ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

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July 1, 2001, Through June 30, 2002

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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 51 sample sites in the Interstate Streams Water Quality Network from July 1, 2001 to June 30, 2002. Only 25 out of 2,784 parameter observations exceeded water quality standards. Assessment results indicate that approximately 30 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.

A Seasonal Kendall Test was performed on water quality parameters to determine trends and their magnitude for the period 1986-2002. Overall, an increasing trend was found in total chloride, while decreasing trends were found for total ammonia, total nitrogen, total phosphorus, total iron, and total manganese.

A Pearson Product Moment Correlation was performed on WQI, RBP III score, and physical habitat score to determine any relationships between the parameters. A significant ($p<0.05$) positive correlation occurred between biological community score and physical habitat score for Group 3 sites, indicating that as the quality of the habitat increased so did the quality of the biological community. No other groups of streams had correlations that were significant. These relationships, while based on a small number of observations, are presented as subjects to be considered by resource managers, local interest groups, elected officials, and other policy-makers.

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 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 2002, which covers July 1, 2001, to June 30, 2002.

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, Maryland. 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 reaches cross 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. Originally, water samples were collected from Group 1 stations every other month, except January and February. Sampling was alternated so that streams along the New York-Pennsylvania border were sampled during November, March, May, July, and September, while streams along the Pennsylvania-Maryland border were sampled during October, December, April, June, and August. During fiscal year 1997, water quality sampling of Group 1 streams was reduced to quarterly sampling. In this sampling period, 2001-2002, New York-Pennsylvania streams were sampled July, November, February, and April. Pennsylvania-Maryland stations were sampled July and August, November, February, and April. Benthic macroinvertebrates were collected and habitat assessments were performed in Group 1 streams during July and August 2001.

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 2001.

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 2001–2002

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 2001-2002

Streams judged to have a low potential for impacts were assigned to Group 3. During previous reporting years, these stations were not sampled but were visually inspected for signs of degradation once a year. However, beginning in fiscal year 2000, 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 2002 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. Stream discharges are tabulated according to station name and date in Appendix A.

Water samples

Water samples were collected at each of the sites to measure nutrient and metal concentrations. Chemical and physical parameters monitored are listed in Table 4. Water samples were collected using a depth-integrated sampler. Composite samples were obtained by collecting numerous 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. The samples were chilled on ice and sent to the Pennsylvania

Department of Environmental Protection (Pa. DEP), 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).

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 5.0	Cowanesque River, Elkland, Pa.	1	Conditions upstream of flood control reservoir
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

Table 2. Stream Stations Sampled along the New York–Pennsylvania Border and Sampling Rationale—Continued

Station	Stream and Location	Monitoring Group	Rationale
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

*Not sampled in 2001-2002

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

Station	Stream and Location	Monitoring Group	Rationale
LNGA 2.5	Long Arm Creek, Bandanna, Pa.	1	Monitor for potential water quality impacts
SBCC 20.4	South Branch Conewago Creek, Bandanna, Pa.	2	Monitor for potential water quality impacts
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
SCTT 3.0	Scott Creek, Delta, Pa.	1	Historical pollution due to untreated sewage
BBDC 4.1	Big Branch Deer Creek, Fawn Grove, Pa.	2	Monitor for potential water quality impacts
FBDC 4.1	Falling 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
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
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

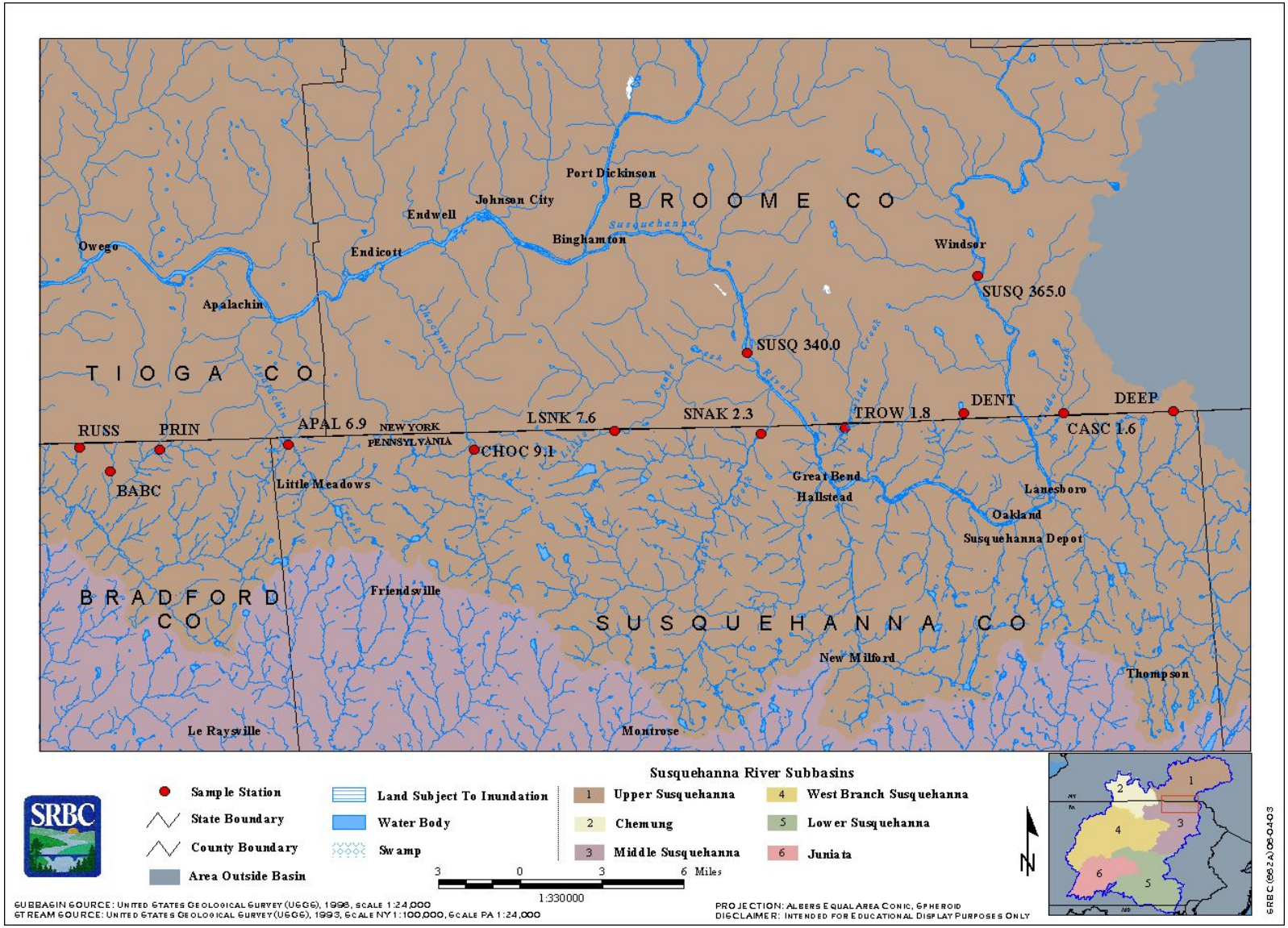

Figure 1. Interstate Streams along the New York-Pennsylvania Border between Russell Run and Deep Hollow Brook

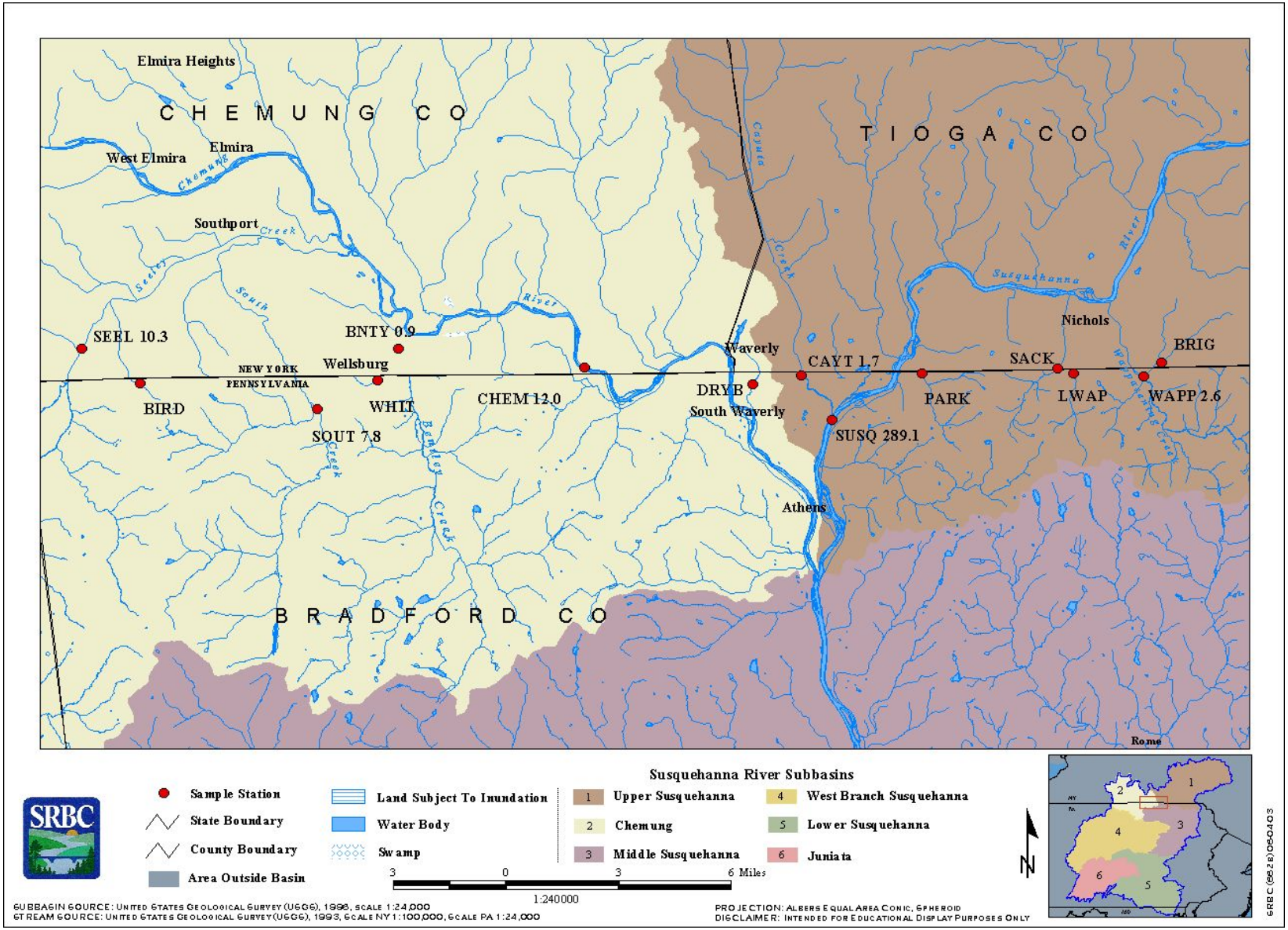

Figure 2. Interstate Streams along the New York-Pennsylvania Border between Seeley Creek and Briggs Hollow

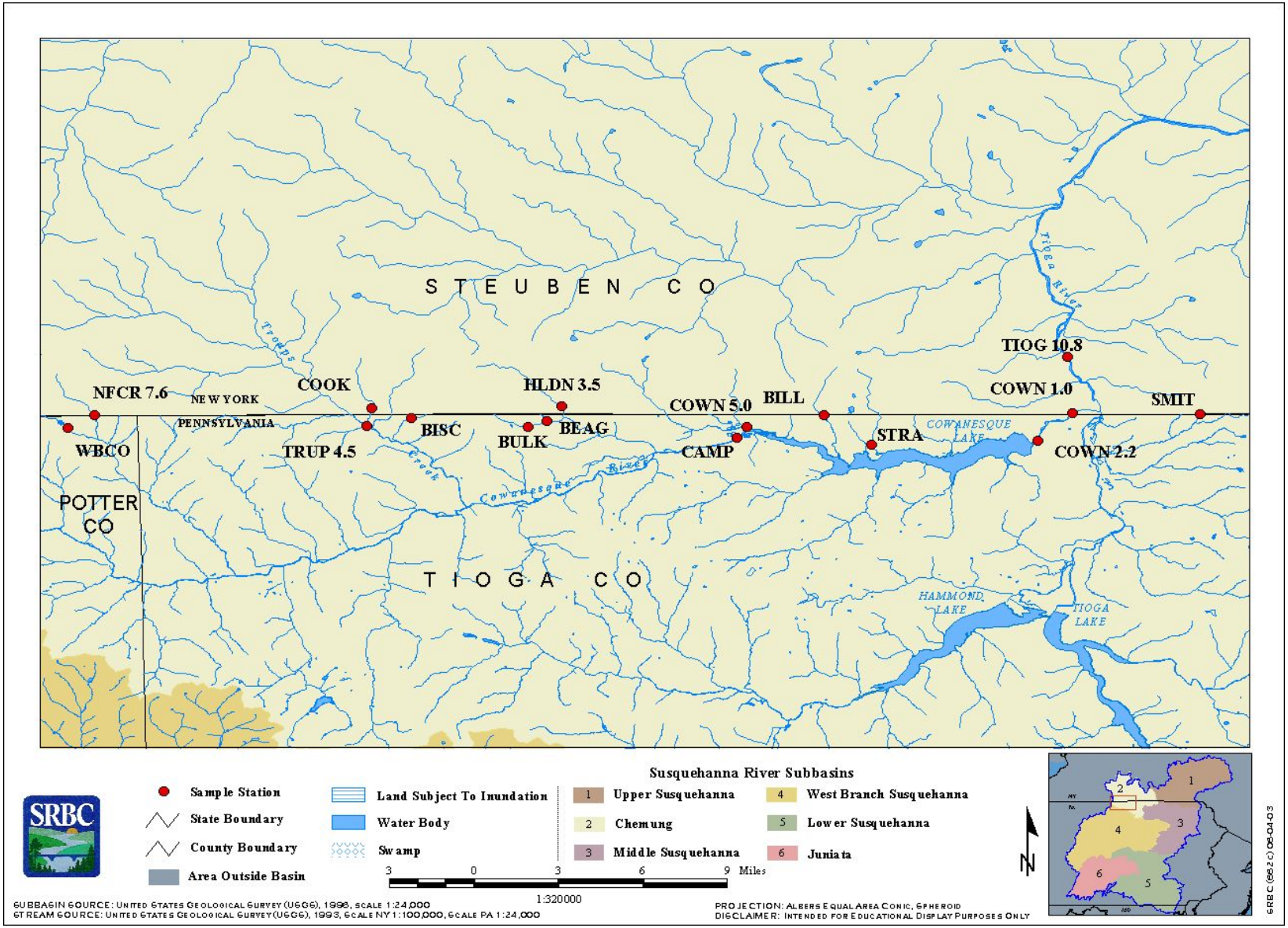

Figure 3. Interstate Streams along the New York-Pennsylvania Border between White Branch Cowanesque River and Smith Creek

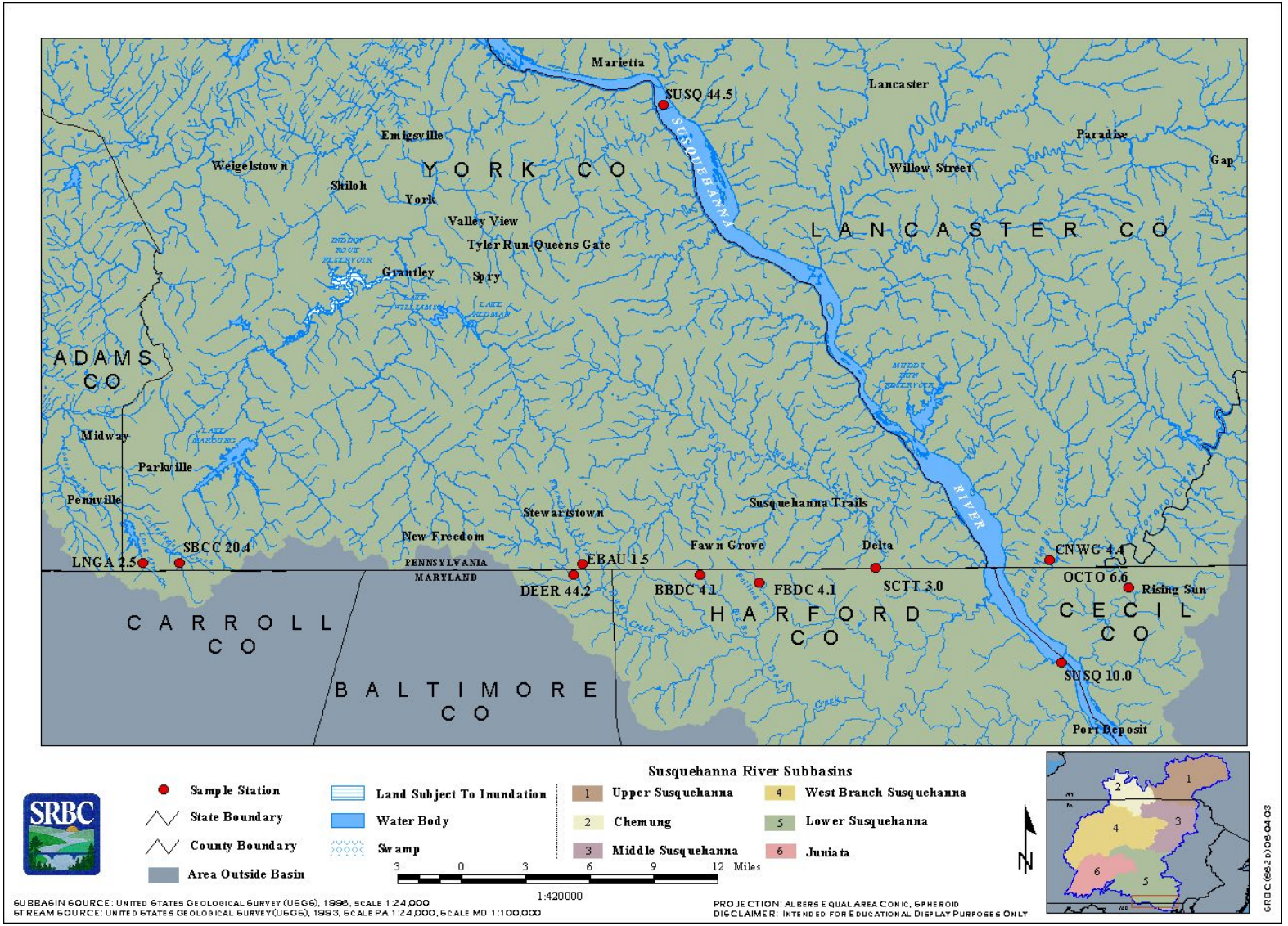

Figure 4. Interstate Streams along the Pennsylvania-Maryland Border

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

Macroinvertebrate and physical habitat sampling

SRBC staff collected benthic macroinvertebrate samples from Group 1 and Group 2 stations between July 23 and August 1, 2001, and from Group 3 streams between May 6 and 9, 2002. 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 isopropyl alcohol for later laboratory analysis.

In the laboratory, composite samples were sorted into 100-organism subsamples using a gridded pan and a random numbers table. The organisms contained in the subsamples were identified to genus (except Chironomidae and Oligochaeta) and enumerated using keys developed by Merrit and Cummins (1996), Peckarsky and others (1990), and Pennak (1989). Each taxon was assigned an organic pollution tolerance value and a functional feeding category as outlined in Appendix B. A taxa list for each station can be found in Appendix C.

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

Data Synthesis Methods

Chemical water quality

Results of laboratory analysis for chemical parameters were compared to New York, Pennsylvania, and Maryland State water quality standards. In addition, a simple WQI was calculated, using procedures established by McMorran and Bollinger (1990). The WQI was used to make comparisons between sampling periods and stations within the same geographical region; therefore, the water quality data were divided into two groups. One group contained stations along the 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 44.

Reference category designations

Four reference sites were included in this study. These four 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. Big Branch Deer Creek (BBDC 4.1) near Fawn Grove, Pa., served as the reference site for sampling stations located on the Pennsylvania-Maryland border. Big Branch Deer Creek had the best combination of biological, water quality, and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987). The Susquehanna River (SUSQ 365.0) at Windsor, N.Y., was used as the reference site for all of the Susquehanna River mainstem samples, as well as for Cowanesque River, Chemung River, and Tioga River sites. White Hollow (WHIT) near Wellsburg, N.Y., served as the reference site for the Group 3 sites as it had the best biological and habitat conditions of these sites.

Table 5. Criteria Used to Evaluate Physical Habitat

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

Table 5. Criteria Used to Evaluate Physical Habitat—Continued

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

Table 5. Criteria Used to Evaluate Physical Habitat—Continued

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

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

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

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

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

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

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

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

Source: Modified from Barbour and others, 1999.

Biological and physical habitat conditions

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

The 100-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

A long-term trend has been defined as a steady increase or decrease of a variable over time, as opposed to a change (step trend), which is a sudden difference in water quality associated with an event (Bauer and others, 1984). As the interstate streams data are not useful for analyzing step trends due to large drainage areas and insufficient information about discharges, only long-term trends were included in this study. Trends analysis was performed on Group 1 streams (see Table 1) for the following parameters: total suspended solids, total ammonia, total nitrogen, total phosphorus, total chloride, total sulfate, total iron, total manganese, total aluminum, and WQI. The period covered for the trends analysis was April 1986 through June 2002. Streams that have been recently added to the Group 1 sampling were not included in the trends analysis due to lack of historic seasonal data. Those steams were Bentley Creek, Cascade Creek, Little Snake Creek, Seeley Creek, and Long Arm Creek.

The nonparametric trend test used in this study was the Seasonal Kendall Test, which is described by Bauer and others (1984) and Smith and others (1982). The Seasonal Kendall Test was used to detect the presence or absence of monotonic trends in the parameters described above. This test is useful for testing trends of quarterly water quality samples with seasonal variability, because seasonality is removed by comparing data points only within the same quarter for all years in the data set. Outliers also do not present a problem, because the test only considers differences in the data points. The Seasonal Kendall Test also can be used with missing and censored data.

Differences in flow also can produce trends in water quality. To adjust the concentrations to compensate for flow, a technique known as Locally Weighted Scatterplot Smoothing (LOWESS), described by Hirsch and others (1991), was used. This technique flow-adjusts the concentrations by using the residual, the result of the actual observation minus the expected observation. The residuals were tested for trends using the Seasonal Kendall Test. Detailed descriptions of the procedures for Seasonal Kendall Test and LOWESS can be found in Trends in Nitrogen, Phosphorus, and Suspended Sediment in the Susquehanna River Basin, 1974-93 (Edwards, 1995).

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 100-organism subsample. Number decreases with increasing stress.
2. Shannon-Weaver 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. 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 100 organism subsample. Number decreases with increasing stress.
5. Percent Ephemeroptera (a)	The percentage of Ephemeroptera in a 100 organism subsample. Ratio decreases with increasing stress.
6. Percent Dominant Taxa (a)	A measure of community balance at the lowest positive taxonomic level. Percentage increases with increasing stress.
7. Percent Chironomidae (a)	The percentage of Chironomidae in a 100 organism subsample. Ratio increases with increasing stress.

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

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

SAMPLING AND ANALYSIS

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TOTAL BIOLOGICAL SCORE DETERMINATION

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

↓

BIOASSESSMENT

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

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

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

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

↓
↓
↓

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

RESULTS

Water Quality

During fiscal year 2002, water quality in approximately two-thirds of the Group 1 and Group 2 interstate streams continued to meet designated use classes and water quality standards (Table 9, Appendix D). Eleven out of the 30 sites had parameters exceeding water quality standards. The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Most of the samples in which total iron exceeded the standard were from the river sites. Only 25 out of 2,784 total observations exceeded 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 44.

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 9.

New York-Pennsylvania streams

New York-Pennsylvania sampling stations consisted of nine sites located near or on the New York-Pennsylvania border. The biological community of one (11.1 percent) of these streams was nonimpaired. Six streams were slightly impaired (66.7 percent), and two streams were moderately impaired (22.2 percent). None of the streams were severely impaired. Seven of the New York-Pennsylvania sites had excellent habitats (77.8 percent). Two sites (22.2 percent) had supporting habitats, and no sites had partially supporting or nonsupporting habitat. Holden Creek, Cascade Creek, Little Snake Creek, North Fork Cowanesque River, and Trowbridge Creek were not sampled for macroinvertebrates during the summer due to drought conditions. Cascade Creek and Little Snake Creek were sampled quarterly throughout the rest of the year for water quality.

Pennsylvania-Maryland streams

The Pennsylvania-Maryland interstate streams included eight stations located on or near the Pennsylvania-Maryland border. Five (62.5 percent) streams were designated non-impaired, using RBP III protocol designations. Three sites (37.5 percent) were slightly impaired, and none of the sites were moderately impaired or severely impaired. Five (62.5 percent) of the Pennsylvania-Maryland border sites had excellent habitats. Two sites (25 percent) had supporting habitats, and one site (12.5 percent) had partially supporting habitat. None of the sites was designated nonsupporting in habitat. Scott Creek, which was not sampled for macroinvertebrates due to drought conditions, was sampled throughout the rest of the year for water quality. Island Branch is not sampled due to its small size.

River sites

River sites consisted of ten 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. The biological communities of four out of nine sites (44.4 percent) were nonimpaired, three sites (33.3 percent) were slightly impaired, and two sites (22.2 percent) were moderately impaired. Six of the nine sites (66.7 percent) had excellent habitats. The remaining three sites (33.3 percent) were supporting.

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	87	4
pH	Pa. aquatic life N.Y. general	6.0-9.0 6.5-8.5	87 56	1 2
Dissolved Oxygen	Pa. aquatic life N.Y. trout waters	5.0 mg/l (CWF), 4.0 mg/l (WWF) 5.0 mg/l (trout), 4.0 mg/l (nontrout)	87 56	2 1
Dissolved Iron	Pa. aquatic life	0.3 mg/l	87	1
Total Iron	N.Y. aquatic (chronic)	300 µg/l	56	9
Total Aluminum	N.Y. aquatic (chronic)	100 µg/l	56	5

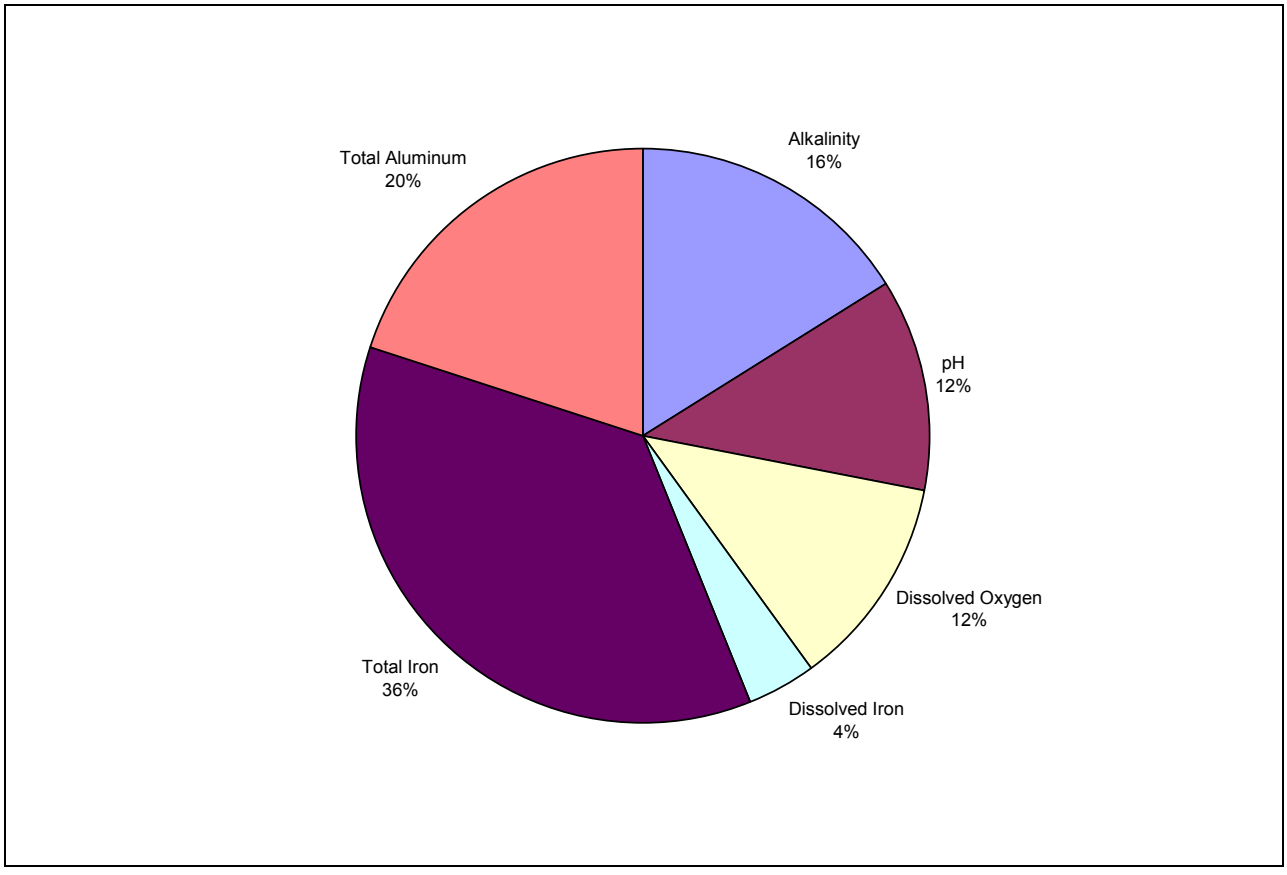


Figure 5. Parameters Exceeding Water Quality Standards

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

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	SEEL 10.3	SNAK 2.3	SOUT 7.8	TRUP 4.5	WAPP 2.6
Raw Summary									
Number of Individuals	144	141	140	158	257	152	149	121	145
% Shredders	0	2.1	0	1.9	0.4	0.7	0.7	0	0
% Collector-Gatherers	16.7	54.6	15	41.1	72.8	38.8	21.5	11.6	57.9
% Filterer-Collectors	63.9	29.1	34.3	39.9	15.6	40.1	55.7	40.5	30.3
% Scrapers	18.8	7.1	47.9	13.3	2.3	14.5	21.5	34.7	6.9
% Predators	0.7	7.1	2.9	3.8	8.9	5.9	0.7	13.2	4.8
Number of EPT Taxa	6	9	7	10	6	16	9	5	12
Number of EPT Individuals	93	74	54	74	49	86	92	54	54
Metric Scores									
Taxonomic Richness	12	16	16	20	15	25	15	14	19
Shannon Diversity Index	1.8	2.0	2.3	2.1	1.3	2.6	2.1	2.2	1.7
Modified Hilsenhoff Biotic Index	4.5	5.0	4.5	4.6	5.3	4.2	4.5	4.6	5.0
EPT Index	6	9	7	10	6	16	9	5	12
Percent Ephemeroptera	3.5	22.0	9.3	8.9	6.6	18.4	5.4	0.8	8.3
Percent Chironomidae	15.3	36.2	10.0	39.2	68.9	25.0	14.8	10.7	55.2
Percent Dominant Taxa	44.4	36.2	25.0	39.2	68.9	25.0	30.2	22.3	55.2
Percent of Reference or Percentage Score									
Taxonomic Richness	48	64	64	80	60	100	60	56	76
Shannon Diversity Index	70.7	78.4	87.6	80.6	49	100	82.4	84.7	64
Hilsenhoff Index	93.3	83	92.8	90.7	79.3	100	92.5	90.6	83.6
EPT Index	37.5	56.3	43.8	62.5	37.5	100	56.3	31.3	75
Percent Ephemeroptera	3.5	22	9.3	8.9	6.6	18.4	5.4	0.8	8.3
Percent Chironomidae	15.3	36.2	10	39.2	68.9	25	14.8	10.7	55.2
Percent Dominant Taxa	44.4	36.2	25	39.2	68.9	25	30.2	22.3	55.2
Biological Condition Scores									
Taxonomic Richness	2	4	4	6	4	6	4	2	4
Shannon Diversity Index	4	6	6	6	2	6	6	6	4
Hilsenhoff Index	6	4	6	6	4	6	6	6	4
EPT Index	0	0	0	0	0	6	0	0	2
Percent Ephemeroptera	2	4	2	2	2	4	2	0	2
Percent Chironomidae	4	0	4	0	0	2	4	4	0
Percent Dominant Taxa	0	2	4	2	0	4	4	4	0
Total Biological Score									
Total Biological Score	18	20	26	22	12	34	26	22	16
Biological % of Reference	52.9	58.8	76.5	64.7	35.3	100	76.5	64.7	47.1

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
Raw Summary								
Number of Individuals	151	135	173	156	131	162	117	119
% Shredders	12.6	3.7	1.7	0.6	11.5	4.3	3.4	17.6
% Collector-Gatherers	19.2	15.6	10.4	29.5	20.6	37.0	10.3	15.1
% Filterer-Collectors	21.9	23.0	33.5	43.6	15.3	27.2	73.5	26.9
% Scrapers	27.2	49.6	44.5	23.1	22.1	24.7	12.0	19.3
% Predators	19.2	8.1	9.8	3.2	30.5	6.8	0.9	21.0
Number of EPT Taxa	13	9	14	11	14	6	13	9
Number of EPT Individuals	78	55	76	104	53	71	93	60
Metric Scores								
Taxonomic Richness	22	18	25	19	29	17	23	17
Shannon Diversity Index	2.6	2.3	2.5	2.3	2.8	2.2	2.4	2.5
Modified Hilsenhoff Biotic Index	3.3	4.6	4.2	4.5	3.8	4.9	4.2	3.4
EPT Index	13	9	14	11	14	6	13	9
Percent Ephemeroptera	7.9	17.8	12.1	20.5	3.1	16.0	13.7	7.6
Percent Chironomidae	11.3	8.1	4.0	7.7	16.8	19.8	5.1	9.2
Percent Dominant Taxa	19.2	36.3	23.7	25.6	16.8	21.0	23.1	17.6
Percent of Reference or Percentage Score								
Taxonomic Richness	100	81.8	113.6	86.4	131.8	77.3	104.5	77.3
Shannon Diversity Index	100	85.1	93.9	87.7	105.6	84.6	92.6	93.9
Hilsenhoff Index	100	72.9	79.7	73.5	88	68	79.5	97.7
EPT Index	100	69.2	107.7	84.6	107.7	46.2	100	69.2
Percent Ephemeroptera	7.9	17.8	12.1	20.5	3.1	16	13.7	7.6
Percent Chironomidae	11.3	8.1	4	7.7	16.8	19.8	5.1	9.2
Percent Dominant Taxa	19.2	36.3	23.7	25.6	16.8	21	23.1	17.6
Biological Condition Scores								
Taxonomic Richness	6	6	6	6	6	4	6	4
Shannon Diversity Index	6	6	6	6	6	6	6	6
Hilsenhoff Index	6	4	4	4	6	2	4	6
EPT Index	6	0	6	4	6	0	6	0
Percent Ephemeroptera	2	4	4	4	2	4	4	2
Percent Chironomidae	4	4	6	4	4	4	4	4
Percent Dominant Taxa	6	2	4	4	6	4	4	6
Total Biological Score								
Total Biological Score	36	26	36	32	36	24	34	28
Biological % of Reference	100	72.2	100	88.9	100	66.7	94.4	77.8

Table 13. Summary of River RBP III Biological Data

	CHEM 12.0	COWN 1.0	COWN 2.2	COWN 5.0	SUSQ 289.1	SUSQ 340	SUSQ 365	SUSQ 44.5	TIOG 10.8
Raw Summary									
Number of Individuals	144	168	123	145	118	182	153	140	144
% Shredders	0	0.6	17.9	1.4	0	0	1.3	0.7	0.7
% Collector-Gatherers	16	47.6	28.5	17.2	9.3	10.4	19	11.4	25
% Filterer-Collectors	63.9	18.5	49.6	60.7	41.5	25.8	39.2	53.6	63.9
% Scrapers	16	29.8	0	17.9	44.9	52.2	28.1	33.6	4.9
% Predators	4.2	3.6	4.1	2.8	4.2	11.5	12.4	0.7	5.6
Number of EPT Taxa	12	5	2	8	13	8	12	11	9
Number of EPT Individuals	93	42	59	97	68	73	86	102	84
Metric Scores									
Taxonomic Richness	21	14	7	16	17	12	21	18	18
Shannon Diversity Index	2.5	1.7	1.3	2.1	2.2	1.9	2.4	2.3	2.2
Modified Hilsenhoff Biotic Index	4.5	5.2	5.5	4.2	4	4.3	4.1	4.5	4.9
EPT Index	12	5	2	8	13	8	12	11	9
Percent Ephemeroptera	24.3	5.4	0	20.7	25.4	7.1	20.3	26.4	10.4
Percent Chironomidae	13.2	42.3	28.5	16.6	0	7.7	13.1	0	22.9
Percent Dominant Taxa	16	42.3	47.2	19.3	36.4	44.5	19.6	24.3	22.9
Percent of Reference or Percentage Score									
Taxonomic Richness	100	66.7	33.3	76.2	81	57.1	100	85.7	85.7
Shannon Diversity Index	107	73.3	54.5	90.2	92.2	80.9	100	95.9	93.5
Hilsenhoff Index	90.6	78.1	73.6	97.8	101.6	95.6	100	91.4	82.2
EPT Index	100	41.7	16.7	66.7	108.3	66.7	100	91.7	75
Percent Ephemeroptera	24.3	5.4	0	20.7	25.4	7.1	20.3	26.4	10.4
Percent Chironomidae	13.2	42.3	28.5	16.6	0	7.7	13.1	0	22.9
Percent Dominant Taxa	16	42.3	47.2	19.3	36.4	44.5	19.6	24.3	22.9
Biological Condition Scores									
Taxonomic Richness	6	4	0	4	6	2	6	6	6
Shannon Diversity Index	6	4	4	6	6	6	6	6	6
Hilsenhoff Index	6	4	4	6	6	6	6	6	4
EPT Index	6	0	0	0	6	0	6	6	2
Percent Ephemeroptera	4	3	0	4	6	3	4	6	4
Percent Chironomidae	4	0	2	4	6	4	4	6	2
Percent Dominant Taxa	6	0	0	6	2	0	6	4	4
Total Biological Score									
Total Biological Score	38	15	10	30	38	21	38	40	28
Biological % of Reference	100	39.5	26.3	78.9	100	55.3	100	105.3	73.7

