

Assessment of Persistent Bioaccumulative Toxic Chemicals in Michigan Fish from Several Trophic Levels

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Executive Summary

This project had two components: the analysis of game fish for PCBs and mercury in Muskegon Lake and White Lake (Areas of Concern) to determine the status of the Restrictions on Fish Consumption Beneficial Use Impairment and to examine the distribution of Polybrominated Diphenyl Ethers (PBDEs) in selected recreational waters in Michigan. We collected and analyzed game fish for PCB congeners and mercury in a manner consistent with the MDEQ Fish Contaminant Monitoring Program and used Pentwater Lake as a reference system. The delisting targets established by the Public Advisory Councils (PACs) for the two AOCs utilized Pentwater Lake as a reference and required that contaminant concentrations did not show a statistically significant difference between the reference site and the AOC or that a decreasing trend was present when compared to historical levels. No statistical differences in mercury and PCB congener levels in common carp, largemouth bass, and northern pike between fish from Muskegon Lake and Pentwater Lake and between White Lake and Pentwater Lake. While the fish collections of largemouth bass and northern pike were similar in size and lipid composition in the study lakes, common carp from Pentwater Lake were significantly larger and contained more lipids than the group from Muskegon Lake. Since the concentration of these contaminants is related to the age (size) and lipid content of the fish, analysis of organisms that were more similar in length and weight would result in a more valid comparison. Because the group of common carp collected from Muskegon Lake was significantly smaller, it is recommended that an additional sampling and analysis round of more comparable sized fish be conducted in 2011 to determine if PCB and mercury concentrations are similar in Muskegon Lake and the reference system. Walleye were not present in Pentwater Lake and consequently, historical trends were examined for this species in the two lakes. A distinct decreasing trend was noted for mercury and PCBs in Muskegon Lake from 1987-2006. A distinct decreasing trend was not present in White Lake; however there was no statistical difference noted between PCBs and mercury in walleye from Muskegon Lake and White Lake in the 2006 data. Concentrations of these contaminants were 50% lower in White Lake in the 1980s compared to Muskegon Lake. Since a decreasing trend of PCB and mercury concentrations was not observed in White Lake, an additional sampling of walleye is recommended in 2011 to determine if contaminant levels have reached a steady state.

We conducted an investigation of PBDEs in fish from multiple trophic levels in the Kalamazoo River, Muskegon Lake, White Lake, Pentwater Lake, Saginaw Bay, and the northern Lake Michigan embayments. These locations represent systems with varying degrees of anthropogenic impact and have significant sport fisheries with respect to angler usage and fish production. Forage and predator species were collected from each location and analyzed for PBDE congeners and % lipids. PBDE concentrations were found to be variable across study sites and species, suggesting that a diffuse source such as atmospheric deposition is responsible for contaminant levels observed. The highest concentrations in common carp were found in the northern Lake Michigan embayments and Kalamazoo Lake (232 ng/g and 218 ng/g, respectively). The highest concentrations in walleye was found in Muskegon Lake (84 ng/g) while the highest concentration in northern pike was found in Saginaw Bay (23.72 ng/g). Concentrations of PBDE in yellow perch, round goby, and largemouth bass were

similar and ranged from 0.5-10 ng/g. The higher concentrations in walleye may be due to the fact that they feed on chinook salmon and rainbow trout which have elevated levels of PBDE. The higher concentrations of PBDEs found in common carp can be attributed to their bottom feeding behavior and the association of PBDEs in sediments. Bottom feeding forage fish such as mimic shiner, bluntnose minnow and spottail shiner also had high levels of PBDE congeners compared other fish from similar size classes.

1. Introduction

Persistent Bioaccumulative Toxic Chemicals (PBTs) continue to pose a threat to human and environmental health in the Great Lakes basin. Polybrominated diphenylethers (PBDEs), polychlorinated biphenyls (PCBs) and mercury are considered the most significant toxic chemicals in the Great Lakes ecosystem (Fields 2005). PBDEs are a class of additive flame retardants that have been found in measurable amounts in various samples around the world (Hites 2004). The technical products are commonly referred to as penta-BDE, octa-BDE, and deca-BDE, and each consists of a relatively limited number of congeners. With about 40% of the world total consumption of PBDEs occurring in North America (Manchester-Neesvig et al. 2001), it is not surprising that these chemicals have been found in fish from all of the Great Lakes (Luross et al. 2002; Zhu and Hites 2004). Lake Michigan fish contain 6 times more PBDEs than Baltic salmon (Asplund et al. 1999), and their body burdens are among the highest in all the Great Lakes and show an increasing trend with respect to concentration from 1980 to 2000 (Zhu and Hites 2004). In southeastern Lake Michigan, PBDE levels in sediments also increased during the same time period while PCB concentrations decreased (Manchester-Neesvig et al. 2003). Sediments can serve as a sink for hydrophobic organic chemicals and also function as a source of these materials to the aquatic food web (Burkhard 1998; Maruya and Lee 1998). Food web magnification of PBDEs related to diet and predator/prey relationships has been observed in invertebrates and fish collected from Grand Traverse Bay (Stapleton and Baker 2003). Very little information is available concerning the concentration of PBDEs in fish from other locations in Michigan and degree of magnification within trophic levels. In consideration of the potential of the human health impacts associated with PBDEs (McDonald 2002) and the importance of fisheries to the state of Michigan, an assessment of PBDE concentrations in fish from multiple trophic levels is critical to the development of strategies to effectively manage our resources and minimize future degradation.

We conducted an investigation of PBDEs in fish from multiple trophic levels in the Kalamazoo River, Muskegon Lake, White Lake, Pentwater Lake, Saginaw Bay, and the northern Lake Michigan embayments. These locations represent systems with varying degrees of anthropogenic impact and have significant sport fisheries with respect to angler usage and fish production. Forage and predator species were collected from each location and analyzed for PBDE congeners and % lipids. These data provide important information concerning the concentrations of these bioaccumulative chemicals in fish and how they are distributed in the food web.

Concentrations of PCBs and mercury are measured as part of the MDEQ Fish Contaminant Monitoring Program and most Michigan waterbodies have advisories listed that restrict or limit consumption. While atmospheric deposition accounts for a majority of the anthropogenic inputs of these chemicals, a number of locations in Michigan have experienced direct discharges of PCBs and mercury from industrial effluents and improper waste disposal practices. Many of these locations are classified as Areas of Concern (AOCs) and have the Beneficial Use Impairment (BUI) Restrictions on Fish and Wildlife Consumption, listed because of historical pollution sources. Two of the study sites, White Lake and Muskegon Lake, are AOCs that have conducted waste minimization and remediation programs to remove contaminant sources from the system. Both AOCs have recently developed numerical targets for delisting this BUI and

need to assess the progress of restoration activities. The targets require fish contaminant monitoring data to support the removal of the BUI. We analyzed the higher trophic level fish collected in this project for PCB congeners and mercury in a manner consistent with the MDEQ Fish Contaminant Monitoring Program and used Pentwater Lake as a reference system. The delisting targets established by the PACs for the two AOCs utilize Pentwater Lake as a reference and require that contaminant concentrations do not show a statistically significant difference between the reference site and the AOC. The project data provided sufficient information for the AOCs to determine if the numerical targets have been met and pending a favorable outcome, prepare a request to the MDEQ for delisting the Restrictions on Fish and Wildlife Consumption BUI.

The PBDE data provided important information concerning how this emerging chemical is accumulating in the food web at key fisheries in Michigan and serve as a baseline for future monitoring. By examining PBDE levels in lower trophic level species, this project also helped provide an indication how bioaccumulation patterns may be altered by population shifts from invasive species such as the round goby.

The sampling locations we evaluated are shown in Figure 1.1. We sampled the Kalamazoo River, White Lake, Muskegon Lake, Pentwater Lake, three sites in northern Lake Michigan (protected embayments), and two sites in Saginaw Bay (open embayment) during 2006. We sampled wetland and adjacent littoral habitats at each site for lower trophic level fish (5-10 cm) using fyke nets. We supplemented fyke netting in the lake habitats with boat electrofishing to increase the number of large predatory fish collected. Target species (≥ 25 cm) included common carp, walleye, northern pike, and largemouth bass. We strove to collect a minimum of 10 fish from each of the target species. Fish samples were kept on ice in the field and returned to the laboratory where they were frozen until analyzed. Fish collected by the fyke nets were analyzed as composites of 5-10 organisms per species and analyzed on a whole fish basis. The larger fish were filleted and analyzed as edible portion. Analyses for PBDE and PCB congeners were conducted by negative ion chemical ionization (NCI) and mercury was analyzed by cold vapor atomic absorption.

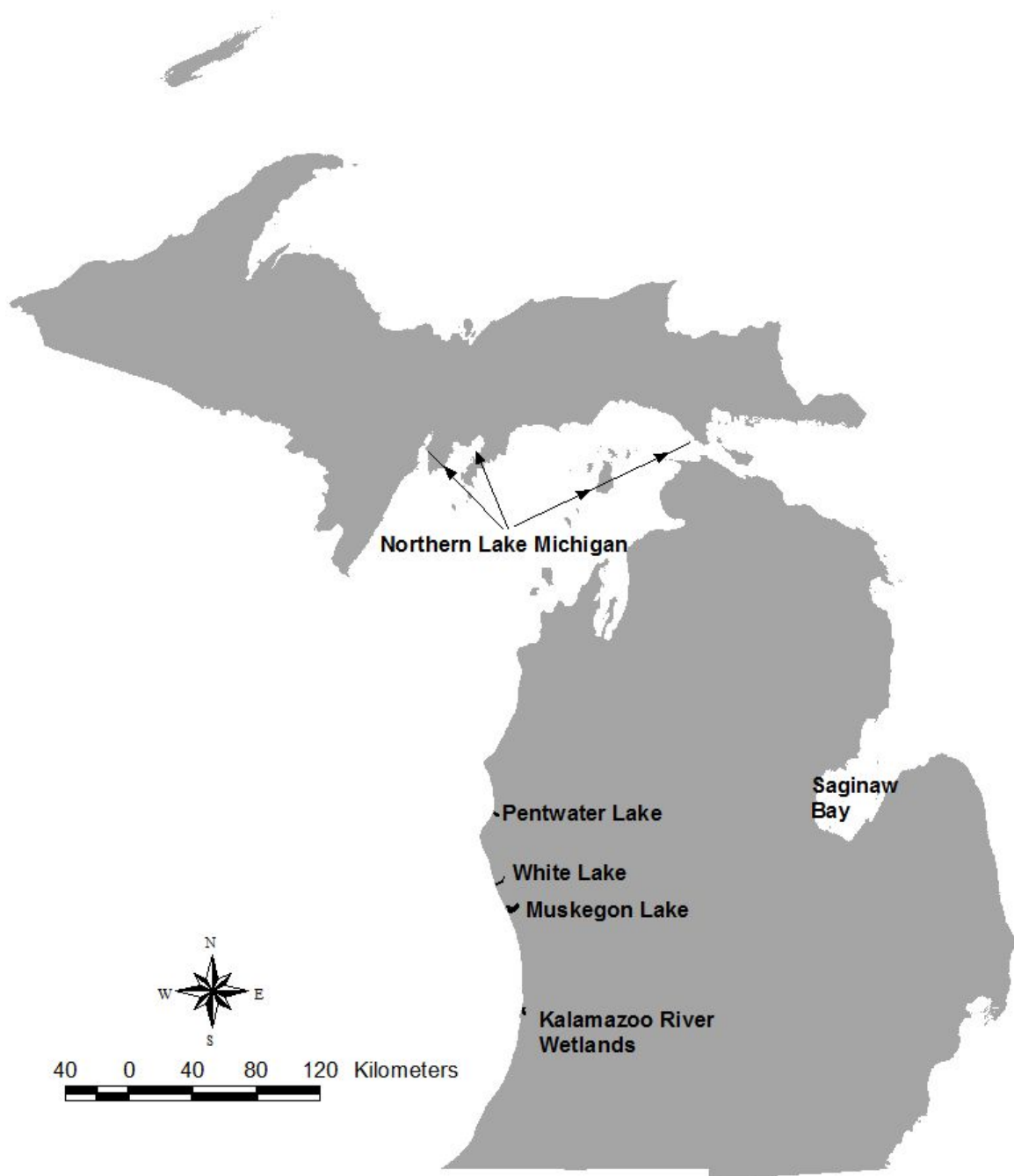


Figure 1. 1. Michigan Fish Collection Sites.

2. Methods

2.1 Sampling methods

2.1.1 Sampling Design

We conducted an investigation of PBDEs in fish from multiple trophic levels in the Kalamazoo River, Muskegon Lake, White Lake, Pentwater Lake, Saginaw Bay, and the northern Lake Michigan embayments. These locations represent systems with varying degrees of anthropogenic impact and have significant sport fisheries with respect to angler usage and fish production. Forage and predator species were collected from each location and analyzed for PBDE congeners and % lipids. These data provided important information concerning the concentrations of these bioaccumulative chemicals in fish and how they are distributed in the food web. Approximately 300 fish were analyzed for this project.

The White Lake and Muskegon Lake AOCs recently have developed numerical targets for delisting the Restrictions on Fish and Wildlife Consumption BUI and needed to assess the progress of restoration activities. The targets required fish contaminant monitoring data to support the removal of the BUI. We analyzed the higher trophic level fish collected in this project for PCB congeners and mercury in a manner consistent with the MDEQ Fish Contaminant Monitoring Program and used Pentwater Lake as a reference system. The delisting targets established by the PACs for each AOC utilize Pentwater Lake as a reference and require that contaminant concentrations do not show a statistically significant difference between the reference site and the AOC. The project data provided sufficient information for the AOCs to determine if the numerical targets had been met and pending a favorable outcome, prepare a request to the MDEQ for delisting the Restrictions on Fish and Wildlife Consumption BUI.

2.1.2 Sampling Methods

The sampling locations we evaluated are shown in Figure 1. We sampled the Kalamazoo River, White Lake, Muskegon Lake, Pentwater Lake, three sites in northern Lake Michigan (protected embayment), and two sites in Saginaw Bay (open embayment) during 2006. We sampled wetland and adjacent littoral habitats at each site for lower trophic level fish (5-10 cm) using fyke nets (see Breen and Ruetz [2006] for detailed description of fyke nets). We sampled 2-3 sites (3 nets per site) in the littoral habitat and 2-3 sites in the adjacent wetland habitat (12-18 nets were fished at each location) at each location. Fyke nets were fished for 1 night. The following 10 fish species are representative of typical fyke net collections:

Largemouth bass (mostly YOY)	Spottail shiner	Banded killifish
Yellow perch (mostly YOY)	Round goby	Mimic shiner
Common carp (mostly YOY)	Bluntnose minnow	Sand shiner
White sucker (mostly YOY)		

We supplemented fyke netting in littoral habitats with boat electrofishing (Smith-Root 5.0 GPP control box) to increase the number of large predatory fish collected. Target species (≥ 25 cm) included common carp, walleye, northern pike, and largemouth bass. We strove to collect a minimum of 10 fish from each of the target species. The time spent electrofishing was dependent on the ease of capturing the target species, but we spent about 1 hr electrofishing at each littoral site. Once identified and measured (length), fish were euthanized with a lethal dose (250 mg/L) with a standard fish anesthetic (tricaine methanesulfonate), kept on ice in the field, and returned to the laboratory where they were frozen until analyzed.

Chemical and physical parameters were monitored at each study site during sample events. A Hydrolab DataSonde 4a was used to determine pH, redox potential, chlorophyll a, DO, DO% saturation, temperature, and specific conductance. Grab samples were collected and analyzed for chloride, sulfate, soluble reactive phosphorus, nitrate-N, and ammonia-N at the Annis Water Resources Institute laboratory.

2.2 Analytical Methods

Laboratory procedures have been selected based on previous use for water quality investigations, established ranges for accuracy/precision, and limited problems related to matrix interferences. Standard operating procedures (SOPs) have been prepared for all analytical methods used in this project. A summary of analytical methods is given in Table 2.1. Method summaries are provided in the following sections.

2.2.1. Hydrolab Methods

Hydrolab measurements of pH, temperature, dissolved oxygen, and specific conductance were conducted according to the methods in the instrument users manual (Hydrolab 1998). The Hydrolab Datasonde 4a was calibrated in the lab prior to use in the field. The instrument was placed in the water at each site and the technician waited for a stable reading of the sensors. Measurements were recorded at 0.5 m increments at each station. Precision was assessed by the measurement of field duplicates at 10% of the stations.

2.2.2 Fish Tissue Preparation

Fish tissue was prepared by homogenization in a stainless steel blender or Hobart 4822 grinder. Lower trophic level fish were prepared as composites of 5-10 organisms per species. Larger fish were filleted before homogenization and prepared as individual samples. A 20 gram portion of the ground matrix was then extracted by Soxhlet extractor as specified in EPA method 1668. All samples were spiked with two non-aroclor surrogates (IUPAC#65 and IUPAC#166). Both surrogates were used to assess the extraction effectiveness for the PCB congener analysis. The second surrogate was used to determine the effectiveness for the PBDE analysis. A matrix spike and matrix spike duplicate were performed on five percent of the samples. The MS/MSD

samples were spiked with all nine PBDEs that were analyzed as well as six PCB congeners (IUPAC# 44,101,151,180,185 and 207).

Table 2. 1 Laboratory Analytical Methods

Parameter	Preparation	Preservation	Holding Time	Methods Reference
pH*	*	*	*	Hydrolab 1998
Redox potential*	*	*	*	Hydrolab 1998
Chlorophyll <i>a</i> *	*	*	*	Hydrolab 1998
Dissolved Oxygen*	*	*	*	Hydrolab 1998
Temperature*	*	*	*	Hydrolab 1998
Specific conductance*	*	*	*	Hydrolab 1998
Turbidity*	*	*	*	Hydrolab 1998
Total Dissolved Solids*	*	*	*	Hydrolab 1998
Soluble Reactive Phosphorus (SRP-P)	0.45 μ m filter in field	Freeze -10°C	28 days	4500-P F.
Ammonia (NH ₃ -N)	filter to remove turbidity	H ₂ SO ₄ Cool to 4°C	28 days	4500-NH ₃ H.
Nitrate (NO ₃ -N)	0.45 μ m filter	Freeze -10°C	28 days	4100 C.
Sulfate (SO ₄)	0.45 μ m filter	Freeze -10°C	28 days	4100 C.
Chloride (Cl)	0.45 μ m filter	Freeze -10°C	28 days	4100 C.
PBDE Congeners	Homogenization	Freeze -10°C	6 mo	Schmidt (1997)
PCB Congeners	Homogenization	Freeze -10°C	6 mo	Schmidt (1997)
% Lipids	Homogenization	Freeze -10°C	6 mo	Schmidt (1997)
Mercury	Homogenization	Freeze -10°C	6 mo	USEPA (1999) (3050/7140)

* Measured directly in the field

2.2.3. Fish Tissue Analysis

PBDE and PCB congener concentrations were determined in each of the composite samples using the negative chemical ionization mass spectrometry for PBDEs and the GC/ECD for PCB congeners. This procedure is outlined by Schmidt (1997), however we used a slight modification to this procedure by including soxhlet extraction and a multi-layered anthropogenic column to remove oils and some interfering co-extractables (USEPA 1999; Method 1668). Lipids were measured gravimetrically by evaporating an aliquot of the soxhlet extract. The NCI mass spectrometer was calibrated using individual congener standards from AccuStandard (New Haven, CT). Concentrations for each of 9 PBDE and 83 PCB congeners were determined. The following congeners were analyzed in the fish samples:

- PCB Congeners 6, 8, 9, 16, 17, 18, 20, 22, 25, 26, 28, 31, 32, 33, 37, 40, 41, 42, 44, 45, 46, 48, 49, 52, 56, 60, 63, 64, 66, 70, 71, 74, 77, 82, 84, 85, 87, 91, 92, 95, 97, 99, 101, 105, 109, 110, 118, 123, 128, 132, 135, 137, 138, 141, 144, 146, 149, 151, 153, 156, 158, 163, 167, 170, 171, 172, 174, 176, 177, 178, 179, 180, 183, 185, 187, 189, 190, 193, 194, 195, 196, 199, 202, 203, 206, and 209.

- PBDE Congeners 28, 47, 66, 85, 99, 100, 153, 154, and 183.

Some PCB congeners were reported as a pair if a co-elution existed. When this condition occurred, the response factor of the more dominant aroclor congener was used. Appropriate quality control samples (blanks, matrix spikes, and duplicates) were analyzed to ensure precision and accuracy.

Mercury in fish tissue was analyzed by cold vapor atomic absorption according to USEPA (1999) methods (3050/7140). Initial calibration was accomplished by analyzing 5 standards and a blank. Appropriate quality control samples (blanks, matrix spikes, and duplicates) and continuing calibration checks were analyzed to ensure precision and accuracy.

3.0 Results and Discussion

The inventories of fish collected and water chemistry data from each location are presented by basin in Section 3.1. GPS coordinates of the collection sites also are presented. PCB congener and mercury data for White Lake, Muskegon Lake, and Pentwater Lake are contained in Section 3.2. An analysis of the data with respect to delisting the Restriction on Fish Consumption BUI also is included. Finally, the results and discussion of the PBDE analyses are presented in Section 3.3. The congener specific results of PCBs and total mercury analyses are included in Appendix A. Congener specific analyses for PBDEs are included in Appendix B.

3.1 Fish Sampling Results and Water Chemistry

3.1.1. Kalamazoo River

The sampling locations for the Kalamazoo River and site information are provided in Figure 3.1.1 and Table 3.1.1, respectively. Three wetland and three river locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 47% agriculture, 28% forest and 7% developed.

Fish inventory and water chemistry results are summarized in Tables 3.1.2 and 3.1.3, respectively. Common prey fish collected in the fyke nets included banded killifish, bluntnose minnow, and spottail shiner. Electrofishing collections consisted of 13 common carp and 3 largemouth bass. Walleye and northern pike were not collected during electrofishing. There was no significant difference between water chemistry results.

3.2.1. Muskegon Lake

The sampling locations for Muskegon Lake and site information are provided in Figure 3.1.2 and Table 3.1.4, respectively. Three wetland and three river locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 45-50% forest, 11-16% agriculture, and 9-12% developed.

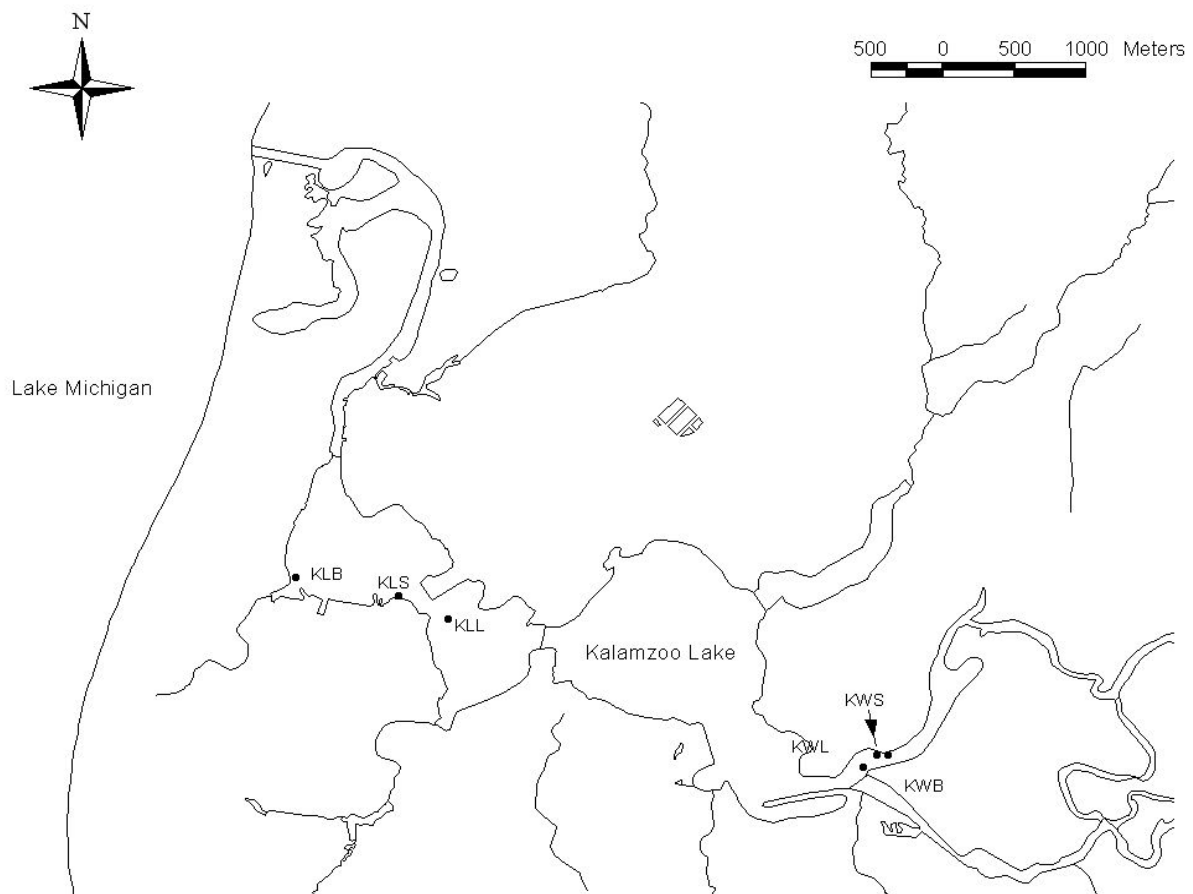


Figure 3.1. 1. Kalamazoo River Sampling Locations

Table 3.1. 1 Kalamazoo River Sampling Location Information

Date:	Macro habitat:	Micro habitat:	Code:	Lat.	Long.	Watershed Land Use and Cover:				
						%Ag.	%Forest	%Open/Herb.	%Dev.	%Water
6/12/2006	Lake	Bare	KLB	42° 38.98'	86° 12.59'	47.36	28.55	12.84	7.39	3.87
6/12/2006		Lily	KLL	42° 38.82'	86° 11.82'	47.36	28.55	12.84	7.39	3.87
6/12/2006		SAV	KLS	42° 38.91'	86° 12.07'	47.36	28.55	12.84	7.39	3.87
6/12/2006	Wetland	Bare	KWB	42° 38.31'	86° 9.58'	47.63	28.46	12.76	7.31	3.82
6/12/2006		Lily	KWL	42° 38.26'	86° 9.71'	47.63	28.46	12.76	7.31	3.82
6/12/2006		SAV	KWS	42° 38.31'	86° 9.64'	47.63	28.46	12.76	7.31	3.82

Table 3.1. 2. Kalamazoo River Fish Inventory

Species	Kalamazoo River	Kalamazoo Wetland	Total
Fyke nets			
Banded killifish	32	20	52
Bluntnose minnow	62		62
Common carp	3		3
Mimic shiner		56	56
Round goby	2		2
Spottail shiner	27	8	35
White sucker	1		1
Yellow perch	1	1	2
Electrofishing			
Common carp	13		13
Largemouth bass	3		3

Table 3.1. 3. Kalamazoo River Physical and Chemical Data

Parameter	Lake			Wetland		
	Bare	Lily	SAV	Bare	Lily	SAV
Date	6/12/2006	6/12/2006	6/12/2006	6/12/2006	6/12/2006	6/12/2006
Temperature (°C)	20.61	20.44	20.49	21.87	21.04	22.12
Dissolved Oxygen (mg/L)	10.21	8.54	9.06	9.89	9.05	9.84
Spec. Conductance (µS/cm)	587.8	587.5	588.6	587.9	589.7	588.1
pH	9.18	8.78	8.94	8.87	9.04	9.00
Pheno. Alkalinity (mg/L CaCO ₃)	6.0	3.0	0.0	4.0	3.0	3.0
Total Alkalinity (mg/L CaCO ₃)	213.0	212.0	213.0	212.0	210.0	212.0
NH ₄ -N (mg/L; D.L.=0.01)	<0.01	0.03	0.01	<0.01	0.01	<0.01
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cl- (mg/L; D.L.=0.1)	19.8	20.7	20.8	22.0	22.9	17.3
SO ₄ -S (mg/L; D.L.=0.1)	20.8	19.0	28.3	20.8	23.1	16.9
NO ₃ -N (mg/L; D.L.=0.01)	0.43	0.49	0.77	0.61	0.58	0.46
depth (cm)	50.0	55-100	30-40	40.0	50-100	65.0
soft organic (%)	0	5	0	0	5	5

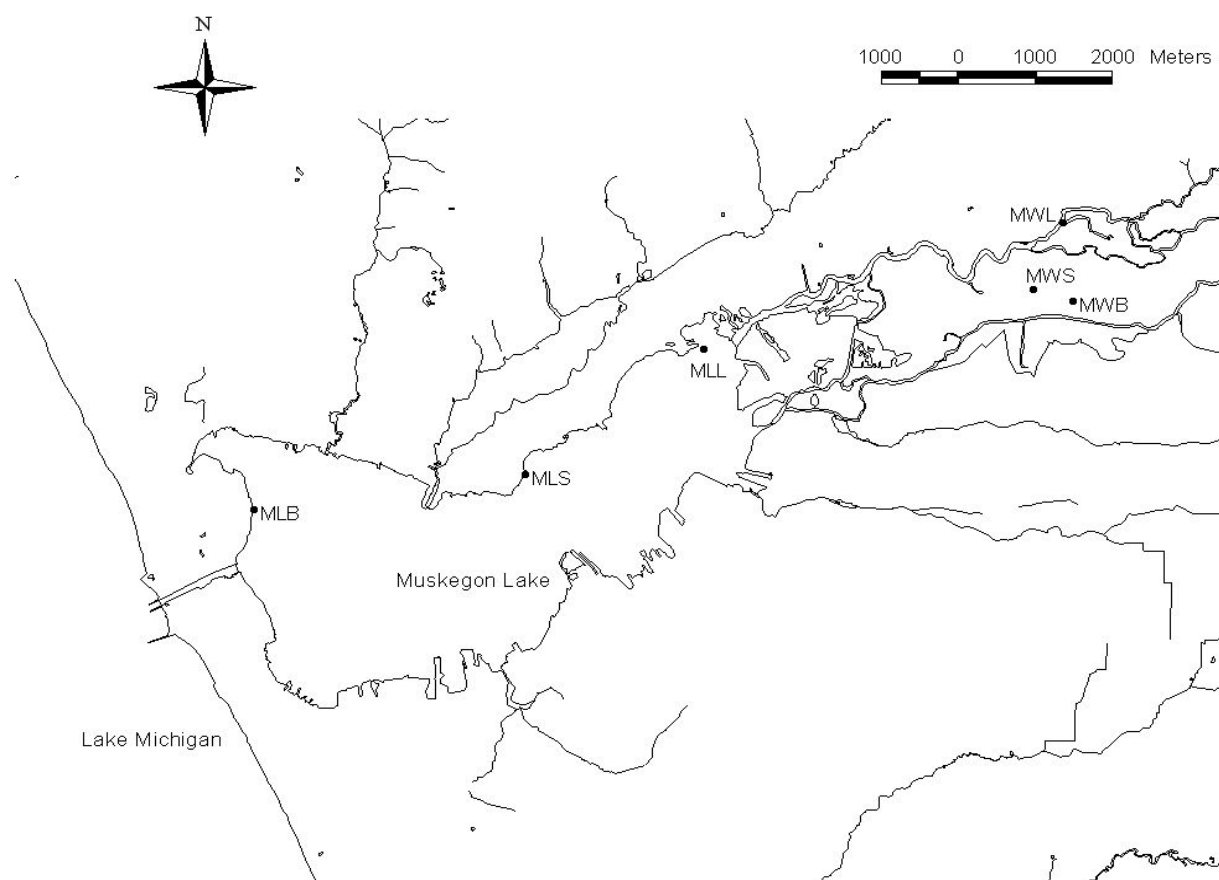


Figure 3.1. 2. Muskegon Lake Sampling Locations

Table 3.1.4. Muskegon Lake Sampling Location Information

Date:	Macro habitat:	Micro habitat:	Code	Watershed Land Use and Cover:						
				Lat.	Long.	%Ag.	%Forest	%Open/Herb.	%Dev.	%Water
6/20/2006	Lake	Bare	MLB	43° 14.35'	86° 19.51'	11.62	45.75	20.90	10.86	10.88
6/20/2006		Lily	MLL	43° 15.55'	86° 15.22'	11.62	45.75	20.90	10.86	10.88
6/20/2006		SAV	MLS	43° 14.62'	86° 16.92'	11.62	45.75	20.90	10.86	10.88
6/20/2006	Wetland	Bare	MWB	43° 15.91'	86° 11.70'	16.24	49.74	20.57	4.45	8.99
6/20/2006		Lily	MWL	43° 16.49'	86° 11.79'	16.24	49.74	20.57	4.45	8.99
6/20/2006		SAV	MWS	43° 15.99'	86° 12.08'	16.24	49.74	20.57	4.45	8.99

Fish inventory and water chemistry results are summarized in Tables 3.1.5 and 3.1.6, respectively. Common prey fish collected in the fyke nets included banded killifish, YOY largemouth bass, mimic shiner, round goby, spottail shiner, and YOY yellow perch. Walleye, northern pike, largemouth bass, and common carp were collected during electrofishing. Wetland collections accounted for <5% of the total number of fish taken from Muskegon Lake. There was no significant difference between water chemistry results in the wetlands and Muskegon Lake except for dissolved oxygen which was lower in the wetland.

Table 3.1. 5. Muskegon Lake Fish Inventory

Species	Muskegon Lake	Muskegon Wetland	Total
Fyke nets			
Bluntnose minnow	46		46
Largemouth bass (YOY)	52	3	55
Mimic shiner	49		53
Round goby	46	7	53
Spottail shiner	52		52
White sucker	1		1
Yellow perch (YOY)	51	8	59
Electrofishing			
Common carp	9		9
Walleye	10		10
Northern pike	9		9
Largemouth bass	11		11

Table 3.1. 6. Muskegon Lake Physical and Chemical Data

	Lake			Wetland		
	Bare	Lily	SAV	Bare	Lily	SAV
Date	6/20/2006	6/20/2006	6/20/2006	6/20/2006	6/20/2006	6/20/2006
Temperature (°C)	20.88	23.05	22.90	21.16	22.15	21.69
Dissolved Oxygen (mg/L)	8.00	9.11	9.90	7.70	7.64	7.70
Spec. Conductance (uS/cm)	349.3	383.2	364.2	374.5	382.3	370.6
pH	7.86	8.17	8.21	7.90	8.04	7.83
Pheno. Alkalinity (mg/L CaCO ₃)	0.0	0.0	0.0	0.0	0.0	0.0
Total Alkalinity (mg/L CaCO ₃)	133.5	141.5	138.0	142.5	144.5	140.5
NH ₄ -N (mg/L; D.L.=0.01)	0.01	0.03	0.03	0.02	0.03	0.04
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Cl ⁻ (mg/L; D.L.=0.1)	20.7	22.5	39.9	16.9	32.9	25.2
SO ₄ -S (mg/L; D.L.=0.1)	15.3	13.1	24.7	12.3	26.6	13.9
NO ₃ -N (mg/L; D.L.=0.01)	0.16	0.01	0.21	0.02	0.21	0.06
depth (cm)	65.0	55.0	110.0	50.0	35.0	65.0
soft organic (%)	0	>100	0	0	15	5

3.1.3. White Lake

The sampling locations for White Lake and site information are provided in Figure 3.1.3 and Table 3.1.7, respectively. Three wetland and three river locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 17% agriculture, 64% forest and 2-3% developed.

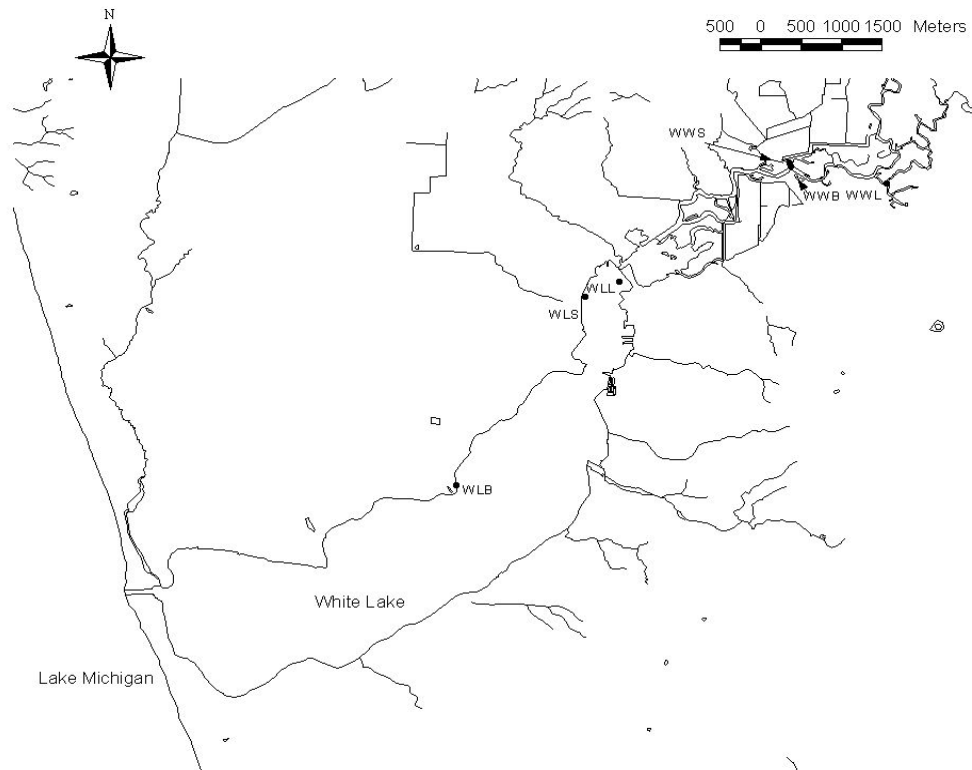


Figure 3.1. 3. White Lake Sampling Locations

Table 3.1. 7. White Lake Sampling Location Information

Date:	Macro habitat:	Micro habitat:	Code	Watershed Land Use and Cover:						
				Lat.	Long.	%Ag.	%Forest	%Open/Herb.	%Dev.	%Water
6/22/2006	Lake	Bare	WLB	43° 23.28'	86° 22.60'	16.78	63.22	13.41	2.91	3.67
6/22/2006		Lily	WLL	43° 24.72'	86° 21.13'	16.78	63.22	13.41	2.91	3.67
6/22/2006		SAV	WLS	43° 24.61'	86° 21.44'	16.78	63.22	13.41	2.91	3.67
6/22/2006	Wetland	Bare	WWB	43° 25.54'	86° 19.56'	17.16	64.32	13.23	2.30	2.99
6/22/2006		Lily	WWL	43° 25.42'	86° 18.69'	17.16	64.32	13.23	2.30	2.99
6/22/2006		SAV	WWS	43° 25.56'	86° 19.57'	17.16	64.32	13.23	2.30	2.99

Fish inventory and water chemistry results are summarized in Tables 3.1.8 and 3.1.9, respectively. Common prey fish collected in the fyke nets included bluntnose minnow, YOY largemouth bass, round goby, and YOY yellow perch. Walleye, northern pike, largemouth bass, and common carp were collected during electrofishing. There was no significant difference between wetland and lake water chemistry results

Table 3.1. 8. White Lake Fish Inventory

Species	White Lake	White Lake Wetland	Total
Fyke nets			
Bluntnose minnow	32		32
Largemouth bass (YOY)	95		95
Mimic shiner	7		7
Round goby	2	15	17
Spottail shiner	1		1
White sucker		10	10
Yellow perch (YOY)	35	15	50
Electrofishing			
Common carp	10		10
Walleye	7		7
Northern pike	10		10
Largemouth bass	10		10

Table 3.1. 9. White Lake Physical and Chemical Data

	Lake			Wetland		
	Bare	Lily	SAV	Bare	Lily	SAV
Date	6/22/2006	6/22/2006	6/22/2006	6/22/2006	6/22/2006	6/22/2006
Temperature (°C)	23.09	21.29	22.53	20.06	20.92	21.15
Dissolved Oxygen (mg/L)	8.88	5.62	13.01	7.74	8.69	6.51
Spec. Conductance (uS/cm)	371.6	395.9	367.6	391.9	353.2	403.7
pH	8.51	7.85	8.98	8.22	8.49	7.70
Pheno. Alkalinity (mg/L CaCO ₃)	1.0	0.0	0.0	0.0	0.0	0.0
Total Alkalinity (mg/L CaCO ₃)	142.0	150.0	132.0	151.0	143.0	150.0
NH ₄ -N (mg/L; D.L.=0.01)	0.04	0.04	0.02	0.04	0.02	0.06
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cl- (mg/L; D.L.=0.1)	22.7	13.7	53.4	37.5	16.4	32.2
SO ₄ -S (mg/L; D.L.=0.1)	18.2	9.4	34.5	32.3	14.3	20.3
NO ₃ -N (mg/L; D.L.=0.01)	0.15	0.01	<0.01	0.64	0.17	0.10
depth (cm)	60.0	45.0	100.0	50.0	55.0	80.0
soft organic (%)	0	60	40	0	25	>100

3.1.4. Pentwater Lake

The sampling locations and site information for Pentwater Lake are provided in Figure 3.1.4 and Table 3.1.10, respectively. Three wetland and three river locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 26-32% agriculture, 47-54% forest and 1-3% developed.

