ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

Monitoring Report No. 14
July 1, 1999, Through June 30, 2000

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Susquehanna River Basin Commission

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ASSESSMENT OF INTERSTATE STREAMS IN THE SUSQUEHANNA RIVER BASIN

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July 1, 1999, Through June 30, 2000

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ABSTRACT

The Susquehanna River Basin Commission (SRBC) used a water quality index (WQI) and the U.S. Environmental Protection Agency's (USEPA's) Rapid Bioassessment Protocol III (RBP III) to assess the chemical water quality, biological conditions, and physical habitat of 51 sample sites in the Interstate Streams Water Quality Network from July 1, 1999, to June 30, 2000. Only 39 out of 2,662 parameter observations exceeded water quality standards. Assessment results indicate that approximately 26 percent of the sites supported nonimpaired biological communities. Water quality impacts in the New York-Pennsylvania border streams were mostly from metals, while Pennsylvania-Maryland border sites suffered from high nutrient levels.

A Seasonal Kendall Test was performed to determine trends and their magnitudes for 1986-2000. Overall, an increasing trend was found in total chloride, while decreasing trends were found for total ammonia, total phosphorus, total sulfate, total iron, total manganese, and WQI.

A Pearson Product Moment Correlation was performed on WQI, RBP III score, and physical habitat score. A significant ($p<0.05$) positive correlation occurred between biological community and physical habitat score for New York-Pennsylvania sites and for river sites. These relationships, while based on a small number of observations, are presented as subjects to be considered by resource managers, elected officials, and local interest groups.

INTRODUCTION

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

The interstate water quality monitoring program includes periodic collection of water and biological samples from, as well as physical habitat assessments of, interstate streams. 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 1 to June 30. This report is presented for fiscal year 2000, which covers July 1, 1999, to June 30, 2000.

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. At 45 of these locations, streams flow from New York into Pennsylvania. Twenty-two reaches cross from Pennsylvania into New York, 15 from Pennsylvania into Maryland, and nine from Maryland into Pennsylvania. Many streams are small, and 32 are unnamed.

METHODS

Field and Laboratory Methods

Sampling frequency

In Water Year 1989, the interstate streams were divided into three groups, according to the degree of water quality impairment, historical water quality impacts, and potential fordegradation. 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. Group 1 streams are sampled quarterly for water chemistry and annually for benthic macroinvertebrates and habitat information. During fiscal year 2000, New York-Pennsylvania streams were sampled in July, November, February, and May. Pennsylvania-Maryland stations were sampled in August, November, February, and May. Benthic macroinvertebrates were collected and habitat assessments were performed in Group 1 streams during July and August 1999.

Streams judged to have a moderate potential for impacts were assigned to Group 2. Water quality samples, benthic macroinvertebrate samples, and physical habitat information are obtained from Group 2 stations annually, preferably during base flow conditions in the summer months. During fiscal year 2000, water chemistry, macroinvertebrate, and physical habitat information were collected during July and August 1999.

Streams judged to have a low potential for impacts were assigned to Group 3. During fiscal year 2000, the biological and habitat conditions of these streams were assessed during May 2000. Stream field chemistry parameters also were measured on Group 3 streams at the time of biological sampling.

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.
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.
Red House/Beagle Hollow	3	N.Y.→Pa.
Russell Run	3	N.Y.→Pa.
Sackett Creek	3	Pa.→ N.Y.
Seeley Creek	1	Pa.→ N.Y.
South Creek	2	Pa.→ N.Y.
Snake 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 Cowanesque River	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.
1 Unnamed tributary	3	N.Y.→Pa.→N.Y.

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	2	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.

New York-Pennsylvania border and Pennsylvania-Maryland border stream stations sampled during fiscal year 2000 are listed in Tables 2 and 3, respectively, and are depicted in Figures 1 through 4.

Stream discharge

Stream discharge was measured at all Group 1 and 2 stations unless high streamflows made access impossible. Several stations are located near U.S. Geological Survey (USGS) streamgages. These stations include the following: the Susquehanna River at Windsor, N.Y., Kirkwood, N.Y., Sayre, Pa., Marietta, Pa., and Conowingo, Md.; the Chemung River at Chemung, N.Y.; the Tioga River at Lindley, N.Y.; and the Cowanesque River at Lawrenceville, Pa. Recorded stages from USGS gaging stations and rating curves were used to determine instantaneous discharges in cubic feet per second (cfs). Instantaneous discharges for stations not located near USGS gaging stations were measured at the time of sampling, using standard USGS procedures. Stream discharges are tabulated according to station name and date in Appendix A.

Water samples

Water samples were collected at each of the Group 1 and 2 sites to measure nutrient and metal concentrations. Chemical and physical parameters monitored are listed in Table 4. Water samples were collected using a depth-integrating sampler. Composite samples were obtained by collecting eight depth-integrated samples across the stream channel and combining them in a churn splitter that was previously rinsed with distilled water. Water samples were thoroughly mixed in the churn splitter and collected in 250-ml bottles. One whole-water sample and one filtered sample were collected for nutrient analysis. A whole water sample and a filtered sample were collected in acid-rinsed bottles and fixed with concentrated nitric acid (HNO3) for metal analysis. A whole water sample and a filtered water sample were collected and fixed with concentrated sulfuric acid (H_2SO_4) to analyze total and dissolved ammonia, phosphorus, and orthophosphate. A cellulose acetate filter with 0.45-micrometer pore size was used to obtain the filtrate for laboratory analysis. The samples were chilled on ice and sent to the Pennsylvania Department of Environmental Protection (Pa. DEP), Bureau of Laboratories in Harrisburg, Pa., within 24 hours of collection.

Field chemistry

Temperature, dissolved oxygen, conductivity, pH, alkalinity, and acidity were measured at all sites 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 0.02 N sulfuric acid. Acidity was measured by titrating a known volume of sample water to pH 8.3 with 0.02N sodium hydroxide (NaOH).

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
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
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

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

Station	Stream and Location	Monitoring Group	Rationale
PARK	Parks Creek, Litchfield, N.Y.	3	Monitor for potential impacts
PRIN	Prince Hollow Run Cadis, Pa.	3	Monitor for potential impacts
REDH	Red House Run, Osceola, Pa.	3	Monitor for potential impacts
RUSS	Russell Run, Windham, Pa.	3	Monitor for potential impacts
SACK	Sackett Creek, Nichols, N.Y.	3	Monitor for potential impacts
SEEL 10.3	Seeley Creek, Seeley Creek, N.Y.	1	Monitor for potential water quality impacts
SMIT	Smith Creek, East Lawrence, Pa.	3	Monitor for potential impacts
SNAK 2.3	Snake Creek, Brookdale, Pa.	2	Monitor for potential water quality impacts
SOUT 7.8	South Creek, Fassett, Pa.	2	Monitor for potential water quality impacts
STRA	Strait Creek, Nelson, Pa.	3	Monitor for potential impacts
SUSQ 365.0	Susquehanna River, Windsor, N.Y.	1	Large drainage area (1,882 sq. mi.); municipal discharges from Cooperstown, Sidney, Bainbridge, and Oneonta, N.Y.
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, Pa.
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

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

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

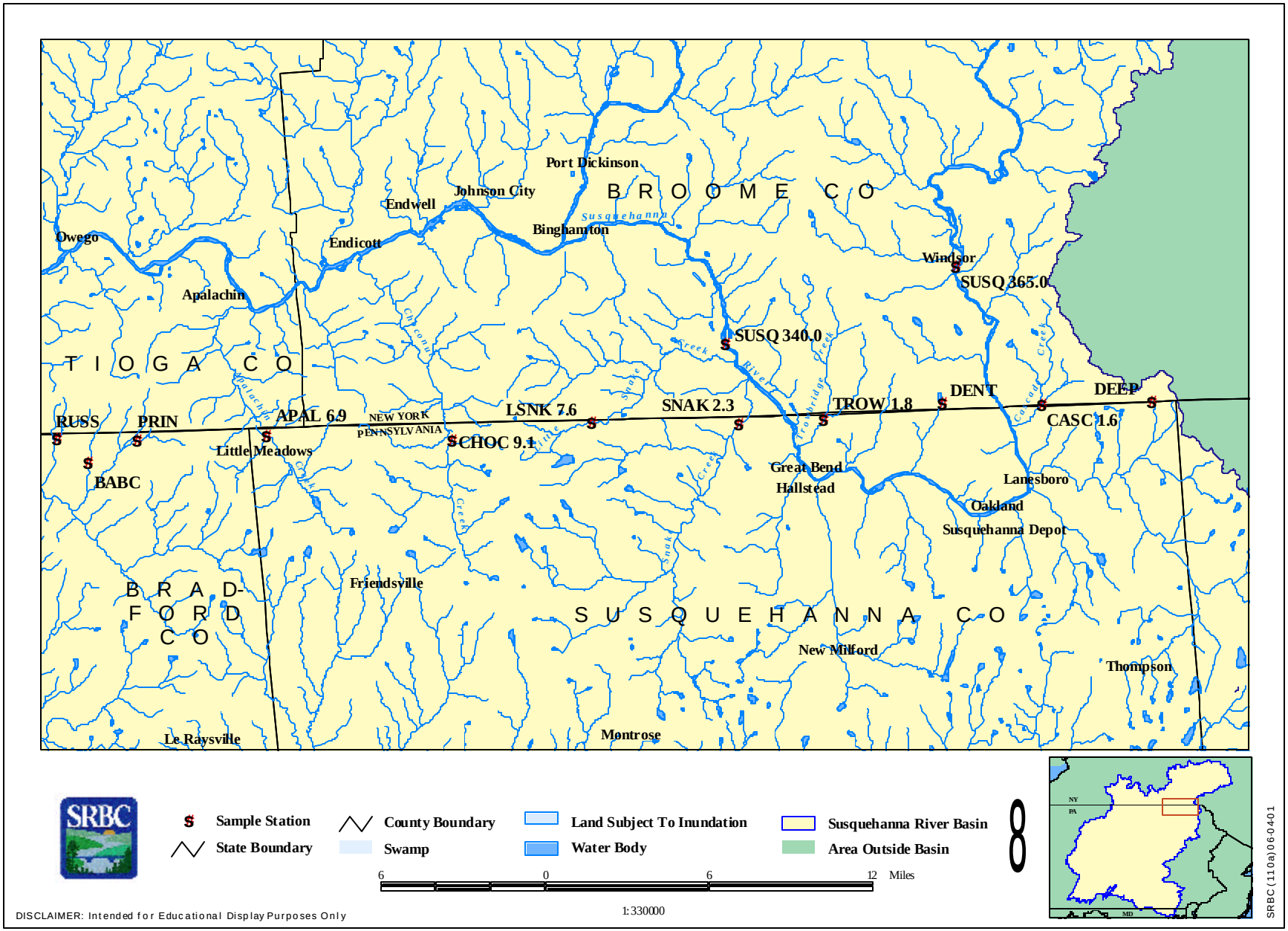

Figure 1. Interstate Streams Along the New York-Pennsylvania Border Between Russell Run and Deep Hollow Run

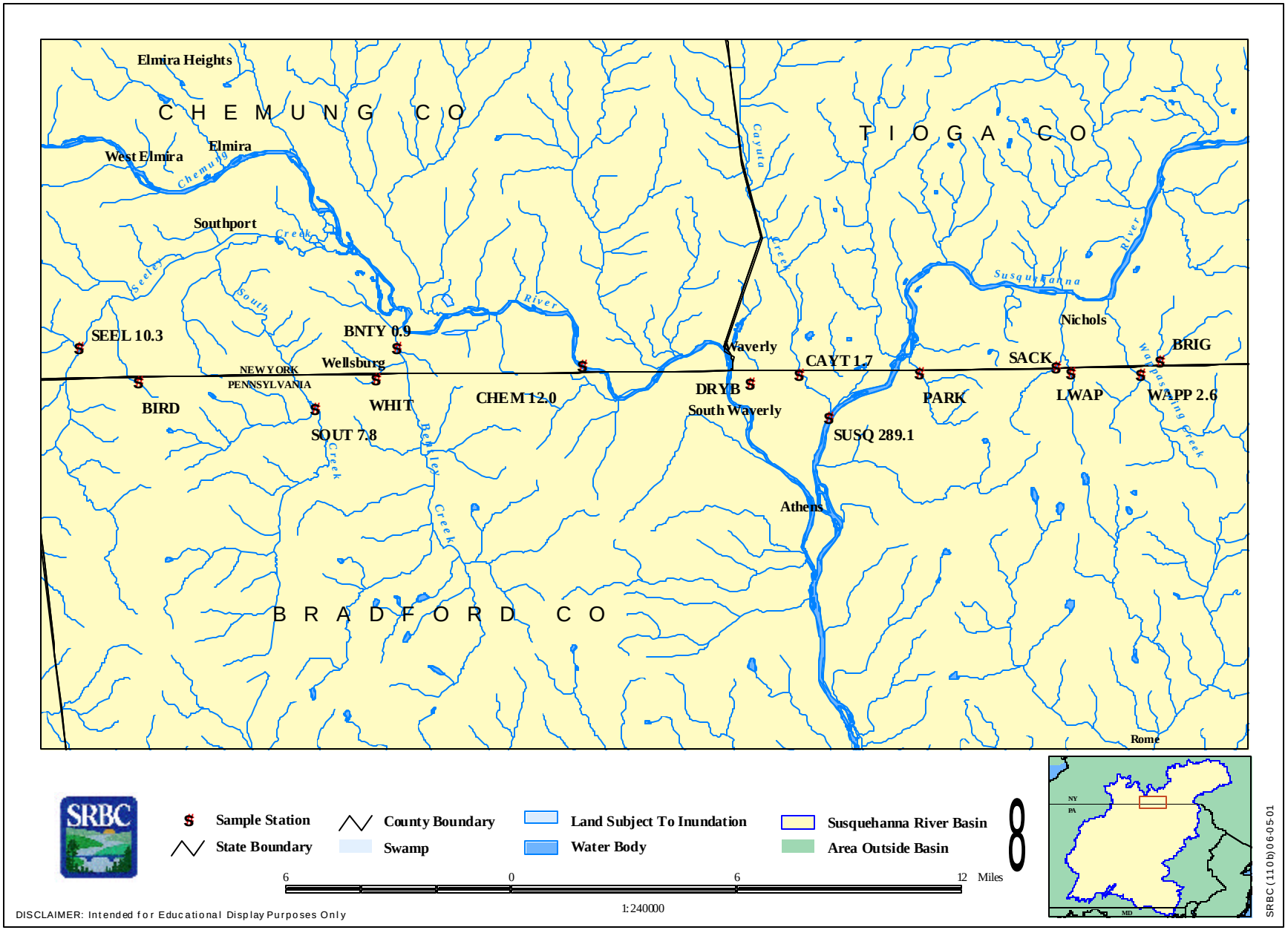

Figure 2. Interstate Streams Along the New York-Pennsylvania Border Between Seeley Creek and Briggs Hollow Run

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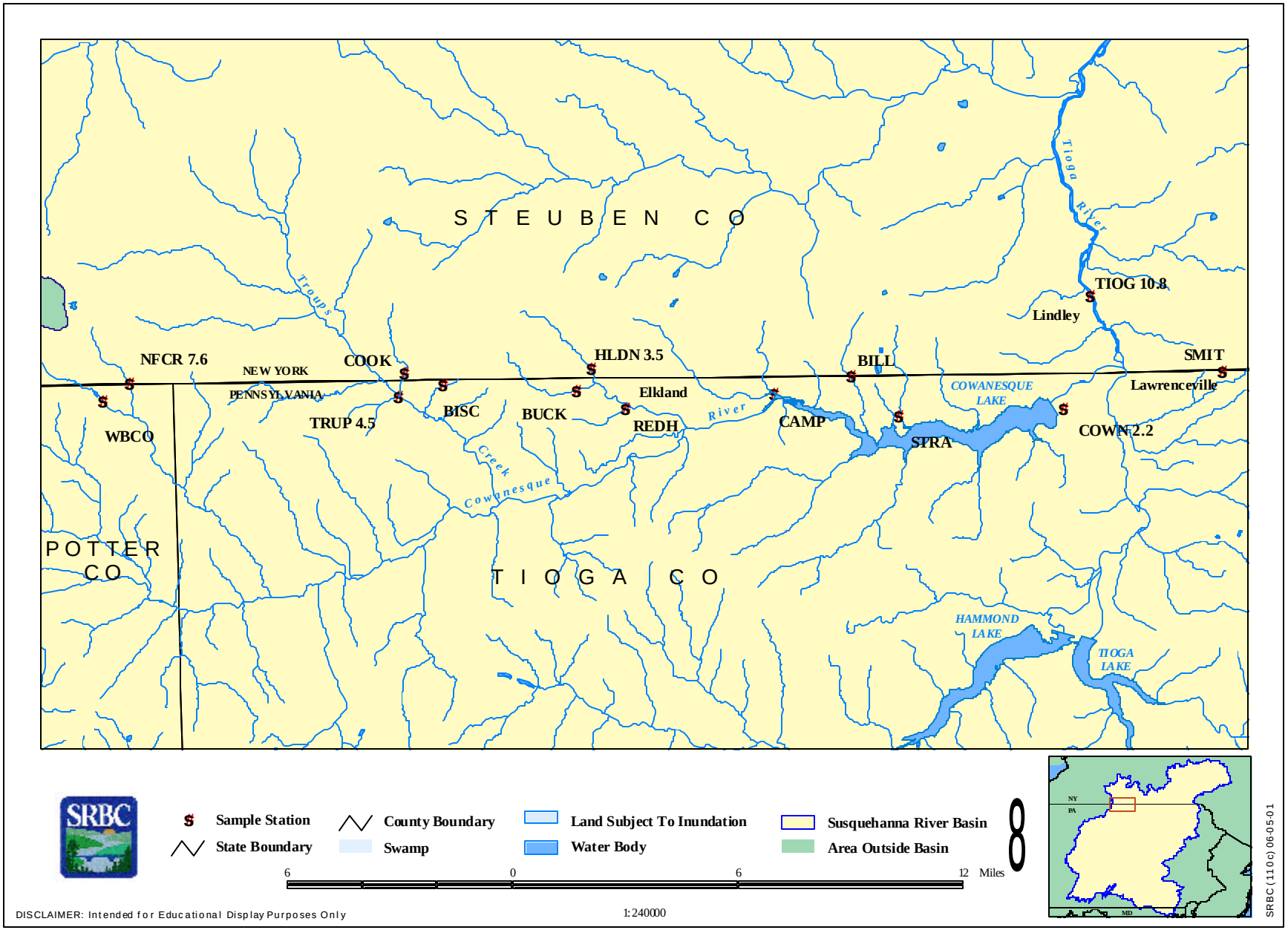

Figure 3. Interstate Streams Along the New York-Pennsylvania Border Between White Branch Cowanesque River and Smith Creek

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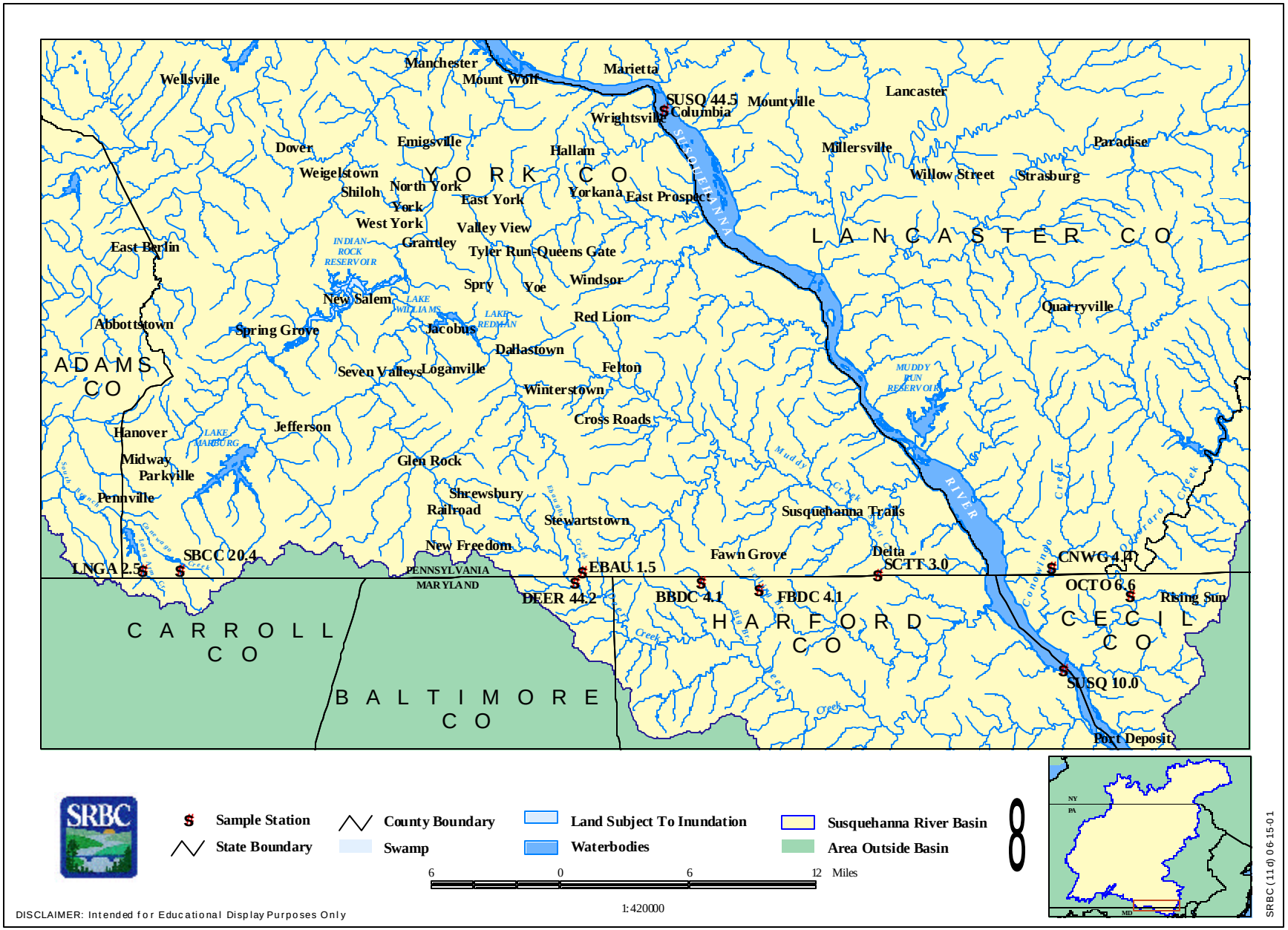

Figure 4. Interstate Sreams Along the Pennsylvania-Maryland Border

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
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 19 and August 5, 1999 and from Group 3 streams between May 15 and 23, 2000. 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 Plafkin and others (1989). Sampling was performed using a 1-meter-square kick screen with size No. 30 mesh. The kick screen was stretched across the current to collect organisms dislodged from riffle/run areas by physical agitation of the stream substrate. Two kick screen samples were collected from a representative riffle/run at each station. The two samples were composited and preserved in isopropyl alcohol for later laboratory analysis.

In the laboratory, composite samples were sorted into 100-organism subsamples using a gridded pan and a random numbers table. The organisms contained in the subsamples were identified to genus (except Chironomidae) and enumerated. 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 Plafkin and others (1989). Eleven habitat parameters were field-evaluated at each site and used to calculate a site-specific habitat assessment score. Habitat parameters were identified as primary, secondary, or tertiary parameters, based on their contribution to habitat quality. Primary parameters, stream habitat features that have the greatest direct influence on the structure of aquatic macroinvertebrate communities, were evaluated on a scale of 0 to 20 and included stream bottom substrate, embeddedness, and velocity/depth diversity. Secondary parameters included stream channel morphology characteristics, such as pool/riffle ratio, pool quality, riffle/run quality, and channel alteration, and were scored on a scale of 0 to 15. Tertiary parameters, such as streambank erosion, streambank stability, streamside vegetative cover, and riparian buffer zone width, characterized riparian and bank conditions and were scored on a scale of 0 to 10. 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, and acidity were not factored into the percentile scores. The rank of each chemical analysis was divided by the total number of observations in the group to obtain a percentile. The WQI score was calculated by averaging all percentile ranks for each sample. Water quality index 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 49.

Reference category designations

Four reference sites were included in this study. These four sites represented the best

Table 5. Criteria Used to Evaluate Physical Habitat

Habitat Parameter	Excellent	Good	Fair	Poor
1 Bottom Substrate	Greater than 50% cobble, gravel, submerged logs, undercut banks, or other stable habitat. **(16-20)**	30-50% cobble, gravel, or other stable habitat. Adequate habitat. **(11-15)**	10-30% cobble, gravel, or other stable habitat. Habitat availability is less than desirable. **(6-10)**	Less than 10% cobble, gravel, or other stable habitat. Lack of habitat is obvious. **(0-5)**
2 Embeddedness (a)	Larger substrate particles (e.g., gravel, cobble, boulders) are between 0 and 25% surrounded by fine sediment. **(16-20)**	Larger substrate particles (e.g., gravel, cobble, boulders) are between 25 and 50% surrounded by fine sediment. **(11-15)**	Larger substrate particles (e.g., gravel, cobble, boulders) are between 50 and 75% surrounded by fine sediment. **(6-10)**	Larger substrate particles (e.g., gravel, cobble, boulders) are over 75% surrounded by fine sediment. **(0-5)**
3 Velocity/Depth Diversity	Four habitat categories consisting of slow (<1.0 ft/s), deep (>1.5 ft); slow, shallow (<1.5 ft); fast (> 1.0 ft/s), deep; fast, shallow habitats are all present. **(16-20)**	Only three of the four habitat categories are present. **(11-15)**	Only two of the four habitat categories are present. **(6-10)**	Dominated by one velocity/depth category (usually pools). **(0-5)**
4 Pool/Riffle Ratio (or Run/Bend)	Distance between riffles divided by mean wetted width equals 5-7. Stream contains a variety of habitats including deep riffles and pools. **(12-15)**	Distance between riffles divided by mean wetted width equals 7-15. Adequate depth in pools and riffles. **(8-11)**	Distance between riffles divided by mean wetted width equals 15-25. Stream contains occasional riffles. **(4-7)**	Distance between riffles divided by mean wetted width >25. Stream is essentially straight with all flat water or shallow riffle. Poor habitat. **(0-3)**
5 Pool Quality (b)	Pool habitat contains both deep (>1.5 ft) and shallow areas (<1.5 ft) with complex cover and/or depth greater than 5 ft. **(12-15)**	Pool habitat contains both deep (>1.5 ft) and shallow (<1.5 ft) areas with some cover present. **(8-11)**	Pool habitat consists primarily of shallow (<1.5 ft) areas with little cover. **(4-7)**	Pool habitat rare with maximum depth <0.5 ft, or pool habitat absent completely. **(0-3)**
6 Riffle/Run Quality (c)	Riffle/run depth generally >8 in. and consisting of stable substrate materials and a variety of current velocities. **(12-15)**	Riffle/run depth generally 4-8 in. and with a variety of current velocities. **(8-11)**	Riffle/run depth generally 1-4 in.; primarily a single current velocity. **(4-7)**	Riffle/run depth <1 in.; or riffle/run substrates concreted. **(0-3)**
7 Channel Alteration (d)	Little or no enlargement of islands or point bars, and/or no channelization. **(12-15)**	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present. **(8-11)**	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled with silt; and/or embankments on both banks. **(4-7)**	Heavy deposits of fine material, increased bar development; most pools filled with silt; and/or extensive channelization. **(0-3)**

Table 5. Criteria Used to Evaluate Physical Habitat—Continued

Habitat Parameter	Excellent	Good	Fair	Poor
8. Upper and Lower Streambank Erosion (e)	Stable. No evidence of erosion or of bank failure. Side slopes generally <30%. Little potential for future problems. **(9-10)**	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40% on one bank. Slight potential in extreme floods. **(6-8)**	Moderately unstable. Moderate frequency and size of erosional areas. Side slopes up to 60% in some areas. High erosion potential during extreme high flow. **(3-5)**	Unstable. Many eroded areas. Side slopes >60% common. "Raw" areas frequent along straight sections and bends. **(0-2)**
9. Upper and Lower Streambank Stability (e)	Over 80% of the streambank surface is covered by vegetation or boulders and cobble. **(9-10)**	50-79% of the streambank surface is covered by vegetation, gravel, or larger material. **(6-8)**	25-49% of the streambank surface is covered by vegetation, gravel, or larger material. **(3-5)**	Less than 25% of the streambank surface is covered by vegetation, gravel, or larger material. **(0-2)**
10. Streamside Vegetative Cover *(Both Banks)*	Dominant vegetation that provides stream shading, escape cover, and/or refuge for fish within the bankfull stream channel is shrub. **(9-10)**	Dominant vegetation that provides stream shading, escape cover, and/or refuge for fish within the bankfull stream channel is trees. **(6-8)**	Dominant vegetation that provides stream shading, escape cover, and/or refuge for fish within the bankfull stream channel is forbs and grasses. **(3-5)**	Over 50% of the streambank has no vegetation and dominant material is soil, rock, bridge materials, culverts, or mine tailings. **(0-2)**
11. Forested Riparian Buffer Zone Width (f) *(Least Forested Bank)*	Riparian area consists of all three zones of vegetation, Zones 1-3. (See zone descriptions (f). **(9-10)**	Riparian area consists of Zones 1 and 2. **(6-8)**	Riparian area is limited primarily to Zone 1. Zone 2 may be forested but is subject to disturbance (e.g. grazing, intensive forestry practices, roads). **(3-5)**	Riparian area lacks Zone 1 with or without Zones 2 and/or 3. **(0-2)**

(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) Pool Quality — 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. Within a category, higher scores are assigned to segments that have undercut banks, woody debris, or other types of cover for fish.

(c) Riffle/Run Quality — Rated based on the depth, complexity, and functional importance of riffle/run habitat in the segment, with highest scores assigned to segments dominated by deeper riffle/run areas, stable substrates, and a variety of current velocities.

(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, as well as recent sediment bar development. Sediment bars typically form on the inside of bends, below channel constrictions, and where stream gradient decreases. Bars tend to increase in depth and length with continued watershed disturbance. Ratings for this metric are based on the presence of artificial structures as well as the existence, extent, and coarseness of sediment bars, which indicate the degree of flow fluctuations and substrate stability.

(e) Upper and Lower Streambank Erosion and Stability — These parameters include the concurrent assessment of both the upper and lower banks. The upper bank is the land area from the break in the general slope of the surrounding land to the top of the bankfull channel. The lower bank is the intermittently submerged portion of the stream cross section from the top of the bankfull channel to the existing waterline.

(f) Forested Riparian Buffer Zone Width
- Zone 1: a 15-ft-wide buffer of essentially undisturbed forest located immediately adjacent to the stream.
- Zone 2: a 100-ft-wide buffer of forest, located adjacent to Zone 1, which may be subject to non-intensive forest management practices.
- Zone 3: a 20-ft-wide buffer of vegetation, located adjacent to Zone 2 that provides sediment filtering and promotes the formation of sheet flow runoff into Zone 2. Zone 3 may be composed of trees, shrubs, and/or dense grasses and forbs, which are subject to haying and grazing, as of as long as vegetation is maintained in vigorous condition.

Source: Modified from Plafkin and others, 1989.

available suite of conditions, in terms of habitat and biological community, 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 biological and habitat conditions in the Northern Appalachian Plateau and Uplands Ecoregion (Omernik, 1987). 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 biological and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987). The Susquehanna River (SUSQ 365) at Windsor, N.Y., was used as the reference site for all of the Susquehanna River main stem samples, as well as for Cowanesque River, Chemung River, and Tioga River sites. Cook Hollow near Austinburg, Pa., served as the reference site for the Group 3 sites as it had the best biological and habitat conditions of these sites.

Biological and physical habitat conditions

Benthic macroinvertebrate samples were assessed using procedures described by Plafkin and others (1989). Using this method, staff calculated a series of biological indexes for a stream and compared them to a nonimpaired reference station in the same region to determine the degree of impairment. The metrics used in this survey are summarized in Table 6. Metrics 1, 3, 4, 6, and 8 were taken directly from Plafkin and others (1989). Metric 2 (Shannon Diversity Index) was substituted for the recommended ratio of shredders to total macroinvertebrates, which required specialized sampling procedures. Metric 5 (Percent Trophic Similarity) was substituted for ratio of scrapers to filtering collectors and ratio of shredders to total metrics. Metric 7 (Percent Taxonomic Similarity) was substituted for the community loss metrics.

The 100-organism subsample data were used to generate scores for each of the eight metrics. Each metric score was then converted to a biological condition score, based on the percent similarity of the metric score, relative to the metric score of the reference site. The sum of the biological condition scores constituted the total biological score for the sample site, and total biological scores were used to assign each site to a biological condition category (Table 7). Habitat assessment scores of sample sites were compared to those of reference sites to classify each sample site into a habitat condition category (Table 8).

Trend analysis

A long-term trend has been defined as a steady increase or decrease of a variable over time, as opposed to a change (step trend), which is a sudden difference in water quality associated with an event (Bauer and others, 1984). As the interstate streams data are not useful for analyzing step trends due to large drainage areas and insufficient information about discharges, only long-term trends were included in this study. Trends analysis was performed on all Group 1 streams (see Table 1) for the following parameters: total suspended solids, total ammonia, total nitrogen, total phosphorus, total chloride, total sulfate, total iron, total aluminum, total manganese, and water quality index. The period covered for the trends analysis was April 1986 through June 2000.

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

Differences in flow also can produce trends in water quality. To adjust the concentrations to remove the effects of flow, a technique known as Locally Weighted Scatterplot Smoothing (LOWESS), described by Hirsch and others (1991), was used. This technique examines the relationship between concentration and flow and uses the residual (the actual concentration

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

Metric	Description
1. Taxonomic Richness (a)	The total number of taxa present in the 100 organism subsample
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
3. Hilsenhoff Biotic Index (a)	A measure of the overall pollution tolerance of a benthic macroinvertebrate community
4. EPT Index (a)	The total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa present in the 100 organism subsample
5. Percent Trophic Similarity (b)	A measure of the similarity between the functional feeding group composition of a sample site and its appropriate reference community
6. Ratio of EPT/Chironomids (a)	A measure of community balance and indicator of environmental stress
7. Percent Taxonomic Similarity (b)	A measure of the similarity between taxonomic composition of the sample site and its appropriate reference community
8. Percent Dominant Taxa (a)	A measure of community balance at the lowest positive taxonomic level

Sources: (a) Plafkin and others (1998); and
(b) calculated using software developed by Kovach (1993)

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

SAMPLING AND ANALYSIS

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TOTAL BIOLOGICAL SCORE DETERMINATION

Metric	Biological Condition Scoring Criteria			
	6	4	2	0
1. Taxonomic Richness (a)	>80 %	79 – 60 %	59 – 40 %	<40 %
2. Shannon Diversity Index (a)	>75 %	74 – 50 %	49 – 25 %	<25 %
3. Modified Hilsenhoff Biotic Index (b)	>85 %	84 – 70 %	69 – 50 %	<50 %
4. EPT Index (a)	>90 %	89 – 80 %	79 – 70 %	<70 %
5. Percent Trophic Similarity (c,d)	>75 %	74 – 50 %	49 – 25 %	<25 %
6. Ratio EPT/Chironomids (a)	>75 %	74 – 50 %	49 – 25 %	<25 %
7. Percent Taxonomic Similarity (d)	>45 %	44 – 33 %	32 – 20 %	<20 %
8. Percent Dominant Taxa (e)	<20 %	20 – 30 %	31 – 40 %	>40 %
Total Biological Score (f)				

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BIOASSESSMENT

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

(a) Score is study site value/reference site value X 100.
(b) Score is reference site value/study site value X 100.
(c) Functional Feeding Group Designations are summarized in Appendix B.
(d) Range of values obtained. A comparison to the reference station is incorporated in these indices.
(e) Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
(f) Total Biological Score = the sum of Biological Condition Scores assigned to each metric.
(g) Values obtained that are intermediate to the indicated ranges will require subjective judgment as to the correct placement into a biological condition category.

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

DETERMINATION OF HABITAT ASSESSMENT SCORES				
Parameter	Habitat Parameter Scoring Criteria			
	Excellent	Good	Fair	Poor
Bottom Substrate	20-16	15-11	10-6	5-0
Embeddedness	20-16	15-11	10-6	5-0
Velocity/Depth Diversity	20-16	15-11	10-6	5-0
Pool-Riffle (Run-Bend) Ratio	15-12	11-8	7-4	3-0
Pool Quality	15-12	11-8	7-4	3-0
Riffle/Run Quality	15-12	11-8	7-4	3-0
Channel Alteration	15-12	11-8	7-4	3-0
Upper and Lower Streambank Erosion	10-9	8-6	5-3	2-0
Upper and Lower Streambank Stability	10-9	8-6	5-3	2-0
Streamside Vegetative Cover	10-9	8-6	5-3	2-0
Forested Riparian Buffer Zone Width	10-9	8-6	5-3	2-0
Habitat Assessment Score (a)				

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

(a) Habitat Assessment Score = Sum of Habitat Parameter Scores

minus the expected concentration) to test for trend. The residual also is known as the flow-adjusted concentration (FAC). The residuals were tested for trends using the Seasonal Kendall Test. Detailed descriptions of the procedures for Seasonal Kendall Test and LOWESS can be found in Trends in Nitrogen, Phosphorus, and Suspended Sediment in the Susquehanna River Basin, 1974-93 (Edwards, 1995).

RESULTS

Water Quality

During fiscal year 2000, water quality in most interstate streams continued to meet designated use classes and water quality standards (Table 9, Appendix D). The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Only 39 out of 2,662 observations exceeded water quality standards.

Biological Communities and Physical Habitat

RBP III biological data for New York-Pennsylvania, Pennsylvania-Maryland, river sites, and Group 3 streams are summarized in Tables 11 through 14, respectively. A high rapid bioassessment protocol score indicates a low degree of impairment and a healthy macroinvertebrate population. RBP III results for each site can be found in the "Bioassessment of Interstate Streams" section, beginning on page 49.

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 12 sites located near or on the New York-Pennsylvania border. The biological communities of two (16.6 percent) of these streams were nonimpaired. Five streams were slightly impaired (41.7 percent), and five streams were moderately impaired (41.7 percent). Two of the New York-Pennsylvania sites had excellent habitats (16.6 percent). Five sites (41.7 percent) had supporting habitats, three sites (25 percent) had partially supporting habitats, and two sites (16.6 percent) had nonsupporting habitats. Holden Creek and North Fork Cowanesque River were not sampled due to drought conditions.

Pennsylvania-Maryland streams

The Pennsylvania-Maryland interstate streams included nine stations located on or near the Pennsylvania-Maryland border. One (11.1 percent) stream was designated nonimpaired, using RBP III protocol designations. Of the remaining eight sites, four sites (44.4 percent) were slightly impaired, and three sites (33.3 percent) were moderately impaired, while one site (11.1 percent) was designated severely impaired. Four (44.4 percent) of the Pennsylvania-Maryland border sites had excellent habitats. Three sites (33.3 percent) had partially supporting habitats, and two sites (22.2 percent) had nonsupporting habitats.

River sites

River sites consisted of nine stations located on the Susquehanna River, Chemung River, Cowanesque River, and Tioga River. One station (SUSQ 10.0) was not sampled for macro-invertebrates due to deep water and a lack of riffle habitat at the site. The biological communities of six sites (75 percent) were nonimpaired, one site (12.5 percent) was slightly impaired, and one site (12.5 percent) was moderately impaired. Five of the sites (62.5 percent) had excellent habitats. Of the remaining sites, two sites (25 percent) had supporting habitats, and one site (12.5 percent) had a partially supporting habitat.

