
**ASSESSMENT OF INTERSTATE
STREAMS IN THE
SUSQUEHANNA RIVER BASIN**

Monitoring Report No. 20
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INTRODUCTION

The Susquehanna River Basin is the largest river basin on the Atlantic Coast of the United States, draining 27,510 square miles. The Susquehanna River originates at the outlet of Otsego Lake, Cooperstown, N.Y., and flows 444 miles through New York, Pennsylvania, and Maryland to the Chesapeake Bay at Havre de Grace, Md. Eighty-three streams cross state lines in the basin. Several streams traverse the state lines at multiple points, contributing to 91 crossings. Of those 91 crossings, 45 streams flow from New York into Pennsylvania, 22 from Pennsylvania into New York, 15 from Pennsylvania into Maryland, and 9 from Maryland into Pennsylvania. Many streams are small and 32 are unnamed.

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

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

SRBC's interstate monitoring program began in April 1986. For the first five years, results were reported for water years that ran from October to September. In 1991, SRBC changed the reporting periods to correspond with its fiscal year that covers the period from July to June. Reports are typically completed during the following summer for the data from the previous fiscal year. In 2007, a web-based format was initiated to provide a more user-friendly product that is easily accessible to not only government agencies but also to anyone who is interested in the condition of these streams and rivers. Recent reports are available online from the SBRC website at <http://www.srbc.net/docs/Publications/techreports.htm>.

METHODS

Field and Laboratory Methods

Sampling frequency

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

Streams with impaired water quality or judged to have a high potential for degradation due to large drainage areas or historical pollution have been assigned to Group 1. Each year, Group 1 streams are sampled in July or August, October, February, and May. Benthic macroinvertebrates are collected and habitat assessments are performed at all Group 1 streams during the summer sampling period.

Streams judged to have a moderate potential for impacts have been assigned to Group 2. Water quality samples, benthic macroinvertebrate samples, and physical habitat information were obtained from Group 2 stations once a year; usually during base flow conditions in the summer months of July or August.

Streams judged to have a low potential for impacts have been assigned to Group 3 and are sampled each May for macroinvertebrates, and habitat conditions are assessed. Field chemistry parameters also are measured on Group 3 streams at the time of biological sampling.

Stream discharge

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

Water samples

Water samples are collected at each of the Group 1 and Group 2 streams to measure nutrient and metal concentrations. Water samples are collected using a depth-integrated sampler. Composite samples are obtained by collecting several depth-integrated samples across the stream channel and combining them in a churn splitter that was previously rinsed with stream water. Water samples are mixed thoroughly in the churn splitter and collected in a 500-ml bottle and two 250-ml bottles. The 500-ml bottle is for a raw sample. Each of the 250-ml bottles consists of a whole water sample, one fixed with concentrated nitric acid (HNO₃) for metal analysis and one fixed with concentrated sulfuric acid (H₂SO₄) for nutrient analysis. The samples are chilled on ice and sent to the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Laboratories in Harrisburg, Pa., within 24 hours of collection.

Field chemistry

Temperature, dissolved oxygen, conductivity, pH, alkalinity, and acidity are measured in the field. Dissolved oxygen is measured using a YSI model 55-dissolved oxygen meter that is calibrated at the beginning of each day when water samples are collected. A VWR Scientific Model 2052 conductivity meter is used to measure conductivity. A Cole Parmer meter is used to measure pH. The pH meter is calibrated at the beginning of the day and randomly checked throughout the day. Alkalinity is determined by titrating a known volume of water to pH 4.5 with 0.02N H₂SO₄. Acidity is measured by titrating a known volume of sample water to pH 8.3 with 0.02N sodium hydroxide (NaOH). Total chlorine is measured at Cayuta and Ebaughs Creeks since CAYT 1.7 and EBAU 1.5 are located downstream of wastewater treatment plants. A HACH Datalogging Colorimeter model DR/890 is used with the DPD Test and Tube method (10101) to measure chlorine concentrations.

Macroinvertebrate and physical habitat sampling

SRBC staff collects benthic macroinvertebrate samples from Group 1 and Group 2 stations in July and August and from Group 3 streams in May. The benthic macroinvertebrate community is 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 are analyzed using field and laboratory methods described in Rapid Bioassessment Protocol for Use in Streams and Rivers by Barbour and others (1999). Sampling is performed using a 1-meter-square kick screen with size No. 30 mesh. The kick screen is stretched across the current to collect organisms dislodged from riffle/run areas by physical agitation of the stream substrate. Two kick screen samples are collected from a representative riffle/run at each station. The two samples are composited and preserved in denatured ethyl alcohol for later laboratory analysis.

In the laboratory, composite samples are sorted into 200-organism subsamples using a gridded pan and a random numbers table. The organisms contained in the subsamples are identified to genus (except Chironomidae and Oligochaeta) and enumerated using keys developed by Merrit and Cummins (1996), Peckarsky and others (1990), and Pennak (1989). Each taxon is assigned an organic pollution tolerance value and a functional feeding category.

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

Data Synthesis Methods

Chemical water quality

Results of laboratory analysis for chemical parameters are compared to New York, Pennsylvania, and Maryland state water quality standards. In addition, a simple water quality index (WQI) is calculated, using procedures established by McMorran and Bollinger (1990). The WQI is used to make comparisons between sampling periods and stations within the same geographical region; therefore, the water quality data are divided into two groups. One group contains stations along the New York-Pennsylvania border, and the other group contains stations along the Pennsylvania-Maryland border. The data in each group are sorted by parameter and ranked by increasing order of magnitude, with several exceptions. Dissolved oxygen is ranked by decreasing order of magnitude, while pH, alkalinity, acidity, calcium, and magnesium are not included in the WQI analysis. The values of each chemical analysis are divided by the highest ranking value in the group to obtain a percentile. The WQI score is calculated by averaging all percentile ranks for each sample. WQI scores range from 1 to 100, and high WQI scores indicate poor water quality.

Biological and physical habitat conditions

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

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

Trend analysis

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

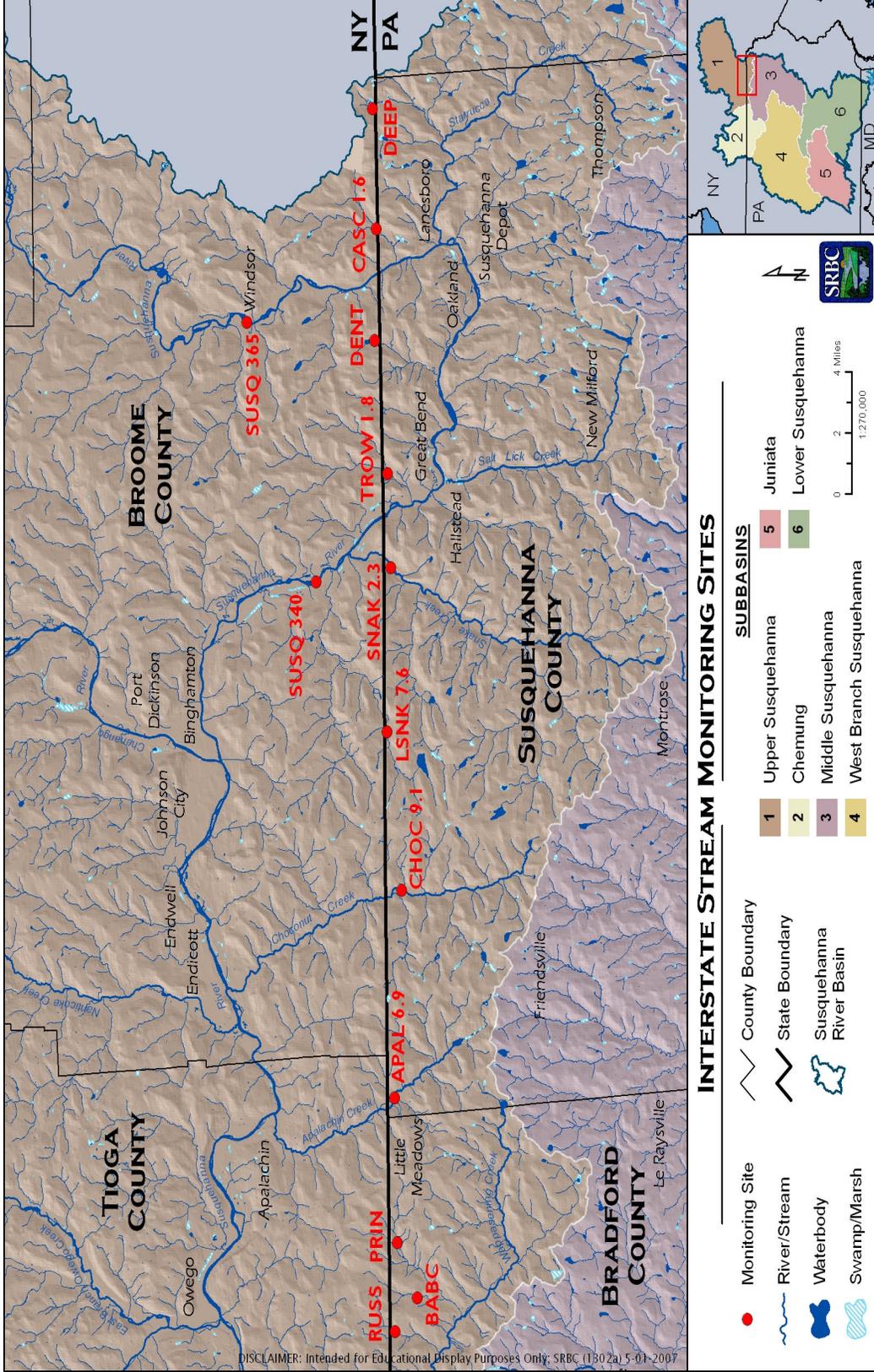
The nonparametric trend test used in previous reports was the Seasonal Kendall Test, which is described by Bauer and others (1984), and Smith and others (1982). For more information on this test and how it was used to assess trends in the data see Trends in Nitrogen, Phosphorus, and Suspended Sediment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

List of New York- Pennsylvania Interstate Streams

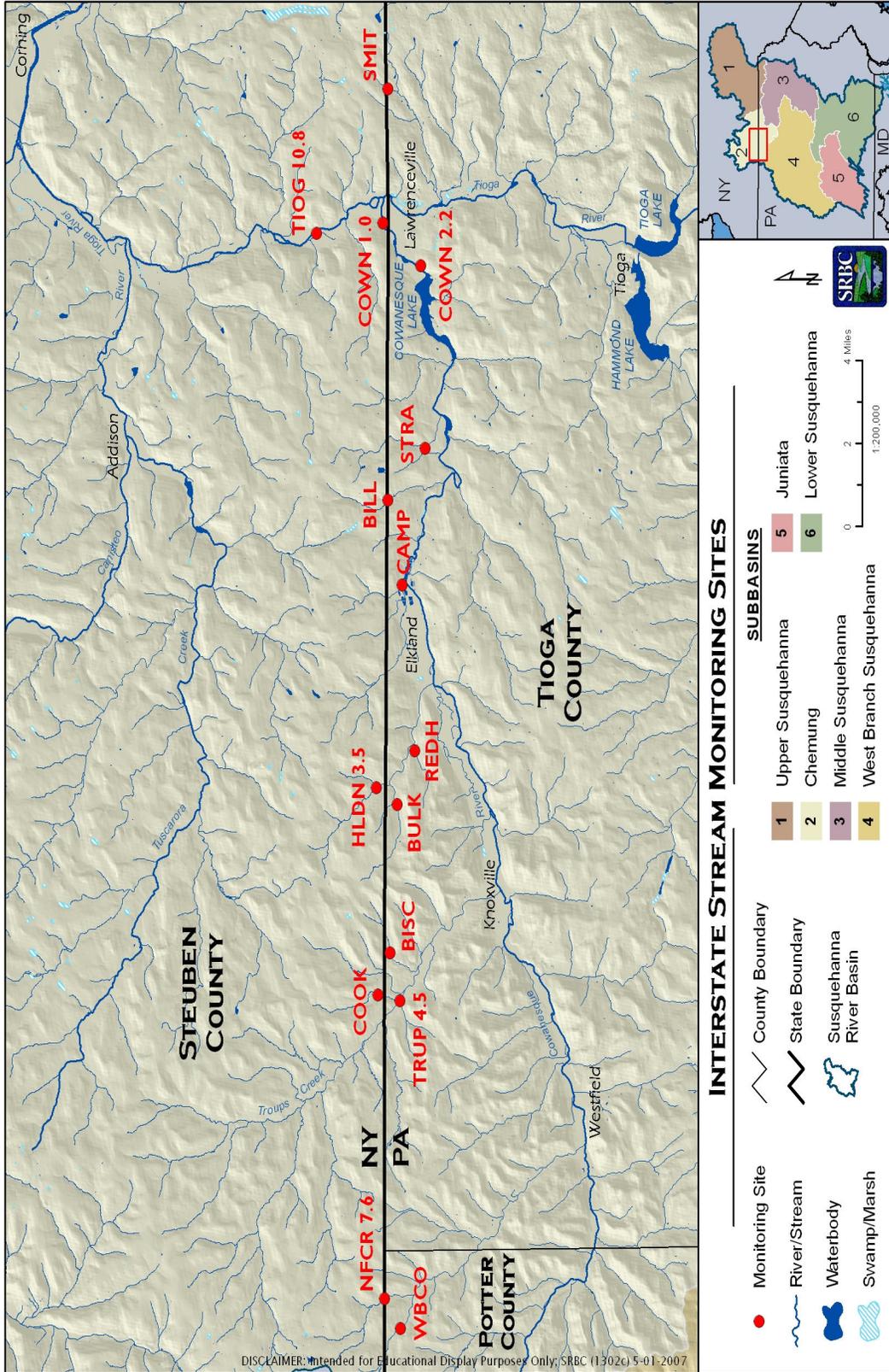
Station	Stream and Location	Monitoring Group	Rationale
APAL 6.9	Apalachin Creek, Little Meadows, PA	2	Monitor for potential water quality impacts
BABC	Babcock Run, Cadis, PA	3	Monitor for potential impacts
BEAG	Beagle Hollow Run, Osceola, PA	3	Monitor for potential impacts
BILL	Bill Hess Creek, Nelson,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

List of Pennsylvania-Maryland Interstate Streams

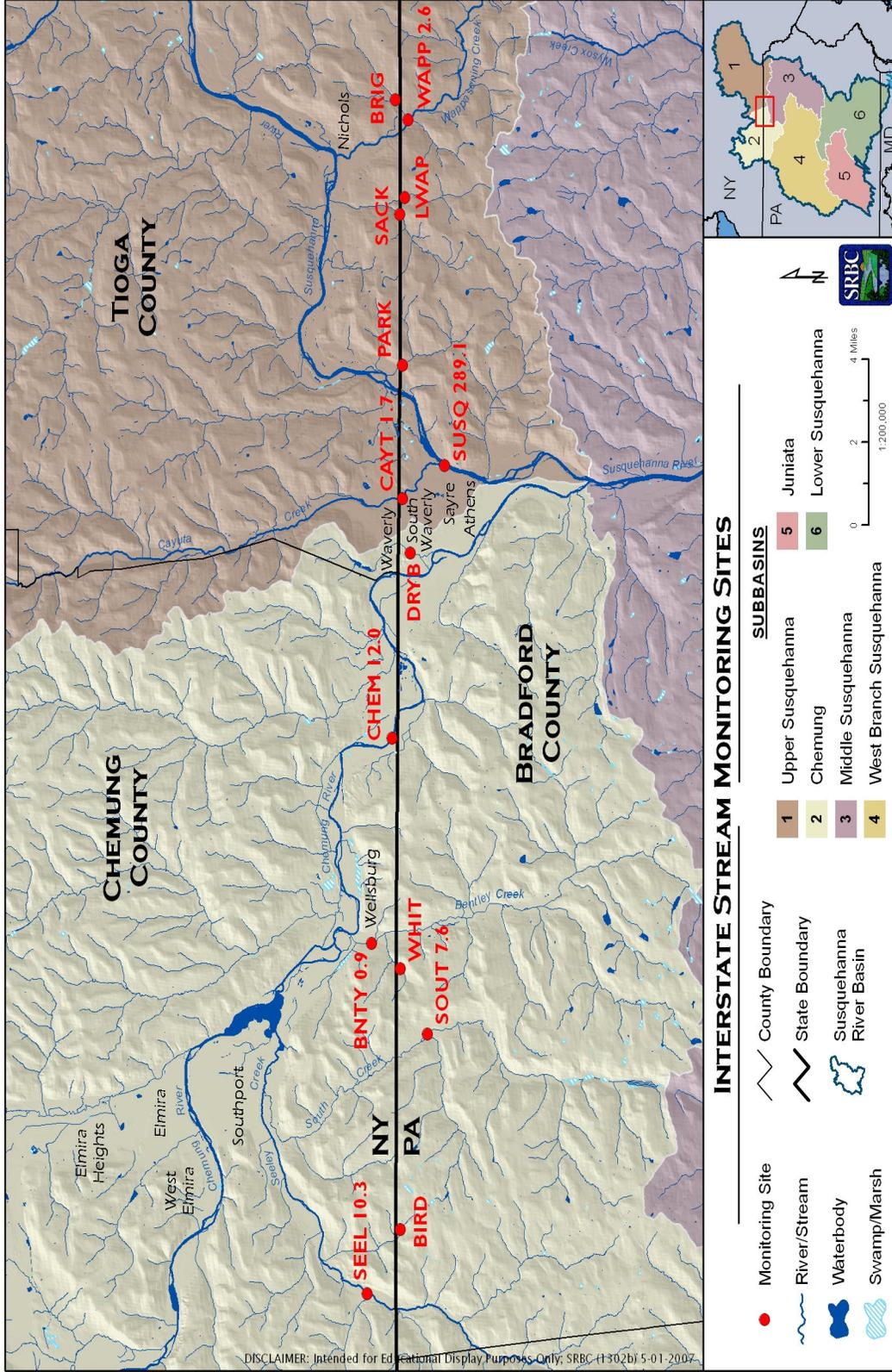
Station	Stream and Location	Monitoring Group	Rationale
BBDC 4.1	Big Branch Deer Creek, Fawn Grove, PA	2	Monitor for potential water quality impacts
CNWG 4.4	Conowingo Creek, Pleasant Grove, PA	1	High nutrient loads and other agricultural runoff; nonpoint runoff to Chesapeake Bay
DEER 44.2	Deer Creek,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



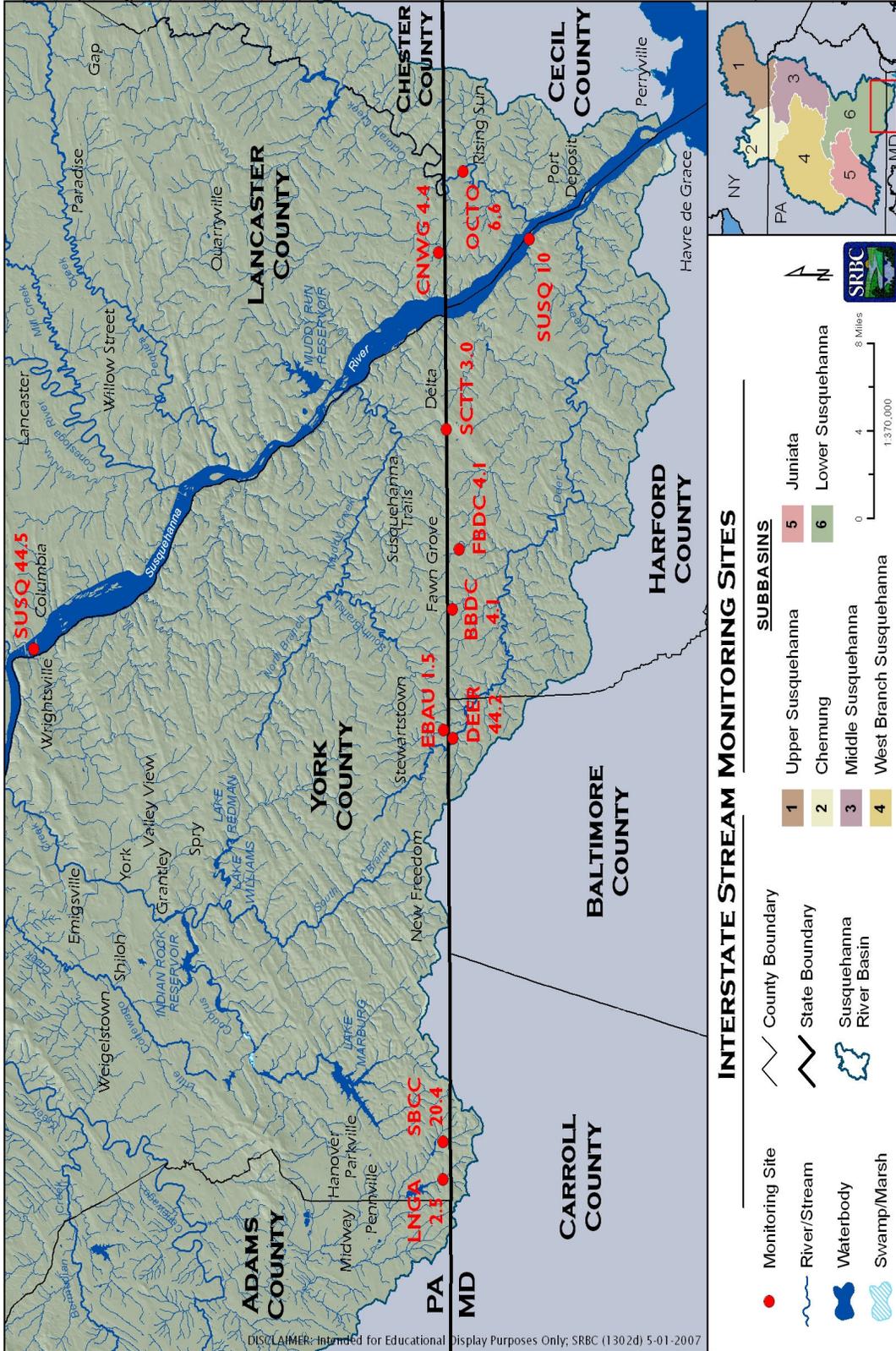
Map of New York-Pennsylvania Interstate Streams (western section)



Map of New York-Pennsylvania Interstate Streams (eastern section)



Map of New York-Pennsylvania Interstate Streams (central section)



Map of Pennsylvania-Maryland Interstate Streams

Criteria Used to Evaluate Physical Habitat

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

Criteria Used to Evaluate Physical Habitat—Continued

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

Criteria Used to Evaluate Physical Habitat—Continued

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

¹R/R – Riffle/Run

²G/P – Glide/Pool

^a Embeddedness

^b Velocity/Depth Regimes

^c Pool Variability

^d Channel Alteration

^e Condition of Banks

Habitat assessment parameters used for streams characterized by riffles and runs.

Habitat assessment parameters used for streams characterized by glides and pools.

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.

The general guidelines are 0.5 m depth to separate shallow from deep, and 0.3 m/sec to separate fast from slow.

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

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.

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

Source: Modified from Barbour and others, 1999.

