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CHEMICAL CONTAMINANTS IN SEDIMENTS OF NEW YORK TRIBUTARIES TO LAKE ONTARIO

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Concern for toxic contaminants entering Lake Ontario has prompted establishment of a bi-national project, the Lake Ontario Toxics Management Plan, to study the extent of the problem and make recommendations for the restoration of the affected resources. While point sources are recognized as a component of toxics loading, the great bulk of loading seems to originate from the tributaries to the Lake. Tributaries from the New York side considered potentially significant toxics sources are, ignoring the Niagara which is a shared waterway and treated elsewhere, Eighteenmile Creek, Genesee River, Oswego River, and Black River. Eighteenmile Creek, the Genesee and Oswego Rivers have also been designated by the International Joint Commission (IJC) as Areas of Concern (AOCs). The AOCs are or will be subjects of focused efforts to identify waterbody problems and devise a plan of remedial action. Chemically contaminated sediments are a major part of the perceived problem at all of the New York AOCs but little information is available on the scope of contamination, on comparisons between AOCs, and on interpretation of the significance of the contaminants.

The problem of contaminated sediments can be approached in three ways each having advantages and disadvantages. The simplest is to establish a criterion for bulk sediment contaminant concentrations against which measurements can be compared. The second approach assumes that chemicals in bioavailable sediments should not exceed a background concentration. The third approach depends on the outcome of toxicity tests. Criterion methods necessitates setting rational limits which if exceeded would result in increased risk of harm. So far such limits have not been available. Part of the difficulty is the physically heterogeneous nature of sediment samples. Different sediments may have, depending on particle size and organic content, differing affinities for contaminants. The U.S. Environmental Protection Agency (EPA) is currently pursuing the criterion approach and is attempting to use contaminant affinity characteristics to predict interstititial water concentrations of non-polar organics given a particular bulk contaminant concentration. The predicted interstitial water chemical concentrations could then be compared against existing water quality criteria. The chemistry of metal/sediment interactions is presently considered too poorly understood to allow predictions based on knowing bulk sediment concentrations (Zarba, 1988). The U.S. Army Corps of Engineers (USCOE) has used elutriate tests to characterize metal release and EPA is investigating <u>in situ</u> interstitial water samplers for assessing metals.

The background approach assumes a naturally dictated concentration that should not be exceeded. Certain Great Lakes sediments are relatively rich in metals such as copper and zinc. Concentrations of these naturally occurring substances are to be expected but not at artificially enriched levels. Synthetic contaminants, PCBs, and mirex as examples, ought not to be present at all. A modified background method was suggested by EPA (U.S. Region V, 1977). Great Lake harbors were surveyed, visually classified as nonpolluted, moderately polluted, and highly polluted, and sediment samples were taken. Sediment chemical concentrations were assessed and breakpoints were established. Thus, for example, zinc concentrations greater than 200 mg/kg are characteristic of polluted harbors and zinc concentrations less than 90 mg/kg are characteristic of non-polluted harbors. This method is very attractive in its ease of application. Table 1 shows that its values seem to make sense in at least one well studied Great Lakes tributary, the Buffalo River. The table shows the EPA guidelines as lower (boundary between non- and moderately polluted) and upper (boundary between moderately- and highly polluted) values and Buffalo River medians from the industrially affected portion and upstream in an urban/residential area.

TABLE 1

COMPARISON OF EPA SEDIMENT GUIDELINES
WITH HEAVILY AND MODERATELY POLLUTED BUFFALO RIVER SEGMENTS
(all values in mg/kg)

substance	EPA guidelines		Buffalo River medians	
	lower	upper	urban/residential n=16	industrial n=162
iron	17,000	25,000	1,110	31,700
nickel	20	50	17.9	38.5
manganese	300	500	179	623
cadmium	NA	6	ND	1.88
chromium	25	75	5.21	22.0
copper	25	50	15.6	57.3
lead	40	60	30.4	90.5
zinc	90	200	52.5	238
mercury	NA	1	ND	0.41
PCB	NA	10	0.096	0.969

The counterargument for the background tactic is that sediment remediation is extremely costly and of uncertain public accability. Because of these costs a strong demonstration of actual or potential harm is required. Simple observation of a chemical in exceedence of background is not a convincing argument for action. Furthermore, it is not always apparent what should be used as a background, especially in tributaries where the local geology is not well known.

Biological toxicity tests can provide the demonstration of harm lacking in the background approach and obtainable only through difficulty by the criterion method. Biological testing procedures have been used by the New York State Department of Environmental Conservation (NYSDEC) on Niagara River area sediments (Litten, 1988) and by the USCOE on Oswego harbor sediments. Drawbacks from biological testing are chiefly in the abundance and diversity of organisms and effects. Biological tests for sediment toxicity include Microtox (Bulich, 1984), algal photosynthesis bioassay (Ross, Jarry, and Sloterdijk, 1987), fish bioaccumulation (Litten, 1988), Ames test (Ames, McCann, and Yamasaki, 1975), zooplankton life cycle test (Mount and Norberg, 1984), and invertebrate bioassays (Nebeker et al, 1984). Black et al. (1985) has induced tumors by painting sediment extracts on fish.

The failure to observe a particular toxic response in one organism does not rule out other toxic responses. For example, absence of acute toxicity in an organism does not mean that a longer term test would not reveal kidney damage or liver tumors or the target effect in another species. Also there are several distinct habitats between sediments and water inhabited by different species.

Regardless of the use to which sediments are put once collected, sampling alone provides significant challanges. Analytical results of closely spaced samples often show very large differences. This may be due to real environmental heterogeneity alone or a combination of environmental heterogeniety and laboratory imprecision. One way to lessen the impact of environmental heterogeneity is to collect sediment cores instead of simple grab samples. A core has the advantage of repeated samples from a hydrologically and depositionally consistant point. If one assumes that sedimentation is occurring in an orderly fashion, a core also samples time. The bottom of the core represents older material than the top. In many dredged harbors the natural stratrigraphy is jumbled but radiodating techniques can be used to verify continunity. Cores are also needed for estimating contaminant mass and in predicting the consequences of dredging. At the same time it should be realized that coring is not always possible because of the physical problems in bringing in the needed machinery or inadequate depth of recoverable sediment.

The interpretive and sampling problems in sediment work make decisions on small samples tested for limited characteristics risky. There are few sites where the evidence for real or potential harm is overwhelming. Usually numerous samples and tests are needed to establish a case for a particular course of action beyond normal practice.

Here data are presented from work performed on Eighteenmile Creek, Genesee River, Oswego Harbor and the Black River. Figure 1 shows the locations of the sampled areas. Besides a review and discussion of historical data, we also show new data produced by NYSDEC from sampling performed in October of 1987 and May of 1988. The majority of the NYSDEC samples were cores taken with a Vibracorer. The Vibracorer has a compressed air driven vibrating head that pushes a steel barrel into sediments. The barrel has a cutting head and back projecting stainless steel fingers that help hold sediments in a Lexan tube carried within the barrel (Figure 2). The assembly is operated from a pontoon boat equipped with an air compressor, a tripod derrick, and anchoring spuds. One sample from Eighteenmile Creek (Clinton Street) was taken with a mini-Ponar and the other upstream samples were made with hand driven corers. Cores collected from the Burt Dam in Eighteenmile Creek were taken by commercial divers (Allen Marine Services). Cores were kept in a near vertical position and, when sufficiently long, were sectioned at the laboratory. Chemical analyses for NYSDEC were performed by the New York State Health Department at the Wadsworth Center for Laboratories and Research. Metals analyses were accomplished using ICP. Sediment characteristics were assessed by total volatile solids (TVS), total organic carbon using the persulfate-ultraviolet oxidation method (TOC-1), and total organic carbon using the combustion-infrared method (TOC-2). All samples were also tested for PCBs and Oswego River samples were additionally analyzed for organochlorine pesticides.

Eighteenmile Creek

Eighteenmile Creek receives treated wastes from the City of Lockport and Harrison Radiator. These discharges enter above two small power dams at the hamlets of Newfane and Burt. The creek discharges into Lake Ontario at Olcott hamlet. The USCOE maintains the mouth of Eighteenmile Creek. Recent sediment work has been performed for USCOE (T.P. Associates International, Inc, 1987) and EPA (Kizlauskas, Rockwell, and Claff, 1981). Sample locations from EPA, USCOE, and NYSDEC are shown in Figure 3. Table 2 summarizes results from the EPA and USCOE activities.

Metal concentrations reported by USCOE at the mouth showed one site that was far more heavily contaminated than the others (Table 2, USCOE sites 3 and 3B). Of the 15 substances measured and with EPA-Region V Guidelines for non-polluted, moderately polluted, and heavily polluted, sample USCOE-3 and its replicate (3B) had 9 and 10 substances respectively at concentrations indicitative of heavily polluted harbors. All the other six samples had two substances in the heavily polluted range. EPA samples 4 and 3 had the higher concentrations. EPA-4 corresponds roughly with USCOE-3 and is close to NYSDEC-Olcott Bar.

NYSDEC cores were taken from a mud bar in the Olcott harbor and upstream of the dredged area at Olcott. Other samples were taken behind the dams at Burt and Newfane, from the confluence of Eighteenmile Creek and a small creek called "The Gulf", within the City of Lockport, and, for controls, from the East Branch Eighteenmile Creek. Initially a single East Branch grab sample was collected but the area was revisited in May of 1988 to confirm the sample results. NYSDEC attempted to repeat the USCOE-3 sample but was unable to recover material from the site indicated in the USCOE Report map. A near-by core recoverd by NYSDEC did not show the elevated concentrations. On the other hand, NYSDEC samples from upstream sites were found to have exceedingly high metal concentrations. Figure 4 displays selected zinc concentrations from all Eighteenmile Creek sites visited by NYSDEC. Results of the NYSDEC project appear in Appendix A.

Note that control samples on the East Branch had concentrations as high as 770 mg/kg and a sample from behind the Newfane Dam had over 2% zinc. Other metals showed a similar pattern of very high concentrations at Newfane and low concentrations at Olcott. The dams appear to be effective traps of metals on particles. However, some breakthrough was seen in the top two inches of the Olcott core for zinc, copper, titanium, and chromium.

When compared with the EPA and USCOE data, NYSDEC results from the two lower river cores at Olcott Bar and Upstream of Rt. 18 Bridge are lower for lead and mercury and possibly lower for zinc, arsenic, copper and chromium. NYSDEC barium and iron values are slightly higher than comparable values from the USCOE and, at least for barium, EPA. At this time it is impossible to determine if the differences are due to sampling or laboratory methods.

The high concentrations from the NYSDEC control site are puzzling. Concentrations at the control site are significantly higher than those downstream at Olcott. One hypothesis held that the control site might have been influenced by bridge painting metals but the bridge over the East Branch on Route 104 is concrete. The site is also below the Niagara escarpment. One of the geological units in the escarpment, the Rochester Shale, is rich in zinc, copper, lead and arsenic (Litten, 1988). Table 3 compares metal concentrations from literature value for Lake Ontario background (Mudroch, 1983), Rochester Shale, Eighteenmile

TABLE 3

COMPARISON OF METAL CONCENTRATIONS IN ROCHESTER SHALE, EAST BRANCH EIGHTEENMILE CREEK, AND OLCOTT CORE MEANS (mg/kg)

	As	Cd	Cr	Cu	Pb	Ni	Zn
Lake Ontario background (Mudroch, 1983)	NA	NA	50	100	25	100	100
Rochester Shale (max.)	112	8.4	28	260	472	76	5800
Rochester Shale (mean)	34	NC	24	41	132	24	761
18-Mile Control Site	3.3	<2	20	23	34	28	175
	2.9	<2	20	13	21	28	95
	2.8	<2	17	28	44	23	770
	8.3	<2	34	142	216	32	564
Olcott Core (mean) (n = 15)	1.6	<2	25	21	5	28	90

NC - not calculated due to excessive non-detect observations.

Creek control site observations, and Olcott means.
Table 3 illustrates problems in use of the background approach to evaluate sediments. A geological explanation is possible for the erratic and high metal concentrations seen at the control site. Generally accepted backgrounds, for example Lake Ontario deposition zone sediments below the Ambrosia horizon, may underestimate relevant natural metal concentrations. We do not rule out the possibility that an as yet unknown source contaminated the control area.

The metals found in high concentration are associated with manufacturing. They include lead (maximum of 4760 mg/kg), chromium (maximum of 2750 mg/kg), cobalt (maximum of 25 mg/kg), and tin (maximum of 1100 mg/kg).

Toxicity experiments have not been conducted in the most contaminated sites. It would be appropriate to examine these sediments for aquatic invertebrates. The site supports aquatic plants which grow in profusion.

Genesee River

Manufacturing, brewing, and chemical plant wastes have been discharged to the Genesee as well as urban storm sewers from the City of Rochester. The Genesee empties into Lake Ontario. Its mouth is also maintained for navigation by the USCOE. Genesee River sediments have been investigated by the Monroe County Department of Health (1986) and EPA (Kizlauskas, Rockwell, and Claff (1984). Monroe County performed two sets of samples. The first, conducted on May 16, 1984, examined composited cores from the upper and lower turning basins. None of the pesticides, PCBs, volatiles, acid/phenolics, or base/neutrals sought were present above the detection limits. The second set of 14 samples were taken on August 2/3, 1984. This second set contained detectable concentrations of PAHs, chloroform, and toluene. The EPA sampling was performed on May 3, 1981. The lower detection limits used by EPA resulted in frequent observations of PCBs and pesticides. Sample locations are shown in Figure 5. Metal results, and for EPA PCB results, for lower river sites are shown in Table 4.

NYSDEC samples were taken on the west side of the lower river above the portion heavily used by pleasure craft and commercial shipping. Sample locations are presented in Figure 5. Three cores were retrieved ranging from 18 to 26 inches in length. Each core was sectioned into two inch intevals and each interval was analyzed for metals, PCBs, total organic carbon, and total volatile solids. Results are given in Appendix A. Figure 6 illustrates the distributions of chemicals with depth for each of the cores through the example of zinc.

The highest concentrations for almost all substances occurred between 4 and 10 inches in NYSDEC-2. Elevated concentrations also appeared in the bottom four segments of NYSDEC-1. The NYSDEC maxima for barium, copper, mercury, chromium, PCB, beryllium, and zinc were at least twice those reported by Monroe County or EPA even from sites closer to known contaminant sources. A few metals, silver and arsenic, were not found in higher concentrations in NYSDEC samples despite the greater sample size. Large variations in depth distribution between closely spaced cores suggest sediment reworking. The only potential contaminant source within the reach sampled by DEC is construction demolition disposal site operated between 1951 and 1970.

Oswego Harbor

The Oswego River receives water from the Seneca River, the Oneida River, and Onondaga Lake. Onondaga Lake itself is the recepient of the City of Syracuse's effluent as well as current and historical wastes from chemical and metals industries. A single sample was recoverd in the river's mouth near the western shore. The Oswego harbor is maintained by the USCOE and a series of samples were collected and analyzed by the Corps on May 2, 1987. A summary of these results are given. Sample locations are given in Figure 7. Selected results are shown in Table 5.

The USCOE also performed triplicate 96 hour acute toxicity experiments exposing Hexagenia limbata (sediment burrowing invertebrate), Daphnia magna (water column invertebrate), and Pimephales promelas (fish) to sediments. Using Duncan's analysis of variance procedure, the USCOE data were analyzed for similarity in toxicity. Figure 8 presents results of the analysis. Duncan's test examines all comparisons for a given species and shows groups of sediment samples associated with indistinguishable mortality rates.

All three experiments show that sediment station 12 produced significatly higher mortalities than the control. Analyses for bulk metals, bulk organic contaminants, and elutriate metals failed to distinguish sample 12 from the others.

NYSDEC obtained a single short core from Oswego Habor (see Figure 7). Bulk chemical concentrations, like those of USCOE, were low. Data appear in Appendix A. Due to local concerns, the Priority Pollutant pesticides were also analyzed in the NYSDEC Oswego samples. DDT and its metabolites were detected in all samples but co-elution with PCBs, quantified in all samples, prevented quantification of the DDTs. Most substances show a slight increased concentration at the bottom of the core.

Black River

The Black River drains the Tug Hill plateau and the western Adirondacks. Industrial activities in its basin are largely confined to paper making and hydroelectric generation. The City of Watertown discharges treated effluents to the Black. Black River empties into Black River Bay and then into eastern Lake Ontario.

A synoptic survey of Lake Ontario volatile halocarbons (Kaiser, Comba, and Huneault, 1983) was conducted in November 16-22, 1981. By ranking the observations (ties given equal weight) and "T" (trace) and "ND" (non-detect) observations given penultimate and ultimate ranks) and summing the ranks for each site, the disparate concentrations from 13 substances were coalesced into a single value. The top ranking sites (the top five percent) are off the Welland canal, immediately outside Hamilton Harbour, off New York midway between the Niagara River and Rochester, and in Black River Bay. The Black River Bay site had particularly high ranks for trichloroethylene, 1,1-dichloroethylene, 1,2-dichloropropane, dibromomethane, and tetrachloroethylene. More recent work (Biberhofer and Stevens, 1987) has shown Black River Bay total PCB concentrations second only to the mouth of Hamilton Harbour (1.92 ng/L for Black River Bay and 3.1 ng/L for Hamilton Harbour mouth).

