ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

Monitoring Report No. 17
July 1, 2002, Through June 30, 2003

Publication 233 *July 30, 2004*

Prepared by
Susan R. LeFevre
Biologist

Darryl L. Sitlinger
Water Quality Technician

Watershed Assessment and Protection Program
Susquehanna River Basin Commission

Printed on recycled paper

This report is prepared in cooperation with the U.S. Environmental Protection Agency under Contract No. 1-003991-03.

SUSQUEHANNA RIVER BASIN COMMISSION

Paul O. Swartz, Executive Director

Erin M. Crotty, N.Y. Commissioner
Kenneth P. Lynch, N.Y. Alternate
Scott J. Foti, N.Y. Alternate/Advisor

Kathleen A. McGinty, Pa. Commissioner
Cathleen C. Myers, Pa. Alternate
William A. Gast, Pa. Alternate/Advisor

Kendl Philbrick, Md. Commissioner
Dr. Robert M. Summers, Md. Alternate
Matthew G. Pajerowski, Md. Alternate/Advisor

Brigadier General Merdith W. B. Temple, U.S. Commissioner
Colonel Robert J. Davis, Jr., U.S. Alternate
Stacey E. Brown, U.S. Advisor

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

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

This report is available on our website (www.SRBC.net) by selecting Public Information/Technical Reports. For a CD Rom or for a hard copy, contact the Susquehanna River Basin Commission, 1721 N. Front Street, Harrisburg, Pa. 17102-2391, (717) 238-0423, FAX (717) 238-2436, E-mail: srbc@srbc.net.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIXES

ACKNOWLEDGMENTS

The authors would like to acknowledge those who made significant contributions to the completion of this project. The Pennsylvania Department of Environmental Protection Bureau of Laboratories, in Harrisburg, Pa., conducted all laboratory analysis of chemical water quality. Jennifer Hoffman and David Heicher supervised the project and reviewed the report. Donna Gavin and Jeff Zimmerman produced all the maps. Doreen McCabe provided proofreading and formatting services, and Susan Obleski provided helpful reviews of this report. Additional thanks go to the U.S. Environmental Protection Agency, which provided funding for this project.

ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

Monitoring Report No. 17

July 1, 2002, Through June 30, 2003

Susan R. LeFevre, Biologist

Darryl L. Sitlinger, Water Quality Technician

ABSTRACT

The Susquehanna River Basin Commission (SRBC) used a water quality index (WQI) and the U.S. Environmental Protection Agency's (USEPA's) Rapid Bioassessment Protocol III (RBP III) to assess the chemical water quality, biological conditions, and physical habitat of 52 sample sites in the Interstate Streams Water Quality Network from July 1, 2002, to June 30, 2003. Only 41 out of 1,182 possible parameter observations exceeded water quality standards. Assessment results indicate that approximately 33 percent of the sites supported nonimpaired biological communities. Water quality impacts in the New York-Pennsylvania border streams tend to be mostly from metals, while most Pennsylvania-Maryland border sites have higher nitrogen and nitrate values in addition to some elevated metals.

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 scores and physical habitat scores for river and Group 3 sites; however, river habitat scores and Group 3 biological and habitat scores were not normally distributed. 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 state agencies in New York, Pennsylvania, and Maryland. The state agencies do not assess all of the interstate streams and do not produce comparable data needed to determine potential impacts on the water quality of interstate streams. SRBC's ongoing interstate monitoring program is partially funded through a grant from the USEPA.

The interstate water quality monitoring program includes periodic collection of water and biological samples from interstate streams, as well as assessments of their physical habitat. Water quality data are used to: (1) assess compliance with water quality standards; (2) characterize stream quality and seasonal variations; (3) build a database for assessment of water quality trends; (4) identify streams for reporting to USEPA under Section 305(b) of the Clean Water Act; (5) provide information to signatory states for 303(d) listing and possible Total Maximum Daily Load

(TMDL) development; and (6) identify areas for restoration and protection. Biological conditions are assessed using benthic macroinvertebrate populations, which provide an indication of the biological health of a stream and serve as indicators of water quality. Habitat assessments provide information concerning potential stream impairment from erosion and sedimentation, as well as an indication of the stream's ability to support a healthy biological community.

SRBC's interstate monitoring program began in April 1986. For the first five years, results were reported for water years that ran from October to September. In 1991, SRBC changed the reporting periods to correspond with its fiscal year that covers the period from July to June. This report is presented for fiscal year 2003, which covers July 1, 2002 to June 30, 2003.

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 from Pennsylvania into New York, 15 from Pennsylvania into Maryland, and nine from Maryland into Pennsylvania. Many streams are small, and 32 are unnamed.

METHODS

Field and Laboratory Methods

Sampling frequency

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

Streams with impaired water quality or judged to have a high potential for degradation due to large drainage areas or historical pollution were assigned to Group 1. In sampling period 2002-2003, New York-Pennsylvania Group 1 streams were sampled August, November, March, and May. Pennsylvania-Maryland Group 1 stations were sampled July and August, November and December, February, and June. Benthic macroinvertebrates were collected and habitat assessments were performed in Group 1 streams during July and August 2002.

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 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 2003 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

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 2002–2003

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 2002-2003

include the following: the Susquehanna River at Windsor, N.Y., Kirkwood, N.Y., Sayre, Pa., Marietta, Pa., and Conowingo, Md.; the Chemung River at Chemung, N.Y.; the Tioga River at Lindley, N.Y.; and the Cowanesque River at Lawrenceville, Pa. Recorded stages from USGS gaging stations and rating curves were used to determine instantaneous discharges in cubic feet per second (cfs). Instantaneous discharges for stations not located near USGS gaging stations were measured at the time of sampling, using standard USGS procedures (Buchanan and Somers, 1969). Stream discharges are tabulated according to station name and date in Appendix A.

Water samples

Water samples were collected at each of the sites to measure nutrient and metal concentrations. Chemical and physical parameters monitored are listed in Table 4. Water samples were collected using a depth-integrated sampler. Composite samples were obtained by collecting several depth-integrated samples across the stream channel and combining them in a churn splitter that was previously rinsed with stream water. Water samples were thoroughly mixed in the churn splitter and collected in two 500-ml bottles and four 250-ml bottles. One of the 500-ml bottles was for a raw sample and the other 500-ml bottle consisted of a filtered sample. The two 250-ml bottles consisted of a whole water sample and a filtered sample fixed with concentrated nitric acid (HNO_3) for metal analysis. The other two 250-ml bottles consisted of a whole water sample and a filtered water sample fixed with concentrated sulfuric acid (H_2SO_4) for nutrient analysis. A cellulose acetate filter with 0.45-micrometer pore size was used to obtain the filtrate for laboratory analysis. The samples were chilled on ice and sent to the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Laboratories in Harrisburg, Pa., within 24 hours of collection.

Field chemistry

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

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

Station	Stream and Location	Monitoring Group	Rationale
APAL 6.9	Apalachin Creek, Little Meadows, Pa.	2	Monitor for potential water quality impacts
BABC	Babcock Run, Cadis, Pa.	3	Monitor for potential impacts
BEAG	Beagle Hollow Run, Osceola, Pa.	3	Monitor for potential impacts
BILL	Bill Hess Creek, Nelson, Pa.	3	Monitor for potential impacts
BIRD	Bird Creek, Webb Mills, N.Y.	3	Monitor for potential impacts
BISC	Biscuit Hollow, Austinburg, Pa.	3	Monitor for potential impacts
BNTY 0.9	Bentley Creek, Wellsburg, N.Y.	1	Monitor for potential water quality impacts
BRIG	Briggs Hollow, Nichols, N.Y.	3	Monitor for potential impacts
BULK	Bulkley Brook, Knoxville, Pa.	3	Monitor for potential impacts
CAMP	Camp Brook, Osceola, Pa.	3	Monitor for potential impacts
CASC 1.6*	Cascade Creek, Lanesboro, Pa.	1	Monitor for potential water quality impacts
CAYT 1.7	Cayuta Creek, Waverly, N.Y.	1	Municipal discharge from Waverly, N.Y.
CHEM 12.0	Chemung River, Chemung, N.Y.	1	Municipal and industrial discharges from Elmira, N.Y.
CHOC 9.1	Choconut Creek, Vestal Center, N.Y.	2	Monitor for potential water quality impacts
COOK	Cook Hollow, Austinburg, Pa.	3	Monitor for potential impacts
COWN 2.2	Cowanesque River, Lawrenceville, Pa.	1	Impacts from flood control reservoir
COWN 1.0	Cowanesque River, Lawrenceville, Pa	1	Recovery zone from upstream flood control reservoir
DEEP	Deep Hollow Brook, Danville, N.Y.	3	Monitor for potential impacts
DENT	Denton Creek, Hickory Grove, Pa.	3	Monitor for potential impacts
DRYB	Dry Brook, Waverly, N.Y.	3	Monitor for potential impacts
HLDN 3.5	Holden Creek, Woodhull, N.Y.	2	Monitor for potential water quality impacts
LSNK 7.6	Little Snake Creek, Brackney, Pa.	1	Monitor for potential water quality impacts
LWAP	Little Wappasening Creek, Nichols, N.Y.	3	Monitor for potential impacts
NFCR 7.6	North Fork Cowanesque River, North Fork, Pa.	2	Monitor for potential water quality impacts
PARK	Parks Creek, Litchfield, N.Y.	3	Monitor for potential impacts
PRIN	Prince Hollow Run Cadis, Pa.	3	Monitor for potential impacts
RUSS	Russell Run, Windham, Pa.	3	Monitor for potential impacts

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

Station	Stream and Location	Monitoring Group	Rationale
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 2002-2003

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

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

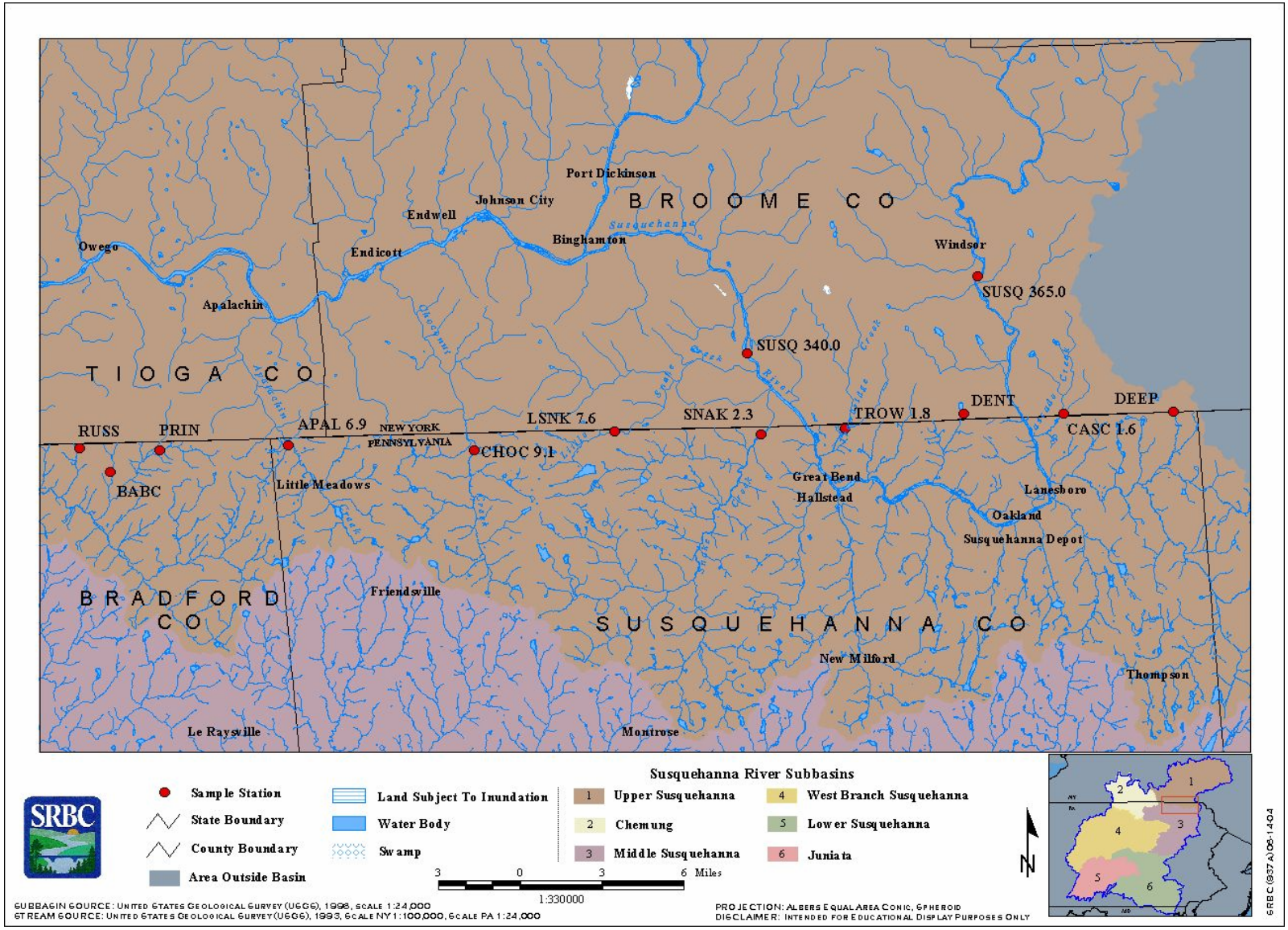


Figure 1. Interstate Streams Along the New York-Pennsylvania Border Between Russell Run and Deep Hollow Brook

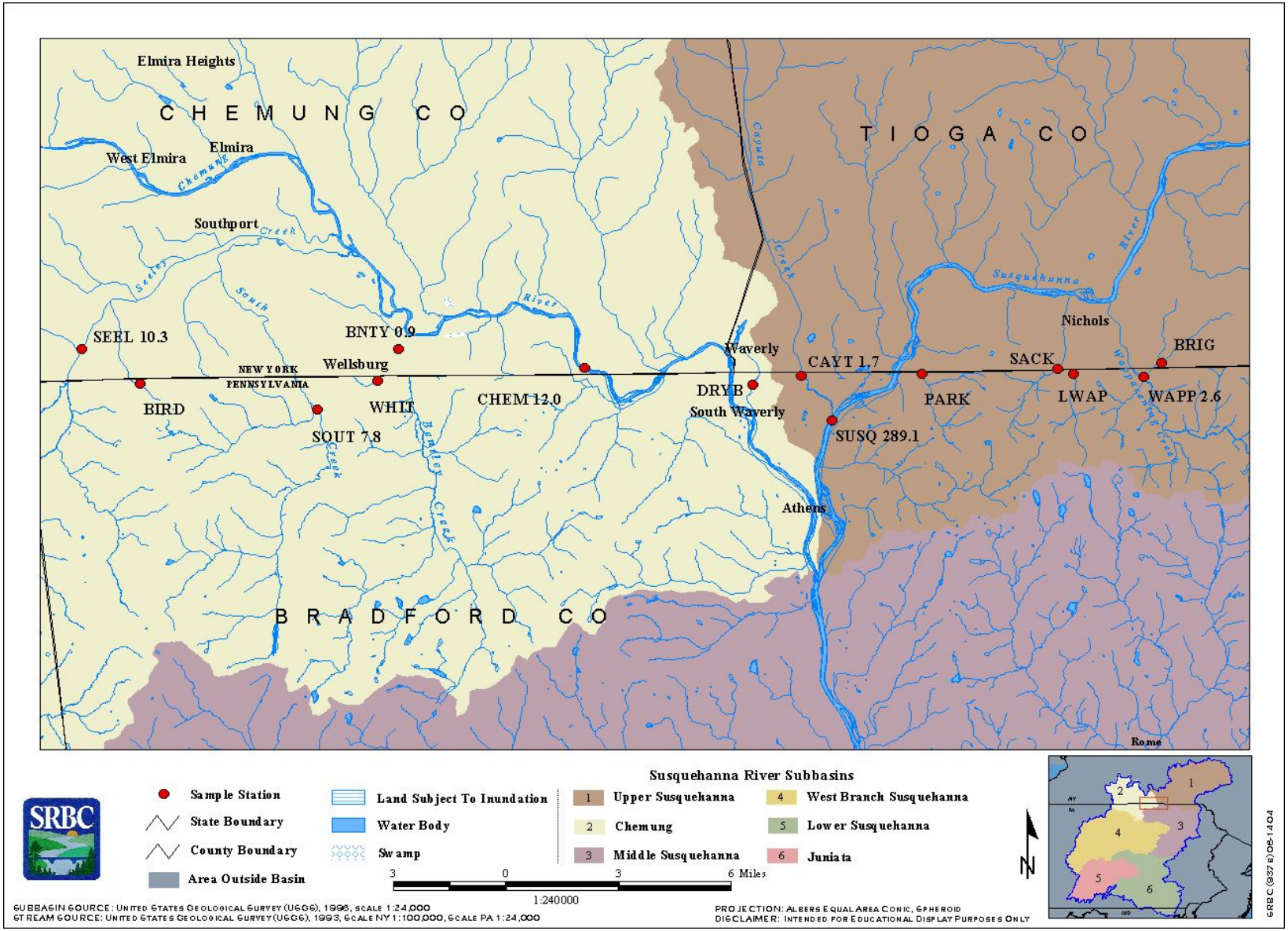


Figure 2. Interstate Streams Along the New York-Pennsylvania Border Between Seeley Creek and Briggs Hollow

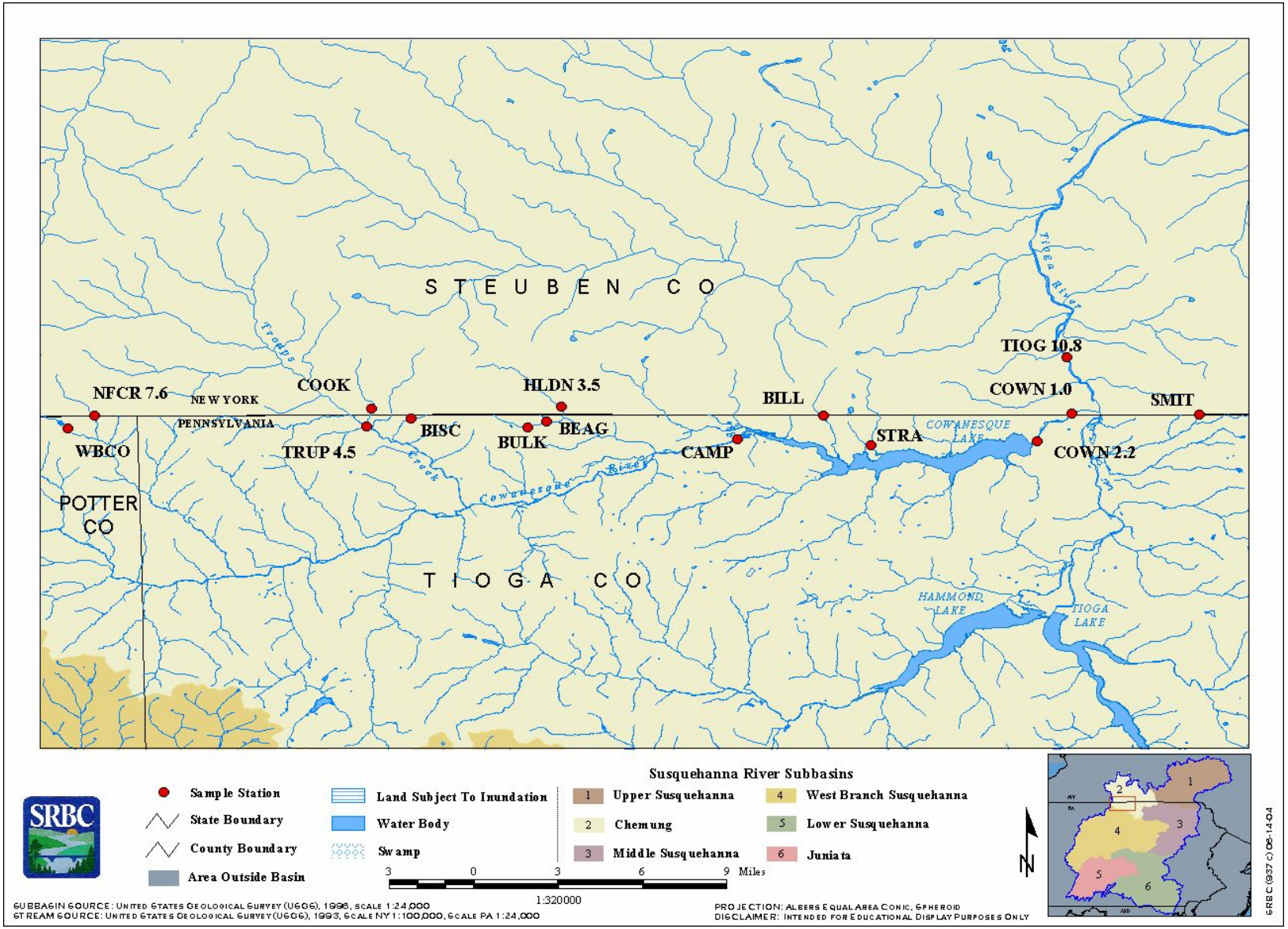


Figure 3. Interstate Streams Along the New York-Pennsylvania Border Between White Branch Cowanesque River and Smith Creek

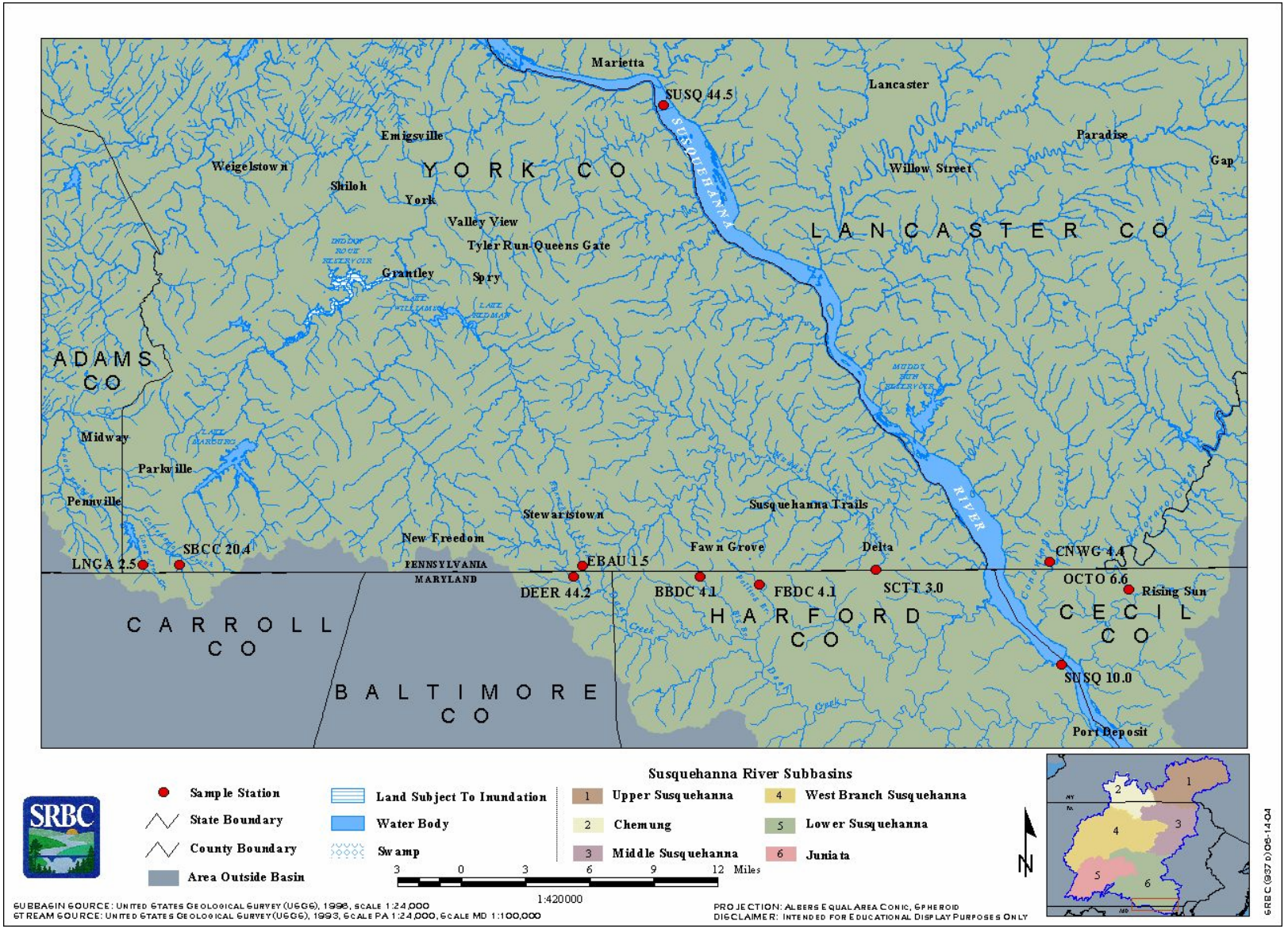


Figure 4. Interstate Streams Along the Pennsylvania-Maryland Border

Table 4. Monitored Parameters

Parameter	STORET Code
Physical	
Discharge	00060
Temperature	00010
Chemical	
Field Analyses	
Conductivity	00095
Dissolved Oxygen	00300
pH	00400
Alkalinity	00410
Acidity	00435
Laboratory Analyses	
Solids, Dissolved	00515
Solids, Total	00500
Ammonia as Nitrogen, Dissolved	00608
Ammonia as Nitrogen, Total	00610
Nitrite as Nitrogen, Dissolved	00613
Nitrite as Nitrogen, Total	00615
Nitrate as Nitrogen, Dissolved	00618
Nitrate as Nitrogen, Total	00620
Nitrogen, Dissolved	00602
Nitrogen, Total	00600
Phosphorus, Dissolved	00666
Phosphorus, Total	00665
Orthophosphate, Dissolved	00671
Orthophosphate, Total	70507
Organic Carbon, Total	00680
Calcium, Total	00916
Magnesium, Total	00927
Chloride, Total	00940
Sulfate, Total	00945
Iron, Dissolved	01046
Iron, Total	01045
Manganese, Dissolved	01056
Manganese, Total	01055
Aluminum, Dissolved	01106
Aluminum, Total	01105
Turbidity	82079

Macroinvertebrate and physical habitat sampling

SRBC staff collected benthic macroinvertebrate samples from Group 1 and Group 2 stations between July 30 and August 8, 2002, and from Group 3 streams between May 13 and 15, 2003. 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 200-organism subsamples using a gridded pan and a random numbers table. The organisms contained in the subsamples were identified to genus (except Chironomidae and Oligochaeta) and enumerated using keys developed by Merrit and Cummins (1996), Peckarsky and others (1990), and Pennak (1989). Each taxon was assigned an organic pollution tolerance value and a functional feeding category as outlined in Appendix B. A taxa list for each station can be found in Appendix C.

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

Data Synthesis Methods

Chemical water quality

Results of laboratory analysis for chemical parameters were compared to New York, Pennsylvania, and Maryland State water quality standards. In addition, a simple WQI was calculated, using procedures established by McMorran and Bollinger (1990). The WQI was used to make comparisons between sampling periods and stations within the same geographical region; therefore, the water quality data were divided into two groups. One group contained stations along the 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 38.

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, Chemung, and Tioga River sites. White Hollow (WHIT) near Wellsburg, N.Y., served as the reference site for 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 used for streams characterized by riffles and runs.

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

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

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

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

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

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

Source: Modified from Barbour and others, 1999.

Biological and physical habitat conditions

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

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

Trend analysis

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

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

RESULTS

Water Quality

During fiscal year 2003, 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). Fourteen out of the 31 sites had parameters exceeding water quality standards. The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Only 41 out of 1,182 possible observations (based on the number of applicable water quality standards of each state) exceeded water quality standards.

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

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

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

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

SAMPLING AND ANALYSIS

↓

↓

↓

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

↓

↓

↓

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

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

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

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

↓
↓
↓

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

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

Table 9. Stream Classifications

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

* See Appendix D for stream classification descriptions

Table 10. Water Quality Standard Summary

Parameter	Standard	Standard Value	Number of Observations	Number Exceeding Standards
Alkalinity	Pa. aquatic life	20 mg/l	92	5
pH	N.Y. general	6.5-8.5	58	2
Dissolved Oxygen	Pa. aquatic life	5.0 mg/l (CWF), 4.0 mg/l (WWF) 5.0 mg/l Feb. 15 - July 31 otherwise 4.0 mg/l (TSF)	92	1
	Md. aquatic life	5.0 mg/l	30	1
Dissolved Iron	Pa. public water supply	0.3 mg/l	92	1
Total Iron	N.Y. aquatic (chronic)	300 µg/l	58	12
Total Aluminum	N.Y. aquatic (chronic)	100 µg/l	58	6
Total Chlorine	N.Y. aquatic (acute)	0.019 mg/l	4	4
	Md. aquatic life	0.019 mg/l	3	3
Total Dissolved Solids	Pa. public water supply	750 mg/l	92	3
	N.Y. general	500 mg/l	58	2
Nitrite plus Nitrate	Pa. public water supply	10 mg/l	92	1

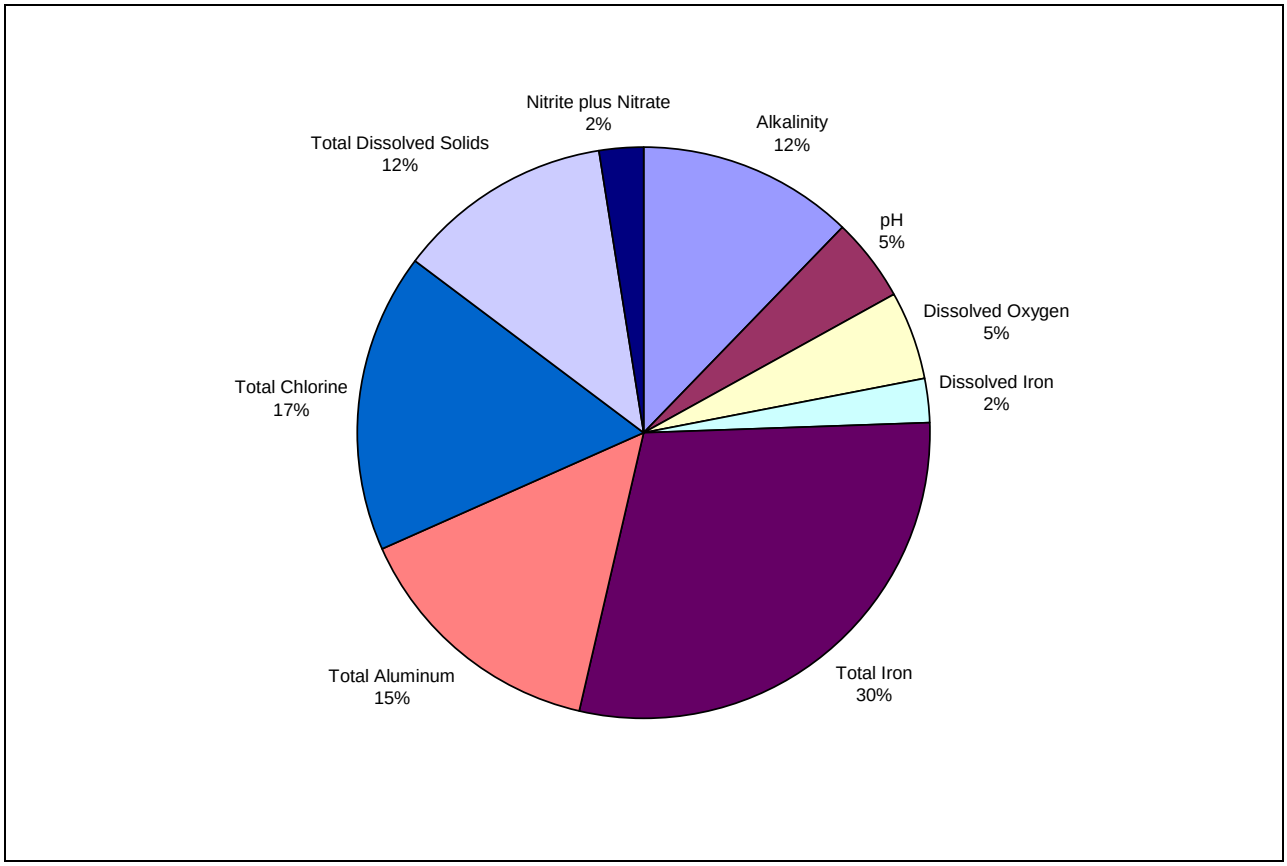


Figure 5. Parameters Exceeding Water Quality Standards

Biological Communities and Physical Habitat

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

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 13 sites located near or on the New York-Pennsylvania border. The biological community of 10 (76.9 percent) of these streams was nonimpaired, and three streams were slightly impaired (23.1 percent). None of the streams were moderately or severely impaired. Eight of the New York-Pennsylvania sites had excellent habitats (61.5 percent). Four sites (30.8 percent) had supporting habitats, and one site (7.8 percent) had partially supporting habitat. No sites had nonsupporting habitat. Cascade Creek was not sampled for macroinvertebrates during the summer due to dry conditions; however, the site was sampled quarterly throughout the rest of the year for water quality.

