the Management Recommendations Section will commit their best energies toward improvement of the Region, whether through the projects we have suggested herein or by other means we may not have envisioned. We further hope that all stakeholders – anyone who lives, works or plays in the Raccoon Creek Region – are inspired and empowered by this Plan to strive for a place "where progress and quality of life are not mutually exclusive."

Figure 8.1: Raccoon Creek at Rocky Bottom, 2/10/2012. Photo by John Davidson.

"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

John Muir, the father of our National Parks, 1911

Goals & Objectives of the 20D Raccoon Creek Watershed Conservation Plan

Land Resources

Goal: Preservation of the green, quiet, rural, scenic character of the Region.

Objectives:

- Restore Abandoned Mine Lands
- Preserve open, green space and green corridors
- Minimize impacts of the energy development industry
- Promote sustainable residential, industrial and transportation development
- Facilitate access to locally-grown fresh food

Water Resources

Goal: Continual water quality improvement throughout the Region.

Objectives:

- Treat Abandoned Mine Drainage
- Minimize impacts of the energy development industry
- Minimize pollution from sewage, litter, road runoff and agricultural runoff
- Reduce erosion and siltation
- Address storm water runoff and flooding issues

Biological Resources

Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region.

Objectives:

- Identify, protect and connect significant biological diversity areas
- Restore natural stream characteristics
- Control invasive species
- Cultivate public concern for biological resources

Cultural Resources

Goal: Plentiful recreational opportunities that showcase natural and historic resources of the Region.

Objectives:

- Establish, expand and connect land and water trails
- Identify and preserve historic structures, features and community character
- Maintain and improve state, county and municipal parks and public lands
- Improve public perception of the Region

Land Resources: Action Items	*Goal: Preservation of the green, quiet, rural, scenic character of the Region.*
Objective: Restore Abandoned Mine Lands	
Reclaim AML sites, especially those identified in "Section 3: Land Resources"	
Reuse coal waste piles for power generation	
Operate, maintain and repair existing AMD treatment systems	
Mitigate industrial/commercial development within 20D	
Treat AMD as an industrial development mitigation tool	
Redevelop brownfields and grayfields	
Objective: Preserve open, green space and establish green corridors	
Develop/implement county and municipal green space plans	
Expand/connect green corridors along major streams, park lands and conserved areas	
Fund land conservation efforts of local land trusts and watershed organizations	
Train local elected officials and planning commissions in conservation development methods	
Offer readily accessible, site-specific information to enhance restoration and planning efforts	
Objective: Minimize impacts of the energy development industry	
Direct earth disturbances away from pristine natural areas, previously undisturbed areas and farm lands	
Re-develop/re-purpose previously disturbed areas	
Facilitate planning dialog between energy industry and conservation entities	
Cluster/consolidate/centralize earth disturbances	
Improve public safety in areas experiencing increased development	
Objective: Promote sustainable residential, industrial & transportation development	
Direct new development away from pristine natural areas, previously undisturbed areas and farm lands	
Re-develop/re-purpose previously disturbed areas	
Revitalize/upgrade existing housing stock	
Improve public safety in areas experiencing increased development	
Establish non-motorized, alternative transportation routes	
Objective: Facilitate access to locally-grown fresh food	
Fund and support PA's Agricultural Lands Preservation Program and private land trust farm preservation efforts	
Facilitate establishment of new farms by young farmers	
Promote and market locally grown fresh food	
Potential responsible parties and key partners	
PA State Legislature; PA Bureau of Abandoned Mine Reclamation; PA Department of Environmental Protection; Energy Industry; USDI Office of Surface Mining; County/Local Governments; County Conservation Districts; Watershed Organizations; Land Trusts; Farm Service Agency; Penn State Extension; Corporations for Economic Development; Corps of Engineers; Department of Conservation & Natural Resources; PA Department of Transportation	

Water Resources: Action Items	***Goal: Continual water quality improvement throughout the Region.***
Objective: Treat Abandoned Mine Drainage	
Reclaim AML sites, especially those identified in "Section 3: Land Resources"	
Operate, maintain and repair existing AMD treatment systems	
Utilize AMD water in energy development industry	
Mitigate industrial/commercial development within 20D	
Treat AMD as an industrial development mitigation tool	
Objective: Minimize impacts of the energy development industry	
Utilize AMD water in energy development industry	
Transport, treat and re-use local water resources safely	
Monitor waterways for continued quality	
Objective: Minimize pollution from litter, sewage, road runoff and agricultural runoff	
Eliminate illegal dumping; remove illegal dump sites	
Maintain on-lot septic systems properly	
Establish agricultural nutrient best management practices	
Establish mandatory household refuse collection	
Offer recyclable materials collections and hard-to-dispose item collections	
Objective: Reduce erosion and siltation	
Establish, expand and preserve riparian buffers	
Enforce earth disturbance regulations and controls	
Stabilize eroding stream banks with natural methods	
Implement soil-conserving agricultural practices	
Objective: Address storm water runoff and flooding issues	
Use porous pavement, bio-swales and on-site water infiltration methods	
Restrict development in or near floodplains	
Build wetlands and infiltration areas for large-scale storm/flood water retention	
Potential responsible parties and key partners	
PA Legislature; PA Dept. of Environmental Protection; PA Bur. of Abandoned Mine Reclamation; Energy Industry; USDI Office of Surface Mining; Natural Resources Conservation Service; County/Local Gov'ts; Depts. of Community & Economic Development; County Conservation Districts; Watershed Org's.; Land Trusts; Farm Service Agency; Penn State Extension; Farmers and the Farming Industry; Corps of Engineers; Department of Conservation & Natural Resources	

Biological Resources: Action Items	***Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region***
Objective: Identify, protect and connect significant biological diversity areas	
Facilitate planning dialog between gas industry and conservation entities	
Expand and connect green corridors along major streams, park lands and conserved areas	
Encourage earth disturbances away from pristine natural areas, previously undisturbed areas and farm lands	
Fund land conservation efforts of local land trusts and watershed organizations	
Train local elected officials and planning commissions in land preservation mechanisms	
Offer readily accessible, site-specific information to enhance restoration and planning efforts	
Objective: Restore natural stream characteristics	
Establish, expand and preserve riparian buffers	
Stabilize eroding stream banks with natural methods	
Remove run-of-the-river dams where appropriate	
Objective: Control/manage invasive species	
Control/manage/monitor invasive species of concern to the Region	
Plant native species in residential and commercial landscapes	
Minimize forest fragmentation by pipelines and other development	
Objective: Cultivate public concern for biological resources	
Fund and increase environmental education outreach for all ages	
Plant native species in residential and commercial landscapes	
Fund environmental educator/interpreter positions at parks and conservation organizations	
Prosecute off-road vehicle trespassers on conserved lands	
Potential responsible parties and key partners	
PA Legislature; PA Department of Conservation & Natural Resources; PA Department of Environmental Protection; County/Local Governments; County Conservation Districts; Watershed Organizations; Land Trusts; Farm Service Agency; Penn State Extension; PA Department of Agriculture; Energy Industry; Law Enforcement Agencies; Keep Pennsylvania Beautiful	

Cultural Resources: Action Items	*Goal: Plentiful recreational opportunities that showcase natural and historic resources of the Region.*
Objective: Establish, expand and connect land and water trails	
Develop/implement county and municipal green space plans	
Expand/connect existing land and water recreational trails	
Establish proper public recreational access to the lower main stem of Raccoon Creek	
Establish non-motorized transportation routes	
Objective: Identify and preserve historic structures, features and community character	
Fund and support local historic preservation societies	
Update PA Historic & Museum Commission and National Register site inventories	
Revitalize/upgrade housing stock in small towns and villages	
Publicize local historic and cultural features	
Objective: Maintain and improve state, county and municipal parks and public lands	
Fund environmental educator/interpreter positions at parks and conservation organizations	
Upgrade existing nature centers; build new interpretive centers	
Increase funding to Keystone Parks & Recreation Fund	
Maintain and upgrade county, municipal and state parks and public spaces	
Objective: Improve public perception of the Region	
Educate elected officials and general public about notable features of the Region	
Promote the Region as a great place to live, work and play	
Fund and increase environmental education outreach for all ages	
Eliminate illegal dumping; remove illegal dump sites	
Potential responsible parties and key partners	
PA Legislature; PA Department of Conservation & Natural Resources; PA Department of Environmental Protection; County/Local Governments; PA Historic & Museum Commission; County Tourist Promotion Agencies; PA Department of Transportation; County Conservation Districts; Watershed Organizations; Land Trusts; Farm Service Agency; Penn State Extension; Energy Industry; Law Enforcement Agencies; Keep Pennsylvania Beautiful	

Recommended Involvement for the Pennsylvania General Assembly

Land Resources Goal: Preservation of the green, quiet, rural, scenic character of the Region

- Fund reclamation of AML sites identified in "Section 3: Land Resources"
- Fund operation, maintenance and repair of existing AMD treatment systems
- Fund land conservation efforts of local land trusts and watershed organizations
- Fund PA's Agricultural Lands Preservation Program and efforts of private land trust efforts

Water Resources Goal: Continued water quality improvement throughout the Region

- Fund reclamation of AML sites identified in "Section 3: Land Resources"
- Fund operation, maintenance and repair of existing AMD treatment systems
- Fund land conservation efforts of local land trusts and watershed organizations
- Fund community efforts to eliminate illegal dump sites

Biological Resources Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region

- Fund land conservation efforts of local land trusts and watershed organizations
- Fund community efforts to eliminate illegal dump sites
- Establish and fund programs to control invasive species
- Fund environmental educator/interpreter positions at parks and conservation organizations
- Fund upgrades to existing nature centers; build new interpretive centers

Cultural Resources Goal: Plentiful recreational opportunities that showcase natural and historic features of the Region

- Fund land conservation efforts of local land trusts and watershed organizations
- Fund PA's Agricultural Lands Preservation Program and efforts of private land trust efforts
- Fund community efforts to eliminate illegal dump sites
- Establish mandatory household refuse collection
- Fund environmental educator/interpreter positions at parks and conservation organizations
- Fund upgrades to existing parks and nature centers; build new interpretive centers
- Fund and support local historic preservation societies

Recommended Involvement for County Government and County Planning Commissions

Land Resources Goal: Preservation of the green, quiet, rural, scenic character of the Region

- Use Act 13 money to fund Abandoned Mine Discharge/Abandoned Mine Land reclamation
- Keep mitigation projects for industrial/commercial development within 20D
- Encourage AMD treatment as an industrial development mitigation tool
- Encourage redevelopment of brownfields, grayfields and previously disturbed areas
- Facilitate planning dialog between gas industry and conservation entities
- Establish, expand and connect green corridors along major streams, park lands and conserved areas
- Direct earth disturbances away from pristine natural areas, undisturbed areas and farm lands
- Develop, update and implement county green space plans
- Participate in training for local elected officials and planning commissions in conservation development mechanisms

Water Resources Goal: Continued water quality improvement throughout the Region

- Use Act 13 money to fund Abandoned Mine Discharge/Abandoned Mine Land reclamation
- Keep mitigation projects for industrial/commercial development within 20D
- Encourage AMD treatment as an industrial development mitigation tool
- Encourage redevelopment of brownfields and grayfields
- Encourage use of porous pavement, bio-swales and on-site water infiltration methods
- Encourage construction of wetlands and infiltration areas for storm/flood water retention
- Restrict development in or near floodplains
- Facilitate planning dialog between gas industry and conservation entities

Biological Resources Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region

- Facilitate planning dialog between gas industry and conservation entities
- Develop, update and implement county green space plans

Cultural Resources Goal: Plentiful recreational opportunities that showcase natural and historic features of the Region

