

Canadian Habitat Restoration in the Detroit River

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Background

The Detroit River is a 51-km connecting channel that links Lake St. Clair to the western basin of Lake Erie. The river runs through two major urban areas (Detroit, MI and Windsor, ON) and has long been used for industrial and recreational purposes. Over the past 100 years, the river, its shoreline, and watershed have been impacted by considerable industrial, urban, and agricultural development. As these pressures became more intense, habitat for species began to disappear and become degraded. The construction of shipping channels, dumping of dredge spoils, hardening of the shoreline, and destruction of shallow wetlands all contributed to the loss and modification of habitat on the Detroit River (Manny et al., 1988). For example, habitat for Lake Whitefish and Lake Sturgeon spawning in the river was removed during dredging of the river bottom for navigational purposes, resulting in large population decreases for both species and near extirpation (Roseman et al. 2007). The loss of habitat in the Detroit River and on its shores was one of the factors that led to the river to be designated a Great Lakes Area of Concern in 1985 (Green et al., 2010). The Detroit River Canadian Cleanup (DRCC) partnership and the agencies responsible for implementing the Remedial Action Plan that addresses habitat loss and other concerns in the river, have been exploring and implementing actions to reduce the impacts of habitat loss. Actions include protecting remaining habitat, replacing lost habitats through restoration, or enhancing or improving the function of existing natural features.

Delisting Criteria for the Habitat Beneficial Use Impairment (BUI)

Delisting criteria have been identified under the following four categories for the *Loss of Fish and Wildlife Habitat* beneficial use impairment for the Canadian side of the Detroit River: coastal wetlands; aquatic and riparian habitat; shoreline softening; and terrestrial habitat. The delisting criteria state that the *Loss of Fish and Wildlife* BUI will be considered not impaired on the Canadian side of the Detroit River when the following criteria have been achieved:

“a) Coastal wetlands: protect existing coastal wetland habitat and restore wetland function in priority areas of the AOC and its watershed.

b) Aquatic & riparian habitat: protect existing deep water, coastal spawning, and tributary fish and aquatic wildlife habitat and restore ecosystem function in priority areas in, and hydrologically connected to, the Detroit River.

c) Shoreline softening: develop and begin to implement a shoreline management strategy to soften and naturalize Detroit River Canadian shoreline, whenever opportunities arise.

d) Terrestrial habitat: protect existing natural terrestrial corridors and restore ecosystem function between the Detroit River and the Ojibway Prairie Complex, the LaSalle Candidate Natural Heritage sites, and other major identified habitat sites.”

Identifying and Prioritizing Habitat Restoration

As part of the Remedial Action Plan, strategies to prioritize habitats within the Detroit River and its watershed for potential restoration or protection, where possible, were developed to guide future habitat-related actions. The Ontario Ministry of Natural Resources (1993) developed a survey of candidate sites on both the St. Clair and Detroit rivers for Potential Habitat Rehabilitation/Enhancement. More recently, the Detroit River Canadian Cleanup Habitat Work Group created the Canadian Habitat Priorities Report (2007) outlining priority habitat sites within the river. This includes 18 sites with significant habitats located in the river and its watershed where future efforts can be focused on protection, restoration, or acquisition.

Priority has been placed on creation of habitat historically lost in shallow, coastal, in-river areas within the Canadian side of the Detroit River proper. To determine the feasibility of the restoration of some of these areas, a study was commissioned in 2015 to assess the potential of seven habitat creation sites within the Detroit River. This study examined the non-biological characteristics of restoring and enhancing each potential habitat site, as well as the feasibility of the potential project while taking into account physical habitat, hydrography, cost, and navigation hazards. These seven sites were located from upstream Detroit River (two at Peche Island), to midstream Detroit River (three at Fighting Island), to downstream Detroit River (two at Boblo Island). The proposed in-water works consist of constructing a mixture of sheltering islands, shoals, and reefs at these sites to create wetlands for wildlife and fish, as well as establish aquatic vegetation in backwater areas to provide fish spawning and nursery areas. A decision matrix is being used to rank proposed restoration sites using ecological, logistical, and economic factors.

Habitat Restoration on the Canadian side of the Detroit River

The location of habitat restoration projects in the Detroit River and its watershed can be found in Figure 1.

