

Beneficial Use Impairment #3 Assessment Report
Degradation of Fish and Wildlife Populations

Bay of Quinte AOC

October 31, 2016

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Note: In 1986, the federal/provincial Bay of Quinte Remedial Action Plan (RAP) Coordinating Committee was established to oversee the development of a Bay of Quinte RAP. The Coordinating Committee was charged with developing the RAP through parallel processes of technical evaluation and public participation. A Public Advisory Committee (PAC) was established in 1988 to oversee the Bay of Quinte RAP public participation component. Both committees were dissolved in 1996 and in 1997 the Bay of Quinte RAP Restoration Council was formed to oversee implementation of the RAP.

Executive Summary

The Bay of Quinte was identified as an Area of Concern in 1985 by the International Joint Commission in part because of degraded fish populations in the bay. In the Bay of Quinte Remedial Action Plan (RAP) Stage 1 RAP Report (1990) and subsequently the Stage 2 RAP Report (1993), the Bay of Quinte Remedial Action Plan Coordinating Committee confirmed this by classifying the 'Degradation of Fish and Wildlife Populations' beneficial use as being impaired.

Although there was an abundance of fish, the fish community was dominated by a few species. Fish populations had been affected by high levels of eutrophication, land use changes in and around the Bay of Quinte, and by invasions of non-indigenous species, including common carp, Eurasian milfoil, white perch, and dreissenid (zebra and quagga) mussels.

For the wildlife component of this beneficial use, there was no documented or anecdotal evidence of wildlife population degradation. However, it was considered important to scientifically determine the status of the wildlife populations before the beneficial use could be deemed to be 'not impaired'.

In 1991, the International Joint Commission established the following redesignation guideline for this impaired beneficial use:

“When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present”.

Five targets with associated criteria were established in the Bay of Quinte Stage 2 RAP report to assess the status of the 'Degradation of Fish and Wildlife Populations' impaired beneficial use:

1. A diverse and stable fish community structure;
2. A wetland fish community reflective of an unimpaired coastal wetland habitat;
3. Healthy coastal wetland amphibian populations;
4. Healthy coastal wetland breeding bird populations; and
5. Shoreline habitat suitable for raptors.

Numerous actions have been taken to improve conditions for the fish and wildlife populations of the bay. For fish populations, these actions included: changes to the commercial fishing allocations and practices; preparation and implementation of a Bay of Quinte Fisheries Management Plan; remediation initiatives to improve fish habitats; enforcement of regulations and guidelines related to development along shorelines; improved management of nutrient inputs with a significant reduction of the levels of phosphorous entering the bay; and federal and provincial legislative controls on the management of toxins.

A Management Plan to Address Wildlife Related Impairments Actions was prepared in 2007, and all recommended actions in the plan have been implemented, including: developing Natural Heritage Reports; conducting wildlife habitat and coastal wetland monitoring; enhancing communications with resource users and the public; implementing a shoreline naturalization program; establishing land securement and/or conservation easements as recommended in the Natural Heritage Strategy; and maintaining and establishing nesting platforms for osprey. The action of supporting species at risk

recovery strategies was later determined to be outside of the scope of the Remedial Action Plan (RAP).

The targets and associated criteria used to assess the status of fish and wildlife populations have all been met, according to the monitoring results reported in the five delisting criteria status reports prepared by members of the Fish and Wildlife Technical Work Group, a sub-committee which reports to the Restoration Council. The status reports are contained in Appendices F-J of this report.

The status of 'not impaired' is recommended for this beneficial use.

1.0 Introduction

This report assesses the Bay of Quinte Area of Concern impaired beneficial use 'Degradation of Fish and Wildlife Populations' and recommends, based on scientific evidence, that this beneficial use has been restored. The evidence is taken from a series of scientific reports that assess the quality of the fish and wildlife populations in the Bay of Quinte Area of Concern. The scientific reports are included within the appendices of this document.

The Bay of Quinte (BQ) was identified as an Area of Concern (AOC) by the International Joint Commission in 1985 in part because of degraded fish populations within the bay. At that time, although fish were abundant, the fish community was dominated by a few species (i.e. the fish community was not diverse) which is typical of eutrophic systems. In addition, fish habitat had been substantially altered after 200 years of settlement around the bay, which led to instability in the fish populations and a decline in fish biodiversity. In the 1990 Bay of Quinte RAP Stage 1 RAP Report, the Bay of Quinte Remedial Action Plan Coordinating Committee classified the 'Degradation of Fish and Wildlife Populations' beneficial use (BU) as being 'impaired'. This was supported by additional scientific evidence presented in the subsequent Stage 2 RAP Report (Bay of Quinte Remedial Action Plan Coordinating Committee 1993).

For the wildlife component of this beneficial use, there was no documented or anecdotal evidence of wildlife population degradation. However, it was considered important to scientifically determine the status of the wildlife populations before the beneficial use could be deemed to be 'not impaired'.

This report summarizes the five scientific reports (see Appendices F through J) on the status of the fish and aquatic wildlife populations of the Bay of Quinte. The work was completed by members of the Fish and Wildlife Technical Working Group who assessed whether those targets and criteria have been met. The report also documents the historical deterioration of the quality of fish populations and the various actions taken to improve the quality of fish and wildlife populations over the years.

2.0 Targets and Criteria for Redesignating the Impaired Beneficial Use 'Degradation of Fish and Wildlife Populations'

In 1991, the International Joint Commission identified the following redesignation guideline for the impaired beneficial use 'Degradation of Fish and Wildlife Populations':

"When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present".

Beginning in 1993, specific targets and criteria were developed for the Bay of Quinte Area of Concern by the RAP Coordinating Committee in consultation with AOC stakeholders and the public, to be able to effectively track changes in fish and wildlife populations over time. Over the years, these targets and criteria have been refined based on changing conditions and research results. A chronology of these changes is located in Appendix E. Table 2.1 lists the final targets and criteria used to assess whether fish and wildlife populations can be considered no longer impaired. For each of the five targets a

separate, stand-alone delisting criteria status report has been developed. Together, these reports document the rationale for changing the status of this beneficial use from 'impaired' to 'not impaired'.

Table 2.1 - Delisting Targets and Criteria

DELISTING TARGETS	CRITERIA	STATUS
FISH POPULATIONS		
<p>1. Fish Communities Restore the Bay of Quinte ecosystem to conditions capable of supporting a more diverse and stable community structure including a top-level predator assemblage of northern pike, smallmouth bass and walleye that existed prior to the onset of hypereutrophic conditions in the bay.</p>	<p>1A. Maintain an average Index of Biotic Integrity (IBI) score in the range of 60-80 for fish assemblages in the littoral zone (Minns et al. 1994).</p>	Achieved
	<p>1B. Achieve and maintain a proportion of piscivore biomass (PPB) in the fish community of 20% or greater (Hurley et al. 1986; Hoyle et al. 2012) in the nearshore (trapnet) and 20% or greater in the offshore (gillnet surveys) using sampling methods documented in Hoyle et al. (2012).</p>	Achieved
<p>2. Wetland Fish Communities Wetland fish community is reflective of unimpaired coastal wetland habitat.</p>	<p>The fish community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2005-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2005-2010.</p>	Achieved
WILDLIFE POPULATIONS		
<p>3. Coastal Wetland Amphibian Populations Healthy amphibian populations in the Bay of Quinte coastal wetlands.</p>	<p>The amphibian community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p>	Achieved
<p>4. Coastal Wetland Breeding Bird Populations Healthy wetland bird populations in the Bay of Quinte coastal wetlands.</p>	<p>The breeding bird community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p>	Achieved
<p>5. Shoreline Habitat for Raptors Shoreline habitat is suitable for supporting raptors.</p>	<p>The presence of nesting osprey including the successful fledging of chicks on, or near, the Bay of Quinte shoreline each year.</p>	Achieved

3.0 Historical Impacts (Fish Populations)

In 1938 for the first time, commercial fishermen encountered severe fouling of their nets with filamentous algae. By this time, municipal water treatment plants were plagued with algal related taste and odour problems. During the 1940s, the bay's highly lucrative lake herring commercial fishery collapsed. Fouling of spawning beds with filamentous algae was the suspected cause.

A further indication of a nutrient enrichment problem became evident during the 1940s and 1950s with a shift in the fish community structure from northern pike, largemouth bass and smallmouth bass to one dominated by walleye. While this shift was a welcome one in some respects, it signified a shift in community composition from sight feeders to one of non-sight feeding fish species which was an indication of more turbid water caused by increased algal stocks.

The Water Quality Board of the International Joint Commission identified the Bay of Quinte as an Area of Concern in 1985 and as having degraded fish populations. At that time although fish were abundant, the fish community was dominated by a few species, which is typical of eutrophic systems. In addition, fish habitat had been substantially altered after 200 years of settlement around the bay, which led to instability in the fish populations and the decline in fish biodiversity.



Above: Map highlighting the upper, middle and lower Bay of Quinte.

The RAP Stage 1 Report identified negative impacts on fish populations from excessive phosphorous enrichment, loss of wetlands due to shorelines being developed, an influx of invasive species and predation. Combined, these impacts had caused shifts in the fish community structure, leading to an

unbalanced fish community (i.e., the fish community is dominated by one or two species of planktivores or benthivores) (Hurley 1986).

3.1 Eutrophication

Nutrient changes in the bay have affected the plankton and benthic communities, which are sources of food for fish. The resultant impact on fish communities can be seen as the abundance and composition of their food sources change. Specific fish populations have declined, while others increased.

As settlements in the watershed expanded over time, the input of nutrients and sediments associated with erosion, land runoff, storm sewer effluent, sewage systems and industrial discharges increased. The resultant high levels of phosphorous in the bay caused increases in algal densities, shading out submerged macrophytes, with shifts toward blue-green species which are poor quality food items for the fish. Phosphorous inputs to the bay were uncontrolled until the mid-1970s when the Canadian government mandated a reduction of phosphates in detergents and imposed phosphorous controls at sewage treatment plants. Although the direct inputs of phosphorous to the bay have diminished since then, the sediment in the bay has become an internal phosphorous source due to its highly enriched condition, refluxing high amounts of phosphorus back to the water column. This internal phosphorus loading has helped to maintain the eutrophic state of the bay (Minns et al. 1986).

3.2 Land Use Changes

Fish migration and spawning routes had been blocked by dams on many of the tributaries to the bay. Natural tributary flows that maintained summer water exchanges and the 'self-cleaning capacity' of the tributaries and the bay were disrupted as a result, and natural water level fluctuations required to maintain the diversity of wetlands were permanently altered.

