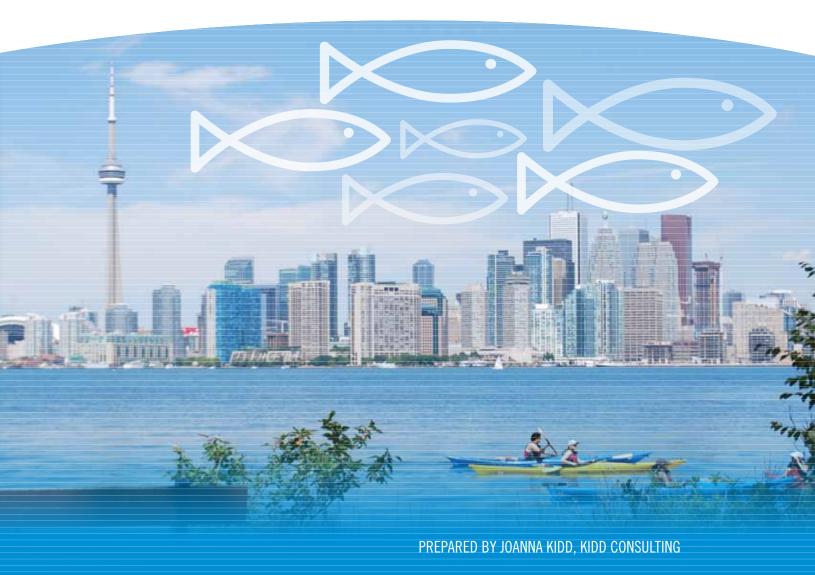


# WITHIN REACH:

2015 TORONTO AND REGION REMEDIAL ACTION PLAN PROGRESS REPORT





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# **EXECUTIVE SUMMARY**

The Toronto and Region Remedial Action Plan (RAP) is aimed at restoring the health of Toronto's waters and habitats and has been underway since 1987. This report – *Within Reach: 2015 Toronto and Region RAP Progress Report* – outlines the key actions that have been carried out and the progress that has been made since the last Progress Report was prepared in 2007. This update highlights the positive strides we have made towards delisting success.

Since the RAP began in 1987, agencies, municipalities and non-governmental organizations have worked together to improve the environmental conditions in the Toronto RAP area. Implementation of remedial and restoration actions began in 1994 and has led to significant and demonstrable improvements in the quality of water and sediment, the amount and condition of terrestrial and aquatic habitats, and the health of aquatic biota and aquatic communities. Key outcomes include:

- phosphorus levels along the waterfront are no longer an issue and meet the mesotrophic target set for the RAP (although continued work on critical wet weather flow infrastructure is needed to ensure that this does not change);
- there has been a substantial reduction in loadings of *E*. *coli* to the waterfront which has resulted in a steady decline in beach closings and the awarding of Blue Flag status to eight of Toronto's eleven waterfront beaches;
- the aesthetics of watercourses and the waterfront in the Toronto RAP area are generally considered excellent or good (meaning the water in rivers and along the waterfront is generally free of substances such as oil slicks or surface scum);
- bottom sediments along the waterfront are getting cleaner and will continue to improve as critical wet weather flow infrastructure projects are completed;
- the health of benthic communities has improved as a result of cleaner sediments;
- after decades of decline as urbanization has taken place, the amount of habitat (natural cover) is relatively stable in the TRCA jurisdiction, which includes the Toronto RAP area;
- the restoration of habitats and the creation of hundreds of hectares of terrestrial and aquatic habitat along streams and along the waterfront have improved conditions for both fish and wildlife;
- aquatic habitat improvements including the creation and restoration of habitats for migration, spawning, nursery, feeding, shelter and overwintering support an increased diversity of fish species along the waterfront and the north shore of the Inner Harbour;
- in terms of ecosystem health, the fish community along the waterfront is "fair", with a proportion of top predator fish that is approaching (or perhaps is at) a healthy level;
- levels of contaminants (mercury and PCBs) in fish continue to decline and there are no restrictions on consumption of many resident fish due to contaminants; and
- fish-eating wildlife in the Toronto RAP area are not at risk from contaminants.

Progress is evident in that five of the original eleven Beneficial Uses that were identified as "Impaired" thirty years ago have now been redesignated as "Not Impaired". This major accomplishment is covered in section 4.1 of this report.

Of course, all is not good news. Levels of chloride in the watersheds, primarily caused by the increased use of road salts during the winter, continue to rise in relation to the amount of urbanization that has taken place. In the watersheds there has been a decrease in native fish species

and an increase in pollution tolerant species. Levels of PCBs in migratory fish species and in two resident species continue to restrict consumption. Along the waterfront, fish populations are dominated by degradation tolerant species. And wildlife species continue to be adversely affected by urbanization, with continuing loss of some species.

The take home message is this: In many fundamental ways the conditions of Toronto's waters, fish, wildlife and habitats have improved since 1994, in part due to actions taken under the Remedial Action Plan. But the work is not yet completed and there is much to be done before the RAP finishes, and continued vigilance after that to preserve the gains that have been made, given continued population growth in the Toronto area.

Over the next five years, the Toronto and Region RAP will focus on actions to address the remaining four Beneficial Use Impairments that continue to be designated as "Impaired". These are:

- Eutrophication or Undesirable Algae;
- Beach Closings;
- Degradation of Fish and Wildlife Populations; and
- Loss of Fish and Wildlife Habitat.

This Report identifies the targets that need to be reached for these Beneficial Use Impairments to be re-designated as "Not Impaired", along with the key actions that need to be carried out to meet these targets. It also identifies actions that will be taken relating to the Restrictions on Fish Consumption and Degradation of Phytoplankton and Zooplankton Communities Beneficial Use Impairments. More study is needed to demonstrate that they are also "Not Impaired".

The goal – to be ready for delisting the Toronto and Region Area of Concern by 2020 – will be challenging to meet, but it is indeed, within reach.



Source: ECCC

# INTRODUCTION

The Toronto and Region Remedial Action Plan (RAP) is aimed at restoring the health of Toronto's waters and habitats. This report updates the progress that has been made since the last RAP Progress Report was prepared in 2007. The title – *Within Reach* – was chosen to communicate the fact that after almost three decades of effort to understand the many problems facing the Toronto RAP area, develop strategies to address those problems, and implement a host of protection, restoration and remedial actions, the end of the Remedial Action Plan is in sight. Since 1987, agencies, municipalities and non-governmental organizations have worked together to improve the environmental conditions in the Toronto RAP area. This has led to significant and demonstrable improvements in the quality of water and sediment, the amount and condition of terrestrial and aquatic habitats, and the health of aquatic biota and aquatic communities.

Although we aren't there yet, there is a clear path forward for completing the Toronto and Region RAP and de-listing Toronto as an Area of Concern on the Great Lakes. This report describes the path forward, how far along the path we are now, and where we need to get to. It provides updates on the environmental conditions relating to water quality, bottom sediments and the invertebrates that inhabit those sediments, fish and wildlife habitats, and fish and wildlife populations. It summarizes the key actions that have been carried out since 2007 and it measures the progress that has been made since that time. It finishes off by itemizing the key actions that need to be taken in order to be ready for de-listing by 2020.

Completing the Remedial Action Plan will require continued funding, implementation of key actions and cooperation of all partners. Accomplishing this won't be easy, but is indeed, *Within Reach*.

# 1.1. HOW WE GOT HERE: THE HISTORY OF THE TORONTO AND REGION RAP

## Designation as an Area of Concern

It was in 1985 that the International Joint Commission (IJC) identified Toronto as one of 42 areas in the Great Lakes where water quality and other ecosystem functions were badly impaired. (A 43rd was subsequently added to the list). Seventeen of these environmental "hotspots" were in Canada. In 1987, Canada and the United States agreed to work together to restore these 43 Areas of Concern (AOCs). The two parties embedded the concept of AOCs in the 1987 Great Lakes Water Quality Agreement and started to develop Remedial Action Plans across the Great Lakes. As a result of remedial work carried out, three of the 17 Canadian AOCs (Collingwood Harbour, Severn Sound and Wheatley Harbour) have been "de-listed" and two (Spanish Harbour and Jackfish Bay) have achieved the status of Area of Concern in Recovery.<sup>1</sup>

The Toronto and Region AOC (the Toronto RAP area) extends from Etobicoke Creek in the west to the Rouge River in the east and includes six major watersheds that drain into Lake Ontario. These are Etobicoke Creek, Mimico Creek, the Humber River, the Don River, Highland Creek

<sup>1</sup> An Area of Concern is "de-listed" when all objectives for the impaired beneficial uses defined in the Remedial Action Plan have been achieved (i.e., the AOC is restored). An Area of Concern in Recovery is an AOC where, based on community and government consensus, all scientifically-feasible and economically-reasonable actions have been carried out, and time is needed for the environment to recover naturally. See <u>https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=E08EA691-1</u>



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and the Rouge River. These watersheds drain an area of 2,000 square kilometres, and include 42 km of waterfront, eleven municipal jurisdictions, and over four million people. The Toronto RAP area lies within the Greater Toronto Area which is one of the fastest growing urban areas in North America. The Toronto RAP area itself has experienced high population growth over the last 30 years. Much of this growth has taken place in the headwaters areas to the west in the Region of Peel and to the north in the Region of York and, more recently, in the core of Toronto itself.

As in most of the AOCs in the Great Lakes, in 1985 Toronto was suffering from the impacts of historic industrialization and urbanization. These were manifest in poor water quality, contaminated sediments, contaminants in fish, loss of wildlife habitat and populations, and beaches that were often closed due to high levels of bacteria. The IJC developed 14 criteria to categorize the issues found in the AOCs and labelled them "Beneficial Use Impairments" (or BUIs). As shown below, eight of these were thought to apply to the Toronto RAP area, and three required further assessment to determine if there was an impairment or not.<sup>2</sup>

	Status	Status in 1989	
Beneficial Use Impairment	Impaired	Requires Further Assessment	
Restrictions on fish consumption	Х		
Degradation of benthos	Х		
Restrictions on dredging activities	Х		
Eutrophication or undesirable algae	Х		
Beach closings	Х		
Degradation of aesthetics	Х		
Degradation of fish and wildlife populations	Х		
Loss of fish and wildlife habitat	Х		
Fish tumours or other deformities		Х	
Bird or animal deformities or reproductive problems		Х	
Degradation of phytoplankton and zooplankton communities		Х	

As described in section 1.2 and detailed in section 4.1 of this report, significant progress has been made since 2007 in restoring the waters and habitats in the Toronto and Region AOC. By mid-2016, five of the original eight BUIs have been re-designated as "Not Impaired". More study is needed for two other BUIs to demonstrate that they also are "Not Impaired", and only four BUIs require extensive remedial actions.

#### Milestones in the Remedial Action Plan

A number of important milestones have been reached in the RAP, beginning with the 1989 Stage 1 *Environmental Conditions and Problem Definition* report which identified the nature and scope of issues related to water quality, fish, wildlife and habitats. The Stage 2 strategy to address the identified problems (*Clean Waters*, *Clear Choices*) was developed in 1994. It set out broad

<sup>2</sup>There were 3 other BUIs that were not an issue in the Toronto AOC. These were: tainting of fish and wildlife flavour; restrictions on drinking water or taste and odour problems; and added costs to agriculture and industry. Also, the restriction on wildlife consumption (considered by the International Joint Commission as part of "Restrictions on fish and wildlife consumption" was not considered an impaired beneficial use in the Toronto and Region AOC.

#### TABLE 1

Original status of Beneficial Use Impairments in the Toronto and Region AOC (1989) restoration targets and identified 53 key actions to restore the waters and habitats in the area. After the strategy was developed, implementation of remedial actions began. Progress on implementation has been reported on five times since 1996. The most recent of these – the 2007 Progress Report (*Moving Forward*) – contained recommendations on key actions relating to clean waters, healthy habitats, science and monitoring, sustainable watersheds, and education and involvement of the public. Progress on these actions is presented in section 4.2 of this report.

Stage	Reports
Stage 1: Problem Definition	Environmental Conditions and Problem Definition (1989)
Stage 2: Strategy Development	Strategies for Restoring Our Waters (1993) Clean Waters, Clear Choices: Recommendations for Action (1994)
Stage 3: Implementation	A Path to Clean Waters: Actions for Ecosystem Protection and Restoration (1996) Clean Waters, Clear Choices: Progress Report (1998) Clean Waters, Clear Choices: Progress Report (1999) Clean Waters, Healthy Habitats: Progress Report (2001) Moving Forward: Progress Report (2007)

## Partners in the RAP

Under the Great Lakes Water Quality Agreement (GLWQA) and the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA, 2014), Environment and Climate Change Canada (ECCC) and the Ontario Ministry of the Environment and Climate Change (MOECC) share responsibility for ensuring that progress is made in the Canadian AOCs. The 2012 amendments to the GLWQA reaffirmed the Canada-U.S. commitment to restore beneficial uses and to ultimately delist all AOCs. They also provided direction on how this is to be achieved, the geographic scope of AOCs, the need for regular reporting on progress, and other matters.

The Toronto and Region RAP is managed by representatives from ECCC, the MOECC, the Ministry of Natural Resources and Forestry (MNRF) and the Toronto and Region Conservation Authority (TRCA). Since 2002, TRCA has led the administration of the RAP under an agreement with ECCC and the MOECC.

The heart of the Remedial Action Plan is the suite of remedial actions that are contained in it: the planning, pollution reduction, conservation, restoration, monitoring, research, and education activities. The implementation of these actions is being carried out by government agencies, TRCA, the municipalities in the Toronto RAP area, watershed councils, non-governmental organizations, businesses, farmers, and individual homeowners and residents.

# 1.2. WHERE WE NEED TO GET TO

## The Process

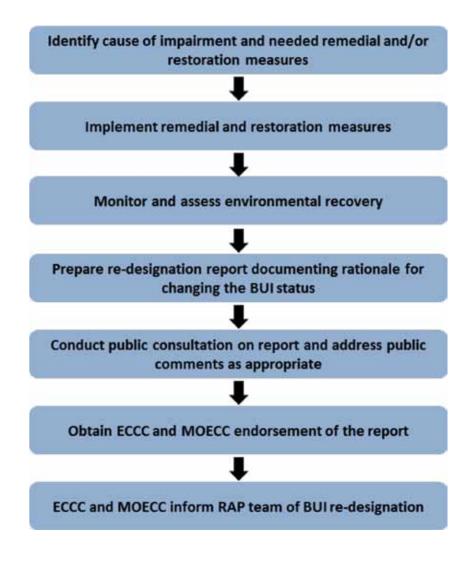
As noted above, when the Stage 1 *Environmental Conditions and Problem Definition* Report was developed in 1989, it identified that there were eight BUIs in the Toronto and Region AOC and there were three BUIs which required further assessment to determine if an impairment was present. Restoring these beneficial uses is fundamental to the RAP process. When a BUI meets established de-listing criteria, it is re-designated from "Impaired" to "Not Impaired" (see Figure 1).

## TABLE 2

Milestones in the Toronto and Region RAP

#### **FIGURE 1**

Process for Re-designating Beneficial Use Impairments



When all priority actions in the RAP have been completed and the criteria for the impaired beneficial uses defined in the RAP have been met, the RAP Team will develop a RAP Completion (Stage 3) Report. The RAP Team will then solicit review and comments from federal and provincial government agencies, municipalities, non-government agencies, First Nations, Métis, the public, and the IJC. When environmental monitoring confirms that beneficial uses have been restored in accordance with the criteria established in the RAP, ECCC with concurrence from the Province will remove Toronto and Region from the list of Great Lakes AOCs.

#### The Beneficial Use Impairments

Since Toronto and Region was designated an AOC in 1987, considerable progress has been made to counteract the impacts of urbanization, loss of habitat, and water pollution from stormwater runoff, combined sewer discharges and industrial and municipal sewage discharges. This has meant that some BUIs have been re-designated as "Not Impaired". More information on this is presented in section 4.1 of this report.

Since 2007, <u>assessments</u> on five of the eleven original BUIs that were deemed impaired or required further assessment have confirmed their re-designation as "Not Impaired". These BUIs are:

- Bird or Animal Deformities or Reproductive Problems;
- Degradation of Benthos;
- Fish Tumors or Other Deformities ;
- Restrictions on Dredging Activities; and
- Degradation of Aesthetics.

As shown in Table 3, <u>preliminary assessments</u> have been carried out on two additional BUIs. Although there is some evidence to suggest that these are close to being re-designated as "Not Impaired," more study is needed to confirm this. Actions to confirm this status are presented in section 5 of this Progress Report. These BUIs are:

- Restrictions on Fish Consumption; and
- Degradation of Phytoplankton and Zooplankton Communities.

Much of the focus in the Toronto and Region RAP is now to address the remaining four BUIs that continue to be designated as "Impaired". These are:

- Eutrophication or Undesirable Algae;
- Beach Closings;
- Degradation of Fish and Wildlife Populations; and
- Loss of Fish and Wildlife Habitat.

The key actions that are required to re-designate the remaining four BUIs are presented in section 5 of this Progress Report.

	Status in 2016		
Beneficial Use Impairment	Impaired	More Study Needed to Confirm if Not Impaired	Not Impaired
Restrictions on fish consumption		Х	
Degradation of benthos			Х
Restrictions on dredging activities			Х
Eutrophication or undesirable algae	Х		
Beach closings	Х		
Degradation of aesthetics			Х
Degradation of fish and wildlife populations	Х		
Loss of fish and wildlife habitat	Х		
Fish tumours or other deformities			Х
Bird or animal deformities or reproductive problems			Х
Degradation of phytoplankton and zooplankton communities		Х	

TABLE 3

Current status of Beneficial Use Impairments in the Toronto and Region AOC (June 2016)

# **1.3. ABOUT THIS REPORT**

This report updates the progress that has been made since 2007 in implementing the Toronto and Region Remedial Action Plan.

- Section 2 outlines the **Existing Conditions** of the surface waters, sediments and benthic organisms, habitats and wildlife in the Toronto and Region AOC.
- Section 3 provides an overview of the **Key Actions** that have taken place since 2007 in the Toronto and Region AOC. Where possible, these actions are linked to the Beneficial Use Impairments that they aim to address.
- Section 4 focuses on the **Progress** that has been made in the RAP since 2007. Progress is measured against both the Key Actions identified in the 2007 Progress Report and the BUI re-designation criteria.
- Section 5 presents the **Key Actions** that are needed to address the remaining Beneficial Use Impairments in the Toronto and Region AOC.
- Section 6 provides a **Wrap Up** of the Progress Report and describes the next steps in the RAP process.

This Progress Report is intended to document the progress that has been made in restoring the waters and habitats of the Toronto RAP area through the Remedial Action Plan process. It is not intended to be an all-encompassing State of the Environment Report, and accordingly does not consider issues such as energy use, solid waste generation, or pollutant emissions to air. It focuses specifically on the Beneficial Use Impairments that have been identified in the Remedial Action Plan process. Geographically, the focus is on the "waters of the Great Lakes" within the Toronto RAP area. The scope of the Progress Report, like the scope of the RAP itself, is guided and defined by Annex 1 of the Great Lakes Water Quality Agreement.

# 2 EXISTING CONDITIONS AND TRENDS

# 2.1. WATER QUALITY

The Toronto and Region RAP focuses primarily on water quality conditions in the "waters of the Great Lakes", reflecting the direction provided by the GLWQA as amended in 2012. Water quality in the AOC watersheds is considered where direct links can be made to impacts on the waterfront in the Toronto RAP area.

The focus of the RAP's research, monitoring and remedial actions are those pollutants that relate to current Beneficial Use Impairments. These include phosphorus, *E. coli* bacteria, heavy metals and persistent organic compounds. Information on these parameters is presented in this section of this report, along with information on chloride which is not only a pollutant of concern, but also a useful indicator of the impacts of urbanization on watercourses.

## Watersheds

TRCA assesses water quality in the watersheds through the network of stations that comprise the Regional Watershed Monitoring Program. One of the tools used to measure the health of the creeks and rivers in the Toronto RAP area is the Water Quality Index (WQI)<sup>3</sup>, which summarizes water quality conditions from multiple parameters into a single measure of water quality per site. The WQI is a representation of the number of parameters that exceed guidelines or objectives, as well as the frequency and magnitude of those exceedances. Figure 2 shows the average water quality conditions in the six watersheds in the RAP area based on the most recent WQI scores. Overall, the Humber and Rouge watersheds have the best water quality, while the Don, Highland and Mimico watersheds have more impaired water quality conditions. The water quality in Etobicoke Creek is fair. The two major watersheds that affect the Toronto and Region AOC are the Humber, in which overall water quality is good, and the more heavily urbanized Don, in which overall water quality is poor.