- Establish, expand and connect green corridors along major streams, park lands and conserved areas
- Develop and implement county green space plans
- Participate in training for local elected officials and planning commissions in conservation development mechanisms
- Establish non-motorized transportation routes; expand and connect existing land and water recreational trails

Recommended Involvement for Local Governments and Local Planning Commissions

Land Resources Goal: Preservation of the green, quiet, rural, scenic character of the Region

- Establish, expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Establish, expand and connect existing land and water recreational trails
- Receive training in conservation development mechanisms
- Fund land conservation efforts of local land trusts and watershed organizations
- Direct earth-disturbing development away from farmlands, pristine natural areas and previously undisturbed areas
- Support community efforts to eliminate illegal dump sites
- Offer recyclable materials collections and hard-to-dispose materials collections

Water Resources Goal: Continued water quality improvement throughout the Region

- Establish, expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Establish, expand and connect existing land and water recreational trails
- Fund land conservation efforts of local land trusts and watershed organizations
- Encourage proper maintenance of on-lot septic systems
- Encourage use of porous pavement, bio-swales, wetlands and on-site water infiltration methods for storm/flood water retention
- Restrict development in or near floodplains

Biological Resources Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region

- Establish, expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Fund land conservation efforts of local land trusts and watershed organizations
- Prosecute off-road vehicle trespassers on conserved land

Cultural Resources Goal: Plentiful recreational opportunities that showcase natural and historic features of the Region

- Establish, expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Establish, expand and connect existing land and water recreational trails
- Fund land conservation efforts of local land trusts and watershed organizations
- Support community efforts to eliminate illegal dump sites
- Establish proper public recreational access to the lower main stem of Raccoon Creek
- Revitalize/upgrade housing stock
- Publicize local historic and cultural features

Recommended Involvement for County Conservation Districts, Watershed Organizations, Land Trusts and Conservancies

Land Resources Goal: Preservation of the green, quiet, rural, scenic character of the Region

- Operate, maintain and repair existing AMD treatment systems; build new treatment systems
- Promote use of Act 13 money for AMD reclamation
- Participate in planning dialog between energy industry and conservation entities
- Train local elected officials and planning commissions in conservation development mechanisms
- Establish, expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Establish, expand and connect land and water recreational trails
- Offer readily accessible, site-specific information to enhance restoration and planning efforts
- Facilitate establishment of new farms by young farmers

Water Resources Goal: Continued water quality improvement throughout the Region

- Operate, maintain and repair existing AMD treatment systems; build new treatment systems
- Promote use of Act 13 money for AMD reclamation
- Promote utilization of AMD water in energy development industry
- Expand and connect green corridors and riparian buffers along major streams, parks and conserved areas
- Offer readily accessible, site-specific information to enhance restoration and planning efforts
- Monitor waterways for continued quality
- Identify eroding stream banks; stabilize with natural methods
- Encourage use of porous pavement, bio-swales, wetlands and on-site water infiltration methods

Biological Resources Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region

- Expand & connect green corridors & riparian buffers along major streams, parks & conserved areas
- Offer readily accessible, site-specific information to enhance restoration and planning efforts
- Encourage planting of native species in residential and commercial landscapes

Cultural Resources Goal: Plentiful recreational opportunities that showcase natural and historic features of the Region

- Partner in implementation of county and municipal green space plans
- Establish, expand and connect land and water recreational trails
- Establish proper public recreational access to the lower main stem of Raccoon Creek
- Partner in community efforts to eliminate illegal dump sites
- Increase environmental education outreach for all ages
- Publicize and promote notable historic, cultural and natural features of the Region

Recommended Involvement for the Energy Development Industry

Land Resources Goal: Preservation of the green, quiet, rural, scenic character of the Region

- Mitigate for industrial/commercial development within the 20D Region
- Cluster/consolidate/centralize earth disturbances
- Minimize forest fragmentation by pipelines and other industrial development
- Participate in planning dialog between energy industry and conservation entities
- Fund training of local elected officials and planning commissions in land preservation methods
- Fund land conservation efforts of local land trusts and watershed organizations
- Develop public-private partnerships to reuse coal waste piles for power generation

Water Resources Goal: Continued water quality improvement throughout the Region

- Cluster/consolidate/centralize earth disturbances
- Mitigate industrial/commercial development within 20D
- Transport, treatment and re-use local water resources safely
- Participate in planning dialog between energy industry and conservation entities
- Fund land conservation efforts of local land trusts and watershed organizations
- Develop/participate in public-private partnerships to reuse coal waste piles for power generation
- Utilize AMD water in industrial processes

Biological Resources Goal: Healthy and diverse terrestrial and aquatic habitats throughout the Region

- Cluster/consolidate/centralize earth disturbances
- Minimize forest fragmentation by pipelines and other industrial development
- Participate in planning dialog between energy industry and conservation entities
- Fund land conservation efforts of local land trusts and watershed organizations

Cultural Resources Goal: Plentiful recreational opportunities that showcase natural and historic features of the Region

- Maintain/improve public safety in areas experiencing industrial development
- Fund implementation of county and municipal green space plans
- Fund land conservation efforts of local land trusts and watershed organizations
- Expand & connect green corridors along major streams, park lands and conserved areas
- Establish proper public recreational access to the lower main stem of Raccoon Creek
- Fund upgrades to municipal, county and state parks and public spaces

Priority Implementation Projects

Three main avenues of work have been chosen by the 20D Steering Committee as Priority Implementation Projects for the 20D Raccoon Creek Region Conservation Plan: Abandoned Mine Discharge Treatment; the 20D Regional GreenWay; and the Land Conservation Initiative. They are outlined as follows:

1. Abandoned Mine Discharge Treatment

Project 1.a. JB2 AMD Treatment System Renovation

Project 1.b. Hamilton AMD Treatment System Renovation/Expansion

Project 1.c. ELF: Erie-Langeloth-Francis Mine Proposed Treatment System

2. 20D Regional GreenWay

Project 2.a. Rocky Bottom Public Access Project

Project 2.b. Independence Township Community Park (Washington County)

Project 2.c. Raccoon Creek Water Trail

3. Land Conservation Initiative

Project 3.a. 20D Regional GreenWay Implementation

Project 3.b. Farmland Conservation Partnerships

Project 3.c. High-Value Biological Diversity Area Preservation

All of these initiatives have been researched by their respective responsible parties and potential partners. In many cases, cost estimates and significant preparation is already in place, paving the way for successful implementation. Stakeholders have clearly shown their support for clean water, public recreation, productive farms and the “green and quiet” character of the Raccoon Creek Region – goals these projects will help to achieve.

Collectively, these Priority Implementation Projects address many of the specific objectives of the 20D Raccoon Creek Watershed Conservation Plan as described earlier in Section 8:

- Restore Abandoned Mine Lands and treat Abandoned Mine Discharge
- Preserve open, green space; establish and connect green corridors
- Protect farmland; facilitate access to locally-grown fresh food
- Identify, protect and connect significant biological diversity areas
- Expand and connect land and water trails
- Identify and preserve historic structures, features and community character
- Improve public perception of the Region.

1. Abandoned Mine Discharge Treatment

Abandoned Mine Discharge impacts at least thirty miles of headwater streams in the Raccoon Creek Watershed. AMD remediation is the most pervasive, expensive and challenging issue faced by the dedicated agency professionals, industry experts, business leaders and citizen volunteers who have worked tirelessly on it for decades. As a result of their persistent efforts, five passive treatment systems have been built in the Raccoon Creek Watershed since 1999. Together, these systems treat 2.5 billion gallons per year of AMD, removing over 2000 tons per year of acidity, iron and other metals. Fish and aquatic wildlife are making a comeback in many reaches of streams. Paddlers, swimmers and anglers enjoy clean water. But much remains to be done.

For purposes of the 20D Raccoon Creek Region Conservation Plan, three passive treatment systems described below are the highest priorities. JB2, Hamilton and the ELF are projects which reflect major expenditures of money, time, research and lessons learned. They will not only improve water quality, but protect the gains made by millions of dollars of public, corporate and private investment in existing AMD treatment systems and efforts.

1.a. JB2 Abandoned Mine Discharge Treatment System Renovation

The JB2 Passive Treatment System is owned and operated by Independence Conservancy and maintained with assistance from the Washington County Conservation District and Penn's Corner Conservancy Charitable Trust. The system is located on both sides of Joffre-Cherry Valley Road in Smith Township on land donated to the Conservancy by the Sasso Family. Originally built in 2004 as a vertical flow pond and settling basin, JB2 has undergone a series of renovations and a major expansion in 2009. The system treats about 137 million gallons of Abandoned Mine Drainage yearly from the Joffre Branch 2 discharge.

JB2 is experiencing an overall decline in treatment due to various maintenance issues and a high metal pollutant load. Maintenance and retrofitting of the system is recommended. The JB2 AMD Treatment System Renovation project seeks to:

- Expand the treatment capability of the passive system by installing about one half-acre of low-pH iron terrace/channel starting at the existing collection pond on the eastern end of the site and wrapping around the existing treatment pond to the western end of the pond. This will result in removal of iron at low pH and will reduce the accumulation of metals within the existing limestone bed decreasing maintenance and extending the life of the treatment media.

- Clean the existing limestone treatment media to remove accumulated metals and restore treatment capability of the limestone bed.

- Retrofit the limestone bed to an automatic flushing limestone pond to aid in flushing metals from the system, thereby increasing efficiency and long-term sustainability.

- Install additional split-rail fencing around the newly constructed treatment components for public safety.

Estimated cost of renovations: $100,000

Previous investments, 2003 - 2012: $500,000+

Figure 8.2: John Hewitt, Matt Golden and Shannon Miles unclog one of the drains at JB2 to prepare for removal of the mushroom compost layer, 8/3/2009.

Figure 8.3: Gary Stokum, John Davidson, Jeremy Matinko and Al Moran wrestle with 12" PVC pipe to build an odor-control structure at JB2's lower treatment pond, 9/8/2005.

1.b. Hamilton AMD Treatment System Renovation/Expansion

The Hamilton AMD Passive Treatment System is located off Washington Road in Findlay Township, Allegheny County. The system was installed to treat a discharge known as Hamilton Three (or H3) that emanates from an underground coal mine located beneath a closed landfill. Like JB2, the H3 Discharge was identified in the Raccoon Creek Watershed Abandoned Mine Drainage Survey and Preliminary Restoration Plan as one of seven primary discharge sites in Raccoon Creek that need to be treated.

In 2002, a passive treatment system for Hamilton was designed by PA Department of Environmental Protection - Bureau of Abandoned Mine Reclamation (BAMR) under contract # AMD02(0642)101.1. The system was built on the former Hamilton Farm as part of a public-private partnership effort that included the Washington County Conservation District, Raccoon Creek Watershed Association, Independence Conservancy, and PA DEP BAMR. Funding was provided by the PA Turnpike Commission, US Office of Surface Mining and other sources. Construction was completed in 2003 by BKG Industries of Imperial, PA, including a heavy-duty access road, Vertical Flow Pond and Settling Pond.

Figure 8.4: Members of the Raccoon Creek Watershed Association gather at the newly-completed Hamilton AMD Treatment System to present the owners of BKG Industries with certificates of appreciation for a job well done, 9/30/2003. L to R: Jeff Lloyd, George Robbie, Dave Wright, Michael Harcher, Andy Harcher, Gary Kisow, John Davidson, Vicky Michaels (holding Ken Kisow's certificate), Bill Kisow and George Lantz. Photo by Gary Stokum.

