A
Fish Habitat Management Plan
for the Bay of Quinte

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and
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Bay of Quinte Remedial Action Plan
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Acknowledgements

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Section 1: Introduction

In 1985, the Bay of Quinte was identified as one of 43 Great Lakes Areas of Concern (AOCs), due, in part, to excessive nutrient enrichment, nuisance algal growth, low concentration of dissolved oxygen in bottom waters and localized bacterial concerns (Bay of Quinte Remedial Action Plan 1990). AOCs are severely degraded geographic areas within the Great Lakes Basin and are defined by the U.S.-Canada Great Lakes Water Quality Agreement (GLWQA) as "geographic areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life" (GLIN 2005). An impaired beneficial use (IBU) is defined as a change in the chemical, physical or biological integrity of the Great Lakes system that is sufficient to cause any of the fourteen scenarios listed in Table 1.

Table 1. Summary of Impaired Beneficial Uses, as defined by the Great Lakes Water Quality Agreement, for the Bay of Quinte Area of Concern.

<table>
<thead>
<tr>
<th>Bay of Quinte</th>
<th>Impaired Beneficial Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 1.</td>
<td>Restrictions on fish and wildlife consumption</td>
</tr>
<tr>
<td>x 2.</td>
<td>Tainting of fish and wildlife flavour</td>
</tr>
<tr>
<td>✓ 3.1</td>
<td>Degradation of fish populations</td>
</tr>
<tr>
<td>x 3.2</td>
<td>Degradation of wildlife populations</td>
</tr>
<tr>
<td>? 4.</td>
<td>Fish tumours or other deformities</td>
</tr>
<tr>
<td>x 5.</td>
<td>Bird or animal deformities or reproduction problems</td>
</tr>
<tr>
<td>✓ 6.</td>
<td>Degradation of benthos</td>
</tr>
<tr>
<td>✓ 7.</td>
<td>Restrictions on dredging activities</td>
</tr>
<tr>
<td>✓ 8.</td>
<td>Eutrophication or undesirable algae</td>
</tr>
<tr>
<td>✓ 9.</td>
<td>Restrictions on drinking water consumption, or taste and odour problems</td>
</tr>
<tr>
<td>✓ 10.</td>
<td>Beach closings</td>
</tr>
<tr>
<td>✓ 11.</td>
<td>Degradation of aesthetics</td>
</tr>
<tr>
<td>x 12.</td>
<td>Added costs to agriculture or industry</td>
</tr>
<tr>
<td>✓ 13.</td>
<td>Degradation of phytoplankton and zooplankton populations</td>
</tr>
<tr>
<td>✓ 14.1</td>
<td>Loss of fish habitat</td>
</tr>
<tr>
<td>✓ 14.2</td>
<td>Loss of wildlife habitat</td>
</tr>
</tbody>
</table>

✓ - identified as an IBU for the Bay of Quinte AOC
x - not identified as an IBU for the Bay of Quinte AOC
? - undergoing further evaluation

The GLWQA directs the Canadian and American federal governments to cooperate with state and provincial governments to develop and implement Remedial Action Plans (RAPs) for each AOC to restore and protect the impaired beneficial uses within their area (GLIN 2005). Remedial Action Plans identify specific problems in an AOC and provide recommended actions for correcting them. As outlined in Annex 2 of the GLWQA, each RAP should take an ecosystem approach to restoring and protecting beneficial uses in AOCs.

Ten IBUs were identified for the Bay of Quinte AOC in the 1990 BQRAP Stage I document, Environmental Setting and Problem Definition (see Table 1). The IBU related to fish tumours is still being investigated to determine if it applies to the Bay of Quinte.
One of the IBU’s identified was the loss of fish habitat (IBU #14.1). Given the inherent link between fish habitat and fish production, the Fish Habitat Management Plan (FHMP) will also support the restoration of IBU #3.1: degradation of fish populations. The purpose of this plan is to provide the information and management framework to protect and restore the habitat conditions that are necessary to restore IBU 3.1 and indirectly IBU 14.1. These IBUs will be considered restored when delisting criteria have been met.

1.1 Background information

1.1.1 Location and characteristics of the Bay of Quinte

The Bay of Quinte is a ‘Z’ shaped bay on the northeastern shore of Lake Ontario. The bay is approximately 100 km long and covers an area of approximately 254 km$^2$. It consists of three distinct bays: the upper, middle and lower bays (Figure 1). The upper bay extends from the Murray Canal at the western end of the bay near Trenton, past Belleville and Deseronto to the upstream end of Long Reach. The middle bay extends from the upstream end of Long Reach to the constriction at Glenora, including Picton Bay and Hay Bay. The lower bay extends from the constriction at Glenora east to Lake Ontario. The Bay of Quinte is connected to Lake Ontario by the Upper and Lower Gaps on both ends of Amherst Island. The Murray Canal creates a man-made link to Lake Ontario at the western end of the upper bay (Figure 1).

The following summary of the characteristics of the three bays that make up the Bay of Quinte is derived from the Stage I and Stage II Bay of Quinte RAP reports (BQRAP 1990 and 1993). The upper bay is relatively shallow and rarely exceeds 5 m in depth. The Bay of Quinte flushes from the west to the east, where it opens into Lake Ontario. Flushing of the upper bay occurs due to inflow of the Trent, Moira, Salmon, and Napanee Rivers, with the bulk of the inflow from the Trent River. The upper bay receives no flushing from oligotrophic (low nutrient) Lake Ontario water, and is thus strongly influenced by anthropogenic inputs (e.g., fertilizer runoff and sewage treatment plant outflows) from communities both on the bay and upstream on the tributaries. The upper bay, with an average depth of 3.5 m, warms more quickly than the middle and lower bays, and usually exceeds 25°C in summer.

The middle bay is deeper than the upper bay, with an average depth of 5.2 m. Backflows from Lake Ontario sometimes provide low nutrient waters to the middle bay that mixes and dilutes the waters in the middle bay. Distinct thermoclines frequently develop in the middle bay but gradual warming of bottom waters homogenizes water temperatures in most years. Surface temperatures peak in mid-August, which is later than peak temperatures in the upper bay.

Relative to the other two bays, the lower bay is much deeper with an average depth of 24.4 m and maximum depths greater than 55 m. Maximum water temperatures in the lower bay are lower than, and occur later in the summer than, the upper and middle bays.
Figure 1. Bay of Quinte Remedial Action Plan Fish Habitat Management Plan study area map.
The Trent, Moira, Salmon and Napanee Rivers (Figure 1) are the major tributaries to the Bay of Quinte and originate in the Canadian Shield. Their watersheds and the lands in Prince Edward County draining into the Bay cover 17,315 km$^2$ (BQRAP 1993). The Trent River drainage area is the largest in the Bay of Quinte watershed, comprising approximately 67% of the drainage area. Southwest and west of the Shield the watersheds cross a hilly region comprised of the Oak Ridge and Dummer moraines and the Peterborough drumlin field. In contrast, the southeastern portion of the watershed is a relatively level to undulating zone called the Napanee Plain. Limestone bedrock, covered by a thin mantle of clay soil in this plain, emerges to form a scarp along portions of the southern watershed boundary in Prince Edward County.

Three counties (Hastings, Lennox/Addington and Prince Edward) with two cities, Belleville and Quinte West; an amalgamation of Trenton, Sidney, Murray and Frankford and three towns (Napanee, Deseronto and Picton) border the Bay of Quinte. A very small part of Northumberland County fronts the bay’s extreme western shoreline. Of the population immediately surrounding the Bay of Quinte, the north shore of the upper bay supports approximately 80% or 105,000 people (BQRAP 2005), mainly in the urban centres of Trenton, Belleville, Deseronto and Napanee.

1.1.2 Fish habitat impacts in the Bay of Quinte

The *Fisheries Act* defines fish habitat as:

> Spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Impacts to fish habitat in the Bay of Quinte have been numerous and varied (Table 2) but generally fall into one of four categories: loss and degradation of coastal wetlands, barriers to fish migration, degradation of nearshore habitat, loss of natural shorelines and the impact of aquatic invasive species. These main impacts to fish habitat are described below.

**Coastal Wetland Loss**

Coastal wetlands are an important component of nearshore fish habitat, providing valuable spawning, feeding, nursery and rearing habitat. It has been estimated that approximately 12,000 ha of wetland habitat has been lost within 3.2 km of the Bay of Quinte (BQRAP 1990). Figures 2 and 3 provide graphic examples of coastal wetland loss in the Bay of Quinte due to urbanization and infilling. Coastal wetlands in Lake Ontario, including the Bay of Quinte, have also been impacted by water level regulation on Lake Ontario, which has dampened water level fluctuations responsible for maintaining habitat diversity (Reid, 2001).

Figures 4 and 5 identify the main coastal wetlands within the Bay of Quinte. Although much coastal wetland habitat has been lost and degraded, it should also be noted that efforts to reduce phosphorous loadings and improve water quality, and the introduction of zebra mussels, have increased water clarity which has helped to restore rooted aquatic vegetation in many shallow areas of the bay.
Table 2. Summary of significant impacts on fish habitat in the Bay of Quinte.

<table>
<thead>
<tr>
<th>Time period</th>
<th>General situation</th>
<th>Significant habitat changes</th>
</tr>
</thead>
</table>
| Early settlement (pre 1920’s) | European settlement of the Quinte area began in the 1780’s. Settlers brought with them an old world culture and economy founded on agriculture and industry. | • Clearing of forests along shorelines and within the watershed leads to nutrient enrichment and increased erosion.  
• River mouths dammed for power blocking fish migration routes, and leading to the disappearance of Atlantic salmon and disruption of spawning routes for other species.  
• Natural flushing of the Bay is altered through the construction of The Trent Canal and major saw mill operations at Deseronto, Belleville and Trenton.  
• Construction of the Murray Canal disrupts flow regime of the Upper Bay.  
• Road bridge across the Bay of Quinte at Belleville disrupts water flows.  
• Wetlands drained for agriculture, resulting in loss of fish and wildlife habitat. |
| Eutrophication (1930 – 1978) | Land clearing and loss of wetlands contributed to increased runoff and associated phosphorus reaching the Bay. | • Construction of the St. Lawrence Seaway reduces natural water level fluctuations (1959-1960) and natural processes, resulting in a loss of coastal wetland diversity and fish habitat.  
• 12,008 ha of wetland lost within 3.2km of the Bay of Quinte shoreline.  
• Loss of riparian and nearshore habitat as shorelines in the upper bay developed.  
• Wild rice disappears from the bay. Suspected cause is reduction in water level fluctuations (BQRAP 1993).  
• Non-indigenous Eurasian milfoil dominates submerged vegetation.  
• Bay approaches hyper-eutrophic state. |
| Phosphorous control (1978 – 1994) | From 1978 to 1994, phosphorus control measures lead to decreases in algal densities. | • Decreased algal densities and increases in zooplankton biomass were observed.  
• Turbidity was moderate and aquatic vegetation densities were still low.  
• Walleye became moderate, but other sport fishes remained in low numbers. |
| 1994 – Present               | Phosphorous reductions and introduction of zebra mussels result in increased water clarity, which causes a resurgence of aquatic macrophytes. | • Zebra mussels increase water clarity in the Bay by filter feeding.  
• Submergent aquatic macrophytes increase in density and distribution.  
• Zebra mussel colonization reduces the quality of spawning shoals.  
• Zebra mussels physically alter some areas of rocky habitat to a covering of finer substrates with submergent vegetation.  
• Ongoing incremental losses of riparian habitat associated with shoreline development and conversion of lands to residential use. |
Figure 2. Aerial photographs of Bayside Marsh, October 22, 1931 (top) and May 2, 1993 (bottom), illustrating the impact of urban development on coastal wetland habitat.
Figure 3. Aerial photographs of Zwicks Island, Belleville, December 3, 1948 (top) and May 6, 1992 (bottom), illustrating the infilling of coastal wetland habitat at the mouth of the Moira River.
Coastal wetlands in the upper bay of the Bay of Quinte:

1. Dead Creek Marsh
2. Carrying Place Marsh
3. Bayside Wetland
4. Pine Point Marsh
5. Belleville Treatment Plant Marsh
6. Belleville Marsh
7. Bell Creek Marsh
8. Blessington Creek Marsh
9. Sawguin Creek Marsh
10. Lower Salmon River
11. Robinson's Cove Marsh
12. Big Island Marsh
13. Big Marsh
14. Bluff Point Marsh
15. Lower Sucker Creek
16. Northport Swamp
17. Airport Creek Marsh
18. Forester's Island
19. Lower Napanee River

Figure 4. Map of the upper bay, Bay of Quinte, showing wetlands and depth contours.
Coastal wetlands in the middle and lower bays of the Bay of Quinte (continued):

20. Hay Bay Marsh
21. Carnachan Bay
22. Adolphustown
23. Cressy Swamp

Figure 5. Map of the middle and lower bays, Bay of Quinte, showing wetlands and depth contours.
Barriers to Fish Migration

Barriers to upstream habitats have also resulted in the significant loss of access to fish habitat on the Bay of Quinte. Three of the Bay’s largest tributaries, the Trent, Moira and Salmon Rivers, have been blocked to fish migration in their lower reaches by dams. Additionally, barriers exist on some smaller tributaries to the Bay and are preventing access to coastal wetland habitat at Dead Creek and Big Marsh.