Pennsylvania-Maryland streams

The Pennsylvania-Maryland interstate streams included nine stations located on or near the Pennsylvania-Maryland border. Two (22.2 percent) streams were designated nonimpaired, using RBP III protocol designations. Five sites (55.5 percent) were slightly impaired, one (11.1 percent) of the sites was moderately impaired, and one (11.1 percent) was severely impaired. Six (66.7 percent) of the Pennsylvania-Maryland border sites had excellent habitats. One site (11.1 percent) had supporting habitats, one site (11.1 percent) had partially supporting habitat, and one site (11.1 percent) had nonsupporting habitat. Island Branch is not sampled due to its small size.

River sites

River sites consisted of nine stations located on the Susquehanna, Chemung, Cowanesque, and Tioga Rivers. One station (SUSQ 10.0) is not sampled for macroinvertebrates due to deep water and a lack of riffle habitat at the site. The biological communities at two out of eight sites (25 percent) were nonimpaired, four sites (50 percent) were slightly impaired, and two sites (25 percent) were moderately impaired. Seven of the eight sites (87.5 percent) had excellent habitats. One site (12.5 percent) was nonsupporting.

Group 3 sites

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Three of the 21 sites sampled (14.3 percent) had nonimpaired biological conditions. Fourteen sites (66.7 percent) were slightly impaired, two sites (9.5 percent) were moderately impaired, and two sites (9.5 percent) were severely impaired. Twelve (57.1 percent) of the Group 3 sites had excellent habitat scores. Six sites (28.6 percent) had supporting habitat conditions. Three sites (14.3 percent) were designated partially supporting, and no sites were nonsupporting.

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

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Raw Summary													
Number of Individuals	381	240	281	447	299	400	297	310	245	268	209	244	300
% Shredders	0	0	0	0.4	0.3	0.8	5.1	0	0	0	0	0	0
% Collector-Gatherers	16.3	21.7	24.6	27.5	48.8	36.8	43.4	61.0	24.5	22.8	19.6	14.3	50.7
% Filterer-Collectors	63.5	34.6	33.5	44.5	10.4	31.5	6.1	27.7	48.6	25.7	17.2	40.2	24.7
% Scrapers	16.5	32.5	34.2	25.3	28.8	16.8	25.6	3.5	18.8	49.3	36.8	23.4	15.7
% Predators	3.7	11.3	7.8	2.0	11.7	14.3	18.9	7.7	8.2	2.2	25.8	22.1	9.0
Number of EPT Taxa	11	12	11	13	24	15	17	12	15	15	17	11	13
Number of EPT Individuals	250	99	126	289	119	166	112	100	174	97	90	141	120
Metric Scores													
Taxonomic Richness	22	21	22	27	40	32	29	25	22	25	26	24	24
Shannon Diversity Index	1.8	2.4	2.5	2.3	2.7	2.5	2.5	1.7	2.5	2.4	2.5	2.6	2.4
Modified Hilsenhoff Biotic Index	4.4	4.7	4.5	4.0	4.7	4.6	4.2	5.3	4.1	4.6	4.0	4.2	5.2
EPT Index	11	12	11	13	24	15	17	12	15	15	17	11	13
Percent Ephemeroptera	3.4	9.2	12.5	38	22.4	9.0	20.2	7.7	23.7	14.6	9.6	25.4	18.0
Percent Chironomidae	14.7	17.5	17.1	21.5	27.8	30.0	31.6	56.1	11.4	14.9	12.9	8.2	35.0
Percent Dominant Taxa	50.9	19.6	17.1	21.5	27.8	30.0	31.6	56.1	22	24.3	30.1	16.8	35.0
Percent of Reference or Percentage Score													
Taxonomic Richness	100	95.5	100	122.7	181.8	145.5	131.8	113.6	100	113.6	118.2	109.1	109.1
Shannon Diversity Index	71.8	96.6	98.7	91.1	108	97.9	98.2	66.8	100	95	97.7	104.4	95.4
Hilsenhoff Index	93	88.4	90.6	103.7	87	90.5	98.9	77.7	100	88.7	103.1	97.3	79.9
EPT Index	73.3	80	73.3	86.7	160.0	100	113.3	80	100	100	113.3	73.3	86.7
Percent Ephemeroptera	3.4	9.2	12.5	38	22.4	9	20.2	7.7	23.7	14.6	9.6	25.4	18
Percent Chironomidae	14.7	17.5	17.1	21.5	27.8	30	31.6	56.1	11.4	14.9	12.9	8.2	35
Percent Dominant Taxa	50.9	19.6	17.1	21.5	27.8	30	31.6	56.1	22	24.3	30.1	16.8	35
Biological Condition Scores													
Taxonomic Richness	6	6	6	6	6	6	6	6	6	6	6	6	6
Shannon Diversity Index	4	6	6	6	6	6	6	4	6	6	6	6	6
Hilsenhoff Index	6	6	6	6	6	6	6	4	6	6	6	6	4
EPT Index	2	4	2	4	6	6	6	4	6	6	6	2	4
Percent Ephemeroptera	2	2	4	6	4	2	4	2	4	4	4	6	4
Percent Chironomidae	4	4	4	2	2	2	2	0	4	4	4	4	2
Percent Dominant Taxa	0	6	6	4	4	4	2	0	4	4	4	6	2
Total Biological Score													
Total Biological Score	24	34	34	34	34	32	32	20	36	36	36	36	28
Biological % of Reference	66.7	94.4	94.4	94.4	94.4	88.9	88.9	55.6	100	100	100	100	77.8

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

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Raw Summary									
Number of Individuals	236	292	318	258	227	172	298	243	45
% Shredders	7.6	0.7	0.3	1.6	7.0	3.5	2.7	10.3	0
% Collector-Gatherers	30.1	21.9	23.0	5.8	23.8	41.3	27.2	23.5	71.1
% Filterer-Collectors	16.5	34.6	46.9	34.1	13.2	6.4	24.5	7.0	17.8
% Scrapers	35.6	36.6	24.5	51.9	22.5	33.7	44.3	51.9	4.4
% Predators	10.2	6.2	5.3	5.4	33.5	15.1	0.7	7.4	6.7
Number of EPT Taxa	16	10	16	9	10	8	12	11	2
Number of EPT Individuals	92	136	213	114	60	20	146	60	8
Metric Scores									
Taxonomic Richness	29	21	24	19	30	20	22	26	10
Shannon Diversity Index	2.6	2.1	2.6	1.9	2.7	2.1	2.5	2.0	1.3
Modified Hilsenhoff Biotic Index	3.2	5.0	4.4	4.4	4.0	5.0	4.7	4.2	5.8
EPT Index	16	10	16	9	10	8	12	11	2
Percent Ephemeroptera	10.6	19.2	24.2	6.2	1.8	4.7	21.5	7.0	0
Percent Chironomidae	24.2	13.7	12.9	2.3	21.1	36.6	9.7	21.0	66.7
Percent Dominant Taxa	24.2	31.5	20.4	44.2	21.1	36.6	27.9	40.3	66.7
Percent of Reference or Percentage Score									
Taxonomic Richness	100	72.4	82.8	65.5	103.4	69	75.9	89.7	34.5
Shannon Diversity Index	100	81.6	100	73.7	103	80.1	96.6	78.3	49.5
Hilsenhoff Index	100	64.9	73.4	73.6	81	64.1	69.2	77	55.8
EPT Index	100	62.5	100	56.3	62.5	50	75	68.8	12.5
Percent Ephemeroptera	10.6	19.2	24.2	6.2	1.8	4.7	21.5	7	0
Percent Chironomidae	24.2	13.7	12.9	2.3	21.1	36.6	9.7	21	66.7
Percent Dominant Taxa	24.2	31.5	20.4	44.2	21.1	36.6	27.9	40.3	66.7
Biological Condition Scores									
Taxonomic Richness	6	4	6	4	6	4	4	6	0
Shannon Diversity Index	6	6	6	4	6	6	6	6	2
Hilsenhoff Index	6	2	4	4	4	2	2	4	2
EPT Index	6	0	6	0	0	0	2	0	0
Percent Ephemeroptera	4	4	4	2	2	2	4	2	0
Percent Chironomidae	2	4	4	6	2	0	4	2	0
Percent Dominant Taxa	4	2	4	0	4	2	4	0	0
Total Biological Score									
Total Biological Score	34	22	34	20	24	16	26	20	4
Biological % of Reference	100	64.7	100	58.8	70.6	47.1	76.5	58.8	11.8

Table 13. Summary of River RBP III Biological Data

	CHEM 12.0	COWN 1.0	COWN 2.2	SUSQ 44.5	SUSQ 289.1	SUSQ 340	SUSQ 365	TIOG 10.8
Raw Summary								
Number of Individuals	365	270	208	309	383	266	316	294
% Shredders	0	1.1	7.2	5.2	2.6	0.4	0.3	0.3
% Collector-Gatherers	32.6	39.6	58.2	3.2	14.4	14.7	21.2	26.5
% Filterer-Collectors	61.1	30.0	28.4	52.8	52.0	38.0	21.2	60.2
% Scrapers	4.1	17.4	4.3	35.3	30.0	43.2	49.4	6.5
% Predators	2.2	11.9	1.4	1.3	1.0	3.8	7.9	6.5
Number of EPT Taxa	12	6	6	9	12	14	20	10
Number of EPT Individuals	214	106	66	197	194	123	148	184
Metric Scores								
Taxonomic Richness	21	16	15	17	23	22	29	20
Shannon Diversity Index	2.4	1.9	1.4	2.3	2.5	2.2	2.6	2.4
Modified Hilsenhoff Biotic Index	4.9	5.3	5.9	4.3	4.7	4.1	4.3	4.4
EPT Index	12	6	6	9	12	14	20	10
Percent Ephemeroptera	26.3	12.2	4.3	17.2	22.7	10.5	23.7	24.5
Percent Chironomidae	21.9	37.8	56.7	1.0	8.1	9.8	10.1	20.7
Percent Dominant Taxa	21.9	37.8	56.7	27.5	20.4	26.7	26.3	20.7
Percent of Reference or Percentage Score								
Taxonomic Richness	72.4	55.2	51.7	58.6	79.3	75.9	100	69
Shannon Diversity Index	92.1	72.7	52	86.2	94.4	84.6	100	89
Hilsenhoff Index	86.8	80.7	72.1	98.9	91.4	103.4	100	96.6
EPT Index	60	30	30	45	60	70	100	50
Percent Ephemeroptera	26.3	12.2	4.3	17.2	22.7	10.5	23.7	24.5
Percent Chironomidae	21.9	37.8	56.7	1	8.1	9.8	10.1	20.7
Percent Dominant Taxa	21.9	37.8	56.7	27.5	20.4	26.7	26.3	20.7
Biological Condition Scores								
Taxonomic Richness	4	2	2	2	4	4	6	4
Shannon Diversity Index	6	4	4	6	6	6	6	6
Hilsenhoff Index	6	4	4	6	6	6	6	6
EPT Index	0	0	0	0	0	2	6	0
Percent Ephemeroptera	6	4	2	4	4	4	4	4
Percent Chironomidae	2	0	0	6	4	4	4	2
Percent Dominant Taxa	4	2	0	4	4	4	4	4
Total Biological Score								
Total Biological Score	28	16	12	28	28	30	36	26
Biological % of Reference	77.8	44.4	33.3	77.8	77.8	83.3	100	72.2

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	249	218	242	241	220	237	258	249	245	222	203
% Shredders	33.7	32.6	8.7	27.8	51.4	4.2	41.5	24.5	35.1	20.7	5.9
% Collector-Gatherers	37.3	42.7	63.2	27.0	31.8	75.1	33.7	18.9	21.6	14.4	55.7
% Filterer-Collectors	0.8	3.7	2.5	0.4	15.0	4.6	7.4	26.9	8.6	29.7	15.8
% Scrapers	1.2	1.4	17.4	35.3	0	9.3	0.4	14.1	20.4	23.9	19.2
% Predators	26.5	18.8	8.3	9.5	1.8	6.8	17.1	15.3	13.9	11.3	3.4
Number of EPT Taxa	13	14	13	12	7	12	13	18	22	16	8
Number of EPT Individuals	198	188	181	211	141	155	227	148	164	170	46
Metric Scores											
Taxonomic Richness	18	25	16	20	11	17	19	26	34	30	18
Shannon Diversity Index	2.2	2.3	2.3	2.0	1.5	1.9	2.2	2.5	2.7	2.5	1.7
Modified Hilsenhoff Biotic Index	2.8	1.6	2.9	1.8	4.1	2.8	1.9	2.9	3.0	3.7	5.3
EPT Index	13	14	13	12	7	12	13	18	22	16	8
Percent Ephemeroptera	20.9	37.6	57.4	52.3	10.9	51.9	26.7	16.1	11.4	24.3	9.9
Percent Chironomidae	17.7	5.5	6.6	7.5	20.5	31.2	6.6	4.0	15.1	10.8	54.2
Percent Dominant Taxa	17.7	23.4	21.1	32.8	51.4	33.8	31.4	22.9	29.0	19.8	54.2
Percent of Reference or Percentage Score											
Taxonomic Richness	85.7	119	76.2	95.2	52.4	81	90.5	123.8	161.9	142.9	85.7
Shannon Diversity Index	93	95.4	93.3	83.3	60.4	80.4	91	104.2	109.8	103.9	71.1
Hilsenhoff Index	40.2	70.3	38.9	61.6	27	40.4	59.7	38.7	37.2	30.3	21.3
EPT Index	92.9	100	92.9	85.7	50	85.7	92.9	128.6	157.1	114.3	57.1
Percent Ephemeroptera	20.9	37.6	57.4	52.3	10.9	51.9	26.7	16.1	11.4	24.3	9.9
Percent Chironomidae	17.7	5.5	6.6	7.5	20.5	31.2	6.6	4	15.1	10.8	54.2
Percent Dominant Taxa	17.7	23.4	21.1	32.8	51.4	33.8	31.4	22.9	29	19.8	54.2
Biological Condition Scores											
Taxonomic Richness	6	6	4	6	2	6	6	6	6	6	6
Shannon Diversity Index	6	6	6	6	4	6	6	6	6	6	4
Hilsenhoff Index	0	4	0	2	0	0	2	0	0	0	0
EPT Index	6	6	6	4	0	4	6	6	6	6	0
Percent Ephemeroptera	4	6	6	6	4	6	6	4	4	4	4
Percent Chironomidae	4	4	4	4	4	2	4	6	4	4	0
Percent Dominant Taxa	6	4	4	2	0	2	2	4	4	6	0
Total Biological Score											
Total Biological Score	32	36	30	30	14	26	32	32	30	32	14
Biological % of Reference	80.0	90	75	75	35	65	80	80	75	80	35

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

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Raw Summary										
Number of Individuals	255	225	247	194	279	226	287	249	227	251
% Shredders	1.2	37.3	22.3	7.2	24.7	6.2	42.5	41.4	0	29.1
% Collector-Gatherers	95.3	37.8	46.2	78.9	31.9	42.5	12.2	20.1	81.1	35.5
% Filterer-Collectors	3.1	3.6	2.4	2.6	1.1	0.0	16.4	11.2	12.3	8.8
% Scrapers	0.0	10.7	4.0	8.8	1.4	26.1	10.1	16.5	0.4	2.4
% Predators	0.4	10.7	24.7	2.6	40.1	25.2	18.5	10.8	6.2	23.5
Number of EPT Taxa	4	14	19	12	12	17	14	15	2	14
Number of EPT Individuals	9	195	210	152	249	154	210	186	28	225
Metric Scores										
Taxonomic Richness	10	21	26	17	20	23	26	21	7	21
Shannon Diversity Index	0.5	2.2	2.4	2.2	2.1	2.3	2.4	2.2	0.8	2.4
Modified Hilsenhoff Biotic Index	5.8	2.1	1.7	2.6	1.2	1.9	2.6	2.8	6.0	1.1
EPT Index	4	14	19	12	12	17	14	15	2	14
Percent Ephemeroptera	2.7	40.0	40.9	69.1	29.4	43.8	4.9	20.9	0	33.1
Percent Chironomidae	91.4	7.6	8.1	18.6	3.2	6.2	9.1	3.2	79.7	3.2
Percent Dominant Taxa	91.4	33.3	31.2	18.6	26.5	32.3	31.4	41.0	79.7	27.1
Percent of Reference or Percentage Score										
Taxonomic Richness	47.6	100	123.8	81	95.2	109.5	123.8	100	33.3	100
Shannon Diversity Index	19.6	90.7	98.5	91.6	86.4	97	100.4	89.9	31.4	100
Hilsenhoff Index	19.2	53.7	67.8	43	96.4	59.3	42.7	40.1	18.7	100
EPT Index	28.6	100	135.7	85.7	85.7	121.4	100	107.1	14.3	100
Percent Ephemeroptera	2.7	40	40.9	69.1	29.4	43.8	4.9	20.9	0	33.1
Percent Chironomidae	91.4	7.6	8.1	18.6	3.2	6.2	9.1	3.2	79.7	3.2
Percent Dominant Taxa	91.4	33.3	31.2	18.6	26.5	32.3	31.4	41	79.7	27.1
Biological Condition Scores										
Taxonomic Richness	2	6	6	6	6	6	6	6	0	6
Shannon Diversity Index	0	6	6	6	6	6	6	6	2	6
Hilsenhoff Index	0	2	2	0	6	2	0	0	0	6
EPT Index	0	6	6	4	4	6	6	6	0	6
Percent Ephemeroptera	2	6	6	6	6	6	2	4	0	6
Percent Chironomidae	0	4	4	4	6	4	4	6	0	6
Percent Dominant Taxa	0	2	2	6	4	2	2	0	0	4
Total Biological Score										
Total Biological Score	4	32	32	32	38	32	26	28	2	40
Biological % of Reference	10	80	80	80	95	80	65	70	5	100

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

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	HLDN 3.5	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Epifaunal Substrate	7	12	18	9	7	13	10	13	16	10	8	7	14
Instream Cover	12	14	18	12	15	16	16	11	14	14	16	14	15
Embeddedness/Pool Substrate	10	18	17	14	14	14	15	15	11	16	12	13	15
Velocity/Depth Regimes/Pool Variability	13	13	16	18	13	13	13	9	17	13	9	8	14
Sediment Deposition	9	16	16	15	14	11	14	16	16	14	16	15	13
Channel Flow Status	10	7	11	11	8	9	11	8	9	9	7	9	9
Channel Alteration	14	8	14	9	13	18	18	16	18	16	18	16	13
Frequency of Riffles/Channel Sinuosity	5	14	18	13	13	16	16	12	16	14	18	14	16
Condition of Banks													
Left Bank	8	8	9	6	8	9	9	8	9	8	8	9	8
Right Bank	6	8	9	8	5	8	7	8	7	7	8	5	8
Vegetative Protective Cover													
Left Bank	8	7	9	7	8	9	9	8	9	8	8	9	8
Right Bank	8	8	9	8	8	8	8	7	6	9	8	7	8
Riparian Vegetative Zone Width													
Left Bank	4	7	8	2	5	9	8	9	8	6	2	4	8
Right Bank	4	6	4	3	5	9	9	3	4	9	9	4	5
Total Habitat Score													
Total Habitat Score	118	146	176	135	136	162	163	143	160	153	147	134	154
Habitat Percent of Reference	73.8	91.3	110	84.4	85	101.3	101.9	89.4	100	95.6	91.9	83.8	96.3

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

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Epifaunal Substrate	18	18	18	16	14	6	15	9	5
Instream Cover	18	16	16	15	18	3	18	15	15
Embeddedness/Pool Substrate	12	16	16	16	15	5	15	12	12
Velocity/Depth Regimes/Pool Variability	16	18	16	16	9	8	16	10	8
Sediment Deposition	8	14	15	18	10	5	12	14	5
Channel Flow Status	13	15	16	18	9	12	15	10	5
Channel Alteration	18	18	13	15	18	12	18	18	15
Frequency of Riffles/Channel Sinuosity	16	8	13	15	18	5	18	13	16
Condition of Banks									
Left Bank	7	9	7	9	9	3	9	8	9
Right Bank	7	6	5	9	9	3	9	8	6
Vegetative Protective Cover									
Left Bank	9	8	8	9	9	6	9	8	8
Right Bank	9	8	7	9	9	6	9	8	4
Riparian Vegetative Zone Width									
Left Bank	9	7	2	7	9	1	9	9	8
Right Bank	9	3	2	5	8	1	9	9	2
Total Habitat Score									
Total Habitat Score	169	164	154	177	164	76	181	151	118
Habitat Percent of Reference	100	97	91.1	104.7	97	45	107.1	89.3	69.8

Table 17. Summary of River Sites Physical Habitat Data

	CHEM 12.0	COWN 1.0	COWN 2.2	SUSQ 44.5	SUSQ 289.1	SUSQ 340	SUSQ 365	TIOG 10.8
Epifaunal Substrate	16	12	5	12	13	12	16	9
Instream Cover	16	15	12	16	16	15	16	16
Embeddedness/Pool Substrate	16	16	5	14	16	16	14	13
Velocity/Depth Regimes/Pool Variability	18	16	9	18	18	13	16	16
Sediment Deposition	14	15	8	16	16	16	15	12
Channel Flow Status	13	13	12	14	13	15	12	14
Channel Alteration	13	10	6	18	15	18	18	14
Frequency of Riffles/Channel Sinuosity	16	11	7	16	14	14	16	11
Condition of Banks								
Left Bank	9	9	8	9	9	8	5	8
Right Bank	9	9	8	9	6	9	8	8
Vegetative Protective Cover								
Left Bank	9	9	2	9	9	8	6	8
Right Bank	9	9	7	8	9	9	8	8
Riparian Vegetative Zone Width								
Left Bank	8	6	2	9	5	6	9	9
Right Bank	4	2	2	8	9	5	8	8
Total Habitat Score								
Total Habitat Score	170	152	93	176	168	164	167	154
Habitat Percent of Reference	101.8	91	55.7	105.4	100.6	98.2	100	92.2

Table 18. Summary of Group 3 Sites Physical Habitat Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Epifaunal Substrate	18	13	16	17	12	17	15	16	15	18	17
Instream Cover	16	17	18	15	10	16	13	16	16	18	18
Embeddedness/Pool Substrate	17	15	15	14	17	17	12	15	10	18	16
Velocity/Depth Regimes/Pool Variability	15	14	16	12	9	10	10	13	9	16	17
Sediment Deposition	14	16	14	16	10	13	7	14	11	16	15
Channel Flow Status	15	14	14	16	9	15	9	14	12	17	17
Channel Alteration	19	18	14	18	16	16	18	18	13	19	15
Frequency of Riffles/Channel Sinuosity	18	18	18	18	11	18	16	18	16	19	18
Condition of Banks											
Left Bank	6	5	9	7	7	7	9	7	8	6	9
Right Bank	7	7	9	9	3	8	8	8	8	9	9
Vegetative Protective Cover											
Left Bank	8	7	9	8	5	8	8	9	7	7	8
Right Bank	9	8	9	8	5	7	8	9	7	7	8
Riparian Vegetative Zone Width											
Left Bank	9	9	6	8	2	8	9	9	8	7	9
Right Bank	9	9	8	9	2	2	9	9	8	7	6
Total Habitat Score											
Total Habitat Score	180	170	175	175	118	162	151	175	148	184	182
Habitat Percent of Reference	96.8	91.4	94.1	94.1	63.4	87.1	81.2	94.1	79.6	98.9	97.8

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

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Epifaunal Substrate	13	16	17	17	18	17	17	17	12	18
Instream Cover	14	15	18	12	16	16	16	16	16	17
Embeddedness/Pool Substrate	15	16	17	18	16	15	16	15	11	16
Velocity/Depth Regimes/Pool Variability	10	10	16	16	10	13	10	13	16	15
Sediment Deposition	11	17	11	15	17	13	9	17	7	17
Channel Flow Status	15	14	15	16	17	14	14	15	15	16
Channel Alteration	8	18	16	15	17	15	16	13	12	18
Frequency of Riffles/Channel Sinuosity	16	18	18	12	18	18	15	18	12	18
Condition of Banks										
Left Bank	6	5	7	8	7	5	6	7	9	7
Right Bank	6	8	7	2	7	4	9	7	9	9
Vegetative Protective Cover										
Left Bank	6	6	8	6	8	5	8	7	5	8
Right Bank	6	8	8	1	8	4	8	7	5	9
Riparian Vegetative Zone Width										
Left Bank	1	9	9	5	8	9	9	7	2	9
Right Bank	1	9	9	0	9	9	9	8	2	9
Total Habitat Score										
Total Habitat Score	128	169	176	143	176	157	162	167	133	186
Habitat Percent of Reference	68.8	90.9	94.6	76.9	94.6	84.4	87.1	89.8	71.5	100

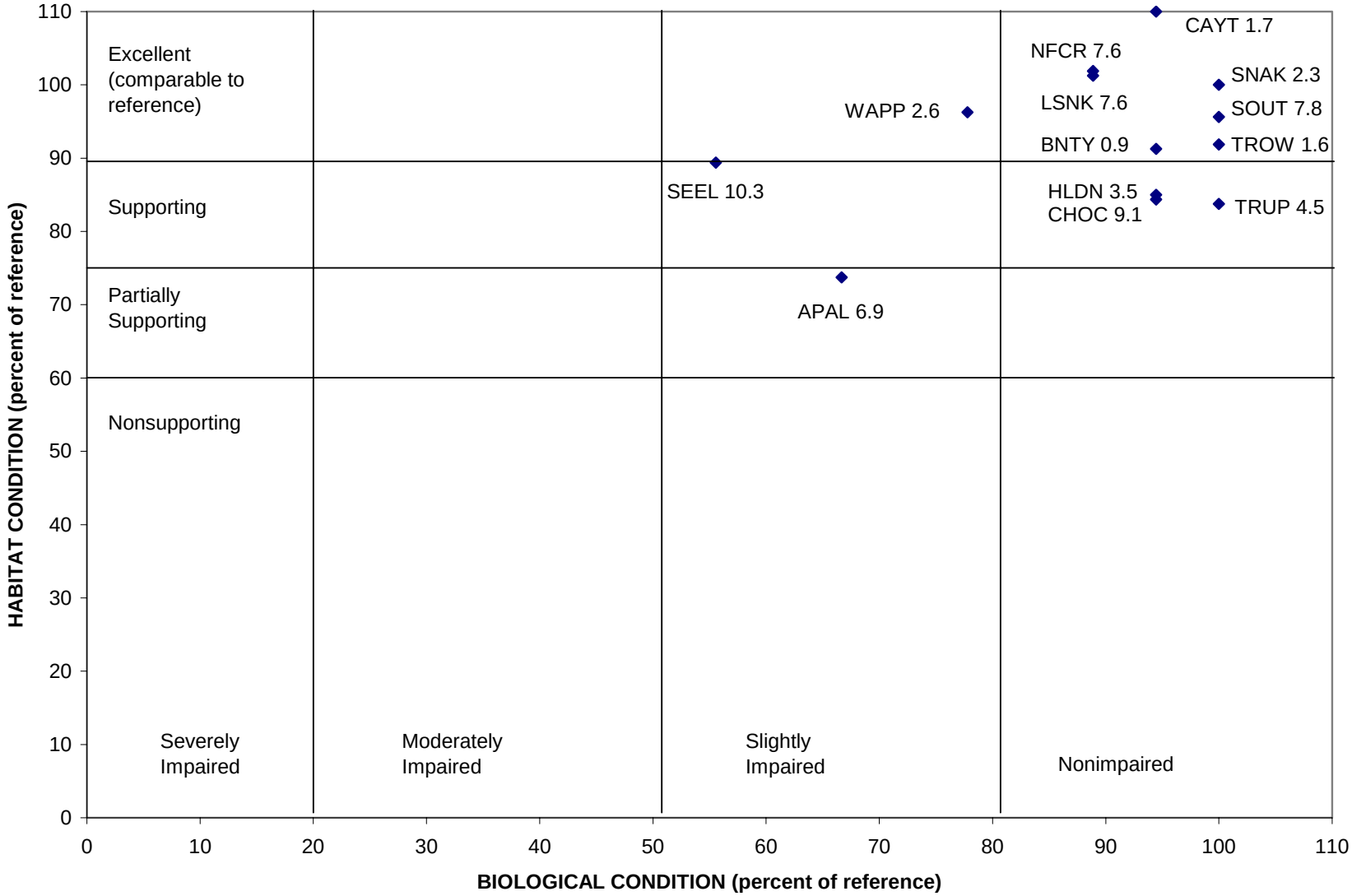


Figure 6. Summary of New York-Pennsylvania Border Streams Habitat and Biological Condition Scores

