Recommendations

Fully engage sportsmen groups in the developing habitat improvement projects.

The Beaverdale Sportsmen and the Dunlo Rod & Gun Club hold property and hunting camps in the watershed study area. Each group is concerned about the quality of the fishery and has completed small habitat improvement projects on the tributaries located on their property. Through working together with the Pennsylvania Fish & Boat Commission (PFBC) and the local PA DEP watershed manager, the Conservation District will assist them to develop strategies to increase alkalinity in the South Fork and enhance the fishery through larger scale habitat improvement projects along the main stem of the river or on tributaries that would be most beneficial to the watershed as a whole. In 2002, the PFBC identified the South Fork (above the Lloydell/Beaverdale reservoir) as a prime candidate for application of limestone sand treatment. This would help raise the naturally low alkalinity in the stream and boost the fertility, increasing the wild trout population above the reservoir and increasing fish populations in the reservoir. However, access to the headwater tributaries is very limited. The local DEP Watershed Manager and Conservation District staff will be working with the Dunlo Sportsmen's Group in 2007 to prepare a Growing Greener grant application for a lime dosing project along a headwater tributary being impacted by low alkalinity levels.

The Beaverdam Conservation Group is currently working on a similar project on the Beaverdam Reservoir, another drinking water reservoir in the headwaters of the South Fork. Since its construction, the Beaverdam Reservoir was closed to all public use and access. In August of 1999, a group of local residents contacted Highland Sewer and Water Authority to consider opening the reservoir for public fishing. The men agreed to form an organization in order to "police" and "maintain" the Beaverdam Reservoir property. In 2000, the authority for the first time allowed public access to the lake and the Beaverdam Conservation Group was formed.

Over the past several years, the group has successfully built partnerships with the PFBC, the Cambria County Conservation District, the Southern Alleghenies Conservancy and local government agencies. The group installed a boat launch with dock and parking lot in 2001. The group worked with the Conservation District to acquire Growing Greener funding to develop and implement a lake management plan to boost alkalinity levels in the Beaverdam Reservoir. The Conservation Group and the Conservation District have retained Aqua-Link, Inc. of Doylestown to develop the restoration plan and oversee the implementation of the plan. The implementation project was started in the Spring of 2006. Lake liming and stream liming will be conducted over a two year period. Upon completion of the project, additional monitoring will be conducted and a maintenance plan will be developed for the Conservation Group to continue the liming, thus maintaining the increased alkalinity levels in the reservoir.

The success that the Beaverdam Conservation Group has experienced with the Beaverdam Reservoir is due to the strong local interest in improving the fishery and a commitment to working with the PFBC, DEP and Highland Sewer & Water Authority to achieve the group's recreational goals.

Geographically and geologically similar to the Beaverdale Reservoir, the low alkalinity levels in the Beaverdam Reservoir are directly due to the poor buffering capacity of the soils and underlying bedrock.

Once completed, the Beaverdam Liming Project can be used as a model for work in the Beaverdale Reservoir watershed. Funding is available through the DEP Growing Greener program for habitat improvement projects. PFBC has taken an interest in the South Fork as a possible “Eastern Brook Trout Joint Venture" project.

Establish a formal water quality monitoring program between the Beaverdale Sportsmen, the Little Conemaugh Watershed Association and the Forest Hills Middle School.

Forest Hills Middle School students are currently monitoring several points along the main stem of the South Fork. A coordinated effort between the school, the sportsmen and the watershed group would enable them to develop a comprehensive database where each group could enter their data and track water quality trends of the main stem as well as that of the numerous small springs that feed the major tributaries. This would also benefit the watershed association that is developing projects to clean up abandoned mine pollution in the main stem of the South Fork near Beaverdale.

Continue South Fork Riparian Health Project.

In 2005, the Little Conemaugh Watershed Association partnered with the Natural Biodivesity Conservation Strategy (NBCS) and the Kiski-Conemaugh Stream Team to conduct a riparian health survey project on the South Fork Branch of the Little Conemaugh River. The survey was designed to assess the impacts of invasive and exotic plant species on the natural health of the river basin.

