Field Data Report

Lake Ontario Tributaries

2005-2006

Participating Personnel:

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Contents

Background

The Lakewide Management Plan for Lake Ontario has identified six critical pollutants which contribute to lakewide beneficial use impairments due to their toxicity, persistence in the environment, and/or their ability to bioaccumulate. The six critical pollutants are polychlorinated biphenyls (PCBs), mercury, DDT, dieldrin, mirex, and dioxins. Approximately 80% of the surface water flow to Lake Ontario is from the Niagara River. A long term monitoring program conducted by Environment Canada, as a component of the Niagara River Toxics Management Plan, has provided good estimated loadings of pollutants from the Niagara River and the upstream Great Lakes. However, definitive current information regarding loadings from other U.S. tributaries to Lake Ontario had been lacking. In 2002, the U.S. Environmental Protection Agency (EPA) initiated a program to regularly monitor U.S. tributaries for the critical pollutants. Previous reports have provided program results for 2002 through 2004. This report adds changes and results from 2005 through 2006.

Monitoring Locations

Beginning in April 2002, ambient water samples were collected two to three times annually from stations located in the downstream portions of each of the following tributaries to Lake Ontario:

Black River
Salmon River
Oswego River
Genesee River
Eighteen Mile Creek

The first four tributaries were selected because they are the largest American tributaries to Lake Ontario. They also have U.S. Geological Survey (USGS) gage stations, which provide measurements of flow at the time of sampling. Eighteen Mile Creek, which has no gage station, was selected for monitoring because of its history as a source of PCBs. These five tributaries are referred to collectively as the primary tributaries.

In 2005, monitoring was expanded to include additional tributaries. These streams are smaller, and may or may not have gage stations. Collectively this set of tributaries is referred to as the secondary tributaries. The secondary tributaries are monitored less frequently, on an irregular schedule. They have been included to expand the base of information regarding sources of critical pollutants. The secondary tributaries are:

Twelve Mile Creek
Johnson Creek
Oak Orchard Creek
Irondequoit Creek
Wine Creek
Sandy Creek

Figure 1 - Tributaries sampled 2002-2006

At each tributary, sampling locations were selected to be as far as possible downstream, while also being far enough upstream of the convergence with Lake Ontario to avoid the influence of the lake itself. Practical considerations of access for boat launching and safety also influenced site selection. Occasionally, unusual weather or flow conditions required some minor adjustment of sampling locations. Sampling locations were initially recorded with global positioning system (GPS) equipment. The GPS equipment was used to return to the initial sampling location for subsequent sampling events. Appendix A includes detailed maps showing the sampling location and the associated USGS gage station for each tributary.

Sampling Procedures

Each of the primary tributaries was sampled twice annually (three times in 2003). The secondary tributaries were sampled on a more irregular basis. Sampling dates were varied each year in order to capture a variety of seasonal conditions. The matrix on Table 1 shows the sampling dates for each stream.

At most sampling locations, samples were collected from a small boat anchored at mid-channel. A sonar depth finder was used to locate the deepest part of the stream crossection and to record depth. Where conditions did not permit the use of a boat, the sampling team waded to midstream to collect samples.

Table 1
Lake Ontario Tributaries Sampling Events

	April 16-18, 2002	September 17-18, 2002	May 6-7, 2003	July 9-10, 2003	October 7-8, 2003	May 11-12, 2004	September 28-29, 2004	May 3-4, 2005	August 30-31, 2005	July 25-26, 2006	September 19-20, 2006
Eighteen Mile Creek	●	●	●	●	●	●	●	●	●	●	●
Genesee River	●	●	●	●	●	●	●	●	●	●	●
Oswego River	●	●	●	●	●	●	●	●	●	●	●
Salmon River	●	●	●	●	●	●	●	●	●	●	●
Black River	●	●	●	●	●	●	●	●	●	●	●
Twelve Mile Creek											●
Johnson Creek								●			
Oak Orchard Creek								●			●
Irondequoit Creek										●	
Wine Creek									●		
Sandy Creek									●	●	

At each location, a YSI Model 63 meter was used to measure pH, temperature, and specific conductivity. The meter's probe was lowered to one half meter below the surface, and readings were recorded after they had stabilized.

All samples for laboratory analyses were collected as direct grab samples. For the collection of mercury samples, a two person "clean hands/dirty hands" sampling team was required. This procedure is based upon EPA Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels. One person was designated as "clean hands" and performed all operations involving direct contact with the sample and containers. The other person was "dirty hands" and was responsible for all other activities not involving direct contact with the samples. To further minimize opportunity for sample contamination, the sampling team wore disposable tyvek lab coats, an inner pair of shoulder length polyethylene gloves, and an outer layer of powder free, non-colored latex gloves. The teflon lined sample containers for mercury samples were precleaned and supplied by the laboratory performing the analyses. At each sampling location, mercury samples were always collected first. The teflon sample container was removed from its protective plastic bags, opened, and quickly plunged into the current with the open end of the container facing upstream. The container was then quickly capped and resealed in plastic bags. Mercury samples were chemically preserved upon receipt by the laboratory, in order to further reduce chances for field contamination.

After collection of the mercury sample, direct grab samples were collected for the remaining parameters. The containers for the parameters other than mercury were new, single use certified precleaned containers.

For each sampling event, field blanks were collected at one sampling location. Procedures have been designed so that the sample containers are the only equipment which comes into direct contact with the samples. The blanks are intended to detect any trace contamination due to sampling procedures, atmospheric contamination, or deficiencies in container cleaning.

Analytical Methods

Analytical methods and laboratories utilized in 2005 and 2006 are summarized below in Table 2.

Table 2
Analytical Methods and Laboratories, 2005-2006

Analyte	Method	Laboratory
pH	EPA 150.1	Field
Temperature	EPA 170.1	Field
Specific Conductivity	EPA 120.1	Field
Total Suspended Solids	EPA 160.2	EPA Region 2
Mercury	EPA 1631E	Batelle Marine Science Lab
PCBs	EPA 1668A	EPA Region 2
Pesticides	see discussion	Maxxam Analytical Lab

With the exception of the pesticides, the analytical methods utilized in 2005/06 were consistent with methods used in previous years.

Prior to 2005, pesticides (DDT, DDD, DDE, dieldrin, mirex) had been analyzed by EPA method 8081B. No pesticides were detected above the reporting limit (2.6 - 5.5 ng/L) for those compounds, with this method. In 2005, pesticides were analyzed with a high resolution gas chromatograph/ high resolution mass spectrometer (HRGC/HRMS), utilizing a method developed by the New York State Department of Environmental Conservation and Axys Analytical Laboratory. Those samples were analyzed by Maxxam Analytical Laboratory. Pesticides were detected at very low levels in several samples. In 2006, the EPA Region 2 laboratory attempted to analyze tributary samples for pesticides utilizing the same method. Ultimately all of the 2006 data were rejected because of serious blank contamination in the laboratory. In 2007, the regular analysis of tributary samples for pesticides was discontinued because of a lack of funds for commercial analyses.

Findings

Appendix B includes spreadsheets for each tributary, presenting all data collected between 2002 and 2006.

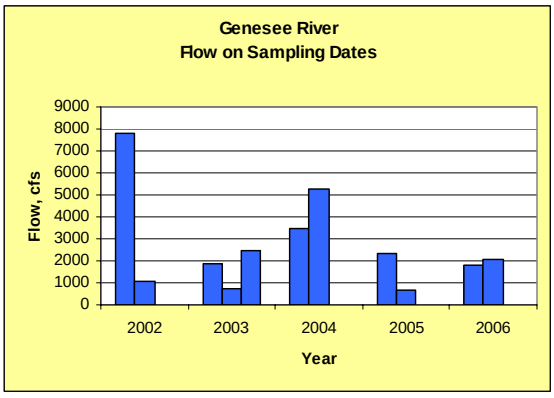
Discussion

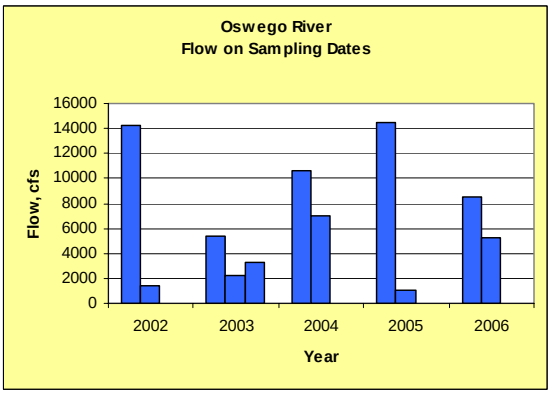
As indicated earlier, one field blank was collected by the field sampling team for each sampling event. The laboratory(ies) also ran laboratory method blanks with each batch of samples. Analytical data were compared with results for both field blanks and method blanks. If an analyte was detected in a sample at a concentration less than three times the concentration detected in either blank, the data was rejected, and the result was treated as a "non-detect." If the analyte was found to have a concentration more than three times the greatest concentration detected in any of the blanks, the data was used without further adjustment. In other words, data were screened for blank influence, but data were not blank corrected. With PCBs, blank screenings were done for individual congeners.

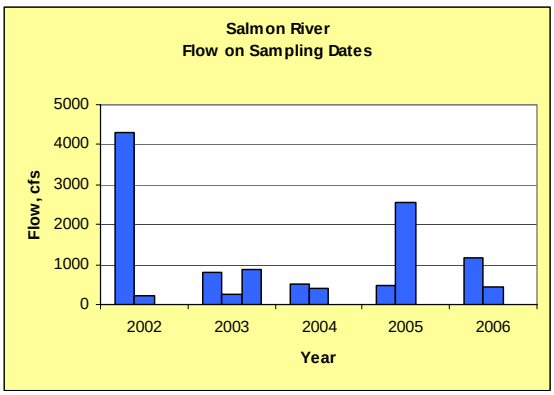
In calculating totals (such as total PCBs), non-detects were treated as zeros. Data qualified as "J", indicating that the observed value was less than the reporting limit were included in the total, without adjustment.

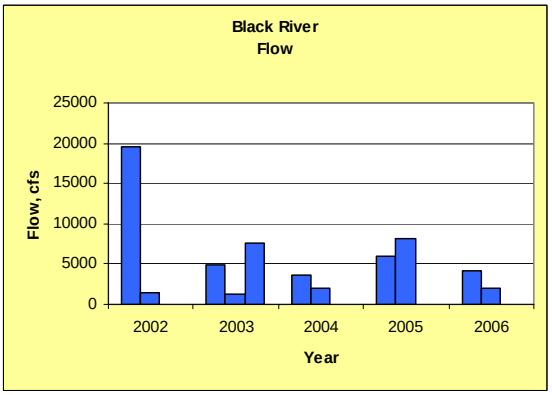
Flow:

Sampling events have captured a wide range of flow conditions. The charts below show the actual flows encountered, as obtained from USGS gage stations on the actual sampling date(s). There is no gage station for Eighteen Mile Creek. In order to calculate a very rough estimate of loadings from Eighteen Mile Creek, a rough annual estimate of 90 cfs was used.









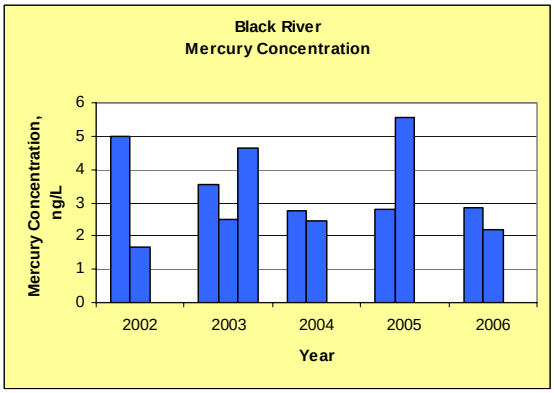
Of the secondary tributaries sampled in 2005/06, only Sandy Creek and Irondequoit Creek had gage stations. In July 2006, both streams had flows less than 100 cfs. In August 2005, the flow in Sandy Creek was 950 cfs. However, this was an unusual flow condition due to heavy rains from the remnants of Hurricane Katrina.

Sandy Creek - August 2005

Sandy Creek - July 2006

Mercury:

During the 2005/06 period, combined mercury loadings from the five primary tributaries ranged from 44.2 grams per day (g/day) to 121.1 g/day. The two secondary tributaries equipped with gaging stations (Sandy Creek and Irondequoit Creek) had mercury loadings ranging from 0.20 g/day to 6.03 g/day. Because atmospheric transport is a large contributor to mercury loadings, periods of increased precipitation and higher stream flows nearly always resulted in both higher in-stream mercury concentrations and correspondingly higher loadings. The bar charts on the next page for the Black River illustrate the point, when compared to the bar chart for flow at the top of this page. A similar pattern for all tributaries can be seen by examining the bar charts in Appendix C.