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	131	128	148	120	130	130	144	117	140	112	135
% Shredders	19.1	50	16.2	10.8	25.4	2.3	26.4	31.6	17.9	14.3	2.2
% Collector-Gatherers	54.2	29.7	42.6	27.5	20.8	46.9	63.2	25.6	50.7	34.8	46.7
% Filterer-Collectors	4.6	7.8	1.4	0	28.5	2.3	0.7	11.1	0.7	32.1	40
% Scrapers	3.8	2.3	33.1	45	6.2	3.1	1.4	24.8	7.9	6.3	9.6
% Predators	18.3	10.2	6.8	16.7	19.2	45.4	8.3	6.8	22.9	12.5	1.5
Number of EPT Taxa	11	13	14	11	9	14	10	14	13	14	5
Number of EPT Individuals	87	114	85	78	84	125	100	78	73	57	46
Metric Scores											
Taxonomic Richness	16	20	21	14	15	18	16	21	20	24	13
Shannon Diversity Index	2.2	2.1	2.4	2	2.1	1.6	2.2	2.5	2.3	2.6	1.7
Modified Hilsenhoff Biotic Index	2.4	1.3	3.5	2.6	4.3	0.5	2.6	2.7	3.8	3.6	5.4
EPT Index	11	13	14	11	9	14	10	14	13	14	5
Percent Ephemeroptera	30.5	25.8	34.5	49.2	10.8	48.5	36.1	24.8	16.4	9.8	3
Percent Chironomidae	26.7	5.5	16.2	23.3	10	1.5	25.7	10.3	37.1	26.8	45.9
Percent Dominant Taxa	26.7	31.3	20.3	29.2	24.6	42.3	25.7	16.2	37.1	26.8	45.9
Percent of Reference or Percentage Score											
Taxonomic Richness	69.6	87	91.3	60.9	65.2	78.3	69.6	91.3	87	104.3	56.5
Shannon Diversity Index	83.3	79.6	88	73.3	78.9	57.5	81.5	94	85.6	96	61.9
Hilsenhoff Index	65.8	120.6	45.3	61.6	37.3	313.5	62.3	58.9	41.5	44	29.6
EPT Index	68.8	81.3	87.5	68.8	56.3	87.5	62.5	87.5	81.3	87.5	31.3
Percent Ephemeroptera	30.5	25.8	34.5	49.2	10.8	48.5	36.1	24.8	16.4	9.8	3
Percent Chironomidae	26.7	5.5	16.2	23.3	10	1.5	25.7	10.3	37.1	26.8	45.9
Percent Dominant Taxa	26.7	31.3	20.3	29.2	24.6	42.3	25.7	16.2	37.1	26.8	45.9
Biological Condition Scores											
Taxonomic Richness	4	6	6	4	4	4	4	6	6	6	2
Shannon Diversity Index	6	6	6	4	6	4	6	6	6	6	4
Hilsenhoff Index	2	6	0	2	0	6	2	2	0	0	0
EPT Index	0	4	4	0	0	4	0	4	4	4	0
Percent Ephemeroptera	6	6	6	6	4	6	6	4	4	2	2
Percent Chironomidae	2	4	4	2	4	6	2	4	0	2	0
Percent Dominant Taxa	4	2	4	4	4	0	4	6	2	4	0
Total Biological Score											
Total Biological Score	24	34	30	22	22	30	24	32	22	24	8
Biological % of Reference	60	85	75	55	55	75	60	80	55	60	20

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	138	128	122	123	133	128	225	117	146	120
% Shredders	10.9	3.1	13.9	0	6	3.9	52.9	8.5	0	31.7
% Collector-Gatherers	67.4	51.6	43.4	88.6	53.4	62.5	24	34.2	44.5	18.3
% Filterer-Collectors	2.9	4.7	3.3	0	0	4.7	6.2	0.9	51.4	7.5
% Scrapers	0	10.2	4.1	5.7	0.8	11.7	1.8	53.8	2.7	5
% Predators	18.8	30.5	35.2	5.7	39.8	17.2	15.1	2.6	1.4	37.5
Number of EPT Taxa	4	15	18	8	11	11	8	8	6	16
Number of EPT Individuals	21	108	112	14	92	118	146	41	59	99
Metric Scores										
Taxonomic Richness	9	21	22	13	13	16	19	13	12	23
Shannon Diversity Index	1.3	2.4	2.2	0.8	1.9	1.9	2	1.6	1.7	2.7
Modified Hilsenhoff Biotic Index	5.2	2	1.2	5.4	2.3	0.8	3.2	3.7	5.7	1.6
EPT Index	4	15	18	8	11	11	8	8	6	16
Percent Ephemeroptera	5.1	53.1	41.8	8.1	25.6	71.9	2.7	24.8	1.4	18.3
Percent Chironomidae	62.3	5.5	3.3	83.7	28.6	1.6	21.3	9.4	42.5	4.2
Percent Dominant Taxa	62.3	25	32	83.7	30.1	50.8	38.2	52.1	42.5	14.2
Percent of Reference or Percentage Score										
Taxonomic Richness	39.1	91.3	95.7	56.5	56.5	69.6	82.6	56.5	52.2	100
Shannon Diversity Index	46.6	88	81.3	30.7	70.3	69.3	73.9	61.1	63.4	100
Hilsenhoff Index	30.5	81.2	132.1	29.2	70.6	199.7	49.2	43.5	28.1	100
EPT Index	25	93.8	112.5	50	68.8	68.8	50	50	37.5	100
Percent Ephemeroptera	5.1	53.1	41.8	8.1	25.6	71.9	2.7	24.8	1.4	18.3
Percent Chironomidae	62.3	5.5	3.3	83.7	28.6	1.6	21.3	9.4	42.5	4.2
Percent Dominant Taxa	62.3	25	32	83.7	30.1	50.8	38.2	52.1	42.5	14.2
Biological Condition Scores										
Taxonomic Richness	0	6	6	2	2	4	6	2	2	6
Shannon Diversity Index	2	6	6	2	4	4	4	4	4	6
Hilsenhoff Index	0	4	6	0	4	6	0	0	0	6
EPT Index	0	6	6	0	0	0	0	0	0	6
Percent Ephemeroptera	2	6	6	2	6	6	2	4	2	4
Percent Chironomidae	0	4	6	0	2	6	2	4	0	6
Percent Dominant Taxa	0	4	2	0	4	0	2	0	0	6
Total Biological Score										
Total Biological Score	4	36	38	6	22	26	16	14	8	40
Biological % of Reference	10	90	95	15	55	65	40	35	20	100

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

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	SEEL 10.3	SNAK 2.3	SOUT 7.8	TRUP 4.5	WAPP 2.6
Epifaunal Substrate	14	14	16	16	14	14	16	9	16
Instream Cover	12	9	14	11	9	14	11	11	12
Embeddedness/Pool Substrate	13	14	13	16	12	16	14	16	16
Velocity/Depth Regimes/Pool Variability	10	12	14	10	9	16	9	12	14
Sediment Deposition	14	9	13	16	9	15	14	12	16
Channel Flow Status	9	1	12	1	10	12	9	7	9
Channel Alteration	14	9	13	13	10	14	14	13	12
Frequency of Riffles/Channel Sinuosity	9	14	12	13	13	15	15	13	13
Condition of Banks	16	9	12	13	16	14	14	13	13
Left Bank	8	3	6	6	8	7	8	8	5
Right Bank	8	6	6	7	8	7	6	5	8
Vegetative Protective Cover	15	13	12	8	15	15	15	16	15
Left Bank	7	6	7	4	9	8	8	9	7
Right Bank	8	7	5	4	6	7	7	7	8
Riparian Vegetative Zone Width	4	6	7	4	12	6	4	6	8
Left Bank	2	3	6	2	8	3	2	3	4
Right Bank	2	3	1	2	4	3	2	3	4
Total Habitat Score									
Total Habitat Score	130	110	138	121	129	139	135	128	144
Habitat Percent of Reference	93.5	79.1	99.3	87.1	92.8	100	97.1	92.1	103.6

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
Epifaunal Substrate	16	16	15	14	15	12	16	16
Instream Cover	14	15	14	14	15	11	15	13
Embeddedness/Pool Substrate	15	13	13	12	13	10	13	13
Velocity/Depth Regimes/Pool Variability	13	16	14	13	10	12	16	14
Sediment Deposition	14	10	14	12	11	9	15	13
Channel Flow Status	12	12	13	14	12	13	14	13
Channel Alteration	14	15	15	14	15	14	15	15
Frequency of Riffles/Channel Sinuosity	16	14	12	16	13	10	16	15
Condition of Banks	15	14	12	16	15	9	16	16
Left Bank	7	6	6	8	8	5	8	8
Right Bank	8	8	6	8	7	4	8	8
Vegetative Protective Cover	16	16	9	16	16	12	16	16
Left Bank	8	8	6	8	8	6	8	8
Right Bank	8	8	3	8	8	6	8	8
Riparian Vegetative Zone Width	11	9	4	12	3	4	11	4
Left Bank	9	6	2	6	8	2	8	7
Right Bank	2	3	2	6	3	2	3	4
Total Habitat Score								
Total Habitat Score	156	150	135	153	138	116	163	148
Habitat Percent of Reference	100	96.2	86.5	98.1	88.5	74.4	104.5	94.9

Table 17. Summary of River Sites Physical Habitat Data

	CHEM 12.0	COWN 1.0	COWN 2.2	COWN 5.0	SUSQ 289.1	SUSQ 340	SUSQ 365	SUSQ 44.5	TIOG 10.8
Epifaunal Substrate	16	15	9	13	15	10	14	10	16
Instream Cover	14	13	9	13	13	13	16	13	15
Embeddedness/Pool Substrate	14	12	8	14	14	14	14	16	16
Velocity/Depth Regimes/Pool Variability	17	15	9	15	17	16	17	16	16
Sediment Deposition	14	14	14	14	14	13	13	14	14
Channel Flow Status	14	14	13	10	13	12	13	13	14
Channel Alteration	14	15	9	10	15	15	15	15	15
Frequency of Riffles/Channel Sinuosity	NA	13	9	11	16	10	15	13	16
Condition of Banks	17	15	17	14	16	15	16	16	16
Left Bank	9	8	9	7	8	8	8	8	7
Right Bank	8	7	8	7	8	7	8	8	9
Vegetative Protective Cover	15	16	17	15	15	16	16	13	18
Left Bank	8	9	9	6	8	9	8	5	9
Right Bank	7	7	8	9	7	7	8	8	9
Riparian Vegetative Zone Width	10	8	13	11	8	9	10	6	7
Left Bank	7	6	7	4	2	6	4	2	7
Right Bank	3	2	6	7	6	3	6	4	7
Total Habitat Score									
Total Habitat Score	145	150	127	140	156	131	159	145	163
Habitat Percent of Reference	91.2	94.3	79.9	88.1	98.1	82.4	100	91.2	102.5

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	9	19	18	18	18	16	17
Instream Cover	16	18	18	15	7	16	19	17	16	13	16
Embeddedness/Pool Substrate	16	17	15	17	11	18	14	11	16	14	14
Velocity/Depth Regimes/Pool Variability	15	18	16	11	15	16	18	9	16	11	18
Sediment Deposition	17	15	17	13	8	14	9	12	14	16	16
Channel Flow Status	13	15	17	16	16	9	13	15	15	15	9
Channel Alteration	14	18	15	16	16	10	19	16	12	18	13
Frequency of Riffles/Channel Sinuosity	18	18	18	18	5	18	18	17	18	17	18
Condition of Banks	11	10	19	11	14	8	16	11	11	16	16
Left Bank	3	5	10	2	10	3	9	8	4	7	8
Right Bank	8	5	9	9	4	5	7	3	7	9	8
Vegetative Protective Cover	17	12	19	11	15	10	18	14	11	15	16
Left Bank	9	6	10	2	8	5	9	7	5	7	8
Right Bank	8	6	9	9	7	5	9	7	6	8	8
Riparian Vegetative Zone Width	16	17	11	15	4	9	20	19	17	17	17
Left Bank	9	9	5	10	2	7	10	9	8	7	10
Right Bank	7	8	6	5	2	2	10	10	9	10	7
Total Habitat Score											
Total Habitat Score	162	176	183	161	120	147	172	159	149	168	170
Habitat Percent of Reference	91	98.9	102.8	90.4	67.4	82.6	96.6	89.3	83.7	94.4	95.5

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

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Epifaunal Substrate	14	19	18	16	18	18	17	18	11	16
Instream Cover	14	18	17	10	14	18	17	15	9	15
Embeddedness/Pool Substrate	11	18	16	15	19	18	9	13	6	18
Velocity/Depth Regimes/Pool Variability	9	15	11	17	9	17	8	9	18	17
Sediment Deposition	14	14	9	9	10	13	5	13	5	15
Channel Flow Status	15	15	11	12	8	15	10	15	18	16
Channel Alteration	6	16	18	11	12	9	18	11	12	17
Frequency of Riffles/Channel Sinuosity	14	19	17	9	18	16	15	18	11	16
Condition of Banks	15	9	4	5	7	10	18	18	16	14
Left Bank	7	4	2	3	3	5	9	9	10	6
Right Bank	8	5	2	2	4	5	9	9	6	8
Vegetative Protective Cover	14	12	9	6	12	12	17	9	15	14
Left Bank	7	6	5	4	6	6	9	5	7	7
Right Bank	7	6	4	2	6	6	8	4	8	7
Riparian Vegetative Zone Width	2	20	18	6	15	18	18	13	11	20
Left Bank	1	10	8	3	5	8	10	8	5	10
Right Bank	1	10	10	3	10	10	8	5	6	10
Total Habitat Score										
Total Habitat Score	128	175	148	116	142	164	152	137	132	178
Habitat Percent of Reference	71.9	98.3	83.1	65.2	79.8	92.1	85.4	77	74.2	100

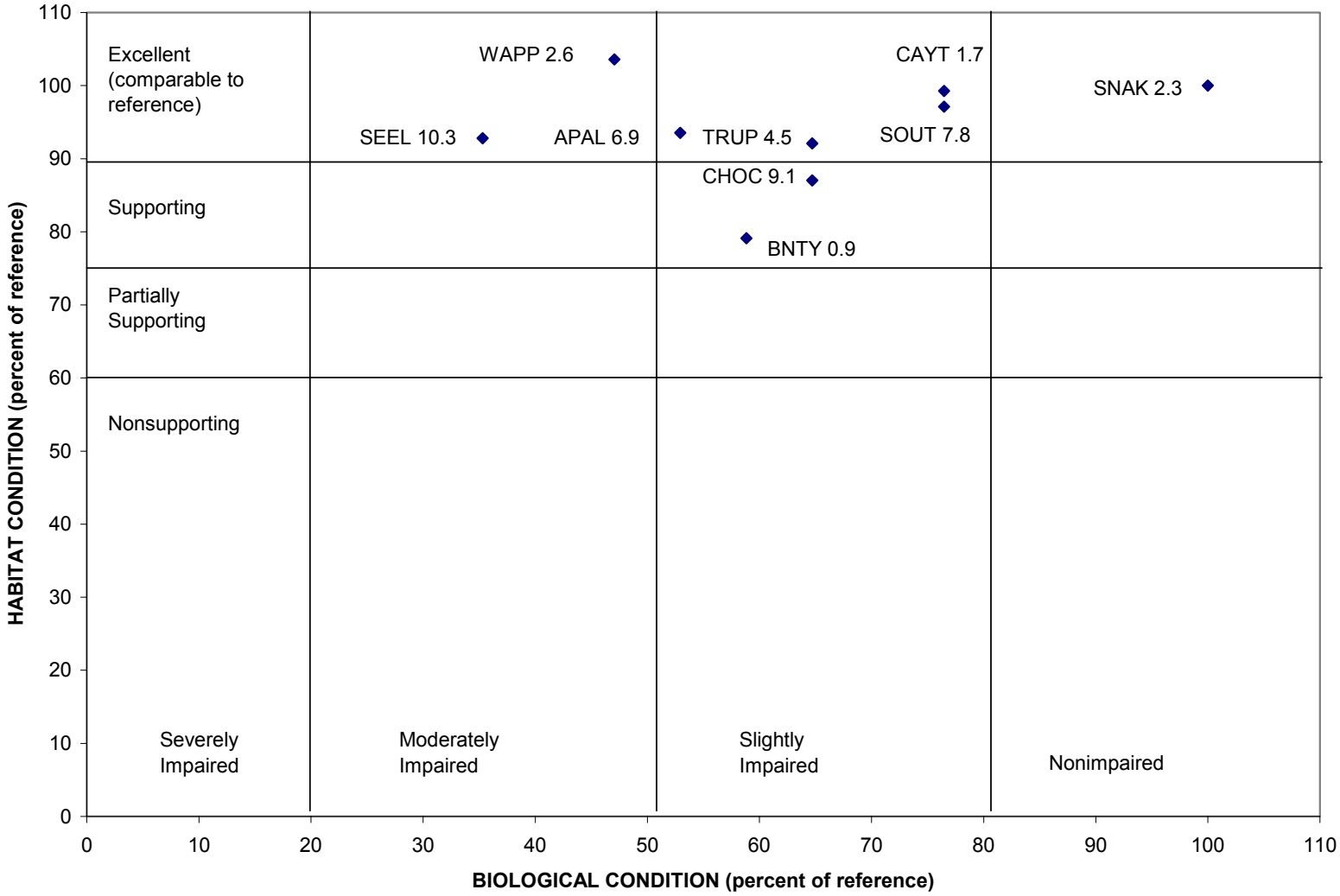


Figure 6. Summary of New York-Pennsylvania Border Streams Habitat and Biological Condition Scores

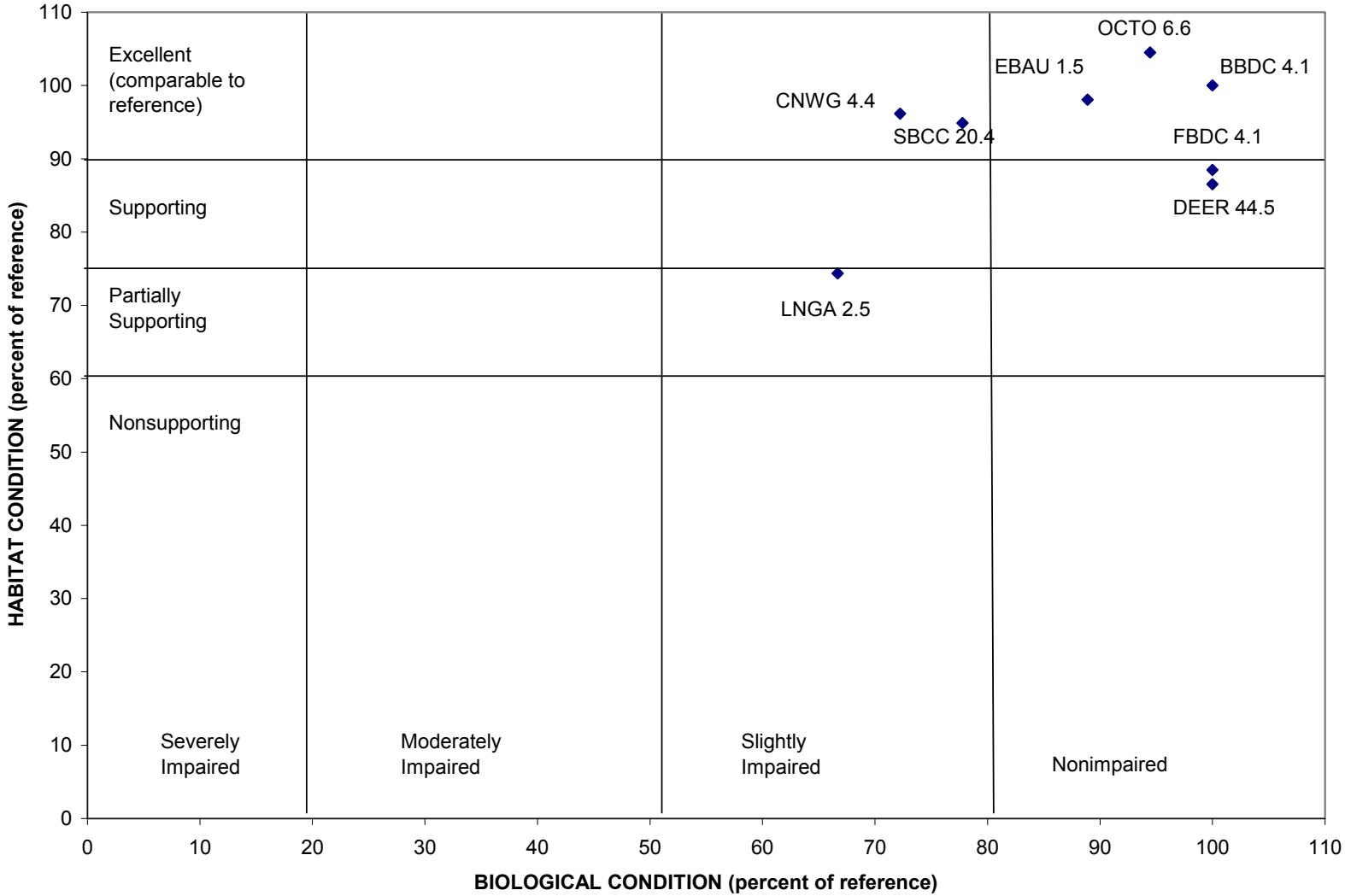


Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

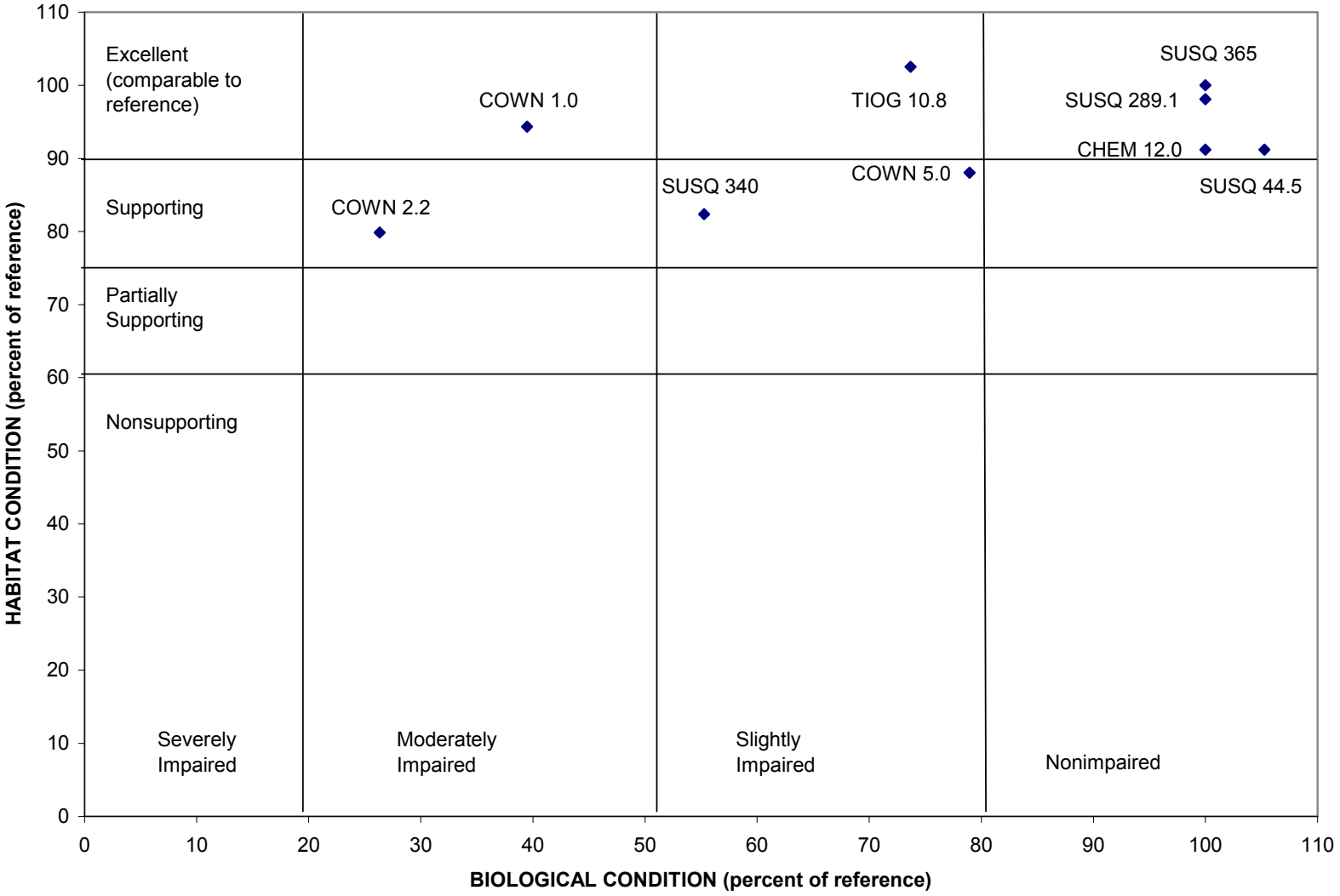


Figure 8. Summary of River Habitat and Biological Condition Scores

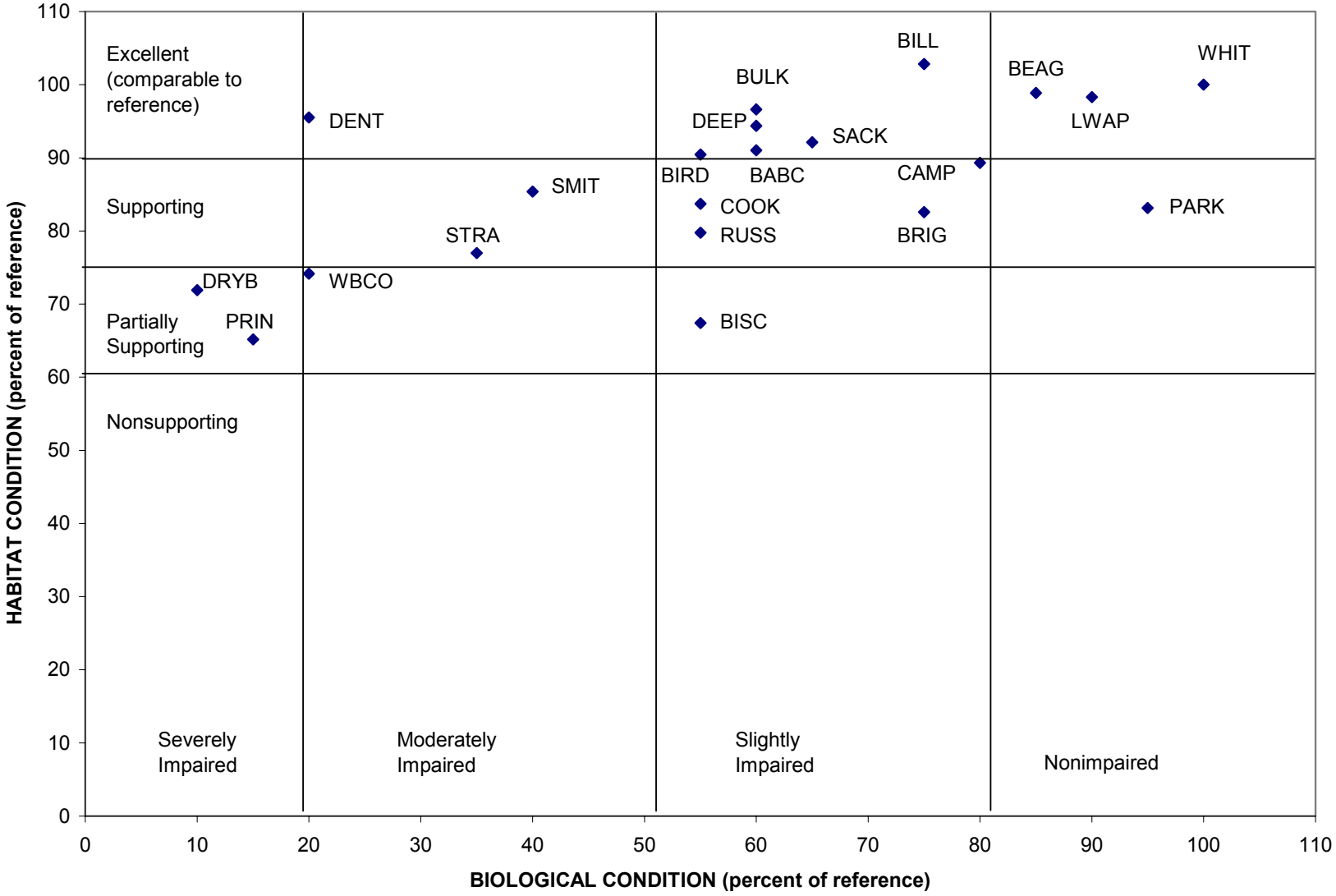


Figure 9. Summary of Group 3 Streams Habitat and Biological Condition Scores

Group 3 Sites

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Four of the 21 sites sampled (19 percent) had nonimpaired biological conditions. Eleven sites (52.4 percent) were slightly impaired, four sites (19 percent) were moderately impaired, and two sites (9.5 percent) were severely impaired. Ten (47.6 percent) of the Group 3 sites had excellent habitat scores. Seven sites (33.3 percent) had supporting habitat conditions. Four sites (19 percent) were designated partially supporting.

Trends Analysis

A summary of trend statistics is presented in Table 19. The statistical trends were simplified into trend categories: a highly significant ($p<0.05$) trend that was increasing (INC) or decreasing (DEC); a significant ($p<0.10$) trend that was increasing (inc) or decreasing (dec); or no trend (0). The trend categories are presented for both the concentration and the flow-adjusted concentrations. In Tables 20 and 21, weighted values were assigned for each station, and an average weighted value was calculated to indicate the strength of an overall trend for each variable. Each category was given a value: -2 for DEC, -1 for dec, 0 for 0, +1 for inc, and +2 for INC. An average value was calculated for each parameter. An analysis of "strong decreasing trend" required an average weighted value of less than –1.50. An analysis of "decreasing trend" required an average value between –1.00 and –1.50. Conversely, an average weighted value of greater than +1.50 represented a "strong increasing trend" and an average weighted value between +1.00 and +1.50 represented an "increasing trend." An analysis of no trend was indicated by a value of –1.00 to +1.00.

Detailed results of the Seasonal Kendall Test are presented in Appendix E, Tables E1-E8. The statistics include the probability, (P), slope estimate (b), Kendall's Tau median, and percent slope. The median was calculated from the median of the entire quarterly time series. The percent slope was expressed in percent of the median concentration per year and was calculated by dividing the slope (b) by the median and multiplying by 100. The percent slope identifies those stations for which trend slope (b) is large with respect to the median value. Table 55 provides a summary of detected trends and overall direction.

Total suspended solids

Trend analysis results for total suspended solids are presented in Appendix E, Table E1. Concentration values at the stations showed strong, increasing trends at Cowanesque River and Deer Creek, and increasing trends at Chemung River, Susquehanna River sites 44.5, 340, 365, and Troups Creek. Only one decreasing trend was calculated at Tioga River for concentration analysis, and no decreasing trends were calculated for flow-adjusted concentration analysis. Two strong, increasing trends at Deer Creek and Susquehanna River 365 and one increasing trend at Octoraro Creek were calculated for flow-adjusted concentration analysis (Table 19). There were no overall trends for unadjusted concentrations or flow-adjusted concentrations, indicated by weighted average values of 0.53 and 0.33 (Tables 20 and 21, respectively).

Total ammonia

Total ammonia trend analysis results are presented in Appendix E, Table E2. Concentration values showed strongly decreasing values at all sites except Scott Creek and Troups Creek, which had values of zero (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Cayuta Creek, Chemung River, Ebaughs Creek, Tioga River, and Susquehanna River sites 44.5, 289.1, 340, and 365, and decreasing trends at Cowanesque River, Deer Creek, and Susquehanna River site 10.0 (Table 19). There was an overall strong decreasing trend in concentration with a weighted value of –1.73 (Table 20), and a decreasing trend with a weighted value of –1.27 in flow-adjusted concentrations (Table 21).

Total nitrogen

The results of trend analysis for total nitrogen are presented in Appendix E, Table E3. Concentration values at the Group 1 stations showed strongly decreasing trends at Chemung River, Cowanesque River, Tioga River, Troups Creek, and Susquehanna River sites 10.0, 289.1, 340, and 365, decreasing trends at Cayuta Creek, a strongly increasing trend at Conowingo Creek, and an increasing trend at Deer Creek (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, Tioga River, and Susquehanna River sites 10.0, 289.1, 340, and 365. A decreasing trend was found at Scott Creek. A strongly increasing trend occurred at Conowingo Creek (Table 19). Overall, there was no trend in concentration, and a decreasing trend in flow-adjusted concentrations, with average weighted values of –0.93 and –1.00, respectively (Tables 20 and 21). Note that a strong increasing trend for total nitrogen in both concentration and flow-adjusted concentration was found in Conowingo Creek, which is a Pennsylvania-Maryland border stream heavily influenced by agriculture.

Total phosphorus

Trend analysis results for total phosphorus are presented in Appendix E, Table E4. Concentration values showed strongly decreasing trends at all sites except Chemung River, which had a decreasing trend, and Ebaughs Creek and Scott Creek, which had no trend (Table 19). Flow-adjusted concentrations showed strongly decreasing trends at Cayuta Creek, Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, 289.1, 340, and 365. Decreasing trends were found at Cowanesque River and Scott Creek, and an increasing trend at Troups Creek (Table 19). Overall, there were strong decreasing trends in unadjusted phosphorus concentrations (average value = -1.67) and flow-adjusted concentrations (average value = -1.53) (Tables 20 and 21). The decreasing trend may be due to a decrease of phosphates in detergents, to the application of agricultural Best Management Practices (BMPs), and to the upgrade of wastewater treatment plants.

Total chloride

The results of trend analysis for total chloride are presented in Appendix E, Table E5. Concentration values showed strongly increasing trends in all sites, except Scott Creek and Tioga River, which had no trends (Table 19). Flow-adjusted concentrations indicated strongly increasing trends at Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, and Susquehanna River sites 10.0, 44.5, 289.1, 340, and 365, and an increasing trend at Ebaughs Creek (Table 19). Overall, there was a strong, increasing trend in concentration (average weighted value = 1.73) and an increasing trend in flow-adjusted concentrations, (average weighted value = 1.27) (Tables 20 and 21).

Total sulfate

Trend analysis results for total sulfate are presented in Appendix E, Table E6. Concentration values at the stations showed strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, and Tioga River, a decreasing trend at Troups Creek, and strongly increasing trends at Deer Creek and Ebaughs Creek (Table 19). Strongly decreasing trends were found at Cayuta Creek, Chemung River, Cowanesque River, Susquehanna River site 44.5, and Tioga River, decreasing trends at Scott Creek and Troups Creek, and increasing trends at Deer Creek and Ebaughs Creek indicated by flow-adjusted concentrations (Table 19). There were no overall trends in concentrations and flow-adjusted concentrations, with weighted values of -0.33 and –0.67, respectively (Tables 20 and 21).

Total iron

Total iron trend analysis results are found in Appendix E, Table E7. Group 1 concentration values showed strongly decreasing trends at all sites, except Cowanesque River, Scott Creek, and Troups Creek, which had no significant trends (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Chemung River, Conowingo Creek, Deer Creek, Ebaughs

Creek, and all Susquehanna River sites, and decreasing trends at Octoraro Creek and Scott Creek (Table 19). Overall, there was a strongly decreasing trend in unadjusted concentrations (average value = -1.60), and a decreasing trend in flow-adjusted concentrations for iron (average value = -1.33) (Tables 20 and 21).

Total aluminum

The results of trend analysis for total aluminum are presented in Appendix E, Table E8. Concentration values at the Group 1 stations showed strongly decreasing trends at Conowingo Creek, Octoraro Creek, and Susquehanna River sites 10.0 and 44.5, a decreasing trend at Susquehanna River site 289.1, and an increasing trend at Scott Creek (Table 19). Flow-adjusted concentration values showed strongly decreasing trends at Conowingo Creek, and Susquehanna River sites 10.0, 44.5, and 289.1, a decreasing trend at Susquehanna River site 365.0, and a strongly increasing trend at Tioga River (Table 19). There was no overall trend in either concentrations or flow-adjusted concentrations, indicated by a weighted value of -0.53 and -0.47, respectively (Tables 20 and 21).

Total manganese

Trend analysis results for total manganese are presented in Appendix E, Table E9. Concentration values showed strongly decreasing trends at Cayuta Creek, Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, Scott Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, 289.1, and 365. The only increasing trend was a strongly increasing trend at Cowanesque River (Table 19). Flow-adjusted concentrations showed strongly decreasing tends at Cayuta Creek, Chemung River, Deer Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, and 289.1, and decreasing trends at Conowingo Creek, Ebaughs Creek, and Scott Creek (Table 19). Overall, there were decreasing trends in unadjusted and flow-adjusted manganese concentrations with average values of -1.33 and -1.13, respectively (Tables 20 and 21).

Water quality index

Trend analysis results for the WQI are presented in Appendix E, Table E10. Only a few strongly increasing trends were calculated for WQI. Concentration values showed a strongly increasing trend at Ebaughs Creek, and flow-adjusted concentrations had strongly increasing trends at Deer Creek, Ebaughs Creek, and Troups Creek (Table 19). There were no overall trends for WQI values with an average weighted value of 0.13 for concentrations and an average weighted value of 0.4 for flow-adjusted concentrations (Tables 20 and 21).

