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AQUATIC SURVEY OF THE NORTH AND SOUTH BRANCHES OF BLACKLICK CREEK

BLACKLICK TOWNSHIP

CAMBRIA COUNTY

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ABSTRACT

A survey to assess acid mine drainage (AMD) impacts in the upper Blacklick Creek watershed, Blacklick Township, Cambria County, was conducted by DEP's Bureau of Abandoned Mine Reclamation (BAMR). Existing water quality conditions and aquatic life were assessed in the North and South Branches of Blacklick Creek by Pam Milavec, Rich Beam, and Kay Spyker of BAMR. Scarlift Report No. 185 was also reviewed to determine the location of AMD discharges within the watershed and their impacts on the North and South Branches of Blacklick Creek. This information will be used to determine the feasibility of a comprehensive AMD abatement plan for the upper Blacklick Creek watershed.

INTRODUCTION

Blacklick Creek, a subwatershed of the Conemaugh River, is located within Indiana and Cambria Counties (Figure 1). Generally flowing east to west between the towns of Ebensburg and Blairsville, the subwatershed drains an area of approximately 425 square miles. Coal mining in the area began in the early 1800's and primarily focused on the upper and lower Freeport and the lower Kittanning coal seams. Coal was extracted from both deep and surface mines and continues today in some areas.

This report focused on two tributaries in the headwater regions of Blacklick Creek: the North Branch of Blacklick Creek and the South Branch of Blacklick Creek. The confluence of these two tributaries is in Vintondale, Pennsylvania and together they form Blacklick Creek. Four stations were sampled on both tributaries and the upstream station on the North Branch was used as a reference station for this report. One discharge (Red Mill discharge) was also sampled on the North Branch. The headwaters of the North Branch of Blacklick Creek appear to be unaffected by AMD and some tributaries downstream are unaffected as well. However, the majority of the South Branch of Blacklick Creek is AMD impacted even though some tributaries do not contribute AMD.

According to Scarlift Report No. 185 (Blacklick Creek Watershed Mine Drainage Pollution Abatement Project, completed 1978), 91,548 lb./day of acid was introduced into the North Branch of Blacklick Creek in 1974. Elk Run, a tributary North of White Mill Crossing, accounts for 83% of this total. Of the total amount of pollution draining the Elk Run Watershed, approximately 70% of the AMD is from mine waste banks that are adjacent to the tributary. These refuse piles, known as the Colver Refuse Piles, are currently being reprocessed, although completion of the project may take twenty years. Just under 17% of the total acid load to the North Branch (above the borehole discharges) is from a slope mine entry (Red Mill Discharge - Commercial Coal Mining Company) which lies about 0.71 miles (1.14 km) south of the town of Red Mill. The remaining 0.1 % of acid load was considered to be of natural origins. In addition, AMD discharges from the Vinton No. 6 mine were relocated in 1995 from the South Branch to the mouth of the North Branch because of basement flooding in some homes in Vintondale. These discharges contribute an additional average acid load of about 14,000 lb./day.

The Scarlift report divides the South Branch into 16 sub-basins of which only 6 appear to be unpolluted or naturally acidic and 1 (North of Mundy's Corner) posed no serious pollution problems as long as the treatment facility operated by Bethlehem Mines Corporation was operating properly (Figure 2). The remaining tributaries are negatively impacted by drainage from deep mines, surface mines, and runoff from refuse piles and contribute AMD to the South Branch. Drift mine discharges and seepage from mine waste banks add additional AMD directly to the main stem of the South Branch of Blacklick Creek.

METHODS

Macroinvertebrates and water samples were collected at nine locations in the Blacklick Creek watershed (Figure 2). The North Branch was sampled 25 October 1996 and the South Branch was sampled 5 November 1996. One sample station was chosen upstream of the influence of AMD to provide reference data. This site was located on the North Branch at Adams Crossing. The remaining sample locations were chosen to show how AMD from both deep mining and surface mining is affecting the waters of the North and South Branches of Blacklick Creek. In total five stations were sampled on the North Branch (including the Red Mill Discharge) and four stations were located on the South Branch.

