Northern Bear Run

Coldwater Conservation Plan

Indiana County
Conservation District

Prepared by:
Western Pennsylvania Conservancy

Assistance Provided By:
Indiana County Conservation District

Ken Sink Chapter of Trout Unlimited

Coldwater Heritage Partnership

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CONSERVATION PLAN OBJECTIVES

Western Pennsylvania Conservancy's (WPC) coldwater conservation plan for the North Branch of Bear Run contains stream health analyses based upon water quality data, as well as recommendations for proposed restoration and protection strategies supported by these analyses. The plan aims to generate support and participation from local landowners and encourage community awareness, so that the recommendations can then be advanced into the implementation phase.

BACKGROUND

The Bear Run watershed is a 19-square-mile drainage of the upper West Branch of the Susquehanna River in Indiana, Clearfield, and Jefferson counties. The headwaters of the North Branch of Bear Run start in the southeast corner of Jefferson County, immediately cross into Indiana County, pass the town of Hillman, and continue to flow southeast through Banks Township, Indiana County. The North Branch and South Branch of Bear Run meet to form the main stem and flow east into the West Branch of the Susquehanna River at McGees Mills, Clearfield County.

Forested land comprises the majority of the Bear Run watershed (79 percent), though evidence of disturbed land can still be found with tree cover now growing over it (Map #1 and Map #2). Agriculture, primarily hayland, pasture, and row crops, is the second-leading land use, making up 15.2 percent of the watershed. Disturbed lands (abandoned coal mines, quarries, etc.) make up approximately 5.6 percent of the watershed, but seem to have the largest water quality impact.

A majority of the North Branch flows through State Game Lands (SGL) 174, and contains minimal residential and no urban areas. For these reasons, much of the North Branch incurs relatively few impacts and contains a naturally reproducing native brook trout fishery. However, there are factors within the watershed which have affected the quality of the stream and its tributaries.

The South Branch is highly degraded by abandoned mine drainage (AMD). Coal mining began in the region in the 1880s

and it remains an important industry within the watershed. The effects of the abandoned mines remain the most degrading impact to the South Branch and the main stem. The trout within the watershed are contained within the North Branch due to the poor water quality at the confluence of the North Branch and South Branch.

Thus far, WPC has collected data through a variety of methods, including Geographic Information Systems (GIS), macroinvertebrate and chemical samples, visual assessments, and electrofishing within the North Branch. This conservation plan has been constructed by evaluating the physical, chemical, and biologic integrity of the Bear Run watershed. Through this thorough evaluation, a number of different impacts have been identified. Recommendations for restoration of those impacts, as well as protection of key ecological attributes, will be the end result of this document. Once distributed, WPC hopes this document will guide efforts that occur on the North Branch for years to come. Distribution of this plan will include state and local government officials, watershed organizations, and local landowners. The aforementioned distribution is targeted with the intent of creating interest, support, and action. With the protection of the watershed's key ecological features, and the remediation of non-point source pollution sources, the watershed will remain intact for future generations to enjoy.

BEAR RUN WATERSHED — GEOLOGY

The entire Bear Run watershed is contained within the Pittsburgh Low Plateau Section of the Appalachian Plateaus Province. The Pittsburgh Low Plateau Section is characterized by a rolling surface cut by frequent, narrow, relatively shallow valleys (DEP 5). The highest elevations occur along the north and southwest borders of the watershed. It varies from 2,100 feet above sea level to below 1,400 feet where the North Branch and South Branch meet to form Bear Run, less than 10 miles west of their confluence with the West Branch of the Susquehanna River.

The Conemaugh and Allegheny rock groups dominate the watershed and are both of the Pennsylvanian geologic age dating from 290–323 million years ago. The majority of coal in Pennsylvania was deposited during the Pennsylvanian Period of

ACKNOWLEDGMENTS

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Coldwater Heritage Partnership

Indiana County Conservation District

Ken Sink Chapter of Trout Unlimited

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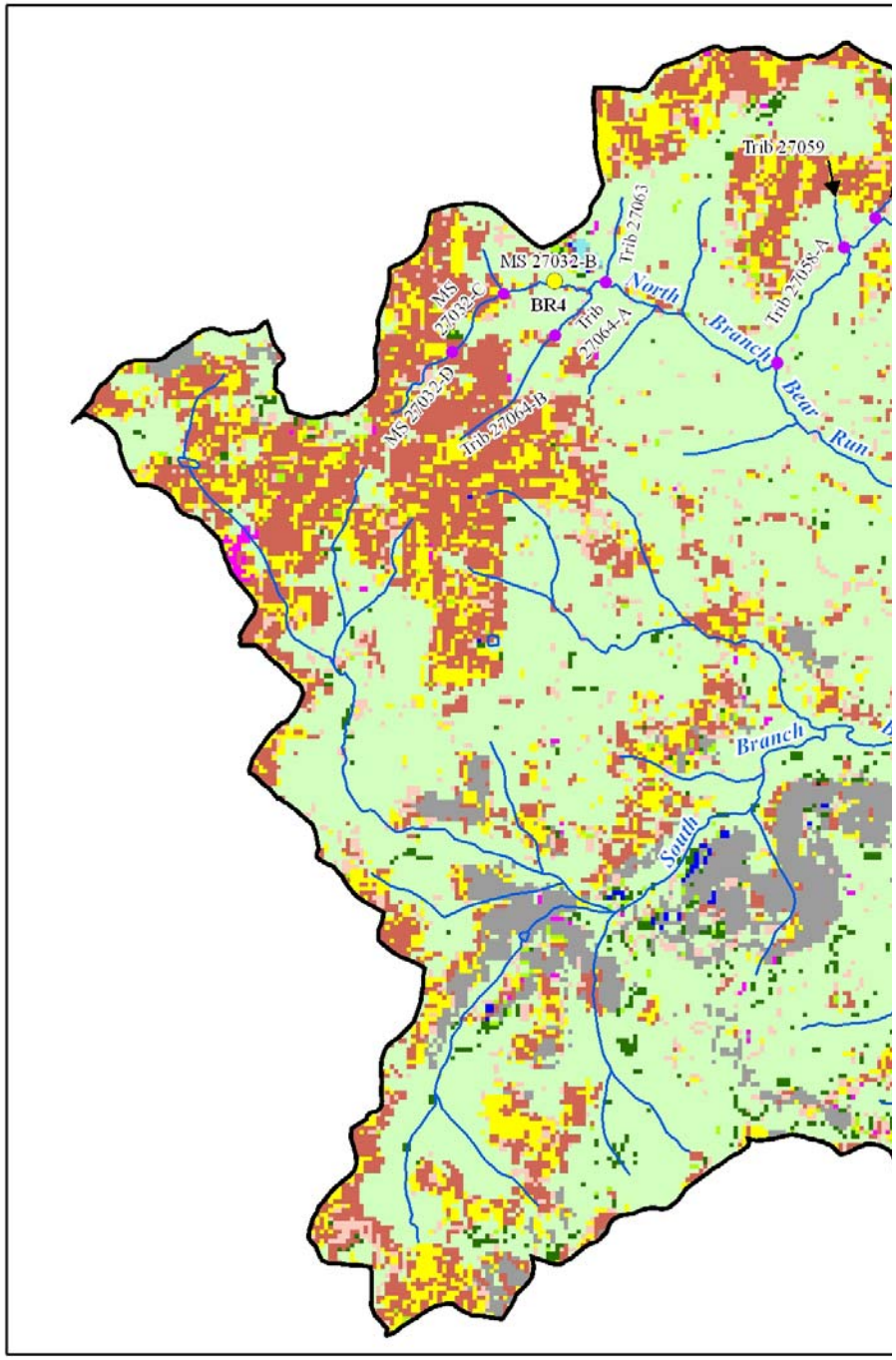
geologic time. The Allegheny Group contains nearly all of the economically mineable coals in Pennsylvania, creating many regions where coal outcrops are abundant and easily accessible. The exposed bedrock, which lies immediately beneath the unconsolidated material in the North Branch, consists of sandstone, shale, limestone, and coal (DEP 1, 2, and 10).

Over most of southwestern Pennsylvania, including the Bear Run watershed, sufficient water for domestic purposes can be obtained from bedrock wells. Larger amounts, enough for industrial or municipal purposes, are more difficult to obtain because these bedrock wells are naturally lower yielding. Dispersal of limestone outcroppings have a limited ability to buffer iron concentrations within the water; therefore, bedrock wells often exceed recommended drinking water concentrations for iron. According to Williams and McElroy’s 1991 report on the water resources of Indiana County, 77 percent of the 523 wells tapped the Conemaugh Group and another 21 percent tapped the Allegheny Group (DEP 9-10).

BR-3 directly above confluence with South Branch .



survival. Increased habitat for wildlife is also established, which can make for enjoyable nature viewing.

Control impervious surface discharge

Storm gutters, grassed waterways, or other water controlling devices can be utilized to reduce the impact of concentrated water flow.

Continued Monitoring

A monitoring program should be established for the North Branch of Bear Run. At a minimum, one year of consistent monitoring should be performed to establish baseline criteria for the stream. This would also assist in measuring the overall impact of acid deposition within the watershed.

Upgrade stream to high quality cold water fishery (HQ CWF)

For a stream to be eligible for HQ status, it must meet one of three qualifiers, either for water chemistry based on twelve parameters, biological assessment using benthic macroinvertebrates, or being a Class A Wild Trout Stream. The third option would be used to upgrade Bear Run to high quality status.

WPC staff measure brook trout collected during the assessment.

FUTURE RECOMMENDATIONS

Landowner education

Education is often the most effective tool in addressing watershed-related problems. Landowners are often willing to alter their past practices when it is explained to them how conservation practices benefit and beautify their reach of stream. Simple practices, such as not mowing the stream edge and checking on septic tank conditions, can dramatically improve stream conditions for both terrestrial and aquatic life.