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

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

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

Summary of Criteria Used to Classify the Biological Conditions of Sample Sites

SAMPLING AND ANALYSIS



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



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

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

Summary of Criteria Used to Classify the Habitat Conditions of Sample Sites

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



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

(a) Combined score of each bank

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

RESULTS

Sites that represent the best available suite of conditions, in terms of biological community, water quality, and habitat for each group of stream sites are designated as reference sites. All other locations within that grouping are compared to the reference site. The reference sites for 2005-2006 are South Creek, Susquehanna River 365, Big Branch Deer Creek, and Deep Hollow Brook. Sites located on the New York-Pennsylvania border were compared to South Creek at Fassett, Pa. South Creek represented the best combination of biological, water quality, and habitat conditions in the Northern Appalachian Plateau and Uplands Ecoregion. River sites in New York, Pennsylvania, and Maryland were all compared to the conditions at the Susquehanna River at river mile 365. SUSQ 365 represented the best combination of conditions of the seven river sites sampled.

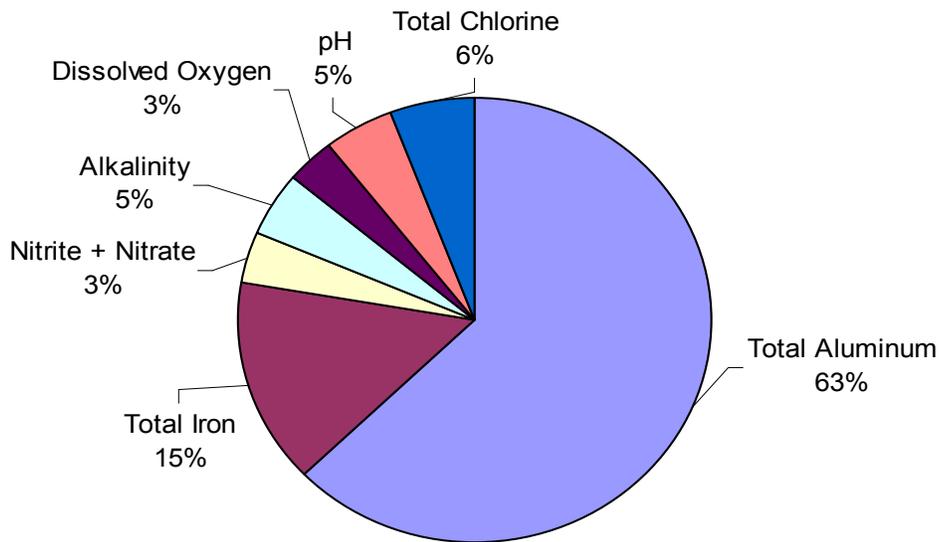
Big Branch Deer Creek (BBDC 4.1) near Fawn Grove, Pa., served as the reference site for sampling stations located on the Pennsylvania-Maryland border. BBDC 4.1 had the best combination of biological, water quality, and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987). Deep Hollow Brook (DEEP) near Danville, N.Y., served as the reference site for Group 3 sites, as it had the best biological, habitat, and field chemistry conditions of these sites. This was the second consecutive year that DEEP represented the best of the Group 3 sites.

Water Quality

During fiscal year 2006, water quality in approximately 20 percent of the Group 1 and Group 2 interstate streams continued to meet designated use classes and water quality standards. Twenty-two out of the 28 sites had parameters exceeding water quality standards, with 17 of those having more than one violation. The parameter that most frequently exceeded water quality standards was total aluminum. Eighty-six out the 607 possible observations (based on the number of applicable water quality standards of each state) exceeded water quality standards.

Water Quality Standard Summary

Parameter	Standard	Standard Value	Number of Observations	Number Exceeding Standards
Alkalinity	Pa. aquatic life	20 mg/l	77	4
Total Iron	N.Y. aquatic (chronic)	300 µg/l	54	13
	Pa. aquatic life	1500 µg/l	89	0
Total Aluminum	N.Y. aquatic (chronic)	100 µg/l	54	54
Total Chlorine	N.Y. aquatic (acute)	0.019 mg/l	4	2
	Md. aquatic life	0.019 mg/l	4	3
Nitrite plus Nitrate	Pa. public water supply	10 mg/l	89	3
Dissolved Oxygen	Pa. aquatic life	5.0 mg/l	89	3
pH	N.Y. general	6.5-8.5	77	4



Parameters Exceeding Water Quality Standards

Macroinvertebrates

Nineteen (43 percent) of the 44 interstate streams sites at which macroinvertebrate samples were collected contained nonimpaired biological communities. Biological conditions at another 16 sites (36 percent) were slightly impaired, while nine sites (21 percent) were moderately impaired. No sites were designated severely impaired. Nine sites (SUSQ 10.0, SUSQ 44.5, CASC 1.6, TROW 1.8, LSNK 7.6, WAPP 2.6, HLDN 3.5, NFCR 7.6, SCTT 3.0) were not sampled using RBP III techniques due to either dry conditions or deep waters and, thus, were not averaged into the final scores.

Habitat Assessment

Twenty one (48 percent) sites had excellent habitats. Twenty two (50 percent) had supporting habitats, and one site (2 percent) was designated as having a partially supporting habitats.

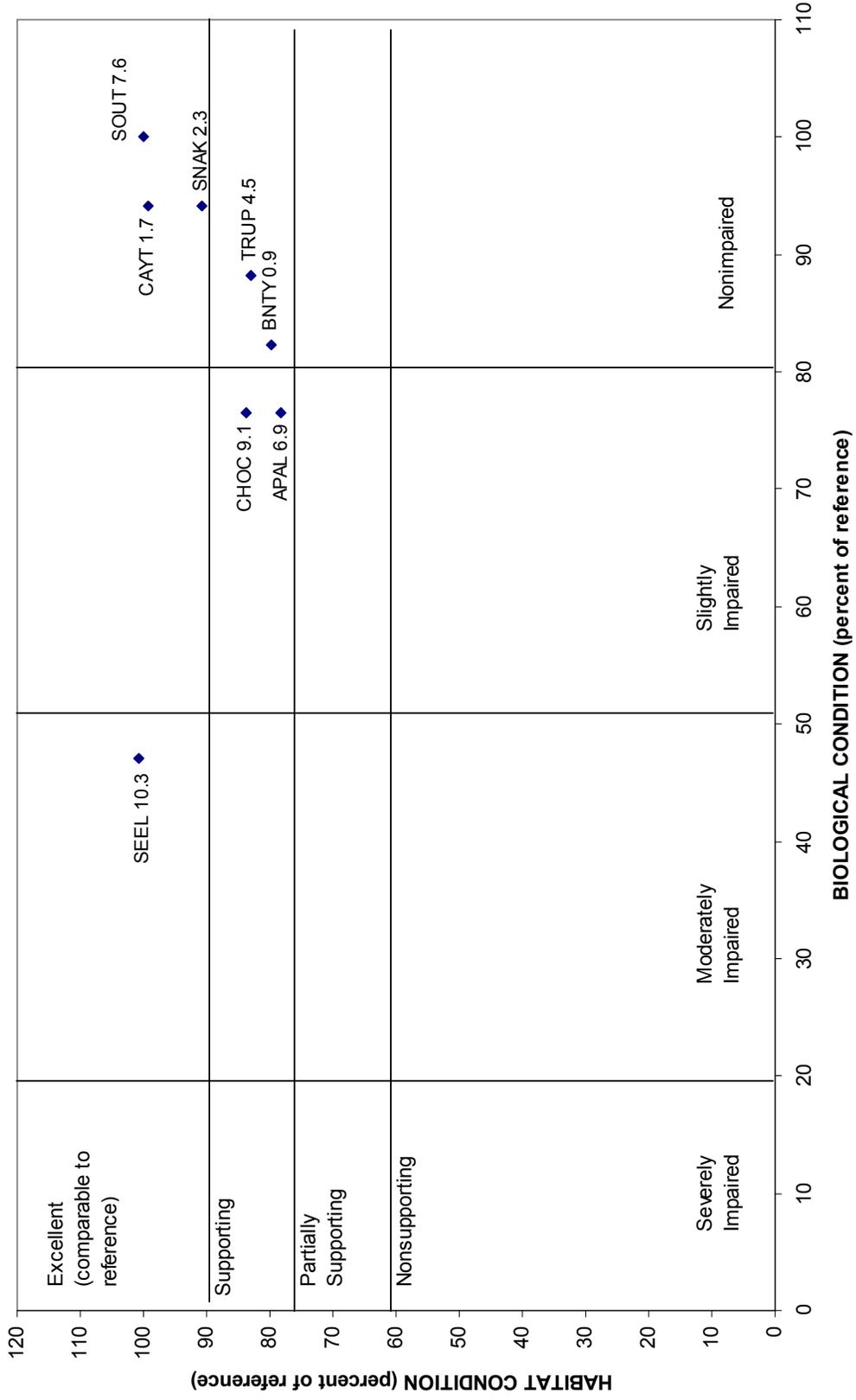
Results for New York-Pennsylvania Streams

Sites that represent the best available suite of conditions, in terms of biological community, water quality, and habitat for each group of stream sites are designated as reference sites. All other locations within that grouping are compared to the reference site. The reference sites for 2005-2006 are South Creek, Susquehanna River 365, Big Branch Deer Creek, and Deep Hollow Brook. Sites located on the New York-Pennsylvania border were compared to South Creek at Fassett, Pa. South Creek represented the best combination of biological, water quality, and habitat conditions in the Northern Appalachian Plateau and Uplands Ecoregion.

New York-Pennsylvania sampling stations consisted of 14 sites located near or on the New York-Pennsylvania border. During the summer sampling event, six of these streams were dry so no macroinvertebrate or habitat assessment could be completed. Of the remaining eight sites, the biological community of four (50 percent) of these streams was nonimpaired. Three stream sites were slightly impaired (37.5 percent) and one site (12.5 percent) was designated as moderately impaired. Four of the New York-Pennsylvania sites had excellent habitats (50 percent), while the other four sites (50 percent) had supporting habitats. No sites had partially supporting or nonsupporting habitat. The most common habitat concern among the New York-Pennsylvania streams is lack of riparian buffer zone along the stream banks.

The reference site for the New York-Pennsylvania border streams was South Creek at Fassett, Pa. This site had the best combination of water quality, biological community, and physical habitat of all the New York-Pennsylvania sites. The rankings for the other New York-Pennsylvania border sites are compared to the conditions in South Creek. The macroinvertebrate community at South Creek showed high rankings for taxonomic richness, Shannon Diversity Index, Hilsenhoff Biotic Index, percent Ephemeroptera, percent Chironomidae, and percent dominant taxa. In the habitat assessment for SOUT 7.8, condition of banks and vegetative protective cover were rated as optimal.

The chart below summarizes the biological and habitat data for the New York-Pennsylvania streams.



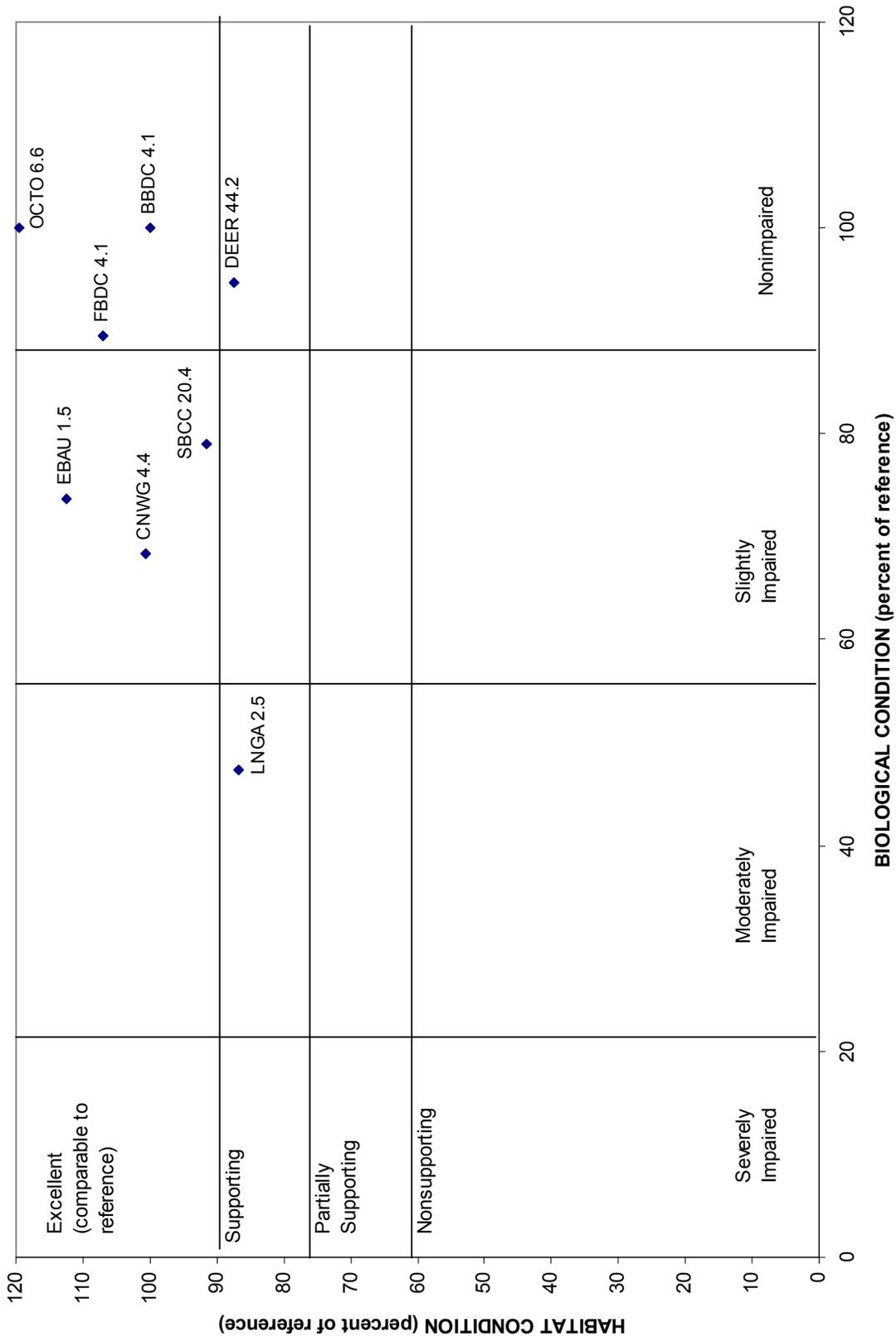
Results for Pennsylvania-Maryland Streams

Sites that represent the best available suite of conditions, in terms of biological community, water quality, and habitat for each group of stream sites are designated as reference sites. All other locations within that grouping are compared to the reference site. The reference sites for 2005-2006 are South Creek, Susquehanna River 365, Big Branch Deer Creek, and Deep Hollow Brook. 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. BBDC 4.1 had the best combination of biological, water quality, and habitat conditions in the Northern Piedmont Ecoregion (Omernik, 1987).

The Pennsylvania-Maryland interstate streams include nine stations located on or near the Pennsylvania-Maryland border. During FY-06, eight of these sites were sampled; Scott Creek was dry during the sampling event so no data was collected. Four streams (50 percent) were designated nonimpaired, using RBP III protocol designations. Three sites (37.5 percent) were slightly impaired and one site (12.5 percent) was moderately impaired. No sites were ranked as severely impaired. Six (75 percent) of the Pennsylvania-Maryland border sites had excellent habitats, while two sites (25 percent) had supporting habitats. No sites were designated as having partially supporting or nonsupporting physical habitat. The most common habitat concern at the Pennsylvania-Maryland sites was the lack of a riparian buffer zone.

The reference site for the Pennsylvania-Maryland border streams was Big Branch Deer Creek at Fawn Grove, Pa. This site had the best combination of water quality, biological community, and physical habitat of all the Pennsylvania-Maryland sites. The rankings for the other Pennsylvania-Maryland border sites are compared to the conditions at Big Branch Deer Creek. The macroinvertebrate community at Big Branch Deer Creek showed high rankings for Hilsenhoff Biotic Index, EPT Index, and percent Chironomidae. In the habitat assessment for BBDC 4.5, instream cover, channel flow status, condition of banks, and vegetative protective cover were all rated as optimal.

The chart below summarizes the biological and habitat data for the Pennsylvania-Maryland streams.



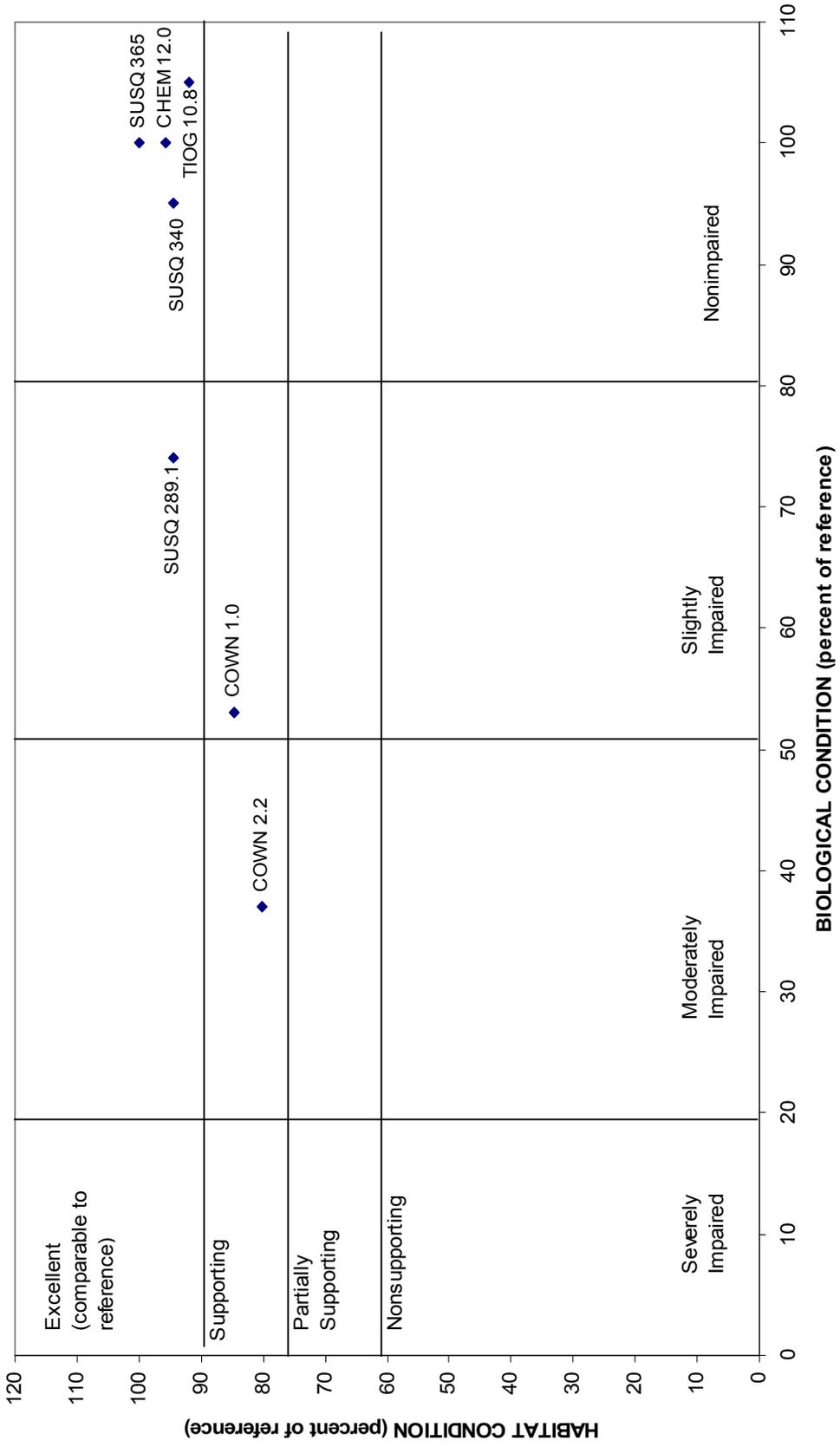
Results for River Sites

Sites that represent the best available suite of conditions, in terms of biological community, water quality, and habitat for each group of stream sites are designated as reference sites. All other locations within that grouping are compared to the reference site. The reference sites for 2005-2006 are South Creek, Susquehanna River 365, Big Branch Deer Creek, and Deep Hollow Brook. River sites in New York, Pennsylvania, and Maryland were all compared to the conditions at the Susquehanna River at river mile 365. SUSQ 365 represented the best combination of conditions of the seven river sites sampled.

River sites consisted of nine stations located on the Susquehanna, Chemung, Cowanesque, and Tioga Rivers. Two stations (SUSQ 10.0 and SUSQ 44.5) were not sampled for macroinvertebrates due to deep water and a lack of riffle habitat at the sites. Of the seven river sites that were sampled during fiscal year 2006, the biological community at four (57 percent) of these sites was nonimpaired. One site (14 percent) had slightly impaired biological conditions and two sites (29 percent) were ranked as moderately impaired. The habitat at five (71 percent) of the river sites was excellent and the other two sites (29 percent) rated as having supporting habitat. The most common habitat concern along the river sites is lack of riparian buffer.

The reference site for all of the interstate river sites was Susquehanna River 365. This site had the best combination of water quality, biological conditions, and physical habitat of all the sampled river sites. The rankings for the other river sites are compared to the conditions at Susquehanna River 365. The macroinvertebrate community at SUSQ 365 was at the top of all river sites in scores for taxonomic richness, Shannon Diversity Index, Hilsenhoff Biotic Index, EPT Index, and percent dominant taxa. In the habitat assessment for SUSQ 365, frequency of riffles, velocity/depth regimes, and vegetative protective cover were all rated as optimal.

The chart below summarizes the biological and habitat data for the river sites.