Fish spawning areas were silted-over as a result of de-forestation, human settlement and farming. Wetlands and low-lying areas had been dredged, drained or filled, and shoreline alterations had destroyed some critical fish habitat (Bay of Quinte Remedial Action Plan Coordinating Committee 1993).

3.3 Invasive species

The Bay of Quinte ecosystem had also been adversely influenced by invasions by non-indigenous species including common carp, Eurasian milfoil, white perch, and dreissenid (zebra and quagga) mussels. These invaders have altered the indigenous aquatic community structure and food-chain relationships.

4.0 Beneficial Use Impairments (Fish Populations)

The bay's fish community has experienced significant ecological stress associated with excessive anthropogenic nutrient input and the invasion of non-native species (Hurley and Christie 1977; Hoyle et al. 2012).

4.1 Fish Community Structure

Hyper-abundant non-native fish species, such as white perch and alewife, were the primary species in the fish community of the 1970s. After implementation of phosphorus input control measures and simultaneous winter-kills of the hyper-abundant non-native fish in the late 1970s, walleye recovered and served to restore a predator-prey balance to the fish community by the late 1980s. However, in the absence of a significant recovery of submerged aquatic vegetation in littoral areas, off-shore species (e.g. alewife and white perch) still tended to dominate, even in littoral areas. Following establishment of dreissenid mussels in the mid-1990s, water transparency increased and submerged aquatic vegetation increased significantly in littoral areas. This pivotal event led to a shift in the fish community that included an overall decline in walleye, an increase followed by a decrease in yellow perch, and dominance of centrarchids (i.e. bluegill, pumpkinseed, black crappie and largemouth bass) in the nearshore (Hoyle et al. 2012).

4.2 Commercial Fishing

The commercial fishery of the Bay of Quinte has had a long history dating back to the 1800s that has helped to shape local culture. It is a multi-species fishery that includes migratory species (e.g., lake whitefish) from Lake Ontario proper and resident species, especially yellow perch, sunfishes (pumpkinseed and bluegill), brown bullhead and the invasive white perch.

Trends over time have included declines in brown bullhead and lake whitefish harvests and increases in sunfish harvest in the upper/middle bay, and a lake whitefish harvest decline in the lower bay (OMNR 2010b). Overall, yearly harvests and the overall value of the commercial fisheries in the Bay of Quinte have declined significantly since the peak in the early 1900s.

4.3 Sports Fishing

The recreational fishery has had a shorter history than the commercial fishery, having developed in the 1950s and has been based largely on walleye. Most fishing pressure and walleye harvest occurs in the upper and middle bay but there has been some increased importance in the lower bay more recently. Angler participation peaked in 1996 at over one million hours of angling effort (OMNR 2010b). Walleye fishing success and participation in the fishery has declined in response to shifts in the Bay of Quinte ecosystem, particularly after the establishment of dreissenid mussels in the mid-1990s which resulted in increased water transparency and a significant increase of submerged aquatic vegetation in littoral areas. This pivotal event led to a major shift in the fish community, evidenced by a 75% decline in abundance of walleye young of the year, contributing to population levels being reduced to about 25% of their peak abundance. This was coincident with an increase followed by a decrease in yellow perch, and dominance of centrarchids (i.e. bluegill, pumpkinseed, black crappie and largemouth bass) in the nearshore (Hoyle et al. 2012).

5.0 Actions Undertaken to Address the Beneficial Use Impairments (Fish Populations)

5.1 Fisheries Management

By the mid-1980s, a significant recreational fishery had developed in the Bay of Quinte. A growing interest in offshore angling for trout and salmon developed in the eastern basin of Lake Ontario, as the combined effects of sea lamprey control and fish stocking resulted in substantial numbers of salmonids. Conflicts between recreational and commercial fishermen intensified as the recreational fishery expanded, especially related to incidental catch of non-target, non-commercial species in the gill net fishery. Restructuring of the commercial fishery took place in the late 1980s, and included: reducing the number of commercial harvesters; encouraging more biologically and socially acceptable harvesting methods; and use of management actions such as gill net reduction (buy-out) programs, gear experimentation and conversion, and gill netting restrictions.

Through the 1990s, the OMNRF fishery managers tried to assist the industry by adjusting the previous management programs (OMNR 2010a). Measures included increased quota allocation where stocks were improving, greater flexibility in quota transfers, realignment of unused quota within the industry and an extended fishing season where feasible.

Commercial allocations are adjusted annually through the quota system. In establishing annual quotas, OMNRF managers attempt to find an appropriate balance among biological, social, and economic considerations, within the overall objective of resource sustainability. The status of individual species/stocks of fish is the principal factor influencing quota decisions. The determination of stock status involves the review of available fisheries assessment information (e.g. index fishing, commercial catch sampling, etc.), trends in commercial harvests in proceeding years, and input and observations from the local commercial licence holders. The interests of other resource users (i.e. aboriginal, recreational and tourism interests) are also considered in broad allocation decisions.

The recreational fishery in the Bay of Quinte is currently designated within Lake Ontario Fisheries Regulations Zone 20. These regulations identify species and size of fish, as well as seasons, gear, catch and possession limits governing licenced anglers. For example, an angler with a sport licence can catch up to 4 walleye, one of which can be over 63 cm while the holder of a conservation licence can take 2 walleye one of which can be over 63 cm. The recreation fishing season for walleye in the Bay of Quinte is open from the first Saturday in May until December 31st and from January 1st to March 1st (Ontario Ministry of Natural Resources and Forestry 2014).

In recent times, less than 50 commercial fishing licences are issued annually for the upper and middle bay (Trenton to Glenora including Hay Bay - quota zone 1-3), and the lower bay (Glenora to east end Amherst Island - quota zone 1-4) (OMNR 2010a). Individual license conditions have been established that included harvest (species-specific quotas), season and gear restrictions (Smith and Edwards 2003). Upper and middle reaches of the Bay of Quinte are managed with somewhat different objectives compared to the lower bay. This was done to minimize conflict among multiple resource users in the more populated upper and middle bay region. For example, primarily only live-capture fishing gear (hoop and trap nets) and no walleye harvest is permitted in the upper and middle bay.

In 2010 the OMNRF produced the Bay of Quinte Fisheries Management Plan, which developed strategies to achieve a sustainable fisheries resource. Components of this plan include strategies for

assessment of fisheries, promotion and enforcement of fishing regulations, and improved communication and community involvement (OMNR 2010a).

5.2 Habitat Remediation

In 2007 the Bay of Quinte Restoration Council produced a Fish Habitat Management Plan for the Bay of Quinte, which outlined the current state of fish habitat and provided an overall management framework required to restore fish habitat and support the restoration of the fish populations. Components of this plan have been implemented on a yearly basis (Bay of Quinte Remedial Action Plan 2007).

Direct local actions, stewardship and education/outreach programs have been used to restore degraded habitats. These include reforestation, stream clean-up and rehabilitation, marsh restoration, and habitat compensation.

Specific remediation initiatives recently undertaken include the Big Island Marsh Improvement Project. Remediation activities included the creation of 745 metres of channels through a cattail marsh and habitat ponds, artificial shoals were constructed to establish spawning and nursery areas, and 350 metres of shoreline were naturalized in partnership with private landowners. A more complete list of habitat remediation initiatives undertaken in the Bay of Quinte Area of Concern can be found in Appendix E of this report.

5.3 Land Use Management

Fish populations have also benefited from the enforcement of regulations and guidelines prohibiting development along shorelines and the destruction of fish habitat. The four key regulations are as follows:

1. *Fisheries Act (1985)*: Section 2(1) of the federal *Fisheries Act* defines fish habitat to mean "spawning grounds and other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes". Section 35(1) states that "No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery." Section 2(2) defines 'serious harm to fish' to mean the death of fish or any permanent alteration to, or destruction of, fish habitat (S 2(2)).
2. *Conservation Authorities Act (1990)*: Conservation Authority regulations require all new development (construction/filling/site grading) to be setback at least 15 metres from the 1:100 year floodplain, or 30 metres from a wetland. Under the Regulations, no person shall:
 - Undertake development, or permit another person to undertake development in or on areas within the jurisdiction of the Conservation Authority that are subject to hazards associated with flooding, erosion, dynamic beaches, unstable slopes; or
 - Straighten, change, divert or interfere in any way with the existing channel of a river, creek, stream or watercourse or change or interfere with a wetland without the prior written approval of the Conservation Authority.
3. Local municipal zoning bylaws: prohibit the construction of buildings, structures or private sewage disposal systems within 30 metres of the existing high water mark.

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4. Provincial Policy Statement 2014 (*Planning Act*): Section 2.1 of the Ontario Provincial Policy Statement (PPS) states that development and site alteration shall not be permitted within significant wetlands or within significant coastal wetlands in ecoregions 5E, 6E and 7E – the Bay of Quinte is located within ecoregion 6E.

The PPS also indicates that development and site alteration shall not be permitted within the 120 metre adjacent lands around a provincially significant wetland, or a significant coastal wetland, unless the ecological function of the adjacent lands have been evaluated and it has been demonstrated that there will be no negative impact on the natural features or on their ecological functions.

5.4 Nutrient Management

Targeting a reduction in phosphorous inputs has been an important management direction for the Bay of Quinte. The actions that have contributed to a significant reduction of phosphorus loadings to the bay have included: phosphorus removal at the inland sewage treatment plants; conservation and best management farming practices; and a mandated reduction of industrial phosphorus discharges.

Phosphorus loads were first reduced in Canada in 1973 by federal regulations restricting the phosphate content of laundry detergent to 2.2% by weight, resulting in a drop of 55 kg-P/day to the inflow to the sewage treatment plants (BQ RAP Coordinating Committee 1993).

Beginning in the late 1970s, technologies aimed at improved nutrient removal were installed at the sewage treatment plants bordering the Bay of Quinte. From the late 1970s to the mid-1990s, phosphorus discharges from these sewage treatment plants decreased from about 160 kg-P/day to about 15 kg-P/day (BQ RAP Coordinating Committee 1993). Reduced discharges of nutrients have also been realized through the implementation of phosphorus loading limits on sewage treatment plants that discharge into the Bay of Quinte.

The implementation of a rural water quality program promoting Best Management Practices to the agricultural sector resulted in non-point source reductions of approximately 16,500 kilograms/year of phosphorus into streams draining to the Bay of Quinte between 1994 and 2002 (Tejani and Muir 2004).