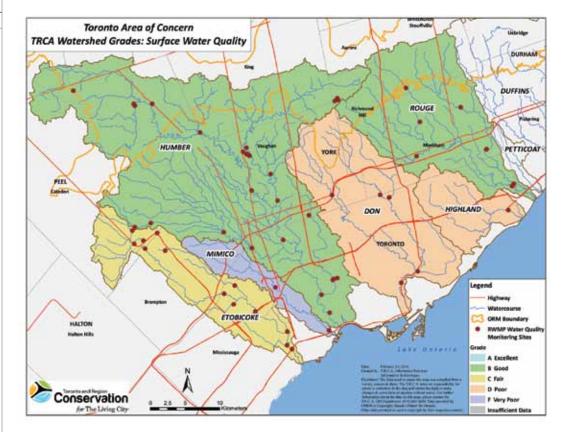
Generally, water quality conditions are directly linked to the scale of urbanization upstream of a monitoring station. Non-point sources of pollution from urbanization, such as stormwater runoff continue to be the largest contributor to poor water quality conditions within TRCA's jurisdiction. Point sources of contamination – such as discharge from wastewater treatment plants and industries – can also contribute to the degradation of water quality. Levels of certain contaminants (e.g., total phosphorus) have decreased over the past twenty years while others such as chloride (derived from road salt) show an increasing trend.

<sup>3</sup> The WQI was developed by the Canadian Council of Ministers of the Environment (CCME).

#### **FIGURE 2**

Surface water quality as a measure of the Water Quality Index (2015)

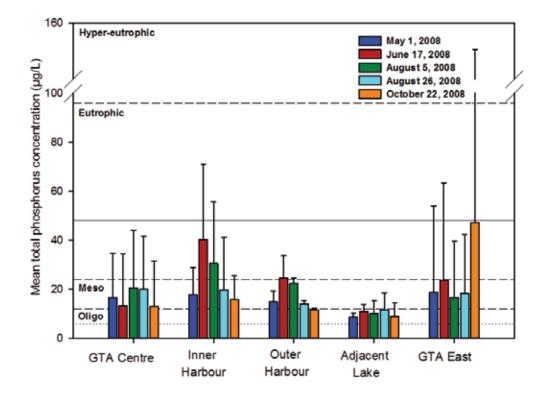
Source: TRCA



#### Waterfront

Conditions along the waterfront in Toronto are influenced both by land-based and offshore factors. Land-based factors include inputs from rivers, stormsewers and sewage treatment plants. Offshore factors include lake circulation, wind-driven currents, eddies, thermal stratification (the change in temperature of the lake at different depths), and the frequency of upwelling and downwelling events. In these upwelling and downwelling events which take place every 10 to 12 days in the summer months, cold and relatively clean offshore waters replace warmer and less clean waters along the waterfront.

Along the waterfront, water quality is poorest near the mouths of tributaries, especially during rainfall events. Water quality can also be poor in embayments with little circulation, such as the Ship Channel, and in the Inner Harbour during rainfall events, reflecting the influence of the Don River and combined sewer overflows. As illustrated in Figure 3 which shows measurements of total phosphorus concentrations along the nearshore, there can be great variation within a season due to rainfall and upwellings. Generally, however, the level of pollutants declines as one moves offshore, due to the influence of currents and the mixing of inputs with water in Lake Ontario. Most of the measurements fall within the mesotrophic classification range, which is the target for the Toronto and Region RAP.



# 2.1.1. Phosphorus

**Challenge:** Phosphorus is a key focus of the RAP because it is directly related to the Eutrophication or Undesirable Algae BUI.

Phosphorus is naturally occurring and is an essential nutrient for all living organisms. However if the concentration of phosphorus in surface waters is too high, it can lead to a proliferation of plant and algae growth that leads to reduced levels of oxygen in the water. This enrichment process – called eutrophication – can result in unsightly mats of algae. In extreme cases, low oxygen levels can lead to the death of fish.

In 1989, Eutrophication or Undesirable Algae was identified as a BUI in the Toronto and Region AOC because concentrations of phosphorus frequently exceeded the Interim Provincial Water Quality Objective (PWQO) of 20 µg/l total phosphorus and nuisance algae growth was seen in the western waterfront. At that time, local industrial, agricultural and municipal sources contributed high loadings of phosphorus to tributary and nearshore waters.

Total phosphorus concentrations have been declining throughout the Great Lakes since the 1970s as a result of remedial actions in Canada and the U.S. including legislative changes to reduce phosphorus loadings from Waste Water Treatment Plant (WWTP) effluent and other point sources. The Toronto Region is still a major contributor of phosphorus to the Western Basin of Lake Ontario.

In the Toronto and Region AOC considerable progress has been made in reducing the loadings of phosphorus. This has resulted from efforts to improve treatment of sewage, implement wet weather flow projects, reduce dry weather flows and improve stormwater management. Despite these efforts, inputs from combined sewer overflows (i.e., stormwater mixed with sewage) and storm sewers following heavy rainfall or snowmelt continue to degrade water quality in the lower portions of the Don and Humber Rivers and along the central waterfront. Excess algae growth continues to be observed along the western waterfront.

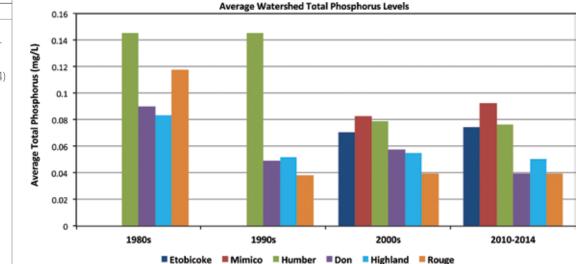
#### FIGURE 3

Mean surface concentration of Total Phosphorus measured along the north shore of Toronto and Region AOC (based on five sampling surveys conducted by MOECC between late April and October 2008)

Source: Toronto and Region RAP Preliminary Assessment of the Eutrophication or Undesirable BUI along the Toronto and Region Waterfront (August 2015)

#### Watersheds

Phosphorus levels in the watersheds that drain into the Toronto and Region AOC are measured through TRCA's Regional Watershed Monitoring Program. The PWQO for rivers and streams is different from that used for open lakes and is 30 µg/l total phosphorus. Data from 2010 to 2014 show that over this five-year period, median levels of total phosphorus exceeded the Interim PWQO at 21 out of 29 stations (72%) within the Toronto and Region AOC. Most of these stations are located in the mid to lower reaches of the Humber, Don and Rouge Rivers. In general, the concentrations of phosphorus in streams and rivers increase as one moves downstream, and concentrations tend to peak during the summer months when fertilizer use is greatest. Total phosphorus levels are typical of urban streams. As shown in Figure 4, average concentrations of phosphorus in the watersheds have been decreasing since the 1980s.



#### **FIGURE 4**

Average total phosphorus concentrations reported for Toronto and Region AOC watersheds (1980s to 2014)

Source: TRCA

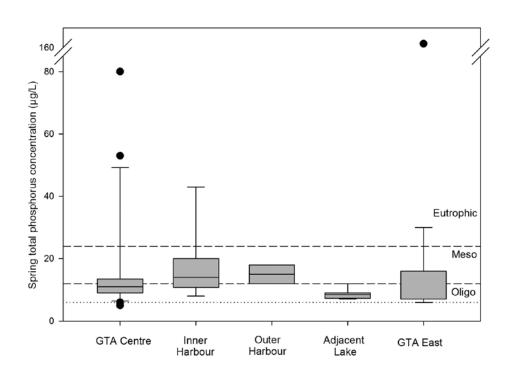
### Waterfront

The most recent assessment of nutrient pollution along the waterfront of the Toronto and Region AOC is found in the *Toronto and Region RAP Preliminary Assessment of the Eutrophication or Undesirable BUI along the Toronto and Region Waterfront*, released in August 2015. This report presents an assessment of the most recently available water quality data (1993–2013) collected by the MOECC and ECCC at long-term monitoring stations located along the Toronto and Region waterfront. It examines four parameters: spring total phosphorus concentrations, summer chlorophyll concentrations, clarity of water (secchi disc depth), and Trophic State Index.

Analysis of data over the 1993 to 2013 period show that, apart from 2000 (when extreme rainfall events occurred), median spring total phosphorus concentrations have remained within the mesotrophic ( $12-24 \mu g/l$ ) classification range – well within the target level for the RAP – and have been generally below the Interim PWQO along the waterfront of the Toronto RAP area. No persistent water clarity problems have been observed.

With respect to phosphorus, the report suggests that the Eutrophication or Undesirable Algae BUI should be re-designated as "Not Impaired" in the Toronto and Region AOC. However, because of high phosphorus loadings from point and non-point sources, there is "an inherent risk that eutrophic conditions could develop in the Toronto and Region nearshore given proper conditions". Accordingly, the report concludes that it is vital to implement major infrastructure projects including the Don River and Central Waterfront Project, planned improvements to the City's WWTPs, and the Don River Naturalization project. These enhancements will help reduce nutrient inputs to the nearshore, improve water quality, improve aquatic habitat for fish and wildlife, and reduce the risk of developing eutrophic conditions along the waterfront. Progress on these critical projects is presented in sections 3.2 and 4.2.

Within the Toronto and Region AOC excess *Cladophora* (algae) growth continues to be observed along the exposed shale bed of the lake on the western waterfront. Despite improvements on a local scale, colonization by zebra and quagga mussels has led to a concentration of phosphorus near the lake bed. On a regional scale this has led to a resurgence of *Cladophora* growth. This benthification – a shift in energy production from the pelagic (open waters) to the benthic (sediment) region – has made the nearshore area increasingly sensitive to current inputs of phosphorus throughout the western basin of Lake Ontario. Because *Cladophora* growth and beds occur at a regional scale, the issue needs to be considered at the lakewide scale, through initiatives such as the Lake Ontario Action and Management Plan (LaMP) and Nearshore Framework.



# **Trend for Phosphorus:** Levels continue to improve in the watersheds. Levels currently not an issue along the waterfront due to dilution and lake upwelling but could become one in the future without implementation of key infrastructure projects. *Cladophora* growth is a regional issue in the western basin of Lake Ontario.

# 2.1.2. Bacteria

**Challenge:** The major focus of the RAP is the quality of water at beaches and the prevention of beach closures due to pathogens in human and animal sewage which are measured using *Escherichia coli (E. coli)*.

Human sewage is a major source of bacteria in surface waters, and can come from combined sewer overflows, illegal cross-connections between sanitary and storm sewers, and septic systems. Faeces from livestock, pets and wildlife (including waterfowl) can also be significant sources of bacteria. Municipalities use *E. coli* which is an indicator of bacteria from humans and animals to measure whether recreational bathing waters are safe for the public.

#### FIGURE 5

Spring total phosphorus concentrations at five areas along the Toronto waterfront, 2008

Source: Toronto and Region RAP Preliminary Assessment of the Eutrophication or Undesirable BUI along the Toronto and Region Waterfront (August 2015)





#### Watersheds

Bacterial levels in the watersheds that drain into the Toronto and Region AOC are measured through TRCA's Regional Watershed Monitoring Program. Data from 2010 to 2014 show that over this five-year period, average counts of E. coli exceeded the PWQO of 100 E. coli per 100 ml of water at all 29 monitoring stations. Concentrations of *E. coli* increased as one moves downstream, and were found to be highly correlated with concentrations of phosphorus. Some stations were found to have consistently high median E. coli values in the past few years on Etobicoke Creek (downstream of the QEW), Mimico Creek (near Park Lawn and the Queensway), Humber River (on Black Creek near Scarlett Road and St. Clair), Don River (on the main branch at Pottery Road and on the Taylor Massey Creek west of the DVP) and Highland Creek (at Kingston Road and Colonel Danforth Trail). E. coli levels increase in urbanized areas due to combined sewer systems, illegal connections between storm and sanitary sewers, and precipitation events that overflow those sewer systems. ECCC has recently completed a bacterial source trackdown on Etobicoke Creek and the Humber River, and will be studying the Rouge River over the next couple of years in a coordinated effort to identify potential sources of human sewage. The aim of these trackdown studies is to identify sources such as sanitary sewer cross connections which may be affecting Marie Curtis Beach, Sunnyside Beach and Rouge Beach.

#### Waterfront

On the waterfront, concern about bacteria relates to the health of people swimming and engaging in watersports. Eight of Toronto's eleven beaches are now certified as Blue Flag beaches (see Table 4), which is two more than were certified in 2007. The international Blue Flag certification recognizes that these beaches meet high standards for water quality (including levels of *E. coli*), and meet other criteria such as environmental education, environmental management, safety and services. Each beach is assessed yearly to determine if it is still eligible for the designation.

The remaining non-Blue Flag beaches – Marie Curtis Park East Beach, Sunnyside Beach and Rouge Beaches – are near the mouths of creeks and rivers, and are therefore strongly affected by stormwater flows. See section 3.2.5 for more detail on actions that have been taken to improve beach water quality.

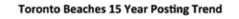
Beach	Blue Flag Status?
Marie Curtis Park East Beach	no
Sunnyside Beach	no
Hanlan's Point Beach	yes
Gibraltar Point Beach	yes
Centre Island Beach	yes
Ward's Island Beach	yes
Cherry Beach	yes
Woodbine Beaches	yes
Kew Balmy Beach	yes
Bluffer's Park Beach	yes
Rouge Beach	no

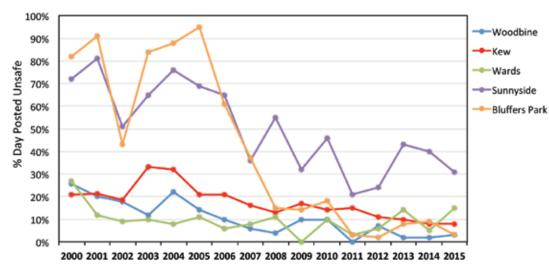
# TABLE 4

Blue Flag status of Toronto's beaches, from west to east (2015) The City of Toronto's Health Department continues to monitor bacteria levels at all beaches during the swimming season. The Department posts signs to advise swimmers when water quality conditions are considered unsafe for swimming due to high levels of *E. coli*, (i.e. when levels exceed the PWQO for recreational body contact). The RAP re-designation target for the Beach Closings BUI states that water quality should meet this guideline for at least 80% of the swimming season (June 1 to September 30). Table 5 shows the percentage of swimming days that were posted as not safe by the Medical Officer of Health (MOH) for Toronto's beaches in 2015.

Area	Beach	% of swimming days posted as "not safe" by the MOH
Etobicoke	Marie Curtis Park East Beach	37%
Western	Sunnyside Beach	31%
	Hanlan's Point Beach	5%
lalanda	Gibraltar Point Beach	2%
Islands	Centre Island Beach	8%
	Ward's Island Beach	11%
Outer Harbour	Cherry Beach	6%
Fratra	Woodbine Beaches	3%
Eastern	Kew Balmy Beach	6%
Coorborough	Bluffer's Park Beach	5%
Scarborough	Rouge Beach	18%

As illustrated in Figures 6 and 7, since 2000 there have been significant improvements in recreational water quality at Toronto's beaches. Despite differences in the amount of precipitation, there has been a steady decline in average number of days beaches were posted as being not safe for swimming, reflecting a reduction in loadings of *E. coli* as a result of remedial actions that have been taken.





#### TABLE 5

Summary of beach postings in 2015

*Source: City of Toronto Public Health Department* 

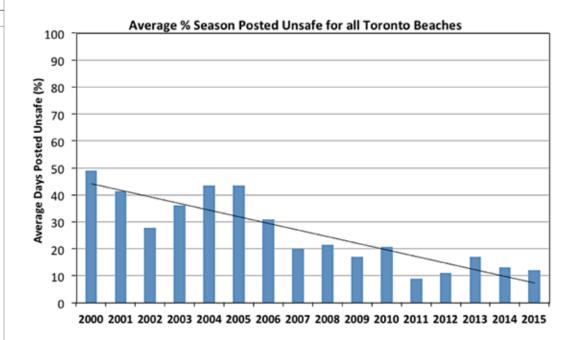
#### **FIGURE 6**

Posting trend for five Toronto beaches (2000 to 2015) *Source: ECCC* 

#### **FIGURE 7**

Average days of beach postings for all Toronto beaches (2000 to 2015)

*Source: City of Toronto Public Health Department* 



**Trend for Bacteria:** Overall steady improvement in beach water quality. Eight of eleven beaches now meet Blue Flag criteria. Levels at the 3 waterfront beaches located adjacent to watercourses do not meet the RAP target.

# 2.1.3. Heavy Metals and Persistent Organic Compounds

**Challenge:** Heavy metals and persistent organic compounds have been a concern for the Toronto and Region RAP because they relate to a number of BUIs including Degradation of Benthos, Restrictions on Dredging Activities, Fish Tumours or Other Deformities, Bird or Animal Deformities or Reproductive Problems, and Restrictions on Fish Consumption.

## **Heavy Metals**

Heavy metals such as copper, lead, aluminum, iron and zinc are naturally present in the environment at trace levels. At high concentrations, however, these substances can be toxic to aquatic life. The sources of these metals include industrial discharges, stormwater runoff and wind-blown dust.

#### Watersheds

Levels of copper, lead and zinc in the watersheds that drain into the Toronto and Region AOC are measured through TRCA's Regional Watershed Monitoring Program. Data from 2009 to 2013 are summarized in the *Regional Watershed Monitoring Program: 2013 Surface Water Quality Summary*. This report shows that over the five-year period, surface water at only 4 of 29 monitoring sites (14%) had median copper concentrations that exceeded the PWQO. Median concentrations of lead were well below the PWQO at all monitoring sites (3%). At most sites, metals are not an issue, and levels found are typical of urban streams.

From 2003 to 2009, MOECC sampled metals in all six watersheds in the Toronto and Region AOC as part of the *Toronto Tributary Toxics Assessment*. The results showed that for several metals the PWQOs were exceeded most frequently in heavily urbanized (downstream) sites as compared to more rural (upstream) sites, particularly during wet weather, but also in some cases during dry weather conditions. It is worth noting, however, that there have been some improvements in concentrations of metals in tributaries since 1999, especially with respect to copper and lead.

## Waterfront

Metals tend to be bound to particulates and therefore end up in sediments rather than the water column. Accordingly, levels in the surface water of Lake Ontario tend to be very low. The MOECC Great Lakes Reconnaissance Survey of 2004 found exceedances of the PWQO for some metals, particularly in the Keating Channel, Bathurst Street Slip and mouth of the Humber River. This was related to high concentrations of suspended solids from stormsewers and combined sewer overflows. Further information on metals in sediments is presented in section 2.2.1.

**Trend for Heavy Metals:** In the watersheds, levels of metals are not an issue at most sites. Levels are strongly related to the amount of urbanization, and tend to be higher in wet weather conditions. Some improvements have been observed in copper and lead concentrations in tributaries since 1999.

# **Persistent Organic Compounds**

Persistent organic compounds such as polychlorinated biphenyls (PCBs), mirex and dioxin are of concern because of their toxicity to aquatic life, their long life in the environment, and their ability to bioaccumulate in the tissues of benthic organisms, fish, wildlife and humans.

## Watersheds

From 2003 to 2009, MOECC sampled for persistent organic compounds in all six watersheds in the Toronto and Region AOC as part of the *Toronto Tributary Toxics Assessment*. The results showed that levels of PCBs and polycyclic aromatic hydrocarbons (PAHs) were typical of concentrations found in streams in other urban areas in the Great Lakes Region and North America. The PWQO for PAHs and PCBs was exceeded most frequently in heavily urbanized (downstream) sites as compared to more rural (upstream) sites, particularly during wet weather.

## Waterfront

Persistent organic compounds tend to be bound to particulates and therefore end up in bottom sediments rather than the water column. Accordingly, levels in the surface water of Lake Ontario tend to be very low. Information on these compounds in sediments is presented in section 2.2.1.

**Trend for Persistent Organic Compounds:** In the watersheds, levels of compounds such as PCBs and PAHs are typical of streams in urban areas, are strongly related to the amount of urbanization, and tend to be higher in wet weather conditions.

# 2.1.4. Chloride

Chloride in the rivers and streams in the Toronto and Region AOC comes mainly from the application of road salt to protect motorists from accidents in snowy and icy winter conditions. High concentrations of chloride can have adverse effects on freshwater ecosystems, soil, vegetation and wildlife. Once present in aquatic systems, chloride does not break down and cannot be removed by water treatment systems. The concentration of chloride is also a useful indicator of the impacts of urbanization. Monitoring reveals that the concentrations of chloride in watercourses have been steadily increasing since the late 1960s, as urbanization has spread in the Toronto area.

The Canadian federal government classified road salt as a toxic substance in 2001 and in 2011 the Canadian Council of Ministers of the Environment set a Canadian Water Quality Guideline for chloride to protect aquatic life. The Guideline is 120 mg/L for long-term chronic exposure and 640 mg/L for short-term acute exposure. Background concentrations of chloride in natural areas are typically below 10 mg/L

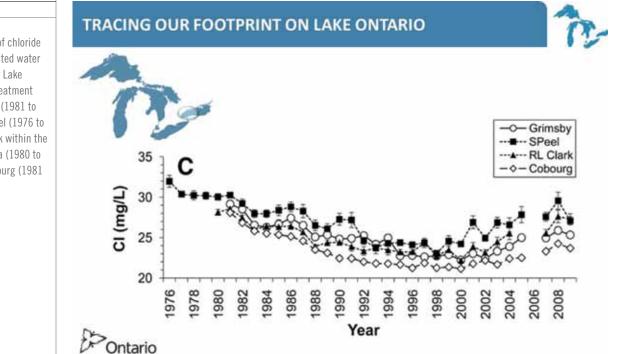
#### Watersheds

A summary of data on chloride levels in Toronto's watersheds can be found in the *Regional Watershed Monitoring Program: Surface Water Quality Summary 2006-2010.* Data show that 8 of the 38 monitoring sites (or 21%) had very high levels of chloride – average chloride concentrations that exceeded the acute guideline – while 16 sites (42%) had average concentrations that were less than the chronic guideline. In general, chloride concentrations were highest in the winter and spring and lowest in the summer and autumn. Although overall concentrations were lower in the summer and autumn, at 16 of the sites (42%) average chloride concentrations continued to exceed the chronic effects guideline in the summer and autumn months. This year-round persistence of chloride concentrations at levels above the chronic effects guideline is a change from 2007.

