ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

Monitoring Report No. 18
July 1, 2003, Through June 30, 2004

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**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 53 sample sites in the Interstate Streams Water Quality Network from July 1, 2003, to June 30, 2004. Ninety-nine out of 1,001 possible parameter observations exceeded water quality standards. Assessment results indicate that approximately 41 percent of the sites supported nonimpaired biological communities. Water quality impacts in the New York-Pennsylvania border streams tend to be mostly from metals, while most Pennsylvania-Maryland border sites 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 2004, which covers July 1, 2003, to June 30, 2004.

BASIN GEOGRAPHY

The Susquehanna River Basin is the largest river basin on the Atlantic Coast of the United States, draining 27,510 square miles. The Susquehanna River originates at the outlet of Otsego Lake, Cooperstown, N.Y., 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. In sampling period 2003-2004, New York-Pennsylvania Group 1 streams were sampled July through September (depending on flow conditions), December, February or March, and May. Pennsylvania-Maryland Group 1 stations were sampled July and September, November, February and March, and April and May. Benthic macroinvertebrates were collected and habitat assessments were performed in Group 1 streams during July and August 2003.

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 2003.

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 Pennsylvania-Maryland border stream stations sampled during fiscal year 2004 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, N.Y., Kirkwood, N.Y., Sayre, Pa., Marietta, Pa., and Conowingo, Md.; the Chemung River at Chemung, N.Y.; the Tioga River at Lindley, N.Y.; 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.

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.→ N.Y.
Babcock Run	3	N.Y.→ Pa.
Beagle Hollow	3	N.Y.→Pa.
Bentley Creek	1	Pa.→ N.Y.
Bill Hess Creek	3	N.Y.→Pa.
Bird Creek	3	Pa.→N.Y.
Biscuit Hollow	3	N.Y.→Pa.
Briggs Hollow Run	3	N.Y.→Pa.
Bulkley Brook	3	N.Y.→Pa.
Camp Brook	3	N.Y.→Pa.
Cascade Creek	1	N.Y.→Pa.
Cayuta Creek	1	N.Y.→Pa.
Chemung River	1	N.Y.→Pa.→N.Y.→Pa.
Choconut Creek	2	Pa.→ N.Y.
Cook Hollow	3	N.Y.→Pa.
Cowanesque River	1	Pa.→ N.Y.
Deep Hollow Brook	3	N.Y.→Pa.
Denton Creek	3	N.Y.→Pa.
Dry Brook	3	N.Y.→Pa.
Holden Creek	2	N.Y.→Pa.
Little Snake Creek	1	Pa.→ N.Y.
Little Wappasening Creek	3	Pa.→ N.Y.
North Fork Cowanesque River	2	N.Y.→Pa.
Parks Creek	3	Pa.→ N.Y.
Prince Hollow Run	3	N.Y.→Pa.
Russell Run	3	N.Y.→Pa.
Sackett Creek	3	Pa.→ N.Y.
Seeley Creek	1	Pa.→ N.Y.
Smith Creek	3	Pa.→ N.Y.
Snake Creek	2	Pa.→ N.Y.
South Creek	2	Pa.→ N.Y.
Strait Creek	3	N.Y.→Pa.
Susquehanna River	1	N.Y.→Pa.→N.Y.→Pa.
Tioga River	1	Pa.→ N.Y.
Troups Creek	1	N.Y.→Pa.
Trowbridge Creek	2	N.Y.→Pa.
Wappasening Creek	2	Pa.→ N.Y.
White Branch	3	N.Y.→Pa.
White Hollow	3	Pa.→ N.Y.
17 Unnamed tributaries*	3	N.Y.→Pa.
2 Unnamed tributaries*	3	Pa.→ N.Y.
2 Unnamed tributaries*	3	Pa.→ N.Y.→Pa.

*Not sampled in 2003-2004

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 2003-2004

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 thoroughly mixed in the churn splitter and collected in two 500-ml bottles and four 250-ml bottles. One of the 500-ml bottles was for a raw sample and the other 500-ml bottle consisted of a filtered sample. The two 250-ml bottles consisted of a whole water sample and a filtered sample fixed with concentrated nitric acid (HNO_3) for metal analysis. The other two 250-ml bottles consisted of a whole water sample and a filtered water sample fixed with concentrated sulfuric acid (H_2SO_4) for nutrient analysis. A cellulose acetate filter with 0.45-micrometer pore size was used to obtain the filtrate for laboratory analysis. In October 2003, dissolved parameters were removed from the chemical water quality analysis. All other parameters remained the same. 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, N.Y.	3	Monitor for potential impacts
BISC	Biscuit Hollow, Austinburg, Pa.	3	Monitor for potential impacts
BNTY 0.9	Bentley Creek, Wellsburg, N.Y.	1	Monitor for potential water quality impacts
BRIG	Briggs Hollow, Nichols, N.Y.	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, N.Y.	1	Municipal discharge from Waverly, N.Y.
CHEM 12.0*	Chemung River, Chemung, N.Y.	1	Municipal and industrial discharges from Elmira, N.Y.
CHOC 9.1	Choconut Creek, Vestal Center, N.Y.	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, N.Y.	3	Monitor for potential impacts
DENT	Denton Creek, Hickory Grove, Pa.	3	Monitor for potential impacts
DRYB	Dry Brook, Waverly, N.Y.	3	Monitor for potential impacts
HLDN 3.5	Holden Creek, Woodhull, N.Y.	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, N.Y.	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, N.Y.	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, N.Y.	3	Monitor for potential impacts
SEEL 10.3	Seeley Creek, Seeley Creek, N.Y.	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, N.Y.	1	Large drainage area (1,882 sq. mi.); municipal discharges from Cooperstown, Sidney, Bainbridge, and Oneonta
SUSQ 340.0	Susquehanna River, Kirkwood, N.Y.	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, N.Y.	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, N.Y.	2	Monitor for potential water quality impacts
WBCO	White Branch Cowanesque River, North Fork, Pa.	3	Monitor for potential impacts
WHIT	White Hollow,Wellsburg, N.Y.	3	Monitor for potential impacts

*No macroinvertebrate sample collected in 2003-2004

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 2003-2004

Macroinvertebrate and physical habitat sampling

SRBC staff collected benthic macroinvertebrate samples from Group 1 and Group 2 stations between July 21 and August 14, 2003, and from Group 3 streams between May 10 and 12, 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.

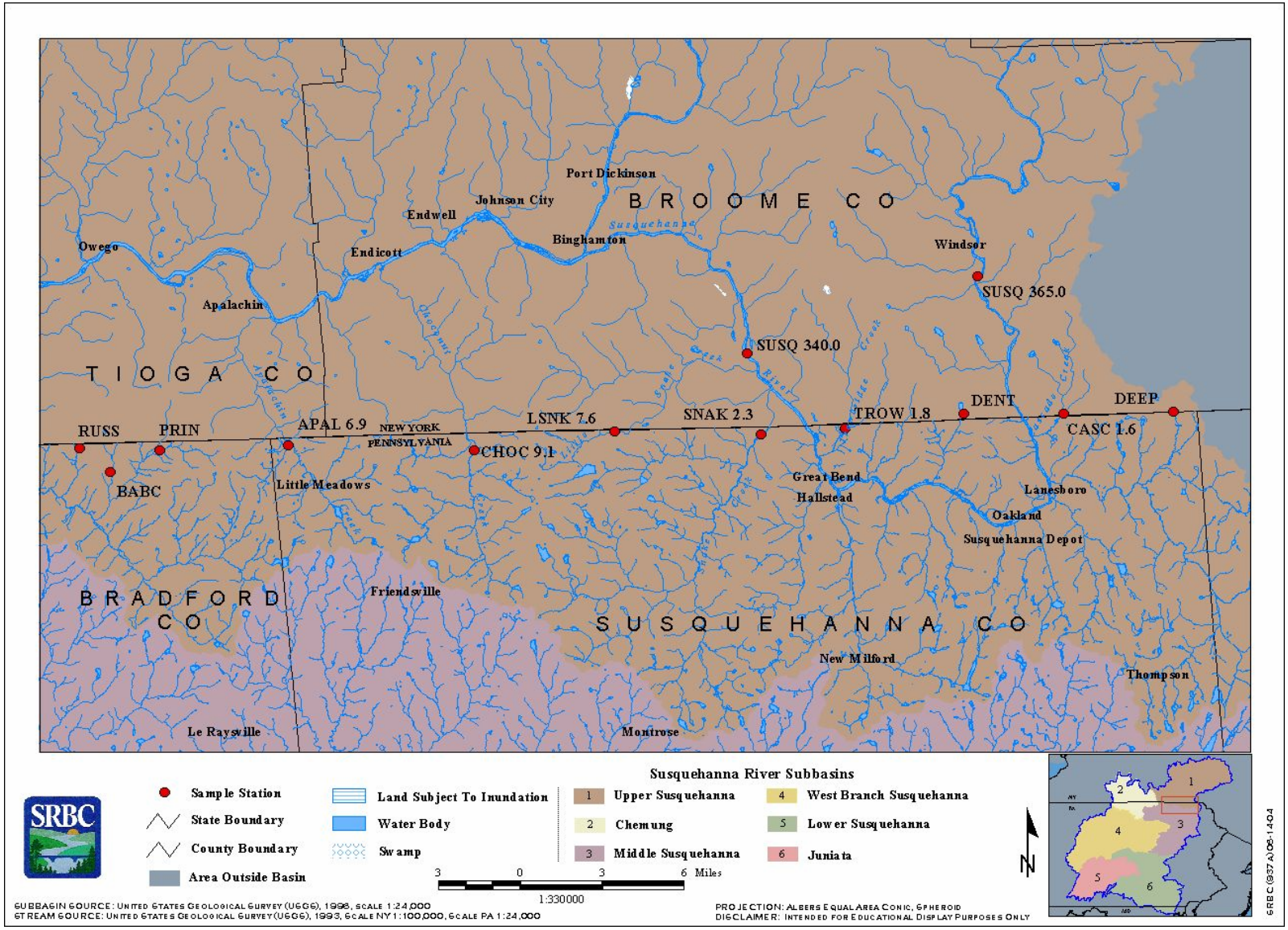

Figure 1. Interstate Streams Along the New York-Pennsylvania Border Between Russell Run and Deep Hollow Brook

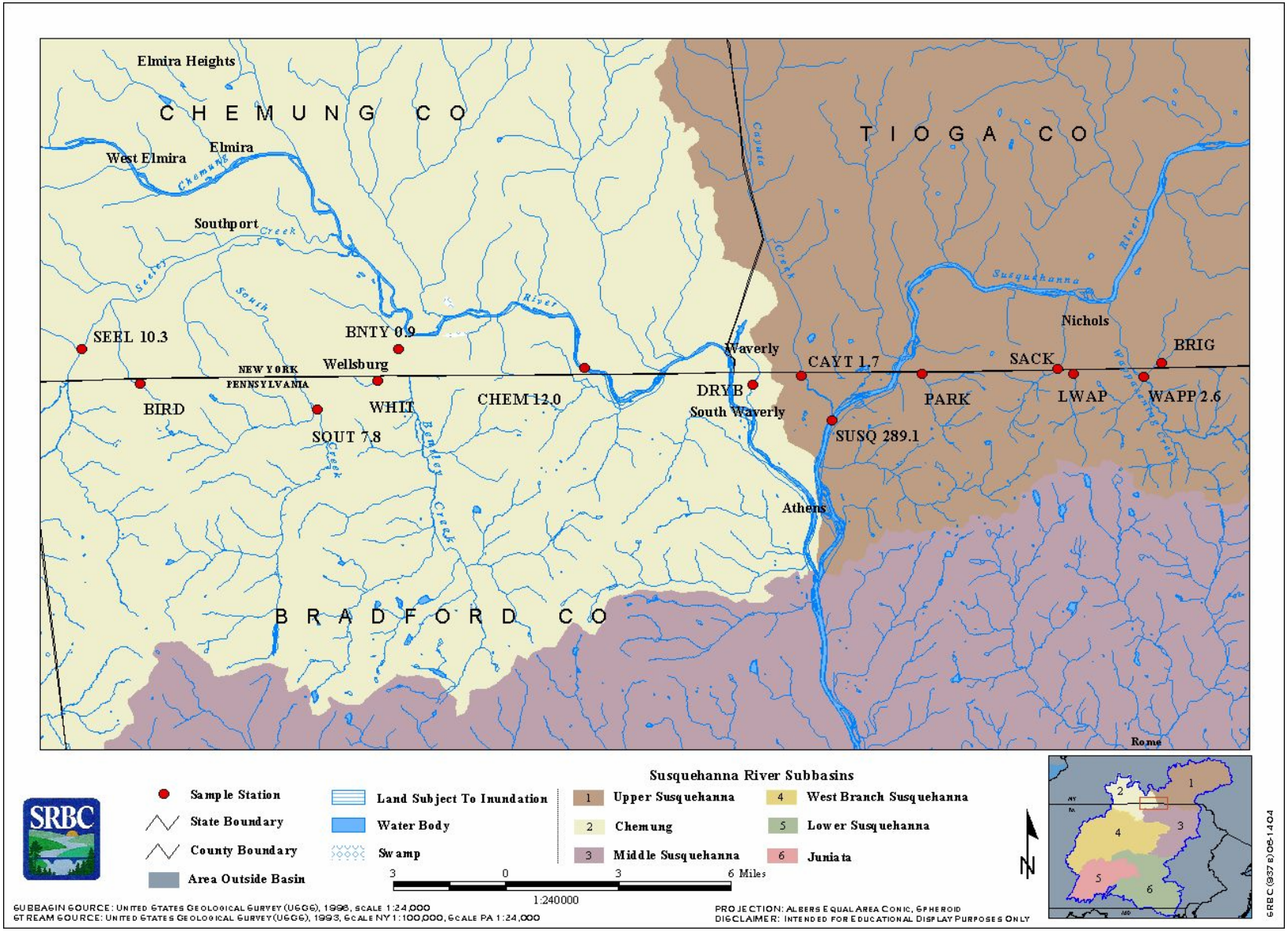

Figure 2. Interstate Streams Along the New York-Pennsylvania Border Between Seeley Creek and Briggs Hollow

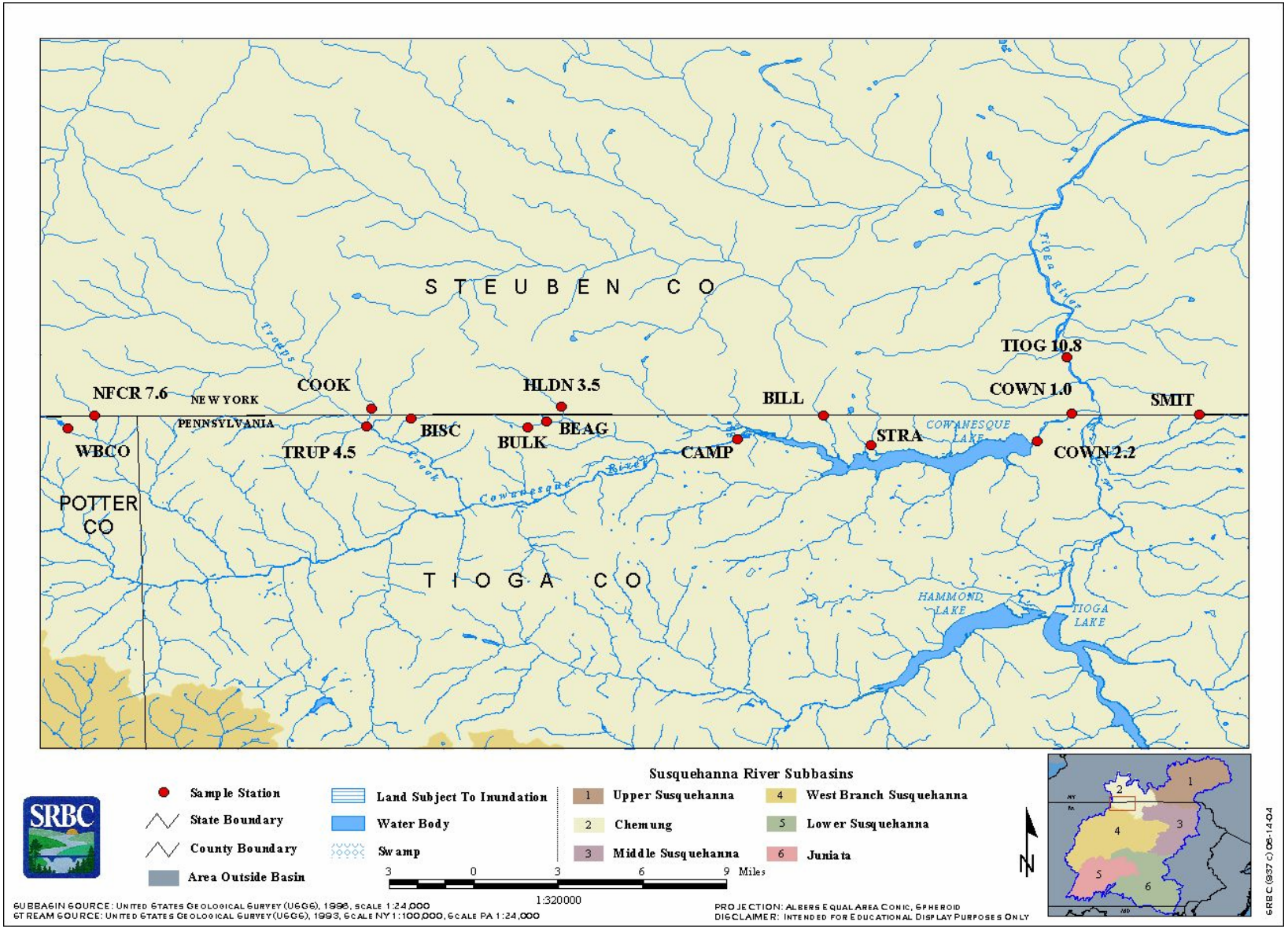

Figure 3. Interstate Streams Along the New York-Pennsylvania Border Between White Branch Cowanesque River and Smith Creek

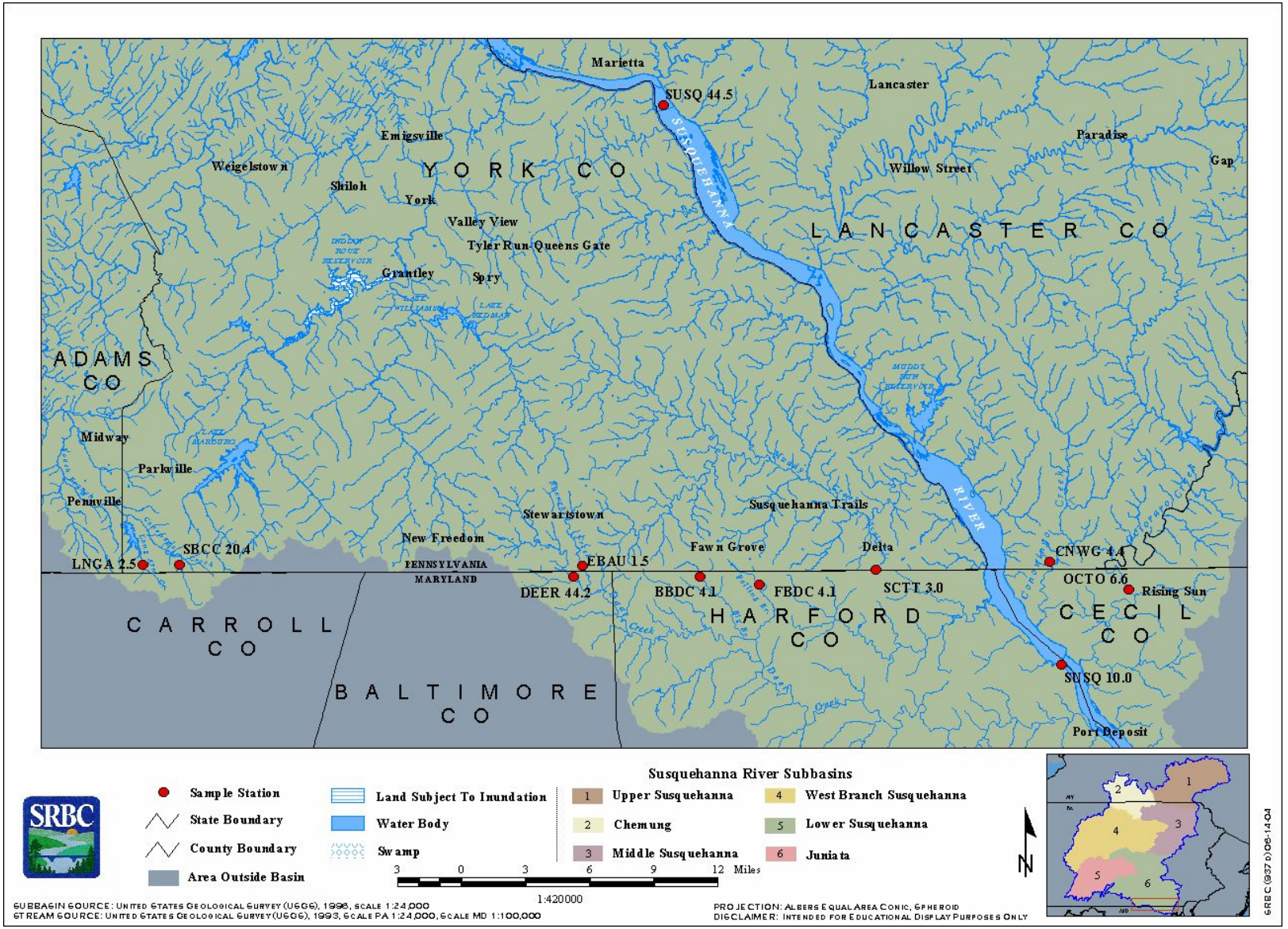

Figure 4. Interstate Streams Along the Pennsylvania-Maryland Border

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, Dissolved	00515
Solids, Total	00500
Ammonia as Nitrogen, Dissolved	00608
Ammonia as Nitrogen, Total	00610
Nitrite as Nitrogen, Dissolved	00613
Nitrite as Nitrogen, Total	00615
Nitrate as Nitrogen, Dissolved	00618
Nitrate as Nitrogen, Total	00620
Nitrogen, Dissolved	00602
Nitrogen, Total	00600
Phosphorus, Dissolved	00666
Phosphorus, Total	00665
Orthophosphate, Dissolved	00671
Orthophosphate, Total	70507
Organic Carbon, Total	00680
Calcium, Total	00916
Magnesium, Total	00927
Chloride, Total	00940
Sulfate, Total	00945
Iron, Dissolved	01046
Iron, Total	01045
Manganese, Dissolved	01056
Manganese, Total	01055
Aluminum, Dissolved	01106
Aluminum, Total	01105
Turbidity	82079

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).

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.

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 New York-Pennsylvania border, and the other group contained stations along the Pennsylvania-Maryland 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 35.

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 New York-Pennsylvania border were compared to Snake Creek (SNAK 2.3) at Brookdale, Pa. Snake Creek represented the best combination of biological, water quality, and habitat conditions in the Northern Appalachian Plateau and Uplands Ecoregion. Since only two macroinvertebrate samples were collected on the river stations during fiscal year 2004, these samples (SUSQ 365 and SUSQ 340) were included in the analysis for the New York – Pennsylvania border sites. Deer Creek (DEER 44.2) near Gorsuch Mills, Md., served as the reference site for sampling stations located on the Pennsylvania-Maryland border. Deer Creek had the best combination of biological, water quality, and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987). Smith Creek (SMIT) near East Lawrence, Pa., served as the reference site for Group 3 sites, as it had the best biological, habitat, and field chemistry conditions of these sites.

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 2004, water quality in approximately one-third of the Group 1 and Group 2 interstate streams continued to meet designated use classes and water quality standards (Table 9, Appendix D). Twenty-two out of the 32 sites had parameters exceeding water quality standards, with 15 of those having more than one violation. The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Ninety-nine out of 1,001 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				
	Biological Condition Scoring Criteria			
Metric	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				
Parameter	**Habitat Parameter Scoring Criteria**			
	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 *	N.Y. 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	94	8
pH	N.Y. general	6.5-8.5	94	3
Dissolved Iron	Pa. public water supply	0.3 mg/l	31	4
Total Iron	N.Y. aquatic (chronic) Pa. aquatic life	300 µg/l 1500 ug/l	59 94	36 10
Total Aluminum	N.Y. aquatic (chronic)	100 µg/l	59	29
Total Chlorine	N.Y. aquatic (acute) Md. aquatic life	0.019 mg/l 0.019 mg/l	6 4	2 4
Nitrite plus Nitrate	Pa. public water supply	10 mg/l	94	2
Turbidity	Md. aquatic life	150 NTU	35	1

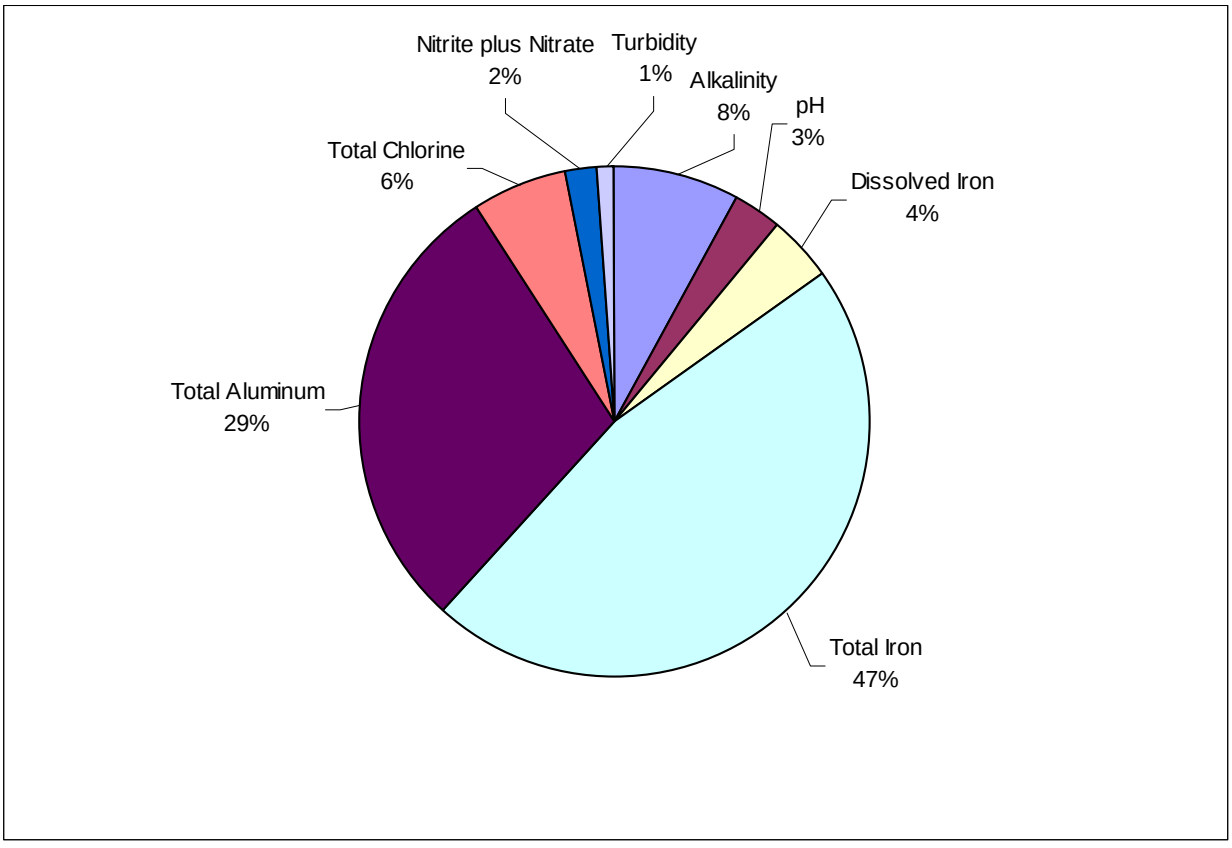


Figure 5. Parameters Exceeding Water Quality Standards

Biological Communities and Physical Habitat

RBP III biological data for New York-Pennsylvania, Pennsylvania-Maryland, 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 35.

RBP III physical habitat data for New York-Pennsylvania, Pennsylvania-Maryland, 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 New York-Pennsylvania border. The biological community of six (42.9 percent) of these streams was nonimpaired, and eight streams were slightly impaired (57.1 percent). None of the streams were moderately or severely impaired. Nine of the New York-Pennsylvania sites had excellent habitats (64.3 percent), while five sites (35.7 percent) had supporting habitats. No sites had partially supporting or nonsupporting habitat.

Pennsylvania-Maryland streams

The Pennsylvania-Maryland interstate streams included nine stations located on or near the Pennsylvania-Maryland border. Four (44.4 percent) streams were designated nonimpaired, using RBP III protocol designations. Two sites (22.2 percent) were slightly impaired, and three (33.3 percent) of the sites were moderately impaired. Seven (77.8 percent) of the Pennsylvania-Maryland border sites had excellent habitats, while two sites (22.2 percent) had supporting habitats. 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 2004, high flows precluded macroinvertebrate sampling and habitat assessment of six stations: the Susquehanna River at Sayre and Marietta, Pa.; the Chemung River; the Cowanesque River; and the Tioga River. The biological communities of the remaining stations, the Susquehanna River at Windsor and Kirkland, N.Y., were compared to Snake Creek, the reference site for the New York–Pennsylvania border streams. The biological communities of both stations were designated nonimpaired, and the habitats were rated as excellent.

