Detroit River Rehabilitation Site Survey 2015

Lake Erie Management Unit, 2016

DRAFT REPORT

Ontario

Suggested Citation:

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1 Introduction:

The Detroit River is listed as one of many Areas of Concern (AOCs) in the Great Lakes basin that have been identified as having experienced high levels of environmental degradation. Under the 1987 Great Lakes Water Quality Agreement, Remedial Action Plans (RAP) were developed to restore the ecosystem health of AOC's like the Detroit River. RAP programs are designed to identify stressors that limit the natural system ability to provide beneficial uses to humans and wildlife; referred to as a beneficial use impairment (BUI). Some examples of a beneficial use include; recreational uses like swimming and wildlife use like providing habitat. In the Detroit River several beneficial uses of the river that have been deemed impaired or degraded include the *Degradation of Fish and Wildlife Populations*, and the *Loss of Fish and Wildlife Habitat.* To remediate these BUI's, and ultimately de-list the river, the future goal is to rehabilitate selected sites on the river based on site-specific project feasibility and the potential for net gain of fish and wildlife habitat quality and quantity.

In summer 2015, the Ministry of Natural Resources and Forestry (MNRF) collected fish and habitat data from 22 sites on the Detroit River (Figure 1). The sites targeted for survey were based on those prioritized by the members of the Detroit River Canadian Clean-Up (DRCC) working group. Of the 22 sites, 20 were identified in a then Ontario Ministry of Natural Resources (OMNR) survey report in 1993 and 2 were chosen based on proprietary access (OMNR, 1994). The goal of the survey was to collect current baseline data on fish community compositions and habitat to assess the potential for rehabilitation.

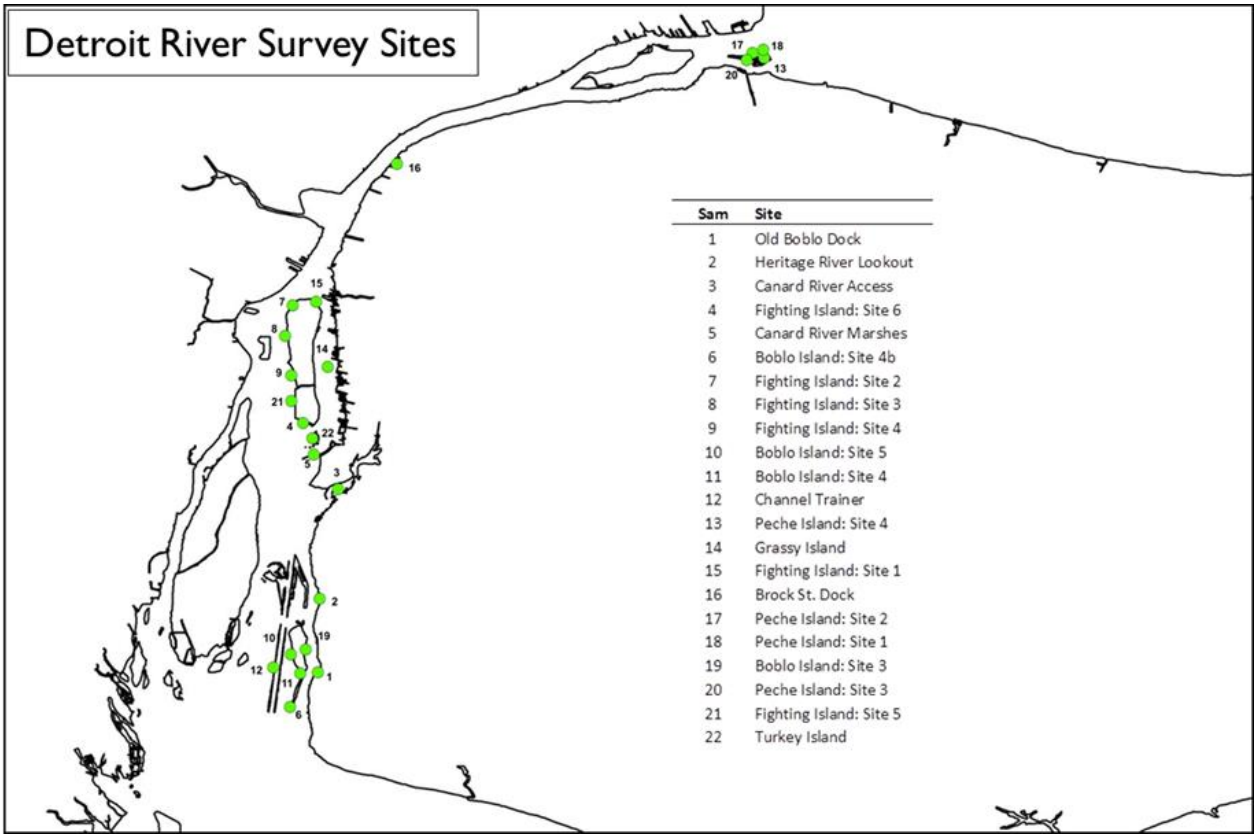


Figure 1: Sites surveyed on the Detroit River in 2015 for fish and habitat. Numerical order indicates order in which sites were assessed.

2 Methodologies:

Field protocols were adapted from the Department of Fisheries and Oceans Lake Ontario Vulnerability Assessment, Methodology Report 2013 (Reddick, 2013). Modifications were based on consultation with Susan Doka (DFO – Research Scientist) and Jason Barnucz (DFO – Aquatic Science Biologist). Prior to commencing field sampling, all sites were visited to be photographed and to assess suitability for sampling. Field sampling was broken down into two surveys; fish community composition and a habitat survey. Both surveys were conducted from a 21 foot Smith Root boat electrofisher with a 3 to 4 man crew. Attempts were made to complete the electrofishing and the habitat survey in one day for a given site; however, depending on the size of the site and on weather conditions, several days were occasionally needed to fully assess a site. Electrofishing was always completed prior to habitat assessment to minimize the effects of our presence and activities on fish community composition. Protocols were refined at the Old Boblo Dock and Heritage River Lookout sites, and then adapted for the remaining sites. The parameters for data collection included: a description of riparian/shoreline where possible (photos/notes), water depth, water clarity, water temperature, dissolved oxygen and other physical-chemical properties (conductivity, pH and ORP), flow, sediment classification, submerged aquatic vegetation (SAV) percent coverage and percent dominant species , and fish community composition. Attempts were made to assess flow with a handheld current meter (Swoffer model 2100 current meter) but was abandoned due to instrument limitations and because more reliable data could be obtained from flow models.

2.1 Electrofishing Survey:

To sample the fish community, electrofishing was conducted both in shallow nearshore (~ 1.5m) and deeper offshore water habitats (≥2m); however, individual site characteristics resulted in variation of transect depth and number of transects (Table 1). Transects were electrofished in 100m straight-line sub-samples, called bins, following the targeted depth contours. Sequentially the bins were electrofished from downstream-up, however individual bins were fished upstream-down. The distance between bins and number of bins varied depending on the size of the site. For each bin, start and end coordinates, water depths and turbidity readings were recorded. A profile of water quality parameters was logged by YSI (model 650 MDS) including temperature (°C), dissolved oxygen (mg/L), conductivity (mS/cm), pH and oxidation-reduction potential (ORP mV), at the surface, bottom and every even meter between. For each site the weather conditions and the power settings (voltage, amperage, percent, and pulses/sec) for the electrofishing boat were recorded; if power settings needed to be adjusted those too were recorded.

After each bin, with the exception of Old Boblo Dock and Heritage River Lookout where fish were pooled by transect, fish were sorted and enumerated by species and life stage (young-of-the-year (YOY) and yearling-and-older (YAO)). Total lengths (mm) for up to 20 of each species and life stage were measured. Fish were released except for voucher specimens as per Department of Fisheries and Oceans SARA permit conditions.

Table 1: Summary of sampling effort by site on the Detroit River.

Site Number	Site Name and Transect Locations		# of Bins	Bin Length (m)
1	Old Boblo Dock	nearshore	2	100
		offshore	1	200
2	Heritage River Lookout	nearshore	1	300
		offshore	1	300
3	Canard River Access *	nearshore	1	100
		offshore	1	100
4	Fighting Island: Site 6	nearshore	3	100
		offshore**	3	100
5	Canard River Marshes	nearshore	2	100
		offshore	2	100
6	Bois Blanc (Boblo) Island: Site 4b	nearshore	1	100
7	Fighting Island: Site 2	nearshore	2	100
		offshore	2	100
8	Fighting Island: Site 3	nearshore	2	100
		offshore	2	100
9	Fighting Island: Site 4	nearshore	3	100
		offshore	3	100
10	Bois Blanc (Boblo) Island: Site 5	nearshore	2	100
		offshore	2	100
11	Bois Blanc (Boblo) Island: Site 4	nearshore	3	100
		offshore	3	100
12	Channel Trainer	nearshore	3	100
		offshore	3	100
13	Peche Island: Site 4*	nearshore	3	100
14	Grassy Island	nearshore	2	100
		offshore	2	100
15	Fighting Island: Site 1*	nearshore	1	100
16	Brock St. Dock	nearshore	2	100
17	Peche Island: Site 2	nearshore	3	100
		offshore	3	100
18	Peche Island: Site 1	nearshore	2	100
		offshore	1	100
19	Bois Blanc (Boblo) Island: Site 3	nearshore	4	100
		offshore	3	100
20	Peche Island: Site 3	nearshore	2	100
		offshore	2	100
21	Fighting Island: Site 5	nearshore	3	100
		offshore	3	100
22	Turkey Island	nearshore	2	100
		offshore	2	100

***Sites characteristics excluded offshore habitats to electrofishing**

****Two offshore transects pooled as replicates of bins**

2.2 Habitat Survey:

To assess habitat, quadrats were sampled along perpendicular-to-shore transects. Typically, transects were spaced 100m apart with quadrats spaced at 30m intervals. However the distance between transects and quadrats varied among sites so that a representative area of the site was assessed (Table 2). To minimize the effects of our presence, samplings started at the furthest downstream transect and processed upstream. Quadrats were sampled from nearshore to offshore along transects. At each quadrat; water quality, sediments and submerged aquatic vegetation (SAV) were assessed.

