

BIOASSESSMENT OF INTERSTATE STREAMS

Abbreviations for water quality standards are provided in Table 19. Summaries of all stations include WQI scores, parameters that exceeded water quality standards, and parameters that exceeded the 90th percentile at each station. RBP III biological and habitat data also are provided, along with graphs depicting historical water quality and biological conditions over the past five years. A white bar indicates fiscal year 2003 WQI scores, and black bars in all WQI graphs indicate previous WQI scores.

New York-Pennsylvania Border Streams

Apalachin Creek (APAL 6.9)

Apalachin Creek at Little Meadows, Pa., (APAL 6.9), showed a slightly impaired biological community during fiscal year 2003 for the second year in a row. The number of taxa was higher than the previous year. However, the biological scores for percent dominant and EPT Index were low, and APAL 6.9 had the lowest percentage of Ephemeroptera of all the New York-Pennsylvania border streams. Habitat was rated partially supporting due to low scores in epifaunal substrate, sediment deposition, frequency of riffles, and riparian vegetative zone width.

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

Bentley Creek (BNTY 0.9)

A nonimpaired biological community existed at Bentley Creek in Wellsburg, N.Y., (BNTY 0.9) for the first time in the past 11 years. Organic pollution intolerant taxa present at BNTY 0.9 included *Atherix* (Diptera: Athericidae), *Antocha* (Diptera: Tipulidae), *Hexatoma* (Diptera: Tipulidae), *Serratella* (Ephemeroptera: Ephemerebellidae), *Epeorus* (Ephemeroptera:

Heptageniidae), *Stenonema* (Ephemeroptera: Heptageniidae), *Isonychia* (Ephemeroptera: Isonychiidae), *Acroneturia* (Plecoptera: Perlidae), *Agnatina* (Plecoptera: Perlidae), and *Neoperla* (Plecoptera: Perlidae). Habitat was rated excellent, although slightly low scores were given for channel flow status and channel alteration. The Bradford County Conservation District in Pennsylvania and the U.S. Fish and Wildlife Service are conducting a stream stabilization project on this stream. Rock structures, such as cross vanes and single rock vanes, have been constructed into portions of the stream to redirect the force of the flow.

During fiscal year 2000, water quality sampling at BNTY 0.9 was increased to quarterly sampling, and the stream was added to the Group 1 stations. Total iron concentrations exceeded New York standards during February and May 2000, but no values exceeding standards were found in fiscal years 2001–2003 (Table 21).

Cascade Creek (CASC 1.6)

Cascade Creek at Lanesboro, Pa., (CASC 1.6) was not sampled for macroinvertebrates and water quality in August 2002, due to drought conditions.

Cascade Creek was added to the Group 1 streams during the 2000 sampling season to monitor conditions in the stream during the winter months. Water quality standards for total iron, alkalinity, and dissolved solids were exceeded during the 2002–2003 sampling period (Table 22). Total iron and alkalinity standards have been exceeded in previous years. This site had the most water quality exceedances of all the New York-Pennsylvania streams.

Cayuta Creek (CAYT 1.7)

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

Table 19. Abbreviations Used in Tables 20 Through 51

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

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

Choconut Creek (CHOC 9.1)

The biological index score for Choconut Creek at Vestal Center, N.Y., (CHOC 9.1) increased in fiscal year 2003 after steadily

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

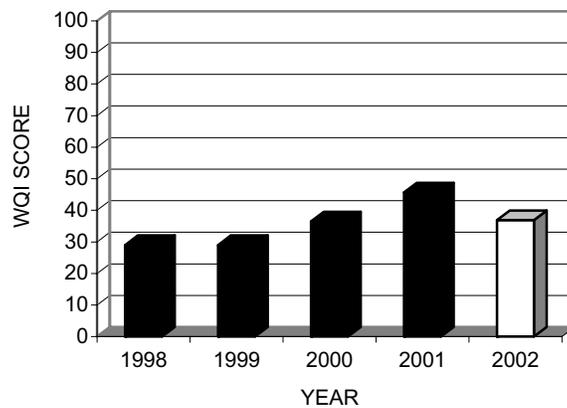
No parameters exceeded standards during August 2002, although the WQI was slightly higher than it has been in the past five years. Total ammonia was the only parameter to exceed the 90th percentile (Table 24).

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

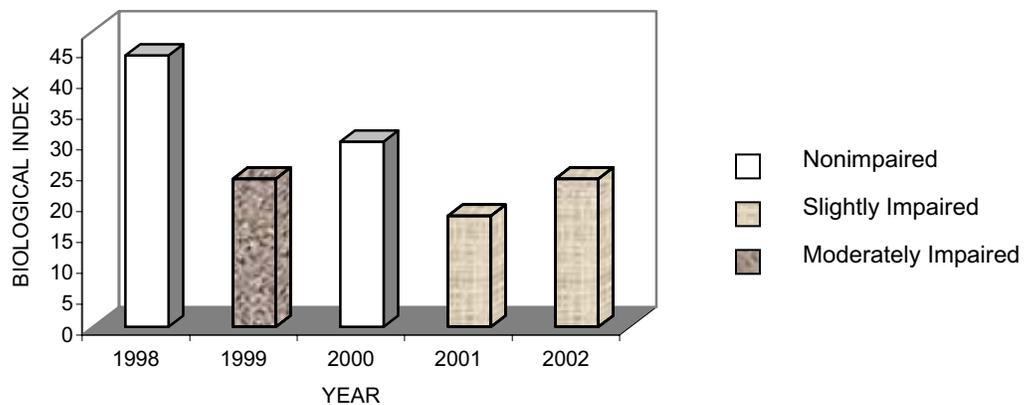
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	08/06/02	459 µg/l	300 µg/l	N.Y. aquatic (chronic)
DO	08/06/02	4.75 mg/l	5.0 mg/l	Pa. aquatic life

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

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



Water Quality Index



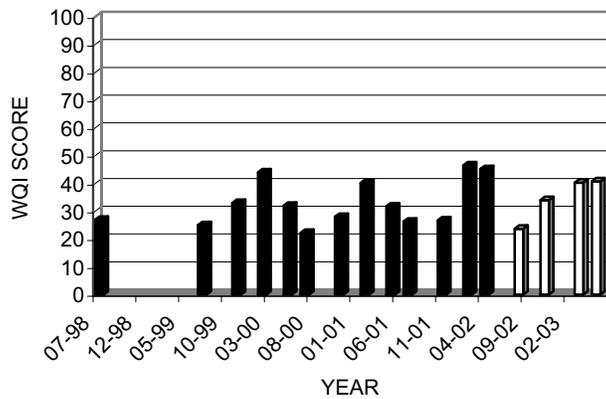
Biological Index

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

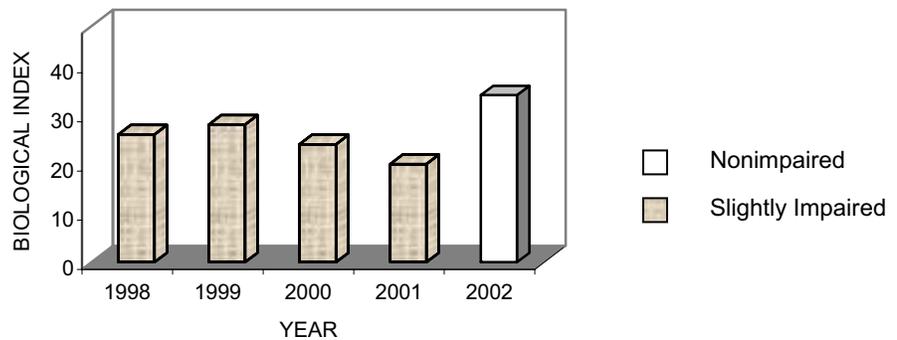
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



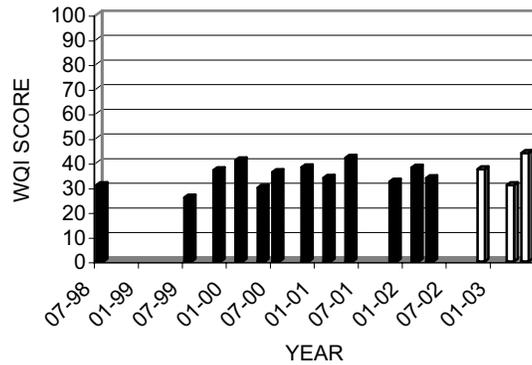
Biological Index

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

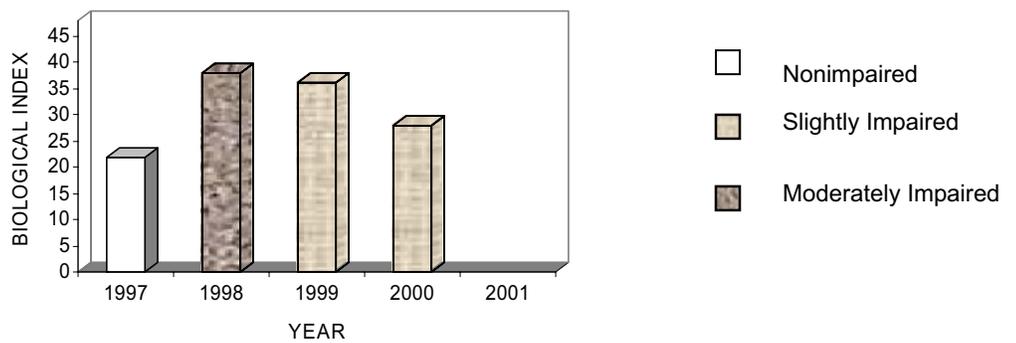
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	3/3/03	319 µg/l	300 µg/l	N.Y. aquatic (chronic)
TFe	5/27/03	415 µg/l	300 µg/l	N.Y. aquatic (chronic)
ALK	11/12/02	16 mg/l	20 mg/l	Pa. aquatic life
ALK	3/3/03	12 mg/l	20 mg/l	Pa. aquatic life
ALK	5/27/03	14 mg/l	20 mg/l	Pa. aquatic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

