

FISH COMMUNITY SAMPLING IN NATIONAL WILDLIFE AREAS IN SOUTHWESTERN ONTARIO, 2002-2005

D. Marson, J. Barnucz, and N. E. Mandrak

Central and Arctic Region
Fisheries and Oceans Canada
Burlington, ON L7R 4A6

2010

**Canadian Manuscript Report of
Fisheries and Aquatic Sciences 2918**



Fisheries and Oceans Canada
Pêches et Océans Canada

Canada

Canadian Manuscript Report of Fisheries and Aquatic Sciences

Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional problems. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Manuscript reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1-900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 901-1425 were issued as Manuscript Reports of the Fisheries Research Board of Canada. Numbers 1426-1550 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Manuscript reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Les rapports manuscrits contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui traitent de problèmes nationaux ou régionaux. La distribution en est limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, e'est-à-dire les sciences halieutiques et aquatiques.

Les rapports manuscrits peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports manuscrits sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1 à 900 de cette série ont été publiés à titre de manuscrits (série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés comme manuscrits (série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros 901 à 1425 ont été publiés à titre de rapports manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 sont parus à titre de rapports manuscrits du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 1551.

Les rapports manuscrits sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Manuscript Report of
Fisheries and Aquatic Sciences 2918

2010

FISH COMMUNITY SAMPLING IN NATIONAL WILDLIFE AREAS IN
SOUTHWESTERN ONTARIO, 2002-2005

by

D. Marson, J. Barnucz, and N. E. Mandrak

Central and Arctic Region
Fisheries and Oceans Canada
Burlington, Ontario L7R 4A6

© Her Majesty the Queen in Right of Canada, 2010.
Cat. No. Fs 97-4/2918E ISSN 0706-6473

Correct citation for this publication:

Marson, D., J. Barnucz, and N.E. Mandrak. 2010. Fish community sampling in National Wildlife Areas in southwestern Ontario, 2002-2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2918: v + 47 p.

TABLE OF CONTENTS

ABSTRACT	VI
RÉSUMÉ	VI
INTRODUCTION	1
METHODS	1
ELECTROFISHING SAMPLING	1
SEINING	2
FYKE NET SAMPLING	2
HABITAT DATA COLLECTION	2
RESULTS	2
BIG CREEK NWA	2
Electrofishing Sampling	2
Fyke Net Sampling	3
Seining	3
Habitat Data	3
Species at Risk	3
LONG POINT NWA	4
Electrofishing Sampling	4
Fyke Net Sampling	4
Habitat Data	5
Species at Risk	5
ST. CLAIR NWA	6
Fyke Net Sampling	6
Habitat Data	6
Species at Risk	6
DISCUSSION	6
CRITICAL HABITAT	8
MONITORING RECOMMENDATIONS	9
Big Creek NWA	9
Long Point NWA	9
St. Clair NWA	10
ACKNOWLEDGEMENTS	10
LITERATURE CITED	11

LIST OF TABLES

Table 1: Summary of catch data by gear type inside and outside of Big Creek NWA.....	12
Table 2: Summary of sampling effort by gear type inside and outside of Big Creek NWA.....	12
Table 3: Summary of species detection inside and outside of Big Creek NWA.....	12
Table 4: Total number of each species captured by gear type inside and outside of Big Creek NWA.....	13
Table 5: Summary of catch data by gear type inside and outside of Long Point NWA.....	13
Table 6: Summary of sampling effort by gear type inside and outside of Long Point NWA.....	14
Table 7: Summary of species detection by gear type inside and outside of Long Point NWA.....	14
Table 8: Total number of each species captured by gear type inside and outside Long Point NWA, with total number of specimens captured in cell.....	15
Table 9: Summary of catch data by gear type in St. Clair NWA sites.....	16
Table 10: Summary of sampling effort by gear type in St. Clair NWA sites.....	16
Table 11: Summary of species captured by gear type in St. Clair NWA fyke net sampling.....	16

LIST OF FIGURES

Figure 1: Location of fish sampling sites at Big Creek NWA.....	17
Figure 2: Location of fish sampling sites at Long Point NWA.....	18
Figure 3: Location of fish sampling sites at St. Clair NWA.....	19

LIST OF APPENDICES

Appendix 1: Common and scientific names of species collected in NWAs, 2002-2005 (according to Nelson et al. 2004).....	23
Appendix 2: Big Creek NWA sampling site habitat data.....	21
Appendix 3: St. Clair NWA sampling site habitat data.....	23
Appendix 4: Long Point NWA sampling site habitat data.....	24
Appendix 5: Locality descriptions of the Big Creek NWA sites sampled.....	28
Appendix 6: Locality description of the Long Point NWA sites sampled.....	30
Appendix 7: Locality description of the St. Clair NWA sites sampled.....	34
Appendix 8: Summary of sampling effort for Big Creek NWA sites.....	35
Appendix 9: Summary of Long Point NWA sampling effort.....	36
Appendix 10: Summary of St. Clair NWA sampling effort.....	38
Appendix 11: Species captured by site at Big Creek NWA by DFO in 2005.....	39
Appendix 12: Species caught by site at Long Point NWA by DFO in 2002, 2004 and 2005.....	41
Appendix 13: Species caught by site at St. Clair NWA by DFO in 2005.....	47

ABSTRACT

Marson, D., J. Barnucz, and N.E. Mandrak. 2010. Fish community sampling in National Wildlife Areas in southwestern Ontario, 2002-2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2918: v + 47 p.

From 2002-2005, Fisheries and Oceans Canada (DFO) sampled the Big Creek, Long Point and St. Clair National Wildlife Areas (NWA). Boat electrofishing, fyke netting and seining were used to survey the fish assemblages in the NWAs. Four species at risk (SAR), including one Endangered (Pugnose Shiner [*Notropis anogenus*]), one Threatened (Lake Chubsucker [*Erimyzon sucetta*]), and two Special Concern (Grass Pickerel [*Esox americanus vermiculatus*] and Warmouth [*Lepomis gulosus*]) were captured. Three SAR were captured in Big Creek NWA (Grass Pickerel, Lake Chubsucker and Warmouth), three in Long Point NWA (Grass Pickerel, Lake Chubsucker and Pugnose Shiner); however, none were detected in the St. Clair NWA. A preference for clear water with a high density of submergent and emergent aquatic vegetation by the three SAR captured was confirmed. Additional sampling is recommended to monitor the presence of fish SAR in, or near, the NWAs sampled.

RÉSUMÉ

Marson, D., J. Barnucz, and N.E. Mandrak. 2010. Fish community sampling in National Wildlife Areas in southwestern Ontario, 2002-2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2918: v + 47 p.

Entre 2002 et 2005, Pêches et Océans Canada (MPO) a procédé à des échantillonnages dans les réserves nationales de faune (RNF) de Big Creek, Long Point et St. Clair. La pêche à l'électricité en bateau, la pêche au verveau et la pêche à la senne ont été utilisées pour effectuer les relevés des assemblages de poissons dans les RNF. Quatre espèces en péril (EP), dont une espèce en voie de disparition (le Méné Camus [*Notropis anogenus*]), une espèce menacée (le Sucet de Lac [*Erimyzon sucetta*]), et deux espèces préoccupantes (le Brochet Vermiculé [*Esox americanus vermiculatus*] et le Crapet Sac-à-Lait [*Lepomis gulosus*]) ont été capturées. Trois EP ont été capturées dans la RNF de Big Creek (le Brochet Vermiculé, le Sucet de Lac et le Crapet Sac-à-Lait), et dans la RNF de Long Point (le Brochet Vermiculé, le Sucet de Lac et le Méné Camus); cependant, aucune n'a été détectée dans la RNF de St. Clair. La préférence des trois EP capturées pour des eaux claires ayant une végétation aquatique partiellement submergée et émergée de haute densité a été confirmée. Des échantillonnages supplémentaires sont recommandés afin de surveiller la présence d'espèces de poisson en péril dans les RNF échantillonnées ou à proximité.

INTRODUCTION

National Wildlife Areas have been created throughout Canada to preserve wildlife by ensuring that suitable habitat is protected for a variety of plants and animals. Between 2002 and 2005, Fisheries and Oceans Canada (DFO) sampled the Big Creek, Long Point, and St. Clair National Wildlife Areas (NWA). Long Point NWA, a 3250 ha protected area, was established in 1978 and is located approximately 115 km southwest of Toronto, on the north shore of Lake Erie (Figure 1). Big Creek NWA, an 802 ha protected area established in 1978, is located adjacent to Long Point NWA, at the base of Long Point's extension into Lake Erie next to the town of Port Rowan, Ontario (Figure 2). The St. Clair NWA, a 289 ha protected area, was established in 1978 and is located on the shore of Lake St. Clair, approximately 30 km directly south of Sarnia and 15 km west of Chatham (Figure 3).

Sampling was undertaken to survey the fish assemblages in the NWAs and specifically targeted fish species at risk (SAR). Several fish SAR, including Grass Pickerel (*Esox americanus vermiculatus*) (common and scientific names according to Nelson et al. 2004; listed in Appendix 1), Lake Chubsucker (*Erimyzon sucetta*), Pugnose Shiner (*Notropis anogenus*), Spotted Gar (*Lepisosteus oculatus*), and Warmouth (*Lepomis gulosus*) have been historically captured in, or in close proximity to, one or more of the NWAs sampled (Mandrak and Crossman 1992). Four of these species were captured in the current study, including one Endangered (Pugnose Shiner), one Threatened (Lake Chubsucker), and two of Special Concern (Grass Pickerel and Warmouth). From the data gathered, a comparison of three sampling techniques was performed to determine their relative success in capturing diverse fish species. The sampling techniques included two active methods, boat electrofishing and seining, and one passive method, fyke netting. Site and habitat information were analyzed from sites where SAR were captured in an attempt to gain a better understanding of the species' habitat preferences.

METHODS

ELECTROFISHING SAMPLING

Boat electrofishing was employed in Long Point and Big Creek sampling. In 2002, boat electrofishing sampling was performed using a single boom, 4.57 m johnboat equipped with a 5.0 GPP (gas powered pulsator), a 5.0 kW generator, and three foot pedals. A single netter retrieved fishes as they were stunned and transferred them into bins filled with water until sampling of the site was completed. The species were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for any SAR caught during sampling. Voucher specimens were kept for lab verification. In 2004, boat electrofishing was performed using a 6.35 m Model SR-20 Smith-Root electrofishing boat equipped with a Model 7.5 kW Smith-Root generator, 7.5 GPP control box, three kick plates, and dual foot pedals. Methods were consistent with those listed above, with

the exception of having two netters retrieving stunned fishes and placing captured fish into an aerated live-well.

SEINING

Seining was performed in 2005 using an 8.5 m bag seine with 6.35 mm ace mesh. Seining occurred at a single site in Big Creek on June 7, 2005. Seining was conducted with one end of the net remaining in contact with the shoreline while the other is hauled parallel to the shoreline at either the full length of the net (from the shoreline) or as far as water depth will allow waders to safely proceed. Although the seining protocol involves a minimum of three hauls per site, with an additional three following the capture of a new species, only two hauls were performed during the 2005 sampling due to net damage. It was determined that the habitat was unsuitable for further seining efforts. Fishes were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for all SAR caught during sampling. Voucher specimens were kept for lab verification.

FYKE NET SAMPLING

Fyke net sampling was performed using nets with 6.4 mm square mesh, an inner hoop diameter of 15 cm, a wing length of 7.62 m, and a lead length of 15.24 m. Fyke nets were set perpendicular to shore, with the lead set at the waters edge. Fyke nets were set, left overnight, and fished the following day at approximately the same time (24 h sets). Effort was recorded as the difference between Start Time (the time the net was set) and Stop Time (the time of retrieval). Fishes that were caught were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for all SAR caught during sampling. Voucher specimens were kept for lab verification.