Initially, the system treated 210 million gallons of AMD per year. In recent years, Hamilton has experienced a decline in effectiveness due to the ravages of time and accumulation of iron in the ponds. Fortunately, the opportunity now exists to capture the H3 discharge at its source on the adjacent uphill property and pre-treat the AMD before it enters the existing system. Such an arrangement was not an option when Hamilton was designed in 2002.

To fully treat the H3 discharge, it must be captured at its source. The existing Hamilton AMD Treatment System needs repaired and expanded to include an Anoxic Limestone Drain, additional settling ponds and wetlands. This project is expected to revitalize and improve the treatment efficiency of the Hamilton system and substantially improve stream quality in Potato Garden Run. Expected environmental results include:

- Neutralization of acidity: 100,000 lbs/year (50 tons/year) (274 lbs/day)
- Removal of iron: 100,000 lbs/year (50 tons/year) (274 lbs/day)
- Stream improvement: estimated 3 miles of unnamed tributary and Potato Garden Run
- Wetland creation: ~½ to 2 acres of wetlands depending upon final design

Estimated cost of renovation/expansion: $895,038
This project was submitted to (but not funded by) the PA DEP Growing Greener program in 2013; grant request of $758,089; match of $ 136,949; total project cost of $895,038. The Hamilton AMD Treatment System Renovation/Expansion is ready to build, if funded.

Previous investments, 2003 - 2012: $500,000+

Figure 8.5: A crew from BKG Industries evaluates the need to install a French drain around the eastern side of the Hamilton AMD Treatment System, 7/22/2003. L to R: Michael Kisow, Bill Kisow, Gary Kisow and Jeremy Kapaldo.

1.c. ELF: Erie-Langeloth-Francis Mine Proposed Treatment System

Abandoned underground mines in the Pittsburgh coalbed continue to degrade over thirty miles of streams in the Raccoon Creek Watershed. In 2006, selected discharges were evaluated with conceptual treatment approaches that included the "ELF" System. The acronym "ELF" is a simple way to identify the AMD discharge that would be created by consolidating discharges from the Erie Mine, Langeloth Mine and Francis-Patterson Mines. The ELF has the potential to substantially eliminate AMD impacts to Burgetts Fork and restore about 3.5 miles to its confluence with Raccoon Creek.

The ELF system would combine and relocate AMD from these various underground mine pools in the Burgetts Fork Watershed (where construction room is limited) by inter-mine pool transfer to a single discharge point for possible future use and/or for treatment by a single system. Future uses could potentially include frack water for the gas industry or other industrial applications. To evaluate the feasibility of the ELF system, the geologic setting, man-made features, water monitoring data and historical mining were considered. Composite mine maps were developed.

Figure 8.6: Randy McKay and John Rigger of McKay and Gould drill test site EW1 (Erie Mine), hole #4, 1/28/2010. Photo courtesy of BioMost, Inc.

In early 2010, two injection and withdrawal tests were conducted to evaluate the degree of hydrologic interconnectedness of the mine workings. In summary, both Test 1 and Test 2 indicated no impediment to flow within the Erie Mine relating to the east and west test sites and the main Erie Mine discharge (E1). The tests indicate that the Erie Mine discharge can be successfully relocated by implementing the ELF system. Test 2 also showed that withdrawing water from the Langeloth Mine Shaft by injection into the Erie Mine may substantially decrease flow from the Francis Mine. Francis Mine is the major source of drainage issuing from the Patterson Mine. The physical feasibility of the ELF system to decrease or eliminate the flow at discharge P7A requires additional confirmation, however.

A second withdrawal test from the Langeloth Mine is most likely needed. This test would involve installing a more sensitive weir or flume at P7A, two additional piezometers (one each in the probable Francis and Langeloth in-mine gob areas), and pressure transducers in the fourteen functional piezometers in the Langeloth, Francis and Patterson Mines. If connectivity

can be established, the ELF project has potential to proceed by using horizontal borings, siphons and piping systems to transfer water from mine pool to mine pool, ultimately bringing the majority of the AMD to one location without pumping. Once all of the mine discharges are consolidated, a single large passive or active treatment system could be built, and/or the drainage could be utilized by industry.

Estimated costs:
To complete the ELF project, install a treatment system and restore Raccoon Creek requires a series of steps. Each step should be successfully completed before proceeding to the next.

1. Conduct additional testing to confirm hydrologic interconnectedness with Francis Mine. Estimate: $50,000
2. Design ELF treatment system. Estimate: $50,000 to $100,000+
3. Land acquisition: Costs unknown.
4. Landowner and municipal approvals. Cost unknown.
5. Construct ELF treatment system. Cost unknown; dependent upon water quality, flow rates, land availability, treatment technology utilized, etc. Cost range likely $1- 10 million.

Potential environmental benefit of the ELF is considerable. About 3.5 miles of currently-degraded Burgetts Fork would be restored without any additional water treatment. If a treatment system were built for the ELF-created discharge, there is potential to significantly improve - if not restore – over ten miles of Raccoon Creek.

Figure 8.7: Bruce Leavitt prepares the piezometer screen for test site EP1 as Randy McKay, John Rigger and Tim Danhey look on, 1/27/2010. Photo courtesy of BioMost, Inc.

2. 20D Regional GreenWay

All three counties in the 20D Raccoon Creek Region – Allegheny, Beaver and Washington – have greenway or green corridor plans. Although these plans end at their respective county lines, they share common themes of working with public and private sector partners to build and connect county-wide systems of greenways, trails and conservation corridors. These corridors will protect open space, preserve stream corridors, wetlands, unique habitats and other areas identified as priorities for conservation.

Washington County's Greenways Plan, adopted in January of 2007, suggests green corridors for Cross Creek, Aunt Clara Fork, King's Creek, Hillman State Park and the Route 22 vicinity. The Plan recommends establishment of a Raccoon Creek Valley Natural Area to protect the high-value biological diversity areas in the Raccoon Creek Floodplain. It also recommends creating the Cross Creek Natural Area to protect over 5,000 acres of agricultural easements, Cross Creek County Park and the Meadowcroft Rockshelter.

Beaver County's 2008 Greenways & Trails Plan and 2010 Comprehensive Plan identify the entire length of the main stem of Raccoon Creek as the "Raccoon Creek GreenWay," envisioning a conserved corridor of lands open to the public for paddling, walking, cycling and quiet enjoyment of nature.

In an earlier effort, the Townships of Greene, Raccoon, Independence, and Potter (GRIP) adopted a multi-municipal comprehensive plan in 2005, intended to guide future growth and development in a coordinated fashion amongst the four contiguous municipalities. The GRIP Plan designates a Conservation Area District along Raccoon Creek and the Ohio River with floodplain and riparian buffer standards. It also includes a Natural Heritage Area Overlay with development standards for sensitive environmental features. Two stated objectives of the GRIP Plan attest to stakeholder interest in a Raccoon Creek Greenway:

- Explore recreation opportunities along the Ohio River and Raccoon Creek including an interconnected system of trails throughout the four municipalities.

- Protect and promote the historic and cultural assets in the area by engaging local historic preservation and identifying recreational linkages.

In the course of developing the 20 Raccoon Creek Region Conservation Plan, a recurring theme emerged – a need for better recreational access to the creek and its major tributaries. Stakeholders have long made it clear that they want bicycle and walking trails, places to hunt and fish; access for swimming, floating and paddling in more places than are presently available along Raccoon Creek. Please see "Section 2: Issues, Concerns, Constraints" for comments on these topics.

For purposes of the 20D Plan, the 20D Regional GreenWay includes three related component projects that will contribute significantly to implementing concepts presented in both Washington and Beaver County's Comprehensive Plans:

- **2.a. Rocky Bottom Public Access Project**
- **2.b. Independence Township (Washington County) Community Park**
- **2.c. Raccoon Creek Canoe Trail.**

These three projects are presented in detail as follows.

2.a. Rocky Bottom Public Access Project

Background

The first priority implementation project for the 20D Regional GreenWay is the Rocky Bottom Public Access Project. Beaver County's GreenWays & Trails Plan identifies land trusts, local governments and watershed associations as partners to preserve and improve lands along Raccoon Creek for public access and protection of natural resources. Independence Conservancy, the only land trust active in the Raccoon Creek Region, has undertaken the Rocky Bottom Public Access Project to advance the Raccoon Creek GreenWay as broadly described in the Beaver County's 2008 GreenWays & Trails Plan.

In December of 2010, Horsehead Corporation, as part of terms of settlement of a federal water pollution lawsuit, granted to Independence Conservancy (IC) ownership of two parcels of land flanking Potter Township's "Tank Farm" property on Raccoon Creek Road in Potter Township. These parcels were given with a deed restriction mandating that the IC will hold the land strictly

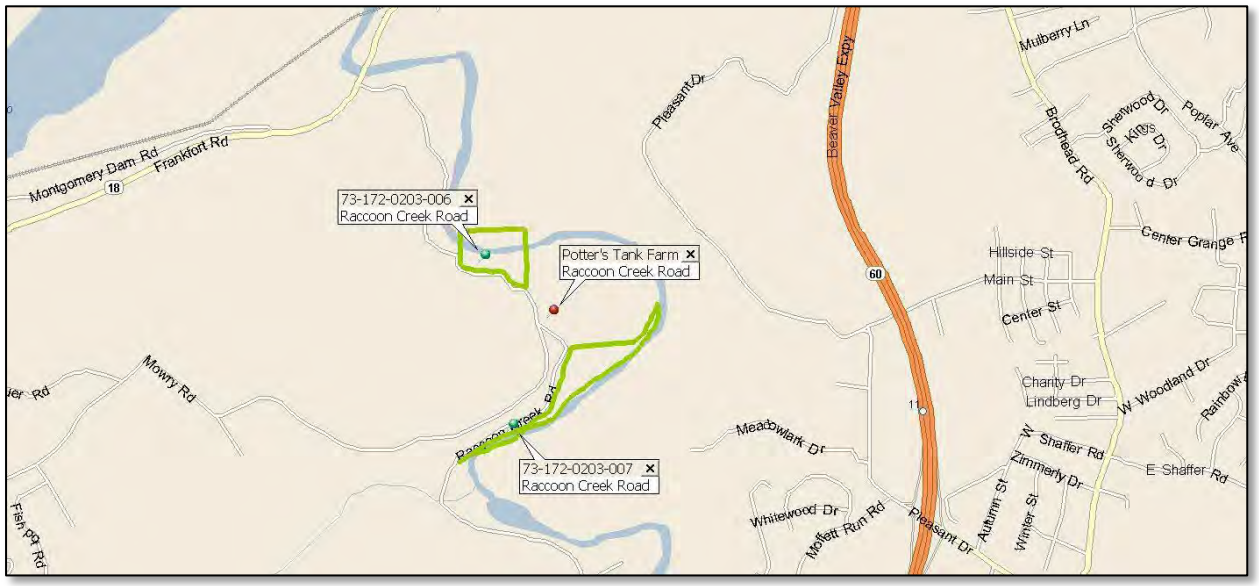


Figure 8.8: Location map of Independence Conservancy's "Rocky Bottom" parcels, flanking Potter Township's "Tank Farm."

for conservation purposes which include public access to Raccoon Creek for low-impact, non-motorized public recreation. The southern, upstream parcel is locally known as "Rocky Bottom" because of the smooth, shallow, flat bottom of Raccoon Creek in this vicinity.

Rocky Bottom has been a very popular recreational destination for generations of local people. Due to the great strides made in Abandoned Mine Discharge Treatment, visitors to Rocky Bottom enjoy water fit for swimming, paddling, fishing and quiet relaxation. However, the site lacks even the most basic amenities. There is no place to park and there are no restroom facilities. The IC must establish a proper visitor area to alleviate traffic hazards on Raccoon Creek Road and mitigate damage to fragile riparian lands from passenger cars, off-road vehicles, ATVs and dirt bikes.