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

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



Water Quality Index



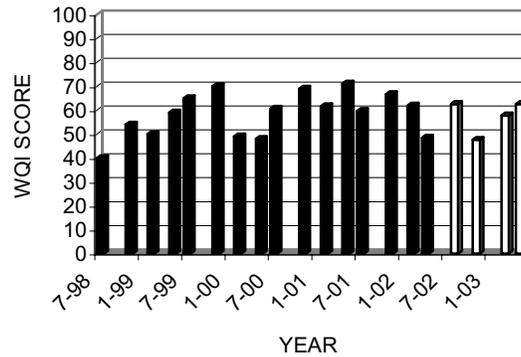
Biological Index

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

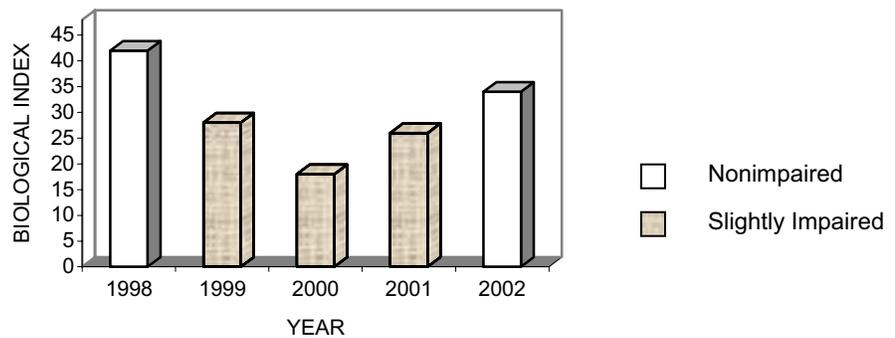
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	08/07/02	1270 µg/l	100 µg/l	N.Y. aquatic (chronic)
TCIn	08/07/02	0.04 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCIn	11/13/02	0.13 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCIn	03/04/03	0.12 mg/l	0.019 mg/l	N.Y. aquatic (acute)
TCIn	05/28/03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

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

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



Water Quality Index



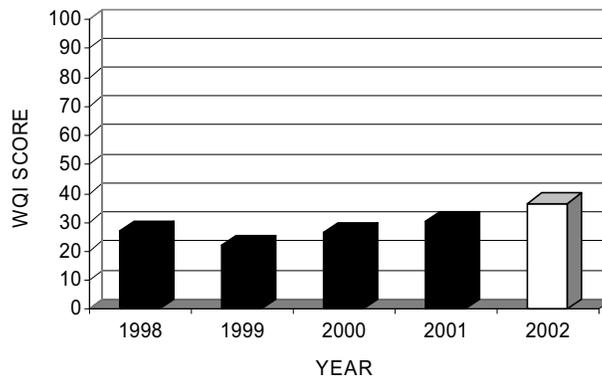
Biological Index

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

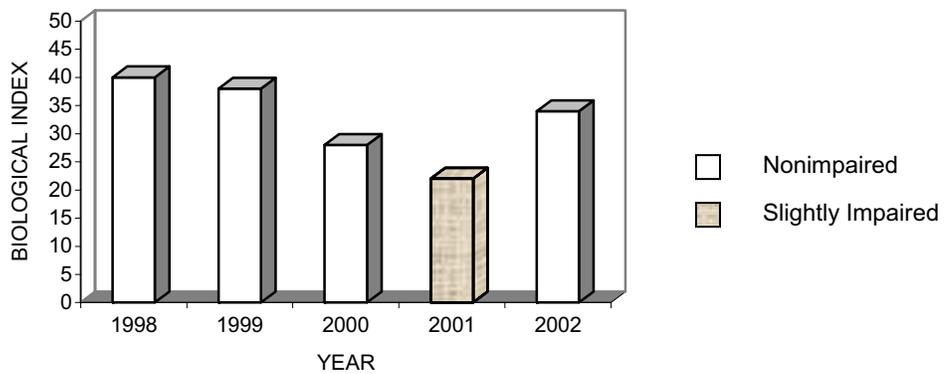
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



Biological Index

Holden Creek (HLDN 3.5)

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

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

Little Snake Creek (LSNK 7.6)

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

North Fork Cowanesque River (NFCR 7.6)

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

Seeley Creek (SEEL 10.3)

During the 1999-2000 sampling season, Seeley Creek was added to the Group 1 streams in the ISWQN. Seeley Creek at Seeley Creek, N.Y., (SEEL 10.3) contained a moderately impaired biological community for the past five years. In August 2002, SEEL 10.3 was rated slightly impaired; however, this site had the lowest Shannon Diversity Index (1.7), highest Hilsenhoff Biotic Index (5.3), highest percentage Chironomidae (56.1), and highest percent dominant taxon (56.1) of all Group 1 and 2 New York-Pennsylvania streams. Chironomidae heavily dominated this site as in previous years. No parameters exceeded standards, and only dissolved oxygen exceeded the 90th percentile (Table 28).

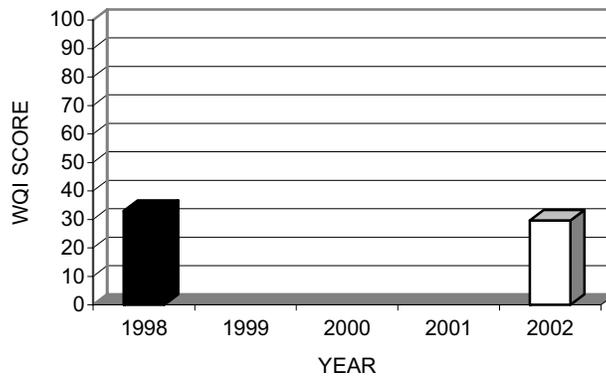
Habitat conditions appear to be a possible cause for the impaired macroinvertebrate community. New York State Department of Conservation (NYSDEC) listed Seeley Creek as “threatened” in its publication, The 1998 Chemung River Basin Waterbody Inventory and Priority Waterbodies List (NYSDEC, 1998). According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

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

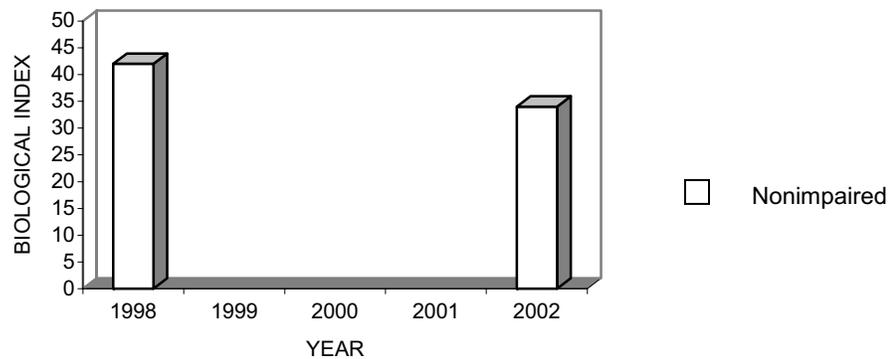
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



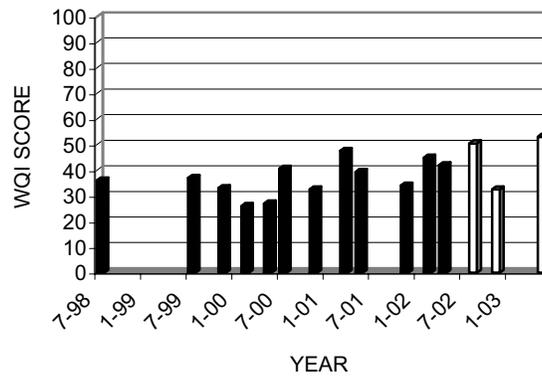
Biological Index

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

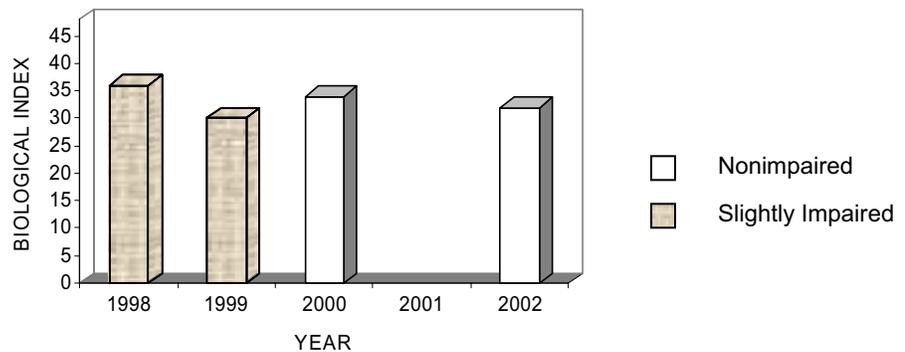
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	08/06/02	590 µg/l	300 µg/l	N.Y. aquatic (chronic)
DFe	08/06/02	404 µg/l	300 µg/l	Pa. public water supply
ALK	05/27/03	18 mg/l	20 mg/l	Pa. aquatic life
TFe	05/27/03	423 µg/l	300 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



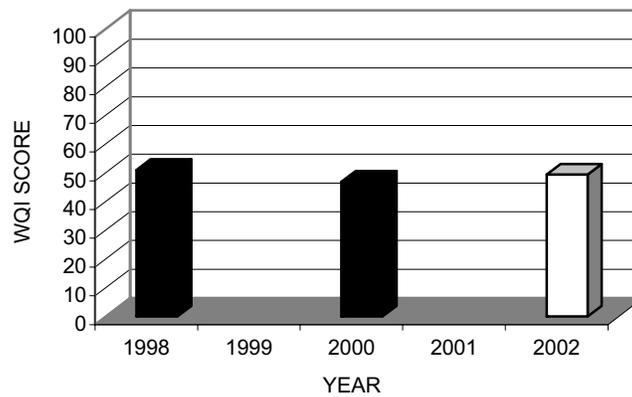
Biological Index

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

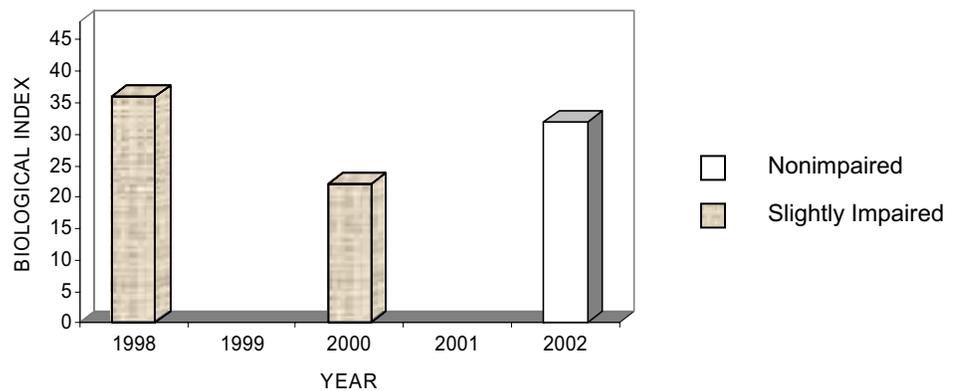
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



