Beaverdam Run

Coldwater Conservation and Watershed Management Plan

2013

Acknowledgements

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The Stonycreek-Conemaugh River Improvement Project SCRIP

Cover photo: Beaverdam Run

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Executive Summary

In 2012, the Coldwater Heritage Partnership, which supports the evaluation, conservation and protection of Pennsylvania's coldwater streams, awarded the Conemaugh Valley Conservancy (CVC) a Coldwater Conservation grant for Beaverdam Run in the Shade Creek Watershed, Somerset County, Pennsylvania. CVC used this grant and matching funds to acquire present-day data from Beaverdam Run and its tributaries. Beaverdam Run is a 6.2-mile stream that originates along the Allegheny Front. The upper portion of Beaverdam Run is classified as a High-Quality Coldwater Fishery, while the lower portion is a Coldwater Fishery.

In the 1990s, the upper portion of Beaverdam Run was deemed a Class A Wild Trout Water by the Pennsylvania Fish and Boat Commission (PFBC). Wild brook and brown trout were found in abundance; however, a drop in trout biomass in the late 1990s and early 2000s, prompted the PFBC to lower this section of Beaverdam Run to a Class B stream in July 2006. Since it had been eight years since the last fish surveys, CVC wanted to investigate the current condition of Beaverdam Run and opportunities for protecting and enhancing this special watershed.

Fish surveys completed in 2012 by the CVC, in partnership with the California University of Pennsylvania, and PFBC indicate a healthy fish population in the upper section of Beaverdam Run with acid deposition and fishing pressure degrading the middle and lower stream reaches.

CVC believes that in the 1990s, the alkalinity generated by a private landowner who added limestone to his pond was enough to bolster the wild brown trout population, which out-competed the wild brook trout. When the landowner stopped liming his pond, naturally acidic conditions caused by the geology of the region and acid deposition lowered alkalinity concentrations. Brook trout survive better than brown trout in more acidic environments, so there was a decline in brown trout populations and an increase in brook trout populations. Both brook and brown trout populations are cyclic; when conditions favors one species that species' population will increase until the carrying capacity of the stream is reached. Then, a decline in population will be seen until life requirements are such that the population will start to increase again. This natural fluctuation is limited in Beaverdam Run and its tributaries by episodic acidic events.

CVC believes applications of an alkaline-generating material in select locations will "sweeten the water" enough to enhance this fishery. A limestone application in Berkebile Run, the largest tributary to Beaverdam Run, by the Shade Creek Watershed Association proves this treatment method can work. Berkebile Run now supports a Class C wild brook trout population below the limestone dose. This fishery could be extended with alkaline additions in its headwaters and other fisheries in the watershed improved.

Figure 1. A true blue crayfish (Cambarus monongalensis), a rare find as it is a burrower, most active at night, and at the very edge of its range in the Beaverdam Run Watershed.

Introduction

About the Conemaugh Valley Conservancy, Inc.

The Conemaugh Valley Conservancy, Inc. (CVC) was formed in 1994 to conserve, preserve, and restore the cultural, historic, and natural resources within the Conemaugh River Basin by promoting environmental stewardship and low-impact recreation. CVC is a membership-based organization that has a board of 15 volunteers who oversee its operations. The board meets the second Monday of even months at 7:00 PM at the Hebron Lutheran Church in Blairsville.

The Kiski-Conemaugh Stream Team is an award-winning program of CVC that manages two water monitoring programs, provides environmental education, particularly through Trout in the Classroom projects, conducts special projects, and offers technical assistance to conservation groups.

Learn more at www.conemaughvalleyconservancy.org.

About the Shade Creek Watershed Association

The Shade Creek Watershed Association, referred to as SCWA (pronounced “Squaw”) by its members, is an all-volunteer non-profit organization founded in 1999 to protect and restore water and fish habitat of the Shade Creek Watershed. Its primary focus is water monitoring and treatment on Dark Shade Creek and its tributaries.

Learn more at www.shadecreekwatershed.org.

Conservation Plan Objectives

The objectives of this conservation plan are to identify and inventory the water quality of and potential threats to Beaverdam Run and its tributaries and recommend enhancement and protection measures to secure this coldwater resource. A goal is to determine why trout biomass diminished and prompted the Pennsylvania Fish and Boat Commission to remove this waterway from the Class A Trout Waters List.

The compilation of this plan includes recent and historical fish surveys completed by the PFBC and California University of Pennsylvania, which collaborated with CVC. The plan also includes water quality data acquired through data loggers, volunteer and professional grab sampling, macroinvertebrate community structure, and historical information.

This plan will be shared with conservation partners, state agencies, and municipalities as a reference tool to maintain or improve stream quality, aquatic habitat, and recreation in the watershed.

About the Watershed

WATERSHED LOCATION

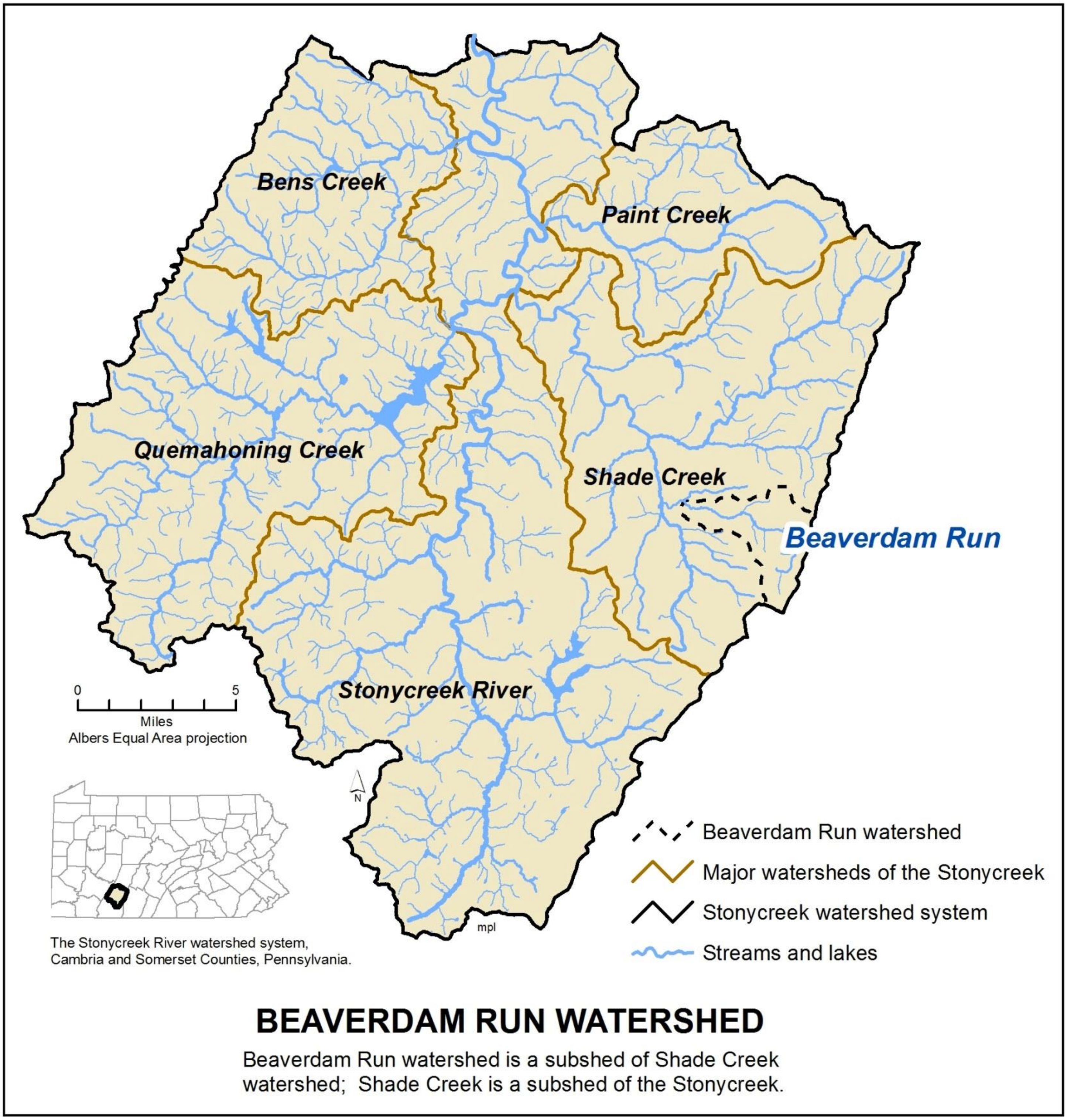


Figure 2

Beaverdam Run is a 6.21-mile long coldwater stream in Shade Township, outside the borough of Central City, Somerset County, Pennsylvania. It is a first to second order, headwater stream that originates on Shaffer Mountain and the Allegheny Front. Beaverdam Run is a tributary to Laurel Run, which flows into Dark Shade Creek, which ultimately confluences with Clear Shade Creek and forms Shade Creek. Shade Creek is a tributary of Pennsylvania's 2012 River of the Year – the Stonycreek River (Figure 2).

The Beaverdam Run watershed encompasses 7.4 square-miles on the Allegheny Front Section of Pennsylvania's Appalachian Plateau. The majority of the watershed is located within Shade Township, while a very small portion lies within Central City Borough (Figure 3).

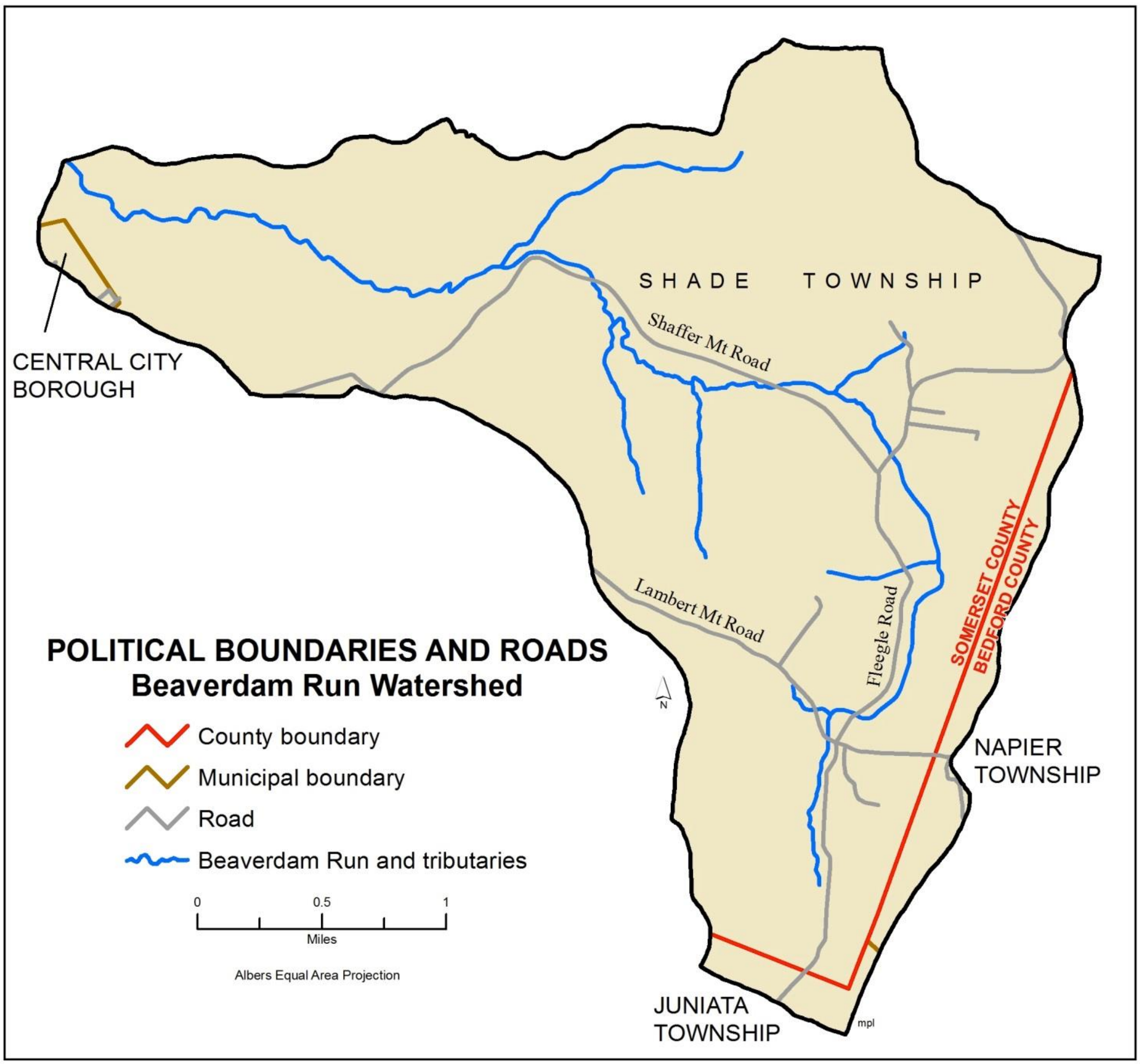


Figure 3

GENERAL HISTORY

Shade Township was formed from Stonycreek Township in 1814 and includes the present-day townships of Paint and Ogle (Baldwin 2). Few Native Americans permanently settled in Shade Township, likely from the cold, long winters and deep snows; however, the Iroquois did hunt, fish and gather in this area. Edmund Cartlidge is believed to be the first white man to settle in Shade Township, having set up a trading post at Edmund's Swamp around 1750 (Baldwin 31). Early settlers were mostly of German descent and were known as "Pennsylvania Dutch." Many of these earliest settlers' descendants still reside in Shade Township (Baldwin 33).

Until the early 1900s, when the Babcock Lumber Company moved its operations into the township, agriculture was the primary industry (Baldwin 33). Eastern hemlock, white pine, chestnut, hickory, maple, oak and more species provided refuge to wildlife and supplies to settlers and residents. Water-powered saw mills dotted the watershed. From about 1896 to 1916, L.D. Sine built and operated a sawmill on what was then known as "Beaver Run," near the confluence of Berkebile Run and Beaverdam Run. Babcock Lumber Company is believed to have taken "upwards of a half-billion feet of valuable lumber" from Shade Township (Baldwin 126-127).

A hand-drawn map of Shade Township, found on page 80 in N. Leroy Baldwin's self-published book, *Two Hundred Years in Shade Township, Somerset County, Pennsylvania 1762-1962*, shows Laurel Run as a tributary to Beaver Run, today's Beaverdam Run. Since at least 1971, however, Beaverdam Run has been listed by the United States Geologic Survey as a tributary to Laurel Run, even though Beaverdam Run is at least four times larger than Laurel Run.

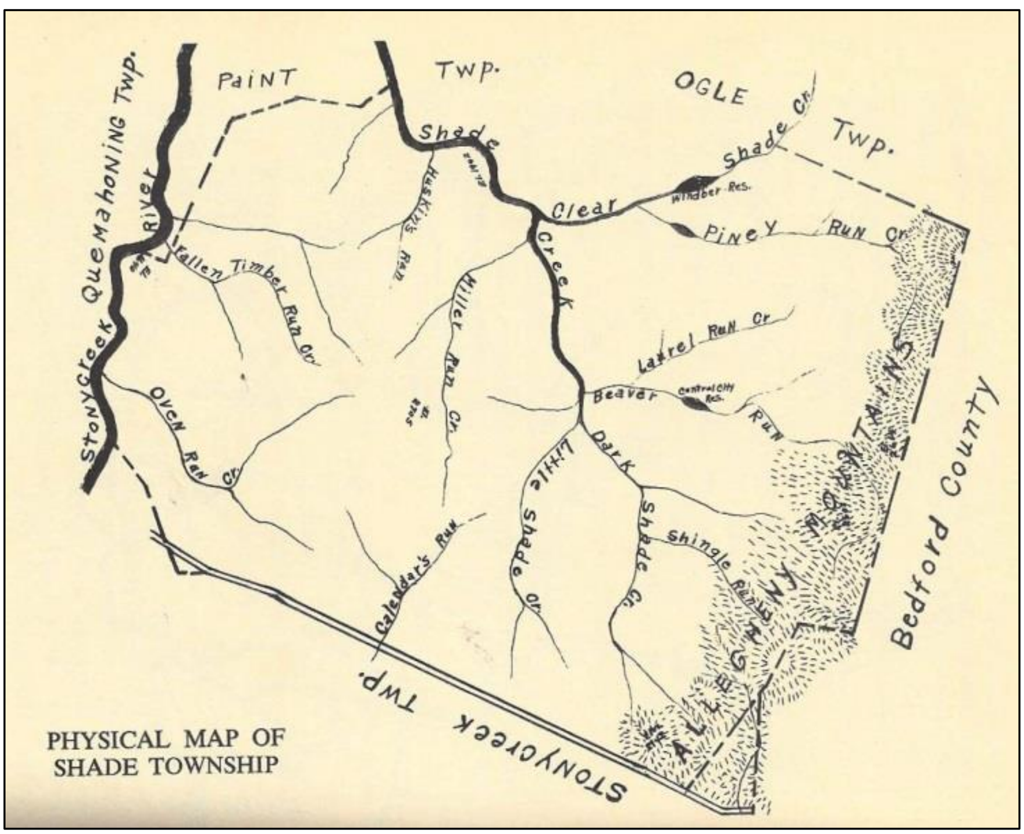


Figure 4

DEMOGRAPHICS

Key demographics gleaned from the 2010 United States Census for Shade Township, Central City Borough, and the state may be found in Table 1. Compared to the state, a much higher than average number of residents of these municipalities own their homes. Employed residents travel an average of 25-26 minutes to work. Educational Services, Health Care, and Social Assistance employed the greatest percentage of residents. Manufacturing employed the second highest percentage of Shade Township residents, while Central City Borough residents were employed in Retail Services. The Median Household Income was far lower than the state average, as was the percent of residents who held a Bachelor's Degree or higher; however, an above average percentage of residents graduated high school.

	Shade Township	**Central City Borough**	**Pennsylvania**
Total Population	2,774	1,124	12,702,739
Average Household Size	2.36	2.30	2.45
Average Family Size	2.9	2.9	3.0
% of Housing Occupied by Owner	86.5	80.0	69.6
% of Housing Occupied by Renter	13.5	20.0	30.4
% Population a High School Graduate or Higher	52.7	41.9	37.6
% Population with a Bachelor's Degree or Higher	7.6	4.7	16.5
Population Employed (16 year old and higher)	1,224	544	5,938,507
Number Employed Who Commute to Work	1,195	497	5,594,547
Mean Travel Time to Work (minutes)	26.2	25.3	25.7
Highest Employment Industry	18.2% in Educational Services, Health Care, and Social Assistance	24.5% in Educational Services, Health Care, and Social Assistance	25.2% in Educational Services, Health Care, and Social Assistance
Second Highest Employment Industry	16.2% in Manufacturing	15.1% in Retail Trade	12.8% in Manufacturing
Median Household Income	$38,490	$34,750	$51,651
Source: United States Census Bureau, 2010			

Table 1

LAND USE

Unlike the majority of streams within the Shade Creek Watershed, Beaverdam Run is not degraded by Abandoned Mine Drainage, coal mining, or coal refuse piles. A small portion of land (less than 1% of the total watershed acreage) near the mouth of Beaverdam Run is disturbed for the New Enterprise Stone and Lime Company, Inc.'s Sand Plant, an active quarry (Figures 5, 6 and 8). According to New Enterprise's website,

> Sand is the primary fine aggregate used to produce Portland Cement Concrete. It will not compact because of its particular shape. Produced only at specific plants, sand is sized into two specific classifications: *Mason sand*, used to produce masonary grout, and *Concrete sand*, which is used to make Ready Mixed Concrete. Other uses include golf course and recreational areas, beaches, walkways, and play areas.
>
> Bituminus Concrete Sand is the main fine aggregate used in the production of Blacktop and is also used in residential sand mound construction. Other uses include walkways and play areas, trench lining, and any situations where an aggregate cushioning material is needed. The material will compact somewhat, but will not remain so.
>
> Limestone Concrete Sand is used primarily in the mixture of concrete. This fine aggregate is sized and screened the same as Bituminus Concrete Sand, and it is also washed.

On the fringe of the watershed, previously disturbed land stems from old deep mines. Historical data from the Pennsylvania Department of Environmental Protection indicate that coal seams B (Lower Kittanning), C (Middle Kittanning), C Prime (Upper Kittanning), and D (Lower Freeport) were mined in these disturbed areas (Figure 6). This was likely the Reitz #1 mine. One Abandoned Mine Discharge (AMD) emanates from the Reitz #1 mine and, prior to 2006, decimated the water quality of Laurel Run, the stream that receives

Figure 5. An aerial view of New Enterprise Sand Plant near the mouth of Beaverdam Run.

Beaverdam Run; however, an AMD treatment system built by the Shade Creek Watershed Association is effectively remediating this discharge. Caution should be had, though, because if that deep mine was breached in another location and the geology aligned, Beaverdam Run could be polluted near its mouth.

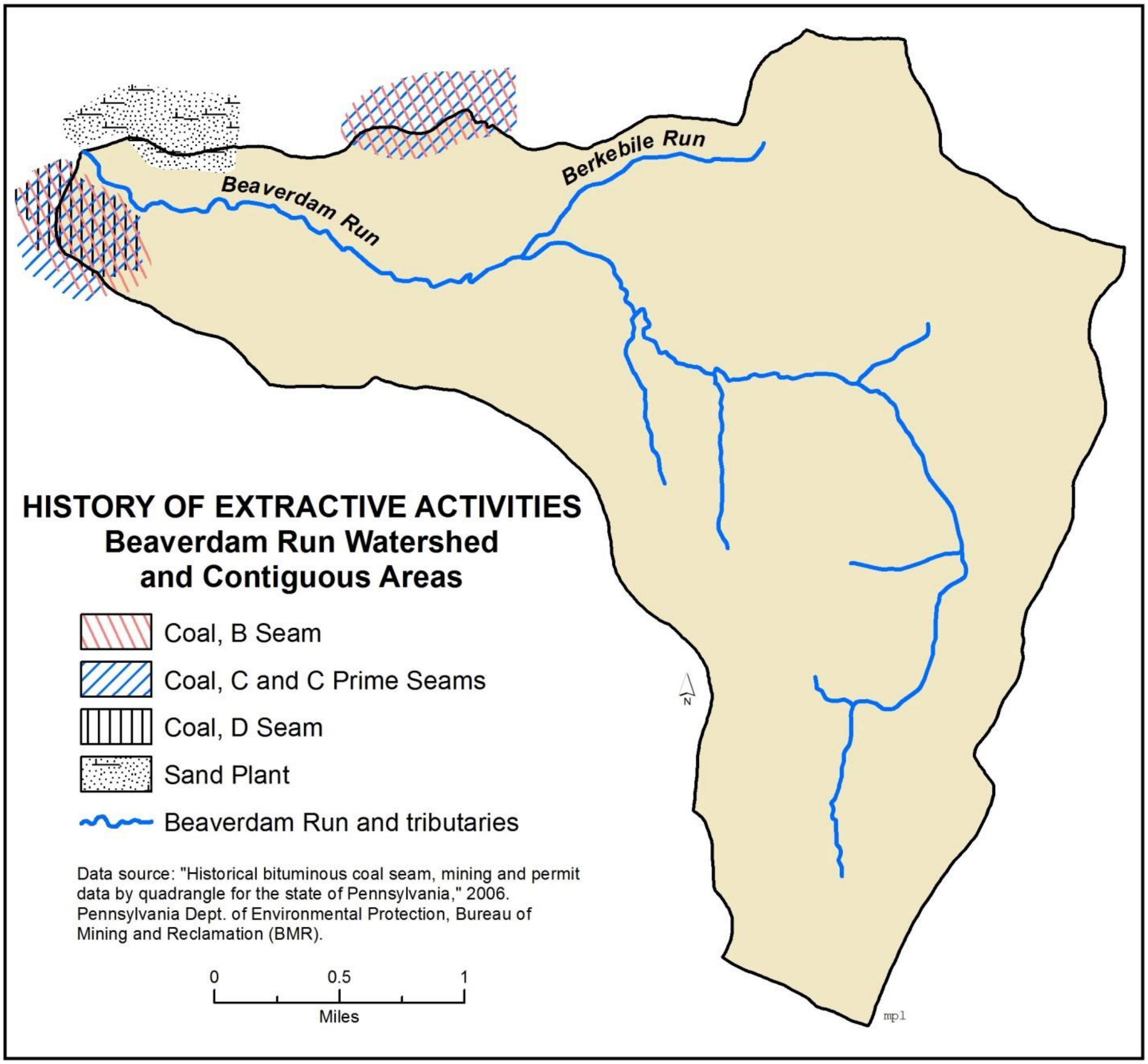


Figure 6

Contributing to the high quality of Beaverdam Run are the rural nature of the watershed and the facts that approximately 90% of the watershed is forested; 7% is classified field-pasture-grass; and agriculture, residential, roads, and disturbed soils account for one or less than one percent each (Figures 7 and 8 and Table 2).

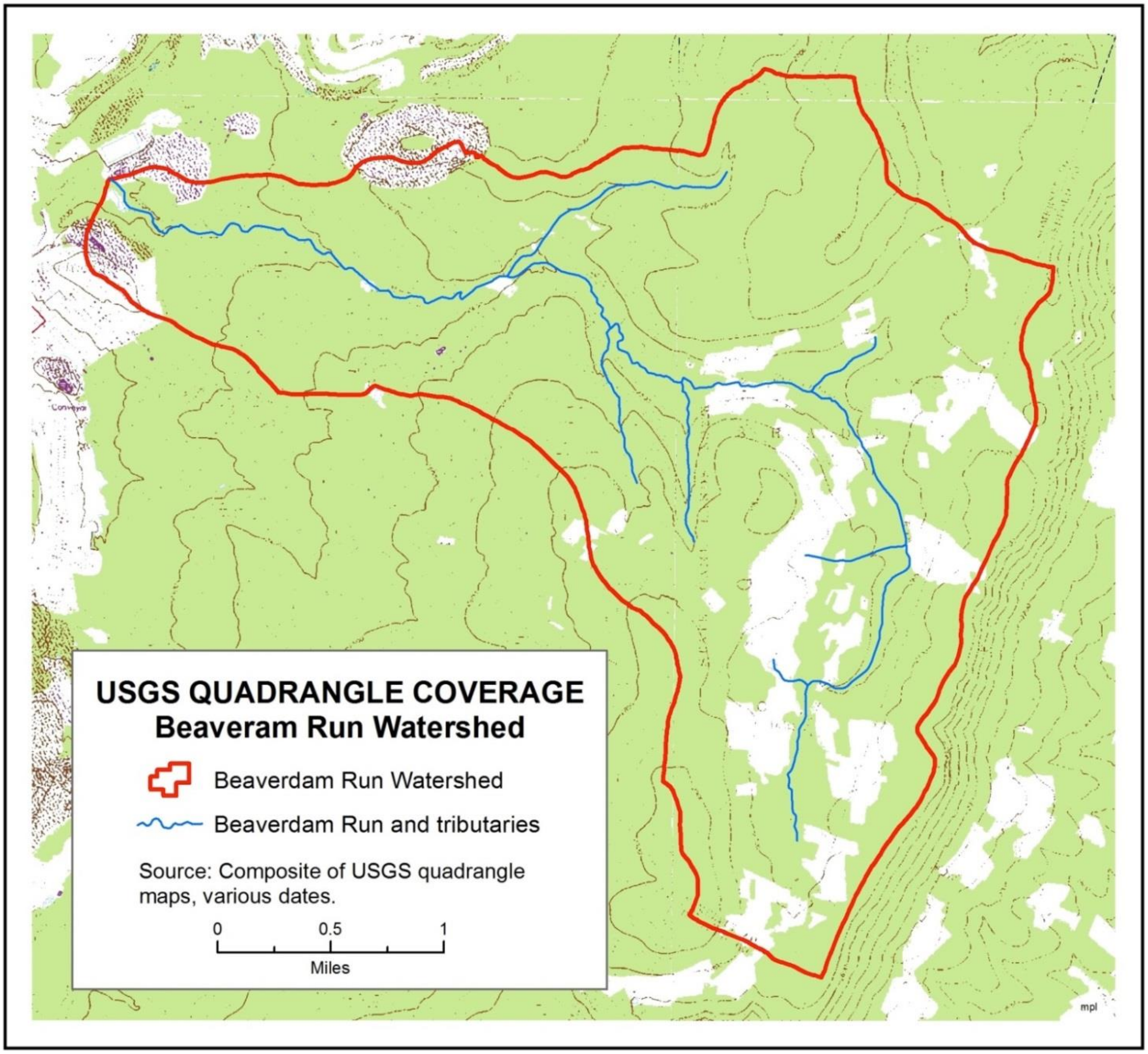


Figure 7

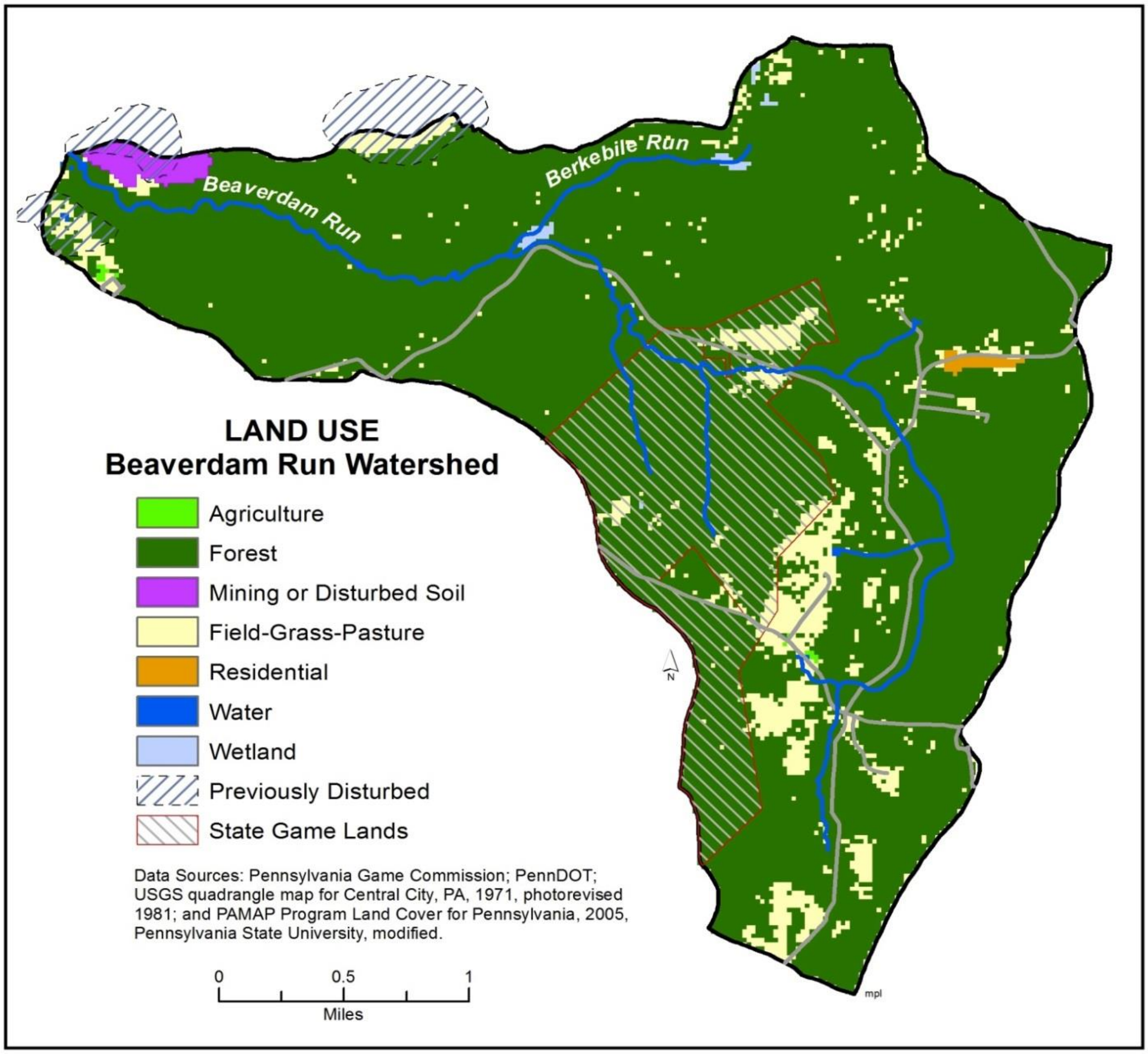


Figure 8

Beaverdam Run Watershed Land Uses		
Land Use Categories	**Acres, approximately**	**Percent of total**
Residential	12	<1
Roads	48	<1
Agriculture	3	Negligible
Grass-Field-Pasture	354	7
Forest	4250	90
Water	5	Negligible
Wetland	12	<1
Mining/Disturbed Soils	38	~1
Source: Derived from the PAMAP Program Land Cover for Pennsylvania, 2005		

Table 2

Using Pennsylvania Department of Transportation GIS files, there are approximately 10.6 miles of state and local roads (Figure 3). This number does not include private roads, like driveways, nor do they include dirt and gravel roads. According to 2011 Traffic Volume figures obtained online from the Pennsylvania Department of Transportation, an average of 200 vehicles per day travel cross the Bedford/Somerset County line via Shaffer Mountain Road (SR 1018), while only 100 vehicles per day travel Fleegle Road and Lambert Mountain Road (SR 1035).

SPECIES OF CONCERN

Beaverdam Run Watershed encompasses portions of Pennsylvania State Game Lands #228. The Pennsylvania Natural Heritage Program (PNHP) designates a portion of State Game Lands #228 outside the Beaverdam Run Watershed as a Landscape Conservation Area, with two defined Biological Diversity Areas (BDA). In the Coal Run Trail BDA, Mountain bellwort (*Uvularia pudica*), a plant species of special concern was found. In Pennsylvania, Mountain bellwort has only been recorded in Somerset and Westmoreland Counties. According to the *Somerset County Natural Heritage Inventory* prepared by the Western Pennsylvania Conservancy in January 2006, "Mountain bellwort inhabits dry, mid-elevation forests near trails and roads." In all but one occurrence, Mountain bellwort was "found in ridgetop acidic oak forest with a healthy understory" (127). In the Shingle Run BDA, yellow-fringed orchid (*Platanthera ciliaris*), a state species of concern, was documented. It is tolerant of habitats ranging from wet, humus areas such as bogs to dry rocky mountain slopes, usually in acidic soils. The large track of forest preserves water quality and habitat (129).

Figure 9. Yellow-fringed orchid. Photo by Jeff McMillian at USDA-NRCS PLANTS Database. Used with permission.

A Pennsylvania Natural Heritage Index (PNDI) search of the watershed in spring 2013 resulted in conservation measures suggested by the Pennsylvania Department of Conservation and Natural Resources (DCNR) and United States Fish and Wildlife Service (USFWS). The USFWS also noted a potential, but unspecified impact in the northeastern part of the Beaverdam Run Watershed. Before any earth-disturbance activities take place in the watershed, the DCNR's Bureau of Forestry and USFWS should be contacted. DCNR and USFWS want to ensure species of special concern and sensitive species are not disturbed.

A PNDI search in the southern tip of the Beaverdam Run Watershed revealed that Mountain bellwort (*Uvularia pudica*) could be present.

Throughout the watershed, the USFWS would like to see roosting and foraging habitat for endangered bats conserved, which means retaining at least 50% canopy cover, large diameter (greater than 12 inch diameter breast height) snags and dying trees, and all hickory trees. The threatened small-footed bat (*Myotis leibii)* and endangered Indiana bat (*Myotis sodalis*) have been reported in Somerset County (Butchkoski 2). More bat species may be added to the state's endangered species list in the future by the Pennsylvania Game Commission due to the spread of White Nose Syndrome, caused by the white fungus, *Geomyces destructans*, which is decimating bat populations (Graef). On October 4, 2012, however, the Pennsylvania Game Commission announced that it would not be adding three, unspecified species of bats to the state's endangered species list (Cregan).

Figure 10. A small-footed bat.
A PA Game Commission photo by Cal Butchkoski.