Rocky Bottom Public Access Project Goals

- To increase recreational opportunities by providing free public access to the bed and banks of Raccoon Creek at parcel #73-172-0203.007 per the property's deed restriction.
- To provide on-site parking for about 12 vehicles, compliant with the standards of the Americans with Disabilities Act (ADA).
- To connect the parking area to the western bank of Raccoon Creek in an ADA-compliant fashion, accounting for limitations of the site due to seasonal flooding.
- To restrict ATV, dune buggy, dirt bike and 4WD vehicle traffic and resulting damage by extending the existing PennDot guide rail along Raccoon Creek Road.
- To install didactic signage listing hours of operation, park rules, site history, etc.
- To provide a location at the parking area for placement of a portable toilet from late April through late October with adequate clearance for maintenance of the unit.

Rocky Bottom Public Access Project Accomplishments (as of September, 2014)

In June of 2014, Independence Conservancy selected KU Resources, Inc. of Duquesne, PA, through a publicly-advertised bidding process to design, engineer and permit an initial phase of improvements at Rocky Bottom.

In August, 2014, the Beaver County Board of Commissioners donated $11,100 from the County's Act 13 Marcellus Legacy Fund to Independence Conservancy to apply toward the total $56,835 cost of the engineering phase of the Rocky Bottom Public Access Project. This donation will enable wetland delineation and other seasonal field work to be accomplished in 2014. KU Resources has completed a Phase One Environmental Site Assessment and created an artist's rendering of the public access area. Please see Figure 8.9.

Rocky Bottom Public Access Project – Future Efforts

Independence Conservancy must accomplish the following series of tasks to bring the Rocky Bottom Public Access Project to life:

- Raise $45,735 needed to complete the engineering phase;
- Secure funds to build the improvements designed and permitted in the engineering phase – costs to be determined;
- Cultivate a corps of local site stewards who will assist the Conservancy with maintenance, monitoring and public relations – costs to be determined;
- Establish a dedicated funding stream for long-term stewardship of the natural and built features of the site – costs to be determined.

Figure 8.9: Artist's rendering of the proposed Rocky Bottom Public Access Area, KU Resources, Inc., April, 2014.

2.b. Independence Township (Washington Co.) Community Park Master Plan Implementation

Background

The second Priority Implementation Project of the 20D Regional GreenWay is implementation of Independence Township's Community Park Master Plan. In 1966 the township acquired 43 acres from the Campbell farm estate to establish a park between the town of Avella and the village of P&W Patch. Seeking to update an initial plan from 1975, Independence Township retained Pashek Associates of Pittsburgh in 2013 to assess the site, help define residents' needs for their community park, develop a new park master plan, suggest phases for implementation and provide cost estimates to build the park as funds are secured.

Site Analysis and Recommendations

Development at Independence Township Community Park will concentrate around two knolls, one located on the east side of the property and one at the west. The western knoll contains more acreage of relatively level ground and has the better development potential for large,

level athletic fields and traditional park structures. The eastern knoll is better suited to more passive recreational uses and smaller buildings because of wet soils and steep topography. Vehicular access to the parkland is feasible from Independence Road on the west and Wylie Avenue on the north near the middle of the property. (Please see Figure 8.10). Walking trail connections to the residential neighborhoods to the southwest and east would encourage use of the park without involving automobile traffic.

Master Plan

Based on the results of community opinion-gathering efforts and site constraints, Pashek Associates rolled out a master Plan for Independence Township Community Park in October of 2013. Although there was some interest in providing team sports fields in the park, the public in general placed greater emphasis on adequate picnic facilities and trails. Local middle schoolers surveyed preferred a playground and open, grassy fields where they could throw Frisbees, fly kites, or pick up a game of flag football – impromptu activities more than structured sports.

Accessibility and sustainability were defined as musts for the park's design. Sustainable parks are those built to protect natural resources, improve wildlife habitat – and which are managed and maintained in harmony with the environment. Independence Township's Community Park Master Plan incorporates DCNR's Green Principles for Park Management by:

- Minimizing grading and site disturbance by locating proposed facilities on the most level areas and avoiding steep slopes
- Improving wildlife habitat by including a forest management plan to enhance biodiversity, remove invasive species and maintain viable woodlots
- Reducing stormwater runoff by using stabilized turf for parking areas and incorporating rain gardens or bio-infiltration swales to absorb and treat water from impervious surfaces
- Reducing park waste by offering recycling containers near each facility, restroom, trailhead, etc.

The final plan for Independence Township Community Park is depicted in Figure 8.10. It features two distinct areas, each with its own entrance and intended use. The eastern side of the park is more passive and less developed; the western side is more active and more extensively developed. Proposed facilities include for the western side include:

- Diamond-shaped field with outfield at about 300 feet
- Rectangular shaped field, 330 feet by 180 feet, overlapping the outfield of the diamond shaped field
- Playground
- 1 ½ basketball courts
- Small amphitheater for up to 250 people
- Sledding hill
- Restrooms/concessions stand
- Maintenance facility

Proposed improvements at the eastern, more passive side include:

- Reservation picnic areas
- Seasonal ice skating area

Common features for both areas:

- Trails of varying length and difficulty with benches and drinking fountain at the trailhead

Accomplishments (as of November, 2014)

Overall development of the park is planned in six phases based on reasonable expectations for future grants and availability of matching funds and in-kind contributions from project supporters.

Phase One of the development of Independence Township Community Park was partially funded by a DCNR Community Conservation Partnership (C2P2) Grant in 2014. This $76,000 grant enabled excavating for both entryways; excavating for parking areas #3 and #13, the ice rink #14; the eastern portion of trail #12; and pavilions on the eastern side of the park (please see Figure 8.10). Independence Township has applied to the PA Department of Community and

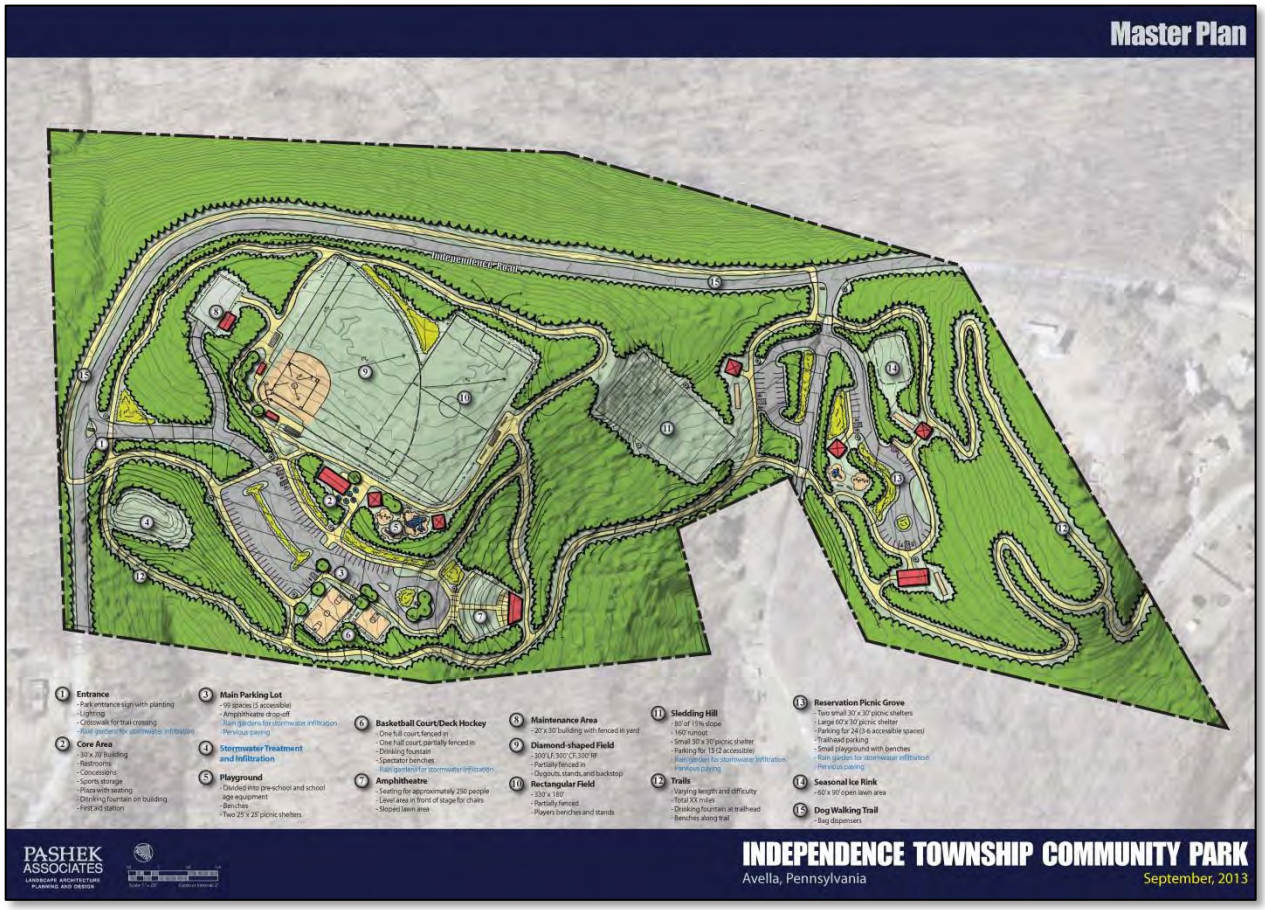


Figure 8.10: Independence Township Community Park Master Plan, courtesy of Pashek Associates, September 2013.

Economic Development (DCED) for $300,000 from local share assessment of gaming funds to complete Phase One and accomplish Phase Two. Scope of work includes paving the roadways, completing the parking area and trail surfaces, constructing the ice rink and the pavilions.

Future Efforts

Independence Township is planning to prepare a spring 2015 proposal to the C2P2 Grant Program to launch Phase Three which includes the sledding hill and trails on the western, more developed side of the park. Phases Four, Five and Six will be the most costly, as they include the outdoor amphitheater, restrooms, concession area, levelled playing fields, playground, deck hockey/basketball court and maintenance facilities.

Total estimated cost of all improvements included in the scope of the master plan for Independence Township Community Park is $3.1 million.

2.c. Raccoon Creek Water Trail

Background

The third Priority Implementation Project of the 20D Regional GreenWay is the Raccoon Creek Water Trail. Over the past several years, no fewer than six public planning studies in Washington and Beaver Counties have called for formal designation of green corridors along Raccoon Creek, Cross Creek and major tributaries. Most recently, Beaver County's 2010 Comprehensive Plan delineated a Raccoon Creek GreenWay to provide adjacent population centers with opportunities for walking, biking and paddling – while preserving the scenic vistas, clean water and abundant wildlife that give the Raccoon Creek valley its treasured appeal.

Floating has always been a popular pastime on the lower reaches of Raccoon Creek. In the days before tubeless tires, inner-tubing was an easy way to enjoy a lazy float down the 'crik.' Many locals have fond summer memories of this simple, affordable family fun – and the pungent smell of sun-warmed rubber and Acid Mine Drainage that went along with it!

Figure 8.11: Teresa Welte, Jaye DeVaughn and Shelby Angelo, members of Hopewell High School Conservation, Fishing and Hunting Club, pull tires and garbage out of Raccoon Creek in Independence Township on 5/27/2002. Photo by Tom Welte.

