A Fisheries Survey of Selected Lake Erie Coastal Marshes in Michigan, 2005

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Introduction:
Coastal marshes are an important component of fisheries habitat in western Lake Erie. These marsh habitats are vital and unique for a number of reasons. The extensive use of wetlands by fish and wildlife is related to their diverse structural habitat and high primary productivity (Jude and Pappas 1992). These marshes are generally shallow, protected from wave energy, and have a diversity of emergent and submerged vegetation. The aquatic macrophytes provide structural heterogeneity that is particularly important for providing refugia for small fish, as well as providing substrate for large populations of invertebrate species which is a source of food for fishes. Because these areas are shallow and protected, they warm quicker in the spring than the open water. Also, rivers and streams bring downstream drift and nutrients to near shore waters. These factors promote increased productivity in marshes versus open water habitat. Herdendorf (1987) found that phytoplankton production in western Lake Erie marshes is much higher than in offshore areas. The availability of coastal marshes is especially important given that estimates of only 10% of original coastal marshes remain along Lake Erie (Herdendorf 1987).

Coastal marshes typically have a high number of fish species associated with them. This is because the Great Lakes fish community preferentially use coastal marshes and wetlands for spawning and nursery habitat (Wei et al. 2004). Jude and Pappas (1992) evaluated 113 species from open water and coastal wetlands habitats, from all five Great Lakes. Of this total, they found 82 species that are either resident or migrate seasonally into coastal wetlands for nursery, spawning, and shelter.

The coastal marshes of the lower Detroit River and Michigan's coastal marshes of Lake Erie are now protected under the Detroit River International Wildlife Refuge. In 2001 the refuge was established on the lower 18 miles of the Detroit River and in 2003 the refuge was expanded to include the Lake Erie coastline down to the Ohio/Michigan border. The purpose of the refuge is to protect remaining high-quality fish and wildlife habitats of the Detroit River and Lake Erie before they are lost to further development and to restore and enhance degraded wildlife habitats. In addition, establishment of the refuge will assist in efforts to conserve, enhance, and restore the native aquatic and terrestrial community characteristics of the Detroit River and Lake Erie (USFWS 2005).

The objective of this study was to document the fish community associated with coastal marshes in Michigan waters of Lake Erie. Since all of the sites were encompassed in the recently established Detroit River International Wildlife Refuge, this study also served to inventory fisheries resources of the refuge.

Methods:
Site Descriptions:
The fish community was sampled in 4 marsh complexes along the western basin of Lake Erie from September 12, 2005 to September 16, 2005 (Figure 1). Each marsh shared some similar habitat characteristics, however, even within a given marsh, there was a great degree of habitat variability resulting in different microhabitats. An effort was made to sample as wide a variety of habitat at each location as possible.

North Maumee Bay is an approximately 2,000 acre wetland complex (Figure 2). The Ottawa River and Halfway Creek are two tributaries to the bay, as well a number of smaller drains and creeks. The Woodtick Peninsula is a barrier that protects the bay from wave energy. In general, the marsh is relatively shallow with areas of submergent vegetation. Areas such as the mouth of the rivers and the channel behind the Woodtick Peninsula were found to have

extensive stands of emergent vegetation on the margins. Plant species include American lotus, cattails, Phragmites, rushes, and arrowhead. Due to the large size of this site, two days were dedicated to sampling this location.

The **Huron River Estuary** is located where the Huron River empties into Lake Erie (Figure 3), creating a freshwater estuary. The southern part of the estuary is bounded by the dike for the Pt. Mouillee State Game Area. There is an excavated channel that allows boating access from the Huron River to Lake Erie, but generally the estuary is characterized as shallow, having large areas of submergent vegetation. Many areas along the shoreline have lily pads, cattails, Phragmites and other emergent vegetation.

The **Swan Creek Estuary** is also a freshwater estuary, where Swan Creek empties into Lake Erie (Figure 4). It is similar to the Huron River Estuary, characterized as shallow, having large areas of submergent vegetation. Many areas along the shoreline have lily pads, cattails, Phragmites and other emergent vegetation.

Plum Creek Bay is largely a drowned river mouth where Plum Creek enters into Lake Erie (Figure 5). There were large beds of American lotus throughout the bay, as well as emergent and submergent vegetation along much of the shoreline. Based on historic aerial photographs, extensive filling has taken place where the bay meets Lake Erie. Currently a power plant discharges cooling water into the canal that flows to Lake Erie (Figure 5). This results in significant increases in water temperature within the canal, but this thermal discharge also backs up into Plum Creek Bay and affects a large area lake-ward into Lake Erie.

Fish Sampling:

Fish community sampling was conducted using day-time seining and night-time electrofishing. Seining was done using one of two seines; either a 43 foot long, 5 foot tall, 3/8 inch mesh seine or a 25 foot long, 5 foot tall, ¼ inch mesh seine. The larger seine was used where possible, but some sites were restricted in size and required the smaller seine. The specific protocol varied due to site specific conditions. At some locations, the net was stretched out perpendicular to shore. The brail on shore remained stationary and the outside brail was swung in an arc towards shore. At other locations, the net was deployed perpendicular to shore, both brails were walked along shore for a short distance (30-50 feet), and then the outside brail was swung in an arc towards shore while the inside brail remained stationary. The third technique included walking the net off shore and stretching it out so the net was parallel to shore. Then both brails were walked towards shore at the same time.

Regardless of the specific technique used, the processing protocol was the same. All fish caught in the seines were collected into sorting tubs. The fish were identified to species, measured to the nearest inch, and the fish were released. Fish measuring 1.0 to 1.9 inches were recorded in the 1 inch group, from 2.0 to 2.9 inches in the 2 inch group, as so forth.

The day-time crew also had responsibility for selecting and marking the night-time electrofishing locations. GPS coordinates were recorded for the start location and a stake was used for visual confirmation.

Two electrofishing boats were used to collect fish samples after sunset. Each boat used a Smith-Root electrofishing unit, operated at 250 volts, pulsed DC, producing 6-10 amps. Each crew began by positioning themselves at the designated starting point identified by the day-time crew. A 10-minute transect was run and an effort was made to net all fish encountered and place them in a holding tank. After the transect was completed, all fish in the holding tub were

identified to species, measured to the nearest inch, and released. The crew then resumed electrofishing where they left off from the first site and continued along the transect for an additional 10-minutes. However, on this second run, only species that were not collected during the first run were collected. Common species that were readily identified by the netters were not collected on the second half of the run. Any new species that were collected were measured and recorded. At the Huron River Estuary site, only the first 10-minute transect was completed at two of the six transects locations, because sampling habitat was restricted in size.