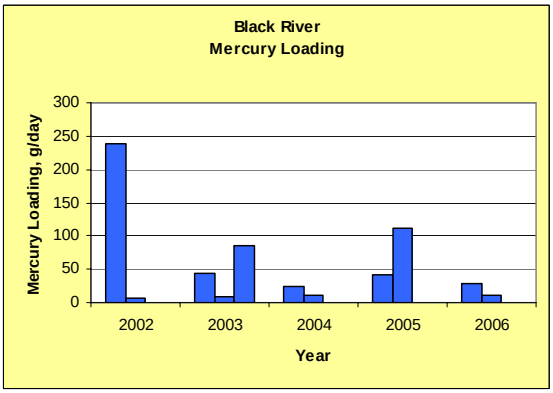


Table 3
Mercury Results

Mercury Concentrations (ng/L)				
	May 05	Aug 05	Jul 06	Sep 06
Eighteen Mile Creek	3.28	2.07	1.42	5.73
Genesee River	2.63	1.14	3.16	2.81
Oswego River	1.71	<0.59[B]	1.69	1.22
Salmon River	1.68	1.18	1.95	1.83
Black River	2.82	5.55	2.84	2.19
Johnson Creek	3.35			
Oak Orchard Creek	2.20			2.97
Wine Creek		6.91		
Sandy Creek		2.59	1.48	
Irondequoit Creek			2.01	
Twelve Mile Creek				<0.90[B]
Mercury Load (g/day)				
Eighteen Mile Creek	0.72	0.46	0.31	1.26
Genesee River	15.07	1.78	13.68	14.39
Oswego River	60.61	---	35.43	15.75
Salmon River	2.00	7.39	5.59	1.96
Black River	41.51	111.48	28.45	10.84
Total Load for Primary Tributaries (g/day)	119.91	121.11	83.42	44.20
Sandy Creek		6.03	0.20	
Irondequoit Creek			0.37	

Notes: - Loadings for Eighteen Mile Creek are based upon an estimated flow of 90 cfs.
- For secondary tributaries, loadings were only calculated if flow could be obtained from a gage.
- Loadings were not calculated if concentration data was rejected due to blank contamination.
- B indicates that data was qualified because value was not three times greater than concentration found in the associated blank(s).

PCBs:

Samples were analyzed for PCBs by EPA Method 1668, using a one liter sample size. In the first two years (2002-2003), the target list of congeners included 106 of the 209 possible congeners. In 2004, the target list of congeners was expanded to include all 209 congeners.

In calculating total PCBs and the totals for various homolog groups, the concentrations of individual congeners (after screening for blank influence) were summed. Non detects and results rejected for excessive blank contamination were treated as zero.

Table 4
PCB Results for all Tributaries

PCB Concentrations (pg/L)				
	May 05	Aug 05	Jul 06	Sep 06
Eighteen Mile Creek	35,507	47,252	50,407	52,243
Genesee River	313	338	358	596
Oswego River	4,760	107	335	26
Salmon River	7,401	848	ND	390
Black River	12,205	10,337	1,515	385
Johnson Creek	ND			
Oak Orchard Creek	123			1,156
Wine Creek		36,429		
Sandy Creek		74,140	ND	
Irondequoit Creek			R	
Twelve Mile Creek				7,394
PCB Loading (g/day)				
Eighteen Mile Creek[E1]	7.81	10.39	11.08	11.48
Genesee River	1.79	0.53	1.57	3.05
Oswego River	168.71	0.28	7.02	0.34
Salmon River	8.81	5.32	---	0.42
Black River	179.66	207.64	15.18	1.91
Total Load for Primary Tributaries (g/day)	366.78	224.16	34.85	17.20
Wine Creek[E2]	1.64			
Sandy Creek		172.53	---	
Irondequoit Creek			---	

NOTES: ND - indicates that no congeners were detected above the reporting limit.
E1 - Loading calculation is based on an estimated average annual flow of 90 cfs.
E2 - Loading calculation is based on a flow estimate derived from cross sectional area and current measurement at the time of sampling.
R - Data were rejected because duplicate sample yielded significantly (>10x) different result.

Total loading from the five primary tributaries ranged from 17 g/day to 367 g/day. In the previous period (2002-2004), total loadings ranged from 12 g/day to 112 g/day.

An examination of Table 4 reveals several anomalies. PCB concentrations detected in the Genesee River and Oswego River samples in May 2005 were more than 10 times greater than anything that had been previously detected in these tributaries. In late August 2005, exceptionally high PCB concentrations were observed in Wine Creek (36 ng/L) and Sandy Creek (74 ng/L). Sandy Creek was resampled in July 2006, and no PCBs were detected. During the August 2005 sampling event, there was heavy rain from the tropical remnants of Hurricane Katrina. This may have been a contributing factor.

A longer lasting anomaly occurred with data from the Black River. Between April 2002 and May 2004, PCB concentrations ranged from 0.42 to 1.85 ng/L. However, in September 2004, a significant increase in PCB concentrations was observed, rising to 19.5 ng/L. As can be seen from Table 5, the increase persisted through 2005, with concentrations returning to the lower range in July 2006. Data from 2004 and 2005 were not received until the winter of 2005/06. So it was not possible to collect additional samples until the 2006 sampling season. At that time, additional samples were collected upstream in the vicinity of the USGS gage station. The 2006 results were similar for the upstream and downstream locations. The reasons for the anomalies observed in 2004 and 2005 have never been determined. The Black River has historically been contaminated with PCBs from upstream mills. There are also several hydroelectric dams immediately upstream of the routine sampling location for the Black River. There is the possibility that activities upstream disturbed older contaminated sediments, causing movement downstream.

Table 5
Black River PCBs (ng/L)

	May 04	Sep 04	May 05	Aug 05	July 06	Sep 06
Downstream	1.31	19.5	12.2	10.3	1.52	0.39
Upstream					1.86	0.25

Pesticides:

As indicated earlier, pesticides were not detected in any samples prior to 2005, using EPA method 8081B for analysis. In 2005 samples were analyzed by a commercial laboratory, utilizing a HRGC/HRMS. Streams were sampled again in 2006, but these data were rejected because of high blank values. The 2005 data are summarized on Table 6. Mirex was not detected in any samples. DDT and dieldrin concentrations were very low, generally less than 1.0 ng/L. The exception was Wine Creek, which had a total DDT concentration of 1.29 ng/L, and a dieldrin concentration of 5.67 ng/L.

Table 6
Pesticide Results for all Tributaries

	Total DDT, ng/L		Dieldrin, ng/L		Mirex, ng/L	
	May 05	Aug 05	May 05	Aug 05	May 05	Aug 05
Eighteen Mile Creek	0.94	0.81	0.28	0.38	U	U
Genesee River	B	B	B	U	U	U
Oswego River	B	U	B	U	U	U
Salmon River	B	U	U	0.04	U	U
Black River	B	U	U	U	U	U
Johnson Creek	0.97		0.17		U	
Oak Orchard Creek	0.50		0.24		U	
Wine Creek		1.29		5.67		U
Sandy Creek		U		0.09		U

Notes: U - Analyte was not detected above the reporting limit.
B - Data is indistinguishable from one or more blanks.
- Total DDT equals the sum of DDD + DDE + DDT.

Conclusions

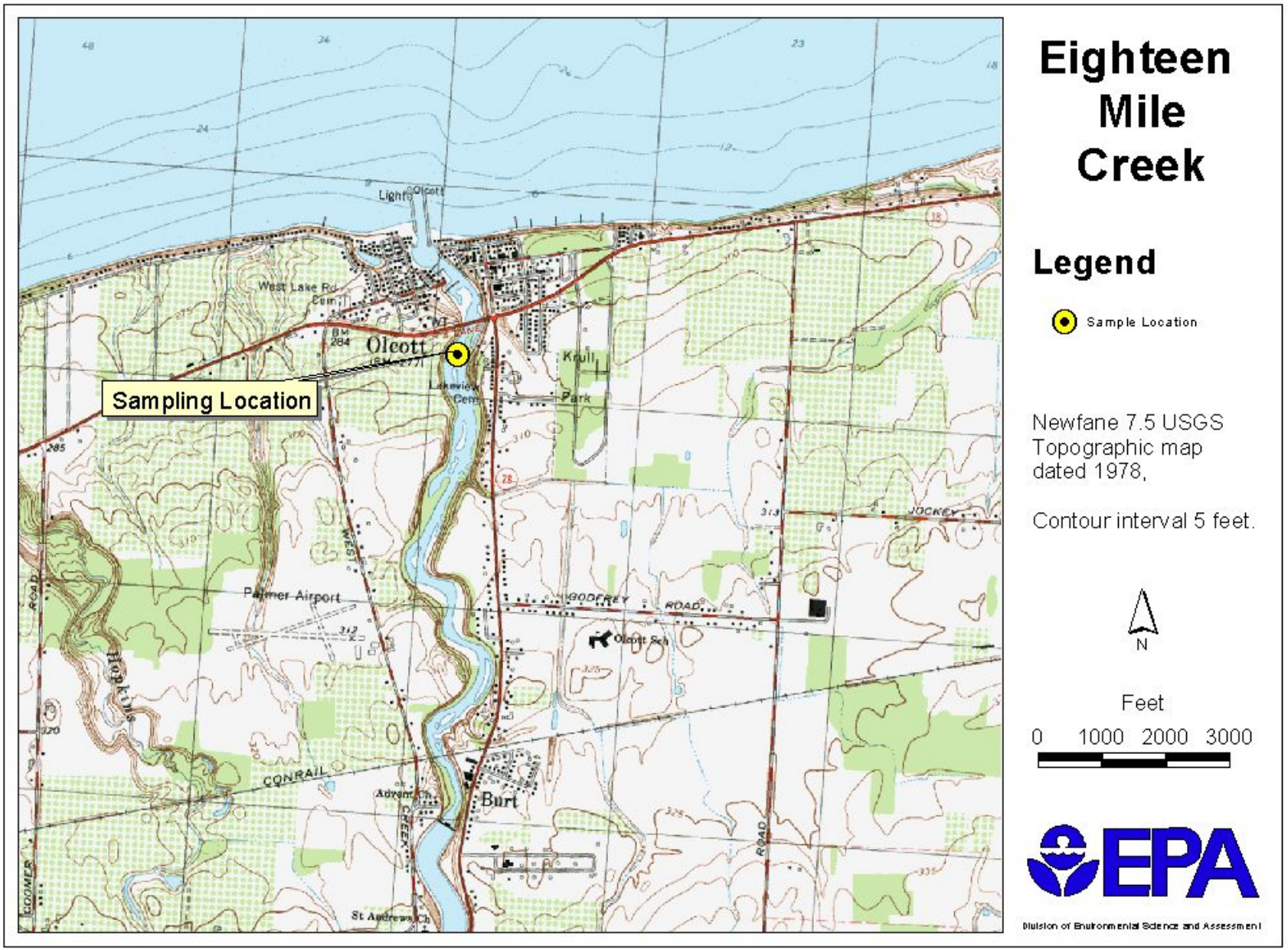
Measurable loadings of mercury and PCBs enter Lake Ontario from these tributaries. PCB concentrations are significant in Eighteen Mile Creek, and to a lesser extent, the Black River. Mercury appears to be more evenly distributed. Mercury concentrations closely mirror flow, reflecting the significance of atmospheric sources (through precipitation and runoff). Pesticide concentrations are very low or not detected. No relationship between total suspended solids concentrations and critical pollutant concentrations was observed.