5.5 Management of Toxins

The federal *Canadian Environmental Protection Act*, as well as the provincial *Environmental Protection Act*, *Ontario Water Resources Act* and *Pesticides Act* have helped to eliminate the use of lead as an additive in fuel, the use of PCBs and DDT, and have required the use of pesticides to be strictly controlled. Legislation has also contributed to the creation of stormwater management facilities and the clean-up of contaminated sites such as the former Deloro mine site, the former Domtar wood preserving plant in Trenton, CFB Trenton and correctional facilities in Millbrook (now closed) and Warkworth. Closure of the Bakelite chemical plant in Belleville, the Domtar wood preserving plant in Trenton and coal gasification plants in Belleville and Napanee have resulted in significant reductions of contaminants such as phenolic compounds, including pentachlorophenol; dioxins and furans; PCBs, including dioxin-like PCBs; and metals, including arsenic, being discharged to the bay.

6.0 Historical Status (Wildlife Populations)

Although the wildlife populations component of the beneficial use was not originally identified as 'impaired', supporting rationale for this assessment was not provided in the Stage I and II Remedial Action Plan Reports. The Bay of Quinte Restoration Council deemed it necessary to undertake an assessment of the current status of wildlife populations in order to validate the assumption of a 'not impaired' status. For this assessment, a range of species groups were selected to represent the wildlife in and around the bay. Amphibians and wetland birds were chosen to reflect the conditions of coastal wetlands and nesting raptors were chosen to reflect shoreline wildlife health. Population-based delisting criteria should not be viewed in isolation; these criteria are supported by habitat delisting criteria of the Loss of Fish and Wildlife Habitat impaired beneficial use.

Incorporating a delisting criterion for fur bearing mammals (e.g. river otter, muskrat, mink and beaver) was also considered, to round-out the overview of coastal wetland wildlife. However, data for fur bearing animals (usually trapping data) are strongly influenced by current market value and the number of trappers in an area, thus preventing the development of quantifiable delisting criteria.

A study was undertaken in 1986 to summarize the available information on the Bay of Quinte's shoreline fauna for the past 50 years (Minns et al. 1986). Although no consistent sampling of fauna had been undertaken during that period, information was available in literature supplemented by personal interviews. The study found only five obvious trends over the 50-year time span:

- 1) a reduction in the numbers of breeding ducks;
- 2) a change in the community of ducks from blue-winged teal and American black duck to mallard which was also seen across Southern Ontario;
- 3) a reduction in the numbers of offshore fish-eating birds, followed by increased visiting of double-crested cormorants and ring-billed gulls;
- 4) a slight increase in beavers since the 1930s; and
- 5) fluctuating populations of muskrats.

The conclusion was that, apart from the indirect effects of changes in food plants and lowered plant diversity, eutrophication does not appear to have greatly changed the fauna of the wetlands. Drainage, hunting, trapping and recreational traffic (i.e., boat traffic during breeding season) appear to have had the greatest impacts (Minns et al. 1986).

Furthermore, during the development of the Lake Ontario Lakewide Management Plan (LaMP) a review was undertaken of trapping and sighting information, and the findings "clearly showed that mink and otter populations in the Lake Ontario basin are healthy" and that this can be extrapolated to conclude that the habitat for mammals is healthy (United States and Canada 2006). Additionally, a contaminant study focusing on trapper-caught mink undertaken by the Environment and Climate Change Canada Canadian Wildlife Service showed that mink that were collected from within Bay of Quinte coastal wetlands or four kilometres from the bay had concentrations of PCBs and other chlorinated hydrocarbons and mercury that were far below those associated with negative reproductive effects (P. Martin, CWS unpublished data).

7.0 Actions Undertaken to Improve the Beneficial Use (Wildlife Populations)

7.1 Wildlife Population Management

In 2007, the Bay of Quinte AOC Restoration Council produced a *Management Plan to Address Wildlife Related Impairments* (Bay of Quinte Remedial Action Plan 2007a). This plan provides action-based recommendations to guide efforts to improve and protect wildlife habitat in the Area of Concern and criteria against which wildlife population criteria should be assessed. Populations have been assessed against the criteria and have been found to be not degraded (see details in Section 5 below). All recommended actions in this plan have been addressed:

Recommendation 1.1: Complete Natural Heritage Reports for areas bordering the Bay of Quinte.

The development of the Bay of Quinte RAP Natural Heritage Strategy was completed in 2014 for the six municipalities (City of Quinte West, City of Belleville, Town of Greater Napanee, Tyendinaga Township, Loyalist Township, and Municipality of Prince Edward County) and the Tyendinaga Mohawk First Nations Territory which border the Bay of Quinte. In addition to helping meet Bay of Quinte Remedial Action Plan (BQ RAP) goals and objectives, the Natural Heritage Strategy will assist municipalities in meeting the Provincial Policy Statement requirements in their official plans as they are updated. The implementation of a Natural Heritage Strategy which protects natural heritage resources along with the ecosystems and biodiversity they support will also benefit the people and communities living among them as well as the local Bay of Quinte economy.

The outcome of this has been a series of maps that can be used by the municipalities and other stakeholders to initiate public consultation and incorporate a Natural Heritage Strategy into local decision making and official plans. The model itself is a flexible, easy to use tool that can be customized using modified criteria as deemed appropriate by individual municipalities.

Recommendation 2.1: Ensure wildlife habitat monitoring is completed.

This recommendation focuses on ensuring that monitoring at the identified coastal wetland sites be continued until the Area of Concern is in an Area in Recovery phase or until it is delisted. This recommended monitoring is still on-going to ensure that the beneficial uses of the Bay of Quinte continue to be not impaired.

Recommendation 2.2: Complete the coastal wetland monitoring in the Bay of Quinte following the Durham Region Coastal Wetland Monitoring Project.

All coastal wetland monitoring follows the Durham Region Coastal Wetland Monitoring Project protocol, and coastal wetland monitoring continues on a yearly basis to confirm that the Bay of Quinte coastal wetlands continue to be some of the best quality habitat around Lake Ontario.

Recommendation 3.1: Enhance communications with resource users and the public.

Staff of the Bay of Quinte RAP Office and of partner agencies are continually promoting the information that the Bay of Quinte is a healthy ecosystem, with healthy fish and wildlife populations. Through the use of traditional media such as newspapers, magazines, radio, television and special interest publications, the RAP's message of healthy fish and wildlife populations is delivered in a targeted manner. Non-traditional media such as video screens at a local mall, hockey rink boards

and bus signage all ensure the message reaches the most diverse audience possible. Social media (Facebook, Twitter and YouTube) is used to complement other communications tools by promoting RAP messages to a wide and engaged audience. Community events and presentations spread the RAP's message and provide the opportunity to directly connect with the public and stakeholders.

Recommendation 4.1: Shoreline naturalization program incorporating outreach, education and stewardship activities.

The Bay of Quinte RAP has been promoting shoreline naturalization through the Habitat Enhancement Program, which offers funding incentives to landowners who live on waterfront properties and want to create or improve a natural shoreline or wildlife habitat, as well as buffer planting, fencing of livestock and removal of retaining walls. Examples of the projects include:

- Deseronto Naturalization Project: involved removing 77 metres of gabion stone baskets and naturalizing the shoreline by increasing the buffer zone and planting native species;
- Trenton Greenbelt Demo Site: naturalized 170 metres shoreline by increasing the buffer zone and planting native species;
- Bayside Shoreline Naturalization: 3 property owners naturalized 100 metres of shoreline by increasing the buffer zone and planting native species; and
- Big Island Marsh Improvement Project: created larger areas of open water by channeling through the large cattail stands which covered much of the marsh area. 745 metres of cattail marsh were cut with channels.

Recommendation 4.2: BQ RAP actively seek out potential land securement and/or conservation agreements with support from partner agencies.

Land securement will be guided by the information and mapping produced from the Bay of Quinte Natural Heritage Strategy, and will be considered as opportunities present themselves.

Recommendation 4.3: Maintenance of existing nesting platforms and establishment of additional nesting platforms for Bald Eagle and Osprey.

In 2008, all known osprey platforms had metal guards installed to prevent raccoons and other predators from gaining access to the nests. Since 2008, the Bay of Quinte region has annually installed several osprey platforms, all with predator guards. Consistent monitoring of platforms and nesting sites has occurred from 2008 to the present. During the monitoring program, observers record information pertaining to osprey activity and platform condition (see Appendix J).

The original delisting criteria from 2007 also included the presence of nesting bald eagles, but with the qualifier that this should not be considered a prerequisite for delisting. Bay of Quinte Remedial Action Plan staff did investigate establishing bald eagle nesting platforms within the Bay of Quinte with guidance from conservation partners, Bird Studies Canada and the *Conserving Lake Ontario and Upper St. Lawrence River Bald Eagle Habitats* report (St. Lawrence Bald Eagle Working Group 2008). Discussions with these experts confirmed that it is extremely difficult to entice bald eagles into an area by erecting nesting platforms (Mary Gunning, personal communication). In spring 2008 two bald eagle nesting platforms were installed along the Black River in Prince Edward County, but they remain vacant. Bald eagles had, however, been known to overwinter in the bay, concentrating along the shoreline of the county. They were first spotted in the 1980s and there has been a gradual increase in observations since then (Sprague 2013).

Up until 2016, there have been no confirmed sightings of bald eagles nesting around the Bay of Quinte since 1945, when they were last sighted nesting on Main Duck Island which is located just outside of the Bay of Quinte Area of Concern, in Lake Ontario (Sprague 2016). Because of this, it was concluded that no additional nest platforms would be installed and that the reference to bald eagles would be removed from the delisting criteria.

Surprisingly, though, in spring 2016, a pair of eagles was reported to be nesting in the central area of the Bay of Quinte and an immature eagle was seen flying in the area in August, 2016 (Sprague 2016). Eagles are proven indicators of environmental health and, as such, a successful breeding pair in the Bay of Quinte Area of Concern supports the recommendation that the fish and wildlife habitat and populations are no longer impaired.

Recommendation 4.4: Support species at risk recovery plans

It was determined that directly supporting species at risk recovery plans is out of the scope of the RAP process. There is specific legislation to provide for the legal protection of wildlife species and conservation of biological diversity, and the Habitat Stewardship Program (HSP) funding program which is a partnership-based conservation initiative sponsored by the Government of Canada helps Canadians protect species and their habitats. The HSP is administered by Environment and Climate Change Canada and is managed cooperatively with Parks Canada Agency and Fisheries and Oceans Canada.