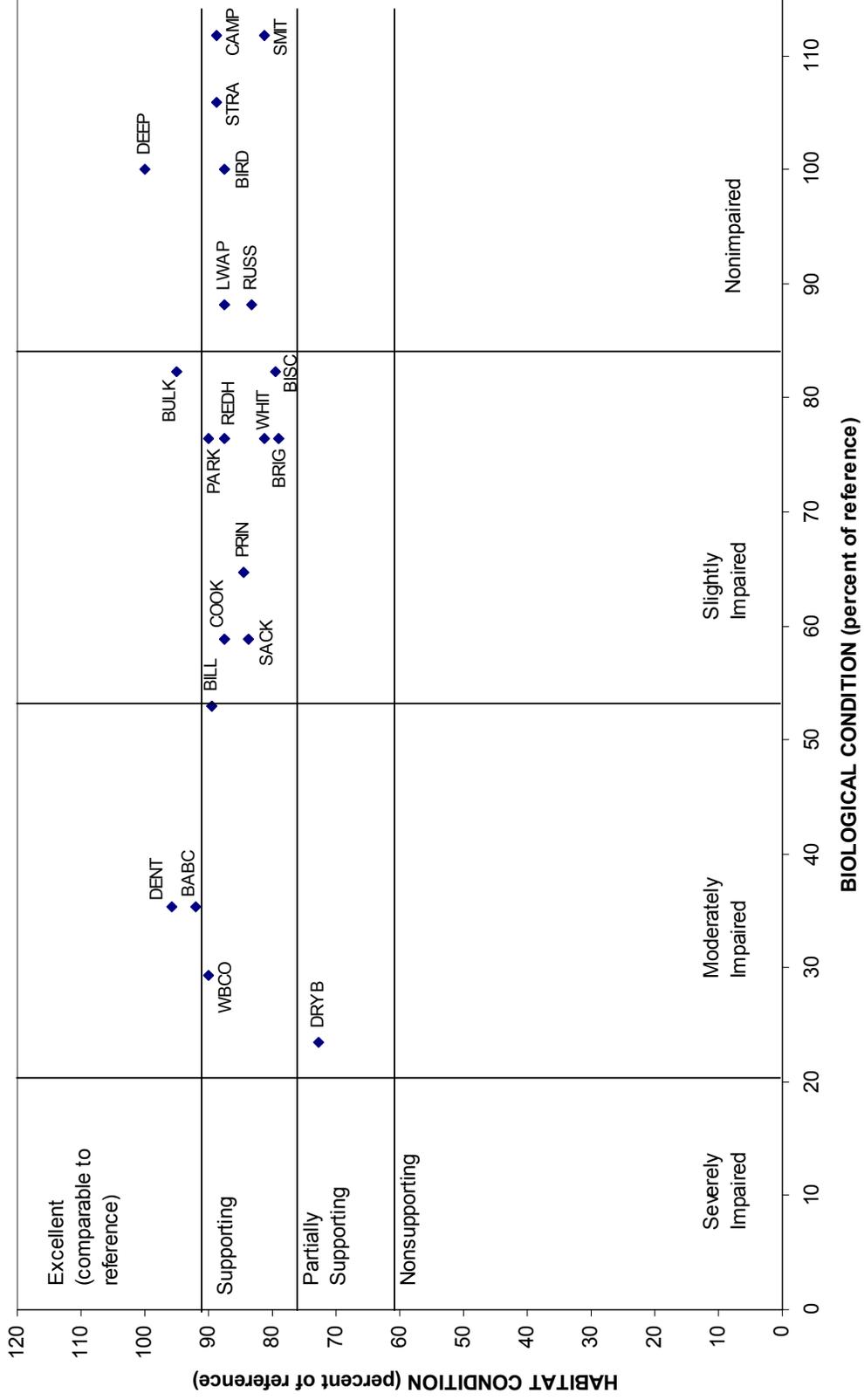
Results for Group 3 Sites

Sites that represent the best available suite of conditions, in terms of biological community, water quality, and habitat for each group of stream sites are designated as reference sites. All other locations within that grouping are compared to the reference site. The reference sites for 2005-2006 are South Creek, Susquehanna River 365, Big Branch Deer Creek, and Deep Hollow Brook. Sites located on the New York-Pennsylvania border were compared to South Creek at Fassett, PA. Deep Hollow Brook (DEEP) near Danville, N.Y., served as the reference site for Group 3 sites, as it had the best biological, habitat, and field chemistry conditions of these sites. This was the second consecutive year that DEEP represented the best of the Group 3 sites.

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Seven of the 21 sites sampled (33 percent) had nonimpaired biological conditions. Nine sites (43 percent) were slightly impaired, and five sites (24 percent) were moderately impaired. Six (29 percent) of the Group 3 sites had excellent habitat scores. Fourteen sites (67 percent) had supporting habitat conditions, while one site (4 percent) was designated partially supporting, and no sites were nonsupporting.

The reference site for the Group 3 streams was Deep Hollow Brook at Danville, N.Y. This site had the best combination of biological community and physical habitat of all the Group 3 sites. The rankings for the other Group 3 sites are compared to the conditions at Deep Hollow Brook. The macroinvertebrate community at DEEP showed highest rankings for taxonomic richness, Shannon Diversity Index, and EPT Index. In the habitat assessment for Deep Hollow Brook, epifaunal substrate, instream, cover, channel alteration, frequency of riffles, vegetative protective cover, and riparian vegetative zone were all rated as optimal.

The chart below summarizes the biological and habitat data for the Group 3 streams.



BIOASSESSMENT OF INTERSTATE STREAMS

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

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

New York-Pennsylvania Border Streams

Apalachin Creek at Little Meadows, Pa. (APAL 6.9)



Water Quality: Aluminum, iron and dissolved oxygen exceeded water quality parameters.

Biological Condition: Slightly Impaired

Habitat Assessment: Supporting

Trends: Water quality and biological condition declined from last year, and the physical habitat remained at supporting.

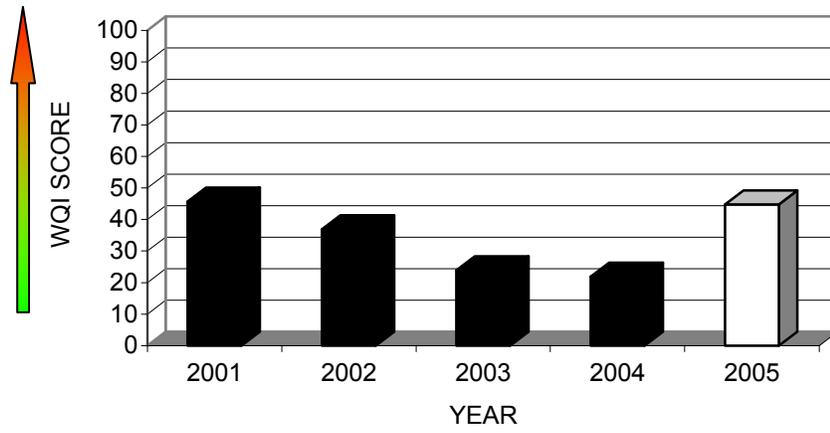
Other notes: Staff noted an oil slick in the creek upstream of the sampling site in August 2006.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	08/02/2005	325 ug/l	300 ug/l	N.Y. aquatic life (chronic)
TAI	08/02/2005	1201 ug/l	100 ug/l	N.Y. aquatic life (chronic)
DO	08/02/2005	4.69 mg/l	5.0 mg/l	Pa. aquatic life

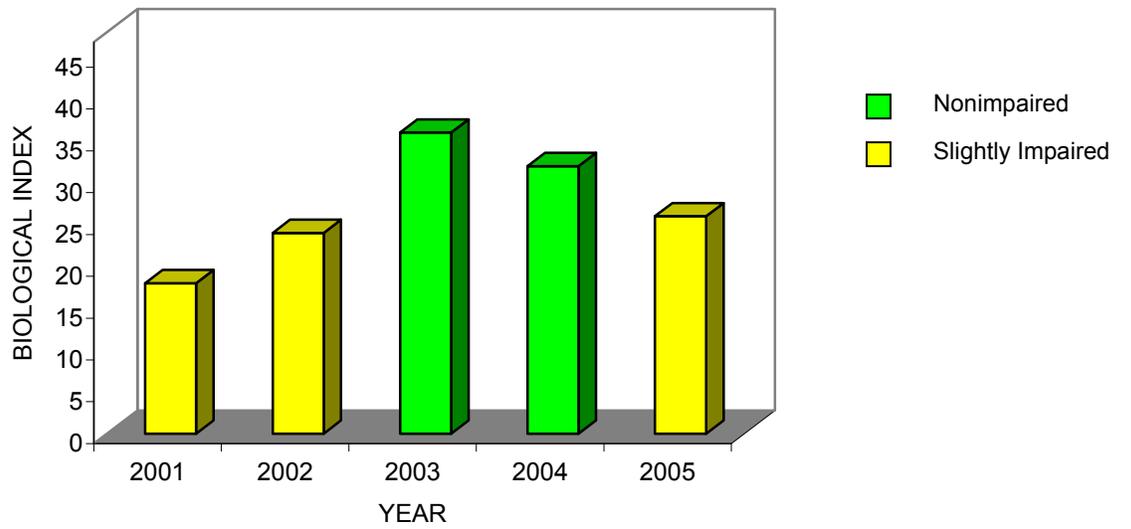
Date	WQI	Parameters Exceeding 90 th Percentile							
08/02/05	44.8	TFe	Tal	TMn	DO				

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	1.85
Biological Score	26
Biological Condition	Slightly Impaired
Total Habitat Score	101
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Bentley Creek at Wellsburg, N.Y. (BNTY 0.9)



Water Quality: Aluminum exceeded water quality standards.

Biological Condition: Slightly Impaired

Habitat Assessment: Supporting

Trends: Water quality and biologic condition both showed some decline from last year, while habitat assessment remained supporting.

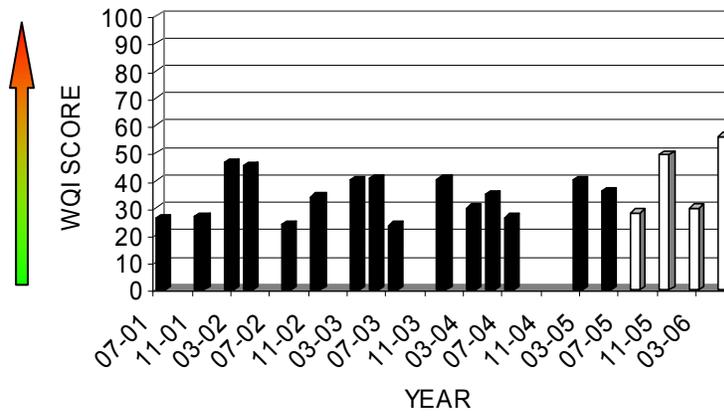
Other Notes: The Bradford County Conservation District in Pennsylvania and the U.S. Fish and Wildlife Service conducted a stream stabilization project on this stream. Rock structures, such as cross vanes and single rock vanes, have been constructed in portions of the stream to redirect the force of the flow.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/02/2005	1092 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	301 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/22/2006	1312 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1487 ug/l	100 ug/l	N.Y. aquatic (chronic)

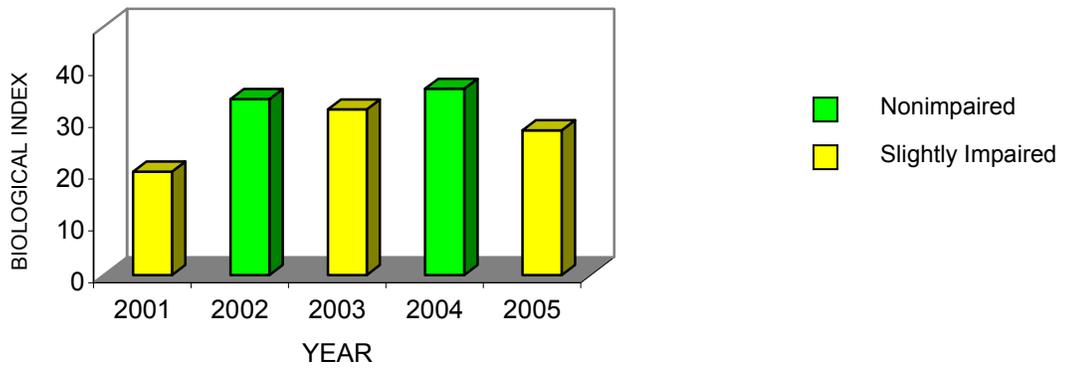
Date	WQI	Parameters Exceeding 90 th Percentile							
08/02/2005	28.2	TEMP							
11/02/2005	49.3	TEMP							
02/22/2006	30.0	DO							
05/17/2006	56.2	TP	TPO4	TAI	DO				

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	1.80
RBP III Score	28
RBP III Condition	Slightly Impaired
Total Habitat Score	103
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Cascade Creek at Lanesboro, Pa. (CASC 1.6)



Water Quality: Aluminum, iron, alkalinity, and pH all exceeded water quality standards.

Biological Condition: NA

Habitat Assessment: NA

Trend: Water quality showed some decline over the past year.

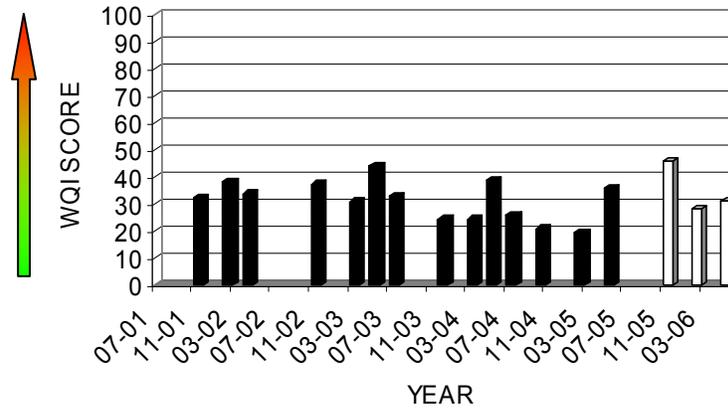
Other Notes: Cascade Creek was dry during the summer sampling event so no macroinvertebrates were collected and no habitat assessment was done.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	11/03/2005	407 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	11/03/2005	550 ug/l	100 ug/l	N.Y. aquatic (chronic)
ALK	11/03/2005	8 mg/l	20 mg/l	Pa. aquatic life
pH	11/03/2005	6.3	6.5-8.5	N.Y. general
TAI	02/23/2006	1769 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/16/2006	1280 ug/l	100 ug/l	N.Y. aquatic (chronic)

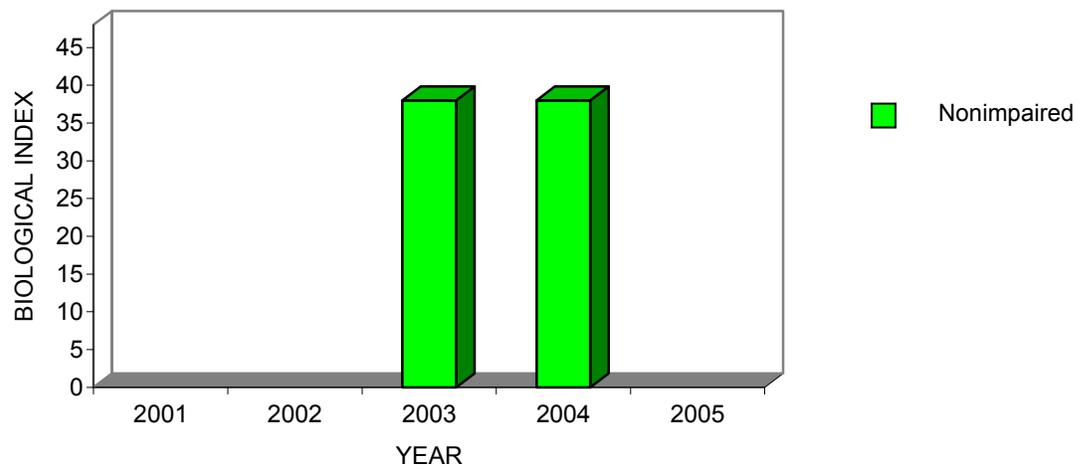
Date	WQI	Parameters Exceeding 90 th Percentile						
11/03/2005	46.0	None						
02/23/2006	28.1	None						
05/16/2006	31.1	DO						

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

Water Quality Index



Biological Index



Cayuta Creek at Waverly, N.Y. (CAYT 1.7)



Water Quality: Aluminum, chlorine, and pH all exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality showed a slight decline, biological community remained nonimpaired and the physical habitat showed some improvement.

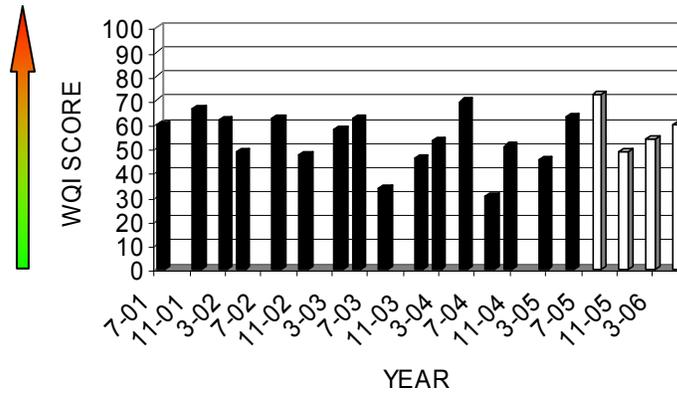
Other Notes: This site is downstream of wastewater discharges from the Waverly sewage treatment facility.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TCIn	08/02/2005	0.04 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TAI	08/02/2005	1137 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/03/2005	268 ug/l	100 ug/l	N.Y. aquatic (chronic)
pH	11/03/2005	6.1	6.5-8.5	N.Y. general
TAI	02/22/2006	1178 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/16/2006	1310 ug/l	100 ug/l	N.Y. aquatic (chronic)
TCIn	05/16/2006	0.08 mg/l	0.019 mg/l	N.Y. aquatic (acute)

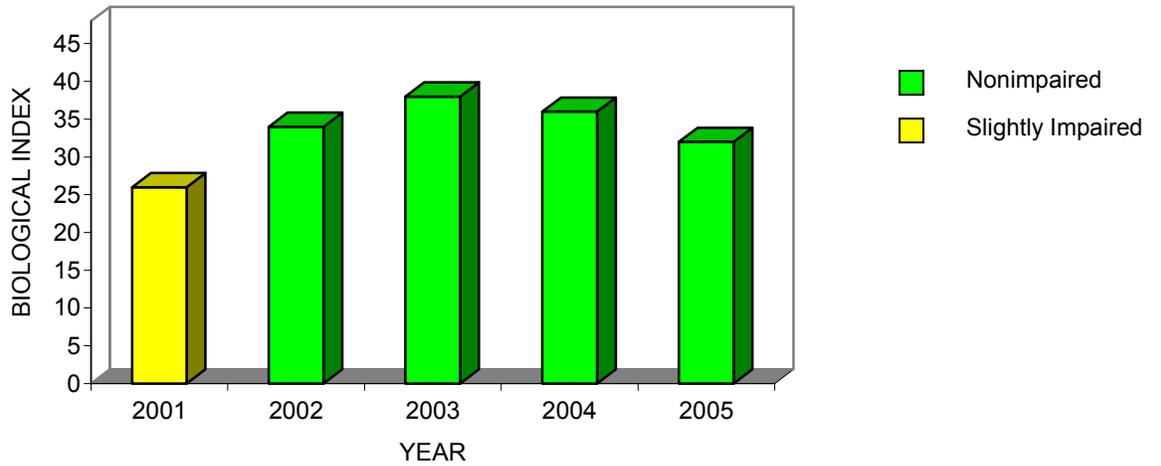
Date	WQI	Parameters Exceeding 90 th Percentile								
		TS	TNO3	TP	TPO4	TNH3	TN	TCI	COND	
08/02/2005	72.3	TS	TNO3	TP	TPO4	TNH3	TN	TCI	COND	
11/03/2005	48.5	None								
02/22/2006	53.8	TP	TPO4	DO						
05/16/2006	60.1	DO								

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.28
RBP Score	32
RBP Condition	Nonimpaired
Total Habitat Score	128
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Choconut Creek at Vestal Center, N.Y. (CHOC 9.1)



Water Quality: Aluminum, iron, dissolved oxygen, and pH all exceeded water quality standards.

Biological Condition: Slightly Impaired

Habitat Assessment: Supporting

Trends: Water quality, biological condition, and habitat rating all declined from 2004-2005.

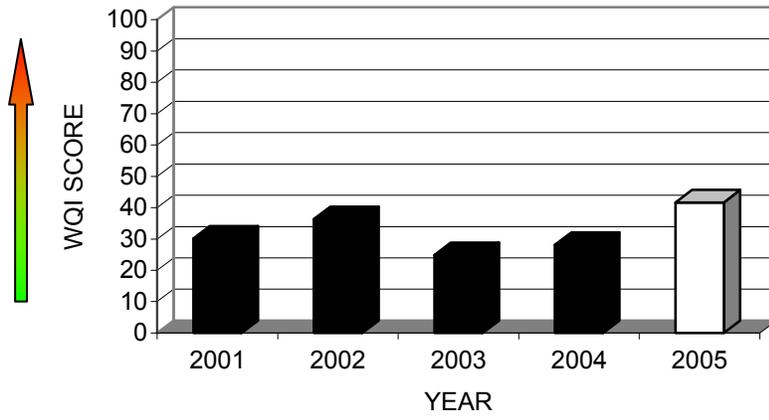
Other Notes: Riparian buffer zone was very poor and there is a lot of rip rap along Choconut Creek at this site.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/02/2005	1286 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	08/02/2005	304 ug/l	300 ug/l	N.Y. aquatic (chronic)
DO	0/02/2005	4.92 mg/l	5.0 mg/l	Pa. aquatic life
pH	08/02/2005	6.4	6.5-8.5	N.Y. general

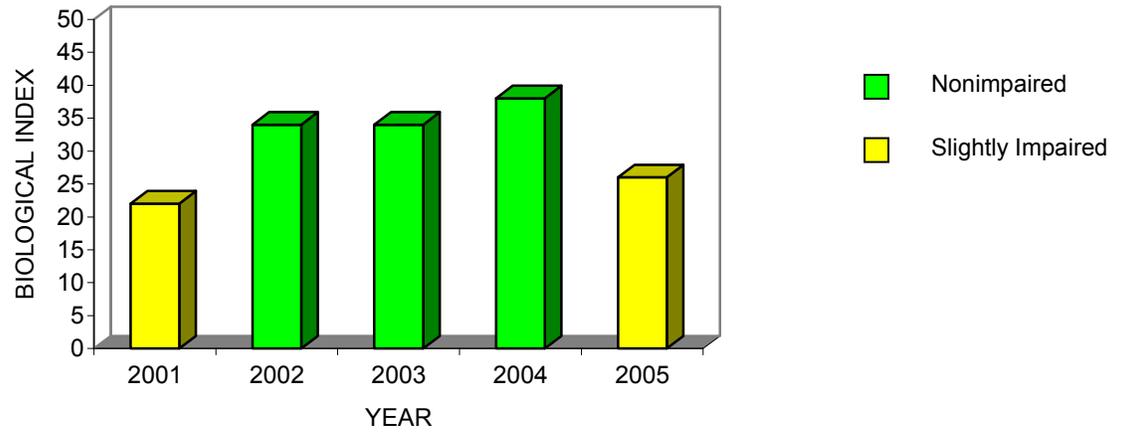
Date	WQI	Parameters Exceeding 90 th Percentile						
08/02/2005	41.7	TFe	TAI	DO	SS			

Biological and Habitat Summary	
Number of Taxa	27
Diversity Index	2.07
RBP Score	26
RBP Condition	Slightly Impaired
Total Habitat Score	108
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Cowanesque River at Lawrenceville, Pa. (COWN 1.0)



Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Moderately Impaired

Habitat Assessment: Supporting

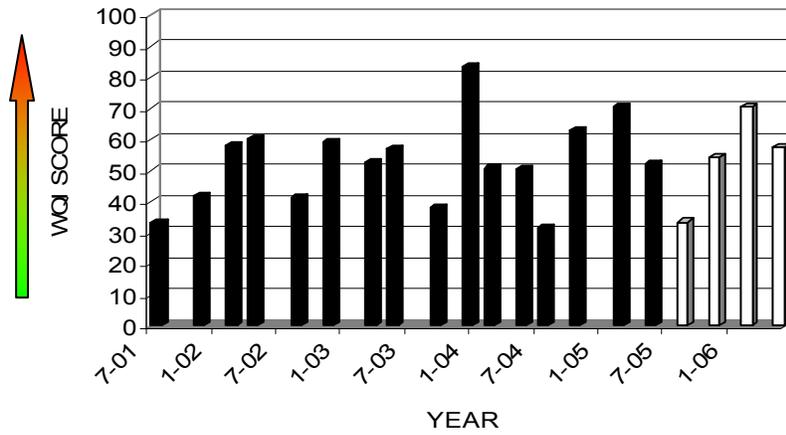
Trend: Water quality declining slightly since 2004-2005; biological condition declining from last year; physical habitat remains the same.