Table 19. Trend Summary of Selected Parameters for Group 1 Streams, 1986-2002

Site	Total Solids		Total Ammonia		Total Nitrogen		Total Phosphorus		Total Chloride		Total Sulfate		Total Iron		Total Aluminum		Total Manganese		WQI	
	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC
Cayuta Creek	0	0	DEC	DEC	dec	DEC	DEC	DEC	INC	0	DEC	DEC	DEC	0	0	0	DEC	DEC	0	0
Chemung River	inc	0	DEC	DEC	DEC	DEC	dec	DEC	INC	INC	DEC	DEC	DEC	DEC	0	0	DEC	DEC	0	0
Conowingo Creek	0	0	DEC	0	INC	INC	DEC	DEC	INC	INC	0	0	DEC	DEC	DEC	DEC	DEC	dec	0	0
Cowanesque River	INC	0	DEC	dec	DEC	DEC	DEC	dec	INC	0	DEC	DEC	0	0	0	0	INC	0	0	0
Deer Creek	INC	INC	DEC	dec	inc	0	DEC	DEC	INC	INC	INC	inc	DEC	DEC	0	0	DEC	DEC	0	INC
Ebaughs Creek	0	0	DEC	DEC	0	0	0	0	INC	inc	INC	inc	DEC	DEC	0	0	0	dec	INC	INC
Octoraro Creek	0	inc	DEC	0	0	0	DEC	DEC	INC	INC	0	0	DEC	dec	DEC	0	DEC	0	0	0
Scott Creek	0	0	0	0	0	dec	0	dec	0	0	0	dec	0	dec	inc	0	DEC	dec	0	0
Susquehanna River 10.0	0	0	DEC	dec	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	DEC	DEC	DEC	DEC	0	0
Susquehanna River 44.5	inc	0	DEC	DEC	0	0	DEC	DEC	INC	INC	0	DEC	DEC	DEC	DEC	DEC	DEC	DEC	0	0
Susquehanna River 289.1	0	0	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	dec	DEC	DEC	DEC	0	0
Susquehanna River 340	inc	0	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	0	0	0	0	0	0
Susquehanna River 365	inc	INC	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	0	dec	DEC	0	0	0
Tioga River	dec	0	DEC	DEC	DEC	DEC	DEC	DEC	0	0	DEC	DEC	DEC	0	0	INC	DEC	DEC	0	0
Troups Creek	inc	0	0	0	DEC	0	DEC	inc	INC	0	dec	dec	0	0	0	0	0	0	0	INC

INC	Strong, Significant Increasing Trend; Probability < 5 %
inc	Significant Increasing Trend; 5 % < Probability < 10 %
O	No Significant Trend; Probability > 10%
dec	Significant Decreasing Trend; 5 % < Probability < 10 %
DEC	Strong, Significant Decreasing Trend; Probability < 5 %
CONC	Concentrations
FAC	Flow-Adjusted Concentrations

Table 20. Trend Category Counts and Weighted Values of Concentrations for Group 1 Streams

Concentration	Trend Category Count						Weighted Values						
	DEC	dec	0	inc	INC	Total	DEC	dec	0	inc	INC	SUM	Average Value*
Total Solids	0	1	7	5	2	15	0	-1	0	5	4	8	0.53
Total Ammonia	13	0	2	0	0	15	-26	0	0	0	0	-26	-1.73
Total Nitrogen	8	1	4	1	1	15	-16	-1	0	1	2	-14	-0.93
Total Phosphorus	12	1	2	0	0	15	-24	-1	0	0	0	-25	-1.67
Total Chlorides	0	0	2	0	13	15	0	0	0	0	26	26	1.73
Total Sulfate	4	1	8	0	2	15	-8	-1	0	0	4	-5	-0.33
Total Iron	12	0	3	0	0	15	-24	0	0	0	0	-24	-1.6
Total Aluminum	4	1	9	1	0	15	-8	-1	0	1	0	-8	-0.53
Total Manganese	11	0	3	0	1	15	-22	0	0	0	2	-20	-1.33
Water Quality Index	0	0	14	0	1	15	0	0	0	0	2	2	0.13

DEC = -2 each
dec = -1 each
0 = 0 each
inc = 1 each
INC = 2 each

*Average Value	
< - 1.50	Strong Decreasing Trend
-1.5 to -1.00	Decreasing Trend
-1.00 to 1.00	No Trend
1.00 to 1.50	Increasing Trend
>1.50	Strong Increasing Trend

Table 21. Trend Category Counts and Weighted Values of Flow-Adjusted Concentrations for Group 1 Streams

Concentration	Trend Category Count						Weighted Values						
	DEC	dec	0	inc	INC	Total	DEC	dec	0	inc	INC	SUM	Average Value*
Total Solids	0	0	12	1	2	15	0	0	0	1	4	5	0.33
Total Ammonia	8	3	4	0	0	15	-16	-3	0	0	0	-19	-1.27
Total Nitrogen	8	1	5	0	1	15	-16	-1	0	0	2	-15	-1.00
Total Phosphorus	11	2	1	1	0	15	-22	-2	0	1	0	-23	-1.53
Total Chlorides	0	0	5	1	9	15	0	0	0	1	18	19	1.27
Total Sulfate	5	2	6	2	0	15	-10	-2	0	2	0	-10	-0.67
Total Iron	9	2	4	0	0	15	-18	-2	0	0	0	-20	-1.33
Total Aluminum	4	1	9	0	1	15	-8	-1	0	0	2	-7	-0.47
Total Manganese	7	3	5	0	0	15	-14	-3	0	0	0	-17	-1.13
Water Quality Index	0	0	12	0	3	15	0	0	0	0	6	6	0.4

DEC = -2 each
dec = -1 each
0 = 0 each
inc = 1 each
INC =2 each

*Average Value	
< - 1.50	Strong Decreasing Trend
-1.5 to -1.00	Decreasing Trend
-1.00 to 1.00	No Trend
1.00 to 1.50	Increasing Trend
>1.50	Strong Increasing Trend

BIOASSESSMENT OF INTERSTATE STREAMS

Abbreviations for water quality standards are provided in Table 22. 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 2002 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 slightly impaired biological community during fiscal year 2002, degraded from a nonimpaired designation the previous year. The number of taxa and diversity index score were much lower than the previous year. In fact, the number of taxa was half the number of the previous year (12 versus 24), and it was the lowest score of all the New York-Pennsylvania border streams (Table 23).

Total iron exceeded water quality standards during July 2001, as in July 1999 and 2000. Total and dissolved iron, total and dissolved ammonia, and total and dissolved manganese exceeded the 90th percentile. The WQI increased slightly from the previous year as it has done over the past five years (Table 23).

Bentley Creek (BNTY 0.9)

A slightly impaired biological community existed at Bentley Creek at Wellsburg, N.Y., (BNTY 0.9). Biological conditions at BNTY 0.9 have been impaired for the past 11 years. This could be due to heavy disturbances caused by dredging and the unstable nature of this glacial stream. The habitat assessment scores were lower in channel alteration, sediment deposition, instream cover, channel flow status, condition of banks, and vegetated riparian zone width. The Bradford County Conservation District in Pennsylvania and the U.S. Fish and Wildlife Service are conducting a stream stabilization project on this stream. Rock structures, such as cross vanes and single rock vanes, have been constructed into 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 concentrations exceeded New York standards during February and May 2000, but no values exceeding standards were found in fiscal year 2001 or 2002 (Table 24).

Cascade Creek (CASC 1.6)

Cascade Creek at Lanesboro, Pa., (CASC 1.6) was not sampled for macroinvertebrates and water quality in July 2001 due to drought conditions.

Cascade Creek was added to the Group 1 streams during the 2000 sampling season to monitor conditions in the stream during the winter months. Water quality standards for total iron, dissolved iron, and alkalinity were exceeded during the 2000-2001 and 2001-2002 sampling period (Table 25). Iron values fluctuated throughout the year and were highest during the November sampling, which was also the sample with the lowest corresponding flow.

Cayuta Creek (CAYT 1.7)

Biological conditions of Cayuta Creek at Waverly, N.Y., (CAYT 1.7) were designated slightly impaired, same as the two previous years. This site had the lowest percentage of Chironomidae (10 percent) compared to the other New York-Pennsylvania border streams. Even though no water quality standards were exceeded at CAYT 1.7, this site had the highest values of total chloride (104 milligrams per liter (mg/l)), conductivity (642 micromhos/centimeter (µmhos/cm)), total phosphorus (0.17 mg/l), dissolved phosphorus (0.142 mg/l), dissolved orthophosphate (0.14 mg/l), and total orthophosphate (0.148 mg/l) of all interstate streams in fiscal year 2002 (Table A1). Many parameters exceeded the 90th percentile including dissolved oxygen, conductivity, total and

dissolved nitrates, total and dissolved phosphorus, total and dissolved orthophosphate, total chloride, total and dissolved nitrogen, and total and dissolved solids (Table 26). The total chlorine values were 0.09 mg/l in July, 0.11 mg/l in November, and 0.1 mg/l in February and April.

Poor water quality conditions may be due to a variety of causes, including wastewater discharges from the Waverly sewage treatment facility, runoff from the city of Waverly, failure of upstream septic systems, or agriculture. More detailed studies would need to be performed in order to determine the cause of impairment.

Cayuta Creek showed 11 decreasing trends and only one increasing trend for total concentrations. Total nitrogen showed a significant decreasing trend ($0.05<p<0.10$), while strong, significant decreasing trends ($p<0.05$) were observed for total ammonia, total phosphorus, total sulfate, total iron, and total manganese (Table 19). A strong, increasing trend was calculated only for total chloride. When flow-adjusted concentrations were calculated, total ammonia, total nitrogen, total phosphorus, total sulfate, and total manganese showed strong, significant, decreasing trends (Table 19).

Choconut Creek (CHOC 9.1)

The biological index score for Choconut Creek at Vestal Center, N.Y., (CHOC 9.1) has been decreasing over the past five years. After four years of being designated nonimpaired, the designation changed to slightly impaired in fiscal year 2002. Some of the organic pollution intolerant taxa present in fiscal year 2001, that were not found in the fiscal year 2002 sample, included *Stenonema* (Ephemeroptera: Heptageniidae), *Nigronia* (Megaloptera: Corydalidae), *Ophiogomphus* (Odonata: Gomphidae), and *Agnetina* (Plecoptera: Perlidae). The habitat was rated supporting with low ratings for riparian vegetative zone and vegetative protective cover.

No parameters exceeded standards during July 2001, although the WQI was slightly higher than it has been in the past four years. No parameters exceeded the 90th percentile (Table 27). Large amounts of riprap were present at this site, and upstream hay fields recently had been mowed, which decreased the habitat rating.

Little Snake Creek (LSNK 7.6)

Little Snake Creek at Brackney, Pa., (LSNK 7.6) was not sampled for macroinvertebrates in July 2002 due to drought conditions. Water quality values exceeded standards for total iron and alkalinity (Table 28). Total iron values were lower than in fiscal year 2001, and total aluminum did not exceed standards as it did in fiscal year 2001.

Table 22. Abbreviations Used in Tables 23 Through 53

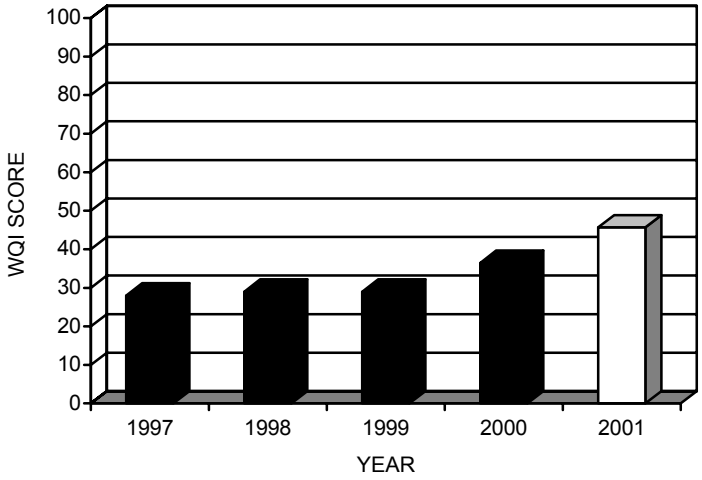
Abbreviation	Parameter	Abbreviation	Parameter
ALK	Alkalinity	DNO3	Dissolved Nitrate
COND	Conductivity	TNO3	Total Nitrate
DAl	Dissolved Aluminum	DN	Dissolved Nitrogen
TAl	Total Aluminum	TN	Total Nitrogen
TCa	Total Calcium	DO	Dissolved Oxygen
TCl	Total Chloride	DP	Dissolved Phosphorus
DFe	Dissolved Iron	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
		RBP	Rapid Bioassessment Protocol

Table 23. Water Quality Summary Apalachin Creek at Little Meadows, Pa.

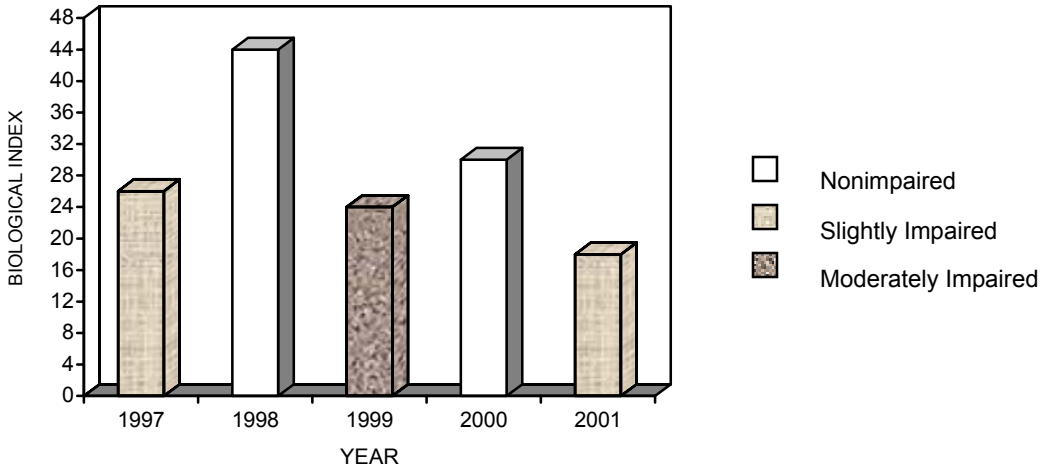
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/25/01	598 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/25/01	45.7	DNH3	TNH3	TFE	DFE	TMN	DMN		

Biological and Habitat Summary	
Number of Taxa	12
Diversity Index	1.83
RBP Score	18
RBP Condition	Slightly Impaired
Total Habitat Score	130
Habitat Condition Category	Excellent



Water Quality Index



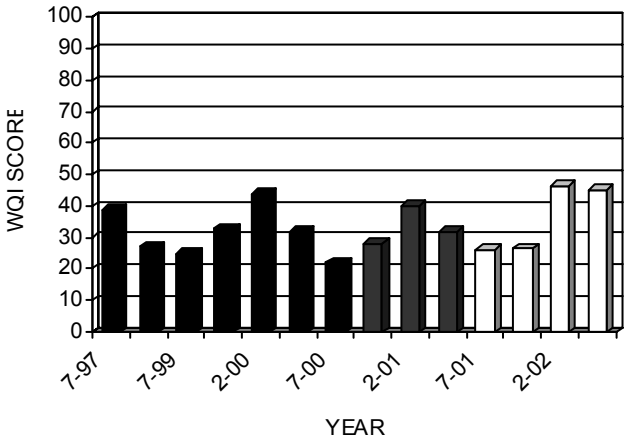
Biological Index

Table 24. Water Quality Summary Bentley Creek at Wellsburg, N.Y.

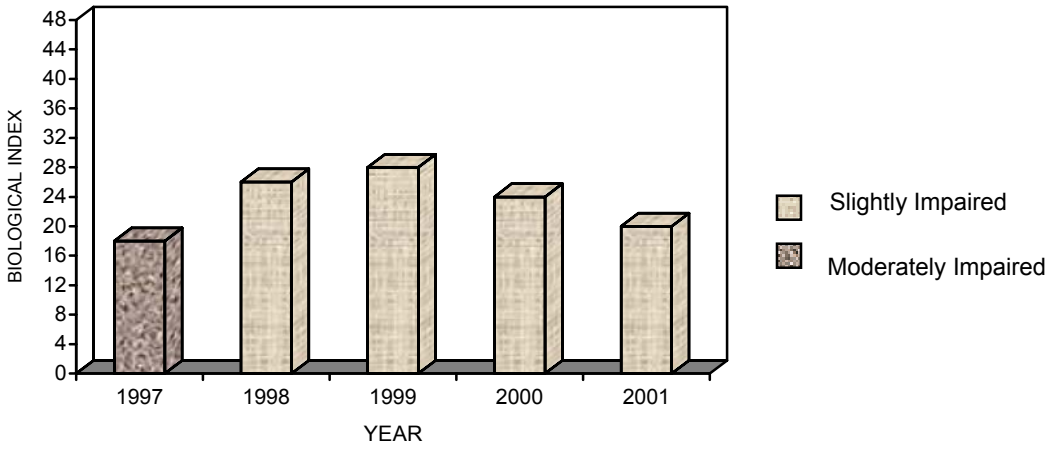
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	26.3	None							
11/06/01	26.7	None							
02/26/02	46.5	DO							
04/23/02	45.2	None							

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	2.0
RBP III Score	20
RBP III Condition	Slightly Impaired
Total Habitat Score	110
Habitat Condition Category	Supporting



Water Quality Index



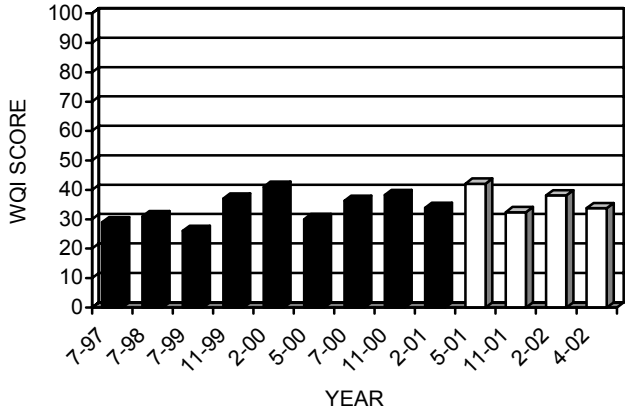
Biological Index

Table 25. Water Quality Summary Cascade Creek at Lanesboro, Pa.

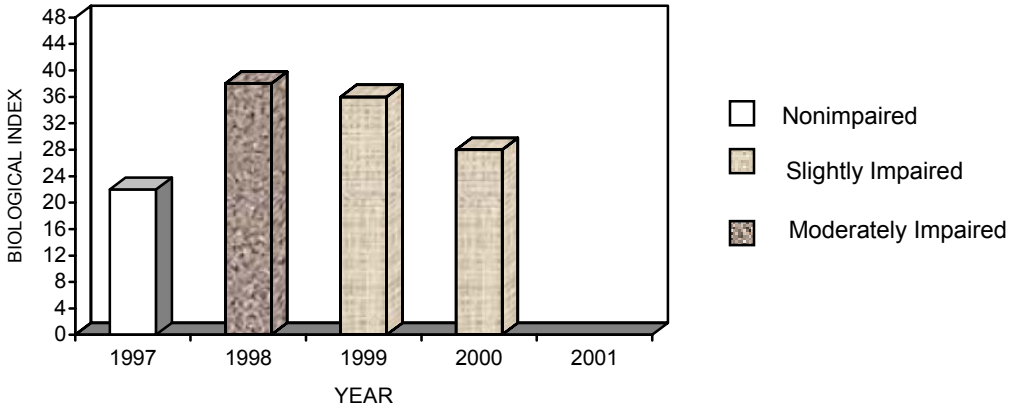
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DFe	11/05/01	421 µg/l	300 µg/l	Pa. aquatic life
TFe	11/05/01	750 µg/l	300 µg/l	N.Y. aquatic (chronic)
ALK	02/25/02	16 mg/l	20 mg/l	Pa. aquatic life
ALK	04/22/02	18 mg/l	20 mg/l	Pa. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
11/05/01	32.4	TFe	DFe						
02/25/02	38.1	DO							
04/22/02	33.8								

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



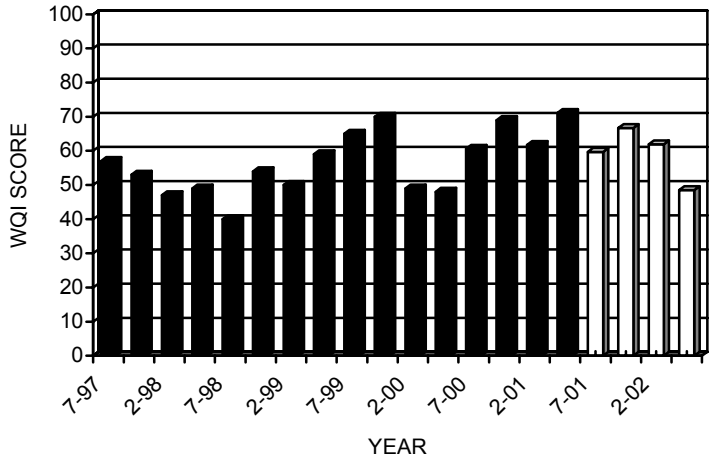
Biological Index

Table 26. Water Quality Summary Cayuta Creek at Waverly, N.Y.

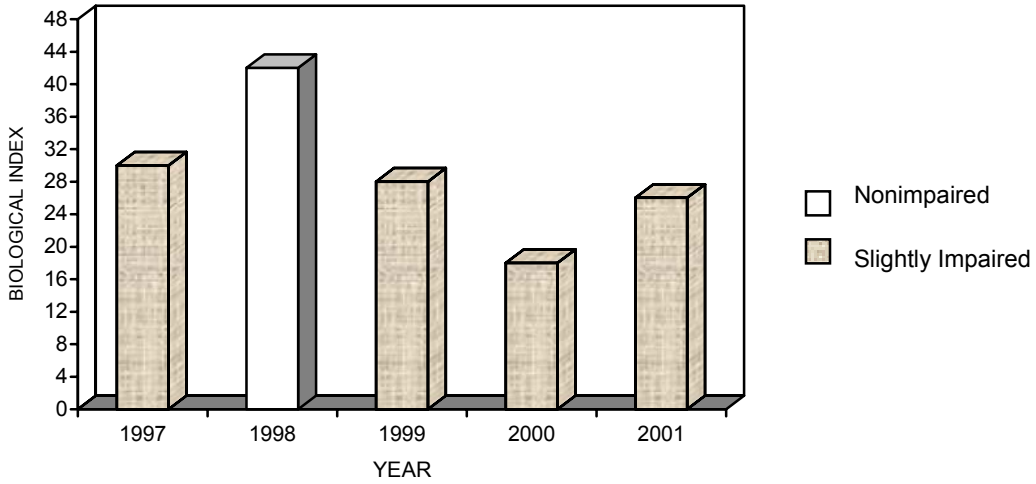
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	59.7	COND	DS	TS	DP	TP	DPO4	TPO4	TCl
11/06/01	66.7	COND	DS	TS	DN	TN	DNO3	TNO3	DP
		TP	DPO4	TPO4	TCl				
02/26/02	61.9	DO	DP	TP	DPO4	TPO4			
04/23/02	48.5	None							

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	2.3
RBP Score	26
RBP Condition	Slightly Impaired
Total Habitat Score	138
Habitat Condition Category	Excellent



Water Quality Index



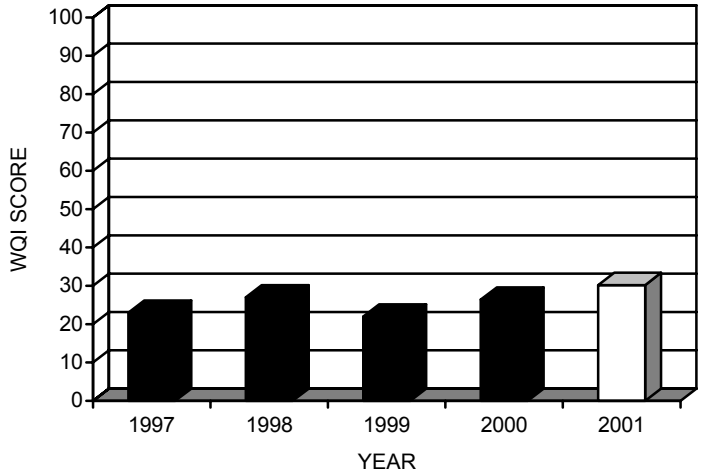
Biological Index

Table 27. Water Quality Summary Choconut Creek at Vestal Center, N.Y.

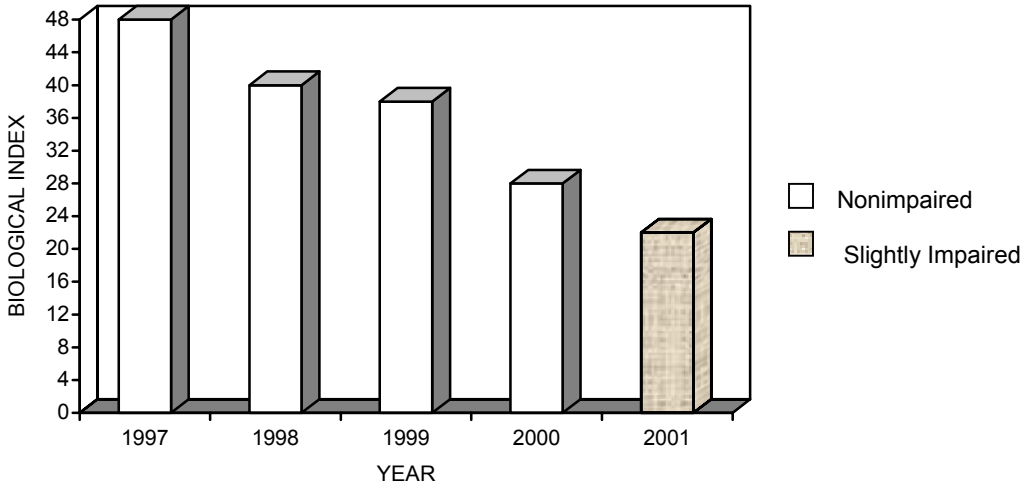
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/25/01	30.2	None							

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.1
RBP Score	22
RBP Condition	Slightly Impaired
Total Habitat Score	121
Habitat Condition Category	Supporting



Water Quality Index



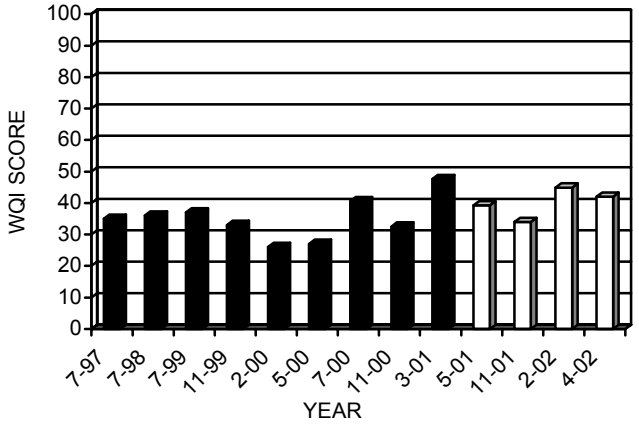
Biological Index

Table 28. Water Quality Summary Little Snake Creek at Brackney, Pa.

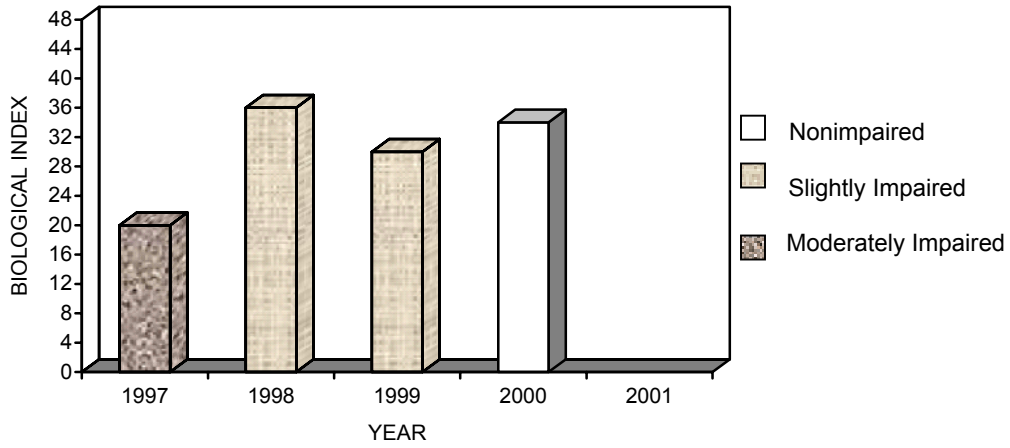
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	11/05/01	390 µg/l	300 µg/l	N.Y. aquatic (chronic)
ALK	02/25/02	18 mg/l	20 mg/l	Pa. aquatic life
TFe	04/22/02	308 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
11/05/01	34.0	None							
02/25/02	44.9	DO	DFe						
04/22/02	42.0	DFe							

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

Seeley Creek (SEEL 10.3)

During the 1999-2000 sampling season, Seeley Creek was added to the Group 1 streams in the ISWQN. Seeley Creek at Seeley Creek, N.Y., (SEEL 10.3) contained a moderately impaired biological community for the past five years. In July 2001, this site scored the worst of the New York-Pennsylvania border streams in Hilsenhoff Index (5.29), percent dominant taxa (68.9 percent), percent Chironomidae (68.9 percent), and Shannon-Weaver Diversity Index (1.27) metrics. Chironomidae heavily dominated this site as in the previous year. The WQI was slightly higher than in previous years, except for the November 2001 sample. However, no parameters exceeded standards, and only dissolved oxygen and total sulfate exceeded the 90th percentile (Table 29).

Habitat conditions appear to be a possible cause for the moderately impaired macroinvertebrate community. New York State Department of Conservation (NYSDEC) listed Seeley Creek as "threatened" in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel. SRBC staff saw evidence of dredging and assigned low habitat assessment scores for channel alteration, instream cover, velocity/depth regimes, and channel flow status.

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, excellent physical habitat, and a relatively low WQI score with no parameters exceeding standards (Table 30). The biological community has remained nonimpaired for the past five years. Snake Creek supported many pollution intolerant taxa, including *Atherix* (Diptera: Athericidae), *Antocha* (Diptera: Tipulidae), *Dicranota* (Diptera: Tipulidae), *Hexatoma* (Diptera: Tipulidae), *Ephemerella* (Ephemeroptera: Ephemerellidae), *Epeorus* (Ephemeroptera: Heptageniidae), *Leucrocuta* (Ephemeroptera: Heptageniidae), *Stenonema, Isonychia* (Ephemeroptera: Isonychiidae), *Nigronia*, *Leuctra* (Plecoptera: Leuctridae), *Acroneuria* (Plecoptera: Perlidae), *Agnetina*, and *Dolophilodes* (Trichoptera: Philopotamidae).

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 2002, South Creek at Fassett, Pa., (SOUT 7.8) had a slightly impaired biological community. 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.

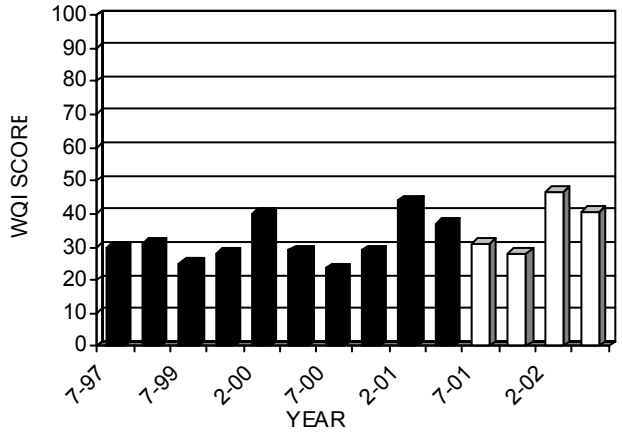
No water quality parameters exceeded standards; however, total and dissolved ammonia exceeded the 90th percentile for New York-Pennsylvania border streams (Table 31). The WQI was lowest in the same year (1998) when the macroinvertebrate population was nonimpaired. SRBC staff noted the stream had been impaired by recent flooding. Impairment of the biological community at this site may be due to periodic drying of the streambed or to poor habitat diversity.

Table 29. Water Quality Summary Seeley Creek at Seeley Creek, N.Y.

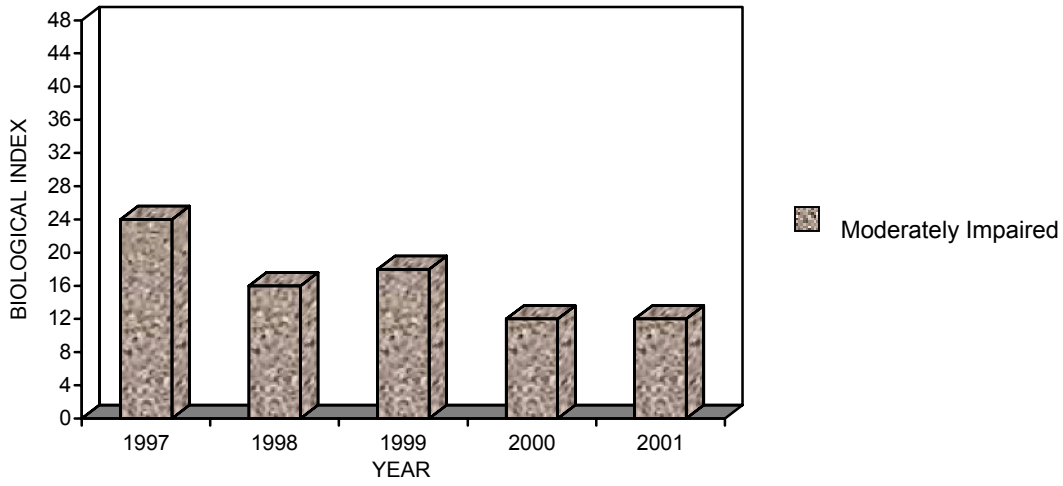
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	31.1	TSO4							
11/06/01	28	None							
02/26/02	46.7	DO							
04/23/02	40.7	None							

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	1.3
RBP III Score	12
RBP III Condition	Moderately Impaired
Total Habitat Score	129
Habitat Condition Category	Excellent



Water Quality Index



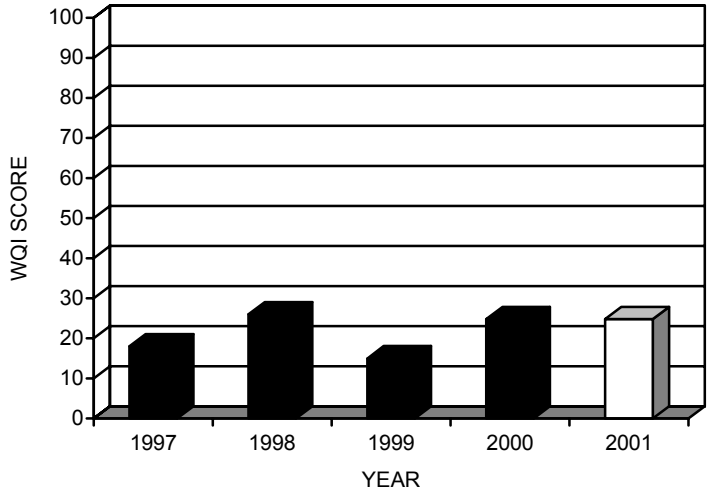
Biological Index

Table 30. Water Quality Summary Snake Creek at Brookdale, Pa.

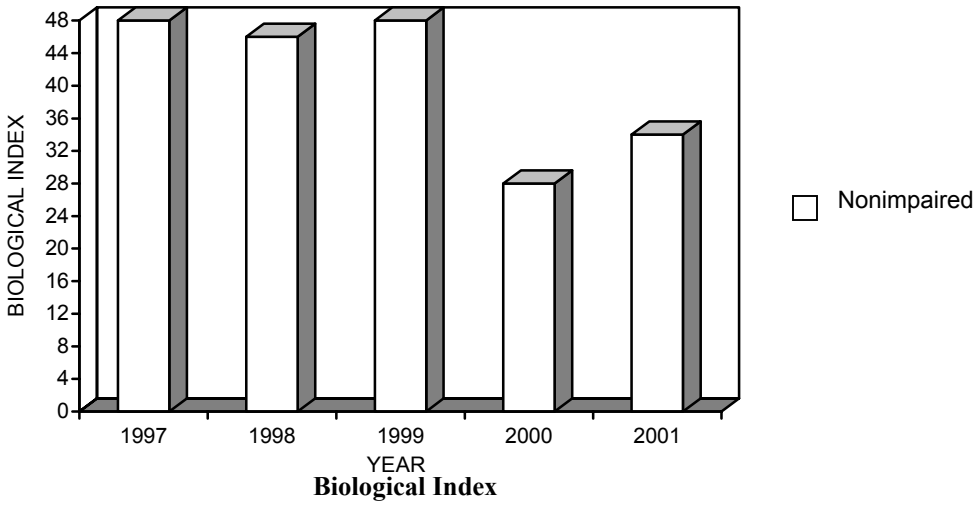
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/25/01	24.8	None							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.6
RBP III Score	34
RBP III Condition	Reference
Total Habitat Score	139
Habitat Condition Category	Reference



Water Quality Index



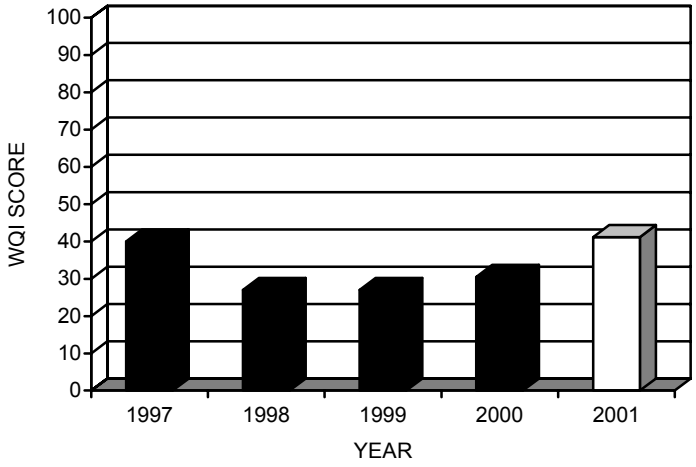
Biological Index

Table 31. Water Quality Summary South Creek at Fassett, Pa.

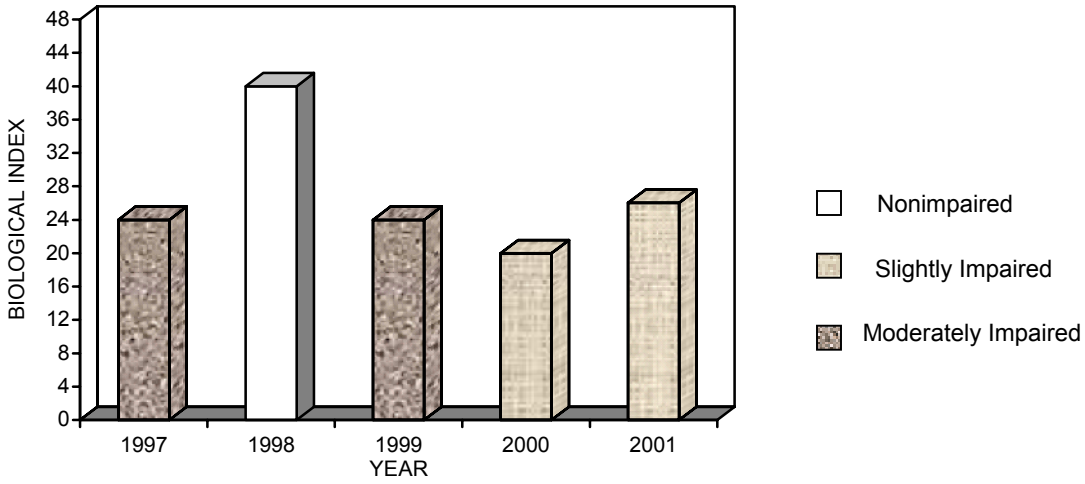
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	41.2	DNH3	TNH3						

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	2.1
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	135
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Troups Creek (TRUP 4.5)

Troups Creek at Austinburg, Pa., (TRUP 4.5) had a slightly impaired biological community. It had the worst scores in percent Ephemeroptera (0.83 percent) and number of EPT taxa (5); however, it had the best percent dominant taxa score (22.3 percent) of all the New York-Pennsylvania border streams. Dissolved oxygen and total aluminum exceeded standards, and dissolved oxygen, total aluminum, total orthophosphate, and turbidity exceeded the 90th percentile in the WQI scoring (Table 32).

Troups Creek had four increasing trends and four decreasing trends. Strong, increasing trends were shown for unadjusted concentrations of total chloride and flow-adjusted WQI scores. Increasing trends were seen in total solids concentrations and total phosphorus flow-adjusted concentrations. Strong decreasing trends were evident for unadjusted concentrations of total nitrogen and total phosphorus, and decreasing trends were seen for unadjusted and flow-adjusted concentrations of total sulfate (Table 19).

Trowbridge Creek (TROW 1.8)

Trowbridge Creek at Great Bend, Pa., (TROW 1.8) was not sampled due to drought conditions. The WQI and biological index scores from previous years are found in Table 33.