Nearshore Habitats

The nearshore or littoral zone may be defined as the area extending from the average annual high water mark to the bottom of the photic zone, or the depth to which light penetrates (Figure 6). Penetration of light to the substrate in the nearshore zone allows for the growth of aquatic plants which are important nursery habitat for many fish species. Wave-washed gravel and cobble are important spawning habitat for some species. Some habitats in the nearshore zone are only seasonally inundated, providing important transitional habitats. Virtually all Bay of Quinte fish species utilize nearshore habitat to fulfill at least one life stage requirement. Although the nearshore zone of the Bay of Quinte is critically important for many fish species, it is this zone that has been most impacted historically, and continues to be most threatened by development projects that take place in and near the water.

Natural Shoreline Habitat

Natural shoreline habitat contributes to fish habitat by adding physical cover to the water in the form of woody debris, adding food sources (e.g., leaf litter) and providing shading. In a review of fish and wildlife habitat status and trends in the Canadian watershed of Lake Ontario, Reid (2001) noted that “Terrestrial habitats in a natural state are in a limited supply along the shoreline and are declining further.” In fact, forest and other natural habitats were found to occupy less than 12% of the shoreline, while recreational comprised 15%, residential 25%, agricultural 30% and commercial 18%. Wichert et al. (2005) noted the under-representation of Great Lakes shoreline habitats in protected areas and conservation lands, in the Great Lakes Conservation Blueprint for Aquatic Biodiversity.

Aquatic Invasive Species

Aquatic invasive species such as zebra mussels and Eurasian water milfoil have had profound impacts on the Bay of Quinte ecosystem. Zebra mussels have increased water clarity and reduced available walleye habitat in the Upper Bay of Quinte (Chu et al., 2004). In some areas, Eurasian water milfoil forms thick stands that alter nearshore habitat. Fish populations may also be affected by the introduction of disease, such as the recent outbreaks of viral hemorrhagic septicemia (VHS) in the Great Lakes region (including the Bay of Quinte in 2005).

Management of fish habitat must address historical losses, but must also recognize and plan for future impacts to habitat. Future threats to fish habitat in the Bay of Quinte include: climate change, which is predicted to lower water levels in the Great Lakes;
Figure 6. Shoreline ecosystem diagram.
introduction of aquatic invasive species; population growth and urban development. Some of these threats are manageable, while others such as climate change are outside of the scope of the FHMP but will require adaptive responses by management agencies and the public. Most importantly, management agencies must strive to protect the physical and ecological diversity of habitats, so that the ecosystem as a whole has improved resiliency and adaptability to ecosystem change.

1.1.3 Fish community – changes through time

Fish communities in the Bay of Quinte have undergone dramatic changes over time, generally corresponding to different phosphorus levels. Phosphorus levels cause indirect changes to fish communities by influencing plant and algal growth. Prior to the 1950’s, the Bay of Quinte was considered mesotrophic (having a moderate amount of dissolved nutrients) with a fish community dominated by lake herring, lake whitefish, walleye, yellow perch and northern pike (Hurley 1986). Numerous other species including bass, sunfish, crappie, bullheads, catfish and smelt were also well represented locally.

The ‘pre-phosphorus control’ era (prior to 1978) resulted in a hypereutrophic aquatic system (overly enriched with dissolved nutrients), characterized by high numbers of small fish with relatively short life spans and high reproductive potentials. By the late 1970’s phosphorus levels were reduced, bringing the bay back to a eutrophic or mesotrophic state, leading to more fish community changes. Walleye populations increased in the bay, resulting in intense predation of small fishes. A winter-kill of white perch then led to a strong year-class of walleye because of less competition. The fish community over the next several years was characterized by abundant walleye with high growth rates. Abnormally cold water temperatures and continued stocking of lake trout may have caused declines in prey numbers that led to declines in condition and eventually population declines in walleye (Casselman et al. 1999). Phosphorus control and zebra mussel invasion in 1994 changed the bay back to a mesotrophic system. These changes in the ecosystem (e.g., introduction of exotic and invasive species) may have resulted in declining numbers of walleye and increases in centrarchids (e.g., bass, sunfish and crappie) (Table 3).

Table 3. Overview of the Bay of Quinte fish community from prior to the 1950’s to 2002.

<table>
<thead>
<tr>
<th>Date</th>
<th>Trophic status</th>
<th>Dominant fish community and trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1950</td>
<td>Mesotrophic</td>
<td>lake herring ↓, lake whitefish, walleye, yellow perch, northern pike, white perch ↑ (invasive)</td>
</tr>
<tr>
<td>&lt;1977</td>
<td>Hypereutrophic</td>
<td>white perch ↑, small, stunted fish with short life spans ↑, species listed from before 1950 ↓ (remnant sport fish populations only)</td>
</tr>
<tr>
<td>1978 – 1995</td>
<td>Eutrophic to Mesotrophic</td>
<td>walleye ↑, white perch ↓, smallmouth bass ↑ then ↓</td>
</tr>
<tr>
<td>1995 – 2002</td>
<td>Mesotrophic</td>
<td>walleye ↓, smallmouth bass ↑, yellow perch ↑ then ↓, whitefish ↓, round goby (exotic) ↑, Centrarchids ↑</td>
</tr>
</tbody>
</table>
Appendix IIa provides a summary of fish species historically and currently found in the Bay of Quinte. This list was compiled from contemporary and historical information presented in Hurley (1986) and from recent Lake Ontario Management Unit (LOMU) Annual reports (MNR 1997, 1999, 2001, 2002 and 2003). Table IIa is not intended to provide a list of all fish species present in the Bay of Quinte, but rather to provide information on the types of species and families that characterize the bay. It should be noted that the sampling gears for the data presented in Hurley (1986) are unknown and sampling programs conducted by LOMU are not designed to capture all fish species.

Six fish species native to the Bay of Quinte are now considered to be at some degree of risk of becoming threatened or endangered. Additionally, the blue pike is now extinct and the Lake Ontario population of Atlantic salmon is considered extirpated. Atlantic salmon have been stocked into Lake Ontario in recent years as part of research efforts to determine the feasibility of reintroducing this species. Species found in the Bay of Quinte for which there is some degree of concern are listed in Table 4. Additional information on the assessment of these species is provided in Appendix IIb.

Thirteen of the fish species now present in the Bay of Quinte were either intentionally or unintentionally introduced to Lake Ontario (see Appendix IIc). Some of the species were introduced for recreational fishing purposes, some gained access to Lake Ontario and the Bay of Quinte via navigation canals, while other species were unintentionally introduced in ballast water discharge from ocean going ships.
<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic salmon</td>
<td>Loss of spawning and nursery habitat in Lake Ontario streams due to habitat degradation and the construction of dams was a major reason for Atlantic salmon being extirpated from Lake Ontario by the late 1800s. Recent studies have indicated that suitable spawning habitat does exist for Atlantic salmon in Lake Ontario tributaries and rehabilitation research is ongoing. The consumption of alewife and rainbow smelt (which contain thiaminase) is also considered to be a major barrier to Atlantic salmon restoration because this can result in low reproductive success (Lake Ontario Management Unit, 2005)</td>
</tr>
<tr>
<td>bridle shiner</td>
<td>Preferred habitat includes calm areas of streams, and occasionally lakes, with clear water and aquatic vegetation. Loss of wetland habitat through infilling and increases in turbidity negatively affect this species. Dense stands of Eurasian milfoil may also reduce the usable habitat, especially during times of spawning. (Environment Canada, 2005)</td>
</tr>
<tr>
<td>channel darter</td>
<td>Preferred habitat is pools and margins of riffles of small to medium-sized rivers and sand and gravel beaches of lakeshores where current is slow. Threats to conservation include sedimentation, decreased water quality, migration barriers and possibly competition with the introduced round goby (<em>Neogobius melanostomus</em>) (Phelps and Francis, 2002). Channel darters have recently been captured in the Moira River.</td>
</tr>
<tr>
<td>grass pickerel</td>
<td>The grass pickerel is typically found in warm, slow moving streams and shallow bays of lakes, and is always associated with extensive submergent and emergent vegetation. Loss of aquatic vegetation, water level manipulation and decreased water transparency are threats to the conservation of this species (Crossman and Holm, 2005).</td>
</tr>
<tr>
<td>greater redhorse</td>
<td>The greater redhorse prefers large streams having clear waters throughout most of the year and bottoms of clean sand, gravel or boulders. Threats which have been identified for the greater redhorse include the alteration of habitat due to lowhead dams, channelization, increased water velocities, non-point source pollution, and degradation of riparian areas (United States Geological Survey, 2005).</td>
</tr>
<tr>
<td>lake sturgeon</td>
<td>Lake sturgeon are known to be vulnerable to losses in riverine spawning habitat and over-exploitation. Populations may also be affected negatively by dams, contaminants, invasive species, poaching and genetic contamination through stocking and aquaculture programs (Committee on the Status of Endangered Wildlife in Canada, 2005).</td>
</tr>
<tr>
<td>river redhorse</td>
<td>Preferred habitat of the river redhorse is medium to large rivers with moderate to strong currents and gravel to cobble substrate. Habitat alterations such as dams, channelization of rivers, turbidity, siltation and other forms of pollutants are major threats to conservation of the river redhorse (Michigan Natural Features Inventory, 2004).</td>
</tr>
</tbody>
</table>
2.0 Partners in fish habitat conservation

Protecting and rehabilitating fish habitat requires an integrated approach where all levels of government (federal, provincial, First Nations and municipal), stakeholders and individuals work cooperatively to meet a set of common goals. The importance of healthy fish habitat cannot be overstated, as it is the foundation for valuable social, cultural and economic fisheries in the Bay of Quinte. This plan and its implementation will strive to engage partners collaboratively to protect and rehabilitate fish habitat. The following section outlines the roles and responsibilities of agencies, governments, stakeholders, and individuals in protecting fish habitat.

Note, in most cases the term ‘rehabilitation’ will be used as opposed to ‘restoration’ in this document. Restoration implies that an area has been restored to its original state, whereas rehabilitation implies that the area has been improved, but has not been returned to its original state. One exception would involve the removal of a barrier to fish migration; in this case access has been ‘restored’.

2.1 Government agencies

2.1.1 Department of Fisheries and Oceans Canada (DFO)

Under the authority of the Fisheries Act, DFO is the lead agency for the conservation and protection of fish and fish habitat supporting Canadian fisheries. The Act, as well as the accompanying 1986 Policy for the Management of Fish Habitat and the 2004 Fish Habitat Compliance Protocol, provides the legislative and policy statements for fish habitat management. Support and guidance for the application of the policy and legislation is provided to DFO habitat biologists through various documents, two of which include the 1998 Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction (HADD) of Fish Habitat and the 1998 Habitat Conservation and Protection Guidelines developed for the Policy for the Management of Fish Habitat. DFO's long-term policy objective is the achievement of an overall Net Gain of the productive capacity of fish habitats, and operates under the guiding principle of No Net Loss of fish habitat.

The primary national legislation for the management and protection of fish habitat and water quality is the federal Fisheries Act. Section 35(1) of the Act states: ‘no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat’ (a.k.a. HADD). Provisions within the Act include orders to restore impacted fish habitat. Only the Minister or his delegated authority may authorize the HADD of fish habitat.

In addition, DFO provides research and scientific support for conservation initiatives through efforts from the Great Lakes Laboratory for Fisheries and Aquatic Sciences (GLLFAS). This invaluable research provides practitioners with tools and information that are essential to making “on the ground” decisions when dealing with land owners, stakeholders and resource users.
2.1.2 Environment Canada (EC)

EC has ultimate responsibility for enforcement of the pollution prevention provisions of the *Fisheries Act* (involving the release of deleterious substances under section 36(3)). Under the Act, EC is the lead enforcement agency for the pollution prevention provisions for federal lands and federally regulated industries (e.g., federal departments, airports, crown corporations, First Nations’ lands). For most other cases (e.g. non-federal lands or non-federally regulated industries), EC refers potential occurrences to the Ontario Ministry of the Environment (MOE), unless the potential occurrence involves sediment as the deleterious substance, in which case the referral goes to DFO. Should the MOE not respond to the referral, EC will take action as it is responsible for the administration of the pollution prevention provisions of the *Fisheries Act*. EC is also involved in developing recovery strategies for species at risk under the *Species at Risk Act (SARA)*, however any fishes that are part of the SARA registry have been delegated to DFO.

2.1.3 Parks Canada

Parks Canada manages National Parks, National Marine Conservation Areas, National Historic Sites, and National Historic Canals (e.g., the Trent-Severn Waterway). Parks Canada has a legislated mandate to protect these representative areas in ways that ensure their ecological and commemorative integrity for present and future generations. This protection mandate is strengthened through the Historic Canals Regulations and, in particular, the *National Parks Act* which states that protecting ecological integrity will take precedence in acquiring, managing and administering heritage places and programs. In addition to being Peace Officers, Park Wardens are appointed special constables and Fishery Officers, which gives them the authority to apply the Contravention Regulations and to enforce the *Fisheries Act* and other mandate-related federal and provincial statutes on lands and waters administered by Parks Canada.

2.1.4 Ontario Ministry of Natural Resources (MNR)

The MNR is the provincial agency responsible for the protection and management of Ontario’s natural resources, including the management of fisheries delegated by DFO. The goal for Ontario’s fisheries is ‘healthy aquatic ecosystems that provide sustainable benefits, contributing to society’s present and future requirements for a high-quality environment, wholesome food, employment and income, recreational activity, and cultural heritage’ (MNR 1992).

