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West Branch Susquehanna Subbasin Survey

A Water Quality and Biological Assessment, July - November 2002

SUSQUEHANNA RIVER BASIN COMMISSION

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The Susquehanna River Basin Commission (SRBC) conducted a Year-1 survey of the West Branch Susquehanna Subbasin from July to November 2002, which included point-in-time samples of the water quality, macroinvertebrate community, and habitat. This report provides an assessment of that data. SRBC monitors and assesses the six major subbasins (Figure 1) of the Susquehanna River Basin on a rotating schedule. The previous surveys of the West Branch Susquehanna Subbasin were conducted in 1985 and 1994. An assessment of the data from the 1994 survey also is included in this report for comparison purposes. Historical data from these surveys, as well as all other subbasin surveys, are available from SRBC.

Subbasin survey information is used by SRBC staff and others to:

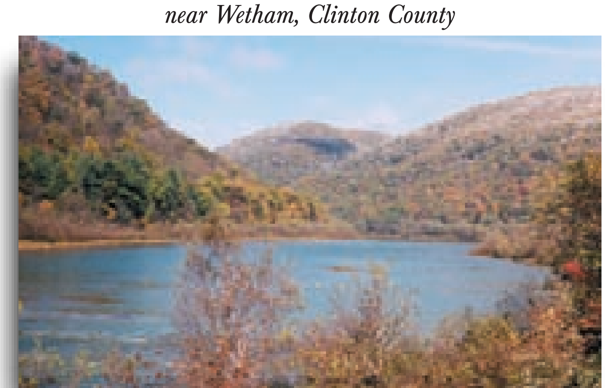
- evaluate the chemical, biological, and habitat conditions of streams in the basin;
- identify major sources of pollution and lengths of stream impacted;
- identify high quality sections of streams that need to be protected;
- maintain a database that can be used to document changes in stream quality over time;
- review projects affecting water quality in the basin; and
- identify areas for more intensive study.

D. Gavin

Figure 1. *The Susquehanna River Basin Subbasins*

SRBC will conduct a Year-2 study of a priority watershed within the West Branch Susquehanna Subbasin during 2003 and 2004. The priority watershed will be selected based on results from the Year-1 survey and input from local interests. SRBC will work with area groups to provide additional data to aid in remediation or protection efforts.

West Branch Susquehanna River near Wetham, Clinton County



S. LeFevre

Description of the West Branch Susquehanna Subbasin

The West Branch Susquehanna Subbasin drains an area of approximately 6,982 square miles from Carrolltown to Northumberland, Pennsylvania, which includes significant portions of Cambria, Clearfield, Elk, Cameron, Potter, Clinton, Centre, Tioga, Sullivan, Lycoming, Union, and Montour Counties. Three different ecoregions are found within this area:

- **Northern Appalachian Plateau and Uplands,**
- **North Central Appalachians, and**
- **Central Appalachian Ridges and Valleys** (Omerick, 1987) (Figure 2).

The West Branch Susquehanna Subbasin contains some of the most scenic forestland in Pennsylvania. This subbasin consists largely of rural lands dominated by state forests and game lands with a few small urban areas scattered throughout (Figure 3). The largest urban centers in this watershed are Williamsport, State College, Lock Haven, and Clearfield. Strip mining is a prominent industry in this area due to the large stores of coal located in the western portion of the watershed. The many miles of streams impacted by abandoned mine drainage (AMD) are evidence of the heavy mining activity in this region. Agricultural activity is found mostly in the eastern and southern portions of the watershed.

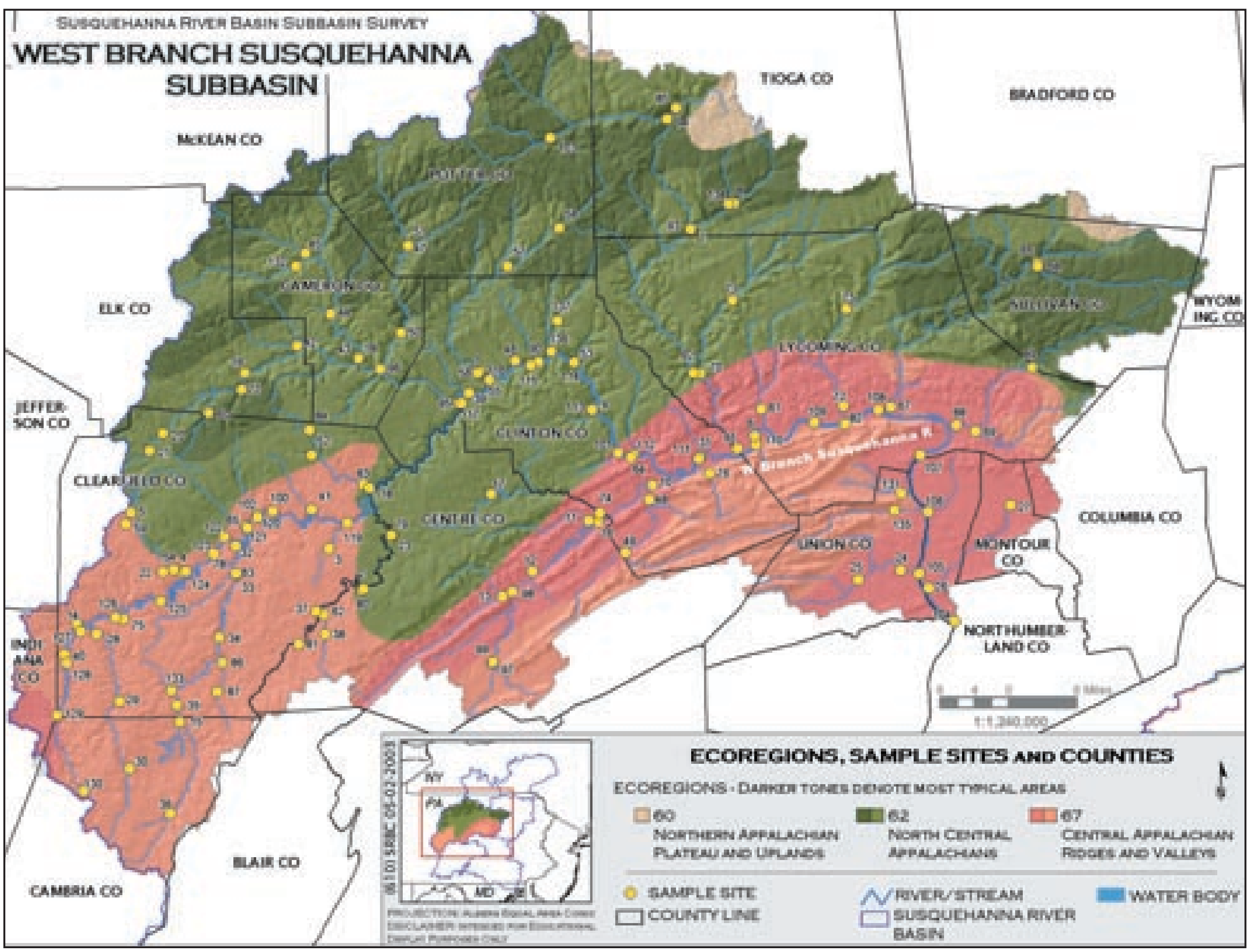
Methods Used in the 2002 Subbasin Survey

DATA COLLECTION

During the summer and fall of 2002, SRBC staff visited and collected samples from 137 sites throughout the West Branch Susquehanna Subbasin. Appendix A contains a list with the sample site number, the station name (designated by stream mile), a description of the sampling location, the latitude and longitude, the ecoregion, and the drainage size category. Macroinvertebrate samples were taken at 129 sites. Staff could not sample eight sites due to lack of riffle habitat or dry conditions. Habitat was rated at the sites where a macroinvertebrate sample was collected.

The sites were sampled once in this Year-1 sampling round in order to provide a point-in-time picture of stream characteristics throughout the whole subbasin. Samples were collected using a slightly modified version of the U.S. Environmental Protection Agency's (USEPA's) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (RBP III) (Barbour and others, 1999).

Figure 2. *Ecoregions and Counties in the West Branch Susquehanna Subbasin*



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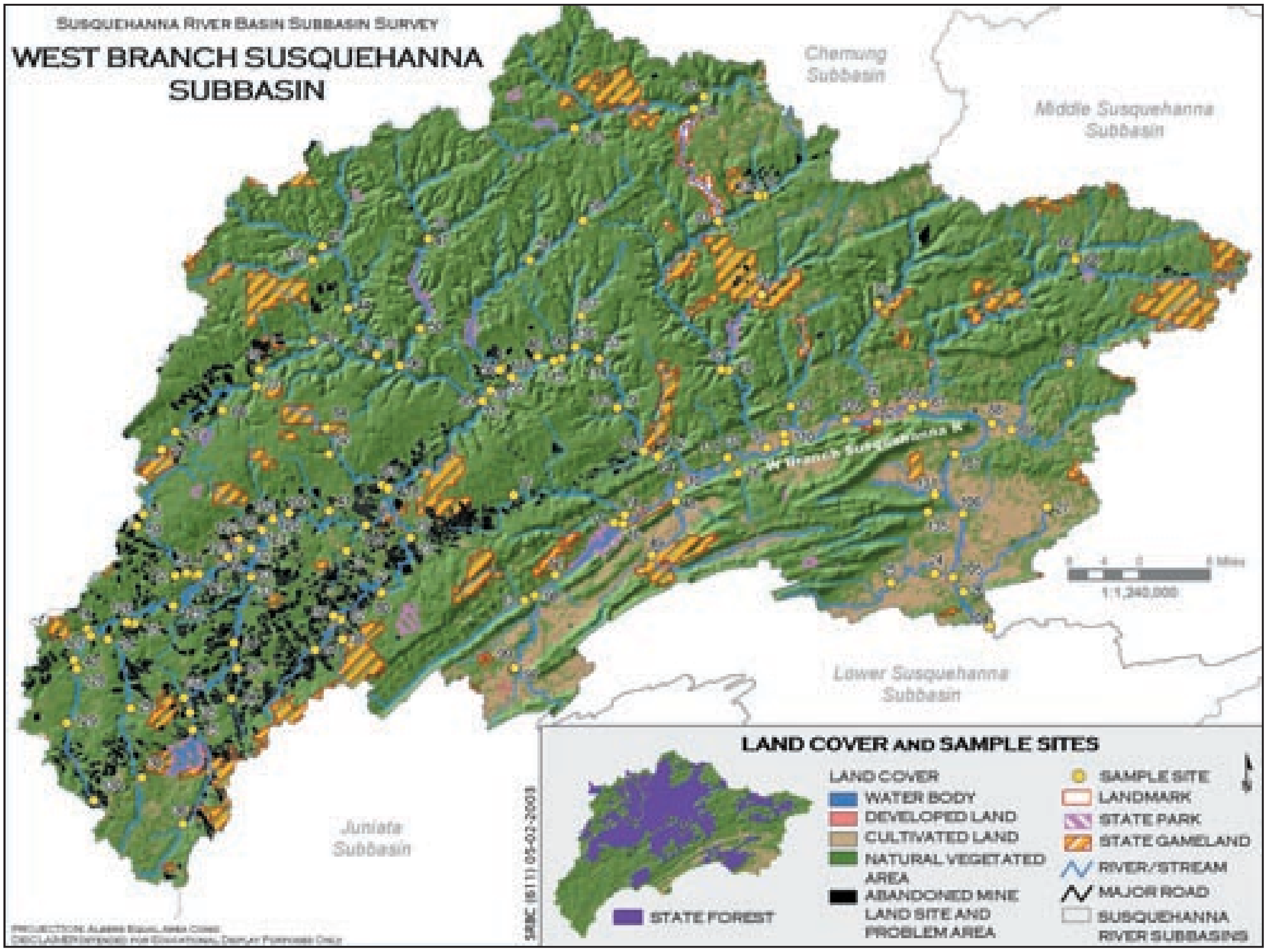

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Figure 3. *Land Use in the West Branch Susquehanna Subbasin*

WATER QUALITY

A portion of the water sample from each collection site was separated for laboratory analysis, and the rest of the sample was used for field analysis. A list of the field and laboratory parameters and their units is found in Table 1. Measurements of flow, water temperature, dissolved oxygen, pH, conductivity, alkalinity, and acidity were taken in the field. Flow was measured using standard U.S. Geological Survey (USGS) methodology (Buchanan and Somers, 1969). Temperature was measured with a field thermometer in degrees Celsius. A Cole-Parmer Model 5996 meter was used to measure pH. Dissolved oxygen was measured with a YSI 55 meter, and conductivity was measured with a Cole-Parmer Model 1481 meter. Alkalinity was determined by titration of a known volume of sample water to pH 4.5 with 0.02N H_2SO_4. Acidity was determined by titration of a known volume of sample water to pH 8.3 with 0.02N NaOH.

One 500-ml bottle and two 250-ml bottles of water were collected for laboratory analyses. One of the 250-ml bottles was acidified with nitric acid for metal analyses. The other 250-ml bottle was acidified with sulfuric acid for nutrient analyses. Samples were iced and shipped to the Pennsylvania Department of Environmental Protection (Pa. DEP), Bureau of Laboratories in Harrisburg, Pennsylvania.