Wappasening Creek (WAPP 2.6)

The biological index rating for Wappasening Creek at Nichols, N.Y., (WAPP 2.6) had decreased in 2000 and 2001 to moderately impaired compared to slightly impaired and nonimpaired ratings in previous years (Table 34). This site scored poorly in percent dominant taxa (55.17 percent), percent Chironomidae (55.17 percent), and Shannon-Weaver Diversity Index (1.65).

No parameters exceeded water quality standards; however, WAPP 2.6 had the highest total and dissolved nitrogen, and total and dissolved nitrate values of the New York/Pennsylvania border streams. Total nitrogen, dissolved nitrogen, dissolved nitrite, dissolved nitrate, and total nitrate exceeded the 90th percentile.

North Fork Cowanesque River (NFCR 7.6)

North Fork Cowanesque River at North Fork, Pa., (NFCR 7.6) was not sampled due to drought conditions in July 2001 (Table 35).

Pennsylvania-Maryland Streams

Big Branch Deer Creek (BBDC 4.1)

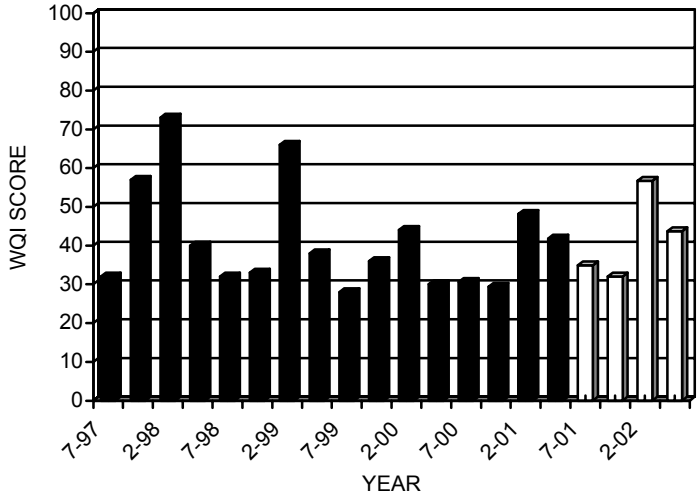
Big Branch Deer Creek at Fawn Grove, Pa., (BBDC 4.1) served as the reference site for the Pennsylvania-Maryland border streams during fiscal year 2002. This site had the best combination of biological community and physical habitat of the Pennsylvania-Maryland streams. It had the best value for the Hilsenhoff Biotic Index (3.32) metric of all the New York-Pennsylvania border streams, indicating the presence of a large number of organic pollution intolerant taxa at this site. These taxa with a Hilsenhoff Biotic Index value of three or less included *Antocha*, *Serratella* (Ephemeroptera: Ephemerellidae), *Epeorus*, *Isonychia*, *Nigronia*, *Leuctra*, *Acroneuria*, *Claassenia* (Plecoptera: Perlidae), *Hansonoperla* (Plecoptera: Perlidae), *Dolophilodes*, and *Rhyacophila* (Trichoptera: Rhyacophilidae). The biological community has been nonimpaired for the past five years. Water quality was good in Big Branch Deer Creek in July 2001, as in previous years, with no parameters exceeding standards or the 90th percentile (Table 36). The land use for this site was predominantly forest.

Table 32. Water Quality Summary Troups Creek at Austinburg, Pa.

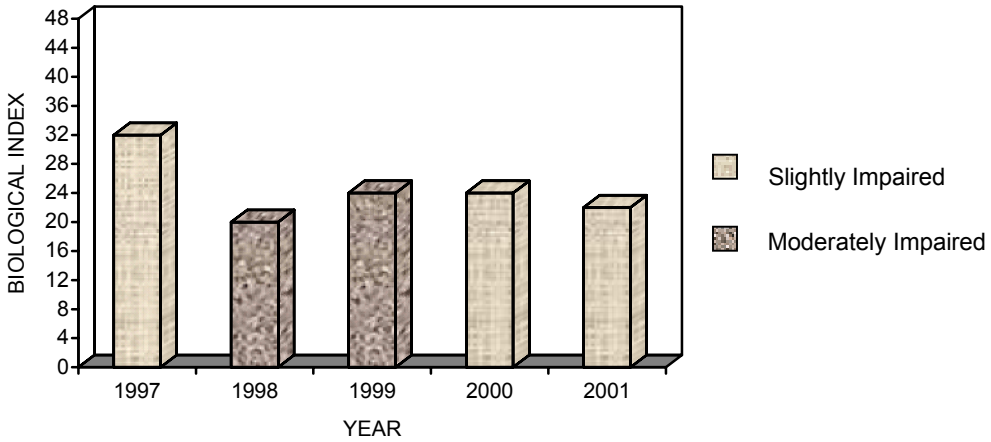
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DO	07/23/01	4.78 mg/l	5.0 mg/l	Pa. aquatic life
TAl	02/27/02	254 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/23/01	34.9	None							
11/07/01	32	None							
02/27/02	56.7	DO	TAl	TPO4	TURB				
04/24/02	43.7	None							

Biological and Habitat Summary	
Number of Taxa	14
Diversity Index	2.2
RBP Score	22
RBP Condition	Slightly Impaired
Total Habitat Score	128
Habitat Condition Category	Excellent



Water Quality Index



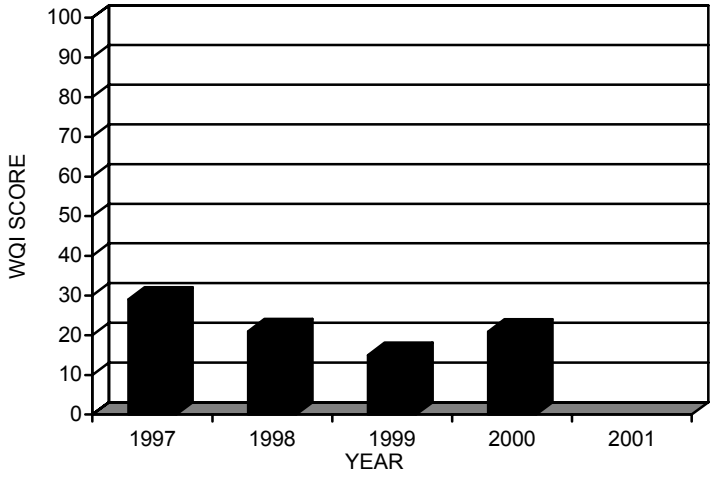
Biological Index

Table 33. Water Quality Summary Trowbridge Creek at Great Bend, Pa.

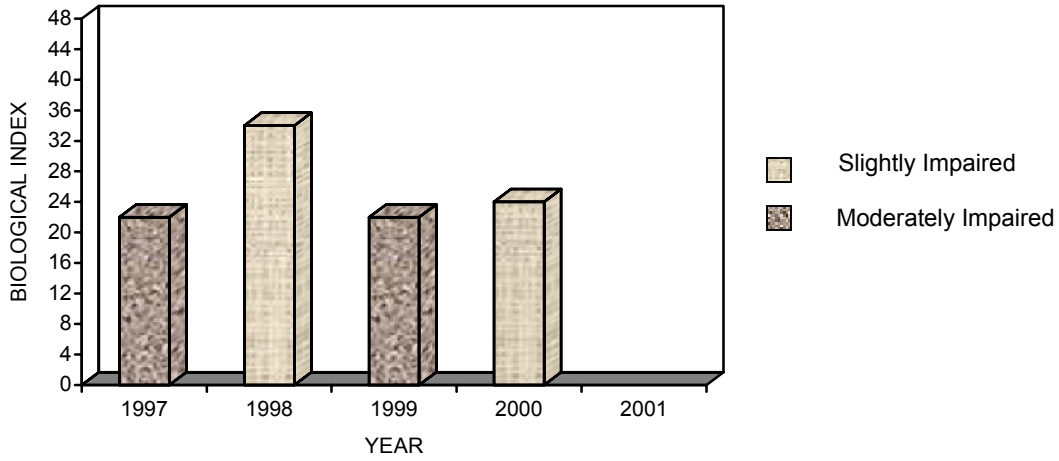
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
NA				

Date	WQI	Parameters Exceeding 90th Percentile							
NA	NA								

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



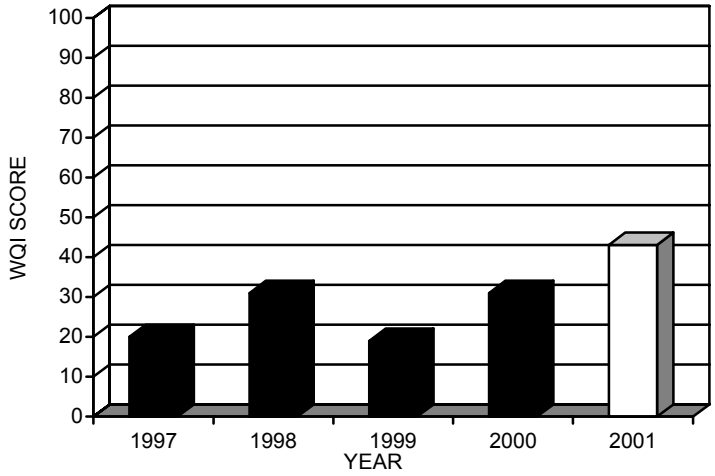
Biological Index

Table 34. Water Quality Summary Wappasening Creek at Nichols, N.Y.

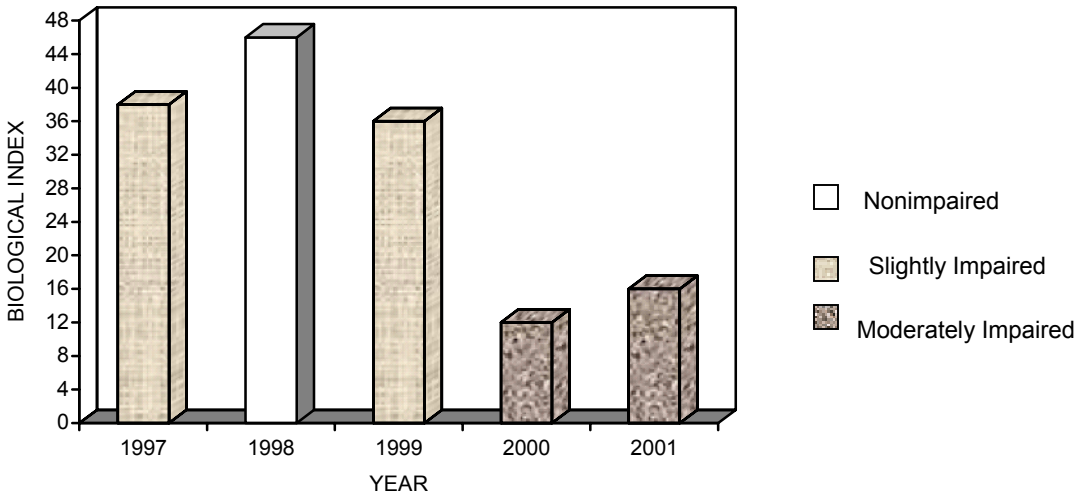
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	43.1	TN	DN	DNO2	DNO3	TNO3			

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	1.7
RBP Score	16
RBP Condition	Moderately Impaired
Total Habitat Score	144
Habitat Condition Category	Excellent



Water Quality Index



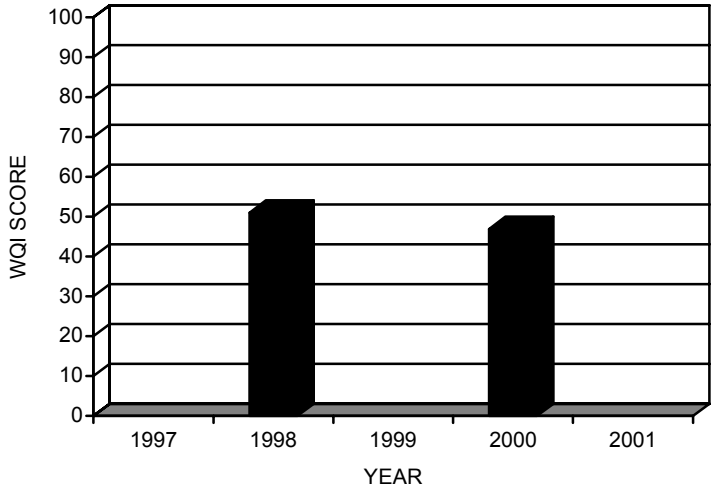
Biological Index

Table 35. Water Quality Summary North Fork Cowanesque River at North Fork, Pa.

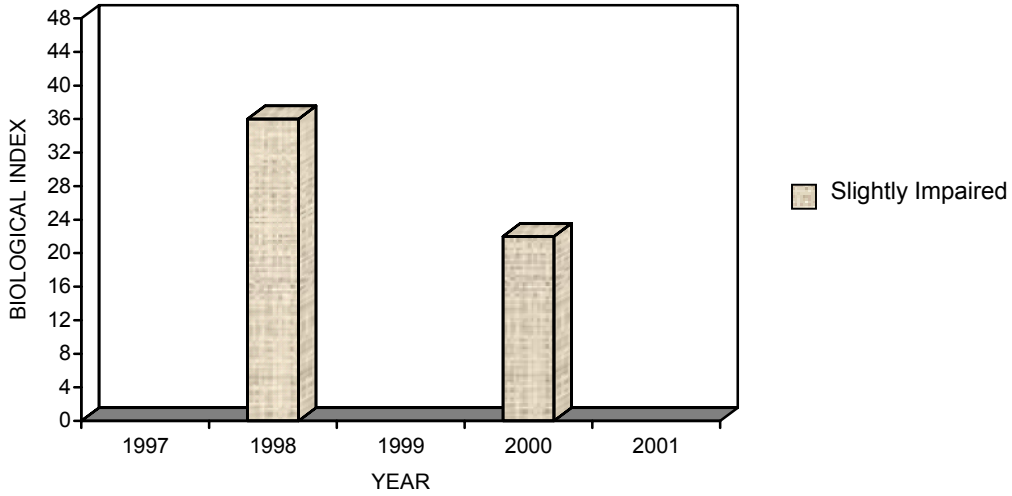
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
NA				

Date	WQI	Parameters Exceeding 90th Percentile							
NA	NA								

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



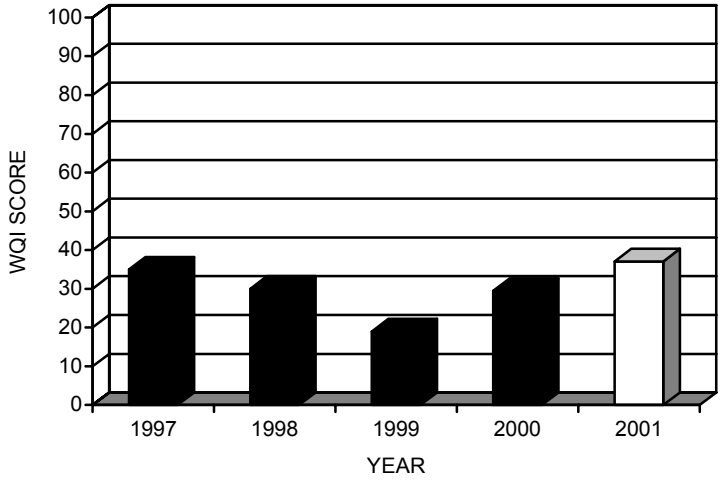
Biological Index

Table 36. Water Quality Summary Big Branch Deer Creek at Fawn Grove, Pa.

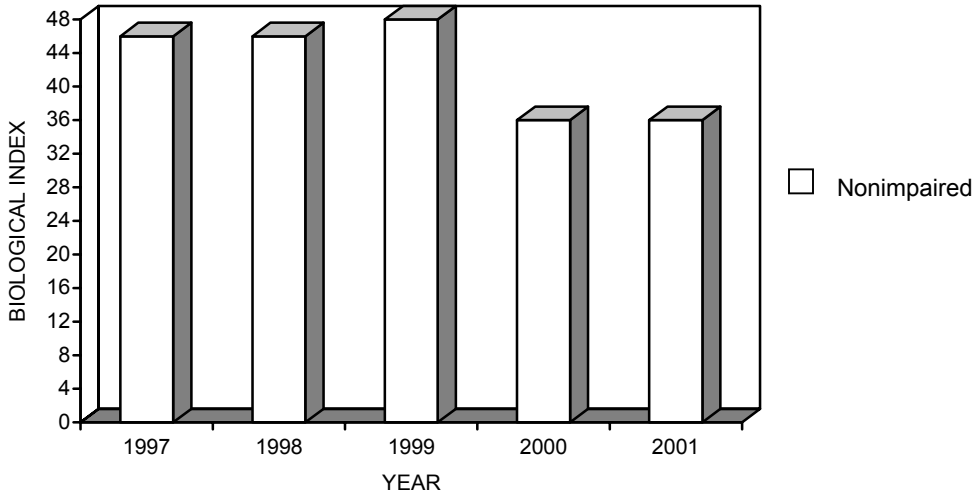
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/01	37.1	None							

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.6
RBP Score	36
RBP Condition	Reference
Total Habitat Score	156
Habitat Condition Category	Reference



Water Quality Index



Biological Index

Conowingo Creek (CNWG 4.4)

Conowingo Creek at Pleasant Grove, Pa., (CNWG 4.4) had a slightly impaired community, and the worst percent dominant taxa metric score of all the Pennsylvania-Maryland border streams. This stream was impacted by agricultural activities, as evidenced by high sediment deposition and elevated nutrients. Parameters that exceeded the 90th percentile included dissolved oxygen, total and dissolved nitrogen, total and dissolved nitrate, dissolved phosphorus, dissolved orthophosphate, total and dissolved nitrite, total and dissolved solids, total organic carbon, and total iron (Table 37). CNWG 4.4 had the highest values of total and dissolved nitrogen (9.89 mg/l), total and dissolved nitrate (9.13 mg/l and 8.92 mg/l, respectively), and total and dissolved solids (718 mg/l and 706 mg/l, respectively) of all the interstate streams (Table A2). However, no parameters exceeded the current standards and an improvement was seen in the dissolved oxygen values from 4.79 mg/l in August 2000 to 7.96 mg/l in August 2001.

Conowingo Creek had nine decreasing trends and four increasing trends. Strong, significant, decreasing trends were shown for total phosphorus, total iron, and total aluminum (unadjusted and flow-adjusted concentrations), total ammonia and total manganese (unadjusted concentrations), and a significant decreasing trend for total manganese (flow-adjusted concentrations). Strong, significant, increasing trends occurred for both unadjusted and flow-adjusted concentrations for total nitrogen and total chloride (Table 19).

Deer Creek (DEER 44.2)

Deer Creek at Gorsuch Mills, Md., (DEER 44.2) returned to a nonimpaired biological community after being slightly impaired for three years. It had the best scores for EPT Index (14) and percent Chironomidae (4.05 percent) metrics of all the Pennsylvania-Maryland sites. Pollution intolerant taxa at this site included *Promoresia* (Coleoptera: Elmidae), *Atherix, Antocha, Heterocloeon* (Ephemeroptera: Baetidae), *Serratella, Stenonema, Isonychia, Nigronia, Ophiogomphus, Leuctra, Acroneuria, Agnetina, Claassenia*, and *Neoperla* (Plecoptera: Perlidae). No parameters exceeded water quality limits, and only dissolved iron exceeded the 90th percentile (Table 38). This sampling site was located adjacent to agricultural activities, and downstream of a beaver dam.

Deer Creek showed eight increasing and eight decreasing trends during the period between 1986 and 2002. Strong, significant upward trends were found for flow-adjusted and unadjusted concentrations of total solids and total chloride, and for unadjusted concentrations of total sulfate and flow-adjusted WQI values. Significant increasing trends also occurred in flow-adjusted concentrations of total sulfate and unadjusted concentrations of total nitrogen. Strong, significant, decreasing trends occurred in both unadjusted and flow-adjusted total phosphorus, total iron, and total manganese. Total ammonia had a strong, significant, decreasing trend in unadjusted concentrations and a significant, decreasing trend in flow-adjusted concentrations (Table 19).

Ebaughs Creek (EBAU 1.5)

Ebaughs Creek at Stewartstown, Pa., (EBAU 1.5) improved from a moderately impaired biological community in August 2000 to a nonimpaired community in July 2001. For 12 years prior to July 2001, this site had either a slightly or moderately impaired biological condition. EBAU 1.5 had the best percent Ephemeroptera score (20.5 percent) of all the Pennsylvania-Maryland streams, and included organic pollutant intolerant macroinvertebrates such as *Promoresia, Antocha, Stenonema, Isonychia, Leuctra, Acroneuria,* and *Dolophilodes*.

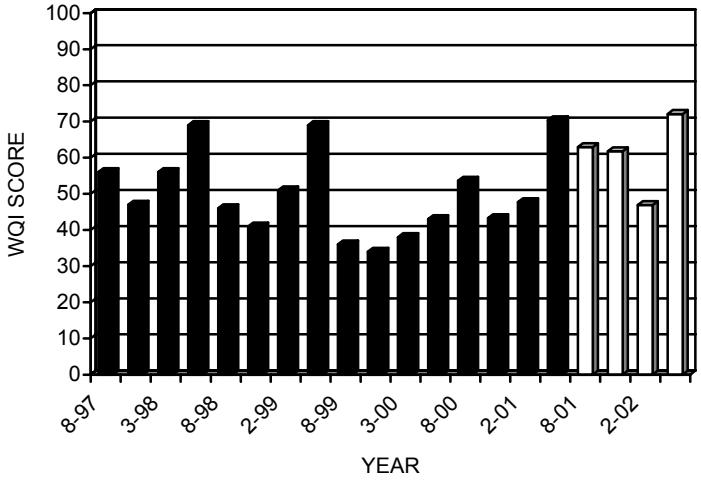
Even though the macroinvertebrate population had improved, the WQI was actually higher than in previous years. Although no parameters exceeded water quality standards, Ebaughs Creek had elevated concentrations of total and dissolved phosphorus, total chloride, dissolved iron,

Table 37. Water Quality Summary Conowingo Creek at Pleasant Grove, Pa.

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

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/01	62.9	DO	DN	TN	DNO3	TNO3	DP	DPO4	
11/13/01	61.8	DN	TN	DNO2	TNO2	DNO3	TNO3		
02/20/02	46.9	DS	TS	DN	TN	DNO3	TNO3		
04/18/02	72.1	DO	DN	TN	DNO2	TNO2	DNO3	TNO3	TOC
		TFe							

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.3
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	150
Habitat Condition Category	Excellent



Water Quality Index

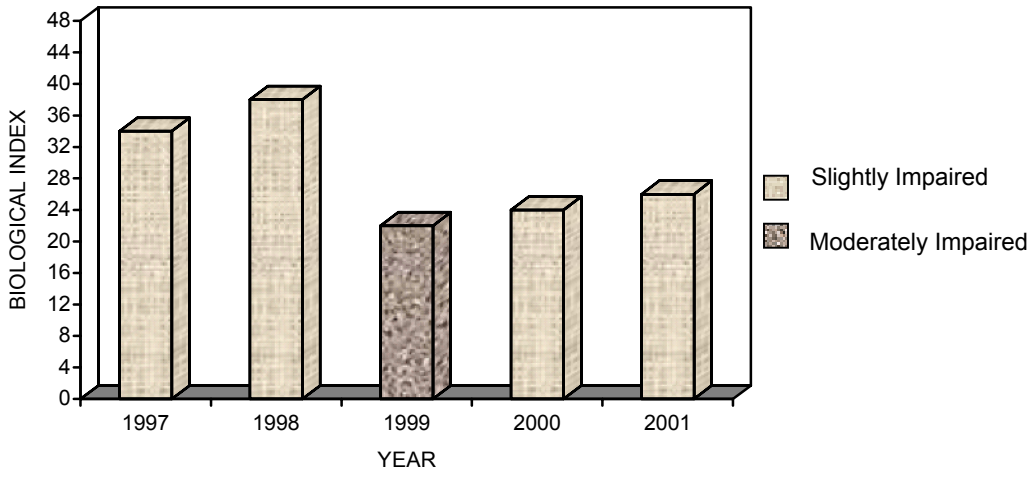


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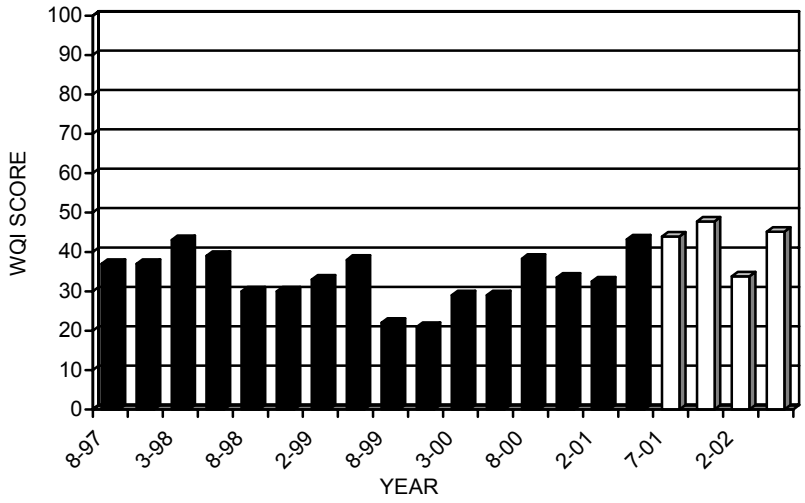
Table 38. Water Quality Summary Deer Creek at Gorsuch Mills, Md.

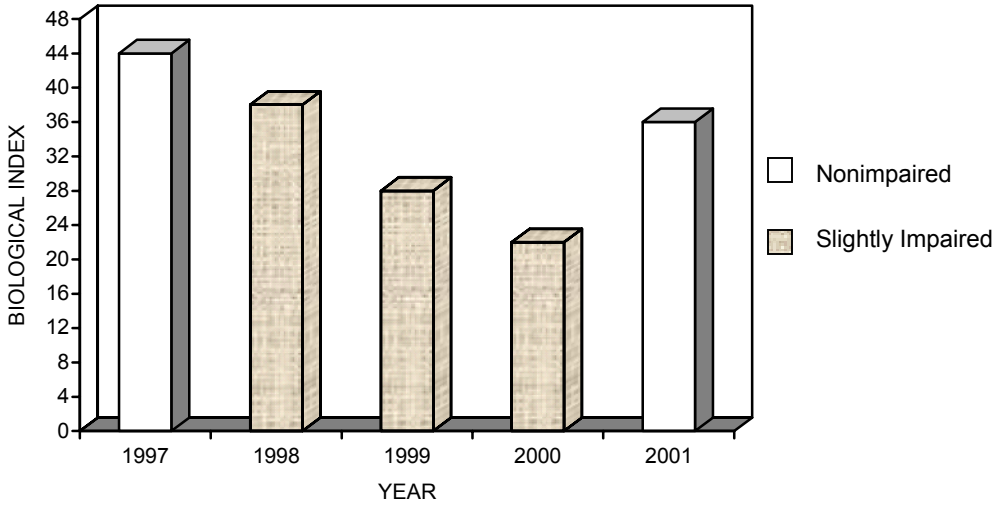
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/01	43.9	None							
11/12/01	47.7	None							
02/19/02	33.8	None							
04/17/02	45.1	DFe							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.5
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	135
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

dissolved manganese, total and dissolved orthophosphates, total nitrogen, and total and dissolved nitrites (Table 39). The dissolved phosphorus (0.068 mg/l) and total and dissolved orthophosphate (0.074 mg/l and 0.064 mg/l, respectively) values were the highest of all the Pennsylvania-Maryland sites (Table A2). The total chlorine values were 0.21 mg/l in July, 0.09 mg/l in November, 0.11 mg/l in February, and 0.07 mg/l in April. The relatively high WQI and chemical analysis suggested that wastewater discharges upstream might have affected the water quality at the time of sampling; however, the biological condition was relatively unaffected.

Ebaughs Creek had six upward and five downward water quality trends. Strong, significant increasing trends occurred for unadjusted total chloride, unadjusted total sulfate, and unadjusted and flow-adjusted WQI values. Significant, increasing trends occurred for flow-adjusted concentrations of total chloride and total sulfate. Strong, significant, decreasing trends were found for both unadjusted and flow-adjusted total ammonia and total iron. A significant, decreasing trend also was found for flow-adjusted total manganese (Table 19).

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, an improvement from moderately and slightly impaired the two previous years. This site scored the best on taxa richness (29), percent dominant taxa (16.8 percent), and Shannon-Weaver Index (2.79) metrics; however, had the worst percentage of Ephemeroptera (3.05 percent). The organic pollution intolerant macroinvertebrates present were Promoresia, *Serratella, Epeorus, Stenonema, Nigronia, Boyeria* (Odonata: Aeshnidae), *Leuctra, Beloneuria* (Plecoptera: Perlidae), *Claassenia, Eccoptura* (Plecoptera: Perlidae), *Diplectrona* (Trichoptera: Hydropsychidae), *Dolophilodes*, and *Rhyacophila*. Alkalinity exceeded the Pennsylvania state standard, and dissolved iron exceeded the 90th percentile (Table 40).

Long Arm Creek (LNGA 2.5)

For the seventh consecutive year, Long Arm Creek at Bandanna, Pa., (LNGA 2.5) had a slightly impaired biological community. This site had the worst scores for taxa richness (17), Hilsenhoff Biotic Index (4.89), EPT Index (6), percent Chironomidae (19.75 percent), and Shannon-Weaver (2.24) metrics for the Pennsylvania-Maryland streams. LNGA 2.5 was located in a cow pasture, although it appeared not to have been in use for some time. 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. The streambanks were heavily eroded, and the embeddedness and sediment deposition scores were lower due to mud and silt in the stream during the July 2001 habitat assessment.

During the 2000 sampling season, Long Arm Creek was elevated to a Group 1 stream. Although no water quality standards were exceeded, total and dissolved iron, dissolved manganese, and dissolved oxygen exceeded the 90th percentile at this site (Table 41).

Octoraro Creek (OCTO 6.6)

Octoraro Creek at Rising Sun, Md., (OCTO 6.6) had a nonimpaired biological community for the second year in a row. Pollution intolerant taxa that were present in August 2001 were *Promoresia, Antocha, Heterocloeon, Serratella, Stenonema, Isonychia, Brachycentrus* (Trichoptera: Brachycentridae), *Macrostemum* (Trichoptera: Hydropsychidae), *Lepidostoma* (Trichoptera: Lepidostomatidae), and *Rhyacophila*. Although no parameters exceeded state standards, numerous parameters exceeded the 90th percentile including dissolved oxygen, total and dissolved ammonia, total and dissolved phosphorus, total and dissolved orthophosphate, total organic carbon, total and dissolved nitrite, total and dissolved iron, total and dissolved manganese, total aluminum, and turbidity (Table 42). These exceeding values may be due to significant agricultural activities and Octoraro Lake located upstream of this site. The WQI bar

graph indicates that the WQI was overall consistently higher throughout the seasons in fiscal year 2002 than in other years.

Three increasing and seven decreasing trends were found at OCTO 6.6. Total chloride had strong, significant increasing trends for both unadjusted and flow-adjusted concentrations, and total solids flow-adjusted concentration had a significantly increasing trend. Strong, significant decreasing trends were found in unadjusted total ammonia, total iron, total aluminum, and total manganese, and unadjusted and flow-adjusted total phosphorus. Significant decreasing trends were evident in flow-adjusted total iron (Table 19).

Scott Creek (SCTT 3.0)

Scott Creek at Delta, Pa., (SCTT 3.0) was not sampled in the summer or fall of 2001 due to drought conditions. This stream traditionally has been poor in quality and biological condition has been rated moderately to severely impaired. There were no parameters that exceeded state standards in the winter and spring of 2002; however, in fiscal year 2001 dissolved oxygen and dissolved iron exceeded Maryland and Pennsylvania state standards. The number of parameters exceeding standards was less than the previous year (fiscal year 2000), so this may indicate that water quality conditions are improving. WQI scores are lower than they were in 2000. Parameters that exceeded the 90th percentile in February and April of 2002 were conductivity, total and dissolved ammonia, total and dissolved phosphorus, total chloride, total sulfate, total and dissolved solids, total and dissolved orthophosphates, and total organic carbon (Table 43). Scott Creek had the highest conductivity (496 µmhos/cm), total chloride (74 mg/l), and total phosphorus (0.11 mg/l) compared to all the other Pennsylvania-Maryland streams, and the highest ammonia value (0.3 mg/l) of all the interstate streams (Table A2).

Scott Creek had one increasing and six decreasing trends during fiscal year 2002. The increasing trend was for unadjusted total aluminum concentrations. The decreasing trends were in flow-adjusted concentrations of total nitrogen, total phosphorus, total sulfate, total iron, and total manganese, and one strong, significant decreasing trend in unadjusted total manganese (Table 19).

South Branch Conewago Creek (SBCC 20.4)

South Branch Conewago Creek near Bandanna, Pa., (SBCC 20.4) contained a slightly impaired biological community for the fifth consecutive year. It had the worst taxa richness score (17, along with LNGA 2.5) of all the Pennsylvania-Maryland streams. Before this stream was slightly impaired, it had served as the Pennsylvania-Maryland reference site for several years. The Hilsenhoff Biotic Index was still good with many pollution intolerant taxa, including *Dicranota*, *Hexatoma*, *Limnophila* (Diptera: Tipulidae), *Stenonema*, *Nigronia*, *Leuctra*, *Tallaperla* (Plecoptera: Peltoperlidae), and *Dolophilodes*. Some the taxa not present in the July 2001 sample that were present in the July 2000 sample were *Acroneuria*, *Isoperla* (Plecoptera: Perlodidae), *Diplectrona*, and *Rhyacophila.*

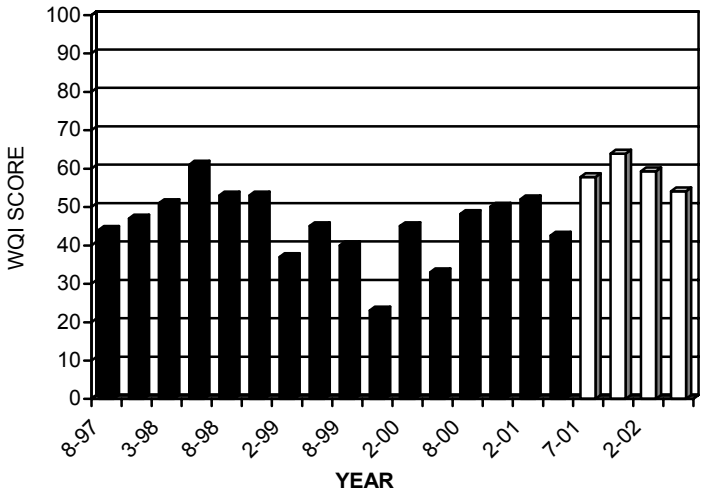
The WQI score has been increasing slightly over the past couple years, but it is still low and no parameters exceeded standards (Table 44). Total nitrite at SBCC 20.4 exceeded the 90th percentile and also was the highest value (0.1 mg/l) of all the interstate streams (Table A2). The habitat was rated excellent. The area around the stream was forested, although there was evidence of fairly recent logging.

Table 39. Water Quality Summary Ebaughs Creek at Stewartstown, Pa.

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

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/01	57.8	DP	TCl						
11/12/01	63.9	DP	TP	DFe	DMn	TPO4			
02/19/02	59.3	TN	DNO2	TNO2	DP	DPO4	TPO4		
04/17/02	54.1	None							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.3
RBP Score	32
RBP Condition	Nonimpaired
Total Habitat Score	153
Habitat Condition Category	Excellent



Water Quality Index

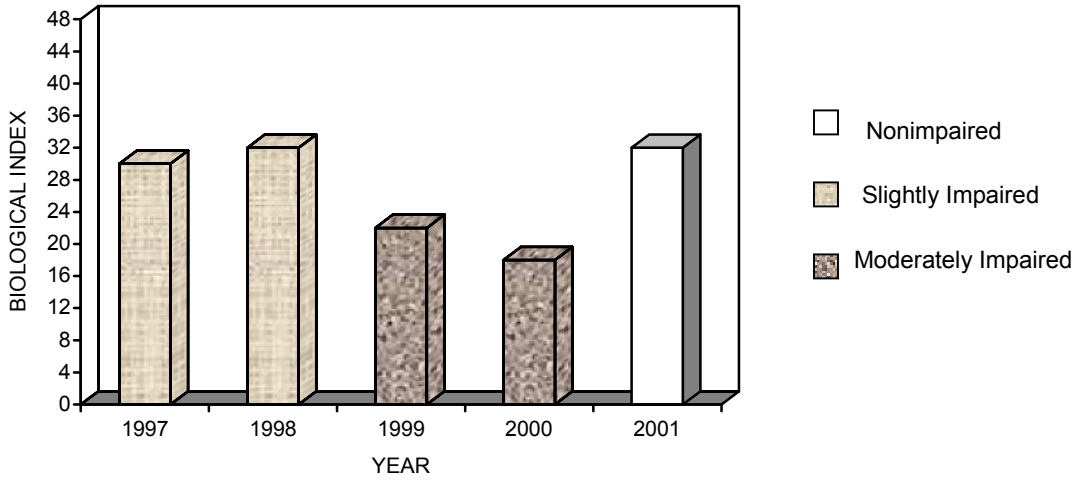


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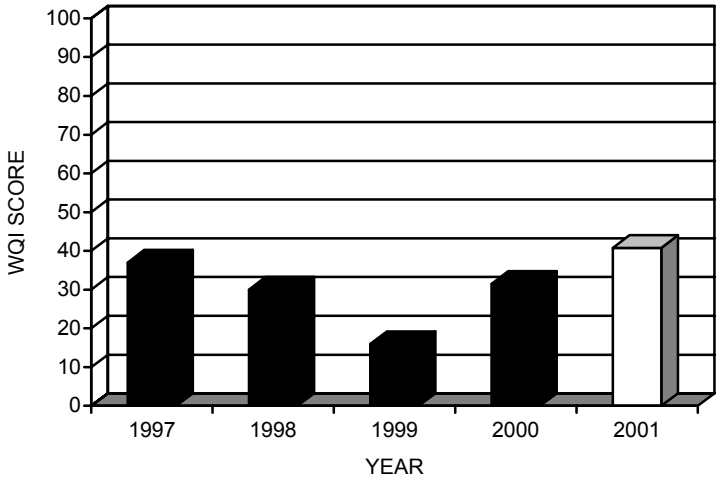
Table 40. Water Quality Summary Falling Branch Deer Creek at Fawn Grove, Pa.

