Field Data Report

Eighteen Mile Creek Sediment

2008

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Background

In the mid-1980's Eighteen Mile Creek (Niagara County) was designated as a Great Lakes Area of Concern (AOC). The underlying reasons for this designation were water and sediment quality problems associated with past discharges and waste disposal practices. Numerous contaminants have been previously identified in creek sediments which have a detrimental effect on the AOC and on Lake Ontario. These contaminants include polychlorinated biphenyls (PCBs), mercury, dioxins/furans, pesticides, lead, and copper. Sediment contamination has been a contributing factor in the issuance of health advisories regarding the consumption of fish and wildlife taken from Eighteen Mile Creek. The New York State Department of Health advisory for all fish taken from Eighteen Mile Creek is to "eat none" (NYDOH 2008). The New York State Department of Environmental Conservation (NYDEC) has cited sediment contamination as a probable cause for listing Eighteen Mile Creek as an impaired water on its 303(d) list. Contaminated sediments have also resulted in restrictions on the disposal of dredged materials from the AOC.

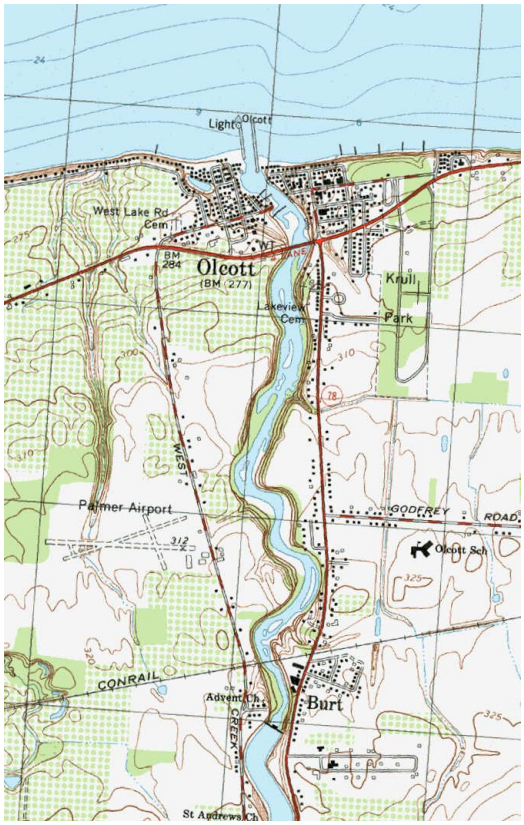

Figure 1 - Eighteen Mile Creek

Since 2002, EPA has regularly sampled the water column of Eighteen Mile Creek, just upstream of the Route 18 bridge in Olcott. Levels of PCBs in the water column have

been up to 20 times higher than levels observed in any other tributary to Lake Ontario from the American side of the Lake.

Table 1
Water Column PCB Concentrations (ng/L), Eighteen Mile Creek at Olcott, NY

	2002	2003	2004	2005	2006	2007
Sample #1	35.7	29.6	51.3	35.5	50.4	36.8
Sample #2	32.5	38.7	39.5	47.3	52.2	36.9
Sample #3		21.5				

Note: Samples were collected 2-3 times annually.
Results are from whole water analysis of samples.

In 2003, the US Army Corps of Engineers (COE) sampled surficial sediments at 15 locations downstream of Burt Dam. The COE found evidence of significant sediment contamination with PCBs, DDT, dioxins, copper, and lead. The sampling area was subdivided into five reaches, and samples from each reach were composited for analysis. PCB concentrations ranged from 77.9 to 279 ug/kg (COE, 2006).

Sampling 2008

In order to update and verify the current condition of surficial sediments in Eighteen Mile Creek, three sediment samples were collected by EPA in August 2008. Three locations were sampled, as shown in Figure 2. The sampling locations were: immediately upstream of the Route 18 bridge (Downstream); approximately 500 feet downstream of the railroad bridge north of Burt Dam (Upstream); and a midpoint between the other two locations (Midstream).