Streambank fencing for agricultural operations

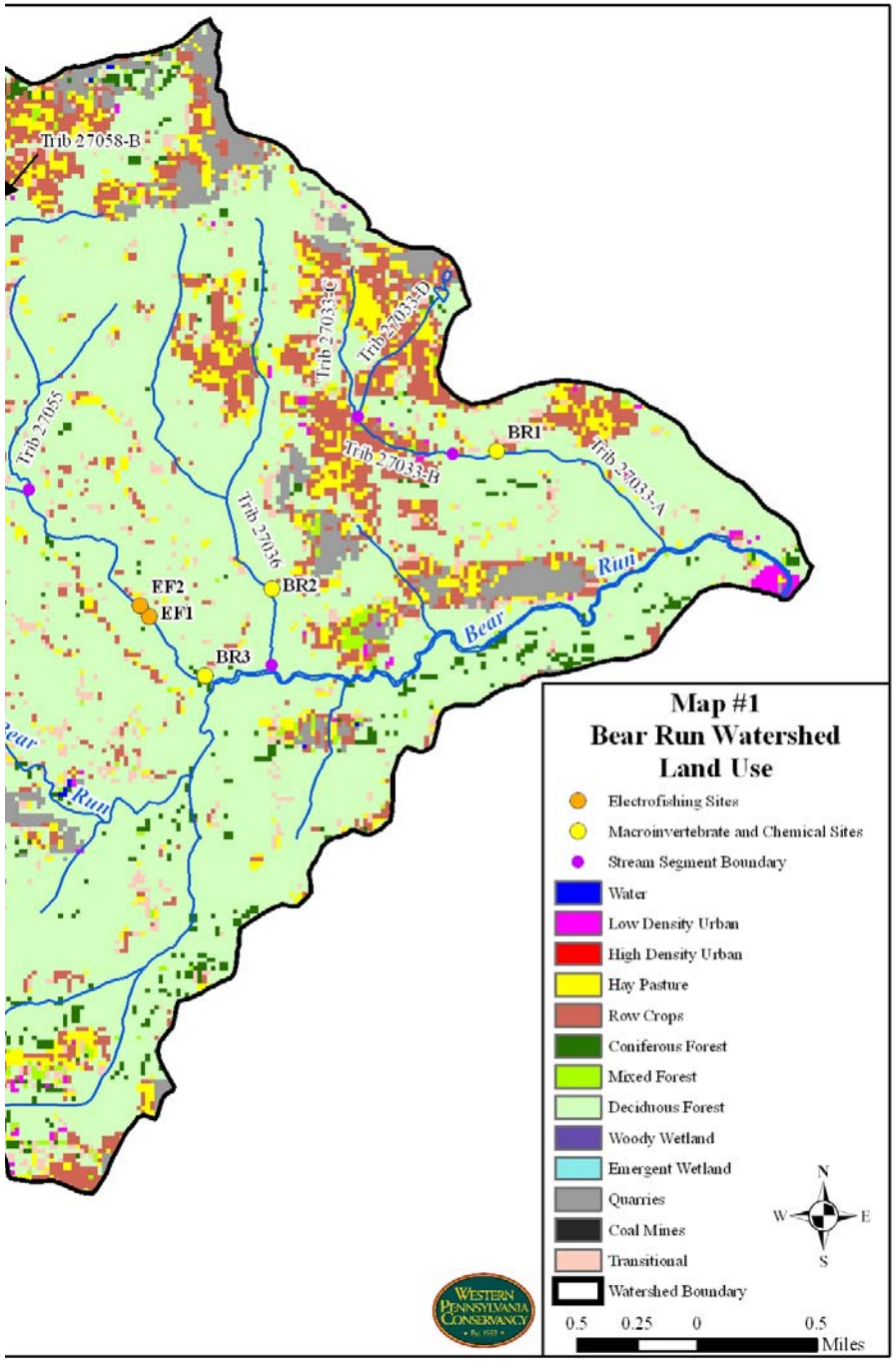
Streambank fencing is effective in reducing sediment and nutrient concentrations. Through the construction of fencing, the streambank becomes stabilized by new plant growth. This buffer zone slows nutrient runoff and allows stormwater to percolate through the soil, rather than become surface runoff that directly enters the stream. By limiting livestock activity in the riparian area, nutrient concentrations are also reduced in the stream. Additionally, macroinvertebrate and fish populations have benefited significantly within the fenced area and beyond. Along with reducing nutrients and erosion, the stream is shaded by plant regeneration, which offers colder water for its inhabitants. Cooler water temperatures are very important to the native brook trout.

Agricultural best management practices (BMP)

Conservation practices, such as conservation tillage, rotational grazing, contour strip cropping, no-till planting, stabilized stream crossings, cover crops, roof gutters, and grassed waterways, can affect the amount of, and the way in which, water and nutrients run off, and soil is eroded from, the land. Slowing the flow of water and allowing it to evenly disperse over vegetated land, permits the water to naturally percolate through the soil before reaching the receiving stream. Vegetation slows the water and holds the soil and nutrients, so they are not washed away.

Establishing streambank vegetation for commercial and residential areas

Allowing vegetation to establish along streambanks not only helps to stabilize the bank and reduce erosion, but also shades the stream, cooling the water and increasing the dissolved oxygen levels. Native brook trout rely on ample amounts of DO for their



NORTH BRANCH BEAR RUN

A majority of the North Branch is contained within SGL 174. Because of state ownership, this section of Bear Run has remained reasonably isolated and, consequently, has experienced few watershed impacts. The Pennsylvania Game Commission manages these state lands for hunting. This area of the watershed is sparsely populated, with a low percentage of the available land developed.

Most residences that are located within this watershed are scattered in close proximity to the perimeter of the North Branch and are associated with a variety of agricultural operations, including hayland, pasture, and row crops. Runoff that occurs from the yearly cultivation of fields, as well as grazing that occurs on the pastures, is known to cause excess sedimentation in the watershed. This sediment can be detrimental to the stream ecology if best management practices are not implemented. Agricultural land is predominately found in the headwaters to tributaries of the North Branch. It appears that the entire North Branch subwatershed has experienced siltation because of these land uses. Sediment, as a result of poor agricultural practices, threatens the food supply for native brook trout located throughout the watershed. The silt and sediment are beginning to cover the substrate, leaving nominal macroinvertebrate habitat. Native brook

WPC staff performs chemical sampling at BR-2 located on unnamed tributary (UNT) 27036.

	Potential Partners
sh and Boat Commission	**DCNR** – PA Department of Conservation and Natural Resources
ssociation of Conservation Districts	**CCD** – County Conservation District
limited	**TU** – Trout Unlimited
Department of Agriculture	**WPC** – Western Pennsylvania Conservancy
tern PA Watershed Program	**PGC** – PA Game Commission
al Resources Conservation Service	
mental Protection Agency	
nding sources, both public and private, may be applicable.	

Conservation Reserve Enhancement Program (CREP), which awards incentives for agricultural landowners who use conservation practices. State and federal partnerships make possible this program, which offers rental assistance and cost-sharing opportunities.

Environmental Protection Agency (EPA)

An agency of the United States federal government, the EPA was established to address issues concerning the environment and human health. This organization provides resources for a wide variety of environmental issues.

Office of Surface Mining (OSM)

A subdivision of the United States Department of the Interior, OSM is involved with all aspects of mining operations, from regulating active mines to the reclamation of impacted lands and waterways. The organization also offers grants to help fund projects pertaining to abandoned mines.

Possible Funding Sources	
DCNR – PA Department of Conservation and Natural Resources **DEP –** PA Department of Environmental Protection **NFWF –** National Fish and Wildlife Foundation **OSM –** Office of Surface Mining **PA Act 38 Program –** PA Nutrient Management Act **FSA –** Farm Service Agency	**PFBC** – PA Fis **PACD** – PA As **TU** – Trout Unl **USDA** – U.S. D **WPWP** – West **NRCS** – Natura **EPA** – Environ
Above list of sources is not comprehensive, and other fu	

POSSIBLE FUNDING SOURCES

PA Department of Environmental Protection (DEP)

As the state agency for environmental protection, DEP awards Growing Greener grants with the goal of, "protecting and preserving our environment while restoring our communities," and creating employment opportunities.

Natural Resources Conservation Service (NRCS)

NRCS is focused on conserving, maintaining, and improving natural resources. As such, this organization provides funding for a wide variety of environmentally beneficial activities. Programs for communities and landowners, including farmers, exist. For example, Environmental Qualities Incentives Program (EQIP) is a program developed by the Farm Security and Rural Investment Act of 2002 that provides financial and technical assistance to implement sustainable land practice management techniques. Cost-sharing and incentive payments are offered. Wildlife Habitat Improvement Program (WHIP) provides technical assistance and cost-sharing for individuals who wish to develop and improve wildlife habitat, usually on private lands.