Table 9. Stream Classifications

Stream	Pa. Classification *	N.Y. Classification *
Apalachin Creek	CWF	D
Babcock Run	CWF	C
Bentley Creek	WWF	D
Bill Hess Creek	WWF	C
Bird Creek	CWF	A
Biscuit Hollow	CWF	C
Briggs Hollow	CWF	C
Bulkley Brook	WWF	C
Camp Brook	WWF	C
Cascade Creek	CWF	C(T)
Cayuta Creek	WWF	B
Chemung River	WWF	C
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
Parks Creek	WWF	C
Prince Hollow Run	CWF	C
Red House Hollow	WWF	C
Russell Run	CWF	C
Sackett Creek	WWF	C
Seeley Creek	CWF	C
Smith Creek	WWF	C
Snake Creek	CWF	C
South Creek	TSF	C
Strait Creek	WWF	C
Susquehanna River @ Windsor		B
Susquehanna River @ Kirkwood	WWF	
Susquehanna River @ Waverly	WWF	B
Tioga River	WWF	C
Trowbridge Creek	CWF	C
Troups Creek	CWF	D
Wappasening Creek	CWF	C
White Branch Cowanesque River	WWF	C
White Hollow	WWF	C
	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	TSF-MF	IV-P
Scott Creek	TSF	
South Branch Conewago Creek	WWF	
Susquehanna River @ Marietta	WWF	
Susquehanna River @ Conowingo		I

* See Appendix D for stream classification descriptions

Table 10. Water Quality Standard Summary

Parameter	Number of Observations	Number Exceeding Standards	Standard
Alkalinity	92	4	Pa. aquatic life
Dissolved Iron	92	5	Pa. aquatic life
Total Iron	92 92	15 4	N.Y. health (water source) Pa. aquatic life
Total Manganese	92 92	1 2	N.Y. health (water source) Pa. water supply
pH	92 92	3 1	N.Y. aquatic life Md. aquatic life
Dissolved Oxygen	89 89	1 3	N.Y. aquatic life Pa. aquatic life

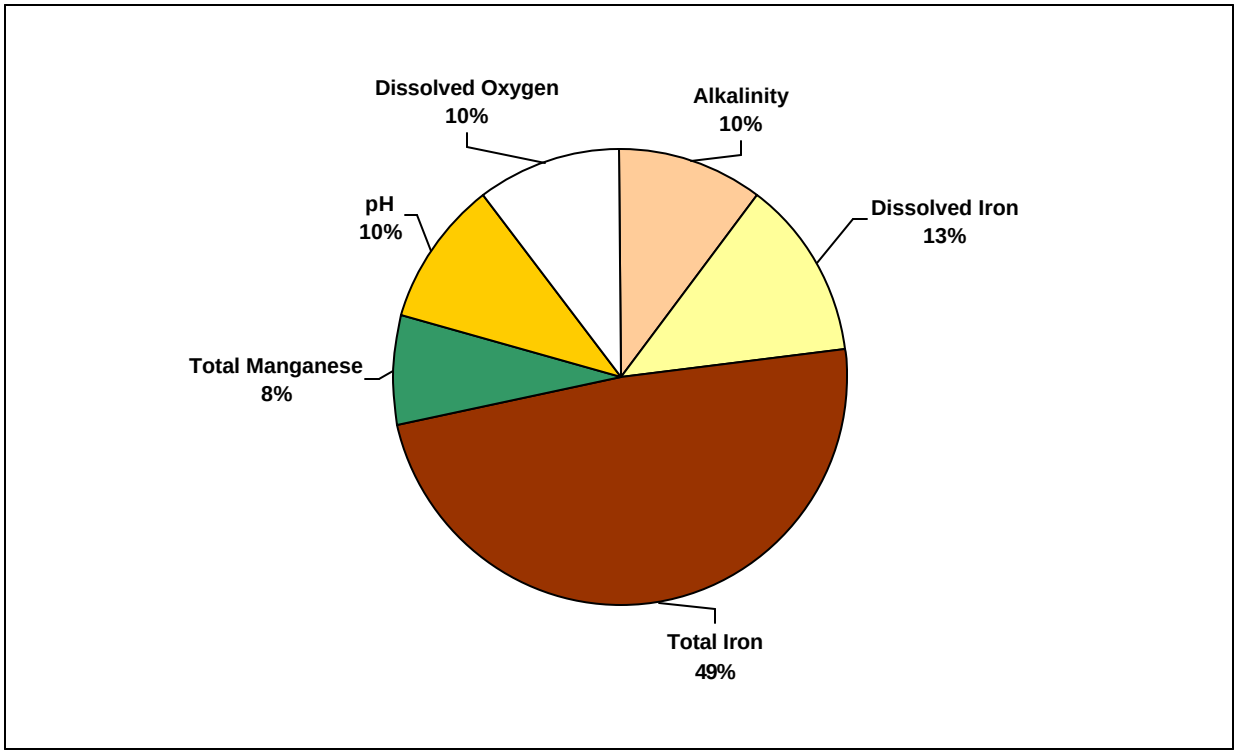


Figure 5. Parameters Exceeding Water Quality Standards

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

	SNAK 2.3	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1
Raw Summary						
Number of Individuals	139	140	122	146	139	142
% Shredders	0.7	0.7	0.0	2.7	0.0	0.0
% Collector-Gatherers	18.7	14.3	23.0	29.5	11.5	9.9
% Filterer-Collectors	59.0	37.1	52.5	30.1	43.2	45.1
% Scrapers	15.1	40.7	12.3	24.7	36.7	31.0
% Predators	6.5	7.1	12.3	13.0	8.6	14.1
Number of EPT Taxa	18	8	8	16	9	10
Number of EPT Individuals	112	55	71	69	78	75
Metric Scores						
Taxonomic Richness	27	15	15	27	16	18
Shannon Diversity Index	3.9	3.0	2.9	3.7	3.5	3.6
Modified Hilsenhoff Biotic Index	3.7	4.4	4.0	3.9	4.1	3.8
EPT Index	18	8	8	16	9	10
Percent Trophic Similarity	100.0	73.7	89.9	71.1	76.3	76.5
Ratio EPT/Chironomids	11.2	2.8	2.5	1.7	4.9	5.8
Percent Taxonomic Similarity	100.0	40.9	50.6	50.5	43.9	64.1
Percent Dominant Taxa	19.4	27.1	24.6	28.1	30.9	16.2
Percent of Reference						
Taxonomic Richness	100.0	55.6	55.6	100.0	59.3	66.7
Shannon Diversity Index	100.0	75.9	74.7	93.4	82.6	91.6
Hilsenhoff Index	100.0	82.4	90.6	93.3	88.6	95.9
EPT Index	100.0	44.4	44.4	88.9	50.0	55.6
Percent Trophic Similarity	100.0	73.7	89.9	71.1	76.3	76.5
Ratio EPT/Chironomids	100.0	24.6	22.6	15.0	43.5	51.5
Percent Taxonomic Similarity	100.0	40.9	50.6	50.5	43.9	64.1
Percent Dominant Taxa	19.4	27.1	24.6	28.1	30.9	16.2
Biological Condition Scores						
Taxonomic Richness	6	2	2	6	2	4
Shannon Diversity Index	6	6	4	6	6	6
Hilsenhoff Index	6	4	6	6	6	6
EPT Index	6	0	0	4	0	0
Percent Trophic Similarity	6	4	6	4	6	6
Ratio EPT/Chironomids	6	0	0	0	2	4
Percent Taxonomic Similarity	6	4	6	6	4	6
Percent Dominant Taxa	6	4	4	4	2	6
Total Biological Score						
Total Biological Score	48	24	28	36	28	38
Biological % of Reference	100	50	58	75	58	79

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

	LSNK 7.6	SEEL 10.3	SOUT 7.8	TROW 1.5	TRUP 4.5	WAPP 2.6
Raw Summary						
Number of Individuals	150	177	143	131	132	140
% Shredders	2.0	0.0	0.7	0.8	0.0	0.0
% Collector-Gatherers	25.3	46.3	33.6	41.7	19.7	25.0
% Filterer-Collectors	58.7	47.5	28.0	15.2	14.4	42.9
% Scrapers	4.7	1.7	27.3	27.3	9.1	26.4
% Predators	9.3	4.5	10.5	15.2	56.8	5.7
Number of EPT Taxa	11	7	10	11	8	12
Number of EPT Individuals	92	113	49	28	24	101
Metric Scores						
Taxonomic Richness	21	14	19	18	22	19
Shannon Diversity Index	3.4	2.4	3.4	3.1	3.2	3.5
Modified Hilsenhoff Biotic Index	4.6	4.9	4.9	5.1	3.8	3.6
EPT Index	11	7	10	11	8	12
Percent Trophic Similarity	89.2	42.4	69.0	56.2	48.7	82.4
Ratio EPT/Chironomids	2.6	2.1	1.1	0.6	1.1	3.9
Percent Taxonomic Similarity	56.8	30.4	35.5	27.3	31.0	60.9
Percent Dominant Taxa	24.0	37.3	30.8	38.6	37.9	18.6
Percent of Reference						
Taxonomic Richness	77.8	51.9	70.4	66.7	81.5	70.4
Shannon Diversity Index	87.0	60.6	86.1	77.4	80.8	89.5
Hilsenhoff Index	80.1	75.1	74.7	70.9	95.5	101.3
EPT Index	61.1	38.9	55.6	61.1	44.4	66.7
Percent Trophic Similarity	89.2	72.4	69.0	56.2	48.7	82.4
Ratio EPT/Chironomids	22.8	18.3	9.9	4.9	9.7	34.7
Percent Taxonomic Similarity	56.7	30.4	35.5	27.3	31.0	60.9
Percent Dominant Taxa	24.0	37.3	30.8	38.6	37.9	18.6
Biological Condition Scores						
Taxonomic Richness	4	2	4	4	6	4
Shannon Diversity Index	6	4	6	6	6	6
Hilsenhoff Index	4	4	4	4	6	6
EPT Index	0	0	0	0	0	0
Percent Trophic Similarity	6	4	4	4	2	6
Ratio EPT/Chironomids	0	0	0	0	0	2
Percent Taxonomic Similarity	6	2	4	2	2	6
Percent Dominant Taxa	4	2	2	2	2	6
Total Biological Score						
Total Biological Score	30	18	24	22	24	36
Biological % of Reference	63	38	50	46	50	75

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

	BBDC 4.1	CNWG 4.4	DEER 44.2	EBAU 1.5	FBDC 4.1
Raw Data Summary					
Number of Individuals	194	194	187	175	178
% Shredders	25.8	0.5	1.1	1.7	4.5
% Collector-Gatherers	9.3	11.9	13.4	9.7	34.8
% Filterer-Collectors	20.1	24.8	53.5	18.3	30.9
% Scrapers	27.3	58.2	11.8	66.3	15.7
% Predators	17.5	4.6	20.3	4.0	14.0
Number of EPT Taxa	17	9	10	8	9
Number of EPT Individuals	123	101	114	45	76
Metric Scores					
Taxonomic Richness	25	16	21	18	22
Shannon Diversity Index	3.9	3.2	3.8	2.7	3.4
Modified Hilsenhoff Biotic Index	2.8	4.3	4.0	4.7	5.1
EPT Index	17	9	10	8	9
Percent Trophic Similarity	100.0	61.9	59.7	60.6	63.7
Ratio EPT/Chironomids	12.3	5.6	6.7	7.5	1.5
Percent Taxonomic Similarity	100.0	26.8	31.5	41.7	31.2
Percent Dominant Taxa	19.6	31.4	21.4	51.4	28.7
Percent of Reference					
Taxonomic Richness	100.0	64.0	84.0	72.0	88.0
Shannon Diversity Index	100.0	82.7	98.4	68.6	87.9
Hilsenhoff Index	100.0	65.1	69.8	59.6	55.3
EPT Index	100.0	52.9	58.8	47.1	52.9
Percent Trophic Similarity	100.0	61.9	59.7	60.6	63.7
Ratio EPT/Chironomids	100.0	45.6	54.5	61.0	12.1
Percent Taxonomic Similarity	100.0	26.8	31.5	41.7	31.2
Percent Dominant Taxa	19.6	31.4	21.4	51.4	28.7
Biological Condition Scores					
Taxonomic Richness	6	4	6	4	6
Shannon Diversity Index	6	6	6	4	6
Hilsenhoff Index	6	2	2	2	2
EPT Index	6	0	0	0	0
Percent Trophic Similarity	6	4	4	4	4
Ratio EPT/Chironomids	6	2	4	4	0
Percent Taxonomic Similarity	6	2	2	4	2
Percent Dominant Taxa	6	2	4	0	4
Total Biological Score					
Total Biological Score	48	22	28	22	24
Biological % of Reference	100	46	58	46	50

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

	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Raw Data Summary				
Number of Individuals	152	148	116	96
% Shredders	8.6	7.4	16.4	3.1
% Collector-Gatherers	12.5	14.2	17.2	90.6
% Filterer-Collectors	36.2	48.6	29.3	0.0
% Scrapers	18.4	28.4	19.8	6.3
% Predators	24.3	1.4	17.2	0.0
Number of EPT Taxa	9	11	11	0
Number of EPT Individuals	70	96	57	0
Metric Scores				
Taxonomic Richness	19	19	21	4
Shannon Diversity Index	3.5	3.6	3.7	0.9
Modified Hilsenhoff Biotic Index	4.0	4.4	3.2	7.3
EPT Index	9	11	11	0
Percent Trophic Similarity	73.9	65.5	82.8	18.7
Ratio EPT/Chironomids	5.0	13.7	3.2	0.0
Percent Taxonomic Similarity	26.0	22.8	44.5	6.9
Percent Dominant Taxa	21.1	18.2	15.5	83.3
Percent of Reference				
Taxonomic Richness	76.0	76.0	84.0	16.0
Shannon Diversity Index	91.3	93.7	94.7	23.3
Hilsenhoff Index	70.5	63.0	88.6	38.2
EPT Index	52.9	64.7	64.7	0.0
Percent Trophic Similarity	73.9	65.5	82.8	18.7
Ratio EPT/Chironomids	40.7	111.5	25.7	0.0
Percent Taxonomic Similarity	26.0	22.8	44.5	6.9
Percent Dominant Taxa	21.1	18.2	15.5	83.3
Biological Condition Scores				
Taxonomic Richness	4	4	6	0
Shannon Diversity Index	6	6	6	0
Hilsenhoff Index	4	2	6	0
EPT Index	0	0	0	0
Percent Trophic Similarity	4	4	6	0
Ratio EPT/Chironomids	2	6	2	0
Percent Taxonomic Similarity	2	2	4	0
Percent Dominant Taxa	4	6	6	0
Total Biological Score				
Total Biological Score	26	30	36	0
Biological % of Reference	54	63	75	0

Table 13. Summary of River RBP III Biological Data

	SUSQ 365	CHEM 12.0	COWN 2.2	COWN 1.0
Raw Summary				
Number of Individuals	180	235	118	152
% Shredders	0.6	0.0	47.5	17.1
% Collector-Gatherers	21.7	20.0	27.1	25.6
% Filterer-Collectors	25.0	59.1	5.9	35.5
% Scrapers	42.8	18.7	9.3	19.7
% Predators	10.0	2.1	10.2	2.0
Number of EPT Taxa	14	10	4	7
Number of EPT Individuals	86	164	17	65
Metric Scores				
Taxonomic Richness	25	18	10	19
Shannon Diversity Index	4.0	3.6	2.4	3.3
Modified Hilsenhoff Biotic Index	4.2	4.5	6.9	5.3
EPT Index	14	10	4	7
Percent Trophic Similarity	100.0	65.9	47.5	68.9
Ratio EPT/Chironomids	6.1	5.3	0.6	2.1
Percent Taxonomic Similarity	100.0	44.8	14.1	41.0
Percent Dominant Taxa	22.8	17.9	44.1	23.0
Percent of Reference				
Taxonomic Richness	100.0	72.0	40.0	76.0
Shannon Diversity Index	100.0	90.1	59.5	84.4
Hilsenhoff Index	100.0	93.9	61.8	79.7
EPT Index	100.0	71.4	28.6	50.0
Percent Trophic Similarity	100.0	65.9	47.5	68.9
Ratio EPT/Chironomids	100.0	86.1	9.9	34.1
Percent Taxonomic Similarity	100.0	44.8	14.1	41.0
Percent Dominant Taxa	22.8	17.9	44.1	23.0
Biological Condition Scores				
Taxonomic Richness	6	4	2	4
Shannon Diversity Index	6	6	4	6
Hilsenhoff Index	6	6	2	4
EPT Index	6	2	0	0
Percent Trophic Similarity	6	4	2	4
Ratio EPT/Chironomids	6	6	0	2
Percent Taxonomic Similarity	6	4	0	4
Percent Dominant Taxa	4	6	0	4
Total Biological Score				
Total Biological Score	46	38	10	28
Percent of Reference	100	83	22	61

Table 13. Summary of River RBP III Biological Data—Continued

	SUSQ 340	SUSQ 289.1	SUSQ 44.5	TIOG 10.8
Raw Summary				
Number of Individuals	118	134	146	142
% Shredders	0.0	0.0	0.0	0.0
% Collector-Gatherers	12.7	4.5	13.7	19.7
% Filterer-Collectors	33.1	53.7	36.3	64.8
% Scrapers	50.0	37.3	47.3	9.9
% Predators	4.2	4.5	2.7	5.6
Number of EPT Taxa	14	11	13	10
Number of EPT Individuals	60	80	88	108
Metric Scores				
Taxonomic Richness	21	18	20	20
Shannon Diversity Index	4.1	3.4	3.3	3.4
Modified Hilsenhoff Biotic Index	4.5	4.2	4.3	3.9
EPT Index	14	11	13	10
Percent Trophic Similarity	84.7	71.3	84.2	60.2
Ratio EPT/Chironomids	8.6	26.7	22.0	5.1
Percent Taxonomic Similarity	43.6	55.4	54.0	41.0
Percent Dominant Taxa	11.9	23.9	32.9	19.7
Percent of Reference				
Taxonomic Richness	84.0	72.0	80.0	80.0
Shannon Diversity Index	102.5	86.4	82.6	85.6
Hilsenhoff Index	94.4	101.2	99.3	109.2
EPT Index	100.0	78.6	92.9	71.4
Percent Trophic Similarity	84.7	71.3	84.2	60.2
Ratio EPT/Chironomids	139.5	434.1	358.1	83.7
Percent Taxonomic Similarity	43.6	55.4	54.0	41.0
Percent Dominant Taxa	11.9	23.9	32.9	19.7
Biological Condition Scores				
Taxonomic Richness	6	4	6	6
Shannon Diversity Index	6	6	6	6
Hilsenhoff Index	6	6	6	6
EPT Index	6	2	6	2
Percent Trophic Similarity	6	4	6	4
Ratio EPT/Chironomids	6	6	6	6
Percent Taxonomic Similarity	4	6	6	4
Percent Dominant Taxa	6	4	2	6
Total Biological Score				
Total Biological Score	46	38	44	40
Percent of Reference	100	83	96	87

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

	COOK	BABC	BILL	BIRD	BISC	BRIG
Raw Summary						
Number of Individuals	112	119	115	112	105	56
% Shredders	12.5	21.0	0.9	1.8	4.8	3.6
% Collector-Gatherers	40.2	68.9	81.7	83.9	74.3	91.1
% Filterer-Collectors	5.6	4.2	0.9	10.7	7.6	3.6
% Scrapers	38.4	1.7	8.7	2.7	8.6	1.8
% Predators	3.6	4.2	7.8	0.9	4.8	0.0
Number of EPT Taxa	14	10	10	8	11	8
Number of EPT Individuals	80	97	97	97	96	55
Metric Scores						
Taxonomic Richness	21	14	17	12	16	10
Shannon Diversity Index	3.8	2.6	2.7	2.5	2.7	1.5
Modified Hilsenhoff Biotic Index	3.4	2.1	2.3	1.5	1.1	0.4
EPT Index	14	10	10	8	11	8
Percent Trophic Similarity	100.0	62.1	54.2	50.9	62.4	49.1
Ratio EPT/Chironomids	11.4	5.1	13.9	8.1	19.2	55.0
Percent Taxonomic Similarity	100.0	27.7	35.2	18.8	30.4	20.2
Percent Dominant Taxa	14.3	43.7	44.4	37.5	47.6	75.0
Percent of Reference						
Taxonomic Richness	100.0	66.7	81.0	57.1	76.2	47.6
Shannon Diversity Index	100.0	68.6	70.7	65.3	71.0	38.7
Hilsenhoff Index	100.0	158.5	149.1	217.3	301.3	817.4
EPT Index	100.0	71.4	71.4	57.1	78.6	57.1
Percent Trophic Similarity	100.0	62.1	54.2	50.9	62.4	49.1
Ratio EPT/Chironomids	100.0	44.7	121.3	70.7	168.0	481.3
Percent Taxonomic Similarity	100.0	27.7	35.2	18.8	30.4	20.2
Percent Dominant Taxa	14.3	43.7	44.0	37.5	47.6	75.0
Biological Condition Scores						
Taxonomic Richness	6	4	6	2	4	2
Shannon Diversity Index	6	4	4	4	4	2
Hilsenhoff Index	6	6	6	6	6	6
EPT Index	6	2	2	0	2	0
Percent Trophic Similarity	6	4	4	4	4	2
Ratio EPT/Chironomids	6	2	6	4	6	6
Percent Taxonomic Similarity	6	2	4	0	2	2
Percent Dominant Taxa	6	0	0	2	0	0
Total Biological Score						
Total Biological Score	48	24	32	22	28	20
Biological % of Reference	100	50	67	46	58	42

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

	BULK	CAMP	DEEP	DENT	DRYB	LWAP
Raw Summary						
Number of Individuals	114	112	117	191	118	101
% Shredders	12.3	13.4	23.9	1.0	1.7	10.9
% Collector-Gatherers	37.7	67.0	49.6	25.1	83.1	72.3
% Filterer-Collectors	13.2	3.6	3.4	70.2	10.2	0.0
% Scrapers	12.3	7.1	6.0	2.6	2.5	5.9
% Predators	24.6	8.9	17.1	1.0	2.5	10.9
Number of EPT Taxa	12	11	16	4	7	11
Number of EPT Individuals	97	95	67	78	43	95
Metric Scores						
Taxonomic Richness	20	17	27	11	14	17
Shannon Diversity Index	3.6	2.8	3.6	2.3	2.4	2.6
Modified Hilsenhoff Biotic Index	1.6	1.1	3.7	5.6	5.4	0.6
EPT Index	12	11	16	4	7	11
Percent Trophic Similarity	71.2	67.0	65.7	35.2	52.3	60.6
Ratio EPT/Chironomids	24.3	15.8	2.0	1.6	0.7	47.5
Percent Taxonomic Similarity	26.6	28.6	27.1	5.3	27.0	22.5
Percent Dominant Taxa	20.2	49.1	29.1	29.8	50.0	43.6
Percent of Reference						
Taxonomic Richness	95.2	81.0	128.6	52.4	66.7	81.0
Shannon Diversity Index	94.3	72.9	94.0	59.5	61.7	69.0
Hilsenhoff Index	205.8	313.3	89.7	60.2	61.8	521.6
EPT Index	85.7	78.6	114.3	28.6	50.0	78.6
Percent Trophic Similarity	71.2	67.0	65.7	35.2	52.3	60.6
Ratio EPT/Chironomids	212.2	138.5	17.2	14.2	6.4	415.6
Percent Taxonomic Similarity	26.6	28.6	27.1	5.3	27.0	22.5
Percent Dominant Taxa	20.2	49.1	29.1	29.8	50.0	43.6
Biological Condition Scores						
Taxonomic Richness	6	6	6	2	4	6
Shannon Diversity Index	6	4	6	4	4	4
Hilsenhoff Index	6	6	6	2	2	6
EPT Index	4	2	6	0	0	2
Percent Trophic Similarity	4	4	4	2	4	4
Ratio EPT/Chironomids	6	6	0	0	0	6
Percent Taxonomic Similarity	2	2	2	0	2	2
Percent Dominant Taxa	4	0	4	4	0	0
Total Biological Score						
Total Biological Score	38	30	34	14	16	30
Biological % of Reference	79	63	71	29	33	63

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

	PARK	PRIN	REDH	RUSS	SACK	SMIT
Raw Summary						
Number of Individuals	110	109	108	106	110	159
% Shredders	26.4	5.5	72.2	9.4	16.4	54.1
% Collector-Gatherers	57.3	83.5	12.0	84.0	64.5	17.6
% Filterer-Collectors	1.8	1.8	4.6	0.0	1.8	4.4
% Scrapers	9.1	5.5	0.9	2.8	10.9	13.8
% Predators	5.5	3.7	10.2	3.8	6.4	10.1
Number of EPT Taxa	10	12	9	7	13	11
Number of EPT Individuals	102	84	97	96	107	114
Metric Scores						
Taxonomic Richness	15	18	15	13	17	21
Shannon Diversity Index	2.9	3.4	1.9	2.2	2.7	3.2
Modified Hilsenhoff Biotic Index	1.1	3.4	0.8	0.8	1.0	2.2
EPT Index	10	12	9	7	13	11
Percent Trophic Similarity	67.2	56.6	33.7	56.0	69.0	51.9
Ratio EPT/Chironomids	34.0	4.4	16.2	24.0	107.0	9.5
Percent Taxonomic Similarity	29.7	43.4	19.1	22.9	29.7	36.2
Percent Dominant Taxa	40.0	20.2	68.5	60.4	48.2	40.9
Percent of Reference						
Taxonomic Richness	71.4	85.7	74.4	61.9	81.0	100.0
Shannon Diversity Index	75.1	88.8	50.4	57.3	71.5	83.9
Hilsenhoff Index	307.7	97.6	412.0	418.7	341.9	155.6
EPT Index	71.4	85.7	64.3	50.0	92.9	78.6
Percent Trophic Similarity	67.2	56.6	33.7	56.0	69.0	51.9
Ratio EPT/Chironomids	297.5	38.7	141.5	210.0	936.3	83.1
Percent Taxonomic Similarity	29.7	43.4	19.1	22.9	29.7	36.2
Percent Dominant Taxa	40.0	20.2	68.5	60.4	48.2	41.0
Biological Condition Scores						
Taxonomic Richness	4	6	4	4	6	6
Shannon Diversity Index	6	6	4	4	4	6
Hilsenhoff Index	6	6	6	6	6	6
EPT Index	2	4	0	0	6	2
Percent Trophic Similarity	4	4	2	4	4	4
Ratio EPT/Chironomids	6	2	6	6	6	6
Percent Taxonomic Similarity	2	4	0	2	2	4
Percent Dominant Taxa	2	4	0	0	0	0
Total Biological Score						
Total Biological Score	32	36	22	26	34	34
Biological % of Reference	67	75	46	54	71	71

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

	STRA	WBCO	WHIT
Raw Summary			
Number of Individuals	113	135	128
% Shredders	4.4	5.9	31.3
% Collector-Gatherers	57.5	61.5	51.6
% Filterer-Collectors	8.8	3.0	2.3
% Scrapers	23.0	25.2	3.1
% Predators	6.2	4.4	11.7
Number of EPT Taxa	17	13	10
Number of EPT Individuals	82	112	118
Metric Scores			
Taxonomic Richness	25	19	13
Shannon Diversity Index	3.8	3.5	2.9
Modified Hilsenhoff Biotic Index	2.6	2.8	1.8
EPT Index	17	13	10
Percent Trophic Similarity	76.5	77.8	61.7
Ratio EPT/Chironomids	5.9	8.6	13.1
Percent Taxonomic Similarity	40.0	42.9	40.8
Percent Dominant Taxa	16.8	21.5	31.3
Percent of Reference			
Taxonomic Richness	119.0	90.5	61.9
Shannon Diversity Index	99.7	92.2	75.4
Hilsenhoff Index	129.9	118.6	191.0
EPT Index	121.4	92.9	71.4
Percent Trophic Similarity	76.5	77.8	61.7
Ratio EPT/Chironomids	51.3	75.4	114.7
Percent Taxonomic Similarity	40.0	42.9	40.8
Percent Dominant Taxa	16.8	21.5	31.3
Biological Condition Scores			
Taxonomic Richness	6	6	4
Shannon Diversity Index	6	6	6
Hilsenhoff Index	6	6	6
EPT Index	6	6	2
Percent Trophic Similarity	6	6	4
Ratio EPT/Chironomids	4	6	6
Percent Taxonomic Similarity	4	4	4
Percent Dominant Taxa	6	4	2
Total Biological Score			
Total Biological Score	44	44	34
Biological % of Reference	92	92	71

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

	SNAK 2.3	APAL 6.9	BNTY 0.9	CASC 1.6	CAYT 1.7	CHOC 9.1
Primary Parameters						
Bottom Substrate	17	15	9	10	15	15
Embeddedness	17	15	16	15	15	16
Velocity/Depth Diversity	16	10	8	7	17	11
Secondary Parameters						
Pool/Riffle Ratio	13	7	7	7	12	13
Pool Quality	11	8	6	6	11	7
Riffle/Run Quality	12	6	7	6	11	9
Channel Alteration	11	9	3	10	10	9
Tertiary Parameters						
Streambank Erosion	8	7	2	6	7	7
Streambank Stability	8	7	5	8	9	7
Streamside Vegetative Cover	7	7	2	7	5	5
Riparian Buffer Zone	2	2	2	5	2	2
Total Habitat Score						
Total Habitat Score	122	93	67	87	114	101
Habitat Percent of Reference	100	76	55	71	93	83

	LSNK 7.6	SEEL 10.3	SOUT 7.8	TROW 1.5	TRUP 4.5	WAPP 2.6
Primary Parameters						
Bottom Substrate	15	8	12	14	16	15
Embeddedness	17	15	16	15	16	16
Velocity/Depth Diversity	10	7	9	6	10	13
Secondary Parameters						
Pool/Riffle Ratio	10	4	8	5	11	9
Pool Quality	7	6	7	4	7	10
Riffle/Run Quality	7	3	6	5	8	8
Channel Alteration	8	3	9	12	11	8
Tertiary Parameters						
Streambank Erosion	7	2	7	6	7	6
Streambank Stability	9	3	7	7	8	7
Streamside Vegetative Cover	9	4	5	5	5	5
Riparian Buffer Zone	6	2	2	2	2	5
Total Habitat Score						
Total Habitat Score	105	57	88	81	101	102
Habitat Percent of Reference	86	47	72	66	83	84

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

	BBDC 4.1	CNWG 4.4	DEER 44.2	EBAU 1.5	FBDC 4.1
Primary Parameters					
Bottom Substrate	17	17	12	9	13
Embeddedness	17	16	12	11	11
Velocity/Depth Diversity	12	17	13	9	7
Secondary Parameters					
Pool/Riffle Ratio	11	13	11	8	8
Pool Quality	10	12	10	8	6
Riffle/Run Quality	10	10	9	9	6
Channel Alteration	12	10	7	12	9
Tertiary Parameters					
Streambank Erosion	7	6	2	8	7
Streambank Stability	9	8	4	9	9
Streamside Vegetative Cover	9	7	4	5	9
Riparian Buffer Zone	7	5	2	2	2
Total Habitat Score					
Total Habitat Score	121	121	86	90	87
Habitat Percent of Reference	100	100	71	74	72

	LNGA 2.5	OCTO 6.6	SBCC 20.4	SCTT 3.0
Primary Parameters				
Bottom Substrate	5	17	16	6
Embeddedness	7	16	17	10
Velocity/Depth Diversity	8	15	13	7
Secondary Parameters				
Pool/Riffle Ratio	6	13	9	5
Pool Quality	8	9	8	4
Riffle/Run Quality	6	11	7	4
Channel Alteration	7	12	12	11
Tertiary Parameters				
Streambank Erosion	5	8	8	7
Streambank Stability	6	9	9	9
Streamside Vegetative Cover	5	5	8	6
Riparian Buffer Zone	2	2	8	2
Total Habitat Score				
Total Habitat Score	65	117	115	71
Habitat Percent of Reference	54	97	95	59

Table 17. Summary of River Sites Physical Habitat Data

	SUSQ 365	CHEM 12.0	COWN 2.2	COWN 1.0
Primary Parameters				
Bottom Substrate	17	15	5	11
Embeddedness	16	15	9	14
Velocity/Depth Diversity	17	17	8	16
Secondary Parameters				
Pool/Riffle Ratio	11	11	3	8
Pool Quality	12	11	10	9
Riffle/Run Quality	12	12	3	9
Channel Alteration	12	11	12	11
Tertiary Parameters				
Streambank Erosion	6	7	8	5
Streambank Stability	7	9	9	7
Streamside Vegetative Cover	7	5	5	5
Riparian Buffer Zone	5	5	2	2
Total Habitat Score				
Total Habitat Score	122	118	74	97
Habitat Percent of Reference	100	97	61	80

	SUSQ 340	SUSQ 289.1	SUSQ 44.5	TIOG 10.8
Primary Parameters				
Bottom Substrate	13	16	10	17
Embeddedness	16	16	16	16
Velocity/Depth Diversity	17	16	16	17
Secondary Parameters				
Pool/Riffle Ratio	9	13	10	13
Pool Quality	11	11	10	12
Riffle/Run Quality	11	12	12	12
Channel Alteration	11	10	12	11
Tertiary Parameters				
Streambank Erosion	6	7	8	7
Streambank Stability	9	9	8	7
Streamside Vegetative Cover	5	5	5	6
Riparian Buffer Zone	5	2	2	5
Total Habitat Score				
Total Habitat Score	113	117	109	123
Habitat Percent of Reference	93	96	89	101

Table 18. Summary of Group 3 Sites Physical Habitat Data

	COOK	BABC	BILL	BIRD	BISC	BRIG
Primary Parameters						
Bottom Substrate	17	18	17	16	11	12
Embeddedness	16	17	17	16	13	16
Velocity/Depth Diversity	10	17	11	10	10	10
Secondary Parameters						
Pool/Riffle Ratio	10	13	10	11	8	10
Pool Quality	8	13	7	9	7	8
Riffle/Run Quality	9	12	9	11	9	9
Channel Alteration	12	12	12	11	12	4
Tertiary Parameters						
Streambank Erosion	6	8	8	5	6	4
Streambank Stability	8	8	9	6	8	4
Streamside Vegetative Cover	8	9	8	8	9	6
Riparian Buffer Zone	5	6	9	5	2	5
Total Habitat Score						
Total Habitat Score	109	133	117	108	95	88
Habitat Percent of Reference	100	122	107	99	87	81

	BULK	CAMP	DEEP	DENT	DRY	LWAP
Primary Parameters						
Bottom Substrate	18	14	18	16	12	15
Embeddedness	17	16	18	17	15	16
Velocity/Depth Diversity	10	10	13	15	10	10
Secondary Parameters						
Pool/Riffle Ratio	9	11	12	10	9	11
Pool Quality	7	7	11	7	10	8
Riffle/Run Quality	10	11	13	11	10	11
Channel Alteration	13	7	12	12	8	4
Tertiary Parameters						
Streambank Erosion	8	3	8	7	8	3
Streambank Stability	9	5	9	8	8	5
Streamside Vegetative Cover	9	6	8	8	8	6
Riparian Buffer Zone	5	5	9	5	2	9
Total Habitat Score						
Total Habitat Score	115	95	131	116	100	98
Habitat Percent of Reference	106	87	120	106	92	90

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

	PARK	PRIN	REDH	RUSS	SACK	SMIT
Primary Parameters						
Bottom Substrate	10	10	18	12	13	18
Embeddedness	15	14	18	16	15	16
Velocity/Depth Diversity	11	12	10	11	10	11
Secondary Parameters						
Pool/Riffle Ratio	11	9	11	9	10	11
Pool Quality	10	7	3	7	7	11
Riffle/Run Quality	10	9	11	10	9	10
Channel Alteration	3	3	12	3	3	12
Tertiary Parameters						
Streambank Erosion	2	2	8	2	2	7
Streambank Stability	3	3	9	2	3	9
Streamside Vegetative Cover	7	5	8	2	5	9
Riparian Buffer Zone	3	1	9	7	2	8
Total Habitat Score						
Total Habitat Score	85	75	117	81	79	122
Habitat Percent of Reference	78	69	107	74	72	112

	STRA	WBCO	WHIT
Primary Parameters			
Bottom Substrate	15	16	17
Embeddedness	15	16	17
Velocity/Depth Diversity	11	9	10
Secondary Parameters			
Pool/Riffle Ratio	9	10	11
Pool Quality	8	7	11
Riffle/Run Quality	8	10	11
Channel Alteration	7	12	11
Tertiary Parameters			
Streambank Erosion	5	8	8
Streambank Stability	6	8	9
Streamside Vegetative Cover	5	7	8
Riparian Buffer Zone	5	5	5
Total Habitat Score			
Total Habitat Score	94	108	118
Habitat Percent of Reference	86	99	108

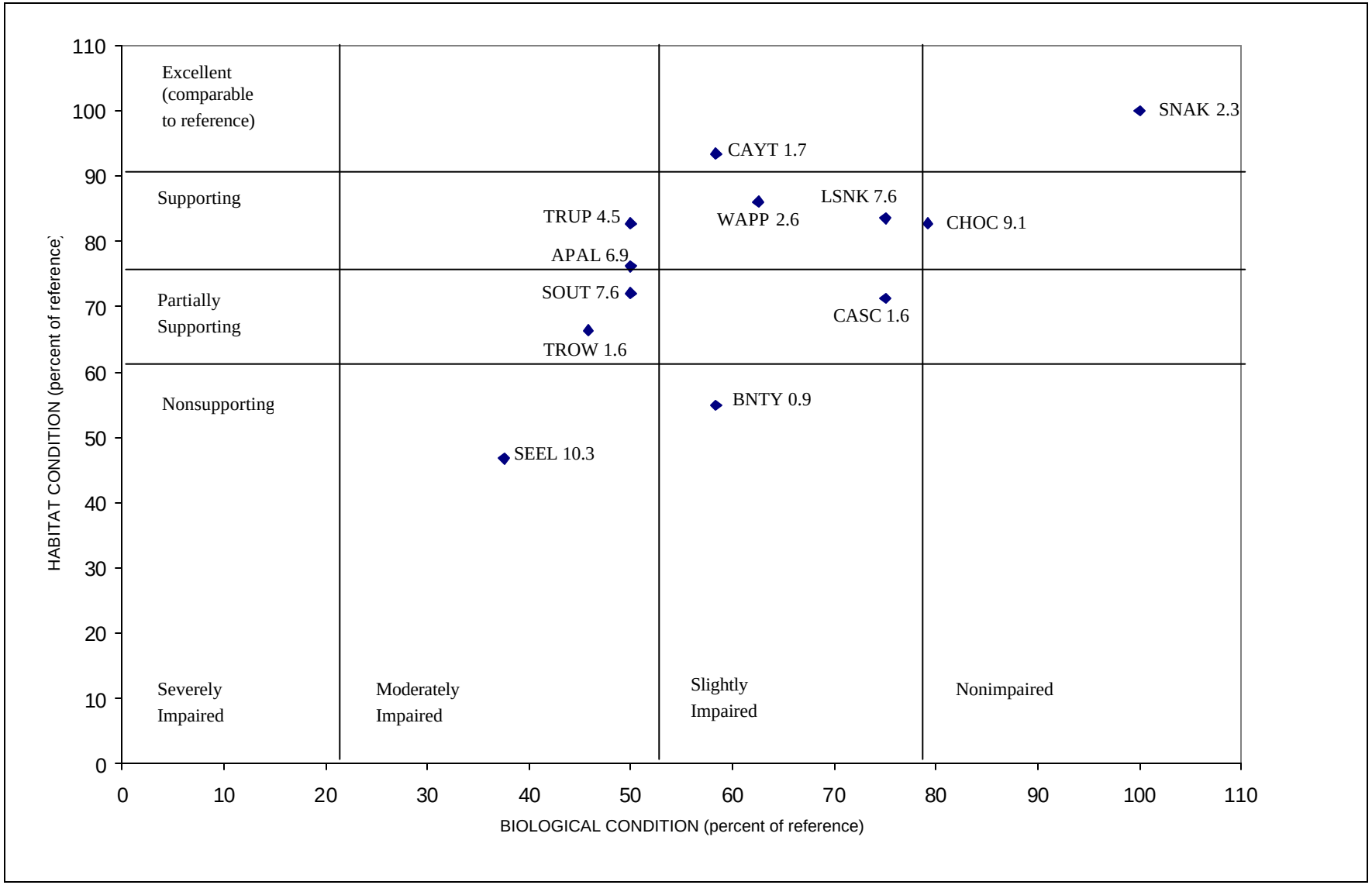


Figure 6. Summary of New York-Pennsylvania Border Streams Habitat and Biological Condition Scores