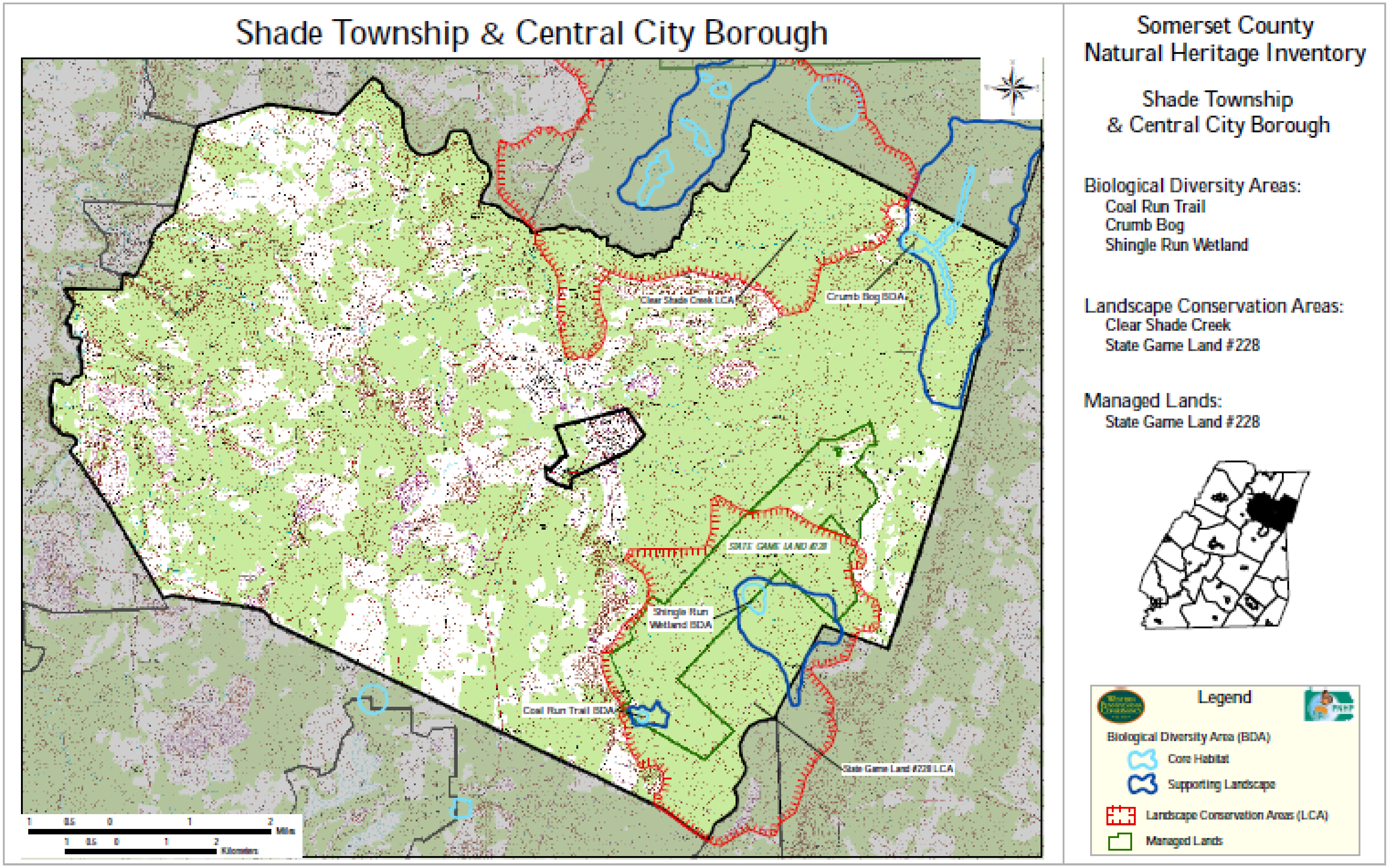

Shade Township & Central City Borough
Clear Shade Creek LCA
Crumb Bog BDA
STATE GAME LAND #228
Shingle Run Wetland BDA
Coal Run Trail BDA
State Game Land #228 LCA
Somerset County
Natural Heritage Inventory
Shade Township
& Central City Borough
Biological Diversity Areas:
Coal Run Trail
Crumb Bog
Shingle Run Wetland
Landscape Conservation Areas:
Clear Shade Creek
State Game Land #228
Managed Lands:
State Game Land #228
Legend
Biological Diversity Area (BDA)
Core Habitat
Supporting Landscape
Landscape Conservation Areas (LCA)
Managed Lands

Figure 11

The Indiana bat (*Myotis sodalis*) is an endangered species protected by the Pennsylvania Game Commission (PGC). It is found in low numbers across eastern United States. The Indiana bat closely resembles the common little brown bat and they often hibernate together. Hibernacula are found in areas with well-developed limestone caverns and abandoned mines. Their hibernation sites must have noticeable airflow and the lowest non-freezing temperature possible. Sites often have some flowing or standing water too. Many Indiana bats will roost in trees. Females will gather under loose bark, which serve as maternity sites in the summer. The PGC found that, "their primary insect-foraging habitat was on gentle to moderate south-facing slopes covered by mixed oak or mixed northern hardwood forests." The PGC has confirmed summer live captures and winter hibernacula in Somerset County. Loss of habitat, mine collapses, traffic, windmills, and White Nose Syndrome threaten Indiana bats (Butchkoski 1-4).

Figure 12. An Indiana bat.
A PA Game Commission photo by Cal Butchkoski.

The small-footed bat (*Myotis leibii*) is a threatened species in Pennsylvania, though nationally, it has no special protection. The PGC has found these bats in the summer and winter in Somerset County. These bats usually roost individually, not in colonies, hibernating in caves and mines, under large rocks and in tight crevices. It flies slowly and erratically, often one to three feet above the ground, suggesting it may not be affected by windmills. More data are needed on its behavior and population (Butchkoski 1-2).

While conservation measures have enhanced their numbers in Pennsylvania, bald eagles (*Haliaeetus leucocephalus*) are still listed as a threatened species in the state, though the Commonwealth is considering removing bald eagles from the list of threatened species. Bald eagles do not get their characteristic white heads and tails until the age of five. They are opportunistic foragers and while they typically eat fish, they will dine on dead waterfowl and mammals. They are attracted to larger bodies of water with good water quality to support their diet and large trees to support their massive nests. Many bald eagles migrate through Pennsylvania, as evident in the Allegheny Plateau Audubon Society's Spring Bird Count (Table 3), but some will winter here. Poor water quality, habitat loss through timbering and urbanization, and human interference all still threaten this national symbol (Gross and Brauning 1-6).

Ospreys (*Pandion haliaetus*) are a threatened species in Pennsylvania, but nationally, they are not listed as threatened or endangered. They are a large bird of prey that feed almost exclusively on fish, earning them the name "fish hawk." They nest near large bodies of water. Once listed as extirpated in Pennsylvania, osprey populations are rising. The PGC identifies Somerset County as a nesting county for osprey (Gross 1-2).

Hawk Count			
	Spring 2013	**Spring 2012**	**Spring 2011**
Bald eagle	16	14	13
Osprey	61	121	56
Northern harrier	11	22	16
Source: Allegheny Plateau Audubon Society Hawk Count at the Allegheny Front			

Table 3

Once known as the "marsh hawk," the northern harrier (*Circus cyaneus)* is listed as a threatened species in Pennsylvania because of its population decline due to habitat loss, especially wetlands, and fragmentation. While Somerset County is listed as a nesting place for northern harriers, the PGC cautions that only one or two pair may nest in a county and not necessarily every year. Nests are built on the ground. They hunt by sight and sound in open fields of tall grasses. Northern harriers may also be found in open wetlands, bogs, meadows, farmland, thickets, and riparian woodlands. The PGC says, "They can be distinguished from other open country raptors… by their narrow wings forming a V-shape in flight, long tail, dark wing tips, and white rump patch" with the latter being a key indicator. Landowners can help protect this species by not mowing large areas of grasslands until after July 15th and reducing mowing to every three to five years (Haffner and Gross 1-4).

The long-eared owl (*Asio otus)* is a threatened species in Pennsylvania that nests in Somerset County. It is a rare bird that is not fully understood due to its secretive nature and limited sightings. The long-eared owl is one of the few owls that migrate. It tends to nest in dense conifers and hunt primarily rodents in open fields, wetlands, and in and along forests. It looks similar to a great horned owl, but is about 1/5th the size, has ear tufts that point up, not out, a longer tail, and no white throat patch. The long-eared owl is larger and slimmer than the eastern screech-owl (Gross 1-4).

The West Virginia water shrew (*Sorex palustris punctulatus)* is a threatened species protected by the PGC. In Pennsylvania, they are only found on the Allegheny Plateau, including portions of Somerset and Bedford counties. The West Virginia water shrew is the second largest shrew in the state at six inches from nose to tail tip. They are a semi-aquatic shrew and have slightly webbed hind feet to help them swim. They can stay underwater for more than 45 seconds. West Virginia water shrew prefers high elevation, mountain streams of high water quality, moderate flow, and deeply undercut banks. Changes in water quality and temperature, forest fragmentation, and sedimentation threaten these shrews. Nationally, the species is considered secure (Butchkoski 1-2).

Any work within the Beaverdam Run Watershed should consider the possibility of augmenting or restoring habitat for species of special concern or sensitive species, including bats. Further, Integrated Pest Management practices should be used on agricultural lands. Integrated Pest Management means using common sense and economical measures to manage pests, often through mechanical or biological processes instead of chemical ones.

INVASIVE SPECIES

Invasive species were not assessed for the creation of this plan; however, Japanese knotweed (*Fallopia japonica*) was notably absent from this watershed. Care should be taken to keep it and other invasive species out of the Beaverdam Run Watershed.

WETLANDS

While the ridges of Somerset County were not glaciated, the geology of the area created some upland bogs that boast extensive beds of sphagnum and wetland plants (Shade Creek Watershed Association 15). One such bog that is nearly five acres in size can be found in the wedge between the confluence of Beaverdam Run and Berkebile Run (Figures 13 and 14). The United States Fish and Wildlife Service's National Wetlands Inventory lists fourteen defined wetlands and ponds in the Beaverdam Run Watershed (Figure 13 and Table 4). Many of these are bogs. These wetlands total approximately 16.5 acres of land or less than 1% of the watershed. Still, they are significant ecosystems within the watershed and serve multiple purposes. Wetlands act like a giant sponge, slowly absorbing and releasing water when needed. They slow the flow of water down thereby reducing erosion and sedimentation and helping to control flooding. The lush vegetation also helps filter debris and pollutants out of the water, improving water quality. Many types of animals use wetlands as nurseries and places to raise their young, while other animal species require wetlands to survive throughout their life.

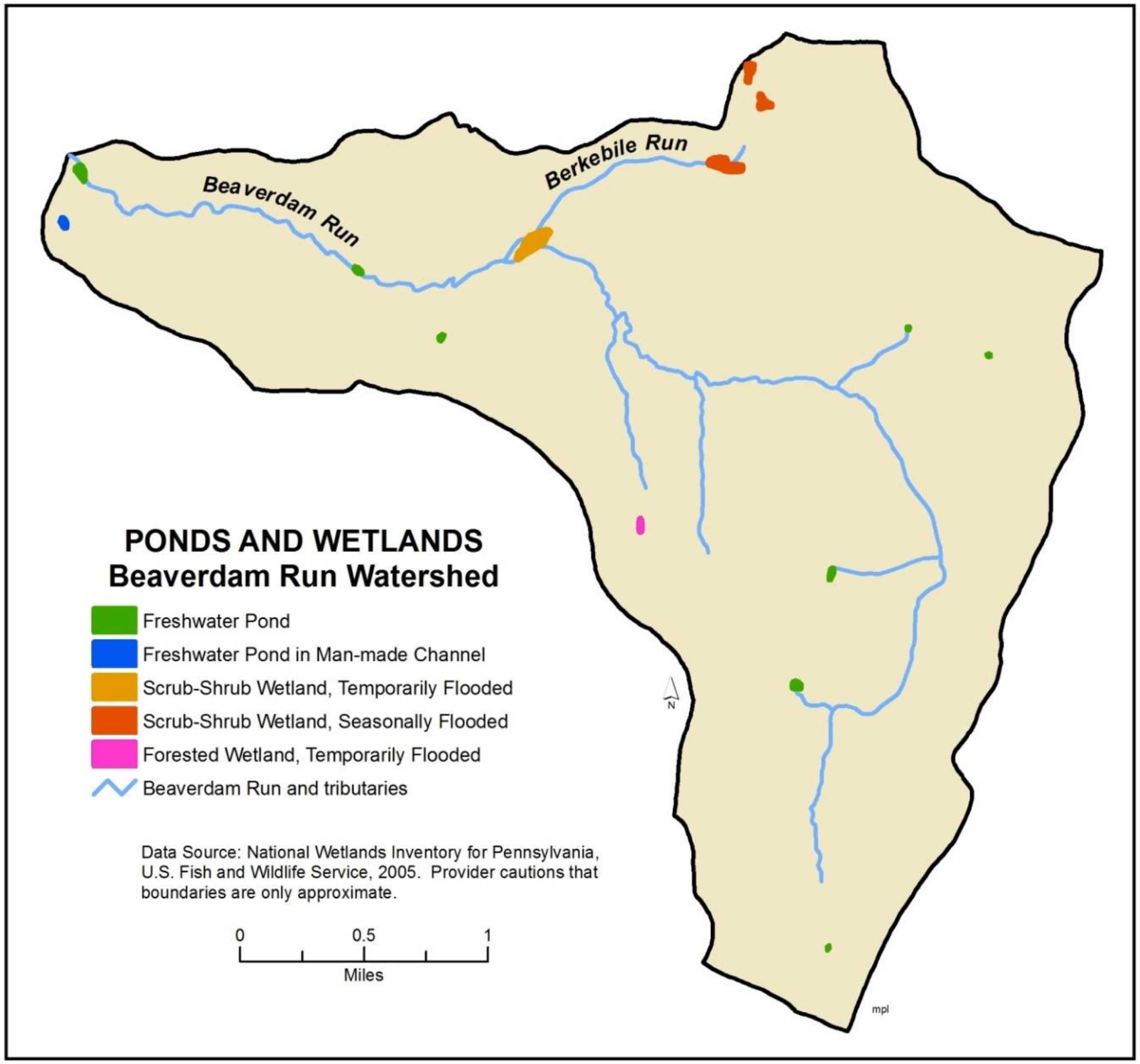


Figure 13

Wetlands Acreage	
Wetland or Pond in Figure 12	**Approximate Acreage**
1	1.30
2	0.72
3	0.50
4	0.31
5	4.90
6	3.63
7	1.41
8	1.37
9	0.58
10	0.12
11	0.15
12	0.55
13	0.84
14	0.11
TOTAL	**16.49**
Data Source: Pennsylvania Department of Environmental Protection, Water Attribute Viewer and Extracts (WAVE) - United States Fish and Wildlife Service	

Table 4

	USFWS Wetland Code	Description
Forested Wetland, Temporarily Flooded	PFO1A	(P) Palustrine, (FO) Forested, (1) Broad-Leaved Deciduous, (A) Temporarily Flooded
Freshwater Pond	PUBH	(P) Palustrine, (UB) Unconsolidated Bottom, (H) Permanently Flooded
Freshwater Pond, Artificial	PUBHx	(P) Palustrine, (UB) Unconsolidated Bottom, (H) Permanently Flooded, (x) Excavated
Scrub-Shrub Wetland, Temporarily Flooded	PSS1A	(P) Palustrine, (SS) Scrub-Shrub, (1) Broad-Leaved Deciduous, (A) Temporarily Flooded
Scrub-Shrub Wetland, Seasonally Flooded	PSS1C	(P) Palustrine, (SS) Scrub-Shrub, (1) Broad-Leaved Deciduous, (C) Seasonally Flooded

Table 5

Table 5 indicates how the United States Fish and Wildlife Service classifies the wetlands found in the Beaverdam Run Watershed. The Palustrine System includes non-tidal, freshwater wetlands dominated by trees, shrubs, emergent, mosses or lichens. Temporary Flooded means, “Surface water is present for brief periods during growing season, but the water table usually lies well below the soil surface for most of the growing season.” Seasonally Flooded means, “Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.” Permanently Flooded means, “Water covers the land surface throughout the year,” every year.

Wetland #2 has a special modifier indicating that it was Excavated and “Lies within a basin or channel that have been dug, gouged, blasted or suction through artificial means by man.” It is located in the area that corresponds to historic mining and might be a remnant of this work.

Figure 14. The bog at the confluence of Berkebile and Beaverdam Runs. Note the small tributary to Berkebile Run that flows through the bog in the foreground.

GEOLOGICAL FORMATIONS

The Beaverdam Run Watershed lies within the Allegheny Front Section of Pennsylvania's Physiographic Provinces. According to the Pennsylvania Bureau of Topographic and Geologic Survey, the eastern side of this province consists of rounded to linear hills, which "rise in a stepwise fashion to an escarpment. West of the escarpment, undulating hills slope away. Sandstone, siltstone, and shale are the underlying rock types."

This escarpment, the Allegheny Front, marks the Continental Divide; water that falls to the east of it flows to the Atlantic Ocean whereas water that falls to the west of it flows to the Gulf of Mexico. This ridge offers remarkable vistas and serves as a thoroughfare for migratory birds, which is why the Allegheny Plateau Audubon Society manages a "Hawk Watch" off Lambert Mountain Road on the edge of the watershed. For more info on the Hawk Watch visit: www.alleghenyplateauaudubon.org or www.hawkcount.org.

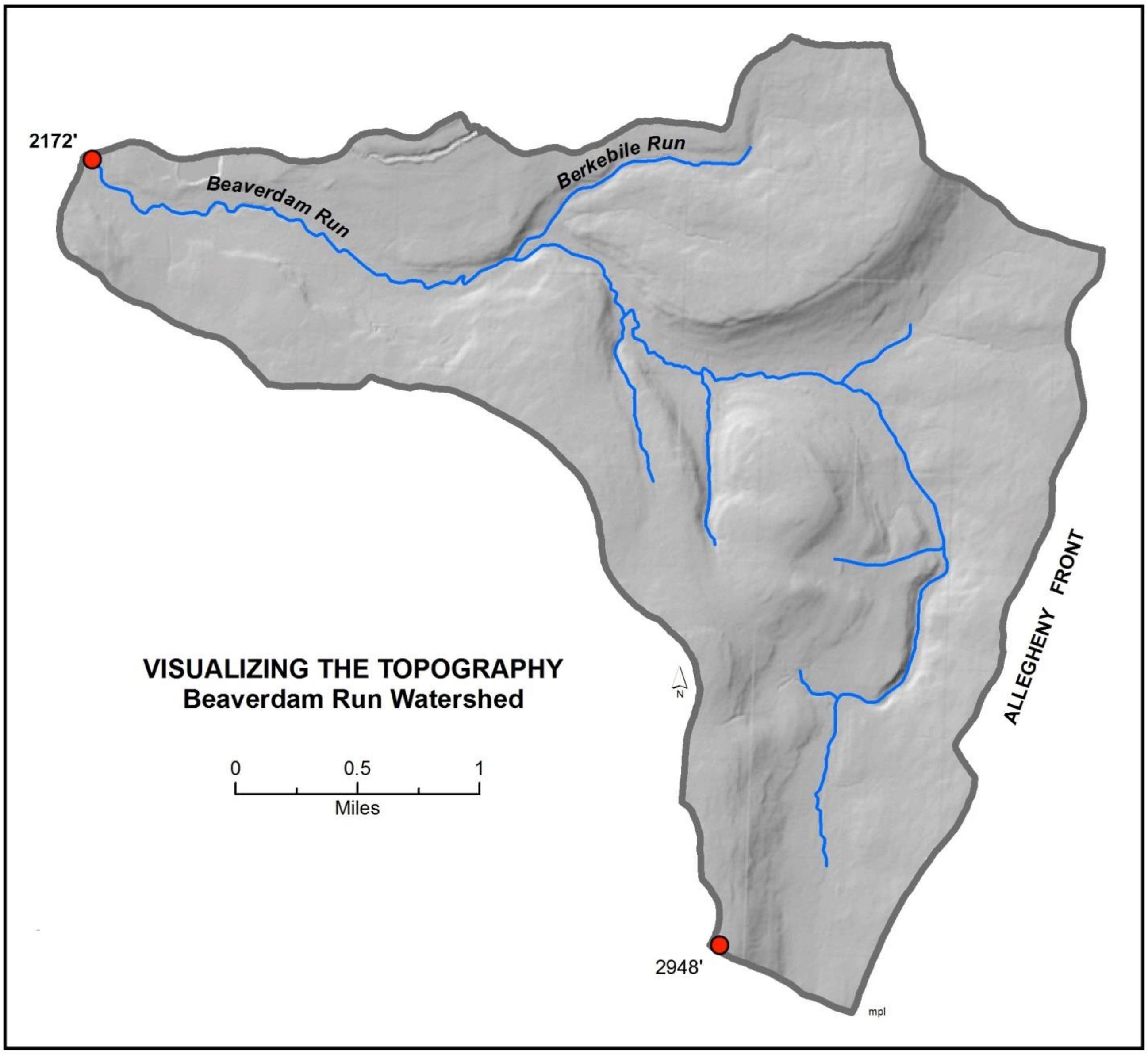


Figure 15

The highest elevations, found in the southern portion of the watershed, exposes the Burgoon Sandstone, which is from the Mississippian Age. The United States Geologic Survey (USGS) defines Burgoon Sandstone as a buff, medium-grained, crossbedded sandstone that includes shale, coal, and plant fossils, and, in places, conglomerate at the base.

Moving west in the Beaverdam Run Watershed, the Mauch Chunk Formation is next exposed. The USGS defines this formation as a grayish-red shale, siltstone, sandstone, and some conglomerate and says "It includes Loyalhanna Member (crossbedded, sandy limestone) at [the] base in … southwestern Pennsylvania [and can include] Greenbrier Limestone Member, and Wymps Gap and Deer Valley Limestones, which are tongues of the Greenbrier."

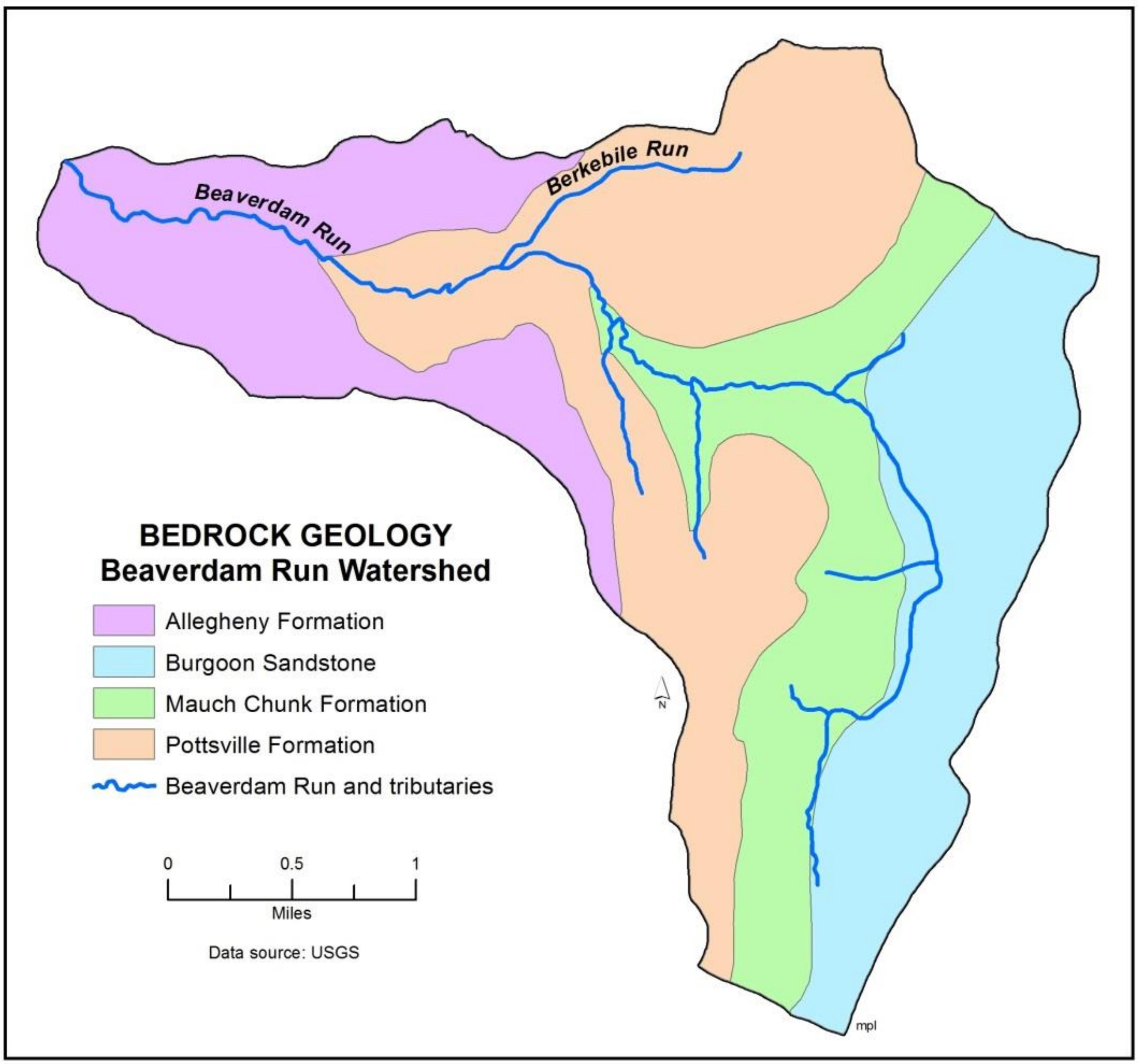


Figure 16

The Pottsville Formation is next uncovered. It is a predominantly gray sandstone and conglomerate. It also contains thin beds of shale, claystone, limestone, and coal. It can contain minable coals and commercially valuable high-alumina clays locally (USGS).

In the western-most portion of the Beaverdam Run Watershed, the Allegheny Formation is found. The USGS says this is the layer that has, "cyclic sequences of sandstone, shale, limestone, clay, and coal; … valuable clay deposits and Vanport Limestone; [and] commercially valuable Freeport, Kittanning, and Brookville-Clarion coals." This explains the earth disturbance seen in Figure 6 for historical coal mines and the sand plant.

The sandstones, shale, and conglomerates produce no alkalinity to buffer acid precipitation. According to The Weather Channel, Central City, Pennsylvania receives an average of 50.87 inches of precipitation a year. Rain and snow tend to be slightly acidic.

SOILS

The predominant soil types in the Beaverdam Run Watershed are from the Hazelton-Cookport association, with some areas, particularly in the upper portion of the watershed, having soils from the Leck Kill-Albrights association. According to the *Soil Survey of Somerset County Pennsylvania*, the Hazelton-Cookport soils are, "Nearly level to very steep, deep, well drained and moderately well drained soils; on foot slopes of hills and on mountains." These soils tend to be too stony for farming and have "a seasonal high water table." Forests cover much of these areas. Sandstones tend to lie under these soils (Yaworski 4, 6). Leck Kill-Albrights soils are, "Gently sloping to very steep, deep, well drained to somewhat poorly drained soils; on hills and ridges." Streams and drainage ways dissect these uplands areas. While these soils are suitable for farming, "slope and a seasonal high water table are major limitations." Red shale tends to underlie these soils (Yaworski 6-8).

The most predominant soil types in the Beaverdam Run Watershed, in areas not limed for agriculture, range from strongly acid to extremely acid in the surface layer and subsoil. The Hazelton HbB covers about 24% of the watershed. It is a deep, well-drained, stony, sandy loam soil with a 3-8% slope and has moderately rapid to rapid permeability. While runoff is rated "medium," there is only a slight erosion risk. The Hazelton HbD covers 10% of the watershed. It too is a deep, well-drained, stony, sandy loam soil but with greater slope at 8-25%. Runoff is rapid, but still there is only a slight erosion risk.

The Cookport CpB covers 7% of the watershed and is mostly found in the headwaters of tributaries to and the mainstem of Beaverdam Run. It is a moderately drained soil with moderately slow permeability. The depth of its high water table is 18-30 inches.

The Nolo NsB soil also covers 7% of the watershed, but is mostly found surrounding the last quarter of Beaverdam Run, near its mouth, though it is also found surrounding an unnamed tributary near Mr. Gordon's pond. It is a poorly drained soil with a high available water capacity. This soil is conducive to water-loving trees and has a rich black organic layer. The depth of the water table is only 0-6 inches when the water table is high.

Also near the mouth of Beaverdam Run is the Hazelton HzD soil, which is a well-drained soil with lots of boulders and surface stones that tends to be "droughty" (dry). The Hazelton HzB covers 6% of the watershed and is largely found near the confluence of Beaverdam Run with Unnamed Tributary 1 and Berkebile Run. Soils tend to become droughty during dry periods.

The disturbed soils in Figure 17 are listed in the *Soil Survey of Somerset County Pennsylvania* as Udorthents mine spoil, which "consists of areas that have been surface mined for coal." Permeability, available water capacity, runoff, and erosion hazard are variable depending on the disturbed area, slope, and backfill (Yaworski 26-47).

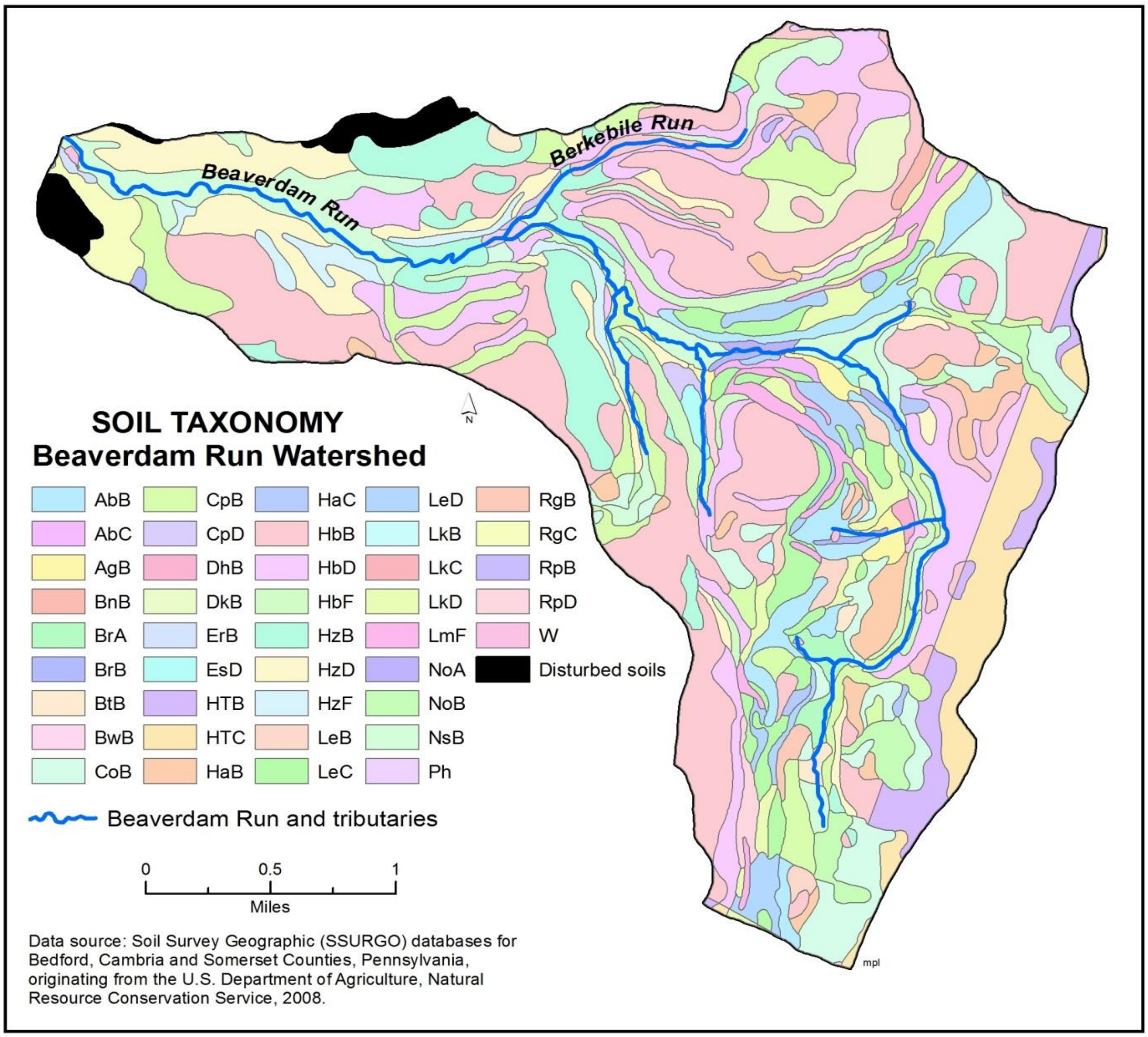


Figure 17

Predominant Soils and Characteristics in the Beaverdam Run Watershed								
Code	**Name**	**Slope (%)**	**Soil Description**	**Permeability**	**Available Water Capacity**	**Runoff**	**Soil Condition**	**% Surface with Stones**
HbB	Hazelton very stony sandy loam	3-8	Gently sloping, deep, well drained, stony	Moderately rapid to rapid	Low to very low	Medium; slight erosion hazard	Extremely acid to strongly acid	3-15 large stones
HbD	Hazelton very stony sandy loam	8-25	Sloping and moderately steep, deep, well drained, stony	Moderately rapid to rapid	Low to very low	Rapid; slight erosion hazard	Extremely acid to strongly acid	3-15 large stones
CpB	Cookport very stony loam	3-8	Gently sloping, deep, moderately well drained	Moderately slow	Moderate	Medium; slight erosion hazard	Very strongly acid and strongly acid	3-15 large stones
NsB	Nolo very stony loam	0-8	Nearly level and gently sloping, deep, poorly drained, stony	Slow	High	Very slow to slow	Very strongly acid or extremely acid	3-15 large stones
HzB	Hazelton very bouldery sandy loam	0-8	Nearly level and gently sloping, deep, well drained	Moderately rapid to rapid	Low to very low	Slow and Medium; slight erosion hazard	Extremely acid to strongly acid	60-90 boulders and stones
HzD	Hazelton very bouldery sandy loam	8-25	Moderately steep, well drained	Moderately rapid to rapid	Low to very low	Medium; slight erosion hazard	Extremely acid to strongly acid	60-90 boulders and stones
Source: Soil Survey of Somerset County Pennsylvania, 1977								

Table 6

SHALE GAS

Hydraulic fracturing or “fracking” is a process used to extract natural gas from deep geologic formations that have natural gas trapped in tightly compressed rock layers. Vertical and horizontal drilling is used to access the gas. The vertical portion is drilled to the necessary depth and then a curve is made to drill horizontally, up to 8,000 feet, though technology is developing that will allow horizontal wells to go over two miles in length, through the formation of interest. Explosive charges fracture the formation. Then, a slurry of millions of gallons of water, chemicals and sand are pumped under high pressure into the well to fracture the shale and facilitate the release of gas from the formation. The amount of water typically required for fracking ranges from one million to five million gallons per well. The actual mixture and percentage of chemicals used are listed as proprietary information; however, some of the chemicals used include algaecides, viscosifiers and petroleum compounds, many of which are known carcinogens. After the fracking process, the used water, “flowback water,” must be reused in the next well or treated at an approved facility (PA DEP).

The Marcellus and Utica Shale formations lie under the Beaverdam Run Watershed. Currently, gas companies are most interested in tapping the Marcellus Shale; however, companies are exploring ways to access the deeper Utica Shale.

Maps developed by the Penn State Marcellus Center for Outreach and Research indicate that under the Beaverdam Run Watershed, the Marcellus Shale is approximately 200-250 feet thick and lies at a depth of 7,000-9,000 feet (Figures 18 & 19). While no wells have been drilled in the Beaverdam Run Watershed, drilling is a potential risk. At least two wells in the neighboring watersheds of Laurel Run and Piney Run were drilled and fractured by Chesapeake Appalachia, LLC, which is based in Oklahoma City, Oklahoma. According to Matt Estep, Central City Water Authority Manager, these wells did not produce, so they were capped. The Authority had sold water to the gas company for the development of two of these wells.

Even if shale gas wells are not drilled in the watershed, installation of pipelines to take the gas to market could occur, which will bring concerns of fragmentation, the introduction of invasive species, erosion and sedimentation, and air and thermal pollution.

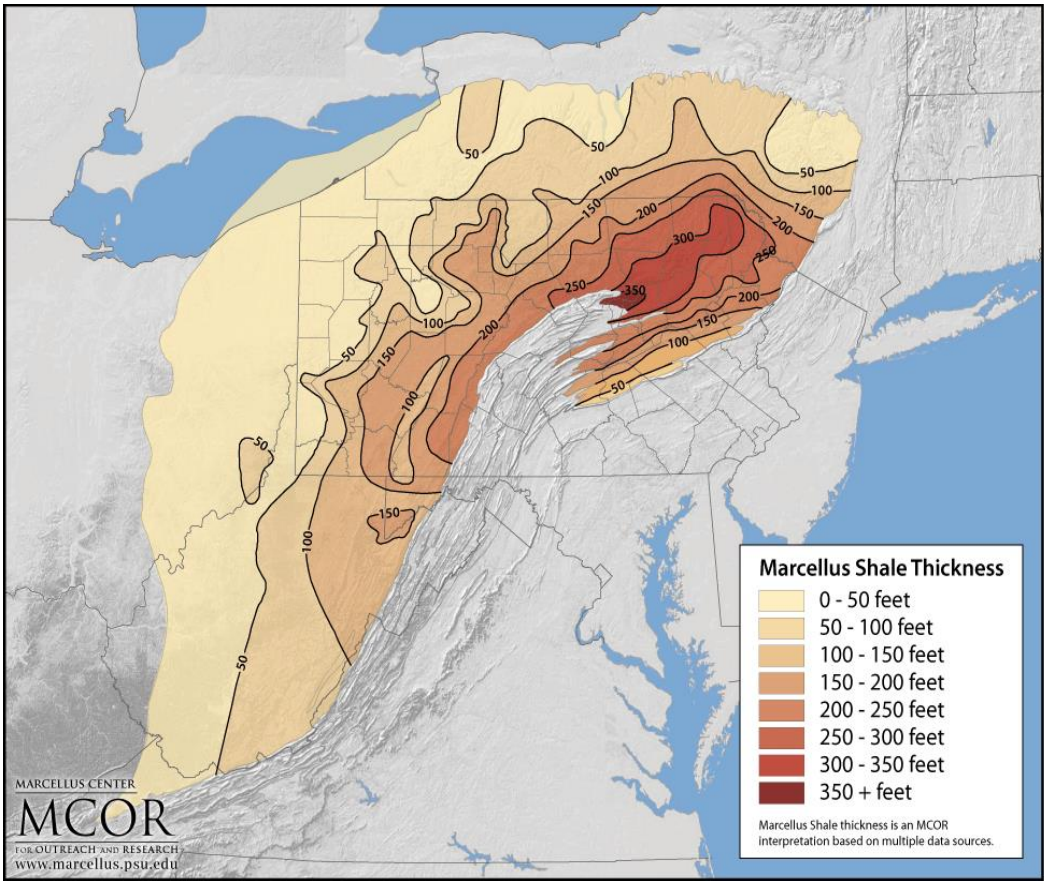


Figure 18

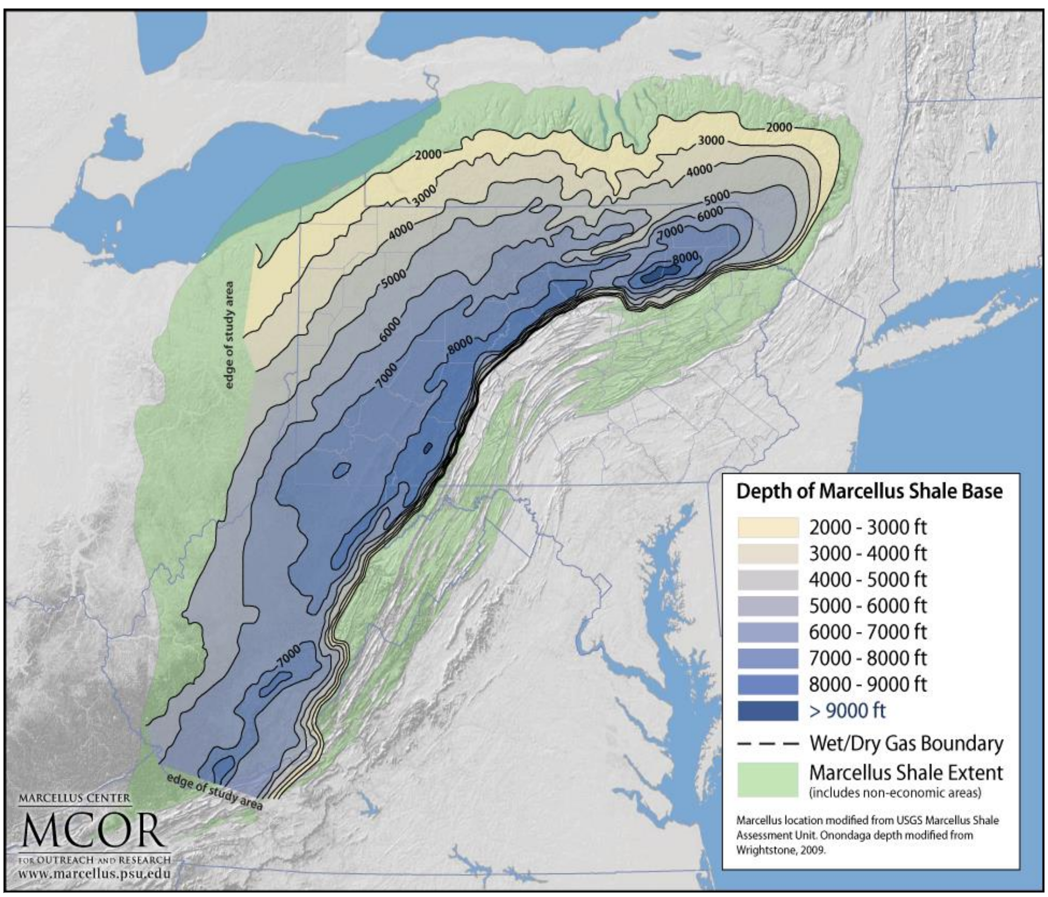


Figure 19

The Utica Shale also underlies the Beaverdam Run Watershed. Here it is approximately 400-500 feet thick and at a depth of 10,000-12,000 feet (Figures 20 & 21).