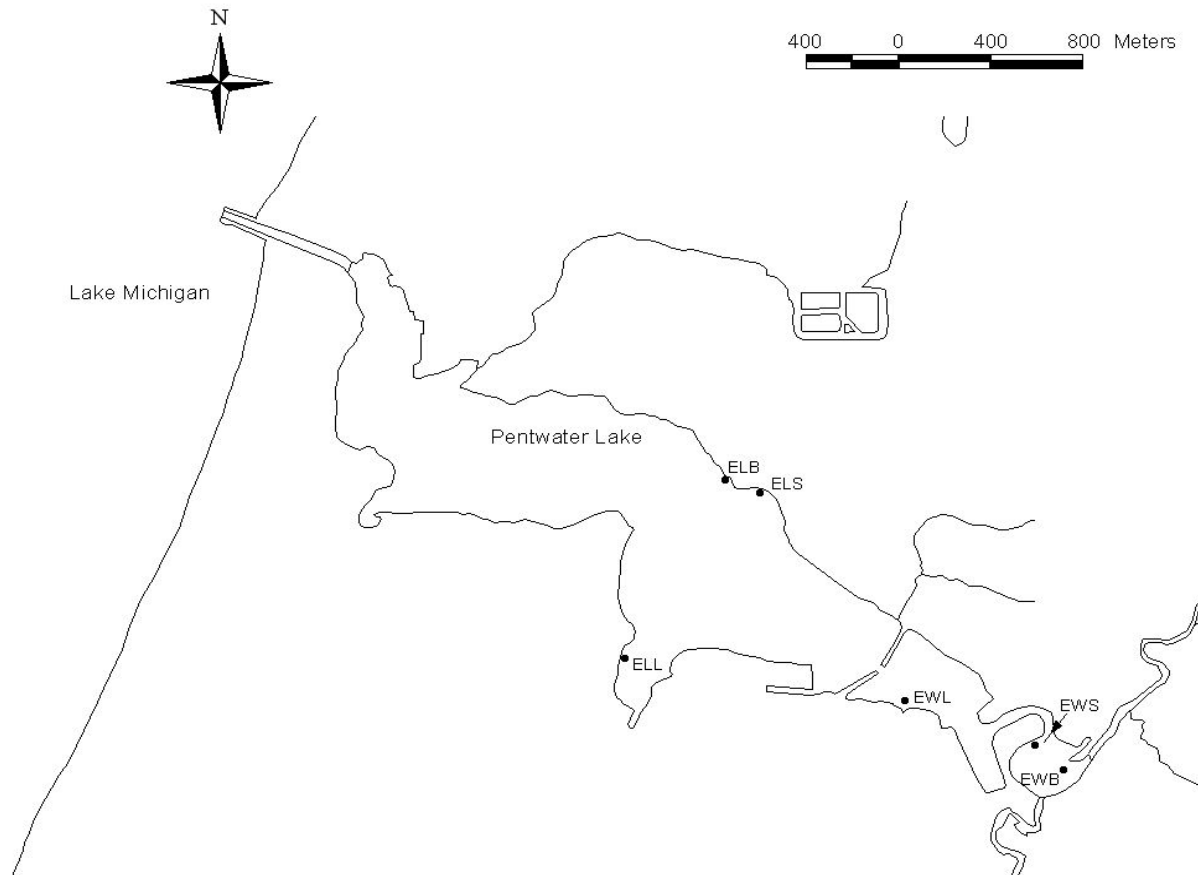


Figure 3.1. 4. Pentwater Lake Sampling Locations

Table 3.1. 10. Pentwater Lake Sampling Location Information

Date:	Macro habitat:	Micro habitat:	Code	Watershed Land Use and Cover:						
				Lat.	Long.	%Ag.	%Forest	%Open/Herb.	%Dev.	%Water
6/26/2006	Lake	Bare	ELB	43° 46.28'	86° 25.02'	32.62	47.44	14.03	2.82	3.10
6/26/2006		Lily	ELL	43° 45.84'	86° 25.34'	32.62	47.44	14.03	2.82	3.10
6/26/2006		SAV	ELS	43° 46.25'	86° 24.91'	32.62	47.44	14.03	2.82	3.10
6/26/2006	Wetland	Bare	EWB	43° 45.57'	86° 23.93'	33.41	47.07	14.23	2.65	2.63
6/26/2006		Lily	EWL	43° 45.74'	86° 24.44'	33.41	47.07	14.23	2.65	2.63
6/26/2006		SAV	EWS	43° 45.63'	86° 24.02'	26.22	54.33	14.33	1.85	3.27

Fish inventory and water chemistry results are summarized in Tables 3.1.11 and 3.1.12, respectively. Prey fish collected in the fyke nets included banded killifish, bluntnose minnow, YOY largemouth bass, mimic shiner, round goby, and YOY yellow perch. Only 3 fish were collected from the wetlands. Electrofishing collections consisted of common carp, northern pike, and largemouth bass. No walleye were collected. The absence of walleye in Pentwater Lake was confirmed by discussions with local anglers and thought to be due to the removal of weed beds. There was no significant difference between wetland and lake water chemistry results.

Table 3.1. 11 Pentwater Lake Fish Inventory

Species	Pentwater Lake	Pentwater Wetland	Total
Fyke nets			
Banded killifish	1		1
Bluntnose minnow	57		57
Largemouth bass	21	3	24
Mimic shiner	63		63
Round goby	50		50
Spottail shiner	1		1
Yellow perch	51		51
Electrofishing			
Common carp	9		9
Walleye	0		0
Northern pike	10		10
Largemouth bass	10		10

Table 3.1. 12 Pentwater Lake Physical and Chemical Data

	Lake			Wetland		
	Bare	Lily	SAV	Bare	Lily	SAV
Date	6/26/2006	6/26/2006	6/26/2006	6/26/2006	6/26/2006	6/26/2006
Temperature (°C)	22.20	21.56	22.02	18.24	18.10	22.13
Dissolved Oxygen (mg/L)	9.58	8.75	8.87	9.24	7.30	10.16
Spec. Conductance (uS/cm)	353.3	354.5	357.6	380.8	396.7	380.2
pH	8.67	8.68	8.64	8.18	7.99	8.45
Pheno. Alkalinity (mg/L CaCO ₃)	0.0	1.0	0.0	0.0	0.0	0.0
Total Alkalinity (mg/L CaCO ₃)	145.0	145.0	145.5	164.0	168.0	172.0
NH ₄ -N (mg/L; D.L.=0.01)	0.02	0.03	0.03	0.02	0.05	0.08
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Cl ⁻ (mg/L; D.L.=0.1)	31.8	19.2	19.3	18.5	21.2	36.8
SO ₄ -S (mg/L; D.L.=0.1)	21.7	13.3	13.1	12.3	13.5	21.1
NO ₃ -N (mg/L; D.L.=0.01)	0.99	0.61	0.61	1.12	0.99	1.65
depth (cm)	60.0	70.0	100.0	35.0	80.0	35.0
soft organic (%)	0	8	0	15	35	30

3.1.5. Saginaw Bay

The sampling locations and site information for Saginaw Bay are provided in Figure 3.1.5 and Table 3.1.13, respectively. Four wetland locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 33% agriculture, 57% forest and 7% developed.

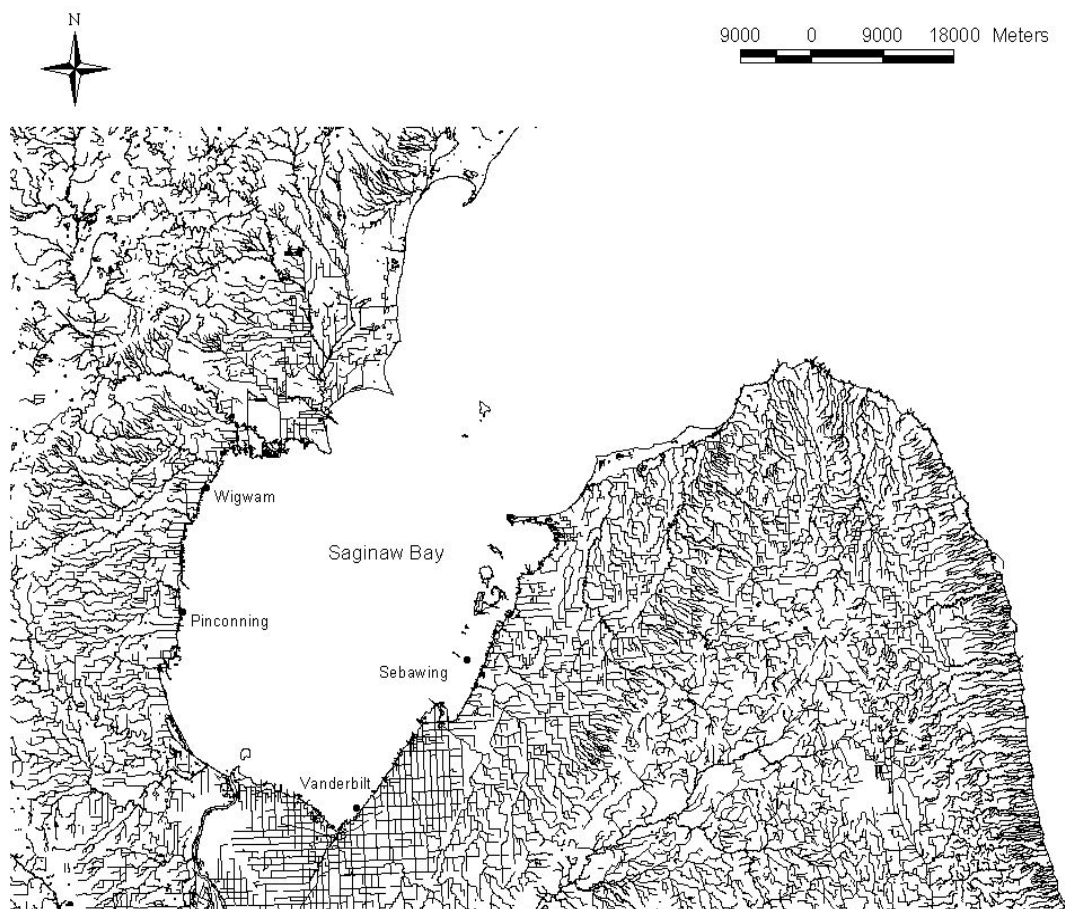


Figure 3.1. 5. Saginaw Bay Sampling Locations

Fish inventory and water chemistry results are summarized in Tables 3.1.14 and 3.1.15, respectively. Common prey fish collected in the fyke nets included banded killifish, bluntnose minnow, common carp, YOY largemouth bass, round goby, sand shiner, and YOY yellow perch. Electrofishing collections consisted of walleye, common carp, northern pike, and largemouth bass. Conductance and alkalinity were higher at the Pinconning wetland, indicating a greater potential for groundwater influx. This location had marl on the bottom in several of the locations. There was no significant difference between nutrients at the four wetland locations in Saginaw Bay.

Table 3.1. 13. Saginaw Bay Sampling Location Information

Site	Macrohab:	Microhab:	Code:	Watershed Land Use and Cover:					
				Lat:	Long:	%Ag.	%For.	%Range	%Dev.
Pinconning	Vegetated	Inner	PIV	43.82223	83.91580	0.51	16.31	75.64	7.53
		Outer	POV						
	Unvegetated	Inner	PIO						
		Outer	POO						
Sebawing	Vegetated	Inner	SIV	43.76239	83.47283	29.67	56.81	12.16	1.36
		Outer	SOV						
	Unvegetated	Inner	SIO						
		Outer	SOO						
Vanderbilt	Vegetated	Inner	VIV	43.60708	83.65197	33.70	7.39	58.91	0.00
		Outer	VOV						
	Unvegetated	Inner	VIO						
		Outer	VOO						
Wigwam	Vegetated	Inner	WIV	43.95441	83.87442	1.28	1.00	95.40	1.00
		Outer	WOV						
	Unvegetated	Inner	WIO						
		Outer	WOO						

Table 3.1. 14. Saginaw Bay Fish Inventory

Species	Wigwam	Pinconning	Sebawing	Vanderbilt	Total
Fyke nets					
Banded killifish	12	11	51		74
Bluntnose minnow	27	69			96
Common carp	9	8		5	22
Largemouth bass (YOY)	26	8	14	2	50
Round goby	50				50
Sand shiner			74		74
Spottail shiner	2	60			62
White sucker				2	2
Yellow perch (YOY)	58				58
Electrofishing					
Common carp	1	5		4	10
Walleye	4	3		4	10
Northern pike	3	3	2	3	11
Largemouth bass	4	2	3	4	13

Table 3.1. 15. Saginaw Bay Physical and Chemical Data

Parameter	Pinconning Wetland				Wigwam Wetland				Sebawing Wetland				Vanderbilt Park			
	Vegetated		Unvegetated		Vegetated		Unvegetated		Vegetated		Unvegetated		Vegetated		Unvegetated	
	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Date	7/25/2006	7/25/2006	7/25/2006	7/25/2006	7/25/2006	7/25/2006	7/25/2006	7/25/2006	7/27/2006	7/27/2006	7/27/2006	7/27/2006	7/27/2006	7/27/2006	7/27/2006	7/27/2006
Temperature (°C)	26.43	25.98	27.09	26.78	27.02	25.87	26.51	25.65	29.21	27.60	29.99	27.88	22.77	22.59	22.90	22.34
Dissolved Oxygen (mg/L)	10.39	9.48	9.96	9.42	8.82	9.06	9.25	8.41	9.83	9.75	10.95	9.11	4.97	8.47	4.83	8.25
Spec. Conductance (µS/cm)	384.4	361.5	434.9	390.5	388.6	389.9	388.2	373.1	331.1	356.3	327.2	337.5	422.0	365.4	444.0	374.7
pH	8.86	8.89	8.72	8.82	8.99	9.02	9.01	9.05	8.87	8.90	8.97	8.82	8.01	9.04	7.78	8.95
Pheno. Alkalinity (mg/L CaCO ₃)	8.0	7.5	7.0	6.5	8.0	8.0	8.0	7.5	6.0	6.0	7.0	4.0	0.0	8.0	0.0	7.0
Total Alkalinity (mg/L CaCO ₃)	102.0	96.0	119.0	105.0	90.0	89.0	87.0	88.0	87.0	85.0	86.0	87.0	122.0	89.0	137.0	96.0
NH ₄ -N (mg/L; D.L.=0.01)	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.20	<0.01	0.18	<0.01
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cl ⁻ (mg/L; D.L.=0.1)	15.0	38.8	19.1	30.3	30.7	14.6	29.9	14.1	15.8	11.6	23.8	30.4	26.0	11.8	29.7	28.1
SO ₄ -S (mg/L; D.L.=0.1)	7.8	23.6	10.1	19.7	20.5	10.5	21.6	8.6	12.9	9.3	20.2	24.2	15.5	9.6	17.7	16.9
NO ₃ -N (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
depth (cm)	40.0	60.0	36.1	37.0	30.0	47.0	25.0	48.3	29.3	40.0	22.0	30.3	29.7	51.3	23.0	32.7
soft organic (%)	0	0	0	0	0	0	0	0	2	0	10	0	5	0	3	0

3.1.6. Northern Lake Michigan Embayments

The sampling locations and site information for the northern Lake Michigan embayments are provided in Figure 3.1.6 and Table 3.1.16, respectively. Three wetland locations were sampled with fyke nets and electrofishing. Local landuse/cover classifications were approximately 0-43% agriculture, 32-45% forest, and 2-67% developed. Fish inventory and water chemistry results are summarized in Tables 3.1.17 and 3.1.18, respectively. Common prey fish collected in the fyke nets included banded killifish, bluntnose minnow, white sucker, YOY largemouth bass, round goby, sand shiner, spottail shiner, and YOY yellow perch. Electrofishing collections consisted of walleye, common carp, northern pike, and largemouth bass. There was no significant difference between the three wetland sites.

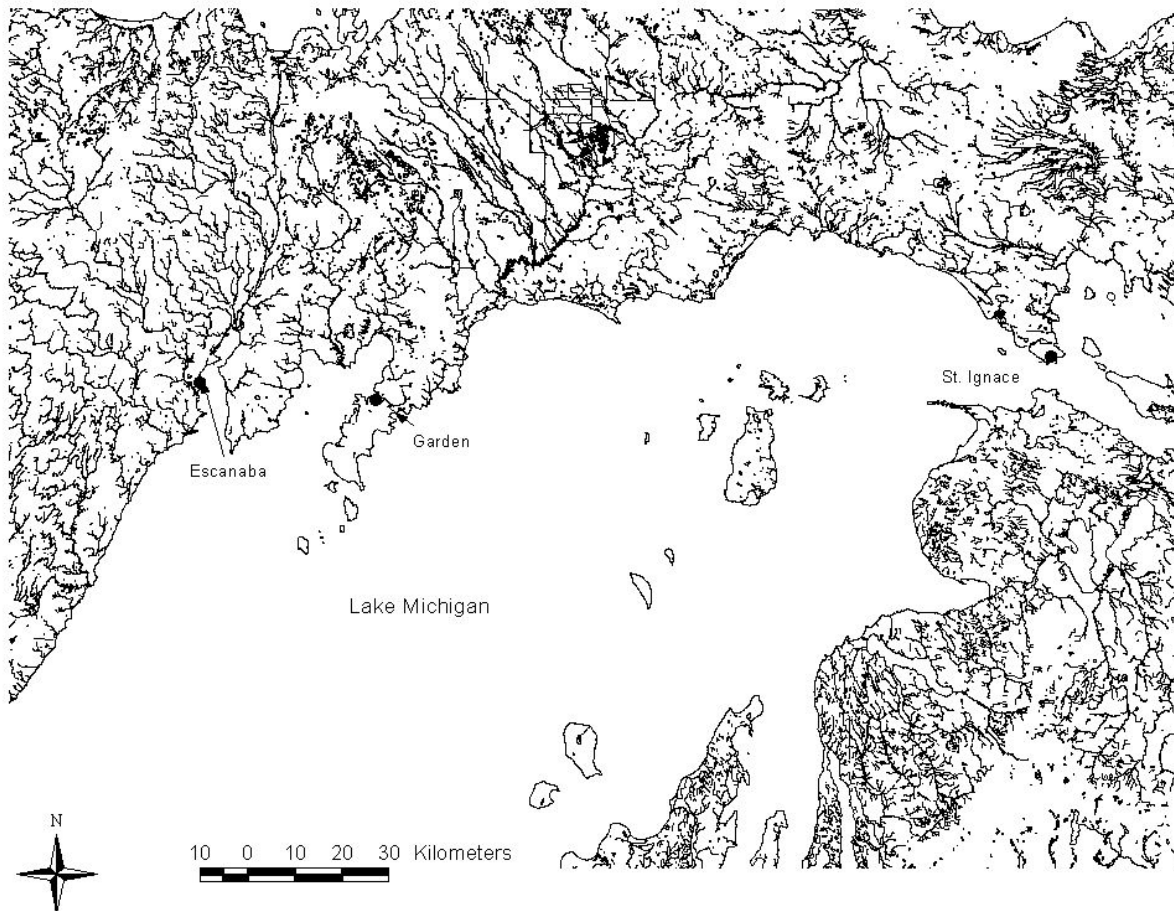


Figure 3.1. 6. Northern Lake Michigan Embayments Sampling Locations

Table 3.1. 16. Northern Lake Michigan Embayments Sampling Location Information

Site	Macrohab:	Microhab:	Code:	Watershed Land Use and Cover:					
				Lat:	Long:	%Ag.	%For.	%Range	%Dev.
St. Ignace	Vegetated	Inner	IIV	45.84738	84.73762	0.00	44.63	21.85	33.52
		Outer	IOV						
	Unvegetated	Inner	IIO						
		Outer	IOO						
Garden	Vegetated	Inner	GIV	45.77237	86.57374	42.67	37.88	17.30	2.15
		Outer	GOV						
	Unvegetated	Inner	GIO						
		Outer	GOO						
Escanaba	Vegetated	Inner	EIV	45.80125	87.05582	0.00	31.60	1.79	66.60
		Outer	EOV						
	Unvegetated	Inner	EIO						
		Outer	EIO						

Table 3.1. 17. Northern Lake Michigan Embayments Fish Inventory

Species	St. Ignace	Garden	Escanaba	Total
Fyke nets				
Banded killifish	22	31	10	63
Bluntnose minnow	14	18	19	51
Largemouth bass	20	14	16	50
Round goby	15	19	17	50
Sand shiner	12	26	20	58
Spottail shiner	3	9	0	12
White sucker	23	28	18	69
Yellow perch	26	24	16	66
Electrofishing				
Common carp	3	5	2	10
Walleye	3	3	3	9
Northern pike	2	8		10
Largemouth bass	2	4	3	9

Table 3.1. 18. Northern Lake Michigan Embayments Physical and Chemical Data

Parameter	Escanaba Wetland				Garden Wetland				St. Ignace			
	Vegetated		Unvegetated		Vegetated		Unvegetated		Vegetated		Unvegetated	
	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Date	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/14/2006	8/14/2006	8/14/2006	8/14/2006
Temperature (°C)	19.13	20.93	20.83	21.54	23.71	23.04	24.99	23.39	22.14	21.56	23.16	20.67
Dissolved Oxygen (mg/L)	8.76	8.79	4.75	8.76	10.92	10.73	11.64	11.35	10.93	10.31	8.71	9.90
Spec. Conductance (µS/cm)	289.0	284.0	315.0	292.0	232.0	235.0	240.0	233.0	245.0	251.0	282.0	257.0
pH	8.23	8.03	8.02	8.27	8.95	8.85	9.06	8.89	8.78	8.87	7.88	8.30
Pheno. Alkalinity (mg/L CaCO ₃)	5.0	3.0	0.0	4.0	9.0	9.0	10.0	9.0	5.0	2.0	0.0	2.0
Total Alkalinity (mg/L CaCO ₃)	108.0	104.0	118.0	106.0	81.0	82.0	81.0	80.0	94.0	95.5	107.0	98.0
NH ₄ -N (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SRP (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cl- (mg/L; D.L.=0.1)	17.1	7.9	13.9	15.2	10.0	19.9	7.6	9.5	17.1	11.4	5.1	4.0
SO ₄ -S (mg/L; D.L.=0.1)	17.7	13.4	13.9	15.3	20.0	32.3	15.9	18.8	28.0	14.9	6.9	6.4
NO ₃ -N (mg/L; D.L.=0.01)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.07	<0.01	0.04
depth (cm)	41.3	92.3	40.0	80.0	58.7	107.3	43.7	92.0	52.3	47.7	43.0	83.7
soft organic (%)	0	0	2	0	0	0	2	2	0	0	0	0

3.2 PCB Congeners and Mercury in White Lake, Muskegon Lake, and Pentwater Lake.

3.2.1 PCB Congener and Mercury Concentrations

The results of total PCB congener and mercury analyses on game fish from Muskegon Lake, White Lake, and Pentwater Lake are shown in Tables 3.2.1, 3.2.2, and 3.2.3, respectively and

Table 3.2. 1. Total PCB Congeners and Mercury in Muskegon Lake Fish (2006). (Largemouth Bass and walleye are skin-on fillets; northern pike and common carp are skin-off fillets.)

Largemouth Bass												
Collection Date	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	Mean
Avg. Length (cm)	30.8	34.5	32.0	21.0	21.5	25.2	23.8	22.0	23.0	24.0	25.0	25.7
Avg. Weight (g)	728.2	911.2	768.8	296.4	252.7	347.9	335.7	284.7	281.0	287.5	216.8	428.3
% Lipid	0.93	0.95	1.54	1.19	0.52	1.13	1.19	1.31	1.21	0.57	0.51	1.0
Total PCB Congeners (ug/kg)	16	65	51	29	11	19	18	14	15	9.6	7.2	23
Mercury (mg/kg)	0.18	0.31	0.13	0.09	0.07	0.18	0.07	0.07	0.07	0.10	0.09	0.12
Northern Pike												
Collection Date	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	8/3/06	8/3/06			
Avg. Length (cm)	57.0	51.0	44.0	46.0	67.0	60.8	25.2	45.5	61.5			50.9
Avg. Weight (g)	1530.10	1245.60	396.9	411.5	2952.3	2666.2	148.5	858.1	2031.6			1360
% Lipid	0.80	0.72	0.43	0.48	0.35	0.46	0.30	0.31	0.42			0.5
Total PCB Congeners (ug/kg)	21	28	37	11	31	19	39	24	60			30
Mercury (mg/kg)	0.20	0.20	0.12	0.12	0.39	0.21	0.12	0.12	0.37			0.21
Walleye												
Collection Date	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06		
Avg. Length (cm)	53.3	55.9	49.5	47.2	55.4	50.8	64.8	54.6	60.5	55.5		54.7
Avg. Weight (g)	1595.3	1757.7	1162.3	1105.6	1672.6	1020.6	2409.7	1474.2	2721.6	1595.3		1651
% Lipid	1.14	2.47	1.99	1.53	2.43	1.24	4.33	2.88	3.62	1.20		2.3
Total PCB Congeners (ug/kg)	20	163	88	116	120	46	470	265	633	35		196
Mercury (mg/kg)	0.10	0.22	0.20	0.35	0.17	0.11	0.39	0.36	0.53	0.14		0.26
Common Carp												
Collection Date	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06			
Avg. Length (cm)	28.5	33.0	48.0	26.0	28.0	39.4	48.9	50.5	67.0			41.0
Avg. Weight (g)	722.5	443.2	3042.3	498.0	555.0	1495.2	3195.4	3182.1	9090.1			2469
% Lipid	0.72	1.67	8.19	0.64	0.69	2.39	2.82	5.84	7.94			3.4
Total PCB Congeners (ug/kg)	442	459	1412	259	173	165	320	580	116			436
Mercury (mg/kg)	0.05	0.06	0.32	0.14	0.15	0.06	0.09	0.10	0.31			0.14

Table 3.2. 2. Total PCB Congeners and Mercury in White Lake Fish (2006). (Largemouth Bass and walleye are skin-on fillets; northern pike and common carp are skin-off fillets.)

Largemouth Bass												
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	Mean
Avg. Length (cm)	31.5	31.0	30.7	31.5	32.5	31.5	33.0	33.0	32.0	29.5		31.6
Avg. Weight (g)	848.3	716.6	692.6	954.2	853.9	979.3	1051.0	1114.4	941.1	662.0		881.3
% Lipid	1.33	0.71	0.93	1.26	1.06	1.46	0.98	0.58	1.03	0.43		1.0
Total PCB Congeners (ug/kg)	44.8	20.5	22.6	51.9	45.8	70.7	20.8	8.0	39.3	44.3		37
Mercury (mg/kg)	0.44	0.36	0.23	0.35	0.38	0.42	0.32	0.21	0.17	0.19		0.31
Northern Pike												
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06		
Avg. Length (cm)	54.0	49.5	53.5	47.5	50.5	45.0	54.3	41.5	41.5	38.9		48.6
Avg. Weight (g)	1521.5	802.9	1510.4	942.5	1516.9	1453.2	1433.2	712.4	757.1	660.2		1131
% Lipid	0.69	0.46	1.10	0.61	0.28	0.29	0.38	0.54	0.50	0.21		0.5
Total PCB Congeners (ug/kg)	29.1	1.4	36.3	20.2	14.3	5.1	41.7	8.7	7.9	1.2		17
Mercury (mg/kg)	0.15	0.13	0.22	0.13	0.36	0.09	0.54	0.14	0.098	0.15		0.2
Walleye												
Collection Date	9/20/06	9/20/06	7/18/06	7/18/06	8/22/06	8/22/06	8/23/06					
Avg. Length (cm)	46.8	44.3	44.6	40.6	47.0	53.5	43.0					45.7
Avg. Weight (g)	1234.66	1199.91	1185.41	1195.61	1218.63	1542.10	1358.90					1276
% Lipid	1.47	2.52	1.52	2.52	2.52	2.65	3.40					2.4
Total PCB Congeners (ug/kg)	134.6	67.9	84.2	77.6	90.0	777.0	287.0					217
Mercury (mg/kg)	0.20	0.56	0.38	0.21	0.16	0.13	0.13					0.25
Common Carp												
Collection Date	6/23/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/23/06		
Avg. Length (cm)	44.2	27.0	53.5	61.5	45.0	45.5	52.0	47.8	55.5	65.0		49.7
Avg. Weight (g)	2063.0	620.6	4122.6	7155.9	4798.8	2352.7	3111.8	2680.5	4522.2	6661.2		3809
% Lipid	6.83	2.57	5.54	4.63	7.16	6.71	10.41	4.92	3.42	13.43		6.6
Total PCB Congeners (ug/kg)	80.0	144.5	93.8	52.8	111.7	182.7	439.7	143.9	458.4	1462.0		317
Mercury (mg/kg)	0.064	0.051	0.19	0.29	0.15	0.075	0.28	0.22	0.17	0.23		0.17

**Table 3.2. 3. Total PCB Congeners and Mercury in Pentwater Lake Fish (2006).
(Largemouth Bass and walleye are skin-on fillets; northern pike and common carp are skin-off fillets.)**

Largemouth Bass												
Collection Date	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/23/06	8/24/06	8/25/06	8/26/06	Mean	SE
Avg. Length (cm)	30.5	36.7	34.0	28.0	26.5	23.0	21.6	23.2	31.3	31.5	28.6	1.59
Avg. Weight (g)	810.4	1348.6	998.5	525.8	517.3	292.3	239.3	288.7	942.2	904.8	687	117
% Lipid	1.01	1.13	0.67	0.72	1.48	1.19	1.35	0.63	0.56	0.96	1.0	0.10
Total PCB Congeners (ug/kg)	19.9	80.2	26.7	28.7	9.0	5.0	12.0	12.9	7.1	25.2	23	6.9
Mercury (mg/kg)	0.24	0.45	0.33	0.33	0.11	0.098	0.14	0.12	0.31	0.35	0.25	0.04
Northern Pike												
Collection Date	8/22/06	8/22/06	8/22/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06		
Avg. Length (cm)	47.5	45.0	42.0	45.0	76.0	48.0	22.8	21.5	50.5	32.5	43.1	4.9
Avg. Weight (g)	1274.7	481.1	771.2	945.0	3586.9	1031.4	118.1	116.5	1134.1	383.5	984	317.1
% Lipid	0.59	0.45	0.32	0.87	0.91	0.56	0.72	0.44	0.59	0.74	0.6	0.06
Total PCB Congeners (ug/kg)	12.4	9.3	1.9	29.9	46.0	12.2	4.5	0.9	74.4	5.9	19.7	7.5
Mercury (mg/kg)	0.05	0.05	0.073	0.094	0.39	0.19	0.069	0.076	0.27	0.089	0.14	0.04
Common Carp												
Collection Date	8/22/06	8/22/06	8/23/06	8/23/06	8/23/06	8/23/06	8/20/06	8/20/06	8/22/06			
Avg. Length (cm)	66.5	63.0	55.0	54.5	58.0	52.0	52.2	54.0	61.4		57.4	1.72
Avg. Weight (g)	6173.1	5179.8	5100.8	4281.0	6042.3	3929.1	3582.4	4135.6	6020.6		4938	332
% Lipid	8.75	3.82	8.48	4.36	15.04	6.83	3.50	4.57	7.04		6.9	1.21
Total PCB Congeners (ug/kg)	873.5	73.5	348.5	186.7	1673.1	39.1	98.1	271.1	279.0		427	177
Mercury (mg/kg)	0.19	0.21	0.21	0.26	0.26	0.098	0.25	0.14	0.34		0.22	0.02

displayed in Figure 3.2.1. As discussed in Section 3.1.4, walleye were not present in fyke net or electro fishing collections from Pentwater Lake. PCB accumulation was related to lipid content as residues were highest in carp (3-6% lipids) and walleye (1.5-2.3% lipids). Mean concentrations of total PCB congeners in carp ranged from 0.32-0.44 mg/kg for the three lakes with single fish exceeding 1 mg/kg in each system. Mercury residues were similar across fish species as this metal concentrates in muscle tissue (Berger et al 2005) and ranged from 0.1-0.3 mg/kg across lakes and species. Largemouth bass in White Lake and Pentwater Lake (0.31 mg/kg and 0.25 mg/kg, respectively) and walleye in Muskegon Lake and White Lake (0.26 mg/kg and 0.25 mg/kg, respectively) were highest in mercury.

In order to delist the Restrictions on Fish Consumption BUI in Muskegon Lake and White Lake, numerical targets were established for residue concentrations of mercury and PCBs that required:

1. Concentrations to be statistically similar to Pentwater Lake as a reference system; or
2. Show a significant, decreasing trend compared to historic data.

PCB and mercury residues in largemouth bass, northern pike, and common carp from Muskegon Lake and White Lake were compared to similar fish from Pentwater to determine if concentrations and growth related parameters (length, weight, and % lipids) were similar using the t-Test to determine statistical significance. There were no statistically significant differences with respect to the length ($p=0.18$), weight ($p=0.07$), and % lipids ($p=0.81$) of largemouth bass in Muskegon Lake and Pentwater Lake. Similarly, there were no statistically significant differences in the length ($p=0.28$), weight ($p=0.43$), and % lipids ($p=0.11$) of northern pike in the two lakes. In contrast, statistically significant differences were present for the length ($p=0.01$), weight ($p=0.03$), and % lipids ($p=0.04$) of common carp between Muskegon Lake and Pentwater Lake. Common Carp from Pentwater Lake were significantly longer, heavier, and contained more lipids than the group collected from Muskegon Lake.

The results for the comparison of PCB and mercury concentrations in Muskegon Lake and Pentwater Lake are shown in Figure 3.2.2. There were no statistically significant differences between the two lakes with respect to PCBs in largemouth bass ($p=0.95$) and northern pike

($p=0.84$) and mercury in northern pike ($p=0.18$). Mercury was significantly lower in largemouth bass from Muskegon Lake ($p=0.01$) than Pentwater Lake. There was no statistically significant differences between the two lakes with respect to PCBs ($p=0.96$) and mercury ($p=0.09$) in common carp, however the fish from Pentwater Lake were significantly larger and contained more lipids. Since the concentration of these contaminants is related to the age (size) and lipid content of the fish, analysis of organisms that are more similar in length and weight would result in a more valid comparison. Because the group of common carp collected from Muskegon Lake was significantly smaller than the group from Pentwater Lake, it is recommended that an additional sampling and analysis round of more comparable sized fish be conducted in 2011 to determine if PCB and mercury concentrations are similar in Muskegon Lake and the reference system.

Since walleye were not present in Pentwater Lake, current data were compared to historical results to determine if a decreasing trend was present. Comparisons of current and historical (2002, 1987, and 1986) mean PCBs and mercury data for Muskegon Lake walleye are shown in Figures 3.2.3 and 3.2.4, respectively. A strong decreasing trend in mean total PCBs ($r^2=0.88$) and mean mercury ($r^2=0.78$) was noted for the time period from 1986-2006. Walleye length, weight, and % lipids from the historical collections were compared to 2006 and there were no statistically significant differences (t-test; $p>0.05$) between years except for 1986 weights. Walleye from 1986 (mean=2,128 g) were significantly heavier than fish collected in the other years (mean range 1,515-1,651 g; $p<0.05$). While the increased weight may have resulted in some of the observed increase in contaminant levels in 1986, the decreasing trend is still present in the 1987-2006 data. With the exception of common carp, all fish species examined from Muskegon Lake were either similar in size, length, % lipids, and the concentration of PCB congeners and mercury to the reference system, Pentwater Lake, or exhibited a decreasing trend.

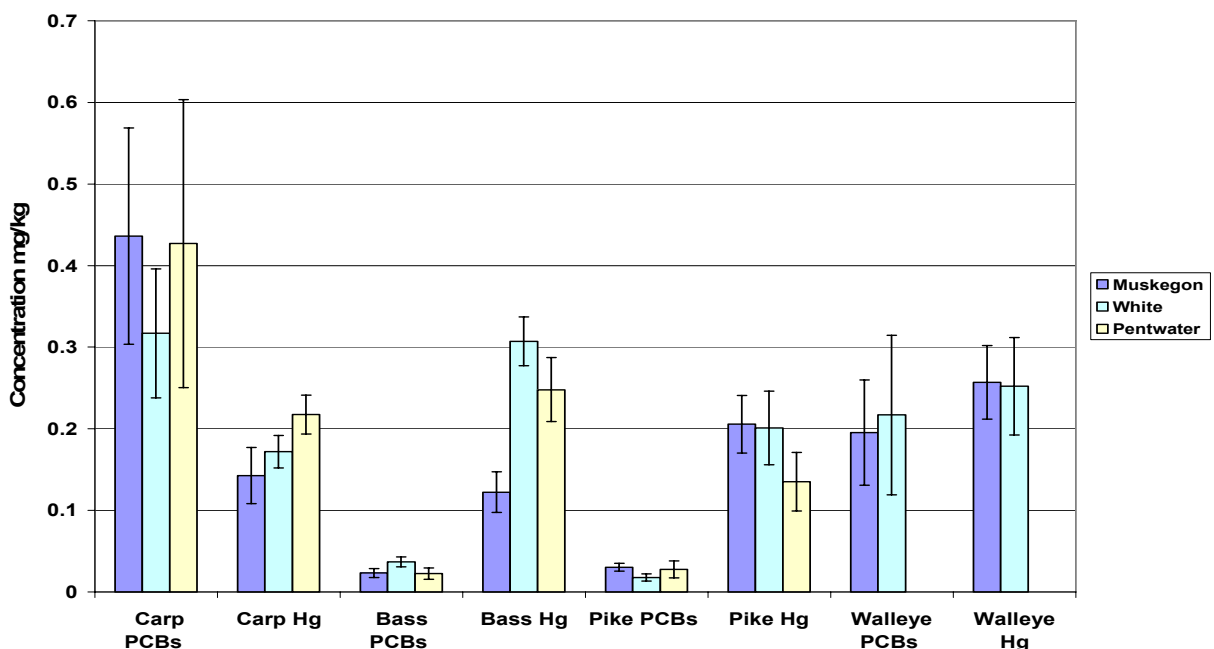


Figure 3.2. 1. Total PCB Congeners and Mercury in Fish from Muskegon Lake, White Lake and Pentwater Lake (2006). (Largemouth Bass and walleye are skin-on fillets; northern pike and common carp are skin-off fillets.)

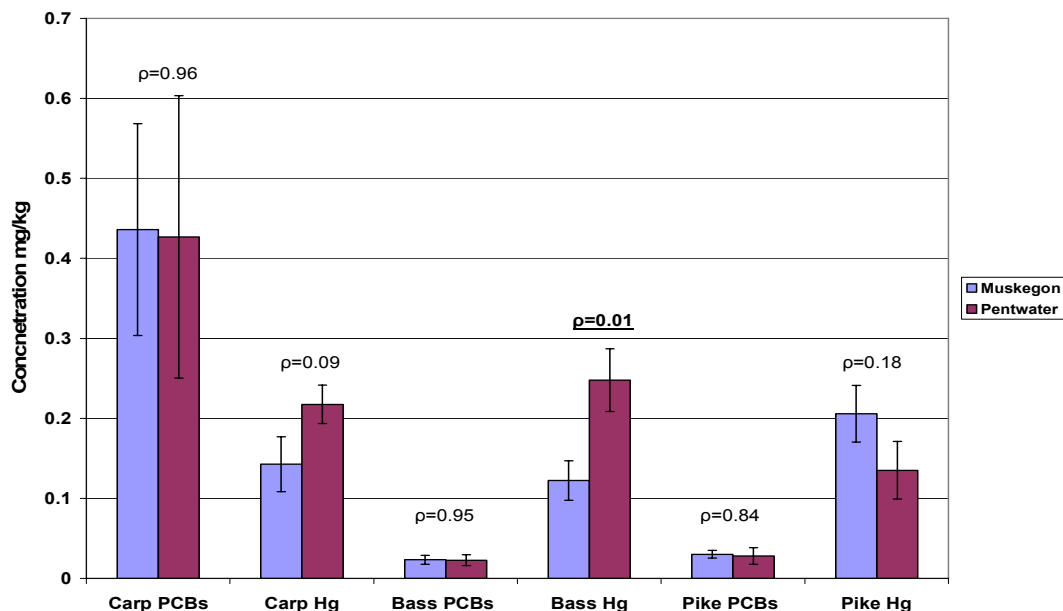


Figure 3.2. 2. Comparison of Total PCB Congeners and Mercury in Fish from Muskegon and Pentwater Lake (2006). (Largemouth Bass are skin-on fillets; northern pike and common carp are skin-off fillets.) (ρ calculated by t-Test).

