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TARGETED, WADEABLE SAMPLING OF FISH SPECIES AT RISK IN THE LAKE ST. CLAIR WATERSHED OF SOUTHWESTERN ONTARIO, 2003

by

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ABSTRACT

Southwestern Ontario has the highest freshwater fish species richness of any region in Canada. During September 2003, the Department of Fisheries and Oceans conducted a targeted sampling survey of several southwestern Ontario drainages to investigate the current distribution of several fish species at risk (SAR). Targeted sampling refers to the non-random sampling of habitats, thought to contain "target species" based on previous sampling and known habitat preferences, using gears most likely to capture target species. Seven drainages within the Lake St. Clair watershed were sampled, including Little Bear Creek, East Otter Creek, Maxwell Creek, the North and East Sydenham rivers, Fansher Creek, Whitebread Drain/Grape Run and West Otter Creek. Overall, 40 sites were sampled by backpack electrofishing and seining. A total of 53 species were detected, including four species at risk (blackstripe topminnow, grass pickerel, pugnose minnow and pugnose shiner). Both electrofishing and seining were effective in capturing a diversity of species, but were particularly effective when used together.

RÉSUMÉ

Le Sud-Ouest de l'Ontario possède la plus grande quantité d'espèces de poissons d'eau douce que n'importe quelle autre région du Canada. En septembre 2003, le ministère des Pêches et des Océans a réalisé une étude sur un échantillonnage ciblé de quelques drainages au Sud-Ouest de l'Ontario afin d'enquêter la répartition actuelle de quelques espèces de poissons en péril. L'échantillonnage ciblé fait référence à l'échantillonnage non aléatoire des habitats dont l'on considère contenir les « espèces cibles » en fonction de l'échantillonnage précédent et les préférences d'habitat connues au moyen de matériel pouvant probablement capturer les espèces cibles. Sept drainages à l'intérieur du bassin versant du lac Sainte-Claire ont été échantillonnés, y compris le ruisseau Little Bear, le ruisseau Otter Est, le ruisseau Maxwell, la rivière Sydenham Nord et Est, le ruisseau Fansher, le drain Whitebread/passage Grape et le ruisseau Otter Ouest. Au total, 40 sites ont été échantillonnés au moyen de la pêche électrique par sac à dos et la pêche à la senne. Un total de 53 espèces ont été relevées, notamment quatre espèces en péril (le fondule rayé, le brochet vermiculé, le petit-bec et le méné camus). La pêche électrique et la pêche à la senne se sont avérées efficaces pour la capture d'une diversité d'espèces, mais étaient particulièrement efficaces lorsque qu'utilisées ensemble.

1.0 INTRODUCTION

Southwestern Ontario contains the highest diversity of freshwater fish species of any region in Canada (Staton and Mandrak, 2006). Drainages in southwestern Ontario have been periodically sampled over the past few decades and records for several fish species at risk (SAR) exist for this region. During September 2003, Fisheries and Oceans Canada conducted a targeted sampling survey of several southwestern Ontario drainages to investigate the current distribution of fish SAR. Targeted sampling refers to the non-random sampling of habitats, thought to contain "target species" based on previous sampling and known habitat preferences, using gears most likely to capture target species. During September 9-19, 2003, seven drainages within the Lake St. Clair watershed were sampled, including East Otter Creek, Fansher Creek, Little Bear Creek, Maxwell Creek, the North and East Sydenham rivers, West Otter Creek and Whitebread Drain/Grape Run (Figure 1, Appendix 1). A total of 40 sites were sampled at 26 locations, including 14 locations with 2 sites. Most of the sites were located in the Sydenham River watershed (Figure 1, Appendix 1).

2.0 METHODS

Only sites containing wadeable habitats were sampled during the study. Wadeable sites are defined as sites where the water depth is <1.5m, stream flow is low, and substrates are stable. The sampling gear used was a backpack electrofishing unit and two types of seine nets: a 25' bag seine and a 30' straight seine, each with 14mm mesh. These gears were used during the previous collections of fish SAR at the sites sampled. A total of 40 sites were sampled at 26 locations (Appendix 2). Twelve of the 26 sites were sampled with only one gear type, either seining (8 sites) (Appendix 3a, 4) or electrofishing (4 sites) (Appendix 3b, 4). The remaining 14 sites were sampled using both electrofishing and seining (Appendix 3, 4).

2.1 ELECTROFISHING TECHNIQUES

Electrofishing was conducted using a backpack electrofishing unit (Smith Root LR 24 Backpack Unit), with sampling effort ranging from 150 to 1400 seconds of shocking (Appendix 4). Fishes were captured in nets as they approached the surface of the water and were placed in water-filled buckets. Upon completion of electrofishing, the sampled fishes were identified, measured and returned to the water. Voucher

specimens of each species were preserved in 10% formalin for later laboratory verification of the species identity.

At some sites, electrofishing was not possible for various safety reasons: the bank slope was too steep; substrate type was not conducive to secure footing; or, water depth was too deep to ensure collectors would not come into contact with the water.

