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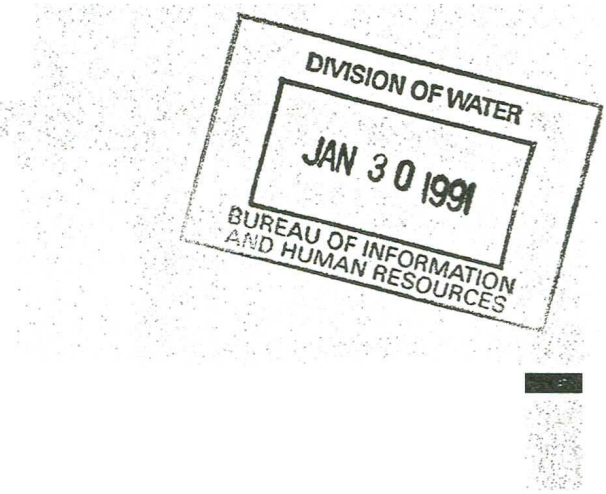

Division of Water

Biological Stream Assessment

Eighteenmile Cre:ek

1990 Survey

New York State/Department of Environmental Conservation

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BIOLOGICAL STREAM ASSESSMENT

Eighteenmile Creek Niagara
County, New York

Survey date: July 25, 1990
Report date: December 17, 1990

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Stream Biomonitoring unit Bureau of Monitoring
and Assessment Division of Water NYS
Department of Environmental Conservation
Albany, New York

stream: Eighteenmile Creek, Niagara County, New York

Reach: Lockport to Newfane

Backqround:

Biological sampling was performed by the stream Biomonitoring Unit on Eighteenmile Creek on July 25, 1990. The purpose of this survey was to collect data to determine if biological impairment occurs in the reach from Lockport to the mouth. Previous studies have indicated high levels of contaminants downstream of Lockport; the present survey was a preliminary "rapid assessment" effort to determine the presence of any biological impact in the stream. In the present macro invertebrate survey, traveling kick samples were taken in riffle areas at each site, as described in Appendix I. The contents of each sample were field-inspected to determine major groups of organisms present, and then preserved in alcohol for laboratory inspection of a 100-specimen subsample. Water quality assessments were based on resident macro invertebrates (aquatic insects, worms, mollusks, crustaceans, etc.). Community parameters used in the determination of water quality included species richness, biotic index, EPT value, percent model affinity, and field assessment (see Appendices II and III). Table 1 provides a listing of sampling sites, and Table 2 provides a listing of all macroinvertebrate species collected in the present survey.

Results and Conclusions:

1. Significant impairment of the invertebrate community was indicated at the Corwin site, compared to the upstream control site on the East Branch. The impairment was judged to be caused more by inorganic (toxic) factors than organic (sewage) factors. Elevated levels of PCBs, dioxins, and many metals were found in tissues of resident invertebrates collected at this site.

2. The macro invertebrate community at Newfane exhibited slight improvements compared to corwin, but was similarly classified as moderately impacted.

3. A control site on the East Branch downstream of Lockport was assessed as slightly impacted, but this assessment probably reflected habitat influence rather that water quality problems.

Discussion of results:

The site sampled on the East Branch of Eighteenmile Creek downstream of Lockport was chosen as a reference or control *for* suspected downstream impact. Water quality parameters fell within the slightly impacted category, but this assessment probably reflects habitat impact rather that water quality problems. The stream at this site was slow-moving and filled with macrophytes, compared to the true riffle habitats at the downstream sites, and this could account *for* parameter values being less-than-maximum. There is no indication of water quality impairment at this site.

Significant impairment of the invertebrate community was indicated at the Corwin site, compared to the upstream control site on the East Branch (Figure 2). Although these sites shared three of the five dominant species, species richness at the Corwin site had decreased 50% from the East Branch, the species lost being less numerous intolerant organisms such as mayflies, dobsonflies, and water pennies. Impairment was probably caused by both organic (sewage) wastes and inorganic (toxic) wastes. The presence of toxics was confirmed by bioaccumulation results showing elevated levels of PCBs, dioxins, and metals (chromium, copper, lead, and zinc) in invertebrate tissues (Table 3). This site was previously sampled in May and August of 1989 by the Stream Biomonitoring Unit, and the community was similarly assessed as moderately impacted.

Table 3. Contaminants exceeding existing guideline levels in macroinvertebrate tissues, Eighteenmile Creek. Since the sample collected *for* tissue analysis included caddisflies and crayfish, only metals are listed *for* which guideline levels were exceeded *for* both caddisflies and crayfish. Levels for metals and PCBs given in ppm, dry weight, levels *for* dioxin given in ppt, dry weight. See Tables 4-6 *for* explanation of guideline levels.

Contaminant	Caddisflv Guideline level	CraYfish Guideline level	Sample level
Chromim	20	7	23
Copper	40	200	248
Lead	20	20	23
Zinc	250	200	257
PCB (total)	1.0	1.0	2.5
2,3,7,8-TCDD (Dioxin)	5.0	5.0	6.6

Early morning dissolved oxygen measurements at the Corwin site were 5.5 mg/l, compared to 7.5 mg/l upstream on the East Branch and 7.9 mg/l downstream at Newfane. Although this shows an oxygen deficit, it is not low enough to account for the impairment reflected in all parameters. The Hilsenhoff Biotic Index (HBI), widely regarded as the best direct indicator *of* dissolved oxygen problems, showed only a slight change at Corwin. Neither did the dominant species reflect the usual makeup *of* invertebrate faunas commonly found at organically impacted sites. Based on these indications, it appears that the impairment at the Corwin site is due more to toxic problems than organic (sewage problems).

The impairment measured at Corwin exceeded four *of* the five proposed biological impairment criteria for streams (Bode et al., 1990). Although replicated sampling as prescribed for the criteria was not conducted, it is projected that significant impairment would be upheld by replicate sampling, based on the exceedance of four criteria in a single sample upstream/downstream comparison. Exceedance of anyone of the five criteria constitutes biological impairment.

The macro invertebrate community at Newfane exhibited slight improvements compared to Corwin, but was still classified as moderately impacted. Improvements occurred in all *four* parameters, and intolerant mayflies increased, while tolerant sowbugs decreased. The increase in dissolved oxygen levels at this site to 7.9 mg/l compared to 5.5 mg/l at Corwin were probably due to aeration from the Newfane dam.