Recent monitoring by TRCA suggests that increased levels of chloride in Toronto watercourses are affecting benthic communities, leading to an increased abundance of organisms that are tolerant of salt and a reduced abundance of those that are sensitive to it.

#### Waterfront

Limited monitoring of chloride levels has been done in Lake Ontario, but the data suggest that levels have been increasing since the turn of the century, as a result of loading from rivers and streams. Figure 8 shows levels of chloride from untreated water collected at Toronto's R.L. Clark water treatment plant, along with three others.



**Trend for Chloride:** Levels continue to increase in the watersheds. In some places, elevated concentrations are becoming a year-round issue. Increase in levels in Lake Ontario.

## 2.1.5. Aesthetics

**Challenge:** The aesthetics target for the RAP is for waters to be free of any substance that produces a persistent objectionable unnatural deposit, unnatural colour, objectionable odours, or unnatural turbidity (for instance, oil slick or surface scum).

#### **FIGURE 8**

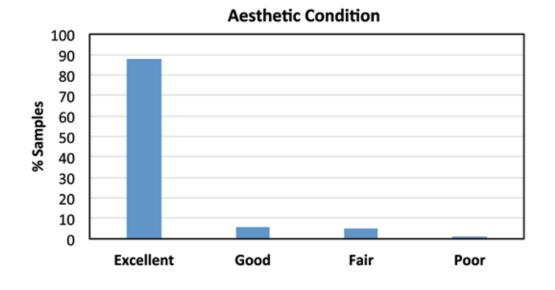
Annual average concentrations of chloride (mg/L) in untreated water collected at four Lake Ontario water treatment plants: Grimsby (1981 to 2009), South Peel (1976 to 2009), R.L. Clark within the Toronto RAP area (1980 to 2009), and Cobourg (1981 to 2009).

Source: MOECC

Degradation of Aesthetics is one of the eleven Beneficial Use Impairments that were identified in the Toronto and Region AOC in 1989. The IJC's de-listing objective for the Degradation of Aesthetic BUI was focused on oil scum and unnatural foamy water, not nuisance aquatic plants or litter. In the Toronto RAP area, the aesthetics concerns in 1989 related mainly to debris and litter along watercourses, weed growth along the western shoreline and turbidity near river mouths. The Degradation of Aesthetics BUI is challenging to assess in a quantifiable manner, in part because it is subjective – one person's "natural" shoreline can be "unattractive" to others because of the presence of woody debris, for example.

In 2011 the Toronto and Region RAP developed a semi-quantitative protocol, *Method to Assess Beneficial Use Impairment (BUI) Degradation of Aesthetics (Toronto)* to assess aesthetics in the AOC in a less subjective manner. In 2012 the aesthetics monitoring program was incorporated into TRCA's Regional Watershed Monitoring Program and monitoring for aesthetics was carried out in 2012, 2013 and 2015. In order to reduce subjective bias, technical staff members were trained to survey in a comparable and standardized manner using four aesthetic categories (debris, odour, colour and clarity of water). Monitoring was carried out throughout the watersheds and along the waterfront in both RAP and non-RAP areas, and sites were rated as excellent, good, fair or poor. A total of 305 sites were surveyed in the Toronto RAP area over the three-year period.

Out of a total of 1,663 samples collected over the three year period, only 22 samples (1%) were assessed as "Poor", or having unacceptable aesthetic condition (see Figure 9). These samples represented 12 unique sites within the Toronto RAP area (with 4 sites located in the general vicinity of the Lower Don River and Keating Channel). Of the remaining 1,647 samples, the majority were assessed as "Excellent" or "Good". The conclusion of the monitoring program was that the aesthetic condition of Toronto's watercourses and waterfront is acceptable and there does not seem to be systemic aesthetic issues. More detail on the Degradation of Aesthetics BUI can be found in section 4.1.5.



**Trend for aesthetics:** No longer an issue in the watersheds and waterfront of the Toronto RAP area. Overwhelming evidence that the Toronto and Region AOC does not have persistent and objectionable aesthetic conditions.



#### FIGURE 9

Percentage of samples by aesthetic condition (2012, 2013 and 2015)

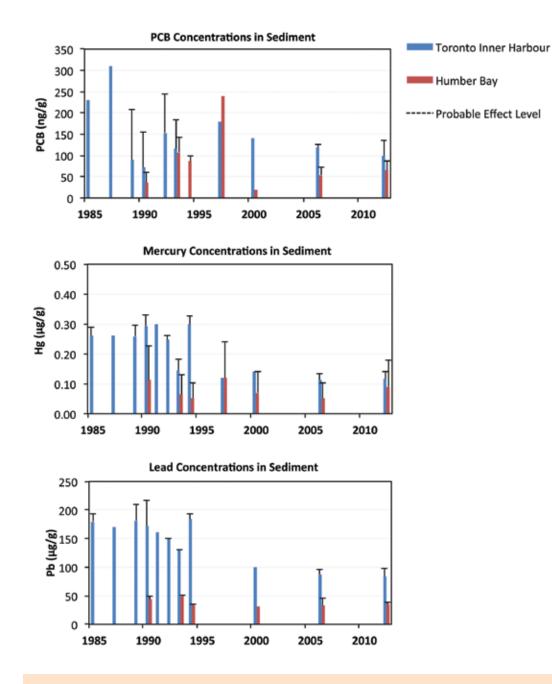
# 2.2. BOTTOM SEDIMENTS AND BENTHIC ORGANISMS

**Challenge:** The conditions of sediments and benthic organisms relate to the BUIs for the Degradation of Benthos and Restrictions on Dredging Activities.

# 2.2.1. Bottom Sediments

Studies undertaken in the 1970s showed that sediments in Toronto's Inner Harbour and Humber Bay were contaminated with a number of metals and organic compounds, while sediments in the Outer Harbour and the eastern waterfront had low concentrations of contaminants that generally did not contribute to biological effects. During the 1970s, concentrations of many of the metals in the Inner Harbour and Humber Bay exceeded the Provincial Sediment Quality Guidelines Severe Effect Levels (SEL). The sediments also had a high nutrient content, indicating organic enrichment, due mainly to runoff (storm-water, snowmelt and combined sewer overflows) from the largely urbanized areas of the two main watersheds draining to the AOC – the Humber River and the Don River.

More recent surveys carried out by ECCC and MOECC have shown that concentrations of metals and organic compounds have decreased significantly in the Inner Harbour and Humber Bay. There are now only a few contaminants that exceed the SELs in a limited number of sampling locations (see Figure 10). Elevated concentrations of some metals are found only in some of the slips along the north shore of the Inner Harbour. These areas receive direct stormwater runoff and combined sewer overflow discharges; this urban runoff is likely the main source of these elevated metal concentrations. While much work has been done (and more is underway) to address stormwater management and combined sewer overflows in the Toronto RAP area (see section 3.2), loadings to the slips from stormwater drainage are expected to continue until these plans are implemented.



#### **FIGURE 10**

Concentrations of lead (Pb), mercury (Hg) and PCBs in sediments from Toronto Harbour and Humber Bay (1985 to 2012) in relation to CCME's Probable Effect Level (PEL) at which adverse biological effects can be expected to occur

Source: MOECC

**Trend for Bottom Sediments:** Overall, concentrations of metals and organic compounds in sediments in the Inner Harbour and Humber Bay continue to decrease. Elevated concentrations of some metals are found only in some of the slips in the Central Waterfront. Implementation of key wet weather flow projects will further improve conditions.

# 2.2.2. Benthic Communities

The benthic (or bottom-dwelling) organisms in our rivers, streams and the lake are a vital part of the aquatic food web. Benthic invertebrates such as molluscs, crayfish, worms, insects and snails provide food for many forage fish and play important roles in productivity and the cycling of nutrients. Benthic organisms are also good indicators of water quality. Some benthic species are pollution-tolerant; others are sensitive to pollution and cannot survive in areas where water or sediment quality is poor. In general, the greater the number of species present, the healthier the benthic community.

One method to determine whether benthic invertebrates are being affected by sediment-bound contaminants is to carry out a benthic community assessment. This involves studying the abundance and diversity of sediment-dwelling organisms in areas where sediment contamination is a concern and comparing the results with organisms in an appropriate reference area to allow a determination of whether the sediment of concern is toxic.

#### Watersheds

Benthic communities in watersheds within the AOC show effects that are due to urbanization, particularly the effects of increased imperviousness in the urban landscape, rather than the effects of contaminants. As urbanization of the Toronto area proceeds, these effects are expected to continue. Local initiatives to improve habitat quality, such as the restoration of forest cover, are expected to result in local improvements in benthic community structure, but these will be limited to confined reaches. These communities will also be constrained by the physical conditions in watercourses, and in many cases, the benthic communities that become established will represent the best that can be attained given the physical limitations of the habitats.

#### Waterfront

Toronto and Region RAP BUI Status Re-designation Document: Degradation of Benthos (April 2013) provides the most recent understanding of contaminant conditions in bottom sediments and the conditions of the benthic community in the Toronto and Region AOC. Agencies have conducted benthic invertebrate community assessments along the Toronto waterfront sporadically from 1971 to 2008. These biological tests show that effects due to contaminants in sediments are largely absent in habitats along the Toronto waterfront, and the main factors affecting biota relate to the physical nature of the sediments, which in many areas are largely comprised of silts. The higher nutrient levels of these silts favour benthic communities which are adapted to these conditions.

A key observation in the BUI Status Redesignation Document is that over time there has been an increase in the diversity of the major groups of organisms present in depositional environments (such as river mouths) along the waterfront. The increased number of species of oligochaetes and chironomids is a clear indicator of improvement over historical conditions where communities, particularly the Inner Harbour and Humber Bay, were characterized by very limited number of taxa known to be highly tolerant of the organically enriched conditions. Incremental changes are likely to continue to occur, but overall diversity of the benthic community will continue to be effected by the physical conditions along the waterfront, limiting communities to species that are adapted to fine sediment accumulations in depositional areas.

**Trend for Benthic Communities:** Overall, there has been an increase in diversity of benthic organisms, reflecting improved conditions of bottom sediments along the waterfront. The main factors affecting biota relate to the physical nature of depositional sediments.

# 2.3. HABITATS

**Challenge:** The extent and quality of habitat relates to the BUIs for the Loss of Fish and Wildlife Habitat and the Degradation of Fish and Wildlife Populations.

# 2.3.1. Natural Cover

Natural cover includes forests, meadow, wetlands and coastal habitats. Natural cover is important for many reasons – it holds stormwater, cleans the air, provides habitat for wildlife and provides opportunities for human recreation.





As shown in Table 6, 54% of TRCA's jurisdiction is considered to be built-up (urbanized)<sup>4</sup>. In this area, natural cover comprises only 13% of the land. Within the Greenbelt planning area however, natural cover represents 48% of the land. TRCA began collecting natural cover data using aerial photographs in 1999 and since that time have completed this exercise three times, in 2002, 2007/2008, and 2013. Analysis of these four complete data sets spanning 15 years show a relatively stable trend (23% to 26%) in what once was a rapidly declining percentage of natural cover. This is a promising trend.

However, there has been a decline in the quality of that habitat over time. As shown in Figure 11, the natural cover within the built-up area is of poor quality. This is because the natural cover is comprised of small, linear-shaped habitat patches that are surrounded by an urban matrix. In contrast, the natural cover in the Greenbelt planning zone is of higher quality with patches predominately in the fair category but also in the good category. These habitat patches are larger in size and surrounded by agricultural land use which exerts less of a negative influence than urban areas.

Dianning Area	Extent of Area		Extent of Natural Cover within the Planning Area	
Planning Area	Hectares	% of Region	Hectares	% of Planning Area
Greenbelt	77,343	31%	36,855	48%
Agricultural and Rural	20,170	8%	3,282	16%
Designated Greenfield Development Areas	17,529	7%	6,118	35%
Built-Up	134,159	54%	17,605	13%
Total	249,201	100%	63,861	26%

Type of Habitat	Extent in Hectares	% of Jurisdiction
Forest	36,382	15%
Meadow	19,252	8%
Successional	4,787	2%
Wetland	3,263	1%
Beach/Bluff	180	<1%
Total	63,861	26%

#### TABLE 6

Existing Natural Cover in the TRCA Jurisdiction by Planning Area (based on 2013 ortho imagery)

Source: TRCA

#### TABLE 7

Existing natural cover in the TRCA jurisdiction (based on 2013 ortho imagery)

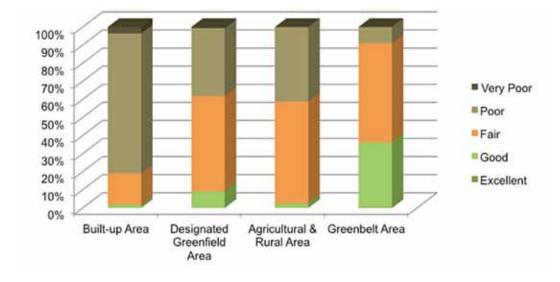
Source: TRCA

<sup>4</sup>There figures are for the entire TRCA jurisdiction, including Duffins and Carruthers watersheds, which are not within the Toronto and Region AOC.

#### **FIGURE 11**

Quality of existing natural cover in the TRCA jurisdiction by planning area (data based on 2013 ortho imagery)

Source: TRCA



**Trend for Natural Cover:** The lowest percentage and the poorest quality is in urbanized areas. Amount of natural cover is relatively stable, but quality has declined over time.

# 2.3.2. Wetlands

Wetlands are "nature's sponges" that play important roles in our watersheds. Riverine wetlands help to recharge groundwater, mediate stormwater flows and improve water quality. They also provide habitat for a broad range of fish, amphibians, birds and animals. Prior to European settlement, Southern Ontario had some 2.4 million hectares of wetlands, comprising about 25% of the land base. Most of these have been filled or drained as a consequence of urban, agricultural and industrial development.

One of the keys to restoring the health of the watersheds in the Toronto and Region AOC is to protect and restore the wetlands that remain, and where possible, create new ones. The target in RAP area watershed plans is 10% wetland cover.

Watershed	Percent of Watershed with Wetland Cover
Etobicoke	2.3%
Mimico	0.6%
Humber	5.1%
Don	0.7%
Highland	0.6%
Rouge	5.4%

Trend for Wetlands: Continued losses partly offset by wetland creation.

# 2.3.3. Riparian Vegetation

Riparian cover refers to the forests, shrubs, meadows or wetlands that are found along the banks of rivers and streams. Riparian vegetation protects the health of watercourses in a number of ways – it improves water quality, retains stormwater, guards against erosion, provides shade that helps keep water temperatures low, and provides shelter and food for fish and wildlife.



TABLE 8

Percentage wetland cover in watersheds (2013) *Source: TRCA*  Ideally, the riparian zone includes a 30-metre buffer on both sides of a watercourse. The ideal target for watercourses in the Toronto RAP area is 100% coverage of the riparian zone with vegetation, with 75% of the vegetation being forest. In highly urbanized watersheds such as Mimico and Highland Creek, this may not be realistic to achieve. Based on 2013 ortho-photography none of the watersheds meet these targets (see Table 9). There has been a possible slight increase in percent of natural cover in the riparian zone over that reported in the 2007 RAP Progress Report.

Type of Habitat	Extent in Hectares	% of Jurisdiction
Forest	36,382	15%
Meadow	19,252	8%
Successional	4,787	2%
Wetland	3,263	1%
Beach/Bluff	180	<1%
Total	63,861	26%

**Trend for Riparian Vegetation:** Possible slight increase due to restoration efforts and regulations that protect the floodplain from development.

# 2.3.4. Aquatic Habitat

#### Watersheds

TRCA monitors aquatic habitat in the Toronto and Region AOC watersheds at a total of 150 sites, with 50 sites being monitored each year. Monitoring examines the fish community present, along with in-stream habitat, the benthic invertebrate community, water temperature, and other factors. Over time, monitoring has shown a general increase in stream temperature, increased flows during rainfall events ("flashiness"), and increased concentrations of contaminants in streams in relation to road density. Thirteen years of aquatic habitat and species data analyses show that urban development, including higher road densities, in-stream habitat modifications, and decreases in forest cover, are largely responsible for the overall decline of stream health in the region. This has been dubbed "Urban Stream Syndrome". Healthier sites are located in coldwater streams in the upper reaches of the Rouge and Humber watersheds where there are low levels of urbanization (<10%) and relatively high levels of forest (12-40%). The unhealthiest sites are located in streams surrounded by high levels of urbanization (63-100%) and low levels of forest cover (<2%). These sites also tend to have man-made modifications such as concrete-lined channels.

### Waterfront

In over 200 years of urbanization, there have been significant losses of aquatic habitat along Toronto's waterfront as a result of stonehooking (gathering stone from the nearshore for use in construction), lakefilling and other activities. In the early 20th century, the Ashbridges Bay Marsh was filled and the mouth of the Don River was straightened and channelized to form the Keating Channel in what is now the Portlands. The loss of this large 428 ha coastal wetland in Toronto and the development of Toronto Harbour negatively impacted fish and wildlife populations and is one of the reasons Toronto was listed as an AOC. Of the 835 hectares of coastal marshes that once lined the shores, only 124 hectares remain. This is found at four places – the Humber River Marshes, the Toronto Island Wetlands, the Highland Creek Wetland Complex, and the Rouge River Marshes. Although these are important and rich centres of productivity, they continue to be threatened by turbidity and the deposition of sediments.

Along the waterfront, wetland losses have been stopped due to regulation, and the construction of new wetlands has helped to reverse the trend of wetland loss. In the 1990s, over 20 hectares of new wetlands were created at Colonel Sam Smith Park, the Mimico Creek Estuary, Humber Bay Park,

#### TABLE 9

Percent of riparian area with natural cover by watershed (based on 2013 orthoimagery) *Source: TRCA* 



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Toronto Bay and Bluffer's Park. In 2005, TRCA completed construction of a 7.7 hectare wetland in Tommy Thompson Park. Since 2007, a significant amount of additional habitat has been created along the waterfront (see section 3.3.4.).

These wetlands creation projects, along with the embayments created during the development of Tommy Thompson Park and the lakefill parks provide sheltered habitat where fish can spawn, forage and find protection from predators and the cold waters of Lake Ontario.

**Trend for Aquatic Habitat:** In the watersheds, aquatic habitat is greatly influenced by the degree of urbanization. Along the waterfront, the extent and quality of aquatic habitat has been improved through habitat creation and restoration.

# 2.4. FISH AND WILDLIFE

# 2.4.1. Fish Communities

**Challenge:** The abundance, diversity and health of fish communities relates to the BUIs for the Loss of Fish and Wildlife Habitat and the Degradation of Fish and Wildlife Populations.

## Watersheds

With its Regional Watershed Monitoring Program, TRCA monitors fish communities throughout the watersheds in the Toronto area. This monitoring shows a decrease in the number of native species in more urban sites as compared to more rural ones. The composition of aquatic communities has also changed, with an increase in more degradation tolerant species.

# Waterfront

TRCA has been monitoring the waterfront fish community extensively since 1989 through the Lake Ontario Monitoring Program. The purpose of the program is to collect data on species composition, abundance and distribution to track changes in fish communities over time. A variety of sampling methods are used, however TRCA employs electrofishing from boats as its principle monitoring technique. As part of this program, sampling occurs across a number of habitat types along the waterfront. Habitats are classified as open coast, embayment or rivermouth (estuary). The fish communities present among these habitat types are often very different and are highly influenced by a number of parameters that include vegetation, substrate, shoreline composition, depth, temperature and water quality.