HABITAT DATA COLLECTION

Habitat variables recorded at each site included air temperature (°C), water temperature (°C), conductivity ($\mu\text{S}/\text{cm}$), water depth (m), Secchi depth (m), substrate composition (% based on Wentworth scale), aquatic vegetation (% emergent, % submergent, % floating), riparian vegetation (%), sampling distance from shore (m), and weather conditions. Habitat data were collected prior to sampling with fyke nets or seining but followed sampling when electrofishing.

RESULTS

BIG CREEK NWA

Electrofishing Sampling

A total of five sites were sampled by boat electrofishing in the vicinity of Big Creek NWA (Figure 1). The boat electrofishing took place on June 18, 2002. Of the five sites

sampled by boat electrofishing, four sites were adjacent to, but outside of, the NWA boundary and will be considered separately from sampling that occurred within the boundaries.

Site 31 was the only boat electrofished site that fell within Big Creek NWA boundaries. Site 31 was electrofished for a total of 3241 sec. A total of 43 fishes representing eight different species were captured (Tables 1 and 3). The mean CPUE was 47.76 fish/h, and the mean effort per site was 54.02 min (Table 2).

Sites 28, 29, 30, and 32 were located adjacent to, but outside of, the Big Creek NWA boundary. The total electrofishing effort for these sites was 10 248 sec, with an average of 2562 sec per site. A total of 97 fishes were captured representing 16 species (Tables 1, 3, 4). The mean CPUE was 37.04 fish/h and the mean effort per site was 42.7 min (Table 2). The minimum number of fishes captured was 14 and the maximum number was 35 (Table 3).

Fyke Net Sampling

A total of 26 sites were sampled in the Big Creek NWA, from June 6 to June 16 2005, using fyke nets (Figure 1). The fyke net sampling resulted in the capture of 345 fishes representing 18 species (Tables 1, 3, 4). The mean CPUE was 0.55 fish/h and the mean effort per site was 24.08 h (Table 2). The minimum number of fishes per site captured was zero, and the maximum number was 68 (Table 1).

Seining

A single site (Site 6) was sampled by seining inside Big Creek on June 7, 2005 (Figure 1). Two hauls resulted in the capture of 22 fishes representing 6 species (Tables 1, 3, 4).

Habitat Data

All sites sampled were 100% vegetated with emergent and submergent vegetation (Appendix 2). Secchi depth ranged from a low of 0.54 m at Site 1 to greater than 1.2 m at Sites 12, 19, 21, 22, 24, 25, 26, and 27 (Appendix 2). Habitat data were not recorded for Sites 28-32.

Species at Risk

Three SAR, Grass Pickerel, Lake Chubsucker, and Warmouth were captured during the Big Creek NWA sampling. A total of two Grass Pickerel were captured from two sites (26 and 30). Site 26 was sampled by fyke netting while Site 30 was sampled by boat electrofishing. Site 26 was 100% vegetated with emergent vegetation. Habitat data were not recorded for Site 30.

A total of 13 Lake Chubsucker were captured from five sites (Sites 20, 23, 25, 26, 27), all of which were collected using fyke nets. The sites containing SAR were 100% vegetated with a combination of submergent and emergent vegetation. The Secchi depth was greater than the water depth in all but one of the sites (Site 23). At each of the sites, the substrate was composed primarily of a combination of silt and organic matter.

A total of 11 Warmouth were captured from two sites (23 and 26), both sampled using fyke nets. Ten Warmouth were captured in a single set at Site 23. Both of the sites were 100% vegetated with emergent and submergent vegetation. Secchi depth was greater than water depth at Site 26 but was 0.76 m at Site 23, where water depth was 2 m. Both of the sites had substrate dominated by silt and organic matter.

LONG POINT NWA

Electrofishing Sampling

A total of 61 sites were electrofished in the vicinity of Long Point NWA between June 19, 2002 and August 30, 2004 (Figure 2). Of the 61 sites sampled, seven fell within Long Point NWA boundaries (Sites 25, 26, 27, 30, 31, 32, 66). The remaining 54 sites were located adjacent to, but outside of, the NWA boundary, and will be analyzed separately.

A total of 318 fishes representing 24 species were caught at the seven sites electrofished within Long Point NWA. The mean CPUE was 250.39 fish/h and the mean effort/site was 0.18 h (648 sec) (Table 6). The minimum number of fishes caught was 10 (Site 26) and the maximum was 84 (Site 31) (Table 5).

The 54 sites sampled outside the NWA produced 2390 fishes representing 33 species (Tables 7 and 8). The mean CPUE was 271.84 fish/h and the mean effort/site was 0.15 h (540 sec) (Table 6). The minimum number of fishes caught was zero (Sites 41, 42, 52, 53, 54, 58, 59, 60, 62, 63) and the maximum was 200 (Site 75) (Table 5).

Fyke Net Sampling

A total of 24 sites were sampled with fyke nets in Long Point NWA June 22-30, 2005 (Figure 2). All but Site 24 were located within the Long Point NWA boundaries. A total of 501 fishes representing 16 species, were caught inside the NWA boundary (Tables 5 and 7). The mean CPUE was 0.9 fish/h and the mean effort/site was 24.22 h (Table 6). The minimum number of fishes caught was zero (Site 8) and the maximum was 183 fishes (Site 20) (Table 5).

Site 24 was the only site sampled in 2005 outside of Long Point NWA. Only a single fish, a Pumpkinseed (*Lepomis gibbosus*), was captured in the 24 h fyke net set, resulting in a CPUE of 0.04 fish/h (Tables 5 and 6).

Habitat Data

All of the sites, except 26, 28, 32, 35, 40-45, and 47, were 100% vegetated. Emergent and submergent vegetation were the dominant vegetation types present. Secchi depth was equal to, or greater than, maximum water depth in all but Sites 50, 51, 54, 59, 60, 65, 69, 70, 71, and 73-78. The range of Secchi depth was from a low of 0.55 m at Site 66 to a high of 3.8 m at Site 58. Habitat data were not recorded for Sites 82-85.

Species at Risk

Three SAR, Grass Pickerel, Lake Chubsucker, and Pugnose Shiner, were captured during the Long Point NWA sampling. A total of five Grass Pickerel were captured from four sites (25, 36, 70, and 75). All four sites were sampled by boat electrofishing. Site 25 was located within Long Point NWA, while Sites 36, 70, and 78 were located outside, but adjacent to, Long Point NWA. Site 25 was 100% vegetated, composed of equal parts emergent and submergent vegetation. Site 36 was composed of 60% emergent vegetation and 40% submergent. Site 70 was 50% vegetated, all of which was emergent, while Site 75 was 40% vegetated, with equal parts emergent and submergent vegetation. Secchi depth was equal to maximum water depth at Site 25, was not recorded at Site 36, and was 1.4 m at Site 70, and 0.8 m at Site 75. Sand and silt were the primary substrate components associated with sites where Grass Pickerel were located.

A total of two Lake Chubsucker were captured from two sites (20 and 29). Site 20 was sampled using a fyke net whereas, Site 29 was sampled by boat electrofishing. Site 20 was located within the Long Point NWA boundary, however, Site 29 was located outside, but adjacent to, the NWA. Both sites were 100% vegetated, composed of emergent and submergent vegetation. Secchi depth equalled or exceeded maximum water depth at both sites. Substrate was predominantly comprised of silt and organic matter at both sites.

A total of 30 Pugnose Shiner were captured from 13 sites, only one of which was located within the Long Point NWA (Site 66). All Pugnose Shiner were caught boat electrofishing between July 6 and August 30, 2004. The maximum number of Pugnose Shiner caught in a single site was 11 (Site 71). Eight of the 11 sites were 100% vegetated, primarily with emergent and submergent vegetation. Only a single site (Site 75) was comprised of less than 50% aquatic vegetation. Secchi depth was equal to, or exceeded, maximum water depth at all but 3 sites (Sites 69, 71, and 75). Sand, silt and organic matter were the most dominant substrate components associated with Pugnose Shiner capture.

ST. CLAIR NWA

Fyke Net Sampling

A total of 20 sites were sampled in the St. Clair NWA from July 6 to 14, 2005 (Figure 3). All of the sites were sampled using fyke nets. A total of 134 fishes representing 12 species were captured during the sampling (Table 9, 10, 11). The total sampling effort was 480 h, resulting in a mean CPUE of 0.28 fish/h (Table 10). The minimum catch per site was one fish (at Sites 4, 10, 14) and the maximum catch was 30 fishes (Site 3) (Table 9).

Habitat Data

Sites 1-11, 19, and 20, were all 100% vegetated (Appendix 3) and were dominated by emergent and submergent vegetation. Only Sites 14 and 17 had less than 50% vegetation. Secchi depth exceeded maximum water depth at all sites, except Site 14, indicating that the turbidity level was very low throughout the sampled sites.

Species at Risk

No SAR were captured during the sampling of the St. Clair NWA.

DISCUSSION

Gear comparisons within the respective NWAs highlight the relationship between gear efficiency and effort. Although although the gear efficiency in terms of CPUE may have been low for a particular gear, it may still have resulted in the highest catch due to the amount of effort directed to the gear. For example, boat electrofishing within the Big Creek NWA boundary had a mean CPUE of 47.76 fish/h whereas, fyke netting had a mean CPUE of 2.55 fish/h. Although the total number of fishes captured by fyke netting in Big Creek ($n = 345$) was greater than the number caught by boat electrofishing both inside (43) and outside (97) the NWA boundary, the mean number of fishes caught per site was greater for both electrofishing inside (43) and outside (24.25) than fyke netting (13.27, Table 1). The higher total catch by fyke netting is the result of a greater sampling effort through this method (26 sites sampled by fyke net sampled vs 5 sites sampled by boat electrofishing).

The greater total number of species and unique species (a species detected by a single sampling method) captured using fyke nets (total number = 18, unique species = 8), relative to electrofishing inside (8, 0) and outside (16, 5) the Big Creek NWA (Table 3) is also reflective of the greater sampling effort using fyke nets. Despite the large discrepancy between boat electrofishing CPUE and fyke netting CPUE, the significantly greater amount of sampling effort by fyke netting resulted in a higher total number of fishes caught, as well as higher species richness.

Species at risk in Big Creek NWA were captured by both boat electrofishing and fyke netting. All three SAR were captured using fyke nets. This increased capture efficiency may be due to increased sampling effort, but it should be considered that fyke netting may be a more effective method of capturing Grass Pickerel, Lake Chubsucker, and Warmouth.

The relationship between the electrofishing and fyke netting in Long Point NWA was opposite to that in Big Creek NWA, as electrofishing sampling effort was greater than fyke netting effort at Long Point NWA. Although only seven sites were electrofished within Long Point NWA, another 54 sites were sampled outside, whereas only 23 sites were sampled using fyke nets inside the NWA boundary and one site outside the NWA. As a result, the total number of fishes captured electrofishing outside the Long Point NWA boundary was greatest (2390), followed by fyke netting inside (501), electrofishing inside (318), and fyke netting outside (1) (Table 5). The greatest number of species and unique species captured was by electrofishing outside and inside, followed by fyke netting inside and outside (Table 7). Despite fewer sites sampled inside the Long Point NWA boundary, electrofishing inside Long Point NWA resulted in the capture of greater species richness than fyke netting.

Species at risk were captured both by fyke netting and electrofishing in Long Point NWA, however, one of two Lake Chubsucker, all five Grass Pickerel, and all of the 30 Pugnose Shiner were caught electrofishing (Table 8). Boat electrofishing appears to be more effective at capturing Pugnose Shiner than fyke netting, although 29 of the 30 Pugnose Shiner were captured outside Long Point NWA boundaries, where only a single fyke net set was fished. Additionally, the only pugnose shiner captured inside the Long Point NWA was captured by boat electrofishing (in one of 7 sites inside the NWA boundary) and was not detected in any of the 23 fyke net sites inside the boundary.

