ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

Monitoring Report No. 19
July 1, 2004, Through June 30, 2005

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The Susquehanna River Basin Commission was created as an independent agency by a federal-interstate compact* among the states of Maryland, New York, 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 basin water resources among the public and private sectors.

**Statutory Citations: Federal - Pub. L. 91-575, 84 Stat. 1509 (December 1970); Maryland - Natural Resources Sec. 8-301 (Michie 1974); New York - ECL Sec. 21-1301 (McKinney 1973); and Pennsylvania - 32 P.S. 820.1 (Supp. 1976).*

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ABSTRACT

The Susquehanna River Basin Commission (SRBC) used a water quality index (WQI) and the U.S. Environmental Protection Agency's (USEPA's) Rapid Bioassessment Protocol III (RBP III) to assess the chemical water quality, biological conditions, and physical habitat of 52 sample sites in the Interstate Streams Water Quality Network from July 1, 2004, to June 30, 2005. Seventy-two of 734 possible parameter observations exceeded water quality standards. Assessment results indicate that approximately 49 percent of the sites supported nonimpaired biological communities. Water quality impacts in the NY-PA border streams continue to be mostly from metals, while most PA-MD border sites continued to have higher nitrogen and nitrate values, in addition to some elevated metals.

INTRODUCTION

One of SRBC's functions is to review projects that may have interstate impacts on water resources in the Susquehanna River Basin. SRBC established a monitoring program in 1986 to collect data that were not available from monitoring programs implemented by state agencies in New York, Pennsylvania, and Maryland. The state agencies do not assess all of the interstate streams and do not produce comparable data needed to determine potential impacts on the water quality of interstate streams. SRBC's ongoing interstate monitoring program is partially funded through a grant from the USEPA.

The interstate water quality monitoring program includes periodic collection of water and biological samples from interstate streams, as well as assessments of their physical habitat. Water quality data are used to: (1) assess compliance with water quality standards; (2) characterize stream quality and seasonal variations; (3) build a database for assessment of water quality trends; (4) identify streams for reporting to USEPA under Section 305(b) of the Clean Water Act; (5) provide information to signatory states for 303(d) listing and possible Total Maximum Daily Load (TMDL) development; and (6) identify areas for restoration and protection. Biological conditions are assessed using benthic macroinvertebrate populations, which provide an indication of the biological health of a stream and serve as indicators of water quality. Habitat assessments provide information concerning potential stream impairment from erosion and sedimentation, as well as an indication of the stream's ability to support a healthy biological community.

SRBC's interstate monitoring program began in April 1986. For the first five years, results were reported for water years that ran from October to September. In 1991, SRBC changed the reporting periods to correspond with its fiscal year that covers the period from July to June. This report is presented for fiscal year 2005, which covers July 1, 2004, to June 30, 2005.

BASIN GEOGRAPHY

The Susquehanna River Basin is the largest river basin on the Atlantic Coast of the United States, draining 27,500 square miles. The Susquehanna River originates at the outlet of Otsego Lake, Cooperstown, NY, and flows 444 miles through New York, Pennsylvania, and Maryland to the Chesapeake Bay at Havre de Grace, MD. Eighty-three streams cross state lines in the basin (Table 1). Several streams traverse the state lines at multiple points, contributing to 91 crossings. Of those 91 crossings, 45 streams flow from New York into Pennsylvania, 22 from Pennsylvania into New York, 15 from Pennsylvania into Maryland, and nine from Maryland into Pennsylvania. Many streams are small, and 32 are unnamed.

METHODS

Field and Laboratory Methods

Sampling frequency

In Water Year 1989, the interstate streams were divided into three groups, according to the degree of water quality impairment, historical water quality impacts, and potential for degradation. These groupings were determined based on historical water quality and land use. To date, these groups remain consistent and are described below.

Streams with impaired water quality or judged to have a high potential for degradation due to large drainage areas or historical pollution were assigned to Group 1. During sampling period 2004-2005, NY-PA Group 1 streams were sampled July through September (depending on flow conditions), October, February, and May. Pennsylvania-Maryland Group 1 stations were sampled July or August, October, February, and May. Benthic macroinvertebrates were collected and habitat assessments were performed in Group 1 streams during July and August 2004.

Streams judged to have a moderate potential for impacts were assigned to Group 2. Water quality samples, benthic macroinvertebrate samples, and physical habitat information were obtained from Group 2 stations once a year; preferably during base flow conditions in the summer months. In this sampling period, water chemistry, macroinvertebrate, and physical habitat information were collected during July and August 2004.

Table 1. Interstate Streams in the Susquehanna River Basin

Stream Name	Monitoring Group	Flow Direction (from→to)
Streams Along the New York–Pennsylvania Border		
Apalachin Creek	2	PA→NY
Babcock Run	3	NY→PA
Beagle Hollow	3	NY→PA
Bentley Creek	1	PA→NY
Bill Hess Creek	3	NY→PA
Bird Creek	3	PA→NY
Biscuit Hollow	3	NY→PA
Briggs Hollow Run	3	NY→PA
Bulkley Brook	3	NY→PA
Camp Brook	3	NY→PA
Cascade Creek	1	NY→PA
Cayuta Creek	1	NY→PA
Chemung River	1	NY→PA→NY→PA
Choconut Creek	2	PA→NY
Cook Hollow	3	NY→PA
Cowanesque River	1	PA→NY
Deep Hollow Brook	3	NY→PA
Denton Creek	3	NY→PA
Dry Brook*	3	NY→PA
Holden Creek	2	NY→PA
Little Snake Creek	1	PA→NY
Little Wappasening Creek	3	PA→NY
North Fork Cowanesque River	2	NY→PA
Parks Creek	3	PA→NY
Prince Hollow Run	3	NY→PA
Russell Run	3	NY→PA
Sackett Creek	3	PA→NY
Seeley Creek	1	PA→NY
Smith Creek	3	PA→NY
Snake Creek	2	PA→NY
South Creek	2	PA→NY
Strait Creek	3	NY→PA
Susquehanna River	1	NY→PA→NY→PA
Tioga River	1	PA→ NY
Troups Creek	1	NY→PA
Trowbridge Creek	2	NY→PA
Wappasening Creek	2	PA→ NY
White Branch	3	NY→PA
White Hollow	3	PA→ NY
17 Unnamed tributaries*	3	NY→PA
2 Unnamed tributaries*	3	PA→ NY
2 Unnamed tributaries*	3	PA→ NY→PA

*Not sampled in 2004-2005

Table 1. Interstate Streams in the Susquehanna River Basin—Continued

Stream Name	Monitoring Group	Flow Direction (from→to)
Streams Along The Pennsylvania–Maryland Border		
Big Branch Deer Creek	2	PA→MD
Conowingo Creek	1	PA→MD
Deer Creek	1	PA→MD
Ebaughs Creek	1	PA→MD
Falling Branch Deer Creek	2	PA→MD
Island Branch*	3	PA→MD
Long Arm Creek	1	MD→PA
Octoraro Creek	1	PA→MD
Scott Creek	1	MD→PA
South Branch Conewago Creek	2	MD→PA
Susquehanna River	1	PA→MD
6 Unnamed tributaries*	3	MD→PA
7 Unnamed tributaries*	3	PA→MD

*Not sampled in 2004-2005

Streams judged to have a low potential for impacts were assigned to Group 3 and were visually inspected only for signs of degradation once a year until fiscal year 2000 when the biological and habitat conditions of these streams were assessed during May. Field chemistry parameters also were measured on Group 3 streams at the time of biological sampling. New York-Pennsylvania border and PA-MD border stream stations sampled during fiscal year 2005 are listed in Tables 2 and 3, respectively, and are depicted in Figures 1 through 4.

Stream discharge

Stream discharge was measured at all stations unless high stream flows made access impossible. Several stations are located near U.S. Geological Survey (USGS) stream gages. These stations include the following: the Susquehanna River at Windsor, NY, Kirkwood, NY, Sayre, PA, Marietta, PA, and Conowingo, MD; the Chemung River at Chemung, NY; the Tioga River at Lindley, NY; and the Cowanesque River at Lawrenceville, PA. Recorded stages from USGS gaging stations and rating curves were used to determine instantaneous discharges in cubic feet per second (cfs). Instantaneous discharges for stations not located near USGS gaging stations were measured at the time of sampling, using standard USGS procedures (Buchanan and Somers, 1969). Stream discharges are tabulated according to station name and date in Appendix A.

Water samples

Water samples were collected at each of the sites to measure nutrient and metal concentrations. Chemical and physical parameters monitored are listed in Table 4. Water samples were collected using a depth-integrated sampler. Composite samples were obtained by collecting several depth-integrated samples across the stream channel and combining them in a churn splitter that was previously rinsed with stream water. Water samples were mixed thoroughly in the churn splitter and collected in a 500-ml bottle and two 250-ml bottles. The 500-ml bottle was for a raw sample. Each of the 250-ml bottles consisted of a whole water sample, one fixed with concentrated nitric acid (HNO_3) for metal analysis and one fixed with concentrated sulfuric acid (H_2SO_4) for nutrient analysis. The samples were chilled on ice and sent to the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Laboratories in Harrisburg, PA, within 24 hours of collection.

Field chemistry

Temperature, dissolved oxygen, conductivity, pH, alkalinity, and acidity were measured in the field. Dissolved oxygen was measured using a YSI model 55-dissolved oxygen meter that was calibrated at the beginning of each day when water samples were collected. A VWR Scientific Model 2052 conductivity meter was used to measure conductivity. A Cole Parmer meter was used to measure pH. The pH meter was calibrated at the beginning of the day and randomly checked throughout the day. Alkalinity was determined by titrating a known volume of water to pH 4.5 with 0.02N H_2SO_4. Acidity was measured by titrating a known volume of sample water to pH 8.3 with 0.02N sodium hydroxide (NaOH). Total chlorine was measured at Cayuta and Ebaughs Creeks since CAYT 1.7 and EBAU 1.5 were located downstream of wastewater treatment plants. A HACH Datalogging Colorimeter model DR/890 was used with the DPD Test and Tube method (10101) to measure chlorine concentrations.

Table 2. Stream Stations Sampled Along the New York–Pennsylvania Border and Sampling Rationale

Station	Stream and Location	Monitoring Group	Rationale
APAL 6.9	Apalachin Creek, Little Meadows, PA	2	Monitor for potential water quality impacts
BABC	Babcock Run, Cadis, PA	3	Monitor for potential impacts
BEAG	Beagle Hollow Run, Osceola, PA	3	Monitor for potential impacts
BILL	Bill Hess Creek, Nelson, PA	3	Monitor for potential impacts
BIRD	Bird Creek, Webb Mills, NY	3	Monitor for potential impacts
BISC	Biscuit Hollow, Austinburg, PA	3	Monitor for potential impacts
BNTY 0.9	Bentley Creek, Wellsburg, NY	1	Monitor for potential water quality impacts
BRIG	Briggs Hollow, Nichols, NY	3	Monitor for potential impacts
BULK	Bulkley Brook, Knoxville, PA	3	Monitor for potential impacts
CAMP	Camp Brook, Osceola, PA	3	Monitor for potential impacts
CASC 1.6	Cascade Creek, Lanesboro, PA	1	Monitor for potential water quality impacts
CAYT 1.7	Cayuta Creek, Waverly, NY	1	Municipal discharge from Waverly, NY
CHEM 12.0*	Chemung River, Chemung, NY	1	Municipal and industrial discharges from Elmira, NY
CHOC 9.1	Choconut Creek, Vestal Center, NY	2	Monitor for potential water quality impacts
COOK	Cook Hollow, Austinburg, PA	3	Monitor for potential impacts
COWN 2.2	Cowanesque River, Lawrenceville, PA	1	Impacts from flood control reservoir
COWN 1.0	Cowanesque River, Lawrenceville, PA	1	Recovery zone from upstream flood control reservoir
DEEP	Deep Hollow Brook, Danville, NY	3	Monitor for potential impacts
DENT	Denton Creek, Hickory Grove, PA	3	Monitor for potential impacts
DRYB*	Dry Brook, Waverly, NY	3	Monitor for potential impacts
HLDN 3.5	Holden Creek, Woodhull, NY	2	Monitor for potential water quality impacts
LSNK 7.6	Little Snake Creek, Brackney, PA	1	Monitor for potential water quality impacts
LWAP	Little Wappasening Creek, Nichols, NY	3	Monitor for potential impacts
NFCR 7.6	North Fork Cowanesque River, North Fork, PA	2	Monitor for potential water quality impacts
PARK	Parks Creek, Litchfield, NY	3	Monitor for potential impacts
PRIN	Prince Hollow Run Cadis, PA	3	Monitor for potential impacts
RUSS	Russell Run, Windham, PA	3	Monitor for potential impacts
SACK	Sackett Creek, Nichols, NY	3	Monitor for potential impacts
SEEL 10.3	Seeley Creek, Seeley Creek, NY	1	Monitor for potential water quality impacts
SMIT	Smith Creek, East Lawrence, PA	3	Monitor for potential impacts
SNAK 2.3	Snake Creek, Brookdale, PA	2	Monitor for potential water quality impacts
SOUT 7.8	South Creek, Fassett, PA	2	Monitor for potential water quality impacts
STRA	Strait Creek, Nelson, PA	3	Monitor for potential impacts
SUSQ 365.0	Susquehanna River, Windsor, NY	1	Large drainage area (1,882 sq. mi.); municipal discharges from Cooperstown, Sidney, Bainbridge, and Oneonta
SUSQ 340.0*	Susquehanna River, Kirkwood, NY	1	Large drainage area (2,232 sq. mi.); historical pollution due to sewage from Lanesboro, Oakland, Susquehanna, Great Bend, and Hallstead
SUSQ 289.1*	Susquehanna River, Sayre, PA	1	Large drainage area (4,933 sq. mi.); municipal and industrial discharges
TIOG 10.8*	Tioga River, Lindley, NY	1	Pollution from acid mine discharges and impacts from flood control reservoirs
TRUP 4.5	Troups Creek, Austinburg, PA	1	High turbidity and moderately impaired macroinvertebrate populations
TROW 1.8	Trowbridge Creek, Great Bend, PA	2	Monitor for potential water quality impacts
WAPP 2.6	Wappasening Creek, Nichols, NY	2	Monitor for potential water quality impacts
WBCO	White Branch Cowanesque River, North Fork, PA	3	Monitor for potential impacts
WHIT	White Hollow, Wellsburg, NY	3	Monitor for potential impacts

*No macroinvertebrate sample collected in 2004-2005

Table 3. Stream Stations Sampled along the Pennsylvania–Maryland Border and Sampling Rationale

Station	Stream and Location	Monitoring Group	Rationale
BBDC 4.1	Big Branch Deer Creek, Fawn Grove, PA	2	Monitor for potential water quality impacts
CNWG 4.4	Conowingo Creek, Pleasant Grove, PA	1	High nutrient loads and other agricultural runoff; nonpoint runoff to Chesapeake Bay
DEER 44.2	Deer Creek, Gorsuch Mills, MD	1	Past pollution from Gorsuch Mills, MD, Stewartstown, PA; nonpoint runoff to Chesapeake Bay
EBAU 1.5	Ebaughs Creek, Stewartstown, PA	1	Municipal discharge from Stewartstown, PA; nonpoint runoff to Chesapeake Bay
FBDC 4.1	Falling Branch Deer Creek, Fawn Grove, PA	2	Monitor for potential water quality impacts
LNGA 2.5	Long Arm Creek, Bandanna, PA	1	Monitor for potential water quality impacts
OCTO 6.6	Octoraro Creek, Rising Sun, MD	1	High nutrient loads due to agricultural runoff from New Bridge, MD; water quality impacts from Octoraro Lake; nonpoint runoff to Chesapeake Bay
SBCC 20.4	South Branch Conewago Creek, Bandanna, PA	2	Monitor for potential water quality impacts
SCTT 3.0	Scott Creek, Delta, PA	1	Historical pollution due to untreated sewage
SUSQ 44.5*	Susquehanna River, Marietta, PA	1	Bracket hydroelectric dams near the state line
SUSQ 10.0*	Susquehanna River, Conowingo, MD	1	Bracket hydroelectric dams near the state line

* No macroinvertebrate sample collected in 2004-2005

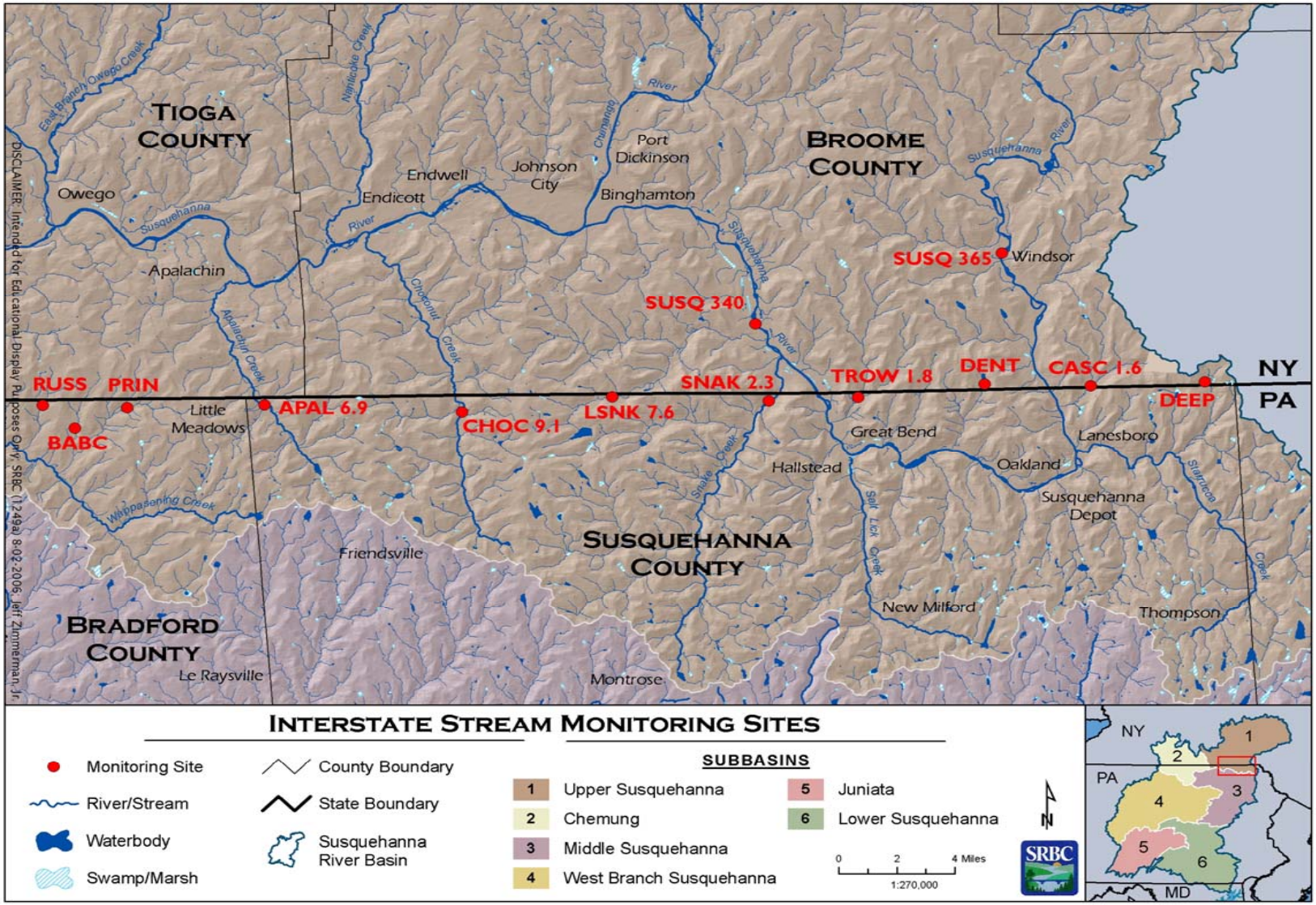

Figure 1. Interstate Streams Along the New York-Pennsylvania Border Between Russell Run and Deep Hollow Brook

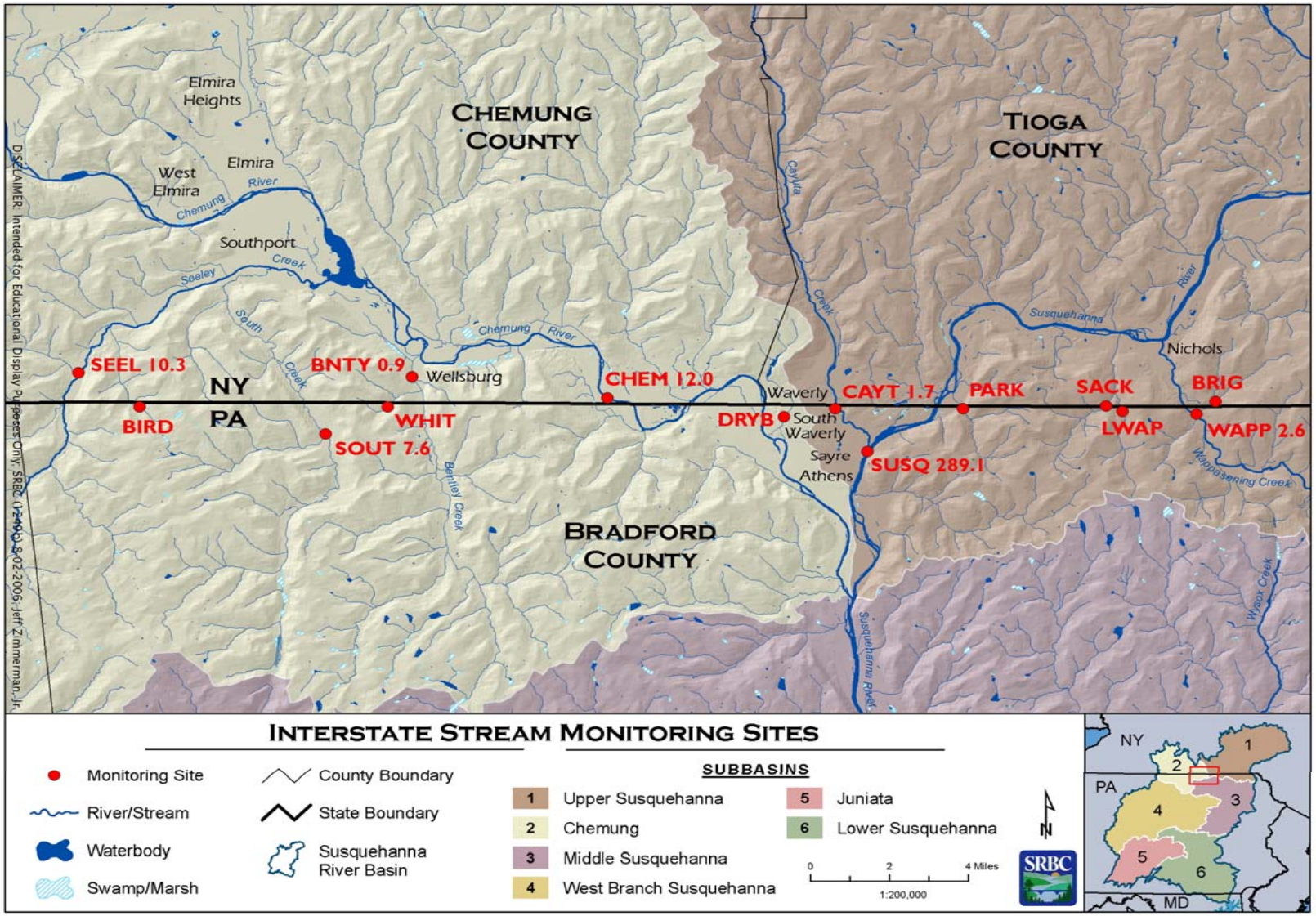

Figure 2. Interstate Streams Along the New York-Pennsylvania Border Between Seeley Creek and Briggs Hollow

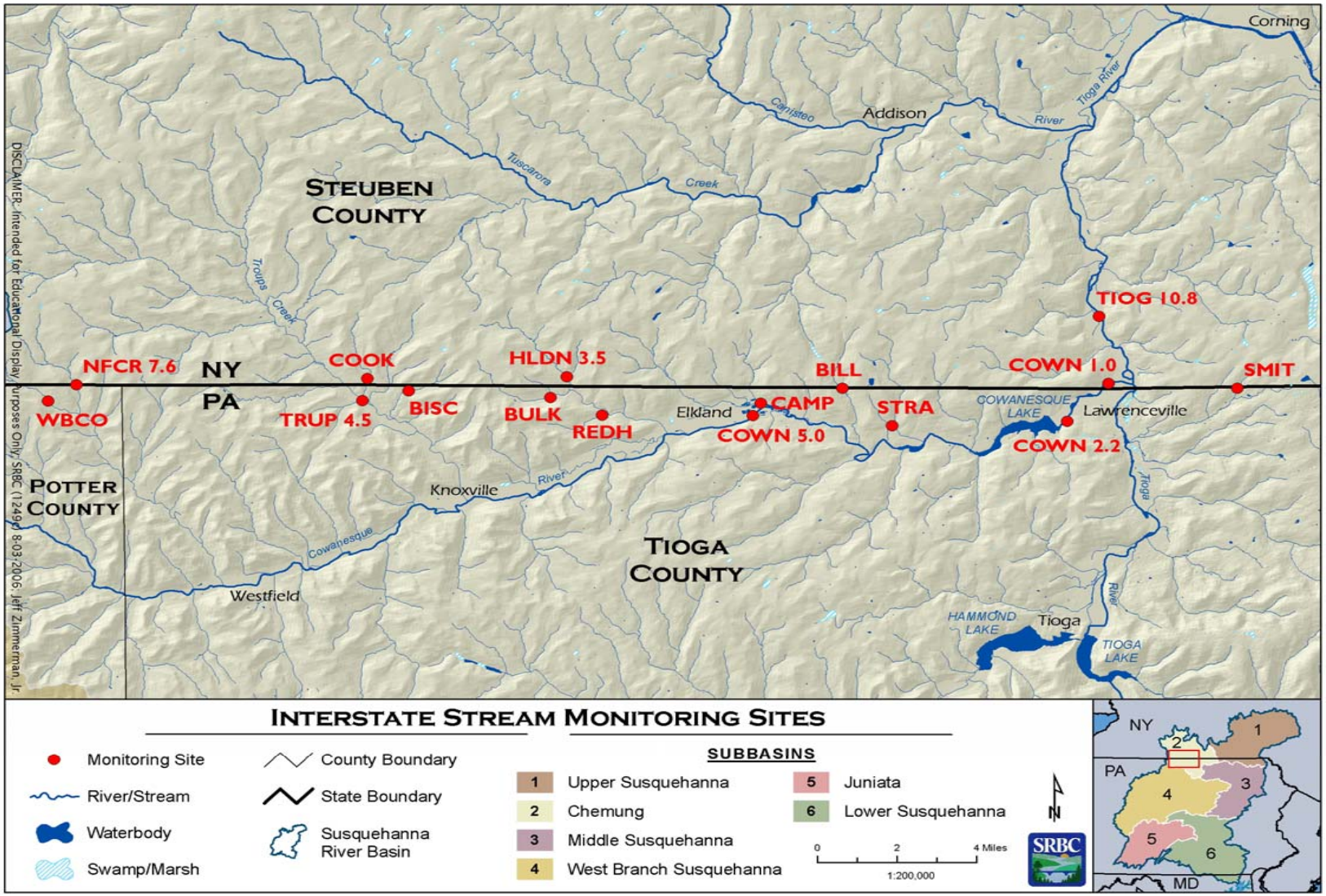

Figure 3. Interstate Streams Along the New York-Pennsylvania Border Between White Branch Cowanesque River and Smith Creek

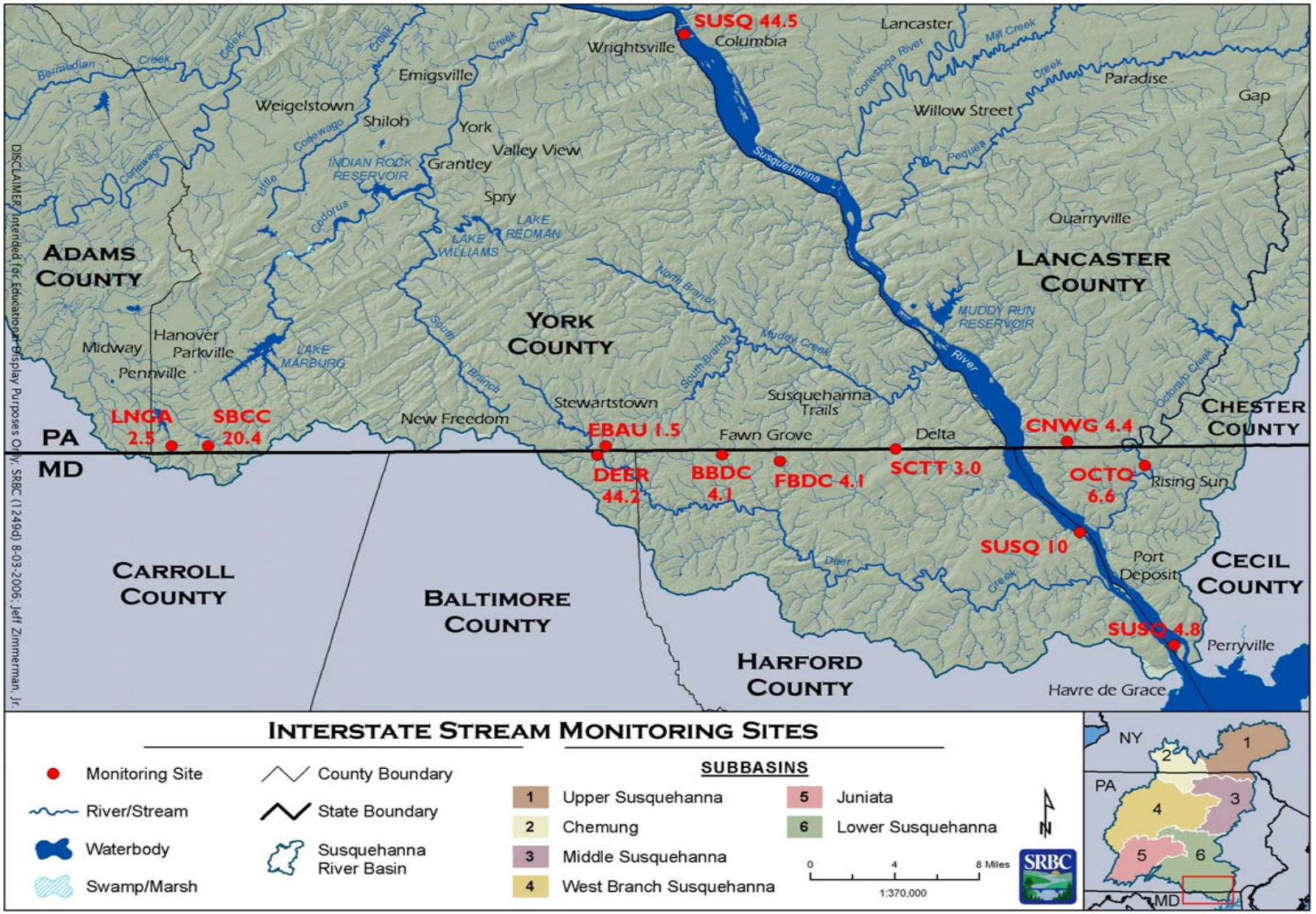

Figure 4. Interstate Streams Along the Pennsylvania-Maryland Border

Table 4. Monitored Parameters

Parameter	STORET Code
Physical	
Discharge	00060
Temperature	00010
Chemical	
Field Analyses	
Conductivity	00095
Dissolved Oxygen	00300
pH	00400
Alkalinity	00410
Acidity	00435
Laboratory Analyses	
Solids, Total	00500
Ammonia as Nitrogen, Total	00610
Nitrite as Nitrogen, Total	00615
Nitrate as Nitrogen, Total	00620
Nitrogen, Total	00600
Phosphorus, Total	00665
Orthophosphate, Total	70507
Organic Carbon, Total	00680
Calcium, Total	00916
Magnesium, Total	00927
Chloride, Total	00940
Sulfate, Total	00945
Iron, Total	01045
Manganese, Total	01055
Aluminum, Total	01105
Turbidity	82079

Macroinvertebrate and physical habitat sampling

SRBC staff collected benthic macroinvertebrate samples from Group 1 and Group 2 stations between July 13 and August 26, 2004, and from Group 3 streams between May 23 and 25, 2004. The benthic macroinvertebrate community was sampled to provide an indication of the biological condition of the stream. Macroinvertebrates are defined as aquatic insects and other invertebrates too large to pass through a No. 30 sieve.

Benthic macroinvertebrate samples were analyzed using field and laboratory methods described in Rapid Bioassessment Protocol for Use in Streams and Rivers by Barbour and others (1999). Sampling was performed using a 1-meter-square kick screen with size No. 30 mesh. The kick screen was stretched across the current to collect organisms dislodged from riffle/run areas by physical agitation of the stream substrate. Two kick screen samples were collected from a representative riffle/run at each station. The two samples were composited and preserved in denatured ethyl alcohol for later laboratory analysis.

In the laboratory, composite samples were sorted into 200-organism subsamples using a gridded pan and a random numbers table. The organisms contained in the subsamples were identified to genus (except Chironomidae and Oligochaeta) and enumerated using keys developed by Merrit and Cummins (1996), Peckarsky and others (1990), and Pennak (1989). Each taxon was assigned an organic pollution tolerance value and a functional feeding category as outlined in Appendix B. A taxa list for each station can be found in Appendix C.

Physical habitat conditions at each station were assessed using a slightly modified version of the habitat assessment procedure outlined by Barbour and others (1999). Eleven habitat parameters were field-evaluated at each site and used to calculate a site-specific habitat assessment score. Habitat parameters were evaluated on a scale of 0 to 20 and were based on instream composition, channel morphology, and riparian zone and bank conditions. Some of the parameters to be evaluated varied based on whether the stream was characterized by riffles and runs or by glides and pools. Table 5 summarizes criteria used to evaluate habitat parameters.

Data Synthesis Methods

Chemical water quality

Results of laboratory analysis for chemical parameters were compared to New York, Pennsylvania, and Maryland State water quality standards. In addition, a simple WQI was calculated, using procedures established by McMorran and Bollinger (1990). The WQI was used to make comparisons between sampling periods and stations within the same geographical region; therefore, the water quality data were divided into two groups. One group contained stations along the NY-PA border, and the other group contained stations along the PA-MD border. The data in each group were sorted by parameter and ranked by increasing order of magnitude, with several exceptions. Dissolved oxygen was ranked by decreasing order of magnitude, while pH, alkalinity, acidity, calcium, and magnesium were not included in the WQI analysis. The values of each chemical analysis were divided by the highest ranking value in the group to obtain a percentile. The WQI score was calculated by averaging all percentile ranks for each sample. WQI scores range from 1 to 100, and high WQI scores indicate poor water quality. Water quality scores and a list of parameters exceeding standards for each site can be found in the "Bioassessment of Interstate Streams" section, beginning on page 33.

Reference category designations

Three reference sites were included in this study. These three sites represented the best available suite of conditions, in terms of biological community, water quality, and habitat for each of the categories. Sites located on the NY-PA border were compared to Cascade Creek (CASC 1.6) at Lanesboro, PA. Cascade Creek represented the best combination of biological, water quality, and habitat conditions in the Northern Appalachian Plateau and Uplands Ecoregion. Since only three macroinvertebrate samples were collected on the river stations during fiscal year 2005, these samples (SUSQ 365, COWN 1.0 and COWN 2.2) were included in the analysis for the NY-PA border sites. Deer Creek (DEER 44.2) near Gorsuch Mills, MD, served as the reference site for sampling stations located on the PA-MD border. Deer Creek had the best combination of biological, water quality, and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987). Deep Hollow Brook (DEEP) near Danville, NY, served as the reference site for Group 3 sites, as it had the best biological, habitat, and field chemistry conditions of these sites.