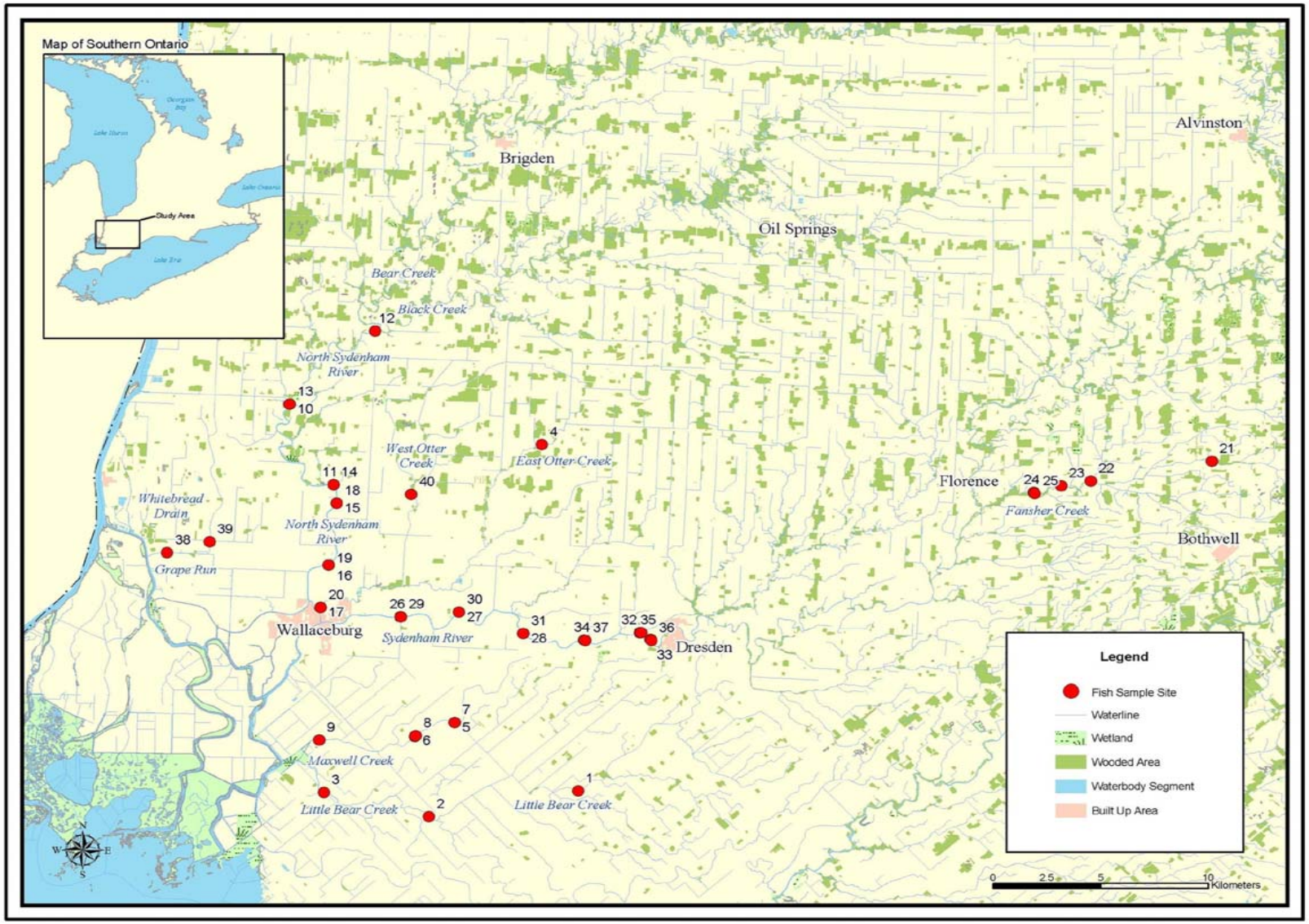

Figure 1. Sites sampled in Lake St. Clair watershed in 2003. See Appendix 1 for detailed site descriptions.

2.2 SEINING TECHNIQUES

Two types of seine nets were used to collect fishes at most sites sampled. Bag seines and straight seines were used interchangeably, depending on equipment damage. If one seine type was damaged, the other would be used as an alternate. At some sites, seining was not possible due to obstacles in the waterway (e.g. woody debris and refuse).

Seining methods involved multiple hauls, terminating when sampling yielded no additional species, or when five hauls were performed. Usually five hauls were performed at each site, unless complications arose. Complications included limited accessibility, very high abundances of fishes, or the presence of obstacles that would have damaged the nets.

3.0 RESULTS

3.1 FISH ASSEMBLAGE SAMPLING

A total of 53 species were detected in the seven waterbodies sampled in this study. Fewer species were detected using electrofishing than the combined seining techniques: 44 and 52 species, respectively (Table 1; Appendix 3). Electrofishing failed to detect nine species of 53 species captured, while seining detected all but one species in all sites.

3.2 SAMPLING EFFORT

The combined effort of seining and electrofishing methods yielded a total of 13389 fishes. A total of 10137 fishes were collected using seining, compared to 3252 fishes collected using electrofishing (Table 1). Sampling effort reached a total of 69 seine hauls, and 316.7 minutes of electrofishing (Table 1; Appendix 4). Mean values of Catch per Unit Effort (CPUE) at the seining and electrofishing sites were calculated as 146.9 fish/haul and 10.3 fish/minute, respectively (Table 1).

Table 1. Summary of sampling effort.

	Combined Gears	Seining (Bag Seine+Straight Seine)	Electrofishing
Total Fish Captured	13389	10137	3252
Species Richness	53	52	44
Total Effort	na	69 hauls	316.7 minutes
Mean CPUE	na	146.9 fish/haul	10.3 fish/minute

na = not applicable

3.3 SPECIES AT RISK

Several fish SAR, listed by COSEWIC[1], were collected in this study, including two species listed as Special Concern and one species listed as Endangered. All three COSEWIC-listed species were detected by both sampling techniques (Table 2; Appendix 3). Some differences in SAR sampling efficiency were observed between the two sampling methods. Detection of the pugnose shiner was more successful with electrofishing than with seining (Table 2; Appendix 3). The pugnose minnow was detected approximately twice as often by seining than with electrofishing (Table 2, Appendix 3). The blackstripe topminnow was detected at marginally higher rates by seining methods than by electrofishing, while the grass pickerel was detected at nearly equal rates by both sampling methods (Table 2; Appendix 3).

[1] Committee on the Status of Endangered Wildlife in Canada

Table 2. Summary of species collected in the Lake St. Clair watershed in 2003. Scientific and common names according to Nelson *et al*. 2004. COSEWIC status: END-Endangered; SC-Special Concern; NAR-Not at Risk

Common Name	Scientific Name	COSEWIC Status	Occurrence (% of sites)	
			Electrofishing sites	Seining sites
black bullhead	*Ameiurus melas*		100	13.6
black crappie	*Pomoxis nigromaculatus*		38.9	81.8
blackside darter	*Percina maculata*		27.8	31.8
blackstripe topminnow	*Fundulus notatus*	SC	55.6	72.7
bluegill	*Lepomis macrochirus*		72.2	95.5
bluntnose minnow	*Pimephales notatus*		100	95.5
brindled madtom	*Noturus miurus*	NAR	5.6	4.5
brook silverside	*Labidesthes sicculus*		22.2	59.1
brook stickleback	*Culaea inconstans*		22.2	4.5
brown bullhead	*Ameiurus nebulosus*		100	9.1
central mudminnow	*Umbra limi*		100	13.6
channel catfish	*Ictalurus punctatus*		11.1	18.2
common shiner	*Luxilus cornutus*		22.2	4.5
creek chub	*Semotilus atromaculatus*		22.2	13.6
emerald shiner	*Notropis atherinoides*		16.7	13.6
freshwater drum	*Aplodinotus grunniens*		100	9.1
ghost shiner	*Notropis buchanani*		5.6	13.6
gizzard shad	*Dorosoma cepedianum*		50	72.7
golden redhorse	*Moxostoma erythrurum*		5.6	4.5
golden shiner	*Notemigonus crysoleucas*		5.6	31.8
goldfish	*Carassius auratus*		100	4.5
grass pickerel	*Esox americanus vermiculatus*	SC	11.1	13.6
green sunfish	*Lepomis cyanellus*		88.9	86.4
greenside darter	*Etheostoma blennioides*	NAR	33.3	9.1
johnny darter	*Etheostoma nigrum*		55.6	27.3
largemouth bass	*Micropterus salmoides*		38.9	77.3
least darter	*Etheostoma microperca*	NAR	11.1	4.5
logperch	*Percina caprodes*		22.2	27.3
longear Sunfish	*Lepomis megalotis*		5.6	9.1
mimic shiner	*Notropis volucellus*		5.6	18.2
northern hog sucker	*Hypentelium nigricans*		100	4.5
northern pike	*Esox lucius*		5.6	54.5

Table 2 (Con't). Summary of species collected in the Lake St. Clair watershed in 2003.