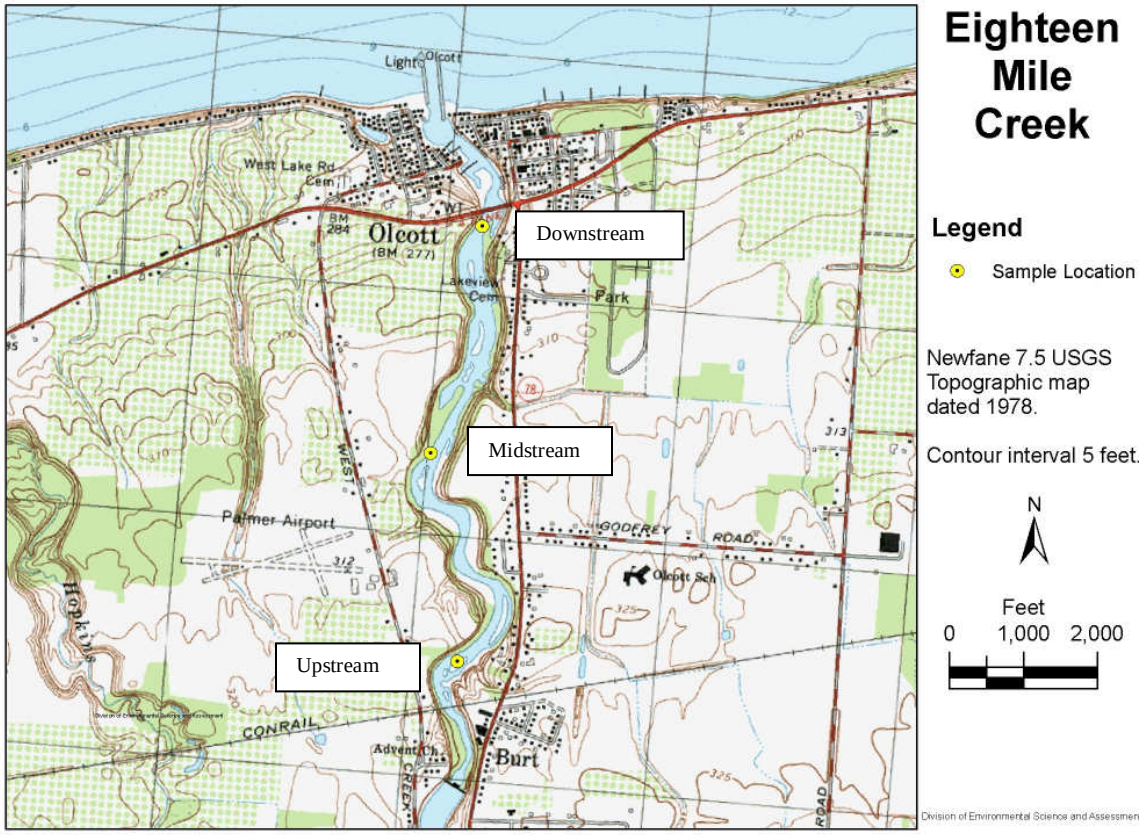

Figure 2 - Sediment sampling locations August 2008

Sediment samples were collected with a petite ponar dredge, which collects the upper 3-8 centimeters of sediment, depending on penetration of the dredge. Sediment was placed in a stainless steel bowl, homogenized by hand mixing, and then placed in the various sample containers. The sampling team experienced some difficulty in finding appropriate sampling locations for the Upstream, and to a lesser extent Midstream sampling locations. Much of the stream substrate in these sections was coarse gravel or very firm material, which inhibited dredge penetration. Figures 3, 4, and 5 are photographs of the three sampling locations.

Figure 3 - Upstream sediment sampling location.

Samples were collected for analysis of PCBs, Metals, Pesticides, and Total Organic Carbon (TOC). Samples were analyzed at the EPA Laboratory in Edison, New Jersey. The analytical methods utilized are summarized in Table 2.

Table 2 - Analytical Methods

Analytye	Method Reference	Laboratory SOP
PCBs	EPA – 608	C-91
Pesticides	EPA - 608	C-91
Mercury	EPA – 245.1	C-110
Metals	EPA – 200.7	C-109
Total Organic Carbon	EPA – 415.1	C-88

Figure 4 - Midstream sampling location

Figure 5 - Downstream sampling location

Table 3
Sample Locations

Sample Location	Latitude	Longitude	Datum
Downstream	43.33470	-78.71597	WGS 84
Midstream	43.32614	-78.71794	WGS 84
Upstream	43.31844	-78.71597	WGS 84

Results

Samples were analyzed for 61 of 209 PCB congeners. The list of target congeners is provided in Appendix A. The PCB target congeners included covered 64 of the most commonly occurring congeners. The target list also included 3 of the 4 most prevalent congeners detected by the Corps of Engineers in the 2003 sampling (COE, 2006). Surprisingly, no PCB congeners were detected in any sample at a concentration greater than the reporting limit of 1.0 ug/L. More investigation of stream sediments is necessary before conclusions can be drawn. This is especially true in light of the high levels of PCBs that continue to be measured in the water column.