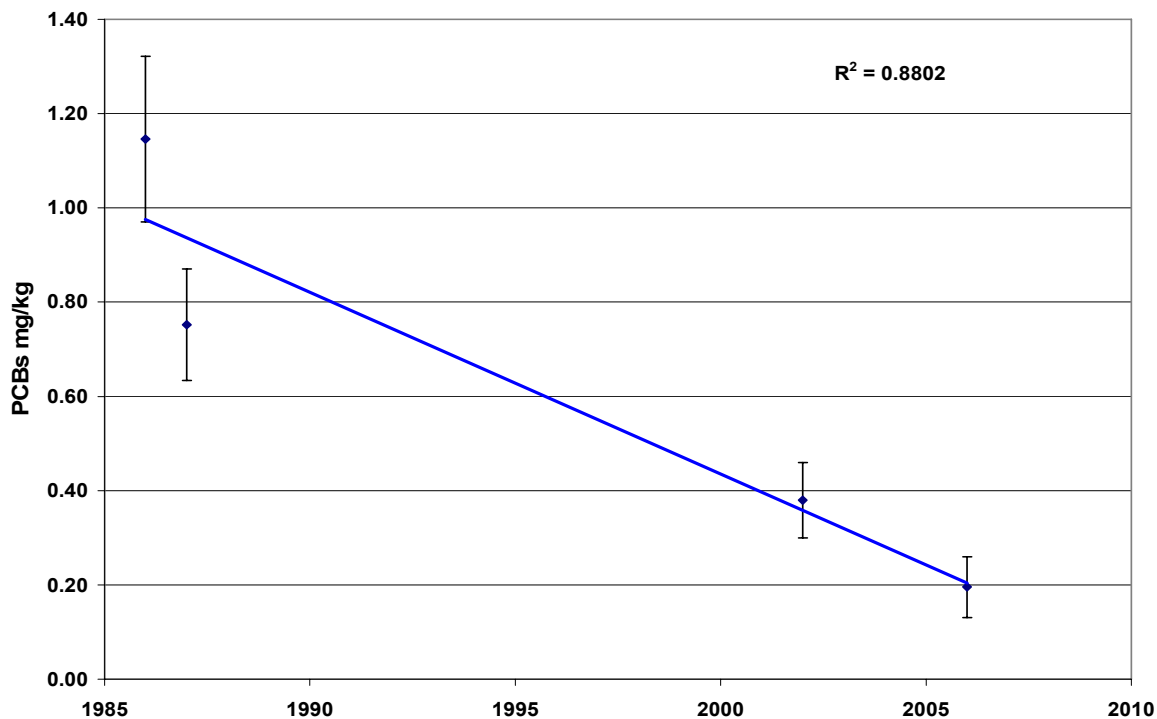


Figure 3.2. 3. Comparison of Current and Historical Mean Concentrations of Total PCBs in Walleye from Muskegon Lake. (skin-on fillets; error bars represent SE).

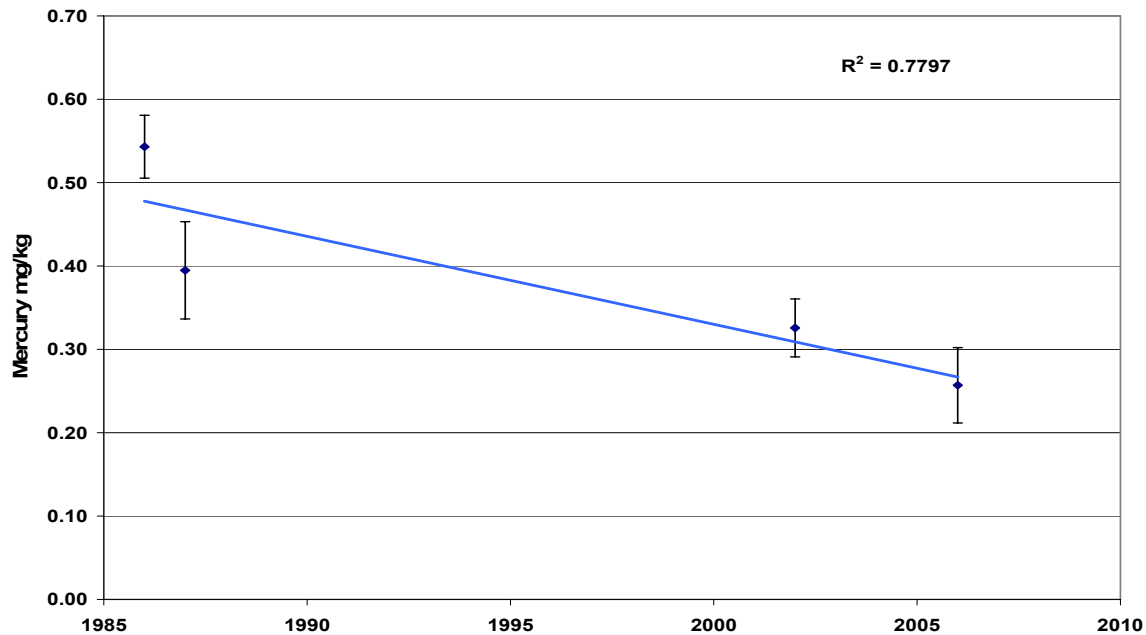


Figure 3.2. 4. Comparison of Current and Historical Mean Concentrations of Mercury in Walleye from Muskegon Lake. (skin-on fillets; error bars represent SE).

With respect to White Lake, there were no statistically significant differences between length ($p=0.10$), weight ($p=0.15$), and % lipids ($p=0.96$) of largemouth bass compared to the reference system, Pentwater Lake. Similarly, there were no statistically significant differences in the length ($p=0.41$), weight ($p=0.67$), and % lipids ($p=0.48$) of northern pike between the two lakes. Common carp also were similar between the lakes as there were no statistically significant differences with respect to the length ($p=0.06$), weight ($p=0.15$), and % lipids ($p=0.81$). The results for the White Lake/Pentwater Lake comparison of PCBs and mercury are shown in Figure 3.2.5. There was no statistically significant differences between the two lakes with respect to PCBs in common carp ($p=0.63$), largemouth bass ($p=0.14$), and northern pike ($p=0.39$) and mercury in common carp ($p=0.23$), largemouth bass ($p=0.25$) and northern pike ($p=0.27$). Comparisons of current and historical mean PCBs and mercury data for White Lake walleye are shown in Figures 3.2.6 and 3.2.7, respectively. A moderate decreasing trend in mean total PCBs ($r^2=0.47$) and a weak increasing trend in mean mercury ($r^2=0.24$) were noted for the time period from 1986-2006. While the fish contaminant trends in Muskegon Lake and White Lake were dissimilar, it is important to note that there was no significant difference between walleye PCBs ($p=0.85$) and mercury ($p=0.94$) in the 2006 data. Muskegon Lake walleye were significantly longer ($p=0.01$) and heavier ($p=0.25$) than fish collected from White Lake, however, there was no significant difference in % lipids ($p=0.85$). Comparisons of the historical Muskegon (3.2.3 and 3.2.4) and White Lake (Figures 3.2.6 and 3.2.7) data show that PCBs were considerably higher in Muskegon Lake in 1986 (mean 1.15 mg/kg) than in White Lake (mean 0.21 mg/kg).

Mercury also was considerably higher in Muskegon Lake in 1986 (mean 0.54 mg/kg) than in White Lake (mean 0.25 mg/kg). Based on the 2006 contaminant means for PCBs (0.22 mg/kg)

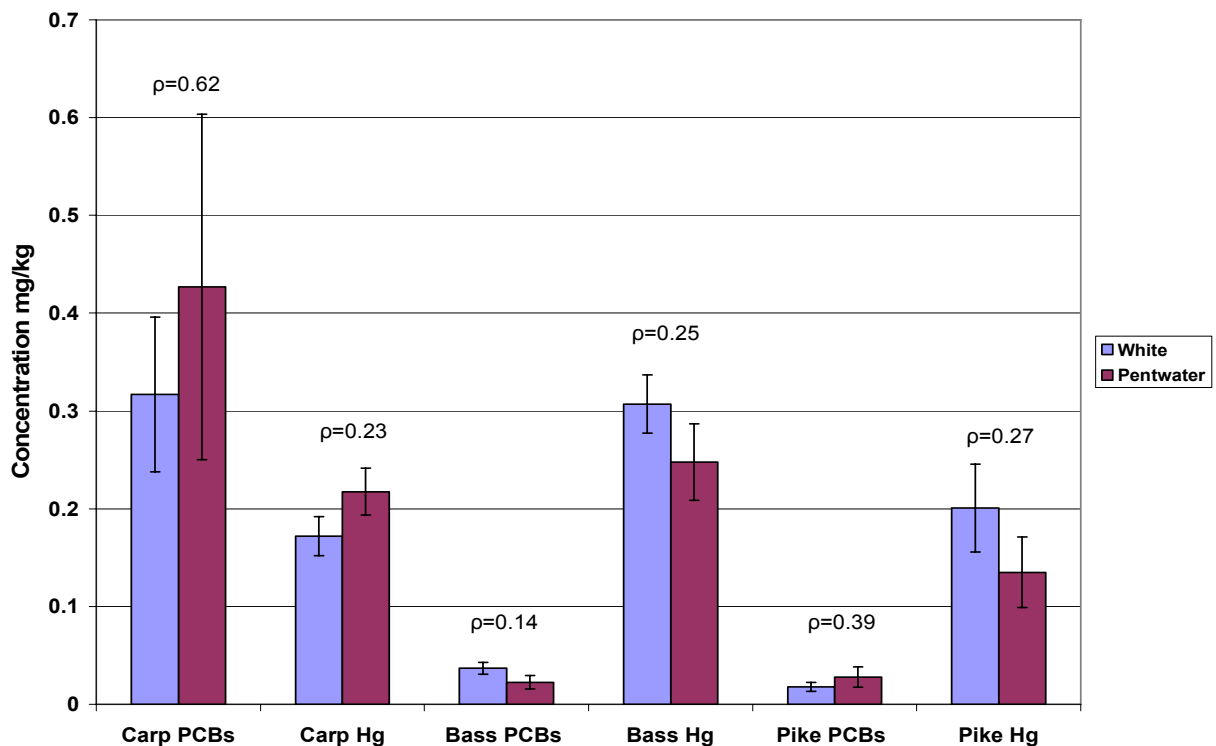


Figure 3.2. 5. Comparison of Total PCB Congeners and Mercury in Fish from White and Pentwater Lake (2006). (Largemouth Bass are skin-on fillets; northern pike and common carp are skin-off fillets.) (p calculated by t-Test).

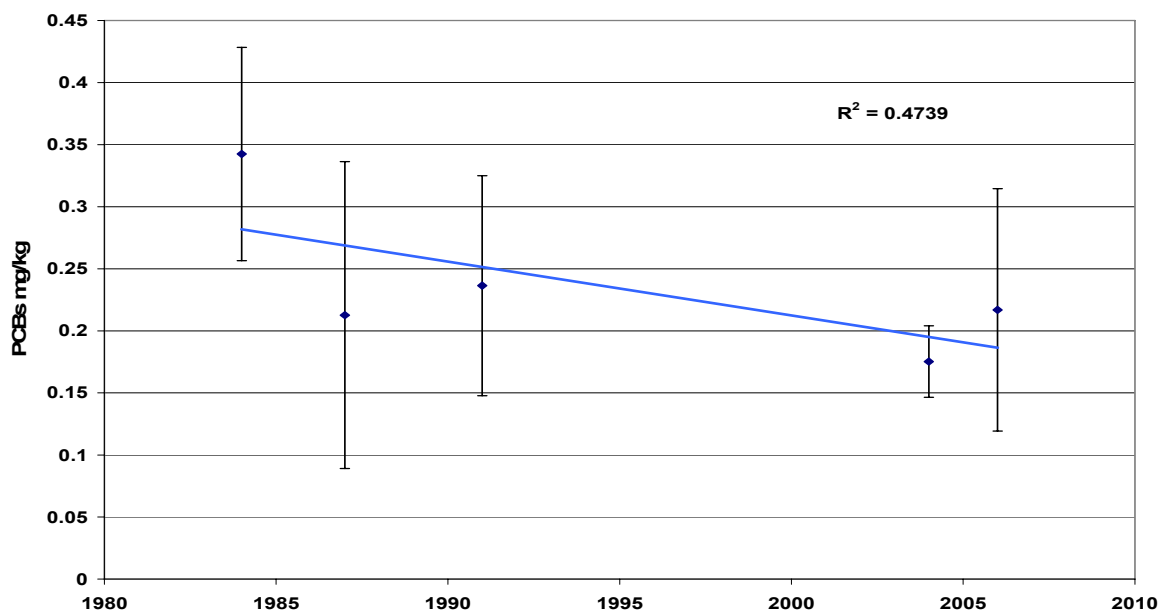


Figure 3.2. 6. Comparison of Current and Historical Mean Concentrations of Total PCBs in Walleye from White Lake. (skin-on fillets; error bars represent SE).

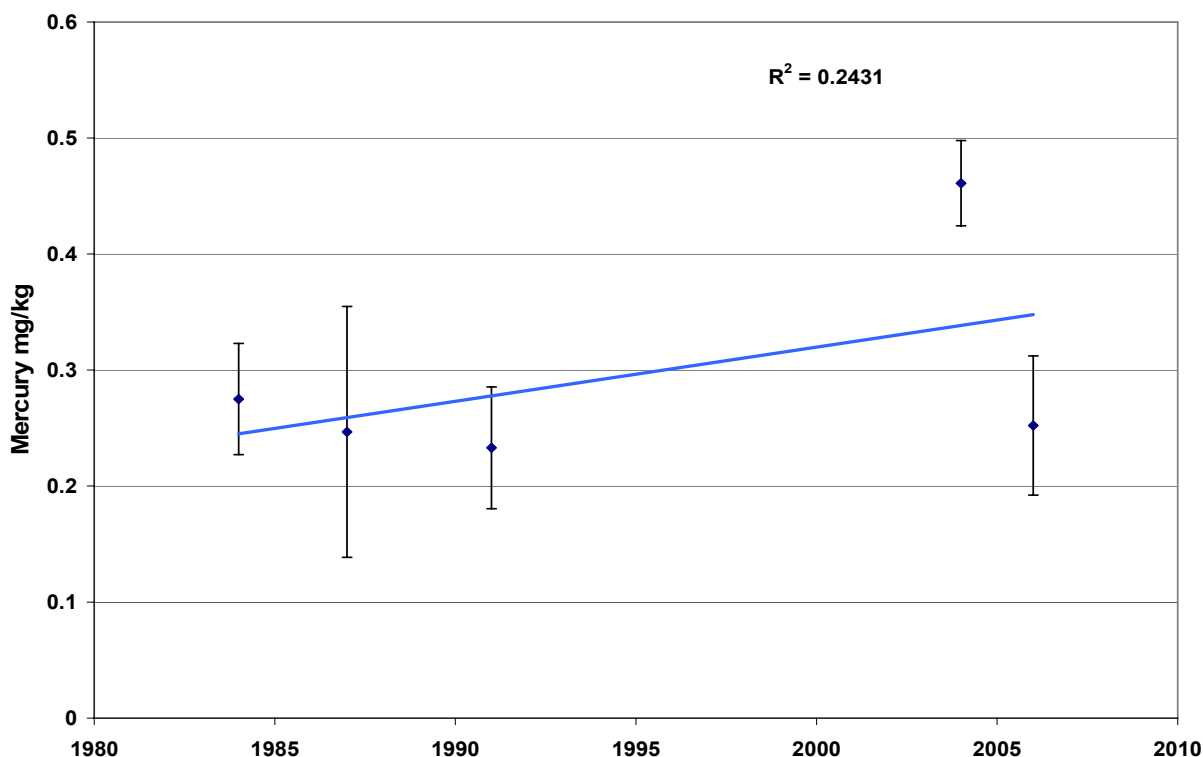


Figure 3.2. 7. Comparison of Current and Historical Mean Concentrations of Mercury in Walleye from White Lake. (skin-on fillets; error bars represent SE).

and mercury (0.25 mg/kg), concentrations in walleye are similar to Muskegon Lake and the lack of a decreasing trend appears to be related to lower historic contaminant levels. Since a decreasing trend of PCB and mercury concentrations was not observed in White Lake, an additional sampling of walleye is recommended in 2011 to determine if contaminant levels have reached a steady state.

3.3 PBDE Congeners in Fish Tissue

The results of the PBDE congener analyses conducted on fish collected from the six study locations are presented in Sections 3.3.1-3.3.6. A comparison of concentrations between the locations is provided in Section 3.3.7.

3.3.1 Kalamazoo River

The concentrations of total PBDE congeners in fish tissue from the Kalamazoo River are summarized in Table 3.3.1 and means for individual species are presented in Figure 3.3.1.

Table 3.3. 1. Total PBDE Congeners in Fish Tissue samples Collected from the Kalamazoo River (2006). (Largemouth Bass are individual skin-on fillets; common carp are individual kin-off fillets; all other species are whole fish composites.)

Species	Number	Length (cm)	% Lipids	PBDE (ng/g)
Banded Killifish	6	8.9	2.03	3.18
Banded Killifish	14	5.5	2.82	4.42
Banded Killifish	14	7.4	1.85	3.00
Banded Killifish	18	7.1	2.12	5.66
Bluntnose Minnow	22	4.5	3.43	4.09
Bluntnose Minnow	20	5.2	3.10	3.55
Bluntnose Minnow	10	6.3	4.63	9.97
Bluntnose Minnow	11	6.7	2.32	6.04
Common Carp	1	42.1	3.96	7.26
Common Carp	1	42.5	3.16	3.96
Common Carp	1	50.5	5.00	52.29
Common Carp	1	48.3	4.72	7.29
Common Carp	1	41.0	3.96	2.33
Common Carp	1	43.0	3.16	40.34
Common Carp	1	41.0	5.00	218.45
Common Carp	1	40.2	3.03	12.25
Common Carp	1	50.0	4.79	7.12
Common Carp	1	46.5	5.90	10.07
Common Carp	1	29.5	1.24	0.63
Common Carp	1	44.5	1.70	2.12
Common Carp	1	46.5	1.58	36.57
Largemouth Bass	1	14.8	0.94	6.99
Largemouth Bass	1	18.0	2.39	7.71
Largemouth Bass	1	25.5	3.61	1.85
Largemouth Bass	1	33.0	1.43	10.61
Mimic Shiner	28	4.6	3.99	13.16
Mimic Shiner	28	4.7	5.21	13.58
Round Goby	2	6.3	1.41	1.75
Spottail Shiner	15	6.1	6.31	5.19
Spottail Shiner	14	6.3	4.67	7.05
Spottail Shiner	7	8.0	4.21	8.73
Yellow Perch	4	9.4	3.55	0.65
Yellow Perch	3	11.0	3.69	11.64
Yellow Perch	3	13.7	1.51	6.07

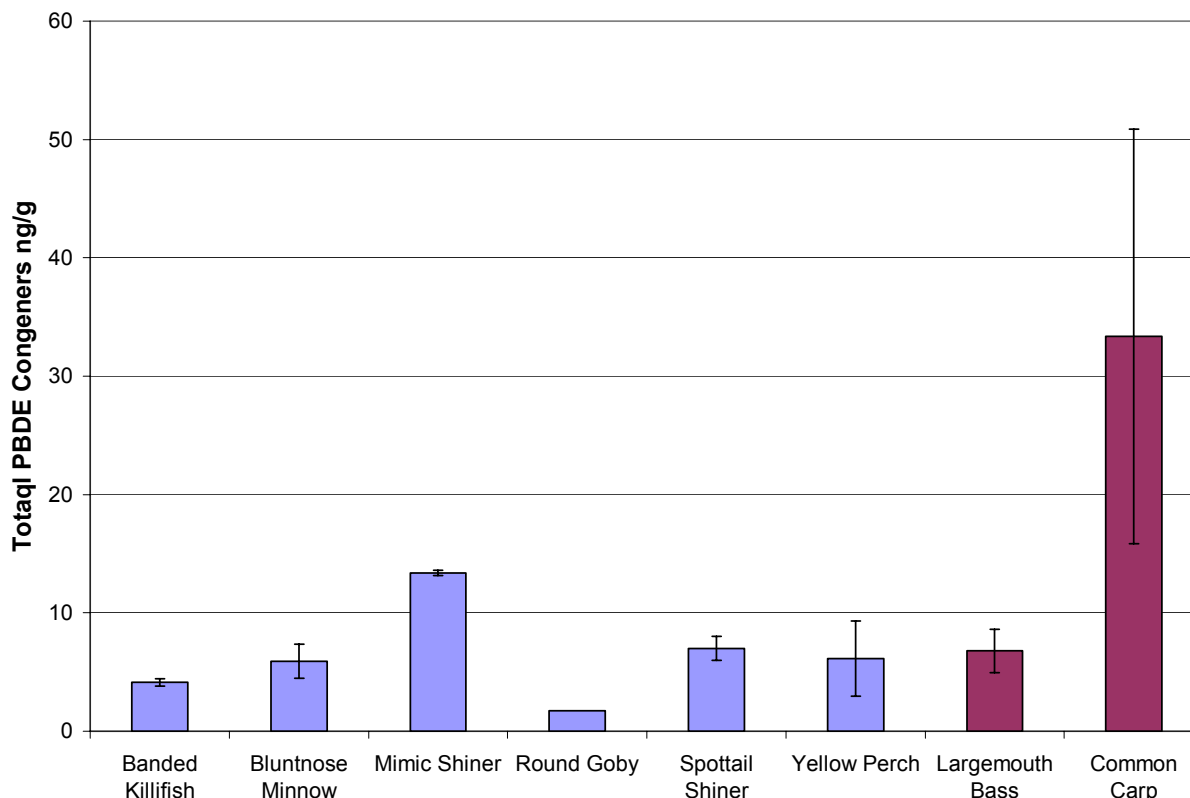


Figure 3.3. 1. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Fish Collected from the Kalamazoo River (2006). (Largemouth Bass are individual skin-on fillets; common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

Total PBDE congeners were highly variable in common carp and ranged from 0.71-218.45 ng/g (Table 3.3.1). Largemouth bass were less variable and ranged from 1.85-10.61 ng/g. Yellow perch showed similar variability and ranged from 0.65-11.64 ng/g. The two composites ($n=28$) of mimic shiner were the highest in PBDE concentration (≈ 13 ng/g) of all small fish (< 10 cm). Composites of banded killifish, bluntnose minnow, and spottail shiner ranged from 3.15-8.73 ng/g. A single composite of round goby ($n=2$) contained 1.75 ng/g of total PBDE congeners. Mean PBDE congeners were 5x higher in common carp than the other species (Figure 3.3.1). The results of an ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.2. There was no significant difference in PBDE concentrations between largemouth bass and prey fish (banded killifish, bluntnose minnow, mimic shiner, spottail shiner, and yellow perch) ($p>0.05$). Banded killifish were significantly lower in concentration than mimic shiner ($p=0.024$). Since common carp are bottom feeding fish, these data suggest that transfer of PBDE congeners from sediment may be more significant than food web bioaccumulation in this ecosystem.

Table 3.3. 2. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from the Kalamazoo River (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Banded Killifish	Bluntnose Minnow	-1.848	0.955	Mimic Shiner	Spottail Shiner	6.380	0.281
	Mimic Shiner	-9.305	0.037		Yellow Perch	7.250	0.177
	Spottail Shiner	-2.925	0.817		Largemouth Bass	6.580	0.210
	Yellow Perch	-2.055	0.950	Spottail Shiner	Yellow Perch	0.870	0.999
	Largemouth Bass	-2.725	0.814		Largemouth Bass	0.200	1.000
Bluntnose Minnow	Mimic Shiner	-7.458	0.124	Yellow Perch	Largemouth Bass	-0.670	1.000
	Spottail Shiner	-1.078	0.997				
	Yellow Perch	-0.208	1.000				
	Largemouth Bass	-0.878	0.998				

3.3.2. Northern Lake Michigan Embayments

The concentrations of total PBDE congeners in fish tissue from the northern Lake Michigan embayments are summarized in Table 3.3.3 and means for individual species are presented in Figure 3.3.2.

Table 3.3. 3. Total PBDE Congeners in Fish Tissue samples Collected from the Northern Lake Michigan Embayments (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

Species	Number	Length (cm)	% Lipids	PBDE (ng/g)	Species	Number	Length (cm)	% Lipids	PBDE (ng/g)
Banded Killifish	34	4.3	2.63	0.94	Round Goby	25	5.0	2.74	1.26
Banded Killifish	18	5.2	2.91	1.06	Round Goby	13	6.9	2.42	1.09
Banded Killifish	17	5.7	2.65	0.94	Round Goby	6	8.3	2.59	0.98
Bluntnose Minnow	36	4.5	3.42	1.42	Sand Shiner	34	3.9	4.09	2.08
Bluntnose Minnow	12	5.6	6.42	1.65	Sand Shiner	34	4.0	4.45	1.57
Common Carp	1	25.5	15.76	0.27	Walleye	1	10.5	1.32	4.05
Common Carp	1	48.0	11.84	10.55	Walleye	1	21.3	1.89	0.56
Common Carp	1	49.5	11.31	1.10	Walleye	1	28.5	1.81	0.46
Common Carp	1	53.0	8.71	16.94	Walleye	1	30.0	1.11	0.31
Common Carp	1	53.5	3.06	5.20	Walleye	1	31.2	0.96	0.31
Common Carp	1	54.5	3.97	5.68	Walleye	1	41.5	2.59	2.68
Common Carp	1	54.5	15.52	8.77	Walleye	1	41.7	2.15	3.81
Common Carp	1	55.5	1.80	8.84	Walleye	1	49.5	1.84	9.93
Common Carp	1	55.5	1.36	12.69	Walleye	1	54.0	1.65	31.09
Common Carp	1	57.3	8.17	232.09	White Sucker	32	5.3	1.84	0.9
Largemouth Bass	20	5.4	0.73	0.33	White Sucker	23	6.4	1.99	0.77
Largemouth Bass	17	6.4	0.89	0.41	White Sucker	3	10.1	1.77	0.9
Largemouth Bass	9	7.3	0.48	0.42	White Sucker	3	11.4	3.60	0.85
Largemouth Bass	1	12.5	1.37	1.42	White Sucker	2	13.9	3.26	0.59
Largemouth Bass	1	14.2	0.96	1.38	White Sucker	2	15.0	1.82	0.63
Largemouth Bass	1	15.5	0.33	0.20	White Sucker	1	16.0	1.03	0.6
Largemouth Bass	1	15.8	0.64	0.27	White Sucker	1	16.0	2.47	0.77
Largemouth Bass	1	23.5	2.28	0.82	White Sucker	1	16.0	1.39	0.44
Largemouth Bass	1	16.0	0.33	0.51	Yellow Perch	8	8.5	3.95	1.74
Largemouth Bass	1	16.4	1.74	0.45	Yellow Perch	7	8.7	2.86	0.74
Largemouth Bass	1	16.5	1.62	0.52	Yellow Perch	8	9.3	3.76	0.7
Largemouth Bass	1	18.0	1.42	0.26	Yellow Perch	8	9.6	3.02	0.99
Northern Pike	1	14.5	0.77	0.50	Yellow Perch	8	9.6	3.07	0.92
Northern Pike	1	15.7	0.94	0.38	Yellow Perch	5	10.1	2.02	1.7
Northern Pike	1	16.3	1.31	0.65	Yellow Perch	4	10.3	2.87	1.03
Northern Pike	1	18.3	1.03	0.72	Yellow Perch	5	10.3	2.60	1.03
Northern Pike	1	24.6	0.22	0.13	Yellow Perch	4	11.3	3.09	1.75
Northern Pike	1	33.5	0.56	0.71	Yellow Perch	3	11.6	2.91	1.1
Northern Pike	1	39.5	0.42	0.38	Yellow Perch	2	12.6	3.27	2.04
Northern Pike	1	42.3	0.17	0.16	Yellow Perch	1	16.0	3.11	1.76
Northern Pike	1	47.0	0.38	0.37	Yellow Perch	1	16.0	2.84	2.85
Northern Pike	1	47.8	0.42	0.31					

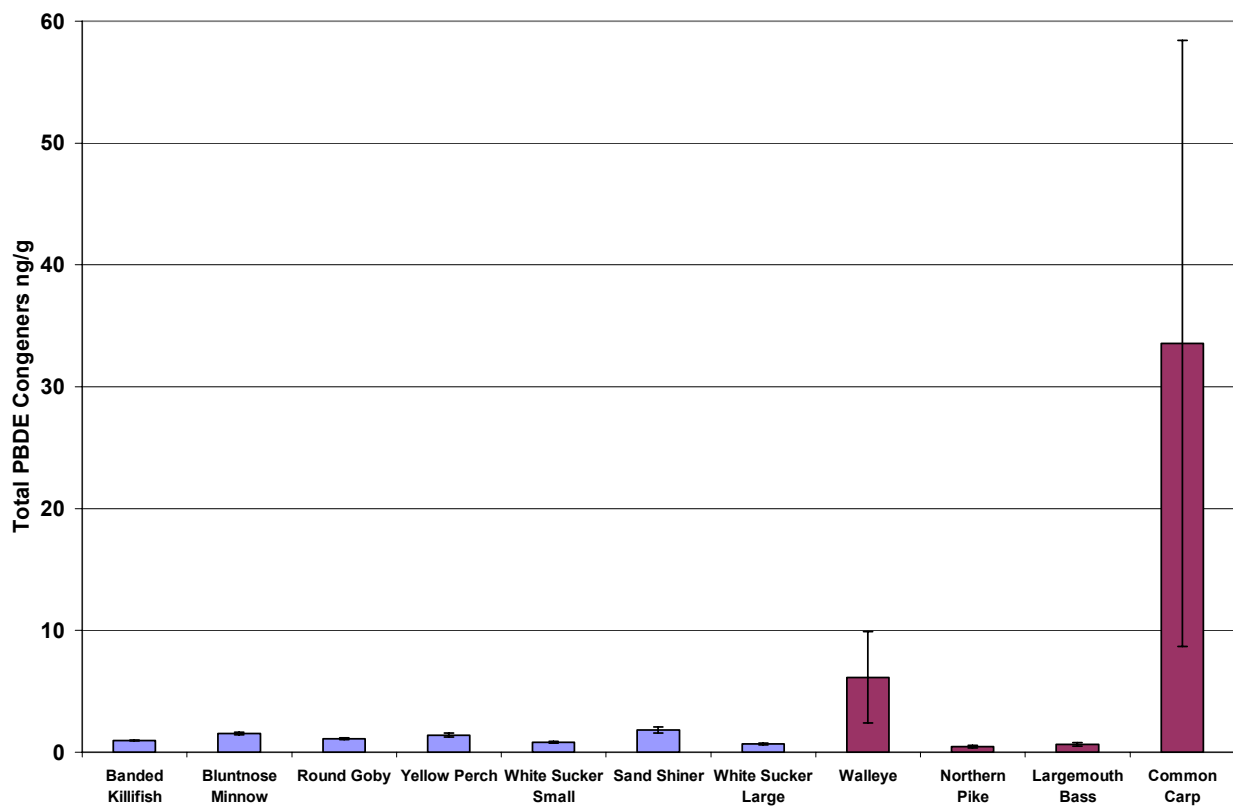


Figure 3.3. 2. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Fish Collected from the Northern Lake Michigan Embayments (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

Total PBDE congeners were highly variable in common carp and walleye with ranges of 0.27-232.09 ng/g and 0.31-30.91 ng/g, respectively (Table 3.3.3). The common carp sample collected from northern Lake Michigan embayments contained the highest amount of PBDE congeners recorded in this project. Largemouth bass and northern pike were less variable and ranged from 0.26-1.42 ng/g and 0.16-0.72 ng/g, respectively. Yellow perch showed similar variability and ranged from 0.70-2.04 ng/g. The two composites ($n=28$) of mimic shiner were the highest in PBDE concentration (≈ 13 ng/g) of all small fish (< 10 cm). Composites of banded killifish, bluntnose minnow, and spottail shiner ranged from 0.94-2.08 ng/g. Round goby composites contained 0.98-1.26 ng/g of total PBDE congeners. White sucker was the lowest in PBDE congeners with a range of 0.44-0.90 ng/g. Mean PBDE congeners were 5-10x higher in common carp than the other species (Figure 3.3.2). The results of an ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.4. There was no significant difference in PBDE concentrations within the group of forage fish (banded killifish, bluntnose minnow, round goby, sand shiner, and yellow perch) ($p>0.05$).

Table 3.3. 4. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from the Northern Lake Michigan Embayments (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Round Goby	Banded Killifish	0.130	1.000	Yellow Perch	White Sucker	0.695	0.005
	Bluntnose Minnow	-0.425	0.938		Sand Shiner	-0.413	0.870
	Yellow perch	-0.302	0.934		Largemouth Bass	0.829	0.000
	White Sucker	0.393	0.816	White Sucker	Northern Pike	0.981	0.000
	Sand Shiner	-0.715	0.520		Sand Shiner	-1.108	0.019
	Largemouth Bass	0.528	0.465		Largemouth Bass	0.134	0.994
Banded Killifish	Northern Pike	0.679	0.190	Sand Shiner	Northern Pike	0.286	0.774
	Bluntnose Minnow	-0.555	0.793		Largemouth Bass	1.243	0.004
	Yellow perch	-0.432	0.697		Northern Pike	1.394	0.001
	White Sucker	0.263	0.974	Largemouth Bass	Northern Pike	0.152	0.986
	Sand Shiner	-0.845	0.308				
	Largemouth Bass	0.398	0.782				
Bluntnose Minnow	Northern Pike	0.549	0.439				
	Yellow perch	0.123	1.000				
	White Sucker	0.818	0.176				
	Sand Shiner	-0.290	0.996				
	Largemouth Bass	0.953	0.047				
	Northern Pike	1.104	0.018				

PBDE congener levels in piscivorous fish (large mouth bass and northern pike) were significantly lower than common prey fish (bluntnose minnow, shiner, and yellow perch; $p < 0.05$) and not significantly different from round goby, banded killifish, and white sucker ($p > 0.05$). The high levels in common carp compared to predators suggest that age and bottom feeding behavior are more important than food web accumulation. Higher levels in walleye compared to largemouth bass and northern pike may be due to habitat and dietary differences. Walleye also were higher in lipid content than largemouth bass and northern pike (Table 3.3.3). Due to the lipophilic nature of PBDEs, higher lipid content can influence body burdens of these contaminants.

3.3.3. Muskegon Lake

The concentrations of total PBDE congeners in fish tissue from Muskegon Lake are summarized in Table 3.3.5 and means for individual species are presented in Figure 3.3.3. Total PBDE congeners were highly variable in walleye and ranged from 4.64-84.83 ng/g (Table 3.3.3). The walleye sample collected from Muskegon Lake was the highest in PBDE congeners for its species recorded in this project. Largemouth bass, carp, and northern pike were less variable and ranged from 0.79-6.20 ng/g, 0.40-10.32 ng/g and 0.76-14.13 ng/g, respectively. Spottail shiner showed similar variability and ranged from 7.43-20.26 ng/g. The composites ($n=6$) of spottail shiner were highest in PBDE concentration (≈ 20 ng/g) of all small fish (< 10 cm). Composites of banded killifish, bluntnose minnow, and yellow perch ranged from 6.65-8.96 ng/g, 1.61-4.83 ng/g, and 3.15-6.60 ng/g respectively. Round goby composites contained 2.01-6.88 ng/g of total PBDE congeners. Mean PBDE congeners were 2x higher in walleye than the other species (Figure 3.3.3). The results of ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.6.

Table 3.3. 5. Total PBDE Congeners in Fish Tissue samples Collected from Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

Species	Number	Length	% Lipids	PBDE (ng/g)	Species	Number	Length	% Lipids	PBDE (ng/g)
Common Carp	1	28.5	0.72	1.38	Round Goby	22	3.8	3.40	3.50
Common Carp	1	33.0	1.67	0.78	Round Goby	10	5.9	3.03	2.01
Common Carp	1	48.0	8.19	7.80	Round Goby	10	6.1	4.23	4.52
Common Carp	1	26.0	0.64	0.40	Round Goby	10	6.6	3.08	6.88
Common Carp	1	27.0	0.64	0.45	Spottail Shiner	6	4.1	8.49	20.28
Common Carp	1	39.4	2.39	1.30	Spottail Shiner	11	7.3	7.22	12.62
Common Carp	1	48.9	2.82	10.32	Spottail Shiner	11	7.4	9.87	9.81
Common Carp	1	50.5	5.84	8.48	Spottail Shiner	11	7.5	11.98	7.43
Common Carp	1	67.0	7.94	13.56	Walleye	1	54.0	1.14	4.11
Largemouth Bass	47	3.4	0.93	3.15	Walleye	1	49.5	2.47	17.77
Largemouth Bass	1	30.8	0.95	2.07	Walleye	1	53.5	1.99	14.54
Largemouth Bass	1	34.5	1.54	6.20	Walleye	1	47.5	1.53	15.84
Largemouth Bass	1	32.0	1.19	6.09	Walleye	1	50.5	2.43	11.05
Largemouth Bass	1	21.0	0.52	1.73	Walleye	1	45.0	1.24	6.87
Largemouth Bass	1	21.5	1.13	0.79	Walleye	1	54.3	4.33	71.60
Largemouth Bass	1	25.2	1.19	2.12	Walleye	1	41.5	2.88	35.15
Largemouth Bass	1	23.8	1.31	1.85	Walleye	1	41.5	3.62	84.83
Largemouth Bass	1	22.0	1.31	2.11	Walleye	1	38.9	1.20	4.64
Largemouth Bass	1	23.0	0.57	2.22	Yellow Perch	9	8.0	3.34	3.15
Largemouth Bass	1	24.0	0.51	1.29	Yellow Perch	11	8.2	5.55	5.68
Largemouth Bass	1	25.0	0.72	0.89	Yellow Perch	10	8.6	6.99	4.51
Mimic Shiner	30	4.4	3.48	9.55	Yellow Perch	9	8.8	6.17	3.99
Mimic Shiner	23	5.1	5.34	6.03	Yellow Perch	10	9.0	5.08	5.60
Northern Pike	1	57.0	0.80	4.62	Yellow Perch	6	10.5	6.66	6.60
Northern Pike	1	51.0	0.72	3.79	Yellow Perch	3	10.7	3.48	3.47
Northern Pike	1	44.0	0.43	0.76	Yellow Perch	4	12.7	2.66	6.28
Northern Pike	1	46.0	0.48	0.96	Banded Killifish	20	3.5	7.00	1.61
Northern Pike	1	67.0	0.35	4.62	Banded Killifish	11	5.5	4.79	4.83
Northern Pike	1	60.8	0.46	2.64	Bluntnose Minnow	19	5.2	7.51	6.56
Northern Pike	1	25.2	0.30	0.76	Bluntnose Minnow	18	6.0	4.80	8.35
Northern Pike	1	45.5	0.31	0.96	Bluntnose Minnow	9	7.0	8.72	8.96
Northern Pike	1	61.5	0.42	14.13					

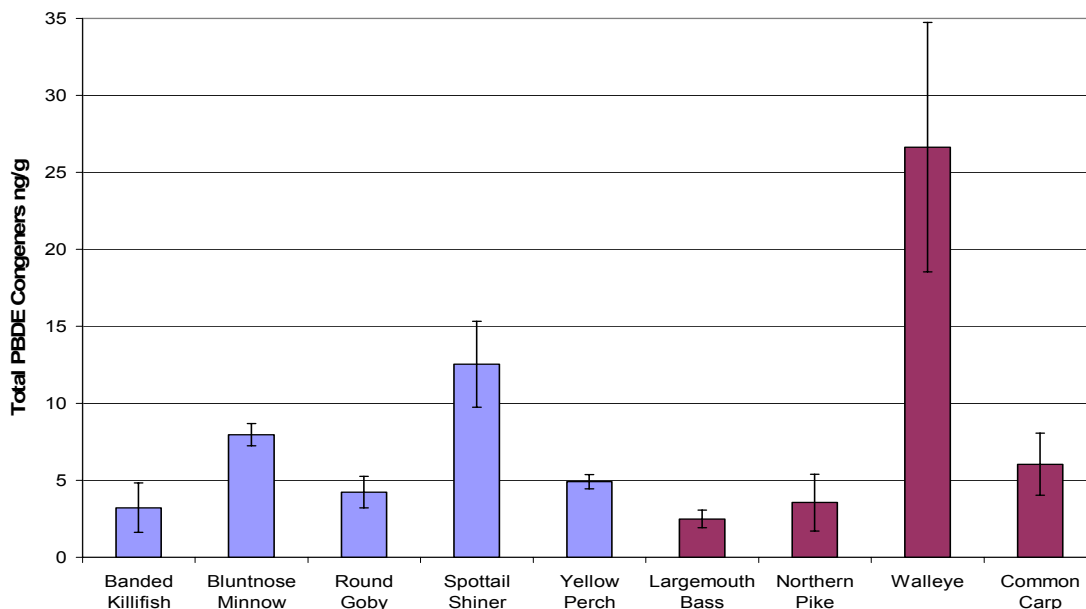


Figure 3.3. 3. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Fish Collected from Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

Spottail shiners were significantly higher in PBDE congeners compared to yellow perch, common carp, northern pike, and largemouth bass ($p < 0.05$). PBDE congener levels in piscivorous fish (large mouth bass and northern pike) were not significantly different from common prey fish (banded killifish, bluntnose minnow, round goby, and yellow perch) and common carp ($p > 0.05$). This was not true for walleye as they were significantly higher with respect to the same group of prey fish ($p < 0.05$). Significantly higher levels in walleye compared to largemouth bass and northern pike may be due to habitat and dietary differences. Walleye also were higher in lipid content than largemouth bass and northern pike (Table 3.3.5). Due to the lipophilic nature of PBDEs, higher lipid content can influence body burdens of these contaminants. Unlike Kalamazoo River and Le Cheneaux Islands, carp from Muskegon Lake did not contain the highest mean concentration of PBDE congeners of all species captured.