Table 2: Summary of habitat sampling effort by site on the Detroit River

Site Name	Transects #	Quadrats #
Old Boblo Dock	3	10
Heritage River Lookout	4	8
Canard River Access	4	12
Fighting Island: Site 6	5	18
Canard River Marshes	5	11
Boblo Island: Site 4b	5	8
Fighting Island: Site 2	5	19
Fighting Island: Site 3	3	9
Fighting Island: Site 4	5	13
Boblo Island: Site 5	4	12
Boblo Island: Site 4	8	24
Channel Trainer	5	11
Peche Island: Site 4	4	7
Grassy Island	5	20
Fighting Island: Site 1	1	5
Brock St. Dock	4	8
Peche Island: Site 2	3	9
Peche Island: Site 1	3	9
Boblo Island: Site 3	9	15
Peche Island: Site 3	4	11
Fighting Island: Site 5	5	13
Turkey Island	4	16

2.2.1 Water Quality:

Water quality sampling was performed upon arriving to a quadrat, prior to anchor deployment to minimize the effect of the boat. Using the same method described for electrofishing, water quality parameters were recorded using the YSI including; temperature (°C), dissolved oxygen (mg/L), conductivity (mS/cm), pH and oxidation-reduction potential (ORP mV) and water depth. Turbidity measurements (NTU's) were taken using a LaMotte portable turbidimeter.

2.2.2 Sediments:

A 6" petite ponar was used to collect sediment samples. The ponar was manually deployed and retrieved over the side of the vessel and the sample was emptied into a bucket to be photographed and assessed for percent composition of silt, clay, sand, gravel. Percent cobble and boulder was assessed visually when water depth and clarity allowed. Grain size was based on the Wentworth 1922 scale: clay (< 0.39 µm), silt (3.9–62.5 µm), sand (62.5 µm–2mm), gravel (2–64mm), cobble (64mm–256mm), and boulder (>256mm). Up to 10 substrate subsamples (gravel size or less) were kept in 250mL jars for quantitative analysis at a later date. The presence/absence of photos and/or sediment samples was recorded.

2.2.3 Submerged Aquatic Vegetation:

One of three methods were used to sample SAV at each quadrat: 1) rake method; which used a gravel rake with an extended handle to rake and retrieve all submerged vegetation within a 1m x 1m white PVC pipe quadrat sampler placed on bottom (Figure 2) 2) grapple toss; using a mesh lined grapple repeatedly

tossed (3 times) into the water and dragged on bottom to retrieve SAV where water depths were too great for the rake method (Figure 3) 3) visual; where water depth and clarity made for easy identification of SAV coverage and species, confirmed with a quick rake sample. The percent coverage of SAV in quadrats was visually estimated; however, in cases where turbidity or depth was too great to see bottom, coverage was estimated based on feel and on quantity of SAV retrieved. SAV species were sorted and identified in the field and rated on percent dominance (Dominant ≥50%, subdominant ≥10% to <50%, trace <10%). Species of SAV that were observed nearby but were not collected by sampling methods were recorded as being in the area. Any species of unknown SAV were bagged, labelled and kept cool to be examined and photographed for identification at a later date. Species that could not be identified were recorded to nearest identifiable family (ie. Potamogeton spp. with narrow leaf). Any presence/absence of photos of vegetation from quadrats was recorded.

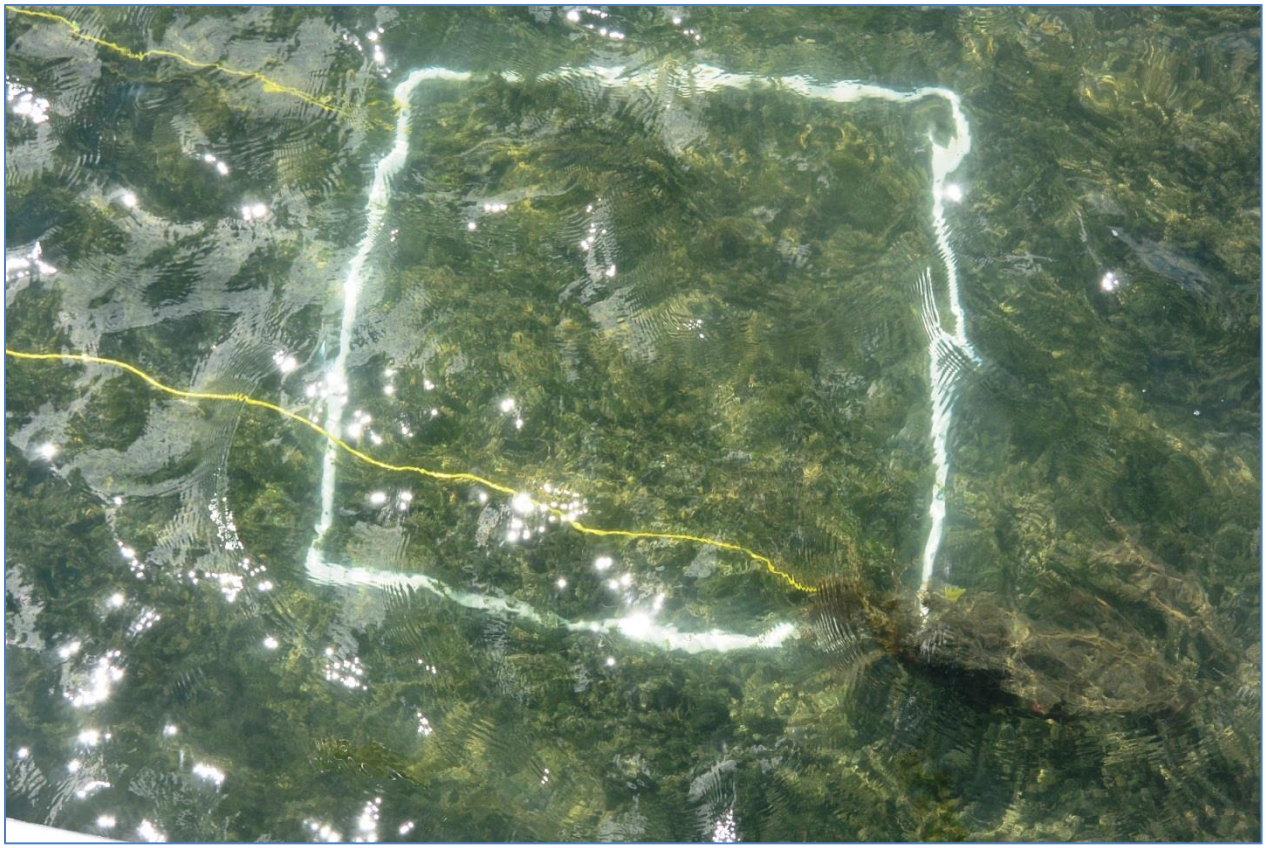


Figure 2: PVC pipe quadrat sampler, 1m x 1m, with attached floats used to sample SAV by rake method.

Figure 3: Grapple toss used to sample SAV at quadrats at Detroit River Rehabilitation Survey sites where water depths were too great to reach by rake.

3 Results:

3.1 Pêche Island:

In 1993, at the time of the OMNR survey of candidate sites for rehabilitation on the Detroit River, Pêche Island was owned and managed by the Province of Ontario and maintained as a day use provincial park. Currently, the City of Windsor owns the island after acquiring it from the Province in 1999 (City of Windsor, 2016). The island has been naturalized, providing walking paths, picnic areas, and access for non-motorized boats to the islands inner cannels.

The shoreline and nearshore areas of the island have remained similar to that described in 1993; north and eastern nearshore areas are shallow with sand and gravel substrates and relatively little SAV. To the south and west of the island the substrate contains more sand, silt and clay and a greater diversity and coverage of SAV. The western tip of the island has a sandy beach and the inner cannels of the island contain a diversity of submergent and emergent vegetation with evidence of heavy siltation accumulated in the downstream substrates of the canal entrance. Through local knowledge it was learned that water clarity is regularly very poor inside the canals but in 2015 the water clarity was observed to be very good with minimal turbidity. This could be in part from the high water levels experienced great-lakes-basin wide that year, or due to some potential dredging of the canal entrance

as some evidence indicated. Either would allow more water to flush through the inner island canals. This could also potentially be due to lower turbidity in the source water from Lake St.Clair, however lake turbidity levels were not assessed for the purposes for this report in 2015. Observations from locals also suggested that a significant amount of erosion had occurred on the north shore of the island as a result of high water levels and ice scour during the previous two years. As reported in 1993, the river current flows strongly around the island from the east-north-east, seeing shipping traffic on the north side of the island and pleasure-craft on the south side.

In 2015, four sites around the island were sampled for fish and habitat data (Figure 4).

Figure 4: Pêche Island site locations (Google, 2016).

3.1.1 Pêche Island Site 1:

Pêche Island Site 1 is located on the north-east side of the island. It is fully exposed to lake conditions of Lake St.Clair and the water current that breaks at the tip of the island, flowing north around the island to the shipping channel. It has a shrubby and wooded shoreline cover and in 2015 with water levels above average, it had very little exposed shoreline (Figure 5). Conditions of the site appear to be much the same as those described in 1993 (OMNR, 1994)

Figure 5: Pêche Island Site 1.

Electrofishing:

A one day fish community survey was completed in late August at Pêche Island Site 1. Three one hundred meter bins were sampled; two along a nearshore transect and one along an offshore transect to assess different habitat types based on depth. Exceeding 2m in depth was difficult due to the very extensive shallow reef to the east, resulting in an offshore sampling location slightly less than 2m.

Only two species of fish were caught at this location, Logperch (*Percina Caprodes)* and Smallmouth Bass (*Micropterus Dolomieu*) (Table 3). Smallmouth Bass comprised 86% and Logperch 14% of the community composition, resulting in the lowest species richness and diversity recorded for all sites surveyed (Figure 36).

Habitat:

Habitat was also surveyed in late August; approximately one week after the electrofishing survey was completed. Water quality parameters met Provincial Water Quality Objectives (PWQOs) and were within normal ranges for a freshwater river (Table 4) (MOEE, 1994). Substrate composition was predominantly composed of cobble (42%), sand (27%) and gravel (22%) with some of the smallest amounts of clay (2%) and silt (6%) reported for all sites surveyed on the river (Figure 37). Average SAV coverage at the site was 77% (SE = ±8%), with the second lowest species richness of all sites (Table 4). Muskgrass (*Chara sp.*) comprised most of the SAV composition, with trace proportions of Slender Naiad (*Najas Flexilis*), Wild Celery (*Vallisneria Americana*) and a wide-leaf pondweed species (*Potamogeton spp. wide leaf*).