Other Notes: This site is a little more than a mile downstream of the Cowanesque Reservoir.

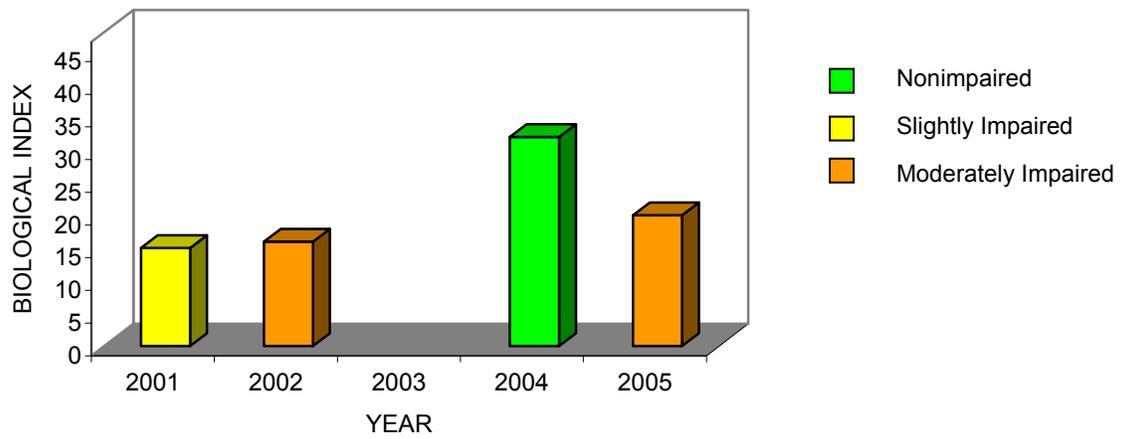
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/03/2005	1200 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	297 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	02/21/2006	1202 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	02/21/2006	3133 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1408 ug/l	100 ug/l	N.Y. aquatic (chronic)

Date	WQI	Parameters Exceeding 90 th Percentile							
08/03/2005	33.5	TAI	TEMP						
11/02/2005	54.1	TOC	TEMP						
02/21/2006	70.5	TFe	TURB	TNH3	TAI	TOC	SS	TEMP	
05/17/2006	57.7	DO							

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	2.01
RBP Score	20
RBP Condition	Moderately Impaired
Total Habitat Score	137
Habitat Condition Category	Supporting



Water Quality Index



Biological Index

Cowanesque River at Lawrenceville, Pa. (COWN 2.2)



Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Moderately Impaired

Habitat Assessment: Supporting

Trends: Water quality declining since 2004-2005, biological index remains moderately impaired, and habitat showed some improvement.

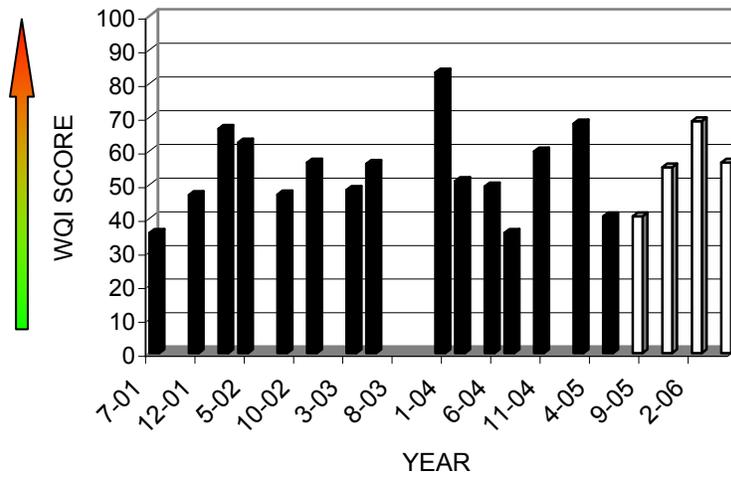
Other Notes: Sampling site located directly downstream of the Cowanesque Reservoir.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/03/2005	1220 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	306 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	02/21/2006	1102 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	02/21/2006	2582 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1448 ug/l	100 ug/l	N.Y. aquatic (chronic)

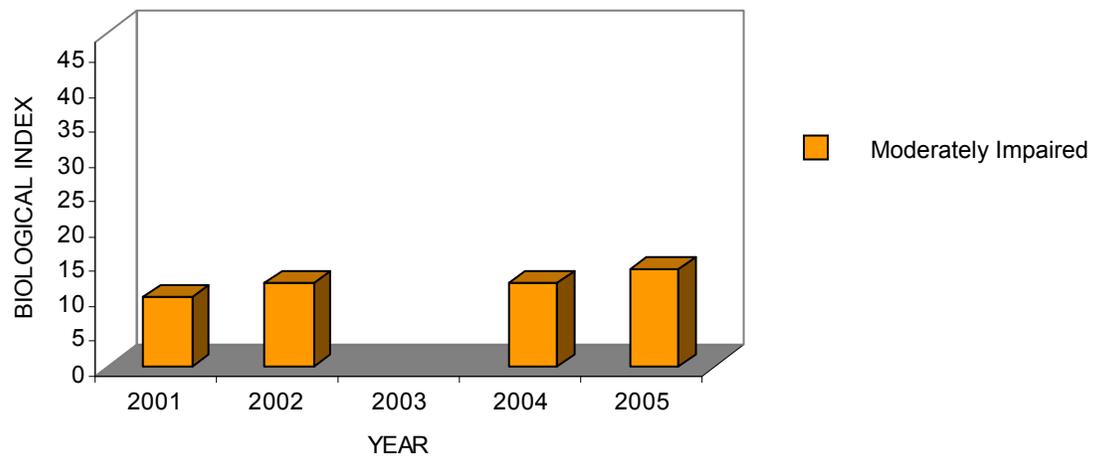
Date	WQI	Parameters Exceeding 90 th Percentile						
08/03/2005	40.6	TAI	TEMP					
11/02/2005	55.2	TOC	TEMP					
02/21/2006	68.8	TFe	TURB	TOC	SS			
05/17/2006	56.6	DO						

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	1.68
RBP Score	14
RBP Condition	Moderately Impaired
Total Habitat Score	130
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Holden Creek at Woodhull, N.Y. (HLDN 3.5)

Water Quality: NA

Biological Condition: NA

Habitat Assessment: NA

Trend: Water quality and biological condition have been fairly consistent when there is water in the stream channel; however, the site has been dry two of the past five years.

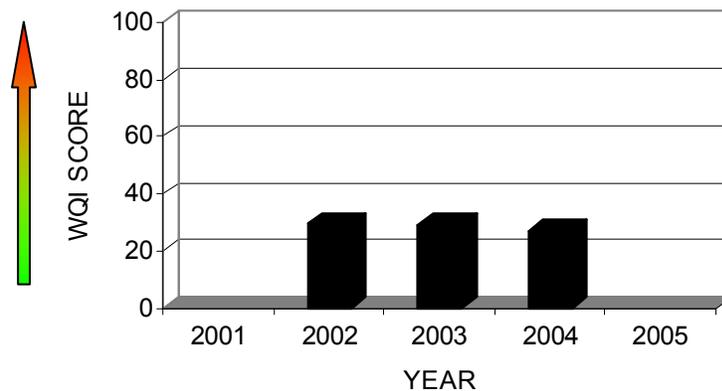
Other Notes: Holden Creek was mostly dry on 8/3/05 when it was visited for sampling. Staff noted the construction of a new bridge in progress that had caused a lot of disturbance in the stream channel. No water quality, macroinvertebrate, or habitat data was obtained for Holden Creek for FY06.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DRY				

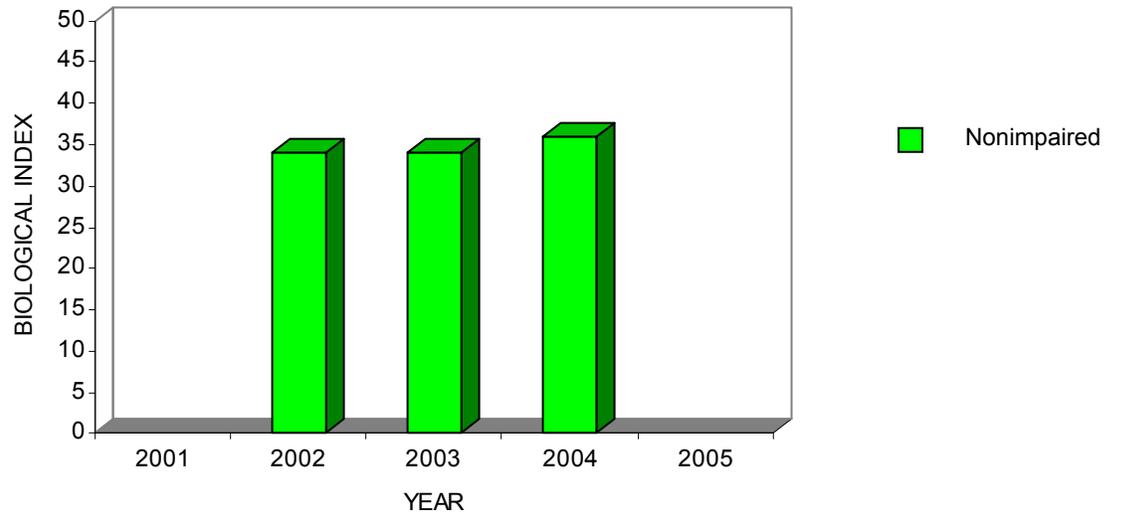
Date	WQI	Parameters Exceeding 90 th Percentile							
DRY									

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

Water Quality Index



Biological Index



Little Snake Creek at Brackney, Pa. (LSNK 7.6)



Water Quality: Aluminum, alkalinity, and iron all exceeded water quality standards.

Biological Condition: NA

Habitat Assessment: NA

Trend: Water quality has been improving slightly over the last five years, and biological condition and habitat have remained consistent when there was enough water in the stream to sample in the summer.

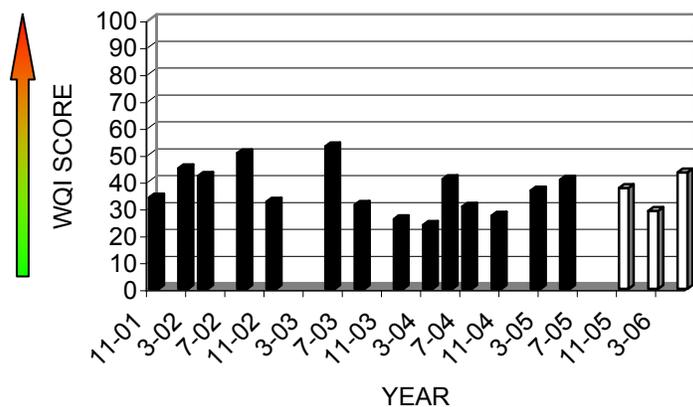
Other Notes: Little Snake Creek was dry when site was visited on 8/01/05. No water quality, macroinvertebrate, or habitat data was taken.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	11/03/2005	283 ug/l	100 ug/l	NY aquatic (chronic)
ALK	11/03/2005	14 mg/l	20 mg/l	PA aquatic life
TAI	02/23/2006	1361 ug/l	100 ug/l	NY aquatic (chronic)
ALK	02/23/2006	14 mg/l	20 mg/l	PA aquatic life
TAI	05/16/2006	1305 ug/l	100 ug/l	NY aquatic (chronic)
TFe	05/16/2006	345 ug/l	300 ug/l	NY aquatic (chronic)

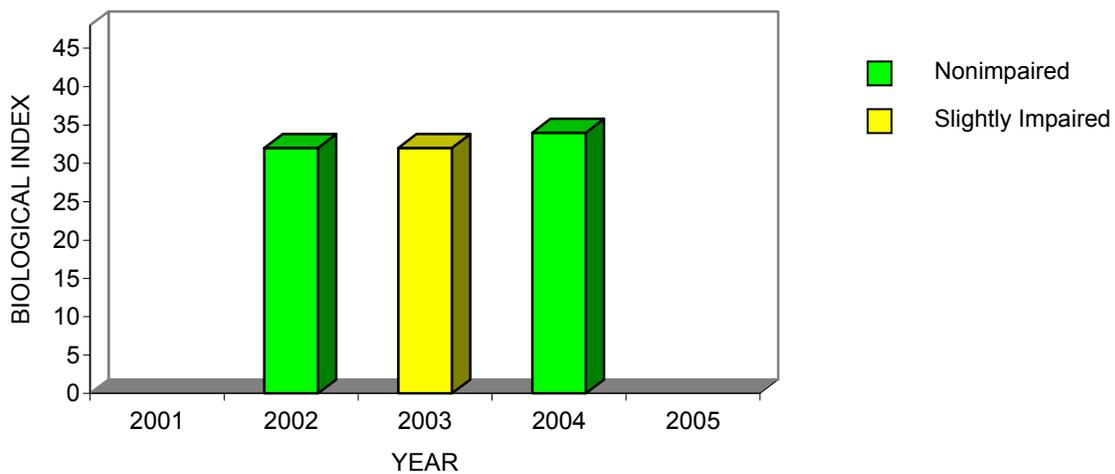
Date	WQI	Parameters Exceeding 90 th Percentile						
11/03/2005	37.5	TEMP						
02/23/2006	29.0	DO						
05/16/2006	43.3	TFe						

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

Water Quality Index



Biological Index



North Fork Cowanesque River at North Fork, PA (NFCR 7.6)

Water Quality: NA
 Biological Condition: NA
 Habitat Assessment: NA

Trend: Water quality and biological condition have been fairly consistent, but there have been dry conditions at this site 2 of the past 5 years.

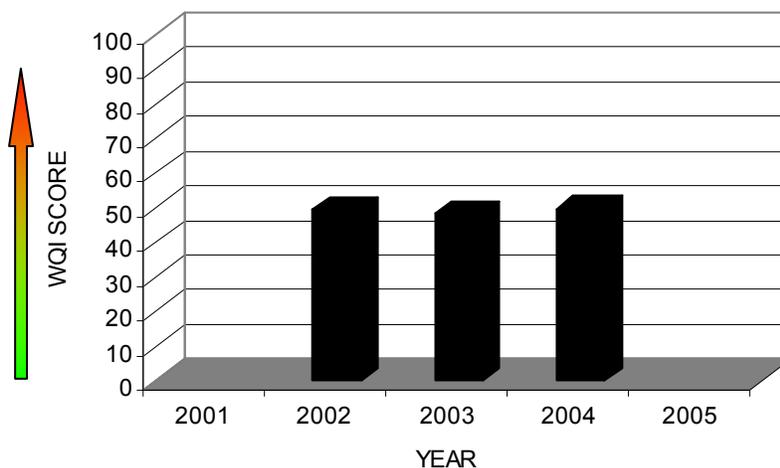
Other Notes: North Fork Cowanesque River had no flow when site was visited on 08/04/05, so no water quality, macroinvertebrate, or habitat data was taken.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DRY				

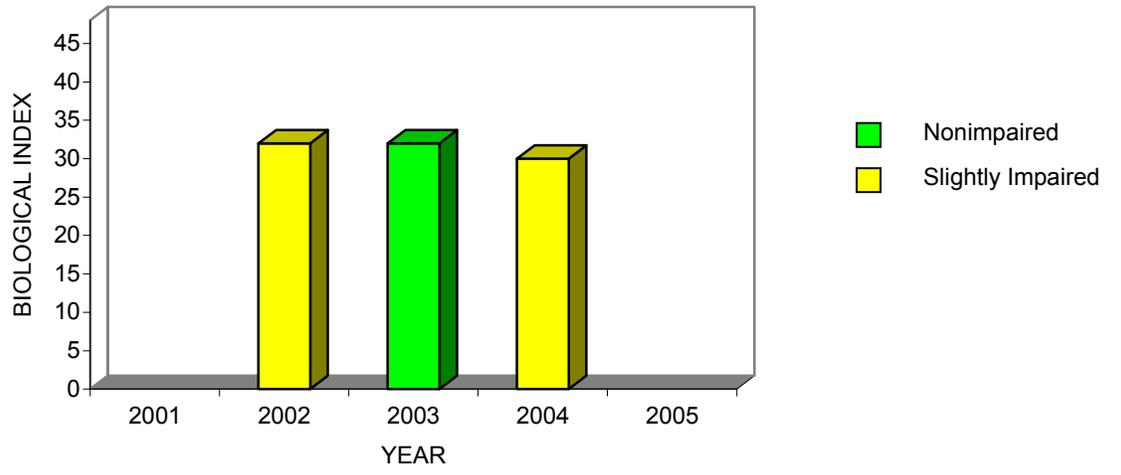
Date	WQI	Parameters Exceeding 90 th Percentile						
DRY								

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

Water Quality Index



Biological Index



Seeley Creek at Seeley Creek, N.Y. (SEEL 10.3)

Water Quality: Aluminum exceeded water quality parameters.

Biological Condition: Moderately Impaired

Habitat Assessment: Excellent

Trends: Water quality and biological condition both showed a decline from last year, but physical habitat was slightly improved.

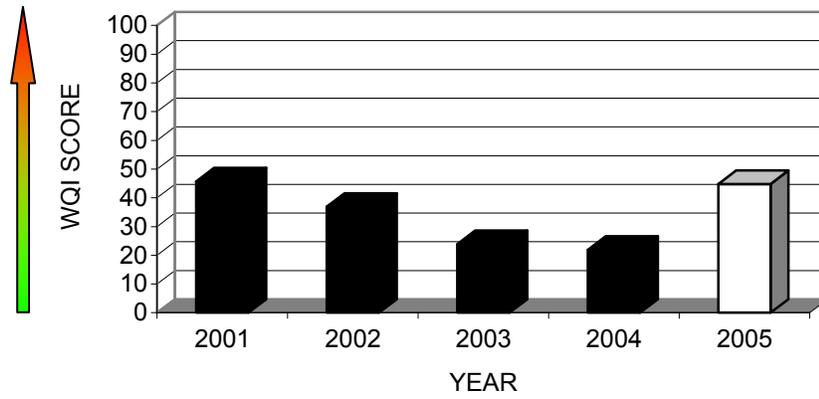
Other Notes: New York State Department of Conservation (NYSDEC) listed Seeley Creek as “threatened” in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According to this publication, the stream is threatened by habitat alteration, streambank erosion, and instability of the stream channel.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/03/2005	1220 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	257 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/21/2006	1285 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1467 ug/l	100 ug/l	N.Y. aquatic (chronic)

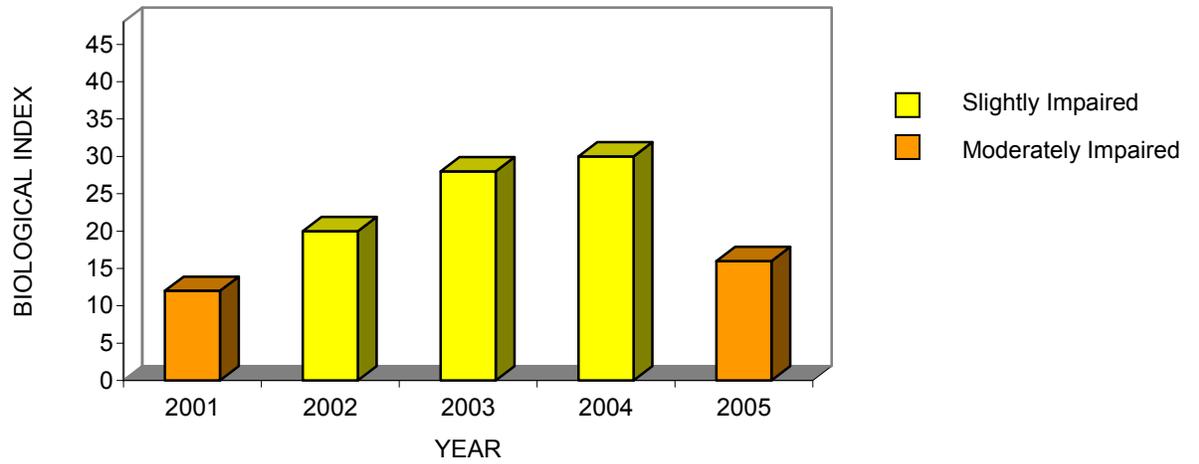
Date	WQI	Parameters Exceeding 90 th Percentile						
08/03/2005	27.8	TAI						
11/02/2005	55.8	TNH3	DO	COND	TEMP			
02/21/2006	37.3	DO						
05/17/2006	47.2	TAI	TOC	DO				

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	1.66
RBP III Score	16
RBP III Condition	Moderately Impaired
Total Habitat Score	130
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Snake Creek at Brookdale, Pa. (SNAK 2.3)



Water Quality: Aluminum exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality remained about the same and biological condition and habitat rating both kept their nonimpaired and excellent ratings, respectively.

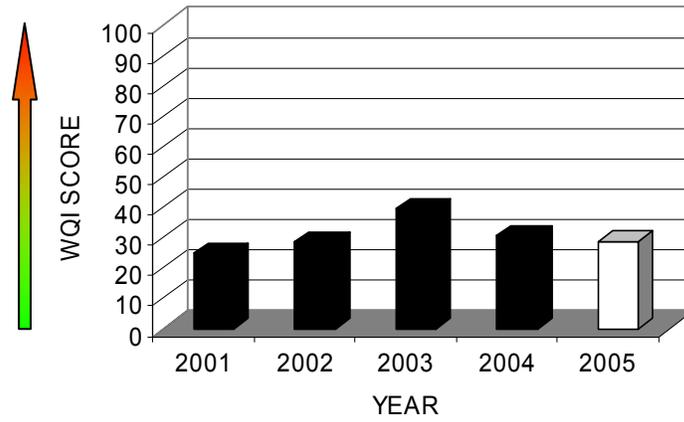
Other Notes: In 2000, SRBC staff conducted a small watershed study on the Snake Creek Watershed during the second year of the Upper Susquehanna Subbasin Survey (Diehl and Sitlinger, 2001). The study concluded that the Snake Creek Watershed was healthy and recommended that this watershed be protected.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/01/2005	1210 ug/l	100 ug/l	N.Y. aquatic (chronic)

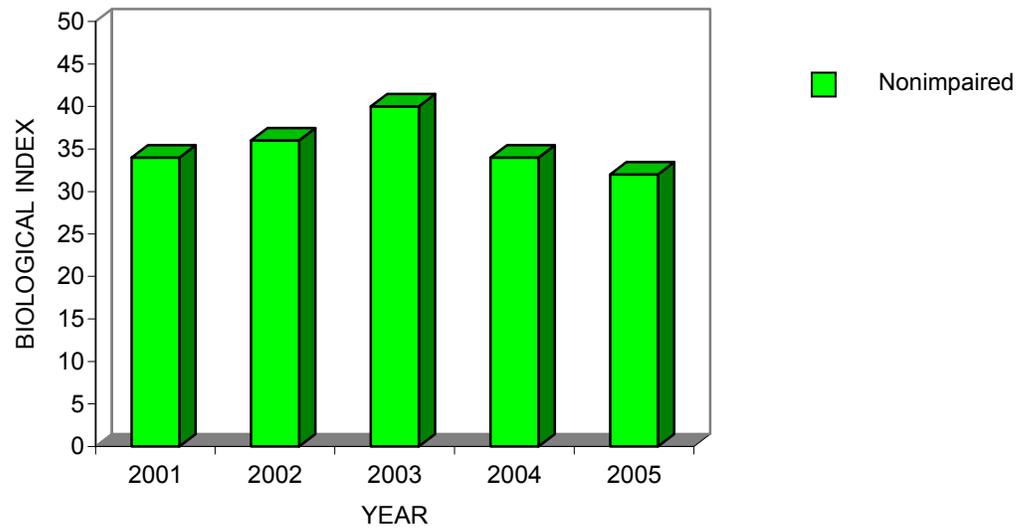
Date	WQI	Parameters Exceeding 90 th Percentile						
08/01/2005	28.6	TAI	TEMP					

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.31
RBP III Score	32
RBP III Condition	Nonimpaired
Total Habitat Score	117
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



South Creek at Fassett, Pa. (SOUT 7.8)

Water Quality: Aluminum exceeded water quality standards.