Common Name	Scientific Name	COSEWIC Status	Occurrence (% of sites)	
			Electrofishing sites	Seining sites
pugnose minnow	*Opsopoeodus emiliae*	SC	11.1	22.7
pugnose shiner	*Notropis anogenus*	END	5.6	4.5
pumpkinseed	*Lepomis gibbosus*		33.3	54.5
redfin shiner	*Lythrurus umbratilis*	NAR	33.3	18.2
rock bass	*Ambloplites rupestris*		77.8	63.6
round goby	*Neogobius melanostomus*		27.8	40.9
shorthead redhorse	*Moxostoma macrolepidotum*		16.7	9.1
spotfin shiner	*Cyprinella spiloptera*		38.9	13.6
spottail shiner	*Notropis hudsonius*		100	9.1
spotted sucker	*Minytrema melanops*		5.6	9.1
stonecat	*Noturus flavus*		11.1	100
striped shiner	*Luxilus chrysocephalus*		16.7	4.5
sunfish hybrid	*Lepomis* hybrid		33.3	36.4
tadpole madtom	*Noturus gyrinus*		61.1	50
tubenose goby	*Proterorhinus marmoratus*		5.6	4.5
unidentified sp.	*Lepomis* sp.		100	4.5
white crappie	*Pomoxis annularis*		5.6	22.7
white perch	*Morone americana*		100	18.2
white sucker	*Catostomus commersonii*		33.3	36.4
yellow bullhead	*Ameiurus natalis*		33.3	59.1
yellow perch	*Perca flavescens*		22.2	50

3.4 INDIVIDUAL WATERBODY DATA

3.4.1 Little Bear Creek

Three locations in the Little Bear Creek drainage were sampled (Figure 1, Appendix 1-2). All three sites were seined, one with a bag seine and the other two with a straight seine (Appendix 4). In this drainage, 27 species were detected, including four fish SAR (Table 3). Blackstripe topminnow (24 fish) and pugnose minnow (3) were detected at Site 3, pugnose shiner (2) and grass pickerel (1) were collected at Site 2 (Appendix 3), and three grass pickerel were collected at Site 1.

Macrophytes were common at all of the sites in this drainage. Sites 2 and 3 were dominated by submergent vegetation, while Site 1 was dominated by floating vegetation (Appendix 5a). All three sites had substrates dominated by silt and clay (Appendix 5b). Turbidity at these sites was high, with Secchi depths ranging from 0.07 to 0.41 m (Appendix 5b).

Table 3. Summary of fishes caught and sampling effort at sites on the Little Bear Creek drainage.

	Seining (Bag Seine+Straight Seine)
Total Fish Captured	1770
Species Richness	27
Species at Risk	4
Total Effort (hauls)	7
Mean CPUE (fish/haul)	252.9

3.4.2 East Otter Creek

Only one location in the East Otter Creek drainage was sampled during this study (Figure 1, Appendix 1-2). This site was sampled using a 25' bag seine (Appendix 4). A total of 14 species were collected, including two fish SAR: blackstripe topminnow (83 fish); and, pugnose minnow (1 fish) (Table 4; Appendix 3).

This site was dominated by open water with little vegetation (Appendix 5a). The substrate of this site consisted mostly of clay, and some boulder (Appendix 5b). Turbidity was high, with a Secchi depth of 0.42 m (Appendix 5b).

Table 4. Summary of fishes caught and sampling effort at sites on the East Otter Creek drainage.

	Seining (Bag Seine)
Total Fish Captured	256
Species Richness	14
Species at Risk	2
Total Effort (hauls)	5
Mean CPUE (fish/haul)	51.2

3.4.3 Maxwell Creek

Three locations were sampled in the Maxwell Creek drainage (Figure 1, Appendix 1-2). Two of the locations were sampled by both electrofishing and seining (30' straight seine). The third location was only sampled with a 30' straight seine (Appendix 4). In this drainage, 19 species were detected, including three fish SAR (Table 5). Blackstripe topminnow (4 fish), grass pickerel (3 fish) and pugnose minnow (2 fish) were collected at Sites 5, 7 and 9 (Appendix 3), of which sites 7 and 9 were sampled by seining (Appendix 4).

Macrophytes were common at all of the sites in this drainage, with submerged vegetation dominating two of the locations (Sites 8 and 9), where the blackstripe topminnow and pugnose were located. The third location, where grass pickerel was

collected, had a variety of aquatic vegetation, including submergents and emergents (Appendix 5a). The two locations that were electrofished and seined had substrate consisting of a silt/clay mixture, while the substrate of Site 9 consisted of equal parts of muck and a silt/clay mixture (Appendix 5b). Turbidity at these sites was high. Secchi depths ranged from 0.28 to 0.59 m, with the highest turbidity at sites where fish SAR were detected (Appendix 5b).

Table 5. Summary of fishes caught and sampling effort at sites on the Maxwell Creek drainage.

	Combined Gears	Seining (Bag Seine+Straight Seine)	Electrofishing
Total Fish Captured	1276	1016	260
Species Richness	19	19	11
Species at Risk	3	3	1
Total Effort	NA	9 hauls	30.7 minutes
Mean CPUE	NA	112.9 fish/haul	8.5 fish/minute

3.4.4 Sydenham River

A total of 16 sites were sampled within the Sydenham River drainage (Figure 1, Appendix 1-2). Of these sites, four were sampled by either electrofishing (3) or seining (1). Of the three seining locations in this drainage, two were sampled using a bag seine and one using a straight seine. The remaining 12 locations were sampled using both methods. Eleven of the 12 seining sites were sampled using a bag seine (Appendix 4). In this drainage, 47 species were detected, including 2 fish SAR (Table 6).

Blackstripe topminnow was detected at a large number of sampling sites using both electrofishing (9 sites) and seining (11 sites) methods. The most abundant catch (132 fish) came from 3 bag seine hauls at Site 13. Electrofishing efforts at the same location failed to detect blackstripe topminnow. Similarly, the second most abundant catch of blackstripe topminnow (43 fish) came from 1 straight seine haul at Site 30, while the electrofishing efforts at the same location (Site 27) yielded 21 fish. Grass pickerel was detected while electrofishing at Site 26. Pugnose minnow was detected at 2 locations in the Sydenham River drainage. At sites 34 and 37, both electrofishing (Site 34) and seining (Site 37) were successful; however, pugnose minnow was only detected by electrofishing at the second location (1 fish at Site 16)(Appendix 3).

Macrophytes were relatively uncommon at many of the sites in this drainage. Of the 16 locations in this drainage, 10 contained sites that were spatially dominated by open water, including all 5 Fansher Creek locations (Appendix 2, 5a). The remaining six

sites were dominated by submergents (3), floating plants (2), slender emergents (2), or a mixture of these 3 types (1) (Appendix 5a). The majority of the sampling sites in the Sydenham drainage had substrates dominated by silt and clay (10 of 18), while the remainder were dominated by sediments containing 'muck' (2), mud and silt (2), a slightly more stable mixture of sand and muck (1), or boulders (1). Turbidity at these sites was moderate to high, with Secchi depths usually ranging from 0.19 to 0.45m. The lowest value of turbidity was 0.66m at two sites (Sites 28 and 31), and 0.71m at two other sites (Sites 32 and 35) (Appendix 5b).