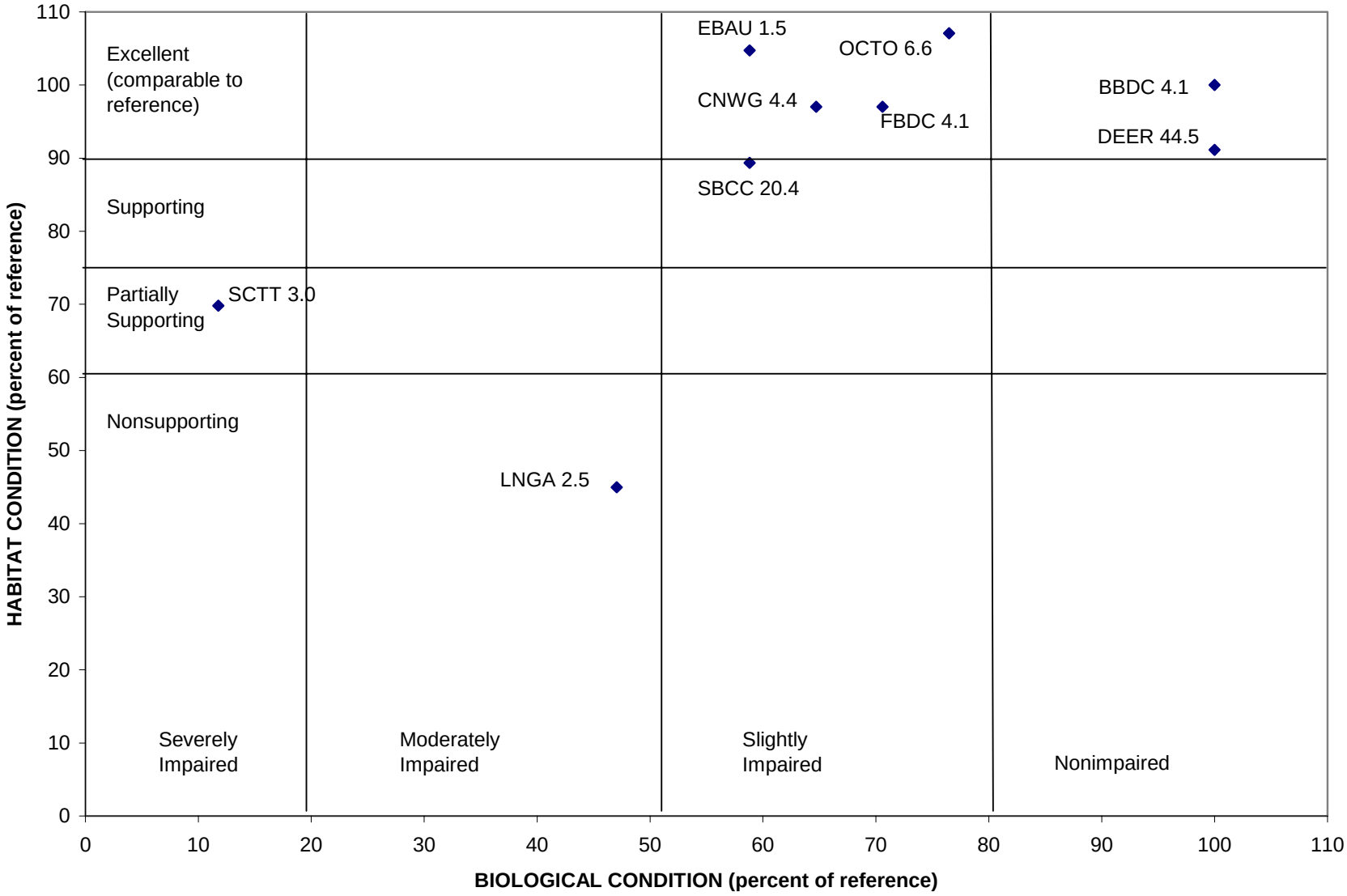


Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

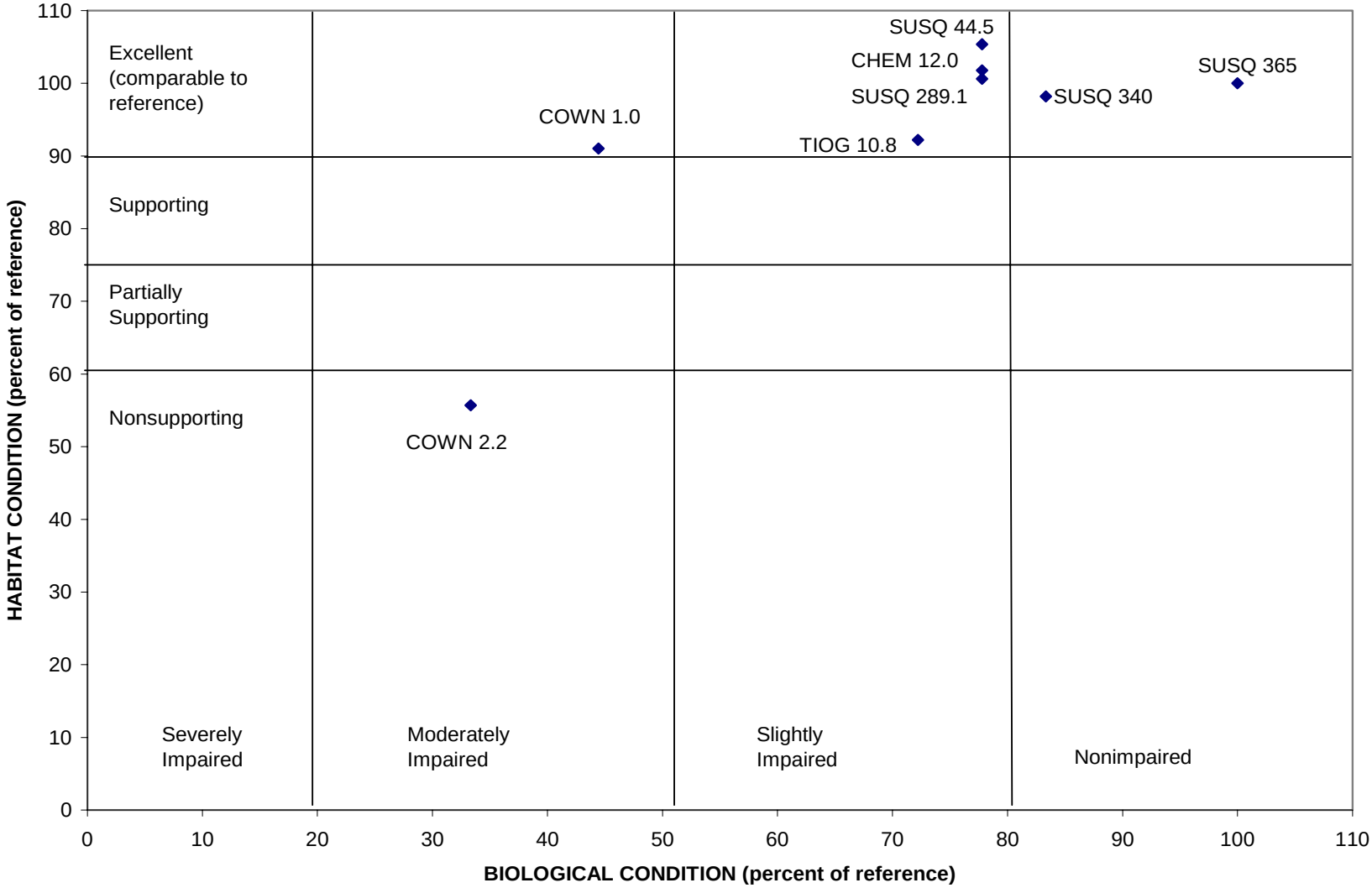


Figure 8. Summary of River Habitat and Biological Condition Scores

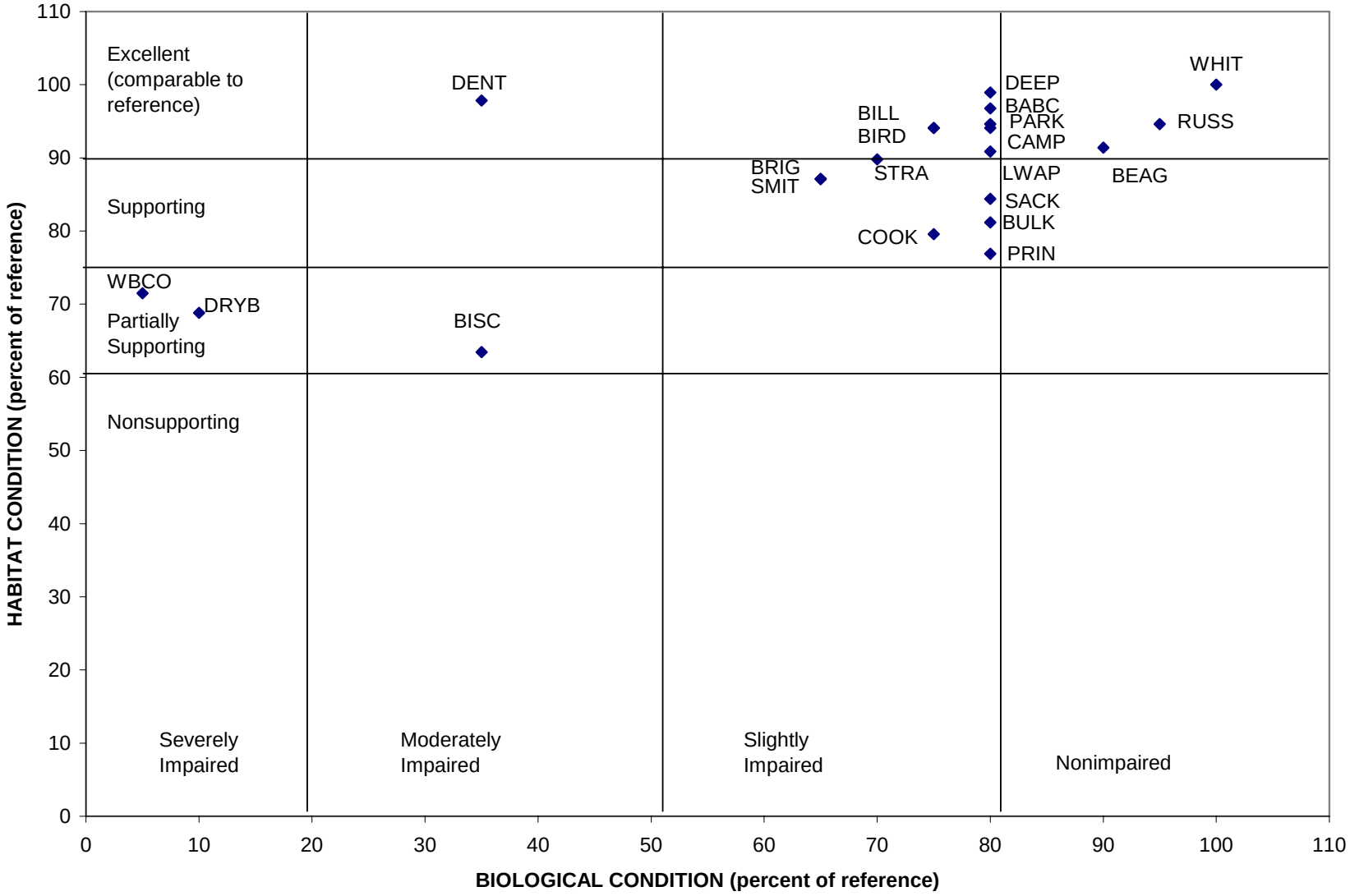


Figure 9. Summary of Group 3 Streams Habitat and Biological Condition Scores

BIOASSESSMENT OF INTERSTATE STREAMS

Abbreviations for water quality standards are provided in Table 19. Summaries of all stations include WQI scores, parameters that exceeded water quality standards, and parameters that exceeded the 90th percentile at each station. RBP III biological and habitat data also are provided, along with graphs depicting historical water quality and biological conditions over the past five years. A white bar indicates fiscal year 2003 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 2003 for the second year in a row. The number of taxa was higher than the previous year. However, the biological scores for percent dominant and EPT Index were low, and APAL 6.9 had the lowest percentage of Ephemeroptera of all the New York-Pennsylvania border streams. Habitat was rated partially supporting due to low scores in epifaunal substrate, sediment deposition, frequency of riffles, and riparian vegetative zone width.

Total iron exceeded water quality standards during August 2002, as in previous summers 1999–2001. Dissolved oxygen also exceeded the Pennsylvania aquatic life standard in August 2002. The WQI decreased slightly from the previous year after steadily increasing over the past five years (Table 20).

Bentley Creek (BNTY 0.9)

A nonimpaired biological community existed at Bentley Creek in Wellsburg, N.Y., (BNTY 0.9) for the first time in the past 11 years. Organic pollution intolerant taxa present at BNTY 0.9 included *Atherix* (Diptera: Athericidae), *Antocha* (Diptera: Tipulidae), *Hexatoma* (Diptera: Tipulidae), *Serratella* (Ephemeroptera: Ephemerellidae), *Epeorus* (Ephemeroptera: Heptageniidae), *Stenonema* (Ephemeroptera: Heptageniidae), *Isonychia* (Ephemeroptera: Isonychiidae), *Acroneuria* (Plecoptera: Perlidae), *Agnetina* (Plecoptera: Perlidae), and *Neoperla* (Plecoptera: Perlidae). Habitat was rated excellent, although slightly low scores were given for channel flow status and channel alteration. 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 years 2001-2003 (Table 21).

Cascade Creek (CASC 1.6)

Cascade Creek at Lanesboro, Pa., (CASC 1.6) was not sampled for macroinvertebrates and water quality in August 2002, 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, alkalinity, and dissolved solids were exceeded during the 2002-2003 sampling period (Table 22). Total iron and alkalinity standards have been exceeded in previous years. This site had the most water quality exceedances of all the New York-Pennsylvania streams.

Cayuta Creek (CAYT 1.7)

Biological conditions of Cayuta Creek at Waverly, N.Y., (CAYT 1.7) were rated nonimpaired, an improvement from previous years. Organic pollutant tolerant taxa present at this site included *Antocha, Hexatoma, Serratella, Epeorus, Isonychia, Nigronia* (Megaloptera: Corydalidae), *Acroneuria,* and *Agnetina*.

Table 19. Abbreviations Used in Tables 20 Through 51

Abbreviation	Parameter	Abbreviation	Parameter
ALK	Alkalinity	DNO3	Dissolved Nitrate
COND	Conductivity	TNO3	Total Nitrate
DAl	Dissolved Aluminum	DN	Dissolved Nitrogen
TAl	Total Aluminum	TN	Total Nitrogen
TCa	Total Calcium	DO	Dissolved Oxygen
TCl	Total Chloride	DP	Dissolved Phosphorus
DFe	Dissolved Iron	TP	Total Phosphorus
TFe	Total Iron	DPO4	Dissolved Orthophosphate
TMg	Total Magnesium	TPO4	Total Orthophosphate
DMn	Dissolved Manganese	DS	Dissolved Solids
TMn	Total Manganese	TS	Total Solids
DNH3	Dissolved Ammonia	TSO4	Total Sulfate
TNH3	Total Ammonia	TOC	Total Organic Carbon
DNO2	Dissolved Nitrite	TURB	Turbidity
TNO2	Total Nitrite	WQI	Water Quality Index
TCln	Total Chorine	RBP	Rapid Bioassessment Protocol

CAYT 1.7 exceeded the New York aquatic (chronic) standard for total aluminum in August 2002; however, all other Cayuta Creek samples for 2002-2003 remained below the detection limit of 200 micrograms per liter (µg/l) for aluminum. Many parameters exceeded the 90th percentile including dissolved oxygen, conductivity, total and dissolved nitrates, total and dissolved phosphorus, total and dissolved orthophosphate, total and dissolved nitrogen, total and dissolved solids, dissolved nitrite, and total aluminum (Table 23). The total chlorine values were 0.04 milligrams per liter (mg/l) in August, 0.13 mg/l in November, 0.12 mg/l in March, and 0.08 mg/l in May. These values exceed the New York aquatic life standard for total residual chlorine. This site is downstream of wastewater discharges from the Waverly sewage treatment facility. Additional concerns in the watershed include runoff from the city of Waverly, malfunctioning septic systems, and agriculture.

Choconut Creek (CHOC 9.1)

The biological index score for Choconut Creek at Vestal Center, N.Y., (CHOC 9.1) increased in fiscal year 2003 after steadily decreasing over the past five years. The biological condition returned to nonimpaired, and this site had the highest percent Ephemeroptera (38 percent) of Group 1 and 2 New York-Pennsylvania border streams. The Hilsenhoff Biotic Index score was good with numerous organic pollution intolerant taxa including *Antocha, Dicranota* (Diptera: Tipulidae), *Serratella, Epeorus, Leucrocuta* (Ephemeroptera: Heptageniidae), *Stenonema*, *Isonychia*, *Paraleptophlebia* (Ephemeroptera: Leptophlebiidae), *Nigronia*, *Boyeria* (Odonata: Aeshnidae), *Ophiogomphus* (Odonata: Gomphidae), *Leuctra* (Plecoptera: Leuctridae), *Agnetina*, and *Rhyacophila* (Trichoptera: Rhyacophilidae). The habitat was rated supporting with low ratings for epifaunal substrate, channel alteration, and riparian vegetative zone. Dredging and new rip-rap were noted at this site.

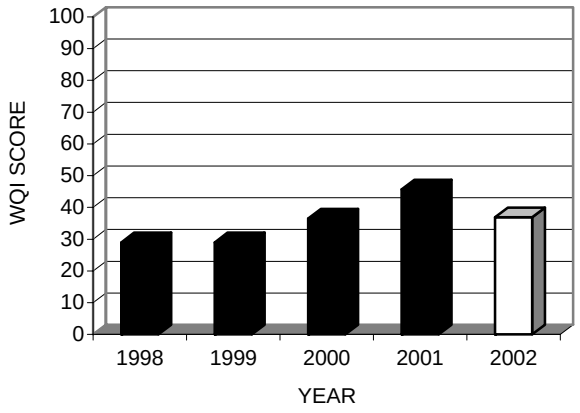
No parameters exceeded standards during August 2002, although the WQI was slightly higher than it has been in the past five years. Total ammonia was the only parameter to exceed the 90th percentile (Table 24).

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

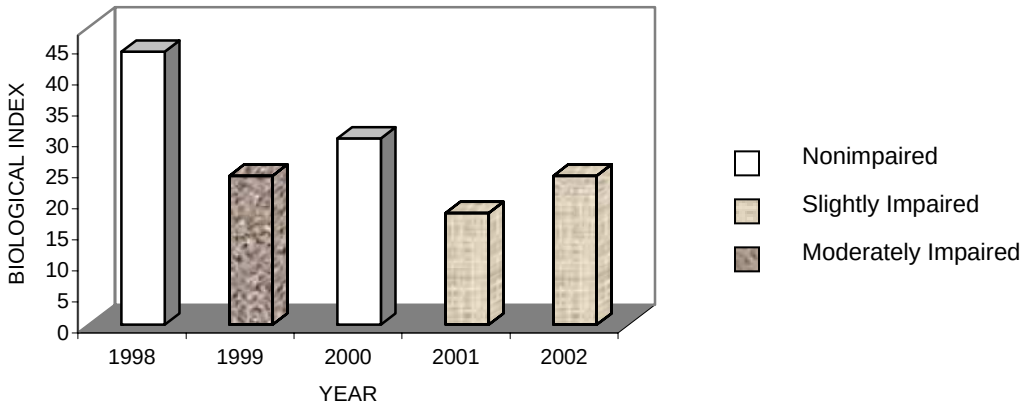
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	08/06/02	459 µg/l	300 µg/l	N.Y. aquatic (chronic)
DO	08/06/02	4.75 mg/l	5.0 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
08/06/02	36.9	DO							

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	1.8
RBP Score	24
RBP Condition	Slightly Impaired
Total Habitat Score	118
Habitat Condition Category	Partially Supporting



Water Quality Index



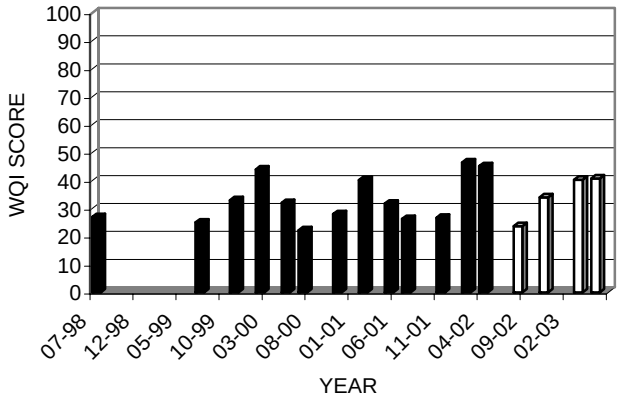
Biological Index

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

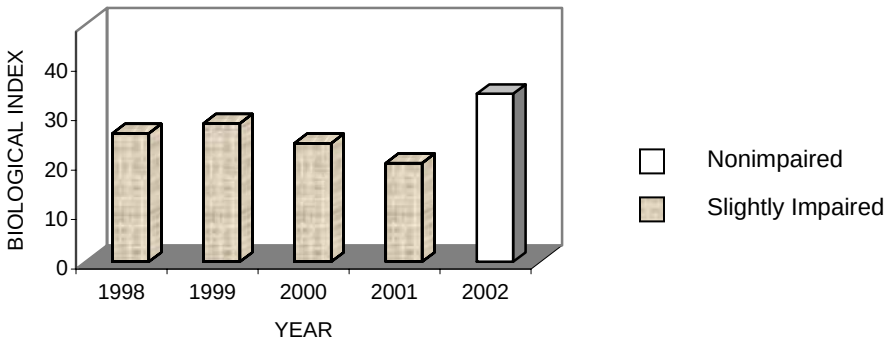
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/07/02	23.7	None							
11/13/02	34.0	None							
03/04/03	40.3	None							
05/28/03	40.8	None							

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.4
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	146
Habitat Condition Category	Excellent



Water Quality Index



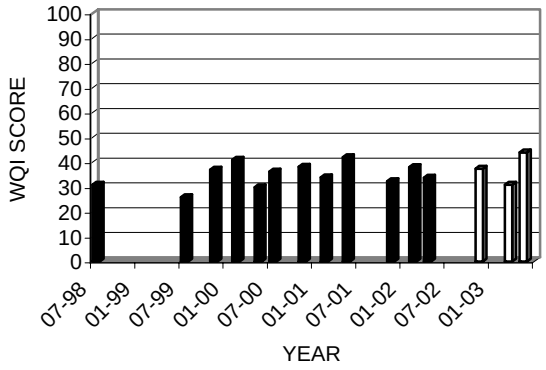
Biological Index

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

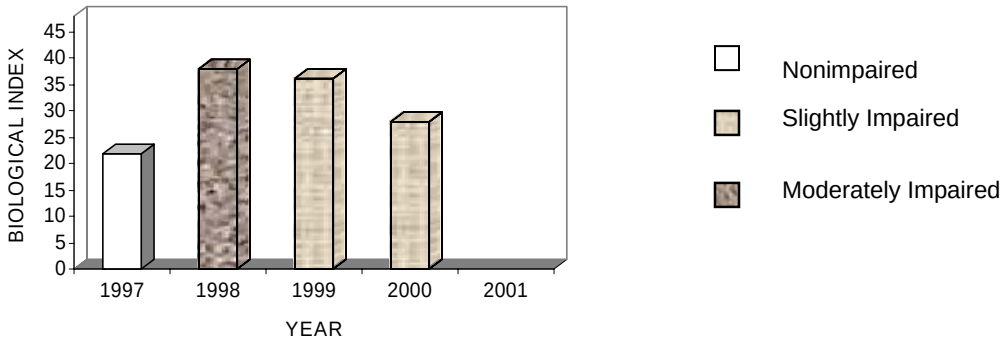
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	3/3/03	319 µg/l	300 µg/l	N.Y. aquatic (chronic)
TFe	5/27/03	415 µg/l	300 µg/l	N.Y. aquatic (chronic)
ALK	11/12/02	16 mg/l	20 mg/l	Pa. aquatic life
ALK	3/3/03	12 mg/l	20 mg/l	Pa. aquatic life
ALK	5/27/03	14 mg/l	20 mg/l	Pa. aquatic life
DS	11/12/02	1449 mg/l	750 mg/l	Pa. public water supply
DS	11/12/02	1449 mg/l	500 mg/l	N.Y. general

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
11/12/02	37.4	DFe	TS	DS					
03/03/03	31	DFe	DO						
5/27/03	44	TFe	DO						

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



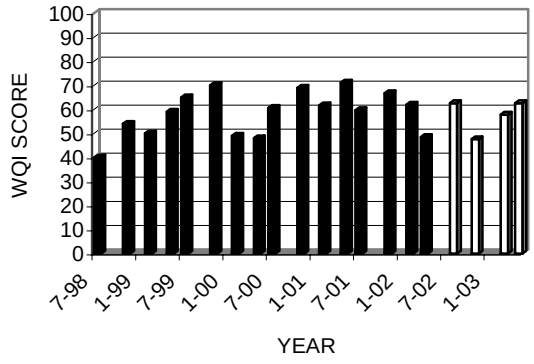
Biological Index

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

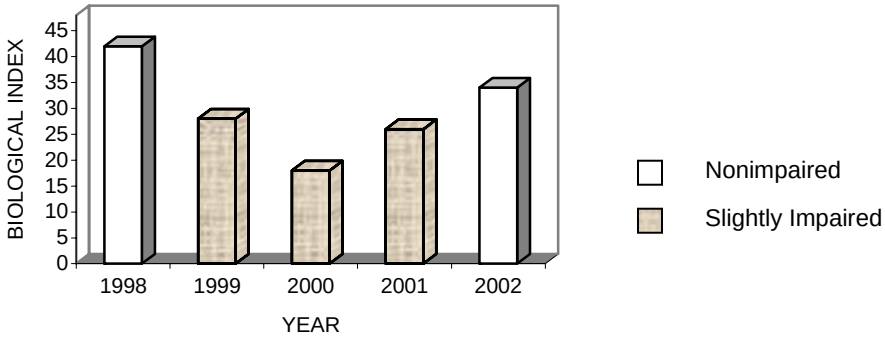
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	08/07/02	1270 µg/l	100 µg/l	N.Y. aquatic (chronic)
TCln	08/07/02	0.04 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCln	11/13/02	0.13 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCln	03/04/03	0.12 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCln	05/28/03	0.08 mg/l	0.019 mg/l	N.Y. aquatic (acute)

Date	**WQI**	**Parameters Exceeding 90th Percentile**								
08/07/02	62.6	COND	TS	DS	TN	DN	DNO2	TNO3	DNO3	TAl
11/13/02	47.6	DN	TNO3	DNO3						
03/04/03	57.8	DO	TP	DP	TPO4	DPO4				
05/28/03	62.6	TP	DP	TPO4	DPO4					

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.5
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	176
Habitat Condition Category	Excellent



Water Quality Index



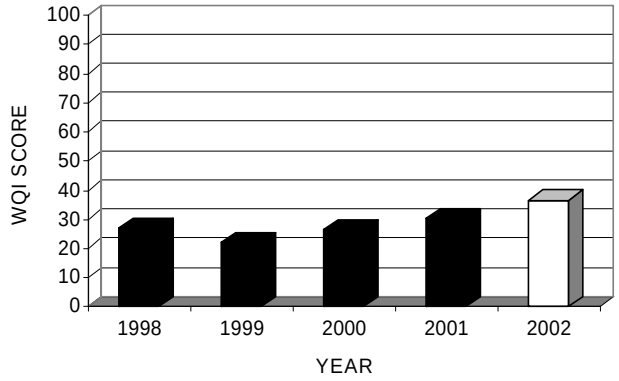
Biological Index

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

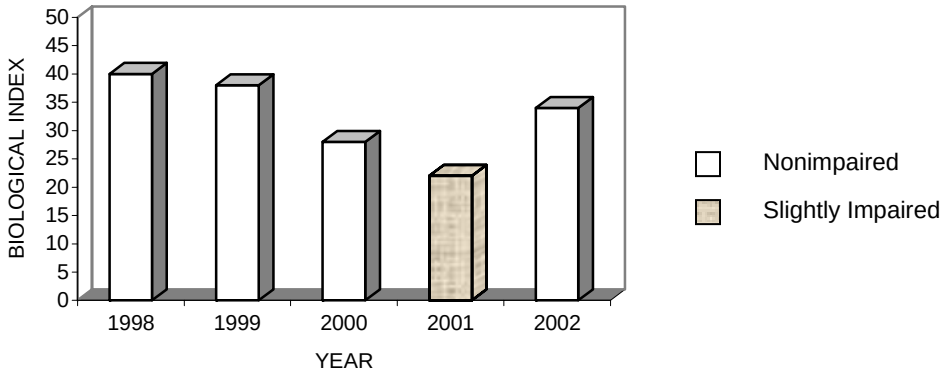
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/06/02	36.4	TNH3							

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	2.3
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	135
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Holden Creek (HLDN 3.5)

Holden Creek at Woodhull, N.Y. (HLDN 3.5) has not been sampled since 1998 due to dry conditions. In fiscal year 2003, the flow was low; however, a sample was collected. The biological condition was designated nonimpaired with a high number of taxa, good diversity, and a high EPT Index. Organic pollutant intolerant taxa included *Antocha, Hexatoma, Heterocloeon* (Ephemeroptera: Baetidae), *Ephemerella* (Ephemeroptera: Ephemerellidae), *Leucrocuta, Stenonema, Paraleptophlebia, Boyeria, Ophiogomphus, Acroneuria, Agnetina, Neoperla, Dolophilodes* (Trichoptera: Philopotamidae), and *Wormaldia* (Trichoptera: Philopotamidae). The biological condition also was nonimpaired in 1998 (Table 25).

No parameters exceeded water quality standards or the 90th percentile. The WQI score was similar to the WQI score that was calculated in the 1998 sample. The habitat was rated supporting with low epifaunal substrate and channel flow status ratings. There was evidence of past erosion and agricultural pastureland use, and an automobile junkyard was located upstream in the watershed.

Little Snake Creek (LSNK 7.6)

Little Snake Creek at Brackney, Pa., (LSNK 7.6) was designated nonimpaired in August 2002 by SRBC staff. This site had a high number of total taxa (32) that included the organic pollution intolerant genera *Atherix, Antocha, Dicranota, Hexatoma, Ephemera* (Ephemeroptera: Ephemeridae), *Leucrocuta, Stenonema, Isonychia, Paraleptophlebia, Nigronia, Sweltsa* (Plecoptera: Chloroperlidae), *Leuctra*, and *Acroneuria*. Water quality values exceeded Pennsylvania and New York standards for total and dissolved iron and alkalinity (Table 26). The dissolved iron value for August 2002 was the highest (404 µg/l) of all interstate streams in fiscal year 2003. Habitat was mostly forested with a beaver dam located upstream of the sampling site.

North Fork Cowanesque River (NFCR 7.6)

North Fork Cowanesque River at North Fork, Pa., (NFCR 7.6) had a nonimpaired biological community. Organic pollution intolerant taxa found at this site included *Antocha, Dicranota, Hexatoma, Serratella, Epeorus, Leucrocuta, Stenonema, Paraleptophlebia, Nigronia, Paracapnia* (Plecoptera: Capnidae), *Leuctra, Acroneuria, Agnetina, Diplectrona* (Trichoptera: Hydropsychidae), and *Dolophilodes*. No parameters exceeded the New York or Pennsylvania water quality standards, although total and dissolved nitrite, total and dissolved phosphorus, and total and dissolved orthophosphate exceeded the 90th percentile (Table 27). Habitat was rated excellent with predominantly forested land cover. This stream sampling site is often dry during July and August when Group 1 and 2 sampling is performed; therefore, macroinvertebrate samples have not been collected every year.

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 August 2002, SEEL 10.3 was rated slightly impaired; however, this site had the lowest Shannon Diversity Index (1.7), highest Hilsenhoff Biotic Index (5.3), highest percentage Chironomidae (56.1), and highest percent dominant taxon (56.1) of all Group 1 and 2 New York-Pennsylvania streams. Chironomidae heavily dominated this site as in previous years. No parameters exceeded standards, and only dissolved oxygen exceeded the 90th percentile (Table 28).

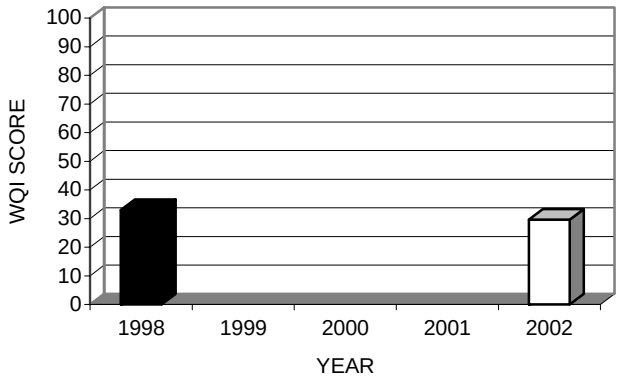
Habitat conditions appear to be a possible cause for the impaired macroinvertebrate community. New York State Department of Conservation (NYSDEC) listed Seeley Creek as "threatened" in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel.

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

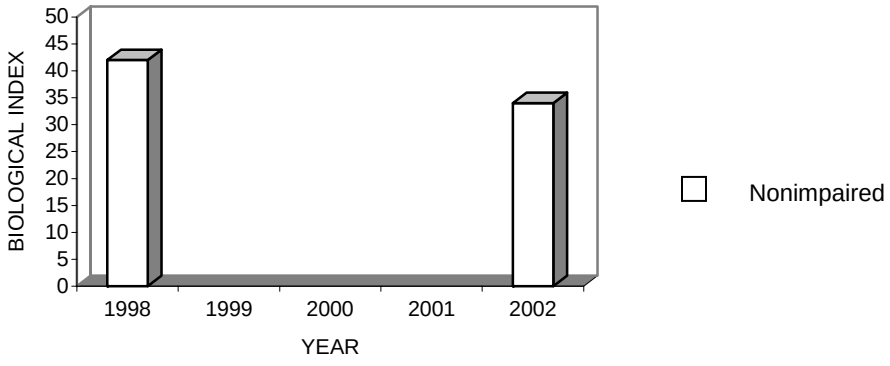
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/08/02	29.6	None							

Biological and Habitat Summary	
Number of Taxa	40
Diversity Index	2.7
RBP III Score	34
RBP III Condition	Nonimpaired
Total Habitat Score	136
Habitat Condition Category	Supporting



Water Quality Index



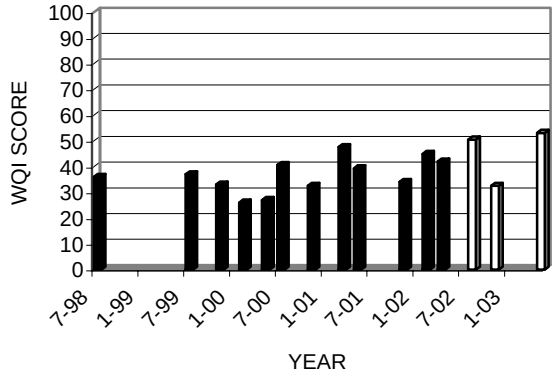
Biological Index

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

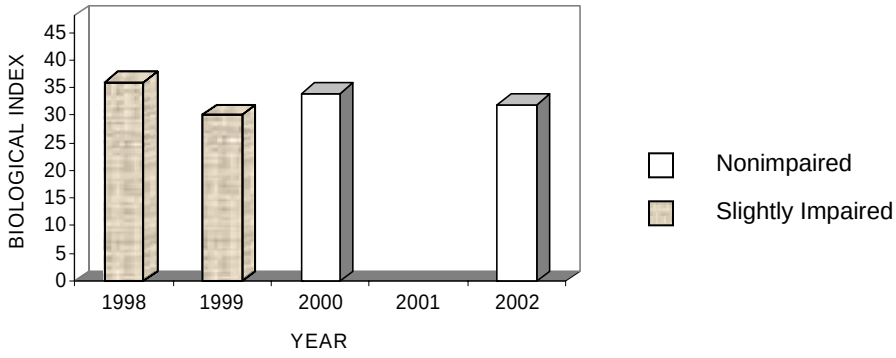
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	08/06/02	590 µg/l	300 µg/l	N.Y. aquatic (chronic)
DFe	08/06/02	404 µg/l	300 µg/l	Pa. public water supply
ALK	05/27/03	18 mg/l	20 mg/l	Pa. aquatic life
TFe	05/27/03	423 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/06/02	50.5	TNH3	DNH3	TFe	DFe				
11/12/02	32.5	DFe							
5/27/03	53.1	DO	TOC	TFe	DFe				

Biological and Habitat Summary	
Number of Taxa	32
Diversity Index	2.5
RBP III Score	32
RBP III Condition	Nonimpaired
Total Habitat Score	162
Habitat Condition Category	Excellent



Water Quality Index



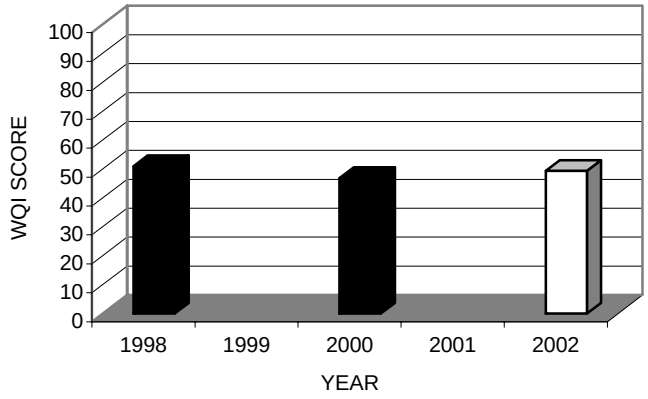
Biological Index

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

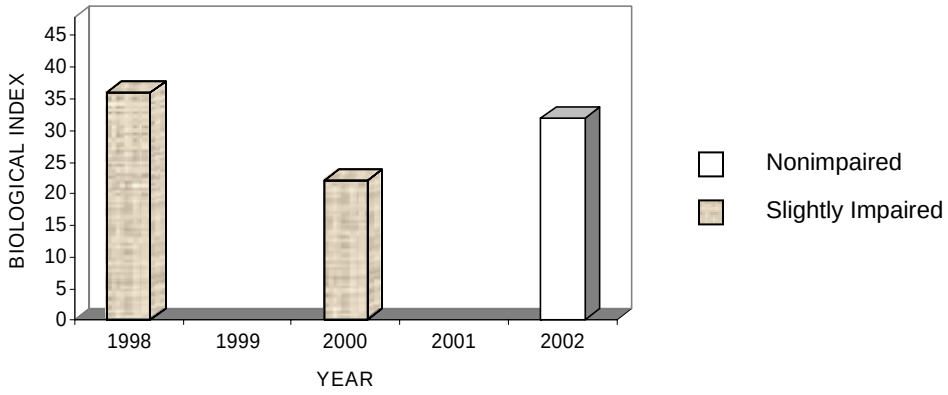
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/08/02	49.4	TNO2	DNO2	TP	DP	TPO4	DPO4		

Biological and Habitat Summary	
Number of Taxa	29
Diversity Index	2.5
RBP III Score	32
RBP III Condition	Nonimpaired
Total Habitat Score	163
Habitat Condition Category	Excellent



Water Quality Index



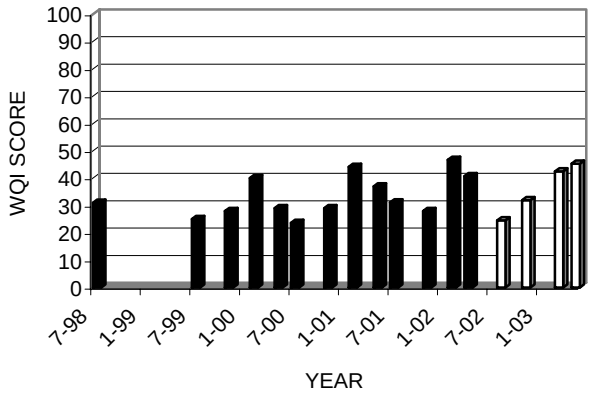
Biological Index

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

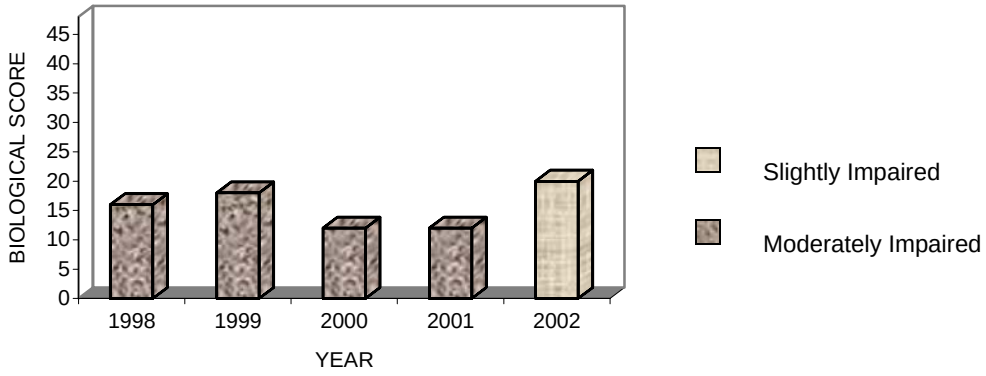
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/07/02	24.6	None							
11/13/02	32.0	DO							
03/04/03	42.5	DO							
05/28/03	45.3	DO							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	1.7
RBP III Score	20
RBP III Condition	Slightly
Total Habitat Score	143
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

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 29). The biological community has remained nonimpaired for the past six years. Snake Creek supported many pollution intolerant taxa, including *Atherix, Antocha, Dicranota, Centroptilum* (Ephemeroptera: Baetidae), *Serratella, Epeorus, Stenonema, Isonychia, Neoperla, Paragnetina* (Plecoptera: Perlidae), *Glossosoma* (Trichoptera: Glossosomatidae), and *Rhyacophila*.