Biological Condition: Reference (Nonimpaired)

Habitat Assessment: Reference (Excellent)

Trends: Water quality remained about the same, but biological condition and habitat both showed improvement to move to the highest ranking in each category.

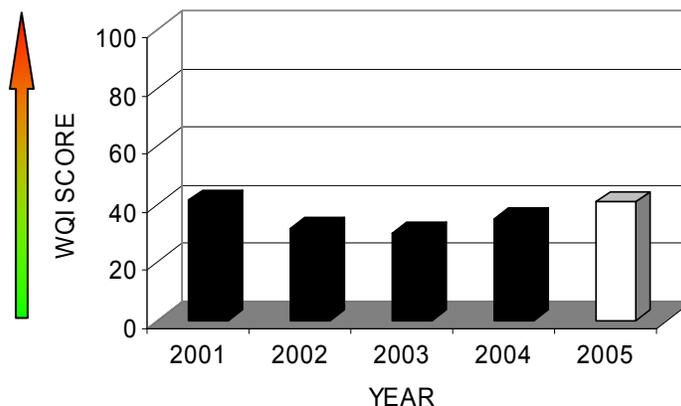
Other Notes: South Creek was used as the reference site for all the New York-Pennsylvania border streams because it had the best combination of results for water quality, macroinvertebrates, and physical habitat.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAl	08/03/2005	1300 ug/l	100 ug/l	N.Y. aquatic (chronic)

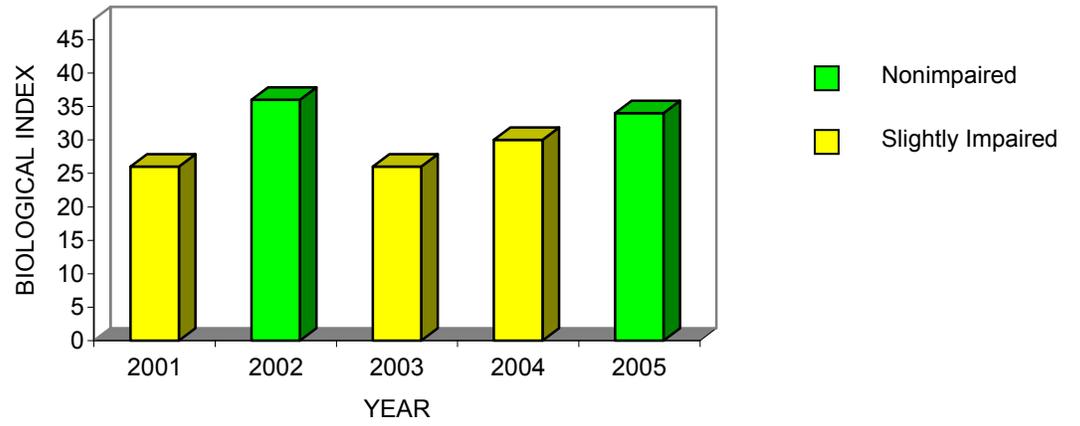
Date	WQI	Parameters Exceeding 90 th Percentile						
08/03/2005	40.7	TAL	TOC	DO				

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.45
RBP III Score	34
RBP III Condition	Reference
Total Habitat Score	129
Habitat Condition Category	Reference

Water Quality Index



Biological Index



Troups Creek at Austinburg, Pa. (TRUP 4.5)

Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Supporting

Trends: Water quality showed a slight improvement; biological index also improved and habitat remained supporting.

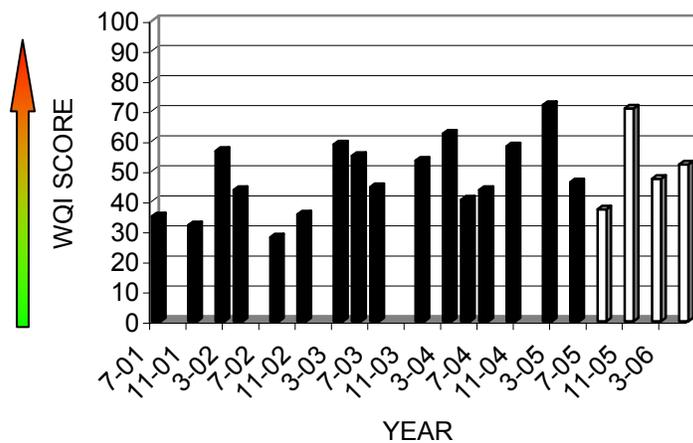
Other Notes: Staff noted a very poor riparian buffer zone at Troups Creek at this sampling location.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/04/2005	1255 ug/l	100 ug/l	NY aquatic (chronic)
TFe	11/02/2005	410 ug/l	300 ug/l	NY aquatic (chronic)
TAI	11/02/2005	508 ug/l	100 ug/l	NY aquatic (chronic)
TFe	02/21/2006	306 ug/l	300 ug/l	NY aquatic (chronic)
TAI	02/20/2006	1931 ug/l	100 ug/l	NY aquatic (chronic)
TAI	05/17/2006	1280 ug/l	100 ug/l	NY aquatic (chronic)

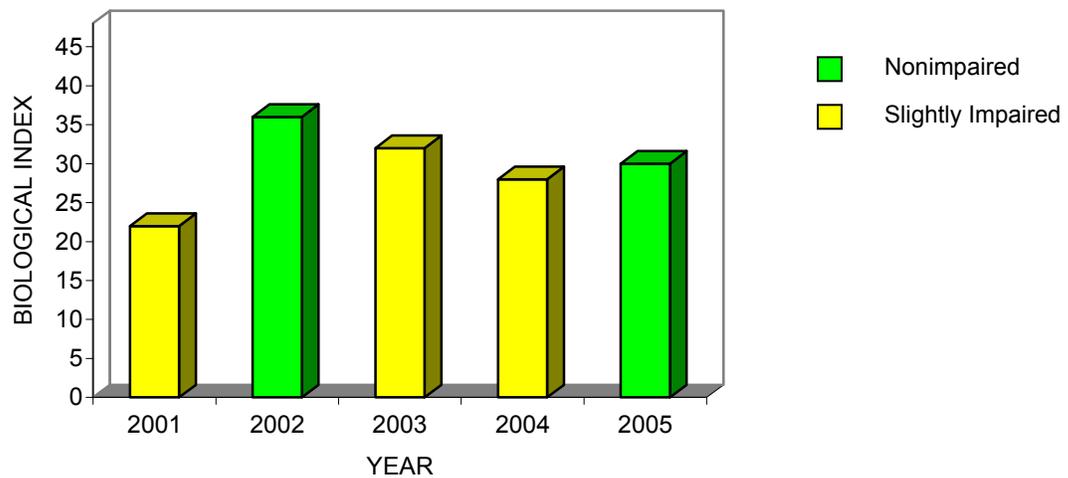
Date	WQI	Parameters Exceeding 90th Percentile							
08/04/2005	37.3	TAI							
11/02/2005	70.8	TPO4	TURB	TN	TOC				
02/20/2006	47.4	DO							
05/17/2006	52.2	TURB	TAI	DO					

Biological and Habitat Summary	
Number of Taxa	22
Diversity Index	2.13
RBP Score	30
RBP Condition	Nonimpaired
Total Habitat Score	107
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Trowbridge Creek at Great Bend, Pa. (TROW 1.8)



Water Quality: NA

Biological Condition: NA

Habitat Assessment: NA

Trend: Water quality has remained fairly consistent over the past five years and biological condition has shown some improvement. However, this site has been dry two of the last five years.

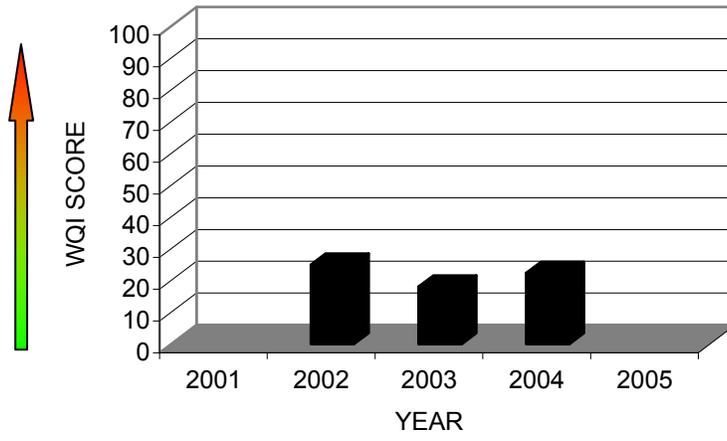
Other Notes: There was no flow at Trowbridge Creek during sampling visit on August 1, 2005. No water quality, macroinvertebrate, or habitat data was taken.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DRY				

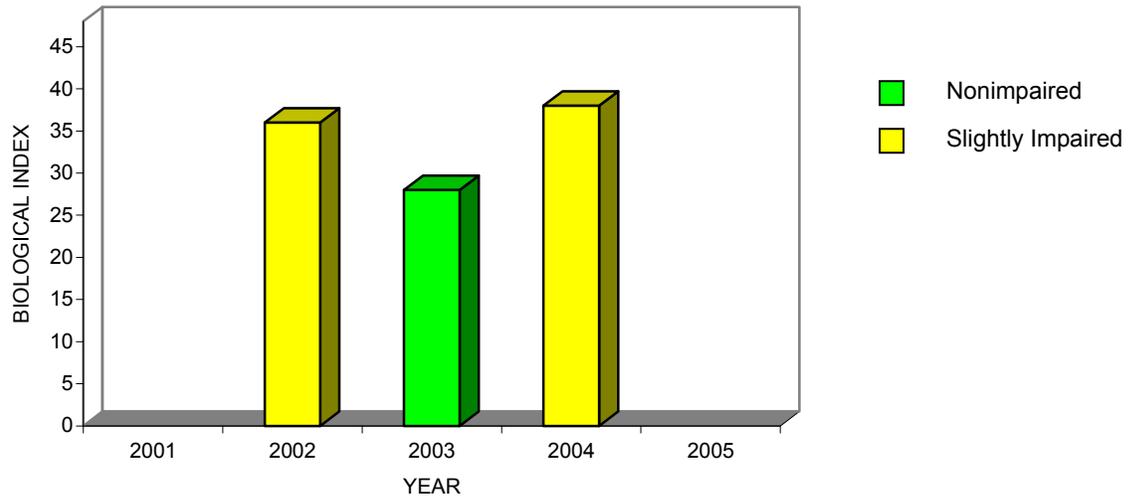
Date	WQI	Parameters Exceeding 90 th Percentile						
DRY								

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

Water Quality Index



Biological Index



Wappasening Creek at Nichols, N.Y. (WAPP 2.6)



Water Quality: NA

Biological Condition: NA

Habitat Assessment: NA

Trend: Water quality and biological condition have been steadily improving over the past five years. This is the first time in five years that the stream has been dry during a sampling event.

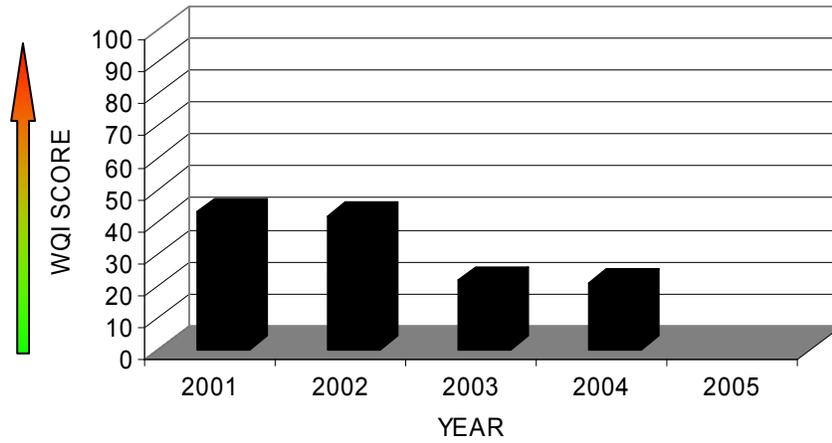
Other Notes: There was insufficient flow for any sampling during the annual sampling visit on August 2, 2005 at Wappasening Creek.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DRY				

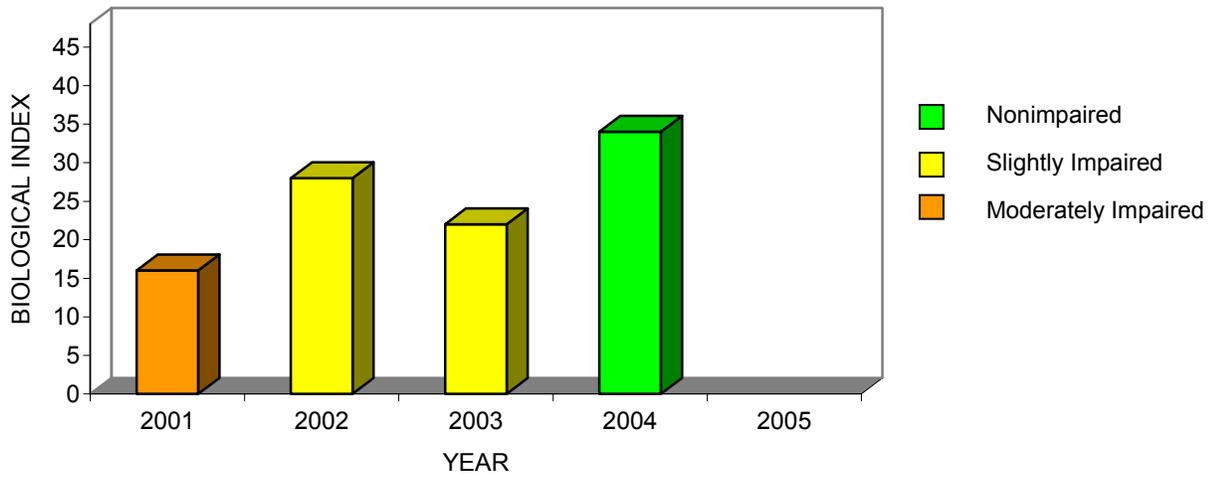
Date	WQI	Parameters Exceeding 90 th Percentile						
DRY								

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

Water Quality Index



Biological Index



Pennsylvania- Maryland Border Streams

Big Branch Deer Creek at Fawn Grove, Pa. (BBDC 4.1)



Water Quality: No parameters exceeded water quality standards.

Biological Condition: Reference (Nonimpaired)

Habitat Assessment: Reference (Excellent)

Trends: Water quality, biological condition, and physical habitat remained the same over the last year.

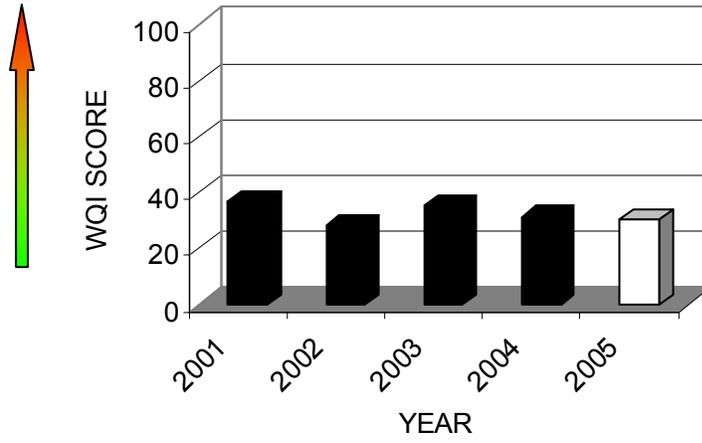
Other Notes: Big Branch Deer Creek was used as the reference site to which all the other Pennsylvania-Maryland border streams were compared.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

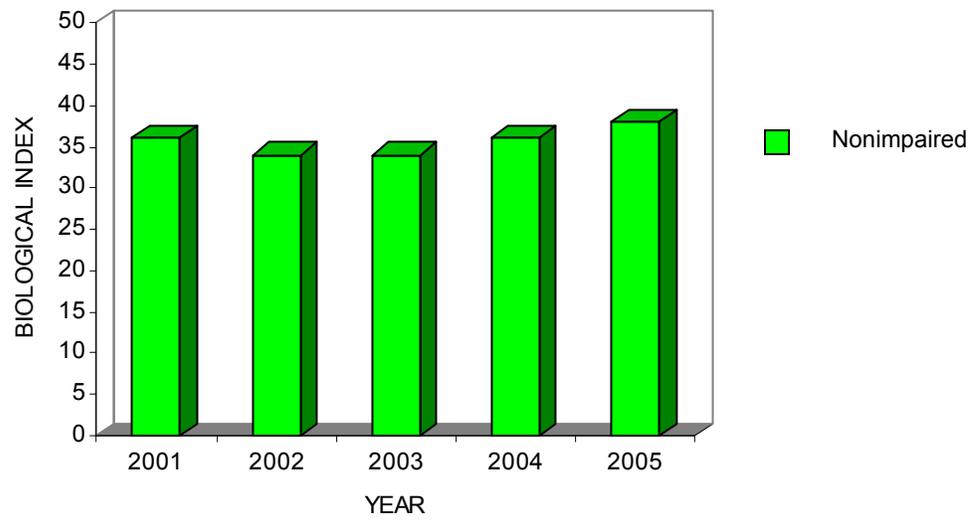
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	30.5	None						

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.45
RBP Score	38
RBP Condition	Reference
Total Habitat Score	143
Habitat Condition Category	Reference

Water Quality Index



Biological Index



Conowingo Creek at Pleasant Grove, Pa. (CNWG 4.4)



Water Quality: Nitrate plus nitrite exceeded water quality standards.

Biological Condition: Slightly impaired

Habitat Assessment: Excellent

Trends: Water quality remained about the same, as did biological condition and physical habitat over the past year.

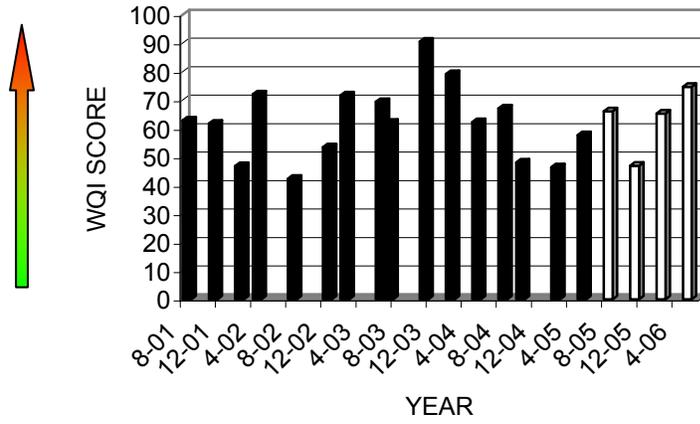
Other Notes: Staff noted poor riparian vegetative habitat at this sampling location.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
Nitrate + Nitrite	11/08/2005	11.29 mg/l	10 mg/l	Pa. public water supply
Nitrate + Nitrite	03/01/2006	12.24 mg/l	10 mg/l	Pa. public water supply
Nitrate + Nitrite	05/03/2006	11.54 mg/l	10 mg/l	Pa. public water supply

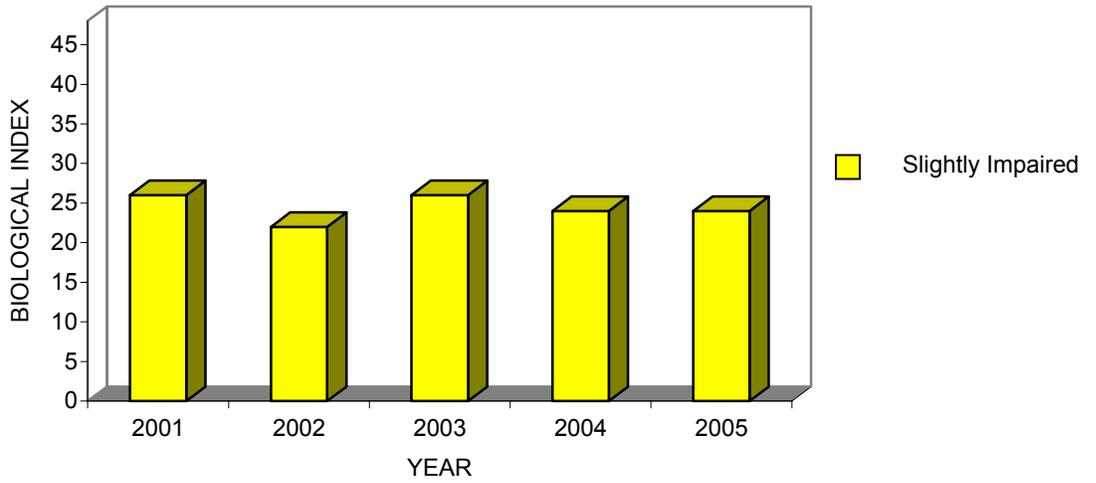
Date	WQI	Parameters Exceeding 90 th Percentile							
08/18/2005	66.1								
11/08/2005	47.0	TS	TNO3	TN					
03/01/2006	65.3	TNO3	TAI	TN	DO	TEMP			
05/03/2006	74.7	TFe	TS	TNO3	TAI	TN	DO	COND	SS

Biological and Habitat Summary	
Number of Taxa	13
Diversity Index	2.05
RBP III Score	24
RBP III Condition	Slightly Impaired
Total Habitat Score	144
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Deer Creek at Gorsuch Milles, Md. (DEER 44.2)



Water Quality: No parameters exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Supporting

Trends: Water quality showed a slight decline since last year with higher WQI scores, biological condition remained nonimpaired but habitat ranking fell to supporting.

