Division of Water

BIOLOGICAL IMPAIRMENT CRITERIA FOR FLOWING WATERS IN NEW YORK STATE

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New York State/Department of Environmental Conservation

BIOLOGICAL IMPAIRMENT CRITERIA FOR FLOWING WATERS IN NEW YORK STATE

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SPECIES	TOLERANCE	REFERENCE
Chironomidae		
Orthocladiinae		
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	6	73
	6	73

SPECIES	TOLERANCE	REFERENCE
Chironomidae		
Tanypodinae		
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Conchapelopia goniodes	6	61
Conchapelopia rurika	6	61
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Labrundinia nr. virescens	7	99
Larsia canadensis Natarsia	7	99
sp. A	6	8
Natarsia baltimoreus	8	100
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Nilotanypus sp. paramerina	8	98
sp.	.6	98
Pentaneura inconspicua?	6	81
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sublettei Psectrotanypus	9	60
dyari Rheopelopia perda?	9	60
Rheopelopia sp. 2 Rheopelopia	10	100
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stellatus Telopelopia okoboji	4	61
Thienemannimyia gr. spp.	10	58
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Trissopelopia ogemawi	8	61
Zavrelimyia sinuosa	6	61
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Tanypodinae	4	61
Podonominae	8	101
Paraboreochlus sp.	8	81
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Potthastia gaedii Potthastia		
longimana Pseudokiefferiella	5	24
sp. SYmpotthastia sp.	1	24
Undetermined Diamesinae	2	24
Prodiamesinae	2	24
Monodiamesa dipectinata	1	24
prodiamesa sp. 1 Prodiamesa	2	24,25
sp. 2	2	24
Orthocladiinae	7	65
	3	81
	3	81

SPECIES	TOLERANCE	REFERENCE
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prosimulium hirtipes	2	79,85
prosimulium magnum prosimulium	1	79,85
rhizophorum Simulium aureum	2	79,85
Simulium decorum	7	79,85
Simulium fibrinflatum Simulium	7	79,85
gouldingi Simulium jenningsi	6	79,85
Simulium latipes	3	79,85
Simulium parnassum Simulium	4	79.,85
pictipes	4	79,85
Simulium rugglesi	7	79,85
Simulium tuberosum Simulium	4	79
venustum	5	79,85
Simulium vittatum	4	79,85
Simulium sp.	5	79,85
Tabanidae	7	79,85
Chrysops sp.	5	79,85
Tabanus sp.	5	94
Undetermined Tabanidae	5	111
Rhagionidae	5	94
Atherix sp.	2	94
Empididae	6	94
Chelifera sp.	6	94
Clinocera sp.	6	94
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Undetermined Dolichopodidae	6	94
Ephydridae	6	94
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Muscidae	8	62
Undetermined Muscidae	8	62
Anthomyiidae	8	62
Undetermined Anthomyiidae	8	62
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Tanypodinae	4	59,101
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Ablabesmyia monilis	6	61
Ablabesmyia philosphagnos		
Ablabesmyia simpsoni		
Ablabesmyia sp.		
Clinotanypus pinguis		
Coelotanypus scapularis		
Conchapelopia aleta		
Conchapelopia americana		
Conchapelopia dusena		

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SPECIES	TOLERANCE	REFERENCE
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Triaenodes sp. Undetermined	6	82
Leptoceridae		
LEPIDOPTERA	4	82
Arctiidae		
Estigmene sp.	5	121
Nepticulidae		
Undetermined Nepticulidae	5	121
Pyralidae		
Acentria sp.	5	121
Nymphula sp.	7	121
Parapoynx sp.	5	121
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	3	95
Undetermined Lepidoptera	3	95
	5	121
DIPTERA	3	95
Tipulidae	3	95
Antocha sp. 1	4	95
Antocha sp. 2	2	95
Antocha sp.	2	95
Dicranota sp.	2	95
Helius sp.	6	95
Hexatoma sp. 1	7	95
Hexatoma sp. 2	4	95
Hexatoma sp.	4	95
Limonia sp.	4	94
pilaria sp.	10	94
Tipula sp.		
Undetermined Tipulidae	9	54
Psychodidae	0	94
Pericoma sp.	1	111
Undetermined Psychodidae	8	111
Ptychopteridae	6	36,54
Bittacomorpha clavipes	6	36,54
Blephariceridae	10	36,54
Undetermined Blephariceridae	6	36,54
Dixidae	6	36,54
Dixa sp.	6	36,54
Chaoboridae		
Chaoborus punctipennis		
Ceratopogonidae		
Bezzia sp. 1		
Bezzia sp. 2		
Culicoides? sp.		
Forcipomyia sp.		
Probezzia sp. 1		
Probezzia sp. 2		
Sphaeromais longipennis		
Undetermined Ceratopogonidae		

SPECIES	TOLERANCE	REFERENCE
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oxyethira sp.	3	63
Palaeagapetus celsus	4	82
Palaeagapetus sp.	1	82
Phryganeidae		
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ptilostomis sp.	5	82
Brachycentridae		
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Brachycentrus incanus	<,~,~.."\,." 0	31
Brachycentrus lateral is	1 1	31
Brachycentrus numerosus	1	31
Brachycentrus solomoni	2	31
Micrasema sp. 1	2	31
Micrasema sp. 2	2	31
Micrasema sp. 3	2	31
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Apatania sp.	3	
Hesperophylax designatus	3	82
Hydatophylax sp. Nemotaulius sp.	2	82
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Neophylax sp.	3	82
Platycentropus sp.	3	82
Pseudostenophylax sp.	4	82
Psychoglypha sp. Pycnopsyche sp. Undetermined Limnephilidae	0	82
Lepidostomatidae	0	82
Lepidostoma sp.	4	82
Odontoceridae		82
Psilotreta sp.	1	82
Molannidae		
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Helicopsychidae		
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Helicopsyche sp.	3	82
Leptoceridae	3	
Ceraclea punctata		82
Ceraclea sp.	3	82
Mystacides sepulchralis	3	
Mystacides sp.	4	55
Nectopsyche sp.	4	55
Oecetis avara	3	86
Oecetis cinerascens	8	86
Oecetis inconspicua	8	34
Oecetis sp.	8	63
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		63
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Hydropsyche leonardi	0	70
Hydropsyche morosa Hydropsyche	6	69,70
orris Hydropsyche phalerata	5	70 70
Hydropsyche recurvata	1	70 70
Hydropsyche scalaris	4	70 70
Hydropsyche separata	2	70 70
Hydropsyche slossonae	4	70 70
Hydropsyche sparna Hydropsyche	4	63 63
valanis Hydropsyche venularis	6	63 82
Hydropsyche sp.'	6	82 82
Macronema carolina Macronema	4	
zebratum Macronema sp.	4	
Parapsyche sp.	3	
Potamyia sp.	3	
Undetermined Hydropsychidae	3	
Rhyacophilidae	0	
Rhyacophila carolina gr.	5	
Rhyacophila carpenteri?	5	
Rhyacophila fuscula		
Rhyacophila glaberrima	1	29 29
Rhyacophila melita Rhyacophila	1	29 29
nigrita Rhyacophila sp.	0	29 29
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Agapetus sp.	1	
Glossosoma sp.	1	
Protoptila sp.	1	
Hydroptilidae		
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Alisotrichia sp. Hydroptila	0	82
ajax?	1	
Hydroptila nr. albicornis		
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Hydroptila nr. armata	6	63 63
Hydroptila consimilis?	6	63 63
Hydroptila nr. grandiosa sp. 3	6	63 63
Hydroptila nr. hamata sp. 1	6	63 63
Hydroptila nr. hamata sp. 2	6	63 63
Hydroptila spatulata?	6	63 63
Hydroptila nr. waubesiana	6	63 63
Hydroptila sp.	6	
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sp. Mayatrichia ayama	6	
Neotrichia sp.	6	
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SPECIES	TOLERANCE	REFERENCE
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Optioservus sp.	4	13
Oulimnius latiusculus	4	13
Promoresia elegans	2	13
Promoresia tardella	2	13
promoresia sp.	2	13
Stenelmis bicarinata	5	13
Stenelmis concinna Stenelmis crenata Stenelmis markeli	5	13
Stenelmis musgravei	5	13
Stenelmis sp. Undetermined	5	13
Elmidae	5	13
MEGALOPTERA	4	63
Corydalidae	5	27
Chauliodes sp.	4	63
Corydalus cornutus Nigronia serricornis	4	63
Sialidae	4	63,8
Sialis sp.	0	2
NEUROPTERA	2	30
Sisyridae	2	30
Climacia areolaris	8	30
TRICHOPTERA	8	30
Philopotamidae	7	30
Chimarra aterrima? Chimarra socia	7	30
Chimarra obscura? Chimarra sp.	5	30
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Lype diversa	6	30
psychomyia flavida	6	30
Polycentropodidae Cyrnellus fraternus Cyrnellus sp. 2	1	82
Neureclipsis bimaculata	5	82
Neureclipsis sp.	0	82
Nyctiophylax celta	6	70
Nyctiophylax moestus	6	70
Phylocentropus sp.	6	70
Polycentropus remotus		
Polycentropus sp.		
Hydropsychidae		
Arctopsyche sp.		
Cheumatopsyche sp.		
Diplectrona sp. Hydropsyche betteni Hydropsyche bronta		
Hydropsyche nr. depravata		

SPECIES	TOLERANCE	REFERENCE
Perlodidae	2	117
Cultus decisus Helopicus subvarians Isogenoides	2	112,117
hansoni Isoperla	0	112
holochlora Isoperla sp.	2	38,117
Malirekus hastatus	2	77,117
Undetermined Perlodidae	2	112,117
pteronarcidae	2	117
pteronarcys	0	112,117
pteronarcys biloba	0	116,117
pteronarcys dorsata	0	117
COLEOPTERA sp.		
Haliplidae	5	96,87
Haliplus sp.	5	96,87
Peltodytes sp.	.5	96,87
Dytiscidae	5	96,87
Agabetes sp.	5	96,87
Agabus sp.	5	96,87
Hydroporous sp. Laccophilus sp. Undetermined Dytiscidae	5	96,87
Gyrinidae	5	96,87
Dineutus sp.	5	96,87
Hydrophilidae	5	96,87
Berosus sp.	4	96,87
Helochares sp.	5	96,87
Helophorus sp.	5	96,87
Hydrobius sp.	5	96,87
Laccobius sp.	5	96,87
Psephenidae	5	96,87
Ectopria nervosa	5	96,87
Ectopria sp.	5	96,87
Psephenus herricki Psephenus sp.	5	13
Dryopidae	5	13
Helichus sp.	4	13
Scirtidae	4	13
Undetermined Scirtidae	5	13,87,96
Elmidae	5	54
Ancyronyx variegatus	6	13
Dubiraphia bivittata	8	13
Dubiraphia quadrinotata	5	13
Dubiraphia vittata	6	13
Dubiraphia sp. Macronychus glabratus Optioservus	6	13
fastiditus Optioservus	5	13
immunis Optioservus oval is	4	13
Optioservus nr. sandersoni	4	13
	4	13
	4	13

SPECIES	TOLERANCE	REFERENCE
PLECOPTERA		
Capniidae	3	64,117
Allcrcapnia vivipara	3	64,117
Allocapnia sp.	1	117
Paracapnia sp.	3	117
Undetermined Capniidae	0	91,117
Leuctridae	0	91,117
Leuctra ferruginea	0	117
Leuctra tenuis Leuctra	0	117
sp. Zealeuctra sp.	3	92,117
Nemouridae	3	92,117
Amphinemura	3	92,117
Amphinemura delosa	1	1],7
Amphinemura nigritta	2	1i7
Nemoura sp. wui	2	117
Ostrocerca sp.	2	117
Shipsa rotunda	3	116,117
Undetermined Nemouridae	2	33, 117
Taeniopterygidae Strophopteryx	2	33,117
fasciata Taeniopteryx burksi	2	33,117
Taeniopteryx lonicera	2	33,117
Taeniopteryx nivalis	2	33,117
Taeniopteryx parvula	0	76,117
Taeniopteryx sp.	0	7 6 11 7
Perlidae	0	76,117
Acroneuria abnormis Acroneuria	0	117
carolinensis Acroneuria	2	74,117
lycorias Acroneuria sp.	2	74,117
Agnetina capitata	2	117
Agnetina flavescens Agnetina	3	77
sp.	3	117
Claasenia? sp.	1	38,117
Neoperla sp.	1	38,117
Paragnetina immarginata	5	38,117
Paragnetina media	3	117
Perlesta placida Undetermined	0	117
perlidae	0	117
Peltoperlidae	0	117
Tallaperla sp.	1	117
Chloroperlidae	0	117
Alloperla sp.	0	117
Haploperla brevis	0	117
Rasvena terna		
Suwallia sp.		
Sweltsa sp.		
Undetermined Chloroperlidae		

SPECIES	TOLERANCE	REFERENCE
Caenidae		
Brachycercus sp.	3	87
Caenis sp.	7	46
Baetiscidae		
Baetisca Spa	4	87,26
Potamanthidae		
Potamanthus verticis	4	48
Potamanthus Spa	4	48
Ephemeridae		
Ephemera guttulata Ephemera sp.	2	48
Hexagenia sp.	2	48
PolYmitarcyidae	6	48
Ephoron leukon?		
ODONATA	2	26
Gomphidae		
Gomphus sp.		
Lanthus sp.	5	80
Ophiogomphus Spa	5	80
Stylurus sp.	1	80
Undetermined Gomphidae	4	80
Aeschnidae	4	80
Basiaeschna janata		
Boyeria Spa	6	80
Cordulegasteridae	2	80
Cordulegaster sp.		
Libellulidae	3	80
Macromia Spa		
Neurocordulia Spa	2	80
Calopterygidae	2	80
Calopteryx sp.		
Undetermined Calopterygidae	6	80
Agrionidae	6	80
Hetaerina sp.		
Undetermined Agrionidae	6	80
Coenagrionidae	6	80
Argia sp.		
Enallagma sp.	6	80
Ischnura sp. 1	8	80
Ischnura Spa 2	9	80
Ischnura sp. 3	9	80
Ischnura sp. 4	9	80
Ischnura Spa 5	9	80
Ischnura Spa	9	80
Undetermined Coenagrionidae	9	80
HEMIPTERA	8	80
Corixidae		
Hesperocorixa sp.		
Undetermined Corixidae	5	54
	5	54

SPECIES	TOLERANCE	REFERENCE
Heptageniidae		
Stenonema femoratum Stenonema	5	7
integrum Stenonema ithaca	4	7
Stenonema mediopunctatum	3	7
Stenonema modestum	3	7
Stenonema pulchellum Stenonema	1	7
terminatum Stenonema vicarium	3	7
Stenonema sp.	4	7
Undetermined Heptageniidae	2	7
Leptophlebiidae	3	7
Choroterpes sp.	3	87
Habrophlebia vibrans		
Habrophlebia sp.	2	87
Habrophlebiodes sp.	4	26
Leptophlebia sp.	4	87
Paraleptophlebia guttata	6	87
Paraleptophlebia mollis	4	87
Paraleptophlebia sp.	1 1	17
Undetermined Leptophlebiidae	1 4	17
Ephemerellidae		87
Attenella margarita Dannella		87
simplex		
Dannella sp.	1	88 1 1
Drunella cornuta	2	2
Drunella cornutella	2	2
Drunella lata	0	2
Drunella tuberculata Drunella	0	2
walkeri Ephemerella aurivillii	0	2
Ephemerella dorothea	0	5
Ephemerella excrucians?	0	5
Ephemerella invaria Ephemerella	0	5
needhami Ephemerella rotunda	1 1	5
Ephemerella subvaria	1 1	5
Ephemerella sp.	1 1	5
Eurylophella funeral is	1	5
Eurylophella temporal is	0	5
Eurylophella verisimilis	5	4
Eurylophella sp.	2	4
Serratella deficiens Serratella	2	4
serrata Serratella serratoides	2	4
Serratella sordida Serratella	2	3
sp.	2	3
Undetermined Ephemerellidae	2	3
Tricorythidae	2	3
Tricorythodes sp.		87
	4	87

SPECIES	TOLERANCE	REFERENCE
Limnocharidae		
Limnochares sp.	6	54
Sperchonidae		
Sperchon sp.	6	54
Unionicolidae		
Unionicola sp. 1	6	54
Unionicola sp. 2	6	54
Undetermined Acariformes	6	54
INSECTA		
COLLEMBOLA		
Isotomidae		
Isotomurus palustris	5	54
EPHEMEROPTERA		
Siphlonuridae		
Ameletus ludens	0	87,26
Ameletus sp.	0	87
Isonychia bicolor	2	44
Isonychia obscura	2	44
Siphlonurus sp.	7	87
Baetidae		
Baetis amplus	6	49
Baetis brunneicolor Baetis	4	49
flavistriga Baetis	4	49
intercalaris Baetis	6	49
macdunnoughi Baetis pluto	5	49
Baetis propinquus Baetis	6	49
pygmaeus	6	49
Baetis tricaudatus Baetis	4	49
sp.	6	49
Callibaetis sp.	6	49
Centroptilum sp.	9	87
Cloeon sp.	2	87
Heterocloeon	4	87
pseudocloeon curiosum	2	87,26
Undetermined sp.	4	87
Heptageniidae Cinygmula	6	87
subaequalis Epeorus	2	87
(Iron) sp.	0	87
Heptagenia culacantha	2	28
Heptagenia flavescens	4	17
Heptagenia marginalis	4	17
Heptagenia pulla gr.	4	17
Heptagenia sp. Leucrocuta	4	17
sp.	1	32
Nixe (Nixe) sp. Rithrogena	2	32
sp. Stenacron	o.	87
interpunctatum Stenonema	7	7
exiguum	5	7

SPECIES	TOLERANCE	REFERENCE
~RTHROPODA		
CRUSTACEA		
ISOPODA.		
Anthuridae		
Cyathura polita	5	114
Idoteidae		
Chiridotea almyra	5	114
Edot~a sp.	5	114
Asellidae		
Asellus communis	8	83,84
Asellus racovitzai	8	83,84
Asellus racovitzai racovitzai	8	83,84
Asellus nr. racovitzai Asellus	8	83,84
sp.	.8.	83,84
Lirceus sp.	8	84
AMPHIPODA		
Gammaridae		
Gammarus fasciatus	6	11,40
Gammarus pseudolimnaeus Gammarus	4	11,40
tigrinus	6	11,40
Gammarus sp.	6	11,40
Oedicerotidae		
Monoculodes edwardsi	5	11
Talitridae		
Hyalella azteca	8	11
CUMACEA		
Almyracuma proximoculi	5	114
DECAPODA		
Cambaridae		
Cambarus sp.	6	22,39
Orconectes obscurus	6	22,39
Orconectes sp.	6	22,39
Undetermined Cambaridae	6	22,39
ARACHNOIDEA		
Arrenuridae		
Arrenurus sp.	6	5 4
Lebertiidae		
Lebertia sp.	6	5 4
Atractideidae		
Atractides sp.	6	5 4
Mideopsidae		
Mideopsis sp.	6	5 4
Tyrellidae		
Tyrellia sp.	6	5 4
Limnesidae		
Limnesia sp.	6	5 4

SPECIES	TOLERANCE	REFERENCE
Planorbidae		
Helisoma campanulata	6	35,16
Helisoma trivolvis Menetus	6	35,16
dilatatus Undetermined	6	35,16
Planorbidae	6	35,16
Ancylidae		
Ferrissia rivularis	6	35,16
MESOGASTROPODA		
Viviparidae		
Campeloma decisa	6	35,16
Viviparus georgianus	6	35,16
Pleuroceridae		
Goniobasis livescens	6	35,16
Goniobasis virginica	6	35,16
Goniobasis sp.	6	35,16
Pleurocera acuta	6	35,16.
Hydrobiidae		
Amnicola integra Amnicola limosa	8	35,16
Amnicola lustrica Amnicola sp.	8	35,16
Bithynia tentaculata	8	35,16
Pomatiopsis lapidaria	8	35,16
Probythinella lacustris	8	35,16
Undetermined Hydrobiidae	8	35,16
Valvatidae		
Valvata lewisi	8	35,16
Valvata piscinalis Valvata sincera	8	35,16
Valvata tricarinata	8	35,16
PELECYPODA	8	35,16
UNIONIDA		
Unionidae		
Anodonta cataracta	6	21,15
Anodonta implicata	6	21,15
Elliptio complanatus	8	21,15
Lampsilis radiata radiata	6	21,15
VENEROIDEA		
Sphaeriidae		
Musculium partumeium	8	14,45
Musculium transversum	8	14,45
pisidium amnicum pisidium	8	14,45
casertanum pisidium	8	14,45
compressum pisidium	8	14,45
variabile Pisidium sp.	8	14,45
Sphaerium corneum Sphaerium	8	14,45
striatinum Sphaerium sp.	8	14,45
Undetermined Sphaeriidae	8	14,45

SPECIES	TOLERANCE	REFERENCE
Naididae	8	'37
Stylaria lacustris Vejdovskyella comata Vejdovskyella intermedia ~ Vejdovskyella sp.	4 4 4	37 37 37
HIRUDINEA		
RHYNCHOBDELLIDA		
Glossiphoniidae		
Batracobdella phalera Helobdella elongata Helobdella stagnalis Helobdella triserialis Placobdella montifera Undetermined Hirudinea	6 6 6 6 6 6	42 42 42. 42 42 42
APHANONEURA		
AEOLOSOMATIDA		
Aeolosomatidae		
Aeolosoma headleyi? Aeolosoma leidyi? Aeolosoma quarternarium? Aeolosoma tenebrarum? Aeolosoma travancorense? Undetermined Aeolosomatidae	8 8 8 8 8 8	20 20 20 20 20 20
BRANCHIOBDELLIDA		
BRANCHIOBDELLIDA		
Branchiobdellidae		
Branchiobdella sp. Undetermined Branchiobdellidae	6 6	54 54
MOLLUSCA		
GASTROPODA		
BASOMMATOPHORA		
Physidae		
Physa elliptica Physa gyrina Physa heterostropha Physa integra Physa sayii Physa sp.	8 8 8 8 8 8	35,16 35,16 35,16 35,16 35,16 35,16
Lymnaeidae		
Lymnaea humilis Lymnaea humilis Lymnaea palustris Lymnaea stagnalis Pseudosuccinea columella Radix auricularia Stagnicola catascopium Undetermined Lymnaeidae	6 6 6 6. 6 6 6	35,16 35,16 35,16 35,16 35,16 35,16 35,16
Planorbidae		
Gyraulus hirsutus Gyraulus parvus	6 8 8	35,16 35,16 35,16

SPECIES	TOLERANCE	REFERENCE
Tubificidae		
Branchiura sowerbyi	10	78
Ilyodrilus templetoni Isochaetides freyi	10	78
Limnodrilus cervix	10	78
Limnodrilus claparedeianus	10	78
Limnodrilus hoffmeisteri Limnodrilus profundicola Limnodrilus udekemianus	10	78
Peloscolex sp.	10	78
Quistadrilus multisetosus	10	78
Spirosperma ferox	10	78
Tubifex tubifex	10	78
Undet. Tubificidae wi cap. setae	10	78
Undet. Tubificidae w/o cap. setae	10	78
Naididae	10	78
Amphichaeta americana? Arcteonais lomondi	10	78
Chaetogaster diaphanus Chaetogaster diastrophus Chaetogaster limnaei	6	37
Chaetogaster setosus Chaetogaster sp.	6	37
Dero digitata	6	37
Dero furcata	6	37
Dero nivea	6	37
Dero obtusa	10	37
Dero pectinata	10	37
Dero sp.	10	37
Haemonais waldvogeli	10	37
Nais barbata	10	37
Nais behningi	8	37
Nais bretscheri	8	37
Nais communis	6	37
Nais elinguis	6	37
Nais pardalis	8	37
Nais simplex	10 8	37
Nais variabilis	6 .	37
Nais sp.	10	37
Ophidonais serpentina	8	37
pristina aequiseta Pristina	6	37
breviseta pristina leidyi	8	37
Pristina menoni	8	37
pristina sp.	8	37
pristinella jenkinae	8	37
pristinella osborni	8	37
Pristina/Pristinella spp.	10	37
Ripistes paras ita Slavina	10	37
appendiculata Specaria	10	37
josinae	8	37
	6	37
	6	37
		37

APPENDIX IV
NYSDEC STREAM BIOMONITORING UNIT
MACRO INVERTEBRATE SPECIES LIST

09/20/90
PAGE: 1

SPECIES	TOLERANCE	REFERENCE
80ELENTERATA		
HYDROZOA		
HYDROIDA		
Hydridae		
Hydra Spa	5	54
NEMERTEA		
ENOPLA		
HOPLONEMERTINI		
Prostomatidae		
Prostoma graecense (=rubrum)	8	54
PLATYHELMINTHES		
TURBELLARIA		
TRICLADIDA		
Planariidae		
Dugesia tigrina	6	41
Dugesia Spa	6	41
Undetermined Planariidae	6	41
Undetermined Turbellaria	6	41
ANNELIDA		
POLYCHAETA		
SABELLIDA		
Sabellidae		
Manayunkia speciosa	6	*20*
OLIGOCHAETA		
LUMBRICINA		
Undetermined Lumbricina	8	87
LUMBRICULIDA		
Lumbriculidae		
Lumbriculus Spa	8	37
Stylodrilus heringianus	8	37
Undetermined Lumbriculidae	8	37
TUBIFICIDA		
Enchytraeidae		
Undetermined Enchytraeidae Spa 1	*10*	12,43
Undetermined Enchytraeidae Spa 2	*10*	12,43
Undetermined Enchytraeidae	*10*	12,43
Tubificidae		
Aulodrilus americanus	8	78
Aulodrilus limnobius	8	78
AulodLilus piqueti	8	78
Aulodrilus pluriseta	8	78
Aulodrilus Spa	8	78

APPENDIX IV. SPECIES AND IDENTIFICATION REFERENCE LIST

SPECIES includes macro invertebrates collected in water quality surveys of New York State streams by the Stream Biomonitoring unit since 1972. These are listed primarily in phylogenetic order. Classifications included for most organisms are phylum, class, order, family, genus, and species. Genera are arranged alphabetically within each family (subfamily for Chironomidae).

