DEC
PUBLICATION

Division of Water

Schoharie Creek

Biological Assessment

1989 Survey

New York State/Department of Environmental Conservation

Macroinvertebrate Water Quality Survey of:

Schoharie Creek and tributaries
Greene County, New York

Survey Date: June 22, 1989
Report Date: January 26, 1990

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Stream: Schoharie Creek and tributaries

Reach: Tannersville to Jewett Center, Greene County, New York

Background:

The Stream Biomonitoring Unit conducted a biological survey of Schoharie Creek, including several sites on tributaries, on June 22, 1989. The purpose of the survey was to provide water quality information to be coordinated with data from an intensive water quality survey planned by the Survey Section, Bureau of Monitoring and Assessment. Six sites on Schoharie Creek were sampled, in the reach from Tannersville to Jewett Center. Four Gooseberry Creek locations, and 1 each on the Red Kill and Shanty Hollow Brook were also sampled. Kick samples were taken in riffle areas at each site, as described in Appendix I. The contents of each sample were field-inspected to determine major groups of organisms present, and then preserved in alcohol for laboratory inspection of a 100-specimen subsample. Water quality assessments were based on resident macroinvertebrates (aquatic insects, worms, molluscs, crustaceans, etc.). Community parameters used in the determination of water quality included species richness, biotic index, EPT value, percent model affinity, and field assessment (see Appendices II and III). Results from several of the sites were also compared to those from surveys performed by the Stream Biomonitoring Unit in 1975 and 1986.

Results and Conclusions:

1. Within the reach surveyed, Schoharie Creek possesses water of excellent quality, with no biological effects seen which can be attributed to any point source or non-point source discharges.

2. Water quality in Gooseberry Creek appears to be unimpacted by discharges at the 4 sites sampled. The water quality has improved since the last biological survey in October, 1986, due to a rerouting of the Tannersville STP discharge into a holding pond.

3. Water quality in the Red Kill was assessed as non-impacted; at the time of sampling there did not appear to be any biological effects attributable to the Whistle Tree sewage treatment plant, which is located just upstream from the sampling site.

4. The macroinvertebrate community at the Shanty Hollow Brook site was different from the communities at other similar locations in this survey and may represent a biological impairment. Resurvey of Shanty Hollow Brook, including sampling at upstream sites, is recommended, to try to distinguish between possible sewage effluent effects from the Hunter Highlands STP and lake outlet effects from Dolans Lake below the Hunter Mountain ski area.

Discussion:

In general, the water quality in Schoharie Creek and its tributaries in this reach is excellent, with diverse communities present at each of the sites surveyed. Although there are six sewage treatment plants in the reach, all except the Tannersville village plant are small private facilities associated with ski areas or housing developments, which have wide seasonal variation in discharge volumes.

The only site showing possible effects from a sewage discharge was on Shanty Hollow Brook. This station was dominated by Nais behningi, a facultative worm, and had reduced numbers of mayflies and caddisflies. The species composition is altered from the expected fauna, but it is not possible, with only one site, to distinguish between any effects from the sewage treatment plant discharge and potential lake outlet effects from Dolan Lake, approximately 200 meters upstream from the sampling site (see Appendix IV). Another survey, with additional sampling sites upstream of the discharge and directly below the lake, is needed to pinpoint the cause of the possible water quality impairment.

Gooseberry Creek below the Tannersville village STP has water quality greatly improved from the last biological survey, conducted in 1986. At that time, effects indicative of intermittent chlorine toxicity were present. Since then the discharge has been rerouted from direct discharge to the creek to a holding pond; this has eliminated the impact below the plant.

Schoharie Creek

Description of sites sampled:

On June 22, 1989, Schoharie Creek was 10-35 meters wide and 0.2-0.3 meters deep, with current speeds of 83-111 cm/sec in riffles. Conductivity was 30-50 umhos and the temperature was 17.0-21.0 °C. Measurements for each site are found in the field data summary sheets. Water quality at all 6 of the Schoharie Creek sites was excellent, and did not appear to be affected by any inputs to the stream from point sources or non-point source discharges.

Station 4. This site was located on Schoharie Creek 50 meters above the confluence with Gooseberry Creek.

Species richness: 27 (excellent)
Biotic index: 4.42 (excellent)
EPT value: 12 (excellent)
% Model affinity: 66 (excellent)
Dominant species:
Orthocladius (Euorthocladius) Type I spp. (facultative midge) 29%
Pseudocloeon sp. (intolerant mayfly) 12%
Orthocladius obumbratus (facultative midge) 8%
Water Quality Assessment: non-impacted

Station 5. This site was located 20 meters below the Route 214 bridge, between the villages of Tannersville and Hunter.

Species richness: 28 (excellent)
Biotic index: 3.70 (excellent)
EPT value: 11 (excellent)
% Model affinity: 79 (excellent)

Dominant species:
Stenelmis bicarinata (intolerant riffle beetle) 12%
Dolophilodes sp. (intolerant caddisfly) 11%
Pseudocloeon sp. (intolerant mayfly) 10%
Water Quality Assessment: non-impacted

Station 7. The next downstream site was in the village of Hunter, 40 meters below the Route 83 bridge.
Species richness: 34 (excellent)
Biotic index: 4.10 (excellent)
EPT value: 14 (excellent)
% Model affinity: 85 (excellent)
Dominant species:
Paraleptophlebia mollis (intolerant mayfly) 9%
Stenelmis sp. (facultative riffle beetle) 9%
Orthocladius (Euorthocladius) Type I spp. (facultative midge) 9%
Water Quality Assessment: non-impacted

Station 9. This site was in Hunter, 15 meters above the Bridge St. bridge.
Species richness: 35 (excellent)
Biotic index: 3.64 (excellent)
EPT value: 16 (excellent)
% Model affinity: 76 (excellent)
Dominant species:
Dolophilodes sp. (intolerant caddisfly) 11%
Orthocladius (Euorthocladius) Type I spp. (facultative midge) 8%
Ephemerella dorothea (intolerant mayfly) 7%
Water Quality Assessment: non-impacted

Station 10. A sample was taken below Hunter, 30 meters above the Deming Rd. bridge.
Species richness: 25 (good)
Biotic index: 3.99 (excellent)
EPT value: 14 (excellent)
% Model affinity: 81 (excellent)
Dominant species:
Baetis intercalaris (facultative mayfly) 15%
Pseudocloeon sp. (intolerant mayfly) 12%
Stenelmis bicarinata (intolerant riffle beetle) 11%
Water Quality Assessment: non-impacted

Station 11. The most downstream station on the Schoharie was located in Jewett Center, 200 meters above the confluence with the East Kill.
Species richness: 37 (excellent)
Biotic index: 4.63 (good)
EPT value: 14 (excellent)
% Model affinity: 71 (excellent)
Dominant species:
Orthocladius obumbratus (facultative midge) 12%
Polypedilum aviceps (facultative midge) 12%
Baetis brunneicolor (intolerant mayfly) 8%
Water Quality Assessment: non-impacted

Gooseberry Creek

Description of sites sampled:

The 4 Gooseberry Creek locations were 4-8 meters wide and 0.2-0.4 meters deep, with current speeds in the riffles of 67-100 cm/sec. The water temperature was 17.0 °C, conductivity ranged from 55-65 umhos, and dissolved oxygen was 9.2-9.4 mg/l. Water quality was assessed as non-impacted at all four sites.

Station 1A. This site was located at the Tannersville sewage treatment plant, at the point in the stream opposite the now inactive discharge pipe (the effluent is now discharged into a holding pond).

Species richness: 36 (excellent)
Biotic index: 4.12 (excellent)
EPT value: 12 (excellent)
% Model affinity: 81 (excellent)
Dominant species:
Baetis flavistriga (intolerant mayfly) 32%
Orthocladius obumbratus (facultative midge) 8%
Dolophilodes sp. (intolerant caddisfly) 6%
Water Quality Assessment: non-impacted

Station 2. This location was 75 meters downstream of Station 1A. Water quality appeared unchanged from upstream; this is different from the survey conducted in 1986 when the sewage treatment plant still discharged into the stream above this point and impacts from chlorine were seen (Bode et al., 1986).

Species richness: 29 (excellent)
Biotic index: 3.46 (excellent)
EPT value: 13 (excellent)
% Model affinity: 82 (excellent)
Dominant species:
Baetis flavistriga (intolerant mayfly) 11%
Dolophilodes sp. (intolerant caddisfly) 11%
Paraleptophlebia mollis (intolerant mayfly) 10%
Water quality Assessment: non-impacted

Station 2A. The sample was taken 10 meters above the Bloomer Rd. bridge. The community was similar to that at the upstream stations.