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 2003, South Creek at Fassett, Pa., (SOUT 7.8) had a nonimpaired biological community. Organic pollution intolerant taxa at this site consisted of *Promoresia* (Coleoptera: Elmidae), *Atherix, Antocha, Dicranota, Leucrocuta, Stenonema, Isonychia, Sweltsa, Acroneuria, Neoperla,* and *Psilotreta* (Trichoptera: Odontoceridae). The macro-invertebrate 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, although total organic carbon exceeded the 90th percentile for New York-Pennsylvania border streams (Table 30). The habitat was rated excellent; however, channel flow status was low, and SRBC staff noted the upstream streambed was rather dry. Habitat impairment by flooding has been noted in the past; therefore, biological impairment at this site may be due to large fluctuations in flow and periodic drying of the streambed.

Troups Creek (TRUP 4.5)

Troups Creek at Austinburg, Pa., (TRUP 4.5) had a nonimpaired biological community. This site showed great improvement in biological metrics from the previous year. The percent Ephemeroptera improved from 0.83 percent to 25.4 percent, number of taxa improved from 14 to 24, and number of EPT taxa improved from 5 to 11. The WQI showed improvement at the time of biological sampling (August 2002); however, the WQI during the other seasons did not show improvement. Total iron, total aluminum, and pH exceeded New York State water quality standards in March and May 2003. Furthermore, numerous metal and organic parameters exceeded the 90th percentile in March and May 2003 (Table 31).

Trowbridge Creek (TROW 1.8)

Trowbridge Creek at Great Bend, Pa., (TROW 1.8) showed nonimpaired biological conditions. Organic pollution intolerant taxa consisted of *Antocha, Hexatoma, Serratella, Leucrocuta, Stenonema, Isonychia, Paraleptophlebia, Suwallia* (Plecoptera: Chloroperlidae), *Sweltsa, Agnetina, Neoperla, Dolophilodes,* and *Wormaldia*. No water quality standards were exceeded in August 2002, and no parameters exceeded the 90th percentile (Table 32). Habitat was rated excellent; however, channel flow status was low, the stream was not well-shaded, and anthropogenic debris was noted along the left bank.

Wappasening Creek (WAPP 2.6)

The biological index rating for Wappasening Creek at Nichols, N.Y., (WAPP 2.6) has fluctuated between moderately impaired, slightly impaired, and nonimpaired ratings over the past

five years (Table 33). In August 2002, it scored a slightly impaired rating. The habitat was rated excellent in 2003, although SRBC staff noted that channel flow was low, and the stream disappeared underground upstream and downstream of the sampling site. No parameters exceeded water quality standards; however, total and dissolved nitrogen, total and dissolved nitrate, and total ammonia exceeded the 90th percentile.

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 2003. This site had the best combination of biological community, physical habitat, and water quality of the Pennsylvania-Maryland streams. It had the best value for the EPT Index (16) and Hilsenhoff Biotic Index (3.22) 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 3 or less included *Promoresia, Antocha, Dicranota, Serratella, Epeorus, Leucrocuta, Nixe* (Ephemeroptera: Heptageniidae), *Stenonema, Isonychia, Nigronia, Cordulegaster* (Odonata: Cordulegastridae), *Leuctra, Acroneuria, Diplectrona, Dolophilodes, Wormaldia,* and *Rhyacophila*. The biological community has been nonimpaired for at least the past five years. Water quality was good in Big Branch Deer Creek in August 2002, with no parameters exceeding standards or the 90th percentile (Table 34). The land cover at this site was predominantly forest with the only low score resulting from sediment deposition in pools and slight erosion of the streambanks.

Conowingo Creek (CNWG 4.4)

Conowingo Creek at Pleasant Grove, Pa., (CNWG 4.4) had a slightly impaired community for the third year in a row. This stream was impacted by agricultural activities, as evidenced by high sediment deposition and elevated nutrients. Parameters that exceeded the 90th percentile were predominantly forms of nitrogen with some phosphorus, orthophosphates, solids, and dissolved iron (Table 35). CNWG 4.4 had the highest values of total and dissolved nitrogen (11.0 mg/l and 10.83 mg/l, respectively), total and dissolved nitrate (10.01 mg/l and 10.09 mg/l, respectively), total and dissolved solids (1,766 mg/l and 1,760 mg/l, respectively), and dissolved orthophosphate (0.476 mg/l) of all the interstate streams (Table A2). Nitrate plus nitrite and dissolved solids exceeded the Pennsylvania standards for public water supply. This stream also has relatively high metals at times due to problems with sediment erosion in the watershed.

Deer Creek (DEER 44.2)

Deer Creek at Gorsuch Mills, Md., (DEER 44.2) showed a nonimpaired biological community for the second year in a row, after being slightly impaired for three years. It had the best scores for percent Ephemeroptera (24.2 percent) and percent dominant taxon (20.4 percent) metrics of all the Pennsylvania-Maryland sites. Pollution intolerant taxa at this site included *Atherix, Antocha, Serratella, Epeorus, Leucrocuta, Stenonema, Isonychia, Nigronia, Leuctra, Acroneuria, Claassenia* (Plecoptera: Perlidae), and *Neophylax* (Trichoptera: Uenoidae). The only parameter to exceed standards was alkalinity in December 2002, which may have been due to snowmelt (Table 36). This sampling site was located adjacent to agricultural activities.

Ebaughs Creek (EBAU 1.5)

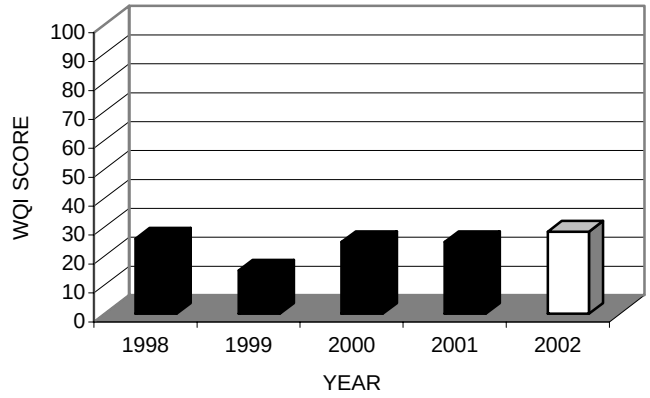
Ebaughs Creek at Stewartstown, Pa., (EBAU 1.5) had a slightly impaired community in July 2002. This site usually has slightly or moderately impaired biological conditions, with the July 2001 rating of nonimpaired being an anomaly. EBAU 1.5 had the best percent Chironomidae score (2.33 percent) of all the Pennsylvania-Maryland streams. The WQI improved in all samples except July 2002. The July 2002 sample had numerous organic parameters exceed the 90th percentile, such as nitrogen, ammonia, nitrites, phosphorus, and orthophosphates (Table 37). This sample also had the highest total and dissolved nitrites (0.58 mg/l and 0.59 mg/l, respectively) of all interstate stream sites (Table A2). EBAU 1.5 is located downstream of the Stewartstown Treatment Plant. The total chlorine values were 0.07 mg/l in July, 0.1 mg/l in February, and 0.05 mg/l in June. These values exceed the Maryland aquatic life standard for total chlorine.

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

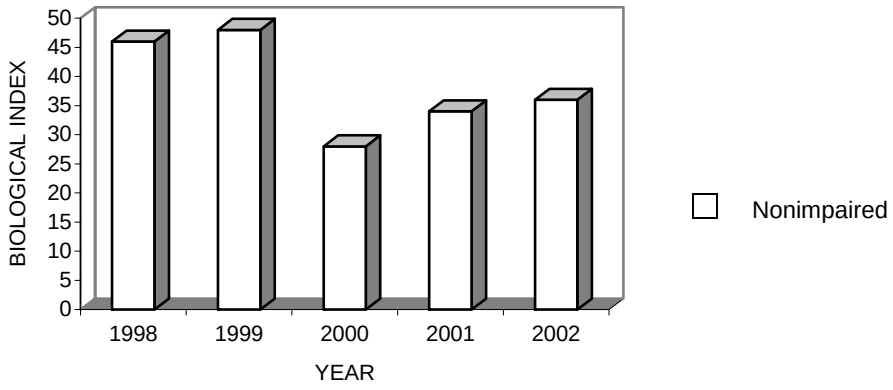
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
8/5/02	28.4	DNH3							

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.5
RBP III Score	36
RBP III Condition	Reference
Total Habitat Score	160
Habitat Condition Category	Reference



Water Quality Index



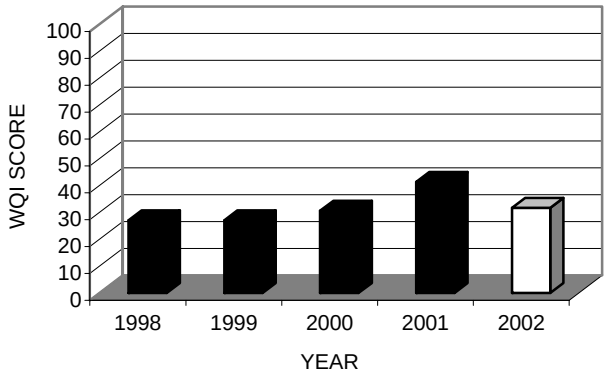
Biological Index

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

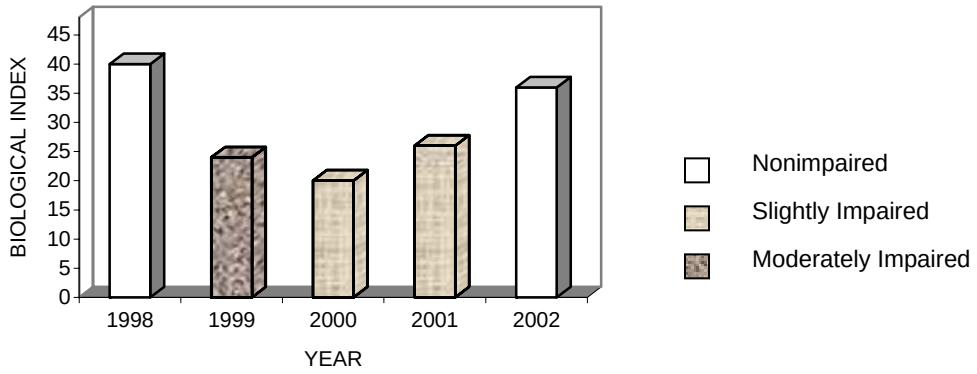
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/07/02	31.6	TOC							

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	2.4
RBP III Score	36
RBP III Condition	Nonimpaired
Total Habitat Score	153
Habitat Condition Category	Excellent



Water Quality Index



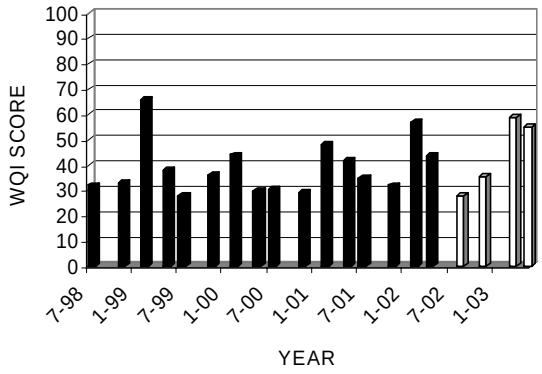
Biological Index

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

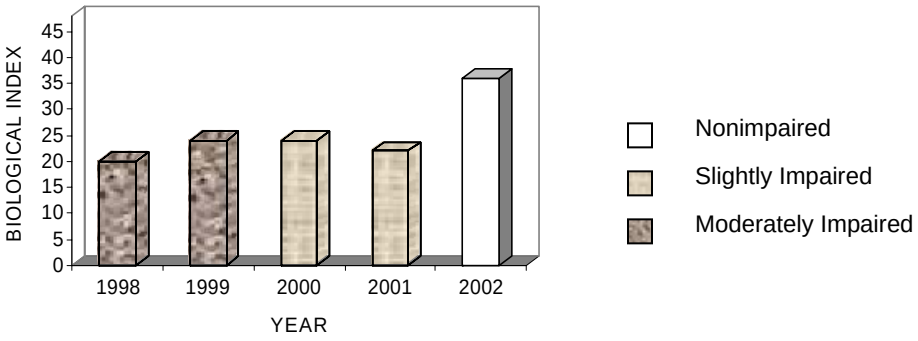
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	03/05/03	363 µg/l	100 µg/l	N.Y. aquatic (chronic)
TFe	03/05/03	428 µg/l	300 µg/l	N.Y. aquatic (chronic)
pH	05/29/03	9.0	6.5-8.5	N.Y. general
TFe	05/29/03	351 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	05/29/03	267 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90th Percentile							
08/08/02	28.0	None							
11/14/02	35.6	TNH3							
03/05/03	58.9	TN	DN	TNO3	DNO3	TAl	TURB		
05/29/03	55.1	DP	TOC	TAl	TPO4	TURB			

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.6
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	134
Habitat Condition Category	Supporting



Water Quality Index



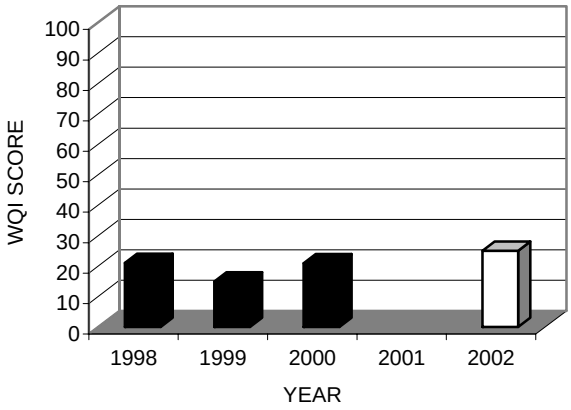
Biological Index

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

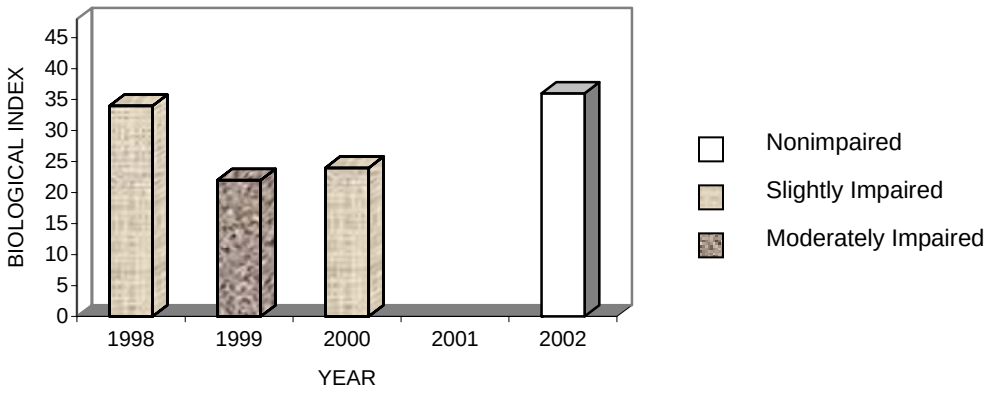
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
NA				

Date	WQI	Parameters Exceeding 90th Percentile							
08/05/02	25.0	None							

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.5
RBP III Score	36
RBP III Condition	Nonimpaired
Total Habitat Score	147
Habitat Condition Category	Excellent



Water Quality Index



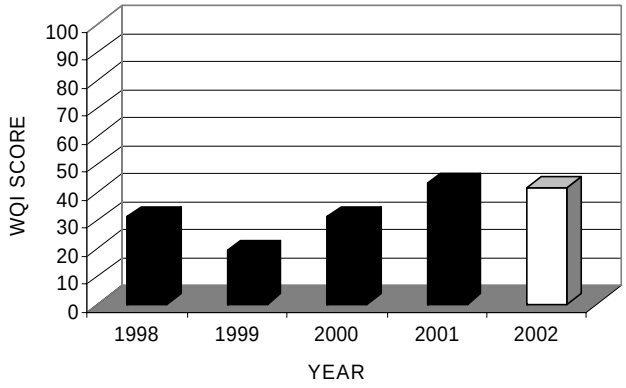
Biological Index

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

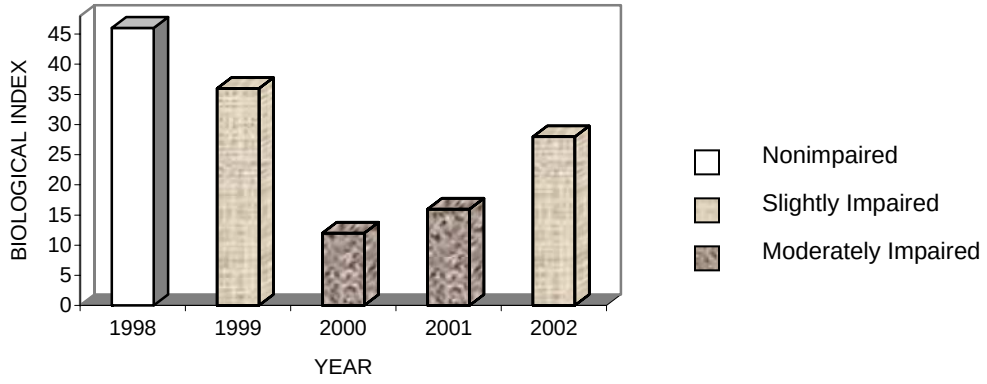
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/06/02	41.7	TN	DN	TNH3	TNO3	DNO3			

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.4
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	154
Habitat Condition Category	Excellent



Water Quality Index



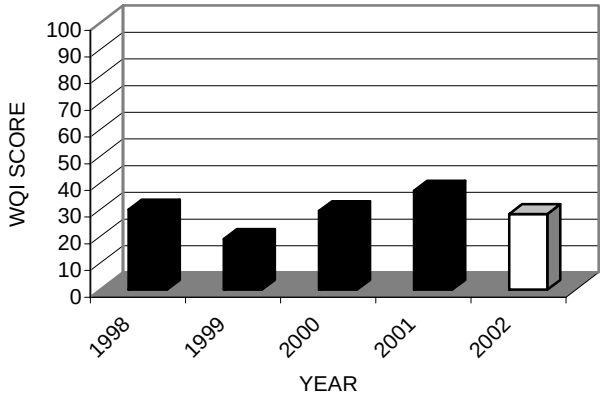
Biological Index

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

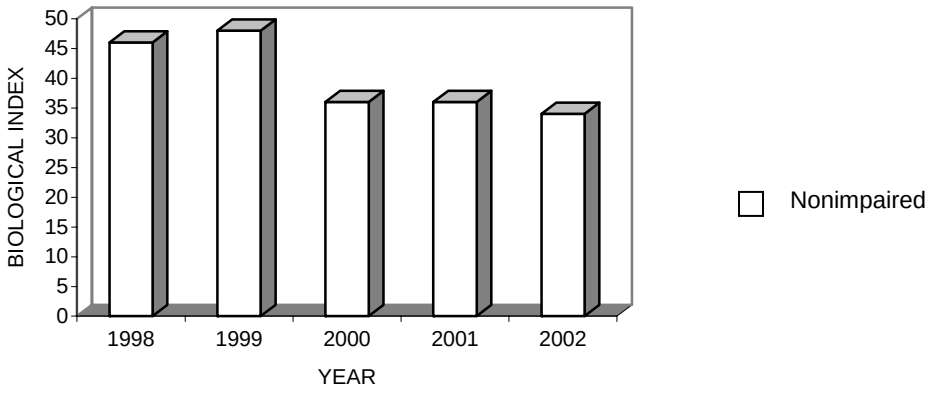
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/02	28.4	None							

Biological and Habitat Summary	
Number of Taxa	29
Diversity Index	2.6
RBP Score	34
RBP Condition	Reference
Total Habitat Score	169
Habitat Condition Category	Reference



Water Quality Index



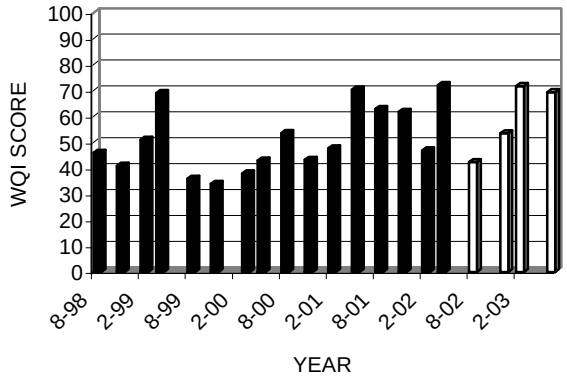
Biological Index

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

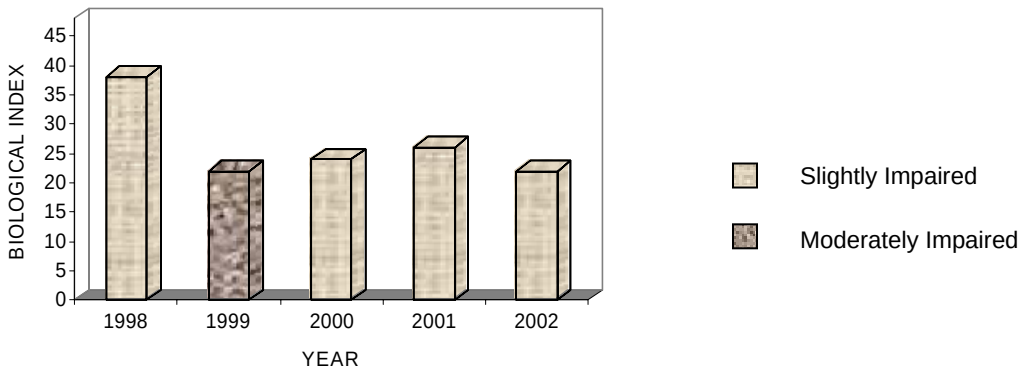
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
Nitrite plus Nitrate	12/18/02	10.02 mg/l	10.0 mg/l	Pa. public water supply
DS	06/03/03	1760 mg/l	750 mg/l	Pa. public water supply

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/02	42.4	TNO3	DNO3						
12/18/02	53.5	TN	DN	DNO2	TNO3	DNO3			
02/26/03	71.7	DO	TN	DN	DNO2	TNO3	DNO3	DP	TPO4
		DPO4							
06/03/03	69.4	TS	DS	TN	DN	TNO3	DNO3	DP	DPO4
		DFe							

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.1
RBP III Score	22
RBP III Condition	Slightly Impaired
Total Habitat Score	164
Habitat Condition Category	Excellent



Water Quality Index



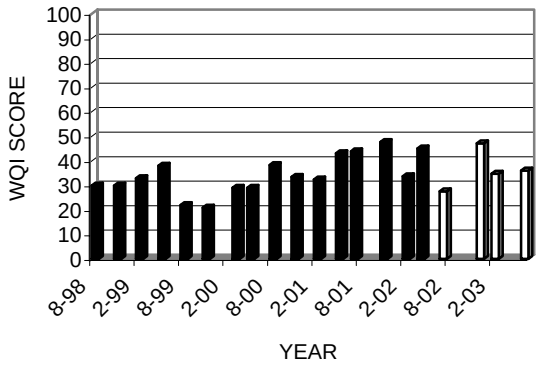
Biological Index

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

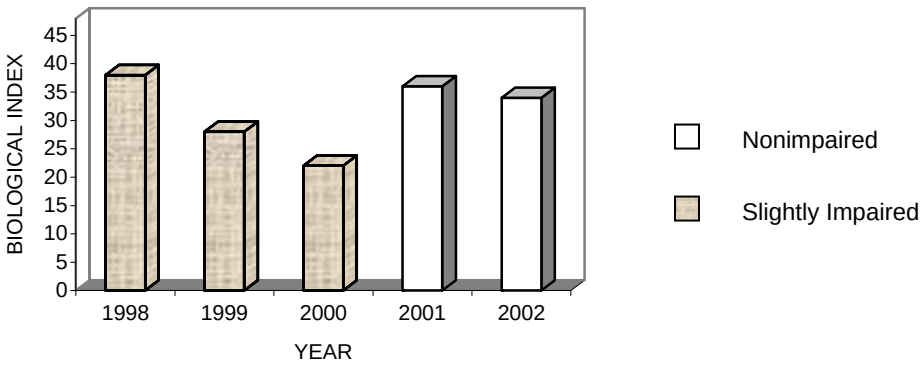
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
ALK	12/18/02	12 mg/l	20 mg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/02	27.6	None							
12/18/02	47.2	TCl							
02/27/03	34.8	DO							
06/02/03	36.1	None							

Biological and Habitat Summary	
Number of Taxa	24
Diversity Index	2.6
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	154
Habitat Condition Category	Excellent



Water Quality Index



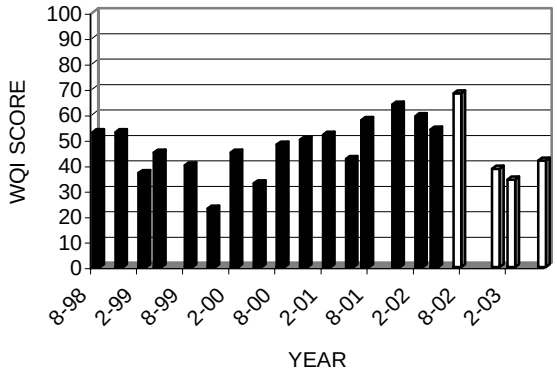
Biological Index

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

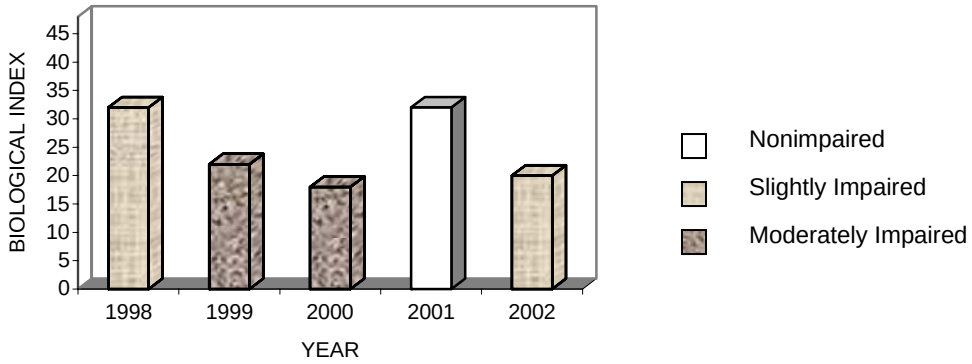
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TCln	07/30/02	0.07 mg/l	0.019 mg/l	Md. aquatic life
TCln	02/27/03	0.1 mg/l	0.019 mg/l	Md. aquatic life
TCln	06/02/03	0.05 mg/l	0.019 mg/l	Md. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/30/02	68.3	TN	DN	TNH3	DNH3	TNO2	DNO2	TP	DP
		TPO4	DPO4						
12/18/02	38.7	None							
02/27/03	34.4	DO							
06/02/03	41.9	None							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	1.9
RBP Score	20
RBP Condition	Slightly Impaired
Total Habitat Score	177
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Falling Branch Deer Creek (FBDC 4.1)

The biological community of Falling Branch Deer Creek at Fawn Grove, Pa., (FBDC 4.1) was designated slightly impaired. This site scored the best on taxa richness (30) and Shannon Diversity Index (2.68) metrics; however, it had a low percentage of Ephemeroptera (1.76 percent). The habitat was rated excellent with a dense vegetative cover. Salamanders were noted at this site. No parameters exceeded water quality standards or the 90th percentile (Table 38).

Long Arm Creek (LNGA 2.5)

Long Arm Creek at Bandanna, Pa., (LNGA 2.5) had a moderately impaired biological community and a nonsupporting habitat. LNGA 2.5 was located in a cow pasture. The site was expected to improve as an organic farm with fewer livestock and reduced access to the stream replaced the previous operation; however, significant improvements have not been noted yet. There was no stream cover, no forested riparian zone, eroded streambanks, considerable sediment in the stream, extensive channel alteration from the cows, and poor epifaunal substrate.

During the 2000 sampling season, Long Arm Creek was elevated to a Group 1 stream. Although no water quality standards were exceeded in fiscal year 2003, both metals and nutrients such as total iron, total and dissolved manganese, total aluminum, total and dissolved nitrates, and total nitrite exceeded the 90th percentile at this site. Dissolved oxygen and turbidity also exceeded the 90th percentile (Table 39).

Octoraro Creek (OCTO 6.6)

Octoraro Creek at Rising Sun, Md., (OCTO 6.6) had a slightly impaired biological community. Although no parameters exceeded state standards, numerous metals and organics exceeded the 90th percentile (Table 40). In fact, OCTO 6.6 had the highest total and dissolved ammonia (1.34 mg/l and 1.3 mg/l, respectively), total and dissolved phosphorus (0.75 mg/l and 0.56 mg/l, respectively), total organic carbon (10.6 mg/l), total iron (2320 µg/l), total aluminum (2070 µg/l), and total orthophosphate (0.569 mg/l) (Table A2). The high levels of metals appear to be from considerable erosion of soil in this watershed during high flows. The WQI values are higher during the higher flow periods.