Water samples were collected by grab method at each water sample location using one 500 ml bottle and two 125 ml bottles (one fixed with hydrochloric acid for ferrous iron analysis and one fixed with nitric acid for all other metal analyses). Water samples were then placed in a cooler with ice until they were transported to the laboratory for analysis.

Macroinvertebrates were collected following DEP's modified version of EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers (Plafkin et al. 1989). Rapid Bioassessment Protocol III was the technique followed for macroinvertebrate collection. Macroinvertebrates were collected using a D-frame net and then preserved in a 90% alcohol solution so that samples could be identified in the laboratory at a future date. Two macroinvertebrate samples were collected at each site: one from a fast current velocity riffle and one from a slow current velocity riffle. The two samples were then combined for processing (total net contents were placed in the alcohol solution in a plastic container). Once at the laboratory, the samples were thoroughly rinsed using a sieve and placed in a large pan with a numbered grid on the bottom. A number was randomly selected to match a corresponding square within the gridded pan. All organisms were removed from the first square selected and the process continued until 100 organisms were picked from the pan (because some streams are contaminated by mine drainage, collection of 100 insects was not always possible). The macroinvertebrates were then identified to the lowest possible taxonomic level using a dissecting microscope and recorded on a data sheet. The remainder of the sample was checked to note any additional species present in the sample that were not present in the subsample. The raw numbers from the subsample were then analyzed to compute taxa richness, modified EPT index, modified Hilsenhoff biotic index, percent dominant taxa, and percent modified mayfly index.

Taxa richness reflects the health of a community by measuring the variety of species in a subsample. Generally, three factors increase taxa richness: increased water quality, habitat diversity, and habitat suitability. The EPT index increases with increasing water quality and summarizes taxa richness within the pollution sensitive orders of Ephemeroptera, Plecoptera, and Trichoptera. The Hilsenhoff index increases as water quality decreases. The index summarizes the pollution tolerance of the benthic community. Percent dominant taxa measures the percent contribution of the numerically dominant taxon to the total number of organisms in the sample. Percent dominant taxa increases with decreasing water quality. The percent modified mayfly index increases with increasing water quality and is based on the number of pollution intolerant mayflies in the subsample.

The rapid bioassessment protocol metric comparison calculates a numerical value for each metric using raw data. Calculated values for candidate stations are then compared to the values derived from the reference station. Each metric is then assigned a score for each station based on its comparability to the reference station. The scores for each metric are then totaled within each sampling station and compared to the total metric score for the reference station. The percent comparison between the total scores provides the basis for determining the biological condition of the stream station (Plafkin et al. 1989). Five metrics (listed in Table 4) were used to determine percent comparability to reference station. This information was used to determine if a stream was nonimpaired (>83%), slightly impaired (54-83%), moderately impaired (21-54%), or severely impaired (<21%). This comparison is more accurate if each station analyzed has a subsample of 100 organisms. Reliability of the statistics decreases with the reduced number of organisms in the subsample and may not show how severely a stream is impaired. Rapid Bioassessment Protocol III field sheets were also filled out for each sample location to determine habitat suitability.

RESULTS

Water sample results are listed in Table 1 and Macroinvertebrate information can be found in Table 1 and Table 2 (qualitative information). The habitat rating for each of the eight stations is similar, with numbers ranging from 146 to 200 (Table 1). Metric comparisons are found in Table 3. The metric comparisons seem to rely heavily on the number of taxa and not the number of individuals, so that stations that have several taxa but few individuals may not show stream impairment even though AMD may have negative impacts on the stream community. Also, metric comparisons may not show negative impacts due to the low number of individuals collected in each sample.