Group 3 sites

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Seven of the 21 sites sampled (33.3 percent) had nonimpaired biological conditions. Eleven sites (52.4 percent) were slightly impaired, and three sites (14.3 percent) were moderately impaired. Seventeen (81.0 percent) of the Group 3 sites had excellent habitat scores. Two sites (9.5 percent) had supporting habitat conditions, while two sites (9.5 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	263	193	263	311	270	220	322	222	204	377	258	288	195	224
% Shredders	0.8	0.0	5.7	0.0	0.0	0.9	0.3	18.9	0.5	0.0	0.0	0.3	0.0	0.0
% Collector-Gatherers	9.9	48.2	20.5	25.4	15.6	37.3	33.9	8.6	68.1	37.1	27.9	54.2	29.7	68.3
% Filterer-Collectors	52.5	17.1	35.4	15.8	44.8	15.5	42.2	40.1	15.7	40.1	46.5	12.5	28.2	19.6
% Scrapers	25.9	12.4	9.1	44.4	31.1	33.2	13.4	13.1	7.4	15.6	20.2	17.4	19.5	4.5
% Predators	11.0	22.3	29.3	14.5	8.5	13.2	10.2	19.4	8.3	7.2	5.4	15.6	22.6	7.6
Number of EPT Taxa	12	17	11	17	12	15	11	11	11	16	8	16	10	11
Number of EPT Individuals	160	87	119	124	144	79	183	146	115	264	122	99	162	100
Metric Scores														
Taxonomic Richness	21	26	24	30	21	28	20	20	24	23	19	25	17	19
Shannon Diversity Index	2.5	2.7	2.6	2.5	2.4	2.5	2.4	2.3	2.4	2.6	2.0	2.2	2.4	1.9
Modified Hilsenhoff Biotic Index	4.3	4.6	4.1	4.2	4.2	4.5	4.3	3.5	4.8	3.9	5.4	4.7	4.3	5.4
EPT Index	12	13	12	18	11	13	11	10	8	15	9	15	9	10
Percent Ephemeroptera	60.8	45.1	45.2	39.9	53.3	35.9	56.8	65.8	56.4	70.0	47.3	34.4	83.1	44.6
Percent Chironomidae	8.7	24.9	19.8	9.0	10.4	23.2	24.5	6.3	26.0	18.6	26.7	41.3	6.7	38.4
Percent Dominant Taxa	20.9	24.9	19.8	26.0	20.7	24.5	24.5	25.2	26.0	18.6	31.8	41.3	14.9	38.4
Percent of Reference or Percentage Score														
Taxonomic Richness	91.3	113.0	104.3	130.4	91.3	121.7	87.0	87.0	104.3	100.0	82.6	108.7	73.9	82.6
Shannon Diversity Index	93.5	101.2	100.0	95.8	90.9	94.4	91.1	87.5	90.3	100.0	76.7	82.8	91.4	71.3
Hilsenhoff Index	91.8	84.4	96.5	92.4	93.2	86.9	90.4	111.6	81.1	100.0	72.9	82.6	90.9	72.2
EPT Index	80.0	86.7	80.0	120.0	73.3	86.7	73.3	66.7	53.3	100.0	60.0	100.0	60.0	66.7
Percent Ephemeroptera	60.8	45.1	45.2	39.9	53.3	35.9	56.8	65.8	56.4	70.0	47.3	34.4	83.1	44.6
Percent Chironomidae	8.7	24.9	19.8	9.0	10.4	23.2	24.5	6.3	26.0	18.6	26.7	41.3	6.7	38.4
Percent Dominant Taxa	20.9	24.9	19.8	26.0	20.7	24.5	24.5	25.2	26.0	18.6	31.8	41.3	14.9	38.4
Biological Condition Scores														
Taxonomic Richness	6	6	6	6	6	6	6	6	6	6	6	6	4	6
Shannon Diversity Index	6	6	6	6	6	6	6	6	6	6	6	6	6	4
Hilsenhoff Index	6	4	6	6	6	6	6	6	4	6	4	4	6	4
EPT Index	4	4	4	6	2	4	2	0	0	6	0	6	0	0
Percent Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Percent Chironomidae	4	2	4	4	4	2	2	4	2	4	2	0	4	0
Percent Dominant Taxa	4	4	6	4	4	4	4	4	4	6	2	0	6	2
Total Biological Score														
Total Biological Score	36	32	38	38	34	34	32	32	28	40	26	28	32	22
Biological % of Reference	90	80	95	95	85	85	80	80	70	100	65	70	80	55

Table 12. Summary of Pennsylvania-Maryland Border RBP III Biological 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
Raw Summary									
Number of Individuals	306	267	263	213	269	65	273	254	238
% Shredders	7.2	0.4	1.1	0.5	3.7	0.0	6.6	7.5	3.8
% Collector-Gatherers	46.4	29.6	17.1	54.9	20.4	50.8	35.2	33.5	90.8
% Filterer-Collectors	20.9	31.5	29.3	26.3	43.9	26.2	26.0	24.0	4.2
% Scrapers	14.7	36.7	43.3	17.8	6.7	12.3	30.8	19.7	0.0
% Predators	10.8	1.9	9.1	0.5	25.3	10.8	1.5	15.4	1.3
Number of EPT Taxa	12	5	11	6	10	4	7	10	5
Number of EPT Individuals	123	116	91	73	176	21	121	91	14
Metric Scores									
Taxonomic Richness	22	12	24	13	18	13	16	19	10
Shannon Diversity Index	2.2	2.0	2.5	1.7	2.2	2.0	2.1	2.2	0.5
Modified Hilsenhoff Biotic Index	4.0	5.4	4.5	5.4	3.8	5.4	5.4	4.1	5.8
EPT Index	12	5	11	6	10	4	7	10	5
Percent Ephemeroptera	40.2	43.4	34.6	34.3	65.4	32.3	44.3	35.8	5.9
Percent Chironomidae	35.9	12.0	12.5	46.9	18.2	40.0	17.2	28.3	89.1
Percent Dominant Taxa	35.9	30.7	19.0	46.9	26.0	40.0	24.5	28.3	89.1
Percent of Reference or Percentage Score									
Taxonomic Richness	91.7	50.0	100.0	54.2	75.0	54.2	66.7	79.2	41.7
Shannon Diversity Index	91.2	82.4	100.0	67.6	89.5	82.2	86.2	89.1	22.3
Hilsenhoff Index	112.1	84.5	100.0	83.7	120.2	84.0	83.1	110.5	77.9
EPT Index	109.1	45.5	100.0	54.5	90.9	36.4	63.6	90.9	45.5
Percent Ephemeroptera	40.2	43.4	34.6	34.3	65.4	32.3	44.3	35.8	5.9
Percent Chironomidae	35.9	12.0	12.5	46.9	18.2	40.0	17.2	28.3	89.1
Percent Dominant Taxa	35.9	30.7	19.0	46.9	26.0	40.0	24.5	28.3	89.1
Biological Condition Scores									
Taxonomic Richness	6	2	6	2	4	2	4	4	2
Shannon Diversity Index	6	6	6	4	6	6	6	6	0
Hilsenhoff Index	6	4	6	4	6	4	4	6	4
EPT Index	6	0	6	0	6	0	0	6	0
Percent Ephemeroptera	6	6	6	6	6	6	6	6	2
Percent Chironomidae	2	4	4	0	4	0	4	2	0
Percent Dominant Taxa	2	4	6	0	4	2	4	4	0
Total Biological Score									
Total Biological Score	34	26	40	16	36	20	28	34	8
Biological % of Reference	85	65	100	40	90	50	70	85	20

Table 13. Summary of River RBP III Biological Data

	SUSQ 340	SUSQ 365
Raw Summary		
Number of Individuals	233	299
% Shredders	1.7	0.0
% Collector-Gatherers	13.3	13.0
% Filterer-Collectors	24.5	22.1
% Scrapers	57.1	50.2
% Predators	3.4	14.7
Number of EPT Taxa	12	16
Number of EPT Individuals	96	118
Metric Scores		
Taxonomic Richness	22	27
Shannon Diversity Index	2.2	2.4
Modified Hilsenhoff Biotic Index	4.8	4.3
EPT Index	16	15
Percent Ephemeroptera	41.2	39.5
Percent Chironomidae	2.1	7.0
Percent Dominant Taxa	38.2	34.4
Percent of Reference or Percentage Score		
Taxonomic Richness	95.7	117.4
Shannon Diversity Index	82.8	91.9
Hilsenhoff Index	82.2	90.2
EPT Index	106.7	100.0
Percent Ephemeroptera	41.2	39.5
Percent Chironomidae	2.1	7.0
Percent Dominant Taxa	38.2	34.4
Biological Condition Scores		
Taxonomic Richness	6	6
Shannon Diversity Index	6	6
Hilsenhoff Index	4	6
EPT Index	6	6
Percent Ephemeroptera	6	6
Percent Chironomidae	6	4
Percent Dominant Taxa	2	2
Total Biological Score		
Total Biological Score	36	36
Biological % of Reference	90	90

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	243	221	246	218	225	210	243	217	245	240	232
% Shredders	16.5	29.4	15.0	17.0	20.4	2.9	23.9	5.1	24.9	15.4	1.3
% Collector-Gatherers	42.0	38.5	61.8	62.8	44.4	67.1	48.1	88.5	46.9	44.2	49.6
% Filterer-Collectors	1.2	9.5	7.3	4.1	19.6	1.4	10.3	0.9	10.2	16.3	26.7
% Scrapers	0.8	5.0	4.5	4.6	4.0	9.0	1.2	0.5	9.0	10.4	19.8
% Predators	39.5	17.6	11.4	11.5	11.6	19.5	16.5	5.1	9.0	13.8	2.6
Number of EPT Taxa	14	15	16	17	16	13	15	13	15	19	7
Number of EPT Individuals	172	167	185	168	159	172	167	167	167	148	107
Metric Scores											
Taxonomic Richness	19	19	23	24	21	18	21	17	26	28	13
Shannon Diversity Index	2.1	2.3	2.6	2.2	2.5	1.9	2.3	2.0	2.6	2.7	1.5
Modified Hilsenhoff Biotic Index	2.8	2.2	2.4	2.0	4.0	1.5	3.1	2.2	3.4	3.7	5.2
EPT Index	14	15	16	17	16	13	15	13	15	19	7
Percent Ephemeroptera	70.8	75.6	75.2	77.1	70.7	81.9	68.7	77.0	68.2	61.7	46.1
Percent Chironomidae	24.7	22.2	14.6	18.8	16.9	14.8	26.3	21.2	20.4	25.4	49.6
Percent Dominant Taxa	29.6	22.2	22.8	36.2	18.7	44.8	26.3	25.8	20.4	25.4	49.6
Percent of Reference or Percentage Score											
Taxonomic Richness	70.4	70.4	85.2	88.9	77.8	66.7	77.8	63.0	96.3	103.7	48.1
Shannon Diversity Index	86.1	93.8	102.8	90.0	101.0	75.2	92.5	80.0	105.2	108.4	60.0
Hilsenhoff Index	94.9	118.3	109.1	130.6	66.1	168.8	83.9	117.9	76.7	70.1	50.0
EPT Index	82.4	88.2	94.1	100.0	94.1	76.5	88.2	76.5	88.2	111.8	41.2
Percent Ephemeroptera	70.8	75.6	75.2	77.1	70.7	81.9	68.7	77.0	68.2	61.7	46.1
Percent Chironomidae	24.7	22.2	14.6	18.8	16.9	14.8	26.3	21.2	20.4	25.4	49.6
Percent Dominant Taxa	29.6	22.2	22.8	36.2	18.7	44.8	26.3	25.8	20.4	25.4	49.6
Biological Condition Scores											
Taxonomic Richness	4	4	6	6	4	4	4	4	6	6	2
Shannon Diversity Index	6	6	6	6	6	6	6	6	6	6	4
Hilsenhoff Index	6	6	6	6	2	6	4	6	4	4	2
EPT Index	4	4	6	6	6	2	4	2	4	6	0
Percent Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6
Percent Chironomidae	2	2	4	4	4	4	2	2	2	2	0
Percent Dominant Taxa	4	4	4	2	6	0	4	4	4	4	0
Total Biological Score											
Total Biological Score	32	32	38	36	34	28	30	30	32	34	14
Biological % of Reference	80	80	95	90	85	70	75	75	80	85	35

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

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Raw Summary										
Number of Individuals	202	215	193	104	250	216	253	233	204	212
% Shredders	2.5	5.1	11.4	1.0	6.8	2.3	32.4	0.9	0.0	15.6
% Collector-Gatherers	81.2	40.0	59.1	46.2	58.8	51.4	26.9	80.7	14.7	43.9
% Filterer-Collectors	4.0	4.7	2.1	1.0	1.6	0.9	22.1	0.9	82.4	0.0
% Scrapers	5.9	24.7	11.4	20.2	1.2	22.7	7.5	9.0	1.0	0.5
% Predators	6.4	25.6	16.1	31.7	31.6	22.7	11.1	8.6	2.0	40.1
Number of EPT Taxa	10	17	14	12	11	12	17	16	4	13
Number of EPT Individuals	38	188	188	81	195	207	198	165	170	198
Metric Scores										
Taxonomic Richness	19	21	17	17	15	15	27	22	8	16
Shannon Diversity Index	1.4	2.5	1.7	2.2	1.8	1.7	2.5	2.4	1.2	1.9
Modified Hilsenhoff Biotic Index	5.6	1.9	1.1	2.6	1.6	0.8	2.6	2.9	5.7	0.9
EPT Index	10	17	14	12	11	12	17	16	4	13
Percent Ephemeroptera	18.8	87.4	97.4	77.9	78.0	95.8	78.3	70.8	83.3	93.4
Percent Chironomidae	66.8	6.5	1.6	17.3	16.8	3.2	11.9	24.5	12.7	5.2
Percent Dominant Taxa	66.8	22.3	53.9	26.9	38.8	40.7	19.0	24.5	55.4	33.0
Percent of Reference or Percentage Score										
Taxonomic Richness	70.4	77.8	63.0	63.0	55.6	55.6	100.0	81.5	29.6	59.3
Shannon Diversity Index	56.1	100.0	69.3	90.1	73.3	67.3	100.0	97.1	47.4	76.6
Hilsenhoff Index	46.6	137.3	239.0	100.3	167.0	324.3	100.0	89.0	45.9	284.0
EPT Index	58.8	100.0	82.4	70.6	64.7	70.6	100.0	94.1	23.5	76.5
Percent Ephemeroptera	18.8	87.4	97.4	77.9	78.0	95.8	78.3	70.8	83.3	93.4
Percent Chironomidae	66.8	6.5	1.6	17.3	16.8	3.2	11.9	24.5	12.7	5.2
Percent Dominant Taxa	66.8	22.3	53.9	26.9	38.8	40.7	19.0	24.5	55.4	33.0
Biological Condition Scores										
Taxonomic Richness	4	4	4	4	2	2	6	6	0	2
Shannon Diversity Index	4	6	4	6	5	5	6	6	2	6
Hilsenhoff Index	0	6	6	6	6	6	6	6	0	6
EPT Index	0	6	4	2	0	2	6	6	0	2
Percent Ephemeroptera	4	6	6	6	6	6	6	6	6	6
Percent Chironomidae	0	4	6	4	4	6	4	2	4	4
Percent Dominant Taxa	0	4	0	4	2	0	6	4	0	2
Total Biological Score										
Total Biological Score	12	36	30	32	25	27	40	36	12	28
Biological % of Reference	30	90	75	80	62.5	67.5	100	90	30	70

Table 15. Summary of New York-Pennsylvania Sites Physical Habitat 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
Epifaunal Substrate	15	15	13	15	17	17	16	16	15	17	17	14	7	16
Instream Cover	12	11	16	13	15	16	14	15	12	16	13	14	10	15
Embeddedness/Pool Substrate	13	14	13	14	15	16	15	15	16	17	15	15	15	16
Velocity/Depth Regimes/Pool Variability	14	13	13	14	17	12	11	12	16	17	16	10	14	16
Sediment Deposition	11	11	11	13	14	15	13	14	11	17	15	16	10	14
Channel Flow Status	13	12	10	14	15	14	13	14	12	15	15	11	13	14
Channel Alteration	15	10	16	13	12	16	14	17	14	15	14	16	16	13
Frequency of Riffles/Channel Sinuosity	9	15	16	12	16	17	17	17	15	16	15	16	15	15
Condition of Banks														
Left Bank	6	8	6	7	6	6	9	6	7	8	7	5	5	8
Right Bank	5	5	6	7	7	4	8	6	8	8	6	6	5	7
Vegetative Protective Cover														
Left Bank	7	8	6	7	7	7	9	6	8	9	7	5	7	8
Right Bank	6	5	8	7	8	7	9	5	7	8	7	8	8	8
Riparian Vegetative Zone Width														
Left Bank	5	7	6	2	3	5	6	9	3	5	3	3	2	8
Right Bank	4	7	9	4	2	5	7	8	3	4	3	6	3	7
Total Habitat Score														
Total Habitat Score	135	141	149	142	154	157	161	160	150	166	153	145	130	165
Habitat Percent of Reference	81.3	84.9	89.8	85.5	92.8	94.6	97.0	96.4	90.4	100.0	92.2	87.3	78.3	99.4

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	15	15	16	10	14	17	12
Instream Cover	17	17	15	13	15	14	15	14	13
Embeddedness/Pool Substrate	15	12	15	12	12	9	16	14	11
Velocity/Depth Regimes/Pool Variability	13	17	14	11	11	11	17	14	9
Sediment Deposition	16	10	15	13	11	9	16	14	11
Channel Flow Status	17	15	15	17	16	16	16	15	12
Channel Alteration	15	17	15	15	15	16	15	16	13
Frequency of Riffles/Channel Sinuosity	16	16	15	16	15	10	17	16	14
Condition of Banks									
Left Bank	7	5	6	8	8	6	7	7	6
Right Bank	8	7	6	7	7	5	5	8	7
Vegetative Protective Cover									
Left Bank	8	8	7	9	9	5	8	8	9
Right Bank	8	8	6	8	8	5	8	8	7
Riparian Vegetative Zone Width									
Left Bank	7	7	2	6	5	5	3	7	3
Right Bank	7	5	1	6	6	4	4	7	1
Total Habitat Score									
Total Habitat Score	171	161	147	156	154	125	161	165	128
Habitat Percent of Reference	116.3	109.5	100.0	106.1	104.8	85.0	109.5	112.2	87.1

Table 17. Summary of River Sites Physical Habitat Data

	SUSQ 340	SUSQ 365
Epifaunal Substrate	16	16
Instream Cover	16	15
Embeddedness/Pool Substrate	15	14
Velocity/Depth Regimes/Pool Variability	17	16
Sediment Deposition	14	14
Channel Flow Status	15	14
Channel Alteration	17	16
Frequency of Riffles/Channel Sinuosity	9	15
Condition of Banks		
Left Bank	8	6
Right Bank	8	7
Vegetative Protective Cover		
Left Bank	9	9
Right Bank	8	8
Riparian Vegetative Zone Width		
Left Bank	5	8
Right Bank	5	7
Total Habitat Score		
Total Habitat Score	162	165
Habitat Percent of Reference	97.6	99.4

Table 18. Summary of Group 3 Sites Physical Habitat Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Epifaunal Substrate	18	18	18	18	10	18	18	17	17	18	17
Instream Cover	17	17	18	17	9	18	18	17	18	18	16
Embeddedness/Pool Substrate	17	16	16	14	17	16	16	16	15	17	15
Velocity/Depth Regimes/Pool Variability	10	10	10	10	8	10	11	10	12	10	10
Sediment Deposition	16	16	17	16	16	15	17	16	16	16	11
Channel Flow Status	16	16	16	16	16	15	17	15	16	17	15
Channel Alteration	18	18	16	17	17	16	18	18	13	16	11
Frequency of Riffles/Channel Sinuosity	18	18	18	18	16	18	18	18	17	17	17
Condition of Banks											
Left Bank	7	9	9	7	8	7	9	9	8	7	9
Right Bank	8	8	9	8	7	8	9	9	9	9	9
Vegetative Protective Cover											
Left Bank	9	9	9	7	8	8	9	9	8	8	9
Right Bank	9	9	9	7	7	7	9	9	9	9	9
Riparian Vegetative Zone Width											
Left Bank	9	8	9	9	2	8	9	9	8	8	9
Right Bank	7	9	9	7	3	3	9	9	8	9	6
Total Habitat Score											
Total Habitat Score	163	181	183	171	144	167	169	181	158	179	163
Habitat Percent of Reference	94.2	104.6	105.8	98.8	83.2	96.5	97.7	104.6	91.3	103.5	94.2

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

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Epifaunal Substrate	10	18	18	15	17	18	16	17	15	18
Instream Cover	12	18	18	14	17	17	15	17	9	18
Embeddedness/Pool Substrate	14	17	17	17	17	16	16	16	8	17
Velocity/Depth Regimes/Pool Variability	13	11	12	13	8	12	9	10	10	12
Sediment Deposition	9	16	17	10	18	16	14	16	8	16
Channel Flow Status	16	17	16	14	12	17	16	17	16	16
Channel Alteration	7	18	18	17	18	18	18	16	10	17
Frequency of Riffles/Channel Sinuosity	16	18	18	16	18	18	18	17	16	18
Condition of Banks										
Left Bank	7	7	5	8	7	9	9	9	8	7
Right Bank	5	9	7	5	7	8	9	8	8	7
Vegetative Protective Cover										
Left Bank	3	8	8	6	8	9	9	9	3	8
Right Bank	3	9	8	3	8	8	8	8	3	8
Riparian Vegetative Zone Width										
Left Bank	1	9	9	6	9	9	9	7	1	7
Right Bank	1	9	9	2	9	9	7	6	2	9
Total Habitat Score										
Total Habitat Score	117	184	180	146	173	184	173	173	117	178
Habitat Percent of Reference	67.6	106.4	104.0	84.4	100.0	106.4	100.0	100.0	67.6	102.9

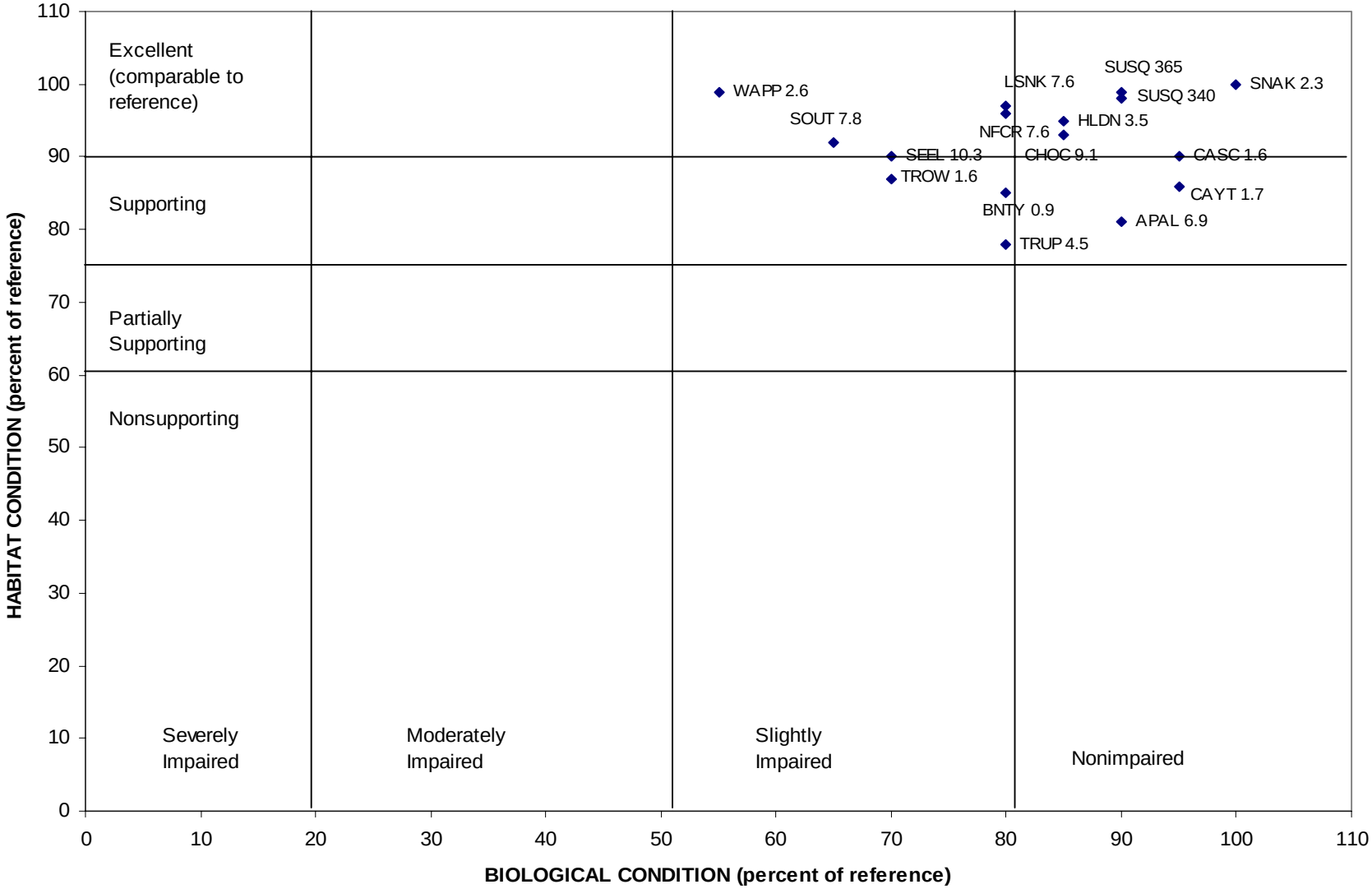


Figure 6. Summary of New York-Pennsylvania Border Streams and River Habitat and Biological Condition Scores

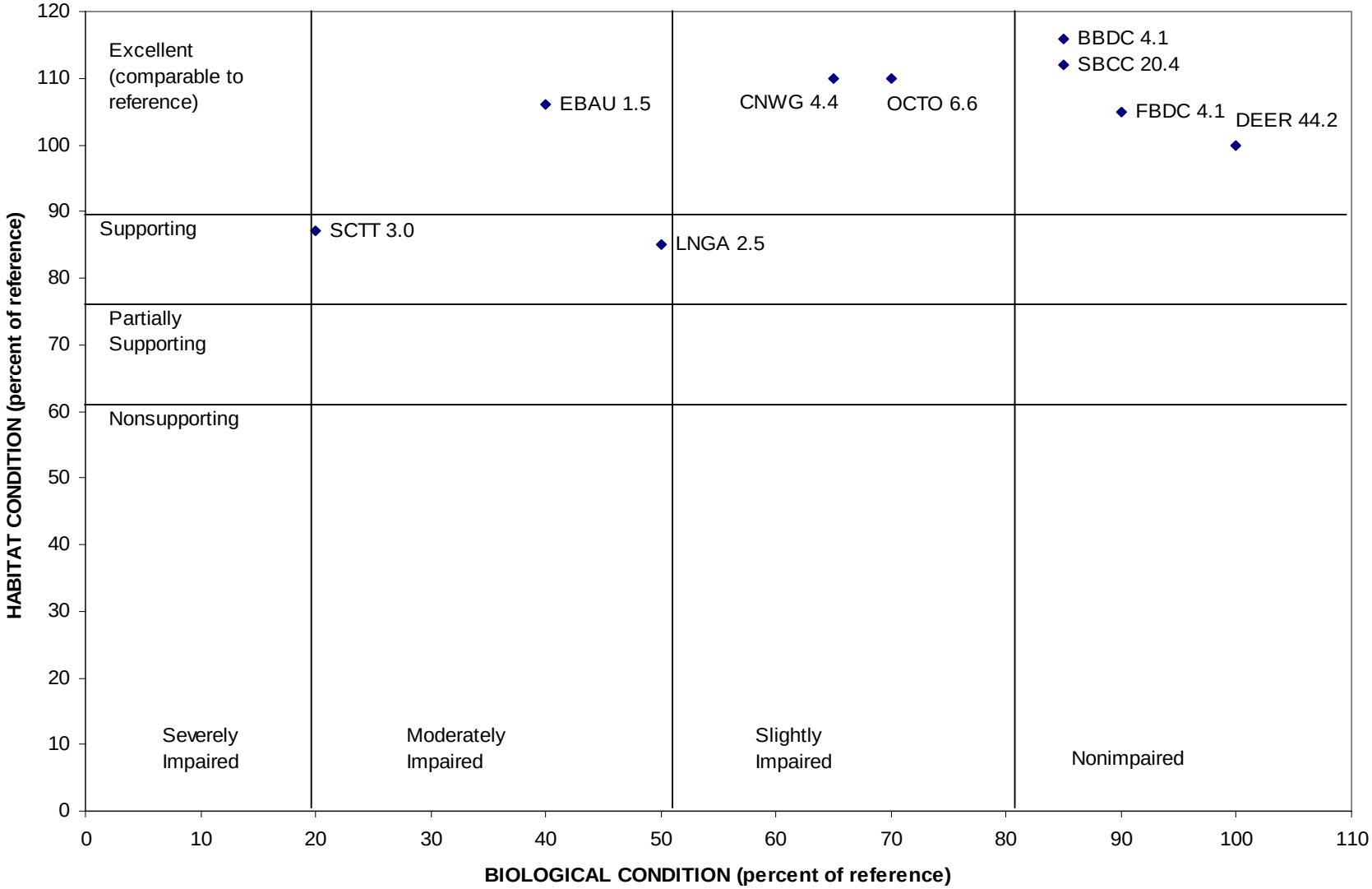


Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

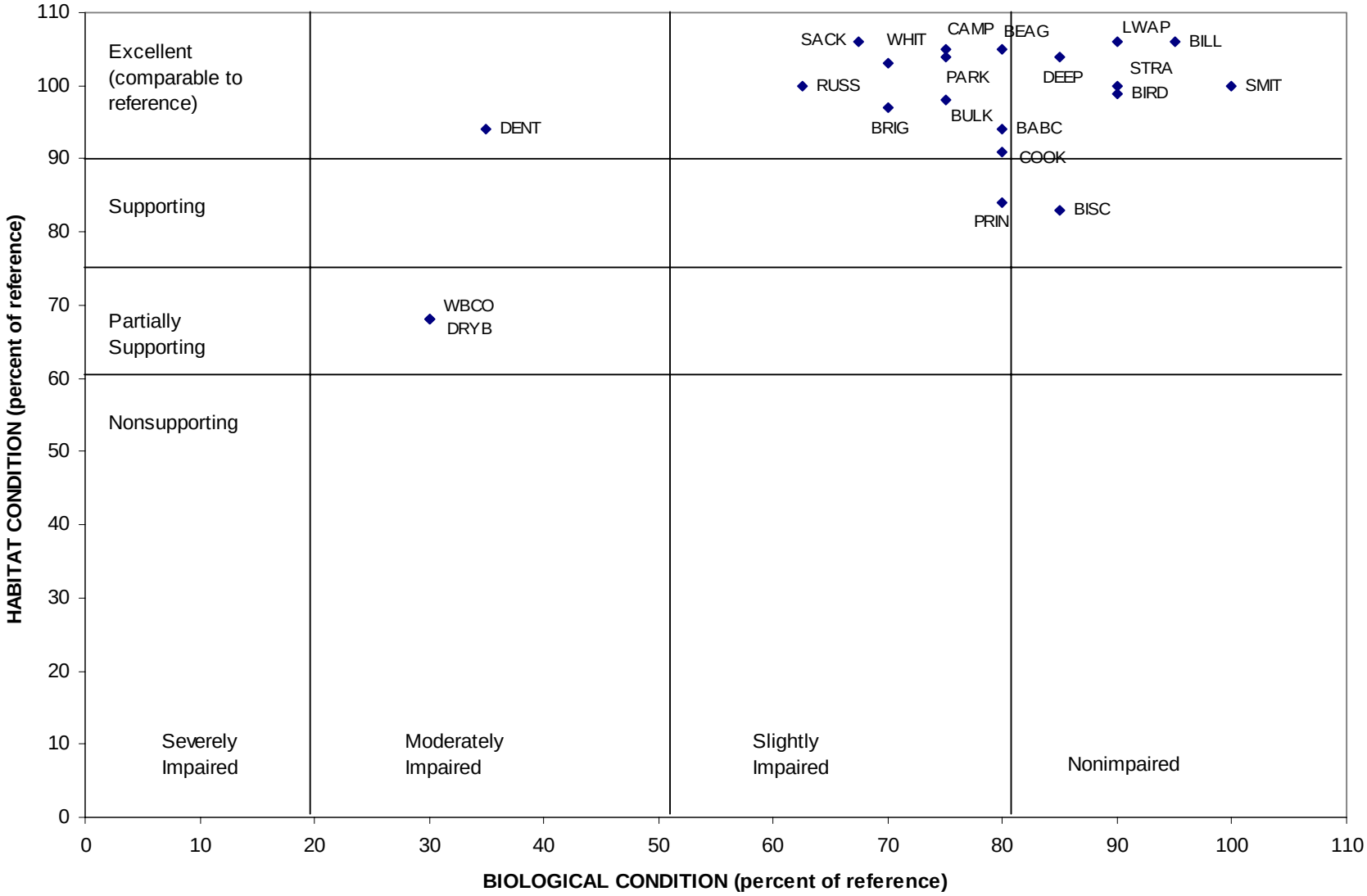


Figure 8. Summary of Group 3 Streams Habitat and Biological Condition Scores

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 2004 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 2004, after being slightly impaired for two years. Habitat was rated supporting, with low scores for frequency of riffles and riparian vegetative zone width.