TOLERANCE is a listing of tolerance values for each species used in the calculation of the Hilsenhoff Biotic Index. Tolerance values range from 0 for organisms very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes. Most of these values were taken from Hilsenhoff (1987). For species not included in Hilsenhoff's listing, such as Oligochaeta, values were assigned based on water quality data from Stream Biomonitoring Unit surveys and from other literature references. Values taken from survey data were assigned by taking the mean of the tolerance values of other species in the sample.

REFERENCE provides the number referring to the primary reference or references used to identify the species. These references are listed in numerical order following the species list. For references which include only keys for adult, non-aquatic stages, specimens of the larvae were reared and identified in the adult stage.

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

113. Harper, P. P. and K. W. stewart. 1984. Plecoptera. Chapter 13, pp. 182-230 in R. W. Merritt and K. W. Cummins (eds.). An introduction to the aquatic insects of North America, 2nd Edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

114: Gosner, K. L. 1971. Guide to Identification of Marine and Estuarine Invertebrates: Cape Hatteras.to the Bay of Fundy. Wiley Interscience, Division of John Wiley & Sons, Inc. New York. 693 pp.

115. Mason, P. G. 1985. The larva of Tvetenia vitracies (Saether) (Diptera: Chironomidae) . Proc. Entomol. Soc. Wash. 87 (2): 418-420.

116. Claassen, P. W. 1931. Plecoptera nymphs of America (north of Mexico). The Thomas Say Foundation, Charles C. Thomas, Publisher: Springfield, Illinois. 199 pp.

117. Stewart, K. W. and B. P. Stark. 1988. Nymphs of North American stone fly genera (Plecoptera). Entomological Society of America, Thomas Say Foundation, 12. 460 pp.

118. Wiederhohm, T. (ed.). 1986. Chironomidae of ~he Holarctic region: Keys and diagnoses. Part II. Pupae. Entomologica Scandinavica Supple 28:1-482.

119. Bilyj, B. 1988. A taxonomic review of Guttipelopia (Diptera: Chironomidae). Ent. Scand. 19:1-26.

120. Vineyard, R. N. and G. B. Wiggins. 1987. Seven new species from North America in the caddisfly genus Neophvlax (Trichoptera: Limnephilidae). Ann. Ent. Soc. Amer. 80:62-73.

121. Lange, W. H. 1984. Aquatic and. semiaquatic Lepidoptera. Chapter 18, pp. 348-360, in R. W. Merritt and K. W. Cummins (eds.), An introduction to the aquatic insects of North America, 2nd edition. Kendall/Hunt Publ. Co.,

101. Roback, S. S. 1971. The adults of the subfamily Tanypodinae (= Pelopiinae) in North America (Diptera: Chironomidae). Monogr. Acad. Nat. Sci. Phila. 17: 1-410.

102. Mozley, S. C. 1982. Larvae of Parakiefferiella Thienemann. Southeastern Water Pollution Biologists Association Newsletter. 6: 1-11.

103. Caldwell, B. A. 1986. Description of the immature stages and adult female of Unniella multivirqa Sa ether (Diptera: Chironomidae) with comments on phylogeny. Aquatic Insects.

104. Townes, H. K., Jr. 1945. The Nearctic species of Tendipedini (Diptera: Tendipedidae) (= Chironomidae). Amer. MidI. Natur. 34(1): 1-206.

105. Epler, J. H. 1987. Revision of the Nearctic Dicrotendipes Kieffer, 1913 (Diptera: Chironomidae). Evolutionary Monographs 9: 102 pp. + 241 figs.

106. Grodhaus, G. 1987. Endochironomus Kieffer, Tribelos Townes, Svnendotendipes, n. gen., arid Endotribelos, n. gen. (Diptera: Chironomidae) of the Nearctic Region. J. Kansas Ent. Soc. 60(2): 167-247.

107. Jackson, G. A. 1977. Nearctic and Palearctic Paracladopelma Harnisch and Saetheria n. gen. (Diptera: Chironomidae). J. Fish. Res. Bd. Can. 34(9): 1321-1359.

108. Beck, W. M. and E. C. Beck. > 1970. The immature stages of some Chironomini (Chironomidae). Q. JI. Fla. Acad. Sci.- 33: 29-42.

109. Brundin, L. 1948. Uber die Metamorphose der sectio Tanvtarsariae connectentes (Dipt. Chironomidae). Ark. Zool. 41(2): 1-22 + VII pl.

110. Boesel, M. W. 1974. Observations on the Coelotanypodini of the northeastern states, with keys to the known stages. (Diptera: Chironomidae: Tanypodinae). J. Kansas Ent. Soc. 17(4): 417-432.

111. Wirth, W. W. and A. Stone. 1971. Aquatic Diptera. Ch. 14, pp. 372-482 in: R. L. Usinger, (ed.). Aquatic insects of California. Univ. of Calif. Press, Berkeley. 508 pp.

112. Ricker, W. E. 1952. systematic Studies in Plecoptera. Indiana University Publications. Science Series No. 18. Indiana University, Bloomington, Indiana. 200 pp.

APPENDIX III (continued)

90. Harper, P. P. and H.B. N. Hynes. 1971. The Capniidae of Can. Eastern Canada (Insecta: Plecoptera). J. Zool. 49: 921-940.

91. Harper, P. P. and H. B. N. Hynes. 1971. The Leuctridae of Eastern Canada (Insecta: Plecoptera). Can. J. Zool. 49: 915-920.

92. Harper, P. P. and H. B. N. Hynes. 1971. The nymphs of Nemouridae of Eastern Canada (Insecta: Plecoptera) Can. J. Zool. 49: 1129-1142.

93. Fiance, s. B. 1977. The Genera of Eastern North American Chloroperlidae: Key to larval stages. Psyche. 84: 308-316.

94. Tesky, H. J. 1984. Aquatic Diptera. Part I. Larvae of Aquatic Diptera. Chapter 21. pp. 448-466 in R. W. Merritt and K. W. Cummins (eds.) An introduction to the aquatic insects of. North America, 2nd Edi tion. Kendall/Hunt publ. Co., Dubuque, Iowa. 722 pp.

95. Byers, G. W. 1984. Tipulidae. Chapter 22, pp 491-514 in R. W. Merritt and K. W. Cummins (eds.) An introduction to the aquatic insects of North America, 2nd Edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

96. White, D. S., W. U. Brigham, and J. T. Doyen. 1984. Aquatic Coleptera. Chpater 19. pp. 361-437 in R. W. Merritt and K. W. Cummins (eds.) An introduction to the aquatic insects of North America, 2nd Edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

97. Murray, D. A. and E. J. Fittkau. 1985. Hayesomvia, a new genus of Tanypodinae from the Holarctic (Diptera: Chironomidae). Spixiana Suppl. 11: 195-207.

98. Roback, S. S. 1986. The immature chironomids of the Eastern united states. VIII. pentaneurini-genus Nilotanvpus, wi th the description of a new species from Kansas. Proc. Acad. Nat. Sci. Phila. 138(2): 443-465.

99. Roback, S. S. 1987. The immature chironomids of the Eastern United states. IX. pentaneurini-genus Labrundinia with the description of some neotropical material. Proc. Acad. Nat. Sci. Phila. 139: 159-209. .

100. Roback, S. S. 1978. The immature chironomids of the Eastern united states. III. Tanypodinae-Anatopyniini, Macropelopiini and Natarsiini. Proc. Acad. Nat. Sci. Phila. 129(11): 151-202.

79. stone, A. and H. A. Jamnback. 1955. The black flies of New York state (Diptera: Simuliidae). Bull. N. Y. S. Museum. 349: 1-144.

80. Westfall, M. J. 1984. Odonata. Chapter 11, pp. 126-176 in R. W. Merritt and K. W. Cummins (eds.), An introduction to the aquatic insects of North America, 2nd edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

81. Wiederholm, T. (ed.). 1983. Chironomidae of the Holarctic region: Keys and diagnoses. Part I. Larvae. Entomologica Scandinavica Supple 19: 1-457.

82. Wiggins, G. B. 1977. Larvae of the North American caddisfly genera. Univ. Toronto Press, Toronto. 401 pp.

83. Williams, W. D. 1970. A revision of North American epigean species of Asellus (Crustacea: Isopoda). Smithsonian contributions to Zoology. No. 49. smithsonian Institute Press, Washington. 80 pp.

84. Williams, W. D. 1972. Freshwater isopods (Asellidae) of North America. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems Identification Manual No.7. 45 pp.

85. Wood, D. M., B. I. Peterson, D. M. Davies, and H. Gyorhos. 1963. The black flies (Diptera: Simuliidae) of Ontario. Part II. Larval identification, with descriptions and illustrations. Proc. Entomol. Soc. ontario. 93: 99-129.

86. Yamamoto, T. and G. B. Wiggins. 1964. A comparative study of the North American species of the caddisfly gehus Mvstacides (Trichoptera: Leptoceridae). Can. J. Zool. 42: 1105-1126.

87. Peckarsky, B. L. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press, Ithaca, New York. 442 pp.

88. Allen, R. K. and G. F. Edmunds, Jr. 1961. A revison of the genus Ephemerella (Ephemeroptera: Ephmerellidae). III. The subgenus Attenuatella. J. Kan. Ent. Soc. 34(4): 161-173.

89. Merritt, R. W. and K. W. cummins (eds.). 1984. An introduction to the aquatic insects of North America, 2nd edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

69. Schefter, P. W. and G. B. Wiggins. 1986. A systematic study of the Nearctic larvae of the Hydropsyche morosa group (Trichoptera: Hydropsychidae). Life Sciences Miscellaneous Publication, Royal ontario Museum, Toronto. 94 pp.

70. Schuster, G. A. and D. A. Etnier. 1978. A manual for the identification of the larvae of the caddisfly genera Hydropsyche Pictet and Symphitopsyche Ulmer in eastern and central North America (Trichoptera: Hydropsychidae). U. S. No. EPA=600j4-78-060. 129 pp.

71. Simpson, K. W. and R. W. Bode. 1980. Common larvae of Chironomidae (Diptera) from New York State streams and rivers, with particular reference to the fauna of artificial substrates. Bull. N. Y. S. Museum. 439: 1-105.

72. Simpson, K. W., R. W. Bode, and P. Albu. 1983. Keys for the genus Cricotopus adapted from "Revision der Gattung Cricotopus van der Wulp und ihrer Verwandten (Diptera, Chironomidae)" by M. Hirvenoja. Bull. N. Y. S. Museum. 450: 1-133.

73. Soponis, A. R. 1977. A revision of the Nearctic species of Orthocladius (Orthocladius) Van der Wulp (Diptera: Chironomidae). Mem. Entomol. Soc. Can. 102: 1-187.

74. Stark, B. P. 1986. The Nearctic species of Agnetina (Plecoptera: Perlidae). J. Kan. Entomol. Soc. 59: 437-445.

75. Stark, B. P. and A. R. Gaufin. 1976a. The Nearctic genera of Perlidae (Plecoptera). Misc. Publ. Entomol. Soc. Am. 10(1): 1-80.

76. Stark, B. P. and A. R. Gaufin. 1976a. The Nearctic species of Acroneuria (Plecoptera: Perlidae). J. Kans. Ent. Soc. 49(2): 221-253.

77. Stewart, K. W. and B. P. Stark. 1984. Nymphs of North American Perlodinae genera (Plecoptera: Perlodidae). Great Basin Nat. 44(3): 373-415.

78. Stimpson, K. S., D. J. Klemm, and J. K. Hiltunen. 1982. A guide to the freshwater Tubificidae (Annelida: Clitellata:: Oligochaeta) of North America. U. s. Environ. Proto Agency, Environ. Monitoring Series. No. EPA-600/3-82-033. 61 pp.

56. Roback, S. S. 1957. The immature tendipedids of the Philadelphia area. Monogr. Acad. Natur. Sci. Philadelphia. 9: 1-152 + 28 pl.

57. Roback, S. S. 1963. The genus Xenochironomus (Diptera: Tendipedidae) Kieffer, taxonomy and immature stages. Trans. Amer. Entomol. Soc. 88: 235-245.

58. Roback, S. S. 1969. The immature stages of the genus Tanvpus Meigen. Trans. Amer. Entomol Soc. 94: 407-428.

59. Roback, S. S. 1976. The immature chironomids of the eastern United States. I. Introduction and TanYPodinae Coelotanypodini. Proc. Acad. Natur. Sci. Philadelphia. 127: 147-201.

60. Roback, S. S. 1~80. The immature chironomids of the eastern united States. IV. Tanypodinae-Procladiini. Proc. Acad. Natur. Sci. Philadelphia. 132: 1-63.

61. Roback, S. S. 1981. The immature chironomids of the eastern united States. V. pentaneurini-Thienemannimvia group. Proc. Acad. Natur. Sci. Philadelphia. 133: 73-128.

62. Roback, S. S. 1985 The immature chironomids of the eastern united States. VI. Pentaneurini-genus Ablabesmyia. Proc. Acad. Natur. Sci. Philadelphia. 137: 153-212.

63. Ross, H. H. 1944. The caddis flies, or Trichoptera, of Illinois. Bull. Ill. Nat. Surv. 23: 1-326.

64. Ross, H. and W. Ricker. 1971. The classification, evolution, and dispersal of the winter stone fly genus Allocapnia. Ill. BioI. Monogr. 45: 1-666

65. Saether, o. A. 1973. Taxonomy and ecology of three new species of Monodiamesa Kieffer, with keys to Nearctic and palearctic species of the genus (Diptera: Chironomidae). J. Fish. Res. Board Can. 30: 655-679.

66. Saether, o. A. 1975. Nearctic and Palearctic Heterotrissocladius (Diptera: Chironomidae) . Bull. Fish. Res. Bd. Can. 193: 1-67.

67. Saether, O. A. 1976. Revision of Hvdrobaenus, Trissocladius, Zalutschia, Paratrissocladius and some related genera (Diptera:. Chironomidae) . Bull. Fish. Res. Bd. Can. 195: 1-287.

68. Saether, O. A. 1977. Taxonomic studies on Chironomidae: Nanocladius, Pseudochironomus, and the Harnischia complex. Bull. Fish. Res. Bd. Can. 196: 1-143.

44. Kondratieff, B. C. and J. R. Voshell, Jr. 1984. The North and Central American species *of* Isonvchia (Ephemeroptera: oligoneuriidae). Trans. Am. Entomol. Soc. *110:* 129-244.

45- Mackie, G. L., D. S. White, and T. W. Zdeba. 1980. A guide to freshwater mollusks *of* the Laurentian Great Lakes with species emphasis on the genus pisidium. U. S. Environ. Proto Agency, Environ. Res. Lab. Duluth, Minnesota. 144 pp.

46. Malzacher, P. 1984. The European species *of* the genus Caenis Stephens (Insecta: Ephemeroptera). (in German) Stuttgartr Beitr. Naturk., Sere A. 373: 1-48.

47. Maschwitz, D. E. 1976. Revision *of* the Nearctic species *of* the subgenus Polvpedilum (Chironomidae: Diptera) . Doctoral Dissertation, Univ.ersity *of* Minnesota. 325 pp.

48. McCafferty, W. P. 1975. The burrowing mayflies *of* the united States (Ephemeroptera: Ephemeroidea). Trans. Amer. Ent. Soc. *101:* 447-504.

49. Morihara, D. K. and W. P. McCafferty. 1978. The Baetis larvae *of* North America (Ephemeroptera: Baetidae). Trans. Amer. Ent. Soc. *105:* 139-221.

50. Neunzig, H. H. 1966. Larvae *of* the genus Niqronia Banks (Neuroptera: Corydalidae) . Proc. Ent. Soc. Wash. 68 (1); 11-16.

51. Oliver, D. R. and R. W. Bode. 1985. Description *of* the larva and pupa *of* Cardiocladius albiplumus Saether (Diptera: Chironomidae). Can. Ent. 117(7): *803-809.*

52. Oliver, D. R. and M. E. Roussel. 1983a. A redescription *of* Brillia Kieffer (Diptera: Chironomidae) with descriptions *of* Nearctic species. Can. Ent. 115: 257-279.

53. Oliver, D. R. and M. E. Roussel. 1983b. The insects and arachnids *of* Canada. Part II. The genera *of* larval midges *of* Canada (Diptera: Chironomidae). Res. Br. Agr. Can. 1746: 1-263.

54. Pennak, R. W. 1989. Freshwater invertebrates *of* the United States (3rd ed.). John Wiley & Sons, New York. 628 pp.

55. Resh, V. H. 1976. The biology and immature stages *of* the caddisfly genus Ceraclea in eastern North America (Trichoptera: Leptoceridae). Ann. Ent. Soc. Amer. 69: 1039-1061.

33. Fullington, K. E. and K. W. stewart. 1980. Nymphs of the stone fly genus Taeniopteryx (Plecoptera: Taeniopterygidae) of North America, J. Kans. Ent. Soc. 53(2): 237-259.

34. Haddock, J. D. 1977. The biosystematics of the caddis fly genus Nectopsvche in North America with emphasis on the aquatic stages. Amer. Mid. Nat. 98: 382-421.

35. Harman, W. N., and C. O. Berg. 1971. The freshwater snails of central New York with illustrated keys to the genera and species. Search. 1: 1-68.

36. Hilsenhoff, W. L. 1981. Aquatic insects of Wisconsin. Nat. Hist. Council, Uni v. of Wisconsin, Madison. Publ. No.2. 60 pp.

37. Hiltunen, J. K., and D. J. Klemm. 1980. A guide to the Naididae (Annelida: Clitellata: Oligochaeta) of North America. U. S. Environ. Prot.' Agency, Environ. Monitoring Series. No. EPA-600/4-80-031. 48 pp.

38. Hitchcock, S. W. 1974. Guide to the insects of Connecticut. Part VII. The Plecoptera or stoneflies of Connecticut. state Geological and Natural Histori Survey of Connecticut, Dept. Environ. Proto Bull. 107. 262 pp.

39. Hobbs, H. H., Jr. 1972. Crayfishes (Astacidae) of North and Middle America. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems, Identification Manual No.9. 173 pp.

40. Holsinger, J. R. 1972. The freshwater amphipod crustaceans (Gammaridae) of North America. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems Identification Manual No.5. 89 pp.

41. Kenk, R. 1972. Freshwater planarians (Turbellaria) of North America. U. S. Environ~ Proto Agency, Biota of Freshwater Ecosystems Identification Manual No.1. 81 pp.

42. Klemm, D. J. 1982. Leeches (Annelida: Hirudinea) of North America. U. S. Environ. Proto Agency, Environ. Monitoring Series No. EPA-600/3-82-025. 177 pp.

43. Klemm, D. J. (ed.) 1985. A guide to the freshwater Annelida (Polychaeta, Naidid and Tubificid Oligochaeta, and Hirudinea) of North America. Kendall/Hunt Publ. Co., Dubuqua, Iowa. 198 pp.

APPENDIX III (continued)

23. Curry, L. L. 1958. Larvae and pupae of the species of Crvptochironomus (Diptera) in Michigan. Limnol. Oceanogr. 3: 427-442.

24. Doughman, J. S. 1985a. A~~otated keys to the genera of the tribe Diamesini (Diptetia: Chironomidae), descriptions of the female and immatures of Potthastia iberica Tosio, and keys to the known species of Potthastia. Institute of Water Resources/Engineering Experiment Station, University of Alaska-Fairbanks, Report IWR-107. Fairbanks, Alaska. 37 pp. + 13 plates.

25. Doughman, J. S. 1985b. SVffiPotthastia pagast (Diptera: Chironomidae), an update based on .larvae from North Carolina, S. diastena (Sublette) comb. n. and other Nearctic species. Brimleyana. 11: 39-53.

26. Edmunds, G. F., Jr., S. L. Jensen, and L. Berner. 1976. The mayflies of North and Central America. Univ. Minn. Press, Minnesota, 330 pp.

27. Evans, E. D. and H. H. Neunzig. 1984. Megaloptera and aquatic Neuroptera. Chapter 15, pp. 261-270 in R. W. Merritt and K. W. Cummins (eds.), An introQuction to the aquatic insects of North America, 2nd edition. Kendall/Hunt Publ. Co., Dubuque, Iowa. 722 pp.

28. Evans, J. L., W. L. Botts, Jr., and R. W. Flowers. 1985. A new Heptaqenia (Ephemeroptera: Heptageniidae) from the Susquehanna and Delaware Rivers from eastern North America. Ann. Entomol. Soc. Am. 78: 5-7

29. Flint, o. S., Jr. 1962. Larvae of the' caddis flygenus Rhvacophila in eastern North America (Trichoptera: Rhyacophilidae). Proc. U. S. Nat. Museum. 113: 465-493.