Species richness: 26 (good)
Biotic index: 3.73 (excellent)
EPT value: 14 (excellent)
% Model affinity: 79 (excellent)
Dominant species:
Pseudocloeon sp. (intolerant mayfly) 17%
Dolophilodes sp. (intolerant caddisfly) 14%
Baetis flavistriga (intolerant mayfly) 11%
Water Quality Assessment: non-impacted

Station 3. Station 3 was located 20 meters above the confluence with Schoharie Creek; access to the site was from the Kissley Rd. campground. Although species richness and percent model affinity were slightly lower than at the upstream stations, overall water quality appeared to be unchanged.

Species richness: 20 (good)
Biotic index: 4.28 (excellent)

EPT value: 11 (excellent)
% Model affinity: 60 (good)
Dominant species:
Baetis flavistriga (intolerant mayfly) 27%
Baetis intercalaris (facultative mayfly) 24%
Pseudocloeon sp. (intolerant mayfly) 13%
Water Quality Assessment: non-impacted

Red Kill, Shanty Hollow Brook

Description of sites sampled: The physical-chemical measurements for these two tributaries are contained in the field data summary sheets.

Station 6. Station 6 was located on the Red Kill, which flows into the Schoharie upstream of Hunter. The kick sample was taken 40 meters above the Route 23A bridge, at Scribner Hollow Rd. The community was dominated by mayflies, with 42% of the sample composed of one genus, Epeorus. The species composition of this community was somewhat different from those on Schoharie and Gooseberry Creeks, but still indicative of very good water quality.

Species richness: 25 (good)
Biotic index: 2.13 (excellent)
EPT value: 12 (excellent)
% Model affinity: 66 (excellent)
Dominant species:
Epeorus sp. (intolerant mayfly) 42%
Pseudocloeon sp. (intolerant mayfly) 17%
Polypedilum aviceps (facultative midge) 6%
Water Quality Assessment: non-impacted

Station 8. Station 8 was located on Shanty Hollow Brook, approximately 200 meters below where the Dolan Lake outlet empties into the brook, and 30 meters above the confluence with the Schoharie. Although mayflies, stoneflies, and caddisflies were all noted in the field, the 100-organism subsample was dominated by Nais behningi, a facultative worm, and the overall water quality assessment was slightly impacted.

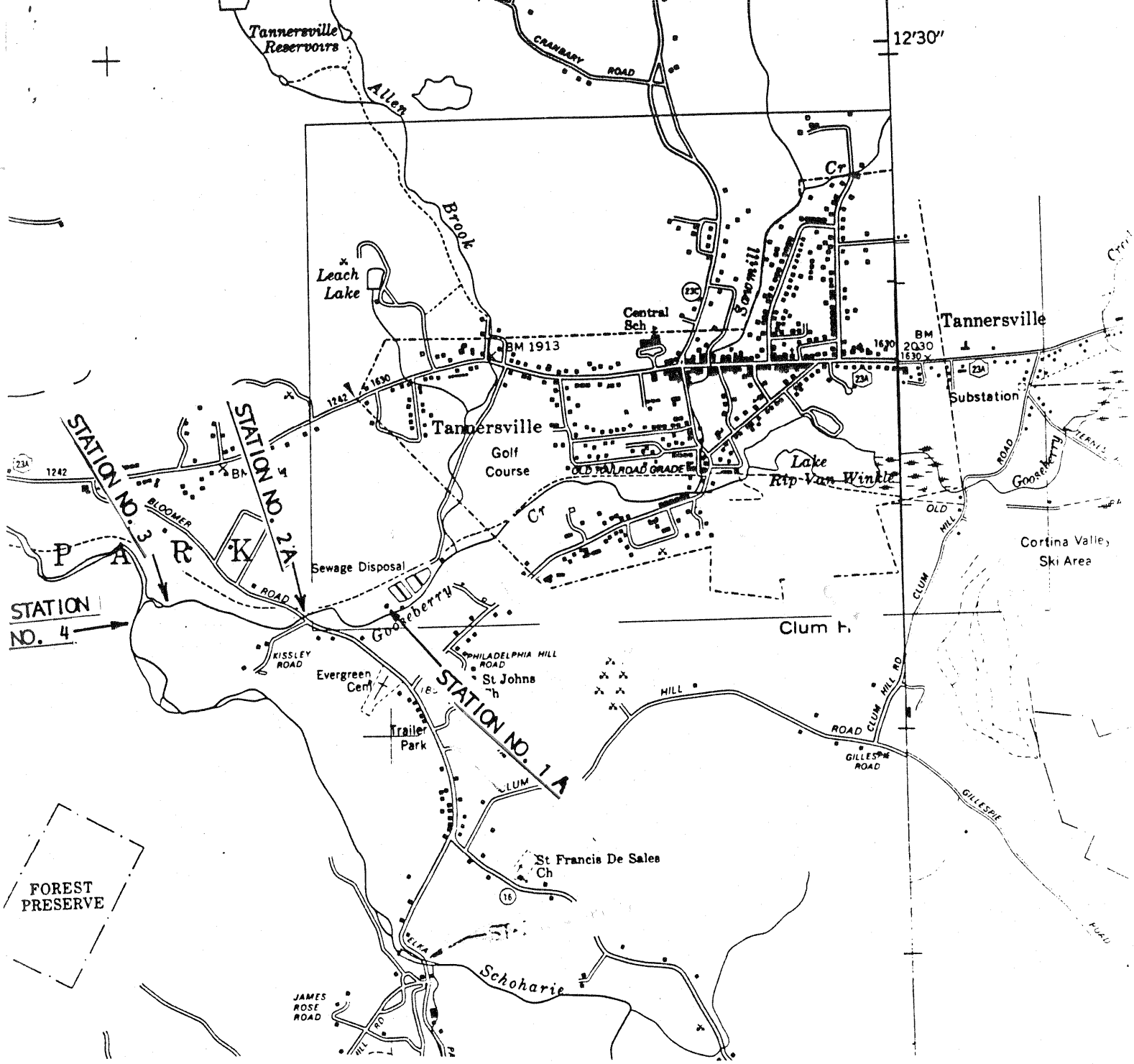
Species richness: 29 (excellent)
Biotic index: 5.34 (good)
EPT value: 8 (good)
% Model affinity: 49 (fair)
Dominant species:
Nais behningi (facultative worm) 35%
Pseudocloeon sp. (intolerant mayfly) 6%
Orthocladius (Euorthocladius) Type I spp. (facultative midge) 5%
Water Quality Assessment: slightly impacted

TABLE 1. Station Locations and Descriptions.

Schoharie Creek

COUNTY: Greene
BASIN: 12

STATION NUMBER	LOCATION
01A	Tannersville - Gooseberry Creek at Tannersville STP
02	Tannersville - Gooseberry Creek 75 m below inactive discharge pipe at STP
02A	below Tannersville - Gooseberry Creek 10 m above Bloomer Rd. bridge
03	below Tannersville - Gooseberry Creek 20 m above confluence with Schoharie Creek
04	below Tannersville - Kissley Rd. campground 50 above confluence with Gooseberry Creek
05	below Tannersville 20 m below Rte. 214 bridge
06	above Hunter - Red Kill 40 m above Rte. 23A bridge, at Scribner Hollow Rd.
07	Hunter 40 m below Rte. 83 bridge
08	Hunter - Shanty Hollow Brook 30 m above confluence with Schoharie Creek
09	Hunter 15 m above Bridge St. bridge
10	below Hunter 30 m above Deming Rd. bridge
11	Jewett Center 200 m above confluence with East Kill



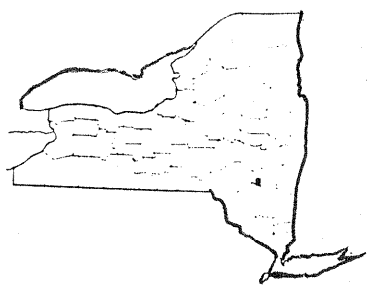
Schoharie Creek Sampling Sites 1989 Survey