Aquatic communities are impacted by metals which occur in mine drainage. Aluminum is one metal from mine drainage which has a deleterious effect on aquatic life. Jane Earle (1995) reported that water with a pH below 6.0 combined with a high aluminum concentration has a lethal effect on aquatic life. Aluminum, which is least soluble at a pH between 4.5 and 6.5, is lethal to organisms because precipitated aluminum covers the substrate (reducing viable habitat and smothering organisms), accumulates on the feeding mechanisms of filter feeders (reducing food availability), and accumulates on fish gills, thereby interfering with respiration. In general, the North Branch was less influenced by aluminum because the lowest pH was 6.4 and the aluminum concentrations were moderate, allowing some pollution tolerant organisms to survive. However, the reduced pH levels combined with the high aluminum concentrations on the South Branch most likely had detrimental effects on the aquatic community. Jane Earle (1995) indicated that a combination of pH less than 5.5 and a dissolved aluminum concentration of at least 0.5 mg/l would virtually eliminate all fish species and negatively impact the macroinvertebrate community. This situation existed on 3 of the 4 South Branch stations (SB01, SB03, and SB04).

Iron is another metal that has negative impacts on aquatic life (Gray 1996). Although fish can survive in alkaline waters with iron precipitate, their numbers and diversity are lower than would be found in clean waters. Macroinvertebrate abundance also decreases in streams with increased iron precipitate and insects may be less tolerant to iron precipitate than fish because they are not as mobile as fish. Like aluminum precipitate, iron precipitate coats the substrate reducing living space and food resources for macroinvertebrates. While iron precipitate is apparent on the North Branch from Elk Run to its mouth, the potential exists to remove the majority of precipitate with the treatment of two AMD sources, exclusive of the boreholes that have been drilled in the North Branch mouth. The contamination on the South Branch is more complex with pollution entering through several tributaries and from mines directly on the South Branch. The combination of iron and aluminum contamination on the North and South Branches of Blacklick Creek virtually eliminates the diversity and number of organisms in the macroinvertebrate community.

NB01 - North Branch at Adams Crossing

The North Branch of Blacklick Creek was sampled upstream of all known AMD contaminants. Laboratory results for this stream station show a pH of 6.7 with low metal concentrations (Fe = 0.317 mg/l and Al ≤ 0.135 mg/l). No measurable acidity was found at this station and metal loadings were low compared to the other sampling stations on the watershed (Table 1). There were 15 species found within the macroinvertebrate subsample with 6 additional species recorded from the remainder of the sample. The diversity and number of macroinvertebrates at this station is indicative of a healthy insect community and this conclusion is supported by the metrics in Table 4. In addition, station NB01 was the only station where a 100 organism subsample was attained. Because of the good water quality, lack of pollution sources and the high number of macroinvertebrates, this sample station was used as the reference station for the watershed.

NB02 - North Branch upstream of Carney Run

Elk Run, which is AMD impacted by the Colver refuse piles, enters the North Branch of Blacklick Creek between NB01 and NB02. It is the first tributary to contribute AMD to the North Branch and according to Scarlift Report 185, this tributary contributes an acid load of 75,984 lb./day (83% of the total acid load to the North Branch exclusive of the relocated borehole discharges). NB02 was chosen to show the effects of Elk Run on the North Branch. Water quality at this station was fair (pH = 6.5, Fe = 2.84 mg/l, and Al = 1.39 mg/l) and iron precipitation coated the stream bottom. Metal loadings are higher at this station than any other station sampled. Although only ten insects were found in the sample compared to the 1000 plus found at NB01, results from the macroinvertebrate analysis indicate that the stream is only moderately impaired at this station. Both water quality and macroinvertebrates indicate that this sample station is AMD impacted.

NB03 - North Branch upstream Red Mill discharge

Between NB02 and NB03, Carney Run (a reproducing trout stream) enters the North Branch of Blacklick Creek. Water quality at this station is slightly better than NB02 with a pH = 6.5, Fe = 2.25 mg/l, and Al = 1.15 mg/l, but iron precipitation still coats the stream substrate. Metal loadings at NB03 are similar to NB02 indicating little or no additional metals entering the North Branch between NB02 and NB03. Forty-three macroinvertebrates were found at this station and the metric comparison shows a taxa richness similar to the reference station with no one species dominating the community. In comparison to the reference station, NB03 is slightly impaired.