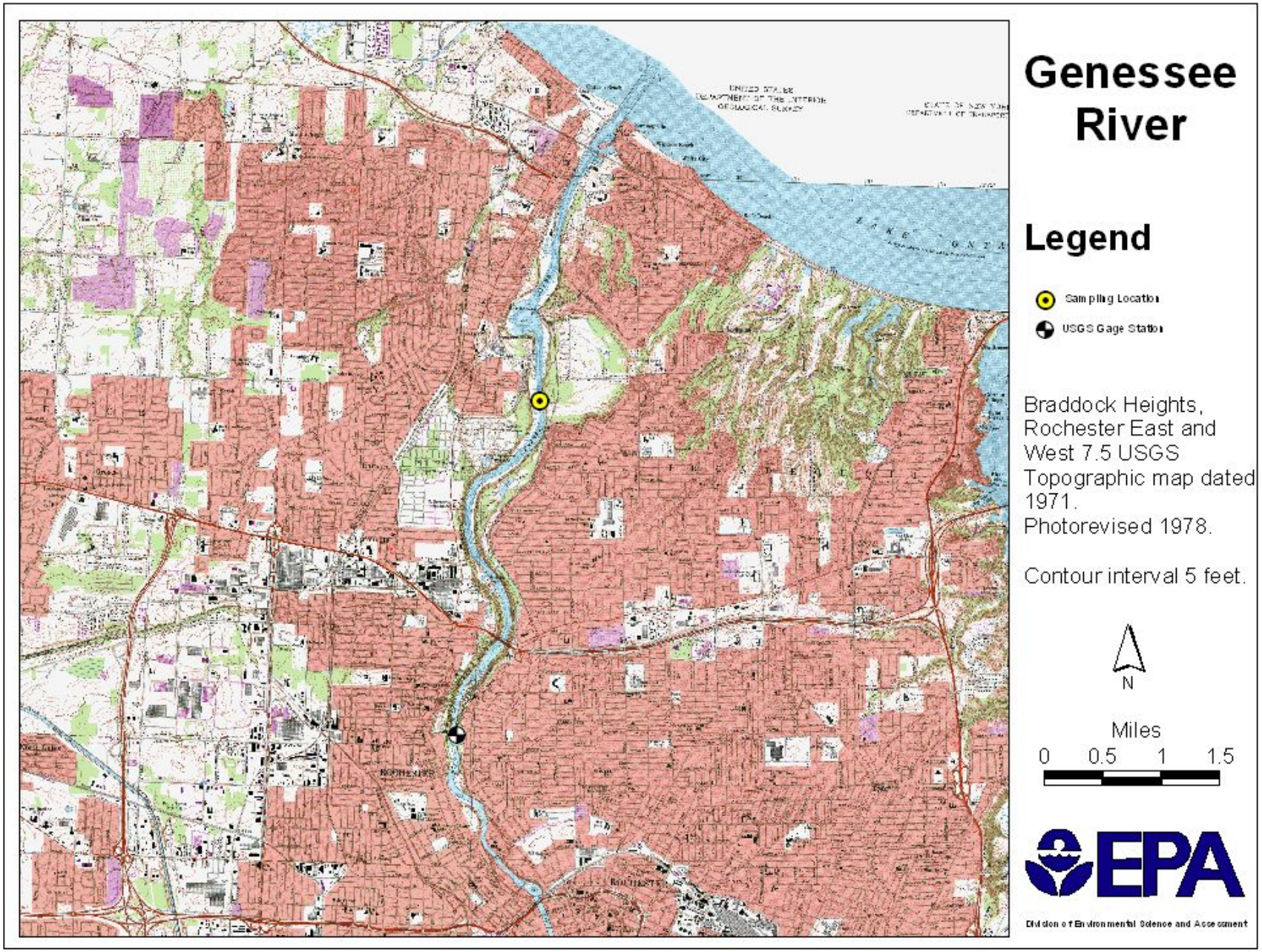
Burt Dam - Eighteen Mile Creek

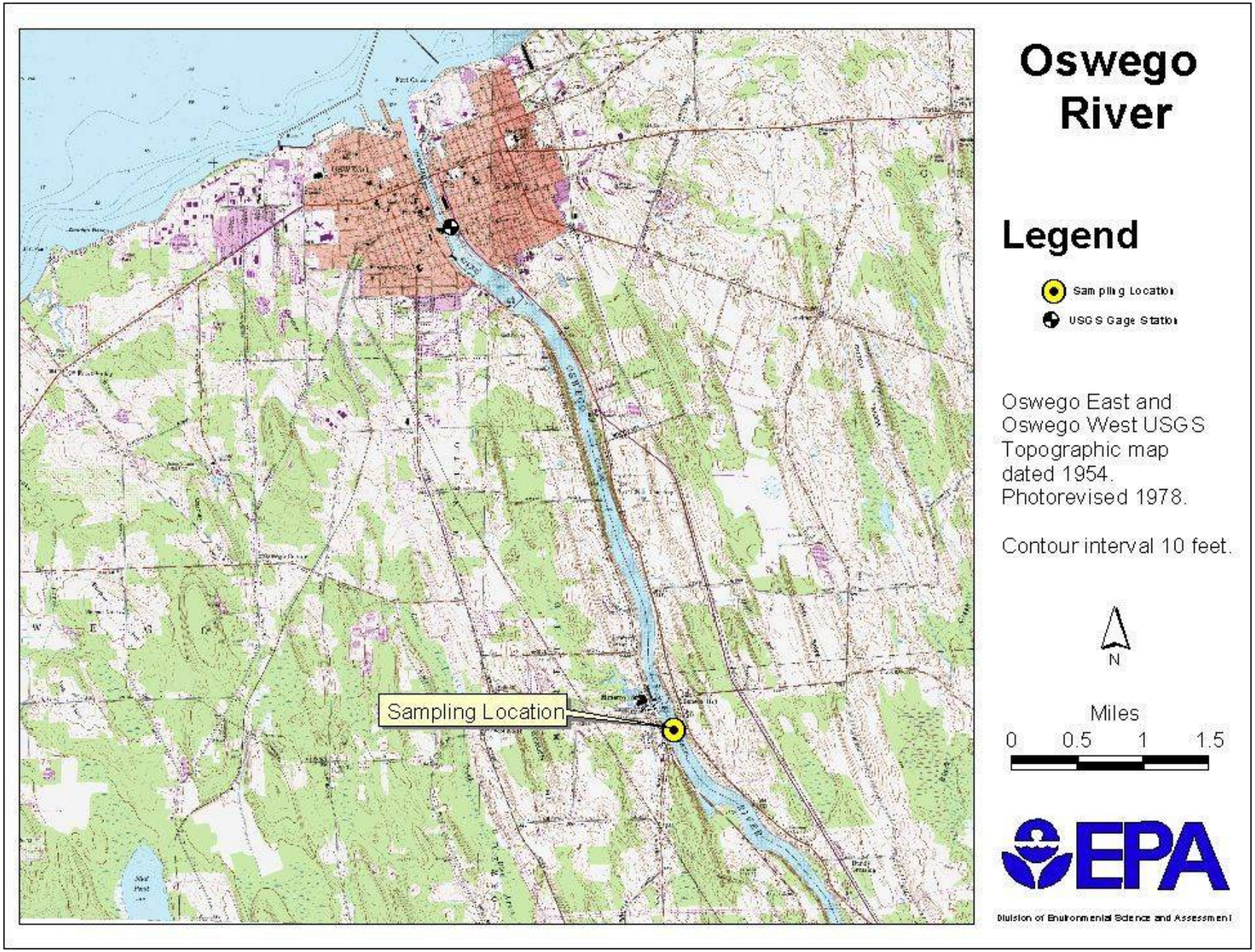
Sampling Location Eighteen Mile Creek

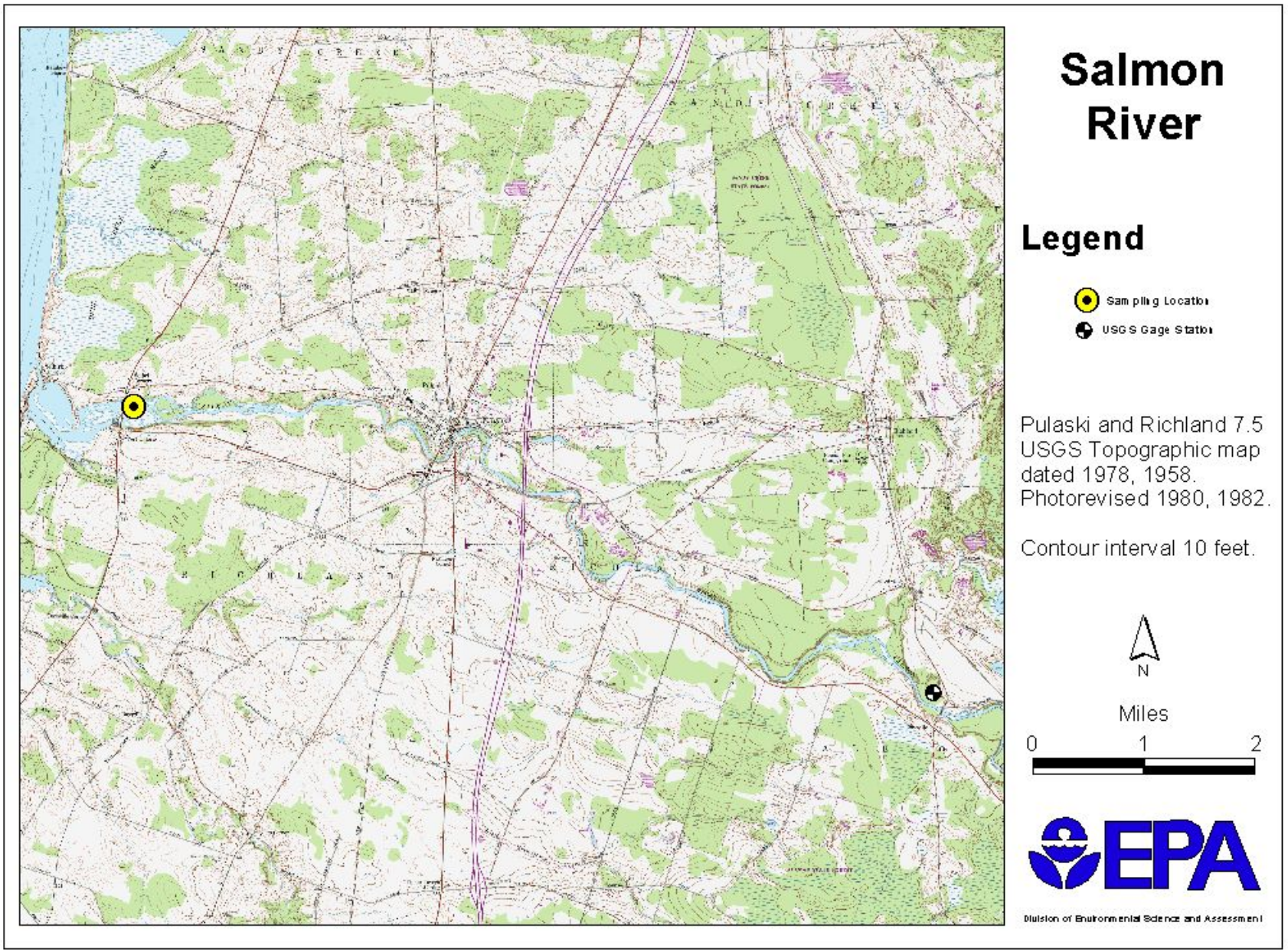
Appendix A

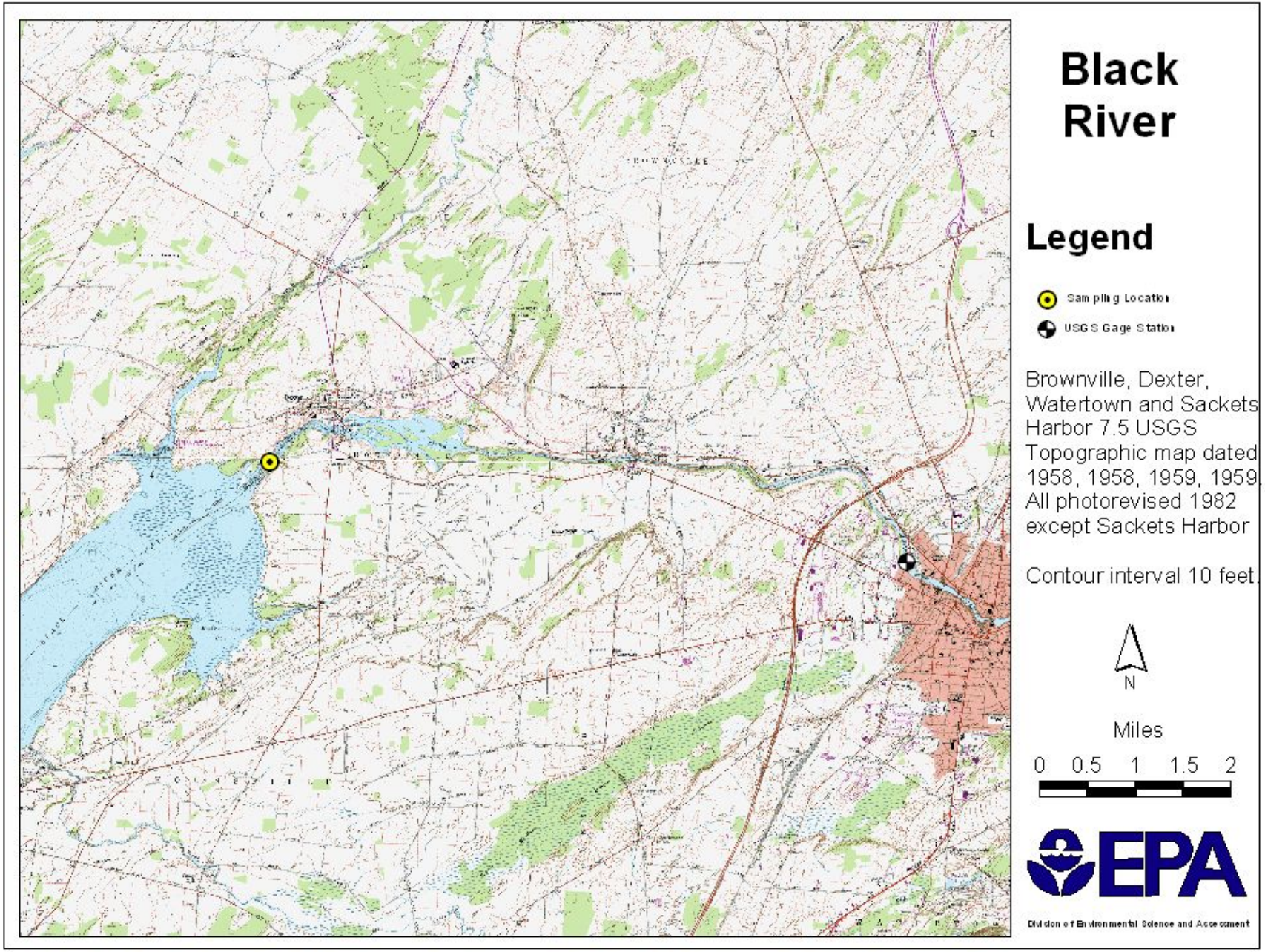
Maps of Sampling Locations


Eighteen Mile Creek
Legend
Sample Location
Sampling Location
Newfane 7.5 USGS Topographic map dated 1978,
Contour interval 5 feet.
N
Feet
0 1000 2000 3000
EPA
Division of Environmental Science and Assessment
Olcott
Burt
Palmer Airport
CONRAIL
GOODRICH ROAD
JOCKEY
Krull Park
West Lake Rd Cem
Lakeview Cem
Advent Ch
St Andrews Ch
Olcott Sch
Hopkins
ROAD
BOOMER
DEEKEN