Table 1. *Water Quality Parameters Sampled in the West Branch Susquehanna Subbasin*

FIELD PARAMETERS	
Flow, instantaneous cfs[a]	Conductivity, µmhos/cm[c]
Temperature, °C	Alkalinity, mg/l
pH	Acidity, mg/l
Dissolved Oxygen, mg/l[b]	
LABORATORY ANALYSIS	
Specific Conductance, µmhos/cm	Total Sodium, mg/l
pH	Total Potassium, mg/l
Alkalinity, mg/l	Chloride, mg/l
Total Suspended Solids, mg/l	Sulfate - IC, mg/l
Total Nitrogen, mg/l	Total Fluoride, mg/l
Total Ammonia - N, mg/l	Total Copper, µg/l[d]
Nitrite - N, mg/l	Total Iron, µg/l
Nitrate - N, mg/l	Total Lead, µg/l
Total Phosphorus, mg/l	Total Manganese, µg/l
Total Organic Carbon, mg/l	Total Nickel, µg/l
Total Hardness, mg/l	Total Zinc, µg/l
Total Calcium, mg/l	Total Aluminum, µg/l
Total Magnesium, mg/l	Total Orthophosphate, mg/l

[a] cfs = cubic feet per second
[b] mg/l = milligram per liter
[c] µmhos/cm = micromhos per centimeter
[d] µg/l = micrograms per liter

MACROINVERTEBRATES

Benthic macroinvertebrates (organisms that live on the stream bottom, including aquatic insects, crayfish, clams, snails, and worms) were collected using a modified version of RBP III (Barbour and others, 1999). Two kick-screen samples were obtained at each station by disturbing the substrate of representative riffle/run areas and collecting dislodged material with a one-meter-square 600-micron mesh screen. Each sample was preserved in 95 percent denatured ethyl alcohol and returned to SRBC's lab, where the sample was sorted into a subsample of at least 200 organisms. Organisms in the subsample were identified to genus, except for midges and aquatic worms, which were identified to family.

HABITAT

Habitat conditions were evaluated using a modified version of RBP III (Plafkin and others, 1989; Barbour and others, 1999). Physical stream characteristics relating to substrate, pool and riffle composition, shape of the channel, conditions of the banks, and the riparian zone were rated on a scale of 0-20, with 20 being optimal. Other observations were noted about weather, substrate material composition, surrounding land use, and any other relevant features in the watershed.

DATA ANALYSIS

Six reference categories were created for data analysis based on ecoregions (Omernick, 1987) and drainage size. The two ecoregions in the West Branch Susquehanna Subbasin where sampling sites were located were Ecoregion 62 (North Central Appalachians) and Ecoregion 67 (Central Appalachian Ridges and Valleys) (Figure 2). All the sites within each ecoregion were divided into small (< 50 square miles), medium (50 to 500 square miles), and large drainage areas (> 500 square miles).

Water quality was assessed by examining field and laboratory parameters that included nutrients, major ions, and metals (Table 1). Limit values were obtained for each parameter based on current state and federal regulations or references for approximate tolerances of aquatic life (Table 2). Laboratory values were used when field and laboratory data existed for the same parameter, and calcium and acidity were not analyzed due to inapplicability to the analysis. Ammonia values were not analyzed due to unusually high values, even in streams with known healthy fish populations. The difference between each value and the limit value was calculated for each site, and if the value did not exceed the limit value, the site was given a score of zero. If the limit value was exceeded, the difference was listed, and an average of all the parameters for each site was calculated. The sites were grouped according to

Table 2. *Water Quality Limits and References*

PARAMETERS	LIMITS	REFERENCE CODE
Temperature	>25°C	a,f
D.O.	<4 mg/l	a,g
Conductivity	>800 µmhos/cm	d
pH	<5	c,f
Alkalinity	<20 mg/l	a,g
TSS	>15 mg/l	h
Nitrogen	>1.0 mg/l	k,l,m
Ammonia	>0.2 mg/l	f
Nitrite	>1.0 mg/l	f
Nitrate	>1.0 mg/l	e,i
Phosphorus	>0.1 mg/l	e
TOC	>10 mg/l	b
Hardness	>300 mg/	e
Magnesium	>35 mg/l	j
Sodium	>20 mg/l	j
Potassium	>30 mg/l	b
Chloride	>150 mg/l	a
Sulfate	>250 mg/l	a
Fluoride	>2.0 mg/l	a
Copper	>12 µg/l	e
Iron	>1,500 µg/l	a
Lead	>1.0 µg/l	e
Manganese	>1,000 µg/l	a
Nickel	>158 µg/l	d
Zinc	>106 µg/l	e
Aluminum	>200 µg/l	c
Phos T Orth	>0.05 mg/l	m

REFERENCE CODES AND REFERENCES	
a	http://www.pacode.com/secure/data/025/chapter93/s93.7.html
b	Hem (1970)
c	Gagen and Sharpe (1987) and Baker and Schofield (1982)
d	http://www.uky.edu/WaterResources/Watershed/KRB_AR/wq_standards.htm
e	http://www.uky.edu/WaterResources/Watershed/KRB_AR/krww_parameters.htm
f	http://www.hach.com/h2ou/h2wtrqual.htm
g	http://sites.state.pa.us/PA_Exec/Fish_Boat/education/catalog/pondstream.pdf
h	http://www.deq.state.va.us/pdf/watrregs/fish.pdf
i	http://www.fisheries.org/publications/bookpdf/aquaticmethods.pdf
j	http://www.dec.state.ny.us/website/regs/703.htm
k	http://water.usgs.gov/pubs/circ/circ1225/images/table.html
l	http://www.ecan.govt.nz/Land/pdf%20files/sheet13.pdf
m	http://h2osparc.wq.ncsu.edu/info/

their reference categories, and a percentage of the highest average value (representing the worst water quality) was taken in order to account for differences in water quality between ecoregions and drainage sizes. All sites that received a score of zero (no parameters exceeded the limits) were classified as "higher" quality. Sites that had a percentage value between zero and one were classified as "middle" quality, and sites that had a percentage value greater than one were classified as "lower" quality.

Benthic macroinvertebrate samples were analyzed using seven metrics mainly derived from RBP III (Barbour and others, 1999):

(1) taxonomic richness;
(2) modified Hilsenhoff Biotic Index;
(3) percent Ephemeroptera;
(4) percent contribution of dominant taxon;
(5) number of Ephemeroptera/ Plecoptera/Trichoptera (EPT) taxa;
(6) percent Chironomidae; and
(7) Shannon-Wiener Diversity Index.

Reference sites were determined for each reference category, primarily based on the results of the macroinvertebrate metrics and secondarily based on habitat and water quality scores, to represent the best combination of conditions. The metric scores were compared to the reference scores, and a biological condition category was assigned based on RBP III methods (Plafkin and others, 1989; Barbour and others, 1999).

The same reference sites were used in the analysis for the habitat scores. The ratings for each habitat condition were totaled, and a percentage of the reference site was calculated. The percentages were used to assign a habitat condition category to each site (Plafkin and others, 1989; Barbour and others, 1999).

Methods Used in the 1994 Subbasin Survey

In the 1994 survey of the West Branch Susquehanna Subbasin, SRBC selected 92 sample sites. Eighty-seven sites were sampled once between July 5 and August 17, 1994, while five sites on the mainstem of the river were sampled on September 14, 1994, due to earlier storm events. The sites where data were collected in 1994, in addition to 2002, are indicated in Appendix A with an asterisk. The methods for sampling in 1994 were very similar to the methods in 2002, with some minor changes in protocol, equipment, and monitoring forms. As in 2002, benthic macroinvertebrates and water quality were sampled, and habitat was evaluated.

Biological and habitat conditions were evaluated according to USEPA RBP III (Plafkin, 1989). A different habitat form was used in 1994 than was used in 2002. Some of the parameters were slightly different, and were rated on a different scale than in 2002. Parameters relating to substrate and instream cover were rated on a scale of 0-20; these parameters included bottom substrate, embeddedness, canopy cover, and flow. Parameters relating to channel morphology were rated on a scale of 0-15; these included channel alteration, bottom scouring and deposition, pool/riffle-run/bend ratio, and bank capacity. Parameters relating to riparian and bank structure were rated on a scale from 0 to 10 and included bank stability, bank vegetative protection, streamside cover, and riparian zone.

1994 DATA ANALYSIS

The reference categories in the 1994 analysis differed since the USEPA's ecoregion coverage was used instead of the USGS's coverage. USEPA's coverage consisted of three ecoregions in the West Branch Susquehanna Subbasin. The third ecoregion that is not included in the USGS coverage is Ecoregion 69, the Central Appalachian region (Woods, 1996), where the headwaters of the West Branch Susquehanna River are located. Small streams (drainage areas <100 sq. mi.) were grouped by Level IV Ecoregion, medium streams (drainage area 100-500 sq. mi.) were grouped by Level III Ecoregion, and large streams (drainage area >500 sq. mi.) were grouped regardless of Ecoregion. Some of the small streams in subecoregions with similar characteristics were combined into a single reference category.

A different method was used to assess the 22 water quality parameters examined in 1994 (Table 3). Each parameter from every site was assigned a ranked percentile on a scale from 0 to 100 to obtain a percentile score. Water quality indices were developed from the median and average of all the parameter percentile scores from each site to be used in the designation of water quality conditions. Every parameter was characterized as "good," "fair," or "poor" based on: comparison of its percentile ranking to the median percentile of all sites for that parameter; the percentile derived from the established water quality standard for that parameter; and the median percentile of the reference sites. Each site was then designated "good," "fair," or "poor" based on analysis of its parameters and its water quality indices.

Different metrics were chosen in 1994 for analysis of the macroinvertebrate data; however, the overall method was the same as that which was used in 2002.

Table 3. *Water Quality Parameters Analyzed in 1994*

PHYSICAL	NUTRIENTS	MAJOR IONS	METALS
pH	Total nitrogen	Hardness	Copper
Dissolved oxygen	Total ammonia	Sodium	Dissolved iron
Conductivity	Total nitrate	Potassium	Lead
Alkalinity	Dissolved phosphate	Chloride	Total manganese
Acidity		Sulfate	Nickel
Dissolved residue			Zinc
			Aluminum

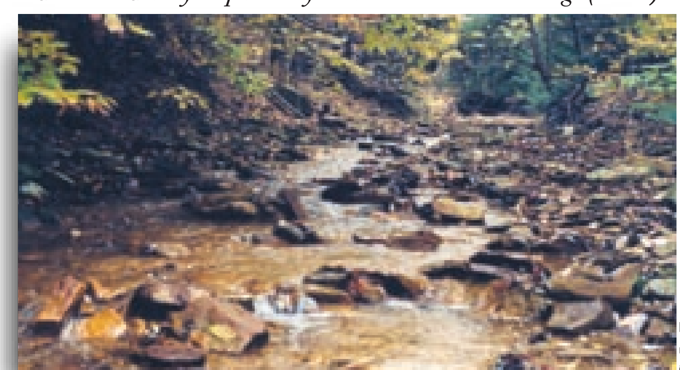
The six metrics used in 1994 were: (1) taxonomic richness; (2) Shannon-Wiener Diversity Index; (3) Hilsenhoff Biotic Index; (4) number of EPT taxa; (5) Percent Taxonomic Similarity (measures the similarity of the taxonomic composition of the sample community against the reference community); and (6) Percent Trophic Similarity (measures the similarity of the functional feeding group composition of the sample community against the reference community). The 1994 method for analysis of the habitat data was the same as was used in 2002.

2002 Results/Discussions

Since the West Branch Susquehanna Subbasin is mostly forestland with a few small towns, there is minimal urban influence on this subbasin. However, large portions of this watershed are degraded and lacking in biological life due to AMD. Figure 3 shows that past and current mining activities occurred mostly in the headwaters region of this subbasin. Table 4 shows sites with extreme values in parameters that are characteristic of AMD or agriculture/wastewater treatment plants. This table shows that there were numerous sites that were impacted by AMD and several sites that were impacted by nitrogen; however, no stations were clearly influenced by wastewater treatment plants. Chloride and dissolved oxygen values did not exceed the limits. Table 5 lists the same parameters that are characteristic of AMD or agriculture/wastewater treatment plants; however, it contains values for sites that have been designated as Exceptional Value (EV). Tables 4 and 5 provide comparisons of the same water quality parameters at those sites that were polluted to sites that were high quality.

Figures 4 and 5 show the larger watersheds in the subbasin and their relative locations. These figures also show the ratings for water quality, biological condition, and habitat condition of the sites in each ecoregion. Figure 6 (A, B, and C) shows a summary of the ratings for water quality, biological condition, and habitat condition in each reference category. Ecoregion 67-Small had the highest number of sites severely impacted due to water quality, biological score, and habitat; however, Ecoregion 62-Large had the largest percentage of sites impaired due to water quality and biological score. The habitat condition was rated excellent for most of the sites because a majority of the subbasin is forested. This rating is misleading for many of the streams that suffered from AMD precipitate coating the streambed. This precipitate interferes with the quality of habitat used by macroinvertebrates and was scored low for the parameters of "Epifaunal Substrate" and "Embeddedness"; however, the overall high-quality habitat of the streams outweighed these ratings. Another influence that could have affected the data in this survey was the severe drought during the summer and early fall of 2002.

Headwaters of the West Branch Susquehanna River near Bakerton, Cambria County Impacted by Abandoned Mine Drainage (AMD)



S. LeFevre

The Clean Water Act Section 303(d), established in 1972, requires a Total Maximum Daily Load (TMDL) to be developed for any waterbody designated as impaired, or not meeting the state water quality standards or its designated use. Streams in Pennsylvania are being assessed as part of the State Surface Waters Assessment Program, and, if they are found to be impaired, a TMDL is calculated for the watershed. Some of the watersheds in the West Branch Susquehanna Subbasin have been rated impaired largely due to AMD, and subsequently, will require a TMDL. Figure 7 and Table 6 identify those watersheds that SRBC and Pa. DEP are working on as part of the TMDL program. More information on the TMDL program is available at http://www.dep.state.pa.us/watermanagement_apps/tmdl/default.asp.