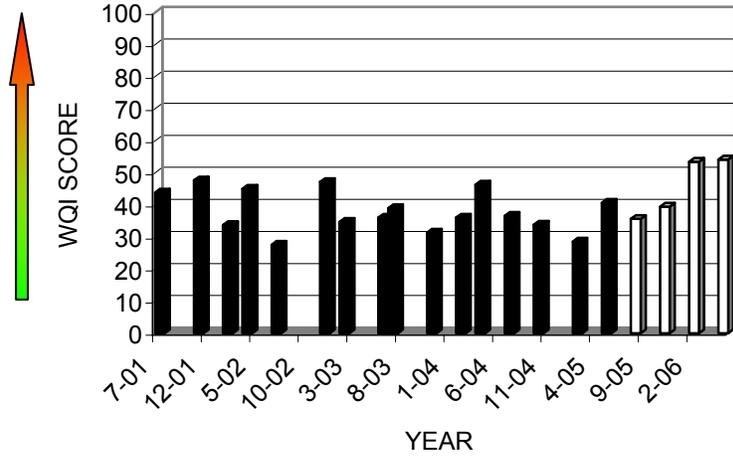
Other Notes: The macroinvertebrate community at this site has been rated nonimpaired for five consecutive years.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

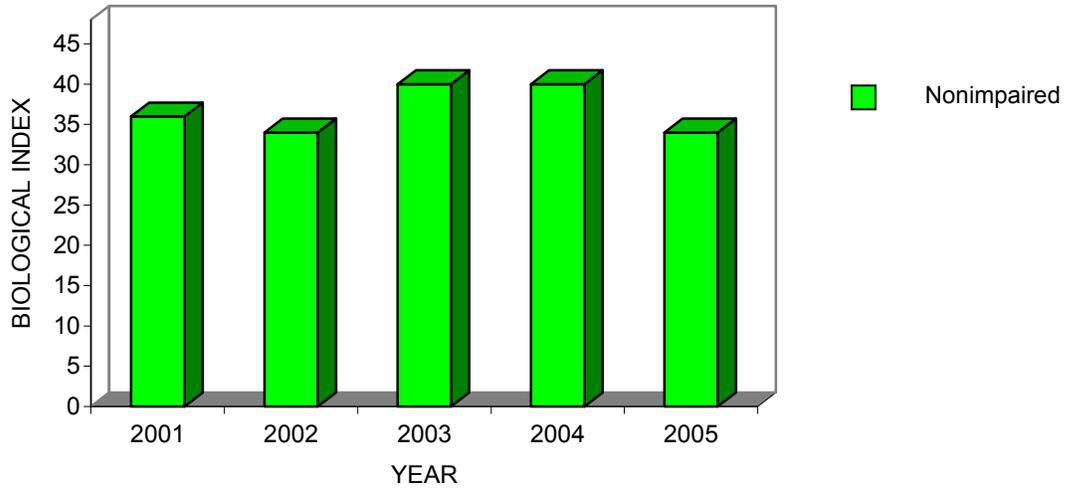
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	35.7	None						
10/26/2005	39.5	None						
02/28/2006	53.5	DO	SS					
05/02/2006	54.2	TAI	DO					

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.63
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	125
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Ebaughs Creek at Stewartstown, Pa. (EBAU 1.5)



Water Quality: Chlorine exceeded water quality standards.

Biological Condition: Slightly impaired

Habitat Assessment: Excellent

Trends: Water quality, biological condition, and physical habitat all remained the same as they were in 2004-2005.

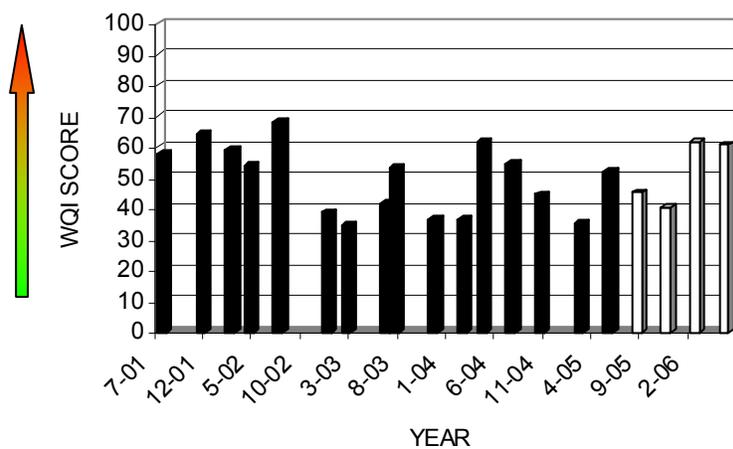
Other Notes: EBAU 1.5 is located downstream of the Stewartstown Treatment Plant.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TCln	08/17/2005	0.06 mg/l	0.019 mg/l	Md. aquatic life
TCln	10/26/2005	0.06 mg/l	0.019 mg/l	Md. aquatic life
TCln	05/02/2006	0.02 mg/l	0.019 mg/l	Md. aquatic life

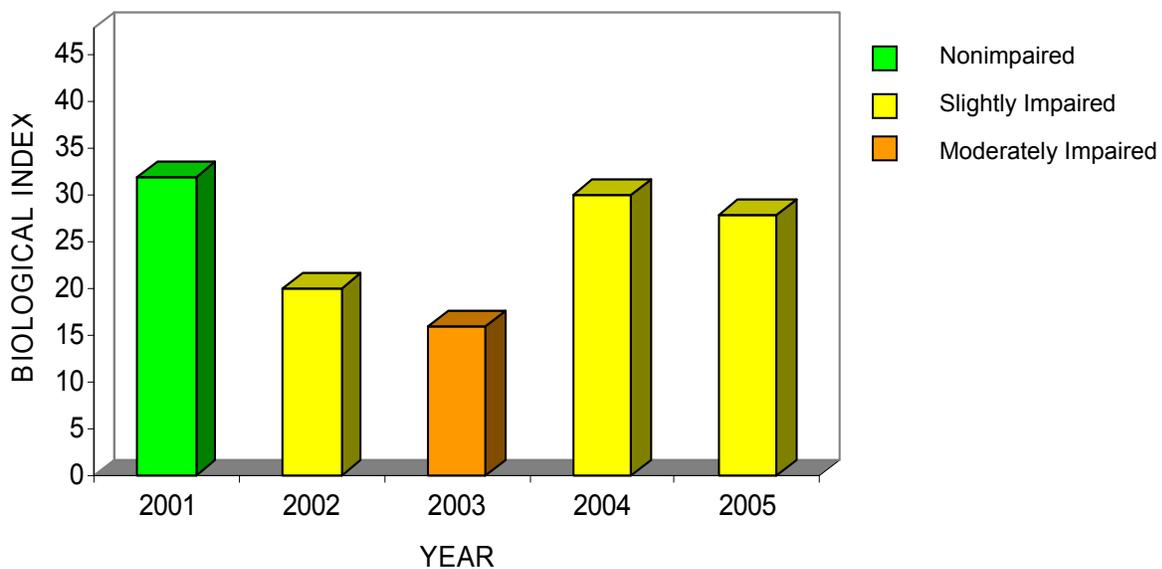
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	45.2	None						
10/26/2005	40.2	None						
02/28/2006	61.4	TAI	DO	SS				
05/02/2006	60.6	TNO2	TURB	TAI				

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.0
RBP Score	26
RBP Condition	Slightly impaired
Total Habitat Score	161
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Falling Branch Deer Creek at Fawn Grove, Pa. (FBDC 4.1)



Water Quality: Alkalinity exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality improved slightly, habitat remained excellent, and there was no macroinvertebrate sample collected last year.

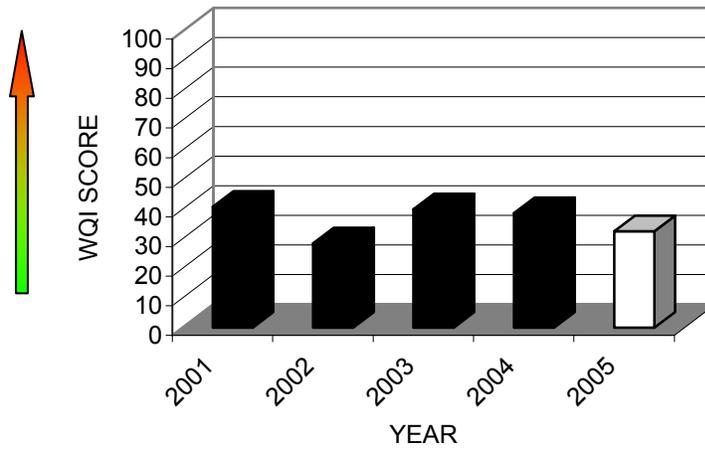
Other Notes: Staff noted excellent instream cover and vegetative protective bank cover at this sampling site.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
ALK	08/17/2005	14 mg/l	20 mg/l	Pa. aquatic life

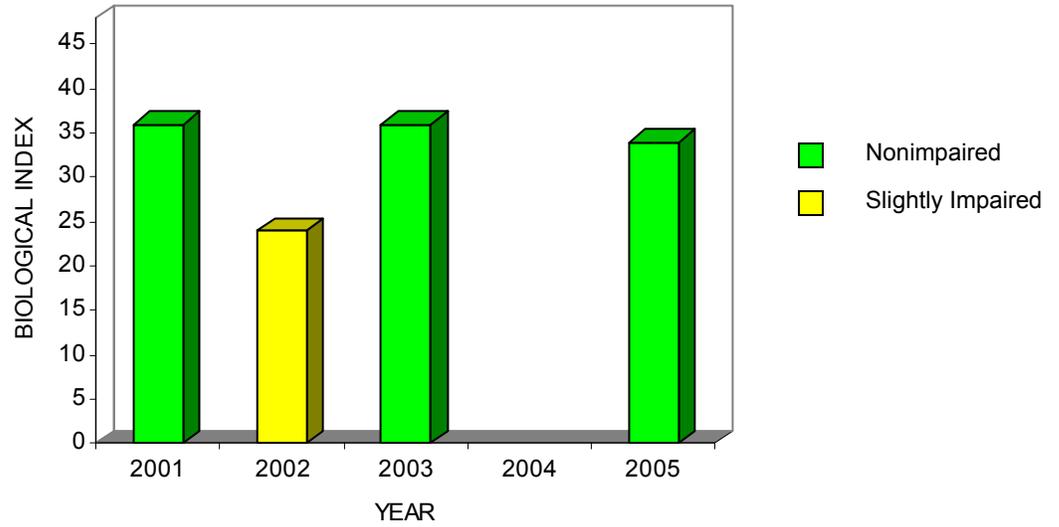
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	32.5	None						

Biological and Habitat Summary	
Number of Taxa	26
Diversity Index	2.63
RBP Score	34
RBP Condition	Nonimpaired
Total Habitat Score	153
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Long Arm Creek at Bandanna, Pa. (LNGA 2.5)



Water Quality: At LNGA 2.5, pH exceeded the water quality standard.

Biological Condition: Moderately impaired

Habitat Assessment: Supporting

Trends: Water quality and biological condition both showed a decline from 2004-2005; however, there was some improvement in habitat score.

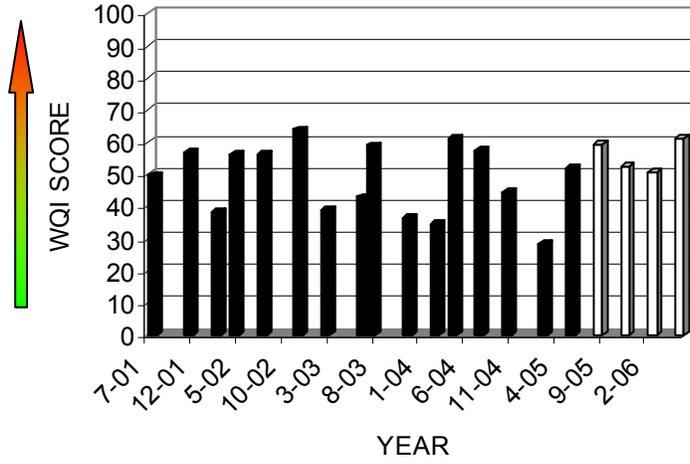
Other Notes: LNGA 2.5 was previously used as a cow pasture, but SRBC staff noted in July 2004 that there was no evidence that the area surrounding the sampling station had been used as a pasture recently and that the stream banks were re-vegetated. In 2005, staff noted that the old cow pasture continued to grow up well and conditions were improving.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
pH	10/26/2005	6.0	6.5-8.5	Pa. drinking water supply

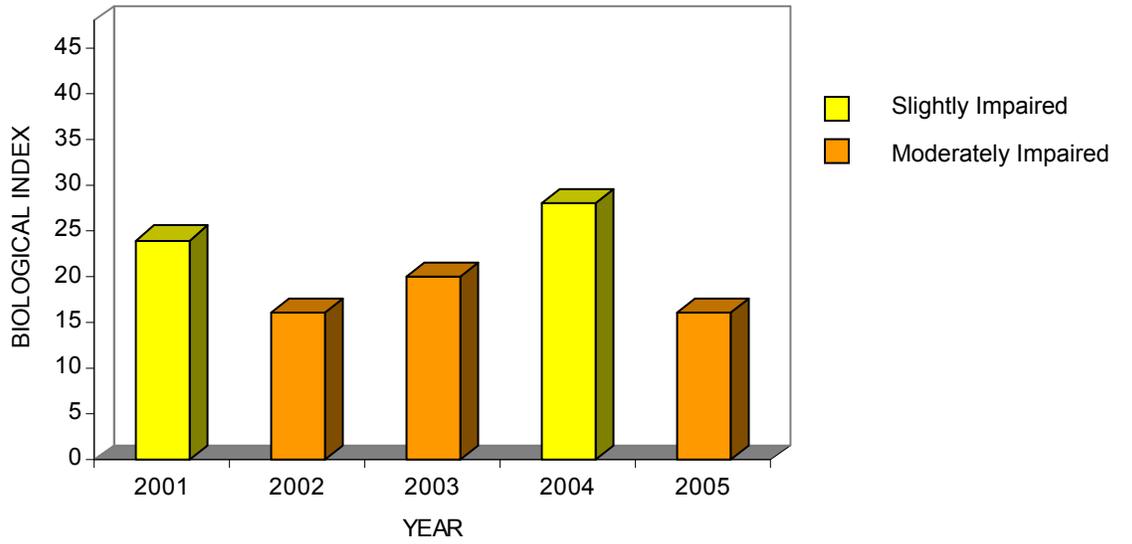
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	59.3	TFe	TURB	TAI	TMn	SS		
10/26/2005	52.3	None						
02/28/2006	50.4	TAI	DO					
05/02/2006	61.3	TP	TPO4	TAI	DO			

Biological and Habitat Summary	
Number of Taxa	15
Diversity Index	1.76
RBP III Score	16
RBP III Condition	Moderately impaired
Total Habitat Score	124
Habitat Condition Category	Supporting

Water Quality Index



Biological Index



Octoraro Creek at Rising Sun, Md. (OCTO 6.6)



Water Quality: No parameters exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality declined slightly over the past year, biological condition showed improvement, and physical habitat remained excellent.

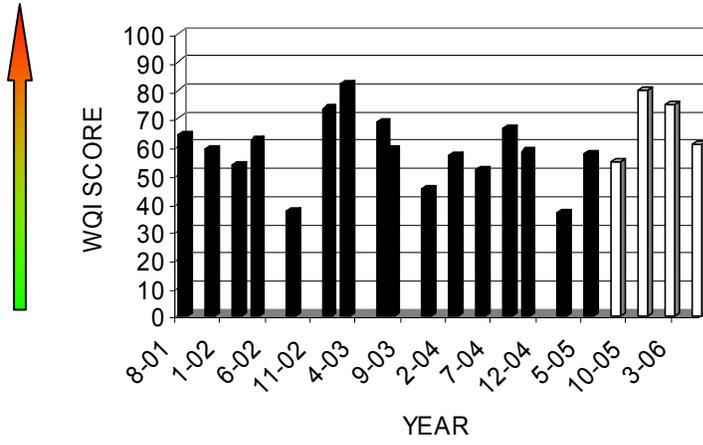
Other Notes: Staff noted that Octoraro Creek at this location had excellent habitat for macroinvertebrates and fish.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

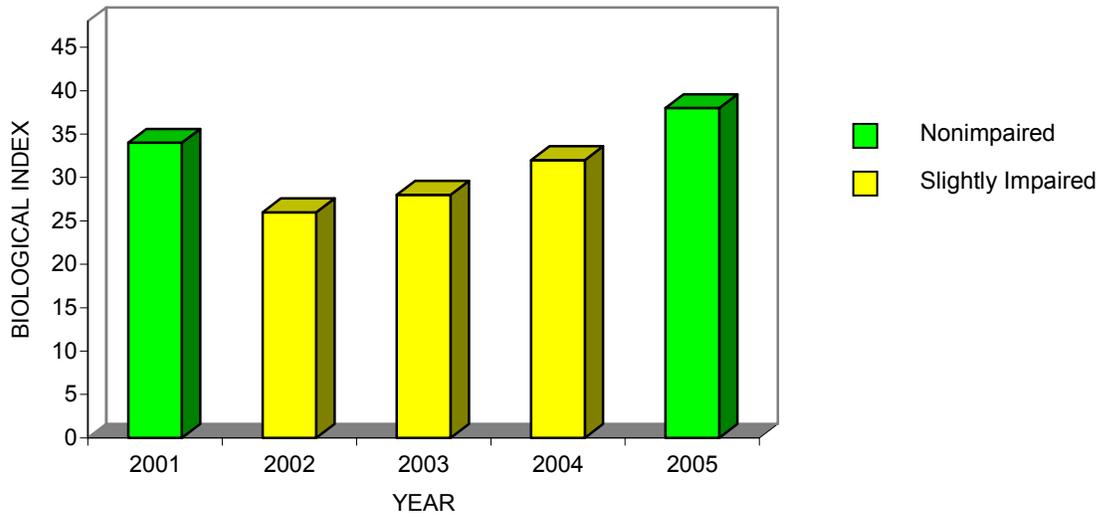
Date	WQI	Parameters Exceeding 90 th Percentile							
08/18/2005	54.3	None							
10/26/2005	79.8	TFe	TNO2	TP	TPO4	TURB	TAI	TMn	TOC
03/01/2006	75.0	TP	TPO4	TAI	TOC	DO			
05/03/2006	60.9	TS	TAI	DO	COND	TEMP			

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.41
RBP III Score	38
RBP III Condition	Nonimpaired
Total Habitat Score	171
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Scott Creek at Delta, Pa. (SCTT 3.0)

Water Quality: No parameters exceeded water quality standards.

Biological Condition: NA

Habitat Assessment: NA

Trends: Water quality showed some improvement over the last year. Macroinvertebrate collection and habitat assessment were not completed at this site in 2005 due to very low flow conditions.

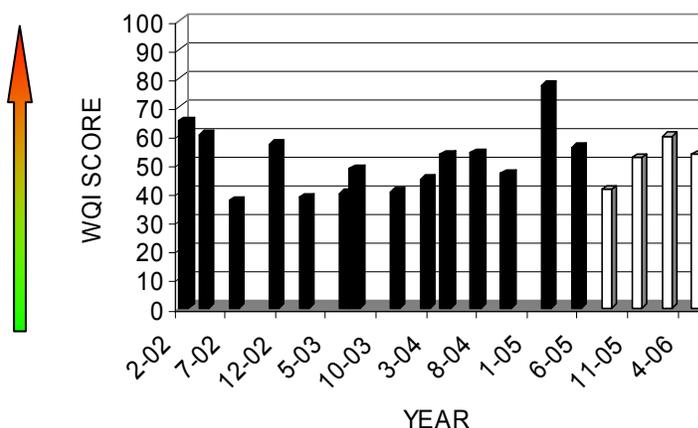
Other Notes: Scott Creek is typically one of the most impaired sites on the Pennsylvania-Maryland border but it has shown some improvement in recent years.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

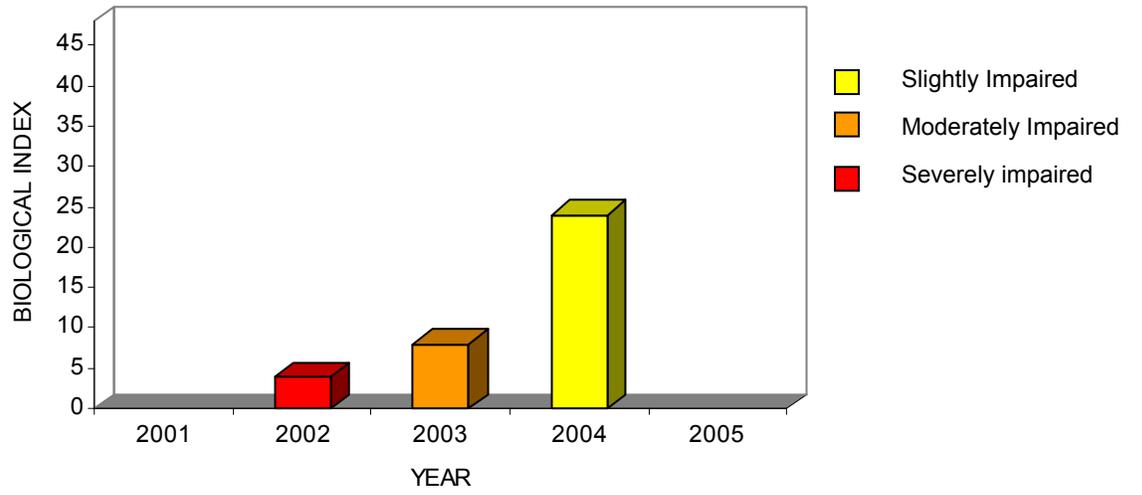
Date	WQI	Parameters Exceeding 90 th Percentile							
08/18/2005	41.1	None							
10/26/2005	52.2	TSO4	COND	TCI					
03/01/2006	59.7	TPO4	TAI	TCI	DO	TEMP			
05/02/2006	53.3	TAI	TCI	DO	COND				

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

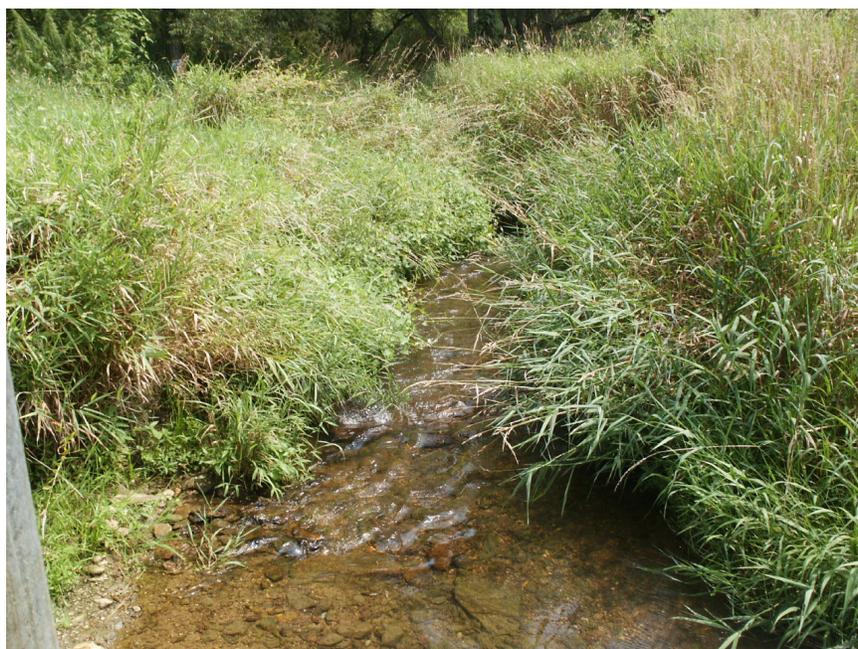
Water Quality Index



Biological Index



South Branch Conewago Creek at Bandanna, Pa. (SBCC 20.4)



Water Quality: No parameters exceeded water quality standards.

Biological Condition: Slightly impaired

Habitat Assessment: Excellent

Trends: Water quality, biological condition, and habitat assessment were all consistent with last year's sampling results.