SCALE 1:24 000

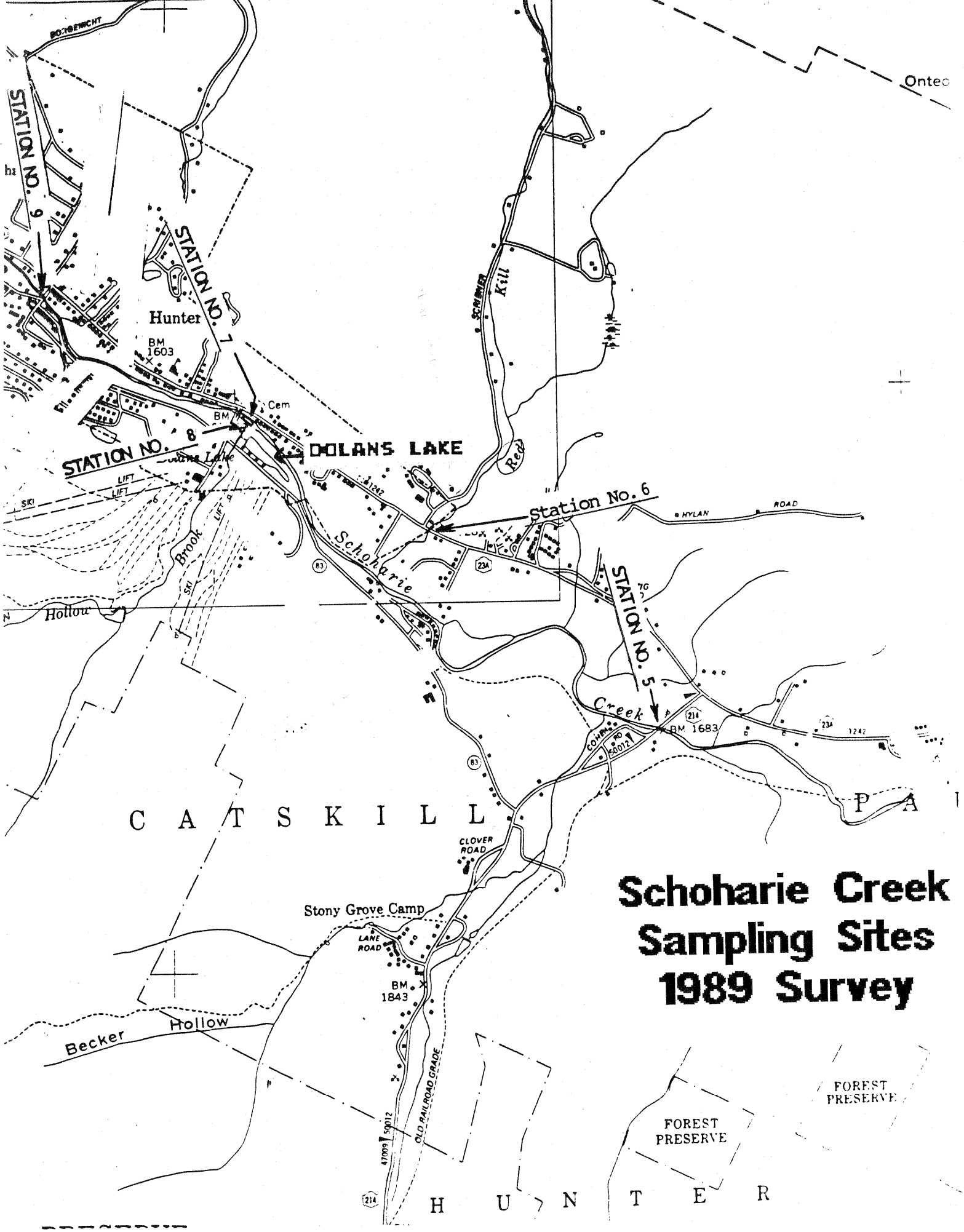
1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