The present survey was very limited in scope, and should be considered a screening survey of biological impact in the stream. Since Rapid Assessment surveys such as this are based on kick sampling in riffles, one *of* the limiting factors is the number of suitable riffles. Few riffles suitable for kick sampling were found on Eighteenmile Creek. Unless more riffles are located on the stream, the possibilities *for* a more expanded survey of this type on Eighteenmile Creek are limited.

Literature cited

Bode, R.W., M.A. Novak, and L.E. Abele. 1990. Biological impairment criteria for flowing waters in New York state. NYS DEC Technical Memorandum, 110 pages.

Description of sites sampled:

On the date of sampling, July 25, 1990, Eighteenmile Creek in the reach sampled was 15-20 meters wide, 0.3-0.4 meters deep, and with current speeds of 59-100 em/see in riffles. Dissolved oxygen was 6.0-8.4 mg/l in mid-morning and 5.5-7.5 mg/l in early morning, conductivity was 450-525 ~mhos, and the temperature was 19.0-20.0 °C. Measurements for each site are found in the field data summary sheets.

station 1. This site was located on the East Branch downstream of Lockport at Route 104, approximately 1 mile upstream of the confluence with the West Branch. The site was chosen as an appropriate control or reference site for comparison with water quality downstream of the confluence with the West Branch. A kick sample was taken in a riffle 5 meters downstream of the Route 104 bridge. From the sample taken, all parameters of the resident macroinvertebrate community fell within the category of slightly impacted water quality; this assessment is judged to reflect the slow-moving stream conditions, rather than impact resulting from a discharge.

Species richness: 22 (good)
Biotic index: 5.99 (good)
EPT value: 7 (good)
Percent Model Affinity: 62% (good)
Dominant species:
Stenelmis crenata (facultative riffle beetle) 19% Stenacron interpunctatum (facultative mayfly) 17%
Gammarus sp. (facultative scud) 13%
Water Quality Assessment: slightly impacted

station 2. Sampling was conducted in a riffle upstream of the Jacques Road bridge in Corwin. Early morning dissolved oxygen readings at this site were 5.5 mg/l, compared to 7.5 mg/l at station 1. The bottom rubble at this site was covered with moss, and the associated fauna was dominated by scuds (side-swimming crustaceans), facultative organisms often associated with moss. Based on the four parameters, water quality was assessed as moderately impacted. Assessments of moderate impact were also indicated by kick samples taken at this site in May and August of 1989.

Species richness: 11 (fair)
Biotic index: 6.19 (good)
EPT value: 3 (fair)
Percent Model Affinity: 37% (fair)
Dominant species:
Gammarus sp. (facultative scud) 60%
Caecidotea sp. (tolerant sowbug). 10% Hydropsyche betteni (facultative caddisfly) 7%
Water Quality Assessment: moderately impacted

station 3. This site was located 50 meters downstream of the McKee Road bridge in Newfane. The substrate at- this site was very

similar to that found upstream at Corwin, with most rocks covered with moss and silt. Early morning dissolved oxygen levels had increased to 7.9 mgjl, probably due to aeration from the Newfane dam. Improvements were seen in all invertebrate community parameters at this site, but overall assessment was still in the category of moderate impact.

species richness: 15 (fair)
Biotic index: 5.94 (good)
EPT value: 4 (fair)
Percent Model Affinity: 54% (good)
Dominant species:
Gammarus sp. (facultative scud) 48%
Baetis flavistriqa (intolerant mayfly) 11%
Polvpedilum convictum (facultative midge) 7%
Water Quality Assessment: moderately impacted