Table 6. Summary of fishes caught and sampling effort at sites on the Sydenham River drainage, including the North Sydenham River, East Sydenham River and Fansher Creek.

	Combined Gears	Seining (Bag Seine+Straight Seine)	Electrofishing
Total Fish Captured	7715	5482	2233
Species Richness	47	44	41
Species at Risk	3	2	3
Total Effort	NA	40 hauls	264.2 minutes
Mean CPUE	NA	137.1 fish/haul	8.5 fish/minute

3.4.5 Whitebread Drain/Grape Run

Two locations in the Whitebread Drain/Grape Run drainage were sampled (Figure 1, Appendix 1-2). One location was sampled by electrofishing while the other was sampled with a bag seine (Appendix 4). In this drainage, 28 species were detected, including three fish SAR (Table 7). Blackstripe topminnow was detected at both sites, although a much higher yield (20 fish) resulted from electrofishing (at Site 38) than from bag seining (only 1 fish was collected at site 39). Pugnose shiner and pugnose minnow were each detected by one gear type, electrofishing (3 fish) and seining (18 fish), respectively (Appendix 3).

Macrophytes were uncommon in both of the sites in this drainage. Both sites were spatially dominated by open water (Appendix 5a). These two sites both had substrates consisting almost entirely of a silt/clay mixture, although Site 38 had a few boulders present as well. Turbidity at these sites is unknown as Secchi depth measurements were not recorded (Appendix 5b).

Table 7. Summary of sampling effort and SAR sampling efficiency for 2003 targeted sampling sites on the Whitebread Drain/Grape Run drainage system.

	Combined Gears	Seining (Bag Seine+Straight Seine)	Electrofishing
Total Fish Captured	2179	1420	759
Species Richness	28	21	20
Species at Risk	3	2	2
Total Effort	NA	5 hauls	21.8 minutes
Mean CPUE	NA	284.0 fish/haul	34.8 fish/minute

3.4.6 West Otter Creek

One location in the West Otter Creek drainage was sampled (Site 40) (Figure 1, Appendix 1-2). This site was sampled with a 25' bag seine (Appendix 4). A total of 13 species were detected during sampling, including one fish SAR, blackstripe topminnow. Thirty-three specimens of blackstripe topminnow were collected at this site (Table 8; Appendix 3).

This site was spatially dominated by open water, with very small numbers of macrophytes (Appendix 5a). The substrate of this site consisted exclusively of a mixture of silt and clay. Turbidity was high, with a Secchi depth of 0.36 m (Appendix 5b).

Table 8. Summary of sampling effort and SAR sampling efficiency for 2003 targeted sampling sites on the West Otter Creek drainage.

	Seining (Bag Seine)
Total Fish Captured	193
Species Richness	13
Species at Risk	1
Total Effort (hauls)	3
Mean CPUE (fish/haul)	64.3

4.0 DISCUSSION

Of the 26 locations sampled in this study, at least one fish SAR was detected at 19 locations (Appendix 3). The methods of sampling used in this study were successful, particularly when the two methods, electrofishing and seining, were both used. This gear combination was not possible at many sites due to site inaccessibility, obstacles in the waterway and other site complications. Several species were detected exclusively by only one of the two gear types. However, due to this sampling bias, no conclusions regarding gear preference are possible.

Regardless of gear type, targeted sampling in this study was found to be a successful and efficient sampling method, notably when used for detecting fish SAR.

Targeted sampling effectively increases the probability of detecting a specific fish species by focusing sampling efforts on historical sites and preferred habitats where the species of interest was successfully detected; however, targeted sampling strategies do have their shortcomings. Targeted sampling is biased because of the subjectivity associated with site and habitat selection. Sampling efforts are not standardized; therefore, an assessment of habitat characteristics in the surrounding locality of the sampling site is not collected. Poos *et al*. (in press) adopted a standardized fish community sampling approach in streams for fish SAR detection and habitat associations. Although they also used backpack electrofishing and seining in wadeable habitats, their standardized approach was less successful at SAR detection than our targeted sampling efforts. It can be concluded then that, although standardized approach to fish SAR sampling does improve the ability of generating fish habitat associations compared to targeted sampling techniques, targeted sampling is far superior to standardized sampling for simple detection of a fish SAR.

For species detection in a given waterbody, targeted sampling can be considered an efficient technique for the detection of specific fish species. Nevertheless, the limitations of targeted sampling must be recognized when developing sampling protocols. For example, targeted sampling is a useful method of exploratory sampling. Once detection of a specific fish SAR has occurred within a particular site, the site should be re-sampled using a standardized approach to measure abundance and to examine fish SAR habitat associations.

5.0 ACKNOWLEDGEMENTS

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Appendix 1. Site legend for Figure 1.

Number on Map (Site)	Field Number	Latitude	Longitude	Waterbody Name
1	BC091703-1SN	42.51965	-82.23457	Little Bear Creek
2	BC091703-2SN	42.50700	-82.31857	Little Bear Creek
3	BC091703-3SN	42.51734	-82.37794	Little Bear Creek
4	EOC091903-01SN	42.67684	-82.25827	East Otter Creek
5	MAX091803-1BPEF	42.55005	-82.30489	Maxwell Creek
6	MAX091803-2BPEF	42.54338	-82.32726	Maxwell Creek
7	MAX091803-1SN	42.55005	-82.30488	Maxwell Creek
8	MAX091803-2SN	42.54365	-82.32676	Maxwell Creek
9	MAX091803-3SN	42.54122	-82.38110	Maxwell Creek
10	SYD091003-2BPEF	42.69357	-82.40117	North Sydenham River
11	SYD091003-3BPEF	42.65737	-82.37566	North Sydenham River
12	SYD091003-1SN	42.72730	-82.35361	North Sydenham River
13	SYD091003-2SN	42.69357	-82.40117	North Sydenham River
14	SYD091003-3SN	42.65737	-82.37566	North Sydenham River
15	SYD091103-1BPEF	42.64879	-82.37357	North Sydenham River
16	SYD091103-2BPEF	42.62074	-82.37754	North Sydenham River
17	SYD091103-3BPEF	42.60131	-82.38165	North Sydenham River
18	SYD091103-1SN	42.64879	-82.37357	North Sydenham River
19	SYD091103-2SN	42.62074	-82.37754	North Sydenham River
20	SYD091103-3SN	42.60131	-82.38165	North Sydenham River
21	SYD091203-1BPEF	42.67286	-81.87893	Fansher Creek
22	SYD091203-2BPEF	42.66323	-81.94718	Fansher Creek
23	SYD091203-3BPEF	42.66092	-81.96394	Fansher Creek
24	SYD091203-4BPEF	42.65782	-81.97945	Fansher Creek
25	SYD091203-4SN	42.65722	-81.97884	Fansher Creek
26	SYD091503-1BPEF	42.59763	-82.33649	East Sydenham River
27	SYD091503-2BPEF	42.60011	-82.30342	East Sydenham River
28	SYD091503-3BPEF	42.59085	-82.26687	East Sydenham River
29	SYD091503-1SN	42.59766	-82.33633	East Sydenham River
30	SYD091503-2SN	42.60011	-82.30342	East Sydenham River
31	SYD091503-3SN	42.59085	-82.26687	East Sydenham River
32	SYD091603-1BPEF	42.59200	-82.20095	East Sydenham River
33	SYD091603-2BPEF	42.58902	-82.19484	East Sydenham River
34	SYD091603-3BPEF	42.58827	-82.23257	East Sydenham River
35	SYD091603-1SN	42.59203	-82.20031	East Sydenham River
36	SYD091603-2SN	42.58840	-82.19444	East Sydenham River
37	SYD091603-3SN	42.58810	-82.23186	East Sydenham River
38	WBDL090903-2BPEF	42.62529	-82.46907	Whitebread Drain/Grape Run
39	WBDL090903-1SN	42.63054	-82.44516	Whitebread Drain/Grape Run
40	WOC091903-1SN	42.39213	-82.19871	West Otter Creek

Appendix 2. Site location data for 2003 Lake St. Clair SAR sampling sites.