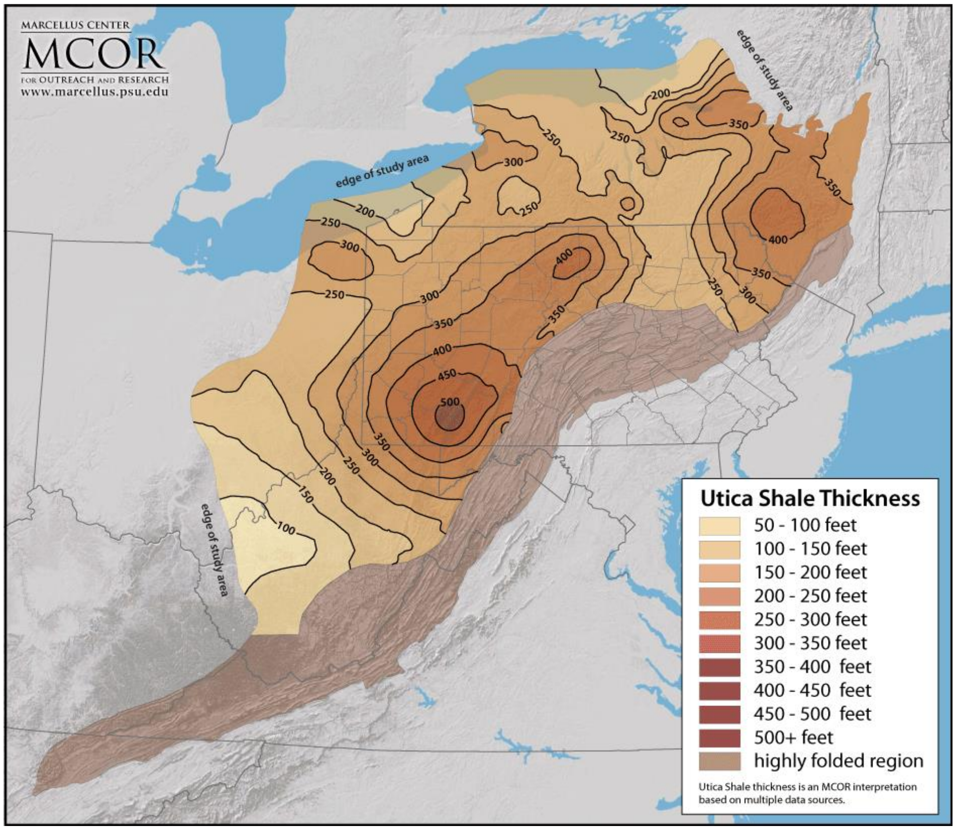


Figure 20

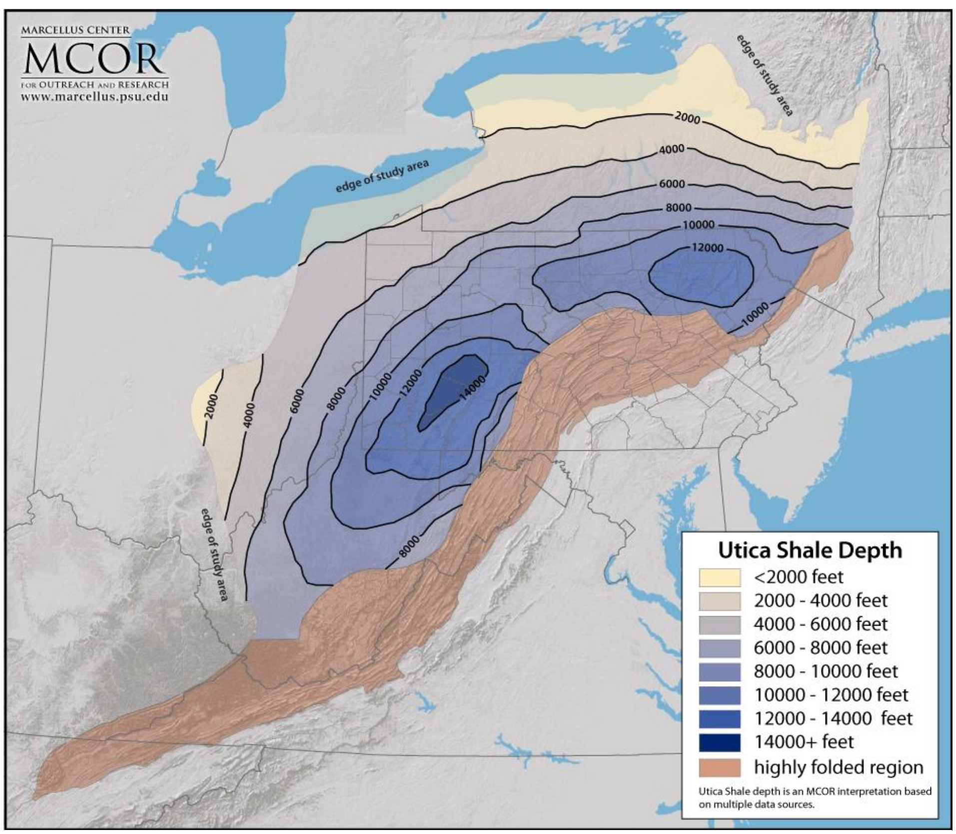


Figure 21

WIND ENERGY

Being on the Allegheny Front, the Beaverdam Run Watershed is threatened by wind energy development. For years, Gamesa Energy pursued their Shaffer Mountain Wind Project, which was projected to put 30 two-megawatt windmills on the Allegheny Front outside Central City (Figure 22). At least eight of these windmills would have been in the Beaverdam Run Watershed, between Berkebile Run and Shaffer Mountain Road. It was a hotly contested project. Conservation groups were concerned about the environmental impacts to exceptional value and high quality streams on this ridge as well as migratory birds and raptures like the golden eagle and the federally endangered Indiana Bat. Residents wanted to preserve the natural and scenic beauty of the mountain. Others promoted jobs and energy independence. In June 2012, Gamesa announced that it pulled the plug on this project, due to "a combination of factors, including uncertainty surrounding federal policies…" (Siwy).

While it's unlikely, it is possible that another wind energy company would consider placing windmills in the Beaverdam Run Watershed. This development could displace wildlife, fragment their habitat, kill birds, raptors, and bats, increase erosion, sedimentation, and thermal pollution, introduce invasive species, and, depending on one's opinion, destroy viewscapes, hunting opportunities, and repose found in the woods.

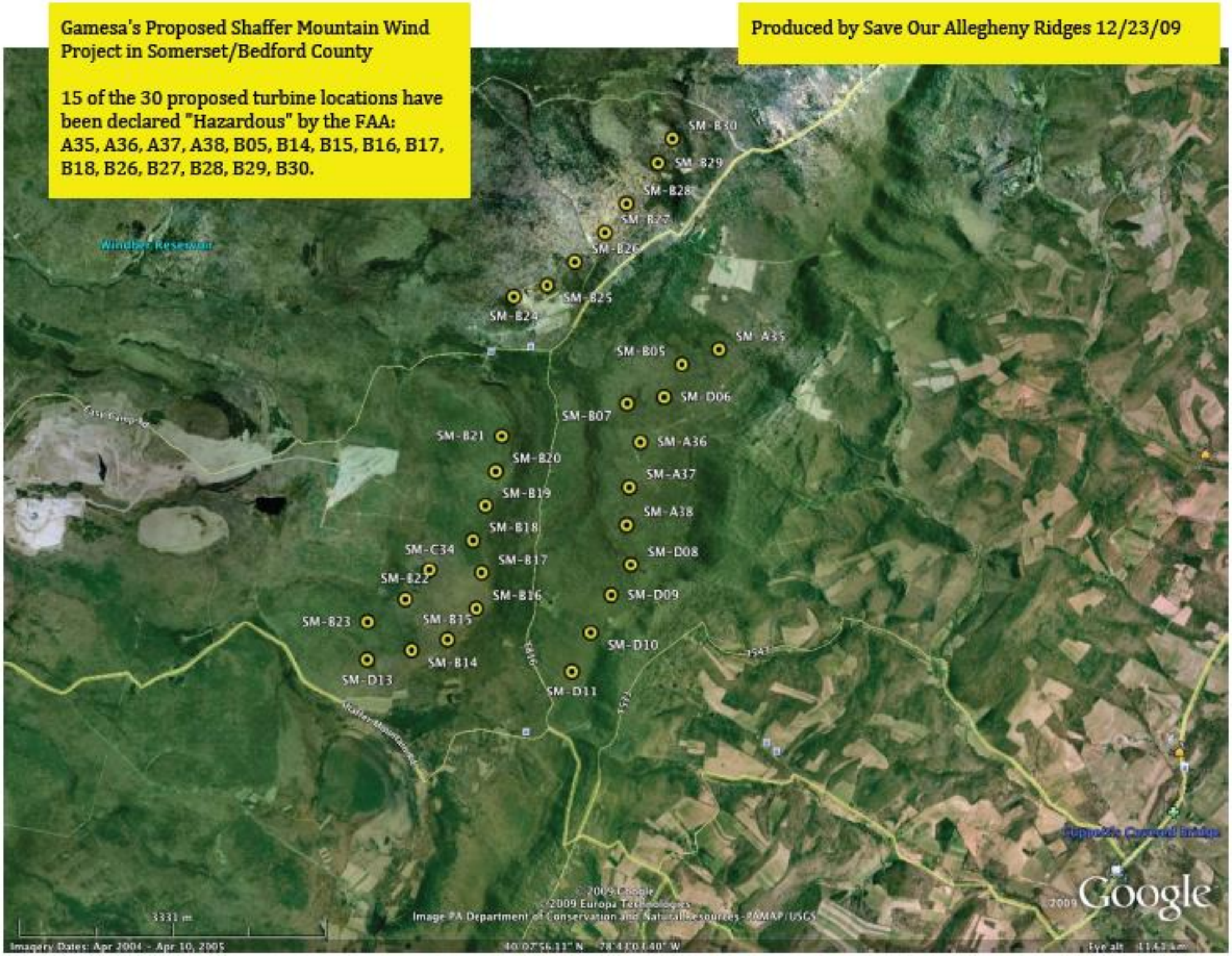


Figure 22. A map of the proposed Gamesa wind turbines. Source: www.shaffermountain.com/FAAMap.pdf

WATER SUPPLY

The Central City Water Authority has two wells in the Beaverdam Run Watershed. Matt Estep, Central City Water Authority Manager, said, in 2012, the upper well, Well 1, had a safe yield of 300 gallons per minute (GPM) or 432,000 gallons per day (GPD), and the lower well, Well 2, had a safe yield of 105 GPM or 151,200 GPD. These wells provide water to about 950 customers and draw water from the Mauch Chunk Aquifer. This aquifer, located along the northwest slope of the Allegheny Front, is reliable and produces high quality, soft, alkaline water (Highland Sewer and Water Authority). A third well might be added in the future.

The Central City Water Authority is working with the DEP on a Source Water Protection Plan (Estep).

The Central City Reservoir lies on Beaverdam Run, but the Water Authority has not used it as a public water supply since 1998 when new surface water regulations that their treatment facility could not meet went into affect. Now anglers enjoy fishing the reservoir, though sediment is filling it in.

RECREATION

The Beaverdam Run Watershed encompasses a portion of Pennsylvania State Game Lands #228, which is open to hunting, hiking, and other non-invasive forms of recreation. At a parking area along Shaffer Mountain Road, the Pennsylvania Game Commission has a food plot for wildlife.

Figure 23. A pheasant near the PA Game Commission's State Gamelands 228.

Some private lands are open to the public as well.

The Central City Sportsmen's Club lies within the Beaverdam Run Watershed. This membership-only club hosts fishing rodeos at the pond on their property along Shaffer Mountain Road and permits Shade-Central City High School access during the school's Trout in the Classroom Release Day.

As stated on page 19, the Allegheny Plateau Audubon Society maintains the Allegheny Plateau Hawk Watch, which is located on the edge of the Beaverdam Run Watershed at North 40° 4' 53.1", West -78° 43' 40.2". Offering magnificent vistas and observations of migratory birds, this site attracts about 4,000 people annually and provides valuable hawk and avian data (McGlynn).

The Beaverdam Run Trout Cooperative and Nursery is located in the headwaters of Beaverdam Run and has a water allocation permit from the Commonwealth to sustain the nursery. Brook, rainbow, and golden rainbow trout are raised at this nursery and stocked in local waterways. Please see page 69 for more on the nursery.

The Pennsylvania Fish and Boat Commission (PFBC) stocks brook and brown trout in Beaverdam Run, once in the spring, about three quarters downstream of the Shaffer Mountain Road (SR1018) Bridge to the mouth of Beaverdam Run. PFBC staff name Beaverdam Run a fishing "hotspot" (Figure 24). Please see the Fish section beginning on page 63 for more information.

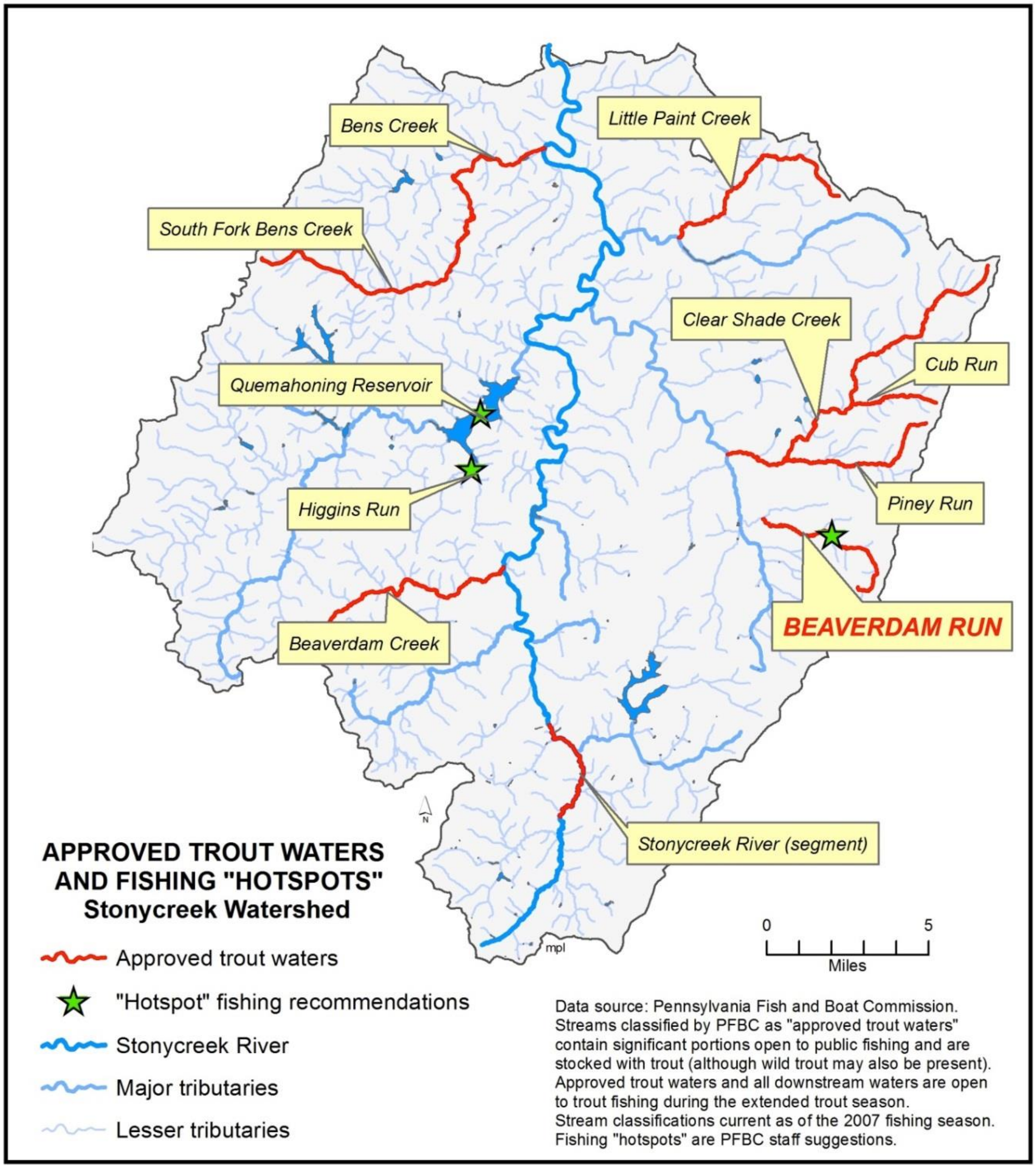


Figure 24

Monitoring Sites

In partnership with the Pennsylvania Department of Environmental Protection (DEP), the Shade Creek Watershed Association (SCWA) collects water samples from Beaverdam Run, its tributaries, and other streams within the Shade Creek Watershed. SCWA also acquires field readings from select sites. This is to comply with a Chapter 105 Water Obstruction and Encroachment permit SCWA has to conduct its limestone dosing project, in which crushed limestone is placed along streambanks and in-stream to boost alkalinity and pH (please see page 37 for more details). The DEP's Bureau of Laboratories analyzes these water samples. Historical and present-day monitoring sites may be seen in Figure 27 and Table 7. Field data and laboratory results may be found in Appendixes 1 and 4.

Shade Creek Watershed Association and Pennsylvania Department of Environmental Protection Water Monitoring Sites			
Site Alias	**Description**	**Latitude (North)** DDMMSS	**Longitude (West)** DDMMSS
BDR1	Beaverdam Run at Trout Nursery upstream of road	40 06 10	-78 44 03
BDR2	Beaverdam Run at Mouth	40 07 03	-78 47 46
BDR3	Beaverdam Run at Daley Church bridge	40 05 10	-78 44 20
BDR4	Beaverdam Run at power lines	40 06 47	-78 45 59
BDR5	Beaverdam Run at bridge above Krovoniak's on Mountain Road	40 06 50	-78 45 33
BDR6	Beaverdam Run below Lambert Pond on Lambert Mountain Road	40 05 17	-78 44 24
BDR7	Beaverdam Run on Levar Property 30 meters below stream crossing	40 05 17	-78 44 05
BDR8	Beaverdam Run 5 meters above Berkebile Run	40 06 50	-78 45 51
BDR9	Beaverdam Run 30 meters below Berkebile Run	40 06 50	-78 45 52
BBR2	Berkebile Run 5 meters above lime dosing site on water authority road	40 06 59	-78 45 39
BBR3	Berkebile Run 50 meters below water authority road	40 06 57	-78 45 41
BBR4	Berkebile Run 200 meters below water authority road	40 06 54	-78 45 44
BBR5	Berkebile Run at Mouth	40 06 50	-78 45 50

Table 7

The Pennsylvania Fish and Boat Commission has surveyed Beaverdam Run for decades. Their sites may be found in Table 8.

Pennsylvania Fish and Boat Commission Fish Survey Sites						
Stream	**River Mile**	**Section**	**Site**	**Latitude (North)** DDMMSS	**Longitude (West)** DDMMSS	**Survey Year**
Beaverdam Run	0.1	2	0202	40 07 09	-78 47 50	1983, 1992
Beaverdam Run	1.3	2	0201	40 06 52	-78 46 44	1983, 1992
Beaverdam Run	1.5	2	0201	40 06 46	-78 46 32	1983
Beaverdam Run	2.51	1	0102	40 06 45	-78 45 26	1979, 1988
Beaverdam Run	2.93	1	0102	40 06 34	-78 45 18	1991
Beaverdam Run	3.1	1	0102	40 06 29	-78 45 15	1998-2004
Beaverdam Run	5.37	1	0101	40 05 16	-78 44 14	1979-2004
Berkebile Run	0.08	1		40 06 53	-78 45 48	2013

Table 8

For the creation of this document, the Conemaugh Valley Conservancy (CVC) considered SCWA/DEP monitoring sites and Pennsylvania Fish and Boat Commission (PFBC) survey sites, as well as tributaries to Beaverdam Run on which no data exist. CVC focused its attention on seven key sites throughout the watershed. These may be found in Table 9 or in Figure 32 on page 53.

Conemaugh Valley Conservancy Coldwater Conservation Plan Monitoring Sites							
Site Alias	**Description**	**Latitude (North)** DDMMSS	**Longitude (West)** DDMMSS	**Water Chemistry?**	**Data Logger?**	**Macro-invertebrate Survey?**	**Fish Survey?**
BDR-1	Beaverdam Run Mouth (PFBC Site 0202)	40 07 12.7	-78 47 51.9	Yes	Yes	Yes	Yes (by PFBC)
BDR-2	Beaverdam Run at first crossing under Shaffer Mountain Road (PFBC Site 0102)	40 06 47.5	-78 45 26.7	Yes	Yes	Yes	Yes
BDR-2.5	Beaverdam Run at the Trout Nursery	40 06 05.9	-78 44 02.0	Yes		Yes	
BDR-3	Beaverdam Run near origins, on Levar property (PFBC Site 0101)	40 05 16.9	-78 44 04.6	Yes	Yes	Yes	Yes
Berkebile	Berkebile Run, about 100 meters below limestone (UNT 45337)	40 06 55.9	-78 45 42.1	Yes		Yes	
BDR-B	Tributary 1	40 06 36.8	-78 45 20.0	Yes		Yes	
BDR-C	Tributary 2	40 06 24.8	-78 44 58.2	Yes		Yes	

Table 9

Beaverdam Run 3 (BDR-3)

This site is located the furthest upstream on the mainstem of Beaverdam Run. The site begins at a roadway culvert on Fleegle Road where, upstream of the culvert, Beaverdam Run is a braided stream channel, composed of multiple spring seeps and a very small-defined main channel. Below the culvert, Beaverdam Run has a larger, more defined channel and is no longer braided. Springs still provide cold water input to the mainstem, but they do not braid the mainstem channel.

Here, Beaverdam Run is surrounded by a thick forest with secondary and tertiary timber stands composed mostly of conifers with a few deciduous trees along the stream bank. The bottom substrate is composed of large rock and boulders with smaller cobble and sand filling the interstitial space between the larger rocks. Large pools are not common in this area; only one exists in the sampling reach. The stream flow is composed primarily of riffles and small runs. The predominant geologic input in this section is from the Mauch Chunk Formation and Burgoon Sandstone.

Beaverdam Run 2 (BDR-2)

This site is located in the middle reaches of the mainstem of Beaverdam Run. It is heavily forested and possesses a complete riparian buffer. The stream is more defined here than at BDR-3, and riffle, run, and pool characteristics are evenly spread throughout the stream section. The substrate in this section is composed of diverse sizes ranging from sand to large boulders. Cobble composes the majority of the substrate. This area receives input from two small tributaries (BDR-B and BDR-C), multiple springs, and the largest tributary, Berkebile Run (UNT45337). Some inflowing waters, like Unnamed Tributary 1 (BDR-B), are acidic due to outcroppings of the Pottsville geology.

This section of Beaverdam Run is stocked by the local cooperative trout nursery as a put-and-take fishery.

Beaverdam Run 1 (BDR-1)

This site is located less than 200 meters upstream of the confluence of Beaverdam Run with Laurel Run. It consists of lower gradient riffles, deeper runs, and pools. The substrate is composed of small stones, fine sands, and cobble. The site is adjacent New Enterprise Stone and Lime Company, Inc. property, making regular visits for logger downloads and field chemistry more difficult, due to New Enterprise’s hours of operation and the need for personnel to sign-in at the office. The land adjacent to the stream is developed as a sand quarry and has had mining activity (Figure 6). The sand plant has several settling ponds and discharges (Figure 5). Some of the discharges are acidic, while some are slightly alkaline. The discharges seem to have no combined detrimental affects on chemistry or temperature in the mainstem of Beaverdam Run.

Berkebile Run

Berkebile Run (UNT45337) is the largest tributary to Beaverdam Run. The confluence of Berkebile Run and Beaverdam Run is located less than 500 meters downstream of Beaverdam Run Site 2. Berkebile Run begins as a low gradient stream that originates from several bogs. The natural characteristic of the stream is acidic due to the bogs and Pottsville geology. Berkebile Run is heavily forested and transitions into a high gradient, headwater stream composed of large rock cobble and sand in its lower reaches. The Shade Creek Watershed Association placed a limestone dose on Berkebile Run 300 meters upstream of its confluence with Beaverdam Run to add alkalinity to Beaverdam Run.

Beaverdam Run 2.5 (BDR-2.5)

This site was located on the mainstem of Beaverdam Run on property owned by the Beaverdam Run Trout Cooperative and Nursery. It is located between Beaverdam Run Sites 3 and 2 (Figure 27). The nursery's discharge is downstream of the actual sample location. The buffer is complete and forested except for the area around the trout nursery that is mowed and has a few farm animals. The stream substrate mimics the substrate found at Beaverdam Run Site 2. Beaverdam Run Site 2.5 consists of riffles and runs, much like Beaverdam Site 3. The stream channel here is well defined.

Unnamed Tributary 1 (BDR-B)

This is a first-order, unnamed tributary to Beaverdam Run. It is a high gradient stream with a shallow channel and flows through predominantly Pottsville geology, making it naturally acidic. This tributary may go dry during the heat of summer or flow below the surface.

Unnamed Tributary 2 (BDR-C)

This unnamed tributary exhibits the same physical characteristics as the other unnamed tributary except that its surrounding geology is not as acidic. The riparian buffer is heavily forested and has the same channel definition as Unnamed Tributary 1 (BDR-B).

Figure 25. Unnamed Tributary 2 flows into Beaverdam Run.

Other Sites

CVC collected field chemistry from a few other sites throughout the Beaverdam Run Watershed, as shown in Table 10 and on Figure 27. Field chemistry results may be found in entirety in Appendix 2.

Other CVC Water Monitoring Sites			
Site	**Site Alias**	**Latitude (North)** DDMMSS	**Longitude (West)** DDMMSS
Beaverdam Before Confluence with Berkebile	MP1	40 06 51.8	-78 45 47.6
Berkebile Run Below Limestone Pile at Mouth	MP2	40 06 51.6	-78 45 48.0
Berkebile Run Above Limestone Pile	MP3	40 06 59.2	-78 45 38.0
Bog Tributary A	MP4	40 06 54.3	-78 45 42.7
Bog Tributary B	MP5	40 06 54.4	-78 45 42.8
Berkebile Tributary 1	MP6	40 06 57.4	-78 45 37.2
Spring at Mile Marker SR1018 - 90	MP7	40 06 29.2	-78 45 00.1
Spring in Woods at Tom's	MP8	40 06 30.1	-78 44 13.5
Tom's Pond Effluent	MP9	40 06 35.0	-78 44 00.7
Tributary beside Tom's Pond (Pond Influent)	MP10	40 06 34.0	-78 43 59.6

Table 10

Limestone Dosing

To combat the chronic acidification of waterways in the Shade Creek Watershed, the Shade Creek Watershed Association (SCWA) secured a Chapter 105 Water Obstruction and Encroachment permit from the PA DEP to begin "limestone dosing," in which crushed or powdered limestone, with a high-calcium carbonate content, is added to streams in select locations. In 2004, SCWA placed three tri-axles of 3/8th anti-skid material from the Ashcom Mine in Bedford on the banks of Berkebile Run, adjacent an access road, about 1/3 down its length. In 2008, the Cambria Somerset Authority donated sixteen hours of labor and a skid steer to push 60 tons of limestone into Berkebile Run. In 2010, 23 tons of "sand mound sand" from Con-Stone in Bellefonte was delivered to Berkebile Run (Hutchinson).

Figure 26. Limestone pile on Berkebile Run.

The low flow and low gradient of Berkebile Run allows much of the limestone to remain in the streambed. Field chemistry acquired by the CVC in 2012 and 2013 show that Berkebile Run has an average pH of 5.2 and an alkalinity of < 4 mg/L above the limestone pile and an average pH of 6.3 and an alkalinity of 11 mg/L below the pile. The pH and alkalinity do progressively increase towards the mouth of Berkebile Run, as the water has more time to react with the limestone.

In 2008, SCWA dumped 23 tons of "glass stone #2" from the Graymont plant in Pleasant Gap along the banks of Beaverdam Run. Please see Figure 27 for locations.

The Beaverdam Run Trout Club and Cooperative Nursery applies about five to ten ton of 2B limestone dust every spring about a quarter-mile upstream of its nursery (Wojcik).

Water Quality

The Pennsylvania Code's Title 25, Chapter 93 Water Quality Standards designates Beaverdam Run from its source near Daley to River Mile 1.93 as a High Quality Coldwater Fishery and Beaverdam Run from River Mile 1.93 to its mouth as a coldwater fishery (Figure 27). The High Quality designation affords Beaverdam Run special protections when authorities review zoning changes and permit applications. As a coldwater fishery, the state indicates that Beaverdam Run can support the maintenance and/or propagation of fish species including the Salmonidae family and other flora and fauna indigenous to a coldwater habitat.

CVC installed three data loggers in the mainstem of Beaverdam Run. These Solinst Leveloggers LTC data loggers are set to acquire a stream's water level, temperature and conductivity every 15 minutes. They are downloaded about every two weeks, at which time field readings of pH, conductivity, Total Dissolved Solids, and temperature are obtained using a Hanna All-in-One Combo Meter. Alkalinity and Chloride measurements are also acquired using LaMotte field kits. Tables of the field data may be found in Appendix 2.

Through its Data Logger Program, funded primarily by the Colcom Foundation, CVC hired Geochemical Testing, a private, state-certified lab in Somerset, Pennsylvania to collect and analyze water samples from Beaverdam Run Sites 1, 2 and 3. Geochemical obtained these samples on August 7, 2012 and November 19, 2012. Complete results may be found in Appendix 3.

The water quality results were compared to determine the effects of acid deposition on the buffering capacity of Beaverdam Run. These data will be used to determine where and how much treatment is needed to restore the buffering capacity in Beaverdam Run.

As previously mentioned, the Shade Creek Watershed Association routinely samples five stream monitoring sites in the Beaverdam Run Watershed, and, in partnership with the Pennsylvania Department of Environmental Protection (PA DEP), occasionally collects a water sample for analysis by the PA DEP's Bureau of Laboratories. These data may be found in Appendixes 1 and 4.

The following is a brief explanation of the most commonly measured water quality parameters.

pH

This is the measure of hydrogen ions in solution. The pH scale is 0-14. A pH of 7 is neutral, while numbers less than 7 indicate an acidic substance and numbers above 7 are basic or alkaline. The lower the number, the more acidic the water, while the higher the number, the more alkaline. pH is a logarithmic scale, meaning every whole number increase is an increase by a power of ten. Water with a pH of 5 is 10 times more acidic that water with a pH of 6. Water with a pH of 4 is 100 times more acidic than water with a pH of 6. Low and high pH values can break down tissue and dissolve metals. These metals can create an osmotic imbalance in the respiratory systems of aquatic life. Water quality standards listed in Chapter 93 of Title 25 in Pennsylvania Code indicates pH should be between 6.0 and 9.0.

Temperature

Temperature directly affects many water chemistry parameters. Water is most dense at 4 degrees Celsius. At this density, water cannot dissolve as high of volume of material as it can when it is warm and less dense. Warm water can affect the rate of biological processes and cause lactic acid build-up in coldwater species.

Conductivity

Conductivity is the measure of how well water conducts electricity. The higher the conductivity reading, the better the water is at conducting electricity. Conductivity is affected by many components: metals, salts, organics, high calcium, biological processes, sediment, etc. Pure (distilled or deionized) water has a conductivity reading of zero while Marcellus Shale flowback water has a conductivity that can exceed 80,000 uS/cm.

Total Dissolved Solids (TDS)

TDS are the direct contributor to conductivity. TDS measures the material that, when dry, would be a solid, but due to the water’s chemistry, is in solution. The higher the TDS reading, the higher the conductivity reading; the amount of TDS is approximately 65% of the conductivity. PA Code states TDS should not exceed 500 mg/L for a monthly average or a maximum of 750 mg/L.

Water Level

Water level is very important for determining if pollution episodes are episodic (caused by rain or snowmelt) or chronic (always present). This factor, combined with conductivity, can determine if the increase in conductivity is natural or manmade.

Alkalinity

Alkalinity is the capacity of water to neutralize or buffer acidity, so the more alkalinity, the better. The capacity is caused by the water's content of carbonate, bicarbonate, or hydroxide. It measures how much acid can be added to a liquid without causing a great change in pH. PA Code states a minimum of 20 mg/L of alkalinity is preferred unless levels are naturally less.

Iron

Iron is the most abundant metal found in abandoned mine drainage, and some geologic formations are naturally high in iron. While iron is low in toxicity, it can embed a stream bottom and diminish or destroy macroinvertebrate communities. PA Code states a maximum of 0.3 mg/L of dissolved iron is permitted in streams.

Aluminum

Aluminum is also commonly found in abandoned mine drainage, and it is the most abundant metal in the earth. When it is dissolved, it is very toxic and is a limiting factor in aquatic communities. Dissolved aluminum shuts down fish and macroinvertebrate respiratory systems. Streams with aluminum concentrations greater than 0.5 mg/L, and in some instances, even greater than just 0.3 mg/L, can kill aquatic life.

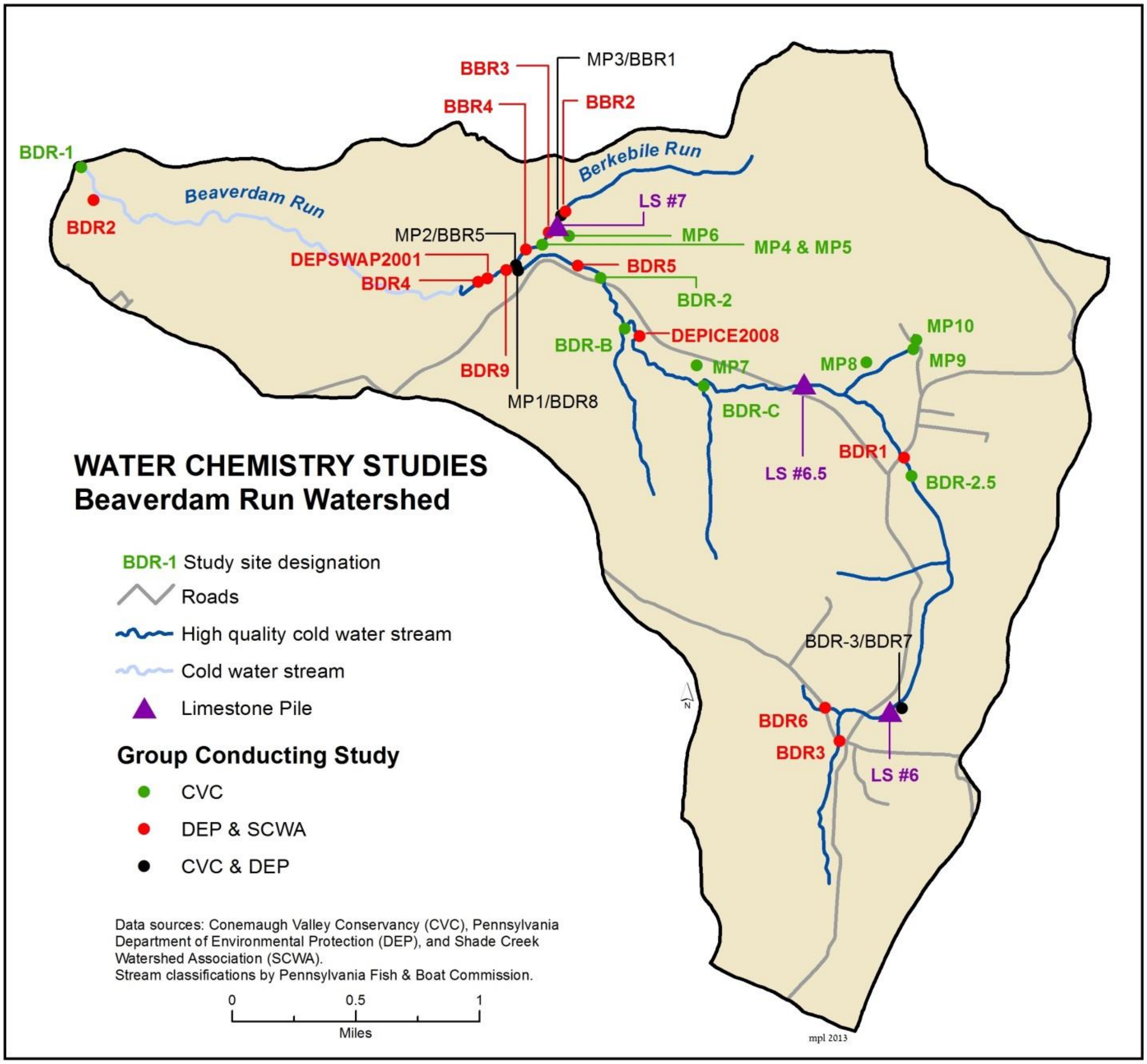


Figure 27

Beaverdam Run 3

The Pennsylvania Fish and Boat Commission (PFBC) field data from 1979 to 2004 indicate an alkalinity of 7-16 mg/L, while the CVC field data from 2012-2013 range from 12 to 34 mg/L and averages 21 mg/L. Testing by Geochemical showed an alkalinity of 24 mg/L in the summer and 9 mg/L in the fall. The pH of this site in all chemistry collections was never lower than 6.1, while field conductivity ranged from 33 to 129 uS/cm. The laboratory analyses indicate low metal concentrations, as shown in Table 11.