Total iron exceeded water quality standards during August 2003, as in previous summers 1999-2002. The WQI again decreased slightly from the previous year, reaching its lowest value in five years (Table 20).

Bentley Creek (BNTY 0.9)

A slightly impaired biological community existed at Bentley Creek in Wellsburg, N.Y., (BNTY 0.9) after a rating of nonimpaired the previous year. This site received a low rating for percent Chironomidae, which was the dominant taxon. Habitat was rated supporting, with low scores given for channel alteration, instream cover, and sediment deposition. Scour marks from a previous high flow event were noted, as was abundant algae covering the streambed. 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 December 2003; otherwise, water quality was comparable to preceding years (Table 21).

Table 19. Abbreviations Used in Tables 20 Through 51

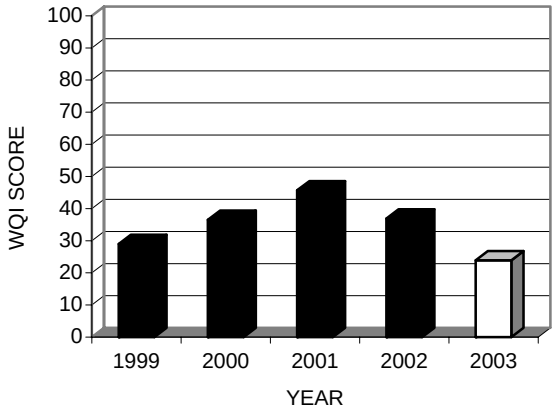
Abbreviation	Parameter	Abbreviation	Parameter
ALK	Alkalinity	DNO3	Dissolved Nitrate
COND	Conductivity	TNO3	Total Nitrate
DAl	Dissolved Aluminum	DN	Dissolved Nitrogen
TAl	Total Aluminum	TN	Total Nitrogen
TCa	Total Calcium	DO	Dissolved Oxygen
TCl	Total Chloride	DP	Dissolved Phosphorus
DFe	Dissolved Iron	TP	Total Phosphorus
TFe	Total Iron	DPO4	Dissolved Orthophosphate
TMg	Total Magnesium	TPO4	Total Orthophosphate
DMn	Dissolved Manganese	DS	Dissolved Solids
TMn	Total Manganese	TS	Total Solids
DNH3	Dissolved Ammonia	TSO4	Total Sulfate
TNH3	Total Ammonia	TOC	Total Organic Carbon
DNO2	Dissolved Nitrite	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.

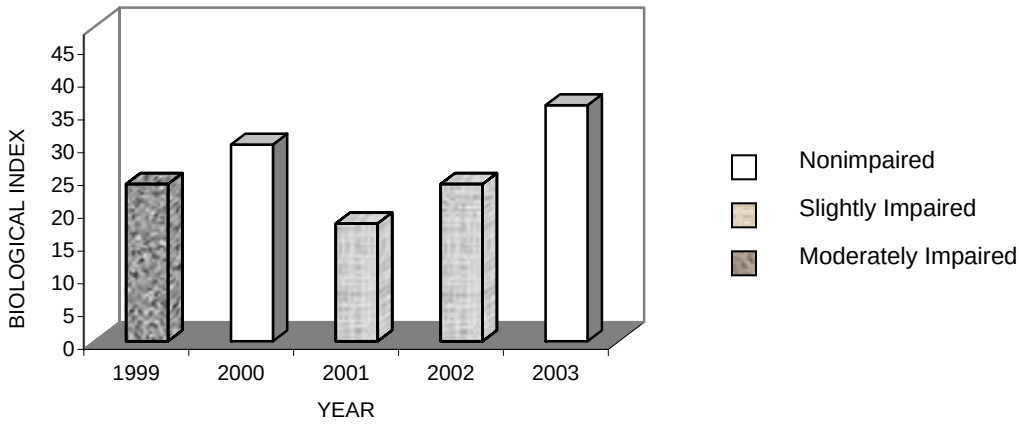
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	08/13/03	350 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/13/03	23.9	TEMP	DO						

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.46
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	135
Habitat Condition Category	Supporting



Water Quality Index



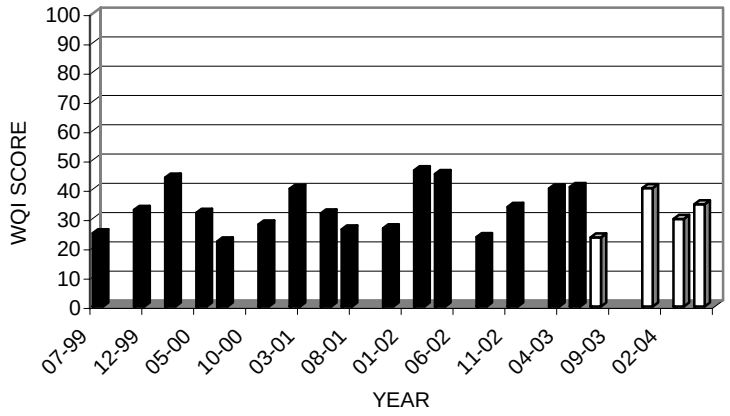
Biological Index

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

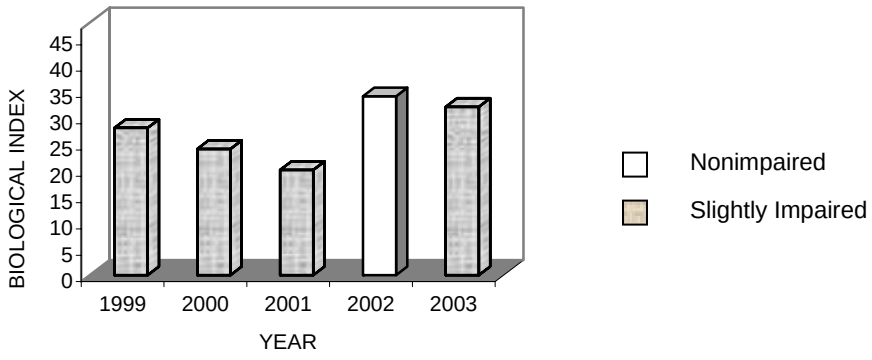
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	12/18/03	398 µg/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/18/03	309 µg/l	100 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/03	23.6	None							
12/18/03	40.4	TEMP	DO						
03/18/04	29.9	None							
05/04/04	34.9	None							

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.66
RBP III Score	32
RBP III Condition	Slightly Impaired
Total Habitat Score	141
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Cascade Creek (CASC 1.6)

Cascade Creek at Lanesboro, Pa., (CASC 1.6) was rated as nonimpaired in fiscal year 2004. CASC 1.6 was not sampled for macroinvertebrates and water quality in August 2002, due to drought conditions. Habitat conditions were rated as excellent, though low scores were given for sediment deposition and channel flow status.

Cascade Creek was added to the Group 1 streams during the 2000 sampling season to monitor conditions in the stream during the winter months. Results at this site indicated continuing water quality concerns, as state standards for pH, total iron, dissolved iron, alkalinity, and total aluminum were exceeded during the 2003-2004 sampling period (Table 22). Total iron and alkalinity standards have been exceeded in previous years. Along with Troups Creek (see Table 31), Cascade Creek had the most water quality exceedances of all the New York-Pennsylvania streams.

Cayuta Creek (CAYT 1.7)

Biological conditions of Cayuta Creek at Waverly, N.Y., (CAYT 1.7) were rated nonimpaired, as they were during fiscal year 2003. This site had the greatest taxa richness and EPT Index of all streams along the Pennsylvania-New York border. Habitat conditions were rated as supporting, although very low scores were given for riparian vegetative zone width, as Cayuta Creek is located in an urbanized area of Waverly, N.Y. Abundant algal growth noted on the stream substrate.

CAYT 1.7 exceeded the New York aquatic (chronic) standard for total aluminum in May 2004; however, all other Cayuta Creek total aluminum samples for 2003-2004 remained below the detection limit of 200 micrograms per liter (µg/l). Both the New York and Pennsylvania state standards for total iron were exceeded at CAYT 1.7 in May 2004, with a concentration of 3,720 µg/l. Several parameters exceeded the 90th percentile including conductivity, total chloride, total residue, total phosphorus, total orthophosphate, total iron, and total organic carbon (Table 23). The total chlorine values were 0.07 milligrams per liter (mg/l) in December and 0.06 mg/l in February. These values 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, N.Y., (CHOC 9.1) remained nonimpaired for the second consecutive year, although the EPT Index was low compared to the reference site. The habitat was rated excellent, although a low rating was given for riparian vegetative zone width. Scour marks from a previous storm were noted at the time of sampling.

No parameters exceeded standards during July 2003, and the WQI was slightly lower than the past several years. Temperature was the only parameter to exceed the 90th percentile (Table 24).

Holden Creek (HLDN 3.5)

The biological community at Holden Creek at Woodhull, N.Y., (HLDN 3.5) was designated nonimpaired for the second consecutive year. In the past, flow conditions have been very low, which precluded macroinvertebrate sampling. The biological condition also was nonimpaired in 1998 (Table 25). During the July 2003 sampling event, taxonomic richness was high, with eight mayfly taxa.

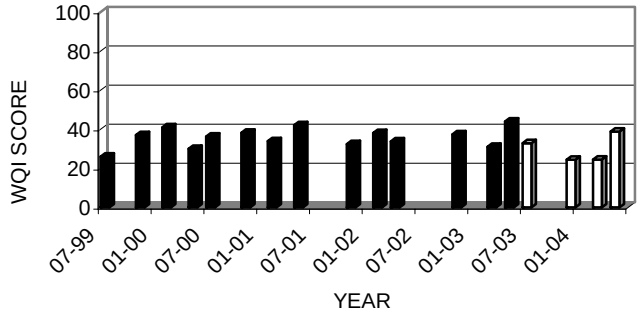
Although no parameters exceeded water quality standards, temperature, dissolved oxygen, and total organic carbon exceeded the 90th percentile at HLDN 3.5 during July 2003. The WQI score was consistent with the WQI score that was calculated in the 1998 and 2002 sample. The habitat was rated excellent, with high scores for epifaunal substrate and frequency of riffles. A salvage yard was located upstream of the sampling site, and scour marks and downed trees were noted due to the previous high flow event.

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

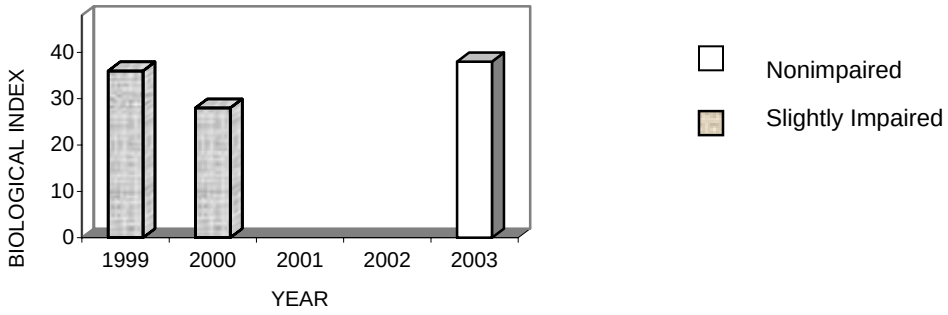
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	12/17/03	6.4	6.5	N.Y. general
ALK	12/17/03	14 mg/l	20 mg/l	Pa. aquatic life
TFe	07/21/03	1496 ug/l	300 ug/l	N.Y. aquatic (chronic)
DFe	07/21/03	1020 ug/l	300 ug/l	Pa. public water supply
ALK	03/18/04	8 mg/l	20 mg/l	Pa. aquatic life
pH	05/03/04	6.4	6.5	N.Y. general
ALK	05/03/04	18 mg/l	20 mg/l	Pa. aquatic life
TFe	03/18/04	313 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/03/04	497 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/03/04	262 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/21/03	32.9	DFe	TMn	DMn					
12/17/03	24.4	None							
03/18/04	24.5	None							
05/03/04	38.3	TP	TPO4						

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.63
RBP III Score	38
RBP III Condition	Nonimpaired
Total Habitat Score	149
Habitat Condition Category	Excellent



Water Quality Index



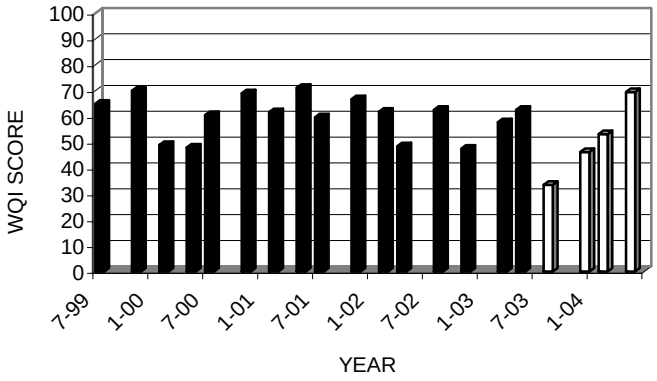
Biological Index

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

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TCln	12/17/03	0.07 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCln	02/17/04	0.06 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TFe	05/03/04	3720 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/03/04	3720 ug/l	1500 ug/l	Pa. aquatic life
TAl	05/03/04	3150 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**								
08/14/03	33.6	None								
12/17/03	46.3	COND	TCl							
02/17/04	53.2	COND	TRES	TP	TCl	TPO4				
05/03/04	69.5	SS	TP	TOC	TFe	TAl	TURB			

Biological and Habitat Summary	
Number of Taxa	30
Diversity Index	2.52
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	142
Habitat Condition Category	Supporting



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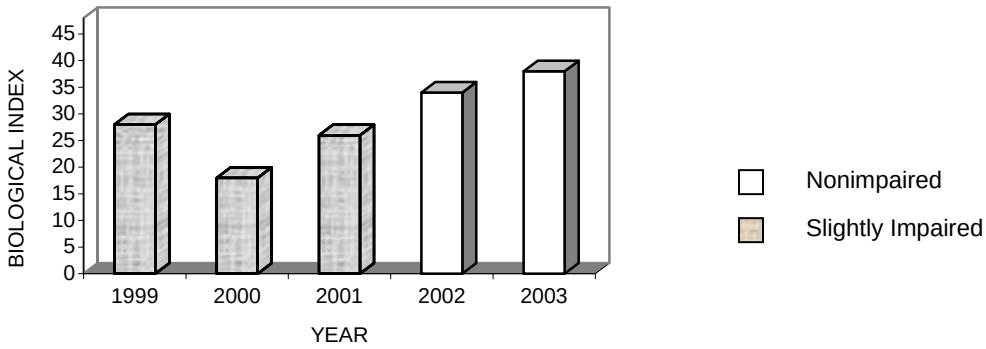


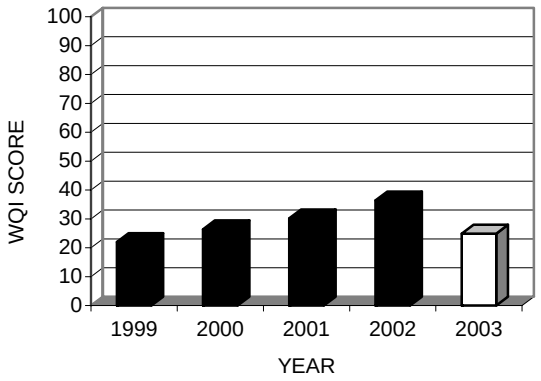
Biological Index

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

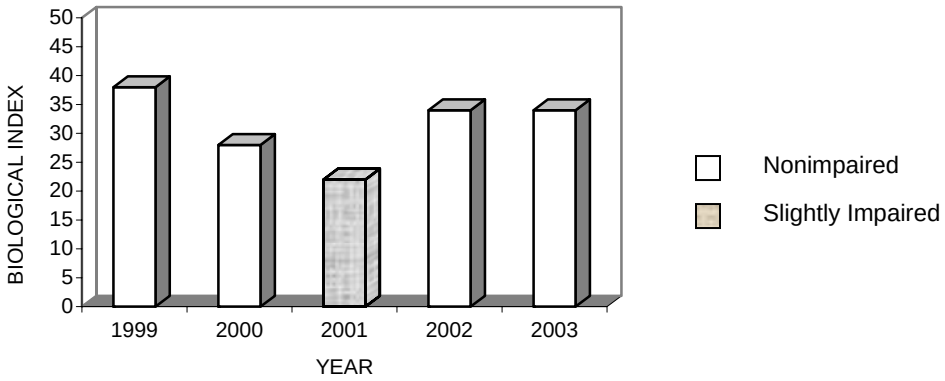
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/13/03	24.9	TEMP							

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.39
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	154
Habitat Condition Category	Excellent



Water Quality Index



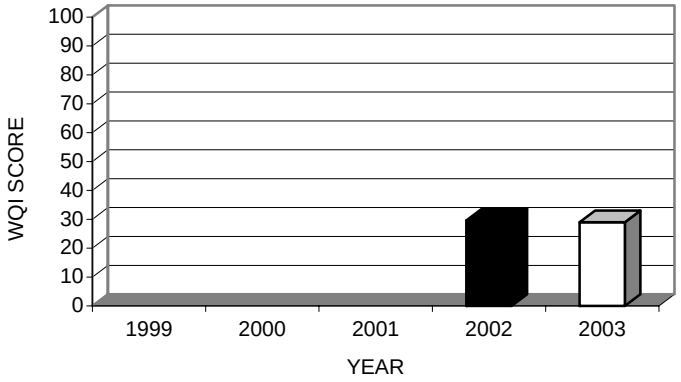
Biological Index

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							
07/30/03	29.0	TEMP	DO	TOC					

Biological and Habitat Summary	
Number of Taxa	28
Diversity Index	2.49
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	157
Habitat Condition Category	Excellent



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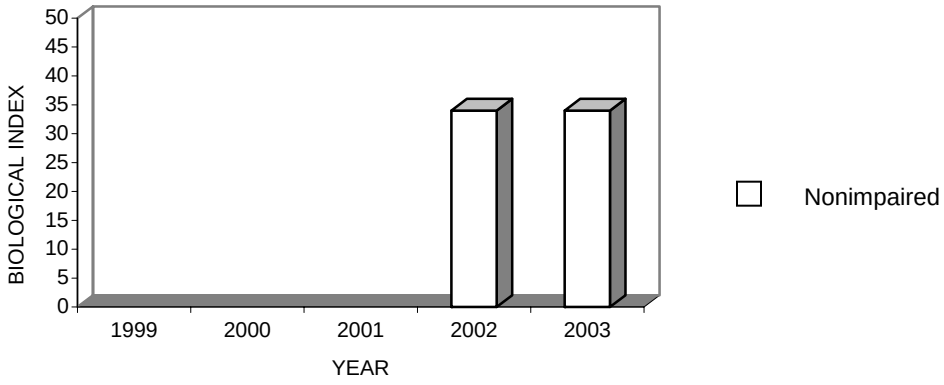


Biological Index

Little Snake Creek (LSNK 7.6)

Little Snake Creek at Brackney, Pa., (LSNK 7.6) was designated slightly impaired in August 2003 after being nonimpaired for the previous two sampling events. The slightly impaired rating was due largely to a low EPT Index and a high percentage of midges (Chironomidae). The stream was not sampled during 2001 due to low flow conditions.

Water quality values exceeded Pennsylvania and New York standards for total and dissolved iron, total aluminum, and alkalinity (Table 26). Habitat was mostly forested with logging activities occurring upstream of the site. Scour marks from a previous storm event were noted at the time of sampling. The habitat at LSNK 7.6 was rated excellent during 2003 with high scores for frequency of riffles and condition of banks.

North Fork Cowanesque River (NFCR 7.6)

North Fork Cowanesque River at North Fork, Pa., (NFCR 7.6) had a slightly impaired biological community, after being nonimpaired the previous year. This rating was due mainly to a very low EPT Index. The Hilsenhoff Index was low, probably due to the large number of organic-pollution intolerant stonefly, *Leuctra* (Plecoptera: Leuctridae), as was the percentage of Chironomidae in the sample.

Total iron exceeded the New York water quality standard, and several nutrient parameters exceeded the 90th percentile (Table 27). Habitat was rated excellent, with high scores for riparian vegetative zone width, channel alteration, 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, macro-invertebrate samples have not been collected every year.

Seeley Creek (SEEL 10.3)

During the 1999-2000 sampling season, Seeley Creek was added to the Group 1 streams in the Interstate Streams Water Quality Network (ISWQN). Seeley Creek at Seeley Creek, N.Y., (SEEL 10.3) contained a slightly impaired biological community for the second consecutive year, after being moderately impaired for the previous five years. However, this site had the lowest score of all New York-Pennsylvania streams for EPT Index and a large number of midges. Total iron and total aluminum exceeded New York water quality standards, while no parameters exceeded the 90th percentile (Table 28).

Habitat conditions appear to be a possible cause for the impaired macroinvertebrate community. New York State Department of Conservation listed Seeley Creek as "threatened" in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (New York State Department of Conservation, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel. At the time of sampling, SRBC staff noted that the previous storm appeared to have moved much of the substrate at SEEL 10.3.

Snake Creek (SNAK 2.3)

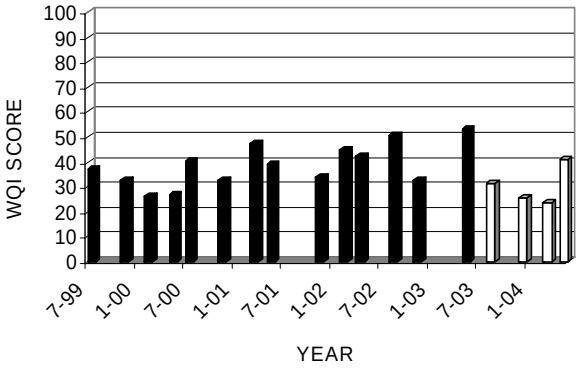
Snake Creek at Brookdale, Pa., (SNAK 2.3) served as the reference site for the New York-Pennsylvania border streams. It had a nonimpaired biological community and excellent physical habitat. SNAK 2.3 had a higher than normal WQI during July 2003, with several parameters exceeding the 90th percentile, although no parameters exceeded state standards (Table 29). The biological community has remained nonimpaired for the past seven years. Snake Creek supported many pollution intolerant taxa, including *Atherix* (Diptera: Athericidae), *Hexatoma* (Diptera: Tipulidae), *Epeorus* (Ephemeroptera: Heptageniidae), *Leucrocuta* (Ephemeroptera: Heptageniidae), *Stenonema* (Ephemeroptera: Heptageniidae), *Isonychia* (Ephemeroptera: Isonychiidae), *Paraleptophlebia* (Ephemeroptera: Leptophlebiidae), *Nigronia* (Megaloptera: Corydalidae), *Acroneuria* (Plecoptera: Perlidae), *Paragnetina* (Plecoptera: Perlidae), *Dolophilodes* (Trichoptera: Philopotamidae) and *Rhyacophila* (Trichoptera: Rhyacophilidae).

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

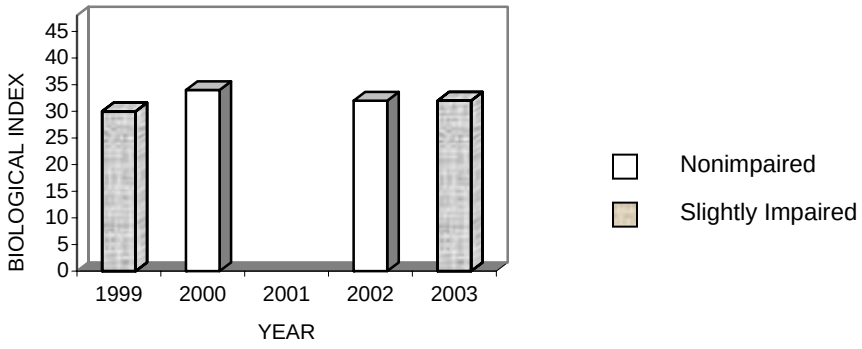
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	08/13/03	1067 ug/l	300 ug/l	N.Y. aquatic (chronic)
DFe	08/13/03	722 ug/l	300 ug/l	Pa. public water supply
ALK	12/17/03	14 mg/l	20 mg/l	Pa. aquatic life
ALK	03/18/04	16 mg/l	20 mg/l	Pa. aquatic life
ALK	05/03/04	12 mg/l	20 mg/l	Pa. aquatic life
TFe	05/03/04	846 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/03/04	512 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/13/03	31.3	TEMP	DO						
12/17/03	25.9	None							
03/18/04	23.8	None							
05/03/04	40.9	None							

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.40
RBP III Score	32
RBP III Condition	Slightly Impaired
Total Habitat Score	161
Habitat Condition Category	Excellent



Water Quality Index



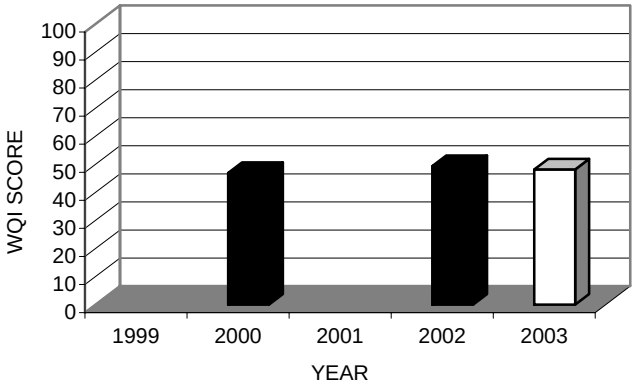
Biological Index

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

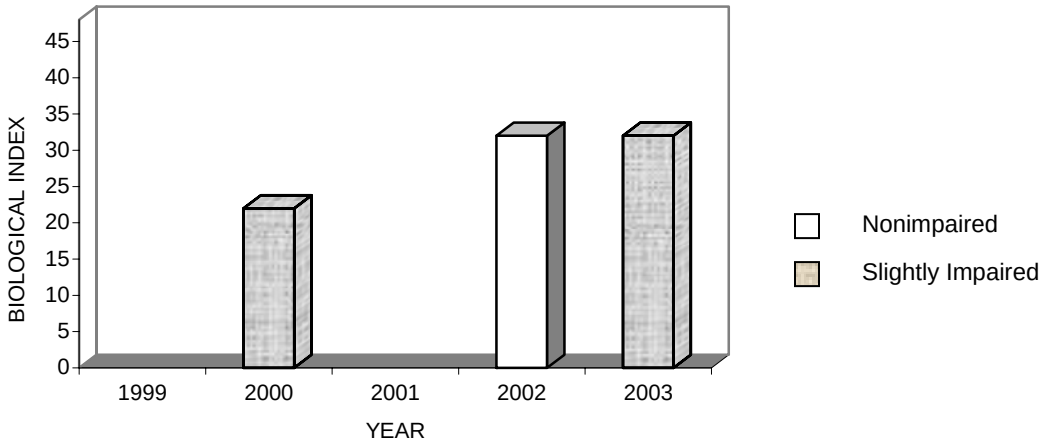
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/30/03	430 ug/l	300 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/30/03	48.2	TN	DN	TNO3	DNO3				

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.30
RBP III Score	32
RBP III Condition	Slightly Impaired
Total Habitat Score	160
Habitat Condition Category	Excellent



Water Quality Index



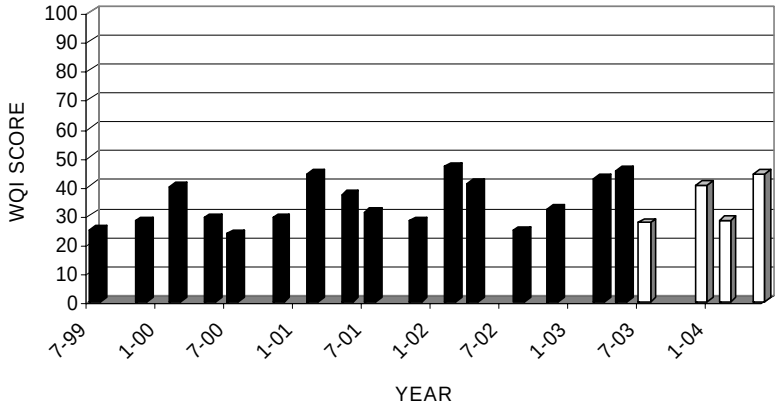
Biological Index

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

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	12/18/03	305 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/18/03	229 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/03	27.4	None							
12/18/03	40.5	None							
02/18/04	28.2	None							
05/04/04	44.1	None							

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.38
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	150
Habitat Condition Category	Excellent



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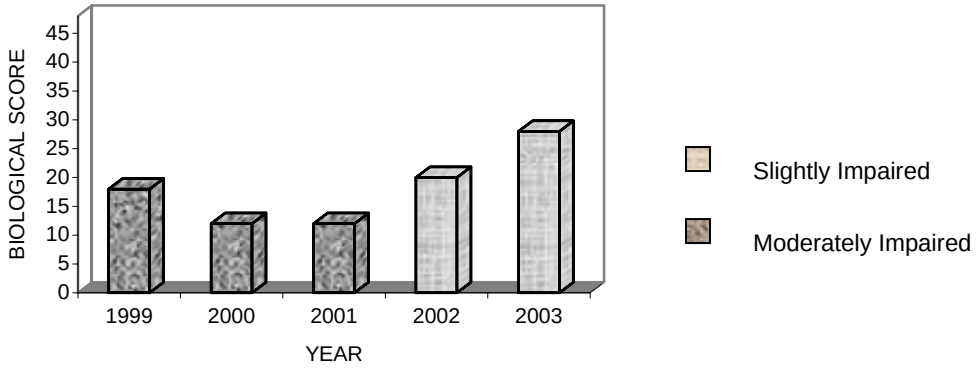


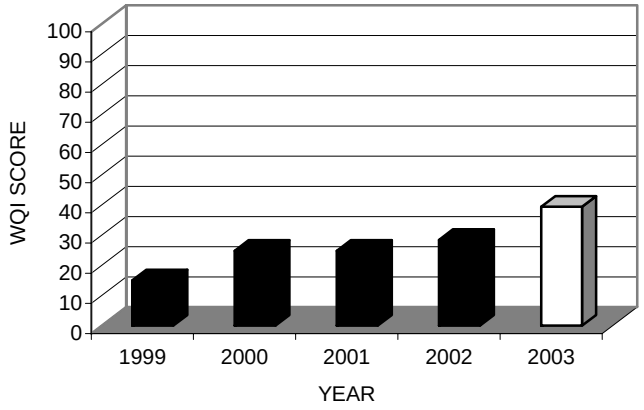
Biological Index

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

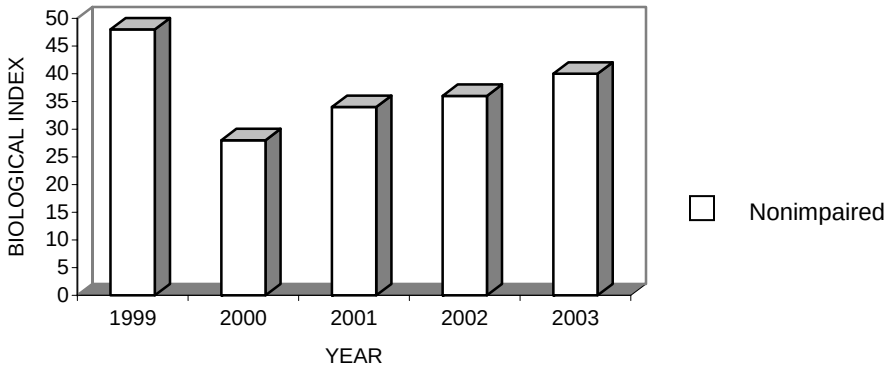
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/13/03	39.4	TEMP	TP	DP	DPO4	TSO4			

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.63
RBP III Score	40
RBP III Condition	Reference
Total Habitat Score	166
Habitat Condition Category	Reference



Water Quality Index



Biological Index

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 heavy dredging, and the study recommended that the riparian vegetation along areas of the stream be reestablished.