Table 3.3. 6. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from Muskegon Lake (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Walleye	Round Goby	22.413	0.047	Yellow Perch	Banded Killifish	1.690	0.003
	Spottail Shiner	14.105	0.057		Bluntnose Minnow	-3.047	0.925
	Yellow Perch	21.730	0.006		Mimic Shiner	-2.880	0.562
	Banded Killifish	23.420	0.001		Northern Pike	1.217	0.544
	Bluntnose Minnow	18.683	0.001		Largemouth Bass	2.368	0.748
	Mimic Shiner	18.850	0.001		Common Carp	-0.031	0.562
	Northern Pike	22.947	0.004		Banded Killifish	-4.737	0.985
	Largemouth Bass	24.098	0.001		Mimic Shiner	-4.570	0.738
	Common Carp	21.699	0.003		Northern Pike	-0.473	0.767
Round Goby	Spottail Shiner	-8.308	0.034	Bluntnose Minnow	Largemouth Bass	0.678	0.861
	Yellow Perch	-0.683	0.928		Common Carp	-1.721	0.798
	Banded Killifish	1.008	0.995		Mimic Shiner	0.167	0.968
	Bluntnose Minnow	-3.729	0.995		Northern Pike	4.263	0.958
	Mimic Shiner	-3.563	0.987		Largemouth Bass	5.414	0.439
	Northern Pike	0.534	0.942		Common Carp	3.016	0.248
	Largemouth Bass	1.685	0.995		Mimic Shiner	4.097	0.394
	Common Carp	-0.714	0.995		Largemouth Bass	5.248	0.553
	Yellow Perch	7.625	0.006		Common Carp	2.849	0.430
Spottail Shiner	Banded Killifish	9.315	0.057	Northern Pike	Largemouth Bass	1.151	0.295
	Bluntnose Minnow	4.578	0.088		Common Carp	-1.248	0.730
	Mimic Shiner	4.745	0.259		Largemouth Bass	-2.399	0.868
	Northern Pike	8.842	0.002	Largemouth Bass	Common Carp	-2.399	0.868
	Largemouth Bass	9.993	0.000				
	Common Carp	7.594	0.003				

3.3.4. White Lake

The concentrations of total PBDE congeners in fish tissue from White Lake are summarized in Table 3.3.7 and means for individual species are presented in Figure 3.3.4. Total PBDE congeners were highly variable in walleye and common carp and ranged from 2.18-28.44 ng/g and 0.32-21.52 ng/g, respectively (Table 3.3.7). Largemouth bass and northern pike were less

variable and ranged from 0.63-7.35 ng/g and 0.22-4.23 ng/g, respectively. Spottail shiner showed similar variability and ranged from 7.43-20.26 ng/g. Composites of banded killifish, bluntnose minnow and yellow perch ranged from 2.05-3.19 ng/g and 2.68-3.35 ng/g, respectively. Round goby composites contained 2.13-2.22 ng/g of total PBDE congeners. Mean PBDE congeners were $\approx 2\times$ higher in walleye than the other species (Figure 3.3.4). The results of ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.8. There was no significant difference in PBDE concentrations within the group of forage fish (banded killifish, bluntnose minnow, round goby, and yellow perch; $p>0.05$). PBDE congener levels in piscivorous fish (largemouth bass and northern pike) were similar to those in common prey fish (banded killifish, bluntnose minnow, round goby, and yellow perch; $p>0.5$). This was not true for walleye as they were significantly higher with respect to the same group of prey and predator fish ($p>0.05$). Significantly higher levels in walleye compared to largemouth bass and northern pike may be due to habitat and dietary differences and lipid content (Table 3.3.7). PBDE levels in carp related to the other species captured from White Lake were similar to Muskegon Lake as they ranked second to the concentrations found in walleye.

Table 3.3. 7. Total PBDE Congeners in Fish Tissue samples Collected from White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites.)

Species	Number	Length	% Lipids	PBDE (ng/g)	Species	Number	Length	% Lipids	PBDE (ng/g)
Bluntnose Minnow	20	5.1	3.34	2.05	Northern Pike	1	54.0	0.69	3.05
Bluntnose Minnow	8	5.6	4.74	2.53	Northern Pike	1	49.5	0.46	0.64
Bluntnose Minnow	5	6.8	3.82	3.19	Northern Pike	1	53.5	1.10	4.23
Common Carp	1	44.2	6.83	2.40	Northern Pike	1	47.5	0.61	2.13
Common Carp	1	27.0	2.57	0.32	Northern Pike	1	50.5	0.28	1.66
Common Carp	1	53.5	5.54	3.16	Northern Pike	1	45.0	0.29	1.20
Common Carp	1	61.5	4.63	2.52	Northern Pike	1	54.3	0.38	5.36
Common Carp	1	45.0	7.16	3.29	Northern Pike	1	41.5	0.54	1.09
Common Carp	1	45.5	6.71	1.52	Northern Pike	1	41.5	0.50	1.10
Common Carp	1	52.0	10.41	7.79	Northern Pike	1	38.9	0.21	0.22
Common Carp	1	47.8	4.92	14.11	Round Goby	10	5.0	2.71	2.22
Common Carp	1	55.5	3.42	1.98	Round Goby	7	6.9	2.65	2.13
Common Carp	1	65.0	13.43	21.53	Spottail Shiner	1	10.5	0.74	0.73
Largemouth Bass	3	6.2	1.70	2.59	Walleye	1	47.0	2.52	7.82
Largemouth Bass	43	2.0-2.6	1.90	0.63	Walleye	1	53.5	2.65	28.44
Largemouth Bass	43	2.0-2.6	2.65	0.70	Walleye	1	43.0	3.40	25.46
Largemouth Bass	1	31.5	1.33	2.37	Walleye	1	46.8	1.47	3.25
Largemouth Bass	1	31.0	0.71	1.65	Walleye	1	44.3	2.52	2.21
Largemouth Bass	1	30.7	0.93	1.05	Walleye	1	44.6	1.52	2.18
Largemouth Bass	1	31.5	1.26	3.26	Walleye	1	40.6	2.52	2.70
Largemouth Bass	1	32.5	1.06	3.21	White Sucker	2	8.0	2.92	1.76
Largemouth Bass	1	31.5	1.46	7.35	Yellow Perch	10	7.1	3.74	2.68
Largemouth Bass	1	33.0	0.98	3.23	Yellow Perch	8	7.5	3.37	2.85
Largemouth Bass	1	33.0	0.58	0.83	Yellow Perch	8	7.7	2.29	3.35
Largemouth Bass	1	32.0	1.03	1.10	Yellow Perch	8	8.3	3.32	2.85
Largemouth Bass	1	29.5	0.43	6.04	Yellow Perch	7	9.0	3.75	3.17
Mimic Shiner	7	5.4	2.59	3.92					

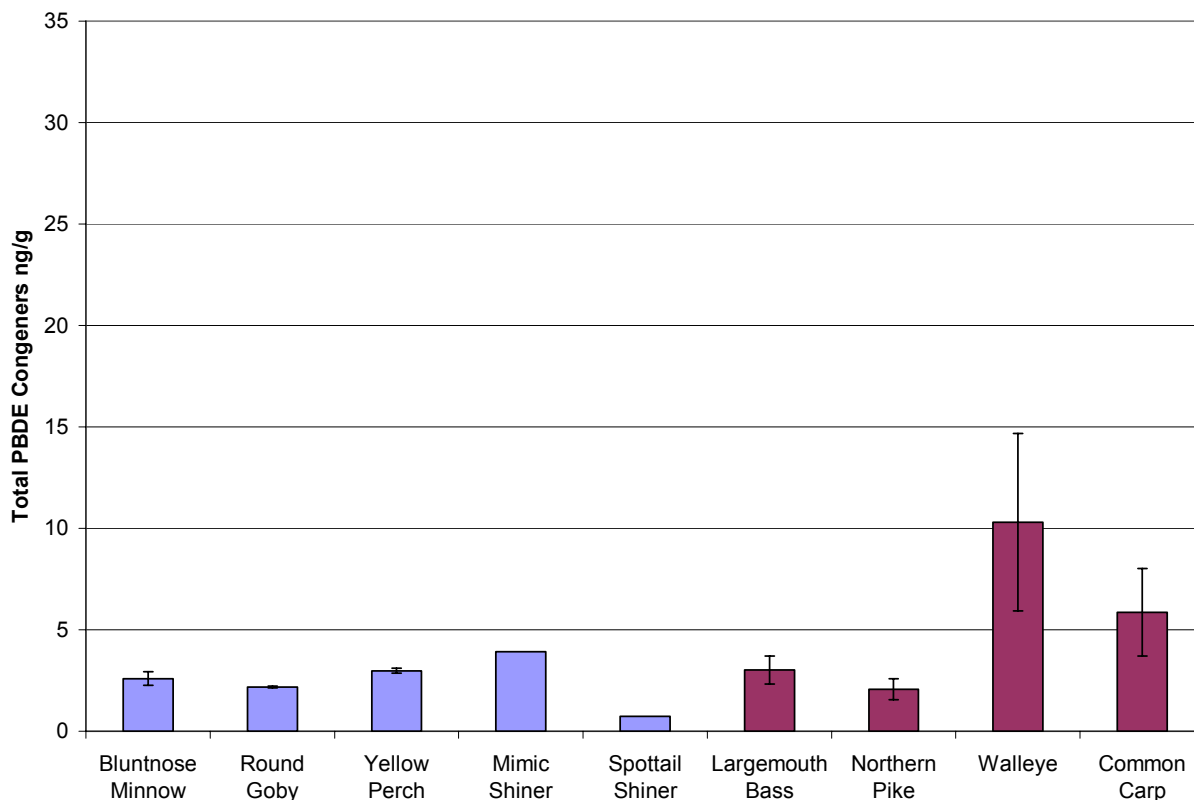


Figure 3.3. 4. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Fish Collected from White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

Table 3.3. 8. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from White Lake (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Bluntnose Minnow	Common Carp	-3.272	0.803	Largemouth Bass	Northern Pike	0.548	0.995
	Largemouth Bass	-0.026	0.994		Round Goby	0.441	0.994
	Northern Pike	0.522	0.989		Walleye	-7.678	0.066
	Round Goby	0.415	0.934		Yellow Perch	-0.364	0.901
	Walleye	-7.704	0.269		Round Goby	-0.107	0.980
	Yellow Perch	-0.390	0.995	Northern Pike	Walleye	-8.226	0.050
Common Carp	Largemouth Bass	3.246	0.348	Round Goby	Yellow Perch	-0.912	0.998
	Northern Pike	3.794	0.639		Walleye	-8.119	0.451
	Round Goby	3.687	0.908		Yellow Perch	-0.805	0.998
	Walleye	-4.432	0.109	Walleye	Yellow Perch	7.314	0.071
	Yellow Perch	2.882	0.344				

3.3.5. Pentwater Lake

The concentrations of total PBDE congeners in fish tissue from Pentwater Lake are summarized in Table 3.3.9 and means for individual species are presented in Figure 3.3.5. Total PBDE

Table 3.3. 9. Total PBDE Congeners in Fish Tissue samples Collected from Pentwater Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

Species	Number	Length	% Lipids	PBDE (ng/g)	Species	Number	Length	% Lipids	PBDE (ng/g)
Bluntnose Minnow	22	4.8	2.54	4.02	Mimic Shiner	32	4.5	3.03	5.28
Bluntnose Minnow	13	6.1	2.31	3.43	Mimic Shiner	32	4.8	3.32	5.36
Bluntnose Minnow	14	7.7	3.56	4.96	Northern Pike	1	47.5	2.30	3.76
Common Carp	1	66.5	11.06	17.26	Northern Pike	1	45.0	1.80	2.63
Common Carp	1	63.0	5.07	7.42	Northern Pike	1	42.0	0.74	1.04
Common Carp	1	55.0	8.74	14.29	Northern Pike	1	45.0	3.00	4.83
Common Carp	1	54.5	9.74	14.95	Northern Pike	1	76.0	3.31	5.68
Common Carp	1	58.0	43.12	62.61	Northern Pike	1	48.0	1.48	2.15
Common Carp	1	52.0	3.96	5.59	Northern Pike	1	22.8	0.66	1.62
Common Carp	1	52.2	6.01	8.73	Northern Pike	1	21.5	0.25	0.52
Common Carp	1	54.0	22.67	32.22	Northern Pike	1	50.5	6.94	10.98
Common Carp	1	61.4	9.50	13.72	Northern Pike	1	32.5	0.80	1.34
Largemouth Bass	15	5.0	0.64	1.34	Round Goby	26	4.5	1.37	2.61
Largemouth Bass	8	5.9	0.55	1.13	Round Goby	9	6.9	1.74	3.46
Largemouth Bass	1	30.5	2.54	3.79	Yellow Perch	9	9.4	2.83	4.89
Largemouth Bass	1	36.7	9.84	15.97	Yellow Perch	9	9.6	2.97	5.89
Largemouth Bass	1	34.0	4.75	7.26	Yellow Perch	9	10.2	2.43	4.35
Largemouth Bass	1	28.0	3.14	4.95	Yellow Perch	9	10.5	2.77	5.17
Largemouth Bass	1	26.5	1.30	2.27	Yellow Perch	6	11.2	3.44	3.91
Largemouth Bass	1	28.0	0.89	1.45	Yellow Perch	5	11.3	2.88	4.07
Largemouth Bass	1	21.6	1.49		Yellow Perch	3	13.0	2.48	4.63
Largemouth Bass	1	23.2	1.43						
Largemouth Bass	1	31.3	0.89						
Largemouth Bass	1	31.5	2.60						

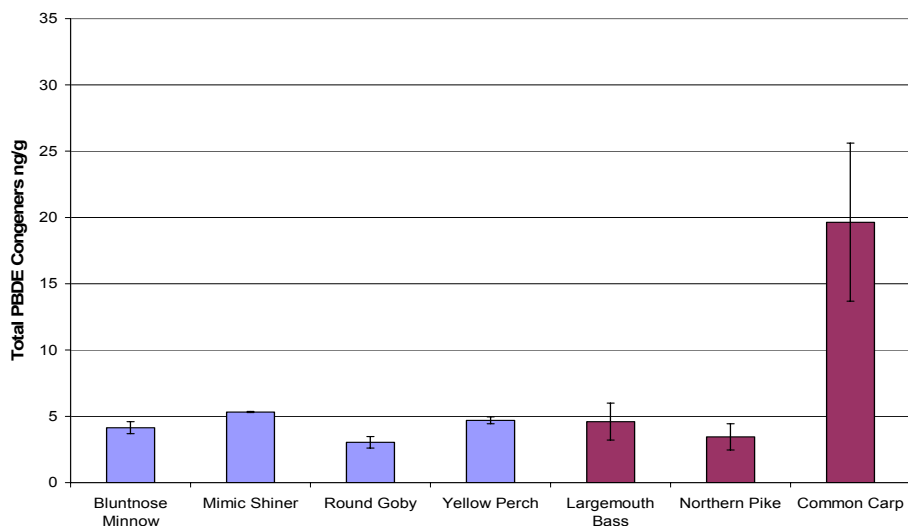


Figure 3.3. 5. Mean Concentrations (±SE) of PBDE Congeners in Fish Collected from Pentwater Lake (2006). (Largemouth bass are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

congeners were highly variable in common carp and ranged from 5.59-62.61 ng/g (Table 3.3.9). Largemouth bass and northern pike had moderate levels and ranged from 1.13-15.97 ng/g and 0.51-10.98 ng/g, respectively. Yellow perch showed low variability and ranged from 2.61-5.98 ng/g. The two composites (n=32) of mimic shiner also showed low variability and ranged from 5.28-5.36 ng/g. Composites of bluntnose minnow and round goby composites contained 3.43-4.96 ng/g and 2.62-3.46 ng/g, respectively of total PBDE congeners. Mean PBDE congeners were 5-10x higher in common carp than the other species (Figure 3.3.9). The results of ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.10. There was no significant difference in PBDE concentrations within the group of forage fish (bluntnose minnow, round goby, mimic shiner, and yellow perch) (Kruskal-Wallis; $p=0.332$). PBDE congener levels in piscivorous fish (largemouth bass and northern pike) also were not significantly different in PBDE congener levels than common prey fish (bluntnose minnow, round goby, mimic shiner, and yellow perch).

Table 3.3. 10. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from Pentwater Lake (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Bluntnose Minnow	Common Carp	-15.507	0.129	Largemouth Bass	Mimic Shiner	-1.284	0.997
	Largemouth Bass	0.101	0.986		Northern Pike	0.581	0.876
	Mimic Shiner	-1.183	0.988		Round Goby	1.001	0.987
	Northern Pike	0.682	0.992		Yellow Perch	-0.666	0.986
	Round Goby	1.102	0.999		Mimic Shiner	1.865	0.999
	Yellow Perch	-0.565	0.925		Round Goby	2.285	1.000
Common Carp	Largemouth Bass	15.608	0.004	Mimic Shiner	Yellow Perch	0.619	0.929
	Mimic Shiner	14.323	0.364		Northern Pike	0.420	0.950
	Northern Pike	16.188	0.004		Yellow Perch	-1.246	0.991
	Round Goby	16.608	0.205	Round Goby	Yellow Perch	-1.666	0.999
	Yellow Perch	14.942	0.023				

3.3.6. Saginaw Bay

The concentrations of total PBDE congeners in fish tissue from Saginaw Bay are summarized in Table 3.3.11 and means for individual species are presented in Figure 3.3.6. Total PBDE congeners were highly variable in common carp and northern pike and ranged from 5.58-44.08 ng/g and 0.81-23.72 ng/g, respectively (Table 3.3.11). Largemouth bass and walleye were less variable and ranged from 1.44-3.87 ng/g and 1.27-2.96 ng/g, respectively. The two composites (n=61 and 29) of bluntnose minnow were the highest in PBDE concentration (≈ 3 ng/g) of all small fish (< 10 cm). Composites of banded killifish, yellow perch, sand shiner, and spottail shiner ranged from 1.44-4.25 ng/g. Round goby composites contained 2.18-3.06 ng/g of total PBDE congeners. Mean PBDE congeners were 5-10x higher in common carp than the other species (Figure 3.3.6). The results of ANOVA with Tukey-Kramer post hoc test with a group of predator and prey fish are summarized in Table 3.3.12. There was no significant difference in PBDE concentrations within the group of forage fish (banded killifish, bluntnose minnow, round goby, sand shiner, spottail shiner, and yellow perch; $p>0.05$). PBDE congener levels in piscivorous fish (largemouth bass, walleye, and northern pike) were not significantly different

Table 3.3. 11. Total PBDE Congeners in Fish Tissue samples Collected from Saginaw Bay (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

Species	Number	Length	% Lipids	PBDE (ng/g)	Species	Number	Length	% Lipids	PBDE (ng/g)
Banded Killifish	55	3.5	1.55	1.74	Northern Pike	1	16.4	0.62	1.91
Banded Killifish	18	5.3	1.04	1.47	Northern Pike	1	32.5	0.16	1.73
Bluntnose Minnow	61	4.0	2.44	2.03	Northern Pike	1	33.5	0.14	0.52
Bluntnose Minnow	29	6.1	4.09	4.25	Northern Pike	1	33.5	0.41	23.72
Common Carp	14	4.9	3.52	1.73	Northern Pike	1	37.7	0.69	1.33
Common Carp	8	6.4	4.00	1.55	Northern Pike	1	38.0	1.07	2.80
Common Carp	1	36.5	8.36	22.90	Northern Pike	1	39.8	0.96	1.53
Common Carp	1	41.5	4.16	5.58	Northern Pike	1	40.0	2.12	0.81
Common Carp	1	42.5	6.16	8.78	Northern Pike	1	46.0	0.33	1.39
Common Carp	1	42.5	14.00	11.09	Northern Pike	1	56.5	0.27	2.33
Common Carp	1	43.0	3.88	15.06	Northern Pike	1	60.5	0.51	18.34
Common Carp	1	44.0	4.72	8.59	Round Goby	40	3.4	2.75	2.70
Common Carp	1	44.5	6.10	10.41	Round Goby	22	5.1	2.83	3.06
Common Carp	1	44.5	3.49	9.48	Round Goby	19	5.3	2.76	2.18
Common Carp	1	45.0	5.71	44.08	Sand Shiner	37	4.5	1.74	1.44
Common Carp	1	46.5	9.32	15.27	Sand Shiner	40	4.6	2.01	1.63
Largemouth Bass	30	4.7	0.67	1.81	Spottail Shiner	30	3.8	2.53	2.17
Largemouth Bass	7	8.7	0.86	2.46	Spottail Shiner	32	4.1	2.94	3.26
Largemouth Bass	1	16.3	1.46	1.44	Walleye	1	39.7	1.32	3.47
Largemouth Bass	1	16.3	0.73	1.51	Walleye	1	38.0	1.11	1.63
Largemouth Bass	1	17.2	1.29	2.00	Walleye	1	33.3	1.51	2.96
Largemouth Bass	1	18.0	1.45	1.60	Walleye	1	33.0	1.04	1.58
Largemouth Bass	1	19.5	0.63	1.67	Walleye	1	34.2	0.96	3.16
Largemouth Bass	1	20.0	0.95	1.64	Walleye	1	33.4	0.70	1.52
Largemouth Bass	1	24.5	1.15	2.73	Walleye	1	28.6	0.48	1.27
Largemouth Bass	1	25.0	1.52	1.60	Walleye	1	40.5	1.40	2.15
Largemouth Bass	1	26.5	1.57	1.12	Walleye	1	30.1	0.63	1.44
Largemouth Bass	1	26.8	2.16	2.75	White Sucker	3	6.0	2.24	1.27
Largemouth Bass	1	29.0	1.00	3.87					
Yellow Perch	30	4.1	2.79	1.60					
Yellow Perch	28	4.3	2.08	1.54					

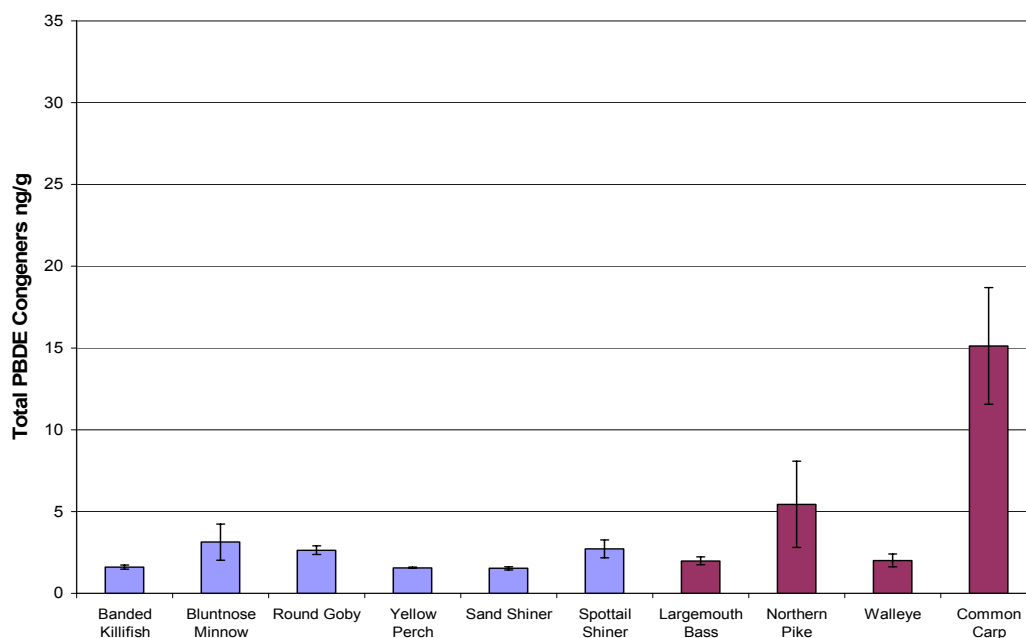


Figure 3.3. 6. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Fish Collected from Saginaw Bay (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites; fish without error bars represent a single composite or fish analyzed.)

from common prey fish (banded killifish, bluntnose minnow, round goby, sand shiner, white sucker, and yellow perch: $\rho > 0.05$). In contrast, PBDE levels in common carp were significantly higher when compared to the same group. The high levels in common carp compared to predators suggest that age and bottom feeding behavior are more important than food web accumulation.

Table 3.3. 12. Results of ANOVA with Tukey-Kramer post hoc Tests on PBDE Concentrations in Fish from Saginaw Bay (2006).

Group 1	Group 2	Mean Diff.	Prob.	Group 1	Group 2	Mean Diff.	Prob.
Banded Killifish	Bluntnose Minnow	-1.535	1.000	Largemouth Bass	Yellow Perch	0.445	0.996
	Common Carp	-11.272	0.035		Northern Pike	-3.113	0.858
	Largemouth Bass	-0.410	0.935		Round Goby	-0.631	0.988
	Yellow Perch	0.035	0.996		Sand Shiner	0.480	1.000
	Northern Pike	-3.523	0.992		Spottail Shiner	-0.700	0.999
	Round Goby	-1.042	0.998		Walleye	-0.116	0.968
	Sand Shiner	0.070	1.000		Yellow Perch	-3.558	0.997
	Spottail Shiner	-1.110	1.000		Round Goby	-1.077	1.000
	Walleye	-0.526	0.994		Sand Shiner	0.035	0.996
	Common Carp	-9.737	0.014		Spottail Shiner	-1.145	1.000
Bluntnose Minnow	Largemouth Bass	1.125	0.999	Northern Pike	Walleye	-0.561	1.000
	Yellow Perch	1.570	1.000		Round Goby	2.482	0.939
	Northern Pike	-1.988	0.697		Sand Shiner	3.593	0.998
	Round Goby	0.493	0.996		Spottail Shiner	2.413	0.883
	Sand Shiner	1.605	1.000		Walleye	2.997	0.850
	Spottail Shiner	0.425	0.949		Round Goby	1.112	1.000
	Walleye	1.009	0.997		Spottail Shiner	-0.068	0.991
	Common Carp	10.861	0.003		Walleye	0.516	0.907
	Yellow Perch	11.307	0.040		Sand Shiner	-1.180	1.000
	Northern Pike	7.748	0.007		Walleye	-0.596	1.000
Common Carp	Round Goby	10.230	0.013	Spottail Shiner	Walleye	0.584	0.993
	Sand Shiner	11.342	0.044				
	Spottail Shiner	10.162	0.020				
	Walleye	10.746	0.007				

3.3.7. PBDE Concentrations by Fish Species and Location

Mean concentrations of PBDE congeners in common carp from the six study locations are shown in Figure 3.3.7. Common carp from Kalamazoo Lake and the northern Lake Michigan embayments had the highest mean PBDE congener levels (≈ 33 ng/g) followed by Pentwater and Saginaw Bay with 19 ng/g and 15 ng/g, respectively. Carp from Muskegon Lake and White Lake were the lowest in mean PBDE concentration (≈ 6 ng/g). Although only a few samples of smaller carp were collected, larger fish ranged from 10-100x higher in PBDE levels. Mean concentrations of PBDE congeners in largemouth bass from the six study locations are shown in Figure 3.3.8. Largemouth bass from Kalamazoo Lake and Pentwater Lake had the highest mean PBDE congener levels (6.8 ng/g and 4.6 ng/g, respectively) followed by White Lake and Muskegon Lake with 3.0 ng/g and 2.5 ng/g, respectively. Largemouth bass from Saginaw Bay and northern Lake Michigan embayments were the lowest in mean PBDE concentration (2.0 ng/g and 0.65 ng/g, respectively). The large difference in PBDE concentrations related to size was not as great with largemouth bass as for carp. In fact, there was little difference in PBDE concentrations between the size classes in Muskegon Lake, Saginaw Bay, and northern Lake Michigan embayments. Largemouth bass have a faster growth rate than carp and there could be a greater age difference between size classes of carp than for largemouth bass.

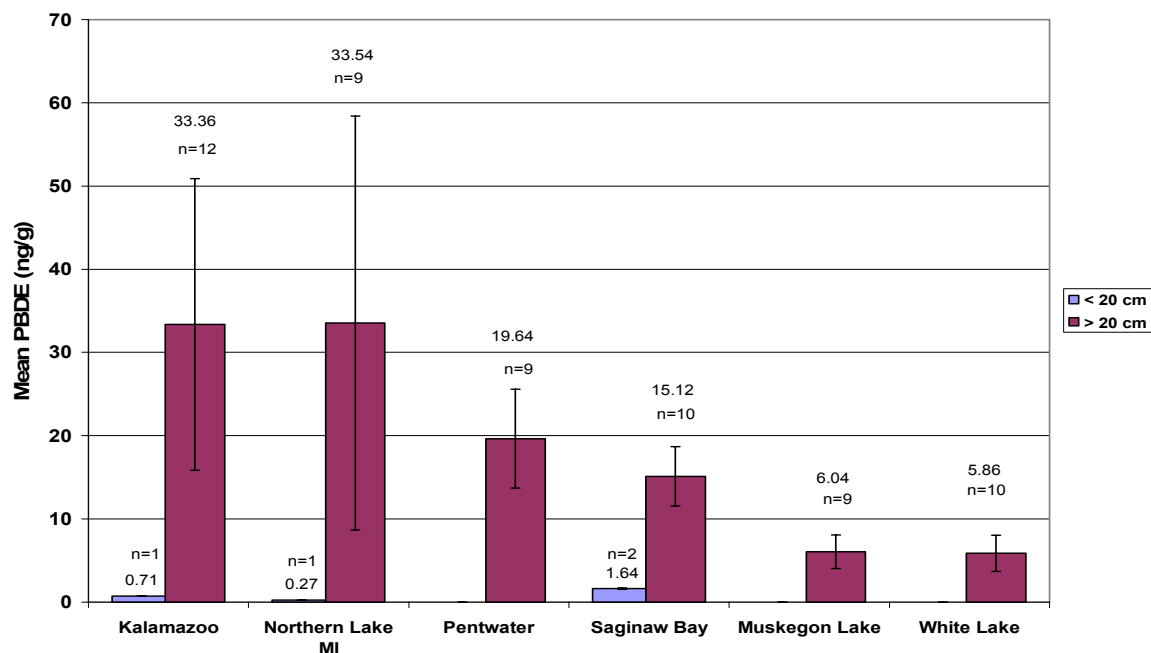


Figure 3.3. 7. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Common Carp Collected from the Six Study Locations (2006). (< 20 cm are whole fish composites; > 20 cm are individual skin-off fillets)

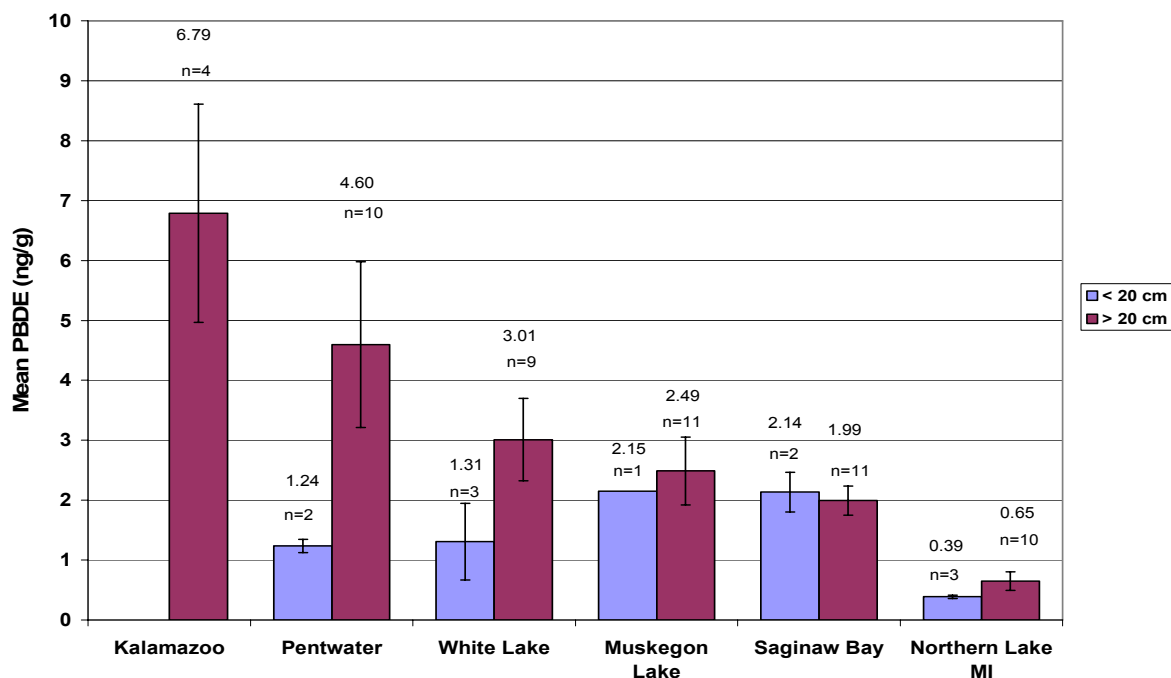


Figure 3.3. 8. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Largemouth Bass Collected from the Six Study Locations (2006). (< 20 cm are whole fish composites; > 20 cm are individual skin-on fillets)

Mean concentrations of PBDE congeners in walleye from the four study locations are shown in Figure 3.3.9. Walleye were not present in the collections from Kalamazoo Lake and Pentwater Lake. Walleye from Muskegon Lake and White Lake had the highest mean PBDE congener levels (27 ng/g and 11 ng/g, respectively) followed by the northern Lake Michigan embayments and Saginaw Bay with 6.1 ng/g and 2.0 ng/g, respectively. The large difference in PBDE concentrations related size was not as great with walleye as for carp and similar to largemouth bass. Walleye and largemouth bass have similar growth rates and consequently, would not tend to show the potential for accumulation from age difference as with carp.

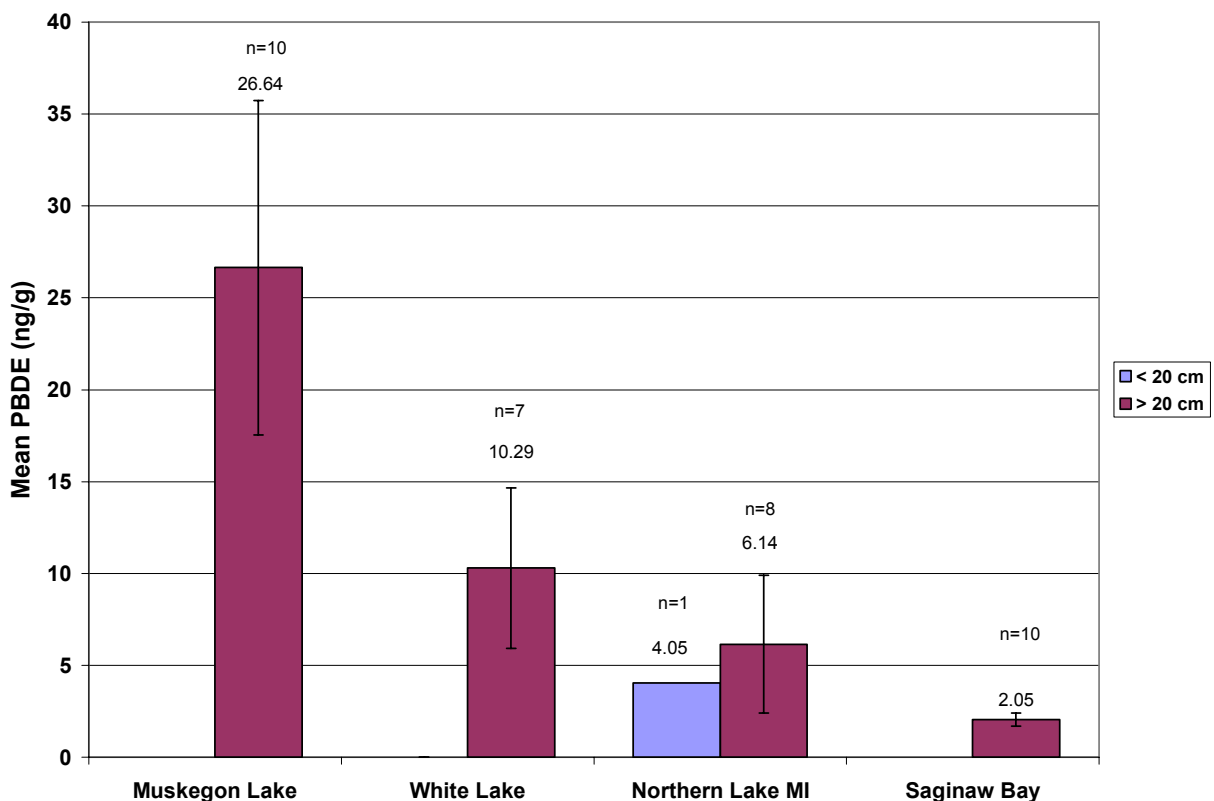


Figure 3.3. 9. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Walleye Collected from the Four Study Locations (2006). (< 20 cm are whole fish composites; > 20 cm are individual skin-on fillets)

Mean concentrations of PBDE congeners in northern pike from the five study locations are shown in Figure 3.3.10. Northern pike were not present in the collections from Kalamazoo Lake. Northern Pike from Saginaw Bay had the highest mean PBDE congener levels ($\approx$ 5.4 ng/g) followed by Muskegon Lake and Pentwater Lake with 3.5 ng/g and 3.6 ng/g, respectively. Northern Pike from White Lake and the northern Lake Michigan embayments were the lowest in mean PBDE concentration (2.1 ng/g and 0.39 ng/g, respectively). Size differences with respect to PBDE concentrations were observed in northern pike from Saginaw Bay but not from the northern Lake Michigan embayments.

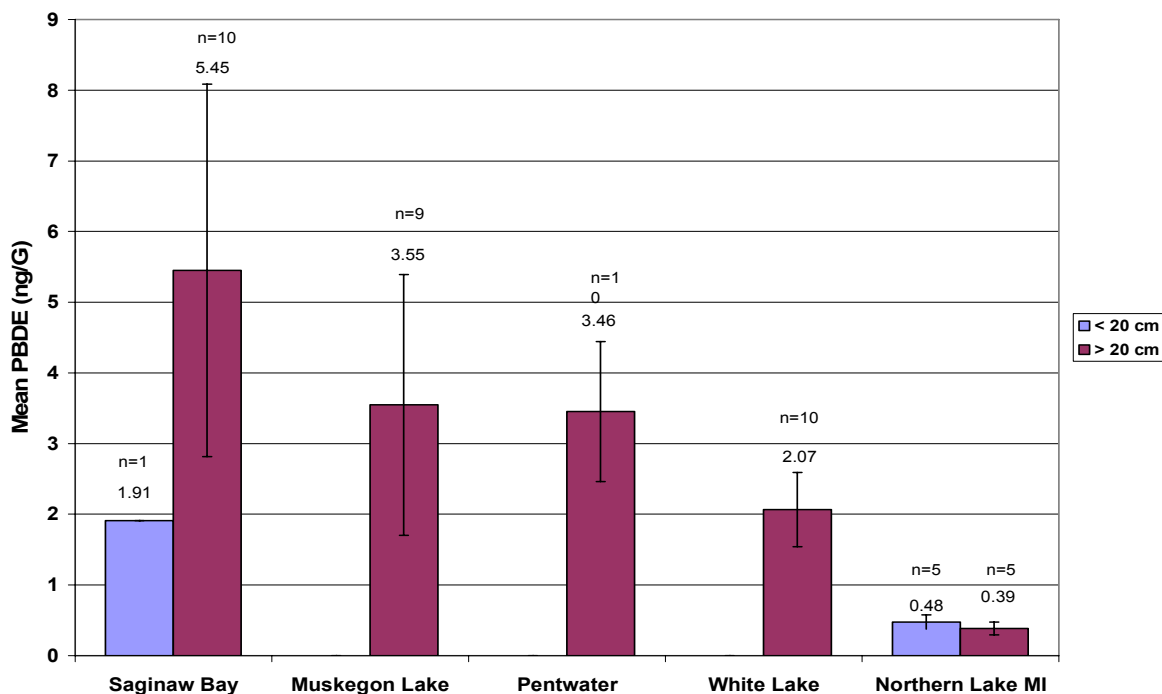


Figure 3.3. 10. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Northern Pike Collected from the Five Study Locations (2006). (< 20 cm are whole fish composites; > 20 cm are individual skin-off fillets)

Mean concentrations of PBDE congeners in yellow perch were similar to largemouth bass and northern pike. Mean concentrations of PBDE congeners in yellow perch from the six study locations are shown in Figure 3.3.11. Yellow perch from Kalamazoo Lake and Muskegon Lake had the highest mean PBDE congener levels (6.1 ng/g and 4.9 ng/g, respectively) followed by Pentwater Lake and White Lake with 4.1 ng/g and 3.0 ng/g, respectively. Yellow perch from Saginaw Bay and the northern Lake Michigan embayments were the lowest in mean PBDE concentration (1.6 ng/g and 1.4 ng/g, respectively).