Red Mill discharge

The Red Mill discharge is the only significant discharge directly on the North Branch of Blacklick Creek and has a flow of 422 gpm, pH = 3.4, Fe = 52.1 mg/l, and Al = 7.06 mg/l. In comparison to Elk Run this one discharge, according to SL 185, had an acid load of 902.53 lb./day, Fe loading of 264.17 lb./day, and an aluminum load of 35.39 lb./day (accounting for just under 17% of the acid load to the North Branch, exclusive of the relocated borehole discharges).

NB04 - North Branch Mouth

The North Branch of Blacklick Creek was sampled 0.65 miles (1.04 km) upstream of its confluence with the South Branch Blacklick Creek and includes all AMD influences that enter the North Branch upstream of the boreholes. The water quality at this station reflects the effects of the Red Mill discharge on the North Branch of Blacklick Creek (pH at this station was 6.3, Fe = 2.02 mg/l, and Al = 0.915 mg/l). Loading rates for some metals were lower at this station indicating that metals are precipitating from the water column from the upstream sampling station to the mouth of the tributary. This station was only 13% comparable to the reference station meaning that the stream at this point is severely biologically impaired. Taxa richness was lowest at NB04 on the North Branch and no Mayfly genera were found, which supports the above assessment.

SB01 - South Branch at Beulah Road

Although this station is upstream on the South Branch, there is a refuse pile (known as the Revloc Pile) which is upstream of this sampling station. This pile is adjacent to the South Branch and provides significant AMD to the stream. The water quality of the South Branch at this sampling station is pH = 4.7, Fe = 0.55 mg/l, and Al = 4.4 mg/l. The combination of these factors severely limits macroinvertebrate life. Although the bioassessment only indicates that the stream is moderately impaired, only nine insects were collected at this station, taxa richness was low and no mayfly genera (pollution tolerant organisms) were collected.

SB02 - South Branch Upstream of Nanty Glo

A few deep and surface mine discharges enter the South Branch between SB01 and SB02. There is also a treated AMD discharge from a post primacy deep mine which may account for the elevated pH (6.5) compared to other pH values on the South Branch. The Fe concentration = 0.503 mg/l and Al = 2.16 mg/l. The metric comparisons found that SB02 was moderately impaired, however, only 12 insects were collected at this station (two caddisfly genera). Taxa richness was low at this station, the EPT index was low, 83 % of the macroinvertebrate community was dominated by one species and no mayflies were collected. All of these factors indicate reduced water quality at this sampling station.

SB03 - South Branch Downstream of Nanty Glo

Although a high quality stream and a treated discharge enter the South Branch upstream of SB03, two major areas contribute AMD between SB02 and SB03 (2 refuse piles and the Webster deep mine discharge near the village of Nanty Glo). The water quality at this station was: pH = 5.0, Fe = 3.43 mg/l, and Al = 3.98 mg/l. The bioassessment rates SB03 as moderately impaired (27 % comparable to the reference station) but taxa richness is lower than at any other station in the watershed (one caddisfly species was collected) and no mayflies were collected. Because only 2 insects were collected at this station, the metric comparison results may not reflect the severity of degradation at this point.

SB04 - South Branch Mouth

The final sampling station was the mouth of the South Branch of Blacklick Creek. The water at this station had a pH = 4.8, Fe = 4.13 mg/l, and Al = 4.16 mg/l. The metal loadings indicate a cumulative effect at this point from the addition of various AMD discharges along the length of the South Branch. According to the bioassessment, SB04 is severely impaired biologically with only two macroinvertebrate species collected (none from the pollution intolerant order Ephemeroptera (mayfly)). Taxa richness was low, the EPT index was 0, and the Hilsenhoff index at this station was higher than at any other station.