Scott Creek (SCTT 3.0)

Scott Creek at Delta, Pa., (SCTT 3.0) was rated severely impaired in July 2002, as it has been for numerous years. This site consistently had the worst macroinvertebrate metric scores of all the Maryland-Pennsylvania sites. There were no mayflies or stoneflies found at this site, and it was heavily dominated by Chironomidae. No parameters exceeded state standards in fiscal year 2003; however, conductivity, total and dissolved solids, total chloride, total organic carbon, total sulfate, and dissolved aluminum exceeded the 90th percentile. SCTT 3.0 had the highest dissolved aluminum value (209 µg/l) of all interstate streams in November 2002 (Table A2). WQI scores appear to be decreasing, indicating potential for improvement (Table 41). The habitat was rated partially supporting, and the stream was stagnant in places due to the low flow. Human and construction refuse was noted in the stream.

South Branch Conewago Creek (SBCC 20.4)

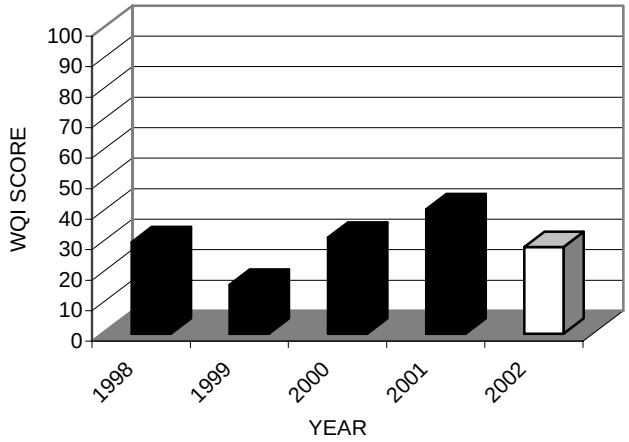
South Branch Conewago Creek near Bandanna, Pa., (SBCC 20.4) contained a slightly impaired biological community for the sixth consecutive year. No water quality standards were exceeded, and no parameters exceeded the 90th percentile (Table 42). The habitat was rated supporting with low scores for epifaunal substrate, velocity/depth regimes, and channel flow status. The stream was very shallow during July 2002, making it difficult to sample. Before this stream was slightly impaired, it had served as the Pennsylvania-Maryland reference site for several years. Logging activities occur upstream in the watershed; however, it has not been determined whether this is the source of impairment.

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

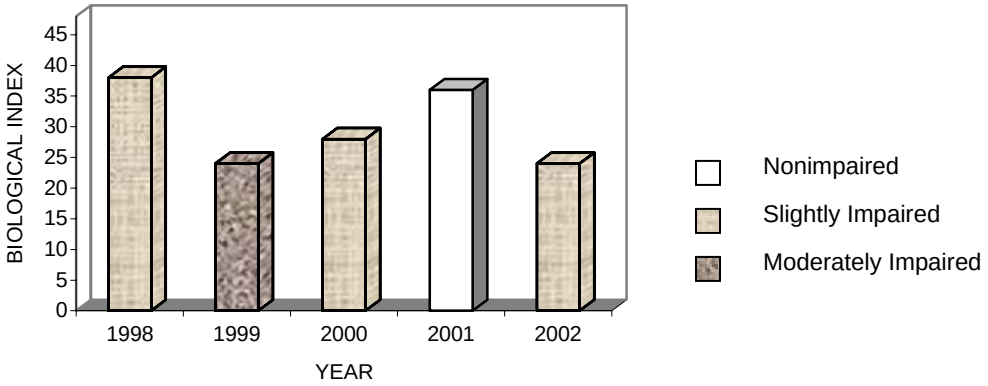
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/02	28.4	None							

Biological and Habitat Summary	
Number of Taxa	30
Diversity Index	2.7
RBP Score	24
RBP Condition	Slightly Impaired
Total Habitat Score	164
Habitat Condition Category	Excellent



Water Quality Index



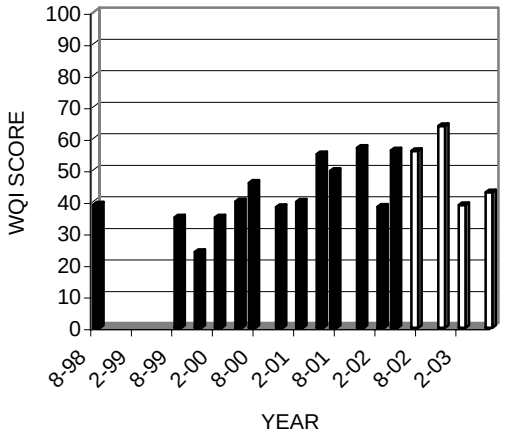
Biological Index

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

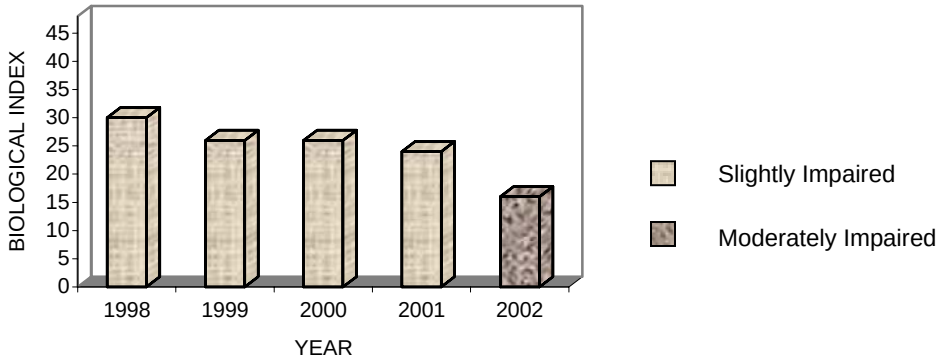
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/30/02	56.0	TFe	TMn	DMn	TAl	TURB			
11/18/02	63.9	DO	TNO2	TFe	TAl	TURB			
02/27/03	38.8	DO	TNO3	DNO3					
06/02/03	42.9	DO							

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.1
RBP III Score	16
RBP III Condition	Moderately Impaired
Total Habitat Score	76
Habitat Condition Category	Nonsupporting



Water Quality Index



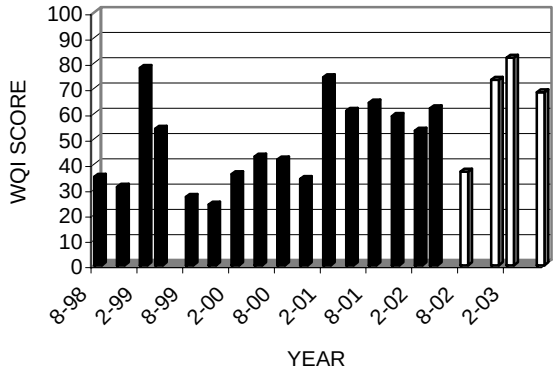
Biological Index

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

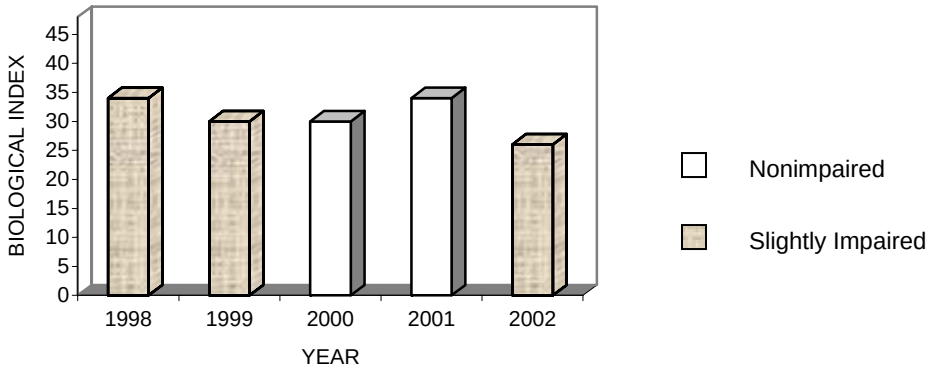
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/02	37.0	TOC	DFe						
12/18/02	73.4	TNH3	DNH3	TNO2	DNO2	TP	DP	TPO4	DPO4
02/26/03	82.1	DO	TNH3	DNH3	TNO2	DNO2	TP	DP	TOC
		TPO4	DPO4	TFe	DFe	TMn	DMn	TAl	TURB
06/03/03	68.4	TNH3	DNH3	TNO2	DNO2	TP	TOC	TPO4	

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.5
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	181
Habitat Condition Category	Excellent



Water Quality Index



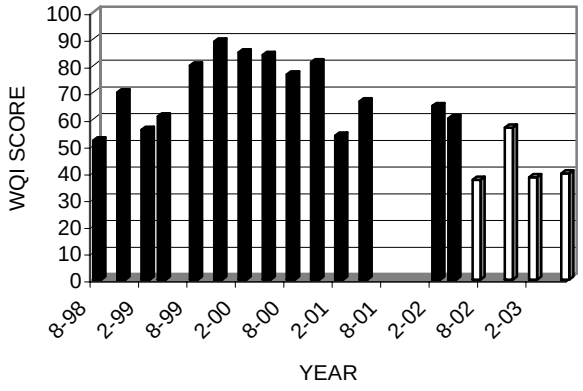
Biological Index

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

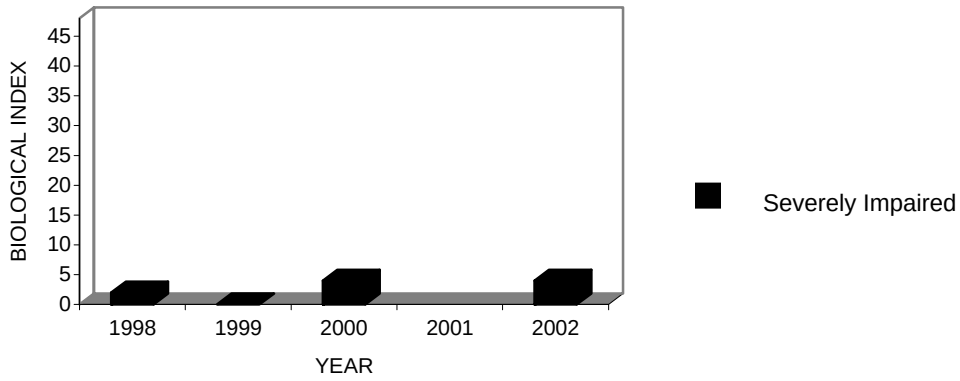
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile								
07/31/02	37.3	COND	TS	DS	TCl					
11/18/02	56.8	DO	COND	TS	DS	TOC	TSO4	DAl		
02/27/03	38.3	DO	COND	TS	DS	TCl	TSO4			
06/02/03	39.7	COND	TCl	TSO4						

Biological and Habitat Summary	
Number of Taxa	10
Diversity Index	1.3
RBP III Score	4
RBP III Condition	Severely Impaired
Total Habitat Score	118
Habitat Condition Category	Partially Supporting



Water Quality Index



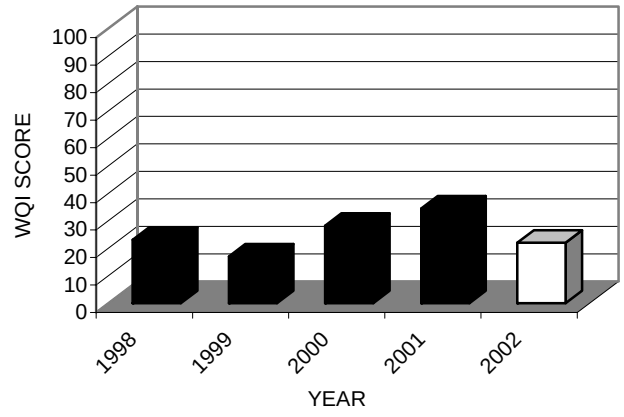
Biological Index

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

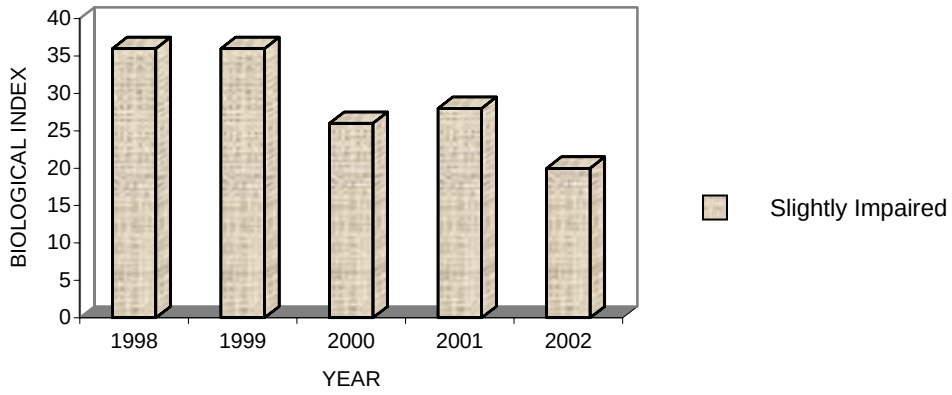
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/30/02	22.0	None							

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.0
RBP III Score	20
RBP III Condition	Slightly Impaired
Total Habitat Score	151
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

River Sites

Chemung River (CHEM 12.0)

A slightly impaired biological community existed in the Chemung River at Chemung, N.Y., (CHEM 12.0). During the past five years, this site has fluctuated between slightly impaired and nonimpaired. This site had the highest percentage Ephemeroptera (26.3 percent) of all the river sites. Total iron slightly exceeded the New York water quality standard during March 2003. Numerous parameters exceeded the 90th percentile including conductivity, total and dissolved nitrites, total and dissolved phosphorus, total and dissolved orthophosphate, total chloride, dissolved oxygen, total and dissolved nitrogen, total and dissolved nitrates, total and dissolved solids, and dissolved ammonia (Table 43). Habitat was rated excellent.

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 11 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 from the dam depressed oxygen levels in the Cowanesque River downstream of the outflow. COWN 2.2 had the worst performance on all macroinvertebrate metrics compared to other river sites. During August 2002, the site was dominated by Chironomidae (Diptera) and *Cheumatopsyche* (Trichoptera: Hydropsychidae), and the rest of the sample mostly consisted of other taxa tolerant of low dissolved oxygen conditions such as *Hemerodromia* (Diptera: Empididae), *Caecidotea* (Isopoda: Asellidae), *Gammarus* (Amphipoda: Gammaridae), *Gordius* (Nematomorpha: Gordidae), *Simulium* (Diptera: Simuliidae), and *Ceratopsyche* (Trichoptera: Hydropsychidae). However, the presence of Stenonema, which is organic pollution intolerant, was noted at this site. The diversity also appears to be slightly improved in 2002, and the number of taxa increased from five to 15.

Only two parameters exceeded state water quality standards in fiscal year 2003. Dissolved oxygen did not exceed the water quality standard as in the previous year; however it did exceed the 90th percentile and it was the lowest value (4.45 mg/l) in August 2002 of all the interstate streams (Table 44). COWN 2.2 also had the highest total manganese value (490 µg/l) in November 2002 of all the interstate sites (Table A1). Other parameters that were elevated at COWN 2.2 were total and dissolved nitrites, total and dissolved nitrogen, dissolved manganese, turbidity, dissolved ammonia, total organic carbon, total iron, total aluminum, and dissolved nitrate. Habitat conditions were nonsupporting with low scores in many categories (Table 17).

Cowanesque River (COWN 1.0)

A site was added on the Cowanesque River near the mouth of the stream (COWN 1.0) during the 1999-2000 sampling season to determine the extent of impairment in the river. The biological community at COWN 1.0 remains moderately impaired in August 2002 after declining from slightly impaired in 1999 and 2000. The macroinvertebrate population improved slightly at COWN 1.0 compared to COWN 2.2. Organic pollution intolerant taxa found at COWN 1.0 were *Stenonema* and *Serratella*. Habitat conditions were considered excellent.

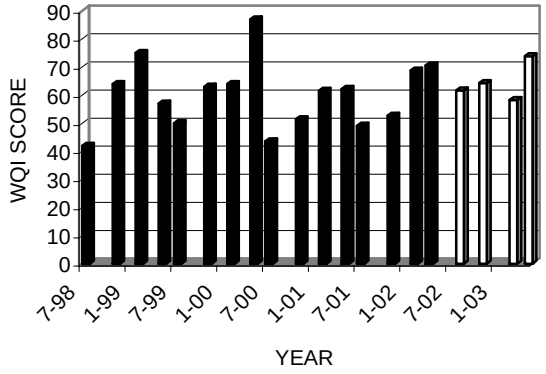
Total iron and total aluminum exceeded the New York water quality standards in November and March. Parameters that exceeded the 90th percentile were total organic carbon, total and dissolved nitrite, total and dissolved nitrogen, dissolved oxygen, total iron, and total sulfate (Table 45). The Cowanesque Reservoir and a wastewater treatment plant discharge are located upstream of COWN 1.0.

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

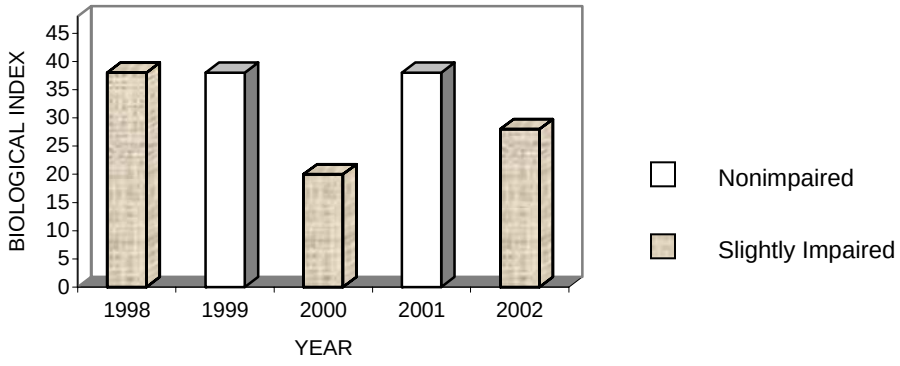
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	03/04/03	302 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/07/02	61.7	COND	TNO2	DNO2	TP	DP	TPO4	DPO4	TCl
11/13/02	64.3	DO	COND	TN	DN	TNO3	DNO3	TP	DP
		TCl	TPO4	DPO4					
03/04/03	58.3	COND	TS	DS	TN	DN	TCl		
05/28/03	73.9	DO	COND	TS	DS	TN	DN	DNH3	TNO2
		DNO3	TCl	TPO4					

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.4
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	170
Habitat Condition Category	Excellent



Water Quality Index



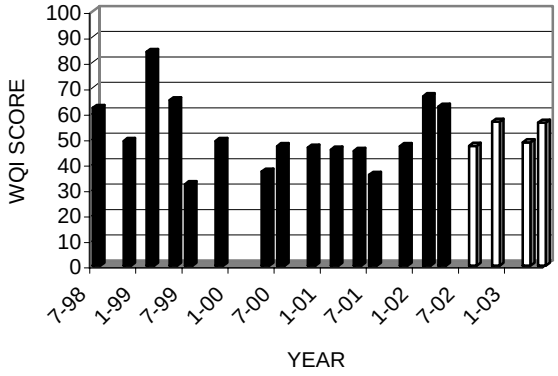
Biological Index

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

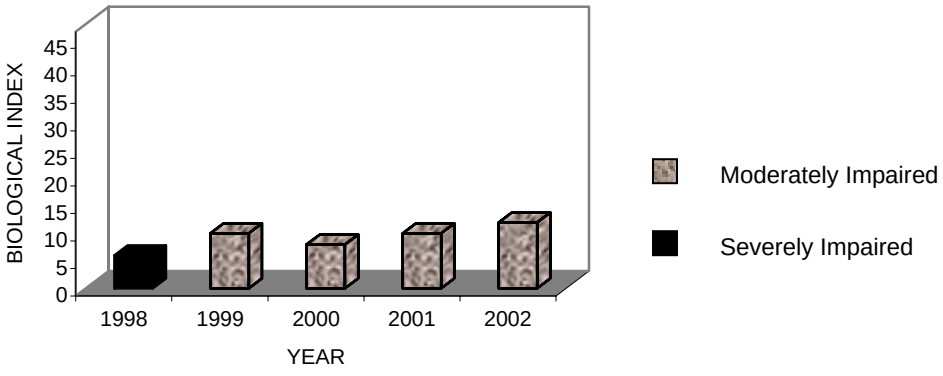
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	11/14/02	584 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	11/14/02	301 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/08/02	47.1	DO	TNO2	DNO2	TMn	DMn	TURB		
11/14/02	56.6	DNH3	TOC	TFe	TMn	DMn	TAl	TURB	
03/04/03	48.5	DO	TN	DN	TOC				
05/29/03	56.2	DNO3	TOC						

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	1.9
RBP Score	12
RBP Condition	Moderately Impaired
Total Habitat Score	93
Habitat Condition Category	Nonsupporting



Water Quality Index



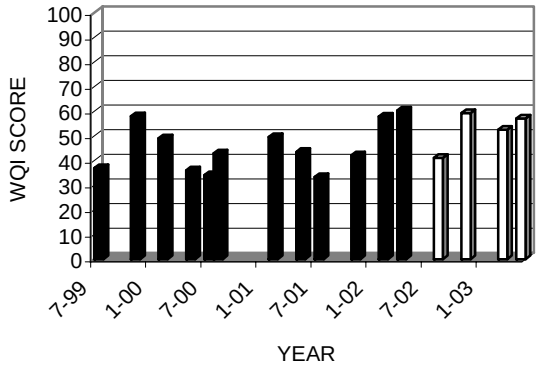
Biological Index

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

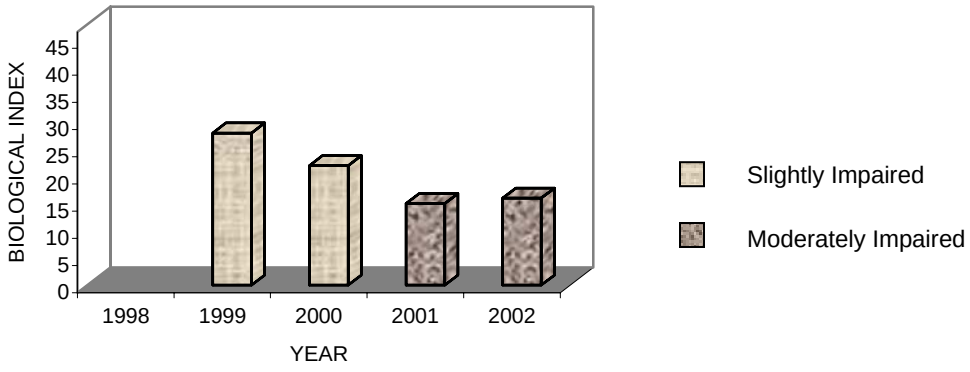
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	11/13/02	341 µg/l	300 µg/l	N.Y. aquatic (chronic)
TFe	03/04/03	611 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAl	11/13/02	205 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/07/02	41.1	TNO2	DNO2						
11/13/02	59.3	TN	DN	TNO2	DNO2	TOC			
03/04/03	52.5	DO	TN	TOC	TFe				
05/29/03	57.1	TN	DNO3	TOC	TSO4				

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	1.9
RBP Score	16
RBP Condition	Moderately Impaired
Total Habitat Score	152
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

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 for the second year in a row. SUSQ 365.0 had the highest number of taxa (29), highest Shannon Diversity Index (2.6), and highest EPT Index (20). Pollution intolerant taxa at this site were *Promoresia, Heterocloeon, Serratella, Leucrocuta, Rhithrogena* (Ephemeroptera: Heptageniidae), *Stenonema, Isonychia, Ephoron* (Ephemeroptera: Polymitarcyidae), *Acroneuria, Agnetina, Glossosoma,* and *Psychomyia* (Trichoptera: Psychomyiidae). Total iron and pH slightly exceeded New York aquatic standards. Dissolved oxygen was depressed, while dissolved nitrate, total organic carbon, total and dissolved ammonia, and dissolved nitrogen were elevated (Table 46) at this site. The habitat was excellent with good riparian vegetative zone and forested land cover.

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

Susquehanna River at Kirkwood, N.Y., (SUSQ 340.0) returned to a nonimpaired biological condition after being slightly impaired in 2001. The number of taxa and diversity index increased, respectively, from 12 and 1.9 in July 2001 to 22 and 2.2 in August 2002 (Table 47). The Hilsehoff Index value at SUSQ 340.0 was the lowest of all the river sites, indicating numerous organic pollution intolerant taxa, such as *Serratella, Stenonema, Isonychia, Agnetina, Micrasema* (Trichoptera: Brachycentridae), *Protoptila* (Trichoptera: Glossosomatidae), and *Macrostemum*. The habitat condition was rated excellent, although riparian vegetative zone width could be improved. Dissolved solids were very high in November and exceeded both Pennsylvania and New York water quality standards. Additional water quality analysis indicated that only dissolved oxygen exceeded the 90th percentile, in March and May (Table 47).

Susquehanna River at Sayre, Pa. (SUSQ 289.1)

The Susquehanna River at Sayre, Pa., (SUSQ 289.1) had a slightly impaired biological community after being nonimpaired for four consecutive years. The habitat was still rated excellent with good vegetative protective cover. Total aluminum exceeded the New York standards in May, and the total chloride value in August (96.6 mg/l) was the highest of all interstate streams (Table A1). Other parameters that were elevated compared to other Group 1 and 2 New York-Pennsylvania streams were nutrients such as total and dissolved nitrite, total and dissolved nitrogen, and total and dissolved nitrate. Dissolved oxygen also exceeded the 90th percentile in November (Table 48).

Susquehanna River at Marietta, Pa. (SUSQ 44.5)

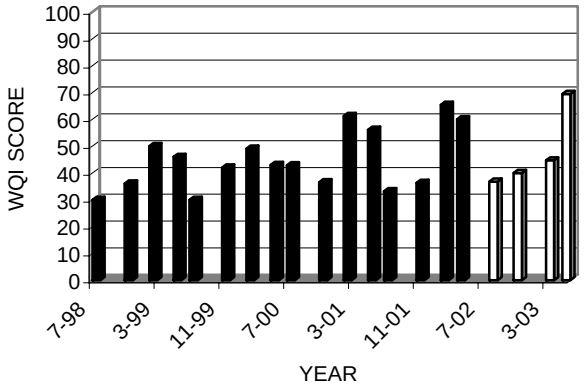
The Susquehanna River at Marietta, Pa., (SUSQ 44.5) had a slightly impaired biological community in August 2002. This site had the best score for percent Chironomidae (0.97 percent) metrics of all the Pennsylvania-Maryland streams. No parameters exceeded Pennsylvania or Maryland water quality standards; however, total iron (2940 µg/l) and total aluminum (1490 µg/l) levels were high in June. Water quality analysis indicated that total sulfate, total orthophosphate, total organic carbon, total iron, total and dissolved manganese, total aluminum, dissolved oxygen, and turbidity exceeded the 90th percentile (Table 49). The highest values for turbidity (65.6 mg/l) and total sulfate (60.5 mg/l) of all interstate streams were from the SUSQ 44.5 samples during June and August, respectively.

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

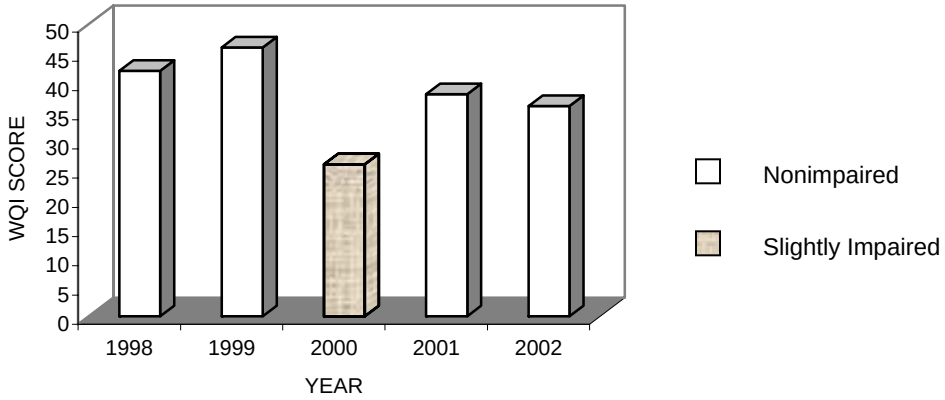
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	08/05/02	8.6	6.5-8.5	N.Y. general
TFe	05/27/03	340 µg/l	300 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/05/02	36.8	None							
11/12/02	40.0	DO							
03/03/03	44.7	TNH3							
05/27/03	69.4	DN	TNH3	DNH3	DNO3	TOC			

Biological and Habitat Summary	
Number of Taxa	29
Diversity Index	2.6
RBP Score	36
RBP Condition	Reference
Total Habitat Score	167
Habitat Condition Category	Reference



Water Quality Index



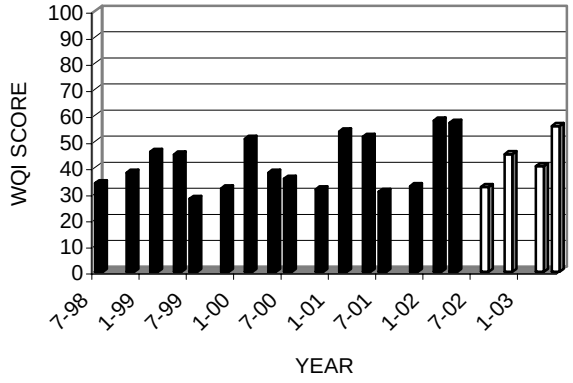
Biological Index

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

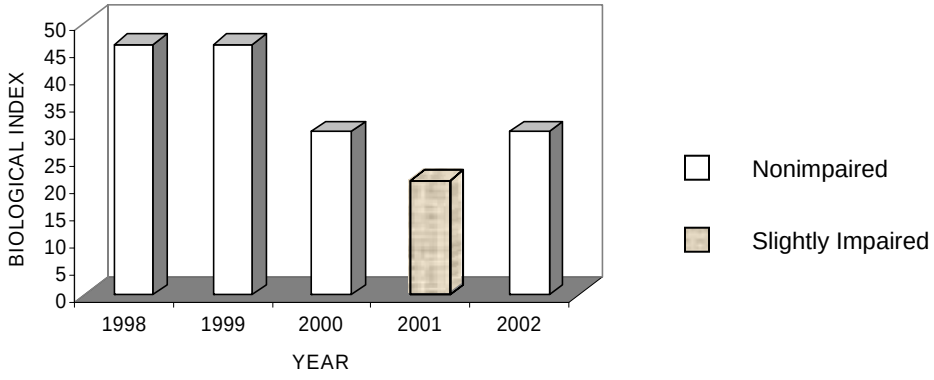
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DS	11/12/02	1274 mg/l	750 mg/l	Pa. public water supply
DS	11/12/02	1274 mg/l	500 mg/l	N.Y. general

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/05/02	32.5	None							
11/12/02	45.1	None							
03/03/03	40.5	DO							
05/27/03	55.9	DO							

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.2
RBP Score	30
RBP Condition	Nonimpaired
Total Habitat Score	164
Habitat Condition Category	Excellent



Water Quality Index



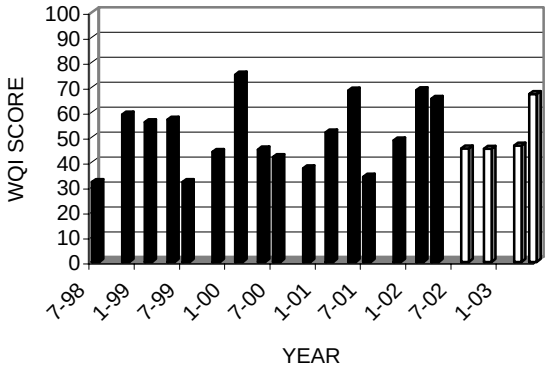
Biological Index

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

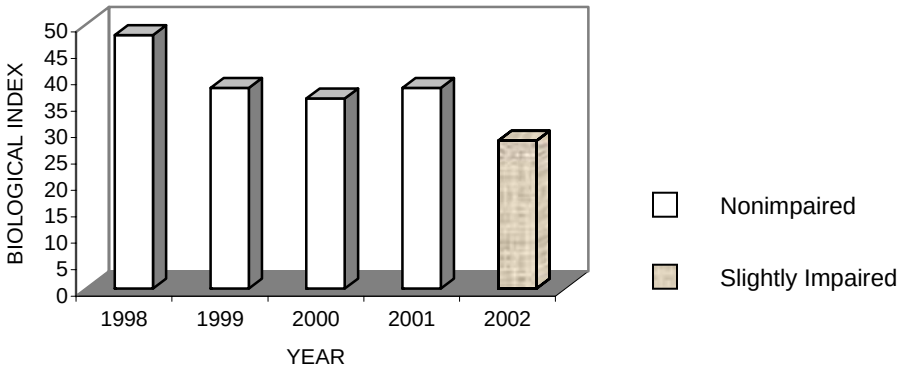
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TAl	05/28/03	212 µg/l	100 µg/l	N.Y. aquatic (chronic)

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
08/06/02	45.4	TNO2	TCl						
11/13/02	45.3	DO	TN						
03/03/03	46.6	None							
05/28/03	67.2	TN	DN	TNO2	DNO2	TNO3	DNO3		

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.5
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	168
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

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. Dissolved oxygen exceeded the Maryland aquatic life standard in July and exceeded the 90th percentile in July, November, and June. SUSQ 10.0 was not sampled in February due to the access area being closed. Other parameters that exceeded the 90th percentile were total sulfate, dissolved iron, and dissolved manganese (Table 50).