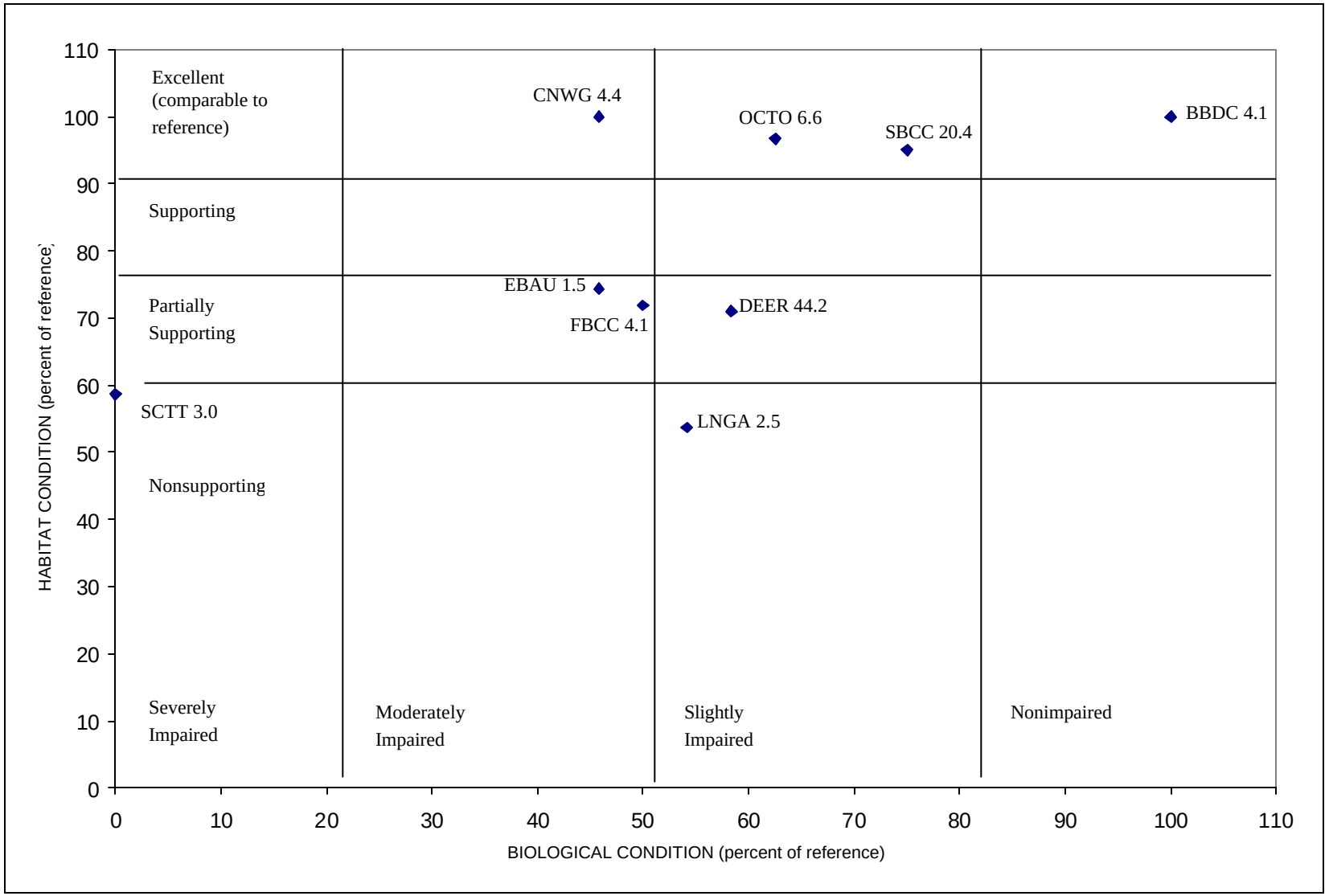


Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

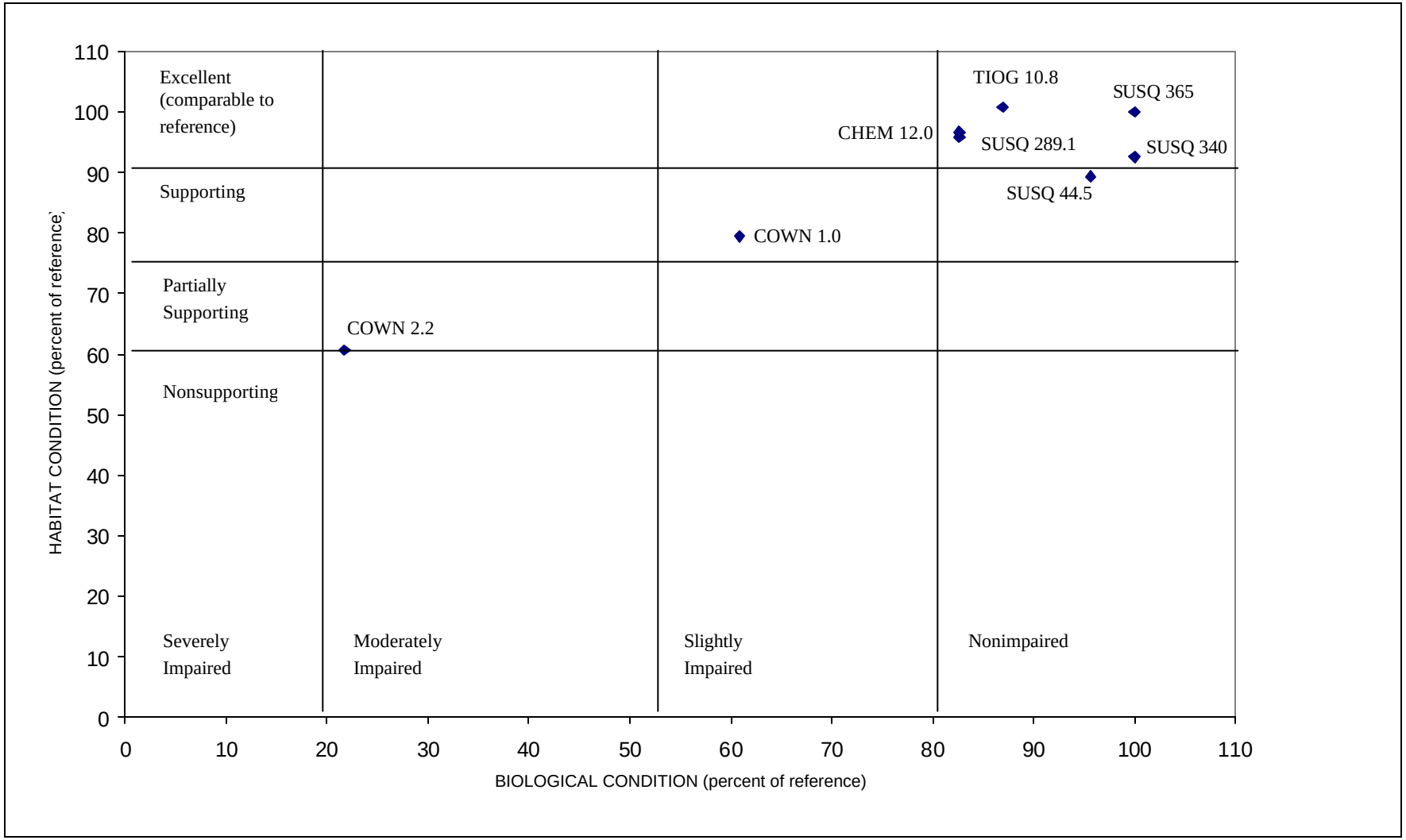


Figure 8. Summary of River Habitat and Biological Condition Scores

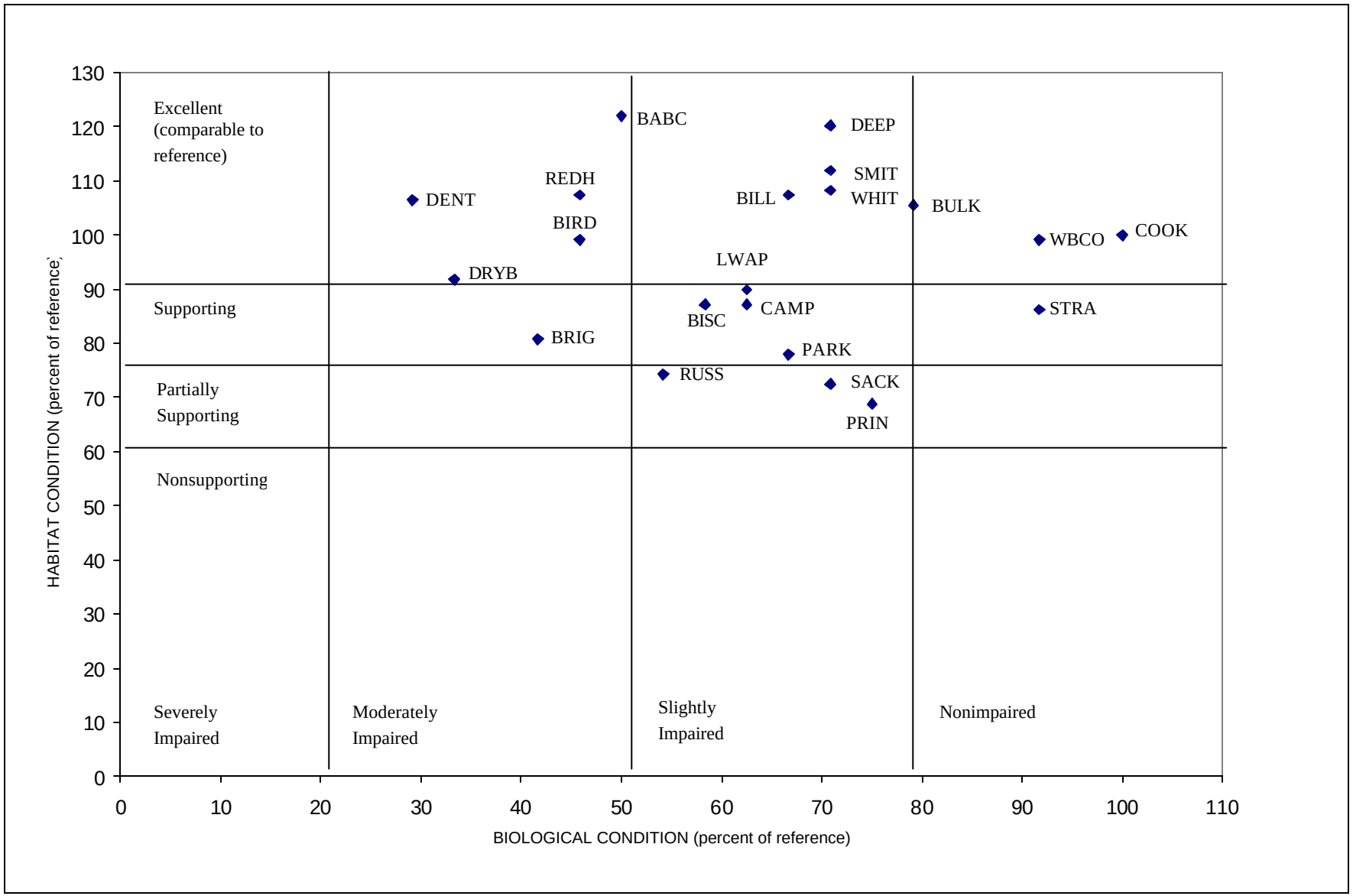


Figure 9. Summary of Group 3 Streams Habitat and Biological Condition Scores

Group 3 sites

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Four of the sites (19 percent) had nonimpaired biological conditions. Eleven sites (52.4 percent) were slightly impaired, and six sites (28.6 percent) were moderately impaired. Eleven (52.4 percent) of the Group 3 sites had excellent habitat scores. Six sites (28.6 percent) had supporting habitat conditions, and the remaining four sites (19 percent) had partially supporting habitats.

Trends Analysis

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

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

Total suspended solids

Trend analysis results for total suspended solids are presented in Appendix E, Table E1. Concentration values at the stations showed one strongly decreasing trend at Tioga River and one increasing trend at Ebaughs Creek (Table 19). Flow-adjusted concentration analysis indicated one increasing trend at Scott Creek (Table 19). There was no overall trend, indicated by a weighted value of -0.07 for concentrations and 0.07 for flow-adjusted concentrations (Tables 20 and 21, respectively).

Total ammonia

Total ammonia trend analysis results are presented in Appendix E, Table E2. Concentration values showed strongly decreasing values at Cayuta Creek, Chemung River, Deer Creek, Ebaughs Creek, Octoraro Creek, Tioga River, and Susquehanna River sites 289.1, 340, and 365 (Table 19). Flow adjusted concentrations indicated strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, Tioga River, and Susquehanna River sites and a decreasing trend at Susquehanna River site 44.5 (Table 19). There was an overall decreasing trend in concentration with a weighted value of -1.20 (Table 20), but a weighted value of -0.87 indicates that there was no overall trend in flow-adjusted concentrations (Table 21). This result may indicate that the apparent trends in NH_3 concentrations may be an artifact of climatic conditions, since no overall trend was detected in FAC.

Total nitrogen

The results of trend analysis for total nitrogen are presented in Appendix E, Table E3. Concentration values at the Group 1 stations showed strongly decreasing trends at Tioga River and Susquehanna River sites 289.1, 340, and 365, decreasing trends at Chemung River and Cowanesque River, an increasing trend at Octoraro Creek, and a strongly increasing trend at Conowingo Creek (Table 19). Note that increasing trends for total nitrogen were found only in Pennsylvania-Maryland border sites, which are heavily influenced by agriculture. Flow

Table 19. Trend Summary of Selected Parameters for Group 1 Streams, 1986-98

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

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

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

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

Concentration	Trend Category Count					
	DEC	dec	O	inc	INC	Total
Total Solids	1	0	13	1	0	15
Total Ammonia	9	0	6	0	0	15
Total Nitrogen	4	2	7	1	1	15
Total Phosphorus	9	3	3	0	0	15
Total Chlorides	0	0	5	2	8	15
Total Sulfate	8	0	6	1	0	15
Total Iron	10	1	4	0	0	15
Total Aluminum	2	1	12	0	0	15
Total Manganese	6	3	6	0	0	15
Water Quality Index	6	3	6	0	0	15

Concentration	Weighted Values						
	DEC	dec	O	inc	INC	Sum	Average Value*
Total Solids	-2	0	0	1	0	-1	-0.07
Total Ammonia	-18	0	0	0	0	-18	-1.20
Total Nitrogen	-8	-2	0	1	2	-7	-0.47
Total Phosphorus	-18	-3	0	0	0	-21	-1.40
Total Chlorides	0	0	0	2	16	18	1.20
Total Sulfate	-16	0	0	1	0	-15	-1.00
Total Iron	-20	-1	0	0	0	-21	-1.40
Total Aluminum	-4	-1	0	0	0	-5	-0.33
Total Manganese	-12	-3	0	0	0	-15	-1.00
Water Quality Index	-12	-3	0	0	0	-15	-1.00

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

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

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

Concentration	Trend Category Count					
	DEC	dec	O	inc	INC	Total
Total Solids	0	0	14	1	0	15
Total Ammonia	6	1	8	0	0	15
Total Nitrogen	3	2	8	1	1	15
Total Phosphorus	5	3	7	0	0	15
Total Chlorides	0	0	7	0	8	15
Total Sulfate	9	1	5	0	0	15
Total Iron	9	0	6	0	0	15
Total Aluminum	3	1	10	1	0	15
Total Manganese	2	1	12	0	0	15
Water Quality Index	3	1	11	0	0	15

Concentration	Weighted Values						
	DEC	dec	O	inc	INC	Sum	*Average* Value*
Total Solids	0	0	0	1	0	1	0.07
Total Ammonia	-12	-1	0	0	0	-13	-0.87
Total Nitrogen	-6	-2	0	1	2	-5	-0.33
Total Phosphorus	-10	-3	0	0	0	-13	-0.87
Total Chlorides	0	0	0	0	16	16	1.07
Total Sulfate	-18	-1	0	0	0	-19	-1.27
Total Iron	-18	0	0	0	0	-18	-1.20
Total Aluminum	-6	-1	0	1	2	-5	-0.33
Total Manganese	-4	-1	0	0	0	-5	-0.33
Water Quality Index	-6	-1	0	0	0	-7	-0.08

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

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

adjusted concentrations indicated strongly decreasing trends at Cayuta Creek and Susquehanna River sites 289.1 and 340. Decreasing trends were found at Susquehanna River site 10 and Tioga River. An increasing trend occurred at Deer Creek, while a strongly increasing trend was found at Conowingo Creek (Table 19). Overall, there was no trend in either concentration or flow-adjusted concentrations, with average weighted values of -0.47 and -0.33, respectively (Tables 20 and 21).

Total phosphorus

Trend analysis results for total phosphorus are presented in Appendix E, Table E4. Concentration values showed strongly decreasing trends at Susquehanna River sites 10, 289.1, 340, and 365, Cayuta Creek, Deer Creek, Ebaughs Creek, Octoraro Creek, and Scott Creek, and decreasing trends at Conowingo Creek, Susquehanna River 44.5, and Troups Creek (Table 19). Flow-adjusted concentrations showed strongly decreasing trends at Susquehanna River sites 10, 289.1, and 340, Deer Creek, and Octoraro Creek. Decreasing trends were found at Conowingo Creek, Ebaughs Creek, and Susquehanna River site 365 (Table 19). Overall, there was a decreasing trend in phosphorus concentrations (average value = -1.40), but no trend in flow-adjusted concentrations (average value = -0.87) (Tables 20 and 21).

Total chloride

The results of trend analysis for total chloride are presented in Appendix E, Table E5. Concentration values showed strongly increasing trends in Chemung River, Conowingo Creek, Deer Creek, Ebaughs Creek, Octoraro Creek, and Susquehanna River sites 289.1, 340, and 365. Increasing trends also were found in Scott Creek and Troups Creek (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Chemung River, Conowingo Creek, Deer Creek, Ebaughs Creek, Octoraro Creek, Scott Creek, and Susquehanna River sites 289.1 and 340 (Table 19). Overall, there was an increasing trend in both concentration and flow-adjusted concentrations, with average weighted values of 1.20 and 1.07, respectively (Tables 20 and 21). This indicates that there is some process other than flow causing the increase in total chloride.

Total sulfate

Trend analysis results for total sulfate are presented in Appendix E, Table E6. Concentration values at the stations showed strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, Scott Creek, Susquehanna River sites 10 and 289.1, Tioga River, and Troups Creek, and an increasing trend at Deer Creek (Table 19). Strongly decreasing trends were found at Cayuta Creek, Chemung River, Cowanesque River, Scott Creek, Susquehanna River sites 44.5, 289.1, and 365, Tioga River, and Troups Creek, with a decreasing trend at Susquehanna River 340, indicated by flow-adjusted concentrations (Table 19). There were overall decreasing trends in concentrations and flow-adjusted concentrations, with weighted values of -1.00 and -1.27, respectively (Tables 20 and 21). This indicates that some process other than flow is causing a reduction in sulfate.

Total iron

Total iron trend analysis results are found in Appendix E, Table E7. Group 1 concentration values showed strongly decreasing trends at all Susquehanna River sites, Cayuta Creek, Chemung River, Conowingo Creek, Deer Creek, and Ebaughs Creek and a decreasing trend at Scott Creek (Table 19). Flow-adjusted concentrations indicated similar results, with strongly decreasing trends at Chemung River, Conowingo Creek, Deer Creek, Ebaughs Creek, and all Susquehanna River sites (Table 19). Overall, there were decreasing trends in both concentrations and flow-adjusted concentrations for iron, indicated by values of -1.40 and -1.20, respectively (Tables 20 and 21). This indicates that some process other than flow is causing a reduction in iron.

Total aluminum

The results of trend analysis for total aluminum are presented in Appendix E, Table E8. Concentration values at the Group 1 stations

showed strongly decreasing trends at Conowingo Creek and Susquehanna River site 44.5 and a decreasing trend at Susquehanna River 289.1 (Table 19). Flow-adjusted concentration values showed strongly decreasing trends at Conowingo Creek, and Susquehanna River sites 289.1 and 365, a decreasing trend at Susquehanna River site 10, and an increasing trend at Tioga River (Table 19). There was no overall trend, indicated by a weighted value of -0.33 for both the concentrations and flow-adjusted concentrations (Tables 20 and 21).

Total manganese

Trend analysis results for total manganese are presented in Appendix E, Table E9. Concentration values showed strongly decreasing trends at Cayuta Creek, Susquehanna River sites 10 and 44.5, and Tioga River, decreasing trends at Chemung River, Deer Creek, and Scott Creek, and a strongly increasing trend at Cowanesque River (Table 19). Flow-adjusted concentrations showed strongly decreasing tends at Susquehanna River site 44.5 and Tioga River. A decreasing trend was found at Chemung River (Table 19). Overall, there was a decreasing trend in manganese concentrations (average value = 1.00), but not flow-adjusted concentrations with a value of -0.33 (Tables 20 and 21).

Water quality index

Trend analysis results for the water quality index are presented in Appendix E, Table E10. Concentration values at the stations showed strongly decreasing trends at Conowingo Creek, Deer Creek, Octoraro Creek, Scott Creek, and Susquehanna River sites 10 and 44.5. Decreasing trends were found at Cayuta Creek and Susquehanna River sites 289.1 and 340 (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Conowingo Creek and Susquehanna River sites 10 and 44.5, and a decreasing trend at Deer Creek (Table 19). There was an overall trend with an average weighted value of -1.00 for concentrations but no trend for flow-adjusted concentrations, with an average weighted value of -0.08 (Tables 20 and 21).

BIOASSESSMENT OF INTERSTATE STREAMS

Abbreviations for water quality standards are provided in Table 22. Summaries of all stations include WQI scores, parameters that exceeded water quality standards, and parameters that exceeded the 90th percentile at each station. RBP III biological and habitat data also are provided, along with graphs depicting historical water quality and biological conditions over the past five years. A white bar indicates fiscal year 2000 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 moderately impaired biological community during fiscal year 2000, decreased from a nonimpaired designation the previous year. Impairment conditions may have been due to low flow conditions at the time of sampling. Additionally, very little riffle habitat is present at the site due to still-water conditions, which may affect the biological community.

Total iron exceeded water quality standards during July 1999. Dissolved manganese also exceeded the 90th percentile, and the water quality index was elevated for a Group 2 stream (Table 23).

Bentley Creek (BNTY 0.9)

A slightly impaired biological community existed at Bentley Creek at Wellsburg, N.Y. (BNTY 0.9). Biological conditions at BNTY 0.9 have been poor for the past ten years. Impairment may have been due to rechannelization of the stream or to low flow conditions at the time of sampling. The habitat at this site is considered nonsupporting and heavily altered.

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. Additionally, total ammonia, dissolved oxygen, and total orthophosphates exceeded the 90th percentile during the sampling period (Table 24).

Table 22. Abbreviations Used in Tables 21 Through 51

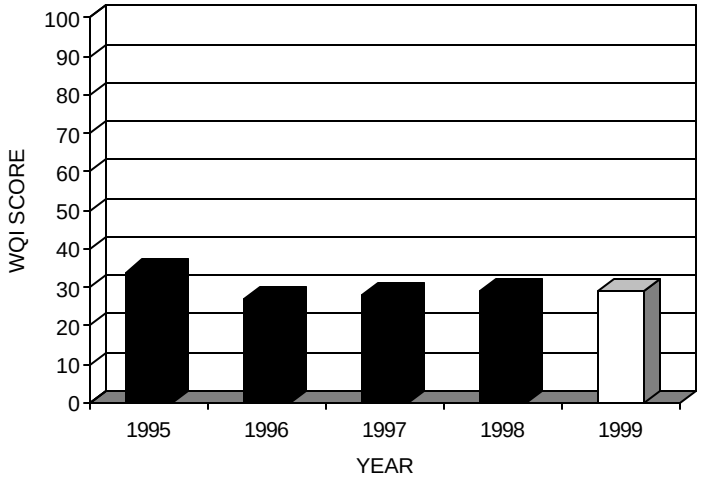
Abbreviation	Parameter
ALK	Alkalinity
COND	Conductivity
DAl	Dissolved Aluminum
TAl	Total Aluminum
TCa	Total Calcium
TCl	Total Chloride
DFe	Dissolved Iron
TFe	Total Iron
TMg	Total Magnesium
DMn	Dissolved Manganese
TMn	Total Manganese
DNH3	Dissolved Ammonia
TNH3	Total Ammonia
DNO2	Dissolved Nitrite
TNO2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

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

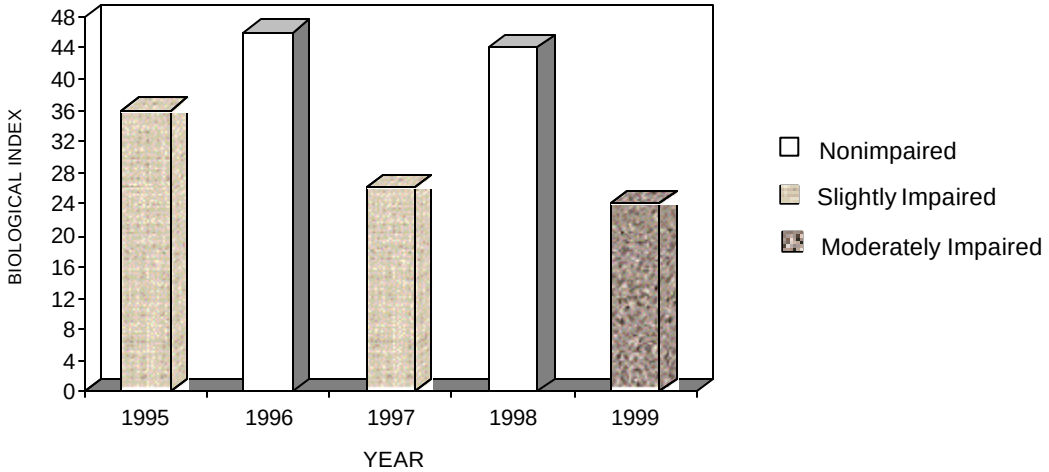
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/20/99	596 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/20/99	29	DMn							

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	2.9
RBP Score	24
RBP Condition	Moderately Impaired
Total Habitat Score	93
Habitat Condition Category	Supporting



Water Quality Index



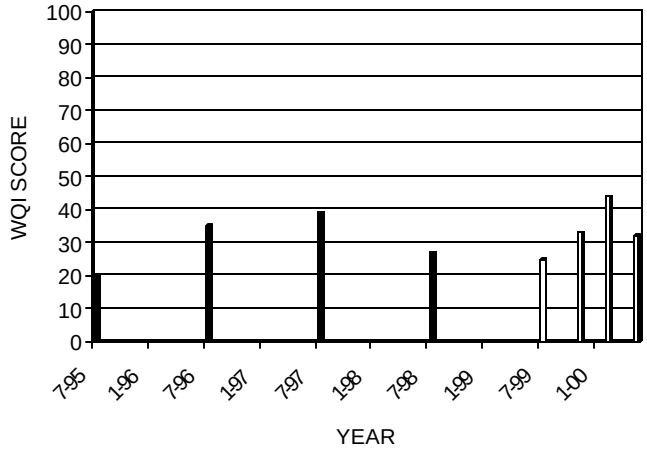
Biological Index

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

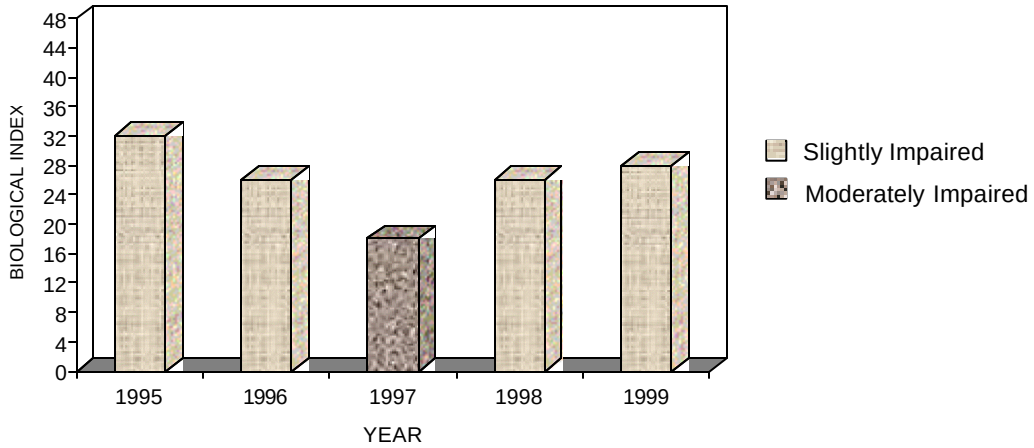
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/16/00	374 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
TFe	05/10/00	507 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/26/99	25								
11/09/99	33	TNH3	DFe						
02/16/00	44	DO	TPO4						
05/10/00	32								

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	2.94
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	67
Habitat Condition Category	Nonsupporting



Water Quality Index



Biological Index

Cascade Creek (CASC 1.6)

During fiscal year 2000, Cascade Creek at Lanesboro, Pa., (CASC 1.6) showed a slightly impaired macroinvertebrate community. This stream also was designated slightly impaired during the 1999 fiscal year.

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 and dissolved iron, pH, and alkalinity were exceeded during the sampling period (Table 25). The marginal macroinvertebrate community may be due to low flow conditions during July 1999, which can cause stress on the biological community, to poor habitat conditions at the site, or to poor water quality during the winter sampling season.

Cayuta Creek (CAYT 1.7)

Biological conditions of Cayuta Creek at Waverly, N.Y., (CAYT 1.7) were designated slightly impaired, decreased from nonimpaired conditions the previous year. Total iron and pH exceeded water quality standards during fiscal year 2000 at CAYT 1.7. Water quality analysis also indicated that Cayuta Creek at Waverly contained elevated concentrations of total and dissolved phosphorus, total and dissolved orthophosphates, total and dissolved solids, and total chlorides (Table 26).

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

Cayuta Creek showed several downward trends for total concentrations. WQI showed a significant decreasing trend ($0.05<p<0.10$), while strong, significant decreasing trends ($p<0.05$) were observed for total ammonia, total phosphorus, total sulfate, total iron, and total manganese (Table 19). When flow-adjusted concentrations were calculated, total ammonia, total nitrogen, and total sulfate showed strong, significant decreasing trends (Table 19).

Choconut Creek (CHOC 9.1)

During fiscal year 1999, the biological community of Choconut Creek at Vestal Center, N.Y., (CHOC 9.1) was designated nonimpaired for the third consecutive year. CHOC 9.1 had several pollution-intolerant taxa, including *Atherix* (Diptera: Athericidae), *Isonychia* (Ephemeroptera: Isonychiidae), *Nigronia* (Megaloptera: Corydalidae), *Ophiogomphus* (Odonata: Gomphidae), and *Acroneuria* (Plecoptera: Perlidae).

No parameters exceeded standards during July 1999, and water quality analysis indicated that water quality conditions were comparable to the reference site. No parameters exceeded the 90th percentile (Table 27). Impairment during 1996 may have been due to rechannelization, as evidenced by large amounts of riprap at the site.

Little Snake Creek (LSNK 7.6)

Little Snake Creek at Brackney, Pa., (LSNK 7.6) showed a slightly impaired biological community again in July 1999, as it had during the previous sampling period. The impairment may be due to low flow conditions at the time of sampling.

During fiscal year 2000, Little Snake Creek was added to the Group 1 streams and sampled quarterly. Total and dissolved iron exceeded water quality standards during July 1999, alkalinity during February 2000, and total iron during May 2000 (Table 28). Additionally, LSNK 7.6 had one of the highest WQI scores among the annually-sampled New York-Pennsylvania streams, with total and dissolved iron exceeding the 90th percentile.

Seeley Creek (SEEL 10.3)

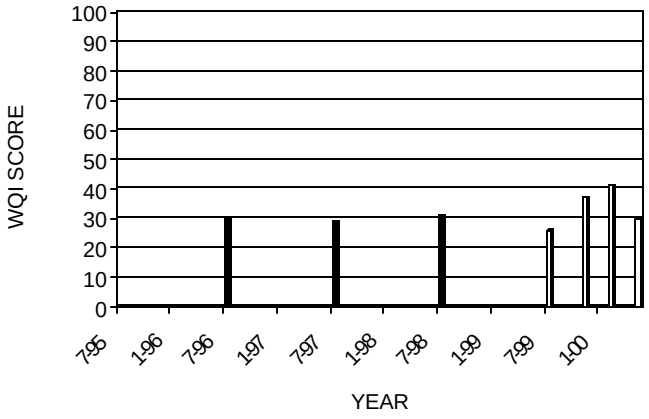
Seeley Creek at Seeley Creek, N.Y., (SEEL 10.3) contained a moderately impaired biological community and had shown a slightly to moderately impaired biological community for the past 10 years. During the 2000 sampling season,

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

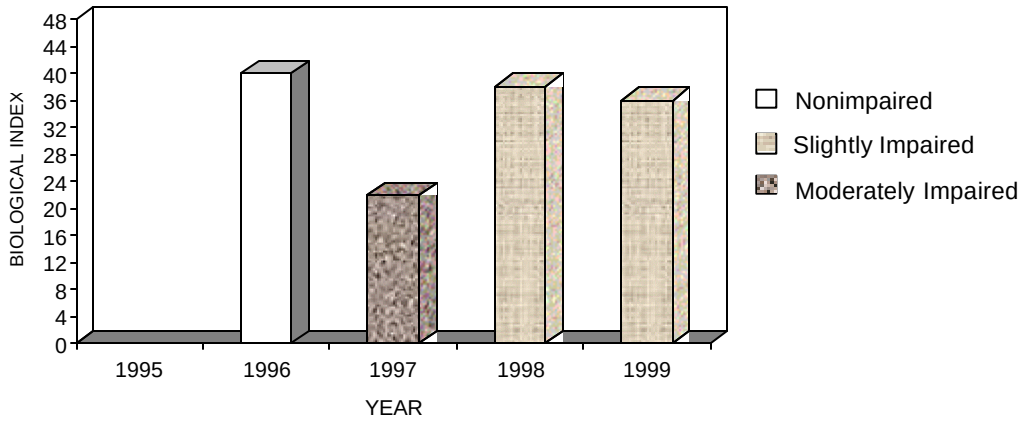
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/10/99	460 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
ALK	11/08/99	20 mg/l	20 mg/l	Pa. aquatic life
pH	02/15/00	5.9	6.5-8.5	N.Y. aquatic life
pH	02/15/00	5.9	6.0-9.0	Pa. aquatic life
ALK	02/15/00	4 mg/l	20 mg/l	Pa. aquatic life
TFe	02/15/00	578 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
DFe	02/15/00	437 µg/l	300 µg/l	Pa. aquatic life
ALK	05/09/00	14 mg/l	20 mg/l	Pa. aquatic life
TFe	05/09/00	372 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/99	26	DMn							
11/08/99	37	TNH3	DFe						
02/15/00	41	DO	DFe						
05/09/00	30	DFe	TPO4						

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	3.68
RBP III Score	36
RBP III Condition	Slightly Impaired
Total Habitat Score	87
Habitat Condition Category	Partially Supporting



Water Quality Index



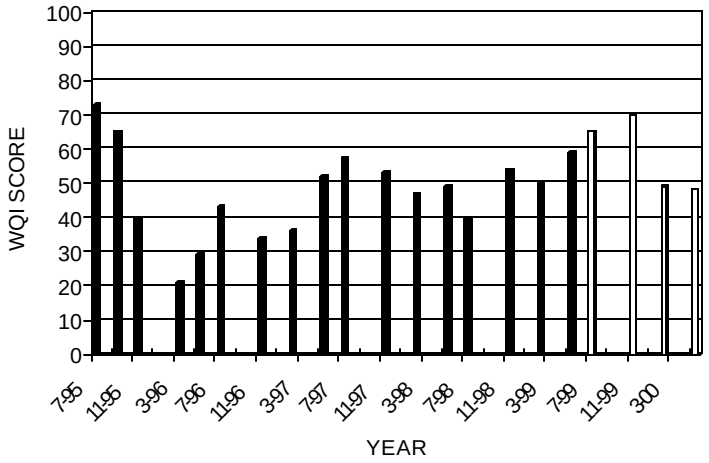
Biological Index

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

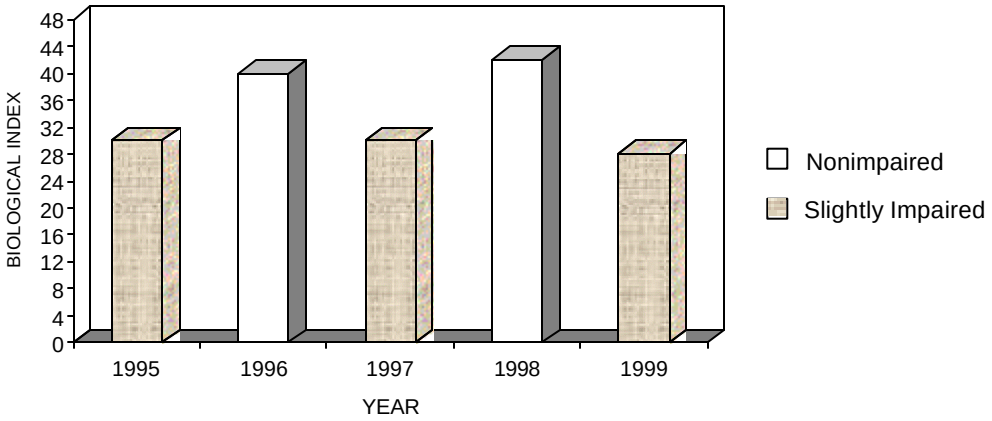
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	11/08/99	8.5	6.5-8.5	N.Y. aquatic life
TFe	02/15/00	393 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
pH	05/09/00	8.55	6.5-8.5	N.Y. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/99	65	COND	TS	DS	DNO3	TNO3	TP	DP	DPO4
		TCa	TCl	TSO4	TPO4				
11/08/99	70	COND	TS	DS	DNO2	TNO2	TP	DP	DPO4
		TOC	TCa	TCl	TPO4	TURB			
02/15/00	49	DO	TPO4						
05/09/00	48	COND	DPO4	TCa	TCl				

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	3.25
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	114
Habitat Condition Category	Excellent



Water Quality Index



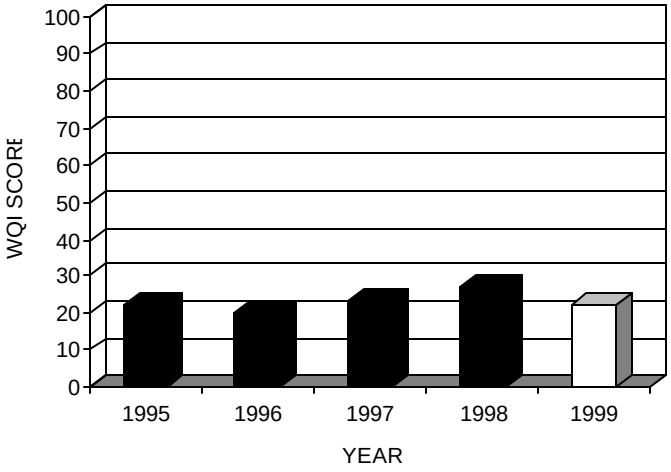
Biological Index

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

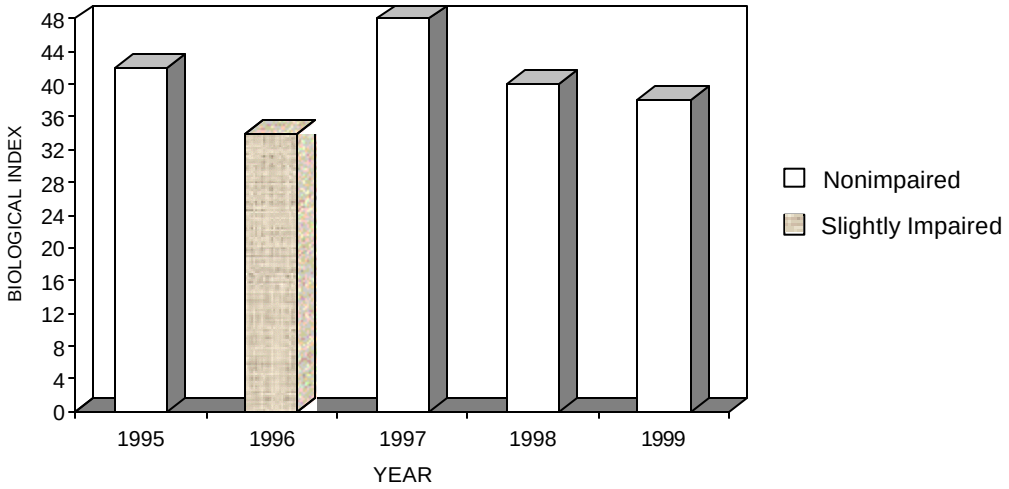
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/20/99	22								

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	3.61
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	101
Habitat Condition Category	Supporting



Water Quality Index



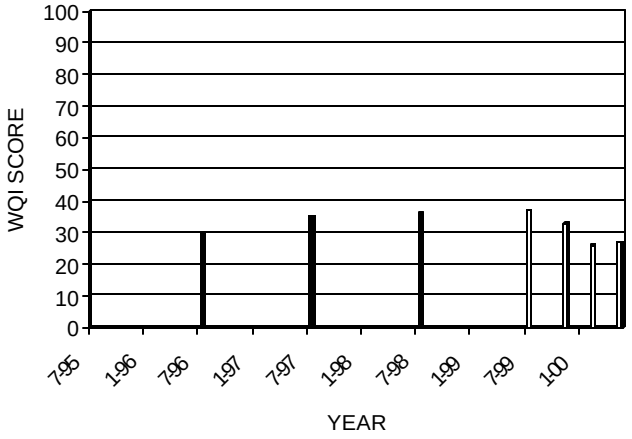
Biological Index

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

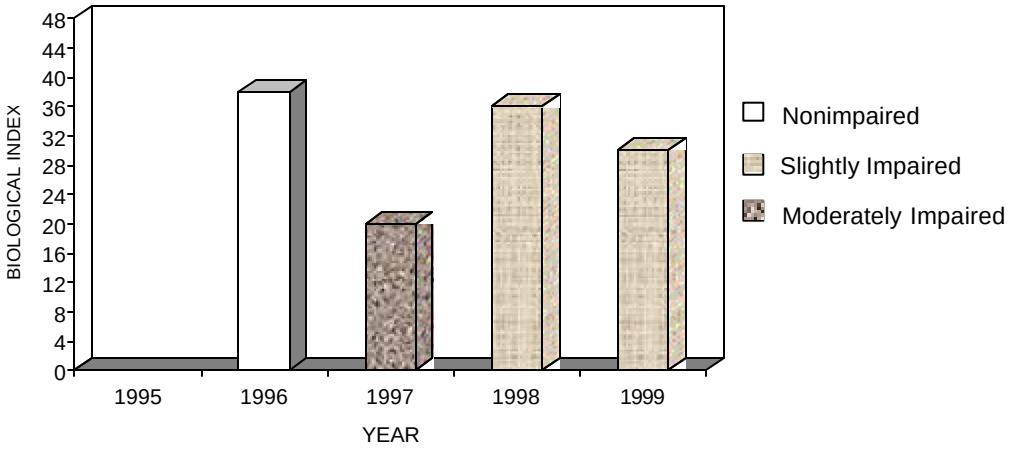
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	07/20/99	889 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
DFe	07/20/99	520 µg/l	300 µg/l	Pa. aquatic life
ALK	02/22/00	14 mg/l	20 mg/l	Pa. aquatic life
TFe	05/09/00	338 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/20/99	37	TFe	DFe						
11/08/99	33								
02/22/00	26	DO							
05/09/00	27	DFe							

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	3.42
RBP III Score	30
RBP III Condition	Slightly Impaired
Total Habitat Score	105
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Seeley Creek was added to the Group 1 streams in the ISWQN. Water quality analysis indicated fair water quality conditions in the stream with no parameters exceeding standards, and only total calcium, dissolved oxygen, and total organic carbon exceeding the 90th percentile (Table 29). The impaired biological community may have been due to flow-related incidents. During periods of low flow, large amounts of instream substrate were exposed in Seeley Creek. Additionally, rechannelization and removal of the instream habitat may have contributed to impairment at this site, as these activities reduce the habitat quality of the site. Habitat conditions at this site were considered nonsupporting.