Boat electrofishing sampling was performed in Big Creek NWA (5 sites) and Long Point NWA (61 sites). Effort and catch data have been divided between those sites which were sampled within, and outside, the NWA boundary. The mean effort per site located inside and outside Big Creek and Long Point NWAs were 54.02, 42.70, 10.80, and 9 min, respectively. Clearly the effort/site was much higher in Big Creek NWA, which resulted from targeted sampling for Spotted Gar in 2002. The Spotted Gar targeted sampling involved more prolonged electrofishing sampling events than typical community sampling. Similar targeted sampling efforts of up to 29 min were conducted in Long Point NWA at Sites 69-85, some of which were sampled for Spotted Gar in 2002. Standardized sampling (100 sec) at Sites 39-68 resulted in the reduction of the overall mean effort per site in the Long Point NWA sampling. This reduction in mean effort may help to explain the difference in mean CPUE between Big Creek and Long Point sites inside and outside the NWAs of 47.76, 34.07, 250.39, and 271.85 fish/h, respectively. The difference in mean CPUE may be a result of either the Spotted Gar targeted sampling being more selective in what was netted (not netting every stunned fish) or that the CPUE while boat electrofishing diminishes as sampling time increases (perhaps due to netter fatigue) .

Fyke net sampling was conducted at all of the NWAs: Big Creek (26 sites), Long Point (24 sites), and St. Clair (20 sites). A single site in Long Point NWA was located outside, but adjacent to, the NWA boundary, but will be combined with the Long Point data for this analysis. The mean effort per site in Big Creek, Long Point, and St. Clair NWAs was 24.08, 24.21, and 24 h, respectively. The mean catch was 0.55, 0.87, and 0.28 fish/h, respectively. Fyke netting was successful in locating all three SAR caught in Big Creek, one of three in Long Point NWA (Lake Chubsucker), and no SAR were detected in St. Clair NWA.

Seine net sampling was conducted exclusively in the Big Creek NWA. A single site was sampled, resulting in the capture of 22 fishes representing 6 species. No SAR were detected by seining.

Boat electrofishing was an effective means of collecting a large number of diverse species in a relatively small amount of sampling time, however, sampling is limited to areas of sufficient depth where the boat can be manoeuvred around obstacles and can be limited by extensive macrophyte growth. In circumstances where boat electrofishing is limited, seining and fyke netting represent alternative sampling options. The most effective gear type is site-specific and will depend on site conditions. If, however, a more accurate analysis of gear comparison is required, it would be wise to sample the same sites with the gears being compared. Although the current analysis provides some trends in gear selectivity, by minimizing the time between sampling visits, and the distance between the sites being sampled by the various gear types, it will be possible to develop a more accurate comparison.

CRITICAL HABITAT

Of the sites where SAR were captured, only a single site had less than 50% vegetation, with 15 of 22 sites being 100% vegetated. Submergent and emergent vegetation were the most dominant vegetation types associated with the capture of SAR. At all but five sites where SAR were caught, the Secchi depth readings were limited by the water depth (i.e. Secchi depth was greater than the maximum water depth), while the lowest Secchi depth reading for all the sites where SAR were caught was 0.55 m. These findings indicate a preference for clear water with a high density of submergent and emergent aquatic vegetation by the Grass Pickerel, Lake Chubsucker, Pugnose Shiner, and Warmouth captured during the study. T-test analyses indicated that sites in which Pugnose Shiner were located had significantly more vegetation than sites in which Pugnose Shiner were not found ($p < 0.05$), suggesting a preference by this species for highly vegetated habitats. Pugnose Shiner sites also had a significantly lower percentage of organic substrate and were composed of significantly less emergent vegetation ($p < 0.05$). This would suggest that Pugnose Shiner prefer sites with higher submergent vegetation, however, although the mean percent submergent vegetation in Pugnose Shiner sites was higher than in non-Pugnose Shiner sites, there was not a significant difference (t-test, $p > 0.05$).

A t-test analysis of Lake Chubsucker habitat preferences in Long Point NWA and Big Creek NWA suggests a preference for higher overall percentage of aquatic vegetation,

with a preference for submergent vegetation ($p < 0.05$). Sites without Lake Chubsucker had significantly higher percentages of emergent vegetation ($p < 0.05$) and a significantly higher percentage of sandy substrate ($p < 0.05$). Therefore, Lake Chubsucker appears to prefer highly vegetated sites, composed primarily of submergent vegetation with a primarily organic substrate composition.

All four SAR seemed to prefer a combination of sand, silt, and organic matter as substrate. An organic matter-dominated substrate preference was noted for Lake Chubsucker, while Pugnose Shiner seemed to prefer a primarily sandy substrate, and Warmouth preferred higher proportions of silt and organic matter. The substrate preferences correspond with those documented in the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports for the Lake Chubsucker (Mandrak et al. 2005), Pugnose Shiner (Holm and Mandrak 2002) and Warmouth (Crossman et al. 1994). Although Grass Pickerel substrate preferences were unclear, the association with highly vegetated sites consisting of emergent and submergent vegetation matches that documented in the COSEWIC status report (Crossman and Holm 2005). Therefore, consistent with the COSEWIC status reports, the four SAR captured in this study require systems with a dense mixture of submergent and emergent vegetation, low turbidity, and substrate comprised of silt, sand, and organic debris.

MONITORING RECOMMENDATIONS

Big Creek NWA

Boat electrofishing and fyke net sampling of Big Creek NWA resulted in the capture of two Grass Pickerel, 13 Lake Chubsucker, and 11 Warmouth. Although this provides evidence of their presence in the NWA, it is necessary to continue sampling to determine the distribution and abundance of these species.

While Spotted Gar have been documented in Big Creek wetland and both Pugnose Shiner and Spotted Gar have been documented in Long Point Bay (Holm and Mandrak 2002, COSEWIC 2005a), neither of these species were captured during DFO sampling at Big Creek from 2002 to 2005. The habitat characteristics documented at most of the sites sampled are consistent with the habitat requirements listed in the COSEWIC status reports, with most sites being heavily vegetated and having Secchi depths exceeding the maximum sampling depth, therefore, the absence of Pugnose Shiner and Spotted Gar was not the result of targeting inappropriate habitats. Further targeted sampling of Pugnose Shiner and Spotted Gar preferred habitats may re-establish their presence. It may be valuable to increase boat electrofishing effort, as well as incorporating other sampling techniques such as seining.

Long Point NWA

Grass Pickerel, Lake Chubsucker, and Pugnose Shiner were all collected within, and adjacent to, Long Point NWA. However, only a single Grass Pickerel, Lake Chubsucker

and Pugnose Shiner were captured within Long Point NWA. Despite providing evidence of their presence in the NWA, few fishes were found utilizing the habitat within the NWA. The actual populations of Grass Pickerel, Lake Chubsucker, and Pugnose Shiner located in the NWA may, nevertheless, prove to be much larger following additional sampling of the area.

Other SAR, including the Spotted Gar and Warmouth, had been documented in Long Point Bay but were not located during the Long Point NWA sampling. Considering that Warmouth was captured in Big Creek NWA, it is likely that with additional sampling effort in similar habitat, their presence would be detected in Long Point NWA as well. As with Big Creek NWA sampling, the majority of sites sampled in Long Point NWA had high water clarity and were primarily 100% vegetated with emergent and submergent vegetation. Therefore, the absence of Spotted Gar and Warmouth is unlikely a result of targeting unsuitable habitat and more likely a result of insufficient sampling effort. It is recommended that additional sampling should target areas with high water clarity and heavy emergent and submergent vegetation.

St. Clair NWA

Although the Lake Chubsucker has recently been documented in the St. Clair NWA (Mandrak et al. 2005), they were not captured during the 2005 fyke net sampling performed by DFO. Grass Pickerel have also been documented in the vicinity of St. Clair NWA and may be detected with additional sampling. Continued fyke net sampling, along with electrofishing and seining (where possible), is advised to verify the continued presence and abundance of Lake Chubsucker in the St. Clair NWA and to establish whether Grass Pickerel are present. Sampling should target areas with heavy emergent and submergent vegetation and high water clarity.

ACKNOWLEDGEMENTS

We thank Jeff Robinson of the Canadian Wildlife Service (CWS) for facilitating our sampling in the National Wildlife Areas (NWA). John Haggeman (CWS) facilitated our stay at the St. Clair NWA and Paul Ashley (CWS) greatly assisted in our sampling in the Big Creek NWA and Long Point NWA. Andrew Drake, Steve Marson, Matt Regan and Jarrod Stackhouse assisted with the field work. This project was funded by the DFO Species at Risk Program.

LITERATURE CITED

- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2005a. COSEWIC assessment and update status report on the spotted gar, *Lepisosteus oculatus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 17 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2005b. COSEWIC assessment and update status report on the warmouth, *Lepomis gulosus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 16 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
- Crossman, E.J. and E. Holm. 2005. COSEWIC status report on the grass pickerel, *Esox americanus vermiculatus*, in Canada. In COSEWIC assessment and status report on the grass pickerel, *Esox americanus vermiculatus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 27 pp.
- Holm, E. and N.E. Mandrak. 2002. Update COSEWIC status report on the pugnose shiner, *Notropis anogenus*, in Canada. In COSEWIC assessment and update status report on the pugnose shiner, *Notropis anogenus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 15 pp.
- Mandrak, N.E., and E.J. Crossman. 1992. A checklist of Ontario freshwater fishes annotated with distribution maps. Royal Ontario Museum, Toronto, Ontario. v + 176 pp.
- Mandrak, N.E., B. Cudmore, and E.J. Crossman. 2005. Draft update COSEWIC status report on the lake chubsucker, *Erimyzon sucetta*, in Canada. iii + 20 pp.
- Nelson, J.S., E.J. Crossman, H. Espinosa-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, and J.D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society. Special Publications 29, Bethesda Maryland. 386 pp.

Table 1: Summary of catch data by gear type inside and outside of Big Creek NWA.

Catch Data	BEF* (Inside)	BEF* (Outside)	FN* (Inside)	Seine (Inside)
Total Fishes Caught	43	97	345	22
Mean Fishes	43	24.25	13.27	22
Minimum Number of Fishes Caught	43	14	0	22
Maximum Number of Fishes Caught	43	35	68	22

*BEF – boat electrofishing;

*FN – fyke net

Table 2: Summary of sampling effort by gear type inside and outside of Big Creek NWA.

Sampling Effort	BEF* (Inside)	BEF* (Outside)	FN* (Inside)
Mean CPUE (fish/h)	47.76	34.07	0.55
Mean Effort/Site	54.02	42.7	1444.8
Total Sampling Effort	0.9	2.85	626

*BEF – boat electrofishing;

*FN – fyke net

Table 3: Summary of species detection inside and outside of Big Creek NWA.

	BEF* (Inside)	BEF* (Outside)	FN* (Inside)	Seine (Inside)
Species Richness	8	16	18	6
Unique Species	0	5	8	0
Common Species	8	11	10	6
Total Species	25			

*BEF – boat electrofishing;

*FN – fyke net

Table 4: Total number of each species captured by gear type inside and outside of Big Creek NWA. COSEWIC status: EN – Endangered, SC – Special Concern

Common Name	BEF* (Inside)	BEF* (Outside)	FN** (Inside)	Seining (Inside)
Alewife		1		
Black Bullhead		2		
Black Crappie			41	
Blackchin Shiner			1	
Bluegill	9	22	19	1
Bluntnose Minnow		2	4	4
Bowfin			11	
Brook Silverside		1		
Brown Bullhead	7	8	22	
Central Mudminnow			1	
Common Carp		2		
Emerald Shiner			2	6
Freshwater Drum		2		
Gizzard Shad	1	4		
Golden Shiner		3	44	
Grass Pickerel (SC)		1	1	
Lake Chubsucker (EN)			13	
Largemouth Bass	1	4	2	
Longnose Gar			5	
Northern Pike	1	3		
Pumpkinseed	10	26	117	3
Rainbow Trout			1	
Rock Bass	2	2	43	2
Warmouth (SC)			11	
Yellow Perch	12	14	7	6

*BEF – boat electrofishing;

**FN – fyke net

Table 5: Summary of catch data by gear type inside and outside of Long Point NWA.