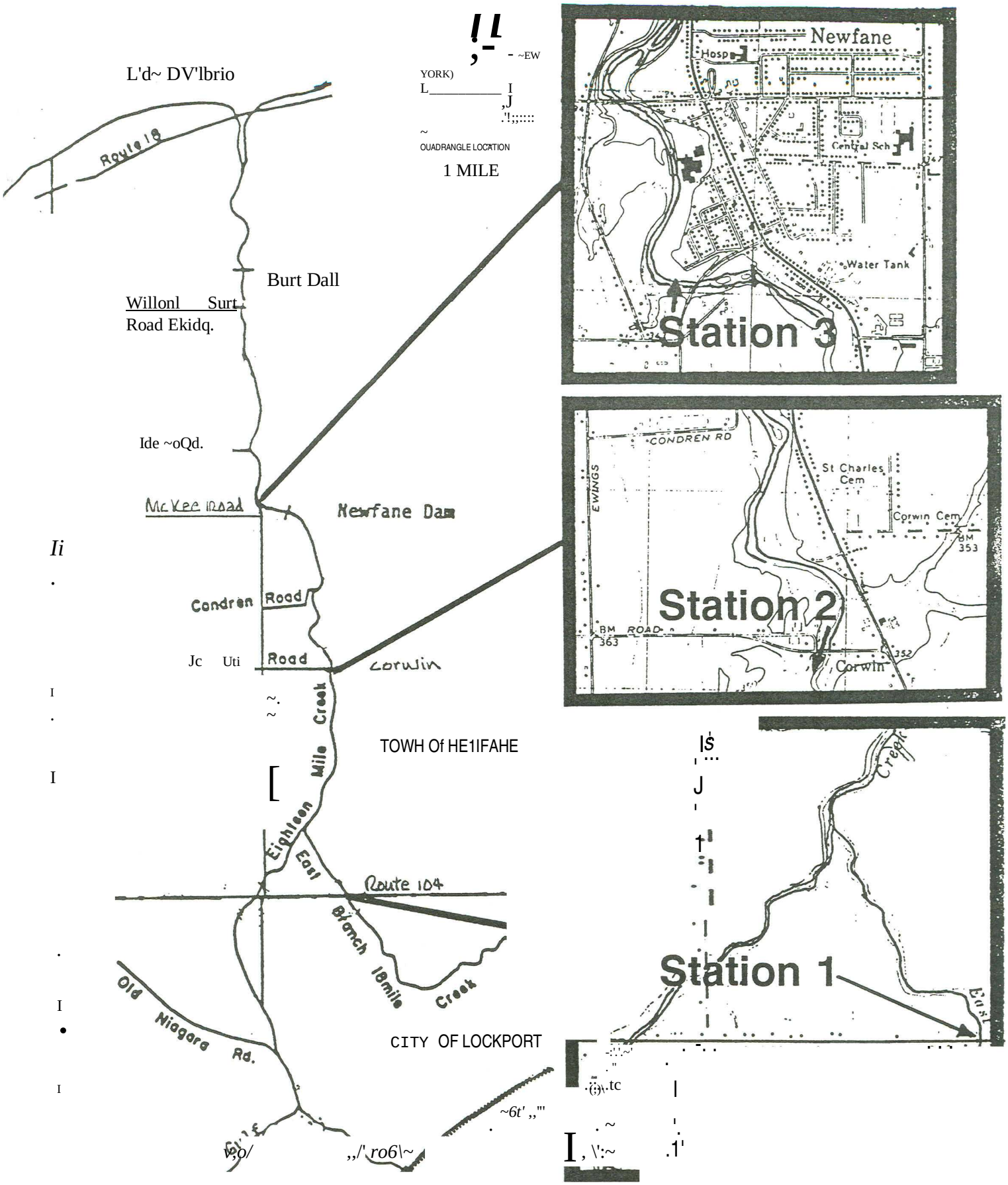

Figure 1: Eightee7i1e Creek sampling sites, 1990.

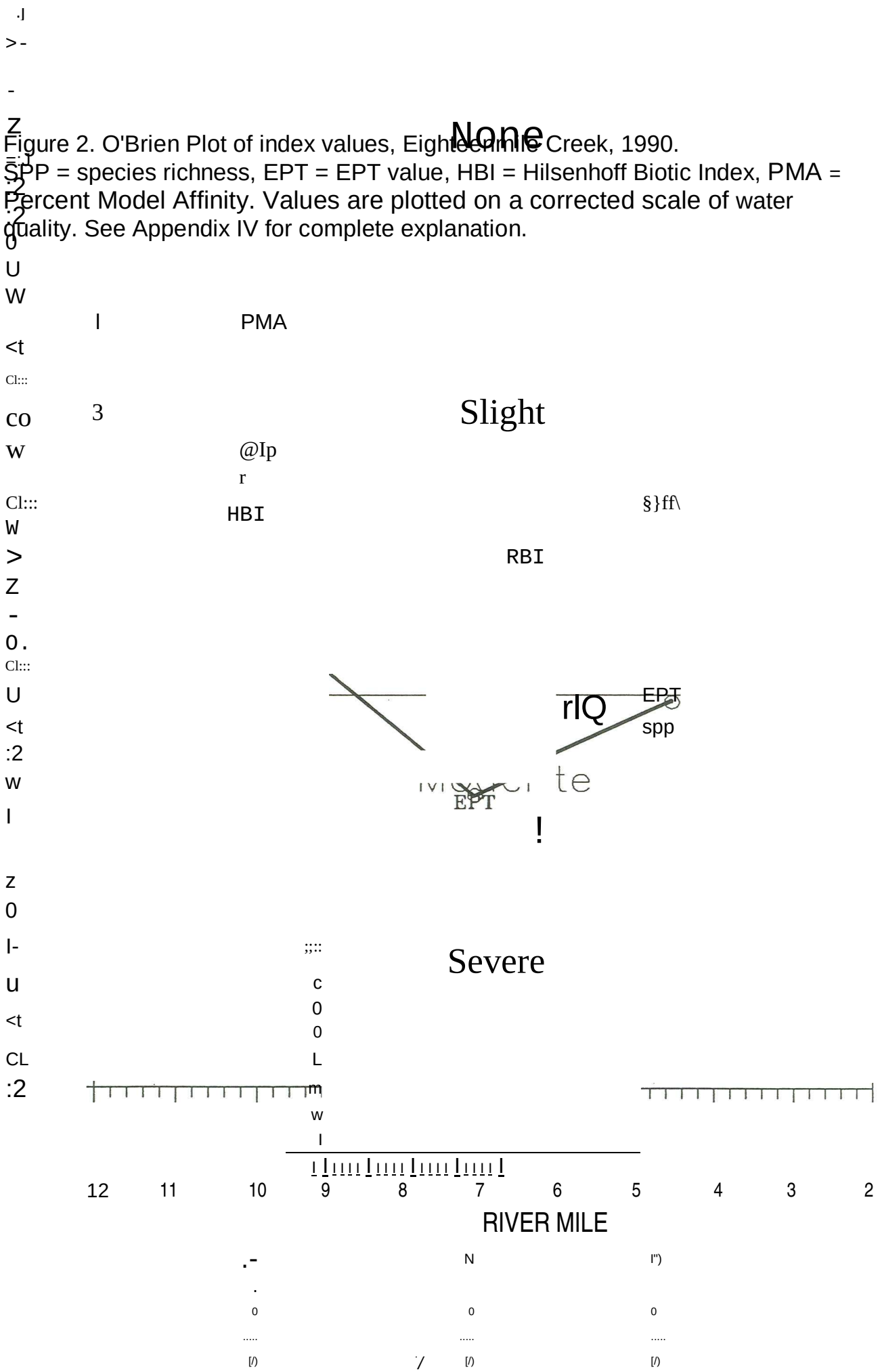

Figure 2. O'Brien Plot of index values, Eighteenmile Creek, 1990. SPP = species richness, EPT = EPT value, HBI = Hilsenhoff Biotic Index, PMA = Percent Model Affinity. Values are plotted on a corrected scale of water quality. See Appendix IV for complete explanation.

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TABLE 1. station Locations and Descriptions.

Eighteenmile Creek

COUNTY: Niagara
BASIN: 03

STATION NUMBER	LOCATION
01	below Lockport East Branch - 5 m below Rt. 104 bridge
02	Corwin Jacques Rd.
03	Newfane 50 m below McKee Rd. bridge

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TABLE 2. MACROINVERTEBRATE SPECIES COLLECTED IN
EIGHTEENMILE CREEK, NIAGARA COUNTY, NEW YORK
JULY 25, 1990

ANNELIDA OLiGOCHAET A
Tubificidae
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Naididae
Pristinella osborni
MOLLUSCA
GASTROPODA
Ancylidae
Ferrissia rivularis
Hydrobiidae
Bithynia tentaculata
PELECYPODA
Sphaeriidae
Sphaerium sp.
ARTHROPODA
CRUSTACEA
ISOPODA
Asellidae
Caecidotea sp.
AMPHIPODA
Gammaridae
Gammarus sp.
INSECTA
EPHEMEROPTERA
Baetidae
Baetis flavistriga
Baetis sp.
Heptageniidae
Stenacron interpunctatum
Caenidae
Caenis sp.
ODONATA
Calopterygidae
Undetermined Calopterygidae
COLEOPTERA
Psephenidae
Psephenus sp.
Elmidae
Stenelmis crenata
MEGALOPTERA
Corydalidae '
Nigronia serricornis