8.0 Beneficial Use Assessment: Results and Recommendations

To assess the current condition of the beneficial use 'Degradation of Fish and Wildlife Populations', and to determine whether redesignation can be recommended, a team of experts (members of the Fish and Wildlife Technical Work Group) have conducted the necessary monitoring and research, and summarized their findings and recommendations in a series of status reports that address each of the five targets and associated criteria separately.

Appendices F through J of this report contain the full status reports for each of the five delisting targets and associated criteria. The following is an overview of the results of these reports. All quotes are from the relevant delisting criteria status reports.

FISH POPULATIONS – Beneficial Use Assessment

8.1 Fish Communities

Appendix F: Bay of Quinte Fish Communities Delisting Criteria Status Report. June, 2016

Authors:

- Christine (Brousseau) Boston, Aquatic Science Biologist, Fisheries and Oceans Canada
- Jim Hoyle, Assessment Biologist, Lake Ontario Assessment Unit, Ontario Ministry of Natural Resources and Forestry
- Robert G. Randall, Ph.D., Research Scientist, Central and Arctic Region, Fisheries and Oceans Canada

Fish populations in the Bay of Quinte have been recognized as degraded since the area's initial designation as an Area of Concern in 1987. Although the area supported one of the best walleye fisheries in North America, there was uncertainty around how management actions relating to phosphorus control would affect the sports fishery. Other effects of concern included the overall loss of fish habitat in terms of modified shorelines and wetland habitat and the impacts of invasive species (Bay of Quinte Remedial Action Plan Coordinating Committee 1990).

From the outset, targets sought to increase the assemblage of top-level predators, and to use an ecosystem-based approach to do so. Over time, the target related to fish communities evolved to:

'Restore the Bay of Quinte ecosystem to conditions capable of supporting a more diverse and stable community structure including a top-level predator assemblage of northern pike, smallmouth bass and walleye that existed prior to the onset of hypereutrophic conditions in the bay.'

Two criteria were established to measure achievement of this target, one dealing with average Index of Biotic Integrity, and the second with achieving and maintaining a level of piscivore biomass.

Criterion 1A: 'Maintain an average Index of Biotic Integrity (IBI) score in the range of 60-80 for fish assemblages in the littoral zone' (Minns et al. 1994).

Electrofishing surveys were conducted from 1990 to 2015, with results showing healthy littoral fish assemblages. Calculation of the Index of Biotic Integrity scores between 1999 and 2015 show Index of Biotic Integrity levels within the thresholds of Criterion 1A (IBI of 60-80) for the years 1999 to 2015. (Table 8.1)

Table 8.1. Average annual biomass, catch in numbers, species richness and IBI metrics in the upper Bay of Quinte (Trenton Harbour, Belleville Harbour and Big Bay). Source: Table 2, Fish Communities Criteria Status Report

Metric name	Mean Bay of Quinte					
	1990	1999	2007	2009	2011	2015
Biomass (kg)	8.9	3.9	5.9	8.1	6.4	7.5
Numbers	115.2	81.5	74.4	77.4	50.4	49.8
Species richness	8.2	8.1	9.0	9.6	8.8	7.6
Native species richness	6.9	7.9	8.3	8.9	8.1	7.0
Centrarchid species richness	1.8	3.3	4.0	3.4	2.8	2.5
Turbidity intolerant species richness	0.9	1.2	1.0	1.2	1.1	0.7
Non-native species richness	1.3	0.2	0.7	0.7	0.8	0.6
Native cyprinid species richness	0.6	0.8	0.6	1.2	0.9	0.5
Percent piscivore biomass	31.0	31.7	35.6	41.3	46.6	49.8
Percent generalist biomass	20.6	18.3	11.8	17.5	17.5	18.1
Percent specialist biomass	48.5	50.0	52.6	41.2	36.0	32.1
Number of native individuals	92.7	80.6	72.4	72.4	47.6	48.2
Biomass of natives (kg)	6.6	3.5	5.2	6.9	5.4	6.0
Percent non-native species by number	23.1	1.6	4.6	7.4	8.3	7.7
Percent non-native species by biomass	20.2	4.8	4.9	10.2	9.7	12.9
Percent offshore species by number	37.9	5.9	7.9	12.5	15.2	16.4
Percent offshore species by biomass	24.1	5.9	14.3	8.9	10.4	9.7
IBI	63.6	74.4	74.2	76.6	72.3	67.0
Adjusted IBI*	46.0	70.0	66.2	68.7	63.6	58.9
Sample size	19.0	51.0	55.0	52.0	36.0	42.0

Criterion 1B: 'Achieve and maintain a proportion of piscivore biomass (PPB) in the fish community of 20% or greater (Hurley et al. 1986; Hoyle et al. 2012) in the nearshore (trapnet) and 20% or greater in the offshore (gillnet surveys) using sampling methods documented in Hoyle et al. (2012)'.

The results of fish community sampling from 1969 to the present, and for near-shore and off-shore habitats, were analysed to consider criterion 1B. Over this period, considerable ecological changes have taken place in the Bay of Quinte, in effect establishing three major time stanzas:

- i. Pre-1978: pre-phosphorous control, with hyper-eutrophic conditions;
- ii. 1978-1994: post-phosphorous control, with eutrophic conditions; and
- iii. 1995-present: post-dreissenid mussel arrival.

The significant effect of these conditions on the piscivore community is demonstrated in Figure 8.1. The presence of dreissenid mussels combined with improved water quality encouraged increased levels of macrophytes, resulting in increased levels of those species who prefer clearer water and abundant macrophytes, notably Centrarchids (e.g., bass and sunfish).

The authors of the Fish Community Delisting Report conclude that:

'Currently, PPB (proportion of piscivore biomass) in the upper Bay of Quinte Fish Community is greater than 20% in both nearshore (trapnet) and offshore (gillnet) surveys. This fish community trophic structure indicator demonstrates a desirable balance between predator and prey, and achieves criterion FP-1B - degraded fish population restoration target'.

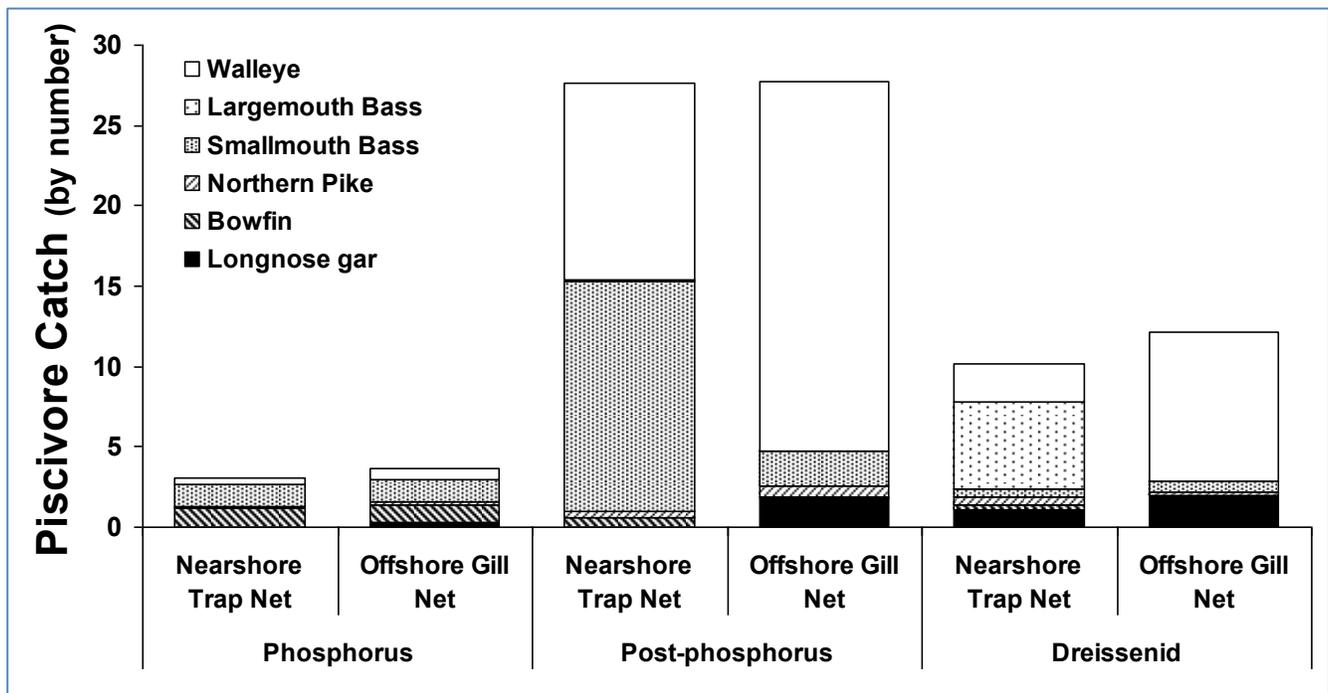


Figure 8.1. Piscivore species composition and abundance (number per net) in nearshore trap nets and offshore gill nets in three time-stanzas. (Source: Figure 7, Fish Communities Criteria Status Report)

The Index of Biotic Integrity target has been met and piscivore biomass is at or above the target of 0.2. Piscivore biomass was highest in the post-phosphorus time period but still remains high in the post-dreissenid time period although piscivore composition has changed. Abundance and biomass of fish has decreased in the bay since the introduction of dreissenid mussels. This result is not unexpected based on the reduction in phosphorous loadings to the Bay of Quinte.

Summary The conclusion drawn for the target of restoring fish communities is that this target has been met and that community structure of fish and piscivore assemblages can be considered to be 'not impaired'.

8.2 Coastal Wetland Fish Community

Appendix G: Coastal Wetland Fish Community Delisting Criteria Status Report. October 22, 2015

Authors:

- Angela Darwin, Landscape Assessment Officer, Canadian Wildlife Service, Environment and Climate Change Canada
- Greg Grabas, Habitat Ecologist, Canadian Wildlife Service, Environment and Climate Change Canada

Coastal wetlands provide important habitat for many fish species in the Bay of Quinte, but historically these species have not been the subject of extensive research. The importance of coastal wetlands has been recognized in the targets related to the Loss of Fish and Wildlife Habitat impaired beneficial use, and in the target specific to the fish communities that rely on those wetland habitats:

'Wetland fish community is reflective of unimpaired coastal wetland habitat'.

The criterion that has been established to measure target achievement uses an Index of Biotic Integrity:

'The fish community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2005-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2005-2010.'