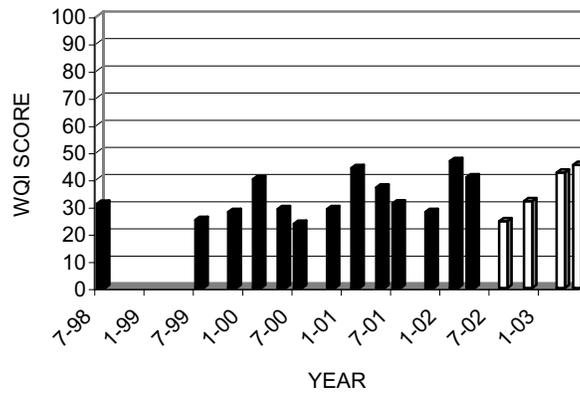
Biological Index

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

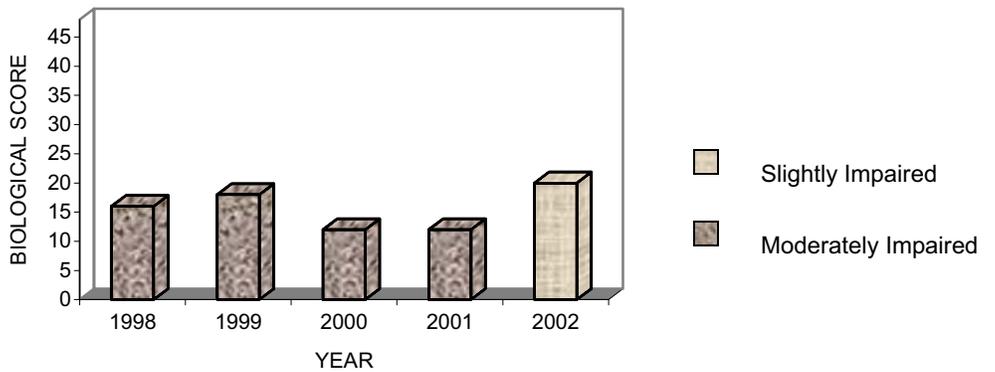
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



Biological Index

Snake Creek (SNAK 2.3)

Snake Creek at Brookdale, Pa., (SNAK 2.3) served as the reference site for the New York-Pennsylvania border streams. It had a nonimpaired biological community, excellent physical habitat, and a relatively low WQI score with no parameters exceeding standards (Table 29). The biological community has remained nonimpaired for the past six years. Snake Creek supported many pollution intolerant taxa, including *Atherix*, *Antocha*, *Dicranota*, *Centroptilum* (Ephemeroptera: Baetidae), *Serratella*, *Epeorus*, *Stenonema*, *Isonychia*, *Neoperla*, *Paragnetina* (Plecoptera: Perlidae), *Glossosoma* (Trichoptera: Glossosomatidae), and *Rhyacophila*.

SRBC staff conducted a small watershed study on the Snake Creek Watershed during the second year of the Upper Susquehanna Subbasin Survey (Diehl and Sitlinger, 2001). Ten sites in the Snake Creek Watershed and three sites on the Little Snake Creek Watershed were monitored during low and high flow for water quality, macroinvertebrates, and physical habitat. The study concluded that the Snake Creek Watershed was healthy and recommended that this watershed be protected. The Little Snake Creek Watershed showed signs of heavy dredging, and the study recommended that the riparian vegetation along areas of the stream be reestablished.

South Creek (SOUT 7.8)

During fiscal year 2003, South Creek at Fassett, Pa., (SOUT 7.8) had a nonimpaired biological community. Organic pollution intolerant taxa at this site consisted of *Promoresia* (Coleoptera: Elmidae), *Atherix*, *Antocha*, *Dicranota*, *Leucrocuta*, *Stenonema*, *Isonychia*, *Sweltsa*, *Acroneuria*, *Neoperla*, and *Psilotreta* (Trichoptera: Odontoceridae). The macroinvertebrate community at this site has fluctuated in its degree of impairment throughout the past five years between moderately impaired, slightly impaired, and nonimpaired.

No water quality parameters exceeded standards, although total organic carbon exceeded

the 90th percentile for New York-Pennsylvania border streams (Table 30). The habitat was rated excellent; however, channel flow status was low, and SRBC staff noted the upstream streambed was rather dry. Habitat impairment by flooding has been noted in the past; therefore, biological impairment at this site may be due to large fluctuations in flow and periodic drying of the streambed.

Troups Creek (TRUP 4.5)

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

Trowbridge Creek (TROW 1.8)

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

Wappasening Creek (WAPP 2.6)

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

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

Pennsylvania-Maryland Streams

Big Branch Deer Creek (BBDC 4.1)

Big Branch Deer Creek at Fawn Grove, Pa., (BBDC 4.1) served as the reference site for the Pennsylvania-Maryland border streams during fiscal year 2003. This site had the best combination of biological community, physical habitat, and water quality of the Pennsylvania-Maryland streams. It had the best value for the EPT Index (16) and Hilsenhoff Biotic Index (3.22) metric of all the New York-Pennsylvania border streams, indicating the presence of a large number of organic pollution intolerant taxa at this site. These taxa with a Hilsenhoff Biotic Index value of 3 or less included *Promoresia*, *Antocha*, *Dicranota*, *Serratella*, *Epeorus*, *Leucrocuta*, *Nixe* (Ephemeroptera: Heptageniidae), *Stenonema*, *Isonychia*, *Nigronia*, *Cordulegaster* (Odonata: Cordulegastridae), *Leuctra*, *Acroneturia*, *Diplectrona*, *Dolophilodes*, *Wormaldia*, and *Rhyacophila*. The biological community has been nonimpaired for at least the past five years. Water quality was good in Big Branch Deer Creek in August 2002, with no parameters exceeding standards or the 90th percentile (Table 34). The land cover at this site was predominantly forest with the only low score resulting from sediment deposition in pools and slight erosion of the streambanks.

Conowingo Creek (CNWG 4.4)

Conowingo Creek at Pleasant Grove, Pa., (CNWG 4.4) had a slightly impaired community for the third year in a row. This stream was impacted by agricultural activities, as evidenced by high sediment deposition and elevated nutrients. Parameters that exceeded the 90th percentile were predominantly forms of nitrogen with some phosphorus, orthophosphates, solids, and dissolved iron (Table 35). CNWG 4.4 had the highest values of total and dissolved nitrogen

(11.0 mg/l and 10.83 mg/l, respectively), total and dissolved nitrate (10.01 mg/l and 10.09 mg/l, respectively), total and dissolved solids (1,766 mg/l and 1,760 mg/l, respectively), and dissolved orthophosphate (0.476 mg/l) of all the interstate streams (Table A2). Nitrate plus nitrite and dissolved solids exceeded the Pennsylvania standards for public water supply. This stream also has relatively high metals at times due to problems with sediment erosion in the watershed.

Deer Creek (DEER 44.2)

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

Ebaughs Creek (EBAU 1.5)

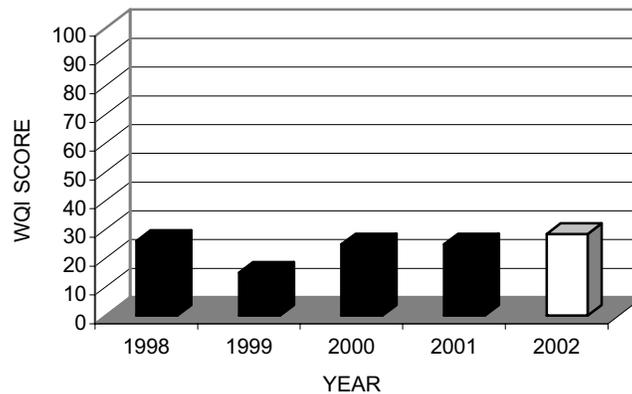
Ebaughs Creek at Stewartstown, Pa., (EBAU 1.5) had a slightly impaired community in July 2002. This site usually has slightly or moderately impaired biological conditions, with the July 2001 rating of nonimpaired being an anomaly. EBAU 1.5 had the best percent Chironomidae score (2.33 percent) of all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

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

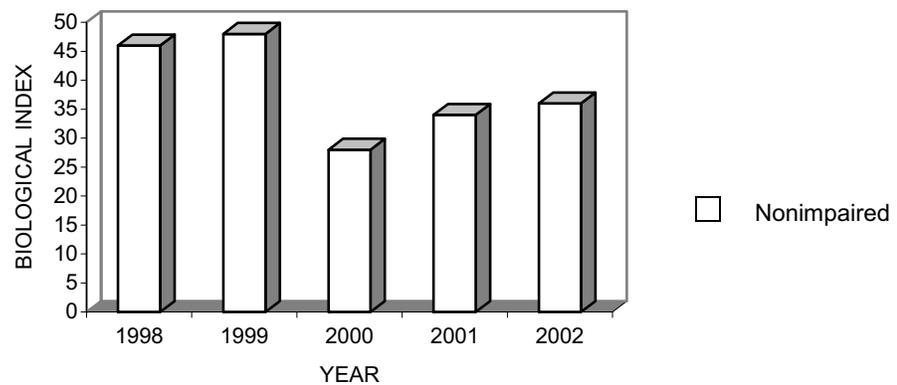
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



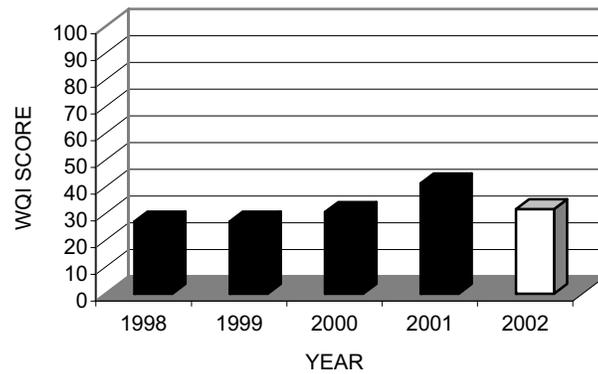
Biological Index

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

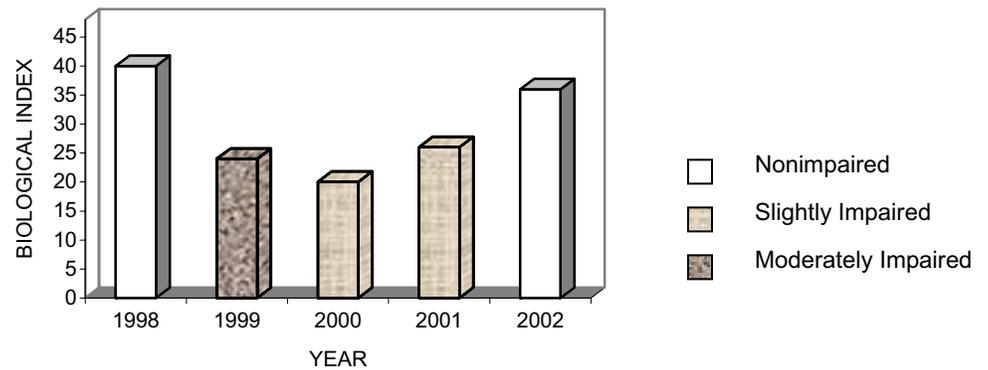
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