South Creek (SOUT 7.8)

During fiscal year 2004, South Creek at Fassett, Pa., (SOUT 7.8) had a slightly impaired biological community, with poor scores for EPT Index, percentage of Chironomidae, and percentage of the dominant taxa. The macroinvertebrate community at this site has fluctuated in its degree of impairment throughout the past five years between moderately impaired, slightly impaired, and nonimpaired.

Total and dissolved iron exceeded New York and Pennsylvania standards, respectively, although no parameters exceeded the 90th percentile (Table 30). The habitat was rated excellent, with high scores for epifaunal substrate and velocity/depth regimes. 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, after being designated nonimpaired the previous year. Over the past five years, this site has fluctuated through moderately, slightly, and nonimpaired biological conditions. During the July 2003 sampling event, taxonomic richness was the lowest of the New York-Pennsylvania border streams and EPT Index also was depressed. A large storm event occurred in the watershed in mid-July, which appears to have scoured the streambed and may be affecting the macroinvertebrate community in this sample. There were water marks at approximately 14 feet higher than normal flows and major damage to streamside trees and shrubs from the storm. The habitat was rated supporting, with low scores for epifaunal substrate and riparian vegetative zone width.

Total iron and total aluminum concentrations exceeded New York water quality standards during all sampling periods, while pH exceeded New York water quality standards and total iron exceeded Pennsylvania standards in December 2003. Furthermore, a variety of parameters exceeded the 90th percentile in July 2003, March 2004, and May 2004 (Table 31).

Trowbridge Creek (TROW 1.8)

Trowbridge Creek at Great Bend, Pa., (TROW 1.8) showed slightly impaired biological conditions, after being nonimpaired the previous year. During July 2003, percentage of Chironomidae and percentage of dominant taxa were elevated, contributing to the slightly impaired designation. The biological conditions at this site have fluctuated between moderately, slightly, and nonimpaired over the past five years. Alkalinity exceeded Pennsylvania water quality standards in July 2003, although no parameters exceeded the 90th percentile (Table 32). Habitat was rated supporting; however, low ratings were given for velocity/depth regime and riparian vegetative zone width.

Wappasening Creek (WAPP 2.6)

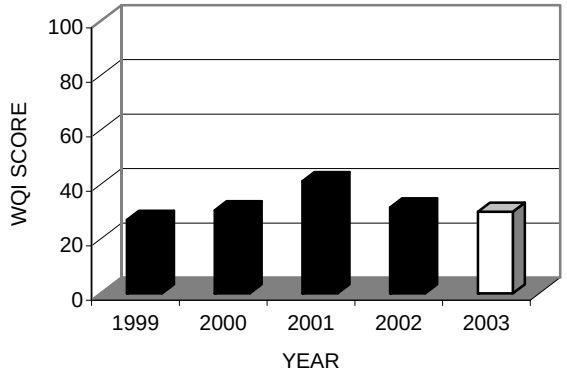
The biological index rating for Wappasening Creek at Nichols, N.Y., (WAPP 2.6) has fluctuated between moderately impaired and slightly impaired ratings over the past five years (Table 33). In July 2003, it scored a slightly impaired rating. The habitat was rated excellent, although SRBC staff noted scour marks from a previous storm, as well as changes to the gravel bars and the existence of numerous dry overflow channels. No parameters exceeded water quality standards; however, temperature exceeded the 90th percentile.

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

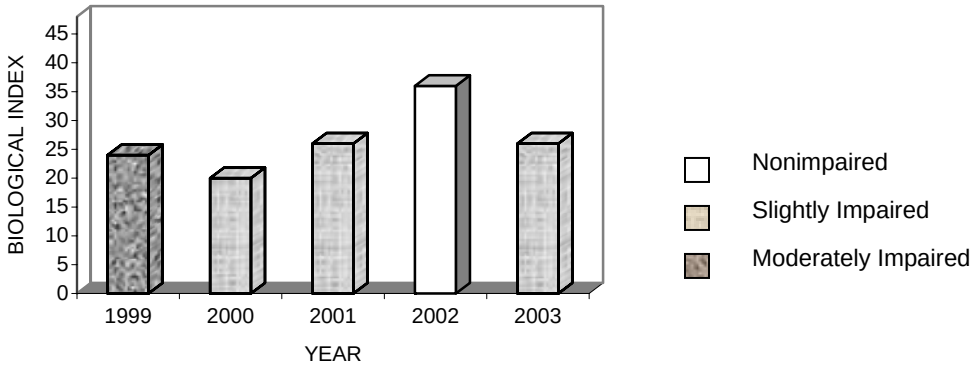
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/31/03	720 ug/l	300 ug/l	N.Y. aquatic (chronic)
DFe	07/31/03	335 ug/l	300 ug/l	Pa. public water supply

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/03	30.0	None							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.02
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	153
Habitat Condition Category	Excellent



Water Quality Index



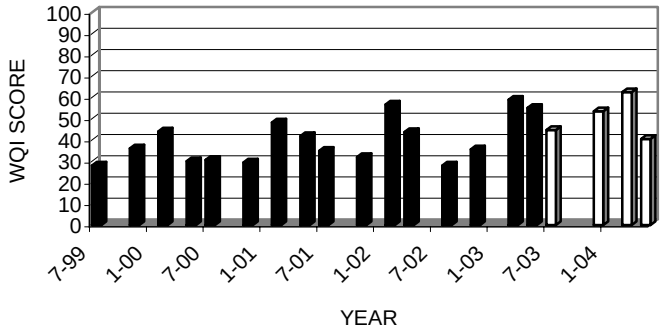
Biological Index

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

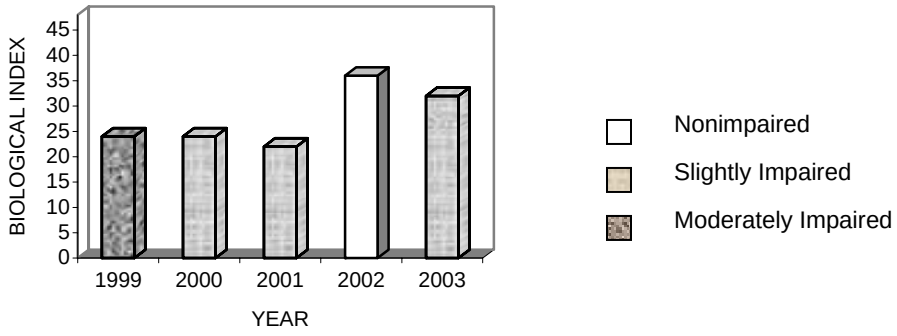
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/30/03	1320 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	07/30/03	1350 ug/l	100 ug/l	N.Y. aquatic (chronic)
pH	12/18/03	6.4	6.5	N.Y. general
TFe	12/18/03	2690 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	2690 ug/l	1500 ug/l	Pa. aquatic life
TFe	03/18/04	1380 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/18/03	1490 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	03/18/04	1210 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	05/05/04	335 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/05/04	201 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/30/03	44.7	TPO4	TURB						
12/18/03	53.5	None							
03/18/04	62.5	TEMP	DO	TN	TFe	TAl	TURB		
05/05/04	40.5	COND	TS						

Biological and Habitat Summary	
Number of Taxa	17
Diversity Index	2.41
RBP Score	32
RBP Condition	Slightly Impaired
Total Habitat Score	130
Habitat Condition Category	Supporting



Water Quality Index



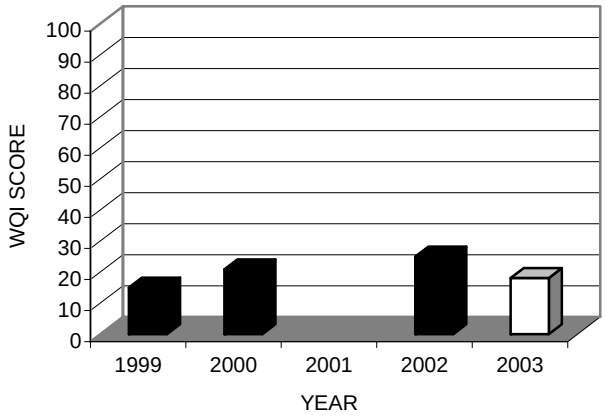
Biological Index

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

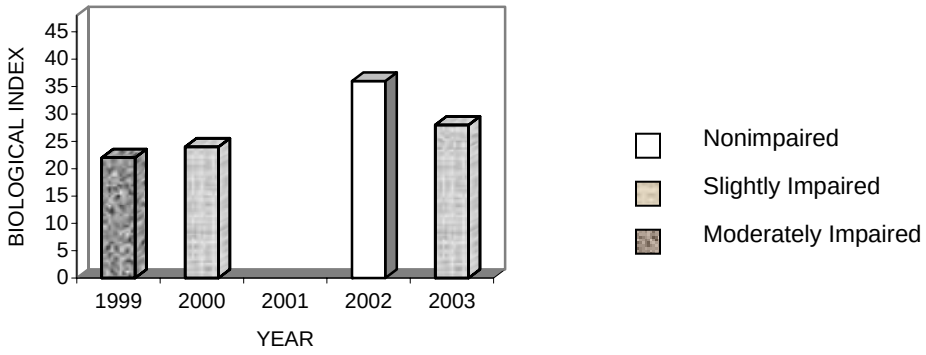
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
ALK	07/21/03	16 mg/l	20 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/03	18.1	None							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.18
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	145
Habitat Condition Category	Supporting



Water Quality Index



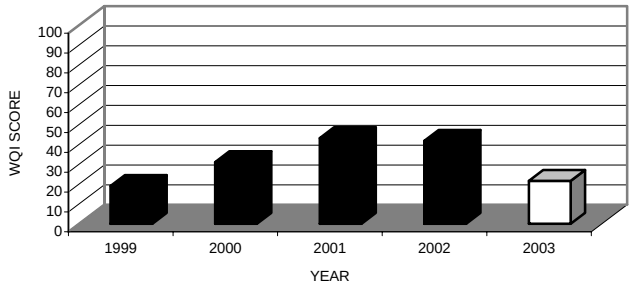
Biological Index

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

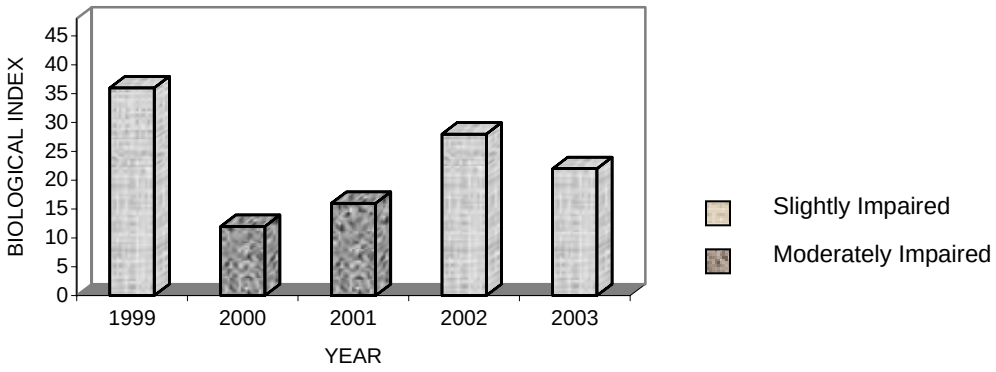
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/03	21.6	TEMP							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	1.88
RBP Score	22
RBP Condition	Slightly Impaired
Total Habitat Score	165
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 2004, as it has for at least the past six years. It had the highest EPT Index of all Pennsylvania-Maryland sites and good scores for Hilsenhoff Biotic Index, Shannon Diversity Index, and taxonomic richness; however, the community scored poorly for percentage of Chironomidae and percentage of dominant taxa. Water quality was fairly good in Big Branch Deer Creek in August 2003, with only alkalinity exceeding Pennsylvania standards and no parameters exceeding the 90th percentile (Table 34). BBDC 4.1 had the best habitat conditions of all the Pennsylvania-Maryland border sites, with high scores for a number of parameters, including epifaunal substrate, instream cover, and channel flow status.

Conowingo Creek (CNWG 4.4)

Conowingo Creek at Pleasant Grove, Pa., (CNWG 4.4) had a slightly impaired community for the fourth year in a row, with a very low taxonomic richness and EPT Index. This stream was impacted by agricultural activities, as evidenced by high sediment deposition and elevated nutrients. Parameters that exceeded the 90th percentile were predominantly nutrients (Table 35). Nitrate plus nitrite exceeded the Pennsylvania standards for public water supply during July 2003 and May 2004 and remained elevated during the other sampling seasons. Pennsylvania water quality standards for total iron also were exceeded during November 2003 and February 2004. These high metal values may be due to problems with sediment erosion in the watershed.

Deer Creek (DEER 44.2)

Deer Creek at Gorsuch Mills, Md., (DEER 44.2) served as the reference site for fiscal year 2004. DEER 44.2 had the highest taxonomic richness and diversity index and the lowest percent dominant taxa of the Pennsylvania-Maryland streams, as well as a high EPT Index and low percent Chironomidae. Organic-pollution intolerant organisms included: *Atherix*, *Antocha* (Diptera: Tipulidae), *Dicranota* (Diptera: Tipulidae), *Serratella* (Ephemeroptera: Ephemerellidae), *Isonychia*, *Nigronia*, *Ophiogomphus* (Odonata: Gomphidae), *Leuctra* (Plecoptera: Leuctridae), *Tallaperla* (Plecoptera: Peltoperlidae), *Acroneuria*, *Agnetina* (Plecoptera: Perlidae), *Paragnetina*, and *Dolophilodes*. This site had fairly good water quality, with no parameters exceeding standards, and only temperature and dissolved oxygen exceeding the 90th percentile during the November 2003 sampling period (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 moderately impaired community in July 2003 and scored poorly in a number of metrics, including taxonomic richness, EPT Index, percentage of Chironomidae, and percentage of dominant taxa. This site usually has slightly or moderately impaired biological conditions, with the July 2001 rating of nonimpaired being an anomaly. Habitat was rated as excellent, with high scores for bank vegetative protection and channel flow status.

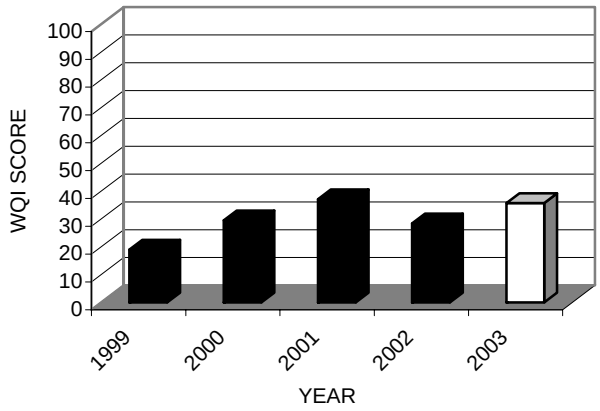
Total chlorine values exceeded state standards during every sampling period with ranges of 0.1 mg/l to 0.07 mg/l (Table 37). A variety of other parameters exceeded the 90th percentile. EBAU 1.5 is located downstream of the Stewartstown Treatment Plant.

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

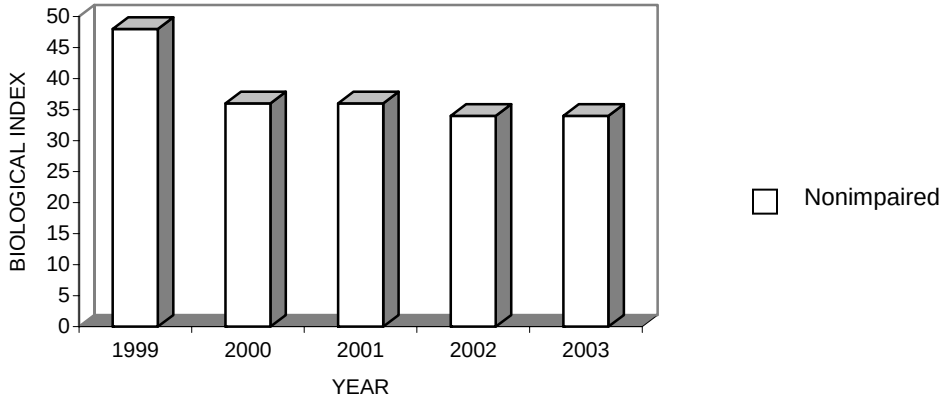
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
ALK	07/28/03	16 mg/l	20 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/28/03	35.7	None							

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.24
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	171
Habitat Condition Category	Excellent



Water Quality Index



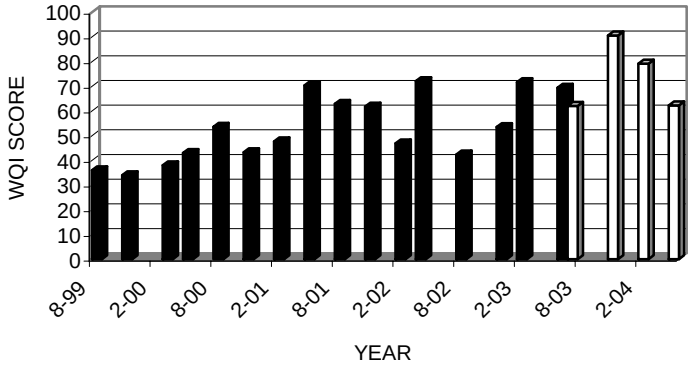
Biological Index

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

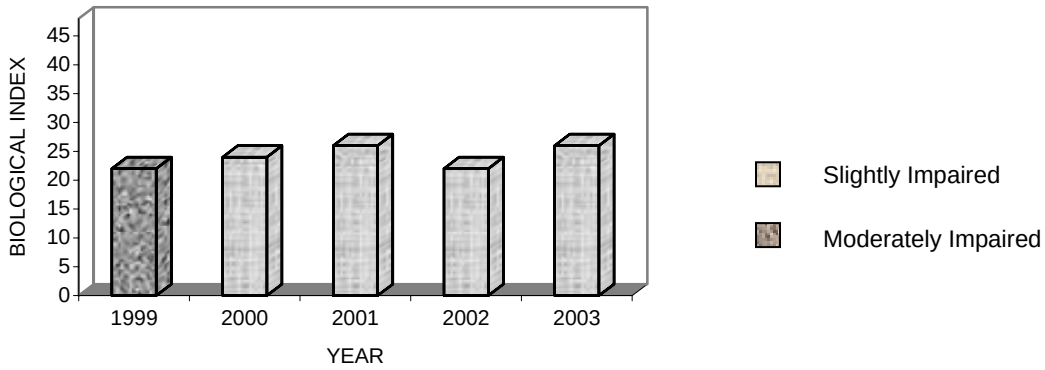
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
Nitrate + Nitrite	07/29/03	10.63 mg/l	10 mg/l	Pa. public water supply
TFe	11/07/03	6530 ug/l	1500 ug/l	Pa. aquatic life
Nitrate + Nitrite	05/06/04	10.82 mg/l	10 mg/l	Pa. public water supply
TFe	02/11/04	2950 ug/l	1500 ug/l	Pa. aquatic life
TURB	11/07/03	204.3 NTU	150 NTU	Md. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/29/03	62.1	TS	DS	TN	DN	TNO3	DNO3	TPO4	
11/07/03	90.6	SS	TEMP	DO	TS	TN	TNH3	TNO2	TNO3
		TP	TOC	TFe	TMn	TAl	TPO4	TURB	
02/11/04	79.2	SS	TN	TNH3	TP	TOC	TFe	TAl	TPO4
		TURB							
05/06/04	62.3	COND	TS	TN	TNO3	TP	TPO4		

Biological and Habitat Summary	
Number of Taxa	12
Diversity Index	2.03
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	161
Habitat Condition Category	Excellent



Water Quality Index



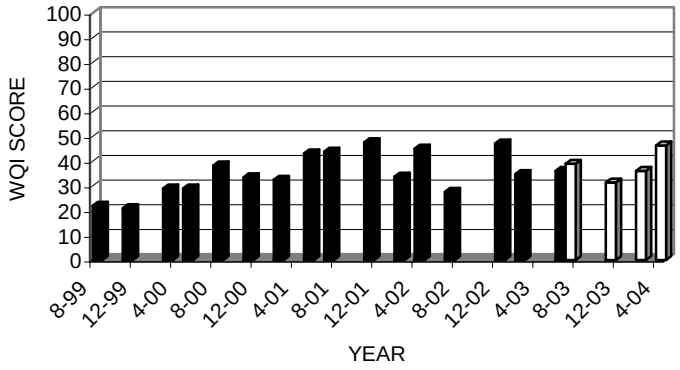
Biological Index

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

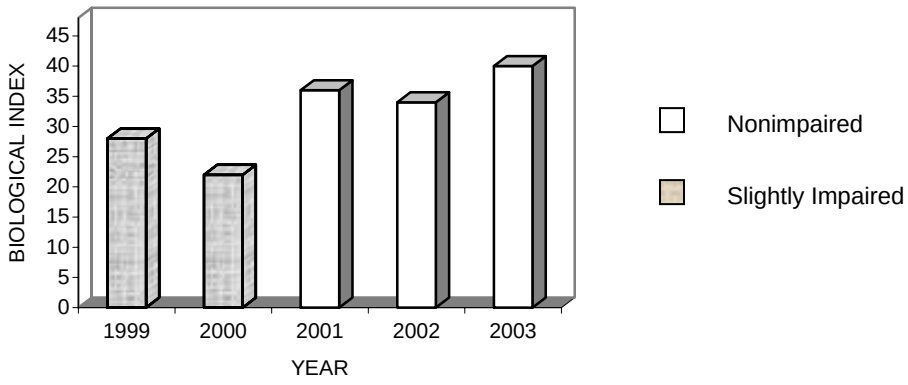
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
0728/03	39.0								
11/06/03	31.4	TEMP	DO						
02/10/04	36.1								
04/27/04	46.4								

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.46
RBP Score	40
RBP Condition	Reference
Total Habitat Score	147
Habitat Condition Category	Reference



Water Quality Index



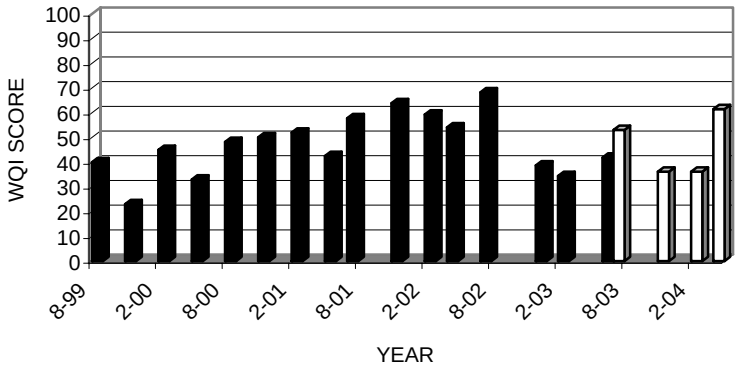
Biological Index

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

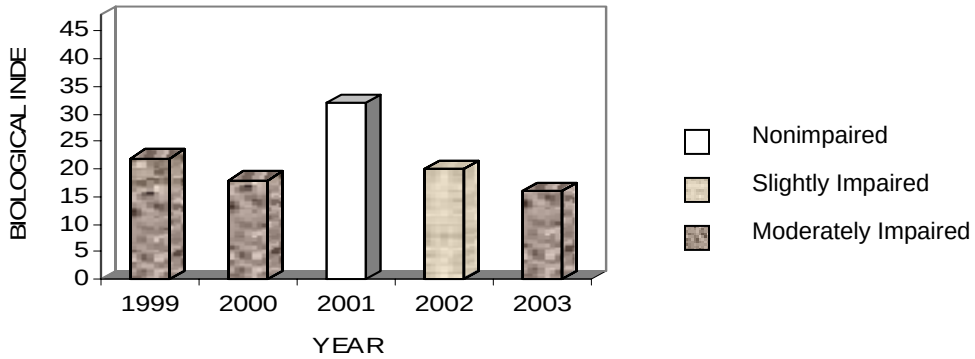
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TCln	07/28/03	0.1 mg/l	0.019 mg/l	Md. aquatic life
TCln	11/06/03	0.09 mg/l	0.019 mg/l	Md. aquatic life
TCln	02/10/04	0.07 mg/l	0.019 mg/l	Md. aquatic life
TCln	04/27/04	0.09 mg/l	0.019 mg/l	Md. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/28/03	53.1	DFe	DMn						
11/06/03	36.2	TEMP	DO	TNO2					
02/10/04	36.2	TEMP	TNO3						
04/27/04	61.5	TNH3	TNO2	TP	TPO4				

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	1.66
RBP Score	16
RBP Condition	Moderately Impaired
Total Habitat Score	156
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Falling Branch Deer Creek (FBDC 4.1)

The biological community of Falling Branch Deer Creek at Fawn Grove, Pa., (FBDC 4.1) was designated nonimpaired. This site had the lowest Hilsenhoff Biotic Index and the highest percentage of Ephemeroptera of all the Pennsylvania-Maryland stations. The habitat was rated excellent with a dense vegetative cover; however staff noted that the riparian vegetative zone width was much better upstream of the station than downstream. Water quality was fairly good with only alkalinity exceeding Pennsylvania aquatic life standards and no parameters exceeding the 90th percentile (Table 38).

Long Arm Creek (LNGA 2.5)

Long Arm Creek at Bandanna, Pa., (LNGA 2.5) had a moderately impaired biological community for the second consecutive year, with low metric scores for taxonomic richness, EPT Index, and percentage of Chironomidae. LNGA 2.5 was located in a cow pasture. The site was expected to improve as an organic farm with fewer livestock and reduced access to the stream replaced the previous operation; however, significant improvements have not been noted yet. SRBC staff noted that several steers were using the pasture and entering Long Arm Creek upstream of the sampling site. Habitat conditions were rated as supporting; however the site received low scores for 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 2004, both metals and nutrients such as total iron, total aluminum, total nitrate, and total organic carbon exceeded the 90th percentile at this site. Dissolved oxygen and turbidity also exceeded the 90th percentile (Table 39).

Octoraro Creek (OCTO 6.6)

Octoraro Creek at Rising Sun, Md., (OCTO 6.6) had a slightly impaired biological community, with a low score for Hilsenhoff Index, indicating a large number of organic-pollution tolerant organisms. Total iron exceeded Pennsylvania standards during February 2004 (Table 40). Solids, phosphorus, temperature, dissolved oxygen, and conductivity exceeded the 90th percentile, and total nitrogen and total nitrate were elevated, although they did not exceed the 90th percentile.

Scott Creek (SCTT 3.0)

Scott Creek at Delta, Pa., (SCTT 3.0) was rated moderately impaired in July 2003, after being designated severely impaired for numerous years. This site consistently had the worst macroinvertebrate metric scores of all the Pennsylvania-Maryland sites and was heavily dominated by Chironomidae. However, during fiscal year 2004, several pollution sensitive organisms appeared in the sample for the first time, including *Nigronia*, *Diplectrona* (Trichoptera: Hydropsychidae), and Dolophilodes. No parameters exceeded state standards in fiscal year 2004; however, a variety of parameters, including dissolved oxygen, conductivity, solids, total chloride, total sulfate, and total organic carbon exceeded the 90th percentile. WQI scores appear to be decreasing, indicating potential for improvement (Table 41). The habitat was rated supporting, with poor scores for riparian vegetative zone width and velocity/depth regimes. A slight fuel oil smell was noted when the substrate was disturbed.

South Branch Conewago Creek (SBCC 20.4)

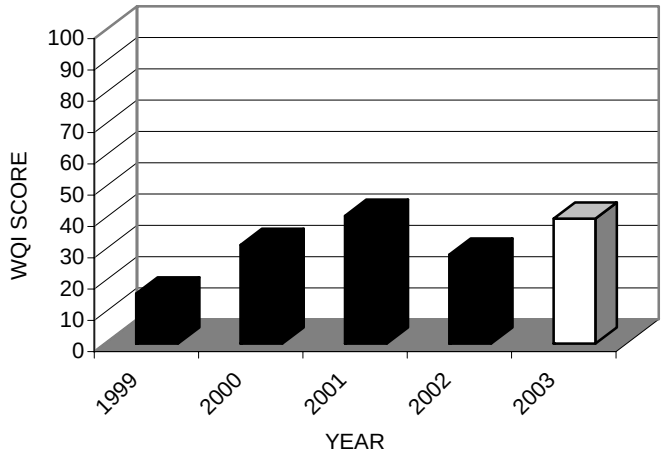
South Branch Conewago Creek near Bandanna, Pa., (SBCC 20.4) contained a nonimpaired biological community after being rated as slightly impaired for the previous six years. No water quality standards were exceeded, and no parameters exceeded the 90th percentile (Table 42). The habitat was rated excellent, with high scores for epifaunal substrate, channel alteration, frequency of riffles, and vegetative protective cover. Before this stream was slightly impaired, it had served as the Pennsylvania-Maryland reference site for several years. Logging activities occur upstream in the watershed; however, it has not been determined whether this is the source of impairment. All-terrain vehicle tracks were noted on the streambank and in South Branch Conewago Creek at the time of sampling.