Tioga River (TIOG 10.8)

The Tioga River at Lindley, N.Y., (TIOG 10.8) had a slightly impaired biological community during August 2002, and habitat conditions were considered excellent. No parameters exceeded the state water quality standards in fiscal year 2003, although metals have been slightly elevated at this site previously. Parameters that exceeded the 90th percentile were dissolved oxygen, total and dissolved nitrites, dissolved ammonia, total and dissolved manganese, and total sulfate (Table 51). Total sulfate was elevated in all the samples, and the dissolved manganese value (328 µg/l) in March was the highest of all interstate streams (Table A1).

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

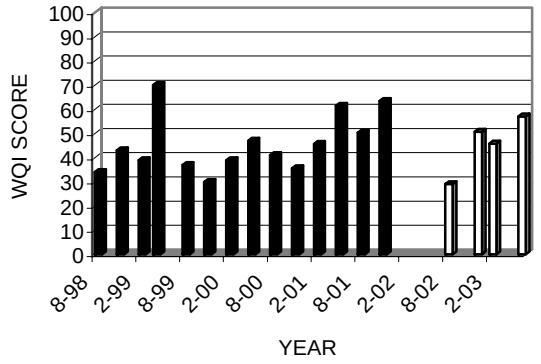
In 2001 and 2002, SRBC and Gannett Fleming, Inc. assessed the Pennsylvania portion of the Tioga River Watershed and developed a remediation strategy through the aid of a Pennsylvania Growing Greener Grant. SRBC produced a report identifying acid mine drainage problem areas and prioritizing sites for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

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

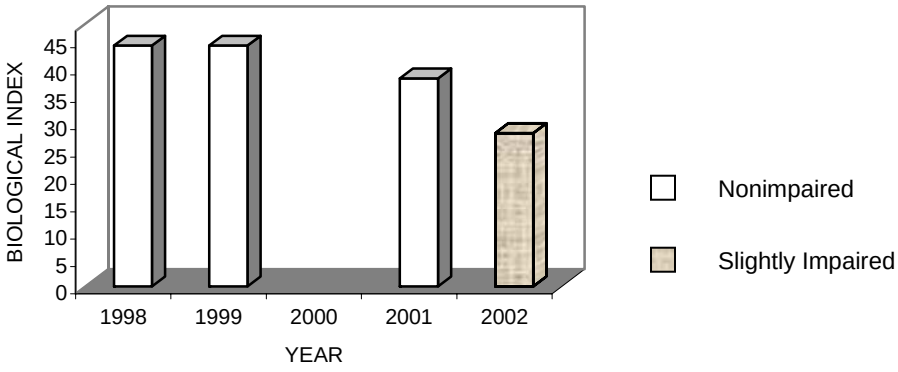
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/01/02	29.1	TSO4							
12/18/02	50.7	TFe	TMn	DMn					
02/27/03	45.8	DO							
06/03/03	57.1	DO	TOC	TFe	TMn	TAl	TPO4	TURB	

Biological and Habitat Summary	
Number of Taxa	17
Diversity Index	2.3
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	176
Habitat Condition Category	Excellent



Water Quality Index

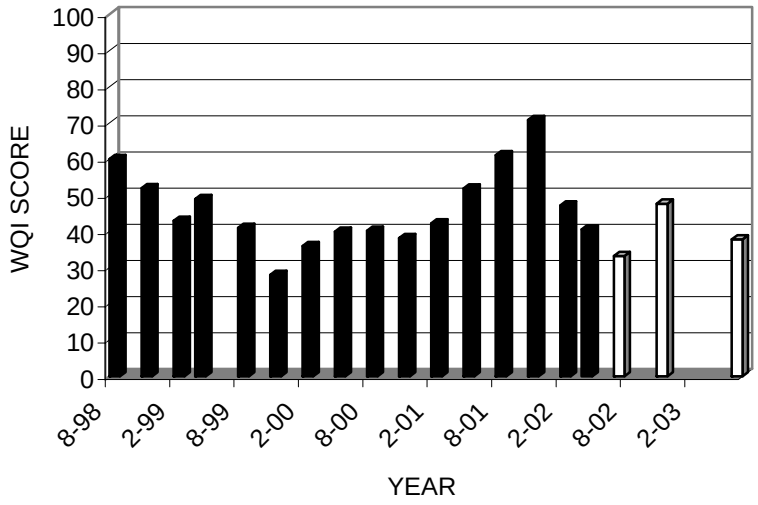


Biological Index

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

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DO	07/31/02	4.56 mg/l	5.0 mg/l	Md. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/31/02	33.2	DO							
11/18/02	47.7	DO	DFe						
06/02/03	37.8	DO	TSO4	DMn					



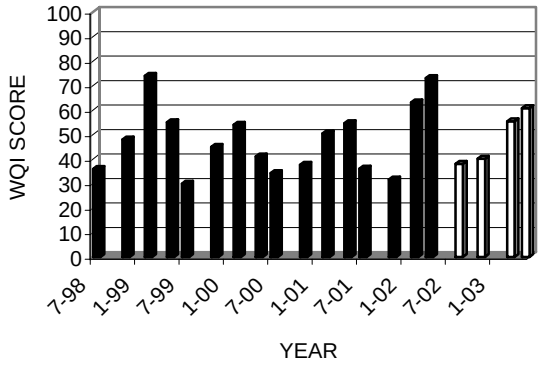
Water Quality Index

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

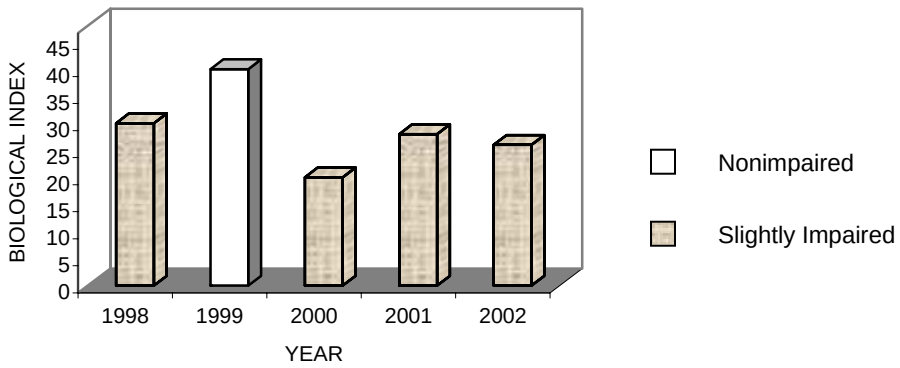
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/07/02	38.1	TNO2	DNO2	TSO4					
11/13/02	40.2	TSO4							
03/04/03	55.4	DO	DNH3	TSO4	TMn	DMn			
05/28/03	60.8	DO	TSO4	TMn	DMn				

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.4
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	154
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Group 3 Sites

Babcock Run (BABC)

During May 2003, the macroinvertebrate community of Babcock Run near Cadis, Pa., was designated slightly impaired. This site had the best percent dominant value (17.7 percent) of all Group 3 streams. Physical habitat conditions were mostly forested and designated excellent, and all field chemistry parameters were within acceptable limits.

Beagle Hollow Run (BEAG)

Nonimpaired biological conditions existed at Beagle Hollow Run near Osceola, Pa., during May 2003. The Hilsenhoff Biotic Index was low (1.59) indicating numerous organic pollution intolerant taxa consisting of *Prosimulium* (Diptera: Simuliidae), *Hexatoma, Limnophila* (Diptera: Tipulidae), *Ameletus* (Ephemeroptera: Ameletidae), *Ephemerella, Epeorus, Sweltsa, Leuctra, Amphinemura* (Plecoptera: Nemouridae), *Ostrocerca* (Plecoptera: Nemouridae), *Acroneuria, Isoperla* (Plecoptera: Perlodidae), *Yugus* (Plecoptera: Perlodidae), *Diplectrona, Wormaldia*, and *Rhyacophila*. SRBC staff also found an immature salamander in the sample, which was identified as a dusky salamander (Caudata: Plethodontidae) Desmognathus. Habitat conditions were considered excellent, and all field chemistry parameters were within natural ranges.

Bill Hess Creek (BILL)

Bill Hess Creek near Nelson, Pa., was designated slightly impaired. The sample taken at Bill Hess Creek scored well in percent Ephemeroptera (57.4 percent), and the sample was mostly dominated by *Acentrella* (Ephemeroptera: Baetidae) and *Paraleptophlebia*. The habitat was rated excellent, although a lot of algae were noted in the stream, and the rocks were slippery and white. All field chemistry parameters were within acceptable limits, although conductivity (339 µmhos/cm), alkalinity (120 mg/l), and pH (8.2) were the highest and acidity (1.0 mg/l) was the lowest 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 (52.3 percent) and was dominated by the organic pollution intolerant taxon *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)

Moderately impaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during this survey. The site was heavily dominated by the taxon *Amphinemura*. The impairment was most likely due to habitat conditions. 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 numerous beaver dams. Field chemistry parameters were within natural ranges.

Briggs Hollow Run (BRIG)

Briggs Hollow Run near Nichols, N.Y., was designated slightly impaired during the 2003 sampling season. It had a relatively high percent Ephemeroptera (51.9 percent) score, which was comprised mostly of organic pollution intolerant *Epeorus*. Pollution tolerant Chironomidae also comprised a relatively large percent (31.2 percent). The physical habitat was designated supporting with a lot of algae and a thin riparian vegetative zone width on the right bank. The dominant land use was agriculture with a horse pasture along the right bank of the stream. During sampling, residents were dumping concrete below the bridge by the stream, downstream of the sampling site. All field chemistry parameters were within acceptable limits.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, Pa., had a slightly impaired biological community and

supporting habitat conditions during the 2002-2003 sampling season. Low-flow conditions caused difficulty in collecting a macroinvertebrate sample and allowed excessive sediment deposition in the pools. Also, a beaver dam was noted upstream. 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 2003. This site had higher Shannon Diversity Index (2.52) and EPT Index (18) metric scores than most of the other Group 3 sites. The physical habitat of the stream was designated excellent, although a large amount of algae was noted on the rocks. All field chemistry parameters were normal. The conductivity value at Camp Brook of 288 µmhos/cm (micromhos per centimeter) was the second highest value of all Group 3 streams (Table A3).

Cook Hollow (COOK)

Cook Hollow near Austinburg, Pa., had a slightly impaired biological community. This site scored highest of all Group 3 streams in the taxonomic richness (34), Shannon Diversity Index (2.65), EPT Index (22) metrics. *Amphinemura* dominated the sample in May 2003. The streambed was embedded, and the flow was low, making it difficult to sample for macroinvertebrates. The habitat was rated 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 excellent physical habitat. This site had high taxonomic richness (30), high Shannon Diversity Index value (2.51), and good percent dominant taxon (19.8 percent). A lot of algae were noted in the stream, and a beaver dam was located upstream of the sampling site on Deep Hollow Brook. Alkalinity (8.0 mg/l) was the lowest value of all Group 3 streams and exceeded the Pennsylvania aquatic life standard. This site had low alkalinity in previous years, also. The pH value (6.25) also exceeded the New York general water quality standard.

Denton Creek (DENT)

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community during May 2003. DENT was dominated by pollution tolerant Chironomidae. The habitat was rated excellent with high scores for frequency of riffles and instream cover; however, this sampling site was located downstream of Hawkins Lake. The lake is not heavily used since swimming, boating, and camping are not allowed, but it still impacts water quality on Denton Creek. DENT had the highest temperature (14.3 C (degrees Celsius)), lowest pH (6.1) and lowest alkalinity (8.0) of all the Group 3 sites (Table A3). These pH and alkalinity values exceeded the New York and Pennsylvania water quality standards, respectively.

Dry Brook (DRYB)

Dry Brook at Waverly, N.Y., was designated severely impaired in May 2003 by SRBC staff with the lowest Shannon Diversity Index (0.47) and the lowest percent Chironomidae and percent dominant taxon scores. DRYB had biological scores of zero for every metric except taxonomic richness and percent Ephemeroptera. This stream runs directly through residential and commercial areas in the town of Waverly and has partially supporting habitat conditions due to channel alteration and lack of vegetated riparian zone. The sediment was black, and a presence of oil on the water was noted at the time of sampling. All field chemistry parameters were within acceptable limits.

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, N.Y., was designated slightly impaired in May 2003. This site was rated nonimpaired the previous year and moderately impaired prior to that, indicating this stream quality fluctuates. The high-cut banks with areas of erosion indicate large fluctuations in flow. The land cover is mostly forested, with some agriculture in the headwaters. The habitat

was rated excellent with good stream cover. In 2001, dredging equipment was found in the stream, and timber was being removed from the streambanks. In 2002 and 2003, no evidence of dredging or timber removal was noted. All field chemistry parameters were normal.

Parks Creek (PARK)

The location of the site for Parks Creek near Litchfield, N.Y., was moved upstream slightly due to logging at the previous sampling site. PARK had a slightly impaired biological community during the 2003 sampling season. This site had good taxonomic richness (26), Hilsenhoff Biotic Index (1.65), EPT Index (19), and percent Ephemeroptera (40.9 percent). A number of organic pollution intolerant taxa existed at the Parks Creek sampling site, including *Prosimulium, Hexatoma, Ameletus, Ephemerella, Cinygmula* (Ephemeroptera: Heptageniidae), *Epeorus, Stenonema, Haploperla, Sweltsa, Leuctra, Amphinemura, Ostrocerca, Acroneuria, Isoperla, Diplectrona, Lepidostoma* (Trichoptera: Lepidostomatidae), and *Neophylax*. The site had excellent habitat, although some sediment deposition and disturbance to the streambanks were noted. The land cover was forest, and there was considerable woody debris. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)

Prince Hollow Run near Cadis, Pa., greatly improved from severely impaired to slightly impaired from May 2002 to 2003. In 2003, PRIN had the highest percentage of Ephemeroptera (69 percent), including: *Ameletus, Acentrella; Baetis* (Ephemeroptera: Baetidae); *Cinygmula; Epeorus; Stenonema*; and *Paraleptophlebia*. The habitat also improved from partially supporting to supporting in 2003. In 2002, there was evidence of dredging, which was not noted in 2003. Habitat condition problems such as eroded streambanks, scarce riffle habitat, lack of vegetative protective cover, and lack of vegetative riparian zone still existed in sections. Alkalinity was low (18 mg/l) and exceeded the Pennsylvania aquatic life standard (Table A3).

Russell Run (RUSS)

Russell Run near Windham, Pa., appears to be recovering from stream channelization and timbering activities performed close to the stream in 2001. SRBC staff designated the biological community of Russell Run moderately impaired in 2001, slightly impaired in 2002, and nonimpaired in 2003. The nonimpaired community in 2003 consisted of numerous organic pollution intolerant taxa such as *Prosimulium, Hexatoma, Ameletus, Cinygmula, Epeorus, Paraleptophlebia, Haploperla, Sweltsa, Leuctra, Amphinemura, Acroneuria, Clioperla* (Plecoptera: Perlodidae), and *Isoperla*. The habitat also has improved from nonsupporting to excellent, although eroded banks are still evident. 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 supporting. SACK had good metric scores for EPT Index (17) and percent Ephemeroptera (43.8 percent). Ephemeropteran taxa present at this site included *Acentrella, Baetis* (Ephemeroptera: Baetidae), *Diphetor* (Ephemeroptera: Baetidae), *Ephemerella, Cinygmula, Epeorus, Leucrocuta,* and *Paraleptophlebia*. The most abundant taxon at this site was the organic pollution intolerant *Epeorus*. This stream has been dredged previously, and severe erosion and bank failure were noted. All field chemistry parameters were within normal ranges.

Smith Creek (SMIT)

The biological conditions at Smith Creek near East Lawrence, Pa., were designated slightly impaired. This site had a low percent Ephemeroptera metric score (4.9 percent); however, the dominant taxon was the pollution intolerant stonefly *Amphinemura*. This small stream drains a wetland area and mixed forest, and the habitat was rated supporting. The water level was low at the time of sampling, and the stream was impacted by sediment deposition. There were no extreme values in the field chemistry parameters.

Strait Creek (STRA)

A slightly impaired biological community existed at Strait Creek near Nelson, Pa., after being nonimpaired in fiscal year 2001 and moderately impaired in fiscal year 2002. Also, the most abundant taxon changed from *Paraleptophlebia*, to *Psephenus*, to *Amphinemura*. This heavy dominance of *Amphinemura* also resulted in a low percent dominant taxon metric score. Large amounts of algae were noted in the stream, and the rocks were very slippery. The physical habitat was designated excellent, despite evidence of past channelization. All field chemistry parameters were within normal limits, although dissolved oxygen (7.82 mg/l) was the lowest value of all Group 3 streams (Table A3).

White Branch Cowanesque River (WBCO)

White Branch Cowanesque River near North Fork, Pa., continues to degrade in biological quality. In May 2003, this site was designated severely impaired with the worst metric scores in taxonomic richness (7), Hilsenhoff Biotic Index (6.0), EPT Index (2), and percent Ephemeroptera (0 percent). This site had been nonimpaired in May 2000 with a number of pollution intolerant taxa, and then it degraded to moderately impaired during May 2001 and May 2002. The sample was dominated by the pollution tolerant taxa Chironomidae, comprising 79.7 percent of the sample. The habitat was partially supporting due to low scores in sediment deposition, embeddedness, and riparian vegetative zone width. Cows had direct access to the stream in a pasture upstream of the sampling site. Field chemistry measurements were within acceptable ranges.

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated as the reference site for Group 3 streams in fiscal year 2003 due to the best combination of biological, water quality, and habitat data. This site had the best Hilsenhoff Biotic Index (1.1) and percent Chironomidae (3.2 percent). Macroinvertebrate taxa with a low Hilsenhoff tolerance value included *Prosimulium*, *Hexatoma*, *Ameletus*, *Ephemerella*, *Epeorus*, *Suwallia*, *Sweltsa*, *Leuctra*, *Amphinemura*, *Ostrocerca*, *Isoperla*, *Yugus*, *Diplectrona*, *Wormaldia*, and *Neophylax*. The physical habitat was excellent with good stream cover and ample woody debris 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 13 sites in this reference category have shown and continue to show a large degree of variability in water quality; however, they do not vary much in biological or habitat condition. The biological conditions overall are nonimpaired or only slightly impaired and habitat degradation at numerous sites continues to be due to dredging in the stream and the unstable nature of these glacial streams. Fiscal year 2003 sampling was conducted during drought conditions for part of the year, and channel flow conditions were very low during that time. These low flows may have

contributed to higher concentrations of water chemistry parameters and less streambank erosion. There was no significant correlation between RBP III score and WQI score, and no significant correlation between RBP III score and habitat; however, the RBP III scores were not normally distributed.

Pennsylvania – Maryland Sites

There were no significant correlations between RBP III score and water chemistry, RBP III score and habitat, and habitat and water chemistry between the nine Pennsylvania-Maryland border sites. Habitat conditions were not normally distributed. In fiscal years 2001 and 1999, there was a significant ($p<0.05$) negative correlation between biological score and WQI, and in fiscal year 1999 there also was a significant negative correlation between 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 years 2001 and 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. Nutrient enrichment encourages excessive plant growth, which can depress dissolved oxygen levels during plant decomposition. Erosion also may contribute metals that were present in the soil to the stream water.

River Sites

For the eight river sites, there was a positive significant correlation between RBP III scores and habitat; however, habitat scores were not normally distributed. There were no other significant correlations in these data sets. In fiscal years 2000 and 2001, there was a significant positive correlation between physical habitat and RBP III scores, indicating that better physical habitats supported better macroinvertebrate communities. 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 ($p<0.05$) positive correlation between physical habitat and biological community for the Group 3 sites; however, the populations were not normally distributed. 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 or exceeded water quality standards. DRYB, WBCO, and SCTT 3.0 were the only sites to have severely impaired macroinvertebrate communities. Moderately impaired biological conditions were found at Biscuit Hollow, Denton Creek, Long Arm Creek, and Cowanesque River (COWN 1.0 and COWN 2.2). Additional study of stream water chemistry, biology, and habitat at varying flows may help explain some impairment problems.

Those streams that exceeded water quality standards, Apalachin Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, Troups Creek, Conowingo Creek, Deer Creek, Ebaughs Creek, Chemung River, Cowanesque River, and the Susquehanna River (10.0, 289.1, 340.0, 365.0), 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

Seventeen (33.3 percent) of the 51 interstate macroinvertebrate sampling sites contained nonimpaired biological communities. Biological conditions at another 26 sites (51 percent) were slightly impaired, while five sites (9.8 percent) were moderately impaired. Three sites (5.9 percent), Dry Brook, White Branch Cowanesque River, and Scott Creek were designated severely impaired. Two sites (SUSQ 10.0 and CASC 1.6) were not sampled using RBP III techniques and, thus, were not averaged into the final scores. Thirty-three sites (64.7 percent) had excellent habitats. Eleven sites (21.6 percent) had supporting habitats, and five sites (9.8 percent) had partially supporting habitats. Two sites (3.9 percent) had nonsupporting habitat ratings.

Overall, interstate streams seemed to achieve their designated uses, and only 41 observations (3.5 percent) of water chemistry parameters exceeded state standards. Total iron exceeded standards most frequently with 12 violations (30 percent). Total and dissolved iron appears to be naturally high in some of these watersheds. Tioga River is the only stream that has documented abandoned mine discharge indicated by high metals and high acidity. Elevated aluminum and depressed alkalinity may be due to acid precipitation especially in the New York-Pennsylvania border streams. Total dissolved solids, nitrate plus nitrite, and dissolved oxygen are all indicators of organic pollution.

Of the New York-Pennsylvania border streams, the biological community of 10 (76.9 percent) of these streams was nonimpaired, and three sites (23.1 percent) were slightly impaired. Eight sites had excellent habitats (61.5 percent), four sites (30.8 percent) had supporting habitat, and one site (7.8 percent) had partially supporting habitat. 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, total dissolved solids, total chlorine, pH, and alkalinity. Iron standards were exceeded at Apalachin Creek, Cascade Creek, Little Snake Creek, and Troups Creek. Aluminum standards were exceeded at Cayuta and Troups Creeks. Dissolved oxygen standards were exceeded at Apalachin Creek. Total dissolved solids were exceeded at Cascade Creek, total chlorine was exceeded at Cayuta Creek, pH was exceeded at Troups Creek, and Cascade Creek and Little Snake Creek exceeded alkalinity standards. In fiscal year 2003, improved biological conditions were seen at many of the New York-Pennsylvania streams in particular, Bentley Creek, Cayuta Creek, Choconut Creek, Seeley Creek, South Creek, Trowbridge Creek, Troups Creek, and Wappasening Creek. Higher numbers of taxa were observed at many sites, which may be due to the increase to 200-count subsamples. Sediment deposition also was noted at numerous streams, which was due to reductions in flow. Cascade Creek, Holden Creek, and North Fork Cowanesque River are often dry during the July and August sampling of Group 1 and 2 streams, so it is recommended that they be sampled with the Group 3 streams in May.

Nonimpaired biological conditions existed at two (22.2 percent) of the nine Pennsylvania-Maryland interstate streams. Five sites (55.5 percent) were slightly impaired, and one (11.1 percent) each were moderately and severely impaired. Six (66.7 percent) of the Pennsylvania-Maryland border sites had excellent habitats, and one each (11.1 percent) had supporting, partially supporting and nonsupporting habitats. Biological conditions at Pennsylvania-Maryland sites appeared to be remaining the same or decreasing slightly during fiscal year 2003. The only sites that exceeded Pennsylvania and Maryland water quality standards were CNWG 4.4 for dissolved solids and nitrite plus nitrate, EBAU 1.5 for total chlorine, and DEER 44.2 for alkalinity. Only total chlorine exceeded Maryland standards for this group of streams; however, Maryland does not have standards for metals as New York does, and New York, Pennsylvania, and Maryland have yet to develop aquatic life standards for organics and nutrients. 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 eight 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 two sites (25 percent) were nonimpaired, four sites (50 percent) were slightly impaired, and two sites (25 percent) were moderately impaired. Seven of the sites (87.5 percent) had excellent habitats, and one site (12.5 percent) had nonsupporting habitat. Water quality parameters that exceeded state standards were pH, dissolved oxygen, dissolved solids, total iron, and total aluminum. Standards were exceeded at CHEM 12.0, COWN 2.2, COWN 1.0, SUSQ 10.0, SUSQ 365.0, SUSQ 340.0, and SUSQ 289.1. The river sites remained relatively the same in biological condition from previous years, except for COWN 2.2, which appeared to improve with the presence of the organic pollution intolerant taxon *Stenonema* and an increased number of taxa. Water quality also appeared to improve with fewer exceedances of state water quality standards. Water quality at TIOG 10.8 also appeared to improve.

Of the 21 Group 3 sites, three stations (14.3 percent) were considered nonimpaired. Fourteen sites (66.7 percent) had slightly impaired biological communities, and two stations each (9.5 percent) had moderately impaired and severely impaired conditions. Twelve (57.1 percent) of the 21 stations sampled had excellent habitat conditions, six (28.6 percent) had supporting habitats, and three sites (14.3 percent) had partially supporting habitats. Most of the Group 3 streams remained relatively the same as previous years; however, PRIN improved greatly from severely impaired to slightly impaired. Biological conditions at RUSS, SMIT, and STRA also appeared to improve slightly, while WBCO continued to degrade.