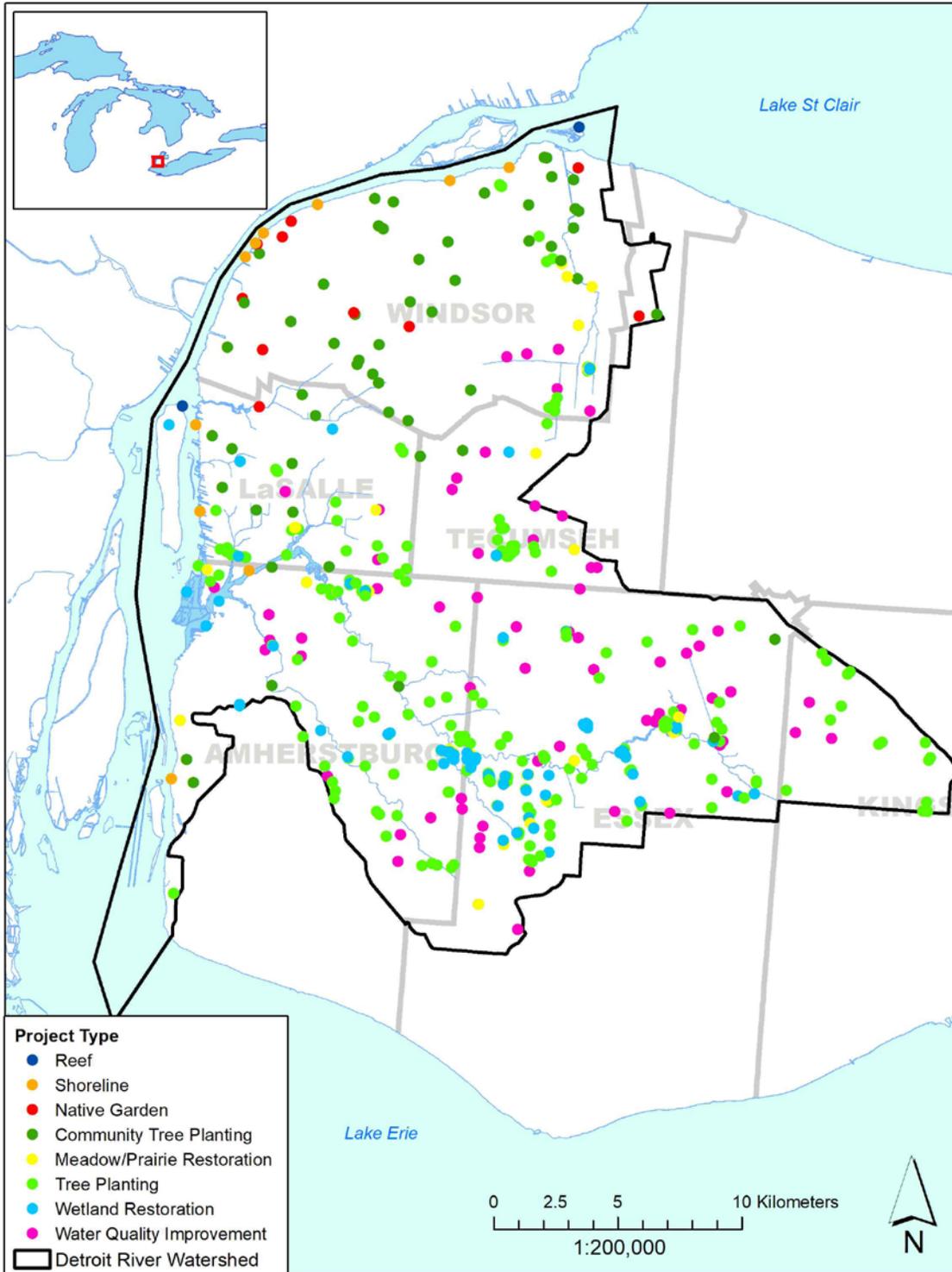
Shoreline softening

On the Canadian side of the Detroit River, 19 habitat restoration/enhancement projects have been or are planned to be implemented by many Detroit River Canadian Cleanup (DRCC) partners, including Environment and Climate Change Canada through the Great Lakes Sustainability Fund, Ontario Ministry of Natural Resources and Forestry through the Canada-Ontario Agreement, Essex Region Conservation Authority (ERCA), and others (Table 1). To date, the majority of habitat restoration on the Canadian side of the river has been via shoreline softening. A total of 14 shoreline softening projects have been completed on the Canadian shoreline of the Detroit River (Table 1). These softening projects involve putting in rocks, plants, and other materials along the shoreline to stabilize the shoreline. Unlike sheet steel and other ‘hard’ shoreline stability methods, soft shorelines not only reduce shoreline erosion, but also provide an ecological benefit (see soft shoreline indicator report for more information). Some of the shoreline softening projects also incorporated other habitat features such as shoals, offshore sheltering islands, and root wads, to further enhance habitat (Table 1).