30. Flint, o. S. 1964. Notes on some Nearctic Psychomyiidae with special reference to their larvae (Trichoptera). Proc. U. S. Nat. Mus. 115: 467-481.

31. Flint, o. S., Jr. 1984. The genus Brachycentrus in North America, with a proposed phylogeny of the genera of Brachycentridae (Trichoptera). Proc. U. S. .Nat. Mus. 115: 467-481.

32. Flowers, R. W. 1980. Two new genera of Nearctic Heptgeniidae (Ephemeroptera). Fla. Ent. 63(3): 296-307.

11. Bousfield, E. L. 1973. Shallow-water gammaridean Amphipoda of New England. Corne~l University Press, Ithaca, New York. 312 pp.

12. Brinkhurst, R. O. 1986. Guide to the freshwater aquatic microdrile Oligochaetes of North America. Canadian Special Publication of Fisheries and Aquatic Sciences 84. Department of Fisheries and Oceans, Ottawa. 259 pp.

13. Brown, H. P. 1972. Aquatic dryopoid beetles (Coleoptera) of the united States. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems, Identification Manual No.6. 82 pp.

14. Burch, J. B. 1972. Freshwater sphaeriacean clams (Mollusca: Pelecypoda) of North America. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems Identification Manual No.3. 31 pp.

15. Burch, J. B. 1973. Freshwater unionacean clams (Mollusca: Pelecypoda) of North America. U. S. Environ. Proto Agency, Biota of Freshwater Ecosystems Identification Manual No. 11. 176 pp.

16. Burch, J. B. 1982. Freshwater snails (Mollusca: Gastropoda) of North America. U. S. Environ. Protection Agency, Environ. Monitoring Series No. EPA-600j3-82-026. 294 pp.

17. Burks, R. D. 1953. The mayflies, or Ephemeroptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 26(1):. 1-216.

18. Caldwell, B. A. 1984. Two new species and records of other chironomids from Georgia (Diptera: Chironomidae) with some observations on ecology. Georgia J. Sci. 42: 81-96.

19. Caldwell, B. A. and A. R. Soponis. 1982. Hudsonimvia parrishi, a new species of Tanypodinae (Diptera: Chironomidae) from Georgia. Fla. Ent. 65: 506-513.

20. Chekanovskaya, O. V. 1962. Aquatic Oligochaeta of the USSR. (English translation published by Amerind Publishing Co. New Delhi, India). 513 pp.

21. Clarke, A. H. and C. O. Berg. 1959. The freshwater mussels. of central New York with an illustrated key to the species of northeastern North America. Cornell Univ. Agr.Exp. Sta. Mem. 367: 1-79.

22. Crocker, D. W. 1957. The crayfishes of New York State (Decapoda, Astacidae). Bull. N. Y. S. Museum. 355: 1-97.

APPENDIX III

MACROINVERTEBRATE IDENTIFICATION REFERENCES NEW YORK STATE STREAM BIOMONITORING UNIT

1. Allen, R. K. and G. F. Edmunds, Jr. 1962a. A revision of the genus Ephemerella (Ephemeroptera: Ephemerellidae) IV. The subgenus Dannella. J. Kan. Ent. Soc. 35: 333-338.

2. Allen, R. K. and G. F. Edmunds, Jr. 1962b. A revision of the genus Ephemerella (Ephemeroptera: Ephemerellidae) V. The subgenus Drunella in North America. Misc. Publ. Ent. Soc. Amer. 3: 147-179.

3. Allen, R. K. and G. F. Edmunds, Jr. 1963a. A revision of the genus Ephemerella (Ephemeroptera: Ephemerellidae) VI. The subgenus Serratella in North America. Ann. Ent. Soc. Amer. 56: 583-600.

4. Allen, R. K. and G. F. Edmunds, Jr. 1963b. A.revision of the genus Ephemerella (Ephemeroptera: Ephemerellidae) VII. The subgenus Eurvlophella in North America. Can. Ent. 95: 597-623.

5. Allen, R. K. and G. F. Edmunds, Jr. 1965. A revision of the genus Ephemerella (Ephemeroptera: Ephemerellidae) VIII. The subgenus Ephemerella in North America. Can. Ent. 95: 597-623.

6. Baumann, R. W. 1975. Revision of the stone fly family Nemouridae (Plecoptera): a study of the world fauna at the generic level. smithsonian contributions to Zoology. No. 211. Smithsonian Institution Press, Washington Press, Washington, 74 pp.

7. Bednarik, A. F. and W. P. McCafferty. 1979. Biosystematic revision of the genus Stenonema(Ephemeroptera: Heptageniidae). Can. Bull. Fish. Aquat. Sci. 201. 73 pp.

8. Bilyj, B. 1981. [Manuscript keys to irnrnatures of Nearctic Larsia]. Freshwater Institute, 501 University Crescent, Winnipeg, Canada, R3T 2N6.

9. Bode, R. W. 1983. Larvae of North America Eukiefferiella and Tvetenia (Diptera: Chironomidae). N.Y.S. Museum Bull. 452: 1-40.

10. Borkent, A. 1984. A systematics and phylogeny of the Stenochironomus complex (Xestochironomus, Harrisius, and Stenochironomus) (Diptera: Chironomidae). Mem. Ent. Soc. Can. 128: 1-269.

APPENDIX II (continued)

Limnephilidae: genus	82, 87, or 89
Lepidostomatidae: genus	82, 87, or 89
Odontoceridae: genus	82, 87, or 89
Molannidae: genus	82, 87, or 89
Helicopsychidae: genus	82, 87, or 89
Leptoceridae: genus	82, 87, or 89
Lepidoptera	82, 87, or 89
Arctiida~: family	
Nepticulidae: family	87.or 89
Pyralidae: family	87 or 89
Diptera	87 or 89
Tipulidae: genus	
Psychodidae: genus	87 or 89
Ptychopteridae: genus	87 or 89
Blephariceridae: family	87 or 89
Dixidae: genus	87 or 89
Chaoboridae: ge~us	87 or 89
Ceratopogonidae: family	87 or 89
Simuliidae: species	87 or 89
Tabanidae: family	79 or 85
Rhagionidae: family	87 or 89
Empididae: family	87 or 89
Dolichopodidae: family	87 or 89
Ephydridae: family	87 or 89
Muscidae: family	87 or 89
Anthomyiidae: family	87 or 89
Chironomidae	87 or 89
Ablabesmvia: species	62
Cricotopus: species group	72
Eukiefferiella: species group	9
Nanocladius: species	68
Orthocladius: species	73 or 81
Psectrocladius: species group	81
Tvetenia: species group	9
Dicrotendipes: species	105
Polvpedilum: species	47
Rheotanvtarsus: species group	71
Tanvtarsus: species group.	71
All others: genus	81, 87, or 89

The level of taxonomy required for each group is based on these factors: differences in water quality tolerances within a group, likelihood of increased accuracy of species richness with more refined taxonomy, availability of identification keys, and history of identification of the group by the stream Biomonitoring Unit.

Baetiscidae: genus	26, 87, or 89
Potamanthidae: genus	26, 87, or 89
Ephemeridae: genus	26, 87, or 89
Polymitarcidae: genus	26, 87, or 89
Oaonata	
Gomphidae: genus Aeschnidae:	87 or 89
genus Cordulegasteridae: genus	87 or 89
Libellulidae: genus	87 or 89
Calopterygidae: genus	87 or 89
Agrionidae: genus	87 or 89
Coenagrionidae: genus	87 or 89
Hendptera	87 or 89
Corixidae: genus	
Plecoptera	87 or 89
Capniidae: genus Leuctridae:	
genus Nemouridae: genus	87, 89, or 117
Taeniopterygidae: species	87, 89, or 117
perlidae: species	87, 89, or 117
Peltoperlidae: genus	33
Chloroperlidae: genus	38, 74, 76
Perlodidae: genus	87, 89, or 117
pteronarcidae: genus	87, 89, or 117
Coleoptera	87, 89, or 117
Haliplidae: genus	87, 89, or 117
Dytiscidae: family Gyrinidae:	
family Hydrophilidae: family	87 or 89
Psephenidae: genus	87 or 89
Dryopidae: family Scirtidae:	87 or 89
family	87 or 89
Elmidae: species	87 or 89
Megaloptera	87 or 89
Corydalidae: genus Sialidae:	87 or 89
family	13
Neuroptera	
Sisyridae: family	87 or 89
Trichoptera	87 or 89
Philopotamidae: genus	
Psychomyiidae: genus	87 or 89
Polycentropodidae: genus	
Hydropsychidae	
Hydropsyche: species	82, 87, or 89
All others: genus	82, 87, or 89 82, 87, or 89
Rhyacophilidae: species	
Glossosomatidae: genus	
Hydroptilidae: genus	70 82, 87, or 89
Phryganeidae: genus	29
Brachycentridae	82, 87, or 89 87, or 89
Brachycentrus: species	82, 87, or 89
All others: genus	
	31
	82, 87, or 89

APPENDIX II. Level of taxonomy and taxonomic keys required for macroinvertebrate identification. Numbers correspond to references
listed in Appendix III.

Phvloqenetic qroup/ taxonomic level	Identification reference no.
Coelenterata: family	54
Nemertea: genus	54
Platyhelminthes: class	54
Polychaeta: genus	54
Oligochaeta	
Lumbricina: order	87
Lumbriculidae: genus	12 or 87 12
Enchytraeidae: family	or 87 12 or
Tubificidae: species	87 12 or 87
Naididae: species	43, 54, or 87 54 or 87
Hirudinea: order Aphanoneura:	54
family Branchiobdellida: order	
Gastropoda	
Physidae: species	
Lymnaeidae: species	
Planorbidae: species	35 or 87 35 or
Ancylidae: species	87 35 or 87 35
viviparidae: species	or 87 35 or 87
Pleuroceridae: species	35 or 87 35 or
Hydrobiidae: species	87 35 or 87
Valvatidae: species	
Pelecypoda	
unionidae: species Sphaeriidae: genus	21 or 87 87
Crustacea	
Anthuridae: family	
Idoteidae: family	
Asellidae: genus	114
Gammaridae: genus	114
Oedicerotidae: family	54 or 87 54 or
Talitridae: family	87 114
Cumacea: order	54 or 87 114
Decapoda: order	54 or 87 54 or
Arachnoidea: order Collembola:.	87 87 or 89
order Ephemeroptera	
siphlonuridae: genus	
Baetidae	
Baetis: species All others: genus	26, 87, or 89
Heptageniidae stenonema: species All others: genus	49 26, 87, or 89
Leptophlebiidae: genus	
Ephemerellidae: species	7
Tricorythidae: genus	26, 87, or 89 26, 87, or 89 l,
Caenidae: genus	2, 3, 4, 5, 88 26, 87, or 89
	26, 87, or 89

H. PROCEDURE FOR CALCULATING PERCENT SIMILARITY.

Percent similarity, as presented in Washington (1984) is a measure of similarity between two communities or two samples. Values range from 0 for samples with no species in common, to 100 for samples which are identical. It is calculated as follows:

1. Convert all values to percentages for both samples.

2. For each species, find the absolute difference between percentages between the two samples being compared. Total these absolute differences.

3. Multiply the sum of the absolute differences by 0.5 and subtract this value from 100. This is the percent similarity between the two samples.

Example:

Genus/ species	Rep. A.	Rep. B.	Absolute difference
OLIGOCHAETA			
Nais communis Nais	5	15	10
variabilis	0	10	10
pristina leidvi	3	7	4
MOLLUSCA			
Phvsa gvrina	2	2	0
EPHEMEROPTERA			
Baetis amplus	10 3	4	6
Stenonema ithaca	1	0	3
Drunella cornuta		0	1
PLECOPTERA			
Paraqnetina media	1	0	1
COLEOPTERA			
Stenelmis crenata	9	2	7
TRICHOPTERA Cheumatopsvche			
sp. Hvdropsvche	19	5	14
morosa Hvdroptila sp.	15	0	15
	2	0	2
CHIRONOMIDAE			
Conchapelopia sp.	3	10	7
Cricotopus bicinctus	1	15	14
Cricotopus tremulus	0	20	20
Orthocladius sp.	2	8	6
Polvpedilum sp.	24	2	22
TOTAL	100	100	142

Sum of absolute differences for all species= 142
142 x 0.5= 71. 100 - 71= 29= percent similarity

G. PROCEDURE FOR PERFORMING THE STUDENT'S T-TEST

Student's t-test is used to test the null hypothesis that two samples are drawn from populations with the same means and variances. For use in biological impairment criteria, these two samples are the means of indices drawn from upstream and downstream sets of replicates. If the calculated value of t is greater than the tabulated value, the difference in sample means is significant at the 5% level, and the null hypothesis is rej ected. The tabulated value of t at the 5% level with 4 degrees of freedom is 2.776. The formula for the calculated value of t as given by Elliot (1971) is:

$$t = \frac{\text{difference between means}}{\text{standard error of difference}} = \frac{Xl - Xz}{J^{sz}\left(\frac{1}{nl} + \frac{1}{n2}\right)}$$

where $SZ = \sqrt{\frac{!:(XI-XI)2 + \sim(xz-xz)2}{nl + nz-2} - \frac{[L\,(xi) - Xl\,LXI] + [L\,(x\sim - xz\,LXZ]}{nl + nz-2}}$

where the counts *(x)*, arithmetic mean *(x)*, and number of sampling units *(n)* are Xl, Xl, nl for the first sample, and *Xz*, *xz*, *nz* for the second sample.

An example is provided using upstream/downstream EPT values:

Upstream (1)	Replicate A= 15 Replicate B= 13 Replicate c= 11 Mean= 13	Downstream (2)	Replicate A= 10 Replicate B= 9 Replicate C= 8 Mean= 9

$$S2 = \frac{(515 - 13(39)) + (245 - 9(27))}{3 + 3 - 2} = \frac{10}{4} = 2.5$$

$$t = \frac{13 - 9}{J2.5\,(1/3 + 1/3)} = \frac{4}{1.29} = 3.10$$

In this example, since the calculated t value of 3.10 is greater than the tabulated t value of 2.776, the difference in means of EPT values from the upstream and downstream sites is significant at the 5% level.

Elliott, J.M. 1971. Some methods for the statistical analysis of samples of benthic invertebrates. Freshw. BioI. Assoc. Sci. Publ. No. 25. 144 pp.

F. PROCEDURE FOR CALCULATING PERCENT MODEL AFFINITY

1. Determine the percent contribution for each of the 7.major groups: Oligochaeta, Ephemeroptera, Plecoptera, Coleoptera, Trichoptera, Chironomidae, and Other. These must add up to 100.

2... For each group find the absolute difference in percentage from the model value for that group. Add up these differences.

3. Multiply the total of differences by 0.5 and subtract this number from 100. This is the Percent Model Affinity.

Example:

	Sample	Model	Absolute difference
OLIGOCHAETA	8	5	3
EPHEMEROPTERA	14	40	26
PLECOPTERA	1	5	4
COLEOPTERA	9	10	1
TRICHOPTERA	36	10	26
CHIRONOMIDAE	30	20	10
OTHER	2	10	8
TOTAL	100	100	78

TOTAL ABSOLUTE DIFFERENCE= 78 78

x 0.5= 39

100- 39= 61= PMA value

E. PROCEDURE FOR CALCULATING THE HILSENHOFF BIOTIC INDEX..

1. Determine the tolerance value for each species .in the sample. Each value is an assigned number from 0-10 based on its tolerance, 0 being very intolerant and 10 being very tolerant. These are available in the New York state species list (Appendix IV) or in Hilsenhoff (1987).

2. For each species, multiply the number of individuals by its tolerance value. Total all these products.

3. Divide the total of tolerance value/individuals products by the total number of individuals in the sample. This is the biotic index value.

Example:

Genus/ species	indo	tol.	tol. sub.
OLIGOCHAETA			
Nais communis	5	8	40
pristina leidvi	3	8	24
MOLLUSCA			
Phvsa qvrina	2	8	16
EPHEMEROPTERA			
Baetis amplus	10	6	60
Stenonema ithaca	3	3	9
Drunella cornuta	1	0	0
PLECOPTERA			
Paraqnetina media	1	1	1
COLEOPTERA			
Stenelmis crenata	9	5	45
TRICHOPTERA			
Cheumatopsvche sp.	19	5	95
Hvdropsvche morosa	15	6	90
Hvdroptila sp.	2	6	12
CHIRONOMIDAE			
Conchapelopia sp. 3		6	18
Cricotopus bicinctus	1	7	7
Orthocladius sp.	2	6	12
Polvpedilum sp.	24	6	144
TOTAL	100		573

ind: number of individuals. tol: assigned tolerance value. tol. sub.: subtotal of tolerance value x number of individuals.

HBI= 5.73 (tolerance subtotal divided by 100 individuals)

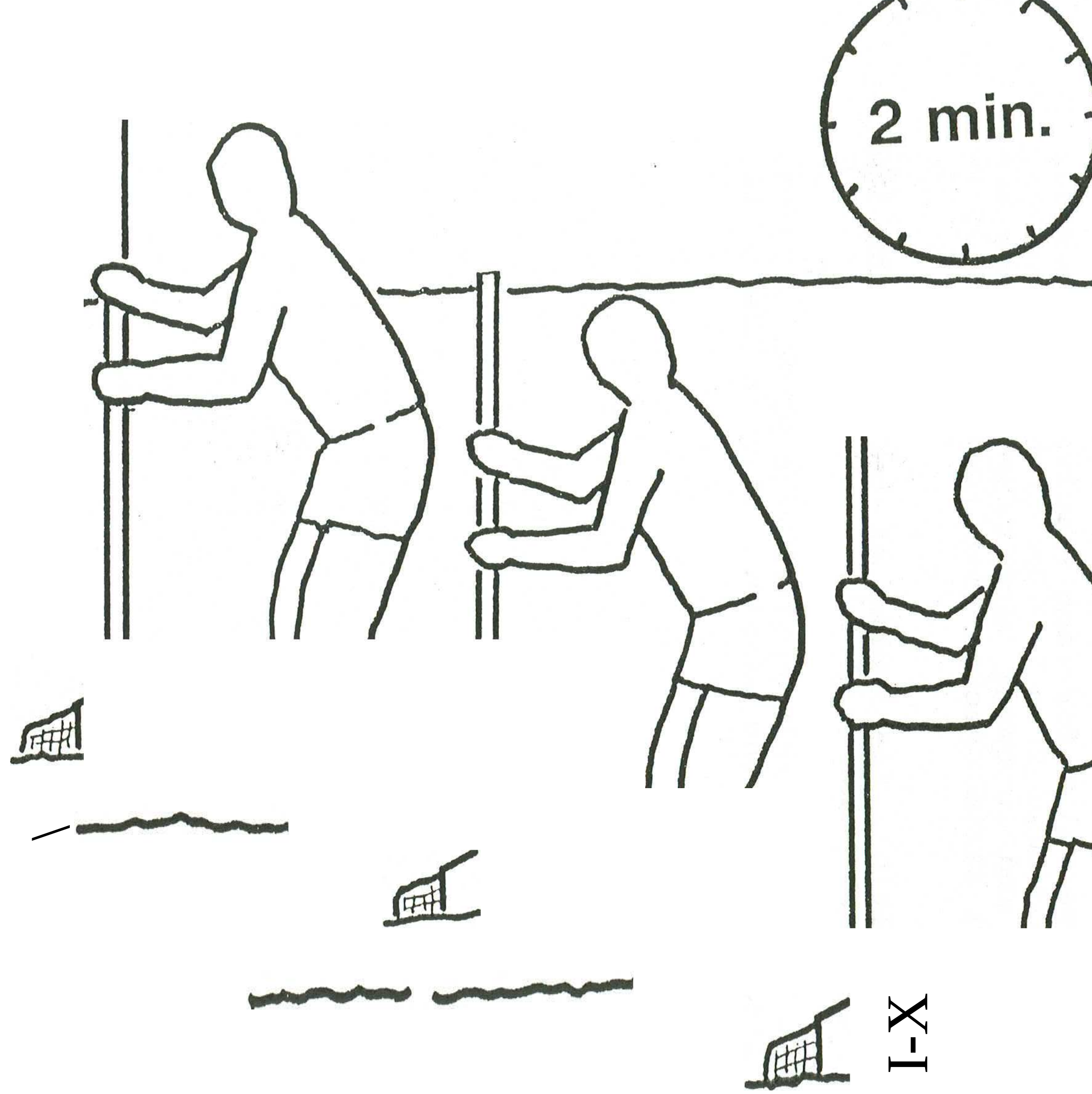

2 min.

FIGURE 9.
TRAVELING KICK SAMPLE

~ current

Rocks and sediment in the riffle are dislodged by foot upstream of the net; dislodged organisms are carried by the current into the net. Sampling is continued for two minutes, gradually moving downstream to cover a distance of 5 meters.

2. Traveling kick sampling

a. Rationale: Kick sampling is a method of sampling benthic organisms by kicking or disturbing bottom sediments and catching the dislodged organisms downstream with an aquatic net. The use of a standardized traveling kick method provides a semi-quantitative sample of the resident benthic macro invertebrate community. The kick sampling technique and analysis of the riffle community lends itself to rapid assessments of stream water quality. Its use is limited to wadeable areas of flowing waters.

b. Sampling: An aquatic net (mesh opening size less than 0.9 square mm) is positioned in the water about 0.5 m downstream and the stream bottom is disturbed by foot, so that the dislodged organisms are carried into the net (Figure 9.). Sampling is continued for a specified time (2 minutes for biological i~pairment criteria sampling) and for a specified distance in the stream (5 meters). Four replicates are collected at each site. For replicated kick sampling, the lines of sampling for each sample should not overlap (Figure 10.). The preferred line of sampling is a diagonal transect of the stream. The net contents are emptied into a pan of stream water. The contents are then examined, and the. maj or groups of organisms are recorded, usually on the ordinal level (e. g. I stoneflies, mayflies, caddisflies). Larger rocks, sticks, and plants may be removed from the sample if organisms are first removed from them. The net is thoroughly cleaned before further sampling by vigorous rinsing in the stream. The CO~ltents of the pan are poured into a u.S. no. 30 standard sieve and transferred to a quart jar. The sample is then preserved by adding 95% ethyl alcohol containing 125 mg/l rose bengal stain.

c. Sample sorting and subsampling: In the laboratory the sample is rinsed with tap water in a u.S. no. 40 standard sieve to remove the rose bengal alcohol. 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 containing 70% ethyl alcohol. This portiori is examined under a stereomicroscope and the organisms are removed from the debris. As they are removed, they are sorted into major groups, placed in vials containing 70% ethyl alcohol, and counted. Sorting is continued until 100 organisms have been removed. The remaining portion of the sample is retained in alcohol, for possible future need of additional subsamples. Determination of the need for additional subsampling is made following organism identification and preliminary analysis of the data.

d. Organism identification: Procedures follow those for multiplate sampling with the exception of Chironomidae and Oligochaeta, which are identified in their entirety.