3.1.2 Pêche Island Site 2:

Figure 6: Pêche Island Site 2.

Sampling efforts for Pêche Island Site 2 were completed in the embayment on the northern side of the Island. Much like Site 1, this site is exposed to a large the fetch, as well as the shipping traffic that passes through the channel to the north of the island (OMNR, 1994). It has a heavily wooded and shrubby shoreline and as a result of high water levels, had very little exposed shoreline. A local kayaker encountered during the survey who frequents the island had reported that the site had experienced significant erosion over the last two years, where parts of the island trails that normally followed this shoreline had been washed away. This possibly was a result of increased ice cover and high water levels experienced in the last two years. Due to the size of the site, sampling efforts were spaced at greater distances in an attempt to accurately describe the site characteristics.

Electrofishing:

The electrofishing survey was completed in one day during mid-August. This site had the second lowest species richness (SR=3) and diversity (Shannon H' = 0.69, Simpson's = 0.38) (Figure 36). Brook Silverside (*Labidesthes sicculus*) dominated species composition (77%) followed by Logperch (15%) and Shorthead Redhorse (*Moxostoma Macrolepidotum*) (8%). On the day of the survey anglers were observed fishing in the area catching bass, most likely smallmouth bass due to habitat type, so it can be assumed that there is a population of smallmouth bass in the area.

Habitat:

The habitat survey was completed the same day as the electrofishing survey. Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Substrate compositions were comprised mostly of sand (63%) and gravel (20%), and as with Pêche Island Site 1, had very little clay (7%) and silt (9%). This site had an average SAV coverage of 36% (SE = ± 10%), the lowest for all sites recorded, as well as the third lowest species richness (SR=5). SAV composition was very similar to Pêche Island Site 1, dominated mostly by Muskgrass (Table 4). Wild celery samples that were collected both at Site 2 and at Site 1 were stunted in growth as compared to other locations in the river.

3.1.3 Pêche Island Site 3:

Located off the south and west shore of Pêche Island, Site 3 was characterized by a mix of wetland and sandy beach shoreline, as described in 1993 (OMNR, 1994). Phragmites (*Phragmites Australis*) was present along much of the shoreline. A wide, shallow shelf at the mouth of the inner canals tapers to a narrow point at the west before dropping off quickly to deeper waters (Figure 4). The channel to the south is regularly used by pleasure craft and the beach is frequented for recreational use (Figure 7).

Figure 7: Pêche Island Site 3.

Electrofishing:

Completed at the end of August, the electrofishing survey suggests moderate to high species richness and diversity when compared to other surveyed sites (Figure 36). Species composition was dominated by Yellow Perch (*Perca Flavescens*) (41%), followed by Brook Silverside (24%), Bluntnose Minnow (*Pimephales Notatus*) (10%) and Common White Sucker (*Catostomus Commersonii*) (8%). Fourteen other species made up the remaining 17% community composition. Site 3 was one of only five sites where Musky (*Esox Masquinogy*) was captured. This was a YAO specimen, length measurement 456mm. The only captures of Blacknose Shiner (*Notropis*

heterolepis) and Golden Redhorse (*Moxostoma erythrurum*) throughout the rehabilitation site survey occurred at this site (Table 3).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Substrate composition was primarily a silt (56%), sand (32%), and clay (11%) mixture (Figure 37). Species richness for SAV was moderate to high in comparison to the other sites (Table 4). SAV coverage was high 97% (SE = ± 2%), with the dominant species being Wild Celery, followed to a lesser extent by Canada Waterweed (*Elodea Canadensis*), and Muskgrass. It was one of three sites at which curly White Water Crowfoot (*Ranunculus Longirostris*) was sampled.

3.1.3 Pêche Island Site 4:

Figure 8: Pêche Island Site 4. Clockwise from left: the canal entrance, looking west at inner canals from near entrance, silt deposition in the canals.

In the 1993 OMNR report the canals were described as being "primarily closed off from flow through river water due to siltation in the upstream canal entrance" (OMNR, 1994). In 2015, the entrance channel to the inner canals did not appear to be closed off from flow-through river water, possibly as a result of high water levels. Alternatively, local information indicated that dredging had been occurring under the bridges to allow non-motorized boats passage, however, this information was not confirmed with the City of Windsor. There did appear to be evidence of heavy siltation in the canals in general. Local knowledge indicated that the canals used to be deep enough to allow for passage of sail boats with

a 4ft draft. Only one sample location within the canals had a maximum depth of 1.25m (~4ft), all other depths were 0.94m (~3 ft) or less.

Electrofishing:

Results of the electrofishing survey indicated relatively high species richness and diversity (Figure 36). The species composition was dominated by Yellow Perch (30%), followed by Bluntnose Minnow (23%), Largemouth Bass (*Micropterus salmoides*) (12%), Bluegill (*Lepomis macrochirus*) (12%) and Pumpkinseed (*Lepomis gibbosus*) (8%). The remaining species represented smaller portions of the composition. The proportion of species present in the YOY stage suggests that this area acts as a nursery ground for several species (Table 3). A YOY Grass Pickerel (*Esox Americanus Vermiculatus*) was caught at this location and was found to be the first recorded specimen in the area by the Department of Fisheries and Oceans (Amy Boyko, personal communication). This species is listed as a SAR species with 'Special Concern' designation (DFO, 2015).

Habitat:

Water quality, specifically turbidity, was not found to be degraded in the summer of 2015. Parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediment composition was mostly made up of silt (56%), sand (21%) and clay (14%) (Figure 37). Mean SAV coverage was relatively low 56% (SE = ± 16%) with only three other river survey sites with lower mean coverage. However, SAV species richness was highest (SR=17) at this location. Canada Waterweed, Curly White Water Crowfoot, and Wild Celery were the most dominant species. This site had some unique species not seen at other survey sites including; Duckweed sp. (*Lemnaceae sp.*), sedge sp (*Carex sp.*), and Yellow Waterlily (*Nuphar sp.*). Phragmites was observed in the canals as well, however did not fall within any quadrat samples.

3.2 Brock Street Dock:

Figure 9: Brock St. Dock. (Satellite image: Google, 2016).

Brock Street Dock is located just south-west of the Ambassador Bridge and is owned by Windsor Port Authority, City of Windsor and Ambassador Bridge. The shoreline is mostly rocky rubble on the north side of the dock and a mix of failing steel wall and rubble on the south side. The dredging company that previously owned the property used material from another dredging site to fill in behind the steel wall. This was done illegally in the 1970's and the federal government subsequently took possession of the property (DRCC, personal correspondence). The city has created a small park on the shoreline and locals angle from the steel wall for fish. This site was not previously assessed in the 1993 OMNR report.

Electrofishing:

Site characteristics only permitted two bins to be electrofished for the entire site. Although they were treated as two transects, the depth did not vary enough within the slip to sample two discrete habitat types. This location had relatively high species richness and diversity (Figure 36), where composition was dominated by Yellow Perch (40%), Bluntnose Minnow (23%), Bluegill (12%) and Largemouth Bass (9%). The remaining 14 species comprised the additional 16% composition. This was one of three sites where YOY musky was captured. The number of species that were present in the YOY stage indicates that this location is potentially utilized as nursery habitat for several species. This location was also the only site where Silver Lamprey (*Ichthyomyzonunicuspis*) were captured (Table 3).

Habitat:

Water quality parameters for this site fell within PWQOs, although turbidity was high compared to other sites sampled and dissolved oxygen (DO) was relatively low (Table 4). Brock Street Dock had a predominantly silt (69%), sand (19%), clay (11%) substrate composition with the highest proportion of silt recorded for all sites (Figure 37). SAV coverage at this location was high compared to other sites (Table 4), dominated by Wild Celery, and Coontail (*Ceratophyllum Demersum*) with several other species present in trace proportions.

3.3 Fighting Island:

Fighting Island is located downriver from Windsor and opposite of LaSalle. It is still owned by BASF Corporation and is used primarily as a hunting club, conference and education centre. The island remains in similar condition to that described in 1993; a narrow underwater shelf extending from the east side of the island quickly dropping off into a channel, and a large shelf extending approximately 150m into the river from the northern end of the island, widening to roughly 650 meters at the southern end of the island (OMNR, 1994). There is a narrow channel that runs along the shoreline of the southernmost disposal cell (Site 5) and across the south end of the island (Site 6). The main shipping channel (Fighting Island Channel) runs to the west of the island, and a smaller channel for non-freighter traffic runs to the east of the island. There is a speed restriction (10km/h) in place for boating traffic at the northeast end of the island (Figure 10).

Figure 10: Fighting Island rehabilitation survey sites (Google, 2016; DigitalGlobe, 2016).

An extensive restoration project has already been completed off the northeast end of the island. In 2008, a spawning reef was created for Lake Sturgeon (*Acipenser Fluvescens*), and then expanded in 2013 after monitoring efforts indicated that Walleye (*Sander Vitreus*), Lake Whitefish (*Coregonus Clupeaformis*), Northern Madtom (*Notorus stigmosus*) and native sucker species (*Catostomidae spp.*) were using the reef (Roseman et al., 2011; DFO, 2012).

3.3.1 Fighting Island Site 1:

Figure 11: Fighting Island Site 1.

In 2015, the coordinates provided for the site 1 survey were located in the small bay adjacent to the main lodge for the hunting club and gazebo. The survey was completed from the gazebo to approximately 100m downstream past the main guest dock to the small caretaker and fishing boat docks. The underwater shelf at this location extends approximately 20m into the river before water depths drop off quickly from approximately 1m to 8m depth. The site description in the 1993 report suggests that the site identified for potential rehabilitation could have been 300 – 400 m further downstream, from the tip of the point to the work dock across from Senator Street. At this location the underwater shelf extends approximately 100m into the river as described in the 1993 report. Likely this was due to a misinterpretation of the text which described the site as being “a small cove adjacent to the northeast shore of the island where the corporation has its hunting club and docking facilities” (OMNR, 1994).