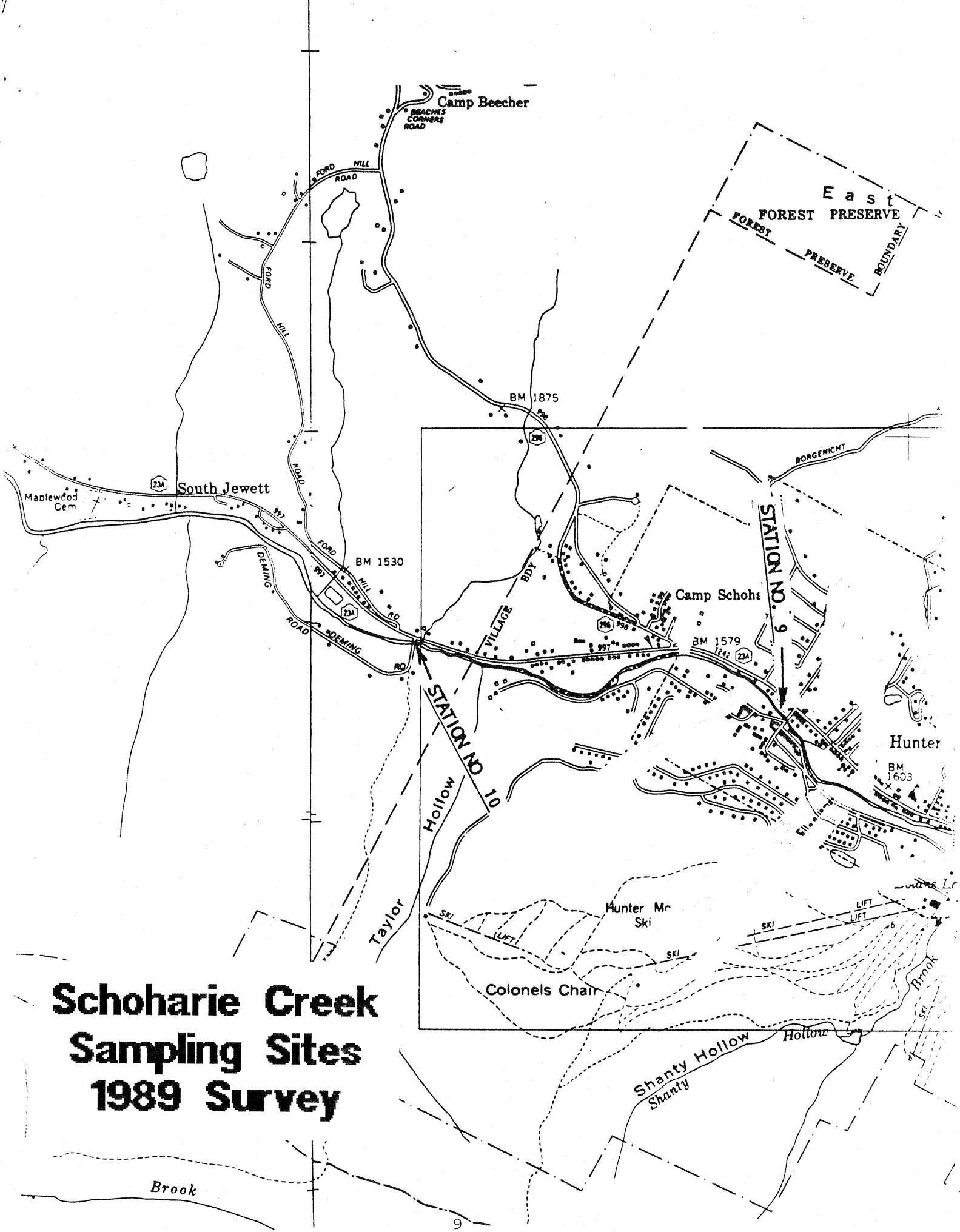
1 KILOMETER



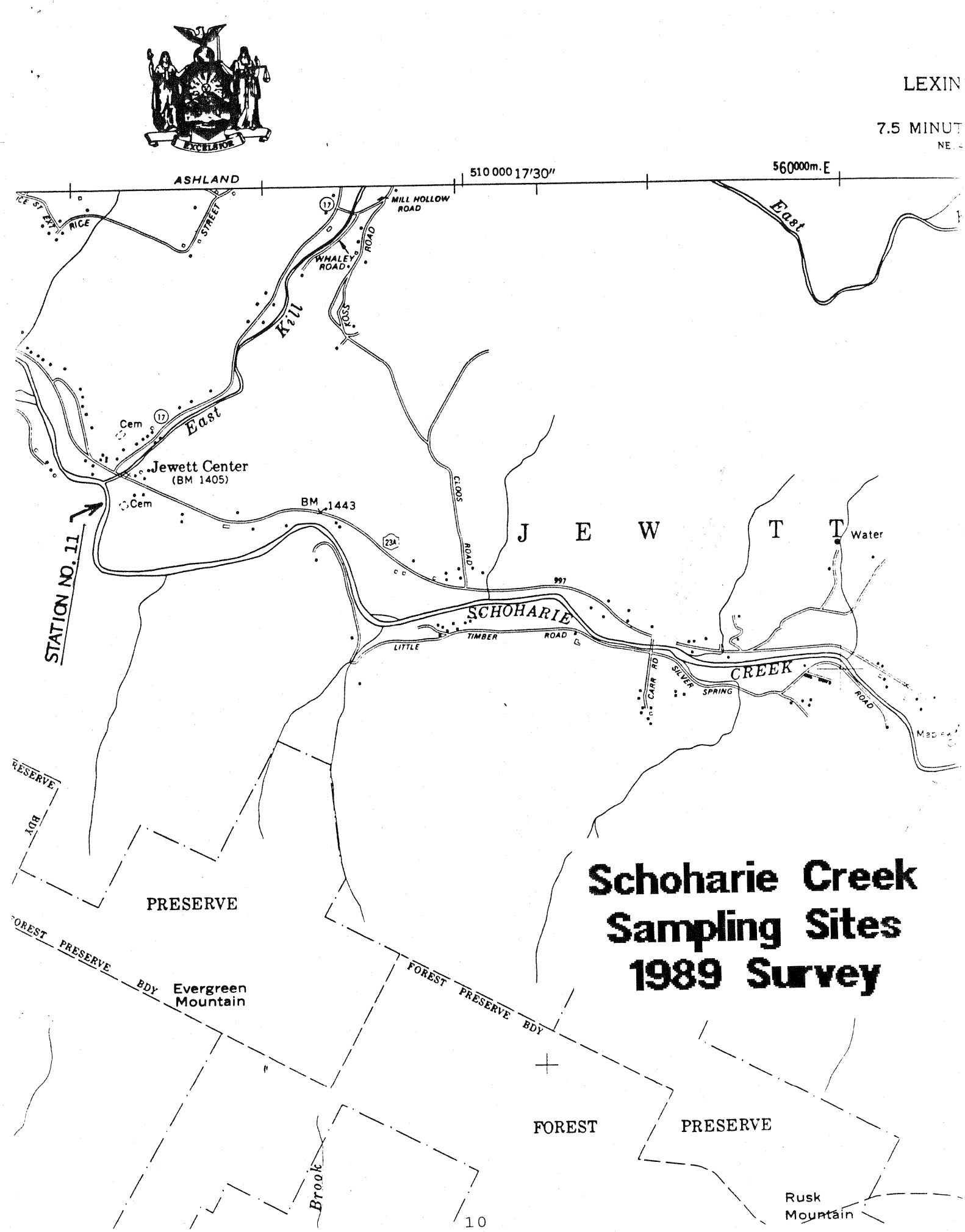
QUADRANGLE LOCATION



Schoharie Creek Sampling Sites 1989 Survey



Schoharie Creek Sampling Sites 1989 Survey

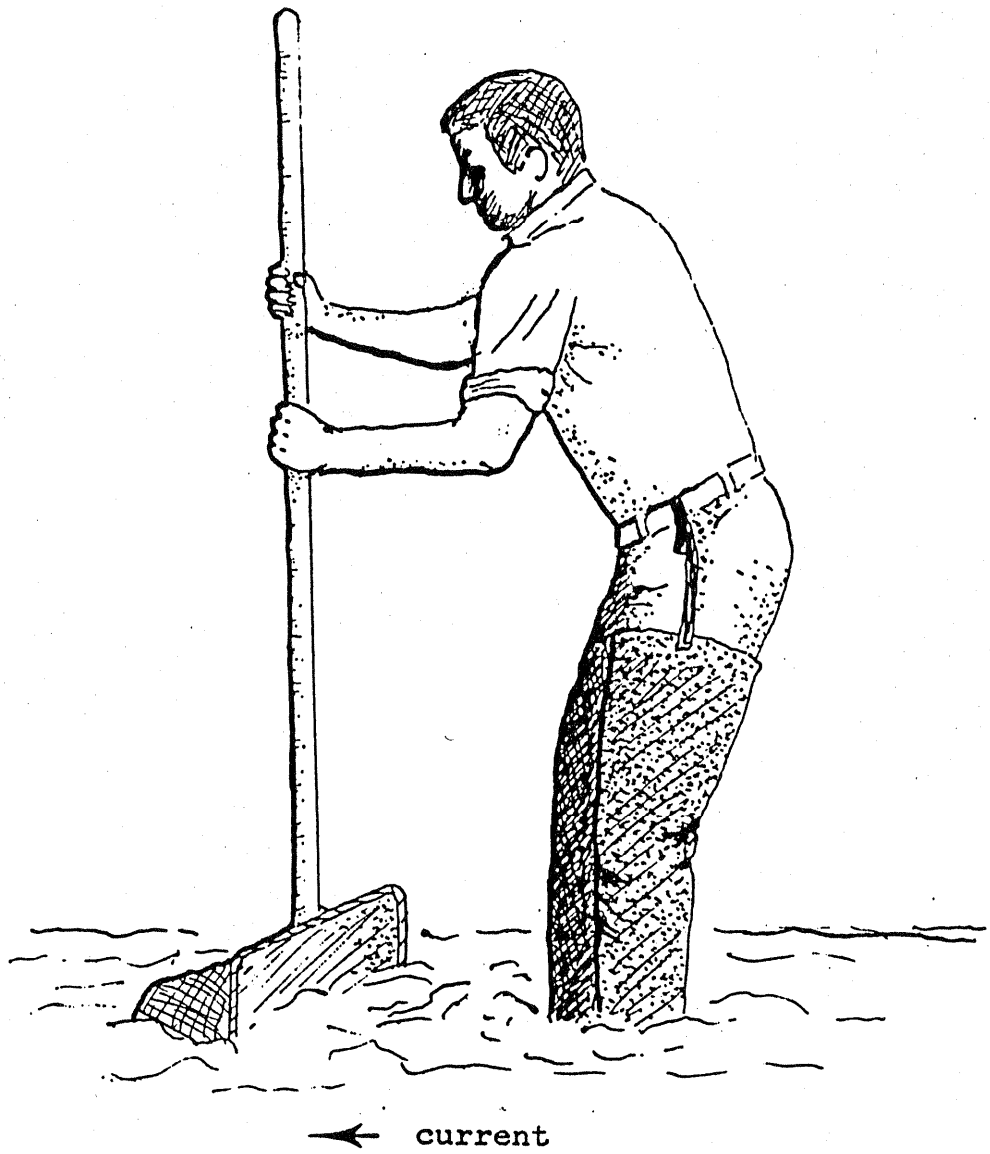


Schoharie Creek Sampling Sites 1989 Survey

TABLE 1. MACROINVERTEBRATE SPECIES
COLLECTED IN SCHOHARIE CREEK AND TRIBUTARIES,
GREENE COUNTY, NEW YORK JUNE 22, 1989

ANNELIDA
OLIGOCHAETA
Lumbriculidae
Undetermined Lumbriculidae
Enchytraeidae
Undetermined Enchytraeidae sp. 1
Tubificidae
Undet. Tubificidae w/o cap. setae
Naididae
Nais behningi
Nais bretscheri
Nais communis
Nais pardalis
BRANCHIOBDELLIDA
Branchiobdellidae
Undetermined Branchiobdellidae
MOLLUSCA
GASTROPODA
Lymnaeidae
Undetermined Lymnaeidae
PELECYPODA
Sphaeriidae
Undetermined Sphaeriidae
EPHEMEROPTERA
Baetidae
Baetis brunneicolor
Baetis flavistriga
Baetis intercalaris
Pseudocloeon sp.
Heptageniidae
Epeorus (Iron) sp.
Leucrocuta sp.
Stenacron interpunctatum
Stenonema terminatum
Stenonema sp.
Habrophlebia vibrans
Paraleptophlebia guttata
Paraleptophlebia mollis
Ephemerellidae
Attenella margarita
Drunella cornuta
Drunella cornutella
Ephemerella dorothea
Serratella deficiens
ODONATA
Gomphidae
Undetermined Gomphidae
PLECOPTERA
Leuctridae
Leuctra ferruginea
Nemouridae
Amphinemura wui
Perlidae
Acroneuria sp.
Agnetina capitata
Neoperla sp.
Paragnetina immarginata
Paragnetina media
Chloroperlidae
Alloperla sp.
Sweltsa sp.
COLEOPTERA
Psephenidae
Psephenus sp.
Elmidae
Promoresia tardella
Stenelmis bicarinata
Stenelmis crenata
Stenelmis sp.
MEGALOPTERA
Corydalidae
Nigronia serricornis
TRICHOPTERA
Philopotamidae
Dolophilodes sp.