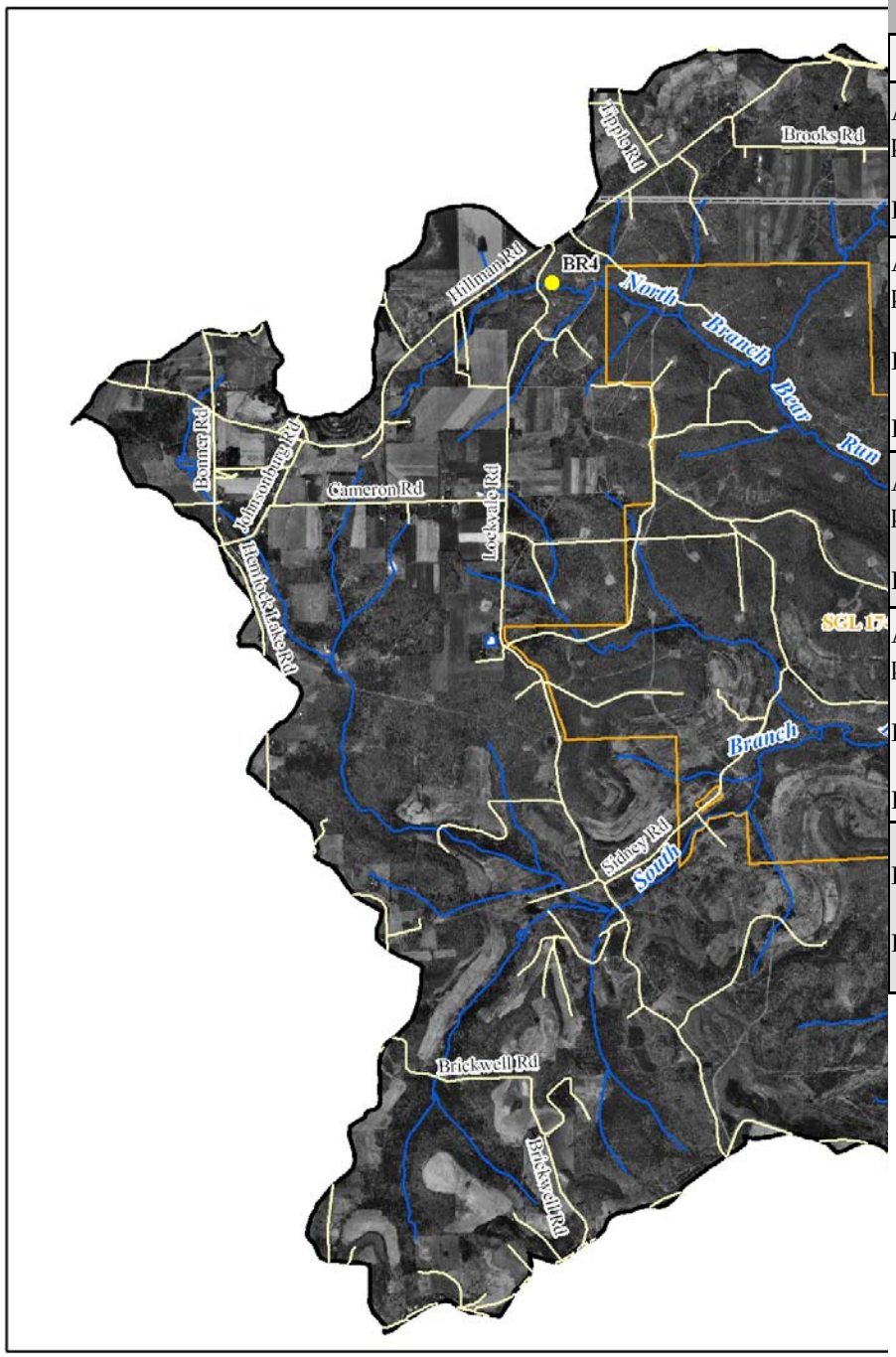
Farm Service Agency (FSA)

FSA provides a wide variety of resources for agricultural landowners. These include, but are not limited to, the

Native brook trout collected by WPC staff during electrofishing.

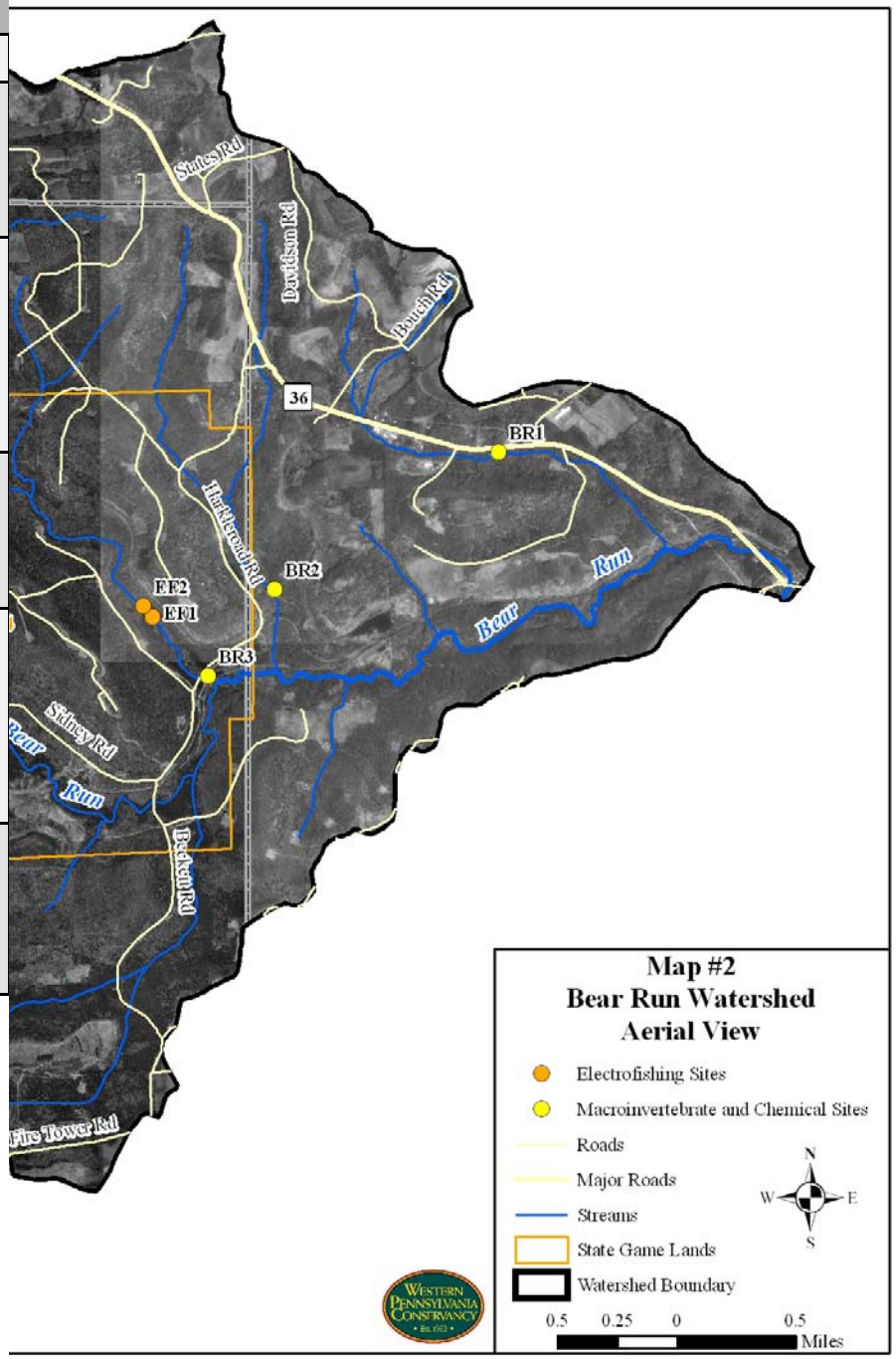
trout thrive in situations that allow them to feed on a diverse macroinvertebrate population; these populations only occur when proper habitat is present. A mix of gravel, cobble, and boulders allow suitable cover for both fish and macroinvertebrates; however, this habitat becomes compromised when stream bottoms begin to clog due to excess sediment. This appears to be occurring in the North Branch. The existing trout communities are isolated within the tributaries of the North Branch due to the poor water quality at the confluence with the South Branch. The possibility exists that the trout are feeding on the young of their own species. The large number of native trout present, and limited food sources found, lead WPC to believe that the existing population may become threatened due to their current isolation, limited food supply, and increased sediment retention.

The North Branch is currently designated as a Cold Water Fishery (CWF) by PA Code 25, Chapter 93. Studies conducted over the past year by WPC have concluded that the North Branch has the potential to be added to the Class A Wild Trout list based on the abundance of native brook trout. DEP can then be petitioned to designate the stream as high quality. This analysis was run by conducting two 100-meter single pass depletion samples and calculating the results of those surveys. The information was collected during electrofishing in August 2005 and the results are highlighted on pages 13 and 16.



Remediation Strategy	Possible Funding Sources	Priority
Agricultural best management practices Riparian plantings	DEP NFWF USDA PA Act 38 Program	High
Agricultural best management practices Landowner education Riparian plantings	DEP NFWF USDA WPWP PA Act 38 Program PACD	High
Agricultural best management practices Riparian plantings	DEP NFWF USDA PA Act 38 Program	Medium
Agricultural best management practices Landowner education Riparian plantings	DEP NFWF USDA WPWP PA Act 38 Program PACD	Medium
Landowner education Riparian plantings	WPWP DEP NFWF USDA PACD	Low

Limiting Factor: Riparian Vegetation Degradation	
Stream Segment Name	Description of Impact
Trib 27064-B	The stream's border is comprised largely of agricultural fields.
MS 27032-D	Pasture fields and residential mowing impacting growth of vegetation.
Trib 27058-B	Upper portion of stream reach affected by cropping of fields.
Trib 27033-B	Lack of vegetation due to agriculture and lumberyard operations adjacent to stream.
MS 27032-C	Residential mowing is decreasing streambank vegetation.



SITE SELECTION

WPC staff walked the perimeter of the North Branch and its tributaries and performed visual assessments using the USDA protocol at each of the 12 assessment sites. This method requires staff to rate 10 factors that affect stream quality. An average is taken from these ratings to give the stretch of stream an overall score between 1 and 10. A score of >9.0 is rated excellent, 7.5–8.9 is given a good ranking, 6.1–7.4 is ranked as fair, and <6.0 is poor. Included within the 10 stream quality rating categories are: channel condition, riparian zone, bank stability, water appearance, nutrient enrichment, fish barriers, instream fish cover, embeddedness, invertebrate habitat, and canopy cover.