Mean concentrations of PBDE congeners in yellow perch were similar to largemouth bass and northern pike. Mean concentrations of PBDE congeners in yellow perch from the six study locations are shown in Figure 3.3.11. Yellow perch from Kalamazoo Lake and Muskegon Lake had the highest mean PBDE congener levels (6.1 ng/g and 4.9 ng/g, respectively) followed by Pentwater Lake and White Lake with 4.1 ng/g and 3.0 ng/g, respectively. Yellow perch from Saginaw Bay and the northern Lake Michigan embayments were the lowest in mean PBDE concentration (1.6 ng/g and 1.4 ng/g, respectively). Mean concentrations of PBDE congeners in round goby were similar to yellow perch (Figure 3.3.12). Round Goby from Pentwater Lake and Muskegon Lake had the highest mean PBDE congener levels ($\approx$ 4 ng/g) followed by Saginaw Bay and White Lake with 2.6 ng/g and 2.2 ng/g, respectively. Round Goby from Kalamazoo Lake and the northern Lake Michigan embayments were the lowest in mean PBDE concentration (1.8 ng/g and 1.1 ng/g, respectively).

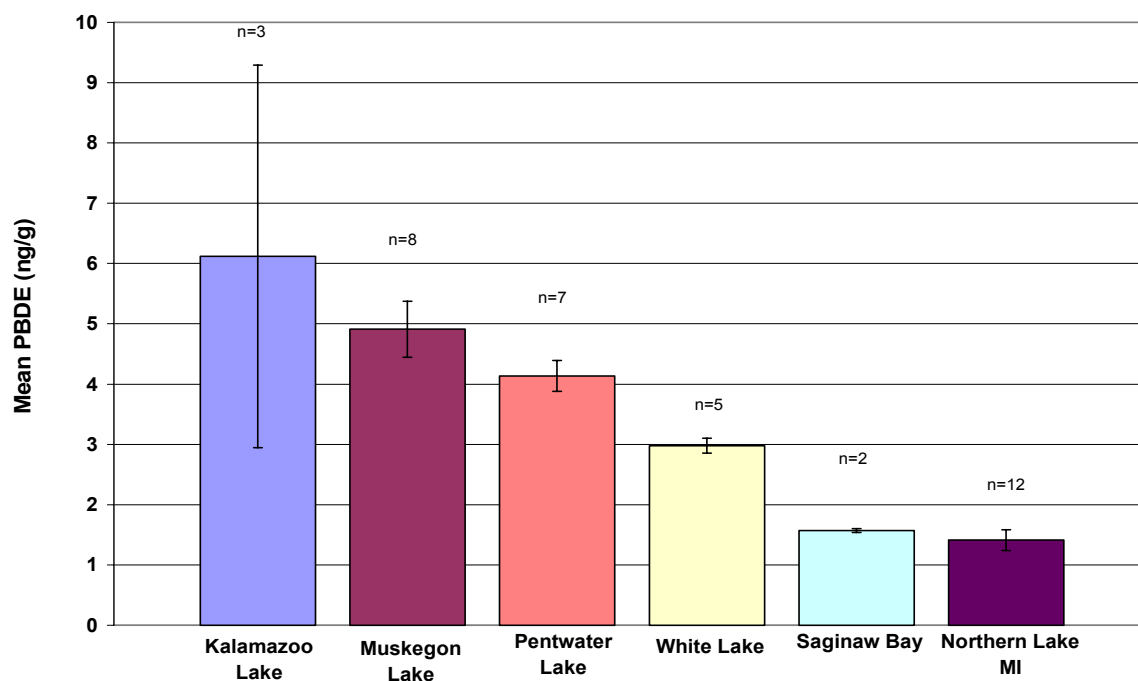


Figure 3.3. 11. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Yellow Perch Collected from the Five Study Locations (2006). (whole fish composites)

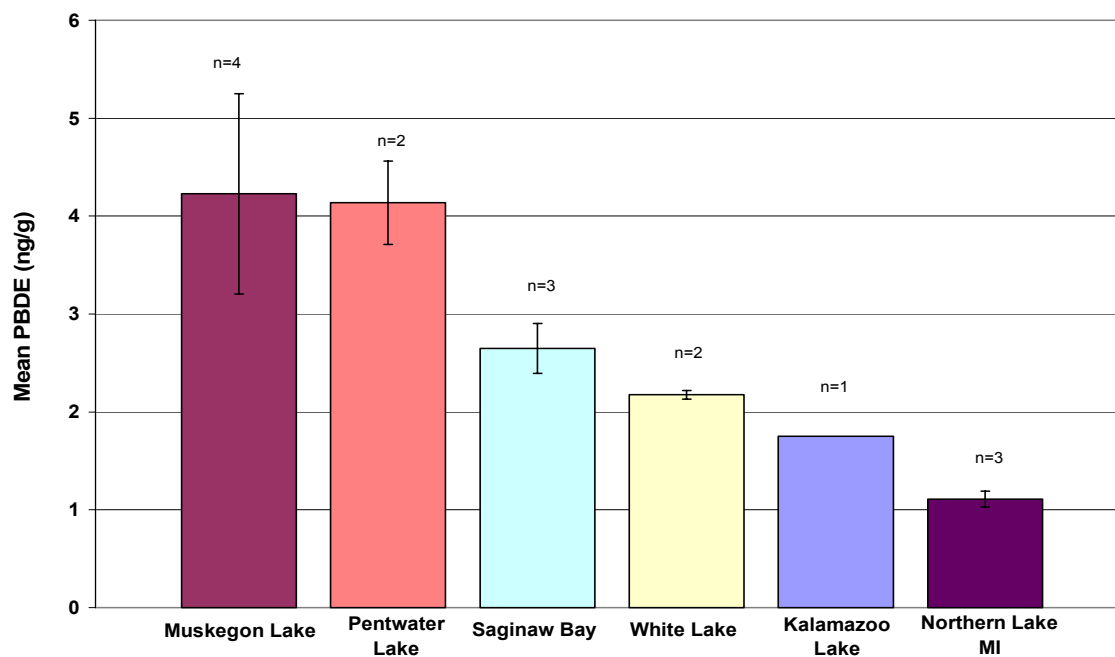


Figure 3.3. 12. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Round Goby Collected from the Five Study Locations (2006). (whole fish composites)

Mean concentrations of PBDE congeners in bluntnose minnow, spottail shiner, and mimic shiner are shown in Figures 3.3.13-3.3.15, respectively. Mean PBDE concentrations in this group of forage fish were higher than yellow perch and round goby and also greater than levels in largemouth bass and northern pike. The highest concentrations of PBDE congeners for the bluntnose minnow were in Muskegon Lake and Kalamazoo Lake (8.0 ng/g and 5.9 ng/g, respectively). Spottail shiner followed a similar pattern with the highest concentrations in Muskegon Lake and Kalamazoo Lake (12 ng/g and 7 ng/g, respectively). Mimic shiner had the highest concentrations in Kalamazoo Lake and Muskegon Lake (13 ng/g and 8 ng/g, respectively). These species are bottom feeding organisms and may ingest sediment and detritus as part of their diet. These data suggest that bottom feeding behavior may rapidly impart high concentrations of PBDEs to forage fish.

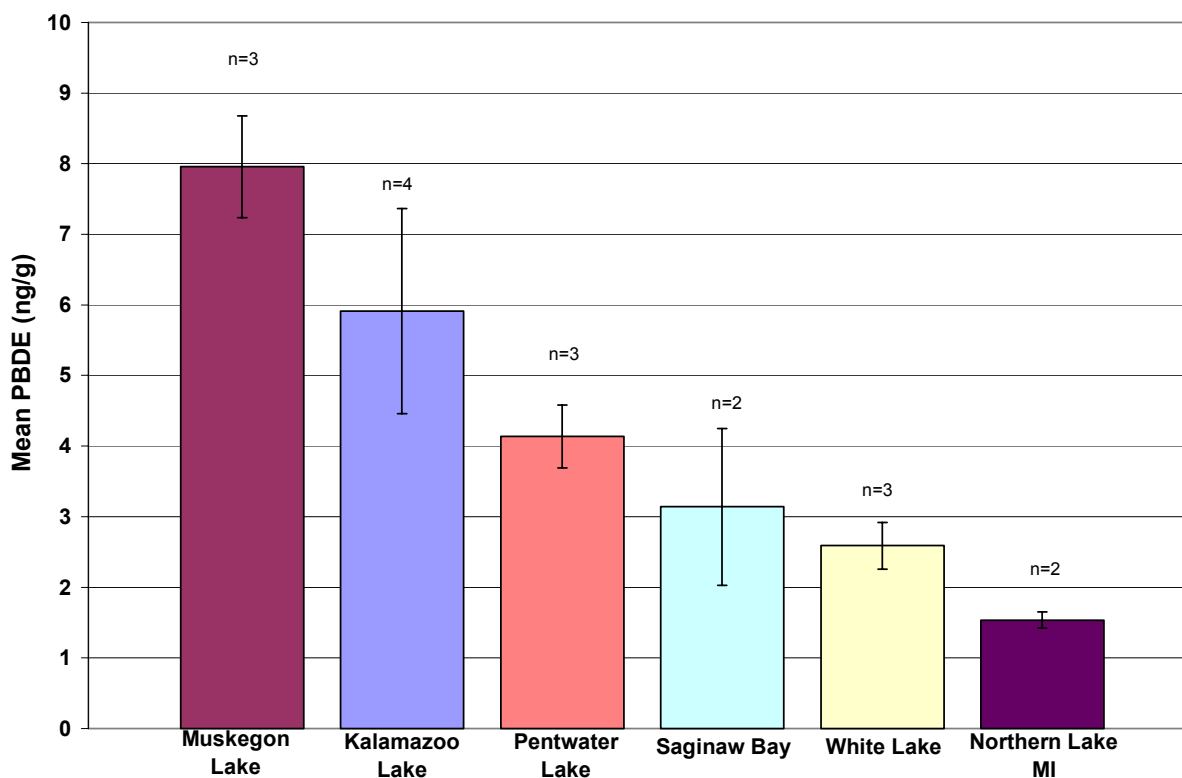


Figure 3.3. 13. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Bluntnose Minnow Collected from the Five Study Locations (2006). (whole fish composites)

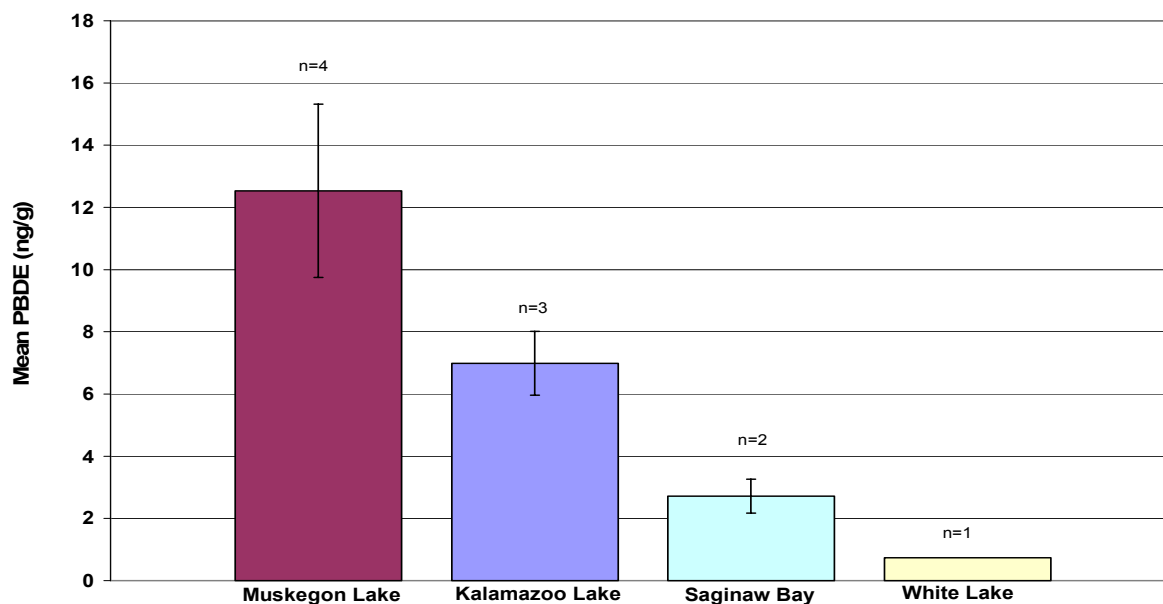


Figure 3.3. 14. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Spottail Shiner Collected from the Five Study Locations (2006). (whole fish composites)

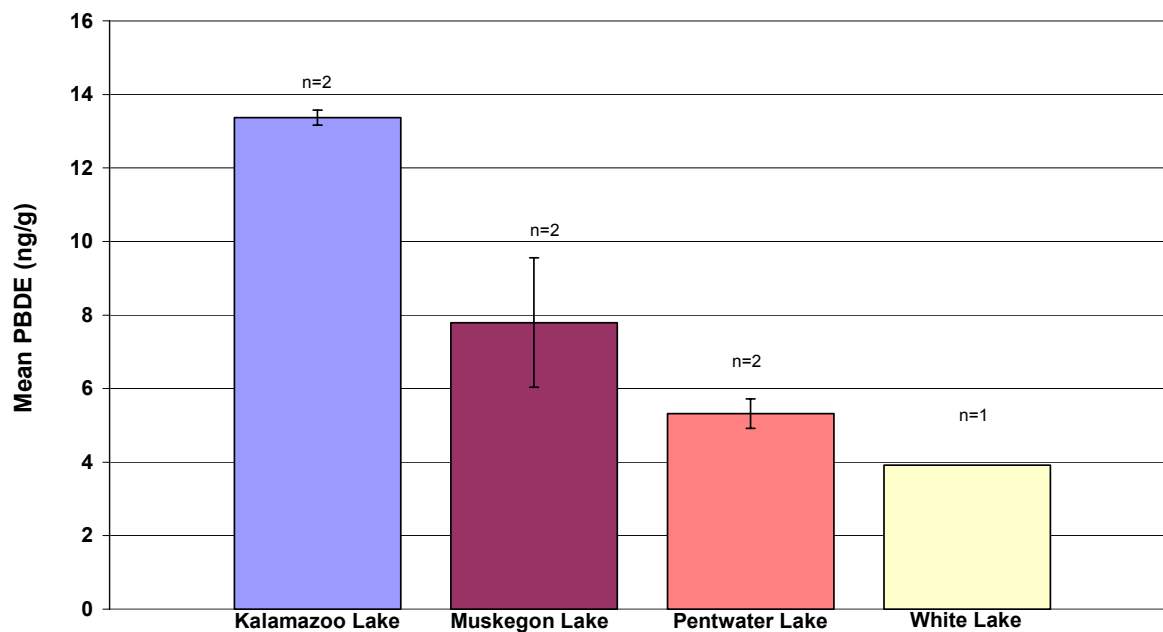


Figure 3.3. 15. Mean Concentrations ($\pm$ SE) of PBDE Congeners in Mimic Shiner Collected from the Five Study Locations (2006). (whole fish composites)

4.0 Conclusions

This project had two components: the analysis of game fish for PCBs and mercury in Muskegon Lake and White Lake (Areas of Concern) to determine the status of the Restrictions on Fish Consumption Beneficial Use Impairment and to examine the distribution of Polybrominated Diphenyl Ethers (PBDEs) in selected recreational waters in Michigan. We collected and analyzed game fish for PCB congeners and mercury in a manner consistent with the MDEQ Fish Contaminant Monitoring Program and used Pentwater Lake as a reference system. The delisting targets established by the Public Advisory Councils (PACs) for the two AOCs utilized Pentwater Lake as a reference and required that contaminant concentrations did not show a statistically significant difference between the reference site and the AOC or that a decreasing trend was present when compared to historical levels. No statistical differences in mercury and PCB congener levels in common carp, largemouth bass, and northern pike between fish from Muskegon Lake and Pentwater Lake and between White Lake and Pentwater Lake. While the fish collections of largemouth bass and northern pike were similar in size and lipid composition in the study lakes, common carp from Pentwater Lake were significantly larger and contained more lipids than the group from Muskegon Lake. Since the concentration of these contaminants is related to the age (size) and lipid content of the fish, analysis of organisms that were more similar in length and weight would result in a more valid comparison. Because the group of common carp collected from Muskegon Lake was significantly smaller, it is recommended that an additional sampling and analysis round of more comparable sized fish be conducted in 2011 to determine if PCB and mercury concentrations are similar in Muskegon Lake and the reference system. Walleye were not present in Pentwater Lake and consequently, historical trends were examined for this species in the two lakes. A distinct decreasing trend was noted for mercury and PCBs in Muskegon Lake from 1987-2006. A distinct decreasing trend was not present in White Lake; however there was no statistical difference noted between PCBs and mercury in walleye from Muskegon Lake and White Lake in the 2006 data. Concentrations of these contaminants were 50% lower in White Lake in the 1980s compared to Muskegon Lake. Since a decreasing trend of PCB and mercury concentrations was not observed in White Lake, an additional sampling of walleye is recommended in 2011 to determine if contaminant levels have reached a steady state.

We conducted an investigation of PBDEs in fish from multiple trophic levels in the Kalamazoo River, Muskegon Lake, White Lake, Pentwater Lake, Saginaw Bay, and the northern Lake Michigan embayments. These locations represent systems with varying degrees of anthropogenic impact and have significant sport fisheries with respect to angler usage and fish production. Forage and predator species were collected from each location and analyzed for PBDE congeners and % lipids. PBDE concentrations were found to be variable across study sites and species, suggesting that a diffuse source such as atmospheric deposition is responsible for contaminant levels observed. The highest concentrations in common carp were found in the northern Lake Michigan embayments and Kalamazoo Lake (232 ng/g and 218/ng/g, respectively). The highest concentrations in walleye was found in Muskegon Lake (84 ng/g) while the highest concentration in northern pike was found in Saginaw Bay (23.72 ng/g). Concentrations of PBDE in yellow perch, round goby, and largemouth bass were similar and ranged from 0.5-10 ng/g. The higher concentrations in walleye may be due to the fact that they

feed on chinook salmon and rainbow trout which have elevated levels of PBDE. The higher concentrations of PBDEs found in common carp can be attributed to their bottom feeding behavior and the association of PBDEs in sediments. Bottom feeding forage fish such as mimic shiner, bluntnose minnow and spottail shiner also had high levels of PBDE congeners compared other fish from similar size classes.

5.0 References

- APHA (American Public Health Association). 1998. Standard Methods for the Evaluation of Water and Wastewater. 20th edition. APHA, Washington, DC.
- Asplund, L., Hornung, M., Peterson, R. E., Turesson, K., Bergman, A. 1999. Levels of polybrominated diphenyl ethers (PBDEs) in fish from the Great Lakes and Baltic Sea. *Organohalogen Compd.* 40:351-354.
- Batterman, S, Chernyak, S., Gwynn, E., Cantonwine, D., Jia, C. Begnoche, L. and Hickey, J.P. (2007). Trends of Brominated Diphenyl Ethers in Fresh and Archived Great Lakes Fish (1979-2005) *Chemosphere*, 69, 444-457.
- Breen, M.J., Ruetz, C.R. 2006. Gear bias in fyke netting: evaluating soak time, fish density, and predators. *North American Journal of Fisheries Management* 26:32-41.
- Burkhard, L.P. 1998. Comparison of two models for predicting bioaccumulation of hydrophobic organic chemicals in a Great Lakes food web. *Environ. Toxicol. Chem.* 17:383-393.
- Burger, J.; Stern, A. H.; Gochfeld, M. 2005. Mercury in commercial fish: Optimizing individual choices to reduce risk. *Environ. Health Perspect.* 113:266-271.
- Diana, C. 2006. Prey Utilization and Somatic Growth of Walleye (*Sander Vitreus*) in the Muskegon River and Muskegon Lake, Michigan. MS Thesis. University of Michigan. School of Natural Resources.
- Fields S. 2005. The Great Lakes: a resource at risk. *Environ. Health Perspect.* 113:A164–A173.
- Hites, R. A. 2004. Polybrominated diphenyl ethers in the environment and in people; a meta-analysis of concentrations. *Environ. Sci. Technol.* 38:945-956.
- Luross, J. M., Alae, M., Sergeant, D. B., Cannon, C. M., Michael, W. D., Solomon, K. R., Muir D. 2002. Spatial distribution of Polybrominated Diphenyl Ethers and Polybrominated Biphenyls in Lake Trout from the Laurentian Great Lakes. *Chemosphere* 46(5):665-672.
- Manchester-Neesvig, J. B., Valters, K., Sonzogni, W. C. 2001. Comparison of polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) in Lake Michigan Salmonids. *Environ. Sci. Technol.* 35:1072-1077.
- Manchester-Neesvig, J. B., Sonzogni, W. C., Hahm, J. L. A. 2003. Depth profile of polybrominated diphenyl ethers (PBDES) and polychlorinated biphenyls (PCBs) in sediments from Lake Michigan. *Organohalogen Compd.* 61:45-48.

- Maruya, K.A. and Lee, R.F. 1998. Biota-sediment accumulation and trophic transfer factors for extremely hydrophobic polychlorinated biphenyls. *Environ. Toxicol. Chem.* 17:2463-2469.
- McDonald, T.A. 2002. A perspective on the potential health risks of PBDEs. *Chemosphere.* 46(5):45-755.
- Schmidt L.J. 1997. Method for analysis of total PCBs and PCB congeners (full suite) and transnonachlor for gas chromatography / negative chemical ionization single ion mass spectrophotometry. Vol. II of Lake Michigan Mass Balance study methods compendium. U. S. Environmental Protection Agency Great Lakes National Program Office EPA-905-R-97-012b, Chicago, IL, USA.
- Song, W., A. Li, J.C. Ford, N.C. Sturchio, K.J. Rockne, D.R. Buckley et al. 2005. Polybrominated Diphenyl Ethers in the Sediments of the Great Lakes. 2. Lakes Michigan and Huron. *Environ Sci Technol* 39:3474-9.
- Stapleton, H.M. and Baker, J.E. 2003. Comparing polybrominated diphenyl ether and polychlorinated biphenyl bioaccumulation in a food web in Grand Traverse Bay, Lake Michigan. *Arch. Environ. Contam. Toxicol.* 45:227-234.
- USEPA 1999. Method 1668, Revision A: Chlorinated biphenyl congeners in waters, soil, and tissue by HRGC / HRMS. U. S. Environmental Protection Agency EPA-821-R-00-002, Washington, DC, USA.
- Zhu, L. Y. and Hites, R. A. 2004. Temporal trends and spatial distributions of brominated flame retardants in archived fishes from the Great Lakes. *Environ. Sci. Technol.* 38(10):2779-2784.

Appendix 1
PCB and Mercury Results

Table I- 1. PCB and Mercury Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

		ML35	ML135	ML36	ML136	ML37	ML38	ML39	ML40	ML41
		Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike
Collection Date		9/20/06	9/22/06	9/20/06	9/22/06	9/20/06	9/20/06	9/20/06	8/3/06	8/3/06
Number of Fish		1	1	1	1	1	1	1	1	1
Avg. Length (cm)		57.0	51.0	44.0	46.0	67.0	60.8	25.2	45.5	61.5
Avg. Weight (g)		1530.10	1245.60	396.89	411.50	2952.30	2666.20	148.52	858.10	2031.60
% Lipid		0.80	0.72	0.43	0.48	0.35	0.46	0.30	0.31	0.42
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	< 0.20	1.13	0.53	< 0.20	< 0.20	< 0.20	2.37	< 0.20	< 0.20
Congener#40	ng/g	< 0.50	2.40	< 0.50	< 0.50	< 0.50	< 0.50	4.13	< 0.50	< 0.50
Congener#41	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	0.61	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	1.22	0.67	< 0.50	< 0.50	< 0.50	2.42	< 0.50	< 0.50
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	< 0.50	1.56	0.97	< 0.50	< 0.50	< 0.50	2.14	< 0.50	< 0.50
Congener#56/#84	ng/g	< 0.50	0.71	0.63	< 0.50	< 0.50	< 0.50	0.93	< 0.50	< 0.50
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	0.00	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	0.57	1.42	0.95	< 0.50	0.65	0.63	2.23	< 0.50	1.75
Congener#70	ng/g	< 0.50	2.09	0.94	< 0.50	< 0.50	0.74	2.85	0.53	1.65
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	< 0.50	0.79	0.54	< 0.50	< 0.50	< 0.50	1.19	< 0.50	0.64
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	< 0.50	< 0.50	0.59	< 0.50	0.51	< 0.50	0.60	< 0.50	1.15
Congener#87	ng/g	0.52	< 0.50	0.64	< 0.50	< 0.50	< 0.50	0.62	0.62	< 0.50
Congener#92	ng/g	< 0.50	0.53	0.58	< 0.50	0.63	< 0.50	0.65	< 0.50	1.06
Congener#95	ng/g	< 0.50	1.65	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	< 0.50	< 0.50	0.70	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.13
Congener#99	ng/g	0.79	0.93	1.41	< 0.50	1.53	0.87	1.33	0.98	2.53
Congener#101	ng/g	1.67	2.31	2.60	< 0.50	2.73	2.05	3.00	2.42	4.53
Congener#105	ng/g	0.71	0.52	0.66	< 0.50	0.86	0.72	0.69	0.93	1.95
Congener#109/#123	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.60
Congener#110	ng/g	1.12	1.77	1.83	1.50	1.69	1.29	2.51	1.80	3.34
Congener#118	ng/g	1.88	1.95	2.64	2.50	2.23	1.73	2.64	2.40	4.56
Congener#128	ng/g	0.67	0.40	0.89	< 0.20	0.71	0.59	0.41	0.75	1.58
Congener#132/#153	ng/g	2.34	1.58	3.98	2.48	3.91	2.08	1.92	3.03	6.80
Congener#135	ng/g	0.55	< 0.20	0.30	< 0.20	0.31	0.60	0.30	< 0.20	0.60
Congener#137	ng/g	< 0.20	< 0.20	0.22	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.42
Congener#138	ng/g	1.77	1.07	2.70	1.42	2.43	1.53	1.27	2.33	< 0.20
Congener#141	ng/g	0.38	< 0.20	0.55	< 0.20	0.54	0.33	0.21	0.44	1.19
Congener#144	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.18
Congener#146	ng/g	0.44	0.37	0.79	< 0.20	0.76	0.39	0.44	0.55	1.26
Congener#149	ng/g	1.66	0.87	1.71	0.26	1.84	1.23	1.02	1.61	3.46
Congener#151	ng/g	0.37	0.31	0.44	< 0.20	0.52	0.35	0.23	0.44	1.14
Congener#156	ng/g	0.22	< 0.20	0.29	< 0.20	0.28	< 0.20	< 0.20	0.30	0.87
Congener#158	ng/g	0.23	< 0.20	0.28	< 0.20	0.26	0.20	< 0.20	0.31	0.84
Congener#163	ng/g	0.57	0.38	0.90	< 0.20	0.99	0.53	0.45	0.73	1.77
Congener#164	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.35
Congener#167	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.30
Congener#170	ng/g	0.47	0.24	0.74	0.51	0.61	0.36	0.24	0.46	1.12
Congener#171	ng/g	0.18	< 0.10	0.21	< 0.10	0.20	0.13	< 0.10	0.15	0.39
Congener#172	ng/g	0.12	< 0.10	0.21	< 0.10	0.17	0.11	< 0.10	0.11	0.36
Congener#174	ng/g	0.25	< 0.10	0.41	< 0.10	0.43	0.23	< 0.10	0.20	0.96
Congener#176	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.19
Congener#177	ng/g	0.22	< 0.10	0.36	< 0.10	0.36	0.22	< 0.10	0.24	0.94
Congener#178	ng/g	0.19	< 0.10	0.22	< 0.10	0.26	0.14	< 0.10	0.16	0.54
Congener#179	ng/g	0.14	< 0.10	0.14	< 0.10	0.18	0.10	< 0.10	0.14	0.28
Congener#180	ng/g	0.96	0.62	1.61	1.14	1.57	0.75	0.59	0.95	2.43
Congener#183	ng/g	0.39	0.19	0.50	< 0.10	0.52	0.31	0.20	0.36	1.19
Congener#185	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10
Congener#187	ng/g	0.75	0.45	1.13	1.10	1.34	0.60	0.47	0.78	2.04
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	0.10	< 0.10	0.15	< 0.10	0.13	< 0.10	< 0.10	0.10	0.30
Congener#193	ng/g	< 0.10	< 0.10	0.12	< 0.10	0.12	< 0.10	< 0.10	< 0.10	0.28
Congener#194	ng/g	0.17	< 0.10	0.26	< 0.10	0.23	0.12	< 0.10	0.14	0.82
Congener#195	ng/g	< 0.10	< 0.10	0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	0.14
Congener#196	ng/g	0.13	< 0.10	0.16	< 0.10	0.17	0.10	< 0.10	0.12	0.34
Congener#199	ng/g	0.33	0.15	0.36	< 0.10	0.38	0.24	< 0.10	0.24	0.96
Congener#202	ng/g	< 0.10	< 0.10	0.11	< 0.10	0.14	< 0.10	< 0.10	< 0.10	0.26
Congener#203	ng/g	0.18	0.10	0.23	< 0.10	0.25	0.11	< 0.10	0.16	0.75
Congener#206	ng/g	< 0.10	< 0.10	0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	0.18
Congener#209	ng/g	< 0.10	0.21	0.11	< 0.10	< 0.10	< 0.10	0.25	< 0.10	0.10
Total	ng/g	21.0	27.9	37.2	10.9	31.3	19.4	39.0	24.5	60.3
Mercury	ug/g	0.20	0.20	0.12	0.12	0.39	0.21	0.12	0.12	0.37

Table I-1 (continued). PCB and Mercury Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	ML45	ML46	ML47	ML48	ML49	ML50	ML51	ML52	ML53
	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye
Collection Date	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	54.0	49.5	53.5	47.5	50.5	45.0	54.3	41.5	41.5
Avg. Weight (g)	1595.3	1757.7	1162.3	1105.6	1672.6	1020.6	2409.7	1474.2	2721.6
% Lipid	1.14	2.47	1.99	1.53	2.43	1.24	4.33	2.88	3.62
Congener#6	ng/g < 2.0	2.54	< 2.0	< 2.0	< 2.0	< 2.0	3.40	< 2.0	4.26
Congener#8	ng/g < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.65	< 2.0	3.63
Congener#9	ng/g < 2.0	1.70	< 2.0	< 2.0	< 2.0	< 2.0	2.17	< 2.0	3.32
Congener#16	ng/g < 2.0	3.43	< 2.0	< 2.0	< 2.0	< 2.0	6.38	3.14	8.09
Congener#17	ng/g < 2.0	4.43	< 2.0	< 2.0	2.54	< 2.0	7.88	4.08	13.92
Congener#18	ng/g < 2.0	3.64	< 2.0	< 2.0	2.36	< 2.0	8.03	4.42	11.64
Congener#20/#33	ng/g < 2.0	5.64	< 2.0	2.56	3.39	< 2.0	7.72	4.60	10.04
Congener#22	ng/g < 2.0	1.04	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.28
Congener#25	ng/g < 2.0	0.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g < 2.0	1.56	< 2.0	< 2.0	3.20	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g < 2.0	1.82	< 2.0	< 2.0	< 2.0	< 2.0	2.00	< 2.0	3.98
Congener#31	ng/g < 2.0	0.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.53
Congener#32	ng/g < 2.0	0.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.12
Congener#37/#64	ng/g 0.39	2.19	< 2.0	1.47	1.41	< 2.0	3.44	3.23	6.08
Congener#40	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	2.39	1.46	3.94
Congener#41	ng/g < 0.50	2.09	< 0.50	0.86	1.13	< 0.50	4.50	2.57	5.95
Congener#42	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.02	3.71
Congener#44	ng/g < 0.50	2.79	1.59	1.23	1.86	< 0.50	4.25	2.91	8.41
Congener#45	ng/g < 0.50	< 0.50	< 0.50	0.66	< 0.50	< 0.50	3.96	1.46	3.83
Congener#46	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g 0.73	6.20	1.83	1.67	2.56	1.07	8.95	6.23	15.77
Congener#56/#84	ng/g < 0.50	3.24	0.65	1.24	1.99	0.76	5.25	3.24	6.97
Congener#60	ng/g < 0.50	0.61	< 0.50	0.51	0.53	< 0.50	1.85	0.94	2.25
Congener#63	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.92
Congener#66/#91	ng/g < 0.50	3.48	1.85	2.20	2.56	0.90	8.53	4.71	11.72
Congener#70	ng/g 0.68	3.41	2.18	2.47	2.50	1.16	8.56	5.55	12.66
Congener#71	ng/g < 0.50	2.66	< 0.50	< 0.50	< 0.50	< 0.50	2.78	1.76	4.58
Congener#74	ng/g < 0.50	1.67	0.69	1.06	1.19	< 0.50	3.70	2.62	5.42
Congener#77	ng/g < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.65	< 0.50	0.57
Congener#82	ng/g < 0.50	0.97	0.50	0.85	0.85	< 0.50	3.33	1.98	3.91
Congener#85	ng/g < 0.50	1.86	1.44	1.96	1.87	0.68	6.74	4.07	9.43
Congener#87	ng/g < 0.50	2.19	1.32	1.95	1.92	0.67	5.90	4.11	8.72
Congener#92	ng/g < 0.50	1.83	1.35	1.67	1.70	0.66	5.59	3.74	8.52
Congener#95	ng/g 0.93	4.38	3.10	2.73	3.25	1.64	7.98	5.82	14.23
Congener#97	ng/g < 0.50	2.47	1.45	2.33	2.31	0.84	6.86	5.07	11.01
Congener#99	ng/g 0.74	4.35	2.61	4.04	4.08	1.34	13.69	8.20	19.46
Congener#101	ng/g 1.76	8.08	5.60	7.41	7.37	3.00	23.58	15.58	34.06
Congener#105	ng/g 0.63	3.04	2.59	2.95	2.66	1.37	10.48	6.05	14.11
Congener#109/#123	ng/g < 0.50	1.06	0.85	0.97	0.89	< 0.50	3.44	1.98	4.68
Congener#110	ng/g 1.17	7.19	4.16	6.09	5.81	2.17	17.11	13.05	26.85
Congener#118	ng/g 1.40	7.28	5.70	6.74	6.34	2.95	23.19	13.87	27.78
Congener#128	ng/g 0.57	2.65	2.26	2.73	2.36	1.22	9.82	5.61	12.54
Congener#132/#153	ng/g 2.09	11.81	8.68	11.15	10.30	4.61	43.51	23.18	51.31
Congener#135	ng/g 0.21	1.06	0.83	0.99	0.86	0.47	3.74	2.19	4.58
Congener#137	ng/g < 0.20	0.61	0.48	0.60	0.56	0.25	2.25	1.24	2.83
Congener#138	ng/g 1.70	9.27	6.79	8.91	7.82	3.55	31.58	18.34	40.06
Congener#141	ng/g 0.31	1.48	1.17	1.44	1.30	0.66	5.18	3.06	6.48
Congener#144	ng/g < 0.20	0.30	0.20	0.25	0.26	< 0.20	0.92	0.58	1.21
Congener#146	ng/g 0.40	2.39	1.73	2.21	2.01	0.94	8.89	4.82	10.99
Congener#149	ng/g 1.31	6.34	4.78	5.72	5.44	2.54	19.96	12.49	27.17
Congener#151	ng/g 0.31	1.51	1.10	1.45	1.31	0.57	4.86	3.05	6.41
Congener#156	ng/g < 0.20	0.81	0.65	0.73	0.69	0.34	2.83	1.54	3.58
Congener#158	ng/g < 0.20	0.85	0.68	0.82	0.76	0.37	2.79	1.66	3.82
Congener#163	ng/g 0.44	2.82	1.85	2.89	2.47	1.18	10.03	5.91	11.46
Congener#164	ng/g < 0.20	0.60	0.47	0.52	0.47	0.28	1.95	1.16	2.48
Congener#167	ng/g < 0.20	0.46	0.37	0.43	0.39	0.21	1.76	0.89	2.13
Congener#170	ng/g 0.40	1.95	1.62	1.85	1.50	0.91	8.13	3.89	9.27
Congener#171	ng/g 0.13	0.59	0.53	0.59	0.53	0.29	2.64	1.26	2.87
Congener#172	ng/g 0.10	0.53	0.45	0.50	0.42	0.27	2.53	1.09	2.63
Congener#174	ng/g 0.25	1.33	0.95	1.20	1.08	0.57	5.17	2.75	5.97
Congener#176	ng/g < 0.10	0.17	0.11	0.14	0.13	< 0.10	0.60	0.32	0.76
Congener#177	ng/g 0.20	1.11	0.86	1.04	0.90	0.47	4.72	2.22	5.36
Congener#178	ng/g 0.14	0.73	0.60	0.68	0.59	0.33	3.21	1.45	3.55
Congener#179	ng/g 0.15	0.59	0.42	0.53	0.47	0.22	2.45	1.20	2.80
Congener#180	ng/g 0.82	4.32	3.33	4.09	3.61	1.88	18.96	8.66	20.66
Congener#183	ng/g 0.29	1.39	1.17	1.32	1.23	0.67	5.83	2.79	6.43
Congener#185	ng/g < 0.10	0.16	0.13	0.15	0.13	0.07	0.60	0.33	0.71
Congener#187	ng/g 0.59	3.37	2.54	3.22	2.87	1.43	14.76	6.76	16.28
Congener#189	ng/g < 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.36	0.14	0.35
Congener#190	ng/g < 0.10	0.38	0.32	0.36	0.30	0.17	1.63	0.77	1.86
Congener#193	ng/g < 0.10	0.28	0.26	0.27	0.25	0.16	1.31	0.55	1.39
Congener#194	ng/g 0.14	0.67	0.53	0.62	0.51	0.31	3.44	1.27	3.37
Congener#195	ng/g < 0.10	0.29	0.21	0.25	0.19	0.12	1.30	0.49	1.30
Congener#196	ng/g < 0.10	0.44	0.42	0.47	0.41	0.26	2.42	0.97	2.23
Congener#199	ng/g 0.21	1.04	0.82	0.99	0.85	0.50	5.42	2.07	5.28
Congener#202	ng/g < 0.10	0.39	0.29	0.38	0.32	0.17	2.13	0.79	2.10
Congener#203	ng/g 0.13	0.64	0.49	0.59	0.53	0.29	3.24	1.22	3.09
Congener#206	ng/g < 0.10	0.33	0.23	0.27	0.24	0.14	1.58	0.55	1.47
Congener#209	ng/g 0.53	0.15	0.13	0.14	0.16	< 0.10	0.67	0.23	0.57
Total	ng/g 20.0	162.7	87.9	116.1	120.5	45.6	470.1	265.0	632.7
Mercury	ug/g 0.099	0.22	0.20	0.35	0.17	0.11	0.39	0.36	0.53

Table I-1 (continued). PCB and Mercury Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