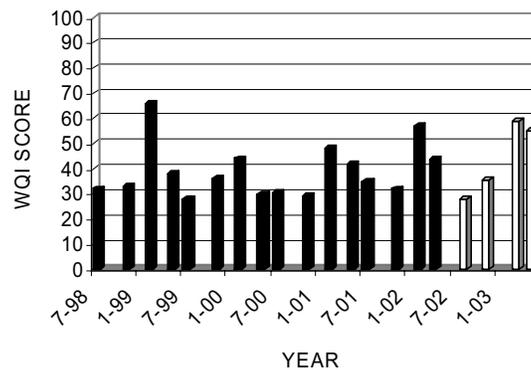
Biological Index

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

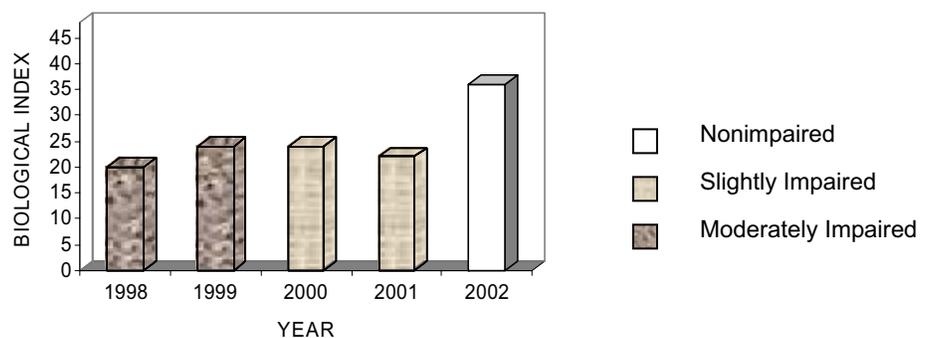
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	03/05/03	363 µg/l	100 µg/l	N.Y. aquatic (chronic)
TFe	03/05/03	428 µg/l	300 µg/l	N.Y. aquatic (chronic)
pH	05/29/03	9.0	6.5-8.5	N.Y. general
TFe	05/29/03	351 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAI	05/29/03	267 µg/l	100 µg/l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

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

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



Water Quality Index



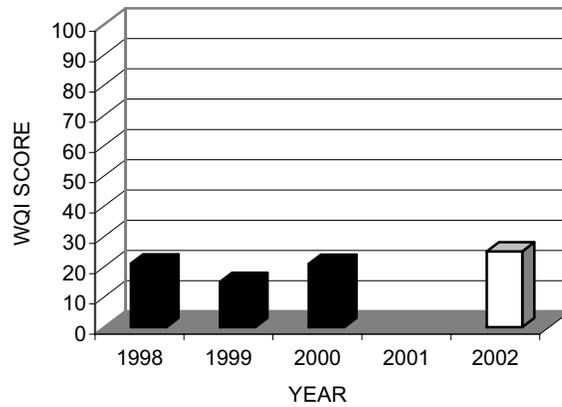
Biological Index

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

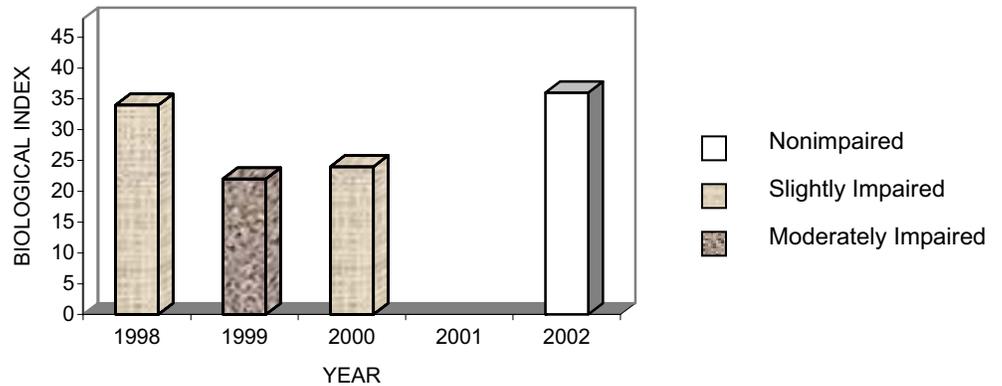
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
NA				

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

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



Water Quality Index



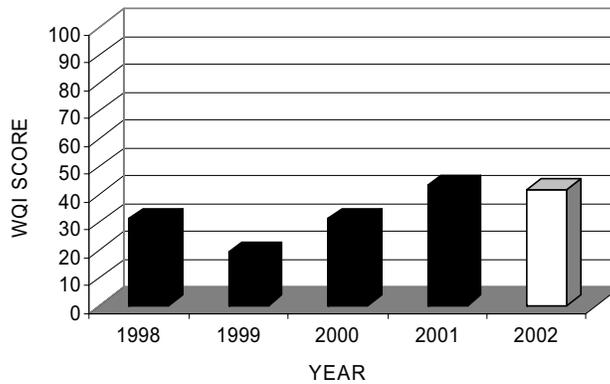
Biological Index

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

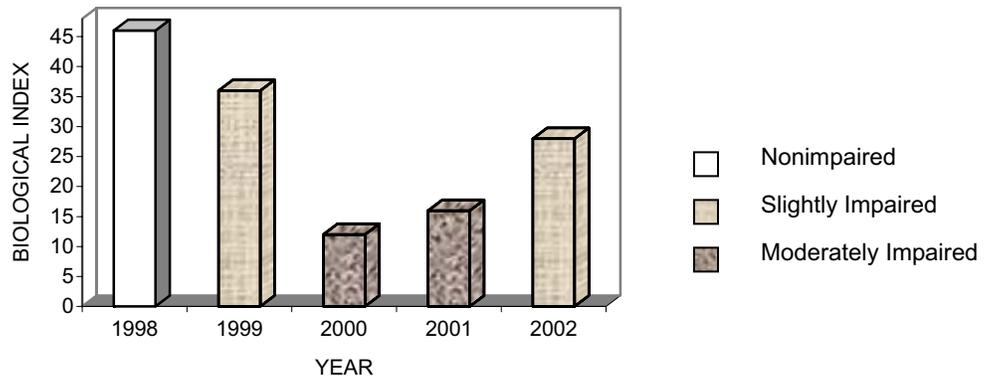
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



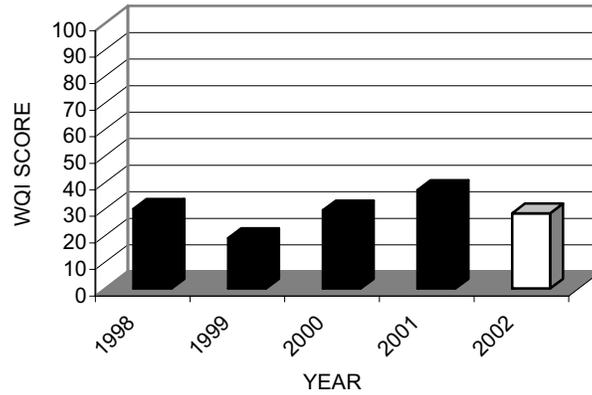
Biological Index

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

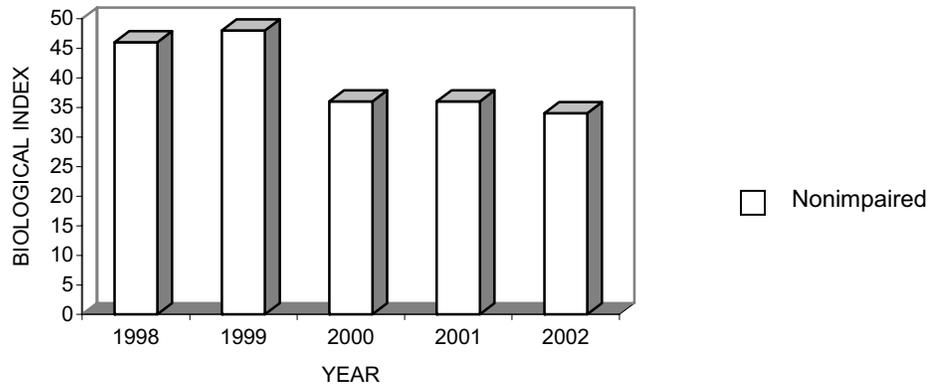
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



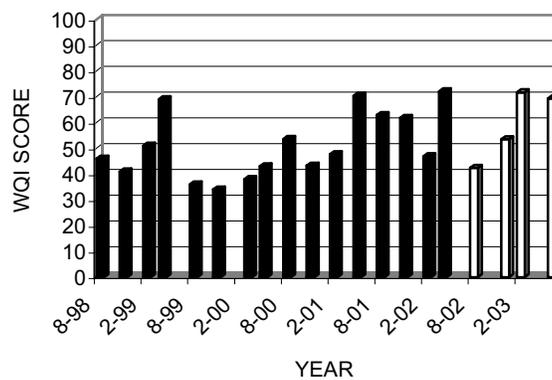
Biological Index

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

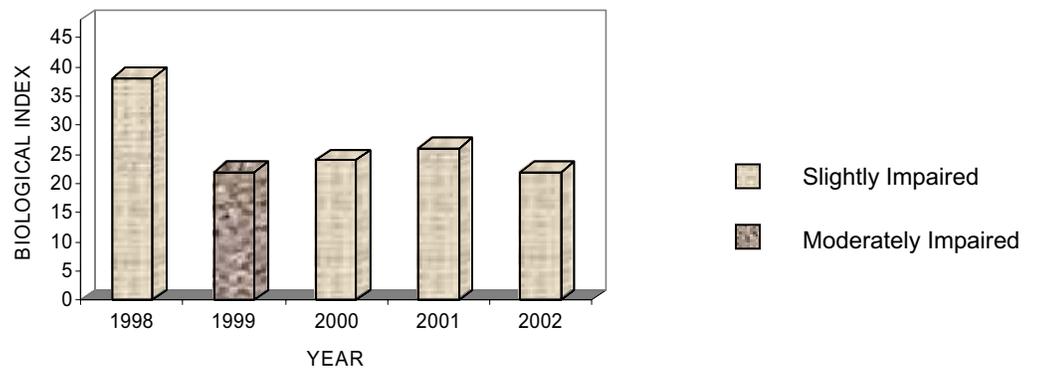
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
Nitrite plus Nitrate	12/18/02	10.02 mg/l	10.0 mg/l	Pa. public water supply
DS	06/03/03	1760 mg/l	750 mg/l	Pa. public water supply