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

REFERENCES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX A

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

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

Parameter	Units	APAL 6.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	CASC 1.6	CASC 1.6	CASC 1.6
Date	yyyymmdd	20020806	20020807	20021113	20030304	20030528	20021112	20030303	20030527
Time	hhmm	1015	1045	1145	1005	1140	1140	1100	1245
Discharge	cfs	0.343	0.777	3.788	10.36	11.104	3.229	3.802	2.085
Temperature	degree C	21	19.5	8.5	0.2	13.2	9.1	0.1	15.4
Conductance	umhos/cm	127	292	193	154	146	56	51	54
Dissolved Oxygen	mg/l	4.75	7.78	7.45	9.07	9.23	7.09	8.79	7.69
pH		7.6	8.2	7.6	7.5	7.7	6.7	7	6.95
Alkalinity	mg/l	40	78	58	84	42	16	12	14
Acidity	mg/l	4	2	2	8	4	8	4	2
Solids, Total	mg/l	90	148	144	116	88	1450	62	34
Solids, Dissolved	mg/l	76	148	144	112	88	1449	56	34
Ammonia, Total	mg/l	0.04	<0.02	0.2	<0.02	<0.02	0.18	<0.02	<0.02
Ammonia, Dissolved	mg/l	0.04	<0.02	0.17	<0.02	<0.02	0.08	<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	<0.04	0.05	0.28	1.04	0.1	<0.04	0.21	<0.04
Nitrate, Dissolved	mg/l	<0.04	<0.04	0.27	1.05	0.1	<0.04	0.21	<0.04
Nitrogen, Total	mg/l	0.330	0.180	0.750	1.320	0.290	0.330	0.430	0.090
Nitrogen Dissolved	mg/l	0.310	0.150	0.730	1.240	0.330	0.400	0.410	0.200
Phosphorus, Total	mg/l	0.04	<0.01	<0.01	<0.01	0.016	<0.01	0.014	0.015
Phosphorus, Dissolved	mg/l	0.029	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	0.013
Orthophosphate, Total	mg/l	0.016	0.012	<0.01	0.012	0.014	<0.01	0.013	0.014
Orthophosphate, Dissolved	mg/l	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Organic Carbon, Total	mg/l	3	2	2.7	2.3	2.7	2	1.5	2.8
Calcium	mg/l	11.9	33.7	23.2	16.7	17.5	5.65	4.21	5.31
Magnesium	mg/l	3.4	6.23	4.64	3.48	3.22	1.66	1.43	1.58
Chloride	mg/l	8.5	22.3	11.6	14.4	8.4	2	5.6	2
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	2.52	<1	<1	2.65	1.28	1.07	3.07	2.61
Iron, Total	µg/l	459	<20	24	136	26	239	319	415
Iron, Dissolved	µg/l	183	<20	<20	39	<20	118	111	240
Manganese, Total	µg/l	166	<10	<10	<10	<10	35	16	76
Manganese, Dissolved	µg/l	103	<10	<10	<10	<10	28	<10	58
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	20020807	20021113	20030304	20030528	20020807	20021113	20030304	20030528
Time	hhmm	825	930	730	905	930	1035	845	1010
Discharge	cfs	12.032	14.92	35.12	63.7	304	414	NA	NA
Temperature	degree C	18	8.7	0.3	13.5	22	9.2	0.2	15.6
Conductance	umhos/cm	545	357	254	188	494	465	333	275
Dissolved Oxygen	mg/l	6.34	7.41	8.98	9.38	5.1	6.16	9.01	8.22
pH		8.05	7.85	8.3	7.5	8.1	7.8	8.1	7.7
Alkalinity	mg/l	106	108	130	48	100	122	80	68
Acidity	mg/l	4	6	0	4	4	6	4	4
Solids, Total	mg/l	332	230	176	118	268	324	248	166
Solids, Dissolved	mg/l	328	230	168	114	260	322	242	160
Ammonia, Total	mg/l	<0.02	0.11	<0.02	<0.02	0.02	0.16	0.02	0.04
Ammonia, Dissolved	mg/l	<0.02	0.02	<0.02	<0.02	0.03	0.17	<0.02	0.04
Nitrite, Total	mg/l	0.01	<0.01	<0.01	0.01	0.02	0.01	<0.01	0.02
Nitrite, Dissolved	mg/l	0.02	<0.01	<0.01	0.01	0.02	0.01	0.01	0.01
Nitrate, Total	mg/l	1.17	0.75	0.83	0.3	0.48	0.7	1.14	0.41
Nitrate, Dissolved	mg/l	1.13	0.76	0.86	0.31	0.49	0.71	1.16	0.41
Nitrogen, Total	mg/l	1.370	1.210	1.390	0.600	0.840	1.290	1.490	0.830
Nitrogen Dissolved	mg/l	1.390	1.230	1.120	0.650	0.770	1.340	1.420	0.780
Phosphorus, Total	mg/l	0.04	0.04	0.062	0.044	0.07	0.075	0.031	0.039
Phosphorus, Dissolved	mg/l	0.033	0.027	0.056	0.02	0.055	0.064	0.024	0.013
Orthophosphate, Total	mg/l	0.032	0.031	0.047	0.025	0.061	0.059	0.021	0.026
Orthophosphate, Dissolved	mg/l	0.029	0.03	0.041	0.018	0.045	0.059	0.015	<0.01
Organic Carbon, Total	mg/l	3.1	1.9	2.3	3.1	3.8	3	2.7	3.5
Calcium	mg/l	47.7	41.3	25.6	19	50.2	50.2	33.3	28.2
Magnesium	mg/l	10.3	7.93	5	3.78	10.9	11.6	6.92	5.71
Chloride	mg/l	84.2	37.2	30.5	18.8	88.8	56.1	46	30.9
Sulfate	mg/l	31.7	23.4	28.8	<20	29.4	32.8	26.3	23.3
Turbidity	ntu	1.19	1.1	2.13	4.19	4.44	1.2	3.17	3.7
Iron, Total	µg/l	164	76	156	200	141	61	302	170
Iron, Dissolved	µg/l	45	39	55	72	20	39	47	41
Manganese, Total	µg/l	32	<10	13	15	53	10	57	38
Manganese, Dissolved	µg/l	19	<10	10	11	<10	<10	45	<10
Aluminum, Total	µg/l	1270	<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	20020806	20020807	20021113	20030304	20030529	20020808	20021114	20030304
Time	hhmm	910	1515	1505	1410	810	730	1030	1525
Discharge	cfs	0.933	27	22	NA	NA	NA	NA	NA
Temperature	degree C	20	26.4	8.8	3.9	16	21	9.3	3.7
Conductance	umhos/cm	129	191	209	249	164	190	203	210
Dissolved Oxygen	mg/l	5.41	7.9	7.12	8.09	9.05	4.45	7.27	8.39
pH		7.5	8.45	7.3	8	8.4	8.1	7.35	7.7
Alkalinity	mg/l	32	50	66	50	38	68	66	42
Acidity	mg/l	2	0	6	4	0	2	4	6
Solids, Total	mg/l	76	120	146	176	100	144	136	176
Solids, Dissolved	mg/l	74	118	146	172	100	138	126	164
Ammonia, Total	mg/l	0.16	0.02	0.12	<0.02	<0.02	0.03	0.26	0.02
Ammonia, Dissolved	mg/l	0.13	<0.02	0.12	<0.02	<0.02	0.04	0.2	<0.02
Nitrite, Total	mg/l	0.01	0.02	0.02	<0.01	<0.01	0.02	0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	0.02	0.02	<0.01	<0.01	0.02	0.01	<0.01
Nitrate, Total	mg/l	0.18	0.22	0.51	1.11	0.45	0.07	0.26	1.1
Nitrate, Dissolved	mg/l	0.16	0.22	0.51	1.12	0.44	0.08	0.26	1.12
Nitrogen, Total	mg/l	0.390	0.730	1.360	1.520	0.760	0.680	0.740	1.480
Nitrogen Dissolved	mg/l	0.380	0.660	1.360	1.380	0.730	0.590	0.880	1.450
Phosphorus, Total	mg/l	0.02	0.04	0.054	0.014	0.022	0.02	0.021	0.014
Phosphorus, Dissolved	mg/l	0.015	0.029	0.037	<0.01	0.01	0.015	<0.01	<0.01
Orthophosphate, Total	mg/l	0.016	0.03	0.048	0.013	0.016	0.019	0.026	0.013
Orthophosphate, Dissolved	mg/l	<0.01	0.023	0.032	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	2	5.8	4.2	3.3	3.8	5.1	4.6	3.5
Calcium	mg/l	10.5	21.4	23.1	26	16.8	21.1	22.9	26.4
Magnesium	mg/l	3.07	4.14	4.76	5.24	3.36	4.42	4.76	5.19
Chloride	mg/l	12.4	11.5	13.9	27.8	12.9	10.2	13.9	27.1
Sulfate	mg/l	<20	<20	<20	24.2	26.5	<20	<20	23.8
Turbidity	ntu	2.99	2.5	7.07	2.71	4.19	5.04	10.2	2.63
Iron, Total	µg/l	293	153	341	611	81	147	584	128
Iron, Dissolved	µg/l	133	36	45	32	<20	68	45	25
Manganese, Total	µg/l	65	73	123	82	36	319	490	79
Manganese, Dissolved	µg/l	47	36	67	56	13	226	268	59
Aluminum, Total	µg/l	<200	<200	205	<200	<200	<200	301	<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	COWN2.2	HLDN3.5	LSNK 7.6	LSNK 7.6	LSNK 7.6	NFCR7.6	SEEL10.3	SEEL10.3
Date	yyyymmdd	20030529	20020808	20020806	20021112	20030527	20020808	20020807	20021113
Time	hhmm	930	900	745	1350	1455	1145	1300	1315
Discharge	cfs	NA	NA	0.332	3.166	3.207	0.271	2.355	5.476
Temperature	degree C	15.6	14.8	19	8.8	15.5	16.3	19.3	9.6
Conductance	umhos/cm	160	348	317	152	109	204	327	329
Dissolved Oxygen	mg/l	8.88	6.46	5.35	7.26	8.26	6.85	5.97	6.14
pH		8.4	7.9	7.7	7.1	7.1	7.8	7.8	7.8
Alkalinity	mg/l	40	122	44	26	18	58	110	116
Acidity	mg/l	0	4	2	6	2	4	6	6
Solids, Total	mg/l	114	236	200	104	84	144	176	222
Solids, Dissolved	mg/l	110	224	196	100	84	134	176	222
Ammonia, Total	mg/l	<0.02	<0.02	0.16	0.13	<0.02	<0.02	<0.02	0.16
Ammonia, Dissolved	mg/l	<0.02	<0.02	0.16	0.11	<0.02	<0.02	<0.02	0.15
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Nitrate, Total	mg/l	0.45	<0.04	0.04	<0.04	<0.04	0.4	0.07	0.13
Nitrate, Dissolved	mg/l	0.44	<0.04	0.04	<0.04	<0.04	0.4	0.07	0.13
Nitrogen, Total	mg/l	0.740	0.260	0.300	0.380	0.280	0.780	0.120	0.480
Nitrogen Dissolved	mg/l	0.700	0.260	0.310	0.330	0.340	0.780	0.150	0.500
Phosphorus, Total	mg/l	0.02	0.02	0.02	<0.01	0.018	0.07	<0.01	<0.01
Phosphorus, Dissolved	mg/l	0.011	0.017	0.018	<0.01	0.018	0.056	0.011	<0.01
Orthophosphate, Total	mg/l	0.015	0.015	0.013	<0.01	0.017	0.055	0.01	<0.01
Orthophosphate, Dissolved	mg/l	<0.01	0.012	<0.01	<0.01	0.012	0.048	0.01	<0.01
Organic Carbon, Total	mg/l	3.8	2.5	3.7	2.3	4	3.9	1.6	1.4
Calcium	mg/l	17.6	40.8	20.2	10.6	7.73	20.2	46.8	45.7
Magnesium	mg/l	3.47	12.9	5.02	2.68	2.13	6.75	7.15	7.4
Chloride	mg/l	13.1	15.8	63.1	22	15.1	13.9	14.7	21.6
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	20.3
Turbidity	ntu	3.42	1.97	2.27	1.05	3.03	2.86	<1	<1
Iron, Total	µg/l	86	64	590	209	423	142	<20	<20
Iron, Dissolved	µg/l	32	26	404	120	280	45	<20	<20
Manganese, Total	µg/l	31	<10	166	46	28	34	<10	<10
Manganese, Dissolved	µg/l	10	<10	139	41	26	15	<10	<10
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	SEEL10.3	SEEL10.3	SNAK2.3	SOUT6.9	SUSQ289.1	SUSQ289.1	SUSQ289.1
Date	yyyymmdd	20030304	20030528	20020805	20020807	20020806	20021113	20030303
Time	hhmm	1135	1315	1600	1140	1330	820	1340
Discharge	cfs	12.126	20.874	4.307	0.19	867	6860	NA
Temperature	degree C	0.1	13.4	27.6	18.7	24.6	8.7	0
Conductance	umhos/cm	228	212	119	212	362	221	227
Dissolved Oxygen	mg/l	8.63	8.29	6.41	6.95	6.01	6.72	9.17
pH		7.5	8	8	7.9	8.3	7.7	8
Alkalinity	mg/l	104	64	34	50	82	70	40
Acidity	mg/l	10	2	2	2	0	2	4
Solids, Total	mg/l	156	130	50	50	252	142	180
Solids, Dissolved	mg/l	168	130	50	50	248	138	172
Ammonia, Total	mg/l	<0.02	<0.02	0.1	<0.02	<0.02	0.14	0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	0.16	<0.02	<0.02	0.14	0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01
Nitrate, Total	mg/l	1.1	0.06	0.1	<0.04	0.36	0.58	0.95
Nitrate, Dissolved	mg/l	1.11	0.06	0.1	<0.04	0.35	0.57	0.96
Nitrogen, Total	mg/l	1.260	0.280	0.350	0.410	0.790	1.290	1.250
Nitrogen Dissolved	mg/l	1.340	0.330	0.360	0.430	0.680	1.130	1.340
Phosphorus, Total	mg/l	<0.01	0.015	0.02	0.02	0.04	0.027	0.023
Phosphorus, Dissolved	mg/l	<0.01	0.013	0.015	0.025	0.023	0.012	0.013
Orthophosphate, Total	mg/l	<0.01	0.011	0.011	0.021	0.025	0.014	0.018
Orthophosphate, Dissolved	mg/l	<0.01	<0.01	0.011	0.018	0.017	0.013	0.011
Organic Carbon, Total	mg/l	2.2	3.2	2.2	6.5	3.8	3	1.7
Calcium	mg/l	24.9	24	9.93	16.7	37.4	26.8	24.4
Magnesium	mg/l	4.17	4.06	2.83	4.05	6.57	3.94	3.78
Chloride	mg/l	28.4	17.7	10.7	24.6	96.6	17.8	30.4
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	<1	<1	1.08	1.25	2.43	3.01	3.38
Iron, Total	µg/l	45	47	70	201	155	188	221
Iron, Dissolved	µg/l	<20	22	36	160	30	78	57
Manganese, Total	µg/l	<10	<10	10	38	40	19	18
Manganese, Dissolved	µg/l	<10	<10	<10	30	<10	<10	11
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	20030528	20020805	20021112	20030303	20030527	20020805	20021112
Time	hhmm	750	1430	1245	1210	1345	1135	1045
Discharge	cfs	NA	371	2458	NA	NA	154	2200
Temperature	degree C	16.9	28.2	9.1	0	16.4	26.2	9.1
Conductance	umhos/cm	206	239	192	183	193	259	197
Dissolved Oxygen	mg/l	8.83	6.93	7.14	8.86	8.54	5.81	6.74
pH		8.05	8.35	7.5	8	7.9	8.6	7.6
Alkalinity	mg/l	62	80	58	42	52	136	62
Acidity	mg/l	2	0	6	10	2	0	6
Solids, Total	mg/l	122	144	1278	160	118	152	312
Solids, Dissolved	mg/l	116	144	1274	134	118	146	304
Ammonia, Total	mg/l	<0.02	0.06	0.14	<0.02	<0.02	0.11	0.15
Ammonia, Dissolved	mg/l	<0.02	0.14	0.12	<0.02	<0.02	0.07	0.04
Nitrite, Total	mg/l	0.02	0.01	<0.01	<0.01	<0.01	0.01	<0.01
Nitrite, Dissolved	mg/l	0.02	0.01	<0.01	<0.01	<0.01	0.01	<0.01
Nitrate, Total	mg/l	0.57	0.22	0.36	0.73	0.33	0.44	0.44
Nitrate, Dissolved	mg/l	0.4	0.22	0.37	0.75	0.34	0.42	0.47
Nitrogen, Total	mg/l	0.820	0.480	0.980	0.980	0.560	0.680	1.070
Nitrogen Dissolved	mg/l	0.830	0.420	0.960	0.960	0.580	0.690	0.950
Phosphorus, Total	mg/l	0.025	0.02	0.012	0.011	0.016	0.03	0.011
Phosphorus, Dissolved	mg/l	0.013	0.016	<0.01	<0.01	0.013	0.024	<0.01
Orthophosphate, Total	mg/l	0.019	<0.01	<0.01	0.011	0.017	0.012	0.012
Orthophosphate, Dissolved	mg/l	0.012	<0.01	<0.01	<0.01	0.01	0.012	<0.01
Organic Carbon, Total	mg/l	3.2	2.6	2.6	1.6	3	2.5	2.7
Calcium	mg/l	23.6	29.6	26.3	22.4	23.4	33.5	27.8
Magnesium	mg/l	3.43	3.73	2.85	2.66	2.7	4.16	3.11
Chloride	mg/l	20.2	20.4	13.6	22.2	18.5	21.1	13.2
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	3.48	1.17	1.56	2.48	3.45	1.34	2.45
Iron, Total	µg/l	297	115	184	236	181	99	202
Iron, Dissolved	µg/l	44	47	94	79	78	36	85
Manganese, Total	µg/l	20	24	20	20	30	27	22
Manganese, Dissolved	µg/l	<10	12	17	15	19	13	14
Aluminum, Total	µg/l	212	<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	SUSQ365.0	TIOG10.0	TIOG10.0	TIOG10.0	TIOG10.0	TROW1.6	TRUP4.5
Date	yyyymmdd	20030303	20030527	20020807	20021113	20030304	20030528	20020805	20020808
Time	hhmm	950	1130	1430	1435	1250	1445	1330	1030
Discharge	cfs	NA	NA	76	6599	NA	NA	NA	1.705
Temperature	degree C	0	15	23.2	8	0.5	15.3	23.6	18.9
Conductance	umhos/cm	142	190	221	232	214	170	102	322
Dissolved Oxygen	mg/l	9.03	8.93	6.6	7.08	8.79	8.04	7.17	7.45
pH		7.3	7.7	7.7	7.15	7.6	7.6	7.8	8
Alkalinity	mg/l	40	58	48	26	48	28	36	94
Acidity	mg/l	4	2	4	6	8	2	4	2
Solids, Total	mg/l	164	140	146	170	110	116	58	204
Solids, Dissolved	mg/l	152	138	144	170	96	114	56	198
Ammonia, Total	mg/l	0.07	0.05	<0.02	0.15	0.05	<0.02	0.09	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.04	<0.02	0.06	0.04	<0.02	0.12	<0.02
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	0.78	0.39	0.31	0.31	0.94	0.28	0.13	<0.04
Nitrate, Dissolved	mg/l	0.78	0.42	0.32	0.32	0.95	0.28	0.13	<0.04
Nitrogen, Total	mg/l	1.280	0.680	0.590	0.840	1.230	0.580	0.250	0.270
Nitrogen Dissolved	mg/l	0.980	0.810	0.590	0.750	1.180	0.600	0.170	0.290
Phosphorus, Total	mg/l	0.017	0.023	0.02	0.011	0.018	0.016	0.012	<0.01
Phosphorus, Dissolved	mg/l	<0.01	0.016	0.018	<0.01	<0.01	0.012	0.016	0.013
Orthophosphate, Total	mg/l	0.011	0.021	0.019	<0.01	0.017	0.017	<0.01	0.015
Orthophosphate, Dissolved	mg/l	<0.01	0.012	0.013	<0.01	<0.01	<0.01	0.011	<0.01
Organic Carbon, Total	mg/l	2.3	3.9	3.8	2.3	2.7	2.6	1.7	3
Calcium	mg/l	23.4	24.4	24.2	24.5	21.7	17.2	6.9	34.9
Magnesium	mg/l	2.72	2.87	5.64	7.65	5.04	4.35	2.24	8.17
Chloride	mg/l	23.5	15.8	10.9	11.4	21	11.4	8.6	26.4
Sulfate	mg/l	21.4	<20	35.7	58.1	33	28.6	<20	<20
Turbidity	ntu	1.89	5.61	1.73	1.83	3.44	3.71	<1	1.77
Iron, Total	µg/l	163	340	76	99	176	132	37	66
Iron, Dissolved	µg/l	73	97	28	<20	39	30	<20	26
Manganese, Total	µg/l	18	28	72	231	377	288	<10	<10
Manganese, Dissolved	µg/l	14	16	31	186	328	200	<10	<10
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	TRUP4.5	TRUP4.5	TRUP4.5	WAPP2.6
Date	yyyymmdd	20021114	20030305	20030529	20020806
Time	hhmm	905	845	1110	1135
Discharge	cfs	4.533	10.321	12.713	NA
Temperature	degree C	7.5	0.6	16.5	22
Conductance	umhos/cm	358	225	180	174
Dissolved Oxygen	mg/l	7.59	9.03	9.37	5.68
pH		8	8.2	9	7.5
Alkalinity	mg/l	106	80	54	44
Acidity	mg/l	4	6	0	2
Solids, Total	mg/l	200	174	122	108
Solids, Dissolved	mg/l	200	172	118	108
Ammonia, Total	mg/l	0.33	<0.02	<0.02	0.17
Ammonia, Dissolved	mg/l	0.18	<0.02	<0.02	0.07
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	<0.04	1.33	<0.04	1.21
Nitrate, Dissolved	mg/l	<0.04	1.37	<0.04	1.25
Nitrogen, Total	mg/l	0.180	1.570	0.250	1.250
Nitrogen Dissolved	mg/l	0.200	1.570	0.250	1.270
Phosphorus, Total	mg/l	<0.01	0.014	0.016	0.02
Phosphorus, Dissolved	mg/l	<0.01	<0.01	0.02	0.016
Orthophosphate, Total	mg/l	<0.01	0.036	0.025	<0.01
Orthophosphate, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01
Organic Carbon, Total	mg/l	2.5	2.9	4.1	1.5
Calcium	mg/l	42.6	22.7	19.9	16.6
Magnesium	mg/l	9.48	5.45	4.29	4.64
Chloride	mg/l	32.1	27.7	13.6	11.5
Sulfate	mg/l	46	<20	<20	<20
Turbidity	ntu	1.17	11.44	8.89	<1
Iron, Total	µg/l	61	428	351	34
Iron, Dissolved	µg/l	33	80	60	<20
Manganese, Total	µg/l	<10	14	11	<10
Manganese, Dissolved	µg/l	<10	12	<10	<10
Aluminum, Total	µg/l	<200	363	267	<200
Aluminum, Dissolved	µg/l	<200	<200	<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	20020731	20020801	20021218	20030226	20030603	20020730	20021218	20030227
Time	hhmm	900	1130	1040	1445	1140	1215	745	1040
Discharge	cfs	0.437	4.665	14.91	16.43	12.582	3.276	15.03	17.23
Temperature	degree C	18.8	26.2	1.3	0.8	14.7	25.2	1	1.2
Conductance	umhos/cm	132	221	242	208	240	227	222	237
Dissolved Oxygen	mg/l	6.94	6.99	8.48	9.04	8.53	6.62	9.04	9.13
pH		7.7	8	7.2	7	7.5	8.2	6.95	7.2
Alkalinity	mg/l	42	42	36	36	36	64	12	30
Acidity	mg/l	6	2	14	4	2	2	14	4
Solids, Total	mg/l	128	176	220	184	1766	178	196	156
Solids, Dissolved	mg/l	122	170	210	162	1760	176	192	182
Ammonia, Total	mg/l	<0.02	0.06	<0.02	0.95	0.04	0.03	0.05	0.06
Ammonia, Dissolved	mg/l	<0.02	0.06	<0.02	0.98	0.02	0.02	<0.02	0.06
Nitrite, Total	mg/l	<0.01	0.03	<0.01	0.03	0.04	0.02	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	0.03	0.02	0.03	0.04	0.02	<0.01	<0.01
Nitrate, Total	mg/l	4.66	6.14	10.01	6.29	8.28	2.45	6.28	5.04
Nitrate, Dissolved	mg/l	4.67	6.24	10.09	6.19	8.44	2.51	6.17	5.07
Nitrogen, Total	mg/l	5.100	6.230	11.000	8.660	9.150	2.980	6.870	5.600
Nitrogen Dissolved	mg/l	5.090	6.370	10.830	8.310	9.160	2.970	6.760	5.520
Phosphorus, Total	mg/l	0.02	0.05	0.046	0.599	0.072	0.02	0.076	0.023
Phosphorus, Dissolved	mg/l	0.018	0.05	0.034	0.52	0.042	0.013	0.069	0.016
Orthophosphate, Total	mg/l	0.012	0.038	0.039	0.513	0.047	0.012	0.084	0.02
Orthophosphate, Dissolved	mg/l	<0.01	0.032	0.034	0.476	0.034	<0.01	0.054	0.012
Organic Carbon, Total	mg/l	1.4	3.5	2.4	7.1	3.1	2.5	1.5	1.4
Calcium	mg/l	9.86	15.2	19.5	13.9	16.4	20	19	16.4
Magnesium	mg/l	5.45	9.72	10.9	8.33	11	6.46	6.61	5.62
Chloride	mg/l	10.6	19	21.8	18.7	20	26.6	30.3	40.1
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	1.24	2.89	3.37	14.69	6.16	2.44	2.28	3.81
Iron, Total	µg/l	181	225	148	849	538	162	107	146
Iron, Dissolved	µg/l	37	131	63	178	133	53	36	55
Manganese, Total	µg/l	15	39	42	77	40	21	32	27
Manganese, Dissolved	µg/l	<10	33	34	65	26	21	22	26
Aluminum, Total	µg/l	276	<200	<200	590	303	<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	20030602	20020730	20021218	20030227	20030602	20020731	20020730	20021118
Time	hhmm	1045	1330	900	1135	1210	1020	900	840
Discharge	cfs	10.237	5.953	7.59	24.3	9.306	0.173	0.213	NA
Temperature	degree C	11.9	24	0.9	1.7	11.9	21	22.6	7.5
Conductance	umhos/cm	213	277	185	195	199	111	212	190
Dissolved Oxygen	mg/l	9.01	5.14	9.17	8.59	9.66	5.82	5.72	7.16
pH		7.35	7.7	6.8	7.25	7.25	7.8	8.1	7.1
Alkalinity	mg/l	36	70	34	32	32	38	70	32
Acidity	mg/l	2	8	NA	4	2	6	4	6
Solids, Total	mg/l	152	206	166	182	162	110	190	198
Solids, Dissolved	mg/l	140	202	162	154	150	100	176	190
Ammonia, Total	mg/l	<0.02	0.2	0.04	<0.02	<0.02	<0.02	0.16	0.1
Ammonia, Dissolved	mg/l	<0.02	0.22	0.04	<0.02	<0.02	0.02	0.16	0.1
Nitrite, Total	mg/l	<0.01	0.58	0.01	0.01	0.02	<0.01	0.11	0.03
Nitrite, Dissolved	mg/l	<0.01	0.59	0.01	<0.01	0.02	<0.01	0.09	0.01
Nitrate, Total	mg/l	4.8	4.78	6.22	5.58	4.68	3.68	3.43	6
Nitrate, Dissolved	mg/l	4.91	4.84	6.22	5.49	4.71	3.66	3.58	6.21
Nitrogen, Total	mg/l	4.900	7.570	6.720	5.980	5.340	3.950	4.650	7.390
Nitrogen Dissolved	mg/l	4.960	7.790	6.760	6.040	5.350	3.830	4.560	7.140
Phosphorus, Total	mg/l	0.018	0.27	0.03	0.024	0.055	0.02	0.06	0.086
Phosphorus, Dissolved	mg/l	0.014	0.257	0.026	0.017	0.03	0.014	0.022	0.055
Orthophosphate, Total	mg/l	0.012	0.21	0.027	0.018	0.027	0.012	0.038	0.054
Orthophosphate, Dissolved	mg/l	<0.01	0.208	0.02	0.011	0.024	<0.01	0.018	0.038
Organic Carbon, Total	mg/l	1.5	3.2	1.5	1.3	2	1.9	3	3.9
Calcium	mg/l	16.4	17.7	15.8	15	14.4	7.79	21.5	17
Magnesium	mg/l	5.93	6.46	5.7	5.4	5.56	4.38	6.56	5.99
Chloride	mg/l	27.9	28	21.1	26.9	22.9	9	18.3	14.7
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	2.79	1.36	1.46	2.96	2.93	1.48	27.5	10.1
Iron, Total	µg/l	119	174	85	182	268	320	677	667
Iron, Dissolved	µg/l	58	79	33	43	51	99	119	99
Manganese, Total	µg/l	31	22	25	27	29	53	284	62
Manganese, Dissolved	µg/l	23	13	21	23	20	17	230	40
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	351	459
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	20030227	20030602	20020801	20021218	20030226	20030603	20020730	20020731
Time	hhmm	830	900	935	1010	1315	1010	1000	1115
Discharge	cfs	1.873	1.435	37.568	NA	NA	NA	0.14	NA
Temperature	degree C	2.7	11.1	25.6	0.3	0.7	16.3	22.1	24
Conductance	umhos/cm	185	186	225	259	167	242	174	484
Dissolved Oxygen	mg/l	8.89	8.25	5.56	8.61	8.97	8.48	6.18	6.45
pH		7.3	7.05	8.3	7.15	7.35	7.8	7.9	8
Alkalinity	mg/l	22	28	72	60	52	48	92	156
Acidity	mg/l	6	4	0	14	8	4	6	6
Solids, Total	mg/l	192	172	182	222	148	144	114	436
Solids, Dissolved	mg/l	146	172	172	208	112	107	108	436
Ammonia, Total	mg/l	0.08	0.03	0.02	0.17	1.34	0.08	<0.02	0.05
Ammonia, Dissolved	mg/l	0.08	0.03	0.04	0.15	1.3	0.08	<0.02	0.04
Nitrite, Total	mg/l	<0.01	0.01	0.01	0.03	0.04	0.06	0.02	<0.01
Nitrite, Dissolved	mg/l	0.01	<0.01	<0.01	0.02	0.03	0.05	0.02	<0.01
Nitrate, Total	mg/l	6.59	5.53	1.43	6.01	2.86	5.54	0.56	1.77
Nitrate, Dissolved	mg/l	6.45	5.74	1.49	6.02	2.91	5.28	0.47	1.74
Nitrogen, Total	mg/l	7.040	6.410	1.840	7.170	6.180	6.550	0.730	1.910
Nitrogen Dissolved	mg/l	6.770	6.430	1.900	7.190	5.890	6.360	0.780	2.060
Phosphorus, Total	mg/l	0.046	0.02	0.07	0.168	0.745	0.153	0.02	0.06
Phosphorus, Dissolved	mg/l	0.033	0.014	0.052	0.128	0.555	0.037	0.011	0.054
Orthophosphate, Total	mg/l	0.029	0.017	0.038	0.12	0.569	0.079	0.014	0.039
Orthophosphate, Dissolved	mg/l	0.019	<0.01	0.032	0.102	0.464	0.029	0.011	0.037
Organic Carbon, Total	mg/l	1.5	1.9	4.3	4.6	10.6	3.8	2	2.1
Calcium	mg/l	15.9	15.9	17.1	22.9	11	19.3	24.3	49.5
Magnesium	mg/l	5.88	6.24	10.8	10.9	6.21	10.6	4.29	25.5
Chloride	mg/l	20.6	17.8	18.2	20.7	13.9	18.8	6.9	53
Sulfate	mg/l	<20	<20	43.2	<20	<20	<20	<20	36.4
Turbidity	ntu	8.08	7.58	5.12	6.36	45.54	28.26	3.99	<1
Iron, Total	µg/l	314	271	427	292	2320	1170	304	96
Iron, Dissolved	µg/l	45	61	153	92	288	56	89	36
Manganese, Total	µg/l	51	71	90	67	149	98	50	28
Manganese, Dissolved	µg/l	40	56	37	41	100	16	45	25
Aluminum, Total	µg/l	219	<200	254	<200	2070	840	<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	SCTT3.0	SCTT3.0	SCTT3.0	SUSQ10.0	SUSQ10.0	SUSQ10.0	SUSQ44.5
Date	yyyymmdd	20021118	20030227	20030602	20020731	20021118	20030602	20020801
Time	hhmm	1210	1305	1330	1215	1305	1435	1315
Discharge	cfs	0.396	1.037	1.114	5550	53600	NA	6740
Temperature	degree C	8.8	1.8	13.2	30.4	11.2	18.9	32.4
Conductance	umhos/cm	319	398	281	292	270	222	356
Dissolved Oxygen	mg/l	7.38	8.78	8.78	4.56	6.9	7.64	6.74
pH		7.2	7.1	7.6	8	7.5	7.7	8.7
Alkalinity	mg/l	56	80	48	80	56	48	84
Acidity	mg/l	6	10	2	2	8	2	0
Solids, Total	mg/l	282	260	210	210	220	140	252
Solids, Dissolved	mg/l	274	260	208	208	208	130	280
Ammonia, Total	mg/l	0.04	<0.02	<0.02	0.1	0.04	0.04	0.03
Ammonia, Dissolved	mg/l	0.03	<0.02	<0.02	0.12	0.04	0.04	0.05
Nitrite, Total	mg/l	<0.01	0.01	<0.01	0.04	0.02	0.02	<0.01
Nitrite, Dissolved	mg/l	<0.01	0.01	<0.01	0.04	0.01	0.01	<0.01
Nitrate, Total	mg/l	2.71	3.15	2	0.62	1.81	1.16	0.46
Nitrate, Dissolved	mg/l	2.58	3.3	1.95	0.58	1.86	1.18	0.43
Nitrogen, Total	mg/l	3.610	3.400	1.910	1.020	2.470	1.330	0.820
Nitrogen Dissolved	mg/l	3.470	3.360	1.970	1.130	2.450	1.310	0.760
Phosphorus, Total	mg/l	0.084	0.025	0.031	0.05	0.036	0.043	0.03
Phosphorus, Dissolved	mg/l	0.077	0.02	0.028	0.015	0.025	0.013	0.023
Orthophosphate, Total	mg/l	0.061	0.019	0.029	0.019	0.032	0.022	0.021
Orthophosphate, Dissolved	mg/l	0.06	0.016	0.025	<0.01	0.021	0.01	0.014
Organic Carbon, Total	mg/l	5.7	1.7	2.6	3.2	2.7	2.8	3.2
Calcium	mg/l	24.8	20.5	17.6	28.3	27.1	21.6	33.6
Magnesium	mg/l	16.3	13	11.4	8.69	7.54	6.04	12.1
Chloride	mg/l	25.4	78.2	36.4	20.8	17.8	16.2	27.2
Sulfate	mg/l	45.9	28.9	22.2	43.1	37.1	24.1	60.5
Turbidity	ntu	2.67	1.5	1.74	2.25	5.8	8.38	1.56
Iron, Total	µg/l	201	87	161	152	451	365	87
Iron, Dissolved	µg/l	97	39	78	22	131	36	37
Manganese, Total	µg/l	26	36	32	148	67	127	45
Manganese, Dissolved	µg/l	23	36	28	69	28	44	26
Aluminum, Total	µg/l	<200	<200	<200	<200	214	231	<200
Aluminum, Dissolved	µg/l	209	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SUSQ44.5	SUSQ44.5	SUSQ44.5
Date	yyyymmdd	20021218	20030227	20030603
Time	hhmm	1145	1505	1315
Discharge	cfs	72050	NA	NA
Temperature	degree C	2.8	0.5	16.5
Conductance	umhos/cm	247	310	205
Dissolved Oxygen	mg/l	8.53	8.96	8.36
pH		7.1	8.2	7.5
Alkalinity	mg/l	44	64	46
Acidity	mg/l	26	2	2
Solids, Total	mg/l	206	214	140
Solids, Dissolved	mg/l	176	210	66
Ammonia, Total	mg/l	0.04	0.19	0.04
Ammonia, Dissolved	mg/l	0.03	0.17	0.03
Nitrite, Total	mg/l	0.01	0.03	0.01
Nitrite, Dissolved	mg/l	0.01	0.03	0.01
Nitrate, Total	mg/l	3.24	2.5	1.55
Nitrate, Dissolved	mg/l	3.42	2.48	1.52
Nitrogen, Total	mg/l	3.920	3.090	2.230
Nitrogen Dissolved	mg/l	3.780	2.930	1.880
Phosphorus, Total	mg/l	0.046	0.07	0.131
Phosphorus, Dissolved	mg/l	0.016	0.049	0.022
Orthophosphate, Total	mg/l	0.027	0.045	0.082
Orthophosphate, Dissolved	mg/l	0.012	0.029	0.018
Organic Carbon, Total	mg/l	3	2.3	4.1
Calcium	mg/l	25.6	27.7	22.5
Magnesium	mg/l	6.27	7.06	5.65
Chloride	mg/l	27.2	44.2	15.8
Sulfate	mg/l	20.9	25.9	<20
Turbidity	ntu	6.89	6.89	65.6
Iron, Total	µg/l	652	499	2940
Iron, Dissolved	µg/l	93	150	103
Manganese, Total	µg/l	118	113	278
Manganese, Dissolved	µg/l	57	84	22
Aluminum, Total	µg/l	269	<200	1490
Aluminum, Dissolved	µg/l	<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	20030513	20030514	20030515	20030514	20030515	20030513
Time	hhmm	1415	1600	0730	1145	0930	1545
Temperature	degree C	11.4	10.5	8.3	10.1	10.4	10.7
pH		6.90	6.70	8.20	7.10	7.25	7.30
Dissolved Oxygen	mg/l	9.25	9.37	9.38	9.54	8.97	9.96
Conductivity	umhos/cm	111	85	339	181	174	181
Alkalinity	mg/l	30.0	28.0	120.0	42.0	66.0	54.0
Acidity	mg/l	4.0	2.0	1.0	4.0	6.0	4.0

Parameter	Units	Bukley Brook	Camp Brook	Cook Hollow Run	Deep Hollow Brook	Denton Creek	Dry Brook
Date	yyyymmdd	20030515	20030514	20030515	20030513	20030513	20030514
Time	hhmm	0900	1500	1000	0940	1145	1000
Temperature	degree C	8.9	11.3	8.9	10.2	14.3	11.2
pH		6.70	7.80	7.20	6.25	6.10	7.30
Dissolved Oxygen	mg/l	9.06	8.83	8.24	10.13	8.68	8.11
Conductivity	umhos/cm	105	288	223	40	44	225
Alkalinity	mg/l	34.0	92.0	84.0	8.0	8.0	56.0
Acidity	mg/l	6.0	4.0	6.0	6.0	2.0	4.0

Parameter	Units	Little Wappasenning Creek	Parks Creek	Prince Hollow Run	Russell Run	Sackett Creek	Smith Creek
Date	yyyymmdd	20030514	20030513	20030513	20030513	20030514	20030514
Time	hhmm	0800	1545	1340	1500	0845	1245
Temperature	degree C	9.6	10.0	10.6	10.4	9.6	10.6
pH		7.00	6.90	6.80	7.10	7.20	7.25
Dissolved Oxygen	mg/l	9.57	9.17	9.21	9.23	8.87	8.16
Conductivity	umhos/cm	129	119	94	140	163	180
Alkalinity	mg/l	42.0	42.0	18.0	34.0	54.0	50.0
Acidity	mg/l	4.0	4.0	4.0	2.0	4.0	2.0

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

Parameter	Units	Strait Creek	White Branch Cowanesque River	White Hollow
Date	yyyymmdd	20030514	20030515	20030514
Time	hhmm	1345	1115	1100
Temperature	degree C	11.8	11.9	9.3
pH		7.70	7.50	7.05
Dissolved Oxygen	mg/l	7.82	7.87	9.82
Conductivity	umhos/cm	226	192	156
Alkalinity	mg/l	82.0	38.0	38.0
Acidity	mg/l	4.0	4.0	4.0