Table 5. Criteria Used to Evaluate Physical Habitat

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
1. Epifaunal Substrate (R/R)[1]	Well-developed riffle/run; riffle is as wide as stream and length extends 2 times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than 2 times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the width; some cobble present.	Riffle or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
1. Epifaunal Substrate (G/P)[2]	Preferred benthic substrate abundant throughout stream site and at stage to allow full colonization (i.e. log/snags that are not new fall and not transient).	Substrate common but not prevalent or well suited for full colonization potential.	Substrate frequently disturbed or removed.	Substrate unstable or lacking.
2. Instream Cover (R/R)	> 50% mix of boulders, cobble, submerged logs, undercut banks or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat availability less than desirable.	< 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
2. Instream Cover (G/P)	> 50% mix of snags, submerged logs, undercut banks or other stable habitat; rubble, gravel may be present.	30-50% mix of stable habitat; adequate habitat for maintenance of populations.	10-30% mix of stable habitat; habitat availability less than desirable.	Less than 10% stable habitat; lack of habitat obvious.
3. Embeddedness [a] (R/R)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediments.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediments.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediments.	Gravel, cobble, and boulder particles are >75% surrounded by fine sediments.
3. Pool Substrate Characterization (G/P)	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
4. Velocity/Depth Regimes [b] (R/R)	All 4 velocity/depth regimes present (slow/deep, slow/shallow, fast/deep, fast/shallow).	Only 3 of 4 regimes present (if fast/shallow is missing, score lower than if missing other regimes).	Only 2 of 4 regimes present (if fast/shallow or slow/shallow are missing, score low).	Dominated by 1 velocity/depth regime.
4. Pool Variability [c] (G/P)	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.

Table 5. Criteria Used to Evaluate Physical Habitat—Continued

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
5. Sediment Deposition (R/R)	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; >50% of the bottom changing frequently; pools almost absent due to sediment deposition.
5. Sediment Deposition (G/P)	Less than 20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of island of point bars.	20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation.	50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial movement during storm events.	Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to substantial sediment deposition.
6. Channel Flow Status (R/R) (G/P)	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
7. Channel Alteration [d] (R/R) (G/P)	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 yr) may be present, but not recent.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; >80% of the reach channelized and disrupted.
8. Frequency of Riffles (R/R)	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the stream width is between 15-25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is >25.
8. Channel Sinuosity (G/P)	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bend in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long time.
9. Condition of Banks [e] (R/R) (G/P)	Banks stable; no evidence of erosion or bank failure, little potential for future problems; <5% of bank affected; on Glide/Pool streams side slopes generally <30%.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion; on Glide/Pool streams side slopes up to 40% on one bank; slight erosion potential in extreme floods.	Moderately unstable, 30-60% of banks in reach have areas of erosion; high erosion potential during floods; on Glide/Pool streams side slopes up to 60% on some banks.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars; on Glide/Pool streams side slopes > 60% common.
(score each bank 0-10)	**(9-10)**	**(6-8)**	**(3-5)**	**(0-2)**

Table 5. Criteria Used to Evaluate Physical Habitat—Continued

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
10. Vegetative Protective Cover (R/R) (G/P)	>90% of the streambank surfaces covered by vegetation; vegetative disruption through grazing or mowing minimal.	70-90% of the streambank surfaces covered by vegetation; disruption evident but not affecting full plant growth potential to any great extent.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation.	<50% of the streambank surfaces covered by vegetation; disruption is very high; vegetation removed to 5 cm or less.
(score each bank 0-10)	**(9-10)**	**(6-8)**	**(3-5)**	**(0-2)**
11. Riparian Vegetative Zone Width (R/R) (G/P)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width or riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
(score each bank 0-10)	**(9-10)**	**(6-8)**	**(3-5)**	**(0-2)**

[1]R/R – Riffle/Run — Habitat assessment parameters used for streams characterized by riffles and runs.

[2]G/P – Glide/Pool — Habitat assessment parameters used for streams characterized by glides and pools.

[a] Embeddedness — The degree to which the substrate materials that serve as habitat for benthic macroinvertebrates and for fish spawning and egg incubation (predominantly cobble and/or gravel) are surrounded by fine sediment. Embeddedness is evaluated with respect to the suitability of these substrate materials as habitat for macroinvertebrates and fish by providing shelter from the current and predators and by providing egg deposition and incubation sites.

[b] Velocity/Depth Regimes — The general guidelines are 0.5 m depth to separate shallow from deep, and 0.3 m/sec to separate fast from slow.

[c] Pool Variability — Rated based on the variety and spatial complexity of slow- or still-water habitat within the sample segment. It should be noted that even in high-gradient segments, functionally important slow-water habitat may exist in the form of plunge-pools and/or larger eddies. General guidelines are any pool dimension (i.e., length, width, oblique) greater than half the cross-section of the stream for separating large from small and 1 m depth separating shallow and deep.

[d] Channel Alteration — A measure of large-scale changes in the shape of the stream channel. Channel alteration includes: concrete channels, artificial embankments, obvious straightening of the natural channel, rip-rap, or other structures.

[e] Condition of Banks — Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks and are therefore considered to be unstable. Left and right bank orientation is determined by facing downstream.

Source: Modified from Barbour and others, 1999.

Biological and physical habitat conditions

Benthic macroinvertebrate samples were assessed using procedures described by Barbour and others (1999), Klemm and others (1990), and Plafkin and others (1989). Using these methods, staff calculated a series of biological indexes for a stream and compared them to a reference station in the same region to determine the degree of impairment. The metrics used in this survey are summarized in Table 6. Metric 2 (Shannon Diversity Index) followed the methods described in Klemm and others (1990), and all other metrics were taken from Barbour and others (1999).

The 200-organism subsample data were used to generate scores for each of the seven metrics. Scores for metrics 1-4 were converted to a biological condition score, based on the percent similarity of the metric score, relative to the metric score of the reference site. Scores for metrics 5-7 were based on set scoring criteria developed for the percentages (Plafkin and others, 1989; Ohio Environmental Protection Agency, 1987b). The sum of the biological condition scores constituted the total biological score for the sample site, and total biological scores were used to assign each site to a biological condition category (Table 7). Habitat assessment scores of sample sites were compared to those of reference sites to classify each sample site into a habitat condition category (Table 8).

Trend analysis

Long-term trend analysis has been performed on Group 1 streams that have been sampled since April 1986 to identify increases and decreases over time in total suspended solids, total ammonia, total nitrogen, total phosphorus, total chloride, total sulfate, total iron, total manganese, total aluminum, and the WQI. Overall these long-term trends do not change very much from year to year. Therefore, SRBC has decided to analyze for trends every five years. A trend analysis will not be performed in this report. The next trend analysis will be in the 2008 Interstate Report.

The nonparametric trend test used in previous reports was the Seasonal Kendall Test, which is described by Bauer and others (1984), and Smith and others (1982). For more information on this test and how it was used to assess trends in the data see Trends in Nitrogen, Phosphorus, and Suspended Sediment in the Susquehanna River Basin, 1974-93 (Edwards, 1995), LeFevre (2003), and other previous Interstate reports.

RESULTS

Water Quality

During fiscal year 2005, water quality in approximately 40 percent of the Group 1 and Group 2 interstate streams continued to meet designated use classes and water quality standards (Table 9, Appendix D). Nineteen out of the 32 sites had parameters exceeding water quality standards, with 16 of those having more than one violation. The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Seventy-two out the 734 possible observations (based on the number of applicable water quality standards of each state) exceeded water quality standards.

Table 6. Summary of Metrics Used to Evaluate the Overall Biological Integrity of Stream and River Benthic Macroinvertebrate Communities

Metric	Description
1. Taxonomic Richness (a)	The total number of taxa present in the 200 organism subsample. Number decreases with increasing stress.
2. Shannon Diversity Index (b)	A measure of biological community complexity based on the number of equally or nearly equally abundant taxa in the community. Index value decreases with increasing stress.
3. Modified Hilsenhoff Biotic Index (a)	A measure of the organic pollution tolerance of a benthic macroinvertebrate community. Index value increases with increasing stress.
4. EPT Index (a)	The total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa present in the 200 organism subsample. Number decreases with increasing stress.
5. Percent Ephemeroptera (a)	The percentage of Ephemeroptera in the 200 organism subsample. Ratio decreases with increasing stress.
6. Percent Dominant Taxa (a)	Percentage of the taxon with the largest number of individuals out of the total number of macroinvertebrates in the sample. Percentage increases with increasing stress.
7. Percent Chironomidae (a)	The percentage of Chironomidae in a 200 organism subsample. Ratio increases with increasing stress.

Sources: (a) Barbour and others, 1999
(b) Klemm and others, 1990

Table 7. Summary of Criteria Used to Classify the Biological Conditions of Sample Sites

SAMPLING AND ANALYSIS

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TOTAL BIOLOGICAL SCORE DETERMINATION

Metric	Biological Condition Scoring Criteria			
	6	4	2	0
1. Taxonomic Richness (a)	>80 %	79 – 60 %	59 – 40 %	<40 %
2. Shannon Diversity Index (a)	>75 %	74 – 50 %	49 – 25 %	<25 %
3. Modified Hilsenhoff Biotic Index (b)	>85 %	84 – 70 %	69 – 50 %	<50 %
4. EPT Index (a)	>90 %	89 – 80 %	79 – 70 %	<70 %
5. Percent Ephemeroptera (c)	>25 %	10 – 25 %	1 – 9 %	<1 %
6. Percent Chironomidae (c)	<5 %	5 – 20 %	21 – 35 %	>36 %
7. Percent Dominant Taxa (c)	<20 %	20 – 30 %	31 – 40 %	>40 %
Total Biological Score (d)				

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BIOASSESSMENT

Percent Comparability of Study and Reference Site Total Biological Scores (e)	Biological Condition Category
>83	Nonimpaired
79 - 54	Slightly Impaired
50 - 21	Moderately Impaired
<17	Severely Impaired

(a) Score is study site value/reference site value X 100.
(b) Score is reference site value/study site value X 100.
(c) Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
(d) Total Biological Score = the sum of Biological Condition Scores assigned to each metric.
(e) Values obtained that are intermediate to the indicated ranges will require subjective judgment as to the correct placement into a biological condition category.

Table 8. Summary of Criteria Used to Classify the Habitat Conditions of Sample Sites

DETERMINATION OF HABITAT ASSESSMENT SCORES				
	Habitat Parameter Scoring Criteria			
Parameter	Excellent	Good	Fair	Poor
Epifaunal Substrate	20-16	15-11	10-6	5-0
Instream Cover	20-16	15-11	10-6	5-0
Embeddedness/Pool Substrate	20-16	15-11	10-6	5-0
Velocity/Depth Regimes/Pool Variability	20-16	15-11	10-6	5-0
Sediment Deposition	20-16	15-11	10-6	5-0
Channel Flow Status	20-16	15-11	10-6	5-0
Channel Alteration	20-16	15-11	10-6	5-0
Frequency of Riffles/Channel Sinuosity	20-16	15-11	10-6	5-0
Condition of Banks (a)	20-16	15-11	10-6	5-0
Vegetative Protective Cover (a)	20-16	15-11	10-6	5-0
Riparian Vegetative Zone Width (a)	20-16	15-11	10-6	5-0
Habitat Assessment Score (b)				

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↓
↓

HABITAT ASSESSMENT	
Percent Comparability of Study and Reference Site Habitat Assessment Scores	**Habitat Condition Category**
>90	Excellent (comparable to reference)
89-75	Supporting
74-60	Partially Supporting
<60	Nonsupporting

(a) Combined score of each bank
(b) Habitat Assessment Score = Sum of Habitat Parameter Scores

Table 9. Stream Classifications

Stream	PA Classification *	NY Classification *
Apalachin Creek	CWF	C
Babcock Run	CWF	C
Beagle Hollow	WWF	C
Bentley Creek	WWF	C
Bill Hess Creek	WWF	C
Bird Creek	CWF	C
Biscuit Hollow	CWF	C
Briggs Hollow	CWF	C
Bulkley Brook	WWF	C
Camp Brook	WWF	C
Cascade Creek	CWF	C
Cayuta Creek	WWF	B
Chemung River	WWF	A
Choconut Creek	WWF	C
Cook Hollow	CWF	C
Cowanesque River	WWF	C
Deep Hollow Brook	CWF	C
Denton Creek	CWF	C
Dry Brook	WWF	C
Little Snake Creek	CWF	C
Little Wappasening Creek	WWF	C
North Fork Cowanesque River	CWF	C
Parks Creek	WWF	C
Prince Hollow Run	CWF	C
Russell Run	CWF	C
Sackett Creek	WWF	C
Seeley Creek	CWF	C (T)
Smith Creek	WWF	C
Snake Creek	CWF	C
South Creek	CWF	C
Strait Creek	WWF	C
Susquehanna River	WWF	B
Tioga River	WWF	C
Trowbridge Creek	CWF	C
Troups Creek	CWF	C
Wappasening Creek	CWF	C
White Branch Cowanesque River	WWF	C
White Hollow	WWF	C
Stream	**PA Classification**	**MD Classification ***
Big Branch Deer Creek	CWF	III-P
Conowingo Creek	CWF	I-P
Deer Creek	CWF	III-P
Ebaughs Creek	CWF	III-P
Falling Branch Deer Creek	CWF	IV-P
Long Arm Creek	WWF	I-P
Octoraro Creek	WWF-MF	IV-P
Scott Creek	TSF	I-P
South Branch Conewago Creek	WWF	I-P
Susquehanna River	WWF	I-P

* See Appendix D for stream classification descriptions

Table 10. Water Quality Standard Summary

Parameter	Standard	Standard Value	Number of Observations	Number Exceeding Standards
Alkalinity	PA aquatic life	20 mg/l	91	5
Total Iron	NY aquatic (chronic) PA aquatic life	300 µg/l 1500 ug/l	59 91	24 7
Total Aluminum	NY aquatic (chronic)	100 µg/l	59	24
Total Chlorine	NY aquatic (acute) MD aquatic life	0.019 mg/l 0.019 mg/l	6 3	5 3
Nitrite plus Nitrate	PA public water supply	10 mg/l	91	4

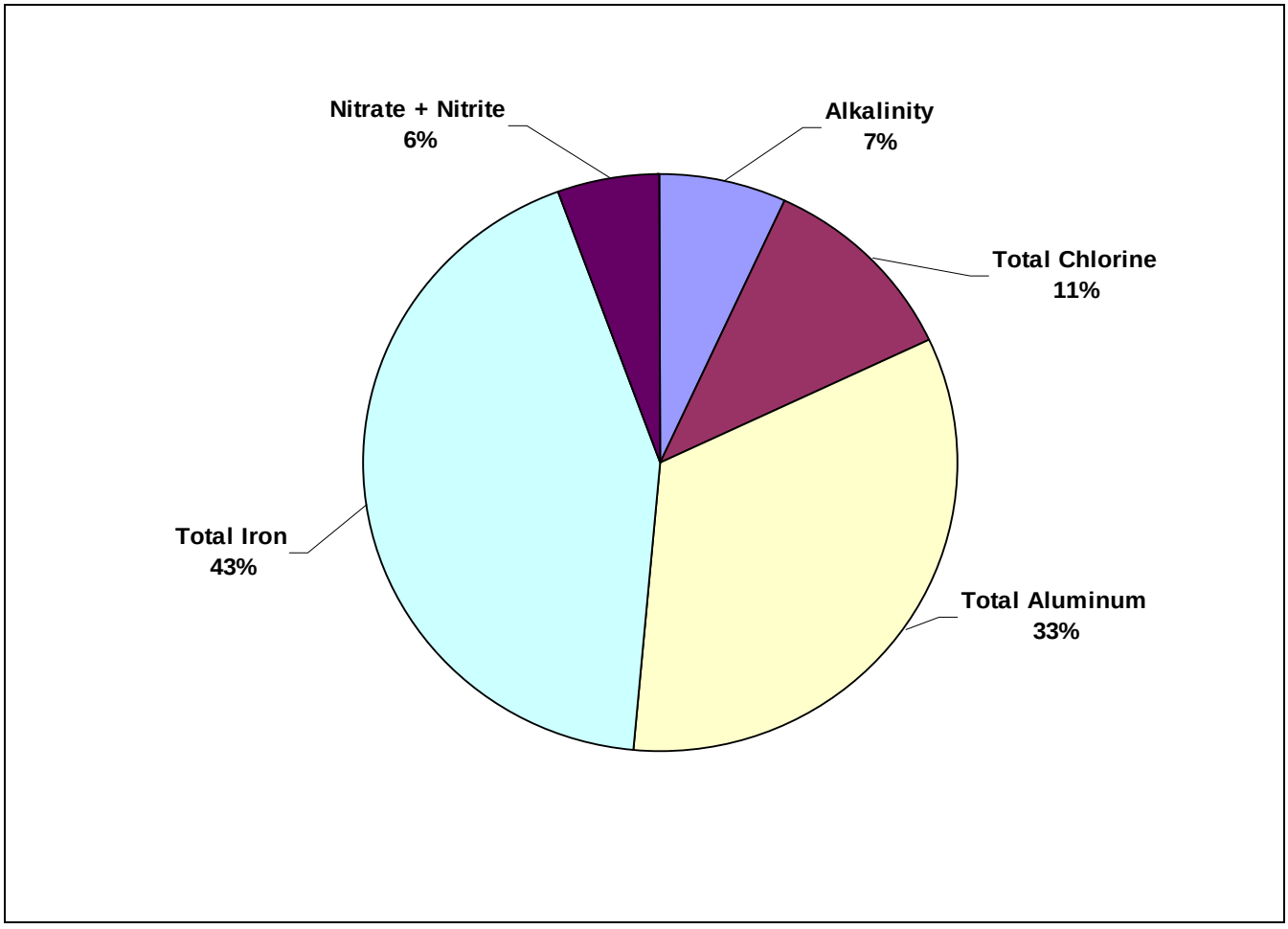


Figure 5. Parameters Exceeding Water Quality Standards

Biological Communities and Physical Habitat

RBP III biological data for NY-PA, PA-MD, river sites, and Group 3 streams are summarized in Tables 11 through 14, respectively. A high rapid bioassessment protocol score indicates a low degree of impairment and a healthy macroinvertebrate population. RBP III results for each site can be found in the "Bioassessment of Interstate Streams" section, beginning on page 38.

RBP III physical habitat data for NY-PA, PA-MD, river sites, and Group 3 streams are presented in Tables 15 through 18, respectively. A high score indicates a high-quality physical habitat. RBP III physical habitat and biological data are summarized in Figures 6 through 8.

New York-Pennsylvania streams

New York-Pennsylvania sampling stations consisted of 14 sites located near or on the NY-PA border. The biological community of ten (71.4 percent) of these streams was nonimpaired, and four stream sites were slightly impaired (28.5 percent). None of the streams were moderately or severely impaired. Eight of the NY-PA sites had excellent habitats (57.1 percent), while six sites (42.9 percent) had supporting habitats. No sites had partially supporting or nonsupporting habitat.

Pennsylvania-Maryland streams

The PA-MD interstate streams included nine stations (biological data were collected at eight sites during fiscal year 2005) located on or near the PA-MD border. Two streams (25 percent) were designated nonimpaired, using RBP III protocol designations. Six sites (75 percent) were slightly impaired. Seven (77.8 percent) of the PA-MD border sites had excellent habitats, while one site (11.1 percent) had supporting habitats, and one site (11.1 percent) had partially supporting habitat. Island Branch is not sampled due to its small size.

River sites

River sites consisted of nine stations located on the Susquehanna, Chemung, Cowanesque, and Tioga Rivers. One station (SUSQ 10.0) is not sampled for macroinvertebrates due to deep water and a lack of riffle habitat at the site. During fiscal year 2005, high flows precluded macroinvertebrate sampling and habitat assessment of five stations: SUSQ 340.0, SUSQ289.1, SUSQ 44.5, CHEM 12.0, and TIOG 10.8. The biological community of the remaining stations, the Susquehanna River at Windsor, NY, and the two sites on the Cowanesque River, were compared to Cascade Creek, the reference site for the New York – Pennsylvania border streams. The biological communities of two of the river stations (SUSQ 365 and COWN 1.0) were designated as nonimpaired, while the Cowanesque River at Lawrenceville (COWN 2.2) was moderately impaired. The habitat for the Susquehanna River at Windsor, NY was rated as excellent, and the habitat at both Cowanesque River sites was rated as supporting.

Group 3 sites

Group 3 sampling stations consisted of 20 sites on small streams located along the NY-PA border. Eight of the 20 sites sampled (40 percent) had nonimpaired biological conditions. Eight sites (40 percent) were slightly impaired, and four sites (20 percent) were moderately impaired. Four (20 percent) of the Group 3 sites had excellent habitat scores. Ten sites (50 percent) had supporting habitat conditions, while six sites (30 percent) were designated partially supporting, and no sites were nonsupporting.

Table 11. Summary of New York-Pennsylvania Border RBP III Biological Data

	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Raw Summary														
Number of Individuals	265	236	229	238	248	198	245	210	255	233	218	222	248	223
% Shredders	0	0.9	0.9	0.0	0.4	5.1	0.4	22.4	0.8	6.9	1.4	0.9	2.0	0.0
% Collector-Gatherers	30.2	15.3	8.7	10.5	16.1	37.4	8.6	16.2	41.2	31.8	7.8	41.4	69.4	57.9
% Filterer-Collectors	12.5	36.9	46.3	12.6	39.1	31.3	55.9	20.0	26.3	23.6	26.2	13.1	10.9	20.2
% Scrapers	32.8	14.4	10.9	67.2	24.6	15.7	8.6	19.1	21.2	15.0	38.1	19.4	10.1	16.6
% Predators	24.5	32.6	33.2	9.7	19.8	10.6	26.5	22.4	10.6	22.8	26.6	25.2	7.7	5.4
Number of EPT Taxa	12	16	12	14	13	16	11	10	12	17	9	13	11	13
Number of EPT Individuals	76	114	127	52	116	147	158	145	93	102	62	108	150	138
Metric Scores														
Taxonomic Richness	25	27	25	25	25	26	23	19	21	29	20	23	16	23
Shannon Diversity Index	2.49	2.7	2.7	2.3	2.7	2.7	2.4	2.5	2.2	2.7	2.2	2.4	1.9	2.3
Modified Hilsenhoff Biotic Index	4.51	4.2	3.8	4.3	4.3	4.5	3.8	3.2	5.1	3.9	4.0	4.4	5.0	4.8
EPT Index	12	16	12	14	13	16	11	10	12	17	9	13	11	13
Percent Ephemeroptera	12.1	19.9	12.2	5.0	12.5	36.4	2.0	17.6	15.7	12.5	1.8	20.7	47.9	52.5
Percent Chironomidae	24.2	9.3	7.9	3.8	10.5	7.6	5.7	6.2	34.1	24.9	6.4	15.8	34.3	23.3
Percent Dominant Taxa	24.2	20.3	15.7	27.7	18.9	20.2	26.9	21.2	34.1	24.9	24.8	19.4	34.3	27.8
Percent of Reference or Percentage Score														
Taxonomic Richness	100.0	108.0	100.0	100.0	100.0	104.0	92.0	76.0	84.0	116.0	80.0	92.0	64.0	92.0
Shannon Diversity Index	91.5	97.4	100.0	85.3	97.4	98.2	87.5	90.8	79.4	99.3	80.5	89.7	69.9	85.7
Hilsenhoff Index	84.1	89.5	100.0	89.1	87.9	84.6	98.9	120.1	75.0	96.8	94.0	86.4	75.9	79.7
EPT Index	100.0	133.3	100.0	116.7	108.3	133.3	91.7	83.3	100.0	141.7	75.0	108.3	91.7	108.3
Percent Ephemeroptera	12.1	19.9	12.2	5.0	12.5	36.4	2.0	17.6	15.7	12.5	1.8	20.7	48.0	52.5
Percent Chironomidae	24.2	9.3	7.9	3.8	10.5	7.6	5.7	6.2	34.1	24.9	6.4	15.8	34.3	23.3
Percent Dominant Taxa	24.2	20.3	15.7	27.7	19.0	20.2	26.9	21.9	34.1	24.9	24.8	19.4	34.3	27.8
Biological Condition Scores														
Taxonomic Richness	6	6	6	6	6	6	6	4	6	6	6	6	4	6
Shannon Diversity Index	6	6	6	6	6	6	6	6	6	6	6	6	4	6
Hilsenhoff Index	4	6	6	6	6	4	6	4	4	6	6	6	4	6
EPT Index	6	6	6	6	6	6	6	4	6	6	2	6	6	6
Percent Ephemeroptera	4	4	4	2	4	4	2	4	4	4	2	4	6	6
Percent Chironomidae	2	4	4	6	4	4	6	4	2	2	4	4	2	2
Percent Dominant Taxa	4	4	6	4	6	6	4	4	2	4	4	6	4	4
Total Biological Score														
Total Biological Score	32	36	38	36	38	36	36	30	30	34	30	38	30	36
Biological % of Reference	84	95	100	95	100	95	95	79	79	89	79	100	79	95

Table 12. Summary of Pennsylvania-Maryland Border RBP III Biological Data

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Raw Summary								
Number of Individuals	218	263	269	231	150	259	217	126
% Shredders	22.0	0.0	2.2	1.3	7.3	4.3	4.2	9.5
% Collector-Gatherers	15.1	32.3	11.9	29.0	47.3	39.4	8.3	30.9
% Filterer-Collectors	23.9	31.6	41.3	43.7	8.7	23.6	44.7	53.9
% Scrapers	23.9	28.9	30.9	22.9	32.0	31.7	31.3	0.8
% Predators	15.1	7.2	13.8	3.0	4.7	1.2	11.5	4.8
Number of EPT Taxa	12	6	13	10	8	10	9	4
Number of EPT Individuals	96	142	151	140	68	171	133	83
Taxonomic Richness	26	13	25	18	16	19	14	12
Shannon Diversity Index	2.6	2.0	2.6	2.1	2.0	2.2	1.9	2.1
Modified Hilsenhoff Biotic Index	3.7	5.3	4.4	4.7	4.8	5.1	4.3	5.0
EPT Index	12	6	13	10	8	10	9	4
Percent Ephemeroptera	9.2	21.3	12.3	16.9	32.7	48.3	10.6	13.5
Percent Chironomidae	4.1	9.9	3.4	8.7	6.7	5.4	0.5	11.9
Percent Dominant Taxa	21.6	27.0	19.7	29.4	32.7	32.8	35.5	31.8
Taxonomic Richness	104.0	52.0	100.0	72.0	64.0	76.0	56.0	48.0
Shannon Diversity Index	103.5	79.6	100.0	83.9	78.4	87.5	72.5	80.4
Hilsenhoff Index	121.3	83.8	100.0	93.7	91.8	86.6	104.2	88.6
EPT Index	92.3	46.2	100.0	76.9	61.5	76.9	69.2	30.8
Percent Ephemeroptera	9.2	21.3	12.3	16.9	32.7	48.3	10.6	13.5
Percent Chironomidae	4.1	9.9	3.3	8.7	6.7	5.4	0.5	11.9
Percent Dominant Taxa	21.6	27.0	19.7	29.4	32.7	32.8	35.5	31.8
Taxonomic Richness	6	2	6	4	4	4	2	2
Shannon Diversity Index	6	6	6	6	6	6	4	6
Hilsenhoff Index	6	4	6	6	6	6	6	6
EPT Index	6	0	6	2	0	2	0	0
Percent Ephemeroptera	2	4	4	4	6	6	4	4
Percent Chironomidae	6	4	6	4	4	6	6	4
Percent Dominant Taxa	4	4	6	4	2	2	2	2
Total Biological Score	36	24	40	30	28	32	24	24
Biological % of Reference	90	60	100	75	70	80	60	60

Table 13. Summary of River RBP III Biological Data

	COWN 1.0	COWN 2.2	SUSQ 365
Raw Summary			
Number of Individuals	242	210	324
% Shredders	5.0	12.9	0.3
% Collector-Gatherers	24.4	34.8	17.9
% Filterer-Collectors	38.0	50.0	39.8
% Scrapers	23.9	0.5	25.3
% Predators	8.7	1.9	16.7
Number of EPT Taxa	11	5	14
Number of EPT Individuals	120	109	186
Metric Scores			
Taxonomic Richness	20	13	23
Shannon Diversity Index	2.3	1.6	2.5
Modified Hilsenhoff Biotic Index	5.1	6.1	4.2
EPT Index	11	5	14
Percent Ephemeroptera	13.2	1.9	11.4
Percent Chironomidae	22.7	28.1	12.3
Percent Dominant Taxa	22.7	44.3	24.1
Percent of Reference or Percentage Score			
Taxonomic Richness	80.0	52.0	92.0
Shannon Diversity Index	83.1	59.6	91.9
Hilsenhoff Index	74.2	62.4	89.5
EPT Index	91.7	41.7	116.7
Percent Ephemeroptera	13.2	1.9	11.4
Percent Chironomidae	22.7	28.1	12.4
Percent Dominant Taxa	22.7	44.3	24.1
Biological Condition Scores			
Taxonomic Richness	6	2	6
Shannon Diversity Index	6	4	6
Hilsenhoff Index	4	2	6
EPT Index	6	0	6
Percent Ephemeroptera	4	2	4
Percent Chironomidae	2	2	4
Percent Dominant Taxa	4	0	4
Total Biological Score			
Total Biological Score	26	12	36
Biological % of Reference	68	32	95

Table 14. Summary of Group 3 Sites RBP III Biological Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Raw Summary											
Number of Individuals	210	234	217	223	255	197	258	184	265	223	257
% Shredders	11.4	20.1	10.1	12.1	9.0	1.5	17.1	2.7	11.3	4.5	2.7
% Collector-Gatherers	58.6	47.0	86.2	74.9	59.2	82.7	62.0	83.7	67.6	51.1	50.9
% Filterer-Collectors	0.9	6.4	1.8	2.7	13.7	0.5	8.5	0.0	5.7	6.7	37.7
% Scrapers	8.6	6.4	0.9	2.2	10.6	0.0	2.7	1.6	3.8	22.9	0.0
% Predators	20.5	20.0	0.9	8.1	7.5	15.2	9.7	10.3	11.7	14.8	1.6
Number of EPT Taxa	18	16	10	16	16	12	12	10	19	16	5
Number of EPT Individuals	113	152	136	95	177	89	145	102	126	145	93
Metric Scores											
Taxonomic Richness	23	23	14	20	23	15	20	14	22	24	10
Shannon Diversity Index	2.2	2.5	1.8	1.7	2.3	1.7	2.1	1.8	1.9	2.66	1.5
Modified Hilsenhoff Biotic Index	4.0	25.	3.7	4.0	4.8	3.5	4.1	3.1	4.2	3.78	5.6
EPT Index	18	16	10	16	16	12	12	10	19	16	5
Percent Ephemeroptera	24.8	20.0	50.7	22.9	42.4	23.4	24.8	20.7	18.5	48.0	0.4
Percent Chironomidae	42.4	27.8	35.9	54.7	22.4	52.8	39.9	40.8	50.6	25.6	50.6
Percent Dominant Taxa	42.4	27.8	35.9	54.7	33.3	52.8	39.9	40.8	50.6	25.6	50.6
Percent of Reference or Percentage Score											
Taxonomic Richness	95.8	95.8	58.3	83.3	95.8	62.5	83.3	58.3	91.7	100.0	41.7
Shannon Diversity Index	81.6	94.0	67.7	65.0	86.8	62.8	77.8	68.0	72.9	100.0	57.9
Hilsenhoff Index	93.6	151.2	101.9	94.2	79.1	108.6	91.8	123.8	89.8	100.0	67.3
EPT Index	112.5	100.0	62.5	100.0	100.0	75.0	75.0	62.5	118.8	100.0	31.3
Percent Ephemeroptera	24.8	20.1	50.7	22.9	42.4	23.4	24.8	20.7	18.5	48.0	0.4
Percent Chironomidae	42.4	27.8	35.9	54.7	22.4	52.8	39.9	40.8	50.6	25.6	50.6
Percent Dominant Taxa	42.4	27.8	35.9	54.7	33.3	52.8	39.9	40.8	50.6	25.6	50.6
Biological Condition Scores											
Taxonomic Richness	6	6	2	6	6	4	6	2	6	6	2
Shannon Diversity Index	6	6	4	4	6	4	6	4	4	6	4
Hilsenhoff Index	6	6	6	6	4	6	6	6	6	6	2
EPT Index	6	6	0	6	6	2	2	0	6	6	0
Percent Ephemeroptera	6	6	6	4	6	4	4	4	4	6	0
Percent Chironomidae	0	2	0	0	2	0	0	0	0	2	0
Percent Dominant Taxa	0	4	2	0	2	0	2	0	0	4	0
Total Biological Score											
Total Biological Score	30	36	20	26	32	20	26	16	26	36	8
Biological % of Reference	83	100	56	72	89	56	72	44	72	100	22

Table 14. Summary of Group 3 Sites RBP III Biological Data—Continued

	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Raw Summary									
Number of Individuals	184	207	236	261	246	252	215	383	208
% Shredders	7.6	3.4	2.1	1.2	0.8	24.2	2.3	0.5	15.4
% Collector-Gatherers	70.1	75.4	64.8	64.4	83.7	10.3	81.8	64.0	40.4
% Filterer-Collectors	1.1	1.9	6.4	0.4	0.4	30.6	0.5	29.5	2.4
% Scrapers	1.6	0.0	15.3	7.7	4.5	12.3	5.1	1.8	1.9
% Predators	19.0	19.3	11.4	26.4	10.6	22.6	8.8	3.4	39.9
Number of EPT Taxa	12	11	13	12	7	15	16	6	13
Number of EPT Individuals	125	125	139	156	89	171	182	133	171
Metric Scores									
Taxonomic Richness	15	15	21	16	9	28	21	11	16
Shannon Diversity Index	2.1	2.0	2.3	1.9	1.2	2.6	2.3	1.3	2.2
Modified Hilsenhoff Biotic Index	3.0	2.5	4.2	3.0	4.0	2.1	2.8	5.7	1.1
EPT Index	12	11	13	12	7	15	16	6	13
Percent Ephemeroptera	41.3	29.0	42.4	33.3	21.1	4.8	69.8	5.2	36.5
Percent Chironomidae	30.4	33.3	32.2	37.2	63.4	8.7	12.1	60.3	5.8
Percent Dominant Taxa	30.4	33.3	32.2	37.2	63.4	25.8	26.5	60.3	29.8
Percent of Reference or Percentage Score									
Taxonomic Richness	62.5	62.5	87.5	66.7	37.5	116.7	87.5	45.8	66.7
Shannon Diversity Index	79.3	75.2	87.6	71.8	46.6	97.0	86.5	47.4	81.2
Hilsenhoff Index	125.1	148.8	89.7	125.7	93.9	177.7	133.7	66.2	333.2
EPT Index	75.0	68.8	81.3	75.0	43.8	93.8	100.0	37.5	81.3
Percent Ephemeroptera	41.3	29.0	42.4	33.3	21.1	4.8	69.8	5.2	36.5
Percent Chironomidae	30.4	33.3	32.2	37.2	63.4	8.7	12.1	60.3	5.8
Percent Dominant Taxa	30.4	33.3	32.2	37.2	63.4	25.8	26.5	60.3	29.8
Biological Condition Scores									
Taxonomic Richness	4	4	6	4	0	6	6	2	4
Shannon Diversity Index	6	4	6	4	2	6	6	2	6
Hilsenhoff Index	6	6	6	6	6	6	6	2	6
EPT Index	2	0	4	2	0	6	6	0	4
Percent Ephemeroptera	6	6	6	6	4	2	6	2	6
Percent Chironomidae	2	2	2	0	0	4	4	0	4
Percent Dominant Taxa	2	2	2	2	0	4	4	0	4
Total Biological Score									
Total Biological Score	28	24	32	24	12	34	38	8	34
Biological % of Reference	78	67	89	67	33	94	106	22	94