The MNR has primary administration and enforcement responsibilities for the *Lakes and Rivers Improvement Act* (LRIA), the *Public Lands Act* (PLA), the *Crown Forest Sustainability Act* (CFSA) and the *Aggregate Resources Act*. The MNR supports the referral process by screening and referring work permit applications under the PLA and the LRIA. In addition, MNR issues timing restrictions for in-water work and provides fisheries information to Conservation Authorities (CAs) and DFO. The MNR, rather than CAs, review Ontario Ministry of Transportation (MTO) proposals, activities under the CFSA and Community Fisheries, and Wildlife Involvement Program (CFWIP) proposals under Section 35 of the *Fisheries Act*. MNR Conservation Officers are appointed as Fishery Officers under the *Fisheries Act* and in the course of responding to complaints related to provincial legislation may provide compliance support and actions relating to fish habitat provisions of the Act.
Under the 2005 Provincial Policy Statement fish habitat is identified as a Natural Heritage Feature and “development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.” Likewise, “development and site alteration shall not be permitted in significant coastal wetlands.” The MNR also provides input to the official planning process, to ensure that natural resource values are protected.

2.1.5 Ontario Ministry of the Environment (MOE)

The MOE is the provincial agency responsible for enforcing the Ontario Water Resources Act (OWRA), the Environmental Protection Act (EPA) and the Nutrient Management Act (NMA). The MOE also utilizes pollution prevention measures of the Fisheries Act (s. 36(3)) to assist in the protection of the environment. The OWRA prohibits discharges that may impair the quality of any waters. The EPA prohibits discharges of anything that causes or is likely to cause an adverse effect on the environment. The NMA provides for the management of nutrients applied to agricultural lands. The MOE also manages aquatic herbicide use in Ontario.

2.1.6 Department of National Defence (DND)

The Department of National Defence (DND) owns and operates a number of properties in the Bay of Quinte watershed. In some cases these properties contain fish and wildlife habitat that could be rehabilitated. The Department of National Defence hired an environmental consultant (Gartner Lee Limited) in 1993 to complete an Environment Assessment for the Canadian Forces Base at 8 Wing in Trenton. This report provided a number of recommendations for improving fish and wildlife habitat on the base, primarily through restoring shoreline and riparian cover around watercourses.

2.2 Local governments

2.2.1 Municipal

Collectively, the municipalities of Quinte West, Belleville, Greater Napanee and Prince Edward County comprise the majority of the Bay of Quinte shoreline and population bordering the bay. Municipalities can play an important role in fish habitat management by guiding development within their planning area away from sensitive areas, requiring setbacks and buffers around watercourses and in some cases developing by-laws. Specifically, the Planning Act requires that decisions affecting planning matters, such as those made by municipalities, “shall be consistent with” policy statements issued under the Act (i.e., the Provincial Policy Statement).

Municipalities surrounding the Bay of Quinte have also included various statements in their Official Plans which lend support to the Bay of Quinte RAP and its initiatives.

2.2.2 Mohawks of the Bay of Quinte (MBQ)

The Tyendinaga Mohawk Territory stretches for approximately 12 km along the northern shore of the Bay of Quinte between Shannonville in the west and Deseronto in the east. As with other areas of the bay, this shoreline and associated riparian lands are important fish habitat. The Mohawks of Tyendinaga have been active participants in the Bay of Quinte RAP, and due to their proximity to the Bay, will continue to play an important role in protecting fish habitat.
2.3 Non-government agencies

2.3.1 Conservation Authorities (CAs)

Conservation Authorities bordering the Bay of Quinte (Lower Trent Conservation, Quinte Conservation and Cataraqui Region Conservation Authority) are empowered by the Conservation Authorities Act to undertake programs to further the conservation, restoration, development, and management of natural resources on a watershed basis. The Conservation Authorities Act allows for regulations that pertain to the use of water, prohibit or require permission to interfere in any way with the existing channel of a watercourse or wetland and prohibit or require permission to undertake development (construction, structural alteration, grading, filling) in areas where the control of flooding, erosion, dynamic beaches, pollution, or the conservation of lands may be affected.

Conservation Authorities in the Bay of Quinte watershed are the first point of contact in the fish habitat referral process. DFO has signed Level 2 Agreements with Lower Trent Conservation, Quinte Conservation and Cataraqui Region Conservation Authority which allow these CAs to undertake the review of project proposals under Section 35 of the Fisheries Act. Under a Level 2 agreement a CA can negotiate project redesign, relocation and mitigation to avoid a HADD, but do not have the authority to determine if a HADD associated with a project is acceptable or not. Projects are referred to DFO for the determination and authorization of a HADD of fish habitat.

Conservation Authorities also assist municipalities in their Official Plan review to ensure that fish and fish habitat are protected.

2.3.2 Stakeholders and conservation groups

The Bay of Quinte supports recreational, commercial and bait fisheries, tourism-based activities and related service industries. These activities generate significant income for the local community, and make the Bay of Quinte an attractive area to live. Therefore, it is not only those directly involved in resource-based activities, but all watershed residents that benefit from a healthy Bay of Quinte. Shorefront landowners own a significant proportion of the Bay of Quinte shoreline, and are, therefore, in a unique position to directly preserve and restore shoreline habitat.

There are many conservation and stewardship groups which have played a significant role in educating resource users about the importance of healthy fish habitat, conducting research and carrying out habitat rehabilitation projects. Developing and continuing partnerships with these stakeholders and drawing upon their work is essential to the long term success of protecting and rehabilitating fish habitat in the Bay of Quinte.
3.0 Purpose and plan development

3.1 Purpose

The purpose of the Bay of Quinte Fish Habitat Management Plan (FHMP) is to protect and rehabilitate fish habitat in support of delisting the Bay of Quinte as an Area of Concern. Delisting will occur when Impaired Beneficial Uses (IBUs), including the degradation of fish populations (IBU 3.1) and the loss of fish habitat (IBU 14.1) are no longer considered impaired when evaluated against delisting criteria. Recognizing the importance of taking an ecosystem approach to habitat restoration, the FHMP will not function in isolation from other BQRAP initiatives. Efforts to reduce phosphorous loading and improve water quality are still cornerstones of the BQRAP and are essential components of protecting and rehabilitating fish habitat.

3.2 Steering committee members

A steering committee of professionals, with expertise concerning Bay of Quinte fish populations and habitat was formed to guide the development of this FHMP. Although every effort was made to find compromise amongst differing views, it should not be assumed that all members agreed on all aspects of the Plan. The following individuals have contributed, at one time or another, to the development of the Plan:

- Barry Jones, Implementation Manager, BQRAP
- Brad McNevin, Regulation Officer/Fisheries Biologist, Quinte Conservation
- Bruce Morrison, Assessment Supervisor, MNR - Lake Ontario Management Unit
- Charles K. Minns, Research Scientist, DFO - GLLFAS
- Jim Kelleher, General Manager, Lower Trent Conservation
- Kevin Esseltine, Management Biologist, MNR, Kingston
- Mark Ferguson, Fish Habitat Biologist, DFO – Prescott
- Michael Ewaschuk, Aquatic Biologist, BQRAP
- Patricia Edwards, Management Biologist, MNR - Lake Ontario Management Unit
- Paul Johanson, Fish and Wildlife Biologist, BQRAP
- Paul McCoy, Operations Manager, Quinte Conservation
- Sarah Crabbe, Fish and Wildlife Biologist, BQRAP
- Susan Doka, Research Scientist, DFO – GLLFAS
- Terry Murphy, General manager, Quinte Conservation

3.3 Development of strategies

A backgrounder document (BQRAP 2005) was prepared as a first step in the development of the FHMP. The Backgrounder was intended to function as a ‘spring board’ for the plan by assembling information on the status of fish habitat and populations, resource usage by stakeholders, management of fish and fish habitat, and concerns of habitat managers and resource users. Production of this document included extensive consultation with stakeholders. The identification of issues in the Backgrounder was instrumental in guiding the development of strategies and recommendations in this Plan.
Four focal areas (habitat management; research, monitoring and assessment; public education and involvement and habitat protection and rehabilitation) were chosen, based upon the 8 strategies identified in the Department of Fisheries and Oceans’ Policy for the Management of Fish Habitat (Appendix III). Under each of the four focal areas a series of recommendations are provided that identify implementers, potential partners and an approximate timeframe for implementation. The level of involvement by potential partners may vary from direct involvement throughout a project, to simply providing information or advice on protocols and strategies. A summary of recommendations by partner group is provided in Appendix IV.

3.4 Management context

The BQRAP is supported by Project Quinte, a multi-agency, long term research project that has gathered detailed information on the trophic interactions, fish community changes and habitat impacts in the Bay of Quinte. Recommendations in this version of the plan are based upon the best available knowledge regarding habitat limitations and rehabilitative techniques. It was recommended that rehabilitation projects recommended in this plan incorporate research and monitoring elements to assess the impacts of habitat manipulations. The information gathered from these studies, as well as that from ongoing research activities, will help determine future priorities for the rehabilitation of fish habitat in the Bay of Quinte. This adaptive approach to management will support fish habitat improvement projects in the short term, while allowing for integration of the best current information as it becomes available.

3.5 Plan area

The loss of fish habitat in the Bay of Quinte was initially attributed to the loss of rooted aquatic vegetation, the degradation of nearshore habitat and loss of coastal wetland habitat. Given this, and the enormous size of the Bay of Quinte watershed (nearly 18,000 km²), the FHMP will strategically focus on an area where cost-effective management actions can be identified and prioritized. This area includes the Bay of Quinte from the mouth of the Murray Canal eastward to Amherst Island, including areas upstream to the first migratory barrier and associated coastal wetlands and riparian areas (Figure 1). This area will provide the focus for activities and recommendations in the FHMP. However, it does not preclude, support for habitat enhancement projects and partnerships within the broader watershed that promote Bay of Quinte RAP objectives because of their potential positive influence on downstream habitats.

3.6 Delisting criteria

In 2001, the BQRAP developed delisting criteria that were intended to guide the development of its 2001-2005 Work Plan. Delisting criteria for IBUs 3 and 14 were general statements about protecting and restoring habitat to the greatest extent possible and demonstrating that populations were consistent with a stable, diverse and healthy aquatic ecosystem. Primarily, the delisting criteria (called targets) relied upon action-based items such as completion of Natural Heritage Reports, rather than measurable, quantifiable delisting criteria. At that time, the Bay of Quinte was not unique in this respect; in fact, very few AOCs had developed measurable, quantifiable delisting criteria.

Since that time, a number of Canadian AOCs have undertaken the development of measurable, quantifiable delisting criteria. This process can be complicated and time
consuming, being confounded by uncertainty in ecosystem functions, ongoing ecosystem change and unknown possibilities for ecosystem recovery. However, measurable and achievable delisting criteria are essential to guide the work of RAPs and to determine when AOCs can be considered ‘delisted’. To guide the development of the FHMP a set of interim delisting criteria for IBUs 14.1 and 3.1 were developed by the BQRAP, based on consultation with various Project Quinte partners. These delisting criteria have been referred to as ‘interim’ to recognize the ongoing research on the Bay, which may necessitate changes to the criteria as our understanding of the ecosystem changes.

3.6.1 Fish habitat interim delisting criteria

Interim delisting criteria for IBU 14: loss of fish and wildlife habitat (Table 5) were designed to reflect ecosystem attributes and functions that collectively, would demonstrate whether fish habitat should be considered ‘impaired’, or ‘not impaired’. Interim delisting criteria for the wildlife habitat component have been included in Table 5 (shaded cells) to show the overlap between the two aspects of IBU 14 (i.e., fish and wildlife habitats). A separate, report ‘A Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Area of Concern” has also been prepared that deals with wildlife-related recommendations.

In the case of fish habitat, a great deal of work has been done at the ecosystem level (e.g., reduction in phosphorous levels) and much of the existing habitat in the Bay of Quinte would no longer be considered impaired based on the original problem definition; loss of vegetated habitats. In spite of this, some areas remain impaired and there is also a historical loss component to the IBU that must be addressed (e.g., infilling of coastal wetland). However, some of the damage to the Bay of Quinte ecosystem is irreversible, and it is not reasonable to expect full ecosystem recovery. Even so, where feasible projects have been proposed that would help offset historical losses of habitat, there is an onus on the BQRAP to pursue or promote these possibilities.