Catch Data	BEF* (Inside)	BEF* (Outside)	FN** (Inside)	FN** (Outside)
Total Fishes Caught	318	2390	501	1
Mean Fishes Caught/Site	45.43	44.26	21.78	1
Minimum Number of Fishes Caught	10	0	0	1
Maximum Number of Fishes Caught	84	200	183	1

*BEF – boat electrofishing;

**FN – fyke net

Table 6: Summary of sampling effort by gear type inside and outside of Long Point NWA.

Sampling Effort	BEF* (Inside)	BEF* (Outside)	FN** (Inside)	FN** (Outside)
Mean CPUE (fish/h)	250.39	271.84	0.9	0.04
Mean Effort/Site (h)	0.18	0.15	24.22	24
Total Sampling Effort (h)	1.27	8.24	557	24

*BEF – boat electrofishing;

**FN – fyke net

Table 7: Summary of species detection by gear type inside and outside of Long Point NWA.

Species Detection	BEF* (Inside)	BEF* (Outside)	FN* (Inside)	FN* (Outside)
Species Richness	24	33	16	1
Unique Species*	2	8	1	0
Common Species	22	25	15	1
Total Species Richness	36			

*BEF – boat electrofishing;

*FN – fyke net

* Unique Species = a species which was only caught by a single gear type

Table 8: Total number of each species captured by gear type inside and outside Long Point NWA, with total number of specimens captured in cell. COSEWIC status: EN – Endangered, SC – Special Concern

Common Name	BEF* (Inside)	BEF* (Outside)	FN** (Inside)	FN** (Outside)
Banded Killifish	1	11	1	
Black Bullhead	2	5		
Black Crappie			12	
Blackchin Shiner	58	122	6	
Blacknose Shiner	2	36		
Bluegill	6	202	8	
Bluntnose Minnow	10	87	1	
Bowfin	3	3	2	
Brook Silverside	3	14		
Brown Bullhead	14	158	22	
Channel Catfish	1			
Common Carp	4	29		
Emerald Shiner	7	265		
Freshwater Drum	1	11		
Gizzard Shad		3		
Golden Shiner	13	61	111	
Goldfish		13		
Grass Pickerel (SC)	1	4		
Iowa Darter		1		
Johnny Darter		6		
Lake Chubsucker (EN)		1	1	
Largemouth Bass	11	131	1	
Logperch		3		
Longnose Gar	15	10	8	
Mimic Shiner	1	50		
Northern Pike		13	2	
Pugnose Shiner (EN)	1	29		
Pumpkinseed	38	387	300	1
Rock Bass	3	24	6	
Round Goby		8		
Smallmouth Bass		1		
Spotfin Shiner	4			
Spottail Shiner		11		
Tadpole Madtom		1	18	
Yellow Bullhead	1	1		
Yellow Perch	118	689	3	

*BEF – boat electrofishing;

**FN – fyke net

Table 9: Summary of catch data by gear type in St. Clair NWA sites.

Catch Data	Fyke Netting
Total Fishes Captured	134
Mean Fishes Captured/Site	6.7
Minimum Number of Fishes Captured	1
Maximum Number of Fishes Captured	30

Table 10: Summary of sampling effort by gear type in St. Clair NWA sites.

Sampling Effort	Fyke Netting
Mean CPUE (catch/h)	0.28
Mean Effort/Site	24
Total Sampling Effort (h)	480

Table 11: Summary of species captured by gear type in St. Clair NWA fyke net sampling.

Common Name	Fyke Netting
Black Crappie	10
Bluegill	19
Bowfin	17
Brown Bullhead	2
Central Mudminnow	1
Common Carp	1
Golden Shiner	4
Goldfish	6
Largemouth Bass	33
Northern Pike	5
Pumpkinseed	35
Smallmouth Bass	1

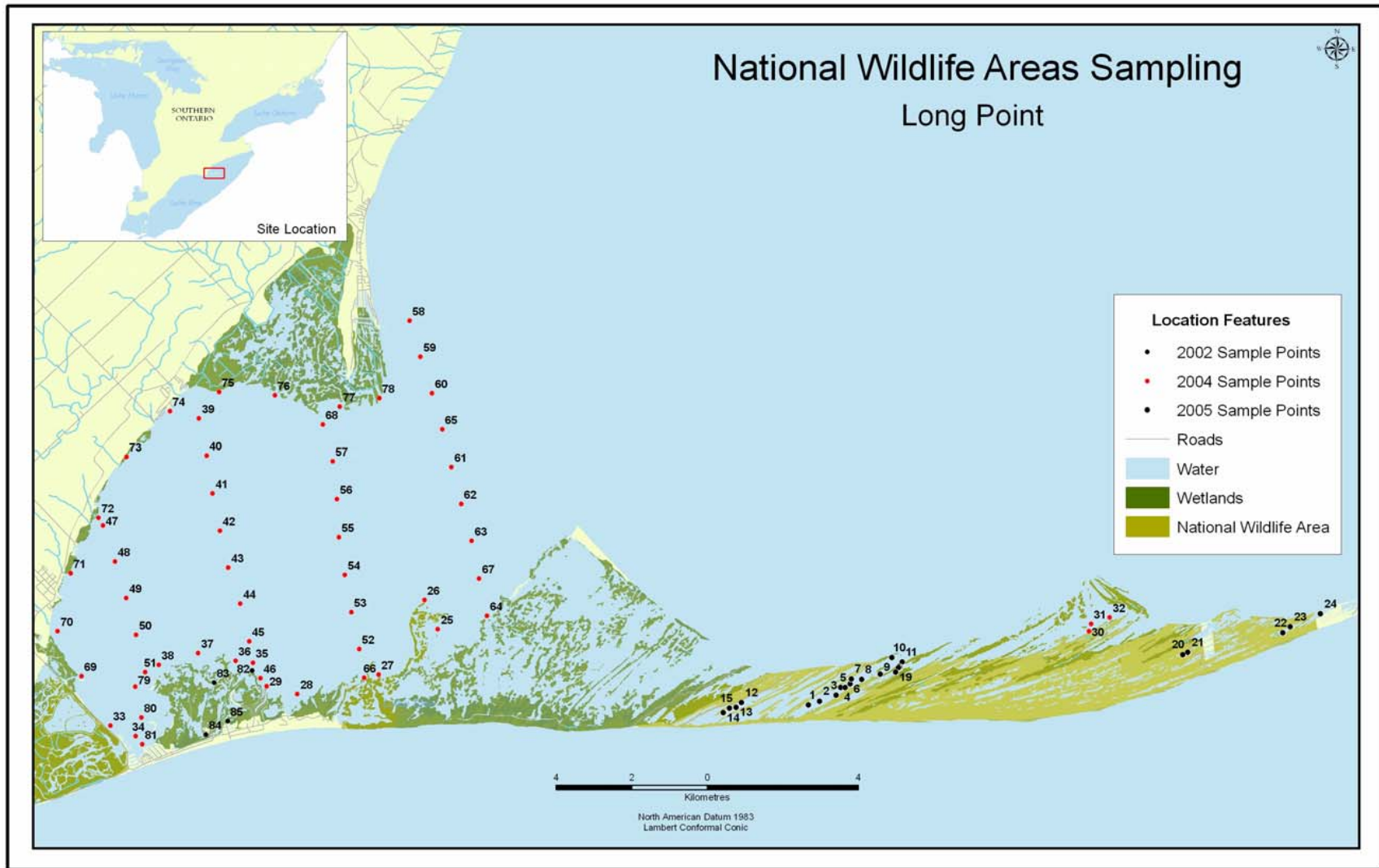


Figure 1: Location of fish sampling sites at Long Point NWA. See Appendix 6 for detailed site descriptions.

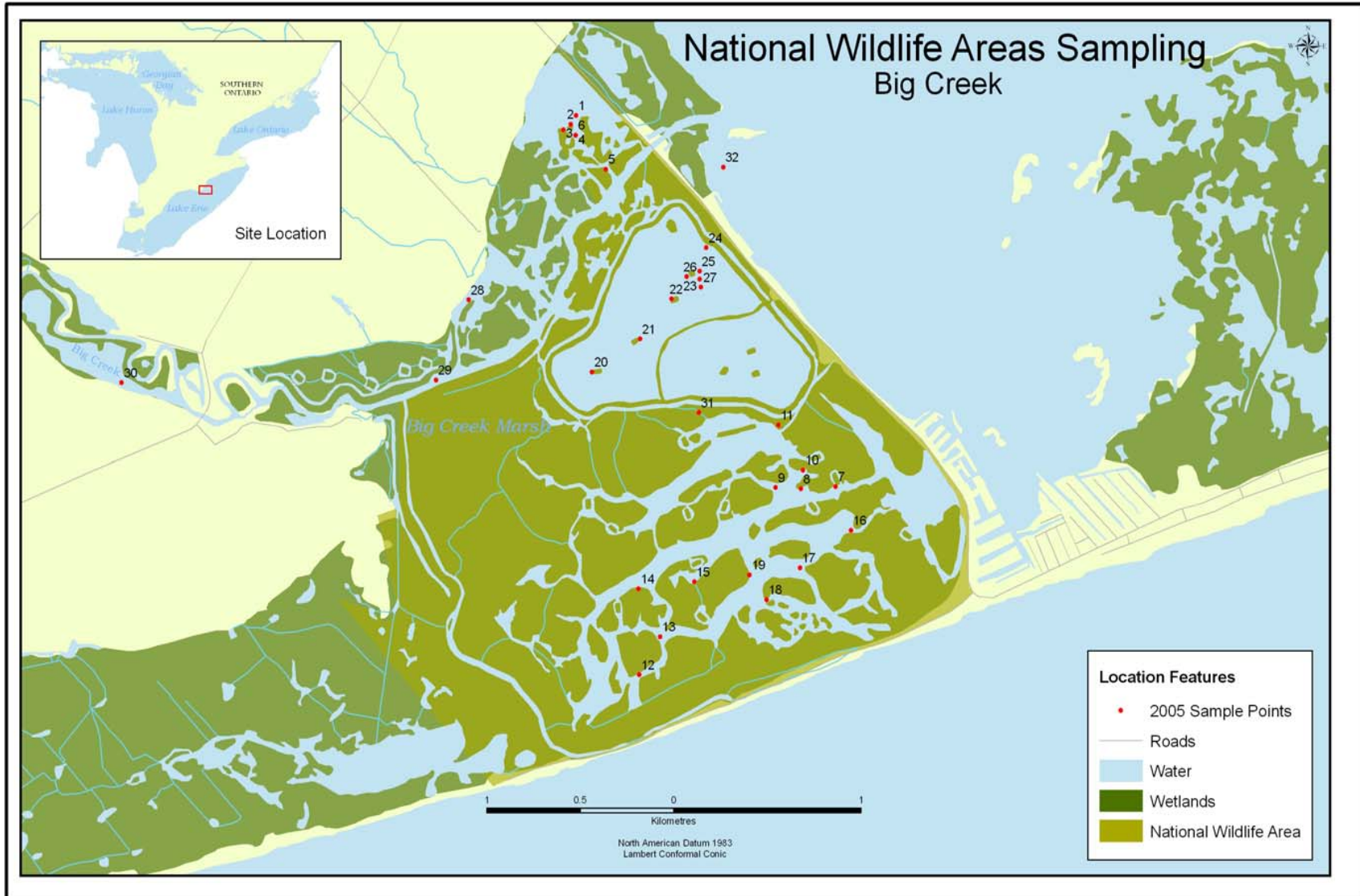


Figure 2: Location of fish sampling sites at Big Creek NWA in 2005. See Appendix 5 for detailed site descriptions.

Appendix 1: Common and scientific names of species collected in NWAAs, 2002-2005 (according to Nelson et al. 2004).