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

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



Water Quality Index



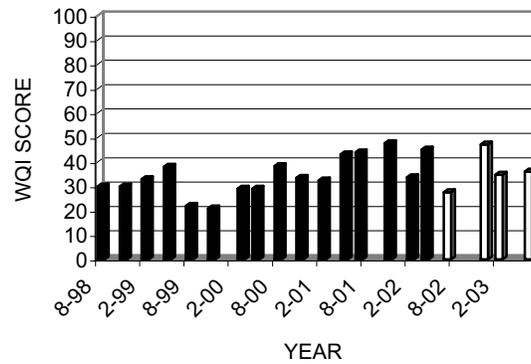
Biological Index

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

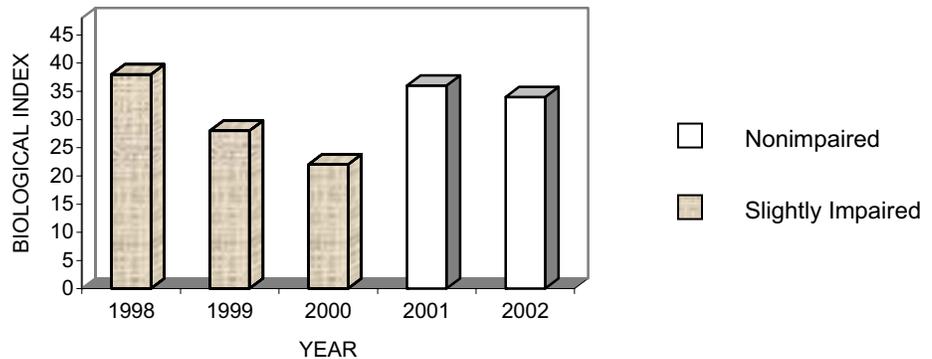
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
ALK	12/18/02	12 mg/l	20 mg/l	Pa. aquatic life

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

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



Water Quality Index



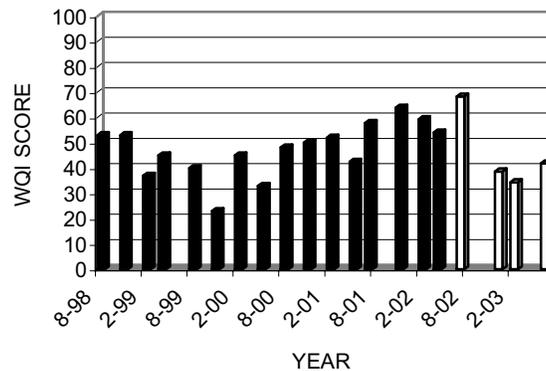
Biological Index

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

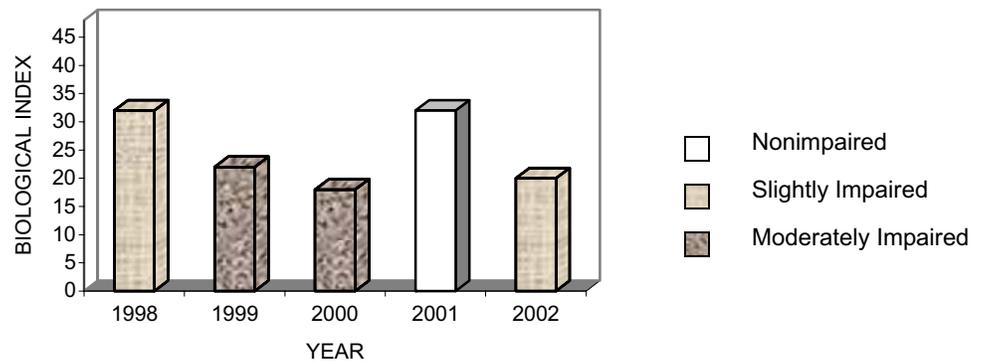
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TCIn	07/30/02	0.07 mg/l	0.019 mg/l	Md. aquatic life
TCIn	02/27/03	0.1 mg/l	0.019 mg/l	Md. aquatic life
TCIn	06/02/03	0.05 mg/l	0.019 mg/l	Md. aquatic life

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

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



Water Quality Index



Biological Index

Falling Branch Deer Creek (FBDC 4.1)

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

Long Arm Creek (LNGA 2.5)

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

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

Octoraro Creek (OCTO 6.6)

Octoraro Creek at Rising Sun, Md., (OCTO 6.6) had a slightly impaired biological community. Although no parameters exceeded state standards, numerous metals and organics exceeded the 90th percentile (Table 40). In fact, OCTO 6.6 had the highest total and dissolved ammonia (1.34 mg/l and 1.3 mg/l, respectively), total and dissolved phosphorus (0.75 mg/l and 0.56 mg/l, respectively), total organic carbon

(10.6 mg/l), total iron (2320 µg/l), total aluminum (2070 µg/l), and total orthophosphate (0.569 mg/l) (Table A2). The high levels of metals appear to be from considerable erosion of soil in this watershed during high flows. The WQI values are higher during the higher flow periods.

Scott Creek (SCTT 3.0)

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

South Branch Conewago Creek (SBCC 20.4)

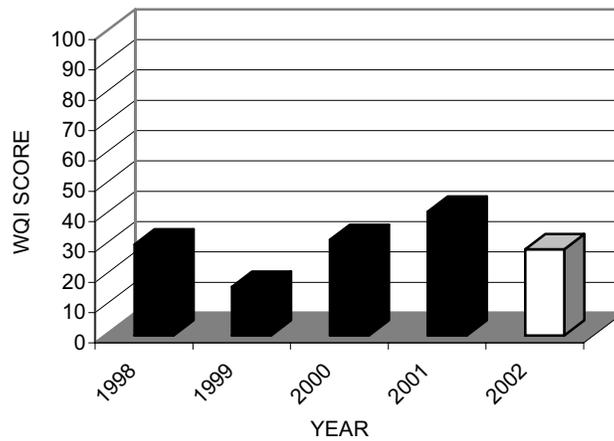
South Branch Conewago Creek near Bandanna, Pa., (SBCC 20.4) contained a slightly impaired biological community for the sixth consecutive year. No water quality standards were exceeded, and no parameters exceeded the 90th percentile (Table 42). The habitat was rated supporting with low scores for epifaunal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

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

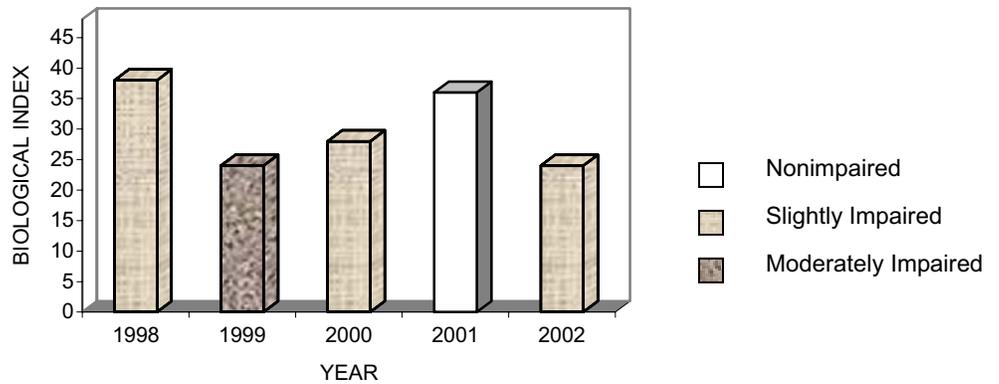
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



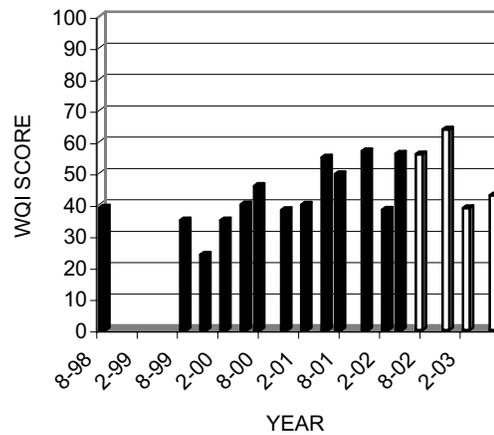
Biological Index

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

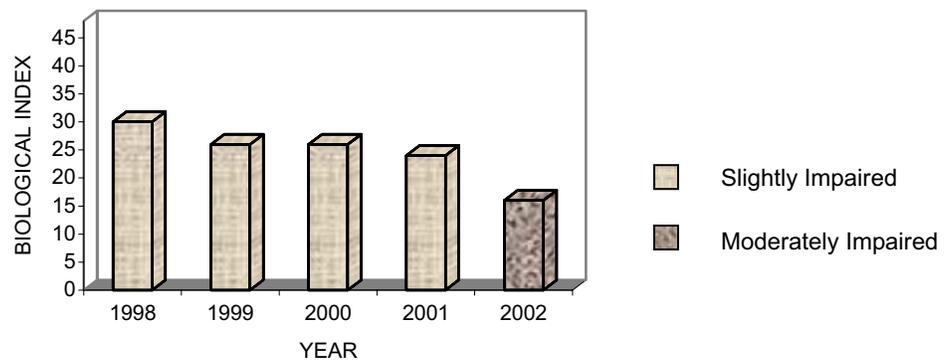
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



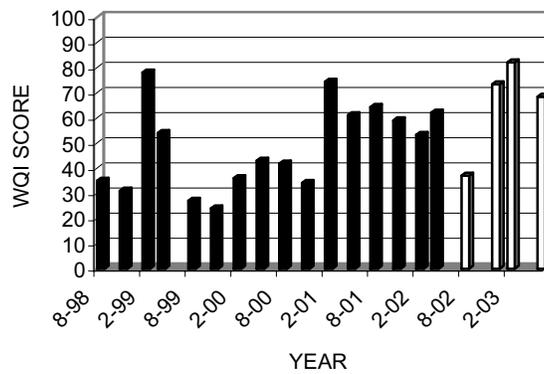
Biological Index

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

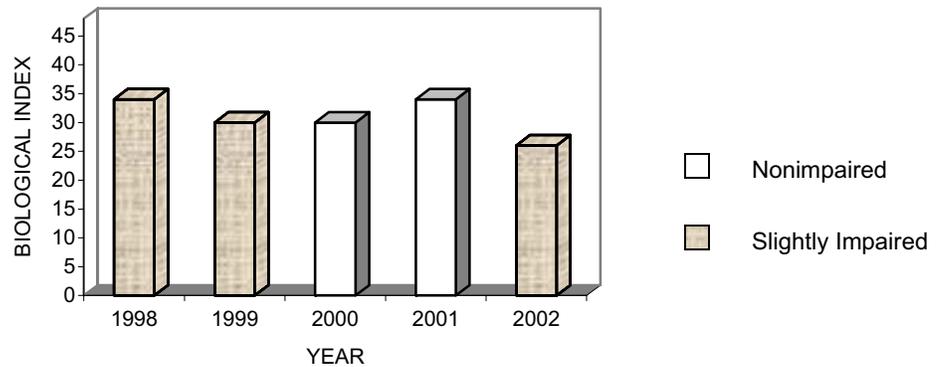
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