New York State Department of Conservation (NYSDEC) listed Seeley Creek as "threatened" in their publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel. SRBC's findings concur with this statement.

Snake Creek (SNAK 2.3)

Snake Creek at Brookdale, Pa., (SNAK 2.3) served as the reference site for New York-Pennsylvania border streams. This site had an excellent biological community and physical habitat, with the lowest WQI score of the Group 2 New York-Pennsylvania streams (Table 30). Snake Creek supported many pollution-intolerant taxa, including *Atherix, Epeorus* (Ephemeroptera: Heptageniidae), *Isonychia*, *Nigronia*, *Leuctra* (Plecoptera: Leuctridae), and *Dolophilodes* (Trichoptera: Philopotamidae).

South Creek (SOUT 7.8)

During fiscal year 2000, South Creek at Fassett, Pa., (SOUT 7.8) showed a moderately impaired biological community. During the previous year, a nonimpaired biological community existed at SOUT 7.8. However, for the previous eight years, a slightly to moderately impaired macroinvertebrate population had inhabited this site.

Water quality at SOUT 7.8 was fair for a Group 2 New York-Pennsylvania stream, with no parameters exceeding standards or the 90th percentile (Table 31). Impairment at this site may be due to periodic drying of the streambed or to poor habitat diversity.

Troups Creek (TRUP 4.5)

Troups Creek at Austinburg, Pa., (TRUP 4.5) had a moderately impaired biological community for the second consecutive year during July 1999. This is the third time in five years that Troups Creek has contained a moderately impaired macroinvertebrate population.

Water quality in Troups Creek was somewhat degraded during the sampling period, although better than the previous year. Dissolved oxygen exceeded New York and Pennsylvania standards for aquatic life during May 2000. Additional water quality analysis indicated that dissolved oxygen and total organic carbon exceeded the 90th percentile (Table 32).

Troups Creek showed a strong, significant decreasing trend in total sulfate in both concentrations and flow-adjusted concentrations. The stream also showed a significant decreasing trend in total phosphorus and a significant increasing trend in total chloride (Table 19).

Trowbridge Creek (TROW 1.8)

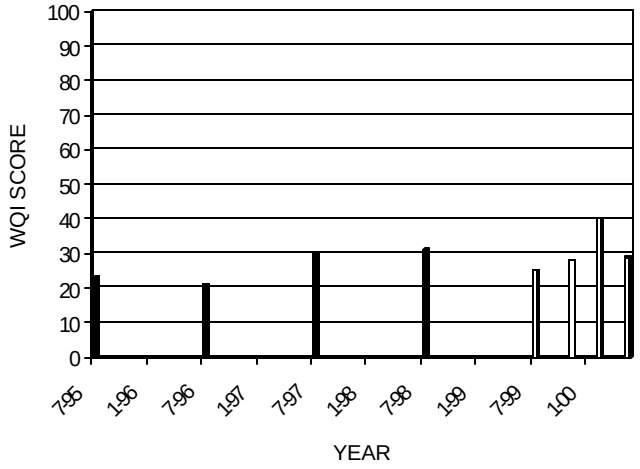
Trowbridge Creek at Great Bend, Pa., (TROW 1.8) had a moderately impaired biological community after being designated slightly impaired during fiscal year 1999. Impaired biological conditions at this site may be due to low flow conditions at the time of sampling or to poor habitat conditions. The location of the site also may contribute to the impaired designation of the site. TROW 1.8 is located directly adjacent to a road, which may lead to an influx of pollutants. In the past, chemically treated grass clippings were deposited in the stream, as reported by local residents.

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

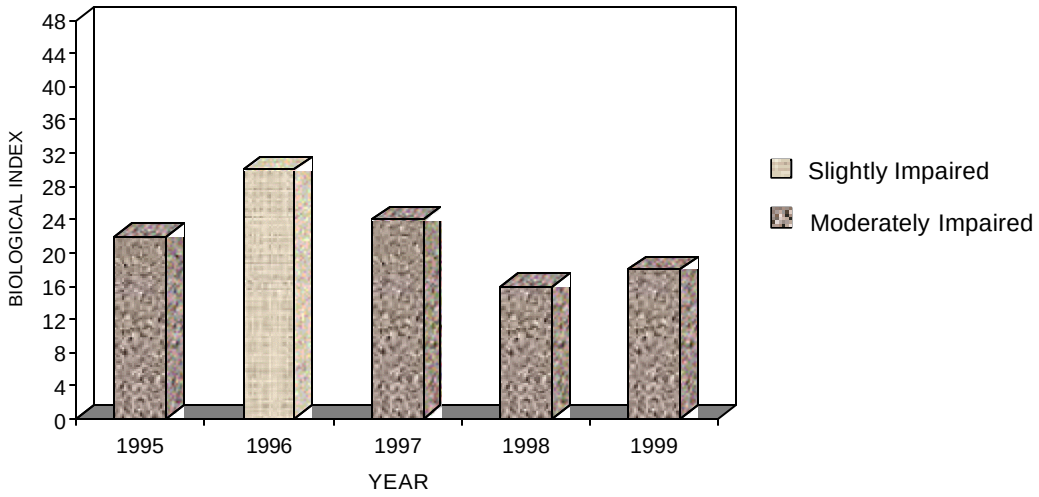
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/26/99	25	TCa							
11/09/99	28	DO	TCa						
02/16/00	40	DO	TOC						
05/10/00	29								

Biological and Habitat Summary	
Number of Taxa	14
Diversity Index	2.38
RBP III Score	18
RBP III Condition	Moderately Impaired
Total Habitat Score	57
Habitat Condition Category	Nonsupporting



Water Quality Index



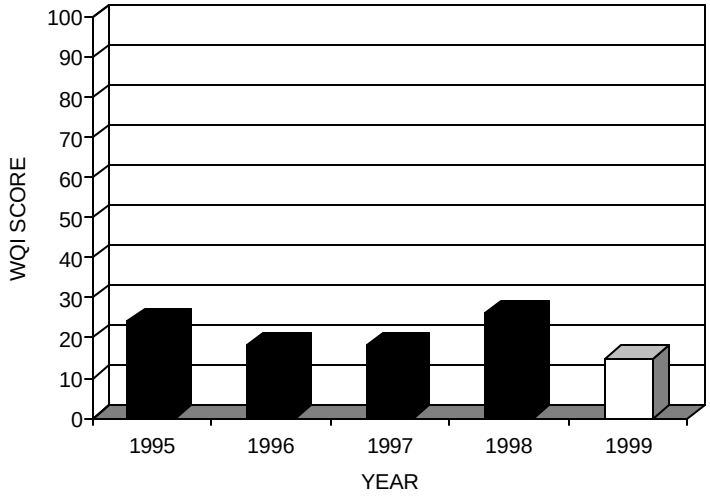
Biological Index

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

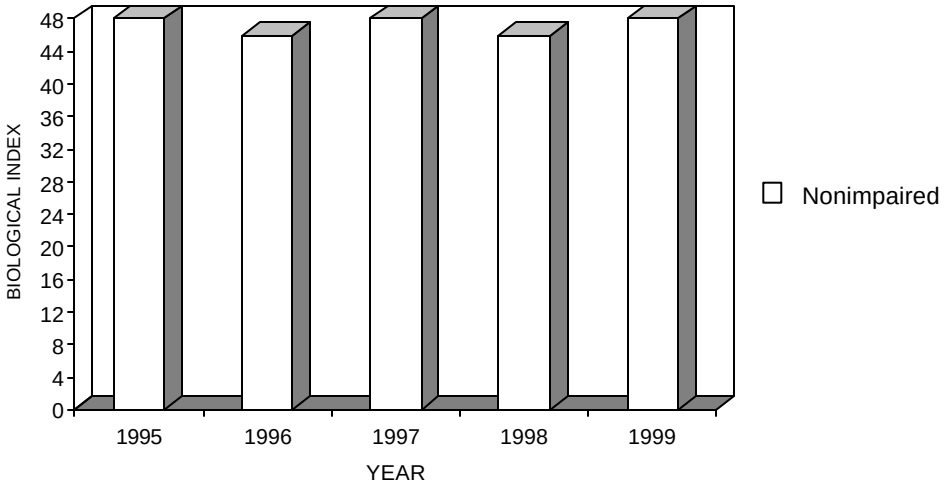
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/20/99	15								

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	3.93
RBP III Score	48
RBP III Condition	Reference
Total Habitat Score	122
Habitat Condition Category	Reference



Water Quality Index



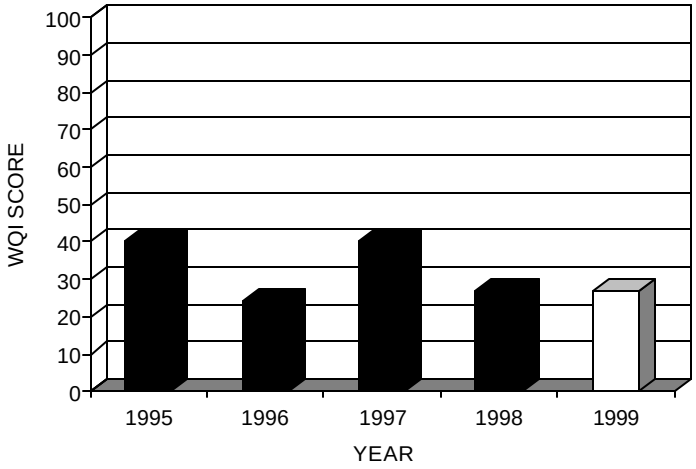
Biological Index

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

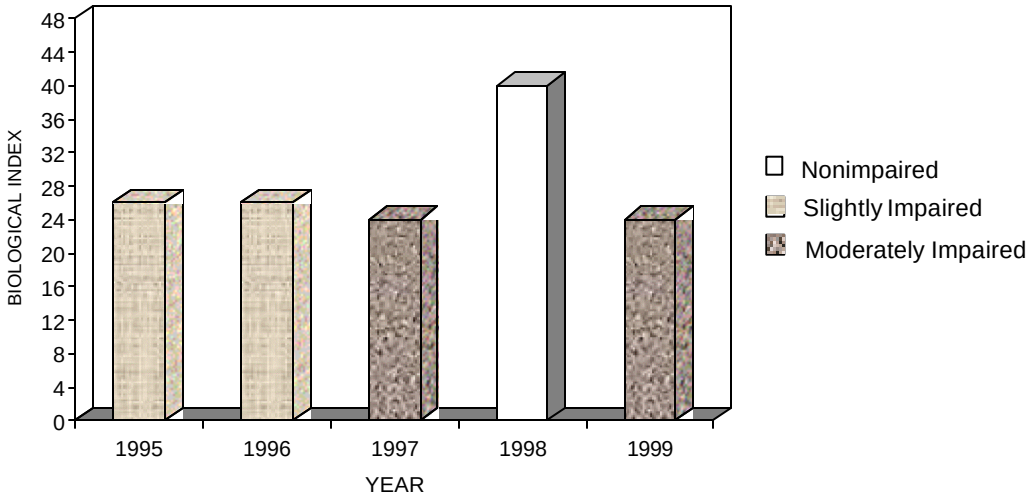
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/26/99	27								

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	3.39
RBP III Score	24
RBP III Condition	Moderately Impaired
Total Habitat Score	88
Habitat Condition Category	Partially Supporting



Water Quality Index



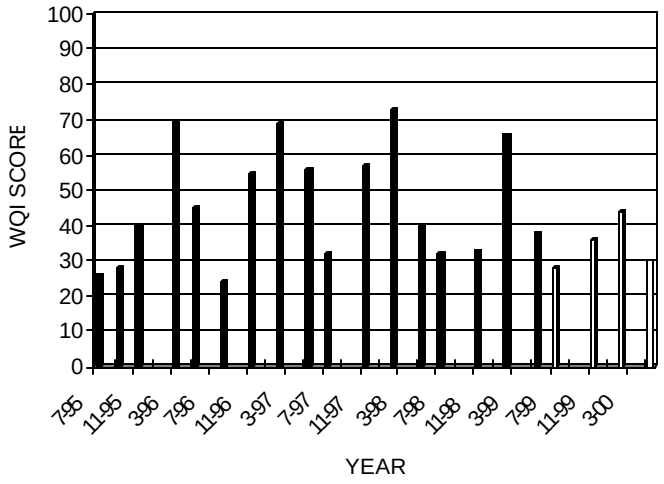
Biological Index

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

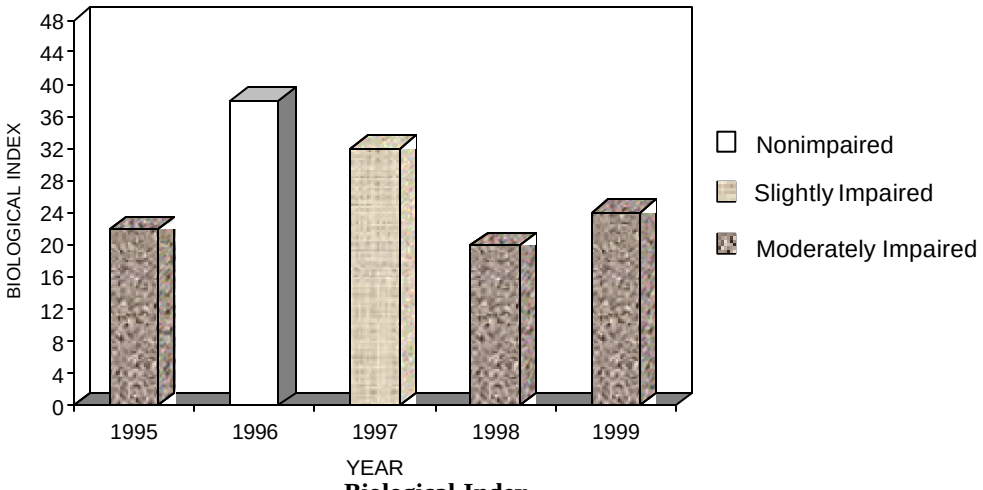
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DO	05/10/00	3.83 mg/l	4.0 mg/l	N.Y. aquatic life
DO	05/10/00	3.83 mg/l	4.0 mg/l	Pa. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**							
07/27/99	28								
11/09/998	36								
02/16/00	44	DO							
05/10/00	30	DO	TOC						

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	3.18
RBP Score	24
RBP Condition	Moderately Impaired
Total Habitat Score	101
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Along with Snake Creek (SNAK 2.3), TROW 1.8 had the lowest WQI score (15) of any New York-Pennsylvania border stream (Table 33). Dissolved oxygen and alkalinity were somewhat depressed during the sampling period, but did not exceed standards or the 90th percentile.

Wappasening Creek (WAPP 2.6)

A slightly impaired biological community was present at Wappasening Creek at Nichols, N.Y., (WAPP 2.6) during fiscal year 2000. WAPP 2.6 had a nonimpaired biological community during the previous year. Water quality conditions at this site were comparable to the reference site, with no parameters exceeding standards of the 90th percentile (Table 34).

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 August 1999. This site had the best combination of biological community and physical habitat of the Pennsylvania - Maryland streams. A large number of organic pollution intolerant taxa inhabited this site, including *Antocha* (Diptera: Tipulidae), *Epeorus*, *Stenonema* (Ephemeroptera: Heptageniidae), *Isonychia*, *Nigronia*, *Leuctra*, *Acroneuria*, *Agnetina* (Plecoptera: Perlidae), *Eccoptura* (Plecoptera: Perlidae), *Glossosoma* (Trichoptera: Glossosomatidae), *Dolophilodes*, and *Rhyacophila* (Trichoptera: Rhyacophilidae). Overall water quality was good in Big Branch Deer Creek, with no parameters exceeding standards or the 90th percentile (Table 35).

Conowingo Creek (CNWG 4.4)

Conowingo Creek at Pleasant Grove, Pa., (CNWG 4.4) had a moderately impaired community after having slightly impaired biological conditions for the three previous years. Habitat at this site was considered excellent.

Although no parameters exceeded state standards, nitrate concentrations were elevated, as they are at many sites in this region. Additional water quality analysis indicated that solids, aluminum, nitrates, and magnesium were elevated and dissolved oxygen was reduced (Table 36). As agriculture is the area's prevalent land use, it appears that the stream was enriched by agricultural runoff.

Conowingo Creek had a variety of upward and downward trends. Strong significant increasing trends occurred for total nitrogen and total chloride in both concentrations and flow-adjusted concentrations. Strong, significant decreasing trends were found for total iron, total aluminum, and WQI for both concentrations and flow-adjusted concentrations and significant decreasing trends occurred for both concentrations and flow-adjusted concentrations of total phosphorus (Table 19).

Deer Creek (DEER 44.2)

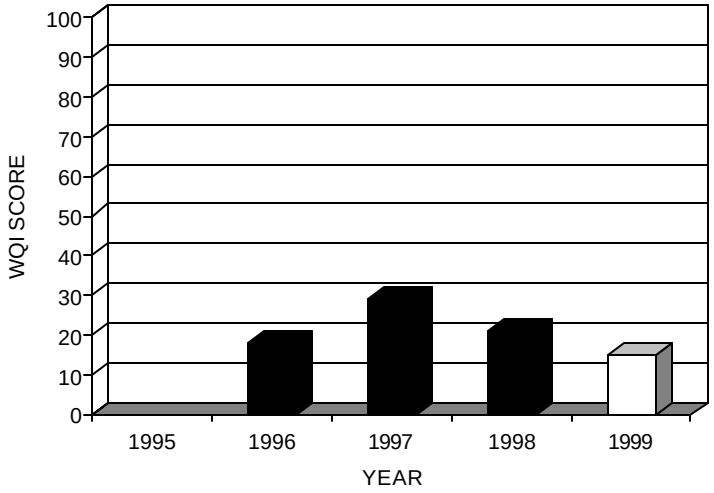
Deer Creek at Gorsuch Mills, Md., (DEER 44.2) had a slightly impaired macroinvertebrate community for the second consecutive year, after having a nonimpaired community for two years. Habitat conditions at the site were considered partially supporting, and the sampling site is located adjacent to agricultural activities, which may affect the biological community at DEER 44.2. Deer Creek had the lowest average WQI score (25.3) and the lowest individual WQI score (21) of Group 1 streams in this region. Water quality at this site was good (Table 37), although nitrate levels were somewhat elevated, as they were in most streams in this area. Dissolved oxygen also exceeded the 90th percentile during March 2000. Deer Creek harbored a diverse macroinvertebrate community, including pollution-intolerant taxa such as *Atherix*, *Serratella* (Ephemeroptera: Ephemerellidae), *Isonychia*, *Nigronia*, *Leuctra*, and *Acroneuria*.

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

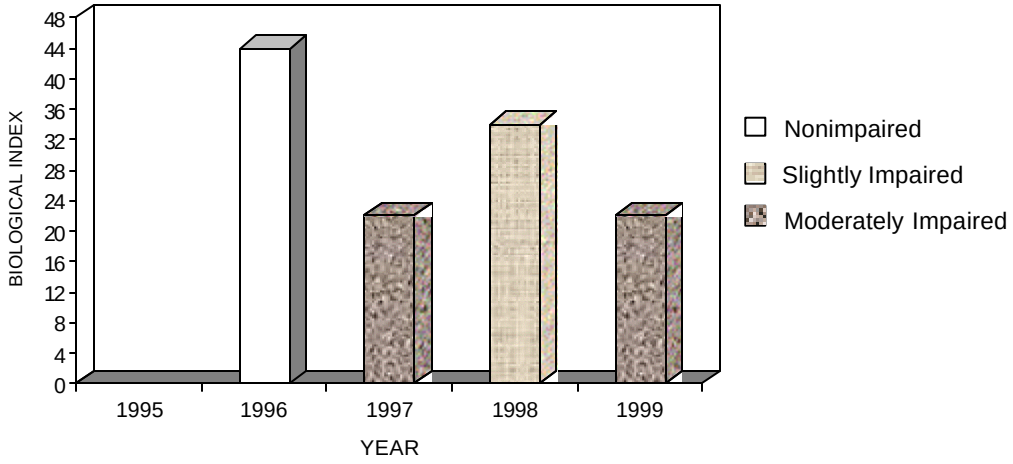
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/99	15								

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	3.05
RBP III Score	22
RBP III Condition	Moderately Impaired
Total Habitat Score	81
Habitat Condition Category	Partially Supporting



Water Quality Index



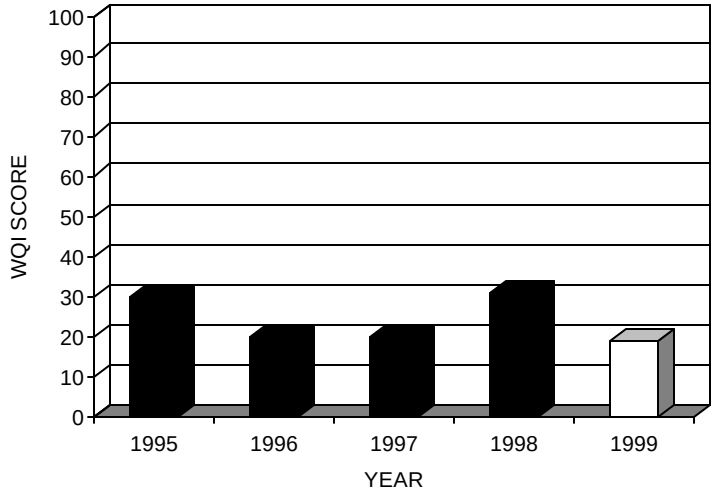
Biological Index

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

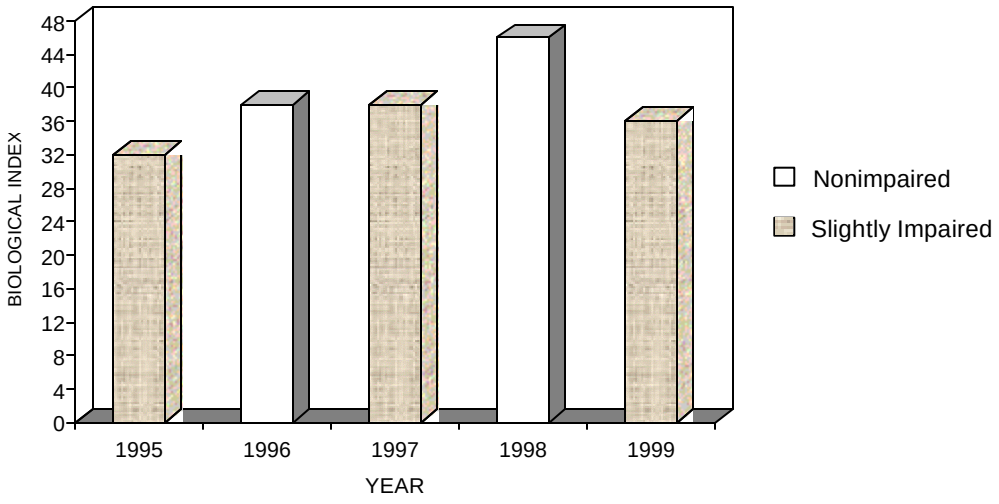
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/99	19								

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	3.52
RBP Score	36
RBP Condition	Slightly Impaired
Total Habitat Score	102
Habitat Condition Category	Supporting



Water Quality Index



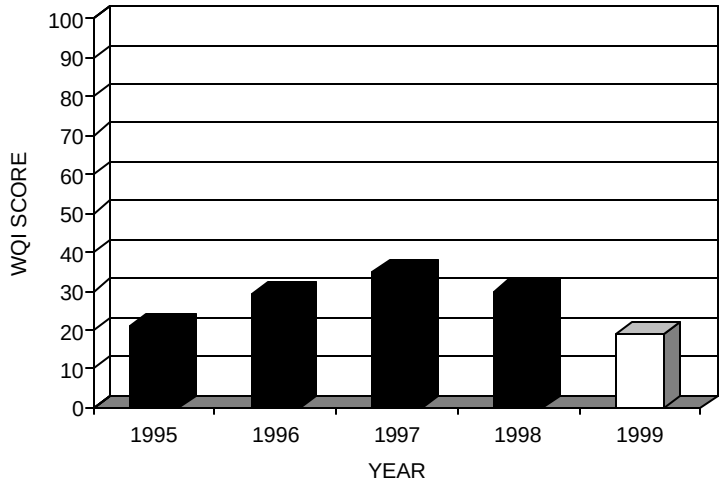
Biological Index

Table 35. Water Quality Summary Big Branch Deer Creek at Fawn Grove, Pa.

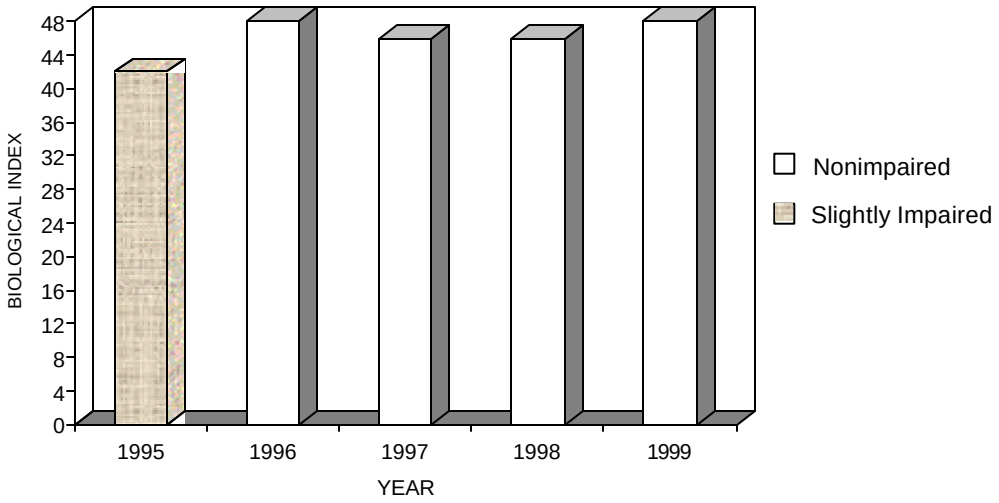
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/03/99	19								

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	3.86
RBP Score	48
RBP Condition	Reference
Total Habitat Score	121
Habitat Condition Category	Reference



Water Quality Index



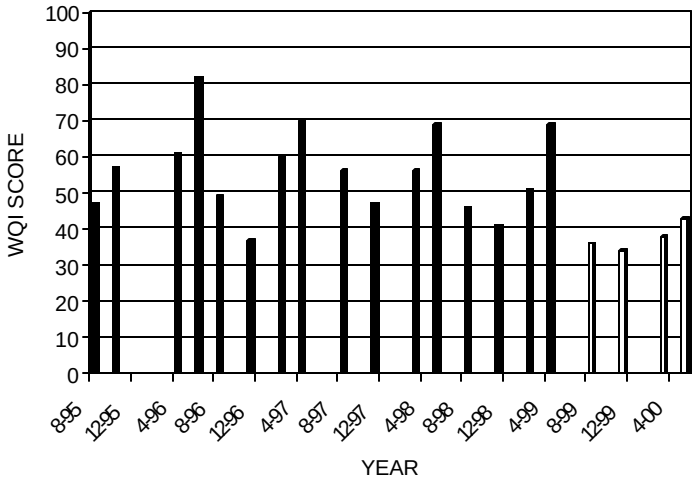
Biological Index

Table 36. Water Quality Summary Conowingo Creek at Pleasant Grove, Pa.

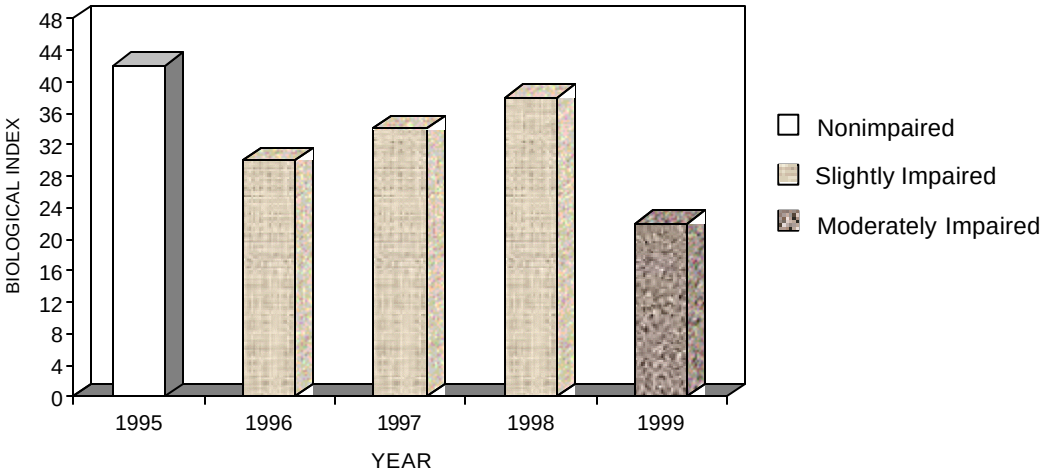
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/04/99	36	TNO3	TAL						
11/12/99	34	DNO3	TNO3						
03/08/00	38	DO	DNO3	TNO3					
05/03/00	43	DO	TS	DS	DNO3	TNO3	TMg		

Biological and Habitat Summary	
Number of Taxa	16
Diversity Index	3.19
RBP III Score	22
RBP III Condition	Moderately Impaired
Total Habitat Score	121
Habitat Condition Category	Excellent



Water Quality Index



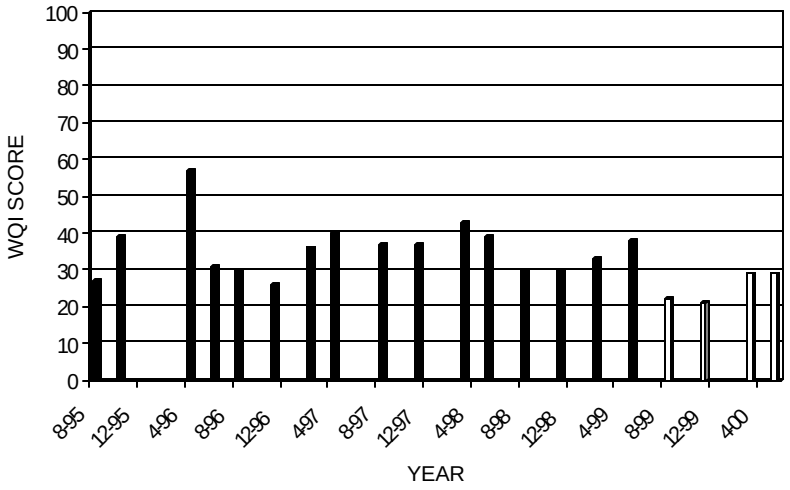
Biological Index

Table 37. Water Quality Summary Deer Creek at Gorsuch Mills, Md.

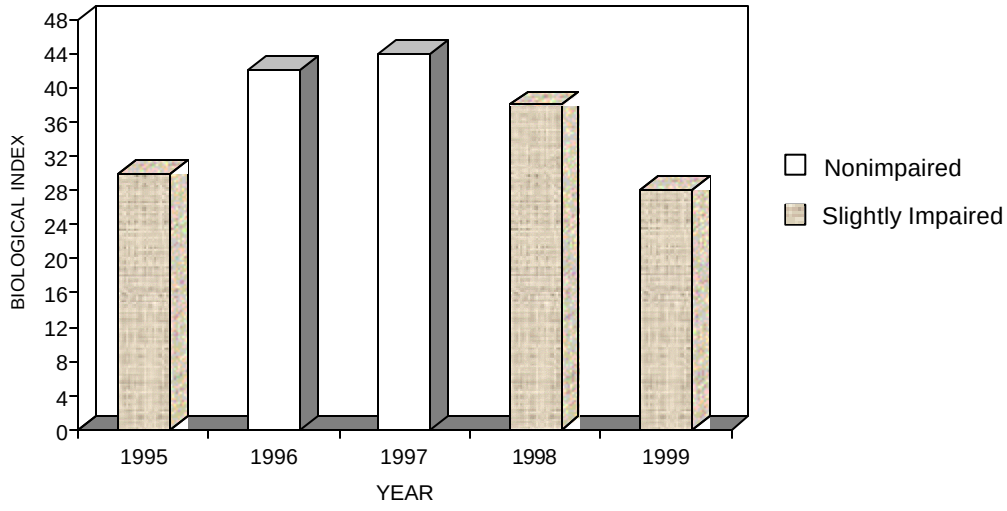
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/03/99	22								
11/11/99	21								
03/08/00	29	DO							
05/02/00	29								

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	3.8
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	86
Habitat Condition Category	Partially Supporting



Water Quality Index



Biological Index

Deer Creek showed a mixture of increasing and decreasing trends of the period 1986 through 2000. Strong, significant upward trends were found for total chloride concentrations and flow-adjusted concentrations. Significant increasing trends also occurred in total nitrogen flow-adjusted concentrations of total nitrogen and total sulfate concentrations. Strong, significant decreasing trends occurred in both total phosphorus and total iron concentrations and flow-adjusted concentrations and total ammonia concentrations. Significant decreasing trends also were found in total manganese concentrations and flow-adjusted WQI (Table 19).

Ebaughs Creek (EBAU 1.5)

For the eleventh year, Ebaughs Creek at Stewartstown, Pa., (EBAU 1.5) had a slightly to moderately impaired biological community. Physical habitat at this site was considered partially supporting during the 2000 fiscal year, and the biological community was designated moderately impaired.

Although no parameters exceeded water quality standards, Ebaughs Creek had elevated concentrations of total and dissolved nitrates, total and dissolved ammonia, dissolved phosphorus, and dissolved orthophosphates (Table 38). The relatively high WQI, low RBP III scores, and the chemical analysis suggested that wastewater discharges might have affected the water quality and the biological community at this site.

Ebaughs Creek had a mixture of upward and downward water quality trends. Strong, significant increasing trends occurred in both total chloride concentrations and flow-adjusted concentrations. A significant increasing trend occurred in total solids concentrations. Strong significant decreasing trends were found for total iron concentrations and FAC and in both total ammonia and total phosphorus concentrations. A flow-adjusted total phosphorus (Table 19).

Falling Branch Deer Creek (FBDC 4.1)

The biological community of Falling Branch Deer Creek at Fawn Grove, Pa., (FBDC 4.1) was designated moderately impaired, a decrease from slightly impaired the previous year. The impairment may have been due to poor habitat, low flow conditions, runoff from cropland adjacent to the site, and the large amount of agricultural activity in the small watershed.

Overall, water quality appeared to be good, with no parameters exceeding standards or the 90th percentile (Table 39).

Long Arm Creek (LNGA 2.5)

For the fifth consecutive year, Long Arm Creek at Bandanna, Pa., (LNGA 2.5) had a slightly impaired biological community. LNGA 2.5 was located adjacent to agricultural activities, which may have been the source of impairment at this site. Livestock in the stream reduced the habitat quality in Long Arm Creek, which may have affected the biological community. However, the situation is expected to improve as an organic farm, with fewer livestock and reduced access to the stream, has replaced the previous operation.

During the 2000 sampling season, Long Arm Creek was elevated to a Group 1 stream. LNGA2.5 showed elevated nitrogen values, as did most of the streams in this region. Overall, the water quality in this stream was fair for a Pennsylvania-Maryland Group 1 stream (Table 40). Although no water quality standards were exceeded, total aluminum, dissolved oxygen, dissolved phosphorus, dissolved orthophosphate, and turbidity exceeded the 90th percentile at this site.

Octoraro Creek (OCTO 6.6)

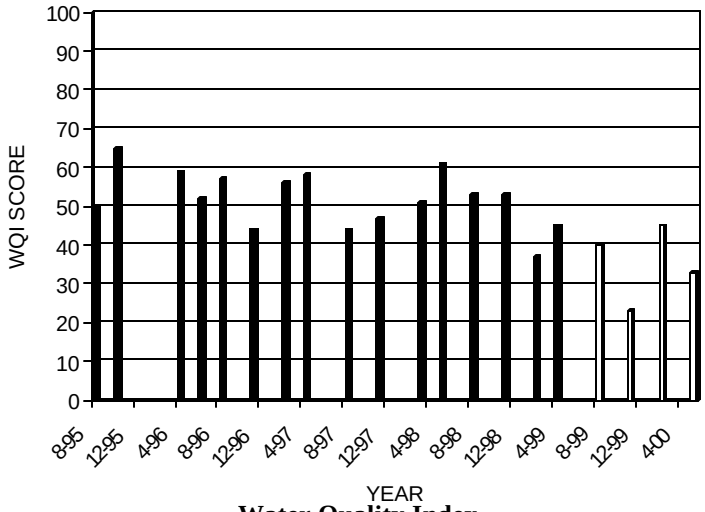
Octoraro Creek at Rising Sun, Md., (OCTO 6.6) had a slightly impaired biological community during the 1999 sampling season. The habitat at this site was excellent. No parameters exceeded water quality standards, and WQI scores were good for Group 1 streams in this region, although dissolved oxygen was reduced and solids were elevated (Table 41). OCTO 6.6 also showed elevated nitrate values. The slightly impaired biological community may have been due to

Table 38. Water Quality Summary Ebaughs Creek at Stewartstown, Pa.

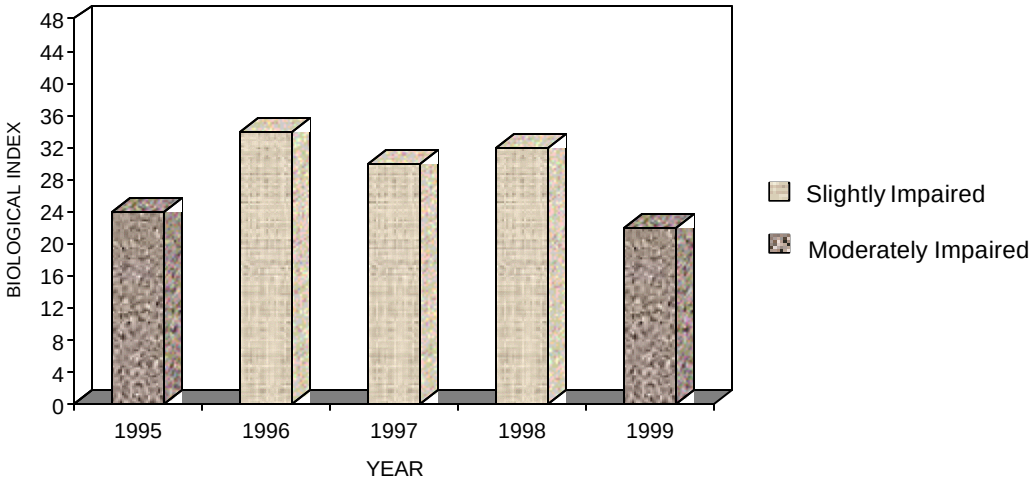
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/03/99	40	DNO3	TNO3	DP	DPO4				
11/11/99	23								
02/08/00	45	DNH3	TNH3						
05/02/00	33								

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.65
RBP Score	22
RBP Condition	Moderately Impaired
Total Habitat Score	90
Habitat Condition Category	Partially Supporting



Water Quality Index



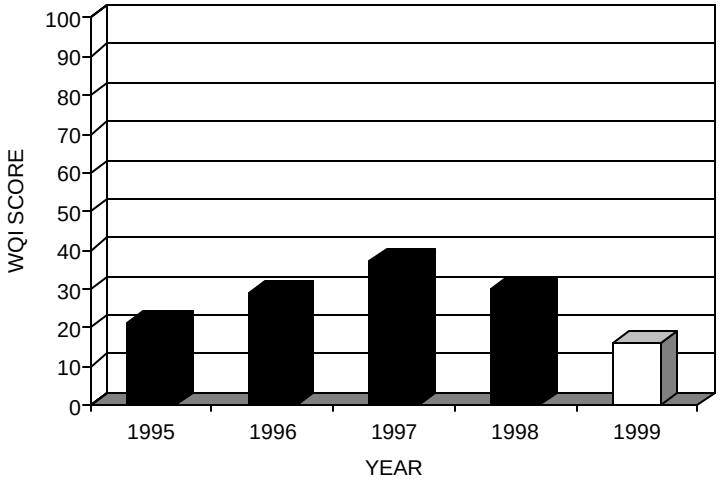
Biological Index

Table 39. Water Quality Summary Falling Branch Deer Creek at Fawn Grove, Pa.