Table 15. Summary of New York-Pennsylvania Sites Physical Habitat Data

	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Epifaunal Substrate	17	15	16	17	17	16	17	16	18	16	18	12	17
Instream Cover	15	16	17	16	17	17	17	16	17	16	17	16	17
Embeddedness/Pool Substrate	16	17	16	16	17	16	17	15	17	17	17	15	16
Velocity/Depth Regimes/Pool Variability	17	15	15	17	15	15	15	17	16	15	15	16	18
Sediment Deposition	11	15	16	17	16	18	16	11	16	12	18	12	11
Channel Flow Status	15	14	17	15	14	17	15	15	15	13	18	15	16
Channel Alteration	10	16	11	11	15	11	15	15	15	12	10	14	13
Frequency of Riffles/Channel Sinuosity	17	17	17	16	17	17	16	16	16	16	17	15	16
Condition of Banks	6	14	11	10	14	15	15	10	10	14	10	10	10
Left Bank	2	7	6	4	7	8	7	5	5	7	4	3	5
Right Bank	4	7	5	6	7	7	8	5	5	7	6	7	5
Vegetative Protective Cover	6	16	10	14	16	16	16	16	14	14	11	14	13
Left Bank	3	8	5	8	8	8	8	8	7	7	6	7	6
Right Bank	3	8	5	6	8	8	8	8	7	7	5	7	7
Riparian Vegetative Zone Width	6	16	5	6	14	10	16	6	6	4	6	4	16
Left Bank	2	7	4	3	7	5	8	4	3	2	2	2	8
Right Bank	4	9	1	3	7	5	8	2	3	2	4	2	8
Total Habitat Score													
Total Habitat Score	136	171	151	155	172	168	175	153	160	149	157	143	163
Habitat Percent of Reference	80	100	88	91	101	98	102	89	94	87	92	84	95

Table 16. Summary of Pennsylvania-Maryland Sites Physical Habitat Data

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Epifaunal Substrate	17	17	16	15	16	7	17	16	14
Instream Cover	16	17	16	14	16	6	17	8	15
Embeddedness/Pool Substrate	15	15	15	14	15	8	13	14	14
Velocity/Depth Regimes/Pool Variability	14	17	16	14	15	12	17	14	15
Sediment Deposition	14	14	15	15	10	7	14	10	14
Channel Flow Status	15	16	17	17	15	16	16	14	14
Channel Alteration	15	15	15	15	15	13	15	15	11
Frequency of Riffles/Channel Sinuosity	16	15	16	15	16	10	16	15	14
Condition of Banks	10	12	11	11	15	14	12	12	10
Left Bank	6	7	7	7	9	7	6	6	6
Right Bank	4	5	4	4	6	7	6	6	4
Vegetative Protective Cover	14	14	15	16	16	14	13	12	10
Left Bank	7	7	9	8	8	7	7	6	7
Right Bank	7	7	6	8	8	7	6	6	3
Riparian Vegetative Zone Width	16	10	2	4	16	2	6	16	5
Left Bank	8	6	1	2	9	1	2	8	4
Right Bank	8	4	1	2	7	1	4	8	1
Total Habitat Score									
Total Habitat Score	162	162	154	150	165	109	156	146	136
Habitat Percent of Reference	105	105	100	97	107	71	101	95	88

Table 17. Summary of River Sites Physical Habitat Data

	APAL 6.9*	COWN 1.0	COWN 2.2	SUSQ 365
Epifaunal Substrate	15	16	12	18
Instream Cover	15	16	12	17
Embeddedness/Pool Substrate	15	15	14	17
Velocity/Depth Regimes/Pool Variability	16	16	14	17
Sediment Deposition	15	16	12	15
Channel Flow Status	17	16	16	17
Channel Alteration	14	14	14	16
Frequency of Riffles/Channel Sinuosity	5	5	5	8
Condition of Banks	11	10	12	11
Left Bank	6	5	6	5
Right Bank	5	5	6	6
Vegetative Protective Cover	12	16	16	14
Left Bank	6	8	8	7
Right Bank	6	8	8	7
Riparian Vegetative Zone Width	4	5	2	10
Left Bank	2	3	1	6
Right Bank	2	2	1	4
Total Habitat Score				
Total Habitat Score	139	145	129	160
Habitat Percent of Reference	81	85	75	94

**Apalachin Creek exhibited glide/pool habitat characteristics*

Table 18. Summary of Group 3 Sites Physical Habitat Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Epifaunal Substrate	15	16	13	10	13	10	15	13	15	14	10
Instream Cover	16	15	15	13	11	10	16	15	15	14	11
Embeddedness/Pool Substrate	16	15	12	11	8	12	13	12	12	16	15
Velocity/Depth Regimes/Pool Variability	10	8	9	10	10	11	10	8	12	10	7
Sediment Deposition	15	11	11	10	10	12	10	11	11	17	12
Channel Flow Status	11	10	10	10	13	8	5	12	10	11	9
Channel Alteration	14	13	10	11	12	10	11	12	12	16	13
Frequency of Riffles/Channel Sinuosity	15	16	16	16	16	10	13	16	16	16	10
Condition of Banks	10	8	5	6	14	10	10	10	12	11	14
Left Bank	4	4	3	3	7	5	6	7	6	5	7
Right Bank	6	4	2	3	7	5	4	3	6	6	7
Vegetative Protective Cover	16	16	16	16	16	10	18	16	18	16	16
Left Bank	9	8	8	8	8	5	9	8	9	8	8
Right Bank	7	8	8	8	8	5	9	8	9	8	8
Riparian Vegetative Zone Width	15	16	13	16	2	2	19	15	10	16	17
Left Bank	10	10	4	6	1	1	9	9	6	8	9
Right Bank	5	6	9	10	1	1	10	6	4	8	8
Total Habitat Score											
Total Habitat Score	153	144	130	129	121	105	140	140	143	157	134
Habitat Percent of Reference	97	92	83	82	77	67	89	89	91	100	85

Table 18. Summary of Group 3 Sites Physical Habitat Data - continued

	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Epifaunal Substrate	11	14	11	11	13	10	16	14	12
Instream Cover	13	15	14	11	13	11	14	12	14
Embeddedness/Pool Substrate	13	12	14	14	12	5	13	8	11
Velocity/Depth Regimes/Pool Variability	5	8	10	10	7	6	8	8	9
Sediment Deposition	5	6	6	7	5	11	11	10	5
Channel Flow Status	5	6	10	9	6	10	8	10	10
Channel Alteration	5	5	10	10	4	15	12	11	10
Frequency of Riffles/Channel Sinuosity	15	12	11	13	11	10	16	16	16
Condition of Banks	4	4	5	6	6	14	7	14	6
Left Bank	2	2	2	4	3	7	4	7	3
Right Bank	2	2	3	2	3	7	3	7	3
Vegetative Protective Cover	16	14	14	11	14	18	10	16	16
Left Bank	8	7	7	5	7	9	5	8	8
Right Bank	8	7	7	6	7	9	5	8	8
Riparian Vegetative Zone Width	16	18	8	10	16	16	9	2	16
Left Bank	8	9	4	4	7	9	4	1	6
Right Bank	8	9	4	6	9	7	5	1	10
Total Habitat Score									
Total Habitat Score	108	114	113	112	107	126	124	121	125
Habitat Percent of Reference	69	73	72	71	68	80	79	77	80

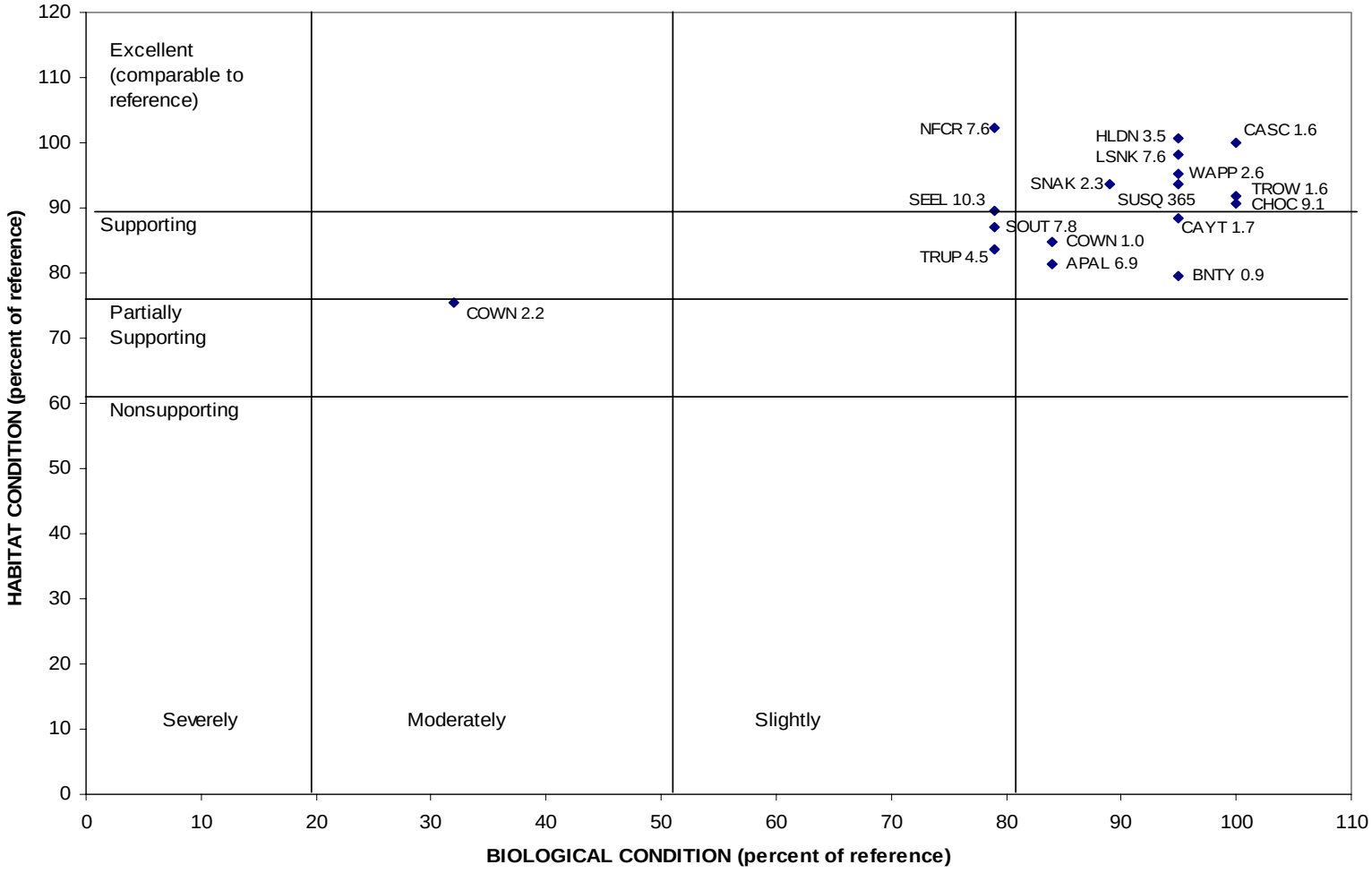


Figure 6. Summary of New York–Pennsylvania Border Streams and River Habitat and Biological Condition Scores

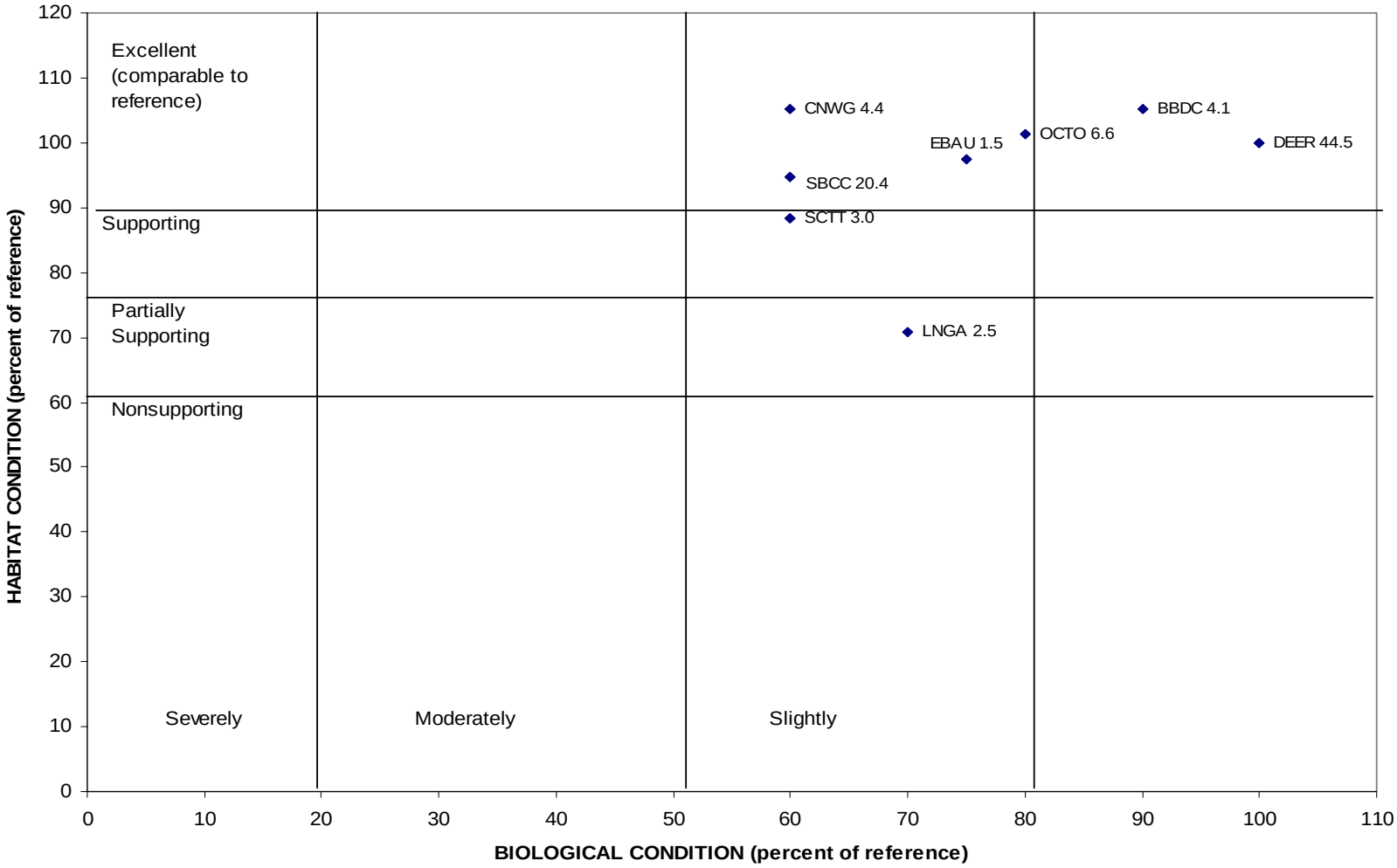


Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

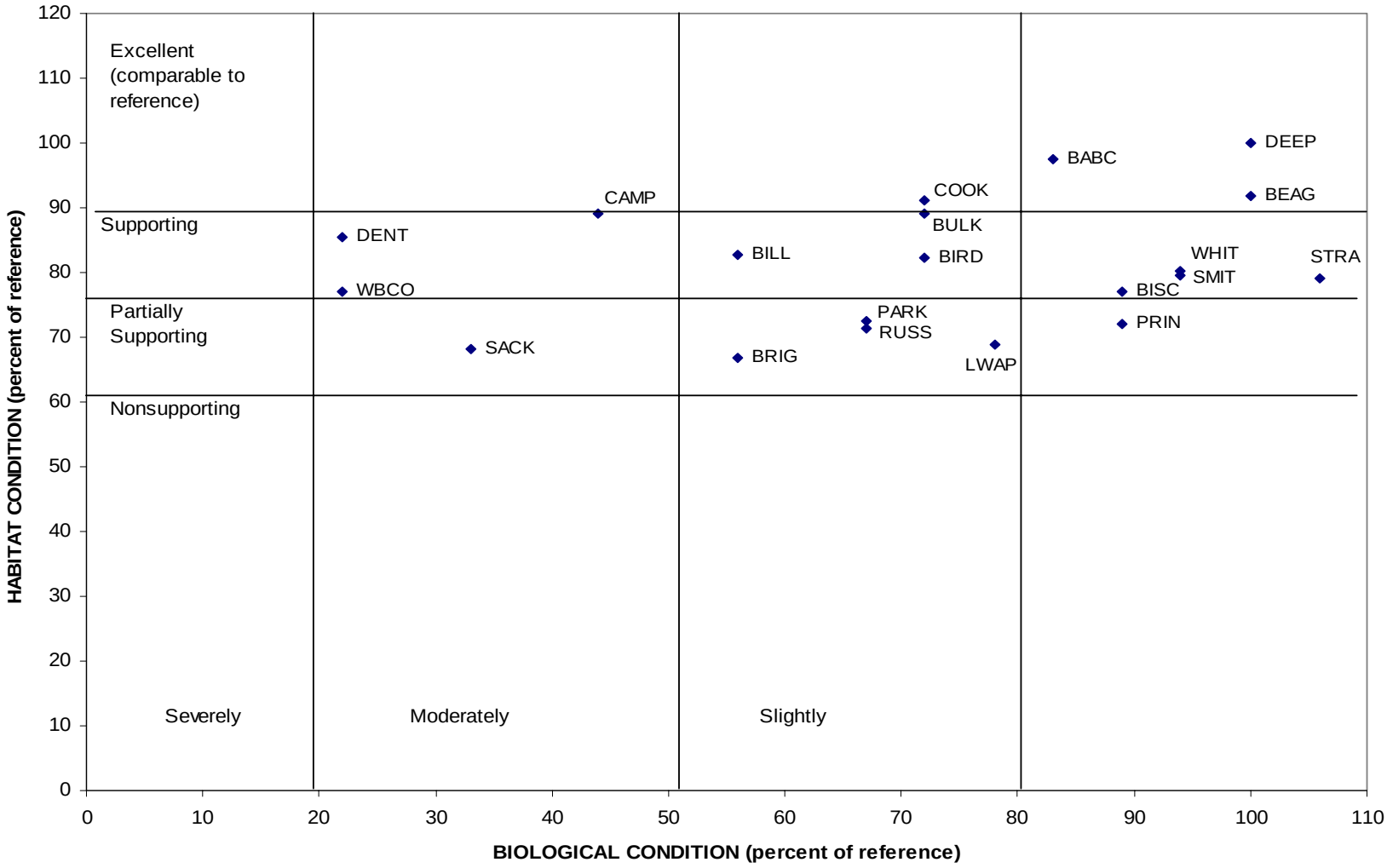


Figure 8. Summary of Group 3 Streams Habitat and Biological Condition Scores

BIOASSESSMENT OF INTERSTATE STREAMS

Abbreviations for water quality standards are provided in Table 19. Summaries of all stations include WQI scores, parameters that exceeded water quality standards, and parameters that exceeded the 90th percentile at each station. RBP III biological and habitat data also are provided, along with graphs depicting historical water quality and biological conditions over the past five years. A white bar indicates fiscal year 2005 WQI scores, and black bars in all WQI graphs indicate previous WQI scores.

New York-Pennsylvania Border Streams

Apalachin Creek (APAL 6.9)

Apalachin Creek at Little Meadows, PA, (APAL 6.9), showed a nonimpaired biological community during fiscal year 2005 for the second consecutive year. Habitat was rated as supporting, with low scores for frequency of riffles and riparian vegetative zone width. Staff noted that substrate had been disturbed due to a recent high water event.

There were no parameters that exceeded water quality standards during August 2004. This is the first time during the past five years that total iron has not exceeded water quality standards in Apalachin Creek. The WQI again decreased slightly from the previous year, reaching its lowest value in six years (Table 20).

Bentley Creek (BNTY 0.9)

A nonimpaired biological community existed at Bentley Creek in Wellsburg, NY, (BNTY 0.9) in August 2004, after a rating of slightly impaired the previous year. This site received a high rating for taxonomic richness, Shannon Diversity Index and EPT Index. Habitat was rated supporting, with low scores given for channel alteration, condition of banks, and vegetative protective cover. The Bradford County Conservation District in Pennsylvania and the U.S. Fish and Wildlife Service conducted a stream stabilization project on this stream. Rock structures, such as cross vanes and single rock vanes, have been constructed in portions of the stream to redirect the force of the flow.

During fiscal year 2000, water quality sampling at BNTY 0.9 was increased to quarterly sampling, and the stream was added to the Group 1 stations. Total iron and total aluminum concentrations exceeded New York standards during February 2005, and dissolved oxygen and temperature each exceeded the 90th percentile one time during the year (Table 21).

Table 19. Abbreviations Used in Tables 20 Through 51

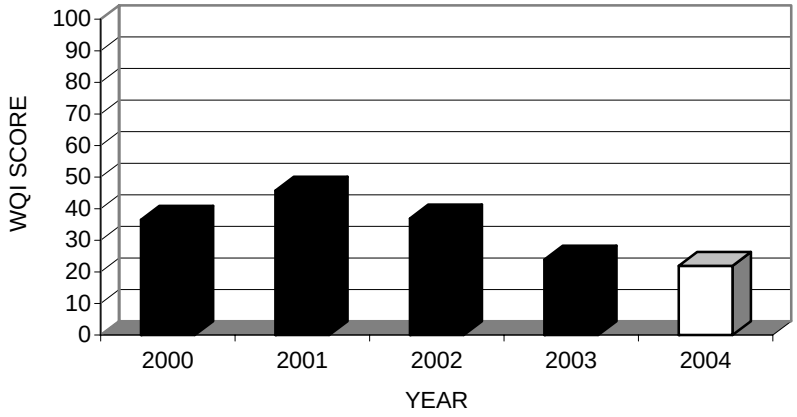
Abbreviation	Parameter	Abbreviation	Parameter
ALK	Alkalinity	TNO3	Total Nitrate
COND	Conductivity	TN	Total Nitrogen
TAl	Total Aluminum	DO	Dissolved Oxygen
TCa	Total Calcium	TP	Total Phosphorus
TCl	Total Chloride	TPO4	Total Orthophosphate
TFe	Total Iron	TS	Total Solids
TMg	Total Magnesium	TSO4	Total Sulfate
TMn	Total Manganese	TOC	Total Organic Carbon
TNH3	Total Ammonia	TURB	Turbidity
TNO2	Total Nitrite	WQI	Water Quality Index
TCln	Total Chorine	RBP	Rapid Bioassessment Protocol
SS	Suspended Sediment		

Table 20. Water Quality Summary Apalachin Creek at Little Meadows, Pa.

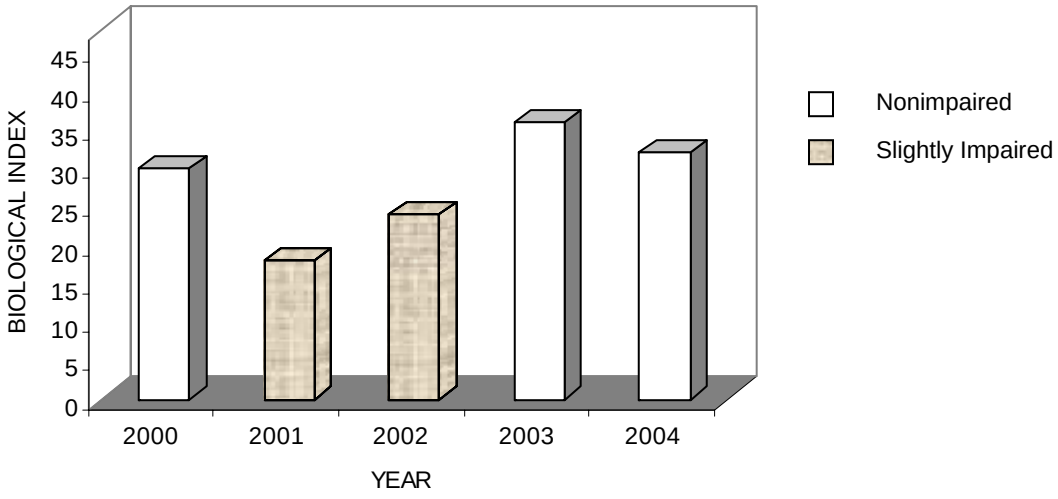
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/25/04	21.9	None							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.49
RBP Score	32
RBP Condition	Nonimpaired
Total Habitat Score	139
Habitat Condition Category	Supporting



Water Quality Index



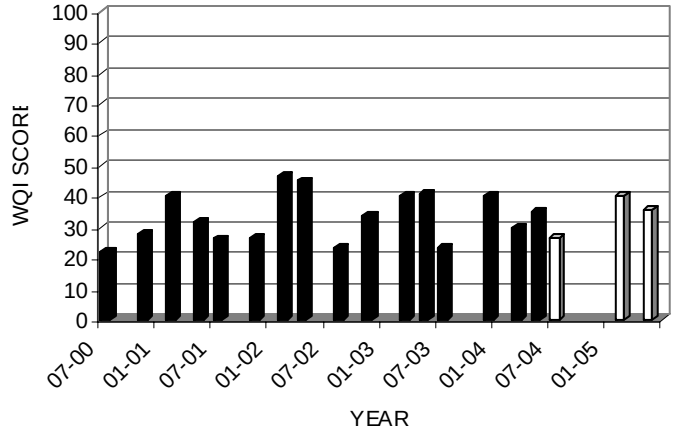
Biological Index

Table 21. Water Quality Summary Bentley Creek at Wellsburg, N.Y.

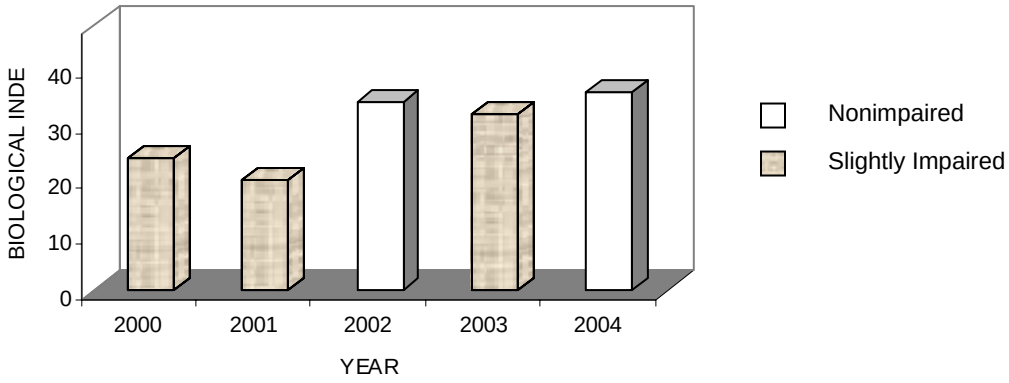
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	02/15/05	298 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/15/05	337 ug/l	300 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/20/04	26.6	None							
02/15/05	40.0	DO							
05/10/05	36.0	Temp							

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	2.65
RBP III Score	36
RBP III Condition	Nonimpaired
Total Habitat Score	136
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Cascade Creek (CASC 1.6)

Cascade Creek at Lanesboro, PA, (CASC 1.6) served as the reference site for the NY-PA streams in fiscal year 2005 because it had the best combination of biological, habitat, and water quality conditions. It had a nonimpaired biological community with high taxonomic richness and Shannon Diversity Index, as well as low values for percent Chironomidae and percent dominant taxa. Habitat conditions were rated as excellent, with high scores for embeddedness, instream cover, frequency of riffles, and riparian vegetative zone width.

Cascade Creek was added to the Group 1 streams during the 2000 sampling season to monitor conditions in the stream during the winter months. Cascade Creek did exceed the water quality standard for total iron in July 2004 and for alkalinity in October, February, and May (Table 22). High values for total iron and low alkalinity values are not uncommon in headwater glacial streams such as Cascade Creek and do occur naturally resulting from the local hydrogeology.

Cayuta Creek (CAYT 1.7)

Biological conditions of Cayuta Creek at Waverly, NY (CAYT 1.7) were rated nonimpaired, as they were during fiscal year 2004. This site had the lowest percent Chironomidae of all streams along the Pennsylvania-New York border. Habitat conditions were rated as supporting, with low scores for riparian vegetative zone width, channel alteration, and conditions of banks as Cayuta Creek is located in an urbanized area of Waverly, NY. Abundant algal growth was noted on the stream substrate as it has been in previous years.

CAYT 1.7 exceeded the New York aquatic (chronic) standard for total aluminum in February 2005; however, all other Cayuta Creek total aluminum samples for 2004-2005 remained below the detection limit of 200 micrograms per liter (µg/l). New York state standards for total iron were exceeded at CAYT 1.7 in February 2005. Several parameters exceeded the 90th percentile including dissolved oxygen, total phosphorus, total orthophosphate, total nitrate, and total solids (Table 23). The total chlorine values were 0.06 milligrams per liter (mg/l) in August, 0.04 mg/l in October, 0.1 mg/l in February and 0.04 mg/l in May. These values all exceed the New York aquatic life standard for total residual chlorine. This site is downstream of wastewater discharges from the Waverly sewage treatment facility. Additional concerns in the watershed include runoff from the City of Waverly, malfunctioning septic systems, and agriculture.

Choconut Creek (CHOC 9.1)

The biological index score for Choconut Creek at Vestal Center, NY, (CHOC 9.1) remained nonimpaired for the third consecutive year. The habitat was rated excellent; however it was given low ratings for riparian vegetative zone width and conditions of banks.

Total aluminum and total iron exceeded water quality standards in July 2004 with values of 226 µg/l and 442 µg/l, respectively. However, no parameters exceeded the 90th percentile (Table 24). The WQI increased slightly in 2005, indicating a decrease in overall water quality.

Holden Creek (HLDN 3.5)

The biological community at Holden Creek at Woodhull, NY (HLDN 3.5) was designated nonimpaired for the third consecutive year. During the July 2004 sampling event, Shannon Diversity Index and EPT index were both among the highest of all the NY-PA border streams. HLDN 3.5 was not sampled from in 2000 and 2001 due to low flow conditions.

No parameters exceeded water quality standards or the 90th percentile at HLDN 3.5 during July 2004. The WQI score was consistent with the WQI score that was calculated the past two years. The habitat was rated excellent, with high scores for epifaunal substrate, instream cover, and frequency of riffles. A salvage yard was located upstream of the sampling site.

Little Snake Creek (LSNK 7.6)

Little Snake Creek at Brackney, PA, (LSNK 7.6) was designated nonimpaired in July 2004 after being slightly impaired the previous summer. LSNK 7.6 had one of the lowest scores for percent Chironomidae of any of the NY-PA border streams. Little Snake Creek was not sampled during 2001 due to low flow conditions.

Water quality values exceeded water quality standards for total iron in three out of the four sampling periods (Table 26). Aluminum and alkalinity also exceeded water quality standards. Dissolved oxygen was above the 90th percentile in February 2005. Habitat was mostly forested with logging activities occurring upstream of the site. The habitat at LSNK 7.6 was rated excellent during 2004 with high scores for sediment deposition, instream cover, and frequency of riffles.

North Fork Cowanesque River (NFCR 7.6)

North Fork Cowanesque River at North Fork, PA, (NFCR 7.6) had a slightly impaired biological community for the second consecutive year. This rating was due mainly to a very low EPT Index and low taxonomic richness. The Hilsenhoff Index was low, probably due to the large number of organic-pollution intolerant stonefly, *Leuctra* (Plecoptera: Leuctridae), as was the case in 2003.

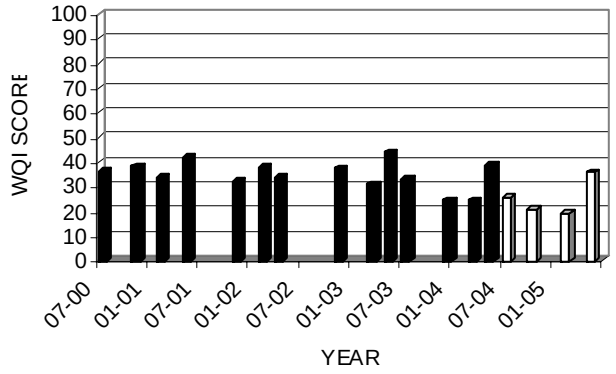
Total iron and total aluminum both exceeded the New York water quality standards, and total nitrogen and total nitrate exceeded the 90th percentile (Table 27). Habitat was rated excellent with the highest overall habitat score of all the NY-PA border streams. High scores were given for epifaunal substrate, instream cover, riparian vegetative zone width, and frequency of riffles. Land use at NFCR 7.6 was predominantly forest. This sampling site is often dry during July and August when Group 1 and 2 sampling is performed; therefore, macroinvertebrate samples have not been collected every year.

Table 22. Water Quality Summary Cascade Creek at Lanesboro, Pa.

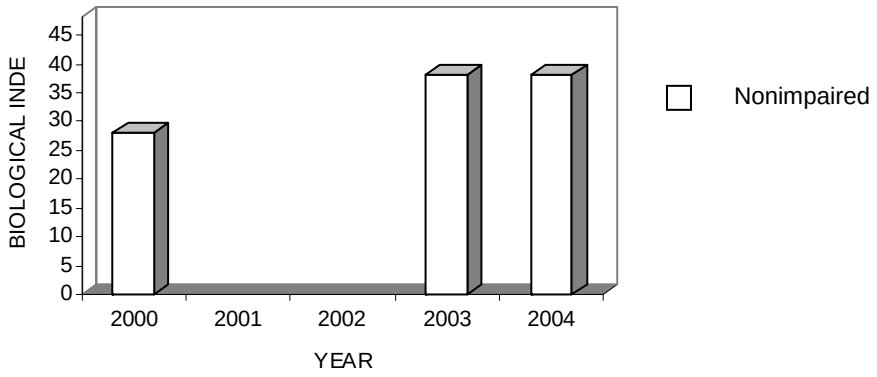
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/19/04	868 ug/l	300 ug/l	NY aquatic (chronic)
ALK	10/20/04	12 mg/l	20 mg/l	PA aquatic life
ALK	02/14//05	16 mg/l	20 mg/l	PA aquatic life
ALK	05/9/05	10 mg/l	20 mg/l	PA aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
7/19/04	25.8	DO							
10/20/04	21.0	None							
2/14/05	19.4	DO							
5/9/05	35.9	TFe							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.72
RBP III Score	38
RBP III Condition	Reference
Total Habitat Score	171
Habitat Condition Category	Reference



Water Quality Index



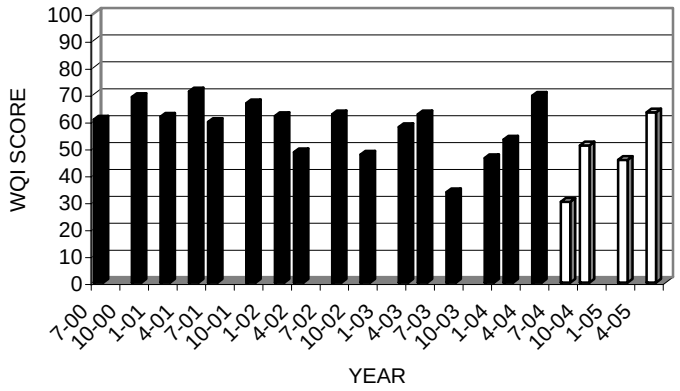
Biological Index

Table 23. Water Quality Summary Cayuta Creek at Waverly, N.Y.