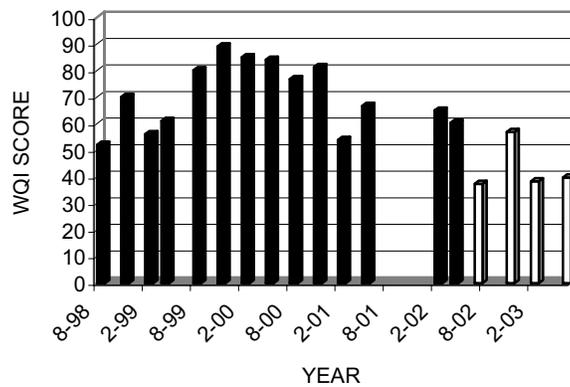
Biological Index

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

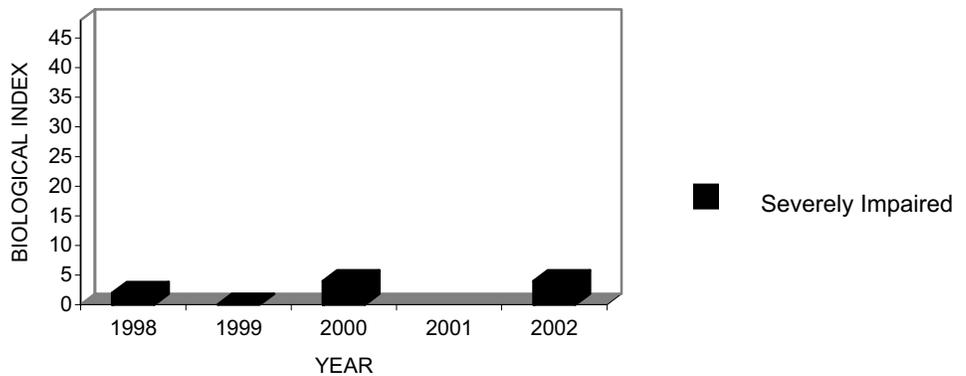
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



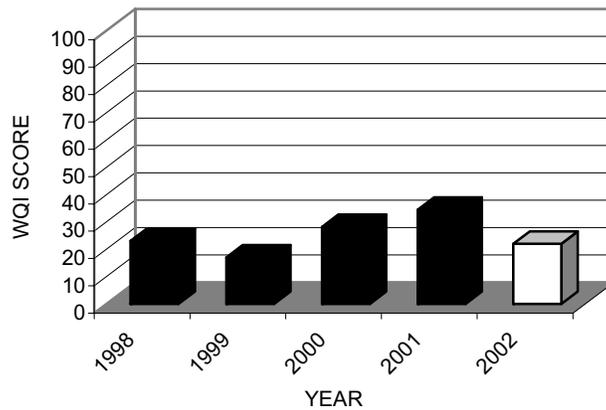
Biological Index

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

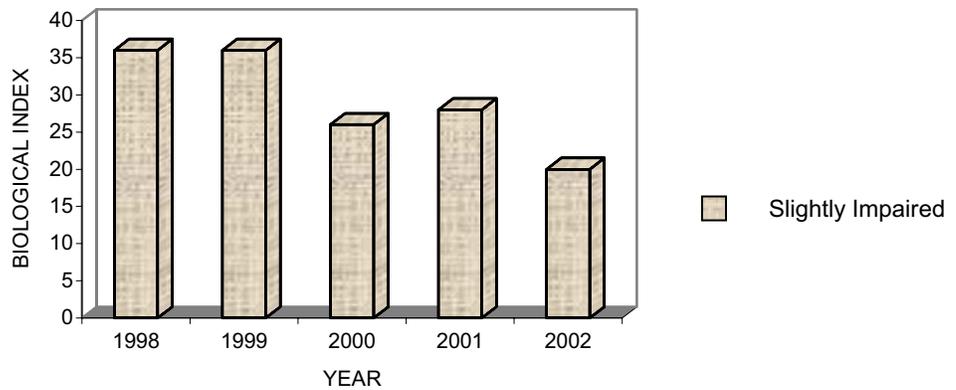
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



Biological Index

River Sites

Chemung River (CHEM 12.0)

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

Cowanesque River (COWN 2.2)

Moderately impaired biological conditions existed on the Cowanesque River downstream of the Cowanesque Reservoir at Lawrenceville, Pa., (COWN 2.2). Moderately to severely impaired conditions have existed at this site for the past 11 years of sampling. In the past, increased phytoplankton production in the Cowanesque Reservoir may have caused a shift in the macroinvertebrate community, resulting in a biological population dominated by filter-feeding organisms. Additionally, the bottom discharge from the dam depressed oxygen levels in the Cowanesque River downstream of the outflow. COWN 2.2 had the worst performance on all macroinvertebrate metrics compared to other river sites. During August 2002, the site was dominated by Chironomidae (Diptera) and *Cheumatopsyche* (Trichoptera: Hydropsychidae), and the rest of the sample mostly consisted of other taxa tolerant of low dissolved oxygen conditions such as *Hemerodromia* (Diptera: Empididae), *Caecidotea* (Isopoda: Asellidae), *Gammarus* (Amphipoda: Gammaridae), *Gordius* (Nematomorpha: Gordidae), *Simulium* (Diptera: Simuliidae), and *Ceratopsyche* (Trichoptera: Hydropsychidae). However, the presence of

Stenonema, which is organic pollution intolerant, was noted at this site. The diversity also appears to be slightly improved in 2002, and the number of taxa increased from five to 15.

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

Cowanesque River (COWN 1.0)

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

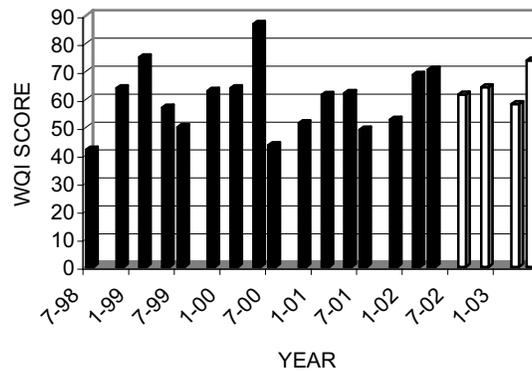
Total iron and total aluminum exceeded the New York water quality standards in November and March. Parameters that exceeded the 90th percentile were total organic carbon, total and dissolved nitrite, total and dissolved nitrogen, dissolved oxygen, total iron, and total sulfate (Table 45). The Cowanesque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

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

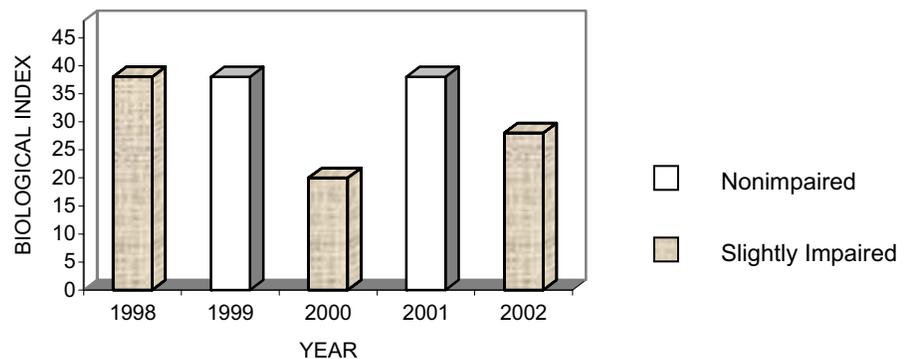
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	03/04/03	302 µg/l	300 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



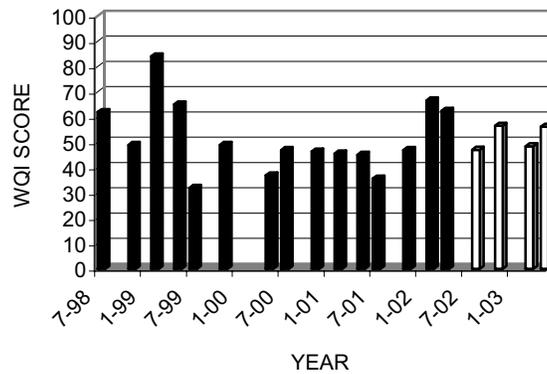
Biological Index

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

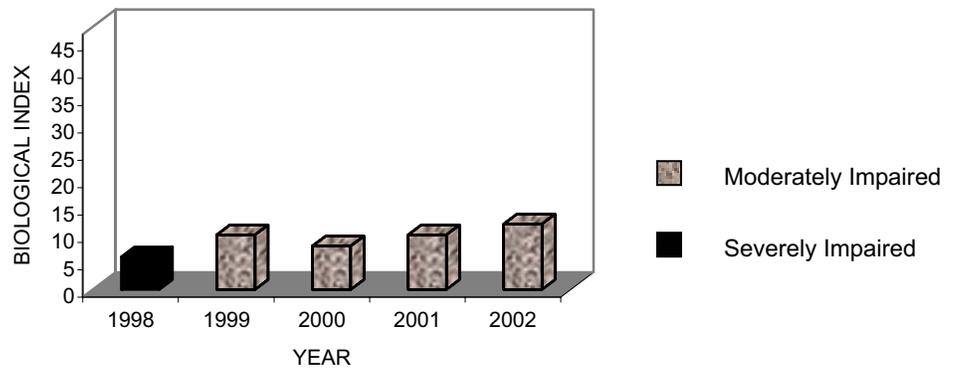
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	11/14/02	584 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAI	11/14/02	301 µg/l	100 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