Visual assessments can be used to summarize the condition of a watershed and be an effective tool in establishing future chemical and macroinvertebrate sampling points (Map #3). By thoroughly examining many areas of a watershed, it is possible to predict where pollution sources and land-use impacts may be entering the stream and affecting water quality. These sources may be easy to spot if they are point sources coming from a distinct site or could be more difficult to locate when sources are non-point, such as agricultural runoff. If pollution sources are visually predicted, they should be confirmed using chemical testing.

At BR-4, a native brook trout survives within a slow-moving, sediment-filled stretch of the stream.

Remediation Strategy	Possible Funding Sources	Priority
Agricultural best management practices Landowner education Riparian plantings	DEP NFWF USDA WPWP PA Act 38 Program PACD	Low
Eliminate rainwater from reaching coal piles Isolate and treat contaminated water	OSM	Low

Remediation Strategy	Possible Funding Sources	Priority
Stabilize streambank Riparian plantings	DEP NFWF USDA	Medium
Agricultural best management practices Riparian plantings Stabilize streambank	DEP NFWF USDA PA Act 38 Program	Medium
Agricultural best management practices Stabilize streambank Riparian plantings	DEP NFWF USDA PA Act 38 Program	Medium

Limiting Factor: Compromised Fish and Macroinvertebrate Habitat Continued	
Stream Segment Name	Description of Impact
Trib 27033-D	Evidence of silt and mud accumulating on stream bottom.
Trib 27064-A	Coal loading station runoff water impacting pH.

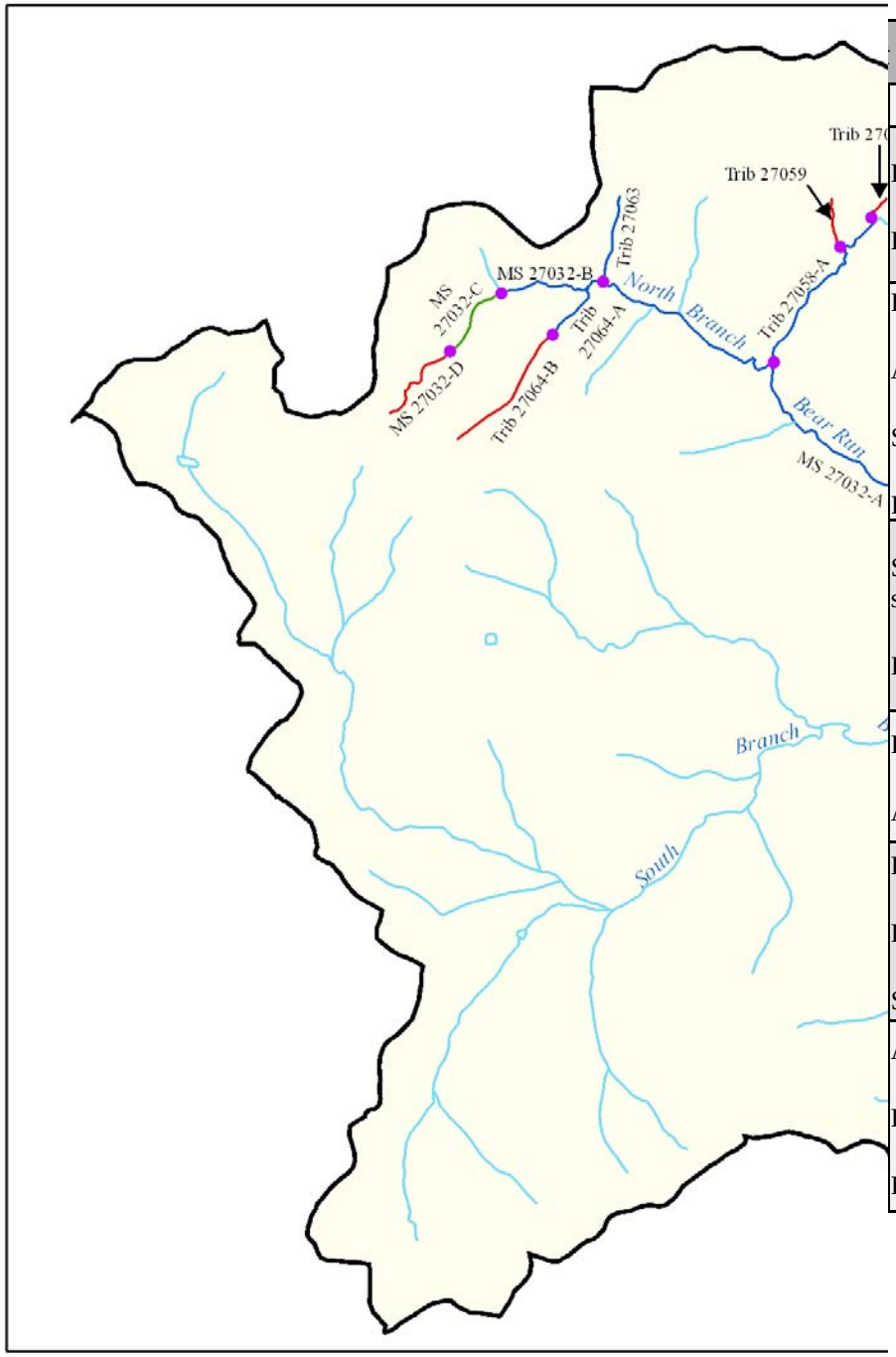
Limiting Factor: Erosion	
Stream Segment Name	Description of Impact
Trib 27033-A	Steep banks and steep gradient are major sources for erosion.
MS 27032-D	Erosion of crop fields contributing to stream impacts.
Trib 27033-B	Streambank erosion is a major concern.

WPC staff established four main sample points (Map #4). These were selected based upon the findings of the visual assessments and were meant to show possible impacts from varying land uses surrounding the stream. They show differences in water quality throughout the North Branch. Each site was tested for chemical levels and macroinvertebrates. Site BR-1 is located on TRIB 27033 and site BR-2 is located on TRIB 27036. Site BR-3 is directly above the confluence with the South Branch, while site BR-4 was sampled on the main stem of the North Branch where the stream intersects SR 1053. The first two sites were selected in order to show the possible impacts coming from the eastern end of the tributaries of the North Branch. Sites BR-3 and BR-4 show the change in stream quality from near the headwaters in Hillman to the confluence with the South Branch. Chemical samples were taken on November 1, 2005. Macroinvertebrate samples were taken on October 6, 2005. Visual assessments were performed on September 2, 2005, September 20, 2005, and October 6, 2005.

ELECTROFISHING

WPC staff electrofished two sites in August 2005. Both were located on the main stem of the North Branch. Sites were named Electrofishing 1 (EF1) and Electrofishing 2 (EF2) (Map #4). Site EF1 is located directly above the confluence of the North and South branches, and begins near macroinvertebrate and chemical site BR-3. Site EF2 is 100 meters upstream from site EF1. Both electrofishing sites were selected as representative of the quality throughout the North Branch. The samples were meant to represent the number of native brook trout present in any given section of the North Branch. Both samples were collected within a heavily forested section of SGL 174.

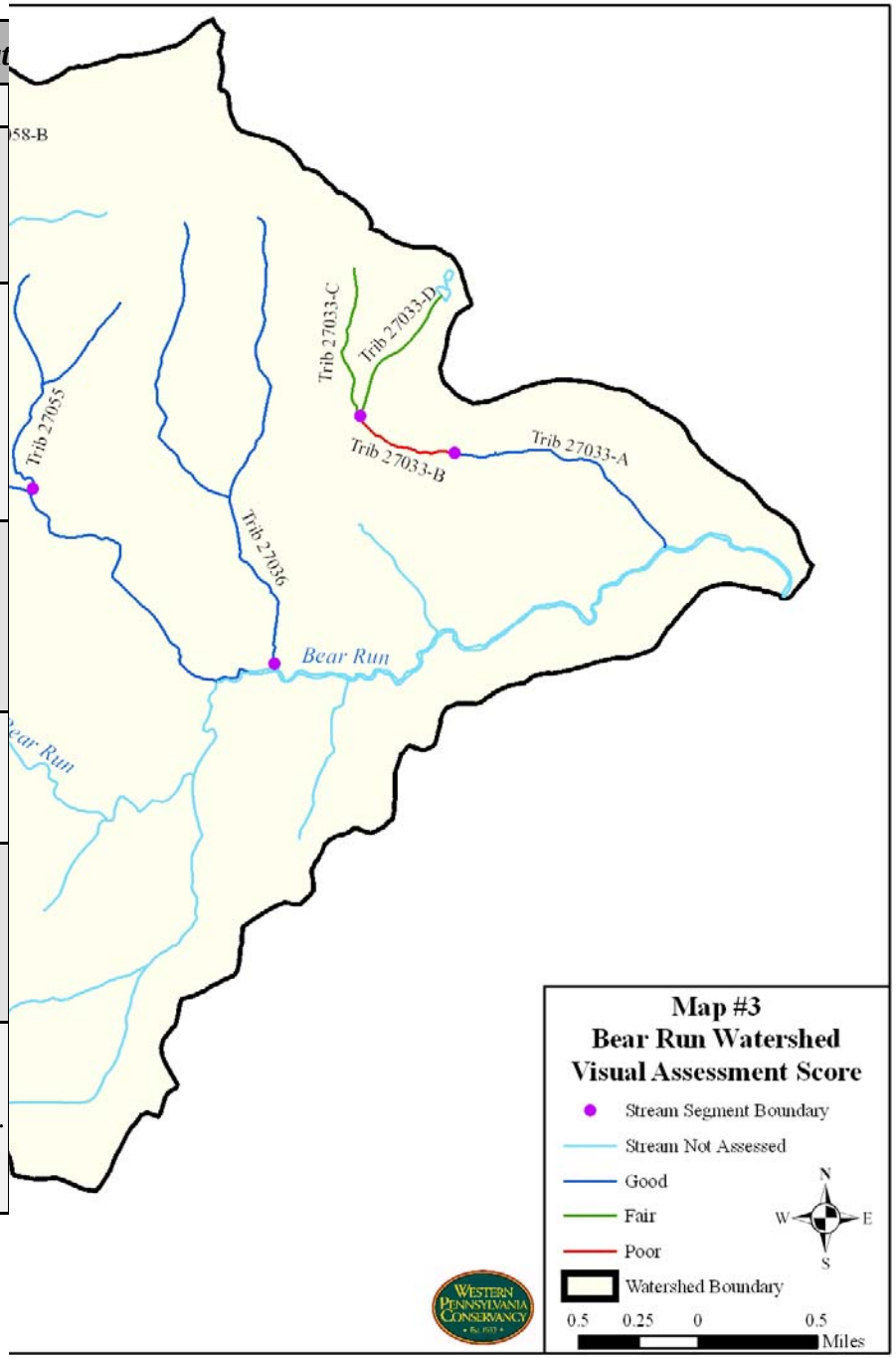
During electrofishing, many young of year (YOY) native brook trout were observed. YOY size class include young trout in their first year of life, and indicate that populations are viable and are experiencing natural reproduction. With the North Branch, the population of native brook trout remain physically isolated, due to the AMD water quality impairments of the South Branch. Limited specimens over two years of age were present. WPC's initial hypothesis indicated that an adequate supply of food may not be