CUSH CREEK and BEAR RUN

Cush Creek and Bear Run were the two most upstream creeks on the West Branch of the Susquehanna River that were sampled. The sampling site at the mouth of Cush Creek was found to be "middle" water quality, since it slightly exceeded the aluminum standard. The macroinvertebrate population was slightly impaired, and the habitat was partially supporting. AMD precipitate caused severe impairment at Bear Run. The precipitate covered the rocks and degraded the habitat in the stream; however, the surrounding habitat was supporting. High metal concentrations and low pH and alkalinity degraded the water quality at Bear Run. SRBC currently is sampling this stream as part of the TMDL program for AMD impairment.

CHEST CREEK WATERSHED

The water quality in Chest Creek was "middle" to "lower" quality with high nitrogen and temperature in the headwaters and elevated hardness, magnesium, and sulfate downstream. The macroinvertebrate population was moderately to slightly impaired downstream, and the habitat ranged from nonsupporting in the headwaters to excellent at the mouth. The uppermost sampling site (CHST 24.5) was located just downstream of the town of Patton in a channelized ditch with few riffles. The middle site was located in the town of Westover and also was disturbed by anthropogenic influences; the downstream site was located in a forested area.

Table 4.
West Branch Susquehanna Subbasin Sites with Values Exceeding Standards for Parameters that are Characteristic of Abandoned Mine Drainage (AMD) and Agriculture/Wastewater Treatment Plants

* Values based on limit values in Table 2.

	pH	AMD				AGRICULTURE/WASTE WATER TREATMENT PLANT				
Sites	Lab pH (<5.0)[c,f]	Iron (>1,500ug/l)[a]	Manganese (>1,000ug/l)[a]	Aluminum (>200ug/l)[c]	Sulfate (>250mg/l)[a]	D.O. (<4.0mg/l)[a,g]	Nitrogen T (>1.0mg/l)[k,l,m]	Phosphorus T (>0.1mg/l)[e]	T. Org. Carbon (>10.0mg/l)[b]	Chloride (>150mg/l)[a]
2MIL 0.1	3.2	7,110	8,800	12,600	610					
ALDR 4.7	3	23,500	13,600	17,900	603		1.12			
ANDR 0.4			1,600	278						
ANTE 0.1				260			2.7			
BALD 4.5							1.9			
BALD 14.0							1.73			
BALD 24.7							3.63			
BEAR 0.1	3.9	1,580	5,220	2,755						
BECH 1.7	4		6,280	3,547						
BECH 20.3	3.3	3,300	10,700	5,515	463					
BENN 3.8	4.8		1,240	1,201						
BENN 17.6	4.3		1,300	6,547						
BILG 0.1		4,080	1,010	224						
BLMO 0.1	4.5	2,270	2,780	603						
BUFF 2.0							2.08			
BUFF 10.4							1.62			
CHLL 0.9							2.35			
CHLL 19.3							1.44			
CHST 1.0					284					
CHST 13.2					318					
CHST 24.5							1.06			
CLFD 0.9			3,220		353					
CLFD 8.2			4,020		372					
CLFD 22.8		3,600	3,300	521	401					
CLFD 42.2			3,370		271					
CLFD 60.5				692			1.09			
COLD 1.1	4.9	2,680	1,100	1,060						
COOK 0.1	2.8	29,300	4,410	20,000	655					
CUSH 0.1				209						
DEER 0.2	3.9	3,090	6,630	3,050	494					
DENT 0.6	3.5		12,200	15,700	833					
DRUR 0.7				854						
FISH 2.1							3.26			
FISH 13.3							2.36			
KTTL 0.2				506						
LAND 1.7	3.4	7,880	9,280	8,781	464					
LARR 2.9							1.17			
LAUR 0.1	3.9		12,300	3,300	727					
LICW 0.3				227						
LMUN 0.1							1.5			
LYCO 2.0							1.06			
MCCR 1.0				379						
MEDX 0.1				208						
MONT 0.2	4.3		10,100	3,925	511					
MOSH 5.1	3.3		6,230	6,770	576					
MOSH 19.1	3.3	4,440	5,820	6,430	620					
MOSH 39.9	3.6	4,130	6,210	4,360						
MQTO 13.8				213						
MRSH 1.6							2.12	0.36		
MUDD 0.3		3,020	5,020		612					
MUDD 4.5		2,450	6,270	2,170	454					
MUNC 1.1							1.61			
SLAB 0.2							4.3			
SPRG 0.2							4.19			
SPRG 14.8							3.88			
SURV 0.3	4.8		4,250	4,625	516					
TROT 0.1				340						
WBSR 0.0							1.66			
WBSR 7.5							1.34			
WBSR 15.0							1.5			
WBSR 37.5							1.58			
WBSR 45.3							1.06			
WBSR 55.0				228			1.14			
WBSR 64.0				210						
WBSR 97.0			1,110	316						
WBSR 103.8				272						
WBSR 110.0			1,430	439						
WBSR 131.0			2,220	1,510	264					
WBSR 142.0				401						
WBSR 175.0				218						
WBSR 191.0				260						
WBSR 200.0				285						
WBSR 208.0				295						
WBSR 214.0				658						
WBSR 224.0		1,670		1,583						
WBSR 235.0	3.7	3,840	2,160	9,350	465					
WDHC 1.9							1.53			
WILS 0.5		3,790	5,500	5,858	398					

Abandoned Mine Drainage

Table 5.
Values of Exceptional Value (EV)[a] West Branch Susquehanna Subbasin Sites based on Abandoned Mine Drainage (AMD) and Agriculture/Wastewater Treatment Plant Characteristics

[a] Strongest special protection designated use for surface water that meets specific water chemistry and biological qualifiers (The Commonwealth of Pennsylvania, 2002)

		pH	AMD				AGRICULTURE/WASTE WATER TREATMENT PLANT				
Sites	Designation	Lab pH	Iron ug/l	Manganese ug/l	Aluminum ug/l	Sulfate ug/l	D.O. mg/l	Nitrogen T mg/l	Phosphorus T mg/l	T. Org. Carbon mg/l	Chloride mg/l
KTTL 34.1	EV	7.4	95	15	44.4	6.62	6.61	0.3	0.01	1.2	3.1
KTTL 25.3	EV	7.4	90	17	35	7.08	6.49	0.19	0.01	1.4	3.8
PADY 0.1	EV	6.6	34	10	24.7	7.69	7.6	0.18	0.01	1.2	1.5
PINE 57.5	EV	8.6	103	13	48.4	8.75	7.95	0.26	0.013	2.1	7.3

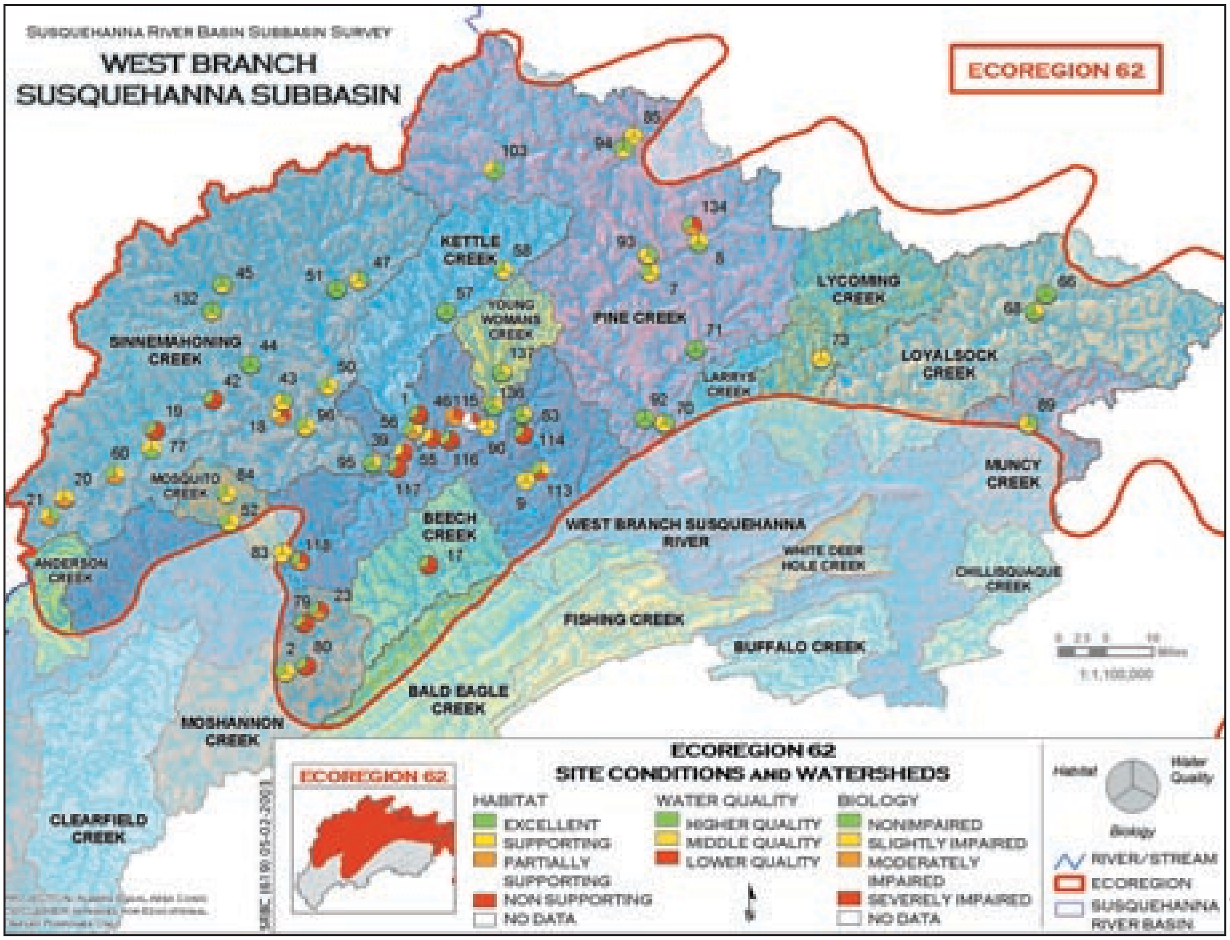


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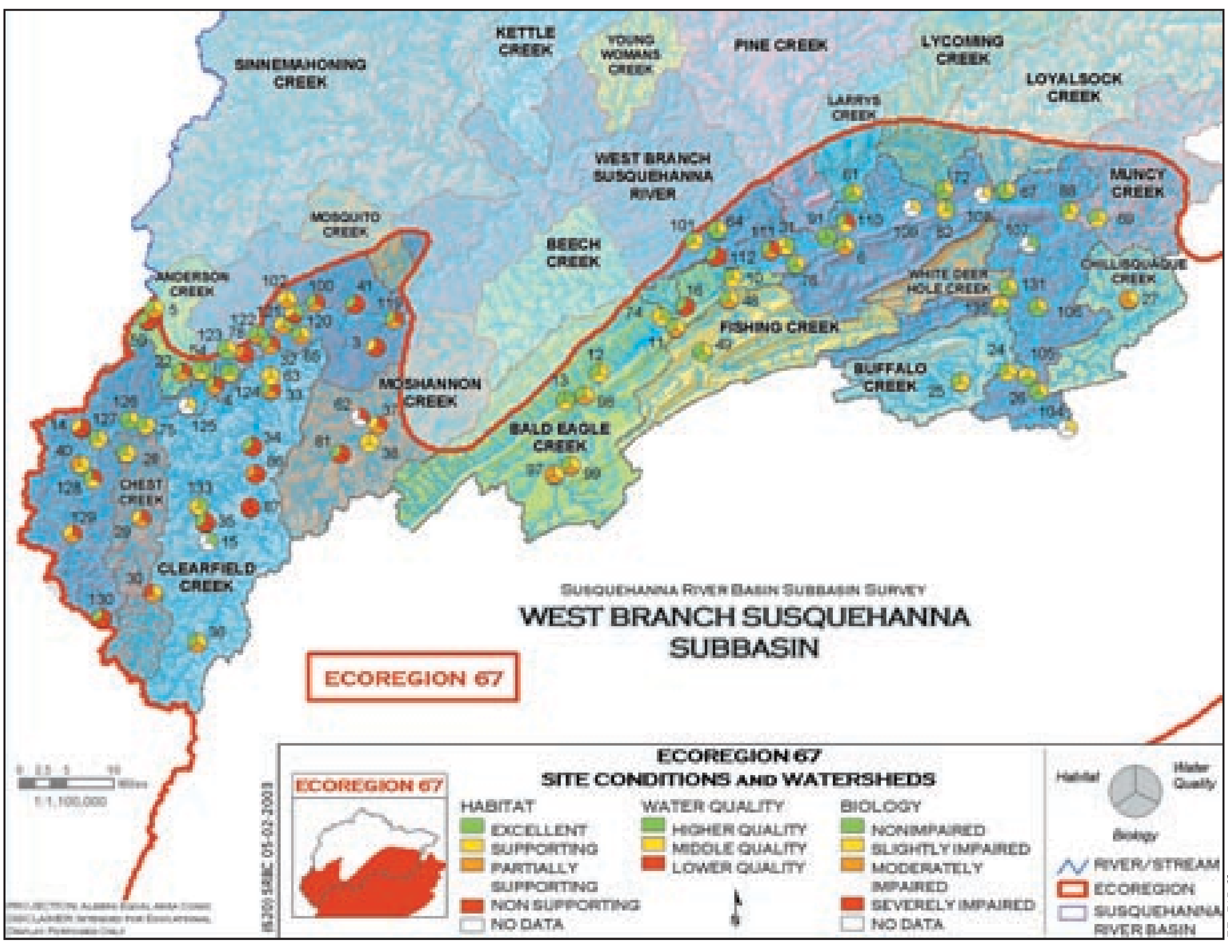
Figure 4. *Water Quality, Biological, and Habitat Categories in Ecoregion 62 Sample Sites in the West Branch Susquehanna Subbasin*