The chemistry of this site indicates that it has potential for its natural buffering capacity to be stressed by large acid deposition episodes.

BDR 3 – Select Lab Results		
	Summer 2012	**Fall 2012**
Alkalinity	24 mg/L	9 mg/L
pH	7.39	7.14
Conductivity	70 uS/cm	51 uS/cm
Iron	0.05 mg/L	0.07 mg/L
Aluminum	< 0.1 mg/L	N/A

Table 11

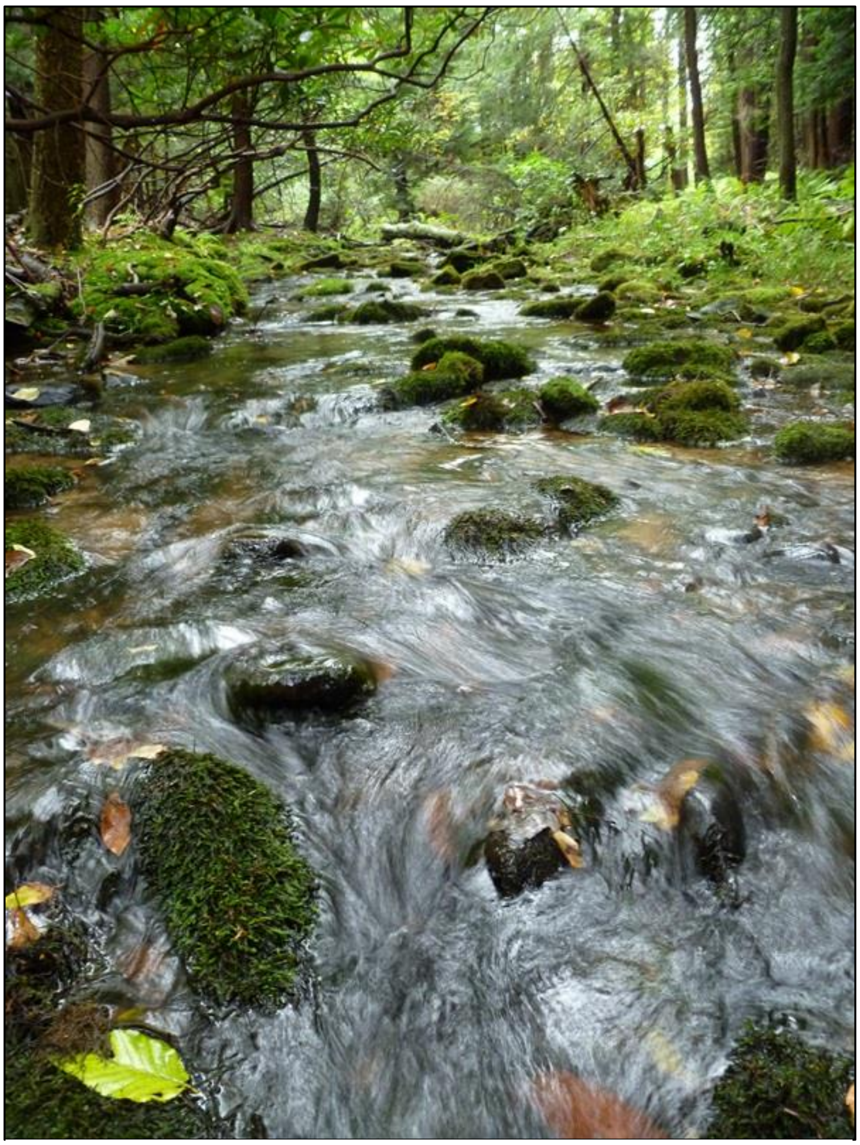
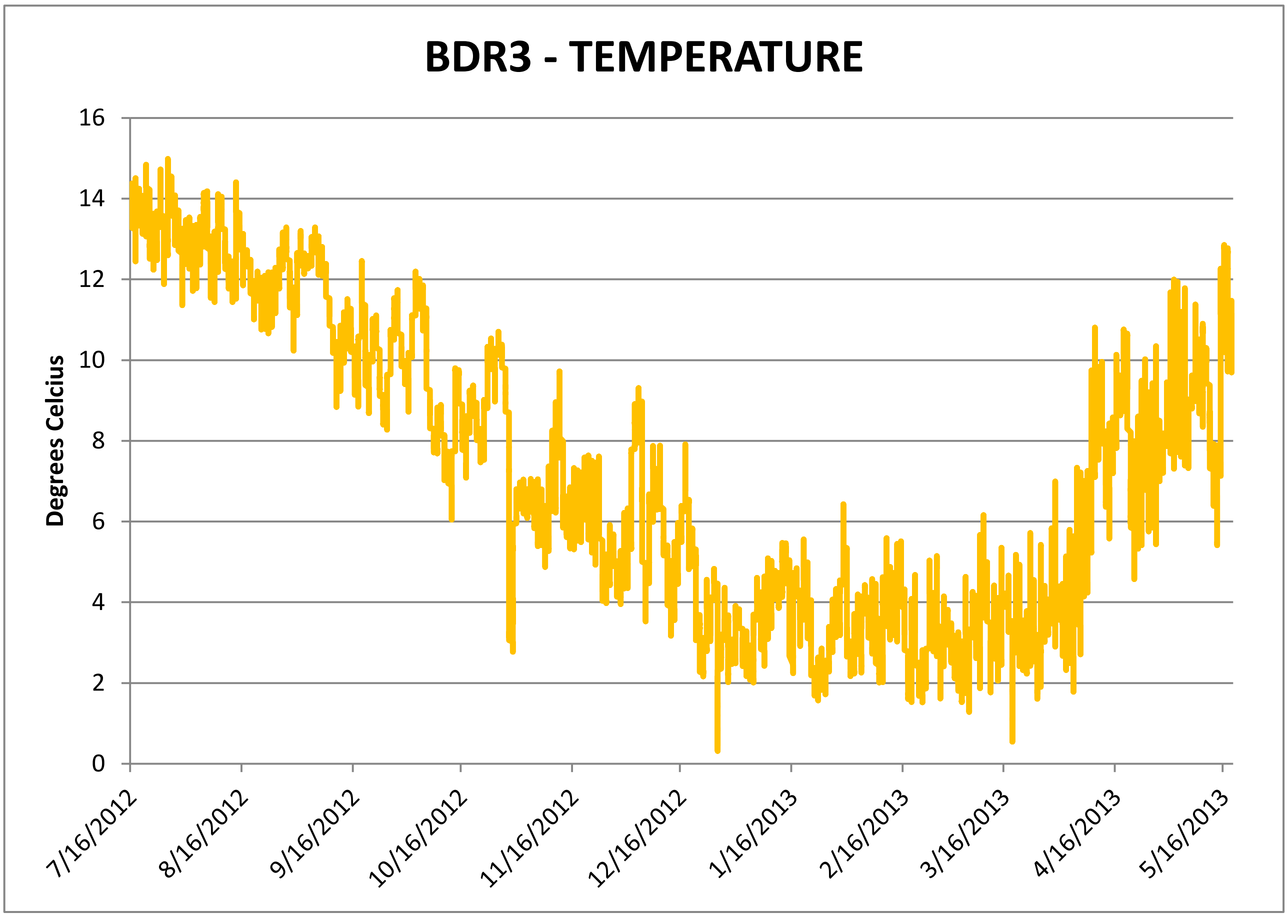


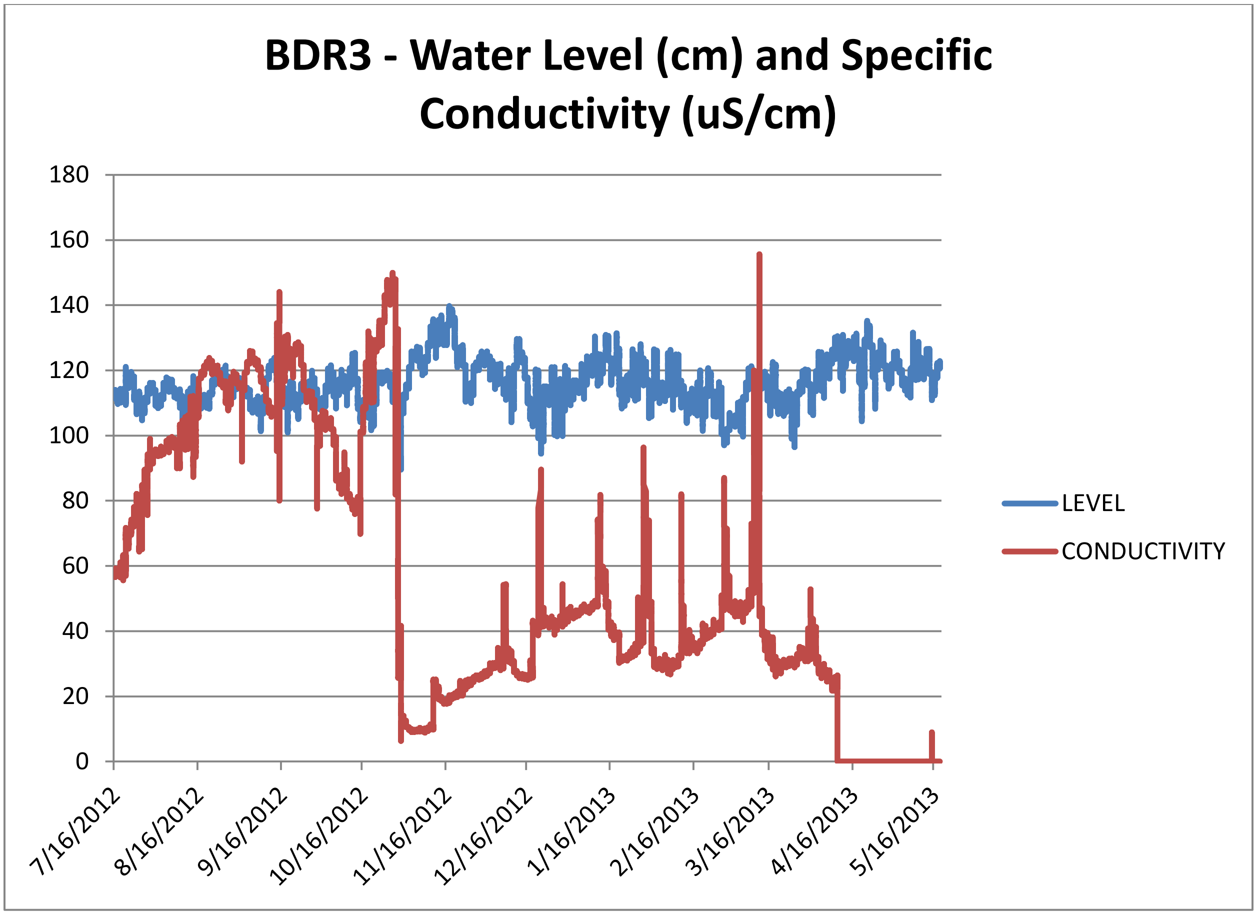
Figure 28. Beaverdam Run Site 3

The data logger data collected at this site indicate that winter conductivities range from 50 uS/cm and below, while summer conductivities range from 60-130 uS/cm, with a couple of peaks in the fall and spring. The summer increase is due to the increased solubility for dissolved ions in warmer water. The highest conductivity recorded was 155.6 in March 2013. The following graphs show some conductivities of zero. This is because the data logger has an error bar of +/- 20 uS/cm and it is not uncommon for Beaverdam Run to have a conductivity, in winter, of less than 20 uS/cm.

From July 16, 2012 through May 16, 2013, the stream 24-hour temperature remained below 14.8° Celsius (58.6° Fahrenheit).



Graph 1



Graph 2

Beaverdam Run 2

PFBC field data from 1979 to 2004 indicate alkalinity ranging from 6 to18 mg/L; pH values ranging from 6.3 to 7.1; and conductivity measurements ranging from 48 to 85 uS/cm. The CVC field chemistry acquired in 2012 and 2013 indicate alkalinity ranging from 8 to 28 mg/L; pH values ranging from 6.0 to 8.5; and conductivity measurements between 34 and 99 uS/cm. Table 12 shows some of the laboratory analysis results.

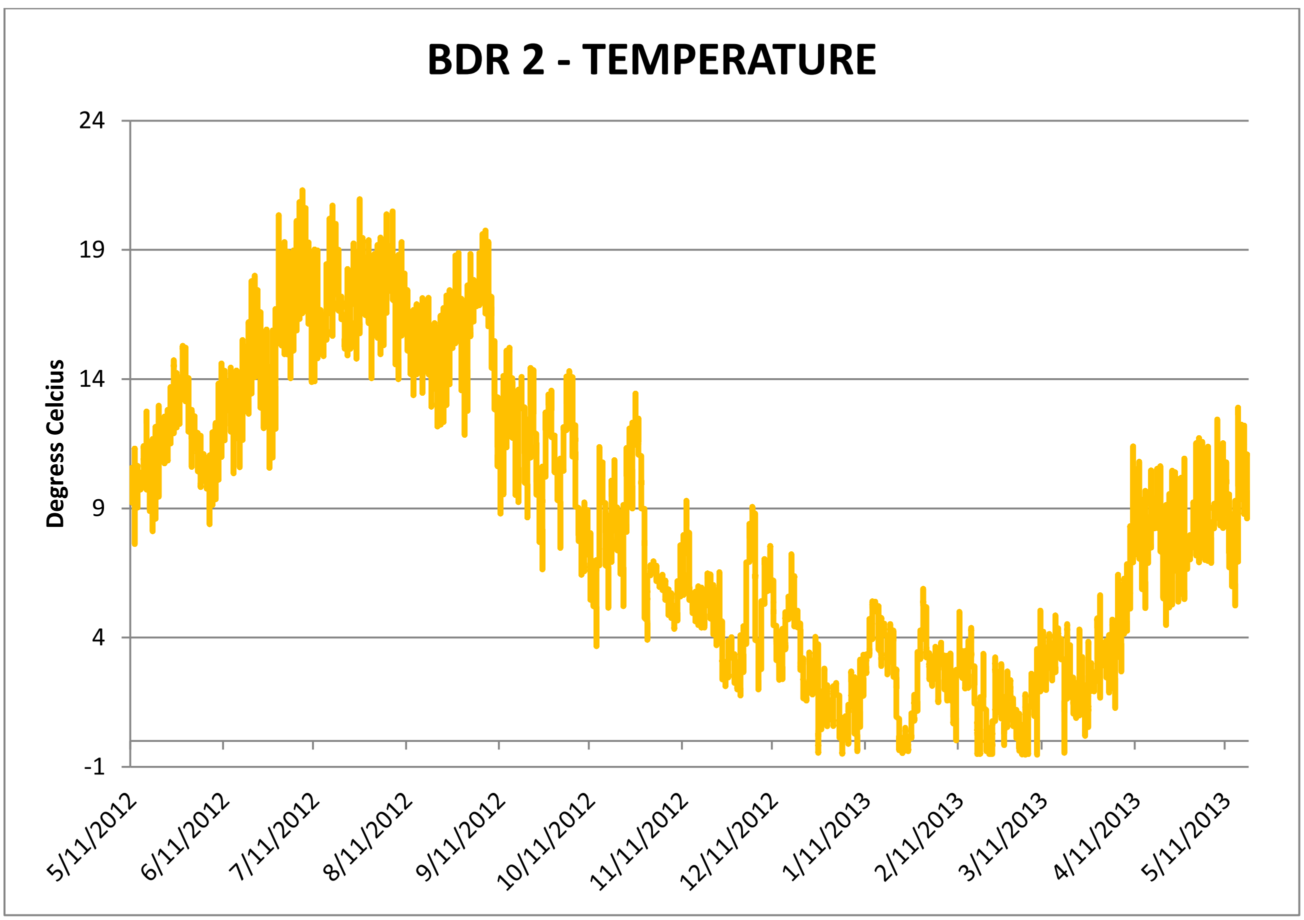
This area of Beaverdam Run was very low in metal concentrations and consistently yielded alkalinities below 20 mg/L. This site is more prone to acid deposition than Site 3.

BDR 2 – Select Lab Results		
	Summer 2012	**Fall 2012**
Alkalinity	18 mg/L	8 mg/L
pH	7.44	7.04
Conductivity	67 uS/cm	48 uS/cm
Iron	0.08 mg/L	0.09 mg/L
Aluminum	< 0.1 mg/L	N/A

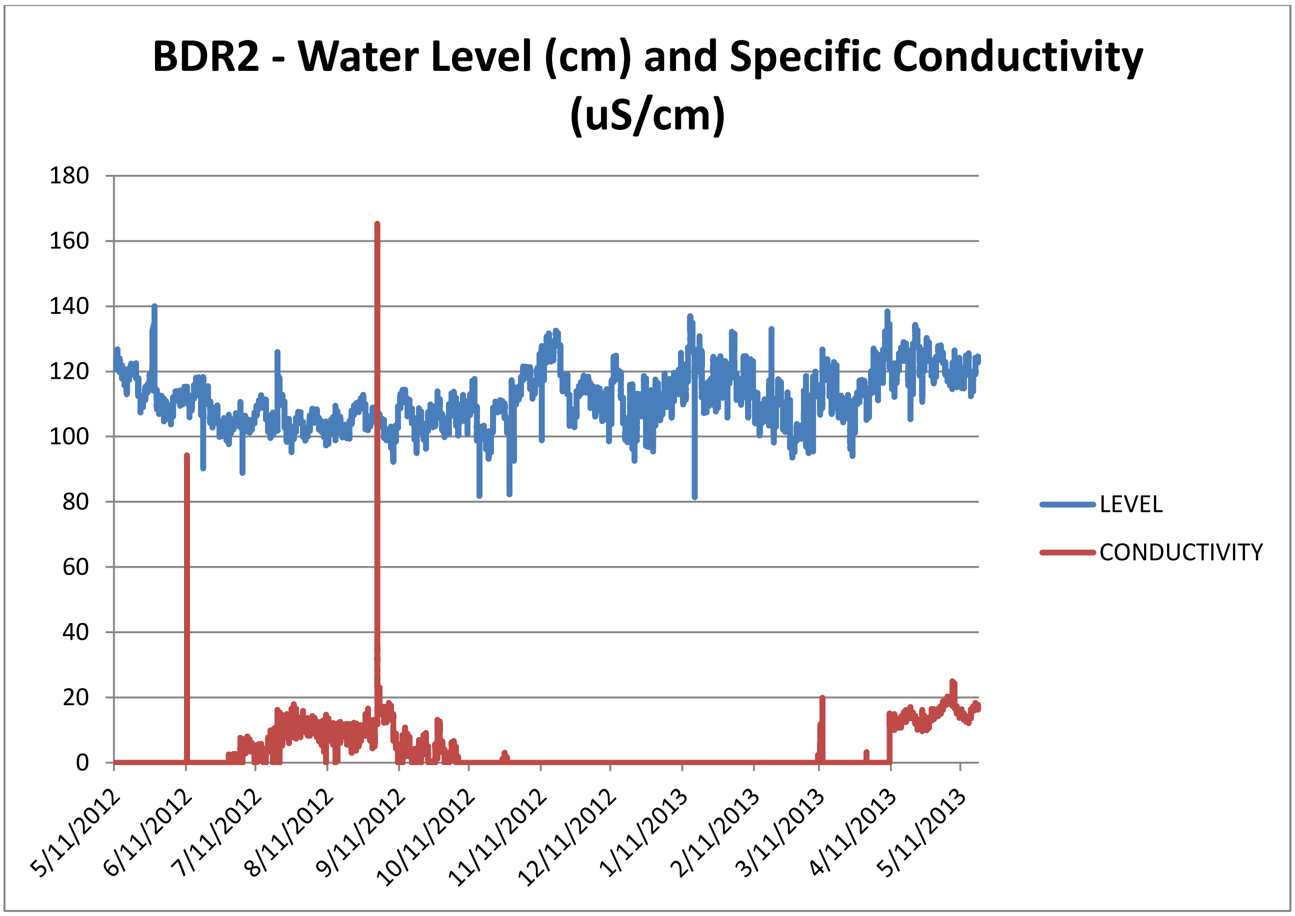
Table 12

The conductivity readings collected from the data logger were less than 25 us/cm throughout the year, except for two rapid spikes that occurred in June and September 2012. Both spikes lasted several hours but did not exceed 160 uS/cm. The small agricultural and residential areas in this area of the watershed could account for the spikes.

From May 2012 through May 2013, the stream 24-hour temperature remained below 22° Celsius (71.6° F) throughout the year.



Graph 3



BDR2 - Water Level (cm) and Specific Conductivity (uS/cm)
180
160
140
120
100
80
60
40
20
0
5/11/2012
6/11/2012
7/11/2012
8/11/2012
9/11/2012
10/11/2012
11/11/2012
12/11/2012
1/11/2013
2/11/2013
3/11/2013
4/11/2013
5/11/2013
LEVEL
CONDUCTIVITY

Graph 4

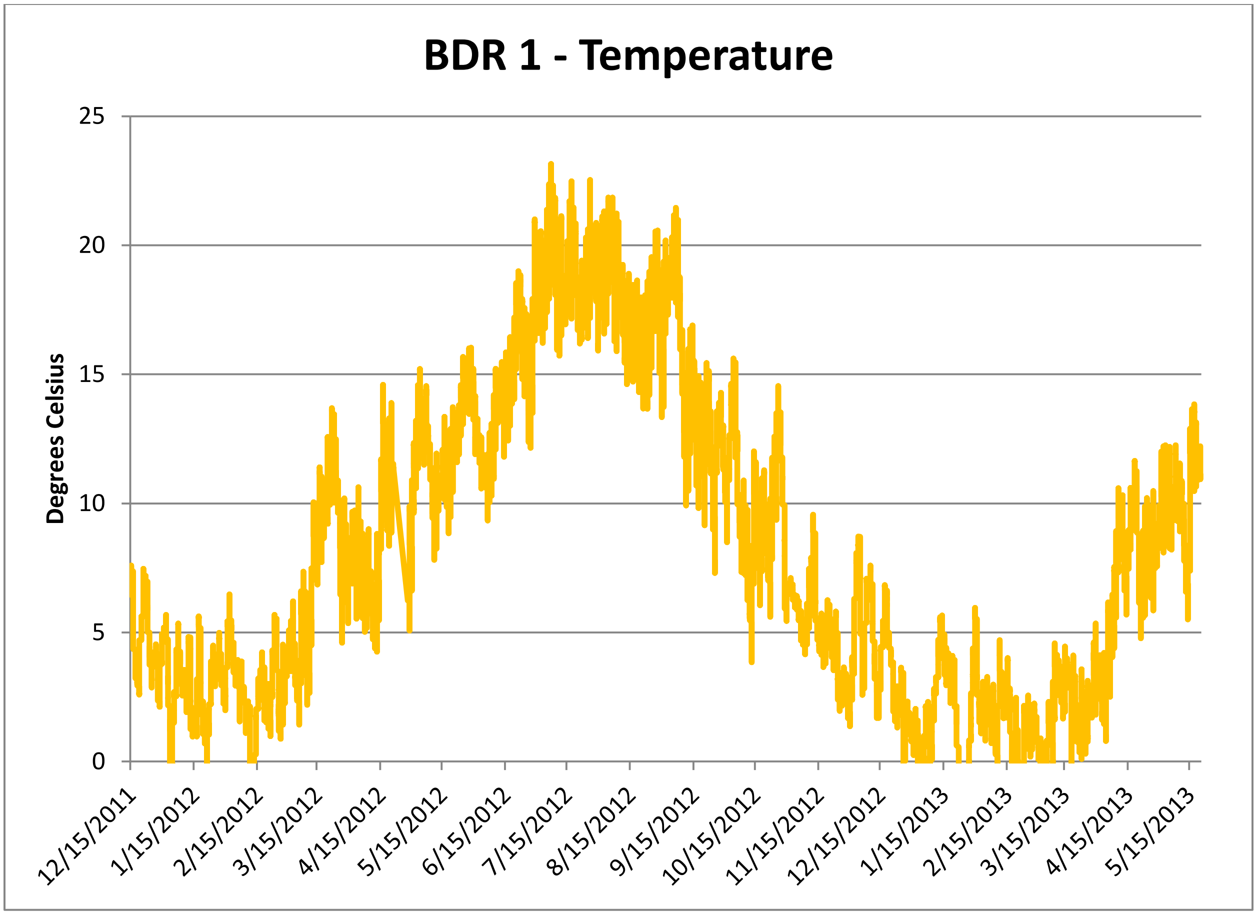
Beaverdam Run 1

The PFBC collected three sets of field chemistry from this site since 1983. The alkalinity in these samples ranged from 2 to 8 mg/L; pH ranged from 6.5 to 6.9; and conductivity ranged between 40 and 50 uS/cm. The CVC field chemistry in 2012 and 2013 showed alkalinity from 8 to 28 mg/L; pH of 6.0 to 8.5; and conductance of 28 to 66 uS/cm. Table 13 shows Geochemical Testing results.

BDR 1 – Select Lab Results		
	Summer 2012	**Fall 2012**
Alkalinity	13 mg/L	< 5 mg/L
pH	7.29	6.89
Conductivity	60 uS/cm	43 uS/cm
Iron	0.16 mg/L	0.06 mg/L
Aluminum	< 0.1 mg/L	N/A

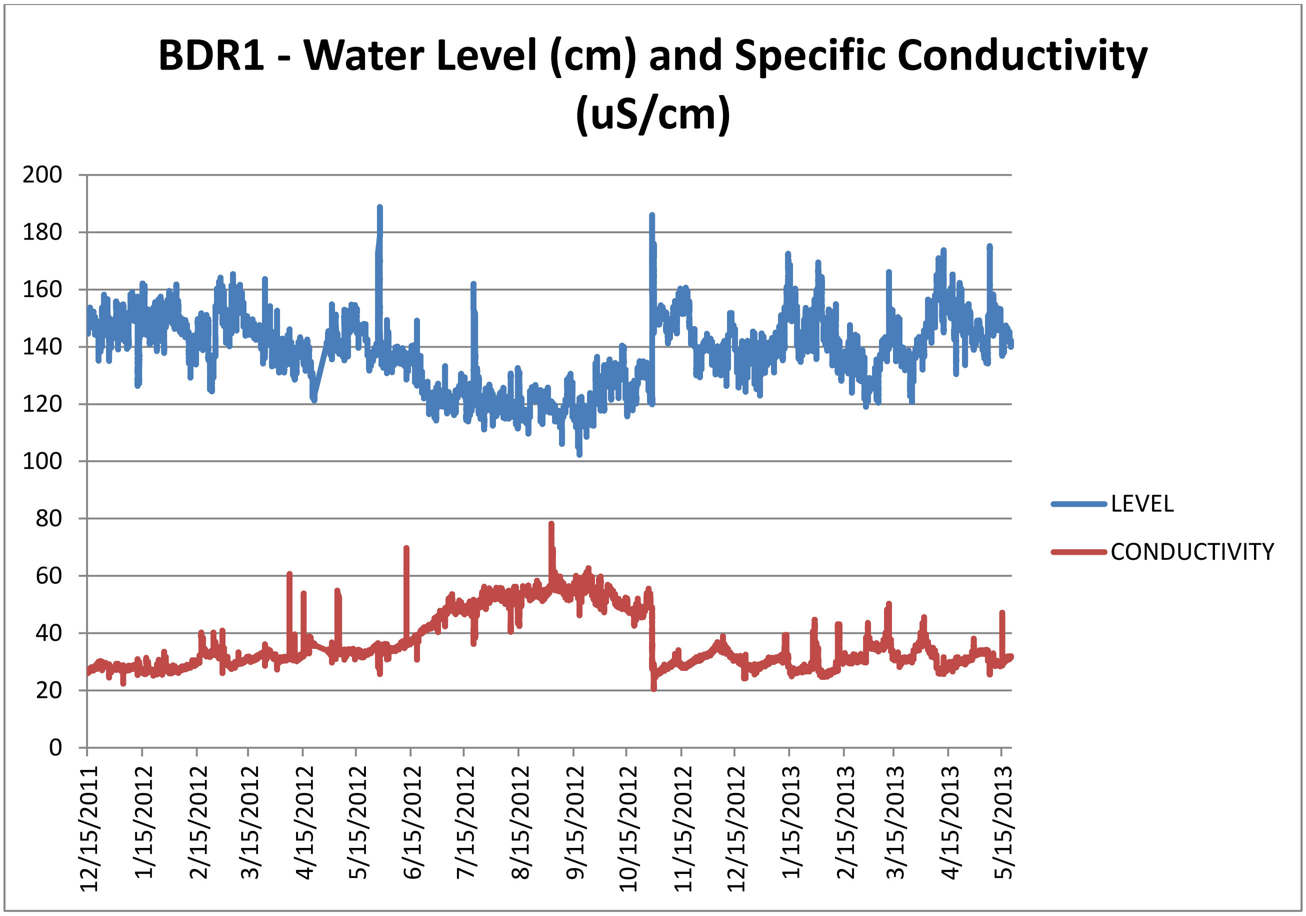
Table 13

The logger data indicated a very consistent conductivity that ranges between 25 and 80 uS/cm and temperatures that remained below 24° Celsius (75.2° F) throughout the year (December 2011 through May 2013).



Graph 5

Figure 29. PFBC's Mike Depew, Rick Lorson, and Joe Cocco survey Beaverdam Run near its mouth at PFBC Site 0202.



Graph 6

Berkebile Run

CVC collected field chemistry on several occasions both above and below the limestone sand dose on Berkebile Run. The alkalinity above the dose averaged 4 mg/L, while below the dose it ranged from 4 to 24 mg/L. The pH upstream of the dose ranged from 4.6 to 6.0, while downstream of the dose the pH ranged from 5.3 to 7.4. The conductivity above the dose never exceeded 21 and below the dose it did not exceed 40 uS/cm.

Beaverdam Run 2.5

CVC collected field chemistry samples here in the spring and fall of 2012. The alkalinity ranged from 20 to 24 mg/L; pH was 6.9; and conductivity ranged from 44 to 73 uS/cm.

Unnamed Tributary 1 (BDR-B)

The field chemistry collected by CVC indicated acidic geology, which is a trait of the Pottsville Formation. Alkalinity ranged from 0 to 12 mg/L; pH was 4.8 to 6.7; and conductivity ranged from 15 to 76 uS/cm.

Unnamed Tributary 2 (BDR-C)

CVC collected field chemistry samples here in the spring and fall of 2012. Results indicated mildly acidic geology with an alkalinity ranging from 12 to 16 mg/L; pH of 6.6 to 6.7; and conductivity from 22-36 uS/cm.

Other Sites

Beaverdam Run before its confluence with Berkebile Run (MP1) had an average pH of 6.45 and an average alkalinity of 13 mg/L from December 2012 through April 2013.

The pH and alkalinity in Berkebile Run increases from the limestone pile down to its mouth. Berkebile Run is a low gradient stream and so much of the limestone stays in the streambed, even during high flow periods; it never reaches the mouth, allowing for more reaction time. At its mouth (MP2), Berkebile Run averages a pH of 6.1 and an alkalinity of twelve or less. Berkebile Run above the limestone (MP3) averages a pH of 5.2 and an alkalinity of four or less.

A small, unnamed tributary that is not even marked on most maps parallels Berkebile Run and flows through a bog, breaking into two branches as it does so. Bog Tributary A (MP4) and Bog Tributary B (MP5) eventually confluence just before they enter Berkebile Run downstream of the limestone dose. Bog Tributary B tends to be slightly more acidic than Bog Tributary A and has a larger flow. CVC sampled this tributary to Berkebile Run (MP6) before it flowed under the water authority's dirt access road and before it entered the bog. This tributary averages a pH of 4.6 and an alkalinity of 4 or less, making it slightly more acidic than the mainstem of Berkebile Run. In the first half of 2013, it had an average conductivity of 21 uS/cm.

In December 2012 and April 2013, CVC sampled a spring just a few meters south of Shaffer Mountain Road at Mile Marker SR1018-90. It had an average pH of 6.5, an average conductivity of 92 uS/cm, and an average alkalinity of 18 mg/L.

Higher in the watershed, CVC sampled the influent and effluent of Mr. Tom Gorden's pond, which is fed by a spring and a small tributary to Beaverdam Run that flows through the Central City Sportsmen's Club pond. The spring confluences with the tributary about two meters before Tom's pond. After this confluence, a pipe in the stream pulls water into Tom's pond. CVC occasionally sampled the outfall of this pipe (the influent of the pond). More often, CVC sampled the stream beside the pond (MP10), so there was better mixing of the spring and tributary and flow could be obtained in a defined channel. This site is MP10. MP9, the effluent of the pond, is taken from a pipe that crosses under Tom's driveway. MP9, the effluent of Tom's pond, had a pH that ranged from 5.8 to 6.3, an alkalinity of 8 to 12 mg/L, and a conductivity of 16 to 62 uS/cm during CVC's sampling from December 2012 through June 2013. MP10, the tributary that feeds the pond, had a pH of 4.9 to 6.3, alkalinity of 4 to 12 mg/L, and conductivity of low teens in the winter to upper 30s in the spring and summer.

Figure 30. Central City Sportsmen's Club Pond

Macroinvertebrates

Figure 31. Larry Hutchinson bags macroinvertebrates collected for identification.

Macroinvertebrates were collected by CVC from seven sites in the Beaverdam Run watershed (see Table 9 on page 33 and Figure 32). These sites were sampled in spring 2012 and fall 2012. Four sites were located on the mainstem of Beaverdam Run and the remaining three were located on small, unnamed tributaries to Beaverdam Run, though the one tributary is locally known as Berkebile Run. Macroinvertebrates were collected using a 0.3 m^2 Surber Sampler to collect five subsamples from across a riffle area in each site, according to United States Environmental Protection Agency 1999 *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers*. Macroinvertebrates were preserved in the field using 70% isopropyl alcohol and transported to the CVC Aquatic Biologist for enumeration and identification to the lowest taxonomic level practicable, usually the genus level. The macroinvertebrates for each site were pooled to run various metrics on the samples.

The metrics used for the Beaverdam Run survey were the Hilsenhoff Biotic Index (HBI), percent Ephemeroptera, Plecoptera, and Tricoptera (EPT), taxa richness, mean diversity, percent dominant taxa, and total individuals collected. Graphs displaying the results of these metrics may be found on pages 57-62.

The **HBI** assigns a score value to each taxon. A taxon is an individual classification of a living organism. The value reflects the tolerance to organics that the taxon possesses – the higher the value, the higher the tolerance to organic loading. Scores of 4.0 or higher indicate organic loading may be present. These scores are inserted into an equation that weights the individual scores and determines a total score for the site.

The **percent EPT** measures the mayfly (*Ephemeroptera*), stonefly (*Plecoptera*), and caddisfly (*Trichoptera*) taxa in the sample. The higher the percent EPT, the better the water quality. EPT percentages over 50 are desirable, though higher is better.

The **taxa richness index** measures the total number of individual taxa collected in a sample. The more taxa, the better the diversity the sample will possess, thereby indicating better water quality, so the higher the number, the better.

The **mean diversity index** measures how well balanced the distribution of taxa in the community is. The more balanced the community distribution, the better the water quality. Mean diversity scores of 2.0 or higher indicate a good diversity.

Percent dominant taxa determines if the dominant taxa in the sample is a tolerant or intolerant taxa. Percent dominant taxa should be less than 30%.

The **total individuals** collected can determine the type of pollution that is present in the stream by the decrease or increase in the number of individuals. Higher numbers are not necessarily good, as the sample could have been dominated by one taxa.

The Pennsylvania Department of Environmental Protection has also surveyed macroinvertebrates at several sites in the Beaverdam Run Watershed as shown in Figure 31. These data may be found in Appendix 6.

The following discussion, table and graphs are based upon CVC's macroinvertebrate surveys.