Overall, the status of IBU 14 from a fish habitat perspective should be considered impaired, but on a conditional basis, with good prospects for reaching the ‘not impaired’ status. Two of the five fish habitat delisting criteria for IBU 14, are considered ‘not impaired – conditional’ and should be supplemented with additional data before a final determination is made. The shoreline habitat delisting criterion (FWH-4) requires further assessment and delisting criterion FWH-5 (implementation of the FHMP) will require future assessment when all reasonable actions and recommendations identified in the FHMP have been taken. Delisting criteria measures and their status for IBU 14 are provided in Table 5. Explanations of fish habitat delisting criteria follow the table.
Table 5. BQRAP interim delisting targets for IBU 14: loss of fish and wildlife habitat.
(Shaded rows apply mainly to the wildlife component of IBU 14)

<table>
<thead>
<tr>
<th>Delisting criteria</th>
<th>Description</th>
<th>Current status</th>
</tr>
</thead>
</table>
| **FWH-1** | The extent (surface area) of submerged aquatic vegetation in the Bay of Quinte has been restored to levels more reflective of the mesotrophic system that existed in the Bay of Quinte before nutrient loading created a eutrophic/hyper-eutrophic system.  
  - Criteria for aquatic macrophyte restoration, as set out in IBU 8 (Eutrophication and undesirable algae), has been met. | Not impaired (conditional) |
| **FWH-2** | Submerged aquatic vegetation in Bay of Quinte coastal wetlands is not impaired.  
  - The average submerged aquatic vegetation Index of Biotic Integrity (IBI) at representative coastal wetlands (Appendix V) will be 60 or above (very good or better) using the Durham Region Coastal Wetland Monitoring Program (DRCWMP): Methodology Handbook (EC and CLOCA, 2007) to collect data and EC and CLOCA (2004) for data analysis, and is stable or improving based on multi-year assessments. However, no more than three of the coastal wetland sites can score less than 60. This target and criteria is based on expert advice provided by the Canadian Wildlife Service (CWS) and the current conditions of the Bay of Quinte coastal wetlands. | Not impaired (conditional) |
| **FWH-3** | Coastal wetland water quality  
  - The average water quality parameter scores at representative Bay of Quinte coastal wetlands (Appendix V) will be 3.5 (good) or above following (Environment Canada 2007 – in prep.), and is stable or improving based on multi-year assessments. However, no more than three of the coastal wetland sites can score less than 3.33. This target and criteria is based on expert advice provided by CWS and the current conditions of Bay of Quinte coastal wetlands. | Impaired |
| **FWH-4** | Shorelines around the Bay of Quinte have an acceptable level of natural vegetation which protects water quality and contributes to fish and wildlife habitat. | Unknown (likely impaired) |
| FWH-4 (continued) | • An undisturbed terrestrial vegetated buffer of 30-m along shore-lands and 120-m adjacent to Provincially Significant Wetlands (PSW).  
• 80 percent of the shorelines along the Bay of Quinte must have an undisturbed natural terrestrial vegetated buffer of five meters or greater from the high water mark. From five meters to thirty meters (120-m for PSW lands) the extent of the buffer should be 60 percent naturally vegetated. This criterion may be revised pending initial field verification that will examine current extent of buffering within the 30-m and 120-m areas of the Bay of Quinte.  
• This criterion was based on discussions and professional advice from the ‘Wildlife Steering Committee members that assisted in the production of the Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Area of Concern’. | Unknown (likely impaired) |
| FWH-5 | Implement the institutional arrangements and site specific rehabilitation recommendations contained in the Bay of Quinte Remedial Action Plan - Fish Habitat Management Plan (this document). | Future assessment required |
| FWH-6 | Implement the institutional arrangements and site specific rehabilitation recommendations contained in the Bay of Quinte Remedial Action Plan - ‘A Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Area of Concern’. | Future assessment required |
| FWH-7 | Complete Natural Heritage Reports for all local governments bordering the Bay of Quinte. | Incomplete |
| OVERALL | | Impaired (conditional) |
FWH-1 – Coverage of submerged aquatic vegetation in the Bay of Quinte: Not impaired (conditional)

Submerged aquatic vegetation (SAV) provides valuable habitat for fish and wildlife species and is affected by environmental quality, making it a key indicator of aquatic ecosystem health. Restoration of SAV in the Bay of Quinte has been made possible by reductions in phosphorous inputs through improvements in sewage treatment processes, elimination of phosphorous based detergents, improvements in land management, and impact of zebra mussels. An assessment of the high variability and evaluation of natural fluctuations will ensure that the 'not impaired' status is correct.

The Great Lakes Laboratory for Fisheries and Aquatic Sciences (GLLFAS) completed an assessment of submergent aquatic vegetation for the Bay of Quinte (Leisti et al., 2006) which supported the delisting of criteria 8.3 for IBU 8 (Eutrophication or undesirable algae) had been met. This delisting criterion stated:

Using 1986-1994 as a “base year period”, increase area of submerged aquatic macrophytes so that 30% of the upper Bay of Quinte has macrophyte coverage of more than 50%....that is, from about 38km² to 45km² or about a 20% increase in the area of submerged aquatic macrophytes in the upper Bay of Quinte.

FWH-2 – Wetland submerged aquatic vegetation: Not impaired (conditional)

Coastal wetlands provide valuable fish and wildlife habitat. The SAV found in coastal wetlands is an indication of the health of that wetland and its ability to support fish and wildlife species. In conjunction with an assessment of fish populations, measures of wetland health can help develop an overall picture of environmental quality. The Durham Region Coastal Wetland Monitoring Program: Methodology allows for the comparison of coastal wetland fish community health against AOC and non-AOC areas of the north shore of Lake Ontario.

Sampling conducted by the Canadian Wildlife Service in 2003 and 2005 at 5 Bay of Quinte coastal wetlands (Environment Canada, 2006) indicated that SAV at sampled coastal wetlands was “very good” or “excellent”, in comparison with other near-shore areas. Coastal wetlands sampled, included Hay Bay (2 sites), Big Island (2 sites), Robinson’s Cove Marsh, Blessington Creek Marsh and Sawguin Creek Marsh. Because relatively undisturbed coastal marshes were sampled, these preliminary results can not be considered representative of Bay of Quinte coastal wetlands. It is recommended that future sampling be conducted at a representative suite of Bay of Quinte coastal wetlands (see Appendix V) for at least 2-3 years before a more definitive assessment is made. Until that time, the status of ‘not impaired’ should be considered conditional.

FWH-3 – Coastal wetland water quality: Impaired

Water quality has a strong influence on the overall aquatic habitat quality in coastal wetlands. Poor water quality can directly affect fish and wildlife, and can affect fish and wildlife habitat by affecting aquatic vegetation (Environment Canada, 2006). Water quality in coastal marshes is impacted both by water quality in the Bay, and inputs from surrounding areas and watersheds.
Environment Canada (2006) presented water quality results for 8 sampling locations in the Bay of Quinte, which indicated coastal wetland water quality ranged from “good” (3-4) to “excellent” (4-5). Compared against a delisting criterion of 3 or better, water quality in Bay of Quinte coastal wetlands should be considered ‘not impaired’. However, the samples collected in 2005 were from relatively undisturbed coastal marshes. Therefore, it is recommended that sampling be conducted at a representative suite of Bay of Quinte coastal wetlands before a final assessment is made. Until that time, this delisting criterion should be considered ‘impaired’.

FWH-4 – Natural shoreline habitat: unknown (likely impaired)

Natural shoreline habitat around the Bay of Quinte has been lost or severely degraded in many areas, and is under ongoing further development pressure. IBU 14 can not be considered restored if shorelines, which provide diverse and valuable habitat for numerous species, are not protected. The proposed criteria should be viewed as a minimum for delisting to occur, not a preferred state. Ideally, there would be natural vegetation along all Bay of Quinte shorelines, including some areas with large undisturbed natural areas (e.g., forested areas) adjacent to the Bay providing connectivity to upland habitats. However, given the realities of development pressure and existing regulations regarding shoreline development, a target of 80 percent of the shorelines along the Bay of Quinte must have an undisturbed natural terrestrial vegetative buffer of 5-m or greater from the high water mark. From 5-m to 30-m (or 120-m for PSW) the extent of the buffer should be 60 percent naturally vegetated.

The current status of this delisting criterion is unknown and requires field verification. The criteria may be revised pending initial field verification that will examine the current extent of buffering within the 30-m and 120-m areas of the Bay of Quinte. Reid (2001) noted that terrestrial habitats along the Canadian shoreline of Lake Ontario are “in very limited supply and are declining further”. Based on the overall trend in shoreline development and field observations within the Bay of Quinte, this delisting criterion is likely impaired, or is in danger of becoming impaired without remedial or preventative action.

FWH-5 – Implementation of the Fish Habitat Management Plan

Completion of actions (both institutional commitments and habitat protection and rehabilitation) identified in this Plan should be seen as a prerequisite for delisting. Future assessment will be required to determine when all reasonable actions have been taken.

3.6.2 Fish populations interim delisting criteria

Implementation of the FHMP will support restoration of IBU 3.1: degradation of fish populations by providing and protecting the habitat necessary to support the fish community. The Ontario Ministry of Natural Resources is currently developing Bay of Quinte Fish Community Objectives (FCOs) with an anticipated completion date of around December 2006. In the absence of Bay of Quinte specific objectives, the FHMP was written with consideration for the Lake Ontario nearshore fish community objectives.
(Stewart et. al 1999), and to address historical impairments to the fish community (as outlined in the BQRAP Stage I and II Reports).

Based on the fish populations interim delisting criteria (Table 6) the status of IBU 3 should be considered not impaired. The only ‘outstanding’ delisting criterion regarding fish populations is to support species at risk recovery plans where appropriate. Because recovery plans have not been completed, it is impossible to say whether actions will be required in the Bay of Quinte, so for the time being IBU 3 should be considered not impaired.

**Table 6.** BQRAP interim delisting criteria for IBU 3: degradation of fish and wildlife populations (fish populations only).

<table>
<thead>
<tr>
<th>Delisting criteria</th>
<th>Description</th>
<th>Current status</th>
</tr>
</thead>
</table>
| FP-1               | Littoral fish community is reflective of unimpaired littoral habitat.  

  - Maintain an adjusted littoral Index of Biotic Integrity (IBI\text{adj}) score of 60 or above (good or better), using the approach set out in Minns et. al. (1994).  | Not impaired (conditional) |
| FP-2               | Wetland fish community is reflective of unimpaired coastal wetland habitat.  

  - Using the Durham Region Coastal Wetland Monitoring methodology achieve and maintain a fish community IBI score of 60 or above (very good or better) at representative coastal wetlands in the Bay of Quinte.  | Not impaired (conditional) |
| FP-3               | Species at risk  

  - Where appropriate and feasible, support for species at risk recovery plans has been provided for those species at risk that reside in the Bay of Quinte.  | Requires future assessment |
| OVERALL            |                                                                                             | Not impaired |
FP-1 – Littoral fish community: Not impaired (conditional)

Electrofishing conducted by DFO-GLLFAS at Trenton, Belleville and Big Island in 1999 (the most recent available data) produced a mean IBI\textsubscript{adj} of 67.1, up from 48.5 in 1990. Positive metrics that contributed to the increase in the IBI\textsubscript{adj} included native, centrarchid, and intolerant species richness, and piscivore biomass (%). A decrease in negative metrics including non-indigenous species richness, density and biomass, also contributed to a higher IBI score (Boston and Randall, 2001). Electrofishing in Carnachan Bay in 1999 produced a mean IBI\textsubscript{adj} of 72.0, which was up from 57.9 in 1992 (unpublished data).

Note that IBI\textsubscript{adj} has been used rather than IBI, because it removes the impact of offshore fish species being incorporated into the analysis and it is more relevant to Bay of Quinte fish habitat assessment. IBI scores of 40-60 are considered “fair”, 60-80 are considered “good” and above 80 are “excellent”.

1999 was the last year in which the Belleville/Trenton/Big Island areas were sampled to generate IBI\textsubscript{adj} values. At a minimum these areas should be sampled 2 more years (beyond 2006) to demonstrate whether IBI\textsubscript{adj} values have remained in the “good – excellent” range since 1999. The designation of ‘not impaired’ should remain conditional until further sampling is conducted and currently planned for 2007.

FP-2 – Wetland fish community: Not impaired (conditional)

Electrofishing was conducted in 2005 at the following Bay of Quinte coastal wetlands: Hay Bay (North and South), Big Island East Marsh, Robinson’s Cove Marsh and Sawguin Creek Marsh, using the methodology outlined in the Durham Region Coastal Wetland Monitoring Protocol. Coastal wetland fish community condition was found to range from “very good” (IBI 60-80) to “excellent” (IBI 80-100) at these sites.

Because relatively undisturbed coastal marshes were sampled in 2005, these preliminary results can not be considered representative of Bay of Quinte coastal wetlands. It is recommended that future sampling be conducted at a representative suite of Bay of Quinte coastal wetlands for at least 2-3 years before a more definitive assessment is made. The designation of ‘not impaired’ should remain conditional until further sampling is conducted.

FP-3 – Species at risk: Requires future assessment

The biodiversity of an ecosystem is a reflection of its health. As part of restoring IBU 3 the BQRAP should take all reasonable efforts to promote the protection and restoration of species at risk in the AOC. Three fish species in the Bay of Quinte are recognized as being at some degree of risk under the SAR Registry. Ensuring that all species at risk in the Bay of Quinte AOC watershed are protected is not feasible, since species at risk often face challenges beyond the immediate scope of the RAP. However, it was considered reasonable that where actions are identified in species at risk recovery plans, that the BQRAP and its partners should contribute where appropriate. It should not be required that the BQRAP develop species at risk recovery plans as this would likely draw resources away from priority items, but would support and provide assistance where possible to EC and DFO.
Species at risk that rely upon coastal habitats in the Bay of Quinte include the following:

- Bridle shiner – Special Concern (Schedule 1)
- Channel darter – Threatened (Schedule 2)
- River redhorse – Special Concern (Schedule 3)

In addition to these species, grass pickerel and lake sturgeon have been identified as species of special concern by the Committee on the Status of Endangered Wildlife in Canada, but have not been added to the Species at Risk Registry. Support for these species and protection of their habitats should be provided where possible, but should not be seen as a prerequisite to delisting unless they are added to the Species at Risk Registry.
4.0 Focal areas and recommendations

The Bay of Quinte RAP Fish Habitat Management Plan outlines the overall management framework required to restore IBU 14.1: loss of fish habitat and support restoration of IBU 3.1: degradation of fish populations. Recommendations are structured under the four focal areas summarized below. Details for each focal area are provided in Sections 4.1 through 4.4.

Focal area 1: Habitat management
- Recommendation 1.1 – Ensure no net loss of fish habitat
- Recommendation 1.2 – Prevent the spread of aquatic invasive species

Focal area 2: Research, assessment and monitoring
- Recommendation 2.1 – Develop and implement scientifically-based management and assessment tools to inform and guide habitat management decision making
- Recommendation 2.2 – Initiate required monitoring

Focal area 3: Public education and involvement
- Recommendation 3.1 – Enhance communications with resource users and the public

Focal area 4: Habitat protection and rehabilitation
- Recommendation 4.1 – Mitigate barriers to fish migration
- Recommendation 4.2 – Implement a shoreline naturalization program
- Recommendation 4.3 – Rehabilitate coastal marshes
- Recommendation 4.4 – Support species at risk recovery plans
Focal area 1: Habitat management

Fish habitat is managed in the Bay of Quinte by the Department of Fisheries and Oceans in cooperation with its partners. DFO’s Policy for the Management of Fish Habitat has a policy objective of a net gain of habitat for Canada’s fisheries resources and operates under the guiding principle of no net loss of fish habitat. The following section identifies habitat management practices that must be improved and enshrined to restore IBU 14.1; loss of fish habitat.