Site	Field Number	Latitude	Longitude	Waterbody Name	Site Description
1	LBC091703-1SN	42.5197	-82.23457	Little Bear Creek	Located approximately 1.5 km N. of Countryview Line on Caledonia. Sampled on E. side of bridge culvert.
2	LBC091703-2SN	42.507	-82.31857	Little Bear Creek	Turned east off of Hwy. 40 (N) onto Greenvally Line. Followed road ~200m to bridge over Bear Creek. Sampled north side of bridge.
3	LBC091703-3SN	42.5173	-82.37794	Little Bear Creek	On south side of Bear Line at Bridge SE of Robin Line
4	EOC091903-01SN	42.6768	-82.25827	East Otter Creek	South of the Town of Brigden; Follow Mandaumin Rd. S from Brigden; go east on Turloch Line; Site located midway between Mandaumin Rd. and Brigden Rd.
5	MAX091803-1BPEF	42.5501	-82.30489	Maxwell Creek	Corner of Oilfield Rd. and Prince Albert Rd. in Chatham township. Sampled 30m downstream of oilfield bridge, to 20m upstream of Prince Albert bridge.
6	MAX091803-2BPEF	42.5434	-82.32726	Maxwell Creek	1 Kilometer South of Corktown Line/ Fraser intersection. Sampled E. side of bridge on Fraser Rd.
7	MAX091803-1SN	42.5501	-82.30488	Maxwell Creek	Corner of Oilfield Rd. and Prince Albert Rd. in Chatham township.
8	MAX091803-2SN	42.5437	-82.32676	Maxwell Creek	1 Kilometer South of Corktown Line/ Fraser intersection. Sampled E. side of bridge on Fraser Rd.
9	MAX091803-3SN	42.5412	-82.3811	Maxwell Creek	1.5 Km North of Meadowvale Line/Baldoon Rd. Intersection. Sampled on East side of Bridge on Baldoon Rd.
10	SYD091003-2BPEF	42.6936	-82.40117	North Sydenham River	N. of the Darcy W. McKeough Floodway off Holt Line
11	SYD091003-3BPEF	42.6574	-82.37566	North Sydenham River	Off of boat ramp on east river road, North of Lambton Line, on east side of Sydenham
12	SYD091003-1SN	42.7273	-82.35361	North Sydenham River	Downstream from 31 Hwy bridge beside Wilkesport Line @ Boat launch

Appendix 2 (Con't). Site location data for 2003 Lake St. Clair SAR sampling sites.

Site	Field Number	Latitude	Longitude	Waterbody Name	Site Description
13	SYD091003-2SN	42.6936	-82.40117	North Sydenham River	N. of the Darcy W. McKeough Floodway, off Holt Line
14	SYD091003-3SN	42.6574	-82.37566	North Sydenham River	Off of Boat ramp on East River Rd, North of Lambton Line, on East
15	SYD091103-1BPEF	42.6488	-82.37357	North Sydenham River	South of Lambton Line along East River Road on east side of N.
16	SYD091103-2BPEF	42.6207	-82.37754	North Sydenham River	North of Wallaceburg along East River Road on East side of River
17	SYD091103-3BPEF	42.6013	-82.38165	North Sydenham River	Off of Water Street onto Main St, sampled North of bridge on Main St
18	SYD091103-1SN	42.6488	-82.37357	North Sydenham River	South of Lambton Line along East River Road on East side of N.
19	SYD091103-2SN	42.6207	-82.37754	North Sydenham River	North of Wallaceburg along East River Road on East Side of River
20	SYD091103-3SN	42.6013	-82.38165	North Sydenham River	
21	SYD091203-1BPEF	42.6729	-81.87893	Fansher Creek	
22	SYD091203-2BPEF	42.6632	-81.94718	Fansher Creek	
23	SYD091203-3BPEF	42.6609	-81.96394	Fansher Creek	
24	SYD091203-4BPEF	42.6578	-81.97945	Fansher Creek	
25	SYD091203-4SN	42.6572	-81.97884	Fansher Creek	
26	SYD091503-1BPEF	42.5976	-82.33649	East Sydenham River	
27	SYD091503-2BPEF	42.6001	-82.30342	East Sydenham River	
28	SYD091503-3BPEF	42.5909	-82.26687	East Sydenham River	
29	SYD091503-1SN	42.5977	-82.33633	East Sydenham River	
30	SYD091503-2SN	42.6001	-82.30342	East Sydenham River	
31	SYD091503-3SN	42.5909	-82.26687	East Sydenham River	
32	SYD091603-1BPEF	42.592	-82.20095	East Sydenham River	
33	SYD091603-2BPEF	42.589	-82.19484	East Sydenham River	
34	SYD091603-3BPEF	42.5883	-82.23257	East Sydenham River	
35	SYD091603-1SN	42.592	-82.20031	East Sydenham River	
36	SYD091603-2SN	42.5884	-82.19444	East Sydenham River	
37	SYD091603-3SN	42.5881	-82.23186	East Sydenham River	
38	WBGR090903-2BPEF	42.6253	-82.46907	Whitebread Drain/Grape	
39	WBGR090903-1SN	42.6305	-82.44516	Whitebread Drain/Grape	
40	WOC091903-1SN	42.3921	-82.19871	West Otter Creek	

Appendix 3a. Summary of species collected by site in the Lake St. Clair watershed by seining. See Table 2 for Common names.