The specific pollutants under investigation included chemical and nutrient runoff entering the system along with sediment from increased erosion. Other factors included water temperature and wildlife habitat. Several stations were set up along the stream and community volunteers worked with NBCS staff to conduct detailed assessments and learning to identify different types of vegetation and conduct basic water quality assessment with field test kits and macroinvertebrate sampling. Stations were strategically placed along different sections of the stream where water quality ranges from high quality to severely impacted.

Information collected is being used to determine to what extent invasive plant monocultures in riparian areas decrease biodiversity and increase erosion and sediment pollution (see **Appendix A** for Data Results/Summaries Report). This project provides an excellent opportunity to educate and engage local community members. During the summer of 2005, several watershed volunteers took part in public meetings, attended trainings and participated in the planning process as well as in the field data collection for this project. A detailed management plan is being developed based on the data collected throughout the summer and fall of 2005. Integrated Pest Management (IPM) practices will be implemented along the South Fork to control Japanese knotweed with an ecological approach (headwaters to downstream). Native species will be planted following control and removal of invasive species to help re-establish functioning natural plant communities in the riparian areas of the South Fork tributary.

Encourage landowners in the watershed to develop forest management plans and practice sustainable forestry.

Highland Sewer and Water Authority and the Beaverdale Sportsmen own large tracts of land in the Exceptional Value and High Quality portions of the South Fork Watershed. The

Beaverdale Sportsmen have recently hired a forester to develop a forest management plan that will enable the group to protect several springs on their property that feed several high quality tributaries that enter the main stem of the South Fork below the Lloydell/Beaverdale Reservoir. The forester is developing strategies for the group to harvest timber in some areas of the property while reforesting several areas of the property where previous logging has caused poor hardwood regrowth. The Little Conemaugh Watershed Association and the Natural Biodiversity Conservation Strategy will encourage the Beaverdale Sportsmen to practice sustainable forestry and assist with the eradication of invasive plant species in the headwaters.

The Little Conemaugh Watershed Association continues to work with the DEP Cambria County District Mining Office and Hedin Environmental to develop treatment strategies for several abandoned mine discharges

The Little Conemaugh Watershed Association is currently working with the DEP Cambria County District Mining Office and Hedin Environmental under a Trout Unlimited Technical Assistance Grant (TAG) (see **Appendix B** for Interim Report). The purpose of the project is to assess and develop treatment strategies for several abandoned mine seeps and one large discharge located along the South Fork Branch below the Beaverdale Reservoir and above the village of Beaverdale where the water quality status is reduced form High Quality to Cold Water Fishery. Flow measurement devices were installed and regular quarterly sampling is being conducted to determine appropriate treatment methods. Upon completion of the TAG project, the designs will be submitted for funding through the next round of the DEP Growing Greener Grant Program. Successful remediation of the seeps will extend the High Quality fishery several stream miles to the village of Beaverdale. We are also working with interns from the University of Pittsburgh at Johnstown to collect additional water quality information on several large volume abandoned mine discharges in the village of Beaverdale (see **Appendix C**). This data will be used to supplement existing historical data collected by the Stonycreek Conemaugh Rivers Improvement Project (SCRIP) and the Cambria County Conservation District. Once initial projects are completed to restore the headwaters, the LCWA will seek funding to tackle the larger, more acidic discharges.

Utilize the headwater fishery as an educational tool to introduce students to a healthy stream, comparing headwater conditions to downstream conditions where the stream is severely impacted from abandoned mine pollution

The Little Conemaugh Watershed Association will continue to partner with the Kiski-Conemaugh Stream Team and the Cambria County Conservation District to develop and promote water quality related educational programs to local school districts. Though Stream Team Symposiums and Conservation District sponsored field trips, students will study the flora and fauna of the healthy headwater fishery, conduct their own field monitoring tests and sample macroinvertebrate populations at headwater and downstream locations. This will lead into discussion on how we can repair impacted streams and what measures are being taken to protect and improve the pristine headwater fisheries of the South Fork.