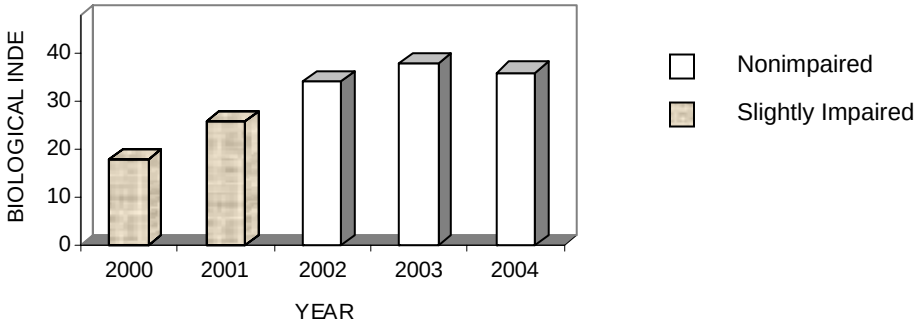
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TCln	08/26/04	0.06 mg/l	0.019 mg/l	NY aquatic (acute)
TCln	10/21/04	0.04 mg/l	0.019 mg/l	NY aquatic (acute)
TFe	02/15/05	372 ug/l	300 ug/l	NY aquatic (chronic)
TCln	02/15/05	0.1 mg/l	0.019 mg/l	NY aquatic (acute)
TAl	02/15/05	260 ug/l	100 ug/l	NY aquatic (chronic)
TCln	05/09/05	0.04 mg/l	0.019 mg/l	NY aquatic (acute)

Date	**WQI**	**Parameters Exceeding 90th Percentile**								
08/26/24	30.1	None								
10/21/04	51.0	TPO4	TP							
02/15/05	45.6	DO								
05/09/05	63.3	TPO4	TNO3	TP	TS					

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.32
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	151
Habitat Condition Category	Supporting



Water Quality Index



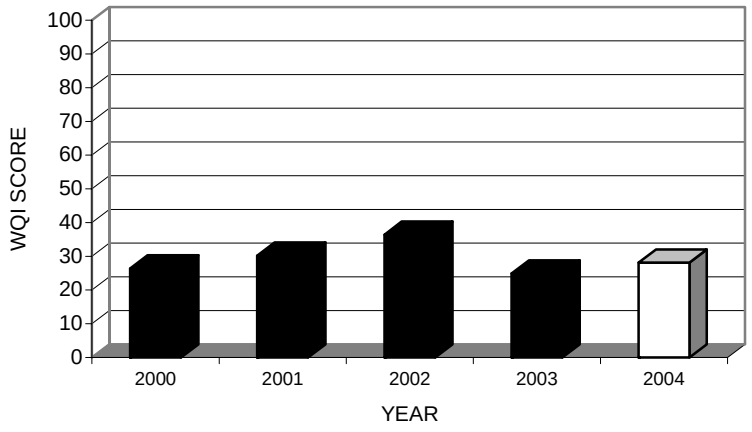
Biological Index

Table 24. Water Quality Summary Choconut Creek at Vestal Center, N.Y.

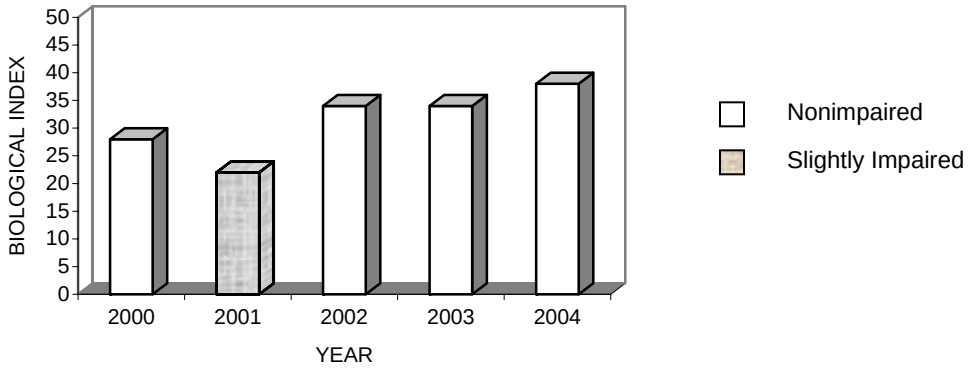
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	7/20/04	226 ug/l	100 ug/l	NY aquatic (chronic)
TFe	7/20/04	442 ug/l	300 ug/l	NY aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
7/20/04	28.1	None							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.65
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	155
Habitat Condition Category	Excellent



Water Quality Index



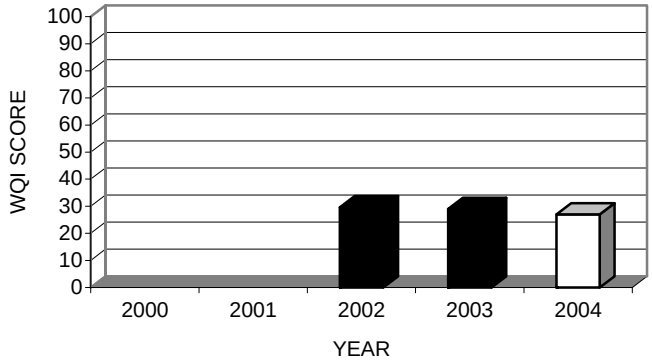
Biological Index

Table 25. Water Quality Summary Holden Creek at Woodhull, N.Y.

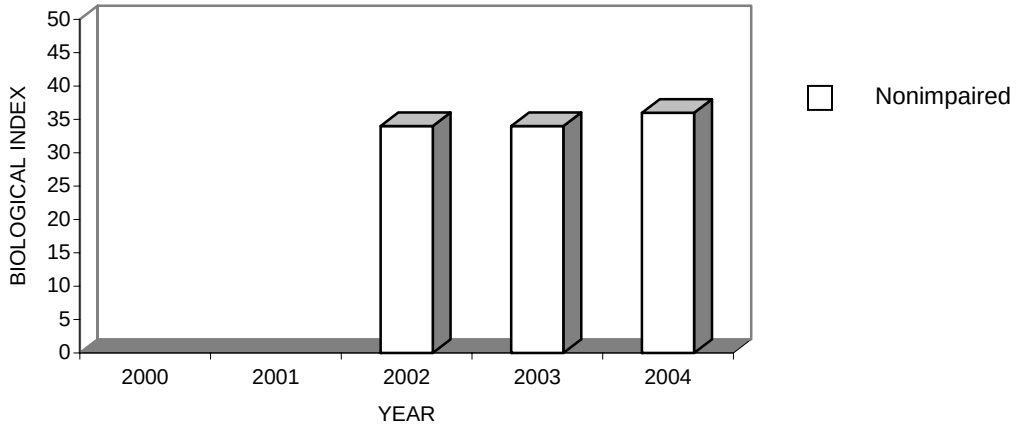
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/04	27.0	None							

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.67
RBP III Score	36
RBP III Condition	Nonimpaired
Total Habitat Score	172
Habitat Condition Category	Excellent



Water Quality Index



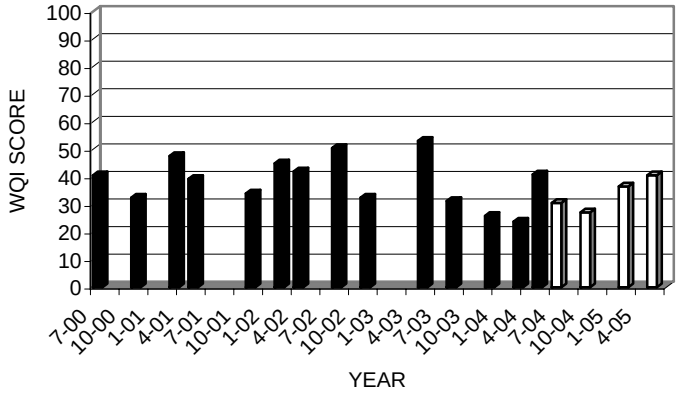
Biological Index

Table 26. Water Quality Summary Little Snake Creek at Brackney, Pa.

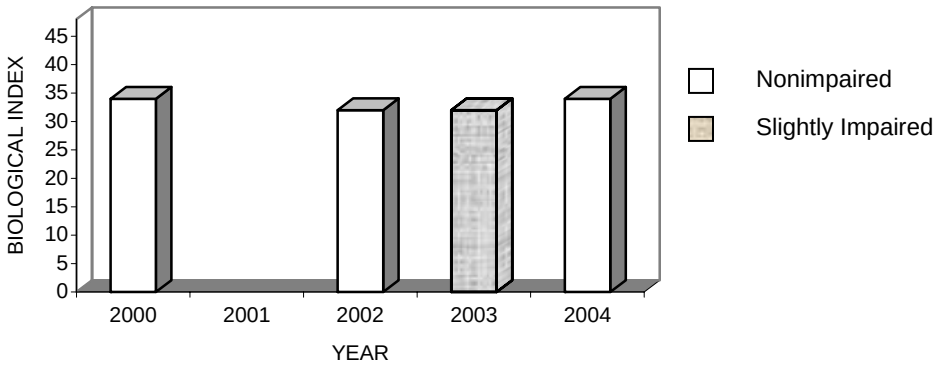
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/19/04	602 ug/l	300 ug/l	NY aquatic (chronic)
TFe	10/20/04	345 ug/l	300 ug/l	PA public water supply
ALK	02/14/05	18 mg/l	20 mg/l	PA aquatic life
TFe	02/14/05	411 ug/l	300 ug/l	NY aquatic (chronic)
TAl	02/14/05	205 ug/l	100 ug/l	NY aquatic (chronic)
ALK	05/09/05	16 mg/l	20 mg/l	PA aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/19/04	30.6	None							
10/20/04	27.2	None							
02/14/05	36.6	DO							
05/09/05	40.6	None							

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.38
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	168
Habitat Condition Category	Excellent



Water Quality Index



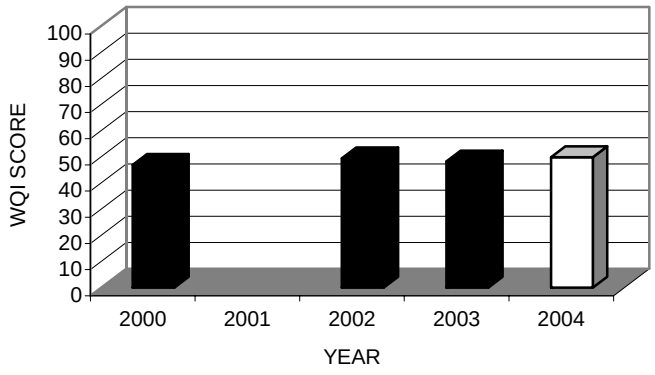
Biological Index

Table 27. Water Quality Summary North Fork Cowanesque River at North Fork, Pa.

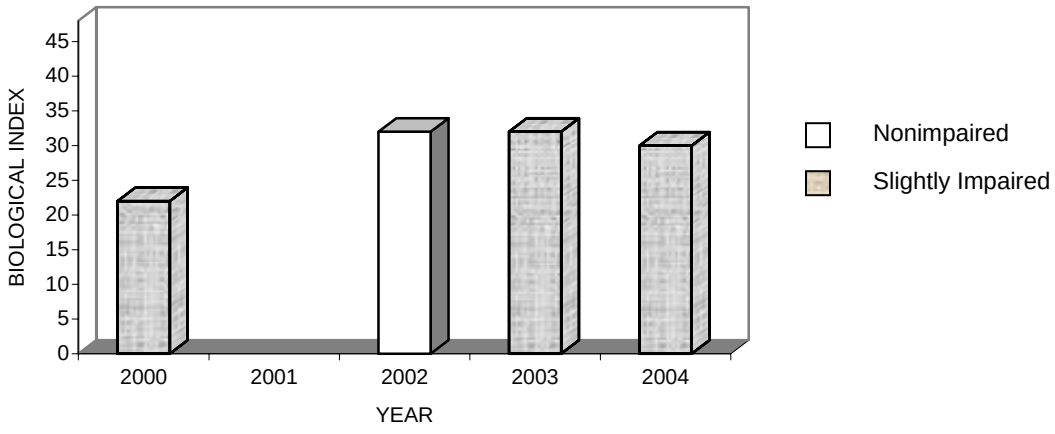
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/21/04	375 ug/l	300 ug/l	NY aquatic (chronic)
TAl	07/21/04	209 ug/l	100 ug/l	NY aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/04	49.8	TN	TNO3						

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.47
RBP III Score	32
RBP III Condition	Nonimpaired
Total Habitat Score	175
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Seeley Creek (SEEL 10.3)

During the 1999-2000 sampling season, Seeley Creek was added to the Group 1 streams in the ISWQN. In 2004, Seeley Creek at Seeley Creek, NY, (SEEL 10.3) contained a slightly impaired biological community for the third consecutive year, after being moderately impaired for the previous five years. However, this site had the worst scores for Hilsenhoff Biotic Index, percent Chironomidae, and percent dominant taxa of all the NY-PA border streams. Total aluminum exceeded NY water quality standards in October 2004. Dissolved oxygen exceeded the 90th percentile during three of the four sampling events (Table 28).

Habitat was rated as supporting in Seeley Creek, with low scores for riparian vegetative zone width, conditions of banks, and sediment deposition. Habitat conditions may be a possible cause for the impaired macroinvertebrate community. New York State Department of Conservation (NYSDEC) listed Seeley Creek as "threatened" in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel.

Snake Creek (SNAK 2.3)

Snake Creek at Brookdale, PA, (SNAK 2.3) had a nonimpaired biological community and excellent physical habitat. There were no parameters exceeding water quality standards or the 90th percentile at SNAK 2.3 during fiscal year 2005 (Table 29). The biological community has remained nonimpaired for the past eight years. Snake Creek supported many pollution intolerant taxa, including *Atherix* (Diptera: Athericidae), *Hexatoma* (Diptera: Tipulidae), *Leucrocuta* (Ephemeroptera: Heptageniidae), *Isonychia* (Ephemeroptera: Isonychiidae), *Paraleptophlebia* (Ephemeroptera: Leptophlebiidae), *Nigronia* (Megaloptera: Corydalidae), *Acroneuria* (Plecoptera: Perlidae), *Paragnetina* (Plecoptera: Perlidae), *Leuctra*, and Dolophilodes (Trichoptera: Philopotamidae). This site was given high habitat scores for epifaunal substrate, instream cover, and embeddedness.

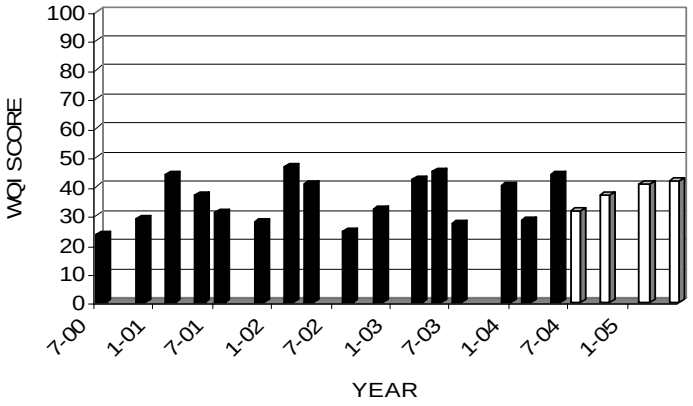
In 2000, SRBC staff conducted a small watershed study on the Snake Creek Watershed during the second year of the Upper Susquehanna Subbasin Survey (Diehl and Sitlinger, 2001). Ten sites in the Snake Creek Watershed and three sites on the Little Snake Creek Watershed were monitored during low and high flow for water quality, macroinvertebrates, and physical habitat. The study concluded that the Snake Creek Watershed was healthy and recommended that this watershed be protected. The Little Snake Creek Watershed showed signs of extensive dredging, and the study recommended that the riparian vegetation along areas of the stream be reestablished.

Table 28. Water Quality Summary Seeley Creek at Seeley Creek, N.Y.

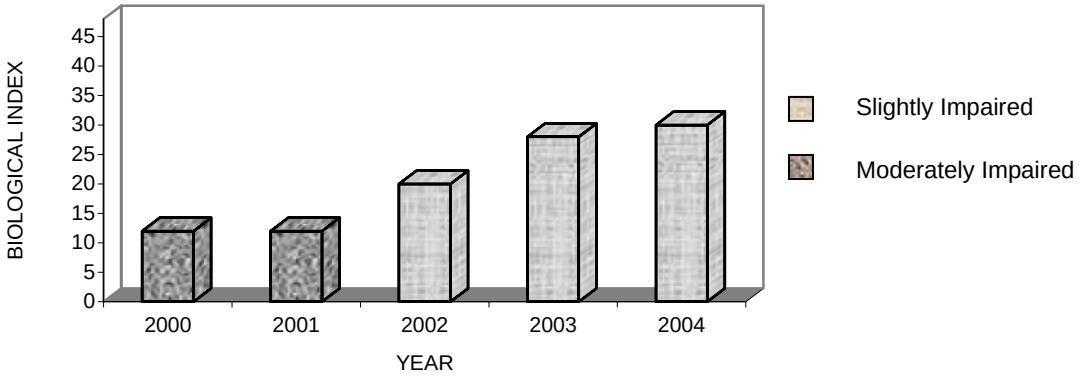
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	10/21/04	200 ug/l	100 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/20/04	31.5	DO	TEMP						
10/21/04	36.8	TOC							
02/15/05	40.6	DO							
05/10/05	41.7	DO	TEMP						

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.16
RBP III Score	30
RBP III Condition	Slightly Impaired
Total Habitat Score	153
Habitat Condition Category	Supporting



Water Quality Index



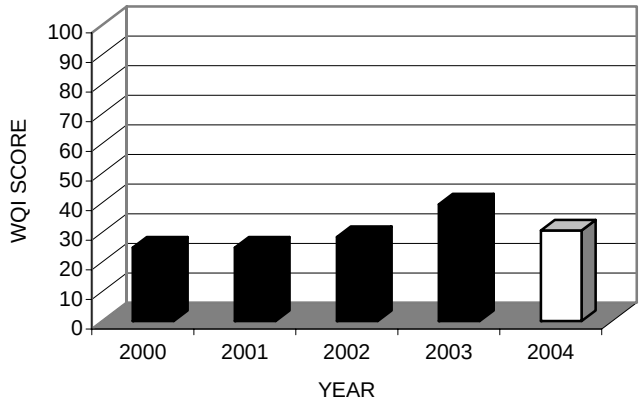
Biological Index

Table 29. Water Quality Summary Snake Creek at Brookdale, Pa.

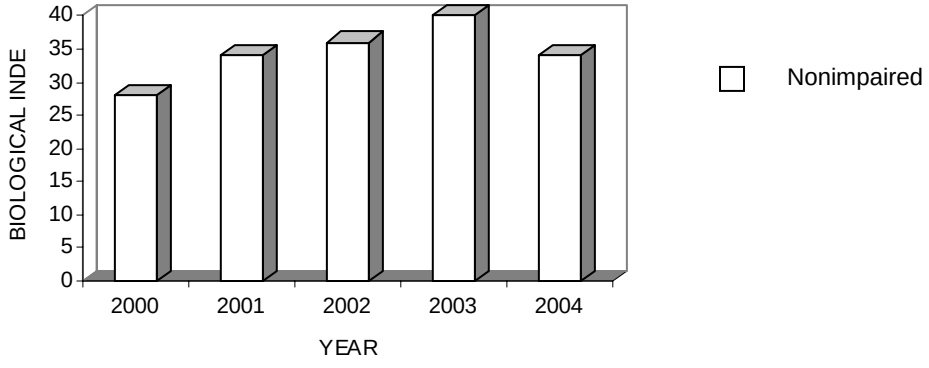
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/04	30.6	None							

Biological and Habitat Summary	
Number of Taxa	29
Diversity Index	2.70
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	160
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

South Creek (SOUT 7.8)

During fiscal year 2005, South Creek at Fassett, PA, (SOUT 7.8) had a slightly impaired biological community for the second consecutive year. This site showed poor scores for EPT Index, Shannon Diversity Index, and percentage of Ephemeroptera.

Total iron exceeded New York water quality standards with a value of 787 µg/l in July 2004. Additionally, temperature and total organic carbon both exceeded the 90th percentile (Table 30). The habitat was rated supporting, with high scores for epifaunal substrate and embeddedness, but low scores for riparian vegetative zone width and channel alteration. Staff noted an abundance of algae covering much of the substrate. In past sampling seasons, staff has noted extremes in flow regimes; therefore, biological impairment at this site may be due to large fluctuations in flow and periodic drying of the streambed.

Troups Creek (TRUP 4.5)

Troups Creek at Austinburg, PA, (TRUP 4.5) had a slightly impaired biological community in July 2004 as it had the previous summer. Taxonomic richness was the lowest of the PA-NY border streams, and this site also had the worst scores for percent dominant taxa and percent Chironomidae. Staff noted the stream was very turbid, and there was evidence of recent high flow events and new point bar formation. The habitat was rated supporting, with low scores for epifaunal substrate, condition of banks, sediment deposition, and riparian vegetative zone width.

Total iron and total aluminum concentrations exceeded New York State water quality standards during three of the four sampling periods, including a February sample that also exceeded Pennsylvania water quality standards at 3,527 ug/l. Numerous parameters exceeded the 90th percentile, including total aluminum, total iron, turbidity, and total organic carbon (Table 31).

Trowbridge Creek (TROW 1.8)

Trowbridge Creek at Great Bend, PA, (TROW 1.8) showed nonimpaired biological conditions, after being slightly impaired last year. During July 2004, the macroinvertebrates at TROW 1.8 had good scores for EPT Index and percent Chironomidae. Total iron exceeded New York water quality standards in July 2004, although no parameters exceeded the 90th percentile (Table 32). Habitat was rated excellent, primarily due to high scores for epifaunal substrate, sediment deposition, instream cover, and channel flow status. However, low scores were given for riparian vegetative zone width and condition of banks.

Wappasening Creek (WAPP 2.6)

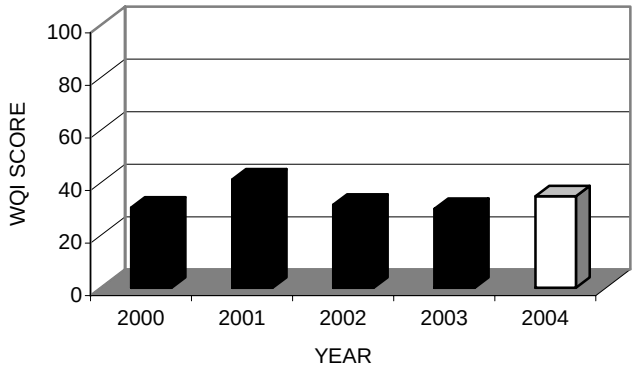
The biological index rating for Wappasening Creek at Nichols, NY, (WAPP 2.6) seems to be increasing over the past five years, improving from two years of moderately impaired and two years of slightly impaired to a nonimpaired ranking in July 2004 (Table 33). This site had the highest score for percent Ephemeroptera of all NY-PA border sites, as well as a good score for taxonomic richness. The habitat was rated excellent, with high scores for velocity/flow regimes, epifaunal substrate, instream cover, and riparian vegetative zone width. Staff noted evidence of recent extremely high flows at the time of sampling, as well as an abundance of algae covering the stream bed. No parameters exceeded water quality standards or the 90th percentile.

Table 30. Water Quality Summary South Creek at Fassett, Pa.

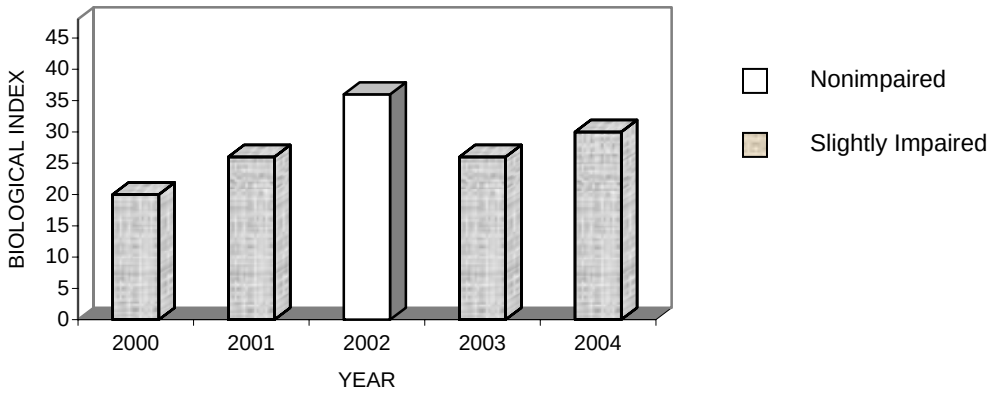
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/20/04	787 ug/l	300 ug/l	NY aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/20/04	34.8	TEMP	TOC						

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.19
RBP III Score	30
RBP III Condition	Slightly Impaired
Total Habitat Score	149
Habitat Condition Category	Supporting



Water Quality Index



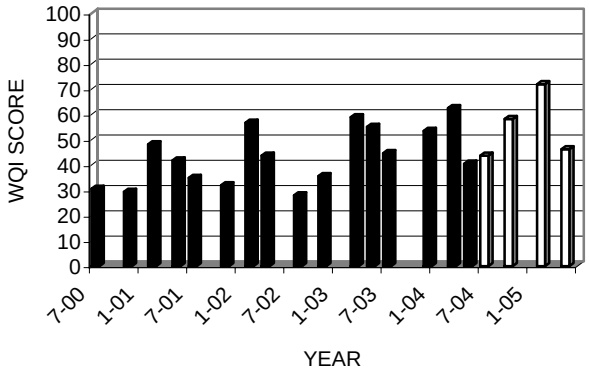
Biological Index

Table 31. Water Quality Summary Troups Creek at Austinburg, Pa.

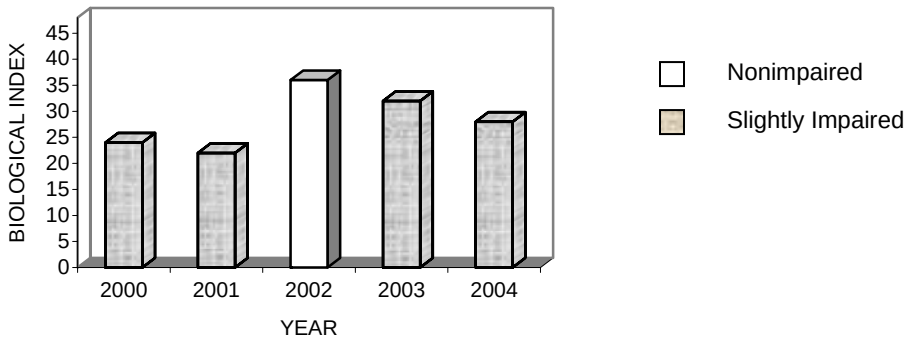
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/21/04	462 ug/l	300 ug/l	NY aquatic (chronic)
TAl	07/21/04	371 ug/l	100 ug/l	NY aquatic (chronic)
TFe	10/21/04	2000 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/21/04	1760 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/16/05	3527 ug/l	1500 ug/l	PA aquatic life
TFe	02/16/05	3527 ug/l	300 ug/l	NY aquatic (chronic)
TAl	02/16/05	3843 ug/l	100 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/21/04	43.7	None							
10/21/04	58.2	TAl	TFe	TURB					
02/16/05	72.0	TAl	TFe	TP	TS	TURB	SS		
05/10/05	46.2	TOC							

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	1.90
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	143
Habitat Condition Category	Supporting



Water Quality Index



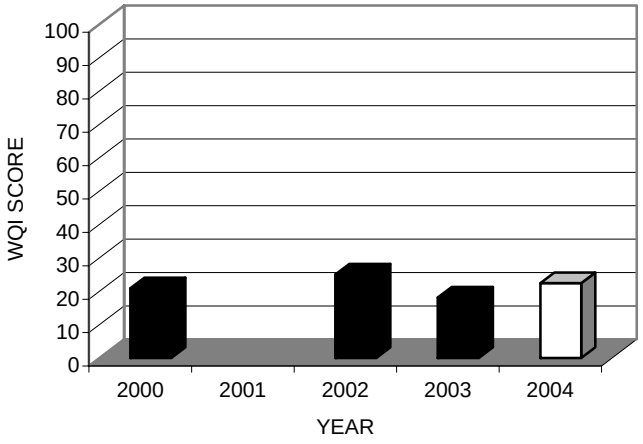
Biological Index

Table 32. Water Quality Summary Trowbridge Creek at Great Bend, Pa.

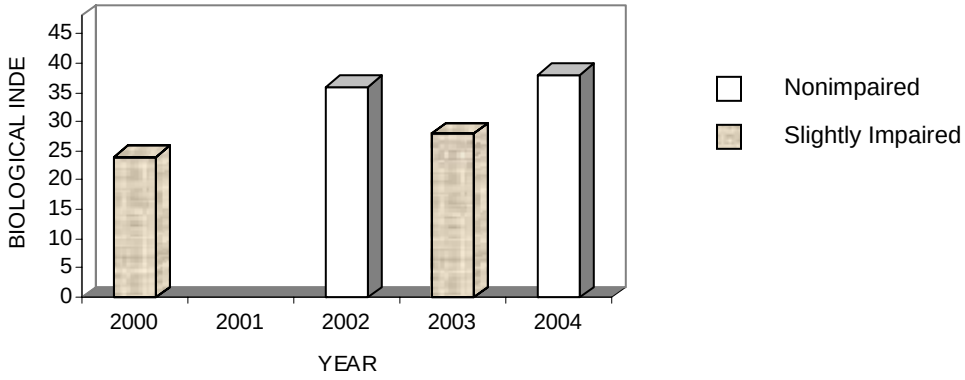
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/19/04	337 ug/l	300 ug/l	NY aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/04	22.4	None							

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.44
RBP III Score	38
RBP III Condition	Nonimpaired
Total Habitat Score	157
Habitat Condition Category	Excellent



Water Quality Index



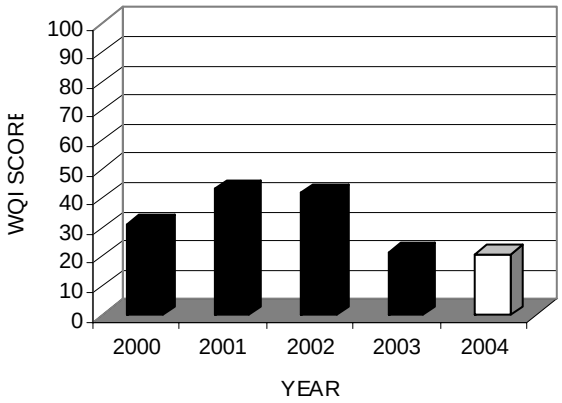
Biological Index

Table 33. Water Quality Summary Wappasening Creek at Nichols, N.Y.

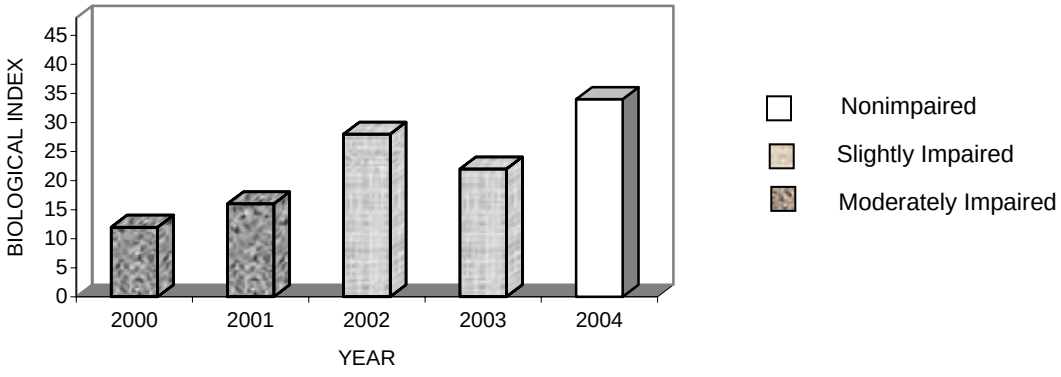
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/25/04	21.0	None							

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.33
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	163
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Pennsylvania-Maryland Streams

Big Branch Deer Creek (BBDC 4.1)

Big Branch Deer Creek at Fawn Grove, PA, (BBDC 4.1) had a nonimpaired biological community during fiscal year 2005, as it has for at least the past seven years. It had the highest taxonomic richness of the Maryland-Pennsylvania sites and good scores for Hilsenhoff Biotic Index, Shannon Diversity Index, and EPT Index; however, the community scored poorly for percentage of Ephemeroptera. Water quality was good in Big Branch Deer Creek in July 2004, with no parameters exceeding PA state standards and only dissolved oxygen exceeding the 90th percentile (Table 34). BBDC 4.1 had one of the best habitat conditions of all the PA-Maryland border sites, with high scores for a number of parameters, including epifaunal substrate, instream cover, and frequency of riffles.

Conowingo Creek (CNWG 4.4)

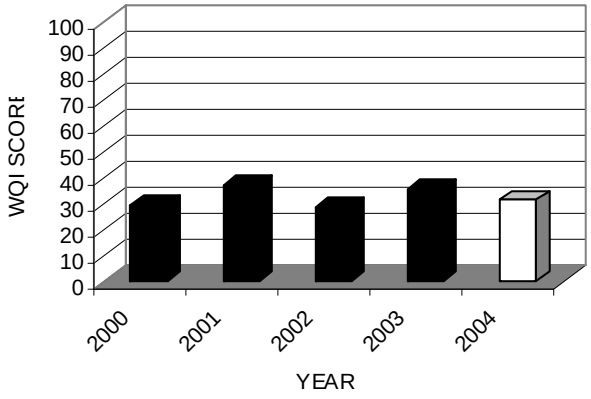
Conowingo Creek at Pleasant Grove, PA, (CNWG 4.4) had a slightly impaired community for the fifth year in a row, with a very low taxonomic richness and EPT Index and the poorest score of all Maryland-Pennsylvania streams for Hilsenhoff Biotic Index. This stream was impacted primarily by agricultural activities, as evidenced by high sediment deposition and elevated nutrients. Parameters that exceeded the 90th percentile were predominantly nutrients and dissolved oxygen (Table 35). Nitrate plus nitrite exceeded the Pennsylvania standards for public water supply during all four sampling events: August 2004, October 2004, February 2005, and May 2005. Habitat was rated as excellent, with high scores for instream cover and channel flow status.

Table 34. Water Quality Summary Big Branch Deer Creek at Fawn Grove, Pa.

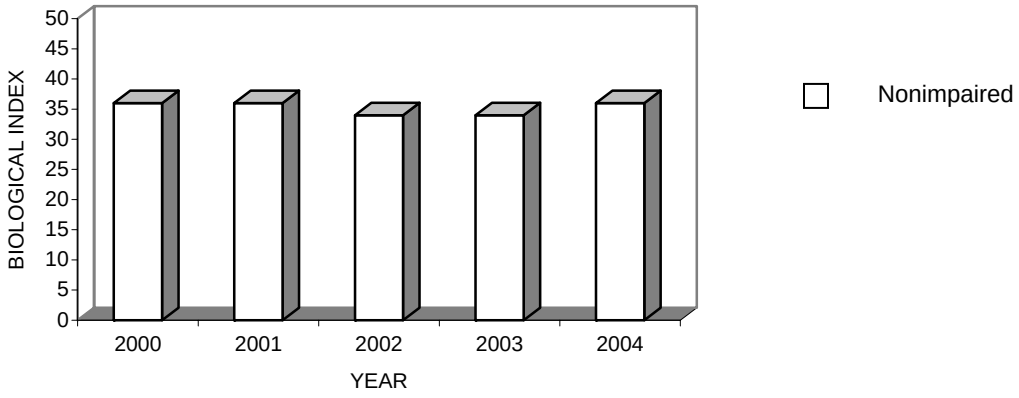
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/14/04	31.5	DO							

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.64
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	162
Habitat Condition Category	Excellent



Water Quality Index



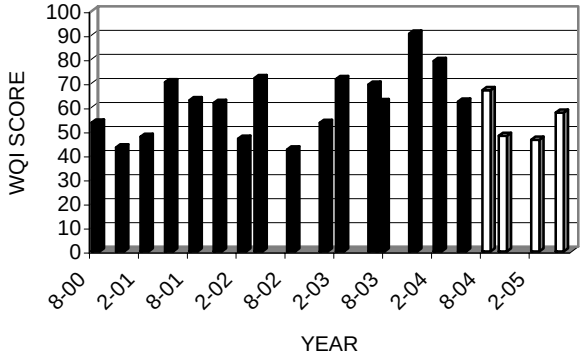
Biological Index

Table 35. Water Quality Summary Conowingo Creek at Pleasant Grove, Pa.