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
Banded Killifish	<i>Fundulus diaphanus</i>
Black Bullhead	<i>Ameiurus melas</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
Blackchin Shiner	<i>Notropis heterodon</i>
Blacknose Shiner	<i>Notropis heterolepis</i>
Bluegill	<i>Lepomis macrochirus</i>
Bluntnose Minnow	<i>Pimephales notatus</i>
Bowfin	<i>Amia calva</i>
Brook Silverside	<i>Labidesthes sicculus</i>
Brown Bullhead	<i>Ameiurus nebulosus</i>
Central Mudminnow	<i>Umbra limi</i>
Channel Catfish	<i>Ictalurus punctatus</i>
Common Carp	<i>Cyprinus carpio</i>
Emerald Shiner	<i>Notropis atherinoides</i>
Freshwater Drum	<i>Aplodinotus grunniens</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Goldfish	<i>Carassius auratus</i>
Grass Pickerel	<i>Esox americanus vermiculatus</i>
Iowa Darter	<i>Etheostoma exile</i>
Johnny Darter	<i>Etheostoma nigrum</i>
Lake Chubsucker	<i>Erimyzon sucetta</i>
Largemouth Bass	<i>Micropterus salmoides</i>
Logperch	<i>Percina caprodes</i>
Longnose Gar	<i>Lepisosteus osseus</i>
Mimic Shiner	<i>Notropis volucellus</i>
Northern Pike	<i>Esox lucius</i>
Pugnose Shiner	<i>Notropis anogenus</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Rock Bass	<i>Ambloplites rupestris</i>
Round Goby	<i>Neogobius melanostomus</i>
Smallmouth Bass	<i>Micropterus dolomieu</i>
Spotfin Shiner	<i>Cyprinella spiloptera</i>
Spottail Shiner	<i>Notropis hudsonius</i>
Tadpole Madtom	<i>Noturus gyrinus</i>
Warmouth	<i>Lepomis gulosus</i>
Yellow Bullhead	<i>Ameiurus natalis</i>
Yellow Perch	<i>Perca flavescens</i>

Appendix 2: Big Creek NWA sampling site habitat data.

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance From Shore (m)	Aquatic Veg. Type1	Aquatic Veg. 1 (%)	Aquatic Veg. Type2	Aquatic Veg. 2 (%)
1	22.1	23	0.546	0.73	0	Emergent	100		
2	25.2	23	0.58	20	0	Emergent	100		
3	25.7	23	0.735	0.73	0	Emergent	80	Submergent	20
4	24.6	23	0.67	1.5	0	Emergent	80	Submergent	20
5	27.7	23.5	0.65	1.5	0	Emergent	80	Submergent	20
6				1.5		Emergent	80	Submergent	20
7	22.4	25	0.704	0.5	0	Submergent	50	Emergent	50
8	22.9		0.78	0.8	0	Submergent	50	Emergent	50
9	22.9	26	0.61	0.5	0	Emergent	50	Submergent	50
10	23.4	27	0.612	0.5		Emergent	70	Submergent	30
11	23	25	0.69	0.6	10	Emergent	80	Submergent	20
12	23.2	25	1.2+	0.51	10	Emergent	50	Submergent	50
13	21.4	25.5	0.81	0.64	5	Emergent	50	Submergent	50
14	26.7	26	0.71	0.56	5	Emergent	70	Submergent	30
15	26.9	26	0.7	0.5	5	Emergent	65	Submergent	35
16	24.6	24	0.67	0.6	5	Emergent	50	Submergent	50
17	25.8	24		0.59	4	Emergent	60	Submergent	40
18	26.8	25	0.8	0.65	5	Emergent	50	Submergent	50
19	25.4	25.5	1.2+	0.71	5	Emergent	50	Submergent	50
20	21	23	0.802	0.64	5	Emergent	40	Submergent	60
21	21.6	23.5	1.2+	1.05	5	Emergent	50	Submergent	50
22	21.7	26	1.2+	2+	10	Emergent	70	Submergent	30
23	21.1	25	0.76	2	5	Emergent	40	Submergent	60
24	16.9	23.5	1.2+	0.6	5	Emergent	50	Submergent	50
25	17	23.5	1.2+	0.95	2	Emergent	50	Submergent	50

Appendix 2: Continued

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance From Shore (m)	Aquatic Veg. Type1	Aquatic Veg. 1 (%)	Aquatic Veg. Type2	Aquatic Veg. 2 (%)
26	16.4	24	1.2+	0.82	5	Emergent	60	Submergent	40
27	19.4	24	1.2+	0.7	0	Emergent	40	Submergent	60
28	0	0					0		0
29	0	0					0		0
30	28	0					0		0
31	25	19					0		0
32	0	0					0		0

Appendix 3: St. Clair NWA sampling site habitat data.

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance From Shore (m)	Aquatic Veg. Type 1	Aquatic Veg. 1 (%)	Aquatic Veg. Type 2	Aquatic Veg. 2 (%)	Aquatic Veg. Type 3	Aquatic Veg. 3 (%)
1	21.9	20.7	1.2+	0.79	5	Emergent	50	Submergent	50		
2	21.7	21.6	1.2+	0.69	6	Emergent	60	Submergent	40		
3	21.8	21.9	1.2+	0.81	0	Emergent	60	Submergent	40		
4	22	21.8	1.2+	0.78	0	Emergent	80	Submergent	20		
5	24.5	22.1	1.2+	0.7	0	Emergent	65	Submergent	35		
6	24.5	22.8	1.2+	0.71	0	Emergent	70	Submergent	30		
7	25.4	22.4	1.2+	0.68	0	Emergent	60	Submergent	40		
8	26.7	22.5	1.2+	0.72	0	Emergent	60	Submergent	40		
9	21.2	21.9	1.2+	0.7	8	Emergent	60	Submergent	40		
10	24.6	21.6		0.7	12	Emergent	50	Submergent	50		
11	25	22.3	1.2+	0.7	5	Emergent	40	Submergent	60		
12	25.7	23	1.2+	0.8	5						
13	21.1	24	0.80	0.6	0	None	30	Floating	10	Submergent	60
14	25.9	25.1	0.41	0.6	0	None	60	Submergent	40		
15	26.3	24.9	1.05	0.6	0	Floating	20	None	30	Submergent	50
16	24.9	26.3	1.15	0.4	0	None	30	Emergent	20	Submergent	50
17	25	24.5	1.2+	0.71	0	None	60	Floating	10	Submergent	30
18	26.7	25.7	1.2+	0.69	0	None	50	Floating	5	Submergent	45
19	27.2	25.4	1.2+	0.7	0	Floating	30	Submergent	70		
20	26.5	26.1		1	0	Floating	10	Submergent	40	Emergent	50

Appendix 4: Long Point NWA sampling site habitat data.

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance From Shore (m)	Aquatic Veg. Type 1	Aquatic Veg. 1 (%)	Aquatic Veg. Type 2	Aquatic Veg. 2 (%)
1	18.4	23	1.2+	0.6	5	Emergent	60	Submergent	40
2	18.6	23	1.2+	0.65	20	Emergent	70	Submergent	30
3	18.8	23	1.2+	1	15	Emergent	60	Submergent	40
4	18.4	23	1.2+	1	10	Emergent	60	Submergent	40
5	19.6	23	1.2+	0.69	10	Emergent	40	Submergent	60
6	23.5	24	1.2+	0.6	50	Emergent	70	Submergent	30
7	23.8	24	1.2+	0.66	10	Emergent	90	Submergent	10
8	21.1	23	1.2+	0.5	0	Emergent	60	Submergent	40
9	23.6	24.5	1.2+	0.65	10	Emergent	60	Submergent	40
10	22.6	24.5	1.2+	0.69	10	Emergent	80	Submergent	20
11	22.6	24.5	1.2+	0.59	10	Emergent	60	Submergent	40
12	27	29	0.835	0.87	0	Emergent	50	Submergent	50
13	27.1	29	1.2+	0.81	0	Emergent	60	Submergent	40
14	22.1	29	1.2+	0.69	0	Emergent	50	Submergent	50
15	26.2	29	1.2+		0	Emergent	70	Submergent	30
16	26.9	26.5	1.2+	0.58	2	Emergent	100		
17	27	26.5	1.2+	0.56	3	Emergent	70	Submergent	30
18	27.5	26.5	1.2+	0.71	1	Emergent	80	Submergent	20
19	27.5	26.5	1.2+	0.68	2	Emergent	60	Submergent	40
20	30	28	1.2+	1.25	0	Emergent	50	Submergent	50
21	30	28	1.2+	1.5	0	Emergent	50	Submergent	50
22	29	29	1.2+	0.5	5	Emergent	60	Submergent	40
23	29	29	1.2+	0.5	5	Emergent	100		
24	27.2	29	1.2+	0.6	5	Submergent	40	Emergent	60
25	0	0	1.10	1.1	10	Emergent	50	Submergent	50

Appendix 4: Continued

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance From Shore (m)	Aquatic Veg. Type 1	Aquatic Veg. 1 (%)	Aquatic Veg. Type 2	Aquatic Veg. 2 (%)	Aquatic Veg. Type 3	Aquatic Veg. 3 (%)
26	0	0	1.08	1.08	10	Emergent	80	None	20		0
27	0	0	2	2	10	Emergent	50	Submergent	50		0
28	0	0	0.9	0.9	100	Submergent	40	Emergent	40	None	20
29	0	0	1.0	1	30	Emergent	40	Submergent	60		0
30	23.9	25.6	0.92	0.92	10	Emergent	50	Submergent	50		0
31	0	0	0.95	0.95	100	Typha	30	Chara	50	Zizania	20
32	25.6	26.2	1.03	1.03		Emergent	70	Submergent	20	None	10
33	21	23	0.80	0.75	20	Submergent	80	Floating	20		0
34	25.1	23.5	1.38	1.38	150	Emergent	50	Submergent	50		0
35	0	0		1.25	5	Emergent	40	Submergent	20	None	40
36	22	18	>1.25		200	Emergent	60	Submergent	40		0
37	22	18	>1.25		300	Zizania	50	Submergent	50		0
38	24	18	>1.25		500	Zizania	50	Submergent	50		0
39	20.3	23.5	2.15	2.15	500	Submergent	100		0		0
40	19.2	23.1	1.88	1.88	1000	Submergent	80	None	20		0
41	20.7	22.8	1.72	2.2		None	100		0		0
42	20.2	22.6	2.35	2.35		None	100		0		0
43	20.7	22.7	2.18	2.18	2500	None	100		0		0
44	19.3	22.3	2.11	2.11	3000	None	100		0		0
45	20.1	22.6	1.68	1.68	2000	None	100		0		0
46	20.4	22.7	0.92	0.92	500	Chara	80	Vallisneria	20		0
47	22.5	23.1	1.95	1.95	280	Myriophyllum	80	None	20		0
48	21.3	22.9	2.3	2.3	1300	Myriophyllum	100		0		0
49	20.7	22.8	1.97	1.97	2500	Myriophyllum	60	None	40		0
50	21.7	22.9	0.86	2.27	2000	None	100		0		0