There are no easy explanations for elevated chemical concentrations in the Black River. However, several considerations may apply. The numerous hydroelectric and paper plants in the drainage have the potential for release of PCBs although none has been documented. Chlorination of humic waters may account for some of the observed halocarbons. And lastly, the relatively protected Black River Bay may contribute to slower dilution rates than those off the Niagara, Hamilton, or other possible contaminant sources.

NYSDEC took three cores ranging in length from 17 to 20 inches in length from a quiescent area upstream of the last dam at Dexter, New York. Locations of the samples are given in Figure 9. Figure 10 shows zinc concentrations in the three cores. Results are displayed in Appendix A.

Comparison Between Sites

Figures 11, 12, and 13 display the depth averaged concentrations from NYSDEC cores at Olcott, Genesee River, Oswego Harbor, and Black River for zinc, lead, and copper. The EPA guidelines are indicated as parallel vertical lines. These show Genesee River cores containing the maxima but high concentrations are also seen in Black River samples. For several substances concentrations reported by NYSDEC were lower in lower Eighteen Mile Creek cores than those shown by USCOE and EPA. This may be due to sample position, sample time, sample collection procedures, or laboratory methods. Comparison between NYSDEC and other studies on the Genesee and Oswego do not show similar patterns. However, better knowlege of inter- and intralaboratory variability is needed to evaluate sites visited by multiple investigators. The contaminant peak in the top section of the Olcott Bar core could be explained as a consequence of recent breakthrough where the highly contaminated upper river material is just now appearing in the lower river. This thin surface layer might be more efficiently sampled with the methods used by EPA and USCOE. It may also be easily removed during storms or dredging. Figure 14 displays total organic carbon (TOC-1) as measured by persulfate and UV light digestion. TOC-1 profiles show that the Black and Oswego Rivers had the highest concentrations. Black River cores were taken behind a dam, the others pictured in Figures 11 to 14 were in areas more likely to be influenced by Lake Ontario. This may account for the higher concentrations. However the most exposed site, Oswego Harbor, also showed relatively high TOC-1 concentrations near the surface. Further sediment sampling should be undertaken to determine the source of Black River sediment metals. A geological explanation should be considered.

One of the barriers to developing sediment criteria has been the problem of normalizing concentrations from different sediments. Because of their matrix disparities, bulk concentrations have different significances. Highly organic or fine grained sediments have a greater capacity for holding contaminants than do coarser sediments. Correlations were calculated between each of the three sediment quality parameters (%TVS, total organic carbon by combustion, and total organic carbon by persulfate digestion) and bulk zinc for all samples, lower Eighteenmile samples, Black River samples, and Genesee River samples. Because of the small sample size, separate calculations for Oswego Harbor were not undertaken. The correlation coefficients were converted to z scores following the method of Fisher (taken from Steel and Torrie, 1960) and the lower bound of the confidence interval was calculated at the .01 level based on $s_z = (1/(n-3))^{.5}$. Table 6 displays the correlations and indicates which are statistically significant. Total volatile solids and persulfate TOC yield higher correlations than the conventional combustion TOC. TVS and TOC-1 may be more descriptive of relevant sediment characteristics than the combustion TOC.

TABLE 6

CORRELATION MATRIX FOR SEDIMENT QUALITY PARAMETERS AND ZINC
r significantly > 0 indicated by *

	all	Lower Eighteenm. Ck.	Black R.	Genesee R.
n =	88	30	18	34
TOC1 vs TOC2	.63*	.34	.47	.71*
TOC1 vs TVS	.70*	.42*	.62*	.77*
TOC2 vs TVS	.75*	.40*	.47	.69*
TOC1 vs Zn	.45*	.37	.62*	.58*
TOC2 vs Zn	.17	.11	.54*	.09
TVS vs Zn	.42*	.03	.33	.59*

TOC1 - total organic carbon by persulfate digestion
TOC2 - total organic carbon by conventional combustion
TVS - total volatile solids

Conclusions

Results of observations from upper Eighteenmile Creek point to the importance of adequately understanding background sources of target substances. While we do not expect to find natural sources of PCBs or mirex, we should be prepared to see metals and possibly PAHs. The Genesee River cores point to short distance depositional irregularities. Just as surface grab samples are subject to highly significant short distance differences, so too are cores. Acute toxicity results from Oswego harbor shows some similarities but also the difficulty in interpretation. Conclusions from biological testing are highly dependent on the organism and effect studied. Sediment characteristic parameters are important in understanding contaminant relations but again, problems arise in choosing the best characteristics. It appears that the relatively mild persulfate digestion may be a more descriptive characteristic than the more thorough combustion TOC usually employed.

Site Specific Conclusions

Eighteenmile Creek was found to have very high sediment metal concentrations (relative to values observed elsewhere in New York State and in other Great Lakes harbors) behind the two power dams. Background sources may be significant but the majority of the load appears to originate from activities within the watershed. Possible breakthrough to Olcott harbor was found by NYSDEC, EPA, and USCOE data.

The lower Genesee sediments had the highest river mouth sediment metal concentrations. The majority of the load seems to originate from discharges to the lower river.

Metal concentrations in Oswego harbor are low relative to other New York and Great Lakes harbor sediment concentrations. Biological experiments show that sites in the western harbor are more toxic than laboratory controls and, in some species, more toxic than sediments from the dredged spoil open lake dump site.

Black River sediments were not collected in the mouth but samples taken behind the last dam show elevated metal concentrations. The extent of background contribution is not known and should be assessed.

Comparisons of H. limbata mortalities

```
station   12   14   13   11   15    6    16    17    5   3    4    C
mean      10    9   8.3   8   6.7  6.3  6.3  6.3  4.3  4    3   1.7
   group
     A    --------------
     B         ---------------
     C              --------------------------
     D                        -----------------------
     E                              ---------------------
     G                                                  ---------
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Comparisons of D. magna mortalities

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station   12   11   15   17   17    3   14   4    5    6    C   13
mean       8  7.7  5.7  5.3  4.7  4.3   4   4   3.7   3    3    3
   group
     A    ---------------------------------------
     B        ------------------------------------------------
```

Comparisons of P. promelas mortalities

```
station   12   11   6    3    4    15   14    5   16   17   13  C
mean     3.3   3   2.7  2.7  2.7  2.7  2.3  2.3  2.3  2.3   2  1
   group
     A    -------------------------------------------------
     B        -------------------------------------------------
```

Figure 8. Similarities between Oswego harbor sediments based on toxicity to H. Limbata, D. magna, and P. promelas. Data: USCOE, 1987.

TABLE 2

EIGHTEENMILE CREEK SEDIMENTS RESULTS
USCOE 1987; Kizlauskas, Rockwell, and Claff, 1981

sample	As	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Sn	Zn	Fe
EPA - 8/30/1981											
1	NA	88	0.9	30	49	43	BDL	37	BDL	190	16000
4	NA	290	0.4	60	110	230	1.9	25	13	320	19000
3	NA	330	0.3	88	130	290	3.0	32	11	350	21000
2	NA	44	BDL	15	13	BDL	BDL	28	BDL	66	16000
USCOE - 6/5-1987											
ref.	7	42	1	24	26	35	2.5	22	NA	150	12200
1	4	90	0.5	17	26	38	0.17	24	NA	150	14000
2	6	50	1	40	48	89	0.78	40	NA	330	11000
3	6	85	2	87	140	200	0.59	110	NA	920	13000
3B	7	75	2	79	150	200	0.78	110	NA	940	14500
4	4	54	1	17	50	73	0.82	17	NA	200	8300
5	2	15	2	8	18	20	0.05	14	NA	100	6900
6	2	15	1	4	9	5	0.03	8	NA	44	5700

BDL - species qualitatively identified but below detection limit.
NA - not analyzed.

TABLE 5

USCOE BULK SEDIMENT CONTAMINANT RESULTS FROM OSWEGO HARBOR
(all results in mg/kg)

sample	As	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Zn
2	2	130	0.5	7	16	110	0.79	8	170
3	3	41	1	6	24	26	0.94	10	63
4	2	26	0.5	6	12	13	0.47	8	38
5	3	38	0.5	8	18	20	0.46	11	57
8	1	8	<.4	2	2	1	0.51	5	12
9	2	29	0.5	4	9	9	0.11	7	33
10	1	14	0.5	5	5	3	0.04	5	17
11	4	40	1	8	21	19	0.18	11	59
12	3	27	0.5	6	11	6	0.79	9	29
13	5	46	1	10	24	11	0.47	10	49
14	3	14	0.5	6	10	2	0.09	6	24
15	2	14	<.5	3	6	1	0.03	4	18
15B	2	17	<.4	3	8	<1	0.03	5	17
16	2	19	0.5	4	10	6	0.09	6	33
17	3	24	1	5	12	8	<.09	8	37
17B	3	24	1	6	9	7	<.09	6	34

TABLE 4

GENESEE RIVER SEDIMENT METAL CONCENTRATIONS
Monroe County (1986) and Kizlauslas, Rockwell and Claff (1984)
(all concentrations in mg/kg)

sample	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
5/16/84										
lower turning basin	13	<.7	<.7	22	32	8	<.07	59	9.7	345
upper turning basin	8.1	<.7	4	19	38	9.7	<.07	47	10	143
8/3/84										
off Riverside Cemetary	19	.6	4.8	24	40	49	.56	37	20	187
upstream of. Kodak	5.8	<.5	<.7	10	16	15	<.1	16	1.1	57
downstream of Kodak	12	<.5	2.9	21	25	41	.15	29	24	112
KOD (top of core)	12	.81	27	37	46	69	.89	41	27	440
KOD (bottom of core)	16	<.5	6.5	23	32	41	.47	35	12	194

EPA

(arsenic and beryllium were not reported by EPA)

5/3/81	PCB	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
1	.04	82	1.0	20	30	24	.1	25	4.8	100
2	.121	100	4.1	24	51	67	.3	23	14	170
3	.72	410	29	65	98	250	.5	37	23	780
3B	NA	140	6.5	38	58	170	.3	36	5.8	280
4	.077	86	2.3	19	28	31	.4	24	8.5	120
5	.052	32	ND	11	15	15	ND	16	2.1	51
6	.084	45	0.5	14	27	34	.1	20	4.4	80
7	.078	64	4.2	16	28	39	.1	19	9.2	95
8	.31	240	9.1	37	73	130	.4	24	30	220
9	.043	48	0.9	13	21	24	.2	18	4.7	76
10	.07	86	3.1	21	28	34	.2	23	11	140
11	.043	49	0.6	12	16	14	ND	17	2.7	62
12	.053	30	0.4	11	17	31	.2	14	0.4	55
14	.031	72	1.5	17	25	27	.2	21	6.6	99

NA - not analyzed in the replicate sample.
ND - not detected.

APPENDIX A

All analyses were performed at the NYSDOH Wadsworth Center for Laboratories and Research.

SL - sample lost
NA - not analyzed
SU - suspicious result
UI - unknown interference
EE - estimated result

Through a laboratory error, samples were placed in plastic containers before analysis for organics. Plasticizers from the containers may have contaminated the samples and introduced interferences.

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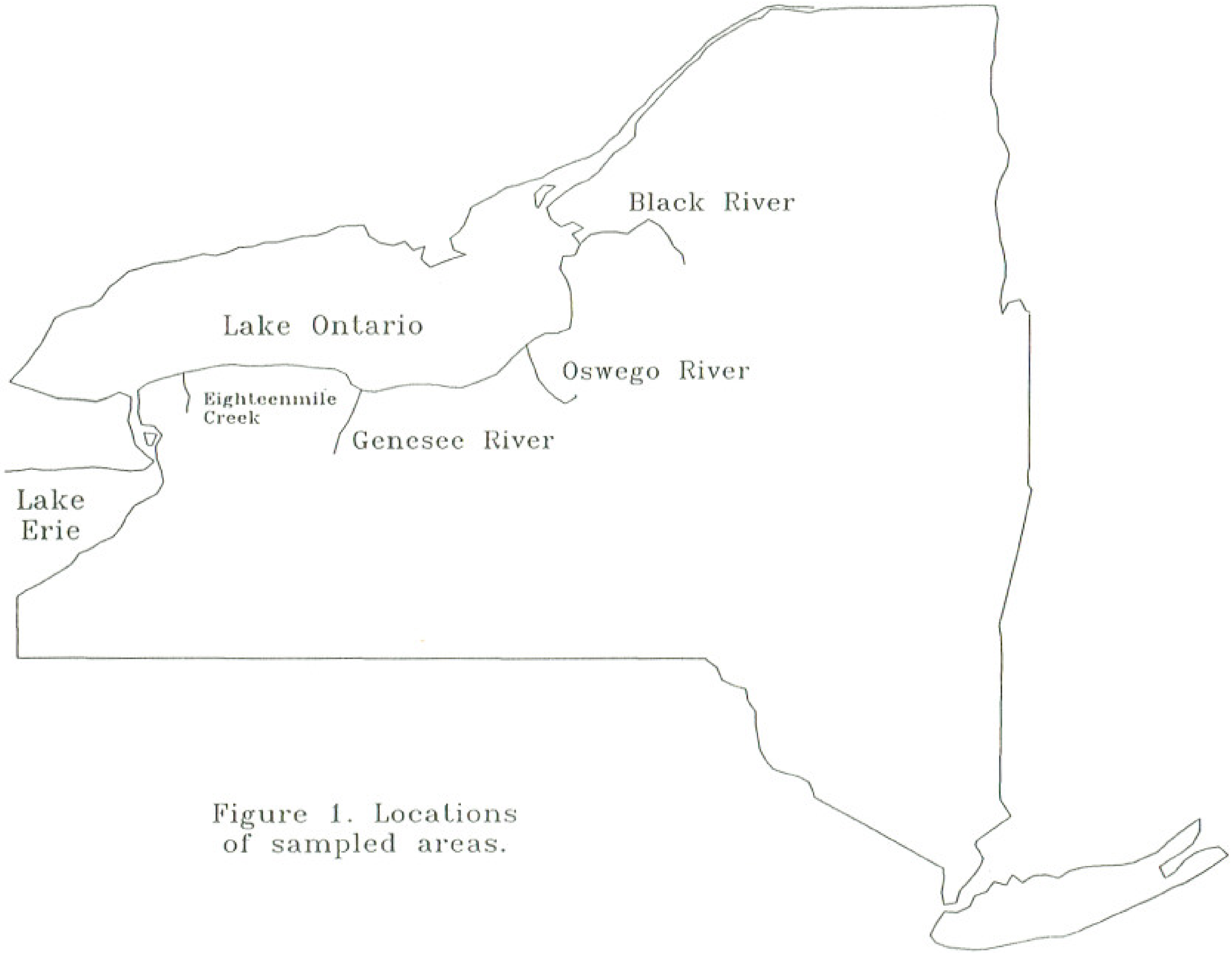


Figure 1. Locations of sampled areas.

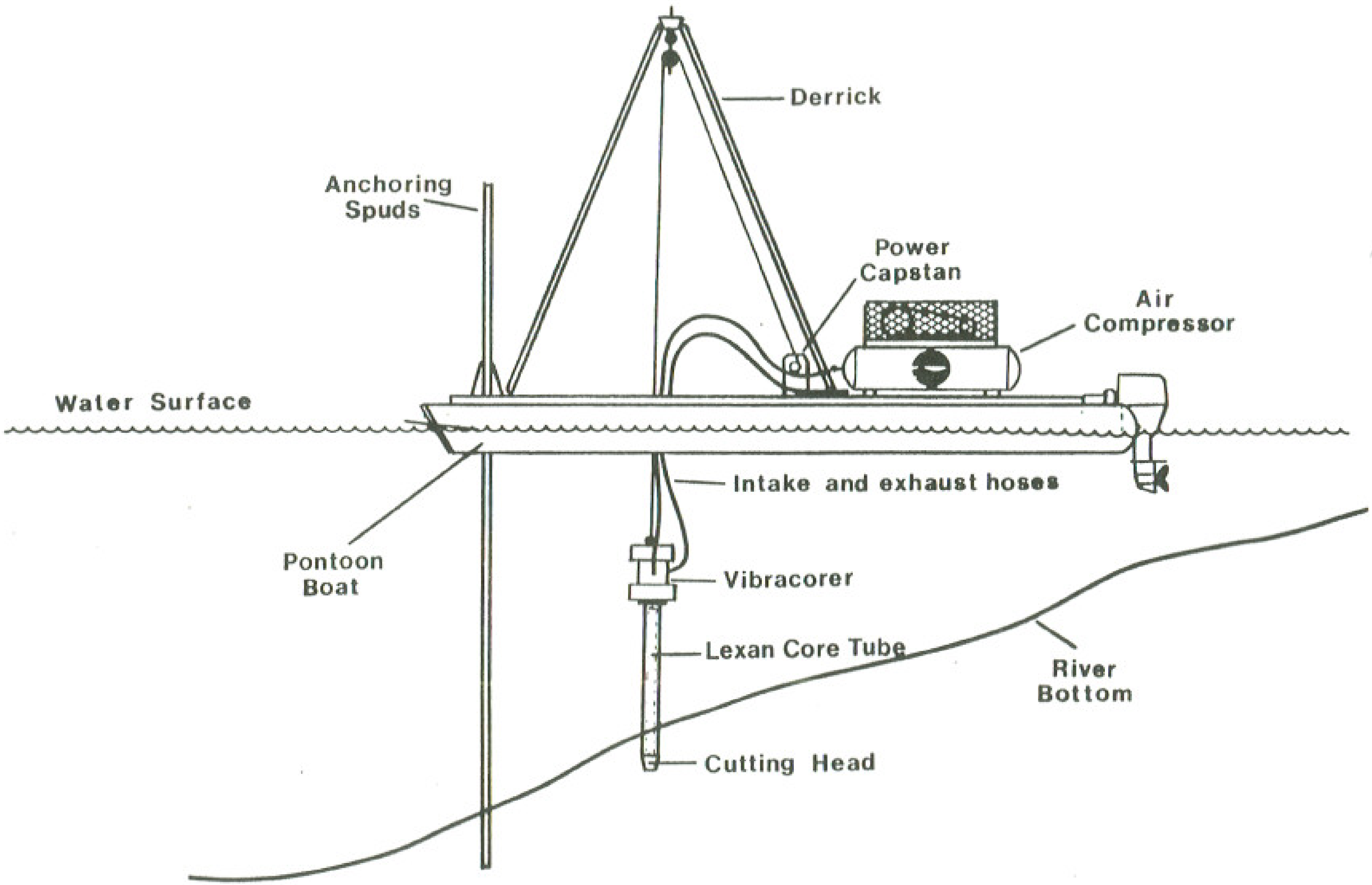


Figure 2. Schematic view of coring equipment.