Remediation Strategy	Possible Funding Sources	Priority
Landowner education Riparian plantings	DEP NFWF USDA WPWP PACD	High
Riparian plantings Agricultural best management practices Streambank stabilization Instream habitat	DEP NFWF USDA PA Act 38 Program TU PFBC	High
Stop erosion and siltation from upstream sources Instream habitat	DEP NFWF USDA TU PFBC DCNR	High
Riparian plantings Agricultural best management practices	DEP NFWF USDA PA Act 38 Program	High
Landowner education Riparian plantings Streambank stabilization	DEP NFWF USDA WPWP PACD	Medium
Agricultural best management practices Landowner education Riparian plantings	DEP NFWF USDA WPWP PA Act 38 Program	Low

Limiting Factor: Compromised Fish and Macroinvertebrate Habitat	
Stream Segment Name	Description of Impact
Trib 27033-B	Evidence of large amounts of silt and mud accumulating on stream bottom.
Trib 27059	Lack of stream velocity allows silt to accumulate.
Trib 27058-A	Stream suffers primarily from embeddedness.
MS 27032-D	Farm and residential land have eliminated woody debris and riparian vegetation.
MS 27032-C	Relatively unstable banks allow increased amounts of embeddedness.
Trib 27033-C	Evidence of silt and mud accumulating on stream bottom.

Refer to Map #1 for land use and Map #3 for visual assessment scores.



present to support large native brook trout.

The macroinvertebrate data for site BR-3 supports this hypothesis, although additional studies should be conducted before a conclusion is made. Many tributaries of the North Branch have fewer macroinvertebrates and contain pollution-tolerant species, indicating poor water quality. Limited food supply in these areas could lead to cannibalistic habits of native brook trout, preventing an increase in population size and diversity.

Table 1: Electrofishing Data

Site	lbs/acre	Abundance	lbs/acre fish<15cm	Brook Trout	Creek Chub
EF1	23.75	98%	4.33	44	1
EF2	26.93	98%	4.82	42	1

Currently, Pennsylvania Fish and Boat Commission (PFBC) will not accept WPC electrofishing data for redesignation. However, PFBC will use data collected from this study as background for their decision-making process. The Ken Sink Chapter of Trout Unlimited has asked PFBC to conduct an additional electrofishing survey in the summer of 2006. Data from this survey will be used to determine possible inclusion to the Class A Wild Trout list. This data will be used to determine possible redesignation and add much-needed protection of this fragile resource. The Ken Sink Chapter, with the support of WPC, also petitioned Pennsylvania DEP in May 2006 to upgrade the existing status of the North Branch, dependent upon its inclusion on the Class A Wild Trout list.

Table 1 shows the results from both electrofishing sites. When compared with the qualifiers for a wild trout stream (WTS) on page 28, site EF2 exceeds all three categories for the classification of a WTS. Site EF1 exceeds two categories, including biomass and percentage abundance, and is only 2.95 lbs below the required lbs/acre.

MACROINVERTEBRATE SAMPLING

WPC staff selected four sample sites within the North Branch for macroinvertebrate collection on October 6, 2005. A kick net was used for one minute at each site to maintain consistency. The

Branch through its redesignation to a HQ/EV-CWF. This designation will protect it from any future mining or industrial impacts that will decrease the stream's health. If mining permits are issued after the HQ/EV-CWF designation, the company will be required to maintain high-quality standards to protect the environmental integrity of the stream. Currently, there is an interested party applying for a mining permit within the North Branch.

Fortunately, many simple precautions can be taken to reduce these impacts to the North Branch, thus improving its health. The health of the watershed can be improved while preserving the agricultural history and economy of the region.

stream's health. Protection of the North Branch from future mining operations is an issue to be addressed along with the redesignation of the stream. Other factors have been noted and will be addressed to encompass all regional economic, social, and environmental issues.

The sedimentation and erosion throughout the North Branch need to be addressed if the health of the stream is going to improve and its native brook trout are going to continue to thrive and grow. There are many agricultural operations farming the productive soils where the headwaters of the North Branch begin. Much of the silt originates within the headwaters of the tributaries, flowing downstream and impacting the entire watershed. Visual assessments show the silt to be focused around these deforested areas. The main land use within these regions is agriculture, which is known to cause excessive sedimentation and bank erosion if agricultural best management practices (BMP) are not put into practice. Livestock also impair water quality when allowed unlimited stream access. Cattle and other farm animals, which drink from and wallow in the stream, deposit nutrients into the water and cause excessive erosion when trampling the already muddy banks. Silt clouds the water and makes it challenging for aquatic life to survive. The lack of riparian vegetation also warms the water as it flows. These impacts compound to further degrade the stream.

Residential and commercial areas are sparsely scattered throughout the remainder of the watershed. Small clusters of houses and businesses are commonly located adjacent to the stream. These buildings often have large tracts of impervious surfaces and/or mowed ground directly up to the streambank. The lack of riparian vegetation increases the impacts through concentrated flows and unstable streambanks.

Erosion can also be found near railroad crossings. The railroad tracks run alongside the South Branch and main stem of Bear Run and cross all of the four main North Branch tributaries directly north of their confluences with the main stem. Streamside stabilization in these four areas would improve the banks and help prevent erosion.

The final segment of the plan is the protection of the North

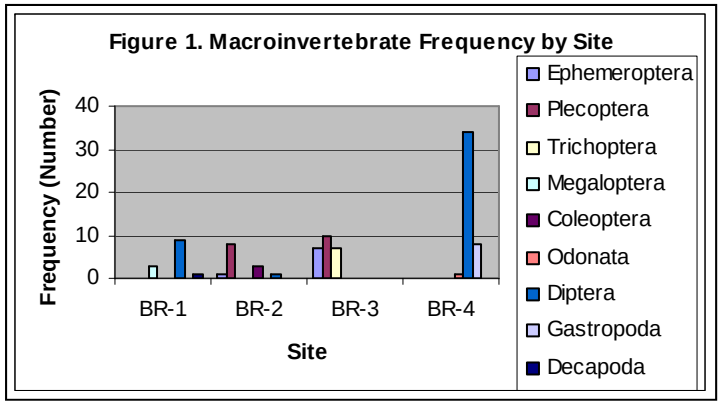
macroinvertebrate samples were preserved in a solution of 30 percent distilled water and 70 percent ethanol alcohol, taken to the WPC facility, and sorted by qualified personnel. Once sorted, two analyses were run on the samples, the pollution tolerance index (PTI) and the EPT:D ratio (the number of ephemeroptera, plecoptera, and trichoptera organisms compared to the number of diptera organisms). Both analyses are designed to generate numbers related to the overall health of the macroinvertebrate populations and, therefore, the stream. The results of the samples and their analysis are highlighted on pages 18–20.

Results from the sampling of the North Branch show that land use influences macroinvertebrate populations within the subwatershed. Map #1 shows sites BR-2 and BR-3 to be surrounded by a high percentage of forested land, thus greatly protecting the stream from potential land-use impacts. Those sites display a variety of sensitive species, while sites BR-1 and BR-4 contain pollution-tolerant species. Agricultural land is the dominant land use surrounding the upper tributaries of the main stem and Trib 27033, on which sites BR-1 and BR-4 lie (Map #1). Poor agricultural practices appear to be causing excess erosion and sedimentation in these areas, thus impacting the macroinvertebrate community.

Twenty percent of the headwaters to Trib 27033 are used for farming and grazing. Nutrient runoff and erosion from this

BR-4 displays increased sedimentation.

agriculture has led to sedimentation throughout the entire stretch of Trib 27033, on which site BR-1 is located. Sedimentation covers stream bottoms, filling in the small spaces between rocks that macroinvertebrates inhabit.



With diminishing habitat, populations are choked out of the area, along with the fish that feed on them. An estimated one mile of Trib 27033 flows alongside PA 36. Runoff from the road, coupled with non-point source pollution from agriculture at the headwaters may be contributing to the low occurrences of macroinvertebrates at this site (Figure 1).

The headwaters of the main stem flow through hayland, pasture, row crops, residential properties, and under SR 1053 and SR 1054, before entering SGL 174. Site BR-4 is located upstream from Trib 27064, directly above the point at which the stream flows under SR 1053 and before entering SGL 174 (Map #1). This site possessed the most significant sedimentation when compared with the other three. The extensive agricultural land uses surrounding the tributaries of the North Branch have impacted the stream bottom in a way that is similar to site BR-1, leaving few macroinvertebrates with the ability to tolerate such sedimentation. In addition, these unnamed tributaries flow through scattered residential properties, where streambanks are maintained as part of manicured lawns. The shallow root system of the grasses provide little soil stabilization and promote undercutting and erosion of the streambanks. This, coupled with a lack of vegetative cover due to overgrazing and/or cultivation has added significantly to the sedimentation in the headwaters and throughout the watershed.

factors explain the increased levels of conductivity and TDS at this site.