Appendix 4: Continued

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance from Shore (m)	Aquatic Veg. Type 1	Aquatic Veg. 1 (%)	Aquatic Veg. Type 2	Aquatic Veg. 2 (%)	Aquatic Veg. Type 3	Aquatic Veg. 3 (%)
51	21.5	22.7	0.98	1.24	1000	None	100		0		0
52	21.7	22.1	1.65	1.65		None	100		0		0
53	21.7	22.4	1.95	1.95		Submergent	10	None	90		0
54	21.1	21.8	2.56	3.1		None	100		0		0
55	20.5	21.4	2.48	2.48		None	100		0		0
56	20.8	21.9	2.35	2.35		None	100		0		0
57	20.8	22.1	1.95	1.95		None	100		0		0
58	20.3	20.4	3.8	3.8		None	100		0		0
59	20.4	19.1	2.92	3.28		None	100		0		0
60	20.4	20	2.95	3.4		None	100		0		0
61	20.6	20.5	3.22	3.22		None	100		0		0
62	20.7	21.3	2.95	2.95		None	100		0		0
63	21.4	22.4	2.08	2.08		None	100		0		0
64	21.3	22.5	0.85	0.85		Emergent	40	None	60		0
65	20.5	19.9	2.95	3.54		None	100		0		0
66	22.7	22.8	0.55	0.55		Emergent	50	Submergent	50		0
67	21.4	22.5	1.72	1.72		None	100		0		0
68	21.7	22.8	1.85	1.85	500	Submergent	40	None	60		0
69	23.7	21.4	0.59	1.1	10	Emergent	25	Submergent	25	None	50
70	17.2	21.8	1.4	1.6	50	Myriophyllum	50	None	50		0
71	16.2	22.4	0.94	1	50	Myriophyllum	50	None	50		0
72	17.2	22.9	1.95	1.95	60	Myriophyllum	50	Zizania	10	None	40
73	18.2	22.9	1.19	1.2	20	Submergent	40	None	60		0
74	18.2	23.2	1.16	1.5	20	Myriophyllum	50	None	50		0

Appendix 4: Continued

Map #	Air Temp. (°C)	Water Temp. (°C)	Secchi Depth (m)	Max. Depth (m)	Distance from Shore (m)	Aquatic Veg. Type 1	Aquatic Veg. 1 (%)	Aquatic Veg. Type 2	Aquatic Veg. 2 (%)	Aquatic Veg. Type 3	Aquatic Veg. 3 (%)
75	18.1	22.6	0.80	1	25	Myriophyllum	20	Emergent	20	None	60
76	16.4	22.4	0.73	1	20	Emergent	50	None	50		0
77	17.9	22.4	0.95	1.5	10	Submergent	20	Emergent	20	None	60
78	18.2	22.7	1.4	1..5	20	Emergent	50	Submergent	10	None	40
79	18	19	>1.2		1000	Submergent	50	Zizania	50		0
80	18	19	>1.2		1000	Chara	50	Zizania	50		0
81	20	19	>1		250	Emergent	50	Submergent	25	Floating	25
82	25	21					0		0		0
83	0	0					0		0		0
84	23	28					0		0		0
85	28	22					0		0		0

Appendix 5: Locality descriptions of the Big Creek NWA sites.

Map #	Field Number	Date	Locality	Latitude	Longitude
1	BGCK05060705001	06/06/2005	East end of North Pond	42.60376358	-80.45822144
2	BGCK05060705002	06/06/2005	Centre of North Pond	42.60343552	-80.45866394
3	BGCK05060705003	07/06/2005	West end of North Pond	42.60326767	-80.45921326
4	BGCK05060705004	07/06/2005	East bank of north channel	42.60290146	-80.45854187
5	BGCK05060705005	07/06/2005	North channel, 50 m from Big Creek main channel	42.6010704	-80.45716858
6	BGCK05060705006	07/06/2005	Same site as 004	42.60290146	-80.45854187
7	BGCK05060805007	08/06/2005	East end of central pond	42.58456421	-80.44756317
8	BGCK05060805008	08/06/2005		42.58485031	-80.44975281
9	BGCK05060805009	08/06/2005	North bank of central pond	42.58518219	-80.45126343
10	BGCK05060805010	08/06/2005	East side of middle pond, adjacent to channel from North Pond	42.5856514	-80.44933319
11	BGCK05060805011	08/06/2005	Easternmost point of North Pond, about 15 m on the right after opening from channel (from NWA dock) to North Pond	42.587883	-80.45019531
12	BGCK05060905012	09/06/2005	Saw Log Pond, north shore, west end	42.57841492	-80.4623642
13	BGCK05060905013	09/06/2005	East end of Saw Log Pond	42.57881546	-80.46053314
14	BGCK05060905014	09/06/2005	Left side of middle pond coming from Saw Log Pond ~ 20 m from channel (from Saw Log Pond) on south bank	42.58221817	-80.46117401
15	BGCK05060905015	09/06/2005	Top of Benson's Pond, on south shore	42.58192062	-80.45763397
16	BGCK05061405016	14/06/2005	Bottom of South Pond (East)	42.58246613	-80.44725037
17	BGCK05061405017	14/06/2005	Middle portion of South Pond	42.58138657	-80.45093536
18	BGCK05061405018	14/06/2005	Top of South Pond near channel to Benson's	42.58033752	-80.45345306
19	BGCK05061405019	14/06/2005	Top of South Pond near channel to Benson's Pond, directly opposite of previous site (018)	42.58161545	-80.45412445
20	BGCK05061505020	15/06/2005		42.59226227	-80.46091461
21	BGCK05061505021	15/06/2005		42.59319687	-80.45749664
22	BGCK05061505022	15/06/2005	North impoundment	42.59461594	-80.45497894
23	BGCK05061505023	15/06/2005	North impoundment, across from first island up from observation deck	42.59518051	-80.45297241

Appendix 5: Continued

Map #	Field Number	Date	Locality	Latitude	Longitude
24	BGCK05061605024	16/06/2005	North impoundment directly across from 1st island ~ 200 m up channel from observation tower	42.59649658	-80.45210266
25	BGCK0506160525	16/06/2005	North impoundment directly across from north side of 1st island ~ 200 m down channel from observation tower	42.59553146	-80.45285797
26	BGCK05061605026	16/06/2005	North impoundment ~ 200 m upstream/up-channel from bird observation tower on far side of 1st island	42.5954361	-80.45373535
27	BGCK05061605027	16/06/2005	First indent on left side when coming out of channel from launch at bird sanctuary. In north impoundment, just before 1st island	42.59481812	-80.4529953
28	SPGR02-BCMR-001	18/06/2002	Big Creek Delta	42.59680176	-80.46749115
29	SPGR02-BCMR-002	18/06/2002	Encroaching the main Big Creek Channel	42.5936203	-80.47064972
30	SPGR02-BCMR-003	18/06/2002	Upstream Of Port Royal Bridge	42.59693909	-80.49005127
31	SPGR02-BCMR-004	18/06/2002	Southern portion of marsh	42.58930969	-80.45493317
32	SPGR02-BCMR-005	18/06/2002	Big Creek Delta	42.59986877	-80.44989777

Appendix 6: Locality description of the Long Point NWA sites sampled.

Map #	Field Number	Date	Locality	Latitude	Longitude
1	LP05062205001	22/06/2005	Western end of Bouck's Pond	42.55578232	-80.22904968
2	LP05062205002	22/06/2005	Western end of Bouck's Pond, approximately 200 m up the channel from Site 1	42.55606842	-80.22538757
3	LP05062205003	22/06/2005	Western end of Bouck's Pond on south side of channel, ~200 m east of Site 2	42.55648041	-80.21985626
4	LP05062205004	22/06/2005	Centre of Bouck's Pond ~150 m up the channel from Site 3 on north side	42.55800247	-80.21794891
5	LP05062305005	23/06/2005	Midpoint of Bouck's Pond	42.55776596	-80.21653748
6	LP05062305006	23/06/2005	Middle of Bouck's Pond ~200 m east of Site 5	42.55836487	-80.21478271
7	LP05062305007	23/06/2005	Middle of Bouck's Pond ~250 m from Site 6	42.55941772	-80.21392822
8	LP05062305008	23/06/2005	Middle of Bouck's Pond ~ 500 m across the pond from Site 7	42.55868149	-80.21086121
9	LP05062405009	24/06/2005	Middle of Bouck's Pond ~ 200 m up the channel from Site 7, on south side	42.558918	-80.2048645
10	LP05062405010	24/06/2005	East end of Bouck's Pond ~ 500 m from opening to Erie, on north side of channel	42.56204987	-80.20010376
11	LP05062405011	24/06/2005	East end of Bouck's Pond- by entrance on south side	42.56044769	-80.19723511
12	LP05062805012	28/06/2005	Squire's Ridge Pond ~ 3 km W of Squire's Ridge Cottage, just off of ATV trail	42.56003571	-80.24923706
13	LP05062805013	28/06/2005	Squire's Ridge Pond – 3 km west of Squire's Ridge Cottage, just off of ATV trail	42.55916595	-80.25118256
14	LP05062805014	28/06/2005	Approx. 3 km west of Squire's Ridge Cottage	42.55875015	-80.25549316
15	LP05062805015	28/06/2005	Approx. 3 km west of Squire's Ridge Cottage	42.55934906	-80.2532959
16	LP05062905016	29/06/2005	Narrow channel joining Little Creek and Bouck's Pond approximately 250 m in from the mouth of Bouck's Pond on south side at the entrance of Little Pond	42.55958557	-80.19841766
17	LP05062905017	29/06/2005	20 m east of mouth of channel joining Bouck's Pond to Little Creek (90 m east of Site 16)	42.55939865	-80.19838715
18	LP05062905018	29/06/2005	South side of Little Creek approximately 20 m west of channel	42.55938721	-80.19881439

Appendix 6: Continued

Map #	Field Number	Date	Locality	Latitude	Longitude
19	LP05062905019	29/06/2005	South side of Little Creek, approximately 50 m down from channel opening from Bouck's Pond to Little Creek	42.55854797	-80.19995117
20	LP05063005020	30/06/2005	Just off Gravelly Bay Road, by Otter Ridge sign, approximately 30 m west on walking trail. Accessed at canoe launch - at far west side of pond	42.54668427	-80.11128998
21	LP05063005021	30/06/2005	Pond is just off Gravelly Bay Road – 30 m west off of trail on walking path, fyke net set at easternmost end of pond	42.54696274	-80.1096344
22	LP05063005022	30/06/2005	West end of Long Pond	42.54611969	-80.0792923
23	LP05063005023	30/06/2005	Northwest end of Long Pond	42.54708481	-80.07654572
24	LP05063005024	30/06/2005	East end of Long Pond	42.54841232	-80.06635284
25	LPBCOA04BE130704001	13/07/2004	Big Rice Bay, outside Long Point Company property	42.59352112	-80.33605194
26	LPBCOA04BE130704002	13/07/2004		42.6009407	-80.33792114
27	LPBCOA04BE130704003	13/07/2004	Little Rice Bay, Long Point Bay	42.58626175	-80.35758972
28	LPBCOA04BE130704004	13/07/2004	South shore of Sturgeon Bay; Long Point Bay - Inner Bay	42.58626938	-80.38372803
29	LPBCOA04BE130704005	13/07/2004	Long Point Bay; south shore of Inner Bay; near Old Cut	42.58969879	-80.39250183
30	LPBCOA04BE140704006	14/07/2004	Bluffs Pond, South Shore	42.55727005	-80.13813019
31	LPBCOA04BE140704007	14/07/2004	Bluffs Pond; Long Point Bay	42.55878067	-80.13693237
32	LPBCOA04BE140704008	14/07/2004	Bluffs Pond; Long Point Bay	42.5592804	-80.13072205
33	LPBCOA04BE160704009	16/07/2004	North of Sandbay Marina	42.58917999	-80.44304657
34	LPBCOA04BE160704010	16/07/2004	Southeast of Sandbay Marina; edge of wild rice bed	42.58541107	-80.43618011
35	LPBCOA04BE290804011	29/08/2004	Long Point Bay; west of Old Cut Marina	42.5958786	-80.39491272
36	LPBCOA04BE290804012	29/08/2004	West of Old Cut Marina	42.597229	-80.40003967
37	LPBCOA04BE290804013	29/08/2004	West of Old Cut Marina	42.60108948	-80.41088104
38	LPBCOA04BE290804014	29/08/2004	West of Old Cut; east of Sandbay -> south shore	42.60052872	-80.42373657
39	LPBHS04BE060704T002H	06/07/2004	Transect 2, point H	42.65481186	-80.39302826