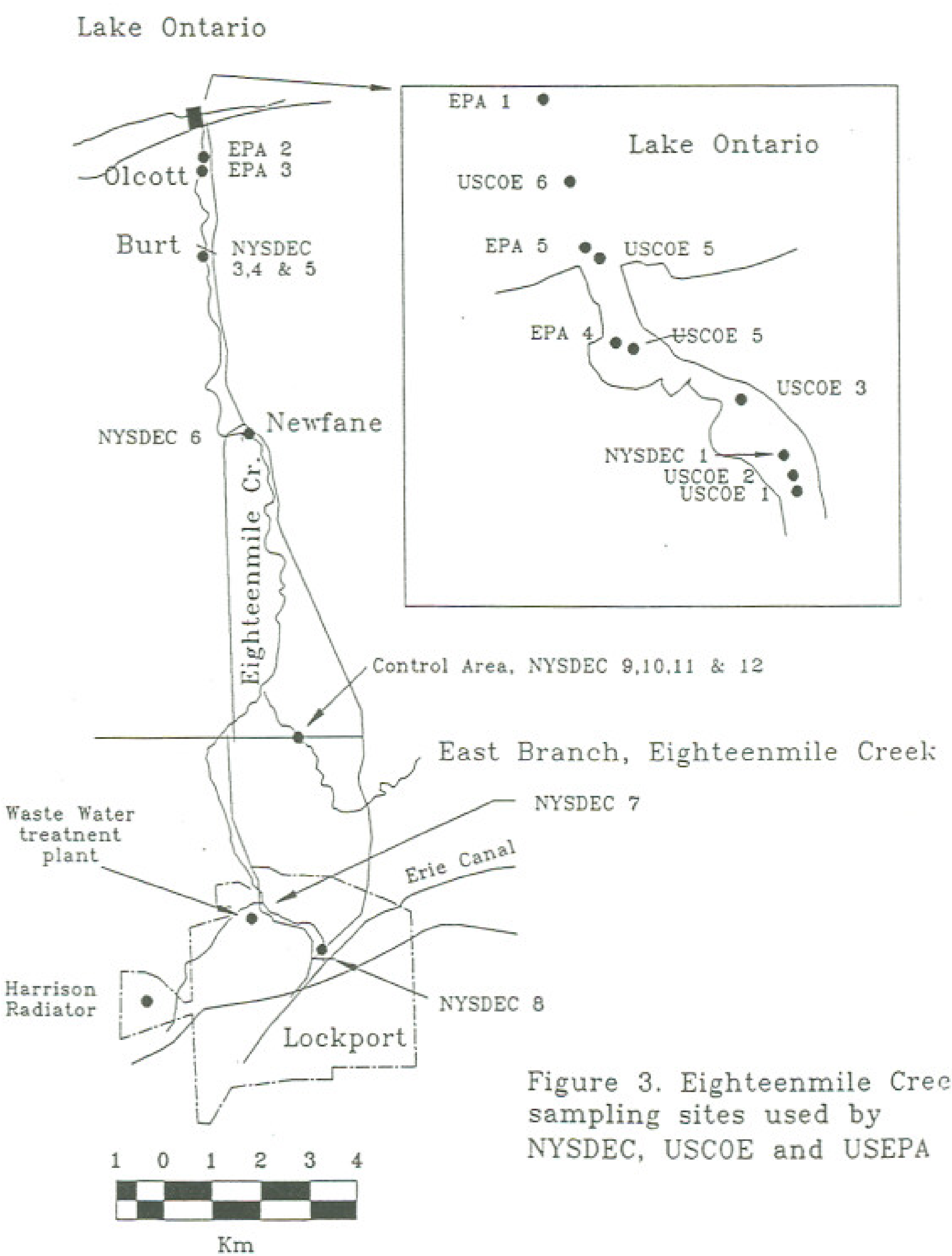


Figure 3. Eighteenmile Creek sampling sites used by NYSDEC, USCOE and USEPA

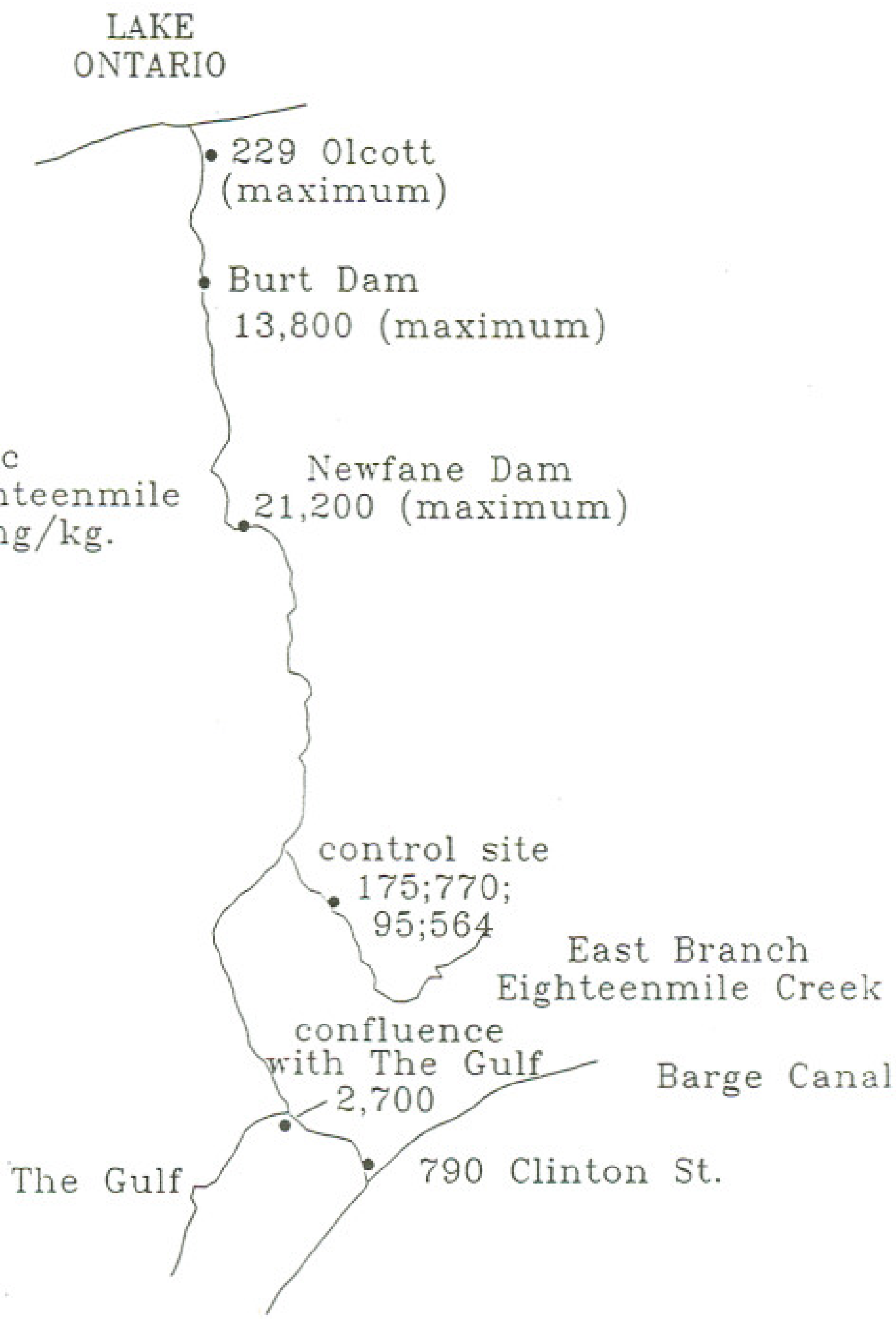


Figure 4. Selected zinc concentrations in Eighteenmile Creek. All values in mg/kg. Data from NYDEC.

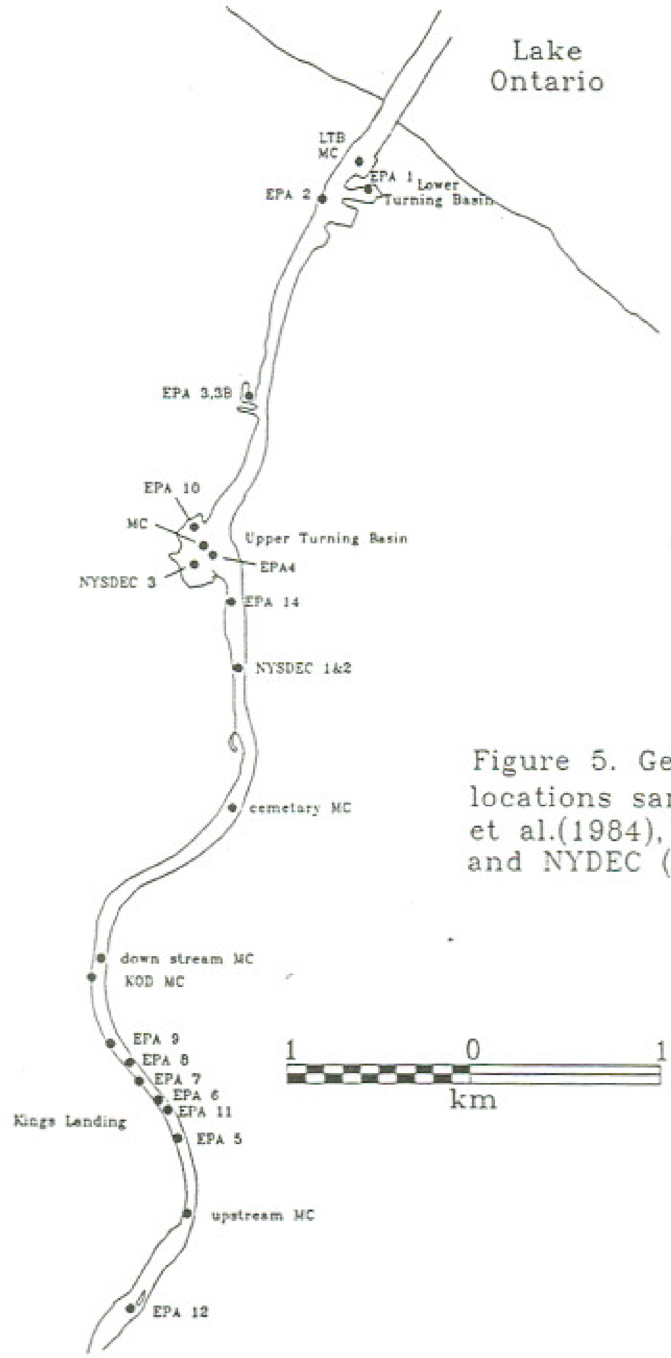
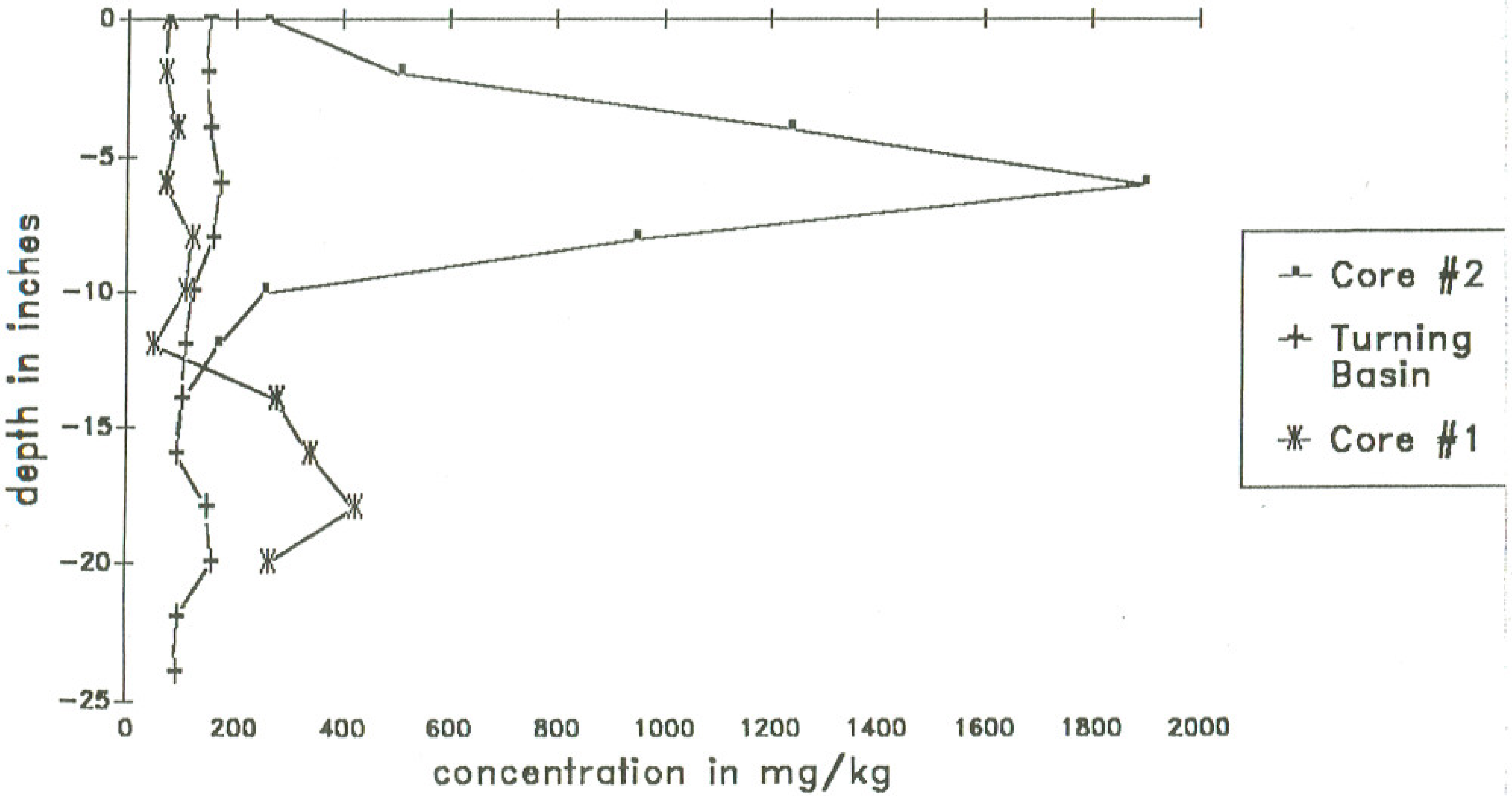


Figure 5. Genesee River and locations sampled by Kizlauskas et al.(1984), Monroe County (1986) and NYDEC (1987).

Figure 6. Zinc concentrations in three Genesee River cores.



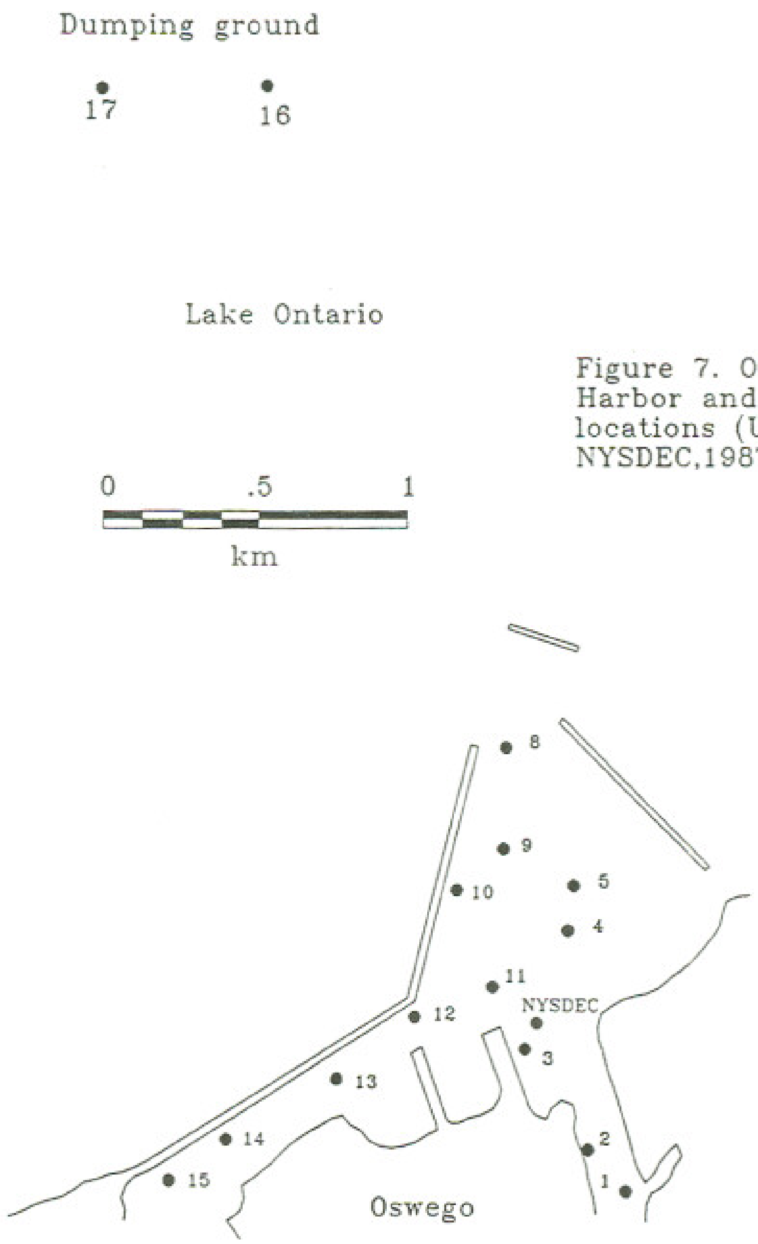


Figure 7. Oswego Harbor and sampling locations (USCOE,1987; NYSDEC,1987).