H. Wolbert

Figure 5. *Water Quality, Biological, and Habitat Categories in Ecoregion 67 Sample Sites in the West Branch Susquehanna Subbasin*

ANDERSON CREEK WATERSHED

The Anderson Creek Watershed was influenced by AMD. The headwaters (ANDR 12.3) were rated "middle" quality, with low alkalinity. The macroinvertebrate population was moderately impaired, and the habitat was excellent, with no evidence of metal precipitate. Little Anderson Creek, a tributary to Anderson Creek downstream of ANDR 12.3, had a macroinvertebrate population that was severely impaired by AMD. The water quality was rated "lower" with elevated levels of magnesium, sulfate, copper, iron, lead, manganese, nickel, zinc, and aluminum. Another source of AMD in this watershed came from Bilger Run, which suffered from high levels of iron, manganese, and aluminum. This stream flows into Kratzer Run, which is a tributary to Anderson Creek. The degraded water quality of Bilger Run did not appear to influence the quality of water sampled at the mouth of Kratzer Run. The water quality at KRAT 0.1 did not exceed any of the limits, and the macroinvertebrate population was slightly impaired. Evidence of the AMD influence upstream was orange sediment in the streambed; however, the rocks were not covered with metal precipitate. The mouth of Anderson Creek (ANDR 0.4) had elevated levels of manganese and aluminum, as well as precipitate of these metals on the rocks of the streambed. The macroinvertebrate population was moderately impaired due to AMD pollution. SRBC prepared a TMDL for Anderson Creek. The causes of the impairments were metals, pH, nutrients, and sediment.

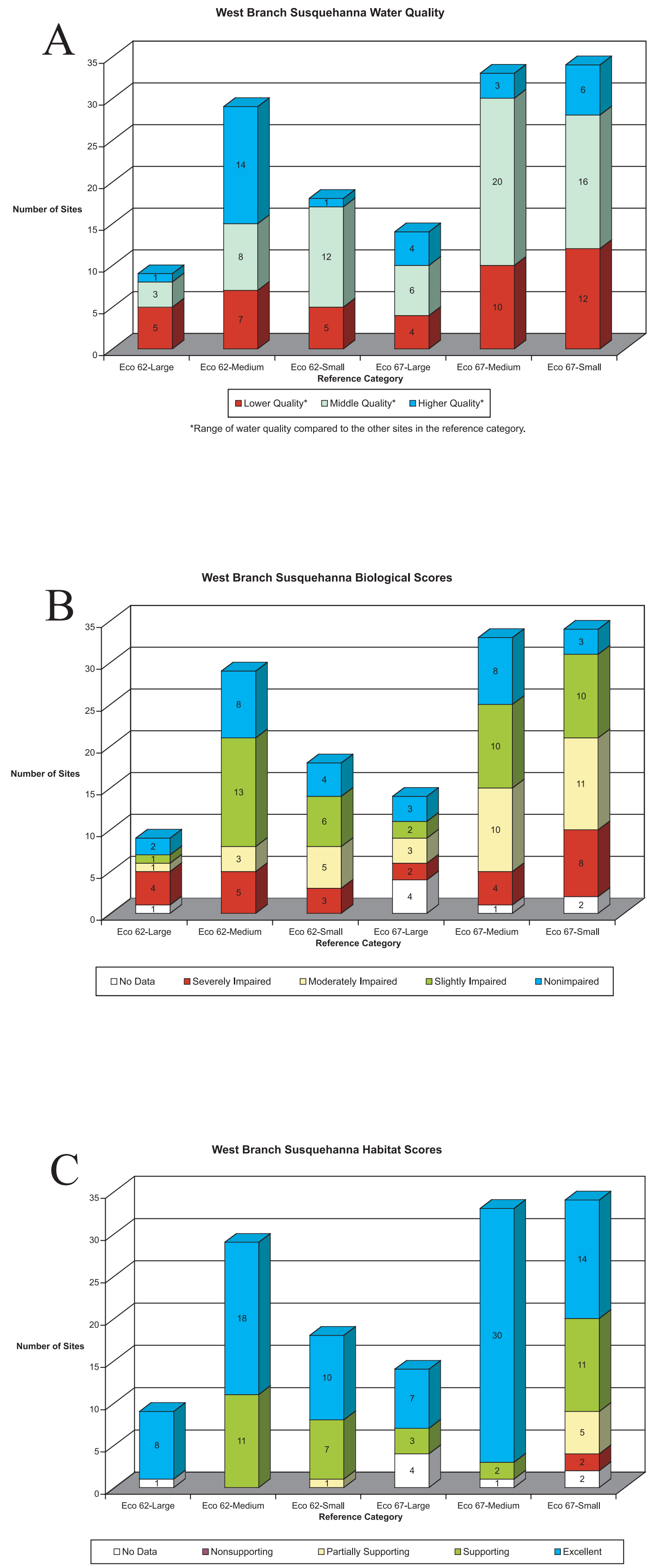
Montgomery Creek entered the West Branch of the Susquehanna River between Anderson Creek and Clearfield Creek. The mouth of Montgomery Creek had high levels of magnesium, sulfate, lead, manganese, nickel, zinc, and aluminum. The macroinvertebrate population was severely impaired, and the habitat was only partially supporting due to channelization, lack of riparian zone, and large amounts of debris from human activity. This stream also had a TMDL prepared for impairment of metals from AMD.

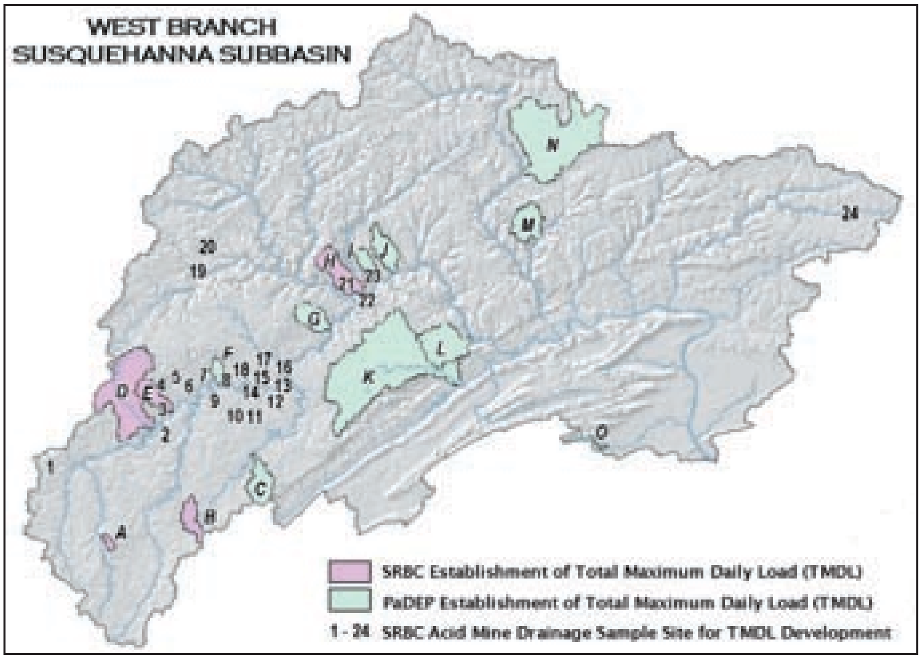
CLEARFIELD CREEK WATERSHED

The most heavily AMD impacted sites in the Clearfield Creek Watershed were on Muddy Run and the mainstem of Clearfield Creek. The other two streams sampled in this watershed were Beaver Dam Run and South Whitmer Run, both of which had "higher" water quality. WHIT 0.1 had only a slightly impaired macroinvertebrate community; Beaver Dam Run was not sampled for macroinvertebrates due to ponded water and lack of riffle habitat. The uppermost site on Clearfield Creek (CLFD 60.5) was "middle" quality and had a moderately impaired macroinvertebrate population. It was impaired by total nitrogen and a small amount of AMD (low alkalinity and high aluminum).

Downstream at CLFD 42.2, the stream was further impacted by AMD, and metal concentrations rose to the point that sulfate, manganese, and zinc exceeded their limits.

Figure 6.
Summary of Water Quality, Biological, and Habitat Characteristics





D. Gavin

Figure 7. *West Branch Susquehanna Subbasin Watersheds and Sampling Sites in the Total Maximum Daily Load (TMDL) program*

Table 6. *Impaired Streams Identified by the Susquehanna River Basin Commission (SRBC) and the Pennsylvania Department of Environmental Protection (Pa DEP)*

Label	Stream	Impairment	TMDL Status	Agency
A	Rock Run	AMD:Metals	Proposed 2003	SRBC
B	Little Muddy Run	AMD:Metals, pH	EPA Approved 2001	SRBC
C	Cold Stream	AMD:Metals, pH	EPA Approved 2001	DEP
D	Anderson Creek	AMD:Metals, pH Nutrients	Proposed 2003	SRBC
E	Montgomery Creek	AMD:Metals	Proposed 2003	SRBC
F	Surveyor Run	AMD:Metals	Proposed 2003	DEP
G	Birch Island Run	AMD: Metals	Proposed 2003	DEP
H	Cooks/Milligan Run	AMD:Metals	Proposed 2003	SRBC
I	Two Mile Run	AMD:Metals, pH	EPA Approved 2001	DEP
J	Drury Run	AMD:Metals, pH	EPA Approved 2001	DEP
K	Beech Creek	AMD:Metals	Proposed 2003	DEP
L	Tangascootack Creek	AMD:Metals, pH	EPA Approved 2001	DEP
M	Otter Run	AMD:Metals	Proposed 2003	DEP
N	Babb Creek	AMD:Metals	Proposed 2003	DEP
O	Buffalo Creek	Atmospheric Deposition: pH	Proposed 2003	DEP
1	Bear Run	AMD:Metals	Sampling 2003	SRBC
2	UNT West Branch Susquehanna	AMD:pH	Sampled 2001	SRBC
3	Montgomery Creek	AMD:Metals, pH	Sampled 2001	SRBC
4	Woods Run	AMD:Metals, pH	Sampled 2001	SRBC
5	Fork Run	AMD:Metals	Sampled 2001	SRBC
6	Lick Run	AMD:pH	Sampling 2003	SRBC
7	Little Trout Run	AMD:Metals, pH	Sampling 2003	SRBC
8	Bald Hill Run	AMD:Metals, pH	Sampled 2002	SRBC
9	Millstone Run	AMD: Metals, pH	Sampled 2002	SRBC
10	Moravian Run	AMD:Metals, pH	Sampled 2002	SRBC
11	Alder Run	AMD:Metals, pH	Sampled 2002	SRBC
12	Rolling Stone Run	AMD:Metals, pH	Sampled 2002	SRBC
13	Mowry Run	AMD:Metals, pH	Sampled 2002	SRBC
14	Big Run	AMD:pH	Sampled 2001	SRBC
15	Sandy Run	AMD:Metals, pH, Other Inorganics	Sampled 2002	SRBC
16	Curleys Run	AMD:Metals	Sampled 2002	SRBC
17	Grimes Run	AMD:Metals, Other Inorganics	Sampled 2002	SRBC
18	Deer Creek	AMD:Metals, pH	Sampling 2003	SRBC
19	UNT Trout Run	AMD:Metals, pH	Sampling 2003	SRBC
20	Dents Run	AMD:Metals, pH	Sampling 2003	SRBC
21	Cooks Run	AMD:Metals, pH, Siltation	Sampled 2001	SRBC
22	Milligan Run	AMD:Metals, pH	Sampled 2001	SRBC
23	Kettle Creek	AMD:Metals, pH	Sampled 2001	SRBC
24	Loyalsock Creek	AMD:Metals, pH	Sampled 2001	SRBC

** UNT stands for "unnamed tributary to"*

The macroinvertebrate population was severely impaired. Muddy Run, severely impaired by AMD, flowed into Clearfield Creek with high levels of total suspended solids, magnesium, sulfate, iron, manganese, zinc, and aluminum. The habitat was nonsupporting at the upstream site (MUDD 4.5) due to extremely large amounts of AMD flocculent and precipitates covering the streambed. There were no macroinvertebrates found in either sample from Muddy Run. SRBC prepared a TMDL for Little Muddy Run, a tributary to Muddy Run, which was approved by the USEPA in 2001.

The two sites on Clearfield Creek downstream of the confluence with Muddy Run had severely impaired macroinvertebrate populations and "lower" water quality due to AMD pollution. The site at the mouth of Clearfield Creek was located downstream of Little Clearfield Creek and showed slight improvement from Little Clearfield Creek's better water quality. CLFD 0.9 had water quality that was still rated as "lower," but the macroinvertebrate population was improved.