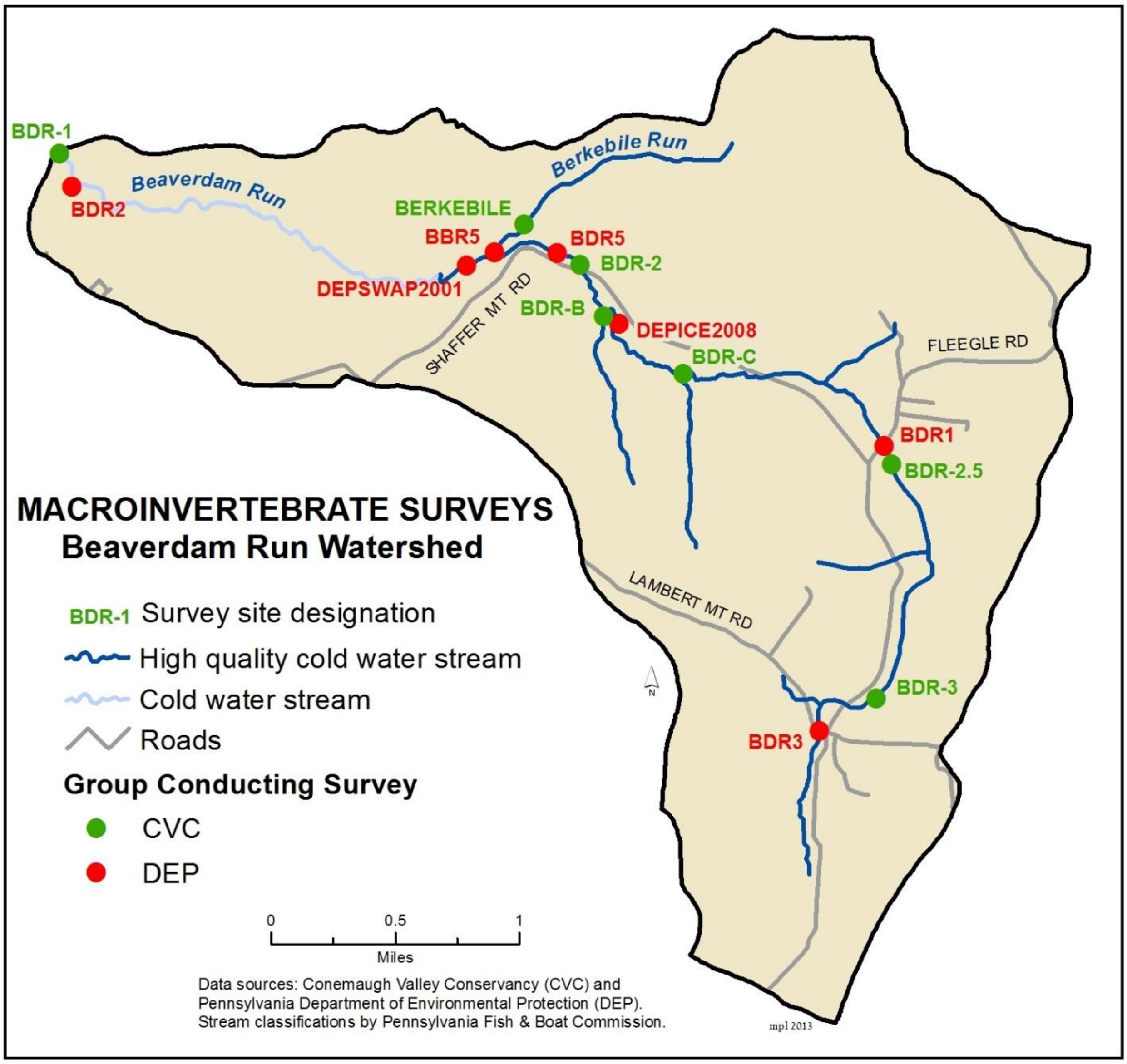


Figure 32

CVC Macroinvertebrate Metrics Results							
		HBI	% EPT	Total Taxa	Mean Diversity	% Dominant Taxa
Preferred score		< 4.0	> 50	high	> 2.0	< 30
Beaverdam Run 3	Spring	3.98	66	18	2.39	23
	Fall	4.10	63	25	2.82	13
Beaverdam Run 2	Spring	4.11	75	27	2.44	24
	Fall	4.24	77	33	2.47	31
Beaverdam Run 2.5	Spring	3.71	80	23	2.33	36
	Fall	3.74	26	19	1.84	49
Beaverdam Run 1	Spring	3.66	97	22	1.21	71
	Fall	3.66	76	23	2.77	18
Berkebile Run	Spring	3.53	72	15	1.54	49
	Fall	4.30	81	13	2.45	22
Unnamed Trib 2	Spring	2.89	94	19	2.09	29
	Fall	3.72	53	22	2.51	22
Unnamed Trib 1	Spring	3.20	87	15	1.52	54
	Fall	3.35	85	14	2.17	22

Table 14

Beaverdam Run 3

Benthic macroinvertebrate samples collected by CVC in spring and fall 2012 yielded healthy results. All metrics for both seasons scored high, though HBI scores were around 4. The total taxa and total individuals collected were not indicative of an infertile headwater freestone stream. Both of these metrics attained high values in both seasons. The dominant taxa collected were *Prosimula* (Blackfly), *Epeorus* (Quill Gordon/Pink Cahill), *Cheumatopsyche* (Sedge caddis), *Chironomidae* (Midge), *Tipula* (Cranefly), and *Peltoperla* (Roachfly). All of these taxa can tolerate mild acid impacts as long as the metals in solution are very limited.

Beaverdam Run 2

Benthic macroinvertebrate samples collected in spring and fall 2012 by CVC indicate good water quality. The HBI scores were slightly elevated beyond the preferred 4.0, while mean diversity remained above 2.0. EPT taxa were above 70% composition and total individuals collected rose to over 600 in both the spring and fall. Total taxa collected were greater than 25 and the percent dominant species collected was 24% in the spring and 31% in the fall. The dominant taxa were composed of *Ephemerella* (Sulphur), *Baetis* (Blue-winged olive), and *Chironomidae* (Midge). These taxa can tolerate acidic conditions as long as dissolved metal concentrations are low.

Figure 33. A giant stonefly found at Beaverdam Run 2.

This site was the most biologically diverse site in the watershed.

Beaverdam Run 1

The benthic macroinvertebrate samples collected by CVC in 2012 indicated a diverse community. The mean diversity value was low at 1.21 in the spring, but this was due to the dominant taxa being *Ephemerella* (Sulphur). Over 300 individuals of *Ephemerella* were collected. The percent composition of EPT taxa was over 70%, while the HBI scores were 3.66 in both the spring and fall, indicating little organic input. Total individuals ranged from 162 in the fall to 473 in the spring, and total taxa were 22 in the spring and 23 in the fall.

Berkebile Run

The macroinvertebrate collections indicate a stressed community. The mean diversity of the community was 1.54 in spring and 2.45 in fall 2012; 2.0 is preferred. Diversity in the spring is typically the highest diversity. This was not the case at Berkebile Run. The dominant taxa in the spring, *Amphinemura*, composed 49 percent of the total spring sample. *Amphinemura* is an acid tolerant stonefly nymph. Total taxa ranged from 13 in the fall to 15 in the spring. The percent composition of EPT was high (72-81%) but was dominated in both the spring and fall by acid tolerant taxa.

Berkebile Run exhibits typical infertile headwater stream metrics, with the addition of being dominated by acid tolerant EPT taxa.

Beaverdam Run 2.5

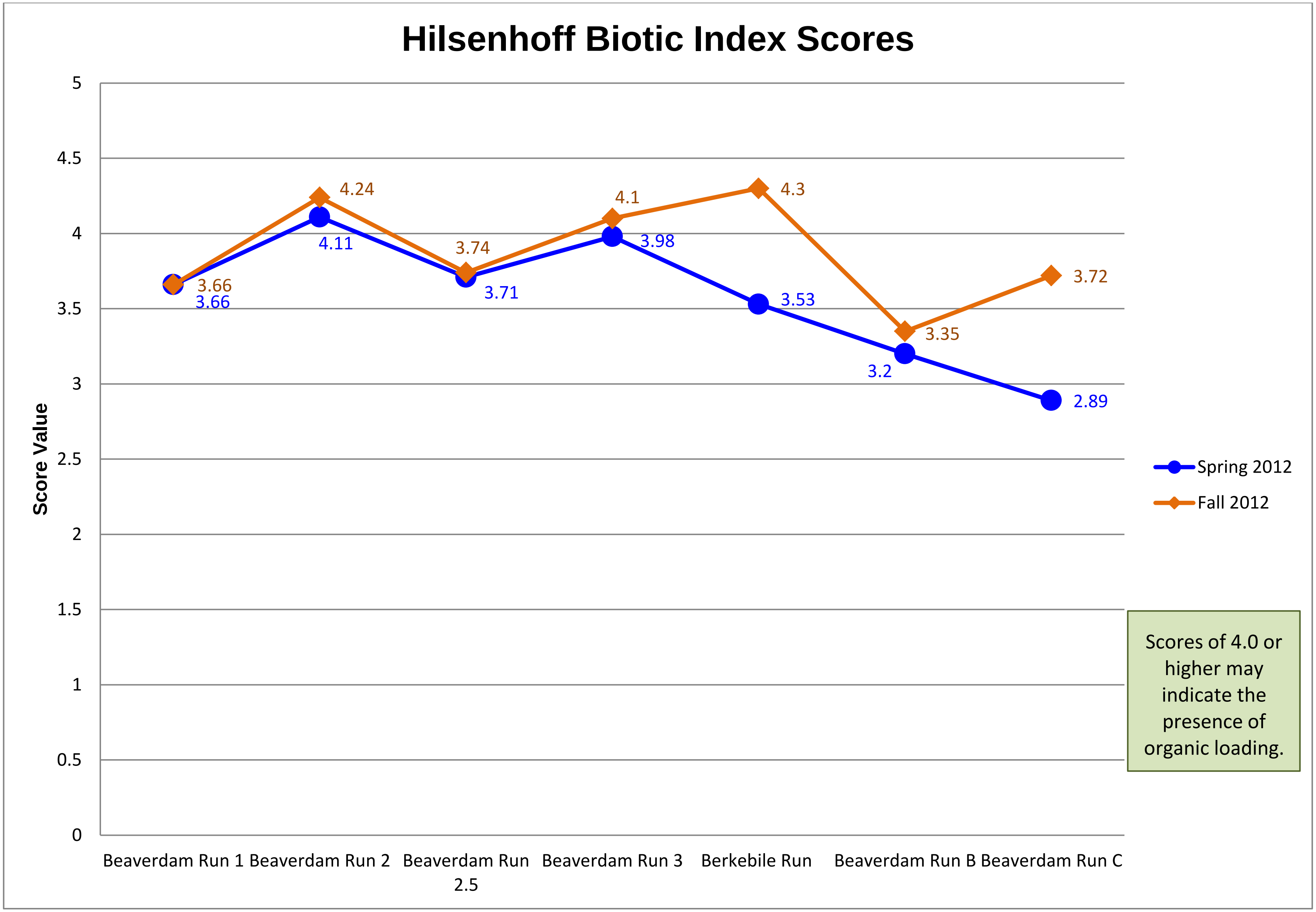
The diversity in the fall benthic macroinvertebrate community at this site was a little low at 1.84, with the dominant taxa being *Optioservus* (Riffle beetle). The dominant taxa in the spring was *Ephemerella* (Sulphur). The percent dominant taxa was higher than the preferred 30 at 49% in the fall and 36% in the spring. The percent EPT taxa was low at 26% in the fall for this site, but high at 80% in the spring. Other metrics indicate a good macroinvertebrate community.

Unnamed Tributary 1

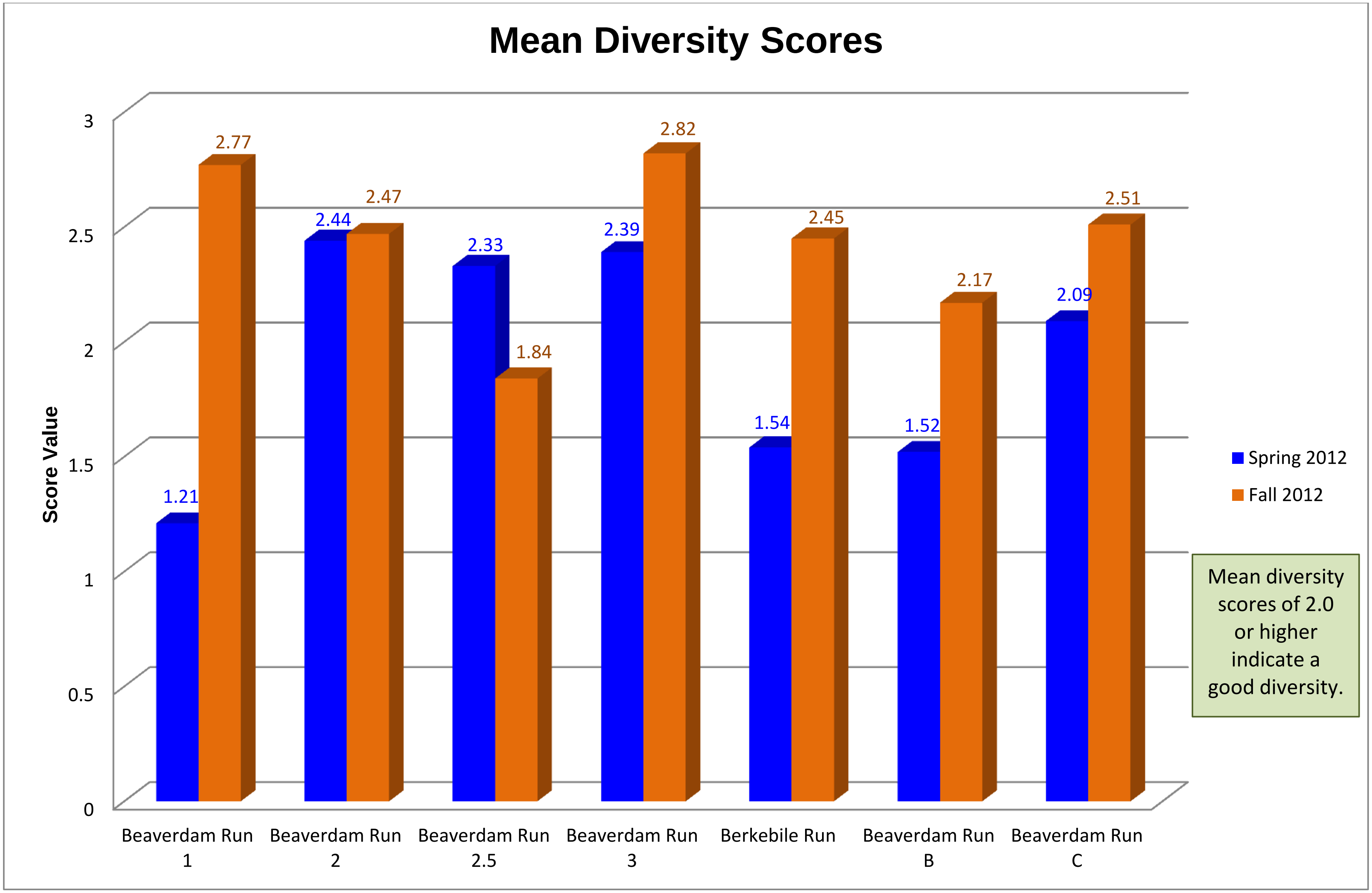
The benthic macroinvertebrate community in this tributary (**BDR-B**) exhibits acid impacts. The dominant taxa are acid tolerant stoneflies, and the diversity is low in the spring. EPT percentages are high, but they are composed of predominantly acid tolerant taxa. The acid tolerant taxa flourish in spring with *Amphinemura* (an acid tolerant stonefly) composing 54% of the 303 individuals collected in spring 2012.

Unnamed Tributary 2

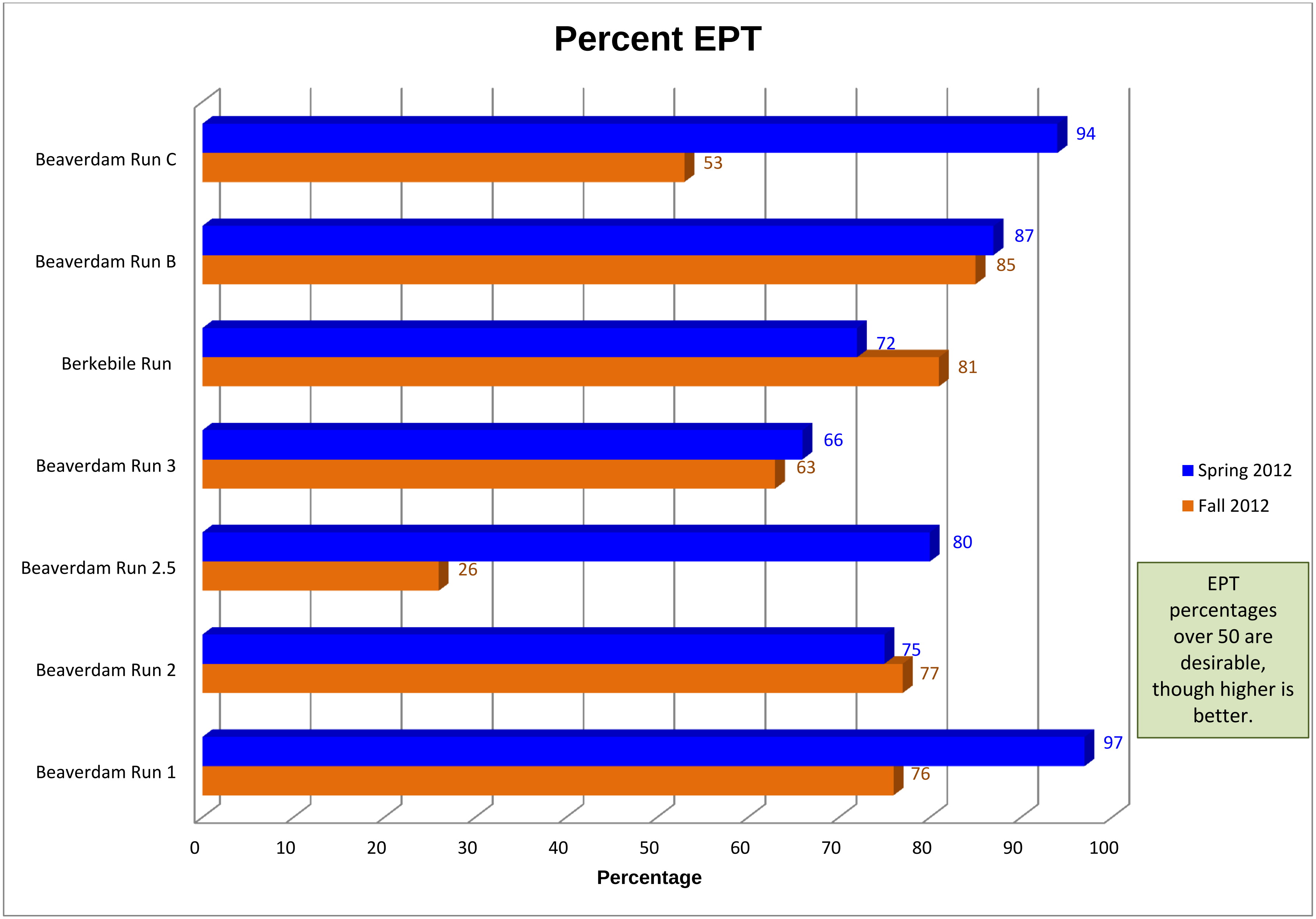
The benthic macroinvertebrate community in Tributary 2 (**BDR-C**) is excellent. All metrics indicate outstanding water quality due to the lack of acid geology.


Hilsenhoff Biotic Index Scores
Score Value
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4.24
4.11
3.74
4.1
3.98
4.3
3.66
3.66
3.71
3.53
3.72
3.35
3.2
2.89
Spring 2012
Fall 2012
Scores of 4.0 or higher may indicate the presence of organic loading.
Beaverdam Run 1
Beaverdam Run 2
Beaverdam Run 2.5
Beaverdam Run 3
Berkebile Run
Beaverdam Run B
Beaverdam Run C

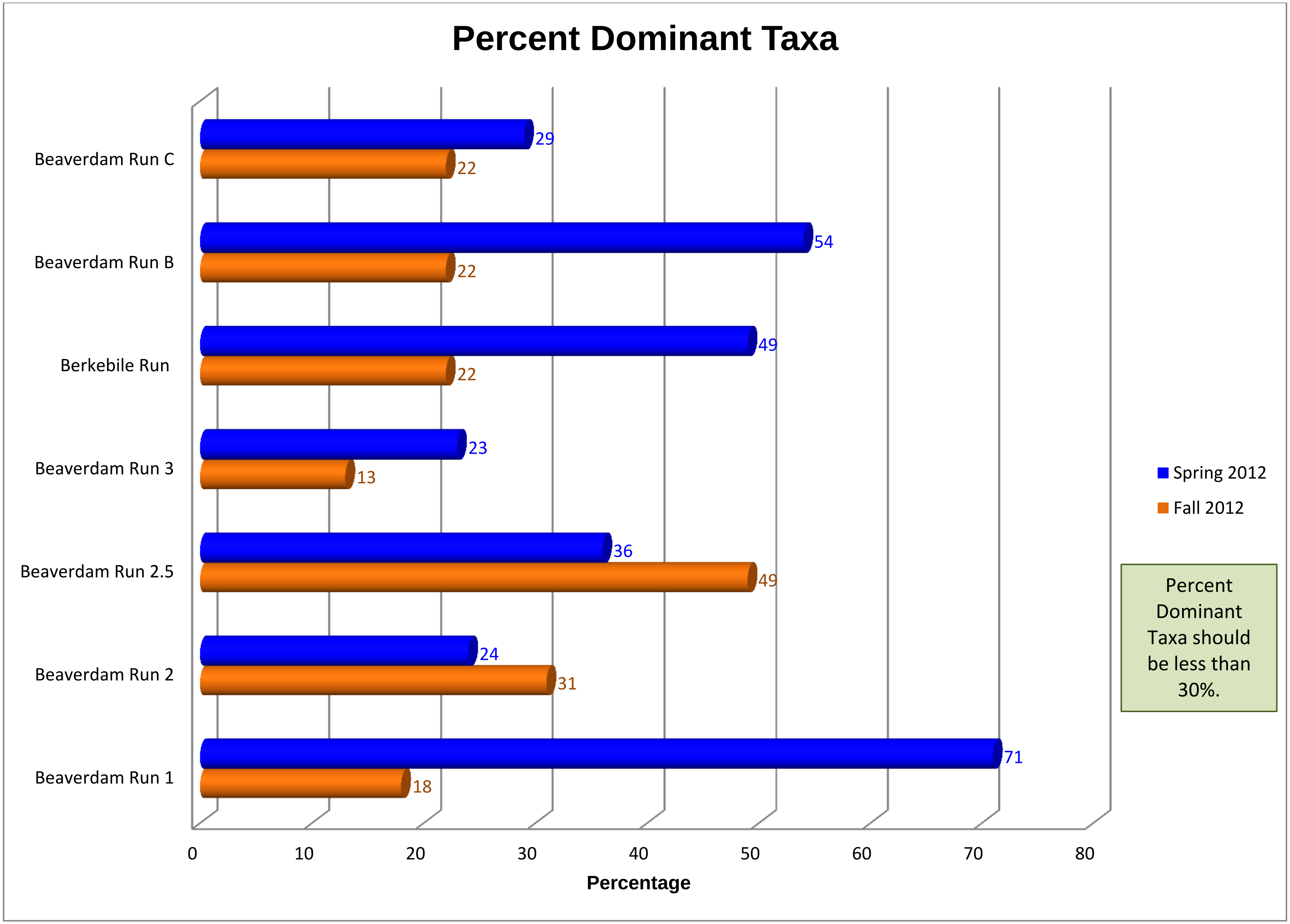
Graph 7


Mean Diversity Scores
Score Value
0
0.5
1
1.5
2
2.5
3
1.21
2.77
2.44
2.47
2.33
1.84
2.39
2.82
1.54
2.45
1.52
2.17
2.09
2.51
Beaverdam Run 1
Beaverdam Run 2
Beaverdam Run 2.5
Beaverdam Run 3
Berkebile Run
Beaverdam Run B
Beaverdam Run C
Spring 2012
Fall 2012
Mean diversity scores of 2.0 or higher indicate a good diversity.

Graph 8

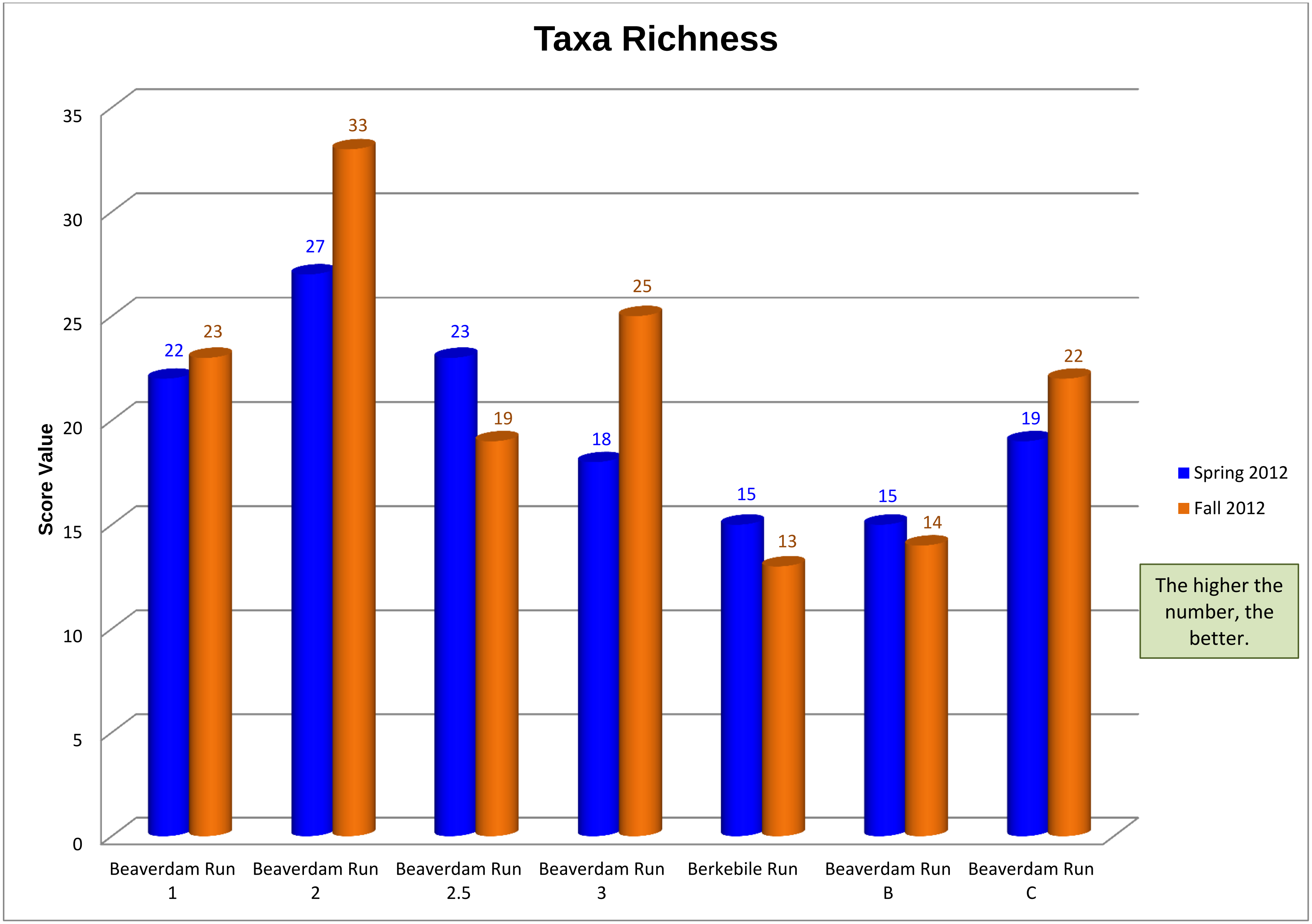

Percent EPT
Beaverdam Run C
Beaverdam Run B
Berkebile Run
Beaverdam Run 3
Beaverdam Run 2.5
Beaverdam Run 2
Beaverdam Run 1
94
53
87
85
72
81
66
63
80
26
75
77
97
76
0
10
20
30
40
50
60
70
80
90
100
Percentage
Spring 2012
Fall 2012
EPT percentages over 50 are desirable, though higher is better.

Graph 9

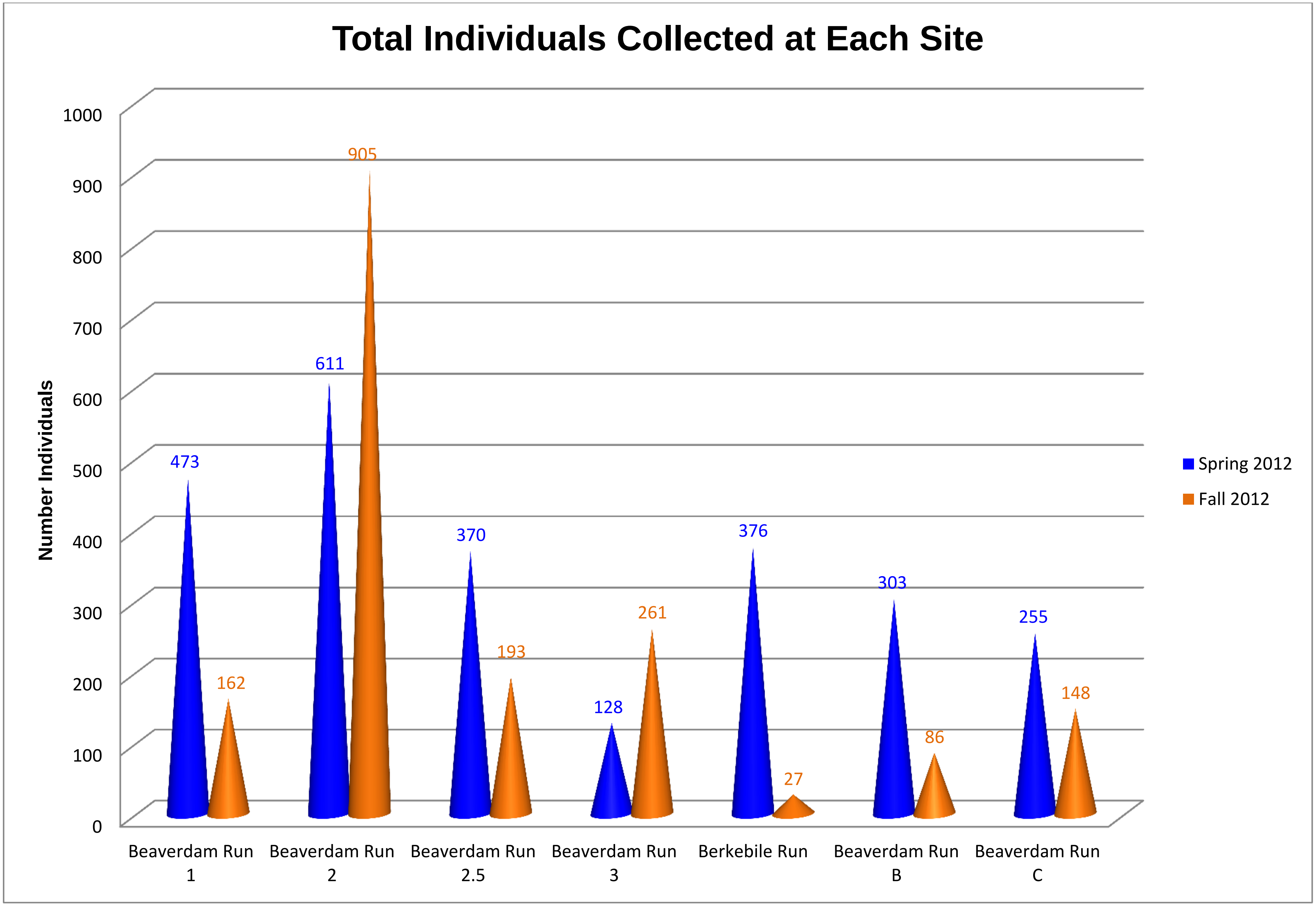


Percent Dominant Taxa
Beaverdam Run C
29
22
Beaverdam Run B
54
22
Berkebile Run
49
22
Beaverdam Run 3
23
13
Beaverdam Run 2.5
36
49
Beaverdam Run 2
24
31
Beaverdam Run 1
71
18
0
10
20
30
40
50
60
70
80
Percentage
Spring 2012
Fall 2012
Percent Dominant Taxa should be less than 30%.

Graph 10


Taxa Richness
Score Value
35
30
25
20
15
10
5
0
22
23
27
33
23
19
18
25
15
13
15
14
19
22
Beaverdam Run 1
Beaverdam Run 2
Beaverdam Run 2.5
Beaverdam Run 3
Berkebile Run
Beaverdam Run B
Beaverdam Run C
Spring 2012
Fall 2012
The higher the number, the better.

Graph 11


Total Individuals Collected at Each Site
Number Individuals
1000
900
800
700
600
500
400
300
200
100
0
473
162
611
905
370
193
128
261
376
27
303
86
255
148
Beaverdam Run 1
Beaverdam Run 2
Beaverdam Run 2.5
Beaverdam Run 3
Berkebile Run
Beaverdam Run B
Beaverdam Run C
Spring 2012
Fall 2012

Graph 12

Fish

In 2012, fish were sampled in four sites on the mainstem of Beaverdam Run. The Conemaugh Valley Conservancy (CVC) and Pennsylvania Fish and Boat Commission (PFBC) each surveyed two sites.

CVC partnered with Dr. William Kimmel, Professor Emeritus at California University of Pennsylvania, to conduct surveys of Beaverdam Run Sites 2 and 3 (PFBC sites 0102 and 0101 respectively) on September 17, 2012. These two sites were the furthest upstream sites of the survey. Both sites have historically been surveyed by the PFBC since 1979 and were last monitored by PFBC in 2004.

CVC used a Direct Current Smith Root backpack electrofishing unit to collect the fish samples at these two sites. The sampling method used was a multi-pass population assessment (Zippin) method to determine the population of wild trout at these two sites. The wild and hatchery trout collected were measured to the nearest half centimeter, enumerated, and returned to the stream. Stations located at these sites were 100 meters and incorporated riffle, run, and pool areas. Three passes of the 100-meter sites were used to estimate the population of wild trout in this area. Fish were identified to species level and measured to the nearest centimeter in the field, then returned to the stream.

The PFBC surveyed two sites on the mainstem of Beaverdam Run on June 11, 2012. These sites were located within PFBC Section 02. Site 0201 is below the Central City Reservoir. Site 0202 is near the mouth of Beaverdam Run and corresponds to CVC Site 1.

The PFBC used an alternating current backpack electrofishing unit to collect the samples from a 200-meter section of stream. PFBC used a Peterson Method for most of their recent samplings to assess the wild trout biomass. Historically, the PFBC used the Zippin method to measure the wild trout populations. Since then, the PFBC developed a calculation/ratio of the biomass collected in the first pass of a Zippin survey and related it to the mark and recapture method biomass. PFBC performed the calculation on CVC data to make a direct comparison of biomass collected in all sampling sites.

CVC surveyed fish in Berkebile Run in September 2012 using a 100-meter single pass method to assess the presence of wild trout in Berkebile Run. The wild brook trout collected were measured to the nearest half centimeter, enumerated, and returned to the stream. These trout data were also run through the PFBC calculation for comparison to the other sites sampled. The DEP surveyed Berkebile Run on May 17, 2012.

Figure 34. Blacknose Dace were common in the watershed.