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

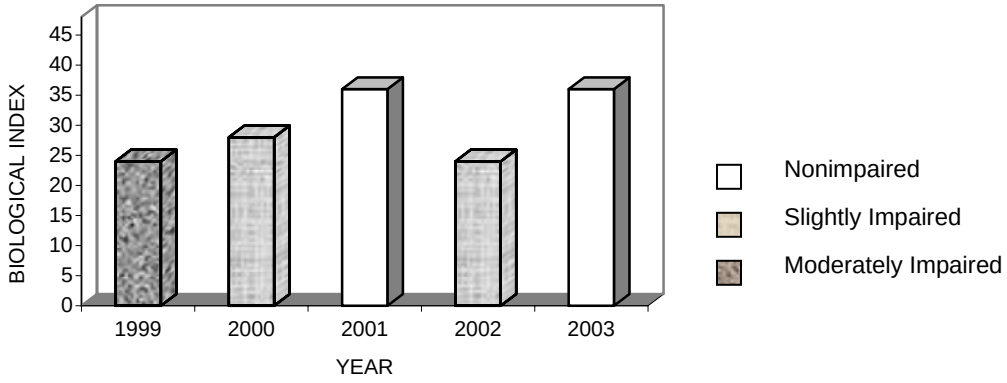
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
ALK	07/29/03	16 mg/l	20 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/29/03	39.9	None							

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.20
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	154
Habitat Condition Category	Excellent



Water Quality Index



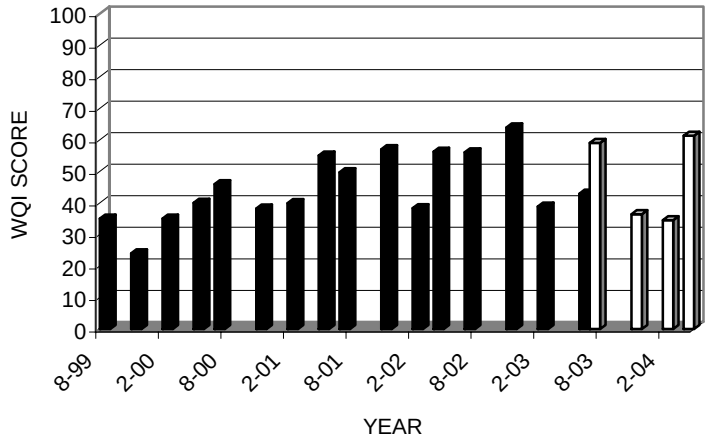
Biological Index

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

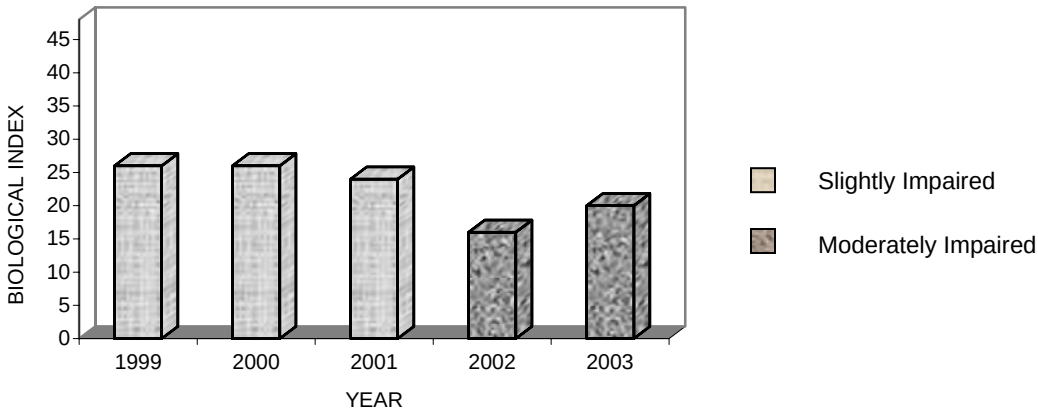
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/28/03	59.0	TAl	TPO4	TURB					
11/06/03	36.4	TEMP	DO						
02/10/04	34.5	TNO3							
04/27/04	61.3	TP	TOC	TFe	TPO4				

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	2.02
RBP III Score	20
RBP III Condition	Moderately Impaired
Total Habitat Score	125
Habitat Condition Category	Supporting



Water Quality Index



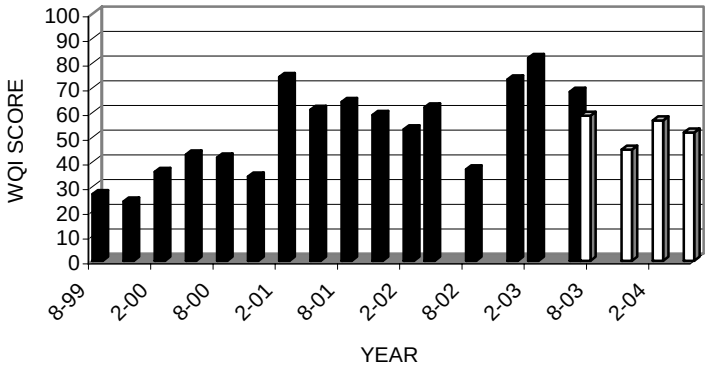
Biological Index

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

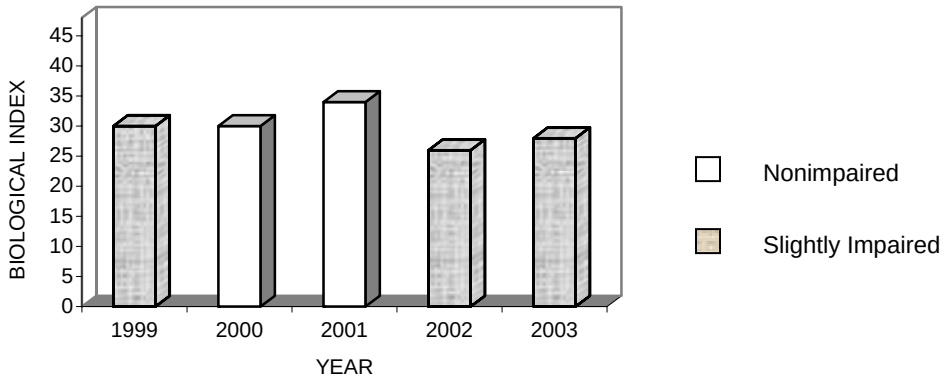
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/11/04	1880 ug/l	1500 ug/l	Pa. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/29/03	58.7	TEMP	TS	DS	TP	DP			
11/07/03	45.0	TEMP	DO						
02/11/04	56.8	None							
05/06/04	51.9	COND	TS						

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	2.12
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	161
Habitat Condition Category	Excellent



Water Quality Index



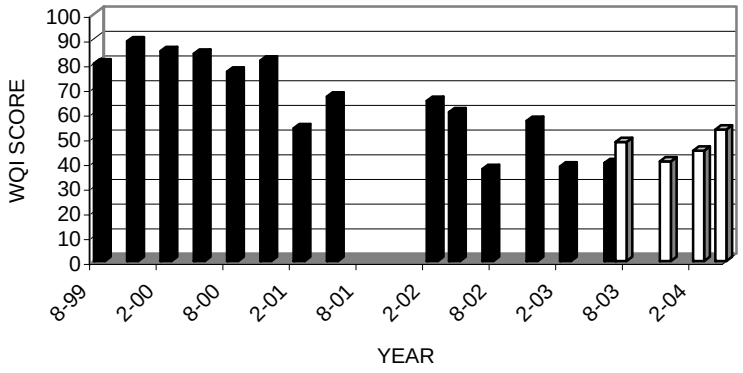
Biological Index

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

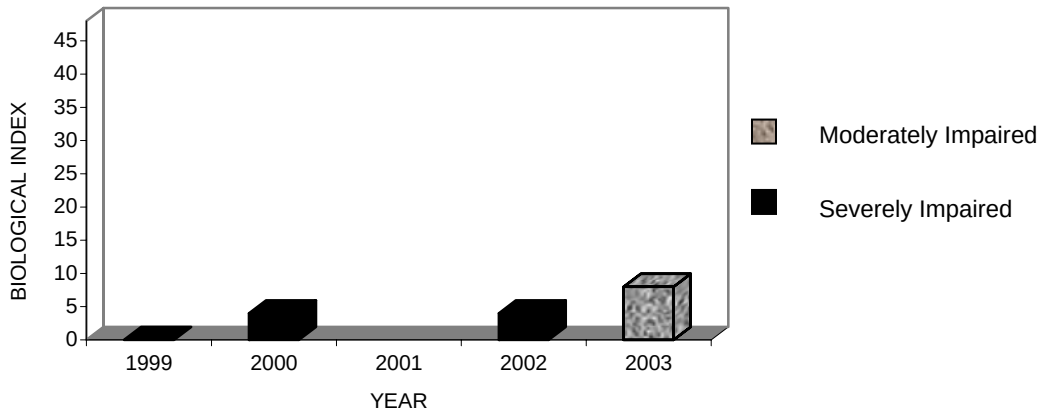
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

Date	WQI	Parameters Exceeding 90th Percentile								
07/29/03	48.2	COND	TS	DS	DP	DPO4	TCl	TPO4		
11/06/03	40.4	TEMP	DO	COND	TCl	TSO4				
02/10/04	44.7	TEMP	COND	TS	TCl					
04/27/04	53.3	COND	TOC	TCl						

Biological and Habitat Summary	
Number of Taxa	10
Diversity Index	0.55
RBP III Score	8
RBP III Condition	Moderately Impaired
Total Habitat Score	128
Habitat Condition Category	Supporting



Water Quality Index



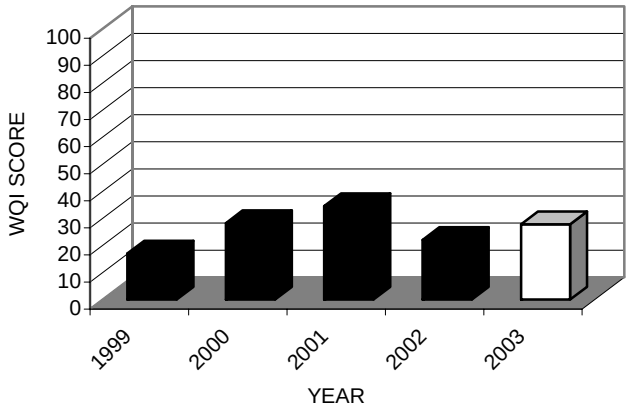
Biological Index

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

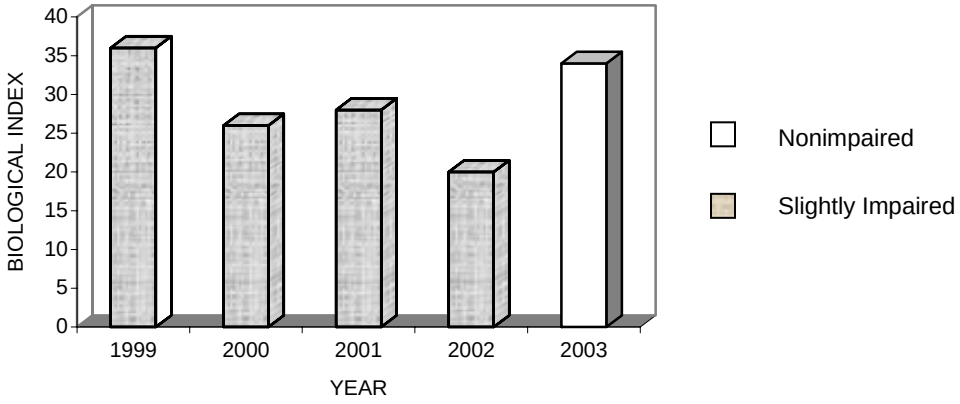
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/28/03	27.8	None							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.19
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	165
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, N.Y., (CHEM 12.0). Total iron and total aluminum exceeded the New York water quality standards during September and December 2003 and May 2004; also exceeded was the Pennsylvania total iron standard during September 2003 and May 2004. Numerous parameters exceeded the 90th percentile including conductivity, solids, and dissolved oxygen, among others (Table 43).

Cowanesque River (COWN 2.2)

Due to high flows throughout the sampling season, no macroinvertebrate sample or habitat data was collected on the Cowanesque River downstream of the Cowanesque Reservoir at Lawrenceville, Pa., (COWN 2.2).

Water quality data was not collected at COWN 2.2 during the first sampling quarter due to very high flows downstream of the Cowanesque Reservoir. Total iron exceeded New York and Pennsylvania standards in December 2003 and the New York standard during February and May 2004, while the New York total aluminum standard also was exceeded during all sampling periods (Table 44). A variety of parameters exceeded the 90th percentile at COWN 2.2 including dissolved oxygen 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. However, due to high flows during summer 2003, no macroinvertebrate sample or habitat information was collected at COWN 1.0.

Total iron and total aluminum exceeded the New York water quality standards during every sampling period, while total iron also exceeded Pennsylvania standards during December 2003. Parameters that exceeded the 90th percentile included dissolved oxygen, total iron, total aluminum, and various nutrients (Table 45). The water quality was very similar between COWN 2.2 and COWN 1.0. The Cowanesque Reservoir and a wastewater treatment plant discharge are located upstream of COWN 1.0.

Susquehanna River at Windsor, N.Y. (SUSQ 365.0)

Since very few macroinvertebrate samples were collected on the larger rivers due to high flow conditions, the biological community at Susquehanna River at Windsor, N.Y., (SUSQ 365.0) was compared to SNAK 2.3, the reference station for the New York-Pennsylvania border streams. SUSQ 365.0 was designated nonimpaired during fiscal year 2004 and had an excellent habitat score, with high ratings for epifaunal substrate, velocity/depth regimes, and vegetative protective cover. Logs and woody debris were noted in the stream, along with some algae covering the rocks.

Total iron and total aluminum slightly exceeded New York aquatic standards. Temperature, total solids, and total chloride were elevated (Table 46) at this site.

Susquehanna River at Kirkwood, N.Y. (SUSQ 340.0)

Susquehanna River at Kirkwood, N.Y., (SUSQ 340.0) also was compared to SNAK 2.3, due to the lack of macroinvertebrate samples collected at most of the river sites. During July 2003, SUSQ 340.0 was designated as nonimpaired and received an excellent score for habitat conditions.

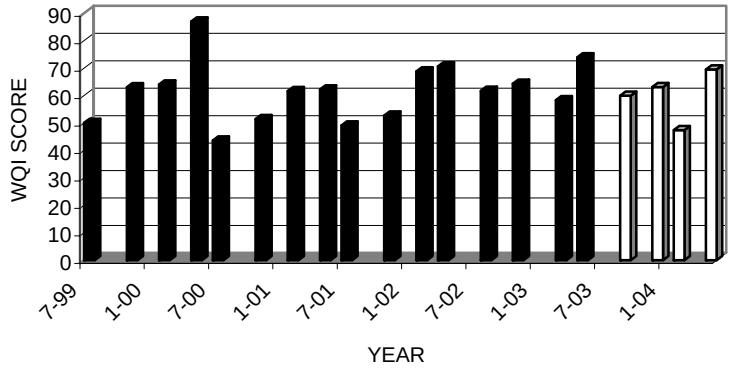
Total iron exceeded New York water quality standards on three occasions, while total aluminum exceeded standards twice. Additional water quality analysis indicated that temperature, dissolved oxygen, and total chloride exceeded the 90th percentile (Table 47).

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

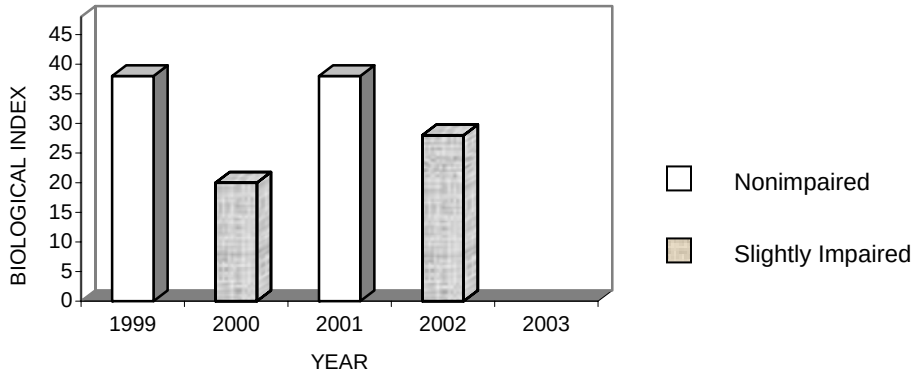
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/23/03	2510 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	09/23/03	2510 ug/l	1500 ug/l	Pa. aquatic life
TAl	09/23/03	2140 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	12/17/03	1450 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/17/03	795 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	05/04/04	1650 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/04/04	1650 ug/l	1500 ug/l	Pa. aquatic life
TAl	05/04/04	1190 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
09/23/03	59.9	COND	TS	DS	TNO2	TCl	TFe	TAl	
12/17/03	63.1	DO	COND	TS	TN	TNO3	TSO4		
02/18/04	47.4	DO	TN	TNO3					
05/04/04	69.5	COND	TS	TN	TP	TCl	TPO4		

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



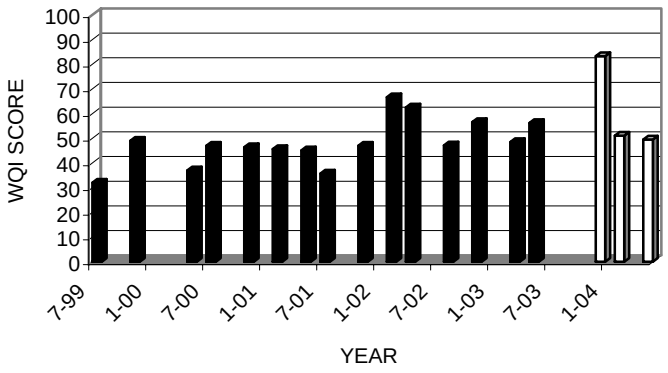
Biological Index

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

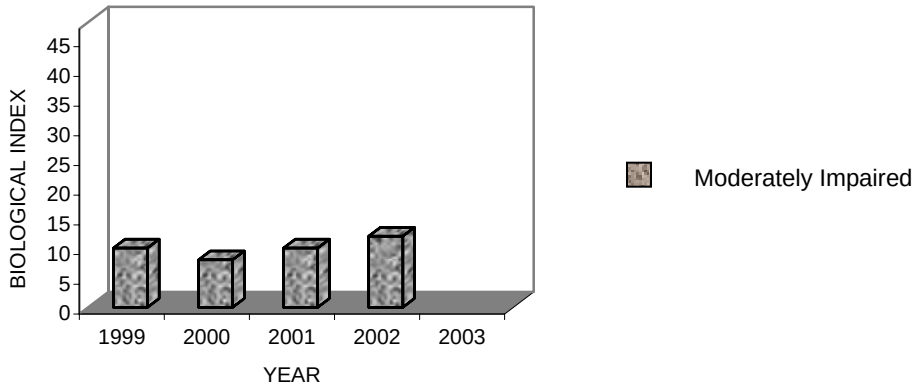
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	12/18/03	5340 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	5340 ug/l	1500 ug/l	Pa. aquatic life
TFe	02/18/04	611 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/18/03	6760 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	02/18/04	578 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	05/05/04	353 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/05/04	290 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
12/18/03	83.3	SS	DO	TS	TNH3	TP	TOC	TFe	TAl
		TPO4	TURB						
02/18/04	51.1	DO	TOC						
05/05/04	49.5	DO	TNO3						

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



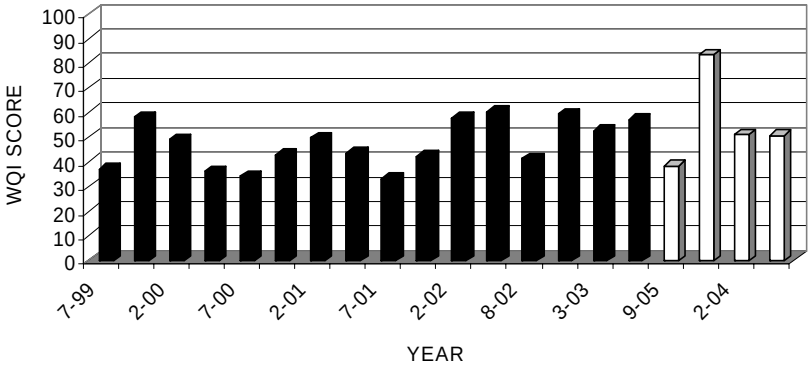
Biological Index

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

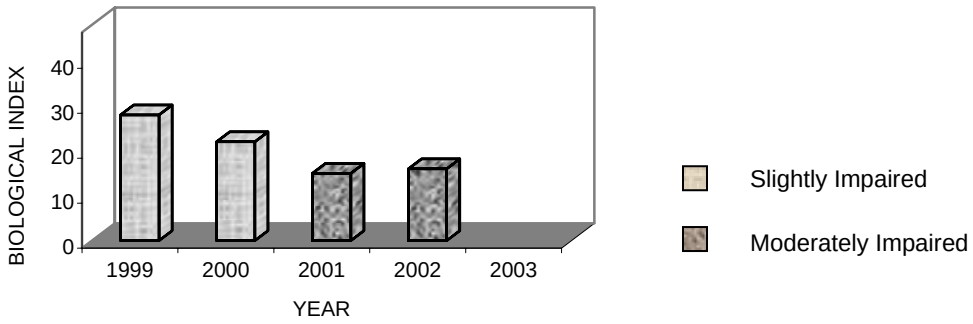
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/23/03	427 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	09/23/03	328 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	5340 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	5340 ug/l	1500 ug/l	Pa. aquatic life
TFe	02/18/04	655 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/18/03	6700 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	02/18/04	606 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	05/04/04	429 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/04/04	392 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
09/23/03	38.3	DNH3	TNH3	TOC					
12/18/03	83.4	SS	DO	TS	TNH3	TP	TOC	TFe	TAl
		TPO4	TURB						
02/18/04	50.8	DO	TOC						
05/04/04	50.6	DO	TNO3						

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



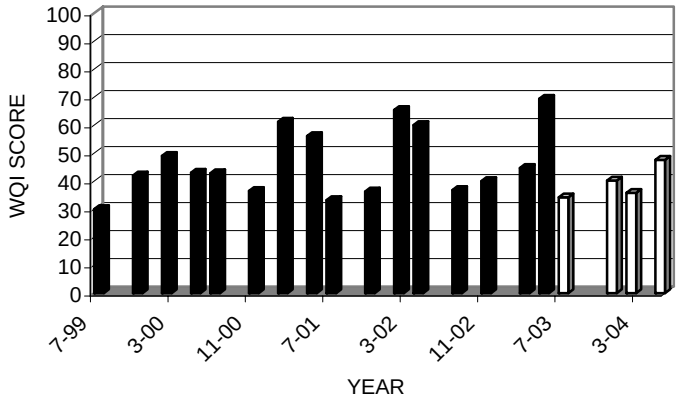
Biological Index

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

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	12/17/03	307 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/03/04	647 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/03/04	375 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/21/03	34.2	TEMP							
12/17/03	40.2	None							
02/17/04	35.8	None							
05/03/04	47.6	TS	TCl						

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	2.42
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	165
Habitat Condition Category	Excellent



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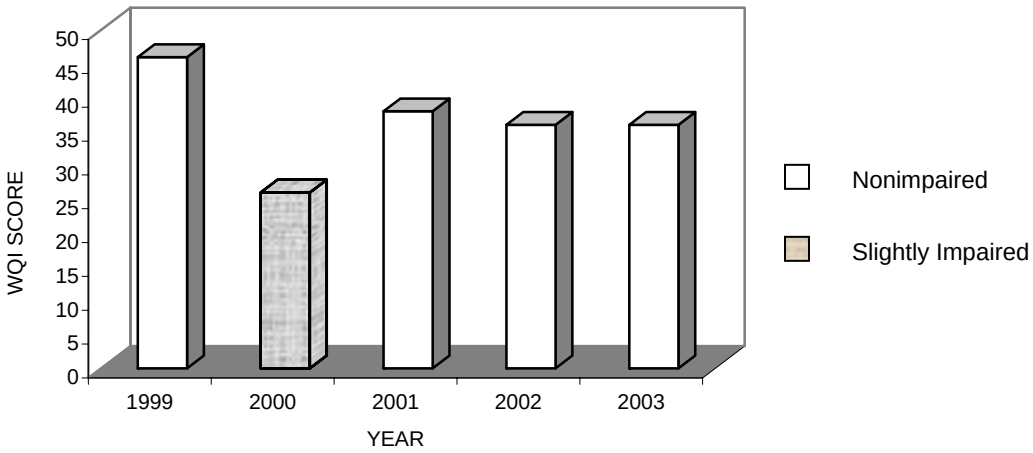


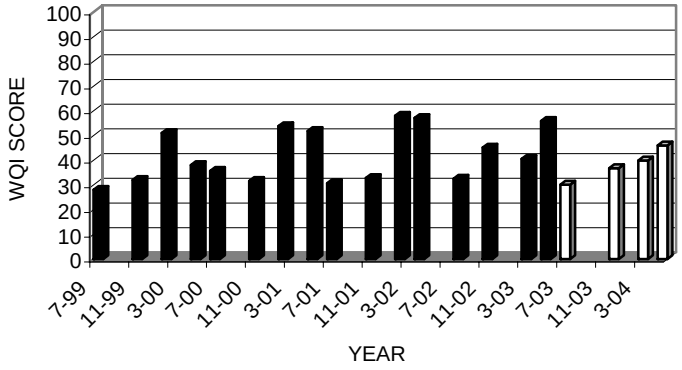
Biological Index

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

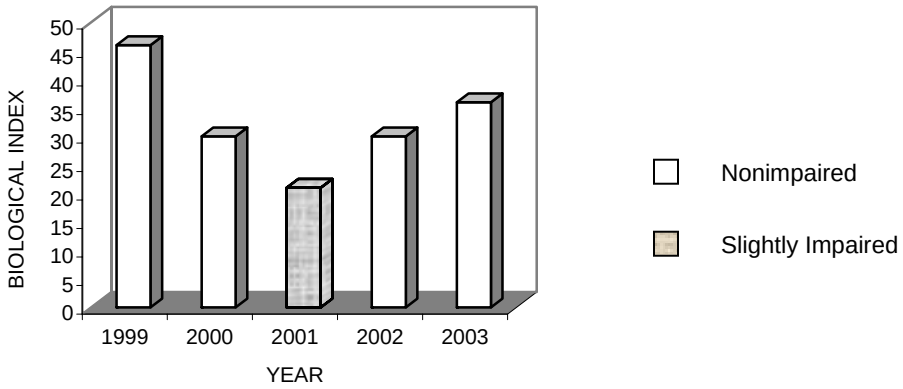
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	12/17/03	356 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	03/18/04	477 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/03/04	624 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	03/18/04	263 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	05/03/04	373 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/21/03	30.1	TEMP							
12/17/03	36.8	None							
03/18/04	39.9	None							
05/03/04	46.0	TEMP	DO	TCl					

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.18
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	162
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Susquehanna River at Sayre, Pa. (SUSQ 289.1)

Due to high river flows throughout the 2003 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, December, and May. Other parameters that were elevated compared to other Group 1 and 2 New York-Pennsylvania streams were temperature, several nutrient parameters, and total chloride (Table 48).

Susquehanna River at Marietta, Pa. (SUSQ 44.5)

As river flows were very high throughout summer 2003, 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; however, several parameters, including dissolved oxygen, conductivity, temperature, and total organic carbon exceeded the 90th percentile (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, and various other constituents (Table 50).

Tioga River (TIOG 10.8)

No macroinvertebrate sampling or habitat assessments occurred during 2003 on the Tioga River at Lindley, N.Y., (TIOG 10.8) due to high flows throughout the sampling season. Total iron exceeded New York water quality standards on three occasions, while total aluminum exceeded New York standards every quarter during FY-2004. The Pennsylvania water quality standard for total iron also was exceeded in December 2003 (Table 51). Additional water quality analysis indicated that total manganese and total sulfate were consistently high through the sampling period.

Acid 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 acid mine drainage by buffering the outflow of Tioga Lake with alkaline waters stored in Hammond Lake. However, the effects of the acid mine drainage may still 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.

Group 3 Sites

Babcock Run (BABC)

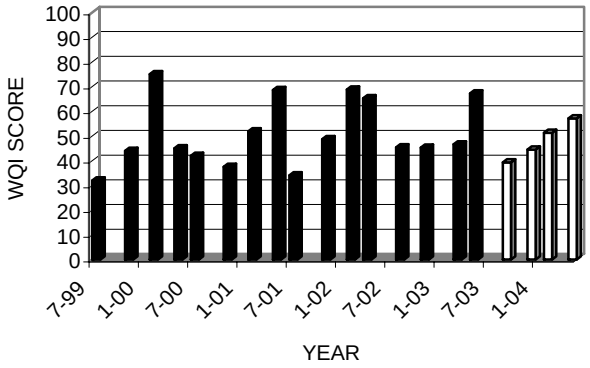
During May 2004, the macroinvertebrate community of Babcock Run near Cadis, Pa., was designated slightly impaired, with a low metric score for percentage of Chironomidae. Physical habitat conditions were designated excellent, and all field chemistry parameters were within acceptable limits. BABC is located in a mostly forested watershed.