Comparisons of *H. limbata* mortalities

station	12	14	13	11	15	6	16	17	5	3	4	C
mean	10	9	8.3	8	6.7	6.3	6.3	6.3	4.3	4	3	1.7
group												
A	-----	-----	-----	-----								
B		-----	-----	-----	-----							
C			-----	-----	-----	-----	-----	-----				
D					-----	-----	-----	-----	-----			
E						-----	-----	-----	-----	-----		
G										-----	-----	-----

Comparisons of *D. magna* mortalities

station	12	11	15	17	17	3	14	4	5	6	C	13
mean	8	7.7	5.7	5.3	4.7	4.3	4	4	3.7	3	3	3
group												
A	-----	-----	-----	-----	-----	-----	-----	-----	-----			
B		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Comparisons of *P. promelas* mortalities

station	12	11	6	3	4	15	14	5	16	17	13	C
mean	3.3	3	2.7	2.7	2.7	2.7	2.3	2.3	2.3	2.3	2	1
group												
A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
B		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Figure 8. Similarities between Oswego harbor sediments based on toxicity to *H. Limbata*, *D. magna*, and *P. promelas*. Data: USCOE, 1987.

Figure 9. NYSDEC sampling sites on the Black River at Dexter.

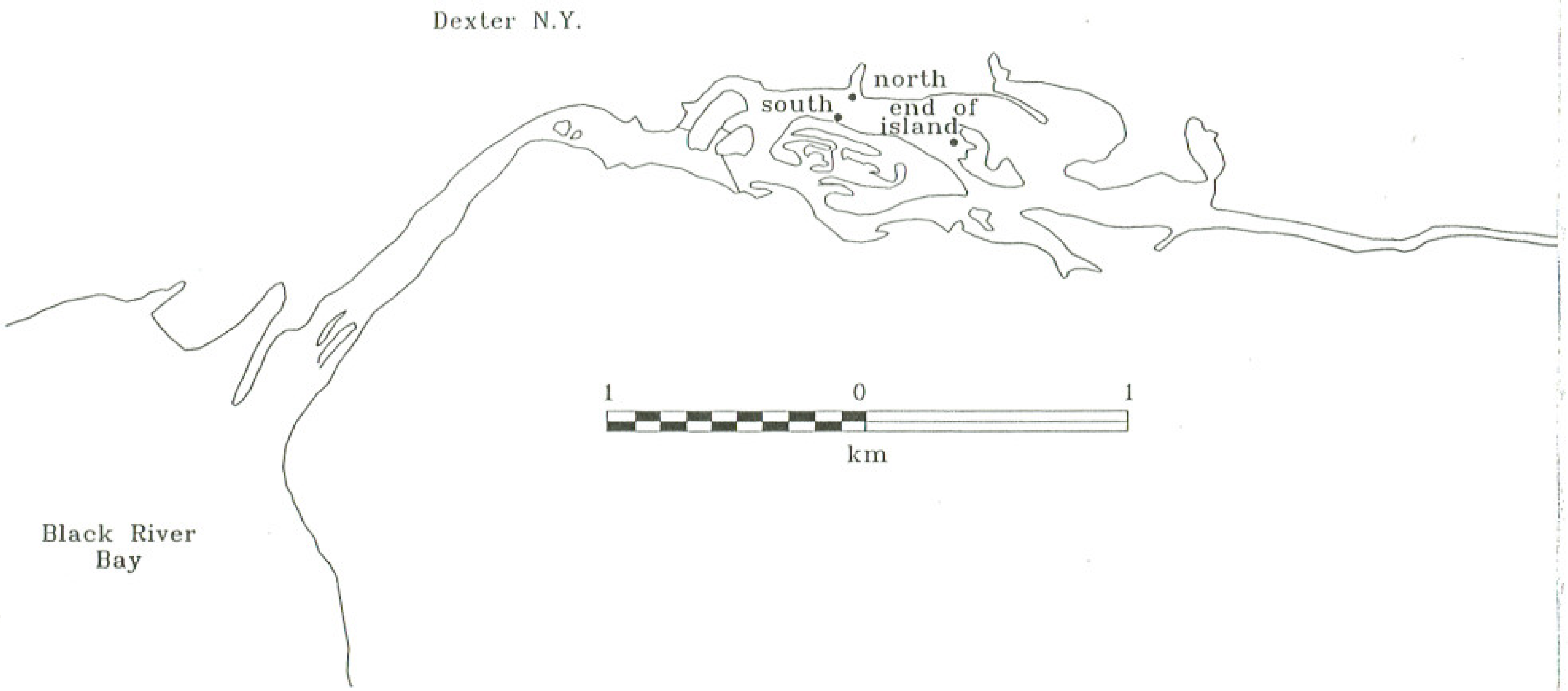


Figure 10. Zinc concentrations in three Black River cores.

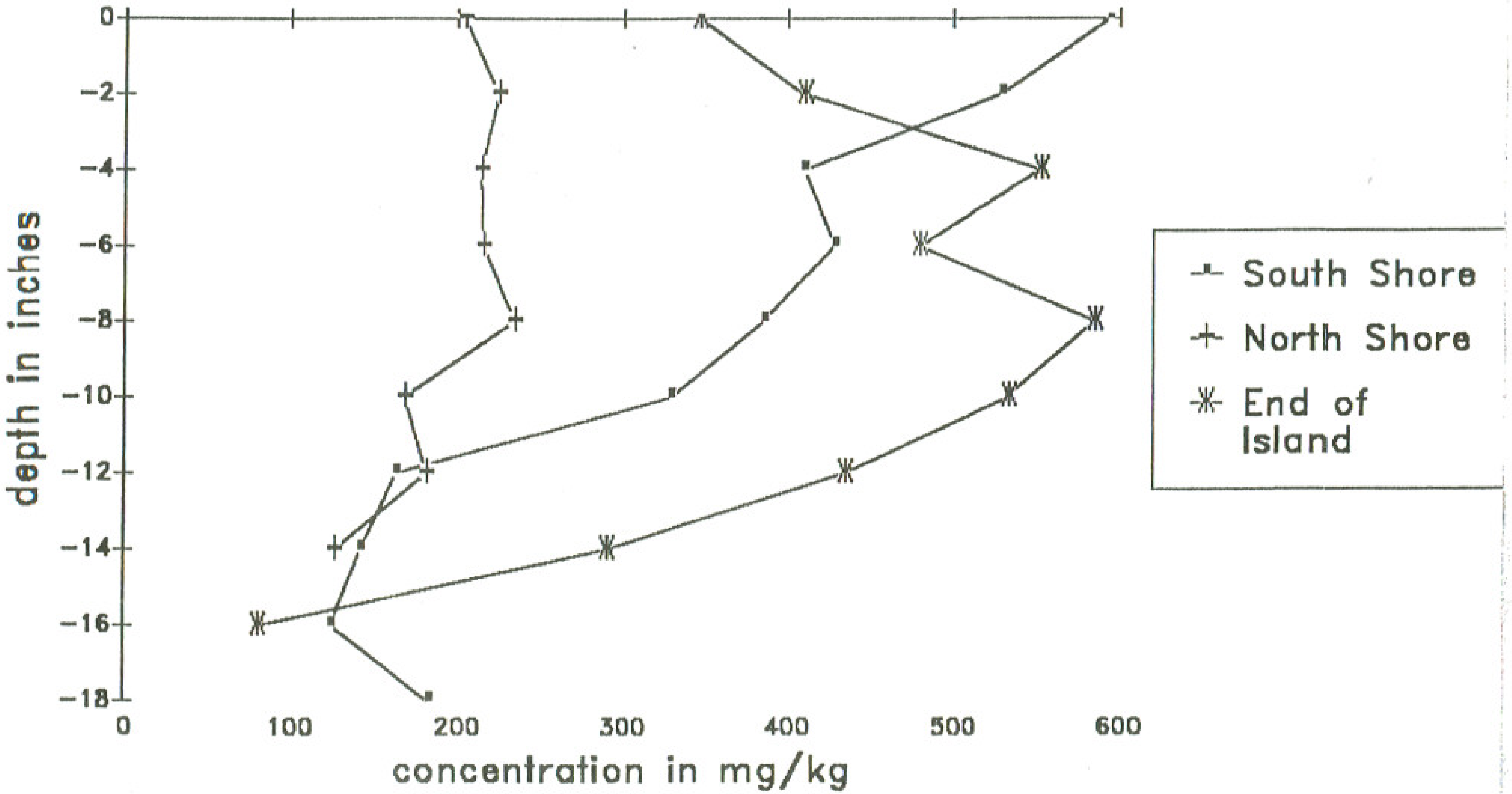


Figure 11. Mean zinc concentration and EPA guidelines.

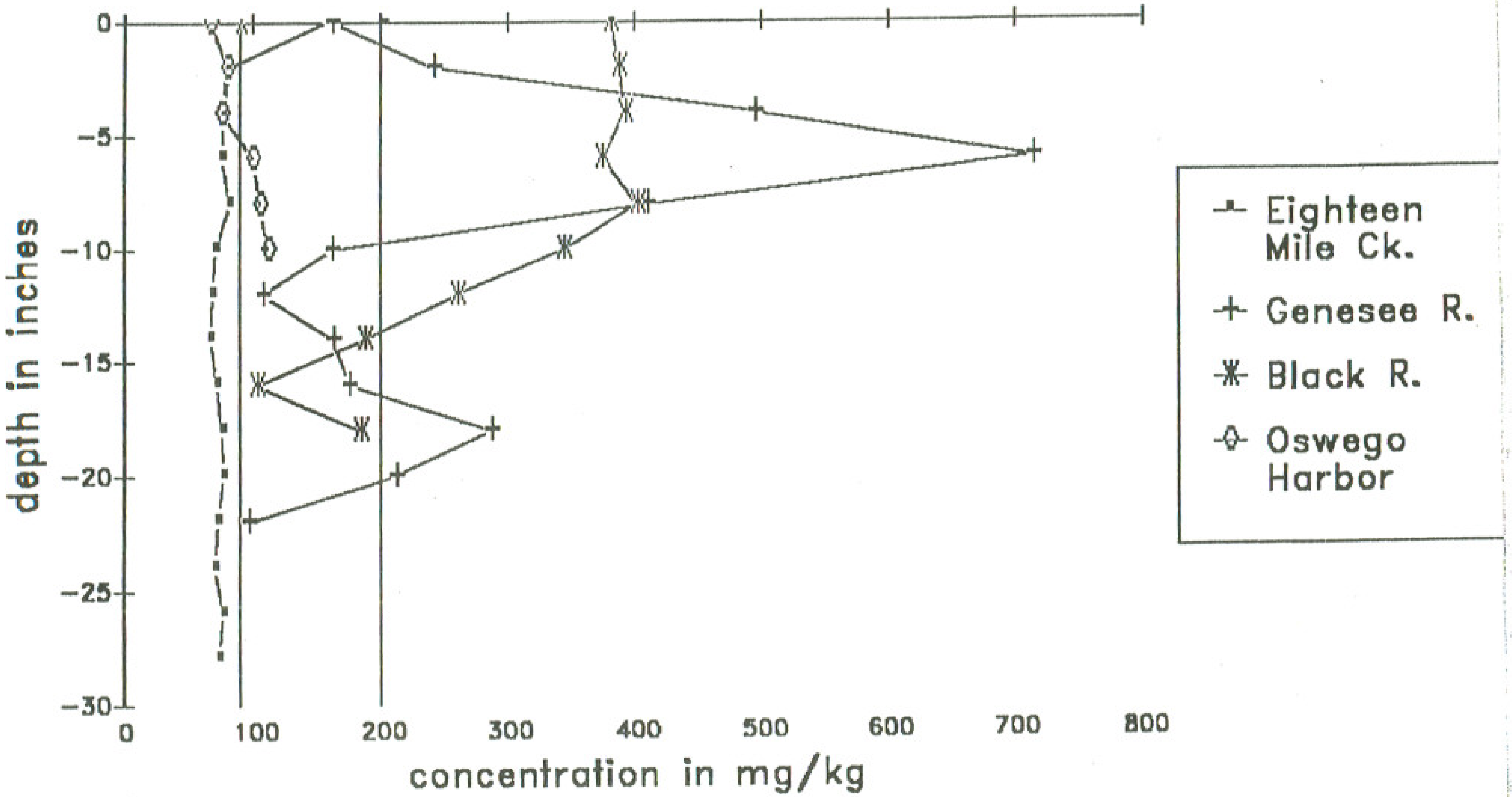


Figure 12. Mean lead concentrations and EPA guidelines.

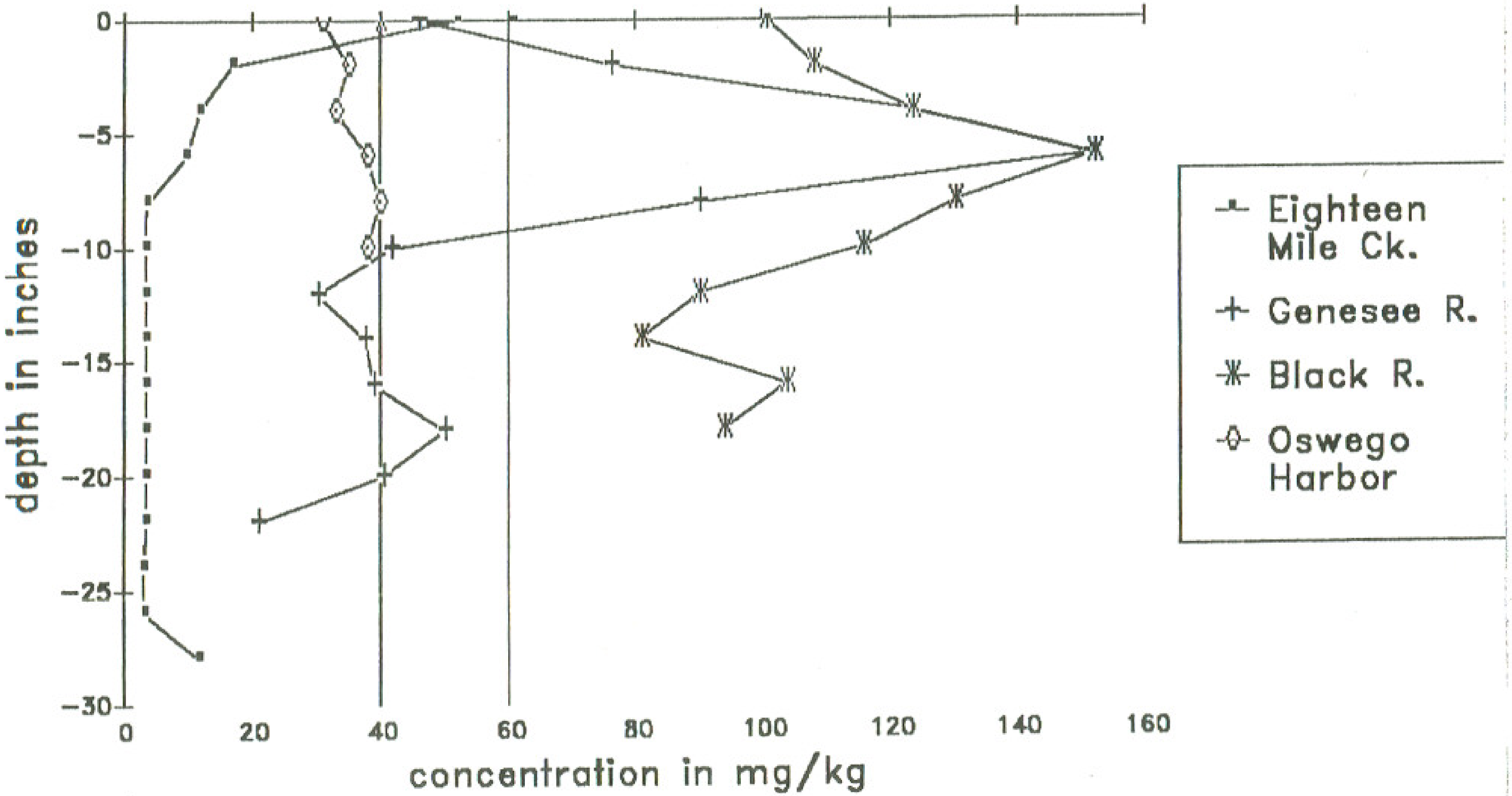


Figure 13. Mean copper concentrations and EPA guidelines.