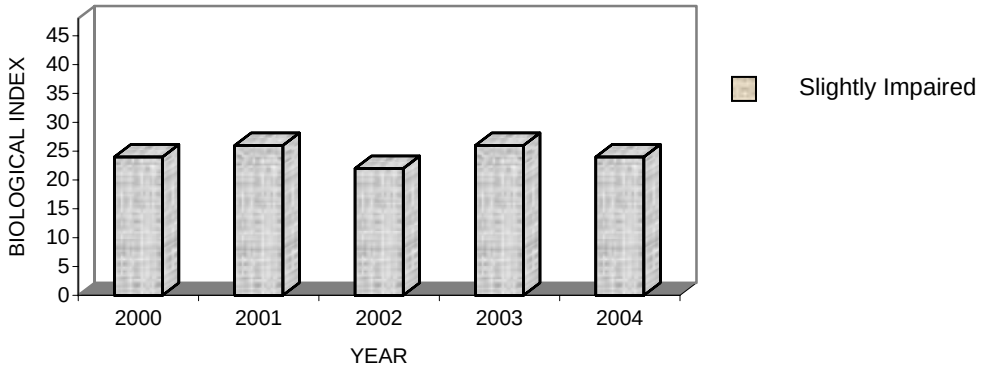
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
Nitrate + Nitrite	08/9/04	11.21 mg/l	10 mg/l	PA public water supply
Nitrate + Nitrite	10/14/04	11.84 mg/l	10 mg/l	PA public water supply
Nitrate + Nitrite	02/8/05	11.09 mg/l	10 mg/l	PA public water supply
Nitrate + Nitrite	05/03/05	11.55 mg/l	10 mg/l	PA public water supply

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/9/04	67.1	TNH3	TNO3	TNO2	TN				
10/14/04	48.1	DO	TNO3	TN					
02/8/05	46.5	DO	TNO3						
05/03/05	57.8	DO	COND	TNO3	TN	TS			

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	2.03
RBP III Score	24
RBP III Condition	Slightly Impaired
Total Habitat Score	162
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Deer Creek (DEER 44.2)

Deer Creek at Gorsuch Mills, MD, (DEER 44.2) served as the reference site for fiscal year 2005. DEER 44.2 had the highest EPT Index and the lowest percent dominant taxa of the PA-MD streams, as well as a high taxonomic richness and low percent Chironomidae. Organic-pollution intolerant organisms included: *Atherix*, *Antocha* (Diptera: Tipulidae), *Isonychia*, *Nigronia*, *Stylogomphus* (Odonata: Gomphidae), *Leuctra*, *Acroneuria*, *Agnetina* (Plecoptera: Perlidae), and *Paragnetina.* This site had fairly good water quality, with no parameters exceeding standards. However, during each of the four sampling periods dissolved oxygen exceeded the 90th percentile, and temperature and total chloride each exceeded the 90th percentile one time (Table 36). This sampling site was located adjacent to agricultural activities.

Ebaughs Creek (EBAU 1.5)

Ebaughs Creek at Stewartstown, PA, (EBAU 1.5) had a slightly impaired macroinvertebrate community in July 2004, and the biological condition seemed to show some improvement from 2003. This site scored in the median range for the Maryland-Pennsylvania streams with regard to many of the metrics; including taxonomic richness, EPT Index, and percent Chironomidae. EBAU 1.5 usually has slightly or moderately impaired biological conditions, with the July 2001 rating of nonimpaired being an anomaly. Habitat was rated as excellent, with highest scores given for channel flow status and vegetative protective cover.

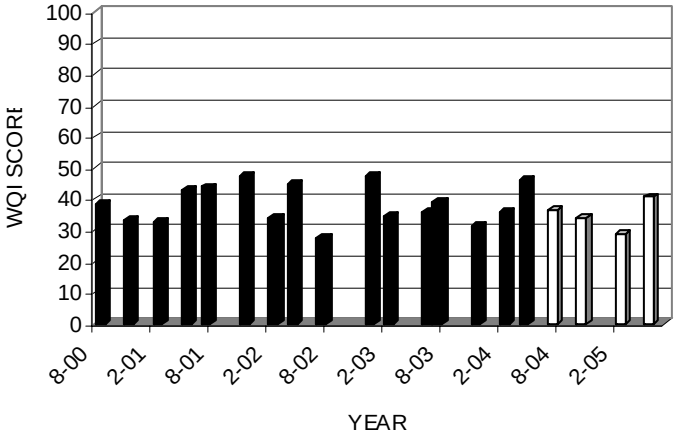
Total chlorine values exceeded state standards during three of the four sampling periods (Table 37). Parameters exceeding the 90th percentile at least two times during the year included total manganese, dissolved oxygen, and total nitrite. EBAU 1.5 is located downstream of the Stewartstown Treatment Plant.

Table 36. Water Quality Summary Deer Creek at Gorsuch Mills, Md.

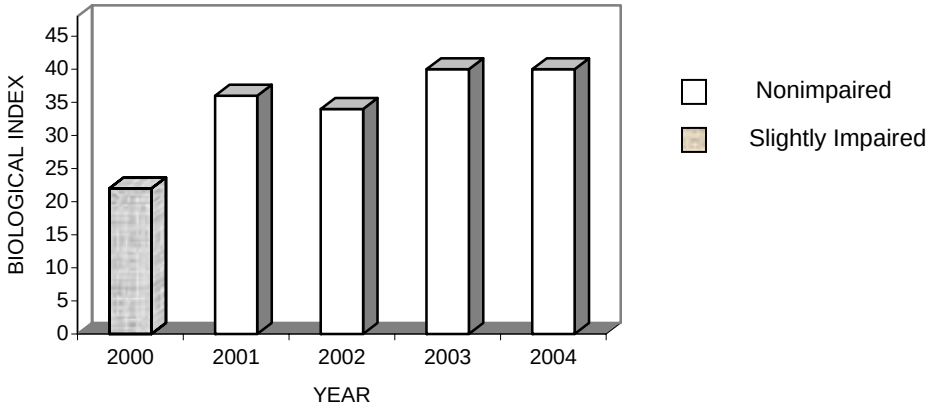
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/13/04	36.7	DO	TEMP						
10/13/04	33.9	DO							
02/07/05	28.6	DO							
05/02/05	40.7	DO	TCl						

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.55
RBP Score	40
RBP Condition	Reference
Total Habitat Score	154
Habitat Condition Category	Reference



Water Quality Index



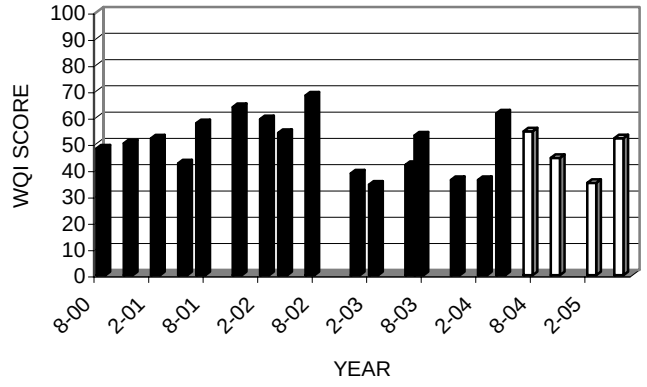
Biological Index

Table 37. Water Quality Summary Ebaughs Creek at Stewartstown, Pa.

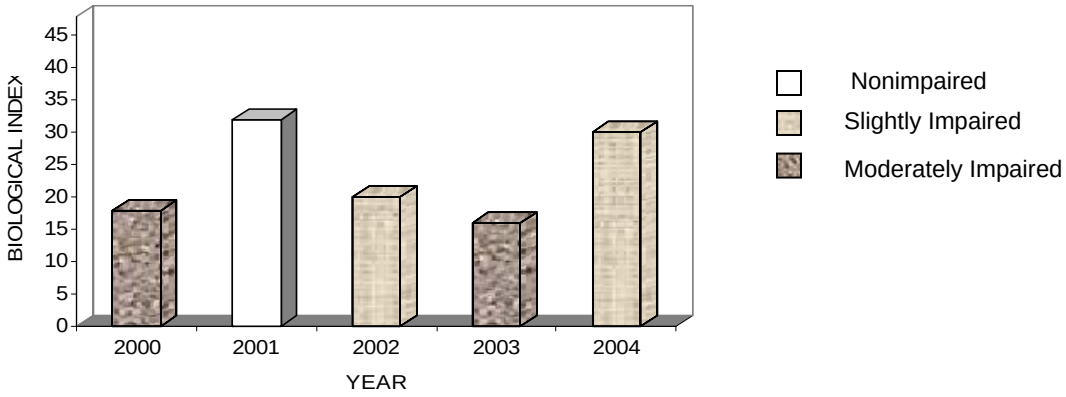
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TCln	07/13/04	0.06 mg/l	0.019 mg/l	MD aquatic life
TCln	10/13/04	0.06 mg/l	0.019 mg/l	MD aquatic life
TCln	05/02/05	0.07 mg/l	0.019 mg/l	MD aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/13/04	54.7	DO	TMn						
10/13/04	44.6	TMn							
02/07/05	35.1	DO	TNO2						
05/02/05	52.1	DO	TNH3	TNO2					

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.14
RBP Score	30
RBP Condition	Slightly Impaired
Total Habitat Score	150
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Falling Branch Deer Creek (FBDC 4.1)

There were no macroinvertebrates present in the sample collected at Falling Branch Deer Creek at Fawn Grove, PA, (FBDC 4.1). The reason for this is unknown; however there was evidence of recent high flows, which may have negatively impacted the macroinvertebrate community. The habitat was rated as excellent, with a dense vegetative cover, high frequency of riffles, and an abundance of instream cover. Water quality was very good, with no parameters exceeding water quality standards and only dissolved oxygen exceeding the 90th percentile (Table 38).

Long Arm Creek (LNGA 2.5)

Long Arm Creek at Bandanna, PA, and (LNGA 2.5) had a slightly impaired biological community, which is an improvement from the previous two years. This site had low metric scores for Shannon Diversity Index and percent dominant taxa but scored as one of the highest sites in percent Ephemeroptera. LNGA 2.5 was previously used as a cow pasture, but SRBC staff noted in July 2004 that there was no evidence that the area surrounding the sampling station had been used as a pasture recently and that the stream banks were revegetated. These changes were reflected in the improved biological community. However, habitat conditions were rated as partially supporting when compared to other Maryland-Pennsylvania streams, due to low scores for epifaunal substrate, instream cover, embeddedness, sediment deposition, and riparian vegetative zone width.

During the 2000 sampling season, Long Arm Creek was elevated to a Group 1 stream. Although no water quality standards were exceeded in fiscal year 2005, both metals and nutrients, such as total aluminum, total phosphorus, and total orthophosphate, exceeded the 90th percentile at this site. Dissolved oxygen and conductivity also exceeded the 90th percentile (Table 39).

Octoraro Creek (OCTO 6.6)

Octoraro Creek at Rising Sun, MD, and (OCTO 6.6) had a slightly impaired biological community for the third consecutive year, with a low score for percent dominant taxa. However, it had the highest percent Ephemeroptera of all the Maryland-Pennsylvania streams. Unfortunately, a large number of these mayflies were the pollution-tolerant taxon, *Baetis* (Ephemeroptera: Baetidae). No parameters exceeded PA state standards during the sampling period. However, dissolved oxygen, temperature, total phosphorus, total orthophosphate, total solids, total organic carbon, turbidity, and conductivity all exceeded the 90th percentile. Total nitrogen and total nitrate were elevated but did not exceed the 90th percentile. Habitat was rated as excellent with high scores for epifaunal substrate, instream cover, and velocity/depth regimes.

Scott Creek (SCTT 3.0)

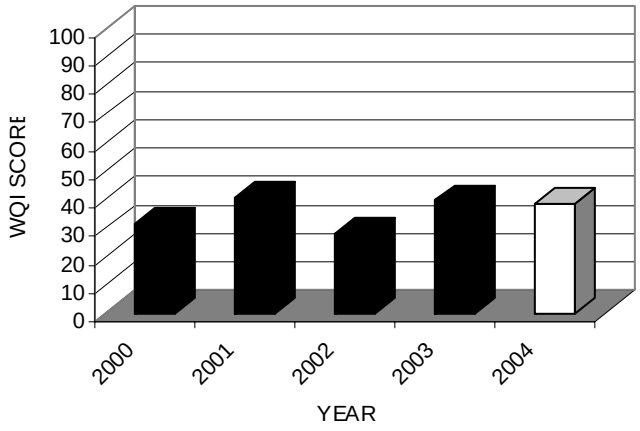
Scott Creek at Delta, PA (SCTT 3.0) was rated slightly impaired in July 2004, after being designated severely impaired for numerous years and moderately impaired last year. This site has consistently had the worst macroinvertebrate metric scores of all the Maryland-Pennsylvania sites. This year the conditions were similar, although there did appear to be some improvement. As in 2004, there were again several pollution sensitive organisms in the 2005 macroinvertebrate sample, including *Nigronia*, *Dicranota (*Diptera: Tipulidae*)*, and *Dolophilodes*. No parameters exceeded state standards in fiscal year 2005; however, a variety of parameters, including dissolved oxygen, conductivity, total chloride, total sulfate, total phosphorus, total iron, and total organic carbon exceeded the 90th percentile. The habitat was rated supporting, with poor scores for riparian vegetative zone width, condition of banks, and channel alteration. SRBC staff noted an abundance of litter at the site during the time of sampling.

Table 38. Water Quality Summary Falling Branch Deer Creek at Fawn Grove, Pa.

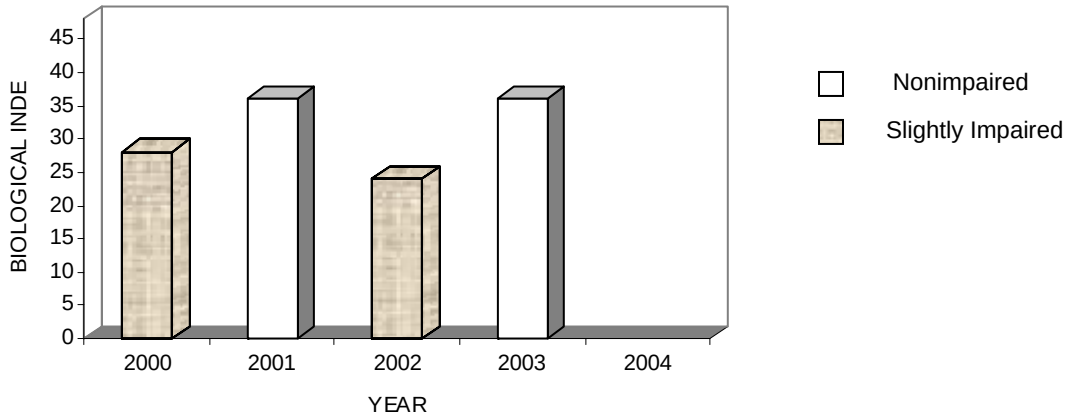
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/14/04	38.6	DO							

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP Score	NA
RBP Condition	NA
Total Habitat Score	165
Habitat Condition Category	Excellent



Water Quality Index



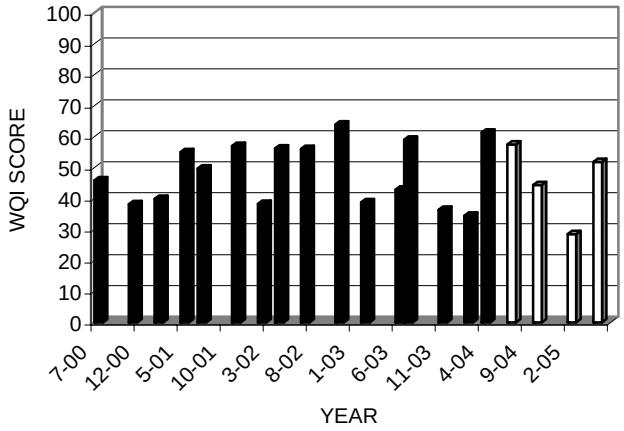
Biological Index

Table 39. Water Quality Summary Long Arm Creek at Bandanna, Pa.

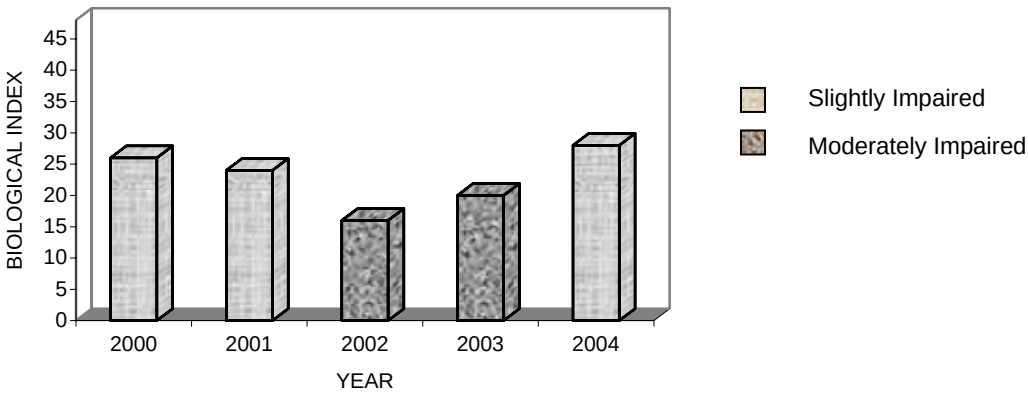
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/13/04	57.5	DO	COND	TAl					
10/13/04	44.4	None							
02/7/05	28.6	DO							
05/2/05	51.9	DO	TPO4	TP					

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	2.00
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	109
Habitat Condition Category	Partially Supporting



Water Quality Index



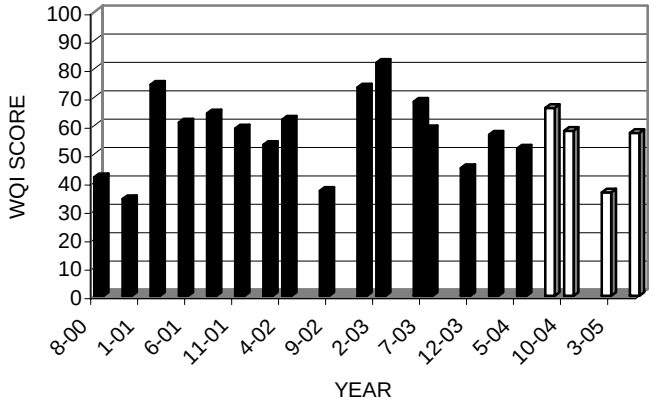
Biological Index

Table 40. Water Quality Summary Octoraro Creek at Rising Sun, Md.

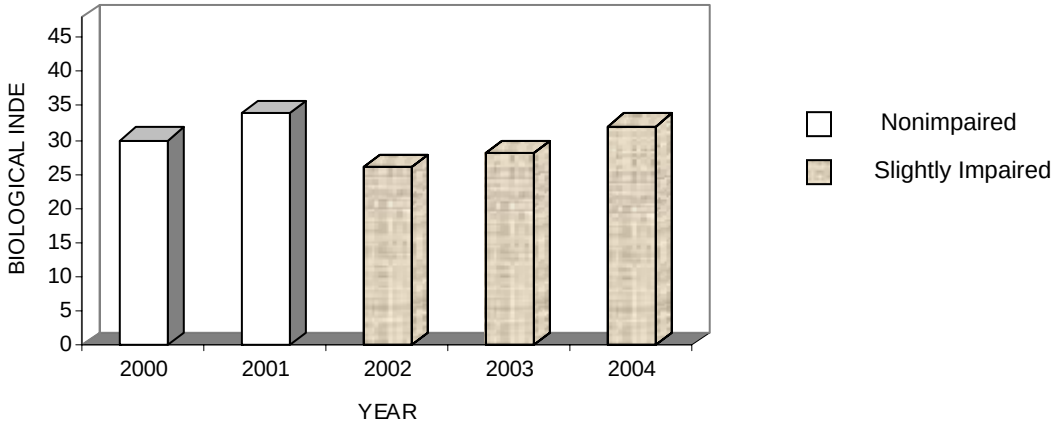
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/9/04	66.2	DO	TEMP	TPO4	TP	TOC	TURB		
10/14/04	58.2	DO	TEMP	TPO4	TP	TOC	TS		
02/08/05	36.4	DO							
05/03/05	57.4	DO	COND	TS					

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.23
RBP III Score	32
RBP III Condition	Slightly Impaired
Total Habitat Score	156
Habitat Condition Category	Excellent



Water Quality Index



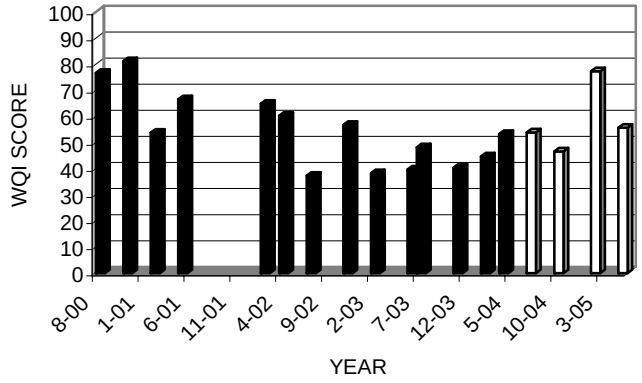
Biological Index

Table 41. Water Quality Summary Scott Creek at Delta, Pa.

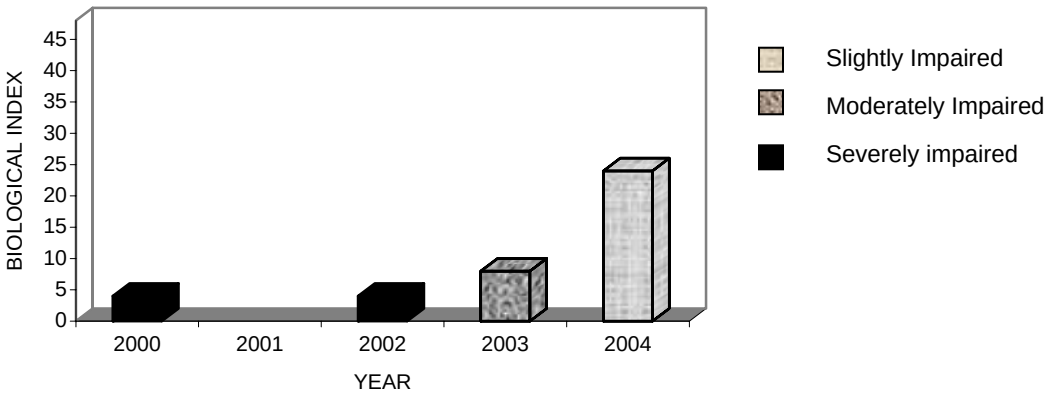
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile								
07/14/04	53.9	DO	TCl	TFe	TS	TSO4				
10/13/04	46.6	DO	COND	TCl	TS					
02/07/05	77.3	DO	COND	TNH3	TCl	TMn	TN	TPO4	TP	TS
		TSO4	TOC							
05/02/05	55.7	DO	SS	TCl	TFe	TMn				

Biological and Habitat Summary	
Number of Taxa	12
Diversity Index	2.05
RBP III Score	24
RBP III Condition	Slightly Impaired
Total Habitat Score	136
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

South Branch Conewago Creek (SBCC 20.4)

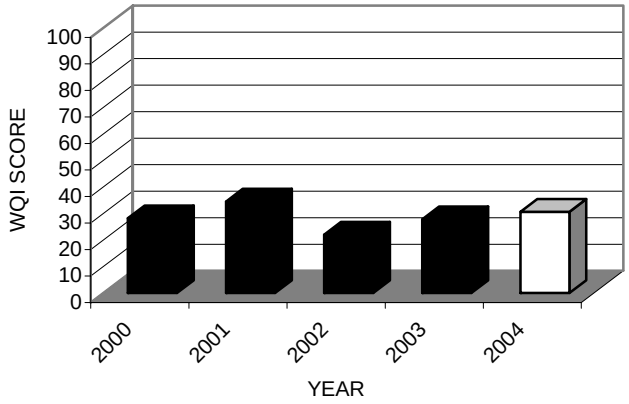
South Branch Conewago Creek near Bandanna, PA, and (SBCC 20.4) contained a slightly impaired biological community, as it has been for five of the last six years. This site had low scores for Shannon Diversity Index and percent dominant taxa, but high scores for Hilsenhoff Biotic Index and percent Chironomidae. No water quality standards were exceeded, and only dissolved oxygen exceeded the 90th percentile (Table 42). The habitat was rated excellent, with high scores for epifaunal substrate, frequency of riffles, and riparian vegetative zone. However, SRBC staff noted a lack of cobble and a large amount of sediment deposition.

Table 42. Water Quality Summary South Branch Conewago Creek at Bandanna, Pa.

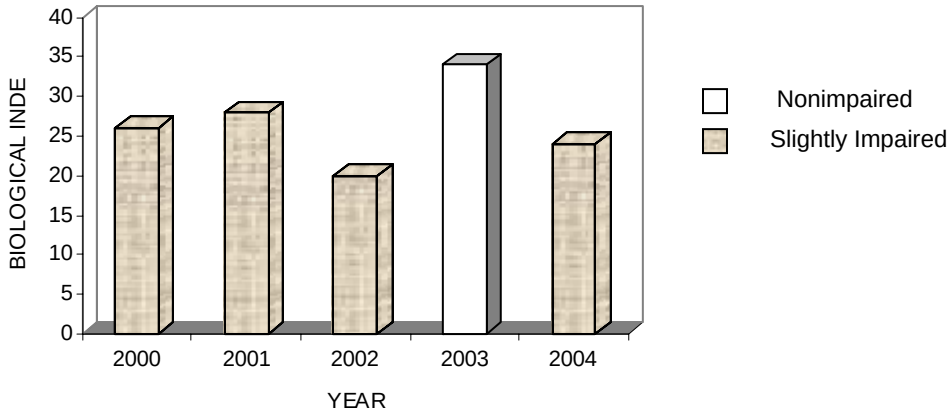
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/13/04	30.6	DO							

Biological and Habitat Summary	
Number of Taxa	14
Diversity Index	1.85
RBP III Score	24
RBP III Condition	Slightly Impaired
Total Habitat Score	146
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

River Sites

Chemung River (CHEM 12.0)

Due to high flows throughout the sampling season, no macroinvertebrate sample was collected at the Chemung River at Chemung, NY, (CHEM 12.0). Total iron and total aluminum exceeded the New York water quality standards during September and October 2004 and February 2005. Numerous parameters exceeded the 90th percentile including conductivity, total chloride, total solids, total nitrate, and total organic carbon, among others (Table 43). The WQI scores for this site seem to have decreased slightly, indicating an improvement in overall water quality.

Cowanesque River (COWN 2.2)

The Cowanesque River downstream of the Cowanesque Reservoir (COWN 2.2) at Lawrenceville, PA, had a moderately impaired biological community in July 2004. This site is routinely rated as moderately impaired, and this year it showed very low scores for taxonomic richness, Shannon Diversity Index, EPT Index, percent Ephemeroptera, and percent Chironomidae. Since very few macroinvertebrate samples were collected on the larger rivers due to high flow conditions, COWN 2.2 was compared to CASC 1.6, the reference station for NY-PA border streams for fiscal year 2005. Habitat was rated as supporting, and the site was given low scores for riparian vegetative zone width, epifaunal substrate, instream cover, and sediment deposition.

Total iron and total aluminum exceeded New York state standards in October 2004 (Table 44). A variety of parameters exceeded the 90th percentile at COWN 2.2, including dissolved oxygen, temperature, total phosphorus, and total organic carbon.

Cowanesque River (COWN 1.0)

A site was added on the Cowanesque River near the mouth of the stream (COWN 1.0) during the 1999-2000 sampling season to determine the extent of impairment in the river. Biological condition at COWN 1.0 was rated as nonimpaired in July 2004 after being moderately impaired for two of the last three years (no sample was taken last year due to high flows). COWN 1.0 also was compared to CASC 1.6 due to lack of macroinvertebrates collected at river sites. Habitat was rated as supporting, with the lowest scores given for channel sinuosity, riparian vegetative zone, and condition of banks.

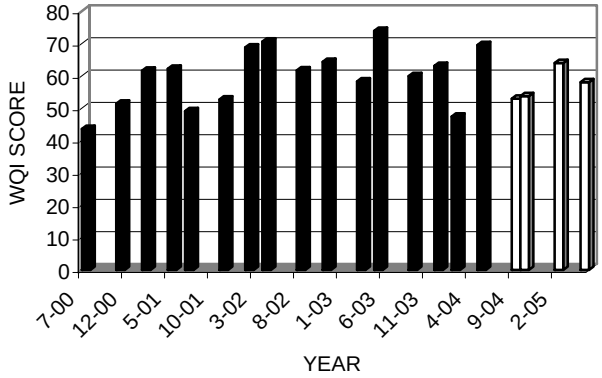
Total iron, total aluminum and total chlorine exceeded the New York water quality standards during the October sampling period. Parameters that exceeded the 90th percentile included dissolved oxygen, temperature, turbidity, total organic carbon, and various nutrients (Table 45). The Cowanesque Reservoir and a wastewater treatment plant discharge are located upstream of COWN 1.0.

Table 43. Water Quality Summary Chemung River at Chemung, N.Y.

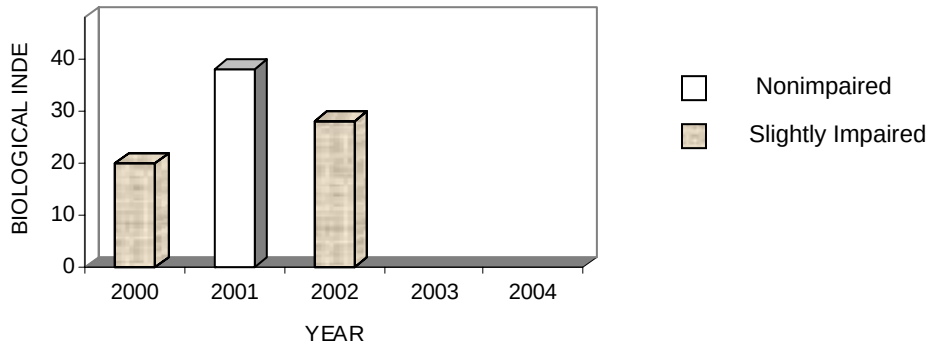
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/29/04	698 ug/l	300 ug/l	NY aquatic (chronic)
TAl	09/29/04	382 ug/l	100 ug/l	NY aquatic (chronic)
TFe	10/20/04	344 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/20/04	255 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/15/05	582 ug/l	300 ug/l	NY aquatic (chronic)
TAl	02/15/05	534 ug/l	100 ug/l	NY aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
09/29/04	53.0	COND	TCl	TS					
10/20/04	53.7	COND	TNO3	TS	TCl	TN			
02/15/05	64.0	COND	DO	TCl	TNO3	TS	TOC		
05/10/05	58.0	COND	TEMP	TCl	TN	TS	TOC		

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP Score	NA
RBP Condition	NA
Total Habitat Score	NA
Habitat Condition Category	NA



Water Quality Index



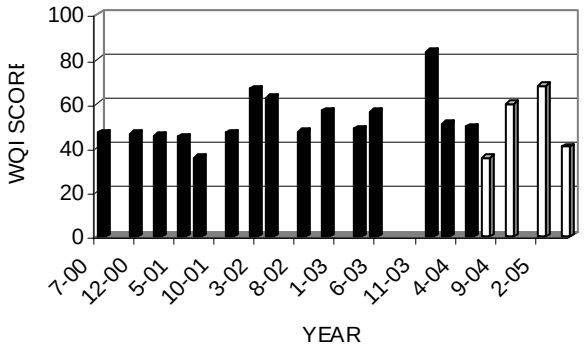
Biological Index

Table 44. Water Quality Summary Cowanesque River (COWN 2.2) at Lawrenceville, Pa.

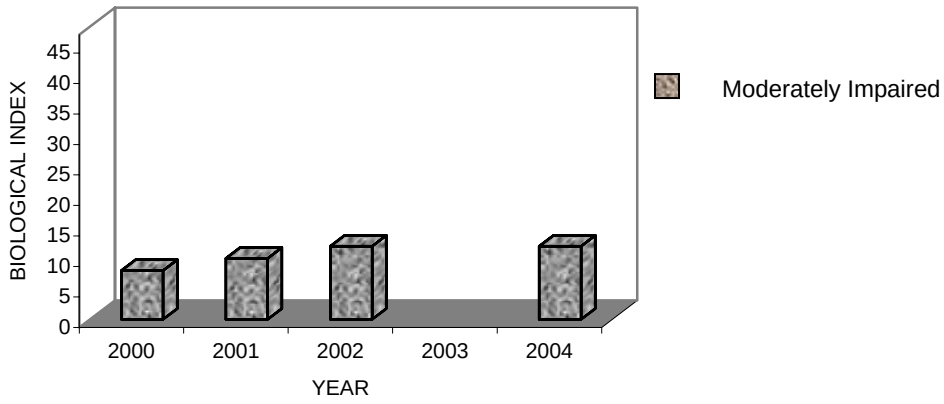
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	10/21/04	759 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/21/04	631 ug/l	100 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/22/04	35.7	DO	TEMP	TNH3					
10/21/04	59.9	DO	TEMP	TOC					
02/16/05	68.1	DO	TEMP	TPO4	TP	TOC			
05/10/05	40.7	DO							

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	1.62
RBP Score	12
RBP Condition	Moderately Impaired
Total Habitat Score	129
Habitat Condition Category	Partially Supporting



Water Quality Index



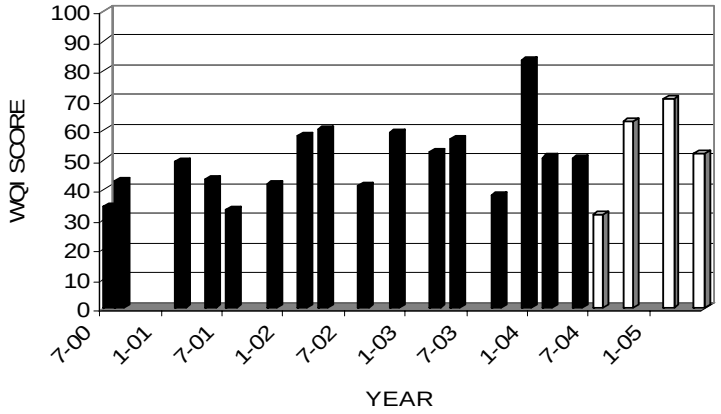
Biological Index

Table 45. Water Quality Summary Cowanesque River (COWN 1.0) at Lawrenceville, Pa.

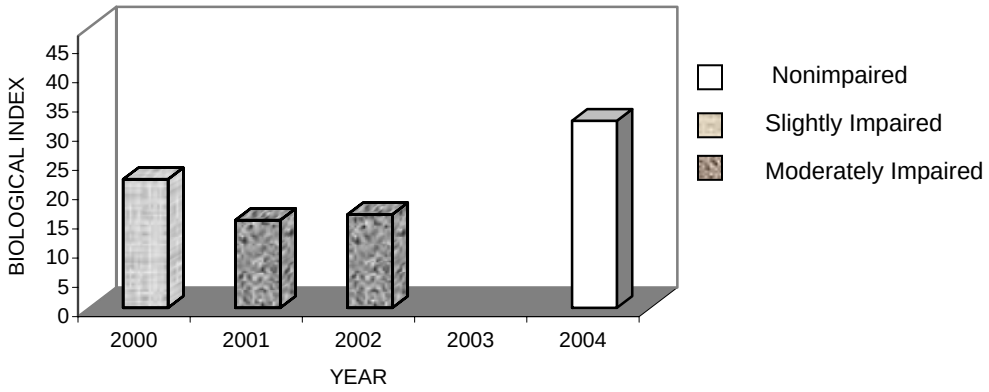
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	10/21/04	1090 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/21/04	972 ug/l	100 ug/l	NY aquatic (chronic)
TCln	10/21/04	1.0 mg/l	0.019 mg/l	NY aquatic (acute)

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/04	31.4	TEMP							
10/21/04	62.9	DO	TEMP	TNH3	TOC				
02/16/05	70.8	DO	TEMP	TN	TPO4	TP	TOC		
05/10/05	52.3	DO	TOC	TURB					

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.26
RBP Score	32
RBP Condition	Nonimpaired
Total Habitat Score	145
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Susquehanna River at Windsor, NY (SUSQ 365.0)

The biological community at Susquehanna River at Windsor, NY, (SUSQ 365.0) was designated nonimpaired during fiscal year 2005 for the fourth consecutive year. Like both Cowanesque River sites, SUSQ 365.0 was compared to CASC 1.6, the reference station for the NY-PA border streams. This site showed high scores for taxonomic richness and EPT Index. Habitat was rated as excellent, with high ratings for epifaunal substrate, instream cover, and pool substrate characterization. Logs and woody debris were noted in the stream, as was the presence of deep pools and deep riffle/run areas.