CONCLUSIONS

Acid mine drainage from surface mines and deep mines has a negative impact on both water quality and the macroinvertebrate community in the upper Blacklick Creek watershed. Elk Run (near White Mill Crossing) is the first tributary that contributes AMD to the North Branch. Refuse piles adjacent to Elk Run should be reprocessed and stabilized within the next twenty years, reducing the detrimental effect on Elk Run and the North Branch. However, until the project is completed the North Branch between White Mill Crossing and the Red Mill discharge will continue to be biologically and chemically impaired by Elk Run. At NB02 (approximately 1.4 miles (2.25 km) downstream of Elk Run) the number of macroinvertebrates dropped from over 1000's of organisms (at station NB01) to 10 organisms. This decrease in macroinvertebrate numbers may be the result of the aluminum concentration at this point combined with the iron precipitate which coats the stream substrate, making the habitat inhospitable to aquatic life.

The negative impacts from Elk Run are apparent on the North Branch to the point where the Red Mill discharge enters the North Branch. However, minimal recovery was noticed at NB03 which lies downstream of Carney Run and directly upstream of the Red Mill discharge. The slight increase in water quality may be attributed to Carney Run, which is a reproducing trout stream. Unpolluted water from this tributary dilutes the negative impacts from Elk Run from the point where Carney Run enters the North Branch to the place where the Red Mill discharge enters the North Branch. At NB03 (approximately 2.2 miles (3.54 km) downstream of Elk Run) the biological community shows some improvement with a total of 43 macroinvertebrates collected in the kick sample.

The Red Mill discharge enters the North Branch directly downstream of NB03. This 422 gpm discharge has a negative impact on both water quality and macroinvertebrates of the North Branch. Its effects can be seen approximately 1.9 miles (3 km) downstream at NB04 where the aquatic life of the North Branch is severely impaired. Treating this discharge may improve water quality and increase the number of macroinvertebrates for approximately 2 miles (3.22 km), depending on the influence of the run off from refuse piles on Elk Run. Once the refuse piles on Elk Run are reprocessed and stabilized and the Red Mill discharge is treated, 4.16 miles (6.69 km) of the North Branch will be positively affected. In addition, treatment of these AMD discharges may allow trout to reproduce in the North Branch of Blacklick Creek. While 4.16 miles (6.69 km) would be beneficially impacted, total water quality improvement on the North Branch would need to include the relocation and treatment of the boreholes in the mouth of the North Branch. Including these boreholes in an AMD abatement plan would result in 4.81 miles (7.73 km) of improved stream quality on the North Branch of Blacklick Creek.

The South Branch of Blacklick Creek and the majority of its tributaries are AMD impacted by deep mines, waste dumps, and strip mines. The first indicator of AMD impact occurs in the town of Revloc where refuse piles are adjacent to the South Branch. These refuse piles are currently being reprocessed by a nearby co-gen plant, but will take several years to complete. Clean up of these refuse piles will eventually benefit approximately 4.5 miles (7.32 km) of stream between Revloc and Stewart Run (a tributary south of Nanty Glo). From Stewart Run to Vintondale numerous AMD discharges negatively impact the South Branch. Discharges (from deep mines, waste dumps, and surface mines) are present on 8 out of 11 tributaries that enter the South Branch between Stewart Run and Vintondale. In addition, several drift mines and waste dumps contribute AMD directly into the main stem of the South Branch. Although the bioassessment indicated moderate impairment for stations SB01, SB02, and SB03, only 9, 12, and 2 organisms were collected at each station, respectively. No mayflies (pollution intolerant organisms) were found on the South Branch and taxa richness was low at each of the sites sampled. Also, 83% of the macroinvertebrate community was dominated by one species at station SB02 and only one species was collected at SB03. According to the bioassessment, SB04 is severely impaired. The combination of the above factors indicates the severity of degradation on the South Branch of Blacklick Creek. In addition, the South Branch shows no indication of improvement between SB02 and SB04 , demonstrating the abundance and severity of AMD pollution within this stretch of stream.