The focus is to maintain a healthy coastal wetland fish community that is either equal to, or better, than that at other Lake Ontario coastal wetland sites, with room for natural variability which is normal in stable ecosystems.

The Bay of Quinte Remedial Action Plan Restoration Council (2007) selected 10 coastal wetlands as representative locations to test the assessment criterion. From these 10 wetlands, 14 sampling sites were monitored over the period 2005-2014. Monitoring was limited: no sampling took place in 2006 and 2007, and only up to five wetlands were monitored for each year. (Table 8.2)

Index of Biotic Integrity (IBI) scores were calculated using metrics developed for the Durham Region Coastal Wetland Monitoring Project (Environment Canada and Central Lake Ontario Conservation Authority 2004):

- Number of native species;
- Number of centrarchid species;
- Percent piscivorous biomass;
- Number of native individuals;
- Percent non-indigenous species biomass;
- Biomass of yellow perch.

The calculations to determine whether this criteria has been met requires: 1) A baseline of coastal wetland health in the bay. This baseline value was calculated from Bay of Quinte wetland data from 2005-2010. 2) The Lake Ontario coastal wetland health mean from 2005-2010. This was calculated from other Lake Ontario sites sample through other projects. 3) 2014 Lake Ontario mean condition. 4) 2014 Bay of Quinte mean condition.

By using four years of data (2005, 2008-2010) instead of just one, any inter-annual differences that result from changes in sampling location would be dampened. Further, to account for natural variability in the wetlands, fluctuations in the quality of bay is allowed. This is calculated and is called the 'threshold value'. The 2014 Bay of Quinte mean condition can be either above or at the threshold value, or at the most, two standard deviations below the threshold value, to be considered as 'not impaired'. The results of the monitoring and calculations for 2014 were:

- 2014 Bay of Quinte Representative Sites Mean IBI = 92.1
- 2014 Corrected Threshold IBI = 58.0

The IBI mean condition for Bay of Quinte coastal wetland sites is above the calculated threshold, meeting the established criterion. Table 8.2 demonstrates that the criterion has been met in each year from 2011-2014:

Table 8.2. Mean fish IBIs of Bay of Quinte (BQ), 'Other Lake Ontario sites', and corrected threshold values from 2011-2014.

Mean IBI	2011	2012	2013	2014
Bay of Quinte	91.9	93.6	90.1	92.1
'Other Lake Ontario sites'	46.4	47.7	49.2	42.0
Corrected BQ IBI threshold	62.5	63.8	65.3	58.0
Criterion met (Y/N)	Y	Y	Y	Y

Summary The 2014 Bay of Quinte mean condition is above the Bay of Quinte threshold value. The conclusions of this report indicate that the Bay of Quinte coastal wetland fish population should be considered to be 'not impaired'.

WILDLIFE POPULATIONS – Beneficial Use Assessment

8.3 Coastal Wetland Amphibian Populations

Appendix H: Coastal Wetland Amphibian Populations Delisting Criteria Status Report. October 22, 2015

Authors:

- Angela Darwin, Landscape Assessment Officer, Canadian Wildlife Service, Environment and Climate Change Canada
- Greg Grabas, Habitat Ecologist, Canadian Wildlife Service, Environment and Climate Change Canada

Coastal wetlands provide important habitat for many amphibian species in the Bay of Quinte, but historically these species have not been the subject of extensive research. The importance of coastal wetlands has been recognized in the targets related to the impaired beneficial use 'Loss of Fish and Wildlife Habitat' and in the target specific to the amphibian communities that rely on those wetland habitats:

'Healthy amphibian populations in the Bay of Quinte coastal wetlands'.

The criterion that has been established to measure target achievement uses an Index of Biotic Integrity (IBI):

'The amphibian community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010'.

To be considered 'not impaired', the amphibian populations at representative Bay of Quinte coastal wetlands should be equal to, or better than, that at other Lake Ontario sites, with room for variability which is normal in stable ecosystems.

The Bay of Quinte Remedial Action Plan Restoration Council selected 10 coastal wetlands as representative locations to test the assessment criterion. From these 10 wetlands, 14 sampling sites were monitored over the period 2006-2014. No survey data was available for Airport Creek Marsh and Lower Sucker Creek Marsh.

Amphibian (frog and toad) populations have been assessed using the Marsh Monitoring Program (MMP) protocol (Bird Studies Canada 2008, 2009). Timmermans et al. (2008) developed a method to report on the condition of calling amphibian communities in Great Lakes coastal wetlands using an Index of Biotic Integrity (IBI). This IBI used the following metrics to summarize amphibian community condition at Bay of Quinte coastal wetlands:

- Mean total species richness across survey stations in a wetland [rTOT];
- Mean species richness of woodland-associated amphibian species across survey stations in a wetland [rWOOD];
- Probability of detection of woodland-associated amphibian species across survey stations in a wetland [pWOOD].

The calculations to determine whether this criteria has been met requires: 1) A baseline of coastal water quality health in the bay. This baseline value was calculated from Bay of Quinte data from the years 2006-2010. 2) The Lake Ontario coastal wetland water quality mean, from 2006-2010. This was calculated from other Lake Ontario sites sample through other projects (minimum two years of data to be included). 3) 2014 Lake Ontario mean condition. 4) 2014 Bay of Quinte mean condition.

By using five years of data (2006-2010) instead of just one, any inter-annual differences that result from changes in sampling location would be dampened. Further, to account for natural variability in the wetlands, fluctuations in the quality of bay is allowed. This is calculated and is called the 'threshold value'. The 2014 Bay of Quinte mean condition can be either above or at the threshold value, or at the most, two standard deviations below the threshold value, to be considered as "not impaired".

The results of the monitoring and calculations for 2014 were:

- 2014 Bay of Quinte Representative Sites Mean IBI = 72.8
- 2014 Corrected Threshold IBI = 49.1

The coastal wetland amphibian mean condition for Bay of Quinte coastal wetland sites is above the calculated threshold, meeting the established criterion. Table 8.3 demonstrates that the criterion has been met in each year from 2011-2014:

Table 8.3 Mean amphibian IBIs of Bay of Quinte (BQ), 'Other Lake Ontario sites', and corrected threshold values from 2011-2014.

Mean IBI	2011	2012	2013	2014
Bay of Quinte	58.4	64.2	70.2	72.8
'Other Lake Ontario sites'	20.0	25.8	16.7	21.6
Corrected BQ IBI threshold	47.5	53.3	44.2	49.1
Criterion met (Y/N)	Y	Y	Y	Y

Summary The 2014 Bay of Quinte mean condition is above the Bay of Quinte threshold value. The conclusions of this report indicate that the Bay of Quinte coastal wetland amphibian population should be considered to be 'not impaired'.

8.4 Coastal Wetland Breeding Bird Populations

Appendix I: Coastal Wetland Breeding Bird Populations Delisting Criteria Status Report. October 22, 2015

Authors:

- Angela Darwin, Landscape Assessment Officer, Canadian Wildlife Service, Environment and Climate Change Canada
- Greg Grabas, Habitat Ecologist, Canadian Wildlife Service, Environment and Climate Change Canada

Coastal wetlands provide important habitat for many breeding marsh bird, and a target was set for breeding bird populations:

'Healthy wetland bird populations in the Bay of Quinte coastal wetlands'.

The criterion that has been established to measure target achievement uses an Index of Biotic Integrity (IBI):

'The breeding bird community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010'.

To be considered 'not impaired', the breeding bird populations at representative Bay of Quinte coastal wetlands should be equal to, or better than, that at other Lake Ontario sites, with room for variability which is normal in stable ecosystems.

The Bay of Quinte Restoration Council (2007) selected 10 coastal wetlands as representative locations to test the assessment criterion. From these 10 wetlands, 14 sampling sites were monitored over the period 2006-2014. The number of representative sites surveyed per year varies from a low of one in 2007 to a high of ten in 2012 and 2013.

The Great Lakes Coastal Wetland Consortium (GLCWC) developed an Index of Biotic Integrity (IBI) by combining the methods used by Environment Canada, Central Lake Ontario Conservation Authority (2004) and Crewe and Timmermans (2005). The Great Lakes Coastal Wetland Consortium study (Grabas et al. 2008) developed and used three metrics for this IBI:

- Mean species richness of area-sensitive marsh nesting obligates;
- Relative abundance (percent) of marsh nesting obligates;
- Relative abundance (percent) of non-aerial foragers-

The calculations to determine whether this criteria has been met requires: 1) A baseline of coastal water quality health in the bay. This baseline value was calculated from Bay of Quinte data from the years 2006-2010. 2) The Lake Ontario coastal wetland water quality mean, from 2006-2010. This was

calculated from other Lake Ontario sites sample through other projects (minimum two years of data to be included). 3) 2014 Lake Ontario mean condition. 4) 2014 Bay of Quinte mean condition.

By using five years of data (2006-2010) instead of just one, any inter-annual differences that result from changes in sampling location would be dampened. Further, to account for natural variability in the wetlands, fluctuations in the quality of bay is allowed. This is calculated and is called the 'threshold value'. The 2014 Bay of Quinte mean condition can be either above or at the threshold value, or at the most, two standard deviations below the threshold value, to be considered as "not impaired".

The results of the monitoring and calculations for 2014 were:

- 2014 Bay of Quinte Representative Sites Mean IBI = 62.5
- 2014 Corrected Threshold IBI = 30.9

The breeding bird population IBI mean condition for Bay of Quinte coastal wetland sites is above the calculated threshold, meeting the established criterion. Table 8.4 demonstrates that the criterion has been met in each year from 2011-2014:

Table 8.4. Mean marsh bird IBIs of Bay of Quinte (BQ), 'Other Lake Ontario sites', and corrected threshold values from 2011-2014.

Mean IBI	2011	2012	2013	2014
Bay of Quinte	46.0	54.8	60.3	62.5
'Other Lake Ontario sites'	39.9	45.9	47.5	40.5
Corrected BQ IBI threshold	30.3	36.3	37.9	30.9
Criterion met (Y/N)	Y	Y	Y	Y

Summary The 2014 Bay of Quinte mean condition is above the Bay of Quinte threshold value. The conclusions of this report indicate that the Bay of Quinte coastal wetland breeding bird population should be considered to be 'not impaired'.

8.5 Shoreline Habitat is Suitable for Supporting Raptors

Appendix J: Shoreline Habitat is Suitable for Supporting Raptors Delisting Criteria Status Report. May, 2016

Authors:

- Mary Gunning, Environmental Technician, Bay of Quinte Remedial Action Plan
- Brad McNevin, Watershed Science and Monitoring Manager, Quinte Conservation Association

Shoreline areas provide important habitat for raptors in the Bay of Quinte. The delisting target specific to raptors that rely on shoreline habitats is:

‘Shoreline habitat is suitable for supporting raptors’.