Over one hundred species of fish are found in Lake Ontario. Of these species, 74 have been identified along the Toronto Waterfront (see Table 10).





r	NATIVE SPECIES	2007	2008	2009	2010	2011	2012	2013	2014	2015
-	Tadpole Madtom	2007	2008	2005	2010	2011	X	X	2014	2013
ł	Largemouth Bass	×	x	x	x	×	x	x	×	x
ł	Pumpkinseed	×	x	x	×	x	x	×	×	x
ł	Rock Bass	×	x	x	x	x	x	×	x	x
- ł	Shorthead Redhorse	×	x	x	×	×	x	×	^	x
es	Smallmouth Bass	x	x	x	x	x	x	×	x	x
Warm Water Species	Spotfin Shiner	×	x	^	x	^	x	^	x	x
8	White Bass	×	x	x	x	×	x	×	x	x
Ę	Black Crappie	×	x	x	x	x	x	×	×	x
ž.	Bluegill	×	x	x	x	x	x	x	x	<u> </u>
ε	Bluntnose Minnow	×	x	x	x	×	x	×	×	x
E I	Bowfin	x	x	x	x	x	x	x	x	x
s	Brown Bullhead	x	x	x	x	×	x	x	x	x
ł	Fathead Minnow	×	x	x	x	x	x	x	x	x
ł	Freshwater Drum	×	x	x	x	x	x	x	×	x
ł	Gizzard Shad	×	x	x	x	x	x	x	x	x
ŀ	Green Sunfish	×	^	^	x	<u>^</u>	x	· ^	×	x
-	Yellow Perch	×	x	x	x	×	x	×	x	x
ŀ	White Sucker									
ł		×	x	x	x	×	x	×	x	x
ŀ	Johnny Darter		X							
ŀ	Lake Chub	x		x	x	×	x		X	x
ŀ	Logperch	x	X	X	X	X	X	X	X	X
-	Longnose Gar		x	x	x	×	x	×	x	x
	Northern Pike	x	X	x	x	x	x	x	x	x
Cool Water Species	Quillback		x							
8	Rainbow Darter						x			
۳.	Spottail Shiner	х	x	x	x	×	x	x	x	х
a l	Threespine Stickleback	х	X		x		x	x	x	х
ŝ.	Walleye	x	x	x	x	×	x	x	×	х
2	American Eel	х			x		x	x	x	х
ŭ į	Banded Killifish				x	×		x	x	х
_ L	Blacknose Dace	х	X	X		x				
- L	Brook Stickleback		x	x	x	x	x	x	x	х
_ L	Common Shiner	х	x	X	x	x	x	x	X	х
- 1	Creek Chub							x	x	х
- 1	Emerald Shiner	x	x	x	x	×	x	x	x	х
_ L	Golden Shiner	х			x	×	x	x	X	x
	Brook Silverside	х	x	x	x	×	x	x	x	х
	Mottled Sculpin	х	x	x	x	x	x			
1	Round Whitefish			х	x					
Species	Trout Perch	х			x					
Species	Atlantic Salmon				x		x	×	×	
)	Burbot				x	×			x	х
[	NON-NATIVE SPECIES									
1	White Perch			х	×	×	x	×	×	х
1	Common Carp	×	x	x	x	×	x	×	×	x
1	Goldfish	×	x	x	x	×	x	×	×	x
1	Grass Carp									x
1	Rainbow Smelt	х	x	x	x	x	x	×	x	x
1	Round Goby	х	x	x	x	x	x	x	x	х
- t	Rudd								-	x
- t	Sea Lamprey	×		x	x	×				
t	Alewife	×	x	x	x	×	x	×	×	x
h	Brown Trout	×	x	x	x	x	x	x	x	x
- H	Chinook Salmon	×	x	x	x	x	x	x	x	x
ł	Coho Salmon	x	x	x	x	x	x	×	x	x
- 1	cono samon	^	~	^	~	^	A.	^	^	~
ł	Total Native Species	33	31	30	38	31	35	32	34	33
- F										
- I	Total Non Native Species	9	8	10	10	10	9	9	9	11
	Total Species Richness	42	39	40	48	41	44	41	43	44

### TABLE 10

Native and non-native fish species caught along the Toronto Waterfront (2007-2015)

Source: TRCA





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TRCA's waterfront monitoring data suggest that the abundance of fish in the Toronto Waterfront is increasing across time in all three of the habitat classifications (see Figure 12). Although it appears that catch rates between 2010 and 2015 have remained consistent, there has generally been a greater magnitude of variation during that period when compared to previous years.

#### FIGURE 12

Annual catch per 1000 seconds of electrofishing effort for all species combined for each habitat type in the Toronto Waterfront from 1989 to 2015

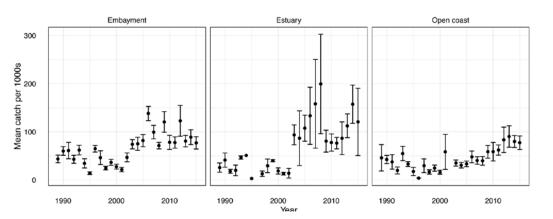
*Source: Fish Communities of the Toronto Waterfront 1989-2015 (July 2016)* 



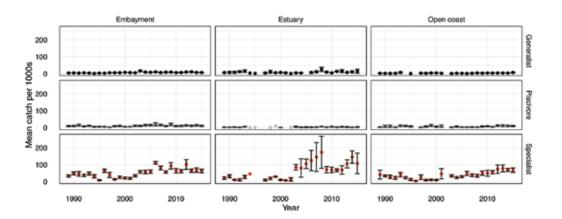
#### **FIGURE 13**

Average number of fish captured by trophic group per 1000 seconds of electrofishing effort for each habitat type

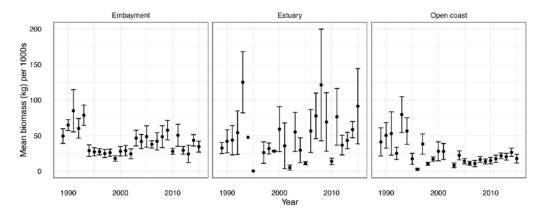
Source: Fish Communities of the Toronto Waterfront 1989-2015 (July 2016)



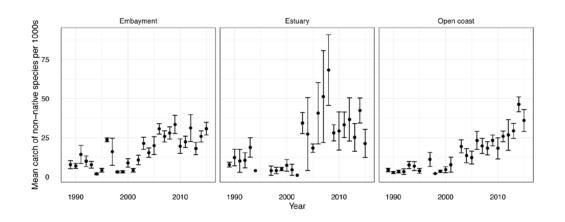
To further characterize the composition of the fish community, the catch data were displayed by trophic levels. Fish species were aggregated into three categories based on their feeding preference. These groups include generalist, specialist and piscivore species. Piscivores forage on fish, generalists can survive on a varied diet, and specialists subsist on a specific food source. TRCA's monitoring results suggest that since 2000, specialist species have increased in abundance relative to generalists and piscivores (see Figure 13). Of the specialist species, there has been a sharp increase in the abundance of common shiner, gizzard shad and spottail shiner in estuary habitats since 2010. There has also been a marked increase in abundance of native cool water specialist species such as emerald shiner and lake chub on the open coast since 2005. Similarly, catch rates of warm water native specialist species such as pumpkinseed, bluegill and rock bass have increased in embayments. For piscivores, the abundance of largemouth bass has increased in embayments, the abundance of smallmouth bass has increased in open coast sites, while the abundance of northern pike and walleye has remained consistent across all habitat types. The abundance of generalist species such as brown bullheads and common carp has increased in coastal embayments.



Although there has been an increase in the number of fishes sampled on the waterfront, there has not been a noticeable increase in biomass across various habitat types along the waterfront (see Figure 14). Biomass is a calculation of total mass of sampled fish calculated in kilograms per annum. Generally, biomass has remained consistent over time in embayment, estuary and open coast habitats. This may suggest that productivity has remained stable across habitat types.



As shown in Figure 15, since 1989 the abundance of non-native fishes such as alewife, common carp and round goby has continued to increase across all habitat types along the Toronto Waterfront.



The Lake Ontario Management Unit of MNRF also carries out fish community monitoring along the waterfront in Lake Ontario using a variety of tools including nearshore community index netting. This provides information on the abundance of fish and the composition of fish communities and how these change over time. MNRF has carried out index netting in Toronto five times between 2006 and 2014, and has analyzed the data to look at trophic structure – the proportion of total fish community represented by top-predator piscivore fish species (fish that eat fish) – and the Index of Biotic Integrity (IBI), which is a measure of ecosystem health. MNRF's monitoring allows a comparison of the fisheries along the Toronto Waterfront with those elsewhere in the Great Lakes.

### **Trophic Structure**

Having a significant and diverse piscivore population is a good indicator of the existence of a dynamic food web. Monitoring carried out by TRCA from 2007 to 2015 found that piscivores represented 21% of the total biomass of all fish caught along the waterfront. Twenty percent is the level that reflects a healthy trophic structure. Within the piscivores, 55% were salmonids (trout and salmon), 29% were northern pike, 8% were bass, and the remaining 8% were other, less prevalent species (see Figure 16).

In its community index netting which uses a different methodology, MNRF found that piscivore species represented just under 20% of the total biomass caught, which confirms TRCA's findings. Figure 17 from MNRF compares the percentage of biomass represented by piscivores for Toronto versus other less-disturbed parts of Lake Ontario (Presqui'le Bay and Prince Edward Bay.).

## FIGURE 14

Annual fish biomass (in kg) per 1000 seconds of electrofishing effort for all species combined for each habitat type in the Toronto Waterfront from 1989 to 2015

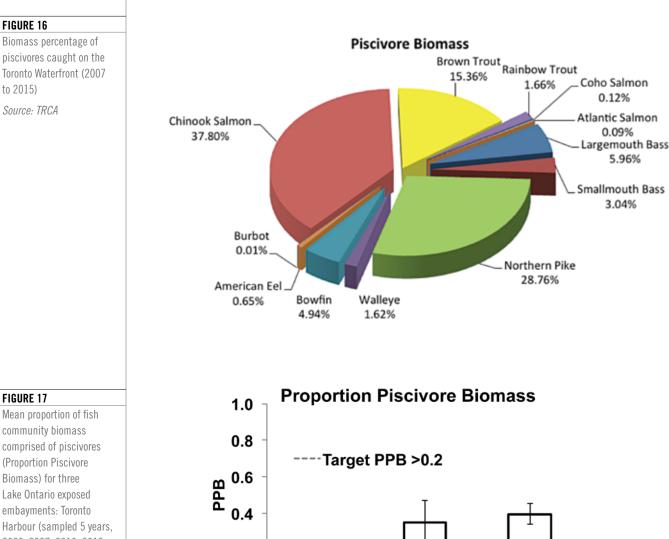
*Source: Fish Communities of the Toronto Waterfront 1989–2015 (July 2016)* 

#### **FIGURE 15**

Average number of nonnative fish species in each site type per 1000 seconds of electrofishing effort for all species combined for each habitat type in the Toronto Waterfront from 1989 to 2015

*Source: Fish Communities of the Toronto Waterfront 1989-2015 (July 2016)* 





Harbour (sampled 5 years, 2006, 2007, 2010, 2012, 2014); Presqu'ile Bay (2008, 2015); and Prince Edward Bay (2009, 2013)

Source: MNRF

## Index of Biotic Integrity

0.2

0.0

**Toronto Harbour** 

As noted above, the Index of Biotic Integrity is a measure of ecosystem health. The mean IBI value for Toronto over MNRF's five-year community index netting program was "fair". The comparison between the results in Toronto and those of other, less-disturbed Lake Ontario nearshore areas is illustrated in Figure 18.

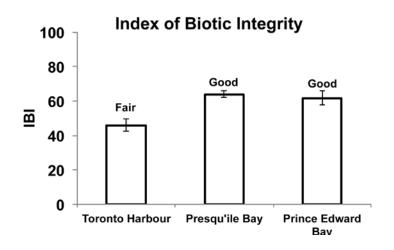
**Presqu'ile Bay** 

Prince Edward

Bay

IBI values for Toronto are driven in a negative direction by the abundance, biomass and frequency of occurrence of non-native species (especially common carp) and the proportion of the fish community comprised of generalist species (such as brown bullhead and common carp). On-going wetland and nearshore habitat restoration and creation efforts in the Toronto AOC, including the development and use of carp exclusion barriers are viewed as beneficial and may increase IBI values.

These same restoration efforts have favoured increases in the abundance of desirable top predators (piscivores), specifically northern pike and largemouth bass. In addition, the stocking of walleye (a native piscivore) was carried out in Toronto in 2012 and more is planned for the future. This may help to "jump-start" fish community restoration in the short- to medium- term, while the benefits of on-going efforts to improve water quality and restore habitats are gradually realized.



**Trend for Fish Communities:** Decrease in native species and increase in degradation tolerant species in the watersheds. Along the waterfront, populations are dominated by degradation tolerant species, Index of Biotic Integrity is "fair" and proportion of piscivores around the "healthy" classification.

# 2.4.2. Contaminants in Fish

**Challenge:** The Restrictions on Fish Consumption BUI relates to consumption restrictions due to persistent contaminants such as mercury, PCBs and mirex in fish and remains one of the major beneficial use impairments at many Great Lakes AOCs.

In 1989, the concern about consumption of fish in the Toronto and Region AOC related to the presence of specific metals and persistent organic contaminants in surface waters and sediments and their subsequent accumulation in the tissues of fish. This included compounds such as polychlorinated biphenyls (PCBs), mirex and mercury. A recent report – Assessment of Fish Consumption Beneficial Use Impairment at the Toronto and Region Area of Concern (Draft February 2016) – provides an updated status assessment for the Restrictions on Fish Consumption BUI.

Overall, the levels of PCBs and mercury in examined fish species have declined substantially over the last 30 plus years (see Figures 19 and 20). The major contaminant of concern today for fish in the Toronto RAP area is PCB.

The most recent consumption advisories published by MOECC are found in the *Guide to Eating Ontario Fish*, 2015-2016 (see Figure 21). This shows that consumption of many resident fish found along the Toronto Waterfront is "unrestricted," meaning eight or more meals per month can be eaten by the general and sensitive populations.<sup>5</sup> These resident fish include many panfish (bluegill, pumpkinseed, rock bass and yellow perch) and brown bullhead. Small sizes of other resident fish such as largemouth bass, northern pike and white suckers can also be consumed in quantities of eight or more meals per month.

In contrast, it is advised not to eat (or to restrict consumption of) almost all sizes of migratory species such as coho salmon, freshwater drum, gizzard shad, lake trout, lake whitefish and white bass. The same applies for common carp which can be migratory. It is also advised not to eat large sizes of brown trout, rainbow trout, round whitefish, walleye and white perch, all of which are migratory species and white sucker, which is a resident. More information can be found at <a href="https://www.ontario.ca/document/guide-eating-ontario-fish">https://www.ontario.ca/document/guide-eating-ontario-fish</a>

More detail on the assessment of the Restrictions on Fish Consumption BUI is found in section 4.1.6.

#### FIGURE 18

Mean Index of Biotic Integrity (IBI) values for three Lake Ontario exposed embayments: Toronto Harbour (sampled 5 years, 2006, 2007, 2010, 2012, 2014); Presqu'ile Bay (2008, 2015); and Prince Edward Bay (2009, 2013).

Source: MNRF







<sup>5</sup>Sensitive populations are defined as women of child-bearing age and children under the age of 15 years.

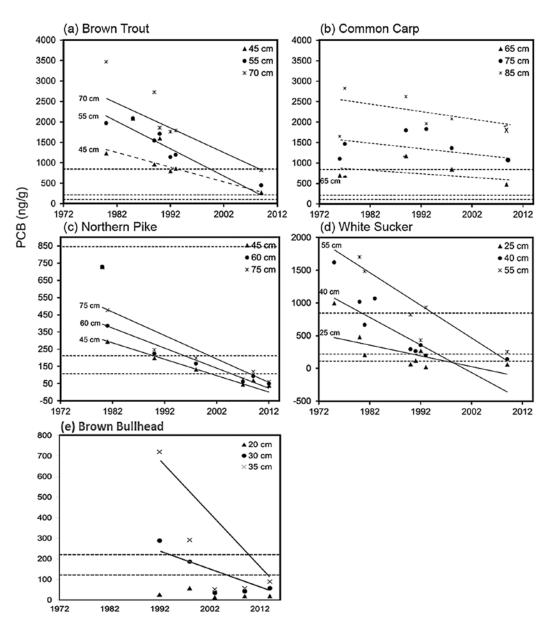
**Trend for Contaminants in Fish:** Levels of PCB and mercury have declined substantially over last 30 years. Consumption of many resident fish is unrestricted. Consumption of most migratory fish species as well as common carp and white sucker are still restricted for certain sizes of fish.

#### **FIGURE 19**

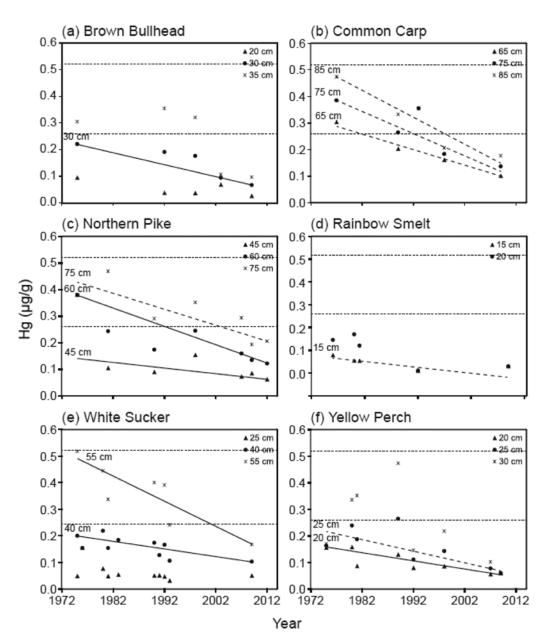
Temporal trends of PCB in fish from the Toronto Waterfront (1)

Source: Assessment of Fish Consumption Beneficial Use Impairment at the Toronto and Region Area of Concern (Draft February 2016)





1) MOECC consumption advisory benchmarks for PCB are indicated with horizontal dashed lines. Brown trout is a migratory species; others are considered resident (mostly non-migratory).



**FIGURE 20** 

Temporal trends of mercury in fish from the Toronto Waterfront (1)

Source: Assessment of Fish Consumption Beneficial Use Impairment at the Toronto and Region Area of Concern (Draft February 2016)



1) MOECC consumption advisory benchmarks for mercury are indicated with horizontal dashed lines. Rainbow smelt are migratory species; all others are considered resident (mostly non-migratory).

#### **FIGURE 21**

Fish consumption advisories for the Toronto waterfront area from the Guide to Eating Ontario Fish, 2015-20161

Source: Guide to Eating *Ontario Fish, 2015-2016* (MOECC, 2015)



Length · Longueur

White Perch<sup>2</sup>

Bar-perche<sup>2</sup>

White Sucker<sup>2</sup>

Meunier noir<sup>2</sup>

Yellow Perch<sup>1,2</sup>

Perchaude<sup>1,2</sup>





Lake Ontario 4a - Toronto Waterfront Area • Lac Ontario 4a -													
Secteur riverain de Toronto													
nearshore area from the west side of Humber Bay Park to the east side of Ashbridges Bay Park • zone littorale entre le secteur ouest du parc Humber Bay et le secteur est du parc Ashbridges Bay													
Bluegill <sup>1,2</sup>		6											
Crapet arlequin <sup>1,2</sup>	16	12											
Brown Bullhead <sup>1,2</sup>	32		6	12	8								
Barbotte brune <sup>1,2</sup>	32	_	6	12	8								
Brown Trout <sup>2,3</sup> Truite brune <sup>2,3</sup>		12	8	4		7	2		_	1		0	)
		12	8	4					(	)			
Coho Salmon <sup>2</sup> Saumon coho <sup>2</sup>									0				
Common Carp <sup>2,3</sup>					2				(	)			
Carpe <sup>2,3</sup>									0				
Freshwater Drum <sup>1,2</sup> Malachigan <sup>1,2</sup>								1	)				
Gizzard Shad <sup>2</sup>						)							
Alose à gésieree <sup>2</sup>					(	)							
Lake Trout <sup>2,13</sup>				1						0			
Truite de lac <sup>2,13</sup>				_	_		(	)					
Lake Whitefish <sup>2</sup>			1		(	)							
Grand corégone <sup>2</sup>				13	0	0							
Largemouth Bass <sup>1,2</sup> Achigan à grande bouche <sup>1,2</sup>	<u> </u>	6 6	8	12	4	8	4						
Northern Pike <sup>1,2</sup>		0	0		_	6	0				12	-1	4
Brochet <sup>1,2</sup>			16			0			12		8		4
Pumpkinseed <sup>1</sup>	16	-			10				_	-		_	-
Crapet-soleil <sup>1</sup>	12												
Rainbow Smelt <sup>2</sup>	1	(	)										
Éperlan arc-en-ciel <sup>2</sup>		0											
Rainbow Trout <sup>2</sup>			2		1	(	)						
Truite arc-en-ciel <sup>2</sup>				(	)								
Redhorse Sucker <sup>2</sup>							2	1					
Succeur rouge <sup>2</sup>							(	)					
Rock Bass <sup>1,2</sup>	16	12											
Crapet de roche <sup>1,2</sup>	16	12		-	_								
Round Whitefish <sup>2</sup> Ménomini rondeee <sup>2</sup>				2	1	)	)						
Walleye <sup>1,2</sup> Doré <sup>1,2</sup>									12	8	4	1	
Doré <sup>1,2</sup>									4		0		
White Bass <sup>1,2</sup>			(	)									
Bar blanc <sup>1,2</sup>			(	)									

15 6" 20 8" 25 10"

30 12" 35 14" 40 16"

45 50 55 60 65 70 18" 20" 22" 24" 26" 28"

75⁺cm 30+"

1) Values are in meals per month, separate for the general and sensitive populations. Species with red arrow can be considered mostly non-migratory. Red boxes highlight restrictive advisories for the non-migratory species. Superscripts 1, 2, 3 and 13 are for advisories caused by mercury, PCB, dioxin-like PCB and mirex, respectively. Source: Ontario Ministry of the Environment and Climate Change 2015

16

16

4

4

12

4

2

0

4 1

4 0

16 12 8

16 12 8

32

#### TRACKING DOWN PCBs IN ETOBICOKE CREEK

In 1999, a study looking at watersheds in the Toronto RAP area identified Etobicoke Creek as having the highest unit-area loads of PCBs. As part of a wider pilot study to reduce tier-one contaminants such as PCBs in Great Lakes watersheds, Etobicoke Creek was selected for Project Trackdown.