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
ALK	07/31/01	18 mg/l	20 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/01	40.8	DFe							

Biological and Habitat Summary	
Number of Taxa	29
Diversity Index	2.8
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	138
Habitat Condition Category	Supporting



Water Quality Index

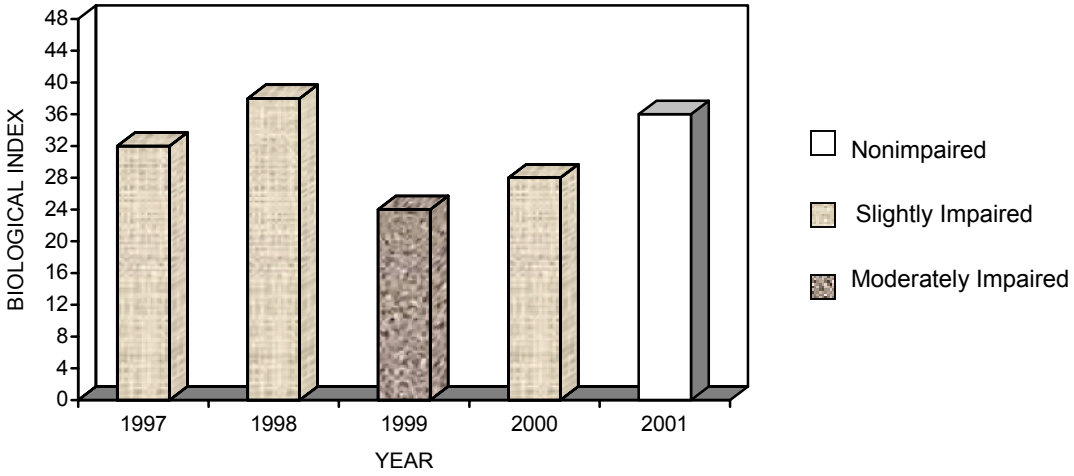


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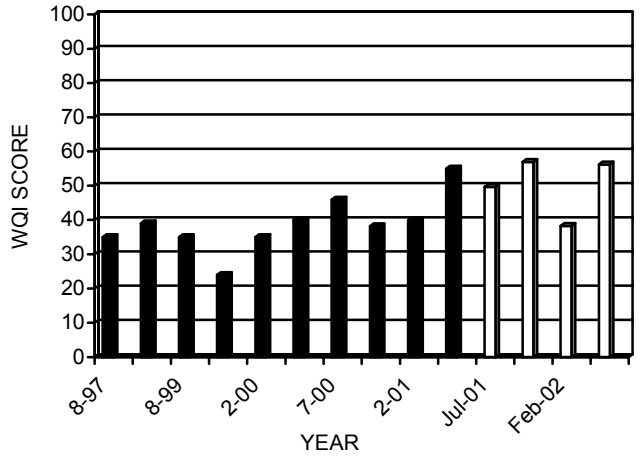
Table 41. Water Quality Summary Long Arm Creek at Bandanna, Pa.

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

Date	WQI	Parameters Exceeding 90th Percentile							
07/30/01	49.7	None							
11/12/01	57	DFe	DMn						
02/19/02	38.3	DO	DFe	DMn					
04/17/02	56.2	DO	TFe	DMn					

Biological and Habitat Summary	
Number of Taxa	17
Diversity Index	2.2
RBP III Score	24
RBP III Condition	Slightly Impaired
Total Habitat Score	116
Habitat Condition Category	Partially Supporting



Water Quality Index

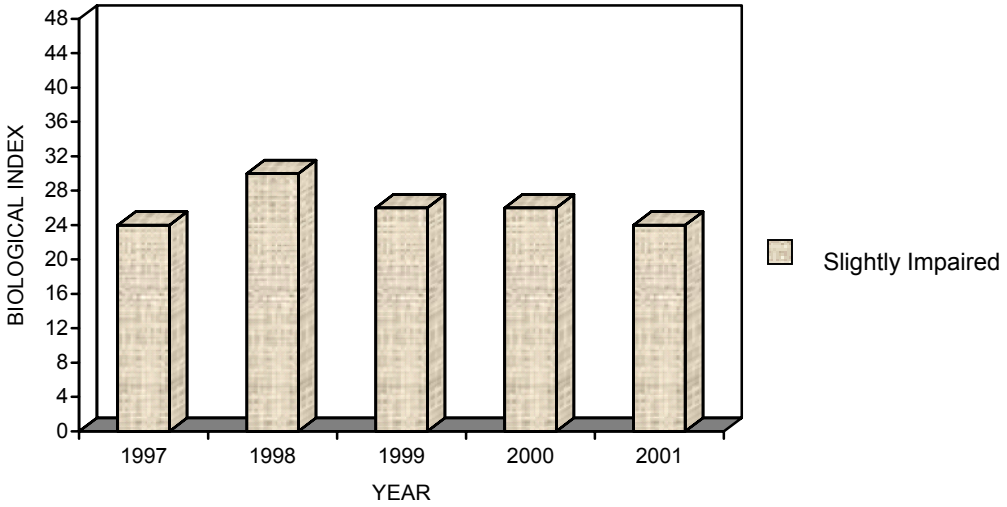


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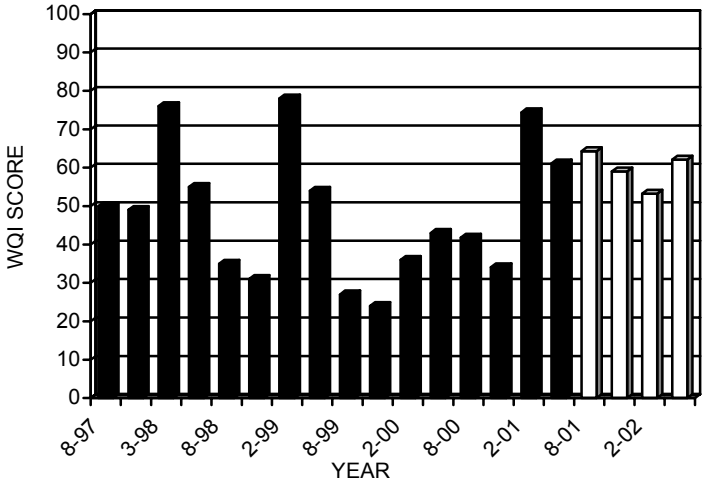
Table 42. Water Quality Summary Octoraro Creek at Rising Sun, Md.

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

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/01	64.3	DO	DP	TP	DPO4	TPO4	TFe	TAl	TURB
11/13/01	59	DNO2	TNO2	TP	TOC	TPO4			
02/20/02	53.2	TOC	DFe	DMn	TMn				
04/18/02	62.1	DO	DNH3	TNH3	TOC				

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.4
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	163
Habitat Condition Category	Excellent



Water Quality Index

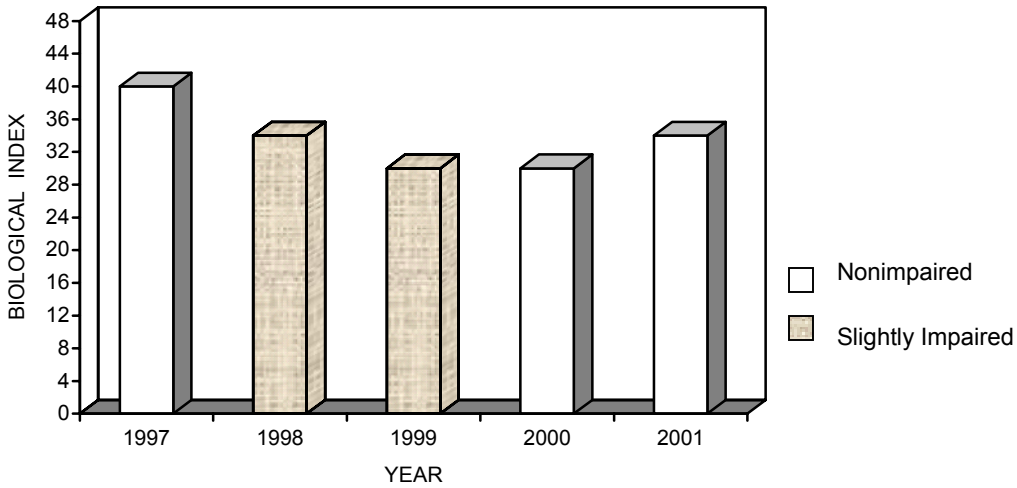


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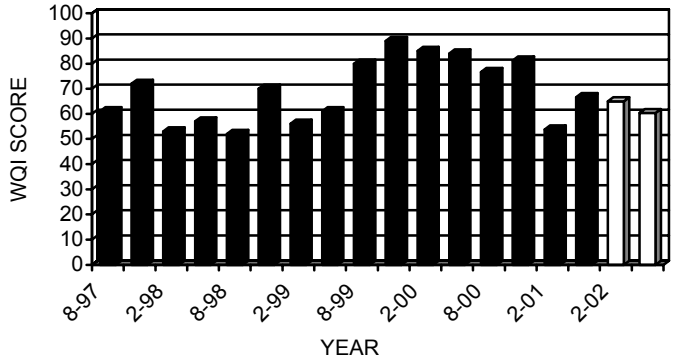
Table 43. Water Quality Summary Scott Creek at Delta, Pa.

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

Date	WQI	Parameters Exceeding 90th Percentile								
02/19/02	64.9	COND	DNH3	TNH3	DP	TP	TCl	TSO4		
04/17/02	60.3	COND	DS	TS	DP	TP	DPO4	TPO4	TOC	TCl
		TSO4								

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

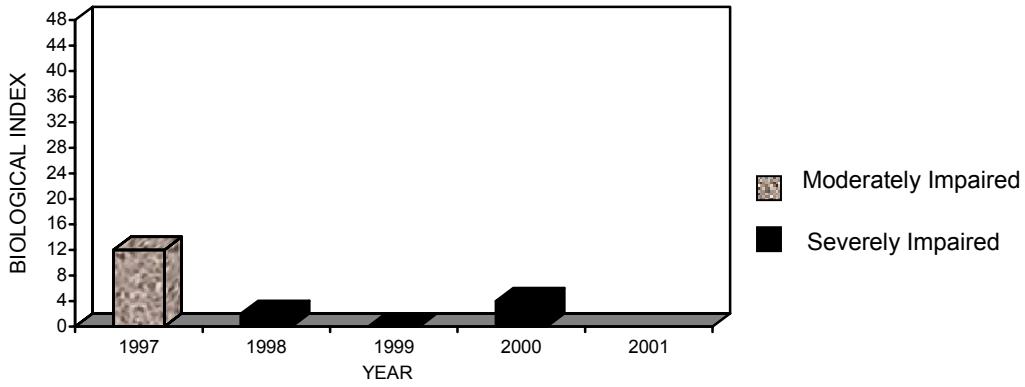


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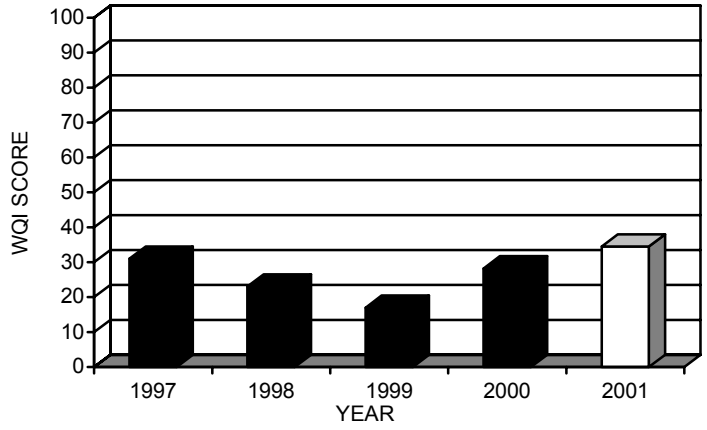
Table 44. Water Quality Summary South Branch Conewago Creek at Bandanna, Pa.

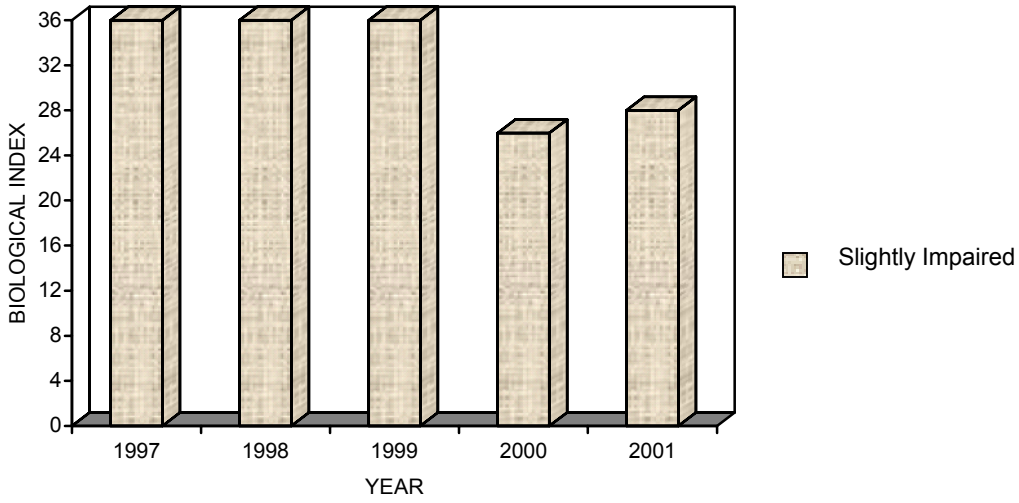
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/30/01	34.5	TNO2							

Biological and Habitat Summary	
Number of Taxa	17
Diversity Index	2.5
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	148
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

River Sites

Chemung River (CHEM 12.0)

A nonimpaired biological community existed in the Chemung River at Chemung, N.Y., (CHEM 12.0). During the past five years, this site has fluctuated from moderately impaired, to slightly impaired, to nonimpaired. This site had the best taxa richness (21), percent dominant taxa (15.97 percent), and Shannon-Weaver (2.53) metric scores of all the river sites. Pollution intolerant taxa included *Heterocloeon, Serratella, Stenonema, Isonychia, Acroneuria, Agnetina, and Macrostemum*.

No parameters exceeded the standards in fiscal year 2002. Analysis indicated that dissolved oxygen was depressed while conductivity, total nitrite, total sulfate, total and dissolved solids, total chloride, turbidity, total and dissolved phosphorus, dissolved orthophosphate, total and dissolved nitrogen, and total and dissolved nitrates were elevated at CHEM 12.0 (Table 45).

There were three increasing and 12 decreasing trends at CHEM 12.0. Unadjusted and flow-adjusted total chloride showed a strong, significant increasing trend, in addition to a significantly increasing trend in unadjusted total solids concentrations. Strong, significant decreasing trends were found for unadjusted and flow-adjusted total ammonia, total nitrogen, total sulfate, total iron, total manganese, and in flow-adjusted total phosphorus. A significant decreasing trend was seen for unadjusted concentrations of total phosphorus (Table 19).

Cowanesque River (COWN 5.0)

Cowanesque River at Elkland, Pa., (COWN 5.0) was sampled only during fiscal year 2002 in order to assess the impacts of the Cowanesque Reservoir. No previous historical data exists for this site. The macroinvertebrate community was rated slightly impaired and had seven pollution intolerant taxa: *Hexatoma, Serratella, Leucrocuta, Stenonema, Isonychia, Ophiogomphus*, and *Neoperla*. The pH value slightly exceeded the New York state water quality standard of 8.5 in July 2001; however, none of the parameters exceeded the 90th percentile (Table 46). The habitat was rated supporting with low scores given to channel flow status and channel alteration.

Cowanesque River (COWN 2.2)

Moderately impaired biological conditions existed on the Cowanesque River downstream of the Cowanesque Reservoir at Lawrenceville, Pa., (COWN 2.2). Moderately to severely impaired conditions have existed at this site for the past 10 years of sampling. In the past, increased phytoplankton production in the Cowanesque Reservoir may have caused a shift in the macroinvertebrate community, resulting in a biological population dominated by filter-feeding organisms. Additionally, the bottom discharge dam depressed oxygen levels in the Cowanesque River downstream of the outflow. None of the organic-pollution intolerant taxa that were found at COWN 5.0 were found at COWN 2.2. In fact, all the taxa present had a Hilsenhoff Biotic Index tolerance value of five or higher. During July 2001, the site was dominated by *Cheumatopsyche* (Trichoptera: Hydropsychidae), and the rest of the sample consisted of other taxa tolerant of low dissolved oxygen conditions such as *Chironomidae* (Diptera), *Hemerodromia* (Diptera: Empididae), *Caecidotea* (Isopoda: Asellidae), *Gammarus* (Amphipoda: Gammaridae), *Simulium* (Diptera: Simuliidae), and *Ceratopsyche* (Trichoptera: Hydropsychidae). COWN 2.2 had the worst scores in all the metrics, except percent Chironomidae, for the river sites.

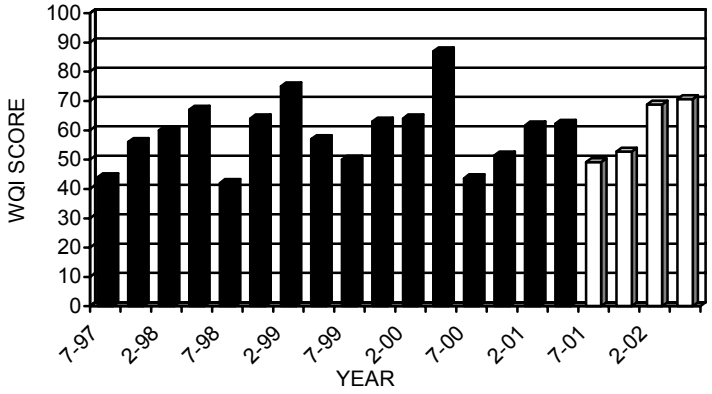
Values for dissolved oxygen, total iron, and total aluminum exceeded Pennsylvania and New York water quality standards. Also, dissolved oxygen, total and dissolved ammonia, total organic carbon, total and dissolved manganese, turbidity, total phosphorus, and total iron exceeded the 90th percentile (Table 47). COWN 2.2 had the lowest dissolved oxygen value (3.65mg/l) and highest total and dissolved manganese values (298 µg/l and 255 µg/l, respectively) for all the interstate sites (Table A1). Habitat conditions were supporting with low scores in epifaunal substrate, instream cover,

Table 45. Water Quality Summary Chemung River at Chemung, N.Y.

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

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	49.1	TNO2	TURB						
11/06/01	52.7	DO	COND	DS	TS				
02/26/02	68.8	DO	COND	DS	TS	TP	TCl	TSO4	
04/23/02	70.6	DO	COND	DN	TN	DNO3	TNO3	DP	DPO4
		TCl	TSO4						

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.5
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	145
Habitat Condition Category	Excellent



Water Quality Index

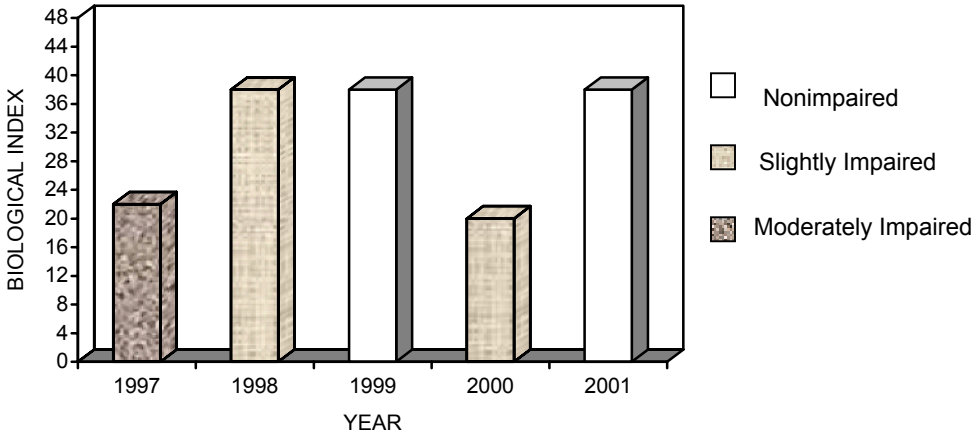


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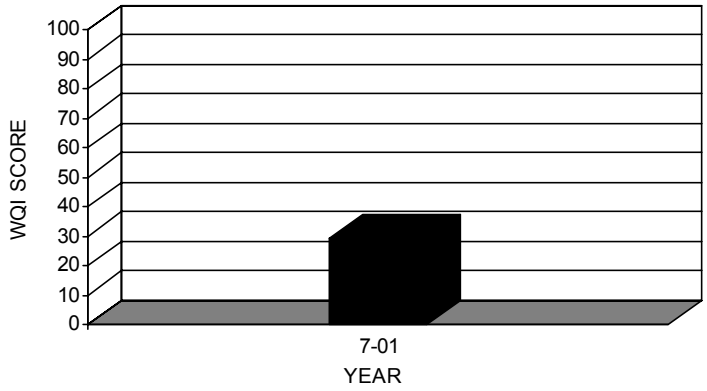
Table 46. Water Quality Summary Cowanesque River (COWN 5.0) at Elkland, Pa.

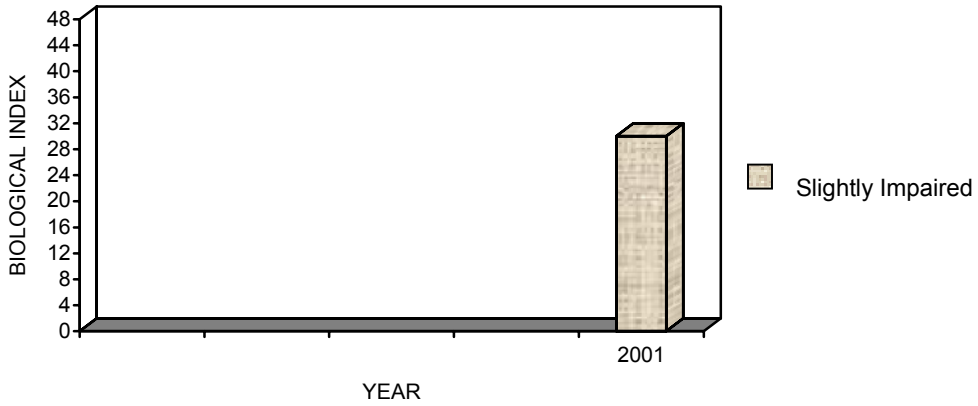
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	07/23/01	8.75	8.5	N.Y. general

Date	WQI	Parameters Exceeding 90th Percentile							
07/23/01	29.2	None							

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	2.1
RBP Score	30
RBP Condition	Slightly Impaired
Total Habitat Score	140
Habitat Condition Category	Supporting



Water Quality Index



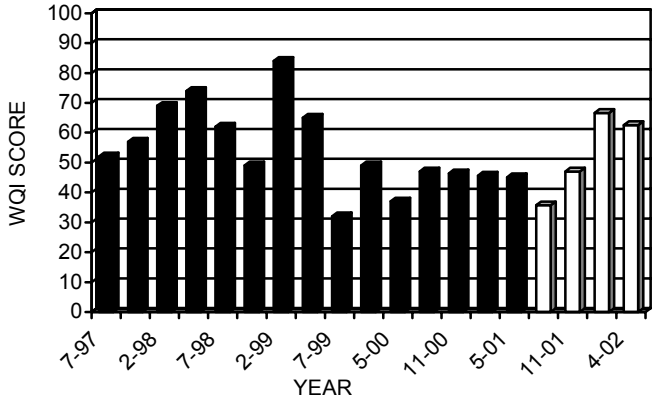
Biological Index

Table 47. Water Quality Summary Cowanesque River (COWN 2.2) at Lawrenceville, Pa.

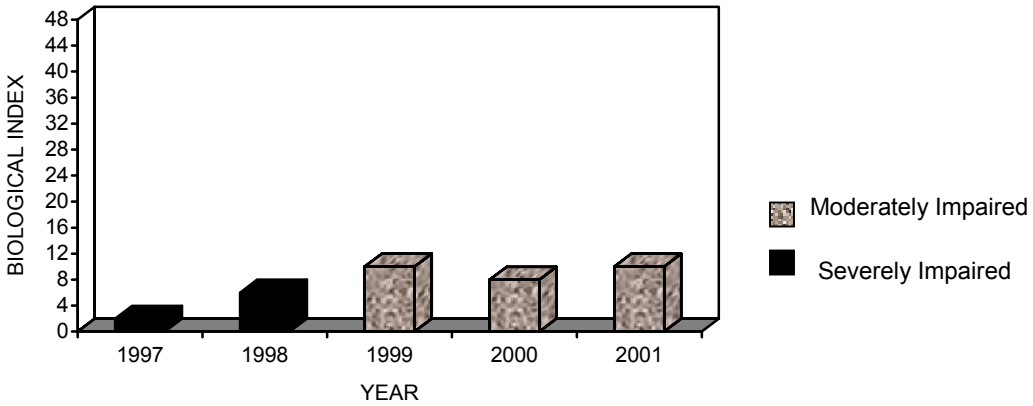
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DO	07/23/01	3.65 mg/l	4.0 mg/l	Pa. aquatic life
DO	07/23/01	3.65 mg/l	4.0 mg/l	N.Y. nontrout waters
TFe	02/26/02	470 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	02/26/02	208 µg/l	100 µg/l	N.Y. aquatic (chronic)
TFe	04/23/02	431 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	04/23/02	236 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/23/01	35.7	DO	DNH3	TNH3	TOC				
11/07/01	47	DO	DNH3	TNH3	DMn	TMn	TURB		
02/26/02	66.6	DO	TNH3	TP	TOC	TFe			
04/23/02	62.5	TOC	TFe						

Biological and Habitat Summary	
Number of Taxa	7
Diversity Index	1.3
RBP Score	10
RBP Condition	Moderately Impaired
Total Habitat Score	127
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

embeddedness, velocity/depth regimes, channel alteration, and frequency of riffles. The substrate was heavily embedded, and the stream contained little riffle habitat.

Cowanesque River had three increasing and eight decreasing trends. Strong, significant increasing trends were found for unadjusted total solids, total chloride, and total manganese. Strong, significant decreasing trends occurred for unadjusted and flow-adjusted total nitrogen and total sulfate, and unadjusted total ammonia and total phosphorus. Significant downward trends were found for flow-adjusted total ammonia and total phosphorus (Table 19).

Cowanesque River (COWN 1.0)

A new 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. The biological community has shown decline at COWN 1.0 over these past three sampling seasons, and was rated moderately impaired in July 2001. The macroinvertebrate population was improved slightly at COWN 1.0 compared to COWN 2.2. Organic pollution intolerant taxa found at COWN 1.0 were *Atherix, Stenonema,* and *Nigronia*. Habitat conditions were considered excellent.

The pH was high at this site, exceeding the New York and Pennsylvania water quality standards. Parameters that exceeded the 90th percentile were total organic carbon, total and dissolved nitrite, and total and dissolved solids (Table 48). Total organic carbon exceeded the 90th percentile every season and was the highest value (4.9 mg/l) for all the interstate streams (Table A1). 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)

Susquehanna River at Windsor, N.Y., (SUSQ 365.0) was designated as the reference for all the river sites. SUSQ 365.0 was one of the river sites with the highest number of taxa (21). Pollution intolerant taxa at this site were *Heterocloeon, Leucrocuta, Rhithrogena* (Ephemeroptera: Heptageniidae), *Isonychia, Ephoron* (Ephemeroptera: Polymitarcyidae), *Ophiogomphus, Acroneuria, Agnetina*, and *Psychomyia* (Trichoptera: Psychomyiidae). In the previous year, the biological community was rated slightly impaired, possibly due to the river habitat being affected by heavy flooding. Regardless of the cause, the biological community has shown recovery.

The water quality at the time of sampling exceeded New York aquatic standards in total iron and total aluminum. Dissolved oxygen was lower, while dissolved nitrite, total sulfate, total and dissolved nitrogen, and total phosphorus were elevated (Table 49) at this site. The total sulfate value (86.2 mg/l) was the highest of all river sites (Table A1).

Four increasing and 10 decreasing trends occurred at SUSQ 365.0. Strong, significant increasing trends occurred in both unadjusted and flow-adjusted total chloride concentrations and flow-adjusted total solids. A significant increasing trend was seen in unadjusted total solids concentrations. Unadjusted and flow-adjusted total ammonia, total nitrogen, total phosphorus, and total iron and unadjusted total manganese showed strong, significant decreasing trends, and flow-adjusted total aluminum showed a significant decreasing trend (Table 19).

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

Slightly impaired conditions existed in the Susquehanna River at Kirkwood, N.Y., (SUSQ 340.0) after being nonimpaired for three years. The number of taxa and diversity index had decreased, respectively, from 22 and 2.5 in July 2000 to 12 and 1.9 in July 2001 (Table 50). The habitat assessment indicated that riffle frequency was low, and the section of river consisted mostly of run area.

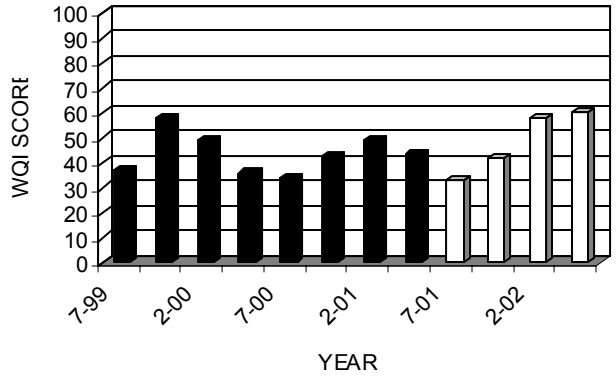
A slightly high total iron value exceeded the New York aquatic standard in February 2002.

Table 48. Water Quality Summary Cowanesque River (COWN 1.0) at Lawrenceville, Pa.

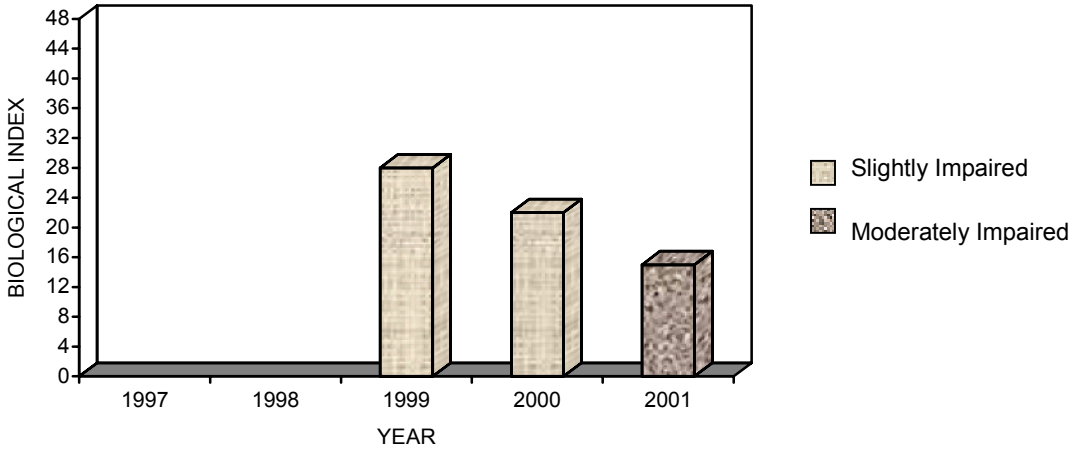
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	07/23/01	9.3	9.0	Pa. aquatic life
pH	07/23/01	9.3	8.5	N.Y. general

Date	WQI	Parameters Exceeding 90th Percentile							
07/23/01	33.3	TOC							
11/06/01	42.1	DNO2	TNO2	TOC					
02/26/02	57.9	TOC							
04/23/02	60.3	DS	TS	TOC					

Biological and Habitat Summary	
Number of Taxa	14
Diversity Index	1.7
RBP Score	15
RBP Condition	Moderately Impaired
Total Habitat Score	150
Habitat Condition Category	Excellent



Water Quality Index



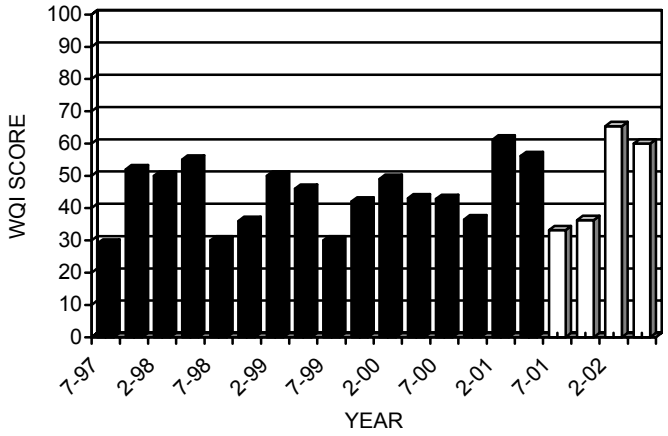
Biological Index

Table 49. Water Quality Summary Susquehanna River (SUSQ 365.0) at Windsor, N.Y.

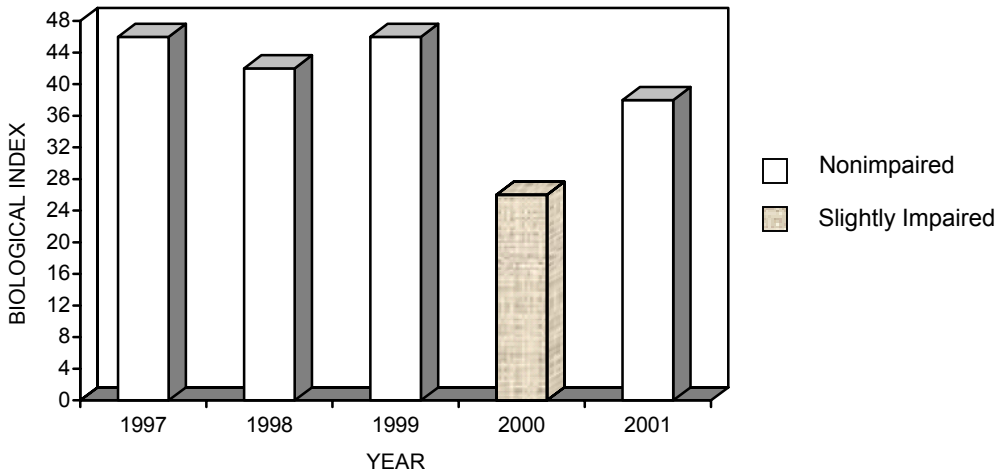
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/25/02	370 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	02/25/02	220 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/25/01	33.2	DNO2							
11/05/01	36.3	DO	TSO4						
02/25/02	65.4	DN	TN	TP					
04/22/02	60	None							

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.4
RBP Score	38
RBP Condition	Reference
Total Habitat Score	159
Habitat Condition Category	Reference



Water Quality Index



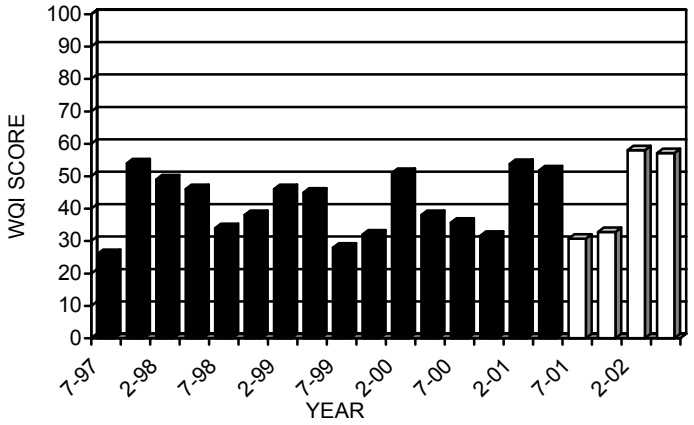
Biological Index

Table 50. Water Quality Summary Susquehanna River (SUSQ 340.0) at Kirkwood, N.Y.

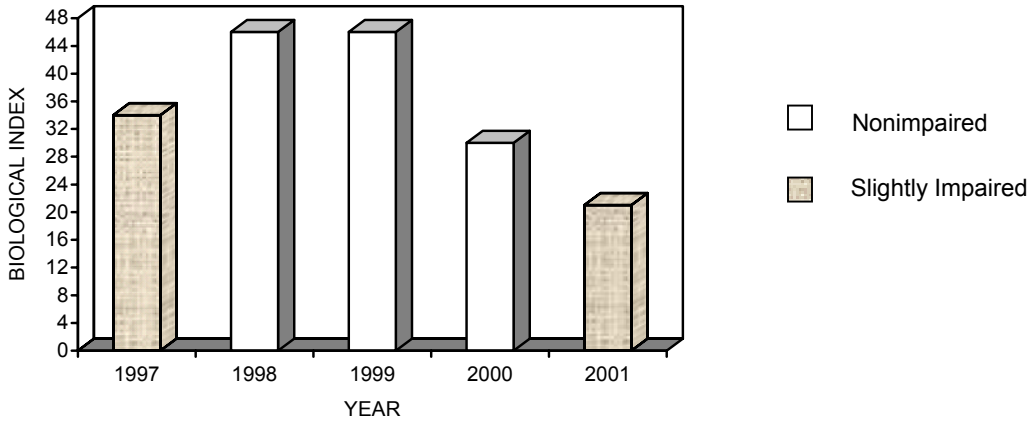
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/25/02	310 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/25/01	30.7	None							
11/05/01	32.8	None							
02/25/02	58	DO							
04/22/02	57.1	None							

Biological and Habitat Summary	
Number of Taxa	12
Diversity Index	1.9
RBP Score	21
RBP Condition	Slightly Impaired
Total Habitat Score	131
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Additional water quality analysis indicated that only dissolved oxygen exceeded the 90th percentile, also in February 2002 (Table 50).

Three increasing and eight decreasing trends occurred at SUSQ 340. Strong, significant increasing trends occurred in total chloride concentrations and a significant increasing trend occurred in unadjusted total solids concentrations. Strong, significant decreasing trends were evident in unadjusted and flow-adjusted total ammonia, total nitrogen, total phosphorus, and total iron (Table 19).

Susquehanna River at Sayre, Pa. (SUSQ 289.1)

The Susquehanna River at Sayre, Pa., (SUSQ 289.1) was nonimpaired in biological community for the fourth consecutive year. This site had the best scores in the Hilsenhoff Biotic Index (4.0), EPT taxa (13), and percent Chironomidae (zero percent) metrics. Pollution intolerant taxa present at this site included *Promoresia, Heterocloeon, Serratella, Stenonema, Isonychia, Agnetina,* and *Macrostemum*.

No parameters exceeded state standards in fiscal year 2002, and no parameters exceeded the 90th percentile in July or November 2001. Parameters that exceeded the 90th percentile in February and April 2002 were dissolved oxygen, total and dissolved nitrogen, total and dissolved ammonia, total and dissolved nitrate, total phosphorus, and total and dissolved nitrite (Table 51).

SUSQ 289.1 had two increasing and 12 decreasing trends in fiscal year 2002. The two increasing trends were in unadjusted and flow-adjusted total chloride. Strong, significant, decreasing trends were found for both unadjusted and flow-adjusted concentrations of total ammonia, total nitrogen, total phosphorus, total manganese, total iron, and flow-adjusted total aluminum. Significant, decreasing trends occurred for unadjusted concentrations of total aluminum (Table 19).

Susquehanna River at Marietta, Pa. (SUSQ 44.5)

The Susquehanna River at Marietta, Pa., (SUSQ 44.5) had a nonimpaired biological community in August 2001. This site had the best scores for percent Ephemeroptera (26.43 percent) and percent Chironomidae (zero percent) metrics of all the Pennsylvania-Maryland streams. Only four taxa were organic pollution intolerant. Those four taxa were *Stenonema, Isonychia, Macrostemum*, and *Psychomyia*. No parameters exceeded water quality standards; however, water quality analysis indicated that conductivity, total and dissolved solids, total chloride, total sulfate, total and dissolved phosphorus, total and dissolved orthophosphates, total organic carbon, and total and dissolved nitrite were elevated at this station (Table 52).