Total iron slightly exceeded New York aquatic standards in October 2004 and February 2005. Dissolved oxygen, total ammonia, suspended sediment, and turbidity all exceeded the 90th percentile one time during the sample period at this site (Table 46).

Susquehanna River at Kirkwood, NY (SUSQ 340.0)

Due to high river flows throughout the 2004 sampling season, no macroinvertebrate sample was collected at Susquehanna River at Kirkwood, NY, (SUSQ 340.0). Total iron and total aluminum each exceeded New York water quality standards on two occasions. Additional water quality analysis indicated that total phosphorus, dissolved oxygen, and total solids all exceeded the 90th percentile one time (Table 47).

Susquehanna River at Sayre, PA. (SUSQ 289.1)

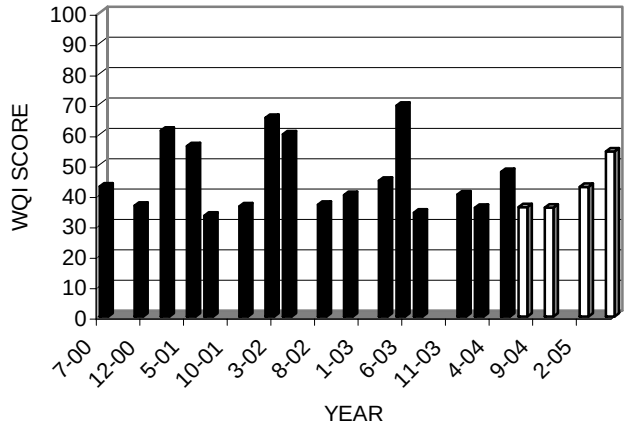
Due to high river flows throughout the 2004 sampling season, no macroinvertebrate sample was collected at the Susquehanna River at Sayre, PA, (SUSQ 289.1). Total aluminum and total iron exceeded New York water quality standards during September and October 2004 and February 2005. Other parameters that were elevated compared to other Group 1 and 2 NY-PA streams were total ammonia, total nitrogen, dissolved oxygen, and total chloride (Table 48).

Table 46. Water Quality Summary Susquehanna River (SUSQ 365.0) at Windsor, N.Y.

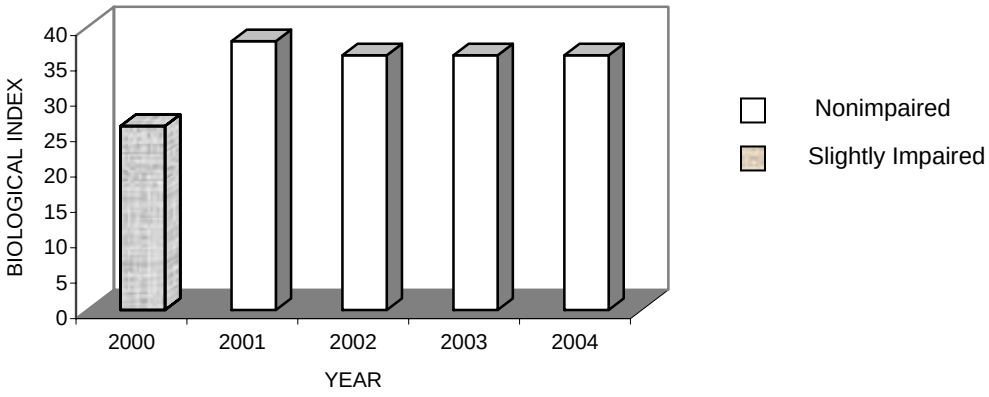
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	10/20/04	326 ug/l	300 ug/l	NY aquatic (chronic)
TFe	02/14/05	339 ug/l	300 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/19/04	36.0	DO							
10/20/04	35.9	None							
02/14/05	42.7	None							
05/09/05	54.4	TNH3	SS	TURB					

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.50
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	160
Habitat Condition Category	Excellent



Water Quality Index



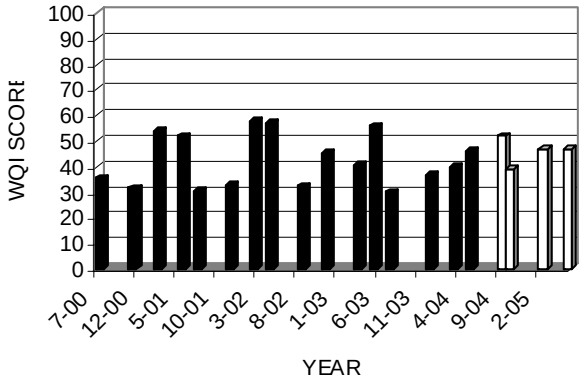
Biological Index

Table 47. Water Quality Summary Susquehanna River (SUSQ 340.0) at Kirkwood, N.Y.

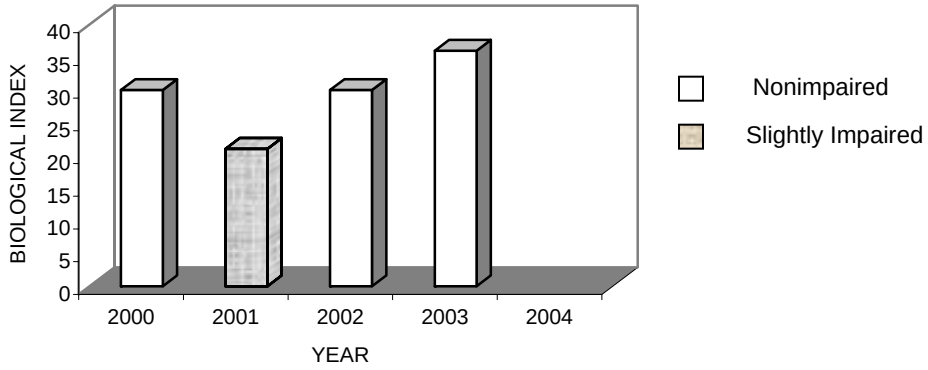
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	09/29/04	1166 ug/l	100 ug/l	NY aquatic (chronic)
TFe	10/20/04	752 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/20/04	436 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/14/05	364 ug/l	300 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
09/29/04	52.1	TP							
10/20/04	39.2	None							
02/14/05	46.8	DO	TS						
05/09/05	46.8	None							

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP Score	NA
RBP Condition	NA
Total Habitat Score	NA
Habitat Condition Category	NA



Water Quality Index



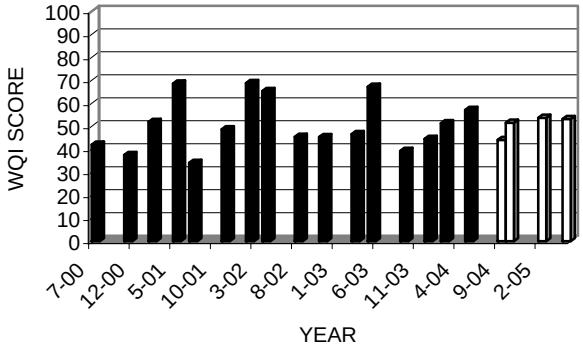
Biological Index

Table 48. Water Quality Summary Susquehanna River (SUSQ 289.1) at Sayre, Pa.

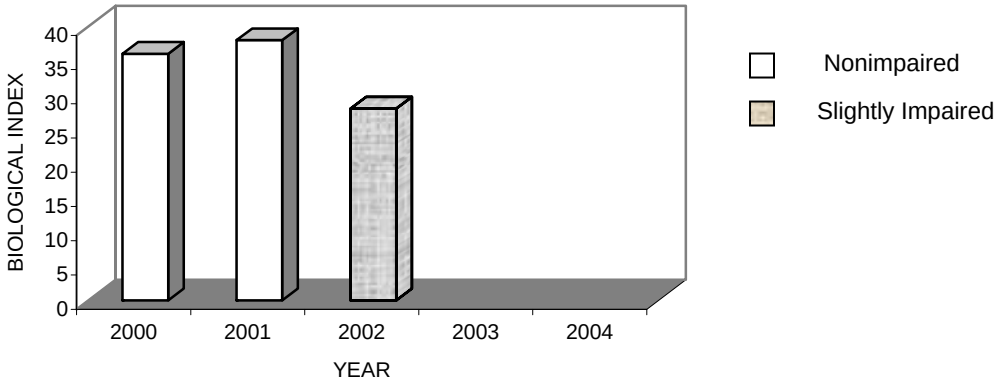
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/29/04	911 ug/l	300 ug/l	NY aquatic (chronic)
TAl	09/29/04	546 ug/l	100 ug/l	NY aquatic (chronic)
TFe	10/21/04	589 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/21/04	319 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/14/05	513 ug/l	300 ug/l	NY aquatic (chronic)
TAl	02/14/05	280 ug/l	100 ug/l	NY aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
09/29/04	44.0	None							
10/21/04	51.5	TNH3	TN						
02/14/05	53.7	DO	TNH3	TCl					
05/09/05	53.2	None							

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP Score	NA
RBP Condition	NA
Total Habitat Score	NA
Habitat Condition Category	NA



Water Quality Index



Biological Index

Susquehanna River at Marietta, PA (SUSQ 44.5)

As river flows were very high throughout summer 2004, no macroinvertebrate sample or habitat information was collected on the Susquehanna River at Marietta, PA, (SUSQ 44.5). No parameters exceeded Pennsylvania or Maryland water quality standards during the sampling period. Several parameters did exceed the 90th percentile multiple times, including dissolved oxygen, total sulfate, total iron, and total organic carbon (Table 49).

Susquehanna River at Conowingo, MD (SUSQ 10.0)

No macroinvertebrate sampling was performed in the Susquehanna River at Conowingo, MD, (SUSQ 10.0) due to deep waters and a lack of riffle habitat. During this sampling season, no parameters exceeded Pennsylvania or Maryland state standards. Parameters that exceeded the 90th percentile included temperature, dissolved oxygen, total sulfate, total manganese, conductivity, and turbidity (Table 50).

Tioga River (TIOG 10.8)

No macroinvertebrate sampling or habitat assessments occurred during 2004 on the Tioga River at Lindley, NY, (TIOG 10.8) due to high flows throughout the sampling season. Total aluminum exceeded New York water quality standards on three occasions, while total iron exceeded New York standards in October 2004 and February 2005. Total iron also exceeded Pennsylvania state standards in February 2005 (Table 51). Additional water quality analysis indicated that total manganese and total sulfate were consistently high through the sampling period, as they were last year.

Abandoned mine drainage problems exist in the headwaters of the Tioga River. The Tioga-Hammond Reservoir, located upstream of TIOG 10.8, alleviates some of the effects of abandoned mine drainage by buffering the outflow of Tioga Lake with alkaline waters stored in Hammond Lake. However, the effects of the acid mine drainage still may be observed downstream. Poor quality water from the Cowanesque River also may affect the Tioga River downstream of their confluence.

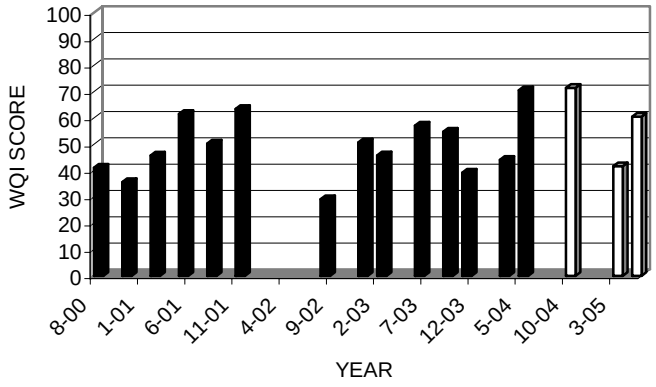
In 2001 and 2002, SRBC and Gannett Fleming, Inc. assessed the Pennsylvania portion of the Tioga River Watershed and developed a remediation strategy through the aid of a Pennsylvania Growing Greener Grant. SRBC created a report identifying acid mine drainage problem areas and prioritizing sites for treatment (Orr, 2003). This report also discusses treatment alternatives and makes predictions as to the possible treatment results.

Table 49. Water Quality Summary Susquehanna River (SUSQ 44.5) at Marietta, Pa.

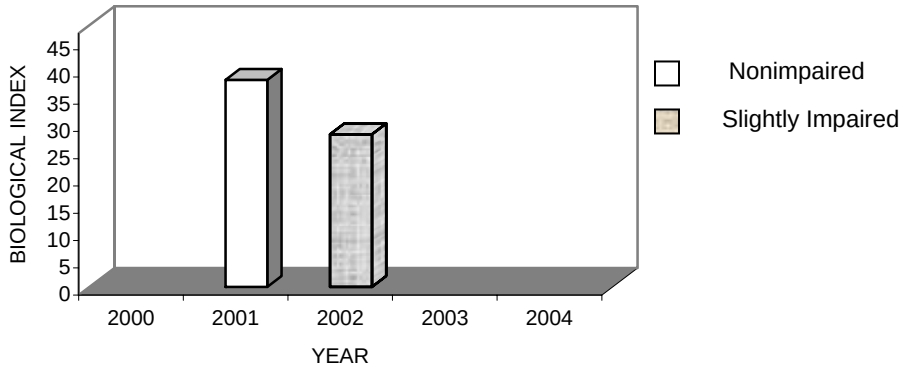
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
10/14/04	715	DO	TEMP	TAl	TNH3	TFe	TMn	TSO4	TOC
		TURB							
03/28/05	41.7	DO							
05/03/05	60.8	DO	COND	TFe	TS	TSO4	TOC		

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP Score	NA
RBP Condition	NA
Total Habitat Score	NA
Habitat Condition Category	NA



Water Quality Index

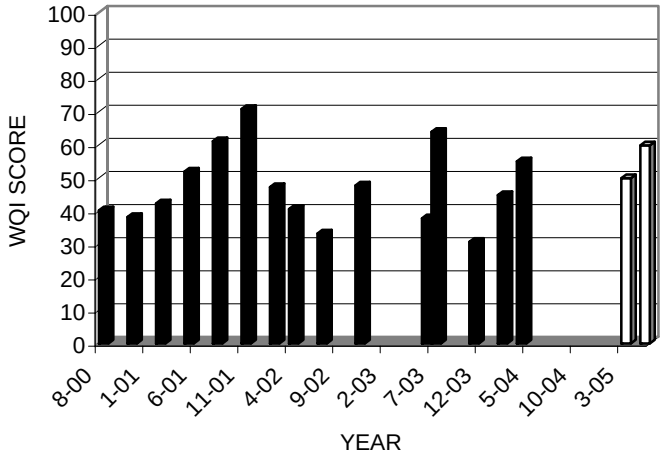


Biological Index

Table 50. Water Quality Summary Susquehanna River (SUSQ 10.0) at Conowingo, Md.

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
03/28/05	49.9	DO	SS	TEMP	TAl	TSO4	TURB	TFe	
05/02/05	59.8	DO	COND	TEMP	TMn	TSO4	TURB		



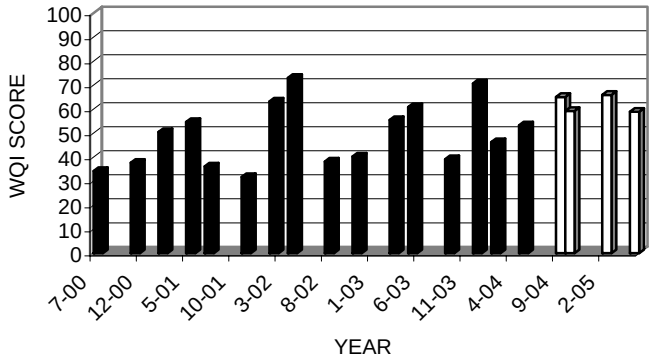
Water Quality Index

Table 51. Water Quality Summary Tioga River at Lindley, N.Y.

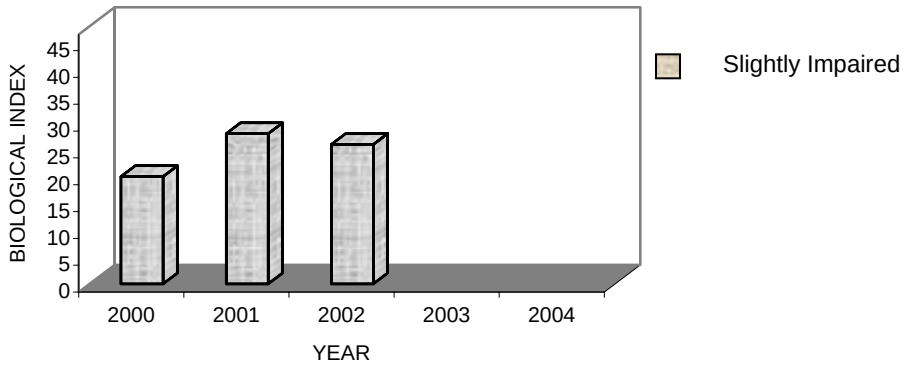
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	09/29/04	1420 ug/l	100 ug/l	NY aquatic (chronic)
TFe	10/20/04	393 ug/l	300 ug/l	NY aquatic (chronic)
TAl	10/20/04	272 ug/l	100 ug/l	NY aquatic (chronic)
TAl	02/15/05	1670 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/15/05	1540 ug/l	300 ug/l	NY aquatic (chronic)
TFe	02/15/05	1540 ug/l	1500 ug/l	PA aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
09/29/04	65.0	TAl	TMn	TSO4	TFe	TPO4	TURB		
10/20/04	59.2	TEMP	TMn	TSO4					
02/15/05	65.9	DO	TMn	TSO4	TOC				
05/10/05	58.9	TMn	TSO4	TURB					

Biological and Habitat Summary	
Number of Taxa	NA
Diversity Index	NA
RBP III Score	NA
RBP III Condition	NA
Total Habitat Score	NA
Habitat Condition Category	NA



Water Quality Index



Biological Index

Group 3 Sites

Babcock Run (BABC)

During May 2005, the macroinvertebrate community of Babcock Run near Cadis, PA, was designated as nonimpaired, with low metric scores for percentage of Chironomidae and percent dominant taxa. Physical habitat conditions were rated excellent, with good scores for instream cover, embeddedness, and vegetative protective cover. Staff noted that the stream was scoured from a recent high water event. All field chemistry parameters were within acceptable limits. BABC is located in a mostly forested watershed, and the stream bed is dominated by cobble substrate.

Beagle Hollow Run (BEAG)

Nonimpaired biological conditions existed at Beagle Hollow Run near Osceola, PA, during May 2005. The sample contained a large number of organic pollution-intolerant organisms and showed a high EPT Index; however, the percentage of Chironomidae was rather high. Habitat conditions were considered excellent, with a large amount of woody debris located in this forested stream and an abundance of epifaunal substrate. All field chemistry parameters were within natural ranges.

Bill Hess Creek (BILL)

Bill Hess Creek near Nelson, PA, was designated slightly impaired, with a high percentage of Ephemeroptera but a low taxonomic richness and Shannon Diversity Index. The habitat was rated supporting, with low scores given for condition of banks, velocity/depth regimes, channel alteration, and channel flow status. All field chemistry parameters were within acceptable limits. Staff noted evidence of recent high water.

Bird Creek (BIRD)

Bird Creek near Webb Mills, NY, was designated slightly impaired. This site had good scores for EPT Index and taxonomic richness but poor scores for a high percentage of Chironomidae and percent dominant taxa. The habitat was designated as supporting primarily due to poor conditions of banks and sediment deposition, which are likely the result of a high water event prior to sampling. All field chemistry parameters fell within acceptable ranges. Staff noted that nearly all of the cobble substrate was covered in algae.

Biscuit Hollow (BISC)

Nonimpaired biological conditions existed at Biscuit Hollow near Austinburg, PA, during this survey, with a high percentage of Ephemeroptera and a high EPT Index. This is the second consecutive year of nonimpaired biological conditions, which is a dramatic improvement from the moderately impaired conditions found during FY-03. The physical habitat at this site was considered supporting, with poor scores given for instream cover, velocity/depth regimes, sediment deposition, and riparian vegetative zone width. The site had slightly eroded banks and was located in an area dominated by abandoned fields and an overgrown pasture, downstream of numerous old beaver dams. Staff noted the presence of cows in the stream. Field chemistry parameters were within acceptable ranges.

Briggs Hollow Run (BRIG)

Briggs Hollow Run near Nichols, NY, was designated slightly impaired during the 2005 sampling season, with poor metric scores for EPT Index, percent dominant taxa and percent Chironomidae.

However, this site did have a very low metric score for Hilsenhoff Index, meaning there were a large number of pollution intolerant organisms in the sample. The physical habitat was designated as partially supporting and was given low scores for epifaunal substrate, instream cover, channel flow status, frequency of riffles, and riparian vegetative zone width. All field chemistry parameters were within acceptable limits. Staff noted that much of the substrate was covered with algae.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, PA, had a slightly impaired biological community and supporting habitat conditions during the 2004-2005 sampling season. The two lowest biological scores for this site were percent dominant taxa and percent Chironomidae. Habitat assessment showed low scores for channel flow status, channel alteration, conditions of banks, and sediment deposition. BULK is located in a forested area downstream of a beaver dam and did have a well developed riparian zone. Field chemistry indicated that all parameters were within acceptable limits.

Camp Brook (CAMP)

Camp Brook near Osceola, PA, had a moderately impaired biological community in May 2005, with low scores for EPT Index, Shannon Diversity Index, percent dominant taxa, and percentage of Chironomidae. The physical habitat of the stream was designated supporting; low scores were given for condition of banks, sediment deposition, velocity/depth regimes, and epifaunal substrate. All field chemistry parameters were normal.

Cook Hollow (COOK)

Cook Hollow near Austinburg, PA, had a slightly impaired biological community. This site had a high EPT Index and taxonomic richness, but scored poorly for percentage of Chironomidae and Shannon Diversity Index. The habitat was rated excellent, and field chemistry parameters were all within acceptable limits. Staff noted logging activities downstream of the sampling site.

Deep Hollow Brook (DEEP)

The biological community of Deep Hollow Brook near Danville, NY, served as the reference site for the Group 3 streams in 2005. This site had the best combination of biological, habitat, and field chemistry conditions of the Group 3 streams. DEEP had the highest Shannon Diversity Index value of all Group 3 streams, as well as high scores for taxonomic richness, EPT Index and percent Ephemeroptera. Alkalinity had exceeded the Pennsylvania aquatic life standard in previous years, but this year was at an acceptable level. Habitat at DEEP was designated as excellent, with high scores for sediment deposition, frequency of riffles, vegetative protective cover, and riparian vegetative zone width. This watershed was located in a mostly forested area, interspersed with scattered cropland and old fields, and the station was located downstream of a beaver dam. Staff noted that, at the time of sampling, the beaver dam had been breached, creating a large wetland area upstream of the sampling site.

Denton Creek (DENT)

Denton Creek near Hickory Grove, PA, had a moderately impaired biological community during May 2005. DENT was dominated by pollution tolerant Chironomidae and had poor scores for several metrics, including EPT Index, percentage of Chironomidae, taxonomic richness, Shannon Diversity Index, and percent Ephemeroptera. The habitat was rated supporting, with low scores for channel flow status, frequency of riffles, and velocity/depth regimes. Higher scores were given for riparian vegetative zone width and vegetative protective cover. The sampling site was located downstream of Hawkins Lake, and

staff noted that the stream went underground downstream of the sampling site. As in previous years, alkalinity values at DENT exceeded the water quality standards, but other field chemistry parameters were within acceptable limits in May 2005.

Dry Brook (DRYB)

Dry Brook at Waverly, NY, was not sampled in 2005 due to insufficient flow levels to take a water quality or macroinvertebrate sample.

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, NY, was designated slightly impaired in May 2005, due to low taxonomic richness and an abundance of midges. Staff noted dramatic changes at this site from previous years, including major stream channel disruption and a completely scoured stream bottom. The stream was approximately four times its normal width, and concrete and metal debris were observed in the channel. The high-cut banks with areas of erosion indicated large fluctuations in flow. The land cover is mostly forested, with some agriculture in the headwaters. The habitat was rated as partially supporting this year after being rated as excellent last year. Low scores were given for sediment deposition, channel flow status, channel alteration, velocity/flow regimes, and condition of banks. In 2001, dredging equipment was found in the stream, and timber was being removed from the streambanks. Since that time no evidence of dredging or timber removal was noted. All field chemistry parameters remained normal.

Parks Creek (PARK)

In 2003, the location of the site for Parks Creek near Litchfield, NY, was moved upstream slightly due to logging at the previous sampling site. PARK had a slightly impaired biological community during the 2005 sampling season. This site scored low for EPT Index and percentage of Chironomidae, which was the dominant taxon. The site had partially supporting habitat, with low scores for a number of parameters, including velocity/depth regimes, sediment deposition, condition of banks, and channel alteration. The predominant land use is forested, with a considerable amount of woody debris and fallen trees in the stream channel. At the time of sampling, staff noted a scoured channel, major bed movement, and eroded banks from a recent high water event. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)

Prince Hollow Run near Cadis, PA, was designated nonimpaired in May 2005, improving from slightly impaired last year and severely impaired in 2002. This site showed high scores for taxonomic richness and percent Ephemeroptera. The habitat was rated as partially supporting, with low scores for condition of banks, sediment deposition, channel flow status, and riparian vegetative zone width. At the time of sampling, very low flow was noted, but there was evidence of channel scarring and severe bank erosion from recent high water.

Russell Run (RUSS)

Russell Run near Windham, PA, was designated slightly impaired in May 2005, as it was the previous year. Poor metric scores were given for percent dominant taxon and percent Chironomidae, which was the dominant taxon. The habitat was considered partially supporting, with low scores given for sediment deposition, channel flow status, channel alteration, and condition of banks. RUSS is located

in a primarily forested area, and staff noted large log jams and much woody debris. The substrate was covered with an abundance of algae. All field chemistry parameters were normal.

Sackett Creek (SACK)

The biological condition of Sackett Creek near Nichols, NY, was designated moderately impaired, and the physical habitat was partially supporting. SACK had the lowest taxonomic richness and Shannon Diversity Index and the highest percent of Chironomidae of all the Group 3 streams. Habitat was rated low for condition of banks, channel flow status, sediment deposition, and channel alteration. Staff noted major changes from May 2004, with the stream bottom having been bulldozed and regraded. Recent flooding left the stream bottom scoured and produced numerous new gravel bars. All field chemistry parameters were within normal ranges.

Smith Creek (SMIT)

Smith Creek near East Lawrence, PA, was designated as nonimpaired with supporting habitat. SMIT had the highest taxonomic richness of all the Group 3 streams and also had above average scores for Shannon Diversity Index, percent Ephemeroptera, and percent Chironomidae. This small stream drains a wetland area and mixed coniferous forest. Low habitat scores were given for a number of parameters, including epifaunal substrate, embeddedness, velocity/depth regimes, and frequency of riffles. Staff noted there was very low flow at this site at the time of sampling, as well as a small dump on the right bank. There were no field chemistry parameters that exceeded state limits.

Strait Creek (STRA)

A nonimpaired biological community existed at Strait Creek near Nelson, PA, during fiscal year 2005. The site had the highest percent Ephemeroptera of all the Group 3 sites and also showed good scores for EPT Index and Hilsenhoff Biotic Index. The physical habitat was designated supporting, and all field chemistry parameters were within normal limits. Low habitat scores were given for velocity/depth regimes, channel flow status, condition of banks, and sediment deposition. Staff noted very low flow at time of sampling, but there was evidence of a recent high water event.

White Branch Cowanesque River (WBCO)

In May 2004, White Branch Cowanesque River near North Fork, PA, was designated moderately impaired for the second consecutive year, with the worst metric scores for Shannon Diversity Index and Hilsenhoff Biotic Index. Additionally, it scored very low for EPT Index, percent Chironomidae, and percent dominant taxa. This site had been nonimpaired in May 2000 with a number of pollution intolerant taxa, but degraded to severely impaired by May 2003. The sample was dominated by midges, comprising 60.3 percent of the sample. The habitat was supporting due to low scores for embeddedness, velocity/depth regimes, and riparian vegetative zone width. WBCO is located downstream of an impoundment. Field chemistry measurements were within acceptable ranges.

White Hollow (WHIT)

White Hollow near Wellsburg, NY, was designated nonimpaired in fiscal year 2005 and showed the highest metric scores of all Group 3 streams for Hilsenhoff Biotic Index and percent Chironomidae. This site was dominated by the pollution intolerant mayfly, *Epeorus* (Ephemeroptera: Heptageniidae). The physical habitat was supporting, with lower scores for channel flow status, sediment deposition, and condition of banks; but high scores for riparian zone and vegetative protective cover. All water chemistry parameters were normal.

MANAGEMENT IMPLICATIONS

Long-term studies of this nature are critical to establish water quality trends and understand biological conditions. To effectively manage the resources, officials and local interest groups must have a true picture of ecological dynamics and possible problem areas, which can only be obtained through long-term studies such as this one.

Several management implications can be extracted from the chemical water quality, macroinvertebrate community, and physical habitat data collected from sampling areas. These observations, although based on a small sample size, are presented as possible subject areas for future research and as issues to be considered by aquatic resource managers, local interest groups, elected officials, and other policy-makers.

New York – Pennsylvania Sites

The sites in this reference category have shown and continue to show a large degree of variability in water quality; however, they do not vary much in biological or habitat condition. The biological conditions overall are nonimpaired or only slightly impaired. Habitat conditions were rated as excellent or supporting at all the NY-PA border sites, with the degradation at numerous sites due to dredging in the stream, inadequate riparian vegetative buffers, and the unstable nature of these glacial streams. Of particular interest is the prevalence of elevated total iron and total aluminum values throughout the sampling period, although there were fewer samples exceeding water quality standards in 2004-2005 than in 2003-2004.

Pennsylvania – Maryland Sites

In fiscal year 2005, total nitrogen and total nitrate concentrations continued to be elevated in the PA-MD interstate sites. The area surrounding the PA-MD border monitoring stations was largely agricultural. Intensive agricultural activities without proper Best Management Practices often result in streambank erosion and sedimentation, contributing to poor instream habitat quality and to nutrient enrichment. Nutrient enrichment encourages excessive plant growth, which can depress dissolved oxygen levels during plant decomposition. The most common habitat problem at the PA-MD sites was lack of riparian vegetative buffer zones along the stream corridors.

River Sites

Due to high river flows, staff collected biological samples at only three of the river stations during summer 2004. SUSQ 365.0 has continuously exhibited higher quality conditions than other river stations in the ISWQN. The Cowanesque River (COWN 2.2) downstream of the Cowanesque Reservoir had the poorest conditions with moderately impaired biological conditions and supporting habitat. Overall, high total iron and total aluminum concentrations were prevalent in the water quality conditions of the river sites during fiscal year 2005.

Group 3 Streams

The Group 3 streams were located on the NY-PA border, so many of them were glacial streams that were dredged for gravel. These disturbances in habitat may have attributed to degradation in the biological community. Conversely, many of the Group 3 streams were small order streams that were largely forested. These protective habitat conditions may have attributed to nonimpaired biological conditions. In fiscal year 2005, these sites were sampled after a high water event which caused noticeable

degradation at many of the Group 3 sites and resulted in lower habitat scores this year than in previous years.

Future Study

Future study and remediation efforts should focus on those streams that had moderately impaired macroinvertebrate communities or exceeded water quality standards. Moderately impaired biological conditions were found at Camp Brook, White Branch Cowanesque River, Denton Creek, Sackett Creek, and the Cowanesque River downstream of the Cowanesque Reservoir (COWN 2.2). Additional study of stream water chemistry, biology, and habitat at varying flows may help explain some impairment problems.

During this sampling period, a large number of streams had water quality parameters that exceeded standards. These streams included Bentley Creek, Cascade Creek, Cayuta Creek, Choconut Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, South Creek, Troups Creek, Trowbridge Creek, Conowingo Creek, Ebaughs Creek, Chemung River, Cowanesque River (1.0 and 2.2), the Susquehanna River (289.1, 340.0, and 365.0), Tioga River, and Denton Creek. The water quality conditions of these streams should be monitored for future violations. Furthermore, the source of these pollutants should be identified. State water quality standards vary across state lines, and problems may arise when the source of these pollutants is located in an adjacent state.

CONCLUSIONS

Twenty-two (48.9 percent) of the 45 interstate streams sites at which macroinvertebrate samples were collected contained nonimpaired biological communities. Biological conditions at another 18 sites (40.0 percent) were slightly impaired, while five sites (11.1 percent) were moderately impaired. No sites were designated severely impaired. Six sites (SUSQ 10.0, SUSQ 44.5, SUSQ 289.1, SUSQ 340.0, TIOG, and CHEM) were not sampled using RBP III techniques and, thus, were not averaged into the final scores. Nineteen sites (42.2 percent) had excellent habitats. Nineteen sites (42.2 percent) had supporting habitats, and seven sites (15.6 percent) had partially supporting habitats.

Overall, 72 observations (9.8 percent) of water chemistry parameters exceeded state standards, which is approximately the same proportion of exceedance values as the previous year. Total iron exceeded standards most frequently with 31 violations (43 percent). Total iron and total aluminum appear to be naturally high in some of these watersheds. Tioga River is the only stream that has documented abandoned mine discharge indicated by high metals and high acidity. Elevated aluminum and depressed alkalinity may be due to acid precipitation, especially in the NY-PA border streams. Total dissolved solids, nitrate plus nitrite, and dissolved oxygen are all indicators of organic pollution.

Of the NY-PA border streams, the biological community of ten (71.4 percent) of these streams was nonimpaired, and four sites (28.6 percent) were slightly impaired. Eight sites had excellent habitats (57.1 percent), and six sites (42.8 percent) had supporting habitats. Overall, biological conditions improved at four sites and stayed the same at the other 10 stations. High metal concentrations, particularly total iron and total aluminum, appeared to be the most common sources of water quality degradation in this region. The parameters that exceeded New York and Pennsylvania state standards were total iron, total aluminum, total chlorine, and alkalinity. Iron standards were exceeded at Bentley Creek, Cascade Creek, Cayuta Creek, Choconut Creek, Little Snake Creek, North Fork Cowanesque River, South Creek, Troups Creek, and Trowbridge Creek. Aluminum standards were exceeded at Bentley Creek, Cayuta Creek, Choconut Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, and Troups Creek. Total chlorine was exceeded at Cayuta Creek, while Cascade Creek and Little Snake Creek exceeded

alkalinity standards. In fiscal year 2005, high flows may have impacted the water quality and biological conditions at the NY-PA border streams.

Nonimpaired biological conditions existed at two (25.0 percent) of the eight PA-MD interstate streams and six sites (75.0 percent) were slightly impaired. Six (75.0 percent) of the PA-MD border sites had excellent habitats, one (12.5 percent) had supporting habitat, and one site (12.5 percent) had partially supporting habitat. Biological conditions at PA-MD sites appeared to improve or remain the same, with the exception of South Branch Conewago Creek, which showed some degradation. Water quality at two sites exceeded Pennsylvania and Maryland water quality standards: nitrite plus nitrate at CNWG 4.4 and total chlorine at EBAU 1.5. The PA-MD border streams are located in a heavily agricultural region, and many of the parameters that exceeded the 90th percentile at these sites were nutrients. Also, streambank erosion and sedimentation created instream habitat problems in this region.