TRICHOPTERA
Hydropsychidae
Cheumatopsyche sp.
Hydropsyche betteni
Hydropsyche sparna
Hydroptilidae
Hydroptila spatulata?
DIPTERA
Simuliidae
Simulium vittatum
Simulium sp.
Empididae
Hemerodromia sp.
Chironomidae
T anypodinae,
Thienemannimyia gr. spp.
Orthocladiinae
Cricotopus bicinctus
Rheocricotopus robacki
Tvetenia vitracies
Chironominae
Chironomini
Polypedilum convictum
Polypedilum illinoense

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Table 4. PRIORITY POLLUTANTS IN MACROINVERTEBRATES: METALS

Concentrations considered provisionally to exceed background levels in tissues of selected macroinvertebrates. All concentrations in mcg/g (ppm) dry weight.

contaminant	Caddisflies	Crayfish
ALUMINUM	5000	400
AN1IMONY	75	20
ARSENIC	4	3
BARIUM	300	300
BERYLLIUM	2	.4
CADMIUM	10	2
CHROMIUM	20	7
COBALT	10	2
COPPER	40	200
IRON	7000	700
LEAD	20	20
MANGANESE	4000	1000
MERCURY	5	.2
MOLYBDENUM	30	10
NICKEL	10	3
SELENIUM	2	1
SILVER	15	4
STRONTIUM	75	1000
THALLIUM	40	20
TIN	75	20
TITANIUM	100	8
VANADIUM	10	2
ZINC	250	200

Most background levels were determined by frequency distributions of state-wide sampling, including 33 caddisfly results and 16 crayfish results. This sampling represented a wide range of water quality from non-impacted to severely impacted. Provisional background levels were set at the level of the mean plus 2.57 standard deviations from the mean. Resul ts reported as below detectable levels were entered as the detection limit, for purposes of the frequency distribution. Provisional levels were sometimes adjusted to reflect known problems. Background levels for metals which were not found above detectable levels were determined by using levels of detection and available data from the literature.

Table 5. PRIORITY POLLUTANTS IN MACROINVERTEBRATES: PCBs

Concentrations considered to exceed guidelines, based on correlations with PCB levels in fish.

FEDERAL HUMAN HEALTH STANDARD FOR FISH: 2 ppm, wet weight
DERIVED LEVEL FOR MACRO INVERTEBRATES: 0.2 ppm, wet weight
1 ppm dry weight

NYS WILDLIFE PROTECTION STANDARD FOR FISH: 0.1 ppm, wet weight 0.01
DERIVED LEVEL FOR MACROINVERTEBRATES: ppm, wet weight 0.05
ppm, wet weight

DERIVATION OF GUIDELINES

	Caddisflies	Fish
WORKING RATIO	1	9 (+ 6.5)

The working ratio of 1 to 9 (95% confidence level) for PCBs was derived by Novak (1987), based on correlations of PCB levels in macroinvertebrates and fish. This means that if macroinvertebrates are found to contain 1 ppm PCBs wet weight, fish samples from the same location and year are expected to contain 2.5 to 15.5 ppm PCBs in 95% of the cases. This is considered a working model that should be tested further with additional correlations of PCB data from fish and macroinvertebrates.

Novak, M.A. 1987. The correlation of macro invertebrate and fish PCB levels in New York State. NYS DEC Technical Memorandum, 10 pages.

Table 6. PRIORITY POLLUTANTS IN MACROINVERTEBRATES: DIOXIN

Eisler (1986) reported the recommendation of 10 ppt in fish muscle in New York state as a level considered acceptable for the protection of human health. Using the invertebrate/fish ratio of 1 to 9 developed for PCBs, the guideline developed for invertebrates would be 1 ppt wet weight, or 5 ppt dry weight.

NYS recommended maximum level for fish: 10 ppt wet weight
Derived maximum level for invertebrates: 1 ppt wet weight
5 ppt dry weight

Eisler, R. 1986. Dioxin hazards to fish, wildlife, and invertebrates: a synoptic review. U.s. Dept. of Interior, Fish and wildlife Service, Biological report 85 (1.8): 37 pp.

LABORATORY DATA SUMMARY

STREAM NAME Eighteenmile Creek DRAINAGE 03 Niagara
DATE SAMPLED 07/25/90 COUNTY
SAMPLING METHOD Traveling kick

STATION	01	02	03
LOCATION	below Lockport	Corwin	Newfane

DOMINANT S~ECIES\% CONTRIBUTION\TOLERANCE\COMMON NAME

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

1.	lstenelmis crenata 19 facultative beetle	Gammarus sp. 60 facultative scud	Gammarus sp. 48 facultative scud
2.	IStenacron interpun 17 facultative mayfly	Caecidotea sp. 10 tolerant sowbug	Baetis flavistr 11 intolerant mayfly
3.	IGammarus sp. 13 facultative scud	Hydropsyche betteni 7 facultative caddis fly	Polypedilum convict 7 facultative midge
4.	ISphaerium sp. 8 facultative clam	Stenelmis crenata 6 facultative beetle	Stenacron interpun 7 facultative mayfly
5.	ICaecidotea sp. 8 tolerant sowbug	Cheumatopsy sp. 5 facultative caddisfly	Hydropsyche sparna 6 facultative caddisfly

% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)			
Chironomidae (midges)	8 (3)	5 (2)	15 (5)
Trichoptera (caddisflies)	28 (3)	12 (2)	7 (2)
Ephemeroptera (mayflies)	0 (3)	4 (1)	18 (2)
Plecoptera (stoneflies)	24 (4)	0 (0)	0 (0)
Coleoptera (beetles)	2 (0)	6 (1)	4 (1)
Oligochaeta (worms) Others (**)	34 (2)	71 (3)	0 (0)
TOTAL	100 (22)	100 (11)	56 (5) - 100 (15)
SPECIES RICHNESS	22	11	15
HBI INDEX	5.99	6.19	5.94
EPT VALUE	7	3	4
PMA VALUE	62 (8)	37 (2)	?4
FIELD ASSESSMENT	non-impacted	slight impacted	slight impacted
OVERALL ASSESSMENT	slightly impacted	moderately impacted	moderately impacted