Reefs

In addition to the shoreline softening projects, reef, fish habitat, and wetland enhancement projects have been constructed in the Detroit River. In 2008, a sturgeon reef was constructed at the northeast tip of Fighting Island. The project was a binational effort, with both American and Canadian partners committing resources to the project. The reef was expanded in 2013, creating a total of 0.84 hectares (0.36 hectares in 2008 and 0.48 hectares in 2013) of aquatic, deep water habitat. The first stage

Figure 1: Location of habitat restoration projects on the Canadian side of the Detroit River and its watershed from 2000 to 2019.



of the project (2008) constructed a boulder field and 12 individual reefs made up of four different rock types. The expansion phase of this project (2013) constructed one reef bed made up of one type of stone (6-12 inch limestone).

Post-construction monitoring of the first stage of this project found Lake Sturgeon spawning occurring in the first and second spring, and for multiple years afterwards. In addition, reef monitoring showed Lake Whitefish, Walleye, and native sucker eggs present on the reef. This post-construction monitoring indicates that the reef has continued to increase the productive capacity of spawning habitat for Lake Sturgeon (and other fishes) in the Detroit River. Further, this project has provided additional opportunities to improve our understanding of the presence, distribution, and ecology of Lake Sturgeon in the Detroit River. In 2017, it was estimated that there are over 6,000 Lake Sturgeon in the Detroit River, and over 30,000 in the Lake Huron to Lake Erie corridor (J. Boase, personal communication).

Wetland enhancement

Several wetland enhancement projects have been completed in the Detroit River to improve wetland habitat and associated ecosystem services to the river. In 1995, the existing finger dike structure at Ruwe Marsh was repaired in an effort to protect existing habitat in an ecologically important area of the Detroit River. More recently, in 2019, the Detroit River Canadian Cleanup and Essex Region Conservation Authority enhanced a 30-hectare coastal wetland in the Canard River, near where it meets the Detroit River. The enhancement involved refurbishing the existing outside berm, maintaining the containment berm along the eastern boundary of the wetland to permit improved water level management flexibility and installing a pumping system. With these enhancements, the wetland water levels will be able to be manipulated and managed to control invasive species to improve habitat for waterfowl, amphibians, and aquatic vegetation.

Fish habitat enhancement

The DRCC and its partners are in the process of gaining appropriate permit approvals for an erosion mitigation and fish habitat enhancement project in the waters to the north and northeast of Peche Island. Peche Island is a 32-hectare island located in the upper Detroit River near Lake St. Clair. The island is a municipal park that is accessible by boat and has high biodiversity, including 22 species of rare native plants (235 plant species documented in total), two rare reptile species, critical habitat for species at risk, freshwater clams and mussels, and numerous birds (including bald eagles) that utilize the island for various life stages. The island has been designated an environmentally-sensitive area and the marsh on the island is an Ontario provincially-significant wetland.

This important island has been eroding at a rapid pace due to strong river currents and heavy wave action from Great Lakes freighter traffic. It is estimated that Peche Island has decreased in area by seven hectares from 1931 to 2015. The primary objective of this project is to create a series of nearshore and sheltering islands and a peastone (cobble) beach on the northeast side of Peche Island and a series of off-shore sheltering islands in the water lot on the north side of the Peche Island to protect it from further erosion. The proposed off-shore islands on the north side of the island will also create a calm-water embayment that will offer fish refuge and the opportunity for macrophytes to establish. It is projected that the entire calm water embayment area will act as a fish spawning and nursing area for the Detroit River, which may have spin-off benefits for the river further downstream. The area will also provide habitat for staging, nesting, brood rearing, and feeding areas for various species of waterfowl. Wading birds such as Great Blue Herons and Black-crowned Night Herons frequent the area and could use the beaches in the calm-water area for feeding. Shorebirds would also use the beaches in the calm-water area during spring and fall migration. In time, this embayment area is anticipated to provide valuable aquatic habitat for local fish and wildlife. This project is the single largest investment in structures that are designed to benefit fish

in the Canadian Detroit River Area of Concern and construction of the project is expected to begin in summer 2020.

Terrestrial habitat

In addition, the Essex Region Conservation Authority (ERCA) conducts wetland and prairie restoration and tree planting activities on public and private lands in the Detroit River watershed. Since 2000, a total of 441 hectares (1,092 acres) of wetlands, prairie, and forest have been restored in the Detroit River watershed through this effort. In addition, the DRCC and ERCA also work together to plant native gardens within the watershed. Approximate locations of these projects can be found in Figure 1.