Conductivity

There is no Pennsylvania water quality standard for conductivity. Conductivity was found to be lowest at site BR-4 and highest at site BR-1.

CURRENT STATE OF THE NORTH BRANCH OF BEAR RUN WITH RESTORATION AND PROTECTION PLANS

Overall, the North Branch, designated as a CWF, offers acceptable water quality and suitable habitat for a small population of valued macroinvertebrate families and naturally reproducing populations of native brook trout. Additionally, the preservation of a large tract of forestland within SGL 174, covering over half of the North Branch, offers long-term protection from urbanization and agricultural threats. However, most of the headwater portions are not part of SGL 174, and, therefore, are vulnerable to environmental impacts. Presently, sedimentation and erosion throughout the North Branch are the largest impacts to the

Sulfate

The Chapter 93 standards for sulfates is set at 250 mg/l for a PWS. All samples collected were below the maximum allowable limits. There is no Pennsylvania standard for a CWF for sulfates.

Phosphate

There have been no national or state water quality standards established for concentrations of phosphorous. However, to control eutrophication, the EPA recommends the total amount of phosphates be between 0.05 and 0.1 mg/l. Site findings varied slightly, yet were all found in amounts greater than the EPA recommends (Table 2). Agricultural runoff is the most likely source of these increased numbers.

Total Dissolved Solids

Chemical tests indicate a gradual drop in total dissolved solids (TDS) from sample site BR-1 through BR-4. This decline does not necessarily indicate an increase in stream health related to these factors. Aquatic life requires a healthy amount of TDS to regulate the flow of water in and out of cells. Chapter 93 recommends an average monthly value of TDS to be 500 mg/l, and 750 mg/l as a maximum value.

There is a significant amount of land area within the North Branch devoted to hay pasture and row crops. Farm runoff increases levels of nitrate and phosphate. Road runoff can also carry salts and other materials that contribute to ions in water. There are several agricultural lands directly upstream from site BR-1, along with a major road running beside the tributary. These

Overall, macroinvertebrate populations throughout the watershed are low. The stream seems to exhibit qualities of a free stone stream in Pennsylvania with limited alkalinity and, therefore, is susceptible to periodic acid doses due to heavy rains or snow packs. It is suspected that sediment caused by agriculture in the headwater tributaries, as well as past mining practices, have also played a role in the low numbers of macroinvertebrates found throughout the watershed. Macroinvertebrate species sampled indicated that the water quality was sufficient to support diverse aquatic life; however, macroinvertebrate numbers indicated that populations were in danger of being removed from the watershed. Removing sediment sources and monitoring the stream year round to further investigate potential episodic acidification would be needed to ensure that macroinvertebrate concentrations remain high enough to support existing native brook trout populations.

POLLUTION TOLERANCE INDEX

The Pollution Tolerance Index (PTI) is based on the concept of indicator organisms and tolerance levels. Indicator organisms are those sensitive to water quality changes, and their presence or absence indicates the condition of the water in which they live. Pollution-sensitive organisms are found in group 1 and the pollution tolerant organisms are found in group 4. Excellent water quality is indicated by the presence of group 1 organisms or a PTI value greater than 23. PTI values for all four sites are shown in Figure 2.

Mayflies, caddisflies, and stoneflies are some of the best indicators of stream health. They are sensitive to pollution and other variations in water quality, and will not be found if there is

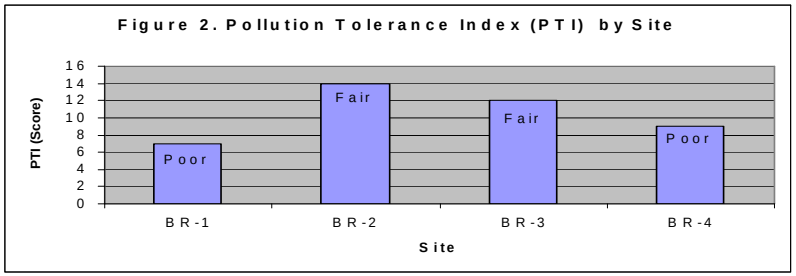


Figure 2 shows that sites BR-2 and BR-3 showed fair water quality, while sites BR-1 and BR-4 showed poor water quality.

poor water quality. Figure 3 displays the fair water quality of sample site BR-3, showing only sensitive species were found. The forests of SGL 174 surrounding, and upstream from, BR-3 protect water quality. Though relatively low numbers of macroinvertebrates were found at sites BR-2 and BR-3, many of the species found were pollution-sensitive. These low numbers of sensitive species indicate moderate water quality throughout the region.

The overabundance of midges and true flies can be indicators of poor water quality. Pollution-tolerant species were collected at sites BR-1 and BR-4, indicating that water quality in these areas is poor, and that erosion, siltation, and sediment have affected the

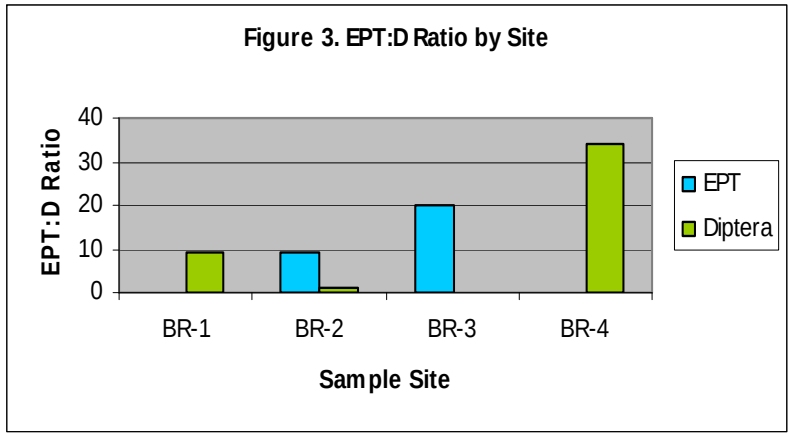


Figure 3 shows that sites BR-2 and BR-3 have higher water quality based on the ratio of EPT taxa compared to diptera taxa.

entire North Branch, yet have the most impact on Trib 27033 and Trib 27064. This information coincides with the visual assessment that indicates this area is also where the most sedimentation was observed. Both pollution-tolerant and -sensitive species were collected, and the numbers and frequency of these occurrences can be found in Figure 1.

EPT:D RATIO

Another metric often used to analyze macroinvertebrate communities is the EPT:D ratio. The EPT:D ratio compares the number of organisms in the pollution-intolerant orders of ephemeroptera, plecoptera, and trichoptera to the pollution-tolerant order of diptera. The higher the number of EPT taxa compared to the number of diptera, the better the water quality.

Site BR-4.

DEP designates 7.0 mg/l of DO as the minimum for a HQ -CWF. Trout are able to survive at these levels; however, they prefer higher concentrations. The North Branch has shown levels to exceed the minimum of 7.0 mg/l. This availability of DO throughout the entire North Branch supports local trout populations.

Iron

Iron was tested to show mining impacts. The maximum 30-day average iron concentration, according to Chapter 93, is 1.5 mg/l for a CWF designation. All samples were well below this maximum and show no signs of past mining operation impacts.

Manganese

According to Chapter 93, the maximum allowable concentration of manganese is 1.0 mg/l for a stream designated as a public water supply (PWS). There is no standard listed for a CWF. All of the sites showed manganese concentrations below this amount.

Nitrate

Chapter 93 lists no standard for nitrates; however, a guideline for nitrates standards is 44 mg/l and below. All sites are within these parameters, except site BR-4. The land-use map (Map #1) illustrates agricultural land upstream and surrounding site BR-4, as well as site BR-1. Agricultural fertilizers and animal waste are the most likely causes of these excess nutrients due to the close proximity of agricultural land to the stream. There are also more private residences located on the tributaries leading to sample sites BR-1 and BR-4. Excess runoff from manicured lawns, faulty septic systems, and erosion of grass-covered riparian areas may also be leading to the higher nitrate levels.

compromise the health of this site.

Temperature

The Chapter 93 maximum allowable temperature for stream water varies throughout the year and by a stream's designated use. At the time of sampling, the maximum allowable temperature for a CWF was 46° Fahrenheit. Three of the four sites were below the maximum temperature allowable for the date sampled. The temperature at site BR-4 was found to be between 50.5° and 51° Fahrenheit, 4.5°–5° Fahrenheit above the maximum. These headwaters have been impacted most significantly by agriculture and residential uses, when compared with the three other sample points and the other headwater areas. The water temperature at this site is influenced by the lack of riparian buffers bordering the stream. Sunlight hits the water more frequently without streamside shade provided by trees and other plant life. These small tributaries heat up very easily with the high levels of sedimentation present. The sediment absorbs the sun's heat more

A brook trout fingerling collected during sampling.

readily than a clear stream. The combination of the sediment and the lack of riparian areas has a great impact on the temperature.

Table 2 shows the difference in temperature between forested and non-forested sample points. The temperature has been dramatically influenced by the lack of forested riparian buffers upstream from sample site BR-4.