Watershed Overview

The South Fork Branch of the Little Conemaugh River is located in Summerhill and Adams Townships in the south-east corner of Cambria County. The South Fork flows north-west approximately twelve miles from the headwaters to the confluence with the main stem of the Little Conemaugh in the Borough of South Fork. The Little Conemaugh flows south-west to join the Stonycreek River forming the Conemaugh River in the City of Johnstown. The South Fork drains approximately 30,308 acres. Much of the watershed is severely degraded by abandoned mine pollution. With the exception of the headwaters, which will be the focus of this report, the watershed has been extensively deep and surfaced mined on several bituminous coal seams.

The study area addressed in this report is the extreme headwaters of the South Fork basin upstream of the village of Beaverdale, prior to the confluence with Beaverdam Run. Refer to **Figure 1** for a map of the study area. This portion of the South Fork drains approximately 13 square miles and is classified as a High Quality Cold Water Fishery by the Pennsylvania Department of Environmental Protection (PA DEP). The South Fork basin upstream of the Lloydell/Beaverdale Reservoir is managed by the Pennsylvania Fish and Boat Commission as Class A Wild Brook Trout Waters. This section has been designated as a "Wilderness Trout Stream" under Fish and Boat's stream management regulations and is designated as Exceptional Value Waters by the PA DEP.

Geology

The headwaters of the South Fork Branch of the Little Conemaugh originate high on the leading edge of the Allegheny Front; a geologic feature that traverses across Pennsylvania separating the Valley and Ridge physiographic province of central Pennsylvania from the bituminous coal fields of the Western Appalachian Plateaus physiographic province of southwestern Pennsylvania.

Most of the underlying bedrock of the study area is classified as Mississippian Age Burgoon Sandstone. Small bands of the Mauch Chunk Formation and Pennsylvanian Age Pottsville Group comprise the surface geology along the western edge of the study area. Refer to **Figure 2** for a geologic map of the area.

The Burgoon Sandstone consists of a medium to light grey, medium-grained, crossbedded sandstone. The sandstone weathers to a buff or light brown color. Beds are well developed and range from medium to thick.

The primary porosity of the Burgoon is low to moderate; however, a secondary porosity provided by joints and bedding-plane openings is high, resulting in an overall high total effective porosity. The permeability of the unit is generally high also. The Burgoon is frequently an excellent aquifer. Artesian flow can be expected in some cases.

The Pottsville Group consists of light to dark grey, fine grained to coarsely conglomerate sandstone with thin grey shale, siltstone, limestone and coal and underclay interbeds. Locally the thickness of the unit range from approximately 80 to 270 feet. The group is generally well

bedded with sandstone and siltstone crossbedded in many places. Joints are moderately well formed and moderately to highly distributed. Porosity is variable depending on lithology, with sandstone having a high to moderate effective porosity in general. The permeability of the group is moderate to low.

The Mauch Chunk formation underlies the Pottsville Group. It consists of red, green and gray interbedded shales, with some minor limestone units. The unit ranges in thickness of up to 200 feet.

Stream Health

Several studies have been conducted in the study area by the PA Fish and Boat Commission (PFBC) since 1990. In 1995 a special protection evaluation report and water quality standards review was conducted on the South Fork headwaters. As part of the assessment, historical water quality data was collected and reviewed, new water quality data was collected, macroinvertebrate studies were completed and a trout population biomass survey was conducted. As a result of this study, the South Fork basin from the source to the Beaverdale Reservoir was changed from a High Quality Cold Water Fishery to an Exceptional Value protection status. Also, a lower portion of the South Fork that flows through the village of Beaverdale was changed from a High Quality to a lower Cold Water Fishery status due to acid mine drainage pollution. In 1998, 2000 and 2002 additional water quality data was collected and trout biomass studies were completed at a monitoring point on the EV section of the South Fork, above the Beaverdale Reservoir as part of five year project to assess Class A wild trout fisheries.