		ML54	ML55	ML56	ML57	ML58	ML59	ML60	ML61	ML62
		Walleye	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date		6/23/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06
Number of Fish		1	1	1	1	1	1	1	1	1
Avg. Length (cm)		38.9	30.8	34.5	32.0	21.0	21.5	25.2	23.8	22.0
Avg. Weight (g)		1595.3	728.2	911.2	768.8	296.4	252.7	347.9	335.7	284.7
% Lipid		1.20	0.93	0.95	1.54	1.19	0.52	1.13	1.19	1.31
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#40	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#41	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	0.62	< 0.50	< 0.50	< 0.50	1.11	< 0.50	< 0.50	< 0.50	< 0.50
Congener#56/#84	ng/g	< 0.50	< 0.50	< 0.50	0.65	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	0.81	< 0.50	0.89	0.85	0.51	< 0.50	< 0.50	< 0.50	< 0.50
Congener#70	ng/g	0.79	< 0.50	0.69	0.87	0.58	< 0.50	< 0.50	< 0.50	< 0.50
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	0.54	< 0.50	0.72	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	0.54	< 0.50	1.02	0.89	0.56	< 0.50	< 0.50	< 0.50	< 0.50
Congener#87	ng/g	0.61	0.53	1.10	1.05	1.03	< 0.50	0.65	< 0.50	< 0.50
Congener#92	ng/g	0.61	< 0.50	1.05	0.82	0.54	< 0.50	< 0.50	< 0.50	< 0.50
Congener#95	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	0.66	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#99	ng/g	1.00	0.94	2.44	2.19	1.38	0.74	1.00	0.89	0.88
Congener#101	ng/g	2.45	1.46	5.20	4.51	3.29	1.36	2.05	2.03	1.77
Congener#105	ng/g	1.08	0.50	1.72	1.52	1.03	< 0.50	0.61	0.60	0.53
Congener#109/#121	ng/g	< 0.50	< 0.50	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#110	ng/g	1.86	1.30	3.40	3.38	2.62	0.90	1.59	1.58	1.19
Congener#118	ng/g	2.44	1.29	4.62	3.79	2.77	0.98	1.86	1.61	1.45
Congener#128	ng/g	0.96	0.46	1.70	1.31	0.79	0.32	0.60	0.56	0.48
Congener#132/#151	ng/g	3.68	2.08	7.82	6.03	2.68	1.38	2.61	2.60	2.02
Congener#135	ng/g	0.33	0.21	0.40	0.31	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#137	ng/g	< 0.20	0.10	0.47	0.32	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#138	ng/g	2.83	1.56	5.93	4.53	2.52	1.03	2.05	1.94	1.58
Congener#141	ng/g	0.57	0.26	1.02	0.74	0.38	0.20	0.27	0.33	0.28
Congener#144	ng/g	< 0.20	< 0.20	0.20	0.16	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#146	ng/g	0.73	0.41	1.57	1.17	0.48	0.27	0.51	0.50	0.40
Congener#149	ng/g	2.14	1.15	3.90	2.95	1.66	0.85	1.30	1.36	1.06
Congener#151	ng/g	0.54	0.30	1.00	0.81	0.41	0.21	0.35	0.33	0.29
Congener#156	ng/g	0.30	< 0.20	0.58	0.44	0.29	< 0.20	< 0.20	< 0.20	< 0.20
Congener#158	ng/g	0.30	< 0.20	0.70	0.54	0.33	< 0.20	0.26	0.21	< 0.20
Congener#163	ng/g	0.83	0.51	1.74	1.46	0.68	0.34	0.56	0.60	0.47
Congener#164	ng/g	0.22	< 0.20	0.34	0.29	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#167	ng/g	< 0.20	< 0.20	0.29	0.20	< 0.20	< 0.20	< 0.21	< 0.22	< 0.23
Congener#170	ng/g	0.72	0.32	1.32	0.92	0.38	0.20	0.34	0.35	0.27
Congener#171	ng/g	0.23	0.10	0.42	0.30	0.12	< 0.10	0.10	0.11	< 0.10
Congener#172	ng/g	0.20	< 0.10	0.33	0.23	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#174	ng/g	0.41	0.17	0.57	0.43	0.17	< 0.10	0.20	0.17	0.13
Congener#176	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#177	ng/g	0.38	0.18	0.63	0.46	0.18	< 0.10	0.19	0.16	0.14
Congener#178	ng/g	0.27	0.10	0.40	0.29	0.10	< 0.10	0.10	0.10	< 0.10
Congener#179	ng/g	0.22	0.10	0.31	0.20	< 0.10	< 0.10	0.12	< 0.10	< 0.10
Congener#180	ng/g	1.54	0.73	3.00	2.00	0.70	0.40	0.71	0.79	0.61
Congener#183	ng/g	0.55	0.24	0.95	0.70	0.25	0.16	0.25	0.29	0.21
Congener#185	ng/g	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#187	ng/g	1.14	0.62	2.27	1.74	0.56	0.35	0.66	0.68	0.51
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	0.14	< 0.10	0.26	0.18	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#193	ng/g	0.12	< 0.10	0.18	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#194	ng/g	0.26	0.12	0.45	0.32	< 0.10	< 0.10	0.11	0.13	< 0.10
Congener#195	ng/g	0.10	< 0.10	0.19	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#196	ng/g	0.21	< 0.10	0.32	0.21	< 0.10	< 0.10	< 0.10	0.10	< 0.10
Congener#199	ng/g	0.43	0.21	0.76	0.53	0.16	0.19	0.19	0.18	0.14
Congener#202	ng/g	0.15	< 0.10	0.27	0.21	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#203	ng/g	0.25	0.13	0.50	0.36	0.11	< 0.10	< 0.10	0.12	< 0.10
Congener#206	ng/g	0.15	< 0.10	0.27	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#209	ng/g	0.12	< 0.10	0.16	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total	ng/g	35.0	16.1	64.7	51.4	28.6	11.2	19.2	18.3	14.4
Mercury	ug/g	0.14	0.18	0.31	0.13	0.094	0.069	0.18	0.065	0.065

Table I-1 (continued). PCB and Mercury Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	ML162	ML63	ML64	ML42	ML43	ML44	ML65	ML165	ML66
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp
Collection Date	7/18/06	7/18/06	7/18/06	8/3/06	8/3/06	8/3/06	8/3/06	8/5/06	8/3/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	23.0	24.0	25.0	28.5	33.0	48.0	26.0	26.0	39.4
Avg. Weight (g)	281.0	287.5	216.8	722.50	443.20	3042.30	498.00	498.00	1495.20
% Lipid	1.31	0.57	0.51	0.72	1.67	8.19	0.64	0.64	2.39
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	3.05	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	4.61	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	3.33	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	4.59	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	10.81	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	9.79	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	23.39	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	3.21	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	2.16	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	3.71	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	4.31	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	3.91	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	< 0.20	0.20	< 0.20	3.35	3.57	10.61	3.54	4.17
Congener#40	ng/g	< 0.50	< 0.50	< 0.50	0.86	0.94	8.78	1.59	< 0.50
Congener#41	ng/g	< 0.50	0.70	< 0.50	< 0.50	11.97	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	0.33	< 0.50	< 0.50	7.85	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	0.28	< 0.50	6.59	7.15	12.93	3.15	< 0.50
Congener#45	ng/g	< 0.50	0.00	< 0.50	< 0.50	6.02	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	0.57	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	< 0.50	0.56	< 0.50	18.68	19.66	28.71	6.57	< 0.50
Congener#56/#84	ng/g	< 0.50	0.50	0.92	4.22	4.51	10.94	3.43	2.77
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	0.93	< 0.50	6.40	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	3.33	< 0.50	0.54	< 0.50
Congener#66/#91	ng/g	< 0.50	< 0.50	< 0.50	4.53	4.76	32.14	5.11	6.01
Congener#70	ng/g	< 0.50	< 0.50	< 0.50	14.90	15.65	12.26	5.84	8.43
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	3.95	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	< 0.50	< 0.50	< 0.50	3.24	3.42	17.07	2.75	3.92
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	0.44	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50	< 0.50	3.73	4.08	7.84	2.12	1.20
Congener#85	ng/g	< 0.50	< 0.50	< 0.50	6.42	6.93	23.07	4.34	2.34
Congener#87	ng/g	< 0.50	< 0.50	< 0.50	13.96	15.33	23.86	4.44	3.18
Congener#92	ng/g	< 0.50	< 0.50	< 0.50	7.38	7.85	19.70	4.07	2.38
Congener#95	ng/g	< 0.50	< 0.50	< 0.50	27.26	29.21	29.94	6.40	5.08
Congener#97	ng/g	< 0.50	< 0.50	< 0.50	11.81	12.82	29.56	5.46	3.23
Congener#99	ng/g	0.73	< 0.50	< 0.50	14.09	14.81	53.32	8.96	5.01
Congener#101	ng/g	1.65	0.76	0.81	44.68	48.61	104.63	17.10	12.29
Congener#105	ng/g	0.53	< 0.50	< 0.50	16.62	17.46	23.35	6.47	4.38
Congener#109/#123	ng/g	0.16	< 0.50	< 0.50	3.29	3.48	11.49	2.15	1.22
Congener#110	ng/g	1.33	0.54	0.61	32.92	34.85	60.30	13.96	8.39
Congener#118	ng/g	1.44	0.76	0.77	40.66	43.47	93.60	14.84	11.52
Congener#128	ng/g	0.45	0.27	0.27	8.76	9.37	27.60	6.07	3.69
Congener#132/#153	ng/g	1.95	1.09	1.07	27.04	29.36	112.99	24.90	14.65
Congener#135	ng/g	< 0.20	< 0.20	< 0.20	2.99	3.23	9.87	2.34	0.94
Congener#137	ng/g	< 0.20	< 0.20	< 0.20	2.29	2.50	7.03	1.36	0.87
Congener#138	ng/g	1.56	0.85	0.82	27.27	29.77	82.60	19.90	11.49
Congener#141	ng/g	0.29	< 0.20	< 0.20	4.96	5.34	20.10	3.35	2.11
Congener#144	ng/g	< 0.20	< 0.20	< 0.20	1.16	1.23	3.59	0.61	0.48
Congener#146	ng/g	0.37	0.22	0.21	4.56	4.98	23.27	5.15	2.63
Congener#149	ng/g	1.08	0.68	0.55	22.31	24.22	62.92	13.22	7.42
Congener#151	ng/g	0.30	< 0.20	< 0.20	4.22	4.62	15.59	3.32	1.97
Congener#156	ng/g	< 0.20	< 0.20	< 0.20	4.01	4.26	10.00	1.65	1.32
Congener#158	ng/g	0.20	< 0.20	< 0.20	4.43	4.79	10.04	1.75	1.58
Congener#163	ng/g	0.45	0.26	0.25	7.00	7.35	27.49	6.48	3.51
Congener#164	ng/g	< 0.20	< 0.20	< 0.20	2.31	2.44	6.06	1.27	0.73
Congener#167	ng/g	< 0.24	< 0.25	< 0.26	1.63	1.74	5.46	0.97	0.65
Congener#170	ng/g	0.26	0.18	0.17	3.04	3.21	26.52	4.23	2.42
Congener#171	ng/g	< 0.10	< 0.10	< 0.10	1.02	1.11	7.66	1.38	0.74
Congener#172	ng/g	< 0.10	< 0.10	< 0.10	0.58	0.64	6.99	1.17	0.62
Congener#174	ng/g	0.14	< 0.10	< 0.10	1.60	1.73	15.86	2.97	1.44
Congener#176	ng/g	< 0.10	< 0.10	< 0.10	0.24	0.26	2.16	0.35	0.23
Congener#177	ng/g	0.17	< 0.10	< 0.10	1.20	1.27	12.80	2.36	1.22
Congener#178	ng/g	< 0.10	< 0.10	< 0.10	0.61	0.65	6.98	1.55	0.66
Congener#179	ng/g	< 0.10	< 0.10	< 0.10	0.60	0.64	5.52	1.27	0.52
Congener#180	ng/g	0.60	0.35	0.36	5.04	5.48	55.51	9.40	5.02
Congener#183	ng/g	0.26	0.14	0.13	1.88	2.02	17.33	3.02	2.10
Congener#185	ng/g	< 0.10	< 0.10	< 0.10	0.23	< 0.10	2.39	< 0.10	< 0.10
Congener#187	ng/g	0.51	0.31	0.29	3.38	3.56	35.95	7.15	3.68
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	0.12	< 0.10	1.16	< 0.10	< 0.10
Congener#190	ng/g	< 0.10	< 0.10	< 0.10	0.58	0.62	5.12	0.81	0.59
Congener#193	ng/g	< 0.10	< 0.10	< 0.10	0.31	0.34	3.50	0.60	0.44
Congener#194	ng/g	< 0.10	< 0.10	< 0.10	0.52	0.56	9.61	1.34	0.90
Congener#195	ng/g	< 0.10	< 0.10	< 0.10	0.21	0.23	3.89	0.53	0.34
Congener#196	ng/g	< 0.10	< 0.10	< 0.10	0.39	0.42	6.96	1.02	0.67
Congener#199	ng/g	0.15	< 0.10	< 0.10	0.81	0.88	12.33	2.22	1.35
Congener#202	ng/g	< 0.10	< 0.10	< 0.10	0.24	0.26	3.37	0.86	0.44
Congener#203	ng/g	0.11	< 0.10	< 0.10	0.57	0.62	8.11	1.32	0.98
Congener#206	ng/g	< 0.10	< 0.10	< 0.10	0.26	0.28	3.96	0.59	0.52
Congener#209	ng/g	< 0.10	< 0.10	< 0.10	0.14	0.15	2.64	0.25	0.35
Total	ng/g	14.7	9.6	7.2	441.6	458.7	1411.9	259.0	173.2
Mercury	ug/g	0.065	0.1	0.087	0.052	0.061	0.32	0.14	0.15

Table I-1 (continued). PCB and Mercury Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

		ML67 Common Carp 8/3/06	ML68 Common Carp 8/3/06	ML69 Common Carp 8/3/06
Collection Date		1	1	1
Number of Fish		48.9	50.5	67.0
Avg. Length (cm)		3195.40	3182.10	9090.10
Avg. Weight (g)		2.82	5.84	7.94
% Lipid		< 2.0	< 2.0	< 2.0
Congener#6	ng/g	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	4.03	< 2.0	< 2.0
Congener#17	ng/g	5.48	< 2.0	2.02
Congener#18	ng/g	6.49	< 2.0	< 2.0
Congener#20/#33	ng/g	10.89	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	3.47	6.58	0.78
Congener#40	ng/g	1.79	4.18	< 0.50
Congener#41	ng/g	4.70	< 0.50	< 0.50
Congener#42	ng/g	1.99	< 0.50	< 0.50
Congener#44	ng/g	5.72	9.19	0.62
Congener#45	ng/g	2.30	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	10.59	16.62	2.11
Congener#56/#84	ng/g	4.95	7.39	0.95
Congener#60	ng/g	0.64	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	4.52	12.83	1.54
Congener#70	ng/g	4.32	13.66	1.58
Congener#71	ng/g	2.23	< 0.50	< 0.50
Congener#74	ng/g	2.57	5.77	0.90
Congener#77	ng/g	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	2.42	4.24	< 0.50
Congener#85	ng/g	4.34	9.93	1.50
Congener#87	ng/g	6.75	9.28	1.35
Congener#92	ng/g	5.47	9.11	1.37
Congener#95	ng/g	12.10	15.05	3.07
Congener#97	ng/g	8.09	12.06	1.57
Congener#99	ng/g	12.46	20.90	3.59
Congener#101	ng/g	27.15	37.36	7.47
Congener#105	ng/g	4.49	15.36	2.86
Congener#109/#123	ng/g	1.99	4.97	1.00
Congener#110	ng/g	14.64	28.72	3.90
Congener#118	ng/g	17.78	30.47	8.42
Congener#128	ng/g	5.83	13.21	2.60
Congener#132/#153	ng/g	24.30	53.89	13.68
Congener#135	ng/g	1.96	4.81	0.72
Congener#137	ng/g	1.66	3.07	0.67
Congener#138	ng/g	20.65	42.82	9.05
Congener#141	ng/g	3.47	6.88	1.63
Congener#144	ng/g	0.96	1.31	0.27
Congener#146	ng/g	4.63	11.80	2.38
Congener#149	ng/g	13.06	29.50	5.41
Congener#151	ng/g	3.74	6.93	1.41
Congener#156	ng/g	2.08	3.80	1.02
Congener#158	ng/g	2.44	4.08	1.05
Congener#163	ng/g	5.26	12.32	2.73
Congener#164	ng/g	1.04	2.66	0.55
Congener#167	ng/g	1.17	2.29	0.63
Congener#170	ng/g	3.71	10.13	2.36
Congener#171	ng/g	1.13	3.11	0.67
Congener#172	ng/g	0.78	2.83	0.65
Congener#174	ng/g	1.79	6.39	1.13
Congener#176	ng/g	0.36	0.80	0.16
Congener#177	ng/g	1.74	5.66	0.98
Congener#178	ng/g	0.80	3.76	0.71
Congener#179	ng/g	0.89	3.03	0.43
Congener#180	ng/g	7.23	22.08	5.64
Congener#183	ng/g	2.42	6.98	1.79
Congener#185	ng/g	0.34	< 0.10	0.22
Congener#187	ng/g	4.59	17.69	4.23
Congener#189	ng/g	0.14	< 0.10	0.10
Congener#190	ng/g	0.66	1.99	0.48
Congener#193	ng/g	0.39	1.49	0.43
Congener#194	ng/g	1.08	3.65	1.01
Congener#195	ng/g	0.42	1.40	0.35
Congener#196	ng/g	0.69	2.41	0.63
Congener#199	ng/g	1.48	5.62	1.40
Congener#202	ng/g	0.43	2.25	0.37
Congener#203	ng/g	0.93	3.26	0.99
Congener#206	ng/g	0.58	1.56	0.59
Congener#209	ng/g	0.32	0.61	0.47
Total	ng/g	319.5	579.8	116.2
Mercury	ug/g	0.091	0.1	0.31

Table I- 2. PCB and Mercury Results for Pentwater Lake (2006). (Largemouth bass are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	PL27	PL28	PL29	PL30	PL31	PL32	PL49	PL50	PL51
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bas	Largemouth Bass	Largemouth Bass
Collection Date	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	30.5	36.7	34.0	28.0	26.5	28.0	21.6	23.2	31.3
Avg. Weight (g)	810.40	1348.60	998.50	525.80	517.30	202.30	239.30	288.70	942.20
% Lipid	1.01	1.13	0.67	0.72	1.48	1.19	1.35	0.63	0.56
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	0.41	0.86	< 0.20	0.47	< 0.20	< 0.20	< 0.20	< 0.20
Congener#40	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#41	ng/g	< 0.50	0.72	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#56/#84	ng/g	0.53	1.07	< 0.50	0.56	< 0.50	< 0.50	< 0.50	< 0.50
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	0.57	1.49	0.63	0.79	< 0.50	< 0.50	< 0.50	< 0.50
Congener#70	ng/g	0.64	1.58	< 0.50	0.94	< 0.50	< 0.50	< 0.50	< 0.50
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	< 0.50	0.63	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	< 0.50	1.24	0.57	0.53	< 0.50	< 0.50	< 0.50	< 0.50
Congener#87	ng/g	< 0.50	0.92	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#92	ng/g	< 0.50	1.02	< 0.50	0.55	< 0.50	< 0.50	< 0.50	< 0.50
Congener#95	ng/g	0.61	1.45	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	< 0.50	1.15	0.60	0.67	< 0.50	< 0.50	< 0.50	< 0.50
Congener#99	ng/g	0.85	2.44	0.98	1.28	< 0.50	0.66	0.60	< 0.50
Congener#101	ng/g	1.48	4.42	1.57	2.04	1.04	0.71	1.15	0.63
Congener#105	ng/g	< 0.50	2.29	0.91	0.82	< 0.50	< 0.50	< 0.50	< 0.50
Congener#109/#123	ng/g	< 0.50	0.80	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#110	ng/g	1.10	3.32	1.28	1.32	0.69	< 0.50	0.73	0.56
Congener#118	ng/g	1.73	5.02	2.02	2.42	1.01	0.70	1.26	0.68
Congener#128	ng/g	0.64	2.15	0.92	0.81	0.33	0.21	0.45	0.26
Congener#132/#153	ng/g	2.55	9.09	3.49	3.40	1.45	1.00	1.95	0.98
Congener#135	ng/g	0.20	0.72	0.23	0.28	< 0.20	< 0.20	< 0.20	< 0.20
Congener#137	ng/g	< 0.20	0.42	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#138	ng/g	1.82	6.13	2.47	2.31	0.98	0.67	1.33	0.71
Congener#141	ng/g	0.31	1.07	0.41	0.34	< 0.20	0.24	0.26	0.20
Congener#144	ng/g	< 0.20	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#146	ng/g	0.57	1.92	0.71	0.79	0.32	0.38	0.39	0.21
Congener#149	ng/g	1.13	3.92	1.57	1.37	0.57	0.40	0.72	0.53
Congener#151	ng/g	0.29	1.00	0.39	0.38	< 0.20	0.24	0.21	< 0.20
Congener#156	ng/g	< 0.20	0.63	0.25	0.21	< 0.20	< 0.20	< 0.20	< 0.20
Congener#158	ng/g	< 0.20	0.59	0.26	0.21	< 0.20	< 0.20	< 0.20	< 0.20
Congener#163	ng/g	0.52	2.13	0.71	0.69	0.29	0.21	0.49	0.26
Congener#164	ng/g	< 0.20	0.44	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#167	ng/g	< 0.20	0.37	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#170	ng/g	0.43	1.76	0.68	0.55	0.27	0.16	0.38	0.27
Congener#171	ng/g	0.14	0.55	0.22	0.17	< 0.10	< 0.10	0.12	0.13
Congener#172	ng/g	0.13	0.55	0.20	0.15	< 0.10	< 0.10	0.10	0.13
Congener#174	ng/g	0.25	0.98	0.33	0.27	0.11	< 0.10	0.14	0.11
Congener#176	ng/g	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#177	ng/g	0.23	0.91	0.32	0.27	0.12	< 0.10	0.13	0.10
Congener#178	ng/g	0.17	0.67	0.23	0.21	< 0.10	< 0.10	0.12	0.13
Congener#179	ng/g	< 0.10	0.36	0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10
Congener#180	ng/g	0.89	3.87	1.44	1.16	0.53	0.33	0.68	0.42
Congener#183	ng/g	0.31	1.27	0.47	0.39	0.18	0.11	0.24	0.20
Congener#185	ng/g	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#187	ng/g	0.77	3.09	1.14	1.01	0.44	0.29	0.58	0.32
Congener#189	ng/g	< 0.10	0.09	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	< 0.10	0.36	0.14	0.11	< 0.10	< 0.10	< 0.10	< 0.10
Congener#193	ng/g	< 0.10	0.28	0.13	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#194	ng/g	0.14	0.73	0.23	0.19	< 0.10	< 0.10	0.12	< 0.10
Congener#195	ng/g	< 0.10	0.25	0.10	0.08	< 0.10	< 0.10	< 0.10	< 0.10
Congener#196	ng/g	0.11	0.49	0.18	0.13	< 0.10	< 0.10	< 0.10	0.12
Congener#199	ng/g	0.23	1.08	0.36	0.30	0.14	< 0.10	0.16	0.11
Congener#202	ng/g	< 0.10	0.37	0.12	0.11	< 0.10	< 0.10	< 0.10	< 0.10
Congener#203	ng/g	0.15	0.62	0.20	0.17	< 0.10	< 0.10	0.13	< 0.10
Congener#206	ng/g	< 0.10	0.33	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#209	ng/g	< 0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10
Total	ng/g	19.9	80.2	26.7	28.7	9.0	12.0	12.9	7.1
Mercury	ug/g	0.24	0.45	0.33	0.33	0.11	0.098	0.12	0.31

Table I-2 (continued). PCB and Mercury Results for Pentwater Lake (2006). (Largemouth bass are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	PL52	PL23	PL24	PL26	PL36	PL37	PL38	PL39	PL40
	Largemouth Bass	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp
Collection Date	8/22/06	8/22/06	8/22/06	8/22/06	8/23/06	8/23/06	8/23/06	8/20/06	8/20/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	31.5	66.5	63.0	55.0	54.5	58.0	52.0	52.2	54.0
Avg. Weight (g)	904.80	6173.10	5179.80	5100.80	4281.00	6042.30	3929.10	3582.40	4135.60
% Lipid	0.96	8.75	3.82	8.48	4.36	15.04	6.83	3.50	4.57
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	3.26	< 2.0	2.49	< 2.0	1.98	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	2.30	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	6.94	< 2.0	< 2.0	1.06	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	5.73	< 2.0	< 2.0	1.11	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	7.38	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.64
Congener#22	ng/g	< 2.0	2.13	< 2.0	< 2.0	1.50	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	3.44	< 2.0	< 2.0	1.85	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	2.82	< 2.0	< 2.0	3.70	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	3.44	< 2.0	< 2.0	2.04	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	< 0.20	3.51	0.72	2.70	1.30	25.60	0.77	2.96
Congener#40	ng/g	< 0.50	2.87	< 0.50	1.50	< 0.50	21.94	< 0.50	3.67
Congener#41	ng/g	< 0.50	2.99	< 0.50	< 0.50	0.66	< 0.50	< 0.50	0.69
Congener#42	ng/g	< 0.50	3.08	< 0.50	1.67	1.02	13.03	< 0.50	2.51
Congener#44	ng/g	< 0.50	4.50	< 0.50	3.35	1.88	28.05	0.85	3.65
Congener#45	ng/g	< 0.50	2.53	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.82
Congener#46	ng/g	< 0.50	2.40	< 0.50	< 0.50	1.00	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	0.66	9.66	1.06	5.05	3.02	41.51	< 0.50	5.66
Congener#56/#84	ng/g	< 0.50	4.21	0.58	2.63	1.75	11.59	0.57	3.06
Congener#60	ng/g	< 0.50	1.57	< 0.50	1.40	0.93	22.92	< 0.50	1.45
Congener#63	ng/g	< 0.50	1.56	< 0.50	0.57	0.78	5.84	< 0.50	0.54
Congener#66/#91	ng/g	0.67	9.92	1.50	7.34	4.76	105.38	1.33	7.01
Congener#70	ng/g	0.74	8.89	1.55	6.10	3.68	17.82	1.15	6.58
Congener#71	ng/g	< 0.50	1.59	< 0.50	0.76	< 0.50	4.73	< 0.50	1.23
Congener#74	ng/g	< 0.50	5.73	0.90	4.05	2.63	< 0.50	< 0.50	3.65
Congener#77	ng/g	< 0.50	0.88	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	2.76	< 0.50	1.68	0.92	14.54	< 0.50	1.64
Congener#85	ng/g	< 0.50	10.03	0.98	5.06	3.01	23.34	0.70	2.91
Congener#87	ng/g	< 0.50	10.79	1.34	5.96	2.94	54.27	0.66	4.27
Congener#92	ng/g	< 0.50	10.10	1.12	4.90	3.04	28.17	0.72	3.54
Congener#95	ng/g	< 0.50	12.76	2.11	7.91	3.85	40.87	< 0.50	6.52
Congener#97	ng/g	< 0.50	12.02	1.14	6.19	3.73	< 0.50	0.92	4.61
Congener#99	ng/g	1.02	30.11	2.74	12.61	8.59	90.83	1.79	7.94
Congener#101	ng/g	1.86	59.94	5.94	26.29	15.48	166.56	3.54	20.56
Congener#105	ng/g	0.54	18.65	1.85	6.91	3.22	2.37	1.36	3.46
Congener#109/#123	ng/g	< 0.50	6.32	0.57	3.34	1.78	20.97	< 0.50	1.59
Congener#110	ng/g	1.36	26.79	3.33	15.23	7.02	100.26	2.04	11.45
Congener#118	ng/g	2.07	57.52	5.13	26.68	13.90	174.25	2.93	13.14
Congener#128	ng/g	0.79	19.90	1.64	7.07	3.70	28.09	0.80	4.02
Congener#132/#153	ng/g	3.06	91.55	7.48	32.12	18.49	105.17	3.71	20.44
Congener#135	ng/g	0.27	4.93	0.53	2.04	1.42	8.53	0.33	1.95
Congener#137	ng/g	< 0.20	5.51	0.38	1.76	0.96	6.58	< 0.20	0.79
Congener#138	ng/g	2.17	63.38	4.99	23.33	12.10	87.52	2.53	12.83
Congener#141	ng/g	0.42	13.20	1.07	4.11	2.47	18.96	0.53	4.06
Congener#144	ng/g	< 0.20	2.42	0.20	0.87	0.45	4.08	< 0.20	0.90
Congener#146	ng/g	0.65	17.89	1.34	6.70	3.91	22.04	0.76	4.17
Congener#149	ng/g	1.36	36.34	3.49	14.48	9.13	58.15	2.05	15.69
Congener#151	ng/g	0.39	9.63	1.03	4.31	2.19	17.93	0.57	5.40
Congener#156	ng/g	0.22	8.07	0.54	2.82	1.24	10.50	0.26	1.39
Congener#158	ng/g	0.23	9.16	0.59	3.05	1.42	10.51	0.29	1.84
Congener#163	ng/g	0.75	19.54	1.59	7.40	3.69	25.45	0.78	5.74
Congener#164	ng/g	< 0.20	3.54	0.35	1.31	0.79	4.90	0.20	1.10
Congener#167	ng/g	< 0.20	4.60	0.29	1.76	0.75	5.87	< 0.20	0.70
Congener#170	ng/g	0.59	20.40	1.47	7.02	3.24	22.94	0.64	6.00
Congener#171	ng/g	0.19	6.12	0.46	2.06	0.98	6.96	0.21	1.82
Congener#172	ng/g	0.17	5.31	0.41	1.85	0.90	6.30	0.18	1.28
Congener#174	ng/g	0.33	8.97	0.92	3.01	1.98	12.84	0.45	4.08
Congener#176	ng/g	< 0.10	1.38	0.13	0.47	0.23	2.00	0.05	0.62
Congener#177	ng/g	0.31	6.33	0.74	3.10	1.53	12.18	0.33	3.18
Congener#178	ng/g	0.22	4.57	0.45	1.72	1.07	6.47	0.22	1.60
Congener#179	ng/g	0.14	3.12	0.32	1.28	0.73	5.54	0.17	1.80
Congener#180	ng/g	1.26	45.38	3.33	15.48	7.05	48.30	1.38	11.93
Congener#183	ng/g	0.42	14.06	1.06	4.53	2.40	15.49	0.47	3.86
Congener#185	ng/g	< 0.10	1.87	0.14	0.59	0.29	2.38	< 0.10	0.73
Congener#187	ng/g	0.99	30.37	2.21	10.62	5.28	34.85	1.09	10.78
Congener#189	ng/g	< 0.10	0.80	0.07	0.34	0.12	1.02	< 0.10	0.21
Congener#190	ng/g	0.12	3.71	0.29	1.40	0.65	4.95	0.13	1.23
Congener#193	ng/g	0.11	3.03	0.22	1.08	0.51	3.26	0.10	0.82
Congener#194	ng/g	0.19	8.74	0.51	3.38	1.13	8.02	0.21	2.42
Congener#195	ng/g	< 0.10	3.31	0.23	1.30	0.49	3.59	0.11	1.11
Congener#196	ng/g	0.16	5.99	0.40	2.17	0.85	5.46	0.17	1.65
Congener#199	ng/g	0.32	11.22	0.83	4.06	1.83	11.27	0.38	2.97
Congener#202	ng/g	0.11	2.67	0.24	0.97	0.56	2.96	0.13	0.64
Congener#203	ng/g	0.21	8.05	0.46	2.78	1.11	7.04	0.23	1.91
Congener#206	ng/g	< 0.10	4.69	0.29	1.98	0.62	3.25	0.13	0.90
Congener#209	ng/g	0.10	2.66	0.28	1.80	0.54	2.83	0.20	0.77
Total	ng/g	25.2	873.5	73.5	348.5	186.7	1673.1	39.1	271.1
Mercury	ug/g	0.35	0.19	0.21	0.21	0.26	0.26	0.098	0.14

Table I- 2 (continued). PCB and Mercury Results for Pentwater Lake (2006). (Largemouth bass are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

		PL41	PL33	PL34	PL35	PL42	PL43	PL44	PL45	PL46
		Common Carp	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike
Collection Date		8/22/06	8/22/06	8/22/06	8/22/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06
Number of Fish		1	1	1	1	1	1	1	1	1
Avg. Length (cm)		61.4	47.5	45.0	42.0	45.0	76.0	48.0	22.8	21.5
Avg. Weight (g)		6020.60	1274.70	461.10	771.20	945.00	3586.90	1031.40	118.06	116.53
% Lipid		7.04	0.59	0.45	0.32	0.87	0.91	0.56	0.72	0.44
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	2.56	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	1.28	< 0.20	< 0.20	< 0.20	< 0.20	1.49	< 0.20	< 0.20	< 0.20
Congener#40	ng/g	1.52	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#41	ng/g	1.06	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.64	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	2.01	< 0.50	< 0.50	< 0.50	< 0.50	2.08	< 0.50	< 0.50	< 0.50
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.52	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	3.07	< 0.50	< 0.50	< 0.50	< 0.50	2.82	< 0.50	< 0.50	< 0.50
Congener#56/#84	ng/g	2.39	< 0.50	< 0.50	< 0.50	0.56	1.32	< 0.50	< 0.50	< 0.50
Congener#60	ng/g	1.08	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	5.51	< 0.50	< 0.50	< 0.50	0.83	1.87	0.70	< 0.50	< 0.50
Congener#70	ng/g	3.93	0.58	< 0.50	< 0.50	0.89	2.30	0.70	< 0.50	< 0.50
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	3.19	< 0.50	< 0.50	< 0.50	0.51	0.75	0.50	< 0.50	< 0.50
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	1.05	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	4.11	< 0.50	< 0.50	< 0.50	0.51	0.73	< 0.50	< 0.50	< 0.50
Congener#87	ng/g	3.86	< 0.50	< 0.50	< 0.50	< 0.50	0.65	< 0.50	< 0.50	< 0.50
Congener#92	ng/g	3.90	< 0.50	< 0.50	< 0.50	0.52	0.80	< 0.50	< 0.50	< 0.50
Congener#95	ng/g	4.69	< 0.50	< 0.50	< 0.50	1.00	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	4.73	< 0.50	< 0.50	< 0.50	0.67	1.00	< 0.50	< 0.50	< 0.50
Congener#99	ng/g	10.76	0.64	0.65	< 0.50	1.11	1.81	0.75	0.52	< 0.50
Congener#101	ng/g	20.40	1.26	1.11	< 0.50	2.00	3.58	1.34	< 0.50	< 0.50
Congener#105	ng/g	5.06	< 0.50	< 0.50	< 0.50	0.62	0.56	< 0.50	< 0.50	< 0.50
Congener#109/#125	ng/g	2.61	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#110	ng/g	9.38	0.88	0.78	< 0.50	1.44	2.50	1.08	0.42	< 0.50
Congener#118	ng/g	21.21	1.22	1.08	< 0.50	2.22	2.78	1.16	0.47	< 0.50
Congener#128	ng/g	6.19	0.36	0.35	< 0.20	0.80	0.83	0.36	< 0.20	< 0.20
Congener#132/#155	ng/g	29.89	1.72	1.40	0.63	3.21	3.17	1.36	0.80	0.28
Congener#135	ng/g	1.73	< 0.20	< 0.20	< 0.20	0.27	0.40	0.20	< 0.20	< 0.20
Congener#137	ng/g	1.71	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#138	ng/g	19.92	1.05	0.99	0.45	2.21	2.29	0.98	0.50	0.20
Congener#141	ng/g	4.25	0.21	< 0.20	< 0.20	0.42	0.55	< 0.20	< 0.20	< 0.20
Congener#144	ng/g	0.74	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#146	ng/g	5.87	0.35	0.30	< 0.20	0.68	0.63	0.28	< 0.20	< 0.20
Congener#149	ng/g	12.21	0.73	0.64	0.33	1.52	1.97	0.66	0.45	0.20
Congener#151	ng/g	3.03	0.26	< 0.20	< 0.20	0.37	0.59	0.22	< 0.20	< 0.20
Congener#156	ng/g	2.53	< 0.20	< 0.20	< 0.20	0.23	0.32	< 0.20	< 0.20	< 0.20
Congener#158	ng/g	2.79	< 0.20	< 0.20	< 0.20	0.25	0.36	< 0.20	< 0.20	< 0.20
Congener#163	ng/g	6.84	0.39	0.28	< 0.20	0.74	0.77	0.32	< 0.20	< 0.20
Congener#164	ng/g	1.24	< 0.20	< 0.20	< 0.20	< 0.20	0.20	< 0.20	< 0.20	< 0.20
Congener#167	ng/g	1.38	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#170	ng/g	5.86	0.28	0.26	0.11	0.62	0.57	0.22	0.15	< 0.10
Congener#171	ng/g	1.76	0.11	< 0.10	< 0.10	0.18	0.19	< 0.10	< 0.10	< 0.10
Congener#172	ng/g	1.57	< 0.10	< 0.10	< 0.10	0.18	0.14	< 0.10	< 0.10	< 0.10
Congener#174	ng/g	3.02	0.18	0.16	< 0.10	0.36	0.43	0.13	0.12	< 0.10
Congener#176	ng/g	0.38	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#177	ng/g	2.93	0.17	0.12	< 0.10	0.33	0.34	0.12	0.12	< 0.10
Congener#178	ng/g	1.62	0.14	< 0.10	< 0.10	0.21	0.17	< 0.10	0.05	< 0.10
Congener#179	ng/g	1.00	0.08	< 0.10	< 0.10	0.14	0.18	< 0.10	0.04	< 0.10
Congener#180	ng/g	13.21	0.62	0.51	0.23	1.29	1.14	0.46	0.29	0.10
Congener#183	ng/g	4.36	0.21	0.17	< 0.10	0.43	0.45	0.16	0.16	< 0.10
Congener#185	ng/g	0.50	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.02	< 0.10
Congener#187	ng/g	9.04	0.54	0.40	0.17	1.01	0.83	0.36	0.25	0.10
Congener#189	ng/g	0.23	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	1.21	< 0.10	< 0.10	< 0.10	0.12	0.11	< 0.10	< 0.10	< 0.10
Congener#193	ng/g	0.86	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#194	ng/g	2.03	0.11	< 0.10	< 0.10	0.21	0.25	< 0.10	< 0.10	< 0.10
Congener#195	ng/g	0.84	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#196	ng/g	1.41	< 0.10	< 0.10	< 0.10	0.15	0.14	< 0.10	< 0.10	< 0.10
Congener#199	ng/g	2.93	0.18	0.13	< 0.10	0.34	0.34	0.11	0.11	< 0.10
Congener#202	ng/g	0.76	< 0.10	< 0.10	< 0.10	0.11	0.10	< 0.10	< 0.10	< 0.10
Congener#203	ng/g	1.95	0.11	< 0.10	< 0.10	0.20	0.24	< 0.10	< 0.10	< 0.10
Congener#206	ng/g	1.02	< 0.10	< 0.10	< 0.10	0.10	0.11	< 0.10	< 0.10	< 0.10
Congener#209	ng/g	0.80	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total	ng/g	279.0	12.4	9.3	1.9	29.9	46.0	12.2	4.5	0.9
Mercury	ug/g	0.34	0.05	0.05	0.073	0.094	0.39	0.19	0.069	0.076

Table I-2 (continued). PCB and Mercury Results for Pentwater Lake (2006). (Largemouth bass are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

Collection Date		PL47	PL48
		Northern Pike 8/23/06	Northern Pike 8/23/06
Number of Fish		1	1
vg. Length (cm)		50.5	32.5
Avg. Weight (g)		1134.10	383.52
% Lipid		0.59	0.74
Congener#6	ng/g	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0
Congener#20/#3	ng/g	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0
Congener#37/#6	ng/g	0.85	< 0.20
Congener#40	ng/g	< 0.50	< 0.50
Congener#41	ng/g	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50
Congener#44	ng/g	1.00	< 0.50
Congener#45	ng/g	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50
Congener#48/#4	ng/g	5.34	< 0.50
Congener#52	ng/g	1.13	< 0.50
Congener#56/#8	ng/g	0.60	< 0.50
Congener#60	ng/g	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50
Congener#66/#9	ng/g	1.66	< 0.50
Congener#70	ng/g	1.98	< 0.50
Congener#71	ng/g	< 0.50	< 0.50
Congener#74	ng/g	0.87	< 0.50
Congener#77	ng/g	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50
Congener#85	ng/g	1.12	< 0.50
Congener#87	ng/g	0.90	< 0.50
Congener#92	ng/g	1.20	< 0.50
Congener#95	ng/g	1.40	< 0.50
Congener#97	ng/g	1.20	< 0.50
Congener#99	ng/g	2.86	< 0.50
Congener#101	ng/g	4.96	0.63
Congener#105	ng/g	1.35	< 0.50
Congener#109/#1	ng/g	0.68	< 0.50
Congener#110	ng/g	2.91	< 0.50
Congener#118	ng/g	4.74	0.63
Congener#128	ng/g	1.76	0.29
Congener#132/#1	ng/g	7.11	1.16
Congener#135	ng/g	0.56	< 0.20
Congener#137	ng/g	0.39	< 0.20
Congener#138	ng/g	4.77	0.78
Congener#141	ng/g	0.91	< 0.20
Congener#144	ng/g	< 0.20	< 0.20
Congener#146	ng/g	1.49	0.23
Congener#149	ng/g	3.25	0.51
Congener#151	ng/g	0.79	< 0.20
Congener#156	ng/g	0.53	< 0.20
Congener#158	ng/g	0.54	< 0.20
Congener#163	ng/g	1.38	0.28
Congener#164	ng/g	0.31	< 0.20
Congener#167	ng/g	0.29	< 0.20
Congener#170	ng/g	1.34	0.21
Congener#171	ng/g	0.43	< 0.10
Congener#172	ng/g	0.39	< 0.10
Congener#174	ng/g	0.75	< 0.10
Congener#176	ng/g	< 0.10	< 0.10
Congener#177	ng/g	0.71	0.11
Congener#178	ng/g	0.48	< 0.10
Congener#179	ng/g	0.31	< 0.10
Congener#180	ng/g	2.82	0.46
Congener#183	ng/g	0.93	0.16
Congener#185	ng/g	0.10	< 0.10
Congener#187	ng/g	2.14	0.34
Congener#189	ng/g	< 0.10	< 0.10
Congener#190	ng/g	0.27	< 0.10
Congener#193	ng/g	0.21	< 0.10
Congener#194	ng/g	0.44	< 0.10
Congener#195	ng/g	0.19	< 0.10
Congener#196	ng/g	0.35	< 0.10
Congener#199	ng/g	0.71	0.12
Congener#202	ng/g	0.26	< 0.10
Congener#203	ng/g	0.46	< 0.10
Congener#206	ng/g	0.19	< 0.10
Congener#209	ng/g	0.12	< 0.10
Total	ng/g	74.4	5.9
Mercury	ug/g	0.27	0.089