Genessee River
Legend
Sampling Location
USGS Gage Station
Braddock Heights, Rochester East and West 7.5 USGS Topographic map dated 1971.
Photorevised 1978.
Contour interval 5 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment


Oswego River
Legend
Sampling Location
USGS Gage Station
Oswego East and Oswego West USGS Topographic map dated 1954. Photorevised 1978.
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment
Sampling Location


Salmon River
Legend
Sampling Location
USGS Gage Station
Pulaski and Richland 7.5 USGS Topographic map dated 1978, 1958. Photorevised 1980, 1982.
Contour interval 10 feet.
N
Miles
0
1
2
EPA
Division of Environmental Science and Assessment


Black River
Legend
Sampling Location
USGS Gage Station
Brownville, Dexter, Watertown and Sackets Harbor 7.5 USGS Topographic map dated 1958, 1958, 1959, 1959. All photorevised 1982 except Sackets Harbor
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5 2
EPA
Division of Environmental Science and Assessment


LAKE ONTARIO
ONTARIO
WILSON
Twelve Mile Creek
Legend
Sampling Location
Six Mile and Wilson
7.5 USGS
Topographic maps dated
1974 and 1979.
Contour interval 5 feet.
N
Miles
0 0.5 1 1.5
EPA
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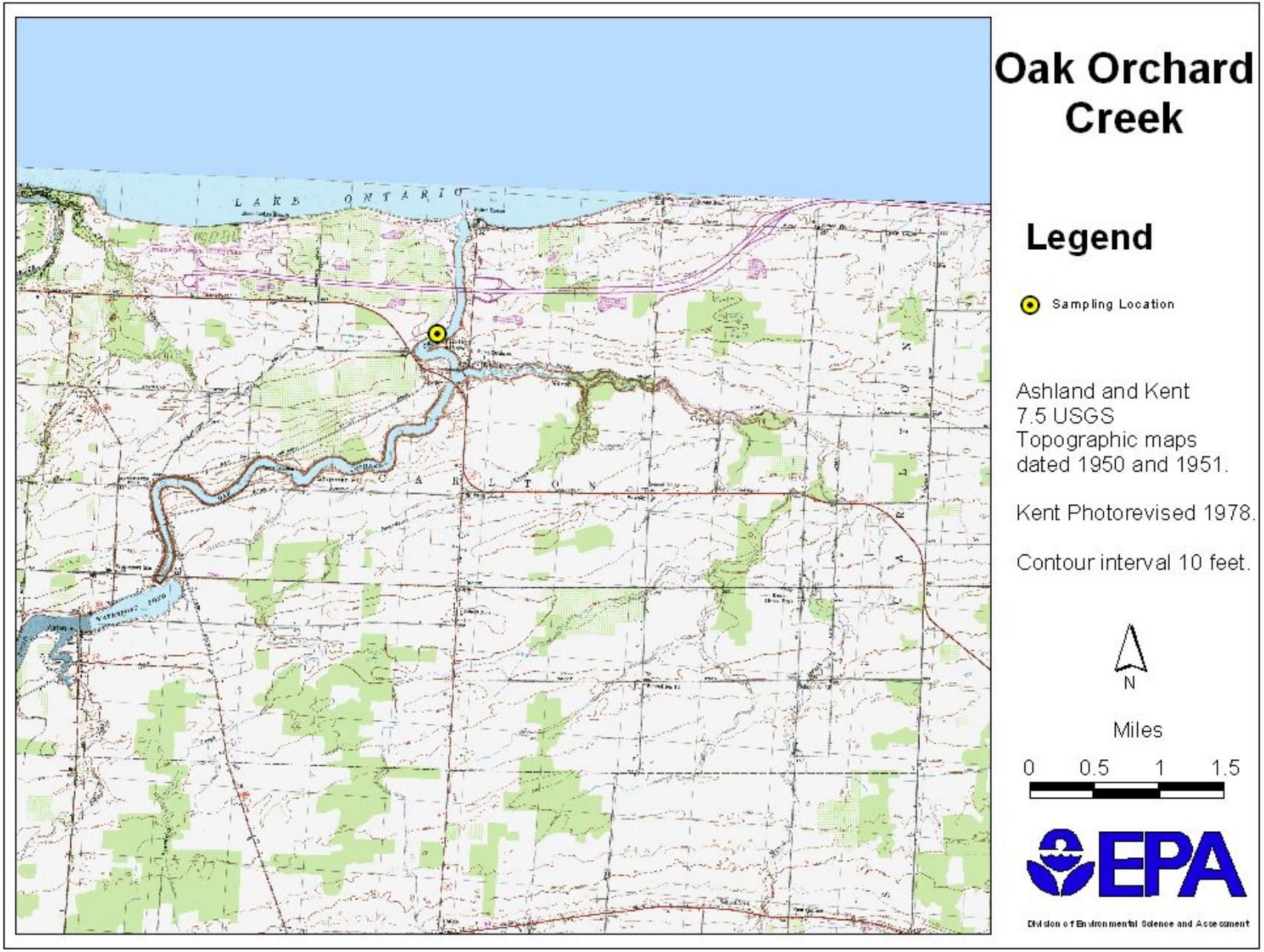
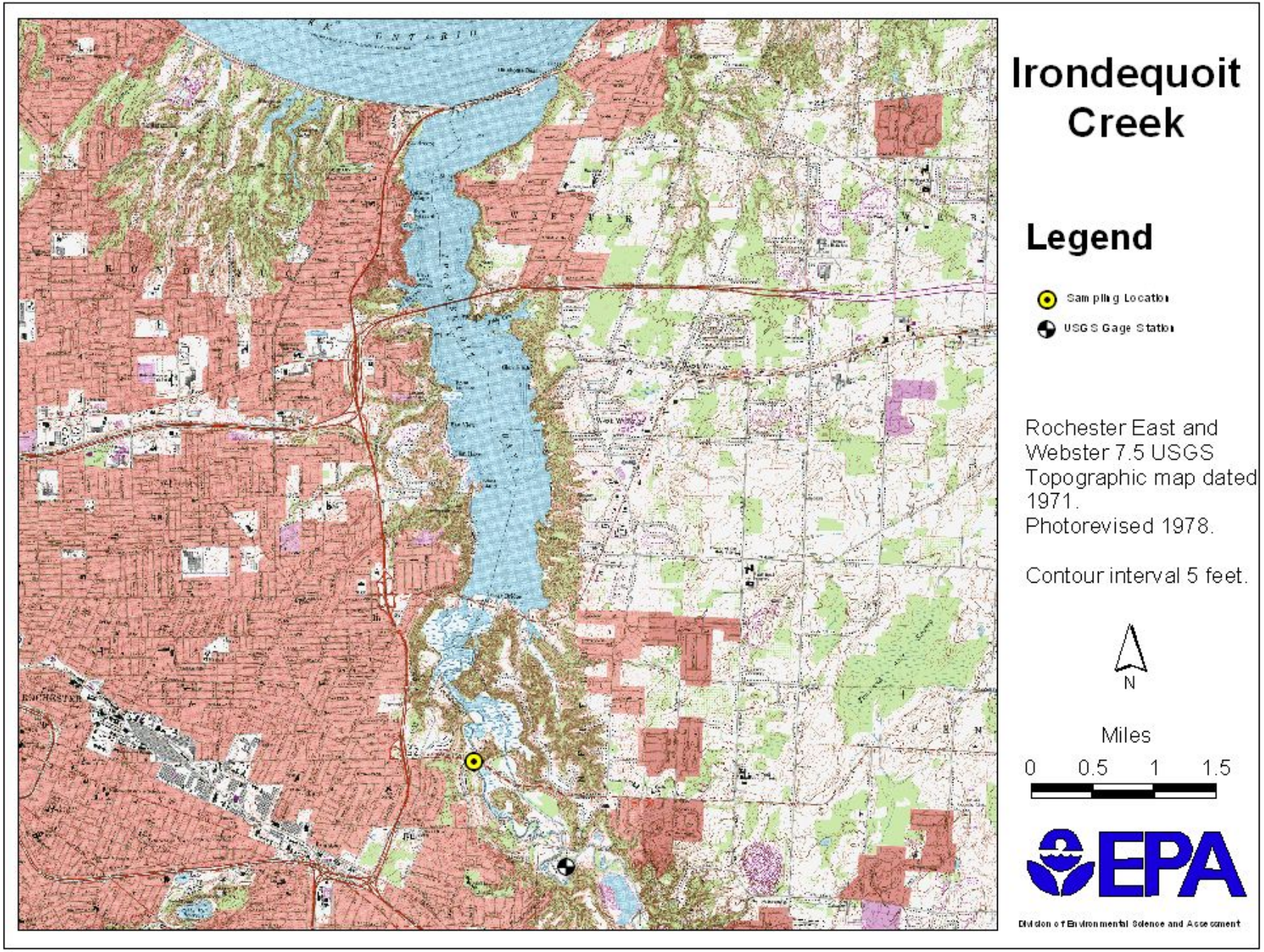
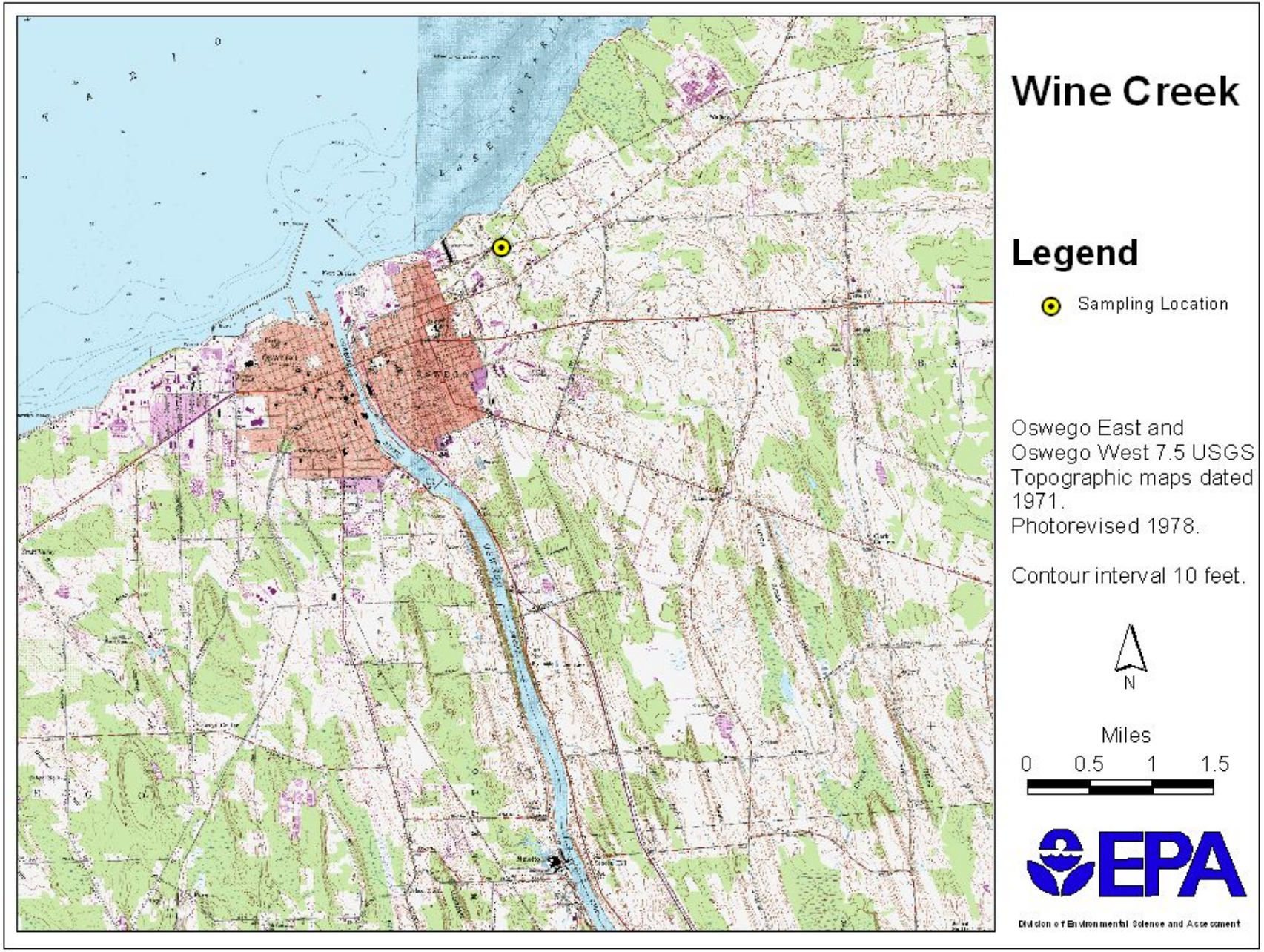
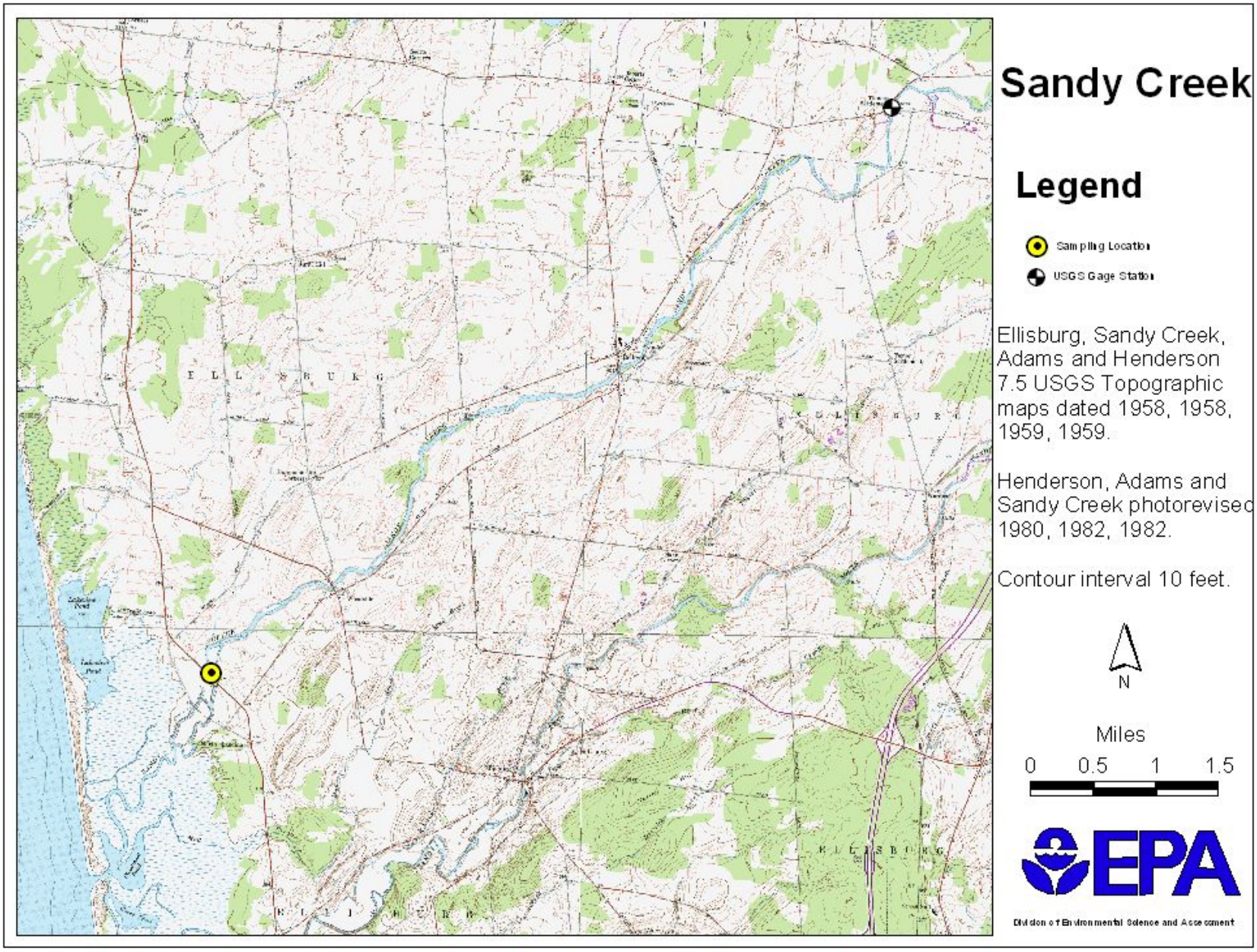
Johnson Creek
Legend
Sampling Location
Ashland and Kent 7.5 USGS Topographic maps dated 1950 and 1951.
Kent Photorevised 1978.
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment