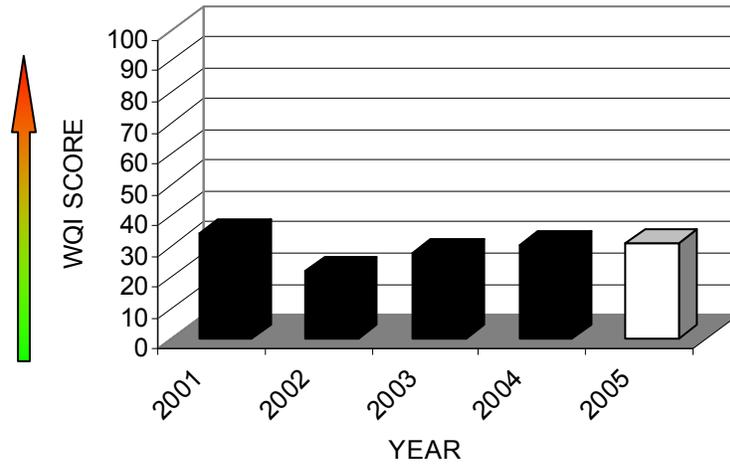
Other Notes: Staff noted a large amount of sediment deposition at this site as well as the presence of eroding bank conditions.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

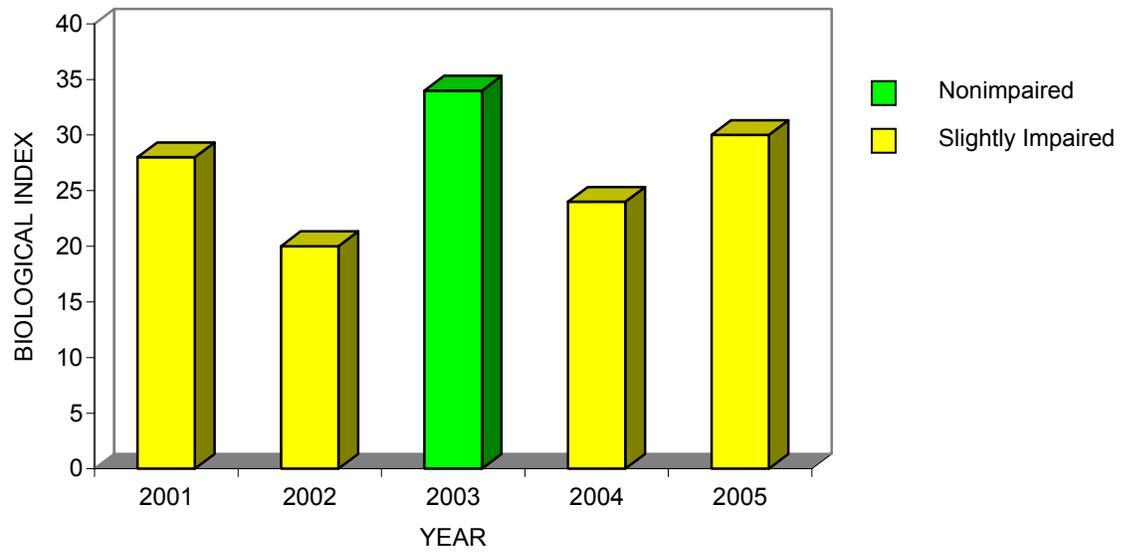
Date	WQI	Parameters Exceeding 90 th Percentile						
08/17/2005	31.3	None						

Biological and Habitat Summary	
Number of Taxa	19
Diversity Index	2.32
RBP III Score	30
RBP III Condition	Slightly Impaired
Total Habitat Score	131
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



River Sites

Chemung River at Chemung, N.Y. (CHEM 12.0)

Water Quality: Aluminum exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality declined slightly; biological condition and physical habitat were not sampled in previous two years due to high flows.

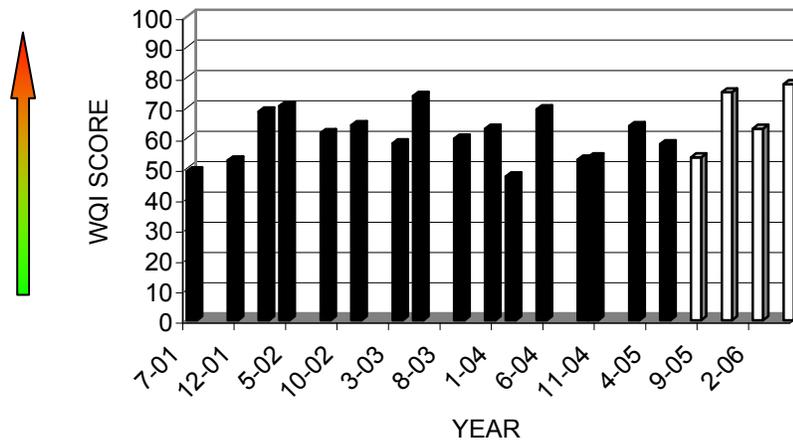
Other Notes: Poor riparian vegetative zone surrounding sampling location.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/02/2005	1209 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	374 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/22/2006	1430 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1397 ug/l	100 ug/l	N.Y. aquatic (chronic)

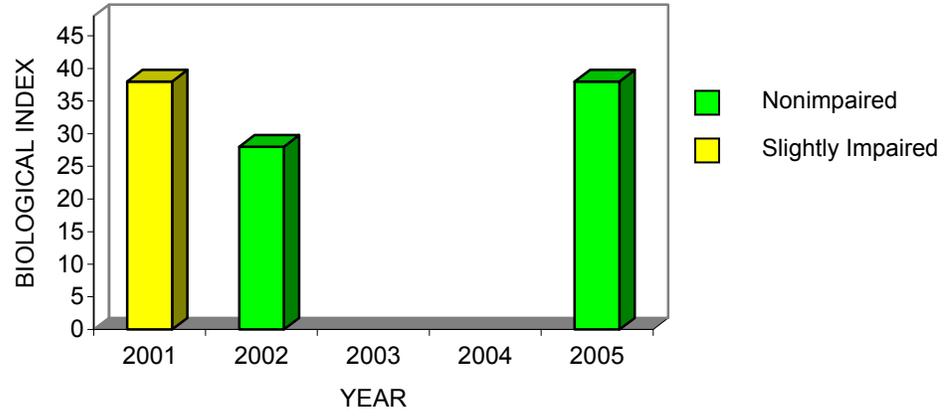
Date	WQI	Parameters Exceeding 90 th Percentile							
08/02/2005	53.7	TURB	TAI	TEMP					
11/02/2005	75.1	TS	TNO3	TP	TPO4	TN	TOC	TCI	COND
		TEMP							
02/22/2006	63.1	TS	TNO3	TN	TCI	DO	COND		
05/17/2006	77.8	TS	TN	TCI	DO	COND	SS	TEMP	

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.39
RBP Score	38
RBP Condition	Nonimpaired
Total Habitat Score	155
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



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



Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Reference (Nonimpaired)

Habitat Assessment: Reference (Excellent)

Trends: Water quality remained about the same, biological condition continues to be nonimpaired and habitat is still excellent.

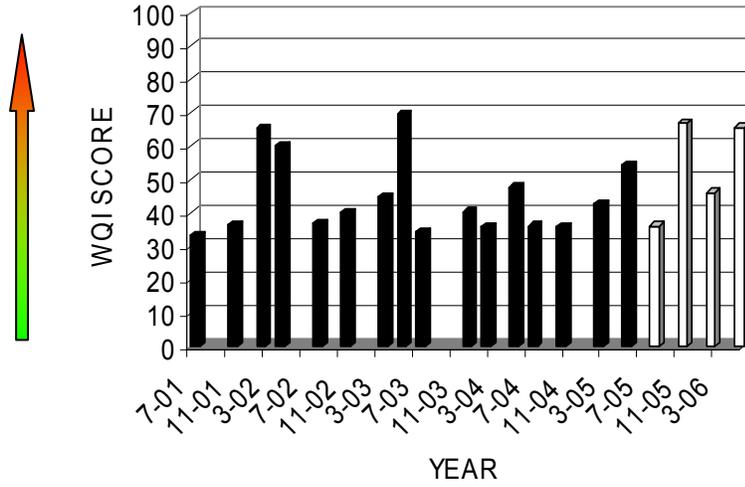
Other Notes: SUSQ 365 was the reference site to which all the other river sites were compared.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/01/2005	1175 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	11/03/2005	674 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	11/03/2005	862 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/23/2006	1580 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/16/2006	1320 ug/l	100 ug/l	N.Y. aquatic (chronic)

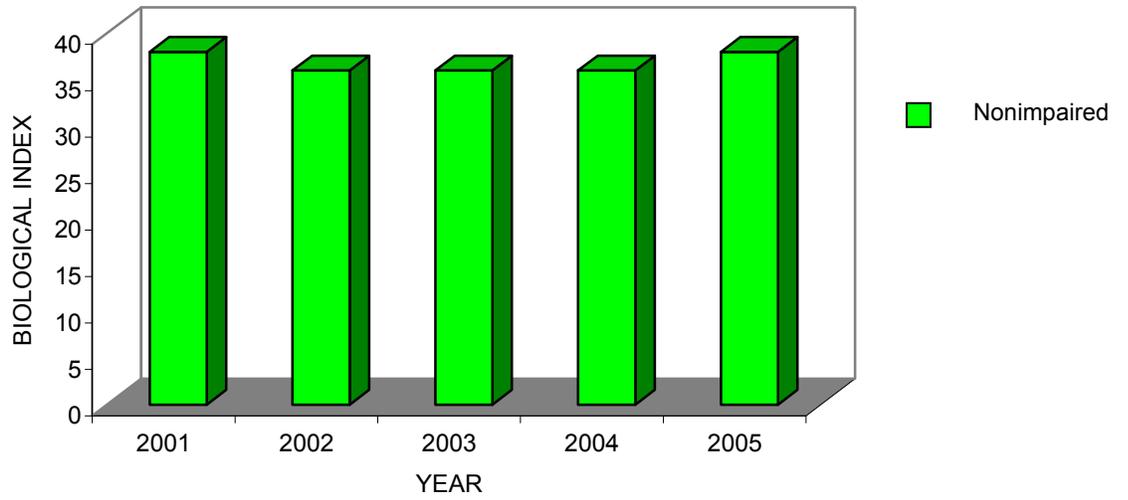
Date	WQI	Parameters Exceeding 90 th Percentile						
08/01/2005	36.0	None						
11/03/2005	66.7	TFe	TAI	DO				
02/23/2006	46.0	None						
05/16/2006	65.6	TPO4	DO	TEMP				

Biological and Habitat Summary	
Number of Taxa	21
Diversity Index	2.69
RBP Score	38
RBP Condition	Reference
Total Habitat Score	162
Habitat Condition Category	Reference

Water Quality Index



Biological Index



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



Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality is declining slightly; biological condition and physical habitat have remained largely the same.

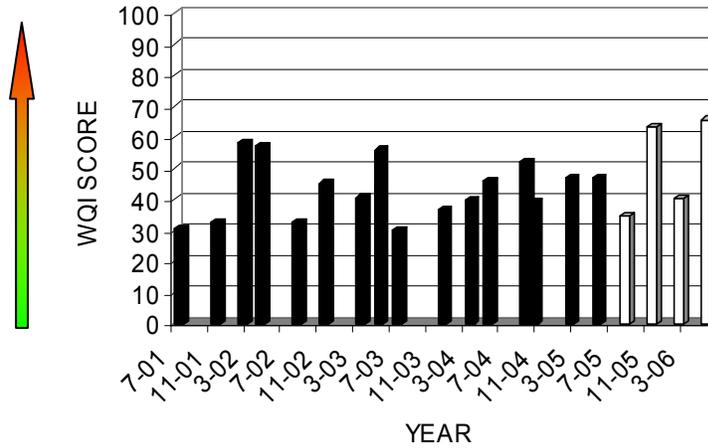
Other Notes: Site upstream of Kirkwood Park.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/01/2005	1330 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	11/03/2005	472 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	11/03/2005	458 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/23/2006	1492 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/16/2006	1260 ug/l	100 ug/l	N.Y. aquatic (chronic)

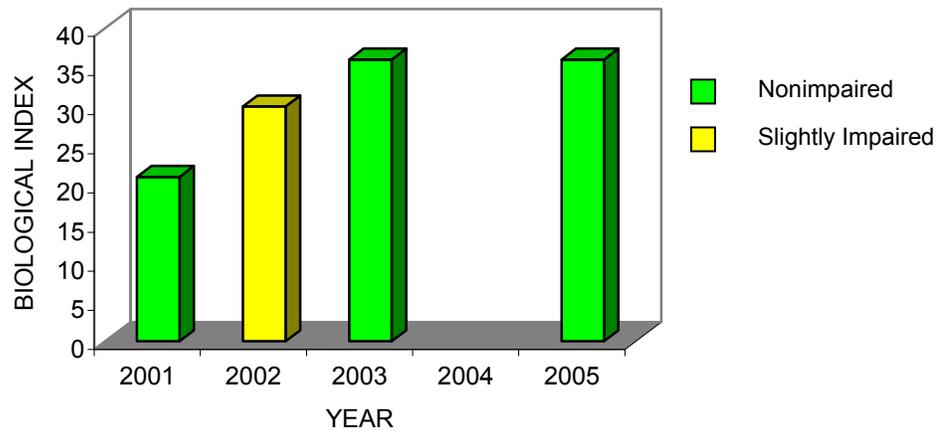
Date	WQI	Parameters Exceeding 90 th Percentile						
08/01/2005	34.7	TAI	TEMP					
11/03/2005	63.4	TNH3	SS					
02/23/2006	40.3	DO						
05/16/2006	65.6	DO	TEMP					

Biological and Habitat Summary	
Number of Taxa	23
Diversity Index	2.46
RBP Score	36
RBP Condition	Nonimpaired
Total Habitat Score	153
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Susquehanna River at Sayre, Pa. (SUSQ 289.1)

Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Slightly Impaired

Habitat Assessment: Excellent

Trends: Water quality declining slightly since 2004-2005; biological condition and physical habitat were not sampled since 2002 due to high river flows.

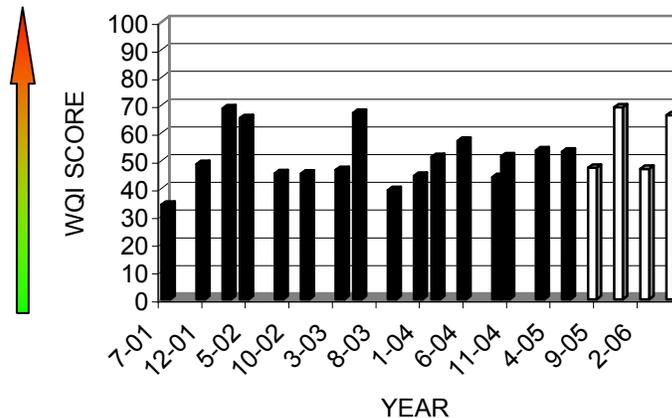
Other Notes: Staff noted that the riparian vegetative zone was marginal at this site on the Susquehanna River.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/02/2005	1269 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	11/03/2005	567 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	11/03/2005	523 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	02/22/2006	1232 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/16/2006	1290 ug/l	100 ug/l	N.Y. aquatic (chronic)

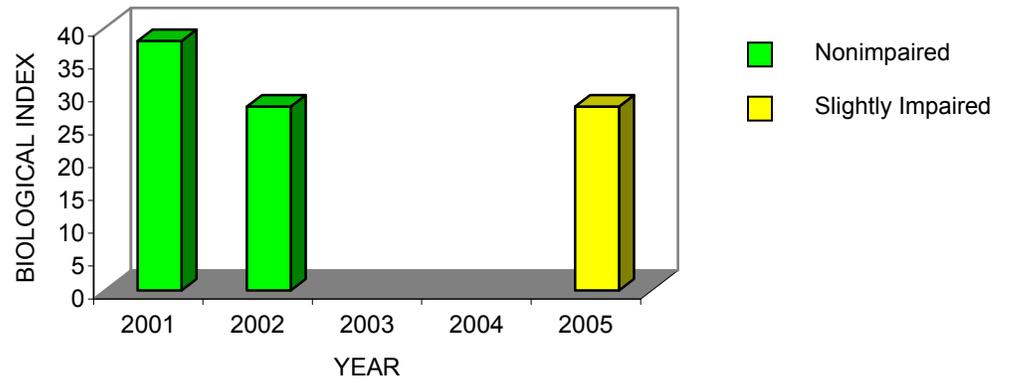
Date	WQI	Parameters Exceeding 90 th Percentile						
08/02/2005	47.4	TAI	TEMP					
11/03/2005	69.2	SS						
02/22/2006	47.0	DO						
05/16/2006	66.3	TNO3	TN	DO	COND	TEMP		

Biological and Habitat Summary	
Number of Taxa	18
Diversity Index	2.09
RBP Score	28
RBP Condition	Slightly Impaired
Total Habitat Score	153
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Susquehanna River at Marietta, Pa. (SUSQ 44.5)



Water Quality: No parameters exceeded water quality standards.

Biological Condition: NA

Habitat Assessment: NA

Trends: Water quality remained about the same over the last year.

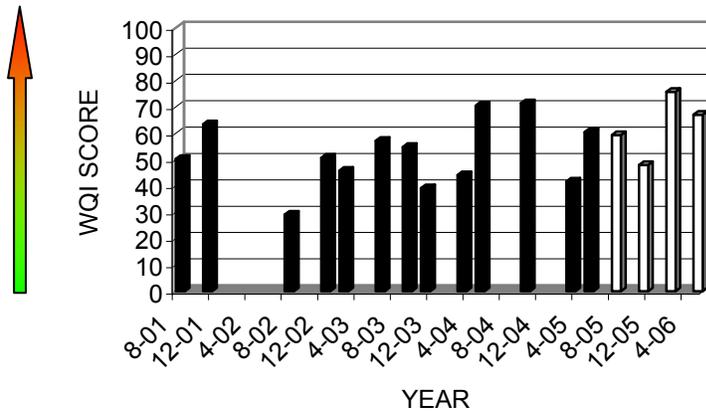
Other Notes: Macroinvertebrate sampling and habitat assessment are not performed at SUSQ 44.5 due to deep waters and lack of riffle habitat.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

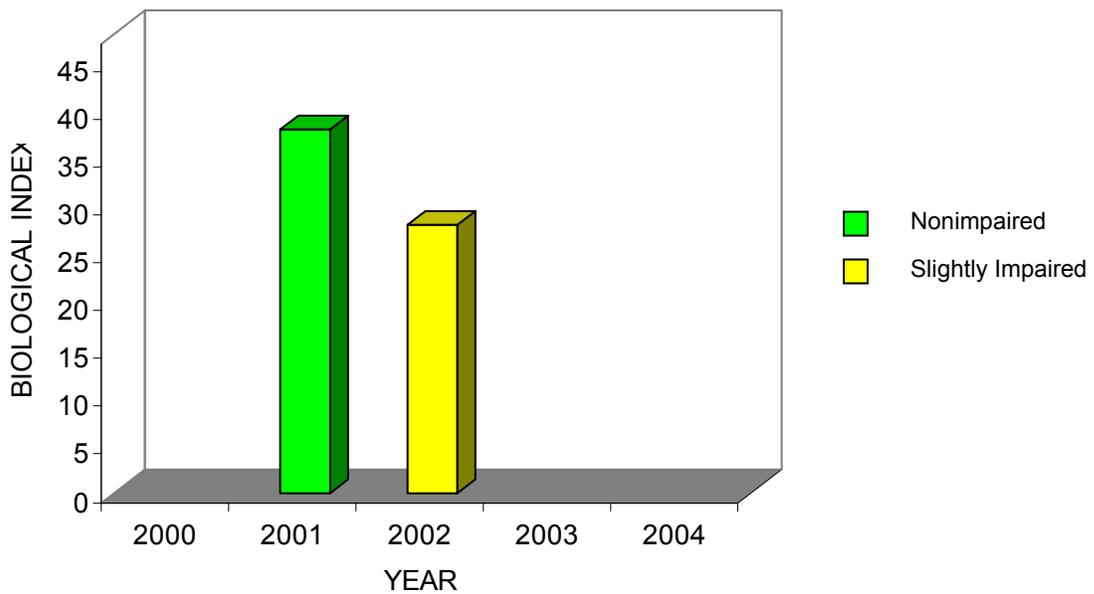
Date	WQI	Parameters Exceeding 90 th Percentile							
08/29/2005	59.3	TSO4	TS	TNH3	TMn	TCI	COND		
11/08/2005	48.0	TNH3							
03/07/2006	75.8	TFe	TSO4	TS	TAI	TMn	DO	COND	
05/03/2006	67.1	TFE	TSO4	TMn	TOC	TEMP			

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

Water Quality Index



Biological Index



Susquehanna River at Conowingo, Md. (SUSQ 10.0)



Water Quality: Dissolved oxygen exceeded water quality standards.

Biological Condition: NA

Habitat Assessment: NA

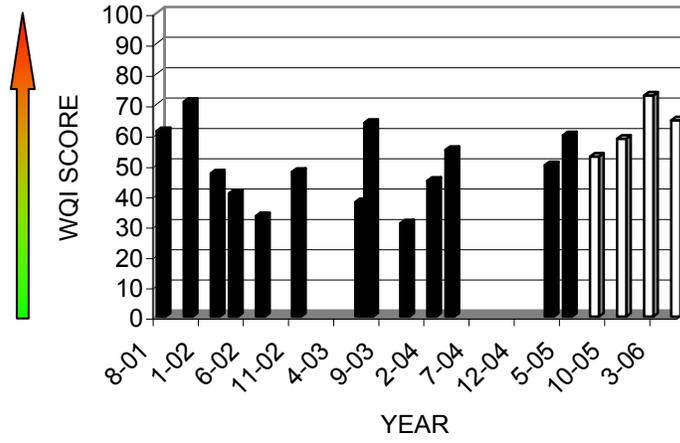
Trends: Water quality showed a slight decline from 2004-2005.

Other Notes: Macroinvertebrate collection and habitat assessments are not performed at SUSQ 10.0 due to deep waters and lack of riffle habitat. This site is only 10 miles upstream of where the Susquehanna River empties into the Chesapeake Bay.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DO	08/18/2005	4.56 mg/l	5.0 mg/l	Md. aquatic life

Date	WQI	Parameters Exceeding 90 th Percentile						
08/18/2005	52.8	TNO2	TMn	DO				
10/26/2005	58.6	TSO4	DO	COND				
03/01/2006	72.9	TURB	TNH3	TAI	TMn	DO	TEMP	
05/03/2006	64.7	TSO4	TURB	TAI	TOC	DO	TEMP	

Water Quality Index



Tioga River at Lindley, N.Y. (TIOG 10.8)

Water Quality: Aluminum and iron exceeded water quality standards.

Biological Condition: Nonimpaired

Habitat Assessment: Excellent

Trends: Water quality is remaining the about the same; biological condition and habitat were not assessed since 2002 due to high flows.