Electrofishing:

The electrofishing survey, completed in mid-august, was restricted to a single bin spanning the full length of the site as a result of site characteristics. The electrical field from anodes spanned both the 1.5m depth and >2m depth habitats at the same time. Species richness and diversity was moderate compared to other sites surveyed (Figure 36). Species composition was dominated by Emerald Shiners (40%), Brook Silverside (34%), and Yellow Perch (14%). Twelve other species made up the remaining 12 5 composition. Site 1 was one of five locations where Musky were captured (YAO, 120mm) (Table 3).

Habitat:

Water quality parameters met PWQOs, although turbidity was moderately high compared to other sites sampled (Table 4). Sediment composition consisted of silt (40%), clay (26%), gravel (21%) and sand (13%) (Figure 37). SAV coverage (82%, SE = ± 16%) was dominated by Wild Celery, Muskgrass, and Canada Waterweed with a total species richness of 9 (Table 4).

3.3.2 Fighting Island Site 2:

Site 2 is located in a cove off the northwest tip of Fighting Island. The shoreline is vegetated with trees and shrubs, reinforced with rock and boulders (Figure 12). It has a shallow underwater shelf that extends approximately 200m into the river. It is open to shipping traffic in the Fighting Island Channel and the day the surveys were completed it was observed that the wake from a single freighter could produce a wave over 5ft tall that would travel the length of the shoreline.

Figure 12: Fighting Island Site 2.

Electrofishing:

The one day electrofishing survey was completed for this site at the end of July. Species richness and diversity was low compared to other sites (Figure 36) Species composition was dominated by Yellow Perch (48%), Freshwater Drum (*Aplodinotus Grunniens*) (16%), and Shorthead Redhorse (*Moxostoma Macrolepidotum*) (12%). Only one species, Smallmouth Bass, was present in YOY lifestage. Boating activity in the shipping channel led to excessive wave action from boat wake which made netting fish difficult, potentially reducing effectiveness of electrofishing and therefore species richness/diversity.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediment composition was comprised mostly of sand (53%), gravel (31%) and silt (11%) (Figure 37). SAV coverage was very low (27% SE= ± 8%) although species richness and diversity was moderate compared to other sites (Table 4). SAV compositon was dominated by Muskgrass, Slender Naiad and Wild Celery.

3.3.3 Fighting Island Site 3:

The site survey was completed off the most northerly end of the northern disposal cell, starting at the islands north channel working south. As site characteristics were similar along the disposal cell the survey location was considered to be representative of the entire area. The shoreline is a mix of sandy beach, Phragmites, trees and shrubs (Figure 13). The shoreline of the north channel is reinforced with rock where it drains into the Detroit River.

Figure 13: Fighting Island Site 3.

Electrofishing:

In late July a one day electrofishing survey was completed. Species richness and diversity was found to be moderately high when compared to other sites surveyed (Figure 36). Yellow Perch (47%) and Rock Bass (*Ambloplites Rupestris*) (16%) dominated the species composition where the remaining 15 species each composed small proportions of the composition.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Silt (29%), sand (28%), gravel (23%) and clay (17%) dominated the sediment compositions (Figure 37). At this location there were signs of iron deposition in the sediment, metallic shavings which smelt like iron, likely from the Great Lakes Steel company located upstream and on the adjacent U.S. shoreline. SAV coverage and species richness was moderate compared to other sites (Table 4), and composition was dominated by Muskgrass, Wild Celery, and Sago Pondweed (*Stuckenia Pectinata*).

3.3.4 Fighting Island Site 4:

Located in the shallow cove off of the western shore of the centre disposal cell, Site 4 is characterized by a slightly more shrub and tree covered shoreline then Site 3, along with some phragmites. As reported in 1993, the northern extent of the disposal cell is demarcated by a man-made point which extends into the river and the southern extent by the south channel of the island, at which point the island cuts back into the river and the shoreline is reinforced with rock (OMNR, 1994). As site characteristics were similar along the disposal cell, the survey location was considered to be representative of the entire area.

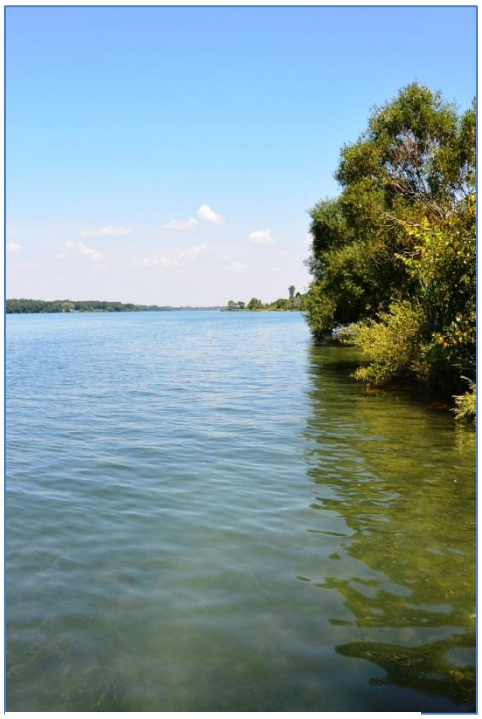


Figure 14: Fighting Island Site 4.

Electrofishing:

The electrofishing survey was completed in late July. Species richness was moderate (SR=14), but diversity was high (Shannon H'= 2.26, Simpson's = 0.87) when compared to other sites surveyed (Figure 37). Species composition was dominated by Yellow Perch (18%), Tubenose Goby (*Proterorhinus Marmoratus*) (18%), Round Goby (*Neogobius Melanostomus*) (17%), and Emerald Shiner (*Notropis Atherinoides*). This was one of two locations that the species Johnny Darter (*Etheostoma Nigrum*) was captured (Table 3).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediments were composed primarily of clay (47%), sand (28%), and silt (22%) (Figure 37). SAV coverage was high but species richness was low compared to other sites (Table 4). SAV composition was

dominated by Muskgrass. Other species present as trace composition include; Slender Naiad, Wild Celery, Milfoil (*Myriophyllum sp.*), Canada Waterweed, Richardson's Pondweed (*Potamogeton Richardsonii*), and a Narrow Leaf Pondweed (*Potamogeton spp* narrow leaf).

3.3.5 Fighting Island Site 5:

Figure 15: Fighting Island Site 5.

Fighting Island Site 5 is located off the western shoreline of the southern disposal site. In 1993, it was reported that "some gravel and boulders exist along the shoreline" however, in 2015 it appeared that the shoreline was heavily reinforced with rocks and boulders (OMNR, 1994). The expanse of the underwater shelf remained to be approximately 600m from shore to its drop off at the main channel. Also, a narrow channel exists immediately parallel to shore, running the length of the disposal cell.

Electrofishing:

The survey was completed in late August for Site 5. There were a total of 11 species captured, and for all sites sampled had the third lowest species diversity (Shannon H'=1.46, Simpson's=0.65) (Figure 36). Species composition was dominated by Brook Silverside (55%), Yellow Perch (13%), and Mimic Shiners (*Notropis Volucellus*).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Substrate material was composed of a clay (57%), silt (33%), and sand (10%) mixture. This site had the second highest clay composition of all sites surveyed (Figure 37). SAV coverage was estimated to be 100% (SE = ± 0%) for this site, based on feel and quantity of SAV retrieved, as depth and water clarity made visual estimates impossible. Species richness was moderate to high compared to other sites (Table 4), dominated by Muskgrass, Slender Naiad and Wild Celery.

3.3.6 Fighting Island Site 6:

Located on the southern shore of Fighting Island, Site 6 has a narrow channel that runs immediately parallel to the shoreline. On the south side of the channel are two islands approximately 300 meters apart; the western island is approximately 125m long by 15m wide and the eastern island is approximately 40m long and 15m wide. As described in 1993, the main shipping channel lies to the west and the smaller Grassy Island boating channel lies to the east. These channels meet roughly 3500 meters to the south. It was reported that the historic wetlands and islands have eroded away as a result of wave action and higher water levels (OMNR, 1994). Evidence of such erosion was observed in 2015 (Figure 16) where vegetation could be seen falling into the river on the south side of the small western island. The shoreline of the island was characterized with shrub and tree cover with Phragmites. This site was surveyed across the expanse of the island due to the variability in site characteristics.

Figure 16: Fighting Island Site 6.

Electrofishing:

The electrofishing survey was completed in mid-July. Species richness and diversity was high compared to other sites (Figure 36). Species composition was dominated by Yellow Perch (42%), and YOY sucker species (size restricted ability to properly identify to species, 29mm average)(13%). Sixteen species each represented a small portion of the remaining 45% composition.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Clay comprised a large portion of sediment composition (60%), the greatest clay composition for all sites (Figure 37), followed by silt (21%) and sand (17%). Mean SAV coverage across the entire site was high (97%, SE = ± 3%) with a moderate species richness (SR=10) compared to other sites. SAV composition varied from the channel habitat to the open shelf, however site wide SAV was dominated by Muskgrass,

Wild Celery and Coontail. Other species of emergent wetland plants (sedge or bulrush) were present in the channel to the south of the island, but were not captured by this site survey.

3.4 Grassy Island:

Surveys were completed off the western shoreline of Grassy Island, where an underwater shelf extends approximately 300m to the Grassy Island boating channel (Figure 17). Local knowledge indicated that the island is mostly reclaimed land filled with refuse from Detroit, Michigan. It was observed that pieces of broken glass, china and other bits of refuse comprised most of the shoreline material at minimum at the survey site and the southern tip of the island. It is vegetated mostly with trees, shrubs and Phragmites. The island extends over 1600 meters (north-south) and although there is a small protected cove at the head of the island, the majority of the shoreline had similar characteristics to the survey location. It was therefore considered to be representative of the majority of the western shoreline of the island.

Figure 17: Grassy Island.

Electrofishing:

This survey was completed in a single day, mid-august. Species richness (SR=19) and diversity (Shannon H'=2.10, Simpson's=0.82) was high compared to other sites surveyed (Figure 36). Species composition was dominated by Spottail Shiner (*Notropis Hudsonius*)(28%), Yellow Perch (26%), and Brook Silverside (11%); the remaining 35% comprised of 16 different species. This was one of three sites where YOY musky was captured (Table 3).