Oak Orchard Creek
Legend
Sampling Location
Ashland and Kent 7.5 USGS Topographic maps dated 1950 and 1951.
Kent Photorevised 1978.
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment


Irondequoit Creek
Legend
Sampling Location
USGS Gage Station
Rochester East and Webster 7.5 USGS Topographic map dated 1971.
Photorevised 1978.
Contour interval 5 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment


Wine Creek
Legend
Sampling Location
Oswego East and
Oswego West 7.5 USGS
Topographic maps dated
1971.
Photorevised 1978.
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment


Sandy Creek
Legend
Sampling Location
USGS Gage Station
Ellisburg, Sandy Creek, Adams and Henderson 7.5 USGS Topographic maps dated 1958, 1958, 1959, 1959.
Henderson, Adams and Sandy Creek photorevised 1980, 1982, 1982.
Contour interval 10 feet.
N
Miles
0 0.5 1 1.5
EPA
Division of Environmental Science and Assessment

Appendix B

Data Tables by Tributary

Eighteen Mile Creek
Latitude 43.33387° Longitude -78.71630°

DATE >>>		4/16/02	9/17/02	5/6/03	7/9/03	10/7/03	5/11/04	9/28/04	5/3/05	8/30/05	7/26/06	9/19/06
Flow Estimated**	mgd	58	58	58	58	58	58	58	58	58	58	58
	cfs	90	90	90	90	90	90	90	90	90	90	90
pH	su	7.67	7.67	8.09	7.58	8.05	8.21	8.16	8.25	7.7	7.59	7.83
Specific Conductivity	uS/cm	NA	472	851	609	550	830	728	740	498	583	462
Temperature	°C	15	20.4	12.9	25.1	11.9	14.7	17.2	9.6	22.4	25.2	18.7
TSS	mg/L	9.0	1.1	6.7	2.0	1.3	6.0	Lab Error	4.5	3.2	1.3	3.2
	kg/day	1,978	242	1,473	440	286	1,319		989	703	286	703
DDD (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.5)	U (5.5)	U (5.3)	U (5.2)	U (5.3)	0.219	0.417	NA	NA
	g/day								0.05	0.09		
	kg/year								0.02	0.03		
DDE (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.5)	U (5.5)	U (5.3)	U (5.2)	U (5.3)	0.540	0.39	NA	NA
	g/day								0.12	0.09		
	kg/year								0.04	0.03		
DDT (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.5)	U (5.5)	U (5.5)	U (5.5)	U (5.3)	0.184	U (0.11)	NA	NA
	g/day								0.04			
	kg/year								0.01			
Total DDT	ng/L	U	U	U	U	U	U	U	0.94	0.807	NA	NA
	g/day								0.21	0.18		
	kg/year								0.08	0.06		
Dieldrin	ng/L	U (5.5)	U (5.0)	U (5.5)	U (5.5)	U (5.3)	U (5.2)	U (5.3)	0.276	0.375	NA	NA
	g/day								0.06	0.08		
	kg/year								0.02	0.03		
Mirex	ng/L	U (2.7)	U (3.0)	U (2.7)	U (2.7)	U 2.6)	U (2.6)	U (2.6)	U (0.0095)	U (0.0099)	NA	NA
	g/day											
Total Mercury	ng/L	12.4	0.863	4.53	1.43	1.3	4.6	1.35	3.28	2.07	1.42	5.73
	g/day	2.73	0.19	1.00	0.31	0.29	1.01	0.30	0.72	0.46	0.31	1.26
	kg/year	0.99	0.07	0.36	0.11	0.10	0.37	0.11	0.26	0.17	0.11	0.46
Total PCBs	pg/L	35,704	32,480	29,612	38,652	21,531	51,325	39,525	35,507	47,252	50,407	52,243
	g/day	7.85	7.14	6.51	8.50	4.73	11.28	8.69	7.81	10.39	11.08	11.48
	kg/year	2.86	2.61	2.38	3.10	1.73	4.12	3.17	2.85	3.79	4.04	4.19
Dioxins TEQ	pg/L	U	13.9	0.016	U	U	NA	NA	NA	NA	NA	NA
	g/day											
Mercury Field Blank	ng/L	0.259	0.225	0.304	0.266	0.359	0.543	0.275	0.181	0.273	0.263	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

** - There is no gage station for this stream. An approximate base flow of 90 cfs is used for calculations.

Genesee River
Latitude 43.22223° Longitude -77.61528° (NAD-83)

DATE >>>		4/16/02	9/17/02	5/6/03	7/9/03	10/7/03	5/11/04	9/28/04	5/4/05	8/30/05	7/26/06	9/20/06
Flow	mgd	5,054	710	1,202	470	1,590	2,236	3,393	1,512	411	1,157	1,351
	cfs	7,820	1,100	1,860	727	2,460	3,460	5,250	2,340	636	1790	2,090
pH	su	8.29	7.9	8.21	8.23	8.25	8.17	8.16	8.27	8	7.93	8.17
Specific Conductivity	uS/cm	NA	592	545	638	411	578	327	431	563	387	512
Temperature	°C	9	22.3	13.4	26.1	10	15.1	17.2	9.7	24.1	24.1	19
TSS	mg/L	200	8.5	28	11	32	27	Lab Error	41	7.1	29	26
	kg/day	3,830,932	22,873	127,556	19,594	192,835	228,810		234,950	11,060	127,166	133,128
DDD (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.2)	U (5.2)	U (5.1)	U (5.5)	U (5.2)	QB (<0.025)	U (0.047)	NA	NA
	g/day											
	kg/year											
DDE (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.2)	U (5.2)	U (5.1)	U (5.5)	U (5.2)	QB (<0.059)	U (0.15)	NA	NA
	g/day											
	kg/year											
DDT (o,p' + p,p')	ng/L	U (5.5)	U (5.0)	U (5.2)	U (5.2)	U (5.1)	U (5.5)	U (5.2)	QB (<0.033)	U (0.067)	NA	NA
	g/day											
	kg/year											
Total DDT	ng/L	U	U	U	U	U	U	U	QB	U	NA	NA
	g/day											
	kg/year											
Dieldrin	ng/L	U (5.5)	U (5.0)	U (5.2)	U (5.2)	U (5.1)	U (5.5)	U (5.2)	QB (<0.049)	U (0.090)	NA	NA
	g/day											
	kg/year											
Mirex	ng/L	U (2.7)	U (3.0)	U (2.6)	U (2.6)	U (2.6)	U (2.8)	U (2.6)	U (0.0035)	U (0.0069)	NA	NA
	g/day											
Total Mercury	ng/L	10.9	1.13	2.26	1.83	1.97	2.53	4.23	2.63	1.14	3.16	2.81
	g/day	208.79	3.04	10.30	3.26	11.87	21.44	54.40	15.07	1.78	13.86	14.39
	kg/year	76.21	1.11	3.76	1.19	4.33	7.83	19.85	5.50	0.65	5.06	5.25
Total PCBs	pg/L	157	414	U	15	256	22	149	313	338	358	596
	g/day	3.01	1.11		0.03	1.54	0.19	1.92	1.79	0.53	1.57	3.05
	kg/year	1.10	0.41		0.01	0.56	0.07	0.70	0.65	0.19	0.57	1.11
Dioxins TEQ	pg/L	0.041	U	U	U	U	NA	NA	NA	NA	NA	NA
	g/day	0.000785										
Mercury Field Blank	ng/L	0.259	0.225	0.304	0.266	0.359	0.543	0.275	0.181	0.273	0.263	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Oswego River
Latitude 43.39688° Longitude -76.47060° (NAD-83)