The results of this study show that the North Branch of Blacklick Creek can be beneficially impacted from the treatment or removal of 2 or 3 AMD sources. A length of 4.16 miles (6.69 km) of stream can be improved with the clean up of the Colver refuse piles and the Red Mill discharge. Removal of these two AMD sources, through passive treatment and surface reclamation, would decrease the metal loadings in the North Branch, which would improve habitat for aquatic life, as a result of reduced metal precipitate accumulation and less cementing of the stream bottom. Improved water quality and habitat would increase macroinvertebrate numbers which may eventually attract trout from Carney Run into the North Branch of Blacklick Creek. The South Branch of Blacklick Creek is severely degraded by numerous discharges for the majority of its length. Approximately 4.5 miles (7.3 km) may moderately improve with the eventual removal of the Revloc refuse piles, but the remaining 8.5 miles (13.7 km) (between Stewart Run and the South Branch mouth) would require a comprehensive approach which addresses the numerous AMD sources in this stretch of stream.

REFERENCES

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Earle, Jane. 1995. Effects of Mine Drainage on Aquatic Life. Unpublished. Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation. Harrisburg, PA. pp 5.

Gray, N.F. 1996. A Substrate Classification Index for the Visual Assessment of the Impact of Acid Mine Drainage in Lotic Systems. Water Research. Vol. 30:1551-1554.

Figure 1. General location of the North Branch and South Branch of Blacklick Creek watersheds, Blacklick Township, Cambria County.