Between 2001 and 2005, MOECC conducted work in the Etobicoke Creek watershed to search for sources of ongoing locally controllable PCB contamination. A combination of water, sediment, and biota samples, along with passive sampling led researchers to a stormsewer outfall entering Etobicoke Creek just south of Bloor Street. Further work conducted in 2008 upstream of this outfall identified a single easement in which contaminated soils eroding from the banks were contributing to elevated PCB concentrations in young-of-the-year forage fish downstream in the watershed.

From 2008, the MOECC engaged local property owners and the municipality to delineate the extent of contamination in the easement and to develop a plan to remove it from the area. In late 2014, over 2,000 m3 of PCB impacted soils was removed from a 100 m open stretch of the easement. The soil was sent for disposal and an engineered channel was constructed to limit exposure to residual contaminated soils. The remediation of the open stretch was completed in December 2014.

PCB contaminated sediment and soils remain in non-remediated sections of, or adjacent to, portions of the easement ditch. Post-remediation monitoring will continue in future years to assess the effectiveness of the remediation. The cleanup will help reduce exposure of forage fish in the watershed to PCBs, and will ultimately help reduce contamination to Lake Ontario.





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#### 2.4.3. Wildlife Communities

**Challenge:** The abundance, diversity and health of wildlife communities relate to the BUIs for the Loss of Fish and Wildlife Habitat and the Degradation of Fish and Wildlife Populations.

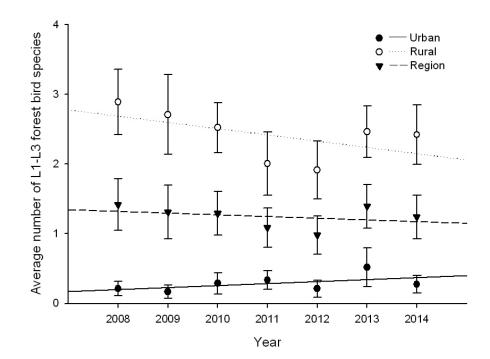
Urban growth continues to impact wildlife populations in the Toronto and Region AOC. This is not only due to the direct loss of habitat but also because of the fragmentation of the natural cover that remains, which yields small habitat fragments that are not able to support populations of area-sensitive wildlife. In the more urbanized sections of the watersheds, wildlife populations are somewhat stable but characterized by more generalist or less sensitive species. In the more rural sections of the watersheds, where natural cover is higher, more specialist or sensitive species are found. However, based on the TRCA's terrestrial long-term monitoring results, forest bird species of Regional Conservation Concern in the rural sections of the watersheds are showing a downward trend (see Figure 22). Although this trend is not statistically significant (p<0.05) values are approaching significance and possibly provide an early warning for where trends are headed. This result suggests that the remaining natural areas in the rural areas are under pressure beyond the initial loss of habitat. Pressures from recreational use, even though they may be more passive uses, can have a negative effect on sensitive fauna species.

#### **FIGURE 22**

Temporal trends in forest bird species of Regional Conservation Concern (2009 to 2014)

Source: TRCA





Based on the latest assessment of the ranks and scores for fauna species of Regional Conservation Concern there has been an overall decline in the total number of species (see Table 11 below). TRCA uses a 10-year threshold on data so if a species has not been observed within the past 10 years it is deemed to have been locally extirpated from the region. From 2007 to 2015 there has been a loss of 12 species which includes 1 bird, 7 mammals, 2 amphibians, and 2 reptiles. However, the overall number of species of Regional Conservation Concern has generally remained the same between the two time periods.

Туре	Total # Species	# Species of Regional Conservation Concern	# Species of Conservation Concern in Urban Areas		
Birds	168	92	43		
Mammals	37	14	15		
Amphibians	14	12	2		
Reptiles	12	9	2		
Total	231	127	62		

**Trend for Wildlife Communities:** Wildlife species continue to be adversely impacted by urbanization. Loss of 12 species since 2007. Some populations of forest birds may be continuing to decline.

## 2.4.4. Contaminants in Wildlife

**Challenge:** Contaminants in wildlife in the Toronto and Region AOC relate to the Bird or Animal Deformities or Reproductive Problems BUI.

When Toronto was identified as an AOC in 1985, there were concerns that persistent contaminants in the water and sediment might be affecting wildlife as well as fish. At the time that Toronto was listed as an AOC, there was insufficient evidence to determine the status of the associated Beneficial Use (Bird or Animal Deformities or Reproductive Problems). It was therefore designated as "Requires Further Assessment".

Since the early 1970s, the Canadian Wildlife Service has monitored contaminants in herring gull eggs from Tommy Thompson Park and at other sites in the Great Lakes. This monitoring has shown a steady decline in levels of persistent contaminants such as PCBs in eggs, reflecting the decline in environmental levels as a result of increased regulation (see Figure 23).

As detailed in section 4.1.4 of this report, from 2001 to 2005 TRCA and ECCC carried out studies in the Toronto and Region AOC on top predator aquatic-feeding species that are known to be sensitive to the effects of contaminants. One study examined reproductive success, morphological deformities and contaminants in eggs of five colonial waterbird species (the ring-billed gull, common tern, Caspian tern, black-crowned night heron and double-crested cormorant). A second study examined wildlife health effects relating to reproduction and/or deformities in two indicator species, the herring gull and the common snapping turtle, which feed within the AOC.

Analysis of the data showed that the endpoints associated with impaired reproduction and deformities in wildlife were similar in the Toronto and Region AOC and in selected lower Great Lakes non-AOC reference sites. The assessment concluded that wildlife in the Toronto and Region AOC are not suffering from exposure to contaminants.

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#### TABLE 11

Status of fauna in Toronto and Region AOC (2015)

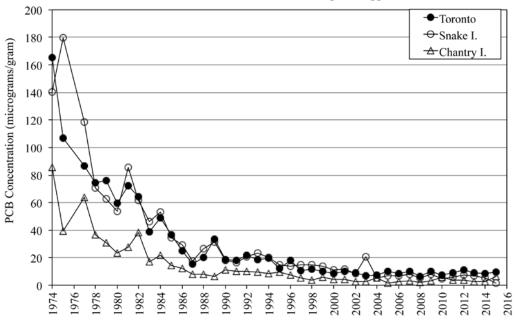
Source: TRCA

#### **FIGURE 23**

Temporal trends as mean level of PCBs in herring gull eggs collected from Toronto Harbour and two Great Lakes reference sites (1974 to 2015)

*Source: Canadian Wildlife Services* 





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**Trend for Contaminants in Wildlife:** Levels of persistent contaminants in the environment have declined over the last 30 years. Species of fish-eating wildlife are not at risk from contaminants in sediments and water.

# KEY ACTIONS TAKEN 2007-2015

# 3.1. LEGISLATION, REGULATIONS AND MAJOR INITIATIVES

Since the last RAP Progress Report in 2007, there have been a number of important legislative and policy changes at the provincial and federal level that will help to improve the health of the waters, habitats, fish and wildlife in the Toronto and Region AOC. These provide guidance and context for the actions that are taking place within the AOC and contribute to improving environmental health generally.

# 3.1.1. Pesticides Act and Ontario Regulation 63/09

Ontario's Cosmetic Pesticides Ban took effect on April 22, 2009. The requirements of the ban are detailed in Ontario Regulation 63/09 and the *Pesticides Act*, which was amended by the *Cosmetic Pesticides Ban Act*, 2008. The cosmetic pesticides ban prohibits the sale and use of pesticides for cosmetic purposes on lawns and gardens and includes many herbicides, fungicides and insecticides. Over 250 products have been banned for sale and more than 115 pesticide ingredients are banned for cosmetic uses.

The MOECC, in collaboration with ECCC and Conservation Ontario, has completed a six-year study comparing cosmetic pesticide levels before and after the cosmetic pesticide ban took effect in 2009. Results show that levels of herbicides in study streams decreased significantly after the ban came into effect. Longer-term trends from 2003-2012 indicate that concentrations of three common lawn care pesticides have been decreasing since before the ban came into effect.

# 3.1.2. Toxics Reduction Act, 2009 and Ontario Regulation 455/09

The *Toxics Reduction Act*, 2009 is the cornerstone of Ontario's strategy to reduce the use and creation of prescribed toxic substances. The goal of the Toxics Reduction Program is to help protect human health and the environment. The Act and Regulation require facilities to examine how they are using or creating prescribed toxic substances and to consider opportunities for reducing use while recognizing that there may be essential and beneficial uses for some prescribed toxic substances. The Minister's Report on Toxics Reduction 2014 is available at <a href="https://www.ontario.ca/document/ministers-report-toxics-reduction-2014">https://www.ontario.ca/document/ministers-report-toxics-reduction-2014</a>.

# 3.1.3. Great Lakes Strategy (2012) and Great Lakes Protection Act (2015)

Ontario's Great Lakes Strategy was developed in 2012 to describe how the Province will support the vision of healthy Great Lakes that continue to be drinkable, swimmable and fishable. The Great Lakes Strategy focuses on empowering action by all partners on the Great Lakes – from provincial ministries to local service clubs – and on restoring Great Lakes water, beaches and coastal areas. It aims to conserve biodiversity and deal with invasive species. It supports science to guide the Province's Great Lakes work and addresses the need for climate change adaptation. The Strategy is available at: <u>www.ontario.ca/document/ontarios-great-lakes-strategy</u>. On March 22, 2016, Ontario released the Great Lakes Strategy's first progress report that highlights key accomplishments and new scientific findings since the release of the Strategy in 2012. Ontario's Great Lakes Protection Act, 2015 reflects the goals and principles of Ontario's Great Lakes Strategy and sets out detailed requirements for Strategy contents, reporting, and periodic review. It is designed to help address the significant environmental challenges facing the Great Lakes and St. Lawrence River Basin, including a changing climate. The Act identifies some initial priorities for immediate action, such as reducing harmful algal blooms and enables public bodies to identify and target actions on priority issues and geographic areas. It provides new tools including:

- establishing a Great Lakes Guardians' Council, a forum to help improve collaboration among Ontario's Great Lakes partners;
- the authority to set Great Lakes targets along with action plans;
- enabling communities and governments to focus actions on local or regional problems through plans known as "geographically-focused initiatives"; and
- establishing or maintaining monitoring programs on key ecological conditions.

#### 3.1.4. Ontario's 12-Point Plan on Blue-Green Algal Blooms

Ontario is working closely with many partners, including other provinces, the federal government, U.S. partners, First Nations and Métis communities, conservation authorities, municipalities and other stakeholders to reduce and address algal blooms in Ontario's rivers and lakes. The Province has a 12-point plan outlining how it is working with partners to fight algal blooms in the Great Lakes and other lakes and rivers. The plan includes efforts to reduce nutrient inputs, protect drinking water, monitor municipal drinking water systems, conduct research into the detection and treatment of cyanobacteria, and monitor municipal drinking water systems. The plan is available at: <a href="https://www.ontario.ca/page/blue-green-algae">www.ontario.ca/page/blue-green-algae</a>

#### 3.1.5. Spill Prevention and Contingency Plans Regulation

In 2007, the Province passed a regulation for Spill Prevention and Contingency Plans (Ontario Regulation 224/07 under the *Environmental Protection Act* (EPA). In general, the regulation applies to industrial plants in sectors subject to the Municipal Industrial Strategy for Abatement ("MISA") regulations made under the EPA. The regulation requires the regulated community to develop and implement spill prevention and contingency plans. The primary objective of these Plans is to help prevent or reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result. The Plans provide detailed information and guidance on actions important for the prevention of spills and provide information on the procedures to detect and respond to spills when they occur.

#### 3.1.6. Source Water Protection

In the wake of the *Clean Water Act of 2006*, the Province began working with municipalities and stakeholders to develop Source Water Protection Plans for drinking water sources. In Toronto, this initiative was carried out by the CTC Source Protection Committee for the areas under the jurisdiction of Credit Valley Conservation, Toronto and Region Conservation Authority, and the Central Lake Ontario Conservation Authority. Much of the effort was focused on municipal water supplies based on groundwater sources, but the Plan also identified threats to water treatment plant intakes in Lake Ontario. The Plan lays out how the risk level of identified threats will be reduced and how future threats will be avoided. The CTC Source Water Protection Plan was approved by the Province in July 2015 and came into effect on December 31, 2015.

#### 3.1.7. Rouge National Urban Park

In the May 4, 2011 throne speech, the federal government announced that Rouge Park was to become Canada's first national urban park. The Rouge Park is rich in natural, cultural and agricultural features including 1,700 species of plants and animals, over 10,000 years of human history, and some of the rarest and best remaining wetlands, forests and agricultural lands in the Greater Toronto Area. It contains working farms, Carolinian forests, one of the region's largest



wetlands, unspoiled beaches, kilometres of hiking trails and the city's only campground. Once fully established, Rouge National Urban Park will be 79.1 km<sup>2</sup> in size – some 22 times the size of Central Park in New York – making it one of the largest and best protected urban parks of its kind in the world. In July 2015, the federal government announced it was committed to expanding the Park by over 36% with the addition of 21 km<sup>2</sup> of lands.

#### 3.1.8. Coordinated Land-Use Planning Review

In 2015, a provincially-appointed Advisory Panel carried out a Coordinated Land-Use Planning Review of four critical, complementary provincial land use plans – the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan, the Growth Plan for the Great Golden Horseshoe, and the Greenbelt Plan. The review included an extensive consultation process with stakeholder and online consultations. The Advisory Panel released its report in December 2015 and made recommendations aimed at building complete communities, supporting agriculture, protecting natural and cultural heritage, providing infrastructure, mainstreaming climate change and implementing the plans themselves.

# **3.2. CLEAN WATERS**

## 3.2.1. Wet Weather Flows in the City of Toronto

Since 2007, the City of Toronto has made significant progress in implementing the City's Wet Weather Flow Master Plan (WWFMP), which is a priority action identified in previous RAP Progress Reports. Since the adoption of the WWFMP by City Council in 2003, the City has invested approximately \$485 million in wet weather flow management projects to improve water quality in Toronto's watercourses and the shoreline along Lake Ontario, build resilience to reduce basement flooding risks associated with extreme storms, and carry out projects to restore and protect watercourses from future erosion, which supports ecosystem health. Toronto Water's 10-Year Capital Plan (2016-2025) identifies almost \$2.8 billion for the implementation of WWFMP projects over the next ten years.

Selected highlights of the key actions taken since 2007 are presented below and in section 4.2 of this report. More information is available on the City of Toronto's website at <u>www.toronto.ca/water</u>

Following the hierarchy of the WWFMP, starting with "at source", then "conveyance", and finally "end-of-pipe" controls, implementation progress since 2007 has included the following:

- *Public Outreach and Education:* The City has implemented multi-media campaigns and has a dedicated stormwater webpage on its website to reach out to residents and provide information on actions they can take to reduce the impacts of stormwater, including downspout disconnection and other tips to manage rainfall where it falls. The stormwater webpage with information for residents is available on the City's website.
- Source Control Measures Downspout Disconnection: In 2008, the City approved the city-wide Mandatory Downspout Disconnection Program, which is being implemented in three phases across Toronto. Implementation of Phase 1 (combined sewer areas) and Phase 2 (basement flooding study areas) was completed in 2011 and 2013 respectively. Implementation of Phase 3 (the remainder of the city) will be completed in December 2016. In 2013, ahead of the Phase 2 deadline, Phase 1 participation was at 79.77%, Phase 2 at 63.82% and Phase 3 at 60.95%.
- Source Control Measures Green Roofs: In 2009, Toronto became the first city in North America to adopt a bylaw to require and govern the construction of green roofs on new development. The City also continued implementation of its Green Roofs Strategy and Eco-Roof Incentive Program, which are designed to encourage the use of Green and Cool Roofs.
- *Municipal Operations:* Key wet weather flow municipal operations include the City's Outfall Monitoring Program (addressed in section 3.2.3), enhanced catchbasin cleaning, street sweeping, beach grooming, and shoreline cleanup.

• Basement Flooding Protection: Building resilience for sewer infrastructure to reduce the risk of basement flooding during extreme storms has become a growing priority for the City's wet weather flow program since 2007. Started in 2006, the City's Basement Flooding Protection Program (BFPP) carries out Basement Flooding Environmental Assessment (EA) studies and implements recommended infrastructure improvements to reduce the risk of future basement and surface flooding. Following the July 8, 2013 extreme storm event, the BFPP was expanded city-wide to 67 study areas. As of 2015, Environmental Assessment studies for 26 areas have been completed and 15 are currently underway. The more recently completed and ongoing BFPP EA studies also identify opportunities to improve stormwater runoff quality and reduce combined sewer overflows with the recommended basement flooding protection projects.

Since 2009, the City has constructed approximately \$245 million in basement flooding protection projects, which have included sewer upgrades, new stormwater ponds and stormwater storage tanks. A key project currently under design that will provide for both basement flooding protection and water quality improvement is the Fairbank-Silverthorn Trunk Storm Sewer Project, which includes an approximately 2.2 km storm tunnel and new collector sewers.

#### **IMPROVED WASTEWATER TREATMENT**

The City is building a new 3-km outfall for the Ashbridges Bay Wastewater Treatment Plant (ABTP). The project is currently under design. When constructed, it will provide full hydraulic capacity for all treated and bypass flows from the facility and eliminate near shoreline discharges from the ABTP. When fully completed, the project will improve the trophic state of waters in the nearshore zone adjacent to Ashbridges Bay.

- Conveyance Control: A major conveyance control initiative being implemented by the City of Toronto is the Green Streets Initiative, which includes the development of Green Streets Guidelines to promote the use of green infrastructure on city streets to better manage stormwater. The City has also completed pilot projects involving the installation of sustainable sidewalks using Silva Cells technology along the Queensway, as well as several green infrastructure demonstration projects at various city intersections.
- Stream Restoration: As of 2015, the City of Toronto has completed many Stream Geomorphic Master Planning Studies and has been implementing recommended projects for Highland Creek, Taylor-Massey Creek, and smaller watercourses including Burke Brooke, Silver Creek, Wilket Creek, Mud Creek, Berry Creek, and Duncan Creek. These projects include remedial works that restore the stream to a more natural condition, improve channel stability, and reduce hazards to existing sewer infrastructure, forest cover, local wildlife and corridor use.
- Environmental Monitoring: The City has installed a network of 14 monitoring stations to monitor stream flow and collect water quality data to characterize wet weather flow conditions for the six major watercourses. Samples are collected over three consecutive years on a 10-year recurring cycle to provide information about the effectiveness of WWFMP projects and the long-term trends in the receiving systems.
- *End-of-Pipe Facilities:* The WWFMP includes a wide range of recommended projects for end-of-pipe wet weather flow management facilities, from underground tanks to stormwater ponds. Since the 2007 RAP Progress Report, the City has made significant progress in completing subsequent EA studies and implementation of prioritized projects that improve water quality in Toronto's Inner Harbour, Lake Ontario shoreline and Toronto's beaches (see Table 12). Other projects that have not been constructed as of 2015 are identified for implementation within Toronto Water's 10-Year Wet Weather Flow Program.

Project	Status	
Bonar Creek Stormwater Management Facility	<ul> <li>EA completed in 2010</li> <li>Construction of stormwater pond to begin in 2017</li> </ul>	
Coatsworth Cut Combined Sewer Overflow (CSO) and Storm Outfalls Control Project	<ul> <li>EA completed in 2008</li> <li>Conveyance controls and CSO storage tank were completed in 2012</li> </ul>	
Don River and Central Waterfront Project	<ul> <li>EA completed in 2012</li> <li>Project design began in 2014 (more details are provided in section 4.2).</li> </ul>	
Don Valley Stormwater Management Wetlands	<ul> <li>EA completed in 2009</li> <li>Implementation planned in 10-Year Wet Weather Flow Program</li> </ul>	
Earl Bales Stormwater Management Pond	<ul> <li>EA completed in 2006</li> <li>Stormwater pond constructed in 2011 and additional works started in 2015 to add additional drainage of 150 hectares to the facility</li> </ul>	
Emery Creek Stormwater Management Ponds	<ul> <li>EA Addendum completed in 2013</li> <li>Construction planned in 2016</li> </ul>	
Etobicoke Waterfront Stormwater Management Study	<ul> <li>EA completed in 2013</li> <li>Implementation planned in 10-Year Wet Weather Flow Program</li> </ul>	
North Toronto Treatment Plant CSO Tank	• Construction to be completed in 2016.	
Scarborough Waterfront CSO and Stormwater Outfalls Control Study	<ul> <li>EA completed in 2011</li> <li>Implementation planned in 10-Year Wet Weather Flow Program</li> </ul>	

#### TABLE 12

Status of key Wet Weather Flow end-of-pipe projects in the Toronto and Region AOC *Source: Toronto Water* 

#### EARL BALES STORMWATER MANAGEMENT POND

In 2011, the City completed construction of one of the largest stormwater ponds in Canada at Earl Bales Park. The need for the pond was identified in the Wet Weather Flow Master Plan to deal with stormwater discharges to the West Don River that adversely affected water quality and fish habitat, eroded area ravines, and exposed underground sewer infrastructure.