Recommendation 1.1: Ensure ‘No Net Loss’ of fish habitat

Fish habitat managers should continue to use regulatory mechanisms and the best available scientific tools (Recommendation 2.1) to ensure there is ‘No Net Loss’ of fish habitat.

A key component to this recommendation is the development of an effective monitoring and compliance program, involving additional resources to science and habitat practitioners for effective implementation. This would help deal with the volume of development proposals and ensure that project proponents have complied with mitigative recommendations and compensation agreements. Findings from monitoring programs, should be tracked to ensure that No Net Loss is actually being achieved in the Bay. Also, it is recommended that a methodology be developed to track findings from monitoring programs in efforts to maximize the benefits from future compensation agreements. This will allow practitioners the ability to see what works and what doesn’t work so that proper techniques can be applied to future projects. The development of a running list of areas within the Bay of Quinte that would benefit from fish habitat compensation agreements would also be an effective tool for decision making. Agencies and consultants are occasionally tasked with the responsibility of finding a suitable location/area to carry out a compensation project. Although it is recognized that DFO prefers sites as close as possible to fish habitat HADD’s, this is not always plausible and more net gain may be achieved at alternate locations.

Landowners on the Bay of Quinte can directly contribute to this process by adopting low-impact development options, naturalizing shorelines, and taking advantage of funding programs to improve habitat, where necessary.

Recommendation type:
- Institutional commitment – Supports delisting criteria FWH-5, FP-1, FP-2 and FP-3

Implementers:
- DFO – Habitat management, local CAs, municipalities

Partners:
- DFO – Science/GLLFAS, MNR – District offices, MBQ, landowners

Timeframe:
- Ongoing
Recommendation 1.2: Prevent the spread of aquatic invasive species

The Federal government should develop legally binding ballast water and sediment management regulations, under the *Canada Shipping Act*, that prevent the spread of aquatic invasive species into and within the Great Lakes basin. These regulations should also cover No Ballast On Board (NOBOB) vessels. The government should also provide the resources necessary for effective program support, monitoring and enforcement of habitat management.

Aquatic invasive species such as zebra mussels have fundamentally altered the Great Lakes ecosystem. The economic cost of introduced species in the Great Lakes is estimated to be in the billions. Aquatic invasive species continue to be introduced to the Great Lakes ecosystem each year via the ballast water from ocean going ships. Ricciardi (2006) noted that the Great Lakes basin has been invaded by at least 182 non-indigenous species and new invaders are discovered every 28 weeks, ballast water from ocean going ships being the putative vector for 65% of all invasions.

Provincial agencies, resource users and stakeholders must also work diligently to limit the introduction and spread of aquatic invasive species within the Great Lakes basin. The “Invading Species Awareness Program” partnership between the Ontario Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters is a good example of proactive measures that can be taken to limit the spread of aquatic invasive species.

Ratification of the International Marine Organization’s Convention for the Control and Management of Ships’ Ballast Water and Sediments, and implementation of the National Action Plan on aquatic alien invasive species are positive steps for Canada to take. However, where regionally specific regulations are necessary to deal with threats, they should also be developed.

Under the guidance of the Great Lakes Fishery Commission, and in striving to achieve fish community objectives for Lake Ontario, Ontario and its state counterparts will continue to stock and manage some non-indigenous species such as Chinook and Coho salmon, rainbow trout and brown trout to sustain recreational fisheries and manage predator-prey interactions.

**Recommendation type:**
- Institutional commitment – Supports delisting criteria FWH-5, FP-1 and FP-2.

**Implementers:**
- Transport Canada

**Partners:**
- MNR – District offices, conservation organizations

**Timeframe:**
- Implement immediately with ongoing implementation and monitoring
Focal area 2: Research, monitoring and assessment

Taking the necessary actions to protect and rehabilitate fish habitat in the Bay of Quinte cannot occur without an understanding of the nature of habitat limitations and the tools and mechanisms to monitor and assess the status of changes in habitat. ‘Focal area 2’ outlines the management and assessment tools, monitoring programs and information sources required to support habitat managers and help protect and rehabilitate IBU 3 and 14(fish populations and habitats).

**Recommendation 2.1: Develop and implement scientifically-based management and assessment tools to inform and guide habitat management decisions.**

2.1.1 Fish habitat classification model

Utilize the Bay of Quinte fish habitat classification model for the Upper and Middle bays to inform and guide habitat management decisions. This classification model should also be extended to the lower Bay of Quinte.

The Department of Fisheries and Oceans – Great Lakes Laboratory for Fisheries and Aquatic Sciences completed a Fish Habitat Classification Model for the Upper and Middle Sections of the Bay of Quinte in July 2006. This scientifically defensible model provides detailed information on the relative suitability of fish habitat in the Bay of Quinte (not its tributaries) and can be used by habitat managers to identify and protect critical fish habitat and guide conservation and rehabilitation activities.

**Recommendation type:**
- Institutional commitment – Supports delisting criteria FWH-5, FP-1 and FP-2.

**Implementer(s):**
- DFO – GLLFAS, DFO – Habitat management, local CAs

**Partners:**
- BQRAP, resource users

**Timeframe:**
- Ongoing

2.1.2 Habitat supply analysis model

Develop a habitat supply analysis model that uses the availability and quality of existing habitats for the fish community and identifies the overall productive capacity of the Bay of Quinte system. This work will help identify what types of habitat are limiting for different groups of fish and can help balance habitat initiatives and decision making.

Quantifying which habitat types are limiting fish communities based on their differing biological needs will help guide rehabilitation projects in support of fish community objectives. Effectively prioritizing rehabilitation projects is essential, given the lack of available funds for this type of work. This will help guide habitat managers in deciding...
between compensation measures by providing information on the relative contribution of habitats towards overall fish community goals.

**Recommendation type:**
- Institutional commitment – Supports delisting criterion FWH-5, FP-1 and FP-2.

**Implementer:**
- DFO – GLLFAS, DFO - Habitat management, local CAs

**Partners:**
- BQRAP, MNR

**Timeframe:**
- Expected development 2006-2010.

### 2.1.3 Species-specific, habitat based population models

Develop species-specific habitat based population models that identify habitat bottlenecks for key fish species that have been identified as important to the Bay of Quinte. The model shall also identify where those important habitats exist within the Bay of Quinte.

Species-specific, habitat based population models would assist habitat managers in making scientifically defensible decisions about all projects especially those intended to increase populations of desirable fish (both ecologically and socially).

**Recommendation type:**
- Institutional commitment – Supports delisting criterion FWH-5

**Implementer:**
- DFO - GLLFAS

**Partners:**
- DFO – Habitat management

**Timeframe:**
- Expected development 2006 - 2010

**Recommendation 2.2: Initiate required monitoring**

#### 2.2.1 Monitoring programs

a) Select and initiate a coastal wetland monitoring program for the Bay of Quinte.

Coastal wetlands are one of the most important fish habitat types in the Bay of Quinte. One of the first steps in conserving and rehabilitating wetland functions is identifying the nature and level of impact of each of the stresses affecting the wetlands. Evaluation of coastal wetland health will be necessary to demonstrate that fish habitat has been restored in support of delisting the Bay of Quinte AOC.

The recommended sampling program would involve application of the procedures outlined in the Durham Region Coastal Wetland Monitoring Project (DRCWMP, 2003). This protocol samples a variety of wetland parameters, can be used to track trends...
through time and presents results in a format that is easily understood by the public and resource managers.

**Recommendation type:**
- Institutional commitment – Supports delisting criteria FWH-2, FWH-3 and FWH-5

**Implementers:**
- BQRAP to contract field work to partner agencies

**Partners:**
- Variable

**Timeframe:**
- Initiate in short term; develop long-term monitoring strategy

b) Monitor the nearshore fish community and habitat.

The nearshore or littoral fish community, to a certain degree, is a reflection of habitat conditions. Long-term monitoring of the nearshore fish community could be used to evaluate the status of IBUs 3 and 14 (fish populations and fish habitat). Electrofishing conducted by DFO-GLLFAS, which generates IBIs comparable to other Great Lakes areas is the recommended approach at the current time, and provides the foundation for delisting criterion FP-2. In addition, the DRCWMP: Methodology is a valuable resource for sampling methodology and standards. Nearshore Community Index Netting (NSCIN) as conducted by the OMNR Lake Ontario Management Unit also provides useful information and could be used to assess the nearshore fish community if resources are not available for electrofishing.

**Recommendation type:**
- Institutional commitment – Supports delisting criteria FP-1 and FWH-5

**Implementer(s):**
- MNR – LOMU

**Partners:**
- DFO – GLLFAS, local CA’s, EC-CWS

**Timeframe:**
- Ongoing

c) Work with partner groups to collect fisheries data on tributaries to the Bay of Quinte.

Tributaries to the Bay of Quinte are an important component of fish habitat for the Bay of Quinte. Sampling tributaries can provide a good opportunity to engage and educate conservation groups, stakeholders and the public about fish habitat. The information collected would provide insight into utilization of habitat by fish species and identify potential sites for restoration of access.

**Recommendation type:**
- Institutional commitment – Supports delisting criterion FWH-5

**Implementer(s):**
- Unknown – resource dependent

**Partners:**
- Conservation groups, MNR, DFO (where possible)

**Timeframe:**
• Immediate and ongoing

d) Monitor the Sawguin Creek Marsh rehabilitation project

Continue to monitor the 1998 Sawguin creek marsh rehabilitation project to determine the effectiveness of this technique in enhancing coastal wetland habitat.

Lake level regulation has reduced natural water level fluctuations that help maintain diverse and productive hemi-marsh conditions (Reid, 2001), and has favoured the expansion of dense cattail stands in marsh areas. During the winter of 1998, a 5.6 km network of open water channels and ponds was created using a backhoe in an attempt to improve habitat conditions in the Sawguin marsh. Dredged material was placed in alternating mounds along the channels to provide additional habitat diversity and safe nesting sites for waterfowl and other wildlife.

Monitoring conducted by the BQRAP in 1999 and 2000 (Hartley, 2000; Wolters-Sword, 2001) and 2006 (BQRAP, 2006) found a number of fish species using the artificial channels. Prior to the rehabilitation project, this area offered very little, if any, usable fish habitat due to the density of cattails and distance from open water (i.e., inaccessible to fish). Monitoring of this site should continue in the long term to assess habitat changes and response to environmental conditions. A key question to address will be the long-term viability of the site, that is, will the area be recolonized by cattails and if so, how long will it take?

Recommendation type:
• Institutional commitment – Supports delisting criterion FWH-5

Implementer:
• BQRAP

Partners:
• Local CAs, conservation organizations, DFO

Timeframe:
• Periodically over the long-term

2.2.3 Habitat manipulation experiments and monitoring

Conduct controlled experiments and monitoring for nearshore development and rehabilitation projects to determine the impact of development and the success of rehabilitation measures or techniques for mitigation.

Habitat managers are often required to recommend actions that will mitigate the effects of a proposed development. However, information is often lacking on the effectiveness of the available techniques. Conducting controlled experiments and monitoring would help address this information gap and help habitat managers recommend the best possible mitigation techniques in an adaptive management approach.

Recommendation type:
• Institutional commitment – Supports delisting criterion FWH-5

Implementers:
Focal area 3: Public education and involvement

The majority of shoreline areas and coastal wetlands bordering the Bay of Quinte are privately owned. These areas are critical in terms of protecting fish habitat; therefore, public education and involvement must be considered one of the cornerstones of any long-term plan to protect and rehabilitate fish habitat. Improved public awareness also provides the impetus for improved public policy and government action, which is critical to long term success.

Recommendation 3.1: Enhance two-way communications with resource users and the public

The Bay of Quinte Remedial Action Plan, and its partners, should make communicating with resources users and the public a priority.

Recommended activities include:

- Preparation of a fish and wildlife/tourism tabloid for distribution which promotes the view that a healthy Bay of Quinte means a strong and healthy local community and economy.
- Presentations to local stakeholders, municipalities, day camps, fish and game clubs and wherever possible to generate interest in contributing to BQRAP goals and objectives. This would require that appropriate feedback be given to BQRAP implementers.

Recommendation type:
- Institutional commitment – Delisting criterion FWH-4 and FWH-5

Implementer(s):
- BQRAP

Partners:
- MNR – District offices, local CAs and conservation groups, and others (time permitting)

Timelines:
- Ongoing

Focal area 4: Habitat protection and rehabilitation

Through the work of the BQRAP and its partners, a great deal of progress has been made towards the restoration of fish habitat in the Bay of Quinte, particularly at the ecosystem level. Phosphorous levels and nuisance algae have been greatly reduced, aquatic plants are more widely distributed and the fish community has returned to a
more mesotrophic state. In this respect, existing fish habitat in the Bay of Quinte may not warrant the label of ‘impaired’. However, it must be remembered that a considerable loss of fish habitat occurred – and is a significant part of IBU 14: loss of fish and wildlife habitat. Therefore, it is incumbent upon the BQRAP to promote the rehabilitation of habitat and offset historical losses of habitat, where feasible.