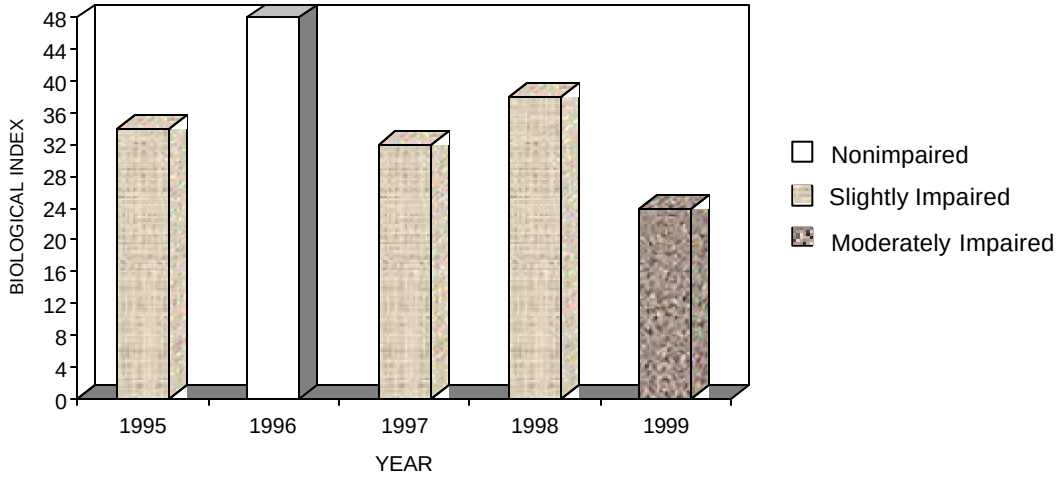
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/03/99	16								

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	3.39
RBP Score	24
RBP Condition	Moderately Impaired
Total Habitat Score	87
Habitat Condition Category	Partially Supporting



Water Quality Index



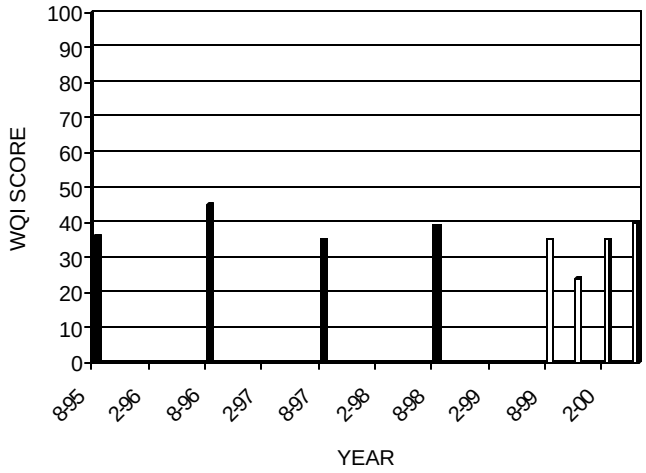
Biological Index

Table 40. Water Quality Summary Long Arm Creek at Bandanna, Pa.

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

Date	WQI	Parameters Exceeding 90th Percentile							
08/02/99	35	TAL							
11/11/99	24								
02/08/00	35	DP	DPO4						
05/02/00	40	DO	TURB						

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	3.53
RBP III Score	26
RBP III Condition	Slightly Impaired
Total Habitat Score	65
Habitat Condition Category	Nonsupporting



Water Quality Index

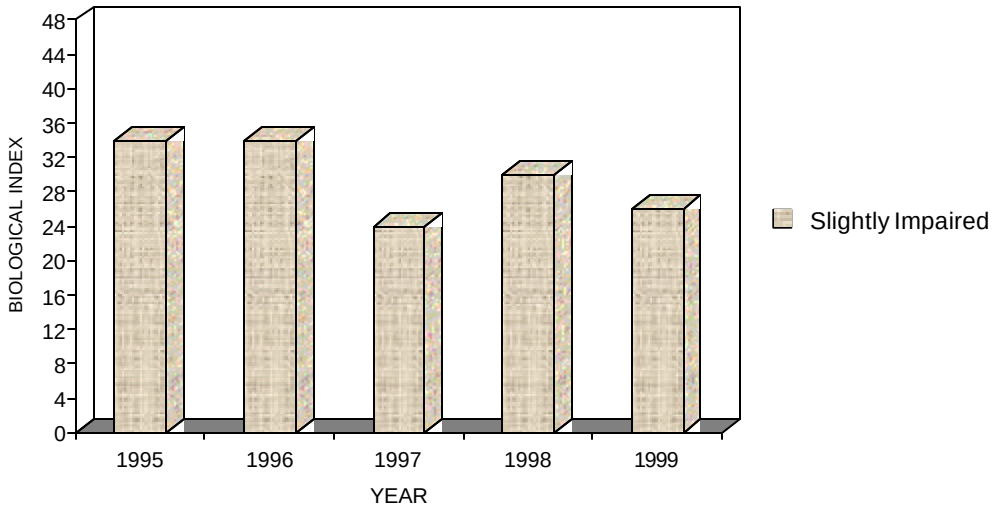


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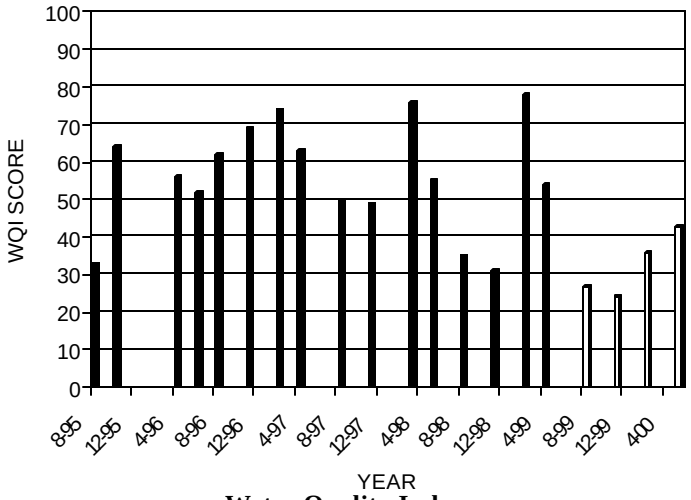
Table 41. Water Quality Summary Octoraro Creek at Rising Sun, Md.

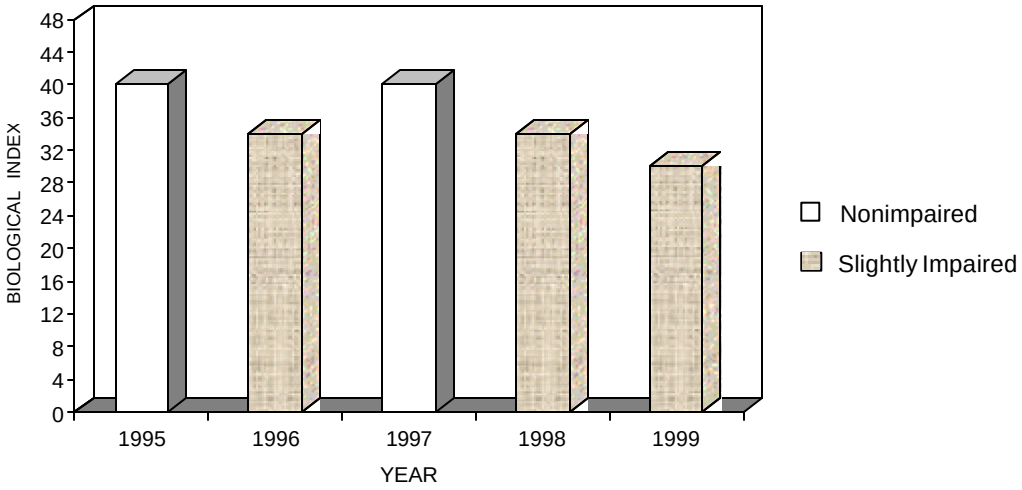
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/04/99	27								
11/12/99	24								
02/09/00	36								
05/03/00	43	DO	TS	DS					

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	3.62
RBP III Score	30
RBP III Condition	Slightly Impaired
Total Habitat Score	117
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

agricultural activities in the watershed or to the impoundment at Octoraro Lake.

Several increasing and decreasing trends were found at OCTO 6.6. Strong, significant increasing trends occurred for total chloride concentrations and flow-adjusted concentrations. A significant increasing trend also was found for total nitrogen concentrations. Strong, significant decreasing trends were found in total ammonia concentrations and WQI and in both the total phosphorus concentrations and flow-adjusted concentrations (Table 19).

Scott Creek (SCTT 3.0)

For the eleventh consecutive year, Scott Creek at Delta, Pa., (SCTT 3.0) had a moderately to severely impaired biological community. During fiscal year 2000, Scott Creek had a severely impaired macroinvertebrate community, with the lowest taxonomic richness (4), lowest diversity index (0.90), highest Hilsenhoff Biotic Index (7.31), lowest EPT index (0), and the highest percent dominant taxa (83 percent) of all streams in the region. Habitat at this site was also nonsupporting.

In January 1998, a fuel spill occurred on Scott Creek in Cardiff, Md. Four to five thousand gallons of home heating fuel spilled into Scott Creek when an attempt was made to steal the fuel. The spill also resulted in a fish kill. Although, the fuel spill probably adversely affected the aquatic inhabitants of the stream, Scott Creek has been impaired for many years.

Dissolved oxygen, total iron, dissolved iron, and total manganese exceeded Pennsylvania state standards during August 1999. Dissolved oxygen, pH, total iron, dissolved iron, and total manganese exceeding standards during November 1999. Total and dissolved iron exceeded standards during February 2000, and dissolved iron exceeded standards during the May 2000 sampling period. Additional water quality analysis indicated that Scott Creek had elevated ammonia, magnesium, chloride, phosphorus, orthophosphates, nitrites, iron, manganese, total organic carbon, and solids, and reduced dissolved oxygen (Table 42). This site also had the highest average WQI score (84.5) and highest individual WQI (89) of the streams in this region. Although a treatment plant has been constructed to serve the area and reduce the impacts of sewage on the stream, raw sewage from the Cardiff-Delta area may continue to degrade water quality and the biological community of Scott Creek. SCTT 3.0 is located upstream of the wastewater treatment plant for Cardiff and Delta.

Scott Creek had a mixture of increasing and decreasing trends during fiscal year 1999. Using concentration values, total chloride showed a significant increasing trend, while total phosphorus, total sulfate, and WQI showed strong, significant decreasing trends. Total iron and total manganese showed a significant decreasing trend (Table 19). When concentrations were flow-adjusted, total chloride showed a significant increasing trend, total solids showed a significant increasing trend, and total sulfate showed a strong, significant decreasing trend (Table 19).

South Branch Conewago Creek (SBCC 20.4)

South Branch Conewago Creek near Bandanna, Pa., (SBCC 20.4) contained a slightly impaired biological community for the third consecutive year, after having served as the Pennsylvania-Maryland reference site for several years. However, several pollution-intolerant taxa inhabited SBCC 20.4, including *Nigronia*, *Leuctra*, *Peltoperla* (Plecoptera: Peltoperlidae), *Acroneuria*, and *Dolophilodes*.

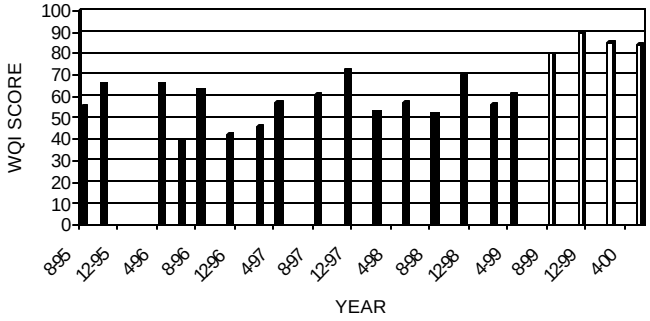
SBCC 20.4 had a low WQI score, and no parameters exceeded standards or the 90th percentile at South Branch Conewago Creek (Table 43). Low flow conditions at the time of sampling may have affected the biological community and produced a slightly impaired designation.

Table 42. Water Quality Summary Scott Creek at Delta, Pa.

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
DO	08/04/99	2.88 mg/l	4.0 mg/l	Pa. aquatic life
TFe	08/04/99	14,200 µg/l	1,500 µg/l	Pa. aquatic life
DFe	08/04/99	5,900 µg/l	300 µg/l	Pa. aquatic life
TMn	08/04/99	2,290 µg/l	1,000 µg/l	Pa. water supply
pH	11/11/99	6.25	6.5 – 8.5	Md. aquatic life
DO	11/11/99	3.36 mg/l	4.9 mg/l	Pa. aquatic life
TFe	11/11/99	18,200 µg/l	1,500 µg/l	Pa. aquatic life
DFe	11/11/99	16,500 µg/l	300 µg/l	Pa. aquatic life
TMn	11/11/99	1,930 µg/l	1,000 µg/l	Pa. water supply
TFe	02/08/00	1,830 µg/l	1,500 µg/l	Pa. aquatic life
DFe	02/08/00	1,240 µg/l	300 µg/l	Pa. aquatic life
DFe	05/02/00	667 µg/l	300 µg/l	Pa. aquatic life

Date	**WQI**	**Parameters Exceeding 90th Percentile**								
08/04/99	80	DO	COND	TNH3	DNH3	TP	TOC	TMg	TCl	TFe
		DFe	TMn	DMn	TPO4	TURB				
11/11/99	89	DO	COND	TS	DS	DNH3	TNH3	DNO2	TNO2	TP
		DP	DPO4	TOC	TCa	TMg	TCl	TFe	DFe	TMn
		DMn	TPO4	TURB						
02/08/00	85	COND	TS	DS	DNH3	TNH3	DNO2	TNO2	DPO4	TOC
		TCa	TMg	TCl	TFe	TMn	DMn	TPO4	TURB	
05/02/00	84	DO	TS	DS	COND	DNH3	TNH3	DNO2	TNO2	TP
		DP	TOC	TCl	TSO4	TFe	DFe	TMn	DMn	TPO4

Biological and Habitat Summary	
Number of Taxa	4
Diversity Index	0.90
RBP III Score	0
RBP III Condition	Severely Impaired
Total Habitat Score	71
Habitat Condition Category	Nonsupporting



Water Quality Index

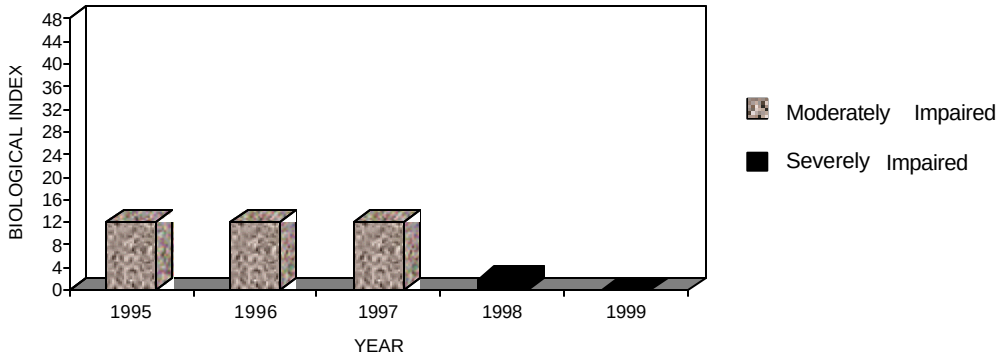


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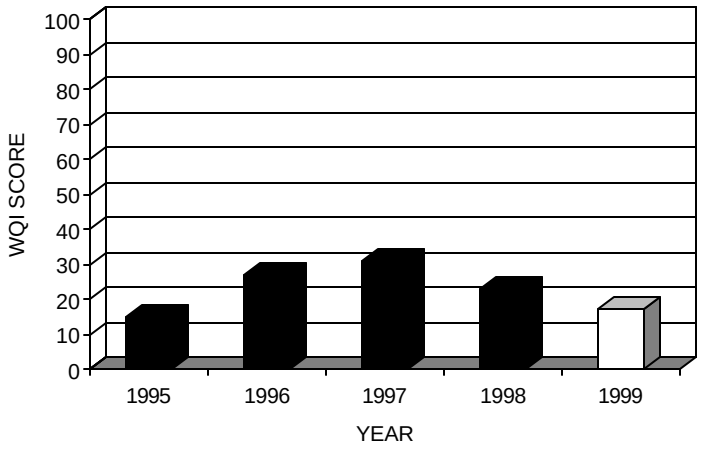
Table 43. Water Quality Summary South Branch Conewago Creek at Bandanna, Pa.

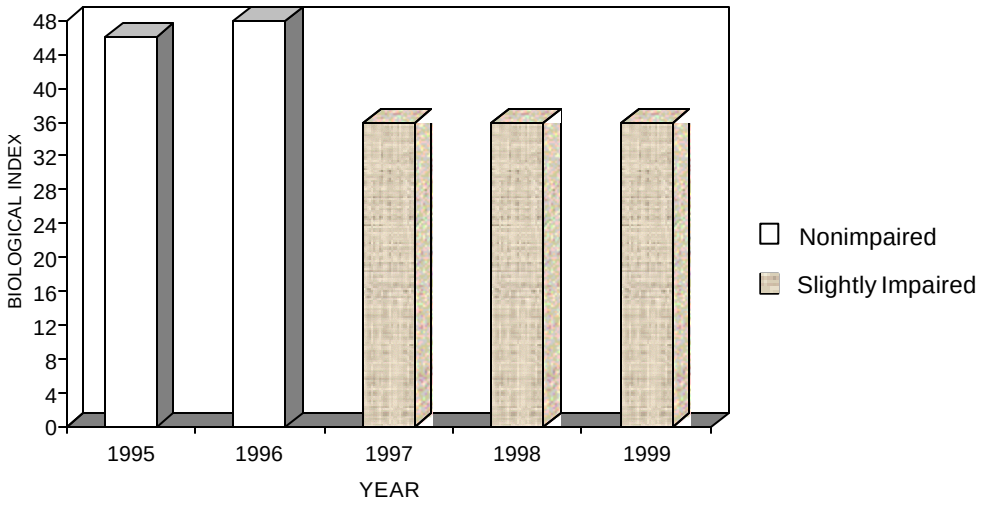
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/02/99	17								

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	3.66
RBP III Score	36
RBP III Condition	Slightly Impaired
Total Habitat Score	115
Habitat Condition Category	Excellent



Water Quality Index



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River Sites

Chemung River (CHEM 12.0)

A nonimpaired biological community existed in the Chemung River at Chemung, N.Y., (CHEM 12.0). During fiscal year 1999, a slightly impaired biological community was found at this site. The physical habitat was considered excellent.

Total iron and pH exceeded standards during the 1999-2000 sampling season. Overall, water quality was poor. Analysis indicated that dissolved oxygen was depressed, while solids, calcium, magnesium, chloride, phosphorus, nitrites, and nitrates were elevated at CHEM 12.0 (Table 44). This site also had the highest overall WQI score (66) and the highest individual WQI score (87) of the river sites.

Total chloride concentrations and FAC showed strong, significant increasing trends. All other parameters decreased over the period involved. Strong, significant decreasing trends were found for concentrations and flow-adjusted concentrations of total ammonia, total sulfate, and total iron. Significant decreasing trends also occurred in total nitrogen concentrations and both the total manganese concentrations and flow-adjusted concentrations (Table 19).

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 eight years of sampling. In the past, increased phytoplankton production in the Cowanesque Reservoir may have caused a shift in the macroinvertebrate community, resulting in a biological population dominated by filter-feeding organisms. Additionally, the bottom discharge dam depressed oxygen levels in the Cowanesque River downstream of the outflow. Impaired conditions also may be affected by partially supporting habitat conditions at this site. The site was heavily dominated by pollution-tolerant aquatic sowbugs (Asellidae). This site had the fewest number of taxa (10), the lowest diversity index (2.35), the highest Hilsenhoff Biotic Index (6.86), the lowest EPT index (4), and the lowest overall RBP III score (10) of the sites in this category.

However, the water quality at COWN 2.2 appeared to have improved from previous sampling periods. No parameters exceeded state standards, although total manganese, nitrites, total organic carbon, total iron, total manganese, turbidity, and dissolved oxygen exceeded the 90th percentile during November 1999 (Table 45).

A strong, significant increasing trend was found for total manganese concentrations. Strong, significant decreasing trends occurred for total sulfate concentrations and FACs and total ammonia flow-adjusted concentrations and a significant downward trend was found for total nitrogen concentrations (Table 19).

Cowanesque River (COWN 1.0)

A new site was added on the Cowanesque River near the mouth of the stream (COWN 1.0) during the 1999-2000 sampling season to determine the extent of impairment in the river. A slightly impaired biological community existed at COWN 1.0 during this time period. Habitat conditions were considered supporting.

Although no parameters exceeded state standards at this site, a number of parameters exceeded the 90th percentile: dissolved oxygen, nitrites, total organic carbon, total iron, total manganese, and turbidity (Table 46).

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

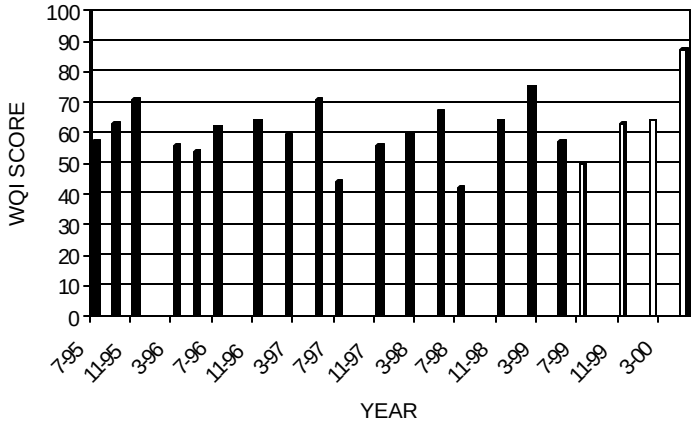
Susquehanna River at Windsor, N.Y., (SUSQ 365.0) served as the reference site for the river stations during fiscal year 2000. SUSQ 365.0 contained several organic pollution-intolerant taxa, including *Atherix*, *Serratella*, *Stenonema*, *Isonychia*, *Ephoron* (Ephemeroptera: Polymitarcyidae), *Acroneuria*, and *Paragnetina* (Plecoptera: Perlidae).

Table 44. Water Quality Summary Chemung River at Chemung, N.Y.

Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
pH	07/21/99	8.9	6.5-8.5	N.Y. aquatic life
TFe	02/16/00	321 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
TFe	05/10/00	7120 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
TFe	05/10/00	7120 µg/l	1,500 µg/l	Pa. aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/99	50	TOC	TMg	TURB					
11/09/99	63	COND	TS	DS	TP	TCa	TMg		
02/16/00	64	DO	COND	TS	DS	DNO3	TNO3	DP	TCa
		TMg	TCl						
05/10/00	87	DO	COND	TS	DS	DNO2	TNO2	TP	DP
		TOC	TCa	TMg	TFe	TAl	TURB		

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	3.56
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	118
Habitat Condition Category	Excellent



Water Quality Index

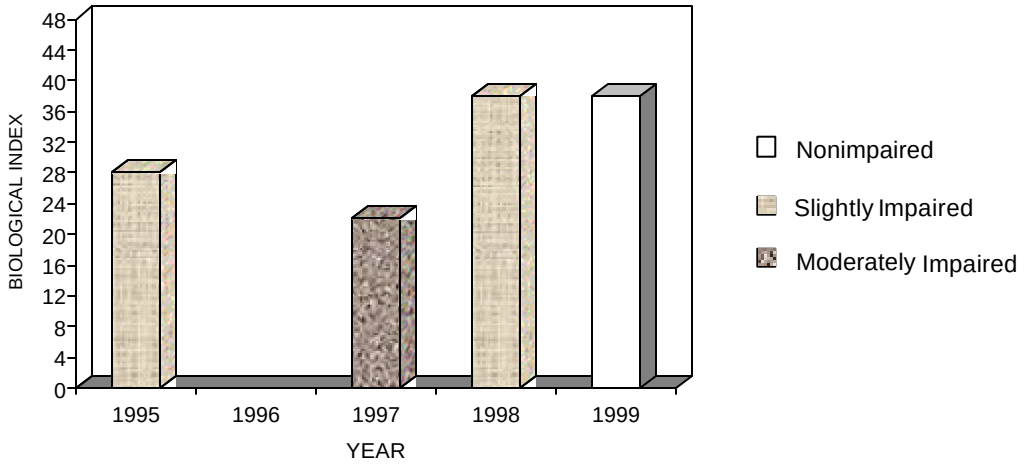


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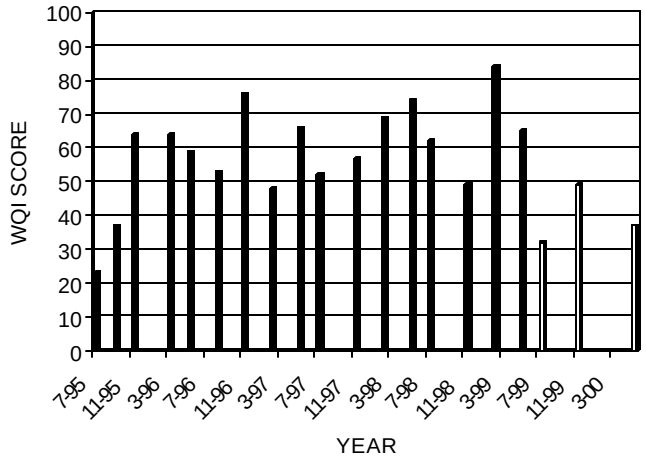
Table 45. Water Quality Summary Cowanesque River (COWN 2.2) at Lawrenceville, Pa.

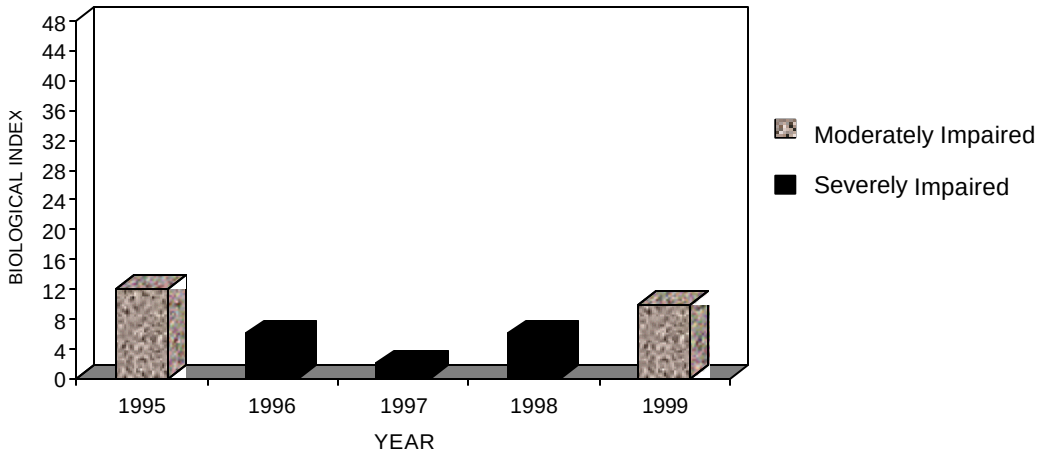
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/27/99	32	TMn							
11/09/99	49	DO	DNO2	TNO2	TOC	TFe	TMn	TURB	
05/10/00	37								

Biological and Habitat Summary	
Number of Taxa	10
Diversity Index	2.35
RBP Score	10
RBP Condition	Moderately Impaired
Total Habitat Score	74
Habitat Condition Category	Partially Supporting



Water Quality Index



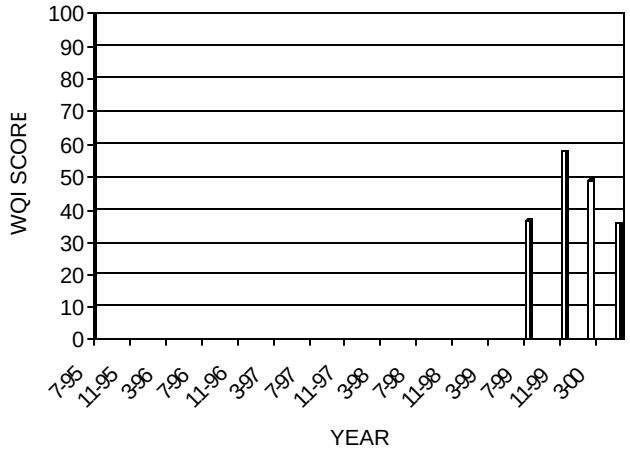
Biological Index

Table 46. Water Quality Summary Cowanesque River (COWN 1.0) at Lawrenceville, Pa.

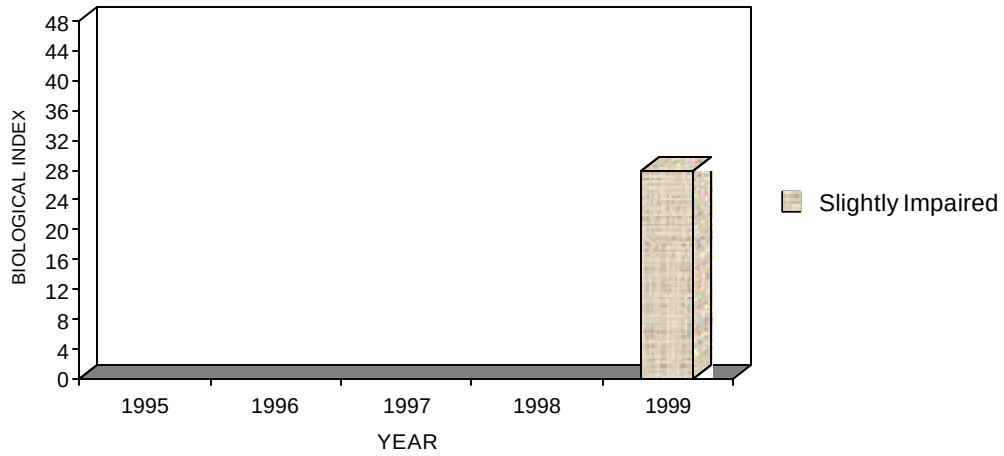
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
07/27/99	37	DNH3	TNO3	DNO2	TNO2				
11/09/99	58	DO	DNO2	TNO2	TOC	TFe	TMn	TURB	
02/16/00	49	DO	TOC						
05/10/00	36	TOC							

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	3.34
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	97
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Water quality data showed that total iron exceeded the New York state standard during February and May 2000. Overall water quality conditions were fair at SUSQ 365. However, dissolved oxygen was slightly reduced, while nitrates, calcium, and dissolved ammonia concentrations were elevated (Table 47) at this site.

Several strong, significant decreasing trends occurred at SUSQ 365.0. These downward trends included both the concentrations and flow-adjusted concentrations of total ammonia and total iron. Strong, significant decreasing trends also occurred for concentrations of total nitrogen and total phosphorus, and flow-adjusted concentrations of total sulfate and total aluminum. A significant decreasing trend also was found in flow-adjusted concentrations of total phosphorus. One strong, significant increasing trend also occurred at this site in total chloride concentrations (Table 19).

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

Nonimpaired conditions existed at Susquehanna River at Kirkwood, N.Y., (SUSQ 340.0) for the second consecutive year. Habitat conditions also were considered excellent.

Total iron exceeded standards during February 2000. Additional water quality analysis indicated that nitrates were elevated during May 2000, and turbidity was high during February 2000, while dissolved oxygen was depressed during July 1999 and February 2000 (Table 48).

Strong, significant downward trends occurred at SUSQ 340.0 for several parameters, including the concentrations and flow-adjusted concentrations of total ammonia, total nitrogen, total phosphorus, and total iron. The WQI and flow-adjusted concentrations of total sulfate also showed a significant downward trend. However, both concentrations and flow-adjusted concentrations of total chloride showed a strong, significant increasing trend for the time period (Table 19).

Susquehanna River at Sayre, Pa. (SUSQ 289.1)

The Susquehanna River at Sayre, Pa., (SUSQ 289.1) was nonimpaired during fiscal year 2000, after serving as the reference site for the river stations the previous year. Several pollution-intolerant taxa inhabited this site, including *Atherix, Serratella*, *Stenonema*, *Isonychia*, *Ephoron*, and *Agnetina.*

Total iron exceeded standards during February 2000, and additional water quality analysis indicated that ammonia, nitrites, and nitrates were elevated at this site, while dissolved oxygen was reduced (Table 49).

Strong, significant decreasing trends were found for several parameters at SUSQ 289.1, including both concentrations and flow-adjusted concentrations of total ammonia, total nitrogen, total phosphorus, total sulfate, and total iron, and flow-adjusted concentrations of total aluminum. Significant decreasing trends occurred for concentrations of total aluminum and WQI. Also, strong, significant increasing trends occurred for total chloride concentrations and flow-adjusted concentrations (Table 19).

Susquehanna River at Marietta, Pa. (SUSQ 44.5)

The Susquehanna River at Marietta, Pa., (SUSQ 44.5) had a nonimpaired biological community during fiscal year 2000. Habitat at this site was considered supporting; however, the substrate at SUSQ 44.5 is largely bedrock with little riffle habitat.

No water quality parameters exceeded state standards during this sampling period. However, water quality analysis indicated that solids, nitrites, calcium, and sulfate were elevated at this station (Table 50).

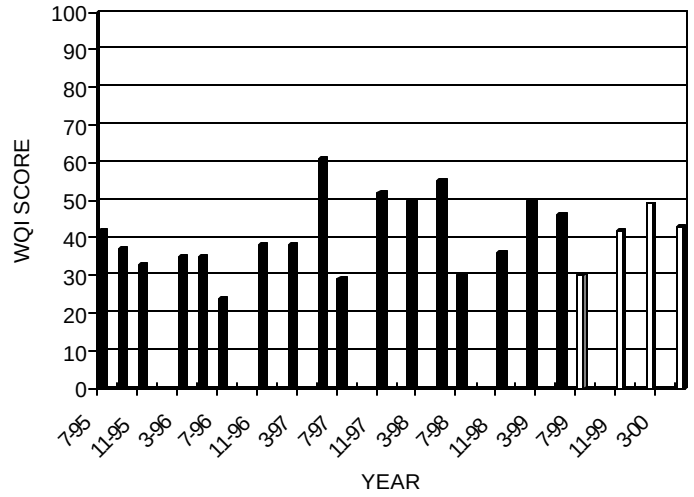
Only decreasing trends were found at this site. Significant downward trends occurred for total phosphorus concentrations and total ammonia flow-adjusted concentrations. Strong, significant decreasing trends were found for total sulfate

Table 47. Water Quality Summary Susquehanna River at Windsor, N.Y.

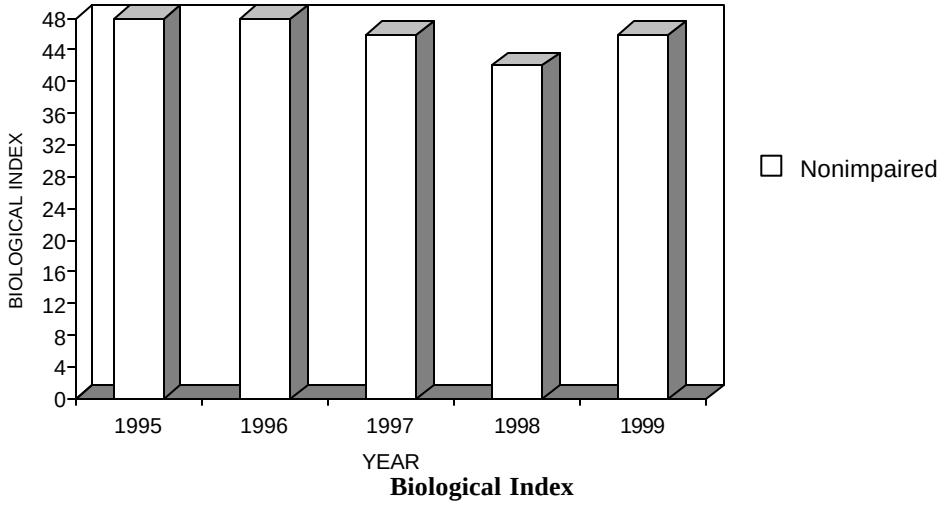
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/15/00	351 µg/l	300 µg/l	N.Y. health (water source) and aquatic life
TFe	05/09/00	317 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/99	30	DO							
11/08/99	42	DNH3							
02/15/00	49	DO							
05/09/00	43	DNO3	TNO3	TCa					

Biological and Habitat Summary	
Number of Taxa	25
Diversity Index	3.95
RBP Score	46
RBP Condition	Reference
Total Habitat Score	122
Habitat Condition Category	Reference



Water Quality Index



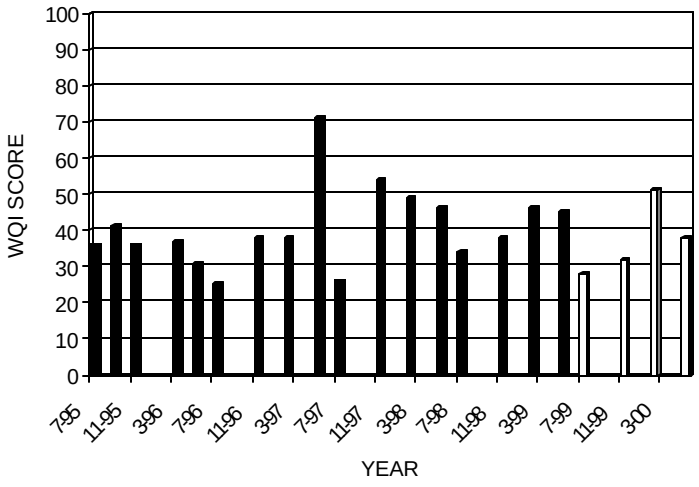
Biological Index

Table 48. Water Quality Summary Susquehanna River at Kirkwood, N.Y.

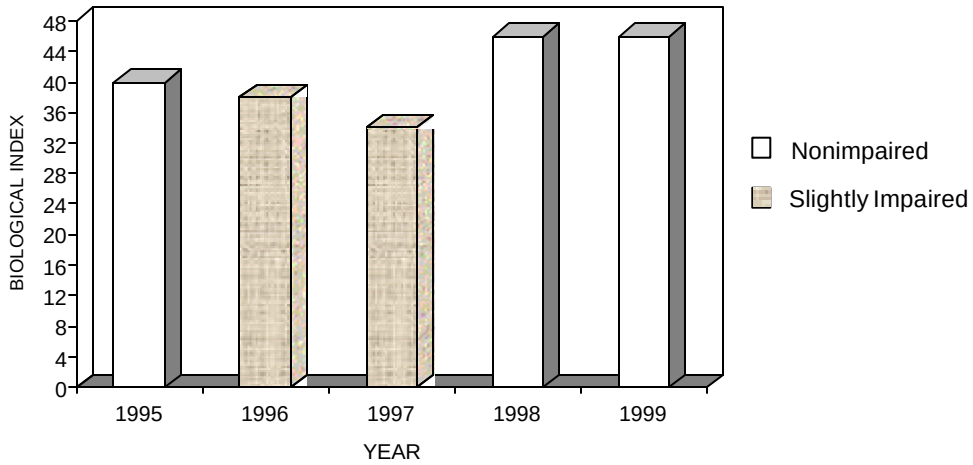
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/15/00	570 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/19/99	28	DO							
11/08/99	32								
02/15/00	51	DO	TURB						
05/09/00	38	DNO3	TNO3						

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	4.05
RBP Score	46
RBP Condition	Nonimpaired
Total Habitat Score	113
Habitat Condition Category	Excellent



Water Quality Index



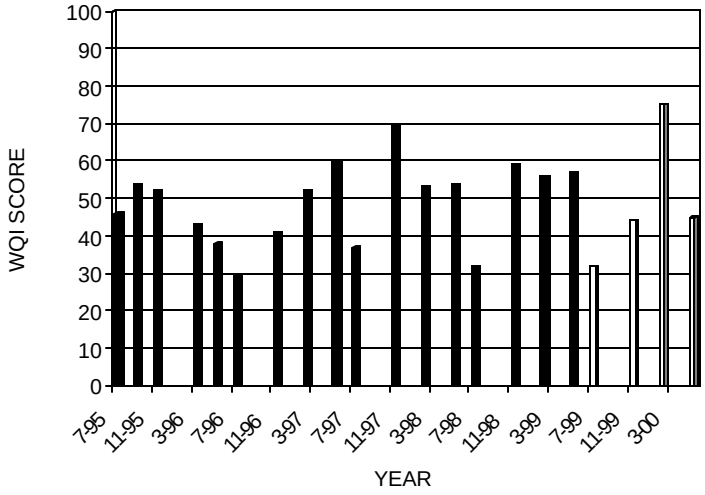
Biological Index

Table 49. Water Quality Summary Susquehanna River at Sayre, Pa.

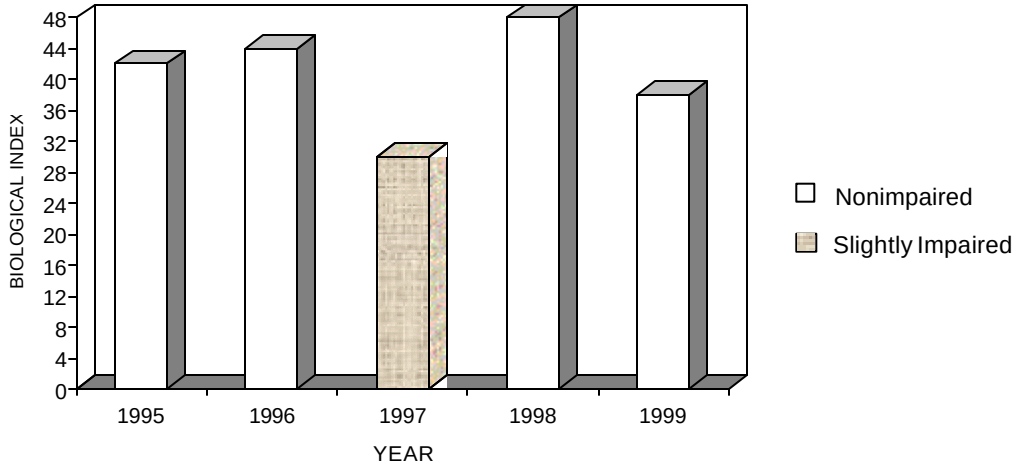
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/15/00	703 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/21/99	32								
11/08/99	44	DNO2	TNO2	TOC					
02/15/00	75	DO	DNH3	TNH3	DNO3	TNO3	TP	DPO4	TFe
		TAl	TPO4						
05/09/00	45	DNO2	DNO3	TNO3	TCa				

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	3.41
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	117
Habitat Condition Category	Excellent



Water Quality Index



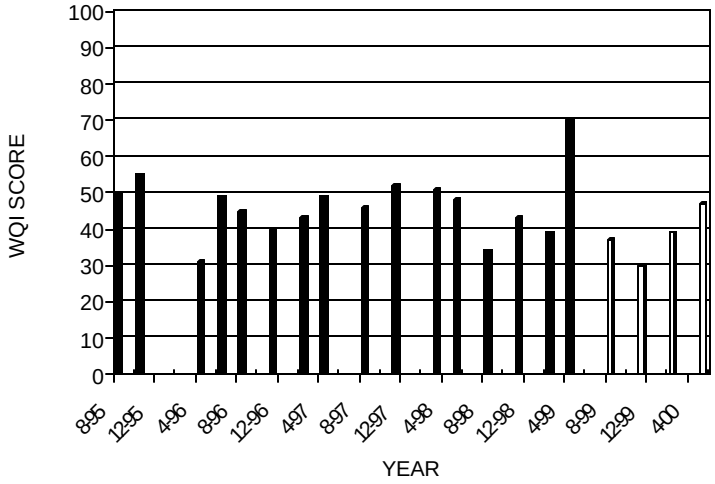
Biological Index

Table 50. Water Quality Summary Susquehanna River at Marietta, Pa.