The Earl Bales pond captures and treats stormwater from a 550 hectare catchment area that includes residential and industrial development. The pond:

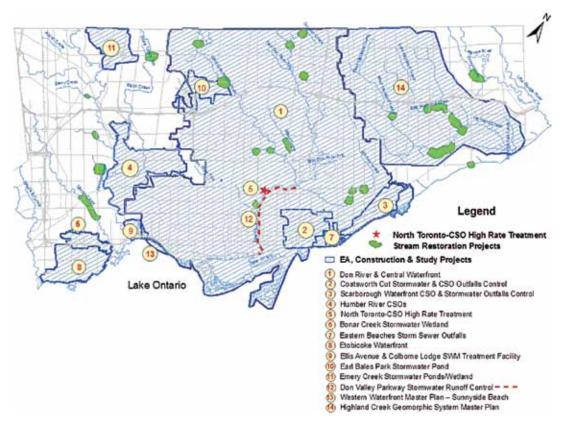
- improves water quality in the West Don by capturing and treating 90% of total annual stormwater runoff from the catchment area;
- prevents erosion and tree loss along 2.5 kilometres of ravine system;
- reduces the withdrawal of water from the river for irrigation at the Don Valley Golf Course and for snowmaking at Earl Bales Ski Centre; and
- protects exposed sections of sewer infrastructure.

Work started in 2015 to add additional drainage of 150 hectares to the facility.

#### **FIGURE 24**

Location of the City of Toronto's major end-of-pipe Wet Weather Flow projects

Source: Toronto Water



## 3.2.2. Other Stormwater Management Initiatives

Since 2007, significant work relating to stormwater management, including Low Impact Development (LID) has been carried out through the multi-agency Sustainable Technologies Evaluation Program (STEP).

LID uses a land planning and engineering design approach to manage stormwater runoff with an aim of replicating pre-development hydrology by storing, filtering, infiltrating, and evaporating runoff at the source. Since 2007, STEP has monitored and evaluated the effectiveness of several LID technologies, including permeable pavements, bioretention, infiltration trenches and chambers, augmenting previous evaluations of green roofs and other conventional stormwater technologies conducted prior to 2007. STEP's evaluation showed that these technologies functioned exceptionally well, reducing runoff by between 40% and 90% and significantly improving the quality of stormwater. STEP also carried out an evaluation of rainwater harvesting technologies at four sites across different land uses. This provided a high quality non-potable supply for indoor and outdoor uses while substantially reducing the use of potable water.

During this period STEP also worked on the development of a tool to evaluate the effectiveness of stormwater management scenarios to meet water quality, water balance and runoff reduction targets, and the development of two detailed inspection and maintenance guides for LID practices and conventional stormwater management facilities such as ponds and wetlands. In 2010 TRCA, along with CVC, developed an LID planning and design guide that is widely used by stormwater practitioners.

The implementation of LID has grown substantially since 2007 as a result of the efforts of STEP and TRCA, along with partner agencies and municipalities. In the last few years, most new development sites in the Toronto RAP area have implemented one or more LID practices to meet erosion and water balance criteria, and there are now several full-scale residential and commercial sites with LID practices used as the primary means of stormwater treatment. Examples include the Glenway Mosaik residential subdivision in Newmarket, the Prairiewood residential subdivision in Stouffville, the Honda Canada headquarters in Markham, the Edwards Gardens site in Toronto,





and the Humber extension residential subdivision in Kleinberg, Vaughan. Several pilot projects have been constructed or are planned for construction, including a biofilter on a public road in Brampton, a green road project in Markham, silva cells on the Queensway in Toronto, various bioretention cells, and swales at U of T Scarborough and elsewhere.

## 3.2.3. Eliminating Dry Weather Flows

As part of the WWFMP, the City of Toronto began a program in 2005 to identify sewer outfalls with sanitary cross-connections. The program was designed to identify all contaminated flows from storm sewers and to initiate remedial actions to eliminate these flows.

City staff have sampled outfalls at all six of the city's subwatersheds during dry weather to measure *E.coli* bacteria, nutrients and metals. As of December 31, 2014, a total of 695 cross connections had been identified, of which 633 (91%) have been corrected. This has led to the delisting of 113 "priority outfalls" – outfalls that are known to have intermittent yet frequent contaminated discharges.

## 3.2.4. Sewers Bylaw

The City of Toronto has been enforcing the Sewers Bylaw that was adopted by City Council in 2000. This Bylaw sets stricter limits on waste discharges and requires certain business sectors to develop and submit a Pollution Prevention Plan to the City of Toronto. Businesses covered by the Sewers Bylaw must produce a new plan every six years and update it every three years.

The Pollution Prevention Program has contributed to reductions in mercury found in the influent at wastewater treatment plants, as well as reductions of nonylphenol ethoxylates (NPE) concentrations and general improvements in environmental performance in all sectors. In 2014, the City added hexavalent chromium as a subject pollutant under the Pollution Prevention Program.

## 3.2.5. Improving Beach Water Quality

The efforts being made by municipalities to improve the management of stormwater and eliminate combined sewer overflows (see above in sections 3.2.1 and 3.2.2) are the key actions that will continue to improve water quality at Toronto's beaches over time. Actions to eliminate dry weather flows (see section 3.2.3) will also reduce bacterial loadings to the waterfront.

As noted in section 2.1.2, eight of Toronto's eleven beaches are now certified as Blue Flag beaches, up from four in 2005 and six in 2007. The Blue Flag status reflects their high standards for water quality, along with other factors such as environmental education, environmental management, safety and services.

The remaining non-Blue Flag beaches – Marie Curtis Park East Beach, Sunnyside Beach and Rouge Beach – are near the mouths of creeks and rivers, and are therefore greatly affected by stormwater and other inputs of fecal pollution into these tributaries. ECCC has recently completed extensive surveillance and microbial source tracking analyses to identify sources of *E. coli* that cause beach postings at Marie Curtis East Park and Sunnyside Beaches. Not surprisingly, *E. coli* concentrations increased significantly during rain events in Etobicoke Creek and the Humber River, contributing to corresponding beach postings at Marie Curtis East Park and Sunnyside Beaches. However, this research has also lead to some unexpected findings that are important for managing these beaches.

The highest *E. coli* concentrations measured in these studies were found to occur in the sand near the water's edge at both Marie Curtis Park East and Sunnyside Beaches. These results are consistent with an emerging understanding that sand at many Great Lakes beaches can serve as a reservoir that accumulates *E. coli* over the bathing season. Through wave action on the beach, this reservoir can be a source of *E. coli* which at times contributes to beach postings. High *E. coli* concentrations were also found in Etobicoke Creek, the Humber River (particularly its Black Creek tributary) and a number of stormwater outfalls discharging into the lower reaches of these tributaries.

Microbial source tracking was used to analyze the microbial DNA recovered from water samples collected at Marie Curtis Park East and Sunnyside Beaches, Etobicoke Creek, the Humber River, and stormwater outfalls. These analyses looked in water samples for DNA markers from bacteria strains that are found only in the gut of humans or those found only in the gut of seagulls. The DNA marker for a strain of *Catellicoccus* bacteria from the seagull gut was more prevalent at Marie Curtis Park East and Sunnyside Beaches than a strain of *Bacteriodales* bacteria from the human gut (see Figure 25). Observations of large numbers of birds and their fecal droppings at beach sampling sites suggested that there were continuous contributions of *E. coli* from gulls over the summer, with more sporadic contributions of *E. coli* from human sewage

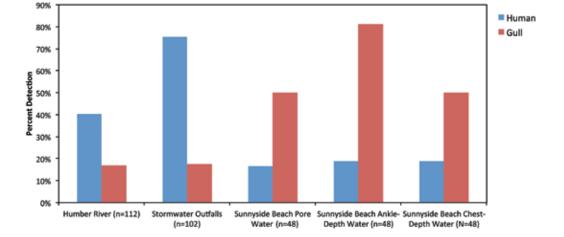
In contrast, in Etobicoke Creek and the Humber River the DNA marker for the strain of *Bacteriodales* bacteria from the human gut was more prevalent, indicating frequent sewage contamination. This DNA marker for sewage contamination was particularly prevalent in Black Creek and several stormwater outfalls in the lower reaches of Etobicoke Creek and the Humber River. Analyses for pharmaceuticals and chemicals like caffeine provided additional lines of evidence for identifying unrecognized sewage cross-connections to a number of these stormwater outfalls.

These studies are helping to target cost-effective remediation actions to reduce releases of *E. coli* and human sewage into Etobicoke Creek, the Humber River, and downstream beach waters. ECCC and the MOECC have also been conducting research on predictive models using parameters such as rainfall or wave height to better predict *E. coli* concentrations and assist the City of Toronto improve the forecasting of beach postings.

#### **FIGURE 25**

Frequency of detection of DNA from human fecal bacteria and seagull fecal bacteria in water samples collected weekly from the Humber River and Sunnyside Beach in 2014

Source: ECCC



#### **BLUFFER'S PARK BEACH WETLAND IMPROVEMENT PROJECT**

In 2008, TRCA worked with Toronto Water to develop a solution to the water quality challenges at Bluffer's Park Beach. Prior to this work, the beach was often closed to public swimming due to high levels of *E. coli* bacteria. The goal of the Wetland Improvement project was to improve beach water quality for wildlife and for swimmers at Bluffer's Park Beach, enhance marsh and dune habitat in the area, and provide better visitor access to the east end of the park.

The City and TRCA created a dune and wetland system to hold and infiltrate runoff that had previously been flowing directly into Lake Ontario. This tertiary water treatment solution included two hectares of restored wetland within a 3 hectare wetland complex and 0.3 hectares of restored beach dune. The work included:

- · Deepening the existing marsh behind the beach to increase its water retention capacity;
- Creating a dune system at the marsh edge as a barrier to water discharging onto the swimming beach, with any storm overflows being directed to infiltration basins;
- Directing water flows within the marsh to the east end of the beach, away from the swimming area;
- Building a small dyke at the base of the bluffs to hold back water and release it at a slow rate through a series of wetlands;
- Creating beach dunes and small wetland features;
- Redirecting stormflow from parking lot into wetland and away from beach;
- · With community involvement planting dune and wetland areas; and
- Installing a fence along the trail.

The benefits of the project include:

- Significant improvement of water quality such that the Bluffer's Park beach was awarded Blue Flag Status in 2011 and continues to be regularly awarded it
- Enhancement of diversity in the existing backshore wetland;
- Increased stormwater infiltration;
- Control of invasive species;
- Management of storm flows; and
- Improved trail connection to the beach area.

As an illustration of water quality improvement, in 2005 Bluffer's Park Beach met the PWQO for only 21% of the swimming season; since 2011 it has met the PWQO provincial water quality over 90% of the time.

#### 3.2.6. Rural and Agricultural Activities

The goal of TRCA's Rural Clean Water Program (RCWP) is to reduce the bacteria, nutrient and phosphorus loading to watercourses and ultimately Lake Ontario. The voluntary program provides technical assistance and financial incentives to farm and rural non-farm landowners to assist them with implementing Best Management Practice projects to address rural water quality, environmental enhancement and sustainability and climate change mitigation and adaptation. Typical RCWP projects include actions to restrict livestock access to streams, upgrade manure storage, dispose of milkhouse washwater, control erosion in fields and streams, protect wells, and repair septic systems. The program also provides education and outreach through workshops, farm tours, good news stories and attendance at agriculturally-related events.

In 2013, RCWP partners undertook an intensive review of the program. On February 27, 2014, new RCWP Guideline recommendations were approved by Peel Regional Council. Two new categories of Best Management Practices were added: Cover Crops and Natural Area Creation and Enhancement. Other adopted recommendations include increased grant rates and caps, priority consideration for projects that fall within Source Water Protection areas, and the addition of composting to the Manure Storage and Handling category. The scope of the overall program



was also increased: it is no longer limited to only projects that address water quality and can now support improvement projects that address habitat enhancement and sustainability and climate change mitigation.

Between 2007 and 2015, the RCWP made over \$380,000 in grant funding available to support more than 150 agri-environmental projects. These projects have a total value of over \$2.0 million. The year 2015 was also a record year for the Program. This year saw not only an increase in the number of projects over the previous 5 years, but also the highest total of grant dollars paid/ allocated (\$63,000) in one year.

# **3.3. HEALTHY HABITATS**

Considerable efforts have been made to protect and restore habitats for fish and wildlife within the Toronto and Region AOC. The development and implementation of the Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS) has resulted in extensive restoration work being done in Tommy Thompson Park and along the Toronto waterfront. This has included restoring and creating coastal wetlands, restoring and naturalizing shorelines, restoring habitat lost through urban development and creating new habitats to support the complex lifecycle requirements of fish and wildlife.

In the watersheds of the AOC, the development and implementation of the Terrestrial Natural Heritage Strategy (TNHS), Watershed Management Plans and Fisheries Management Plans have resulted in similar benefits to fish and wildlife and their habitats. Actions taken under these plans include the removal of barriers to fish migration in rivers, the restoration and naturalization of rivers and valley corridors, and the restoration and creation of terrestrial habitat through planting and reforestation and management efforts to address stormwater runoff.

## 3.3.1. Terrestrial Natural Heritage System

In January 2007, TRCA approved its Terrestrial Natural Heritage Strategy (TNHS) which identifies the lands that need to be protected and restored to form a comprehensive and connected natural heritage system in the TRCA jurisdiction. A key recommendation of the 2007 RAP Progress Report was the need to incorporate the TNHS into municipal Official Plans.

Since 2007, TRCA has worked closely with its partner municipalities who have undertaken Official Plan reviews to incorporate natural heritage system principles and approaches into updated schedules and accompanying policies. This work has used the TRCA Terrestrial Natural Heritage System as a foundation from which municipalities identify a refined system that addresses municipal objectives and priorities. The end result is that the majority of all partner municipalities within the Toronto and Region AOC have adopted a natural systems approach to ecosystem protection.

# 3.3.2. Terrestrial Habitat Creation and Enhancement

Data from the Restoration Opportunities Bank show that between 2007 and 2015, TRCA and its partners created and enhanced 157.4 ha of wetlands in the watersheds of the Toronto and Region AOC. In total, 367 ha of natural cover were created.

Most of the habitat was created or enhanced through wetland, riparian, reforestation and meadow restoration programs across the TRCA jurisdiction. Key areas of focus included large tracts of land owned by TRCA (Claireville Natural Area Tract, Nashville Tract, Albion Hills Conservation Area, Palgrave Tract and Bolton Tract), municipally-owned public land (Brampton Humber Valley Lands, Humber Arboretum and Humber College Valley Lands, City of Toronto Valley Lands, and various private land properties in the Peel and York Region.





#### YOUTH AND COMMUNITY GREENING THE ROUGE RIVER WATERSHED PROJECT

Since 1992, Friends of the Rouge Watershed (FRW) has been conducting ecological education and habitat restoration work at priority sites in Rouge Park with the help of over 50,000 youth and community volunteers. The program aims to improve watershed, ecosystem and community health, while providing participants with environmental knowledge, skills, and values.

Sites restored by FRW provide valuable habitat for wildlife, including species of concern and species at risk. By enlarging core forests, FRW has increased habitat for forest species such as American ginseng, butternut, red-shouldered hawk and hooded warbler. The addition of native grasses and wildflowers to restore meadow areas has created habitat for bobolink, eastern meadowlark, grasshopper sparrow, monarch butterfly, red headed woodpecker, and loggerhead shrike, among other species. Restoration sites have also improved the health of small streams that provide habitat for redside dace, and wetland restoration projects have created a home and successful hatching site for multiple turtle species. Since its completion, the Beare Wetland has become recognized as a potential site to help the Blanding's turtle population recover to a sustainable level with the release of 36 captive-raised turtles by Parks Canada and the Toronto Zoo.

Project benefits by the numbers:

- 515,448 Number of native trees and shrubs planted
- 941 kg Amount of seeds collected and planted from native trees
- 238.9 ha -- Area of native forest restoration
- 75 to 85% Average survival rate of trees
- 184,232 Number of native wildflowers planted
- 73.7 ha Area of meadow restoration
- 1,708 kg Amount of native flower and grass seeds planted
- 38.2 ha Total area of restored wetlands
- 157 Number of frog and turtle ponds created
- 650 million litres/year Reduction of peak runoff volume in the Rouge River
- 14 Number of species of concern and species at risk using restored habitat

#### 3.3.3. Reforestation and Riparian Vegetation

A key action identified in the 2007 RAP Progress Report was the need to support the regeneration of stream corridors to meet targets established in Watershed Strategies and reports. Watershed priorities relating to natural cover, aquatic conditions, hydrologic factors and terrestrial natural heritage values are now identified through the Integrated Restoration Plan. This allows the identification of priority restoration areas.

These areas are then included in the Restoration Opportunities Bank, which includes not only opportunities for riparian restoration, but also opportunities to restore wetlands, forests, meadows and in-stream conditions. The Restoration Opportunities Bank is used to develop reach-based restoration plans that target specific restoration actions around stream corridors. From 2007 to 2015, TRCA and its partners carried out 155.9 ha of riparian plantings and restored 5,964 m of stream.

#### 3.3.4. Aquatic Habitat Creation and Enhancement

Aquatic habitat creation and enhancement in the Toronto and Region AOC is coordinated through Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS) with guidance from Aquatic Habitat Toronto (AHT). TWAHRS has evolved into a highly effective, consensusbased tool aimed at ensuring that the implementation of all waterfront projects incorporates opportunities to improve aquatic habitat and support sustainable aquatic ecosystems. AHT is



a unique, collaborative organization that is responsible not only for implementing the strategy, but also for streamlining the regulatory approvals process. This yields multiple benefits for both regulators and proponents and ultimately the environment. More detailed information on AHT and TWHARS can be found in the *Plan Canada Journal* (Fall 2013) in an article entitled, "Toronto Waterfront Aquatic Habitat Restoration Strategy: A Unique and Collaborative Approach to Streamlining Approvals and Restoring Aquatic Habitat."

AHT is a committee comprised of representatives from Fisheries and Oceans Canada (DFO), ECCC, MNRF, TRCA, the City of Toronto, Ports Toronto and Waterfront Toronto. AHT works with the proponents of waterfront projects in the early planning stages to facilitate the approval process and to design aquatic habitat strategies that will contribute to the improvement of aquatic habitat on the Toronto waterfront. This process is guided by TWAHRS with the goal of conserving, restoring and creating aquatic habitat that was historically degraded. Through this mandate, AHT provides crucial information to help decision makers, designers, and regulatory authorities ensure that waterfront projects incorporate improvements to aquatic habitats and fisheries resources to create a more liveable and sustainable waterfront, with the ultimate goal of delisting Toronto as an AOC.

In the past few years, AHT has been instrumental in the creation and restoration of several coastal wetlands in Toronto including the Cell 1 Wetland (7 ha) and Embayment D wetland (9 ha) in Tommy Thompson Park, the Humber Marshes wetland (1 ha) and the Toronto Islands wetlands (1 ha). In addition, AHT is actively involved in the status assessment of fish habitat and populations as part of the Toronto and Region RAP. This includes a long-term acoustic telemetry project to track seasonal habitat usage by several species of fish (see section 3.6.2), long-term electrofishing survey and assessment by TRCA to examine the diversity and health of fish populations (see section 2.4.1) and habitat mapping and fish community assessment by DFO and MNRF using multiple gear types including bottom trawling and nearshore trap-netting.

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AHT is also focused on raising awareness of improvements of the fisheries resources on the Toronto waterfront. As such, it has produced signage at waterfront sites throughout Toronto to identify local fish species for the public and provide information on sport fish that can be safely eaten. AHT has also produced *Fishing in your Backyard: An Urban Recreational Fisheries Strategy for the Lake Ontario Northwest Waterfront* as a companion piece to TWAHRS (see section 3.4.1).

#### **Major Projects**

Overviews of some of the major TWARHS waterfront habitat enhancement projects that have been completed since 2007 or are currently underway are provided below. Locations of the projects are shown in Figure 26.

- Central Waterfront Fish Habitat Creation: Waterfront Toronto has integrated fish habitat creation into its waterfront projects. As an example of this work, while constructing the Wavedecks in the Central Waterfront, Waterfront Toronto installed river-stone shoals, boulders, root balls and tree logs to provide space for plants to root and increase shelter, feeding and foraging opportunities for fish. These efforts contributed to an increase in the diversity and number of fish in the Central Waterfront, which increased from 13 species in 2007 to 17 in 2012.
- *Tommy Thompson Park Cell 2 Wetland Restoration:* The Cell 2 Wetland Restoration project, nearing completion, will restore 9.3 ha of coastal wetland to the Great Lakes. This will improve fish and wildlife habitat while also creating new opportunities for nature-based recreation. This unique aquatic habitat restoration project will cap and restore a former Confined Disposal Facility that was used to dispose dredged sediment from the mouth of the Don River.