Pesticide analyses included DDT, DDD, DDE, dieldrin, and mirex. No pesticides were detected in any sample. Again, further investigation is recommended.

Results for total organic carbon and metals are summarized on Table 4.

Screening criteria were exceeded for 6-7 metals in both the Midstream and Downstream samples. The Upstream sample only exceeded criteria for lead. In the lower reaches of the stream criteria were exceeded for cadmium, chromium, copper, lead, mercury, nickel, and zinc. Severe Effect Level (SEL) criteria were exceeded in the Midstream sample for lead, nickel, and zinc. This suggests that significant impacts to benthic aquatic life could be anticipated in this portion of the stream.

Table 4
Eighteen Mile Creek Sediments, August 2008

Parameter	Units	LEL[1]	SEL[2]	Results		
				Upstream	Midstream	Downstream
Total Organic Carbon	mg/Kg			7,100	33,000	42,000
Aluminum	mg/Kg			6,800	8,900	9,000
Antimony	mg/Kg	2.0	25.0	<1.3	<1.1	<1.6
Arsenic	mg/Kg	6.0	33.0	4.0	4.3	3.8
Barium	mg/Kg			62	99	89
Beryllium	mg/Kg			0.39	0.43	0.49
Cadmium	mg/Kg	0.6	9.0	<0.20	1.2	0.70
Calcium	mg/Kg			3,200	11,000	15,000
Chromium	mg/Kg	26.0	110.0	13	60	32
Cobalt	mg/Kg			7.8	11	10
Copper	mg/Kg	16.0	110.0	12	80	58
Iron	%	2.0%	4.0%	1.6%	1.8%	1.8%
Lead	mg/Kg	31.0	110.0	32	210	64
Magnesium	mg/Kg			3,800	4,700	4,900
Manganese	mg/Kg	460.0	1100.0	240	390	360
Mercury	mg/Kg	0.15	1.3	0.090	0.16	0.11
Nickel	mg/Kg	16.0	50.0	16	55	30
Potassium	mg/Kg			560	870	970
Selenium	mg/Kg			<1.3	<1.1	<1.6
Silver	mg/Kg	1.0	2.2	<0.33	0.32	<0.39
Sodium	mg/Kg			86	210	210
Thallium	mg/Kg			<1.3	<1.1	<1.6
Titanium	mg/Kg			66	79	95
Vanadium	mg/Kg			15	16	17
Zinc	mg/Kg	120.0	270.0	63	470	260

Notes: 1 – Lowest Effect Level (LEL) means the level of sediment contamination at which moderate impacts to benthic life could be anticipated.
2 – Severe Effect Level (SEL) means the level of sediment contamination at which significant harm to benthic aquatic life is anticipated.
3 – Criteria taken from NYSDEC, 1999.

Conclusions

The limited number of surficial sediment samples collected did not detect contamination of surficial sediments with PCBs and pesticides, in the portion of Eighteen Mile Creek downstream of Burt Dam. However, regular monitoring of the water column continues to confirm very high levels of PCBs in the water column. Additional sampling is required to locate sources of PCB contamination in Eighteen Mile Creek. The sampling

did identify some localized areas of sediments contaminated with metals. Again, additional investigation is necessary in order to determine the extent of contamination, and possibilities for remediation.

References

COE, 2006. Eighteen Mile Creek Great Lakes Area of Concern (AOC) Niagara County, New York. Concentrations, Bioaccumulation and Bioavailability of Contaminants in Surface Sediments. US Army Corps of Engineers, Buffalo District. September 2006

NYSDEC, 1999. Technical Guidance for Screening Contaminated Sediments. New York State Department of Environmental Conservation. January 1999.

NYSDOH, 2008. Chemicals in Sportfish and Game, 2008-2009 Health Advisories. New York State Department of Health. May 2008.