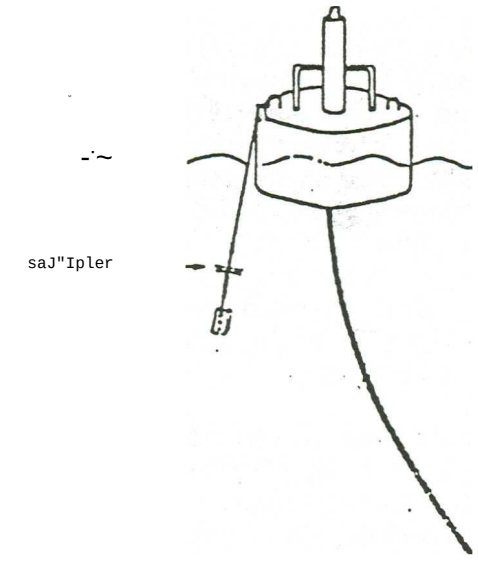
meters deep, the sampler is attached directly to a concrete blo9k. The type of block used is a patio block, 2 x 8. x 16 inches, with holes drilled for attaching the sampler turnbuckles.

d. Sampler retrieval: Samplers are retrieved 5 weeks after placement. The sampler is carefully brought to the water surface and the swivel snaps are unhooked. The sampler is removed from the water and placed in a bucket of stream water. The sampler is disassembled using pliers and/or screwdrivers. All accumulated organisms and other material are scraped from the plates with a 3 inch wide paint scraper into the water in the. bucket. The. resultant slurry is poured into a U.S. no. 30 standard sieve, the residue rinsed with river water, and placed in a 4-ounce glass jar. 95% ethyl alcohol containing 125 mg/l rose bengal stain (Mason and Yevich, 1962) is added to fill the jar.

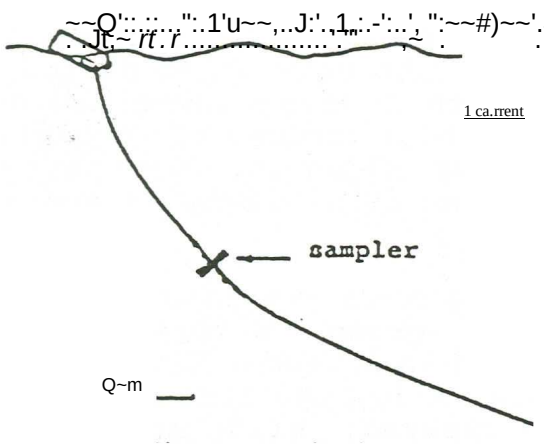
e. Sample sorting and subsampling: For routine monitoring, only one sample from each site/date collection is processed; the other sample is retained for possible later use. The sample with the most accumulated material is selected for processing. The sample is rinsed with tap water in a U.S. no. 40 standard sieve to-remove the rose bengal alcohol. The sample is examined under a dissecting stereomicroscope and the organisms are removed from the debris. As they are removed, they are sorted into major groups, placed in vials containing 70% ethyl alcohol, and counted. For samples which are judged to contain more than 1000 individuals, one-half or one quarter subsamples may be examined. The subsamplilig is done by placing the sample in a tray, evenly distributing it over the bottom, and placing a divider in the tray which divides the sample into quarters. For samples with a large number of a particular group of organisms, the numerous group of organisms may be subsampled, while the remaining organisms are sorted from the entire sample. Sorted specimens of all samples are archived for possible future analysis.

f. Organism identification: organisms are identified to the level prescribed for the appropriate group in Appendix II using the identification references listed in Appendix III. Chironomidae are subsampled for 100 individuals, and Oligochaeta are subsampled for 50 individuals. Both are cleared, 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 is recorded on a laboratory data sheet. Representative specimens from a sample are selected and stored separately in a reference collection. The reference collection of identified specimens is maintained for comparative and quality control purposes.

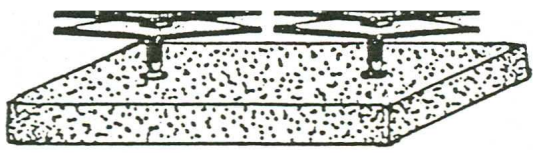
FIGURE 8. MUL TIPLATE
SAMPLER INSTALLMENT



A. Attached to buoy



B. Attached to float



C. Attached to block

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D. SAMPLING PROCEDURES

1. Multiplate Sampling

a. Rationale: Multiplates (multiple-plate samplers) are a type of artificial-substrate sampling device developed by Hester and Dendy (1962). Artificial substrates collect a macro invertebrate sample by providing a substrate for macro invertebrate colonization for a fixed exposure period, after w~ich the sampler is retrieved and the attached organisms are harvested. The use of artificial substrate samplers allows the comparison of results from different locations and times by providing uniformity of substrate type, depth, and exposure period. The mUltiplate macro invertebrate community is influenced more by water quality than by stream bottom conditions.

b. Sampler construction: The sampler design is 3 square hardboard plates, separated by spacers, mounted on a turnbuckle (Figure 7.). Three square plates of tempered hardboard (smooth on both sides) are cut to the size of 6 inches (15 cm) on each side. A 1/4 inch hole is drilled through the center of each. Four square spacers of 1/8 inch tempered hardboard are cut to the size of 1 inch on each side. A 1/4 inch hole is drilled through the center of each. Three of the spacers are glued together to form a triple spacer, with the sides and holes aligned. The plates and spacers are mounted on a No. 13 aluminum turnbuckle as in Figure 7. The top plates are separated by the single spacer, and the ')ottom plates are separated by the triple spacer. A washer is placed above the top plate and below the bottom plate. Both the top and bottom eyebolts of the turnbuckle are tightened securely to prevent loosening during exposure. The total exposed surface area of the sampler is 0.14 square meters (1.55 square feet).

c. Sampler placement: Two sampling units are placed at each site during routine monitoring to increase the chances of recovering at least one sample in case of vandalism, washout, or mishandling during retrieval. The method of sampler placement is dependent on stream depth and buoy availability (Figure 8.). If navigation buoys are used, samplers are suspended with plastic-coated cable attached to a suitable above-water portion of the buoy. A plastic identification tag listing the agency is also attached with cable at this point. Samplers are attached with brass swivel snaps to facilitate sampler retrieval and replacement. In waterways with stronger current, each sampler is stabilized with a brick weight attached to the bottom of the turnbuckle with a swivel snap. Samplers are installed 1.0 meters below the water surface. If navigation buoys are not available and stream depth is greater than 0.5 meters deep, the sampler is suspended from a float constructed of a two-liter plastic bottle filled with styrofoam chips. The float is anchored with a three-holed concrete block, 4 x 8 x 16 inches. Connections are made with 1/8 inch plastic-coated cable. Brass swivel snaps are used to connect the sampler to the cable. Samplers are installed 1 meter below the water surface; in streams 0.5-2.0 meters deep, the samplers are placed midway between the water surface and the stream bottom. In streams less than 0.5

3. CURRENT SPEED: Stream current speed, or velocity, has direct influence on the composition of the benthic macroinvertebrate community. Surface current speed is measured at the specific sampling location by timing floating objects over a fixed distance. Current speed should be between 30 and 150 em/second. The current speed at the upstream site should not differ from that at the downstream site by more than 50% unless it is within 20 em/sec.

4. CANOPY COVER: Canopy cover is defined as the percent of the water surface directly beneath riparian vegetation or bridge structure. An average percentage is estimated for the reach extending from 50 meters upstream to 50 meters downstream of the specific sampling location. The percent canopy cover at the upstream site should not differ from that at the downstream site by more than 50% unless the percentage is within a value of 20.

disturbed by construction, farming activities, or similar activities; areas dominated or heavily affected by dense macrophyte growth; areas within one mile downstream of an impoundment release; and near-shore areas.

C. HABITAT COMPARABILITY CRITERIA

Of the following criteria, all 4 apply to kick sampling. For multiplate sampling, only the, current speed and canopy cover critera are required.

1. SUBSTRATE PARTICLE SIZE: The composition of the substrate determines the availability of suitable habitat for benthic organisms. Substrate type is designated by visual determination of percentage of each particle type, as listed in EPA size categories (Weber, 1973), then converted to phi values as .in Cummins (1962). Mean particle size is calculated by multiplying each phi value by the percentage present and summing all values. The mean particle size at the upstream site should not differ from that at the downstream site by more than 3 phi units.

~	Size (diameter)	Phi scale
Bed rock or solid rock		
Boulders	> 256 rom (10 in.)	-8 -6.5
Rubble Gravel	64-256 rom (2 1/2-10 in.) 2-64 rom	-3
Sand	(1/12 - 2 1/2 in.) 0.06-2.0 rom	2
Silt	0.004-0.06 rom	6.5 9
Clay	less than 0.004	

Example: A stream bottom is estimated to have the following composition: 10% boulders, 40% rubble, 30% gravel, and 20% sand. These values multiplied by their respective phi values would be .8, -2.6, -.9, and +.4. The sum of these, -3.9. phi units, is the median particle size.

2. SUBSTRATE EMBEDDEDNESS: This is the degree to which .large substrate particles (boulder, rubble, or gravel) are surrounded or covered by fine sediments (sand, silt, or clay). Embeddedness is related directly to suitability of the habitat for benthic macroinvertebrates: very low values (e.g., <10%) may indicate loose, shifting substrates prone to scouring, while very high values (e.g., >80%) may indicate substrates too impermeable or compacted for most invertebrates. Embeddedness is visually estimated by observation of the relative proportion of larger particles surrounded by fine sediment. This is best done by removing a few rocks from the bottom, finding the sediment line on each rock (usually evidenced by a color change), and estimating the proportion of the rock below this line. The percent embeddedness at the upstream site should not differ from that at the downstream site by more than 50% unless the percentage embeddedness is within a value of 20 from the downstream site.

APPENDIX I. METHODS FOR APPLICATION OF CRITERIA.

A. DETERMINATION OF SAMPLING METHOD

Since kick sampling requires less time and often is more effective in detecting impairment, it is the preferred method, and.
should be used if conditions allow. The necessary conditions are
sufficient current, wadeable depth, and suitable substrate. If
these cannot be met, multiplate sampling should be conducted. In addition, the habitat comparability criteria must be met between the upstream and downstream site. If no sites are available which meet the criteria for kick sampling sites, multiplate sampling should be conducted.

1. Current speed can be measured using various instruments, or by timing floating objects over a fixed distance. A minimum current speed of 40 cm/sec is considered necessary for the kick sampling method. Current speeds greater than 150 cm/sec are usually unsafe for sampling, although this may be left to the discretion of the sampler.

2. Depth must be less than 1 meter in order to be considered wadeable. Shoreline areas are not suitable for kick sampling.

3. Substrate must include at least one of these sediment sizes: gravel, rubble, or boulders. Sediments which do not include one of these are not suitable ~or kick sampling, including bedrock, sand, silt, or clay.

B. SELECTION OF SAMPLING SITES

1. In relation to a targeted discharge, one site should be upstream of the discharge, and the other site should be downstream of the discharge. The downstream site is usually located in an area representative of complete mixing of the effluent. The distance between the upstream and downstream sites generally should not exceed 5 miles, in order to minimize effects of natural stream processes. site selection should be performed to allow diagnosis of the source of any impact. Upstream discharges should be taken into account in site selection, including those which may cause a far-field effect, such as a dissolved oxygen sag several miles below a sewage discharge.

2. Kick samples should be located in riffles or runs. Multiplate samples should be located in pools or runs.

3. Both sites must meet the habitat comparability criteria (see below). The specific site location may be moved to meet the habitat criteria.

4. Exclusions: areas that should not be sampled include areas directly underneath bridges; areas recently

VI. LITERATURE CITED

American Public Health Association. 1985. Standard methods for the examination of water and wastewater, 16th edition. American Public Health Association, Wash. D.C. 1268 pages.

Bode, R.W. 1988a. Methods for rapid biological assessment of streams. NYS DEC Technical Memorandum. 27 pages.

Bode, R. W. 1988b. Quality assurance wor'Plan for biological stream monitoring in New York State. NYS DEC Technical Memorandum. 56 pages.

Bode, R.W., and M.A. Novak. 1988. Proposed biological criteria for New York State streams. NYS DEC Technical Memorandum. 15 pages.

Cummins, K. W. 1962. An evaluation of some techniques for the collection and analysis of benthic samples with special emphasis on lotic waters. Amer. MidI. Nat. 67:477-504.

Hester, F.E., and J.S. Dendy. 1962. A multiple-plate sampler for aquatic macroinvertebrates. Trans. Amer. Fish. Soc. 91:420421.

Hilsenhoff, W. L. 1987. An improved biotic index of 0 =ganic stream pollution. The Great Lakes Entomologist 20(1): 31-39.

Mason, W.T., Jr., and P.P. Yevich. 1967. The use of Phloxine B and rose bengal stains to facilitate sorting benthic samples. Trans. Amer. Microsc. Soc. 86(2):221-223.

Novak, M.A., and R. W. Bode. In preparation. Percent model affinity, a new measure of macro invertebrate community structure. 6 pages.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gro9s, and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macro invertebrates and fish. U. S. Environmental Protection Agency Publ. EPA/444/4-89-001.

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

Weber, C.I. (ed). 1973. Biological field and laboratory methods for measuring the quality of surface waters and effluents. U.S. Environmental Protection Agency Publ. EPA-670\4-73-001.

TABLE 15. (continued) .

SCHOOAC~ - To~n P~rk

0 A"" HONrH \'EfiR	15 ,Jun. ? 1'018'7 1	1'1 July 1989	17 Rug I<JWI	19 SP.pt 1')8-:1	13 Oct 1<)8';1	1"1 Nov 1~)89	TOTALS
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OrU)Qcl ~di i n,~Q							
Con:lt\OnelW'" t.ari s							1
Ct"i cotopus bi ci nclus	1						
Cricotopus lro/1ulu~ gr. Euki",ff~ri~lla gracei gr. Eukiefferiella pseudoHontana gr.							B
Orthocladius (Euorlhocladius) fyp~							a
Orlhocladiu5 c~rlalus Orthocladius I sp							1
obUHbratlis Parachaelocladius sp.							
Parakieffqriella sp. ParaHelriocneMUS	1						1
lUt\dbecki Rheocricotopus robacki					1	2	1
Synorthocl.~dil.Js nr. sertivinms							2
Thienel1anniella xena?							
Tvetenia b.~varic~ gt-.			2				15
Tvelenia vitracies					1		1
Chi ronoMi nae							1
Chironol1ini							2
Hicrotendipes rydalensis gr.	5	5		9	3		15
Hicrotendipes pedellus gr.							11
Polypedilu/1 avic~ps							
Polypedilu/1 conviclu..,		1					
T .mylat'sini		1					1"1
Cladotanylarsus sp. 2 Conste"'pellina sp. 1	11	7	27	10	12	G	101
Hicropseclra pol ita? Rheotanytar~us		2					2
exigI.Jus gr. SteMpellinella sp. 1							
T aru~t.!trSlB gl abre~cens 91'. Tanytarsus guerlus gr.							1
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		23	3	1		1	65
		2	1			2	7
							1
							1
							1
TorALS	100	100	100	100	100	100	1500

TABLE 15. (continued) .

SCHODRCK - Town P~rk

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P':lcnopsych.. sp.						1	5
LQpidostot1atidaQ							
Lepi do:; t.Ot1., sp.				2			10
Odont.oco;>ri d.,.,.							
Psi! o..r.;".~ sp.	,-, <-	1	1				11
Hqlicopsychid-1tl?							
Helicopsyche borealis							1
OIPfERA							
Ti PIJI i d'.lQ					1	&	10
Anloch-1t sp.							
H,n-«I h~t1.' sp.	1	3	2				1'3
C..n"'lopogoni dJ.SQ							
Undel",rl1in.;.d CQralopogonidae							
5i l1uli i d""				1			2
Prosil1uliul1 hirtipes Sit1uliul1 tuberosul1							
SiHuliuH v",nu:slul1	2	1	1		1	1	10
SiHUliUt1 5p.							
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TABLE 15. (continued) .

SCHOORCI. - To~n P'1rk

	June	July	Aug	S.;>pl	Ocl	tlov	TOTALS
l"'ptcophJebiidae							
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Orun114 cornutella							<1
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EphpH"'reoll invaria						2e	339
Eph"'HrQl1a subvaria	15	1-1	1';'	Ie	13	1"1	'3
Eur-yl ophE.'ll II sp.	1'018'3	1"i89	1 <Jf)':1	1 '389	1913'3	1999	1
SQrratella dpficipns							2
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Serratella seorrtoidQs		Eo	I				I
Serratell,'t sp.	3						:3
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Tricorylhodes sp.		1					')
Ca.;>ni d"",							"-
Caenis sp.		2			1		3
U1 ODONATA							
CD Gortphidae							
OphioqoHphus sp.							1
PLECOPTEP.A							
CapniidaQ							
Paracapnia sp.							15
lQIJC h-i da",							
Leouctra sp.							1
NQHourida9							
UndeterMined Hprtouridap							1
Taenioptpryqidae							
Slrophoptpryx fasciata							1'1
P9rlidap							
Aqnptina capitata	2	1					'1
ChI or oped i d",e							
All OPQrl >It ;sp.							1
SUalJia sp.			.....				1
Sweltsa sp.							1
UndetQrHi rld ChI or oped i d-!lo				1			1
P9rlodidac>							
Isop",d<J sp.							2
UndeterHin.;>d P9rlodidae					1		1
COLEOPTERA							
Ps...phenida",							
Ectopria sp.							1
Pseph....nus sp.	1	1				I	?

PLAf\'HELHINTHES

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	Undto?rHind Turbllria	1		1	2		"1	31

TABLE 15. (continued) .

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SCHOOACK - Town P~rk

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	HI RUOI NEA							
	Undeli?rl1ined Hirudinl?a						1	1
U1	HOLLlJ5CA							
-..J	GASTROPODA							
	Physi d.,.;>							
	Physa sr.		1					3
	PELEC\'POOA							
	5phd"riidae							
	Pisidiul'1 sp.		1					1
	fiRrtJROPODA							
	fRU5TACEA							
	ISOPODA							
	AQIlidaQ							
	Asellu$ sp.							1
	AHPHIPOOA							
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	Gal'll1at.us 5p.							
	I HSECfA							
	EPHEHEROPfERA							
	Siphlonuridii8							
	ISQnychia bicolor				1			1
	Bo!!Io? t.i dae							
	Beti5 brunneicolpr	19	7	"I	If.			50
	Ba"tis flavistrigo					3		3
	Baetis inl8rcalri5			:3	13			1&
	BaG'ti s p'J'Jt1aeU5							2
	BJJoQti 5 5p.							1
	PseudocloQon sp.	13	1	1	5			21
	H...pt.!lgi?niidaQ							
	Epporus (l ron) sp:	3		2				30

TABLE 15. (continued)

SCHnDRCK - TQ~n r~rk

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Tvetenia bavarica *gr.*									
Tvetenia vilracies	4							::.I	j'
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ChironoHini						2			
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pedellus *gr.*		<:..			s				
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PolypediluH convicluH									
Tl.Jnytarsini		3						1	
Cladotanytarsus sp- 2 Const8Npellina sp. 1									
Hicropsectra polita?	1								1
Rheotanytarsu5 exiguus *gr.* SteHpp.llin~llft sp- 1	1	2	1	,"					
Tanytar5U3 glabrescens *gr.* Tanytarsu5 gu~r]us qr.	8	"'	7	::					1
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	10		2			2		15	1
	:··								
	1								
TOTALS	100	100	100	100	JOO	100	100	*100*	100

TABLE 15 ~ (continued) .

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C6'r'atopo,.!oni dat?	1								
IJndt?to;>rHi noi>d Ceor-1ltopogoni 0:13'>									
5i t1ul i i dae									
Prosinuliul1 hirti~9s SiMuliuM	1	;						1	
tuberosut1 SiMuliuM voi>nust.uM	.,								
5i MU I i IJM !Op.	"-							.3	11
Rh-3gionid3Q									
Atherix sp.		1							
fHpi.did.!l9									
Het1erodrot1ia sp.					25	17	31	"1	
HLJ:5ciol-!lO;>									
lInd.d,er..i n""oj Husei di.ll?						1			
	1								

\J1
\J1

TABLE 15. (continued)

L'"pt.oph1",t:>iid....									
Pralo?pl()f'hl"hi.'l sp.	11	3<	21	:3	;:,	-1	3	3	')
Eph'1I1Qn,» , i. d.!)',									
D."un",}} " con",t....ll",									.?
Ephl6M9rella dDrothe									
Ephe...er<.>lla inv.'Iria	'"	;o	36	"H	::t.)	50	30	3	25
Eph9l1erp)la 5ubvria							1		
Eu,'ylophell" sp.	'3	17	17	11	1'"	15	Ii'	1-1	15
Sqrratlla deficiens	5.;.pl. 1 <188	Oct 1 "lfJn	t4.:ov l"jOCI	D..c l':H::f:	J.'... 1 Cj:':1	Feb 1 jB"I	Hrch *190'1*	Apl'i I 1'39j	H''J 1 '.i:39
5....rralJla serrala									
5....rrat.11. SI?IT-3t.oid"s									
Serrat.plJa gp.									
Td I:ont.hi da"									
Tricorylhodes sp.	1								
Co!IQnidao?									
Co!I",ni:3' "'p -									
OOONATA									
GOl'lphidae									
Ophi og('>l1ph'JS gp.									
PLECOPTEPA									
C.pni i d.;)p									
Po!Iracapnia sp.			i'		-t	2	") , .		
L""Jct.rido'le									
L""Jctro sp.								1	
tfo;.NOIJr i do...									
Undeter...ined NQl'louridoe								1	
r a...ni oph'ryg1 dae									
Slrophopteryx fo!lsciata			1	"I	"1	1	2	..,, .-	
P",rli do"									
Agnetina capit.at"!									
Chlorop,;>rl i d.:u									
All oped a :sp.		1							
Suwallia sp.									1
Sweltsa :sp.								1	
Unclet.;;.,...i ned ChI oropo?rl i <:1,"9									
Perl odi dae									
I:soperl.:l sp.		,, .:.							
Undetqr...ind pQrlodidae									
COLEOPTERA									
P$>.1ph<>nidae									
Ecl.opria p.									1
P3.:>phoou:< sp.									-1

::;cuOntlCK - Town P"lrk

011'<'
MONTH
','EIIR

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TABLE 15. MONTHLY KICK SAMPLING RESULTS, MOORDENER KILL, 1988 - 1989.