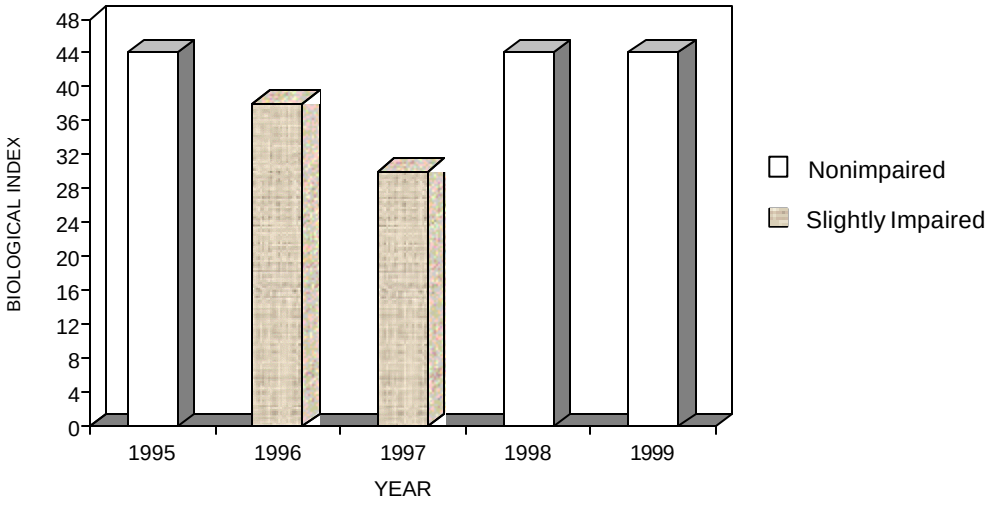
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
None				

Date	WQI	Parameters Exceeding 90th Percentile							
08/05/99	37	COND	TS	DS	DNO2	TNO2	TCa	TSO4	
11/10/99	30	TSO4							
02/10/00	39	DPO4	TCa	TSO4					
05/11/00	47	TS	DP	DPO4	TCa	TSO4	TPO4		

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	3.27
RBP Score	44
RBP Condition	Nonimpaired
Total Habitat Score	109
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

FACs, total aluminum concentrations, and for both concentrations and flow-adjusted concentrations of total iron, total manganese, and WQI (Table 19).

Susquehanna River at Conowingo, Md. (SUSQ 10.0)

No macroinvertebrate sampling was performed in the Susquehanna River at Conowingo, Md., (SUSQ 10.0) due to deep waters and a lack of riffle habitat. Water quality did not exceed standards at SUSQ 10.0; however, several parameters exceeded the 90th percentile including solids, nitrites, total aluminum, and sulfate (Table 51). Even though some parameters were elevated, this site had the lowest individual WQI score (28) and the lowest average WQI score (36) of all river sites.

At SUSQ 10.0, only downward trends were observed. Significant decreasing trends were found for flow-adjusted concentrations of total nitrogen and total aluminum. Strong, significant downward trends occurred in total sulfate and total manganese concentrations and in both concentrations and flow-adjusted concentrations of total phosphorus, total iron and WQI (Table 19).

Tioga River (TIOG 10.8)

The Tioga River at Lindley, N.Y., (TIOG 10.8) had a nonimpaired biological community during July 1999, and habitat conditions were considered excellent. Total iron exceeded water quality standards during February 2000. Additional water quality analysis indicated that sulfate and manganese were elevated, while dissolved oxygen was reduced (Table 52).

Poor water quality at this site may have been due to acid mine drainage in the headwaters of the Tioga River. The Tioga-Hammond Reservoir, located upstream of TIOG 10.8, alleviated some of the effects of acid mine drainage by buffering the outflow of Tioga Lake with alkaline waters stored in Hammond Lake. However, the effects of the acid mine drainage may still be observed downstream. Poor quality water from the Cowanesque River also may affect the Tioga River downstream of their confluence.

Strong, significant decreasing trends were found for concentrations and FACs of total ammonia, total sulfate, and total manganese, and for concentrations of total solids and total nitrogen. A significant decreasing trend occurred in total nitrogen flow-adjusted concentrations, while a significant increasing trend occurred in flow-adjusted concentrations of total aluminum (Table 19).

Group 3 Sites

Babcock Run (BABC)

During the 2000 sampling season, the macroinvertebrate community of Babcock Run near Cadis, Pa., was designated moderately impaired. However, the dominant family was the pollution-intolerant mayfly, *Paraleptophlebia* (Ephemeroptera: Paraleptophlebiidae). Physical habitat conditions were designated excellent, and all field chemistry parameters were normal.

Bill Hess Creek (BILL)

The biological community of Bill Hess Creek near Nelson, Pa., was designated slightly impaired during May 2000, with an excellent physical habitat. All field chemistry parameters were within acceptable limits, although conductivity was somewhat elevated.

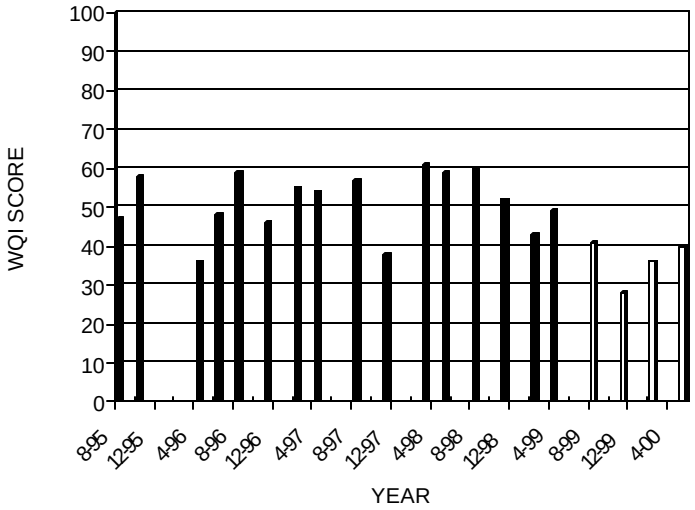
Bird Creek (BIRD)

Bird Creek near Webb Mills, N.Y., was designated moderately impaired, due to a low EPT index and a low taxonomic similarity to the reference site, with an excellent habitat. The stream did have several pollution intolerant taxa, including *Ameletus* (Ephemeroptera: Ameletidae), *Epeorus, Paraleptophlebia, Alloperla* (Plecoptera: Chloroperlidae), *Leuctra*, and *Amphinemura* (Plecoptera: Nemouridae). All field chemistry parameters fell within acceptable ranges.

Table 51. Water Quality Summary Susquehanna River at Conowingo, Md.

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

Date	WQI	Parameters Exceeding 90th Percentile							
08/05/99	41	COND	TS	DS	DNO2	TNO2	TCa	TSO4	
11/12/99	28								
02/08/00	36								
05/03/00	40	TAl	TURB						



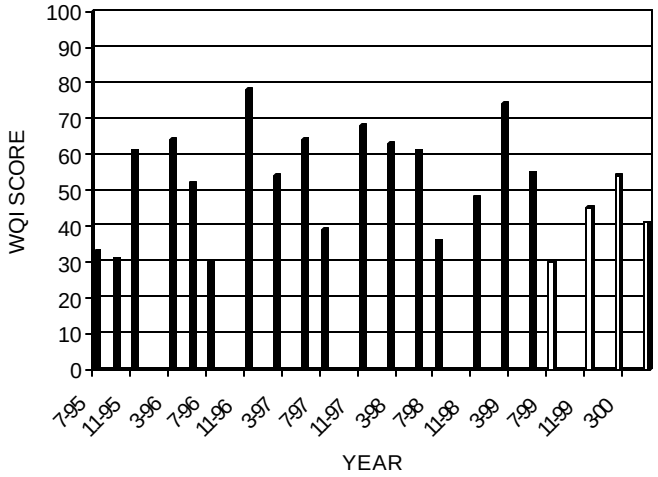
Water Quality Index

Table 52. Water Quality Summary Tioga River at Lindley, N.Y.

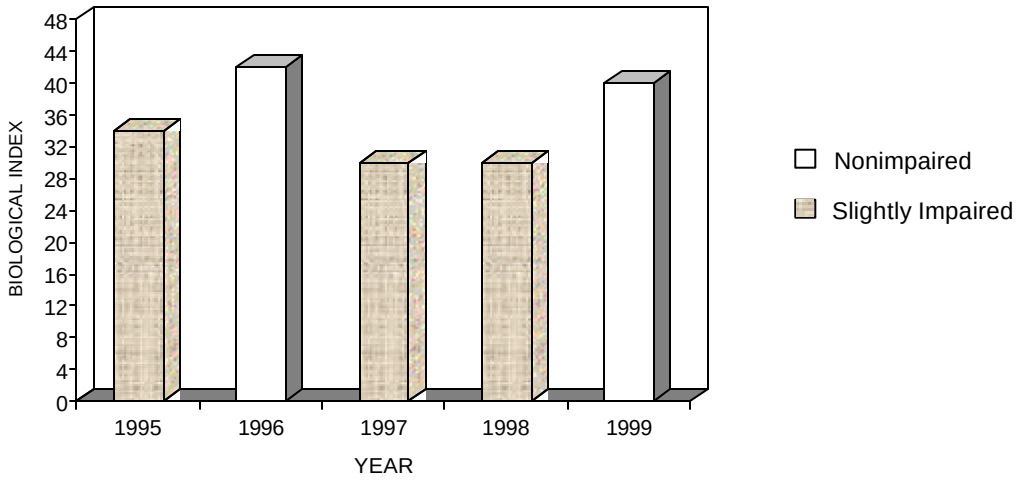
Parameters Exceeding Standards				
Parameter	**Date**	**Value**	**Standard**	**State**
TFe	02/16/00	448 µg/l	300 µg/l	N.Y. health (water source) and aquatic life

Date	WQI	Parameters Exceeding 90th Percentile							
07/26/99	30	TSO4							
11/09/99	45	DO	TSO4	TMN	DMn				
02/16/00	54	DO	TSO4	TMn	DMn				
05/10/00	41	TMn	DMn						

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	3.38
RBP III Score	40
RBP III Condition	Nonimpaired
Total Habitat Score	123
Habitat Condition Category	Excellent



Water Quality Index



Biological Index

Biscuit Hollow (BISC)

Slightly impaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during this survey. Impairment was due largely to the dominance of one taxon, the pollution-intolerant mayfly *Epeorus.* The physical habitat at this site was considered supporting, with poor velocity/depth diversity and a poor riparian zone. Field chemistry parameters were within normal ranges.

Briggs Hollow Run (BRIG)

Briggs Hollow Run near Nichols, N.Y., was designated moderately impaired during the 2000 sampling season. It had the lowest overall diversity (10 taxa), the lowest Shannon Diversity Index (1.48), and the highest Percent Dominant Taxa (75 percent) of all sampling sites. However, the lowest Hilsenhoff Biotic Index score (0.41) also was found at this site due to the large number of *Epeorus* that dominated the sample. The physical habitat was designated supporting with poor riparian conditions and a heavily altered channel. All field chemistry parameters were within acceptable limits.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, Pa., had a nonimpaired biological community and excellent habitat conditions during the 1999-2000 sampling season. Several pollution intolerant taxa existed at Bulkley Brook, including *Hexatoma* (Diptera: Tipulidae), *Epeorus, Stenonema, Nigronia, Ophiogomphus, Alloperla, Leuctra, Amphinemura, Acroneuria,* and *Diplectrona* (Trichoptera: Hydropsychidae). Field chemistry indicated that all parameters were within acceptable limits.

Camp Brook (CAMP)

Camp Brook near Osceola, Pa., had a slightly impaired biological community during the 2000 sampling season. The stream was dominated by the organic pollution intolerant stonefly, *Alloperla*. The physical habitat of the stream was designated supporting with poor riparian conditions. All field chemistry parameters were normal.

Cook Hollow (COOK)

Cook Hollow near Austinburg, Pa., served as the reference site for the Group 3 streams during this survey, as it had the best combination of biological and habitat conditions. A number of pollution intolerant taxa existed at this site, including *Ephemerella* (Ephemeroptera: Ephemerellidae), *Epeorus, Stenonema, Paraleptophlebia, Alloperla, Leuctra, Amphinemura, Acroneuria, Diplectrona, Dolophilodes,* and *Rhyacophila.* This site on Cook Hollow also had the highest Shannon Diversity Index (3.83) and the lowest Percent Dominant Taxa (14.3 percent) of the sampling sites. Field chemistry parameters were all within acceptable limits.

Deep Hollow Brook (DEEP)

The biological community of Deep Hollow Brook near Danville, N.Y., was designated slightly impaired, with an excellent physical habitat. This site had the highest number of taxa (27) of all sampling sites. A beaver dam is located upstream of the sampling site on Deep Hollow Brook, and flows were very high at the time of sampling. Alkalinity was extremely low with a value of 6 mg/l. pH also was somewhat depressed with a value of 6.55.

Denton Creek (DENT)

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community during May 2000. This site is located downstream of Hawkins Pond in New York State. The sampling station on Denton Creek had the highest Hilsenhoff Biotic Index (5.58) and the lowest EPT Index (4) of all Group 3 sampling stations. Habitat conditions at Denton Creek were considered excellent. Alkalinity and pH were depressed with values of 8 mg/l and 6.35, respectively. Dissolved oxygen also was low with a value of 3.75 mg/l, probably due to the upstream pond.

Dry Brook (DRYB)

Moderately impaired biological conditions existed at Dry Brook at Waverly, N.Y., with an excellent physical habitat. Chironomidae (midges) was the dominant macroinvertebrate family at this site. The stream was completely dry the previous summer and runs directly through residential and commercial areas in the town of Waverly. Field water chemistry parameters were within normal ranges.

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, N.Y., was designated slightly impaired during the 2000 sampling season. The site had a diverse stonefly community, with representatives of *Alloperla, Leuctra, Sweltsa* (Perlidae: Chloroperlidae), *Amphinemura,* and *Acroneuria.* The physical habitat was designated supporting with a heavily altered channel and a large amount of streambank erosion. All field chemistry parameters were normal.

Parks Creek (PARK)

Parks Creek near Litchfield, N.Y., had a slightly impaired biological community during the 2000 sampling season. A number of pollution intolerant taxa existed at the Parks Creek sampling site, including *Ameletus, Epeorus, Stenonema, Paraleptophlebia, Alloperla, Sweltsa, Leuctra,* and *Amphinemura*. The site had a supporting habitat with heavy channel alteration. Just prior to the time of sampling, a heavy storm struck the region and heavily altered the stream channel through very high flows. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)

The biological community of Prince Hollow Run near Cadis, Pa., was designated slightly impaired with a partially supporting habitat. Staff noted at time of sampling that the substrate appeared to have been substantially disturbed, probably due to very high flows during the previous week. The stream did contain a number of pollution intolerant taxa, including *Ameletus, Epeorus, Paraleptophlebia, Alloperla, Leuctra, Amphinemura,* and *Acroneuria*. Alkalinity was low, with a value of 20 mg/l.

Red House/Beagle Hollow Run (REDH)

Moderately impaired biological conditions existed at Red House/Beagle Hollow Run near Osceola, Pa., during May 2000. An organic pollution intolerant stonefly, *Leuctra*, dominated the sample. Habitat conditions were considered excellent, and all field chemistry parameters were within normal ranges. Red House Run was completely dry during the summer of 1999.

Russell Run (RUSS)

The biological community of Russell Run near Windham, Pa., was designated slightly impaired, with a partially supporting habitat. High flows had substantially altered the physical habitat prior to the time of sampling. The EPT Index at this site was somewhat low (7), while the value for Percent Dominant Taxa was high (60.4 percent). However, the dominant taxon at this site was the pollution-intolerant mayfly genus, *Epeorus.* 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 partially supporting. It should be noted that the stream had recently experienced very high flows, which may have affected the biological community and the physical habitat. A lot of streambank erosion existed at the site, and stream bank stability was low. 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, while the stream had excellent habitat conditions. The dominant taxon at the site was the pollution-intolerant stonefly taxa, *Leuctra*. Many other intolerant taxa also existed at this

station, including *Ameletus, Ephemerella, Stenonema, Nigronia, Amphinemura, Acroneuria,* and *Diplectrona.* Dissolved oxygen levels in Smith Creek were depressed with a value of 3.79 mg/l. Additionally, a small refuse pile was located upstream of the site.

Strait Creek (STRA)

A nonimpaired biological community existed at Strait Creek near Nelson, Pa. This site had the highest EPT Index (17) of all sampling sites and had a very diverse mayfly community. The physical habitat was designated supporting with poor riparian conditions, such as eroded streambanks and a small buffer zone. All field chemistry parameters were within normal limits.

White Branch Cowanesque River (WBCO)

During May 2000, nonimpaired conditions existed at White Branch Cowanesque River near North Fork, Pa. This site had a number of pollution-intolerant taxa, including *Hexatoma, Ameletus, Epeorus, Paraleptophlebia, Alloperla, Leuctra, Amphinemura, Acroneuria,* and *Dolophilodes*. Physical habitat conditions were designated excellent, and field chemistry measurements were within acceptable ranges.

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., had a slightly impaired biological community during May 2000. Large numbers of organic pollution intolerant *Epeorus* and *Amphinemura* were found in this sample. The physical habitat was designated excellent, and all water chemistry parameters were normal.

MANAGEMENT IMPLICATIONS

To establish water quality trends and understand biological conditions, long-term studies of this nature are critical. Unfortunately, short-term monitoring studies are too often the rule, due to time and monetary constraints. However, to effectively manage the resources, elected 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, elected officials, and local interest groups.

New York – Pennsylvania Sites

The sites in this reference category have shown and continue to show a large degree of variability in water quality. Overall, there was no significant correlation between RBP III score and water chemistry (WQI score). However, there was a significant ($p<0.05$) positive correlation between RBP III score and habitat score for the 12 New York-Pennsylvania border sites. During the 1998 sampling season, there also was a significant positive correlation ($p<0.05$) between habitat score and biological score (Rowles and Sitlinger, 2000). Impairment may have been due to poor physical habitat at many of the New York-Pennsylvania border sites. Bentley Creek and Seeley Creek, in particular, had unstable stream substrates, largely due to removal of instream habitat for rechannelization and the removal of gravel for building and paving materials. Disturbance of instream habitat often reduces the abundance of macroinvertebrates and the species diversity of the area, resulting in an impairment designation.

Pennsylvania – Maryland Sites

During fiscal year 2000, there was no significant correlation between physical habitat

and biological score or between WQI and biological score for the nine Pennsylvania-Maryland border sites. During the 1999 fiscal year, a significant negative correlation existed between the RBP III score and the WQI (Rowles and Sitlinger, 2000). Since a high WQI score denotes poor water quality, this indicated that a degradation in water quality leads to a degradation in the biological community.

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

River Sites

For the seven river sites, there was a significant positive correlation between physical habitat and RBP III scores, indicating that, as physical habitat improved, the quality of the macroinvertebrate community increased. There was no significant correlation between WQI score and total biological scores for the river sites. However, during the previous sampling season, a negative correlation existed between WQI score and biological score (Rowles and Sitlinger, 2000).

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 no significant correlation between physical habitat and biological community for the Group 3 sites. A large number of the Group 3 streams had been completely dry during the summer of 1999, due to a drought that affected most of the Susquehanna River Basin. This dry condition adversely affected the stream biota and probably caused much of the impairment seen throughout these Group 3 sites.

CONCLUSIONS

Thirteen (26 percent) of the 50 interstate macroinvertebrate sampling sites contained nonimpaired biological communities. Biological conditions at another 21 sites (42 percent) were slightly impaired, while 15 sites (30 percent) were moderately impaired. One site (2 percent), Scott Creek, was designated severely impaired. One site (SUSQ 10.0) was not sampled using RBP III techniques and, thus, was not averaged into the final scores. Twenty-two sites (44 percent) had excellent habitats. Thirteen of the sites (26 percent) had supporting habitats, and 11 sites (22 percent) had partially supporting habitats. Four sites (8 percent) had nonsupporting habitats: Bentley Creek, Seeley Creek, Long Arm Creek, and Scott Creek.

Overall, interstate streams seemed to achieve their designated uses, and only 39 observations (1.5 percent) of water chemistry parameters exceeded state standards. Total iron exceeded standards most frequently. These findings corresponded with those in past reporting periods and indicated that elevated iron concentrations may have been a natural condition of the streams in the basin.

Of the New York-Pennsylvania border streams, the biological communities of two (16.7 percent) of these streams were nonimpaired. Five sites (41.7 percent) in the New York-Pennsylvania reference category were slightly impaired, and five streams (41.7 percent) were moderately impaired. Two sites had excellent habitats (16.7 percent) and five sites (41.7 percent) had supporting habitats. Of the remaining sites, three (25 percent) had partially supporting habitats, and two sites (16.7 percent) had nonsupporting habitats. High metal concentrations, particularly total iron, appeared to be the largest source of water quality degradation in this region. Physical habitat and biological score were positively correlated, meaning that, as habitat improved, the quality of the biological community improved. Rechannelization of the streambed and removal of instream habitat may have resulted in poor conditions for macroinvertebrate colonization in several streams, including Bentley Creek and Seeley Creek.

Nonimpaired biological conditions existed at one (11.1 percent) of the nine Pennsylvania-Maryland interstate streams. Of the remaining eight sites, four sites (44.4 percent) were slightly impaired and three sites (33.3 percent) were moderately impaired, while one site (11.1 percent) was designated severely impaired. Four (44.4 percent) of the Pennsylvania-Maryland border sites had excellent habitats. Three sites (33.3 percent) had partially supporting habitats and two sites (22.2 percent) had nonsupporting habitats. Elevated nutrient levels, possibly due to agricultural runoff, appeared to affect the water quality of the streams in this region. Neither WQI score and RBP III scores nor physical habitat and biological community were significantly correlated for the Pennsylvania-Maryland border sties. Streambank erosion and sedimentation were problems 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) was not sampled for macroinvertebrates due to a lack of riffle habitat at the site. The biological communities of six sites (75 percent) were nonimpaired, one site (12.5 percent) was slightly impaired, and one site (12.5 percent) was moderately impaired. Five of the sites (62.5 percent) had excellent habitats. Of the remaining three stations, two sites (25 percent) had supporting habitats, and one site (12.5 percent) had a partially supporting habitat. Physical habitat scores and RBP III scores were significantly correlated for the river stations, indicating that, as physical habitat quality increased, the quality of the macroinvertebrate community increased.

Of the 21 Group 3 sites, the biological communities of four stations (19.0 percent) were designated nonimpaired. Eleven sites (52.4 percent) had slightly impaired biological communities, while six stations (28.6 percent) had moderately impaired conditions. Eleven (52.4 percent) of the 21 stations had excellent habitat conditions, six (28.6 percent) had supporting habitats and four sites (19.0 percent) had partially supporting habitats. There was no significant correlation between physical habitat and biological score during this sampling season.

The Seasonal Kendall nonparametric test for trend was applied to observed concentration and flow-adjusted concentration. Trends were detected ($p<0.10$) for several parameters at individual stations. For each parameter, an overall weighted value was calculated to indicate the strength of the trend in the Susquehanna River Basin over the period 1986 through 2000. Table 53 provides a summary of detected trends and overall direction.

Significant negative overall trends were found in total ammonia, total phosphorus, total sulfate, total iron, total manganese, and WQI. A significant positive overall trend was found in total chloride. Decreasing trends in total iron were found at many of the river stations. Most trends detected were decreasing, indicating an improvement in water quality. However, increasing trends, including total chlorides, total solids, and total nitrogen, were detected at several sites.

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.

Table 53. Summary of Overall Direction of Trends

Parameter	Detected Trends				Overall Direction of Concentration Trend	Overall Direction of Flow-Adjusted Concentration Trend
	Concentration		Flow-Adjusted Concentration			
	+	-	+	-		
Total Suspended Solids	1	1	1	0	None	None
Total Ammonia	0	9	0	7	Decreasing	None
Total Nitrogen	2	6	2	5	None	None
Total Phosphorus	0	12	0	8	Decreasing	None
Total Chloride	10	0	8	0	Increasing	Increasing
Total Sulfate	1	8	0	10	Decreasing	Decreasing
Total Iron	0	11	0	9	Decreasing	Decreasing
Total Aluminum	0	3	1	4	None	None
Total Manganese	0	9	0	3	Decreasing	None
Water Quality Index	0	9	0	4	Decreasing	None

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APPENDIX A

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

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

Parameter	Units	APAL 6.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	BNTY 0.9	CASC 1.6	CASC 1.6	CASC 1.6
Date	yyyymmhh	19990720	19990726	19991109	20000216	20000510	19990719	19991108	20000215
Time	hhmm	1330	1100	0830	0945	0905	1330	1025	1030
Discharge	cfs	0.697	0.971	7.040	17.620	3.795	0.209	4.269	19.920
Temperature	degree C	24.7	21.1	8.2	0.8	15.6	20.7	4.6	0.4
Conductance	umhos/cm	132	320	208	139	138	93	55	43
Dissolved Oxygen	mg/l	5.87	6.31	6.46	7.56	4.32	5.62	7.02	7.04
pH		7.65	8.35	7.80	7.05	7.15	7.10	6.75	5.90
Alkalinity	mg/l	34	98	96	32	60	28	20	4
Acidity	mg/l	2	0	6	6	4	4	4	4
Solids, Total	mg/l	68	116	128	110	130	88	16	44
Solids, Dissolved	mg/l	50	116	122	104	110	46	16	30
Ammonia, Total	mg/l	<0.02	0.06	<0.02	<0.02	<0.02	0.02	0.17	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.06	<0.02	<0.02	<0.02	0.02	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, Total	mg/l	0.11	<0.04	0.52	0.56	0.09	0.04	0.21	0.29
Nitrate, Dissolved	mg/l	0.11	<0.04	0.52	0.56	0.09	0.04	0.21	0.29
Phosphorus, Total	mg/l	0.04	0.02	0.03	0.10	0.03	0.03	0.05	0.12
Phosphorus, Dissolved	mg/l	0.020	0.006	0.027	0.086	0.014	0.022	0.035	0.062
Orthophosphate, Total	mg/l	0.015	0.008	0.013	0.040	0.015	<0.010	0.015	0.025
Orthophosphate, Dissolved	mg/l	0.007	0.005	0.006	0.020	0.013	<0.010	0.015	0.014
Organic Carbon, Total	mg/l	2.9	2.1	2.0	2.7	3.9	2.5	2.6	2.8
Calcium	mg/l	11.20	35.00	27.70	15.50	16.90	9.07	5.90	3.55
Magnesium	mg/l	3.15	6.18	5.17	3.54	3.48	2.63	1.65	1.40
Chloride	mg/l	9	21	14	13	6	3	2	5
Sulfate	mg/l	<20	<20	21	<20	<20	<20	<20	<20
Turbidity	ntu	5.68	<1.00	1.84	5.04	8.54	2.56	1.83	6.48
Iron, Total	µg/l	596	<20	<20	374	507	460	250	578
Iron, Dissolved	µg/l	105	<20	<20	50	66	115	130	437
Manganese, Total	µg/l	212	<10	<10	<10	<10	247	75	48
Manganese, Dissolved	µg/l	138	<10	<10	<10	<10	128	67	45
Aluminum, Total	µg/l	<200	<200	<200	360	592	<200	<200	529
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	394

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

Parameter	Units	CASC 1.6	CAYT 1.7	CAYT 1.7	CAYT 1.7	CAYT 1.7	CHEM 12.0	CHEM 12.0	CHEM 12.0
Date	yyyymmdd	20000509	19990721	19991108	20000215	20000509	19990721	19991109	20000216
Time	hhmm	1045	1200	1525	1500	1510	1300	0735	0830
Discharge	cfs	2.034	13.406	134.230	139.710	17.371	180.000	386.000	2,760.000
Temperature	degree C	15.6	21.6	6.3	0.8	20.1	25.2	6.8	1.0
Conductance	umhos/cm	57	597	432	224	282	475	420	422
Dissolved Oxygen	mg/l	5.09	7.53	8.65	7.62	4.95	5.82	6.78	7.48
pH		6.65	8.30	8.50	7.00	8.55	8.90	8.20	7.75
Alkalinity	mg/l	14	124	136	42	98	106	92	68
Acidity	mg/l	4	0	0	6	0	0	2	2
Solids, Total	mg/l	38	366	300	150	184	268	300	270
Solids, Dissolved	mg/l	26	366	290	138	184	264	300	260
Ammonia, Total	mg/l	<0.02	0.04	<0.02	<0.02	<0.02	0.02	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<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	<0.04	2.59	0.41	0.50	0.45	<0.04	0.46	0.90
Nitrate, Dissolved	mg/l	<0.04	2.53	0.41	0.50	0.44	<0.04	0.46	0.90
Phosphorus, Total	mg/l	0.030	0.340	0.155	0.140	0.040	0.210	0.140	0.140
Phosphorus, Dissolved	mg/l	0.013	0.311	0.155	0.087	0.028	0.127	0.122	0.114
Orthophosphate, Total	mg/l	0.370	0.231	0.102	0.040	0.025	0.109	0.089	0.031
Orthophosphate, Dissolved	mg/l	<0.010	0.225	0.101	0.024	0.017	0.079	0.075	0.014
Organic Carbon, Total	mg/l	2.2	3.1	3.9	2.5	2.6	6.0	2.8	2.7
Calcium	mg/l	5.72	49.4	45.0	19.3	31.3	38.6	48.2	32.2
Magnesium	mg/l	1.68	9.34	7.70	4.51	5.67	13.40	12.20	7.01
Chloride	mg/l	1	71	59	38	31	60	51	83
Sulfate	mg/l	<20	39	22	<20	<20	26	34	22
Turbidity	ntu	1.18	2.16	8.53	4.48	<1.00	8.99	2.18	3.52
Iron, Total	?g/l	372	47	87	393	97	119	70	321
Iron, Dissolved	?g/l	189	<20	<20	57	54	30	<20	36
Manganese, Total	?g/l	105	<10	11	20	<10	227	17	45
Manganese, Dissolved	?g/l	86	<10	11	11	<10	14	10	34
Aluminum, Total	?g/l	<200	<200	<200	356	<200	<200	<200	214
Aluminum, Dissolved	?g/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	CHEM 12.0	CHOC 9.1	COWN 2.2	COWN 2.2	COWN 2.2	COWN 1.0	COWN 1.0	COWN 1.0
Date	yyyymmdd	20000510	19990720	19990727	19991109	20000510	19990727	19991109	20000216
Time	hhmm	0815	1145	0830	1355	1330	0930	1250	1240
Discharge	cfs	2,290.00	0.71	NA	NA	NA	17.00	26.00	354.00
Temperature	degree C	19.2	24.1	10.0	9.8	10.1	14.2	8.6	3.1
Conductance	umhos/cm	265	134	160	201	152	178	203	196
Dissolved Oxygen	mg/l	4.17	5.33	6.40	5.63	5.34	5.63	5.35	7.05
pH		7.40	7.45	7.10	7.50	7.05	7.20	7.45	7.40
Alkalinity	mg/l	68	28	40	40	38	42	40	52
Acidity	mg/l	4	2	4	4	6	4	4	6
Solids, Total	mg/l	340	68	30	120	114	12	140	138
Solids, Dissolved	mg/l	336	58	20	120	108	12	140	132
Ammonia, Total	mg/l	0.04	<0.02	0.06	0.05	<0.02	0.10	0.08	<0.02
Ammonia, Dissolved	mg/l	0.04	<0.02	0.05	0.05	<0.02	0.09	0.07	<0.02
Nitrite, Total	mg/l	0.06	<0.01	0.01	0.02	0.01	0.02	0.02	<0.01
Nitrite, Dissolved	mg/l	0.02	<0.01	0.01	0.01	0.01	0.02	0.02	<0.01
Nitrate, Total	mg/l	0.52	0.04	0.47	0.15	0.55	0.64	0.27	0.66
Nitrate, Dissolved	mg/l	0.52	<0.04	0.47	0.15	0.55	0.63	0.27	0.65
Phosphorus, Total	mg/l	0.17	0.03	0.02	0.05	0.02	0.06	0.07	0.10
Phosphorus, Dissolved	mg/l	0.032	0.017	0.008	0.038	<0.010	0.058	0.052	0.092
Orthophosphate, Total	mg/l	0.036	0.011	0.005	0.011	0.019	0.035	0.022	0.030
Orthophosphat e, Dissolved	mg/l	0.015	0.008	0.004	0.003	<0.010	0.004	0.008	0.018
Organic Carbon, Total	mg/l	4.7	2.3	3.4	3.6	4.5	3.6	3.7	3.4
Calcium	mg/l	29.7	10.0	16.5	26.0	15.1	17.9	25.0	21.5
Magnesium	mg/l	6.99	3.22	2.92	4.77	3.33	3.24	5.08	4.90
Chloride	mg/l	26	13	9	16	10	11	19	16
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	20	20
Turbidity	ntu	63.00	3.09	6.63	8.26	3.50	4.26	7.82	4.20
Iron, Total	µg/l	7,120	291	191	268	231	147	297	298
Iron, Dissolved	µg/l	143	291	<20	<20	49	<20	<20	34
Manganese, Total	µg/l	165	51	280	123	62	58	114	66
Manganese, Dissolved	µg/l	13	51	66	60	21	19	46	19
Aluminum, Total	µg/l	8,680	<200	<200	<200	201	<200	<200	281
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	COWN 1.0	LSNK 7.6	LSNK 7.6	LSNK 7.6	LSNK 7.6	SEEL 10.3	SEEL 10.3	SEEL 10.3
Date	yyyymmdd	20000510	19990720	19991108	20000222	20000509	19990726	19991109	20000216
Time	hhmm	1245	0945	1235	1005	1300	1300	1005	1050
Discharge	cfs	106.000	0.387	0.213	1.345	1.971	NA	8.210	20.220
Temperature	degree C	11.7	22.0	5.3	0.8	18.8	18.9	9.8	0.6
Conductance	umhos/cm	148	195	109	107	115	341	289	219
Dissolved Oxygen	mg/l	5.73	5.53	6.65	7.46	4.43	5.58	5.86	7.04
pH		7.35	7.65	7.00	6.55	7.20	7.75	7.50	7.40
Alkalinity	mg/l	40	40	32	14	24	126	114	48
Acidity	mg/l	6	2	4	4	4	8	8	10
Solids, Total	mg/l	106	200	64	84	100	168	162	162
Solids, Dissolved	mg/l	106	176	64	84	94	168	162	162
Ammonia, Total	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<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	0.46	<0.04	0.23	0.27	<0.04	0.11	0.07	0.60
Nitrate, Dissolved	mg/l	0.46	<0.04	0.23	0.27	<0.04	0.11	0.07	0.60
Phosphorus, Total	mg/l	0.020	0.040	0.040	0.080	0.020	0.020	0.023	0.040
Phosphorus, Dissolved	mg/l	0.010	0.024	0.029	0.040	<0.010	0.010	0.023	0.026
Orthophosphate, Total	mg/l	0.020	0.007	0.021	0.025	0.022	0.003	0.005	0.018
Orthophosphate, Dissolved	mg/l	<0.010	<0.010	0.007	0.015	<0.010	<0.010	0.002	<0.010
Organic Carbon, Total	mg/l	4.4	3.8	2.8	1.9	2.8	1.3	1.6	3.2
Calcium	mg/l	17.00	17.70	7.70	7.35	7.59	46.00	44.30	22.20
Magnesium	mg/l	3.56	3.83	2.01	2.15	2.10	6.21	6.81	4.15
Chloride	mg/l	9	26	18	16	14	10	20	33
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	2.87	4.75	2.29	1.28	3.46	<1.00	1.82	3.59
Iron, Total	µg/l	192	889	195	104	338	<20	<20	248
Iron, Dissolved	µg/l	65	520	99	50	187	<20	<20	59
Manganese, Total	µg/l	39	174	46	12	37	<10	<10	<10
Manganese, Dissolved	µg/l	19	114	45	<10	30	<10	<10	<10
Aluminum, Total	µg/l	<200	205	<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	SEEL 10.3	SNAK 2.3	SOUT 7.8	SUSQ 365.0	SUSQ 365.0	SUSQ 365.0	SUSQ 365.0
Date	yyyymmdd	20000510	19990720	19990726	19990719	19991108	20000215	20000509
Time	hhmm	1035	0830	1200	1130	0940	0945	0935
Discharge	cfs	5.493	9.180	0.166	269.800	860.100	5,825.000	2,350.000
Temperature	degree C	16.2	20.5	22.2	25.5	5.8	0.6	18.4
Conductance	umhos/cm	195	135	220	231	185	201	201
Dissolved Oxygen	mg/l	4.28	5.72	5.56	4.32	6.70	7.22	4.79
pH		7.60	7.50	8.00	7.80	7.70	7.25	7.50
Alkalinity	mg/l	66	28	62	68	60	50	68
Acidity	mg/l	6	2	4	4	4	4	6
Solids, Total	mg/l	124	6	112	154	114	140	140
Solids, Dissolved	mg/l	112	NA	104	124	114	126	128
Ammonia, Total	mg/l	<0.02	<0.02	0.04	0.07	0.09	0.05	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02	0.03	0.04	0.09	0.05	<0.02
Nitrite, Total	mg/l	<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
Nitrate, Total	mg/l	0.05	0.07	0.07	0.09	0.42	0.74	0.57
Nitrate, Dissolved	mg/l	0.05	0.07	0.07	0.09	0.42	0.74	0.57
Phosphorus, Total	mg/l	0.02	0.02	0.04	0.06	0.07	0.16	0.04
Phosphorus, Dissolved	mg/l	0.010	0.013	0.032	0.048	0.065	0.068	0.018
Orthophosphate, Total	mg/l	0.021	0.002	0.009	0.018	<0.002	0.029	0.024
Orthophosphate, Dissolved	mg/l	<0.010	<0.010	0.009	0.017	<0.010	0.017	0.015
Organic Carbon, Total	mg/l	3.3	1.8	4.9	3.8	2.5	2.2	2.6
Calcium	mg/l	26.8	10.5	20.2	29.1	24.7	24.8	29.3
Magnesium	mg/l	3.94	3.35	3.74	3.69	2.89	3.15	2.89
Chloride	mg/l	10	13	17	15	15	28	14
Sulfate	mg/l	<20	<20	<20	<20	29	<20	<20
Turbidity	ntu	1.62	1.87	1.93	2.65	2.58	3.61	2.00
Iron, Total	µg/l	121	74	179	162	124	351	317
Iron, Dissolved	µg/l	46	24	52	39	34	67	63
Manganese, Total	µg/l	<10	<10	93	47	16	31	36
Manganese, Dissolved	µg/l	<10	<10	42	18	16	17	13
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	262	<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	SUSQ 340.0	SUSQ 340.0	SUSQ 340.0	SUSQ 340.0	SUSQ 289.1	SUSQ 289.1	SUSQ 289.1	SUSQ 289.1
Date	yyyymmdd	19990719	19991108	20000215	20000509	19990721	19991108	20000215	20000509
Time	hhmm	1600	1145	1140	1205	1030	1415	1330	1425
Discharge	cfs	429	1,160	7,670	2,410	643	2,980	10,100	6,130
Temperature	degree C	26.6	6.7	0.5	19.1	24.6	7.1	0.8	20.3
Conductance	umhos/cm	211	157	171	198	328	200	326	244
Dissolved Oxygen	mg/l	4.60	6.93	7.34	4.48	4.98	6.80	7.14	4.58
pH		7.70	7.80	6.95	7.70	8.15	7.50	7.10	8.15
Alkalinity	mg/l	60	54	40	62	76	68	60	34
Acidity	mg/l	2	4	6	6	2	4	6	2
Solids, Total	mg/l	142	92	134	124	220	108	214	156
Solids, Dissolved	mg/l	108	92	116	116	218	108	184	94
Ammonia, Total	mg/l	0.05	<0.02	0.05	<0.02	0.03	<0.02	0.18	<0.02
Ammonia, Dissolved	mg/l	0.03	<0.02	0.05	<0.02	0.03	<0.02	0.18	<0.02
Nitrite, Total	mg/l	<0.01	<0.01	0.01	<0.01	0.01	0.02	0.01	0.02
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.01	0.02
Nitrate, Total	mg/l	<0.04	0.26	0.78	0.54	0.39	0.42	0.98	0.58
Nitrate, Dissolved	mg/l	<0.04	0.26	0.78	0.54	0.38	0.42	0.98	0.58
Phosphorus, Total	mg/l	0.04	0.06	0.14	0.02	0.12	0.06	0.20	0.03
Phosphorus, Dissolved	mg/l	0.026	0.034	0.064	0.011	0.084	0.060	0.093	<0.010
Orthophosphate, Total	mg/l	0.008	0.009	0.018	0.019	0.042	0.014	0.042	0.017
Orthophosphate, Dissolved	mg/l	<0.010	0.009	0.016	<0.010	0.018	0.006	0.038	<0.010
Organic Carbon, Total	mg/l	3.6	2.6	2.3	2.4	3.9	3.6	2.3	2.7
Calcium	mg/l	26.2	20.1	18.3	27.7	35.0	24.6	26.0	31.3
Magnesium	mg/l	3.27	2.61	2.78	2.90	5.71	3.82	4.65	4.51
Chloride	mg/l	15	15	24	14	34	20	61	21
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	3.15	1.28	8.04	2.26	<1.00	4.38	5.63	1.45
Iron, Total	µg/l	255	183	570	176	84	161	703	108
Iron, Dissolved	µg/l	69	35	81	62	25	38	46	45
Manganese, Total	µg/l	73	32	44	38	43	19	47	23
Manganese, Dissolved	µg/l	32	28	22	24	<10	13	19	10
Aluminum, Total	µg/l	<200	<200	512	<200	<200	<200	593	<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	TIOG 10.8	TIOG 10.8	TIOG 10.8	TIOG 10.8	TROW 1.8	TRUP 4.5	TRUP 4.5	TRUP 4.5
Date	yyyymmdd	19990726	19991109	20000216	20000510	19990719	19990727	19991109	20000216
Time	hhmm	1445	1145	1145	1145	1500	1130	1530	1400
Discharge	cfs	76.000	117.100	809.200	335.000	NA	3.128	7.870	27.700
Temperature	degree C	24.4	6.1	2.2	15.1	21.8	24.1	4.7	1.1
Conductance	umhos/cm	224	208	191	161	113	382	283	224
Dissolved Oxygen	mg/l	5.33	5.92	6.94	4.33	5.05	5.58	6.99	7.03
pH		7.70	7.30	7.15	6.90	7.00	8.40	7.90	7.50
Alkalinity	mg/l	36	34	40	34	22	112	104	48
Acidity	mg/l	8	8	10	8	4	0	4	6
Solids, Total	mg/l	92	138	138	120	64	120	184	166
Solids, Dissolved	mg/l	88	138	138	112	50	120	184	162
Ammonia, Total	mg/l	0.04	<0.02	0.05	<0.02	<0.02	0.03	<0.02	<0.02
Ammonia, Dissolved	mg/l	0.03	<0.02	0.05	<0.02	<0.02	0.03	<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	0.27	0.37	0.56	0.40	0.12	<0.04	0.16	0.58
Nitrate, Dissolved	mg/l	0.27	0.37	0.56	0.37	0.12	<0.04	0.16	0.58
Phosphorus, Total	mg/l	0.03	0.04	0.08	0.02	0.02	0.02	0.03	0.04
Phosphorus, Dissolved	mg/l	0.013	0.036	0.040	<0.010	0.017	0.018	0.028	0.030
Orthophosphate, Total	mg/l	0.010	0.004	0.026	0.020	0.005	0.019	0.006	0.027
Orthophosphate, Dissolved	mg/l	0.006	<0.010	0.026	<0.010	0.005	0.009	0.003	0.014
Organic Carbon, Total	mg/l	2.9	2.6	2.5	3.0	1.6	4.1	3.0	3.0
Calcium	mg/l	21.8	27.7	20.5	18.4	7.84	38.2	37.7	23.3
Magnesium	mg/l	4.79	6.64	5.34	4.13	2.70	7.31	9.11	5.54
Chloride	mg/l	9	13	13	8	10	31	23	29
Sulfate	mg/l	36	51	34	25	<20	<20	25	<20
Turbidity	ntu	2.66	4.13	2.79	1.96	1.19	3.47	3.92	4.76
Iron, Total	µg/l	140	137	219	166	55	95	36	287
Iron, Dissolved	µg/l	<20	<20	21	80	<20	22	<20	48
Manganese, Total	µg/l	90	111	448	195	15	11	18	11
Manganese, Dissolved	µg/l	46	84	403	161	15	<10	15	<10
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	<200	303
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	TRUP 4.5	WAPP 2.6
Date	yyyymmdd	20000510	19990721
Time	hhmm	1455	0830
Discharge	cfs	2.997	1.291
Temperature	degree C	20.7	20.3
Conductance	umhos/cm	220	156
Dissolved Oxygen	mg/l	3.83	4.88
pH		7.95	7.35
Alkalinity	mg/l	78	40
Acidity	mg/l	6	2
Solids, Total	mg/l	138	120
Solids, Dissolved	mg/l	138	120
Ammonia, Total	mg/l	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	<0.01
Nitrate, Total	mg/l	<0.04	0.37
Nitrate, Dissolved	mg/l	<0.04	0.36
Phosphorus, Total	mg/l	0.02	0.02
Phosphorus, Dissolved	mg/l	<0.010	0.016
Orthophosphat e, Total	mg/l	0.016	<0.002
Orthophosphate, Dissolved	mg/l	<0.01	<0.01
Organic Carbon, Total	mg/l	4.5	1.8
Calcium	mg/l	21.5	14.4
Magnesium	mg/l	4.64	4.48
Chloride	mg/l	11	12
Sulfate	mg/l	<20	<20
Turbidity	ntu	2.37	1.82
Iron, Total	µg/l	91	46
Iron, Dissolved	µg/l	21.00	4.48
Manganese, Total	µg/l	<10	10
Manganese, Dissolved	µg/l	<10	<10
Aluminum, Total	µg/l	<200	<200
Aluminum, Dissolved	µg/l	<200	<200