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

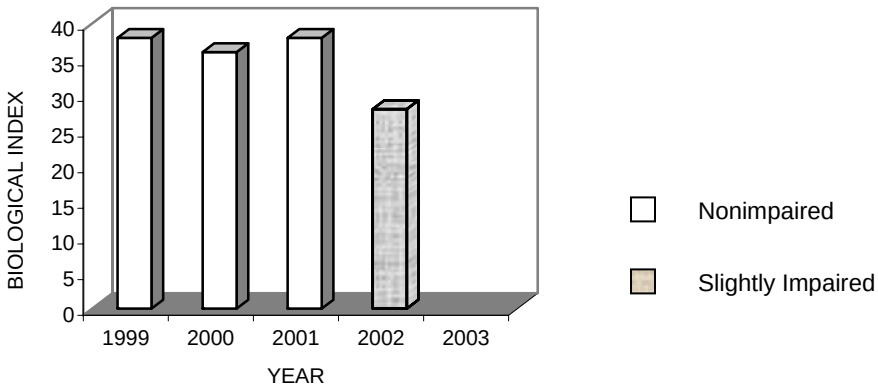
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/23/03	583 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	09/23/03	367 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	12/17/03	517 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	05/03/04	1420 ug//l	300 ug/l	N.Y. aquatic (chronic)
TAl	12/17/03	257 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	05/03/04	1020 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
09/23/03	39.3	None							
12/17/03	44.5	None							
02/17/04	51.3	SS	TN	TNH3	TNO3				
05/03/04	57.1	TEMP	TS	TN	TCl				

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



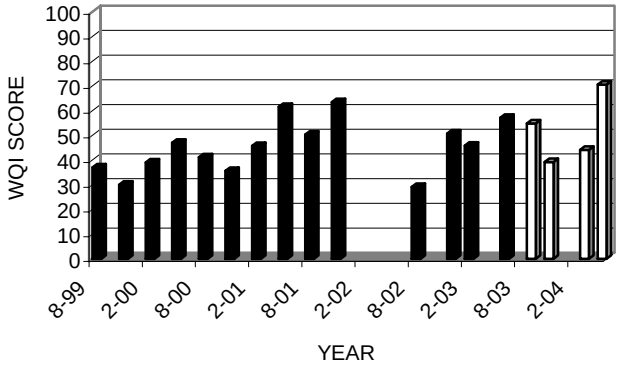
Biological Index

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

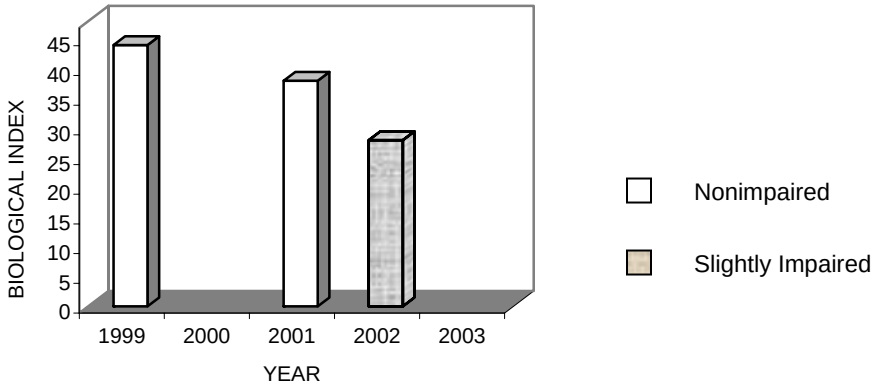
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
09/29/03	54.8	TP	TOC	TFe					
11/07/03	39.2	DO							
03/03/04	44.1	DO	TSO4	TMn					
05/06/04	70.5	SS	TEMP	COND	TS	TP	TOC	TAl	TURB

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

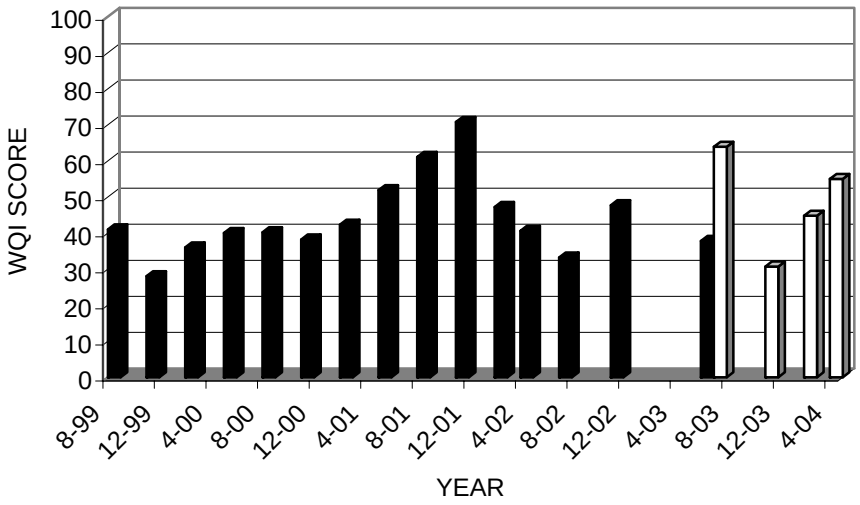


Biological Index

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							
07/29/03	63.9	TEMP	DO	COND	TS	DS	TNH3	TNO2	TOC
		TSO4	TMn						
11/06/03	30.7	TEMP	DO						
02/11/04	44.8	None							
04/27/04	55.0	TEMP	DO	TSO4	TMn				



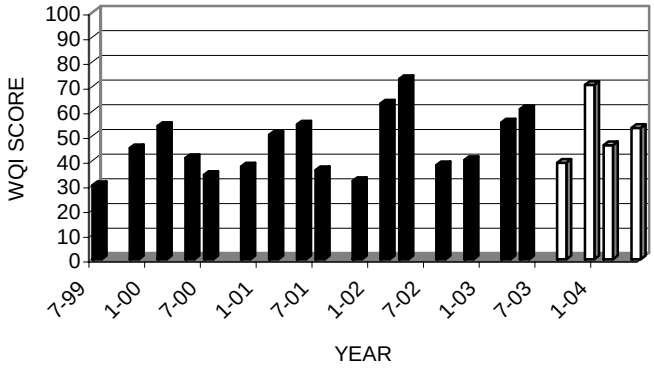
Water Quality Index

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

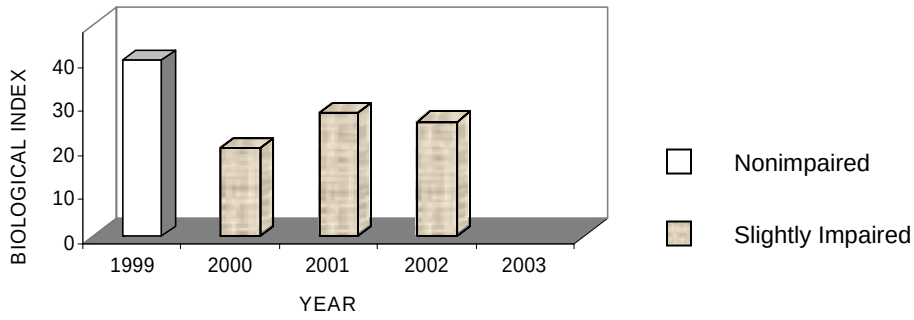
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	09/23/03	723 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	09/23/03	500 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	3380 ug/l	300 ug/l	N.Y. aquatic (chronic)
TFe	12/18/03	3380 ug/l	1500 ug/l	Pa. aquatic life
TAl	12/18/03	3920 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAl	02/18/04	223 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	05/04/04	443 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAl	05/04/04	375 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
09/23/03	39.1	TOC							
12/18/03	70.6	DO	TSO4	TMn					
02/18/04	46.2	TSO4	TMn						
05/04/04	53.2	TSO4	TMn						

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

Beagle Hollow Run (BEAG)

Slightly impaired biological conditions existed at Beagle Hollow Run near Osceola, Pa., during May 2004. The sample contained a large number of organic pollution-intolerant organisms; 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 all field chemistry parameters were within natural ranges.

Bill Hess Creek (BILL)

Bill Hess Creek near Nelson, Pa., was designated nonimpaired, with a high diversity index and a high EPT Index. The habitat was rated excellent, with a low score given only for velocity/depth regimes. All field chemistry parameters were within acceptable limits.

Bird Creek (BIRD)

Bird Creek near Webb Mills, N.Y., was designated nonimpaired. This site had a high EPT Index and was dominated by an organic pollution intolerant mayfly, *Epeorus*. The habitat was designated excellent and was located in a predominantly forested area. All field chemistry parameters fell within acceptable ranges. High flows due to heavy rains the previous evening were noted at the time of sampling.

Biscuit Hollow (BISC)

Nonimpaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during this survey, with a low percentage of dominant taxa and a high EPT Index. This is a dramatic improvement from the moderately impaired conditions found the previous year. The physical habitat at this site was considered supporting, with poor scores given for instream cover, velocity/depth regimes, and riparian vegetative zone width. The site had slightly eroded banks and was located in an area dominated by abandoned fields and lightly used pasture, downstream of numerous old beaver dams. Field chemistry parameters were within acceptable ranges.

Briggs Hollow Run (BRIG)

Briggs Hollow Run near Nichols, N.Y., was designated slightly impaired during the 2004 sampling season, with poor metric scores for EPT Index and percentage of dominant taxa. The sample at BRIG was heavily dominated by the pollution-sensitive mayfly, *Epeorus*, which comprised nearly 45 percent of the organisms. The physical habitat was designated excellent, and all field chemistry parameters were within acceptable limits. Human refuse was noted in the stream at the time of sampling.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, Pa., had a slightly impaired biological community and excellent habitat conditions during the 2003-2004 sampling season. BULK is located in a forested area downstream of a beaver dam. Field chemistry indicated that all parameters were within acceptable limits.

Camp Brook (CAMP)

Camp Brook near Osceola, Pa., had a slightly impaired biological community in May 2004, with low scores for EPT Index and percentage of Chironomidae. The physical habitat of the stream was designated excellent; high scores were given for channel alteration, frequency of riffles, condition of banks, vegetative protective cover, and riparian vegetative zone width. 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 diversity index and taxonomic richness, but scored poorly for percentage of Chironomidae. The habitat was rated excellent, and field chemistry parameters were all within acceptable limits.

Deep Hollow Brook (DEEP)

The biological community of Deep Hollow Brook near Danville, N.Y., was designated

nonimpaired with excellent physical habitat. This site had the highest taxonomic richness, Shannon Diversity Index value, and EPT Index of all the Group 3 stations. Alkalinity (10 mg/l) exceeded the Pennsylvania aquatic life standard, as it has in previous years. The pH value (6.25) also exceeded the New York general water quality standard. DEEP is located in a mostly forested area, interspersed with scattered cropland and old fields, downstream of a beaver dam.

Denton Creek (DENT)

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community during May 2004. DENT was dominated by pollution tolerant Chironomidae and had poor scores for several metrics, including EPT Index, percentage of Chironomidae, and percentage of dominant taxon. The habitat was rated excellent with high scores for condition of banks and vegetative protective cover; however, this sampling site was located downstream of Hawkins Lake. The lake is not heavily used since swimming, boating, and camping are not allowed, but it still impacts water quality on Denton Creek. DENT had low pH (6.35) and the lowest alkalinity (8.0 mg/l) of all the Group 3 sites (Table A3). These pH and alkalinity values exceeded the New York and Pennsylvania water quality standards, respectively.

Dry Brook (DRYB)

Dry Brook at Waverly, N.Y., was designated moderately impaired in May 2004, with the lowest metric scores for percent Ephemeroptera, percent Chironomidae, and percent dominant taxon. This stream runs directly through residential and commercial areas in the town of Waverly and has partially supporting habitat conditions due to channel alteration and lack of vegetated riparian zone. A large amount of human refuse was noted in the steam at the time of sampling. All field chemistry parameters were within acceptable limits.

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, N.Y., was designated nonimpaired in May 2004. This site was rated slightly impaired in 2003, nonimpaired the previous year, and moderately impaired prior to that, indicating this stream quality fluctuates. The high-cut banks with areas of erosion indicate large fluctuations in flow. The land cover is mostly forested, with some agriculture in the headwaters. The habitat was rated excellent with good stream cover. In 2001, dredging equipment was found in the stream, and timber was being removed from the streambanks. In 2002 and 2003, no evidence of dredging or timber removal was noted. All field chemistry parameters were normal.

Parks Creek (PARK)

In 2003, the location of the site for Parks Creek near Litchfield, N.Y., was moved upstream slightly due to logging at the previous sampling site. PARK had a slightly impaired biological community during the 2004 sampling season. This site had highest percent Ephemeroptera and lowest percent Chironomidae of all Group 3 streams; however, the percent dominant taxon was high, due to the large number of the organic pollution intolerant mayfly, *Epeorus*. The site had excellent habitat, with high scores for a number of parameters, including instream cover, epifaunal substrate, and vegetative riparian zone width. 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, high flows were noted, due to heavy rain the previous evening. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)

Prince Hollow Run near Cadis, Pa., was designated slightly impaired in May 2004, after being severely impaired in 2002. The habitat was rated as supporting, with low scores for vegetative protective cover and riparian vegetative zone width. Heavy algal growth was noted at the time of sampling. Alkalinity was low (18 mg/l) and exceeded the Pennsylvania aquatic life standard (Table A3).

Russell Run (RUSS)

Russell Run near Windham, Pa., was designated slightly impaired after being nonimpaired the previous year. Poor metric scores were given for taxonomic richness, EPT Index, and percent dominant taxon. However, the dominant taxon was pollution-intolerant *Epeorus*. The habitat was considered excellent, with high scores given for sediment deposition, channel alteration, and frequency of riffles. All field chemistry parameters were normal.

Sackett Creek (SACK)

The biological condition of Sackett Creek near Nichols, N.Y., was designated slightly impaired, and the physical habitat was excellent. SACK had the lowest Hilsenhoff Biotic Index of all Group 3 sites, as well as a high percent Ephemeroptera, and a low percent Chironomidae. The percent dominant taxon was high, but the taxon in question was the pollution-intolerant mayfly, *Epeorus*. All field chemistry parameters were within normal ranges. High flows due to recent rain events were noted at the time of sampling.

Smith Creek (SMIT)

Smith Creek near East Lawrence, Pa., served as the reference site for the Group 3 streams during May 2004. This site had the best combination of biological, habitat, and field chemistry conditions of the Group 3 streams. This small stream drains a wetland area and mixed coniferous forest, and the habitat was rated excellent, with high scores for a number of parameters, including channel alteration, frequency of riffles, and condition of banks. There were no extreme values in the field chemistry parameters.

Strait Creek (STRA)

A nonimpaired biological community existed at Strait Creek near Nelson, Pa., during fiscal year 2004. The site had a high EPT Index, but a large number of Chironomidae. The physical habitat was designated excellent and all field chemistry parameters were within normal limits.

White Branch Cowanesque River (WBCO)

In May 2004, White Branch Cowanesque River near North Fork, Pa., was designated moderately impaired with the worst metric scores in taxonomic richness, diversity index, Hilsenhoff Biotic Index, and EPT Index. This site had been nonimpaired in May 2000 with a number of pollution intolerant taxa, and then it degraded to moderately impaired during May 2001 and May 2002, and severely impaired in May 2003. The sample was dominated by the pollution tolerant caddisfly taxon, *Cheumatopsyche* (Trichoptera: Hydropsychidae), comprising 55.4 percent of the sample. The habitat was partially supporting due to low scores in embeddedness, vegetative protective cover, and riparian vegetative zone width. Cows had direct access to the stream in a pasture upstream of the sampling site, and sediment was deep in spots. Field chemistry measurements were within acceptable ranges.

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated slightly impaired in fiscal year 2004, after serving as the reference site in May 2003. This site had a high percent Ephemeroptera, and a low Hilsenhoff Biotic Index and percent Chironomidae, but a high percent dominant taxon and a low EPT Index, when compared to other Group 3 streams. However, the dominant taxon in this sample was pollution-intolerant *Epeorus*. The physical habitat was excellent, with a large amount of woody debris, in this mostly forested stream. 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 and habitat degradation at numerous sites continues to be due to dredging in the stream and the unstable nature of these glacial streams. Fiscal year 2004 sampling was characterized by higher than normal flow situations throughout the sampling period. These high flows may have contributed to fluctuations in water chemistry parameters and increased streambank erosion. Of particular interest is the prevalence of elevated total iron and total aluminum values throughout the sampling period.

Pennsylvania – Maryland Sites

In fiscal year 2004, total nitrogen and total nitrate concentrations continued to be elevated in the Pennsylvania-Maryland sites. The area surrounding the Pennsylvania-Maryland border sites 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. Erosion also may contribute metals that were present in the soil to the stream water.

River Sites

Due to high river flows, staff collected biological samples at only two of the river stations during summer 2003. SUSQ 340.0 and SUSQ 365.0 have continuously exhibited higher quality conditions than other river stations in the ISWQN. Overall, high total iron and total aluminum concentrations were prevalent in the water quality conditions of the river sites during fiscal year 2004.

Group 3 Streams

The Group 3 streams were located on the New York-Pennsylvania 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.

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 Dry Brook, White Branch Cowanesque River, Denton Creek, Ebaughs Creek, Long Arm Creek, and Scott Creek. Although, the biological community was not sampled at the Cowanesque River stations (COWN 1.0 and COWN 2.2) in fiscal year 2004, in previous years, these stations also have exhibited moderately impaired conditions. 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: Apalachin Creek, Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, South Creek, Troups Creek, Trowbridge Creek, Big Branch Deer Creek, Conowingo Creek, Ebaughs Creek, Falling Branch Deer Creek, Octoraro Creek, Chemung River, Cowanesque River (1.0 and 2.2), the Susquehanna River (289.1, 340.0, and 365.0), Tioga River, Deep Hollow Brook, Denton Creek, and Prince Hollow Run. 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

Nineteen (41.3 percent) of the 46 interstate streams sites at which macroinvertebrate samples were collected contained nonimpaired biological communities. Biological conditions at another 21 sites (45.7 percent) were slightly impaired, while six sites (13.0 percent) were moderately impaired. No sites were designated severely impaired. Seven sites (SUSQ 10.0, SUSQ 44.5, SUSQ 289.1, COWN 2.2, COWN 1.0, TIOG, and CHEM) were not sampled using RBP III techniques and, thus, were not averaged into the final scores. Thirty-five sites (76.1 percent) had excellent habitats. Nine sites (19.6 percent) had supporting habitats, and two sites (4.3 percent) had partially supporting habitats.

Overall, 99 observations (9.9 percent) of water chemistry parameters exceeded state standards, which is a dramatic increase from the previous year. Total iron exceeded standards most frequently with 46 violations (46.5 percent). Total and dissolved iron appears 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 New York-Pennsylvania border streams. Total dissolved solids, nitrate plus nitrite, and dissolved oxygen are all indicators of organic pollution.

Of the New York-Pennsylvania border streams, the biological community of six (42.9 percent) of these streams was nonimpaired, and eight sites (57.1 percent) were slightly impaired. Nine sites had excellent habitats (64.3 percent), and five sites (35.7 percent) had supporting habitats. Overall, biological conditions degraded at seven stations, while they improved at three sites. 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 and dissolved iron, total aluminum, total chlorine, pH, and alkalinity. Iron standards were exceeded at Apalachin Creek, Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, South Creek, and Troups Creek. Aluminum standards were exceeded at Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, Seeley Creek, and Troups Creek. Total chlorine was exceeded at Cayuta Creek; pH was exceeded at Cascade Creek and Troups Creek, while Cascade Creek, Little Snake Creek, and Trowbridge Creek exceeded alkalinity standards. In fiscal year 2004, high flows may have impacted the water quality and biological conditions at the New York-Pennsylvania border streams.

Nonimpaired biological conditions existed at four (44.4 percent) of the nine Pennsylvania-Maryland interstate streams. Two sites (22.2 percent) were slightly impaired, and three (33.3 percent) were moderately impaired. Seven (77.8 percent) of the Pennsylvania-Maryland border sites had excellent habitats, and two (22.2 percent) had supporting habitats. Biological conditions at Pennsylvania-Maryland sites appeared to improve during fiscal year 2004, with the exception of Ebaughs Creek, which continued to degrade. Water quality at several sites exceeded Pennsylvania and Maryland water quality standards, including: nitrite plus nitrate, total iron, and turbidity at CNWG 4.4; total chlorine at EBAU 1.5; total iron at OCTO 6.6; and alkalinity at BBDC 4.1 and FBDC 4.1. The Pennsylvania-Maryland border streams are located in a heavily agricultural region, and many of the parameters that exceeded the 90^{th} 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 at the site, while six stations were not sampled for

macroinvertebrates during fiscal year 2004 due to high river flows throughout the summer sampling period. The remaining sites (SUSQ 340.0 and SUSQ 365.0) were compared to Snake Creek, the reference station for the New York-Pennsylvania stations. The biological communities of both sites (100 percent) were nonimpaired and had excellent habitats. 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 two river sites sampled remained the same in biological condition from previous years. Water quality appeared to degrade with an increased number of state water quality standard violations.

Of the 21 Group 3 sites, seven stations (33.3 percent) were considered nonimpaired. Eleven sites (52.4 percent) had slightly impaired biological communities, and three stations (14.3 percent) had moderately impaired conditions. Seventeen (81.0 percent) of the 21 stations sampled had excellent habitat conditions, while two each (9.5 percent) had supporting and partially supporting habitats. Most of the Group 3 streams remained the same as previous years or improved slightly; however, the biological conditions in Biscuit Hollow improved greatly from moderately impaired to nonimpaired.

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.

REFERENCES

Aroner, E.R. 1994. WQHYDRO—Water Quality/Hydrology/Graphics/Analysis System User's Manual. WQHYDRO Consulting, Portland, Oregon.

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Bauer, K.M., W.D. Glove, and J.D. Flodo. 1984. Methodologies for Determining Trends in Water Quality Data. Industrial Research Laboratories, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Bollinger, S.W. 1991. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #4, Water Year 1990. Susquehanna River Basin Commission (Publication No. 140), Harrisburg, Pennsylvania.

——. 1992. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #5, October 1, 1990-June 30, 1991. Susquehanna River Basin Commission (Publication No. 146), Harrisburg, Pennsylvania.

——. 1993. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #6, July 1, 1991-June 30, 1992. Susquehanna River Basin Commission (Publication No. 151), Harrisburg, Pennsylvania.

——. 1994. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #7, July 1, 1992-June 30, 1993. Susquehanna River Basin Commission (Publication No. 160), Harrisburg, Pennsylvania.

——. 1995. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #8, July 1, 1993-June 30, 1994. Susquehanna River Basin Commission (Publication No. 165), Harrisburg, Pennsylvania.

Bollinger, S.W. and D.L. Sitlinger. 1996. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #9, July 1, 1994-June 30, 1995. Susquehanna River Basin Commission (Publication No. 173), Harrisburg, Pennsylvania.

——. 1997. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #10, July 1, 1995-June 30, 1996. Susquehanna River Basin Commission (Publication No. 185), Harrisburg, Pennsylvania.

Buchanan, T.J. and W.P. Somers. 1969. Discharge Measurements at Gaging Stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A8, 65 pp. Washington, D.C.

The Commonwealth of Pennsylvania. 1999. Pennsylvania Code: Title 25 Environmental Protection Chapter 93 Water Quality Standards. Department of Environmental Protection, Bureau of Watershed Conservation, Harrisburg, Pa.

Diehl, D.L. and D.L. Sitlinger. 2001. Upper Susquehanna Subbasin Survey: Small Watershed Study, Monitoring Report #1A, October 1, 1999-August 31, 2000. Susquehanna River Basin Commission (Publication No. 213), Harrisburg, Pennsylvania.

Edwards, R.E. 1995. Trends in Nitrogen, Phosphorus, and Suspended Sediment in the Susquehanna River Basin, 1974-1993. Susquehanna River Basin Commission (Publication No. 163), Harrisburg, Pennsylvania.

Hirsch, R.M., R.B. Alexander, and R.A. Smith. 1991. Selection of Methods for the Detection and Estimation of Trends in Water Quality. *Water Resources Research* 27(5): 803-813.

Hoffman, J.L.R. and D.L. Sitlinger. 2001. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #14, July 1, 1999-June 30, 2000. Susquehanna River Basin Commission (Publication No. 215), Harrisburg, Pennsylvania.

Klemm, D. J., P. A. Lewis, F. Fulk, and J. M. Lazorchak. 1990. Macroinvertebrate field and laboratory methods for evaluating the biological integrity of surface waters. U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati, Ohio.

Kovach, W.I. 1993. A Multivariate Statistical Package for IBM-PC's, Version 2.1. Kovach Computing Services, Pentraeth, Wales, U.K., 55 pp.

LeFevre, S.R. and D.L. Sitlinger. 2002. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #15, July 1, 2000-June 30, 2001. Susquehanna River Basin Commission (Publication No. 223), Harrisburg, Pennsylvania.

_____. 2003. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #16, July 1, 2001-June 30, 2002. Susquehanna River Basin Commission (Publication No. 227), Harrisburg, Pennsylvania.

_____. 2004. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #17, July 1, 2002 – June 30, 2003. Susquehanna River Basin Commission (Publication No. 233), Harrisburg, Pennsylvania.

Maryland Department of the Environment. 1993. Water Quality Regulations for Designated Uses, COMAR 26.08.02. Annapolis, Maryland.

McMorran, C.P. 1988. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report for 1986 and 1987 Water Years. Susquehanna River Basin Commission (Publication No. 118), Harrisburg, Pennsylvania.

McMorran, C.P. and S.W. Bollinger. 1989. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #2, 1988 Water Year. Susquehanna River Basin Commission (Publication No. 122), Harrisburg, Pennsylvania.

——. 1990. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #3, 1989 Water Year. Susquehanna River Basin Commission (Publication No. 131), Harrisburg, Pennsylvania.

Merrit, R.W. and K.W. Cummins. 1996. An Introduction to the Aquatic Insects of North America (3rd ed.). Kendall/Hunt Publishing Company, Dubuque, Iowa, 862 pp.

New York State Department of Environmental Conservation. 1998. The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List. Division of Water, Albany, New York.

——. 1992. Water Quality Regulations for Surface Waters and Groundwaters, 6NYCRR Parts 700-705. Division of Water, Albany, New York.

Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

Ohio River Valley Water Sanitation Commission. 1990. Water Quality Trends Ohio River and Its Tributaries. Water Quality Assessment Program, Cincinnati, Ohio.

Omernik, J.M. 1987. Ecoregions of the Conterminous United States. *Ann. Assoc. Am. Geograph.* 77(1):118-125.

Orr, J. 2003. Watershed Assessment and Remediation Strategy for Abandoned Mine Drainage in the Upper Tioga River Watershed. Susquehanna River Basin Commission (Publication No. 230), Harrisburg, Pennsylvania.

Peckarsky, B.L., P.R. Fraissinet, M.J. Penton, and D.J. Conklin, Jr. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press, Ithaca, New York.

Pennak, R.W. 1989. Fresh-Water Invertebrates of the United States: Protozoa to Mollusca. 3rd ed. John Wiley & Sons, New York, New York.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency, Office of Water, Document No. EPA/444/4-89-001, Washington, D.C.

Rowles, J.L. and D.L. Sitlinger. 1998. Water Quality of Interstate Streams in the Susquehanna River Basin, Monitoring Report #11, July 1, 1996-June 30, 1997. Susquehanna River Basin Commission (Publication No. 196), Harrisburg, Pennsylvania.

_____. 1999. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #12, July 1, 1997-June 30, 1998. Susquehanna River Basin Commission (Publication No. 205), Harrisburg, Pennsylvania.

_____. 2000. Assessment of Interstate Streams in the Susquehanna River Basin, Monitoring Report #13, July 1, 1998-June 30, 1999. Susquehanna River Basin Commission (Publication No. 211), Harrisburg, Pennsylvania.

Smith, R.A., R.M. Hirsch, and J.R. Slack. 1982. A Study of Trends in Total Phosphorus Measurements at Stations in the NASQAN Network. U.S. Geological Survey, Water Supply Paper 2254.

U.S. Environmental Protection Agency. 1990. Freshwater Macroinvertebrate Species List Including Tolerance Values and Functional Feeding Group Designations for Use in Rapid Bioassessment Protocols. Assessment and Watershed Protection Division, Rpt. No. 11075.05, Washington, D.C.

Zar, J. H. 1996. Biostatistical Analysis. (3rd ed.). Prentice Hall, Upper Saddle River, New Jersey, 662 pp.

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	BNTY 0.9	CASC 1.6	CASC 1.6	CASC 1.6
Date	yyyymmdd	20030813	20030731	20031218	20040318	20040504	20030721	20031217	20040318
Time	hhmm	1420	1045	0930	1420	0940	1225	1030	1010
Discharge	cfs	5.349	12.382	25.548	12.471	16.536	0.632	6.025	3.983
Temperature	degree C	21.9	19.4	2.9	2.8	8.8	21.3	2.4	0.2
Conductance	umhos/cm	104	211	123	131	114	75	44	45
Dissolved Oxygen	mg/l	5.91	7.17	7.82	8.43	8.2	6.92	9.21	8.17
pH		7.1	7.6	6.85	6.65	7.1	7	6.4	6.65
Alkalinity	mg/l	30	38	60	34	36	26	14	8
Acidity	mg/l	2	6	8	4	4	4	4	2
Solids, Total	mg/l	62	120	94	68	92	52	48	192
Solids, Dissolved	mg/l	58	120	NA	NA	NA	52	NA	NA
Ammonia, Total	mg/l	0.02	<0.02	<0.02	0.03	<0.02	0.02	<0.02	0.04
Ammonia, Dissolved	mg/l	<0.02	<0.02	NA	NA	NA	0.02	NA	NA
Nitrite, Total	mg/l	<0.01	<0.01	<0.04	<0.04	<0.04	0.01	<0.04	<0.04
Nitrite, Dissolved	mg/l	<0.01	<0.01	NA	NA	NA	0.01	NA	NA
Nitrate, Total	mg/l	0.22	0.35	0.58	0.62	0.17	<0.04	0.1	0.18
Nitrate, Dissolved	mg/l	0.22	0.37	NA	NA	NA	<0.04	NA	NA
Nitrogen, Total	mg/l	0.40	0.55	0.63	0.79	0.36	0.31	0.16	0.3
Nitrogen Dissolved	mg/l	0.42	0.56	NA	NA	NA	0.35	NA	NA
Phosphorus, Total	mg/l	0.02	<0.01	0.02	<0.01	0.05	0.03	0.02	0.01
Phosphorus, Dissolved	mg/l	0.01	<0.01	NA	NA	NA	0.02	NA	NA
Orthophosphate, Total	mg/l	0.016	0.01	0.03	<0.01	0.047	0.024	0.013	<0.01
Orthophosphate, Dissolved	mg/l	0.012	<0.01	NA	NA	NA	0.018	NA	NA
Organic Carbon, Total	mg/l	2.6	2.6	2.8	2	3.2	3.8	2.1	1.4
Calcium	mg/l	9.18	23.2	12.9	14.4	14.8	8.662	4.444	4.44
Magnesium	mg/l	2.84	4.685	2.88	3.17	2.92	2.611	1.467	1.43
Chloride	mg/l	6.3	13.5	8.48	11.3	6.74	2.8	1.54	1.9
Sulfate	mg/l	<20	<20	10.3	10.8	9.25	<20	8.15	8.29
Turbidity	ntu	2.32	<1	14.35	1.68	5.58	5.75	2.04	2.77
Iron, Total	µg/l	350	<20	398	93	257	1496	207	313
Iron, Dissolved	µg/l	203	<20	NA	NA	NA	1020	NA	NA
Manganese, Total	µg/l	58	<10	<10	<10	<10	211	35	40
Manganese, Dissolved	µg/l	40	<10	NA	NA	NA	172	NA	NA
Aluminum, Total	µg/l	<200	<200	309	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	NA	NA	NA	<200	NA	NA
Suspended Sediment	ppm	NA	NA	11	3	6	NA	2	8

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

Parameter	Units	CASC 1.6	CAYT 1.7	CAYT 1.7	CAYT 1.7	CAYT 1.7	CHEM 12.0	CHEM 12.0	CHEM 12.0
Date	yyyymmdd	20040503	20030814	20031217	20040217	20040503	20030923	20031217	20040218
Time	hhmm	1050	0845	1450	1435	1440	1140	1530	0830
Discharge	cfs	10.92	98.975	79.59	40.32	NA	2140	4940	NA
Temperature	degree C	10.9	20.5	2.2	0.3	12.1	18	2.4	0.0
Conductance	umhos/cm	38	269	210	398	98	326	214	312
Dissolved Oxygen	mg/l	8.58	6.59	8.07	7.89	8.9	6.67	7.6	7.71
pH		6.4	7.6	7.35	7.4	6.6	7.6	7.25	8
Alkalinity	mg/l	18	76	54	62	38	88	68	70
Acidity	mg/l	4	4	8	10	4	4	6	4
Solids, Total	mg/l	60	162	152	286	138	268	190	198
Solids, Dissolved	mg/l	NA	152	NA	NA	NA	218	NA	NA
Ammonia, Total	mg/l	<0.02	<0.02	0.02	<0.02	<0.02	0.03	0.02	0.05
Ammonia, Dissolved	mg/l	NA	<0.02	NA	NA	NA	0.03	NA	NA
Nitrite, Total	mg/l	<0.04	<0.01	<0.04	<0.04	<0.04	0.03	<0.04	<0.04
Nitrite, Dissolved	mg/l	NA	<0.01	NA	NA	NA	0.01	NA	NA
Nitrate, Total	mg/l	0.09	0.38	0.44	1.11	0.22	0.57	0.89	1.33
Nitrate, Dissolved	mg/l	NA	0.38	NA	NA	NA	0.6	NA	NA
Nitrogen, Total	mg/l	0.44	0.67	0.4	1.23	0.82	0.98	0.93	1.52
Nitrogen Dissolved	mg/l	NA	0.61	NA	NA	NA	1.05	NA	NA
Phosphorus, Total	mg/l	0.44	0.06	0.03	0.13	0.11	0.08	0.04	0.04
Phosphorus, Dissolved	mg/l	NA	0.05	NA	NA	NA	0.04	NA	NA
Orthophosphate, Total	mg/l	0.093	0.043	0.03	0.126	0.029	0.109	0.081	0.027
Orthophosphate, Dissolved	mg/l	NA	0.038	NA	NA	NA	0.029	NA	NA
Organic Carbon, Total	mg/l	5	3.5	2.7	1.7	6.1	4.6	3.2	2.1
Calcium	mg/l	3.85	27.941	20	36.9	10.7	34.9	22	41.9
Magnesium	mg/l	1.23	6.146	4.492	7.11	2.82	7.3	5.058	8.46
Chloride	mg/l	1.29	26.7	28.4	54.2	8.67	31.3	20.9	44.4
Sulfate	mg/l	6.27	<20	11.2	16.3	7.73	20.9	15.2	23.5
Turbidity	ntu	6.3	4	5.34	1.45	68.7	55.3	33.83	1.91
Iron, Total	µg/l	497	192	266	147	3720	2510	1450	113
Iron, Dissolved	µg/l	NA	116	NA	NA	NA	63	NA	NA
Manganese, Total	µg/l	43	14	15	<10	89	63	66	39
Manganese, Dissolved	µg/l	NA	<10	NA	NA	NA	<10	NA	NA
Aluminum, Total	µg/l	262	<200	<200	<200	3150	2140	795	<200
Aluminum, Dissolved	µg/l	NA	<200	NA	NA	NA	<200	NA	NA
Suspended Sediment	ppm	11	NA	8	2	106	NA	28	2