		Site																					
Species List	**Total**	**1**	**2**	**3**	**4**	**7**	**8**	**9**	**12**	**13**	**14**	**18**	**19**	**20**	**25**	**29**	**30**	**31**	**35**	**36**	**37**	**39**	**40**
Ambloplites rupestris	**413**		2	46					13	1	1	7	2	50		8	59	4	34	45	32		
Ameiurus melas	**11**				9																	1	1
Ameiurus natalis	**47**				10			1	1	2	3	1		3		1	5		1	2	2		5
Ameiurus nebulosus	**12**		1																			11	
Aplodinotus grunniens	**3**											1										2	
Carassius auratus	**1**	1																					
Catostomus commersonii	**97**	1			17					1	1	1			19				3				11
Culaea inconstans	**5**																		1				
Cyprinella spiloptera	**71**											1			9			1					
Cyprinus carpio	**18**	5			3																	2	
Dorosoma cepedianum	**1577**		35	184		11	1			224	65	16	1	20		3	29	2	31	51	86	777	
Esox americanus	**8**	3	1			2																	
Esox lucius	**27**		1	1	5		1			2	1			1			1		2		2	4	4
Etheostoma blennioides	**88**														42			1					
Etheostoma microperca	**6**														1								
Etheostoma nigrum	**286**				10						2			4	78			7					8
Fundulus notatus	**593**			24	83			4	8	132	16	8	4	9			43	9	36	23	38	1	33
Hypentelium nigricans	**1**																					1	
Ictalurus punctatus	**22**									14				3				1			1		
Labidesthes sicculus	**153**		5	13			17			28	2			10		1	2	5	3	13	16	3	
Lepomis cyanellus	**1812**	14	36	35	39		1	85	157	163	15			49	1	13	120	21	95	159	76	61	35
Lepomis gibbosus	**834**	4	40	77		231	147	38		3	1	3		2					45			108	
Lepomis hybrid	**37**		2			2		2				1					1		4	1		11	
Lepomis macrochirus	**4048**	4	600	485	3	29	172	108	120	94	43	99	18	97		162	322	42	426	249	175	189	3
Lepomis megalotis	**18**																		15	2			
Lepomis sp	**27**											27											

Appendix 3a (Con't). Summary of species collected by site in the Lake St. Clair watershed by seining.

		Site																					
Species List	**Total**	**1**	**2**	**3**	**4**	**7**	**8**	**9**	**12**	**13**	**14**	**18**	**19**	**20**	**25**	**29**	**30**	**31**	**35**	**36**	**37**	**39**	**40**
Luxilus chrysocephalus	**9**														4								
Luxilus cornutus	**10**														2								
Lythrurus umbratilis	**60**			1											23		2			3			
Micropterus salmoides	**184**	1	12	17		38	20	10			3	3	2	9		3	1	1	2	5	5	3	
Minytrema melanops	**4**													1								2	
Morone americana	**15**									1	8	1						5					
Moxostoma erythrurum	**3**													2									
Moxostoma	**6**															1		2					
Neogobius melanostomus	**130**		1	7				1			5	14	14			33	3	20					
Notemigonus crysoleucas	**114**	4	9	30			2	2														10	16
Notropis anogenus	**5**		2																				
Notropis atherinoides	**12**									3							1			1			
Notropis buchanani	**27**								2	21											3		
Notropis hudsonius	**7**			6								1											
Notropis volucellus	**54**										31	2			2				18				
Noturus flavus	**2**																						
Noturus gyrinus	**115**	1		3	5	20	1	2	4	2				8			5						28
Noturus miurus	**7**														6								
Opsopoeodus emiliae	**28**			3	1			2													2	18	
Perca flavescens	**150**			1		12	6	5			7	3		16	2	2		1				76	
Percina caprodes	**46**										10	10	1	1		5		3					
Percina maculata	**30**				2						6	2			4	1		2					3
Pimephales notatus	**1722**		11	20	46	18	4	8	9	116	26	42	14	112	12	28	3	49	282	8	50	62	43
Pomoxis annularis	**27**			2					4	5	7	8											
Pomoxis nigromaculatus	**207**	1	7	9		2	7	3	5	1	8	12	4	14		5	2		13	5	13	76	
Proterorhinus marmoratus	**16**													12									
Semotilus atromaculatus	**179**				23										14								3
Umbra limi	**5**	2				1																2	

Appendix 3b. Summary of species collected by site in the Lake St. Clair watershed by backpack electrofishing. See Table 2 for Common names.

		Site																	
Species List	**Total**	**5**	**6**	**10**	**11**	**15**	**16**	**17**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**32**	**33**	**34**	**38**
Ambloplites rupestris	**413**				2	11	14	20		1	1	3	12	14	4	5	7	5	10
Ameiurus melas	**11**																		
Ameiurus natalis	**47**						1	1					2	4			1	1	
Ameiurus nebulosus	**12**																		
Aplodinotus grunniens	**3**																		
Carassius auratus	**1**																		
Catostomus commersonii	**97**							1	8	5	9	19		1					
Culaea inconstans	**5**								4										
Cyprinella spiloptera	**71**			1			1		4	22	13	18							1
Cyprinus carpio	**18**								8										
Dorosoma cepedianum	**1577**	17		1		1		8					3		3		1	2	5
Esox americanus vermiculatus	**8**	1											1						
Esox lucius	**27**																		2
Etheostoma blennioides	**88**									6	3	33	1	1	1				
Etheostoma microperca	**6**								2	3									
Etheostoma nigrum	**286**					1		2	65	26	31	35	5	1	9	2			
Fundulus notatus	**593**				7	17		6					4	21	38	4	3	2	20
Hypentelium nigricans	**1**																		
Ictalurus punctatus	**22**							2										1	
Labidesthes sicculus	**153**		8				1								4				22
Lepomis cyanellus	**1812**	4	1	12	22	80	24	25			1	2	72	75	127	62	47	30	53
Lepomis gibbosus	**834**	104	8		4	2									2				15
Lepomis hybrid	**37**					1							3	2	3	3			1
Lepomis macrochirus	**4048**	10	16	2	27	21	9	47					52	50	12		10	13	339
Lepomis megalotis	**18**															1			

Appendix 3b (Con't). Summary of species collected by site in the Lake St. Clair watershed by backpack electrofishing.

		Site																	
Species List	**Total**	**5**	**6**	**10**	**11**	**15**	**16**	**17**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**32**	**33**	**34**	**38**
Lepomis sp	**27**																		
Luxilus chrysocephalus	**9**								1		1	3							
Luxilus cornutus	**10**								5	1	1				1				
Lythrurus umbratilis	**60**			1					13	6	3	7							1
Micropterus salmoides	**184**	20	2					2	2				1		2				20
Minytrema melanops	**4**							1											
Morone americana	**15**																		
Moxostoma erythrurum	**3**														1				
Moxostoma macrolepidotum	**6**						1	1											1
Neogobius melanostomus	**130**					2	15	7					6		2				
Notemigonus crysoleucas	**114**																		41
Notropis anogenus	**5**																		3
Notropis atherinoides	**12**			1					1							5			
Notropis buchanani	**27**				1														
Notropis hudsonius	**7**																		
Notropis volucellus	**54**																	1	
Noturus flavus	**2**										1	1							
Noturus gyrinus	**115**	1	1	4	1	5	1	6						1		1		1	14
Noturus miurus	**7**																1		
Opsopoeodus emiliae	**28**						1											1	
Perca flavescens	**150**	9			1			2											7
Percina caprodes	**46**				3	4							5		4				
Percina maculata	**30**				2				1	3		2			2				
Pimephales notatus	**1722**	56	1	6	25	33	49	148	12	37	3	17	50	18	80	10	17	7	190
Pomoxis annularis	**27**																1		
Pomoxis nigromaculatus	**207**	1				2	1	4									1	1	10
Proterorhinus marmoratus	**16**																		4
Semotilus atromaculatus	**179**								109	12	2	16							
Umbra limi	**5**																		

Appendix 4. Summary of sampling effort by site.