During the 1990s, efforts were made by staff of the USDA Soil Conservation Service (now NRCS) and the Beaver County Conservation District to establish a network of public access areas for paddlers and floaters to enjoy Raccoon

Creek. Talks with landowners resulted in handshake agreements to designate several places as canoe launches for an informal Raccoon Creek Canoe Trail. In the early 2000s the Raccoon Creek Watershed Association published a guide to the Raccoon Creek Canoe Trail listing the informal access points on 28 miles of the lower main stem of the creek from Witherspoon Road in Washington County to the Ohio River.

With the passage of time, many of the informal access points ceased to exist or became unusable due to changes in ownership, flood damage, roadway improvements, etc. Independence Conservancy's website maps the sites remaining from the informal agreements of the 1990s. (Please see Figure 8.12.) Of these sites, only the Raccoon Creek State Park Route 30 entrance has designated parking, signage, ready access to the water and regular upkeep by Park staff.

Recent years have seen innovations in lightweight, highly maneuverable personal watercraft such as kayaks and paddle boards. Kayaks, with their shallow draft, are particularly well-suited to the low summer flows of Raccoon Creek. Paddling has become a very popular sport in the Raccoon Creek Region as evidenced by the many stakeholders who expressed keen support for reviving the canoe trail and creating more and better access points.

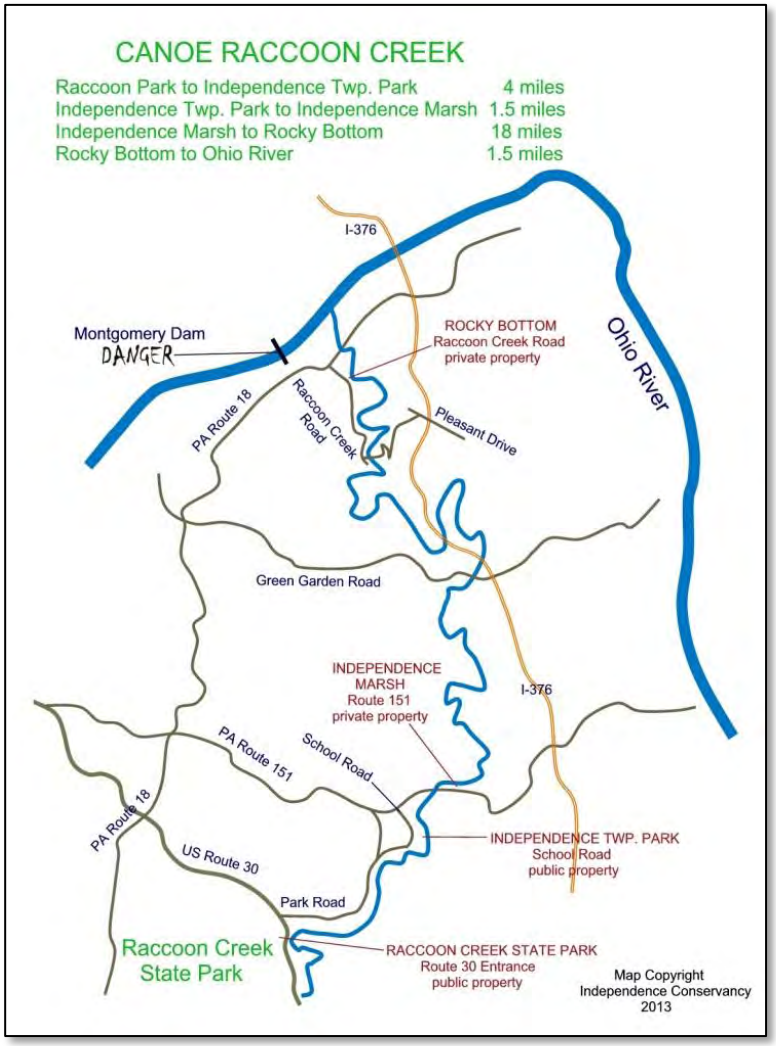


Figure 8.12: Canoe Raccoon Creek map from Raccoon Creek Watershed Association's website, copyright Independence Conservancy 2013.

Pennsylvania Water Trails

The Pennsylvania Water Trail Partnership has published a Guide to Developing Water Trails in PA. Water trails are defined by the Partnership as "…recreational and educational corridors between specific locations that can be used for both single day and multiple day trips. They are comprised of access points, boat launches, day use sites, and -- in some cases -- overnight camping areas." The Guide sets forth basic requirements for a

water trail:

- **A local managing organization** with active volunteers to maintain, manage and promote the trail.
- **State designation** by the PA Fish & Boat Commission (PFBC) as part of the statewide water trail system.
- **Free mapping and information** provided to users through print and the internet.
- **Signage** that can direct users, interpret local features, provide safety and orientation information.
- **Maintenance** of access points, signage, and up-to-date information.

Raccoon Creek Water Trail Considerations

Numerous factors complicate the formal establishment of a water trail on Raccoon Creek. While these issues are not insurmountable, addressing them is likely to be time consuming, logistically challenging and costly. A feasibility study could help to define and characterize the scope of work needed to establish a Raccoon Creek Water Trail. Among the factors to be considered are:

- **Private property**

For most of its length, Raccoon Creek flows through privately owned property. Raccoon Creek State Park and Wildflower Reserve are the only public lands with frontage on a floatable reach of the creek. Private landowners' rights, preferences and concerns must be understood and respected by those seeking to negotiate public access points and by users of the water trail.

- **Debris and downed trees**

In many places, the lower main stem of Raccoon Creek is choked with debris caught in downed trees, toppled by floodwaters from the severe storms of recent years. During key person interviews and public comments, several stakeholders mentioned the difficulty of portaging around debris and the need to remove it. In some cases, heavy equipment and specialized skills are needed to safely clear the obstacles.

Figure 8.13: Google Earth view of Raccoon Creek near Todd Road in Hopewell Township, Beaver County, showing downed trees and debris in the channel of Raccoon Creek. Accessed 12/14.

- **Land/easement acquisition expenses**

Establishing public access points on Raccoon Creek will involve the purchase of land or negotiation of easement agreements crafted for this specific purpose. The Pennsylvania Land Trust Association has created a Model Grant of Fishing & Boating Access Easement. This model can be used to craft agreements to secure

public access to waterways for fishing and boating while respecting the needs of the landowners providing the access. Some landowners may agree to donate easements; others may prefer to be compensated for entering into an access easement agreement. In either case, a fishing and boating access easement is a **voluntary agreement** between the riparian land owner and the land trust or unit of government holding the access easement. In some instances, it may prove more suitable for a conservation entity or a local government to purchase land to establish public access to Raccoon Creek, rather than enter into an easement agreement. This would be true of sites where amenities like primitive camping or comfort stations are planned.

- **Site maintenance expenses**

Built features require maintenance and upkeep, whether they are gravel parking areas, wooden sign kiosks, eco-friendly restrooms or boardwalks spanning wetlands. While costs and needs are as yet undetermined, on-going site maintenance responsibilities will fall upon the land owners, easement holders, water trail managing association, local governments or other responsible entities.

Raccoon Creek Water Trail Project Accomplishments (as of September, 2014)

A good start is underway for formalizing, improving and expanding the existing Raccoon Creek Canoe Trail. As covered in "Section 7: Achievements," the Ohio River Trail Council's first printing of its Ohio River Water Trail Map and Guide mentions Raccoon Creek as normally canoe-able from March through June with a sedate Class 1 rating. As the Raccoon Creek Water Trail develops, more information can be included in subsequent editions of this guide.

Independence Conservancy's Rocky Bottom Public Access Project has received a grant from the Beaver County Commissioners to initiate engineering and investigation of site conditions to prepare for design and permitting. Surveying and wetland determination were conducted in the summer and fall of 2014. When completed, the Rocky Bottom Public Access Area will serve as an anchor, a model – and perhaps a catalyst – for development of other access points on floatable reaches of Raccoon Creek.

Recommendations for Future Efforts

Because of the complexity and expense of establishing and managing a permanent, formal, PFBC-recognized Raccoon Creek Water Trail, it is highly recommended that a feasibility study be conducted. Such a study should:

- quantify current and potential users of the water trail; characterize their needs and wants
- locate potential access points and related amenities to expand the water trail
- gauge the interest of potential partners in managing and stewarding the water trail
- gauge public interest in voluntary hands-on upkeep of the trail
- identify potential funding sources for land/easement acquisition and long-term maintenance of trail facilities

Potential Partners and Funding Sources for the Raccoon Creek Water Trail

Planning, building and maintaining the Raccoon Creek Water Trail will require effective partnerships and collaborations among a variety of entities. Some suggestions are given below, but this is by no means an all-inclusive list. Interested parties, especially local industries and businesses, are strongly encouraged to lend support to the Raccoon Creek Water Trail as the project evolves.

- Ohio River Trail Council
- PA Department of Conservation and Natural Resources
- PA Fish & Boat Commission
- Pennsylvania Environmental Council
- Townships of Potter, Center, Hopewell, Independence, Raccoon, Hanover, Findlay, Smith and Robinson
- Independence Conservancy
- Conservation Districts in Beaver, Washington and Allegheny Counties
- Raccoon Creek Watershed Association
- Venture Outdoors
- Beaver County Rowing Association
- Board of Commissioners - Counties of Beaver and Washington
- Beaver County Department of Community and Economic Development - Greenways, Trails and Recreation Program (GTRP)
- Beaver County Department of Recreation and Tourism
- Washington County Department of Parks and Recreation
- National Park Service – Rivers, Trails and Conservation Assistance Program
- Pennsylvania Land Trust Association
- Foundation for Pennsylvania Watersheds

3. Land Conservation Initiatives

Many of the Priority Implementation Projects set forth in the Management Recommendations Section of the 20D Raccoon Creek Region Conservation Plan require long-term dedication of land to achieve various conservation and/or public recreation goals. For purposes of the 20D Plan, the ultimate goals of land conservation initiatives are…

- preserving ecological values
- preserving working landscapes (farms and forests)
- securing recreational opportunities
- preserving open space and scenic beauty
- preserving historic and cultural features

…all for future generations of residents and visitors to cherish and enjoy.

Land conservation can be accomplished by various means, either perpetual or temporary. Perpetual land preservation mechanisms such as fee simple acquisitions and perpetual conservation easements have a potentially indefinite duration, i.e., they are essentially permanent. Temporary mechanisms such as leases or 'term' conservation easements have a fixed duration. Upon their expiration they must be renegotiated.

Although they may be more costly to establish and maintain, perpetual mechanisms like land purchases and perpetual conservation easement agreements are recommended for practical reasons. Once farms, open spaces, natural places and forests are converted to residential, commercial, highway or other incompatible uses, the change is irreversible. Temporary mechanisms may be less costly but merely delay, and do not foreclose, the possibility of conversion and resulting loss of ecological, cultural, scenic or historic values.

"Section 3: Land Resources" contains an extensive discussion of land conservation methods including conservation easement agreements and purchase of land by a preservation entity. A wealth of information about land preservation and perpetual stewardship of conserved lands is available from the national Land Trust Alliance and the Pennsylvania Land Trust Association.

For purposes of the 20D Plan, the proposed Land Conservation Initiatives include three related avenues of work that will contribute significantly to implementing concepts presented in Washington County's 2007 Greenways Plan and Beaver County's 2010 Comprehensive Plan. These initiatives will serve as keys to achieving many of the overall goals of the Raccoon Creek Watershed Conservation Plan itself:

3.a. 20D Regional GreenWay Implementation

Washington County's Greenways Plan, adopted in January of 2007, suggests green corridors for Cross Creek, Aunt Clara Fork, King's Creek, Hillman State Park and the Route 22 vicinity. The Plan recommends establishment of a Raccoon Creek Valley Natural Area to protect the high-value biological diversity areas in the Raccoon Creek Floodplain. It also recommends creating the Cross Creek Natural Area to protect over 5,000 acres of agricultural easements, Cross Creek County Park and the Meadowcroft Rockshelter.