Appendix 6: Continued

Map #	Field Number	Date	Locality	Latitude	Longitude
40	LPBHS04BE060704T002G	06/07/2004	Transect 2, point G	42.64585114	-80.39351654
41	LPBHS04BE060704T002F	06/07/2004	Transect 2, point F	42.63690948	-80.39447784
42	LPBHS04BE060704T002E	06/07/2004	Transect 2, point E	42.62794876	-80.39510345
43	LPBHS04BE060704T002D	06/07/2004	Transect 2, point D	42.61899185	-80.39530182
44	LPBHS04BE060704T002C	06/07/2004	Transect 2, point C	42.61006927	-80.39433289
45	LPBHS04BE060704T002B	06/07/2004	Transect 2, point B	42.60100937	-80.3944397
46	LPBHS04BE060704T002A	06/07/2004	Transect 2, point A	42.59191895	-80.39375305
47	LPBHS04BE060704T001A	06/07/2004		42.63552856	-80.43029785
48	LPBHS04BE060704T001B	06/07/2004	Long Point Bay - Transect 1, Point 2	42.62656021	-80.42935944
49	LPBHS04BE060704T001C	06/07/2004	LPBHS04 Transect 1, Point C	42.61759186	-80.4286499
50	LPBHS04BE060704T001D	06/07/2004	Transect 1, Point D	42.60858154	-80.42841339
51	LPBHS04BE060704T001E	06/07/2004	Transect 01, Point E	42.59955978	-80.42849731
52	LPBHS04BE070704T003G	07/07/2004	Transect 3, Point G	42.59320831	-80.3615799
53	LPBHS04BE070704T003F	07/07/2004	Transect 3, Point F	42.60211945	-80.36115265
54	LPBHS04BE070704T003E	07/07/2004	Transect 3, Point E	42.61104965	-80.36029816
55	LPBHS04BE070704T003D	07/07/2004	Transect 3, Point D	42.6199913	-80.35926056
56	LPBHS04BE070704T003C	07/07/2004	Transect 3, Point C	42.62879181	-80.35697937
57	LPBHS04BE070704T003B	07/07/2004	Transect 3, Point B	42.63769913	-80.35546112
58	LPBHS04BE070704T004I	07/07/2004	Transect 4, Point I	42.66569138	-80.3214798
59	LPBHS04BE070704T004H	07/07/2004	Transect 4, Point H	42.65679169	-80.32083893
60	LPBHS04BE070704T004G	07/07/2004	Transect 4, Point G	42.64786911	-80.32006073
61	LPBHS04BE070704T004E	07/07/2004	Transect 4, Point E	42.62997055	-80.31967926
62	LPBHS04BE070704T004D	07/07/2004	Transect 4, Point D	42.62097931	-80.31951141
63	LPBHS04BE070704T004C	07/07/2004	Transect 4, Point C	42.6119194	-80.3190918
64	LPBHS04BE070704T004A	07/07/2004	Transect 4, Point A	42.59391022	-80.32009125
65	LPBHS04BE070704T004F	07/07/2004	Transect 4, Point F	42.63898087	-80.31973267

Appendix 6: Continued

Map #	Field Number	Date	Locality	Latitude	Longitude
66	LPBHS04BE070704T003H	07/07/2004	Transect 3, Point H	42.58638	-80.36212158
67	LPBHS04BE070704T004B	07/07/2004	Transect 4, Point B	42.60289001	-80.31965637
68	LPBHS04BE070704T003A	07/07/2004	Transect 3, Point A	42.64665985	-80.35572052
69	LPB04BE080704001	08/07/2004	Shocking to and returning from 0-500 m northwest of Big Creek mouth, following shoreline contours.	42.60206985	-80.44819641
70	LPB04BE080704002	08/07/2004	Shocking from 1500-2000 m northwest of Big Creek mouth (shock 1500-2000, then 2000-1500), following shoreline contours.	42.61373138	-80.45204926
71	LPB04BE080704003	08/07/2004	Shock up and back between 300-3500 m northwest of Big Creek mouth, following shoreline contours	42.62627029	-80.44377899
72	LPB04BE080704004	08/07/2004	Shocking up and back from 4500 to 5000 m northwest of Big Creek mouth, following shoreline contours	42.63753891	-80.43109131
73	LPB04BE080704005	08/07/2004	Shocking up and back, between 6000-6500 m northwest from Big Creek mouth following shoreline contours.	42.64997101	-80.41802979
74	LPB04BE080704006	08/07/2004	Shocking between 7500-8000 m and back, northwest from Big Creek mouth following shoreline contours	42.65803909	-80.40135956
75	LPBE090704007	09/07/2004	Shocking from 9000-9500 m northwest of Big Creek mouth following shoreline contours (and back from 9500-9000 m)	42.65969849	-80.3849411
76	LPB04BE090704008	09/07/2004	Shocking between 10500-11000 m and back, northwest of Big Creek mouth following shoreline	42.65596008	-80.36813354
77	LPB04BE090704009	09/07/2004	Shocking between 12000-12500 m northwest of Big Creek mouth following shoreline contours	42.6497612	-80.34921265
78	LPB04BE090704010	09/07/2004	Shocking between 13500-14000 m northwest of Big Creek mouth following shoreline contours.	42.64957047	-80.33654022
79	LPB04BE300804011	30/08/2004	East of Sandbay Marina; west of Alex Channel	42.59674072	-80.43256378
80	LPB04BE300804012	30/08/2004	West of Alex Channel	42.58935928	-80.43300629
81	LPB04BE300804013	30/08/2004	Alex Channel; isolated (semi) pond	42.58319092	-80.43477631
82	SPGR02-OLCT-001	19/06/2002	Long Point, On	42.59408951	-80.39575195
83	SPGR02-OLCT-002	19/06/2002	Long Point, On	42.59339142	-80.40825653
84	SPGR02-OLCT-003	19/06/2002	Long Point, On	42.58197021	-80.41459656
85	SPGR02-OLCT-004	19/06/2002	Long Point, On	42.58383942	-80.40696716

Appendix 7: Locality description of the St. Clair NWA sites sampled.

Map #	Field Number	Date	Locality	Latitude	Longitude
1	STCL05070605001	06/07/2005	Southern corner of west impoundment	42.35997009	-82.40572357
2	STCL05070605002	06/07/2005	Mouth of channel opening into west dyke channel	42.36198044	-82.40760803
3	STCL05070605003	06/07/2005	300 m north of channel that opens into west dyke channel, right by large deciduous tree, just off of dyke	42.36408997	-82.41074371
4	STCL05070605004	06/07/2005	600 m north of Site 3, in far west corner	42.36756134	-82.41493225
5	STCL05070705005	07/07/2005	Northeast of Site 4 approximately 150 m along dyke, and 50 m out from dyke on small island of emergents	42.36846924	-82.41327667
6	STCL05070605006	07/07/2005	200 m east of Site 5, just inside bay	42.36845016	-82.4105835
7	STCL05070705007	07/07/2005	In north corner of impoundment, right by channel opening to cottage; approximately 20 m northeast of opening	42.37081909	-82.40975189
8	STCL05070705008	07/07/2005	Little bay, just before channel opening to western impoundment	42.370121	-82.40837097
9	STCL05070805009	08/07/2005	East side of first little bay on your left after heading southeast from Haggeman's Cottage	42.37371826	-82.4065094
10	STCL05070805010	08/07/2005	Open water set, just before first bay channels behind Haggeman's Cottage	42.37514877	-82.40486145
11	STCL05070805011	08/07/2005	Opposite end of bay from Site 10	42.3758812	-82.40309143
12	STCL05070805012	08/07/2005	In channel directly behind dock at Haggeman's Cottage	42.37767029	-82.40278625
13	STCL05071205013	12/07/2005		42.36167908	-82.40289307
14	STCL05071205014	12/07/2005		42.36240005	-82.4017868
15	STCL05071205015	12/07/2005		42.36310959	-82.40075684
16	STCL0507120516	12/07/2005		42.36362076	-82.39990997
17	STCL05071405017	14/07/2005	Just off of Balmoral Line	42.3656311	-82.39720154
18	STCL05071405018	14/07/2005		42.36645889	-82.39584351
19	STCL05071405019	14/07/2005		42.36824036	-82.39325714
20	STCL05071405020	14/07/2005		42.3782196	-82.3989563

Appendix 8: Summary of sampling effort for Big Creek NWA sites.

Map #	Capture Method	Effort	Units	Description
1	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
2	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
3	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
4	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
5	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
6	Seine Net	2	Haul	Bag Seine, 1/4" mesh, Length - 8.5 m, 25 ft
7	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
8	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
9	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
10	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
11	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
12	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
13	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
14	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
15	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
16	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
17	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
18	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
19	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
20	FN Large	25	Hours	Fyke Net, Large, 1" Mesh
21	FN Large	25	Hours	Fyke Net, Large, 1" Mesh
22	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
23	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
24	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
25	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
26	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
27	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
28	BEF	2396	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
29	BEF	2063	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
30	BEF	2685	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
31	BEF	3241	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
32	BEF	3104	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom

Appendix 9: Summary of Long Point NWA sampling effort.

Map #	Capture Method	Effort	Units	Description of Method
1	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
2	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
3	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
4	FN Large	25	Hours	Fyke Net, Large, 1" Mesh
5	FN Large	24*	Hours	Fyke Net, Large, 1" Mesh
6	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
7	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
8	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
9	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
10	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
11	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
12	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
13	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
14	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
15	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
16	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
17	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
18	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
19	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
20	FN Large	25	Hours	Fyke Net, Large, 1" Mesh
21	FN Large	25	Hours	Fyke Net, Large, 1" Mesh
22	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
23	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
24	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
25	BEF	478	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
26	BEF	728	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
27	BEF	571	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
28	BEF	643	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
29	BEF	744	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
30	BEF	671	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
31	BEF	1125	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
32	BEF	893	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
33	BEF	557	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
34	BEF	469	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
35	BEF	780	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
36	BEF	841	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
37	BEF	0		E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
38	BEF	865	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
39	BEF	100	Seconds	E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom
40	BEF	100	Seconds	E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom
41	BEF	100	Seconds	E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom
42	BEF	100	Seconds	E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom

Appendix 9: Continued

Map #	Capture Method	Effort	Units	Description of Method
43	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
44	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
45	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
46	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
47	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
48	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
49	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
50	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
51	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
52	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
53	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
54	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
55	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
56	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
57	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
58	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
59	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
60	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
61	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
62	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
63	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
64	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
65	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
66	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
67	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
68	BEF	100	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
69	BEF	1260	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
70	BEF	1607	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
71	BEF	1373	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
72	BEF	1764	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
73	BEF	1427	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
74	BEF	1238	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
75	BEF	1651	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
76	BEF	1313	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
77	BEF	1344	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
78	BEF	811	Seconds	Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom
79	BEF	730	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
80	BEF	765	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
81	BEF	674	Seconds	E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom
82	BEF	1236	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
83	BEF	1553	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
84	BEF	1480	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom
85	BEF	1630	Seconds	SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom

Appendix 10: Summary of St. Clair NWA sampling effort.