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

Parameter	Units	BBDC 4.1	CNWG 4.4	CNWG 4.4	CNWG 4.4	CNWG 4.4	DEER 44.2	DEER 44.2	DEER 44.2
Date	yyyymmdd	19990803	19990804	19991112	20000308	20000503	19990803	19991111	20000308
Time	hhmm	1130	1130	1105	1005	1200	0800	1040	0730
Discharge	cfs	0.633	5.214	7.598	16.420	7.011	2.655	12.780	25.060
Temperature	degree C	17.6	22.1	7.7	8.8	12.4	19.7	10.2	7.7
Conductance	umhos/cm	132	233	228	222	220	221	182	184
Dissolved Oxygen	mg/l	6.75	5.33	5.36	5.49	4.89	5.37	5.36	5.50
pH		7.15	7.40	7.20	7.05	6.90	7.60	7.20	7.00
Alkalinity	mg/l	22	44	40	28	28	50	54	26
Acidity	mg/l	4	4	6	4	4	4	4	4
Solids, Total	mg/l	106	208	148	168	194	156	116	104
Solids, Dissolved	mg/l	76	176	148	162	182	142	102	104
Ammonia, Total	mg/l	0.02	0.07	0.09	<0.02	0.02	0.03	<0.02	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.06	0.09	<0.02	0.02	0.03	<0.02	<0.02
Nitrite, Total	mg/l	<0.01	0.03	0.04	0.02	0.04	0.01	0.01	<0.01
Nitrite, Dissolved	mg/l	<0.01	0.02	0.04	0.02	0.04	0.01	0.01	<0.01
Nitrate, Total	mg/l	4.98	5.26	9.01	9.44	9.54	2.73	4.41	5.30
Nitrate, Dissolved	mg/l	4.98	4.95	9.01	9.34	9.54	2.69	4.40	5.24
Phosphorus, Total	mg/l	0.04	0.13	0.09	0.1	0.04	0.03	0.03	0.05
Phosphorus, Dissolved	mg/l	0.019	0.064	0.044	0.063	0.024	0.018	0.028	0.033
Orthophosphate, Total	mg/l	0.029	0.079	0.024	0.033	0.016	0.007	0.015	0.052
Orthophosphate, Dissolved	mg/l	0.004	0.040	0.021	0.011	0.013	0.006	0.006	0.026
Organic Carbon, Total	mg/l	1.3	3.3	2.3	1.6	2.2	2.5	1.5	1.0
Calcium	mg/l	8.84	17.10	17.50	16.40	18.40	18.30	17.20	13.60
Magnesium	mg/l	4.98	10.70	9.70	8.74	11.00	6.15	6.13	5.16
Chloride	mg/l	10	18	19	18	14	23	23	23
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	10.50	16.20	1.20	3.65	2.34	2.21	1.50	1.47
Iron, Total	µg/l	209	834	129	308	300	120	109	162
Iron, Dissolved	µg/l	<20	83	26	31	50	29	44	30
Manganese, Total	µg/l	33	144	34	38	40	27	22	19
Manganese, Dissolved	µg/l	<10	114	34	29	20	23	19	15
Aluminum, Total	µg/l	<200	616	<200	209	<200	<200	<200	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	DEER 44.2	EBAU 1.5	EBAU 1.5	EBAU 1.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	LNGA 2.5
Date	yyyymmdd	20000502	19990803	19991111	20000208	20000502	19990803	19990802	19991111
Time	hhmm	1005	0900	1245	0940	1100	1030	0800	0830
Discharge	cfs	5.473	1.620	6.730	7.574	2.011	0.433	0.501	0.831
Temperature	degree C	13.5	18.8	10.2	0.5	12.6	17.9	18.8	11.3
Conductance	umhos/cm	180	280	168	172	178	119	201	169
Dissolved Oxygen	mg/l	5.34	5.74	5.53	7.33	5.18	6.03	5.47	4.90
pH		7.05	7.50	7.00	7.10	6.80	7.10	7.20	7.10
Alkalinity	mg/l	30	44	48	42	24	24	40	36
Acidity	mg/l	4	6	6	6	6	4	6	6
Solids, Total	mg/l	152	166	128	158	164	88	208	136
Solids, Dissolved	mg/l	146	156	118	158	154	72	188	136
Ammonia, Total	mg/l	<0.02	0.03	<0.02	0.42	<0.02	0.02	0.11	<0.02
Ammonia, Dissolved	mg/l	<0.02	0.03	<0.02	0.42	<0.02	0.02	0.09	<0.02
Nitrite, Total	mg/l	<0.01	0.04	0.01	0.04	0.02	<0.01	0.04	0.02
Nitrite, Dissolved	mg/l	<0.01	0.04	0.01	0.03	0.02	<0.01	0.03	0.02
Nitrate, Total	mg/l	4.86	5.80	6.04	7.59	5.67	3.48	3.88	5.88
Nitrate, Dissolved	mg/l	4.86	5.80	6.04	7.59	5.67	3.48	3.85	5.82
Phosphorus, Total	mg/l	0.02	0.25	0.12	0.99	0.02	0.02	0.11	0.05
Phosphorus, Dissolved	mg/l	<0.010	0.226	0.117	0.084	0.013	0.014	0.048	0.046
Orthophosphate, Total	mg/l	<0.010	0.158	0.057	0.017	0.015	0.010	0.022	0.015
Orthophosphate, Dissolved	mg/l	<0.010	0.155	0.057	0.013	0.014	<0.010	0.022	0.015
Organic Carbon, Total	mg/l	1.5	2.5	1.4	1.6	1.6	2.2	5.1	1.7
Calcium	mg/l	15.00	14.20	14.60	13.80	14.10	7.55	16.60	17.50
Magnesium	mg/l	5.94	5.88	5.63	5.52	5.76	4.17	5.43	5.56
Chloride	mg/l	21	32	20	22	22	8	17	16
Sulfate	mg/l	<20	<20	<20	<20	<20	<20	<20	<20
Turbidity	ntu	1.11	1.78	<1.00	1.02	1.05	2.78	38.70	2.20
Iron, Total	µg/l	156	102	80	114	180	311	857	230
Iron, Dissolved	µg/l	50	40	51	40	45	114	155	24
Manganese, Total	µg/l	30	13	29	25	31	11	212	53
Manganese, Dissolved	µg/l	22	10	28	20	20	<10	154	43
Aluminum, Total	µg/l	<200	<200	<200	<200	<200	<200	664	<200
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	LNGA 2.5	LNGA 2.5	OCTO 6.6	OCTO 6.6	OCTO 6.6	OCTO 6.6	SBCC 20.4	SCTT 3.0
Date	yyyymmdd	20000208	20000502	19990804	19991112	20000209	20000503	19990802	19990804
Time	hhmm	0815	0745	1015	0930	0945	1015	0900	0800
Discharge	cfs	3.344	0.993	NA	NA	NA	149.270	0.619	0.082
Temperature	degree C	0.30	12.00	2.44	8.20	0.80	13.20	18.30	17.40
Conductance	umhos/cm	166	166	257	225	228	221	167	416
Dissolved Oxy gen	mg/l	7.61	4.72	5.94	5.88	7.81	4.89	6.34	2.88
pH		6.75	6.75	7.95	7.70	7.30	7.20	7.60	7.20
Alkalinity	mg/l	32	28	36	30	34	38	58	132
Acidity	mg/l	6	6	2	2	2	2	4	20
Solids, Total	mg/l	154	166	208	188	140	200	136	310
Solids, Dissolved	mg/l	146	142	202	188	140	200	136	248
Ammonia, Total	mg/l	<0.02	0.03	0.03	<0.02	0.04	0.04	0.03	2.94
Ammonia, Dissolved	mg/l	<0.02	0.03	0.03	<0.02	0.03	0.04	<0.02	2.84
Nitrite, Total	mg/l	0.01	0.01	<0.01	0.01	0.03	0.02	0.01	0.06
Nitrite, Dissolved	mg/l	<0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	0.06
Nitrate, Total	mg/l	6.07	5.81	2.54	5.95	8.28	6.80	1.08	0.21
Nitrate, Dissolved	mg/l	6.07	5.81	2.54	5.87	1.24	6.74	1.08	0.21
Phosphorus, Total	mg/l	0.16	0.03	0.07	0.05	0.12	0.07	0.03	2.00
Phosphorus, Dissolved	mg/l	0.146	0.021	0.067	0.011	0.064	0.016	0.021	0.114
Orthophosphate, Total	mg/l	0.041	0.024	0.057	0.026	0.025	0.018	0.020	0.450
Orthophosphate, Dissolved	mg/l	0.037	0.017	0.028	0.007	0.024	0.015	0.005	0.097
Organic Carbon, Total	mg/l	1.4	2.4	3.6	2.2	1.8	3.1	3.1	8.9
Calcium	mg/l	16.5	14.7	21.3	19.9	19.9	18.3	19.2	32.6
Magnesium	mg/l	5.59	6.02	10.60	9.98	9.78	9.71	3.79	17.80
Chloride	mg/l	18	13	18	16	17	12	8	37
Sulfate	mg/l	<20	<20	22	<20	26	<20	<20	<20
Turbidity	ntu	1.90	3.72	3.02	3.00	1.86	2.46	6.63	68.20
Iron, Total	µg/l	87	481	99	67	179	332	370	14,200
Iron, Dissolved	µg/l	24	74	<20	<20	24	41	78	5,290
Manganese, Total	µg/l	24	59	42	26	28	51	27	2,290
Manganese, Dissolved	µg/l	17	39	42	26	21	<10	22	2,290
Aluminum, Total	µg/l	<200	335	<200	<200	<200	313	<200	258
Aluminum, Dissolved	µg/l	<200	<200	<200	<200	<200	<200	<200	<200

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

Parameter	Units	SCTT 3.0	SCTT 3.0	SCTT 3.0	SUSQ 44.5	SUSQ 44.5	SUSQ 44.5	SUSQ 44.5
Date	yyyymmdd	19991111	20000208	20000502	19990805	19991110	20000210	20000511
Time	hhmm	1405	1105	1245	0830	1335	1310	1230
Discharge	cfs	0.785	0.601	0.601	2,930.000	9,390.000	15,900.000	25,100.000
Temperature	degree C	10.5	2.3	12.6	26.4	24.9	14.6	24.5
Conductance	umhos/cm	431	483	320	409	293	275	252
Dissolved Oxygen	mg/l	3.36	6.90	4.47	4.27	NA	NA	NA
pH		6.25	7.10	6.90	7.75	7.40	7.40	7.90
Alkalinity	mg/l	128	124	40	66	56	58	52
Acidity	mg/l	18	14	18	4	6	6	4
Solids, Total	mg/l	490	318	208	322	186	206	190
Solids, Dissolved	mg/l	468	314	196	310	180	198	172
Ammonia, Total	mg/l	0.32	0.40	9.04	0.07	<0.02	0.14	<0.02
Ammonia, Dissolved	mg/l	0.32	0.40	9.04	0.06	<0.02	0.14	<0.02
Nitrite, Total	mg/l	0.05	0.09	0.18	0.01	0.02	0.02	0.01
Nitrite, Dissolved	mg/l	0.05	0.09	0.18	0.02	0.02	0.02	0.01
Nitrate, Total	mg/l	0.61	1.84	1.20	0.34	0.83	1.44	0.60
Nitrate, Dissolved	mg/l	0.61	1.84	1.20	0.34	0.83	1.43	0.60
Phosphorus, Total	mg/l	0.690	0.220	0.190	0.060	0.177	0.060	0.110
Phosphorus, Dissolved	mg/l	0.483	0.088	0.081	0.030	0.177	0.048	0.074
Orthophosphate, Total	mg/l	0.382	0.071	0.064	0.029	0.047	0.043	0.068
Orthophosphate, Dissolved	mg/l	0.382	0.036	0.032	0.016	0.047	0.035	0.063
Organic Carbon, Total	mg/l	149.0	3.2	9.4	4.7	2.9	1.9	2.5
Calcium	mg/l	36.4	28.0	18.1	33.0	31.1	29.6	24.2
Magnesium	mg/l	19.60	16.10	8.65	14.30	8.35	8.03	6.79
Chloride	mg/l	39	100	29	32	22	23	15
Sulfate	mg/l	<20	23	46	66	59	41	48
Turbidity	ntu	9.50	7.85	2.19	5.11	3.50	1.48	2.67
Iron, Total	µg/l	18,200	1,830	1,070	237	240	198	376
Iron, Dissolved	µg/l	16,500	1,240	667	<20	27	40	<20
Manganese, Total	µg/l	1,930.0	564.0	524.0	143.0	34.4	48.5	101.0
Manganese, Dissolved	µg/l	1,820.0	516.0	490.0	53.0	11.0	39.8	5.1
Aluminum, Total	µg/l	209.0	<200.0	<200.0	249.0	68.5	61.6	144.0
Aluminum, Dissolved	µg/l	<200.0	<200.0	<200.0	<200.0	NA	NA	58.8

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

Parameter	Units	SUSQ 10.0	SUSQ 10.0	SUSQ 10.0	SUSQ 10.0
Date	yyyymmdd	19990805	19991112	20000208	20000503
Time	hhmm	1130	0805	1200	0845
Discharge	cfs	2,770	17,700	14,000	54,300
Temperature	degree C	31.2	12.6	3.3	14.8
Conductance	umhos/cm	405	304	247	178
Dissolved Oxygen	mg/l	4.73	4.57	6.99	5.22
pH		7.55	7.70	7.40	7.35
Alkalinity	mg/l	70	74	68	38
Acidity	mg/l	6	6	4	6
Solids, Total	mg/l	328	210	172	156
Solids, Dissolved	mg/l	304	210	172	136
Ammonia, Total	mg/l	0.11	0.07	0.12	0.08
Ammonia, Dissolved	mg/l	0.10	0.06	0.11	0.08
Nitrite, Total	mg/l	0.07	0.01	0.02	0.01
Nitrite, Dissolved	mg/l	0.07	<0.01	0.02	<0.01
Nitrate, Total	mg/l	0.47	1.21	1.70	1.00
Nitrate, Dissolved	mg/l	0.47	1.21	1.70	1.00
Phosphorus, Total	mg/l	0.04	0.04	0.17	0.04
Phosphorus, Dissolved	mg/l	0.020	0.031	0.063	0.016
Orthophosphate, Total	mg/l	0.022	0.071	0.016	0.018
Orthophosphate, Dissolved	mg/l	0.010	0.017	0.013	0.017
Organic Carbon, Total	mg/l	3.6	3.0	2.3	2.5
Calcium	mg/l	36.3	32.3	28.8	19.9
Magnesium	mg/l	13.40	8.90	6.84	6.02
Chloride	mg/l	30	24	20	11
Sulfate	mg/l	60	33	33	26
Turbidity	ntu	3.35	2.40	2.00	4.09
Iron, Total	µg/l	116	211	214	549
Iron, Dissolved	µg/l	<20	<20	62	85
Manganese, Total	µg/l	125	144	76	175
Manganese, Dissolved	µg/l	49	144	76	124
Aluminum, Total	µg/l	<200	<200	<200	392
Aluminum, Dissolved	µg/l	<200	<200	<200	<200

Table A3. Water Quality Data for Group 3 Streams

Parameter	Units	COOK	BABC	BILL	BIRD	BISC	BRIG	BULK
Date	yyyymmdd	20000523	20000515	20000522	20000517	20000523	20000516	20000523
Time	hhmm	1045	1545	1215	1030	0955	0945	1835
Temperature	degree C	11.2	13.1	11.2	12.9	1.4	8.9	11.0
pH		7.05	7.00	7.50	7.15	7.00	7.20	6.70
Dissolved Oxygen	mg/l	4.27	4.15	4.23	3.79	4.05	4.80	4.26
Conductivity	umhos/cm	99	91	209	123	88	133	77
Alkalinity	mg/l	28	26	70	44	22	44	28
Acidity	mg/l	4	4	6	4	6	6	4

Parameter	Units	CAMP	DEEP	DENT	DRYB	LWAP	PARK	PRIN
Date	yyyymmdd	20000522	20000515	20000515	20000516	20000516	20000516	20000515
Time	hhmm	1310	1030	1155	1415	1145	1300	1415
Temperature	degree C	11.2	9.7	16.5	14.0	10.8	10.9	13.4
pH		7.45	6.55	6.35	7.40	7.10	6.95	6.80
Dissolved Oxygen	mg/l	4.16	4.70	3.75	4.55	4.48	4.36	4.28
Conductivity	umhos/cm	160	40	39	153	117	94	84
Alkalinity	mg/l	54	6	8	36	40	28	20
Acidity	mg/l	2	4	6	4	4	4	4

Parameter	Units	REDH	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Date	yyyymmdd	20000522	20000516	20000516	20000522	20000522	20000523	20000517
Time	hhmm	1445	0830	1050	0930	1100	1235	0830
Temperature	degree C	11.4	9.0	9.3	11.4	11.2	11.6	10.4
pH		6.70	6.90	7.00	7.15	7.30	7.15	7.15
Dissolved Oxygen	mg/l	4.02	4.61	4.61	3.79	4.06	4.07	4.74
Conductivity	umhos/cm	62	120	92	123	144	102	121
Alkalinity	mg/l	22	34	26	44	54	32	32
Acidity	mg/l	4	6	4	4	4	4	4

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
Insecta: Coleoptera	Dytiscidae	*Agabus*	5	P
	Elmidae	*Dubiraphia*	6	SC
		Macronychus	2	SC
		Optioservus	4	SC
		Oulimnius	5	SC
		Stenelmis	5	SC
	Gyrinidae	*Dineutus*	4	P
	Hydrophilidae	*Berosus*	5	CG
		Hydrobius	5	P
		Laccobius	5	P
		Tropisternus	5	CG
	Psephenidae	*Ectopria*	5	SC
		Psephenus	4	SC
	Ptilodactylidae	*Anchytarsus*	5	SH
Diptera	Athericidae	*Atherix*	2	P
	Ceratopogonidae	*Bezzia*	6	P
	Chironomidae	Chironomidae	7	CG
	Empididae	*Hemerodromia*	6	P
	Simuliidae	Simuliidae	6	FC
	Tabanidae	*Tabanus*	5	P
	Tipulidae	*Antocha*	3	CG
		Dicranota	3	P
		Hexatoma	2	P
		Limonia	6	SH
		Tipula	4	SH
Ephemeroptera	Ameletidae	*Ameletus*	0	CG
	Baetidae	*Acentrella*	4	CG
		Baetis	6	CG
	Caenidae	*Caenis*	7	CG
	Ephemerellidae	*Drunella*	1	SC
		Ephemerella	1	SC
		Eurylophella	4	SC
		Serratella	2	SC
	Heptageniidae	*Epeorus*	0	CG
		Heptagenia	4	SC
		Leucrocuta	1	SC
		Stenacron	4	SC
		Stenonema	3	SC
	Isonychiidae	*Isonychia*	2	FC
	Leptophlebiidae	*Paraleptophlebia*	1	CG
		Habrophleboides	6	CG
	Polymitarcyidae	*Ephoron*	2	CG
	Potamanthidae	*Anthopotamus*	4	CG
	Tricorythidae	*Tricorythodes*	4	CG
Hemiptera	Veliidae	*Rhagovelia*	8	P
Lepidoptera	Pyralidae	*Petrophila*	5	SC
Megaloptera	Corydalidae	*Corydalus*	4	P

Class: Order	Family	Family/*Genus*	Organic Pollution Tolerance Value	Functional Feeding Group Designation
Megaloptera	Corydalidae	*Nigronia*	2	P
	Sialidae	*Sialis*	4	P
Odonata	Aeshnidae	*Boyeria*	2	P
	Gomphidae	*Gomphus*	5	P
		Ophiogomphus	1	P
		Stylogomphus	4	P
Plecoptera	Chloroperlidae	*Alloperla*	0	CG
		Sweltsa	0	P
	Leuctridae	*Leuctra*	0	SH
	Nemouridae	*Amphinemura*	2	SH
	Peltoperlidae	*Peltoperla*	2	SH
	Perlidae	*Acroneuria*	0	P
		Agnetina	2	P
		Eccoptura	2	P
		Neoperla	3	P
		Paragnetina	1	P
	Perlodidae	*Diploperla*	2	P
		Isoperla	2	P
Trichoptera	Brachycentridae	*Brachycentrus*	1	FC
	Glossosomatidae	*Glossosoma*	0	SC
	Hydropsychidae	*Ceratopsyche*	4	FC
		Cheumatopsyche	5	FC
		Diplectrona	0	FC
		Hydropsyche	4	FC
		Macrostemum	3	FC
		Potamyia	5	FC
	Hydroptilidae	*Leucotrichia*	6	SC
		Hydroptila	6	SC
	Philopotamidae	*Chimarra*	4	FC
		Dolophilodes	0	FC
	Polycentropodidae	*Polycentropus*	6	FC
	Rhyacophilidae	*Rhyacophila*	1	P
	Uenonidae	*Neophylax*	3	SC
Oligochaeta: Haplotaxida	Naididae	Naididae	8	CG
	Lumbriculidae	Lumbriculidae	8	CG
Hirudinea: Gnathobdellida	Hirudinidae	*Helobdella*	6	P
Crustacea: Amphipoda	Gammaridae	*Gammarus*	6	SH
Decapoda	Cambaridae	*Cambarus*	6	CG
		Orconectes	6	SH
Isopoda	Asellidae	*Caecidotea*	8	SH
Arachnoidea: Hydracarina	Hydracarina	Hydracarina	7	P
Gastropoda: Gastropoda	Physidae	*Physa*	8	SC
	Planorbidae	*Gyraulus*	6	SC
	Pleuroceridae	*Leptoxis*	6	SC
Bivalvia: Pelecypoda	Corbidulidae	*Corbicula*	4	FC
	Sphaeridae	*Psidium*	8	FC

APPENDIX C

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

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

Class: Order	Family	Family/*Genus*	SNAK 2.3	APAL 6.9	BNTY 0.9	CASC 1.6
Insecta: Coleoptera	Elmidae	*Optioservus*	6	2	1	8
		Stenelmis	3	38	7	11
	Gyrinidae	*Dineutus*				
	Hydrophilidae	*Laccobius*				
		Tropisternus				
	Psephenidae	*Psephenus*	2	15		1
Diptera	Athericidae	*Atherix*	1		4	
	Ceratopogonidae	*Bezzia*				
	Chironomidae	Chironomidae	10	20	28	41
	Empididae	*Hemerodromia*		2		4
	Tabanidae	*Tabanus*				
	Tipulidae	*Antocha*	2			
		Dicranota				2
		Hexatoma	1	7	8	1
		Tipula				
Ephemeroptera	Baetidae	*Acentrella*				
		Baetis	1			1
	Caenidae	*Caenis*	9			
	Ephemerellidae	*Drunella*				1
		Ephemerella	1			
		Serratella	5		2	2
	Heptageniidae	*Epeorus*	2			1
		Heptagenia			4	
		Leucrocuta				8
		Stenonema	4	2	1	4
	Isonychiidae	*Isonychia*	27	5	28	29
	Leptophlebiidae	*Paraleptophlebia*	1			
	Tricorythidae	*Tricorythodes*				
Hemiptera	Veliidae	*Rhagovelia*				2
Megaloptera	Corydalidae	*Corydalus*		1		
		Nigronia	1		1	3
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				2
	Gomphidae	*Gomphus*				
		Ophiogomphus				
		Stylogomphus			2	
Plecoptera	Leuctridae	*Leuctra*	1	1		2
	Perlidae	*Acroneuria*	3			5
		Agnetina				
		Paragnetina	2			

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

Class: Order	Family	Family/*Genus*	SNAK 2.3	APAL 6.9	BNTY 0.9	CASC 1.6
Trichoptera	Glossosomatidae	*Glossosoma*				1
	Hydropsychidae	*Ceratopsyche*	13	1	30	
		Cheumatopsyche	16	8	3	3
		Diplectrona	1	1		3
		Hydropsyche	4		2	3
		Macrostemum				1
		Potamyia flava				
	Hydroptilidae	*Leucotrichia*				
		Hydroptila				
	Philopotamidae	*Chimarra*	18	33		1
		Dolophilodes	3	4	1	4
	Polycentropodidae	*Polycentropus*				
	Rhyacophilidae	*Rhyacophila*	1			
Oligochaeta: Haplotaxida	Naididae	Naididae	1			
Crustacea: Decapoda	Cambaridae	*Cambarus*				
		Orconectes				2
Arachnoidea: Hydracarina	Hydracarina	Hydracarina				
Gastropoda: Gastropoda	Planorbidae	*Gyraulus*				

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

Class: Order	Family	Family/*Genus*	CAYT 1.7	CHOC 9.1	LSNK 7.6	SEEL 10.3
Insecta: Coleoptera	Elmidae	*Optioservus*	8	10	2	
		Stenelmis	18	19		1
	Gyrinidae	*Dineutus*	2			
	Hydrophilidae	*Laccobius*				
		Tropisternus				
	Psephenidae	*Psephenus*	10	9	5	
Diptera	Athericidae	*Atherix*		11	4	4
	Ceratopogonidae	*Bezzia*				
	Chironomidae	Chironomidae	16	13	36	55
	Empididae	*Hemerodromia*	2		3	
	Tabanidae	*Tabanus*				1
	Tipulidae	*Antocha*				1
		Dicranota				
		Hexatoma	5	1	1	
		Tipula			2	
Ephemeroptera	Baetidae	*Acentrella*				
		Baetis		1	1	
	Caenidae	*Caenis*				
	Ephemerellidae	*Drunella*				
		Ephemerella				
		Serratella	10	1		
	Heptageniidae	*Epeorus*				
		Heptagenia				
		Leucrocuta				
		Stenonema	1	5		2
	Isonychiidae	*Isonychia*	11	19	15	3
	Leptophlebiidae	*Paraleptophlebia*			1	
	Tricorythidae	*Tricorythodes*				26
Hemiptera	Veliidae	*Rhagovelia*				
Megaloptera	Corydalidae	*Corydalus*				
		Nigronia		1	2	1
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*			2	
	Gomphidae	*Gomphus*				
		Ophiogomphus		3	1	1
		Stylogomphus				
Plecoptera	Leuctridae	*Leuctra*			1	
	Perlidae	*Acroneuria*	1	4	1	1
		Agnetina				
		Paragnetina	2			

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

Class: Order	Family	Family/*Genus*	CAYT 1.7	CHOC 9.1	LSNK 7.6	SEEL 10.3
Trichoptera	Glossosomatidae	*Glossosoma*				
	Hydropsychidae	*Ceratopsyche*	43	13	7	66
		Cheumatopsyche	1	6	27	11
		Diplectrona				
		Hydropsyche		1	11	4
		Macrostemum				
		Potamyia flava		2	6	
	Hydroptilidae	*Leucotrichia*	4			
		Hydroptila				
	Philopotamidae	*Chimarra*	5	23	21	
		Dolophilodes			1	
	Polycentropodidae	*Polycentropus*				
	Rhyacophilidae	*Rhyacophila*				
Oligochaeta: Haplotaxida	Naididae	Naididae				
Crustacea: Decapoda	Cambaridae	*Cambarus*				
		Orconectes				
Arachnoidea: Hydracarina	Hydracarina	Hydracarina				
Gastropoda: Gastropoda	Planorbidae	*Gyraulus*				

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
Insecta: Coleoptera	Elmidae	*Optioservus*			3	2
		Stenelmis	12	20	3	1
	Gyrinidae	*Dineutus*				
	Hydrophilidae	*Laccobius*			1	
		Tropisternus			1	
	Psephenidae	*Psephenus*	21	16	3	3
Diptera	Athericidae	*Atherix*			50	2
	Ceratopogonidae	*Bezzia*		4		
	Chironomidae	Chironomidae	44	51	22	26
	Empididae	*Hemerodromia*	4	6		
	Tabanidae	*Tabanus*			4	
	Tipulidae	*Antocha*			1	
		Dicranota				
		Hexatoma		6	8	4
		Tipula	1			
Ephemeroptera	Baetidae	*Acentrella*		2		3
		Baetis	2		2	3
	Caenidae	*Caenis*				
	Ephemerellidae	*Drunella*				
		Ephemerella				
		Serratella				22
	Heptageniidae	*Epeorus*				3
		Heptagenia				
		Leucrocuta				8
		Stenonema	5		2	1
	Isonychiidae	*Isonychia*	9	8	1	25
	Leptophlebiidae	*Paraleptophlebia*		2		
	Tricorythidae	*Tricorythodes*				
Hemiptera	Veliidae	*Rhagovelia*				
Megaloptera	Corydalidae	*Corydalus*				
		Nigronia		1		1
	Sialidae	*Sialis*	4		1	
Odonata	Aeshnidae	*Boyeria*	1			
	Gomphidae	*Gomphus*			7	
		Ophiogomphus	5			
		Stylogomphus				
Plecoptera	Leuctridae	*Leuctra*		1		
	Perlidae	*Acroneuria*	1			1
		Agnetina		3	1	
		Paragnetina				

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	Glossosomatidae	*Glossosoma*				
	Hydropsychidae	*Ceratopsyche*	6	3	14	15
		Cheumatopsyche	6	5	2	8
		Diplectrona				
		Hydropsyche	14		1	5
		Macrostemum				
		Potamyia		1		
	Hydroptilidae	*Leucotrichia*				
		Hydroptila	1			
	Philopotamidae	*Chimarra*	4	1	1	7
		Dolophilodes		1		
	Polycentropodidae	*Polycentropus*	1	1		
	Rhyacophilidae	*Rhyacophila*				
Oligochaeta: Haplotaxida	Naididae	Naididae				
Crustacea: Decapoda	Cambaridae	*Cambarus*	2			
		Orconectes				
Arachnoidea: Hydracarina	Hydracarina	Hydracarina			3	
Gastropoda: Gastropoda	Planorbidae	*Gyraulus*			1	

Table C2. Macroinvertebrate Data for Pennsylvania-Maryland Border Streams

Class: Order	Family	Family/*Genus*	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5
Insecta: Coleoptera	Elmidae	*Optioservus*			8	
		Oulimnius	38			90
		Stenelmis		61	6	18
	Hydrophilidae	*Hydrobius*				
	Psephenidae	*Psephenus*	1		3	7
		Ectopria				
	Ptilodactylidae	*Anchytarsus*	10			
Diptera	Athericidae	*Atherix*		4	9	
	Ceratopogonidae	*Bezzia*				
	Chironomidae	Chironomidae	10	18	17	6
	Empididae	*Hemerodromia*			5	
	Tipulidae	*Antocha*	1		7	2
		Dicranota				
		Tipula	2		1	1
Ephemeroptera	Baetidae	*Acentrella*		1		
		Baetis	4	4		9
	Ephemerellidae	*Ephemerella*				
		Serratella		6	4	
	Heptageniidae	*Epeorus*	3			
		Heptagenia	4	25		
		Stenonema	7	21	1	1
	Isonychiidae	*Isonychia*	13	21	9	3
Megaloptera	Corydalidae	*Corydalus*		4	3	
		Nigronia	8		13	
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				1
	Gomphidae	*Ophiogomphus*				3
		Stylogomphus	1			
Plecoptera	Leuctridae	*Leuctra*	38		1	
	Peltoperlidae	*Peltoperla*				
	Perlidae	*Acroneuria*	13		8	3
		Agnetina	7			
		Eccoptura	1			
Trichoptera	Brachycentridae	*Brachycentrus*				
	Glossosomatidae	*Glossosoma*	3			
	Hydropsychidae	*Ceratopsyche*	10	4	18	19
		Cheumatopsyche	4	11	40	3
		Diplectrona	1			
		Hydropsyche	6	8	22	6
		Macrostemum				
		Potamyia			4	
	Hydroptilidae	*Leucotrichia*				
	Philopotamidae	*Chimarra*			7	1
		Dolophilodes	4			
	Polycentropodidae	*Polycentropus*	1			
	Rhyacophilidae	*Rhyacophila*	4			

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
Oligochaeta: Haplotaxida	Tubificidae	Tubificidae				
	Lumbriculidae	Lumbriculidae			1	
Crustacea: Amphipoda	Gammaridae	*Gammarus*		1		
Decapoda	Cambaridae	Cambaridae				1
		Orconectes				
		Caecidotea				1
Arachnoidea: Hydracarina	Hydracarina	Hydracarina		1		
Gastropoda: Gastropoda	Physidae	*Physa*				
	Planorbidae	*Gyraulus*				
Bivalvia: Pelecypoda	Corbiculidae	*Corbicula*		4		

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

Class: Order	Family	Family/*Genus*	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4
Insecta: Coleoptera	Elmidae	*Optioservus*	20	14		
		Oulimnius				18
		Stenelmis	4	7	27	
	Hydrophilidae	*Hydrobius*				1
	Psephenidae	*Psephenus*	1	1	2	1
		Ectopria				4
	Ptilodactylidae	*Anchytarsus*	1	6		2
Diptera	Athericidae	*Atherix*				
	Ceratopogonidae	*Bezzia*	7			
	Chironomidae	Chironomidae	51	14	7	18
	Empididae	*Hemerodromia*	3		1	
	Tipulidae	*Antocha*	2	2	1	
		Dicranota	2	32		10
		Tipula	3	1		
Ephemeroptera	Baetidae	*Acentrella*				1
		Baetis	9	3	13	1
	Ephemerellidae	*Ephemerella*		5		
		Serratella			2	
	Heptageniidae	*Epeorus*				
		Heptagenia				
		Stenonema	2	1	6	
	Isonychiidae	*Isonychia*	1		3	
Megaloptera	Corydalidae	*Corydalus*			1	
		Nigronia	6	2		3
	Sialidae	*Sialis*				1
Odonata	Aeshnidae	*Boyeria*				
	Gomphidae	*Ophiogomphus*				
		Stylogomphus	1			1
Plecoptera	Leuctridae	*Leuctra*	4	3		15
	Peltoperlidae	*Peltoperla*				2
	Perlidae	*Acroneuria*		3		4
		Agnetina	4			
		Eccoptura	2			
Trichoptera	Brachycentridae	*Brachycentrus*			5	
	Glossosomatidae	*Glossosoma*				
	Hydropsychidae	*Ceratopsyche*	10	4	15	4
		Cheumatopsyche	37	5	2	5
		Diplectrona				4
		Hydropsyche	7	28	5	1
		Macrostemum			14	
		Potamyia				
	Hydroptilidae	*Leucotrichia*			5	
	Philopotamidae	*Chimarra*		18	26	2
		Dolophilodes				18
	Polycentropodidae	*Polycentropus*				
	Rhyacophilidae	*Rhyacophila*				

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

Class: Order	Family	Family/*Genus*	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4
Oligochaeta: Haplotaxida	Tubificidae	Tubificidae				
	Lumbriculidae	Lumbriculidae				
Crustacea: Amphipoda	Gammaridae	*Gammarus*			11	
Decapoda	Cambaridae	Cambaridae				
		Orconectes		3		
		Caecidotea				
Arachnoidea: Hydracarina	Hydracarina	Hydracarina				
Gastropoda: Gastropoda	Physidae	*Physa*				
	Planorbidae	*Gyraulus*	1			
Bivalvia: Pelecypoda	Corbiculidae	*Corbicula*			2	