Habitat:

Habitat was surveyed less than a week after the electrofishing survey was completed. Water quality parameters met PWQOs and were within normal ranges for a freshwater river, although compared to other sites surveyed, turbidity levels were moderately high and dissolved oxygen were somewhat low (Table 4). Substrate was predominantly silt (51%) and clay (42%), with sand comprising the remaining 8% composition (Figure 37). SAV coverage was 100 (SE = ± 0%), dominated by Wild Celery and Canada Waterweed, with 10 other less dominant species present (Figure 18). The 1993 report indicated that SAV was comprised mostly of Canada Waterweed and milfoil and was "somewhat monoculture" (OMNR, 1994). The results from 2015 suggest that there has since been a possible change in SAV community composition.


Figure 18: Grassy Island habitat survey.

3.5 Turkey Island:

Turkey Island is a privately owned island located off the south east tip of Fighting Island. The boating channel, which runs along the east side of Fighting Island, splits at the northeast end of Turkey Island and then re-converges downstream at the southwest end of the island (Figure 19). The site is open to a large fetch to the south and west as well as wave action from boat wake from the surrounding channels. The island is vegetated with some trees and shrubs, with a fairly dense population of Phragmites (Figure 19). No description of the site was available from the 1993 OMNR report as a result of a page missing from the original scanned document.

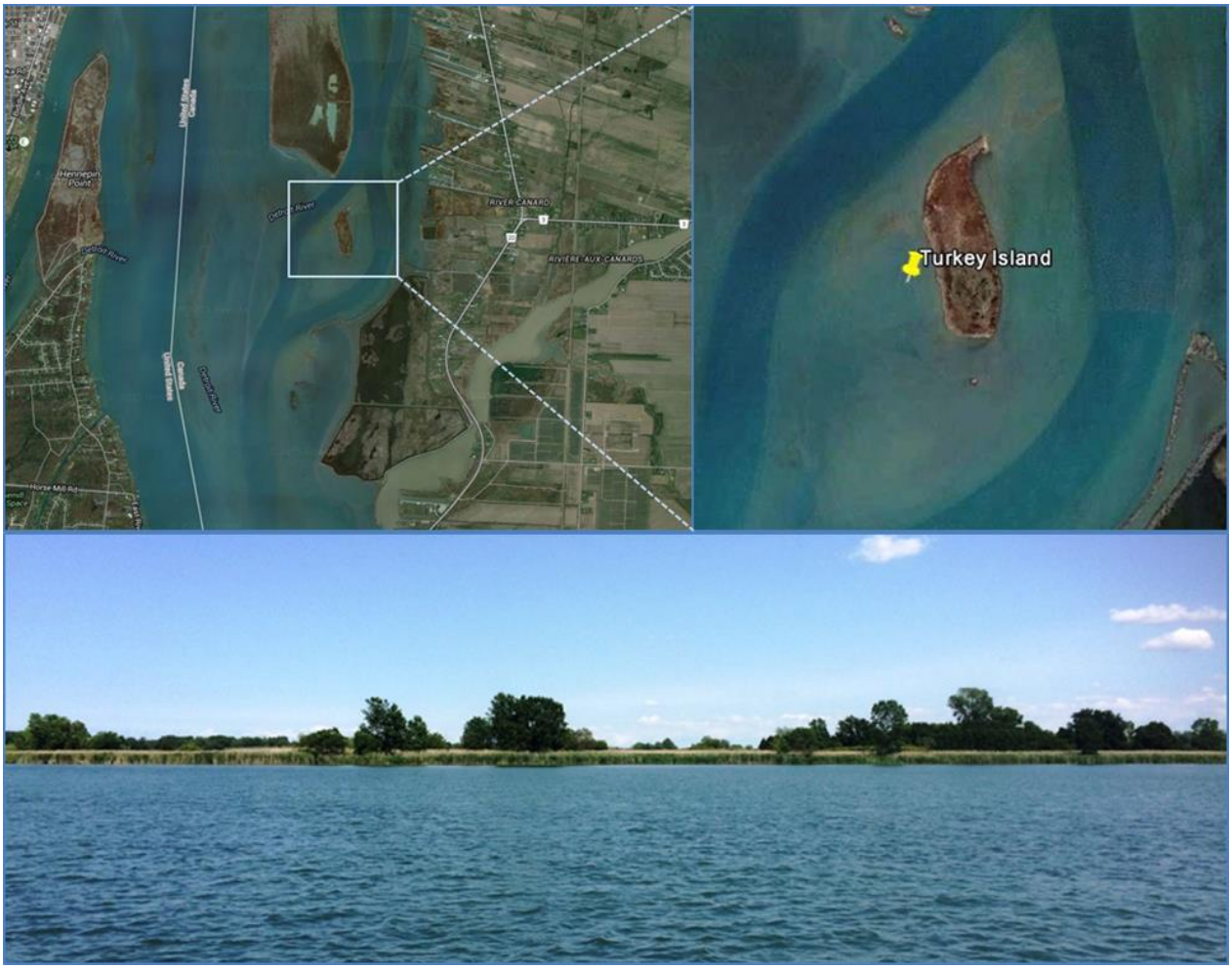


Figure 19: Turkey Island. Top: satellite images (Google, 2016), bottom: looking east at islands western shoreline.

Electrofishing:

The electrofishing survey was completed in late August 2015. This site had the second highest species richness (SR=21) but had moderate diversity (Shannon H'= 1.79, Simpson's = 0.72) compared to other sites surveyed (Figure 36). Species composition was dominated by Yellow Perch (47%) and Emerald Shiner (21%), where 19 other species each comprise a smaller portion of the remaining 32% composition. This was one of only two sites where the Johnny Darter species was captured (Table 3).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediment composition was predominantly a sand (37%), silt (35%), clay mix (27%) with some gravel (2%) (Figure 37). SAV coverage and species richness was moderately high compared to other sites (Table4). SAV composition was dominated Wild Celery, Slender Naiad, and Muskgrass when evaluated by site, however species composition varied from the east to west side of the island. Muskgrass was not as dominant on the east side as it was on the west, and Canada Waterweed and Coontail were more dominant on the east than they were on the west.

Figure 20: Canard River Marsh.

3.6 Canard River Marshes:

The Canard River marsh survey site was located on the north shore of the finger dyke (Figure 20). It was reported in 1993 that the finger dyke had significantly eroded as a result of wave action and currents (OMNR, 1994). This dyke protects the Detroit River AOC wetland (Canard River Marsh wetland) by creating a calm water area to the south of the dyke. The dyke vegetation includes shrubs and trees with patches of Phragmites on a rocky shoreline. In 2015, high water levels allowed overtopping in low areas of the dyke.

Electrofishing:

The survey was completed in late July. Species richness and diversity were high relative to other sites surveyed on the river (Figure 36). Species composition was dominated by Yellow Perch (54%), Largemouth Bass (11%), and Bluntnose Minnow (11%). The remaining 24% composition was distributed across 17 species. This was one of three locations where YOY musky were captured, and the only location where Northern Hogsucker (*Hypentelium nigricans*), were captured. This was also one of two locations where Spotted Sucker (*Minytrema Melanops*) was captured (Table 3). Spotted sucker is listed under the Species at Risk Act (SARA) and designated as a species of 'Special Concern' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (DFO, 2010).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river, although compared to other sites surveyed, turbidity levels were moderately high (Table 4). Sand, silt, clay and gravel comprised most of the substrate composition (Figure

Figure 21: Canard River Marsh site (finger dyke).

37). Detritus material was also present in substrate sample taken near shoreline. Mean SAV coverage for the site was 100% (SE = ± 0%), with moderately low species richness when compared to other sites (Table4). Species composition was dominated by Wild Celery, Muskgrass, and Slender Naiad. Others species present include; Sago Pondweed, Canada Waterweed, milfoil sp., Richardson's Pondweed, and a Narrow Leaf Pondweed (Table 4).

3.7 Canard River Access:

Figure 22: Canard River Access. Left: Satellite image (Google, 2016); Centre: Phragmites and high turbidity at site; Right: looking north from site location.

In 1993 the site was described as the area of wetand located southwest of the bridge for Highway 20 (formerly Hwy 18) (Figure 22, left). It was characterised as a shallow with a silty clay bottom, with four hardened land spits which protrude into the river. The land spits were described as vegetated in course herbaceous plants such as ragweed and some willow clumps, and SAV was identified as being limited by high turbidity (OMNR, 1994). The land spit shoreline vegetation characteristics observed in 2015 appear to differ from those in 1993. Dense populations of Phragmites currently line the shoreline for much of the area around the land spits (Figure 22, centre). Shallow water conditions of the river made sampling the >2m water depth habitat difficult, therefore the deepest location found (average depth = 1.3m, north of the centre of the river) was sampled instead.

Electrofishing:

The electrofishing survey was completed in mid-July. Species richness and diversity was found to be low compared to other sites surveyed in the river (Figure 36). Species composition was dominated by Longnose Gar (*Lepisosteus osseus*) (38%) and Gizzard Shad (*Dorosoma cepedianum*) (31%). The remaining composition was equally distributed by the other 6 species.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river, although comparatively, turbidity levels were very high, and dissolved oxygen was the lowest of all sites surveyed. SAV coverage and species richness was also the lowest for all site surveyed (Table 4). Species composition was dominated by American Lotus (*Nelumbo Lutea*), an ecologically significant species for wetlands, given a max value of Coefficient of Conservatism, indicating a low tolerance for disturbance and a high degree of fidelity to a habitat (Oldham et al., 1995). Sago Pondweed and Wild Celery were also present, comprising a smaller portion of the species composition.

3.8 Heritage River Lookout:

This site was not originally identified for potential rehabilitation or enhancement projects in the 1993 OMNR report. It was identified by the DRCC working group as a potential location due to proprietary access. The strip of land south of the marina and north of the Amherstburg visitor centre, between the river and the road, is owned by the Essex Region Conservation Authority (Figure 23). The shoreline is covered in herbaceous vegetation and with sparse shrubs. There is a 'Do Not Anchor' sign, indicating a submerged cable crosses this section of the river, approximately 150m downstream of the marina (Figure 24).

Figure 23: Heritage River Lookout (Google, 2015).