Appendix A
Target PCB Congeners

Congener	BZ #	IUPAC #
2,3-Dichlorobiphenyl	5	5
2,3'-Dichlorobiphenyl	6	6
2,4'-Dichlorobiphenyl	8	8
3,4-Dichlorobiphenyl	12	12
3,5-Dichlorobiphenyl	14	14
4,4'-Dichlorobiphenyl	15	15
2,2',3-Trichlorobiphenyl	16	16
2,2',4-Trichlorobiphenyl	17	17
2,2',6-Trichlorobiphenyl	19	19
2,3,4'-Trichlorobiphenyl	22	22
2,3',4-Trichlorobiphenyl	25	25
2,3',5-Trichlorobiphenyl	26	26
2,4,5-Trichlorobiphenyl	29	29
2,4',6-Trichlorobiphenyl	32	32
2,3',5'-Trichlorobiphenyl	34	34
3,3',4-Trichlorobiphenyl	35	35
2,2',3,4-Tetrachlorobiphenyl	41	41
2,2'3,5'-Tetrachlorobiphenyl	44	44
2,2',3,6-Tetrachlorobiphenyl	45	45
2,2',3,6'-Tetrachlorobiphenyl	46	46
2,2',4,5'-Tetrachlorobiphenyl	49	49
2,2',4,6'-Tetrachlorobiphenyl	51	51
2,2',5,5'-Tetrachlorobiphenyl	52	52
2,2',6,6'-Tetrachlorobiphenyl	54	54
2,3,4',6-Tetrachlorobiphenyl	64	64
2,3',4,6-Tetrachlorobiphenyl	69	69
2,3',4',5-Tetrachlorobiphenyl	70	70
2,3',4',6-Tetrachlorobiphenyl	71	71
2,3',5',6-Tetrachlorobiphenyl	73	73
3,4,4',5-Tetrachlorobiphenyl	81	81
2,2',3,4',5'-Pentachlorobiphenyl	97	97
2,2',4,4',5-Pentachlorobiphenyl	99	99
2,2',4,4',6-Pentachlorobiphenyl	100	100
2,3,3',4,4'-Pentachlorobiphenyl	105	105
2,3',4',5,5'-Pentachlorobiphenyl	124	124

Congener	BZ #	IUPAC #
2,2’,3,3’,5,6-Hexachlorobiphenyl	134	134
2,2’,3,4,4’,5-Hexachlorobiphenyl	137	137
2,2’,3,4,4’,5’-Hexachlorobiphenyl	138	138
2,2’,3,4,5,5’-Hexachlorobiphenyl	141	141
2,2’,3,4,5’,6-Hexachlorobiphenyl	144	144
2,2’,3,5,5’,6-Hexachlorobiphenyl	151	151
2,3,3’,4,4’,5-Hexachlorobiphenyl	156	156
2,3,3’,4,4’,5’-Hexachlorobiphenyl	157	157
2,3’,4,4’,5,5’-Hexachlorobiphenyl	167	167
2,2’,3,3’,4,5,6-Heptachlorobiphenyl	173	173
2,2’,3,3’,4,5,6’-Heptachlorobiphenyl	174	174
2,2’,3,3’,4,5’,6-Heptachlorobiphenyl	175	175
2,2’,3,3’,4,6,6’-Heptachlorobiphenyl	176	176
2,2’,3,3’,4,5’,6’-Heptachlorobiphenyl	177	177
2,2’3,3’5,6,6’-Heptachlorobiphenyl	179	179
2,2’,3,4,4’,5’,6-Heptachlorobiphenyl	183	183
2,2’,3,4,5,5’,6-Heptachlorobiphenyl	185	185
2,2’,3,4’,5,5’,6-Heptachlorobiphenyl	187	187
2,3,3’,4,4’,5,5’-Heptachlorobiphenyl	189	189
2,3,3’,4,4’,5’,6-Heptachlorobiphenyl	191	191
2,2’,3,3’,4,4’,5,5’-Octachlorobiphenyl	194	194
2,2’,3,3’,4,5,6,6’-Octachlorobiphenyl	199	200
2,2’,3,3’,5,5’,6,6’-Octachlorobiphenyl	202	202
2,3,3’,4,4’,5,5’,6-Octachlorobiphenyl	205	205
2,2’,3,3’,4,4’,5,5’,6-Nonachlorobiphenyl	206	206
Decachlorobiphenyl	209	209