50lOnRCT - To..,", P<srk

nn.... HOUTH ',T n'.~	.) :;0;;1' 1. 1 "1\38	17 Oct. 1"1:'18	1,' 11c",.' 1'10e	H °""0:: 1'.)11:3	1') .).'" , l'W"i	15 Fpb 1IH'3	Ii' M.rcto lQS'J	11 Rp,'i I. l',J89	.r' 1') M"'J 1 :'1'.1
PLRn'HELHI,..THE:5									
llJRflf:LLARI A									
lJ...d,) l.;,w t11. tn .. '! Turb..l] .,rj ~			..					5	'5
AI'!NEI.l £In									
OLIGOCHflF.:fn									
I.'Jr1b,-i co..l i r1.~.~									
IJl1dpl""Hi n...j LUHh,'iclJl i d<t'"								1	
r:llr:hyt.r..~Qj d.:.,;.								.j.<' "	
IJndpV..-Hi ,.,,,,d E,-,,::I",Il".39i d.:;~									
I!.!li di d",~									
N;~i!': b"hni ,,,~i	(,	'I							
N<.Ii~. :5i '"F' 1 .?:-:									
Sl ,~"'1 n."} ;'.p!"-,>?ndi '."/ L ,:.lo ';:;..yl									
'"1'1.3 1 .3cll~d_n s									
HI Rl.lm unl									
I.Jnd~.l.?r,..i tn,,01 Hi ,'lJdi "";'<1									
HOlLU5CR									
Gf\~,; n::OPOOA									
Phy:> i d.).~									
Ph~1.';<1 Sf'.									
PELEC'r'F'OnA									
Sphaeri i dap									
Pi;!;i.dl\11'1 $p.									
m~nIROPOOA									
CRUSTACEA									
I ~;OPOOA									
Aso?l1 i d.3'"									
Asell'J5 !!p.								1	
AHPHI POOR									
";.~t1"ari 0,"0;;.									
G;!I1H.'!Iro.J$:!:p.									
INSECTA									
ff'IIEHfPOPTF.RA									
~,'1 phi onlJri d.!l1?									
Isonyctoio bicolor									
BalE? t.i da",									
fI.a...t.i 5 b,'IJnn",i colo,'Ba...t.i5		1				;~			1
fl""vi$lrig<l B~Qti5									
Int.~rcalaris B~...li '" p'.I'lHaeU:5									
IhQti s :.p.									
r> 5,~"doc I ol?on sp.	~								
Ii<?pt.,~q<?ni j d.!I.,.									
EpenrlJs IIron) sp. LQ'h~rOCIJt..~ sp.									
Nixe (th~:",) "p.									
SlQnOn9H~ l.rMin~tl~ Sl...non<;>tii\			:3		~	t)	8	c̃;'	;:
~;p.		1	·-,	<	1				
				1					
	1								

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~t,.
'~fb;

TABLE 14. (continued) .

EfiST GREEHBUSI1 - Michaels RO./td bri~e

OA\'	18	13	1-1	
HOtHU	S...pt. 1	Oct	tkw 1	
','EAR	'=tUg	l~f.I"J	19B"J	TOTALS
tli 10t<!lnYP'J$ f i I1br i atus				
Thi en"'Manni Myi.;, gr'. spp.				
OiaNe~ina~				
DiaNp.5<'1 '"p.				
Pagast.i~ ~p. A				
Orthocl afh i naQ				
Brn 1i a ~Qora				
Br-i IIi a sp.				
Cricolopus bicinctus Cricotopus treMulus gr.				
Cricolopus trifascia gr. Cricotopus vierriensis				
Oi. pI 0.:18<1i us sp.	1	5	11	6
Euki...fferll?lla claripennis gr. Orthocladius	<1	B	'5	51
carlatus Orthocladius obuMbratus Orthocl.;)dilJs	2			f.,
sp. P-..rachaetocladius sp. Paral1Qotriocnel1us				
lundbQcki Rheocricotopus rob<"Cki				
ThienQol1anniella nr. fusea Tvel...nia bavarica gr.	f>	?		23
Tvetenia vitracie~				
ChironoMina...	2			12
Chi "onol1i ni				
Hicrolendipes rydalensis gr. Hicrotendipes			2	11
pedellus gr. Hilothaul1a babiyi				
Polypqdill Jl1 avic9ps				20
Pol ypo;>di 1 UI1 con\,'i ctUI1 PolYPl?diluN				
fallax gr. Polyp..,dilul1 illinoense	2	2		19
Pol ypl?di 1 UN t.ub...rcIJIIJH				
T .:myt.arsi ni				5
Cladotanytarsus sp. 2 Cladolanytarsu5 sp. 1				
Hi cr'opsl?ctra pol i tar Rheotanytarsu5 exiguus gr.				2
Slel1pqllinella sp. 1 Tanytarsu5 glabresCQns gr.				
Tanytarsus guerlus gr. Tanytarsus sp.				1
ZavrQlia gr. spp.				1
				.
				.
				.
				1
			2	"19
	1		1	16
				1
				2
				c-
				..}
				2
TOTALS				1
	100	100	100	1200

U1
tV

TABLE 14. (continued) .

EAsr GF:[ENBIJSfI .. Hi eho!lels Ro~d bri d91?

01'1"" HntnH	18	13	1~	
','EfiP.	':;'~pl	o,:t.	No...'	
	1 "!fl')	1 'i8'.i	1'389	rorm.s
	3			13
				2
Hydroj:osychirj"„„„	2		5	15
CheuM~lop54che sp. Hydropsycho		I		1
belleni Hydropsych9 bronla	t 1	113		?i'
Hydropsych8 Morosa H,~dropsyche slossona... Hydropsqche sparna				'
H,~dropsyche sp			1	I
P.h':I-ilcophi 1 i d.:'l<?				
Rhyacophila fuseula Rhy..oKophi I a sp.				1
en ossosol1ati dal?			1	1
G I 0550:!'OI1<J sp.	...			
HIJdropt1l i *d~e*	*r.*			
Ii':ldropti 1.:1 sp.				
Li ""ephi 1 i do!llt'	2	1		I;
Ap<ltani~ sp.				
H':ldalophyl ax sp.				1
Ho;>oph'Jl.)x conci nnus P':JcnopslJchO? 5p.				1
Odontoceri d"""""				1
Psilolrela *sp.*				
He 1 i copslJchi d.:!e				"1
H~lieopsychlt' borealis				1
H...lieopsych,:,> sp.				
Lept.oo~ri d~Q				"t
Ceraelea sp.				
OJ PTERA				"1
Ti pul i d<!lQ				1
Anloeha sp.				
Oicranot.a :5p.				1
U(>x~lol1a :!<p.				
C...r,)t.opogoni dae				
P,'obezzia sp. 1	1 ,	1		20
Undeh>rl1i ned C"ratopogoni dao:>				
Si "ul i i dae				2
Prosil1uliUN hirtipes SiMuliul1				2
jenningsi SiMuliul1 lalipes				
SiMuliuM tuberOsuM SiMuliuM				3
venuslul1				2
Rh<'!lgi oni dae				
Atherix sp.				.18
E"pi di *d.~e*	1			1
Hel1erodrol1ia sp.				1
Chironol1idae				
. r .anypodi "<'Ie		"1		'3
.Conehapelopia sp.				1
	1			8
	2	1		B
				3

VI
~

TABLE 14. (cop,tinued) .

EAST GP.EEHfJI.ISH - Hi chael *s* Road bri dge

DAY	19	13	1"1	
HOtHH	Sept,	Od	H,)v	
\'EAR	1'3139	1 <)1)'1	1'-1H"!	TOTALS
S...rr~t...IIQ serrata S...rratella sp.				,I
T (\'} coroJt.hi d."",	2			3
Tricorythodps sp.				
r:phqt1",r\d.:l~	1			
Ephet1"r" sp.				
O[IONRTA				:~
Go,.,phid..,Q				
I.Indet...rHinO?d GOHphid4Q			1	1
C"IoplQrygidaq				...
Calopt.Qryx sp.			10	39
PLECOPTERII				
Capni i d.~e				2
AllocJ.lpnia sp.				
P.'SraC-IJpnid sp.				29
"",,.,ourid,,,,,,				28
UrldeI~?r'Hi noJod I'IG-Houri d4e				
T "...ni opt",,'ygi daG				5
U1 0 Strophopt...ryx fascial.., Taeniopteryx burksi		7		('
Taeniopteryx nivalis Taenioptl?ryx sp.				
Per li dae		3		10
Agnelina capilata				1
AgneU na sp.				
ChI orop","l i *do!le*	1			1
Und"tQrHined Chloroperlida...				
Per-Iodidae				::3
Cullus decisus				
UndeterHined Perlodidae				2
COLEOPTERA				
Psephenidae			;	22
Psephenu5 :sp.				
El Hi d"q				1
[IlJbir..,philJ sp.				
Optiosqrvus fastiditus OptioserVIJ5 oval is	15			37
Opb osqn'u:s sp.				::I
StenQlHis crenata StenO?IHis sp.				'
TRICHOPTERA		1(.	11	1
Philopol"Hid09Q				'
Chit1arra aterriHa?				3
Chi,.,arr" obscura?				1"1
ChiHarra sp.				
Oolophilodes sp.	1			(\
Pol ycentropodi daQ				
Pol ':,tcQntr.opus sJ).	10			1 0
		5	a	13
				:3
	1	3		5
				2

~ABLE 14. (cQntinued) .

EAST GREEHBUSH - Hicha9ls Road bridge

OA\'	18	13	1-1	
HOtHH	S"'pt.	Oct.	t4 0 1,1	
\'E f1R	1"109	198"1	1 "I:3')	TOrnL' >
PLRT'r'HElHI HTHES				
TlIF~BElLARI A				
UndeterMined Turbellaria	:' 1	1		1:3
AHNELI DR				
OLIGOCHAETA				
Enchytnll/'i da...				
Und~tQrMin8d EnchylraQid~8 sp. 1				
Tubi fi ci dal>				
Aulodrilus lit1nobius				1
Aulodrilu3 piquQti				1
Und",t. TubificidaQ ~/ cap. 59t~Q				~
Haididae				
"ais bQhningi "			2	19 .~ <
t~ai 5 brptschli'ri				
"",is :!<ir1plo?x				
"ais variabilis				8
Stylaria lacustris				
HflllLlJ5CA				
GASTROPODA				
Physido!lO?				
Physo!l sp.			1	
ANHROPOOA				
CRUSTACEA				
AHPHIPOOA				
G.3Il'it1at-i do!lGo				
Gat1t1o!1rU5 sp				
INSECTA				
EPHEHEROPTERA				
5i phi onuri d.!l...				
I~onychia bicolor				
BaQt.i daQ	1			2
B.~9ti *S* brunnQi color				
B~9lis flovi5lriga	'3			15
B~Qlis inlercalaris				
BaQtis l1acdunnoughi	2			'"
BaQt.i *5* pygl"l.~8US				13 2
PSQudoclo80n sp.				2
U"'ptageniida...				16
EpQOrU5 (Iron) sp.				
5t9nonel"la tert1inatut1				f.,
Stqnor'o?t1C1 sp.	"'		<1	10
L...ptophl...biidali'		")		II
Para19ptophlqbia sp.				
Ephet19rell i d.~9			1	'3
DrunQlla cornutQIla				
EphQt1Qr911a invaria			22	1
EphQMQrQlla subvaria				If.2
SorratQlla d8ficiQns		G		21

TABLE 14. (continued).

f.JP,EENBIJSH - Hichaels Road briO:J'"

NiiolanYPu5 fiMbriatu5						1			
Thi9np"anniMyid gr. spp.					1				
Oi o!IMesi n."									
Oia"of':!'a sp.	2	1				1		1	
Pagast.da sp. A	1	" "-		2					
Orthocl adi i nae									
DR\' HOt4rH YEAR Brilha sra	H Oo?c 1908	19 ~lan 198'1	15 Fo;.b	17 H.':Irch 198')	11 Apr'i 1 'Jr.')	15 Nay 198'"	15 .JunQ1 1989	11 .July 1':18'3	17 . Rug 198':1
Sri 11 j.a sp.									
Cricotopus bicinctu$						2	1		2
Cricotopus trQMulus gr.								1	
Cricotopu5 trifasci.a gr.							2		
Cricolopus vierriensis							2		
Oiplod.'!dius sp.			1						
Euki9ffQripiia claripQnnis gr.									1
Orlhocladius car'lalus					2		1		
Or.t.hocl adi us oblJ"bralus					2		2		
Or t.hoc 1 adi IJS sp.		2							
00 ParachaptocladilJs sp.					3				
ParaMQlriocnQMUS lundb",cki	I'	1	1	2		a	5	1	':I
RhQocricotopus robacki							3		1
ThienPManniqlla nr. fU5C									1
TVQlQnia bavarica gr.	"1	:3			2				1
TVQtnia vitraciQs	"1	2	1		1			1	1
ChironOMindp.									
ChironoMini									
Nicrolendip9s rydolQnsis gr.		1	2	1	1			1	2
Ni crotendi pes p9d(> 11 us 9r.	5		G		5	2		1	
Nilothau"a babiyi			1						
PolypediluM avic9ps						1	10		"I
PolYPQdilu" convictuM								5	
Polyppdilu" falla gr.						2			
Polyp",dilu" illinoensp									1
PolYPQdiluM tuberculUM					1				
Tanytorsini									
Cladotanyt..,rsus sp. 2						1			
Clodotonyt.arsus sp. "1								1	
Ni cr'ops9ch'a pol i t.o?			25	I	11	5		1	1
RhQotanyt.ar'sus lixi guus 9r.	"I	1	3	1			2	1	2
StQ"pellino?lla sp. 1							1		
fanytarsus glabr",sc9ns 9r.						1	1		
TanJlar5u5 9uerll.15 gr.							5		
Tanytarsus sp.									2

TABLE 14. (continued) .

EAsr GREEHBIJSH - Hicha~ls Road bri~...

OR',' HOHrU ','ERR	1-1 []o;.c	19 J.~to t'::tO':J	15 F.-;.b I~B'~	17 H.}rch 1',S'!	1-1 April l~I3Cf	15 Hay 1')8')	15 .JlJnQ> 1~89	11 .J'Jly 1'33'3	17 Auq 1 '.I WI
	1'.'8:3								
H'J.1t-opsychi									
d~9	;~		-1		2				
ChQUH~lop5ychQ sp.									
Hydropsyche b...tt...ni	;~							'	?
Hydropsyche bronla									
H4drop54c~~ Horosa	E,	3	3		(,	-1		3	23
Hydropsych.;o slossonaq		3	L~					1	
Hydrop5ych~ sparna									
Hydrop5yche SPA									
Rh',_<lcophi 1 i d.~Q RhyacophiJa									
fuscula RhYdCOphi 1." SPA				2					
&1 055050H."ti d/SE'									
G 1 OSO()H" sp.								2	
Hydroph 1 i dae									
H',_dropf.i I <I sp.									
L i Hnqphi I ~ dao;>									
Apat.ania "'p.									
HydalophyJax spMeophylax									
concinnus Pycnopsych.;o sp									
Odont.OCIi'r i d.~Ii'				1	3				
Psilolrqt.a sp.						1			
H~ 1 i copsy,:hi doC?									
HelicopsychQ borQalis			1			2			
H~licopsychQ sp.	3								
L<?ploCl?ri daq			1						
Cer./lcl"", sp.						1			
OJ PTERA									
Ti pul i da9						1			
Antocho/l sp									
Oi cr ~rlo l..'ll sp.									
H9xaloH./I	2			1				B	5
:Sp.				2			1		
r:er'alop"goni diH?									
P,'obo;ozzia sp. 1									
Und...lqrHin...d Cqratopogonidoe							3		
SiHul i ido/l"									
Pro5iHuliuN hirtipes SiNuliuM									
j9nningsi	3	"1	i'	33	1				
SiHul iUH Idtip9s									
SiMuliuN lub9FOSUN						1			
SiHuliuN Itl?nu:>tuN							1	2	....,
.Rh.3gi oni dap									<.
Rth9ri >< sp.						1			
EHpidida9			?						
H9H9rodroHia sp.								"1	
ChironoHida9	I					2		1	
T ."nypodi naq									
Conchap"lopi~ SPA									
	2								

TABLE 14. (continued) .

EHST GREEt,mUSH - Hi ch,"I~l s Road bri rig...

	1-1	1 <I	1 ";	Ii'		",	15	1-'1	1-;'
flA\'	0"'1:	,J,r'l	F",IJ	H,n'h	f I'	!1.-:I,	j.",p	.J'JI y	A'Jo;J
110Ufl!	1<):)8	]9B'	1 'l8':t	190'j	'',	"""",	.1'1::')	1'3B9	1 '3B1
'r'EAR									
SQrratella serrata 5Ii'rr'at~11~ :sp.								i'	
T d con,lt.hi d,)e									
Tricorythod~3 sp.									
Ephli'Med dae									
Ephe"p.r'<1 sp.									
OOONATA									1
l1o"phid.ae									
Undet.;,rHi tiQd GOHphid~Q									
Cd oplerygi d",q								?	
Calophwyx 3p.									
PLECOPTERf1									
Capniid<le									
Alloc,,"pnia :sp.									
r.3racapni <I sp.									
HIi'Hourido!lli'									
Undli'tqrHined HeHouridae	'5	15	"1	..J					
TaQniopterygidae 5trophoptli'ryx									
fascial~ T.aeniopleryx burksi				-,					
Taenioplli'ryx nivalis				'C	n				
T ~eni opt.li'ryx sp.									
PQrlid~...		.							
Agnelina capitala									
Agneli na sp.	3	I	5	B					
ChI orop...rl i dag.	13	12	3					'1	
Und"tli'rHinli'd ChloroPQrlidae									
Perl odidae		5							
CuI tus do?ci sus									
Undli'lli'rHinli'd Perlodidali'									
COLEOPTERA				1					
Psephenidae								1	
PSQphO?nus sp.									
El"idaQ				",					
Dubi nlphi,~ sp.									
Optiosli'rvus faslidilus					~		.~	i'	:3
OptiosO?rvu3 ovalis				"-	'"				
Opb osqrvus sp.									
Slo?ne]His cr"nata Slen.;>lMis sp.					;>			1-'1	
flU CHOPTERA									
PhilopolaHido!lQ							::		15
Chi Marra alerriHa? ChiMarra obscurar								G	
Chi Marra sp.				3					3
Dolophilod",s sp.									
Pol ycentropodi daQ			3						
Polycenlrupus sp.	1	"	2						
	1				2				

T~BLE 14" MONTHLY KICK SAMPLING RESULTS, MILL CREEK, 1988 - 1989.

EnS T GREEt,lBUSH ." Hi eNdel s Road br-i dgt?

Dt1'r' HONTH	11 OQC]<)90	19 Jan 1 cJf.!"J	15 F",b 19::1'~	17 H.~rch l'iO')	1'1 flpr i 1 1 'lR')	15 H,~y 1')8'3	15 .June 1'189	14 .July 1 '3fJ':3	I', Rug 19:3":1
PLAT'?HELHI tiTHES									
rW~B[LLnRI A									
UndeterHined Turbellaria						:3			
TiNNELl DA									
OU GOCHAETA									
[nchyt.r.!lei rl~"									
Undel~rHjngd Enchylraeidat? sp. 1									
fJ.Jbi fi ci de...									
Aulodrilu5 lil1nobius									1
Aulodrilu5 piqueti									1
Undet. Tubificidat? w/ cap. 5...tae									
"ai di £IdE'									
Nai5 behningi							12	3	
ttai 5 bl"et",cheri							2		
Nai *S* 5i. "pI ex							1		
Nai 5 ",'ari <!!obi Ii:5							7	1	
Stylaria lacuslris								1	
HOI.LUSCA									
Gf1STROPOOA									
Physi daE'									
PhYSd sp.									
Ap.nlRopoon									
CRUSTACER									
At1PIH POOA									
G~l1l1aridae									
Gal111arU5 sp					1				
INSECTA									
EPHEHEP.OPTERA									
5iphlonlJrid<l>?									
Isonychid bicolor									1
Ba.;.Udao?									
Baetis brunneicolor									
Baetis flavistriga							'"I	1	
BaQtis into?rcalaris							2	2	
Baetis Hacdunnoughi									
BaQti so pygl1aeus							3	£.	
Pseudoclof'on sp.									
HqplbgQniidde							2		
Epeoru:5 (Iron) sp.						2			
Sto?nonel1a lerHinalul1						2	13	1	f
St.eno"''''Ha sp.									
Lept.ophl o?bi i dae			2						I
Par<!!oIQplophlQbia sp.									
EpheI1E>rt?ll i d,~e		I					2		
Drunella cornut...lla									
Ephel1erella invaria							1		
EpheHerQlla :5ubvaria	19	2-1	12	2"1	211	3'1			
S",rratella deficiens	3	2	2	1	7				

TABLE 13. IMPACT ASSESSMENT, STONY KILL

Location/date

UPSTREAM Stony Kill-lA, upstream of Columbia Corp., 28 Nov 89

DOWNSTREAM Stony Kill-2A, downstream of Columbia Corp., 28 Nov 89

	Percent similarity between replicates (minimum acceptable value 50%)
UPSTREAM	
Replicate A/Replicate B	51 56
Replicate A/Replicate C	64
Replicate B/Replicate C	
DOWNSTREAM	
Replicate A/Replicate B	56
Replicate A/Replicate C	57
Replicate B/Replicate C	61

	Species Richness	EPT Value	Biotic Species Model Index Dominance	Affinity	
UPSTREAM					
Replicate A	29	10	5.11	21	56 64
Replicate B	29	11	4.30	23	54
Replicate C	30	10	4.78	28	
MEAN	29	10	4.73	24	58
DOWNSTREAM					
Replicate A	30	11	5.61	22	50
Replicate B	26	9	5.47	16	49
Replicate C	26	8	5.91	25	53
MEAN	27	9	5.66	21	51
NET CHANGE	-2	-2	+0.93	-3	-7
CRITERIA	-8	-4	+1.50	+15	-20
SIGNIFICANT BIOLOGICAL IMPACT? (Y or N)	N	N	N	N	N

TABLE 12. IMPACT ASSESSMENT, SKANEATELES CREEK - SEPTEMBER

Location/date

UPSTREAM Skaneateles Creek at Case Road, September 8, 1988
"
DOWNSTREAM Skaneateles Creek at Rodak Road, September 8, 1988

Percent similarity between replicates
(minimum acceptable value 50%)

UPSTREAM	
R~plicate A/Replicate B	78
Replicate A/Replicate C	74
Replicate B/Replicate C	75
DOWNSTREAM	
Replicate A/Replicate B	76
Replicate A/Replicate C	52
Replicate B/Replicate C	60

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affinitv
UPSTREAM					
Replicate A	17	8	4.65	27	46
Replicate B	17	8	4.74	23	53
Replicatec	15	7	4.68	21	59
MEAN					
DOWNSTREAM					
Replicate A	16	8	4.69	24	53
Replicate B	24	7	5.10	38	55
Replicate C	25	7	5.20	42	50
MEAN					
NET CHANGE	29	7	5.86	18	55
CRITERIA	26	7	5.39	33	53
SIGNIFICANT BIOLOGICAL IMPACT? (Y or N)	+10 -8 N	-1 -4 N	+0.70 +1. 50 N	+9 +15 N	0 -20 N

TABLE 11. IMPACT ASSESSMENT, SKANEATELES CREEK - JULY

Location/date

UPSTREAM Skaneateles Creek at Case Road, July 21, 1988

DOWNSTREAM Skaneateles Creek at Hamilton Road, July 21, 1988

	Percent similarity between replicates (minimum acceptable value 50%)
UPSTREAM	
Replicate A/Replicate B	57
Replicate A/Replicate C	58
Replicate B/Replicate C	56
DOWNSTREAM	
Replicate A/Replicqte B	63
Replicate A/Replicate C	73
Replicate B/Replicate C	70

	Species Richness	EPT Value	Biotic Index	Species Dominancg	Model Affinit v
UPSTREAM					
Replicate A	14	4	5.34	23.	50
Replicate B	18	5	4.98	24	50
Replicate C	19	5	5.56	24	50
MEAN	17	5	5.29	24	50
DOWNSTREAM					
Replicate A	23	8	5.05	24	62
Replicate B	21	9	5.25	21	57
Replicate C	23	7	5.25	20	58
MEAN	22	8	5.18	22	59
NET CHANGE	+5	+3	-0.11	-2	+9
CRITERIA	-8	-4	+1. 60	+15	-20
SIGNIFICANT BIOLOGICAL IMPACT? (Y or N)	N	N	N	N	N