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

Class: Order	Family	Family/*Genus*	SCTT 3.0
Insecta: Coleoptera	Elmidae	*Optioservus*	
		Oulimnius	
		Stenelmis	
	Hydrophilidae	*Hydrobius*	
	Psephenidae	*Psephenus*	
		Ectopria	
	Ptilodactylidae	*Anchytarsus*	
Diptera	Athericidae	*Atherix*	
	Ceratopogonidae	*Bezzia*	
	Chironomidae	Chironomidae	80
	Empididae	*Hemerodromia*	
	Tipulidae	*Antocha*	
		Dicranota	
		Tipula	
Ephemeroptera	Baetidae	*Acentrella*	
		Baetis	
	Ephemerellidae	*Ephemerella*	
		Serratella	
	Heptageniidae	*Epeorus*	
		Heptagenia	
		Stenonema	
	Isonychiidae	*Isonychia*	
Megaloptera	Corydalidae	*Corydalus*	
		Nigronia	
	Sialidae	*Sialis*	
Odonata	Aeshnidae	*Boyeria*	
	Gomphidae	*Ophiogomphus*	
		Stylogomphus	
Plecoptera	Leuctridae	*Leuctra*	
	Peltoperlidae	*Peltoperla*	
	Perlidae	*Acroneuria*	
		Agnetina	
		Eccoptura	
Trichoptera	Brachycentridae	*Brachycentrus*	
	Glossosomatidae	*Glossosoma*	
	Hydropsychidae	*Ceratopsyche*	
		Cheumatopsyche	
		Diplectrona	
		Hydropsyche	
		Macrostemum	
		Potamyia flava	
	Hydroptilidae	*Leucotrichia*	
	Philopotamidae	*Chimarra*	
		Dolophilodes	
	Polycentropodidae	*Polycentropus*	
	Rhyacophilidae	*Rhyacophila*	

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

Class: Order	Family	Family/*Genus*	SCTT 3.0
Oligochaeta: Haplotaxida	Tubificidae	Tubificidae	7
	Lumbriculidae	Lumbriculidae	
Crustacea: Amphipoda	Gammaridae	*Gammarus*	
Decapoda	Cambaridae	Cambaridae	
		Orconectes	
		Caecidotea	3
Arachnoidea: Hydracarina	Hydracarina	Hydracarina	
Gastropoda: Gastropoda	Physidae	*Physa*	6
	Planorbidae	*Gyraulus*	
Bivalvia: Pelecypoda	Corbiculidae	*Corbicula*	

Table C3. Macroinvertebrate Data for River Sites

Class: Order	Family	Family/*Genus*	SUSQ 365.0	CHEM 12.0	COWN 2.2	COWN 1.0
Insecta: Coleoptera	Elmidae	*Dubiraphia*				
		Macronychus glabratus	5			
		Optioservus	7	3		1
		Stenelmis	41	14		10
	Gyrinidae	*Dineutus*	1			
	Hydrophilidae	*Berosus*				
	Psephenidae	*Psephenus*	9			9
Diptera	Athericidae	*Atherix*	1			1
	Chironomidae	Chironomidae	14	31	28	31
	Empididae	*Hemerodromia*		1	12	
	Simuliidae	Simuliidae	3	6		3
	Tipulidae	*Antocha*				4
		Tipula				1
Ephemeroptera	Baetidae	*Acentrella*	8	6		1
		Baetis	14	9		3
	Caenidae	*Caenis*		1		
	Ephemerellidae	*Ephemerella*				
		Serratella	1	14		
	Heptageniidae	*Heptagenia*				
		Leucrocuta				
		Stenacron				
		Stenonema	4	12	10	10
	Isonychiidae	*Isonychia*	16	29		1
	Polymitarcyidae	*Ephoron*	2			
	Potamanthidae	*Anthopotamus*	1			
	Tricorythidae	*Tricorythodes*				
Hemiptera	Veliidae	*Rhagovelia*				
Lepidoptera	Pyralidae	*Petrophila*		1		
Megaloptera	Corydalidae	*Corydalus*	4	2		1
		Nigronia				1
	Sialidae	*Sialis*				
Plecoptera	Perlidae	*Acroneuria*	4			
		Agnetina		2		
		Paragnetina	8			
Trichotpera	Hydropsychidae	*Ceratopsyche*	16	21		35
		Cheumatopsyche		28	5	11
		Hydropsyche	3		1	4
		Macrostemum	2		1	
	Hydroptilidae	*Leucotrichia*				
		Hydroptila	2			
	Philopotamidae	*Chimarra*	5	42		
	Polycentropodidae	*Polycentropus*				
Oligochaeta: Haplotaxida	Naididae	Naididae				
	Lumbriculidae	Lumbriculidae			4	

Table C3. Macroinvertebrate Data for River Sites—Continued

Class: Order	Family	Family/*Genus*	SUSQ 365.0	CHEM 12.0	COWN 2.2	COWN 1.0
Hirudinea: Gnathobdellida	Hirudinidae	*Helobdella*				
Crustacea: Amphipoda	Gammaridae	*Gammarus*	1		4	3
Isopoda	Asellidae	*Caecidotea*			52	22
Gastropoda: Gastropoda	Physidae	*Physa*			1	
	Pleuroceridae	*Leptoxis*	8			
Bivalvia: Pelecypoda	Corbidulidae	*Corbicula*				
	Sphaeridae	*Psidium*		13		

Table C3. Macroinvertebrate Data for River Sites—Continued

Class: Order	Family	Family/*Genus*	SUSQ 289.1	SUSQ 340.0	SUSQ 44.5	TIOG 10.8
Insecta: Coleoptera	Elmidae	*Dubiraphia*		14		
		Macronychus glabratus				
		Optioservus	2	5	1	
		Stenelmis	32	12	48	1
	Gyrinidae	*Dineutus*				1
	Hydrophilidae	*Berosus*				1
	Psephenidae	*Psephenus*	12	10		
Diptera	Athericidae	*Atherix*	1			3
	Chironomidae	Chironomidae	3	7	4	21
	Empididae	*Hemerodromia*				
	Simuliidae	Simuliidae				1
	Tipulidae	*Antocha*				2
		Tipula				
Ephemeroptera	Baetidae	*Acentrella*				2
		Baetis	2	6	10	1
	Caenidae	*Caenis*			1	
	Ephemerellidae	*Ephemerella*		2	2	
		Serratella	2			
	Heptageniidae	*Heptagenia*			1	
		Leucrocuta		2		
		Stenacron		3		
		Stenonema	1	10	16	13
	Isonychiidae	*Isonychia*	13	6	15	28
	Polymitarcyidae	*Ephoron*	1	2		
	Potamanthidae	*Anthopotamus*			4	
	Tricorythidae	*Tricorythodes*				1
Hemiptera	Veliidae	*Rhagovelia*			1	
Lepidoptera	Pyralidae	*Petrophila*	1			
Megaloptera	Corydalidae	*Corydalus*			2	2
		Nigronia				1
	Sialidae	*Sialis*		3		1
Plecoptera	Perlidae	*Acroneuria*				
		Agnetina	2	1	1	
		Paragnetina		1		
Trichotpera	Hydropsychidae	*Ceratopsyche*	12	8		18
		Cheumatopsyche	19	7	4	8
		Hydropsyche	4	2	11	
		Macrostemum	7	9	4	17
	Hydroptilidae	*Leucotrichia*			1	
		Hydroptila		1		
	Philopotamidae	*Chimarra*	17		18	19
	Polycentropodidae	*Polycentropus*				1
Oligochaeta: Haplotaxida	Naididae	Naididae			1	
	Lumbriculidae	Lumbriculidae				

Table C3. Macroinvertebrate Data for River Sites—Continued

Class: Order	Family	Family/*Genus*	SUSQ 289.1	SUSQ 340.0	SUSQ 44.5	TIOG 10.8
Hirudinea: Gnathobdellida	Hirudinidae	*Helobdella*	3			
Crustacea: Amphipoda	Gammaridae	*Gammarus*				
Isopoda	Asellidae	*Caecidotea*				
Gastropoda: Gastropoda	Physidae	*Physa*				
	Pleuroceridae	*Leptoxis*				
Bivalvia: Pelecypoda	Corbidulidae	*Corbicula*			1	
	Sphaeridae	*Psidium*		7		

Table C4. Macroinvertebrate Data for Group 3 Sites

Class: Order	Family	Family/*Genus*	COOK	BABC	BILL	BIRD
Insecta: Coleoptera	Dytiscidae	*Agabus*				
	Elmidae	*Optioservus*				
		Oulimnius	9			
		Stenelmis				
	Hydrophilidae	*Hydrobius*				
	Psephenidae	*Psephenus*	7		3	
		Ectopria				
Diptera	Athericidae	*Atherix*				
	Ceratopogonidae	*Bezzia*			1	
	Chironomidae	Chironomidae	7	19	7	12
	Empididae	*Hemerodromia*				
	Simuliidae	Simuliidae				2
	Tabanidae	*Tabanus*	2			
	Tipulidae	*Antocha*				
		Dicranota				
		Hexatoma		1	5	1
		Limonia				
		Tipula		2		
Ephemeroptera	Ameletidae	*Ameletus*				28
	Baetidae	*Acentrella*	3	3	3	
		Baetis	15	5	15	
	Ephemerellidae	*Drunella*				
		Ephemerella	10		5	
		Eurylophella				
	Ephemeridae	*Ephemera*				
	Heptageniidae	*Epeorus*	9			42
		Heptagenia				3
		Stenacron			1	
		Stenonema	16	2		
	Leptophlebiidae	*Paraleptophlebia*	2	52	51	1
		Habrophleboides				
Megaloptera	Corydalidae	*Nigronia*				
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				
	Gomphidae	*Ophiogomphus*				
		Stylogomphus			1	
Plecoptera	Chloroperlidae	*Alloperla*	2	3	18	11
		Sweltsa				
	Lectridae	*Leuctra*	2	19		1
	Nemouridae	*Amphinemura*	12	4	1	1
	Perlidae	*Acroneuria*	1	3	1	
		Agnetina				
		Neoperla				
	Perlodidae	*Diploperla*				
		Isoperla				

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	COOK	BABC	BILL	BIRD
Trichoptera	Brachycentridae	*Brachycentrus*				
	Hydropsychidae	*Ceratopsyche*				
		Cheumatopsyche				
		Diplectrona	3			
		Hydropsyche				
	Hydroptilidae	*Hydroptila*			1	
	Philopotamidae	*Chimarra*				
		Dolophilodes	3	5	1	
	Polycentropodidae	*Polycentropus*				10
	Rhyacophilidae	*Rhyacophila*	1	1		
	Uenonidae	*Neophylax*	1			
Oligochaeta: Haplotaxida	Naididae	Naididae	6			
Crustacea: Amphipoda	Gammaridae	*Gammarus*				
Decapoda	Cambaridae	Cambaridae				
		Cambarus	1			
Isopoda	Asellidae	*Caecidotea*				
Gastropoda: Gastropoda	Physidae	*Physa*			1	

Table C4 Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BISC	BRIG	BULK	CAMP
Insecta: Coleoptera	Dytiscidae	*Agabus*				
	Elmidae	*Optioservus*				
		Oulimnius				
		Stenelmis				
	Hydrophilidae	*Hydrobius*				
	Psephenidae	*Psephenus*				2
		Ectopria				
Diptera	Athericidae	*Atherix*				
	Ceratopogonidae	*Bezzia*			1	
	Chironomidae	Chironomidae	5	1	4	6
	Empididae	*Hemerodromia*				
	Simuliidae	Simuliidae				
	Tabanidae	*Tabanus*				
	Tipulidae	*Antocha*				
		Dicranota			1	
		Hexatoma	2		1	7
		Limonia				
		Tipula	1		1	
Ephemeroptera	Ameletidae	*Ameletus*	1	1		
	Baetidae	*Acentrella*				
		Baetis	5		4	3
	Ephemerellidae	*Drunella*			1	1
		Ephemerella				4
		Eurylophella				
	Ephemeridae	*Ephemera*				
	Heptageniidae	*Epeorus*	50	42	23	6
		Heptagenia	7	1	12	
		Stenacron				
		Stenonema	2		1	
	Leptophlebiidae	*Paraleptophlebia*		2		5
		Habrophleboides				
Megaloptera	Corydalidae	*Nigronia*			8	1
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				
	Gomphidae	*Ophiogomphus*			1	
		Stylogomphus				
Plecoptera	Chloroperlidae	*Alloperla*	16	5	12	55
		Sweltsa				
	Lectridae	*Leuctra*	2		9	12
	Nemouridae	*Amphinemura*	2	2	4	3
	Perlidae	*Acroneuria*	3		16	2
		Agnetina				
		Neoperla				
	Perlodidae	*Diploperla*				
		Isoperla				

Table C4 Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	BISC	BRIG	BULK	CAMP
Trichoptera	Brachycentridae	*Brachycentrus*				
	Hydropsychidae	*Ceratopsyche*			3	
		Cheumatopsyche				
		Diplectrona	2	1	7	1
		Hydropsyche				
	Hydroptilidae	*Hydroptila*				
	Philopotamidae	*Chimarra*				3
		Dolophilodes	6			
	Polycentropodidae	*Polycentropus*		1	5	
	Rhyacophilidae	*Rhyacophila*				
	Uenonidae	*Neophylax*				
Oligochaeta: Haplotaxida	Naididae	Naididae				
Crustacea: Amphipoda	Gammaridae	*Gammarus*				
Decapoda	Cambaridae	Cambaridae	1			
		Cambarus				
Isopoda	Asellidae	*Caecidotea*				
Gastropoda: Gastropoda	Physidae	*Physa*				1

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	DEEP	DENT	DRYB	LWAP
Insecta: Coleoptera	Dytiscidae	*Agabus*			1	
	Elmidae	*Optioservus*				
		Oulimnius				
		Stenelmis		5		
	Hydrophilidae	*Hydrobius*				
	Psephenidae	*Psephenus*			1	1
		Ectopria				
Diptera	Athericidae	*Atherix*	2			
	Ceratopogonidae	*Bezzia*				
	Chironomidae	Chironomidae	34	48	59	2
	Empididae	*Hemerodromia*	2	1	1	
	Simuliidae	Simuliidae		57	12	
	Tabanidae	*Tabanus*				
	Tipulidae	*Antocha*	2			
		Dicranota	1			1
		Hexatoma	2			
		Limonia				
		Tipula				
Ephemeroptera	Ameletidae	*Ameletus*			14	
	Baetidae	*Acentrella*			3	
		Baetis	3		18	1
	Ephemerellidae	*Drunella*				
		Ephemerella	3			1
		Eurylophella	1			
	Ephemeridae	*Ephemera*	2			
	Heptageniidae	*Epeorus*	1			44
		Heptagenia				4
		Stenacron			1	
		Stenonema	3			
	Leptophlebiidae	*Paraleptophlebia*	2		4	1
		Habrophleboides	14			
Megaloptera	Corydalidae	*Nigronia*	4	1		1
	Sialidae	*Sialis*				1
Odonata	Aeshnidae	*Boyeria*	1			
	Gomphidae	*Ophiogomphus*	1			
		Stylogomphus				
Plecoptera	Chloroperlidae	*Alloperla*				25
		Sweltsa				3
	Lectridae	*Leuctra*	20			7
	Nemouridae	*Amphinemura*	7	1	2	4
	Perlidae	*Acroneuria*	6			2
		Agnetina				
		Neoperla				
	Perlodidae	*Diploperla*				
		Isoperla				3

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	DEEP	DENT	DRYB	LWAP
Trichoptera	Brachycentridae	*Brachycentrus*		1		
	Hydropsychidae	*Ceratopsyche*				
		Cheumatopsyche	1	41		
		Diplectrona	1			
		Hydropsyche	1	35		
	Hydroptilidae	*Hydroptila*				
	Philopotamidae	*Chimarra*				
		Dolophilodes				
	Polycentropodidae	*Polycentropus*	1			
	Rhyacophilidae	*Rhyacophila*	1		1	
	Uenonidae	*Neophylax*				
Oligochaeta: Haplotaxida	Naididae	Naididae				
Crustacea: Amphipoda	Gammaridae	*Gammarus*	1	1		
Decapoda	Cambaridae	Cambaridae				
		Cambarus				
Isopoda	Asellidae	*Caecidotea*				
Gastropoda: Gastropoda	Physidae	*Physa*			1	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	PARK	PRIN	REDH	RUSS
Insecta: Coleoptera	Dytiscidae	*Agabus*				
	Elmidae	*Optioservus*				
		Oulimnius				
		Stenelmis				
	Hydrophilidae	*Hydrobius*				
	Psephenidae	*Psephenus*				
		Ectopria				
Diptera	Athericidae	*Atherix*				
	Ceratopogonidae	*Bezzia*				
	Chironomidae	Chironomidae	3	19	6	4
	Empididae	*Hemerodromia*		1		
	Simuliidae	Simuliidae	2			
	Tabanidae	*Tabanus*				
	Tipulidae	*Antocha*				
		Dicranota			2	1
		Hexatoma	2	1		3
		Limonia				
		Tipula		1	1	
Ephemeroptera	Ameletidae	*Ameletus*	2	4		6
	Baetidae	*Acentrella*		5		
		Baetis	3	22		2
	Ephemerellidae	*Drunella*			1	
		Ephemerella		1		
		Eurylophella				
	Ephemeridae	*Ephemera*				
	Heptageniidae	*Epeorus*	44	15	4	64
		Heptagenia	8	5		3
		Stenacron				
		Stenonema	2			
	Leptophlebiidae	*Paraleptophlebia*	3	15		
		Habrophleboides				
Megaloptera	Corydalidae	*Nigronia*				
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				
	Gomphidae	*Ophiogomphus*				
		Stylogomphus				
Plecoptera	Chloroperlidae	*Alloperla*	7	8	1	11
		Sweltsa	4		1	
	Lectridae	*Leuctra*	20	2	74	5
	Nemouridae	*Amphinemura*	9	3	3	5
	Perlidae	*Acroneuria*		2		
		Agnetina				
		Neoperla				
	Perlodidae	*Diploperla*				
		Isoperla			7	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	PARK	PRIN	REDH	RUSS
Trichoptera	Brachycentridae	*Brachycentrus*				
	Hydropsychidae	*Ceratopsyche*				
		Cheumatopsyche				
		Diplectrona				
		Hydropsyche				
	Hydroptilidae	*Hydroptila*				
	Philopotamidae	*Chimarra*				
		Dolophilodes			5	
	Polycentropodidae	*Polycentropus*		2		
	Rhyacophilidae	*Rhyacophila*			1	
	Uenonidae	*Neophylax*				
Oligochaeta: Haplotaxida	Naididae	Naididae		3	1	1
Crustacea: Amphipoda	Gammaridae	*Gammarus*				
Decapoda	Cambaridae	Cambaridae			1	1
		Cambarus	1			
Isopoda	Asellidae	*Caecidotea*				
Gastropoda: Gastropoda	Physidae	*Physa*				

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	SACK	SMIT	STRA	WBCO
Insecta: Coleoptera	Dytiscidae	*Agabus*				
	Elmidae	*Optioservus*			2	
		Oulimnius		11		3
		Stenelmis			1	
	Hydrophilidae	*Hydrobius*			1	
	Psephenidae	*Psephenus*			11	
		Ectopria		4		
Diptera	Athericidae	*Atherix*				
	Ceratopogonidae	*Bezzia*		1		
	Chironomidae	Chironomidae	1	12	14	13
	Empididae	*Hemerodromia*		3		
	Simuliidae	Simuliidae				
	Tabanidae	*Tabanus*				
	Tipulidae	*Antocha*				
		Dicranota			1	
		Hexatoma			1	2
		Limonia		5		
		Tipula				
Ephemeroptera	Ameletidae	*Ameletus*	2	2	2	11
	Baetidae	*Acentrella*		1	2	
		Baetis	2	7	7	14
	Ephemerellidae	*Drunella*			1	
		Ephemerella		2	4	2
		Eurylophella			1	
	Ephemeridae	*Ephemera*		5		
	Heptageniidae	*Epeorus*	53		2	6
		Heptagenia	12	1	1	29
		Stenacron			1	
		Stenonema		4	4	
	Leptophlebiidae	*Paraleptophlebia*	6		19	20
		Habrophleboides				
Megaloptera	Corydalidae	*Nigronia*		7		
	Sialidae	*Sialis*				
Odonata	Aeshnidae	*Boyeria*				
	Gomphidae	*Ophiogomphus*				
		Stylogomphus		1		
Plecoptera	Chloroperlidae	*Alloperla*	6		19	14
		Sweltsa	2			
	Lectridae	*Leuctra*	7	65		2
	Nemouridae	*Amphinemura*	10	16	5	6
	Perlidae	*Acroneuria*	4	4		3
		Agnetina			1	
		Neoperla			3	
	Perlodidae	*Diploperla*				
		Isoperla				1

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	SACK	SMIT	STRA	WBCO
Trichoptera	Brachycentridae	*Brachycentrus*				
	Hydropsychidae	*Ceratopsyche*			2	
		Cheumatopsyche				
		Diplectrona	1	7		1
		Hydropsyche				
	Hydroptilidae	*Hydroptila*				
	Philopotamidae	*Chimarra*				
		Dolophilodes	1		8	3
	Polycentropodidae	*Polycentropus*				
	Rhyacophilidae	*Rhyacophila*	1			
	Uenonidae	*Neophylax*				
Oligochaeta: Haplotaxida	Naididae	Naididae				3
Crustacea: Amphipoda	Gammaridae	*Gammarus*				
Decapoda	Cambaridae	Cambaridae				
		Cambarus	1	1		2
Isopoda	Asellidae	*Caecidotea*	1			
Gastropoda: Gastropoda	Physidae	*Physa*				

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	WHIT
Insecta: Coleoptera	Dytiscidae	*Agabus*	
	Elmidae	*Optioservus*	
		Oulimnius	
		Stenelmis	
	Hydrophilidae	*Hydrobius*	
	Psephenidae	*Psephenus*	
		Ectopria	
Diptera	Athericidae	*Atherix*	
	Ceratopogonidae	*Bezzia*	
	Chironomidae	Chironomidae	9
	Empididae	*Hemerodromia*	
	Simuliidae	Simuliidae	
	Tabanidae	*Tabanus*	
	Tipulidae	*Antocha*	
		Dicranota	
		Hexatoma	1
		Limonia	
		Tipula	
Ephemeroptera	Ameletidae	*Ameletus*	4
	Baetidae	*Acentrella*	
		Baetis	13
	Ephemerellidae	*Drunella*	
		Ephemerella	4
		Eurylophella	
	Ephemeridae	*Ephemera*	
	Heptageniidae	*Epeorus*	40
		Heptagenia	
		Stenacron	
		Stenonema	
	Leptophlebiidae	*Paraleptophlebia*	
		Habrophleboides	
Megaloptera	Corydalidae	*Nigronia*	
	Sialidae	*Sialis*	
Odonata	Aeshnidae	*Boyeria*	
	Gomphidae	*Ophiogomphus*	
		Stylogomphus	
Plecoptera	Chloroperlidae	*Alloperla*	
		Sweltsa	6
	Lectridae	*Leuctra*	11
	Nemouridae	*Amphinemura*	29
	Perlidae	*Acroneuria*	
		Agnetina	
		Neoperla	
	Perlodidae	*Diploperla*	8
		Isoperla	

Table C4. Macroinvertebrate Data for Group 3 Sites—Continued

Class: Order	Family	Family/*Genus*	WHIT
Trichoptera	Brachycentridae	*Brachycentrus*	
	Hydropsychidae	*Ceratopsyche*	1
		Cheumatopsyche	
		Diplectrona	
		Hydropsyche	
	Hydroptilidae	*Hydroptila*	
	Philopotamidae	*Chimarra*	
		Dolophilodes	2
	Polycentropodidae	*Polycentropus*	
	Rhyacophilidae	*Rhyacophila*	
	Uenonidae	*Neophylax*	
Oligochaeta: Haplotaxida	Naididae	Naididae	
Crustacea: Amphipoda	Gammaridae	*Gammarus*	
Decapoda	Cambaridae	Cambaridae	
		Cambarus	
Isopoda	Asellidae	*Caecidotea*	
Gastropoda: Gastropoda	Physidae	*Physa*	

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 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 August 1989, Pennsylvania Department of Environmental Resources, Division of Water Quality, 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 November 1, 1993, 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 – Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply: This use designation includes waters that are suitable for water contact sports; play and leisure time activities where individuals may come in direct contact with surface water; fishing; the growth and propagation of fish (other than trout), other aquatic life, and wild life; and industrial supply. The P designation indicates that the water source may be used as a public water supply.

III-P – Natural Trout Waters and Public Water Supply: This use designation includes waters that have the potential for or are suitable for the growth and propagation of trout, and capable of supporting self-sustaining trout populations and their food organisms. The P designation indicates that the water use may be used as a public water supply.

IV-P – Recreational Trout Waters and Public Water Supply: This use designation includes cold or warm waters that have the potential for or are capable of holding or supporting adult trout for put-and-take fishing; and managed as a special fishery by periodic stocking and seasonal catching. The P designation indicates that the waters may be used as a public water supply.

APPENDIX E

STATISTICAL TREND RESULTS BY PARAMETER

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.366	-2.801	-0.093	-1.648	170	0.122	-3.497	-0.187	NA
Chemung River	0.875	0.267	0.023	0.117	228	0.974	0.062	-0.002	NA
Conowingo Creek	0.471	1.360	0.091	0.810	168	0.273	1.649	0.129	-37.206
Cowanesque River	0.187	1.671	0.172	1.359	123	0.000	-0.047	0.007	1.043
Deer Creek	0.753	-0.266	-0.021	-0.196	136	0.618	0.521	0.063	NA
Ebaugh Creek	0.058	4.216	0.226	2.540	166	0.195	4.064	0.164	-24.331
Octoraro Creek	0.505	-1.197	-0.044	-0.688	174	0.809	0.331	0.009	11.699
Scott Creek	0.750	1.108	0.031	0.543	204	0.071	4.724	0.211	NA
Susquehanna River 10.0	0.946	0.000	-0.019	0.000	180	0.790	-1.007	-0.043	-11.758
Susquehanna River 44.5	0.482	3.093	0.070	1.578	196	0.532	-2.166	-0.122	48.272
Susquehanna River 289.1	0.451	-1.263	-0.088	-0.831	152	0.178	-1.404	-0.154	-38.385
Susquehanna River 340	0.948	0.000	0.027	0.000	124	0.974	-0.082	0.016	-13.532
Susquehanna River 365	0.721	-0.309	-0.044	-0.243	127	0.784	0.311	-0.017	-9.744
Tioga River	0.044	-1.965	-0.210	-1.424	135	0.445	-0.787	-0.092	11.014
Troups Creek	0.127	1.995	0.182	1.202	166	0.547	1.505	0.086	NA

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	<0.001	-0.003	-0.445	-8.342	0.030	0.022	-0.002	-0.274	31.611
Chemung River	0.001	-0.003	-0.313	-6.694	0.050	0.020	-0.003	-0.236	NA
Conowingo Creek	0.344	-0.001	-0.092	-2.241	0.050	0.826	0.000	-0.031	3.977
Cowanesque River	0.197	-0.002	-0.164	-3.343	0.060	0.041	-0.003	-0.274	NA
Deer Creek	0.002	-0.002	-0.289	-7.532	0.030	0.483	0.000	-0.077	NA
Ebaugh Creek	0.007	-0.003	-0.261	-6.836	0.050	0.737	-0.001	-0.038	8.896
Octoraro Creek	0.033	-0.003	-0.204	-7.053	0.040	0.369	-0.001	-0.024	39.727
Scott Creek	0.972	0.000	-0.011	0.000	0.150	0.499	0.007	0.082	-29.02
Susquehanna River 10.0	0.210	-0.001	-0.134	-1.767	0.080	0.860	0.000	-0.030	4.574
Susquehanna River 44.5	0.147	-0.001	-0.161	-3.586	0.040	0.058	-0.002	-0.224	39.107
Susquehanna River 289.1	0.010	-0.003	-0.249	-6.017	0.050	0.104	-0.002	-0.158	NA
Susquehanna River 340	0.002	-0.002	-0.297	-4.775	0.035	<0.001	-0.002	-0.357	41.373
Susquehanna River 365	<.0001	-0.002	-0.307	-6.616	0.030	0.015	-0.002	-0.253	52.607
Tioga River	<0.001	-0.003	-0.338	-5.574	0.060	0.445	-0.787	-0.092	11.014
Troups Creek	0.810	0.000	-0.041	0.000	0.020	0.699	0.000	-0.510	12.705

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.132	-0.017	-0.154	-2.895	0.574	0.015	-0.030	-0.274	NA
Chemung River	0.062	-0.013	-0.193	-1.768	0.752	0.338	-0.009	-0.099	-81.456
Conowingo Creek	<0.001	0.195	0.416	2.602	7.480	<0.001	0.224	0.510	NA
Cowanesque River	0.058	-0.015	-0.243	-2.899	0.517	0.722	-0.007	-0.071	43.351
Deer Creek	0.126	0.040	0.160	0.863	4.662	0.072	0.041	0.192	NA
Ebaugh Creek	0.350	0.013	0.103	0.228	5.810	0.831	0.010	0.026	NA
Octoraro Creek	0.067	0.085	0.171	1.607	5.279	0.111	0.107	0.202	NA
Scott Creek	0.621	0.008	0.068	0.388	2.076	0.764	0.009	0.045	-5.291
Susquehanna River 10.0	0.574	-0.005	-0.056	-0.420	1.232	0.057	-0.019	-0.224	NA
Susquehanna River 44.5	0.528	-0.007	-0.067	-0.758	0.901	0.801	0.001	-0.012	9.049
Susquehanna River 289.1	<0.001	-0.020	-0.347	-2.864	0.700	0.011	-0.017	-0.252	NA
Susquehanna River 340	<0.001	-0.019	-0.448	-3.500	0.531	0.001	-0.015	-0.352	63.817
Susquehanna River 365	0.001	-0.017	-0.320	-2.799	0.594	0.138	-0.013	-0.169	-98.397
Tioga River	0.040	-0.011	-0.196	-2.061	0.510	0.082	-0.009	-0.187	NA
Troups Creek	0.120	-0.013	-0.186	-7.071	0.188	0.000	0.000	0.003	-1.625

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.025	-0.005	-0.222	-5.540	0.090	0.108	-0.004	-0.189	NA
Chemung River	0.259	-0.002	-0.113	-2.821	0.070	0.130	-0.002	-0.166	74.050
Conowingo Creek	0.053	-0.003	-0.194	-4.126	0.080	0.065	-0.003	-0.193	NA
Cowanesque River	0.440	0.000	-0.073	0.000	0.030	0.286	-0.001	-0.128	59.063
Deer Creek	<0.001	-0.002	-0.417	-7.323	0.030	0.002	-0.002	-0.332	NA
Ebaugh Creek	0.010	-0.002	-0.251	-5.131	0.040	0.085	-0.002	-0.182	83.148
Octoraro Creek	0.042	-0.003	-0.214	-4.296	0.075	0.035	-0.003	-0.254	43.308
Scott Creek	0.010	-0.008	-0.292	-9.077	0.090	0.275	-0.004	-0.114	52.280
Susquehanna River 10.0	0.002	-0.002	-0.316	-3.967	0.050	0.037	-0.001	-0.245	-81.129
Susquehanna River 44.5	0.064	-0.002	-0.184	-4.161	0.060	0.165	-0.002	-0.197	NA
Susquehanna River 289.1	0.010	-0.003	-0.266	-5.015	0.050	0.007	-0.002	-0.266	-81.579
Susquehanna River 340	<0.001	-0.002	-0.327	-5.008	0.040	0.023	-0.001	-0.231	NA
Susquehanna River 365	<0.001	-0.002	-0.312	-4.537	0.040	0.089	-0.002	-0.192	71.614
Tioga River	0.119	0.000	-0.146	0.000	0.030	0.113	-0.001	-0.158	NA
Troups Creek	0.088	0.000	-0.177	0.000	0.030	0.296	0.000	-0.089	NA

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.641	0.252	0.049	1.145	22.0	0.636	-0.191	-0.039	NA
Chemung River	0.022	1.006	0.231	3.725	27.0	<0.001	0.814	0.412	NA
Conowingo Creek	<0.001	0.175	0.338	1.096	16.0	0.001	0.194	0.344	NA
Cowanesque River	0.581	0.000	0.118	0.000	10.0	1.000	-0.018	0.043	4.486
Deer Creek	<0.001	0.333	0.352	1.958	17.0	<0.001	0.324	0.410	-68.280
Ebaugh Creek	<0.001	2.924	0.372	9.431	31.0	0.008	2.885	0.282	-47.862
Octoraro Creek	0.013	0.144	0.257	1.025	14.0	0.001	0.172	0.404	61.561
Scott Creek	0.050	0.598	0.214	1.760	34.0	0.035	0.485	0.252	-74.474
Susquehanna River 10.0	0.821	0.000	0.020	0.000	15.0	0.621	0.067	0.064	-34.724
Susquehanna River 44.5	0.240	0.302	0.146	2.016	15.0	0.950	0.011	0.059	-1.994
Susquehanna River 289.1	0.003	0.689	0.294	4.593	15.0	<0.001	0.462	0.363	NA
Susquehanna River 340	0.012	0.305	0.253	3.051	10.0	0.012	0.184	0.255	-46.130
Susquehanna River 365	0.009	0.285	0.275	2.851	10.0	0.138	0.155	0.179	-86.319
Tioga River	0.585	0.000	-0.055	0.000	9.0	0.122	-0.099	-0.151	70.828
Troups Creek	0.074	0.403	0.212	3.099	13.0	0.938	0.046	0.017	27.817

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.005	-0.999	-0.283	-4.163	24	0.008	-1.301	-0.294	-84.662
Chemung River	<0.001	-1.017	-0.379	-3.280	31	<0.001	-0.963	-0.385	NA
Conowingo Creek	0.122	-0.398	-0.171	-2.746	14.5	0.233	-0.366	-0.137	63.266
Cowanesque River	<0.001	-1.569	-0.535	-7.133	22	<0.001	-1.290	-0.519	NA
Deer Creek	0.075	0.000	0.159	0.000	10	0.190	0.245	0.141	-61.887
Ebaugh Creek	0.209	0.000	0.108	0.000	10	0.222	0.104	0.131	15.220
Octoraro Creek	0.203	-0.237	-0.133	-1.129	21	0.102	-0.368	-0.154	NA
Scott Creek	0.014	-1.137	-0.259	-4.944	23	0.016	-0.893	-0.276	-88.643
Susquehanna River 10.0	0.037	-0.786	-0.215	-2.069	38	0.204	-0.803	-0.138	48.927
Susquehanna River 44.5	0.613	-0.499	-0.075	-1.061	47	0.001	-1.229	-0.360	NA
Susquehanna River 289.1	0.020	-0.617	-0.236	-3.628	17	0.020	-0.631	-0.238	NA
Susquehanna River 340	0.215	-0.293	-0.126	-1.773	16.5	0.095	-0.519	-0.170	NA
Susquehanna River 365	0.170	-0.300	-0.114	-1.878	16	0.047	-0.517	-0.186	NA
Tioga River	<0.001	-1.755	-0.442	-4.499	39	<0.001	-1.792	-0.495	NA
Troups Creek	<0.001	-1.222	-0.374	-5.817	21	<0.001	-1.191	-0.423	NA

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.002	-24.027	-0.319	-12.449	193	0.585	-3.776	-0.103	28.934
Chemung River	0.003	-23.992	-0.296	-8.756	274	0.017	-26.770	-0.242	49.767
Conowingo Creek	<0.001	-47.189	-0.406	-11.426	413	0.005	-26.752	-0.299	NA
Cowanesque River	0.246	17.000	0.148	6.104	278.5	0.329	26.298	0.123	-56.366
Deer Creek	<0.001	-45.841	-0.544	-17.837	257	0.005	-21.544	-0.301	NA
Ebaugh Creek	<0.001	-47.287	-0.552	-15.842	298.5	<0.001	-24.496	-0.417	NA
Octoraro Creek	0.201	-22.197	-0.175	-5.549	400	0.274	-7.555	-0.076	NA
Scott Creek	0.075	-38.875	-0.209	-8.582	453	0.536	-36.980	-0.061	NA
Susquehanna River 10.0	<0.001	-46.909	-0.375	-10.541	445	0.014	-51.119	-0.282	NA
Susquehanna River 44.5	<0.001	-56.553	-0.393	-10.117	559	0.007	-46.332	-0.352	86.619
Susquehanna River 289.1	<0.001	-46.195	-0.421	-17.498	264	<0.001	-45.275	-0.418	NA
Susquehanna River 340	0.002	-32.347	-0.313	-10.606	305	0.046	-25.027	-0.203	70.683
Susquehanna River 365	0.002	-24.827	-0.323	-9.229	269	0.010	-11.474	-0.335	NA
Tioga River	0.299	-10.232	-0.101	-3.654	280	0.955	0.434	0.007	-1.388
Troups Creek	0.328	-6.713	-0.114	-3.390	198	0.486	-5.478	-0.053	37.463

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.578	0.000	-0.058	0.000	100	0.445	-3.689	-0.112	23.068
Chemung River	1.000	0.000	-0.002	0.000	220	0.978	1.018	0.005	-3.345
Conowingo Creek	0.003	-21.537	-0.296	-8.006	269	0.009	-24.567	-0.282	NA
Cowanesque River	0.257	6.502	0.130	2.520	258	0.214	27.191	0.154	NA
Deer Creek	0.193	-0.745	-0.133	-0.745	100	0.410	-4.524	-0.090	22.903
Ebaugh Creek	0.235	-0.751	-0.116	-0.751	100	0.120	-4.950	-0.167	48.034
Octoraro Creek	0.254	-9.598	-0.122	-3.561	269.5	0.184	-9.755	-0.103	NA
Scott Creek	0.910	0.000	0.009	0.000	100	0.816	2.054	0.031	-8.402
Susquehanna River 10.0	0.151	-7.586	-0.148	-2.952	257	0.078	-8.387	-0.205	NA
Susquehanna River 44.5	0.033	-17.104	-0.227	-6.344	269.6	0.185	-15.726	-0.178	NA
Susquehanna River 289.1	0.080	-8.132	-0.170	-4.620	176	0.015	-10.298	-0.236	NA
Susquehanna River 340	0.491	-0.998	-0.071	-0.632	158	0.511	-2.074	-0.069	14.831
Susquehanna River 365	0.166	-1.502	-0.136	-1.502	100	0.005	-9.144	-0.325	NA
Tioga River	0.360	2.268	0.098	1.080	210	0.056	10.122	0.191	-23.352
Troups Creek	0.444	-2.248	-0.096	-1.551	145	0.938	-0.874	-0.001	5.877

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.008	-0.951	-0.276	-6.341	15	0.203	-0.489	-0.156	NA
Chemung River	0.033	-2.059	-0.217	-2.709	76	0.059	-2.806	-0.192	45.634
Conowingo Creek	0.458	-0.856	-0.079	-1.678	51	0.178	-1.028	-0.146	NA
Cowanesque River	0.016	5.810	0.278	6.835	85	0.657	0.695	0.035	-3.417
Deer Creek	0.059	-0.670	-0.191	-2.310	29	0.286	-0.381	-0.115	NA
Ebaugh Creek	0.367	-0.778	-0.093	-1.944	40	0.562	-0.580	-0.064	27.220
Octoraro Creek	0.151	-1.677	-0.140	-3.494	48	0.211	-0.950	-0.118	NA
Scott Creek	0.081	-11.497	-0.198	-9.581	120	0.699	3.356	0.054	-11.241
Susquehanna River 10.0	<0.001	-4.425	-0.338	-3.116	142	0.105	-2.914	-0.188	-46.136
Susquehanna River 44.5	0.035	-4.215	-0.229	-3.572	118	0.026	-3.895	-0.281	29.668
Susquehanna River 289.1	0.237	-0.430	-0.111	-1.509	28.5	0.141	-0.745	-0.142	28.163
Susquehanna River 340	0.956	0.000	0.008	0.000	38	0.891	0.107	0.016	-2.898
Susquehanna River 365	0.633	-1.000	-0.049	-0.372	27	0.587	-0.208	-0.086	6.317
Tioga River	<0.001	-25.327	-0.382	-9.630	263	0.018	-17.789	-0.247	NA
Troups Creek	0.543	0.000	-0.077	0.000	12.5	0.425	-0.383	-0.072	-55.947

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

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

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

Station	Concentrations					Flow-Adjusted Concentrations			
	P	b	Tau	% Slope	Median	P	b	Tau	% Slope
Cayuta Creek	0.066	-1.000	-0.187	-1.922	52	0.291	-0.605	-0.118	NA
Chemung River	0.422	-0.253	-0.091	-0.401	63	0.059	-2.806	-0.192	45.634
Conowingo Creek	<0.001	-1.558	-0.390	-2.734	57	0.008	-1.259	-0.277	NA
Cowanesque River	0.229	1.002	0.154	2.045	49	0.374	0.913	0.103	NA
Deer Creek	<0.001	-1.196	-0.349	-3.232	37	0.055	-0.682	-0.205	NA
Ebaugh Creek	0.716	0.154	0.034	0.309	50	0.234	0.343	0.128	NA
Octoraro Creek	0.007	-1.195	-0.279	-2.133	56	0.435	-0.499	-0.032	NA
Scott Creek	0.033	-1.258	-0.235	-1.936	65	0.164	-0.858	-0.156	NA
Susquehanna River 10.0	0.006	-1.144	-0.284	-2.118	54	0.029	-0.684	-0.248	-34.154
Susquehanna River 44.5	<0.001	-1.590	-0.410	-3.244	49	<0.001	-1.447	-0.408	NA
Susquehanna River 289.1	0.061	-0.666	-0.187	-1.281	52	0.129	-0.684	-0.147	NA
Susquehanna River 340	0.088	-0.537	-0.173	-1.278	42	0.286	-0.285	-0.110	-65.877
Susquehanna River 365	0.262	-0.415	-0.119	-0.989	42	0.587	-0.221	-0.086	-69.626
Tioga River	0.504	-0.260	-0.069	-0.501	52	0.400	-0.303	-0.081	-57.717
Troups Creek	0.940	0.000	0.028	0.000	36	0.588	-0.316	-0.098	NA

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

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