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- *Tommy Thompson Park Embayment D Wetland:* The Embayment D coastal wetland restoration project was undertaken by TRCA and Ports Toronto during 2012 and 2013. This project saw the isolation of Embayment D from Lake Ontario with the installation of an earthen berm including a fish and water level control structure. A series of islands was constructed outside of the berm to create transitional, backwater and spawning aquatic habitats, and to provide terrestrial nesting opportunities for colonial waterbirds. Deep water and nearshore aquatic habitats were enhanced within the embayment and included rocky shoals, fish cribs, sunken woody material, stump fields and native aquatic vegetation plantings. Water level management and the exclusion of common carp are expected to promote aquatic vegetation growth and lead to the development of a 9 hectare wetland.
- *Humber Marshes Wetland Restoration:* In 2015, 1 ha of wetland was restored in the Lower Humber River. Restoration was achieved by installing a water control structure, a carp gate and submerged aquatic habitat structures. The water control structure helps to accelerate aquatic plant growth by providing the ability to manage water levels as needed. The carp gate excludes common carp which are extremely damaging to aquatic plants. By excluding carp, aquatic plants are able to grow and provide spawning, nursery and feeding habitat for northern pike, largemouth bass and smallmouth bass.

#### **TOMMY THOMPSON PARK – CELL 2 WETLAND RESTORATION**

Designated as an Environmentally Significant Area on the Toronto waterfront, Tommy Thompson Park is a 500 ha man-made wilderness park that extends five-kilometres into Lake Ontario. The park provides an outstanding opportunity to restore coastal wetland habitat that once flourished along the Toronto shoreline prior to the settlement and development of the city. In the early 20<sup>th</sup> century Ashbridges Bay Marsh was filled and the mouth of the Don River straightened to create what is now the Portlands. The loss of this large 428 ha coastal wetland ecosystem in Toronto and the development of Toronto Harbour negatively impacted fish and wildlife populations.

Tommy Thompson Park contains three confined disposal facilities (CDFs) that were created to dispose of contaminated sediments dredged from the Keating Channel and Toronto Harbour. Cells 1 and 2 were filled to capacity in 1985 and 1997, respectively. Capping and restoration of Cell 1 was completed in 2007, converting it to a 7 ha coastal wetland. In 2016 Cell 2 was capped with clean fill to physically and biologically isolate the contaminated sediment, improving water and sediment quality, and creating 9.3 ha coastal hemi-marsh ecosystem for fish and wildlife. Habitat features include deep water pockets for overwintering fish and herptiles; in-water shoals, root wads and other submerged structures for fish reproduction; nursery and foraging habitat; aquatic emergent and floating vegetation areas; islands for Common Tern nesting and turtle nesting; an isolated area for amphibian reproduction; a robust riparian area with meadow and shrub vegetation communities; and a fish and water level control structure to prevent large common carp from entering the wetland and damaging the habitat.



#### **FIGURE 26**

Location of major aquatic habitat creation and enhancement projects along the Toronto Waterfront (2007 to 2015)

Source: TRCA



- Toronto Island Wetland Implementation Project: This multi-year project has created a 1.0 ha wetland complex on the Toronto Islands. The wetland complex includes sheltered embayments to encourage aquatic plant growth to provide spawning, nursery, and feeding habitat for northern pike and largemouth bass. In the spring of 2013, northern pike were seen spawning in the wetland. This project is now completed and is ready to operate as a 'fish habitat bank', a model which will allow habitat creation and restoration projects to continue in perpetuity.
- Long Pond Shoreline Enhancement Project: A 300 m stretch of shoreline in the Toronto Islands was restored in 2014. This project restored a previously disturbed section of shoreline to provide critical aquatic habitat for native fish species. Large woody debris, emergent aquatic vegetation, terrestrial plantings, and fish spawning habitat were incorporated into the shoreline. A recreational fishing node was added to provide safe access for anglers.
- Outer Harbour Marina Fishing Node: In 2015, a recreational fishing node was created in the eastern basin of Toronto's Outer Harbour. This will serve as a public access point to the waterfront and provide a safe space for recreational fishing, birding and nature appreciation. In the immediate area surrounding the fishing node, aquatic habitat was improved by installing woody material and rock shoals. Many other similar recreational fishing access points are becoming integrated into new projects as a result of the newly approved Urban Recreational Fisheries Plan (see section 3.4.1).
- Mimico Linear Waterfront Park Project: This project was designed to create a continuous stretch of accessible waterfront park between Humber Bay Park and Norris Crescent Parkette. Phase 1 was completed in 2008, and included the creation of two small headlands, three cobble beaches, a rounded shoreline at the foot of Superior Avenue, a sheltered embayment, a sand dune and various other habitat features. The second and final phase of the project was completed in 2013. Phase 2 included the addition of 500 m of trails and boardwalks between the Superior Avenue Parkette and Humber Park West. Additionally a series of backwater lagoons and various mixed sized aggregate piles were added to provide both shoreline protection and fish habitat (spawning and nursery habitat for sunfish and bass).



- Scarborough Waterfront Project: The Scarborough Waterfront Project is currently in the EA stage and a complete plan of the project's components is still being developed. The project will expand the waterfront trail system from Bluffers Park to the Highland Creek trail, manage public risk from slope failures and hazardous access routes, and improve aquatic and terrestrial habitat.
- Port Union Shoreline Protection and Tommy Thompson Park Cell 1 Wetland: With funding from Waterfront Toronto, in 2002 TRCA began construction on a 3.6 km waterfront trail that stretched from Highland Creek to the Rouge River. The multi-phased project was completed in 2012 and included the addition of numerous shoreline protection measures, five cobble beaches, extensive terrestrial and aquatic habitat features and a bridge across the mouth of Highland Creek. This project included the creation of the 7.7 ha Cell 1 coastal wetland at Tommy Thompson Park as a habitat offset. The Port Union Shoreline and Cell 1 wetland were the earliest TWAHRS projects to be implemented, leading the way for numerous projects to improve aquatic habitat ion the Toronto waterfront since 2003.
- Tommy Thompson Park Embayment Enhancements: There have been many terrestrial and aquatic habitat enhancement projects implemented at Tommy Thompson Park. In the last decade, much of this activity has been focused on coastal embayments. Work has included the creation of wetlands, backwater lagoons, underwater shoals and fish spawning channels, plantings of terrestrial and emergent vegetation, placement of submerged fish habitat structures, the construction of carp exclusion gates and the construction of shoreline protection measures. The goal of this work is to create a diverse shoreline that includes coastal marshes, shrub thickets, mudflats, cobble beaches, sand dunes and wet meadows capable of supporting a diversity of fish and wildlife species.
- Don Mouth Naturalization and Port Lands Flood Protection Project: This project will transform the existing mouth of the Don River and much of the surrounding Port Lands into a naturalized river outlet to Toronto's Inner Harbour, while at the same time removing the risk of flooding to over 290 hectares of surrounding urban land. On January 28th, 2015 the EA was provincially approved, signifying a major milestone for the project. This project is a major cornerstone of the Toronto RAP. Once implemented, the Don Mouth Project will provide significant improvements in the aquatic and terrestrial ecological functions of the immediate and surrounding areas. In addition, it will:
  - o improve sediment deposition, debris and ice jam mitigation measures;
  - o increase the capacity to manage future flooding events;
  - o create 10 hectares of wetland;
  - o enhance recreational opportunities; and
  - o allow for the management of significant sources of contaminated soil within the Lower Don Lands.





Source: Waterfront Toronto

# 3.4. HEALTHY FISH AND WILDLIFE

## **3.4.1. Fisheries Management Plans**

The completion and implementation of Fish Management Plans (FMPs) for all the watersheds in the Toronto and Region AOC were identified as key actions in the 2007 RAP Progress Report. The Humber FMP was completed by TRCA in partnership with MNRF in 2005 and approved in 2008. The Rouge FMP, completed in 1992 has been updated since 2007 and is in draft form. There is an approved Recreational Fisheries Management Plan that includes the Toronto waterfront. FMPs for the Don River, Highland Creek and Etobicoke and Mimico Creeks are outstanding.

In 2014, MNRF decided to discontinue the development or approval of new watershed-based FMPs as provincial management transitioned to a more regional approach. However, since the updated Rouge River FMP (2011) had already been passed by the TRCA Board, it will still enter the provincial approvals process, pending updates to chapters with endangered species content. The draft plan for the Don River is currently being revised as an Aquatic Habitat Management Plan (AHMP) that will not require approval from MNRF. The Etobicoke Creek FMP, completed in 2006) should be considered a TRCA Aquatic Habitat Management Plan. There is no equivalent FMP or AHMP anticipated for Mimico or Highland Creeks, although updated direction for aquatic habitat management appears in the Etobicoke-Mimico Watersheds Plan Technical Update (2010) and the forth coming Highland Creek Watershed Greening Strategy (in-progress). Over the years, implementation of FMPs or AHMPs has largely taken the form of in-stream barrier mitigation projects and stream or riparian habitat improvements. The Plans are also used as a resource for guiding the land use planning process.

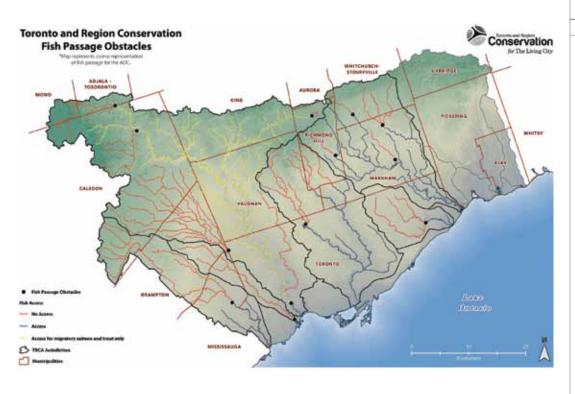
In 2013, AHT and the Toronto and Region RAP initiated *Fishing in your Backyard: An Urban Recreational Fisheries Strategy for the Lake Ontario Northwest Waterfront* as a companion to TWAHRS and in response to changes to the federal *Fisheries Act.* Due to significant regional interest, the scope of the plan eventually expanded to include the waterfront from Burlington to the eastern border of Durham Region. The strategy integrates existing waterfront strategies, plans, research and analyses conducted along the north shore of Lake Ontario. It is intended to provide practical information to decision-makers, planners, designers and regulatory agencies to ensure that nearshore recreational fishing opportunities, habitat restoration and quality angler-access sites are incorporated into municipal and regional waterfront planning initiatives. It is also intended to raise awareness of the fisheries resource through effective marketing and promotion of restoration measures to sustain a healthy fish community.

## 3.4.2. Fish Barrier Mitigation

During the last 200 years of settlement, the six watersheds in the Toronto RAP area have been affected by the construction of concrete weirs and dams. Since the mid-1990s, significant effort has been placed on reconnecting these watersheds to allow for the passage of migratory fish from Lake Ontario. Actions to remove dams and construct fishways and bypass channels have resulted in better connections for migratory species. Naturally-reproducing migratory rainbow trout can now be found in the Rouge and Humber Rivers and white suckers can successfully navigate up the Rouge River from Lake Ontario to Highway 7 in Markham. In the fall, chinook salmon can be seen swimming up the Don River toward Richmond Hill and Vaughan. Still, further effort is needed in the coming years to restore connections between the lake and the habitats in the Humber River and Etobicoke, Highland and Mimico Creeks.

A key action in the 2007 RAP Progress Report was to mitigate barriers to facilitate the passage of native fish species (non-jumpers) in the Humber River, as identified in the Class EA that was completed in 2007. Detailed design for a fishway at Old Mill Dam was completed in 2010 and is on hold, pending funding and approvals. Figure 27 shows existing fish obstacles in the watersheds of the Toronto RAP area, and the extent to which fish can migrate up those watersheds from Lake Ontario.





#### **FIGURE 27**

Passage obstacles for migratory fish species in the watersheds of the Toronto and Region AOC (2015)

Source: TRCA

# **3.5. SUSTAINABLE WATERSHEDS AND WATERFRONT**

## **3.5.1. Sustainable Watershed Actions**

Watershed planning is the development of strategies to protect, maintain and restore watersheds. Such plans typically describe the natural features and functions of a watershed, set targets for desired future conditions, and map out strategies to achieve these conditions.

TRCA has developed (and periodically updated) watershed plans for each of its watersheds, except for Highland Creek, where the watershed plan has been superseded by the City of Toronto's Highland Creek Geormorphic Master Plan, the WWFMP and other processes. In Highland Creek, TRCA and partners have initiated the development of the Highland Creek Greening Strategy, which will provide a strategic restoration action plan for the valley system and overall watershed function. The strategy, scheduled for completion in 2016, will provide a series of management objectives and opportunities associated with the recommendations outlined in the strategies developed by the City of Toronto, TRCA, and other partners that relate to the conservation of the Highland Creek watershed.

TRCA completed watershed plans and associated updates for the Don and Etobicoke-Mimico watersheds in 2009 and 2010, respectively. TRCA is currently reviewing its watershed planning process to outline what the next generation of watershed plans will look like and developing new approaches to improve efforts to address watershed priorities. Most municipalities have now incorporated policies within their updated Official Plans to provide for watershed plan recommendations to be considered in planning decisions. Regeneration projects, including trail and greenspace planning, have been informed by technical information and priorities identified in the watershed plans. The monitoring network continues, and stewardship programs and celebration events seek opportunities to raise awareness of watershed plan directions.

TRCA released Watershed Report Cards for the Etobicoke Creek, Mimico Creek, Humber River, Don River, Highland Creek, Rouge River and the Toronto Waterfront in 2013. TRCA also released a Living City Report Card in 2011, which assessed the environmental health of the Toronto RAP area in terms of water, biodiversity, waste, carbon, land use and air quality.

#### 3.5.2. Sustainable Waterfront Actions

Waterfront Toronto's sustainability activities from 2001 to 2015 are documented in its 2015 *Corporate Social Responsibility and Sustainability Report.* The report covers a broad range of sustainability actions dealing with environmental, social and economic performance.

One of the most relevant performance indicators in terms of the RAP are the activities relating to aquatic habitat creation which were carried out in the Mimico Waterfront Park, Central Waterfront and Port Union. In total, 108,920 m<sup>2</sup> and 3,133 linear metres of aquatic habitat have been created or improved through Waterfront Toronto projects between 2001 and 2012.

With regard to sustainability, Waterfront Toronto has requirements for water conservation and reuse in its Minimum Green Building Requirements. In Sherbourne Common, created in 2010, stormwater management is integrated into the design of the park and its water features. In Don River Park, water is reclaimed from the water play feature and stormwater collection system in closed loop systems to feed the irrigation system and flush the marsh.

#### 3.6. MONITORING AND SCIENCE

#### 3.6.1. Monitoring Actions

TRCA's Regional Watershed Monitoring Program has been in place since 2001 with funding support from the Toronto and Region RAP, the City of Toronto and the Regions of York, Peel and Durham. Its purpose is to collect aquatic and terrestrial ecosystem data at the watershed and sub-watershed scale, and across the region as a whole. The monitoring program includes more than 500 sites that are used for the collection of long-term data related to water quality, hydrology, stream temperature, groundwater, and aquatic communities and habitat.

Over the past decade the network has expanded to include the monitoring of terrestrial conditions through a series of volunteer monitoring sites and terrestrial fixed plots. Recently TRCA has installed monitoring stations at select sites on Etobicoke Creek to continuously monitor water quality during storm events, to capture peak flows and "first flush" levels. Data collection and analysis is ongoing and used to support watershed plan updates.

In 2011, an innovative aesthetics monitoring protocol was developed by the Toronto and Region RAP which was incorporated into the Regional Watershed Monitoring Program and waterfront sampling. This monitoring represents the most comprehensive study of aesthetics in an AOC on the Great Lakes. It is described in sections 2.1.5 and 4.1.5.

With more than a decade of data available, the datasets related to the various indicators included in the program have been valuable in supporting additional research and reporting opportunities from many stakeholders and partners including academia, provincial and federal agencies, NGOs and private interests.

Along the Toronto waterfront, TRCA, the City of Toronto and Ports Toronto continue to monitor water and sediment quality annually. TRCA also carries out intensive sampling of the Keating Channel during dredging operations by Ports Toronto.

Across the Toronto Waterfront, TRCA continues to build upon its fisheries database. From 2007 to 2015, this included sampling of over 141,000 individual fish. This long-term assessment provides valuable information to resource management agencies, as fish are sensitive to a wide range of stressors. Sampling efforts cover a range of habitats such as open coast, sheltered embayments, coastal wetlands and rivermouth systems. This extensive monitoring helps to make educated assessments of the composition and health of the fisheries along the Toronto Waterfront. The fisheries data gathered also play a very important role in prioritizing, planning and designing aquatic habitat creation and restoration projects.

In 2008, agencies joined together on an intensive year of monitoring water quality, flows, tributary discharge, currents and other parameters as part of the Cooperative Science and Monitoring Initiative (CSMI), a multilateral process to enhance cooperation among agency scientists and academic researchers on both sides of the Great Lakes. The work in 2008 allowed researchers to study issues such as land-based influences on water quality, the impacts of tributary discharge on the nearshore, and the influence of the nearshore on the distribution of organic chemicals associated with wastewater. The results of these 2008 studies were published in 2012 in a special issue of the *Journal of Great Lakes Research*. Intensive study was also carried out in 2012 to gather information on where and how ambient water quality conditions are changing over time by periodically monitoring a suite of indicators at a small network of nearshore stations on the Great Lakes. In 2013 CSMI focused on offshore waters and the lower food web. As part of this assessment, phytoplankton and zooplankton were sampled along the Toronto waterfront.

#### 3.6.2. Science Actions

This section provides a brief overview of some of the most relevant science that has been undertaken since 2007 in support of the Toronto and Region RAP. Activities are organized according to the BUI(s) to which they relate. Information on the status assessments that have been carried out on the BUIs themselves is found in section 4.1.

# Activities relating to Water Quality, and the Eutrophication or Undesirable Algae and Beach Closings BUIs:

- *Identifying Targets for* CSO *Control:* As part of the Don River and Central Waterfront Project, City of Toronto staff modeled wet weather flows to identify the storage requirements for 52 combined sewer overflows (CSOs) that discharge to the waterfront to achieve a range of control levels. This allowed researchers to estimate the water quality improvements that can be expected through implementation of this important project. This information allowed policymakers to decide on the target for the project, which is one combined sewer overflow per summer season.
- Assessing Phosphorus Along the Waterfront: A preliminary assessment of nutrient pollution along the waterfront of the Toronto and Region AOC was developed and released (*Toronto and Region RAP Preliminary Assessment of the Eutrophication or Undesirable BUI along the Toronto and Region Waterfront, August 2015*). The major findings from this assessment are provided in section 2.1.1.
- *Phosphorus Modelling Work on Rouge River:* This project examined the interactions of a targeted eastern Toronto watersheds, in particular the Rouge River, with the nearshore zone of Lake Ontario. The aim of the project was to provide detailed and long-term analysis of water quality issues associated with eutrophication effects. Continuous daily simulation of watershed-derived nutrient and sediment loads is required to estimate nearshore water quality in Lake Ontario and the impact of beneficial management practices in the nearshore of the lake. The Soil and Water Assessment Tool was used to build a watershed model that incorporated detailed information about representative land operation activities applicable as agricultural practices in Southern Ontario. Model simulations and estimated nutrient loads under different conditions (BMP scenarios) and climate forcing were developed and results delivered for public dissemination through workshops, presentations and refereed science journals.
- *Identifying Sources of Bacteria in Beaches:* ECCC has carried out research to gather more information on the sources of fecal pollution to Sunnyside Beach, one of three remaining non-Blue Flag beaches on the waterfront. Through DNA testing they were able to distinguish between bird and human sources (see section 3.2.5).
- *Developing Water Balance Criteria:* This project provided the scientific support required for the refinement of water balance criteria guidelines to ensure that the hydrology of natural features such as wetlands, woodlands and watercourses are protected over the long-term in

the urban development process. Maintaining the natural hydrology of these features ensures that important hydrological functions – such as flood attenuation, groundwater recharge, and evapotranspiration – continue to occur, thereby reducing downstream erosion and flooding impacts. These criteria also ensure that ecosystems continue to have the water needed to support the habitat of species sensitive to hydrological changes, such as fish, frogs and birds. This project has been ongoing for several years in partnership with universities and Conservation Authority partners and is coordinated with the Terrestrial Fixed plot project.