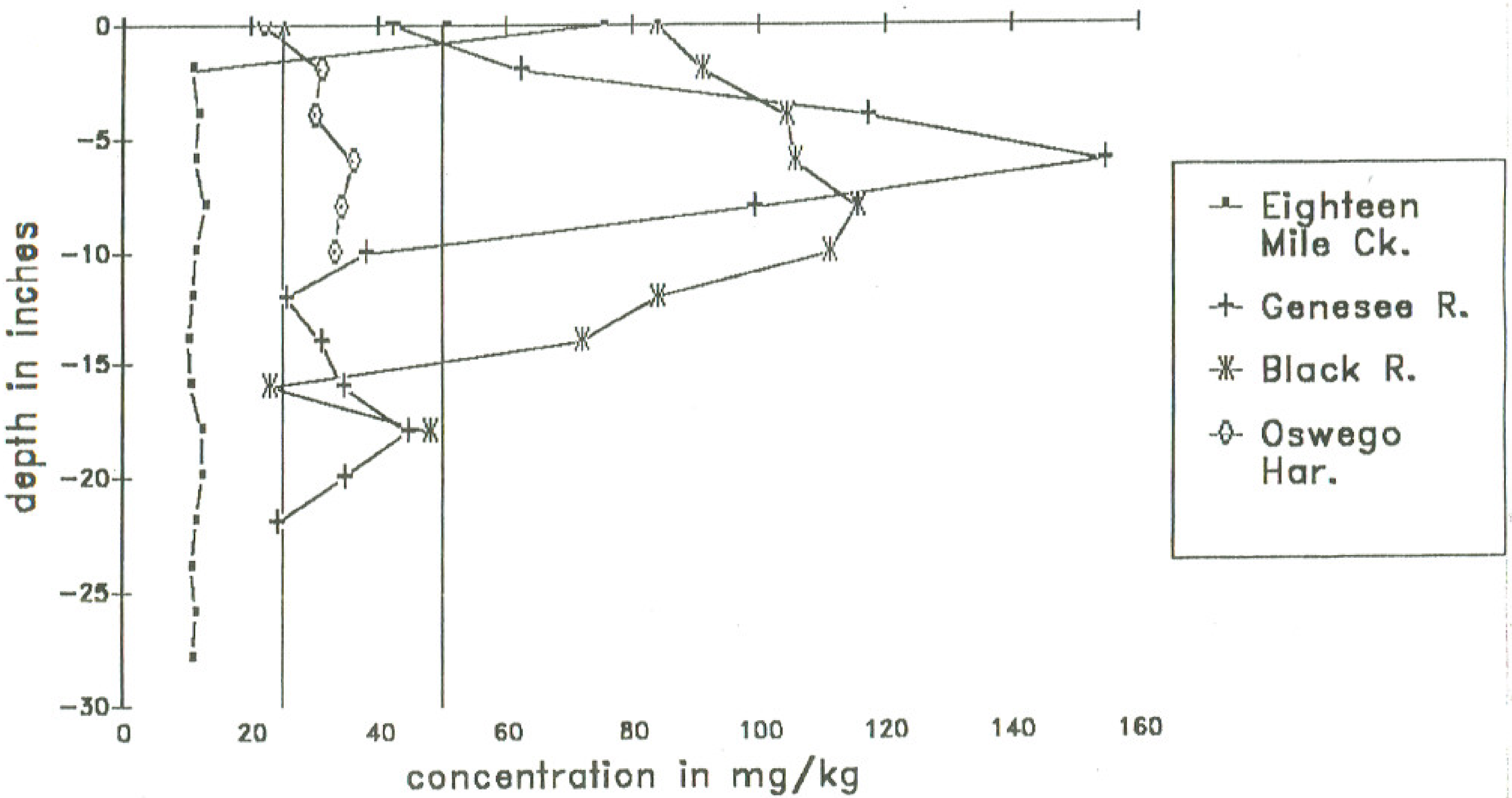
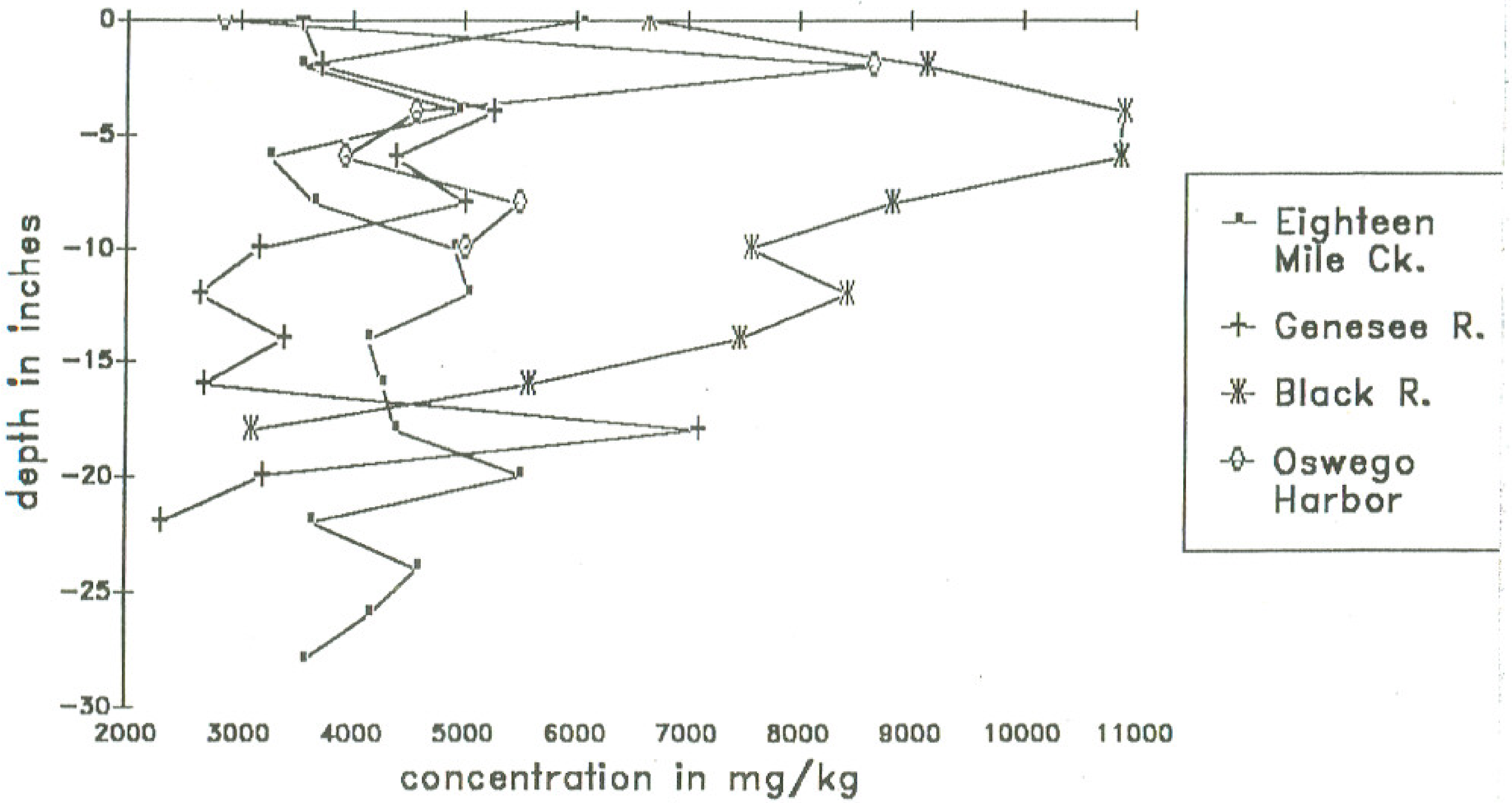


Figure 14. Mean total organic carbon concentrations (TOC-1)



EIGHTEENMILE CREEK SEDIMENTS

all concentrations in mg/kg

SITE		depth (inches)	km from mouth	%TVS	TOC-1	TOC-2	AS	PB	HG	SE
Rt. 104 BRIDGE CONTROL SAMPLES										
50 FT DOWNSTREAM	NYSDEC 12	GRAB	10.01	7	NA	17600	3.3	34	0.11	<.5
50 FT UPSTREAM	NYSDEC 11	GRAB	10.01	5	NA	12800	2.9	21	<.04	<.5
50 FT UPSTREAM	NYSDEC 10	GRAB	10.01	9	NA	21300	2.8	44	0.31	<.5
AT RT. 104 BRIDGE	NYSDEC 9	GRAB	10.01	7	8670	23000	8.3	216	0.04	<.5
TEST SAMPLES										
CLINTON ST.	NYSDEC 8	PONAR	13.66	9	5560	9400	4.1	1330	1.8	<.5
CLINTON ST. (reanalysis)	NYSDEC 8	PONAR	13.66	NA	NA	NA	4.7	1320	1.8	<.5
CONFLUENCE WITH THE GULF	NYSDEC 7	GRAB	12.57	14	18800	72000	4.9	1120	0.27	<.5
NEWFANE DAM. EAST	NYSDEC 6	0-7	5.1	21	9190	12400	12.9	4760	2.7	0.9
NEWFANE DAM. EAST	NYSDEC 6	7-13.5	5.1	18	10300	12700	12.6	3450	2.2	0.8
BURT DAM, WEST	NYSDEC 5	0-5	2.01	14	15900	27800	7.5	1090	0.6	0.6
BURT DAM, WEST	NYSDEC 5	5-10	2.01	15	13100	42300	7.4	934	0.5	0.8
BURT DAM. WEST	NYSDEC 5	10-15	2.01	17	11500	32500	10.2	1450	0.7	0.8
BURT DAM, WEST	NYSDEC 5	15-20	2.01	25	18000	24300	11.2	3600	2.2	1
BURT DAM. WEST	NYSDEC 5	20-25	2.01	22	11900	34000	10.7	4100	1.6	0.8
BURT DAM, CENTER	NYSDEC 4	0-5	2.01	15	12500	29700	6.3	507	0.5	0.5
BURT DAM. CENTER	NYSDEC 4	5-10	2.01	15	8770	19700	5.8	610	0.5	<.5
BURT DAM. EAST	NYSDEC 3	0-5	2.01	21	11600	25600	6.3	741	0.6	<.5
BURT DAM. EAST	NYSDEC 3	5-10	2.01	15	12200	13500	6.6	867	0.6	0.9
BURT DAM. EAST	NYSDEC 3	10-16	2.01	25	9410	19200	10	2280	1.1	0.9
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	0-2	0.52	8	5560	27500	1.9	100	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	2-4	0.52	7	2500	23400	1.9	30	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	4-6	0.52	6	3000	19300	2	20	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	6-8	0.52	7	1210	39100	1.7	16	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	8-10	0.52	9	1900	13600	1.6	4	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	10-12	0.52	7	3150	22400	1.8	3.4	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	12-14	0.52	7	2080	25100	1	3.4	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	14-16	0.52	7	2530	22500	1.2	3.5	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	16-18	0.52	7	1830	27900	1.2	3.2	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	18-20	0.52	8	2150	27100	1.8	3.3	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	20-22	0.52	10	5840	34500	1.4	3.5	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	22-24	0.52	10	2830	23200	1.1	3.2	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	24-26	0.52	9	2540	30000	<1	2.9	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	26-28	0.52	12	3280	41200	<1	3.1	<.04	<.5
UPSTREAM OF RT. 18 BRIDGE	NYSDEC 2	28-30	0.52	13	3090	42600	<1	3.3	0.05	<.5
OLCOTT BAR	NYSDEC 1	0-2	0.2	8	6560	39700	1.8	4	<.04	<.5
OLCOTT BAR	NYSDEC 1	2-4	0.2	10	4580	36300	1.5	3.6	<.04	<.5
OLCOTT BAR	NYSDEC 1	4-6	0.2	9	6910	49300	2	3.6	<.04	<.5
OLCOTT BAR	NYSDEC 1	6-8	0.2	9	5320	50000	1.9	3.2	<.04	<.5
OLCOTT BAR	NYSDEC 1	8-10	0.2	15	5430	45300	1.2	3.4	<.04	<.5
OLCOTT BAR	NYSDEC 1	10-12	0.2	12	6700	39500	2.2	3.4	<.04	<.5
OLCOTT BAR	NYSDEC 1	12-14	0.2	12	8010	52800	1.7	3.4	<.04	<.5
OLCOTT BAR	NYSDEC 1	14-16	0.2	9	5780	30100	1.2	3.3	<.04	<.5
OLCOTT BAR	NYSDEC 1	16-18	0.2	10	6730	24600	1.8	3.6	<.04	<.5
OLCOTT BAR	NYSDEC 1	18-20	0.2	10	6640	18000	1.7	3.6	<.04	<.5
OLCOTT BAR	NYSDEC 1	20-22	0.2	10	5190	98800	1.3	3.4	<.04	<.5
OLCOTT BAR	NYSDEC 1	22-24	0.2	11	4470	20400	1.3	3.6	<.04	<.5
OLCOTT BAR	NYSDEC 1	24-26	0.2	9	6650	34200	1.2	3.5	<.04	<.5
OLCOTT BAR	NYSDEC 1	26-28	0.2	8	5060	22200	1.8	3.4	<.04	<.5
OLCOTT BAR	NYSDEC 1	28-30	0.2	6	4090	18500	2	20	<.04	<.5

EIGHTEENMILE CREEK SEDIMENTS (cont.) all concentrations in mg/kg

	depth (inches)	BE	AG	BA	CD	CO	CR	CU	FE	MN	NI	SR	TI	VN	ZN	MO
CONTROL SAMPLES																
NYSDEC 12	GRAB	2	<4	159	<2	7.2	20	23	28010	443	28	57	122	37	175	<8
NYSDEC 11	GRAB	2.3	<4	166	<2	11	20	13	31900	1370	28	30	198	43	95	<8
NYSDEC 10	GRAB	1.7	<4	205	<2	6.3	17	28	23600	282	23	33	80	30	770	<8
NYSDEC 9	GRAB	2.3	<4	156	<2	15	34	142	38700	1100	32	55	121	36	564	<8
TEST SAMPLES																
NYSDEC 8	PONAR	1.6	<4	150	2.9	5.3	91	605	26600	802	50	108	73	23	790	8
NYSDEC 8	PONAR	1.6	4	158	<2	5.2	95	650	27600	867	49	107	108	24	833	<8
NYSDEC 7	GRAB	1.8	<4	108	<2	5.8	329	718	27900	378	59	76	66	38	2700	12
NYSDEC 6	0-7	2.4	5	368	9.4	25	1390	2750	39300	453	895	137	237	101	21200	116
NYSDEC 6	7-13.5	2.1	<4	187	12	27	1080	2060	33600	450	822	106	39	69	14700	62
NYSDEC 5	0-5	2.9	<4	325	3.9	28	371	635	48500	592	377	86	191	78	3300	40
NYSDEC 5	5-10	2.9	<4	320	3.4	27	331	560	47800	596	323	87	119	75	3010	30
NYSDEC 5	10-15	2.7	<4	352	6.7	31	754	810	47400	528	445	92	90	100	3320	98
NYSDEC 5	15-20	2.6	<4	399	9.7	17	2160	2280	47000	397	479	158	247	109	13800	110
NYSDEC 5	20-25	2.8	<4	385	6	22	930	1760	48500	476	458	131	206	84	11200	44
NYSDEC 4	0-5	3.1	<4	315	2.2	15	162	316	44200	1050	90	89	226	74	1340	8
NYSDEC 4	5-10	2.7	<4	320	2.8	20	181	339	40400	1260	132	99	81	62	1700	8
NYSDEC 3	0-5	2.8	<.4	316	<2	18	258	422	44500	800	231	124	197	66	2150	17
NYSDEC 3	5-10	2.8	<4	304	3	21	304	519	45600	713	318	110	99	62	2460	23
NYSDEC 3	10-16	2.9	<4	403	9	24	1260	1430	51500	563	520	117	142	108	6950	111
.YSDEC 2	0-2	1.9	<4	96	<2	8.5	25	10	25700	324	30	28	116	39	86	<8
NYSDEC 2	2-4	1.9	<4	119	<2	9.2	25	9.9	26800	337	27	23	170	41	81	<8
NYSDEC 2	4-6	1.9	<4	126	<2	9.3	25	12	27000	328	27	27	147	40	75	<8
NYSDEC 2	6-8	1.9	<4	133	<2	9.6	25	11	26900	311	27	23	169	42	75	<8
NYSDEC 2	8-10	1.8	<4	120	<2	8.9	23	13	25400	310	28	21	66	35	81	<8
NYSDEC 2	10-12	1.7	<4	107	<2	8.3	20	8.9	25000	298	24	23	156	35	61	<8
NYSDEC 2	12-14	1.6	<4	105	<2	7.8	19	9	24800	283	24	20	213	34	59	<8
NYSDEC 2	14-16	1.7	<4	117	<2	8	22	8.8	24800	264	24	<20	153	38	60	<8
NYSDEC 2	16-18	1.7	<4	118	<2	8.3	22	9.3	25500	282	26	<20	93	37	63	<8
NYSDEC 2	18-20	1.8	<4	125	<2	9	23	12	26600	301	27	22	193	41	70	<8
NYSDEC 2	20-22	1.9	<4	121	<2	9.2	23	12	27600	325	28	21	173	39	75	<8
NYSDEC 2	22-24	1.6	<4	99	<2	9	20	10	24400	290	26	<20	169	33	66	<8
NYSDEC 2	24-26	1.5	<4	95	<2	8.3	19	9.8	23400	283	26	<20	156	32	65	<8
NYSDEC 2	26-28	1.5	<4	100	<2	9	18	12	23400	295	26	<20	152	28	68	<8
NYSDEC 2	28-30	1.5	<4	103	<2	8.6	19	11	23400	284	26	<20	148	32	67	<8
NYSDEC 1	0-2	1.7	<4	82	<2	5.9	32	141	19900	177	22	<20	385	29	229	<8
NYSDEC 1	2-4	1.9	<4	134	<2	9	25	12	23300	301	29	24	139	40	81	<8
NYSDEC 1	4-6	2	<4	136	<2	9.7	25	12	28100	293	29	24	180	42	80	<8
NYSDEC 1	6-8	2	<4	139	<2	9.6	24	12	26900	279	28	24	217	41	77	<8
NYSDEC 1	8-10	2	<4	150	<2	11	26	13	27200	305	30	25	126	41	83	<8
NYSDEC 1	10-12	2	<4	164	<2	8.5	26	14	26700	295	28	25	218	43	82	<8
NYSDEC 1	12-14	1.9	<4	154	<2	9.1	24	13	25700	291	27	25	188	41	79	<8
NYSDEC 1	14-16	1.7	<4	139	<2	7.9	21	12	23600	268	26	21	31	31	75	<8
NYSDEC 1	16-18	1.8	<4	148	<2	10	26	12	24600	279	28	22	45	35	82	<8
NYSDEC 1	18-20	1.9	<4	153	<2	8.2	25	13	26400	288	29	28	88	40	82	<8
NYSDEC 1	20-22	1.8	<4	138	<2	8.5	23	13	25200	285	27	25	158	38	79	<8
NYSDEC 1	22-24	1.8	<4	142	<2	8.8	23	13	24900	284	28	25	15	30	80	<8
NYSDEC 1	24-26	1.7	<4	131	<2	8.8	21	12	24000	265	26	22	186	34	76	<8
NYSDEC 1	26-28	2	<4	162	<2	8.9	26	11	26600	280	28	23	198	44	86	<8
NYSDEC 1	28-30	2.1	<4	182	<2	8.9	28	11	27900	283	30	21	209	46	81	<8