Table I- 3. PCB and Mercury Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	WL51 Walleye 9/20/06	WL52 Walleye 9/20/06	WL53 Walleye 7/18/06	W54 Walleye 7/18/06	WL18 Walleye 8/22/06	WL19 Walleye 8/18/06	WL36 Walleye 8/23/06	WL20 Largemouth Bass 8/23/06	WL21 Largemouth Bass 8/23/06
Collection Date	9/20/06	9/20/06	7/18/06	7/18/06	8/22/06	8/18/06	8/23/06	8/23/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	46.8	44.3	44.6	40.6	47.0	63.5	43.0	31.5	31.0
Avg. Weight (g)	1234.66	1199.91	1185.41	1195.61	218.63	542.10	1358.90	848.30	716.60
% Lipid	1.47	2.52	1.52	2.52	2.52	2.65	3.40	1.33	0.71
Congener#6 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.12	< 2.0	< 2.0	< 2.0
Congener#8 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.29	2.14	< 2.0	< 2.0
Congener#9 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.45	< 2.0	< 2.0	< 2.0
Congener#16 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.15	< 2.0	< 2.0	< 2.0
Congener#17 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	7.03	4.75	< 2.0	< 2.0
Congener#18 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	6.39	4.58	< 2.0	< 2.0
Congener#20/#33 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	9.16	4.17	< 2.0	< 2.0
Congener#22 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.13	< 2.0	< 2.0	< 2.0
Congener#25 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.23	3.60	< 2.0	< 2.0
Congener#28 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.31	< 2.0	< 2.0	< 2.0
Congener#31 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.17	2.45	< 2.0	< 2.0
Congener#32 ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64 ng/g	1.46	< 0.20	< 0.20	0.97	1.73	7.07	3.58	1.44	0.74
Congener#40 ng/g	0.91	< 0.50	< 0.50	< 0.50	1.91	6.95	4.54	2.93	1.13
Congener#41 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	4.14	2.09	< 0.50	< 0.50
Congener#42 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	5.61	2.92	< 0.50	< 0.50
Congener#44 ng/g	2.20	< 0.50	< 0.50	1.27	1.47	7.73	3.92	1.25	0.57
Congener#45 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	2.78	< 0.50	< 0.50	< 0.50
Congener#46 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52 ng/g	2.41	< 0.50	< 0.50	2.15	2.54	15.18	5.53	1.88	1.18
Congener#56/#84 ng/g	1.34	< 0.50	< 0.50	1.17	1.57	6.00	2.97	1.11	< 0.50
Congener#60 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	2.97	1.23	< 0.50	< 0.50
Congener#63 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.86	0.90	< 0.50	< 0.50
Congener#66/#91 ng/g	1.60	1.33	1.14	1.26	2.51	17.62	6.55	2.01	1.06
Congener#70 ng/g	2.51	1.38	2.17	1.60	3.29	22.13	8.01	2.18	0.86
Congener#71 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	2.61	1.66	< 0.50	< 0.50
Congener#74 ng/g	1.10	< 0.50	0.67	0.86	1.03	7.74	2.51	1.12	0.53
Congener#77 ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.68	< 0.50	< 0.50	< 0.50
Congener#82 ng/g	0.72	< 0.50	0.64	< 0.50	0.59	4.89	1.92	0.47	< 0.50
Congener#85 ng/g	1.72	1.24	1.26	0.98	1.35	12.49	4.06	0.67	0.53
Congener#87 ng/g	2.23	< 0.50	2.29	1.31	1.43	9.71	4.29	0.77	< 0.50
Congener#92 ng/g	1.65	1.10	1.49	1.17	1.31	10.72	3.96	0.77	< 0.50
Congener#95 ng/g	4.47	< 0.50	4.12	7.37	2.98	12.74	7.43	< 0.50	< 0.50
Congener#97 ng/g	2.38	1.06	1.90	1.56	1.40	13.12	4.93	< 0.50	< 0.50
Congener#99 ng/g	3.53	2.54	3.04	2.58	2.72	25.33	8.04	1.76	0.82
Congener#101 ng/g	8.99	5.52	7.90	6.06	5.97	45.38	17.78	3.44	1.68
Congener#105 ng/g	3.70	1.96	2.71	1.72	2.16	16.97	6.13	0.92	0.51
Congener#109/#12 ng/g	1.12	0.57	0.65	0.57	0.75	7.09	2.31	< 0.50	< 0.50
Congener#110 ng/g	6.50	3.88	5.58	4.11	4.53	30.68	13.39	2.50	1.46
Congener#118 ng/g	9.58	5.52	7.48	4.79	5.64	40.30	15.82	3.16	1.72
Congener#128 ng/g	3.34	2.12	2.24	1.57	2.04	18.25	6.07	0.76	0.40
Congener#132/#15 ng/g	13.69	7.91	7.64	6.98	7.85	66.31	22.89	3.10	1.60
Congener#135 ng/g	0.84	0.52	0.61	0.58	0.67	5.65	2.25	0.27	0.07
Congener#137 ng/g	0.78	0.47	0.54	0.39	0.42	3.91	1.30	< 0.20	< 0.20
Congener#138 ng/g	10.53	6.09	6.48	5.17	5.77	52.14	17.35	2.06	1.10
Congener#141 ng/g	2.07	1.09	1.13	0.97	1.08	8.71	3.24	0.35	< 0.20
Congener#144 ng/g	0.36	0.23	0.25	0.20	< 0.20	1.49	0.59	< 0.20	< 0.20
Congener#146 ng/g	2.47	1.52	1.28	1.29	1.64	15.34	4.91	0.75	0.38
Congener#149 ng/g	6.98	3.94	4.57	4.17	4.09	31.63	12.32	1.58	0.78
Congener#151 ng/g	1.70	1.04	1.06	0.89	1.06	8.10	3.12	0.43	0.22
Congener#156 ng/g	1.20	0.81	0.86	0.55	0.53	4.81	1.58	< 0.20	< 0.20
Congener#158 ng/g	1.37	< 0.20	0.94	0.64	0.64	5.18	1.83	0.22	< 0.20
Congener#163 ng/g	3.04	1.94	1.74	1.31	1.87	18.35	5.92	0.87	0.41
Congener#164 ng/g	0.76	0.39	0.46	0.40	0.40	3.30	1.28	< 0.20	< 0.20
Congener#167 ng/g	0.65	0.36	0.38	0.30	0.31	3.04	0.95	< 0.20	< 0.20
Congener#170 ng/g	2.52	1.38	1.05	1.10	1.40	13.64	4.12	0.48	0.26
Congener#171 ng/g	0.75	0.36	0.34	0.34	0.44	4.52	1.33	0.18	< 0.10
Congener#172 ng/g	0.62	0.35	0.27	0.28	0.41	4.16	1.23	0.13	< 0.10
Congener#174 ng/g	1.32	0.83	0.68	0.62	0.90	7.76	2.73	0.26	0.12
Congener#176 ng/g	0.17	0.14	0.13	< 0.10	0.11	0.99	0.33	< 0.10	< 0.10
Congener#177 ng/g	1.10	0.70	0.56	0.52	0.82	7.56	2.38	0.26	0.14
Congener#178 ng/g	0.59	0.40	0.33	0.32	0.50	5.52	1.53	0.22	0.10
Congener#179 ng/g	0.48	0.22	0.25	0.23	0.39	3.64	1.28	0.11	< 0.10
Congener#180 ng/g	5.49	2.69	2.18	2.33	2.95	29.11	8.57	1.03	0.57
Congener#183 ng/g	1.88	1.13	0.86	0.78	1.02	9.84	2.99	0.39	0.20
Congener#185 ng/g	< 0.10	< 0.10	0.12	0.10	0.11	0.93	0.31	< 0.10	< 0.10
Congener#187 ng/g	3.61	1.95	1.57	1.58	2.35	22.95	6.94	0.97	0.50
Congener#189 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.51	0.15	< 0.10	< 0.10
Congener#190 ng/g	0.49	0.35	0.28	0.22	0.24	2.57	0.78	< 0.10	< 0.10
Congener#193 ng/g	0.35	< 0.10	0.18	0.17	0.21	2.23	0.59	0.10	< 0.10
Congener#194 ng/g	0.89	0.54	0.40	0.37	0.47	4.77	1.32	0.20	0.11
Congener#195 ng/g	0.39	0.14	0.14	0.14	0.20	1.84	0.51	0.10	< 0.10
Congener#196 ng/g	0.63	0.40	0.29	0.25	0.39	3.71	1.03	0.14	< 0.10
Congener#199 ng/g	1.32	0.71	0.51	0.51	0.77	7.75	2.19	0.30	0.18
Congener#202 ng/g	0.37	0.21	0.15	0.15	0.27	3.11	0.82	0.14	< 0.10
Congener#203 ng/g	0.92	0.50	0.39	0.35	0.43	4.47	1.25	0.18	0.10
Congener#206 ng/g	0.50	0.27	0.20	0.18	0.20	1.97	0.56	0.15	0.10
Congener#209 ng/g	0.31	0.12	0.13	0.10	0.18	1.32	0.32	0.62	0.38
Total ng/g	134.6	67.9	84.2	77.6	90.0	777.0	287.0	44.8	20.5
Mercury ug/g	0.20	0.56	0.38	0.21	0.16	0.13	0.13	0.44	0.36

Table I-3 (continued). PCB and Mercury Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	WL22	WL23	WL24	WL25	WL26	WL27	WL28	WL29	WL30
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Northern Pike
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	30.7	31.5	32.5	31.5	33.0	33.0	32.0	29.5	54.0
Avg. Weight (g)	692.6	954.20	853.90	979.30	1051.00	1114.40	941.10	662.00	1521.50
% Lipid	0.93	1.26	1.06	1.46	0.98	0.58	1.03	0.43	0.69
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	0.99	1.21	1.20	1.17	< 0.20	1.20	< 0.20	0.41
Congener#40	ng/g	1.96	1.80	1.11	1.88	< 0.50	1.77	< 0.50	1.05
Congener#41	ng/g	< 0.50	0.98	< 0.50	1.04	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	1.26	< 0.50	0.91	< 0.50	1.10	< 0.50	2.38
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.12
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	1.95	1.97	1.97	0.88	< 0.50	1.76	< 0.50	< 0.50
Congener#56/#84	ng/g	0.88	1.13	0.61	1.54	0.00	0.85	< 0.50	0.62
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	1.13	1.99	1.61	1.58	0.66	< 0.50	1.44	0.86
Congener#70	ng/g	1.25	2.30	1.56	1.68	0.72	< 0.50	1.51	0.98
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	0.55	1.09	0.72	0.91	< 0.50	0.83	0.85	< 0.50
Congener#77	ng/g	0.06	0.08	0.08	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	0.00	0.43	0.27	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	0.34	0.77	0.85	1.09	< 0.50	0.68	0.89	< 0.50
Congener#87	ng/g	0.36	0.75	0.66	1.08	< 0.50	0.69	0.94	< 0.50
Congener#92	ng/g	0.44	0.86	0.65	0.91	< 0.50	0.68	0.80	< 0.50
Congener#95	ng/g	0.00	2.56	1.76	1.82	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	0.00	1.29	0.94	0.83	< 0.50	< 0.50	< 0.50	0.52
Congener#99	ng/g	0.75	1.78	1.60	2.22	0.74	0.58	1.27	0.96
Congener#101	ng/g	1.83	3.55	3.01	4.10	1.69	0.65	2.66	2.01
Congener#105	ng/g	0.52	1.09	1.13	1.59	0.73	< 0.50	0.90	1.25
Congener#109/#121	ng/g	0.24	0.46	0.42	0.58	< 0.50	< 0.50	0.51	< 0.50
Congener#110	ng/g	1.38	2.77	2.19	3.04	1.19	0.53	2.30	1.40
Congener#118	ng/g	1.63	3.36	3.18	4.44	1.73	0.81	2.64	1.92
Congener#128	ng/g	0.31	0.87	0.90	1.59	0.60	0.25	0.69	1.32
Congener#132/#151	ng/g	1.28	3.51	3.84	6.59	2.36	1.07	2.94	4.52
Congener#135	ng/g	0.10	0.31	0.29	0.45	< 0.20	< 0.20	0.28	0.35
Congener#137	ng/g	< 0.20	< 0.20	< 0.20	0.36	< 0.20	< 0.20	0.29	< 0.20
Congener#138	ng/g	0.94	2.39	2.63	4.58	1.79	0.71	1.99	3.49
Congener#141	ng/g	< 0.20	0.42	0.45	0.86	0.32	0.20	0.38	0.55
Congener#144	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#146	ng/g	0.32	0.81	0.86	1.42	0.50	0.22	0.66	0.94
Congener#149	ng/g	0.77	1.86	1.82	3.05	1.12	0.39	1.60	2.25
Congener#151	ng/g	< 0.20	0.50	0.47	0.82	0.30	0.21	0.44	0.62
Congener#156	ng/g	< 0.20	0.22	0.25	0.42	< 0.20	< 0.20	0.21	0.32
Congener#158	ng/g	< 0.20	0.29	0.26	0.46	< 0.20	< 0.20	0.27	0.33
Congener#163	ng/g	0.30	0.77	0.96	1.56	0.60	0.30	0.76	1.17
Congener#164	ng/g	< 0.20	< 0.20	< 0.20	0.37	< 0.20	< 0.20	< 0.20	0.30
Congener#167	ng/g	< 0.20	< 0.20	< 0.20	0.23	< 0.20	< 0.20	< 0.20	< 0.20
Congener#170	ng/g	0.24	0.55	0.67	1.21	0.48	0.20	0.44	0.82
Congener#171	ng/g	0.10	0.19	0.22	0.42	0.16	< 0.10	0.16	0.34
Congener#172	ng/g	< 0.10	0.15	0.19	0.38	0.14	< 0.10	0.14	0.31
Congener#174	ng/g	0.10	0.32	0.37	0.63	0.23	0.13	0.30	0.42
Congener#176	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#177	ng/g	0.12	0.30	0.36	0.68	0.23	0.14	0.29	0.43
Congener#178	ng/g	0.11	0.23	0.29	0.50	0.18	< 0.10	0.21	0.38
Congener#179	ng/g	< 0.10	0.13	0.13	0.33	0.12	< 0.10	0.16	0.22
Congener#180	ng/g	0.44	1.21	1.46	2.74	1.01	0.42	1.03	1.45
Congener#183	ng/g	0.20	0.44	0.49	0.96	0.35	0.22	0.41	0.65
Congener#185	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#187	ng/g	0.40	1.06	1.24	2.24	0.78	0.37	0.89	1.46
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	< 0.10	0.11	0.13	0.23	< 0.10	< 0.10	0.23	0.10
Congener#193	ng/g	< 0.10	0.09	0.11	0.20	< 0.10	< 0.10	0.10	0.22
Congener#194	ng/g	< 0.10	0.18	0.22	0.46	0.18	0.21	0.27	0.20
Congener#195	ng/g	< 0.10	0.10	0.11	0.20	< 0.10	< 0.10	0.10	0.12
Congener#196	ng/g	< 0.10	0.15	0.18	0.35	0.13	< 0.10	0.12	0.24
Congener#199	ng/g	0.15	0.32	0.39	0.78	0.30	0.18	0.32	0.46
Congener#202	ng/g	< 0.10	0.13	0.14	0.27	0.10	< 0.10	0.13	0.18
Congener#203	ng/g	< 0.10	0.19	0.24	0.46	0.17	0.15	0.19	0.29
Congener#206	ng/g	< 0.10	0.15	0.14	0.27	0.11	< 0.10	0.12	0.15
Congener#209	ng/g	0.45	0.49	0.42	0.43	0.23	0.12	0.37	0.32
Total	ng/g	22.6	51.9	45.8	70.7	20.8	8.0	39.3	44.3
Mercury	ug/g	0.23	0.35	0.38	0.42	0.32	0.21	0.17	0.15

Table I-3 (continued). PCB and Mercury Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

		WL31	WL34	WL35	WL44	WL45	WL46	WL47	WL48	WL49
		Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike
Collection Date		8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06
Number of Fish		1	1	1	1	1	1	1	1	1
Avg. Length (cm)		49.5	53.5	47.5	50.5	45.0	54.3	41.5	41.5	38.9
Avg. Weight (g)		802.90	1510.40	942.50	1516.90	1453.20	1433.20	712.40	757.10	660.20
% Lipid		0.46	1.10	0.61	0.28	0.29	0.38	0.54	0.50	0.21
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#17	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#18	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	< 0.20	0.94	< 0.20	0.53	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#40	ng/g	< 0.50	< 0.50	< 0.50	0.92	< 0.50	1.46	< 0.50	< 0.50	< 0.50
Congener#41	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#44	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#45	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#56/#84	ng/g	< 0.50	0.78	< 0.50	< 0.50	< 0.50	0.74	< 0.50	< 0.50	< 0.50
Congener#60	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	< 0.50	0.82	0.60	0.62	< 0.50	0.72	0.51	< 0.50	< 0.50
Congener#70	ng/g	< 0.50	0.97	0.54	0.57	< 0.50	0.73	< 0.50	< 0.50	< 0.50
Congener#71	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#74	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#82	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#85	ng/g	< 0.50	0.70	< 0.50	< 0.50	< 0.50	0.76	< 0.50	< 0.50	< 0.50
Congener#87	ng/g	< 0.50	0.63	0.58	< 0.50	< 0.50	0.57	< 0.50	< 0.50	< 0.50
Congener#92	ng/g	< 0.50	0.61	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#95	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#97	ng/g	< 0.50	1.04	< 0.50	< 0.50	< 0.50	1.01	< 0.50	< 0.50	< 0.50
Congener#99	ng/g	< 0.50	1.19	0.89	0.65	< 0.50	1.29	0.56	0.59	< 0.50
Congener#101	ng/g	< 0.50	2.57	1.60	1.15	0.65	2.21	0.90	0.86	< 0.50
Congener#105	ng/g	< 0.50	1.00	0.64	< 0.50	< 0.50	1.12	< 0.50	< 0.50	< 0.50
Congener#109/#121	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#110	ng/g	< 0.50	1.93	1.10	1.03	< 0.50	1.69	0.67	0.71	< 0.50
Congener#118	ng/g	< 0.50	2.70	1.68	1.32	0.65	3.06	0.95	0.93	< 0.50
Congener#128	ng/g	< 0.20	0.89	0.60	0.38	0.25	1.19	0.27	0.29	< 0.20
Congener#132/#151	ng/g	0.47	3.90	2.43	1.59	0.89	4.97	1.27	1.20	0.37
Congener#135	ng/g	< 0.20	0.38	0.23	< 0.20	< 0.20	0.33	< 0.20	< 0.20	< 0.20
Congener#137	ng/g	< 0.20	0.21	< 0.20	< 0.20	< 0.20	0.26	< 0.20	< 0.20	< 0.20
Congener#138	ng/g	0.38	2.51	1.61	1.02	0.70	3.15	0.84	0.81	0.26
Congener#141	ng/g	< 0.20	0.50	0.35	0.21	< 0.20	0.59	< 0.20	< 0.20	< 0.20
Congener#144	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Congener#146	ng/g	< 0.20	0.77	0.47	0.34	< 0.20	1.03	0.26	0.25	< 0.20
Congener#149	ng/g	0.25	1.83	1.31	0.75	0.48	2.03	0.74	0.63	0.23
Congener#151	ng/g	< 0.20	0.51	0.35	0.21	< 0.20	0.49	< 0.20	< 0.20	< 0.20
Congener#156	ng/g	< 0.20	0.26	< 0.20	< 0.20	< 0.20	0.36	< 0.20	< 0.20	< 0.20
Congener#158	ng/g	< 0.20	0.27	0.21	< 0.20	< 0.20	0.37	< 0.20	< 0.20	< 0.20
Congener#163	ng/g	< 0.20	0.97	0.57	0.45	0.23	1.11	0.33	0.28	< 0.20
Congener#164	ng/g	< 0.20	0.21	< 0.20	< 0.20	< 0.20	0.20	< 0.20	< 0.20	< 0.20
Congener#167	ng/g	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.21	< 0.20	< 0.20	< 0.20
Congener#170	ng/g	< 0.10	0.62	0.42	0.27	0.20	0.92	0.19	0.18	< 0.10
Congener#171	ng/g	< 0.10	0.21	0.16	< 0.10	< 0.10	0.32	< 0.10	< 0.10	< 0.10
Congener#172	ng/g	< 0.10	0.19	0.12	< 0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10
Congener#174	ng/g	< 0.10	0.43	0.29	0.17	0.10	0.48	0.12	0.11	0.06
Congener#176	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#177	ng/g	< 0.10	0.39	0.24	0.16	0.10	0.51	0.11	0.10	< 0.10
Congener#178	ng/g	< 0.10	0.28	0.17	0.11	< 0.10	0.37	< 0.10	< 0.10	< 0.10
Congener#179	ng/g	< 0.10	0.17	0.13	< 0.10	< 0.10	0.20	< 0.10	< 0.10	< 0.10
Congener#180	ng/g	0.16	1.42	0.94	0.59	0.30	2.08	0.41	0.41	0.12
Congener#183	ng/g	< 0.10	0.52	0.33	0.20	0.15	0.68	0.15	0.13	0.07
Congener#185	ng/g	< 0.10	0.06	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#187	ng/g	0.13	1.20	0.76	0.50	0.28	1.69	0.35	0.35	0.12
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Congener#190	ng/g	< 0.10	0.13	< 0.10	< 0.10	< 0.10	0.19	< 0.10	< 0.10	< 0.10
Congener#193	ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10
Congener#194	ng/g	< 0.10	0.22	0.18	0.10	< 0.10	0.32	< 0.10	< 0.10	< 0.10
Congener#195	ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10
Congener#196	ng/g	< 0.10	0.17	0.11	< 0.10	< 0.10	0.23	< 0.10	< 0.10	< 0.10
Congener#199	ng/g	< 0.10	0.38	0.27	0.17	0.10	0.54	0.10	0.10	< 0.10
Congener#202	ng/g	< 0.10	0.14	0.11	< 0.10	< 0.10	0.18	< 0.10	< 0.10	< 0.10
Congener#203	ng/g	< 0.10	0.22	0.18	0.11	< 0.10	0.32	< 0.10	< 0.10	< 0.10
Congener#206	ng/g	< 0.10	0.12	< 0.10	< 0.10	< 0.10	0.17	< 0.10	< 0.10	< 0.10
Congener#209	ng/g	< 0.10	0.15	< 0.10	0.13	< 0.10	0.29	< 0.10	< 0.10	< 0.10
Total	ng/g	1.4	36.3	20.2	14.3	5.1	41.7	8.7	7.9	1.2
Mercury	ug/g	0.13	0.22	0.13	0.36	0.09	0.54	0.14	0.098	0.15

Table I-3 (continued). PCB and Mercury Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	WL17	WL32	WL33 RE	WL38	WL39	WL40	WL41	WL42	WL43	WL50
	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp
Collection Date	6/23/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	44.2	27.0	53.5	61.5	45.0	45.5	52.0	47.8	55.5	65.0
Avg. Weight (g)	2063.00	620.60	4122.60	7155.90	4798.80	2352.70	3111.80	2680.50	4522.20	6661.20
% Lipid	6.83	2.57	5.54	4.63	7.16	6.71	10.41	4.92	3.42	13.43
Congener#6	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.72
Congener#8	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	7.06
Congener#9	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	5.42
Congener#16	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.78
Congener#17	ng/g	< 2.0	< 2.0	2.03	< 2.0	< 2.0	< 2.0	5.53	2.62	< 2.0
Congener#18	ng/g	2.06	< 2.0	2.07	< 2.0	2.67	< 2.0	7.42	2.96	< 2.0
Congener#20/#33	ng/g	< 2.0	< 2.0	2.87	< 2.0	2.27	< 2.0	9.33	3.58	< 2.0
Congener#22	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.74	< 2.0	< 2.0
Congener#25	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	1.24	< 2.0	< 2.0
Congener#26	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.39	< 2.0	< 2.0
Congener#28	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.82	< 2.0	< 2.0
Congener#31	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	2.57	< 2.0	3.90	< 2.0	< 2.0
Congener#32	ng/g	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Congener#37/#64	ng/g	2.75	1.57	2.02	1.19	2.64	4.38	7.32	2.44	3.63
Congener#40	ng/g	4.59	0.99	5.36	2.92	8.04	< 0.50	27.28	5.39	0.90
Congener#41	ng/g	< 0.50	< 0.50	0.74	< 0.50	1.05	< 0.50	2.63	1.53	< 0.50
Congener#42	ng/g	< 0.50	< 0.50	1.52	< 0.50	1.55	< 0.50	5.19	1.31	< 0.50
Congener#44	ng/g	3.41	2.34	2.68	1.48	4.02	5.99	8.81	2.63	7.07
Congener#45	ng/g	< 0.50	< 0.50	1.04	< 0.50	0.97	< 0.50	2.55	1.76	< 0.50
Congener#46	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#48/#49	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#52	ng/g	5.32	2.63	3.75	1.86	4.91	< 0.50	15.17	4.50	20.26
Congener#56/#84	ng/g	2.63	1.41	2.18	1.14	2.18	3.02	6.78	2.10	4.47
Congener#60	ng/g	0.53	< 0.50	< 0.50	< 0.50	0.57	< 0.50	1.62	0.63	< 0.50
Congener#63	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Congener#66/#91	ng/g	3.65	1.72	3.47	1.76	4.89	6.39	14.29	4.69	4.87
Congener#70	ng/g	5.34	2.66	4.49	1.91	6.52	9.22	17.03	5.23	16.21
Congener#71	ng/g	< 0.50	< 0.50	0.92	< 0.50	1.33	< 0.50	2.46	0.91	< 0.50
Congener#74	ng/g	1.57	1.16	1.57	0.83	1.77	4.12	5.82	2.04	3.51
Congener#77	ng/g	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.58
Congener#82	ng/g	< 0.50	0.77	< 0.50	< 0.50	0.68	1.31	2.05	0.76	4.01
Congener#85	ng/g	1.07	1.83	1.05	0.76	1.41	2.52	4.94	1.87	7.03
Congener#87	ng/g	1.32	2.35	1.32	0.88	1.59	3.49	6.08	2.03	14.66
Congener#92	ng/g	1.35	1.76	1.36	0.69	1.60	2.50	5.52	1.95	8.01
Congener#95	ng/g	2.78	4.81	3.40	2.02	4.60	5.48	12.86	3.77	28.82
Congener#97	ng/g	1.34	2.60	1.78	< 0.50	2.05	3.44	7.31	2.43	12.43
Congener#99	ng/g	2.53	3.79	2.76	1.75	3.18	5.43	13.16	4.65	15.27
Congener#101	ng/g	5.94	9.71	6.79	3.50	6.90	13.10	28.44	10.00	48.26
Congener#105	ng/g	1.30	4.06	1.55	1.07	1.76	4.73	7.64	2.79	18.01
Congener#109/#123	ng/g	0.52	1.19	0.64	< 0.50	0.75	1.28	3.04	1.05	3.49
Congener#110	ng/g	4.23	6.89	4.62	2.46	5.40	9.15	18.50	6.76	35.16
Congener#118	ng/g	4.42	10.35	5.08	3.65	5.88	12.34	26.43	9.00	42.89
Congener#128	ng/g	0.89	3.51	1.05	0.87	1.12	3.91	5.49	2.10	9.49
Congener#132/#153	ng/g	3.73	14.92	4.44	4.63	5.04	15.49	24.35	9.48	29.35
Congener#135	ng/g	0.44	0.90	0.51	0.21	0.55	1.01	2.06	0.78	3.14
Congener#137	ng/g	< 0.20	0.86	0.24	0.22	0.26	0.93	1.38	0.51	2.42
Congener#138	ng/g	2.48	11.09	3.11	2.77	3.34	12.36	17.68	6.49	28.97
Congener#141	ng/g	0.53	2.20	0.67	0.52	0.64	2.31	3.55	1.31	5.28
Congener#144	ng/g	< 0.20	0.39	< 0.20	< 0.20	< 0.20	0.52	0.79	0.28	1.23
Congener#146	ng/g	0.81	2.61	0.97	0.88	1.10	2.76	5.03	1.92	4.90
Congener#149	ng/g	2.69	7.68	2.87	1.73	3.12	7.84	12.63	5.18	24.37
Congener#151	ng/g	0.70	1.80	0.75	0.49	0.81	2.15	3.60	1.26	4.49
Congener#156	ng/g	0.25	1.30	0.36	0.30	0.33	1.41	2.06	0.73	4.32
Congener#158	ng/g	0.32	1.48	0.40	0.35	0.38	1.73	2.30	0.81	4.85
Congener#163	ng/g	0.89	3.22	1.07	0.97	1.13	3.70	5.08	2.09	7.60
Congener#164	ng/g	0.24	0.81	0.28	< 0.20	0.29	0.80	1.31	0.50	2.48
Congener#167	ng/g	< 0.20	0.68	0.20	0.20	0.20	0.71	1.11	0.41	1.74
Congener#170	ng/g	0.54	2.73	0.77	0.71	0.75	2.61	4.11	1.57	3.27
Congener#171	ng/g	0.21	0.79	0.26	0.24	0.27	0.80	1.31	0.52	1.10
Congener#172	ng/g	0.14	0.66	0.21	0.21	0.20	0.68	1.08	0.44	0.62
Congener#174	ng/g	0.48	1.43	0.60	0.39	0.56	1.55	2.62	1.07	1.70
Congener#176	ng/g	< 0.10	0.18	< 0.10	< 0.10	< 0.10	0.25	0.42	0.16	0.26
Congener#177	ng/g	0.31	1.17	0.41	0.34	0.44	1.34	1.94	0.82	1.27
Congener#178	ng/g	0.24	0.62	0.28	0.24	0.31	0.71	1.38	0.58	0.64
Congener#179	ng/g	0.23	0.51	0.23	0.17	0.25	0.56	1.11	0.42	0.66
Congener#180	ng/g	1.24	5.81	1.65	1.73	1.62	5.33	8.76	3.48	5.44
Congener#183	ng/g	0.49	2.01	0.58	0.59	0.60	2.28	3.15	1.18	1.98
Congener#185	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.44	0.16	< 0.10
Congener#187	ng/g	1.11	3.95	1.31	1.36	1.41	3.98	6.94	2.68	3.55
Congener#189	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16	< 0.10	< 0.10
Congener#190	ng/g	0.10	0.54	0.15	0.14	0.14	0.63	0.86	0.32	0.61
Congener#193	ng/g	0.11	0.37	0.14	0.13	0.14	0.47	0.63	0.25	0.33
Congener#194	ng/g	0.25	0.96	0.33	0.30	0.27	0.97	1.58	0.59	0.57
Congener#195	ng/g	0.11	0.41	0.16	0.14	0.13	0.36	0.77	0.27	0.23
Congener#196	ng/g	0.20	0.66	0.28	0.20	0.24	0.71	1.18	0.47	0.42
Congener#199	ng/g	0.46	1.45	0.58	0.46	0.49	1.47	2.56	1.00	0.89
Congener#202	ng/g	0.19	0.40	0.20	0.14	0.19	0.46	0.87	0.37	0.26
Congener#203	ng/g	0.27	0.98	0.35	0.28	0.31	1.07	1.70	0.64	0.62
Congener#206	ng/g	0.20	0.53	0.30	0.22	0.27	0.56	1.25	0.44	0.29
Congener#209	ng/g	0.49	0.33	1.07	0.76	1.02	0.38	4.05	1.21	0.15
Total	ng/g	80.0	144.5	93.8	52.8	111.7	182.7	439.7	143.9	458.4
Mercury	ug/g	0.064	0.051	0.19	0.29	0.15	0.075	0.28	0.22	0.17

Appendix 2

PBDE Results

Table II- 1. PBDE Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	ML01	ML02	ML04	ML05	ML08	ML09	ML10	ML11	ML12
	Spottail Shiner	Spottail Shiner	Spottail Shiner	Mimic Shiner	Mimic Shiner	Yellow Perch	Yellow Perch	Round Goby	Round Goby
Collection Date	7/20/06	7/20/06	7/20/06	6/21 & 7/20/06	6/21 & 7/20/06	6/21/06	6/21/06	7/20/06	7/20/06
Number of Fish	11	11	11	30	23	9	9	10	22
Avg. Length (cm)	7.4	7.5	7.3	4.4	5.1	8.0	8.8	6.6	3.8
Avg. Weight (g)	7.08	7.85	6.80	1.25	2.09	8.72	11.39	5.54	1.33
% Lipid	8.49	7.22	9.87	3.48	5.34	3.34	5.55	3.40	3.03
PBDE#28 ng/g	0.25	0.23	0.46	0.21	0.18	< 0.10	0.11	4.84	1.13
PBDE#47 ng/g	4.76	4.52	6.04	6.48	3.54	1.81	2.04	1.14	1.24
PBDE#66 ng/g	0.21	< 0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	0.22	< 0.10	0.18	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.60	0.15	0.50	0.16	0.20	0.46	0.66	0.38	0.43
PBDE#100 ng/g	2.18	1.69	3.20	1.81	1.36	0.52	0.68	0.35	0.37
PBDE#153 ng/g	0.49	0.25	0.69	0.35	0.27	< 0.10	0.14	< 0.10	< 0.10
PBDE#154 ng/g	0.98	0.54	1.21	0.54	0.48	0.17	0.27	0.10	0.17
PBDE#183 ng/g	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	9.81	7.38	12.62	9.55	6.03	2.96	3.90	6.81	3.34
	ML13	ML15	ML16	ML17	ML18	ML21	ML24	ML25	ML26
	Round Goby	Round Goby	Bluntnose Minnow	Bluntnose Minnow	Bluntnose Minnow	Largemouth Bass	Spottail Shiner	Banded Killifish	Banded Killifish
Collection Date	7/21/06	6/21 & 9/20/06	6/21/06	6/21/06	7/21/06	6/21/06	7/18/06	7/20,21, 9/19,20	7/20,21, 9/19,20
Number of Fish	10	10	19	9	18	47	6	11	20
Avg. Length (cm)	6.1	5.9	5.2	7.0	6.0	3.4	4.1	5.5	3.5
Avg. Weight (g)	5.06	5.02	2.55	5.90	3.22	0.88	1.37	2.51	0.59
% Lipid	4.23	3.08	7.51	4.80	8.72	2.56	11.98	7.00	4.79
PBDE#28 ng/g	1.79	< 0.10	0.15	0.23	0.48	< 0.10	0.78	0.22	0.44
PBDE#47 ng/g	1.13	0.93	4.44	6.62	6.25	1.46	9.84	2.32	0.62
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.45	0.45	0.20	0.59	0.11	0.87	0.18	1.34	0.26
PBDE#100 ng/g	0.39	0.34	1.28	1.18	1.28	0.51	6.44	0.59	0.15
PBDE#153 ng/g	0.20	0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.00	0.12	< 0.10
PBDE#154 ng/g	0.23	0.19	0.49	0.24	0.20	0.20	2.04	0.18	< 0.10
PBDE#183 ng/g	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	4.43	2.01	6.56	8.86	8.35	3.04	20.28	4.77	1.47
	ML27	ML28	ML31	ML32	ML33	ML34	ML35	ML135	ML36
	White Sucker	Walleye	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Northern Pike	Northern Pike	Northern Pike
Collection Date	7/18/06	9/20/06	7/18/06	7/18/06	7/18/06	7/18/06	9/20/06	9/22/06	9/20/06
Number of Fish	1	1	11	10	6	10	1	1	1
Avg. Length (cm)	15.8	26.8	8.2	8.6	10.5	9.0	57.0	51.0	44.0
Avg. Weight (g)	83.12	234.66	9.72	12.12	20.79	13.19	1530.10	1245.60	396.89
% Lipid	1.30	0.47	6.99	6.17	5.08	6.66	0.80	2.89	0.43
PBDE#28 ng/g	1.07	< 0.10	0.36	0.19	0.22	0.20	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	0.99	1.93	3.52	2.84	4.22	3.49	2.65	2.89	0.48
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.10	0.32	0.51	0.44	0.43	0.56	0.64	0.30	0.15
PBDE#100 ng/g	0.23	0.67	0.88	0.70	1.17	0.93	0.79	0.44	0.13
PBDE#153 ng/g	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	0.23	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	0.20	0.24	0.24	0.40	0.24	0.31	0.16	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.39	3.25	5.51	4.41	6.44	5.53	4.62	3.79	0.76
	ML136	ML37	ML38	ML39	ML40	ML41	ML42	ML43	ML44
	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Common Carp	Common Carp	Common Carp
Collection Date	9/22/06	9/20/06	9/20/06	9/20/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	46.0	67.0	60.8	25.2	45.5	61.5	28.5	33.0	48.0
Avg. Weight (g)	411.50	2952.30	2666.20	148.52	858.10	2031.60	722.50	443.20	3042.30
% Lipid	0.43	0.35	0.46	0.30	0.31	0.42	0.72	1.67	8.19
PBDE#28 ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	0.38	< 0.10	< 0.10	0.49
PBDE#47 ng/g	0.49	2.65	1.74	0.52	0.49	6.15	1.18	0.61	5.93
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.52	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.60	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.29	0.70	0.30	0.12	0.29	1.72	< 0.10	< 0.10	0.10
PBDE#100 ng/g	0.18	0.76	0.44	0.12	0.18	2.35	0.20	0.17	1.01
PBDE#153 ng/g	< 0.10	0.13	< 0.10	< 0.10	< 0.10	0.86	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	0.27	0.16	< 0.10	< 0.10	1.05	< 0.10	< 0.10	0.27
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.50	< 0.10	< 0.10	< 0.10
TOTAL ng/g	0.96	4.62	2.64	0.76	0.96	14.13	1.38	0.78	7.80

Table II- 1 (continued). PBDE Results for Muskegon Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	ML45	ML46	ML47	ML48	ML49	ML50	ML51	ML52	ML53	ML54
	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye
Collection Date	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06
Number of Fish	1	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	54.0	49.5	53.5	47.5	50.5	45.0	54.3	41.5	41.5	38.9
Avg. Weight (g)	1595.34	1757.67	1162.33	1105.63	1672.62	1020.58	2409.71	1474.18	2721.55	1595.34
% Lipid	1.14	2.47	1.99	1.53	2.43	1.24	4.33	2.88	3.62	1.20
PBDE#28	ng/g	0.12	0.42	0.28	0.28	0.30	0.23	1.15	0.89	1.42
PBDE#47	ng/g	2.30	10.59	8.60	9.79	6.77	39.77	21.69	52.32	2.32
PBDE#66	ng/g	< 0.10	0.25	0.21	0.18	0.15	0.11	0.61	1.19	0.10
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99	ng/g	0.75	1.83	1.92	1.99	1.30	0.85	8.41	4.03	9.66
PBDE#100	ng/g	0.59	3.26	2.34	2.35	1.66	1.20	13.31	5.15	13.97
PBDE#153	ng/g	0.11	0.49	0.37	0.35	0.31	0.23	2.48	0.88	1.93
PBDE#154	ng/g	0.24	0.93	0.82	0.90	0.56	0.53	5.36	1.90	4.34
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10
TOTAL	ng/g	4.11	17.77	14.54	15.84	11.05	6.87	35.15	84.83	4.64
	ML55	ML56	ML57	ML58	ML59	ML60	ML61	ML62	ML162	ML63
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06	7/18/06
Number of Fish	1	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	30.8	34.5	32.0	21.0	21.5	25.2	23.8	22.0	23.0	24.0
Avg. Weight (g)	728.20	911.20	768.80	296.39	252.69	347.90	335.73	284.72	281.00	287.53
% Lipid	0.93	0.95	1.54	1.19	0.52	1.13	1.19	1.31	1.31	0.57
PBDE#28	ng/g	< 0.10	0.13	0.14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47	ng/g	1.19	3.40	3.51	1.07	0.50	1.19	1.24	1.15	0.66
PBDE#66	ng/g	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99	ng/g	0.38	0.75	0.86	0.38	0.14	0.44	0.29	0.47	0.53
PBDE#100	ng/g	0.37	1.20	1.06	0.28	0.15	0.32	0.32	0.39	0.37
PBDE#153	ng/g	< 0.10	0.21	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154	ng/g	0.13	0.37	0.37	< 0.10	< 0.10	0.17	< 0.10	0.10	0.16
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL	ng/g	2.07	6.20	6.09	1.73	0.79	2.12	1.85	2.22	1.29
	ML64	ML65	ML165	ML66	ML67	ML68	ML69	ML70	ML71	
	Largemouth Bass	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Yellow Perch	Yellow Perch	
Collection Date	7/18/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	8/3/06	6/21/06	7/18/06	
Number of Fish	1	1	1	1	1	1	1	3	4	
Avg. Length (cm)	25.0	26.0	27.0	39.4	48.9	50.5	67.0	10.7	12.7	
Avg. Weight (g)	216.80	498.00	532.00	1495.20	3195.40	3182.10	9090.10	23.71	34.12	
% Lipid	0.51	0.64	0.64	2.39	2.82	5.84	7.94	3.48	2.66	
PBDE#28	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.78	0.62	1.20	0.17	
PBDE#47	ng/g	0.51	0.29	0.34	0.87	7.12	5.80	9.54	2.02	
PBDE#66	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
PBDE#99	ng/g	0.22	< 0.10	< 0.10	0.11	0.14	0.18	0.16	0.53	
PBDE#100	ng/g	0.16	0.11	0.11	0.22	1.82	1.33	2.16	0.46	
PBDE#153	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	
PBDE#154	ng/g	< 0.10	< 0.10	< 0.10	0.10	0.46	0.34	0.50	0.14	
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
TOTAL	ng/g	0.89	0.40	0.45	1.30	10.32	8.48	13.56	3.32	6.18