Electrofishing:

Two 300m transects were electrofished at this site in mid-July; one along the 1.5 m depth contour and one along the >2m depth contour. Fish were pooled by transect as opposed to the 100m bin protocol that was later adopted. Species richness and diversity was high compared to other sites (Figure 36). Species composition was dominated by Yellow Perch (34%), YOY sucker spp. (16%), Spottail Shiner (12%), and Mimic Shiners (10%). Fourteen other species comprised the remaining 28% species composition.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Substrates were composed of clay (47%), silt (22%), sand (16%), gravel (13%) and cobble (3%) (Figure 37). SAV coverage for the site was high but species richness was low compared to other sites (Table 4). SAV composition was dominated by Sago Pondweed, Wild Celery, and Curly-Leaved Pondweed (*Potamogeton Crispus*). Milfoil, Richardson's Pondweed, Canada Waterweed, and Slender Waterweed (*Elodea Nuttallii*) comprised smaller proportions of the species composition.


Figure 24: Heritage River Lookout.

3.9 Old Boblo Dock (Amherstburg):

Figure 25: Old Boblo Dock (Amherstburg) (Google, 2016).

This site was also not originally identified for potential rehabilitation or enhancement projects in the 1993 OMNR report. It was identified by the DRCC working group as a potential location due to proprietary access (owned by DFO). The old amusement park loading dock currently resides in a dilapidated state in a shallow cove adjacent to Hwy 20 (Figure 25). The dock has been a topic of interest for the town of Amherstburg who reportedly want the old dock removed or improved as it is potentially a safety hazard and unsightly for local residents (Windsor Star, 2016). The shoreline is vegetated with a mix of grass, trees, and shrubs, reinforced in areas with riprap material. There is also a frame of a sunken vessel or barge at the north east end of the cove. The site was surveyed approximately 100m upstream and downstream of the Old Boblo Dock.


Figure 26: Old Boblo Dock (Amherstburg).

Electrofishing:

Two transects were electrofished at this site in mid-July; one along the 1.5 m depth contour and one along the >2m depth contour. Fish were pooled by transect as opposed to the 100m bin protocol that was later adopted. Species richness and diversity were moderately high when compared to other sites sampled (Figure 36). Fish species composition was dominated by Mimic Shiners (34%), Emerald Shiners (15%), and Yellow Perch (15%) and Brown Bullhead (*Amerius Nebulosus*) (9%). The remaining 27% composition was comprised of 13 other species (Table 3).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river, however, turbidity was not measured at this location (Table 4). Sediment composition was dominated by clay (47%), followed by sand (27%), silt (15%), cobble (10%) and gravel (7%) (Figure 37). The site had moderately high SAV coverage but had the second lowest species richness of all sites surveyed (Table 4). Species composition was dominated by sago pondweed and wild celery. Canada Waterweed, Richardson's Pondweed and Curly-leaved Pondweed were also present.

3.10 Boblo (Bois Blanc) Island:

Many changes have occurred to Boblo Island since the 1993 OMNR survey. The Boblo Amusement Park is no longer in operation (closed September 1993) and the north end of the island has been converted into a resort community of condominiums and large homes. Most of the residences are located in what was previously a heavily wooded section of the island. A private ferry on the east shore services resident transportation to the mainland, and the old landing dock for the Amusement Park has been abandoned.

Figure 27: Boblo (Bois Blanc) Island (Google, 2016; DigitalGlobe, 2016; TerraMetrics, 2016).

The small horse-shoe shaped island to the north of the main island has now been connected with a causeway, effectively removing any water flow between the islands where a channel used to exist. In the 1993 survey the cove to south west of the horse-shoe shaped island (Site 1) was identified for rehabilitation/enhancement but was not pursued in 2015 as large waterfront homes had been developed on the northwestern tip of the main island and construction of a large dock

was underway. The cove inside the horse-shoe island and between the horse-shoe island and the northeast tip of the main island were also identified (Site 2) for rehabilitation, however, this was also not pursued due to the development of large waterfront homes with large private docks in both locations. The remaining sites were surveyed in 2015 (Figure 27).

3.10.1 Boblo (Bois Blanc) Island Site 3:

Figure 28: Boblo (Bois Blanc) Island Site 3. Left : South end of cove; Centre : abandoned dock in centre of cove; Right : north end of cove).

This site was described as a shallow cove (depths averaging 1.5m) on the eastern shore of the island, divided by a permanent docking facility (OMNR, 1994). It was characterized by an existing breakwall on the north side of the dock and the absence of any such breakwall to the south (OMNR, 1994) (Figure 28). In 2015, a partial submersed breakwall composed of armourstone was observed to extend approximately 100m north from the southern tip of the cove. Survey sampling was minimal (one bin with three quadrats) on the north side of the dock as the shallow embayment behind the breakwall was inaccessible by electroboat. It was observed that both emergent and submergent aquatic plants were present in the bay and that highwater levels allowed for overtopping of the breakwall. The majority of survey sampling was conducted south of the dock.

The area south of the dock is characterized by a sandy beach embayment created by the dock structure itself. The dock has fallen into a state of disrepair and steel walkways extending from the dock were observed to be falling into the water. The eastern shoreline of the cove was vegetated with trees, shrubs and patches of Phragmites. The shoreline was also reinforced with riprap in different locations. The south end has a natural shoreline leading up to the point from which the submersed rock wall extends. During the habitat survey a freighter passed the site heading north in the Amherstburg channel (east of the island) which caused a significant displacement of water from the cove, drawing SAV out of the cove and drastically raising turbidity levels when water returned to the cove. It can be concluded that freighter traffic has a significant effect on the habitat of the cove.

Electrofishing:

This survey was completed in late August. This site had the highest species richness of all sites surveyed, as well as high diversity (Figure 36). Species composition was dominated by Yellow Perch (31%), Mimic Shiner (20%), Emerald Shiner (11%) and Brook Silverside (8%). The remaining 30% composition was distributed over 18 species, and was the only location where silver redhorse were captured (Table 3).

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediment composition was dominated by silt (35%), followed by sand (21%), clay (19%), boulder (13%), gravel (7%) and cobble (5%) (Figure 37). SAV coverage was estimated to be 69% (SE = ± 11%), which was moderately low compared to all sites surveyed (Table4). Where depth was too great and turbidity too high for visual estimate, coverage was estimated based on feel and amount of SAV retrieved from bottom. Species richness was moderately high as compared to other sites (Table 4) and species composition was dominated by Wild Celery and Richardson's Pondweed. Smaller portions of the composition were made up by 10 other species.

3.10.1 Boblo (Bois Blanc) Island Site 4:

As described in 1993, this site is adjacent to a large sand spit approximately 1900 m long, extending from the southeast tip of the main island in a south west direction (OMNR, 1994). The resulting cove on the west side of the spit was described as having minimal aquatic vegetation, as well as minimal vegetation on the spit in 1993, which no longer appeared to be the case in 2015 (Figure 29). ERCA's White Sands conservation area is located at the southern tip of the main island where it meets the sand spit and is open for day use by boaters and island residents. As the length of the spit was so long, the entire length of the site was not sampled but as site characteristics were similar along the spit, the survey location was considered to be representative of the entire area.

Figure 29: Boblo (Bois Blanc) Island Site 4.

Electrofishing:

This site was surveyed one day in early August 2015. Species richness and diversity were moderately high compared to other sites (Figure 36). Species composition was dominated by Brook Silverside (27%), Yellow Perch (26%), and Emerald Shiner (23%). 14 species comprised the remaining 24% fish composition at this site.

Habitat:

Due to the amount of SAV retrieved within each quadrat and the number of quadrats sampled at this location, the habitat survey was completed over several days in earl August. Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Substrate composition was dominated by silt (50%), sand (26%) and clay (18%) (Figure 37). SAV coverage was high and species

richness was moderately high compared to all sites (Table 4). SAV species composition was dominated by Wild Celery, Canada Waterweed, Muskgrass, and Richardson's pondweed. Flat-Stemmed Pondweed (*Potamogeton Zosteriformis*), Coontail and Milfoil were not dominant but made up more than trace composition. In 2015, aquatic vegetation was observed to have almost completely filled in the cove west of the sand spit.

3.10.2 Boblo (Bois Blanc) Island Site 4b:

Figure 30: Boblo (Bois Blanc) Site 4b. Left : north shoreline of the boot shaped tip; Right : South shoreline of the boot.

The southern tip of the Boblo Island sand spit forms a boot shape, creating a small cove on the northern shoreline (Figure 27). This section of the sand spit is heavily reinforced with rocks and armourstone with trees and shrubs providing overhanging cover for the shoreline (Figure 30 and 31). Water depths quickly drop off to depths greater than 5m. It was not identified originally in the 1993 report to be able to infer any changes that may have occurred over the following 22 years.

Electrofishing:

The electrofishing survey was limited to one pass of the electroboat (100m transect) following the contour of the boot section of the island. The electrical field from the anodes spanned both the 1.5m depth and >2m depth habitats simultaneously. Species richness was moderately low and diversity was low compared to other sites surveyed (Figure 36). Species composition was dominated by Mimic Shiners (74%), and Rock Bass (12%), however, the rocky nature of the shoreline made netting benthic fish species difficult, potentially resulting in an underrepresentation of those species.

Figure 31: A clutch of mallard ducks feeding in floating vegetation at Boblo (Bois Blanc) Island Site 4b

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river. Mean depth was high at this location as a result of the steep drop off from the shoreline (Table 4). Sediment composition was dominated by boulder (38%), silt (32%), clay (18%), and sand (12%). This site had the highest boulder composition of all sites surveyed (Figure 37). SAV coverage

was difficult to determine due to water depth and clarity, sites where coverage could not be visually assessed were estimated based on feel and quantity of SAV retrieved. SAV coverage for this site was estimated to be 50% (SE = ± 20%) (Table 4). SAV was dominated by Muskgrass, Canada Waterweed, and Wild Celery.

3.10.5 Boblo (Bois Blanc) Island Site 5:

Figure 32: Boblo Island Site 5, south of marina, looking north.

The stretch of the river that passes between the western shoreline of Boblo Island and the east shoreline of the Livingston Channel berm is shallow apart from the deep channel that runs parallel to the berm. In 1993, it was described as having extensive aquatic macrophyte beds, a marina mid-way down the main island shoreline, three submerged shoals south of the marina and one north of the marina, and the area was frequented by pleasure boats (OMNR, 1994). Much remained the same in 2015, although only two shoals (partially exposed) could be found south of the marina and none on the north side (Figure 32 and 33). The survey was restricted to the area south of the marina as it appeared to be representative of the entire shoreline.

Electrofishing:

The one day survey was completed in late July. Compared to other sites surveyed, species richness and diversity was moderately high (Figure 36). Species composition was dominated by Yellow Perch (52%), Hornyhead Chub (*Nocomis Biguttatus*) (13%), and Mimic Shiner (10%), where 14 other species comprised the remaining 25%.