Within a plan to protect and rehabilitate habitat, there must be a hierarchy of preferred approaches that guide where limited resources are allocated. The recommendations provided in Focal Area 4 should be considered with the following hierarchy for habitat protection and enhancement in mind:

1st - Protection of existing habitat is the best option.
2nd - Restoration of natural processes is preferred over artificial habitat manipulation
3rd - Restoring access to natural habitat is preferred over habitat creation
4th - Creation of habitat is the least preferred option, but may be necessary under Fisheries Act compensation projects, or if items 1-3 are not possible because of restrictions.

Protection of existing habitat may take the form of formal acquisition of lands bordering the Bay of Quinte. This may be accomplished by using an established conservation organization such as the Nature Conservancy of Canada, through conservation easements or conservation agreements. Protection of habitat through these mechanisms is highly dependent upon opportunities that arise (e.g., landowner interest), but should be encouraged as a mechanism to provide long-term protection of habitat. Specific locations for securement or conservation agreements have not been identified in this plan. However, the Great Lakes Conservation Blueprint for Aquatic and Terrestrial Biodiversity, recently completed by the Nature Conservancy of Canada and the OMNR provides detailed maps identifying areas for protection (Wichert et. al. 2005 and Henson et. al. 2005).

Restoration of natural processes is an important issue for the Bay of Quinte. As discussed, water level regulation has impacted coastal wetland habitat and continues to be an ongoing issue. The International Joint Commission (IJC) has recently commissioned a study to explore options for water level management on Lake Ontario. The proposed options (particularly Option B+ Balanced Environmental) hold promise for restoring more natural water level fluctuations. Initiatives such as this must be considered in the overall management scheme and selection of rehabilitation projects.

Restoring access to existing, natural habitat could contribute significantly to addressing the historical loss of fish habitat. Some sites are not feasible for restoration of fish access (e.g., Trent River), however, sites do exist in the Bay that warrant detailed investigation. Examining these opportunities, and acting where appropriate, must be seen as a prerequisite to delisting IBU 14.

Recommendation 4.1: Mitigate barriers to fish migration

Mitigate barriers to fish migration, where feasible and consistent with fish community objectives.

There are a number of barriers that are limiting access to fish habitat from the Bay of Quinte. Restoring access to those areas would increase the amount of usable upstream
habitat and directly address IBU 14.1: loss of fish habitat. In some cases, removal of barriers is not feasible or desirable. For example, the series of dams and locks on the Trent River, the series of ice control structures and dams on the Moira River, and Ducks Unlimited water control structures in the upper reaches of tributaries.

The sites described below should be thoroughly explored to determine project feasibility. For each site listed below a brief description of potential benefits and drawbacks of the project is provided below for context. Ideally, the pre and post fish community would be monitored to assess the impact of the project. Wildlife considerations must also be taken into account.

**Recommendation type:**
- Action based – Supports delisting criterion FWH-5

**Implementer(s):**
- Variable

**Partners:**
- Variable

**Timeline:**
- Investigations should begin immediately

**Site #1 – Dead Creek Marsh**

Existing barrier:
An inappropriately sized and now partially filled-in culvert underneath Highway 33 at Dead Creek is preventing fish access to Dead Creek Marsh (approx. 400 hectares). There is also an old railroad bed immediately west of Highway 33 with a larger culvert that clogs with cattail debris from the marsh.

Suggested mitigation option:
Replace culvert under Hwy 33 with a large box culvert, capable of passing debris such as clumps of cattail mat. Remove a section of the old railroad bed to allow unrestricted passage.

**Benefits:**
Correcting the failed culvert would restore access to coastal wetland habitat and provide spawning and nursery habitat for numerous Bay of Quinte fish species.

**Potential Impacts:**
Spread of aquatic invasive species.

**Suggested project partners:**
Town of Quinte West, Ministry of Transportation, MNR, DFO and BQRAP.

**Comments:**
- Clogging of the culvert at the old road bed has been a nuisance in the past, requiring ongoing efforts to keep it open so water can drain.
- Carp are already believed to be above the failing culvert (Shawn Meyer, Canadian Wildlife Service, pers. comm.)

**Site #2 – Salmon River**

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Section 4: Strategies and recommendations

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Existing barrier:
A sea lamprey barrier (low-head dam) exists approximately 3.0 km upstream from the Bay of Quinte.

Mitigation options:
There are 3 mitigation options (given that full removal is not feasible) for this site that could allow passage of desirable fish species, while preventing sea lamprey access to spawning areas:

1. Construction of a velocity barrier. These experimental designs create flow velocities which prevent sea lamprey (poor swimmers) from moving upstream while allowing stronger swimmers access.
2. Construction of a vertical slot or denil fishway
3. Construction of an adjustable-crest barrier system.

Site specific considerations would need to be evaluated to determine feasibility and estimated costs. The Great Lakes Fishery Commission has made it a priority to “improve the design of barriers to enhance fish passage while still blocking sea lampreys” (Great Lakes Fishery Commission website: accessed May 2006).

Benefits:
Modifying the existing structure would restore access to kilometers of upstream spawning and nursery habitat, helping to address loss of fish habitat (IBU 14).

Potential impacts:
Spread of aquatic invasive species.

Suggested project partners:
Mohawks of the Bay of Quinte, Department of Fisheries and Oceans, Ministry of Natural Resources, Friends of the Salmon River, BQRAP.

Other issues:
- There is an Aboriginal fishery for walleye in the lower reaches of the Salmon River, including below the dam. Mohawks of the Bay of Quinte must be full project partners and supportive of any plans at the site.
- Exclusion of sea lamprey from spawning habitat can not be undermined as part of the project.
- There is another barrier approximately 2km above the dam in Shannonville, located in Milltown. However, a site visit in June 2006 showed this barrier may be failing and fish passage may already be possible. The current structure does not appear to serve a function and could possibly be further removed to allow fish access further upstream.

Site #3 – Mud (Marysville) Creek / Big Marsh

Existing barrier:
Ducks Unlimited installed a water control structure at the mouth of Big Marsh on Tyendinaga Mohawk Territory to enhance marsh conditions for wildlife. The control
structure consists of concrete footings with a system of removable boards to manipulate water levels.

Suggested mitigation option:
Remove boards, allowing fish passage.

Benefits of mitigation:
Removal of this barrier would restore natural flow regimes to Mud Creek and allow fish access to wetland and upstream tributary habitat. Loss of coastal wetland and tributary habitat has been considerable on the Bay of Quinte and were factors in identifying IBU 14: loss of fish and wildlife habitat.

Impacts of mitigation:
Removing the boards in the water control structure would result in lower water levels in Big Marsh. However, this would simply result in a return to the natural water levels and flow regime for the marsh. Spread of aquatic invasive species must also be considered.

Suggested project partners:
Bay of Quinte Mohawks, Ducks Unlimited, DFO, MNR

Comments:
• The water control structure is located on Tyendinaga Mohawk Territory, therefore project would require their full involvement and support.
• There may be options to offset any losses in wetland habitat caused by a drawdown of water levels, by creating offline ponds in expose floodplains.
• Duck hunters who use the existing marsh may have concerns over modifying existing structure.

Site #4 – Unnamed tributary immediately west of Salmon River

Barrier type:
A rock and concrete flowthrough dam (length 8m; height 3m; constructed in 1982) is identified in the MNR Peterborough District’s 2002 Private Dams GIS layer. The purpose of this structure is unknown at this time.

Suggested mitigation options:
Unknown without site investigation – possibly full removal if serving no purpose.

Benefits of mitigation:
Restoration of natural flow regimes and access to upstream tributary habitat.

Impacts of barrier mitigation:
Unknown – there is very little downstream habitat before entering the Bay of Quinte, so the structure is not likely used for flood protection. Potential spread of aquatic invasive species.

Suggested project partners:
Private landowner, Quinte Conservation, MNR and DFO.

Comments:
• Need to determine the purpose of the structure, quality and extent of accessible upstream habitat, ownership and options for mitigation.

Site #5 – Bell Creek

Barrier type:
A rock, timber check dam (length 10ft; height 2ft) is identified in the MNR Peterborough District’s 2002 Private Dams GIS layer. The purpose of this structure is unknown at this time.

Suggested mitigation options:
Unknown without further investigation – possibly full removal if serving no purpose.

Benefits of mitigation:
Bell Creek is a small tributary to the Bay of Quinte, but at the current time is well-buffered in the lower reaches. There is over 8 kilometers of upstream tributary, although the quality of habitat is unknown.

Impacts of barrier mitigation:
Unknown – potential spread of aquatic invasive species.

Suggested project partners:
Land Owner/Developer, Quinte Conservation, MNR and DFO

Comments:
• The land surrounding the barrier is under review for a subdivision proposal. Major site alteration could be expected as part of the development and impacts on the Bell Creek watershed would likely be significant.

Recommendation 4.2: Implement a shoreline naturalization program

Develop and implement an outreach program that targets shoreline landowners on the Bay of Quinte and provides the funding and technical assistance to carry out shoreline naturalization projects.

The majority of the Bay of Quinte’s shoreline is now privately owned and much has been cleared to the waters edge as part of development activities (e.g., landscaping residential lots). This has resulted in a significant loss and degradation of fish and wildlife habitat. Landowner involvement is essential to restoring shoreline and coastal wetland habitat and should be promoted in conjunction with the necessary financial incentives and technical assistance. Delisting criterion FWH-4 sets out an objective of 80 percent of the shorelines along the Bay of Quinte must have an undisturbed natural terrestrial vegetative buffer of 5-m or greater from the high water mark. From 5-m to 30-m (or 120-m for PSW) the extent of the buffer should be 60 percent naturally vegetated.

The current status of this delisting criterion is unknown and requires field verification. The criteria may be revised pending initial field verification that will examine the current extent of buffering within the 30-m and 120-m areas of the Bay of Quinte. Many of the major funding programs are designed to assist landowners with large land holdings (i.e., farmers). This program would target landowners with small land holdings (i.e.,
residential lots) who are becoming increasingly common around the Bay as landowners subdivide their lots to generate income.

**Recommendation type:**
- Action based – Delisting criterion FWH-4

**Implementer(s):**
- BQRAP

**Partners:**
- Funding partners, CAs, conservation groups, landowners

**Timeline:**
- Ongoing until delisting criteria is met

**Recommendation 4.3: Rehabilitate coastal marshes**

Rehabilitate coastal wetlands where large cattail stands have replaced previously productive and diverse wetland areas.

The regulation of water levels and human disturbances (i.e. sediment inputs) has favoured the establishment of large cattail stands in coastal wetlands, resulting in a loss of habitat diversity and fish habitat. It is recommended that in appropriate locations (large cattail stands), that consideration be given to using techniques employed at Sawguin Creek Marsh in 1998. Projects should include pre and post monitoring of the fish and wildlife community to allow for further assessment and refinement of this technique. Monitoring of the fish community at the Sawguin Creek Marsh sites in 1999 and 2000 (Hartley 2000 and Wolters-Sword 2001) and in 2006 (BQRAP, 2006) have demonstrated that fish are utilizing newly created fish habitat.

Although this technique holds promise for creating fish habitat and offsetting some historical losses of habitat, there are factors that must be considered. First, this technique is relatively new and should be studied for a sufficient time to ensure the benefits are sustained over the long term, primarily that the newly created channels do not quickly "fill in". Second, the Sawguin Creek Marsh rehabilitation project cost approximately $130,000 to implement. Creation of fish habitat using this technique may be suitable where habitat needs to be created as part of fish habitat compensation projects (as in the case of the Sawguin Creek Marsh project). However, in general, rehabilitation monies should be prioritized on more established practices such as habitat protection and restoration of access to existing habitat but, there may be an opportunity to establish a habitat banking system similar to other areas that could be drawn on for larger projects.

Finally, the International Joint Commission (IJC) is currently (at the time this document was produced) evaluating different options for managing water levels on Lake Ontario, after a detailed 5 year study. All of the proposed options would increase, to varying degrees, the amount of intra and interannual water level fluctuations. Plan B+ Balanced Environmental would come the closest to historical water level fluctuations – but would not see a return to natural fluctuations. However, any plans to modify existing coastal wetland habitat must take this into consideration.

**Recommendation type:**
- Action based – Supports delisting criterion FWH-4
Recommendation 4.4: Support species at risk initiatives and recovery plans

The BQRAP and its partners should support species at risk recovery plans for species found in the Bay of Quinte.

When fish species are deemed to be ‘at risk’ this can be a sign of habitat loss and degradation. Previous recommendations in this report will support the protection and rehabilitation of habitat to support all species. However, where site specific actions or practices are recommended in species at risk recovery plans, these should be acted upon as part of the BQRAP’s commitment to restoring IBU 3: degradation of fish populations and to protect biodiversity.

Recommendation type:
• Institutional commitment – Supports delisting criterion FP-3

Implementer(s):
• Multi-agency partnership

Partners:
• BQRAP, EC - CWS, DFO – Habitat management, DFO - GLLFAS, MNR - LOMU, conservation groups, landowners, MBQ, funding partners

Timeline:
• Ongoing
5.0 Plan implementation and assessment

Determining when IBU 14.1 has been restored will be done by evaluating progress made towards Bay of Quinte RAP delisting criteria. Similar to other Great Lakes’ AOCs which have moved towards delisting, the Bay of Quinte will likely go through a stage known as Area of Concern in a State of Natural Recovery, where all reasonable actions to restore IBUs have been taken, but time is needed for natural processes and ecosystem recovery to occur. Monitoring of IBUs will be done through various programs to ensure that progress is sustained and restored beneficial uses don’t become impaired again.