Polycentropodidae
Neureclipsis sp.
Polycentropus sp.
Hydropsychidae
Cheumatopsyche sp.
Hydropsyche morosa
Hydropsyche slossonae
Hydroptilidae
Hydroptila consimilis?
Lepidostomatidae
Lepidostoma sp.
DIPTERA
Tipulidae
Antocha sp.
Hexatoma sp.
Ceratopogonidae
Undetermined Ceratopogonidae
Simuliidae
Simulium parnassum
Simulium tuberosum
Simulium venustum
Simulium sp.
Rhagionidae
Atherix sp.
Empididae
Hemerodromia sp.
Chironomidae
Tanypodinae
Conchapelopia sp.
Nilotanypus fimbriatus
Diamesinae
Diamesa spp.
Pagastia sp. A
Potthastia gaedii
Orthocladiinae
Brillia parva
Cardiocladius obscurus
Cricotopus bicinctus
Cricotopus reversus gr.
Cricotopus tremulus gr.
Eukiefferiella brevicalcar gr.
Eukiefferiella claripennis gr.
Eukiefferiella devonica gr.
Eukiefferiella pseudomontana gr.
Orthocladius (Euorthoclad.) Type I
Orthocladius carlatus
Orthocladius obumbratus
Orthocladius sp.
Parametriocnemus lundbecki
Rheocricotopus robacki
Rheocricotopus tuberculatus
Tvetenia bavarica gr.
Chironominae
Chironomini
Microtendipes pedellus gr.
Phaenopsectra dyari?
Polypedilum aviceps
Polypedilum convictum
Polypedilum digitifer
Polypedilum griseopunctatum
Tanytarsini
Constempellina sp. 1
Micropsectra polita?
Rheotanytarsus exiguus gr.
Sublettea coffmani
Tanytarsus guerlus gr.
Tanytarsus sp.
Zavrelia gr. spp.
Undetermined Tanytarsini
Undetermined Chironominae

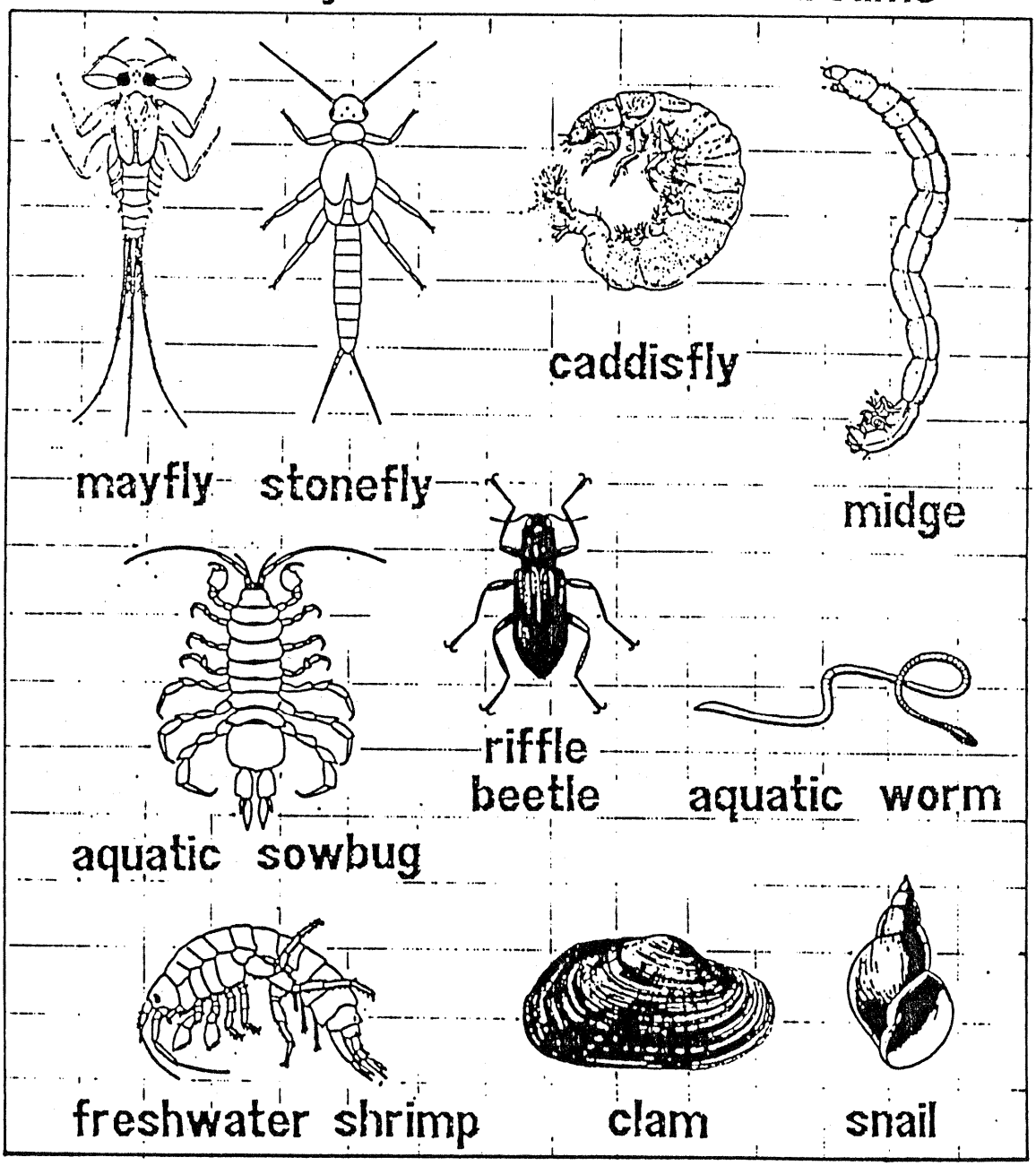
THE TRAVELING KICK SAMPLE



Rocks and sediment in the riffle are dislodged by foot upstream of a net; dislodged organisms are carried by the current into the net. Sampling is continued for five minutes, gradually moving downstream to cover a distance of five meters.