Site	Method	Effort	Effort Units	Electrofishing Settings	Description of Method
1	Seine, Bag	3	haul		Bag Seine - 3 hauls,1/4" mesh
2	Seine, Straight	3	haul		Straight Seine 1/4" mesh, 10m
3	Seine, Straight	1	haul	na	Straight Seine 1/4" mesh, 10m
4	Seine, Bag	5	haul		Bag Seine - 5 hauls,1/4" mesh
5	BackpackEF	1304	seconds	144V,100W,0.69A	Smith Root LR 24 Backpack Unit
6	BackpackEF	538	seconds	148V, 100Watts, 0.69 Amps	Smith Root LR 24 Backpack Unit
7	Seine, Straight	3	haul		Straight Seine - 3 Hauls, 1/4" mesh, 10m
8	Seine, Straight	3	haul		Straight Seine 1/4" mesh, 10m
9	Seine, Straight	3	haul		Straight Seine 1/4" mesh, 10m
10	BackpackEF	150	seconds	142 volts, .7Amps, 97 Watts	Smith Root LR 24 Backpack Unit
11	BackpackEF	1400	seconds	142 V, 0.7A, 97 watts	Smith Root LR 24 Backpack Unit
12	Seine, Straight	2	haul	na	2 hauls with straight seine, 1 haul with bag sn
13	Seine, Bag	3	haul	na	each haul 60m; Bag Seine, 1/4" mesh, 8.5 m
14	Seine, Bag	4	haul	na	4 seine hauls, Bag Seine, 1/4" mesh, 8.5 m
15	BackpackEF	1208	seconds	171 V, .75A, 97 watts	Smith Root LR 24 Backpack Unit
16	BackpackEF	1083	seconds	174 volts, .55Amps, 95 watts	Smith Root LR 24 Backpack Unit
17	BackpackEF	1164	seconds	95 watts, 174 volts, 0.65Amps	Smith Root LR 24 Backpack Unit
18	Seine, Bag	5	haul	na	5 seine pulls, Bag Seine, 1/4" mesh, 8.5 metres
19	Seine, Bag	2	haul	na	2 seine hauls, Bag Seine, 1/4" mesh, 8.5 metres
20	Seine, Bag	5	haul	na	5 seine hauls, Bag Seine, 1/4" mesh, 8.5 m
21	BackpackEF	1133	seconds	88 watts, 180 volts, 0.48 Amps	Smith Root LR 24 Backpack Unit
22	BackpackEF	1123	seconds	174 V, 87 Watts, 0.65 Amps	Smith Root LR 24 Backpack Unit
23	BackpackEF	1232	seconds	166 V, 98watts, 0.58Amps	Smith Root LR 24 Backpack Unit
24	BackpackEF	1084	seconds	180 Volts, 0.43Amps,100Watts	Smith Root LR 24 Backpack Unit
25	Seine, Bag	5	haul	na	Bag Seine- 5 hauls
26	BackpackEF	1284	seconds	165 V, 98 Watts, 0.66 amps	Smith Root LR 24 Backpack Unit
27	BackpackEF	1100	seconds	147Volts, 66Amps, 96 Watts	Smith Root LR 24 Backpack Unit

Appendix 4 (Con't). Summary of sampling effort by site.

Site	Method	Effort	Effort Units	Electrofishing Settings	Description of Method
28	BackpackEF	1013	seconds	na	Smith Root LR 24 Backpack Unit
29	Seine, Bag	5	haul		60m (1hr10min);Bag Seine, 1/4" mesh, 8.5 m
30	Seine, Straight	1	haul	na	Straight Seine; 1/4" mesh
31	Seine, Bag	1	haul		Bag Seine, 1/4" mesh, 8.5metres
32	BackpackEF	1013	seconds	97 Watts, 145 volts, 0.7 Amps	Smith Root LR 24 Backpack Unit
33	BackpackEF	779	seconds	148 Volts, 0.66Amps, 98 Watts	Smith Root LR 24 Backpack Unit
34	BackpackEF	1087	seconds	145V, 98 Watts, 0.65 Amps	Smith Root LR 24 Backpack Unit
35	Seine, Straight	5	haul		Straight seine, 5 seine hauls
36	Seine, Straight	1	haul	na	Straight Seine; 1/4" mesh
37	Seine, Straight	1	haul		Straight Seine 1/4" mesh, 10m
38	BackpackEF	1308	seconds	180V	Smith Root LR 24 Backpack Unit
39	Seine, Bag	5	haul		Bag Seine - 5 hauls,1/4" mesh
40	Seine, Bag	3	haul		Bag Seine - 3 hauls,1/4" mesh

Appendix 5a. Summary of aquatic vegetation at 2003 Lake St. Clair targeted sampling sites.

Site	Field Number	Air Temp (ºC)	Water Temp (ºC)	COND (µS)	Aquatic Vegetation I	%	Aquatic Vegetation II	%	Aquatic Vegetation III	%	Aquatic Vegetation IV	%
1	LBC091703-1SN	18.5	15.5	845	slender emergent	10	floating	65	robust emergent	5	submergent	20
2	LBC091703-2SN	24.5	21.5	578	floating	40	submergent	55	slender emergent	5		0
3	LBC091703-3SN	23.8	25.5	514	submergent	65	floating	5	none	30		
4	EOC091903-01SN	18	17.9	835	submergent	18	slender emergent	2	none	80		0
5	MAX091803-1BPEF	15	17.3	601	robust emergent	30	submergent	30	slender emergent	10	none	30
6	MAX091803-2BPEF	23.7	20.5	485	submergent	60	floating	15	slender emergent	5	none	20
7	MAX091803-1SN	15	17.3	601	robust emergent	30	submergent	30	slender emergent	10	none	30
8	MAX091803-2SN	23.7	20.5	485	submergent	60	floating	15	slender emergent	5	none	20
9	MAX091803-3SN	26.2	23.2	401	submergent	85	floating	5	none	10		
10	SYD091003-2BPEF	21	22.5	na	floating	45	slender emergent	10	submergent	45		
11	SYD091003-3BPEF	29	26.6	506	slender emergent	50	submergents	5	none	45		
12	SYD091003-1SN	16	19.8	722	robust emergent	4	slender emergent	6	floating	80	none	10
13	SYD091003-2SN	21	22.5	na	submergent	11	floating	11	slender emergent	2	none	76
14	SYD091003-3SN	29	26.6	506	slender emergent	50	submergent	5	none	45		
15	SYD091103-1BPEF	15.2	21.9	502	slender emergent	10	none	90		0		
16	SYD091103-2BPEF	25	23	333	slender emergent	6	floating	4	none	90		
17	SYD091103-3BPEF	27.2	27	278	slender emergent	15	submergent	5	floating	5	none	75
18	SYD091103-1SN	15.2	21.9	502	slender emergent	35	none	65		0		
19	SYD091103-2SN	25	23	333	slender emergent	6	floating	4	none	90		
20	SYD091103-3SN	27.2	27	278	slender emergent	15	submergent	5	floating	5	none	75
21	SYD091203-1BPEF	16.1	16	638	slender emergent	15	submergent	22	floating	12	none	51
22	SYD091203-2BPEF	24	16.5	645	none	100		0		0		
23	SYD091203-3BPEF	28	17.8	641	none	100		0		0		
24	SYD091203-4BPEF	27.8	19.1	618	slender emergent	5	floating	5	submergent	5	none	85
25	SYD091203-4SN	27.8	19.1	618	slender emergent	5	floating	5	submergent	5	none	85
26	SYD091503-1BPEF	17.5	23	455	slender emergent	15	none	85		0		

Appendix 5a (Con't). Summary of aquatic vegetation at 2003 Lake St. Clair targeted sampling sites.