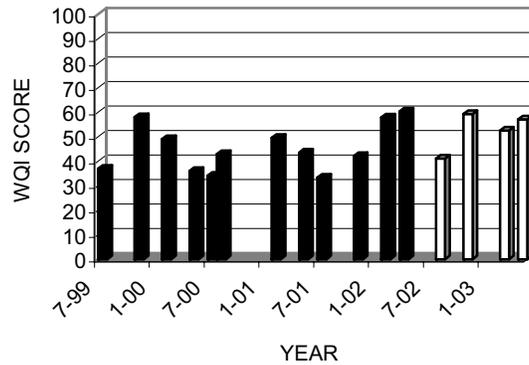
Biological Index

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

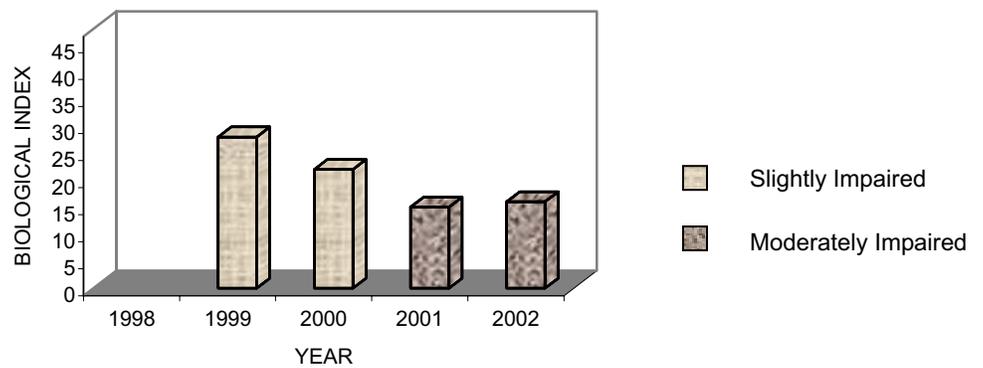
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TFe	11/13/02	341 µg/l	300 µg/l	N.Y. aquatic (chronic)
TFe	03/04/03	611 µg/l	300 µg/l	N.Y. aquatic (chronic)
TAI	11/13/02	205 µg/l	100 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



Biological Index

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

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

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

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

Susquehanna River at Sayre, Pa. (SUSQ 289.1)

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

Susquehanna River at Marietta, Pa. (SUSQ 44.5)

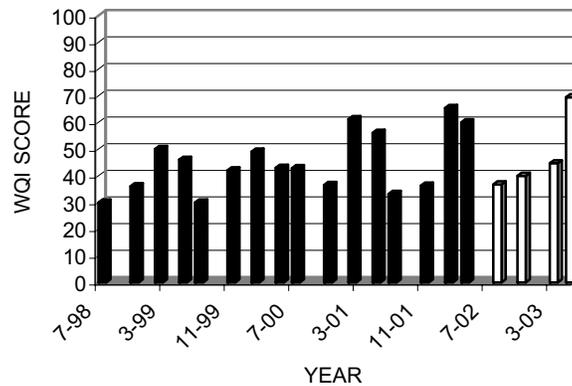
The Susquehanna River at Marietta, Pa., (SUSQ 44.5) had a slightly impaired biological community in August 2002. This site had the best score for percent Chironomidae (0.97 percent) metrics of all the Pennsylvania-Maryland streams. No parameters exceeded Pennsylvania or Maryland water quality standards;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

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

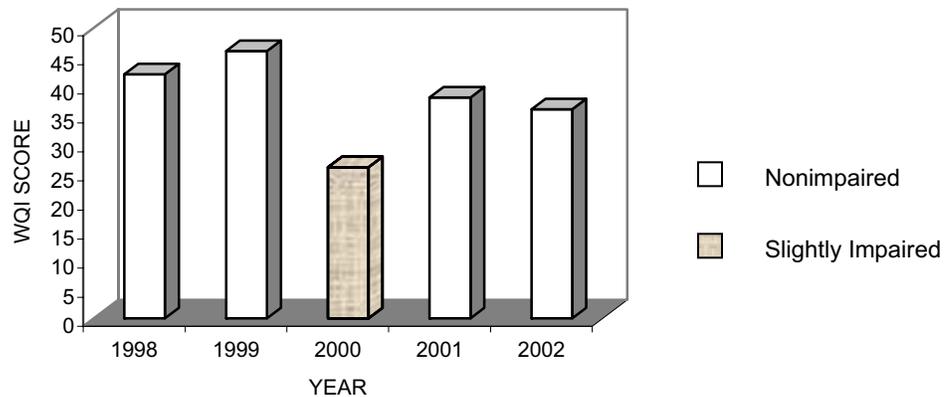
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
pH	08/05/02	8.6	6.5-8.5	N.Y. general
TFe	05/27/03	340 µg/l	300 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



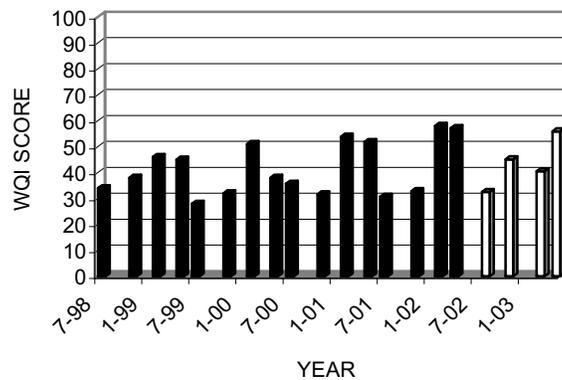
Biological Index

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

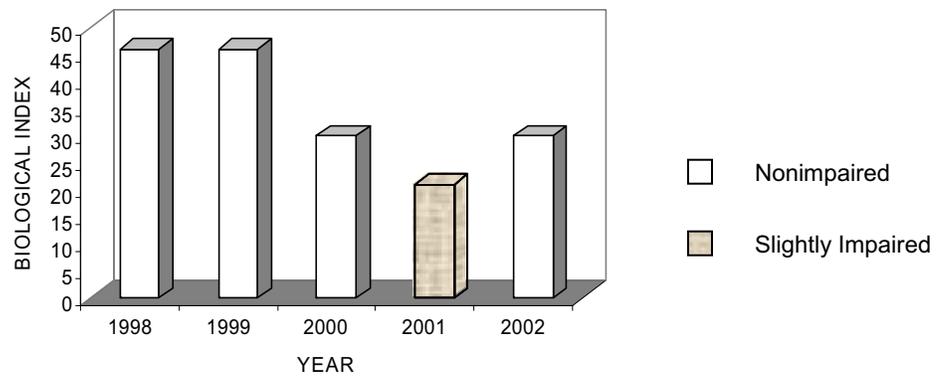
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
DS	11/12/02	1274 mg/l	750 mg/l	Pa. public water supply
DS	11/12/02	1274 mg/l	500 mg/l	N.Y. general

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

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



Water Quality Index



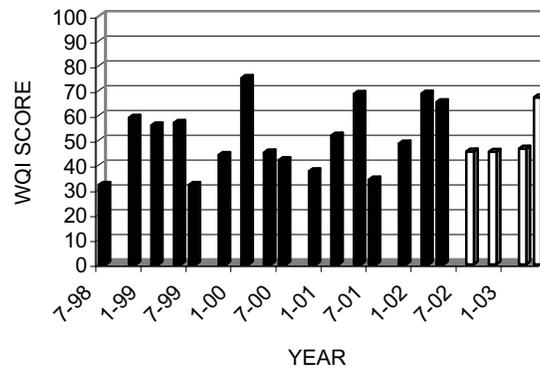
Biological Index

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

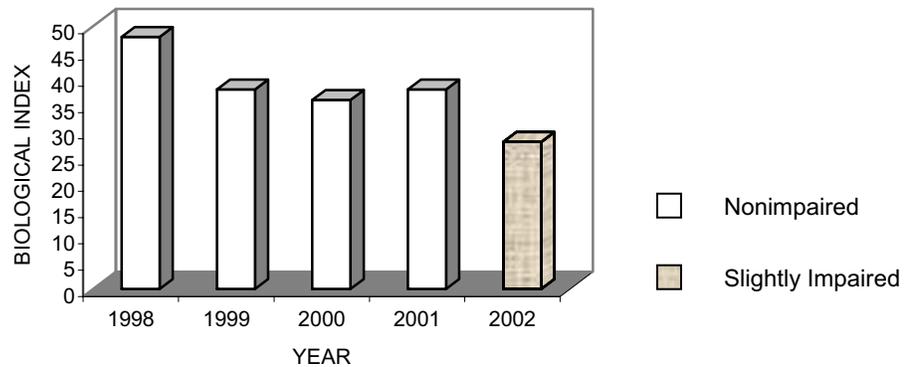
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
TAI	05/28/03	212 µg/l	100 µg/l	N.Y. aquatic (chronic)

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

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



Water Quality Index



Biological Index

Susquehanna River at Conowingo, Md.
(SUSQ 10.0)

No macroinvertebrate sampling was performed in the Susquehanna River at Conowingo, Md., (SUSQ 10.0) due to deep waters and a lack of riffle habitat. Dissolved oxygen exceeded the Maryland aquatic life standard in July and exceeded the 90th percentile in July, November, and June. SUSQ 10.0 was not sampled in February due to the access area being closed. Other parameters that exceeded the 90th percentile were total sulfate, dissolved iron, and dissolved manganese (Table 50).

Tioga River (TIOG 10.8)

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

sulfate was elevated in all the samples, and the dissolved manganese value (328 µg/l) in March was the highest of all interstate streams (Table A1).

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

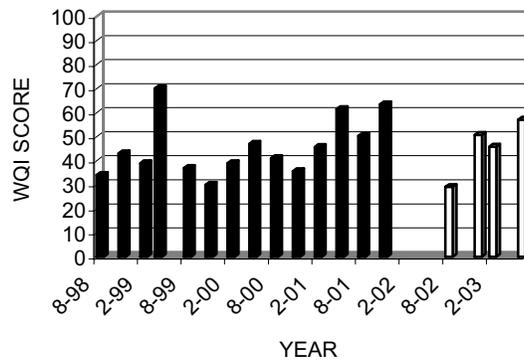
In 2001 and 2002, SRBC and Gannett Fleming, Inc. assessed the Pennsylvania portion of the Tioga River Watershed and developed a remediation strategy through the aid of a Pennsylvania Growing Greener Grant. SRBC produced a report identifying acid mine drainage problem areas and prioritizing sites for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

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

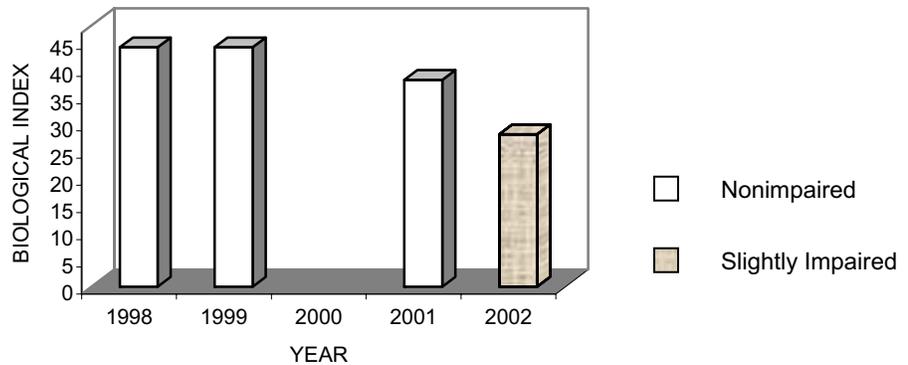
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index