Map #	Capture Method	Duration (Hrs)	Units	Description of Method
1	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
2	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
3	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
4	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
5	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
6	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
7	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
8	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
9	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
10	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
11	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
12	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
13	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
14	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
15	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
16	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
17	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
18	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
19	FN Large	24	Hours	Fyke Net, Large, 1" Mesh
20	FN Large	24	Hours	Fyke Net, Large, 1" Mesh

Appendix 11: Species captured by site at Big Creek NWA by DFO in 2005. COSEWIC status: EN – Endangered, SC – Special Concern

Species	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Alewife	1																	
Black Bullhead	2																	
Black Crappie	41																	
Blackchin Shiner	1									1								
Bluegill	51	5		6	3		1		1						1			2
Bluntnose Minnow	10			1		3	4											
Bowfin	11	1											1	1	1			
Brook Silverside	1																	
Brown Bullhead	37			2	5			1	2		4		1		2			
Central Mudminnow	1																	
Common Carp	2																	
Emerald Shiner	8					1	6	1										
Freshwater Drum	2																	
Gizzard Shad	5																	
Golden Shiner	47	1	4	2	8				2				1					
Grass Pickerel (SC)	2																	
Lake Chubsucker (EN)	13																	
Largemouth Bass	7								1					1				
Longnose Gar	5				1				1	1	1	1						
Northern Pike	4																	
Pumpkinseed	156	15	1	30	14	1	3		4	7			1	3	1			2
Rainbow Trout	1								1									
Rock Bass	49			21	15	1	2		3	2								
Warmouth (SC)	11																	
Yellow Perch	39			6	1		6											
Total	507	22	5	68	47	6	22	2	15	11	5	1	4	5	5	0	0	4

Appendix 11: Continued

Species	Total	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alewife	1											1				
Black Bullhead	2													1		1
Black Crappie	41			1		1	16	1	20		2					
Blackchin Shiner	1															
Bluegill	51	1										6	5	2	9	9
Bluntnose Minnow	10											1				1
Bowfin	11		2	2		1	1		1							
Brook Silverside	1															1
Brown Bullhead	37	1		2			1		1			1		1	7	6
Central Mudminnow	1			1												
Common Carp	2												1			1
Emerald Shiner	8															
Freshwater Drum	2												1	1		
Gizzard Shad	5											3	1		1	
Golden Shiner	47					1	8	1	1	1	14	1		1		1
Grass Pickerel (SC)	2									1				1		
Lake Chubsucker (EN)	13			2			2		1	7	1					
Largemouth Bass	7											2			1	2
Longnose Gar	5															
Northern Pike	4												2	1	1	
Pumpkinseed	156	2	2	1		3	21	4	1	3	1	11	4	6	10	5
Rainbow Trout	1															
Rock Bass	49		1									2			2	
Warmouth (SC)	11						10			1						
Yellow Perch	39											6			12	8
Total	507	4	5	9	0	6	59	6	25	13	18	34	14	14	43	35

Appendix 12: Species caught by site at Long Point NWA by DFO in 2002, 2004 and 2005. COSEWIC status: EN – Endangere, SC – Special Concern

Common Name	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Banded Killifish	13						1								
Black Bullhead	7														
Black Crappie	12														
Blackchin Shiner	186		1		1	1									
Blacknose Shiner	38														
Bluegill	216			1	1								2	1	
Bluntnose Minnow	98											1			
Bowfin	8												2		
Brook Silverside	17														
Brown Bullhead	194			1									2		1
Channel Catfish	1														
Common Carp	33														
Emerald Shiner	272														
Freshwater Drum	12														
Gizzard Shad	3														
Golden Shiner	184			1	28						1				
Goldfish	13														
Grass Pickerel (SC)	5														
Iowa Darter	1														
Johnny Darter	6														
Lake Chubsucker	2														
Largemouth Bass	143														
Log Perch	3														
Longnose Gar	33			2		4		1		1					
Mimic Shiner	51														
Northern Pike	15													1	1
Pugnose Shiner	30														
Pumpkinseed	725	10	25	23	41	7	10		1	28	4			1	
Rock Bass	33			2							3	1			
Round Goby	9														
Smallmouth Bass	1														
Spotfin Shiner	4														
Spottail Shiner	11														
Tadpole Madtom	19			6	1										1
Yellow Bullhead	2														
Yellow Perch	810			1											
Total	3210	10	26	37	72	12	11	1	1	29	8	2	6	3	3

Appendix 12: Continued

Common Name	Total	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Banded Killifish	13														
Black Bullhead	7													2	1
Black Crappie	12						12								
Blackchin Shiner	186			1	2							12		6	
Blacknose Shiner	38											1			1
Bluegill	216	2								1		2		4	3
Bluntnose Minnow	98														
Bowfin	8														
Brook Silverside	17												3		1
Brown Bullhead	194	1					16			1		7		3	4
Channel Catfish	1														
Common Carp	33														
Emerald Shiner	272												4	2	
Freshwater Drum	12														
Gizzard Shad	3														
Golden Shiner	184						81					6		3	
Goldfish	13														
Grass Pickerel (SC)	5											1			
Iowa Darter	1														
Johnny Darter	6														
Lake Chubsucker	2						1								
Largemouth Bass	143								1				1	2	3
Log Perch	3														
Longnose Gar	33														
Mimic Shiner	51														
Northern Pike	15														
Pugnose Shiner	30														
Pumpkinseed	725	1	10	50	4	10	72	2			1	2		6	5
Rock Bass	33												1	1	
Round Goby	9												1		
Smallmouth Bass	1														
Spotfin Shiner	4														
Spottail Shiner	11														
Tadpole Madtom	19				4	6									
Yellow Bullhead	2											1			
Yellow Perch	810						1	1				24		34	29
Total	3210	4	10	51	10	16	183	3	1	2	1	56	10	63	47

Appendix 12: Continued

Common Name	Total	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Banded Killifish	13		1						4		1				
Black Bullhead	7														
Black Crappie	12														
Blackchin Shiner	186	10		24	4	5	5	1	19	9	2				
Blacknose Shiner	38			1				5	5	5	1				
Bluegill	216	10				16	2	3	7	2	2				
Bluntnose Minnow	98			8	1			5		1	2				
Bowfin	8	1	2	1											
Brook Silverside	17					1					2				
Brown Bullhead	194	4	2	2		7	3	6	2	11	6		2		
Channel Catfish	1				1										
Common Carp	33	1	2		2		2		2	1					
Emerald Shiner	272					4					1	2			
Freshwater Drum	12				1	1		3							
Gizzard Shad	3					1									
Golden Shiner	184	2	1	2		8				11	12				
Goldfish	13					1									
Grass Pickerel (SC)	5								1						
Iowa Darter	1														
Johnny Darter	6									1					
Lake Chubsucker	2	1													
Largemouth Bass	143	1	2	3	3	4	1	5	9	4	3				
Log Perch	3							1			1				
Longnose Gar	33		9	1	5										
Mimic Shiner	51				1			6	1		12				
Northern Pike	15					1		2		2	1				
Pugnose Shiner	30	2					1		2	1	1				
Pumpkinseed	725	2	2	14	14	24	2	3	17	13	17				
Rock Bass	33				1	2			4						
Round Goby	9														
Smallmouth Bass	1														
Spotfin Shiner	4				4										
Spottail Shiner	11					3					1				
Tadpole Madtom	19														
Yellow Bullhead	2														
Yellow Perch	810	22	5	28	26	48	10	5	20	89	60	1			
Total	3210	56	26	84	63	126	26	45	93	150	125	3	2	0	0

Appendix 12: Continued

Common Name	Total	43	44	45	46	47	48	49	50	51	52	53	54	55	56
Banded Killifish	13														
Black Bullhead	7														
Black Crappie	12														
Blackchin Shiner	186					1									
Blacknose Shiner	38														
Bluegill	216														
Bluntnose Minnow	98														
Bowfin	8														
Brook Silverside	17														
Brown Bullhead	194			1											
Channel Catfish	1														
Common Carp	33														
Emerald Shiner	272	8	10	4	1		3	3	14	9				8	6
Freshwater Drum	12					2									
Gizzard Shad	3														
Golden Shiner	184							1							
Goldfish	13														
Grass Pickerel (SC)	5														
Iowa Darter	1														
Johnny Darter	6														
Lake Chubsucker	2														
Largemouth Bass	143			1											
Log Perch	3									1					
Longnose Gar	33														
Mimic Shiner	51														
Northern Pike	15														
Pugnose Shiner	30					1									
Pumpkinseed	725				1	1									
Rock Bass	33														
Round Goby	9														
Smallmouth Bass	1														
Spotfin Shiner	4														
Spottail Shiner	11														
Tadpole Madtom	19														
Yellow Bullhead	2														
Yellow Perch	810				5	1				3					
Total	3210	8	10	6	7	6	3	4	14	13	0	0	0	8	6

Appendix 12: Continued

Common Name	Total	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Banded Killifish	13															
Black Bullhead	7															
Black Crappie	12															
Blackchin Shiner	186										12			1	2	9
Blacknose Shiner	38															
Bluegill	216								1					13	10	3
Bluntnose Minnow	98										1			9		2
Bowfin	8															
Brook Silverside	17								2						2	1
Brown Bullhead	194												1		18	6
Channel Catfish	1															
Common Carp	33													1	6	4
Emerald Shiner	272	10				1				1	1			27		1
Freshwater Drum	12															
Gizzard Shad	3														2	
Golden Shiner	184													2	3	1
Goldfish	13														3	3
Grass Pickerel (SC)	5														1	
Iowa Darter	1															
Johnny Darter	6															
Lake Chubsucker	2															
Largemouth Bass	143														5	5
Log Perch	3															
Longnose Gar	33															
Mimic Shiner	51															
Northern Pike	15															
Pugnose Shiner	30										1			2		11
Pumpkinseed	725	1												59	10	15
Rock Bass	33													1		
Round Goby	9															1
Smallmouth Bass	1	1														
Spotfin Shiner	4															
Spottail Shiner	11													1		
Tadpole Madtom	19															
Yellow Bullhead	2															
Yellow Perch	810										1	1		50	28	42
Total	3210	12	0	0	0	1	0	0	3	1	16	1	1	166	90	104

Appendix 12: Continued

Common Name	Total	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Banded Killifish	13							1	1		4				
Black Bullhead	7											4			
Black Crappie	12														
Blackchin Shiner	186	7	2	2	22		7	14			4				
Blacknose Shiner	38				1				2		16				
Bluegill	216	13	11	7	22	14	5	1	7	2	5	7	14	13	9
Bluntnose Minnow	98	10	10	1	4	1	6	1	4		25	1	5		
Bowfin	8		1	1											
Brook Silverside	17		1	1			1			1					1
Brown Bullhead	194	14	11	8	14	2	2	2	18	6			7	1	2
Channel Catfish	1														
Common Carp	33	4	2	2	1		3								
Emerald Shiner	272	3	6	81	31	3	24	3	1						
Freshwater Drum	12			3		1									1
Gizzard Shad	3														
Golden Shiner	184	4	7	1	3		1	1	1				1	1	1
Goldfish	13	1	3	2											
Grass Pickerel (SC)	5				2										
Iowa Darter	1											1			
Johnny Darter	6									1	4				
Lake Chubsucker	2														
Largemouth Bass	143	9	6	20	11	4	15	3	1	5	12	2	1		1
Log Perch	3														
Longnose Gar	33	2	8												
Mimic Shiner	51								19		3	6	3		
Northern Pike	15				2	1						1			3
Pugnose Shiner	30	1			3				2		2				
Pumpkinseed	725	17	13	6	43	7	8	7	17	17	74		2	5	1
Rock Bass	33	2	1		13		1								
Round Goby	9							7							
Smallmouth Bass	1														
Spotfin Shiner	4														
Spottail Shiner	11								6						
Tadpole Madtom	19											1			
Yellow Bullhead	2				1										
Yellow Perch	810	39	32	21	27	10	26	30	37	12	18	7	10	5	1
Total	3210	126	114	156	200	43	99	70	116	44	167	30	43	25	20

Appendix 13: Species caught per site at St. Clair NWA by DFO in 2005.

Common Name	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Black Crappie	10							1										5	4		
Bluegill	19	1		8			3		2	1		2	1								1
Bowfin	17				1							2		4		3	3	1		1	2
Brown Bullhead	2		1	1																	
Central Mudminnow	1																				1
Common Carp	1														1						
Golden Shiner	4								2					1				1			
Goldfish	6																		6		
Largemouth Bass	33	3	2	9				2	1				2					8	4	1	1
Northern Pike	5	1		2							1		1								
Pumpkinseed	35	3	1	10		1						2	1	3			5	4	2		3
Smallmouth Bass	1					1															
Total	134	8	4	30	1	2	3	3	3	3	1	6	5	8	1	3	8	19	16	2	8