Figure 33: Looking west at the Livingston Channel berm from Boblo Island Site 5.

Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Of note in 2015 was the significant water current observed flowing through the site, particularly around the southern most exposed shoal. Silt dominated the sediment composition at 53% followed by sand (26%), and clay

(10%). A small proportion of cobble (7%) and gravel (5%) was present as well (Figure 37). SAV coverage was 100% (SE = ± 0%), with moderately high species richness as compared to other sites surveyed (Table 4). SAV was dominated by Wild Celery, Canada Waterweed, Muskgrass and Sago Pondweed. Eight other species constitute the remaining SAV composition (Table 4).

3.11 Channel Trainer:

Figure 34: Channel Trainer.

The channel trainer runs perpendicular to the the west berm of the Livingston Channel and ends straight out from Sugar Island in U.S. waters (Figure 34). The international boundry lies approximately 200-300m west of the Livingston Channel at the channel trainer and continues in a southwest direction from that location.The berms to the north and east are constructed of armourstone and are partially vegetated with shrubs and trees (Figure 35). To the south, the site is open to the west basin of Lake Erie. The area south of the berm was described as a calm water area averaging one to three meters depth with a "good amount " of SAV in 1993 (OMNR, 1994). Depths averaged over three meters for quadrats sampled in 2015 (Table 4).

Electrofishing:

In mid-August, a one day electrofishing survey was completed at this location. Due to site characteristics, the 1.5m electrofishing transect was located directly along the Livingston Channel berm shoreline and the >2m transect was located approximately 100m west and parallel to the first transect. Fish species richness was moderately low and diversity was moderate compared to other sites surveyed (Figure 36). Species composition for this site was dominated by Rock Bass (24%), Emerald Shiner (21%), Brook Silverside (14%), Yellow Perch (10%) and Freshwater Drum (10%). The remaining 21% was comprised of 7 other species. However, the rocky shoreline of the berm made netting benthic fish species especially difficult, potentially resulting in an underrepresentation of those species. This was also one of two sites where Spotted Sucker, a SAR species, was captured (Table 3).

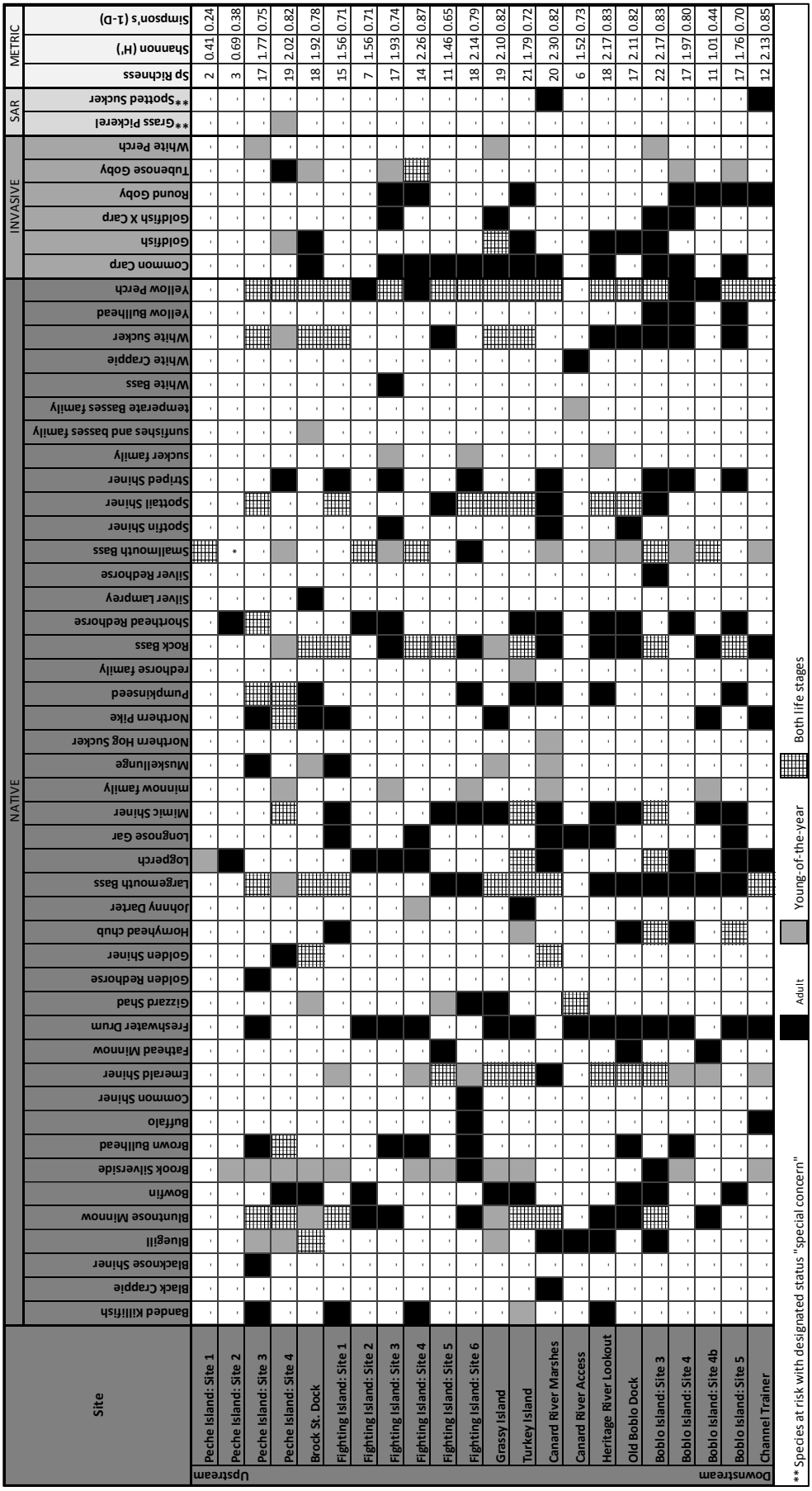
Habitat:

Water quality parameters met PWQOs and were within normal ranges for a freshwater river (Table 4). Sediment composition was varied although dominated by silt (36%). One quadrat in the habitat survey had a presumably solid rock substrate (9% other, Figure 37) as no sample was retrieved and the ponar could be heard and felt to be hitting a very hard surface. As average water depths exceeded 3 meters, water clarity and the varying substrate composition did not allow visual estimates of SAV coverage

except along shore, therefore estimating SAV coverage was very difficult to determine with any accuracy. It is this author's opinion that SAV coverage at least exceeded 50% for the site based on the frequency and quantity of SAV retrieved during the survey. Species richness was the second highest for this site of all sites surveyed (Table 4), its composition dominated by Wild Celery, Richardson's Pondweed, Canada Waterweed, Slender Naiad, and Coontail.

Figure 35: Picture taken south of the channel trainer, facing north.

Table 3: Summary of fish species by life stage as well as species richness and diversity captured by site.



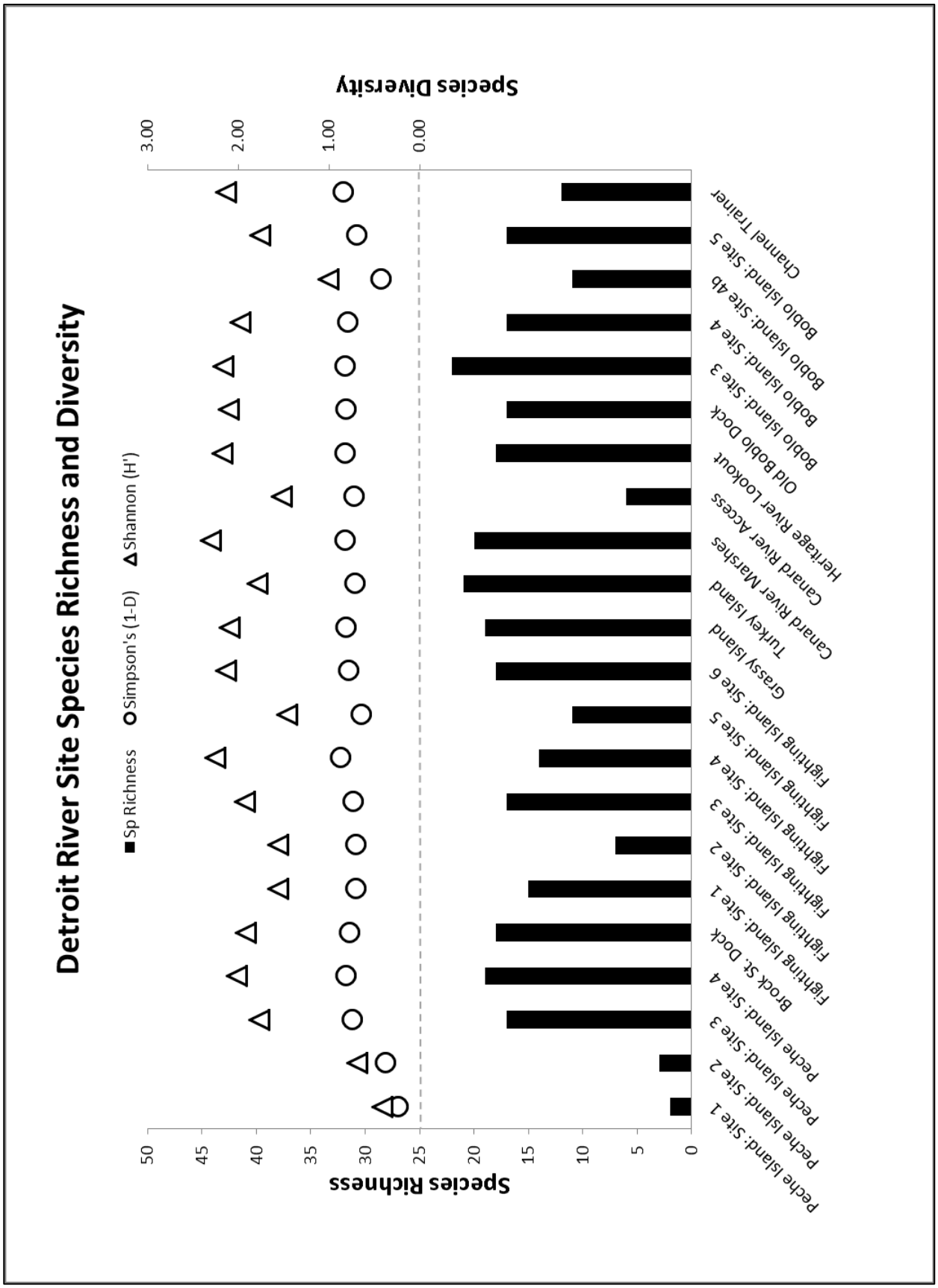


Figure 36: Summary of species richness and diversity (Shannon H' and Simpson's (1-D)) by site surveyed.