Site	Field Number	Air Temp (ºC)	Water Temp (ºC)	COND (µS)	Aquatic Vegetation I	%	Aquatic Vegetation II	%	Aquatic Vegetation III	%	Aquatic Vegetation IV	%
27	SYD091503-2BPEF	22	22.8	514	submergent	90	none	10		0		
28	SYD091503-3BPEF	24	22.7	567	none	100		0		0		
29	SYD091503-1SN	17.5	23	455	slender emergent	15	none	85		0		0
30	SYD091503-2SN	22	22.8	514	submergent	90	none	10		0		
31	SYD091503-3SN	24	22.7	567	none	100		0		0		
32	SYD091603-1BPEF	14.5	21.3	616	submergent	65	floating	5	none	30		
33	SYD091603-2BPEF	20.5	22	631	submergent	90	slender emergent	10		0		
34	SYD091603-3BPEF	24.5	24.5	586	submergent	20	floating	80		0		
35	SYD091603-1SN	14.5	21.3	616	submergent	65	floating	5	none	30		
36	SYD091603-2SN	20.5	22	631	submergent	90	none	10		0		
37	SYD091603-3SN	24.5	24.5	586	submergent	20	floating	80		0		
38	WBGR090903-2BPEF	31	22.5	247	floating	14	submergent	17	slender emergent	4	none	65
39	WBGR090903-1SN	16	20.1	269	slender emergent	3	floating	1	submergent	1	none	95
40	WOC091903-1SN	17.5	17.5	570	floating	5	slender emergent	5	none	90		

Appendix 5b. Substrate data for 2003 Lake St. Clair targeted SAR sampling sites.

Site	Field Number	Width (m)	Max Depth (m)	Secchi Depth (m)	Max Sampling Depth (m)	Flow Rate	Substrate Type I	%	Substrate Type II	%	Substrate Type III	%
1	LBC091703-1SN	3	0.62	0.07	0.62	none	silt/clay	100		0		0
2	LBC091703-2SN	20	na	0.33	na	na	clay/silt	90	cobble	10		0
3	LBC091703-3SN	25	na	0.41	1.34	slow	muck	30	silt/clay	70		0
4	EOC091903-01SN	3	0.42	0.42	0.42	none	clay	50	gravel	15	boulder	35
5	MAX091803-1BPEF	2.0-3.0	0.49	0.49	0.49	slow	clay/silt	100		0		0
6	MAX091803-2BPEF	10	na	0.59	0.96	slow	silt/clay	100		0		0
7	MAX091803-1SN	2.0-3.0	0.49	0.49	0.49	slow	clay/silt	100		0		0
8	MAX091803-2SN	10	na	0.59	0.96	slow	silt/clay	100		0		0
9	MAX091803-3SN	10	na	0.28	1.15	slow	muck	50	clay/silt	50		0
10	SYD091003-2BPEF	30	na	0.29	0.125	slow	mud/silt	95	boulder	5		0
11	SYD091003-3BPEF	75	na	0.29	1.2	slow	muck	50	sand	50		0
12	SYD091003-1SN	30	na	0.19	0.125	slow	mud/silt	95	cobble	5		0
13	SYD091003-2SN	na	na	0.29	na	none	boulder	5	muck	95		0
14	SYD091003-3SN	75	na	0.29	1.2	slow	muck	50	sand	50		0
15	SYD091103-1BPEF	50	na	0.37	1.02	slow	silt/clay	80	gravel	20		0
16	SYD091103-2BPEF	55	na	0.29	na	slow	muck	80	boulder	20		0
17	SYD091103-3BPEF	50	na	0.32	1.3	slow	silt/muck	100		0		0
18	SYD091103-1SN	50	na	0.37	1.02	slow	silt/clay	80	gravel	20		0
19	SYD091103-2SN	55	na	0.29	na	slow	muck	80	boulder	20		0
20	SYD091103-3SN	50	na	0.32	1.3	slow	silt/muck	100		0		0
21	SYD091203-1BPEF	2	0.38	0.38	0.38	slow	clay/silt	90	cobble	10		0
22	SYD091203-2BPEF	2	0.35	0.35	0.35	slow	silt/clay	100		0		0
23	SYD091203-3BPEF	1.5-2	na	na	0.73	slow/ medium	silt/clay	90	gravel	10		0
24	SYD091203-4BPEF	3	na	na	0.62	medium	silt/clay	95	boulder	5		0
25	SYD091203-4SN	3	na	na	0.62	slow/ medium	silt/clay	95	boulder	5		0
26	SYD091503-1BPEF	50	na	na	1.2	slow	gravel	30	boulder	50	clay/silt	20

Appendix 5b (Con't). Substrate data for 2003 Lake St. Clair targeted SAR sampling sites.

Site	Field Number	Width (m)	Max Depth (m)	Secchi Depth (m)	Max Sampling Depth (m)	Flow Rate	Substrate Type I	%	Substrate Type II	%	Substrate Type III	%
27	SYD091503-2BPEF	45	na	0.6	na	slow	silt/clay	50	muck	35	gravel	15
28	SYD091503-3BPEF	50	na	0.66	na	medium	sand	15	silt/clay	80	boulder	5
29	SYD091503-1SN	50	na	na	1.2	slow	gravel	30	boulder	50	clay/silt	20
30	SYD091503-2SN	45	na	0.6	na	slow	silt/clay	50	muck	35	gravel	15
31	SYD091503-3SN	50	na	0.66	na	medium	sand	15	silt/clay	80	boulder	5
32	SYD091603-1BPEF	40	na	0.71	1.43	none/ slow	silt/clay	100		0		0
33	SYD091603-2BPEF	45	na	0.39	1.45	slow	clay/silt	85	detritus	10	boulder	5
34	SYD091603-3BPEF	40	na	0.45	1.3	slow	clay/silt	80	gravel	20		0
35	SYD091603-1SN	40	na	0.71	1.43	na	silt/clay	100		0		0
36	SYD091603-2SN	45	na	0.39	1.45	slow	clay/silt	85	detritus	10	boulder	5
37	SYD091603-3SN	40	na	0.45	1.3	slow	clay/Silt	80	gravel	20		0
38	WBGR090903-2BPEF	13	na	na	1.25	slow	silt/clay	80	boulder	20		0
39	WBGR090903-1SN	8	na	na	1.23	slow	silt/clay	100		0		0
40	WOC091903-1SN	5	na	0.36	0.36	none	clay/silt	100		0		0