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
	Talitridae	*Hyalella*	8	CG
Bivalvia	Corbiculidae	*Corbicula*	4	FC
	Sphaeriidae	*Pisidium*	8	FC
Branchiobdellida	Brachiobdellidae	*Cambarincola*	6	PA/CG
Coleoptera	Carabidae		7	P
	Dryopidae	*Helichus*	5	SC/CG
	Dytiscidae	*Agabus*	5	P
		Oreodytes	5	P
	Elmidae	*Dubiraphia*	6	CG/SC
		Gonielmis	5	SC
		Macronychus	2	CG
		Optioservus	4	SC
		Oulimnious	5	SC
		Promoresia	2	SC
		Stenelmis	5	SC
	Gyrinidae	*Dineutus*	4	P
	Hydrophilidae	*Berosus*	5	CG
		Hydrobius	5	P/CG
	Lampyridae			
	Psephenidae	*Ectopria*	5	SC
		Psephenus	4	SC
	Ptilodactylidae	*Anchytarsus*	5	SH
Decapoda	Cambaridae	*Cambarus*	6	SH
		Orconectes	6	SH
Diptera	Athericidae	*Atherix*	2	P
	Ceratopogonidae	*Ceratopogon*	6	P
		Probezzia	6	P
	Chironomidae	*Chironomidae*	6	CG
	Culcidae	*Mansonia*	8	CG/FC
	Dolichopodidae		4	P
	Empididae	*Chelifera*	6	P
		Hemerodromia	6	P
		Roederiodes	6	P
		Trichoclinocera	6	P
	Psychodidae	*Pericoma*	4	CG
	Sciomyzidae	*Antichaeta*	6	P
		Tetanocera	6	P
	Simuliidae	*Prosimulium*	2	FC
		Simulium	6	FC
	Tabanidae	*Chrysops*	7	P
		Tabanus	5	P
	Tipulidae	*Antocha*	3	CG
		Dicranota	3	P
		Erioptera	7	CG
		Hexatoma	2	P
		Limnophila	3	P
		Pilaria	7	P

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
		Tipula	*4*	SH
Ephemeroptera	Ameletidae	*Ameletus*	*0*	CG
	Baetidae	*Acentrella*	*4*	CG
		Acerpenna	*6*	CG
		Baetis	*6*	CG
		Centroptilum	*2*	CG
		Cloeon	*4*	CG
		Diphetor	*6*	CG
		Heterocloeon	*2*	SC
		Procloeon	*5*	CG
	Caenidae	*Caenis*	*7*	CG
	Ephemerellidae	*Drunella*	*1*	SC
		Ephemerella	*1*	SC
		Serratella	*2*	CG
	Ephemeridae	*Ephemera*	*2*	CG
	Heptageniidae	*Cinygmula*	*1*	SC
		Epeorus	*0*	CG
		Leucrocuta	*1*	SC
		Nixe	*2*	SC/CG
		Rhithrogena	*0*	CG
		Stenacron	*4*	CG
		Stenonema	*3*	SC
	Isonychiidae	*Isonychia*	*3*	FC
	Leptophlebiidae	*Choroterpes*	*2*	CG/SC
		Habrophlebiodes	*6*	SC
		Paraleptophlebia	*1*	CG
	Polymitarcyidae	*Ephoron*	*2*	CG
	Potamanthidae	*Anthopotamus*	*4*	FC
	Tricorythidae	*Tricorythodes*	*4*	CG
Gastropoda	Physidae	*Physella*	*8*	SC
	Pleuroceridae	*Leptoxis*	*7*	SC
	Valvatidae	*Valvata*	*2*	SC
Haplotaxida	Haplotaxidae	*Haplotaxis*	*10*	P
	Lumbricidae		*8*	CG
	Naididae		*8*	CG
Hemiptera	Veliidae	*Microvelia*	*9*	P
Hydrachnidia	Hygrobatidae	*Hygrobates*	*8*	P
	Lebertiidae	*Lebertia*	*8*	P
	Sperchoniidae	*Sperchon*	*7*	P
Isopoda	Assellidae	*Caecidotea*	*6*	SH
Lepidoptera	Pyralidae	*Crambus*	*5*	SH
		Petrophila	*5*	SH
	Sphingidae		*5*	SH
Megaloptera	Corydalidae	*Corydalus*	*4*	P
		Nigronia	*2*	P
	Sialidae	*Sialis*	*6*	P
Nematomorpha			*9*	PA
	Gordidae	*Gordius*	*9*	PA

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
Neuroptera	Sisyridae	*Climacia*	*1*	P
Odonata	Aeshnidae	*Boyeria*	*2*	P
	Calopterygidae	*Hetaerina*	*6*	P
	Coenagrionidae	*Argia*	*6*	P
	Cordulegastridae	*Cordulegaster*	*3*	P
	Gomphidae	*Lanthus*	*5*	P
		Ophiogomphus	*1*	P
		Stylogomphus	*4*	P
Ostracoda			*8*	CG
Pharyngobdellida	Erpobdellidae	*Erpobdella*	*8*	PA
		Mooreobdella	*8*	PA
Plecoptera	Capniidae	*Paracapnia*	*1*	SH
	Chloroperlidae	*Haploperla*	*0*	P
		Suwallia	*0*	P
		Sweltsa	*0*	P
	Leuctridae	*Leuctra*	*0*	SH
	Nemouridae	*Amphinemura*	*3*	SH
		Ostrocerca	*2*	SH
	Peltoperlidae	*Peltoperla*	*2*	SH
		Tallaperla	*0*	SH
	Perlidae	*Acroneuria*	*0*	P
		Agnetina	*2*	P
		Claassenia	*3*	P
		Neoperla	*3*	P
		Paragnetina	*1*	P
		Perlesta	*4*	P
	Perlodidae	*Clioperla*	*2*	P
		Isoperla	*2*	P
		Yugus	*2*	P
Trichoptera	Brachycentridae	*Brachycentrus*	*1*	FC
		Micrasema	*2*	SH
	Glossosomatidae	*Glossosoma*	*0*	SC
		Protoptila	*1*	SC
	Hydropsychidae	*Ceratopsyche*	*5*	FC
		Cheumatopsyche	*6*	FC
		Diplectrona	*0*	FC
		Hydropsyche	*5*	FC
		Macrostemum	*3*	FC
	Hydroptilidae	*Agraylea*	*8*	CG
		Hydroptila	*6*	SC
		Leucotrichia	*6*	SC
	Lepidostomatidae	*Lepidostoma*	*1*	SH
	Odontoceridae	*Psilotreta*	*0*	SC
	Philopotamidae	*Chimarra*	*4*	FC
		Dolophilodes	*0*	FC
		Wormaldia	*0*	FC
	Polycentropodidae	*Neureclipsis*	*7*	CF
		Polycentropus	*6*	P

Class: Order	Family	Family/Genus	Organic Pollution Tolerance Value	Functional Feeding Group Designation
	Psychomyiidae	*Psychomyia*	*2*	CG
	Rhyachophilidae	*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	HLDN 3.5
Coleoptera	Elmidae	*Gonielmis*					3
		Optioservus	7		13	10	6
		Oulimnious		21			
		Promoresia	1				
		Stenelmis	30	23	45	11	5
	Gyrinidae	*Dineutus*			1		
	Psephenidae	*Psephenus*	23	31	35	31	60
Decapoda	Cambaridae	*Cambarus*					1
Diptera	Athericidae	*Atherix*		1			
	Ceratopogonidae	*Probezzia*	1				
	Chironomidae	Chironomidae	56	42	48	96	83
	Empididae	*Hemerodromia*		14	7	1	3
	Simuliidae	*Simulium*	2	2			
	Tipulidae	*Antocha*		1	1	1	3
		Dicranota	1			1	
		Hexatoma	7	6	1		4
Ephemeroptera	Baetidae	*Acentrella*		1			7
		Acerpenna	1				22
		Baetis			1		12
		Diphetor					2
		Heterocloeon					2
		Procloeon					1
	Caenidae	*Caenis*	2			1	6
	Ephemerellidae	*Ephemerella*					1
		Serratella		5	15	2	
	Heptageniidae	*Epeorus*		3	1	4	
		Leucrocuta				14	2
		Stenacron					2
		Stenonema	2	2		47	3
	Isonychiidae	*Isonychia*	5	11	18	84	
	Leptophlebiidae	*Paraleptophlebia*	3			18	1
	Tricorythidae	*Tricorythodes*					6
Haplotaxida	Lumbricidae				1		
	Naididae				2	1	1
Hemiptera	Veliidae	*Microvelia*					2

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

Class: Order	Family	Family/*Genus*	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	HLDN 3.5
Hydrachnidia	Hygrobatidae	*Hygrobates*					3
	Sperchoniidae	*Sperchon*				1	2
Megaloptera	Corydalidae	*Corydalus*				1	
		Nigronia	2		1	1	
Odonata	Aeshnidae	*Boyeria*	1			1	1
	Gomphidae	*Ophiogomphus*				1	2
		Stylogomphus					1
Plecoptera	Chloroperlidae	*Sweltsa*	1				
	Leuctridae	*Leuctra*				2	
	Perlidae	*Acroneuria*		3	10		2
		Agnetina	1	2	2	1	5
		Claassenia					
		Neoperla		1			9
Trichoptera	Hydropsychidae	*Ceratopsyche*	10	47	38	19	11
		Cheumatopsyche	12	8	15	13	5
		Diplectrona					
		Hydropsyche	19		11		1
	Hydroptilidae	*Hydroptila*		1			4
		Leucotrichia			3		
	Philopotamidae	*Chimarra*	194	15	12	83	1
		Dolophilodes					8
		Wormaldia					5
	Polycentropodidae	*Polycentropus*					1
	Rhyachophilidae	*Rhyacophila*				1	

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

Class: Order	Family	Family/*Genus*	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3
Coleoptera	Dytiscidae	*Oreodytes*			1	
	Elmidae	*Optioservus*	14	8	1	
		Oulimnious				8
		Stenelmis	17	1	3	8
	Psephenidae	*Psephenus*	26	41	4	14
Diptera	Athericidae	*Atherix*	4		1	11
	Chironomidae	Chironomidae	120	94	174	28
	Empididae	*Chelifera*	1			
		Hemerodromia	4		2	
	Tabanidae	*Chrysops*		1		
	Tipulidae	*Antocha*	3	1	6	1
		Dicranota	5	24		1
		Hexatoma	1	7	13	
Ephemeroptera	Baetidae	*Acentrella*	2			10
		Acerpenna	5	1		
		Baetis	2		4	
		Centroptilum				6
		Cloeon				9
		Diphetor		20		
	Caenidae	*Caenis*			1	
	Ephemerellidae	*Serratella*		1	1	4
	Ephemeridae	*Ephemera*	4			
	Heptageniidae	*Epeorus*		1		2
		Leucrocuta	1	8		
		Stenacron		4		
		Stenonema	9	18	2	14
	Isonychiidae	*Isonychia*	8		13	13
	Leptophlebiidae	*Paraleptophlebia*	5	7		
	Tricorythidae	*Tricorythodes*			3	
Gastropoda	Physidae	*Physella*			1	
Haplotaxida	Naididae		6			
Hemiptera	Veliidae	*Microvelia*		1		
Hydrachnidia	Lebertiidae	*Lebertia*	2			
	Sperchoniidae	*Sperchon*	2	2		
Megaloptera	Corydalidae	*Nigronia*	15	2	1	
	Sialidae	*Sialis*	1			
Nematomorpha				3		

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

Class: Order	Family	Family/*Genus*	LSNK 7.6	NFCR 7.6	SEEL 10.3	SNAK 2.3
Odonata	Calopterygidae	*Hetaerina*	1			
	Gomphidae	*Lanthus*			1	
		Ophiogomphus			2	
		Stylogomphus	12			
Plecoptera	Capniidae	*Paracapnia*		1		
	Chloroperlidae	*Sweltsa*	2		1	
	Leuctridae	*Leuctra*	3	14		
	Perlidae	*Acroneuria*	7	2	1	
		Agnetina		17		
		Neoperla				1
		Paragnetina			1	6
Trichoptera	Glossosomatidae	*Glossosoma*				1
	Hydropsychidae	*Ceratopsyche*	4	10	42	44
		Cheumatopsyche	13	2	30	8
		Diplectrona		1		
		Hydropsyche	7			
	Hydroptilidae	*Leucotrichia*				1
	Philopotamidae	*Chimarra*	94	3	1	54
		Dolophilodes		2		
	Rhyachophilidae	*Rhyacophila*				1

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

Class: Order	Family	Family/*Genus*	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Coleoptera	Elmidae	*Gonielmis*	2			
		Optioservus	6	7	8	7
		Oulimnious		1		
		Promoresia	1			1
		Stenelmis	65	63	27	4
	Lampyridae			1		
	Psephenidae	*Psephenus*	46	3	16	10
Diptera	Athericidae	*Atherix*	1		1	
	Chironomidae	Chironomidae	40	27	20	105
	Empididae	*Hemerodromia*	1	12	5	16
	Tabanidae	*Tabanus*			1	
	Tipulidae	*Antocha*	8	2		2
		Dicranota	1			
		Hexatoma		3	10	5
Ephemeroptera	Baetidae	*Acerpenna*	2			1
		Baetis	10	4	8	7
		Procloeon		2		
	Caenidae	*Caenis*	1		2	3
	Ephemerellidae	*Serratella*		2		4
	Heptageniidae	*Epeorus*				2
		Leucrocuta	1	2	2	11
		Stenacron		1		
		Stenonema	9	1	4	14
	Isonychiidae	*Isonychia*	16	5	41	12
	Leptophlebiidae	*Paraleptophlebia*		3		
	Tricorythidae	*Tricorythodes*			5	
Haplotaxida	Naididae					28
Hydrachnidia	Sperchoniidae	*Sperchon*				1
Megaloptera	Corydalidae	*Corydalus*			1	
		Nigronia				1
Odonata	Coenagrionidae	*Argia*			2	
	Gomphidae	*Lanthus*			1	
		Ophiogomphus			9	
		Stylogomphus			2	
Plecoptera	Chloroperlidae	*Suwallia*		1		
		Sweltsa	1	3		2
	Perlidae	*Acroneuria*	1			
		Agnetina		10		
		Neoperla	1	25	22	

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

Class: Order	Family	Family/*Genus*	SOUT 7.8	TROW 1.6	TRUP 4.5	WAPP 2.6
Trichoptera	Hydropsychidae	*Ceratopsyche*	4	11	36	30
		Cheumatopsyche	17	1	18	13
		Hydropsyche	11		2	
	Hydroptilidae	*Leucotrichia*	1			
	Odontoceridae	*Psilotreta*	1			
	Philopotamidae	*Chimarra*	21	2	1	19
		Dolophilodes		16		
		Wormaldia		1		
	Polycentropodidae	*Polycentropus*				2

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*		1			
Coleoptera	Elmidae	*Dubiraphia*					1
		Gonielmis	1				1
		Macronychus					2
		Optioservus	36		15	114	30
		Oulimnious	6			4	7
		Promoresia	29				1
		Stenelmis		92	22	3	4
	Psephenidae	*Ectopria*	1				5
		Psephenus		2	12	8	1
	Ptilodactylidae	*Anchytarsus*	5				2
Decapoda	Cambaridae	*Cambarus*				1	1
Diptera	Athericidae	*Atherix*		3	3		
	Chironomidae	Chironomidae	57	40	41	6	48
	Empididae	*Hemerodromia*					2
	Tipulidae	*Antocha*	1	2	5		
		Dicranota	1				1
		Tipula		1		2	5
Ephemeroptera	Baetidae	*Acentrella*			3		
		Baetis	4	19	18	8	1
		Procloeon					1
	Ephemerellidae	*Ephemerella*				3	
		Serratella	3	3	4		
	Heptageniidae	*Epeorus*	5		2		
		Leucrocuta	2	7	1		
		Nixe	1				
		Stenonema	8	5	26	2	1
	Isonychiidae	*Isonychia*	2	22	23	3	
	Leptophlebiidae	*Paraleptophlebia*					1
Haplotaxida	Lumbricidae		1				
	Naididae					1	
Hydrachnidia	Sperchoniidae	*Sperchon*				2	
Megaloptera	Corydalidae	*Corydalus*		8	2		
		Nigronia	4	4	5		7
	Sialidae	*Sialis*		1			1
Nematomorpha	Gordidae	*Gordius*				3	
Neuroptera	Sisyridae	*Climacia*		2			
Odonata	Aeshnidae	*Boyeria*					15
	Cordulegastridae	*Cordulegaster*	1				
	Gomphidae	*Lanthus*	1				26
		Stylogomphus					7

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
Plecoptera	Leuctridae	*Leuctra*	13		1	1	8
	Perlidae	*Acroneuria*	8		5	12	16
		Claassenia			2		
		Perlesta	1				
Trichoptera	Glossosomatidae	*Glossosoma*					1
	Hydropsychidae	*Ceratopsyche*	8	3	11	55	
		Cheumatopsyche	1	64	38	17	20
		Diplectrona	4				
		Hydropsyche		11	12	13	
	Hydroptilidae	*Hydroptila*			1		
		Leucotrichia		1			
	Philopotamidae	*Chimarra*		1	65		
		Dolophilodes	22				10
		Wormaldia	2				
	Rhyachophilidae	*Rhyacophila*	8				1
	Uenoidae	*Neophylax*			1		

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

Class: Order	Family	Family/*Genus*	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Amphipoda	Gammaridae	*Gammarus*		8		
	Talitridae	*Hyalella*	2			
Coleoptera	Carabidae					1
	Dryopidae	*Helichus*			1	
	Elmidae	*Optioservus*	31	1	98	
		Oulimnious	2		14	
		Promoresia				1
		Stenelmis	22	83	1	
	Hydrophilidae	*Hydrobius*			1	
	Psephenidae	*Psephenus*	1	13		
	Ptilodactylidae	*Anchytarsus*	5			
Diptera	Chironomidae	Chironomidae	63	29	51	30
	Culcidae	*Mansonia*				1
	Empididae	*Chelifera*			1	
		Hemerodromia	1			
	Sciomyzidae	*Tetanocera*				1
	Simuliidae	*Prosimulium*	1			
		Simulium		1		
	Tabanidae	*Chrysops*	5			
	Tipulidae	*Antocha*		13		
		Dicranota	17		5	
		Hexatoma	2			
		Tipula			1	
Ephemeroptera	Baetidae	*Baetis*	6	29	1	
		Diphetor			1	
		Heterocloeon		13		
	Ephemerellidae	*Serratella*		10	1	
	Heptageniidae	*Leucrocuta*		4		
		Stenonema		4	12	
	Isonychiidae	*Isonychia*		4		
	Leptophlebiidae	*Habrophlebiodes*	2			
		Paraleptophlebia			2	
Gastropoda	Valvatidae	*Valvata*				1
Haplotaxida	Naididae				1	1
Hemiptera	Veliidae	*Microvelia*			1	
Hydrachnidia	Sperchoniidae	*Sperchon*			1	
Megaloptera	Corydalidae	*Corydalus*		1		
		Nigronia				1
Nematomorpha	Gordidae	*Gordius*		2		

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

Class: Order	Family	Family/*Genus*	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Odonata	Aeshnidae	*Boyeria*			2	
	Coenagrionidae	*Argia*		1		
	Gomphidae	*Lanthus*			4	
		Stylogomphus			1	
Plecoptera	Leuctridae	*Leuctra*	1		21	
	Peltoperlidae	*Tallaperla*			3	
	Perlidae	*Acroneuria*	1		1	
Trichoptera	Brachycentridae	*Brachycentrus*		7		
	Hydropsychidae	*Ceratopsyche*	1	31	3	
		Cheumatopsyche	3	4	14	5
		Hydropsyche	5	13		3
		Macrostemum		13		
	Hydroptilidae	*Leucotrichia*		14		
	Philopotamidae	*Chimarra*	1			
	Polycentropodidae	*Polycentropus*			1	

Table C3. Macroinvertebrate Data for River Sites

Class: Order	Family	Family/*Genus*	CHEM 12.0	COWN 1.0	COWN 2.2	SUSQ 44.5
Amphipoda	Gammaridae	*Gammarus*		1	2	16
	Talitridae	*Hyalella*		2		
Bivalvia	Corbiculidae	*Corbicula*				6
	Sphaeriidae	*Pisidium*	6			
Coleoptera	Elmidae	*Optioservus*	1			
		Stenelmis		3	1	65
	Gyrinidae	*Dineutus*	1	2		
	Hydrophilidae	*Berosus*			1	
	Psephenidae	*Psephenus*		14		11
Diptera	Chironomidae	Chironomidae	80	102	118	3
	Empididae	*Hemerodromia*			2	
	Simuliidae	*Prosimulium*	9			
		Simulium	47	8	3	
Ephemeroptera	Baetidae	*Acentrella*		2		
		Baetis	25			7
		Heterocloeon	7			22
	Caenidae	*Caenis*	1		1	
	Ephemerellidae	*Serratella*	13	1		
	Heptageniidae	*Leucrocuta*				3
		Stenonema	6	30	8	8
	Isonychiidae	*Isonychia*	44			13
	Leptophlebiidae	*Choroterpes*				
Haplotaxida	Haplotaxidae	*Haplotaxis*				2
Isopoda	Assellidae	*Caecidotea*		2	13	
Megaloptera	Corydalidae	*Corydalus*	5	24		2
		Nigronia	1			
Nematomorpha	Gordidae	*Gordius*			1	
Odonata	Coenagrionidae	*Argia*	1	6	1	
Pharyngobdellida	Erpobdellidae	*Erpobdella*				7
Trichoptera	Hydropsychidae	*Ceratopsyche*	41	10	2	
		Cheumatopsyche	31	59	51	17
		Hydropsyche	10			10
		Macrostemum	6			32
	Hydroptilidae	*Agraylea*			1	
		Hydroptila	1			
	Philopotamidae	*Chimarra*	29	4		85
	Polycentropodidae	*Neureclipsis*			3	

Table C3. Macroinvertebrate Data for River Sites—Continued

Class: Order	Family	Family/*Genus*	SUSQ 289.1	SUSQ 340.0	SUSQ 365.0	TIOG 10.8
Amphipoda	Gammaridae	*Gammarus*	8		1	
Bivalvia	Sphaeriidae	*Pisidium*	1			
Coleoptera	Elmidae	*Optioservus*	3	32	28	1
		Oulimnious	8	2	1	
		Promoresia			1	
		Stenelmis	78	60	83	
	Gyrinidae	*Dineutus*		1		1
	Psephenidae	*Psephenus*	19	19	15	1
Decapoda	Cambaridae	*Orconectes*	1			
Diptera	Chironomidae	Chironomidae	31	26	32	61
	Empididae	*Hemerodromia*		1		
	Simuliidae	*Prosimulium*	1			3
		Simulium	38	2		24
Ephemeroptera	Baetidae	*Acentrella*		9	1	9
		Baetis	20	2	20	7
		Heterocloeon			3	2
	Caenidae	*Caenis*	1		4	
	Ephemerellidae	*Serratella*	3	1	4	
	Heptageniidae	*Leucrocuta*	1		9	
		Rhithrogena			3	
		Stenonema	6	1	10	15
	Isonychiidae	*Isonychia*	56	9	19	39
	Leptophlebiidae	*Choroterpes*			1	
	Polymitarcyidae	*Ephoron*			1	
	Potamanthidae	*Anthopotamus*		5		
	Tricorythidae	*Tricorythodes*		1		
Gastropoda	Pleuroceridae	*Leptoxis*			4	
Lepidoptera	Pyralidae	*Petrophila*	1			1
Megaloptera	Corydalidae	*Corydalus*			3	16
		Nigronia				1
Odonata	Gomphidae	*Ophiogomphus*				1
Plecoptera	Perlidae	*Acroneuria*			2	
		Agnetina	4	8	20	
Trichoptera	Brachycentridae	*Micrasema*		1		
	Glossosomatidae	*Glossosoma*			2	
		Protoptila		1		
	Hydropsychidae	*Ceratopsyche*	14	6	12	33
		Cheumatopsyche	14	3	2	12
		Hydropsyche	11		4	
		Macrostemum	9	71	6	51
	Philopotamidae	*Chimarra*	55	5	24	15
	Psychomyiidae	*Psychomyia*			1	1

Table C4. Macroinvertebrate Data for Group 3 Sites

Class: Order	Family	Family/*Genus*	BABC	BEAG	BILL	BIRD	BISC
Coleoptera	Psephenidae	*Psephenus*		2	40	1	
Diptera	Chironomidae	Chironomidae	44	12	16	18	45
	Empididae	*Hemerodromia*				3	
		Roederiodes		1			
	Sciomyzidae	*Antichaeta*				2	
	Simuliidae	*Prosimulium*		2			1
		Simulium	2	1	5		32
	Tipulidae	*Erioptera*					1
		Hexatoma	1	1		2	
		Limnophila		1			
		Pilaria	3				
		Tipula		7		1	
Ephemeroptera	Ameletidae	*Ameletus*	2	51		9	3
	Baetidae	*Acentrella*	20	1	51		6
		Acerpenna	23		4		
		Baetis			8		11
	Ephemerellidae	*Drunella*	2			79	
		Ephemerella		1	2	1	
	Heptageniidae	*Cinygmula*	1				
		Epeorus	4	29	27	37	1
		Stenacron			1		
	Leptophlebiidae	*Paraleptophlebia*			46		3
Haplotaxida	Lumbricidae					1	
Lepidoptera	Pyralidae	*Crambus*		1			
Odonata	Gomphidae	*Ophiogomphus*				2	
Plecoptera	Chloroperlidae	*Haploperla*	28				
		Sweltsa	6	4	5	8	
	Leuctridae	*Leuctra*	44	15	5	8	
	Nemouridae	*Amphinemura*	40	47	16	58	113
		Ostrocerca		1			
	Perlidae	*Acroneuria*	1	1			
		Agnetina			12		
	Perlodidae	*Clioperla*				1	
		Isoperla	26	6	3	3	4
		Yugus		26		2	
Trichoptera	Hydropsychidae	*Ceratopsyche*			1		
		Diplectrona		2			
	Philopotamidae	*Dolophilodes*				1	
		Wormaldia		3			
	Rhyachophilidae	*Rhyacophila*	1	1			
	Uenoidae	*Neophylax*				4	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BRIG	BULK	CAMP	COOK	DEEP
Amphipoda	Talitridae	*Hyalella*					1
Branchiobdellida	Brachiobdellidae	*Cambarincola*				1	
Coleoptera	Elmidae	*Optioservus*				23	1
		Oulimnious					1
		Stenelmis	3		1	3	1
	Psephenidae	*Ectopria*				1	3
		Psephenus			30	8	
	Ptilodactylidae	*Anchytarsus*					1
Diptera	Chironomidae	Chironomidae	74	17	10	37	24
	Empididae	*Hemerodromia*	1		2		
	Psychodidae	*Pericoma*				1	
	Simuliidae	*Prosimulium*		10	35		3
		Simulium	3		13		1
	Tabanidae	*Chrysops*		1		1	1
	Tipulidae	*Dicranota*					7
		Hexatoma	1		9	1	2
		Pilaria		1		3	1
Ephemeroptera	Ameletidae	*Ameletus*	4	19	1	2	
	Baetidae	*Acentrella*	8		6		1
		Acerpenna			1	1	
		Baetis	7	3			2
	Ephemerellidae	*Ephemerella*			3	7	4
	Ephemeridae	*Ephemera*				1	
	Heptageniidae	*Cinygmula*	19			3	
		Epeorus	80	40	26	6	4
		Stenacron			2	1	
		Stenonema				3	36
	Leptophlebiidae	*Habrophlebiodes*					7
		Paraleptophlebia	5	7	1	4	
Haplotaxida	Lumbricidae			1			
Lepidoptera	Pyralidae	*Crambus*		1			
Megaloptera	Corydalidae	*Nigronia*				1	5
Nematomorpha	Gordidae	*Gordius*			1		
Odonata	Gomphidae	*Stylogomphus*				1	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BRIG	BULK	CAMP	COOK	DEEP
Plecoptera	Chloroperlidae	*Haploperla*	4				
		Suwallia			3	1	
		Sweltsa	8	1	1	10	1
	Leuctridae	*Leuctra*		25	4	15	2
	Nemouridae	*Amphinemura*	9	81	57	71	43
		Ostrocerca	1				
	Perlidae	*Acroneuria*		1	2	3	2
		Agnetina			4	4	
		Neoperla			1		
	Perlodidae	*Isoperla*	2	24	16	7	
Trichoptera	Hydropsychidae	*Ceratopsyche*	8		18	3	
		Cheumatopsyche				3	2
		Diplectrona		8	1	12	
		Hydropsyche				3	15
	Philopotamidae	*Chimarra*					44
		Dolophilodes					1
		Wormaldia		1			
	Polycentropodidae	*Polycentropus*					1
	Rhyachophilidae	*Rhyacophila*		16		2	5
	Uenoidae	*Neophylax*		1	1	2	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	DENT	DRYB	LWAP	PARK	PRIN
Amphipoda	Gammaridae	*Gammarus*		1			
	Talitridae	*Hyalella*	1				
Coleoptera	Dytiscidae	*Agabus*		1			1
	Elmidae	*Stenelmis*	20				
	Psephenidae	*Ectopria*	1				
Diptera	Chironomidae	Chironomidae	110	233	17	20	36
	Dolichopodidae				2		
	Empididae	*Chelifera*	1				
		Hemerodromia	3		1	4	
	Simuliidae	*Prosimulium*	2	4	1	1	3
		Simulium	17	4	7	2	1
	Tabanidae	*Chrysops*	1				
	Tipulidae	*Antocha*			1		
		Hexatoma			1	8	1
		Pilaria	1				
Ephemeroptera	Ameletidae	*Ameletus*		3	16	10	34
	Baetidae	*Acentrella*				2	31
		Acerpenna			6	5	
		Baetis		3			12
	Ephemerellidae	*Drunella*			4		
		Ephemerella			3	1	
	Heptageniidae	*Cinygmula*			16	5	16
		Epeorus		1	44	77	30
		Stenacron	2				
		Stenonema	18			1	1
	Leptophlebiidae	*Paraleptophlebia*			1		10
Haplotaxida	Naididae			3			
Lepidoptera	Pyralidae	*Crambus*				1	
Plecoptera	Chloroperlidae	*Haploperla*				7	
		Suwallia			1		
		Sweltsa			17	21	2
	Leuctridae	*Leuctra*			3	11	1
	Nemouridae	*Amphinemura*	12	2	75	41	13
		Ostrocerca			6	1	
	Perlidae	*Acroneuria*	1			3	
	Perlodidae	*Isoperla*			2	18	
Trichoptera	Hydropsychidae	*Ceratopsyche*				1	
		Cheumatopsyche	5			1	
		Diplectrona	3			1	
		Hydropsyche	1				
	Lepidostomatidae	*Lepidostoma*				1	
	Philopotamidae	*Chimarra*	4				
		Wormaldia					1
	Polycentropodidae	*Polycentropus*					1
	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*			17	1	1	
		Oulimnious						1
	Psephenidae	*Ectopria*			5			
		Psephenus	2	41		31		
Diptera	Chironomidae	Chironomidae	9	14	26	8	181	8
	Empididae	*Chelifera*			3			
		Hemerodromia		9			14	
		Trichoclinocera						3
	Simuliidae	*Prosimulium*	1			8		2
		Simulium	2			11		
	Tabanidae	*Chrysops*			10			
	Tipulidae	*Antocha*			2		1	
		Hexatoma	11	6		4		9
		Pilaria			7			
		Tipula	3	1	2			
Ephemeroptera	Ameletidae	*Ameletus*	4		4			10
	Baetidae	*Acentrella*		1				
		Acerpenna	1					3
		Baetis		1		4		
		Diphetor		1				
	Ephemerellidae	*Ephemerella*		5		5		2
	Ephemeridae	*Ephemera*			2			
	Heptageniidae	*Cinygmula*	2	11		4		
		Epeorus	74	73		24		68
		Leucrocuta		1				
		Stenacron			1			
		Stenonema			7			
	Isonychiidae	*Isonychia*				1		
	Leptophlebiidae	*Paraleptophlebia*	1	6		14		
Megaloptera	Corydalidae	*Nigronia*		1	1			
	Sialidae	*Sialis*			2			
Nematomorpha	Gordidae	*Gordius*	1					
Odonata	Aeshnidae	*Boyeria*			1			
	Gomphidae	*Lanthus*						1
Ostracoda							2	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Plecoptera	Chloroperlidae	*Haploperla*	61	9		1		
		Suwallia		3				3
		Sweltsa	25	10	5	4		15
	Leuctridae	*Leuctra*	10	4	28	1		32
	Nemouridae	*Amphinemura*	56	9	90	102		16
		Ostrocerca						25
	Peltoperlidae	*Peltoperla*			2			
	Perlidae	*Acroneuria*	1	2	8			
		Agnetina				4		
	Perlodidae	*Clioperla*	2					
		Isoperla	12	16	3	14		1
		Yugus						27
Trichoptera	Hydropsychidae	*Ceratopsyche*			3	5		
		Cheumatopsyche				2	23	
		Diplectrona			42			3
		Hydropsyche					5	
	Philopotamidae	*Wormaldia*			2	1		17
	Polycentropodidae	*Polycentropus*		1				
	Rhyachophilidae	*Rhyacophila*			13			
	Uenoidae	*Neophylax*		1				3

APPENDIX D

WATER CLASSIFICATION AND BEST USAGE RELATIONSHIPS

New York:

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

Class A:

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

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

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

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

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

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

Pennsylvania:

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

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

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

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

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

Maryland:

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

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

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

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