DATE >>>		4/17/02	9/18/02	5/7/03	7/10/03	10/8/03	5/12/04	9/29/04	5/4/05	8/30/05	7/25/06	9/20/06
Flow	mgd	9,223	931	3,488	1,422	2,120	6,883	4,531	9,352	679	5,532	3,406
	cfs	14,270	1,440	5,397	2,200	3,280	10,650	7,011	14,470	1050	8,560	5,270
pH	su	8.06	7.85	7.85	7.67	8.07	8.01	7.92	8.18	7.91	7.52	8.01
Specific Conductivity	uS/cm	NA	902	597	812	612	620	591	573	954	581	639
Temperature	°C	13	21.7	13.5	25.6	13.2	15.1	19.7	10.4	24.8	26	19.6
TSS	mg/L	9.0	2.6	2.2	3.0	1.4	1.0	Lab Error	5.1	1.8	2.2	2.2
	kg/day	314,597	9,174	29,083	16,168	11,249	26,087		180,765	4,632	46,126	28,399
DDD (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	QB (<0.098)	U (0.036)	NA	NA
	g/day											
	kg/year											
DDE (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	QB (<0.099)	U (0.15)	NA	NA
	g/day											
	kg/year											
DDT (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	QB (<0.064)	U (0.078)	NA	NA
	g/day											
	kg/year											
Total DDT	ng/L	U	U	U	U	U	U	U	QB	U	NA	NA
	g/day											
	kg/year											
Dieldrin	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	U (5.2)	QB (<0.102)	U (0.054)	NA	NA
	g/day											
	kg/year											
Mirex	ng/L	U (2.7)	U (3.0)	U (2.6)	U (2.6)	U (2.6)	U (2.6)	U (2.6)	U (0.0028)	U (0.0040)	NA	NA
	g/day											
Total Mercury	ng/L	3.31	1.24	1.59	1.25	QB (<0.968)	2.2	1.3	1.71	QB (<0.593)	1.69	1.22
	g/day	115.70	4.38	21.02	6.74		57.39	22.32	60.61		35.43	15.75
	kg/year	42.23	1.60	7.67	2.46		20.95	8.15	22.12		12.93	5.75
Total PCBs	pg/L	166	366	U	17	203	193	540	4,760	107	335	26
	g/day	5.80	1.29		0.09	1.63	5.03	9.27	168.71	0.28	7.02	0.34
	kg/year	2.12	0.47		0.03	0.60	1.84	3.38	61.58	0.10	2.56	0.12
Dioxins TEQ	pg/L	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
	g/day											
Mercury Field Blank	ng/L	0.259	0.225	0.304	0.266	0.359	0.543	0.275	0.181	0.273	0.263	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Salmon River

Latitude 43.56965° Longitude -76,18530° (NAD-83)

DATE >>>		4/17/02*	9/18/02	5/7/03	7/10/03	10/8/03	5/12/04	9/29/04	5/5/05	9/1/05	7/25/06	9/20/06
Flow	mgd	2,786	142	514	164	556	323	266	314	1,655	756	282
	cfs	4,310	219	796	254	860	500	412	486	2560	1,170	436
pH	su	6.83	8.63	8.1	7.67	7.93	8.84	7.79	7.76	7.41	7.65	7.91
Specific Conductivity	uS/cm	NA	89	56	82	70	67	72	69	66	66	100
Temperature	°C	9	18.7	11.9	25.6	12.1	13.5	16.5	8.5	21.8	22.3	16.5
TSS	mg/L	3.0	1.1	0.9	2.0	2.1	2.0	Lab Error	1.4	5.3	3.6	4.0
	kg/day	31,677	592	1,753	1,243	4,425	2,448		1,666	33,244	10,315	4,275
DDD (o,p' + p,p')	ng/L	U (5.2)	U (5.0)	U (5.3)	U (5.5)	U (5.2)	U (5.2)	U (5.2)	QB (<0.099)	U (<0.033)	NA	NA
	g/day											
	kg/year											
DDE (o,p' + p,p')	ng/L	U (5.2)	U (5.0)	U (5.3)	U (5.5)	U (5.2)	U (5.2)	U (5.2)	QB (<0.108)	U (<0.11)	NA	NA
	g/day											
	kg/year											
DDT (o,p' + p,p')	ng/L	U (5.2)	U (5.0)	U (5.3)	U (5.5)	U (5.2)	U (5.2)	U (5.2)	QB (<0.054)	U (<0.062)	NA	NA
	g/day											
	kg/year											
Total DDT	ng/L	U	U	U	U	U	U	U	QB	U	NA	NA
	g/day											
	kg/year											
Dieldrin	ng/L	U (5.2)	U (5.0)	U (5.3)	U (5.5)	U (5.2)	U (5.2)	U (5.2)	U (0.045)	0.037	NA	NA
	g/day									0.23		
	kg/year									0.08		
Mirex	ng/L	U (2.6)	U (3.0)	U (2.6)	U (2.8)	U (2.6)	U (2.6)	U (2.6)	U (0.030)	U (<0.0084)	NA	NA
	g/day											
Total Mercury	ng/L	2.85	0.915	2.18	1.68	1.92	2.22	1.74	1.68	1.178	1.95	1.83
	g/day	30.09	0.49	4.25	1.04	4.05	2.72	1.75	2.00	7.39	5.59	1.96
	kg/year	10.98	0.18	1.55	0.38	1.48	0.99	0.64	0.73	2.70	2.04	0.71
Total PCBs	pg/L	300	257	U	13	149	U (19.8)	473	7,401	848	U	390
	g/day	3.17	0.14		0.01	0.31		0.48	8.81	5.32		0.42
	kg/year	1.16	0.05		0.00	0.11		0.17	3.21	1.94		0.15
Dioxins TEQ	pg/L	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
	g/day											
Mercury Field Blank	ng/L	0.259	0.225	0.304	0.266	0.359	0.543	0.275	0.181	0.273	0.263	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Black River
Latitude 43.99969° Longitude -76.05785° (NAD-83)

DATE >>>		4/18/02	9/18/02	5/7/03	7/10/03	10/8/03	5/12/04	9/29/04	5/5/05	9/1/05	7/25/06	9/20/06
Flow	mgd	12,603	944	3,199	814	4,880	2,294	1,247	3,884	5,300	2,643	1,306
	cfs	19,500	1,460	4,950	1,260	7,550	3,550	1,930	6,010	8,200	4,090	2,020
pH	su	7.45	7.76	7.86	7.97	7.57	7.79	7.54	7.83	7.69	7.67	7.87
Specific Conductivity	uS/cm	NA	96	93	129	71	108	100	91	122	91	101
Temperature	°C	15	21.3	13.3	24.8	9.9	16.1	18.4	9.7	21.8	24.4	18.7
TSS	mg/L	9.0	2.4	3.7	2.0	9.4	2.0	Lab Error	3.1	16	3.9	1.5
	kg/day	429,888	8,587	44,860	6,170	173,855	17,389		45,633	321,392	39,066	7,425
DDD (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (6.3)	U (5.5)	U (5.2)	QB (<0.040)	U (0.030)	NA	NA
	g/day											
	kg/year											
DDE (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (6.3)	U (5.5)	U (5.2)	U (0.035)	U (0.16)	NA	NA
	g/day											
	kg/year											
DDT (o,p' + p,p')	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (6.3)	U (5.5)	U (5.2)	U (0.031)	U (0.060)	NA	NA
	g/day											
	kg/year											
Total DDT	ng/L	U	U	U	U	U	U	U	QB	U	NA	NA
	g/day											
	kg/year											
Dieldrin	ng/L	U (5.3)	U (5.0)	U (5.2)	U (5.2)	U (6.3)	U (5.5)	U (5.2)	U (0.030)	U (0.033)	NA	NA
	g/day											
	kg/year											
Mirex	ng/L	U (2.6)	U (3.0)	U (2.6)	U (2.6)	U (3.1)	U (2.8)	U (2.6)	U (0.0031)	U (0.0080)	NA	NA
	g/day											
Total Mercury	ng/L	4.99	1.67	3.55	2.5	4.65	2.74	2.46	2.82	5.55	2.84	2.19
	g/day	238.35	5.97	43.04	7.71	86.00	23.82	11.63	41.51	111.48	28.45	10.84
	kg/year	87.00	2.18	15.71	2.82	31.39	8.70	4.24	15.15	40.69	10.38	3.96
Total PCBs	pg/L	1,849	760	425	1,174	417	1,309	19,486	12,205	10,337	1,515	385
	g/day	88.32	2.72	5.15	3.62	7.71	11.38	92.09	179.66	207.64	15.18	1.91
	kg/year	32.24	0.99	1.88	1.32	2.82	4.15	33.61	65.58	75.79	5.54	0.70
Dioxins TEQ	pg/L	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
	g/day											
Mercury Field Blank	ng/L	0.259	0.225	0.304	0.266	0.359	0.543	0.275	0.181	0.273	0.263	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses. * - Due to high water levels, April 2002 sample location was 43.99601°, -76.06274°
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Twelve Mile Creek
Latitude 43.30812° Longitude - 78.85675° (WGS-84)

DATE >>>		9/19/2006
Flow	mgd	NA
	cfs	
pH	su	8.88
Specific Conductivity	uS/cm	665
Temperature	°C	19.2
TSS	mg/L	1.1
	kg/day	
DDD (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
DDE (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
DDT (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
Total DDT	ng/L	NA
	g/day	
	kg/year	
Dieldrin	ng/L	NA
	g/day	
	kg/year	
Mirex	ng/L	NA
	g/day	
Total Mercury	ng/L	QB (<0.895)
	g/day	
	kg/year	
Total PCBs	pg/L	7,394
	g/day	
	kg/year	
Dioxins TEQ	pg/L	NA
	g/day	
Mercury Field Blank	ng/L	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Johnson Creek
Latitude 43.36088° Longitude -78.26465 (WGS-84)

DATE >>>		5/3/2005
Flow	mgd	NA
	cfs	
pH	su	8.41
Specifc Conductivity	uS/cm	559
Temperature	°C	9.5
TSS	mg/L	5.1
	kg/day	
DDD (o,p' + p,p')	ng/L	0.198
	g/day	
	kg/year	
DDE (o,p' + p,p')	ng/L	0.588
	g/day	
	kg/year	
DDT (o,p' + p,p')	ng/L	0.179
	g/day	
	kg/year	
Total DDT	ng/L	0.965
	g/day	
	kg/year	
Dieldrin	ng/L	0.174
	g/day	
	kg/year	
Mirex	ng/L	U (0.0048)
	g/day	
Total Mercury	ng/L	3.35
	g/day	
	kg/year	
Total PCBs	pg/L	U
	g/day	
	kg/year	
Dioxins TEQ	pg/L	NA
	g/day	
Mercury Field Blank	ng/L	0.181

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Oak Orchard Creek
Latitude 43.35745° Longitude -78.19542° (WGS-84)

DATE >>>		5/3/2005	9/19/2006
Flow	mgd	NA	NA
	cfs		
pH	su	8.31	7.77
Specific Conductivity	uS/cm	726	559
Temperature	°C	10.3	19.3
TSS	mg/L	5.0	4.0
	kg/day		
DDD (o,p' + p,p')	ng/L	QB (<0.212)	NA
	g/day		
	kg/year		
DDE (o,p' + p,p')	ng/L	0.337	NA
	g/day		
	kg/year		
DDT (o,p' + p,p')	ng/L	0.165	NA
	g/day		
	kg/year		
Total DDT	ng/L	0.502	NA
	g/day		
	kg/year		
Dieldrin	ng/L	0.236	NA
	g/day		
	kg/year		
Mirex	ng/L	U (0.0051)	NA
	g/day		
Total Mercury	ng/L	2.20	2.97
	g/day		
	kg/year		
Total PCBs	pg/L	123	1,156
	g/day		
	kg/year		
Dioxins TEQ	pg/L	NA	NA
	g/day		
Mercury Field Blank	ng/L	0.181	0.328

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.

Irondequoit Creek
Latitude 43.15736° Longitude -77.52719° (WGS-84)

DATE >>>		7/26/2006
Flow	mgd	50
	cfs	78
pH	su	8.03
Specific Conductivity	uS/cm	1,194
Temperature	°C	21.2
TSS	mg/L	9.5
	kg/day	1,800
DDD (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
DDE (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
DDT (o,p' + p,p')	ng/L	NA
	g/day	
	kg/year	
Total DDT	ng/L	NA
	g/day	
	kg/year	
Dieldrin	ng/L	NA
	g/day	
	kg/year	
Mirex	ng/L	NA
	g/day	
Total Mercury	ng/L	2.01
	g/day	0.38
	kg/year	0.14
Total PCBs	pg/L	R
	g/day	
	kg/year	
Dioxins TEQ	pg/L	NA
	g/day	
Mercury Field Blank	ng/L	0.263

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT.
R - Data were rejected because duplicate sample yielded significantly different (>10x) result.

Wine Creek

Latitude 43.47119° Longitude -76.48571° (WGS-84)

DATE >>>		8/31/2005
Flow	mgd	11.9
	cfs	18.4*
pH	su	7.45
Specific Conductivity	uS/cm	497
Temperature	°C	20.7
TSS	mg/L	21
	kg/day	947
DDD (o,p' + p,p')	ng/L	0.361
	g/day	0.02
	kg/year	0.01
DDE (o,p' + p,p')	ng/L	0.41
	g/day	0.02
	kg/year	0.01
DDT (o,p' + p,p')	ng/L	0.52
	g/day	0.02
	kg/year	0.01
Total DDT	ng/L	1.29
	g/day	0.06
	kg/year	0.02
Dieldrin	ng/L	5.67
	g/day	0.26
	kg/year	0.09
Mirex	ng/L	U (0.023)
	g/day	
Total Mercury	ng/L	6.91
	g/day	0.31
	kg/year	0.11
Total PCBs	pg/L	36,429
	g/day	1.64
	kg/year	0.60
Dioxins TEQ	pg/L	NA
	g/day	
Mercury Field Blank	ng/L	0.273

Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT
* - Flow was calculated from stream cross sectional area and measurement of current.