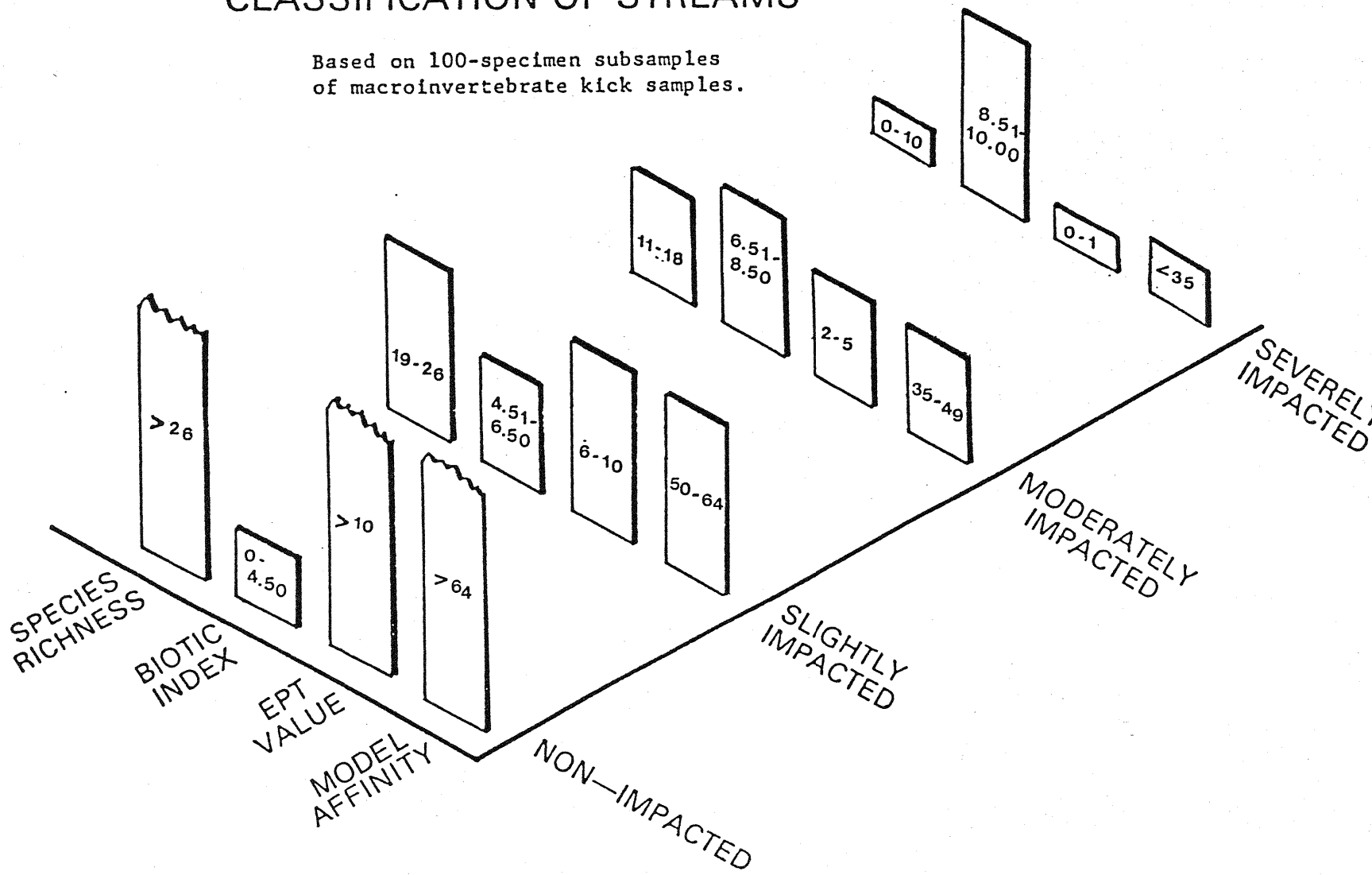
MACROINVERTEBRATES

commonly encountered in streams



SUMMARY OF CRITERIA FOR WATER QUALITY CLASSIFICATION OF STREAMS

Based on 100-specimen subsamples
of macroinvertebrate kick samples.



LABORATORY DATA SUMMARY

STREAM NAME Schoharie Creek DRAINAGE 12
REACH Tannersville to Jewett Center
SAMPLING METHOD Traveling kick

STATION	1A	2	2A	3
DOMINANT SPECIES/ % CONTRIBUTION/ TOLERANCE/ COMMON NAME				
1. [Genus and species names are abbreviated here to accommodate 2. format. Complete names are reported elsewhere. For description of 3. tolerance, intolerant = not tolerant of poor water quality; facultative= occur 4. over a wide range of water quality; tolerant= tolerant of poor water quality.] 5.	Baetis flavis. 32 intolerant mayfly	Baetis flavis. 11 intolerant mayfly	Pseudocloe. sp. 17 intolerant mayfly	Baetis flavis. 27 intolerant mayfly
	Orthoclad. obumbrat. 8 facultative midge	Dolophilod. sp. 11 intolerant caddisfly	Dolophilod. sp. 14 intolerant caddisfly	Baetis intercal.24 facultative mayfly
	Dolophilod. sp. 6 intolerant caddisfly	Paralepto. mollis 10 intolerant mayfly	Baetis flavis. 11 intolerant mayfly	Pseudocloe. sp. 13 intolerant mayfly
	Baetis brunn. 5 intolerant mayfly	Baetis brunn. 8 intolerant mayfly	Tvetenia bavarica 10 facultative midge	Baetis brunn. 6 intolerant mayfly
	Paralepto. mollis 5 intolerant mayfly	Pseudocloe. sp. 7 intolerant mayfly	Paralepto. mollis 5 intolerant mayfly	Dolophilod. sp. 5 intolerant caddisfly
% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)				
Chironomidae (midges)	27 (16)	22 (10)	29 (9)	11 (6)
Trichoptera (caddisflies	7 (2)	13 (3)	16 (2)	5 (2)
Ephemeroptera (mayflies)	52 (8)	49 (9)	46 (11)	80 (9)
Plecoptera (stoneflies)	3 (2)	1 (1)	1 (1)	-
Coleoptera (beetles)	1 (1)	-	-	-
Oligochaeta (worms)	3 (3)	11 (3)	3 (2)	2 (2)
Others	7 (4)	4 (3)	5 (1)	2 (1)
TOTAL	100 (36)	100 (29)	100 (26)	100 (20)
SPECIES RICHNESS	36	29	26	20
HBI INDEX	4.12	3.46	3.73	4.28
EPT VALUE	12	13	14	11
MODEL AFFINITY	81	82	79	60
FIELD ASSESSMENT	no impact	no impact	no impact	no impact
OVERALL ASSESSMENT	non-impacted	non-impacted	non-impacted	non-impacted

COMMENTS

LABORATORY DATA SUMMARY

STREAM NAME Schoharie Creek DRAINAGE 12
REACH Tannersville to Jewett Center
SAMPLING METHOD Traveling kick

STATION	4	5	6	7
DOMINANT SPECIES/ % CONTRIBUTION/ TOLERANCE/ COMMON NAME				
1. [Genus and species names are abbreviated here to accommodate 2. format. Complete names are reported elsewhere. For description of 3. tolerance, intolerant = not tolerant of poor water quality; facultative= occur 4. over a wide range of water quality; tolerant= tolerant of poor water quality.] 5.	Orthoclad. (E) I 29 facultative midge	Stenelmis bicarin. 12 intolerant beetle	Epeorus sp. 42 intolerant mayfly	Paralepto. mollis 9 intolerant mayfly
	Pseudocloe. sp. 12 intolerant mayfly	Dolophil. sp. 11 intolerant caddisfly	Pseudocloe. sp. 17 intolerant mayfly	Stenelmis sp. 9 facultative beetle
	Orthoclad. obumbrat. 8 facultative midge	Pseudocloe. sp. 10 intolerant mayfly	Polypedil. aviceps 6 facultative midge	Orthoclad. (E) I 9 facultative midge
	Ephemerella dorothea 7 intolerant mayfly	Ephemerella dorothea 9 intolerant mayfly	Drunella cornuta 5 intolerant mayfly	Baetis intercal. 7 facultative mayfly
	Eukieffer. brevical. 5 intolerant midge	Orthoclad. obumbrat. 8 facultative midge	Baetis flavis. 3 intolerant mayfly	Drunella cornuta 6 intolerant mayfly
% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)				
Chironomidae (midges)	54 (9)	35 (11)	14 (8)	38 (14)
Trichoptera (caddisflies	4 (2)	13 (3)	2 (2)	8 (4)
Ephemeroptera (mayflies)	29 (7)	33 (8)	72 (6)	40 (10)
Plecoptera (stoneflies)	3 (3)	-	7 (4)	-
Coleoptera (beetles)	1 (1)	13 (2)	-	9 (1)
Oligochaeta (worms)	1 (1)	1 (1)	2 (2)	2 (2)
Others	8 (4)	5 (3)	3 (3)	3 (3)
TOTAL	100 (27)	100 (28)	100 (25)	100 (34)
SPECIES RICHNESS	27	28	25	34
HBI INDEX	4.42	3.70	2.13	4.10
EPT VALUE	12	11	12	14
MODEL AFFINITY	66	79	66	85
FIELD ASSESSMENT	no impact	no impact	no impact	no impact
OVERALL ASSESSMENT	non-impacted	non-impacted	non-impacted	non-impacted

COMMENTS

LABORATORY DATA SUMMARY

STREAM NAME Schoharie Creek DRAINAGE 12
REACH Tannersville to Jewett Center
SAMPLING METHOD Traveling kick