There were three increasing trends and 11 decreasing trends at SUSQ 44.5 during fiscal year 2002. The increasing trends were strong, significant trends for unadjusted and flow-adjusted total chloride and a significant trend for unadjusted total solids. Strong, significant, decreasing trends existed for unadjusted and flow-adjusted total ammonia, total phosphorus, total iron, total aluminum, total manganese, and for flow-adjusted total sulfate (Table 19).

Susquehanna River at Conowingo, Md. (SUSQ 10.0)

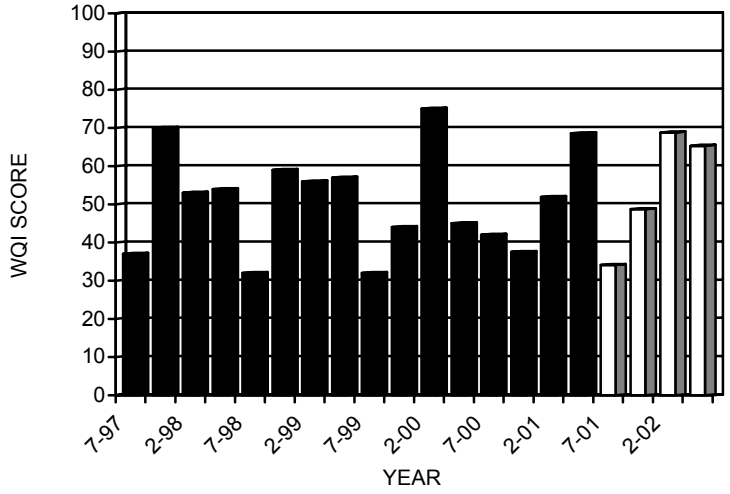
No macroinvertebrate sampling was performed in the Susquehanna River at Conowingo, Md., (SUSQ 10.0) due to deep waters and a lack of riffle habitat. None of the water quality parameters exceeded Pennsylvania or Maryland state standards. In the previous year, dissolved oxygen values exceeded standards; however, values in fiscal year 2002 showed improvement from values around 3 mg/l to values around 8 mg/l. Parameters that exceeded the 90th percentile were total and dissolved ammonia, dissolved nitrite, total organic carbon, total and dissolved manganese, conductivity, total phosphorus, total sulfate, total iron, total orthophosphate, turbidity, dissolved oxygen, and total aluminum.

Table 51. Water Quality Summary Susquehanna River (SUSQ 289.1) at Sayre, Pa.

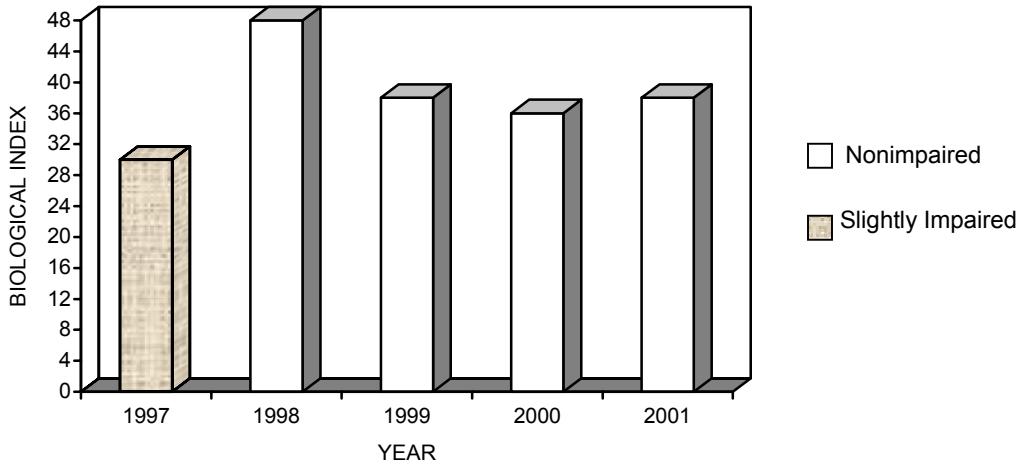
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/24/01	34.1	None							
11/05/01	48.7	None							
02/25/02	68.8	DO	DN	TN	DNH3	TNH3	DNO3	TNO3	TP
04/22/02	65.3	DN	TN	DNO2	TNO2	DNO3	TNO3	TP	

Biological and Habitat Summary	
Number of Taxa	17
Diversity Index	2.2
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	156
Habitat Condition Category	Excellent



Water Quality Index



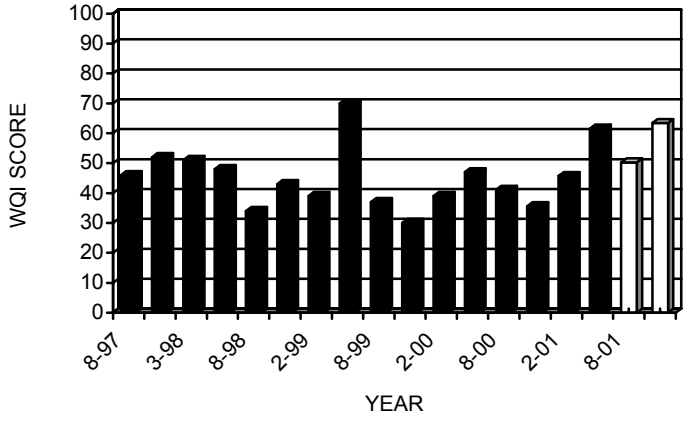
Biological Index

Table 52. Water Quality Summary Susquehanna River (SUSQ 44.5) at Marietta, Pa.

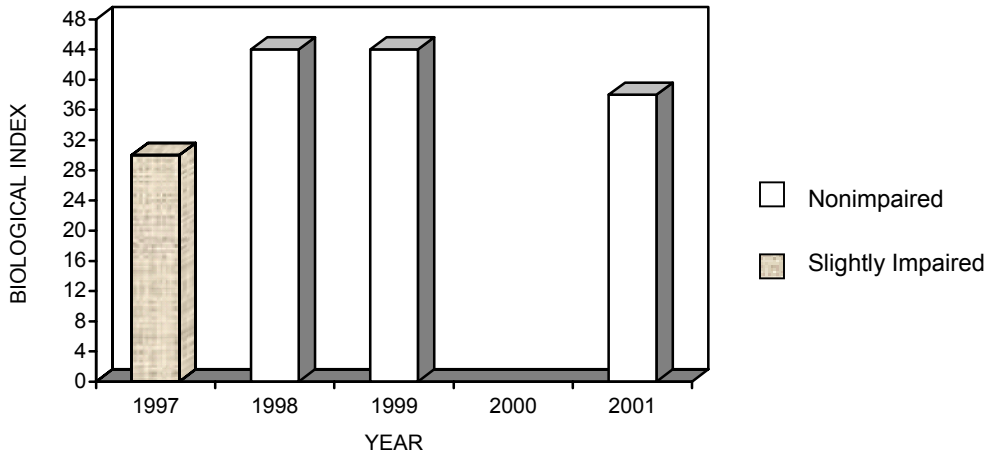
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/01	50.3	COND	DS	TS	TOC	TCl	TSO4		
11/13/01	63.4	DS	TS	DNO2	TNO2	DP	TP	DPO4	TPO4
		TCl							

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.3
RBP Score	40
RBP Condition	Nonimpaired
Total Habitat Score	145
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Total manganese exceeded the 90th percentile in all four seasons (Table 53). SUSQ 10.0 had the highest values for dissolved nitrite (0.09 mg/l), total aluminum (518 µg/l), and turbidity (12.5 ntu) of all the interstate streams (Table A2).

At SUSQ 10.0, two increasing trends and 12 decreasing trends were observed. The only increasing trends were strong, significant, increasing trends in unadjusted and flow-adjusted total chloride. Strong, significant, downward trends occurred in both unadjusted and flow-adjusted total nitrogen, total phosphorus, total iron, total aluminum, and total manganese and unadjusted total ammonia. A significant, decreasing trend was evident in flow-adjusted total ammonia (Table 19).

Tioga River (TIOG 10.8)

The Tioga River at Lindley, N.Y., (TIOG 10.8) had a slightly impaired biological community during July 2001, and habitat conditions were considered excellent with large deep riffles. Total iron and total aluminum exceeded the New York aquatic standards in April 2002. Parameters that exceeded the 90th percentile were dissolved oxygen, dissolved nitrite, total and dissolved manganese, total and dissolved solids, total sulfate, total iron, total aluminum, total orthophosphate, and turbidity (Table 54).

Higher total iron and total aluminum values at this site may have been due to acid mine drainage in the headwaters of the Tioga River. The Tioga-Hammond Reservoir, located upstream of TIOG 10.8, alleviated 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.

TIOG 10.8 had only one increasing trend and 12 decreasing trends. A strong, significant increase was evident in flow-adjusted aluminum. Strong, significant, decreasing trends were found for adjusted and unadjusted total ammonia, total nitrogen, total phosphorus, total sulfate, total manganese, and for unadjusted total iron. A significant, decreasing trend occurred in unadjusted total solids (Table 19).

Group 3 Sites

Babcock Run (BABC)

During the 2001-2002 sampling season, the macroinvertebrate community of Babcock Run near Cadis, Pa., was designated slightly impaired. This site scored fairly well in percent Ephemeroptera (30.5 percent) and Shannon-Weaver (2.25) metrics. Ephemeroptera taxa present in Babcock Run included *Acentrella* (Ephemeroptera: Baetidae), *Cinygmula* (Ephemeroptera: Heptageniidae), *Epeorus*, *Stenacron* (Ephemeroptera: Heptageniidae), *Stenonema,* and *Paraleptophlebia* (Ephemeroptera: Paraleptophlebiidae). Physical habitat conditions were mostly forested and designated excellent, and all field chemistry parameters were normal.

Beagle Hollow Run (BEAG)

Nonimpaired biological conditions existed at Red House/Beagle Hollow Run near Osceola, Pa., during May 2002. Pollution intolerant taxa at this site included, *Prosimulium* (Diptera: Simuliidae), *Hexatoma, Limnophila, Ameletus* (Ephemeroptera: Ameletidae), *Drunella* (Ephemeroptera: Ephemerellidae), *Epeorus, Paraleptophlebia, Sweltsa* (Plecoptera: Chloroperlidae), *Leuctra, Amphinemura* (Plecoptera: Nemouridae), *Isoperla* (Plecoptera: Perlodidae), *Wormaldia* (Trichoptera: Philopotamidae), and *Rhyacophila*. Habitat conditions were considered excellent, and all field chemistry parameters were within normal ranges.

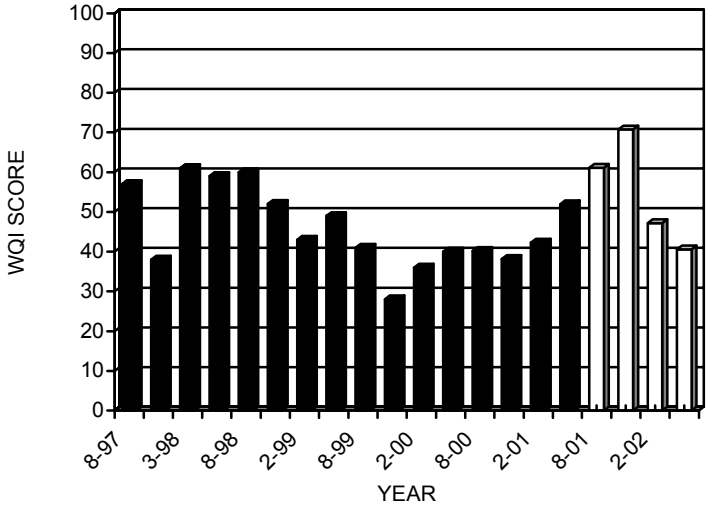
Bill Hess Creek (BILL)

Bill Hess Creek near Nelson, Pa., was designated slightly impaired although in 2000-2001 it served as the reference site for the Group 3 streams.

Table 53. 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							
08/01/01	61.1	DNH3	TNH3	DNO2	TOC	DMn	TMn		
11/12/01	70.8	COND	DNH3	TNH3	TP	TSO4	TFe	TMn	TPO4
		TURB	DO						
02/20/02	47.2	DO	TFe	DMn	TMn	TAl	TURB		
04/18/02	40.6	TMn	TURB						



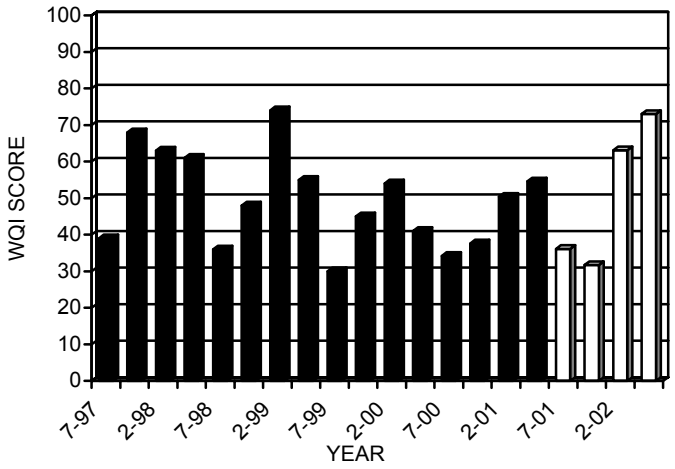
Water Quality Index

Table 54. Water Quality Summary Tioga River at Lindley, N.Y.

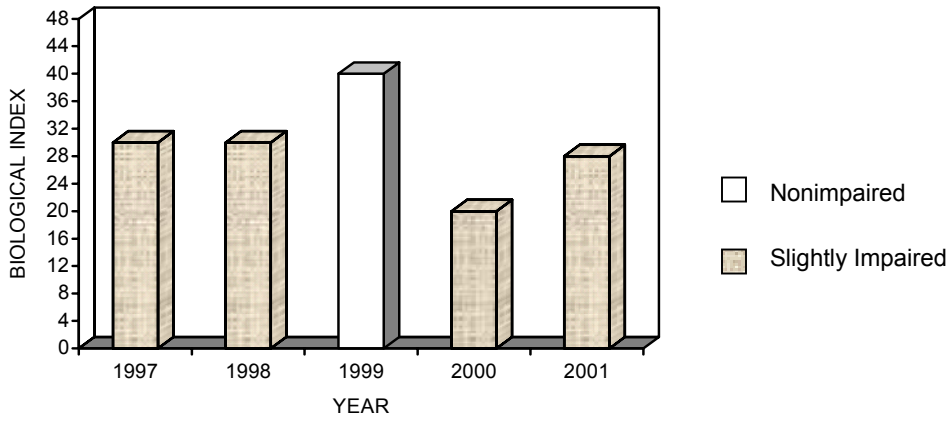
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	04/23/02	408 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	04/23/02	314 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
07/23/01	36.1	None							
11/06/01	31.7	None							
02/26/02	63.1	DO	DNO2	TSO4	DMn	TMn			
04/23/02	73	DS	TS	TSO4	TFe	DMn	TMn	TAl	TPO4
		TURB							

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.2
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	163
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

The sample taken at Bill Hess Creek scored well in taxa richness (21), percent Ephemeroptera (34.5 percent), and Shannon-Weaver Diversity Index (2.38). The habitat was rated excellent with woody debris present and some moss and algae covering the rocks. However, some signs of disturbance were evident such as a four-wheeler trail crossing through the stream and the remnants of a concrete bridge. All field chemistry parameters were within acceptable limits, although conductivity (285 µmhos/cm) and alkalinity (96 mg/l) were the highest of the Group 3 streams (Table A3).

Bird Creek (BIRD)

Bird Creek near Webb Mills, N.Y., was designated slightly impaired. This site had a high percent Ephemeroptera metric score (49.2 percent), and was dominated by *Drunella*. The habitat was designated excellent, and was located in a predominantly forested area. All field chemistry parameters fell within acceptable ranges.

Biscuit Hollow (BISC)

Slightly impaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during this survey. The most abundant taxa present at this site were *Amphinemura*. The physical habitat at this site was considered partially supporting, with a poor riparian vegetative zone width, frequency of riffles, instream cover, sediment deposition, and epifaunal substrate. The site had eroded banks and was located in an agricultural area downstream of a beaver dam. Field chemistry parameters were within normal ranges.

Briggs Hollow Run (BRIG)

Briggs Hollow Run near Nichols, N.Y., was designated slightly impaired during the 2002 sampling season. It had the best Hilsenhoff Biotic Index (0.51) and percent Chironomidae (1.54 percent) metric scores, along with a good score for percent Ephemeroptera (48.5 percent). Pollution intolerant taxa included: *Hexatoma, Ameletus*, *Ephemerella, Cinygmula, Epeorus, Leucrocuta, Paraleptophlebia, Haploperla* (Plecoptera: Chloroperlidae), *Leuctra, Amphinemura, Acroneuria*, and *Isoperla*. The site was dominated by the pollution-tolerant taxa Chironomidae in May 2001; however, in May 2002, the percent Chironomidae metric was low and the site was dominated by *Haploperla* and *Epeorus*. The physical habitat was designated supporting with poor bank stability and a small riparian vegetative zone. The area was agricultural with a horse pasture along the stream. All field chemistry parameters were within acceptable limits.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, Pa., had a slightly impaired biological community and excellent habitat conditions during the 2001-2002 sampling season. The percent Ephemeroptera metric score (36.1 percent) was good at this site. The habitat was rated excellent, with ample stream cover and woody debris. Although the riparian zone was wide, the stream had a high amount of sediment deposition. 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 2002. This site had good taxonomic richness (21), percent dominant taxa (16.2 percent), and Shannon-Weaver Index (2.54) metric scores. The physical habitat of the stream was designated supporting with poor velocity/depth regimes and a large amount of algae. All field chemistry parameters were normal.

Cook Hollow (COOK)

Cook Hollow near Austinburg, Pa., had a slightly impaired biological community. This site scored well in the taxonomic richness (20) and Shannon-Weaver (2.31) metrics, but poorly in percent Chironomidae. Chironomidae dominated this sample with 52 Chironomidae comprising 37 percent of the sample. The habitat was supporting, 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 slightly impaired with an excellent physical habitat. This site had the highest number of taxa (24) of all Group 3 sampling sites, and the second highest Shannon-Weaver Diversity Index value (2.6). An abandoned beaver dam was located upstream of the sampling site on Deep Hollow Brook. The field chemistry values improved from last year. Dissolved oxygen improved from 4.99 mg/l to 8.78 mg/l, alkalinity improved from 8 mg/l to 12 mg/l, and the temperature improved from 18.2 to 13.0 degrees Celsius from 2001 to 2002, respectively. Although improved, the alkalinity level is still lower than the Pennsylvania state standard for aquatic life.

Denton Creek (DENT)

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community during May 2002. DENT received low metric scores, particularly in Hilsenhoff Biotic Index (5.38), EPT taxa (5), and percent Chironomidae (45.9 percent). The sample was dominated by 62 Chironomidae comprising 45.9 percent of the sample. This site had the lowest pH (6.8) and alkalinity (10.0) of all the Group 3 sites (Table A3). All the field chemistry parameters were within acceptable limits, except alkalinity, which was lower than the Pennsylvania state standard for aquatic life. The habitat was rated excellent with high scores for frequency of riffles and velocity/depth regimes. This sampling site is located downstream of Hawkins Lake; however, swimming, boating, and camping are not allowed at this lake.

Dry Brook (DRYB)

Dry Brook at Waverly, N.Y., was designated severely impaired in May 2002 due to biological scores of zero in all the metrics except percent Ephemeroptera and Shannon-Weaver Diversity Index. DRYB had the lowest scores of all Group 3 streams in taxonomic richness (9) and EPT Index (4). Chironomidae dominated this sample with 86 comprising 62.3 percent of the sample. This stream runs directly through residential and commercial areas in the town of Waverly, and is rated partially supporting in habitat condition due to channel alteration and lack of vegetated riparian zone. All field chemistry parameters were within acceptable limits, although the temperature (16.1 degrees Celsius) was the highest of all Group 3 sites (Table A3).

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, N.Y., was designated nonimpaired in May 2002, which was an improvement from the moderately impaired rating during the 2001 sampling season. The site had high taxonomic richness (21), percent Ephemeroptera (53.1 percent), EPT Index (15), and Shannon-Weaver Diversity Index (2.37) values compared to other Group 3 sites. Pollution intolerant taxa at this site included *Prosimulium*, *Hexatoma, Ameletus, Ephemerella, Cinygmula, Epeorus, Paraleptophlebia, Haploperla, Sweltsa*, *Leuctra, Amphinemura, Acroneuria, Isoperla*, and *Neophylax* (Trichoptera: Uenoidae). The physical habitat also was improved greatly from designated nonsupporting to excellent. In 2001, dredging equipment was found in the stream and timber was being removed from the streambanks. In 2002, no evidence of dredging or timber removal was noted, and there was adequate woody debris and stream cover. All field chemistry parameters were normal.

Parks Creek (PARK)

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 nonimpaired biological community during the 2002 sampling season. This site had good taxonomic richness (22), Hilsenhoff Biotic Index (1.2), percent Chironomidae (3.3 percent), and the highest EPT Index (18) of all Group 3 streams. A number of pollution intolerant taxa existed at the Parks Creek sampling site, including *Prosimulium, Hexatoma*, *Ameletus, Ephemerella, Cinygmula, Epeorus, Paraleptophlebia, Haploperla, Sweltsa, Leuctra, Amphinemura*, *Isoperla, Wormaldia*, and *Rhyacophila*. The site had a supporting habitat, unlike the previous rating of nonsupporting; however, the site still

received low ratings for condition of banks and sediment deposition. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)

The biological community of Prince Hollow Run near Cadis, Pa., was designated severely impaired with a partially supporting habitat. There was evidence of dredging, heavily eroded banks, and human debris. Furthermore, the site was located in an agricultural area with a thin vegetated riparian zone, poor vegetative protective cover, poor condition of banks, sediment deposition, and lack of riffles. PRIN had a poor Hilsenhoff Biotic Index score (5.44), and the worst metric scores in percent dominant taxa (83.7 percent), percent Chironomidae (83.7 percent), and Shannon-Weaver Diversity Index (0.83) of all Group 3 sites. The field chemistry parameters were within limits; however, the temperature was the highest (16.1 degrees Celsius) and the dissolved oxygen was the lowest (7.94 mg/l) of all the Group 3 sites (Table A3).

Russell Run (RUSS)

The biological community of Russell Run near Windham, Pa., was designated slightly impaired with a supporting habitat. The stream channel appeared to be rather transient, and the condition of banks received a low rating. The habitat had improved from the previous year when the stream had been channelized and the right bank timbered close to the time of sampling. 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 good metric scores for Hilsenhoff Biotic Index and percent Chironomidae, and the highest metric score for percent Ephemeroptera. Ephemeropteran taxa present at this site included *Acerpenna* (Ephemeroptera: Baetidae), *Baetis* (Ephemeroptera: Baetidae), *Ephemerella, Cinygmula, Epeorus, Isonychia*, and *Paraleptophlebia*. The most abundant taxa at this site was the organic pollution intolerant *Epeorus* (65). Dredging was being done on the stream below where the sample was taken, and possibly had been done in the sampling location previously. All field chemistry parameters were within normal ranges.

Smith Creek (SMIT)

The biological conditions at Smith Creek near East Lawrence, Pa., were designated moderately impaired, while the stream had supporting habitat conditions. This site had a low percent Ephemeroptera metric score; however, the dominant taxon was the pollution intolerant stonefly *Amphinemura* (86). The water level was low at the time of sampling and the stream was impacted by large amounts of silt and sediment. There were no extreme values in the field chemistry parameters.

Strait Creek (STRA)

A moderately impaired biological community existed at Strait Creek near Nelson, Pa., which was a decrease from the nonimpaired rating in fiscal year 2001. One of the largest differences was that the 2001 sample had four taxa of Trichoptera, whereas no Trichoptera taxon was present in 2002. Also, the most abundant taxon changed from *Paraleptophlebia* (34) to *Psephenus* (61). This change in dominant taxa may be because *Psephenus* is a scraper, which feeds on algae. Large amounts of algae and water cress were noted in the stream. The physical habitat was designated supporting due to lack of vegetative cover on the banks and poor velocity/depth regimes. All field chemistry parameters were within normal limits, although alkalinity was rather high (72 mg/l) relative to the other Group 3 streams (Table A3).

White Branch Cowanesque River (WBCO)

During May 2002, moderately impaired conditions existed at White Branch Cowanesque River near North Fork, Pa. This site had been nonimpaired in May 2000 with a number of pollution intolerant taxa; however, during May 2001 and May 2002, it has been moderately impaired. WBCO scored poorly for all the metrics with the lowest ranking of all the Group 3

sites for Hilsenhoff Biotic Index (5.67) and percent Ephemeroptera (1.37 percent) metrics. The sample was dominated by the pollution tolerant taxa Chironomidae (62) comprising 42.5 percent of the sample. The habitat was partially supporting due to low scores in sediment deposition, embeddedness, and instream cover. The stream discharge was high at the time of sampling, and the water was turbid. Cows had direct access to the stream in a pasture upstream of the sampling site. Also, there were silt fences located on the right bank of the stream suggesting that work was being done near the sampling site. Despite these disturbances, field chemistry measurements were within acceptable ranges. In fact, dissolved oxygen was the highest value (12.59 mg/l) of any of the Group 3 streams, which would not be expected since this site was downstream of a dam; however, the stream was at high flow due to recent rains (Table A3).

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated as the reference site for Group 3 streams in fiscal year 2002. This site had the highest number of taxa (23) and number of EPT (16), and also had the best scores in percent dominant taxa (14.17 percent) and Shannon-Weaver Diversity Index (2.70). Macroinvertebrate taxa with a Hilsenhoff tolerance value of three or less included *Prosimulium*, Antocha, Dicranota, *Hexatoma*, *Ameletus*, *Ephemerella*, *Epeorus*, *Haploperla*, *Sweltsa*, Leuctra, *Amphinemura*, *Ostrocerca* (Plecoptera: Nemouridae), *Isoperla*, *Yugus* (Plecoptera: Perlodidae), *Diplectrona, Wormaldia*, and *Rhyacophila*. The physical habitat was designated excellent with good stream cover from a largely coniferous forest. 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. A Pearson Product Moment Correlation was performed for each reference category for average WQI score, RBP III score, and physical habitat score. Statistically significant relationships ($p<0.05$) observed among the chemical characteristics, the biological communities, and physical habitats of the interstate streams are described below. 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 nine sites in this reference category have shown and continue to show a large degree of variability in water quality. There was no significant correlation between RBP III score and water chemistry (WQI score), and no significant correlation between RBP III score and habitat. In fiscal year 1999 and fiscal year 2000, a significant ($p<0.05$) positive correlation between RBP III score and habitat score existed; however, that correlation was not observed in the data for fiscal year 2001 or fiscal year 2002. The habitat in the New York-Pennsylvania border streams often is noted to be unstable due to the glacial history of these streams and the practice of dredging for gravel in streams.

Pennsylvania – Maryland Sites

There was no significant correlation between RBP III score and water chemistry, and no significant correlation between RBP III score and habitat between the eight Pennsylvania-Maryland border sites. In fiscal year 2001, there was a significant ($p<0.05$) negative correlation between biological score and WQI. There were no significant correlations noted during fiscal year 2000; however, during the 1999 fiscal year, a significant negative correlation also existed

between the RBP III score and the water chemistry score. Since a high WQI score denotes poor water quality, this indicates that those sites with degraded water quality also had degraded biological communities in fiscal year 2001 and fiscal year 1999.

The area surrounding the Pennsylvania-Maryland border sites was largely agricultural. Intensive agricultural activities without proper BMPs often result in streambank erosion and sedimentation, contributing to poor instream habitat quality and to nutrient enrichment. Additionally, nutrient enrichment encourages excessive plant growth, which can depress dissolved oxygen levels during plant decomposition.

River Sites

For the nine river sites, there was no significant correlation between RBP III scores and water chemistry, and no significant correlation between RBP III scores and habitat. In fiscal year 2001, there was a significant positive correlation between physical habitat and RBP III scores, indicating that better physical habitats supported better macroinvertebrate communities. There also was a significant positive correlation between physical habitat and RBP III scores in fiscal year 2000. Also, during fiscal year 1999, a negative correlation existed between WQI score and biological score, indicating sites with degraded water quality also had degraded biological communities.

Group 3 Streams

Only physical habitat and biological scores were considered in the correlation analysis of Group 3 streams, as extensive water quality information was not collected during this sampling season. There was a significant ($p<0.05$) correlation between physical habitat and biological community for the Group 3 sites. 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 severely or moderately impaired macroinvertebrate communities, increasing trends, or exceeded water quality standards. DRYB and PRIN were the only sites to have severely impaired macroinvertebrate communities. Moderately impaired biological conditions were found at Denton Creek, Smith Creek, Strait Creek, White Branch Cowanesque River, Seeley Creek, Wappasening Creek, and Cowanesque River (COWN 1.0 and COWN 2.2).

Increasing trends were noted at sites on Cayuta Creek (chloride), Chemung River (chloride and solids), Conowingo Creek (chloride and nitrogen), Cowanesque River (chloride, solids, and manganese), Deer Creek (chloride, solids, nitrogen, sulfate, and WQI), Ebaughs Creek (chloride, sulfate, and WQI), Octoraro Creek (chloride and solids), Scott Creek (aluminum), Susquehanna River (chloride and solids), Tioga River (aluminum), and Troups Creek (chloride, solids, phosphorus, and WQI). These sites should be investigated to determine the source of these parameters, particularly chloride. Chloride trends were increasing at numerous sites, and no decreasing trends for this parameter were found. Efforts should be made to determine why chloride trends are increasing.

Those streams that exceeded water quality standards, Apalachin Creek, Cascade Creek, Little Snake Creek, Troups Creek, Falling Branch Deer Creek, Cowanesque River, Tioga River, and the Susquehanna River, 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

Fourteen (29.8 percent) of the 47 interstate macroinvertebrate sampling sites contained

nonimpaired biological communities. Biological conditions at another 23 sites (48.9 percent) were slightly impaired, while 8 sites (17 percent) were moderately impaired. Two sites (4.3 percent), Dry Brook and Prince Hollow Run, were designated severely impaired. Six sites (SUSQ 10.0, SCTT 3.0, CASC 1.6, LSNK 7.6, NFCR 7.6, and TROW 1.6) were not sampled using RBP III techniques and, thus, were not averaged into the final scores. Twenty-eight sites (59.6 percent) had excellent habitats. Fourteen sites (29.8 percent) had supporting habitats, and five sites (10.6 percent) had partially supporting habitats. No sites had a nonsupporting habitat rating.

Overall, interstate streams seemed to achieve their designated uses, and only 25 observations (0.90 percent) of water chemistry parameters exceeded state standards. Total iron exceeded standards most frequently with nine violations (36 percent). Total iron, dissolved iron, total aluminum, alkalinity, and pH, which all exceeded New York or Pennsylvania standards, are indicators of abandoned mine drainage pollution.

Of the New York-Pennsylvania border streams, the biological community of one (11.1 percent) of these streams was nonimpaired. Six sites (66.7 percent) in the New York-Pennsylvania reference category were slightly impaired, and two streams (22.2 percent) were moderately impaired. Seven sites had excellent habitats (77.8 percent) and two sites (22.2 percent) had supporting habitats. High metal concentrations, particularly total iron, appeared to be the largest source of water quality degradation in this region. The parameters that exceeded New York and Pennsylvania state standards were iron, aluminum, dissolved oxygen, and alkalinity. Iron standards were exceeded at Apalachin Creek, Cascade Creek, and Little Snake Creek. Aluminum and dissolved oxygen standards were exceeded at Troups Creek, and Cascade Creek and Little Snake Creek exceeded alkalinity standards. Rechannelization of the streambed and removal of instream habitat may have resulted in poor conditions for macroinvertebrate colonization in several streams, including Bentley Creek and Seeley Creek. Wappasening Creek and Choconut Creek have shown a decreasing biological condition over the past three or four years. The impairment at WAPP 2.6 may be due to high levels of nutrients such as nitrogen, nitrate, and nitrite, which are shown to exceed the 90th percentile. Choconut Creek may have been impaired by the drought during the past couple years, since it did receive moderate ratings in velocity/depth regime and channel flow status. The impairment at Choconut Creek does not appear to be due to water quality conditions, although it is only sampled once a year, so the water quality is unknown at other times of the year. Consideration should be given to changing these streams to Group 1 status so they can be more closely monitored for water quality impairment.

Nonimpaired biological conditions existed at five (62.5 percent) of the eight Pennsylvania-Maryland interstate streams. The remaining three sites (37.5 percent) were slightly impaired. Five (62.5 percent) of the Pennsylvania-Maryland border sites had excellent habitats, two sites (25 percent) had supporting habitats, and one (12.5 percent) had partially supporting habitat. Some improvements were seen in some aspects of water quality or biological condition of many of the Pennsylvania-Maryland streams, particularly Conowingo Creek, Deer Creek, Ebaughs Creek, Falling Branch Deer Creek, and Scott Creek. The only parameter that exceeded Pennsylvania and Maryland water quality standards was alkalinity, at Falling Branch Deer Creek. The Pennsylvania-Maryland border streams are located in a heavily agricultural region, and many of the parameters that exceeded the 90th percentile at these sites were nutrients. Also, streambank erosion and sedimentation were a problem in the instream habitat for 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. The biological communities of four sites (44.4 percent) were nonimpaired, three sites (33.3 percent) were slightly impaired, and two sites (22.2 percent) were moderately impaired. Six of the sites (66.7 percent) had excellent habitats, and three sites (33.3 percent) had

supporting habitat. Water quality parameters that exceeded state standards were pH, dissolved oxygen, total iron, and total aluminum. Standards were exceeded at COWN 5.0, COWN 2.2, COWN 1.0, SUSQ 365.0, SUSQ 340.0, and TIOG 10.8. Sites that had exceeded state standards in fiscal year 2001, but did not exceed standards in fiscal year 2002, were CHEM 12.0, SUSQ 289.1, SUSQ 44.5, and SUSQ 10.0. Those sites that exceeded standards in fiscal year 2002, that had not exceeded standards in fiscal year 2001, were only SUSQ 365.0 and TIOG 10.8. The effects of the Cowanesque Reservoir were evident through comparison of COWN 5.0, COWN 2.2, and COWN 1.0. The water chemistry changed from upstream of the reservoir (COWN 5.0) to downstream of the reservoir (COWN 2.2) with dissolved oxygen, total iron, and total aluminum values exceeding the state standards and numerous parameters exceeding the 90th percentile at COWN 2.2. Furthermore, the macroinvertebrate community lost seven pollution intolerant taxa from upstream to downstream of the reservoir. Some recovery of the river was evident further downstream of the reservoir at COWN 1.0 with the reappearance of pollution intolerant taxa and the improvement in water chemistry.

Of the 21 Group 3 sites, four stations (19 percent) were designated nonimpaired. Eleven sites (52.4 percent) had slightly impaired biological communities, while four stations (19 percent) had moderately impaired conditions. Two (9.5 percent) of the sites were severely impaired. Ten (47.6 percent) of the 21 stations sampled had excellent habitat conditions, seven (33.3 percent) had supporting habitats, and four sites (19 percent) had partially supporting habitats. There was a significant positive correlation between physical habitat and biological score during this sampling season, suggesting that biological condition depended on the quality of habitat in these small, low order streams.

The Seasonal Kendall nonparametric test for trends was applied to observed concentration and flow-adjusted concentration. Trends were detected ($p<0.10$) for several parameters at individual stations. For each parameter, an overall weighted value was calculated to indicate the strength of the trend in the Susquehanna River Basin over the period 1986 through 2001. The only overall increasing trend was in concentrations of total chlorides. This could be the result of applying salt to remove ice from roads or from the use of chlorine in wastewater and water treatment plants. No overall trends in either unadjusted or flow-adjusted concentrations were evident in total suspended solids, total sulfate, total aluminum, and WQI. All other parameters showed a decreasing trend in either unadjusted or flow-adjusted concentrations. These decreasing trends suggest an improvement in water quality. Total phosphorus showed a particularly strong decreasing trend in both unadjusted and flow-adjusted concentrations. Other strong trends included unadjusted concentrations of total ammonia and total iron.

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 can also serve as a starting point for more detailed assessments and remediation efforts that may be planned on these streams.