** Megaloptera,sowbugs,crayfish,scuds,blackflies,clams

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FIELD DATA SUMMARY SHEET

STREAM NAME: Eighteenmile Creek
REACH: below Lockport to Newfane DATE SAMPLED: 07-25-90
FIELD PERSONNEL INVOLVED: Abele, Bode, Kurtenbach (EPA Reg.2)

STATION	01 9:10	02	03
ARRIVAL TIME AT STATION	below	8:10	7:40
LOCATION	Lockport	Corwin	Newfane
PHySICAL CHARACTERISTICS width (meters)	15	20 0.3	20
Depth (meters)	0.4	100	0.3
Current speed (cm per see)	59		71
Substrate (%)			
rock (> 10 in.)	0	10	20
rubble (2.5-10 in.) gravel	40	50	50
(0.08-2.5 in.) sand (0.06-2.0	20	10	20
mm)	40	15	10
silt (0.004-0.06 mm) clay	0	15	0
(less than 0.004 mm)	0	0	0
Embeddedness (%)		40	30
CHEMICAL MEASUREMENTS			
Temperature (oC)	19.0	20.0	20.0
Conductivity (umhos)	450	490	525
Dissolved Oxygen (mg pHper I)	7.6	6.0	8.4
Other			
BIOLOGICAL ATTRIBUTES			
Canopy (%)		70	20
Aquatic Vegetation algae -			
water column algae -			
filamentous algae -			
diatoms macrophytes	present	present	present
Occurrence of Macroinvertebrates			
Chironomidae (midges) Trichoptera	X	X	X
(caddisflies) Ephemeroptera	X	X	X
(mayflies) Plecoptera (stoneflies)	X	X	X
Coleoptera (beetles) Oligochaeta			
(worms)	X		X
Other (Megaloptera,blackflies			
clams, sowbugs,crayfish, scuds)	X	X	X
ESTIMATED BIOMASS	low	medium	
FIELD ESTIMATE OF WATER QUALITY	non	sIt	sIt
FIELD COMMENTS			

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WADSWORTH CENT~~ fOR LA~ORAIORIES AND RES~ARCH

PAG~ 1 P~SULTS OF EXAMI~ATIaN flNA~ REPORT

-SAMPLE ID: 903457 SAMPLE RECEIygO:90/10/05/ CHARGE:: 10.00
PROGRAM: 570:DEC ROUTIW~ TOXICS SURVEILLANCE'
SOURCE ID: n.RAI~AGE BASIN: GAZETTEER COD~:31~4
POLI!IC',L STT6Dlyr,sInr.;:rWi'lF"MJl:; r::OUNT):: N I AGAR A
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LOCAfrOu; COR~IN EIGHTEEN 41 CREEK STA-~
DES~RI?TlnN:BTO Ace *NO* 90-40, JACQU~S RO BRIDGE
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TEG! PATTERrJ: XPESTPS:DRGANOCHLORINE PESTICIDES' PCB'S - SOIL/SEDIMENT
SAMPLfTYPEf 742:A1UATIC INStCTS
TIME Of ~~~PLTNG: 90/07/25 : DATE PRINTEO:YO/l1/02

AN.\LYSIS: XPpSTPS PESTICIDES & PCB'S - SOIL/SEDI~ENT (D~S 312-2)
DAT~ PRINTED: 90/11/02 fINAL REPORT

----------PARA~ETER----------	RESULT-------
IiCH,A.LPH.a	< 0.2 I-iCG/G
HCH,B~TA	< 0.2 /<\CG/G
HCH,GAMMA (LTN~AN~)	< 0.2 fo\CG/G
HCH,D£LT~	< 0.2 HCG/G
HEPrACJ.tLOR	< 0.2 MCG/G
ALORI~	< 0.08 /f,CGIG
HgpT~C~LnR £POXIP~	< 0.2 MCG/G
ENDOSULf~~~ 1	< 0.2 MCG/G
4,4'-DD£	0.2 MCG/G lPLJ <
DIEJ.lDRI N	0.08 MCG/G
ENDRIN	< 0.08 HCG/G
4,4'-DOD	< 0.2 "'CG/G
ENnOSULf'AN 1r	< 0.2 MCG/G
Et-oDR 1:'1 f\LDE;IIY Dr	< 0.08 MCG/G <
eNDOSULfAN SULFAT~	0.2 MCG/G <
4,4'-DDT	0.2 ~CG/G
METHOX yCHL(!R	< 2.0 "'CG/G <
TOXAPHF.:~F.	4.0 MCG/G < tI. 4
CHLOP DA.	~~CG/G
MIRC;X	< O.}. r-:CG/G
PCB, ARnCl.OR 1221	< 0.2 ,",CG/G <
PCB,AROCLOP 1016/1242	0.2 MCG/G < 0.2
PCB, ARQCTJOo. 1248	/ltCG/G
PCB,ARQCt.OP '.254	2.5 MCG/G
PCB, ARQCt..lOt;: 126(1	< 0.2 MCG/G

1C END Of REPORT *

COPIES S~~T TO: CO(2t, ROC), LPH!C), FED(>, INFO-PC >, INfO-L( )

rRAN~ ESTA8ROOKS
TOXIC ~URVf.ILLA~CE
N.Y.S.DEPT.Of ENVIRO~HENT~L corJSERVATION SU8MITT~U ~Y:R BODE
50 wnL~ RD. ROOM 32H
ALB~~Y,~.1. 12233

~'O539 NEW YORK STATE DEPARTM~NT Or.~,HEAI"TH~_"

~~'~""~~""WiD5'«OR'tH""cetfT'ER~(jR '"LA'BO'R),'fCR I E:S'" AN D" RESEARCH

PAGE 1 RESUI"T5 OF EXAMINATION rINAL REPORT

) iSAMPL~ ID: 9.03458 . .~.rSAMPLE RECEIVED: 90/10/05/ ."CHARGE : 50.00
.PROGRAM: 710: INTENSI VE TOXI~~_~UWf~_~§
SOURCE ID: DRAINAG~ 8ASIH: GAZETTEER CODE~3f54
POLItICAL SU601vISln~:N8wfAN~ COUNT~:NiACARA
LATllnDE;: LONGITUDE: Z DIRECTioN:
LOCATION: NEWp-ANE, EIGHTEEN t.ffLE '"CREE'i<-S-TA;';j--
I DESCRI?TION:BID Ace NO 90-41, AT MCKEE RD BRIDGE
REPORTING L.b:'B: TOX:LAB FOR ORGANIC ANALYTICAL CHEMISTRr
, 'T'EST PATTER~j: f)IOX-PPTl :nloxTN:C&joir-DI8E~zdrliRA~ls'"
SAMPLE TYPE: 742:A~UATIC lustCTS
TIME Of ~AMPL!NG: 90/07/25 :
DATE PRINTgD:90/12/07