The advantage to this fish sampling protocol is that it resulted in a quantitative survey; allowing for catch-per-effort comparisons based on the first half of the run. But it also provided additional sampling time with the second half of the run, to target less common species. It took a significant amount of time to process the catch from the first half of the run. By passing up the common, easily identifiable species on the second half of the run, it allowed additional sampling time which would increase the likelihood of catching species that are not as common. Only a few new species were caught on the second half of the run, and these consisted of only a few individuals. Therefore, the data from the second half of the run was combined with that of the first half of the run.

Results:
A total of 47 species were represented in the catch from all sites and gear combined. This total excludes a few specimens that were identified as hybrid sunfish. These fish were clearly hybrids, having features of both species. It is not uncommon to see hybridization occur, but for the purposes of data analysis, these fish were excluded.

North Maumee Bay
Ten samples were taken by seining and 12 paired electrofishing sites were sampled during September 12-13, 2005. A total of 2,433 fish were collected represented by 35 species, from 13 families (Table 1). White perch, gizzard shad, pumpkinseeds, and largemouth bass were the most frequently caught fish and accounted for 63% of the total catch by number.

Huron River Estuary
Three samples were taken by seining and 6 paired electrofishing sites were sampled during September 14, 2005. A total of 779 fish were collected represented by 37 species from 15 families (Table 2). Bluegill, rock bass, largemouth bass, and gizzard shad were the most frequently caught fish and accounted for 50% of the total catch by number.

Swan Creek Estuary
Four samples were taken seining and 6 paired electrofishing sites during September 15, 2005. A total of 1,590 fish were collected represented by 38 species from 13 families (Table 3). Bluegill, pumpkinseed, largemouth bass, and bluntnose minnows were the most frequently caught fish and accounted for 38% of the total catch by number.

Plum Creek Bay
Three samples were collected with seines during September 16, 2005. A total of 329 fish were collected represented by 12 species from 4 families (Table 4). Bluegill, pumpkinseed, and common shiners were the most frequently caught fish and accounted for 72% of the total catch by number.

Site comparisons
Bluegills, pumpkinseeds, and gizzard shad were consistently some of the species collected most commonly among sites. The rank order of catch per effort (CPE) was similar among sites

for both gear types; Swan Creek had the highest catches, followed by North Maumee Bay, and finally the Huron River (Tables 5 and 6). There was not comparison data between gear for Plum Creek Bay, but the seine catch ranked third highest, between North Maumee Bay and the Huron River. For the three locations that had both seining and electrofishing data, the CPE varied among sites, but the number of species represented at each site was similar; 35 species at North Maumee Bay, 37 species at Huron River Estuary, and 38 species at Swan River Estuary.

Gear comparison

Five species were caught with seines, but not by electrofishing; and 14 species were caught electrofishing, but not with seines (Table 8). There are two reasons contributing to the differences in catch. The five species caught only in the seine were present in small numbers in the sample. In addition, species like tadpole madtom and johnny darters are small, demersal species that would not be readily captured. Many of the sites sampled were very turbid, limiting visibility and efficiency of electrofishing.

The species that were caught electrofishing, but not seining, tended to be larger species that were better able to avoid the seine. However, it is difficult to make direct comparisons of catch between the two gear types because they were used at different time periods (day versus night). Some species may have been present in shallow habitats at night, but not during the day.

Other Species

In addition to the game and forage fish species collected, there were a few species of special interest. Silver chubs were found at two of the four sampling locations. This is significant because silver chubs were reported to be rare in Michigan and were thought to be extirpated from Lake Erie in the 1970s (Becker 1983). Their decline was thought to be linked to the decline in their primary food source in Lake Erie, the mayfly. However, mayflies are once again abundant in the western basin of Lake Erie and may have resulted in their recovery. Although not abundant, silver chubs are caught regularly during annual MDNR fish surveys in the western basin (Jack Hodge, MDNR, Lake St. Clair Fisheries Research Station, Personal Communications).

Orangespotted sunfish were found at all four major locations and spotted suckers were found at 2 of the 4 locations. Both of these species are at the northern end of their range and are only found in southern Michigan (Becker 1983). The orangespotted sunfish is found in soft-bottomed habitat and is tolerant of silt. Similarly, the spotted sucker occurs most frequently over a soft bottom of muck or sand where there is plant detritus (Becker 1983). These habitats are consistent with those found in the marsh areas surveyed. Therefore, protection of these marshes is important to maintaining these species in Michigan.

Discussion:

A total of 47 species from 15 families were documented during this study. The species richness and composition are comparable to other studies conducted in Great Lakes coastal marshes (Table 9). A total of 25% of the total catch by number was comprised of species tolerant to turbidity, including gizzard shad, common carp, and goldfish. Although this is a high number of species we typically associate with degraded habitat, this is not unexpected. While coastal marshes are important to various life stages of fishes, many species only use the marshes seasonally. This sampling effort only lasted for a 5-day period in late September and so it is only a snapshot of the overall fisheries picture. Late in the summer season (like when this sampling effort took place), conditions can actually get hostile in coastal marshes because of

high water temperatures and occasional dissolved oxygen sags due to limited mixing, high biological oxygen demand, and high temperature.

Conversely, another 26% of the total catch by number was composed of game fish species such as bluegill, pumpkinseed, and largemouth bass. The majority of these species caught were juveniles. Coastal marshes serve as spawning and nursery habitat for a variety of fishes. For bluegills, pumpkinseeds, largemouth bass, smallmouth bass, and yellow perch, 86% of the catch was made up of YOY and yearling fish. However, there were high numbers of legal-sized gamefish (especially largemouth bass) in some areas.

In addition, another 18% of the total catch by number was made up of shiners and minnows. These are forage fish species that contribute not only to production in the marshes, but also contribute to the open water community in Lake Erie. Both Herdendorf (1987) and Stephenson (1990) provide evidence that coastal wetlands produce large numbers of forage fish, provide food for larger predatory species, and furnish spawning and nursery areas for many species of important fishes.

In conclusion, a great variety of fish species of various life stages use these Lake Erie coastal marshes. In the late 1980s, Herdendorf (1987) found that only 10% of the original coastal marshes remain along Lake Erie. Furthermore, Jude and Pappas (1992) concluded from evaluating marshes throughout the Great Lakes, that most remaining coastal wetlands are degraded or altered to some degree. Although, they reported that regardless of being degraded, the wetlands still functioned as important fish habitat by exporting large quantities of fish to avian, piscine, and mammalian food chains through predation, and second to the Great Lakes as young-of-the-year sport and forage fishes. The addition of the Michigan's coastal waters of Lake Erie to the Detroit International Wildlife Refuge will hopefully provide an additional measure of protection to this unique habitat.