EIGHTEENMILE CREEK SEDIMENTS (cont.) all concentrations in mg/kg

	depth (inches)	SB	SN	TH	AL	Aroclors 1221	1016/ 1242	1248	1254	1260
CONTROL SAMPLES										
NYSDEC 12	GRAB	<20	<20	<10	24500	NA	NA	NA	NA	NA
NYSDEC 11	GRAB	<20	<20	<10	25400	NA	NA	NA	NA	NA
NYSDEC 10	GRAB	<20	<20	<10	20100	NA	NA	NA	NA	NA
NYSDEC 9	GRAB	<20	<20	<10	23800	<.001	<.001	<.001	<.001	<.001
TEST SAMPLES										
NYSDEC 8	PONAR	<20	20	<10	9800	SL	SL	SL	SL	SL
NYSDEC 8	PONAR	<20	54	<10	11700	NA	NA	NA	NA	NA
NYSDEC 7	GRAB	<20	108	<10	28700	<.001	0.026	0.009	<.001	<.001
NYSDEC 6	0-7	<20	1100	<10	35800	<.001	<.001	<.001	<.001	<.001
NYSDEC 6	7-13.5	<20	25	<10	29000	<.001	<.001	<.001	<.001	<.001
NYSDEC 5	0-5	<20	158	<10	42200	<.001	<.001	<.001	<.001	<.001
NYSDEC 5	5-10	<20	118	<10	42300	<.001	<.001	<.001	<.001	<.001
NYSDEC 5	10-15	<20	142	<10	35000	<.001	<.001	<.001	<.001	<.001
NYSDEC 5	15-20	<20	888	<10	40400	<.001	<.001	<.001	<.001	<.001
NYSDEC 5	20-25	<20	568	<10	38500	<.001	<.001	<.001	<.001	<.001
NYSDEC 4	0-5	<20	87	<10	45100	<.001	<.001	<.001	<.001	<.001
NYSDEC 4	5-10	<20	33	<10	37600	<.001	<.001	<.001	<.001	<.001
NYSDEC 3	0-5	<20	132	<10	37800	<.001	<.001	<.001	<.001	<.001
YSDEC 3	5-10	<20	60	<10	36800	<.001	<.001	<.001	<.001	<.001
NYSDEC 3	10-16	<20	280	<10	36600	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	0-2	<20	<20	<10	25000	<.001	0.007	<.001	<.001	<.001
NYSDEC 2	2-4	<20	<20	<10	25900	<.001	0.005	<.001	<.001	<.001
NYSDEC 2	4-6	<20	<20	<10	25800	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	6-8	<20	<20	<10	26700	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	8-10	<20	<20	<10	23800	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	10-12	<20	<20	<10	21700	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	12-14	<20	<20	<10	20900	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	14-16	<20	<20	<10	24200	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	16-18	<20	<20	<10	24100	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	18-20	<20	<20	<10	25400	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	20-22	<20	<20	<10	24000	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	22-24	<20	<20	<10	19900	<.001	0.001 [SU]	<.001	<.001	<.001
NYSDEC 2	24-26	<20	<20	<10	19300	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	26-28	<20	<20	<10	17000	<.001	<.001	<.001	<.001	<.001
NYSDEC 2	28-30	<20	<20	<10	19100	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	0-2	<20	<20	<10	17100	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	2-4	<20	<20	<10	24900	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	4-6	<20	<20	<10	25300	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	6-8	<20	<20	<10	25600	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	8-10	<20	<20	<10	26200	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	10-12	<20	<20	<10	26600	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	12-14	<20	<20	<10	24400	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	14-16	<20	<20	<10	20500	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	16-18	<20	<20	<10	23100	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	18-20	<20	<20	<10	25400	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	20-22	<20	<20	<10	23400	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	22-24	<20	<20	<10	21700	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	24-26	<20	<20	<10	20700	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	26-28	<20	<20	<10	28500	<.001	<.001	<.001	<.001	<.001
NYSDEC 1	28-30	<20	<20	<10	29800	<.001	<.001	<.001	<.001	<.001

GENESEE RIVER SEDIMENTS
(all concentrations in mg/kg)

SITE	depth (inches)	%TVS	TOC-1	TOC-2	AS	PB	HG	SE	BE	AG	BA	CD	CO	CR	CU
NYSDEC 1	0-2	2	1060	5900	2.9	18	<.04	<.5	1.1	<4	60	<2	4.9	14	20
NYSDEC 1	2-4	3	1160	11400	3.1	18	<.04	<.5	1.1	<4	58	<2	4.1	14	20
NYSDEC 1	4-6	3	1740	7940	3.5	20	<.04	<.5	1.1	<4	82	<2	5	16	26
NYSDEC 1	6-8	2	1610	7300	2.5	17	<.04	<.5	0.9	<4	68	<2	4.5	13	15
NYSDEC 1	8-10	2	3200	11500	4.3	36	0.66	<.5	1.1	<4	105	2.1	5	19	28
NYSDEC 1	10-12	2	2450	6200	6.3	29	0.23	<.5	1	<4	100	2	4.1	17	24
NYSDEC 1	12-14	2	812	3200	2.4	18	0.05	<.5	0.9	<4	75	<2	3.1	9.6	9.7
NYSDEC 1	14-16	3	4090	7500	5.7	52	0.13	<.5	1.7	6.3	459	11	7.9	34	41
NYSDEC 1	16-18	4	4010	11000	6.7	70	0.29	<.5	1.7	<4	520	13	7.6	39	52
NYSDEC 1	18-20	4	7410	12775	6.4	62	0.23	<.5	1.7	26	730	19	7.6	43	52
NYSDEC 1	20-22	3	2500	8300	5.6	45	0.13	<.5	1.5	<4	510	6.2	7.5	28	35
NYSDEC 2	0-2	9	3810	44100	6.3	83	0.42	0.5	1.5	<4	324	3.2	6.5	34	67
NYSDEC 2	2-4	20	6130	17700	7.2	174	0.96	0.5	1.5	<4	716	9.1	6.5	58	129
NYSDEC 2	4-6	20	9730	63500	8.8	310	2.7	1.2	1.8	<4	1630	28	7.6	138	290
NYSDEC 2	6-8	18	7700	7470	12	395	3.7	1.3	2	<4	3020	40	7.7	211	411
NYSDEC 2	8-10	11	8620	19100	10	192	1.5	1	1.9	18	1480	19	8	115	226
NYSDEC 2	10-12	16	4460	26300	7.4	65	0.34	<.5	1.6	<4	379	4.3	6.8	36	58
NYSDEC 2	12-14	9	4740	20000	6.1	44	0.16	<.5	1.5	<4	214	2.3	7	24	42
NYSDEC 2	14-16	4	3360	12760	4.7	37	0.17	<.5	1.4	<4	129	<2	5.5	17	28
NYSDEC 2	16-18	6	1810	9480	5.2	28	0.12	<.5	1.2	<4	133	<2	5.3	15	27
NYSDEC 3	0-2	4	5740	17300	6.1	37	0.08	<.5	1.9	<4	139	<2	7.8	27	39
NYSDEC 3	2-4	4	3830	15200	6.6	37	0.1	<.5	1.9	16	132	<2	8.4	25	38
NYSDEC 3	4-6	4	4320	26000	5.6	40	0.08	<.5	1.9	<4	139	<2	7.8	26	36
NYSDEC 3	6-8	4	3830	17300	5.4	43	0.08	<.5	1.8	<4	143	2.8	7.3	26	38
NYSDEC 3	8-10	4	3210		5.5	43	0.05	<.5	1.8	<4	138	2.7	7.5	26	44
NYSDEC 3	10-12	4	2590	18000	5.1	31	0.05	<.5	1.7	<4	120	<2	6.8	22	32
NYSDEC 3	12-14	3	2390	10200	4.2	29	<.04	<.5	1.3	<4	103	2	5.5	18	25
NYSDEC 3	14-16	3	2730	10700	4.2	24	<.04	<.5	1.4	<4	104	<2	6.3	18	24
NYSDEC 3	16-18	3	2230	14000	4.8	19	<.04	<.5	1.6	<4	109	<2	6.7	19	24
NYSDEC 3	18-20	4	6790	23300	5.5	38	0.04	<.5	1.7	12	164	3.2	7.6	25	37
NYSDEC 3	20-22	4	3910	18725	6.4	36	<.04	<.5	1.8	9	127	2.4	8	25	34
NYSDEC 3	22-24	3	2310	10700	5.5	21	<.04	<.5	1.6	<4	96	<2	7	19	24
NYSDEC 3	24-26	3	3830	12500	5.4	21	<.04	<.5	1.7	<4	101	<2	7.2	20	25

GENESEE RIVER SEDIMENTS (cont.) all concentrations in mg/kg

SITE	depth (inches)	FE	MN	NI	SR	TI	VN	ZN	MO	SB	SN	TH	AL
NYSDEC 1	0-2	16600	266	16	25	168	20	76	<8	<20	<20	<10	9890
NYSDEC 1	2-4	17400	267	15	25	365	22	70	<8	<20	<20	<10	9430
NYSDEC 1	4-6	17100	285	17	29	142	20	91	<8	<20	<20	<10	10800
NYSDEC 1	6-8	14800	212	14	22	104	15	71	<8	<20	<20	<10	8970
NYSDEC 1	8-10	19300	267	17	28	258	23	120	<8	<20	<20	<10	11600
NYSDEC 1	10-12	17800	241	16	24	197	21	108	<8	<20	<20	<10	10700
NYSDEC 1	12-14	17100	209	11	<20	473	22	49	<8	<20	<20	<10	7780
NYSDEC 1	14-16	27500	491	31	50	162	29	279	<8	<20	<20	<10	18200
NYSDEC 1	16-18	27300	485	34	53	118	28	341	<8	<20	<20	<10	18100
NYSDEC 1	18-20	26900	463	33	55	191	27	424	<8	<20	<20	<10	17600
NYSDEC 1	20-22	24300	530	30	43	136	23	264	<8	<20	<20	<10	14100
NYSDEC 2	0-2	23200	485	30	50	70	23	259	<8	<20	<20	<10	14200
NYSDEC 2	2-4	22500	375	34	6868	58	23	506	<8	<20	<20	<10	13500
NYSDEC 2	4-6	27800	437	53	111	115	30	1240	<8	<20	32	<10	16900
NYSDEC 2	6-8	30000	444	59	164	138	34	1900	<8	<20	50	<10	19100
NYSDEC 2	8-10	29000	545	38	103	178	34	951	<8	<20	22	<10	18300
NYSDEC 2	10-12	23900	405	25	44	88	27	256	<8	<20	<20	<10	15300
NYSDEC 2	12-14	24100	437	23	36	84	26	168	<8	<20	<20	<10	14300
NYSDEC 2	14-16	21500	366	22	35	140	22	106	<8	<20	<20	<10	13200
YSDEC 2	16-18	18200	304	20	27	66	19	93	<8	<20	<20	<10	11500
NYSDEC 3	0-2	29300	543	30	50	92	32	152	<8	<20	<20	<10	21500
NYSDEC 3	2-4	28400	536	30	49	159	31	147	<8	<20	<20	<10	20200
NYSDEC 3	4-6	28100	485	30	46	96	28	153	<8	<20	<20	<10	19700
NYSDEC 3	6-8	26500	512	31	44	29	24	173	<8	<20	<20	<10	17700
NYSDEC 3	8-10	26000	487	28	47	67	27	160	<8	<20	<20	<10	17400
NYSDEC 3	10-12	25200	476	27	42	46	27	122	<8	<20	<20	<10	17300
NYSDEC 3	12-14	19600	373	20	32	79	21	108	<8	<20	<20	<10	12800
NYSDEC 3	14-16	20900	385	23	33	44	22	103	<8	<20	<20	<10	13900
NYSDEC 3	16-18	23400	473	25	36	66	26	92	<8	<20	<20	<10	16200
NYSDEC 3	18-20	26800	620	30	45	20	27	150	<8	<20	<20	<10	17200
NYSDEC 3	20-22	27600	563	29	44	149	31	160	<8	<20	<20	<10	18400
NYSDEC 3	22-24	24800	492	26	37	107	28	97	<8	<20	<20	<10	17000
NYSDEC 3	24-26	25200	591	27	41	87	28	92	<8	<20	<20	<10	17300

GENESEE RIVER SEDIMENTS (cont.) all concentrations in mg/kg

SITE	depth (inches)	Aroclors 1221	1016/ 1242	1248	1254	1260
NYSDEC 1	0-2	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	2-4	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	4-6	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	6-8	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	8-10	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	10-12	<.01	<.01	<.01	<.01	<.01
NYSDEC 1	12-14	<.001	<.001	0.016	0.016	<.001
NYSDEC 1	14-16	<.001	<.001	0.053	0.027	<.001
NYSDEC 1	16-18	<.001	<.001	0.075	0.039	<.001
NYSDEC 1	18-20	<.001	<.001	0.088	0.037	<.001
NYSDEC 1	20-22	<.001	<.001	0.034	0.041	<.001
NYSDEC 2	0-2	<.02	<.02	0.24	0.26	<.02
NYSDEC 2	2-4	<.02	<.02	0.43	0.36	<.02
NYSDEC 2	4-6	<.05	<.05	1	0.48	<.05
NYSDEC 2	6-8	<.05	<.05	1.3	0.53	<.05
NYSDEC 2	8-10	<.01	<.01	0.56	0.27	<.01
NYSDEC 2	10-12	<.01	<.01	0.1	0.13	<.01
NYSDEC 2	12-14	<.03	<.03	0.02 [SU]	[UI]	<.03
NYSDEC 2	14-16	<.01	<.01	0.06	0.09	<.01
SDEC 2	16-18	<.01	<.01	0.12	0.12	<.01
NYSDEC 3	0-2	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	2-4	<.02	<.02	<.02	<.02	<.02
NYSDEC 3	4-6	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	6-8	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	8-10	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	10-12	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	12-14	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	14-16	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	16-18	<.01	<.01	<.01	<.01	<.01
NYSDEC 3	18-20	<.01	<.01	<.01	0.01 [SU]	<.01
NYSDEC 3	20-22	<.01	<.01	<.01	0.01 [SU]	<.01
NYSDEC 3	22-24	<.01	<.01	<.01	0.01 [SU]	<.01
NYSDEC 3	24-26	<.02	<.02	<.02	<.02	<.02