Beaver County's 2010 Comprehensive Plan prioritized resources and established conservation greenway corridors that the County should seek to protect. Among these corridors is the proposed Raccoon Creek GreenWay, mentioned many times throughout the 20D Raccoon Creek Region Conservation Plan.

For simplicity's sake, the 20D Plan will term all greenways (Ohio River, Mill Creek, Service Creek, Traverse/Little Traverse Creek, Aunt Clara Fork/King's Creek, Lower Raccoon Creek and Cross Creek) as the 20D Regional GreenWay.

The comprehensive plans of both Beaver and Washington Counties urge their municipalities to be well informed about conservation priorities as they consider new development proposals. Furthermore, the plans advocate support for conservation organizations that can help generate funds for important conservation projects like the 20D Regional GreenWay. Potential conservation partner organizations include – but are not limited to – land trusts, watershed organizations, sportsmen's groups, wildlife associations, trail groups, biking associations, conservation districts, local schools and colleges.

The 20D Regional GreenWay has a good foundation in lands already preserved at Raccoon Creek State Park and Wildflower Reserve, Beaver County Conservation District's Independence Marsh, Potter Township's Tank Farm, Independence Conservancy's Rocky Bottom Natural Area, Cross Creek County Park, Independence Township Community Park (both Washington and Beaver Counties) and many tracts of preserved farmland. Connecting these parcels and protecting adjoining riparian lands is a long-term process that will ultimately establish conserved green corridors throughout the Raccoon Creek Region.

As mentioned earlier, Raccoon Creek and its major tributaries flow through land that is, for the most part, privately owned by individuals and corporations. Some privately-owned riparian tracts are quite large, containing many acres of relatively undisturbed woodlands, wetlands and exceptional/high-value Biological Diversity Areas. Efforts by local governments and conservation entities to preserve these parcels through easement agreements or purchases must be conducted with utmost respect for, and sensitivity to, the intentions of landowners for their properties.

Figure 8.14: Little Blue Mitigation Wetland on Red Dog Road in Greene Township, protected by a conservation easement agreement between FirstEnergy and Independence Conservancy. Photo 6/20/2012.

It should be recognized that many places within the 20D Regional GreenWay are not suitable for public access because of landowner privacy concerns, difficult terrain, inaccessibility for emergency responders, fragile soils, the need to protect habitat of rare plants or animals, or industrial safety concerns.

It is recommended that, as groups work together to establish and expand the 20D Regional GreenWay, they first and foremost seek to connect and protect riparian lands for the benefit of

natural habitat, green infrastructure, scenic views and rural character. Public access to conserved lands should only be sought where it is appropriate, manageable, affordable, and in harmony with the goals of landowners who have - and who will - enter into voluntary conservation easement agreements, sales or donations to land trusts, watershed organizations or local governments.

3.b. Farmland Conservation Partnership

The Raccoon Creek Region has many tracts of scenic and productive farmland, not a few of which have been worked by generations of families. Preserving our Region's farmland assures that fertile soils, rural character and farming traditions are passed on for the future.

Opportunities exist for public and private land conservation organizations to work together on projects where their priorities overlap. Pennsylvania's Agricultural Lands Preservation Program provides a mechanism whereby a private land trust may "pre-acquire" an agricultural conservation easement on a farm which meets State and/or County Minimum Criteria and has been ranked by the County Ag Land Preservation Board (CALP) with the Land Evaluation and Site Assessment (LESA) system. By following a series of detailed and legally-defined steps, the land trust negotiates and acquires a voluntary agricultural conservation easement agreement with the farmer, then assigns the easement to the Commonwealth and/or the CALP for permanent stewardship.

Pre-acquisition by a private land trust enables a CALP to conserve farmland which, because of steep topography, partial location in a floodplain or other limitations, may never rank high enough in the LESA system to be preserved through the CALP's conventional procedures. Partnership with a CALP enables a private land trust to preserve lands it may deem ecologically valuable, not only from a farming standpoint, but also to protect riparian buffers, wetlands, forests, important biodiversity areas and rural character. The farmer can be assured that his/her land will be perpetually protected from conversion to non-agricultural uses.

In Pennsylvania's Lehigh and Westmoreland Counties, land trusts have partnered with County Ag Land Preservation Boards to preserve and protect agricultural lands. Preliminary discussions have taken place between Beaver County's Ag Land Preservation Board and Independence Conservancy relative to a potential partnership similar to that between Western PA Conservancy and Westmoreland County's Ag Land Preservation Board.

It is recommended that Beaver County's Ag Land Preservation Board and Independence Conservancy continue to work toward establishing a formal framework through which they can help farmers preserve farms that consistently rank lower on the Land Evaluation and Site Assessment (LESA) system. Also, it is recommended that the County Agricultural Land Preservation Boards in Washington and Allegheny Counties consider cooperating with private

land trusts in their service areas to establish procedures by which more farmlands could be preserved through pre-acquisition by a private land trust.

Private land trusts have the ability to seek funding from a variety of public and private sources to purchase agricultural easements, known also as development rights. However, such purchases can be quite expensive, ranging upwards from $2,000 per acre, depending on results of the Land Evaluation and Site Assessment performed for the farm to be conserved. It is recommended that, as new industries develop in the Raccoon Creek Region, they reinvest a portion of their profits in the social and environmental fabric of the area by contributing to farmland preservation efforts of local land trusts.

Figure 8.15: Red Oak Farm in Raccoon Township is protected by a conservation easement agreement between the McConnell Family and Independence Conservancy. Photo 12/28/2006.

3.c. Exceptional and High-Value Biological Diversity Area Preservation

Understanding where high priority resources exist can help local governments, planners and developers make choices about where growth should be limited and conservation encouraged. Exceptional and High-Value Biological Diversity Areas are worthy of preservation because they are particularly sensitive to development and disturbance. Once lost, their natural values are irreplaceable.

Western Pennsylvania Conservancy designates a natural area as a Biological Diversity Area (BDA) if it meets one of three criteria: 1) it provides habitat for a species of special concern (e.g. a threatened or endangered plant or animal); 2) it comprises an area supporting a high diversity of plant and/or animal species; or 3) it provides the best example of a particular type of natural community (e.g. wetlands, grasslands or forest lands).
The 20D Raccoon Creek Region includes several exceptional and high-quality BDAs. These are discussed individually in detail in "Section 5: Biological Resources" and mapped in "Plate 5.3: Natural Heritage Inventory." Pennsylvania's Natural Heritage Inventory, an online ecological database, classifies the following places as BDAs of Exceptional Significance:

- Lower Aunt Clara Fork watershed near the West Virginia state line Hanover Township, Washington County;
- Raccoon Creek Floodplain and Floodplain Forest at the intersection of the Beaver, Allegheny and Washington County lines, and
- Ohioview Peninsula, Georgetown Island and Phillis Island, all in the Ohio River.

The Natural Heritage Inventory lists the following places in the Raccoon Creek Region as BDAs of High Significance:

- Cross Creek Valley in Jefferson and Cross Creek Townships;
- Imperial Mine Grasslands (Findlay Grasslands) in Findlay Township;
- Clinton Wetlands in Findlay Township;
- School Road Slopes in Independence Township, Beaver County;
- Lower Raccoon Creek Valley and Ohio River Slopes in the Townships of Raccoon, Center, Potter and Greene; and the Boroughs of Shippingport and Georgetown.

Of the above named Exceptional and High-Value BDAs, those located in Beaver County are already designated for protection within the Raccoon Creek GreenWay or Ohio River GreenWay as detailed in Beaver County's 2010 Comprehensive Plan.

In Washington County's 2007 Greenways Plan, the Raccoon Creek Floodplain and Floodplain Forest BDAs are recommended for low-impact land use; large-scale public infrastructure projects are discouraged. The Plan proposes the adoption of conservation ordinances to protect ecological values and viewsheds in Exceptional and High-Value BDAs. The Plan suggests western Cross Creek Watershed a tourist hub because of its mix of historic, natural and recreational attractions, particularly the Meadowcroft Rockshelter and Historic Village. Cross Creek Watershed Association's 2003 Watershed Restoration and Protection Plan recommends

continuing improvements in riparian buffers and encourages agricultural Best Management Practices for the Cross Creek Valley BDA.

To streamline watershed-based restoration initiatives, it is recommended that future planning efforts in Beaver, Allegheny and Washington Counties be coordinated across county lines to extend greenways along stream corridors and connect important BDAs throughout the Raccoon Creek Region.

Successful conservation of Biological Diversity Areas will be the result of voluntary choices made by landowners exercising their right to determine the use of their land. Most property parcels within the High-Value and Exceptional BDAs are privately owned. Considerations for selecting and protecting lands within these areas should be similar to those outlined earlier in Section 8's discussion of establishing the Raccoon Creek Water Trail and implementing the 20D Regional GreenWay. Efforts by local governments and conservation entities to preserve lands in the various BDAs must be conducted with utmost respect for, and sensitivity to, the intentions and concerns of landowners for their properties.

Again, it is recommended that preserved places within the High and Exceptional Value BDAs be managed for low-impact public access to protect fragile areas and sensitive wildlife and plant populations. And – in some cases – it may be wise, from a conservation standpoint, to have very little or no public access to specific areas. In the case of a particularly fragile habitat or ecosystem, a public access could thwart the very conservation objectives an organization is seeking to achieve.

We have been too efficient at destruction; we have left our souls too little space to breathe in. Every green natural place we save saves a fragment of our sanity and gives us a little more hope that we have a future."

- Wallace Stegner, American historian, novelist and environmentalist, 1991

Figure 8.16: Raccoon Creek flows through the Wildflower Reserve, 4/24/2006.

Publicly-Suggested Implementation Projects

Throughout the course of developing the 20D Raccoon Creek Watershed Conservation Plan, people were asked to share their ideas for improving quality of life or addressing situations of concern in the Raccoon Creek Region. Table 8.1 lists various projects proposed through answers to Citizen Surveys, Key Person Interviews and discussions by the project Steering Committee. Following each project is a list of general category goals the suggested project may address.