It should be noted that the study area is largely unaffected by abandoned mine pollution that has greatly diminished the water quality of the remainder of the South Fork and also the main stem of the Little Conemaugh Watershed. The economic coal seams that have been heavily mined in the area crop out on the western edge of the study area on the eastern flank of the Wilmore Syncline, a large geologic structure containing rich coal seams of the Allegheny Group. However, several small mine drainage seeps have emerged in recent years and have degraded the lower part of the South Fork as it approaches the village of Beaverdale. The Little Conemaugh Watershed Association is currently working with the DEP Ebensburg District Mining Office and Hedin Environmental Inc. under a Trout Unlimited Technical Assistance Grant to develop treatment strategies for several of these acidic discharges. Successful remediation of four small acidic seeps and one larger deep mine discharge would extend the high quality fishery on the South Fork until several large mine discharges enter the stream near the confluence with Beaverdam Run.

The headwaters of the South Fork are unaffected from the pressures of development or the impacts of agriculture. The only substantial non-point source threat to the water quality would be from logging in the forested watershed. Approximately 50% of the watershed is managed as part of State Game Lands #26 by the Pennsylvania Game Commission. Another 14% of the watershed is owned by the Department of Conservation and Natural Resources Bureau of Forestry and is part of the Gallitzin State Forest. The bulk of the remaining watershed is owned by Highland Sewer and Water Authority. There are several smaller landowners in the watershed including the Dunlo Rod & Gun Club and the Beaverdale Sportsmen. However, residential development is almost non-existent upstream of the town of Beaverdale.

As part of this project several water quality monitoring points were established (see **Figure 1**). Field equipment and test kits were purchased to measure dissolved oxygen, pH, alkalinity and conductivity. Four weirs were constructed and installed with the assistance of the Cambria County Conservation District on Rachel Run, and two intermittent tributaries fed by springs located on the Beaverdale Sportsmen's property.

Water quality data was collected on two dates at four monitoring points. The upper most sampling point was located on the main stem of the South Fork, immediately upstream of the Beaverdale Reservoir (SF-01), on the EV section of stream. The second sampling location was at located at the mouth of Rachel Run (RR-01). The third sample location was on the South Fork downstream of the reservoir and Bottle Run (BR-01). The fourth sample was located at the mouth of Bottle Run (SF-02).

Table A: Water Quality Data

Monitoring Point	Date	pH	Alkalinity mg/l	Temp. F	Conductivity Uhmos
SF-01	5/10/04	6.2	3.0	44	26
SF-01	9/28/04	6.0	2.0	51	28
SF-02	5/10/04	5.9	5.0	47	24
SF-02	9/28/04	6.2	6.0	54	22
BR-01	5/10/04	5.0	2.0	47	36
BR-01	9/28/04	4.8	3.0	51	38
RR-01	5/10/04	6.5	5.0	48	35
RR-01	9/28/04	6.2	4.0	53	28

Alkalinity in natural waters is primarily a function of the carbonate system. Carbonates come from limestone and other rocks containing calcium carbonate that dissolve on contact with water. Alkalinity levels are consistently low along the entire length of the South Fork. This is not surprising when examining the geology of the watershed, which is nearly devoid of limestone. Low alkalinity levels are common to streams coming off the Allegheny Front. The absence of limestone gives the streams little or no buffering capacity to protect it from acid rain and acidic snow melt. Ideal alkalinity levels should be somewhere around 20 mg/l to protect the aquatic life in the stream.

The pH readings are also relatively low due to the surrounding geology. Most animals can thrive in a pH 5 to 9 water. The landscape and vegetation around the stream can also affect the pH of the stream. Most of the watershed is heavily forested. Pine needles, oak leaves and sphagnum moss are slightly acidic. Decaying vegetation can have a similar effect, slightly lowering the pH of the stream.

Water quality collected in 2004 was consistent with previously collected data by the PFBC. The PFBC notes in their Management Report for the South Fork in 2004 that water quality above the reservoir remained consistent over the last 12 years. Alkalinity levels measured in 2004 were measured slightly higher that the PFBC data for the same monitoring points. Slightly higher levels can be attributed to the use of testing kits used in the field to measure alkalinity levels by volunteers.