The criterion that has been established to measure target achievement is:

‘The presence of nesting osprey including the successful fledging of chicks on, or near, the Bay of Quinte shoreline each year’.

A Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Area of Concern (Johanson 2007) identified two action-based recommendations to support redesignating this ‘beneficial use impairment’:

- *The BQ RAP should work with its conservation partners to ensure that all osprey nesting platforms around the Bay of Quinte are maintained and have predator raccoon guards installed. Additional nesting platform sites should be encouraged where appropriate.*
- *The BQ RAP should work with its conservation partners to ensure nesting platforms (in the absence of preferred natural nesting sites) have been erected at priority sites identified in the Lake Ontario LaMP ‘Conserving Lake Ontario and Upper St. Lawrence River Bald Eagle Habitats’ (in press) or at sites identified in the Bay of Quinte using the same methodology (the Bay of Quinte was not included in the original analysis). Further, land securement activities should be promoted around priority sites for bald eagle restoration directly linking to recommendation 4.2.*

Since that time Bay of Quinte Remedial Action Plan staff have been implementing the recommendations in the wildlife impairment report. In 2008, all known osprey platforms had metal guards installed to prevent raccoons and other predators from gaining access to the nests. Since 2008, the Bay of Quinte region has annually installed several platforms. Consistent monitoring of platforms and nesting sites has occurred from 2008 to present. During the monitoring program, observers recorded information pertaining to osprey activity and platform condition. In 2015, staff initiated the monitoring of a subsample of nests to calculate the success rate of active osprey nests. Staff have also investigated potential bald eagle nesting sites within the Bay of Quinte with guidance from conservation partners and the *Conserving Lake Ontario and Upper St. Lawrence River Bald Eagle Habitats report* (St. Lawrence Bald Eagle Working Group 2008

Figure 8.2 illustrates the data collected between 1997- 2014 on known osprey nesting sites in the Bay of Quinte. In 1997, there were 21 known platforms along the Bay of Quinte shoreline and five were

active. In 2014, there were 72 known nesting sites located around the Bay of Quinte, 3 of these sites had unknown activity, while 55 of these sites were active.

In 2015, staff established a subsample of the 72 known nesting sites. 50 nests were sampled in 2015, 37 of which were active, 2 had unknown activity, and 11 were not active. From these data, it was postulated (with 95% level of confidence) that, of the 72 known nesting sites, 53 are active, 3 have unknown activity and 16 were not active.

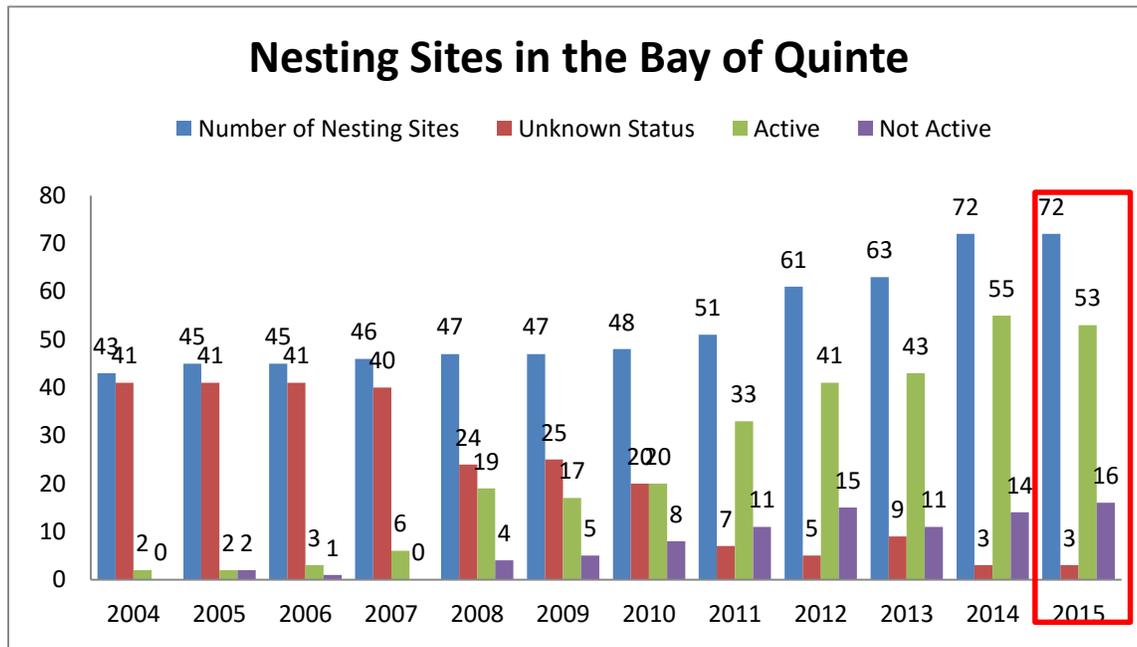


Figure 8.2. Osprey Nesting Sites in the Bay of Quinte. (Source: Shoreline Habitat is Suitable for Supporting Raptors Criteria Delisting Report)

Note: 2015 numbers are postulated based on a confidence level of 95% of a subsample of 50

Summary The *Wildlife Impairment Report* (Johanson 2007) identified that the de-listing criterion for raptor habitat had been met based on field observations and discussions with naturalists and birders. The data collected from 1997 to 2015 indicate that osprey activity in the Bay of Quinte continues to be successfully increasing. The conclusions of this report indicate that the Bay of Quinte shoreline habitat suitable for supporting raptors is ‘not impaired’.

10.0 Post-delisting Monitoring

Monitoring of fish and wildlife populations will be continued post-delisting in order ensure that the health of the bay does not digress. The RAP does not see a need to develop new, AOC-specific monitoring programs in order to accomplish this. Rather, existing programs which routinely sample the Bay of Quinte will be utilized.

Metric	Monitoring Program	BUI Criteria	Responsible Agency and Contact
Fish community trend-thru-time analysis and angler harvest estimates to evaluate targets established in the Bay of Quinte Fisheries Management Plan (FMP)	Annual Trawl sampling Open Water Angling Creel Survey – every 3 – 5 years (2015, 2019, 2023) Ice Angling Creel Survey – every 5 years 2018, 2023, 2028	No linkage to BUI criteria, only to Fisheries Management Plan	Ontario Ministry of Natural Resources and Forestry
Index of Biotic Integrity (IBI) score for fish assemblages	Electrofishing – every 5 years	Fish Communities	Fisheries and Oceans Canada
Proportion of piscivore biomass (PPB)	Annual Trap Net sampling Annual gill net sampling	Fish Communities	Ontario Ministry of Natural Resources and Forestry
Index of Biotic Integrity (IBI) for coastal wetland components	Coastal wetland monitoring – 15 locations each year – amphibian, breeding bird, submerged aquatic vegetation, water quality index, aquatic macroinvertebrate (electrofishing in 5 wetlands each year on a rotating 3 year cycle for fish to have a complete data set for the 15 coastal wetlands after 3 years)	Wetland Fish Communities Coastal Wetland Amphibian Populations Coastal Wetland Breeding Bird Populations	Quinte Conservation Association
Number of osprey chicks	Osprey nest monitoring – annual (organize volunteers, gather nesting statistics, report, repair platforms when needed, install new platforms when funding allows)	Shoreline Habitat is Suitable for Raptors	Quinte Conservation Association

11.0 Conclusions and Recommendations

This assessment of the status of the beneficial use by technical experts of the Fish and Wildlife Technical Work Group suggests that all delisting targets and criteria related to 'Degradation of Fish and Wildlife Populations' have been met. The health of the Bay of Quinte AOC is consistently above that of reference locations as well as many other AOC sites around the Canadian Great Lakes. The Bay of Quinte now supports a healthy, self-sustaining fish community which is more diverse and stable than was found in the mid-1970s, when the bay was considered to be hyper-eutrophic. The fish community includes a top-level predator assemblage of northern pike, bass and walleye. The bay's coastal wetlands support healthy and self-sustaining amphibian, bird and fish populations. In addition, the bay's shoreline habitats support healthy and self-sustaining osprey populations.

The recommendation based on this assessment report is that the 'Degradation of Fish and Wildlife Populations' beneficial use has been restored.

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APPENDICES (attached)

- A. Acronyms**
- B. Bay of Quinte Habitat Remediation Projects**
- C. Contributors, Technical Reviewers, Approvals**
- D. Communications**
- E. Evolution of Delisting Criteria and Measures**

APPENDICES (under separate cover)

- F. Fish Communities Delisting Criteria Status Report**
- G. Coastal Wetland Fish Community Delisting Criteria Status Report**
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- J. Shoreline Habitat is Suitable for Supporting Raptors Delisting Criteria Status Report**

APPENDIX A: Acronyms

AOC	Area of Concern
BQ	Bay of Quinte
BQ RAP	Bay of Quinte Remedial Action Plan
BUI	Beneficial Use Impairment
CFB	Canadian Forces Base
DDT	Dichlorodiphenyltrichloroethane (<i>pesticide</i>)
DFO	Department of Fisheries and Oceans Canada
HSP	Habitat Stewardship Program (a funding program administered by Environment Canada)
IBI	Index of Biotic Integrity
LaMP	Lakewide Management Plan
MMP	Marsh Monitoring Program
OMNR/OMNRF	Ontario Ministry of Natural Resources changed to Ontario Ministry of Natural Resources and Forestry in 2014
PCB	Polychlorinated biphenyls
PPB	Proportion of Piscivore Biomass (<i>of the total fish biomass</i>)
PPS	Ontario Provincial Policy Statement
RAP	Remedial Action Plan
SAV	Submerged Aquatic Vegetation
YOY	Young-of-the-Year (fish which have been born in the past year and have not yet reached one year of age)

APPENDIX B: Bay of Quinte Habitat Remediation Projects

Numerous remediation projects have been undertaken throughout the bay since it was designated as an Area of Concern. The following is a list of the most critical remediation projects undertaken to increase the amount of fish and wildlife habitat which in turn should result in an increase in fish and wildlife populations:

Sawquin Creek Marsh: Water levels in Lake Ontario are regulated and where naturally fluctuating water levels are controlled, wetland habitat quality is compromised. The lack of periodic flooding and lowered water levels results in the establishment of extensive stands of cattails at the expense of other plant community types mostly the meadow marsh community. This type of single species environment does not provide diverse and productive wetland habitat.