Table 55. Summary of Overall Direction of Trends

Parameter	Detected Trends				Overall Direction of Concentration Trend	Overall Direction of Flow-Adjusted Concentration Trend
	Concentration		Flow-Adjusted Concentration			
	+	-	+	-		
Total Suspended Solids	7	1	3	0	None	None
Total Ammonia	0	13	0	11	Decreasing	Decreasing
Total Nitrogen	2	9	1	9	None	Decreasing
Total Phosphorus	0	13	1	13	Decreasing	Decreasing
Total Chloride	13	0	10	0	Increasing	Increasing
Total Sulfate	2	5	2	7	None	None
Total Iron	0	12	0	11	Decreasing	Decreasing
Total Aluminum	1	5	1	5	None	None
Total Manganese	1	11	0	10	Decreasing	Decreasing
Water Quality Index	1	0	3	0	None	None

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APPENDIX A

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

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

Parameter	Units	APAL 6.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	CASC 1.6	CASC 1.6	CASC 1.6
Date	yyyymmdd	20010725	20010724	20011106	20020226	20020423	20011105	20020225	20020422
Time	hhmm	710	915	1110	1135	1040	1050	1140	1130
Discharge	cfs	0.613	1.927	2.748	13.996	9.284	1.002	5.943	3.867
Temperature	degree C	23.4	20.9	7.8	3.9	6.9	7.2	2.8	8.2
Conductance	umhos/cm	122	266	282	153	147	81	49	56
Dissolved Oxygen	mg/l	6.14	10.33	8.04	9.23	8.26	7.34	9.68	9.26
pH		7.15	8	7.9	7.05	7.25	6.95	6.65	6.75
Alkalinity	mg/l	34	98	100	44	56	26	16	18
Acidity	mg/l	4	2	2	6	6	10	4	6
Solids, Total	mg/l	92	128	180	112	358	22	42	24
Solids, Dissolved	mg/l	88	128	180	106	354	4	28	18
Ammonia, Total	mg/l	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.08	0.2	0.12	0.44	0.24	<0.04	0.15	<0.04
Nitrate, Dissolved	mg/l	0.06	0.2	0.12	0.44	0.25	<0.04	0.13	<0.04
Nitrogen, Total	mg/l	0.4	0.34	0.27	0.65	0.47	0.22	0.33	0.23
Nitrogen Dissolved	mg/l	0.34	0.35	0.24	0.65	0.46	0.21	0.39	0.21
Phosphorus, Total	mg/l	0.03	<0.01	0.02	<0.01	0.01	0.02	0.01	0.01
Phosphorus, Dissolved	mg/l	0.01	<0.01	0.011	<0.01	<0.01	0.013	<0.01	<0.01
Orthophosphate, Total	mg/l	0.011	<0.01	<0.01	<0.01	0.01	0.015	<0.01	<0.01
Orthophosphate, Dissolved	mg/l	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	2.3	1.8	1.6	2.4	2.6	2.3	1.8	2.3
Calcium	mg/l	10.6	30.4	34.1	17.3	16.3	8.02	4.54	5.98
Magnesium	mg/l	3.27	6.31	6.38	3.65	3.49	2.4	1.42	1.74
Chloride	mg/l	9	19	20	12	9	4	2	1
Sulfate	mg/l	32.3	31.4	28.2	<20	<20	<20	<20	<20
Turbidity	ntu	3.57	<1	<1	<1	3.31	3.41	1.46	1.71
Iron, Total	µg/l	598	<20	<20	40	128	750	110	214
Iron, Dissolved	µg/l	208	<20	<20	30	80	421	70	133
Manganese, Total	µg/l	127	<10	<10	<10	<10	86	30	47
Manganese, Dissolved	µg/l	77	<10	<10	<10	<10	73	20	39
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	CAYT 1.7	CAYT 1.7	CAYT 1.7	CAYT 1.7	CHEM 12.0	CHEM 12.0	CHEM 12.0	CHEM 12.0
Date	yyyymmdd	20010724	20011106	20020226	20020423	20010724	20011106	20020226	20020423
Time	hhmm	1125	800	910	835	1020	930	1020	930
Discharge	cfs	12.97	14.389	32.545	22.848	218	253	1670	2900
Temperature	degree C	23.7	7.2	4.1	6.5	25.8	8.1	4.8	8.1
Conductance	umhos/cm	642	530	223	205	459	499	285	264
Dissolved Oxygen	mg/l	NA	7.25	9.54	8.42	8.28	6.75	9.35	5.88
pH		8.5	7.9	7.35	7.65	8.3	8.05	7.5	7.7
Alkalinity	mg/l	154	142	64	60	118	132	70	70
Acidity	mg/l	0	2	8	2	0	4	6	2
Solids, Total	mg/l	346	340	134	86	284	338	212	182
Solids, Dissolved	mg/l	326	340	134	76	256	338	212	176
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	0.01	<0.01	<0.01	<0.01	0.02	0.01	0.01	0.01
Nitrite, Dissolved	mg/l	0.01	0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.5	1.04	0.42	0.31	0.18	0.47	0.68	0.66
Nitrate, Dissolved	mg/l	0.5	1.01	0.44	0.31	0.19	0.46	0.67	0.66
Nitrogen, Total	mg/l	0.9	1.41	0.63	0.6	0.61	0.91	0.96	1
Nitrogen Dissolved	mg/l	0.85	1.52	0.69	0.56	0.62	0.85	0.96	0.96
Phosphorus, Total	mg/l	0.17	0.13	0.03	0.02	0.09	0.09	0.03	0.03
Phosphorus, Dissolved	mg/l	0.142	0.134	0.023	0.012	0.046	0.08	0.016	0.02
Orthophosphate, Total	mg/l	0.148	0.126	0.025	0.013	0.055	0.067	0.021	0.019
Orthophosphate, Dissolved	mg/l	0.14	0.119	0.02	0.01	0.041	0.065	0.015	0.014
Organic Carbon, Total	mg/l	2.9	2.1	2.2	2.6	3.4	2.9	3	3.1
Calcium	mg/l	48.1	51.8	23.9	22.3	42.5	50.8	28.2	27.1
Magnesium	mg/l	9.44	8.99	4.64	4.63	11	10.7	5.95	5.94
Chloride	mg/l	104	67	25	20	58	60	31	25
Sulfate	mg/l	37.3	49	<20	<20	37.4	54.8	22.6	27.8
Turbidity	ntu	1.73	<1	1.75	5.16	4.81	<1	2.41	6.68
Iron, Total	µg/l	46	42	110	189	88	57	140	251
Iron, Dissolved	µg/l	<20	22	60	76	<20	22	<20	74
Manganese, Total	µg/l	16	<10	<10	12	84	11	30	40
Manganese, Dissolved	µg/l	<10	<10	<10	<10	<10	<10	<10	20
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	CHOC9.1	COWN1.0	COWN1.0	COWN1.0	COWN1.0	COWN2.2	COWN2.2	COWN2.2
Date	yyyymmdd	20010725	20010723	20011106	20020226	20020423	20010723	20011107	20020226
Time	hhmm	815	1530	1500	1430	1435	1410	945	1530
Discharge	cfs	1.789	25	20	199	281	NA	NA	NA
Temperature	degree C	23.1	28.4	12	4.5	12.7	25.1	10.4	4.4
Conductance	umhos/cm	129	200	213	216	184	196	212	217
Dissolved Oxygen	mg/l	6.85	5.76	9.31	11.21	8	3.65	6.38	9.42
pH		7.05	9.3	8.45	7.7	7.55	8.3	7.3	7.3
Alkalinity	mg/l	30	56	62	56	46	56	68	62
Acidity	mg/l	4	0	0	4	4	0	6	4
Solids, Total	mg/l	80	142	136	152	502	128	124	146
Solids, Dissolved	mg/l	80	142	136	152	498	128	118	124
Ammonia, Total	mg/l	<0.02	<0.02	0.03	<0.02	0.02	0.03	0.06	0.04
Ammonia, Dissolved	mg/l	<0.02	<0.02	0.03	<0.02	0.02	0.03	0.06	0.03
Nitrite, Total	mg/l	0.01	0.01	0.02	0.01	<0.01	0.01	0.01	0.01
Nitrite, Dissolved	mg/l	0.01	0.01	0.02	0.01	<0.01	0.01	0.01	0.01
Nitrate, Total	mg/l	0.18	0.12	0.22	0.56	0.45	0.08	0.12	0.47
Nitrate, Dissolved	mg/l	0.17	0.11	0.24	0.46	0.46	0.1	0.1	0.46
Nitrogen, Total	mg/l	0.46	0.61	0.77	0.95	0.82	0.59	0.62	0.87
Nitrogen Dissolved	mg/l	0.45	0.54	0.72	0.86	0.82	0.53	0.59	0.82
Phosphorus, Total	mg/l	0.01	0.03	0.04	0.02	0.02	0.01	0.02	0.03
Phosphorus, Dissolved	mg/l	<0.01	0.018	0.033	<0.01	0.011	0.01	0.017	<0.01
Orthophosphate, Total	mg/l	<0.01	0.019	0.032	0.012	0.014	0.01	0.016	0.012
Orthophosphate, Dissolved	mg/l	<0.01	0.016	0.025	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	2	4.9	4.3	3.6	3.5	4.7	3.6	3.7
Calcium	mg/l	10.2	20.9	23.6	22.3	18.6	20.5	22.7	22.8
Magnesium	mg/l	3.26	4.14	4.25	4.77	4	4.65	4.43	4.91
Chloride	mg/l	16	16	17	20	15	15	16	21
Sulfate	mg/l	24	21.2	25	20.2	20.6	<20	<20	<20
Turbidity	ntu	1.66	1.75	2.74	2.95	4.09	2.07	4.37	2.95
Iron, Total	µg/l	219	51	134	130	189	73	189	470
Iron, Dissolved	µg/l	67	<20	21	40	74	<20	30	40
Manganese, Total	µg/l	50	48	56	30	40	52	298	140
Manganese, Dissolved	µg/l	34	20	35	20	19	12	255	10
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	208
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	COWN2.2	COWN5.0	LSNK 7.6	LSNK 7.6	LSNK 7.6	SEEL10.3	SEEL10.3	SEEL10.3
Date	yyyymmdd	20020423	20010723	20011105	20020225	20020422	20010724	20011106	20020226
Time	hhmm	1510	1320	1315	1400	1405	720	1240	1250
Discharge	cfs	NA	8.3	3.03	3.708	3.74	2.762	4.036	11.743
Temperature	degree C	12.5	26.6	7.3	3.8	8.5	16	10.9	4.7
Conductance	umhos/cm	174	277	159	114	119	321	343	202
Dissolved Oxygen	mg/l	8.53	5.55	7.25	9.36	9.54	5.63	7.23	10.1
pH		7.6	8.75	7.1	6.9	6.9	7.5	7.9	7.3
Alkalinity	mg/l	48	76	30	18	20	128	130	60
Acidity	mg/l	4	0	6	6	4	6	4	8
Solids, Total	mg/l	322	192	116	74	58	194	238	172
Solids, Dissolved	mg/l	314	184	104	66	58	188	238	172
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.45	<0.04	<0.04	0.18	0.05	0.12	0.11	0.29
Nitrate, Dissolved	mg/l	0.48	0.04	0.11	0.14	0.05	0.11	0.12	0.29
Nitrogen, Total	mg/l	0.81	0.32	0.24	0.39	0.27	0.45	0.1	0.47
Nitrogen Dissolved	mg/l	0.75	0.35	0.51	0.41	0.23	0.43	0.16	0.5
Phosphorus, Total	mg/l	0.02	<0.01	0.02	0.01	0.01	<0.01	0.01	<0.01
Phosphorus, Dissolved	mg/l	<0.01	<0.01	0.014	<0.01	<0.01	<0.01	0.017	<0.01
Orthophosphate, Total	mg/l	0.014	<0.01	0.011	<0.01	0.01	<0.01	<0.01	<0.01
Orthophosphate, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	3.6	2.9	2.6	2	2.5	1.7	1.2	2.4
Calcium	mg/l	17.5	27.8	10	7.85	9.02	44.5	46.9	25.8
Magnesium	mg/l	4.03	6.37	2.62	2.19	2.44	7.15	6.66	4.42
Chloride	mg/l	15	26	24	16	15	16	20	15
Sulfate	mg/l	20.2	<20	20.6	<20	<20	59.5	35	<20
Turbidity	ntu	5.26	1.1	2.47	<1	2.84	<1	<1	<1
Iron, Total	µg/l	431	50	390	170	308	23	<20	40
Iron, Dissolved	µg/l	71	<20	257	90	207	<20	<20	20
Manganese, Total	µg/l	192	14	100	40	59	<10	<10	<10
Manganese, Dissolved	µg/l	15	13	89	40	51	<10	<10	<10
Aluminum, Total	µg/l	236	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SEEL10.3	SNAK2.3	SOUT7.6	SUSQ289.1	SUSQ289.1	SUSQ289.1	SUSQ289.1
Date	yyyymmdd	20020423	20010725	20010724	20010724	20011105	20020225	20020422
Time	hhmm	1200	930	820	1215	1455	1510	1515
Discharge	cfs	6.266	3.042	0.799	1200	1040	9810	8815
Temperature	degree C	8.1	22.5	22.2	27.2	9.5	4.8	13.5
Conductance	umhos/cm	200	128	218	323	386	198	216
Dissolved Oxygen	mg/l	8.23	7.81	8.28	NA	8.13	9.86	7.97
pH		7.5	7.45	7.55	8.45	8.2	7.15	7.35
Alkalinity	mg/l	72	30	64	96	114	58	60
Acidity	mg/l	6	4	6	0	2	6	8
Solids, Total	mg/l	264	84	110	182	236	130	28
Solids, Dissolved	mg/l	264	84	110	182	228	118	172
Ammonia, Total	mg/l	<0.02	<0.02	0.03	<0.02	<0.02	0.04	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	0.03	0.02	<0.02	0.04	<0.02
Nitrite, Total	mg/l	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.04
Nitrite, Dissolved	mg/l	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.03
Nitrate, Total	mg/l	0.12	0.18	0.12	0.29	0.68	0.84	0.64
Nitrate, Dissolved	mg/l	0.18	0.16	0.12	0.29	0.67	0.86	0.63
Nitrogen, Total	mg/l	0.34	0.42	0.5	0.61	1.12	1.16	0.98
Nitrogen Dissolved	mg/l	0.41	0.45	0.45	0.61	1.06	1.14	0.88
Phosphorus, Total	mg/l	<0.01	0.01	0.02	0.04	0.07	0.03	0.04
Phosphorus, Dissolved	mg/l	<0.01	<0.01	0.016	0.03	0.053	0.012	0.013
Orthophosphate, Total	mg/l	<0.01	<0.01	0.015	0.028	0.052	0.015	0.017
Orthophosphate, Dissolved	mg/l	<0.01	0.013	<0.01	0.021	0.047	0.012	<0.01
Organic Carbon, Total	mg/l	2.5	1.7	4.4	2.9	3	2.4	3
Calcium	mg/l	24.6	9.82	19.8	36.9	38	22.9	28.5
Magnesium	mg/l	4.28	3.13	4.3	6.47	6.99	3.71	4.01
Chloride	mg/l	12	14	24	35	41	18	17
Sulfate	mg/l	<20	24.3	36.5	23.5	48.1	<20	<20
Turbidity	ntu	2.56	1.23	2.1	2.04	1.89	4.26	4.02
Iron, Total	µg/l	64	63	248	60	95	220	134
Iron, Dissolved	µg/l	20	21	72	<20	44	50	66
Manganese, Total	µg/l	<10	13	92	20	10	20	35
Manganese, Dissolved	µg/l	<10	<10	64	<10	<10	10	17
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SUSQ340.0	SUSQ340.0	SUSQ340.0	SUSQ340.0	SUSQ365.0	SUSQ365.0	SUSQ365.0
Date	yyyymmdd	20010725	20011105	20020225	20020422	20010725	20011105	20020225
Time	hhmm	1315	1215	1240	1250	1130	935	1030
Discharge	cfs	417	290	3685	3166	378	NA	3409
Temperature	degree C	29	8.6	4.1	12.5	26.2	9.6	3.4
Conductance	umhos/cm	240	260	172	189	252	282	179
Dissolved Oxygen	mg/l	8.32	8.32	10.01	8.43	7.35	7	10.28
pH		8.3	8	7.3	7.35	8.1	7.75	7.2
Alkalinity	mg/l	78	78	50	54	86	90	56
Acidity	mg/l	0	2	4	6	2	6	8
Solids, Total	mg/l	176	160	42	160	190	138	118
Solids, Dissolved	mg/l	176	146	108	160	190	120	108
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01
Nitrate, Total	mg/l	0.12	0.09	0.64	0.47	0.26	0.22	0.7
Nitrate, Dissolved	mg/l	0.1	0.33	0.65	0.48	0.21	0.22	0.76
Nitrogen, Total	mg/l	0.48	0.4	0.92	0.76	0.54	0.74	1.06
Nitrogen Dissolved	mg/l	0.48	0.67	0.92	0.64	0.54	0.75	1.13
Phosphorus, Total	mg/l	0.02	0.02	0.02	0.03	0.01	0.02	0.03
Phosphorus, Dissolved	mg/l	0.011	0.015	<0.01	0.01	0.01	0.015	0.012
Orthophosphate, Total	mg/l	<0.01	0.01	0.014	0.012	<0.01	0.01	0.016
Orthophosphate, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013
Organic Carbon, Total	mg/l	2.5	2.6	2.5	2.7	2.3	2.8	2.8
Calcium	mg/l	36.1	30.2	22	26	33	36.4	23.1
Magnesium	mg/l	4.03	4.07	2.57	2.8	4.01	4.7	2.5
Chloride	mg/l	21	22	16	15	20	23	15
Sulfate	mg/l	30.3	46.9	<20	<20	36.4	86.2	<20
Turbidity	ntu	1.6	2.34	5.23	3.92	1.48	1.96	4.78
Iron, Total	µg/l	84	137	310	192	71	148	370
Iron, Dissolved	µg/l	<20	56	60	105	<20	99	70
Manganese, Total	µg/l	39	36	20	58	20	18	20
Manganese, Dissolved	µg/l	15	<10	20	43	<10	<10	10
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SUSQ365.0	TIOG10.0	TIOG10.0	TIOG10.0	TIOG10.0	TRUP4.5	TRUP4.5	TRUP4.5
Date	yyyymmdd	20020422	20010723	20011106	20020226	20020423	20010723	20011107	20020227
Time	hhmm	1015	1500	1405	1345	1345	1140	845	815
Discharge	cfs	3108	91.2	110	521	662	0.814	2.13	13.62
Temperature	degree C	11.7	26.5	7.7	4.3	10.8	23.9	6.2	4.4
Conductance	umhos/cm	196	210	228	180	167	345	387	186
Dissolved Oxygen	mg/l	8.18	4.37	8.19	9.38	8.24	4.78	7.57	9.15
pH		7.4	7.9	7.25	7	7.1	8.3	7.75	7.65
Alkalinity	mg/l	56	50	42	38	32	118	126	48
Acidity	mg/l	6	4	6	6	6	0	6	2
Solids, Total	mg/l	148	168	150	112	486	224	224	106
Solids, Dissolved	mg/l	148	156	150	104	476	224	214	106
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	0.02	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	0.02	<0.01	<0.01	0.02	<0.01	0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.49	0.26	0.31	0.46	0.39	0.04	<0.04	0.35
Nitrate, Dissolved	mg/l	0.52	0.27	0.32	0.45	0.42	0.05	<0.04	0.33
Nitrogen, Total	mg/l	0.79	0.58	0.59	0.72	0.7	0.42	0.22	0.68
Nitrogen Dissolved	mg/l	0.8	0.56	0.62	0.76	0.69	0.48	0.3	0.59
Phosphorus, Total	mg/l	0.03	0.02	0.02	0.01	0.02	0.01	0.02	0.01
Phosphorus, Dissolved	mg/l	0.012	<0.01	0.011	<0.01	<0.01	<0.01	0.021	<0.01
Orthophosphate, Total	mg/l	0.015	0.012	0.01	0.014	0.023	0.015	<0.01	0.026
Orthophosphate, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	3	3.1	2.8	2.6	2.9	3.5	2.2	2.8
Calcium	mg/l	27.5	22.3	24.1	19.4	16.5	42.3	44.9	19.4
Magnesium	mg/l	2.89	5.49	5.6	4.36	4.02	8.51	9.57	4.71
Chloride	mg/l	14	14	12	14	11	29	30	16
Sulfate	mg/l	<20	26.7	33.1	23.5	27.7	53	60.1	<20
Turbidity	ntu	6.89	1.74	<1	3.56	10.7	1.66	1.81	8.61
Iron, Total	µg/l	252	98	74	210	408	77	33	290
Iron, Dissolved	µg/l	89	24	26	50	78	<20	21	40
Manganese, Total	µg/l	39	84	61	240	227	11	<10	10
Manganese, Dissolved	µg/l	19	40	50	220	160	<10	<10	<10
Aluminum, Total	µg/l	<200	<200	<200	<200	314	<200	<200	254
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	TRUP4.5	WAPP2.5
Date	yyyymmdd	20020424	20010724
Time	hhmm	855	1445
Discharge	cfs	4.539	2.451
Temperature	degree C	8.4	28.3
Conductance	umhos/cm	182	152
Dissolved Oxygen	mg/l	9.93	NA
pH		8.05	8.1
Alkalinity	mg/l	58	38
Acidity	mg/l	2	2
Solids, Total	mg/l	124	118
Solids, Dissolved	mg/l	120	118
Ammonia, Total	mg/l	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	0.01
Nitrite, Dissolved	mg/l	0.01	0.02
Nitrate, Total	mg/l	0.15	1.46
Nitrate, Dissolved	mg/l	0.32	1.44
Nitrogen, Total	mg/l	0.42	2.45
Nitrogen Dissolved	mg/l	0.58	2.48
Phosphorus, Total	mg/l	0.01	0.02
Phosphorus, Dissolved	mg/l	<0.01	<0.01
Orthophosphate, Total	mg/l	0.012	<0.01
Orthophosphate, Dissolved	mg/l	<0.01	0.017
Organic Carbon, Total	mg/l	3	2
Calcium	mg/l	19.4	12.2
Magnesium	mg/l	4.41	3.9
Chloride	mg/l	13	12
Sulfate	mg/l	<20	33.1
Turbidity	ntu	5.26	<1
Iron, Total	µg/l	202	97
Iron, Dissolved	µg/l	41	<20
Manganese, Total	µg/l	<10	<10
Manganese, Dissolved	µg/l	<10	<10
Aluminum, Total	µg/l	<200	<200
Aluminum, Dissolved	µg/l	<200	<200

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

Parameter	Units	BBDC4.1	CNWG 4.4	CNWG 4.4	CNWG 4.4	CNWG 4.4	DEER 44.2	DEER 44.2	DEER 44.2
Date	yyyymmdd	20010731	20010801	20011113	20020220	20020418	20010731	20011112	20020219
Time	hhmm	1100	1045	1150	1220	1235	815	1025	1035
Discharge	cfs	0.886	11.001	11.909	8.236	8.269	6.938	5.242	14.388
Temperature	degree C	16.1	20.9	4.4	5.2	21.6	17.9	3.7	1
Conductance	umhos/cm	129	229	99	229	236	211	204	214
Dissolved Oxygen	mg/l	9.47	7.96	8.73	9.68	6.57	8.5	8.98	10.06
pH		7.15	7.4	7	6.95	7.3	7.45	7	7.1
Alkalinity	mg/l	20	40	42	34	48	40	42	32
Acidity	mg/l	4	4	8	8	6	2	10	6
Solids, Total	mg/l	114	204	180	718	156	208	130	172
Solids, Dissolved	mg/l	114	198	180	706	156	202	122	170
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	<0.02	0.03
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	0.03	<0.04	0.01	0.07	0.01	0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	0.02	<0.04	0.01	0.07	0.01	0.01	<0.01
Nitrate, Total	mg/l	5.4	8.09	8.82	9.13	6.15	4.82	4.71	5.94
Nitrate, Dissolved	mg/l	5.43	8.13	8.78	8.92	6.03	1.16	4.81	6.11
Nitrogen, Total	mg/l	5.94	8.78	9.82	9.89	7.01	5.06	5.36	5.54
Nitrogen Dissolved	mg/l	5.81	8.77	9.81	9.89	6.99	5.1	5.28	5.62
Phosphorus, Total	mg/l	0.01	0.05	0.02	0.03	0.07	0.02	0.02	0.01
Phosphorus, Dissolved	mg/l	<0.01	0.023	0.014	0.017	0.044	<0.01	0.014	0.012
Orthophosphate, Total	mg/l	<0.01	0.027	0.017	0.013	0.037	<0.01	<0.01	<0.01
Orthophosphate, Dissolved	mg/l	<0.01	0.019	<0.01	0.01	0.021	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	1	2.3	1.7	1.3	3.7	1.5	1.6	1.2
Calcium	mg/l	8.63	17.2	17.6	16.1	16.7	16.5	17.1	18.7
Magnesium	mg/l	5.85	10.6	9.58	9.75	10	6.39	6.09	6.76
Chloride	mg/l	11	19	19	20	20	26	25	27
Sulfate	mg/l	<20	35.8	<20	<20	<20	36.9	28.8	<20
Turbidity	ntu	1.58	3.67	1.78	1.79	7.61	2.52	1.25	<1
Iron, Total	µg/l	96	202	68	110	313	215	55	80
Iron, Dissolved	µg/l	<20	31	32	30	105	21	40	50
Manganese, Total	µg/l	10	26	10	20	48	17	<10	20
Manganese, Dissolved	µg/l	<10	15	<10	20	37	10	<10	20
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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	FBDC4.1	LNGA 2.5	LNGA 2.5
Date	yyyymmdd	20020417	20010731	20011112	20020219	20020417	20010731	20010730	20011112
Time	hhmm	1045	900	1140	1145	1215	1000	835	820
Discharge	cfs	9.639	3.104	4.146	5.521	7.24	0.488	0.954	0.827
Temperature	degree C	18.2	17.2	4.9	1.8	16.3	17.7	16.8	3.7
Conductance	umhos/cm	223	223	144	215	217	110	178	178
Dissolved Oxygen	mg/l	7.36	8.53	9.12	10.33	7.81	8.4	8.23	8.36
pH		7.35	7.2	6.95	6.8	7.3	6.85	7.55	7
Alkalinity	mg/l	44	34	34	32	38	18	32	40
Acidity	mg/l	4	4	8	6	4	2	2	6
Solids, Total	mg/l	180	214	165	174	182	108	168	138
Solids, Dissolved	mg/l	174	214	165	158	180	94	160	132
Ammonia, Total	mg/l	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite, Total	mg/l	0.03	0.01	0.02	0.06	0.03	0.01	0.01	0.01
Nitrite, Dissolved	mg/l	0.02	0.01	0.02	0.06	0.03	0.01	0.01	0.01
Nitrate, Total	mg/l	3.83	6.07	6.56	7.12	4.58	4.17	6.14	5.63
Nitrate, Dissolved	mg/l	3.97	6.03	6.53	6.74	4.67	4.16	6.05	5.53
Nitrogen, Total	mg/l	4.22	6.8	7.49	9.04	4.81	4.59	6.88	6.38
Nitrogen Dissolved	mg/l	4.44	6.5	7.52	7.59	5.04	4.64	6.7	6.26
Phosphorus, Total	mg/l	0.02	0.04	0.03	0.08	0.07	0.02	0.02	0.02
Phosphorus, Dissolved	mg/l	0.01	0.022	0.027	0.068	0.053	<0.01	<0.01	0.023
Orthophosphate, Total	mg/l	0.015	0.026	0.021	0.074	0.042	<0.01	0.022	0.014
Orthophosphate, Dissolved	mg/l	0.011	0.017	0.016	0.064	0.04	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	2.3	1.4	1.6	1.8	2.2	1.7	1.6	1.9
Calcium	mg/l	20.2	16.1	14.7	15.5	15.2	7.49	16.3	16.7
Magnesium	mg/l	5.75	5.82	5.61	5.98	5.95	4.56	5.86	5.42
Chloride	mg/l	28	29	25	27	27	10	17	16
Sulfate	mg/l	<20	23.7	28.5	<20	<20	<20	<20	<20
Turbidity	ntu	3.21	2.84	1.57	<1	2.68	2.23	6.41	3.43
Iron, Total	µg/l	118	265	96	110	242	280	313	140
Iron, Dissolved	µg/l	203	55	58	60	69	90	35	54
Manganese, Total	µg/l	23	28	16	30	42	20	25	19
Manganese, Dissolved	µg/l	20	19	14	30	35	<10	15	15
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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	SBCC20.4	SCTT 3.0
Date	yyyymmdd	20020219	20020417	20010801	20011113	20020220	20020418	20010730	20020219
Time	hhmm	815	830	945	1010	1100	1055	945	1325
Discharge	cfs	0.151	0.161	56.532	56.852	56.064	32.511	1.492	0.173
Temperature	degree C	1	15.6	21.9	4.6	4.9	21.6	16.7	6.2
Conductance	umhos/cm	180	192	234	135	249	234	129	496
Dissolved Oxygen	mg/l	8.46	7.29	7.24	8.92	10.28	6.96	9.15	11.19
pH		7.2	7.1	7.7	7.45	7.4	7.4	7.5	7.2
Alkalinity	mg/l	20	44	50	58	50	48	42	84
Acidity	mg/l	4	8	4	8	4	4	2	10
Solids, Total	mg/l	158	132	204	222	184	164	100	388
Solids, Dissolved	mg/l	66	114	200	222	184	152	100	384
Ammonia, Total	mg/l	<0.02	0.06	0.02	<0.02	<0.02	0.09	<0.02	0.3
Ammonia, Dissolved	mg/l	<0.02	0.06	0.02	<0.02	<0.02	0.09	<0.02	0.28
Nitrite, Total	mg/l	<0.01	0.02	0.02	<0.04	0.01	0.05	0.1	0.04
Nitrite, Dissolved	mg/l	<0.01	0.02	0.02	<0.04	0.01	0.05	<0.01	0.04
Nitrate, Total	mg/l	6.89	4.53	3.88	3.43	5.47	4.02	1.82	2.95
Nitrate, Dissolved	mg/l	6.91	4.68	3.83	3.42	5.36	4.02	1.83	2.93
Nitrogen, Total	mg/l	6.25	4.85	4.42	4.19	6.45	4.86	2.16	3.38
Nitrogen Dissolved	mg/l	6.26	5.09	4.3	4.21	6.19	4.72	2.18	3.5
Phosphorus, Total	mg/l	0.01	0.03	0.06	0.03	0.08	0.06	<0.01	0.09
Phosphorus, Dissolved	mg/l	0.01	0.018	0.023	0.014	0.031	0.04	<0.01	0.063
Orthophosphate, Total	mg/l	0.013	0.022	0.049	0.023	0.038	0.022	<0.01	0.058
Orthophosphate, Dissolved	mg/l	<0.01	0.012	0.02	<0.01	0.02	0.017	<0.01	0.055
Organic Carbon, Total	mg/l	1	2.6	3.1	3.3	3.5	3.6	1.3	2.5
Calcium	mg/l	18.8	19.5	18.9	23.3	18.9	18.1	15.8	40.3
Magnesium	mg/l	6.66	5.62	10.5	9.74	9.47	10.1	3.34	22.5
Chloride	mg/l	17	19	18	21	20	18	6	74
Sulfate	mg/l	<20	<20	26	25.7	26.4	21.3	<20	35.8
Turbidity	ntu	3.45	7.6	9.42	1.54	4.98	4.56	1.74	<1
Iron, Total	µg/l	70	347	573	81	320	229	124	100
Iron, Dissolved	µg/l	90	77	31	25	100	50	44	60
Manganese, Total	µg/l	20	103	64	16	70	99	<10	30
Manganese, Dissolved	µg/l	40	89	13	<10	40	58	<10	30
Aluminum, Total	µg/l	<200	200	244	<200	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SCTT 3.0	SUSQ10.0	SUSQ10.0	SUSQ10.0	SUSQ10.0	SUSQ44.5	SUSQ44.5
Date	yyyymmdd	20020417	20010801	20011112	20020220	20020418	20010801	20011113
Time	hhmm	1340	820	1345	905	915	1205	1130
Discharge	cfs	0.248	5290	4370	58100	65600	5630	5670
Temperature	degree C	17.8	27.6	14.3	6.2	18.3	27.5	NA
Conductance	umhos/cm	457	282	241	187	220	345	NA
Dissolved Oxygen	mg/l	8.87	8.43	5.79	8.88	8.32	8.61	NA
pH		7.5	7.4	7.05	7.2	7.45	8.3	NA
Alkalinity	mg/l	74	66	72	36	46	64	NA
Acidity	mg/l	8	6	6	6	4	0	NA
Solids, Total	mg/l	406	180	232	140	134	248	258
Solids, Dissolved	mg/l	402	180	220	140	130	248	248
Ammonia, Total	mg/l	<0.02	0.1	0.1	0.04	0.02	0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.1	0.11	0.04	0.03	0.02	<0.02
Nitrite, Total	mg/l	0.02	0.08	0.02	<0.01	0.02	0.01	<0.04
Nitrite, Dissolved	mg/l	0.02	0.09	0.02	<0.01	<0.01	0.01	<0.04
Nitrate, Total	mg/l	2.09	0.78	0.62	0.91	0.84	0.34	0.44
Nitrate, Dissolved	mg/l	2.25	0.74	0.65	0.91	0.78	0.36	0.45
Nitrogen, Total	mg/l	2.36	1.49	1.22	1.34	1.35	0.83	0.78
Nitrogen Dissolved	mg/l	2.54	1.38	1.22	1.28	1.38	0.82	0.77
Phosphorus, Total	mg/l	0.11	0.03	0.03	0.04	0.04	0.04	0.03
Phosphorus, Dissolved	mg/l	0.061	<0.01	0.018	0.017	0.014	0.012	0.025
Orthophosphate, Total	mg/l	0.059	0.018	0.023	0.04	0.022	0.018	0.022
Orthophosphate, Dissolved	mg/l	0.053	<0.01	<0.01	0.01	<0.01	<0.01	0.025
Organic Carbon, Total	mg/l	3.5	3.5	2.8	2.8	3.1	3.5	2.5
Calcium	mg/l	32.9	28.6	33.3	15.8	22.7	32.1	35.9
Magnesium	mg/l	21.7	8.14	11.3	4.28	5.76	10.9	11.9
Chloride	mg/l	59	21	26	20	16	28	29
Sulfate	mg/l	46	35.1	62.4	26.7	31.7	79.6	49.9
Turbidity	ntu	1.94	4.39	4.2	12.5	9.13	3.76	2.51
Iron, Total	µg/l	145	205	190	600	254	179	109
Iron, Dissolved	µg/l	64	<20	<20	80	72	<20	30
Manganese, Total	µg/l	22	137	69	70	117	74	35
Manganese, Dissolved	µg/l	20	37	<10	40	13	20	<10
Aluminum, Total	µg/l	<200	<200	<200	518	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200

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	20020506	20020508	20020508	20020508	20020509	20020507
Time	hhmm	1730	1500	1100	800	800	900
Temperature	degree C	15.7	12.0	11.7	10.4	12.1	12.1
pH		7.20	7.00	8.00	7.2	7.25	7.4
Dissolved Oxygen	mg/l	8.29	9.66	9.94	9.51	8.32	9.44
Conductivity	umhos/cm	103	79	285	143	148	147
Alkalinity	mg/l	28.0	26.0	96.0	42.0	54.0	46.0
Acidity	mg/l	4.0	4.0	2.0	4.0	6.0	4.0

Parameter	Units	Bukley Brook	Camp Brook	Cook Hollow Run	Deep Hollow Brook	Denton Creek	Dry Brook
Date	yyyymmdd	20020508	20020508	20020509	20020506	20020506	20020507
Time	hhmm	1600	1330	930	1220	1400	1440
Temperature	degree C	15.4	14.1	11.3	13.0	15.1	16.1
pH		7.00	8.50	7.35	7.25	6.80	8.60
Dissolved Oxygen	mg/l	8.17	9.92	9.15	8.78	8.83	9.06
Conductivity	umhos/cm	100	223	189	42	43	181
Alkalinity	mg/l	30.0	74.0	62.0	12.0	10.0	46.0
Acidity	mg/l	6.0	0.0	2.0	4.0	4.0	0.0

Parameter	Units	Little Wappasenning Creek	Parks Creek	Prince Hollow Run	Russell Run	Sackett Creek	Smith Creek
Date	yyyymmdd	20020507	20020507	20020506	20020507	20020507	20020508
Time	hhmm	1100	1350	1620	730	1000	930
Temperature	degree C	13.0	13.5	16.1	11.3	12.5	10.5
pH		7.25	7.30	7.05	7.30	7.30	7.20
Dissolved Oxygen	mg/l	8.98	9.59	7.94	9.96	9.5	9.46
Conductivity	umhos/cm	108	107	94	127	129	170
Alkalinity	mg/l	36.0	36.0	20.0	34.0	42.0	52.0
Acidity	mg/l	4.0	4.0	4.0	4.0	2.0	2.0

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

Parameter	Units	Strait Creek	White Branch Cowanesque River	White Hollow
Date	yyyymmdd	20020508	20020509	20020507
Time	hhmm	1200	1100	1600
Temperature	degree C	13.2	12.5	12.5
pH		7.8	7.40	7.30
Dissolved Oxygen	mg/l	9.42	12.59	10.01
Conductivity	umhos/cm	199	166	141
Alkalinity	mg/l	72.0	32.0	34.0
Acidity	mg/l	4.0	4.0	6.0

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
Amphipoda	Gammaridae	*Gammarus*	6	SH
Bivalvia	Corbiculidae	*Corbicula*	4	FC
	Sphaeriidae	*Musculium*	5	FC
		Pisidium	8	FC
Cladocera			5	FC
Collembola	Isotomidae	*Isotomurus*	5	CG
Coleoptera	Dytiscidae	*Agabus*	5	P
		Hydroporous	5	P
		Oreodytes	5	P
	Elmidae	*Gonielmis*	5	SC
		Optioservus	4	SC
		Oulimnius	5	SC
		Promoresia	2	SC
		Stenelmis	5	SC
	Hydrophilidae	*Berosus*	5	CG
	Psephenidae	*Ectopria*	5	SC
		Psephenus	4	SC
	Ptilodactylidae	*Anchytarsus*	5	SH
Decapoda	Cambaridae	*Cambarus bartoni*	6	SH
		Orconectes	6	SH
Diptera	Athericidae	*Atherix*	2	P
	Ceratopogonidae	*Ceratopogon*	6	P
		Monohelea	6	P
		Probezzia	6	P
	Chironomidae	*Chironomidae*	6	CG
	Empididae	*Chelifera*	6	P
		Clinocera	6	P
		Hemerodromia	6	P
	Muscidae	*Muscidae*	6	P
	Simuliidae	*Prosimulium*	2	FC
		Simulium	6	FC
	Tabanidae	*Chrysops*	7	P
		Tabanus	5	P
	Tipulidae	*Antocha*	3	CG
		Dicranota	3	P
		Hexatoma	2	P
		Limnophila	3	P

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
		Pilaria	7	P
		Tipula	4	SH
Ephemeroptera	Ameletidae	*Ameletus*	0	CG
	Baetidae	*Acentrella*	4	CG
		Acerpenna	6	CG
		Baetis	6	CG
		Barbaetis	6	CG
		Diphetor	6	CG
		Heterocloeon	2	SC
	Caenidae	*Caenis*	7	CG
	Ephemerellidae	*Drunella*	1	SC
		Ephemerella	1	SC
		Eurylophella	4	CG
		Serratella	2	CG
	Ephemeridae	*Ephemera*	2	CG
	Heptageniidae	*Cinygmula*	1	SC
		Epeorus	0	CG
		Leucrocuta	1	SC
		Rhithrogena	0	CG
		Stenacron	4	CG
		Stenonema	3	SC
	Isonychiidae	*Isonychia*	2	FC
	Leptophlebiidae	*Habrophlebiodes*	6	SC
		Leptophlebia	4	CG
		Paraleptophlebia	1	CG
	Polymitarcyidae	*Ephoron*	2	CG
	Tricorythidae	*Tricorythodes*	4	CG
Gastropoda	Lymnaeidae	*Pseudosuccinea*	7	SC
	Physidae	*Physella*	8	SC
	Pleuroceridae	*Leptoxis*	7	SC
Hemiptera	Homoptera		5	P
Hydracarina	Pionidae	*Tiphys*	7	P
	Sperchonidae	*Sperchon*	7	P
Isopoda	Asellidae	*Caecidotea*	6	SH
Lepidoptera	Pyralidae	*Crambus*	5	SH
		Petrophila	5	SH
	Tortricidae	*Archips*	5	SH
Megaloptera	Corydalidae	*Corydalus*	4	P
		Nigronia	2	P
	Sialidae	*Sialis*	4	P
Odonata	Aeshnidae	*Boyeria*	2	P
	Calopterygidae	*Calopteryx*	6	P
	Coenagrionidae	*Amphiagrion*	5	P
	Gomphidae	*Lanthus*	5	P