Initially, coordination and implementation of the Fish Habitat Management Plan (FHMP) will be facilitated through the Bay of Quinte RAP. As the Bay of Quinte moves into an Area of Concern in a State of Natural Recovery, and the RAP’s active role decreases, a new coordinating body comprised of DFO (habitat management and science sections), MNR District Offices, the Lake Ontario Management Unit and local Conservation Authorities will be required. Collectively, these agencies have the mandate and expertise to guide protection and enhancement of fish habitat in the Bay of Quinte.

5.1 Concluding remarks

This plan outlines the management framework necessary to delist IBU 14.1: loss of fish habitat, in support of moving the Bay of Quinte from a Great Lakes Area of Concern to an Area of Concern in a State of Natural Recovery. The Bay of Quinte is an important resource for the local community, providing cultural, social and economic benefits. Protecting and rehabilitating fish habitat benefits everyone who lives in the Bay of Quinte area, not simply those who fish. If management agencies, governments, resource users and the public work together to implement the recommendations contained in this report, it can be accomplished.
6.0 References


Appendix I

List of acronyms
AOC  Area of Concern. AOC’s are severely degraded geographic areas within the Great Lakes Basin and are defined by the U.S.-Canada Great Lakes Water Quality Agreement (Annex 2 of the 1987 Protocol) as "geographic areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life“

BQRAP  Bay of Quinte Remedial Action Plan. Remedial Action Plans identify specific problems in severely degraded Great Lakes Areas of Concern (AOC) and describe methods for correcting them.

CA  Conservation Authority. Ontario has 36 Conservation Authorities that are community-based environmental organizations dedicated to conserving, restoring, developing and managing natural resources on a watershed basis.

COSEWIC  Committee on the Status of Endangered Wildlife in Canada. COSEWIC is a committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada.

CSW  Centre for Sustainable Watersheds. CSW is a non-governmental, non-profit organization that works to help community groups become more effective in protecting their water resources.

CWS  Canadian Wildlife Service. CWS is Canada’s national wildlife agency that handles wildlife matters that are the responsibility of the federal government. This includes the protection and management of migratory birds and nationally important wildlife habitat, endangered species, research on nationally important wildlife issues, control of international trade in endangered species, and international treaties.

DFO  Department of Fisheries and Oceans Canada. DFO is the lead federal government department responsible for developing and implementing policies and programs in support of Canada’s economic, ecological and scientific interests in oceans and inland waters.

DU  Ducks Unlimited. DU is a not for profit organization that conserves, restores, and manages wetlands and associated habitats for North America’s waterfowl.

EC  Environment Canada. Environment Canada’s mandate is to preserve and enhance the quality of the natural environment, including water, air and soil quality; conserve Canada’s renewable resources; conserve and protect Canada’s water resources; carry out meteorology; enforce the rules made by the Canada - United States International Joint Commission relating to boundary waters; and coordinate environmental policies and programs for the federal government.

FCO  Fish Community Objectives. Management of Great Lakes fisheries includes the development of FCO’s every five years by the agencies that share fisheries management responsibilities for each of the lakes – the
New York State Department of Environmental Conservation and the Ontario Ministry of Natural Resources. The FCO document summarizes scientific understanding of the major factors influencing Lake Ontario's fish communities, and specifies strategic objectives that have guided the management of Lake Ontario fisheries.

**GLWQA**

Great Lakes Water Quality Agreement. The GLWQA expresses the commitment of Canada and the United States to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem and includes a number of objectives and guidelines to achieve these goals. The Agreement reaffirms the rights and obligation of Canada and the United States under the Boundary Waters Treaty and has become a major focus of Commission activity.

**GLLFAS**

Great Lakes laboratory for Fisheries and Aquatic Sciences. GLLFAS, located in Burlington Ontario, is one of DFO’s research facilities. GLLFAS conducts freshwater fisheries research in support of DFO priorities related to fish habitat, sea lamprey and the Great Lakes Action Plan, and provide scientific advice to clients and co-operators.

**HADD**

Harmful alteration, disruption or destruction of fish habitat. Any change to the physical, biological or chemical attributes of habitat that adversely affects the habitat’s ability to provide the basic life requisites (spawning, rearing, nursery, overwintering, feeding migration) is considered a HADD. Only the Minister of designate can authorize the HADD of habitat.

**IBU**

Impaired Beneficial Use. An IBU means a change in the chemical, physical or biological integrity of the Great Lakes system sufficient to cause any of the following 14 items:
- restrictions on fish and wildlife consumption;
- tainting of fish and wildlife flavour
- degradation of fish and wildlife populations
- fish tumours or other deformities
- bird or animal deformities or reproduction problems
- degradation of benthos
- restrictions on dredging activities
- eutrophication or undesirable algae
- restrictions on drinking water consumption, or taste and odour problems
- beach closings
- degradation of aesthetics
- added costs to agriculture or industry
- degradation of phytoplankton and zooplankton populations
- loss of fish and wildlife habitat

**IJC**

International Joint Commission. The IJC is an independent binational organization established to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions.
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>LOA</td>
<td>Letter of Advice. The Letter of Advice is the document sent after a project is reviewed, confirming that the project will not cause a HADD.</td>
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<td>LOMU</td>
<td>Lake Ontario Management Unit, is a section of the Fish and Wildlife branch within the MNR. LOMU supports MNR by conducting annual aquatic ecosystem and fisheries assessment, enforcement and management activities on Lake Ontario.</td>
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<td>MBQ</td>
<td>Mohawks of the Bay of Quinte</td>
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<tr>
<td>MOE</td>
<td>Ontario Ministry of the Environment. The MOE works to protect, restore and enhance the natural environment through tough legislation and enforcement, innovative programs and initiatives, strong partnerships, and public engagement. The ministry works to provide all Ontarians with safe and clean air, land and water.</td>
</tr>
<tr>
<td>MNR</td>
<td>Ontario Ministry of Natural Resources. The ministry is committed to protecting and managing the province's natural resources, or its &quot;natural capital&quot;, and making the interest from that capital available for individuals, communities and economies that depend on it.</td>
</tr>
<tr>
<td>NHIC</td>
<td>Ontario’s Natural Heritage Information Centre. The NHIC compiles, maintains and provides information on rare, threatened and endangered species and spaces in Ontario. This information is stored in a central repository containing a computerized database, map files and an information library, which are accessible for conservation applications, land use planning, park management, etc.</td>
</tr>
<tr>
<td>RAP</td>
<td>Remedial Action Plan. RAP's identify specific problems in severely degraded Great Lakes Areas of Concern and describe methods for correcting them.</td>
</tr>
<tr>
<td>SARA</td>
<td>Federal Species at Risk Act. SARA was proclaimed in June 2003, and is one part of Canada strategy for the protection of wildlife species at risk.</td>
</tr>
</tbody>
</table>
Appendix II

Appendix IIa: Fish species list
Appendix IIb: Species of special concern in the Bay of Quinte
Appendix IIc: Non-indigenous fish species found in Lake Ontario
### Appendix IIa. Fish species list for the Bay of Quinte

<table>
<thead>
<tr>
<th>Family</th>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowfins - Amiidae</td>
<td>bowfin</td>
<td>Amia calva</td>
</tr>
<tr>
<td>Bullhead catfishes - Ictilurida</td>
<td>brown bullhead</td>
<td>Ictalurus nebulosus</td>
</tr>
<tr>
<td></td>
<td>channel catfish</td>
<td>Ictalurus punctatus</td>
</tr>
<tr>
<td></td>
<td>stonecat</td>
<td>Noturus flavus</td>
</tr>
<tr>
<td></td>
<td>tadpole madtom</td>
<td>Noturus gyrinus</td>
</tr>
<tr>
<td>Carps &amp; Minnows – Cyprinidae</td>
<td>blackchin shiner</td>
<td>Notropis heterodon</td>
</tr>
<tr>
<td></td>
<td>bluntnose minnow</td>
<td>Pimephales notatus</td>
</tr>
<tr>
<td></td>
<td><strong>bridle shiner</strong></td>
<td>Notropis bifrenatus</td>
</tr>
<tr>
<td></td>
<td>+ carp</td>
<td>Cyprinus carpio</td>
</tr>
<tr>
<td></td>
<td>common shiner</td>
<td>Notropis cornutus</td>
</tr>
<tr>
<td></td>
<td>emerald shiner</td>
<td>Notropis atherinoides</td>
</tr>
<tr>
<td></td>
<td>fallfish</td>
<td>Semotilus corporalis</td>
</tr>
<tr>
<td></td>
<td>fathead minnow</td>
<td>Pimephales promelas</td>
</tr>
<tr>
<td></td>
<td>golden shiner</td>
<td>Notemigonous crysoleucus</td>
</tr>
<tr>
<td></td>
<td>+ goldfish</td>
<td>Carassius auratus</td>
</tr>
<tr>
<td></td>
<td>longnose dace</td>
<td>Rhinichthys cataractae</td>
</tr>
<tr>
<td></td>
<td>+ rudd</td>
<td>Scardinius erythrophthalmus</td>
</tr>
<tr>
<td></td>
<td>sand shiner</td>
<td>Notropis stramineus</td>
</tr>
<tr>
<td></td>
<td>spotfin shiner</td>
<td>Notropis spiopterus</td>
</tr>
<tr>
<td></td>
<td>spottail shiner</td>
<td>Notropis hudsonius</td>
</tr>
<tr>
<td></td>
<td>striped shiner</td>
<td>Notropis chrysocephalus</td>
</tr>
<tr>
<td>Cods – Gadidae</td>
<td>burbot</td>
<td>Lota lota</td>
</tr>
<tr>
<td>Drum – Sciaenidae</td>
<td>freshwater drum</td>
<td>Aplodinotus grunniens</td>
</tr>
<tr>
<td>Eels (freshwater) – Anguillida</td>
<td>American eel</td>
<td>Anquilla rostrata</td>
</tr>
<tr>
<td>Gars – Lepisosteidae</td>
<td>longnose gar</td>
<td>Lepisosteus osseus</td>
</tr>
<tr>
<td>Goby - Gobiidae</td>
<td>+ round goby</td>
<td>Neogobius melanostomus</td>
</tr>
<tr>
<td>Herring – Clupeidae</td>
<td>+ alewife</td>
<td>Alosa pseudoharengus</td>
</tr>
<tr>
<td></td>
<td>+ gizzard shad</td>
<td>Dorosoma cepedianum</td>
</tr>
<tr>
<td>Killifishes – Cyprinodontidae</td>
<td>banded killfish</td>
<td>Fundulus diaphanus</td>
</tr>
<tr>
<td>Lampreys – Petromyzontidae</td>
<td>+ sea lamprey</td>
<td>Petromyzon marinus</td>
</tr>
<tr>
<td>Mooneyes – Hiodontidae</td>
<td>mooneye</td>
<td>Hiodon tergisus</td>
</tr>
<tr>
<td>Family</td>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>--------------------------------</td>
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<td>-------------------------------------------</td>
</tr>
<tr>
<td>Mudminnow – Umbridae</td>
<td>central mudminnow</td>
<td><em>Umbra limi</em></td>
</tr>
<tr>
<td>Perches – Percidae</td>
<td>blue pike</td>
<td><em>Stizostedion vitreum glaucum</em></td>
</tr>
<tr>
<td></td>
<td>channel darter</td>
<td><em>Percina copelandi</em></td>
</tr>
<tr>
<td></td>
<td>fantail darter</td>
<td><em>Etheostoma flabellare</em></td>
</tr>
<tr>
<td></td>
<td>johnny darter</td>
<td><em>Etheostoma nigrum</em></td>
</tr>
<tr>
<td></td>
<td>logperch</td>
<td><em>Percina caprodes</em></td>
</tr>
<tr>
<td></td>
<td>sauger</td>
<td><em>Sander canadense</em></td>
</tr>
<tr>
<td></td>
<td>walleye</td>
<td><em>Sander vitreus</em></td>
</tr>
<tr>
<td></td>
<td>yellow perch</td>
<td><em>Perca flavescens</em></td>
</tr>
<tr>
<td>Pikes – Esocidae</td>
<td>grass pickerel</td>
<td><em>Esox americanus vermiculatus</em></td>
</tr>
<tr>
<td></td>
<td>muskellunge</td>
<td><em>Esox masquinongy</em></td>
</tr>
<tr>
<td></td>
<td>northern pike</td>
<td><em>Esox lucius</em></td>
</tr>
<tr>
<td>Sculpins – Cottidae</td>
<td>mottled sculpin</td>
<td><em>Cottus bairdi</em></td>
</tr>
<tr>
<td></td>
<td>slimy sculpin</td>
<td><em>Cottus cognatus</em></td>
</tr>
<tr>
<td>Silversides – Atherinida</td>
<td>brook silverside</td>
<td><em>Labidesthes sicculus</em></td>
</tr>
<tr>
<td>Smelts – Osmeridae</td>
<td>rainbow smelt</td>
<td><em>Osmerus mordax</em></td>
</tr>
<tr>
<td>Sticklebacks – Gasterosteidae</td>
<td>brook stickleback</td>
<td><em>Culaea inconstans</em></td>
</tr>
<tr>
<td></td>
<td>ninespine stickleback</td>
<td><em>Pungitius pungitius</em></td>
</tr>
<tr>
<td></td>
<td>threespine stickleback</td>
<td><em>Gasterosteus aculeatus</em></td>
</tr>
<tr>
<td>Sturgeon – Acipenserida</td>
<td>lake sturgeon</td>
<td><em>Acipenser fluvescens</em></td>
</tr>
<tr>
<td>Suckers – Catostomidae</td>
<td>bigmouth buffalo</td>
<td><em>Ictiobus cyrinellus</em></td>
</tr>
<tr>
<td></td>
<td>greater redhorse</td>
<td><em>Moxostoma valenciennesi</em></td>
</tr>
<tr>
<td></td>
<td>northern hog sucker</td>
<td><em>Hypentelium nigricans</em></td>
</tr>
<tr>
<td></td>
<td>quillback</td>
<td><em>Carpiodes cyprinus</em></td>
</tr>
<tr>
<td></td>
<td>river redhorse</td>
<td><em>Moxostoma carinatum</em></td>
</tr>
<tr>
<td></td>
<td>shorthead redhorse</td>
<td><em>Moxostoma macrolepidotum</em></td>
</tr>
<tr>
<td></td>
<td>silver redhorse</td>
<td><em>Moxostoma anisurum</em></td>
</tr>
<tr>
<td></td>
<td>white sucker</td>
<td><em>Catostomus commersoni</em></td>
</tr>
<tr>
<td>Sunfishes – Centrarchidae</td>
<td>black crappie</td>
<td><em>Pomoxis nigromaculatus</em></td>
</tr>
<tr>
<td></td>
<td>bluegill</td>
<td><em>Lepomis macrochirus</em></td>
</tr>
<tr>
<td></td>
<td>largemouth bass</td>
<td><em>Micropterus salmoides</em></td>
</tr>
<tr>
<td>Family</td>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>pumpkinseed</td>
<td>Lepomis gibbosus</td>
<td></td>
</tr>
<tr>
<td>rock bass</td>
<td>Ambloplites rupestris</td>
<td></td>
</tr>
<tr>
<td>smallmouth bass</td>
<td>Micropterus dolomieui</td>
<td></td>
</tr>
<tr>
<td>Temperate basses – Percichthyidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>white bass</td>
<td>Morone chrysops</td>
<td></td>
</tr>
<tr>
<td>+ white perch</td>
<td>Morone americana</td>
<td></td>
</tr>
<tr>
<td>Trout-perches – Percopsidae</td>
<td>trout-perch</td>
<td>Percopsis omiscomaycus</td>
</tr>
<tr>
<td>Whitefishes, salmons and trouts – Salmonidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2Atlantic salmon</td>
<td>Salmo salar</td>
<td></td>
</tr>
<tr>
<td>+ brown trout</td>
<td>Salmo trutta</td>
<td></td>
</tr>
<tr>
<td>+ Chinook salmon</td>
<td>Oncorhynchus tshawytscha</td>
<td></td>
</tr>
<tr>
<td>+ coho salmon</td>
<td>Oncorhynchus kisutch</td>
<td></td>
</tr>
<tr>
<td>lake herring/cisco</td>
<td>Coregonus artedii</td>
<td></td>
</tr>
<tr>
<td>lake trout</td>
<td>Salvelinus namaycush</td>
<td></td>
</tr>
<tr>
<td>lake whitefish</td>
<td>Coregonus clupeaformis</td>
<td></td>
</tr>
<tr>
<td>+ rainbow trout</td>
<td>Salmo gairdneri</td>
<td></td>
</tr>
<tr>
<td>round whitefish</td>
<td>Prosopium cylindraceum</td>
<td></td>
</tr>
<tr>
<td>+ splake</td>
<td>Salvelinus namaycush x S. fontinalis</td>
<td></td>
</tr>
</tbody>
</table>