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

Parameter	Units	CHEM 12.0	CHOC 9.1	COWN 1.0	COWN 1.0	COWN 1.0	COWN 1.0	COWN 2.2	COWN 2.2
Date	yyyymmdd	20040504	20030813	20030923	20031218	20040218	20040504	20031218	20040218
Time	hhmm	0810	1300	1440	1335	1315	1345	1405	1445
Discharge	cfs	NA	70204	0950	531	64	490	531	64
Temperature	degree C	11.6	22.2	19.8	2.5	2.1	11.6	2.3	2.3
Conductance	umhos/cm	182	104	178	133	163	131	126	162
Dissolved Oxygen	mg/l	8.42	7.08	6.83	8.08	7.01	7.27	7.57	7
pH		11.6	7.3	7.2	7	7.6	7.35	7.1	7.65
Alkalinity	mg/l	78	26	52	54	56	48	48	58
Acidity	mg/l	4	2	4	6	4	4	6	4
Solids, Total	mg/l	160	98	126	190	130	114	186	114
Solids, Dissolved	mg/l	NA	98	118	NA	NA	NA	NA	NA
Ammonia, Total	mg/l	<0.02	0.02	0.05	0.04	0.06	<0.02	0.04	0.06
Ammonia, Dissolved	mg/l	NA	<0.02	0.05	NA	NA	NA	NA	NA
Nitrite, Total	mg/l	<0.04	<0.01	0.02	<0.04	<0.04	<0.04	<0.04	<0.04
Nitrite, Dissolved	mg/l	NA	<0.01	0.01	NA	NA	NA	NA	NA
Nitrate, Total	mg/l	0.44	0.2	0.32	0.58	0.8	0.53	0.58	0.82
Nitrate, Dissolved	mg/l	NA	0.2	0.32	NA	NA	NA	NA	NA
Nitrogen, Total	mg/l	0.93	0.4	0.70	0.75	1.13	0.75	0.72	1.16
Nitrogen Dissolved	mg/l	NA	0.4	0.74	NA	NA	NA	NA	NA
Phosphorus, Total	mg/l	0.1	0.02	0.03	0.11	0.04	0.07	0.12	0.04
Phosphorus, Dissolved	mg/l	NA	0.01	0.02	NA	NA	NA	NA	NA
Orthophosphate, Total	mg/l	0.09	0.014	0.026	0.261	0.049	0.067	0.256	0.051
Orthophosphate, Dissolved	mg/l	NA	0.01	0.01	NA	NA	NA	NA	NA
Organic Carbon, Total	mg/l	3.9	2.6	5.3	4	3	3.2	3.8	3
Calcium	mg/l	21.4	8.76	20.1	15.2	18.1	16.3	15.3	18.2
Magnesium	mg/l	4.62	2.9	3.92	4.1	3.91	3.32	4.27	3.86
Chloride	mg/l	17.2	9.2	9.3	7.64	10.4	8.12	7.61	10.4
Sulfate	mg/l	16.4	23.9	<20	10.8	13.6	11.8	10.8	13.8
Turbidity	ntu	25.08	1.74	9	142.95	14.64	10.69	141.8	15.09
Iron, Total	µg/l	1650	134	427	5340	655	429	5340	611
Iron, Dissolved	µg/l	NA	55	72	NA	NA	NA	NA	NA
Manganese, Total	µg/l	118	22	87	113	59	68	114	56
Manganese, Dissolved	µg/l	NA	16	11	NA	NA	NA	NA	NA
Aluminum, Total	µg/l	1190	<200	328	6700	606	392	6760	578
Aluminum, Dissolved	µg/l	NA	<200	<200	NA	NA	NA	NA	NA
Suspended Sediment	ppm	45	NA	NA	77	8	9	80	9

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	20040505	20030730	20030813	20031217	20040318	20040503	20030730	20030731
Time	hhmm	0830	1420	1145	1225	1245	1325	1115	0800
Discharge	cfs	414	1.634	1.956	14.167	4.239	11.527	4.178	32.169
Temperature	degree C	11.3	21.9	22.3	0.6	0.3	10.8	16.3	16.4
Conductance	umhos/cm	127	214	148	102	103	89	160	250
Dissolved Oxygen	mg/l	7.01	5.9	5.52	9.33	8.35	8.59	7.26	7.27
pH		7.3	7.6	7.5	6.7	6.7	6.5	7.1	7.05
Alkalinity	mg/l	56	78	22	14	16	12	34	84
Acidity	mg/l	4	4	2	4	4	4	4	16
Solids, Total	mg/l	120	138	110	54	54	110	146	182
Solids, Dissolved	mg/l	NA	138	102	NA	NA	NA	146	182
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	NA	<0.02	<0.02	NA	NA	NA	<0.02	<0.02
Nitrite, Total	mg/l	<0.04	0.01	<0.01	<0.04	<0.04	<0.04	0.01	<0.01
Nitrite, Dissolved	mg/l	NA	0.01	<0.01	NA	NA	NA	0.01	<0.01
Nitrate, Total	mg/l	0.55	<0.04	0.06	0.14	0.22	0.09	3.06	0.33
Nitrate, Dissolved	mg/l	NA	<0.04	0.05	NA	NA	NA	3.08	0.33
Nitrogen, Total	mg/l	0.73	0.80	0.28	0.18	0.4	0.510	3.46	0.46
Nitrogen Dissolved	mg/l	NA	0.30	0.25	NA	NA	NA	3.43	0.44
Phosphorus, Total	mg/l	0.06	0.03	0.03	0.02	0.02	0.03	0.08	0.01
Phosphorus, Dissolved	mg/l	NA	0.02	0.02	NA	NA	NA	0.06	<0.01
Orthophosphate, Total	mg/l	0.057	0.019	0.022	0.013	0.011	0.036	0.065	<0.01
Orthophosphate, Dissolved	mg/l	NA	0.014	0.016	NA	NA	NA	0.048	<0.01
Organic Carbon, Total	mg/l	3.1	4.8	4	2.5	1.9	4.9	4.7	3.1
Calcium	mg/l	16.3	24.3	11.528	7.185	7.85	6.45	16	29.9
Magnesium	mg/l	3.41	5.19	3.255	20.22	2.11	1.84	4.75	5.499
Chloride	mg/l	7.99	14.2	20.1	13.6	17	12.5	9.8	15.4
Sulfate	mg/l	11.6	<20	25.2	8.26	7.87	7.17	21.4	20.9
Turbidity	ntu	10.73	3.2	4.53	2.22	2.6	16.05	4.93	<1
Iron, Total	µg/l	353	227	1067	163	189	846	430	24
Iron, Dissolved	µg/l	NA	40	722	NA	NA	NA	67	<20
Manganese, Total	µg/l	70	16	58	28	31	51	42	<10
Manganese, Dissolved	µg/l	NA	<10	28	NA	NA	NA	<10	<10
Aluminum, Total	µg/l	290	<200	<200	<200	<200	512	<200	<200
Aluminum, Dissolved	µg/l	NA	<200	<200	NA	NA	NA	<200	<200
Suspended Sediment	ppm	7	NA	NA	5	3	14	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	20031218	20040218	20040504	20030813	20030731	20030923	20031217
Time	hhmm	1115	1105	1055	1030	0910	1010	1335
Discharge	cfs	39.116	16.278	25.91	26.684	4.576	3730	16300
Temperature	degree C	2	0.3	9.2	21.4	20.1	18.9	0.8
Conductance	umhos/cm	160	239	146	116	178	239	166
Dissolved Oxygen	mg/l	8.75	8.02	8.67	6.93	6.73	7.28	9.11
pH		7.1	7.4	7.3	7.4	6.8	7.7	7
Alkalinity	mg/l	64	70	100	32	52	64	46
Acidity	mg/l	10	10	6	2	8	2	6
Solids, Total	mg/l	108	160	102	98	138	188	134
Solids, Dissolved	mg/l	NA	NA	NA	96	136	136	NA
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.03
Ammonia, Dissolved	mg/l	NA	NA	NA	<0.02	<0.02	0.03	NA
Nitrite, Total	mg/l	<0.04	<0.04	<0.04	<0.01	<0.01	0.01	<0.04
Nitrite, Dissolved	mg/l	NA	NA	NA	<0.01	<0.01	<0.01	NA
Nitrate, Total	mg/l	0.6	0.64	0.33	0.28	0.11	0.6	0.74
Nitrate, Dissolved	mg/l	NA	NA	NA	0.18	0.11	0.58	NA
Nitrogen, Total	mg/l	0.55	0.73	0.53	0.50	0.37	0.98	0.8
Nitrogen Dissolved	mg/l	NA	NA	NA	0.52	0.66	0.98	NA
Phosphorus, Total	mg/l	0.02	0.02	0.07	0.16	0.03	0.06	0.03
Phosphorus, Dissolved	mg/l	NA	NA	NA	0.14	0.02	0.03	NA
Orthophosphate, Total	mg/l	0.022	<0.01	0.076	0.142	0.027	0.043	0.027
Orthophosphate, Dissolved	mg/l	NA	NA	NA	0.129	0.012	0.026	NA
Organic Carbon, Total	mg/l	3	1.6	3.6	3.4	4.7	4.2	2.7
Calcium	mg/l	15.8	29.9	19.3	9.724	17.1	25.9	21
Magnesium	mg/l	3.08	4.63	3.14	3.206	3.59	4.24	3.548
Chloride	mg/l	17.4	20.3	12.2	9.6	17	22.5	15.6
Sulfate	mg/l	10.6	13	9.29	29.6	<20	<20	8.8
Turbidity	ntu	8.16	<1	4.62	1.46	5.7	12.51	6
Iron, Total	µg/l	305	25	235	103	720	583	517
Iron, Dissolved	µg/l	NA	NA	NA	57	335	64	NA
Manganese, Total	µg/l	<10	<10	<10	<10	53	44	24
Manganese, Dissolved	µg/l	NA	NA	NA	<10	34	<10	NA
Aluminum, Total	µg/l	229	<200	<200	<200	<200	367	257
Aluminum, Dissolved	µg/l	NA	NA	NA	<200	<200	<200	NA
Suspended Sediment	ppm	9	1	5	NA	NA	NA	12

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	20040217	20040503	20030721	20031217	20040318	20040503	20030721
Time	hhmm	1310	1410	1520	1115	1120	1200	1115
Discharge	cfs	NA	NA	1000	6310	NA	NA	600
Temperature	degree C	0.0	14.8	23.7	0.9	1.1	13.8	23.2
Conductance	umhos/cm	268	113	235	145	167	151	244
Dissolved Oxygen	mg/l	7.99	8.14	6.15	8.18	7.99	7.71	7.41
pH		7.3	7.4	7.6	7.05	7	7.1	7.7
Alkalinity	mg/l	52	42	72	44	48	52	72
Acidity	mg/l	6	2	4	6	4	6	4
Solids, Total	mg/l	228	158	148	120	128	110	140
Solids, Dissolved	mg/l	NA	NA	138	NA	NA	NA	136
Ammonia, Total	mg/l	0.08	0.03	<0.02	<0.02	0.05	<0.02	0.02
Ammonia, Dissolved	mg/l	NA	NA	<0.02	NA	NA	NA	0.02
Nitrite, Total	mg/l	<0.04	<0.04	0.02	<0.04	<0.04	<0.04	0.02
Nitrite, Dissolved	mg/l	NA	NA	0.01	NA	NA	NA	0.02
Nitrate, Total	mg/l	1.34	0.47	0.36	0.6	0.77	0.32	0.46
Nitrate, Dissolved	mg/l	NA	NA	0.36	NA	NA	NA	0.5
Nitrogen, Total	mg/l	1.57	0.93	0.61	0.61	1.05	0.7	0.71
Nitrogen Dissolved	mg/l	NA	NA	0.49	NA	NA	NA	0.72
Phosphorus, Total	mg/l	0.03	0.05	0.03	0.02	0.02	0.03	0.03
Phosphorus, Dissolved	mg/l	NA	NA	<0.01	NA	NA	NA	0.01
Orthophosphate, Total	mg/l	0.028	0.012	0.018	0.022	0.019	0.025	0.016
Orthophosphate, Dissolved	mg/l	NA	NA	<0.01	NA	NA	NA	<0.01
Organic Carbon, Total	mg/l	1.7	3.7	2.6	2.4	2	3.1	2.9
Calcium	mg/l	33.1	21.1	26.4	18	21.1	19.1	28.8
Magnesium	mg/l	5.62	3.48	4.332	2.281	2.61	2.42	4.286
Chloride	mg/l	33.6	17	21	11.6	17.2	15.6	21.3
Sulfate	mg/l	12.9	8.6	<20	8.37	8.96	8.14	20.6
Turbidity	ntu	2.03	28.47	3.86	5.48	7.73	11.97	2.65
Iron, Total	µg/l	219	1420	41	356	477	624	164
Iron, Dissolved	µg/l	NA	NA	42	NA	NA	NA	43
Manganese, Total	µg/l	18	59	15	23	26	45	40
Manganese, Dissolved	µg/l	NA	NA	12	NA	NA	NA	14
Aluminum, Total	µg/l	<200	1020	<200	<200	263	373	<200
Aluminum, Dissolved	µg/l	NA	NA	<200	NA	NA	NA	<200
Suspended Sediment	ppm	27	43	NA	10	12	16	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	20031217	20040217	20040503	20030923	20031218	20040218	20040504	20030730
Time	hhmm	0930	0940	0950	1330	1305	1240	1225	1245
Discharge	cfs	5580	NA	NA	3608	1596	NA	NA	34.649
Temperature	degree C	1.3	0.1	13.3	19.3	2.3	0.3	11.7	21.2
Conductance	umhos/cm	155	229	159	178	126	186	129	222
Dissolved Oxygen	mg/l	9.73	7.83	8.8	6.87	7.36	7.94	7.97	6.14
pH		7	7.2	7	7.15	6.7	7.3	6.8	7.7
Alkalinity	mg/l	52	38	46	52	30	42	28	74
Acidity	mg/l	8	6	8	2	8	6	6	6
Solids, Total	mg/l	118	176	154	164	148	164	102	182
Solids, Dissolved	mg/l	NA	NA	NA	144	NA	NA	NA	150
Ammonia, Total	mg/l	0.02	0.02	<0.02	0.04	0.03	0.06	<0.02	<0.02
Ammonia, Dissolved	mg/l	NA	NA	NA	0.04	NA	NA	NA	<0.02
Nitrite, Total	mg/l	<0.04	<0.04	<0.04	0.01	<0.04	<0.04	<0.04	0.01
Nitrite, Dissolved	mg/l	NA	NA	NA	0.01	NA	NA	NA	0.01
Nitrate, Total	mg/l	0.66	1.06	0.37	0.35	0.59	0.8	0.39	0.85
Nitrate, Dissolved	mg/l	NA	NA	NA	0.35	NA	NA	NA	0.83
Nitrogen, Total	mg/l	0.7	1.22	0.7	0.72	0.68	1.03	0.62	1.23
Nitrogen Dissolved	mg/l	NA	NA	NA	0.76	NA	NA	NA	1.08
Phosphorus, Total	mg/l	0.03	0.02	0.02	0.04	0.07	0.02	0.06	0.05
Phosphorus, Dissolved	mg/l	NA	NA	NA	0.02	NA	NA	NA	0.02
Orthophosphate, Total	mg/l	0.022	0.016	0.021	0.034	0.155	0.021	0.058	0.161
Orthophosphate, Dissolved	mg/l	NA	NA	NA	0.012	NA	NA	NA	0.015
Organic Carbon, Total	mg/l	2.6	1.7	3.4	5.2	3.4	1.9	2.9	3.9
Calcium	mg/l	19	28.7	20.3	19.5	13.7	20.8	15.7	25.4
Magnesium	mg/l	2.35	3.51	2.47	4.04	3.6	5.16	3.38	5.17
Chloride	mg/l	11.4	22.3	16.7	9.2	7.09	10.4	7.01	13.5
Sulfate	mg/l	8.47	10.7	7.97	<20	16.4	35.8	20.8	<20
Turbidity	ntu	4.79	1.56	10.87	14.39	81.68	6.14	13.28	87
Iron, Total	µg/l	307	219	647	723	3380	274	443	1320
Iron, Dissolved	µg/l	NA	NA	NA	76	NA	NA	NA	21
Manganese, Total	µg/l	22	19	45	148	208	446	263	31
Manganese, Dissolved	µg/l	NA	NA	NA	17	NA	NA	NA	<10
Aluminum, Total	µg/l	<200	<200	375	500	3920	223	375	1350
Aluminum, Dissolved	µg/l	NA	NA	NA	<200	NA	NA	NA	<200
Suspended Sediment	ppm	13	8	19	NA	51	3	20	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	20031218	20040318	20040505	20030721	20030721
Time	hhmm	1515	1630	1035	1335	1245
Discharge	cfs	29.276	16.476	21.82	0.841	11.242
Temperature	degree C	0.6	3.7	9.1	20	22.4
Conductance	umhos/cm	162	174	169	84	121
Dissolved Oxygen	mg/l	8.33	7.4	8.19	6.86	6.52
pH		6.4	7.3	7.8	7	7.8
Alkalinity	mg/l	82	48	72	16	30
Acidity	mg/l	12	2	8	4	2
Solids, Total	mg/l	168	154	146	60	52
Solids, Dissolved	mg/l	NA	NA	NA	58	52
Ammonia, Total	mg/l	<0.02	0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	NA	NA	NA	<0.02	<0.02
Nitrite, Total	mg/l	<0.04	<0.04	<0.04	0.01	<0.01
Nitrite, Dissolved	mg/l	NA	NA	NA	<0.01	<0.01
Nitrate, Total	mg/l	0.62	0.72	0.16	0.11	0.63
Nitrate, Dissolved	mg/l	NA	NA	NA	0.12	0.63
Nitrogen, Total	mg/l	0.64	1.44	0.27	0.19	0.8
Nitrogen Dissolved	mg/l	NA	NA	NA	0.19	0.8
Phosphorus, Total	mg/l	0.05	0.02	0.045	0.013	0.012
Phosphorus, Dissolved	mg/l	NA	NA	NA	<0.01	0.011
Orthophosphate, Total	mg/l	0.099	0.057	0.048	<0.01	<0.01
Orthophosphate, Dissolved	mg/l	NA	NA	NA	<0.01	<0.01
Organic Carbon, Total	mg/l	2.8	2.1	3.2	2	2.2
Calcium	mg/l	17.8	19.1	23	6.948	9.776
Magnesium	mg/l	4.52	4.49	4.61	2.442	3.478
Chloride	mg/l	13.2	16.8	10.1	6	8.2
Sulfate	mg/l	12.2	12.5	10.6	<20	<20
Turbidity	ntu	71.92	31.71	10.07	<1	<1
Iron, Total	µg/l	2690	1380	335	46	39
Iron, Dissolved	µg/l	NA	NA	NA	<20	<20
Manganese, Total	µg/l	48	21	11	<10	<10
Manganese, Dissolved	µg/l	NA	NA	NA	<10	<10
Aluminum, Total	µg/l	1490	1210	201	<200	<200
Aluminum, Dissolved	µg/l	NA	NA	NA	<200	<200
Suspended Sediment	ppm	48	26	10	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	20030728	20030729	20031107	20040211	20040506	20030728	20031106	20040210
Time	hhmm	1400	1340	1000	0845	1015	1130	0950	1050
Discharge	cfs	2.637	30.788	77.74	33.81	33.92	16.742	32.737	20.584
Temperature	degree C	18.2	23.3	15.6	1.4	11.8	20.9	14.6	3.8
Conductance	umhos/cm	140	245	232	189	227	222	214	216
Dissolved Oxygen	mg/l	7.47	7.34	6.53	8.17	8.81	6.95	6.56	7.67
pH		6.9	7.6	6.8	6.85	609	7.3	7.3	6.9
Alkalinity	mg/l	16	32	38	36	26	34	36	24
Acidity	mg/l	4	2	18	4	2	2	8	4
Solids, Total	mg/l	124	202	276	206	218	154	120	162
Solids, Dissolved	mg/l	120	196	NA	NA	NA	154	NA	NA
Ammonia, Total	mg/l	<0.02	<0.02	0.36	1.63	0.04	<0.02	<0.02	0.03
Ammonia, Dissolved	mg/l	<0.02	<0.02	NA	NA	NA	<0.02	NA	NA
Nitrite, Total	mg/l	<0.01	0.05	0.07	0.04	0.05	<0.01	<0.04	<0.04
Nitrite, Dissolved	mg/l	<0.01	0.06	NA	NA	NA	<0.01	NA	NA
Nitrate, Total	mg/l	5.66	9.84	8.12	4.66	10.6	5.49	5.36	5.46
Nitrate, Dissolved	mg/l	5.6	9.77	NA	NA	NA	5.33	NA	NA
Nitrogen, Total	mg/l	6.15	10.63	9.84	7.9	10.82	5.69	5.73	5.68
Nitrogen Dissolved	mg/l	6.06	10.54	NA	NA	NA	5.72	NA	NA
Phosphorus, Total	mg/l	0.017	0.043	0.631	0.904	0.19	0.013	0.011	0.02
Phosphorus, Dissolved	mg/l	0.011	0.034	NA	NA	NA	0.011	NA	NA
Orthophosphate, Total	mg/l	0.01	0.032	0.369	0.729	0.148	0.014	<0.01	0.019
Orthophosphate, Dissolved	mg/l	<0.01	0.024	NA	NA	NA	<0.01	NA	NA
Organic Carbon, Total	mg/l	1.2	2	9.7	14.4	2	1.5	1.8	1.3
Calcium	mg/l	9.5	18	15.6	11.1	19.2	17.9	17.4	15.9
Magnesium	mg/l	5.55	10.4	9.2	6.8	10.4	6.35	5.98	5.41
Chloride	mg/l	13.2	19.8	17.9	13.7	19	26.8	24.4	33.4
Sulfate	mg/l	<20	<20	<20	9.59	13.8	<20	6.19	6.4
Turbidity	ntu	2.91	5.4	204.3	62.54	6.6	1.06	1.31	4.11
Iron, Total	µg/l	342	253	6530	2950	271	93	112	348
Iron, Dissolved	µg/l	37	40	NA	NA	NA	48	NA	NA
Manganese, Total	µg/l	30	19	122	103	42	17	18	39
Manganese, Dissolved	µg/l	<10	10	NA	NA	NA	13	NA	NA
Aluminum, Total	µg/l	<200	<200	6040	2090	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	NA	NA	NA	<200	NA	NA
Suspended Sediment	ppm	NA	NA	102	59	11	NA	4	11

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	20040427	20030728	20031106	20040210	20040427	20030729	20030728	20031106
Time	hhmm	1100	1230	1100	1200	1220	0930	0845	0815
Discharge	cfs	24.59	10.535	11.972	21.104	13.617	1.462	2.01	3.025
Temperature	degree C	11.5	20.4	14.3	4.5	11.4	17.5	18.9	14.6
Conductance	umhos/cm	198	188	191	196	182	120	188	194
Dissolved Oxygen	mg/l	7.64	6.45	6.59	8.04	8.37	7.46	7.04	6.34
pH		7.2	7.2	7.1	6.9	7.35	6.7	6.7	7
Alkalinity	mg/l	38	32	28	24	34	16	28	32
Acidity	mg/l	2	4	6	4	2	4	6	12
Solids, Total	mg/l	84	130	136	152	152	122	150	150
Solids, Dissolved	mg/l	NA	130	NA	NA	NA	120	138	NA
Ammonia, Total	mg/l	0.03	<0.02	0.03	0.02	0.37	<0.02	0.03	0.04
Ammonia, Dissolved	mg/l	NA	<0.02	NA	NA	NA	0.04	0.03	NA
Nitrite, Total	mg/l	<0.04	0.01	0.07	<0.04	0.17	0.03	<0.01	<0.04
Nitrite, Dissolved	mg/l	NA	0.01	NA	NA	NA	0.03	<0.01	NA
Nitrate, Total	mg/l	4.48	5.66	6.04	5.91	4.67	4.53	5.55	6.48
Nitrate, Dissolved	mg/l	NA	5.64	NA	NA	NA	4.53	5.76	NA
Nitrogen, Total	mg/l	4.89	5.98	6.1	6.27	5.54	6.08	6.38	6.94
Nitrogen Dissolved	mg/l	NA	5.96	NA	NA	NA	5.28	6.39	NA
Phosphorus, Total	mg/l	0.116	0.037	0.013	0.035	0.186	0.011	0.037	0.022
Phosphorus, Dissolved	mg/l	NA	0.026	NA	NA	NA	0.011	0.013	NA
Orthophosphate, Total	mg/l	0.092	0.023	0.01	0.027	0.153	0.011	0.035	0.014
Orthophosphate, Dissolved	mg/l	NA	0.026	NA	NA	NA	0.011	0.011	NA
Organic Carbon, Total	mg/l	2.2	1.6	1.6	1.6	2.6	1.6	2.2	2.3
Calcium	mg/l	16.5	14.1	14.9	14.5	14.4	7.88	16.2	16.5
Magnesium	mg/l	5.641	5.71	5.5	5.11	5.224	4.47	5.95	6.11
Chloride	mg/l	26.3	18.9	18.9	26.1	20.7	11.2	17.6	15.8
Sulfate	mg/l	6.98	<20	6.1	6.94	7.28	<20	<20	7.72
Turbidity	ntu	4.07	1.81	1.23	2.99	3.27	2.05	21.88	4.37
Iron, Total	µg/l	286	790	123	313	267	325	796	331
Iron, Dissolved	µg/l	NA	330	NA	NA	NA	157	50	NA
Manganese, Total	µg/l	38	111	35	36	41	50	69	62
Manganese, Dissolved	µg/l	NA	91	NA	NA	NA	39	33	NA
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	519	<200
Aluminum, Dissolved	µg/l	NA	<200	NA	NA	NA	<200	<200	NA
Suspended Sediment	ppm	9	NA	3	9	9	NA	NA	15

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	20040210	20040427	20030729	20031107	20040211	20040506	20030729	20031106
Time	hhmm	0925	0840	1245	0835	0945	0900	1040	1230
Discharge	cfs	2.342	3.151	117.39	NA	NA	176.49	0.315	1.548
Temperature	degree C	1.7	10.2	25.2	14.8	1.5	14	19.2	15
Conductance	umhos/cm	172	168	248	227	152	227	278	356
Dissolved Oxygen	mg/l	7.93	9.68	6.68	6.83	7.9	8.67	6.49	6.77
pH		6.5	6.85	8	3.95	6.9	7.2	7.4	7.3
Alkalinity	mg/l	22	26	44	40	28	24	60	64
Acidity	mg/l	4	4	2	18	2	4	4	12
Solids, Total	mg/l	154	184	204	188	154	208	196	230
Solids, Dissolved	mg/l	NA	NA	200	NA	NA	NA	190	NA
Ammonia, Total	mg/l	0.08	0.04	<0.02	0.04	1.01	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	NA	NA	<0.02	NA	NA	NA	<0.02	NA
Nitrite, Total	mg/l	<0.04	<0.04	0.05	<0.04	<0.04	0.04	0.03	<0.04
Nitrite, Dissolved	mg/l	NA	NA	0.04	NA	NA	NA	0.03	NA
Nitrate, Total	mg/l	6.28	5.88	6.54	6.63	3.11	7.36	1.19	2.21
Nitrate, Dissolved	mg/l	NA	NA	6.56	NA	NA	NA	1.16	NA
Nitrogen, Total	mg/l	6.61	6.30	7.32	7.38	5.66	7.48	1.37	2.46
Nitrogen Dissolved	mg/l	NA	NA	7.72	NA	NA	NA	1.31	NA
Phosphorus, Total	mg/l	0.032	0.178	0.048	0.199	0.581	0.061	0.037	0.025
Phosphorus, Dissolved	mg/l	NA	NA	0.036	NA	NA	NA	0.038	NA
Orthophosphate, Total	mg/l	0.027	0.153	0.027	0.129	0.454	0.032	0.033	0.018
Orthophosphate, Dissolved	mg/l	NA	NA	0.021	NA	NA	NA	0.029	NA
Organic Carbon, Total	mg/l	1.8	2.6	3	4.6	9.8	2.9	2	3.5
Calcium	mg/l	14.7	14.4	20.5	17.6	9.07	21.3	18.5	24.8
Magnesium	mg/l	5.24	5.224	9.47	8.52	4.6	9.58	12.1	16.7
Chloride	mg/l	18.7	20.7	18.1	14	13	17.5	33.7	44.4
Sulfate	mg/l	7.32	7.28	22.1	16	8.65	19	<20	32
Turbidity	ntu	7.75	3.27	3.34	19.1	34.46	6.24	2.19	1.76
Iron, Total	µg/l	281	267	115	949	1880	130	153	178
Iron, Dissolved	µg/l	NA	NA	20	NA	NA	NA	52	NA
Manganese, Total	µg/l	58	41	23	60	81	54	16	26
Manganese, Dissolved	µg/l	NA	NA	<10	NA	NA	NA	12	NA
Aluminum, Total	µg/l	<200	<200	<200	422	1770	<200	<200	<200
Aluminum, Dissolved	µg/l	NA	NA	<200	NA	NA	NA	<200	NA
Suspended Sediment	ppm	16	9	NA	21	35	11	NA	2