Table 4: Summary habitat data collected by site, including SAV species collected, SAV richness and water quality parameters.

	Site	American Lotus	Brittlewort	Canada Waterweed	Coontail	Curly White Water Crowfoot	Curly-leaved Pondweed	Duckweed	Filamentous algae underwater	Milfoil	Muskgrass	Richardson's Pondweed	Sago Pondweed	Sedge	Slender Naiad	Slender Waterweed	Spiny Naiad	Flat-stemmed Pondweed	Water Star-grass	Wild Celery	Yellow Waterlily	Potamogeton spp. Narrow leaf	Potamogeton spp. Wide leaf	Species Richness	% SAV Coverage (mean ± SE)	Depth (m) (mean ± STD)	Mean Turbidity (NTU)	Mean Temp (°C)	Mean DO (mg/L)	Mean pH	Mean Specific Conduct-ivity (mS/cm)	Mean ORP (mV)
Upstream	Peche Island: Site 1										■				■					■			■	4	77 ± 8	1.42 ± 0.19	0.92	21.54	8.95	8.91	0.202	266
	Peche Island: Site 2										■				■					■		■	■	5	36 ± 10	1.84 ± 0.48	0.66	24.77	9.76	8.75	0.206	275
	Peche Island: Site 3		■	■	■	■				■	■	■			■	■			■	■				11	97 ± 2	1.36 ± 0.30	0.87	21.40	9.40	9.01	0.208	248
	Peche Island: Site 4		■	■	■	■	■	■	■	■	■	■		■		■	■	■	■	■	■			17	56 ± 16	0.84 ± 0.21	1.02	23.44	8.36	8.69	0.206	205
	Brock St. Dock		■	■	■				■	■	■					■	■	■	■	■		■		12	94 ± 6	1.29 ± 0.34	3.76	25.62	5.53	8.63	0.201	194
	Fighting Island: Site 1			■					■	■	■	■			■	■			■	■				9	82 ± 16	1.10 ± 0.51	3.08	23.37	8.63	8.66	0.219	272
	Fighting Island: Site 2			■						■	■	■	■		■	■				■		■	■	10	27 ± 8	1.67 ± 0.23	1.56	23.21	9.99	8.67	0.203	269
	Fighting Island: Site 3		■	■			■			■	■		■		■	■		■	■	■		■		12	73 ± 13	1.64 ± 0.50	2.09	25.27	11.24	8.89	0.222	237
	Fighting Island: Site 4			■						■	■	■			■					■		■		7	97 ± 2	1.84 ± 0.37	1.74	26.06	11.51	8.85	0.222	254
	Fighting Island: Site 5			■	■					■	■	■			■	■		■	■	■		■		11	100 ± 0	2.09 ± 0.39	2.06	20.81	8.55	8.92	0.224	216
	Fighting Island: Site 6			■	■					■	■	■	■		■			■		■		■		10	97 ± 3	1.83 ± 0.23	2.54	21.18	9.21	8.65	0.241	241
	Grassy Island		■	■	■	■				■	■	■			■	■		■	■	■				12	100 ± 0	1.46 ± 0.10	3.51	24.79	6.98	8.67	0.213	163
	Turkey Island		■	■	■					■	■	■			■	■			■	■				10	89 ± 7	1.23 ± 0.41	1.76	21.29	9.25	9.09	0.206	220
	Canard River Marshes			■						■	■	■	■		■					■		■		8	100 ± 0	1.62 ± 0.25	4.05	23.78	10.11	8.89	0.218	192
	Canard River Access	■											■							■				3	25 ± 9	1.10 ± 0.25	39.06	24.48	5.44	7.88	0.440	102
	Heritage River Lookout			■			■			■		■	■			■				■				7	97 ± 3	1.76 ± 0.31	3.63	22.06	6.88	8.47	0.320	112
	Old Boblo Dock			■			■					■	■							■				5	83 ± 11	1.77 ± 0.33	-99.00	21.27	7.45	8.64	N/A	139
Downstream	Boblo Island: Site 3			■	■					■	■	■	■		■	■			■	■		■	■	12	69 ± 11	1.69 ± 0.65	1.88	23.35	8.92	8.84	0.208	264
	Boblo Island: Site 4			■	■					■	■	■			■	■		■	■	■		■		11	98 ± 2	2.15 ± 0.56	1.70	23.16	8.74	8.71	0.208	227
	Boblo Island: Site 4b			■						■	■	■	■		■	■		■	■	■				10	50 ± 20	3.20 ± 1.80	2.53	22.33	8.02	8.37	0.214	250
	Boblo Island: Site 5			■	■					■	■	■	■		■	■		■	■	■			■	12	100 ± 0	1.26 ± 0.38	2.27	25.90	11.20	8.75	0.212	237
	Channel Trainer		■	■	■		■		■	■	■	■			■	■		■	■	■		■		14	unknown	3.33 ± 1.01	1.04	23.55	7.55	8.50	0.215	161

■ Present □ Absent

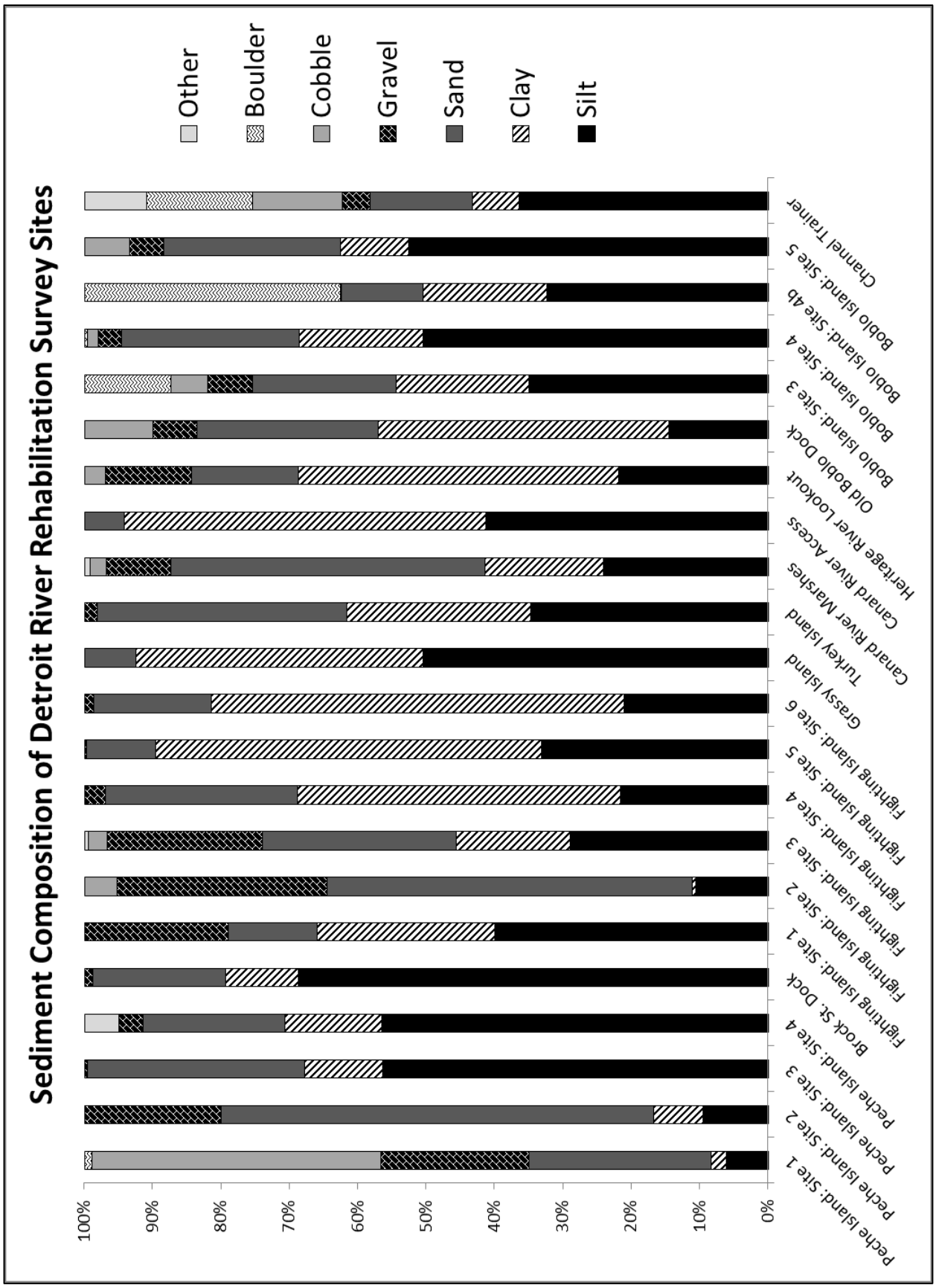


Figure 37: Percent sediment composition by site.

4 Summary:

In the fall of 2015, the DRCC working group met and shortlisted the number of sites for further investigation into the feasibility of rehabilitation and/or enhancement. This was based on data collected in 2015, proprietary access, location within the River and proximity to "good" habitat already present, ability to partner projects for multiple purposes/use, and to be visual to the public. The sites shortlisted included: Pêche Island Site 2 and 4, Fighting Island Site 4, 5, 6, Grassy Island, Turkey Island, Heritage River Lookout, Old Boblo Dock and Boblo Island Site 3.

Feasibility for the proposed site-specific rehabilitation or enhancement will be assessed through modeling, engineer design, and project costing. With the implementation of these projects, the goal is to re-designate the status of the *Degradation of Fish and Wildlife Populations*, and the *Loss of Fish and Wildlife Habitat* BUI's from impaired to unimpaired, and ultimately de-list the Detroit River as an AOC within 5 to 10 years.

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