Almost all of the Detroit River shoreline on the Michigan side has been filled and hardened. Similarly, marsh habitats along Lake St. Clair and the St. Clair River have been largely filled or otherwise eliminated. MDNR and other government agencies, partnering with citizen groups and individuals have joined efforts to protect remaining habitats and even restore degraded areas. Even so, we need to continue to inventory fish species in remaining natural areas to help provide a blue print for restored habitat.

Recommendations:
The objective of this study was to document the late summer fish community in four coastal marshes of Lake Erie. This study provides good baseline data on fish use and should be expanded to evaluate marsh areas of the Detroit River and St. Clair Flats. These are other important coastal areas that lack good fisheries survey data.

In addition, it would be good to sample these marsh areas seasonally to fully understand the fish use of these areas. The composition of marsh fish communities, in terms of species of fishes and their relative abundances, showed dramatic shifts over the seasons (Stephenson 1990). Many species only use marsh areas for specific stages during their life cycle and may not be captured there at other times.

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Figure 1. Map identifying the four sampling locations.

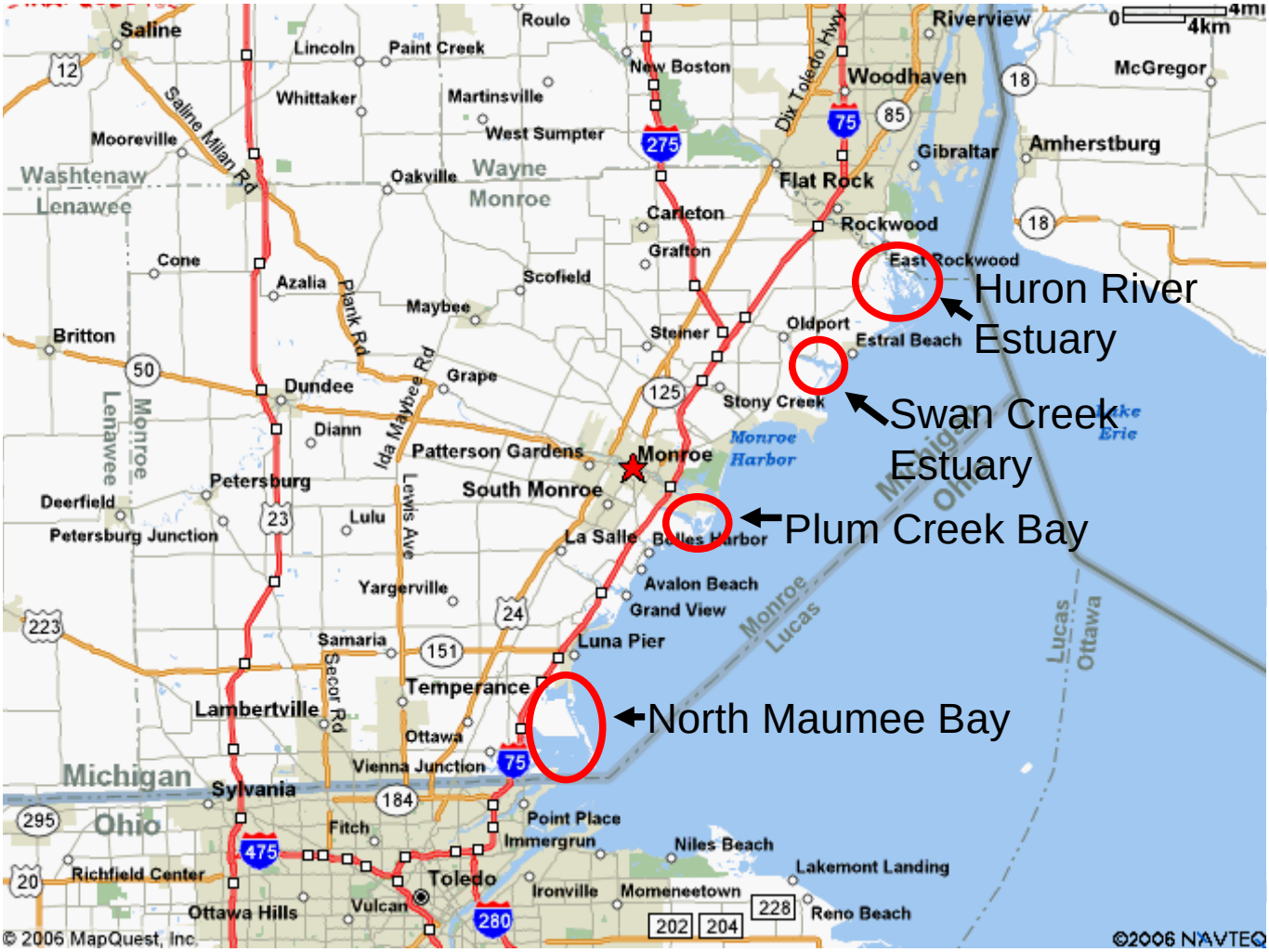

Figure 2. Sampling locations at the North Maumee Bay site. Numbered lines represent night time electrofishing transects and lettered dots represent day time seine locations. Electrofishing and seine sites were given unique sample labels, therefore numbers and letters do not necessarily follow numerically or alphabetically.