ANALYSIS: DIDX-??Tl DIOXINS &/OR DI8ENzorURANS - IN SOLIDS (GC/MS)
DATE PRINTED: 90112/07 FINAL REPORT

~-~--PARAMETER-------	R~SULT------
2 3,7,8-TETRACHLORODIBE~ZODI0XIN	&.6 PG/G
W,3,7, 8-PEl':TACHLORODIBENZOOIOXII~	-'<3.-i-PG/G""
1,2,3,6,7,9-H~XACHLORODI8£NZODIOXIN	24. PG/G
--~,31_11~~~-H~XACHLOROOIBENZODIOXI~	< 4.6 PGIG
1,2,3,4,7, e-H~XACHLORO(\IB8Nz(fD"fOXI!'J	< u5~"5-'PG/G
1,2,3,4,6,7,9-~EPTACHLOROOIBENZODIOXIN	43. PG/G
OCTACHLORorIBENZODIOXIN	2&0.PG/G
2,3,7, S-TETRACHLOROO18ENZOFURAN	'-"---110.-'-PG/G'---'
1,2,3,7,8-PEfTACHLORODIBENZOFURAN	11. PG/G
2,3,4,7,8-PENTACHLnRODI8ENZOFURAN	is. PG/G
r;2~-j'- .i ,-i , R - H CXAC HL01fo fit 8'B N ZO F uR'A'rf-'	'"-~9~ PG-' G
1,2,3,6,7,S-HLXACHLOR09IBENZOfURAN	< 3.0 PG/G
2,3,4,6,7,8-H~XACHLOROOIBe~ZOFURhN	< 3.5 PG/G
1,2,3,7,8,9-HEXACHI.,OROnIBa::rrZerrliRAlJ	(3. 3 p-e;7G'-'
1,2,3,4,6,7,B-HEPTACHLORODIBENZOfURAN	45~ PG/G
OCTACHLORODIB~NzorURAN'	< 8.9 PG/G
-"TOTAL' TtTR~~.CHLciRODI8t'NZO~i)lOXIN!j	14'-;;-'"PG/G
TOTAL pE;!\IIACHLDRODIbENZOI"\10XIN~.	< 3.2 PG/G
TOTAL HEXACHLU~On16ENZODIaxINS	46. PG/G
-T(rTAL-Htpl'Acii1~'OR'ODI8E'NZcfr)fdXtN5	86~ -"PG'tG . -"'
TOTAL TETRACHLORODIBENZOFURANS	340. PG/G
TOTAL PENTACHLOROOIBENZCFURANS	95. PG/G
-T()TAL-HtfACru.;U!;(){jfBt'""ZOFURAi~5'-	130. PG/G
TOTAL HEPT'CHLOR0DI8~NZOFURANS	45. PG/G

**** END OF REPORT **'*

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FRANK F.ST~BROUKS
TOXIC SURVrILLANCE
N. Y-!..~. OEt'T . OF ENV I~ONMENT ArJ -- ~gNSERV A T ION
50 WOLF' rw. ROOM 328.
ALBANY, N. Y .12233

SU8MITTED BY:R BODE

Appendix I. BIOLOGICAL METHODS FOR KICK SAMPLING

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

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

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

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

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

Appendix II. MACROINVERTEBRATE COMMUNITY PARAMETERS

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

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

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

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

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

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

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

Appendix III. LEVELS OF WATER QUALITY IMPACT IN STREAMS.

The description of overall stream water quality based on biological parameters uses a four-tiered system of classification. Level of impact is assessed for each individual parameter, and then combined for all parameters to form a consensus determination.

Five parameters are used: species richness, EPT value, biotic index, percent model affinity, and field assessment. The consensus is bas,ed on the determination of the majority of the parameters; since parameters measure different aspects of the community, they cannot be expected to always form unanimous assessments. The ranges given for each parameter are based on 100-organism subsamples of macro invertebrate riffle kick samples, and also apply to most multiplate samples.