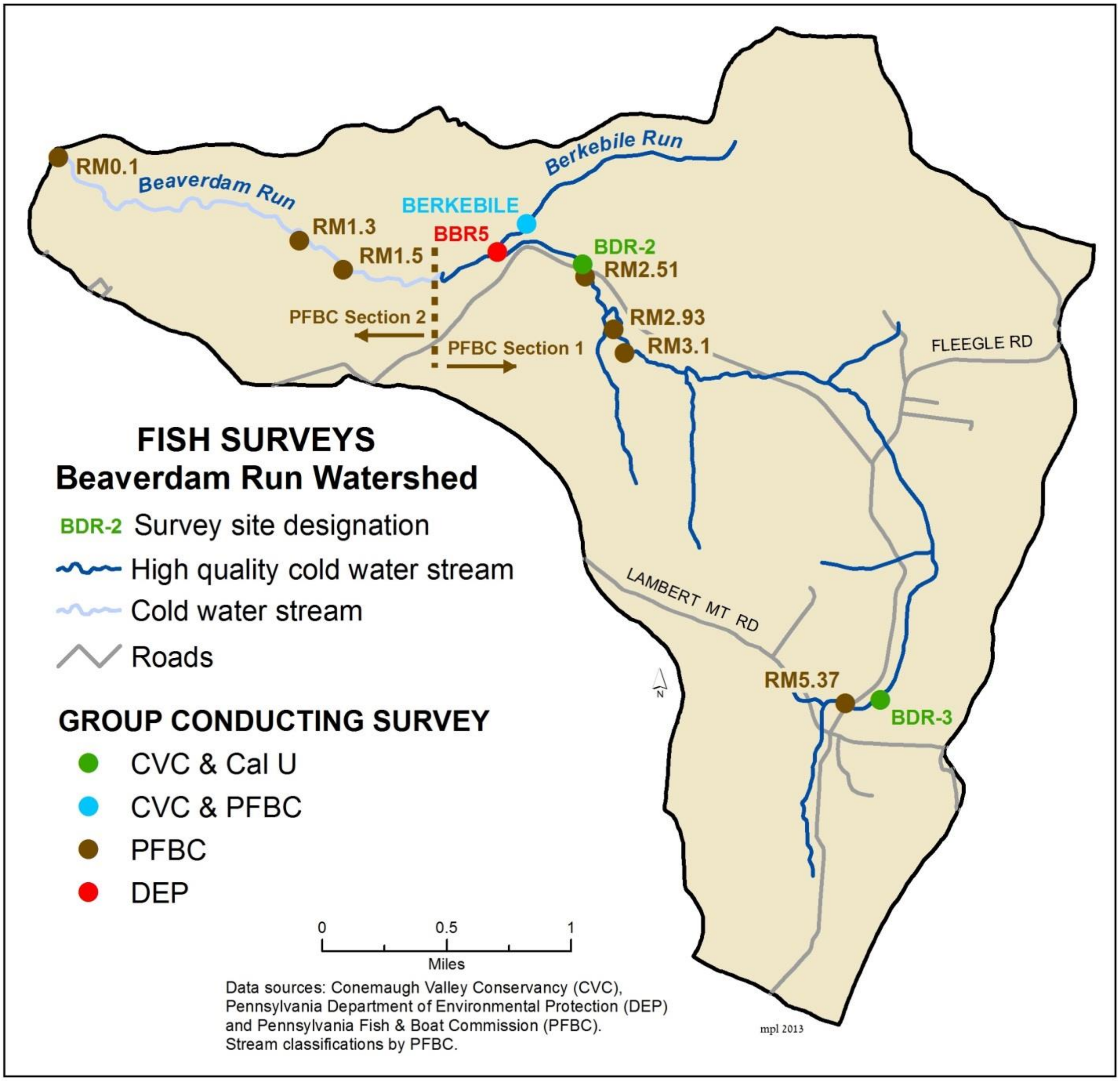
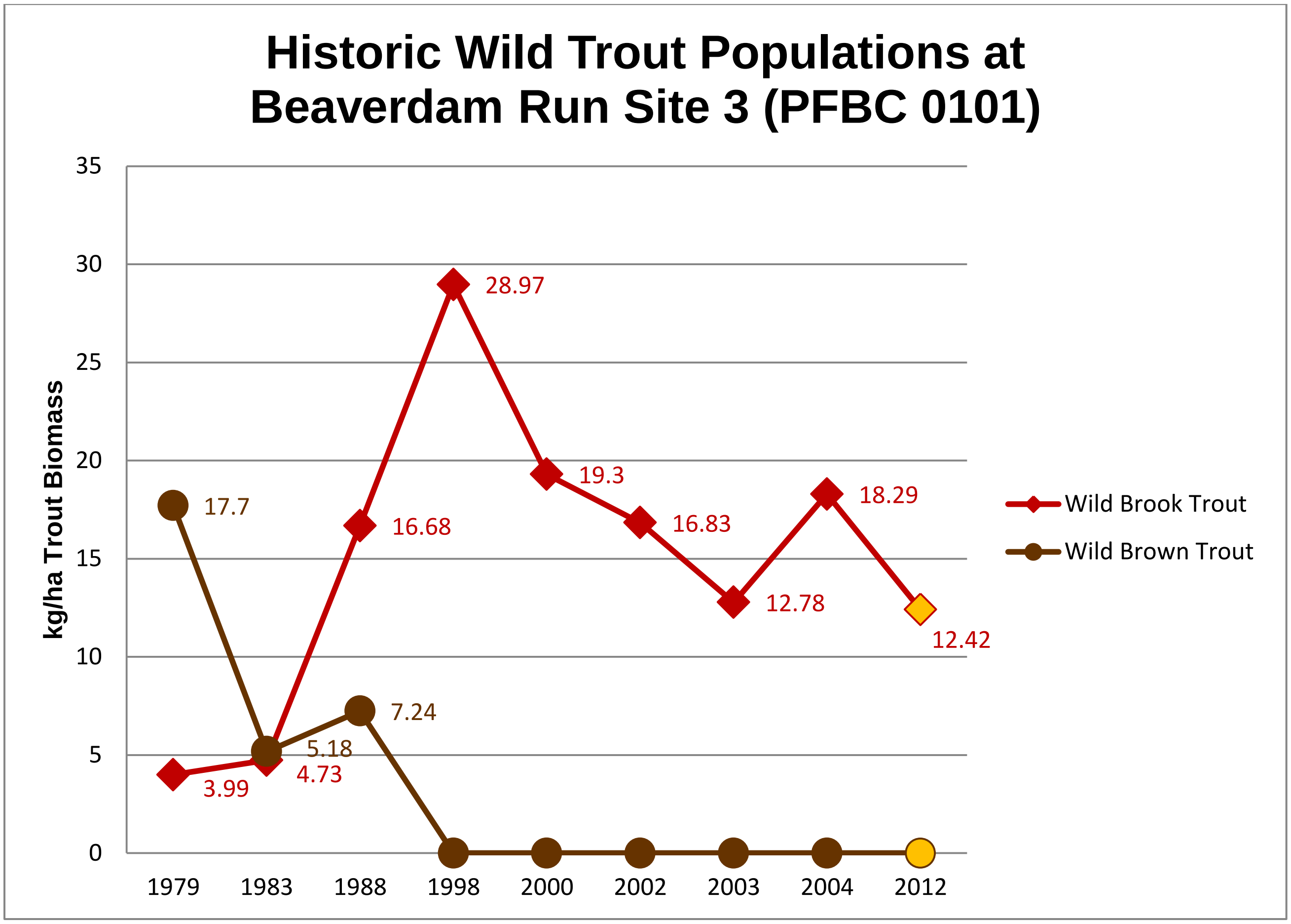


Figure 35

Beaverdam Run Site 3 (PFBC 0101)

The PFBC has surveyed this site for trout since 1979. In 1979, the brook trout population was at an all-time low of 3.99 kg/ha biomass, while the wild brown trout population was the highest recorded at 17.70 kg/ha. The low point for brown trout in PFBC sampling occurred after 1988. Brown trout have not been recorded at this site since then. Brook trout rebounded in 1998 to 28.97 kg/ha, the highest biomass for brook trout that the site has recorded. The sampling that CVC performed in fall 2012 yielded 12.42 kg/ha of brook trout and no brown trout. All trout collected in 2012 were healthy. Year classes ranged from young-of-the-year to more than three years old. As shown in Graph

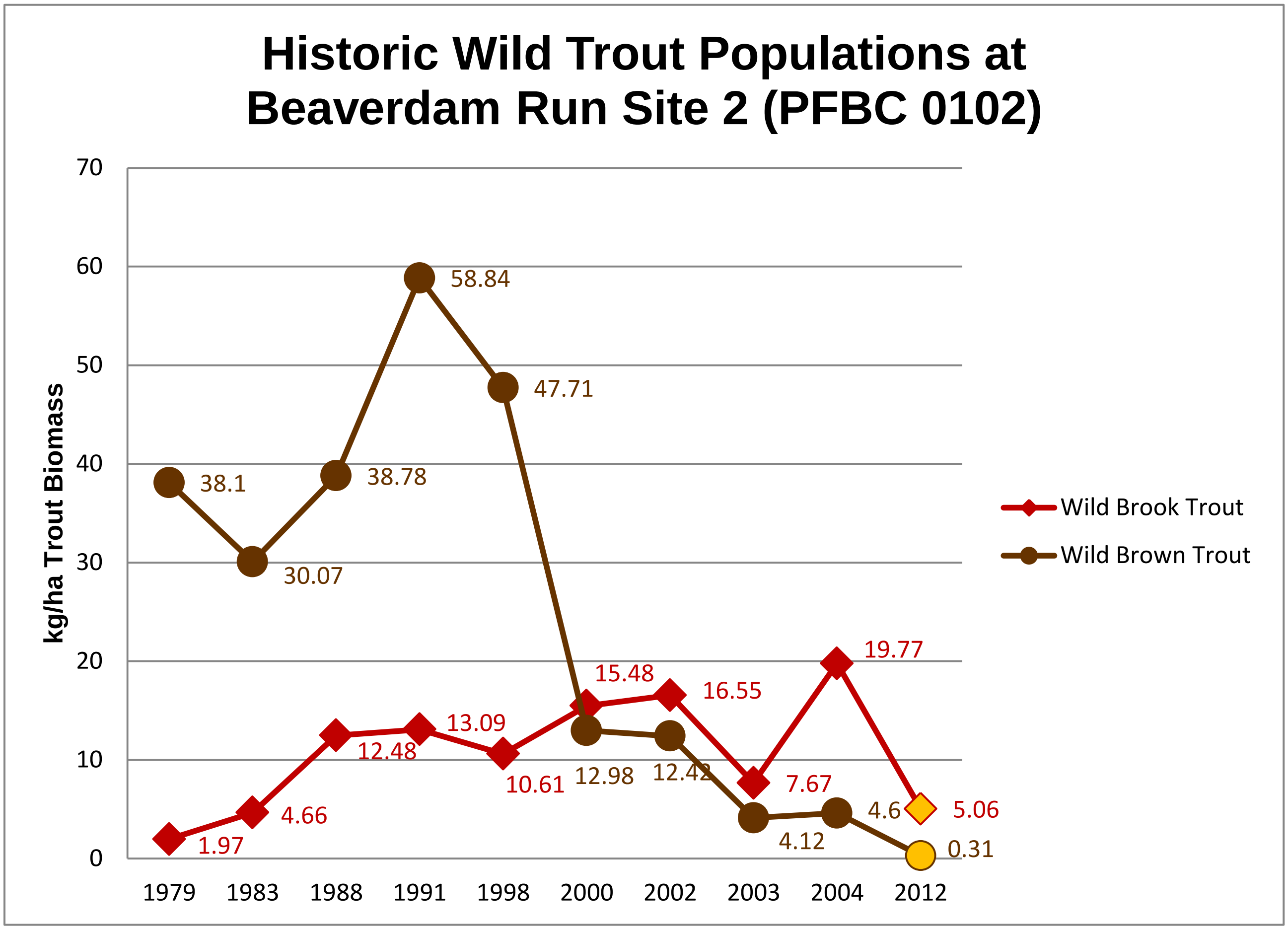
13, the trout at this site in Beaverdam Run has fluctuated drastically since surveying started.



Graph 13. Gold symbols indicate survey completed by CVC and California University of Pennsylvania.

<u>Beaverdam Run Site 2 (PFBC 0102)</u>

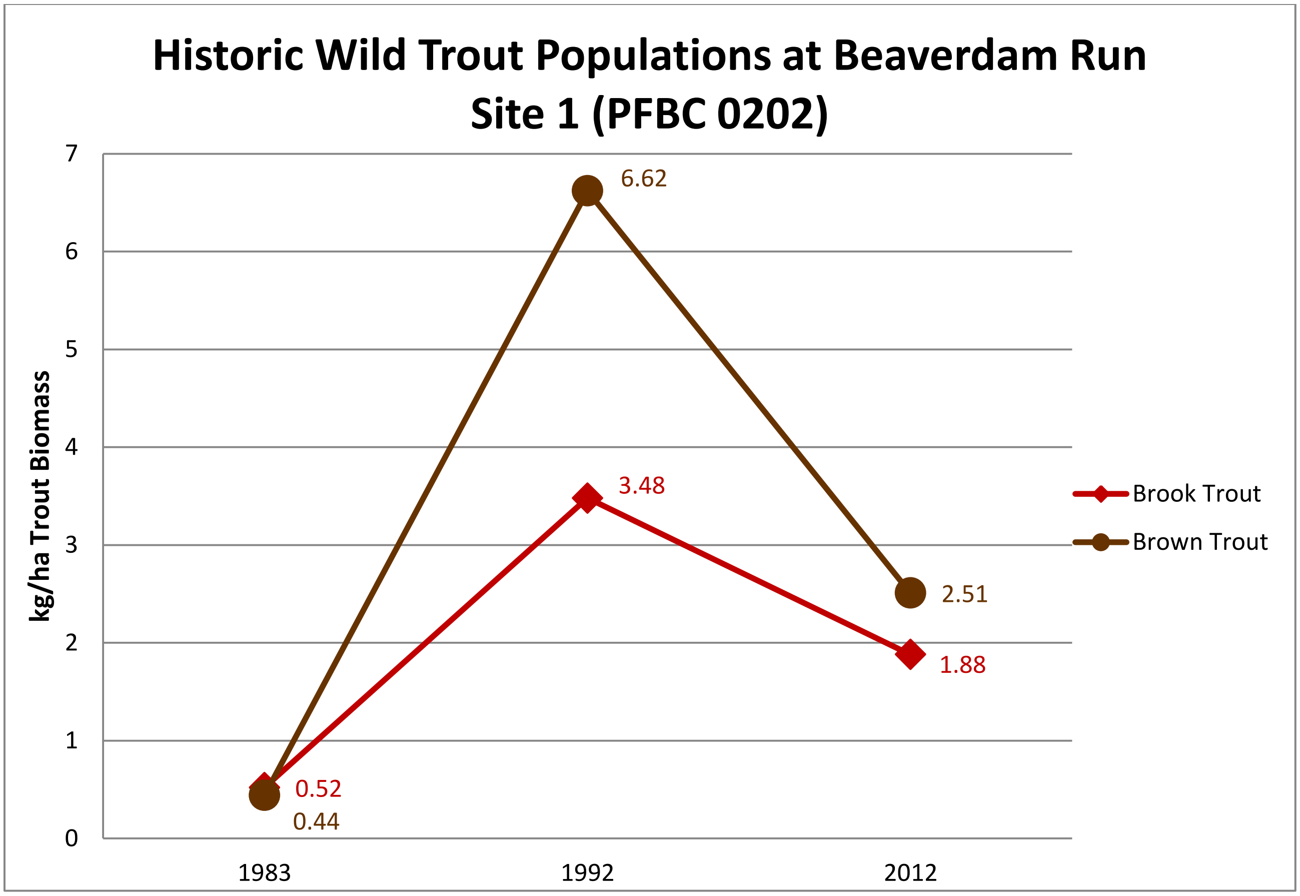
PFBC data have been collected at this site since 1979. The PFBC data indicate that the lowest biomass recorded for brook trout was in 1979, when the biomass was 1.97 kg/ha. The lowest recorded biomass for wild brown trout occurred in 2004; 4.60 kg/ha of brown trout was collected that year. The highest yield of brook trout -19.77 kg/ha - occurred in 2004, while the highest brown trout biomass - 58.84 kg/ha - occurred in 1998. Wild brown trout have been rapidly decreasing since 1998. Please see Conclusions on page 82 for an explanation why. The CVC fish survey in 2012 collected a brook trout biomass of 5.06 kg/ha and a brown trout biomass of 0.31 kg/ha, making the brown trout biomass the lowest ever recorded.



Graph 14. Gold symbols indicate survey completed by CVC and California University of Pennsylvania.

Beaverdam Run Site 1 (PFBC 0202)

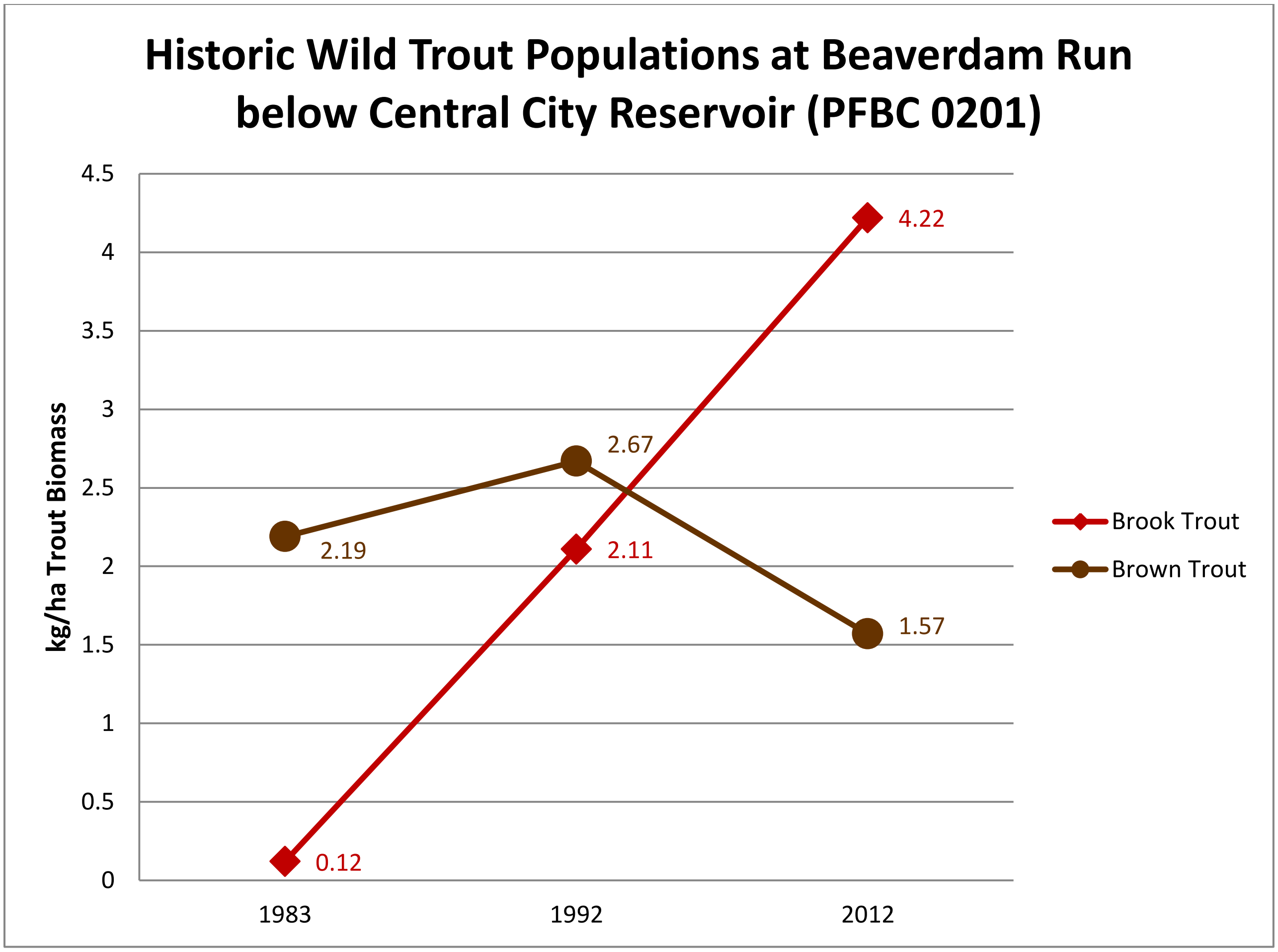
PFBC data have been collected at this site since 1983. The PFBC data indicate that the lowest biomass recorded for both brook and brown trout was in 1983, when the biomass was 0.52 kg/ha and 0.44 kg/ha respectively. The highest yield of brook and brown trout was in 1992. The PFBC's most recent survey in 2012 indicates brook trout biomass is 1.88 kg/ha, and brown trout biomass was 2.51 kg/ha. During the 2012 survey, one legal harvestable size wild brown trout was captured, while seven wild brook trout were captured, two of which were of legal harvestable size (175 mm or 7 inches). One hatchery brook trout was captured. In addition, creek chubs were captured at this site for the first time during the 2012 survey.



Graph 15

<u>Beaverdam Run (PFBC 0201)</u>

The PFBC has surveyed this site, at the mouth of Beaverdam Run, for trout since 1983. Since the 1983 survey when the wild brook trout biomass was 0.12 kg/ha, the brook trout biomass has increased, with the highest brook trout biomass at the site - 4.22 kg/ha - recorded in 2012. In 1983, wild brown trout biomass was estimated at 2.19 kg/ha. It increased to 2.67 kg/ha in 1992 and fell to 1.57 kg/ha in 2012. During the PFBC's survey in the summer of 2012, only two brown trout were captured, and one was of legal harvestable size (175 mm or 7 inches). Thirty-one wild brook trout were captured, three of which were greater than or equal to the legal harvestable size. Additionally, 24 hatchery brook, brown, and rainbow trout were also captured at this site.



Graph 16

<u>Berkebile Run</u>

In May 2012, the Pennsylvania Department of Environmental Protection surveyed fish in Berkebile Run near its mouth, as it had done in May 2005; one year after limestone was placed in Berkebile Run. In 2005, DEP only found one creek chub and two white suckers in Berkebile Run. In 2012, DEP captured seven wild brook trout, 18 blacknose dace, one mottled sculpin, one white sucker, and no creek chubs.

CVC, in partnership with California University of Pennsylvania, utilized a 100-meter one-pass electrofishing survey in September 2012 to determine if trout were still present in Berkebile Run. This survey was conducted below the limestone dose (Figures 26 and 27). Thirty-two wild brook trout were found, though 58 blacknose dace, three mottled sculpin, and three white suckers were also netted. The results attained from this survey were calculated and the projected biomass of wild brook trout was estimated at 34.26 kg/ha - the highest biomass in the Beaverdam Run Watershed in 2012 and above the PFBC Class A brook trout biomass requirement of 30 kg/ha.

At the request of CVC and in collaboration with the PFBC's Unassessed Waters Initiative, PFBC surveyed Berkebile Run for the first time on July 2, 2013. The section started at the road, where the limestone dose was placed, and went downstream 300 meters. It encompassed the CVC's survey site from the year before. PFBC used a Peterson Method. After the first pass, 73 wild brook trout were captured, marked, enumerated, and released. Age classes from young of the year through legal harvestable size (175 mm or 7 inches) were found. The PFBC did not return to recapture the trout, but determined the wild brook trout biomass to be 14.96 kg/ha, a PFBC Class C population. Blacknose dace and mottled sculpin were also observed.

Beaverdam Run Trout Cooperative and Nursery

The Beaverdam Run Trout Cooperative and Nursery, formed in 1972, raises and stocks trout species in the Beaverdam Run and surrounding watersheds. John Wojcik, Jr., a primary caretaker of the nursery, said about 85% of their trout are put in the Central City Reservoir and in Beaverdam Run by the Central City Water Authority's lower well. There is a kids' area adjacent the nursery that is stocked, along with other locations.

In 2012, the group raised approximately 4,000 brook trout, 300 rainbow trout, and 50 golden rainbow trout. They receive their two-inch fingerlings from the Pennsylvania Fish and Boat Commission during the first week of June. By April, the brook trout are about 12-13 inches long. They have not raised tiger trout in the last four years (Wojcik).

In the past, the Beaverdam Run Trout Cooperative and Nursery has disagreed with the PFBC on stocking amounts and locations. Any changes to the fisheries management should be presented and discussed with the group.

Figure 36. Beaverdam Run Trout Cooperative and Nursery.

PFBC Stocking and Fishery Management

Beaverdam Run was part of two statewide wild trout studies (Lorson and Smith 2), including one that evaluated Class A wild trout waters after stocking ceased (1998-2002) and another titled, *Results of Spring and Summer Electrofishing Surveys on Formerly Stocked Freestone Stream Sections* by RT Green, et.al. in 2004.

Section 01

The PFBC stopped stocking Beaverdam Run Section 01 – the upper section – in 1991 due to the presence of a Class A wild trout biomass (Lorson and Smith 1). Further, the PFBC did not want to stock hatchery trout over wild trout populations and hoped wild trout populations would increase without stocking, which a study showed happened at 50% of streams, but this did not happen at Beaverdam Run. In light of this, Beaverdam Run Section 01 was removed from the Class A Wild Trout Waters list in 2006.

Without stocking, brook trout biomass exceeds that of brown trout in Section 01. PFBC staff, RJ Weber and RT Greene's *Statewide 1991 drought study analysis* (Lorson and Smith 4) found that brook trout had a competitive advantage over brown trout in low flow conditions. Additionally, it is believed that a private landowner stopped adding lime to his private pond in the mid-1990s, which then gave brook trout an advantage, as they are more tolerant of acidic conditions than brown trout.

Beaverdam Run Section 01 is managed as a Class B Water. PFBC states in their April 1, 2008 report that, "This watershed is a candidate for a liming project to improve water quality if a sponsor becomes available." It also suggests if stocking resumes that only brook trout are stocked and they are placed in stream as close to opening day as possible. CVC believes only rainbow trout should be stocked because rainbow trout do not compete with brown or brook trout for spawning habitat and are the most susceptible of the trout species to hook and line, thereby removing them from directly competing with the wild fish during the summer, fall and winter months.

Section 02

The PFBC stocks Beaverdam Run Section 02 and plans to continue this stocking. According to PFBC *Beaverdam Run (818E) Section 02 Fisheries Management Report* by Mike Depew and Rick Lorson, "Section 02 is managed with catchable brown and brook trout and is stocked once preseason" (1). It "supports a low density Class D population of wild brook and brown trout. Good numbers of hatchery fish were present at Site 0201 in June 2012 and can provide for a quality angling experience..." (4).

PFBC noted a slight increase in alkalinity in Section 02, likely from the Shade Creek Watershed Association's application of limestone within the Beaverdam Run Watershed in 2004, 2008, and 2010, but cautioned that Beaverdam Run "is susceptible to impacts from acidic precipitation" (Depew and Lorson 4).

Figure 37. PFBC staff, Rick Lorson (left) and Joe Cocco survey Section 0202 near the mouth of Beaverdam Run.

Figure 38. Left, wild brook trout. Right, hatchery brook trout.

Brook trout stocking history of Beaverdam Run, Section 02 (Somerset County, 18E)	
Stocking date	**Average Size**
4/11/2003	9 to 17 inches
4/15/2004	9 to 15 inches
4/14/2005	10 to 17 inches
4/11/2006	10 to 18 inches
4/10/2007	10 to 18 inches
4/8/2008	10 to 19 inches
4/9/2009	10 to 17 inches
4/13/2010	10 to 18 inches
4/12/2011	10 to 20 inches
4/11/2012	10 to 20 inches
4/10/2013	10 to 18 inches

Table 15

Brown trout stocking history of Beaverdam Run, Section 02 (Somerset County, 18E)	
Stocking date	**Average Size**
4/11/2003	9 to 20 inches
4/15/2004	9 to 19 inches
4/14/2005	10 to 22 inches
4/11/2006	10 to 22 inches
4/10/2007	10 to 20 inches
4/8/2008	10 to 20 inches
4/9/2009	11 to 20 inches
4/13/2010	10 to 18 inches
4/12/2011	10 to 20 inches
4/11/2012	10 to 20 inches
4/10/2013	10 to 24 inches

Table 16

Figure 39. A big brown trout netted below the Central City Reservoir.

Fish Species Captured During 2012 Electrofishing Surveys throughout Beaverdam Run Watershed	
Common Name	**Scientific Name**
Blacknose Dace	*Rhinichthys atratulus*
Brook Trout (Hatchery)	*Salvelinus fontinalis*
Brook Trout (Wild)	*Salvelinus fontinalis*
Brown Trout (Hatchery)	*Salmo trutta*
Brown Trout (Wild)	*Salmo trutta*
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*
Tiger Trout (Wild)	*Salmo trutta X Salvelinus fontinalis*
Creek Chub	*Semotilus atromaculatus*
Mottled Sculpin	*Cottus bairdii*
Pumpkinseed	*Lepomis gibbosus*
White Sucker	*Catostomus commersonii*
TOTAL SPECIES	**11**

Table 17. Fish species captured in PFBC and CVC 2012 surveys of Beaverdam Run and tributary, Berkebile Run.

Figure 40. A 90 mm and 100 mm wild Tiger Trout were captured at Beaverdam Run Site 2 in September 2012.

Figure 41. Wild Tiger Trout

Bacteria

In 2012, the Conemaugh Valley Conservancy responded to a request for bacteria monitoring assistance from the Pennsylvania Department of Environmental Protection (DEP). DEP sought to work with volunteer organization to acquire bacteria (fecal coliform) samples from key sites on which very little or no bacteria data existed in streams throughout the Commonwealth. DEP trained CVC staff on sampling protocols and, in the summer of 2012, CVC collected bacteria samples from Beaverdam Run upstream of the SR 1018 Bridge (CVC Site 2), a common monitoring site. Samples were delivered to and analyzed by Geochemical Testing in Somerset, PA. Table 18 shows the results of this monitoring.

		Date 2012					
Stream Name	**Sample Number**	**6/18**	**6/26**	**7/5**	**7/12**	**7/16**	**GEOMEAN**
Beaverdam Run	3020	2520	10	100	<10	20	55.0156

Stream Name	**Sample Number**	**7/31**	**8/3**	**8/8**	**8/14**	**8/16**	**GEOMEAN**
Beaverdam Run	3020	20	70	<10	30	140	35.7994

Table 18

According to Megan Bradburn, a DEP Water Pollution Biologist, “The recreational use standard for Pennsylvania is that a five sample 30-day geometric mean cannot exceed 200 cfu/100 mL. According to DEP's Recreational Use Assessment Methodology, two 30-day geometric means are required to assess a stream. If both geometric means exceed 200 cfu/100 mL then the stream segment is considered Impaired for Recreational Use. If both geometric means are less than 200 cfu/100 mL, the stream segment is considered Attaining Recreational Use. If one geometric mean is greater than 200 cfu/100 mL and the other is less than 200 cfu/100 mL, the site is ruled "inconclusive" and one more round of sampling is required (5 samples collected in a 30-day) the following year to assess the site.”

Beaverdam Run is Attaining for Recreational Use. It will be listed as such on the Category 2 list of the 2014 Pennsylvania Integrated Water Quality and Monitoring Report that DEP submits to the United States Environmental Protection Agency Region III for approval. Bradburn says, “Category 2 lists streams with one or more uses (aquatic life, fish consumption, potable water supply, and recreation) attaining.”

Areas of Concern

Erosion and Sedimentation

Erosion can be a natural source of sedimentation in a stream, but human activities are often the cause of this erosion. While it often appears natural, stream bank erosion can be caused by people's removal of stream bank vegetation or increased runoff from impervious surfaces like parking lots and roadways. Native vegetation is critical to the health of waterways. Not only do native plants provide food and cover for a variety of terrestrial and aquatic species, they stabilize the soil, slow water infiltration, filter runoff, and can withstand local climate and natural events better than introduced species.

Impervious surfaces, like roads, disrupt the natural infiltration of water. They allow water to enter waterways at a faster rate and in higher volumes, which carves deeper ruts in stream banks and increases sedimentation. Fortunately, paved roads cover less than one percent of the Beaverdam Run Watershed, though poorly designed or maintained dirt and gravel roads can contribute sediment to waterways.

Poor agricultural practices can also contribute to erosion and sedimentation. Poorly maintained or reduced riparian buffer zones, as well as livestock's open access to streams can decrease soil stability and increase sedimentation. While no livestock have direct access to waterways in the Beaverdam Run Watershed, riparian buffers should be maintained and enhanced.

Acidification

The acidic nature of several soil types in the Beaverdam Run Watershed impair water quality, and acid deposition is a concern. The closest air monitoring station is PA13, the Allegheny Portage Railroad National Historic Site in Portage, PA. Precipitation constituents may be tracked at the National Atmospheric Deposition Program. A search of 2012 results showed precipitation had an average pH of 4.86. As of 2013, the United States Environmental Protection Agency does not list Somerset County as a non-attainment county for any of the six criteria pollutants: Carbon Monoxide, Lead, Ozone, Particulate Matter, Nitrogen Oxides (NOx) and Sulfur Oxides (SO_2).

Thermal Pollution

Runoff from impervious surfaces or industrial discharges could warm waterways and stress aquatic species. Some species have a narrow thermal range in which they can survive and flourish.

The destruction of riparian zones can open the canopy, exposing streams to sunlight, which can warm waters, increase algal growth and deplete dissolved oxygen.

The Central City Reservoir and the many private ponds in the Beaverdam Run Watershed can thermally impact waterways and should be monitored.

Figures 42 and 43. Central City Reservoir

Permitting

While industry is concentrated at the mouth of Beaverdam Run, continuing or new permits for all forms of development are always a concern throughout the watershed. Compliance with federal, state and local regulations is necessary to protect water quality and wildlife habitat.

Sensitive Species and Species of Concern

The Natural Heritage Inventory indicates that Somerset County and watersheds adjacent to Beaverdam Run contain sensitive species and species of concern. A search for these species should be performed in the Beaverdam Run Watershed.

Industrialization

Energy development, especially in shale gas or wind, and logging could have detrimental effects on the Beaverdam Run Watershed and amplify previously mentioned concerns. Proper siting, oversight, and compliance to regulations are essential to preserving the state of the watershed.

Littering

While the *2008 PA CleanWays Illegal Dump Survey Final Report for Somerset County* does not identify any illegal dumpsites in the Beaverdam Run Watershed, residents must be diligent to prevent them from becoming a problem.

Recommendations

Alkalinity Generation

Beaverdam Run's primary impact is episodic acid deposition. Because this impact does not occur during every precipitation event, the recommendation to restore the wild trout population to this stream is to install pinpoint alkaline doses to very specific points in the watershed and continue monitoring select sites in seasonal peak and base flows. The amount of alkalinity needed in the mainstem is minimal (4-8 mg/L) to buffer the stream in large episodic impacts, but the doses must be placed in areas to buffer against the specific events. CVC is investigating the dosing of one or more private ponds, Tributary B, and Berkebile Run. Funding has been acquired to install an in-stream dose of new calcium silica briquettes from Harsco Minerals in Berkebile Run to extend the brook trout fishery in this tributary and to provide alkalinity to the lower portion of Beaverdam Run. After the experimental evaluation for the new product is completed, it will be determined if this product is a viable alternative to limestone sand.

Municipalities could also encourage the use of limestone on dirt or gravel roads to add alkalinity to the watershed. Alkalinity will increase stream productivity.

Monitor Trout Populations

Wild trout populations should be monitored on a regular basis to assess anticipated improvements from future additions of alkaline material.

Add Berkebile Run to Approved Trout Waters List

In 2012, CVC and California University of Pennsylvania documented wild brook trout in Berkebile Run. As a result, the Pennsylvania Fish and Boat Commission performed its own survey of Berkebile Run and captured and marked 73 brook trout in a 300-meter reach, determining Berkebile Run to have a Class C population of trout at 14.96 kg/ha. Trout populations in Berkebile Run are flashy and should be more closely monitored to determine its true biomass.

Stock Rainbows

Beaverdam Run Site 2 is stocked with hatchery fish from the cooperative nursery located in the watershed. Put-and-take fishing pressure can have negative effects on wild trout populations, as stocked fish can outcompete the wild fish; therefore, it is recommended that the sportsman's club only stock rainbow trout in Beaverdam Run. Rainbow trout do not compete with brown or brook trout for spawning habitat and are the most susceptible of the trout species to hook and line, thereby removing them from directly competing with the wild fish during the summer, fall and winter months. The stocking of rainbow trout will also provide better catch rates for put-and-take anglers, including children.

Remove Central City Reservoir

The Central City Reservoir is no longer used as a water supply. American Rivers could be contacted to investigate the possibility of removing this source of thermal pollution and restoring this stream reach. The Pennsylvania Fish and Boat Commission should also be contacted since anglers do fish at the Reservoir. The PFBC might have data indicating which fishing experience – stream or open body of water – has the highest economic and ecological benefit.

Conservation and Preservation

Conservation easements and agreements must be investigated for the landowners within the watershed to preserve the intact forested buffer along the mainstem and tributaries of Beaverdam Run to prevent future thermal pollution and maintain water quality. Other landowners should be educated on the high value of riparian buffers and encouraged to enhance their properties.

New Enterprise Stone and Lime Company should be commended for protecting Beaverdam Run from its operations and a partnership should be sought to maintain and enhance the riparian buffer along its property. Given its resources, perhaps New Enterprise could provide future project assistance through monetary, product, or equipment donations.

Sensitive Species and Species of Concern

Agencies should search appropriate habitat for the species that the Pennsylvania Natural Heritage Program (PNHP) indicates are in Somerset County and watersheds adjacent to Beaverdam Run and report any findings to the PNHP and appropriate state agency. Prior to any earth disturbance, organizations should work with the Pennsylvania Bureau of Forestry to obtain more information and to protect these species. Groups should contact the United States Fish and Wildlife Service for information on how to augment or restore habitat for sensitive species or species of concern, like bats. Further, grass fields should not be mowed until after July 15th of each year to protect species that nest on the ground.

Control Erosion and Sedimentation

Sedimentation from erosion and runoff could degrade aquatic habitat. Best management practices should be followed to reduce and prevent sedimentation and control stormwater. Residents should ensure healthy, riparian buffer zones, preferably with native plant species, are in place or work to establish them.

Stormwater Management

In compliance with Pennsylvania Stormwater Management Act 167, the Cambria County Conservation District oversaw the completion of the *Stonycreek River Watershed*

Stormwater Management Plan. This plan was developed "to control stormwater runoff from new development on a watershed-wide basis rather than on a site-by-site basis" (Cambria County Conservation District 1). It helps with modeling and set standards and criteria for stormwater control. All municipalities within the Stonycreek River Watershed were required to adopt this plan.

Restore riparian buffers and native habitat

Stream banks should be enhanced through the planting of native trees to provide shade and bank stabilization to improve water quality, offer habitat for terrestrial species, and improve water quality.

While invasive species are not prevalent in the Beaverdam Run Watershed, care must be taken to prevent the spread or introduction of invasive species. It is important to educate the public about the dangers of introducing non-native species, the benefits of planting native species, and the need to research plant species before planting or transplanting.

Public education and vigilance

Those who live or play in the Beaverdam Run Watershed should educate themselves on what constitutes waterway concerns, threats, violations, or emergencies and keep pollution hotline numbers readily available. Citizens should record as much information as possible about the concern, including the date, time, and location. Photographs are beneficial.

The Pennsylvania Fish and Boat Commission has a Pollution Hotline at 855-FISH-KIL (855-347-4545) or its Southwest Regional Office may be contacted at 814-445-8974 or 236 Lake Road, Somerset, PA 15501.

The Pennsylvania Department of Environmental Protection Southwest Regional Office may be contacted at 412-442-4000 or 400 Waterfront Drive, Pittsburgh, PA 15222. PA DEP's Cambria Office may also be contacted at 814-472-1900 or 286 Industrial Park Road, Ebensburg, PA 15931.

The Somerset Conservation District can be contacted for erosion and sedimentation violations at 814-445-4652 x 5 or 6024 Glades Pike, Suite 103, Somerset, PA 15501.

Citizens can always call 911 if they see a waterway emergency that immediately threatens human or aquatic life.