The Beaverdale Sportsmen have been supplied with monitoring equipment and several club members have been trained to properly calibrate and operate the dissolved oxygen meter, pH meters and alkalinity test kits. However, due to low alkalinity levels, it is difficult to obtain an accurate reading with a field titrating test kit. Refer to **Figure 3** for sample locations and Table B for a summary of water quality data collected by the sportsmen on April 26, 2006.

Table B: Sportsmen Group Data

Monitoring Point	Dissolved Oxygen ppm	pH	Temp C
SF-1	8.9	6.2	13.9
SF-2	9.78	5.6	12.3
SF-3	9.81	6.8	10.8
SF-4	9.95	4.6	10.7
SF-5	9.87	4.8	11.8
SF-6	9.78	6.2	12.8
SF-7	10.09	4.8	11.2
SF-8	9.41	5.1	11.9

Dissolved oxygen is an important water quality parameter to monitor because it is essential for the survival of aquatic life and the health of the lakes and rivers. Aquatic plants and animals require oxygen to respire. Dissolved oxygen levels less than about 2 ppm cannot support fish and many other aquatic organisms. More than 5 ppm of dissolved oxygen is required to maintain a healthy and diverse aquatic organism population.

Dissolved oxygen levels measured in the study area are consistent with historical data and typical of healthy streams in this region.

Stream Biology

Benthic macroinvertebrates are often utilized to determine the health of a stream. Generally, the presence of large numbers of species is characteristic of unpolluted areas, whereas relatively smaller number of species indicates stressed conditions. Certain taxa of macroinvertebrates such as Ephemeroptera, Plecoptera and Odonata are sensitive to polluted water. Taxa such as Diptera and Tricoptera are to an extent tolerant of polluted water.

Macroinvertebrate populations were assessed at each monitoring point in September of 2004. At each monitoring point, a 0.1m2 surber sampler was set up along a transect to collect macroinvertebrates. All taxa sampled were classified as tolerant, facultative, and intolerant of pollutants as suggested by Weber (1973).

In western Pennsylvania, macroinvertebrates are commonly found in high, moderate and even sometimes in low water quality streams, depending on the physiochemical parameters of the stream. Generally species such as Heptageniidae (mayfly), Perlidae (stonefly), and Limnephilidae (case building caddisfly) are intolerable to low water quality and therefore if found during sampling, indicate an accurate assessment that the stream is of high water quality. If these species are absent, this is indicative of moderate to low water quality, again, depending on the physiochemical parameters. Table C exhibits species found most

commonly during sampling with stream quality designated by species presence. Table D shows that numerous specimens that were identified at each of the monitoring points.

Table C. Macroinvertebrates used as stream quality indicators

Species	Tolerant	Facultative	Intolerant	Stream Quality		
				High	Moderate	Low
Heptageniidae (flatheaded mayfly)			X	X		
Perlidae (common stonefly)			X	X		
Limnephilidae (northern casemaker)			X	X		
Hydropsychidae (common netspinner)		X			X	
Chironomidae (true fly)	X					X
Cambaridae (crayfish)	X					X
Corydalidae (Dobson fly)		X			X	
Tipulidae (cranefly)			X			X
Gomphidae (dragonfly)			X	X		

Table D. Taxonomic Enumeration of Macroinvertebrate Community by Location

Species	SF-01	SF-02	BR-01	RR-01
Heptagenidae	8	4	2	7
Perlidae	10	6	8	14
Limnephilidae	12	9	7	8
Hydropsychidae	3	4	6	4
Chironomidae	0	0	1	0
Cambaridae	6	8	10	3
Corydalidae	0	0	1	0
Tipulidae	3	4	2	0
Gomphidae	0	1	0	1

In 1995, the PFBC collected macro-invertebrates at several stations in the South Fork. The benthic results for the watershed above the reservoir (sampling locations BR-01 & RR-01) were excellent; indicative of its high water quality. Benthic densities at the sample locations were also good. While the three major taxa: mayflies, stoneflies and caddisflies were fairly well represented, negative impacts to the mayfly populations were noticeable. The most probable influences on the pollution sensitive mayflies are from parameters related to the streams buffering capacity.