TRIBUTARIES to the WEST BRANCH between CLEARFIELD and MOSHANNON CREEK

Lick Run, Trout Run, Surveyor Run, Deer Creek, and Alder Run were affected by elevated levels of metals. Lick Run and Trout Run were moderately impaired and had "middle" water quality. These streams had low alkalinity and high aluminum; however, the pH was greater than 5.0 at the time of sampling, indicating that the aluminum was not in the dissolved form, which is most toxic to fish. SRBC currently is sampling in these two watersheds for metals and pH as part of the AMD TMDL program.

The macroinvertebrate population at Surveyor Run also was moderately impaired; however, the water quality was rated "lower" due to a slightly lower pH and elevated metals. Pa. DEP prepared a TMDL for Surveyor Run in 2003 to address the high levels of metals in this stream. Deer Creek and

Alder Run had severely impaired macroinvertebrate communities. No macroinvertebrates were found at DEER 0.2, and only Chironomidae, a very tolerant taxa, were found at ALDR 4.7. These sites were rated "lower" water quality due to numerous parameters exceeding limits. Alder Run had the highest manganese (13,600 µg/l) of all the West Branch Susquehanna Subbasin sampling sites, and the second highest iron (23,500 µg/l) and aluminum (17,900 µg/l) (Table 4). SRBC has sampled both Deer Creek and Alder Run for metals and pH as part of the TMDL program.

MOSHANNON CREEK WATERSHED

All of the sampling sites on the mainstem of Moshannon Creek had "lower" water quality and contained severely impaired macroinvertebrate populations due to AMD. Laurel Run, a tributary to Moshannon Creek, also was impaired by AMD. The water quality was "lower," and no macroinvertebrate sample was taken due to deep metal precipitate and lack of riffles. Another tributary, Cold Stream, also contributed AMD to the watershed, although the upstream site (COLD 3.6) was not impaired by AMD. COLD 3.6 was located downstream of a small fish hatchery and had only a slightly impaired macroinvertebrate community with "middle" water quality due to low alkalinity. Downstream of the reservoir near Phillipsburg, an AMD discharge entered Cold Stream. COLD 1.1 was downstream of this discharge in the mixing zone. This macroinvertebrate sample was moderately impaired, and the water quality was rated "lower." USEPA approved an AMD TMDL for Cold Stream in 2001.

Another tributary to Moshannon Creek, Six Mile Run, had only a slightly impaired macroinvertebrate community and "middle" water quality due to low alkalinity. Black Moshannon Creek joined Moshannon Creek just downstream of MOSH 5.1 and also suffered from AMD pollution. The macroinvertebrate population was moderately impaired, and the water quality was rated "lower."

MOSQUITO CREEK WATERSHED

The Mosquito Creek Watershed was influenced by acid deposition, particularly in the headwaters, and by AMD on some of its tributaries. The sampling stations in this watershed had slightly impaired macroinvertebrate communities compared to the other stations in Ecoregion 62. The water quality was rated "middle" quality due to low alkalinity at all of the sites and high aluminum at MQTO 13.8. The Penn State Institutes of the Environment is working with the Mosquito Creek Sportsmen Association to remediate the acidic stream water in the headwaters of Mosquito Creek. A vertical flow wetland (VFW) has been installed on an unnamed tributary to Mosquito Creek, and two additional VFWs and liming of a portion of the watershed is planned for this summer and fall. Grimes Run and Curleys Run, both tributaries to Mosquito Creek, were sampled for AMD in 2002 as part of the TMDL program.

SINNEMAHONING CREEK WATERSHED

There are three major tributaries to Sinnemahoning Creek: Driftwood Branch; Bennett Branch; and First Fork. Bennett Branch was affected by AMD pollution, but Driftwood Branch and First Fork were good quality streams. The stations on Driftwood Branch and West Creek did not exceed any of the water quality limits. The macroinvertebrate population ranged from slightly impaired to nonimpaired. First Fork had "higher" water quality except downstream of the George B. Stevenson Dam at FRST 5.3, which was rated "middle" quality due to elevated lead levels.

The headwaters of Bennett Branch (BENN 38.2) had "higher" water quality and a moderately impaired macroinvertebrate community. Within three miles (BENN 35.2) evidence of AMD pollution began to appear. Laurel Run entered the Bennett Branch with "middle" water quality due to low alkalinity and a moderately impaired macroinvertebrate population. Medix Run had the only nonimpaired macroinvertebrate population of the sites sampled in Bennett Branch; however, at the time of sampling, this site had slightly low alkalinity, elevated lead concentrations, and slightly high aluminum. The downstream sites on Bennett Branch had "lower" water quality due to AMD pollution, and BENN 17.6 had a severely impaired macroinvertebrate population. Another tributary to Bennett Branch was Dents Run, which had a severely impaired macroinvertebrate population and "lower" water quality due to AMD pollution. SRBC currently is sampling Dents Run for metals and pH as part of the TMDL program.

The good quality water of Driftwood Branch was able to mitigate the degraded water quality of Bennett Branch after they joined to form Sinnemahoning Creek. The two sampling sites on the mainstem of Sinnemahoning Creek were rated "middle" quality due to low alkalinity values. All other water quality values were not indicative of AMD pollution. At the site downstream of the confluence with First Fork (SINN 0.2), the alkalinity value improved, and the level of metals decreased. The macroinvertebrate community also improved from slightly impaired to nonimpaired.

COOKS RUN

Cooks Run was severely impacted by AMD. The water quality was rated "lower" and had the highest levels of iron (29,300 µg/l) and aluminum (20,000 µg/l), and the lowest pH (2.8) of all the sites sampled in the West Branch Susquehanna Subbasin. The macroinvertebrate community was severely impaired. SRBC sampled and prepared a TMDL for Cooks Run due to its AMD impairment. Six projects are currently implemented or planned by Pa. DEP, other government agencies, and local organizations to mitigate and clean up AMD in this watershed.

KETTLE CREEK WATERSHED

Kettle Creek was designated as EV in its headwaters (Table 5); however, it was severely impacted by AMD in its lower reaches, especially from its tributary, Two Mile Run. The uppermost site (KTTL 34.1) had "middle" water quality due to copper and zinc levels exceeding the limit values, and the macroinvertebrate population was slightly impaired. Downstream at KTTL 25.3, the water quality did not exceed any limits, and the macroinvertebrate population was nonimpaired. At KTTL 2.1, some AMD seepage was evident, and the alkalinity was lower than the state standard. The macroinvertebrate population at this site was moderately impaired.

> ***"Two Mile Run was severely impacted by Abandoned Mine Drainage."***

S. LeFevre

Figure 8. *Tri-colored Substrate in Kettle Creek Downstream of the Two Mile Run Confluence*

S. LeFevre

Abandoned Mine Drainage

Figure 9. *Abandoned Mine Drainage (AMD) Precipitate in Kettle Creek*

Two Mile Run was severely impacted by AMD. The station 2MIL 0.1 had elevated levels of metals, low pH, and low alkalinity. The water quality was rated "lower," and the macroinvertebrate population was severely impaired. In the summer of 2001, Pa. DEP's Bureau of Abandoned Mine Reclamation constructed a passive treatment system to treat a mine drainage seep in Two Mile Run. The system was designed to treat iron, manganese, and aluminum with Successive Alkalinity Producing Systems (SAPS), a wetland, and limestone treatment beds with microorganisms that oxidize manganese. Pa. DEP plans to remediate the system, since the SAPS may be failing.

Directly downstream of the confluence of Two Mile Run with Kettle Creek, tri-colored substrate appeared due to the stratification of the AMD-impacted water in Two Mile Run with the higher quality water in Kettle Creek (Figure 8). Two Mile Run entered Kettle Creek on the left bank, indicated by the orange iron precipitate also seen on the substrate of Two Mile Run. The white substance in the middle of Kettle Creek was aluminum precipitate from Two Mile Run that precipitated when it mixed with the higher pH stream water of Kettle Creek. The far right bank shows the unaffected conditions that characterize Kettle Creek upstream of Two Mile Run. Two Mile Run and other AMD seepages in the lower reaches impacted Kettle Creek at its mouth, where the water quality was "lower" and the macroinvertebrate population severely impaired. Low flow at the time of sampling allowed metal precipitate to form as gelatinous solids throughout the stream channel from Two Mile Run to the mouth of Kettle Creek (Figure 9). Two Mile Run and Kettle Creek were part of the TMDL program. USEPA approved a TMDL for Two Mile Run in 2001, and SRBC sampled Kettle Creek for metals and pH in 2001.

TRIBUTARIES between KETTLE CREEK and BALD EAGLE CREEK

Many of the tributaries in this segment of the West Branch Susquehanna River are higher quality streams. Paddy Run is designated as EV, and Young Womans Creek, Hyner Run, Baker Run, and Lick Run are designated as High Quality Cold Water Fisheries. These streams are all rated as "middle" quality though, due to low alkalinity. This low alkalinity is probably due to natural sources such as the geology of the area. Young Womans Creek, Hyner Run, and Lick Run had nonimpaired macroinvertebrate communities, and Paddy Run and Baker Run had slightly impaired communities. Hyner Run served as the reference stream for the Ecoregion 62-Small category.

Drury Run and Tangascootack Creek had some metal pollution at the sampling sites in addition to lower alkalinity. Drury Run had elevated aluminum and manganese concentrations. The macroinvertebrate population at this site was moderately impaired. The Tangascootack Creek macroinvertebrate population was slightly impaired, possibly by elevated levels of zinc in the stream. USEPA approved an AMD TMDL for both Tangascootack Creek and Drury Run in 2001.

BALD EAGLE CREEK WATERSHED

The Bald Eagle Creek Watershed was influenced by agricultural pollution. All of the sites on the mainstem of Bald Eagle Creek, except for the upstream site (BALD 30.0), had "middle" water quality due to high total nitrogen and total nitrate levels. The Spring Creek and Fishing Creek Watersheds also had high total nitrogen and total nitrate levels. Slab Cabin Run, a tributary to Spring Creek, had the highest total nitrogen value (4.3 mg/l) of all the West Branch sites along with a high sodium level. The Spring Creek (SPRG 14.8) water sample had a high level of hardness. Spring Creek is a popular trout fishery; however, it is affected by many activities in the watershed such as agriculture, urban development, industry, fish culture stations, wastewater treatment plants, and even a superfund site. As this stream is threatened in a rapidly growing area, the Pennsylvania Department of Conservation and Natural Resources has placed it on the Pennsylvania Rivers Conservation Registry. Marsh Creek, a tributary to Bald Eagle Creek, had a slightly impaired macroinvertebrate community and a "higher" water quality rating. Beech Creek, another tributary, was impaired by AMD. The macroinvertebrate population was severely impaired, and the water quality was rated "lower." Pa. DEP has prepared a TMDL for metals impairment on Beech Creek.

MCELHATTAN RUN and CHATHAM RUN

McElhattan Run was chosen as the reference site for the Ecoregion 67-Small category. The macroinvertebrate population was nonimpaired, and the stream was rated as "middle" due to slightly low alkalinity, possibly from natural influences. Chatham Run had a slightly impaired macroinvertebrate population, possibly due to unstable stream banks with a lot of debris from human activity. The water quality parameters did not exceed any of the limit values.

PINE CREEK WATERSHED

Pine Creek was a very high quality stream. A section of the stream in the headwaters, that includes station PINE 57.5, was designated as EV, and all of the sampling sites on the mainstem of Pine Creek were rated "higher" in water quality. The macroinvertebrate populations were either nonimpaired or only slightly impaired. Two sampling sites on Pine Creek were used as reference sites; PINE 14.2 was the reference for Ecoregion 62-Large, and PINE 1.1 was the reference for Ecoregion 67-Large. The Pine Creek Gorge, also known as the Pennsylvania Grand Canyon, was located between sampling sites PINE 57.5 and PINE 40.3. Pine Creek Watershed was not highly populated and was mostly comprised of forestland and agricultural land.

> ***"Pine Creek was a very high quality stream."***

The tributaries that were sampled in the Pine Creek Watershed had a wide range of water quality conditions. West Branch Pine Creek was rated "higher" quality and had a nonimpaired macroinvertebrate community. Marsh Creek was slightly impaired and rated "middle" water quality due to exceedances in nitrogen, nitrate, phosphate, and orthophosphate. This was a low gradient stream with marshlands surrounding it. Babb Creek had low alkalinity; however, it still had a nonimpaired macroinvertebrate community at the headwaters site (BABB 7.2). Wilson Creek, a tributary to Babb Creek, was impacted by AMD. The water quality was rated "lower" due to numerous metals exceeding the limits, high total suspended solids, and high hardness. The macroinvertebrate population was moderately impaired. The site on Babb Creek below Wilson Creek was slightly impaired and also had low alkalinity. Pa. DEP prepared a TMDL for Babb Creek due to AMD impairment. The two sampling sites on Little Pine Creek had "higher" quality water with nonimpaired and slightly impaired macroinvertebrate communities. The slight impairment at the mouth of Little Pine Creek may have been due to AMD impairment on a tributary, Otter Run. Pa. DEP prepared a TMDL to address the high level of metals on Otter Run in 2003.

ANTES CREEK, LARRY'S CREEK, and MOSQUITO CREEK

Antes Creek, located in an agricultural watershed, had high levels of nitrogen, nitrate, and aluminum. The macroinvertebrate population was moderately impaired. The Larry's Creek Watershed was a mixture of forest and agriculture. LARR 2.9 only exceeded the limit for nitrogen, and the macroinvertebrate population was nonimpaired. Even though the sampling site for Mosquito Creek (MOSQ 0.2) was located in a commercial and residential area, the water sample did not have any parameters exceed the limit values. The habitat was rated "supporting," and the macroinvertebrate community was slightly impaired.