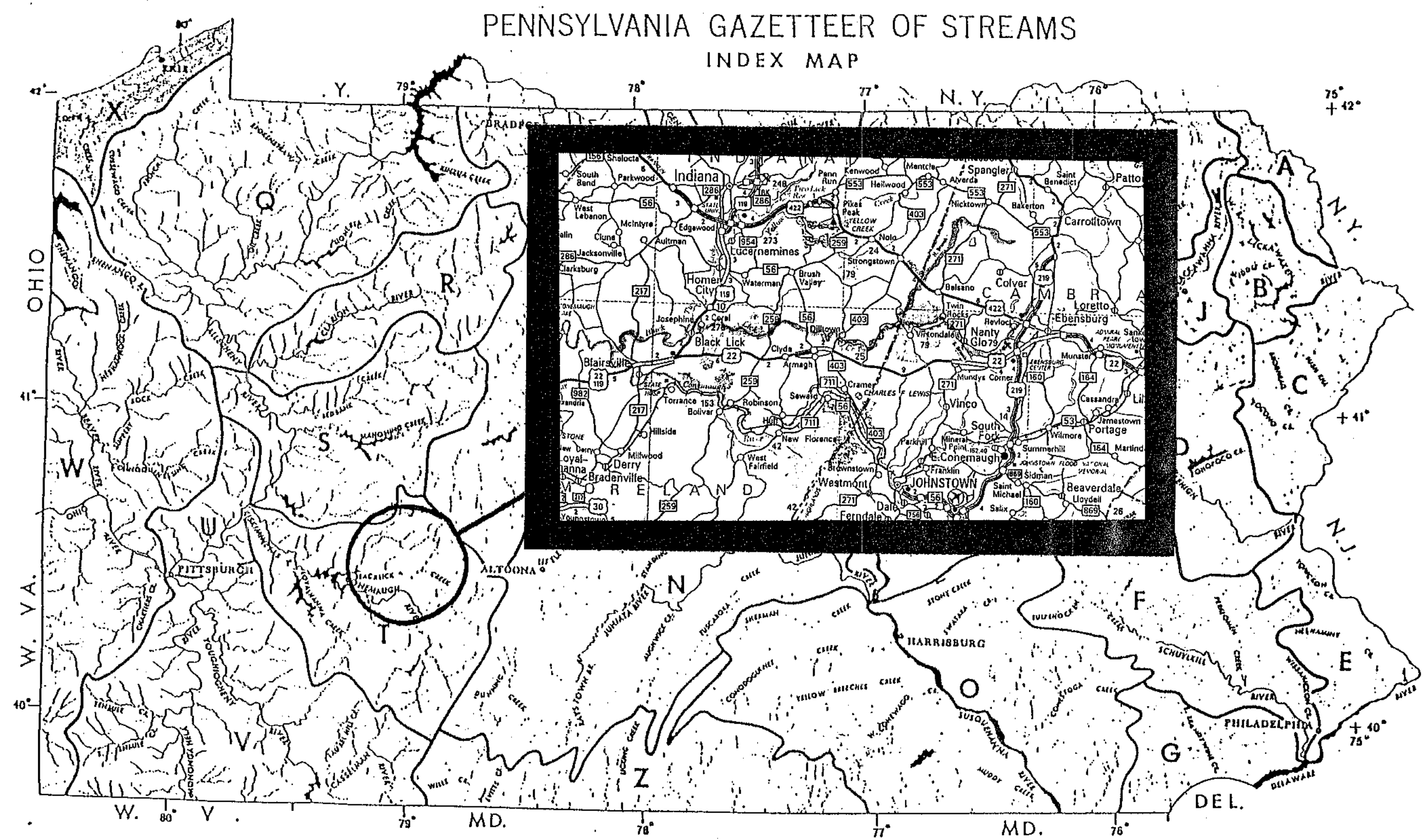

Table 1. A comparison of the water sample analyses for the nine sample locations on the North and South Branches of Blacklick Creek, Blacklick Township, Cambria County. Samples were collected 25 October 1996 and 5 November 1996. (Sample stations are located on Figure 2)

Station:	NB01	NB02	NB03	RED MILL	NB04	SB01	SB02	SB03	SB04
Flow (gpm)	23400	64800	78300	422	80550	6297	13135	23218	28301
pH	6.7	6.5	6.5	3.4	6.4	4.7	6.5	5.0	4.8
Alkalinity (mg/l)	19.8	15.6	15	0	12.8	2.0	15	3.4	2.6
SO4 (mg/l)	1080	10	102	84	328	55	281	348	222
SO4 load (#/day)	303647	7785	95960	425.91	317445	4161	44347	97081	75489
Fe (mg/l)	0.317	2.84	2.25	52.1	2.02	0.55	0.503	3.43	4.13
Fe load (#/day)	89.126	2211.177	2116.774	264.17	1955.002	41.613	79.383	956.862	1404.372
Ferrous (mg/l)	0.05	0.76	0.6	42.84	0.65	0.32	0.13	0.84	1.86
Mn (mg/l)	0.035	0.219	0.197	2.0	0.197	0.389	0.227	0.429	0.636
Mn load (#/day)	9.84	170.510	185.335	10.14	190.661	29.432	35.825	119.677	216.266
Al (mg/l)	0.135	1.39	1.15	7.06	0.915	4.4	2.16	3.98	4.16
Al load (#/day)	37.956	1082.231	1081.907	35.79	885.558	332.902	340.890	1110.294	1414.573
Acidity (mg/l)	0	0	0	178	0	20	0	22	30
Acidity load (#/day)	0	0	0	902.53	0	1513.192	0	6137.305	10201.247
Total # of insects	1000+	10	43		25	9	12	2	5
Total # of taxa	21	6	14		5	6	2	1	2
Habitat Rating	187	191	200		175	152	195	169	146

Table 2. A qualitative list of benthic macroinvertebrates that were collected from the North and South Branches of Blacklick Creek, Blacklick Township, Cambria County. The North Branch macroinvertebrates were collected 25 October 1996 and the South Branch macroinvertebrates were collected 5 November 1996. An x in a column indicates the presence of a species at that sampling station.