TABLE 10. IMPACT ASSESSMENT, TONAWANDA CREEK

Location/date

UPSTREAM Tonawanda Creek above Batavia STP, 30 June 1988

DOWNSTREAM Tonawanda Creek belbw Batavia STP, 30 June 1988

Percent similarity between replicates
(minimum acceptable value 50%)

UPSTREAM	
Replicate A/Replicate B	70
Replicate A/Replicate C	71
Replicate B/Replicate C	75
DOWNSTREAM	
Replicate A/Replicate B	74
Replicate A/Replicate C	65
Replicate B/Replicate C	59

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affiniitv
UPSTREAM					
Replicate A	20	5 3	6.28	33	57
Replicate B	17	4	6.31	29	51
Replicate C	20		6.36	27	54
MEAN	19	4	6.32	30	54
DOWNSTREAM					
Replicate A	14	0	8.49	30	28
Replicate B	15	0	8.49	35	26
Replicate C	11	0	9.14	25	28
MEAN	13	0	8.71	30	27
NET CHANGE	-6	-4	+2.39	0	-27
CRITERIA	-8	-4	+1. 50	+15	-20
SIGNIFICANT BIOLOGICAL IMPAIRMENT? (Y or N)	N	Y	Y	N	Y

TABLE 9. IMPACT ASSESSMENT, POENTIC KILL

Location/date

UPSTREAM poentic Kill above Teller Kill, 15 Sept 1988

DOWNSTREAM Poentic Kill below Teller Kill, 15 Sept 1988

	Percent similarity between replicates (minimum acceptable value 50%)
UPSTREAM	
Replicate A/Replicate B	56
Replicate A/Replicate C	58
Replicate B/Replicate C	67
DOWNSTREAM	
Replicate A/Replicate B	72
Replicate A/Replicate C	58
Replicate B/Replicate C	77

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affinity
UPSTREAM					
Replicate A	22	5	5.28	36	75
Replicate B	20	7	3.85	26	67
Replicate C	20	7	4.06	49	76
MEAN	21	6	4.40	37	73
DOWNSTREAM					
Replicate A	22	4	6.48	49	51
Replicate B	24	4	6.14	31	61
Replicate C	20	3	6.25	27	69
MEAN	22	4	6.25	36	60
NET CHANGE	+1	-2	+1.85	-1	-13
CRITERIA	-8	-4	+1.50	+15	-20
SIGNIFICANT BIOLOGICAL IMPAIRMENT? (Y or N)	N	N	Y	N	N

TABLE 8. IMPACT ASSESSMENT, DELAWARE RIVER

Location/date

UPSTREAM Delaware River, West Branch at Delhi, 14 July 1988

DOWNSTREAM Delaware River, West Branch at Delancey, 14 July 1988

	Percent similarity between replicates (minimum acceptable value 50%)
UPSTREAM	
Replicate A/Replicate B	60
Replicate A/Replicate C	52
Replicate B/Replicate C	53
DOWNSTREAM	
Replicate A/Replicate B	53
Replicate A/Replicate C	51
Replicate B/Replicate C	54

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affinity
UPSTREAM					
Replicate A	29	16	4.62	17	63
Replicate B	26	17	4.63	20	61
Replicate C	28	15	4.17	18	69
MEAN	28	16	4.47	18	64
DOWNSTREAM					
Replicate A	29	10	5.55	42	45
Replicate B	35	18	4.35	20	75
Replicate C	27	12	5.17	16	62
MEAN	30	13	5.02	26	61
NET CHANGE	+2	-3	+0.55	+8	-3
CRITERIA	-8	-4	+1. 50	+15	-20
SIGNIFICANT BIOLOGICAL IMPAIRMENT? (Y or N)	N	N	N	N	N

TABLE 7. IMPACT ASSESSMENT, COEYMANS CREEK

Location/date

UPSTREAM Coeymans Creek, Route 396, 2 Sept 1988

DOWNSTREAM Coeymans Creek, Old Ravena Road, 2 Sept 1988

	Percent similarity between replicates (minimum acceptable value 50%)
UPSTREAM	
Replicate A/Replicate B	62
Replicate A/Replicate C	64
Replicate B/Replicate C	57
DOWNSTREAM	
Replicate A/Replicate B	59
Replicate A/Replicate C	67
Replicate B/Replicate C	59

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affinity
UPSTREAM					
Replicate A	33	10	5.20	14	58
Replicate B	33	9	5.25	13	59
Replicate C	24	8	5.44	24	47
MEAN	30	9	5.30	17	55
DOWNSTREAM					
Replicate A	23	6	5.23	25	46
Replicate B	22	7	4.95	25	53
Replicate C	31	8	5.46	20	51
MEAN	25	7	5.09	23	50
NET CHANGE	-5	-2	-0.21	+6	-5
CRITERIA	-8	-4	+1.50	+15	-20
SIGNIFICANT BIOLOGICAL IMPAIRMENT? (Y or N)	N	N	N	N	N

TABLE 6. IMPACT ASSESSMENT, CANISTEO RIVER

Location/date

UPSTREAM Canisteo River above Hornell, 9 June 1988

DOWNSTREAM Canisteo River below Hornell, 9 June 1988

Percent similarity between replicates

(minimum acceptable value 50%)

UPSTREAM	
Replicate A/Replicate B	55
Replicate A/Replicate C	54
Replicate B/Replicate C	58
DOWNSTREAM	
Replicate A/Replicate B	50
Replicate A/Replicate C	65
Replicate B/Replicate C	57

	Species Richness	EPT Value	Biotic Index	Species Dominance	Model Affinity
UPSTREAM					
Replicate A	26	6	5.33	13	56
Replicate B	28	6	5.59	21	51
Replicate C	22	11	5.85	15	62
MEAN	25	8	5.59	16	56
DOWNSTREAM					
Replicate A	24	8	5.86	19	48
Replicate B	31	7	5.59	11	50
Replicate C	27	8	6.58	14	44
MEAN	27	8	6.01	15	47
NET CHANGE	+2	0	+0.42	-1	-9
CRITERIA	-8	-4	+1. 60	+15	-20
SIGNIFICANT BIOLOGICAL IMPACT? (Y or N)	N	N	N	N	N

TABLE 5. (continued) RAPID ASSESSMENT SITES - 1988

LOCAfION	STATI ON	DATE SAHPLEO	SPECIES RICHNESSJE	CHAGE IN BIOTIC INOEXJE6:	CHAGE IN EPT 'ALUE3E	CHANGE IN CONTRIBUTION OF DOHINANT SPECIES.	SBI	PROBABLE CAUSE	STATUS
Cohocton Ri *vcw*	01	08-Jun-B8							IC;.
Cohocton RivQr	01A	08-Jun-e8	-2	-0.31	-"I	5	'r'	HABI TAT, ONPT m:u]L I Lt I :1uti !)	N fwf
Cohocton RivC?r	02	OB-Jun-BB	-"I	-0."17	3	1	1'1		
Cohocton RivQr	03	OB-Jun-B8	3	1.53	-9	-7	\'	CONI), TOXICS	NE;f.r1 r:r{\H ON *MP* l
Cohoe ton RivC?r	03A	OB-lun-88	"I	0.01	1	2	N		
Cohoe ton RivC?r	0"1	08-Jun-,B	I>	-1."11>	I>	-2	1'1		*ICI((*
Cohocton Rivqr	05	08-Jun-88	-1	-0.55	7	-1	1'1		
SkanQatQ1Qs CrQQk	01	21-lul '-88							
SkanQatQ1Qs CrQQk	03	21-Jul-88	5	-0. 11	3	-2	N		
SkanQatQ1Qs CrQQk	01	OB-SQP-a8							
SkanQatQIQs Crk	02	oa-SQP-8a	10	0.6B	-1	9	N		
Canitt'o RivQr	01	09-Jun-aB							
C-'nistt'o RivC?r	02	09-Jun-88	-1	2.30	-6	2	'r'	CONI), TOXI CS	ON PP LI ST
CanistQo RivQr	03	09-lun-8a	2	. -1.19	2	-1"1	1'1		
CanistQo RivQr	0"1	09-Jun-BB	8	-0.21	2	2"1	'r'	CONV,rOXICS	ON PP LIST
Canistc;>o RivQr	05	09-Jun-8B	-11	-1."12	-1	-1&	'r'	CONV,rOXICS	ON PP LIST
Coni:steo RivQr	06	09-lun-BI3	9	0.77	5	-"1	1'1		

w
(j)

JE: Ch~ngQ in P~~"QtQr
froM upstrQaM station

+: "OthQr" includE's sit...s that t1ay hav... bQ"n on P~P list, but no 10n9"r or"" and sites locatQd outsidQ of ~Q~ 'r'ork Stat",.

. Hils,,"nnoff BioUc Index, 0-5 seal", 11:

Hi1sQnhoff Biotic IndE'x, 0-1(1 :scdh;.

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TABLE 5. (continued) RAPID ASSESSMENT SITES - 1983 - 1987

LOCATION	STATION	DATE SAHPLED	CHANGE IN SPECIES RICHNESS	CHANGE IN BIOTIC INDEX-/	CHANGE IN ErT VALUE-	CONTRIBUTION OF DOHINANT SPECIES	SBI	PROBABLE CAUSE	STATUS
T onawanda Cn.ek	C	25-Jul-O"l							
T on-!lw.enda Cn..ek	0	25-Jul-9"1	13	-0.02	3	?	H		ON P~P LI ST ON p~p LI ST
T onaw.enda Cn.ek	02	25-Jul-O"l	-15	1.12	-1	2?	'r'		
Tonwanda CreQk	03A	25-Jul-O"l	0	0."18	-5	-2"1	'r'		ON p~p LI ST
T onwanda CrQek	039	25-Jul..,9"1	-1	-0.0"1	0	"I	H		
T onaw.enda Cr...ek	O"1A	25-Jul-9"1	-3	-0.09	1	26	'r'		
T on-!lwanda Creek	OB	25-Jul-O"l '	2	-o.?a	3	-10	H		ON P~P LIST
Susquehanna River-Upper	903	23-Jul-05							
Susquehanr,a Ri ver-Upp9r	BO"l	23-Jul-05	-1	-O."I?	-1	5	H		
Susquehanna River-Upper	BO?	23-Jul-SS	3	O."I?	-5	-13	'r'		
Susquehanna River-Upper	B10	23-Jul-9S	?	-0.83	9	-12	H		
Susquehanna River-Uppr	Bll	23-Jul-OS	1	-0.20	0	?	H		
Vi r9i 1 Cn.ek	01	09-Sep-O?							
Vir9il Creek	02	09-Sep-Oi'	-5	-0."18	..1	3	H		
I)i r9i I CreG'k	03	09-SG'p-Oi'	-2	0.15	""	-10	H		ON PWP LIST
all OOHsac Ri Villr	03	OS-Jul-S3							
allooHsac River	01	OB-Jul-03	"I	0.20	-1	-1	H		
all OOH:5aC River	01	2?-Jun-S"I							
all OOH:5aC Ri vClr	02	2i'-Jun-9"1	1	0.03	-(;	-2"1	'r'		SPURIOUS
all OOHsac Ri ver	03	2?-Jun-O"l	0	0.18	3	5	N		
all OOHsac Ri ver	0"1	2?-Jun-O"l	-(;	0.16	-2	-1	N		
oodbury Creek	01	05-Hay-O?							
oodbury Creek	02	OS-HalrO?	1	-1.10	S	6	H		
c'odbury CrE'ek	03	OS-Hay-O?	-2	-0.95	0	39	'r'		
clodbury Creek	01	OS-Hay-9?	3	0.09	-1	-"I	to!		

LV
U1

-: Change in par-!lHeter roH upslreaH station

t: "Olhllw" i ncl udes si tes that. Hay *havQ* bqQn on PP Ii st. but no longet- arq. and si tqS located outside of New York statq.

/: Hilsenhoff Biotic Index, 0-5 scalQ

&: Hilsenhoff Biotic Index, 0-10 scale

TABLE 5. (continued) RAPID ASSESSMENT SITES - 1983 - 1987

LOCATION	STATION	DATE SAMPLED	CHANGE IN SPECIES RICHNESS	CHANGE IN BI on C INDEX	CHANGE IN EPT VALUE	CHANGE IN CONTRIBUTION OF DOMINANT SPECIES	S81	PROBABLE CAUSE	STATUS
Onida Creek	02	03-S",p-86	-1	0.12	2	6	"		
Onida Creek	03	03-SQP-SG	-1	0.65	-1	0	"		
On...i da Cn.,,1:	01	03-SQp-86	5	-0.38	0	1	"		
On",ida C,.,,I:	05	03-SQP-B6	2	0.22	2	-1	H		
On"i da Cn.k	06	03-Sep-86	0	-0.20	0	-8	"		
On,>i da Cn',,!:	07	03-Sp-86	-"I	0.05	1	-1	H		
Or.."i da C,.'",k	08	03-S'"p-8G	2	0.16	-)	1	H	HOHPT	
Or,i da C,.'"I:	09	03-S'"p-I3G	2	0.12	1	-12	"	HONPT	
Pal,In'" Brook	02	18-J'Jn-8-1							
P61,1n'" Brook	03	IS-Jun-S"!	-11	0.91	-1	29	Y		01'1 PI./P LI ST
P6':1n" Bt.ook	0"1	IS-Jun-8"!	8	-0.23	0	-11	"		
P':In... Brook	05	IS-Jun-S'!	6	-0.11	0	-7	1'1		
Oua:5saick Creek	01	OS-Hay-S?							
Oua5sai ck C,-'",k	02	OS-Hay-8?	-3	0.69	-5	16	Y		ON PI./P LIST
Oua:ssaick C,.\?k	03	OS-H'.'ly-87	-6	0.03	-"I	11	'r'	TO:>CICS	ON PI./p LIST
CI'J..!!ssai ck Ct."...k	01"	05-H'!IY-f.)?	5	0.6'1	1	11	'r'	HABITAT	ON PI./P LIST
QUo!Is:5aick CrE'..k	01S	05-H.!ly-8?	1	1.10	-1	-10	'r'	HABITAT	ON PI./P LI ST
w Rl1o!1po Ri ."„.	01	1('-J'Jn-8G							
"" RaH.:Spo Ri \'e'"	02	1 ?-:-..lun-86	-5	0.79	-1	19	'r'		HEL/ DETECn 0"
RlIHo!IpO Ri 'r	03	11-Jun-8G	-2	-0.02	0	-1('	"		
Rlll1o!1pO Ri V"t"	0'1	1('-Jun-BG	7	-0.02	0	-9	t		
R<lt1o!1po Ri \'('r	05	.17-Jun-8G	1"1	-1.39	of	-9	"		
RH.!lpO Ri "t.	06	1 j'-..l'Jn-8G	-9	-0.::12	2	25	Y		ot! PI./P LIST
Schohari... Cn,...k	0"1	02-0d.-SG							
Schohari... Cn'",!:	05	02-0d.-8G	-2	-0.23	-2	1&	Y		SPURIOUS
Sconondoa Cr...ek	01	01-S9p-86							
Sconondoa Cn"k	02	O"l-SQP-SG	-6	0.38	-2	1	"		
Sconondoo!l C""Ci'k	03	01-S...p-8E.	-13	0.26	-3	26	'r'	COM V	01'1 PI./P LI ST
Sconondoo!l cr...	01	0"l-SQp-86	1	0.16	)	-22	"		
Sconondoo!l Cr"...k	0'-.;,	O"l-SQp-86	1	-0.2"1	0	1"1	t		
Scone.ndoo!l Cr"Qk	06	01-SQp-36	"I	-0.07	::I	-18	"		
SU$qu"hanna Riv„"	0':>.-	23-Jul-B-I							
SuquQhanna River	01	2::1-..1IJl-8"1	"I	0.17	-"I	-11	Y		ON PI./P LI ST
SU5quQhanno!l RiVQ,.	05	23-Jul-8"1	-13	0.&0	-7	18	'r'	HABITAT	ON PI-jP LI ST
Suquehanna River	07	23-Jul-8"!	-10	1.25	15	2	t		

TABLE 5. (continued) RAPID ASSESSMENT SITES - 1983 - 1987

LOUtTION	STAn ot!	DflTE SAHPLED	SPECIES RICHMESS-	CHANGE IN BIOTIC I NOEX-/	CHANGE IN Ef>T VALUE)!	CHANGE IN COHTP.I Bun ON OF DOHINANT SPECIES-	S8I	PROBABLE CAUSE	5TArLI:
Hoosi c Ri V>r	0 1	17-Jun-6S	2	0.17	1	-10	H		
Hoosic RivQr	O"lA	I1-J'Jn-SS	-7	0.30	-1	22	'r'		OTHER t
Hoosi c Ri "'Qr	06	19-J'Jn-SS	-12	0.10	-1	52	\'		ON pp LIST
Hoosic RivQr	0 1	IS-Jun-85	5	-0.2"t	1	-21	1'1		
Hoosi c Ri VQr	08	19-Jun-SS	2	0.0'1	3	0	H		
HClo:5ic Rivl?r	0' 3	18-Jun-65	5	-0.78	0	-11	H		
Hoo:5i c Ri vl?r	10	18-J'Jn-9S	5	0.19	2	2	1'1		
Hoosi c Ri VQr	1 1	19-Jun-B5	-6	0.19	-5	"t	'r'		01'1 PP LI ST
Hoosic RivQr	1 3	16-J'.m-85	-3	-0.51	3	3	H		
Hoosic Rivl?r	01	22-Jul-86							
Hoosi c Ri VQr	02	22-J'JI-06	-7	0.99	-s	2	'r'		OTHER t
Hc,o:si c Ri VQr	03	22-J'Jl-9G	-9	-0.32	-1	5	\'		OTHER t
Hoosic RivQt"	0" 1	22-J'JI-66	2	-0.12	2	0	H		
Hoo:sic RivQr	O"tA	22-Jul-96	-3	0.16	0	3	t4		
Hc'osi c Ri VQr	06	22-..1'Jl-66	S	-0.18	.-1	-7	1'1		
Hoosi c Ri vl?r	07	22-Jul-9G	0	0.17	-1	10	1'1		
Hcu:.si c Ri Vl?r	08	22-Jul-86	-,"I	0.05	2	28	'r'		Ot4 PI./P.LI ST
Hoo:si c Ri vl?r	09	22-JIJl-86	-3	0.09	-2	-7	1'1		
Hoosi c Ri "'iW	10	22-Jul-86	9	-0.05	"I	-31	H		
w Hoosi c Ri Vel"	11	22-..1ul -86	-5	0.20	-3	0	H		
w Hoosi c Ri vl?r	13	22-Jul-86	10	-0.56	7	-"I	1'1		
Krot1r1 Ki II	A	16-Jul-9i'							
Kro/1/1a Ki 11	01	1&-..lul-8i'	3	-I. 00	0	9	H		
Krol1t'\a Kill	02	1&-..lul-8i'	2	1.08	-3	-1&	\'		NEI./ DETECT! ON
Kro/1t'\a Ki 11	03	1&-Jul-87	-"I	0.&8 -	0	26	\'		NEI./ OETECn ON
Little Genl?sl?l? Creek	82	25-..1ul-S"I							
Little Gl?nesee Creek	B 3	2S-..1ul-8'1	-7	1.23	-1	1&	'r'		ON PI./P LIST
Little Genl?sel? Creek	B 5	25-Jul-B"I	11	-0.9"t	3	-10	1'1		
Little Genl?see Crel?k	B &	25-Jul-S'1	-2	0.&0	-1	16	\'		01'1 PI./P LIST

TABLE 5. (continued) RAPID ASSESSMENT SITES - 1983 - 1987

	LOtATI ON	STAT! Ot!	DATE SAHPLEO	CHAt!GE I N SPECIES RI(:;ljNESS!IE	CHANGE I N BIOTIC I HOEXV	CHANGE IN EPT VALUE'"	CHANGE It! . CONTRIBUTION OF DOHIHANT SPECIES!IE	SEll	PROBABLE	STATUS
	CoqYl1J!1ns Crqqk	02	I1-JIJn-81							
	COqYl14ns CnQk	0"1	ll-J'Jn-81	"I	-0.08	0	-19	N		
	COQ':!Hans Cn"k	Oe.	II-JIJn-81	0	0.98	-3	0	\'		t!E DETECT! ON
	COQ':!l1.!!ns Cr"qk	01	11-,1IJn-81	-1	0.22	-3	"f	N		
	D"lalolarq RivQI'"	01	2G-AIJg-8G							
	[lqlalolar" Riv"I'"	03	2G-AlJg-8G	18	-1.5"1	"7	-21	N		
	[I"lalolarq RivQr	0"1	2G-AlJg-8G	-2	-O.G3	3	1	H		
	[It>lalolal"'" Riv"r	05A	2G-AIJg-8G	-9	-0.23	-3	0	\'		NE DETECT! ON
	OQIalolarl1' RivQI'"	01	2G-AIJg-BG	3	0.2"1	1	-1	H		
	OQIalolat'o RivQI'"	013	2G-AIJg-86	7	-0.19	8	-"I	1'1		
	F.!Ill Cr"...k	01	09-S...p-81							
	F all Cnt>k	02	0'9-S...p-B1	-G	0.23	2	'9	N		
	Fo/Ill Croqk	03	09-S...p-8?	2	-0.09	-2	-"I	H		
	Fall Cro"k	0"'1	09-Sp-B7	-5	'-0.26	0	"'I	1'1		
	FbIl Cr""k	05	09-S...p-B7	0	0.29	0	-1	N		
	Fall CroQk	OF..	09-S...p-81	0	0."f5	1	1	tI		
w	GildorslQE've Brook	01	09-,11J1-87							
IV	GiIdQI'"sl..."vE' Brook	O' .:.	09-JIJ1-8i'	-G	0.93	0	-15	't'	TOXICS	ME DETECnON
	Gildt>rsl""v" Brook	03	09-JIJl-87	-9	-0.G3	1	21	't'	TOXICS	NE DETECT! OM
	Gi 1 d...,.sl *"'"1'"* Bt'ook	05	09-JIJl-8i'	1	-0.-1?	0	-9	N	TOXICS	
	GoosQbqrl'"Y Crqk	01	02:'"Oct-86							
	Goosqborry Crt>k	02	02-0ct-86	"I	0.35	-1	-1	\'	TOXICS	OM NIP LI ST
	GoosQb,wry C,...?vk	02A	02-0d-8G	-5	-0.57	5	3	M		
	GoosQb"rry Crt>vk	03	02-0d.-86	-3	0.2"'1	0	"I	N		
	Hoosi c: Ri *I'QI'"*	oe.	OS-JIJ1-83							
	HOO3ic Riv"I'"	01	05-JIJl -83	-2	0.20	1	2	H		
	Hoosi c: Ri I'Qr	0'3	*05-,1'.11-83*	-11	-0. Q()	0	3	't'		OM PI-IP.LIST
	Hoo:sic: RivE-r	01	28-,1IJl -83							
	Hoosic: RivQr	0'3	28-,lul-83	-12	-0.1"1	-2	35	't'		ON PI-IP LIST
	Hoosic Rivqr	01	25-Jun-8'1							
	HOQsic: Rivqr	02	25-JIJn-81	2	0.20	::I	-5	H		
	HOQsic: Rivqr	03	2S-Jun-8-1	-10	0.85	-"I	5	't'		OTHER +
	Hc.osi c: Ri *vqr*	01	25-,lun-8'1	'3	-0.31	-3	-10	tI		
	Hoosic: RivE-r	O"lA	2G-JlJn-8"1	-1	0.2?	-1	'3	tI		
	Hoosi c: Ri *VQr*	0';	2G-,1IJn-l3'1	5	-0.62	"'	2	N		
	Hoosic RivQr	07	2G-JlJn-8-1	-'1	0.01	-1	'1	tI		
	Hoosi c: Ri I'"r	08	26-,lun-8'1	1	0.0"'1	1	-7	tI		