LYCOMING CREEK WATERSHED

Lycoming Creek flows through Tiadaghton State Forest and then through the city of Williamsport. Both sampling sites on Lycoming Creek were rated "middle" for water quality. Alkalinity was low at the upstream site (LYCO 17.7), and the macroinvertebrate community was slightly impaired, possibly due to very embedded substrate. The alkalinity was higher at the downstream site (LYCO 2.0), though still less than 20 mg/l, and nitrogen was elevated. However, the macroinvertebrate population was nonimpaired at this site. LYCO 2.0 was located in a commercial and residential area, but was surrounded by an intact vegetative riparian zone.

LOYALSOCK CREEK WATERSHED

Loyalsock Creek Watershed was similar to Lycoming Creek Watershed, though slightly less developed. It flows through Wyoming and Tiadaghton State Forest and then through the commercial and residential area of Montoursville, located adjacent to Williamsport. The two sampling sites on Loyalsock Creek had "middle" water quality, due to low alkalinity, and had nonimpaired macroinvertebrate communities. The station on Little Loyalsock Creek (LITL 0.4), served as a reference site for Ecoregion 62-Medium. LITL 0.4 had "higher" water quality and a nonimpaired macroinvertebrate community. The uppermost headwaters of Loyalsock Creek, between Lopez and Ringdale, were sampled by SRBC in 2001 for possible influence from AMD. Treatment systems previously had been installed to treat the AMD, and the stream was found to be meeting water quality standards, based on Pa. DEP's assessment protocol. Therefore, SRBC suggested it be removed from Pennsylvania's 303(d) List (Orr, 2001).

S. LeFevre

Loyalsock Creek near Forksville, Sullivan County

MUNCY CREEK WATERSHED

The Muncy Creek Watershed was influenced by agriculture. The upstream site (MUNC 18.8) was located in a slightly forested area and did not exceed any of the water quality limit values. The downstream site (MUNC 1.1) was located in an agricultural and residential area, and nitrogen and nitrate concentrations were elevated. A tributary to Muncy Creek, Little Muncy Creek, also was located in an agricultural area and exceeded the limits for temperature, total suspended solids, nitrogen, and nitrate. All of the sampling sites in this watershed had slightly impaired macroinvertebrate communities.

WHITE DEER HOLE and WHITE DEER CREEKS

White Deer Hole and White Deer Creeks flow through Bald Eagle State Forest and Tiadaghton State Forest; however, White Deer Hole Creek also flows through an agricultural area. The sampling sites on both of these streams had nonimpaired macroinvertebrate communities. WDHC 1.9 had "middle" water quality due to nitrogen and nitrate values slightly greater than 1.0 mg/l, and WTDR 3.7 had "middle" water quality due to low alkalinity. WDHC 1.9 served as the reference site for Ecoregion 67-Medium, which included many agricultural streams.

BUFFALO and CHILLISQUAQUE CREEKS

Buffalo and Chillisquaque Creeks were located in highly agricultural areas. All the sites on these two streams had "middle" water quality and exceeded the limits for nitrogen and nitrate. The two sites on Buffalo Creek had slightly impaired macroinvertebrate communities. The upstream site on Chillisquaque Creek (CHLLS 19.3) had a moderately impaired macroinvertebrate community, while the downstream site (CHLLS 0.9) was nonimpaired. Pa. DEP prepared a TMDL for the headwaters of Buffalo Creek due to atmospheric deposition in 2003.

WEST BRANCH SUSQUEHANNA RIVER

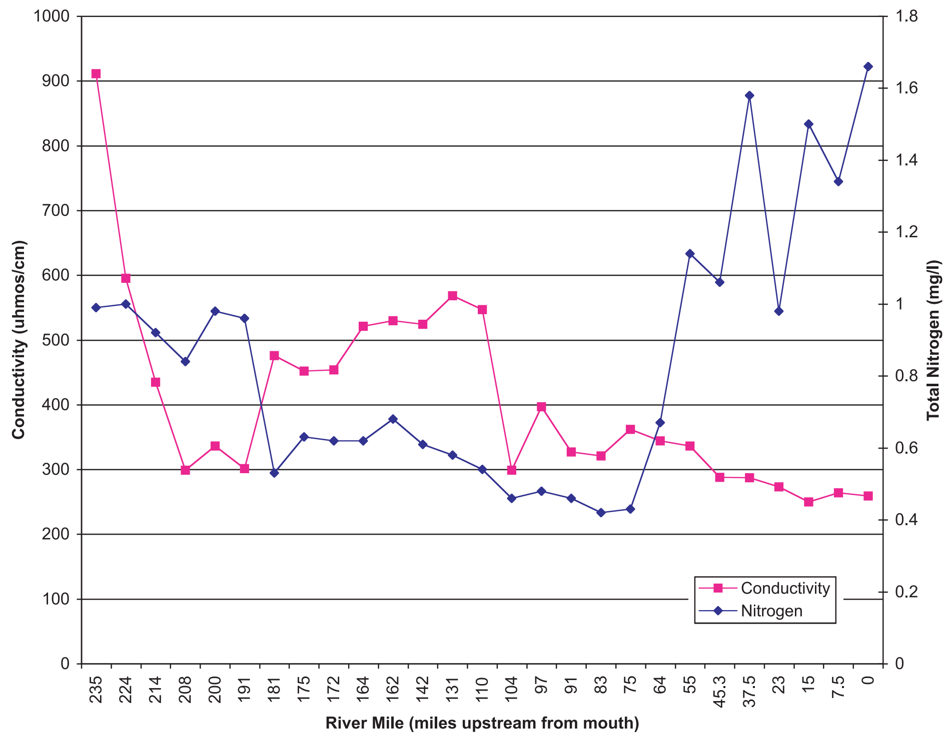
The headwaters of the West Branch Susquehanna River, near Bakerton in Cambria County, were immediately impacted by AMD. The most upstream site, WBSR 235.0, had a severely impaired macroinvertebrate community and "lower" water quality due to low pH and alkalinity and high levels of metals. The water quality continued to be rated as "lower" until WBSR 208.0, near McGees Mills in Clearfield County, where it improved to "middle" quality, with aluminum slightly over the limit value. The macroinvertebrate population at WBSR 208.0 was slightly impaired. The macroinvertebrate population was nonimpaired at WBSR 200.0 and WBSR 175.0. The water quality continued to be "middle" or "higher," with aluminum slightly higher than 200 µg/l at some of the sites, until WBSR 142.0, located downstream of Alder Run, where it degraded to "lower." The macroinvertebrate population began to degrade to moderately impaired at WBSR 172.3, located near Clearfield in Clearfield County. The stretch from WBSR 142.0 to WBSR 75.0 had severely degraded macroinvertebrate populations. The stream remained impacted by AMD with severely and moderately impaired macroinvertebrate communities until WBSR 55.0, near Jersey Shore in Lycoming County, where the river began to recover to "middle" and "higher" water quality. WBSR 15.0 and WBSR 7.5 had nonimpaired macroinvertebrate communities. This lower section of the West Branch Susquehanna Subbasin had more agricultural influences. The pollution sources in this portion of the river were less commonly due to mining activities, as indicated by high conductivity, and were more often due to agricultural activities, as indicated by higher concentrations of nitrogen around river mile 55 (See Figure 10).

1994 Results/Discussion

The results for the 1994 West Branch Susquehanna Subbasin Survey are depicted in Figure 11 on the following page. These results are not directly comparable to the 2002 data since different analysis methods were used and the samples were taken at different flows; however, large differences in the categories indicate that there may have been some change. There were few drastic changes in water quality, biological condition, and habitat from 1994 to 2002, with the following exceptions: CHLLS 0.9, WBSR 162.0, WBSR 164.2, WBSR 55.0, ANDR 0.4, CLFD 42.2, DRUR 0.7, and FISH 2.1. Three of the changes were in water quality, four were in habitat condition, and one was in biological and habitat condition. At six of these eight sites, the conditions improved over the 8-year period.

Forty-three percent of the sampling sites that were historically and currently sampled were either moderately or severely impaired in 2002 compared to 47 percent in 1994. Excellent or supporting habitat was found at 91 percent of the sites in 1994 and 88 percent of the sites in 2002. This indicates there has been no major change in the overall condition of the subbasin. The West Branch Susquehanna River was impaired in the same sections in 2002, as it was in 1994. It was impaired in the headwaters and it was impaired from around Clearfield to approximately river mile 55.

Figure 10. *Nitrogen (mg/l) versus Conductivity (µhmos/cm) according to River Mile*

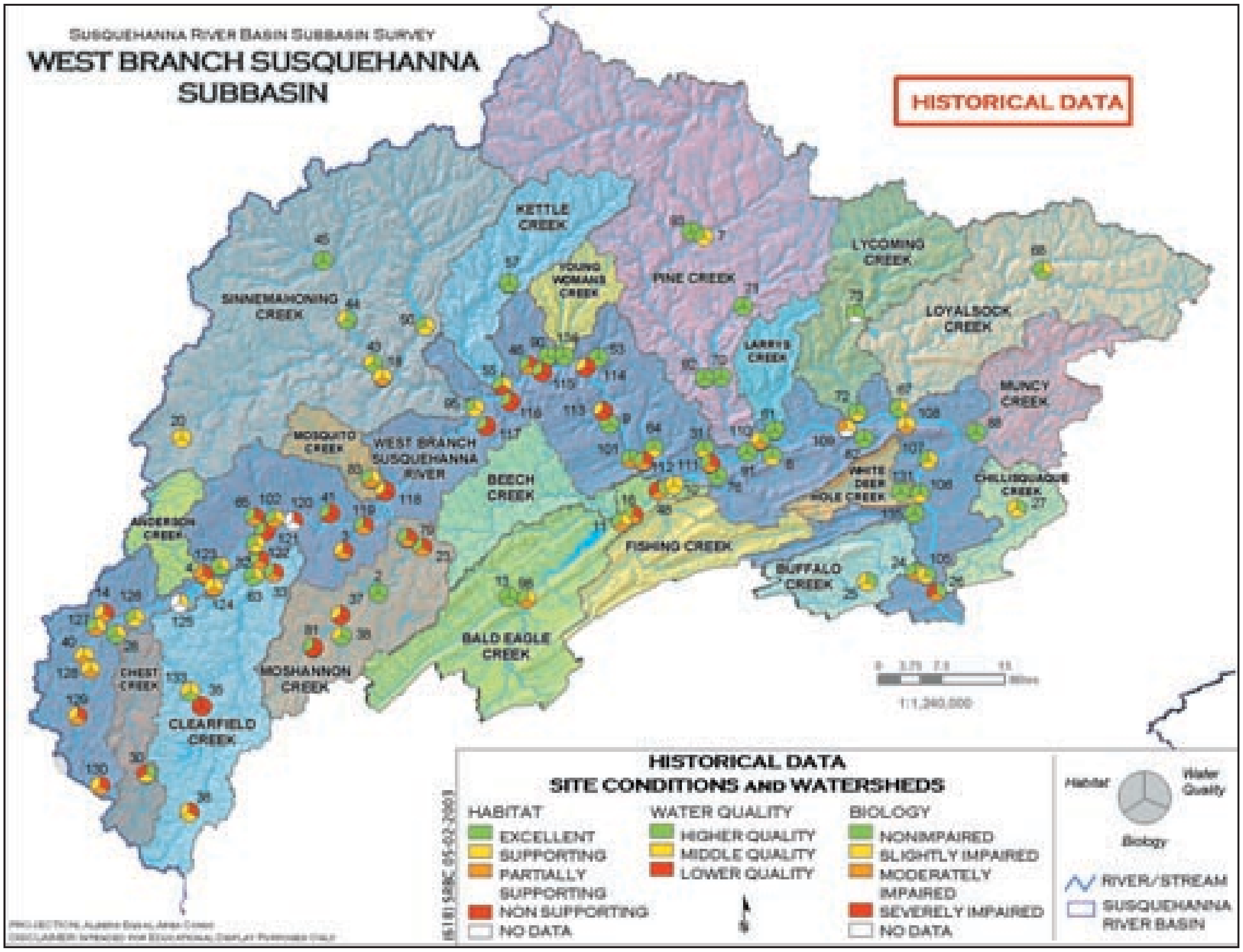


Conclusions

This subbasin had excellent habitat compared to other subbasins in the Susquehanna River Basin; however, it had a large percentage of severely degraded streams. Forty-six percent of the 2002 sampling sites had either moderately or severely impaired biological conditions. Approximately 83 percent of the moderately and severely impaired sites were affected by AMD. The next largest source of pollution was from agriculture. There was minimal effect from urban areas, as there is little urban land use in this watershed. Some of the most degraded watersheds within this subbasin were Muddy Run, Clearfield Creek, Moshannon Creek, Beech Creek, Two Mile Run, Dents Run, Cooks Run, Alder Run, Bear Run, Deer Creek, Little Anderson Creek, and Montgomery Creek. Some of the highest quality watersheds in this subbasin were Pine Creek, First Fork Sinnemahoning, Driftwood Branch Sinnemahoning, Young Womans Creek, Hyner Run, Paddy Run, Lick Run, and White Deer Creek.

The streams in the West Branch Susquehanna Subbasin have the potential to be very high quality streams due to the excellent habitat in this region. The watershed already supports very high quality streams such as Pine Creek. Numerous AMD remediation projects, such as limestone dosing, limestone drains, and passive treatment wetlands, are being implemented throughout the West Branch Susquehanna Subbasin; however, much work remains to be done in order to restore the streams in this watershed.