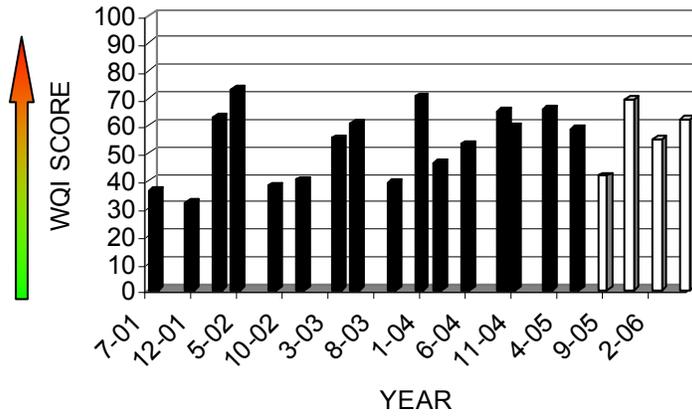
Other Notes: Riparian buffer zone is poor along this stretch of the Tioga River.

Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/03/2005	1160 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	11/02/2005	445 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	11/02/2005	548 ug/l	100 ug/l	N.Y. aquatic (chronic)
TFe	02/21/2006	466 ug/l	300 ug/l	N.Y. aquatic (chronic)
TAI	02/21/2006	2127 ug/l	100 ug/l	N.Y. aquatic (chronic)
TAI	05/17/2006	1503 ug/l	100 ug/l	N.Y. aquatic (chronic)

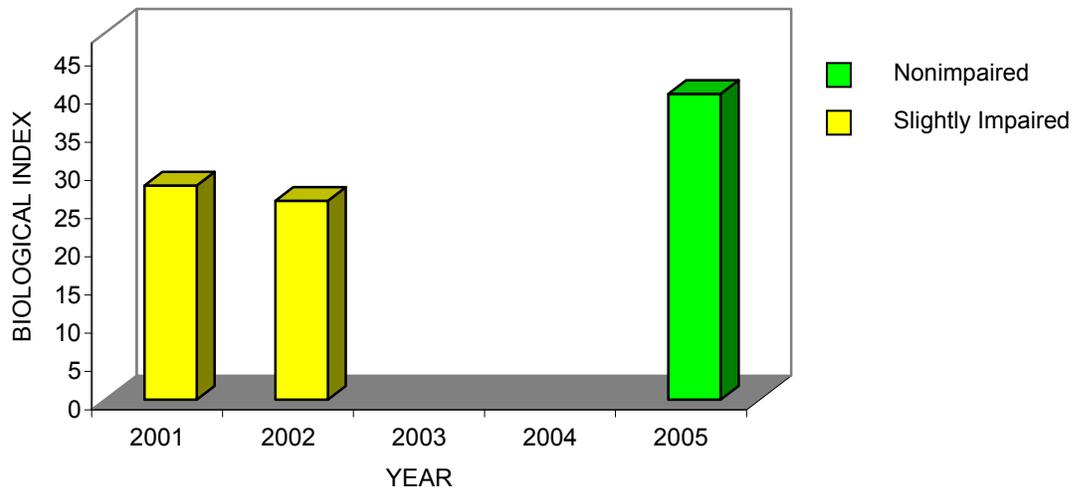
Date	WQI	Parameters Exceeding 90 th Percentile						
08/03/2005	41.7	TSO4	TEMP					
11/02/2005	69.4	TSO4	TMn	TOC				
02/21/2006	54.9	TSO4	TMn	DO				
05/17/2006	62.2	TSO4	TURB	TAI	TMn	DO		

Biological and Habitat Summary	
Number of Taxa	20
Diversity Index	2.49
RBP III Score	40
RBP III Condition	Nonimpaired
Total Habitat Score	149
Habitat Condition Category	Excellent

Water Quality Index



Biological Index



Group 3 Streams

Babcock Run (BABC)



During May 2006, the macroinvertebrate community of Babcock Run near Cadis, Pa., was designated as moderately impaired; which is a marked decline from last years nonimpaired rating. BABC had low metric scores for EPT Index, percent Chironomidae, and percent dominant taxa. The pollution tolerant Chironomidae midges were almost 60 percent of the entire sample. Physical habitat conditions were once again rated excellent, with good scores for epifaunal substrate, velocity/depth regimes, frequency of riffles, and vegetative protective cover. All field chemistry parameters were within acceptable limits. BABC is located in a mostly forested watershed, and the stream bed is dominated by cobble substrate.

Beagle Hollow/Redhouse Run (BEAG)



Slightly impaired biological conditions existed at Beagle Hollow Run (this stream is also sometimes called Redhouse Run) near Osceola, Pa., during May 2006. The sample contained a large number of organic pollution-intolerant organisms, such as the stonefly genus *Leuctra* (Plecoptera: Leuctridae) and the mayfly genus *Eperous* (Ephemeroptera: Heptageniidae). This resulted in high scores for Hilsenhoff Biotic Index and percent Ephemeroptera. However, taxonomic richness and Shannon Diversity did not rank very high. Habitat conditions were considered supporting, with good scores for frequency of riffles and vegetative protective cover but poor scores for condition of banks and riparian vegetative zone width. All field chemistry parameters were within natural ranges.

Bill Hess Creek (BILL)



Bill Hess Creek near Nelson, Pa., was designated moderately impaired, which is a decline from last years ranking of slightly impaired. The biological community showed poor scores for Shannon Diversity Index, Hilsenhoff biotic Index, and percent Chironomidae. Midges dominated the sample at greater than 60 percent of the sample. The habitat was rated supporting again this year, with low scores given for condition of banks, velocity/depth regimes, riparian vegetative zone, and channel flow status. All field chemistry parameters were within acceptable limits.

Bird Creek (BIRD)

Bird Creek near Webb Mills, N.Y., was designated as nonimpaired for biological condition. This site had good scores for EPT Index, percent Ephemeroptera, and percent Chironomidae. This was an improvement from last year's status as slightly impaired. The habitat at Bird Creek was designated as supporting primarily due to poor conditions of banks, velocity/depth regimes, and channel flow status. This site was located in a primarily residential area. All field chemistry parameters fell within acceptable ranges. Staff noted that nearly all of the cobble substrate was covered in algae.

Biscuit Hollow (BISC)

Slightly impaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during the 2006 survey, which is a decline from the last two years when the site was rated as nonimpaired. Biscuit Hollow had a good score for percent Ephemeroptera but just average scores for the other biotic index parameters. The physical habitat at this site was considered supporting, with poor scores given for sediment deposition, conditions of banks, velocity/depth regimes, and riparian vegetative zone width. The site had slightly eroded banks and was located in an area dominated by abandoned fields and an overgrown pasture, downstream of numerous old beaver dams. Staff noted evidence of cows frequently crossing through the stream. Field chemistry parameters were within acceptable ranges.

Briggs Hollow Run (BRIG)



Briggs Hollow Run near Nichols, N.Y., was designated slightly impaired during the 2006 sampling season for the second consecutive year. The sample showed with good metric scores for Hilsenhoff Biotic Index and percent Ephemeroptera. The very low metric score for Hilsenhoff Index means there were a large number of pollution intolerant organisms in the sample, such as the mayfly genera *Epeorus*. However, BRIG also had a fairly low taxonomic richness and Shannon Diversity Index. The physical habitat was designated as supporting and was given low scores for epifaunal substrate, embeddedness, channel flow status, and riparian vegetative zone width. All field chemistry parameters were within acceptable limits.

Bulkley Brook (BULK)

Bulkley Brook near Knoxville, Pa., had a slightly impaired biological community and excellent habitat conditions during the 2006 sampling season. The two lowest biological scores for this site were EPT Index and percent Chironomidae, which was also the dominant taxon. Habitat assessment showed high scores for instream cover, frequency of riffles, vegetative protective cover, and riparian vegetative zone width. BULK is located in a forested area downstream of a beaver dam and continues to have a well developed riparian zone. Field chemistry indicated that all parameters were within acceptable limits.

Camp Brook (CAMP)

Camp Brook near Osceola, Pa., improved from 2005 to have a nonimpaired biological community in May 2006, with high scores for EPT Index, Shannon Diversity Index, taxonomic richness, and percent Ephemeroptera. The biological community at CAMP consisted of a large number of the pollution intolerant mayfly genera *Epeorus* (Ephemeroptera: Heptageniidae). The physical habitat of the stream was designated supporting; low scores were given for condition of banks, velocity/depth regimes, riparian vegetative zone width, and channel flow status. All field chemistry parameters were in the normal range.

Cook Hollow (COOK)

Cook Hollow near Austinburg, Pa., had a slightly impaired biological community for the second straight year. This site had a fairly high EPT Index and taxonomic richness, but scored poorly for percentage of Chironomidae, which were the dominant taxa. The habitat was rated as supporting, with high scored for frequency of riffles, vegetative protective cover, and epifaunal substrate. However, habitat scores for embeddedness, sediment deposition, and riparian vegetative zone were marginal. All field chemistry parameters were within acceptable limits. Staff noted the presence of human garbage along the banks of Cook Hollow at this location.

Deep Hollow Brook (DEEP)

The biological community of Deep Hollow Brook near Danville, N.Y., served as the reference site for the Group 3 streams in 2006 for the second year in a row. This site had the best combination of biological, habitat, and field chemistry conditions of the Group 3 streams. DEEP had the highest taxonomic richness, Shannon Diversity Index, and EPT Index of all Group 3 streams. Alkalinity was slightly below the Pennsylvania aquatic life standard this year but all other field chemistry parameters were at acceptable levels. Habitat at DEEP was designated as excellent, with high scores for epifaunal substrate, frequency of riffles, instream cover, vegetative protective cover, and riparian vegetative zone width. This watershed was located in a mostly forested area, interspersed with scattered cropland and old fields, and the station was located downstream of a beaver dam.

Denton Creek (DENT)

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community during May 2006 for the second straight year. DENT had poor scores for several metrics, including EPT Index, Shannon Diversity Index, percent Ephemeroptera, and percent dominant taxa. The habitat was rated as excellent, with high scores for channel flow status, condition of banks, frequency of riffles, and vegetative protective cover. The sampling site was located downstream of Hawkins Lake. As in previous years, alkalinity values at DENT exceeded the water quality standards, but other field chemistry parameters were within acceptable limits in May 2006.

Dry Brook (DRYB)



Dry Brook at Waverly, N.Y., was sampled again in 2006 after being dry in 2005. The biological condition was rated as moderately impaired. Dry Brook had the poorest scores of all the Group 3 streams for Shannon Diversity Index, Hilsenhoff Biotic Index, percent Chironomidae, and percent dominant taxa. Habitat was rated as partially supporting with low scores for riparian vegetative zone, velocity/depth regimes, condition of banks, and sediment deposition. This site is located in a primarily residential area. Staff noted the presence of human refuse around the site. All field chemistry parameters were within the acceptable range.

Little Wappasening Creek (LWAP)

The biological community of Little Wappasening Creek near Nichols, N.Y., was designated as nonimpaired in May 2006, due to high scores for Hilsenhoff Biotic Index and taxonomic richness. This site was dominated by the pollution intolerant mayfly genus *Epeorus* (Ephemeroptera: Heptageniidae). This was a large shift from last year's sample which was dominated by midges. The physical habitat at LWAP was rated as supporting this year after being rated as partially supporting last year. Low scores were again given for channel flow status, and condition of banks; but the site scored high for instream cover, frequency of riffles, and riparian vegetative zone. In 2001, dredging equipment was found in the stream, and timber was being removed from the streambanks. Since that time, no evidence of dredging or timber removal was noted. All field chemistry parameters remained normal.

Parks Creek (PARK)



Parks Creek was sampled near Litchfield, N.Y., and was designated as having a slightly impaired biological community for the second straight year. This site scored high on the Hilsenhoff Biotic Index and percentage of Chironomidae but fairly low for EPT Index and taxonomic richness. Parks Creek had an excellent habitat ranking in 2006, with high scores for a number of parameters, including epifaunal substrate, sediment deposition, frequency of riffles, and riparian vegetative zone. At the time of sampling, staff noted that the bank conditions were poor on both left and right banks. The predominant land use is forested, with a considerable amount of woody debris and fallen trees in the stream channel. All field chemistry parameters were within acceptable ranges.

Prince Hollow Run (PRIN)



Prince Hollow Run near Cadis, Pa., was designated slightly impaired in May 2006, showing a slight decline from its nonimpaired rating last year but still better than the severely impaired conditions of past years. This site had very low scores for percent Chironomidae, which were the dominant taxa. However, Prince Hollow Run did show good scores for taxonomic richness EPT Index. The habitat was rated as supporting, with low scores for condition of banks, embeddedness, and riparian vegetative zone width but high scores for frequency of riffles and epifaunal substrate. At the time of sampling, staff noted the presence of human trash along the stream banks. All field chemistry parameters were within the acceptable ranges.

Russell Run (RUSS)

Russell Run near Windham, Pa., was designated as nonimpaired, which is an improvement from the past two years of slightly impaired ratings. High metric scores were given for Shannon Diversity Index, Hilsenhoff Biotic Index, and percent Ephemeroptera. The habitat at RUSS was considered supporting, with low scores given for sediment deposition and condition of banks, but high scores for channel alteration, frequency of riffles, and vegetative protective cover. Russell Run is located in a primarily forested area and staff noted that much of the substrate was covered with algae. All field chemistry parameters were normal.

Sackett Creek (SACK)

The biological condition and habitat at Sackett Creek near Nichols, N.Y., were both improved in 2006. SACK was designated as slightly impaired for biology, and the physical habitat was rated supporting. This site had the lowest taxonomic richness of all the Group 3 streams but showed good scores for Hilsenhoff Biotic Index and percent Ephemeroptera. Habitat was rated high for epifaunal substrate, frequency of riffles, and vegetative protective cover, but had low scores for condition of banks and channel flow status. All field chemistry parameters were within normal ranges.

Smith Creek (SMIT)



Smith Creek near East Lawrence, Pa., was designated as having a nonimpaired biological community with supporting physical habitat in May 2006. SMIT had the best score for percent dominant taxa of all the Group 3 streams and also had above average scores for Shannon Diversity Index, taxonomic richness, and EPT Index. Low habitat scores were given for a number of parameters, including sediment deposition, velocity/depth regimes, embeddedness, and riparian vegetative zone width. This small stream drains a wetland area and mixed coniferous forest. There were no field chemistry parameters that exceeded state limits.

Strait Creek (STRA)



A nonimpaired biological community existed at Strait Creek near Nelson, Pa., during fiscal year 2006, for the second consecutive year. The site received excellent rankings for Hilsenhoff Biotic Index due to the number of pollution intolerant genera such as the mayfly *Epeorus* (Ephemeroptera; Heptageniidae) and the stonefly *Alloperla* (Plecoptera: Choloroperlidae). The physical habitat was designated supporting, and all field chemistry parameters were within normal limits. Low habitat scores were given for channel flow status, condition of banks, and riparian vegetative zone width. However, frequency of riffles and vegetative protective cover were rated as optimal.

White Branch Cowanesque River (WBCO)

In May 2006, White Branch Cowanesque River near North Fork, Pa., was designated moderately impaired for the third consecutive year, with the worst metric scores for Hilsenhoff Biotic Index, EPT Index, and percent Ephemeroptera. Additionally, it scored very low for taxonomic richness, percent Chironomidae, and percent dominant taxa. The sample was dominated by midges, comprising 46 percent of the sample. WBCO had been nonimpaired in May 2000 with a number of pollution intolerant taxa, but degraded to severely impaired by May 2003. However, the habitat was excellent due to high scores for frequency of riffles, condition of banks, vegetative protective cover, and epifaunal substrate. WBCO is located downstream of an impoundment. Field chemistry measurements were within acceptable ranges. Staff noted survey markers along stream that looked like a possible stream bank restoration project.

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated as slightly impaired in fiscal year 2006, which was a decline from last years nonimpaired rating. The biological index score was high for Hilsenhoff Biotic Index and percent Chironomidae, but a poor score for taxonomic richness. This site was dominated by the pollution intolerant mayfly, *Epeorus* (Ephemeroptera: Heptageniidae) again this year. The physical habitat was supporting, with lower scores for channel flow status, sediment deposition, and condition of banks; but high scores for frequency of riffles and vegetative protective cover. All water chemistry parameters were within the normal range.

CONCLUSIONS

Nineteen (43 percent) of the 44 interstate streams sites at which macroinvertebrate samples were collected contained nonimpaired biological communities. Biological conditions at another 16 sites (36 percent) were slightly impaired, while nine sites (21 percent) were moderately impaired. No sites were designated severely impaired. Nine sites (SUSQ 10.0, SUSQ 44.5, CASC 1.6, TROW 1.8, LSNK 7.6, WAPP 2.6, HLDN 3.5, NFCR 7.6, SCTT 3.0) were not sampled using RBP III techniques due to either dry conditions or deep waters and, thus, were not averaged into the final scores. Twenty one (48 percent) sites had excellent habitats. Twenty two (50 percent) had supporting habitats, and one site (2 percent) was designated as having a partially supporting habitat.

Overall, 86 observations (14 percent) of water chemistry parameters exceeded state standards, which is a slightly higher proportion of exceedance values than last year. Total aluminum exceeded standards most frequently with 54 violations (63 percent). Twenty-two out of the 28 sites had parameters exceeding water quality standards, with 17 of those having more than one violation. Total iron and total aluminum appear to be naturally high in some of these watersheds. Aluminum exceeded water quality standards (100 µg/l) in every sample for the New York-Pennsylvania border streams. Tioga River is the only stream that has documented abandoned mine discharge indicated by high metals and high acidity. Elevated aluminum and depressed alkalinity may be due to acid precipitation, especially in the New York-Pennsylvania border streams. Total dissolved solids, nitrate plus nitrite, and dissolved oxygen are all indicators of organic pollution.

During the summer sampling event when macroinvertebrates are collected and habitat conditions are assessed, six of the New York-Pennsylvania streams were dry so no macroinvertebrate or habitat assessment could be completed. Of the remaining eight sites, the biological community of four (50 percent) of these streams was nonimpaired. Overall, biological conditions improved at two sites, declined at four sites, and stayed the same at the other two stations. High metal concentrations, particularly total iron and total aluminum, appeared to be the most common sources of water quality degradation in this region. The parameters that exceeded New York and Pennsylvania state standards were total iron, total aluminum, total chlorine, pH, dissolved oxygen, and alkalinity. Iron standards were exceeded at Apalachian Creek, Cascade Creek, Choconut Creek, Little Snake Creek, and Troups Creek. Aluminum standards were exceeded at all of the New York-Pennsylvania streams. Total chlorine was exceeded at Cayuta Creek, while Cascade Creek and Little Snake Creek exceeded alkalinity standards. Dissolved oxygen standards were exceeded at Choconut Creek and Apalachian Creek, and pH standards were exceeded at Choconut Creek and Cayuta Creek. In fiscal year 2006, low flows may have impacted the water quality and biological conditions at the New York-Pennsylvania border streams.

Among the New York-Pennsylvania sites, three streams were slightly impaired (37.5 percent) and one site (12.5 percent) was designated as moderately impaired. Four of the New York-Pennsylvania sites had excellent habitats (50 percent), while the other four sites (50 percent) had supporting habitats. No sites had partially supporting or nonsupporting habitat. In overall habitat ratings, three sites improved, one site declined, and four sites remained the same as the previous year. The most common habitat concern among the New York-Pennsylvania streams is lack of riparian buffer zone along the stream banks.

During FY-06, eight Pennsylvania-Maryland sites were sampled. Scott Creek was dry during the sampling event so no macroinvertebrate or habitat data were collected. Four streams (50 percent) were designated nonimpaired using RBP III protocol designations. Three sites (37.5 percent) were slightly impaired, and one site (12.5 percent) was moderately impaired. No sites were ranked as severely impaired. Biological conditions at Pennsylvania-Maryland sites appeared to improve or remain the same for the second consecutive year, with the exception of Long Arm Creek, which showed some degradation.

Six (75 percent) of the Pennsylvania-Maryland border sites had excellent habitats, while two sites (25 percent) had supporting habitats. Water quality at four sites exceeded Pennsylvania and Maryland water quality standards: nitrite plus nitrate at CNWG 4.4, alkalinity at FBDC 4.1, pH at LNGA 2.5, and total chlorine at EBAU 1.5. The Pennsylvania-Maryland border streams are located in a heavily agricultural region, and many of the parameters that exceeded the 90th percentile at these sites were nutrients. Also, streambank erosion, lack of riparian buffers, and sedimentation created instream habitat problems in this region.

River sites consisted of nine stations located on the Susquehanna, Chemung, Cowanesque, and Tioga Rivers. This year two stations (SUSQ 10.0 and SUSQ 44.5) were not sampled for macroinvertebrates due to deep water and a lack of riffle habitat at the sites. Of the seven river sites that were sampled during fiscal year 2006, the biological community at four (57 percent) of these sites was nonimpaired. One site (14 percent) had slightly impaired biological conditions, and two sites (29 percent) were ranked as moderately impaired. At the three river sites that also were sampled the previous year, conditions remained generally the same, with the exception of a marked decline in biological condition at COWN 1.0. Water quality parameters that exceeded state standards were total iron, total aluminum, and dissolved oxygen. Total iron standards were exceeded at COWN 2.2, COWN 1.0, SUSQ 365.0, SUSQ 340.0, SUSQ 289.1, and TIOG 10.8. Total aluminum standards were exceeded at CHEM 12.0, COWN 2.2, COWN 1.0, SUSQ 365.0, SUSQ 340.0, SUSQ 289.1, and TIOG 10.8. Additionally, dissolved oxygen exceeded water quality standards at SUSQ 10.0. Water quality appeared to decline slightly with an increased number of state water quality standard violations. The habitat at five (71 percent) of the river sites was excellent and the other two sites (29 percent) rated as having supporting habitat.

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Seven of the 21 sites sampled (33 percent) had nonimpaired biological conditions. Nine sites (43 percent) were slightly impaired, and five sites (24 percent) were moderately impaired. Overall, five of the Group 3 sites demonstrated an improvement in biological condition, six sites showed a decline, and nine remained the same. Six (29 percent) of the Group 3 sites had excellent habitat scores. Fourteen sites (67 percent) had supporting habitat conditions, while one site (4 percent) was designated partially supporting, and no sites were nonsupporting. In overall habitat rankings, nine of the Group 3 sites were improved, two showed some degradation, and nine remained the same as the previous year.

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.

Future Study

Future study and remediation efforts should focus on those streams that had moderately impaired macroinvertebrate communities or exceeded water quality standards. Moderately impaired biological conditions were found at Seeley Creek, Long Arm Creek, both sites on the Cowanesque River (1.0 and 2.2), Babcock Run, Bill Hess Creek, Denton Creek, Dry Brook, and White Branch Cowanesque River. Additional study of stream water chemistry, biology, and habitat at varying flows may help explain some impairment problems.

During this sampling period, a large number of streams had water quality parameters that exceeded standards. These streams included Apalachian Creek, Bentley Creek, Cascade Creek, Cayuta Creek, Choconut Creek, Little Snake Creek, Seeley Creek, Snake Creek, South Creek, Troups Creek, Conowingo Creek, Ebaughs Creek, Falling Branch Deer Creek, Long Arm Creek, Chemung River, Cowanesque River (1.0 and 2.2), Susquehanna River (10.0, 289.1, 340, and 365), Tioga River, Deep Hollow Brook, and Denton Creek. The water quality conditions of these streams should be monitored for future violations. Furthermore, the source of these pollutants should be identified. State water quality standards vary across state lines, and problems may arise when the source of these pollutants is located in an adjacent state.

All data from interstate streams sampling from the mid-1980s to the present is available from SRBC upon request.

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