Table II- 2. PBDE Results for Pentwater Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	PL01	PL03	PL06	PL07	PL08	PL09	PL12	PL14	PL15
	Mimic Shiner	Mimic Shiner	Bluntnose Minnow	Bluntnose Minnow	Bluntnose Minnow	Round Goby	Round Goby	Yellow Perch	Yellow Perch
Collection Date	6/24/06	6/24/06	6/26/06	6/26/06	6/26/06	6/27/06	6/27/06	6/27 & 8/26/06	6/27 & 8/26/06
Number of Fish	32	32	22	13	14	26	9	9	9
Avg. Length (cm)	4.8	4.5	4.8	6.1	7.7	4.5	6.9	9.4	10.5
Avg. Weight (g)	1.46	1.43	1.65	3.43	3.03	1.86	7.49	15.23	20.94
% Lipid	4.01	3.27	4.28	4.18	5.62	3.47	2.62	7.85	7.40
PBDE#28 ng/g	0.15	0.16	0.11	0.10	0.13	< 0.10	0.10	0.20	0.51
PBDE#47 ng/g	3.03	3.32	2.54	2.31	3.56	1.37	1.74	2.83	2.97
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	0.10	< 0.10
PBDE#85 ng/g	0.14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.15	< 0.10	0.05	< 0.10	< 0.10	0.40	0.54	0.40	0.33
PBDE#100 ng/g	0.94	0.97	0.75	0.71	0.88	0.42	0.52	0.84	0.83
PBDE#153 ng/g	0.35	0.26	0.12	< 0.10	< 0.10	< 0.10	0.15	0.10	< 0.10
PBDE#154 ng/g	0.53	0.46	0.33	0.17	0.30	0.20	0.27	0.41	0.44
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	5.29	5.17	3.90	3.29	4.87	2.39	3.43	4.88	5.08
	PL29	PL30	PL31	PL32	PL33	PL34	PL35	PL36	PL37
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Northern Pike	Northern Pike	Northern Pike	Common Carp	Common Carp
Collection Date	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	34.0	28.0	26.5	28.0	47.5	45.0	42.0	54.5	58.0
Avg. Weight (g)	998.50	525.80	517.30	439.30	1274.70	461.10	771.20	4281.00	6042.30
% Lipid	0.67	0.72	1.48	1.19	0.59	0.45	0.32	4.36	15.04
PBDE#28 ng/g	0.18	0.12	< 0.10	< 0.10	0.10	0.10	< 0.10	1.99	7.59
PBDE#47 ng/g	4.75	3.14	1.30	0.89	2.30	1.80	0.74	9.74	43.12
PBDE#66 ng/g	0.14	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.59	0.39	0.33	0.23	0.37	0.30	0.10	0.11	0.20
PBDE#100 ng/g	1.08	0.82	0.39	0.25	0.60	0.43	0.20	2.34	9.13
PBDE#153 ng/g	0.16	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.36	0.37	0.14	< 0.10	0.28	< 0.10	< 0.10	0.77	2.57
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	7.26	4.95	2.16	1.37	3.76	2.63	1.04	14.95	62.61
	PL16	PL18	PL19	PL20	PL23	PL24	PL26	PL27	PL28
	Yellow Perch	Yellow Perch	Largemouth Bass	Largemouth Bass	Common Carp	Common Carp	Common Carp	Largemouth Bass	Largemouth Bass
Collection Date	6/27 & 8/26/06	6/27 & 8/26/06	8/23/06	8/23/06	8/22/06	8/22/06	8/22/06	8/22/06	8/22/06
Number of Fish	6	3	15	8	1	1	1	1	1
Avg. Length (cm)	11.2	13.0	5.0	5.9	66.5	63.0	55.0	30.5	36.7
Avg. Weight (g)	25.81	39.36	2.52	4.23	6173.10	5179.80	5100.80	810.40	1348.60
% Lipid	5.01	3.44	3.43	2.02	8.75	3.82	8.48	1.01	1.13
PBDE#28 ng/g	0.17	0.12	< 0.10	< 0.10	2.00	0.99	1.99	0.11	0.32
PBDE#47 ng/g	2.43	2.77	0.64	0.55	11.06	5.07	8.74	2.54	9.84
PBDE#66 ng/g	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.27
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.22	0.27	0.30	0.21	0.08	< 0.10	0.11	0.36	1.59
PBDE#100 ng/g	0.66	0.92	0.16	0.17	3.15	1.07	2.74	0.61	2.64
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.39
PBDE#154 ng/g	0.30	0.37	0.11	0.13	0.97	0.29	0.71	0.17	0.92
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	3.78	4.55	1.21	1.06	17.26	7.42	14.3	3.79	15.97
	PL55	PL47	PL48	PL49	PL50	PL51	PL52	PL53	PL54
	Northern Pike	Northern Pike	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Yellow Perch	Yellow Perch	Yellow Perch
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	6/27 & 8/26/06	6/27 & 8/26/06	6/27 & 8/26/06
Number of Fish	1	1	1	1	1	1	9	9	5
Avg. Length (cm)	50.5	32.5	21.6	23.2	31.3	31.5	9.6	10.2	11.3
Avg. Weight (g)	1134.10	383.52	239.30	288.70	942.20	904.80	17.08	19.04	25.73
% Lipid	0.59	0.74	1.35	0.63	0.56	0.96	5.55	4.67	5.84
PBDE#28 ng/g	0.20	< 0.10	< 0.10	< 0.10	< 0.10	0.12	0.83	0.17	0.64
PBDE#47 ng/g	6.94	0.80	1.49	1.43	0.89	2.60	3.44	2.88	2.48
PBDE#66 ng/g	0.16	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	1.17	0.16	0.29	0.46	0.16	0.41	0.30	0.23	0.23
PBDE#100 ng/g	1.82	0.25	0.36	0.50	0.24	0.63	0.88	0.79	0.65
PBDE#153 ng/g	0.21	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.48	< 0.10	< 0.10	0.17	0.13	0.28	0.26	0.20	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	10.98	1.21	2.14	2.67	1.42	4.04	5.71	4.27	4.00
	PL38	PL39	PL40	PL41	PL42	PL43	PL44	PL45	PL46
	Common Carp	Common Carp	Common Carp	Common Carp	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike
Collection Date	8/23/06	8/20/06	8/20/06	8/22/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	52.0	52.2	54.0	61.4	45.0	76.0	48.0	22.8	21.5
Avg. Weight (g)	3929.10	3582.40	4135.60	6020.60	945.00	3586.90	1031.40	118.06	116.53
% Lipid	6.83	3.50	4.57	7.04	0.87	0.91	0.56	0.72	0.44
PBDE#28 ng/g	0.61	1.09	4.52	1.79	0.15	0.28	< 0.10	0.26	< 0.10
PBDE#47 ng/g	3.96	6.01	22.67	9.50	3.00	3.31	1.48	0.66	0.25
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.24	< 0.10	0.14	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.36	0.57	0.23	0.21	0.17
PBDE#100 ng/g	0.77	1.28	3.82	1.90	0.88	0.74	0.34	0.23	0.10
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.22	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.25	0.35	1.21	0.53	0.44	0.20	0.10	0.12	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	5.59	8.73	32.22	13.72	4.83	5.68	2.15	1.62	0.52

Table II- 3. PBDE Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	WL01	WL02	WL03	WL04	WL05	WL07	WL08	WL09	WL10
	Yellow Perch	Yellow Perch	Large Mouth Bass	Large Mouth Bass	Large Mouth Bass	Bluntnose Minnow	Bluntnose Minnow	Bluntnose Minnow	Yellow Perch
Collection Date	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06
Number of Fish	8	7	43	43	3	20	8	5	10
Avg. Length (cm)	7.7	9.0	2.0-2.6	2.0-2.6	6.2	5.1	5.6	6.8	7.1
Avg. Weight (g)	7.22	12.17	0.30	0.30	5.05	1.81	2.64	4.85	5.64
% Lipid	3.74	3.37	1.70	1.90	2.65	3.34	4.74	3.82	2.29
PBDE#28 ng/g	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.14	0.14	< 0.10
PBDE#47 ng/g	1.97	1.96	0.27	0.39	1.37	1.46	1.52	2.08	1.56
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.40	0.35	0.15	0.15	0.51	0.13	0.18	< 0.10	0.36
PBDE#100 ng/g	0.51	0.49	< 0.10	< 0.10	0.29	0.31	0.35	0.60	0.38
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.22	0.18	< 0.10	< 0.10	0.11	< 0.10	0.13	0.23	0.20
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	3.22	2.98	0.42	0.54	2.28	1.90	2.42	3.05	2.50
	WL11	WL12	WL13	WL14	WL15	WL16	WL17	WL18	WL19
	Yellow Perch	Yellow Perch	Round Goby	Round Goby	Mimic Shiner	White Sucker	Common Carp	Walleye	Walleye
Collection Date	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	6/23/06	8/22/06	8/22/06
Number of Fish	8	8	10	7	7	2	1	1	1
Avg. Length (cm)	8.3	7.5	5.0	6.9	5.4	8.0	44.2	47.0	63.5
Avg. Weight (g)	9.49	7.06	2.58	7.53	2.38	9.04	2063.00	218.63	542.10
% Lipid	3.32	3.75	2.71	2.65	2.59	2.92	6.83	2.52	2.65
PBDE#28 ng/g	0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	0.16	0.18	1.95
PBDE#47 ng/g	1.73	1.74	1.32	1.30	2.60	1.26	1.65	3.93	5.89
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.04
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.33	0.35	0.39	0.32	0.12	< 0.10	< 0.10	1.12	3.38
PBDE#100 ng/g	0.43	0.40	0.31	0.31	0.71	0.23	0.37	1.59	6.37
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	0.32	3.62
PBDE#154 ng/g	0.14	0.16	< 0.10	0.10	0.24	0.10	0.16	0.58	6.19
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.73	2.65	2.02	2.03	3.92	1.59	2.34	7.72	28.44
	WL20	WL21	WL22	WL23	WL24	WL25	WL26	WL27	WL28
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	31.5	31.0	30.7	31.5	32.5	31.5	33.0	33.0	32.0
Avg. Weight (g)	848.30	716.60	692.6	954.20	853.90	979.30	1051.00	1114.40	941.10
% Lipid	1.33	0.71	0.93	1.26	1.06	1.46	0.98	0.58	1.03
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	0.11	0.11	0.19	< 0.10	< 0.10	0.10
PBDE#47 ng/g	1.22	1.04	0.58	1.75	1.79	3.53	1.47	0.50	< 0.10
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.14	< 0.10	< 0.10	0.49
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.19
PBDE#99 ng/g	0.35	0.24	0.27	0.45	0.31	0.90	0.55	0.15	< 0.10
PBDE#100 ng/g	0.43	0.26	0.20	0.59	0.63	1.46	0.66	0.18	0.32
PBDE#153 ng/g	0.10	< 0.10	< 0.10	0.10	0.15	0.41	0.21	< 0.10	< 0.10
PBDE#154 ng/g	0.27	0.11	< 0.10	0.26	0.22	0.72	0.34	< 0.10	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.37	1.65	1.05	3.26	3.21	7.35	3.23	0.83	1.10

Table II- 3 (continued). PBDE Results for White Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	WL29	WL30	WL31	WL32	WL33	WL34	WL35	WL36	WL37
	Largemouth Bass	Northern Pike	Northern Pike	Common Carp	Common Carp	Northern Pike	Northern Pike	Walleye	Spottail Shiner
Collection Date	8/23/06	8/23/06	8/23/06	8/24/06	8/24/06	8/23/06	8/23/06	8/23/06	6/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	29.5	54.0	49.5	27.0	53.5	53.5	47.5	43.0	10.5
Avg. Weight (g)	662.00	1521.50	802.90	620.60	4122.60	1510.40	942.50	1358.90	8.43
% Lipid	0.43	0.69	0.46	2.57	5.54	1.10	0.61	3.40	0.74
PBDE#28 ng/g	0.21	0.12	< 0.10	< 0.10	0.27	0.17	< 0.10	0.83	< 0.10
PBDE#47 ng/g	2.85	1.61	0.36	0.21	2.10	2.32	1.30	13.75	0.47
PBDE#66 ng/g	0.28	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.43	< 0.10
PBDE#85 ng/g	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.72	0.37	0.13	< 0.10	0.11	0.53	0.25	3.35	0.10
PBDE#100 ng/g	1.06	0.60	0.15	< 0.10	0.51	0.80	0.44	4.62	< 0.10
PBDE#153 ng/g	0.24	0.10	< 0.10	< 0.10	< 0.10	0.15	< 0.10	0.82	< 0.10
PBDE#154 ng/g	0.43	0.25	< 0.10	< 0.10	0.17	0.26	0.14	1.66	< 0.10
PBDE#183 ng/g	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	6.04	3.05	0.64	0.21	3.16	4.23	2.13	25.46	0.57
	WL38	WL39	WL40	WL41	WL42	WL43	WL44	WL45	WL46
	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Northern Pike	Northern Pike	Northern Pike
Collection Date	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/24/06	8/23/06	8/23/06	8/23/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	61.5	45.0	45.5	52.0	47.8	55.5	50.5	45.0	54.3
Avg. Weight (g)	7155.90	4798.80	2352.70	3111.80	2680.50	4522.20	1516.90	1453.20	1433.20
% Lipid	4.63	7.16	6.71	10.41	4.92	3.42	0.28	0.29	0.38
PBDE#28 ng/g	0.26	0.27	0.17	0.81	1.82	0.17	< 0.10	< 0.10	0.13
PBDE#47 ng/g	1.63	2.23	1.10	5.23	9.01	1.31	1.00	0.69	2.77
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	0.23	0.18	0.76
PBDE#100 ng/g	0.49	0.51	0.25	1.25	2.67	0.37	0.32	0.22	1.10
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.20
PBDE#154 ng/g	0.14	0.17	< 0.10	0.50	0.61	0.13	0.11	0.11	0.40
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.52	3.29	1.52	7.79	14.11	1.98	1.66	1.20	5.36
	WL47	WL48	WL49	WL50	WL51	WL52	WL53	W54	
	Northern Pike	Northern Pike	Northern Pike	Common Carp	Walleye	Walleye	Walleye	Walleye	
Collection Date	8/23/06	8/23/06	8/23/06	8/23/06	9/20/06	9/20/06	7/18/06	7/18/06	
Number of Fish	1	1	1	1	1	1	1	1	
Avg. Length (cm)	41.5	41.5	38.9	65.0	46.8	44.3	44.6	40.6	
Avg. Weight (g)	712.40	757.10	660.20	6661.20	1234.66	1199.91	1185.41	1195.61	
% Lipid	0.54	0.50	0.21	13.43	1.47	2.52	1.52	2.52	
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	2.12	< 0.10	< 0.10	< 0.10	< 0.11	
PBDE#47 ng/g	0.70	0.73	0.22	14.16	1.93	1.13	1.31	1.64	
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
PBDE#99 ng/g	0.16	0.15	< 0.10	0.21	0.32	0.43	0.35	0.39	
PBDE#100 ng/g	0.23	0.22	< 0.10	3.62	0.67	0.50	0.39	0.44	
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	
PBDE#154 ng/g	< 0.10	< 0.10	< 0.10	1.42	0.20	0.15	0.13	0.23	
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
TOTAL ng/g	1.09	1.10	0.22	21.53	3.25	2.21	2.18	2.70	

Table II- 4. PBDE Results for Saginaw Bay Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	SB01	SB02	SB03	SB04	SB05	SB06	SB07	SB08	SB09
	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	38.0	33.5	40.0	56.5	46.0	26.5	29.0	26.8	25.0
Avg. Weight (g)	370.90	332.50	434.50	1506.90	851.00	437.42	620.50	481.90	437.20
% Lipid	0.62	0.16	0.14	0.41	0.69	0.67	0.86	1.46	0.73
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	1.24	0.32	0.50	1.26	0.75	0.63	1.98	1.52	0.88
PBDE#66 ng/g	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.45	0.10	0.14	0.38	0.14	0.13	0.63	0.32	0.18
PBDE#100 ng/g	0.40	< 0.10	0.14	0.34	0.22	0.19	0.60	0.41	0.25
PBDE#153 ng/g	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10
PBDE#154 ng/g	0.27	< 0.10	< 0.10	0.20	0.16	0.14	0.35	0.24	0.16
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.59	0.42	0.78	2.18	1.27	1.09	3.67	2.49	1.47
	SB10	SB11	SB12	SB13	SB14	SB15	SB18	SB19	SB20
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Bluntnose Minnow	Bluntnose Minnow	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date	8/2/06	8/2/06	8/2/06	8/2/06	7/26/06	7/26/06	7/26 & 7/28/06	7/26 & 7/28/06	7/26 & 7/28/06
Number of Fish	1	1	1	1	61	29	1	30	7
Avg. Length (cm)	24.5	19.5	18.0	16.3	4.0	6.1	20.0	4.7	8.7
Avg. Weight (g)	462.05	190.76	152.07	108.43	0.44	2.25	148.84	1.18	8.77
% Lipid	1.29	1.45	0.63	0.95	2.44	4.09	1.15	1.52	1.57
PBDE#28 ng/g	< 0.10	< 0.10	0.11	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	1.43	0.89	0.92	0.74	1.06	2.99	0.94	1.22	0.94
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.33	0.17	0.12	0.19	0.13	0.10	0.18	0.43	0.51
PBDE#100 ng/g	0.41	0.28	0.27	0.24	0.27	0.74	0.29	0.27	0.43
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.35	0.22	0.16	0.21	0.17	0.25	0.18	0.15	0.18
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	2.52	1.56	1.58	1.38	1.73	4.18	1.59	1.66	2.34
	SB23	SB25	SB26	SB27	SB29	SB31	SB33	SB36	SB38
	Common Carp	Common Carp	Northern Pike	Round Goby	Round Goby	Round Goby	Sand Shiner	Sand Shiner	Banded Killifish
Collection Date	7/26-7/28/06	7/26-7/28/06	7/26/06	7/26/06	7/26/06	7/26/06	7/28/06	7/28/06	7/26/06
Number of Fish	14	8	1	40	22	19	37	40	55
Avg. Length (cm)	4.9	6.4	16.4	3.4	5.1	5.3	4.5	4.6	3.5
Avg. Weight (g)	4.46	7.88	36.63	0.98	2.96	3.65	1.37	1.43	0.53
% Lipid	3.52	4.00	1.07	2.75	2.83	2.76	1.74	2.01	1.55
PBDE#28 ng/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	1.25	1.19	1.10	1.12	1.40	1.02	0.80	0.82	0.76
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	< 0.10	0.23	0.71	0.63	0.47	0.13	0.16	0.37
PBDE#100 ng/g	0.24	0.21	0.36	0.34	0.40	0.28	0.25	0.32	0.24
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	0.12	0.16	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	< 0.10	0.17	0.29	0.34	0.21	0.17	0.21	0.17
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	1.59	1.40	1.86	2.58	2.93	1.98	1.35	1.51	1.54
	SB40	SB41	SB42	SB43	SB44	SB45	SB47	SB48	SB49
	Banded Killifish	White Sucker	Spottail Shiners	Spottail Shiners	Yellow Perch	Yellow Perch	Northern Pike	Northern Pike	Northern Pike
Collection Date	7/26/06	7/28/06	7/26/06	7/26/06	7/26/06	7/26/06	8/2/06	8/2/06	8/2/06
Number of Fish	18	3	30	32	28	30	1	1	1
Avg. Length (cm)	5.3	6.0	3.8	4.1	4.3	4.1	60.5	33.5	39.8
Avg. Weight (g)	1.77	4.41	0.84	1.08	1.38	1.14	2361.30	357.43	562.50
% Lipid	1.04	2.24	2.53	2.94	2.79	2.08	0.96	2.12	0.33
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	0.32	0.38	< 0.10
PBDE#47 ng/g	0.70	0.74	1.21	1.46	0.98	0.92	8.82	13.15	0.89
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	0.37	0.49	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	0.31	0.37	< 0.10
PBDE#99 ng/g	0.28	< 0.10	0.30	0.47	0.20	0.21	2.00	1.85	0.16
PBDE#100 ng/g	0.23	0.20	0.35	0.46	0.26	0.26	3.05	3.38	0.29
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	0.17	< 0.10	< 0.10	0.62	0.68	< 0.10
PBDE#154 ng/g	0.18	0.21	0.17	0.24	< 0.10	0.16	2.85	3.42	0.14
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	1.39	1.15	2.03	3.26	1.44	1.55	18.34	23.72	1.48

Table II- 4 (continued). PBDE Results for Saginaw Bay (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	SB50	SB51	SB52	SB53	SB54	SB55	SB56	SB57	SB58
	Northern Pike	Northern Pike	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp
Collection Date	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06	8/2/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	32.5	37.7	43.0	42.5	46.5	45.0	44.5	44.5	44.0
Avg. Weight (g)	254.26	550.77	2168.50	2028.30	3054.40	2534.90	2211.40	2292.40	2033.80
% Lipid	0.27	0.51	8.36	4.16	6.16	14.00	3.88	4.72	6.10
PBDE#28 ng/g	< 0.10	< 0.10	1.13	0.64	1.33	3.16	0.86	0.79	0.60
PBDE#47 ng/g	0.98	0.74	10.18	5.87	10.54	29.69	6.56	6.16	5.72
PBDE#66 ng/g	< 0.10	< 0.10	0.10	< 0.10	< 0.10	0.44	0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	0.31	0.19	< 0.10	1.08	0.30	0.29	0.19
PBDE#99 ng/g	0.19	0.18	< 0.10	< 0.10	< 0.10	0.11	0.28	< 0.10	< 0.10
PBDE#100 ng/g	0.27	0.20	2.51	1.39	2.51	6.97	1.73	1.52	1.33
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.19	0.16	0.76	0.56	0.81	2.63	0.58	0.64	0.60
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	1.63	1.28	14.99	8.65	15.19	44.08	10.41	9.40	8.44
	SB59	SB60	SB61	SB62	SB64	SB65	SB66	SB67	SB68
	Common Carp	Common Carp	Common Carp	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye
Collection Date	8/2/06	8/2/06	8/2/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	41.5	42.5	36.5	39.7	38.0	33.3	33.0	34.2	33.4
Avg. Weight (g)	2016.70	1928.50	1692.70	926.40	798.40	504.40	510.80	588.50	563.00
% Lipid	3.49	5.71	9.32	1.32	1.11	1.51	1.04	0.96	0.70
PBDE#28 ng/g	0.37	0.77	1.61	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10
PBDE#47 ng/g	3.70	7.39	15.96	1.57	0.94	1.66	0.89	1.80	0.86
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	0.12	< 0.10	0.38	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.11	0.13	0.17	0.59	0.20	0.36	0.19	0.52	0.22
PBDE#100 ng/g	0.95	1.88	3.39	0.51	0.26	0.52	0.26	0.49	0.26
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.33	0.83	1.30	0.56	0.23	0.42	0.24	0.25	0.18
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	5.58	11.00	22.81	3.47	1.63	2.96	1.58	3.16	1.52
	SB69	SB70	SB71	SB72	SB73				
	Walleye	Walleye	Walleye	Largemouth Bass	Largemouth Bass				
Collection Date	9/20/06	9/20/06	9/20/06	8/2/06	8/2/06				
Number of Fish	1	1	1	1	1				
Avg. Length (cm)	28.6	40.5	30.1	16.3	17.2				
Avg. Weight (g)	365.40	1029.50	422.60	100.89	142.09				
% Lipid	0.48	1.40	0.63	2.16	1.00				
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10				
PBDE#47 ng/g	0.75	1.25	0.89	0.84	1.04				
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10				
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10				
PBDE#99 ng/g	0.13	0.28	0.14	0.22	0.30				
PBDE#100 ng/g	0.20	0.34	0.23	0.25	0.35				
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10				
PBDE#154 ng/g	0.19	0.28	0.18	0.14	0.20				
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10				
TOTAL ng/g	1.27	2.15	1.44	1.45	1.89				

Table II- 5. PBDE Results for the Northern Lake Michigan Embayments (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	LCI 01	LCI 02	LCI 03	LCI 04	LCI 05	LCI 06	LCI 08	LCI 09	LCI 10
	Banded Killifish	Banded Killifish	Banded Killifish	White Sucker	Bluntnose Minnow	Bluntnose Minnow	White Sucker	White Sucker	White Sucker
Collection Date	8/8 & 8/15/06	8/8 & 8/15/06	8/8 & 8/15/06	8/8 & 8/15/06	8/15/06	8/15/06	8/8 & 8/15/06	8/8 & 8/15/06	8/8 & 8/15/06
Number of Fish	34	18	17	3	36	12	3	2	23
Avg. Length (cm)	4.3	5.2	5.7	10.1	4.5	5.6	11.4	15.0	6.4
Avg. Weight (g)	1.20	1.97	2.72	19.26	1.00	2.99	27.03	64.51	4.39
% Lipid	2.63	2.91	2.65	1.84	3.42	6.42	1.99	1.77	3.60
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	0.44	0.68	0.59	0.55	0.60	1.09	0.51	0.43	0.54
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.16	0.12	0.12	< 0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#100 ng/g	0.19	0.21	0.17	0.19	0.26	0.32	0.16	0.15	0.14
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	0.79	1.01	0.88	0.74	1.15	1.41	0.67	0.58	0.68
	LCI 12	LCI 13	LCI 14	LCI 15	LCI 16	LCI 17	LCI 28	LCI 29	LCI 30
	White Sucker	Round Goby	Round Goby	Round Goby	Sand Shiner	Sand Shiner	Common Carp	Common Carp	Common Carp
Collection Date	8/8 & 8/15/06	8/15-8/17/06	8/15-8/17/06	8/15-8/17/06	8/15/06	8/15/06	8/8/06	8/8/06	8/8/06
Number of Fish	32	25	13	6	34	34	1	1	1
Avg. Length (cm)	5.3	5.0	6.9	8.3	4.0	3.9	54.5	55.5	53.0
Avg. Weight (g)	2.72	2.92	7.42	12.22	0.90	0.81	4930.30	4829.50	3528.40
% Lipid	3.26	2.74	2.42	2.59	4.09	4.45	15.76	11.84	11.31
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	0.62	0.63	0.61	0.57	0.87	1.12	3.72	5.55	10.94
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	0.25	0.19	0.18	< 0.10	0.13	< 0.10	0.48	< 0.10
PBDE#100 ng/g	0.18	0.22	0.22	0.20	0.35	0.45	0.85	1.34	2.79
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.16	0.24	0.47	0.44	1.21
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	0.80	1.10	1.02	0.95	1.38	1.94	5.64	8.84	16.85
	LCI 31	LCI 32	LCI 33	LCI 34	LCI 35	LCI 36	LCI 37	LCI 38	LCI 39
	Common Carp	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike	Northern Pike
Collection Date	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	55.5	16.3	14.5	18.3	15.7	24.6	39.5	33.5	42.3
Avg. Weight (g)	4037.00	39.08	24.32	54.36	33.47	139.93	801.80	355.60	644.10
% Lipid	8.71	0.77	0.94	1.31	1.03	0.22	0.56	0.42	0.17
PBDE#28 ng/g	1.59	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	8.55	0.39	0.26	0.48	0.19	< 0.10	0.21	0.38	< 0.10
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	0.13	0.11	< 0.10	0.12	< 0.10	< 0.10	0.17	< 0.10
PBDE#100 ng/g	2.03	0.11	0.09	0.15	< 0.10	< 0.10	< 0.10	0.16	< 0.10
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	0.52	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	12.69	0.63	0.46	0.63	0.31	0.00	0.21	0.71	0.00
	LCI 40	LCI 41	LCI 42	LCI 43	LCI 44	LCI 45	LCI 46	LCI 47	LCI 48
	Northern Pike	Northern Pike	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Walleye
Collection Date	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	47.0	47.8	53.5	48.0	57.3	25.5	49.5	54.5	21.3
Avg. Weight (g)	962.40	1084.80	3634.80	2450.70	3999.00	557.40	3385.00	3924.20	155.30
% Lipid	0.38	0.42	3.06	3.97	15.52	1.80	1.36	8.17	1.32
PBDE#28 ng/g	< 0.10	< 0.10	0.65	1.19	17.02	< 0.10	0.15	0.99	< 0.10
PBDE#47 ng/g	0.21	0.17	3.11	6.48	163.45	0.20	0.74	5.64	0.24
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.17	< 0.10	< 0.10	< 0.10	0.10
PBDE#100 ng/g	< 0.10	< 0.10	1.02	1.74	41.89	< 0.10	0.21	1.40	< 0.10
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	< 0.10	0.33	0.93	9.56	< 0.10	0.00	0.66	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	0.21	0.17	5.11	10.49	232.09	0.20	1.10	8.69	0.34
	LCI 49	LCI 50	LCI 51	LCI 52	LCI 53	LCI 54	LCI 55	LCI 57	LCI 58
	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass	Largemouth Bass
Collection Date	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06
Number of Fish	1	1	1	1	1	1	1	1	1
Avg. Length (cm)	16.5	16.4	15.8	23.5	16.0	18.0	14.2	12.5	15.5
Avg. Weight (g)	133.30	112.70	126.80	408.90	138.20	163.60	77.90	55.20	95.10
% Lipid	0.73	0.89	0.48	1.37	0.96	0.33	0.64	2.28	0.33
PBDE#28 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#47 ng/g	0.22	0.20	0.11	0.57	0.28	0.11	0.40	0.72	0.12
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.16	0.11	0.10	< 0.10	0.11	0.11	0.46	0.32	< 0.10
PBDE#100 ng/g	< 0.10	< 0.10	< 0.10	0.16	0.12	< 0.10	0.18	0.22	< 0.10
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10
PBDE#154 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	0.38	0.31	0.21	0.73	0.51	0.22	1.29	1.38	0.12

Table II- 5 (continued). PBDE Results for the Northern Lake Michigan Embayments (2006).
(Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	LCI 59	LCI 60	LCI 61	LCI 62	LCI 63	LCI 64	LCI 65	LCI 66	LCI 67	LCI 68
	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	Walleye	White Sucker	White Sucker
Collection Date	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	9/20/06	8/8 & 8/15/06	8/8 & 8/15/06
Number of Fish	1	1	1	1	1	1	1	1	2	1
Avg. Length (cm)	41.7	30.0	28.5	31.2	49.5	10.5	41.5	54.0	13.9	16.0
Avg. Weight (g)	1366.60	386.10	409.00	538.00	2222.60	100.30	1044.60	2765.50	54.18	88.26
% Lipid	1.89	1.81	1.11	0.96	2.59	2.15	1.84	1.65	1.82	1.03
PBDE#28	ng/g	< 0.10	< 0.10	< 0.10	0.15	< 0.10	0.10	0.10	< 0.10	< 0.10
PBDE#47	ng/g	2.06	0.21	0.30	4.93	2.37	1.54	16.10	0.44	0.42
PBDE#66	ng/g	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99	ng/g	0.53	< 0.10	< 0.10	< 0.10	1.57	0.51	0.30	< 0.10	< 0.10
PBDE#100	ng/g	0.69	< 0.10	0.10	< 0.10	1.94	0.79	0.47	6.02	0.13
PBDE#153	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	0.29	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154	ng/g	0.24	< 0.10	< 0.10	< 0.10	0.85	0.30	0.27	< 0.10	< 0.10
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL	ng/g	3.64	0.21	0.40	0.20	9.93	3.97	2.68	31.09	0.55
	LCI 69	LCI 70	LCI 71	LCI 72	LCI 73	LCI 74	LCI 75	LCI 76	LCI 77	LCI 78
	White Sucker	White Sucker	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch
Collection Date	8/8 & 8/15/06	8/8 & 8/15/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06
Number of Fish	1	1	5	4	4	3	2	1	8	7
Avg. Length (cm)	16.0	16.0	10.1	10.3	11.3	11.6	12.6	16.0	8.5	8.7
Avg. Weight (g)	91.02	78.24	17.92	19.86	28.87	30.51	35.08	79.08	11.47	12.92
% Lipid	2.47	1.39	3.95	2.86	3.76	3.02	3.07	2.02	2.87	2.60
PBDE#28	ng/g	< 0.10	0.12	< 0.10	< 0.10	< 0.10	0.13	0.10	0.14	< 0.10
PBDE#47	ng/g	0.55	0.35	0.85	0.65	0.87	0.59	1.03	0.55	0.43
PBDE#66	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	0.13	< 0.10
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10
PBDE#99	ng/g	< 0.10	0.20	0.13	0.23	0.14	0.25	0.11	0.22	< 0.10
PBDE#100	ng/g	0.14	0.37	0.18	0.40	0.25	0.42	0.37	0.27	0.16
PBDE#153	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#154	ng/g	< 0.10	0.16	< 0.10	0.20	0.12	0.18	0.15	0.17	< 0.10
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL	ng/g	0.69	0.35	1.70	0.96	1.70	1.10	2.04	1.59	0.59
	LCI 79	LCI 80	LCI 81	LCI 82	LCI 83	LCI 84	LCI 85	LCI 86		
	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Yellow Perch	Largemouth Bass	Largemouth Bass	Largemouth Bass		
Collection Date	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06	8/8/06		
Number of Fish	8	8	8	5	1	20	17	9		
Avg. Length (cm)	9.6	9.3	9.6	10.3	16.0	5.4	6.4	7.3		
Avg. Weight (g)	16.61	14.94	17.26	22.79	86.15	3.65	5.86	8.75		
% Lipid	3.09	2.91	3.27	3.11	2.84	1.74	1.62	1.42		
PBDE#28	ng/g	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10		
PBDE#47	ng/g	0.58	0.43	0.53	0.62	1.74	0.19	0.23		
PBDE#66	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#85	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#99	ng/g	0.15	0.11	0.15	0.14	< 0.10	0.11	< 0.10		
PBDE#100	ng/g	0.22	0.16	0.21	0.22	< 0.10	< 0.10	< 0.10		
PBDE#153	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#154	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#183	ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
TOTAL	ng/g	0.95	0.70	0.89	0.98	2.77	0.19	0.34	0.24	

Table II- 6. PBDE Results for Kalamazoo Lake (2006). (Largemouth bass and walleye are individual skin-on fillets; northern pike and common carp are individual skin-off fillets; all other species are whole fish composites)

	KL01	KL02	KL03	KL04	KL05	KL06	KL07	KL08	KL09
	Bluntnose Minnow	Bluntnose Minnow	Bluntnose Minnow	Bluntnose Minnow	Spottail Shiner	Spottail Shiner	Spottail Shiner	Banded Killifish	Banded Killifish
Collection Date	6/13/06	6/13/06	6/13/06	6/13/06	6/13/06	6/13/06	6/13/06	6/13/06	6/13/06
Number of Fish	11	22	10	20	14	15	7	6	14
Avg. Length (cm)	6.7	4.5	6.3	5.2	6.3	6.1	8.0	8.9	5.5
Avg. Weight (g)	5.03	1.45	4.48	2.28	4.36	3.76	7.95	10.62	2.91
% Lipid	3.43	3.10	4.63	2.32	6.31	4.67	4.21	2.03	2.82
PBDE#28 ng/g	0.24	0.20	0.42	0.13	0.20	0.14	0.46	< 0.10	< 0.10
PBDE#47 ng/g	4.34	2.33	7.07	2.51	3.52	2.14	4.36	1.41	2.00
PBDE#66 ng/g	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	< 0.10	0.12	< 0.10	< 0.10	0.14	< 0.10	0.16	0.63	1.09
PBDE#100 ng/g	1.09	0.71	1.95	0.70	1.82	1.54	2.33	0.56	0.72
PBDE#153 ng/g	< 0.10	0.11	< 0.10	< 0.10	0.53	0.46	0.51	0.21	0.24
PBDE#154 ng/g	0.32	0.30	0.53	0.21	0.84	0.83	0.86	0.37	0.37
PBDE#183 ng/g	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	5.99	4.09	9.97	3.55	7.05	5.11	8.68	3.18	4.42
	KL10	KL11	KL12	KL13	KL14	KL15	KL16	KL18	KL19
	Banded Killifish	Banded Killifish	Mimic Shiner	Mimic Shiner	Yellow Perch	Yellow Perch	Round Goby	Common Carp	Common Carp
Collection Date	6/13/06	6/13/06	6/13/06	6/13/06	6/13 & 8/1/06	6/13/06	6/13/06	6/13/06	6/13/06
Number of Fish	14	18	28	28	3	3	2	1	1
Avg. Length (cm)	7.4	7.1	4.6	4.7	13.7	11.0	6.3	42.1	42.5
Avg. Weight (g)	6.96	5.98	1.61	1.81	47.37	23.90	6.29	1778.50	1825.20
% Lipid	1.85	2.12	3.99	5.21	3.55	3.69	1.41	2.18	0.94
PBDE#28 ng/g	0.12	0.23	0.32	0.43	0.18	0.23	< 0.10	0.57	0.34
PBDE#47 ng/g	1.34	1.92	8.63	9.15	3.56	6.60	0.75	4.63	2.36
PBDE#66 ng/g	< 0.10	0.23	< 0.10	< 0.10	0.11	0.13	< 0.10	< 0.10	< 0.10
PBDE#85 ng/g	< 0.10	0.29	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PBDE#99 ng/g	0.58	0.90	< 0.10	0.13	0.37	0.97	0.35	< 0.10	0.11
PBDE#100 ng/g	0.49	0.84	2.60	2.55	1.28	2.44	0.25	1.54	0.88
PBDE#153 ng/g	0.17	0.44	0.51	0.41	0.11	0.33	0.11	< 0.10	< 0.10
PBDE#154 ng/g	0.30	0.51	1.01	0.91	0.46	0.94	0.15	0.52	0.27
PBDE#183 ng/g	< 0.10	0.30	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TOTAL ng/g	3.00	5.66	13.07	13.58	6.07	11.64	1.61	7.26	3.96
	KL20	KL22	KL23	KL24	KL25	KL26	KL27	KL28	
	Common Carp	Largemouth Bass	Largemouth Bass	Largemouth Bass	Common Carp	Common Carp	Common Carp	Common Carp	
Collection Date	6/13/06	8/1/06	8/1/06	8/1/06	8/1/06	8/1/06	8/1/06	8/1/06	
Number of Fish	1	1	1	1	1	1	1	1	
Avg. Length (cm)	50.5	14.8	18.0	33.0	48.3	41.0	43.0	41.0	
Avg. Weight (g)	3900.50	72.66	132.77	870.20	3035.90	1606.80	2242.40	1967.00	
% Lipid	2.39	1.74	3.61	1.43	4.72	3.96	3.16	5.00	
PBDE#28 ng/g	4.1	0.18	0.18	0.32	0.53	0.16	3.92	20.85	
PBDE#47 ng/g	32.31	3.67	4.06	5.82	4.62	1.62	23.69	125.38	
PBDE#66 ng/g	< 0.10	0.13	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
PBDE#99 ng/g	< 0.10	1.16	1.11	1.25	< 0.10	< 0.10	0.10	0.20	
PBDE#100 ng/g	11.94	1.22	1.50	2.05	1.53	0.40	10.50	57.61	
PBDE#153 ng/g	< 0.10	0.20	0.30	0.42	< 0.10	< 0.10	< 0.10	0.12	
PBDE#154 ng/g	3.94	0.43	0.56	0.60	0.61	0.15	2.13	14.29	
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
TOTAL ng/g	52.29	6.99	7.71	10.61	7.29	2.33	40.34	218.45	
	KL29	KL30	KL31	KL32	KL33	KL34	KL35		
	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Common Carp	Yellow Perch		
Collection Date	8/1/06	8/1/06	8/1/06	8/1/06	8/1/06	8/1/06	6/13/06		
Number of Fish	1	1	1	1	1	1	4		
Avg. Length (cm)	40.2	50.0	46.5	29.5	44.5	46.5	9.4		
Avg. Weight (g)	1618.30	3157.20	2133.30	681.60	2325.40	2735.70	16.91		
% Lipid	3.03	4.79	5.90	1.24	1.70	1.58	1.51		
PBDE#28 ng/g	0.98	0.54	0.96	< 0.10	0.13	2.66	< 0.10		
PBDE#47 ng/g	7.29	4.71	6.64	0.51	1.27	22.41	0.47		
PBDE#66 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#85 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#99 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#100 ng/g	3.35	1.38	1.90	0.12	0.54	9.23	0.11		
PBDE#153 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
PBDE#154 ng/g	0.63	0.49	0.57	< 0.10	0.18	2.27	< 0.10		
PBDE#183 ng/g	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
TOTAL ng/g	12.25	7.12	10.07	0.63	2.12	36.57	0.58		