TABLE 5. RAPID ASSESSMENT SITES - 1983 - 1987

LOCATION	STAn ON	DATE SAHPLED	CHANGE IN SPECIES RICHHESSJIE	CHANGE IN eIonc INDEXJIE/	CHANGE IN EPT VALUEJIE	CHANGE IN CONTRIBUTION OF DOHINANT SPECIESJIE	591	PROBABLE CAUSE	STATUS
Bt t.lII'nki 11	00	0"l-Oct-S1							
Bat t.lII'nki 11	01	O"l-Oct-B't	-2	-0.07	1	1<1	N		
Batt.lII'nki11	03	O<l-Oct-B"I	0	0.3£>	2	-'3	tI		
Bt tlll'nki 11,	08	O<l-Oct-8"1	1	0.15	--'3	-2	N		
Bat t,mki 11	16	O"l-Oct-S't	-9	-0.22	--5	1	'r'		ON P"'P LI ST
Bt -t.lII'nld 11	A	25-Jun-86	I						
Bat tlll'l\ki 11	00	25-JIJn-Sf>	0	0."13	"I	-S	N		
Bat t.c;onki 11	01	25-Jun-BG	-'3	0.12	-"I	8	'		NE"' DETECT! 01'1
Bat tc;onki 11	03	25-Jun-SG	0	-0.3'1	2	-6	N		
Bat t.qnki 11	08	25-Jun-SG	21	0.92	'3	-5	'r'		SPURIOUS
9att.qnkill	16	25-..1un-Sf>	-11	0.11	-5	-2	'		ON PI-IP LtST
Canndaigua Outlet	01	20-Jun-9"1							
Canandaigua Outlet	02	20-Jun-B'1	-1	0.88	2	'3	'		OTHER +
Canndaigua Oul1et	03	20-Jun-a"f	6	-0.85	0	-22	H		
Canandaigua Outlet	05	20-Jun-8't	1	-0. 12	6	6	H		
Canndai gua Outl et	06	20-Jun-S'1	-3	-0.07	-3	-12	N		
Canandaigua Jtlet	0:3	20-J'Jn-O'1	2	-0.0i'	0	7	N		
LV Canndaigua Outlet	01	O)-Oct-aS							
I-- ' Canandaigua Outlet	02	03-0ct-aS	-6	0.38	-2	-11	N		
Canndaigua Outlet	03	03-0ct-8S	20	-0.2'1	5	-17	1'1		
Can.ndai gua Outl et	05	0)-Oct-8S	-1	-0.81	3	-1	1'1		
Canandaigua Outlet	06	03-0ct-aS	-2	0.31	1	1	1'1		
Canandaigua Outlet	08	03-0ct-8S	-2	-0.13	-2	-13	tI		
Canandaigua Outlet	01	2"1-S...p-86							
Canandaigua OutlQt	02	2<1-SQop-8f>	2	-0.01	2	-11	1'1		
Canandaigua Outlet	03	2'1-S'i?p-af>	3	-0.17	1	-3	1'1		
Canndaigua Outlet	05	2"1-S9p-8f>	6	-0.50	1	-1	H		
Canndaigua Outlet	06	2"1-SQP-af>	-5	0.13	2	-S	t		
Canandaigua Oullet	08	2"1-S...p-Sf>	6	0.21	3	-1	H		
Cayadut ta CriPek	01	15-JIJl-S6							
Catj-!Sdut ta Cr"..."	02	IS-Jul-Sf>	-1"1	2.00	-1	-5	\'	COHI} . rmu cs	01'1 PI-IP LI ST
Caydut ta Cr"Q"	03	15-Jul-S6	"I	0.12	0	"I	N	COHI,I, rOXI CS	

TABLE 4. DOCUMENTATION OF IMPAIRMENT AT ARTIFICIAL SUBSTRATE SITES

LOCATION	STATION	YEAR SAMPLED	DOCUMENTATION - DATA CORROBORATING IMPAIRMENT
Black River	04	1976	good-toxic effects due to paper mill discharge good-documented effects of Watertown STP
Black River	16	1976	poor-possible effects from paper mill discharge fair-effects of pulp and paper mill discharge.
Black River	11	1982	good-see Station 16 above
Black River	14	1982	good-D.O. sag from Gates-Ogden-chili STP upstream good-see above
Black River	16	1982	good-documented violations from utica STP
Genesee River	04	1974	fair-possible organic effect from Little Falls STP fair-possible organic effect from st. Johnsville STP fair-possible effects from discharges near Schenectady good-documented high metals levels from Rome discharge good-see station 06 above
Genesee River	04	1980	fair-possible organic effect from Canajoharie STP poor-unknown discharges
Mohawk River	06	1972	fair-possible effects from Schenectady Chemical discharge
Mohawk River	13	1972	
Mohawk River	16	1972	
Mohawk River	26	1972	
Mohawk River	03	1978	
Mohawk River	06	1978	
Mohawk River	18	1978	
Mohawk River	19	1986	
Mohawk River	24	1986	

TABLE 3. (continued)

Little Genesee Cr.	B3 B6	25-Jul-84	good-low D.O.s, high BODs from Bolivar STP, natural oil seepage
Little Genesee Cr.	03	25-Jul-84	fair-land use suggests non-point source pollution
Monhagen Brook	12	17-Jun-86	good-low D.O.s due to Middletown STP
Neversink River	03	20-Aug-87	fair-below STP discharge
Payne Brook	!02	,Q8-Jun-84	good-low D.O.s, high BODs due to Hamilton STP
Quassaick Creek	03	,05-May-87	poor- possible urban runoff
Quassaick Creek	02	05-May-87	poor-suspected discharges upstream
Ramapo River	06	17-Jun-86	good-documented permit violations from Orange Co. S. D. #1 fair-
Ramapo River	05	17-Jun-86	new STP facility needed at Tuxedo upstream of site poor-spurious
Schoharie Creek	03	02-0ct-86	good-low D.O.s, high BODs (M&A survey 1987) due to Vernon STP
Sconondoa Creek	04	04-Sep-86	good-operational problems with Binghamton-Johnson City STP fair-
susquehanna R~	25.3	23-Jul-84	suspected toxic landfill leachate; Endicott STP discharge good-
Susquehanna R.	35.6	29-Aug-85	operational problems with Bingham~on-Johnson City STP good-below
Susquehanna R.	B07 02	29-Aug-85	Cooperstown STP
N Susq. R. -Upper	03A	23-Jul-85	good-low D.O.s (SBU survey 5.8), known CSO discharge above site
~.Tonawanda Creek	04A 02	25-Jul-84	good-below Batavia STP
Tonawanda Creek	03	25-Jul-84	poor-changes due to recovery from STP effects
Tonawanda Creek		25-Jul-84	good-reported fish kills, documented high metals concentrations
Walloomsac River		27-Jun-84	poor-spurious .
Woodbury Creek		05-May-87	

TA,BLE 3. DOCUMENTATION OF IMPAIRMENT AT RAPID ASSESSMENT SITES

LOCATION	STATION	DATE SAMPLED	DOCUMENTATION - DATA CORROBORATING IMPAIRMENT
Battenkill River	01	25-Jun-86	fair-land use suggests non-point source pollution poor-spurious
Battenkill River	08	25-Jun-86	fair-suspected discharger Stevens & Tompson, reported fish kil fair-as above
Battenkill River	16	04-0ct-84	poor-habitat not comparable to upstream site good-Johnstown-Gloversville STP, ammonia, metals, fish kills good-as above
Battenkill River	16	25-Jun-86	fair-below Waverly STP discharge
Canandaigua Outlet	02	20-Jun-84	good-low D.O.s due to Elmira STP
Cayadutta Creek	02	15-Jul-86	poor-suspected toxic impact
Cayadutta Creek	04	15-Jul-86	poor-as above
Cayuta Creek	02	27-Aug-84	fair-suspected iron seepage from Selkirk RR yards
Chemung River	07	24-Jul-84	poor-land use suggests non-point source pollution poor-habitat not comparable to upstream site
Coeymans Creek	03	05-0ct-84	fair-high aluminum levels found in chemical sampling good-documented high chlorine level~ from Tannersville STP good-documented high copper levels, fish kills
Coeymans Creek	04	05-0ct-84	good-as above
Coeymans Creek	06	11-Jun-87	poor-site outside of NYS
Delaware River	05A	26-Aug-86	poor-site outside of NYS
Gildersleeve Br.	02	09-Jul-87	poor-site outside of NYS
Gildersleeve Br.	03	09-Jul-87	poor-site at NYjVT border
Gooseberry Creek	02	02-0c.t-86	good-effects of variable dam discharge
Hoosic River	09	05-Jul-83	poor-site outside of NYS fair-suspected metals ,problem good-below Al Tech Steel holding lagoon good-below Al Tech Steel discharge pipe
Hoosic River	09	28-Jul-83	
Hoosic River	03	25-Jun-84	
Hoosic River	02	17-Jun-85	
Hoosic River	04A	17-Jun-85	
Hoosic River	06	18-Jun-85	
Hoosic River	11	18-Jun-85	
Hoosic River	03	22-Jul-86	
Hoosic River	08	22-Jul-86	
Kromma Kill Cr.	02	16-Jul-87	
Kromma Kill Cr.	03	16-Jul-87	

TABLE 2. ARTIFICIAL SUBSTRATE SITES EXCEEDING AT LEAST ONE PROPOSED CRITERION

LOCATION	STATION	YEAR SAMPLED	CHANGE IN SPECIES RICHNESS	CHANGE IN BIOTIC INDEX	CHANGE IN EPT VALUE	CHANGE IN % CONTRIB. DOM. SPECIES
Black River	04	1976	-3	0.29	-4	27
Black River	16	1976	9	2.47	3	26
Black River	11	1982	-4	2.07	-3	30
Black River	14	1982	-10	0.21	0	8
Black River	16	1982	-4	1.79	-2	15
Genesee River	04	1974	-8	1.68	-5	17
Genesee River	04	1980	-1	1.77	-1	12
Mohawk River	06	1972	2	0.72	0	30
Mohawk River	13	1972	-3	-0.58	0	20
Mohawk River	16	1972	-6	1. 06	-4	17
Mohawk River	26	1972	-3	0.52	-1	23
Mohawk River	03	1978	-12	1.00	-4	-4
Mohawk River	06	1978	-4	0.88	-5	10
Mohawk River	18	1978	-4	0.13	-4	17
Mohawk River	19	1986	-2	0.09	-1	16
Mohawk River	24	1986	-1	0.49	0	18

Biotic index values are based on the Hilsenhoff 0 - 10 scale. Values in bold type indicate changes exceeding proposed criteria for that parameter.

TABLE 1. RAPID ASSESSMENT SITES EXCEEDING AT LEAST ONE PROPOSED CRITERION (continued)

LOCATION	STATION	DATE SAMPLED	CHANGE IN SPECIES RICHNESS	CHANGE IN BIOTIC INDEX	CHANGE IN EPT VALUE	CHANGE IN % CONTRIB. DOM. SPECIES	CHANGE IN % MODEL AFFINITY	STATUS
Little Genesee Cr.	B3	25-Jul-84	-7	1.23	-1	16	-32	ON PWP LIf:
Little Genesee Cr.	B6	25-Jul-84	-2	0.60	-1	16	-11	ON PWP LIf:
Monhagen Brook	01	17-Jun-86	-9	0.29	-1	-12	0	ON PWP LIS
Monhagen Brook	03	17-Jun-86	0	0.26	0	23	-21	ON PWP LIS
Neversink River	12	20-Aug-87	-2	-0.18	-7	0	-15	NEW DETECTIC
Payne Brook	03	18-Jun-84	17 -3	0.91	-1	29	-22	ON PWP LIS
Quassaick Creek	02	05-May-87	-6	0.69	-5	16	-34	ON PWP LIS
Quassaick Creek	03	05-May-87	-5	0.03	-4	11	-11	ON PWP LIS
Ramapo River	02	17-Jun-86	-9	0.79	-1	19	-3	NEW DETECTIO
Ramapo River	06	17-Jun-86	-2	-0.32	2	25	15	ON PWP LIS
Schoharie Creek	05	02-0ct-86	-13	-0.23	-2	16	1	SPURIOU
Sconondoa Creek	03	04-Sep-86	4	0.26	-3	26	-11	ON PWP LIS ON
Susquehanna River	04	23-Jul-84	-9	0.17	-4	-11 -	2	PWP LIS ON
Susquehanna River	10	23-Jul-84	-8	0.27	-9	5 15	10	PWP LIS ON.
Susquehanna R.	25.3	29-Aug-85	0	0.25	-7	-10	-10	PWP LIS ON
Susquehanna R.	35.6	29-Aug-85	-15	0.80	-8	27	-20	PWP LIS ON
Tonawanda Creek	02	25-Jul-84	0	1.12	-1 -5	-24	-28	PWP LIS
Tonawanda Creek	03A	25-Jul-84	-3	0.48	1 -5	26	-7	ON PWP' LIS'
Tonawanda Creek	04A	25-Jul-84	3	-0.09	-6	-13 '-	-10	ON PWP LIS'
Susq. River-upper	B07	23-Jul-85	1	0.47	0	24	6 -	ON PWP LIS'
Walloomsac River	02	27-Jun-84	-2	0.03		39	21 -	ON PWP LI S'
Woodbury Creek	03	05-May-87		-0.95			10	SPURIOU:

PWP: NYS DEC Division of Water, Priority Water Problem list

+: "Other" includes sites that may have been on the PWP list, but no longer are, and sites located outsidi of New York State.

Biotic index values are based on the Hilsenhoff 0 - 5 scale. exceeding proposed criteria for Values in bold type indicate changes that parameter.

TABLE 1. RAPID ASSESSMENT SITES EXCEEDING AT LEAST ONE. PROPOSED CRITERION

LOCATION	STATION	DATE SAMPLED	CHANGE IN SPECIES RICHNESS	CHANGE IN BIOTIC INDEX	CHANGE IN EPT VALUE	CHANGE IN % CONTRIB. DOM. SPECIES	CHANGE IN % MODEL AFFINITY	STATUS
Battenkill River	16	04-0ct-84	-9	-0.22	-5	4	-10	ON PWP LIST
Battenkill River	01	25-Jun-86	-3	0.12	-4	8	4	NEW DETECTION
Battenkill River	08	25-Jun-86	21	0.92	3	-5	10	SPURIOUS
Battenkill River	16	25-Jun-86	-11	0.14	-5	-2	-9	ON PWP LIST
Canandaigua Outlet	02	20-Jun-84	-1	0.88	2	9	9	+OTHER
Cayadutta Creek	02	15-Jul-86	-14	2.00	-1	-5	-42	ON PWP LIST
Cayadutta Creek	04	15-Jul-86	-3	0.21	-1	33	-22	ON PWP LIST
Cayuta Creek	02	27-Aug-84	3	1.06	0	-13	-19	NEW DETECTION
Chemung River	07	24-Jul-84	-10	-0.17	-2	16	-10	ON PWP LIST
Coeymans Creek	03	05-0ct-84	-10	0.66	-3	21	-23	NEW DETECTION
Coeymans Creek	04	05-0ct-84	-3	0.10	-4	9	8	NEW DETECTION
Coeymans Creek	06	11-Jun-87	0	0.98	-3	0	3	NEW. DETECTION
Delaware River	05A	26-Aug-86	-9	-0.23	-3	0	-24	NEW DETECTION
Gildersleeve Br.	02	09-Jul-87	-6	0.93	0	-15	-3	NEW DETECTION
Gildersleeve Br.	03	09-Jul-87	-9	-0.63	1	21	-3	NEW DETECTION
Gooseberry Creek	02	02-0ct-86	4	0.35	-7	-1	4	ON PWP LIST
Hoosic River	09	05-Jul-83	-11	-0.06	0	3	-24	ON PWP LIST
Hoosic :River	09	28-Jul-83	-12	-0.14	-2	35	-25	ON PWP LIST
Hoosic River,	03	25-Jun-84	-10	0.85	-4	5	-20	+dTHE
Hoosic River	02	17-J"un-85	3	0.90	-1	6	-8	+OTHE
Hoosic River	04A	17-Jun-85	-7	0.30	-4	22	";17	+OTHEI1
Hoosic River	06	18-Jun-85	-12	0.48	-1	52	-23	ON PWP LIS'!
Hoosic River	11	18-Jun-85	-6	0.49	-5	4	0	ON PWP LIS'!
Hoosic River	02	22-Jul-86	-7	0.99	-5	2	-15	+OTHEF
Hoosic River	03	22-Jul-86	-9	-0.32	-4	5	-27	+OTHEF
Hoosic River	08	22-Jul-86	-4	0.05	2	28	-13	ON PWP LIS,]
Kromma Kill Creek	02	16-Jul-87	2	1.08	-3	-16	-11	NEW DETECTIOli
Kromrna Kill Creek	03	16-Jul-87	-4	0.68	0	28	-9	NEW DETECTIOli

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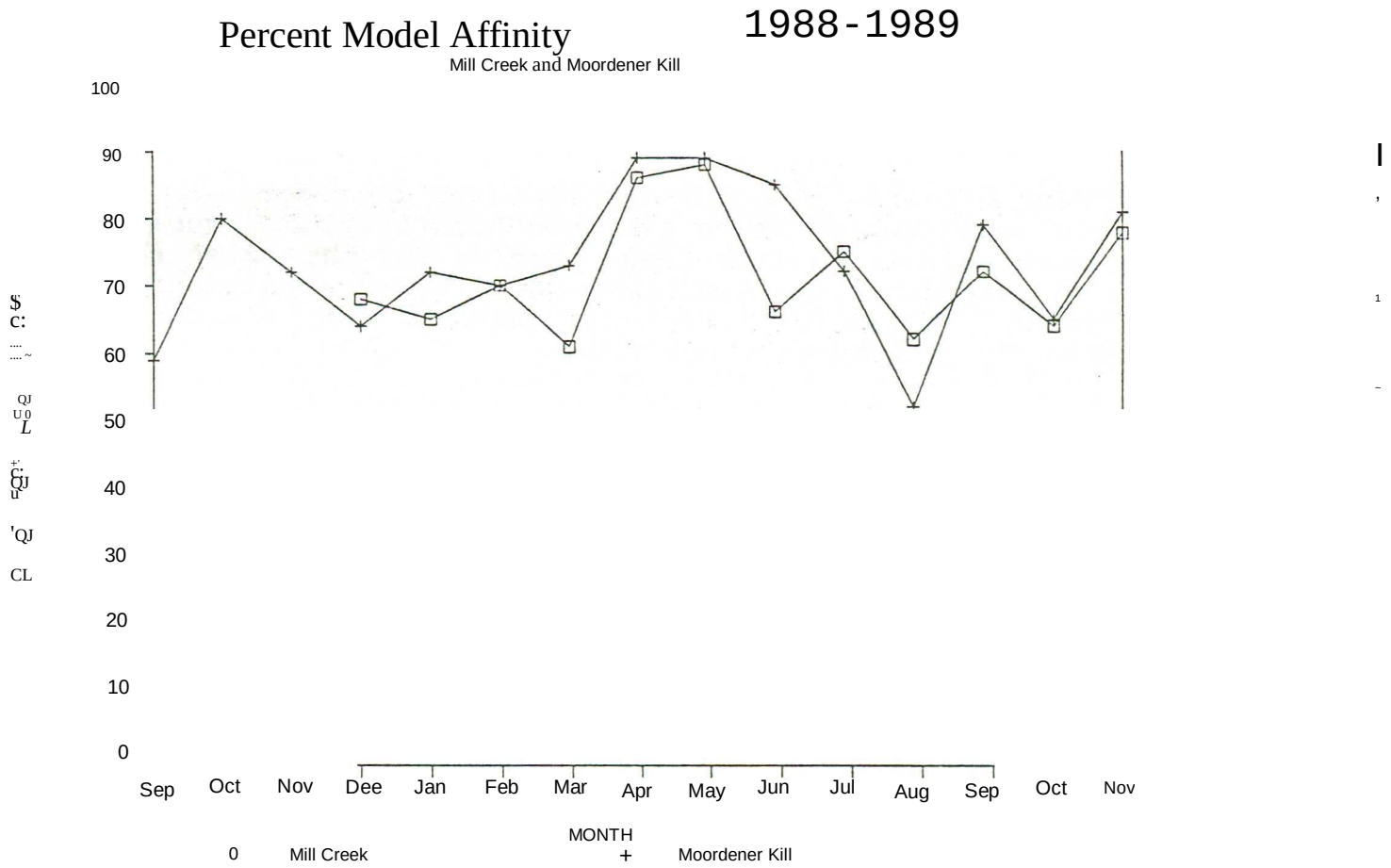
S~'1av.L

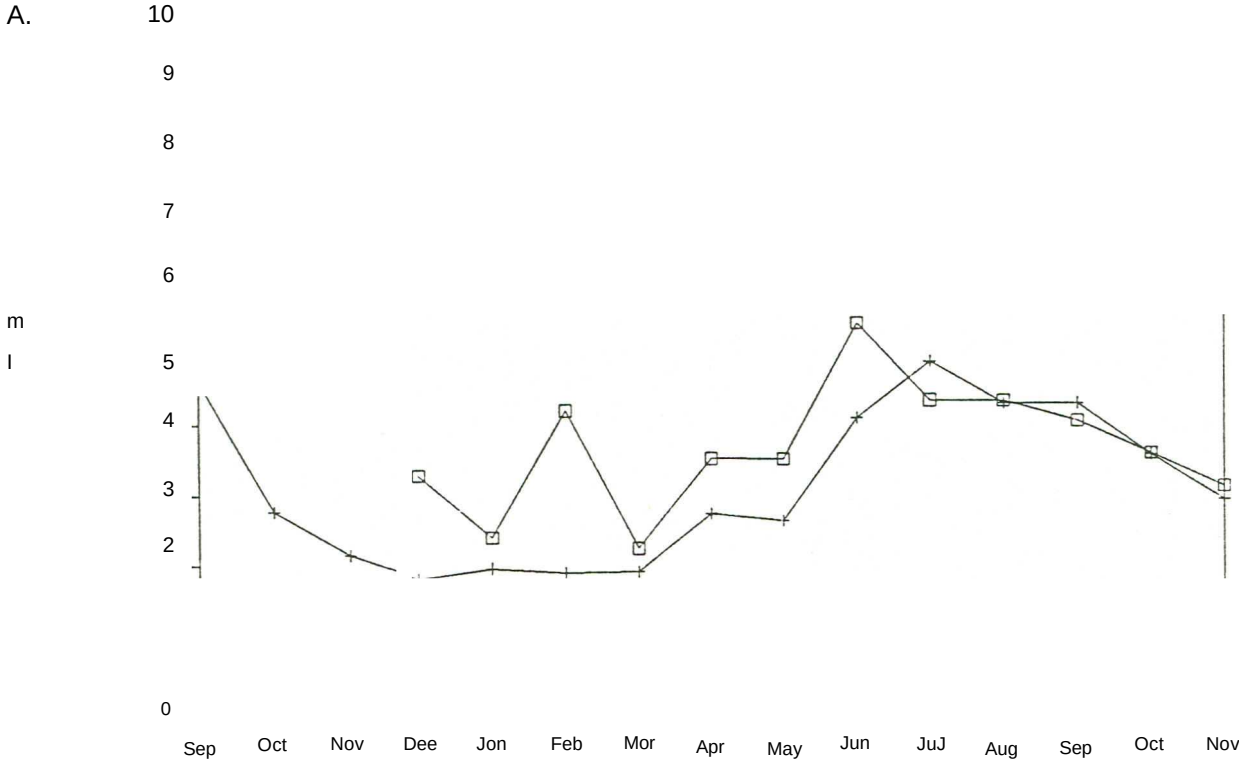
Figure 6.