A second year of more intensive sampling will be conducted in the West Branch Susquehanna Subbasin starting in the fall of 2003. SRBC will focus on a smaller watershed within the West Branch Susquehanna Subbasin based on the survey results and input from watershed organizations and local government entities. The data collected will be provided to these local groups to support protection or remediation efforts in the watershed.



H. Wolbert

Figure 11. *Water Quality, Biological, and Habitat Categories in 1994 Sample Sites in the West Branch Susquehanna Subbasin*

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FOR MORE INFORMATION

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For additional copies of this subbasin survey, contact the Susquehanna River Basin Commission, 1721 N. Front Street, Harrisburg, PA 17102-2391 (717) 238-0423, fax: (717) 238-2436, e-mail: srbc@srbc.net.

For raw data from this survey or more information concerning SRBC, visit our website: **www.srbc.net.**

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Appendix A

Sample Site #	Station	Location Description	Latitude/Longitude	Ecoregion Category	Drainage Size
1	2MIL 0.1	Two Mile Run at SR 4001 bridge near mouth near Westport, Clinton Co.	41°18'57.731"/77°51'32.508"	62	SMALL
2	* 6MIL 0.1	Six Mile Run near mouth at SR 4006 (Munson Rd.) bridge near Winburne Station, Centre Co.	40°56'32.335"/78°07'28.843"	62	SMALL
3	* ALDR 4.7	Alder Run about 0.25 mile downstream of SR 1014 (Schoonover Rd.) bridge near Palestine, Clearfield Co.	41°00'50.922"/78°11'56.484"	67	SMALL
4	* ANDR 0.4	Anderson Creek at Rt. 453 (Filbert St.) bridge in Curwensville, Clearfield Co.	40°58'20.886"/78°31'39.168"	67	MEDIUM
5	ANDR 12.3	Anderson Creek at Rt. 322 bridge near Rockton, Clearfield Co.	41°04'24.046"/78°38'34.759"	67	SMALL
6	* ANTE 0.1	Antes Creek at mouth near Antes Fort, Lycoming Co.	41°11'19.138"/77°14'24.162"	67	MEDIUM
7	* BABB 0.1	Babb Creek at mouth in Blackwell, Tioga Co.	41°33'16.197"/77°22'51.996"	62	MEDIUM
8	BABB 7.2	Babb Creek along Landrus Rd. upstream of Long Run near Morris, Tioga Co.	41°35'58"/77°16'56"	62	SMALL
9	* BAKR 0.1	Baker Run at Rt. 120 bridge near Bucktail State Park Natural Area, Clinton Co.	41°14'49.434"/77°36'23.794"	62	SMALL
10	* BALD 4.5	Bald Eagle Creek at Rt. 150 bridge in Flemington, Clinton Co.	41°07'14.453"/77°28'18.556"	67	LARGE
11	* BALD 14.0	Bald Eagle Creek at T496 (Eagleville Rd.) bridge upstream of Marsh Creek near Eagleville, Centre Co.	41°03'29.668"/77°35'44.350"	67	MEDIUM
12	BALD 24.7	Bald Eagle Creek at Curtain Rd. bridge in Curtain, Centre Co.	40°58'28.810"/77°44'34.831"	67	MEDIUM
13	* BALD 30.0	Bald Eagle Creek at T435 bridge in Wingate, Centre Co.	40°55'56.226"/77°48'39.427"	67	MEDIUM
14	* BEAR 0.1	Bear Run at SR 36 bridge near McGees Station, Clearfield Co.	40°52'55.934"/78°45'45.759"	67	SMALL
15	BEAV 0.2	Beaver Dam Run at SR 1021 bridge in Beaver Valley, Cambria Co.	40°43'01.029"/78°31'54.921"	67	SMALL
16	* BECH 1.7	Beech Creek at Rt. 150 bridge in Beech Creek at Centre Co./Clinton Co. line	41°04'25.263"/77°35'30.116"	67	MEDIUM
17	BECH 20.3	Beech Creek at Panther in Sproul State Forest, Centre Co.	41°06'22.691"/77°50'04.855"	62	MEDIUM
18	* BENN 3.8	Bennett Branch Sinnemahoning Creek upstream of confluence with Driftwood Branch near Tom Mix Park, Cameron Co.	41°20'08.545"/78°08'00.918"	62	MEDIUM
19	BENN 17.6	Bennett Branch Sinnemahoning Creek upstream of Trout Run in Benezette, Elk Co.	41°18'44.172"/78°23'22.509"	62	MEDIUM
20	* BENN 35.2	Bennett Branch Sinnemahoning Creek at Rt. 153 bridge in Penfield, Clearfield, Co.	41°12'28.913"/78°34'23.057	62	SMALL
21	BENN 38.2	Bennett Branch Sinnemahoning Creek at T512 bridge (Ontario St.) in Winterburn, Clearfield Co.	41°10'44.217"/78°36'12.544"	62	SMALL
22	BILG 0.1	Bilger Run at Rt. 879 bridge near Bridgeport, Clearfield Co.	40°58'21.418"/78°34'15.941"	67	SMALL
23	* BLMO 0.1	Black Moshannon Creek near mouth upstream of Rt 53 bridge near Moshannon, Centre Co.	41°02'10.255"/78°03'23.637"	62	MEDIUM
24	* BUFF 2.0	Buffalo Creek beside T379 (Campbell Mill Rd.) near Lewisburg, Union Co.	40°58'17.721"/76°55'02.186"	67	MEDIUM
25	* BUFF 10.4	Buffalo Creek at Rt. 192 bridge in Cowan, Union Co.	40°57'25.071"/77°00'42.653"	67	MEDIUM
26	* CHLLS 0.9	Chillisquaque Creek at Rt. 405 bridge in Chillisquaque, Northumberland Co.	40°56'26.432"/76°51'17.089"	67	MEDIUM
27	* CHLLS 19.3	Chillisquaque Creek at T411 bridge upstream of PPL near Dieffenbach, Montour Co.	41°04'48.830"/76°40'10.126"	67	SMALL
28	* CHST 1.0	Chest Creek at SR 3001/T324 bridge near Ostend, Clearfield Co.	40°51'57.471"/78°43'05.552"	67	MEDIUM
29	CHST 13.2	Chest Creek at SR 3006 bridge at Westover, Clearfield Co.	40°45'05.279"/78°40'00.094"	67	MEDIUM
30	* CHST 24.5	Chest Creek end of 2nd Ave. in Patton, Cambria Co.	40°38'12.559"/78°38'33.207"	67	SMALL
31	* CHTM 0.1	Chatham Run at SR 1002 (River Rd.) bridge near Chatham Run, Clinton Co.	41°10'06.305"/77°21'52.503"	67	SMALL
32	* CLFD 0.9	Clearfield Creek at Rt. 322 bridge near Clearfield, Clearfield Co.	41°01'04.124"/78°24'27.344"	67	MEDIUM
33	* CLFD 8.2	Clearfield Creek upstream of Little Clearfield Creek confluence near Dimeling, Clearfield Co.	40°58'11.142"/78°24'24.613"	67	MEDIUM
34	CLFD 22.8	Clearfield Creek upstream of Lost Run near Belsena Mills, Clearfield Co.	40°51'40.288"/78°26'37.925"	67	MEDIUM
35	* CLFD 42.2	Clearfield Creek at Beechwood Park in Coalport, Clearfield Co.	40°44'45.381"/78°32'16.766"	67	MEDIUM
36	* CLFD 60.5	Clearfield Creek at Rt. 36 bridge in Ashville, Cambria Co.	40°33'39.690"/78°33'06.695"	67	SMALL
37	* COLD 1.1	Cold Stream at Rt. 322 bridge, downstream of the reservoir in Phillipsburg, Centre Co.	40°54'03.344"/78°12'35.626"	67	SMALL
38	* COLD 3.6	Cold Stream upstream of Game Reserve Rd. upstream of Tomtit Run near Phillipsburg, Centre Co.	40°52'03.359"/78°12'26.960"	67	SMALL
39	COOK 0.1	Cooks Run at Rt. 120 bridge in Cooks Run, Clinton Co.	41°16'42.966"/77°53'07.416"	62	SMALL
40	* CUSH 0.1	Cush Creek at Rt. 219 bridge in Dowler Junction Station, Clearfield Co.	40°49'51.334"/78°47'27.047"	67	SMALL
41	* DEER 0.2	Deer Creek upstream of rip-rap at T 637 bridge near Frenchville Station, Clearfield, Co.	41°04'48.940"/78°14'14.955"	67	SMALL
42	DENT 0.6	Dents Run at bridge off Dents Run Road in Dents Run, Elk Co.	41°21'34.046"/78°16'19.000"	62	SMALL
43	* DRFT 0.1	Driftwood Branch Sinnemahoning Creek at the mouth in Driftwood, Cameron, Co.	41°20'13.942"/78°08'02.511"	62	MEDIUM
44	* DRFT 9.9	Driftwood Branch Sinnemahoning Creek at SR 3002 bridge near Sterling Run, Cameron Co.	41°24'48.630"/78°11'47.747"	62	MEDIUM
45	* DRFT 21.2	Driftwood Branch Sinnemahoning Creek upstream of high school at H.W. Zimmer Memorial Park in Emporium, Cameron Co.	41°30'59"/78°15'14"	62	MEDIUM
46	* DRUR 0.7	Drury Run beside Rt. 144 about 1 mile upstream at abandoned factory near Renovo, Clinton Co.	41°20'01.896"/77°46'51.058"	62	SMALL
47	EAST 0.1	East Fork Sinnemahoning Creek at Rt. 872 bridge in Wharton, Potter Co.	41°31'46.594"/78°01'17.767"	62	MEDIUM
48	* FISH 2.1	Fishing Creek at parking area along Rt. 64 upstream of Mill Hall, Clinton Co.	41°05'44.133"/77°28'46.838"	67	MEDIUM
49	FISH 13.3	Fishing Creek at SR 2004 bridge downstream of Lamar National Fish Hatchery, Clinton Co.	41°00'23.964"/77°32'00.696"	67	MEDIUM
50	* FRST 5.3	First Fork Sinnemahoning Creek along Rt. 872 upstream of Lick Island Run in Elk State Forest, Cameron Co.	41°22'51.502"/78°02'17.947"	62	MEDIUM
51	FRST 19.1	First Fork Sinnemahoning Creek upstream of confluence with East Fork Sinnemahoning in Wharton, Potter Co.	41°31'47.542"/78°01'17.486"	62	MEDIUM
52	GIFF 1.6	Gifford Run at Lost Run Road bridge in Moshannon State Forest, Clearfield Co.	41°10'22"/78°14'17"	62	SMALL
53	* HYNR 0.1	Hyner Run at Rt. 120 bridge in Hyner, Clinton Co.	41°19'56.895"/77°38'48.124"	62	SMALL
54	KRAT 0.1	Kratzer Run beside Rt. 879 at mouth at Bridgeport, Clearfield Co.	40°58'35.745"/78°32'51.499"	67	SMALL
55	* KTTL 0.2	Kettle Creek at Rt. 120 bridge in Westport, Clinton Co.	41°18'01.643"/77°50'26.829"	62	MEDIUM
56	KTTL 2.1	Kettle Creek along SR 4001 upstream of Two Mile Run near Westport, Clinton Co.	41°18'46.836"/77°51'52.432"	62	MEDIUM
57	* KTTL 25.3	Kettle Creek along Rt. 144 upstream of Cross Forks, Potter Co.	41°29'40.017"/77°47'51.532"	62	MEDIUM
58	KTTL 34.1	Kettle Creek upstream of Long Run upstream of Rt. 44 bridge near Oleona, Potter Co.	41°33'33.417"/77°40'49.767"	62	SMALL
59	LAND 1.7	Little Anderson Creek downstream of R.R. culvert downstream of T499 bridge at Anderson Station, Clearfield Co.	41°03'14.519"/78°39'21.278"	67	SMALL
60	LARL 3.2	Laurel Run at Saunders Rd./Blackwell Rd. crossing in Moshannon State Forest near Elk Co./Clearfield Co. line	41°14'39.514"/78°28'14.863"	62	SMALL
61	* LARR 2.9	Larrys Creek along Rt. 287 upstream of Old Forge Rd. near Larryville, Lycoming Co.	41°14'57"/77°13'35"	67	MEDIUM
62	LAUR 0.1	Laurel Run at Rt. 53 bridge near Pleasant Hill, Clearfield Co.	40°54'24.588"/78°13'37.083"	67	SMALL
63	* LCLF 0.1	Little Clearfield Creek at mouth near Dimeling, Clearfield Co.	40°58'12.429"/78°24'26.052"	67	SMALL
64	* LICE 0.2	Lick Run at SR 1001 bridge at Farrandsville Community Park in Farrandsville, Clinton Co.	41°10'22.111"/77°30'53.042"	67	SMALL
65	* LICW 0.3	Lick Run at Rt. 879 bridge near Gray Station, Clearfield Co.	41°03'02.411"/78°23'07.975"	67	SMALL
66	LITL 0.4	Little Loyalsock Creek at Rt. 87 bridge in Forksville, Sullivan Co.	41°29'31.342"/76°36'00.067"	62	MEDIUM
67	* LLSK 1.2	Loyalsock Creek at SR 2014 bridge near Montoursville, Lycoming Co.	41°14'59.817"/76°56'07.340"	67	MEDIUM

Stations sampled in 1994 and 2002.