Sandy Creek

Latitude 43.74468° Longitude -76.18564 (WGS-84)

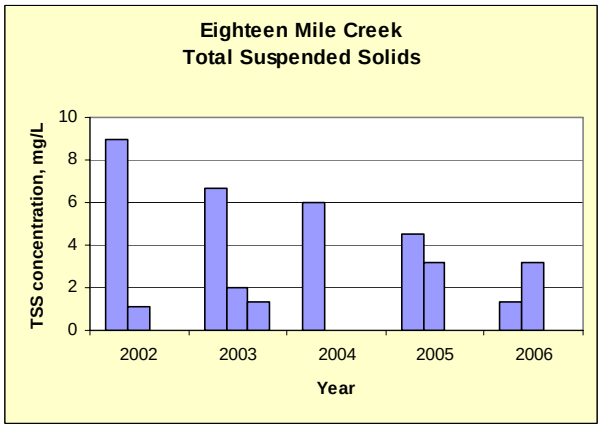
DATE >>>		8/31/2005	7/25/2006
Flow	mgd	614	35
	cfs	950	54
pH	su	8.05	8.16
Specific Conductivity	uS/cm	298	406
Temperature	°C	20.1	20.9
TSS	mg/L	26	3.6
	kg/day	60,504	478
DDD (o,p' + p,p')	ng/L	U (0.039)	NA
	g/day		
	kg/year		
DDE (o,p' + p,p')	ng/L	U (0.18)	NA
	g/day		
	kg/year		
DDT (o,p' + p,p')	ng/L	U (0.071)	NA
	g/day		
	kg/year		
Total DDT	ng/L	U	NA
	g/day		
	kg/year		
Dieldrin	ng/L	0.092	NA
	g/day	0.21	
	kg/year	0.08	
Mirex	ng/L	U (0.020)	NA
	g/day		
Total Mercury	ng/L	2.59	1.48
	g/day	6.03	0.20
	kg/year	2.20	0.07
Total PCBs	pg/L	74,140	U
	g/day	172.53	
	kg/year	62.97	
Dioxins TEQ	pg/L	NA	NA
	g/day		
Mercury Field Blank	ng/L	0.273	0.263

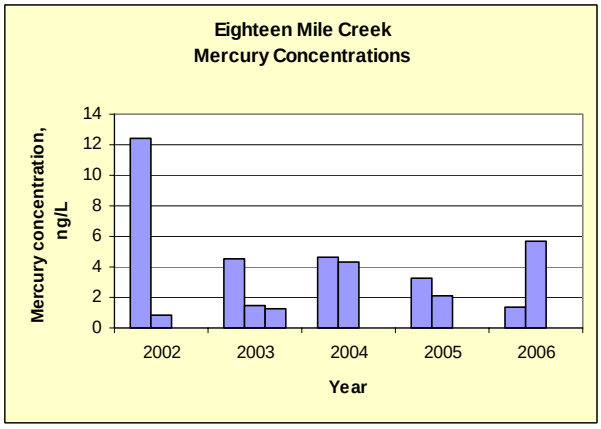
Notes: U - Analyte not detected. Reporting limit is in parentheses.
NA - Not analyzed for this parameter.
QB - Data is indistinguishable from one or more blanks.
-- Total DDT equals sum of DDD + DDE + DDT