STATION	8	9	10	11
DOMINANT SPECIES/ % CONTRIBUTION/ TOLERANCE/ COMMON NAME				
1.	Nais behningi 35 facultative worm	Dolophil. sp. 11 intolerant caddisfly	Baetis intercal.15 facultative mayfly	Orthoclad. obumbrat 12 facultative midge
2.	Pseudocloe. sp. 6 intolerant mayfly	Orthoclad. (E) I 8 facultative midge	Pseudocloe. sp. 12 intolerant mayfly	Polypedil. aviceps 12 facultative midge
3.	Orthoclad. (E) I 5 facultative midge	Ephemerella dorothea 7 intolerant mayfly	Stenelmis bicar. 11 intolerant beetle	Baetis brunn. 8 intolerant mayfly
4.	Rheotany. exiguus 5 facultative midge	Orthoclad. obumbrat. 7 facultative midge	Paralepto. mollis 8 intolerant mayfly	Hexatoma sp. 6 intolerant crane fly
5.	Undet. Lumbric. 4 facultative worm	Baetis brunn. 5 intolerant mayfly	Orthoclad. obumbrat. 7 facultative midge	Serratella deficiens 5 intolerant mayfly
% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)				
Chironomidae (midges)	32 (13)	39 (13)	21 (7)	49 (15)
Trichoptera (caddisflies	5 (2)	15 (4)	5 (4)	8 (5)
Ephemeroptera (mayflies)	13 (5)	31 (9)	56 (9)	24 (7)
Plecoptera (stoneflies)	1 (1)	3 (3)	3 (1)	3 (2)
Coleoptera (beetles)	2 (1)	5 (1)	12 (2)	3 (1)
Oligochaeta (worms)	44 (4)	4 (2)	3 (2)	3 (3)
Others	3 (3)	3 (3)	-	10 (4)
TOTAL	100 (29)	100 (35)	100 (25)	100 (37)
SPECIES RICHNESS	29	35	25	37
HBI INDEX	5.34	3.64	3.99	4.63
EPT VALUE	8	16	14	14
MODEL AFFINITY	49	76	81	71
FIELD ASSESSMENT	no impact	no impact	no impact	no impact
OVERALL ASSESSMENT	slightly impacted	non-impacted	non-impacted	non-impacted

[Genus and species names are abbreviated here to accommodate format. Complete names are reported elsewhere. For description of tolerance, intolerant = not tolerant of poor water quality; facultative= occur over a wide range of water quality; tolerant= tolerant of poor water quality.]

COMMENTS

FIELD DATA SUMMARY SHEET

STREAM NAME Schoharie Creek COUNTY Greene
REACH INCLUDED Tannersville to Jewett Center DATE SAMPLED 22 June, 1989 FIELD PERSONNEL INVOLVED Abele, Bode, Novak

STATION NUMBER		1A	2	2A	3
TIME		9:55	9:20	10:20	10:55
STREAM CHARACTERISTICS					
1. WIDTH (meters)		6	6	8	4
2. DEPTH (meters)		0.2	0.2	0.2	0.4
3. CURRENT SPEED (cm/sec)		67	71	91	100
4. SUBSTRATE (%)	rock	20	20	40	30
	rubble	40	40	30	40
	gravel	30	30	30	20
	sand	10	10	-	10
	silt	-	-	-	-
5. AQUATIC VEGETATION		diatoms	diatoms fil.algae	diatoms fil.algae	diatoms
OTHER MEASUREMENTS					
1. CANOPY (%)		40	70	10	40
2. TEMPERATURE (° C)		17.0	17.0	17.0	17.0
3. CONDUCTIVITY (umhos)		55	60	60	65
4. DISSOLVED OXYGEN (mg/l)		9.3	9.2	9.2	9.4
5. EMBEDDEDNESS (%)		40	40	40	40
OCCURRENCE OF MACROINVERTEBRATES					
Chironomidae (midges)		X	X	X	X
Trichoptera (caddisflies)		X	X		X
Ephemeroptera (mayflies)		X	X	X	X
Plecoptera (stoneflies)		X	X	X	X
Coleoptera (beetles)				X	
Oligochaeta (worms)					
Psephenidae (water pennies)		X			
Decapoda (crayfish)		X		X	
Megaloptera (hellgrammites)			X		
Tipulidae (crane flies)					X
Simuliidae (black flies)					X
MACROINVERTEBRATE BIOMASS		medium	medium	medium	medium
FIELD ESTIMATE OF WATER QUALITY		non-impacted	non-impacted	non-impacted	non-impacted

FIELD DATA SUMMARY SHEET

STREAM NAME Schoharie Creek COUNTY Greene
REACH INCLUDED Tannersville to Jewett Center DATE SAMPLED 22 June, 1989
FIELD PERSONNEL INVOLVED Abele, Bode, Novak

STATION NUMBER		4	5	6	7
TIME		11:11	12:45	1:05	1:30
STREAM CHARACTERISTICS					
1. WIDTH (meters)		10	35	5	20
2. DEPTH (meters)		0.2	0.3	0.2	0.3
3. CURRENT SPEED (cm/sec)		111	100	100	100
4. SUBSTRATE	rock	40	30	30	30
	rubble	30	30	20	30
	gravel	20	30	20	30
	sand	10	10	20	10
	silt	-	-	10	-
5. AQUATIC VEGETATION		diatoms	diatoms	diatoms fil.algae	diatoms
OTHER MEASUREMENTS					
1. CANOPY (%)		5	10	70	0
2. TEMPERATURE (° C)		-	17.0	14.0	19.0
3. CONDUCTIVITY (umhos)		30	40	35	45
4. DISSOLVED OXYGEN (mg/l)		-	-	-	-
5. EMBEDDEDNESS (%)		50	40	40	40
OCCURRENCE OF MACROINVERTEBRATES					
Chironomidae (midges)		X	X	X	X
Trichoptera (caddisflies)		X	X	X	X
Ephemeroptera (mayflies)		X	X	X	X
Plecoptera (stoneflies)		X	X	X	X
Coleoptera (beetles)		X	X	X	X
Oligochaeta (worms)					
Decapoda (crayfish)		X			X
Megaloptera (hellgrammites)					X
Tipulidae (crane flies)			X		
MACROINVERTEBRATE BIOMASS		medium	medium	low	medium
FIELD ESTIMATE OF WATER QUALITY		non-impacted	non-impacted	non-impacted	non-impacted

FIELD DATA SUMMARY SHEET

STREAM NAME Schoharie Creek COUNTY Greene
REACH INCLUDED Tannersville to Jewett Center DATE SAMPLED 22 June, 1989
FIELD PERSONNEL INVOLVED Abele, Bode, Novak

STATION NUMBER		8	9	10	11
TIME		1:46	2:08	2:30	3:00
STREAM CHARACTERISTICS					
1. WIDTH (meters)		3	25	25	25
2. DEPTH (meters)		0.2	0.2	0.2	0.2
3. CURRENT SPEED (cm/sec)		100	83	100	91
4. SUBSTRATE	rock	20	40	20	20
	rubble	30	30	30	40
	gravel	30	20	40	30
	sand	20	10	10	10
	silt	-	-	-	-
5. AQUATIC VEGETATION		diatoms	diatoms	diatoms	diatoms
OTHER MEASUREMENTS					
1. CANOPY (%)		80	0	0	0
2. TEMPERATURE ($^{\circ}$ C)		17.0	18.0	18.0	21.0
3. CONDUCTIVITY (umhos)		40	45	45	50
4. DISSOLVED OXYGEN (mg/l)		-	-	-	-
5. EMBEDDEDNESS (%)		30	40	40	40
OCCURRENCE OF MACROINVERTEBRATES					
Chironomidae (midges)		X	X	X	X
Trichoptera (caddisflies)		X	X	X	X
Ephemeroptera (mayflies)		X	X	X	X
Plecoptera (stoneflies)		X	X	X	X
Coleoptera (beetles)			X		
Oligochaeta (worms)		X			
Decapoda (crayfish)				X	
Odonata (dragonflies)			X		
Tipulidae (crane flies)			X	X	
MACROINVERTEBRATE BIOMASS		low	medium	medium	medium
FIELD ESTIMATE OF WATER QUALITY		non-impacted	non-impacted	non-impacted	non-impacted

Appendix I. BIOLOGICAL METHODS FOR KICK SAMPLING

A. Rationale. The use of the standardized kick sampling method provides a biological assessment technique that lends itself to rapid assessments of stream water quality.

B. Site Selection. Sampling sites are selected based on these criteria: (1) The sampling location should be a riffle with a substrate of rubble, gravel, and sand. Depth should be one meter or less, and current speed should be at least 0.4 meters per second. (2) The site should have comparable current speed, substrate type, embeddedness, and canopy cover to both upstream and downstream sites to the degree possible. (3) Sites are chosen to have a safe and convenient access.