To aide in this education, conservation groups could expand upon existing projects like water sampling and monitoring through field testing and data logger placement or provide presentations and workshops on the following topics:

- the benefits of native plants,
- the threats aquatic invasive species pose,
- the need for healthy, wide riparian zones,

- the proper use of pesticides,
- enhancing habitat for sensitive species,
- Integrated Pest Management,
- sustainable living,
- energy conservation,
- stormwater management, and
- the benefits of clean, cold water.

The community could also build on the Shade-Central City High School's existing Trout in the Classroom project to expand students' learning and develop a stronger relationship with community organizations.

Figure 44. A wild, healthy brook trout in Berkebile Run.

Conclusions

Physically, Beaverdam Run is typical of most headwater mountain streams in Southwestern Pennsylvania. Its acidic Pottsville geology and soil contribute to its naturally low fertility. The Pennsylvania Fish and Boat Commission (PFBC) recorded wild trout population of Beaverdam Run as Class A biomass until the populations declined to what they are today. Beaverdam Run was removed from the Class A Wild Trout Waters list in 2006 and considered impaired by acid deposition. PFBC reports indicate that an individual used to lime a private pond in the upper portion of the Beaverdam Run Watershed so that pond could support trout. When the liming of the pond ceased after the individual passed away, the trout biomass began to decline. While fluctuations are natural for wild trout populations in infertile headwater streams, acidification has depressed populations in the mid and lower portions of the mainstem. The wild trout biomass decreases with downstream progression. Temperature and physical habitat remain ideal for trout populations throughout the stream, but chemistry does not.

The benthic macroinvertebrates of the mainstem are diverse and composed largely of preferred orders of insects. While EPT composition is high, the taxa present are tolerant to acidity that can be limiting to wild trout. The macroinvertebrate communities are very robust for a headwater stream, and typically do not exhibit organic loading impacts. The conductivity spikes that occurred in Beaverdam Site 2 were not detected on the data logger located downstream at Beaverdam Site 1; therefore, what contributed to the conductivity did not impair macroinvertebrate communities. These spikes could have been caused by discharges from several homes or small agricultural sites. Regardless, the increases in conductivity did not affect the macroinvertebrate community. The explanation for the robust macroinvertebrate communities may lie in the forest canopy. Unlike many infertile headwater streams, Beaverdam Run’s canopy consists largely of deciduous trees that provide large amounts of energy to the stream during the fall of the year and contributes to large macroinvertebrate communities.

The chemistry of Beaverdam Run indicates that the stream has a progressively low buffering capacity that becomes increasingly lower in the downstream reaches. The historic liming of the pond quelled the effects of acid deposition, but now the effects can be seen without the active treatment taking place. While the Shade Creek Watershed Association installed two coarse limestone sand deposits along the mainstem, insufficient alkalinity is generated to combat large episodic events. The distribution of dosing should be investigated as a tributary approach instead of a mainstem approach. The alkalinity needed to control the episodic events is minimal, but it must be fully in solution when it reaches the mainstem to be effective. Beaverdam Site 3 should be excluded from dosing, if possible, since this site exhibits wild brook trout cycling and possesses the most buffering capacity of the mainstem sites. The areas downstream of Beaverdam Site 2.5 receive natural acid input from tributaries that decrease the stream’s buffering capacity.

Beaverdam Run does not appear to be affected during every precipitation event, but suffers its most detrimental impacts during large events like big snow melts and severe rain storms.

The macroinvertebrates collected in Berkebile Run indicate that the lower portion of the stream is holding just enough alkalinity to reduce the impacts from naturally acidic geology, upstream bogs, and acid deposition. SCWA's limestone dose was performed in a small area with a small amount of dosing. The limestone used was a very coarse sand and does not dissolve well due to the decrease in surface area exposure; however, Berkebile Run does not achieve velocities needed to remove the limestone fines from the bottom of the stream, so the stream is chronically exposed to the fines. This exposure generates enough of a buffer to allow wild brook trout to live and reproduce in the area below the dose. Berkebile Run possessed the highest brook trout biomass of any of the Beaverdam Run survey sites due to this minimal alkaline input. The dose was originally performed to add alkalinity to Beaverdam Run; instead, it has improved the chemistry of Berkebile Run just enough to support a large biomass of wild brook trout. Berkebile Run could be improved further upstream to allow for the expansion of this brook trout fishery and for the generation of much needed alkalinity for the lower reaches of Beaverdam Run.

Figure 45. Mountain Laurel is abundant throughout the watershed.

Works Cited

Baldwin, N. Leroy. *Two Hundred Years in Shade Township, Somerset County, Pennsylvania 1762-1962*. (1964) Pages 2, 31, 33, 126, 127.

Bradburn, Megan. "2012 Kiski-Conemaugh Stream Team Bacteria Data." Message to the author. 7 January 2013. Email.

Butchkoski, Eileen. *Indiana Bat.* Pennsylvania Game Commission. 10 February 2010. Web. 13 April 2013.

Butchkoski, Eileen. *Small-footed Bat.* Pennsylvania Game Commission. 15 January 2011. Web. 13 April 2013.

Butchkoski, Eileen. *West Virginia Water Shrew.* Pennsylvania Game Commission. 19 January 2010. Web. 13 April 2013.

Cambria County Conservation District. *Stonycreek River Watershed Act 167 – Phase 2 Stormwater Management Plan*. 2005.

Cregan, Amanda. "Bats left off Pennsylvania endangered species list." phillyBurbs.com. 5 October 2012. Web. 11 April 2013.

Depew, Michael and Rick Lorson. Beaverdam Run (818E) Section 02 Fisheries Management Report - Draft. Pennsylvania Fish and Boat Commission. 7 January 2013.

Estep, Matt. Personal interview. 15 July 2013.

Graef, Alicia. "Pennsylvania Considering Endangered Status for Bats." *Care2.com.* 26 August 2012. Web. 11 April 2013.

Gross, Doug and Dan Brauning. *Bald Eagle*. Pennsylvania Game Commission. 25 September 2012. Web. 9 July 2013.

Gross, Doug. *Long-eared owl*. Pennsylvania Game Commission. 21 September 2012. Web. 8 July 2013.

Gross, Doug. *Osprey*. Pennsylvania Game Commission. 26 September 2012. Web. 13 April 2013.

Haffner, Cathy and Doug Gross. *Northern Harrier*. Pennsylvania Game Commission. 21 September 2012. Web. 8 July 2013.

Hawk Count. Allegheny Plateau Audubon Society. August 2013. Web. 28 June 2013.

Highland Sewer and Water Authority. *Well Systems.* Web. 15 July 2013.

Hutchinson, Larry. "answers and stuff." Message to the author. 17 April 2013. Email.

Lorson, Rick and Gary Smith. *Beaverdam Run, Section 01 (818E) Management Report. Pennsylvania Fish and Boat Commission*. April 2003.

Lorson, Rick and Gary Smith. *Beaverdam Run, Section 01 (818E) Management Report. Pennsylvania Fish and Boat Commission*. January 2006.

McGlynn, Rosemary. "APAS info." Message to the author. 17 July 2013. Email.

Monthly Averages for Central City, PA. The Weather Channel, LLC. 2012. Web. 26 September 2013.

National Atmospheric Deposition Program. *NADP/NTN Monitoring Location PA13.* Web. 22 August 2013.

Natural Resource Conservation Service. *PLANTS Database*. United States Department of Agriculture. Web. 13 August 2013.

New Enterprise Stone and Lime Co., Inc. *Products*. Web. 25 March 2013.

PA CleanWays. *Illegal Dump Survey Final Report for Somerset County*. PA CleanWays. 2008.

Penn State Marcellus Center for Outreach and Research. *Maps and Graphics.* Pennsylvania State University. University Park, Pennsylvania. 2010. Web. 28 June 2013.

Pennsylvania Bureau of Topographic and Geologic Survey. *Allegheny Front Section Appalachian Plateaus Province.* Pennsylvania Department of Conservation and Natural Resources. Web. 25 March 2013.

Pennsylvania Department of Environmental Protection. *Marcellus Shale.* October 2011. Web. 19 January 2013.

Pennsylvania Department of Transportation. *Traffic Volume Map Somerset County Pennsylvania*. Web. 26 March 2013.

Shade Creek Watershed Association. *Shade Creek Watershed Restoration Plan*. 2001.

Siwy, Bruce. "Gamesa halts Shaffer Mountain wind plans." *The Daily American* [Somerset, PA] 12 June 2012. Web. 26 March 2013.

United States Census Bureau. *Pennsylvania 2010.* United States Department of Commerce. Web. 3 March 2013.

United States Environmental Protection Agency. *Currently Designated Nonattainment Areas for All Criteria Pollutants*. 31 July 2013. Web. 22 August 2013.

United States Fish and Wildlife Service. *National Wetlands Inventory*. United States Department of the Interior. Web. 8 April 2013.

United States Geologic Survey. *Geologic Formations*. United States Department of Interior. Web. 26 June 2013.

Western Pennsylvania Conservancy. *Somerset County Natural Heritage Inventory*. January 2006. Web. 28 March 2013.

Wocjik, Jr., John. Personal interview. 3 September 2013.

Yaworski, Michael. *Soil Survey of Somerset County Pennsylvania*. United States Department of Agriculture.

Appendix 1 – SCWA / DEP Water Chemistry Data

The following are results for water samples collected by the Shade Creek Watershed Association and/or Pennsylvania Department of Environmental Protection. Water samples are collected according to PA DEP protocol and analyzed by the PA DEP's Bureau of Laboratories. Results are stored in the DEP's Sampling Information System.

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Project ID: SCRIP Monitoring Point: BDR1

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	174	12/14/2001				6.5	26.0	0.00	<.3	<.05	<.5	24.8	<3	
4477	214	03/11/2002				6.7	16.4	0.00	<.3	<.05	<.5	<20.0	<3	
4477	229	04/11/2002				6.5	16.6	0.00	<.3	<.05	<.5	<20.0	<3	
4477	270	06/27/2002				6.4	26.0	27.60	.918	.231	.638	<20.0	34.0	
4477	401	07/23/2003				7.1	25.8	0.00	<.3	<.05	<.5	<20.0	<3	
4477	903	12/09/2003				6.8	16.2	0.00	<.3	<.05	<.5	<20.0	<3	
4477	900	04/17/2004				6.6	11.4	10.60	<.3	1.01	.995	27.1	<3	
4477	900	10/10/2004				6.8	20.4	0.20	<.3	<.05	<.5	23.8	8.0	
4477	900	01/13/2005				6.6	12.2	9.80	<.3	.058	<.5	<20.0	4.0	
4477	001	04/26/2005				7.0	17.2	4.00	<.3	<.05	<.5	<20.0	<3	
4477	901	07/13/2005				6.8	29.0	-5.20	.326	.064	<.5	<20.0	<3	
4477	901	03/13/2006				6.8	16.4	-3.60	<.3	<.05	<.5	<20.0	<3	
4346	801	01/31/2008				7.2	15.8	-6.20	<.3	<.05	<.5	<20.0	12.0	
4346	807	05/02/2008				7.0	13.6	-2.00	<.3	<.05	<.5	<20.0	6	
4346	810	12/10/2008				7.0	16.8	-12.00	.707	.175	.749	<20.0	6	
4346	810	04/28/2009				6.9	14.4	-4.60	.349	.068	<.5	<20.0	10	
4346	812	07/22/2009				7.3	19.2	-9.00	<.3	<.05	<.5	<20.0	<5	
4346	810	10/21/2009				7.2	19.0	-6.40	<.3	<.05	<.5	<20.0	6	
4346	154	11/09/2009				7.1	16.8	-2.40	<.3	<.05	<.5	<20.0	<5	
4346	818	04/27/2010				6.9	17.8	-3.00	<.3	<.05	<.5	<20.0	<5	
4346	805	07/23/2010				7.0	25.0	-9.60	<.3	<.05	<.5	<20.0	20	
4346	807	08/24/2010				7.4	25.2	-11.40	<.3	<.05	<.5	<20.0	<5	
4346	822	11/15/2010				7.2	22.2	-12.00	<.3	<.05	<.5	<20.0	<5	
4346	811	07/31/2011				7.0	31.2	-11.40	<.3	<.05	<.5	<20.0	<5	
4346	812	09/27/2011				7.1	20.2	-8.00	<.3	<.05	<.5	<20.0	<5	
4346	802	10/25/2012				7.4	27.6	-11.60	<.3	<.05	<.5	<20.0	<5	

Project ID: SCRIP Monitoring Point: BDR2

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	177	12/17/2001				6.6	15.6	0.00	<.3	.091	<.5	<20.0	<3	
4477	273	06/27/2002				6.3	15.4	25.60	<.3	.073	<.5	<20.0	<3	
4477	410	07/23/2003				5.8	18.4	56.20	4.46	.125	2.07	<20.0	212.0	
4477	901	04/17/2004				6.0	8.2	26.20	<.3	1.04	1.09	<20.0	<3	
4477	901	10/10/2004				6.7	14.6	11.00	<.3	<.05	<.5	20.0	4.0	
4477	901	01/13/2005				6.5	9.8	19.60	<.3	.058	<.5	<20.0	4.0	
4477	002	04/26/2005				6.8	11.2	11.60	<.3	<.05	<.5	<20.0	<3	
4477	902	07/13/2005				6.8	20.0	-1.40	.568	.184	.555	<20.0	<3	
4346	001	02/15/2006				6.1	9.8	8.20	<.3	<.05	<.5	<20.0	<3	
4477	902	03/13/2006				6.5	9.8	6.00	<.3	<.05	<.5	<20.0	<3	
4477	006	01/17/2007				6.7	12.2	3.20	<.3	<.05	<.5	<20.0	<3	
4346	809	08/30/2007				7.2	13.2	4.60	.113	.035	<.2	<20.0	<2	
4346	802	10/23/2007				7.2	20.8	8.60	<.3	.068	<.5	<20.0	<3	
4346	804	01/24/2008				6.8	10.8	1.40	<.3	<.05	<.5	<20.0	4.0	
4346	802	05/02/2008				6.8	11.0	2.20	<.3	<.05	<.5	<20.0	<5	
4346	813	12/10/2008				6.7	14.4	0.60	1.577	.436	1.404	<20.0	16	
4346	813	04/28/2009				6.8	13.4	-4.60	<.3	<.05	<.5	<20.0	10	
4346	813	07/22/2009				7.3	17.8	-11.00	<.3	<.05	<.5	<20.0	<5	
4346	813	10/21/2009				7.2	19.2	-3.80	<.3	<.05	<.5	<20.0	<5	
4346	152	11/09/2009				7.0	14.4	-1.20	<.3	<.05	<.5	<20.0	<5	
4346	802	01/24/2010				6.5	10.8	3.40	<.3	<.05	<.5	<20.0	<5	
4346	805	04/18/2010				6.7	4.8	4.40	<.3	<.05	<.5	<20.0	<5	
4346	123	04/24/2010				6.6	13.0	0.40	<.3	<.05	<.5	<20.0	<5	
4346	805	08/24/2010				7.3	20.8	-8.40	<.3	<.05	<.5	28.8	<5	
4346	824	11/15/2010				7.0	14.6	-3.20	<.3	<.05	<.5	<20.0	<5	
4346	808	03/28/2011				6.3	10.8	2.80	<.3	<.05	<.5	<20.0	<5	
4346	805	06/30/2011				7.1	17.2	-0.60	<.3	<.05	<.5	<20.0	<5	
4346	813	09/27/2011				6.6	12.0	3.00	<.3	<.05	<.5	<20.0	<5	
4346	011	05/16/2012				6.9	11.8	-14.20	<.3	<.05	<.5	<20.0	<5	
4346	015	07/25/2012				6.9	17.6	1.60	<.3	<.05	<.5	<20.0	<5	

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Project ID: SCRIP Monitoring Point: BDR3

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	212	03/11/2002				6.6	14.4	0.00	<.3	<.05	<.5	<20.0	<3	
4477	227	04/11/2002				6.4	12.6	4.40	<.3	<.05	<.5	<20.0	<3	
4477	247	05/22/2002				6.4	11.6	14.60	<.3	<.05	<.5	<20.0	<3	
4477	268	06/27/2002				6.3	24.0	34.20	.582	.107	<.5	<20.0	34.0	
4477	327	11/26/2002				6.5	13.0	0.00	<.3	<.05	<.5	40.0	<3	
4477	400	07/23/2003				6.8	18.4	0.00	<.3	.064	<.5	<20.0	<3	
4477	902	12/09/2003				6.4	11.6	24.80	<.3	<.05	<.5	<20.0	<3	
4477	902	04/17/2004				6.4	9.8	15.00	<.3	1.01	1.01	<20.0	<3	
4477	902	10/10/2004				6.5	15.6	16.40	<.3	<.05	<.5	<20.0	<3	
4477	902	01/13/2005				6.3	10.6	20.80	<.3	<.05	<.5	<20.0	<3	
4477	003	04/26/2005				6.6	12.0	25.80	<.3	<.05	<.5	<20.0	<3	
4477	903	07/13/2005				6.7	26.6	15.20	.326	.052	<.5	<20.0	<3	
4477	903	03/13/2006				6.5	13.4	8.80	<.3	<.05	<.5	<20.0	<3	
4346	815	08/30/2007				7.1	22.2	2.20	.035	.013	<.2	<20.0	6	
4346	808	05/02/2008				6.6	12.6	-1.80	<.3	<.05	<.5	<20.0	<5	
4346	809	12/10/2008				6.6	14.6	0.80	.416	.095	.591	<20.0	<5	
4346	809	04/28/2009				6.7	13.6	-3.20	.348	.058	<.5	<20.0	10	
4346	809	07/22/2009				7.1	18.4	-7.40	<.3	<.05	<.5	<20.0	<5	
4346	809	10/21/2009				6.9	18.4	-6.00	<.3	<.05	<.5	<20.0	8	
4346	815	04/23/2010				6.7	15.2	-2.00	<.3	<.05	<.5	<20.0	<5	
4346	822	05/03/2010				7.0	15.0	2.20	<.3	<.05	<.5	<20.0	<5	
4346	804	07/23/2010				7.0	28.2	-11.60	2.022	.336	1.338	<20.0	12	
4346	821	11/15/2010				7.1	20.6	-9.80	<.3	<.05	<.5	<20.0	<5	
4346	808	03/20/2011				6.4	11.6	-1.40	<.3	<.05	<.5	<20.0	<5	
4346	810	07/31/2011				6.8	26.0	-7.80	.414	.063	<.5	<20.0	<5	
4346	814	09/27/2011				6.9	18.8	-4.80	<.3	<.05	<.5	<20.0	<5	

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Project ID: SCRIP Monitoring Point: BDR5

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	216	03/11/2002				6.7	14.6	0.00	<.3	<.05	<.5	<20.0	<3	
4477	231	04/11/2002				6.4	13.4	6.40	<.3	<.05	<.5	<20.0	<3	
4477	251	05/22/2002				6.6	12.2	0.00	<.3	<.05	<.5	<20.0	<3	
4477	272	06/27/2002				6.3	22.0	21.20	.925	.278	.771	<20.0	4.0	
4477	331	11/26/2002				6.9	14.8	0.00	<.3	<.05	<.5	<20.0	<3	
4477	406	07/23/2003				5.9	23.4	4.80	<.3	<.05	<.5	42.9	<3	
4477	901	12/09/2003				6.7	14.6	0.00	<.3	<.05	<.5	<20.0	<3	
4477	904	04/17/2004				6.7	10.4	10.40	<.3	1.01	1.03	<20.0	<3	
4477	904	10/10/2004				6.8	19.0	3.60	<.3	<.05	<.5	<20.0	<3	
4477	904	01/13/2005				6.6	11.8	10.00	<.3	<.05	<.5	<20.0	4.0	
4477	005	04/26/2005				7.2	15.6	7.80	<.3	<.05	<.5	<20.0	<3	
4477	905	07/13/2005				6.9	25.6	2.40	<.3	<.05	<.5	<20.0	6.0	
4477	905	03/13/2006				6.7	13.2	1.40	<.3	<.05	<.5	<20.0	<3	
4346	002	06/11/2007				7.2	16.8	2.00	<.3	<.05	<.5	<20.0	6.0	
4346	807	08/10/2007				7.2	17.8	9.60	.144	.038	<.2	<20.0	<2	
4346	808	08/30/2007				7.3	17.4	0.80	.049	.018	<.2	<20.0	<2	
4346	802	01/31/2008				7.0	14.2	-4.00	<.3	<.05	<.5	<20.0	14.0	
4346	806	05/02/2008				7.0	13.6	-0.40	<.3	<.05	<.5	<20.0	<5	
4346	811	12/10/2008				6.9	21.6	-11.20	3.204	.63	3.149	51.6	46	
4346	811	04/28/2009				6.8	11.2	7.80	<.3	<.05	<.5	<20.0	20	
4346	811	07/22/2009				7.2	17.2	-7.20	<.3	<.05	<.5	<20.0	<5	
4346	811	10/21/2009				7.1	17.6	-6.00	<.3	<.05	<.5	<20.0	6	
4346	153	11/09/2009				7.2	16.4	0.20	<.3	<.05	<.5	<20.0	<5	
4346	821	05/03/2010				7.1	15.6	5.00	<.3	<.05	<.5	<20.0	<5	
4346	806	07/23/2010				7.0	23.2	17.40	<.3	<.05	<.5	<20.0	<5	
4346	823	11/15/2010				7.2	19.6	-8.60	<.3	<.05	<.5	<20.0	<5	
4346	809	03/20/2011				6.5	13.0	-2.20	<.3	<.05	<.5	<20.0	<5	
4346	812	07/31/2011				7.0	28.4	-6.40	<.3	<.05	<.5	<20.0	<5	
4346	815	09/27/2011				7.0	17.4	-4.00	<.3	<.05	<.5	<20.0	<5	
4346	803	10/25/2012				7.4	23.8	-12.00	<.3	<.05	<.5	<20.0	<5	

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SCRIP Monitoring Point: BDR6

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	175	12/14/2001				6.6	32.0	0.00	<.3	<.05	<.5	22.9	4.0	
4477	217	03/11/2002				6.3	13.4	4.60	<.3	<.05	<.5	<20.0	<3	
4477	232	04/11/2002				6.2	10.6	6.00	<.3	<.05	<.5	<20.0	<3	
4477	252	05/22/2002				6.6	12.0	0.00	<.3	<.05	<.5	<20.0	<3	
4477	328	11/26/2002				6.8	18.2	0.00	<.3	<.05	<.5	30.4	<3	

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Project ID: SCRIP Monitoring Point: BBR2

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	168	12/14/2001				4.1	9.4	33.80	<.3	.139	<.5	36.9	<3	

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Project ID: SCRIP Monitoring Point: BBR5

Coll ID	Seq	Date Collected	Initial Flow	Final Flow	Determ Method	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L	SO4 MG/L	TSS MG/L	NA MG/L
4477	171	12/14/2001				6.1	19.0	29.60	<.3	<.05	<.5	25.9	4.0	
4477	332	11/26/2002				6.4	10.2	10.40	<.3	.07	<.5	26.7	<3	
4477	006	06/16/2004				6.8	15.2	26.80	<.3	.081	<.5	<20.0	26.0	
4346	001	06/11/2007				4.9	7.6	11.00	<.3	.056	<.5	<20.0	8.0	
4346	801	05/02/2008				5.2	7.2	5.60	<.3	<.05	<.5	<20.0	<5	
4346	812	12/10/2008				6.6	11.2	3.40	.788	.226	.924	<20.0	16	
4346	812	04/28/2009				6.8	11.8	-2.40	<.3	<.05	<.5	<20.0	8	
4346	810	07/22/2009				4.0	1.2	36.80	4.468	1.338	4.144	95.2	16	
4346	812	10/21/2009				7.2	17.6	-4.20	<.3	<.05	<.5	<20.0	<5	
4346	817	04/27/2010				6.7	14.0	1.60	<.3	<.05	<.5	<20.0	<5	
4346	807	07/23/2010				7.0	21.2	-4.20	<.3	<.05	<.5	<20.0	6	
4346	806	08/24/2010				7.4	22.8	-9.40	<.3	<.05	<.5	<20.0	<5	
4346	803	01/02/2011				7.0	15.0	-5.60	<.3	<.05	<.5	<20.0	<5	
4346	810	03/20/2011				6.4	11.2	-1.80	<.3	<.05	<.5	<20.0	<5	
4346	816	09/27/2011				6.9	14.2	-1.40	<.3	<.05	<.5	<20.0	<5	
4346	804	10/25/2012				7.4	22.0	-14.20	<.3	<.05	<.5	<20.0	8	

Appendix 2 – CVC Field Water Quality Data

CVC / Kiski-Conemaugh Stream Team staff and/or a student intern provided by Saint Francis University in Loretto, PA, collected these data using a Hanna All-in-One meter that tested pH, conductivity, Total Dissolved Solids, and temperature; LaMotte kits that tested Chlorides and Alkalinity; and a SonTek FlowTracker ADV that measured discharge.

Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride Field	Sulfates Field (mg/L)	Collector	Notes
BDR1	12/15/2011		10:30	8.07	66	33	8	20	14		MR, AR	unseasonably warm, 57 F, damp, breezy
BDR1	2/2/2012			7.53	28	14	5.2	16	16		MR, AR, LH	
BDR1	4/21/2012			6.84	46	23	12.3	18	14		EN, MR	overcast, cool
BDR1	6/18/2012			7.67	55	27	12.8	20	12			
BDR1	7/9/2012		15:30	7.22	60	30	20.7	28	12		JM, MR	
BDR1	10/12/2012		15:07	7.09	66	32	9.4	16	18	50	MR	partly sunny, breezy, cool
BDR1	10/28/2012			7.81	65	30	10.3		12			
BDR1	11/19/2012		13:56	6.07	36	18	6.3	12	10		MR, MS	overcast
BDR1	4/4/2013		13:54	8.45	43	21	3.3	8	16		JM	Cold, Sunny
BDR1	5/20/2013		11:40	6.83	37	19	15	12	14		JM	Logger had twigs built up in it. Hot. Partly Cloudy.
BDR1	6/3/2013		13:05	7.21	41	20	15.6	12	10		JM	Streambed smells of sulfur. Cool and cloudy
BDR1	6/19/2013		10:30	6.56	47	22	16.8	12	12		JM	Heavy rain last night. Higher flow that normal. Sunny and warm.

Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride Field	Sulfates Field (mg/L)	Collector	Notes
BDR2	4/21/2012			7.36	45	23	11.8	20	16		EN, MR	overcast, cool, 58 F. Collected macros
BDR2	5/11/2012		16:50	7.38	52	26	12.6	21	16		EN, MR	
BDR2	6/28/2012			8	73	36	15.4	12	12			
BDR2	7/5/2012			7.79	57	30	18.8	16	12			
BDR2	7/16/2012			8.34	60	29	19.5	20	16			
BDR2	8/7/2012		14:45	7.2	78	39	19.3	28	8		MR, MS	
BDR2	8/14/2012			8.45	60	30	17.6	20	12			
BDR2	9/1/2012			7.57	86	40	21.7	20	16			
BDR2	9/18/2012			7.22	76	39	15.4	24	16		MR	light rain, 63 F, streams up some from yesterday, over 1 inch of rain in last 14 hours
BDR2	9/28/2012			8.12	70	32	12.5	16	12			
BDR2	10/28/2012			8.33	54	22	10.2	12	12			
BDR2	10/29/2012			7.77	99	49	9.3	20	18		MR	Rain, beginnings of Hurricane Sandy, 39 F; white bubbles on water surface, water looks tanic
BDR2	11/19/2012			6.25	38	19	6.9	16	12		MR, MS	overcast
BDR2	12/18/2012	3264	10:15	8.4	40	20	6.2	12	12		MR, JM	cold, raining, cloudy.
BDR2	1/16/2013	11776		8.54	34	17	4.1	8	12			
BDR2	2/24/2013			6.82	38	20	1.2	16	16			
BDR2	3/8/2013	2189		6.72	48	23	2.3	16	12			
BDR2	4/10/2013	18001	14:04	6.42	34	16	14.3	10	12		JM	Sunny, Stream is flowing very quickly.
BDR2	5/18/2013	5044	13:00	6.06	43	21	14.6	14	12		JM	Cool, partly cloudy.
BDR2	7/2/2013	1382	12:30	6.56	55	27	18.4	16	12		JM	Water is low & clean. Brown tint. Partly Sunny. Brief shower yesterday. Logger calibrated & self tested.
BDR2	8/19/2013	1369										

Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride Field	Sulfates Field (mg/L)	Collector	Notes
BDR3	4/21/2012		11:04	7.65	36	19	11.5	16	12		EN, MR	overcast, front moving in, 61 F. Collected macros. Iron bog seep, stream slightly stained orange
BDR3	5/11/2012		15:45	7.47	55	26	13.3	21	12		EN, MR	
BDR3	7/5/2012			7.48	62	29	16.8	12	12			
BDR3	7/16/2012			7.63	60	31	17.7	16	12			
BDR3	8/7/2012		15:00	7.11	77	38	14.7	34	8			
BDR3	8/14/2012			7.6	66	32	16.2	26	12		MR, MS	
BDR3	9/1/2012			7.89	70	35	18.7	28	12			
BDR3	9/18/2012		14:05	7	113	55	14.8	31	12		MR	light rain, 63 F, streams up some from yesterday, over 1 inch of rain in last 14 hours
BDR3	9/28/2012			7.76	62	30	11.4	22	12			
BDR3	10/29/2012		11:05	8.25	129	66	9.3	30	14		MR	Rain, beginnings of Hurricane Sandy, 39 F; pool looks gray, opaque
BDR3	11/19/2012		14:32	6.4	40	20	7.9	16	12		MR, MS	overcast
BDR3	2/24/2013			6.58	43	21	1.3		12			
BDR3	3/8/2013			6.65	50	24	3.7	20	12			
BDR3	4/10/2013		15:03	6.61	33	16	14.8	12	12		JM	Sunny. The stream is flowing higher than normal, but the water is spread thin in a lot of places, making flow gathering impossible.
BDR3	5/18/2013		16:02	6.28	42	21	13.8	16	12		JM	Cloudy, warm. Clear signs of tree logging. Several trees have been left laying about.
BDR3	6/3/2013		12:13	7.18	56	28	13	24	16		JM	Cool, Cloudy. Heavy machine tracks near cut down trees. Logger has sediment in it.
BDR3	6/19/2013		11:35	6.37	46	23	15.5	20	12		JM	Warm Sunny. Heavy rain last night.

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 1	Beaverdam before confluence with Berkebile	12/18/2012		12:03	6.82	38	19	5.7	12		JM, MR	Cold, raining, cloudy
MP 1	Beaverdam before confluence with Berkebile	4/3/2013		16:40	6.1	52	26	4.7	14		MR	flurries, cold, windy. Some snow still on mountain. 34 F
MP 2	Berkebile below Lime	4/21/2012			7.37	20	10	11.1	12.0	12	MR, EN	overcast, cool, 58 F
MP 2	Berkebile below Lime	9/14/2012			6.91	40	20	15.4	20.0	8	MR, MR	
MP 2	Berkebile below Lime	10/12/2012		11:30	6.40	35	18	7.4	24.0	8	MR	cloudy, cool
MP 2	Berkebile below Lime	1/16/2013		16:15	5.39	9	4	4.8	4.0	8	JM	cloudy, cold. Lots of lime sand in stream. Limestone pile is snowed over.
MP 2	Berkebile below Lime	2/24/2013		12:45	5.90	10	5	1.9	4	6	JM	Cold, snow flurries.
MP 2	Berkebile below Lime	3/8/2013		12:52	6.11	10	5	2.5	8.0	10	JM	Cold, clouds clearing.
MP 2	Berkebile below Lime	4/3/2013		16:29	5.73	12	6	4.8	4.0		MR	flurries, cold, windy. Some snow still on mountain. 34 F

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 3	Berkebile above Lime	9/14/2012		13:51	5.11	19	9	17	4	8	MR, MR	
MP 3	Berkebile above Lime	12/18/2012	729	11:37	5.41	11	5	5.8	4	8	JM, MR	Cold, raining, cloudy
MP 3	Berkebile above Lime	1/16/2013	2737	15:22	4.98	13	7	3.8	4	8	JM	cloudy, cold
MP 3	Berkebile above Lime	2/24/2013		12:23	5.95	21	9	2.0	4	6	JM	Cold, snow flurries.
MP 3	Berkebile above Lime	3/8/2013	244	12:34	5.16	12	6	2.2	6.0	10	JM	Cold. Cloudy. Edges of the stream are dark with sediment.
MP 3	Berkebile above Lime	4/3/2013		17:14	4.92	14	7	4.1	4.0		MR	flurries, cold, windy. Some snow still on mountain. 34 F. Collected macros
MP 3	Berkebile above Lime	4/10/2013	3975	13:24	4.58	14	7	12.3	4.0	4	JM	Stream is running high. Sunny w/ scattered clouds
MP 3	Berkebile above Lime	7/2/2013	135	9:30	5.69	14	7	15.3	4.0	8	JM	Partly cloudy. Stream is very low. Water doesn't cross the road as normal.
MP 4	Bog Trib A	12/18/2012		12:22	5.55	12	6	6.5	4		JM, MR	Cold, raining, cloudy
MP 4	Bog Trib A	4/3/2013		16:50	5.07	12	6	4.6	4		MR	flurries, cold, windy. Some snow still on mountain. 34 F
MP 4	Bog Trib A	7/2/2013		11:54	5.55	19	9	16.9	8		JM, MR	warm. No rain for a change.

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 5	Bog Trib B	12/18/2012		12:18	4.76	16	8	6.3	<4		JM, MR	Cold, raining, cloudy
MP 5	Bog Trib B	4/3/2013		16:47	4.71	15	7	4.6	<4		MR	flurries, cold, windy. Some snow still on mountain. 34 F
MP 5	Bog Trib B	7/2/2013		11:50	4.67	15	7	17.8	4		JM, MR	warm. No rain for a change.
	*(before Berkebile, upstream of dirt road)											
MP 6	Berkebile Trib *	12/18/2012	344	12:23	4.64	16	8	6.4	<4		JM, MR	Cold, raining, cloudy
MP 6	Berkebile Trib *	1/16/2013	1339	16:28	4.49	19	8	4.8	4	8	JM	cloudy, cold. There is a bunch of bubbles sitting on a branch in the stream foaming. The bunch is about the size of a dinner plate.
MP 6	Berkebile Trib *	2/24/2013		12:32	4.88	15	8	2.0	4	8	JM	Cold, snow flurries.
MP 6	Berkebile Trib *	3/8/2013	152	11:53	4.92	17	8	2.1	4.0	12	JM	Cold, cloudy.
MP 6	Berkebile Trib *	4/10/2013	2603	13:13	4.58	23	11	12.9	4.0	8	JM	Stream is running high. Sunny w/ scattered clouds
MP 6	Berkebile Trib *	5/18/2013	466	12:35	4.25	22	11	14.4	4.0	8	JM	Warm Cloudy.
MP 6	Berkebile Trib *	7/2/2013	51	9:37	4.53	20	9	15.2	4.0	8	JM	Partly cloudy. Stream is low.
MP 6	Berkebile Trib *	6/20/2013		13:30	4.44	35	18	16.0	4.0		MR, EN	warm, mostly sunny

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 7	Spring that originates near mile marker SR1018 - 90	12/18/2012		14:05	6.79	50	25	7.4	20		JM, MR	light, occasion snow. Cold and windy.
MP 7	Spring that originates near mile marker SR1018 - 90	4/3/2013		15:00	6.29	134	65	9.2	16	12	MR	partly sunny, cold, windy. Some snow still on mountain. 34 F
MP 8	Spring in Woods	2/24/2013		14:41	5.77	14	7	6.7	4	8	JM	Cold, snow flurries
MP 8	Spring in Woods	3/8/2013		15:13	5.85	13	7	7.1	8	12	JM	Sunny, stream too low for flow.
MP 8	Spring in Woods	4/3/2013		15:50	5.73	21	10	7.2	8		MR	partly sunny, cold, windy. Some snow still on mountain. 34 F
MP 8	Spring in Woods	5/18/2013		15:30	5.3	16	8	10.3	8	12	JM	Cloudy. Warm.
MP 8	Spring in Woods	6/5/2013		11:55	5.36	17	7	12	4		JM	Clear and sunny. Cl indicator ran out, so no Cl can be given.
MP 8	Spring in Woods	6/19/2013		12:00	5.31	17	8	11.1	8	12	JM	Sunny Warm Heavy rain last night.

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 9	Tom Gordon's Pond Effluent	12/14/2012		10:14	6.15	38	19	4.6	8		MR	sunny, clear, cool 39 F
MP 9	Tom Gordon's Pond Effluent	12/18/2012		14:27	6.28	23	11	4.9	8		JM, MR	light, occasion snow. Cold and windy.
MP 9	Tom Gordon's Pond Effluent	2/24/2013		14:20	6.04	27	13	0.9	8	12	JM	Cold, snow flurries. Pipe is frozen. Sample collected further downstream.
MP 9	Tom Gordon's Pond Effluent	3/8/2013		14:54	6.11	39	19	1.9	8	12	JM	Sunny, stream for flow still frozen.
MP 9	Tom Gordon's Pond Effluent	4/3/2013		15:34	6.26	62	30	4	8	16	MR	partly sunny, cold, windy. Some snow still on mountain. 34 F
MP 9	Tom Gordon's Pond Effluent	5/18/2013		15:09	5.83	16	8	18.5	8	12	JM	Partly Cloudy. Warm
MP 9	Tom Gordon's Pond Effluent	6/5/2013		11:40	6.3	35	17	19.7	8	14	JM	Sunny and clear skies.
MP 9	Tom Gordon's Pond Effluent	6/19/2013		12:18	5.96	39	19	23.8	12	20	JM	Warm. Sunny. Site smells unusual. Increased flora could be the cause.