River sites consisted of nine stations located on the Susquehanna River, Chemung River, Cowanesque River, and Tioga River. One station (SUSQ 10.0) is never sampled for macroinvertebrates due to a lack of riffle habitat and deep water at the site, while five stations were not sampled for macroinvertebrates during fiscal year 2005 due to high river flows throughout the summer sampling period. The remaining sites (SUSQ 365.0, COWN 1.0, and COWN 2.2) were compared to Cascade Creek, the reference station for the NY-PA stations. The biological communities of two sites (66.7 percent) were nonimpaired, while COWN 2.2 was moderately impaired. Habitat at SUSQ 365.0 was excellent, and both Cowanesque River sites had supporting habitat. Water quality parameters that exceeded state standards were total iron and total aluminum. Standards were exceeded at CHEM 12.0, COWN 2.2, COWN 1.0, SUSQ 365.0, SUSQ 340.0, SUSQ 289.1, and TIOG 10.8. The biological condition at the one Susquehanna River site sampled remained the same from previous years. COWN 1.0 improved from the last time it was sampled in 2002-2003, while COWN 2.2 remained moderately impaired as in the past. Water quality appeared to improve with a decreased number of state water quality standard violations.

Of the 20 Group 3 sites, eight stations (40.0 percent) were considered nonimpaired. Eight sites (40.0 percent) had slightly impaired biological communities, and four stations (20.0 percent) had moderately impaired conditions. Four (20.0 percent) of the 20 stations sampled had excellent habitat conditions, while 10 (50.0 percent) had supporting and six had partially supporting habitats. Most of the Group 3 streams remained the same as previous years, although five sites did show slight degradation in the biological community.

The current and historical data contained in this report provide a database that enables SRBC staff and others to better manage water quality, water quantity, and biological resources of interstate streams in the Susquehanna River Basin. The data can be used by SRBC's member states and local interest groups to gain a better understanding of water quality in upstream and downstream areas outside of their jurisdiction. Information in this report also can serve as a starting point for more detailed assessments and remediation efforts that may be planned on these streams.

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APPENDIX A

WATER QUALITY DATA FOR INTERSTATE STREAMS CROSSING THE NEW YORK-PENNSYLVANIA AND PENNSYLVANIA-MARYLAND BORDERS

Table A1. Water Quality Data for New York-Pennsylvania Border Streams

Parameter	Units	APAL 6.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	CASC1.6	CASC 1.6	CASC 1.6	CASC 1.6
Date	yyyymmdd	20040825	20040720	20050215	20050510	20040719	20041020	20050214	20050509
Time	hhmm	1210	1210	1110	1335	1215	1030	1045	1010
Discharge	cfs	22.221	31.915	32.355	9.327	3.013	6.48	6.733	2.13
Temperature	degree C	19.3	20.7	1.2	17.7	18.8	9	0.4	10.7
Conductance	umhos/cm	86	193	117	180	63	46	46	62
Dissolved Oxygen	mg/l	7.81	7.75	10.57	8.74	6.62	9.03	10.22	9.32
pH		6.8	8.1	7.8	8.2	6.9	6.9	6.8	6.5
Alkalinity	mg/l	28	64	54	60	24	12	16	10
Acidity	mg/l	4	2	6	2	6	2	4	4
Solids, Total	mg/l	66	158	76	106	50	48	56	64
Ammonia, Total	mg/l	<0.02	<0.02	0.02	0.03	0.02	<0.02	<0.02	0.03
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.15	0.14	0.61	<0.04	0.07	0.04	0.2	0.05
Nitrogen, Total	mg/l	0.28	0.51	0.9	0.6	0.33	0.19	0.24	0.47
Phosphorus, Total	mg/l	0.021	<0.01	0.012	0.022	0.029	0.012	<0.01	0.032
Orthophosphate, Total	mg/l	0.012	<0.01	0.016	<0.01	0.018	0.01	<0.01	0.02
Organic Carbon, Total	mg/l	3.2	3.6	2.23	2.45	3.8	2.8	1.34	1.92
Calcium	mg/l	7.85	22.9	13.9	17.8	6.814	4.57	4.33	5.315
Magnesium	mg/l	2.42	4.32	2.88	3.8	1.843	1.37	1.37	1.582
Chloride	mg/l	4.06	12.6	8.04	9.24	1.71	1.53	1.72	1.86
Sulfate	mg/l	7.35	9.6	10.5	10.6	5.4	5.97	8.29	8.25
Turbidity	ntu	2.55	<1	9.08	1.11	3.09	2.26	3.72	2.91
Iron, Total	µg/l	240	73	337	33	868	275	261	255
Manganese, Total	µg/l	52	<10	<10	<10	96	55	41	39
Aluminum, Total	µg/l	<200	<200	298	<200	<200	<200	<200	<200
Suspended Sediment	ppm	NA	NA	14	3	NA	NA	5	2

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	CAYT 1.7	CAYT 1.7	CAYT 1.7	CAYT 1.7	CHEM 12.0	CHEM 12.0	CHEM 12.0	CHEM 12.0
Date	yyyymmdd	20040826	20041021	20050215	20050509	20040929	20041020	20050215	20050510
Time	hhmm	0850	1020	0835	1515	1250	1450	0945	1425
Discharge	cfs	137.292	76.2	72.35	47.912	2050	3470	4150	1290
Temperature	degree C	17.5	9.7	0.8	14.9	16.4	9.9	1.1	16.2
Conductance	umhos/cm	257	235	175	325	341	304	228	372
Dissolved Oxygen	mg/l	7.28	9.25	9.7	10.01	7.44	8.65	10.1	10.9
pH		7.25	7.6	7.7	8.2	6.55	7.95	8	8.5
Alkalinity	mg/l	82	70	84	56	120	94	72	88
Acidity	mg/l	8	4	2	2	28	2	4	0
Solids, Total	mg/l	174	158	104	214	242	230	170	216
Ammonia, Total	mg/l	<0.02	<0.02	0.03	0.03	0.03	<0.02	0.04	0.03
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.39	0.57	0.58	0.76	0.96	0.69	0.87	0.52
Nitrogen, Total	mg/l	0.55	0.75	0.74	0.81	1.28	0.98	1.12	0.96
Phosphorus, Total	mg/l	0.07	0.125	0.022	0.226	0.062	0.034	0.033	0.057
Orthophosphate, Total	mg/l	0.016	0.113	0.02	0.2	0.063	0.022	0.017	0.029
Organic Carbon, Total	mg/l	2.7	3.3	2.17	2.25	3.3	3.6	2.65	3.21
Calcium	mg/l	26.5	23.1	18.9	29.1	37.3	33.3	24.6	33.8
Magnesium	mg/l	5.45	5	3.92	6.217	7.59	7.61	5.19	8.14
Chloride	mg/l	25.1	24.1	17.3	30.5	31.6	29.3	26	36.7
Sulfate	mg/l	10.3	10.1	11.6	14.9	16	18.8	15.7	19.7
Turbidity	ntu	2.14	2.82	6.73	1.32	23.07	9.15	20.71	1.8
Iron, Total	µg/l	158	164	408	89	698	344	582	93
Manganese, Total	µg/l	12	<10	14	<10	51	30	61	34
Aluminum, Total	µg/l	<200	<200	282	<200	382	225	534	<200
Suspended Sediment	ppm	NA	NA	9	5	NA	NA	35	3

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	CHOC 9.1	COWN 1.0	COWN 1.0	COWN 1.0	COWN 1.0	COWN 2.2	COWN 2.2	COWN 2.2
Date	yyyymmdd	20040720	20040721	20041021	20050216	20050510	20040722	20041021	20050216
Time	hhmm	0845	1300	1220	0800	0950	0820	1310	0930
Discharge	cfs	51.617	158	181	983	91	137	181	992
Temperature	degree C	16.9	24.1	12.6	2	11	22.5	13.1	1.8
Conductance	umhos/cm	82	69	166	135	150	68	165	130
Dissolved Oxygen	mg/l	7.28	6.81	7.91	9.87	7.58	6.2	7.39	10.11
pH		6.85	7.5	7.35	7.3	6.8	7.6	7.3	7.4
Alkalinity	mg/l	22	58	54	54	48	68	50	58
Acidity	mg/l	2	4	2	4	4	4	2	6
Solids, Total	mg/l	74	142	152	120	94	124	162	108
Ammonia, Total	mg/l	0.03	0.04	0.03	0.05	0.03	0.08	0.02	0.05
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.18	0.12	0.58	0.74	0.47	0.09	0.57	0.74
Nitrogen, Total	mg/l	0.89	0.53	0.87	1.25	0.83	0.44	0.87	1.01
Phosphorus, Total	mg/l	0.025	0.028	0.053	0.052	0.072	0.019	0.055	0.049
Orthophosphate, Total	mg/l	0.013	0.019	0.087	0.029	0.048	0.017	0.087	0.029
Organic Carbon, Total	mg/l	4.1	1.4	4.3	2.81	3.14	4.3	4.4	2.9
Calcium	mg/l	6.81	21.6	17.4	16.2	15	22.5	17.8	16
Magnesium	mg/l	2.17	4.4	3.96	3.664	3.37	4.35	3.85	3.606
Chloride	mg/l	5.31	10.4	6.8	8.57	7.42	9.98	6.75	8.49
Sulfate	mg/l	6.7	11.5	10.1	12.4	11.5	11.5	10	12.2
Turbidity	ntu	5.63	8.45	40.54	54.1	4.4	10.07	41.2	54.4
Iron, Total	µg/l	474	282	1090	2174	196	145	759	1858
Manganese, Total	µg/l	34	78	63	96	33	95	60	93
Aluminum, Total	µg/l	226	<200	972	2416	<200	<200	631	2140
Suspended Sediment	ppm	NA	NA	NA	24	5	NA	NA	33

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	COWN 2.2	HLDN 3.5	LSNK 7.6	LSNK 7.6	LSNK 7.6	LSNK 7.6	NFCR 7.6	SEEL 10.3
Date	yyyymmdd	20050510	20040721	20040719	20041020	20050214	20050509	20040721	20040720
Time	hhmm	0910	1140	1445	1215	1325	1240	0900	1420
Discharge	cfs	91	2.326	7.895	10.638	8.884	6.211	3.041	48.334
Temperature	degree C	10.7	20.2	19.9	9.7	0.1	12.9	16.2	22
Conductance	umhos/cm	147	65	130	100	102	120	45	242
Dissolved Oxygen	mg/l	7.47	7.01	7.1	9.06	10.47	9.33	7.16	6.66
pH		6.8	7.45	7	7	7.1	6.7	7.15	7.9
Alkalinity	mg/l	46	64	26	22	18	16	36	78
Acidity	mg/l	4	6	4	2	4	2	4	2
Solids, Total	mg/l	66	120	88	80	106	90	138	190
Ammonia, Total	mg/l	0.03	<0.02	0.02	<0.02	0.03	0.03	0.05	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.37	0.04	0.06	<0.04	0.26	<0.04	2.16	0.26
Nitrogen, Total	mg/l	0.71	0.28	0.26	0.26	0.49	0.49	2.6	0.64
Phosphorus, Total	mg/l	0.061	0.024	0.025	0.021	0.014	0.064	0.107	0.013
Orthophosphate, Total	mg/l	0.038	0.018	0.017	0.013	0.011	0.05	0.091	PBQ
Organic Carbon, Total	mg/l	2.56	5.1	4.7	3.9	2.28	2.27	5.8	3.9
Calcium	mg/l	12	21.8	9.493	7.62	7.04	8.025	16.3	30
Magnesium	mg/l	2.66	4.33	2.354	2.02	1.94	2.208	4.57	4.66
Chloride	mg/l	5.83	13.7	17.8	11.9	15.6	12.7	9.02	15.8
Sulfate	mg/l	9.22	9.4	7.27	6.15	8.45	8.2	10.5	10.6
Turbidity	ntu	3.46	2.64	4.32	3.66	6.71	1.97	8.96	PBQ
Iron, Total	µg/l	72	185	602	345	411	208	359	56
Manganese, Total	µg/l	26	12	66	34	50	23	38	PBQ
Aluminum, Total	µg/l	<200	<200	<200	<200	205	<200	<200	<200
Suspended Sediment	ppm	1	NA	NA	NA	21	3	NA	NA

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	SEEL 10.3	SEEL 10.3	SEEL 10.3	SNAK 2.3	SOUT 7.8	SUSQ 289.1	SUSQ 289.1
Date	yyyymmdd	20041021	20050215	20050510	20040719	20040720	20040929	20041021
Time	hhmm	1135	1245	1155	1400	1315	1145	0830
Discharge	cfs	68.43	29.742	32.385	113.425	12.394	10700	8780
Temperature	degree C	10.1	1.3	16.2	19	21.7	17.3	10.1
Conductance	umhos/cm	186	158	250	102	168	235	215
Dissolved Oxygen	mg/l	8.93	10.16	8.16	7.6	7.73	6.99	8.8
pH		7.8	7.5	8	7.2	7.6	6.5	7.5
Alkalinity	mg/l	74	96	60	26	48	82	60
Acidity	mg/l	2	8	2	2	2	32	2
Solids, Total	mg/l	134	104	136	72	118	174	154
Ammonia, Total	mg/l	<0.02	<0.02	0.03	0.02	<0.02	0.04	0.03
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.26	0.74	0.21	0.2	0.09	0.7	0.5
Nitrogen, Total	mg/l	0.52	0.89	0.6	0.56	0.71	1.05	0.9
Phosphorus, Total	mg/l	0.022	0.011	0.027	0.025	0.04	0.055	0.043
Orthophosphate, Total	mg/l	0.024	0.012	0.015	0.018	0.028	0.033	0.023
Organic Carbon, Total	mg/l	4.4	2.37	2.03	3.4	7	3	3.7
Calcium	mg/l	22.2	19.1	27.8	8.789	17.4	27.7	24.1
Magnesium	mg/l	3.95	3.23	4.7	2.56	3.41	4.29	4.33
Chloride	mg/l	11.8	12.7	14.5	7.88	15.2	19.5	19.6
Sulfate	mg/l	9.47	11.1	11.6	7.7	8.6	8.62	8.76
Turbidity	ntu	7.88	6.52	< 1	2.82	4.03	16.03	8.49
Iron, Total	µg/l	285	262	36	268	787	911	553
Manganese, Total	µg/l	<10	<10	<10	19	54	57	36
Aluminum, Total	µg/l	200	<200	<200	<200	<200	546	302
Suspended Sediment	ppm	NA	7	5	NA	NA	NA	NA

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	SUSQ 289.1	SUSQ 289.1	SUSQ 340.0	SUSQ 340.0	SUSQ 340.0	SUSQ 340.0	SUSQ 365.0
Date	yyyymmdd	20050214	20050509	20040929	20041020	20050214	20050509	20040719
Time	hhmm	1450	1355	0950	1120	1200	1125	1040
Discharge	cfs	10800	6180	5620	3810	5450	2550	1296
Temperature	degree C	0.3	14.4	16.3	9.6	0.3	12.7	20.7
Conductance	umhos/cm	193	267	154	148	171	222	231
Dissolved Oxygen	mg/l	10.28	9.83	7.12	8.93	9.91	9.42	6.07
pH		7.45	8	6.55	7.15	7.2	7.1	7.4
Alkalinity	mg/l	58	46	54	48	52	48	74
Acidity	mg/l	6	2	12	6	6	6	6
Solids, Total	mg/l	140	178	138	120	160	154	142
Ammonia, Total	mg/l	0.06	0.03	0.04	<0.02	0.05	0.03	0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.77	0.55	0.37	0.33	0.63	0.43	0.48
Nitrogen, Total	mg/l	1.06	0.71	0.9	0.63	0.78	0.62	0.81
Phosphorus, Total	mg/l	0.026	0.086	0.133	0.032	0.02	0.04	0.035
Orthophosphate, Total	mg/l	0.02	0.065	0.107	0.025	0.017	0.021	0.018
Organic Carbon, Total	mg/l	2.3	2.48	4	3.5	2.06	2.09	3.4
Calcium	mg/l	21.1	27.4	18.2	16.7	20.1	24.5	31.28
Magnesium	mg/l	3.28	4.165	2.59	2.67	2.51	2.856	3.422
Chloride	mg/l	24.3	22.9	11.6	12.5	20.3	17.3	17.8
Sulfate	mg/l	9.02	10.4	6.96	7.39	8.67	9.5	8.86
Turbidity	ntu	10.35	2.44	38.29	13.99	7.56	2.87	3.01
Iron, Total	µg/l	513	148	1410	752	364	176	278
Manganese, Total	µg/l	27	21	92	41	25	37	26
Aluminum, Total	µg/l	280	<200	972	436	<200	<200	<200
Suspended Sediment	ppm	16	4	NA	NA	9	3	NA

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	SUSQ 365.0	SUSQ 365.0	SUSQ 365.0	TIOG 10.8	TIOG 10.8	TIOG 10.8	TIOG 10.8	TRUP 4.5
Date	yyyymmdd	20041020	20050214	20050509	20040929	20041020	20050215	20050510	20040721
Time	hhmm	0925	0955	0915	1415	1700	1400	1020	1035
Discharge	cfs	2996	8794	2548	590	855	1515	315	62.367
Temperature	degree C	9.5	0.2	11.5	16.5	12	1.7	15.3	18.9
Conductance	umhos/cm	165	177	229	149	175	128	177	64
Dissolved Oxygen	mg/l	8.71	10.86	9.17	7.45	8.48	10.28	11.45	7.16
pH		7.3	7.2	7.15	6.5	7.4	7.3	8.7	7.6
Alkalinity	mg/l	54	52	44	40	40	34	58	72
Acidity	mg/l	2	4	6	38	2	4	0	6
Solids, Total	mg/l	120	114	164	130	154	118	120	178
Ammonia, Total	mg/l	<0.02	0.03	0.04	0.06	0.02	0.05	0.03	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.41	0.69	0.47	0.49	0.52	0.64	0.36	1.02
Nitrogen, Total	mg/l	0.62	0.93	0.65	0.92	0.79	1	0.72	1.44
Phosphorus, Total	mg/l	0.027	0.023	0.04	0.064	0.044	0.038	0.067	0.048
Orthophosphate, Total	mg/l	0.013	0.013	0.024	0.134	0.049	0.015	0.047	0.097
Organic Carbon, Total	mg/l	3.6	2.04	2.2	4.1	3.4	2.78	2.51	4.5
Calcium	mg/l	19.7	21.4	26.5	17.2	18.6	14.8	17.2	23.9
Magnesium	mg/l	2.84	2.47	2.937	4.09	4.85	3.38	4.22	5.46
Chloride	mg/l	13.9	19.5	16.6	5.62	6.92	8.16	7.72	10.8
Sulfate	mg/l	7.66	8.42	9.54	21.2	27.6	17.7	28.2	11.1
Turbidity	ntu	5.61	5.33	4.02	71.46	29.37	45.84	4.38	53.42
Iron, Total	µg/l	326	344	222	2480	393	1540	193	462
Manganese, Total	µg/l	23	19	27	334	482	218	232	19
Aluminum, Total	µg/l	<200	<200	<200	1420	272	1670	<200	371
Suspended Sediment	ppm	NA	9	7	NA	NA	28	2	NA

Table A1. Water Quality Data for New York-Pennsylvania Border Streams – Continued

Parameter	Units	TRUP 4.5	TRUP 4.5	TRUP 4.5	TROW 1.8	WAPP 2.6
Date	yyyymmdd	20041021	20050216	20050510	20040719	20040825
Time	hhmm	1435	1100	0755	1310	1400
Discharge	cfs	11.01	17.259	10.331	16.054	41.927
Temperature	degree C	9.3	0.5	10.3	18.6	20.3
Conductance	umhos/cm	217	168	246	76	103
Dissolved Oxygen	mg/l	8.87	10.89	8.47	7.03	8.75
pH		7.65	7.5	7.35	6.9	8.2
Alkalinity	mg/l	74	80	46	20	36
Acidity	mg/l	2	8	4	2	2
Solids, Total	mg/l	190	170	124	64	72
Ammonia, Total	mg/l	<0.02	0.03	0.02	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.35	0.73	0.06	0.14	0.18
Nitrogen, Total	mg/l	0.57	0.96	0.58	0.38	0.34
Phosphorus, Total	mg/l	0.035	0.049	0.067	0.021	0.015
Orthophosphate, Total	mg/l	0.081	0.022	0.059	0.014	0.01
Organic Carbon, Total	mg/l	3.7	1.82	3.32	3.6	3
Calcium	mg/l	25.2	18.4	25.7	6.059	8.28
Magnesium	mg/l	5.72	4.626	5.66	1.911	2.78
Chloride	mg/l	10.7	16.6	13.6	4.75	5.95
Sulfate	mg/l	12.4	12.4	13.5	6.92	7.54
Turbidity	ntu	46.72	77.4	3.73	3.78	1.39
Iron, Total	µg/l	2000	3486	166	337	84
Manganese, Total	µg/l	34	50	17	12	<10
Aluminum, Total	µg/l	1760	3711	<200	<200	<200
Suspended Sediment	ppm	NA	61	3	NA	NA

Table A2. Water Quality Data for Pennsylvania-Maryland Border Streams

Parameter	Units	BBDC 4.1	CNWG 4.4	CNWG 4.4	CNWG 4.4	CNWG 4.4	DEER 44.2	DEER 44.2	DEER 44.2
Date	yyyymmdd	20040714	20040809	20041014	20050208	20050503	20040713	20041013	20050207
Time	hhmm	0905	0930	1230	0845	1105	1220	1010	1035
Discharge	cfs	3.666	37.503	15.297	36.45	33.058	20.476	14.921	14.248
Temperature	degree C	16.4	17.7	11.1	4.6	9	19.5	9.3	3
Conductance	umhos/cm	148	256	255	255	277	214	212	232
Dissolved Oxygen	mg/l	7.32	8.56	8.7	9.26	9.57	7.23	8.71	9.24
pH		7.2	6.7	7.3	7	7.1	7.35	7.1	7.35
Alkalinity	mg/l	24	36	34	28	24	42	36	36
Acidity	mg/l	2	8	4	6	4	4	4	6
Solids, Total	mg/l	154	212	174	<2	178	160	194	126
Ammonia, Total	mg/l	<0.02	0.12	<0.02	0.09	0.07	<0.02	<0.02	0.03
Nitrite, Total	mg/l	<0.01	0.11	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	5.98	11.1	11.8	11	11.5	4.55	5.58	6.14
Nitrogen, Total	mg/l	6.28	11.73	11.68	11.19	11.7	4.78	6.05	6.29
Phosphorus, Total	mg/l	0.014	0.058	0.031	0.049	0.037	0.013	<0.01	0.019
Orthophosphate, Total	mg/l	<0.01	0.043	0.026	0.044	0.022	0.011	<0.01	<0.01
Organic Carbon, Total	mg/l	1.3	2.3	1.4	2.06	1.88	1.9	1.1	1.07
Calcium	mg/l	12.9	18.4	19.2	19.1	19.1	17.5	16.5	17
Magnesium	mg/l	6.213	10.4	10.5	11.5	11.2	6.451	7.04	6.24
Chloride	mg/l	12.2	19.6	20.1	22.4	19.8	25.4	24.5	36.3
Sulfate	mg/l	3.85	12.6	12.6	14.4	14.4	5.45	4.97	6.24
Turbidity	ntu	2.84	5.98	1.67	12.43	3	1.76	<1	5.73
Iron, Total	µg/l	164	349	98	470	124	213	113	213
Manganese, Total	µg/l	24	32	11	37	20	26	16	36
Aluminum, Total	µg/l	<200	<200	<200	335	<200	<200	<200	<200
Suspended Sediment	ppm	NA	NA	NA	18	4	NA	NA	9

Table A2. Water Quality Data for Pennsylvania-Maryland Border Streams- Continued

Parameter	Units	DEER 44.2	EBAU 1.5	EBAU 1.5	EBAU 1.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	LNGA 2.5
Date	yyyymmdd	20050502	20040713	20041013	20050207	20050502	20040714	20040713	20041013
Time	hhmm	0955	1315	1105	1145	1105	1015	0910	0820
Discharge	cfs	11.587	11.233	19.815	11.029	11.2	2.293	2.909	1.344
Temperature	degree C	9.3	18.8	9.6	3.4	9.2	16.9	18.1	9.3
Conductance	umhos/cm	235	202	200	211	207	134	680	193
Dissolved Oxygen	mg/l	9.32	6.9	9.11	9.89	9.62	7.29	6.8	9.26
pH		7.3	7.2	7	7.2	7.4	7.05	6.8	6.9
Alkalinity	mg/l	34	42	28	26	32	24	32	32
Acidity	mg/l	4	2	2	4	2	6	10	4
Solids, Total	mg/l	146	158	202	140	128	142	176	198
Ammonia, Total	mg/l	0.04	0.04	<0.02	0.33	0.17	0.03	0.02	<0.02
Nitrite, Total	mg/l	<0.01	0.09	<0.01	0.07	0.11	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	5.64	5.12	6.16	6.58	6.04	5.08	6.19	6.96
Nitrogen, Total	mg/l	5.82	5.54	6.8	7.1	6.45	5.33	6.59	7.59
Phosphorus, Total	mg/l	0.019	0.034	0.019	0.037	0.039	0.014	0.02	0.012
Orthophosphate, Total	mg/l	<0.01	0.025	0.016	0.03	0.023	0.011	0.015	0.011
Organic Carbon, Total	mg/l	1.08	2	1.2	1.48	1.36	1.9	1.7	1.2
Calcium	mg/l	16.1	16.3	14.8	14.8	14	10.8	16.2	16.5
Magnesium	mg/l	6.04	6.323	6.65	5.91	5.46	5.09	6.28	7.01
Chloride	mg/l	27.9	21.1	22	28.8	20.8	11.5	15.9	16.5
Sulfate	mg/l	5.96	6.4	5.17	6.82	6.41	3.45	6.42	6.51
Turbidity	ntu	1.74	3.32	1.46	3.94	1.46	3.23	9.05	3.64
Iron, Total	µg/l	123	476	270	210	117	321	511	254
Manganese, Total	µg/l	19	99	57	37	21	70	64	41
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	350	<200
Suspended Sediment	ppm	NA	NA	NA	5	2	NA	NA	NA

Table A2. Water Quality Data for Pennsylvania-Maryland Border Streams- Continued

Parameter	Units	LNGA 2.5	LNGA 2.5	OCTO 6.6	OCTO 6.6	OCTO 6.6	OCTO 6.6	SCTT 3.0	SCTT 3.0
Date	yyyymmdd	20050207	20050502	20040809	20041014	20050208	20050503	20040714	20041013
Time	hhmm	0830	0815	1045	1100	1045	0935	1120	1300
Discharge	cfs	2.546	2.221	174.031	84.027	127.59	141.6	0.799	0.973
Temperature	degree C	2.6	8.1	21.4	12.3	3.2	10.5	18.6	11.6
Conductance	umhos/cm	179	194	238	244	246	271	282	332
Dissolved Oxygen	mg/l	9.07	9.12	7.08	8.26	9.89	9.08	7	7.97
pH		7.2	6.9	7.6	8.1	7.35	7.3	7.5	7.2
Alkalinity	mg/l	34	30	52	70	46	22	60	68
Acidity	mg/l	6	4	2	2	4	4	2	4
Solids, Total	mg/l	134	118	176	258	194	176	246	272
Ammonia, Total	mg/l	0.08	0.05	0.02	0.03	0.09	0.02	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	0.07	<0.01	0.04	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	7.1	6.27	5.65	7.09	9.66	8.44	1.89	2.39
Nitrogen, Total	mg/l	7.7	6.56	6.36	7.26	9.78	8.74	2.22	2.66
Phosphorus, Total	mg/l	0.016	0.073	0.108	0.07	0.057	0.038	0.047	0.022
Orthophosphate, Total	mg/l	0.011	0.058	0.062	0.06	0.053	0.012	0.038	0.022
Organic Carbon, Total	mg/l	1.45	1.15	4.1	2.6	1.52	2.14	2.3	1.5
Calcium	mg/l	16.3	15.5	18.4	19	20.7	20.2	19.7	23
Magnesium	mg/l	6.03	5.56	9.55	9.93	11.1	10.5	12.3	15.7
Chloride	mg/l	17.5	16	15.3	16.8	18.9	17.4	35.3	36.7
Sulfate	mg/l	7.57	7.04	14.9	16.6	18.6	19.2	18.5	22.2
Turbidity	ntu	6.45	3.09	10.63	1.43	6.01	4.65	5.04	1.23
Iron, Total	µg/l	204	161	228	82	197	247	536	112
Manganese, Total	µg/l	56	32	67	<10	32	43	46	16
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	<200
Suspended Sediment	ppm	8	7	NA	NA	1	5	NA	NA

Table A2. Water Quality Data for Pennsylvania-Maryland Border Streams-Continued

Parameter	Units	SCTT 3.0	SCTT 3.0	SBCC 20.4	SUSQ 10.0	SUSQ 10.0	SUSQ 44.5	SUSQ 44.5	SUSQ 44.5
Date	yyyymmdd	20050207	20050502	20040713	20050328	20050502	20041014	20050328	20050503
Time	hhmm	1325	1225	1025	0910	1340	1415	1125	1340
Discharge	cfs	3.556	1.999	2.104	84800	11200	22050	70400	31900
Temperature	degree C	4.2	10.9	17.3	7	15.4	13.5	5.7	12.2
Conductance	umhos/cm	430	225	138	219	281	249	240	293
Dissolved Oxygen	mg/l	9.49	9.77	7.34	9.91	9.17	8.15	10.01	9.68
pH		7.1	7.1	7.2	7.1	7.5	7.7	7.1	7.25
Alkalinity	mg/l	78	46	46	224	40	80	258	66
Acidity	mg/l	4	2	4	10	2	2	6	4
Solids, Total	mg/l	386	130	84	168	154	232	178	178
Ammonia, Total	mg/l	0.77	0.05	<0.02	0.06	0.04	0.04	0.1	0.03
Nitrite, Total	mg/l	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	2.74	1.84	2.02	1.58	1.15	2.27	2.3	1.46
Nitrogen, Total	mg/l	17.48	2.03	2.32	1.9	1.46	2.56	2.56	1.83
Phosphorus, Total	mg/l	0.511	0.033	0.013	0.042	0.028	0.032	0.044	0.029
Orthophosphate, Total	mg/l	0.437	0.019	0.011	0.033	0.013	0.018	0.028	0.015
Organic Carbon, Total	mg/l	69	1.39	1.4	2.45	2.42	2.5	2.43	2.77
Calcium	mg/l	20.7	11.9	16.5	22.2	27.5	36	23.1	27.6
Magnesium	mg/l	13.9	7.61	3.71	6.55	6.76	9.34	5.92	7.06
Chloride	mg/l	81	28.7	7.64	19.8	19.2	19.4	27.5	21.1
Sulfate	mg/l	26.6	15.9	4	26.4	31.6	37.4	22.8	32.6
Turbidity	ntu	3.67	4.25	5.51	17.15	7.89	6.38	11.33	5.85
Iron, Total	µg/l	438	350	363	712	285	385	546	361
Manganese, Total	µg/l	288	66	28	116	67	55	85	60
Aluminum, Total	µg/l	<200	<200	<200	539	<200	219	273	<200
Suspended Sediment	ppm	9	12	NA	22	7	NA	14	8

Table A3. Water Quality Data for Group 3 Streams

Parameter	Units	Babcock Run	Beagle Hollow Run	Bill Hess Creek	Bird Creek	Biscuit Hollow Run	Briggs Hollow Run
Date	yyyymmdd	20050523	20050525	20050525	20050524	20050525	20050525
Time	hhmm	1515	1115	1250	1230	1010	1430
Temperature	degree C	11.2	9.9	12.4	11.3	12.0	12.1
pH		7.15	6.90	8.35	7.20	7.10	7.60
Dissolved Oxygen	mg/l	9.06	8.70	9.34	8.80	8.64	8.35
Conductivity	umhos/cm	126	110	367	222	232	263
Alkalinity	mg/l	36.0	46.0	128.0	64.0	102.0	88.0
Acidity	mg/l	4.0	6.0	0	6.0	4.0	6.0

Parameter	Units	Bulkley Brook	Camp Brook	Cook Hollow Run	Deep Hollow Brook	Denton Creek	Dry Brook
Date	yyyymmdd	20050525	20050525	20050525	20050523	20050523	20050524
Time	hhmm	1045	1205	0935	1130	1235	DRY
Temperature	degree C	9.9	12.3	9.6	10.1	14.7	
pH		6.90	8.40	7.30	7.05	7.0	
Dissolved Oxygen	mg/l	8.20	9.48	8.79	8.30	6.92	
Conductivity	umhos/cm	125	308	259	56	54	
Alkalinity	mg/l	52.0	112.0	108.0	22.0	14.0	
Acidity	mg/l	8.0	0	4.0	4.0	6.0	

Parameter	Units	Little Wappasenning Creek	Parks Creek	Prince Hollow Run	Russell Run	Sackett Creek	Smith Creek
Date	yyyymmdd	20050524	20050524	20050523	20050523	20050524	20050524
Time	hhmm	0745	0930	1430	1550	0830	1340
Temperature	degree C	10.8	10.2	13.0	12.1	11.0	11.3
pH		7.40	7.20	7.10	7.0	7.0	6.80
Dissolved Oxygen	mg/l	7.42	9.07	8.98	8.40	8.09	8.43
Conductivity	umhos/cm	194	152	125	110	240	200
Alkalinity	mg/l	80.0	54.0	32.0	34.0	92.0	76.0
Acidity	mg/l	4.0	4.0	6.0	4.0	8.0	4.0

Table A3. Water Quality Data for Group 3 Streams - Continued

Parameter	Units	Strait Creek	White Branch Cowanesque River	White Hollow
Date	yyyymmdd	20050524	20050525	20050524
Time	hhmm	1435	0830	1135
Temperature	degree C	12.7	12.1	9.1
pH		7.40	7.45	7.10
Dissolved Oxygen	mg/l	8.23	8.36	8.44
Conductivity	umhos/cm	290	177	184
Alkalinity	mg/l	120.0	52.0	60.0
Acidity	mg/l	4.0	4.0	8.0

APPENDIX B

ORGANIC POLLUTION–TOLERANCE AND FUNCTIONAL FEEDING GROUP DESIGNATIONS OF BENTHIC MACROINVERTEBRATE TAXA

Class: Order	Family	Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
Coleoptera	Elmidae	*Dubiraphia*	6	CG
		Optioservus	4	SC
		Oulimnius	5	SC
		Promoresia	2	SC
		Stenelmis	5	SC
	Gyrinidae	*Dinetus*	4	P
	Hydrophilidae	*Enochrus*	9	CG
	Psephenidae	*Ectopria*	5	SC
		Psephenus	4	SC
	Ptilodactylidae	*Anchytarsus*	5	SH
Diptera	Athericidae	*Atherix*	2	P
	Ceratopogonidae	*Bezzia*	6	P
		Probezzia	6	P
	Chironomidae		6	CG
	Empididae	*Chelifera*	6	P
		Hemerodromia	6	P
	Simulidae	*Prosimulium*	2	FC
		Simulium	6	FC
	Tabanidae	*Chrysops*	7	P
		Tabanus	5	P
	Tipulidae	*Antocha*	3	CG
		Dicranota	3	P
		Hexatoma	2	P
		Limnophila	3	P
		Tipula	4	SH
Ephemeroptera	Ameletidae	*Ameletus*	0	CG
	Baetidae	*Acentrella*	4	CG
		Baetis	6	CG
		Heterocoleon	2	SC
	Caenidae	*Caenis*	7	CG
	Ephemerellidae	*Drunella*	1	SC
		Ephemerella	1	SC
		Serratella	2	CG
	Ephemeridae	*Ephemera*	3	CG
	Heptagenidae	*Epeorus*	0	CG
		Heptagenia	4	SC
		Leucrocuta	1	SC
		Stenacron	4	CG
		Stenonema	3	SC
	Isonychiidae	*Isonychia*	3	FC
	Leptophlebiidae	*Paraleptophlebia*	1	CG
	Polymitarcyidae	*Ephoron*	2	CG
	Potamanthidae	*Anthopotamus*	4	FC
	Tricorythidae	*Tricorythodes*	4	CG
Megaloptera	Corydalidae	*Corydalus*	4	P
		Nigronia	2	P
	Sialidae	*Sialis*	6	P
Odonata	Aeshnidae	*Boyeria*	2	P
	Coenagrionidae	*Argia*	6	P
	Gomphidae	*Gomphus*	5	P