Dissolved Oxygen

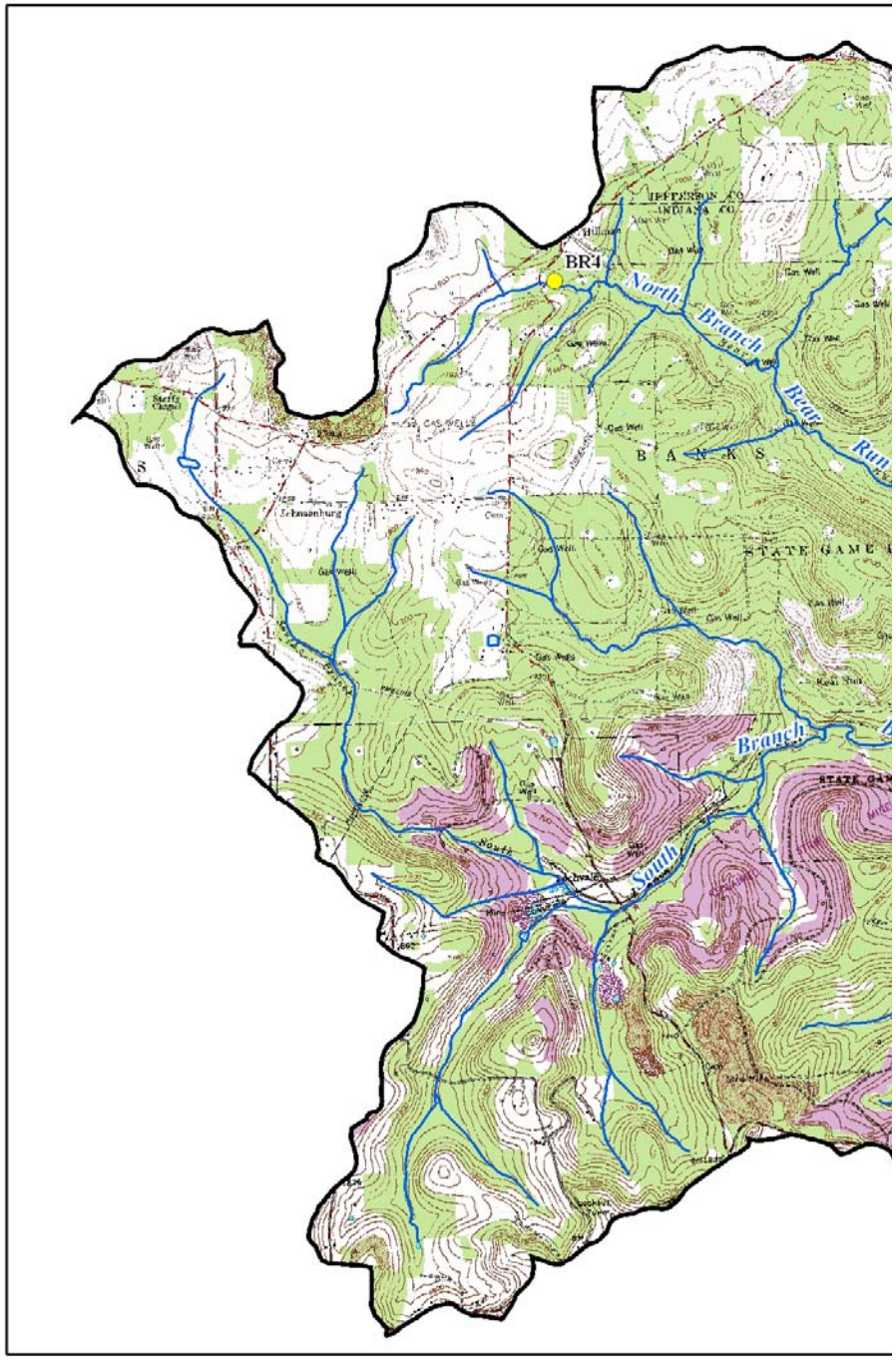
Dissolved oxygen (DO) found at all four sample sites remained consistently above Chapter 93 parameters for an HQ-CWF.

Sites BR-2 and BR-3 showed a higher number of EPT taxa than diptera taxa (Figure 3). This indicates that these sites have good water quality. Sites BR-1 and BR-4 had only diptera taxa compared to EPT taxa (Figure 3). This indicates that there is a noticeable impact to water quality.

CHEMICAL SAMPLING

Chemical samples were taken on November 1, 2005 between 9:00 a.m. and 12:00 p.m. with the air temperature recorded at 60° Fahrenheit. Rainstorms the week before sampling could have increased stream flow. A specific subset of chemical data was gathered at four locations within the North Branch. The chemical samples were intended to further quantify any biologic data collected. WPC collected samples, some of which were analyzed in the field, while others were sent to Mahaffey Laboratory Ltd. in Grampian, Pa. The following eight parameters were tested on-site: pH, degrees Fahrenheit, phosphates, nitrates, dissolved oxygen, turbidity, total dissolved solids, and conductivity. These tests were conducted to display a general overview of water quality and stream health. In an effort to ensure accuracy, WPC sent samples to Mahaffey Laboratory, where nine variants, including pH, conductivity, degrees Fahrenheit, alkalinity, acidity, iron,

North Branch, directly above its confluence with South Branch.



atmosphere, by aeration as water tumbles over rocks, and as a byproduct of photosynthesis. Turbidity is a measure of the

A bridge, no longer used by trains, spans Bear Run at BR-3.

cloudiness of the water. It is caused by suspended solids which scatter light as it passes through water. Dissolved oxygen (DO) and turbidity are indirectly related. High turbidity can lower DO levels because cloudy water absorbs more heat and blocks light needed in photosynthesis. DO is affected by water temperature. Oxygen dissolves more easily in cold water than warm water. High turbidity can be an indicator of runoff from eroding soil.

PENNSYLVANIA WATER QUALITY STANDARDS

pH and Alkalinity

The pH of the North Branch varies slightly between sites (see Table 2), yet remains within the parameters for a HQ-CWF as required by Chapter 93.7 of the PA Code (Chapter 93). An acceptable range for a stream to hold life is a pH between 6 and 9. No negative assertions can be made from this data.

Alkalinity in a stream buffers excess acidity caused by local geology and pollutants, such as acid precipitation. Alkalinity and acidity are indirectly related. BR-1, which contains the highest content of alkalinity along with the lowest acidity, demonstrates this relationship. A sudden increase in acidity would not

and conductivity may prove the presence of limestone and shale. Calcium and carbonate ions dissolve into water when these calcite-containing rocks are present.

pH

A stream's pH can indicate a broad spectrum of environmental impacts, as well as different geological and ecological variants within a local watershed. pH is determined by the acidity or alkalinity of the water and is represented by a scale ranging from 0–14, with 7 denoting a neutral pH. Possible sources of a variation in local pH are soil, bedrock decomposition, industry, acid precipitation, and mining.

Iron

Excess iron in a stream is usually caused by mine discharges. At higher pH levels, iron forms ferric hydroxide. This yellowish precipitate settles to the bottom of the stream and clogs the gills of fish, as well as suffocating bottom-dwelling invertebrates.

Nitrate & Phosphate

High nitrate and phosphate levels can increase aquatic plant growth and lead to eutrophication. Eutrophication is a process whereby waterbodies receive excess nutrients that stimulate excessive plant growth (algae, periphyton attached algae, and nuisance plants and weeds). This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes, and can cause other organisms to die. These nutrients can come from many sources, such as fertilizers applied to agricultural fields, golf courses, and suburban lawns; deposition of nitrogen from the atmosphere; erosion of soil containing nutrients; and sewage treatment plant discharges.

Sulfate

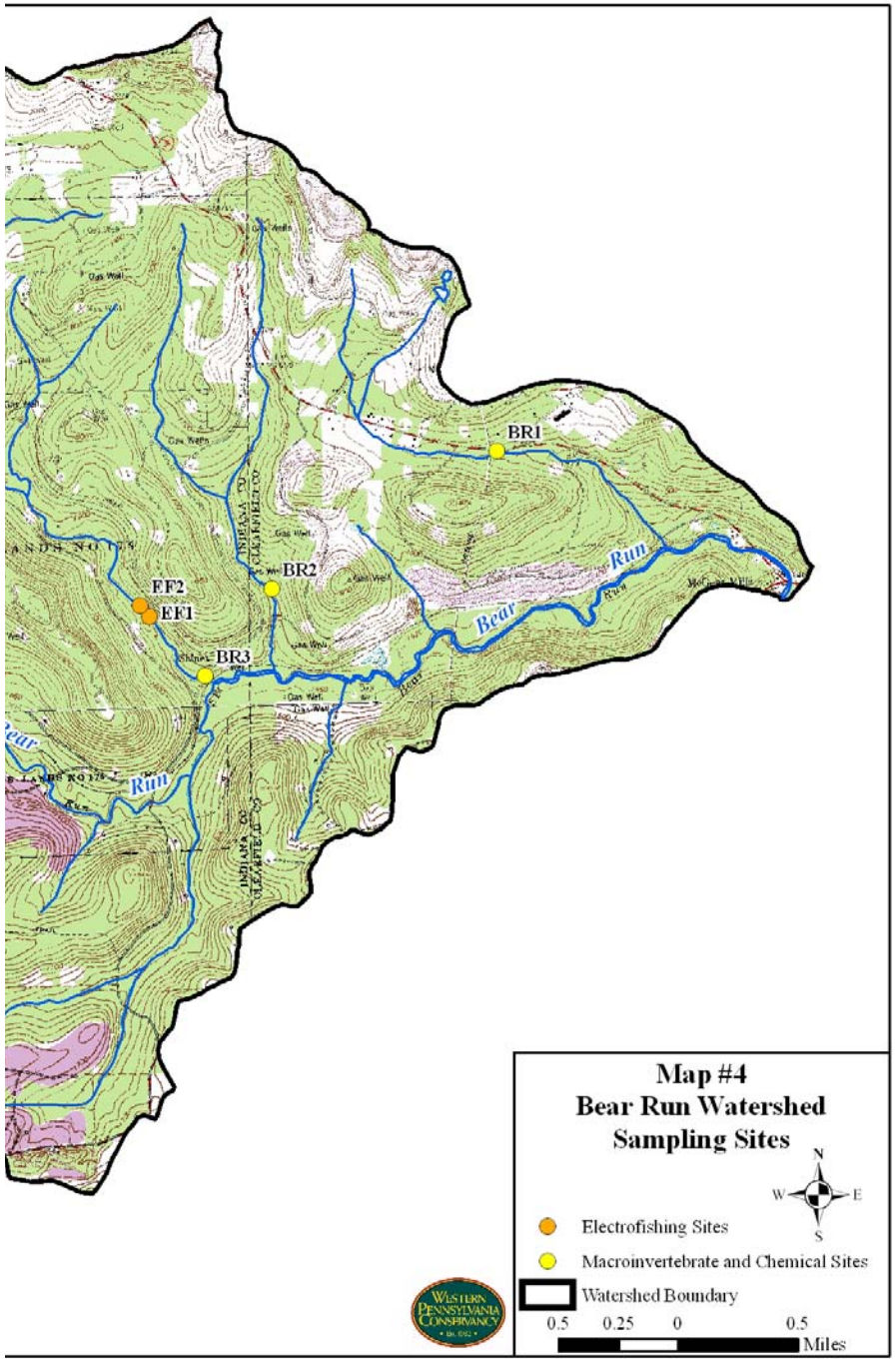
Sulfates are a byproduct of the reaction caused when pyrite is mined. Testing for sulfates is a good indicator of the presence of AMD impacts within a stream.