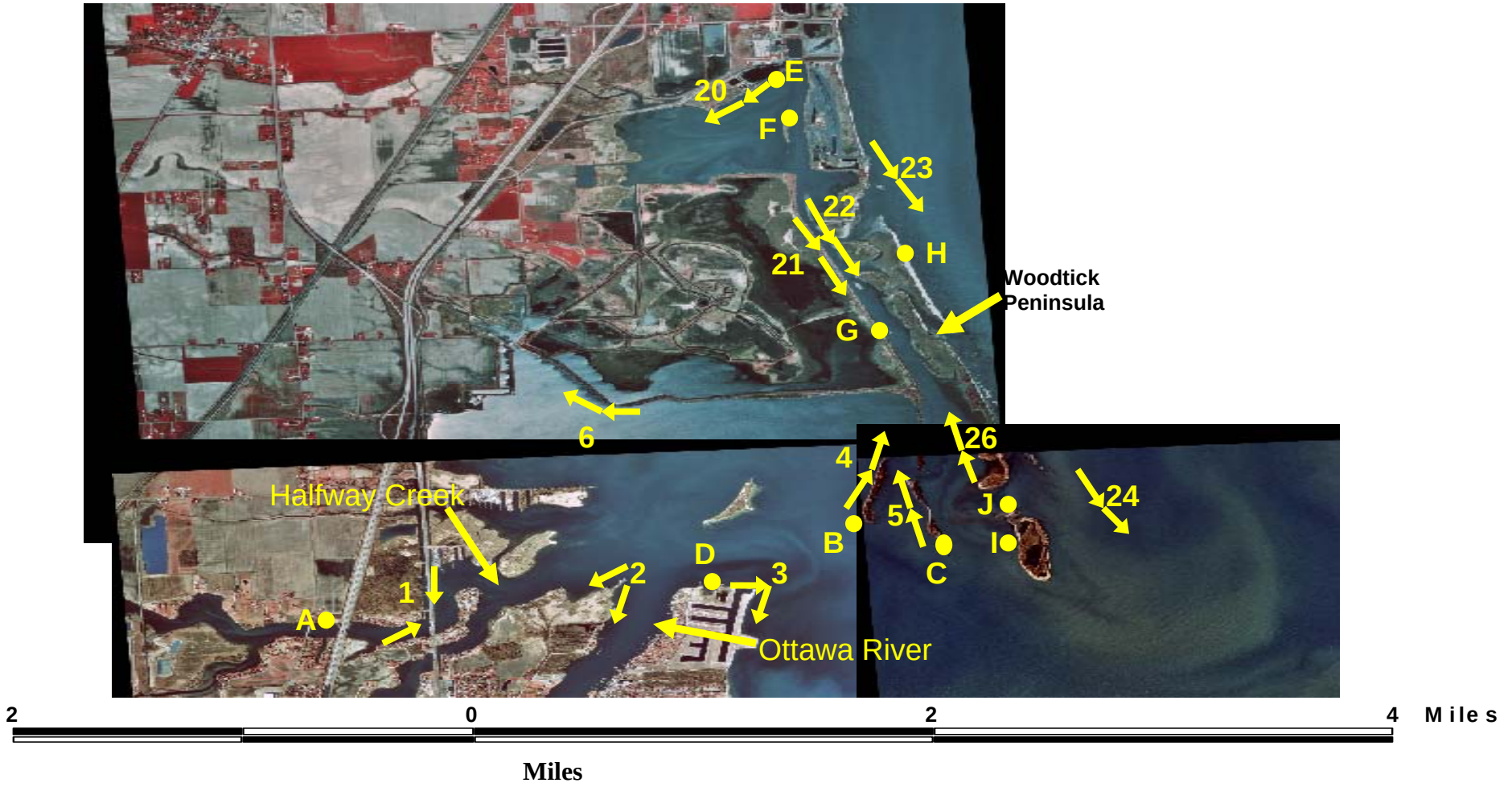

Figure 3. Sampling locations at the Huron River Estuary site. Numbered lines represent night time electrofishing transects and lettered dots represent day time seine locations. Electrofishing and seine sites were given unique sample labels, therefore numbers and letters do not necessarily follow numerically or alphabetically.

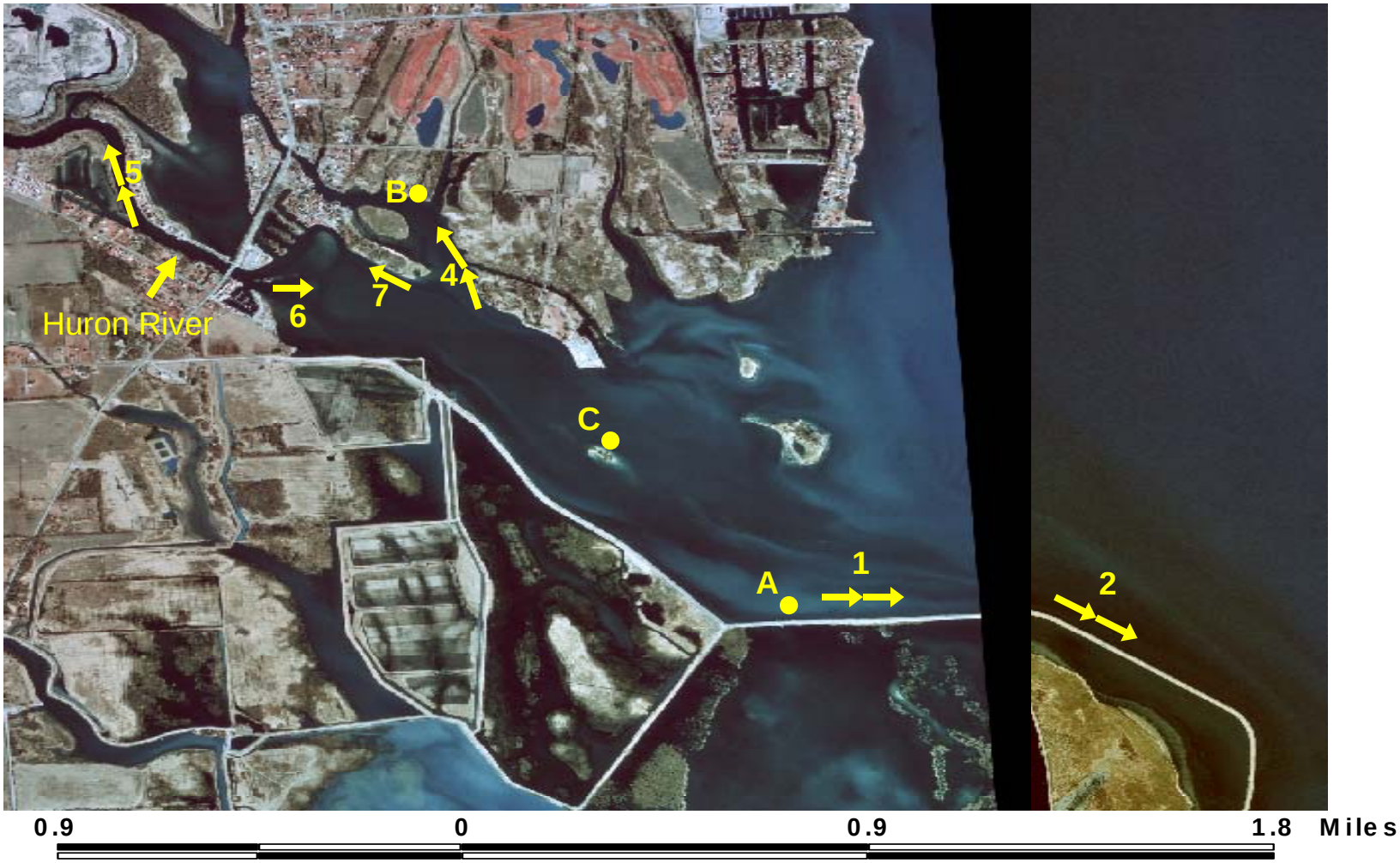

Figure 4. Sampling locations at the Swan Creek Estuary site. Numbered lines represent night time electrofishing transects and lettered dots represent day time seine locations.