Table 8.1: Publicly-Suggested Implementation Projects

	Goals addressed			
Publicly-Suggested Implementation Projects	**Land**	**Water**	**Biological**	**Cultural**
Conduct training sessions for local elected officials, planning commissions and housing developers on conservation development.	•	•	•	•
Conduct training sessions for local elected officials, planning commissions and housing developers on porous pavement, bio-swales, wetlands and natural storm water infiltration techniques.	•	•	•	
Conduct training sessions for municipal road department staff to learn natural stream channel stabilization techniques.	•	•	•	
Conduct bus tours to notable places showcasing historic, cultural and natural features of the Region.			•	•
Develop a smartphone-friendly, web-based guided to notable places showcasing historic, cultural and natural features of the Region.				•
Develop and publish a guide to privately-owned properties where public access to Raccoon Creek is welcomed.				•
Hold 5k/10k races throughout the Region to build awareness and involvement among younger people about specific issues, challenges and opportunities facing the watershed.	•	•	•	•
Inventory and publish a guide to war memorials and monuments in the watershed.				•
Inventory and publish a guide to roadside farm-stands and agri-businesses in the watershed.	•			•
Seek public nominations for places throughout the Region worthy of historical markers.				•
Publish and sell a Raccoon Creek Region Map as a fundraiser for stewardship efforts.	•	•	•	•
Design and install “Welcome to the Greater Raccoon Creek Region” signage on major roadways at watershed boundaries.				•
Perform a comprehensive Abandoned Mine Land inventory/update for the 20D Region.	•	•	•	

Publicly-Suggested Implementation Projects (continued)	Goals addressed			
	Land	Water	Biological	Cultural
Develop and promote an inventory of small towns and villages with available in-fill building lots for new housing.	•			•
Develop alternate transportation routes including bike lanes concurrent with highway improvement projects.	•			•
Re-activate rail lines for public transit.	•			•
Implement recommendations of Washington, Beaver and Allegheny County's greenways/open space plans.	•	•	•	•
Develop greenways plans across county and state lines.	•	•	•	•
Identify and repair eroded areas of various streambank stabilization projects on Raredon Run and Raccoon Creek.	•	•	•	
Design and build passive recreation enhancements at Potter Township's Tank Farm and Independence Conservancy's Rocky Bottom.	•			•
Renovate and expand the Hamilton AMD Treatment System in Findlay Township.	•	•	•	
Remove downed trees and other in-stream debris to make Raccoon Creek safer and more attractive for paddlers.		•	•	•
Conduct video surveillance leading to prosecution of crimes in remote areas such as off-road vehicle trespassing, vandalism and theft.	•	•	•	•
Recruit volunteer walking/hiking teams to monitor environmentally sensitive areas for damage or illegal activity.	•	•	•	•
Maintain and upgrade infrastructure at Raccoon Creek State Park and Hillman State Park.				•
Restore and maintain National Register designated historic structures in Raccoon Creek State Park.				•
Develop a master plan for improvements and upgrades to Hillman State Park.				•

Attachments

Public Meeting Minutes

20D Raccoon Creek Region Conservation Plan Public Meeting Minutes

July 23, 2013
Cross Creek Township Municipal Building

In attendance: Gary Stokum, Vicky Michaels, Jennifer Dann, Al Moran, Rachel Warner Blosser, John Stritzinger, Frank Mancini Jr., Kevin Kisow, Michael Harcher.

Vicky opened the meeting by introducing what a Rivers Conservation Plan (RCP) is, what a watershed is, and why we are developing this plan for the area.

Regions were highlighted (4 focus areas) and the reason for the meeting locations and study areas were reviewed.

After the introduction, the citizen and municipal surveys were passed around and some people began to fill them out.

At this point Gary Stokum reviewed each of the maps that were presented on the tables. The features and purpose of each map was discussed and attendees were asked to comment if they saw any missing information or inaccurate information.

After a review of the maps the floor was open for discussion. The question was raised about whether or not federal money is available to complete projects within the watershed. It was mentioned that funding for the RCP was through DCNR but that federal grants can be obtained for projects, though applications are more robust with an RCP for support.

It was also asked who had created the maps, and was noted as Shaun Busler at BioMost, Inc.

Frank Mancini, Jr., Director of Beaver County's Planning Commission, commended the steering committee for their work on the RCP and remarked that the maps created so far are very well done and most interesting.

At this point in the meeting the 'dot exercise' was conducted with each attendee placing two colored dots on the top two "Water quality issues of concern" and "Important features/activities in the watershed"

The totals were as follows:

Important Features/Activities:

Attractive Natural Settings – 3
Preserving Historical Sites – 1
Preserving Open/Green Space – 2
Recreational Opportunities – 1
Water Quality Improvement – 2
New Businesses/New Jobs - 0
Resource Extraction Industries – 0
Community Service/Volunteering – 0
New Residential Development - 0
Outdoor Learning Opportunities - 0
Redeveloping Brownfields – 2
Adequate Infrastructure - 1

Water Quality Issues:

Abandoned Mine Drainage – 3
Urban/Road Runoff – 0
Sewage – 1
Invasive Species – 0
Storm Water/Flooding – 1
Agricultural Runoff – 0
Land Development – 2
Industrial Discharges - 0
Illegal Dumping/Litter – 2
Resource Extraction Industries – 3

At this point discussion was held on each of the topics, some thoughts included:

- What are farm easements
- What are invasive species
- Discussion on what recreational opportunities (kayaking, bike trails, etc)
- Discussion on definition of historical sites
- Water quality issues of Raccoon Creek (AMD/orange water)
- Discussion on the resource extraction industries

With that the meeting was concluded, finished surveys were collected and tree seedlings were distributed to the attendees.

20D Raccoon Creek Region Conservation Plan Public Meeting Minutes

July 25, 2013
Raccoon Township Municipal Building

In attendance: Gary Stokum, Vicky Michaels, Marty Warchol, Al Moran, Lexa Taylor, Kevin Kisow, Michael Harcher, Nevin Welte, Tom and Alice Allison and four other people.

Vicky opened the meeting by introducing what a Rivers Conservation Plan (RCP) is, what a watershed is, and why we are developing this plan for the area.

Regions were highlighted (4 focus areas) and the reason for the meeting locations and study areas were reviewed.

After the introduction, the citizen and municipal surveys were passed around and some people began to fill them out.

Because the group at Raccoon Township was larger than at Cross Creek, Gary invited the attendees to come forward and view the several maps displayed on the tables. Gary, Vicky and Marty spoke with small groups of people to explain key features of the maps. There was a lively exchange of information, suggestions, questions and ideas. Several people recounted stories of how conditions have changed over the years, especially how the creek no longer runs orange with mine drainage (at least, downstream in Beaver County!)

At this point in the meeting the 'dot exercise' was conducted with each attendee placing two colored dots on the top two "Water quality issues of concern" and "Important features/activities in the watershed"
The totals were as follows:

Important Features/Activities:

- Attractive Natural Settings – 2
- Preserving Historical Sites – 1
- Preserving Open/Green Space – 3
- Recreational Opportunities – 3
- Water Quality Improvement – 4
- New Businesses/New Jobs - 0
- Resource Extraction Industries – 2
- Community Service/Volunteering – 1
- New Residential Development - 0
- Outdoor Learning Opportunities - 1
- Redeveloping Brownfields – 1
- Adequate Infrastructure - 0

Water Quality Issues:
Abandoned Mine Drainage – 3
Urban/Road Runoff – 0
Sewage – 0
Invasive Species – 4
Storm Water/Flooding – 0
Agricultural Runoff – 1
Land Development – 3
Industrial Discharges - 0
Illegal Dumping/Litter – 1
Resource Extraction Industries – 6

Gary reviewed the results of the dot exercise, noting these highlights:

- People are very concerned about the Marcellus Shale industry's long-term impacts on their region in an open-minded and thoughtful way.
- The 'green and quiet' aspect of the region is highly valued, as is the beautiful scenery and rural character; people do not want this spoiled by development.
- More people volunteered in the past; young people need to serve their communities today.
- Water quality issues of Raccoon Creek (AMD/orange water)
- New and historic resource extraction industries have had and will have a tremendous impact on the region.
- Vicky may have unintentionally skewed the results of the dot exercise by mentioning stink bugs as an invasive species example.

With that the meeting was concluded, finished surveys were collected and refreshments were distributed to the attendees. Some people took home additional surveys for friends and family. Vicky announced the third public meeting at Pepsi Roadhouse on July 30th at 7 PM.

20D Raccoon Creek Region Conservation Plan Public Meeting Minutes

July 30, 2013
Pepsi Roadhouse, Hanover Township, Washington County

In attendance: Gary Stokum, Vicky Michaels, Marty Warchol, Lisa Cessna, John Davidson, Barb Davidson, Kevin Kisow, Michael Harcher, Rita Tully, Vince Bologna, Mr. Campbell.

Vicky opened the meeting by introducing what a Rivers Conservation Plan (RCP) is, what a watershed is, and why we are developing this plan for the area.

Regions were highlighted (4 focus areas) and the reason for the meeting locations and study areas were reviewed.

After the introduction, the citizen surveys were distributed and some people began to fill them out.

Gary and Vicky explained the features of the various maps displayed throughout the room, and invited the attendees to walk around and view them on the tables. Gary, Vicky and Marty spoke with small groups of people to explain key features of the maps.

Mr. Campbell, a local farmer, had many questions and concerns about the Marcellus Shale gas industry and its effects on people and the land itself.

At this point in the meeting the 'dot exercise' was conducted with each attendee placing two colored dots on the top two "Water quality issues of concern" and "Important features/activities in the watershed"
The totals were as follows:

Important Features/Activities:

- Attractive Natural Settings – 2
- Preserving Historical Sites – 1
- Preserving Open/Green Space – 3
- Recreational Opportunities – 0
- Water Quality Improvement – 3
- New Businesses/New Jobs - 1
- Resource Extraction Industries – 5
- Community Service/Volunteering – 0
- New Residential Development - 2
- Outdoor Learning Opportunities - 0
- Redeveloping Brownfields – 2
- Adequate Infrastructure - 0

Water Quality Issues:
Abandoned Mine Drainage – 5
Urban/Road Runoff – 0
Sewage – 0
Invasive Species – 1
Storm Water/Flooding – 2
Agricultural Runoff – 0
Land Development – 4
Industrial Discharges - 0
Illegal Dumping/Litter – 1
Resource Extraction Industries – 6

Gary and Vicky placed the results of the dot exercises from all three public meetings together and compared the results, noting these highlights:

- People seem to be more concerned about the Marcellus Shale industry's long-term impacts in the downstream/northern reaches of the watershed than they are in the southern/headwaters region where the industry is already well-underway.
- The 'green and quiet' aspect of the region is highly valued in all focus areas of the watershed, as is the beautiful scenery, rural character and recreational potential; people do not want this spoiled by development or pollution.
- Abandoned mine drainage is a greater concern in the headwaters (historic mined areas of the Pittsburgh Coal Seam) than farther downstream.
- Historic resource extraction industries have had a tremendous impact on the region; new resource extraction industries will bring changes we cannot even imagine at this time.

With that the meeting was concluded, finished surveys were collected and refreshments were distributed to the attendees. Vicky urged participants to share the citizen surveys with friends, neighbors and family.

20D Raccoon Creek Region Conservation Plan Public Meeting Minutes

June 11, 2014
Cross Creek Township Municipal Building

In attendance: Gary Stokum, Vicky Michaels, Al Moran, Rich Dahlgren, Mike and Lee Falcione, Michael Harcher.

Due to a severe, violent thunderstorm with tornado warnings, meeting attendance was very light. Gary opened the meeting by thanking people for braving such a downpour to come to a meeting! He recapped what a Rivers Conservation Plan (RCP) is, what a watershed is, and why we are developing this plan for the 20 Raccoon Creek Region which includes Cross Creek.

Twenty-seven full-color, large format maps were on display throughout the room. These maps were the various plates created to illustrate the text of each section in the 20D Plan. Everyone was given a copy of the "mini-plan" and invited to offer their comments about the content.

Because so few people were at the meeting, it was possible to have a pleasant, informal group discussion. Conversation centered mainly on hopes for the shale gas industry to bring positive changes to our region. Concern was expressed that we do not make mistakes that will burden future generations in more challenging ways than we are burdened now by effects of unregulated coal mining of decades ago.

Refreshments were shared with the attendees. Vicky urged participants to share the mini-plans with friends, neighbors and family – and to forward comments and concerns to her. The meeting was concluded with wishes for safe travel home.

20D Raccoon Creek Region Conservation Plan Public Meeting Minutes

June 16, 2014
Raccoon Township Municipal Building

In attendance: Gary Stokum, Vicky Michaels, Shaun Busler, Marty Warchol, Michael Harcher, Bill Lawrence, Kevin Gurchak, Shannon Debes, John and Barb Davidson, Andy and Donna Harcher, Joe Petrella, Peg Schweinsberg, Greg and Cindy Kalamasz, Pam Petrella, and a landowner from Raccoon Township (our sincere apologies for not getting your name).