In 1992 and 1998 a project in Sawquin Creek Marsh was implemented to improve the quality of wetland habitat and address the loss of fish and wildlife habitat by increasing the amount of open water within the marsh and increasing the amount of edge habitat. These larger areas of open water were created by excavating channels through the large cattail stands which were covering much of the marsh area. The project in 1992 involved the creation of 380 metres of channels dredged through the dense cattail mat. In 1994 the channels were re-assessed and it was determined that further dredging to create wider, deeper channels and ponds was needed. Subsequently, in 1998 5.5 kilometres of sinuous channels were dredged and 4 interconnecting ponds created.

Over the past several years the monitoring in Sawquin Creek Marsh has shown extremely positive results in terms of increases in fish populations and diversity. The channels are maintaining themselves and supporting numerous fish and wildlife species, including species at risk.

Cold Creek: A tributary of the Trent River, Cold Creek was the focus of numerous environmental initiatives through the 1990s. The Cold Creek Improvement Association, in cooperation with other local associations, agencies and private sector sponsors, completed a variety of erosion control, fish habitat rehabilitation, channelization, stream bank stabilizations and pollution abatement projects.

Pine Point: The Pine Point wetland in Ameliasburgh Township was the target for a large-scale enhancement in the mid-1990s. The aging stagnant cattail marsh and shrub swamp was turned into a series of small ponds and connecting channels. The total net gain of wetland and productive habitat was more than 5 hectares.

Palliser Creek: Between 1991 and 2000 on Palliser Creek, a tributary of the Moira River, the Palliser Creek Improvement Association along with partners completed many projects to improve the quality of Palliser Creek. Projects include: planting over 15,000 trees and shrubs; constructing a low level water machinery crossing and 4 bridges; controlling erosion by installing rip rap; restricting cattle access to the stream through the installation of 3 cattle watering stations and fencing at 7 sites .

Deseronto Centennial Park: In 2012-2013, 77 metres of stone-filled gabion baskets were removed from the park shoreline. The area was converted to a naturally sloping shoreline covered with native plant species. This increased the shoreline buffer zone and improved fish and wildlife habitat. Other project components included a walking path designed to link to the Waterfront Trail, signage and various shoreline naturalization initiatives. This project was a demonstration project to show landowners environmentally-friendly alternatives to hardened shorelines.

Trenton Greenbelt Demo Site: Along the waterfront of Trenton, Ontario the park system had limited safe access for the public to use the waterfront. This project involved demonstrating the proper management of shorelines by creating stable access points and naturalizing 170 metres of shoreline by increasing the buffer zone and planting native plant species.

Bayside Shoreline Naturalization: Three property owners naturalized 100 metres of shoreline by removing a vertical concrete wall, regarding the shoreline to a natural slope, and covering it with rocks and native plant species.

Big Island Marsh Improvement Project: The Big Island Coastal Wetland (BICW) is located in Prince Edward County (PEC) on the Bay of Quinte. Historically, BICW had a large sinuous channel carving through the middle, connecting to smaller channels and numerous pockets of open water, which allowed the waters of the Bay of Quinte to flow freely around Big Island. The introduction of water level regulations in the late 1950s and the construction of a causeway to connect the mainland of PEC to Big Island have resulted in the loss of the natural open water variability and diversity in this wetland. Many of the small connecting channels have diminished, and isolated the open pockets of water from continual use by fish (visual observations). Currently, the dominant vegetation in the BICW is Cattail (*Typha sp.*), which forms a solid mat covering the majority of the wetland, limiting water movement. The historical expansion in cattail cover and lack of water flow through the wetland has assisted in clogging of the main channel and smaller channels over time. The historical and current condition of BICW has made it an interesting site for restoration and further investigation.

Restoration efforts occurred in two separate phases. Phase one was a partnership between the Bay of Quinte Restoration Council, Quinte Conservation Association, Lower Trent Region Conservation Authority, Ducks Unlimited and the Hastings and Prince Edward Stewardship Council. In late 2011 and early 2012, access to a large area of open water was created in the Big Island Marsh by channeling through a cattail stand. In total, 745 metres of channel habitat at 10 metres in width was created and provided access to approximately 2.5 acres of additional open water, critical for fish and wildlife.

Phase Two of the BICW restoration efforts started in 2012 and finished in 2014. This phase of the project created an additional 11.71 hectares of open water pond habitat and 4.61 hectares of channel habitat (4610 metres).

APPENDIX C: Contributors, Technical Reviewers, Approvals

The Bay of Quinte 'Degradation of Fish and Wildlife Populations' impaired beneficial use assessment report is a synthesis of environmental assessments undertaken by scientists to determine whether the Bay of Quinte is meeting the delisting criteria. Each of these scientists belong to the Bay of Quinte Fish and Wildlife Technical Work Group, who review all of the fish and wildlife criteria and assessment reports and then provide their expert recommendations to the Delisting Steering Committee. The Delisting Steering Committee provides an additional layer of accountability, ensuring that the appropriate documentation and data substantiate recommendations to the Bay of Quinte Restoration Council that delisting targets and criteria have been met for impaired beneficial uses. The Restoration Council is the body which oversees implementation of the Bay of Quinte Remedial Action Plan, and which ultimately recommends delisting.



Authors of Criterion Reports

REPORT TITLES and DELISTING CRITERIA	Author(s)
<p>Bay of Quinte Fish Communities Criteria Status Report, June 30, 2016</p> <p>1 A. Maintain an average Index of Biotic Integrity (IBI) score in the range of 60-80 for fish assemblages in the littoral zone (Minns et al. 1994).</p>	<p>Christine (Brousseau) Boston Aquatic Science Biologist Fisheries and Oceans Canada</p> <p>Jim Hoyle Assessment Biologist Lake Ontario Management Unit Ontario Ministry of Natural Resources and Forestry</p> <p>Robert G. Randall, Ph.D. Research Scientist, Central & Arctic Region Fisheries and Oceans Canada</p>
<p>Bay of Quinte Fish Communities Criteria Status Report, June 30, 2016</p> <p>1 B. Achieve and maintain a proportion of piscivore biomass (PPB) in the fish community of 20% or greater (Hurley et al. 1986; Hoyle et al. 2012) in the nearshore (trapnet) and 20% or greater in the offshore (gill net surveys) using sampling methods documented in Hoyle et al. (2012).</p>	<p>Christine (Brousseau) Boston Aquatic Science Biologist Fisheries and Oceans Canada</p> <p>Jim Hoyle Assessment Biologist Lake Ontario Management Unit Ontario Ministry of Natural Resources</p> <p>Robert G. Randall, Ph.D. Research Scientist, Central & Arctic Region Fisheries and Oceans Canada</p>
<p>Coastal Wetland Fish Community Criteria Status Report, October 22, 2015</p> <p>The fish community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2005-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the Area of Concern from 2005-2010.</p>	<p>Angela Darwin Landscape Assessment Officer Canadian Wildlife Service Environment and Climate Change Canada</p> <p>Greg Grabas Habitat Ecologist Canadian Wildlife Service Environment and Climate Change Canada</p>
<p>Coastal Wetland Amphibian Populations Criteria Status Report, October 22, 2015</p> <p>The amphibian community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p>	<p>Angela Darwin Landscape Assessment Officer Canadian Wildlife Service Environment and Climate Change Canada</p> <p>Greg Grabas Habitat Ecologist Canadian Wildlife Service Environment and Climate Change Canada</p>
<p>Coastal Wetland Breeding Bird Populations Criteria Status Report, October 22, 2015.</p> <p>The breeding bird community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that has been corrected for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p>	<p>Angela Darwin Great Lakes Officer Canadian Wildlife Service Environment and Climate Change Canada</p> <p>Greg Grabas Habitat Ecologist Canadian Wildlife Service</p>

<p><i>Shoreline Habitat is Suitable for Supporting Raptors Criteria Status Report, May, 2016.</i></p> <p>The presence of nesting osprey including the successful fledging of chicks on, or near, the Bay of Quinte shoreline each year.</p>	<p>Environment and Climate Change Canada</p> <p>Mary Gunning Environmental Technician Bay of Quinte Remedial Action Plan</p> <p>Brad McNevin Watershed Science and Monitoring Manager, Quinte Conservation Association</p>
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Reviewers

Each individual criteria status report and the 'Degradation of Fish and Wildlife Populations' impaired beneficial use assessment report has been reviewed and approved by members of the Fish and Wildlife Technical Work Group and the Delisting Steering Committee. Because many of the memberships overlap, below is an amalgamated list of all who have been involved in the discussion, review and approval process.

Bay of Quinte RAP Office

- Mary Gunning, Environmental Technician
- Sarah Midlane-Jones, Communications Specialist
- Shan Mugalingam Ph.D., P.Eng., BQ RAP Technical Coordinator

Cataraqui Region Conservation Authority

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Central Lake Ontario Conservation Authority

- Ian Kelsey, Aquatic Biologist
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Environment and Climate Change Canada

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Quinte Conservation Association

- Brad McNevin, Watershed Science and Monitoring Manager

St. Lawrence River Institute of Environmental Sciences

- Jeff Ridal, Ph.D., Executive Director

Voting Members and Alternates on the Restoration Council

Agency	Member	Alternate
Lower Trent Region Conservation Authority	Glenda Rodgers, Co-chair RAP Restoration Council CAO and Secretary Treasurer, Lower Trent Region Conservation Authority	Anne Anderson Special Projects Coordinator
Quinte Conservation Association	Terry Murphy, Co-chair RAP Restoration Council General Manager, Quinte Conservation Association	Brad McNevin Watershed Science and Monitoring Manager
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Ontario Ministry of Natural Resources and Forestry	Alastair Mathers Lake Ontario COA Basin Coordinator Lake Ontario Management Unit Glenora Fisheries Station	Jim Hoyle Assessment Biologist Lake Ontario Management Unit Glenora Fisheries Station
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Mohawks of the Bay of Quinte	Nicole Storms Environmental Services Officer	
CFB Trenton	Drew Craig Environmental Officer 8 Wing CFB Trenton	

Formal Approvals

November 20, 2012: Restoration Council approved proceeding with a change in status for this impaired beneficial use. It was recommended that all criteria status reports be sent to the Fish and Wildlife Technical Work Group then to the Delisting Steering Committee for final approval; then the reports would be reviewed by an outside consultant to provide a recommendation of the status of the beneficial use to the Restoration Council.