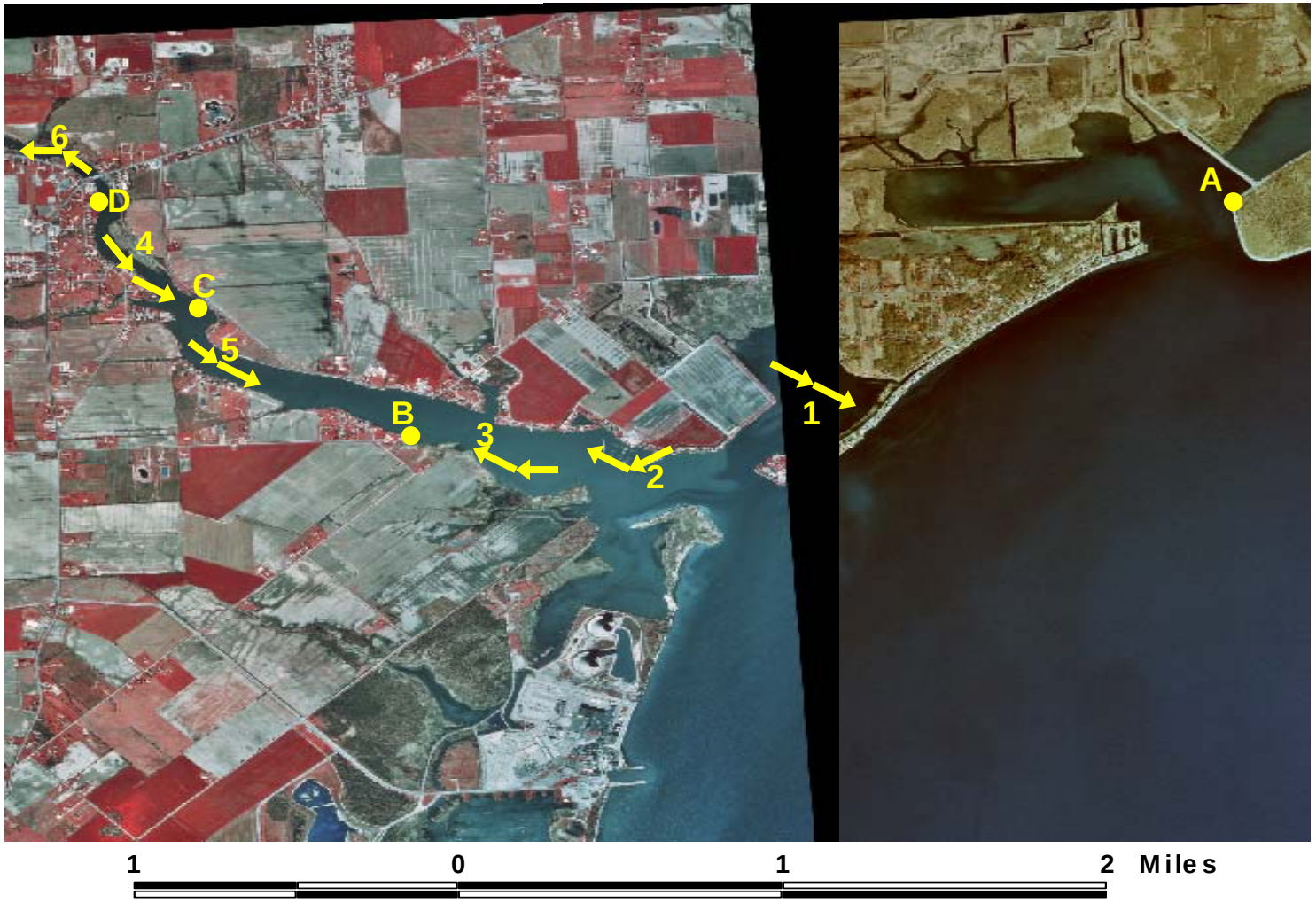

Figure 5. Sampling locations at the Plum Creek Bay site. Lettered dots represent day time seine locations.

Table 1. Catch summary for North Maumee Bay site.

Family common name	Seining Number	Seining Frequency (10 sites)	Electrofishing Number	Electrofishing Frequency (12 sites)	Total Number	Total Frequency (22 sites)
Lampreys						
silver lamprey	0	0	0	0	0	0
Gars						
longnose gar	0	0	4	3	4	3
Bowfins						
bowfin	0	0	0	0	0	0
Herrings						
gizzard shad	193	8	226	12	419	20
Carps and Minnows						
common carp	28	5	30	7	58	12
goldfish	45	5	139	9	184	14
spotfin shiner	29	4	1	1	30	5
spottail shiner	50	5	15	6	65	11
emerald shiner	9	3	16	4	25	7
mimic shiner	0	0	8	5	8	5
sand shiner	11	2	1	1	12	3
common shiner	0	0	0	0	0	0
golden shiner	0	0	0	0	0	0
bluntnose minnow	7	3	2	2	9	5
silver chub	0	0	1	1	1	1
fathead minnow	0	0	0	0	0	0
Suckers						
quillback	5	1	10	5	15	6
bigmouth buffalo	0	0	2	2	2	2
shorthead redhorse	0	0	0	0	0	0
golden redhorse	0	0	0	0	0	0
spotted sucker	0	0	0	0	0	0
white sucker	0	0	2	2	2	2
Bullhead Catfishes						
brown bullhead	40	6	5	4	45	10
yellow bullhead	1	1	0	0	1	1
black bullhead	0	0	0	0	0	0
tadpole madtom	1	1	0	0	1	1
channel catfish	0	0	3	1	3	1
Pikes						
northern pike	0	0	3	2	3	2
Killifishes						
banded killifish	56	5	1	1	57	6