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
MP 10	Spring that feeds Tom's Pond	12/18/2012		14:37	4.9	15	7	5.1	8		JM, MR	light, occasion snow. Cold and windy.
MP 10	Spring that feeds Tom's Pond	2/24/2013		14:16	5.05	13	7	0.4	4	8	JM	Cold, snow flurries. The mixed stream is frozen. No flow can be taken.
MP 10	Spring that feeds Tom's Pond	3/8/2013		14:45	5.07	12	6	2.2	4.0	8	JM	Sunny, stream for flow still frozen.
MP 10	Spring that feeds Tom's Pond	5/18/2013		15:00	5.80	34	16	14.6	8.0	12	JM	Partly Cloudy. Warm
MP 10	Spring that feeds Tom's Pond	6/5/2013		11:20	6.28	39	19	15.3	8.0	12	JM	Sunny and clear skies. Flow is slow.
MP 10	Spring that feeds Tom's Pond	6/19/2013		12:30	5.95	40	19	17.1	12.0	20	JM	Warm Sunny. Inlet pipe averages 32.7 gpm with tote and watch.
BDR 2.5	Beaverdam Run at Trout Nursery	4/21/2012		15:02	6.89	44	22	11.8	20	12	MR, EN	overcast, cool
BDR 2.5	Beaverdam Run at Trout Nursery	10/12/2012			6.90	73	38	7.5	24	14	MR	partly sunny, windy, cool

MP	Site	Date	Flow (GPM)	Time	pH Field	Cond. (uS/cm) Field	TDS (ppm) field	Temp. (°C) Field	Alk. (mg/L) Field	Chloride (mg/L) Field	Collector	Notes
BDR - B	UNT 1	4/21/2012		13:14	4.77	43	21	10.9	0	12	MR, EN	overcast, cool. Eric notes Feldspar sand, comes off Kittanning, acidic conglomerate
BDR - B	UNT 1	10/12/2012		9:45	4.95	76	36	7.4	10	16	MR	Cloudy, cool.
BDR - B	UNT 1	12/18/2012		13:51	6.64	16	8	5.9	8		JM, MR	light, occasion snow. Cold and windy. Too shallow to get flow
BDR - B	UNT 1	2/24/2013		14:18	6.67	19	9	3.8	12.0	12	JM	Sunny.
BDR - B	UNT 1	4/4/2013		15:06	6.51	15	7	4.2	12.0	8	JM	Sunny, cold. A lot of animal prints (deer tracks) near sample site
BDR - B	UNT 1	5/18/2013		14:25	6.35	18	9	12.9	10.0	12	JM	Warm, partly cloudy.
BDR - C	UNT 2	4/21/2012		13:47	6.56	22	11	11.3	12	12	MR, EN	overcast, cool.
BDR - C	UNT 2	10/12/2012		12:15	6.7	36	18	7.3	16	8	MR	cloudy, cool

Appendix 3 – Geochemical Testing Laboratory Results

Staff of Geochemical Testing, a state-certified laboratory in Somerset, PA, collected and analyzed these water samples.

Stream Name	Date	Acidity (mg/L CaCO3)	Specific Conductance (umhos/cm)	pH (Lab)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Alkalinity to 4.5 pH (mg/L CaCO3)	Chloride (mg/L)	Sulfate (mg/L)
Beaverdam Run 1	8/7/2012	2	60	7.29	50	<5	13	3	4
Beaverdam Run 1	11/19/2012	6	43	6.89	42	<5	<5	N/A	5
Beaverdam Run 2	8/7/2012	-2	67	7.44	58	<5	18	4	3
Beaverdam Run 2	11/19/2012	5	48	7.04	44	<5	8	N/A	5
Beaverdam Run 3	8/7/2012	-5	70	7.39	58	<5	24	3	3
Beaverdam Run 3	11/19/2012	2	51	7.14	46	<5	9	N/A	5

Stream Name	Date	Aluminum (mg/L)	Barium (mg/L)	Iron (mg/L)	Dissolved Iron (mg/L)	Manganese (mg/L)	Sodium (mg/L)	Strontium (mg/L)
Beaverdam Run 1	8/7/2012	<0.1	0.03	0.16	N/A	0.03	2.5	0.02
Beaverdam Run 1	11/19/2012	N/A	0.03	0.06	<.05	0.03	2.5	0.01
Beaverdam Run 2	8/7/2012	<0.1	0.03	0.08	N/A	0.02	2.7	0.02
Beaverdam Run 2	11/19/2012	N/A	0.03	0.09	<.05	0.03	2	0.02
Beaverdam Run 3	8/7/2012	<0.1	0.03	0.05	N/A	<0.01	1.8	0.02
Beaverdam Run 3	11/19/2012	N/A	0.03	0.07	<.05	<.01	0.01	N/A

Appendix 4 – SCWA Field Water Chemistry Data

Shade Creek Watershed Association tries to acquire field chemistry of pH and alkalinity every month from select sites throughout the Beaverdam Run Watershed to comply with its limestone dosing permit requirements.

Shade Creek Watershed Association
Field Chemistry Data

Site	Month	Year	Time	pH	Alkalinity
BDR1	February	2011		6.2	10.8
	May	2011		6.7	7.1
	June	2011		7.0	21.8
	September	2011		6.7	12.7
	November	2011		6.5	4.3
	January	2012	14:50	6.8	4.9
	October	2012	16:20	7.0	16.6
	March	2013		6.7	4.0
BDR2	January	2011		5.9	n/a
	February	2011		5.5	2.7
	March	2011	10:34	6.7	0.4
	May	2011		7.0	3.4
	September	2011	11:00	6.1	6.5
	November	2011		6.4	0.4
	May	2012		6.1	32.0
	June	2012	11:38	6.5	7.5
	July	2012	12:08	6.8	30.0
	November	2012		6.4	28.0
	January	2013		6.5	3.4
BDR3	February	2011		6.2	3.2
	March	2011	15:55	6.0	5.7
	April	2011		6.5	21.0
	May	2011		6.6	11.8
	June	2011		7.0	17.0
	September	2011		6.5	11.6

Site	Month	Year	Time	pH	Alkalinity
BDR5	February	2011		6.1	4.6
	March	2011	16:20	6.2	4.6
	April	2011		6.5	61.0
	May	2011		6.8	5.9
	June	2011		7.0	19.8
	September	2011		6.7	9.8
	November	2011		6.5	4.2
	October	2012	16:41	7.1	13.9
	January	2013		6.7	6.8
	March	2013		6.4	3.7
BBR5	January	2011		5.6	1.0
	February	2011		6.0	3.6
	March	2011	16:45	5.8	3.1
	April	2011		6.5	53.0
	May	2011		6.8	4.2
	June	2011		7.0	18.0
	September	2011		6.6	6.8
	November	2011		6.5	1.8
	January	2012	15:20	6.6	3.4
	May	2012		5.3	0.0
	October	2012	17:10	7.0	12.3
	January	2013		7.0	5.2
	March	2013		6.5	6.3

Appendix 5 – CVC Macroinvertebrate Data

The following table totals the macroinvertebrate species collected and identified by the Conemaugh Valley Conservancy at the seven monitoring sites in the spring and fall of 2012.

Beaverdam Watershed Macroinvertebrates
2012

			BDR 1	BDR 2	BDR 2.5	BDR 3	BDR B	BDR C	Berk-ebile
Ephemeroptera	Ephemerellidae	*Ephemerella*	348	174	134	18	3	61	2
		Eurylophella		2				1	
		Attenella		1		19		7	
		Drunella			10				
	Baetidae	*Acentrella*	4	8		11			
		Baetis	4	125	32	15	3		1
	Baetiscidae	*Baetisca*		2					
	Ephemeridae	*Litobrancha*			1				2
	Heptageniidae	*Stenonema*	34	107	30	13		9	1
		Epeorus	4	49	15	21	3	11	2
	Leptophlebiidae	*Paraleptophlebia*	63	24	59	2		78	
		Choroterpes						33	
Plecoptera	Perlidae	*Acroneuria*	2			4			
	Capniidae	*Allocapnia*				4			
		Utacapnia			1				6
		Capnia	16			1		2	12
	Chloroperlidae	*Utaperla*				5			
		Alloperla		3	7	7		2	1
		Suwallia			3		9		
		Sweltsa					1		
	Leuctridae	*Zealeuctra*	30	2	2				
		Leuctra	5			4	84	18	48
	Nemouridae	*Amphinemura*	3	31	12	4	165	31	183
	Perlodidae	*Isoperla*	2	17		16		3	
		Cultus						1	
		Clioperla		18	5				8
	Peltoperlidiae	*Peltoperla*	1	92	1	30	6	8	
	Taeniopterygidae	*Taeniopteryx*	3	10					
	Pteronarcyidae	*Pteronarcys*		13	1				
Trichoptera	Hydropsychidae	*Hydropsyche*	16	52	20	1			
		Cheumatopsyche	18	301		19	14		3
		Diplectronia	19	4	5	3	16	42	7
	Philopotamidae	*Chimarra*	1						
		Wormalidia					3	1	5
		Dolophilodes		103		10	4		
	Limnephilidae	*Apatania*	1						

			BDR 1	BDR 2	BDR 2.5	BDR 3	BDR B	BDR C	Berk-ebile
		Pycnopsyche				5			
		Hydatophylax			2	3		1	1
		Goera	1						
		Limnephilus	1						
	Rhyacophilidae	*Rhyacophila*		3			1		
	Psychomyiidae	*Lype*		4		9	16	3	3
		Psychomyia	3	15			1		3
	Odontoceridae	*Marilia*		4	1				5
	Hydroptilidae	*Palaeagapetus*				26	1		
		Oxyethira						1	
		Hydroptila						1	
	Polycentropodidae	*Polycentropus*	1				1	1	1
		Nyctiophylax					6		
		Cyrnellus		1	6				
	Beraeidae	*Beraea*			1				
	Brachycentridae	*Micrasema*		4				2	
Odonata	Gomphidae	*Lanthus*			6			5	
		Stylogomphus	1	3		1		3	
	Macromiidae	*Macromia*						1	
	Cordulegasteridae	*Cordulegaster*			1				
Coleoptera	Elmidae	*Optioservus*	9	94	94	4	3	6	2
		Microcylloepus	4	24	65	10			
		Oulimnius	5						
		Promorsia	4	115	8	12			1
	Psephenidae	*Psephenus*		1					
		Ectopria		2	1				
	Hydrophilidae	*Hydrophilus*		1					
Megaloptera	Corydalidae	*Nigronia*	3	9					1
Diptera	Chironomidae		12	26	5	36	15	14	10
	Tipulidae	*Tipula*	1	2	1	31		7	
		Antocha	1	1	11			5	
		Hexatoma	12	8	8	8	2	8	
		Pedicia					3	32	
		Limonia					2		
		Pseudolimnophila							1
		Dicranota			1				
	Simuliidae	*Simulium*	1	5					
		Prosimula		36	6	30	25	2	94
	Empididae	*Hemerodromia*							
	Tabanidae	*Haematopota*							
		Chrysops							
		Tabanus				3		1	
	Anthericidae	*Antherix*							
	Ceratopogonidae	*Bezzia*				1			

			BDR 1	BDR 2	BDR 2.5	BDR 3	BDR B	BDR C	Berk-ebile
		Monohelea			2				
		Culicoides							
		Antrichopogon						1	
Decapoda	Cambarridae	*Cambarrus*	*2*	3	5	3	1	1	
Gastropoda	Ancylidae	*Ferrissia*		17					
Bivalvia	Sphaeriidae	*Pisidum*			1				
Oligochaeta							1		
		Total	635	1516	563	389	389	403	403

Appendix 6 – DEP Macroinvertebrate Data

The following are data acquired by the Pennsylvania Department of Environmental Protection during its Qualitative Bioassessment of the Beaverdam Run Watershed.

		PA Hilsenhoff Tolerance Index	Beaverdam Run Sites				
			BDR1 - above hatchery				
			5/2 2008	2/26 2009	Nov. 2009	Apr. 2010	Nov. 2010
			Range of Individuals for Each Taxa: Rare <3, Present 3-9, Common 10-24, Abundant 25-100, Very Abundant 100 or >				
Macroinvertebrates	**Common Name**	**0-10**					
Coleoptera	**Beetles**						
Elmidae	Riffle Beetles	5					
Decapoda	**Arthropods**						
Cambaridae	Crayfish	6	6				
Ephemeroptera	**Mayflies**						
Baetidae	Small Minnow	6	15				3
Baetiscidae		3					
Ephemerellidae	Spiny Crawlers	2	3	1	1		
Ephemeridae	Common Burrowers	4					
Heptageniidae	Flatheaded	3	10	1	8	2	6
Leptophlebiidae		4					
Diptera	**True Flies**						
Athericidae	Snipe Flies	2					
Ceratopogonidae	Biting Midges	6					
Chironomidae	Midges	6			3	2	6
Simulidae	Black Flies					1	
Tabanidae	Deer/Horse Flies				1		
Tipulidae	Craneflies	4			5		1
Megaloptera	**Dobson/Alderflies**						
Corydalidae	Dobsonflies	3					
Sialidae	Alderflies	6					
Odonata	**Dragon/Damselflies**						
Aeshnidae	Dragonflies	3					
Calopterygidae	Damselflies	5					
Gomphidae	Dragonflies	4	2	3	4		2
Lestidae	Damselflies	9					
Oligochaeta	**Aquatic Earthworms**	10				1	
Plecoptera	**Stoneflies**						
Chlorperlidae	Green	0			9		
Leuctridae	Rolledwinged	0			4	10	12
Nemouridae	Broadbacks	2				4	2
Peltoperlidae	Roachlike	2			15	2	6
Perlidae	Common	3				2	1
Perlodidae	Perlodid	2	8		5		
Pteronarcyidae	Giant	2					1
Taeniopterygidae	Broadbacks	2			4		
Trichoptera	**Caddisflies**						

BDR1 - continued			5/2	2/26	Nov.	Apr.	Nov.
			2008	2009	2009	2010	2010
Hydropsychidae	Common Netspinner	5	2		7	2	2
Limnephilidae	Northern Casemaker	4	2	1	1		
Philopotamidae	Fingernet	3			2		
Phryganeidae	Giant	4					
Polycentropodidae	Fingernet	6					
Rhyacophilidae	Freeliving	1	1	1			
Total Number of Individuals			**49**	**7**	**69**	**26**	**42**
Total Number of Families			**9**	**5**	**14**	**9**	**11**

100 meters

		PA Hilsenhoff Tolerance Index	Beaverdam Run Sites						
			BDR2 - Downstream at mouth						
			2/13	5/2	2/26	Nov.	Apr.	Nov.	Apr.
			2006	2008	2009	2009	2010	2010	2011
			Range of Individuals for Each Taxa:						
Macroinvertebrates	**Common Name**	**0-10**	Rare <3, Present 3-9, Common 10-24, Abundant 25-100, Very Abundant 100 or >						
Coleoptera	**Beetles**								
Elmidae	Riffle Beetles	5	Rare						
Decapoda	**Arthropods**								
Cambaridae	Crayfish	6	Rare	4		3	3		2
Ephemeroptera	**Mayflies**								
Baetidae	Small Minnow	6				1		1	
Baetiscidae		3				4	11	6	
Ephemerellidae	Spiny Crawlers	2	Rare	16	3	1			10
Ephemeridae	Common Burrowers	4							
Heptageniidae	Flatheaded	3	Rare	1	4	6	2	2	2
Leptophlebiidae		4							
Diptera	**True Flies**								
Athericidae	Snipe Flies	2	Rare	1					2
Ceratopogonidae	Biting Midges	6	Rare	2					
Chironomidae	Midges	6	Rare			3	2	2	
Simulidae	Black Flies								
Tabanidae	Deer/Horse Flies								
Tipulidae	Craneflies	4	Rare	1	1	3		1	2
Megaloptera	**Dobson/Alderflies**								
Corydalidae	Dobsonflies	3	Rare	3					4
Sialidae	Alderflies	6			1				
Odonata	**Dragon/Damselflies**								
Aeshnidae	Dragonflies	3							
Calopterygidae	Damselflies	5	Rare						
Gomphidae	Dragonflies	4	Rare	2		1			
Lestidae	Damselflies	9							
Oligochaeta	**Aquatic Earthworms**	10	Rare			1	1		
Plecoptera	**Stoneflies**								
Chlorperlidae	Green	0		1	A		2	4	

BDR2 - continued			2/13	5/2	2/26	Nov.	Apr.	Nov.	Apr.
			2006	2008	2009	2009	2010	2010	2011
Leuctridae	Rolledwinged	0	Present	6		8	8	8	
Nemouridae	Broadbacks	2						2	
Peltoperlidae	Roachlike	2	Rare	2	1		3	1	8
Perlidae	Common	3	Common	1		6	2	1	4
Perlodidae	Perlodid	2	Abundant	3	6				10
Pteronarcyidae	Giant	2							
Taeniopterygidae	Broadbacks	2			2				
Trichoptera	**Caddisflies**								
Hydropsychidae	Common Netspinner	5	Present	6		11	9	5	
Limnephilidae	Northern Casemaker	4	Rare		1				2
Philopotamidae	Fingernet	3	Rare	1		6	1		
Phryganeidae	Giant	4							
Polycentropodidae	Fingernet	6				2		1	
Rhyacophilidae	Freeliving	1					3		
Total Number of Individuals			**~**	**50**	**44+**	**56**	**47**	**33**	**46**
Total Number of Families			**19**	**15**	**9**	**14**	**12**	**11**	**10**

100 meters

			Beaverdam Run Sites		
		PA Hilsenhoff Tolerance Index	**BDR3 - Upstream**		
			5/2	Apr.	Nov.
			2008	2010	2010
			Range of Individuals for Each Taxa:		
Macroinvertebrates	**Common Name**	**0-10**	**Rare <3, Present 3-9, Common 10-24, Abundant 25-100, Very Abundant 100 or >**		
Coleoptera	**Beetles**				
Elmidae	Riffle Beetles	5			
Decapoda	**Arthropods**				
Cambaridae	Crayfish	6	**2**		
Ephemeroptera	**Mayflies**				
Baetidae	Small Minnow	6		**1**	
Baetiscidae		3			
Ephemerellidae	Spiny Crawlers	2	**2**		
Ephemeridae	Common Burrowers	4			
Heptageniidae	Flatheaded	3			
Leptophlebiidae		4			
Diptera	**True Flies**				
Athericidae	Snipe Flies	2			
Ceratopogonidae	Biting Midges	6			
Chironomidae	Midges	6		**6**	**2**
Simulidae	Black Flies			**16**	
Tabanidae	Deer/Horse Flies				
Tipulidae	Craneflies	4			

BDR3 - continued			5/2	Apr.	Nov.
			2008	2010	2010
Megaloptera	**Dobson/Alderflies**				
Corydalidae	Dobsonflies	3			
Sialidae	Alderflies	6			
Odonata	**Dragon/Damselflies**				
Aeshnidae	Dragonflies	3	**5**		
Calopterygidae	Damselflies	5			
Gomphidae	Dragonflies	4			
Lestidae	Damselflies	9			
Oligochaeta	**Aquatic Earthworms**	10		**2**	
Plecoptera	**Stoneflies**				
Chlorperlidae	Green	0			
Leuctridae	Rolledwinged	0		**1**	
Nemouridae	Broadbacks	2			
Peltoperlidae	Roachlike	2			
Perlidae	Common	3			
Perlodidae	Perlodid	2			
Pteronarcyidae	Giant	2			
Taeniopterygidae	Broadbacks	2			
Trichoptera	**Caddisflies**				
Hydropsychidae	Common Netspinner	5			
Limnephilidae	Northern Casemaker	4	**2**		
Philopotamidae	Fingernet	3			
Phryganeidae	Giant	4	**2**		
Polycentropodidae	Fingernet	6			
Rhyacophilidae	Freeliving	1			
Total Number of Individuals			**13**	**26**	**2**
Total Number of Families			**5**	**5**	**1**

100 meters

		PA Hilsenhoff Tolerance Index	Beaverdam Run Sites					
			BDR5 - Midstream					
			6/11 2007	5/2 2008	2/26 2009	Nov. 2009	Apr. 2010	Nov. 2010
			Range of Individuals for Each Taxa:					
Macroinvertebrates	**Common Name**	**0-10**	**Rare <3, Present 3-9, Common 10-24, Abundant 25-100, Very Abundant 100 or >**					
Decapoda	**Arthropods**							
Cambaridae	Crayfish	6	**3-9**	**4**	**2**	**4**	**2**	
Ephemeroptera	**Mayflies**							
Baetidae	Small Minnow	6	**3-9**	**17**	**4**	**3**	**6**	**1**
Baetiscidae	Armorred	3				**12**	**2**	**3**
Ephemerellidae	Spiny Crawlers	2	**3-9**	**5**	**5**	**4**		
Ephemeridae	Common Burrowers	4						
Heptageniidae	Flatheaded	3		**10**	**5**	**7**	**4**	**6**
Leptophlebiidae	Prong Gilled	4				**1**		
Diptera	**True Flies**							
Athericidae	Snipe Flies	2	**< 3**				**4**	**1**
Ceratopogonidae	Biting Midges	6	**< 3**					
Chironomidae	Midges	6				**5**	**2**	**12**
Simulidae	Black Flies		**< 3**		**5**		**4**	**1**
Tabanidae	Deer/Horse Flies				**1**			
Tipulidae	Craneflies	4	**3-9**		**2**		**2**	**1**
Megaloptera	**Dobson/Alderflies**							
Corydalidae	Dobsonflies	3	**10-24**	**4**	**2**	**4**	**1**	
Sialidae	Alderflies	6				**1**		
Odonata	**Dragon/Damselflies**							
Aeshnidae	Dragonflies	3		**2**				
Gomphidae	Dragonflies	4	**3-9**	**2**	**4**	**3**	**5**	**5**
Oligochaeta	**Aquatic Earthworms**	10					**2**	**1**
Plecoptera	**Stoneflies**							
Chlorperlidae	Green	0			**8**	**2**	**8**	**2**
Leuctridae	Rolledwinged	0			**3**	**2**	**15**	**12**
Nemouridae	Broadbacks	2						**2**
Peltoperlidae	Roachlike	2		**8**	**10**	**19**	**16**	**30**
Perlidae	Common	3				**3**	**5**	**1**
Perlodidae	Perlodid	2	**3-9**	**5**	**1**	**1**		**1**
Pteronarcyidae	Giant	2	**10-24**	**9**				
Taeniopterygidae	Broadbacks	2			**3**			
Trichoptera	**Caddisflies**							
Hydropsychidae	Common Netspinner	5	**10-24**	**1**	**3**	**33**	**8**	**32**
Limnephilidae	Northern Casemaker	4	**3-9**	**1**	**1**	**4**	**2**	
Philopotamidae	Fingernet	3	**10-24**		**1**	**10**	**2**	**3**
Phryganeidae	Giant	4			**1**			
Polycentropodidae	Fingernet	6						**8**
Rhyacophilidae	Freeliving	1	**3-9**	**8**	**5**	**1**	**1**	**2**
Total Number of Individuals			**~**	**76**	**66**	**112**	**91**	**124**
Total Number of Families			**15**	**13**	**19**	**20**	**19**	**19**

100 meters

		PA Hilsenhoff Tolerance Index	Beaverdam Run Sites		
			BBr5 - Berkebile Run		
			5/2 2008	2/26 2009	5/17 2012
			Range of Individuals for Each Taxa:		
Macroinvertebrates	**Common Name**	**0-10**	**Rare <3, Present 3-9, Common 10-24, Abundant 25-100, Very Abundant 100 or >**		
Decapoda	**Arthropods**				
Cambaridae	Crayfish	6	**2**		**2**
Ephemeroptera	**Mayflies**				
Baetidae	Small Minnow	6			
Baetiscidae	Armorred	3			
Ephemerellidae	Spiny Crawlers	2			
Ephemeridae	Common Burrowers	4			
Heptageniidae	Flatheaded	3			
Leptophlebiidae	Prong Gilled	4			
Diptera	**True Flies**				
Athericidae	Snipe Flies	2			
Ceratopogonidae	Biting Midges	6			
Chironomidae	Midges	6			
Simulidae	Black Flies				
Tabanidae	Deer/Horse Flies				
Tipulidae	Craneflies	4			**6**
Megaloptera	**Dobson/Alderflies**				
Corydalidae	Dobsonflies	3			
Sialidae	Alderflies	6			
Odonata	**Dragon/Damselflies**				
Aeshnidae	Dragonflies	3			**1**
Gomphidae	Dragonflies	4			**1**
Oligochaeta	**Aquatic Earthworms**	10			
Plecoptera	**Stoneflies**				
Chlorperlidae	Green	0	**2**	**8**	**4**
Leuctridae	Rolledwinged	0		**1**	
Nemouridae	Broadbacks	2			**15**
Peltoperlidae	Roachlike	2			**1**
Perlidae	Common	3			
Perlodidae	Perlodid	2	**6**		
Pteronarcyidae	Giant	2			
Taeniopterygidae	Broadbacks	2		**2**	
Trichoptera	**Caddisflies**				
Hydropsychidae	Common Netspinner	5	**4**		**10**
Limnephilidae	Northern Casemaker	4			**1**
Philopotamidae	Fingernet	3		**1**	**1**
Phryganeidae	Giant	4			
Polycentropodidae	Fingernet	6			
Rhyacophilidae	Freeliving	1	**1**	**3**	**5**
Total Number of Individuals			**15**	**15**	**47**
Total Number of Families			**5**	**5**	**11**

100 meters

Pennsylvania Department of Environmental Protection Data from 2001 Qualitative Bioassessment for the Statewide Surface Water Assessment Program. See Figure 27 or 32 for site location.

Field Form: Wadeable Streams

version: 1.0 4/3/2013 2:31:07 PM

Assessment ID:	48362	HUC ID:	05010007
Station ID:	20010625-1500-ALF	HUC Name:	Conemaugh. Pennsylvania.
Survey Type:	Statewide Surface Water Assessment Program		

Residential	5 %	Commercial	0 %	Indus-trial	5 %	Crop-land	0 %	Pasture	0 %
Abd. Mining	0 %	Old Fields	0 %	Forest	90 %	Other	0 %		

OK	Impaired	Criterion
	☐	1. Abundance obviously low.
	☐	2. Seven or fewer Families in the collection
	☐	3. Three or fewer mayfly individuals; excluding Baetidae, Caenidae, and Siphlonuridae
☑		4. Stoneflies collectively present
☑		5. Mayflies and caddisflies are collectively abundant; excluding Baetidae, Caenidae, Siphlonuridae, Hydropsychidae, and Polycentropodidae
☑		6. July thru September: at least 4 EPT Families with Hilsenhoff of 4 or less November Thru May: at least 6
☑		7. 4 or more Families with Hilsenhoff of 3 or less
☑		8. 6 or more Families with Hilsenhoff of 4 or less
☑		9. Dominant Family with Hilsenhoff of 4 or less
	☐	10. Dominant Family with Hilsenhoff greater than 5 (Criteria 7 and 8 negate this criterion)
	☐	11. 7 or more families with Hilsenhoff of 6 or more (Criteria 7 and 8 negate this criterion)
☑		12. Sample dominated by families with a mean Hilsenhoff of 5 or less
	☐	13. Sample dominated by families with a mean Hilsenhoff of 6 or more
	☐	14. [#3 Riff/Run: embeddedness or #3 Glide/Pool: Substrate Character]+ #6 Sediment Deposition 24 or less (20 or less for warm water, low gradient streams)
	☐	15. #9 Condition of banks + #10 Bank Vegetation 24 or less (20 or less for warm water, low gradient streams)
	☐	16. Total Habitat score 140 or less for forested, cold water, high gradient streams (120 or less for warm water low gradient streams
☐	☐	17. Special Conditions. (Left Box OK, Right Box Impaired) DESCRIBE IN COMMENTS

Not Impaired	☑	Impaired Biology	☐	Impaired Habitat	☐	Rock Pick Influenced Assessment?	☐	Impact is Localized	☐	Reevaluate Designated Use?	☐

1 Instream Cover	12	2 Epifaunal Sibstrate	16	Total	
3 Embeddedness	16	4 Velocity/Depth Regimes	15	188	
5 Channel Alterations	16	6 Sediment Deposition	16		
7 Frequency of Riffles	17	8 Channel Flow Status	16		
9 Condition of Banks	16	10 Bank Vegetation	17		
11 Grazing or Disruptive	16				

		12 Riparian Vegetation	15	Chem Sample IDs
pH:	5.3	DO (mg/l):	9.49	
Temp (C):	16.7	Flow (cfs):		
Cond (umhos):	48	Alkalinity (mg/l):		

COMMENTS

Location	160 SOUTH TO CENTRAL CITY STAY STRAIGHT ON MAIN STREET, LEFT ONTO SR 1018 (SHAFFER MT. RD.), LEFT ONTO JEEP TRAIL TO CENTRAL CITY WATER AUTHORITY WELL#2
Land Use	FORESTED SOME CLEAR CUT AREA FOR WELL AND POWER LINE INDUSTRIAL:QUARRY
Special Condition	
Impairment	NONE
Invertebrates, Habitat, and Fish	TRIED TO SAMPLE FURTHER DOWNSTREAM TO SEE IF QUARRY AFFECTING BUT CANNOT GET TO IT-DANGEROUS BLASTING AREAS EPEORUS

Pennsylvania Department of Environmental Protection Data from 2008 Quantitative Bioassessment. See Figure 27 or 32 for site location.

Macroinvertebrate Sample Summary

version: 3.0 4/3/2013 2:29:24 PM

Assessment ID:	62006
Station ID:	20080606-1330-gkenderes (Latitude: 40.1098, Longitude: -78.7544)
Method:	6-Dframe Composite, 200 subsample
Location:	200806061330gkenderes (Pick site) - Beaverdam Run - Quad Central City - Stream code 45336 - HUC 05010007 - HQ-CWF - 18E - Somerset County - Lat 40.10980 Long -78.75447 - Travel to directions: From Central City PA, take SR1018 ~ 3 miles to where road crosses stream and just pass bridge go park - Sampled upstream from bridge 1000 feet. -

Comments:

Land Use: Land use Other: Road follows and crosses stream (paved) - Gamelands 228 covers upper part of watershed - Country homes spread out with some small farms (cattle) - High altitude area.

Impairment: Attaining IBI score - 80.8 (2009 small)

Taxa:

Total # Organisms: 218

Code	Standardized ID Level	Number	Tolerance
1020400300	Baetis	3	6
1020401300	Plauditus	67	4
1020600100	Epeorus	2	0
1020600702	Maccaffertium	3	3
1020800100	Attenella	3	2
1020800300	Ephemerella	4	1
1020800400	Eurylophella	4	4
1020800500	Serratella	3	2
1021200500	Paraleptophlebia	1	1
1030200700	Lanthus	1	5
1040100100	Pteronarcys	1	0
1040200200	Tallaperla	2	0
1040500200	Leuctra	9	0
1040800900	Remenus	2	2
1040801200	Isoperla	1	2
1060200400	Nigronia	1	2
1080100200	Dolophilodes	38	0
1080300500	Polycentropus	1	6
1080400300	Diplectrona	5	0
1080400600	Cheumatopsyche	2	6
1080500100	Rhyacophila	5	1
1080600200	Agapetus	1	0
1080900300	Micrasema	1	2
1101300600	Optioservus	13	4

1101300900	Promoresia	1	2
1121200100	Chelifera	15	6
1122100500	Simulium	12	6
1122200000	Chironomidae	17	6

Metrics:

Metric Name	Raw Metric Values	Standardized Metric Values						
		Freestone Riffle-Run						
		6D200 2009 Small	6D200 2009 Large	6D200 2007	2D100	Multi-habitat Pool-Glide	Lime-stone 2006	Lime-stone 2009
Total Richness	28	84.8	90.3	80.0		90.3	151.4	155.6
Ephemeroptera Richness	9					150.0		
Trichoptera Richness	7					63.6		
EPT Richness	21			91.3	137.3	123.5	262.5	262.5
Trichoptera Richness (PTV 0-4)	5				138.9			
EPT Richness (PTV 0-4)	18	94.7	112.5					
Becks Index (version 3)	34	89.5	154.5	87.2				
Becks Index (version 4)	31				155.8	140.9		258.3
FC + PR + SH Richness	15				129.3			
Hilsenhoff Biotic Index	3.14	84.6	98.7	83.5	101.8		109.1	111.4
% Intolerant Individuals (PTV 0-3)	38.1	45.1	57.1				144.9	
% Intolerant Individuals (PTV 0-5)	77.1			83.4				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	2.46	86.0	86.0	84.8		101.2	128.1	115.5
IBI Score		80.8	88.7	85.0	100.0	92.3	100.0	100.0

% Ephemeroptera: 41.28 % Plecoptera: 6.88 % Trichoptera: 24.31
% Ephemeroptera (PTV 0-4): 39.91 % Dominant Taxon: 30.73

Habitat:

1 Instream Cover:	18	2 Epifaunal Substrate:	15	
3 Embeddedness:	16	4 Velocity/Depth Regimes:	16	
5 Channel Alterations:	20	6 Sediment Deposition:	17	
7 Frequency of Riffles:	17	8 Channel Flow Status:	18	
9 Condition of Banks:	19	10 Bank Vegetation:	18	**Total**
11 Grazing or Disruptive:	20	12 Riparian Vegetation:	20	214

Impairment:

Insufficient?	N	Impaired?	N	Biology Impaired?	N
Habitat Impaired?	N	Rock picks influenced?	N	Impact Localized?	N

Designated Use needs reevaluation? N

Appendix 7 – Fish Data

Fish species occurrence
Beaverdam Run Section 02 Site 0202 (River Mile 0.1)
PA Fish and Boat Commission surveys

		Date		
Common Name	**Scientific Name**	**June 17 1983**	**October 2 1992**	**June 11 2012**
Blacknose Dace	*Rhinichthys atratulus*	X	X	X
Brook Trout	*Salvelinus fontinalis*	X	X	X
Brook Trout (Hatchery)	*Salvelinus fontinalis*			X
Brown Trout	*Salmo trutta*	X	X	X
Creek Chub	*Semotilus atromaculatus*			X
Mottled Sculpin	*Cottus bairdii*	X	X	X
White Sucker	*Catostomus commersonii*	X	X	X
	TOTAL SPECIES	**5**	**5**	**7**

Fish species occurrence
Beaverdam Run Section 02 Site 0201 (River Mile 1.3)
PA Fish and Boat Commission surveys

		Date		
Common Name	**Scientific Name**	**June 16 1983**	**October 2 1992**	**June 11 2012**
Blacknose Dace	*Rhinichthys atratulus*	X	X	X
Brook Trout	*Salvelinus fontinalis*	X	X	X
Brook Trout (Hatchery)	*Salvelinus fontinalis*			X
Brown Trout	*Salmo trutta*	X	X	X
Brown Trout (Hatchery)	*Salmo trutta*			X
Mottled Sculpin	*Cottus bairdii*	X	X	X
Northern Hog Sucker	*Hypentelium nigricans*		X	
Pumpkinseed	*Lepomis gibbosus*			X
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*			X
White Sucker	*Catostomus commersonii*	X	X	X
	TOTAL SPECIES	**5**	**6**	**9**

Fish species occurrence

Beaverdam Run Section 01 Site 0101 (River Mile 5.37)

PA Fish and Boat Commission (1979-2004) and Conemaugh Valley Conservancy & California University of PA (2012) Surveys

		Date								
Common Name	**Scientific Name**	**June 1979**	**June 1983**	**July 1988**	**July 1998**	**July 2000**	**July 2002**	**July 2003**	**July 2004**	**Sept. 2012**
Brook Trout	*Salvelinus fontinalis*	X	X	X	X	X	X	X	X	X
Brook Trout (Hatchery)	*Salvelinus fontinalis*			X	X			X		
Brown Trout	*Salmo trutta*	X	X	X						
Brown Trout (Hatchery)	*Salmo trutta*			X	X	X				
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*				X				X	
Creek Chub	*Semotilus atromaculatus*			X					X	
Brown Bullhead	*Ameiurus nebulosus*	X								
Mottled Sculpin	*Cottus bairdii*	X	X	X	X	X	X	X	X	X
	TOTAL SPECIES	4	3	6	5	3	2	3	4	2

Fish species occurrence

Beaverdam Run Section 01 Site 0102 (River Mile 2.51, 2.93, 3.10)

PA Fish and Boat Commission (1979-2004) and Conemaugh Valley Conservancy & California University of PA (2012) Surveys

		Date									
Common Name	**Scientific Name**	**June 1979**	**June 1983**	**July 1988**	**Aug. 1991**	**June 1998**	**July 2000**	**July 2002**	**July 2003**	**July 2004**	**Sept. 2012**
Brook Trout	*Salvelinus fontinalis*	X	X	X	X	X	X	X	X	X	X
Brook Trout (Hatchery)	*Salvelinus fontinalis*			X	X		X	X		X	
Brown Trout	*Salmo trutta*	X	X	X	X	X	X	X	X	X	X
Brown Trout (Hatchery)	*Salmo trutta*			X	X			X			
Rainbow Trout (Hatchery)	*Oncorhynchus mykiss*			X		X			X		X
Tiger Trout							X				X
Chain Pickerel	*Esox niger*		X					X			
White Sucker	*Catostomus commersoni*			X		X	X	X		X	X
Blacknose Dace	*Rhinichthys atratulus*		X	X	X	X	X	X	X	X	X
Mottled Sculpin	*Cottus bairdii*	X	X	X	X	X	X	X	X	X	X
Johnny Darter	*Etheostoma nigrum*							X			
Creek Chub	*Semotilus atromaculatus*								X		
Rock Bass	*Ambloplites rupestris*									X	
	TOTAL SPECIES	**3**	**5**	**8**	**6**	**6**	**7**	**9**	**6**	**7**	**7**

Fish species occurrence

Berkebile Run below Limestone Dose

PA Department of Environmental Protection (May 2005-May 2012), CVC & Cal U (Sept 2012), and PA Fish and Boat Commission (July 2013) surveys

		Date			
Common Name	**Scientific Name**	**May 2005**	**May 2012**	**Sept 2012**	**July 2013**
Blacknose Dace	*Rhinichthys atratulus*		X	X	X
Brook Trout	*Salvelinus fontinalis*		X	X	X
Creek Chub	*Semotilus atromaculatus*	X			
Mottled Sculpin	*Cottus bairdii*		X	X	X
White Sucker	*Catostomus commersonii*	X	X	X	
	TOTAL SPECIES	**2**	**4**	**4**	**3**

Photographs