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 10.0	SUSQ 10.0
Date	yyyymmdd	20040210	20040427	20030728	20030729	20031106	20040211	20040427
Time	hhmm	1350	1350	0940	1130	1320	1030	1445
Discharge	cfs	1.716	1.821	1.653	NA	NA	NA	NA
Temperature	degree C	4.5	12.4	18.6	26.7	14.3	1.3	16.5
Conductance	umhos/cm	337	237	121	293	173	287	198
Dissolved Oxygen	mg/l	7.43	7.52	6.85	5.73	6.65	7.19	5.91
pH		7.2	7.15	7.1	7.5	7.3	7.3	7.5
Alkalinity	mg/l	32	44	36	62	40	54	44
Acidity	mg/l	4	2	4	6	18	4	2
Solids, Total	mg/l	254	178	112	200	188	212	166
Solids, Dissolved	mg/l	NA	NA	108	192	NA	NA	NA
Ammonia, Total	mg/l	0.06	0.07	<0.02	0.05	0.03	0.33	0.04
Ammonia, Dissolved	mg/l	NA	NA	<0.02	0.05	NA	NA	NA
Nitrite, Total	mg/l	<0.04	<0.04	<0.01	0.06	<0.04	<0.04	<0.04
Nitrite, Dissolved	mg/l	NA	NA	<0.01	0.05	NA	NA	NA
Nitrate, Total	mg/l	2.94	2.13	1.79	1.12	1.16	2.15	1.17
Nitrate, Dissolved	mg/l	NA	NA	1.82	1.13	NA	NA	NA
Nitrogen, Total	mg/l	3.32	2.66	1.94	1.6	1.44	3.09	1.7
Nitrogen Dissolved	mg/l	NA	NA	1.86	1.62	NA	NA	NA
Phosphorus, Total	mg/l	0.019	0.08	0.016	0.039	0.033	0.168	0.049
Phosphorus, Dissolved	mg/l	NA	NA	<0.01	0.021	NA	NA	NA
Orthophosphate, Total	mg/l	0.022	0.075	0.013	0.024	0.025	0.14	0.029
Orthophosphate, Dissolved	mg/l	NA	NA	<0.01	0.012	NA	NA	NA
Organic Carbon, Total	mg/l	1.7	3.2	1.4	3.1	3.2	3.9	2.4
Calcium	mg/l	18.3	15	13.1	28.3	17.7	26.4	20
Magnesium	mg/l	12.3	9.82	3.46	8.11	4.57	7.16	5.571
Chloride	mg/l	58	30.7	7.6	22.9	9.83	29.7	14.2
Sulfate	mg/l	26	22.3	<20	38.1	19.6	33.5	26.9
Turbidity	ntu	2.21	4.17	3.58	11.22	10.49	18.31	14.62
Iron, Total	µg/l	192	296	200	365	346	777	336
Iron, Dissolved	µg/l	NA	NA	68	28	NA	NA	NA
Manganese, Total	µg/l	102	66	20	143	68	98	124
Manganese, Dissolved	µg/l	NA	NA	12	20	NA	NA	NA
Aluminum, Total	µg/l	<200	<200	<200	208	<200	606	<200
Aluminum, Dissolved	µg/l	NA	NA	<200	<200	NA	NA	NA
Suspended Sediment	ppm	3	6	NA	NA	10	12	21

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

Parameter	Units	SUSQ 44.5	SUSQ 44.5	SUSQ 44.5	SUSQ 44.5
Date	yyyymmdd	20030929	20031107	20040303	20040506
Time	hhmm	1330	1145	1400	1140
Discharge	cfs	60900	52200	39900	73600
Temperature	degree C	18.3	13.8	2.9	15.4
Conductance	umhos/cm	249	224	300	222
Dissolved Oxygen	mg/l	6.76	6.16	6.16	8.74
pH		7.2	7	7.4	7.2
Alkalinity	mg/l	40	48	66	70
Acidity	mg/l	24	16	4	4
Solids, Total	mg/l	112	174	214	218
Solids, Dissolved	mg/l	112	NA	NA	NA
Ammonia, Total	mg/l	<0.02	0.06	0.1	0.03
Ammonia, Dissolved	mg/l	<0.02	NA	NA	NA
Nitrite, Total	mg/l	<0.01	<0.04	<0.04	<0.04
Nitrite, Dissolved	mg/l	<0.01	NA	NA	NA
Nitrate, Total	mg/l	2.09	2.14	2.32	2.22
Nitrate, Dissolved	mg/l	2.17	NA	NA	NA
Nitrogen, Total	mg/l	2.20	2.5	2.74	2.48
Nitrogen Dissolved	mg/l	2.21	NA	NA	NA
Phosphorus, Total	mg/l	0.052	0.053	0.039	0.19
Phosphorus, Dissolved	mg/l	0.022	NA	NA	NA
Orthophosphate, Total	mg/l	0.024	0.015	0.026	0.129
Orthophosphate, Dissolved	mg/l	0.019	NA	NA	NA
Organic Carbon, Total	mg/l	3.4	3.6	2	3.2
Calcium	mg/l	25.6	22.4	29.6	27.1
Magnesium	mg/l	6.35	6.41	8.38	6.21
Chloride	mg/l	19.1	14.1	30.7	16.1
Sulfate	mg/l	32.9	24.9	38	20.2
Turbidity	ntu	13.48	9.77	5.06	23.09
Iron, Total	µg/l	1000	946	701	412
Iron, Dissolved	µg/l	95	NA	NA	NA
Manganese, Total	µg/l	116	108	129	72
Manganese, Dissolved	µg/l	24	NA	NA	NA
Aluminum, Total	µg/l	438	520	224	341
Aluminum, Dissolved	µg/l	<200	NA	NA	NA
Suspended Sediment	ppm	NA	19	10	37

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	20040510	20040512	20040512	20040511	20040512	20040510
Time	hhmm	1530	1230	1400	1300	1100	NA
Temperature	degree C	17.5	16.7	18.5	16.3	17.3	18.4
pH		7.25	6.65	7.65	7.05	6.85	7.80
Dissolved Oxygen	mg/l	8.88	7.27	7.49	7.32	6.49	7.32
Conductivity	umhos/cm	102	67	190	100	106	140
Alkalinity	mg/l	30.0	24.0	64.0	28.0	40.0	44.0
Acidity	mg/l	2.0	4.0	4.0	2.0	4.0	4.0

Parameter	Units	Bukley Brook	Camp Brook	Cook Hollow Run	Deep Hollow Brook	Denton Creek	Dry Brook
Date	yyyymmdd	20040512	20040512	20040512	20040510	20040510	20040511
Time	hhmm	1200	1315	1000	1130	1245	1030
Temperature	degree C	19.3	18.1	15.4	12.4	15.8	17.0
pH		6.80	7.55	7.20	6.25	6.35	7.20
Dissolved Oxygen	mg/l	5.77	7.28	9.58	9.12	8.28	7.98
Conductivity	umhos/cm	82	158	144	38	46	113
Alkalinity	mg/l	28.0	52.0	56.0	10.0	8.0	36.0
Acidity	mg/l	4.0	2.0	2.0	4.0	4.0	2.0

Parameter	Units	Little Wappasenning Creek	Parks Creek	Prince Hollow Run	Russell Run	Sackett Creek	Smith Creek
Date	yyyymmdd	20040511	20040511	20040510	20040510	20040511	20040511
Time	hhmm	0745	NA	1445	1630	0840	NA
Temperature	degree C	14.2	14.3	17.8	18.0	14.1	16.6
pH		6.90	6.95	7.70	7.20	7.45	6.80
Dissolved Oxygen	mg/l	7.84	6.22	7.15	8.91	8.03	5.81
Conductivity	umhos/cm	70	78	83	115	93	96
Alkalinity	mg/l	24.0	24.0	18.0	30.0	32.0	30.0
Acidity	mg/l	2.0	4.0	2.0	2.0	2.0	4.0

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

Parameter	Units	Strait Creek	White Branch Cowanesque River	White Hollow
Date	yyyymmdd	20040511	20040512	20040511
Time	hhmm	1530	NA	1145
Temperature	degree C	16.6	15.0	14.1
pH		7.25	6.90	6.90
Dissolved Oxygen	mg/l	7.44	8.86	8.51
Conductivity	umhos/cm	116	122	85
Alkalinity	mg/l	44.0	28.0	24.0
Acidity	mg/l	4.0	2.0	2.0

APPENDIX B

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

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
Coleoptera	**Dytiscidae**	*Agabus*	*5*	*P*
	Elmidae	*Optioservus*	*4*	*SC*
		Oulimnius	*5*	*SC*
		Promoresia	*2*	*SC*
		Stenelmis	*5*	*SC*
	Gyrinidae	*Dinetus*	*4*	*P*
	Hydrophilidae	*Berosus*	*5*	*CG*
		Enochrus	*9*	*CG*
	Psephenidae	*Ectopria*	*5*	*SC*
		Psephenus	*4*	*SC*
	Ptilodactylidae	*Anchytarsus*	*5*	*SH*
Diptera	**Athericidae**	*Atherix*	*2*	*P*
	Ceratopogonidae	*Bezzia*	*6*	*P*
		Stilobezzia	*6*	*P*
	Chironomidae		*6*	*CG*
	Empididae	*Chelifera*	*6*	*P*
		Clinocera	*6*	*P*
		Hemerodromia	*6*	*P*
	Simuliidae	*Prosimulium*	*2*	*FC*
	Simulidae	*Simulium*	*6*	*FC*
	Tipulidae	*Antocha*	*3*	*CG*
		Dicranota	*3*	*P*
		Hexatoma	*2*	*P*
		Pseudolimnophila	*2*	*P*
		Tipula	*4*	*SH*
Ephemeroptera	**Ameletidae**	*Ameletus*	*0*	*CG*
	Baetidae	*Acentrella*	*4*	*CG*
		Baetis	*6*	*CG*
		Centroptilum	*2*	*CG*
	Caenidae	*Caenis*	*7*	*CG*
	Ephemerellidae	*Attenella*	*2*	*CG*
		Drunella	*1*	*SC*
		Ephemerella	*1*	*SC*
		Serratella	*2*	*CG*
	Ephemeridae	*Ephemera*	*3*	*CG*
		Litobrancha	*5*	*CG*
	Heptagenidae	*Cinygmula*	*1*	*SC*
		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*

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
Odonata	**Aeshnidae**	*Boyeria*	*2*	*P*
	Coenagrionidae	*Argia*	*6*	*P*
	Gomphidae	*Lanthus*	*3*	*P*
		Ophiogomphus	*1*	*P*
		Stylogomphus	*4*	*P*
Plecoptera	**Choloroperlidae**	*Alloperla*	*0*	*CG*
		Haploperla	*0*	*P*
		Sweltsa	*0*	*P*
	Leuctridae	*Leuctra*	*0*	*SH*
	Nemouridae	*Amphinemura*	*3*	*SH*
		Nemoura	*2*	*SH*
	Peltoperlidae	*Peltoperla*	*2*	*SH*
		Tallaperla	*0*	*SH*
	Perlidae	*Acroneuria*	*0*	*P*
		Agnetina	*2*	*P*
		Neoperla	*3*	*P*
		Paragnetina	*1*	*P*
		Perlesta	*4*	*P*
	Perlodidae	*Cultus*	*2*	*P*
		Diploperla	*2*	*P*
		Isoperla	*2*	*P*
		Yugus	*2*	*P*
	Pteronarcyidae	*Pteronarcys*	*0*	*SH*
Trichoptera	**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	*Lype*	*3*	*SC*
	Rhyacophilidae	*Rhyacophila*	*1*	*P*
	Uenoidae	*Neophylax*	*3*	*SC*
Amphipoda	**Gammaridae**	*Gammarus*	*6*	*SH*
Decapoda	**Cambaridae**	*Cambarus*	*6*	*SH*
		Orconectes	*6*	*SH*
Gastopoda	**Pleuroceridae**	*Leptoxis*	*7*	*SC*
Gnathobdellida	**Hirudinidae**	*Helobdella*	*6*	*P*
Isopopoda	**Asellidae**	*Caecidotea*	*6*	*SH*
Haplotaxida	**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	Family/*Genus*	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1
Coleoptera	**Elmidae**	*Optioservus*	8	2	6	2	24
		Stenelmis	34	15		45	12
	Psephenidae	*Ectopria*			1		
		Psephenus	20	1	13	81	47
Diptera	**Athericidae**	*Atherix*		2		11	8
	Ceratopogonidae	*Stilobezzia*			5		
	Chironomidae		23	48	52	28	28
	Empididae	*Hemerodromia*		16		1	
	Simuliidae	*Prosimulium*			1		
	Simulidae	*Simulium*	1	4	4		
	Tipulidae	*Antocha*				2	1
		Dicranota	1		30	1	
		Hexatoma	3	16	1	8	1
Ephemeroptera	**Baetidae**	*Acentrella*		15		3	1
		Baetis		14	2	44	8
	Caenidae	*Caenis*		2			
	Ephemerellidae	*Attenella*	1				
		Ephemerella		1			
		Serratella				1	
	Heptagenidae	*Epeorus*	2	3		1	3
		Heptagenia			4		
		Leucrocuta		2		4	
		Stenonema	6	3		1	
	Isonychiidae	*Isonychia*	12	3	9	5	25
	Leptophlebiidae	*Paraleptophlebia*					1
Megaloptera	**Corydalidae**	*Corydalus*	1			3	2
		Nigronia	12		13	1	
	Sialidae	*Sialis*				1	
Odonata	**Aeshnidae**	*Boyeria*			3		
	Gomphidae	*Ophiogomphus*				3	3
		Stylogomphus		2	14		
Plecoptera	**Choloroperlidae**	*Haploperla*		1			
	Leuctridae	*Leuctra*	2		14		
	Perlidae	*Acroneuria*	9	4	9	11	8
		Agnetina	2			5	

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

Class: Order	Family	Family/*Genus*	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	HLDN 3.5
Plecoptera	**Perlidae**	*Neoperla*		1			
		Paragnetina			1		
		Perlesta					1
	Perlodidae	*Yugus*	1				
Trichoptera	**Brachycentridae**	*Brachycentrus*				3	
	Hydropsychidae	*Ceratopsyche*	7	14	9	16	56
		Cheumatopsyche	27	5	7	5	7
		Hydropsyche	36	5	32	3	2
	Hydroptilidae	*Dibusa*				2	
		Leucotrichia				1	
	Odontoceridae	*Psilotreta*				2	
	Philopotamidae	*Chimarra*	55		31	17	31
		Dolophilodes		2			
	Polycentropodidae	*Polycentropus*		1	1		
	Uenoidae	*Neophylax*					1
Decapoda	**Cambaridae**	*Cambarus*			1		

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

Class: Order	Family	Family/*Genus*	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3
Coleoptera	**Dytiscidae**	*Agabus*				1	
	Elmidae	*Optioservus*	10	11	1	3	5
		Stenelmis	1	14	2	2	9
	Hydrophilidae	*Enochrus*	5				
	Psephenidae	*Psephenus*	54	17	21	7	16
Diptera	**Athericidae**	*Atherix*		6		6	11
	Chironomidae		51	79	14	53	70
	Empididae	*Hemerodromia*	1			5	
	Simulidae	*Simulium*	2		3		
	Tipulidae	*Antocha*	1			6	
		Dicranota	1		25		
		Hexatoma	7	6	6	1	1
		Tipula		1		1	
Ephemeroptera	**Baetidae**	*Acentrella*	2	2	1	6	3
		Baetis	18	25	1	24	34
	Caenidae	*Caenis*	2			3	
	Heptagenidae	*Epeorus*			2		26
		Heptagenia			5		
		Leucrocuta	7			3	8
		Stenonema	1	1			20
	Isonychiidae	*Isonychia*	1	12		3	46
	Leptophlebiidae	*Paraleptophlebia*	2	3	1		7
	Tricorythidae	*Tricorythodes*	1			44	
Megaloptera	**Corydalidae**	*Nigronia*	1	4	3	2	1
Odonata	**Aeshnidae**	*Boyeria*	1	1	1		
	Gomphidae	*Ophiogomphus*	6			1	
		Stylogomphus					
Plecoptera	**Choloroperlidae**	*Alloperla*				2	
	Leuctridae	*Leuctra*	2		42		
	Perlidae	*Acroneuria*	1	16			6
		Agnetina	10		8		
		Paragnetina					5
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	11	13	56	21	47
		Cheumatopsyche	11	10	22	5	21
		Hydropsyche		17	5	3	
	Hydroptilidae	*Leucotrichia*					1
	Philopotamidae	*Chimarra*	9	73			22
Trichoptera	**Philopotamidae**	*Dolophilodes*		11	3		15
	Polycentropodidae	*Polycentropus*	1			1	2
	Rhyacophilidae	*Rhyacophila*					1
Haplotaxida	**Lumbriculidae**					1	

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

Class: Order	Family	Family/*Genus*	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Coleoptera	**Elmidae**	*Optioservus*	1	2	1	
		Stenelmis	35	32	7	4
	Gyrinidae	*Dinetus*	3			
	Psephenidae	*Psephenus*	10	8	3	3
Diptera	**Athericidae**	*Atherix*		2	4	2
	Ceratopogonidae	*Bezzia*	1			
	Chironomidae		69	119	13	86
	Empididae	*Hemerodromia*	3			2
	Simulidae	*Simulium*	9			17
	Tipulidae	*Antocha*		2		
		Dicranota	3	1		
		Hexatoma		22	3	8
Ephemeroptera	**Baetidae**	*Acentrella*				5
		Baetis	3	25	39	62
	Ephemerellidae	*Drunella*		6		
	Heptagenidae	*Epeorus*		1		
		Heptagenia			9	
		Leucrocuta		1	11	1
		Stenonema	6	1	7	1
	Isonychiidae	*Isonychia*	6		12	5
	Leptophlebiidae	*Paraleptophlebia*		5	1	
	Tricorythidae	*Tricorythodes*			5	
Megaloptera	**Corydalidae**	*Corydalus*	1			
		Nigronia		1		2
	Sialidae	*Sialis*	1			
Odonata	**Gomphidae**	*Ophiogomphus*			2	
		Stylogomphus				
Plecoptera	**Choloroperlidae**	*Alloperla*		4		
	Perlidae	*Acroneuria*	2	3		
		Agnetina		14		
		Neoperla			35	
		Paragnetina				2
	Pteronarcyidae	*Pteronarcys*		1		
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	2	17	27	19
		Cheumatopsyche	82	14	16	
		Hydropsyche	4	3		1
	Philopotamidae	*Chimarra*	17	1		2
		Dolophilodes		1		
	Polycentropodidae	*Polycentropus*		2		1
	Uenoidae	*Neophylax*				1

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams

Class: Order	Family	Family/*Genus*	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1
Coleoptera	**Elmidae**	*Optioservus*	34	4	35	31	12
		Oulimnius					2
		Stenelmis	2	82	50	3	4
	Psephenidae	*Ectopria*	3				
		Psephenus	1	12	29	3	
	Ptilodactylidae	*Anchytarsus*	11				
Diptera	**Athericidae**	*Atherix*			1		
	Chironomidae		110	32	33	100	49
	Empididae	*Chelifera*				1	
		Hemerodromia			2		
	Simulidae	*Simulium*	1	15	3		
	Tipulidae	*Antocha*	8		4	1	1
		Dicranota			1		
		Tipula		1			1
Ephemeroptera		*Baetis*	22	47	4	16	5
	Ephemerellidae	*Serratella*			3		
	Heptagenidae	*Epeorus*	2				
		Leucrocuta	4				
		Stenonema	1			1	
	Isonychiidae	*Isonychia*	1	4	15	2	
Megaloptera	**Corydalidae**	*Corydalus*		5	5		
		Nigronia	10		5		23
Odonata	**Gomphidae**	*Ophiogomphus*	3		3		1
Plecoptera	**Leuctridae**	*Leuctra*	11		2		9
	Peltoperlidae	*Tallaperla*			1		
	Perlidae	*Acroneuria*	19		3		39
		Agnetina			1		
		Paragnetina			3		
		Perlesta					1
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	3	8	30	25	3
		Cheumatopsyche	24	31	28	26	70
		Diplectrona	2				
		Hydropsyche		26			22
	Philopotamidae	*Chimarra*					1
		Dolophilodes	33		1	3	22
	Rhyacophilidae	*Rhyacophila*	1				4
Isopopoda	**Asellidae**	*Caecidotea*				1	
Haplotaxida	**Lumbriculidae**				1		

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

Class: Order	Family	Family/*Genus*	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Coleoptera	**Dytiscidae**	*Agabus*	1			
	Elmidae	*Optioservus*	4		49	
		Oulimnius			1	
		Stenelmis	4	67		
	Psephenidae	*Psephenus*		12		
Diptera	**Chironomidae**		26	47	72	212
	Empididae	*Chelifera*				1
		Clinocera				1
		Hemerodromia		2		
	Simulidae	*Simulium*	3	4	2	
	Tipulidae	*Antocha*			2	
		Dicranota	2		32	
		Hexatoma	2			
		Tipula		1	1	9
Ephemeroptera	**Baetidae**	*Baetis*	7	49	10	4
	Heptagenidae	*Stenonema*		5		
	Isonychiidae	*Isonychia*	1			
	Leptophlebiidae	*Paraleptophlebia*			1	
Megaloptera	**Corydalidae**	*Corydalus*		1		
		Nigronia			3	1
	Sialidae	*Sialis*	1		1	
Odonata	**Gomphidae**	*Lanthus*	1			
Plecoptera	**Leuctridae**	*Leuctra*			13	
	Peltoperlidae	*Peltoperla*			5	
	Perlidae	*Acroneuria*			2	
		Perlesta			1	
Trichoptera	**Brachycentridae**	*Brachycentrus*		2		
	Hydropsychidae	*Ceratopsyche*		22	5	
		Cheumatopsyche	6	35	22	2
		Diplectrona				1
		Hydropsyche	7	6	9	5
	Philopotamidae	*Chimarra*		2		
		Dolophilodes			23	2
Amphipoda	**Gammaridae**	*Gammarus*		17		
Haplotaxida	**Hirudinidae**	*Helobdella*		1		

Table C3. Macroinvertebrate Data for River Sites

Class: Order	Family	Family/*Genus*	SUSQ 340.0	SUSQ 365.0
Coleoptera	**Elmidae**	*Optioservus*	13	23
		Promoresia	1	
		Stenelmis	89	103
	Gyrinidae	*Dinetus*		3
	Hydrophilidae	*Berosus*	1	1
	Psephenidae	*Psephenus*	22	16
Diptera	**Chironomidae**		5	21
	Simulidae	*Simulium*		1
	Tipulidae	*Antocha*		1
Ephemeroptera	**Baetidae**	*Baetis*		7
		Centroptilum		1
	Caenidae	*Caenis*		1
	Ephemerellidae	*Serratella*		1
	Ephemeridae	*Litobrancha*	25	6
	Heptagenidae	*Heptagenia*		2
		Leucrocuta	3	1
		Stenonema	5	
	Isonychiidae	*Isonychia*	3	12
	Potamanthidae	*Anthopotamus*	10	1
Megaloptera	**Corydalidae**	*Corydalus*		6
	Sialidae	*Sialis*	1	
Odonata	**Coenagrionidae**	*Argia*	1	
	Gomphidae	*Stylogomphus*		1
Plecoptera	**Perlidae**	*Acroneuria*		7
		Agnetina	4	24
		Neoperla	2	
		Paragnetina		3
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	5	10
		Cheumatopsyche	32	2
		Hydropsyche	3	8
		Macrostemum	2	
	Philopotamidae	*Chimarra*	2	32
Amphipoda	**Gammaridae**	*Gammarus*	1	
Decapoda	**Cambaridae**	*Orconectes*	3	
Gastropoda	**Pleuroceridae**	*Leptoxis*		5

Table C4. Macroinvertebrate Data for Group 3 Sites

Class: Order	Family	Family/*Genus*	BABC	BEAG	BILL	BIRD	BISC
Coleoptera	**Elmidae**	*Optioservus*			1		
		Oulimnius		1			
	Psephenidae	*Psephenus*			7	1	2
Diptera	**Chironomidae**		60	49	36	41	38
	Empididae	*Hemerodromia*			2		18
	Simulidae	*Simulium*	3	2	5	1	7
	Tipulidae	*Antocha*			1		
		Hexatoma	6		9	3	
		Tipula	1	2		1	
Ephemeroptera	**Ameletidae**	*Ameletus*	2			10	
	Baetidae	*Acentrella*	12		11		1
		Baetis	19	3	9	4	19
	Ephemerellidae	*Drunella*		4		2	
		Ephemerella	2	6	3	3	2
	Heptagenidae	*Epeorus*	3	33	56	79	30
		Heptagenia					5
		Stenacron	2		2		5
	Isonychiidae	*Isonychia*				1	
	Leptophlebiidae	*Paraleptophlebia*	4		30	1	6
	Tricorythidae	*Tricorythodes*			1		
Megaloptera	**Corydalidae**	*Nigronia*	1				
Plecoptera	**Choloroperlidae**	*Alloperla*			6		
		Haploperla	72		9		
		Sweltsa	3	16		4	
	Leuctridae	*Leuctra*	18	37	20	18	4
	Nemouridae	*Amphinemura*	21	26	17	17	42
	Perlidae	*Acroneuria*	1		2	3	
		Agnetina			5		1
	Perlodidae	*Cultus*		6			
		Isoperla	11			8	6
		Yugus		13		4	
Trichoptera	**Hydropsychidae**	*Ceratopsyche*		2	10	2	4
		Cheumatopsyche		1	3		13
		Diplectrona		13		5	
		Hydropsyche					5
	Philopotamidae	*Chimarra*					15
		Dolophilodes		3			
	Polycentropodidae	*Polycentropus*	2	1	1	3	1
	Rhyacophilidae	*Rhyacophila*		3			
	Uenoidae	*Neophylax*				4	
Decapoda	**Cambaridae**	*Cambarus*				1	
Haplotaxida	**Lumbriculidae**					2	1

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BRIG	BULK	CAMP	COOK	DEEP
Coleoptera	**Elmidae**	*Optioservus*				6	3
		Stenelmis	2			2	
	Psephenidae	*Ectopria*				3	4
		Psephenus				9	1
Diptera	**Chironomidae**		31	64	46	50	61
	Empididae	*Hemerodromia*	1			1	
	Similiidae	*Prosimulium*		2			
		Simulium	2	3	1	3	2
	Tipulidae	*Antocha*					3
		Dicranota					9
		Hexatoma	2	1	2	1	4
Ephemeroptera	**Ameletidae**	*Ameletus*	11		1		
	Baetidae	*Acentrella*	2		15	12	4
		Baetis	1	33	15	29	13
	Ephemerellidae	*Drunella*		2			
		Ephemerella			1		2
	Heptagenidae	*Epeorus*	94	19	54	11	9
		Heptagenia	17			2	4
		Stenacron				7	1
		Stenonema		1			11
	Leptophlebiidae	*Paraleptophlebia*	2	1	5	6	15
Megaloptera	**Corydalidae**	*Nigronia*		4	1	1	5
Odonata	**Gomphidae**	*Stylogomphus*				1	
Plecoptera	**Choloroperlidae**	*Alloperla*			56		
		Haploperla	28				1
		Sweltsa	6		4		1
	Leuctridae	*Leuctra*	4	31	5	40	6
	Nemouridae	*Amphinemura*	2	25	6	20	31
	Perlidae	*Acroneuria*		12		12	3
		Agnetina				2	
		Paragnetina			2		
	Perlodidae	*Cultus*					
		Diploperla					
		Isoperla	3				1
		Yugus		1			
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	1		1	14	3
		Cheumatopsyche		1			
		Diplectrona		15		7	1
		Hydropsyche		3			12
	Philopotamidae	*Chimarra*					21
		Dolophilodes		1		1	
	Polycentropodidae	*Polycentropus*	1	1	2	2	
	Rhyacophilidae	*Rhyacophila*		21		2	9
Decapoda	**Cambaridae**	*Cambarus*		2		1	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	DENT	DRYB	LWAP	PARK	PRIN
Coleoptera	**Dytiscidae**	*Agabus*		11			
	Elmidae	*Stenelmis*	3	1			
		Ectopria					
	Psephenidae	*Psephenus*		11	9		2
Diptera	**Chironomidae**		115	135	14	3	18
	Empididae	*Hemerodromia*	2	1			
	Similiidae	*Prosimulium*		1		1	
	Simulidae	*Simulium*	3		3		
	Tipulidae	*Hexatoma*			1		1
		Tipula		1			1
Ephemeroptera	**Ameletidae**	*Ameletus*		1	2	1	1
	Baetidae	*Acentrella*		4	2		5
		Baetis		19	16	6	8
	Ephemerellidae	*Drunella*					2
		Ephemerella			2	5	2
	Heptagenidae	*Cinygmula*			28		
		Epeorus			48	104	9
		Heptagenia				17	15
		Stenacron		2			
		Stenonema	43		9		
	Leptophlebiidae	*Paraleptophlebia*		1	4		7
Odonata	**Gomphidae**	*Lanthus*					1
		Stylogomphus	1				
Plecoptera	**Choloroperlidae**	*Haploperla*			36	17	28
		Sweltsa			10	10	2
	Leuctridae	*Leuctra*	1	1	1	3	
	Nemouridae	*Amphinemura*	1	2	10	18	
	Perlidae	*Acroneuria*	3			1	
	Perlodidae	*Isoperla*		1	6	2	1
Trichoptera	**Hydropsychidae**	*Ceratopsyche*			7		1
		Cheumatopsyche	43	2		2	
		Diplectrona				1	
		Hydropsyche	13	5			
	Philopotamidae	*Chimarra*	3				
	Polycentropodidae	*Polycentropus*			2	1	
	Psychomyiidae	*Lype*			1		
	Uenoidae	*Neophylax*			4		
Decapoda	**Cambaridae**	*Cambarus*	1			1	
Isopopoda	**Asellidae**	*Caecidotea*		1			
Haplotaxida	**Lumbriculidae**			2			

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Coleoptera	**Elmidae**	*Optioservus*			7			
		Stenelmis				1		
	Psephenidae	*Ectopria*			3			
		Psephenus				4		
Diptera	**Chironomidae**		42	7	30	57	26	11
		Chelifera			7			
	Empididae	*Hemerodromia*					4	
	Simulidae	*Simulium*	2	1				
	Tipulidae	*Antocha*			1		2	
		Hexatoma	10	1		4		2
		Pseudolimnophila				1		
		Tipula	1		1			
Ephemeroptera	**Ameletidae**	*Ameletus*	1			2		3
	Baetidae	*Acentrella*				25		
		Baetis	5	5	28	17		8
	Ephemerellidae	*Ephemerella*			4	4		1
	Ephemeridae	*Ephemera*			1			
	Heptagenidae	*Cinygmula*	3	49		9		
		Epeorus	97	88	7	31		70
		Stenacron		4		5		
		Stenonema			3	3	2	
	Leptophlebiidae	*Paraleptophlebia*	2	7	1	35		1
Megaloptera	**Corydalidae**	*Nigronia*			1	1		
Odonata	**Aeshnidae**	*Boyeria*			1			
	Gomphidae	*Lanthus*			3			
Plecoptera	**Choloroperlidae**	*Alloperla*				16		
		Haploperla	49	44				
		Sweltsa	17		1	4		68
	Leuctridae	*Leuctra*		1	37			15
	Nemouridae	*Amphinemura*	16	4	43	2		9
		Nemoura						8
	Perlidae	*Acroneuria*		1	4	7		
		Agnetina						1
	Perlodidae	*Diploperla*						4
		Isoperla	2	2		1		
		Yugus						6
Trichoptera	**Hydropsychidae**	*Ceratopsyche*	2		1	2		
		Cheumatopsyche			4		113	
		Diplectrona			48			
		Hydropsyche					54	
	Philopotamidae	*Chimarra*					1	
		Dolophilodes		1	3			
	Polycentropodidae	*Polycentropus*	1	1	2	2		
	Rhyacophilidae	*Rhyacophila*			9			4
	Uenoidae	*Neophylax*			2			
Decapoda	**Cambaridae**	*Cambarus*			1			1
Haplotaxida	**Lumbriculidae**						2	

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.