Percent Model Affinity
1988-1989
Mill Creek and Moordener Kill
100
90
80
70
60
50
40
30
20
10
0
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
MONTH
0 Mill Creek
+ Moordener Kill

Biotic Index 1988-1989

Mill Creek and Moordener Kill

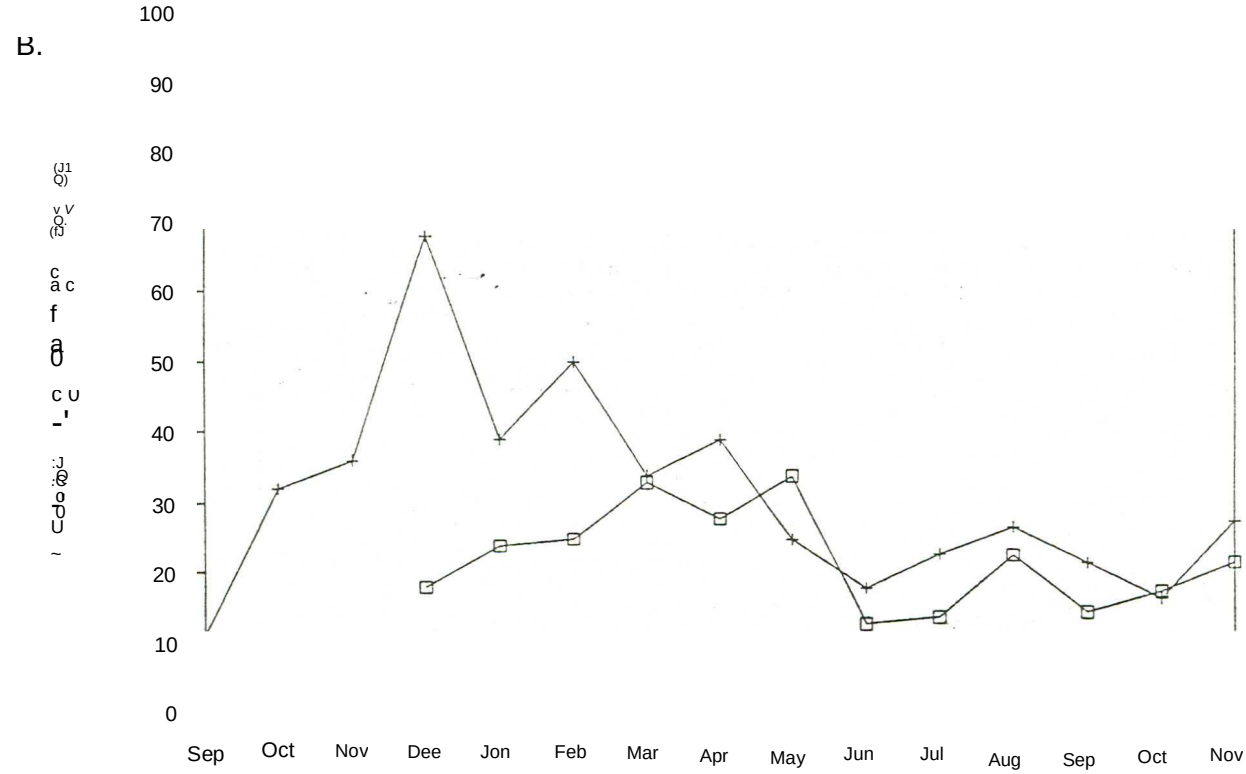
A.



% Contribution Dominant Species-1988-89

Mill Creek and Moordener Kill

B.

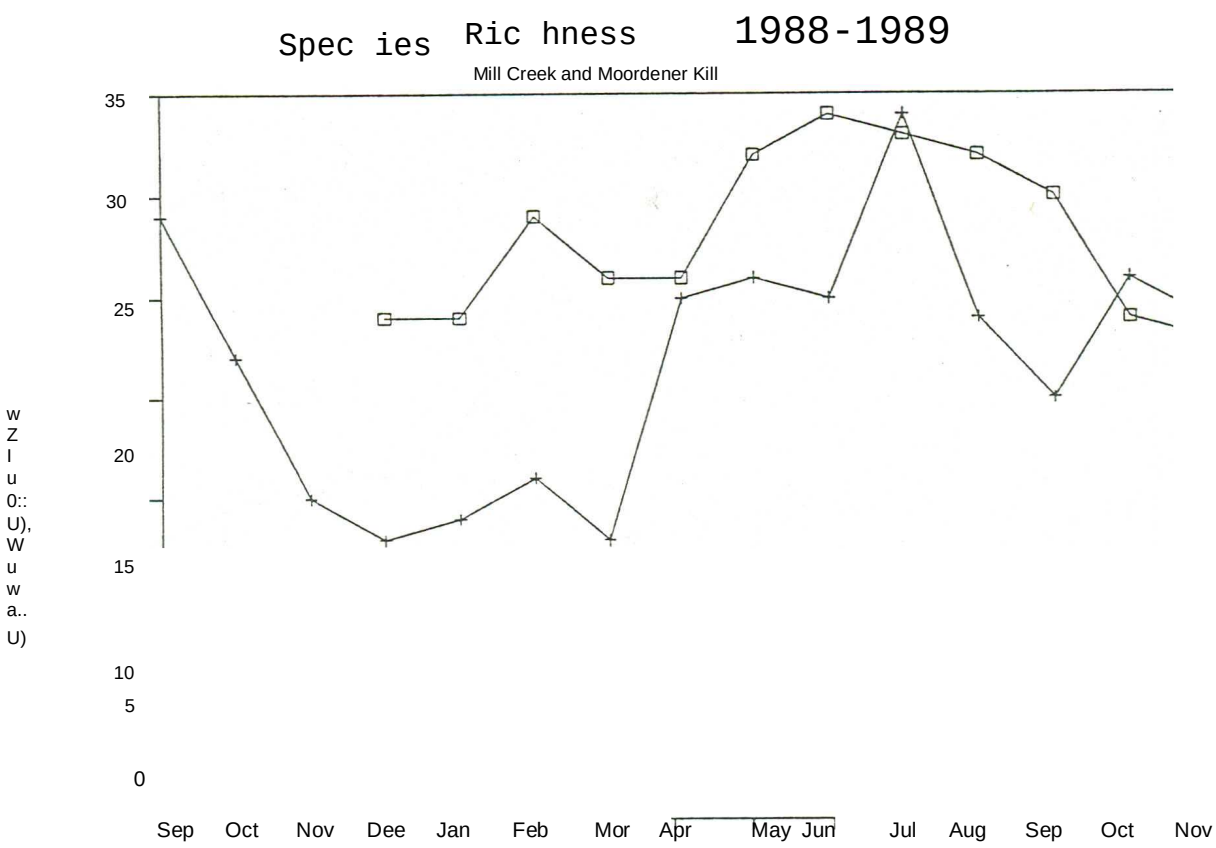


MONTH

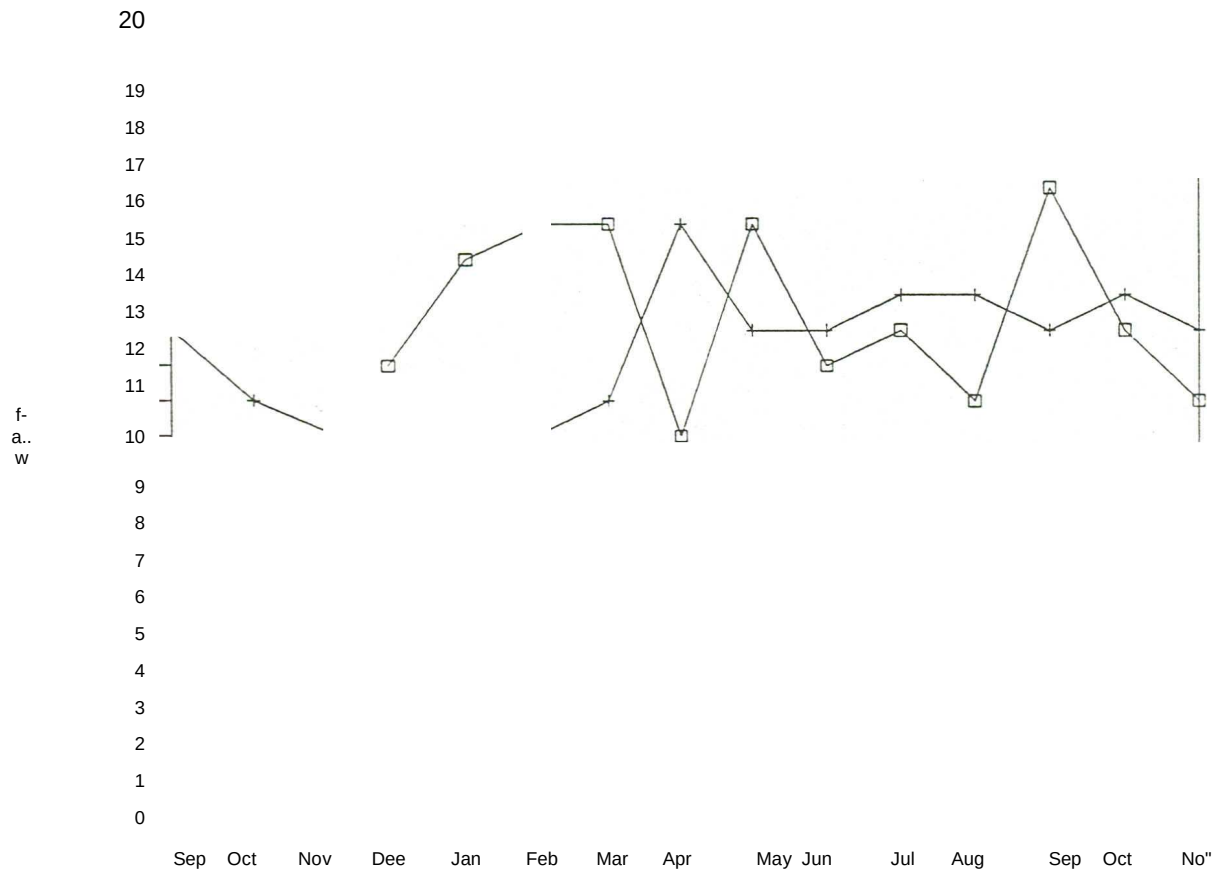
0 Mill Creek + Moordener Kill

~igure 4.

A.


Species Richness 1988-1989
Mill Creek and Moordener Kill
35
30
25
20
15
10
5
0
Sep Oct Nov Dee Jan Feb Mor Apr May Jun Jul Aug Sep Oct Nov

B.


EPT Value - 1988-1989
Mill Creek and Moordener Kill
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Sep Oct Nov Dee Jan Feb Mar Apr May Jun Jul Aug Sep Oct No"
MONTH
Mill Creek
Moordener Kill

4a. COMPONENT TESTED: Whether or not natural seasonal variability in macro invertebrate communities necessitates placing any seasonal restrictions on the application of the biological impairment criteria procedures.

4b. METHOD: Two streams were sampled monthly for one year using the traveling kick method. The 5 biological impairment criteria indices were calculated to determine seasonal changes. The indices were compared between the 2 streams for each month to determine natural variability in the indices.

4c. RESULTS: The raw data are presented in Tables 14-15, and graphs of the indices are shown in Figures 4-6. The following ranges were observed for the 5 indices in each stream: species richness 13-34 (MORD) and 24-34 (MILL); EPT value 8-14 (MORD) and 8-15 (MILL); Hilsenhoff biotic index 1.81-4.89 (MORD) and 2.15-5.43 (MILL); species dominance 11-68 (MORD) and 13-34 (MILL); percent model affinity 52-89 (MORD) and 61-86 (MILL). These wide ranges represent variability in sampling and subsampling as well as natural community changes. Only percent model aff ini ty showed seasonal consistency between the two streams.

4d. CONCLUSIONS: It was not demonstrated that the biological impairment criteria procedures should not be used during certain times of the year. The seasonal changes demonstrated that any upstream/downstream comparison should be conducted within as short a time period as possible. Comparison of index values from one month to another may not be valid.

3a. COMPONENT TESTED: Whether or not the proposed habitat criteria are adequate to ensure adequate comparability between upstream and downstream sites.

3b. METHOD: 9 pairs of sites were selected which had no known water qqality differences, but had substantial differences in at least one habitat parameter. Values were calculated for the 5 biological impairment criteria indices from the kick sample taken at each site and compared for significant differences.

3c. RESULTS: The raw data is presented below. sites which would have indicated impairment (MILL, NINE, and SABL) exceeded at least one habitat criterion, and these sites would have been excluded following proposed procedures.

Sam2le	Date	CUR	CAN	MPS	EMB	SPP	EPT	HBI	DOM	PMA
HONY-9	24 May 89	125	50	-5.95	-40	25	6	5.84	21	52
HONY-10	24 May 89	56	50	1. 85	20	32	5	6.35	14	51
MILL-1	15 May 89	77	50	-2.55	-50	32	.14	3.52	34	88
MILL-1B	15 May 89	59	50	1. 50	10	29	8	4.56	26	69
MORD-1	15 May 89	143	50	-3.40	50	26	11	2.64	25	89
MORD-1B	15 May 89	100	50	-2.00	10	22	8	2.78	25	74
STON-1A	28 Nov 89	167	0	-4.90	60	30	11	4.73	24	58
STON-2A	28 Nov 89	100	10	-3.90	40	28	9	5.66	21	51
LEY-1	20 Jun 89	111	0	-4.75	30	7	0	7.78	84	24
LEY-2	20 Jun 89	20	0	-3.70	10	14	0	9.06	67	32
NINE-1	20 Jun 89	125	60	-5.40	30	21	2	6.75	27	48
NINE-2	20 Jun 89	80	0	+3.50	10	10	0	7.78	45	27
NANG-3	25 Jul 89	125	50	-3.75	30	25	14	3.99	14	67
NANG-3A	25 Jul 89	71	0	-2.2Q	10	24	11	5.09	20	82
SABL-2	27 Jul 89	27100	0	-3.40	-60	38	15	3.63	14	77
SABL-3	Jul 89	100	10	1. 00	10	27	12	3.51	24	71
BATV-1	23 Jun 89	91 23	10	-4.60	50	28	9	4.12	16	57
BATV-4	Jun 89 -	111	10	-2.85	05	31	12	4.40	15	78

CUR: Current speed in em/sec. CAN: % canopy
MPS: Median particle size. EMB: % ernbeddedness Species
SPP: richness. EPT: EPT value
HBI: Hilsenhoff Biotic Index. DOM: Species dominance
PMA: Percent model affinity

3d. CONCLUSION: The proposed criteria are adequate for ensuring comparability between upstream and downstream sites.

2a. COMPONENT TESTED: Whether or not the variability between replicates of kick samples is within acceptable limits.

2b. METHOD: At 16 sites, 3 replicate kick samples were collected. Percent similarity between the 3 samples was calculated for each site. Samples with less than 50% similarity were re-subsampled.

2c. RESULTS: The raw data is presented below. Secondary sample sorting was necessary for 4 samples (STEO-4, SKAN-2, COEY-4, and STON-1A) which had original similarity values less than 50. 92% of the replicates exceeded the minimum similarity criterion of 50% with the other replicates. Mean similarity between all replicates was 62%.

station	Date	Percent Similarity between Replicate Samples		
		A/B	A/C	B/C
STEO-1	9 Jun 1988	55	54	58
STEO-4	9 Jun 1988	50	65	57
COEY-4	2 Sep 1988	62	64	57
COEY-6	2 Sep 1988	59	67	59
DELA-O	14 Jul 1988	60	52	53
DELA-1	14 Jul 1988	53	51	54
POEN-1	15 Sep 1988	56	58	67
POEN-2	15 Sep 1988	72	58	77
TONA-2	30 Jun 1988	70	71	75
TONA-3	30 Jun 1988	74	65	59
SKAN-1	21 Jul 1988	57	58	56
SKAN-3	21 Jul 1988	63	73	70
SKAN-1	8 Sep 1988	78	74	75
SKAN-2	8 Sep 1988	76,	52	60
STON-1A	28 Nov 1989	51	56	64
STON-2A	28 Nov 1989	56	57	61

% Sim. Percent similarity value

2d. CONCLUSION: Variability among replicates was within acceptable levels. The minimum similarity criterion of 50% is a reasonable requirement. Secondary sample sorting is an acceptable method of achieving the minimum similarity.

Trichoptera, 10% Coleoptera, 20% Chironomidae, 5% Oligochaeta, and 10% Other. The criterion for this parameter is -20; a decrease of 20 or more exceeds the allowable amount of change.

C. OUTLINE OF PROCEDURES FOR APPLICATION OF BIOLOGICAL IMPAIRMENT CRITERIA

1. Determine appropriate sampling method bY'Illeasuring habitat parameters at available upstream and downstream sites. The sampling method is given in Appendix I.

rrocedure,for determinin~

2. Select an upstream site and a downstream site that meet the habitat criteria for site comparability (Appendix I). The procedure for site selection is also contained in Appendix I.

3. Conduct sampling at the upstream and downstream site using the For klCk samr11nw, four

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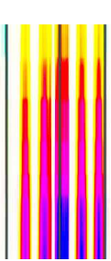
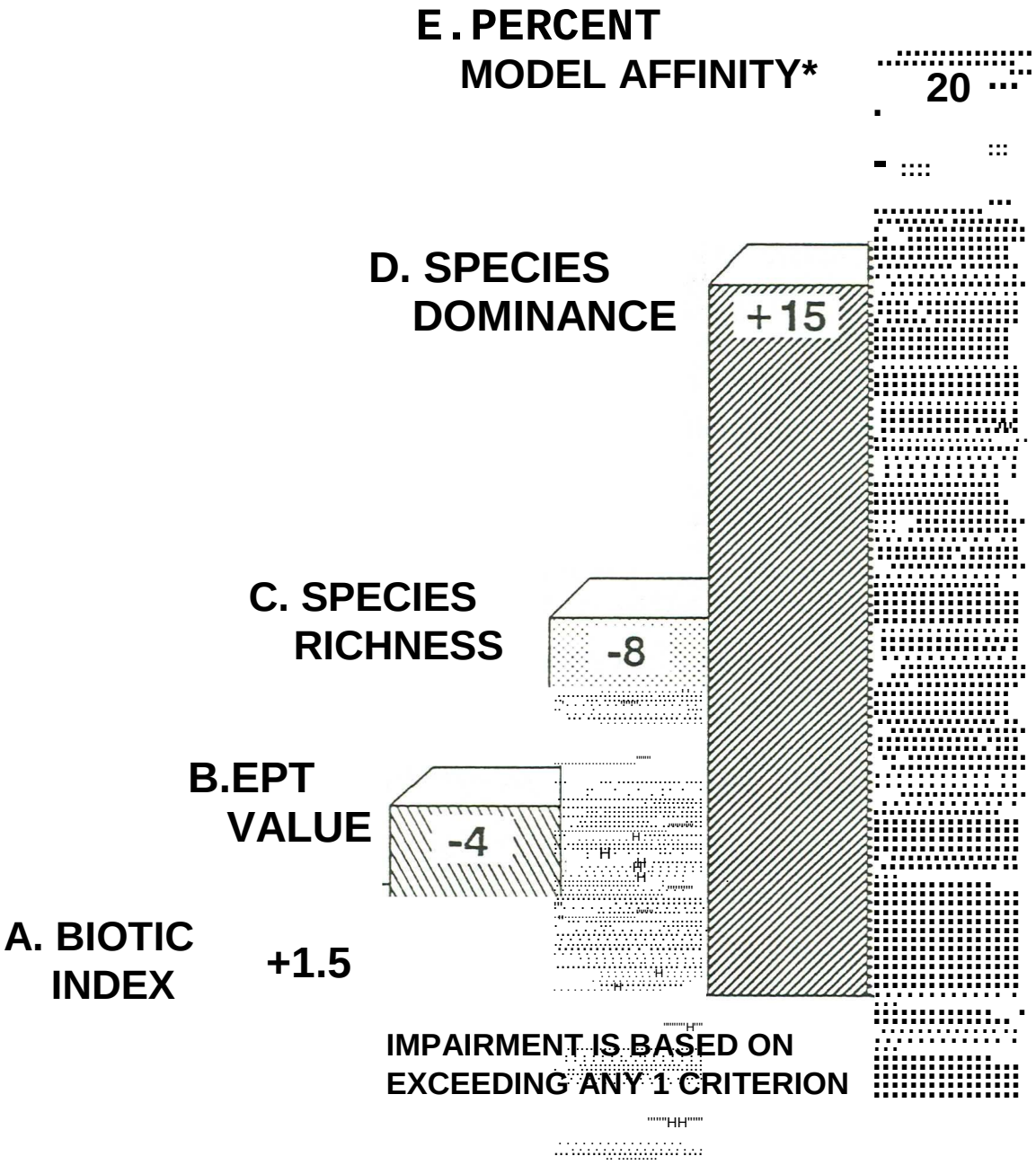


FIGURE 1. BIOLOGICAL IMPAIRMENT CRITERIA FOR FLOWING WATERS IN NEW YORK STATE.



*PERCENT MODEL AFFINITY IS NOT USED WITH MULTIPLATE SAMPLES

I. SUMMARY

A. criteria are established for measuring significant biological impairment in flowing waters of New York State. The criteria are based on sampling benthic macro invertebrate communities and are site-specj,fic, measuring change from conditions upstream of a given d~scharge.

B. The sampl~ng methods to be used ~re the traveling kick method for. stream segments with wadeable riffles, and the multiple-plate artificial substrate sampler for stream segments without wadeable rif~les. Both methods are standardized and authorized by the U.S. EPA. Replication in sampling is necessary to insure reliability of data.

C. The parameters on which the criteria are based, with one exception, are taken from EPA bioassessment methods which are presently being used by the New York State Stream Biomonitoring Uni t. One new parameter is used, percent model aff ini ty ; a manuscript describing this parameter has recently been submitted for scientific publication.

D. The criteria were drawn from data sets collected from flowing waters in New York State over a 17-year period (1972-1989). Preliminary criteria were tested over a 2-year period and modified as necessary. sites designated as having signifjcant biological impairment were corroborated with available water column chemical data to confirm possible impairment.