Grey cells indicate species that were historically recorded (as cited in Hurley 1986), but were not captured during Hurley's research (Hurley 1986).

** indicates fish species that are considered to be at some degree of risk of becoming threatened or endangered; see Table IIb for more information.

+ not indigenous to the Bay of Quinte (see Appendix IIc)

▲ indicates species that are now extinct in Lake Ontario (Crossman and Van Meter 1979, as cited in Hurley 1986)

1 Listed as ‘adventive’ in Mandrak and Crossman (2002)

2 Atlantic salmon were extirpated from Lake Ontario and the Bay of Quinte in the late 1800s. Research and stocking has recently been conducted to assess the feasibility of reintroducing this species.
### Appendix IIb. Species of special concern in the Bay of Quinte.

<table>
<thead>
<tr>
<th>Family</th>
<th>Common Name</th>
<th>SARA status</th>
<th>COSEWIC status</th>
<th>MNR status</th>
<th>Provincial Rank</th>
<th>Global Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnows and carps</td>
<td>bridle shiner</td>
<td>special concern (schedule 1)</td>
<td>special concern</td>
<td>special concern</td>
<td>S2</td>
<td>G5</td>
</tr>
<tr>
<td>Pikes</td>
<td>grass pickerel</td>
<td>-</td>
<td>special concern</td>
<td>-</td>
<td>S3</td>
<td>G5</td>
</tr>
<tr>
<td>Perches</td>
<td>channel darter</td>
<td>threatened (schedule 2)</td>
<td>threatened</td>
<td>threatened</td>
<td>S3</td>
<td>G4</td>
</tr>
<tr>
<td>Sturgeon</td>
<td>lake sturgeon</td>
<td>-</td>
<td>special concern</td>
<td>not at risk</td>
<td>S3</td>
<td>G3</td>
</tr>
<tr>
<td>Suckers</td>
<td>greater redhorse</td>
<td>special concern (schedule 3)</td>
<td>special concern</td>
<td>special concern</td>
<td>S3</td>
<td>G4</td>
</tr>
<tr>
<td></td>
<td>river redhorse</td>
<td>special concern</td>
<td>special concern</td>
<td>S2</td>
<td>S3</td>
<td>G4</td>
</tr>
</tbody>
</table>

Data in this table was compiled from the Ontario Freshwater Fishes Life History Database, Species at Risk Act (SARA) registry, Species at Risk in Ontario List, Natural Heritage Information Centre (NHIC) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Status designations and rankings:

**SARA status**: Special concern species are wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. Once a species is added to Schedule 1, it benefits from all the legal protection afforded, and the mandatory recovery planning required under SARA. Species that are listed on Schedules 2 and 3 must be assessed by COSEWIC within a given timeframe. These wildlife species follow the same process for assessment and classification, but are not included on the official list.

**COSEWIC** is a committee of experts that assesses and designates which species are in some danger of disappearing from Canada. COSEWIC recommendations are sent to the federal government, which makes the final decision whether to add the species to the official list. COSEWIC status designations range from extinct to ‘not at risk’.

**MNR status** designations range from extirpated to not at risk. The MNR Status is assigned by the Ontario Ministry of Natural Resources. MNR status designations range from extinct to ‘not at risk’. Special concern indicates that a species has characteristics that make it sensitive to human activities or natural events.

**Provincial Ranks** are used by the NHIC to set protection priorities for rare species and natural communities. These rankings are not legal designations. Provincial ranks range from S1 – S5, with S1 = extremely rare and S5 = very common. A rank of S3 = rare to uncommon in Ontario, S2 = very rare in Ontario.

**Global Ranks** are assigned by a consensus of the network of Conservation Data Centre(s) (CDCs), scientific experts and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species. Global ranks range from G1 – G5, where G1 is extremely rare and G5 is very common.
Appendix IIc. Non-indigenous fish species found in Lake Ontario.

<table>
<thead>
<tr>
<th>Species</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>alewife</td>
<td>First reported in L. Ontario in the 1870s. Now present in all Great Lakes.</td>
</tr>
<tr>
<td>brown trout</td>
<td>Native to Europe and western Asia; intentionally introduced into the Great Lakes and stocked regularly to sustain recreational fisheries.</td>
</tr>
<tr>
<td>Chinook salmon</td>
<td>Native to Pacific Ocean and tributaries; intentionally introduced into the Great Lakes and stocked regularly to sustain recreational fisheries.</td>
</tr>
<tr>
<td>coho salmon</td>
<td>Native to Pacific Ocean and tributaries; intentionally introduced into the Great Lakes and stocked regularly to sustain recreational fisheries.</td>
</tr>
<tr>
<td>common carp</td>
<td>Native to Asia; introduced to Great Lakes Basin intentionally.</td>
</tr>
<tr>
<td>gizzard shad</td>
<td>Native to L. Erie, gained access to other Great Lakes via canals.</td>
</tr>
<tr>
<td>goldfish</td>
<td>Native to eastern Asia; introduced by release of aquarium stock.</td>
</tr>
<tr>
<td>rainbow smelt</td>
<td>Native to Atlantic Ocean and tributaries; intentionally introduced to the Great Lakes watershed.</td>
</tr>
<tr>
<td>rainbow trout</td>
<td>Native to western North America; intentionally introduced into the Great Lakes and stocked regularly to sustain recreational fisheries.</td>
</tr>
<tr>
<td>round goby</td>
<td>Native to Black and Caspian Seas; introduced with ballast water from ocean going ships.</td>
</tr>
<tr>
<td>rudd</td>
<td>Native to Europe; first reported in Ontario waters of St. Lawrence River in 1990; unintentionally introduced.</td>
</tr>
<tr>
<td>sea lamprey</td>
<td>Possibly native to Lake Ontario and St. Lawrence River; access to upper Great Lakes enabled via the Welland Canal.</td>
</tr>
<tr>
<td>white perch</td>
<td>Native to Atlantic coast; gained access to Lakes Ontario and Erie through the Erie Barge Canal.</td>
</tr>
</tbody>
</table>
Appendix III

Department of Fisheries and Oceans’
Policy Framework for Fish Habitat Management
Objective
Net Gain of productive capacity of fisheries resources

Goal 1
Fish Habitat Conservation

Goal 2
Fish Habitat Restoration

Goal 3
Fish Habitat Development

Guiding Principle
No Net Loss of Productive capacity of habitats

Integrated Planning for Fish Habitat Management

Implementation Strategies
1. Protection and compliance
2. Integrated Resource Planning
3. Research
4. Public Consultation
5. Public Information & Education
6. Cooperative Action
7. Improvement
8. Monitoring

Procedures to apply the No Net Loss Guiding Principle
Appendix IV

Summary of recommendations applicable to partner groups
<table>
<thead>
<tr>
<th>Recommendation</th>
<th>BQRAP</th>
<th>DFO – Habitat</th>
<th>DFO – GLFAS</th>
<th>MNR – LOMU</th>
<th>MNR – District</th>
<th>EC-Canadian Wildlife Service</th>
<th>Local CAs</th>
<th>MBQ</th>
<th>Landowners</th>
<th>Conservation groups</th>
<th>Transport Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy 1: Habitat management</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1.1 – Ensure no net loss of fish habitat</td>
<td>I</td>
<td>P</td>
<td>P</td>
<td>I</td>
<td>P</td>
<td>P</td>
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</tr>
<tr>
<td>1.2 – Prevent the spread of aquatic invasive species</td>
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<tr>
<td><strong>Strategy 2: Research, assessment and monitoring</strong></td>
<td></td>
<td></td>
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<tr>
<td>2.1 – Develop and implement scientifically-based tools to inform and guide habitat management decisions</td>
<td>I</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>2.2 – Monitoring needs</td>
<td>I</td>
<td>P</td>
<td>B</td>
<td>I</td>
<td></td>
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<tr>
<td><strong>Strategy 3: Public education and involvement</strong></td>
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<tr>
<td>3.1 – Enhanced communications with resource users and public</td>
<td>I</td>
<td></td>
<td></td>
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<td>I</td>
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<tr>
<td><strong>Strategy 4: Habitat protection and rehabilitation</strong></td>
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</tr>
<tr>
<td>4.1 – Mitigate barriers to fish migration</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td></td>
<td>P</td>
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</tr>
<tr>
<td>4.2 – Shoreline naturalization program</td>
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<tr>
<td>4.3 – Coastal marsh rehabilitation</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td></td>
<td>P</td>
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</tr>
<tr>
<td>4.4 – Support species at risk recovery plans</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
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<td>P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I = Implementer  
P = Partner  
B = Both

Appendix IV
Appendix V

Suggested representative coastal wetlands for monitoring in the Bay of Quinte
<table>
<thead>
<tr>
<th>Wetland name</th>
<th>MMP</th>
<th>DRCWMP</th>
<th>Disturbance factor</th>
<th>Size</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;100 ha</td>
<td>&gt; 25 ha</td>
<td>Large &gt; 100 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Riverine</td>
<td>Lacustrine</td>
<td></td>
</tr>
<tr>
<td>1. Big Island Marsh</td>
<td>Yes</td>
<td>Yes</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Blessington Creek</td>
<td>Yes</td>
<td>Yes</td>
<td>X</td>
<td>858</td>
<td>X</td>
</tr>
<tr>
<td>3. Carrying Place</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>62</td>
<td>X</td>
</tr>
<tr>
<td>4. Carnachan Bay</td>
<td>No</td>
<td>No</td>
<td>?</td>
<td>71</td>
<td>X</td>
</tr>
<tr>
<td>5. Dead Creek</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>359</td>
<td>X</td>
</tr>
<tr>
<td>6. Hay Bay</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>1333</td>
<td>X</td>
</tr>
<tr>
<td>7. Lower Napanee River</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>206</td>
<td>X</td>
</tr>
<tr>
<td>8. Lower Sucker Creek</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>76</td>
<td>X</td>
</tr>
<tr>
<td>9. Sawguin Creek Marsh</td>
<td>Yes</td>
<td>Yes</td>
<td>X</td>
<td>2093</td>
<td>X</td>
</tr>
<tr>
<td>10. Solmesville Marsh</td>
<td>No</td>
<td>Yes</td>
<td>X</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. DRCWMP = Durham Region Coastal Wetland Monitoring Project data (mostly 2003, 2005 and 2006 data). Note, an indication of “yes” does not necessarily mean that all aspects of the protocol were employed (i.e., electrofishing or bird surveys may not have been completed).
2. MMP = Marsh Monitoring Program data (extent of data varies by sites)
3. Disturbance factor is a subjective term based on field observations within 1km of wetland.
4. Characteristics – where a wetland had a significant riverine component, it was considered riverine.