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
		Ophiogomphus	1	P
		Stylogomphus	4	P
Oligochaeta			10	CG
	Lumbricidae	*Lumbricidae*	8	CG
	Lumbriculidae	*Lumbriculidae*	8	CG
	Naididae	*Amphichaeta*	8	CG
		Naididae	8	CG
Ostracoda			8	FC
Plecoptera	Chloroperlidae	*Haploperla*	0	P
		Sweltsa	0	P
	Leuctridae	*Leuctra*	0	SH
	Nemouridae	*Amphinemura*	3	SH
		Ostrocerca	2	SH
	Peltoperlidae	*Tallaperla*	0	SH
	Perlidae	*Acroneuria*	0	P
		Agnetina	2	P
		Beloneuria	3	P
		Claassenia	3	P
		Eccoptura	2	P
		Hansonoperla	3	P
		Neoperla	3	P
	Perlodidae	*Isoperla*	2	P
		Yugus	2	P
	Taeniopterygidae	*Taeniopteryx*	2	SH
Trichoptera	Brachycentridae	*Brachycentrus*	1	FC
	Hydropsychidae	*Ceratopsyche*	5	FC
		Cheumatopsyche	5	FC
		Diplectrona	0	FC
		Hydropsyche	4	FC
		Macrostemum	3	FC
	Hydroptilidae	*Agraylea*	8	CG
		Hydroptila	6	SC
		Leucotrichia	6	SC
		Mayatrichia	4	SC
		Palaeagapetus	1	SH
	Lepidostomatidae	*Lepidostoma*	1	SH
	Odontoceridae	*Psilotreta*	0	SC
	Philopotamidae	*Dolophilodes*	0	FC
		Chimarra	4	FC
		Wormaldia	0	FC
	Polycentropodidae	*Cyrnellus*	8	FC
		Polycentropus	6	P
	Psychomyiidae	*Psychomyia*	2	CG
	Rhyacophilidae	*Rhyacophila*	1	P
	Uenoidae	*Neophylax*	3	SC

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	CAYT 1.7	CHOC 9.1	SEEL 10.3
Coleoptera	Dytiscidae	*Hydroporous*					5
		Oreodytes					1
	Elmidae	*Optioservus*	5	1	18	2	3
		Promoresia				5	
		Stenelmis	15	6	35	4	
	Psephenidae	*Psephenus*	7	1	14	6	1
Diptera	Athericidae	*Atherix*	1	1		1	7
	Chironomidae		22	51	14	62	177
	Empididae	*Hemerodromia*		2	1		
	Simuliidae	*Simulium*				1	
	Tipulidae	*Antocha*			1	1	5
		Dicranota				1	
		Hexatoma		5		1	8
Ephemeroptera	Baetidae	*Acentrella*		4			
		Baetis	1	13	1	2	
	Ephemerellidae	*Drunella*				4	
		Serratella			5		
	Heptageniidae	*Leucrocuta*					2
		Stenonema		2			
	Isonychiidae	*Isonychia*	4	3	7	8	10
	Tricorythidae	*Tricorythodes*		9			5
Hydracarina	Pionidae	*Tiphys*					1
	Sperchonidae	*Sperchon*			1		
Megaloptera	Sialidae	*Sialis*			1		
Odonata	Gomphidae	*Ophiogomphus*			1		
Oligochaeta	Naididae		1				
Plecoptera	Chloroperlidae	*Sweltsa*				1	
	Leuctridae	*Leuctra*		3		3	
	Perlidae	*Acroneuria*				1	
		Hansonoperla				1	
Trichoptera	Hydropsychidae	*Ceratopsyche*	6	33	18	22	30
		Cheumatopsyche	10	5	12	7	
		Hydropsyche	8		2		
	Hydroptilidae	*Palaeagapetus*					1
	Philopotamidae	*Chimarra*	64		9	25	
	Polycentropodidae	*Polycentropus*		2			1

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

Class: Order	Family	Family/*Genus*	SNAK 2.3	SOUT 7.8	TRUP 4.5	WAPP 2.6
Coleoptera	Elmidae	*Gonielmis*			13	
		Optioservus	7		4	1
		Stenelmis	1	12	8	
	Psephenidae	*Psephenus*	7	17	17	6
Decapoda	Cambaridae	*Orconectes*		1		
Diptera	Athericidae	*Atherix*	2		8	1
	Ceratopogonidae	*Probezzia*				1
	Chironomidae		38	22	13	80
	Empididae	*Hemerodromia*				1
	Tabanidae	*Tabanus*			2	
	Tipulidae	*Antocha*	7	4		
		Dicranota	1	1		
		Hexatoma	1		1	1
Ephemeroptera	Baetidae	*Acentrella*	4			2
		Baetis	5	6		1
	Caenidae	*Caenis*	3			
	Ephemerellidae	*Ephemerella*	1			
	Heptageniidae	*Epeorus*	1			1
		Leucrocuta	2			1
		Stenonema	4	1		2
	Isonychiidae	*Isonychia*	7	1		5
	Leptophlebiidae	*Leptophlebia*	1			
	Tricorythidae	*Tricorythodes*			1	
Megaloptera	Corydalidae	*Nigronia*	2			
Odonata	Gomphidae	*Ophiogomphus*			1	
Plecoptera	Leuctridae	*Leuctra*	1			
	Perlidae	*Acroneuria*	1			2
		Agnetina	2			1
		Neoperla			3	
Trichoptera	Hydropsychidae	*Ceratopsyche*	22	9	27	28
		Cheumatopsyche	4	10	22	2
		Hydropsyche		18		
	Hydroptilidae	*Leucotrichia*		1		
	Odontoceridae	*Psilotreta*		1		
	Philopotamidae	*Dolophilodes*	8			4
		Chimarra	20	45		5
	Polycentropodidae	*Polycentropus*			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
Amphipoda	Gammaridae	*Gammarus*		4			
Collembola	Isotomidae	*Isotomurus*					1
Coleoptera	Elmidae	*Gonielmis*	11				1
		Optioservus	29	1	26	25	15
		Oulimnius	1			2	
		Promoresia			1	1	1
		Stenelmis		49	41	1	10
	Psephenidae	*Psephenus*		2	6	5	
	Ptilodactylidae	*Anchytarsus*	4				
Diptera	Athericidae	*Atherix*		5	5		
	Chironomidae		17	11	7	12	22
	Empididae	*Hemerodromia*			1	1	1
	Tipulidae	*Antocha*	3	2	5	5	
		Dicranota		1			
		Tipula					1
Ephemeroptera	Baetidae	*Acentrella*				4	
		Baetis	2	8	5	24	
		Diphetor				1	
		Heterocloeon			1		
	Ephemerellidae	*Serratella*	1		1		1
	Heptageniidae	*Epeorus*	5				1
		Stenacron	1				
		Stenonema		13	2	2	2
	Isonychiidae	*Isonychia*	3	3	12	1	
Hydracarina	Sperchonidae	*Sperchon*					2
Megaloptera	Corydalidae	*Corydalus*		5	2		
		Nigronia	6		1		9
	Sialidae	*Sialis*	1				1
Odonata	Aeshnidae	*Boyeria*					2
	Calopterygidae	*Calopteryx*					1
	Gomphidae	*Lanthus*					9
		Ophiogomphus			2		
Oligochaeta							2
Plecoptera	Leuctridae	*Leuctra*	14	1	3	1	14
	Perlidae	*Acroneuria*	12		2	4	
		Agnetina			2		
		Beloneuria					9
		Claassenia	3		1		1
		Eccoptura					3
		Hansonoperla	4				
		Neoperla			1		

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

Class: Order	Family	Family/*Genus*	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1
Trichoptera	Hydropsychidae	*Ceratopsyche*	6	7	23	40	2
		Cheumatopsyche	19	8	21	10	11
		Diplectrona					1
		Hydropsyche		13	1	13	1
	Hydroptilidae	*Leucotrichia*		1			
		Mayatrichia		1			
	Philopotamidae	*Dolophilodes*	5			4	5
		Chimarra			1		
	Polycentropodidae	*Polycentropus*					1
	Rhyacophilidae	*Rhyacophila*	3				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
Amphipoda	Gammaridae	*Gammarus*		2	
Bivalvia	Corbiculidae	*Corbicula*		3	
Coleoptera	Elmidae	*Optioservus*	34	3	21
		Promoresia		1	
		Stenelmis	1	5	
	Psephenidae	*Psephenus*	3	1	
	Ptilodactylidae	*Anchytarsus*	5		
Decapoda	Cambaridae	*Orconectes*	1		
Diptera	Chironomidae		32	6	11
	Empididae	*Hemerodromia*			1
	Simuliidae	*Simulium*		1	
	Tipulidae	*Antocha*	4	1	
		Dicranota	8		15
		Hexatoma			5
		Limnophila			1
		Tipula		1	2
Ephemeroptera	Baetidae	*Baetis*	24	1	6
		Heterocloeon		2	
	Ephemerellidae	*Eurylophella*			1
		Serratella		4	
	Heptageniidae	*Stenonema*		2	2
	Isonychiidae	*Isonychia*		7	
	Leptophlebiidae	*Habrophlebiodes*	2		
Hemiptera	Homoptera		1		
Megaloptera	Corydalidae	*Nigronia*	1		3
Plecoptera	Leuctridae	*Leuctra*			16
	Peltoperlidae	*Tallaperla*			3
	Perlidae	*Beloneuria*	1		
Trichoptera	Brachycentridae	*Brachycentrus*		1	
	Hydropsychidae	*Ceratopsyche*	20	27	11
		Cheumatopsyche	12	25	12
		Hydropsyche	12	5	4
		Macrostemum		16	
	Lepidostomatidae	*Lepidostoma*		1	
	Philopotamidae	*Dolophilodes*			5
		Chimarra		1	
	Rhyacophilidae	*Rhyacophila*		1	

Table C3. Macroinvertebrate Data for River Sites

Class: Order	Family	Family/*Genus*	CHEM 12.0	COWN 1.0	COWN 2.2	COWN 5.0
Amphipoda	Gammaridae	*Gammarus*			1	
Bivalvia	Sphaeriidae	*Musculium*	3			
		Pisidium	13			
Coleoptera	Elmidae	*Optioservus*	1			
		Stenelmis	11	28		1
	Hydrophilidae	*Berosus*		1		
	Psephenidae	*Psephenus*	1	19		18
Decapoda	Cambaridae	*Orconectes*				1
Diptera	Athericidae	*Atherix*		1		
	Chironomidae		19	71	35	24
	Empididae	*Hemerodromia*		1	5	
	Simuliidae	*Simulium*			2	
	Tipulidae	*Hexatoma*				1
		Tipula		1		
Ephemeroptera	Baetidae	*Acentrella*		6		
		Barbaetis	1			
		Heterocloeon	1			
	Ephemerellidae	*Serratella*	2			1
	Heptageniidae	*Leucrocuta*				4
		Stenonema	9	3		3
	Isonychiidae	*Isonychia*	22			22
Isopoda	Asellidae	*Caecidotea*			21	
Lepidoptera	Pyralidae	*Petrophila*				1
Megaloptera	Corydalidae	*Corydalus*	1	3		1
		Nigronia		1		
	Sialidae	*Sialis*	1			
Odonata	Gomphidae	*Ophiogomphus*				1
Oligochaeta	Lumbriculidae		1			
Plecoptera	Perlidae	*Acroneuria*	3			
		Agnetina	1			
		Neoperla				1
Trichoptera	Hydropsychidae	*Ceratopsyche*	13		1	25
		Cheumatopsyche	23	29	58	13
		Hydropsyche	10			
		Macrostemum	3			
	Hydroptilidae	*Agraylea*		2		
	Philopotamidae	*Chimarra*	5	2		28

Table C3. Macroinvertebrate Data for River Sites—Continued

Class: Order	Family	Family/*Genus*	SUSQ 44.5	SUSQ 289.1	SUSQ 340.0	SUSQ 365.0	TIOG 10.8
Amphipoda	Gammaridae	*Gammarus*				2	
Bivalvia	Corbiculidae	*Corbicula*	1				
Coleoptera	Elmidae	*Optioservus*	2	2	8	8	
		Promoresia		1			
		Stenelmis	29	43	81	30	1
	Psephenidae	*Psephenus*	2	4	6	2	
Diptera	Athericidae	*Atherix*					1
	Chironomidae				14	20	33
	Empididae	*Hemerodromia*				1	2
	Simuliidae	*Simulium*					16
Ephemeroptera	Baetidae	*Acentrella*	2	4		1	
		Baetis	10	1	1	2	1
		Heterocloeon		1		1	2
	Ephemerellidae	*Serratella*		6			1
	Heptageniidae	*Leucrocuta*				1	
		Rhithrogena				1	
		Stenonema	14	1			4
	Isonychiidae	*Isonychia*	10	17	8	23	7
	Polymitarcyidae	*Ephoron*			4	2	
	Tricorythidae	*Tricorythodes*	1				
Gastropoda	Pleuroceridae	*Leptoxis*				1	
Hydracarina	Sperchonidae	*Sperchon*					1
Lepidoptera	Pyralidae	*Petrophila*					1
Megaloptera	Corydalidae	*Corydalus*					4
Odonata	Coenagrionidae	*Amphiagrion*	1				
	Gomphidae	*Ophiogomphus*				1	
Oligochaeta			2				1
	Naididae	*Amphichaeta*				2	
Plecoptera	Perlidae	*Acroneuria*				2	
		Agnetina		5	21	15	
Trichoptera	Hydropsychidae	*Ceratopsyche*	3	7	13	21	25
		Cheumatopsyche	34	8			24
		Hydropsyche	15	11	3		
		Macrostemum	2	1	12		2
	Hydroptilidae	*Hydroptila*		1			
	Philopotamidae	*Chimarra*	10	5	11	16	18
	Psychomyiidae	*Psychomyia*	1			1	

Table C4. Macroinvertebrate Data for Group 3 Sites

Class: Order	Family	Family/*Genus*	BABC	BILL	BIRD	BISC	BRIG
Coleoptera	Elmidae	*Optioservus*		4			
		Stenelmis		2			
	Psephenidae	*Psephenus*	1	30			
Diptera	Chironomidae		35	24	28	13	2
	Empididae	*Clinocera*		1			
		Hemerodromia			1		1
	Simuliidae	*Prosimulium*	4	1			1
		Simulium	2			24	
	Tipulidae	*Hexatoma*	2	1	13		1
Ephemeroptera	Ameletidae	*Ameletus*					2
	Baetidae	*Acentrella*	3	2	1		
		Acerpenna		6		5	
		Baetis		4			
		Diphetor		4		4	
	Ephemerellidae	*Drunella*			35		
		Ephemerella		12	19	1	2
		Eurylophella			1		
	Heptageniidae	*Cinygmula*	2			2	1
		Epeorus	16	1	3	2	50
		Leucrocuta					1
		Stenacron	2	1			5
		Stenonema	2				
	Leptophlebiidae	*Paraleptophlebia*	15	21			2
Gastropoda	Lymnaeidae	*Pseudosuccinea*				4	
	Physidae	*Physella*				1	
Oligochaeta	Lumbricidae					3	
Plecoptera	Chloroperlidae	*Haploperla*	18	1			55
		Sweltsa			1		
	Leuctridae	*Leuctra*	15	1	4		1
	Nemouridae	*Amphinemura*	10	23	8	32	2
		Ostrocerca			1		
	Perlidae	*Acroneuria*	3				1
		Agnetina		7			
	Perlodidae	*Isoperla*			2	25	1
Trichoptera	Hydropsychidae	*Ceratopsyche*		1			1
		Cheumatopsyche				12	1
	Philopotamidae	*Chimarra*				1	
	Polycentropodidae	*Polycentropus*	1		3		
	Uenoidae	*Neophylax*		1			

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BULK	CAMP	COOK	DEEP	DENT
Cladocera							5
Coleoptera	Elmidae	*Optioservus*			2		
		Oulimnius				1	
		Stenelmis					9
	Psephenidae	*Ectopria*	1			1	
		Psephenus		17	4		
Diptera	Ceratopogonidae	*Ceratopogon*			1		
		Monohelea					1
	Chironomidae		37	12	52	30	62
	Empididae	*Hemerodromia*		1			
	Muscidae		1				
	Simuliidae	*Prosimulium*		6		10	
		Simulium		1			8
	Tipulidae	*Antocha*				2	
		Dicranota				5	
		Hexatoma		1	4	2	
		Pilaria	1			2	
		Tipula				1	1
Ephemeroptera	Ameletidae	*Ameletus*	20	1			
	Baetidae	*Acentrella*		1			
		Acerpenna	4	4	5		
		Diphetor			8		
	Ephemerellidae	*Drunella*		1			
		Ephemerella	1	9			
		Serratella				1	
	Ephemeridae	*Ephemera*				1	
	Heptageniidae	*Epeorus*	17	3		1	
		Stenacron				1	
		Stenonema		1	4	4	4
	Leptophlebiidae	*Paraleptophlebia*	10	9	6	3	
Gastropoda	Physidae	*Physella*		1			
Megaloptera	Corydalidae	*Nigronia*	1			1	
Odonata	Gomphidae	*Ophiogomphus*			1		
Oligochaeta	Naididae		3				1
Ostracoda							2
Plecoptera	Chloroperlidae	*Sweltsa*			4		
	Leuctridae	*Leuctra*	20	19	14	3	2
	Nemouridae	*Amphinemura*	18	18	8	12	
	Perlidae	*Acroneuria*		2	3		1
		Agnetina		1	3		
	Perlodidae	*Isoperla*	4	3	15		

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BULK	CAMP	COOK	DEEP	DENT
Trichoptera	Hydropsychidae	*Ceratopsyche*		6			
		Cheumatopsyche				1	34
		Diplectrona	1			6	
		Hydropsyche				9	5
	Hydroptilidae	*Hydroptila*				1	
	Philopotamidae	*Chimarra*				10	
	Polycentropodidae	*Cyrnellus*			1		
	Rhyacophilidae	*Rhyacophila*	5		1	4	
	Uenoidae	*Neophylax*			1		

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	DRYB	LWAP	PARK	PRIN	BEAG
Amphipoda	Gammaridae	*Gammarus*	3				
Coleoptera	Dytiscidae	*Agabus*	23				
		Oreodytes	2				
	Elmidae	*Oulimnius*					1
	Psephenidae	*Psephenus*		3			
Decapoda	Cambaridae	*Cambarus bartoni*					1
Diptera	Chironomidae		86	7	4	103	7
	Empididae	*Clinocera*				1	
	Simuliidae	*Prosimulium*		3	1		1
		Simulium	3	1			1
	Tipulidae	*Hexatoma*		5	4	2	2
		Limnophila					1
Ephemeroptera	Ameletidae	*Ameletus*	7	2	2		25
	Baetidae	*Acentrella*					1
		Acerpenna		21	1	1	
		Baetis					1
		Diphetor			1		
	Ephemerellidae	*Drunella*				2	2
		Ephemerella		5	1	4	
	Heptageniidae	*Cinygmula*		4	1	1	
		Epeorus		32	39	1	2
		Stenacron			2		
	Leptophlebiidae	*Paraleptophlebia*		4	4	1	2
Lepidoptera	Pyralidae	*Crambus*		1			
	Tortricidae	*Archips*			1		
Oligochaeta	Lumbricidae					1	
	Naididae					2	
Plecoptera	Chloroperlidae	*Haploperla*		26	31	2	
		Sweltsa		2	3		3
	Leuctridae	*Leuctra*		1	2		40
	Nemouridae	*Amphinemura*	12	2	14		23
	Perlidae	*Acroneuria*		2			
	Perlodidae	*Isoperla*	1	3	1	2	1
Trichoptera	Hydropsychidae	*Ceratopsyche*		2	2		
		Cheumatopsyche	1				
	Philopotamidae	*Wormaldia*			1		8
	Polycentropodidae	*Polycentropus*		1	3		2
	Rhyacophilidae	*Rhyacophila*			1		4
	Uenoidae	*Neophylax*		1	3		

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Coleoptera	Elmidae	*Optioservus*			4			
		Stenelmis				2	2	
	Psephenidae	*Psephenus*		2		61		
Diptera	Ceratopogonidae	*Monohelea*					2	
	Chironomidae		38	2	48	11	62	5
	Empididae	*Chelifera*			1			
		Clinocera						2
	Simuliidae	*Prosimulium*		4	3	1		4
		Simulium		1	3			
	Tabanidae	*Chrysops*			5			
	Tipulidae	*Antocha*						1
		Dicranota						1
		Hexatoma	3	1				6
		Limnophila			1			
		Pilaria			8			
		Tipula			1			
Ephemeroptera	Ameletidae	*Ameletus*	2		4	1		1
	Baetidae	*Acentrella*				6		
		Acerpenna		2	2			1
		Baetis		1		4		
	Ephemerellidae	*Ephemerella*		3			1	6
		Eurylophella				1		
	Heptageniidae	*Cinygmula*	1	10				
		Epeorus	23	65				14
		Stenacron	3					
		Stenonema					1	
	Isonychiidae	*Isonychia*		1				
	Leptophlebiidae	*Paraleptophlebia*	5	10		17		
Lepidoptera	Tortricidae	*Archips*						2
Megaloptera	Corydalidae	*Nigronia*			4			
Odonata	Gomphidae	*Lanthus*			1			
		Stylogomphus				1		
Oligochaeta							2	
	Naididae						1	
Ostracoda							18	
Plecoptera	Chloroperlidae	*Haploperla*	40	12				16
		Sweltsa	3	5				11
	Leuctridae	*Leuctra*	2		32			7
	Nemouridae	*Amphinemura*	6	5	86	9		17
		Ostrocerca						12
	Perlidae	*Acroneuria*			3			
	Perlodidae	*Isoperla*	3	4	2	2		1
		Yugus						6
	Taeniopterygidae	*Taeniopteryx*				1		

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Trichoptera	Hydropsychidae	*Ceratopsyche*					3	1
		Cheumatopsyche					27	
		Diplectrona			8			2
		Hydropsyche					20	
	Philopotamidae	*Chimarra*					7	
		Wormaldia						2
	Polycentropodidae	*Polycentropus*	4					1
	Rhyacophilidae	*Rhyacophila*			9			1

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, Pa. DEP, 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.

APPENDIX E

STATISTICAL TREND RESULTS BY PARAMETER

Table E1. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Suspended Solids

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.479	0.000	-0.006	0.000	177	0.157	-2.100	-0.110	15.750
Chemung River	0.061	1.998	0.153	0.861	232	0.202	0.605	0.072	-72.228
Conowingo Creek	0.150	1.382	0.116	0.803	172	0.118	1.081	0.163	89.253
Cowanesque River	0.040	1.803	0.207	1.431	126	0.299	0.997	0.096	-34.718
Deer Creek	0.012	1.900	0.177	1.428	133	0.020	1.668	0.154	NA
Ebaugh Creek	0.131	2.097	0.183	1.271	165	0.453	0.619	0.057	-5.227
Octoraro Creek	0.125	1.144	0.066	0.650	176	0.080	1.435	0.162	44.569
Scott Creek	0.358	1.059	0.116	0.477	222	0.214	2.193	0.196	NA
Susquehanna River 10.0	0.342	0.619	-0.054	0.356	174	0.303	-0.757	-0.204	22.573
Susquehanna River 44.5	0.071	3.362	0.164	1.817	185	0.500	-0.072	0.025	0.650
Susquehanna River 289.1	0.500	0.000	-0.003	0.000	156	0.231	-0.672	-0.078	NA
Susquehanna River 340	0.085	1.153	0.142	0.915	126	0.202	0.794	0.092	-19.328
Susquehanna River 365	0.080	1.171	0.141	0.874	134	0.020	2.114	0.183	-91.738
Tioga River	0.089	-1.268	-0.124	-0.893	142	0.156	-1.023	-0.102	32.507
Troups Creek	0.058	2.008	0.175	1.209	166	0.292	0.733	0.079	-46.726

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E2. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Ammonia

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	<0.001	-0.002	-0.352	-7.965	0.025	0.007	-0.002	-0.233	35.222
Chemung River	<0.001	-0.003	-0.349	-8.364	0.040	0.002	-0.003	-0.260	47.333
Conowingo Creek	0.017	-0.002	-0.229	-4.565	0.040	0.457	0.000	-0.100	1.930
Cowanesque River	0.039	-0.002	-0.201	-3.035	0.060	0.068	-0.003	-0.209	NA
Deer Creek	0.004	-0.001	-0.298	-4.768	0.030	0.079	-0.001	-0.203	24.502
Ebaugh Creek	0.001	-0.003	-0.304	-8.334	0.040	0.019	-0.003	-0.140	44.837
Octoraro Creek	0.003	-0.003	-0.242	-6.256	0.040	0.321	-0.001	-0.017	10.368
Scott Creek	0.370	-0.001	-0.030	-0.778	0.170	0.235	-0.006	-0.119	15.095
Susquehanna River 10.0	0.027	-0.002	-0.150	-2.492	0.070	0.076	-0.002	-0.104	21.392
Susquehanna River 44.5	0.004	-0.002	-0.149	-6.237	0.040	0.016	-0.002	-0.126	NA
Susquehanna River 289.1	<0.001	-0.003	-0.319	-5.992	0.050	0.001	-0.003	-0.275	32.629
Susquehanna River 340	<0.001	-0.002	-0.349	-6.745	0.030	<0.001	-0.002	-0.405	15.682
Susquehanna River 365	<0.001	-0.002	-0.310	-6.636	0.030	<0.001	-0.002	-0.378	33.674
Tioga River	<0.001	-0.004	-0.400	-7.519	0.050	<0.001	-0.003	-0.317	50.559
Troups Creek	0.360	0.000	-0.038	0.000	0.020	0.365	0.000	0.040	-63.454

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E3. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Nitrogen

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.052	-0.020	-0.152	-2.245	0.869	<0.001	-0.058	-0.346	52.960
Chemung River	0.003	-0.027	-0.255	-2.517	1.080	0.003	-0.027	-0.254	-92.979
Conowingo Creek	<0.001	0.156	0.450	1.896	8.225	<0.001	0.154	0.468	NA
Cowanesque River	<0.001	-0.048	-0.389	-5.930	0.810	0.022	-0.029	-0.275	-82.955
Deer Creek	0.068	0.032	0.158	0.643	4.934	0.223	0.021	0.100	26.694
Ebaugh Creek	0.375	0.008	0.095	0.124	6.157	0.223	-0.022	0.031	-17.856
Octoraro Creek	0.308	0.036	0.039	0.631	5.674	0.500	0.001	-0.034	1.347
Scott Creek	0.204	-0.041	-0.080	-1.752	2.360	0.053	-0.069	-0.123	NA
Susquehanna River 10.0	0.020	-0.031	-0.279	-2.040	1.526	0.028	-0.021	-0.233	29.835
Susquehanna River 44.5	0.209	-0.021	-0.066	-1.704	1.234	0.338	-0.007	-0.023	50.787
Susquehanna River 289.1	0.004	-0.025	-0.247	-2.559	0.980	0.003	-0.024	-0.261	NA
Susquehanna River 340	0.003	-0.020	-0.255	-2.605	0.786	0.003	-0.019	-0.256	NA
Susquehanna River 365	<0.001	-0.024	-0.319	-2.927	0.826	0.001	-0.021	-0.345	NA
Tioga River	0.001	-0.034	-0.290	-4.661	0.720	0.001	-0.026	-0.296	NA
Troups Creek	0.004	-0.029	-0.285	-6.654	0.431	0.389	0.004	0.032	-7.304

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E4. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Phosphorus

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.020	-0.004	-0.188	-4.161	0.090	0.011	-0.006	-0.237	34.314
Chemung River	0.077	-0.001	-0.128	-2.045	0.070	0.0124	-0.002	-0.209	32.790
Conowingo Creek	<0.001	-0.003	-0.305	-4.915	0.070	0.002	-0.004	-0.266	62.301
Cowanesque River	0.011	-0.001	-0.228	-4.160	0.030	0.094	-0.001	-0.203	NA
Deer Creek	0.001	-0.001	-0.277	-4.749	0.030	0.004	-0.001	-0.297	30.767
Ebaugh Creek	0.115	-0.001	-0.080	-2.490	0.040	0.288	-0.001	0.003	12.754
Octoraro Creek	0.001	-0.004	-0.235	-5.668	0.070	0.036	-0.003	-0.130	16.726
Scott Creek	0.103	-0.002	-0.072	-2.759	0.090	0.090	-0.007	-0.097	45.906
Susquehanna River 10.0	<0.001	-0.002	-0.258	-3.855	0.050	0.018	-0.001	-0.178	NA
Susquehanna River 44.5	0.013	-0.002	-0.157	-3.333	0.060	0.011	-0.002	-0.182	82.737
Susquehanna River 289.1	<0.001	-0.002	-0.308	-4.992	0.050	<0.001	-0.002	-0.356	93.462
Susquehanna River 340	<0.001	-0.002	-0.368	-5.004	0.040	<0.001	-0.002	-0.338	NA
Susquehanna River 365	<0.001	-0.002	-0.364	-4.153	0.040	0.003	-0.002	-0.261	20.883
Tioga River	0.001	-0.001	-0.290	-3.701	0.030	0.009	-0.001	-0.223	63.567
Troups Creek	0.006	-0.001	-0.256	-5.026	0.020	0.089	0.000	-0.145	-26.572

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E5. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Chloride

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.031	0.756	0.175	2.964	25.500	0.414	0.097	0.029	-3.833
Chemung River	0.001	1.123	0.277	3.743	30.000	<0.001	0.669	0.408	40.307
Conowingo Creek	<0.001	0.253	0.552	1.580	16.000	<0.001	0.244	0.517	NA
Cowanesque River	0.017	0.333	0.265	3.329	10.000	0.299	-0.103	-0.003	26.124
Deer Creek	<0.001	0.539	0.484	3.169	17.000	<0.001	0.483	0.563	NA
Ebaugh Creek	0.002	1.117	0.294	4.137	27.000	0.096	1.071	0.142	-21.813
Octoraro Creek	<0.001	0.251	0.534	1.792	14.000	<0.001	0.255	0.469	NA
Scott Creek	0.243	0.448	0.140	1.210	37.000	0.279	0.143	0.165	11.484
Susquehanna River 10.0	0.014	0.293	0.248	1.954	15.000	0.040	0.259	0.204	NA
Susquehanna River 44.5	0.002	0.500	0.317	3.336	15.000	0.009	0.191	0.308	NA
Susquehanna River 289.1	<0.001	0.749	0.362	4.408	17.000	<0.001	0.529	0.427	79.726
Susquehanna River 340	<0.001	0.502	0.410	5.021	10.000	<0.001	0.406	0.491	NA
Susquehanna River 365	<0.001	0.497	0.417	4.973	10.000	<0.001	0.378	0.371	-90.276
Tioga River	0.230	0.000	0.070	0.000	10.000	0.209	0.049	0.077	-30.260
Troups Creek	0.013	0.497	0.234	3.551	14.000	0.276	0.167	0.072	-28.804

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E6. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Sulfate

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.047	-0.542	-0.156	-2.259	24.000	0.032	-0.698	-0.173	NA
Chemung River	0.002	-0.835	-0.263	-2.878	29.000	<0.001	-0.784	-0.352	86.250
Conowingo Creek	0.419	0.000	0.031	0.000	15.000	0.478	-0.004	0.038	2.588
Cowanesque River	<0.001	-1.008	-0.379	-4.799	21.000	0.027	-0.977	-0.218	NA
Deer Creek	0.003	0.386	0.306	3.859	10.000	0.052	0.259	0.208	NA
Ebaugh Creek	0.009	0.183	0.294	1.827	10.000	0.054	0.326	0.257	NA
Octoraro Creek	0.250	0.166	0.116	0.786	21.150	0.487	0.026	0.072	-4.655
Scott Creek	0.116	-0.454	-0.098	-1.893	24.000	0.090	-0.420	-0.083	NA
Susquehanna River 10.0	0.124	-0.352	-0.113	-0.991	35.550	0.323	-0.193	-0.042	9.388
Susquehanna River 44.5	0.500	0.000	-0.076	0.000	43.200	0.018	-0.687	-0.314	26.446
Susquehanna River 289.1	0.220	-0.215	-0.075	-1.129	19.000	0.131	-0.230	-0.108	29.481
Susquehanna River 340	0.353	0.000	-0.041	0.000	18.000	0.234	-0.145	-0.072	NA
Susquehanna River 365	0.334	0.000	0.051	0.000	17.500	0.397	0.094	0.063	-49.098
Tioga River	<0.001	-1.741	-0.476	-4.706	37.000	<0.001	-1.875	-0.608	NA
Troups Creek	0.062	-0.429	-0.163	-1.951	22.000	0.055	-0.395	-0.171	-86.899

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E7. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Iron

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	<0.001	-18.416	-0.383	-10.801	170.500	0.126	-5.639	-0.106	57.183
Chemung River	<0.001	-26.556	-0.447	-10.580	251.000	0.002	-27.568	-0.264	26.646
Conowingo Creek	<0.001	-46.470	-0.474	-12.679	366.500	0.001	-24.355	-0.277	32.564
Cowanesque River	0.378	4.300	0.036	1.862	231.000	0.190	13.673	0.106	-35.832
Deer Creek	<0.001	-25.659	-0.536	-13.399	191.500	0.001	-15.274	-0.323	35.213
Ebaugh Creek	<0.001	-28.089	-0.511	-12.710	221.000	0.001	-16.520	-0.372	51.755
Octoraro Creek	<0.001	-34.013	-0.400	-8.881	383.000	0.077	-10.018	-0.033	NA
Scott Creek	0.115	-18.027	-0.151	-4.178	431.5	0.094	-38.040	-0.203	29.299
Susquehanna River 10.0	<0.001	-39.931	-0.472	-8.719	458	0.002	-48.136	-0.305	95.824
Susquehanna River 44.5	<0.001	-37.871	-0.391	-7.605	498	0.021	-21.999	-0.277	24.638
Susquehanna River 289.1	<0.001	-35.580	-0.459	-15.470	230	<0.001	-50.020	-0.440	42.305
Susquehanna River 340	<0.001	-30.802	-0.410	-10.336	298	0.005	-27.846	-0.236	21.542
Susquehanna River 365	<0.001	-16.651	-0.331	-6.634	251	0.002	-19.661	-0.285	48.430
Tioga River	0.010	-16.039	-0.215	-7.097	226	0.318	-2.406	-0.046	4.451
Troups Creek	0.241	-2.816	-0.077	-1.551	181.5	0.438	1.044	0.023	-10.476

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E8. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Aluminum

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.332	0.000	-0.042	0.000	100	0.435	-0.655	0.003	39.354
Chemung River	0.345	0.000	-0.041	0.000	200	0.456	-0.310	-0.018	1.278
Conowingo Creek	<0.001	-21.339	-0.352	-9.042	236	0.011	-16.397	-0.165	35.289
Cowanesque River	0.265	2.276	0.056	1.094	208	0.215	7.626	0.112	NA
Deer Creek	0.153	0.000	-0.076	0.000	100	0.332	-1.501	-0.136	4.012
Ebaugh Creek	0.336	0.000	-0.029	0.000	100	0.312	2.190	-0.060	7.708
Octoraro Creek	0.031	-12.388	-0.181	-5.056	245	0.160	-5.713	-0.082	NA
Scott Creek	0.095	1.707	0.143	1.707	100	0.266	2.595	0.067	-8.778
Susquehanna River 10.0	0.026	-10.541	-0.203	-4.233	249	0.023	-10.915	-0.210	NA
Susquehanna River 44.5	0.006	-16.535	-0.250	-6.253	264	0.024	-17.279	-0.232	47.022
Susquehanna River 289.1	0.081	-3.488	-0.125	-1.938	180	0.018	-7.578	-0.189	36.984
Susquehanna River 340	0.176	-1.784	-0.082	-1.122	159	0.362	-1.336	-0.032	8.774
Susquehanna River 365	0.240	0.000	-0.059	0.000	100	0.079	-6.149	-0.135	61.622
Tioga River	0.232	1.793	0.072	0.996	180	0.023	5.424	0.188	-34.161
Troups Creek	0.426	0.000	0.022	0.000	167.5	0.319	3.825	0.052	-32.991

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E9. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Total Manganese

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	<0.001	-1.002	-0.381	-6.908	14.5	0.019	-0.495	-0.199	72.357
Chemung River	<0.001	-3.046	-0.357	-4.352	70	<0.001	-3.302	-0.354	39.326
Conowingo Creek	0.004	-2.080	-0.277	-4.472	46.5	0.096	-1.094	-0.161	16.315
Cowanesque River	0.005	6.197	0.284	6.523	95	0.331	-0.729	-0.068	-71.860
Deer Creek	0.001	-0.886	-0.317	-3.410	26	0.019	-0.643	-0.307	NA
Ebaugh Creek	0.157	-0.633	-0.098	-1.862	34	0.058	-0.900	-0.167	13.691
Octoraro Creek	0.020	-1.155	-0.175	-2.108	54.8	0.210	-0.827	0.053	26.271
Scott Creek	0.011	-8.819	-0.275	-6.061	145.5	0.055	-15.214	-0.183	NA
Susquehanna River 10.0	0.001	-3.520	-0.339	-2.708	130	0.011	-2.584	-0.259	NA
Susquehanna River 44.5	0.005	-4.826	-0.296	-4.252	113.5	0.006	-4.105	-0.326	57.764
Susquehanna River 289.1	0.002	-0.957	-0.267	-3.828	25	0.006	-1.070	-0.239	23.840
Susquehanna River 340	0.379	-0.038	-0.039	-0.104	37	0.262	-0.260	-0.067	9.612
Susquehanna River 365	0.025	-0.418	-0.187	-1.672	25	0.160	-0.291	-0.104	33.087
Tioga River	<0.001	-16.399	-0.404	-6.748	243	<0.001	-15.085	-0.325	NA
Troups Creek	0.205	0.000	-0.096	0.000	11	0.461	-0.032	-0.008	-20.463

P - Trend Probability
Strong Significant Trend: P < 0.05
Significant Trend: 0.05 < P < 0.10
No Significant Trend: P > 0.10

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available

Table E10. Trend Statistics in Concentrations and Flow-Adjusted Concentrations for Water Quality Index

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.488	0.000	-0.004	0.000	53.5	0.137	-0.585	-0.121	NA
Chemung River	0.191	-0.334	-0.108	-0.539	62	0.143	-0.444	-0.130	NA
Conowingo Creek	0.145	-0.581	-0.224	-1.096	53	0.423	0.264	-0.053	-14.708
Cowanesque River	0.116	0.600	0.131	1.249	48	0.392	0.248	-0.011	-9.610
Deer Creek	0.185	0.500	-0.012	1.514	33	0.047	0.689	0.054	-32.253
Ebaugh Creek	0.034	0.831	0.228	1.662	50	0.009	0.827	0.315	NA
Octoraro Creek	0.169	-0.417	-0.127	-0.787	53	0.310	0.254	0.029	NA
Scott Creek	0.405	-0.045	0.010	-0.069	65.5	0.375	-0.132	-0.078	66.018
Susquehanna River 10.0	0.424	-0.124	-0.082	-0.263	47	0.283	-0.398	-0.096	NA
Susquehanna River 44.5	0.289	-0.283	-0.111	-0.616	46	0.203	-0.454	-0.114	27.772
Susquehanna River 289.1	0.478	0.000	-0.010	0.000	52	0.478	-0.025	-0.027	22.348
Susquehanna River 340	0.268	0.198	0.058	0.509	39	0.170	0.275	0.090	-27.301
Susquehanna River 365	0.156	0.473	0.085	1.126	42	0.109	0.742	0.112	NA
Tioga River	0.422	0.000	-0.034	0.000	52	0.398	0.169	0.043	-13.636
Troups Creek	0.198	0.376	0.097	1.074	35	0.005	1.057	0.282	NA

P - Trend Probability
Strong Significant Trend: $P < 0.05$
Significant Trend: $0.05 < P < 0.10$
No Significant Trend: $P > 0.10$

b - Slope or trend direction (+ or -)
% Slope - Percent change of median concentration per year
Median - Median concentration for time period indicated
NA - Not available