Yet another bout of severe weather caused a power outage in the vicinity of the municipal building, but the meeting was successfully held with power supplied by a generator. The meeting began with a welcome by Gary Stokum who expressed the Steering Committee's pleasure at seeing so many participants in attendance - including representatives of local businesses, the energy industry, commerce, transportation, government, agriculture, recreation, land preservation and watershed conservation.

Vicky distributed 20D Raccoon Creek Region mini-plans to the attendees. After reviewing the purpose of a Rivers Conservation Plan and the process involved in its development, she highlighted the mini-plan's content and invited questions and comments from the group. Discussion was conducted on various topics:

- The need for bicycle lanes along our road shoulders – those who wish to bicycle any distance must leave Beaver County in an automobile to do so
- The need for debris and downed trees to be removed from some sections of Raccoon Creek to make it friendlier to paddlers
- Concern for potential harm to the recovering ecosystem of the Ohio River by construction of a proposed hydroelectric plant at Montgomery Dam
- Challenges to obtaining public comment and input from municipal officials
- Questions about availability of the finished plan – it will be hosted on Independence Conservancy's website; a bound copy will be given to each municipality and to the county planning commissions
- Praise for the efforts of everyone who contributed to the mapping and educational content of the 20D Plan - and the amount of thought that goes into creating a useful plan that covers the entire region to the state line, not just Raccoon Creek itself.

Vicky thanked the attendees for a productive meeting, and urged them to forward comments about the mini-plan to her. She also thanked Pam Petrella and Janice Mikoloski, Raccoon Township's Tax Collector and Secretary, respectively, for adjusting the room to accommodate our meeting after a scheduling mix-up with the conference room.

The meeting was concluded with refreshments and social time.

Steering Committee Meeting Attendance

	Steering Committee Meeting Date																
Name	11/15/2012	1/10/2013	2/13/2013	4/11/2013	5/16/2013	6/13/2013	7/17/2013	8/24/2013	10/10/2013	11/14/2013	12/12/2013	1/9/2014	2/13/2014	3/13/2014	4/10/2014	5/8/2014	
Melissa Brewer	x	x		x	x			x									**Steering Committee Members**
Shaun Busler	x	x	x	x	x	x	x							x		x	
Lisa Cessna	x				x												
Wayne Cumer		x		x											x	x	
Jennifer Dann	x		x	x		x		x		x				x			
Jeffrey Donahue	x	x		x	x												
Sandie Egley		x															
Nicholas Gerek																	
Jeremy Matinko	x			x	x				x	x						x	
Rebecca Matsco	x	x	x		x	x	x	x	x			x		x			
Janet Meyers	x	x															
Vicky Michaels	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Shane Miller	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Daniel Reitz		x															
Laura Rusmisel													x				
Doniele Russell	x											x					
Bruce Snyder			x			x		x				x					
Gary Stokum	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	
Marty Warchol		x	x	x	x		x	x		x	x	x	x		x	x	
Shannon Debes														x		x	**Guests**
Sara Dippold																x	
Margaret Dunn					x												
Beth Kahkohen						x											
Kevin Kisow																x	
Al Moran				x	x	x	x	x	x	x	x	x			x	x	
Lisa Segedy											x						

Metadata Summary

The Washington County Conservation District received grants in 2012 from the PA Department of Conservation and Natural Resources and the Foundation for Pennsylvania Watersheds to develop the 20D Raccoon Creek Region Conservation Plan. The purpose of the plan is to provide the general public, municipalities, watershed community, and government agencies with a concise, easily read and used, repository of the natural, historical, cultural, and recreational resources while emphasizing opportunities for stewardship and economic growth within the watershed. To complete the plan, a comprehensive GIS analysis was conducted using primarily existing datasets. Organizations that contributed data to the plan include:

Contributing Organization	Abbreviation
Beaver County Planning Commission	BCPC
Environmental Resources Research Institute (Penn State University)	ERRI
Environmental Systems Research Institute	ESRI
Keep Pennsylvania Beautiful	KPB
National Audubon Society	NAS
Natural Resources Conservation Service	NRCS
PA Department of Conservation & Natural Resources	PADCNR
PA Department of Environmental Protection	PADEP
Pennsylvania Department of Transportation	PennDOT
Pennsylvania Fish and Boat Commission	PAFBC
Pennsylvania Game Commission	PGC
Pennsylvania Historical and Museum Commission	PHMC
Southwestern Pennsylvania Commission	SPC
Stream Restoration Incorporated	SRI
US Army Corps of Engineers	USACE
US Census Bureau	USCB
US Environmental Protection Agency	USEPA
US Fish and Wildlife Service	USFWS
US Geologic Survey	USGS
Washington County Planning Commission	WCPC
Western Pennsylvania Conservancy	WPC

All layers utilized for this report are included in the Layer Summary Table and are included within an ArcGIS File Geodatabase included within the CD of the plan and on PASDA. Most datasets were downloaded from Pennsylvania Spatial Data Access (PASDA) or sent by the responsible organization for use within the plan. Full metadata is available for each dataset as part of the ArcGIS File Geodatabase.

ArcGIS 10.1 was used to geoprocess the layers to clip, buffer, merge, and dissolve to the 20D Raccoon Creek Region boundary. Other types of analysis included spatial queries, joins, etc.

Some layers were updated to include the most current information within the attribute tables. A few layers also contain additional digitized data to improve upon the coverage within the watershed. All layers were reprojected to the following (unless otherwise noted within the metadata contained in the accompanying ArcGIS metadata):

Projection of Layers:

Projection Name: NAD_1983_StatePlane_Pennsylvania_South_FIPS_3702_Feet
EPSG Code: 102729

Horizontal Coordinate System Definition:
- *Map Projection:* Lambert Conformal Conic
  - *Standard Parallel:* 39.933333
  - *Standard Parallel:* 40.966667
  - *Longitude of Central Meridian:* -77.750000
  - *Latitude of Projection Origin:* 39.333333
  - *False Easting:* 1968500.000000
  - *False Northing:* 0.000000
  - *Planar Distance Units:* survey feet
- *Geodetic Model:*
  - *Horizontal Datum Name:* North American Datum of 1983
  - *Ellipsoid Name:* Geodetic Reference System 80
  - *Semi-major Axis:* 6378137.000000
  - *Denominator of Flattening Ratio:* 298.257222

For more information, please contact:

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Layer Summary Tables

Biological Resources

File Name	Source	Publish Date
IBAcore_20D	NAS	10/2009
NaturalHeritageInventory_20D	WPC	01/2005
PGC_WMU_20D	PGC	2013

Cultural Resources

File Name	Source	Publish Date
BicyclePA_20D	PADCNR	10/2009
Covered_Bridges_20D	BMI	12/2014
ExplorePATrails_20D	PADCNR	10/2009
FBC_Access_20D	PAFBC	2007
FBC_Approved_Trout_20D	PAFBC	2007
FBC_ClassA_Streams_20D	PAFBC	2006
FBC_FishingHotspots_20D	PAFBC	2007
FBC_Hatcheries_20D	PAFBC	2007
FBC_Natural_Trout_20D	PAFBC	2009
FBC_Properties_20D	PAFBC	09/2008
Golf_Courses_20D	SPC	07/2013
Historical_Resource_Points_20D	PHMC	05/2014
Hookstown_Fairgrounds	BMI	12/2014
Independence_Conservancy_property	BMI	12/2014
Industrial_Parks_20D	SPC	07/2013
LocalParks_20D	DCNR	04/2013
paddle_access_20D	BMI	12/2014
PHMC_markers_20D	PHMC	05/2014
Sportsmen_Clubs_20D	BMI	12/2014
StateGameLands_20D	PGC	02/2006
StateParks_20D	DCNR	09/2011

Land Resources

File Name	Source	Publish Date
Ag_Easements_20D	BCPC, WCPC	05/2013
AML_points_20D	PADEP	04/2013
AML_polys_20D	PADEP	04/2013
AM_sites_20D	PADEP	04/2013
ASA_20D	BCPC, WCPC	05/2013
bedrock_20D	PADCNR	01/2001
Coal_Permits_20D	PADEP	12/2012
ConservationWell_20D	PADEP	11/2011
gsmsoil_20D	NRCS	04/2006
HistoricOilGasWells_20D	PADEP	01/2013
KPB_IllegalDumpSurvey_20D	KPB	07/2011
Land_Use_20D	SPC	07/2013
LandRecyclingCleanup_20D	PADEP	07/2006
MunicipalWasteOperations_20D	PADEP	07/2006
OilGas_ConvUnconv_20D	PADEP	06/2013
ResidualWasteOperations_20D	PADEP	07/2006
soil_building_20D	NRCS	02/2008
soil_darainageclass_20D	NRCS	02/2008
soil_erosion_20D	NRCS	02/2008
soil_farmlandclass_20D	NRCS	02/2008
soil_hydric_20D	NRCS	02/2008
soil_pH_20D	NRCS	02/2008
WMPMarcellusShale_20D	PADEP	04/2013

Project Area

File Name	Source	Publish Date
airports_10miles	ESRI	03/2012
community_20D	USGS	05/1981
county_bndy	PENNDOT	01/2012
historic_topo_bndy	BMI	12/2014
inactive_railroads_20D	ERRI	01/1996
local_roads_20D	PENNDOT	02/2012
mask_20D	BMI	12/2014
municipal_bndys_20D	PENNDOT	01/2010
municipal_bndys_PA	PENNDOT	01/2010
municipal_bndys_PA_lines	PENNDOT	01/2010
municipal_bndys_WV_OH	USCB	01/2012
municipal_bndys_WV_OH_lines	USCB	01/2012
PA_Congressional_Districts	PENNDOT	02/2014
pa_counties	PENNDOT	01/2012
pa_house_districts_20D	PENNDOT	02/2014
pa_major_cities	USGS	05/1981
PA_senate_districts	PENNDOT	02/2014
railroads_20D	ESRI	03/2012
roads_WV_OH_all	USCB	01/2012
school_districts_20D	PENNDOT	02/2013
sewer	SPC	07/2013
state_roads_all_20D	PENNDOT	01/2012
state_roads_PA	PENNDOT	01/2012
state_roads_WV_OH	USCB	01/2012
states_PA_WV_OH	USCB	01/2012
usa	ESRI	10/2008

Water Resources

File Name	Source	Publish Date
dams_20D	USACE	01/2011
Datashed_PTS_20D	SRI	05/2014
designateduse_20D	PADEP	08/2013
designateduse_shed_20D	PADEP	08/2013
Floodplain_20D	SPC	2008
Harmon_Creek_shed	ERRI	05/1997
HistoricStreams2004_20D	PADEP	01/2004
huc4_pa	USGS	2012
HUC8_PA	USGS	2012
lake_erie	USGS	2012
NHDarea_20D	USGS	2012
NHDstreams_20D	USGS	2012
NHDwaterbody_20D	USGS	2012
Non_Attaining_Streams_20D	PADEP	2012
NWIS_St_20D	USGS	05/2014
Ohio_River_locks	USACE	01/2011
pa_state_water_plan	ERRI	1998
raccoon_shed	ERRI	05/1997
subwatershed_20D	ERRI	05/1997
USGS_gaging_station	USGS	04/2006
WaterResources_20D	PADEP	04/2014
watershed_20D	ERRI	05/1997
Wetlands_20D	ERRI	05/1997

Other

File Name	Source	Publish Date
hillshade_20D	USGS	01/2013
landcover_20D	USGS	02/2011
landcover_change_20D	USGS	02/2011

20D Raccoon Creek Region Conservation Plan electronic files