Table 1--Continued

Family common name	Seine Number	Seine Frequency (10 sites)	Electrofishing Number	Electrofishing Frequency (12 sites)	Total Number	Total Frequency (22 sites)
Silversides						
brook silverside	0	0	12	8	12	8
Striped Basses						
white perch	279	9	445	12	724	21
white bass	3	1	11	5	14	6
Sunfishes						
orangespotted sunfish	48	3	0	0	48	3
green sunfish	4	1	0	0	4	1
longear sunfish	0	0	0	0	0	0
bluegill	120	6	34	7	154	13
pumpkinseed	197	8	110	9	307	17
rock bass	1	1	1	1	2	2
largemouth bass	13	7	61	10	74	17
smallmouth bass	0	0	1	1	1	1
Perches						
yellow perch	7	3	35	8	42	11
walleye	0	0	10	3	10	3
johnny darter	0	0	0	0	0	0
logperch	34	3	34	5	68	8
Drums						
freshwater drum	0	0	6	5	6	5
Gobies						
round goby	19	6	1	1	20	7
tubenose goby	0	0	0	0	0	0
Total	1,203	24 species	1,230	31 species	2,433	35 species
no. of sample sites	10		12		22	

Table 2. Catch summary for Huron River Estuary site.

Family common name	Seining Number	Seining Frequency (3 sites)	Electrofishing Number	Electrofishing Frequency (6 sites)	Total Number	Total Frequency (9 sites)
Lampreys						
silver lamprey	0	0	1	1	1	1
Gars						
longnose gar	0	0	2	1	2	1
Bowfins						
bowfin	0	0	2	2	2	2
Herrings						
gizzard shad	3	2	47	5	50	7
Carps and Minnows						
common carp	0	0	85	6	85	6
goldfish	0	0	1	1	1	1
spotfin shiner	0	0	0	0	0	0
spottail shiner	0	0	1	1	1	1
emerald shiner	0	0	4	3	4	3
mimic shiner	0	0	4	1	4	1
sand shiner	0	0	0	0	0	0
common shiner	0	0	0	0	0	0
golden shiner	7	1	18	4	25	5
bluntnose minnow	7	2	8	3	15	5
silver chub	0	0	0	0	0	0
fathead minnow	0	0	0	0	0	0
Suckers						
quillback	0	0	1	1	1	1
bigmouth buffalo	0	0	2	2	2	2
shorthead redhorse	0	0	0	0	0	0
golden redhorse	0	0	0	0	0	0
spotted sucker	0	0	10	3	10	3
white sucker	0	0	0	0	0	0
Bullhead Catfishes						
brown bullhead	0	0	7	4	7	4
yellow bullhead	0	0	1	1	1	1
black bullhead	0	0	8	1	8	1
tadpole madtom	3	2	0	0	3	2
channel catfish	0	0	2	2	2	2
Pikes						
northern pike	0	0	2	2	2	2
Killifishes						
banded killifish	9	1	1	1	10	2

Table 2-- Continued

Family common name	Seine Number	Seine Frequency (3 sites)	Electrofishing Number	Electrofishing Frequency (6 sites)	Total Number	Total Frequency (9 sites)
Silversides						
brook silverside	26	1	25	4	51	5
Striped Basses						
white perch	0	0	38	2	38	2
white bass	0	0	3	1	3	1
Sunfishes						
orangespotted sunfish	1	1	0	0	1	1
green sunfish	0	0	0	0	0	0
longear sunfish	0	0	13	3	13	3
bluegill	117	2	122	6	239	8
pumpkinseed	5	1	23	5	28	6
rock bass	10	2	49	6	59	8
largemouth bass	8	1	31	6	39	7
smallmouth bass	3	1	12	3	15	4
Perches						
yellow perch	0	0	11	3	11	3
walleye	0	0	1	1	1	1
johnny darter	1	1	0	0	1	1
logperch	0	0	0	0	0	0
Drums						
freshwater drum	0	0	2	2	2	2
Gobies						
round goby	9	3	4	2	13	5
tubenose goby	3	1	4	2	7	3
Total	214	15 species	565	34 species	779	37 species
no. of sample sites	3		6		9	

Table 3. Catch summary for Swan Creek Estuary site.

Family common name	Seining Number	Seining Frequency (4 sites)	Electrofishing Number	Electrofishing Frequency (6 sites)	Total Number	Total Frequency (10 sites)
Lampreys						
silver lamprey	0	0	0	0	0	0
Gars						
longnose gar	0	0	1	1	1	1
Bowfins						
bowfin	0	0	6	2	6	2
Herrings						
gizzard shad	7	2	323	6	330	8
Carps and Minnows						
common carp	3	2	20	4	23	6
goldfish	9	2	102	6	111	8
spotfin shiner	2	1	4	1	6	2
spottail shiner	7	1	14	3	21	4
emerald shiner	30	2	9	6	39	8
mimic shiner	173	3	11	2	184	5
sand shiner	0	0	2	2	2	2
common shiner	50	1	0	0	50	1
golden shiner	25	1	13	3	38	4
bluntnose minnow	186	4	6	5	192	9
silver chub	0	0	1	1	1	1
fathead minnow	1	1	0	0	1	1
Suckers						
quillback	0	0	0	0	0	0
bigmouth buffalo	0	0	0	0	0	0
shorthead redhorse	1	1	0	0	1	1
golden redhorse	0	0	1	1	1	1
spotted sucker	0	0	4	2	4	2
white sucker	0	0	0	0	0	0
Bullhead Catfishes						
brown bullhead	1	1	0	0	1	1
yellow bullhead	0	0	2	2	2	2
black bullhead	0	0	0	0	0	0
tadpole madtom	1	1	0	0	1	1
channel catfish	0	0	0	0	0	0
Pikes						
northern pike	0	0	3	3	3	3
Killifishes						
banded killifish	0	0	0	0	0	0

Table 3--Continued

Family common name	Seine Number	Seine Frequency (4 sites)	Electrofishing Number	Electrofishing Frequency (6 sites)	Total Number	Total Frequency (10 sites)
Silversides						
brook silverside	6	2	17	6	23	8
Striped Basses						
white perch	0	0	44	4	44	4
white bass	1	1	2	2	3	3
Sunfishes						
orangespotted sunfish	0	0	1	1	1	1
green sunfish	0	0	1	1	1	1
longear sunfish	0	0	0	0	0	0
bluegill	109	4	71	5	180	9
pumpkinseed	10	3	144	6	154	9
rock bass	1	1	5	2	6	3
largemouth bass	9	3	74	6	83	9
smallmouth bass	1	1	1	1	2	2
Perches						
yellow perch	1	1	43	6	44	7
walleye	0	0	2	1	2	1
johnny darter	0	0	0	0	0	0
logperch	9	2	2	2	11	4
Drums						
freshwater drum	0	0	6	2	6	2
Gobies						
round goby	9	2	0	0	9	2
tubenose goby	2	1	0	0	2	1
Total	654	25 species	936	31 species	1,590	38 species
no. of sample sites	4		6		10	

Table 4. Catch summary for Plum Creek Bay site.