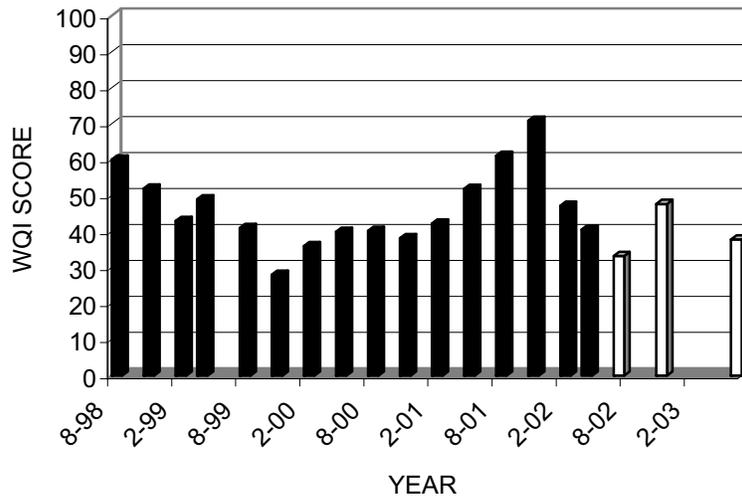


Biological Index

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

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

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



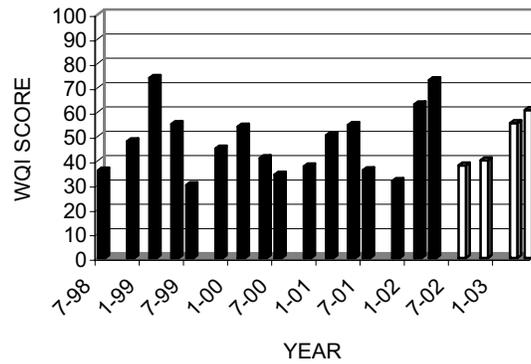
Water Quality Index

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

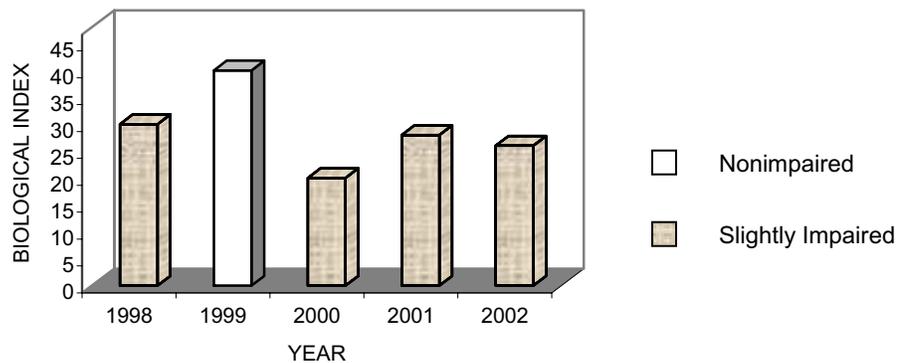
Parameters Exceeding Standards				
Parameter	Date	Value	Standard	State
None				

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

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



Water Quality Index



Biological Index

Group 3 Sites

Babcock Run (BABC)

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

Beagle Hollow Run (BEAG)

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

Bill Hess Creek (BILL)

Bill Hess Creek near Nelson, Pa., was designated slightly impaired. The sample taken at Bill Hess Creek scored well in percent Ephemeroptera (57.4 percent), and the sample was mostly dominated by *Acentrella* (Ephemeroptera: Baetidae) and *Paraleptophlebia*. The habitat was rated excellent, although a lot of algae were noted in the stream, and the rocks were slippery and white. All field chemistry parameters were within acceptable limits, although conductivity (339 μ mhos/cm), alkalinity (120 mg/l), and pH (8.2) were the highest and acidity (1.0 mg/l) was the lowest of the Group 3 streams (Table A3).

Bird Creek (BIRD)

Bird Creek near Webb Mills, N.Y., was designated slightly impaired. This site had a high percent Ephemeroptera metric score (52.3 percent) and was dominated by the organic pollution intolerant taxon *Drunella*. The habitat was designated excellent and was located in a predominantly forested area. All field chemistry parameters fell within acceptable ranges.

Biscuit Hollow (BISC)

Moderately impaired biological conditions existed at Biscuit Hollow near Austinburg, Pa., during this survey. The site was heavily dominated by the taxon *Amphinemura*. The impairment was most likely due to habitat conditions. The physical habitat at this site was considered partially supporting, with a poor riparian vegetative zone width, frequency of riffles, instream cover, sediment deposition, and epifaunal substrate. The site had eroded banks and was located in an agricultural area downstream of numerous beaver dams. Field chemistry parameters were within natural ranges.

Briggs Hollow Run (BRIG)

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

Bulkley Brook (BULK)

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

supporting habitat conditions during the 2002-2003 sampling season. Low-flow conditions caused difficulty in collecting a macroinvertebrate sample and allowed excessive sediment deposition in the pools. Also, a beaver dam was noted upstream. Field chemistry indicated that all parameters were within acceptable limits.

Camp Brook (CAMP)

Camp Brook near Osceola, Pa., had a slightly impaired biological community in May 2003. This site had higher Shannon Diversity Index (2.52) and EPT Index (18) metric scores than most of the other Group 3 sites. The physical habitat of the stream was designated excellent, although a large amount of algae was noted on the rocks. All field chemistry parameters were normal. The conductivity value at Camp Brook of 288 $\mu\text{mhos/cm}$ (micromhos per centimeter) was the second highest value of all Group 3 streams (Table A3).

Cook Hollow (COOK)

Cook Hollow near Austinburg, Pa., had a slightly impaired biological community. This site scored highest of all Group 3 streams in the taxonomic richness (34), Shannon Diversity Index (2.65), EPT Index (22) metrics. *Amphinemura* dominated the sample in May 2003. The streambed was embedded, and the flow was low, making it difficult to sample for macroinvertebrates. The habitat was rated supporting, and field chemistry parameters were all within acceptable limits.

Deep Hollow Brook (DEEP)

The biological community of Deep Hollow Brook near Danville, N.Y., was designated slightly impaired with excellent physical habitat. This site had high taxonomic richness (30), high Shannon Diversity Index value (2.51), and good percent dominant taxon (19.8 percent). A lot of algae were noted in the stream, and a beaver dam was located upstream of the sampling site on Deep Hollow Brook. Alkalinity (8.0 mg/l) was the lowest value of all Group 3 streams and exceeded the Pennsylvania aquatic life standard. This site had low alkalinity in previous years,

also. The pH value (6.25) also exceeded the New York general water quality standard.

Denton Creek (DENT)

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

Dry Brook (DRYB)

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

Little Wappasening Creek (LWAP)

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

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

Parks Creek (PARK)

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

Prince Hollow Run (PRIN)

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

Russell Run (RUSS)

Russell Run near Windham, Pa., appears to be recovering from stream channelization and timbering activities performed close to the stream in 2001. SRBC staff designated the biological community of Russell Run moderately impaired in 2001, slightly impaired in 2002, and nonimpaired in 2003. The nonimpaired community in 2003 consisted of numerous organic pollution intolerant taxa such as *Prosimulium*, *Hexatoma*, *Ameletus*, *Cinygmula*, *Epeorus*, *Paraleptophlebia*, *Haploperla*, *Sweltsa*, *Leuctra*, *Amphinemura*, *Acroneuria*, *Clioperla* (Plecoptera: Perlodidae), and *Isoperla*. The habitat also has improved from nonsupporting to excellent, although eroded banks are still evident. All field chemistry parameters were normal.

Sackett Creek (SACK)

The biological condition of Sackett Creek near Nichols, N.Y., was designated slightly impaired, and the physical habitat was supporting. SACK had good metric scores for EPT Index (17) and percent Ephemeroptera (43.8 percent). Ephemeropteran taxa present at this site included *Acentrella*, *Baetis* (Ephemeroptera: Baetidae), *Dipheter* (Ephemeroptera: Baetidae), *Ephemerella*, *Cinygmula*, *Epeorus*, *Leucrocuta*, and *Paraleptophlebia*. The most abundant taxon at this site was the organic pollution intolerant *Epeorus*. This stream has been dredged previously, and severe erosion and bank failure were noted. All field chemistry parameters were within normal ranges.

Smith Creek (SMIT)

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

Strait Creek (STRA)

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

White Branch Cowanesque River (WBCO)

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

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated as the reference site for Group 3 streams in fiscal year 2003 due to the best combination of biological, water quality, and habitat data. This site had the best Hilsenhoff Biotic Index (1.1) and percent Chironomidae (3.2 percent). Macroinvertebrate taxa with a low Hilsenhoff tolerance value included *Prosimulium*, *Hexatoma*, *Ameletus*, *Ephemerella*, *Epeorus*,

Suwallia, *Sweltsa*, *Leuctra*, *Amphinemura*, *Ostrocerca*, *Isoperla*, *Yugus*, *Diplectrona*, *Wormaldia*, and *Neophylax*. The physical habitat was excellent with good stream cover and ample woody debris from a largely coniferous forest. All water chemistry parameters were normal.

MANAGEMENT IMPLICATIONS

Long-term studies of this nature are critical to establish water quality trends and understand biological conditions. To effectively manage the resources, officials and local interest groups must have a true picture of ecological dynamics and possible problem areas, which can only be obtained through long-term studies such as this one.

Several management implications can be extracted from the chemical water quality, macroinvertebrate community, and physical habitat data collected from sampling areas. A Pearson Product Moment Correlation was performed for each reference category for average WQI score, RBP III score, and physical habitat score. Statistically significant relationships ($p < 0.05$) observed among the chemical characteristics, the biological communities, and physical habitats of the interstate streams are described below. These observations, although based on a small sample size, are presented as possible subject areas for future research and as issues to be considered by aquatic resource managers, local interest groups, elected officials, and other policy-makers.

New York – Pennsylvania Sites

The 13 sites in this reference category have shown and continue to show a large degree of variability in water quality; however, they do not vary much in biological or habitat condition. The biological conditions overall are nonimpaired or only slightly impaired and habitat degradation at numerous sites continues to be due to dredging in the stream and the unstable nature of these glacial streams. Fiscal year 2003 sampling was conducted during drought conditions for part of the year, and channel flow conditions were very low during that time. These low flows may have