OSWEGO HARBOR SEDIMENTS
(all concentrations in mg/kg, depths in inches)

depth	%TVS	TOC-1	TOC-2	PCB	AS	PB	HG	SE	BE	AG	BA	CD	CO	CR	CU	FE	MN
0-2	3	2840	13300	0.019	ND	31	0.09	<.5	0.7	<4	75	<2	3.6	12	22	12200	277
2-4	4	8650	8740	0.028	2.6	35	0.15	<.5	0.8	<4	78	<2	3.4	14	31	13100	291
4-6	3	4560	8330	0.039	1.7	33	0.12	<.5	0.7	<4	67	<2	3.9	14	30	11600	259
6-8	4	3930	1000	0.044	2	38	0.27	<.5	0.8	<4	89	<2	3.8	18	36	13800	295
8-10	4	5500	16300	0.057	2.2	40	0.21	<.5	0.9	<4	96	<2	3.6	20	34	13400	349
10-13	5	5010	4110	0.069	1.8	38	0.27	<.5	0.8	<4	77	<2	4	20	33	13000	387

depth	NI	SR	TI	VN	ZN	MO	SB	SN	TH	AL	a-HCH	b-HCH	g-HCH	d-HCH	heptachlor
0-2	13	49	232	16	67	<8	<20	<20	<10	7190	<.001	<.001	<.001	<.001	<.001
2-4	15	55	236	18	80	<8	<20	<20	<10	8110	<.001	<.001	<.001	<.001	<.001
4-6	15	46	176	18	76	<8	<20	<20	<10	7760	<.001	<.001	<.001	<.001	<.001
6-8	19	50	221	19	100	<8	<20	<20	<10	8520	<.001	<.001	<.001	<.001	<.001
8-10	18	55	229	18	106	<8	<20	<20	<10	8900	<.001	<.001	<.001	<.001	<.001
10-13	17	59	199	18	112	<8	<20	<20	<10	9520	<.001	<.001	<.001	<.001	<.001

depth	p,p'-DDE	dieldrin	aldrin	heptachlo epoxide	endosulfan I	endrin	p,p'-DDD	endosulfan II
0-2	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001
2-4	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001
4-6	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001
6-8	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001
8-10	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001
10-13	TR	<.001	<.001	<.001	<.001	<.001	TR	<.001

depth	endrin aldehyde	endosulfan sulfate	p,p'DDT	methoxychlor	toxaphene	chlordane	mirex	Ar. 1221
0-2	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001
2-4	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001
4-6	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001
6-8	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001
8-10	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001
10-13	<.001	<.001	TR	<.02	<.02	<.002	<.001	<.001

depth (inches)	Ar. 1016/ 1242	Ar. 1248	Ar. 1254	Ar. 1260	2,4'-DDD	o,p'-DDE	o,p'-DDT
0-2	<.001	0.012	0.007	<.001	TR	UI	TR
2-4	<.001	0.0015	0.0013	<.001	TR	UI	TR
4-6	<.001	0.021	0.018	<.001	TR	UI	TR
6-8	<.001	0.026	0.018	<.001	TR	UI	TR
8-10	<.001	0.045	0.012	<.001	TR	UI	TR
10-13	<.001	0.04	0.029	<.001	TR	UI	TR

BLACK RIVER SEDIMENTS
(all concentrations in mg/kg)

SITE	depth (inches)	%TVS	Ar1248	TOC-1	TOC-2	AS	PB	HG	SE	BE	AG	BA	CD	CO	CR	CU	FE
SOUTH SHORE	0-2	21	0.2	11700	130000	4.9	167	3.9	0.5	2.7	<4	138	2	8	42	122	27600
SOUTH SHORE	2-4	15	0.03	10300	106000	4	166	1.6	<.5	2.6	<4	105	<2	8.6	41	127	28300
SOUTH SHORE	4-6	15	0.1	10800	83300	3.4	152	1.4	<.5	2.2	<4	100	<2	6.6	33	133	26000
SOUTH SHORE	6-8	18	0.05	9300	105000	3.8	139	1.6	<.5	2.1	<4	101	<2	7.8	32	111	23900
SOUTH SHORE	8-10	16	0.02	6800	211000	3.3	131	1.1	0.5	2.1	<4	101	<2	6.7	34	112	24800
SOUTH SHORE	10-12	16	0.03	4700	95000	3.2	132	1.1	<.5	2.1	<4	99	<2	6.4	30	117	24600
SOUTH SHORE	12-14	11	0.02	4800	52800	2.3	71	0.9	<.5	2	<4	90	<2	6.4	26	51	23900
SOUTH SHORE	14-16	12	0.02	4900	78500	1.3	76	1.1	<.5	2	<4	89	<2	5	28	38	23500
SOUTH SHORE	16-18	11	0.03	2800	35600	1.3	65	1	<.5	1.7	<4	80	<2	4.2	25	32	21000
SOUTH SHORE	18-20	9	0.02	3100	68500	1.7	94	0.9	<.5	2	<4	86	<2	4.8	25	48	24500
NORTH SHORE	0-2	15	0.01	5000	67600	3	76	0.5	<.5	2.2	<4	118	<2	6.1	29	71	24300
NORTH SHORE	2-4	19	<.003	13200	137000	4	85	0.5	<.5	2.3	<4	133	<2	6.3	32	77	25600
NORTH SHORE	4-6	22	<.001	7700	93800	4.2	95	0.4	<.5	2.4	<4	134	<2	7	37	93	26700
NORTH SHORE	6-8	18	<.001	7200	92800	3.9	194	0.8	<.5	2.2	<4	132	<2	5.8	53	107	25400
NORTH SHORE	8-10	24	<.001	7400	110000	4.5	147	2.2	<.5	1.9	<4	109	<2	4.7	34	143	21300
NORTH SHORE	10-12	19	<.001	8700	52600	3.2	87	1	<.5	1.7	<4	100	<2	4.9	24	96	20000
NORTH SHORE	12-14	17	<.001	7300	127000	3.6	83	1.5	<.5	2	<4	110	<2	5.9	24	105	25000
NORTH SHORE	14-17	12	<.001	5500	29100	1.9	56	0.6	<.5	1.8	<4	98	<2	5.9	21	72	24000
END OF ISLAND	0-2	14		3200	63300	2.6	59	0.7	<.5	2.2	<4	83	<2	7	21	58	23800
END OF ISLAND	2-4	15		3900	34200	3.4	74	0.6	<.5	2.4	<4	94	<2	8.2	24	69	25200
END OF ISLAND	4-6	18		14200	93500	3.6	124	1.7	<.5	2.4	<4	102	<2	9.2	35	87	23800
END OF ISLAND	6-8	20		16100	12200	3.6	124	2.6	<.5	2	<4	89	<2	6.8	33	99	22200
END OF ISLAND	8-10	22		12300	76000	5.2	113	8.6	<.5	2.3	<4	98	<2	7.4	37	92	24000
END OF ISLAND	10-12	23		9300	98900	5.2	129	4.7	0.5	2.4	<4	115	<2	7.6	42	121	26200
END OF ISLAND	12-14	19		13200	107000	3.5	117	1	0.6	2.5	<4	121	<2	9.1	41	96	29900
END OF ISLAND	14-16	20		12000	131000	3.7	111	0.8	<.5	2.1	<4	99	<2	7.9	31	106	25000

BLACK RIVER SEDIMENTS (CONT.)

SITE	depth (inches)	MN	NI	SR	TI	VN	ZN	MO	SB	SN	TH	AL
SOUTH SHORE	0-2	299	26	32	162	39	594	<8	<20	<20	<10	28600
SOUTH SHORE	2-4	342	28	23	272	38	529	<8	<20	28	<10	23300
SOUTH SHORE	4-6	296	19	21	400	35	410	<8	<20	<20	<10	22200
SOUTH SHORE	6-8	305	21	<20	172	30	429	<8	<20	<20	<10	21000
SOUTH SHORE	8-10	286	22	<20	182	34	386	<8	<20	<20	<10	22800
SOUTH SHORE	10-12	273	20	<20	272	35	330	<8	<20	<20	<10	22100
SOUTH SHORE	12-14	262	18	<20	438	40	164	<8	<20	<20	<10	22700
SOUTH SHORE	14-16	274	18	<20	342	39	143	<8	<20	<20	<10	22700
SOUTH SHORE	16-18	237	15	<20	312	35	125	<8	<20	<20	<10	20500
SOUTH SHORE	18-20	312	16	<20	235	32	184	<8	<20	<20	<10	18300
NORTH SHORE	0-2	262	26	<20	631	43	204	<8	<20	<20	<10	26100
NORTH SHORE	2-4	244	27	<20	416	46	225	<8	<20	<20	<10	29400
NORTH SHORE	4-6	246	27	<20	408	48	215	<8	<20	<20	<10	30400
NORTH SHORE	6-8	229	25	<20	296	43	216	<8	<20	<20	<10	27800
NORTH SHORE	8-10	191	23	<20	484	35	235	<8	<20	<20	<10	21000
NORTH SHORE	10-12	177	19	<20	357	34	169	<8	<20	<20	<10	21300
NORTH SHORE	12-14	221	20	<20	496	39	182	<8	<20	<20	<10	23700
NORTH SHORE	14-17	207	20	<20	250	32	127	<8	<20	<20	<10	20000
END OF ISLAND	0-2	262	20	<20	270	30	346	<8	<20	<20	<10	19500
END OF ISLAND	2-4	267	21	21	285	34	410	<8	<20	<20	<10	21800
END OF ISLAND	4-6	235	25	23	117	28	553	<8	<20	<20	<10	20400
END OF ISLAND	6-8	20	23	20	342	28	480	<8	<20	<20	<10	19200
END OF ISLAND	8-10	213	25	<20	184	32	586	<8	<20	<20	<10	22700
END OF ISLAND	10-12	221	28	22	150	38	534	<8	<20	20	<10	26400
END OF ISLAND	12-14	263	28	<20	184	43	435	<8	<20	25	<10	26900
END OF ISLAND	14-16	213	26	23	158	34	291	<8	<20	<20	<10	22300

NIAGARA COUNTY SOIL AND WATER CONSERVATION DISTRICT

4487 LAKE AVENUE
LOCKPORT, NEW YORK 14094
TELEPHONE: 434-4949

January 2, 1990

Linda

Niagara County Health Department
Enviornmental Division
5467 Upper Mountain Road
Lockport, NY 14094

Dear Sir:

The Niagara County SWCD is trying to collect any data available on Water Quality Studies that have been done on the streams, creeks, rivers and lakes that encompass our county boundaries. If current water quality programs go as planned the Soil and Water Conservation Districts statewide will be assisting DEC and other agencies in planning and implementation work on non-point source pollution problems.

[illegible] want to collect any existing data available on water quality studies that have been done [illegible] are in the process of being done. This information will be placed in a library that will be available to the public and other involved agencies. The District plans on using this information for preparing applications and developing water quality strategies and plans for implementation of non-point source pollution problems.

The following is a list of watersheds we are interested in collecting any available data on:

- Bonds Lake
- Jeddo Creek
- Johnson Creek
- Eighteen Mile Creek
- Twelve Mile Creek
- Four Mile Creek
- Bull Creek
- Tonawanda Creek
- Cayuga and Black Creek
- Bergholtz Creek
- Niagara River
- Lake Ontario
- Erie Barge Canal

If there is a cost in obtaining this material, contact our office at 716-434-4949 and we will make the needed arrangements. Thank you for your time and efforts.

Yours In Conservation,

Richard Tillman

Richard Tillman
District Manager

RT:sb

NIAGARA COUNTY
HEALTH DEPARTMENT
5467 UPPER MOUNTAIN ROAD
LOCKPORT, NEW YORK 14094

PATRICIA M. POWELL
Public Health Director
716-439-6129

January 11, 1990

Phillips Carter Service
2481 Lockport Olcott Road
Newfane, NY 14108

Attention: Robert Phillips

Re: 18 Mile Creek
Town of Newfane

Dear Mr. Phillips:

As a result of your correspondence dated December 18, 1989 concerning the above referenced matter I have attached the 1989-1990 Health Advisory for Consumption of Sportfish and Wildlife taken in New York State.

Although the primary contact for surface and ground water quality in New York State is the New York State Department of Conservation, you may also want to contact the Niagara County Soil & Water Conservation District. Attached for your information is a recent correspondence from the Niagara County Soil and Water Conservation District indicating that they are presently compiling data for public review.

Yours very truly,

Ronald Gwozdek, P.E.
Supervisory Public
Health Engineer

RG:lj

Attach.

NEW YORK STATE DEPARTMENT OF HEALTH

INTEROFFICE MEMORANDUM

To: Regional Offices
District Directors
County Health Commissioners/Public Health Directors

From: Dr. Nancy Kim, Director, Division of Environmental Health Assessment N.K.

Date: April 21, 1989

Subject: 1989-1990 Health Advisory for Consumption of Sportfish and Wildlife Taken in New York State

Attached is a copy of a draft press release and the 1989-1990 health advisory for sportfish and wildlife consumption which will be printed in the N.Y.S. Environmental Conservation Department's "New York State Fishing, Small Game Hunting and Trapping Regulations Guide." The new health advisory has been finalized; the wording in the draft press release may undergo minor revision and be released within one week.

Also attached is a draft public information brochure prepared by NYS DOH which is to accompany the health advisory. We will provide you with additional copies of the press release and this brochure for public distribution in the near future.

If you have any questions or want additional information please contact Mr. Tony Forti of my staff at (518) 458-6405.

NK/tf/pb
Attachments
A0630

cc: Dr. Randolph
Dr. Stasiuk
Dr. Hetling
Dr. Hawley
Dr. Grey
Mr. Smith
Mr. Tramontano
Mr. Hudson
Mr. Forti
Regional Directors of Environmental Health
Mr. Slocum

DRAFT PRESS RELEASE - 4/21/81

ALBANY, April -- The State Health Department's 1989-90 fish consumption advisories contain new recommendations for Mohawk River smallmouth bass, Kinderhook Lake white perch and Lake Champlain lake trout, plus some new advice on consuming eels from marine waters, tomalley from lobsters and mustard from crabs.

The advisories, which are published each fall in the State Department of Environmental Conservation (DEC) Fishing and Hunting Guide, are developed from data obtained in an ongoing DEC monitoring program. Fish samples from bodies of water statewide are analyzed for various contaminants and the results are assessed by Health Department toxicologists who revise or modify advisories based on the findings.

The Health Department's general advisory for fish consumption recommends that no more than one meal per week (one-half pound) of fish be eaten from any fresh water body in New York State, the Hudson River Estuary and the New York City Harbor areas and that women of childbearing age, infants and children under the age of 15 should not eat fish from waters which have been shown to be contaminated.

This year an advisory of Eat No More Than One Meal Per Month has been added for smallmouth bass taken from the Mohawk River below Lock #7 in Schenectady. This change was necessary because average PCB levels in this species exceeded the Federal Food and Drug Administration (FDA) limit of 2 parts per million (ppm). The previous advisory of Eat None for white perch from this same section of the river remains in effect.

A finding that the average PCB levels of white perch samples taken from Kinderhook Lake was less than the average FDA limit of 2 ppm has caused the former advisory of Eat No More Than One Meal Per Month to be discontinued. However, the general advisory of Eat No More Than One Meal Per Week , applying to all other fish species caught from this lake remains in effect. There is also a Eat No More than One Meal Per Month advisory for American eels taken from Kinderhook Lake.

A large number of lake trout samples collected by DEC and the Vermont Agency of Natural Resources from Lake Champlain showed that lake trout less than 25 inches in length have an average PCB level considerably below FDA's 2 ppm limit, while the average for larger lake trout exceeded that limit. This led the Health Department this year to limit the advisory to Eat No More Than One Meal Per Month of Lake Champlain lake trout to fish larger than 25 inches only. The former advisory was Eat No More Than One Meal Per Month for all lake trout regardless of size.

American eel samples gathered from New York State marine waters showed that these fish had average PCB levels less than the 2 ppm FDA limit for PCBs, but above levels generally found in marine fish species. To minimize PCB intake, the <u>Eat No More Than One Meal Per Week</u> advisory for bluefish has been extended to include the American eels caught in marine waters. American eels from the Hudson, Harlem and East Rivers, and New York Harbor should not be eaten at all.

The Health Department is advising the public to avoid the consumption of the hepatopancreas (sometimes called mustard in crab or tomalley in lobster) of certain crustaceans. This soft green substance found in the tail or body section of crab or lobster has been found to contain high levels of contaminants, including PCBs and heavy metals. For this reason, the hepatopancreas should not be eaten. In contrast, crab and lobster flesh, the part eaten by most people, generally contains much lower levels of these contaminants and is acceptable for human consumption.

There is a recommendation that no more than six crabs per week taken from the Hudson River and New York Harbor be eaten and that the cooking liquids from those crabs should be discarded.

The complete list of New York State fish advisories specific to species and body of water follows. Anglers fishing in waters of other states or Canadian provinces should consult advisory information from appropriate agencies in those areas.

This year The Health Department is making available a brochure which contains further information on the health advisory. This brochure can be obtained at NYSDEC and NYSDOH regional offices, or by calling 1-800-458-1158.