Family common name	Seining Number	Frequency (3 sites)
Lampreys		
silver lamprey	0	0
Gars		
longnose gar	0	0
Bowfins		
bowfin	0	0
Herrings		
gizzard shad	12	2
Carps and Minnows		
common carp	1	1
goldfish	0	0
spotfin shiner	3	1
spottail shiner	0	0
emerald shiner	0	0
mimic shiner	17	2
sand shiner	0	0
common shiner	156	2
golden shiner	0	0
bluntnose minnow	9	2
silver chub	0	0
fathead minnow	0	0
Suckers		
quillback	0	0
bigmouth buffalo	0	0
shorthead redhorse	0	0
golden redhorse	0	0
spotted sucker	0	0
white sucker	0	0
Bullhead Catfishes		
brown bullhead	0	0
yellow bullhead	0	0
black bullhead	0	0
tadpole madtom	0	0
channel catfish	0	0
Pikes		
northern pike	0	0
Killifishes		
banded killifish	0	0

Table 4--Continued

Family common name	Seine Number	Seine Frequency (3 sites)
Silversides		
brook silverside	0	0
Striped Basses		
white perch	43	2
white bass	3	2
Sunfishes		
orangespotted sunfish	3	1
green sunfish	0	0
longear sunfish	0	0
bluegill	54	3
pumpkinseed	26	3
rock bass	0	0
largemouth bass	2	2
smallmouth bass	0	0
Perches		
yellow perch	0	0
walleye	0	0
johnny darter	0	0
logperch	0	0
Drums		
freshwater drum	0	0
Gobies		
round goby	0	0
tubenose goby	0	0
Total	329	12 species
no. of sample sites	3	

Table 5. Summary of seine catch.

Family common name	Maumee Bay Number	Freq. 10 sites	Huron River Number	Freq. 3 sites	Swan Creek Number	Freq. 4 sites	Plum Creek Number	Freq. 3 sites
Lampreys								
silver lamprey	0	0	0	0	0	0	0	0
Gars								
longnose gar	0	0	0	0	0	0	0	0
Bowfins								
bowfin	0	0	0	0	0	0	0	0
Herrings								
gizzard shad	193	8	3	2	7	2	12	2
Carps and Minnows								
common carp	28	5	0	0	3	2	1	1
goldfish	45	5	0	0	9	2	0	0
spotfin shiner	29	4	0	0	2	1	3	1
spottail shiner	50	5	0	0	7	1	0	0
emerald shiner	69	4	0	0	30	2	0	0
mimic shiner	0	0	0	0	173	3	17	2
sand shiner	11	2	0	0	0	0	0	0
common shiner	0	0	0	0	50	1	156	2
golden shiner	0	0	7	1	24	1	0	0
bluntnose minnow	7	3	7	2	186	4	9	2
silver chub	0	0	0	0	0	0	0	0
fathead minnow	0	0	0	0	1	1	0	0
Suckers								
quillback	5	1	0	0	0	0	0	0
bigmouth buffalo	0	0	0	0	0	0	0	0
shorthead redhorse	0	0	0	0	1	1	0	0
golden redhorse	0	0	0	0	0	0	0	0
spotted sucker	0	0	0	0	0	0	0	0
white sucker	0	0	0	0	0	0	0	0
Bullhead Catfishes								
brown bullhead	40	6	0	0	1	1	0	0
yellow bullhead	1	1	0	0	0	0	0	0
black bullhead	0	0	0	0	0	0	0	0
tadpole madtom	1	1	3	2	1	1	0	0
channel catfish	0	0	0	0	0	0	0	0
Pikes								
northern pike	0	0	0	0	0	0	0	0
Killifishes								
banded killifish	56	5	9	1	0	0	0	0

Table 5--Continued

Family common name	Maumee Bay Number	 Freq. 10 sites	Huron River Number	 Freq. 3 sites	Swan Creek Number	 Freq. 4 sites	Plum Creek Number	 Freq. 3 sites
Silversides								
brook silverside	0	0	26	1	6	2	0	0
Striped Basses								
white perch	279	9	0	0	0	0	43	2
white bass	3	1	0	0	1	1	3	2
Sunfishes								
orangespotted sunfish	48	3	1	1	0	0	3	1
green sunfish	4	1	0	0	0	0	0	0
longear sunfish	0	0	0	0	0	0	0	0
bluegill	120	6	117	2	109	4	54	3
pumpkinseed	197	8	5	1	10	3	27	3
rock bass	1	1	10	2	1	1	0	0
largemouth bass	13	7	8	1	9	3	2	2
smallmouth bass	0	0	3	1	1	1	0	0
Perches								
yellow perch	7	3	0	0	1	1	0	0
walleye	0	0	0	0	0	0	0	0
johnny darter	0	0	1	1	0	0	0	0
logperch	34	3	0	0	9	2	0	0
Drums								
freshwater drum	0	0	0	0	0	0	0	0
Gobies								
round goby	19	6	9	3	9	2	0	0
tubenose goby	0	0	0	0	2	1	0	0
Totals	1,203	24 sp.	214	15 sp.	654	25 sp.	329	12 sp.
number of hauls	10		3		4		3	
number per haul	120.3		71.3		163.5		109.6	

Table 6. Summary of electrofishing catch.