C. Sampling. Macroinvertebrates are sampled using the standardized traveling kick method. An aquatic net is positioned in the water at arms'length downstream and the stream bottom is disturbed by foot, so that the dislodged organisms are carried into the net. Sampling is continued for a specified time and for a specified distance in the stream. Rapid assessment sampling specifies sampling 5 minutes for a distance of 5 meters. The net contents are emptied into a pan of stream water. The contents are then examined, and the major groups of organisms are recorded, usually on the ordinal level (e.g., stoneflies, mayflies, caddisflies). Larger rocks, sticks, and plants may be removed from the sample if organisms are first removed from them. The contents of the pan are poured into a U.S. No. 30 sieve and transferred to a quart jar. The sample is then preserved with 95% ethyl alcohol to which rose bengal stain has been added.

D. Sample Sorting and Subsampling. In the laboratory the sample is rinsed with tap water in a U.S. No. 40 standard sieve to remove any fine particles left in the residues from field sieving. The sample is transferred to an enamel pan and distributed homogeneously over the bottom of the pan. A small amount of the sample is randomly removed with a spatula and placed in a petri dish with alcohol. This portion is examined under a dissecting stereomicroscope and 100 organisms are removed from the debris. As they are removed, they are sorted into major groups, placed in vials containing 70 percent alcohol, and counted. Following identification of a subsample, if the results are ambiguous, suspected of being spurious, or do not yield a clear water quality assessment, additional subsampling may be required.

E. Organism Identification. All organisms are identified to the species level whenever possible. Chironomids and oligochaetes are slide-mounted and viewed through a compound microscope; most other organisms are identified as whole specimens using a dissecting stereomicroscope. The number of individuals in each species, and the total number of individuals in the sample is recorded on a data sheet. All organisms from the subsample are archived, either slide-mounted or preserved in alcohol.

Appendix II. MACROINVERTEBRATE COMMUNITY PARAMETERS

1. Species richness. This is the total number of species or taxa found in the sample. Expected ranges for 100-specimen subsamples of kick samples in most streams in New York State are: greater than 26, non-impacted; 19-26, slightly impacted; 11-18, moderately impacted; less than 11, severely impacted.

2. EPT value. EPT denotes the total number of species of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) found in an average 100-organism subsample. These are considered to be mostly clean-water organisms, and their presence generally is correlated with good water quality (Lenat, 1987). Expected ranges from most streams in New York State are: greater than 10, non-impacted; 6-10, slightly impacted; 2-5, moderately impacted; and 0-1, severely impacted.

3. Biotic index. The Hilsenhoff Biotic Index is calculated by multiplying the number of individuals of each species by its assigned tolerance value, summing these products, and dividing by the total number of individuals. On a 0-10 scale, tolerance values range from intolerant (0) to tolerant (10). Values are listed in Hilsenhoff (1987); additional values are assigned by the NYS Stream Biomonitoring Unit. Ranges for the levels of impact are: 0-4.50, non-impacted; 4.51-6.50, slightly impacted; 6.51-8.50, moderately impacted; and 8.51-10.00, severely impacted.

4. Percent Model Affinity is a measure of similarity to a model non-impacted community based on percent abundance in 7 major groups. Percentage similarity as calculated in Washington (1984) is used to measure similarity to a community of 40% Ephemeroptera, 5% Plecoptera, 10% Trichoptera, 10% Coleoptera, 20% Chironomidae, 5% Oligochaeta, and 10% Other. Ranges for the levels of impact are: >64, non-impacted; 50-64, slightly impacted; 35-49, moderately impacted; and <35, severely impacted.

Hilsenhoff, W. L. 1987. An improved biotic index of organic stream pollution. The Great Lakes Entomologist 20(1): 31-39.

Lenat, D. R. 1987. Water quality assessment using a new qualitative collection method for freshwater benthic macroinvertebrates. North Carolina DEM Technical Report. 12 pp.

Washington, H.G. 1984. Diversity, biotic, and similarity indices. Water Research 18(6):653-694.

Appendix III. LEVELS OF WATER QUALITY IMPACT IN STREAMS.

The description of overall stream water quality based on biological parameters uses a four-tiered sytsem of classification. Level of impact is assessed for each individual parameter, and then combined for all parameters to form a consensus determination. Five parameters are used: species richness, EPT value, biotic index, percent model affinity, and field assessment. The consensus is based on the determination of the majority of the parameters; since parameters measure different aspects of the community, they cannot be expected to always form unanimous assessments. The ranges given for each parameter are based on 100-organism subsamples of macroinvertebrate riffle kick samples, and also apply to most multiplate samples.

1. NON-IMPACTED

Indices reflect excellent water quality. The macroinvertebrate community is diverse, usually with at least 27 species in riffle habitats. Mayflies, stoneflies, and caddisflies are well-represented; the EPT value is greater than 10. The biotic index value is 4.50 or greater. Percent model affinity is greater than 64. Water quality should not be limiting to fish survival or propagation. This level of water quality includes both pristine habitats and those receiving discharges which minimally alter the biota.

2. SLIGHTLY IMPACTED

Indices reflect good water quality. The macroinvertebrate community is slightly but significantly altered from the pristine state. Species richness usually is 19-26. Mayflies and stoneflies may be restricted, with EPT values of 6-10. The biotic index value is 4.51-6.50. Percent model affinity is 50-64. Water quality is usually not limiting to fish survival, but may be limiting to fish propagation.

3. MODERATELY IMPACTED

Indices reflect fair water quality. The macroinvertebrate community is altered to a large degree from the pristine state. Species richness usually is 11-18 species. Mayflies and stoneflies are rare or absent, and caddisflies are often restricted; the EPT value is 2-5. The percent model affinity value is 35-49. Water quality often is limiting to fish propagation, but usually not to fish survival.

4. SEVERELY IMPACTED

Indices reflect poor water quality. The macroinvertebrate community is limited to a few tolerant species. Species richness is 10 or less. Mayflies, stoneflies, and caddisflies are rare or absent; EPT value is 0-1. Percent model affinity is less than 35. The dominant species are almost all tolerant, and are usually midges and worms. Often 1-2 species are very abundant. Water quality is often limiting to both fish propagation and fish survival.

Appendix IV EFFECTS OF LAKE OUTLETS ON AQUATIC INVERTEBRATES

Lakes and ponds have pronounced effects on the invertebrate faunas of their outflows. Although each outflow is dependent on the characteristics of the lake, most outflows share the following traits:

1. A marked succession of species often occurs over a short distance (Hynes, 1970). Macroinvertebrates which are often commonly numerous below lake outlets include Simulium (blackfly larvae), Cheumatopsyche (filter-feeding caddisflies), Nais (worms), Gammarus or Asellus (crustaceans), Cricotopus (midges), Stenelmis (riffle beetles), and Hirudinea (leeches). See the Ramapo River report.

2. Species richness is almost always lower below lake outlets. Due primarily to the lack of upstream communities to provide a resource for colonization and drift, lake outlet communities often have about 60% of the number of species found in comparable downstream segments. See the Canadaigua Outlet report.

3. Productivity may be initially high below the lake, but usually decreases a short distance downstream. Plankton carried downstream from the lake increases the biomass immediately downstream, primarily of organisms which feed by filtering plankton, such as certain caddisflies, blackflies, and midges. This enriching effect does not persist very far downstream, as the plankton is diminished, and communities below this may have very low productivity. See the Upper Susquehanna River report.

4. Lakes with cold-water hypolimnion releases limit the fauna additionally by interference with life cycles of aquatic insects such as mayflies, stoneflies, and caddisflies. Because the temperature of hypolimnetic releases is usually very cold, the downstream communities are often limited to midges, worms, blackflies, snails, and sowbugs. See the reports on the Delaware and Neversink Rivers.

Bode, R.W. 1986. Biological stream assessment, Upper Susquehanna River near Cooperstown, New York. NYS Dept. of Health Technical Memorandum, 13 pp.

Bode, R.W., M.A. Novak, and L.E. Abele. 1986. Rapid biological stream assessment, Ramapo River. NYS DEC Technical Memorandum, 12 pp.

Bode, R.W., M.A. Novak, and L.E. Abele. 1987. Rapid biological stream assessment, Delaware River, West Branch. NYS DEC Technical Memorandum, 18 pp.

Bode, R.W., M.A. Novak, and L.E. Abele. 1988. Biological stream assessment, Neversink River. NYS DEC Technical Memorandum, 26 pp.

Hynes, H.B.N. 1970. The ecology of running waters. The University of Toronto Press. 555 pp.

Novak, M.A., R.W. Bode, and L.E. Abele. 1987. Rapid biological stream assessment, Canandaigua Outlet. NYS DEC Technical Mem., 16 pp.