1. Non-impacted

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

2. Sliqhtlv impacted

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

3. Moderately impacted.

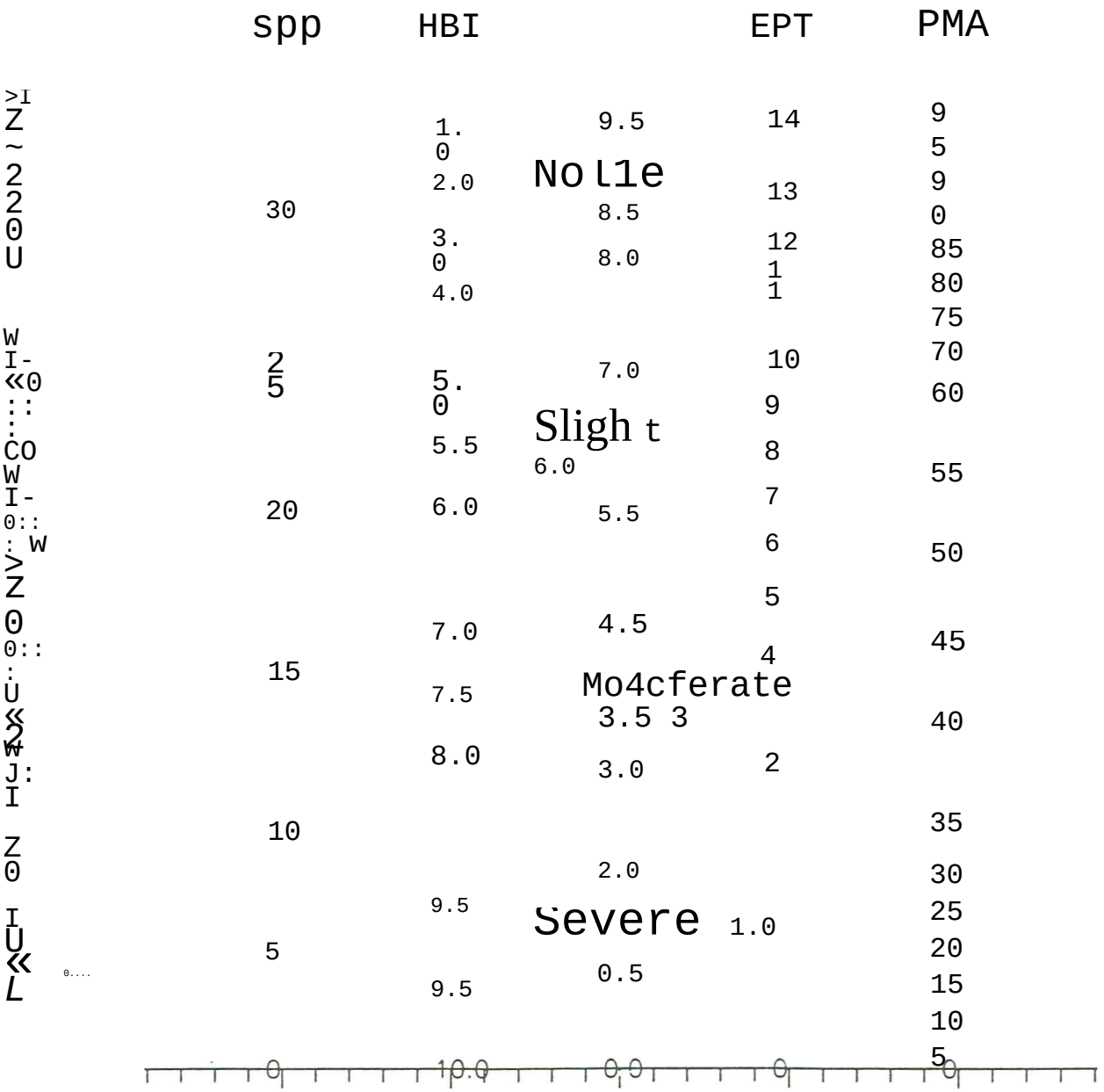
Indices reflect fair water quality. The macroinvertebrate community is altered to a large degree from the pristine state. Species richness usually is 11-18 species. Mayflies and stoneflies are rare or absent, and caddisflies are often restricted: the EPT value is 2-5. The percent model affinity value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

4. Severelv impacted

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

Appendix IV. THE "O'BRIEN PLOT" OF INDEX VALUES

The O'Brien Plot of index values, developed by Phil O'Brien, P.E., Division of Water, NYS DEC, is a method of plotting biological index values on a common scale of water quality impact. Values from the four indices defined in Appendix II are converted to a common 0-10 scale as shown in the figure below.

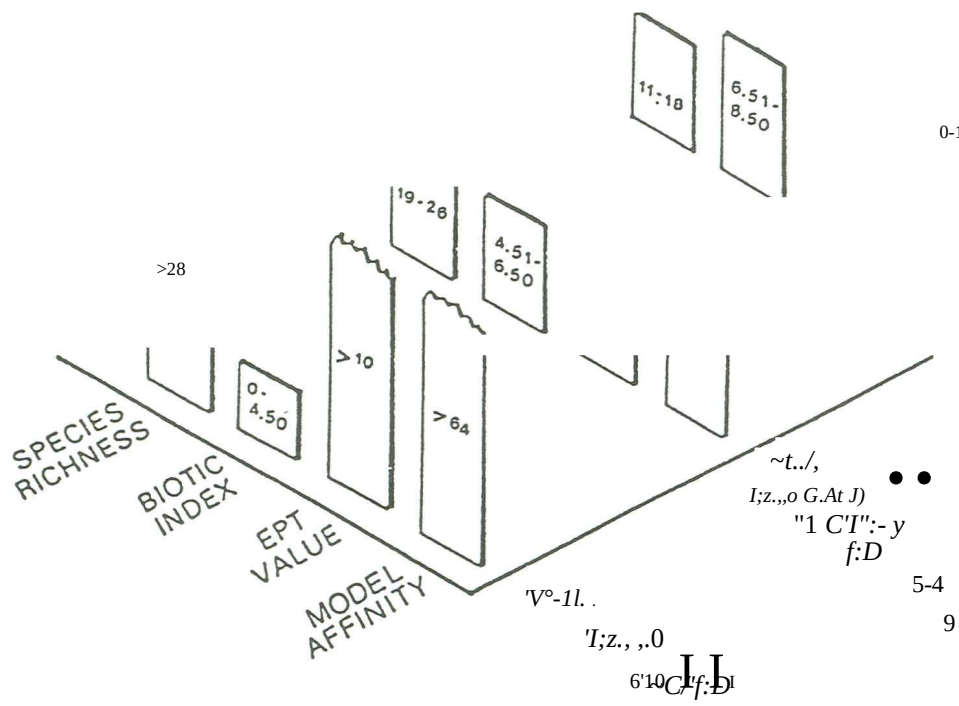


To plot survey data, each site is positioned on the x-axis according to river miles from the mouth, and the scaled values for the four indices are plotted on the common scale. The mean scale value of the four indices is represented by a circle; this value is used for graphing trends between sites, and represents the assessed impact for each site.

Appendix V.

Detection criteria used to determine level of water quality impact in trend monitoring.