68	* LLSK 37.2	Loyalsock Creek upstream of covered bridge upstream of Rt.87 bridge near Forksville, Sullivan Co.	41°29'10"/76°35'57"	62	MEDIUM
69	LMUN 0.1	Little Muncy Creek at Rt. 442 bridge near Muncy, Lycoming Co.	41°12'23.002"/76°44'42.029"	67	MEDIUM
70	* LPIN 0.2	Little Pine Creek at Rt. 44 bridge in Waterville, Lycoming Co.	41°18'35.813"/77°21'46.266"	62	MEDIUM
71	* LPIN 11.5	Little Pine Creek upstream of English Run at English Center, Lycoming Co.	41°26'05.411"/77°17'21.861"	62	MEDIUM
72	* LYCO 2.0	Lycoming Creek adjacent to Weis Markets parking lot from Business Rt. 15 in Garden View, Lycoming Co.	41°15'09.926"/77°02'29.857"	67	MEDIUM
73	* LYCO 17.7	Lycoming Creek at Susque Rd. bridge near Gray, Lycoming Co.	41°25'05.100"/77°02'01.345"	62	MEDIUM
74	MARS 1.2	Marsh Creek at Rt. 150 bridge near Beech Creek, Centre Co.	41°03'38.722"/77°36'57.734"	67	SMALL
75	MCCR 1.0	McCracken Run at T324 bridge near Bower, Clearfield Co.	40°53'32"/78°39'32"	67	SMALL
76	* MCEL 2.0	McElhattan Run along SR 1005 in Mt. Logan Natural Area, Clinton Co.	41°08'23.077"/77°20'37.522"	67	SMALL
77	MEDX 0.1	Medix Run at the mouth near Medix Run, Elk Co.	41°17'03.548"/78°23'48.626"	62	SMALL
78	MONT 0.2	Montgomery Creek at SR 1001 bridge in Hyde, Clearfield Co.	41°00'12.033"/78°27'40.139"	67	SMALL
79	* MOSH 5.1	Moshannon Creek at Rt. 53 bridge upstream of Black Moshannon Creek near Moshannon, Clearfield/Centre Co.	41°02'11.127"/78°03'32.385"	62	MEDIUM
80	MOSH 19.1	Moshannon Creek upstream of Six Mile Run near Winburne Station, Clearfield/Centre Co.	40°56'42.654"/78°07'17.079"	62	MEDIUM
81	* MOSH 39.9	Moshannon Creek at Rt. 970 bridge in Osceola Mills, Clearfield Co.	40°51'01.522"/78°15'57.432"	67	MEDIUM
82	* MOSQ 0.2	Mosquito Creek at Rt. 654 bridge in Duboistown, Lycoming Co.	41°13'19.704"/77°02'17.592"	67	SMALL
83	* MQTO 1.0	Mosquito Creek upstream of unnamed trib. out of Shingle Hollow in Karthaus, Clearfield Co.	41°07'21.277"/78°07'19.967"	62	MEDIUM
84	MQTO 13.8	Mosquito Creek at Lost Run Road bridge in Moshannon State Forest, Clearfield Co.	41°12'56.168"/78°14'37.030"	62	SMALL
85	MRSH 1.6	Marsh Creek along SR 3022 near Asaph, Tioga Co.	41°45'47.223"/77°24'48.508"	62	MEDIUM
86	MUDD 0.3	Muddy Run at T550 bridge near Madera, Clearfield Co.	40°49'08.490"/78°26'12.716"	67	SMALL
87	MUDD 4.5	Muddy Run at SR 729 bridge near Beccaria, Clearfield Co.	40°46'08.339"/78°26'50.266"	67	SMALL
88	* MUNC 1.1	Muncy Creek upstream Main St. bridge (SR 2014) near Muncy, Lycoming Co.	41°13'04"/76°47'12"	67	MEDIUM
89	MUNC 18.8	Muncy Creek at Edkin Hill Rd. bridge in Beech Glen, Sullivan Co.	41°18'51.804"/76°36'55.807"	62	MEDIUM
90	* PADY 0.1	Paddy Run at Rt. 120 bridge near Renovo, Clinton Co.	41°19'52.517"/77°43'41.540"	62	SMALL
91	* PINE 1.1	Pine Creek upstream of Tiadaughton Dr. bridge near Jersey Shore, on Clinton Co./Lycoming Co. line	41°10'55.046"/77°16'50.549"	67	LARGE
92	* PINE 14.2	Pine Creek at Rt. 44 bridge upstream of Little Pine Creek near Waterville, Lycoming Co.	41°18'40"/77°22'45"	62	LARGE
93	* PINE 40.3	Pine Creek at Rt. 414 bridge in Blackwell, Tioga Co.	41°33'24"/77°23'00"	62	MEDIUM
94	PINE 57.5	Pine Creek upstream of Marsh Creek, upstream of Colton Rd. bridge, in Ansonia, Tioga Co.	41°44'38.507"/77°26'03.678"	62	MEDIUM
95	* SINN 0.2	Sinnemahoning Creek at SR 4002 bridge in Keating, Clinton Co.	41°15'39.748"/77°54'26.097"	62	LARGE
96	SINN 11.9	Sinnemahoning Creek at SR 2001 (Wykoff Rd.) bridge upstream of First Fork in Sinnemahoning, Cameron Co.	41°19'09.317"/78°05'02.026"	62	LARGE
97	SLAB 0.2	Slab Cabin Run at SR 3012 (Puddintown Rd.) bridge near Houserville, Centre Co.	40°49'06"/77°50'01"	67	SMALL
98	* SPRG 0.2	Spring Creek upstream of Commercial Rd. bridge in Milesburg, Centre Co.	40°56'24.843"/77°47'17.116"	67	MEDIUM
99	SPRG 14.8	Spring Creek at SR 3012 (Puddintown Rd.) bridge near Houserville, Centre Co.	40°49'14.866"/77°49'56.181"	67	SMALL
100	SURV 0.3	Surveyor Run about 0.3 mile upstream of the mouth near Surveyor, Clearfield Co.	41°04'36.054"/78°19'30.859"	67	SMALL
101	* TANG 0.2	Tangascootack Creek at Rt. 120 bridge near Riverview, Clinton Co.	41°10'34.066"/77°32'59.023"	67	SMALL
102	* TROT 0.1	Trout Run at Rt. 879 bridge in Shawville, Clearfield Co.	41°04'11.226"/78°21'34.193"	67	SMALL
103	WBPC 3.5	West Branch Pine Creek upstream of Right Branch Run in Germania Station, Potter Co.	41°42'45.178"/77°41'56.794"	62	MEDIUM
104	WBSR 0.0	West Branch Susquehanna River at Rt. 11 bridge in Northumberland, Northumberland Co.	40°53'01.500"/76°47'53.664"	67	LARGE
105	* WBSR 7.5	West Branch Susquehanna River at Rt. 45 bridge in Lewisburg, Union Co./Northumberland Co. line	40°57'55.404"/76°52'36.372"	67	LARGE
106	* WBSR 15.0	West Branch Susquehanna River along Rt. 405 between Rt. 80 and Watsontown near Watsontown, Northumberland Co.	41°04'13.908"/76°51'15.228"	67	LARGE
107	* WBSR 23.0	West Branch Susquehanna River at Rt. 54 bridge and Montgomery Fish Access in Montgomery, Lycoming Co.	41°10'01.344"/76°52'12.504"	67	LARGE
108	* WBSR 37.5	West Branch Susquehanna River at PA Fish and Boat Greevy Access and Riverfront Park in Williamsport, Lycoming Co.	41°14'40.956"/76°57'46.152"	67	LARGE
109	* WBSR 45.3	West Branch Susquehanna River at Linden Boat Access off Fourth Ave. near Williamsport, Lycoming Co.	41°13'32.556"/77°06'26.064"	67	LARGE
110	* WBSR 55.0	West Branch Susquehanna River at Rt. 44 bridge (right branch) in Jersey Shore, Lycoming Co.	41°12'12.708"/77°14'32.388"	67	LARGE
111	* WBSR 64.0	West Branch Susquehanna River upstream SR 1003/SR 1005 bridge upstream Chatham Run near Chatham Run, Clinton Co.	41°09'55.416"/77°22'03.208"	67	LARGE
112	* WBSR 75.0	West Branch Susquehanna River upstream Lick Run in Farrandsville, Clinton Co.	41°10'05.432"/77°31'11.680"	67	LARGE
113	* WBSR 83.0	West Branch Susquehanna River upstream Baker Run in Glen Union, Clinton Co.	41°14'59.141"/77°36'25.354"	62	LARGE
114	* WBSR 91.0	West Branch Susquehanna River upstream Hyner Run in Hyner, Clinton Co.	41°19'48"/77°38'50"	62	LARGE
115	* WBSR 97.0	West Branch Susquehanna River at Rt. 144 bridge in Renovo, Clinton Co.	41°19'34.691"/77°44'44.890"	62	LARGE
116	* WBSR 103.8	West Branch Susquehanna River upstream Kettle Creek in Westport, Clinton Co.	41°18'01.524"/77°50'17.453"	62	LARGE
117	* WBSR 110.0	West Branch Susquehanna River upstream of Sinnemahoning Creek in Keating, Clinton Co.	41°15'39.170"/77°54'04.422"	62	LARGE
118	* WBSR 131.0	West Branch Susquehanna River at Rt. 879 bridge in Karthaus, Clearfield Co.	41°07'01.935"/78°06'29.690"	62	LARGE
119	* WBSR 142.0	West Branch Susquehanna River at SR 1011 bridge in Rolling Stone, Clearfield Co.	41°03'25.965"/78°09'26.246"	67	LARGE
120	* WBSR 162.0	West Branch Susquehanna River downstream of powerplant in Shawville, Clearfield Co.	41°03'58.777"/78°21'34.955"	67	LARGE
121	* WBSR 164.2	West Branch Susquehanna River upstream of Lick Run near Gray Station, Clearfield Co.	41°02'52.401"/78°22'55.393"	67	LARGE
122	* WBSR 172.3	West Branch Susquehanna River at railroad bridge in Clearfield, Clearfield Co.	41°01'57.043"/78°26'01.432"	67	MEDIUM
123	* WBSR 175.0	West Branch Susquehanna River at Rt. 879 bridge in Hyde, Clearfield Co.	41°00'16"/78°27'25"	67	MEDIUM
124	* WBSR 181.4	West Branch Susquehanna River at Bloomington Ave. bridge downstream of Anderson Creek in Curwensville, Clearfield Co.	40°58'27.196"/78°31'11.164"	67	MEDIUM
125	* WBSR 191.0	West Branch Susquehanna River at Rt. 729 bridge in Lumber City, Clearfield Co.	40°55'21.951"/78°34'32.441"	67	MEDIUM
126	* WBSR 200.0	West Branch Susquehanna River at T418 (Camp Corbley Rd.) in Bower, Clearfield Co.	40°53'40.928"/78°40'34.773"	67	MEDIUM
127	* WBSR 208.0	West Branch Susquehanna River along T327 downstream of Deer Run near McGees Mills, Clearfield Co.	40°52'14.786"/78°45'19.412"	67	MEDIUM
128	* WBSR 214.0	West Branch Susquehanna River at Rt. 219 bridge north of Burnside, Clearfield Co.	40°48'58.265"/78°47'06.550"	67	MEDIUM
129	* WBSR 224.0	West Branch Susquehanna River at Rt. 580 bridge in Cherry Tree, Indiana Co.	40°43'37.639"/78°48'19.299"	67	MEDIUM
130	* WBSR 235.0	West Branch Susquehanna River at Goodway Rd. bridge near Bakerton, Cambria Co.	40°35'54.241"/78°44'40.298"	67	SMALL
131	* WDHC 1.9	White Deer Hole Creek at SR 1012 bridge near Allenwood, Union Co.	41°06'08.139"/76°54'50.584"	67	MEDIUM
132	WEST 2.0	West Creek at T345 bridge (Hercules Rd.) in West Creek, Cameron Co.	41°29'39.527"/78°16'29.834"	62	MEDIUM
133	* WHIT 0.1	South Whitmer Run at SR 3005 bridge in Irvona, Clearfield Co.	40°46'12.480"/78°33'03.384"	67	SMALL
134	WILS 0.5	Wilson Creek at Rt. 287 bridge in Morris, Tioga Co.	41°35'53.486"/77°17'47.525"	62	SMALL
135	* WTDR 3.7	White Deer Creek along SR 1010 (White Deer Pike) upstream of Rt. 80 crossing near White Deer Furnace, Union Co.	41°04'27.278"/76°55'45.988"	67	SMALL
136	* YGWO 0.5	Young Womans Creek upstream of Rt. 120 bridge at Fire Department Access in North Bend, Clinton Co.	41°20'59.143"/77°41'54.078"	62	MEDIUM
137	YGWO 4.5	Young Womans Creek 0.2 - 0.3 mile upstream of bridge upstream of Laurelly Fork in Sproul State Forest, Clinton Co.	41°24'05"/77°41'05"	62	SMALL

*Stations sampled in 1994 and 2002.

S. LeFevre

Fishing Creek near Lamar, Clinton Co.

In 1972, The Susquehanna River Basin Commission was created as an independent agency by a federal-interstate compact among the states of Maryland, New York, and the Commonwealth of Pennsylvania, and the federal government. In creating the Commission, the Congress and state legislatures formally recognized the water resources of the Susquehanna River Basin as a regional asset vested with local, state, and national interests for which all the parties share responsibility. As the single federal-interstate water resources agency with basinwide authority, the Commission's goal is to coordinate the planning, conservation, management, utilization, development and control of the basin's water resources among the public and private sectors.