90670806

TABLE 1. PCB LEVELS IN FISH
SUBJECT TO W HEALTH ADVICE IN 1989

Waterbody	Year Collected	Species	No of Fish	Chemical Concentration (ppm) Average	Range
Mohawk River Below Lock #7	1987	Smallmouth Bass	7	2.1	0.9-3.9
Kinderhook Lake	1988	White Perch	10	0.69	0.05-1.9
Lake Champlain	1987 & 1988	Lake Trout ≤25"	22	0.99	0.22-2.4
		Lake Trout >25"	19	3.0	0.66-5.2
Atlantic Ocean and Long Island Sound	1986	American eels	229	0.87	<0.10-5.2

TABLE 2. CHEMICAL CONTAMINANTS DATA FOR LONG ISLAND SOUND LOBSTERS (COLLECTED IN 1986)

Number of Lobsters	Chemical	Tissue	Average Concentration (ppm)	Range
80	PCB	Muscle	<0.10	Not detected
	PCB	Hepatopancreas	3.2	0.66-9.1
	Cadmium	Muscle	0.05	<0.04-0.07
	Cadmium	Hepatopancreas	6.1	2.3-14

J680435

1989-90 HEALTH ADVISORY

The following recommendations are based on evaluating contaminant levels in fish and wildlife. To minimize potential adverse health impacts, the New York State Department of Health recommends:

- Eat no more than one meal (one half pound) per week of fish from the state's freshwaters, the Hudson River estuary, or the New York City harbor area (the New York waters of the Hudson River to the Verrazano Narrows Bridge, the East River to the Throgs Neck Bridge, the Arthur Kill, Kill Van Kull, and Harlem River), except as recommended below.
- Women of childbearing age, infants and children under the age of 15 should not eat fish with elevated contaminant levels. The fish species listed from the waters below have contaminant levels that exceed federal food standards and most fish taken from these waters contain elevated contaminant levels.
- Observe the following restrictions on eating fish from these waters and their tributaries to the first barrier impassable by fish:

Water	Species	Recommendation
Belmont Lake (Suffolk Co.)	Carp	Eat None.
Buffalo River and Harbor (Erie Co.)	Carp	Eat none.
Canadice Lake (Ontario Co.)	Lake or brown trout over 21"	Eat none.
Canandaigua Lake (Ontario-Yates Co.)	Lake trout over 24"	Eat no more than one meal per month.
Cayuga Creek (Niagara Co.)	All species	Eat none.
East River (NYC)	American eel	Eat none.
Fourth Lake (Herkimer-Hamilton Co.)	Lake trout	Eat none.
Freeport Reservoir (Nassau Co.)	All species	Eat no more than one meal per month.
Gill Creek (Niagara Co.; mouth to Hyde Park Lake Dam)	All species	Eat none.
Hall's Pond (Nassau Co.)	Carp, Goldfish	Eat none.
Harlem River (NYC)	American eel	Eat none.
Hoosic River (Rensselaer Co.)	Brown and rainbow trout	Eat no more than one meal per month.

Hudson River		
- Hudson Falls to Troy Dam	All species	No fishing.
- Troy Dam south to and including the Lower N.Y. Harbor	American eel, White perch, Carp, Goldfish, Brown bullhead, Largemouth bass, Pumpkinseed, White catfish, Walleye, Striped bass	Eat none.
	Black crappie, Rainbow smelt, Atlantic needlefish, Bluefish, Tiger muskellunge, Northern pike	Eat no more than one meal per month.
	Blue crab	Eat no more than 6 crabs per week.
	- hepatopancreas (mustard, liver or tomalley)	Eat none.
	- cooking liquid	Discard.
Indian Lake (Lewis Co.)	All species	Eat no more than one meal per month.
Irondequoit Bay	Carp	Eat none.
Keuka Lake (Yates-Steuben Co.)	Lake trout over 25"	Eat no more than one meal per month.
*Kinderhook Lake (Columbia Co.)	American eel	Eat no more than one meal per month.
*Lake Champlain		
-whole lake	Lake trout greater than 25"	Eat no more than one meal per month.
-Bay within Cumberland Head to Valcour Island	American eel, Brown bullhead	Eat no more than one meal per month.
Lake Ontario, St. Lawrence and Niagara River below the falls	Eel, Channel catfish, Lake trout, Chinook salmon, Coho salmon over 21", Rainbow trout over 25", Brown trout over 20".	Eat none.
	Carp, White perch, smaller Coho salmon, Rainbow and Brown trout.	Eat no more than one meal per month.

Loft's Pond (Nassau Co.)	Carp, Goldfish	Eat no more than one meal per month.
Long Pond (Lewis Co.)	Splake over 12"	Eat none.
Upper Massapequa Reservoir (Nassau Co.)	White perch	Eat no more than one meal per month.
*Mohawk River (Below Lock 7)	White perch	Eat none.
	Smallmouth bass	Eat no more than one meal per month.
Nassau Lake (Rensselaer Co.)	All species	Eat none.
Niagara River (entire)	Carp	Eat no more than one meal per month.
Niagara River (below the falls; also see Lake Ontario)	Smallmouth bass	Eat no more than one meal per month.
Onondaga Lake (Onondaga Co.)	All species	Eat none.
Oswego River (Oswego Co.; power dam in Oswego to upper dam at Fulton)	Channel catfish	Eat no more than one meal per month.
St. James Pond (Suffolk Co.)	All species	Eat no more than one meal per month.
St. Lawrence River (see Lake Ontario)		
Salmon River (Oswego Co.; mouth to Salmon Reservoir; also see Lake Ontario)	Smallmouth bass	Eat none.
Saw Mill River (Westchester Co.)	American eel	Eat no more than one meal per month.
Schroon Lake (Warren Co.)	Lake trout	Eat no more than one meal per month.
Sheldrake River (Westchester Co.)	American eel	Eat none.
Smith Pond Rockville Center (Nassau Co.)	All species	Eat no more than one meal per month.

Smith Pond Roosevelt Park (Nassau Co.)	Carp, Goldfish	Eat no more than one meal per month.
Spring Pond (Suffolk Co.)	All species	Eat none.
Stillwater Reservoir (Herkimer Co.)	Splake	Eat no more than one meal per month.
Valatie Kill - between Co. Rt. 18 and Nassau Lake	All species	Eat none.

Additional Advice

A brochure which provides further information on the health advisory is available from NYS DEC and NYS DOH Regional Offices or can be obtained by calling 1-800-458-1158.

The health implications of eating deformed or cancerous fish are unknown. Any grossly diseased fish should probably be discarded. Levels of PCB, mirex and possibly other contaminants of concern (except mercury) can be reduced by removing the skin and fatty portions along the back, sides and belly of smallmouth bass, brown trout, lake trout, coho salmon, striped bass, and bluefish. (This technique does not reduce mercury levels, however.) A guide to this method can be obtained from any DEC office.

*Marine Waters - The general advisory (eat no more than one meal per week) applies to bluefish and American eels but not to other fish species taken from marine waters. American eels from the Hudson, Harlem, and East Rivers and New York Harbor should not be eaten.

Marine Striped Bass - Eat no striped bass taken from the marine waters of Western Long Island, which includes that portion of the Island west of a line between Wading River and the terminus of Route 46 near Mastic Beach. Eat no more than one meal (1/2 pound) per month of striped bass taken from Eastern Long Island marine waters. Women of childbearing age, infants and children under 15 should not eat striped bass taken from Long Island marine waters. (Legal minimum length of marine striped bass is 33".)

*Marine Crabs and Lobsters - It is recommended that the hepatopancreas (liver, mustard, or tomalley) of crabs and lobsters not be eaten because this organ has high contaminant levels.

Snapping turtles - Snapping turtles retain contaminants in their fat, liver, eggs and to a lesser extent in the muscle. If you choose to consume snapping turtles, carefully trimming away all fat and discarding the fat, liver, and eggs prior to cooking the meat or preparing soup or other dishes will reduce exposure. Women of childbearing age, and children under the age of 15 should avoid ingesting snapping turtles or any soup or stew made with snapping turtle meat.

Waterfowl - It is recommended that you eat no mergansers and common goldeneyes since they are the most heavily contaminated waterfowl species. Other waterfowl should be skinned and all fat removed before cooking; stuffing should be discarded after cooking; limit eating to two meals per month. Monitoring data indicate that wood ducks and Canada geese are less contaminated than other waterfowl species with dabbler ducks and then diving ducks having increasingly higher contaminant levels.

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*Changes from the 1988-89 Health Advisory

D R A F T
4/21/89

NYS Department of Health

HEALTH ADVISORIES
FISHING AND HUNTING
CHEMICAL CONTAMINANTS

SUMMARY

The New York State Department of Health (DOH) issues an advisory on eating sportfish and wildlife taken in New York State because some of these foods contain potentially harmful levels of chemical contaminants. The health advisory is divided into three sections: (1) general advice on sportfish taken from waters in New York State; (2) advice on sportfish from specific water bodies; and (3) advice on wildlife. The advisory is developed and updated yearly and is directed to persons who may be likely to eat large quantities of sportfish or wildlife which might be contaminated.

BACKGROUND

Fishing and hunting provide many benefits including food and recreation. Many people enjoy cooking and eating their own catch. However, some fish and wildlife contain elevated levels of potentially harmful chemicals. These chemicals or contaminants enter the environment through such means as past industrial discharges, leaking landfills and the widespread use of pesticides. Fish and wildlife take in contaminants directly from the environment and from the food they eat. Some chemicals remain in them and then are ingested by people. DDT, PCBs, mirex, chlordane and mercury have been found in some species of fish taken in New York State at levels that exceed federal food standards. Long-term exposure to high levels of these chemicals has been linked to health effects such as cancer (in laboratory animals) or nervous system disorders (in humans).

The federal government establishes standards (tolerance levels or action levels) for chemical residues in or on raw agricultural products, including fish, in the United States. A tolerance level is the maximum amount of a residue expected when a pesticide is used according to the label directions, provided that the level is not an unacceptable health risk. The health risks are estimated assuming that people eat about one one-half pound fish meal each month. Action levels are established for chemicals that do not have approved agriculture uses but may unavoidably contaminate food due to their environmental persistence. Fish and wildlife cannot be legally sold if they contain a contaminant at a level greater than its tolerance or action level.

In New York State, the Department of Environmental Conservation (DEC) routinely monitors contaminant levels in fish and wildlife. The contaminant levels are measured in a skin-on fillet which has not been trimmed; the federal government uses this sample in determining whether or not the fish exceeds the tolerance level. When fish from a specific water body are found to contain high contaminant levels, DOH issues a sportfish consumption advisory for that species of fish. Under some circumstances, the state prohibits the sale or offering for sale of fish containing high contaminant levels. Advisories are also developed for contaminated wildlife. These actions are taken to minimize public exposure to contaminated food products.

GENERAL ADVISORY

The general health advisory for sportfish is that an individual eat no more than one meal (one-half pound) per week of fish from the state's freshwaters, the Hudson River estuary, or the New York City harbor area (the New York waters of the Hudson River to the Verrazano Narrows Bridge, the East River to the Throgs Neck Bridge, the Arthur Kill, Kill Van Kull, and Harlem River). This general advisory is designed to protect against consumption of large amounts of fish which may come from contaminated waterways that are as yet untested or which may contain unidentified contaminants. The general advisory does not apply to fish taken from marine waters. Ocean fish, although less tested, are generally less contaminated than freshwater fish, and fish that live further out from shore are likely to be even less contaminated than those that live or migrate close to the shore.

SPECIFIC FRESHWATER ADVISORIES

The second part of the health advisory contains information and recommendations for specific bodies of water. Fish monitoring has identified over thirty water bodies that have fish with a contaminant level that exceeds an action level or a tolerance level. Department of Health recommendations are based on the contaminant levels and suggest either limiting or avoiding eating a specific kind of fish from a particular body of water. In some cases, enough information is available to issue advisories based on the length of the fish. Older (larger) fish are often more contaminated than younger (smaller) fish.

The health advisory contains specific advice for infants, children under the age of fifteen and women of childbearing age. The Health Department recommends that they not eat fish from the specific water bodies listed in the advisory. The reason for this specific advice is that chemicals can have a potentially greater impact on developing organs in young children or in the fetus. Waters which have specific advisories have at least one species of fish with an elevated contaminant level, which means that a contamination source is in or near the water.

MARINE WATERS

The Department of Health has issued specific advisories for marine waters. These apply to striped bass, bluefish, and American eels and are the only marine fish advisories currently in effect. Striped bass, bluefish, and eels have specific habits or characteristics which make them more likely to have contaminants than other marine species.

An advisory has been issued for striped bass because of PCB contamination. Although saltwater fish are generally less contaminated than freshwater fish, fish like striped bass which spend time in Hudson River waters, can be contaminated at levels above food standards. The advisory for striped bass is divided into two geographical areas. For striped bass taken from the Hudson River, New York Harbor and western Long Island waters, the Health Department recommends against any consumption. For bass taken from eastern Long Island waters, the advisory is to eat no more than one meal per month. Women of childbearing age, infants and children under fifteen should not eat striped bass.

The Department has extended the general advisory to bluefish and American eels. They are contaminated with PCBs, although to a lesser extent than striped bass. The recommendation for bluefish and American eels caught in New York State's waters is to eat no more than one meal (one-half pound) per week, with an additional recommendation to not eat American eels from the Hudson, Harlem, and East Rivers and New York City harbor.

OTHER ADVISORIES

The Department has also issued special advisories for crabs in the Hudson River, snapping turtles, and waterfowl which have been found to be contaminated with PCBs. Cooking methods that minimize the amount of contaminants which would be eaten are recommended. The complete advisory is provided at the end of this brochure.

The health implications of eating deformed or cancerous fish are unknown. Any obviously diseased fish (marked by tumors, lesions or other abnormal condition of the fish skin, meat or internal organs) should be discarded.

SHELLFISH

Although all foods of animal origin, such as meat, poultry, seafoods and dairy products should be thoroughly cooked before consumption, the Health Department specifically recommends that the public not eat raw or partially cooked clams or oysters. This advice is not because of chemical contamination. Raw or partially cooked shellfish illegally harvested from waters contaminated with sewage have been linked to gastrointestinal illness and hepatitis A, caused by bacteria or viruses.

SHOULD I BE CONCERNED ABOUT MEDICAL-TYPE WASTE AND GARBAGE AFFECTING FISH?

The recent wash-up of medical-type waste and garbage on New York and Long Island beaches has not affected the sanitary condition of marine fish, lobster and crabs. Furthermore, fish do not carry or transmit the AIDS virus. Consumers need not limit consumption of these foods because of these problems. Good sanitary practices should be followed when preparing fish from any waters. Fish should be kept iced or refrigerated until cleaned and filleted and then refrigerated until cooked. Hands, utensils, and work surfaces should be washed before and after handling any raw food, including fish. Seafood should be cooked to an internal temperature of 140° F.

WHAT CAN I DO TO REDUCE MY EXPOSURE TO CHEMICAL CONTAMINANTS FROM FISH?

Fish is an important source of protein and is low in saturated fat. Naturally occurring fish oils have been reported to lower plasma cholesterol and triglycerides, thereby decreasing the risk of coronary heart disease. Increasing fish consumption is useful in reducing dietary fat and controlling weight. By eating a diet which includes food from a variety of protein sources, an individual is more likely to have a diet which is adequate in all nutrients.

Although eating fish has some health benefits, fish with high contaminant levels should be avoided. When deciding whether or not to eat fish which may be contaminated, the benefits of eating those fish can be weighed against the risks. For young women, eating contaminated fish is a health concern not only for herself but also to any unborn or nursing child, since the chemicals may reach the fetus and can be passed on in breastmilk. For an older person with heart disease the risks, especially of long term health effects, may not be as great a concern when compared to the benefits of reducing the risks of heart disease.

Everyone can benefit from eating the fish they catch and can minimize their contaminant intake by following these general recommendations:

1. Choose uncontaminated species from water bodies which are not listed in the Health Department's advisory.
2. Use a method of filleting the fish which will reduce the skin, fatty material and dark meat. These parts of the fish contain many of the contaminants. A pamphlet on this method is available from the DEC.
3. Choose smaller fish, consistent with DEC regulations, within a species since they may have lower contaminant levels. Older (larger) fish within a species may be more contaminated because they have had more time to accumulate contaminants in their bodies.
4. For shellfish, such as crab and lobster, do not eat the soft green substance found in the tail or body sections (tomalley, liver). This part of the shellfish has been found to contain high levels of chemical contaminants, including PCBs and heavy metals.
5. Based on limited studies, cooking methods such as broiling, poaching, boiling, and baking, which allow contaminants from the fatty portions of fish to drain out, are preferable. Pan frying is not recommended. The cooking liquids of fish from contaminated waters should be avoided since these liquids may retain contaminants.

ADDITIONAL INFORMATION

NEW YORK STATE DEPARTMENT OF HEALTH

For more information on health effects from exposure to chemical contaminants, contact:

Environmental Health Information
1-800-458-1158 (toll-free number)

Leave your name, number and brief message. Your call will be returned as soon as possible.

Bureau of Toxic Substance Assessment
2 University Place
Albany, NY 12203-3313
(518) 458-6376

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

For more information on fishing, contact:

Regional Offices

Region 1
SUNY Campus, Bldg. 40
Stony Brook, NY 11794
(516) 751-7900

Region 2
47-40 21st St.
Long Island City, NY 11101
(718) 482-4900

Region 3
21 South Putt Corners Rd.
New Paltz, NY 12561
(914) 255-54538

Region 4
2176 Guilderland Ave.
Schenectady, NY 12306
(518) 382-0680

Region 5
Route 86
Ray Brook, NY 12977
(518) 891-1370

Region 6
State Office Bldg.
Watertown, NY 13601
(315) 785-2236

Region 7
7481 Henry Clay Blvd.
Liverpool, NY 13088
(315) 428-4497

Region 8
Routes 5 and 20
Avon, NY 14414
(716) 226-2466

Region 9
600 Delaware Ave.
Buffalo, NY 14202
(716) 847-4600

For information on contaminant levels, contact:

Bureau of Environmental Protection
50 Wolf Road
Albany, NY 12233
(518) 457-6178

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