Family common name	Maumee Bay Number	Maumee Bay Frequency (12 sites)	Huron River Number	Huron River Frequency (6 sites)	Swan Creek Number	Swan Creek Frequency (6 sites)
Lampreys						
silver lamprey	0	0	1	1	0	0
Gars						
longnose gar	4	3	2	1	1	1
Bowfins						
bowfin	0	0	2	2	6	2
Herrings						
gizzard shad	226	12	47	5	323	6
Carps and Minnows						
common carp	30	7	21	6	20	4
goldfish	139	9	85	6	102	6
spotfin shiner	1	1	0	0	4	1
spottail shiner	15	6	1	1	14	3
emerald shiner	16	4	4	3	9	6
mimic shiner	8	5	4	1	11	2
sand shiner	1	1	0	0	2	2
common shiner	0	0	0	0	0	0
golden shiner	0	0	18	4	13	3
bluntnose minnow	2	2	8	3	6	5
silver chub	1	1	0	0	1	1
fathead minnow	0	0	0	0	0	0
Suckers						
quillback	10	5	1	1	0	0
bigmouth buffalo	2	2	2	2	0	0
shorthead redhorse	0	0	0	0	0	0
golden redhorse	0	0	0	0	1	1
spotted sucker	0	0	10	3	4	2
white sucker	2	2	0	0	0	0
Bullhead Catfishes						
brown bullhead	5	4	7	4	0	0
yellow bullhead	0	0	1	1	2	2
black bullhead	0	0	8	1	0	0
tadpole madtom	0	0	0	0	0	0
channel catfish	3	1	2	2	0	0
Pikes						
northern pike	3	2	2	2	3	3
Killifishes						
banded killifish	1	1	1	1	0	0

Table 6--Continued

Family common name	Maumee Bay Number	Maumee Bay Frequency (12 sites)	Huron River Number	Huron River Frequency (6 sites)	Swan Creek Number	Swan Creek Frequency (6 sites)
Silversides						
brook silverside	12	8	25	4	17	6
Striped Basses						
white perch	445	12	38	2	44	4
white bass	11	5	3	1	2	2
Sunfishes						
orangespotted sunfish	0	0	0	0	1	1
green sunfish	0	0	0	0	1	1
longear sunfish	0	0	13	3	0	0
bluegill	34	7	122	6	71	5
pumpkinseed	110	9	23	5	144	6
rock bass	1	1	49	6	5	2
largemouth bass	61	10	31	6	74	6
smallmouth bass	1	1	12	3	1	1
Perches						
yellow perch	35	8	11	3	43	6
walleye	10	3	1	1	2	1
johnny darter	0	0	0	0	0	0
logperch	34	5	0	0	2	2
Drums						
freshwater drum	6	5	2	2	6	2
Gobies						
round goby	1	1	3	2	0	0
tubenose goby	0	0	4	2	0	0
Total	1,230	31 sp.	565	34 sp.	936	31 sp.
number of transects	12		6		6	
number per transect	102.5		94.2		156.0	

Table 7. Summary of catch, all sites combined.

Family common name	Seining Number	Seining Frequency (20 sites)	Electrofishing Number	Electrofishing Frequency (24 sites)	Total Number	Total Frequency (44 sites)
Lampreys						
silver lamprey	0	0	1	1	1	1
Gars						
longnose gar	0	0	7	5	7	5
Bowfins						
bowfin	0	0	8	4	8	4
Herrings						
gizzard shad	215	14	596	23	811	37
Carps and Minnows						
common carp	32	8	71	17	103	25
goldfish	54	7	326	21	380	28
spotfin shiner	34	6	5	2	39	8
spottail shiner	57	6	30	10	87	16
emerald shiner	39	5	29	13	68	18
mimic shiner	190	5	23	8	213	13
sand shiner	11	2	3	3	14	5
common shiner	206	3	0	0	206	3
golden shiner	32	2	31	7	63	9
bluntnose minnow	209	11	16	10	225	21
silver chub	0	0	2	2	2	2
fathead minnow	1	1	0	0	1	1
Suckers						
quillback	5	1	11	6	16	7
bigmouth buffalo	0	0	4	4	4	4
shorthead redhorse	1	1	0	0	1	1
golden redhorse	0	0	1	1	1	1
spotted sucker	0	0	14	5	14	5
white sucker	0	0	2	2	2	2
Bullhead Catfishes						
brown bullhead	41	7	12	8	53	15
yellow bullhead	1	1	3	3	4	4
black bullhead	0	0	8	1	8	1
tadpole madtom	5	4	0	0	5	4
channel catfish	0	0	5	3	5	3
Pikes						
northern pike	0	0	8	7	8	7
Killifishes						
banded killifish	65	6	2	2	67	8

Table 7--Continued

Family common name	Seine Number	Seine Frequency (20 sites)	Electrofishing Number	Electrofishing Frequency (24 sites)	Total Number	Total Frequency (44 sites)
Silversides						
brook silverside	32	3	54	18	86	21
Striped Basses						
white perch	322	11	527	18	849	29
white bass	7	4	16	8	23	12
Sunfishes						
orangespotted sunfish	52	5	1	1	53	6
green sunfish	4	1	1	1	5	2
longear sunfish	0	0	13	3	13	3
bluegill	400	15	227	18	627	33
pumpkinseed	238	15	277	20	515	35
rock bass	12	4	55	9	67	13
largemouth bass	32	13	166	22	198	35
smallmouth bass	4	2	14	5	18	7
Perches						
yellow perch	8	4	89	17	97	21
walleye	0	0	13	5	13	5
johnny darter	1	1	0	0	1	1
logperch	43	5	36	7	79	12
Drums						
freshwater drum	0	0	14	9	14	9
Gobies						
round goby	37	11	5	3	42	14
tubenose goby	5	2	4	2	9	4
Total	2,400	33 species	2,731	42 species	5,131	47 species
no. of sample sites	20		24		44	

Table 8. List of species caught exclusively by one gear type.

Caught only in Seines	Caught only electrofishing
common shiner	silver lamprey
fathead minnow	bowfin
shorthead redhorse	longnose gar
tadpole madtom	northern pike
johnny darter	silver chub
	freshwater drum
	bigmouth buffalo
	golden redhorse
	spotted sucker
	white sucker
	black bullhead
	channel catfish
	longear sunfish
	walleye

Table 9. Summary of fish species caught during coastal marsh sampling.

Location	Number of Species	Number of Families	Gear	Sampling Year	Source
Winous Point Marshes, Lake Erie	44	16	trap nets, seines, push nets	1982-1987	Johnson 1989
five coastal marshes in Toronto region of Lake Ontario	36	14	hoop nets, fyke nets, minnow traps, seines, backpack electrofisher	1985-1986	Stephenson 1990
Great Lakes coastal marshes	44	15	fyke nets	2001-2002	Seilheimer and Chow-Fraser 2006
Metzger Marsh, Lake Erie	45	16	fish passage trap	1999-2002	Wells et al. 2002
Crane Creek Estuary, Lake Erie	35	13	hoop nets, seining, ichthyoplankton nets	1997	Hintz 1999
Lake Erie coastal marshes	47	15	seining, night time electrofishing	2005	MDNR, Fisheries Division