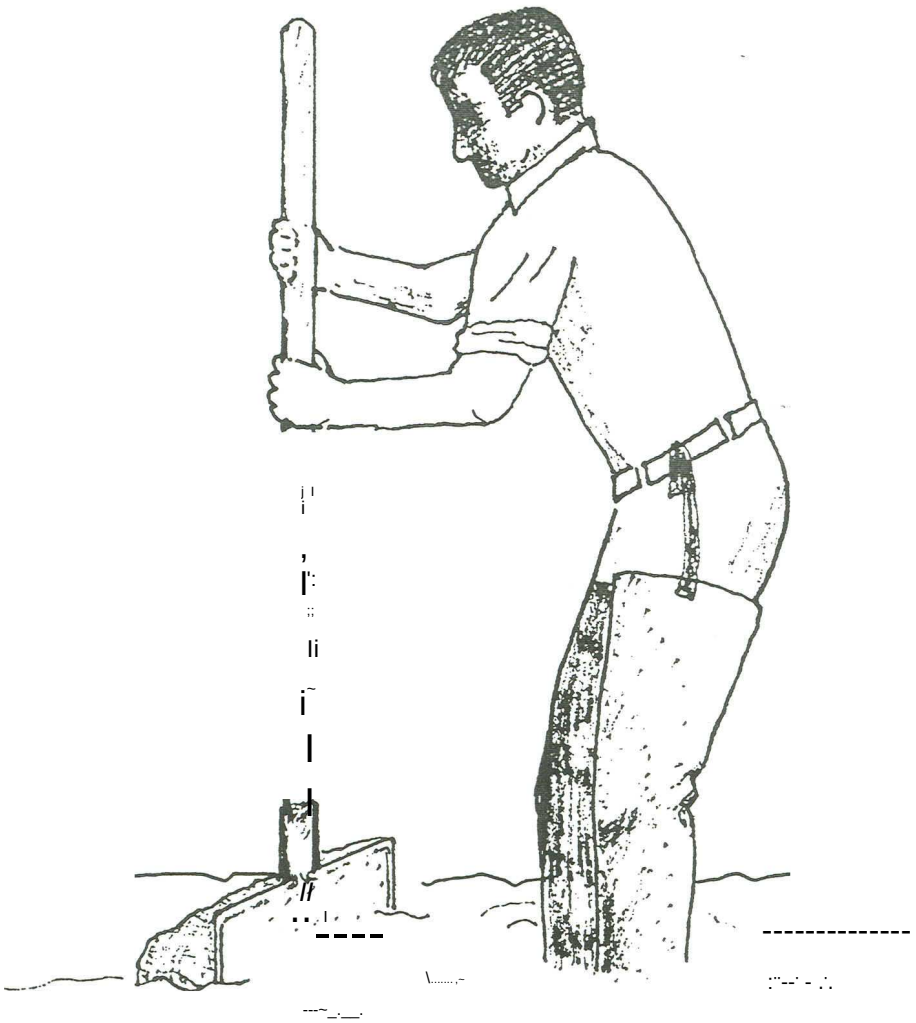
Based on lOO-specimen subsa~ples of
macroinver:ebrate kick samples.



Ranges represent expected values for most flowing waters in New York State. Individual assessments of the four parameters are combined to form an overall assessment of impact.

Appendix VI.

THE TRAVELING KICK SAMPLE



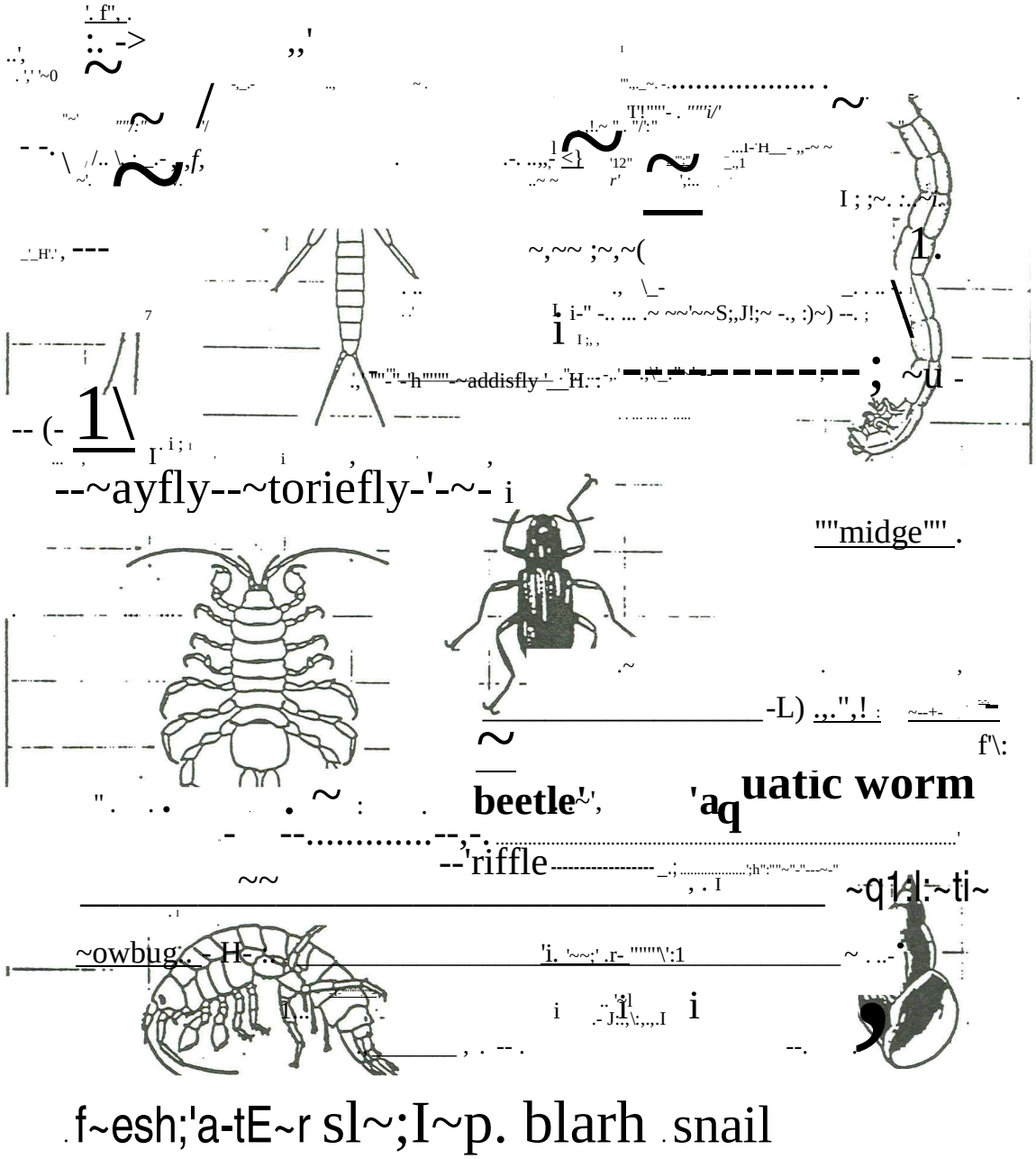
. LUR.Rt:.tJ T.

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

Appendix VII.

MACROINVERTEBRATES

commonly encountered in streams



Benthic macroinvertebrates are bottom-dwelling animals without backbones that are large enough to be visible without a microscope. The major groups of macroinvertebrates are aquatic insects, worms, crustaceans, and mollusks.