LOCATION	NB01	NB02	NB03	NB04	SB01	SB02	SB03	SB04
TAXA								
EPHEMEROPTERA								
(MAYFLIES)								
Heptageniidae								
Stenonema sp.	x	x	x					
Ephemeridae								
Ephemera sp.	x							
Caenidae								
Caenis sp.	x		x					
Leptophlebiidae								
Paraleptophlebia sp.	x							
Beatidae								
Baetis sp.	x	x	x	x				
Oligoneuriidae								
Isonychia sp.	x							
PLECOPTERA								
(STONEFLIES)								
Peltoperlidae					x			
Perlidae								
Acroneuria sp.	x							
Taeniopterygidae								
Taeniopteryx sp.	x	x	x	x				
Capniidae sp.			x					
TRICHOPTERA								
(CADDISFLIES)								
Hydropsychidae								
Hydropsyche sp.	x	x	x	x	x	x		x
Diplectrona sp.						x	x	
Cheumatopsyche sp.	x		x					

Table 2. (Con't)

LOCATION	NB01	NB02	NB03	NB04	SB01	SB02	SB03	SB04
TAXA								
TRICHOPTERA								
(CADDISFLIES)								
Rhyacophilidae								
Rhyacophila sp.					X			
Philopotamidae								
Chimarra sp.	X		X					
Dolophilodes sp.			X					
Lepidostomatidae								
Lepidostoma sp.	X							
Polycentropidae								
Polycentropus sp.	X			X				
DIPTERA								
(MIDGES AND FLIES)								
Chironimidae spp.	X		X		X			X
Ceratopogonidae					X			
Tipulidae								
Antocha sp.	X	X	X					
Athericidae								
Atherix sp.	X							
Tabanidae sp.	X							
Empididae								
Hemerodromia sp.			X					
COLEOPTERA								
(BEETLES)								
Elmidae sp.				X	X			
Optioservus sp.	X		X					

Table 2. (Con't)

LOCATION	NB01	NB02	NB03	NB04	SB01	SB02	SB03	SB04
TAXA								
MEGALOPTERA (ALDERFLIES, FISHFLIES)								
Corydalidae								
Nigronia sp.	X							
Sialidae								
Sialis sp.	X							
HEMIPTERA								
Mesoveliidae								
Mesovelia sp.		X						
COLLEMBOLA (SPRINGTAILS)								
Isotomurus sp.			X					
MOLLUSCA (BIVALVES)								
Sphaeriidae	X							
TOTAL TAXA	21	6	14	5	6	2	1	2

Table 3. Rapid Bioassessment Protocol metric comparison for Blacklick Creek, Blacklick Township, Cambria County (25 October 1996 and 5 November 1996). This table determines the extent of biological impairment of the canditate stream stations in comparison to the reference stream station.

METRIC*	STATION							
	NB02	NB03	NB04	SB01	SB02	SB03	SB04	NB01
1. TAXA RICHNESS	6	14	4	6	2	1	2	15
Cand/Ref (%)	40	93.3	26.6	40	13.3	6.6	13.3	
Biol. Cond. Score	0	6	0	0	0	0	0	6
2. MOD. EPT INDEX	2	5	1	2	1	1	0	6
Cand/Ref (%)	33.3	83.3	16.6	33.3	16.6	16.6	0	
Biol. Cond. Score	0	6	0	0	0	0	0	6
3. MOD. HBI	4.8	4.8	5.0	4.8	4.2	0	5.4	3.9
Cand-Ref	0.9	0.9	1.28	0.9	0.3	-3.9	1.5	
Biol. Cond. Score	4	4	2	4	6	6	0	6
4. % DOMINANT TAXA	50	40	79	33	83	100	60	32
Cand-Ref	18	8	47	1	51	68	28	
Biol. Cond. Score	2	6	0	6	0	0	0	6
5. % MOD. MAYFLYS	10	2	0	0	0	0	0	29
Ref-Cand	19	27	29	29	29	29	29	
Biol. Cond. Score	4	2	2	2	2	2	2	6
TOTAL BIOLOGICAL CONDITION SCORE	10	24	4	12	8	8	2	30
% COMPARABILITY TO REFERENCE	33	80	13	40	27	27	7	
BIOASSESSMENT	Moderately impaired	Slightly impaired	Severely impaired	Moderately impaired	Moderately impaired	Moderately impaired	Severely impaired	Reference station

* All stations were compared to NB01