Manganese

Manganese is often found in association with AMD impacts.

Dissolved Oxygen & Turbidity

Oxygen is dissolved in the water through diffusion from the



manganese, sulfate, and suspended solids, were analyzed. These variants were tested to show possible water quality impacts that would be associated with AMD throughout the North Branch. Sampling results are shown in Table 2.

The physical and chemical makeup of a stream is affected by soil, geology, precipitation, vegetation, and land use within the watershed. Variation in the samples could have occurred because of rain events earlier in the week. Overall, chemical parameters indicate that the North Branch should qualify for additional

Table 2. Chemical Data

	Site			
	BR-1	**BR-2**	**BR-3**	**BR-4**
Lab pH SU	7.3	7	6.8	6.4
Temperature Degrees F	43.7	44.8	45	50.7
Lab Conductivity umhos/cm	370	213	198	147
Dissolved Oxygen mg/L	10.98	10.53	12.03	9.75
Phosphate mg/l	0.88	0.66	0.74	0.68
Nitrate mg/l	19.36	38.28	30.8	51.48
Turbidity FAU	4	1	0	1
TDS ppm	290	170	160	120
Alkalinity mg/l	38	17	12	12
Acidity mg/l	-31	-11	-5	-6
Iron mg/l	0.12	0.09	0.14	0.11
Manganese mg/l	0.1	0.09	0.04	0.06
Sulfate mg/l	105	38	53	25
Suspended Solids mg/l	<6.2	<6.2	<6.2	<6.2

stream. If the stream receives a WTS rating, it will automatically have a HQ rating. These two factors, along with the surrounding protected area of SGL 174, give the North Branch good standing to receive an EV-CWF title.

Once EV classification is received, DEP may issue a permit for a new or expanded discharge into an EV water only if: 1) the proposed discharge has no cost-effective and environmentally sound non-discharge alternative; and 2) the discharger can demonstrate that its proposed discharge will not degrade the water.

Criteria for an upgrade to EV

1. HQ Plus an Attribute –
- It flows in a national wildlife refuge or state game propagation and protection area.
- It flows in a designated state natural park area, state forest natural area, national natural landmark, federal or state wild river, federal wilderness area, or national recreation area.
- It is a surface water of exceptional recreational significance.
- The water received a biological reference score of 92 percent RBP or greater.
- The water is designated a wilderness trout stream by PFBC following public notice and comment.

2. Surface Waters of Exceptional Significance –
- An ecologically important, unique, or sensitive water that does not satisfy traditional water quality measures, such as thermal springs or EV wetlands.

PFBC will not accept the WPC electrofishing data for redesignation. If requested, PFBC will conduct an additional electrofishing survey in the summer of 2006. This data will be used to determine possible redesignation.

DEFINITION OF TERMS

Conductivity & Total Dissolved Solids

Conductivity and TDS are directly related. Conductivity measures the presence of ions of dissolved compounds. Inorganic compounds, such as chloride, nitrate, calcium, and sulfate are better conductors than organic compounds, such as oil or sugar. TDS is the byproduct of the dissolution of inorganic compounds. Differing levels of these factors may also indicate human activities, such as agriculture and industry. Higher levels of TDS

Criteria for an upgrade to HQ

1. Chemical Test –
• Long-term water quality data (at least one year of data) for 12 chemical parameters exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in or on the water.

2. Biological Test – three pathways
• Reference Approach – comparison to reference stream in same ecoregion shows a macroinvertebrate community of 83 percent or greater using a Rapid Bioassessment Protocol.
• Class A Wild Trout Stream – designated by PFBC following public notice and comment.
• Other Bioassessment Procedures – accepted, published, and peer-reviewed procedures DEP approves that determine the condition of the aquatic community.

during electrofishing. A Class A Wild Trout Stream (WTS) classification by PFBC is based on biomass standards that support a population of naturally produced trout of sufficient size and abundance. Qualifiers are shown below. If the North Branch receives a Class A WTS designation, it will automatically receive an HQ rating.

Once HQ classification is received, DEP may issue a permit for a new or expanded discharge that degrades water quality only if: 1) the proposed discharge has no cost-effective and environmentally sound non-discharge alternative; and 2) the discharger can demonstrate that allowing lower water quality is necessary to accommodate important economic or social development in an area in which the water is located.

Exceptional Value Designation

The stream may be able to receive an EV rating. This requires a current HQ rating and one of the six qualifiers shown on page

Qualifiers for a Class A Wild Trout Stream

• 26.7 lbs/acre (brook trout only)
• Biomass < 15 cm (59”) = 0.089 lbs/acre
• Percentage Abundance of 75 percent

29. SGL 174 surrounds a majority of the North Branch, providing recreation opportunities for anglers and protecting much of the

protection. However, continued chemical sampling should be conducted for a period of at least one year to ensure that large storm events and snow melt do not have significant instream impacts.

Site BR-1 is located in a mostly forested area; however, PA 36 runs next to this site. Road runoff has the potential to increase a stream’s turbidity, conductivity, total dissolved solids, sulfates, phosphates, and nitrates, and decrease dissolved oxygen. Results from site BR-1 show an increased level of conductivity, sulfates, and total dissolved solids when compared with the other sample sites.

Sites BR-2 and BR-3 are located in forested areas. Forested areas are the best buffers for streams. This would explain the low temperature and the little to no turbidity at these sites.

Site BR-4 is located just downstream of a heavily agricultural area. This could explain the increased temperature and the high nitrate concentrations found at this site.

SOUTH BRANCH BEAR RUN

WPC staff perform chemical sampling at BR-1.

Impacts from the South Branch have dramatic effects on the connectivity of species found in the North Branch and their ability to migrate downstream. Essentially, aquatic species found in the North Branch are trapped because of non-point source pollution in the form of AMD. This isolated gene pool has the potential to become stagnant, causing a decline in what are now viable populations. Since the late 1800s, numerous deep and surface mines have operated in the South Branch. Large tracts of land in the southwestern portion of the watershed have been greatly disturbed by past deep and strip coal mining operations.

The water quality of the South Branch above Lochvale is good, before the stream enters the abandoned Johnstown Coal and Coke Complex, located approximately four miles west of the confluence of the North Branch and South Branch. The first of many sources of AMD enters the South Branch from the abandoned treatment facilities of the coal operation. Five current mining permit owners are listed in Table 3. The stream is completely degraded downstream of these discharges.

Ken Sink Chapter of Trout Unlimited, Indiana County Conservation District, and the Evergreen Conservancy currently have projects underway to remediate pollution found in the South Branch. Following the guidelines of an assessment and restoration

Table 3: Current Mining Permits

Permit No.	NPDES No.	Effective Dates	Company Name	Status
32930105	PA0212652	7/1994 - 7/2009	P & N Coal Company, Inc. Urey Mine	Stage 2 Bond Release
32880107	PA0598304	5/1999 - 5/2009	Urey Coal Company, Neely Strip	Stage 3 Bond Release
32851601	PA0095966	1985 - 2009	P & N Coal Company, Inc. Hillman Tipple	Active
32803053	PA0124770	11/1984 - 11/2004	A & T Coal Company, Fisher Strip	Post-Mining Discharge
32860115	PA0597864	11/1987 - 11/2007	Paul F. Becker Coal Company, Buchanan Job	Post-Mining Discharge

plan, completed by the conservation district, and a TMDL completed by DEP, design and construction are underway for two of the larger impacts in the watershed. A key to successful protection of the North Branch will include the support of restoration efforts underway in the South Branch.

STREAM REDESIGNATION

Currently, work is being done by the Ken Sink Chapter of Trout Unlimited and Indiana County Conservation District, with support being provided by WPC, to coordinate efforts for stream

Reddish, iron-stained substrate is visible at the confluence of the North Branch and South Branch.

redesignation. The North Branch is currently classified by DEP as a Cold Water Fishery (CWF). If requested, PFBC will conduct another electrofishing survey in the summer of 2006. They will use this data to determine the eligibility of the stream to be added to the Class A Wild Trout list. If the stream is added to this list, DEP can then be petitioned to upgrade the stream for High Quality (HQ) status. HQ CWF classifications protect a waterbody from degradation from activities that require a permit or approval from DEP. If redesignated, the water quality of the North Branch, and its native brook trout populations, will be better protected.

High Quality Designation

WPC tested four of the 12 chemical variants required for an HQ rating and found the overall water quality to be acceptable to support native brook trout populations at the time of sampling. Year-long testing may reveal changes in the chemical makeup of the stream and may disqualify the North Branch from becoming HQ. Macroinvertebrates retrieved were of fair quality, yet of low diversity and low frequency. These two methods will not be pursued as a means of obtaining an HQ classification.

Many naturally reproducing native brook trout were recovered