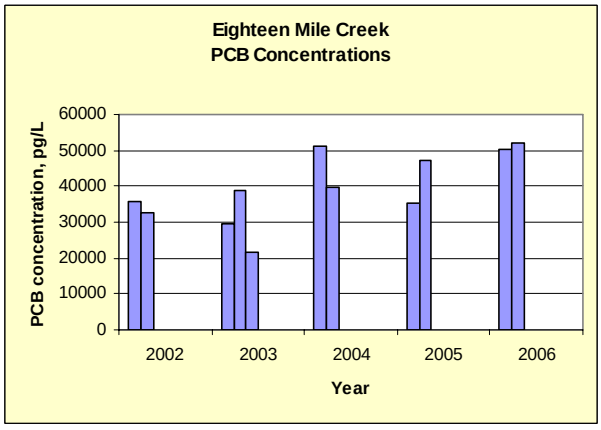
Appendix C

Bar Charts of Results by Tributary

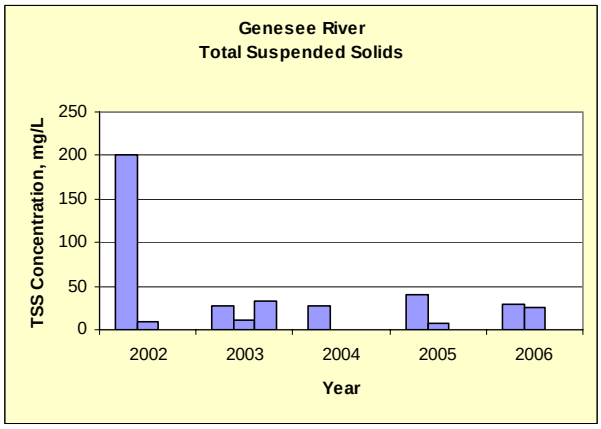
Eighteen Mile Creek

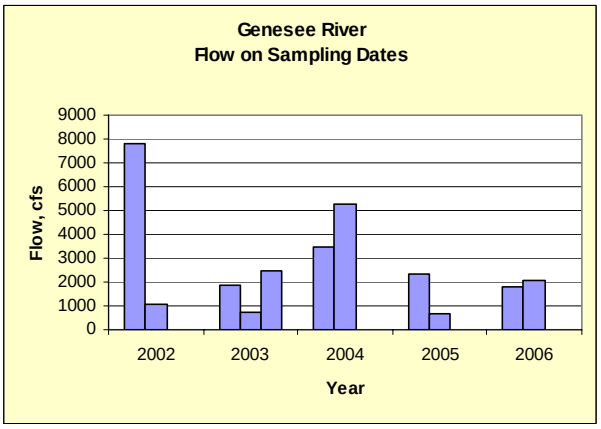


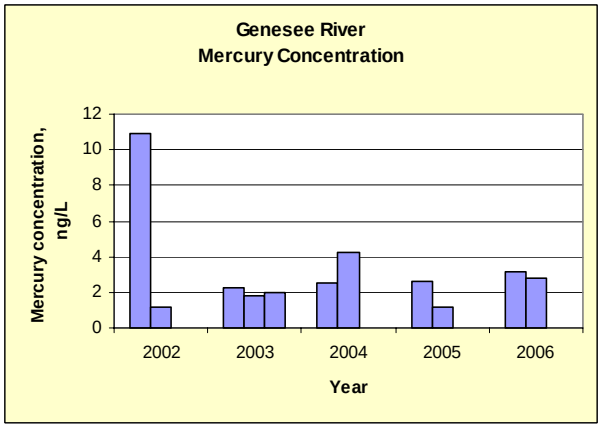


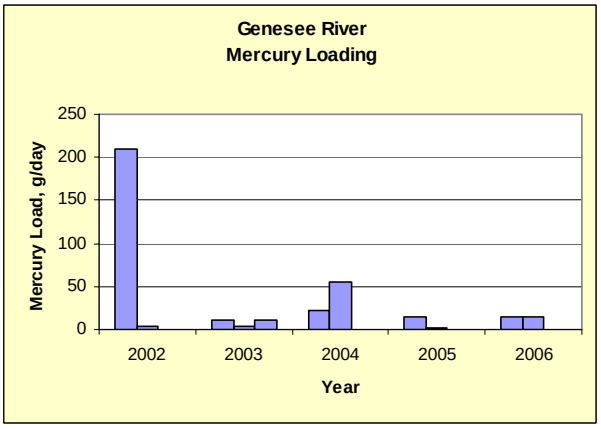


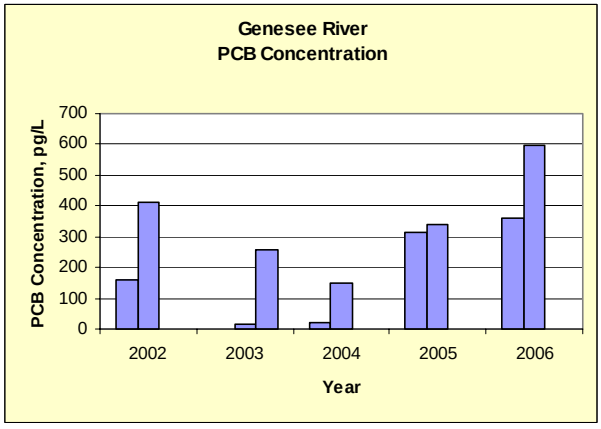
Genesee River

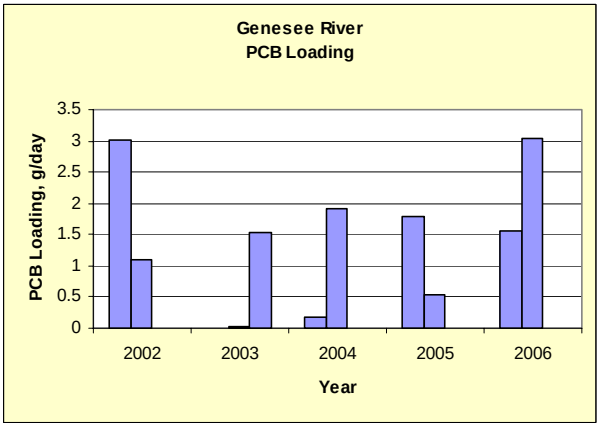




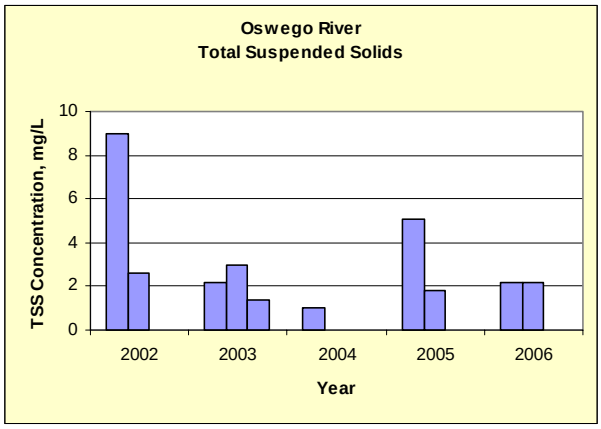


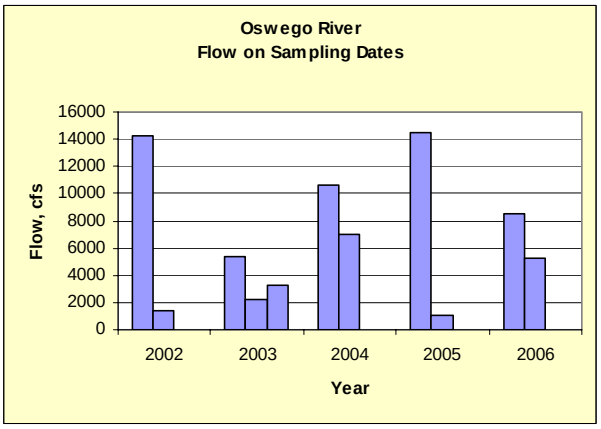


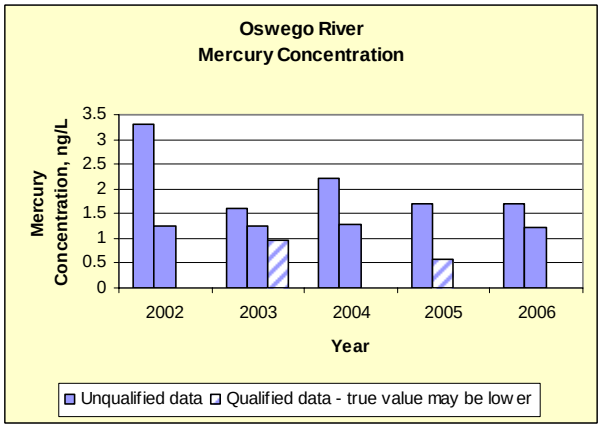


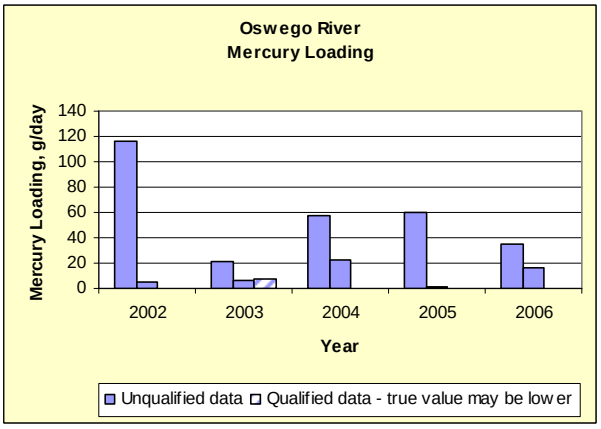


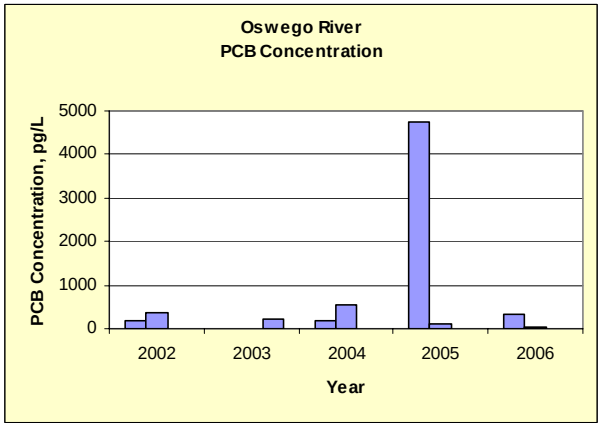
Oswego River

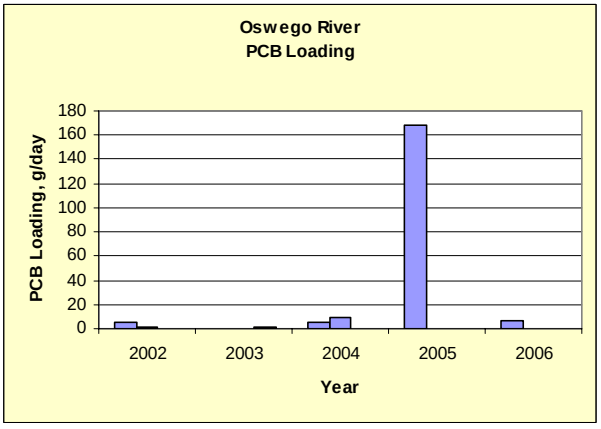




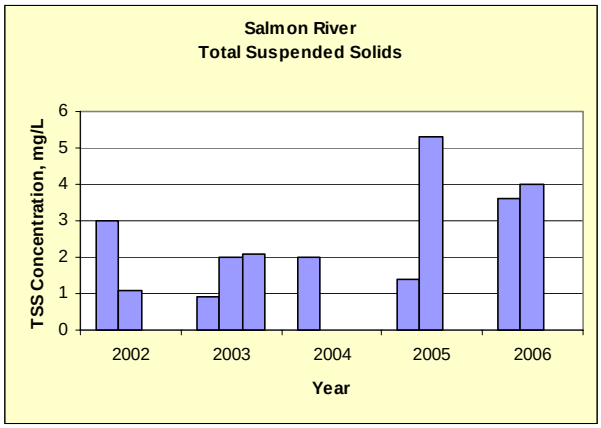


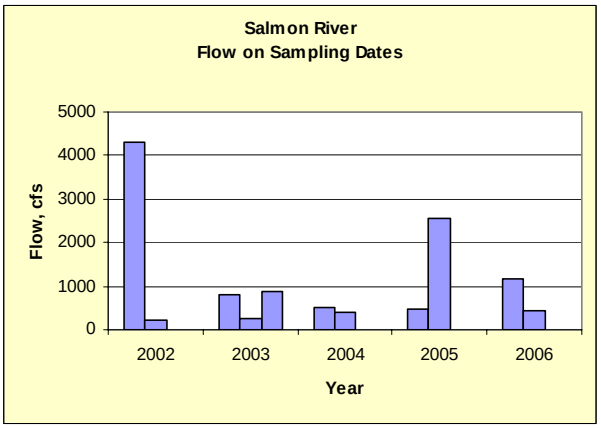


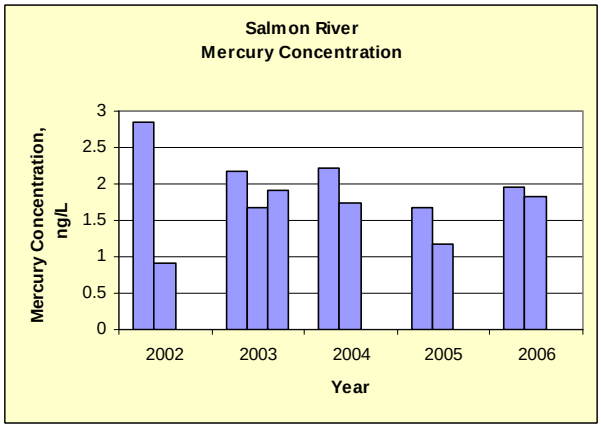


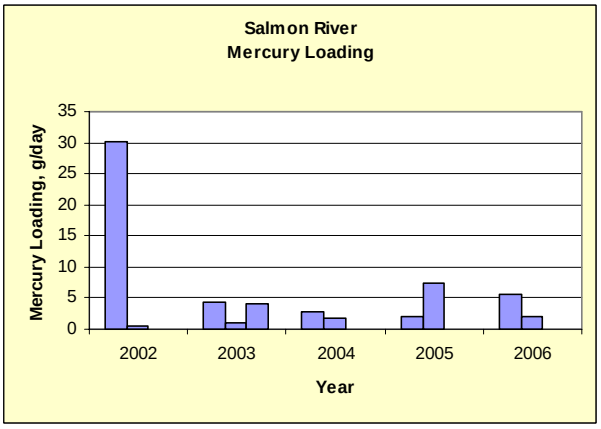


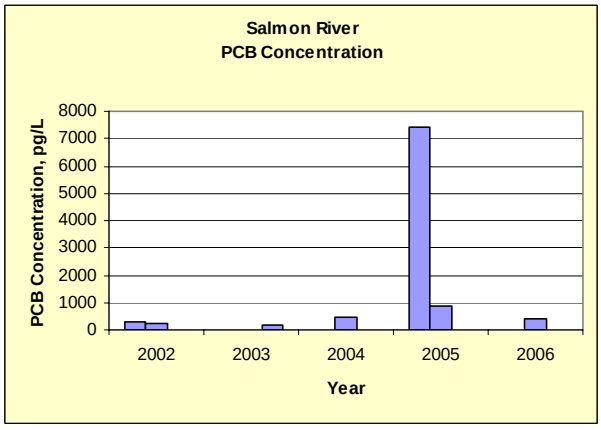
Salmon River

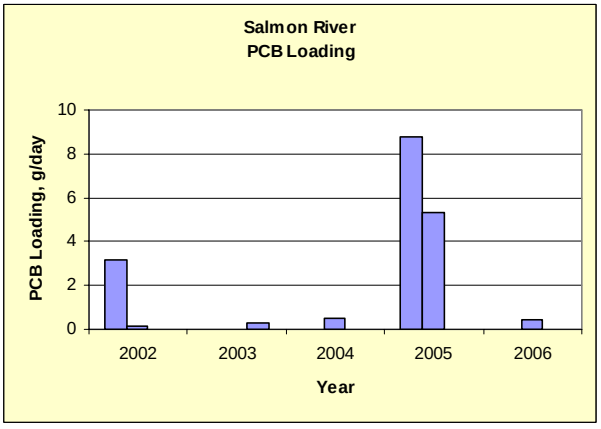




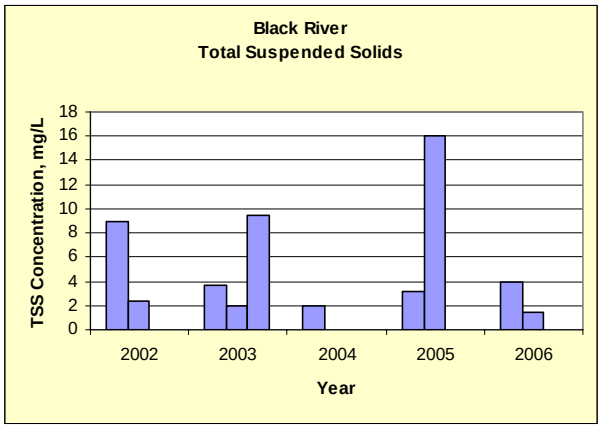


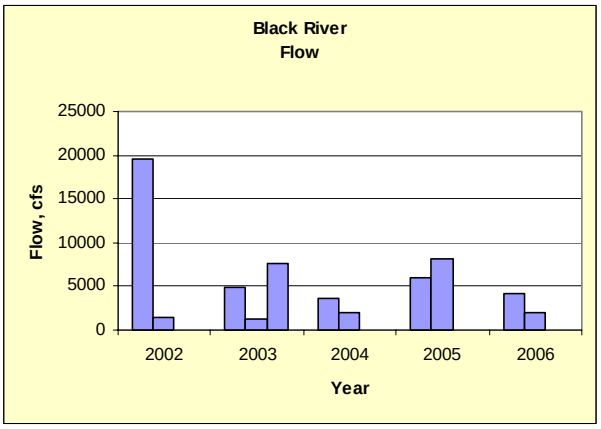


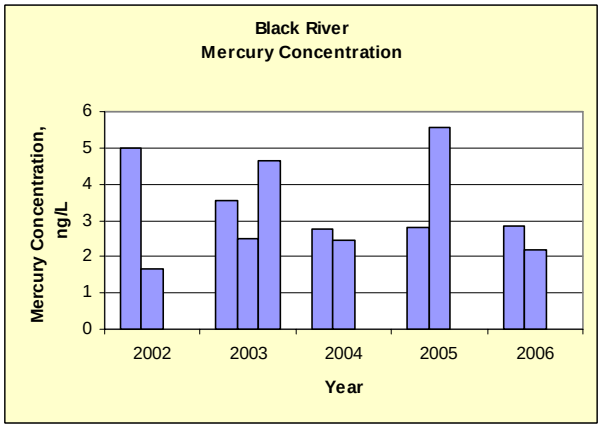


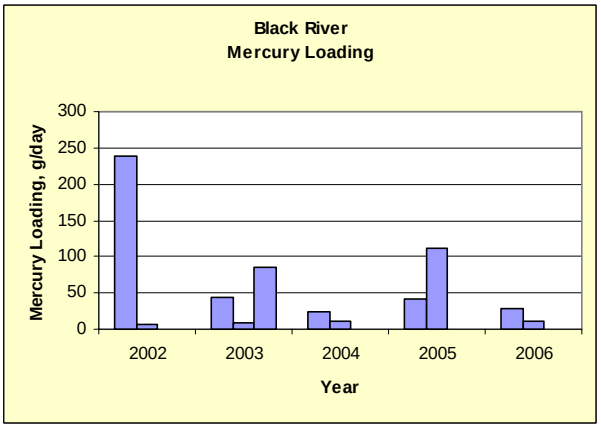


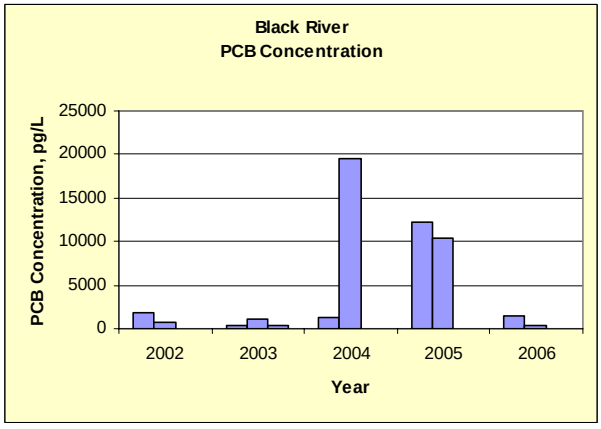
Black River

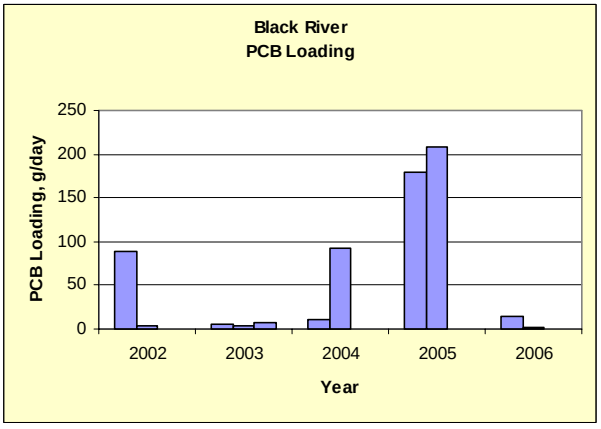

Black River
Total Suspended Solids
TSS Concentration, mg/L
18
16
14
12
10
8
6
4
2
0
2002
2003
2004
2005
2006
Year


Black River
Flow
Flow, cfs
25000
20000
15000
10000
5000
0
2002
2003
2004
2005
2006
Year


Black River
Mercury Concentration
Mercury Concentration, ng/L
6
5
4
3
2
1
0
2002
2003
2004
2005
2006
Year


Black River
Mercury Loading
Mercury Loading, g/day
300
250
200
150
100
50
0
2002
2003
2004
2005
2006
Year


Black River
PCB Concentration
PCB Concentration, pg/L
25000
20000
15000
10000
5000
0
2002
2003
2004
2005
2006
Year


Black River
PCB Loading
PCB Loading, g/day
250
200
150
100
50
0
2002
2003
2004
2005
2006
Year