April 16, 2013: At a combined Fish and Wildlife Technical Work Group and Delisting Steering Committee meeting, all criteria status reports were approved. It was recommended to proceed with the development of a redesignation report. It was decided that instead of an outside consultant, the final assessment report and recommendation for a change in BUI status to the Restoration Council would be developed internally.

Final approval of BUI assessment report by Fish and Wildlife Technical Work Group: DATE

Final approval of BUI assessment report by Delisting Steering Committee: DATE

Final approval of BUI assessment report by Restoration Council: DATE

APPENDIX D: Communications

To be inserted

APPENDIX E: Evolution of Delisting Criteria and Measures

The criteria used for the assessment of the 'Degradation of Fish and Wildlife Populations' impaired beneficial use underwent significant changes since the RAP Stage 2 Report was produced in 1993. As new scientific information became available over time, technical experts refined the criteria so that they were: consistent with the GLWQA Annex 2; indicators of the beneficial use; not a duplication of another target or measure; measurable; and based on best-available science.

The original delisting criteria for BUI #3 and BUI #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 relied upon action-based items such as completion of Natural Heritage Studies, rather than measurable, quantifiable delisting criteria. In 2001, the Bay of Quinte RAP started a process to refine the delisting criteria that were intended to guide the development of the RAP 2001-2005 Work Plan, through consultation with Project Quinte partners. The new criteria were to be measurable and quantifiable, to be able to guide the work of the BQ RAP and to determine when the Area of Concern would be ready to be delisted.

Fish populations delisting criteria were written with consideration for the OMNRF-developed Lake Ontario nearshore fish community objectives (in the absence of Bay of Quinte specific objectives) and to address historical impairments to the fish community as outlined in the BQ RAP Stage I and II Reports.

The following shows how the criteria changed over time, between 1993 and redesignation.

REPORT	BUI OBJECTIVE or TARGET – Changes over time
<p>1993 Stage-2: Time to Act BQ RAP Coordinating Committee September, 1993</p>	<p>Restore the Bay of Quinte ecosystem to conditions capable of supporting a more diverse and stable community structure including a top-level predator assemblage of northern pike, smallmouth bass and walleye that existed prior to the onset of hypereutrophic conditions in the bay.</p>
<p>2001 Five-Year Work Plan 2001-2005 for BQ RAP Fred Stride Environmental February 2001</p>	<p>Demonstrate that key fish and wildlife species – including walleye, bass and pike – are present in numbers consistent with a stable, diverse and healthy aquatic ecosystem. Demonstrate that key indicator species for upland wetlands and forests are present and in sufficient numbers to be self-sustaining.</p>
<p>2007 Fish Habitat Management Plan for the Bay of Quinte Paul Johanson & Brad McNevin March 2007</p>	<p>FP-1: Littoral fish community is reflective of unimpaired littoral habitat. FP-2: Wetland fish community is reflective of unimpaired coastal wetland habitat. FP-3: Support species at risk recovery plans.</p>
<p>2007 A Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Paul Johanson & Brad McNevin March 2007</p>	<p>WP-1: Healthy amphibian populations in the Bay of Quinte coastal wetlands. WP-2: Healthy wetland bird populations in the Bay of Quinte coastal wetlands. WP-3: Shoreline habitat is suitable for supporting raptors. WP-4: Support species at risk recovery plans.</p>

REPORT	BUI OBJECTIVE or TARGET – Changes over time
<p>2011 Revised Criteria as recommended by the Bay of Quinte Delisting Steering Committee and Approved by the Restoration Council</p>	<p>FP-1: Restore the Bay of Quinte ecosystem to conditions capable of supporting a more diverse and stable community structure including a top-level predator assemblage of northern pike, smallmouth bass and walleye that existed prior to the onset of hypereutrophic conditions in the bay.</p> <p>FP-2: Wetland fish community is reflective of unimpaired coastal wetland habitat.</p> <p>WP-1: Healthy amphibian populations in the Bay of Quinte coastal wetlands.</p> <p>WP-2: Healthy wetland bird populations in the Bay of Quinte coastal wetlands.</p> <p>WP-3: Shoreline habitat is suitable for supporting raptors.</p>

REPORT	FISH POPULATIONS MEASURE or CRITERIA – Changes over time
<p>2001 Five-Year Work Plan 2001-2005 for BQ RAP Fred Stride Environmental (Feb)</p>	<p>Demonstrate that key fish and wildlife species are present in numbers consistent with an unimpaired ecosystem.</p> <p>Demonstrate that walleye, bass and pike populations are all self-producing and that none of these species dominate the fish community.</p> <p>Demonstrate that targeted fish and wildlife species are healthy, abundant and self-sustaining in the Bay of Quinte area given the impact and influence of key factors such as habitat availability, habitat features (e.g. impacts of eutrophication, impacts of zebra mussels), human interactions (e.g. fish harvesting) and other factors (e.g. toxic contaminants)</p> <p>Through wildlife monitoring programs, demonstrate that key indicator species for coastal and upland wetlands and existing forests are present and in significant numbers to be self-sustaining.</p>
<p>2007 Fish Habitat Management Plan for the Bay of Quinte Paul Johanson & Brad McNevin March</p>	<p>FP-1: Maintain an adjusted littoral Index of Biotic Integrity (IBI) score of 60 or above (good or better), using the approach set out in Minns et al. (1994).</p> <p>FP-2: Using the Durham Region Coastal Wetland Monitoring methodology, achieve and maintain a fish community IBI score of 60 or above (good or better) at representative coastal wetlands in the Bay of Quinte.</p> <p>FP-3: Where appropriate and feasible, support species at risk recovery plans for those species at risk that reside in the Bay of Quinte.</p>
<p>2011 Revised Criteria as recommended by the Bay of Quinte Delisting Steering Committee and Approved by the Restoration Council</p>	<p>FP-1a: Maintain an average Index of Biotic Integrity (IBI*) score of ≥ 60 (good or excellent) for fish assemblages in the littoral zone (Minns et al. 1994). The IBI target for Quinte excludes offshore species, such as Alewife, Gizzard Shad, White Perch and Walleye (i.e., modified IBI* as described by Minns et al. 1994).</p> <p>FP-1b: Achieve and maintain a proportion of piscivore biomass (PPB) in the fish community of 20% or greater in the nearshore (trapnet surveys) and 20% or greater in the offshore (gillnet surveys) using the sampling methods documented in Hoyle et al. 2011.</p> <p>FP-2: The fish community IBI at representative Bay of Quinte coastal wetlands shall be no less than two standard deviations from the recent representative site mean that has been corrected for varying conditions in Lake Ontario outside of the AOC.</p>
<p>2012 Revised Criteria as recommended by the Bay of Quinte Delisting Steering Committee and Approved by the Restoration Council</p>	<p>FP-1a: Maintain an average Index of Biotic Integrity (IBI) score in the range of 60-80 for fish assemblages in the littoral zone (Minns et al. 1994).</p> <p>FP-1b: Achieve and maintain a proportion of piscivore biomass (PPB) in the fish community of 20% or greater (Hurley et al. 1986; Hoyle et al. 2012) in the nearshore (trapnet) and 20% or greater in the offshore (gillnet surveys) using sampling methods documented in Hoyle et al. (2012).</p> <p>FP-2: The fish community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2005-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2005-2010.</p>

REPORT	WILDLIFE POPULATIONS MEASURE or CRITERIA – Changes over time
<p>2001 Five-Year Work Plan 2001-2005 for BQ RAP Fred Stride Environmental February</p>	<p>Demonstrate that key fish and wildlife species are present in numbers consistent with an unimpaired ecosystem.</p> <p>Demonstrate that targeted fish and wildlife species are healthy, abundant and self-sustaining in the Bay of Quinte area given the impact and influence of key factors such as habitat availability, habitat features (e.g. impacts of eutrophication, impacts of zebra mussels), human interactions (e.g. fish harvesting) and other factors (e.g. toxic contaminants)</p> <p>Through wildlife monitoring programs, demonstrate that key indicator species for coastal and upland wetlands and existing forests are present and in significant numbers to be self-sustaining.</p>
<p>2007 A Management Plan to Address Wildlife Related Impairments for the Bay of Quinte Paul Johanson & Brad McNevin March</p>	<p>WP-1: Maintenance of amphibian populations and diversity at or above Great Lakes non-AOC averages (i.e. in Lake Ontario), as determined by the Marsh Monitoring Program in a suite of representative Bay of Quinte coastal wetlands.</p> <p>WP-2: Maintenance of wetland bird populations and diversity at or above Great Lakes non-AOC averages (i.e. in Lake Ontario), as determined by the Augmented MMP using the IBIs in a suite of representative BQ coastal wetlands.</p> <p>WP-3: Presence of nesting ospreys, including the successful fledging of chicks, on or near the Bay of Quinte shoreline each year.</p> <p>Maintain identified critical natural areas. Preferred criteria would also include the presence of nesting bald eagles, but this should not be considered a prerequisite for delisting.</p> <p>WP-4: Where appropriate and feasible, support species at risk recovery plans for those plants and animals that reside in the Bay of Quinte.</p> <p>Maintain existing habitats for species at risk that have been identified in recovery plans.</p>
<p>2011 Revised Criteria as recommended by the Bay of Quinte Delisting Steering Committee and Approved by the Restoration Council</p>	<p>WP-1: The amphibian community IBI at representative Bay of Quinte coastal wetlands shall be no less than two standard deviations from the recent representative site mean that has been corrected for varying conditions in Lake Ontario outside of the AOC.</p> <p>WP-2: The breeding bird community IBI at representative Bay of Quinte coastal wetlands shall be not less than two standard deviations from the recent representative site mean that has been corrected for varying conditions in Lake Ontario outside of the AOC.</p> <p>WP-3: Presence of nesting ospreys, including the successful fledging of chicks, on or near the Bay of Quinte shoreline each year.</p>

REPORT	WILDLIFE POPULATIONS MEASURE or CRITERIA – Changes over time
<p>2012 Revised Criteria as recommended by the Bay of Quinte Delisting Steering Committee and Approved by the Restoration Council</p>	<p>WP-1: The amphibian community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p> <p>WP-2: The breeding bird community IBI at representative Bay of Quinte coastal wetlands shall not be more than two standard deviations below the 2006-2010 representative site mean that accounts for varying conditions in Lake Ontario outside of the AOC from 2006-2010.</p> <p>WP-3: Presence of nesting osprey including the successful fledging of chicks on, or near, the Bay of Quinte shoreline each year.</p>