Table 1. Habitat projects implemented on the Canadian side of the Detroit River, 1996-2019 (partners included: ERCA, Ministry of Natural Resources and Forestry, Environment and Climate Change Canada, City of Windsor, Town of LaSalle, Town of Amherstburg, Parks Canada, Windsor Port Authority, University of Windsor, Lafarge Canada, Dean Construction, Swim, Drink, Fish, and BASF Corporation). Modified from Hartig et al. (2018)

Location	Project Description	Date
Ruwe Marsh Restoration Project	Repaired an existing finger dike structure in an effort to protect existing habitat in an ecologically important area of the Detroit River. The restoration efforts resulted in the repair of 1,125 m of deteriorated dike protecting 366 ha of downstream wetland as well as providing additional protection to the dike walls of the enclosed wetland.	1995
NE Shore of Fighting Island, LaSalle	Increased shoreline sinuosity by constructing groins that increased stability and enhanced habitat	1996
Dean Construction, LaSalle	Naturalized 550 m of shoreline; established 0.45 ha storm water pond to treat runoff	1999
Goose Bay, Windsor	Stabilized 200 m of shoreline with riprap and native plants, and enhanced fish habitat	1999–2000
St. Rose Beach Park, Windsor	Stabilized 200 m of shoreline and reconstructed shallow beach area; replaced concrete retaining wall with riprap and added fish habitat	2000–2001
Windsor Riverfront (Langlois to Moy Aves.) and the Hatch Wildflower Garden	Created a sloping rock revetment along 472 m of shoreline and rock beach with a shoal with native vegetation	2001
McKee Park, Windsor	Protected and enhanced 135 m of shoreline; constructed 0.17 ha of offshore barrier islands and submerged shoals to reduce high energy currents and to improve fish habitat	2003
Fort Malden, Amherstburg	Stabilized 300 m of shoreline and constructed a rock revetment and offshore deepwater rock/cobble shoals to	2004

	enhance fish habitat and create lake sturgeon spawning habitat	
NW Shore of Fighting Island, LaSalle	Stabilized shoreline to a depth of 37 cm with five-cm crushed limestone bound together with the Elastocoast product	2007
Sturgeon Spawning Reef at Fighting island	Created a 0.84 hectare spawning reef at the northeast tip of Fighting island.	2008, expansion 2013
Windsor Riverfront (Elm to Caron Aves.)	Created rock revetment, cobble and sand beach, sheltering structures, and submerged shoal. Stabilized approximately 250 m of shoreline	2007
Riverdance Park, LaSalle	Removed old marina; stabilized shoreline (approximately 175 m of shoreline) and enhanced wetland and fish habitat	2009-2010
Windsor Central Riverfront (Glengarry to Langlois)	Restored 550 m of shoreline and enhance habitat using a diversity of substrate types and sizes	2011
River Canard Park, Amherstburg	Removed concrete shore protection structure and restored 200 m of shoreline and habitat	2012
Lafarge Inc., Windsor	Stabilized and increased sinuosity of 360 m of shoreline using a diversity of rock types to increase overall shoreline length at the site and offer a diversity of interstitial spaces	2013
HMCS Hunter at Mill Street, Windsor	Placed sloped armor stone along 175 m of shoreline to improve fish and aquatic habitat. Root wads were submerged in the calm water of the harbor to provide habitat for fish and turtles.	2015
Collavino wetland restoration	Refurbishment of existing dykes and installation of pumping infrastructure to manage water levels within the wetland.	2019
Peche Island Erosion Mitigation and Habitat Enhancement Project	Construction of sheltering islands on the north and northeast sides of the island to protect the island from erosion and create a 10.5 ha backwater area for fish spawning and habitat.	2020-2021

Conclusions and Recommendations

Since the Detroit River was listed as an Area of Concern, there has been significant progress towards the restoration of fish and wildlife habitat. Large-scale restoration projects require many partnerships that take time to create. One of the primary challenges to implementing habitat restoration in the Canadian Detroit River is the large amount of privately-owned property along the shoreline. Projects are only possible if landowners are willing and there is a commitment of matching funds. Through various partnerships, the DRCC has been able to identify potential restoration sites and implement restoration at a number of priority sites. Of the 18 sites that were identified as priority sites in the 2007 document, habitat restoration actions have been completed at five of them, with work at one additional site in progress. Of the seven sites included in the aquatic feasibility study, one project is scheduled for

construction to begin in 2020. One question that remains to be answered is: How much habitat is enough? We are currently in the process of creating sub-indicators that will help us answer this question.

Though there are still a number of projects to complete, approximately 3,300 m of shoreline has been softened, several reefs, shoals and sheltering islands have been constructed creating backwater areas for fish to spawn, and almost 400 ha of coastal wetlands have been enhanced to date in the Detroit River. Continued research, monitoring, and maintenance of restoration projects is needed to determine project success. Actions such as removing accumulated sediments from reefs and ensuring structures are stable can help achieve long-term success. In addition, research on the use rates of habitat structures and their effectiveness can help better design restoration projects in the future.

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