In 2004, macroinvertebrate populations were diverse and abundant indicating high water quality in the South Fork upstream of the reservoir and in Rachel Run.

Macroinvertebrate populations in Bottle Run and at the monitoring point downstream of the confluence with Bottle Run were abundant but were dominated by more facultative and tolerant species, indicating slightly lower water quality conditions. Intolerant species were

identified but in much smaller quantity than the tributaries upstream of the reservoir. Lower alkalinity and pH levels are likely responsible.

Fishery

Water quality analysis and fish surveys have been conducted by the PFBC on a biennial basis since 1998 as part of a Federal Aid project to assess Class A wild trout fisheries. According to the Fisheries Management report issued in March of 2003, water quality has remained consistent in the last 12 years. Fish sampling was conducted in 2002 immediately upstream of the Beaverdale Reservoir on the EV section of the South Fork at monitoring point BR-01. Stream flow was low during the 2002 fish sampling.

Sampling was conducted with a Coffelt model BP-1C backpack electrofisher operated at 500 volts AC and 150 watts for 200 meters. Four fish species were collected in 2002 and in 2000, compared to two species that were collected in 1998. In 2002, white suckers *Catostomus commersoni* were common, brown bullheads *Ameiurus nebulosus* were present, and mottled sculpin *Cottus bairdi* were rare. Overall, 125 total wild brook trout were captured. See **Appendix E** for PFBC Summary information for wild brook trout collected in June 1998, June 2000 and July 2002. Total wild trout biomass in 2002, was estimated at a Class B level of 23.92 kg/ha, which declined from 30.96 kg/ha in 2000. Ten hatchery brook trout were also collected and removed from the stream. Two cooperative nursery sponsors stock trout in the South Fork below the reservoir. However, no stocking has taken place in or above the reservoir since 1990.

Recommendations in the 2000 PFBC report include no stocking of trout, particularly rainbow and brown trout, in the Beaverdale Reservoir due to the naturally infertility of the watershed and the wild trout population. The PFBC also recommended in 2004 that the headwaters above the reservoir should continue to be managed as Class A wild brook trout water under the Wilderness Trout Streams Program.

Natural Riparian Health

During the summer of 2005, LCWA volunteers partnered with Natural Biodiversity Conservation staff to conduct a riparian field study in the headwaters of the South Fork. Several sites along the South Fork were selected and studied to determine the role that invasive plant species play in the riparian health of the stream. Sites included a healthy headwater riparian site, a downstream site where Japanese Knotweed was prevalent, a knotweed control site and a bare soil site. As part of this study, a bird survey, mammal survey, water temperature study, basic water chemistry, macroinvertebrate sampling and riparian vegetation plot assessments were conducted on three separate dates.

Bird survey results indicated a higher amount of bird observations at the Japanese Knotweed site than the other sites. Mammal survey results were most favorable at the healthy riparian site, as predicted. Water temperature was consistent for each monitoring site. Water chemistry results showed increased acidity in the downstream sites as the stream is affected by numerous small abandoned mine drainage seeps. Macroinvertebrate results were consistent with the chemical analysis. A vegetation plot assessment was conducted at each site to verify what plant species were present. Native plants were cataloged and counted as well as invasives at a plot designated in each study area.

Summary

The headwaters of the South Fork Branch of the Little Conemaugh have retained its ecological integrity as one of the few high water quality tributaries in the Little Conemaugh Watershed. Unspoiled by mining and far removed from development pressures, the watershed has remained a productive trout fishery.

However, naturally low alkalinity levels that may be compounded by acidic rain and snow melt continue to threaten the fragile fishery. In order to ensure the long-term health of the fishery, the Beaverdale Sportsmen and the Little Conemaugh Watershed Association have started a project with the PA DEP District Mining Office to conduct electrofishing, gather additional water quality information and develop projects to protect and improve water quality, habitat and aquatic resources in this sensitive watershed.

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