Class: Order	Family	Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
		Ophiogomphus	1	P
		Stylogomphus	4	P
Plecoptera	**Choloroperlidae**	*Alloperla*	0	CG
		Haploperla	0	P
		Suwallia	0	P
		Sweltsa	0	P
	Leuctridae	*Leuctra*	0	SH
	Nemouridae	*Amphinemura*	3	SH
	Perlidae	*Acroneuria*	0	P
		Agnetina	2	P
		Beloneuria	3	P
		Neoperla	3	P
		Paragnetina	1	P
		Perlesta	4	P
	Perlodidae	*Isoperla*	2	P
		Yugus	2	P
	Pteronarcyidae	*Pteronarcys*	0	SH
Tricoptera	**Brachycentridae**	*Brachycentrus*	1	FC
	Glossomatidae	*Glossosoma*	0	SC
	Hydropsychidae	*Ceratopsyche*	5	FC
		Cheumatopsyche	6	FC
		Diplectrona	0	FC
		Hydropsyche	5	FC
		Macrostemum	3	FC
	Hydroptilidae	*Dibusa*	3	SC
		Leucotrichia	6	SC
	Odontoceridae	*Psilotreta*	0	SC
	Philopotamidae	*Chimarra*	4	FC
		Dolophilodes	0	FC
	Polycentropodidae	*Polycentropus*	6	P
	Psychomyiidae	*Psychomyia*	2	CG
	Rhyacophilidae	*Rhyacophila*	1	P
	Uenoidae	*Neophylax*	3	SC
Amphipoda	**Gammaridae**	*Gammarus*	6	SH
Decapoda	**Cambaridae**	*Cambarus*	6	SH
		Orconectes	6	SH
Isopoda	**Asellidae**	*Caecidotea*	6	SH
Oligochaeta	**Lumbriculidae**		8	CG
Pelecypoda	**Corbiculidae**	*Corbicula*	4	FC

APPENDIX C

MACROINVERTEBRATE DATA FOR INTERSTATE STREAMS CROSSING THE NEW YORK-PENNSYLVANIA AND PENNSYLVANIA-MARYLAND BORDERS

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams

Class: Order	Family	*Genus*	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1
Coleoptera	Elmidae	*Dubiraphia*	2				
		Optioservus	4	1	3	36	17
		Oulimnius					
		Stenelmis	50	7		66	6
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Psephenus*	9	20	15	51	37
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*		15	6	11	9
	Ceratopogonidae	*Bezzia*	2				
		Probezzia					
	Chironomidae		64	22	18	9	26
	Empididae	*Chelifera*					
		Hemerodromia		30	4		6
	Simulidae	*Prosimulium*					
		Simulium					
	Tabanidae	*Chrysops*	2				
		Tabanus					
	Tipulidae	*Antocha*				1	1
		Dicranota	1		24		8
		Hexatoma	1	16	3	1	13
		Limnophila					
		Tipula					
Ephemeroptera	Ameletidae	*Ameletus*					
	Baetidae	*Acentrella*					1
		Baetis	5	2	1	7	10
		Heterocoleon					
	Caenidae	*Caenis*		3			1
	Ephemerellidae	*Drunella*			2		
		Ephemerella					
		Serratella					
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*			1		
		Heptagenia		1			
		Leucrocuta	1	2		1	
		Stenacron					
		Stenonema	23	3	5	3	
	Isonychiidae	*Isonychia*		27	19	1	19
	Leptophlebiidae	*Paraleptophlebia*	3	1			
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					
	Tricorythidae	*Tricorythodes*		8			

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams - Continued

Class: Order	Family	*Genus*	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1
Megaloptera	Corydalidae	*Corydalus*				1	
		Nigronia	26	3	8	2	5
	Sialidae	*Sialis*	6		2		
Odonata	Aeshnidae	*Boyeria*	3	1	7		
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*					3
		Ophiogomphus		2	2	2	
		Stylogomphus	19	5	9		
Plecoptera	Choloroperlidae	*Alloperla*	6				
		Haploperla					
		Suwallia					
		Sweltsa					
	Leuctridae	*Leuctra*		2	1		
	Nemouridae	*Amphinemura*					
	Perlidae	*Acroneuria*		2	10	2	3
		Agnetina		2	1	2	
		Beloneuria	2				
		Neoperla					
		Paragnetina				2	
		Perlesta					
	Perlodidae	*Isoperla*					
		Yugus					
	Pteronarcyidae	*Pteronarcys*					1
Tricoptera	Brachycentridae	*Brachycentrus*				4	
	Glossomatidae	*Glossosoma*					1
	Hydropsychidae	*Ceratopsyche*	7	48	7	12	47
		Cheumatopsyche	16	5	8	4	15
		Diplectrona	1				
		Hydropsyche	2	6	36		3
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia				1	
	Odontoceridae	*Psilotreta*				2	
	Philopotamidae	*Chimarra*	7	1	36	9	13
		Dolophilodes					
	Polycentropodidae	*Polycentropus*	3	1			1
	Psychomyiidae	*Psychomyia*				2	
	Rhyacophilidae	*Rhyacophila*					1
	Uenoidae	*Neophylax*					
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*			1		
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae					6	1
Pelecypoda	Corbiculidae	*Corbicula*					

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams - Continued

Class: Order	Family	*Genus*	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3
Coleoptera	Elmidae	*Dubiraphia*	2				
		Optioservus	4	2	6	1	3
		Oulimnius					
		Stenelmis	50		1	48	2
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Psephenus*	9	19	16	3	27
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*		28		9	14
	Ceratopogonidae	*Bezzia*	2				
		Probezzia					
	Chironomidae		64	14	13	87	58
	Empididae	*Chelifera*					
		Hemerodromia		4		5	1
	Simulidae	*Prosimulium*					
		Simulium					
	Tabanidae	*Chrysops*	2				
		Tabanus				3	
	Tipulidae	*Antocha*		4	1		
		Dicranota	1	7	20		
		Hexatoma	1	4	6	5	15
		Limnophila					
		Tipula			1		
Ephemeroptera	Ameletidae	*Ameletus*					
	Baetidae	*Acentrella*		1			1
		Baetis	5	1	15	13	9
		Heterocoleon					
	Caenidae	*Caenis*				3	3
	Ephemerellidae	*Drunella*					
		Ephemerella					1
		Serratella					
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*			1		
		Heptagenia			17		
		Leucrocuta	8				2
		Stenacron	3				
		Stenonema	1			2	
	Isonychiidae	*Isonychia*	6	3		21	10
	Leptophlebiidae	*Paraleptophlebia*	10		4		3
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					
	Tricorythidae	*Tricorythodes*				1	
Megaloptera	Corydalidae	*Corydalus*					

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams - Continued

Class: Order	Family	*Genus*	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3
		Nigronia	2	1	1		5
	Sialidae	*Sialis*					1
Odonata	Aeshnidae	*Boyeria*	1	1			
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*					
		Ophiogomphus	2	2			1
		Stylogomphus					2
Plecoptera	Choloroperlidae	*Alloperla*	1				
		Haploperla					
		Suwallia					
		Sweltsa					
	Leuctridae	*Leuctra*	10	1	46	2	13
	Nemouridae	*Amphinemura*					
	Perlidae	*Acroneuria*	1	17		1	10
		Agnetina	5		20	1	
		Beloneuria					
		Neoperla					
		Paragnetina		1			2
		Perlesta				3	
	Perlodidae	*Isoperla*					
		Yugus					
	Pteronarcyidae	*Pteronarcys*					1
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*					
	Hydropsychidae	*Ceratopsyche*	23	66	26	30	13
		Cheumatopsyche	31	5	9	13	9
		Diplectrona					
		Hydropsyche	2	20	5	3	1
		Macrostemum					
		Leucotrichia					
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*		39			20
		Dolophilodes		4	2		2
	Polycentropodidae	*Polycentropus*	2				2
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*					
	Uenoidae	*Neophylax*					
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*					
		Orconectes					2
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae		1	1		1	
Pelecypoda	Corbiculidae	*Corbicula*					

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams - Continued

Class: Order	Family	*Genus*	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Coleoptera	Elmidae	*Dubiraphia*				
		Optioservus			2	3
		Oulimnius				
		Stenelmis	28	34		1
	Gyrinidae	*Dinetus*				
	Hydrophilidae	*Enochrus*				
	Psephenidae	*Psephenus*	54	9		6
	Ptilodactylidae	*Anchytarsus*				
Diptera	Athericidae	*Atherix*	49	5	3	2
	Ceratopogonidae	*Bezzia*				
		Probezzia				
	Chironomidae		14	35	85	52
	Empididae	*Chelifera*				
		Hemerodromia	4			
	Simulidae	*Prosimulium*				
		Simulium				13
	Tabanidae	*Chrysops*				
		Tabanus	2			
	Tipulidae	*Antocha*	1	11		
		Dicranota		1	4	
		Hexatoma		14	4	5
		Limnophila				
		Tipula	1			
Ephemeroptera	Ameletidae	*Ameletus*				
	Baetidae	*Acentrella*		1		8
		Baetis	1	43	78	62
		Heterocoleon				
	Caenidae	*Caenis*	1			
	Ephemerellidae	*Drunella*				
		Ephemerella				
		Serratella				
	Ephemeridae	*Ephemera*				
	Heptagenidae	*Epeorus*		1		3
		Heptagenia				
		Leucrocuta	1		10	7
		Stenacron			1	1
		Stenonema			13	20
	Isonychiidae	*Isonychia*	1		9	16
	Leptophlebiidae	*Paraleptophlebia*		1		
	Polymitarcyidae	*Ephoron*				
	Potamanthidae	*Anthopotamus*				
	Tricorythidae	*Tricorythodes*			8	
Megaloptera	Corydalidae	*Corydalus*	1			
		Nigronia	1	2		1
	Sialidae	*Sialis*	1	1		1
Odonata	Aeshnidae	*Boyeria*		2		
	Coenagrionidae	*Argia*				
	Gomphidae	*Gomphus*				

Table C1. Macroinvertebrate Data for New York-Pennsylvania Border Streams – Continued

Class: Order	Family	*Genus*	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
		Ophiogomphus				1
		Stylogomphus				
Plecoptera	Choloroperlidae	*Alloperla*				3
		Haploperla				
		Suwallia				
		Sweltsa		2		
	Leuctridae	*Leuctra*	2	1	5	
	Nemouridae	*Amphinemura*				
	Perlidae	*Acroneuria*		4		1
		Agnetina		23		1
		Beloneuria				
		Neoperla			8	
		Paragnetina				
		Perlesta				
	Perlodidae	*Isoperla*				
		Yugus				
	Pteronarcyidae	*Pteronarcys*		1		
Tricoptera	Brachycentridae	*Brachycentrus*				
	Glossomatidae	*Glossosoma*				
	Hydropsychidae	*Ceratopsyche*	7	22	16	7
		Cheumatopsyche	13	4	1	5
		Diplectrona				
		Hydropsyche	14	3	1	
		Macrostemum				
	Hydroptilidae	*Dibusa*				
		Leucotrichia				
	Odontoceridae	*Psilotreta*				
	Philopotamidae	*Chimarra*	22			4
		Dolophilodes				
	Polycentropodidae	*Polycentropus*		2		
	Psychomyiidae	*Psychomyia*				
	Rhyacophilidae	*Rhyacophila*				
	Uenoidae	*Neophylax*				
Amphipoda	Gammaridae	*Gammarus*				
Decapoda	Cambaridae	*Cambarus*				
		Orconectes				
Isopoda	Asellidae	*Caecidotea*				
Oligochaeta	Lumbriculidae					
Pelecypoda	Corbiculidae	*Corbicula*				

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams

Class: Order	Family	*Genus*	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	LNGA 2.5
Coleoptera	Elmidae	*Dubiraphia*					
		Optioservus	47		16	47	41
		Oulimnius	1				
		Promoresia					
		Stenelmis		71	53	1	6
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Ectopria*	1				
		Psephenus	1		13	2	
	Ptilodactylidae	*Anchytarsus*	27				6
Diptera	Athericidae	*Atherix*			6		
	Ceratopogonidae	*Bezzia*					
		Probezzia					
	Chironomidae		9	26	9	20	10
	Empididae	*Chelifera*	1				
		Hemerodromia		1	2	4	4
	Simulidae	*Prosimulium*					
		Simulium	1				
	Tabanidae	*Chrysops*					
		Tabanus					
	Tipulidae	*Antocha*	4	4	5	13	12
		Dicranota					
		Hexatoma					2
		Limnophila					
		Tipula	3		2	3	1
Ephemeroptera	Ameletidae	*Ameletus*					
	Baetidae	*Acentrella*	2		1	1	
		Baetis	17	54	16	32	49
		Heterocoleon					
	Caenidae	*Caenis*					
	Ephemerellidae	*Drunella*					
		Ephemerella			1	1	
		Serratella					
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*					
		Heptagenia					
		Leucrocuta					
		Stenacron					
		Stenonema	1	2		2	
	Isonychiidae	*Isonychia*			15	3	
	Leptophlebiidae	*Paraleptophlebia*					
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					
	Tricorythidae	*Tricorythodes*					

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams - Continued

Class: Order	Family	*Genus*	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	LNGA 2.5
Megaloptera	Corydalidae	*Corydalus*		11	4		
		Nigronia	18	7	6		
	Sialidae	*Sialis*					
Odonata	Aeshnidae	*Boyeria*					
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*					
		Ophiogomphus					
		Stylogomphus	7		1		
Plecoptera	Choloroperlidae	*Alloperla*					
		Haploperla					
		Suwallia					
		Sweltsa					
	Leuctridae	*Leuctra*	17		4		4
	Nemouridae	*Amphinemura*					
	Perlidae	*Acroneuria*	5		13	3	
		Agnetina			2		1
		Beloneuria					
		Neoperla					
		Paragnetina			1		
		Perlesta			2		
	Perlodidae	*Isoperla*					
		Yugus					
	Pteronarcyidae	*Pteronarcys*					
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*	1				
	Hydropsychidae	*Ceratopsyche*	12	18	53	68	2
		Cheumatopsyche	16	32	33	16	9
		Diplectrona	3				
		Hydropsyche	4	33	9	8	1
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia		3			
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*			1		1
		Dolophilodes	16			6	
	Polycentropodidae	*Polycentropus*					
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*	2				
	Uenoidae	*Neophylax*					1
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*	1				
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae		1	1	1	1	
Pelecypoda	Corbiculidae	*Corbicula*					

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams - Continued

Class: Order	Family	*Genus*	OCTO 6.6	SBCC 20.4	SCTT 3.0
Coleoptera	Elmidae	*Dubiraphia*			
		Optioservus	1	61	
		Oulimnius			
		Promoresia			
		Stenelmis	39	1	1
	Gyrinidae	*Dinetus*			
	Hydrophilidae	*Enochrus*			
	Psephenidae	*Ectopria*			
		Psephenus	3		
	Ptilodactylidae	*Anchytarsus*			
Diptera	Athericidae	*Atherix*			
	Ceratopogonidae	*Bezzia*			
		Probezzia			
	Chironomidae		14	1	15
	Empididae	*Chelifera*			
		Hemerodromia			
	Simulidae	*Prosimulium*			
		Simulium	16	1	2
	Tabanidae	*Chrysops*			
		Tabanus			
	Tipulidae	*Antocha*	3		
		Dicranota		20	1
		Hexatoma			
		Limnophila			
		Tipula			10
Ephemeroptera	Ameletidae	*Ameletus*			
	Baetidae	*Acentrella*			
		Baetis	85	17	17
		Heterocoleon	11		
	Caenidae	*Caenis*			
	Ephemerellidae	*Drunella*			
		Ephemerella			
		Serratella			
	Ephemeridae	*Ephemera*			
	Heptagenidae	*Epeorus*			
		Heptagenia			
		Leucrocuta	2		
		Stenacron			
		Stenonema	26	6	
	Isonychiidae	*Isonychia*	1		
	Leptophlebiidae	*Paraleptophlebia*			
	Polymitarcyidae	*Ephoron*			
	Potamanthidae	*Anthopotamus*			
	Tricorythidae	*Tricorythodes*			

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams - Continued

Class: Order	Family	*Genus*	OCTO 6.6	SBCC 20.4	SCTT 3.0
Megaloptera	Corydalidae	*Corydalus*	1		
		Nigronia			5
	Sialidae	*Sialis*	1		
Odonata	Aeshnidae	*Boyeria*			
	Coenagrionidae	*Argia*			
	Gomphidae	*Gomphus*			
		Ophiogomphus			
		Stylogomphus			
Plecoptera	Choloroperlidae	*Alloperla*			
		Haploperla			
		Suwallia			
		Sweltsa			
	Leuctridae	*Leuctra*	1	9	
	Nemouridae	*Amphinemura*			
	Perlidae	*Acroneuria*		1	
		Agnetina			
		Beloneuria			
		Neoperla			
		Paragnetina			
		Perlesta		4	
	Perlodidae	*Isoperla*			
		Yugus			
	Pteronarcyidae	*Pteronarcys*			
Tricoptera	Brachycentridae	*Brachycentrus*			
	Glossomatidae	*Glossosoma*			
	Hydropsychidae	*Ceratopsyche*	18	77	
		Cheumatopsyche	14	6	40
		Diplectrona			
		Hydropsyche	12	9	12
		Macrostemum			
	Hydroptilidae	*Dibusa*			
		Leucotrichia			
	Odontoceridae	*Psilotreta*			
	Philopotamidae	*Chimarra*			
		Dolophilodes		4	14
	Polycentropodidae	*Polycentropus*	1		
	Psychomyiidae	*Psychomyia*			
	Rhyacophilidae	*Rhyacophila*			
	Uenoidae	*Neophylax*			
Amphipoda	Gammaridae	*Gammarus*	10		
Decapoda	Cambaridae	*Cambarus*			2
		Orconectes			
Isopoda	Asellidae	*Caecidotea*			
Oligochaeta	Lumbriculidae				7
Pelecypoda	Corbiculidae	*Corbicula*			

Table C3. Macroinvertebrate Data for River Sites

Class: Order	Family	*Genus*	COWN 1.0	COWN 2.2	SUSQ 365.0
Coleoptera	Elmidae	*Dubiraphia*			
		Optioservus			10
		Oulimnius			
		Promoresia			
		Stenelmis	8	1	38
	Gyrinidae	*Dinetus*			12
	Hydrophilidae	*Enochrus*		10	
	Psephenidae	*Ectopria*			
		Psephenus	25		30
	Ptilodactylidae	*Anchytarsus*			
Diptera	Athericidae	*Atherix*			1
	Ceratopogonidae	*Bezzia*			
		Probezzia			
	Chironomidae		55	59	40
	Empididae	*Chelifera*			
		Hemerodromia	19	3	2
	Simulidae	*Prosimulium*			
		Simulium			
	Tabanidae	*Chrysops*			
		Tabanus			
	Tipulidae	*Antocha*	1		
		Dicranota			
		Hexatoma			
		Limnophila			
		Tipula			
Ephemeroptera	Ameletidae	*Ameletus*			
	Baetidae	*Acentrella*		1	
		Baetis	2		14
		Heterocoleon			4
	Caenidae	*Caenis*		3	1
	Ephemerellidae	*Drunella*			
		Ephemerella	1		
		Serratella			
	Ephemeridae	*Ephemera*	1		
	Heptagenidae	*Epeorus*			
		Heptagenia			
		Leucrocuta			
		Stenacron			
		Stenonema	22		
	Isonychiidae	*Isonychia*	6		12
	Leptophlebiidae	*Paraleptophlebia*			
	Polymitarcyidae	*Ephoron*			3
	Potamanthidae	*Anthopotamus*			3
	Tricorythidae	*Tricorythodes*			

Table C3. Macroinvertebrate Data for River Sites - Continued

Class: Order	Family	*Genus*	COWN 1.0	COWN 2.2	SUSQ 365.0
Megaloptera	Corydalidae	*Corydalus*		1	4
		Nigronia			
	Sialidae	*Sialis*			
Odonata	Aeshnidae	*Boyeria*			
	Coenagrionidae	*Argia*	2		
	Gomphidae	*Gomphus*			
		Ophiogomphus			
		Stylogomphus			
Plecoptera	Choloroperlidae	*Alloperla*			
		Haploperla			
		Suwallia			
		Sweltsa			
	Leuctridae	*Leuctra*			
	Nemouridae	*Amphinemura*			
	Perlidae	*Acroneuria*			5
		Agnetina			26
		Beloneuria			
		Neoperla			
		Paragnetina			4
		Perlesta			
	Perlodidae	*Isoperla*			
		Yugus			
	Pteronarcyidae	*Pteronarcys*			
Tricoptera	Brachycentridae	*Brachycentrus*			
	Glossomatidae	*Glossosoma*			
	Hydropsychidae	*Ceratopsyche*	47	11	26
		Cheumatopsyche	33	93	5
		Diplectrona			
		Hydropsyche	3		1
		Macrostemum			4
	Hydroptilidae	*Dibusa*	1		
		Leucotrichia			
	Odontoceridae	*Psilotreta*			
	Philopotamidae	*Chimarra*	3	1	78
		Dolophilodes			
	Polycentropodidae	*Polycentropus*			
	Psychomyiidae	*Psychomyia*			
	Rhyacophilidae	*Rhyacophila*			
	Uenoidae	*Neophylax*	1		
Amphipoda	Gammaridae	*Gammarus*	1	12	1
Decapoda	Cambaridae	*Cambarus*			
		Orconectes	1	2	
Isopoda	Asellidae	*Caecidotea*	10	13	
Oligochaeta	Lumbriculidae				
Pelecypoda	Corbiculidae	*Corbicula*			

Table C4. Macroinvertebrate Data for Group 3 Sites

Class: Order	Family	*Genus*	BABC	BEAG	BILL	BIRD	BISC
Coleoptera	Elmidae	*Dubiraphia*					
		Optioservus					8
		Oulimnius		4			
		Promoresia		3			
		Stenelmis					
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Ectopria*					2
		Psephenus					2
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*					
	Ceratopogonidae	*Bezzia*					
		Probezzia		1			
	Chironomidae		89		78	122	57
	Empididae	*Chelifera*	3	65			
		Hemerodromia	1			1	4
	Simulidae	*Prosimulium*			1		
		Simulium					4
	Tabanidae	*Chrysops*					
		Tabanus					
	Tipulidae	*Antocha*			1		
		Dicranota					
		Hexatoma	2	2		4	
		Limnophila		6			
		Tipula					1
Ephemeroptera	Ameletidae	*Ameletus*					
	Baetidae	*Acentrella*	5	20	48	4	
		Baetis	19		12	13	85
		Heterocoleon		11			
	Caenidae	*Caenis*					
	Ephemerellidae	*Drunella*	1			4	
		Ephemerella	2	2	2	1	3
		Serratella		6			
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*	1		41	28	3
		Heptagenia	12	7			6
		Leucrocuta					
		Stenacron	1		1		
		Stenonema	3				5
	Isonychiidae	*Isonychia*				1	
	Leptophlebiidae	*Paraleptophlebia*	8		6		6
	Polymitarcyidae	*Ephoron*		1			
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					
	Tricorythidae	*Tricorythodes*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	BABC	BEAG	BILL	BIRD	BISC
Megaloptera	Corydalidae	*Corydalus*					
		Nigronia				1	
	Sialidae	*Sialis*					
Odonata	Aeshnidae	*Boyeria*			1		
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*					
		Ophiogomphus					
		Stylogomphus					
Plecoptera	Choloroperlidae	*Alloperla*		6			
		Haploperla	19	11			
		Suwallia					
		Sweltsa	13	5	1	2	
	Leuctridae	*Leuctra*	7	40	9	22	8
	Nemouridae	*Amphinemura*	15	6	13	5	14
	Perlidae	*Acroneuria*	1	3		2	
		Agnetina					1
		Beloneuria					
		Neoperla					
		Paragnetina					
		Perlesta					
	Perlodidae	*Isoperla*	3			5	14
		Yugus		12		2	
	Pteronarcyidae	*Pteronarcys*					
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*					
	Hydropsychidae	*Ceratopsyche*	1		3	1	10
		Cheumatopsyche	1				6
		Diplectrona		15		3	
		Hydropsyche				1	8
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia					
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*					4
		Dolophilodes					3
	Polycentropodidae	*Polycentropus*	1	2		1	
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*		5			
	Uenoidae	*Neophylax*					1
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*	2	1			
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae						
Pelecypoda	Corbiculidae	*Corbicula*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	BRIG	BULK	CAMP	COOK	DEEP
Coleoptera	Elmidae	*Dubiraphia*					
		Optioservus				1	
		Oulimnius					
		Promoresia					
		Stenelmis			3		
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Ectopria*					1
		Psephenus			1	4	
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*					
	Ceratopogonidae	*Bezzia*					
		Probezzia		2			
	Chironomidae		104	103	75	134	57
	Empididae	*Chelifera*					6
		Hemerodromia		1			2
	Simulidae	*Prosimulium*					
		Simulium					2
	Tabanidae	*Chrysops*					
		Tabanus					
	Tipulidae	*Antocha*					
		Dicranota		1			5
		Hexatoma	3		3		4
		Limnophila		2			
		Tipula		2			
Ephemeroptera	Ameletidae	*Ameletus*	4	4			
	Baetidae	*Acentrella*	5		1	1	5
		Baetis	3	45	6	28	15
		Heterocoleon					
	Caenidae	*Caenis*					
	Ephemerellidae	*Drunella*					
		Ephemerella			2	2	10
		Serratella					
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*	32	5	23	1	19
		Heptagenia					28
		Leucrocuta					
		Stenacron					8
		Stenonema		7		2	12
	Isonychiidae	*Isonychia*					
	Leptophlebiidae	*Paraleptophlebia*	2	3	6	15	10
	Polymitarcyidae	*Ephoron*					
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	BRIG	BULK	CAMP	COOK	DEEP
Megaloptera	Corydalidae	*Corydalus*					
		Nigronia		1			
	Sialidae	*Sialis*					1
Odonoata	Aeshnidae	*Boyeria*					
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*	1				
		Ophiogomphus					
		Stylogomphus					
Plecoptera	Choloroperlidae	*Alloperla*	13		43		
		Haploperla	7				
		Suwallia				2	
		Sweltsa	16		4	4	
	Leuctridae	*Leuctra*	1	33		26	3
	Nemouridae	*Amphinemura*	2	8	5	4	7
	Perlidae	*Acroneuria*	3	10		9	
		Agnetina			11	5	
		Beloneuria					
		Neoperla					
		Paragnetina					
		Perlesta					
	Perlodidae	*Isoperla*			1	8	4
		Yugus					
	Pteronarcyidae	*Pteronarcys*					
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*					
	Hydropsychidae	*Ceratopsyche*	1			5	4
		Cheumatopsyche		5		3	
		Diplectrona		8		5	1
		Hydropsyche		9		2	5
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia					
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*					3
		Dolophilodes					
	Polycentropodidae	*Polycentropus*					
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*		8		3	11
	Uenoidae	*Neophylax*				1	
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*		1			
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae						
Pelecypoda	Corbiculidae	*Corbicula*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	DENT	LWAP	PARK	PRIN	RUSS
Coleoptera	Elmidae	*Dubiraphia*					
		Optioservus					
		Oulimnius				2	
		Promoresia					
		Stenelmis	18	1			
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Ectopria*					
		Psephenus				8	
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*					
	Ceratopogonidae	*Bezzia*				1	1
		Probezzia					
	Chironomidae		130	56	69	76	97
	Empididae	*Chelifera*					
		Hemerodromia	4			1	
	Simulidae	*Prosimulium*			1		1
		Simulium	9	2		1	
	Tabanidae	*Chrysops*					
		Tabanus					
	Tipulidae	*Antocha*					
		Dicranota					
		Hexatoma			11	6	6
		Limnophila					
		Tipula					
Ephemeroptera	Ameletidae	*Ameletus*			5		1
	Baetidae	*Acentrella*		7		26	7
		Baetis		16	8	33	9
		Heterocoleon					
	Caenidae	*Caenis*					
	Ephemerellidae	*Drunella*					
		Ephemerella		1		12	
		Serratella					
	Ephemeridae	*Ephemera*					
	Heptagenidae	*Epeorus*		30	46	8	48
		Heptagenia				14	20
		Leucrocuta		1			
		Stenacron		5			
		Stenonema		1			
	Isonychiidae	*Isonychia*					
	Leptophlebiidae	*Paraleptophlebia*	1	15	1	7	2
	Polymitarcyidae	*Ephoron*					
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	DENT	LWAP	PARK	PRIN	RUSS
Megaloptera	Corydalidae	*Corydalus*					
		Nigronia			1	2	
	Sialidae	*Sialis*					
Odonata	Aeshnidae	*Boyeria*					
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*					
		Ophiogomphus					
		Stylogomphus					
Plecoptera	Choloroperlidae	*Alloperla*			27	3	4
		Haploperla		12	18	14	46
		Suwallia					
		Sweltsa		23	6	2	13
	Leuctridae	*Leuctra*	4	1			
	Nemouridae	*Amphinemura*		13	7	5	3
	Perlidae	*Acroneuria*				1	
		Agnetina					
		Beloneuria					
		Neoperla					
		Paragnetina					
		Perlesta					
	Perlodidae	*Isoperla*			2		2
		Yugus					
	Pteronarcyidae	*Pteronarcys*					
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*					
	Hydropsychidae	*Ceratopsyche*				13	
		Cheumatopsyche	45			1	
		Diplectrona			3		
		Hydropsyche	35				
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia					
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*	8				
		Dolophilodes					
	Polycentropodidae	*Polycentropus*			2		1
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*					
	Uenoidae	*Neophylax*					
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*	3				
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae						
Pelecypoda	Corbiculidae	*Corbicula*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	SACK	SMIT	STRA	WBCO	WHIT
Coleoptera	Elmidae	*Dubiraphia*					
		Optioservus		18		1	
		Oulimnius					
		Promoresia					
		Stenelmis			3	3	
	Gyrinidae	*Dinetus*					
	Hydrophilidae	*Enochrus*					
	Psephenidae	*Ectopria*		3			
		Psephenus					
	Ptilodactylidae	*Anchytarsus*					
Diptera	Athericidae	*Atherix*					
	Ceratopogonidae	*Bezzia*					
		Probezzia					
	Chironomidae		156	22	26	231	12
	Empididae	*Chelifera*		10			
		Hemerodromia		3		13	
	Simulidae	*Prosimulium*					
		Simulium	1				
	Tabanidae	*Chrysops*					
		Tabanus					
	Tipulidae	*Antocha*		1	1		
		Dicranota					2
		Hexatoma		1	2		23
		Limnophila		4			
		Tipula		1		2	
Ephemeroptera	Ameletidae	*Ameletus*					4
	Baetidae	*Acentrella*	1		30	1	
		Baetis			31	13	6
		Heterocoleon					
	Caenidae	*Caenis*					
	Ephemerellidae	*Drunella*					
		Ephemerella		6	9	6	4
		Serratella					
	Ephemeridae	*Ephemera*		2			
	Heptagenidae	*Epeorus*	40		19		62
		Heptagenia	11				
		Leucrocuta			1		
		Stenacron		1	2		
		Stenonema		3	1		
	Isonychiidae	*Isonychia*					
	Leptophlebiidae	*Paraleptophlebia*			57		
	Polymitarcyidae	*Ephoron*					
	Polymitarcyidae	*Ephoron*					
	Potamanthidae	*Anthopotamus*					

Table C4. Macroinvertebrate Data for Group 3 Sites - Continued

Class: Order	Family	*Genus*	SACK	SMIT	STRA	WBCO	WHIT
Megaloptera	Corydalidae	*Corydalus*					
		Nigronia		9			
	Sialidae	*Sialis*		3			
Odonata	Aeshnidae	*Boyeria*					
	Coenagrionidae	*Argia*					
	Gomphidae	*Gomphus*		5			
		Ophiogomphus					
		Stylogomphus			1		
Plecoptera	Choloroperlidae	*Alloperla*	9		10		
		Haploperla	10				
		Suwallia					
		Sweltsa	16		8		39
	Leuctridae	*Leuctra*	2	44	4		24
	Nemouridae	*Amphinemura*		15	1		8
	Perlidae	*Acroneuria*		12	1		
		Agnetina			2		
		Beloneuria					
		Neoperla					
		Paragnetina					
		Perlesta					
	Perlodidae	*Isoperla*		3			
		Yugus					12
	Pteronarcyidae	*Pteronarcys*					
Tricoptera	Brachycentridae	*Brachycentrus*					
	Glossomatidae	*Glossosoma*		1			
	Hydropsychidae	*Ceratopsyche*		8	1	1	
		Cheumatopsyche		3		42	2
		Diplectrona		65			2
		Hydropsyche		1		70	
		Macrostemum					
	Hydroptilidae	*Dibusa*					
		Leucotrichia					
	Odontoceridae	*Psilotreta*					
	Philopotamidae	*Chimarra*					
		Dolophilodes					1
	Polycentropodidae	*Polycentropus*		1	5		1
	Psychomyiidae	*Psychomyia*					
	Rhyacophilidae	*Rhyacophila*		6			6
	Uenoidae	*Neophylax*					
Amphipoda	Gammaridae	*Gammarus*					
Decapoda	Cambaridae	*Cambarus*		1			
		Orconectes					
Isopoda	Asellidae	*Caecidotea*					
Oligochaeta	Lumbriculidae						
Pelecypoda	Corbiculidae	*Corbicula*					

APPENDIX D

WATER CLASSIFICATION AND BEST USAGE RELATIONSHIPS

New York:

The New York State water quality classifications are summarized from Water Quality Regulations for Surface Waters and Groundwaters, 6NYCRR Parts 700-705, effective September 1, 1991, New York State Department of Environmental Conservation, Division of Water, Albany, New York. Only classifications that are used in this report will be described in this section. The classes are as follows:

Class A:

(a) The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Class B: The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class C: The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Class D: The best usage of these waters is fishing. Due to such natural conditions as intermittence of flow, water conditions not conducive to propagation of game fishery, or streambed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

(T): Suffix added to classes where trout survival is an additional best use to the use classification.

Pennsylvania:

The Pennsylvania state water quality classifications are summarized from Water Quality Standards of the Department's Rules and Regulations, 25 PA Code, Chapter 93.3-5, effective November 2000, PADEP, Division of Water Quality Assessment and Standards, Harrisburg, Pennsylvania. All surface waters must meet protected water uses for aquatic life (warm water fishes), water supply (potable, industrial, livestock, and wildlife), and recreation (boating, fishing, water contact sports, and aesthetics). Only classifications that are used in this report will be described in this section. The use classifications are as follows:

CWF – Cold Water Fishes: Maintenance and/or propagation of fish species including the family Salmonidae and additional flora and fauna, which are indigenous to a cold water habitat.

WWF – Warm Water Fishes: Maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat.

TSF – Trout Stocked Fishery: Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat.

MF – Migratory Fishes: Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes that ascend to flowing waters to complete their life cycle. The MF designation is in addition to other designations when appropriate.

Maryland:

The Maryland State water quality classifications are summarized from Water Quality Regulations for Designated Uses, COMAR 26.08.02, Effective August 2000, Maryland Department of the Environment, Annapolis, Maryland. All surface waters must protect public health or welfare; enhance the quality of water; protect aquatic resources; and serve the purposes of the Federal Act. Only classifications that are used in this report will be described in this section. The designated use classifications are as follows:

I-P – Protection of fish and aquatic life and contact recreation (fishable/swimmable), and Use I-P, which includes drinking water supply.

III-P – Natural trout waters and Use III-P, which includes a drinking water supply.

IV-P – Recreational trout waters and Use IV-P, which includes drinking water.