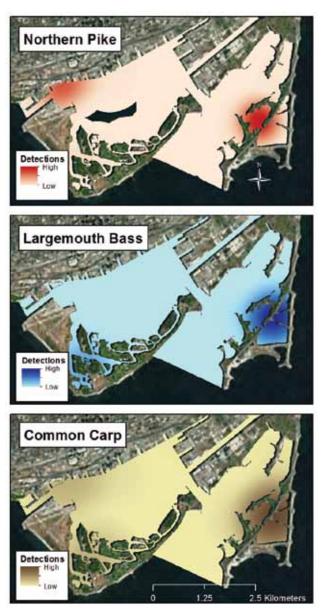
- Evaluating Low Impact Development Technologies: The Sustainable Technologies Evaluation Program (STEP) continued with research relating to Low Impact Development, stormwater management and erosion and sediment control from construction sites. Details are provided in section 3.2.2.
- Other STEP Projects:
  - o *Developing Best Practices for Salt Application in Parking Lots:* Road salts contribute to chloride pollution in surface waters, and much effort has been expended on learning how to reduce the application of salt on streets and highways. This three-year project examined the conditions that influence the effectiveness of commonly use de-icing and anti-icing treatments for parking lots and sidewalks. The ultimate aim is to develop guidelines for the optimum selection of materials, application rates and techniques.
  - o Evaluating Alternatives to Salt for De-icing: In this project, researchers from the University of Waterloo in partnership with STEP compared the performance of three organic and semi-organic anti-icing products to conventional salt brine. The results showed that these alternative de-icers were as effective as salt brine and had a much lower impact on the environment and infrastructure.
  - o Developing Soil Quality and Depth Guidelines: This project developed guidelines for the type and quantity of soil required in new "greenfield" construction. (Greenfield construction is development on lands that have not previously had development, e.g., natural areas or farmland). These will help produce healthier soils that can better intercept, absorb, and cleanse stormwater runoff, thereby improving the health of streams, rivers and Lake Ontario.
  - o *Evaluating Polymer Technology in Stormwater Ponds:* Stormwater ponds must be maintained to remain effective, and this maintenance is a lengthy, costly and disruptive process. In this project, researchers examined the benefits of applying polymers to consolidate saturated soils. This made sediments easier to remove, and with the use of hydraulic dredge technology reduced environmental impacts, disturbances to nearby residents, and off-site impacts.

# Activities relating to the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs:

• Understanding Physical Processes in the Inner Harbour: Researchers from the Department of Physical and Environmental Sciences at the University of Toronto Scarborough carried out a study to identify the mechanisms that lead to flushing and thermal variability in the embayments of Toronto's Inner and Outer Harbours. The project examined water temperature, water level oscillations and currents, in order to improve the understanding of why some species of fish select habitat. One conclusion of the study was that connection width, distance from the lake, and depth alone do not guarantee a specific thermal regime in an embayment. A second finding is that water exchange between the Inner Harbour and Lake Ontario is dominated by water level oscillations over a one-hour period. And finally, upwelling events can play a major role in regulating the thermal regimes by bringing cold water from the bottom of the lake into the Inner Harbour. These upwelling events are currently being modelled in Toronto Harbour to understand the effect of coldwater intrusions on restored wetland habitat and embayments with the aim of improving habitat and ensuring thermal refuge for fish species.



• Tracking Fish Movement: Beginning in 2010, researchers from Carleton University, the University of Toronto and TRCA carried out Fish Telemetry Projects in Toronto's Central Waterfront to gather information on habitat selection, movement corridors, residency timing and other factors. An acoustic telemetry array was established in the Central Waterfront. Receivers were placed in targeted areas such as the slips in the Inner Harbour, the open waters of the Inner Harbour, the lagoons in the Toronto Islands, the Outer Harbour, and the embayments in Tommy Thompson Park. Between 2010 and 2015, 320 fish were tagged from a variety of species, including northern pike, bowfin, common carp, largemouth bass, and others. More than 20 million detections have been made so far. Preliminary findings suggest that there is a high level of residency for all species studied, except for common carp. Notwithstanding this, there are extensive movement of fish throughout the study area, for example, with fish moving between the Inner and Outer Harbour. There tends to be discreet differences between summer and winter habitat use, with overwinter staging in shallow embayments. It was also noted that fish become active in the spring earlier than expected, which is relevant to the timing of habitat construction. Areas where restoration has been done are being used by native fishes, particularly northern pike, largemouth bass, and yellow perch. Continued analysis of these data will shed more light on the effectiveness of habitat restoration to date, and provide direction for future efforts (see Figure 28).





#### **FIGURE 28**

Frequency of detection of three fish species by fish telemetry (2015) *Source: DFO* 





- Understanding How Temperature Changes Affect Fish Movement: Using the telemetry described above, researchers at Carleton University and partners examined how fish in Toronto Harbour respond to rapid changes in water temperature caused by upwellings. Water temperature preferences are different for warm water species (like carp and bass), coolwater species (like walleye and northern pike) and cold water species (like Atlantic salmon and lake whitefish). The study findings suggest that fish are able to select the depth of water at which the temperature matches their preferred thermal range. When there are sudden changes in water temperature is still optimal. Sudden changes in temperature are more likely to cause pike to move compared to bass or carp. The information obtained from this study will help in future habitat creation projects.
- Collecting Information on Fish Communities: Five times between 2006 and 2014, researchers from MNRF carried out Nearshore Fish Community Index Netting (NSCIN) in embayments along the waterfront in the Toronto RAP area. The objective of the NSCIN was to gather data on fish populations in relation to restoration targets for the Toronto and Region AOC. A total of 28 species were caught, with piscivore (fish-eating) making up on average 19% of the biomass caught. This is slightly less than the 20% target for the AOC. Specialist fish species made up on average 31% of the biomass caught, compared to a target of 40%. Among key species, researchers found that rock bass, smallmouth bass and walleye populations were depressed, while common carp populations were elevated, compared to embayments in non-AOC locations. Researchers found that restoration stocking of walleye, a key top predator, could play a role in helping to restore fish communities in the Toronto and Region AOC by improving the quality of the fishery and galvanizing public support.
- Comparing DFO and TRCA Electrofishing Data: Researchers from DFO examined TRCA electrofishing data from a number of areas along the Toronto Waterfront and compared it to data collected by DFO using a different survey protocol. TRCA uses a time-based protocol for electrofishing, while DFO uses a distance-based protocol. An adjustment factor for TRCA data was identified which will allow TRCA data on the health of fish communities (the Index of Biotic Integrity) to be compared with data collected by DFO at other sites on Lake Ontario.
- Surveying Substrates and Shorelines along the Waterfront: This project used aerial imagery and field teams to identify and classify the different types of shorelines in the Toronto and Region AOC. This work supports evaluation of the fish habitat and population BUIs by advancing the understanding of fish-habitat interactions, identifying habitat features that are important or limiting, developing AOC-specific classification schemes and fish-habitat models. This work will provide advice on habitat conservation and AOC-specific restoration actions in support of TWAHRS and will help AHT design and implement habitat restoration and creation projects.
- Establishing Long-Term Terrestrial Monitoring Plots: In this project, TRCA established fixed plots for monitoring terrestrial habitat, breeding birds and amphibian populations in three types of land uses urban, urbanizing and rural. The terrestrial Long-Term Monitoring Program (LTMP) was initiated in 2008 with the establishment of vegetation and bird fixed plots in forest communities across the jurisdiction. In 2009, additional regional plots were set-up to monitor wetland vegetation, wetland birds, frogs, Plethodontid salamanders and meadow birds. The purpose of the LTMP is to detect spatial and temporal trends in the vegetation and species communities over time. Through the use of standardized scientific data collection protocols, the response of the terrestrial system to various landscape changes, such as increased natural cover through reforestation efforts or to increased use of the natural area due to recent nearby urbanization, can be quantitatively documented. The assessment of changes in these natural systems can then be used to better guide management actions on-site with the aim of improving overall biodiversity. In addition, the data generated will provide the quantitative evidence for the BUI de-listing process.
- *Heart Lake Turtle Population Study:* In this project, TRCA worked with the City of Brampton, the Ontario Road Ecology Group and local residents to gather data on turtle populations in Heart Lake. The aim of the project is to develop mitigation strategies to reduce the number of interactions with vehicles and protect these species and the unique and diverse ecosystem in which they live.

# 3.7 STEWARDSHIP AND EDUCATION

#### **TRCA** Activities

TRCA carries out a host of stewardship and education programs that deal with the environment. Those that are most directly related to the RAP include the following:

- TRCA conducts outreach education through mobile education programs such as Watershed on Wheels and the Aquatic Plants Program. Curriculum links include science and technology, local outdoor environment and physical education.
- TRCA has developed "Greening Your Grounds", a homeowner's guide to stormwater landscaping projects, which is used as a teaching tool and a "take away" for addressing stormwater at the source.
- The Yellow Fish Road<sup>™</sup> program engages students and community groups in hands-on outdoor programming that makes the connection between what goes down storm drains in residential communities and impacts on local rivers and Lake Ontario.
- Since 2009, the RAP Team in partnership with TRCA has hosted the Lake Ontario Evening Speaker Series which has been a resounding success. The event has brought together diverse, standing-room only crowds to learn from, and share ideas with, the individuals and organizations working at the forefront of environmental challenges in the Toronto and Region AOC, Lake Ontario, and the Great Lakes as a whole. Event themes have included: Great Lakes Water Diversions, Biodiversity. Lake Ontario Nearshore, Environmental Contaminants, Beach Water Quality, Toronto Fish and Fish Habitat, Drinking Water Source Protection, Urban Angling, and other RAP-related topics.
- TRCA conducted a series of public workshops in support of *Fishing in Your Backyard: an Urban Recreational Fisheries Strategy for the Lake Ontario Northwest Waterfront.* These workshops were held at a various locations across the TRCA jurisdiction to solicit input from a wide variety of stakeholders and agencies with an interest in fishing along the waterfront.

#### **Community Activities**

The following municipal and NGO activities in the Toronto RAP area have been funded through the MOECC Great Lakes Guardian Community Fund from 2013 to 2015.<sup>6</sup>

- Bird Studies Canada "Marshbird Monitoring" program;
- Project Flow which educated and engaged students in water-related actions;
- Black Creek "SNAP Neighbourhood Action" that promoted downspout disconnection and rain harvesting in the Humber River watershed;
- Toronto Zoo "Great Lakes Program" to restore Atlantic salmon and enhance riparian vegetation in the Rouge River
- Ontario Streams "Atlantic Salmon Restoration Program" in the Humber River;
- City of Brampton cleanup of Etobicoke Creek and Calvert Park;
- Earth Rangers "Great Lakes Outreach Program" (education, awareness and action) in the Humber River watershed;
- Milliken Community "Rain Garden" and "Low Impact Development Project" in Highland Creek;
- Evergreen Brickworks "Urban Watershed Ecology", "Watershed Greening", and "Uncover Your Creeks" programs in the Don and Rouge Rivers and Highland Creek;
- Ontario Streams "Wetland Restoration Project" in the Humber and Rouge Rivers;
- York Region "Adopt-a-Stream-Crossing" program which included riparian plantings;



<sup>&</sup>lt;sup>6</sup>It should be noted that these are by no means the only RAP/Lake Ontario-related community activities taking place in the Toronto RAP area. Many other NGO and municipal stewardship and education programs and projects have taken place since 2007.

- Rotary Club of Toronto "Ecosystem Project" to improve fish and wildlife habitat in the Don River;
- Friends of the Rouge Watershed project to restore water quality and habitat in the Rouge River and Highland Creek;
- Valley Park Community Association "Go Green Artificial Wetland Plantings" in the Don River;
- York University streambank restoration and forest naturalization at Glendon Campus in the Don River watershed;
- Association for Canadian Educational Resources "Riparian Rangers" which restored riparian habitats in Etobicoke Creek;
- Environmental Defence "Living Beach Rain Garden" at Woodbine Beach; and
- LEAF "Youth Ambassador" program on the replacement of trees lost to the Emerald Ash Borer in the Rouge, Don and Humber River watersheds.

The following municipal and NGO activities in the Toronto RAP area have been funded through the Great Lakes Sustainability Fund and EcoAction between 2007 and 2013.

- Friends of the Rouge Watershed Inc. "Youth and Community Greening the Rouge River Watershed" to restore priority sites in the Rouge Park involving students and community volunteers;
- Francophone "Your Child's Bright Idea" program to educate children about energy reduction and climate change in the Don River watershed;
- Association for Education Resources "Planting for Change" program involving students from six schools in Halton and Peel Regions examining the impacts of climate change on plants;
- Torat HaTeva "Community Teaching Garden and Naturalization" project;
- Black Creek Conservation "Educating Through Action" and Downsview Dells Stormwater Control" projects on the Black Creek;
- Citizen's Environment Watch "Making Waves" project to protect local streams;
- Evergreen "Greening a Growing Community" project for restoration and stewardship of Phyllis Rawlinson Park in Richmond Hill, "Brickworks Biodiversity Project" to restore a ravine slope in the Don River watershed, and "Neighbourhood Roots Community Stewardship Program" to increase the urban forest;
- Future Watch "Eco Crews" project to promote environmental awareness and action at a community agency and high school in Toronto;
- Metro Zoo's "Aqua-Links" project to educate 600 public school students about water conservation issues relating to the Great Lakes;
- Rouge Valley Naturalists "Reesor Road Farmland and Floodplain Restoration" in Rouge Park;
- Conservation Foundation of Greater Toronto "Don River Water Wise Stewardship Project" to restore through planting a number of wetland sites in the Don River;
- 10,000 Trees for the Rouge Valley "Swamp and Riparian Companion Forest and Meadow" restoration in the Little Rouge River;
- TRCA "Don-Highland Pollinator Plants Restoration Project " to restore degraded areas and create pollinators plant meadows in the Don River and Highland Creek;
- Summerhill Foundation "Portable Gasoline Container Collection Project" to increase awareness of the proper use of fuel containers and the environmental impacts of spills and emissions;
- Ontario Streams "Toronto Region Wetland Restoration Project" to restore wetlands in the Lower Humber River and the Rouge River; and
- Ontario Streams "Caledon Headwaters Rehabilitation Initiatives" to protect and rehabilitate fisheries habitat within the many headwater tributaries of the Town of Caledon through instream habitat enhancement, mitigation of barriers to fish passage, regeneration of riparian areas, Atlantic Salmon re-introduction; and fisheries monitoring.



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# PROGRESS MADE SINCE 2007

# 4.1. PROGRESS ON BENEFICIAL USE IMPAIRMENTS

This section of the report focuses on the progress that has been made since 2007 on the seven BUIs that have been re-designated as "Not Impaired" or which require more study to confirm that they are "Not Impaired" (see Table 13).

	2016 Status			
Beneficial Use Impairment	More Study Needed to Confirm if Not Impaired	Not Impaired		
Restrictions on fish consumption	Х			
Degradation of benthos		Х		
Restrictions on dredging activities		Х		
Degradation of aesthetics		Х		
Fish tumours or other deformities		Х		
Bird or animal deformities or reproductive problems		Х		
Degradation of phytoplankton and zooplankton communities	Х			

#### Approach for Re-designation of BUIs

In 2011, the Toronto and Region RAP Team carried out a Review and Update of the RAP BUI process. This was important for clarifying the path forward for re-designating BUIs. The Review and Update had three steps. It:

- 1. Reconciled the RAP Targets and Actions identified in Clean Water, Clear Choices (1994) on a BUI basis;
- 2. Carried out a technical review and update of the criteria to be applied when determining the status of a BUI; and
- 3. Developed a transparent, science-based framework for changing the status of a BUI from "Impaired" or "Requires Further Assessment" to "Not Impaired".

The Toronto and Region RAP Team adopted a three-tier criteria framework for assessing the status of BUIs:

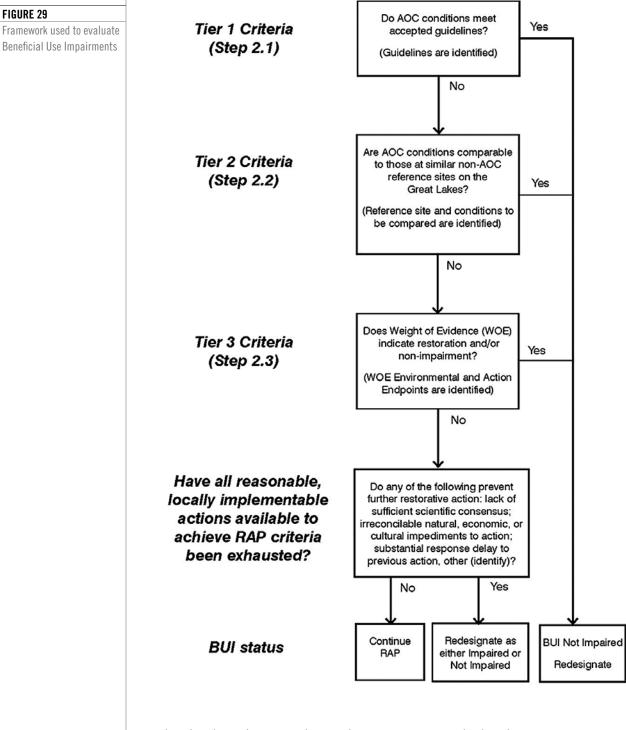
• Tier 1 Guideline Criteria: Do conditions meet generally accepted standards and guidelines (if available)?

#### TABLE 13

Status of BUIs that have been re-designated as "Not Impaired" or which require more study to confirm that they are "Not Impaired" (as of Fall 2016)

- Tier 2 Comparison Criteria: Are conditions comparable to similar non-AOC reference sites elsewhere in the Great Lakes (if available)?
- Tier3 Weight of Evidence Criteria: Does the weight of evidence indicate restoration and/or non-impairment?

A further criterion is whether all reasonable, locally implementable actions available to achieve RAP criteria have been undertaken. The framework is illustrated in Figure 29.



Further details on the approach to re-designating BUIs can be found at <u>www.torontorap.ca/wp-content/uploads/2013/01/GuidetotheRAPtechnicalreviewandupdate.pdf</u>

## 4.1.1. Degradation of Benthos

Studies undertaken in the 1970s showed that sediments in the Toronto Inner Harbour and Humber Bay were contaminated with a number of metals and organic compounds. In contrast, sediments in the Outer Harbour and the eastern waterfront had low concentrations of contaminants and generally did not contribute to biological effects on benthic organisms. During the 1970s, concentrations of many of the metals in the Inner Harbour and Humber Bay sediments exceeded the MOECC's Provincial Sediment Quality Guidelines Severe Effect Levels. The sediments also had a high nutrient content, indicating organic enrichment of the sediments, due mainly to materials in runoff (storm-water, snowmelt and combined sewer overflows) from the largely urbanized areas of the two main watersheds draining to the AOC – the Humber River and the Don River.

The 1991 IJC De-listing Guideline for the Degradation of Benthos BUI is:

When the benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment associated contaminants is not significantly higher than controls.

In the past, assessment of the environmental risk from sediment relied on sediment chemistry alone. Newer, effects-based approaches are now used to better determine whether contaminated sediment poses a risk to aquatic life, non-aquatic wildlife (such as fish-eating animals and birds) and humans. This new approach uses a weight-of-evidence approach that incorporates multiple lines of evidence to more accurately assess the environmental risk posed by contaminated sediment. Using this approach, the BUI assessment considered three factors: sediment chemistry, sediment toxicity, and community assessment of benthic invertebrates. The conclusion of the assessment was that the Degradation of Benthos BUI is considered "Not Impaired" as supported by the following evidence:

- the benthic community has demonstrated improvements over time (there has been an increase in diversity);
- concentrations of various metals and organic contaminants in bottom sediments have been reduced over time, are generally below the guidelines, and are consistent with what might be expected in a large urban area;
- sediment-bound contaminants are not acutely or chronically toxic to test organisms; and
- diversification of the benthic community is limited by the physical aspects of the habitats, which are not expected to change over time as they are a reflection of the urban environment.

More detail on the assessment can be found in the Toronto and Region RAP BUI Status Redesignation Document: Degradation of Benthos (April 2013).

## 4.1.2. Restrictions on Dredging Activities

Routine dredging to maintain adequate depth in navigational channels and harbours is carried out in many locations throughout the Great Lakes. Chemical-specific guidelines have historically been used in both the Canadian and U.S. portions of the Great Lakes to assess the suitability of disposing of the dredged material in open lake environments. In cases where chemical contaminants exceed open water disposal guidelines, the dredged material is not considered suitable for disposal in the open lake and must be disposed or managed in a more restrictive manner within an engineered Confined Disposal Facility or in an appropriate landfill or upland disposal site. Generally, open water disposal of dredged material is less expensive than other alternatives for management of this material.





The 1991 IJC De-listing Guideline for the Restrictions on Dredging BUI is:

When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.

Open-water disposal of sediments is not currently undertaken in the Toronto and Region AOC. Little dredging is done, and currently the only regular dredging activity is carried out in the Keating Channel to remove the buildup of material deposited by the Don River. This is done to maintain depth and reduce the flood potential in the lower section of the river. Disposal of this dredged material is governed by the 1982 Keating Channel EA which requires placement of the dredged sediment in one of three Confined Disposal Sites that were constructed in 1979 in Tommy Thompson Park. Dredging is also occasionally undertaken around Ashbridges Bay and in the Eastern and Western Gaps to remove material that has drifted around the entrance of the bay or into the channels. This material is mostly clean sand and is re-used for beach nourishment in areas along the waterfront where active shoreline erosion occurs or for habitat restoration projects.

Assessment of this BUI used a weight-of-evidence approach that considered three factors: sediment chemistry, sediment toxicity, and community assessment of benthic invertebrates. The conclusion of the assessment was that the Restrictions on Dredging Activities BUI is considered to be "Not Impaired" in the Toronto and Region AOC as supported by the following evidence:

- except for copper, concentrations of metals in Keating Channel sediments have declined since 1987 and all parameters are generally well below the Provincial Sediment Quality Guidelines Severe Effect Levels;
- Keating Channel sediment quality is generally better than that found in non-AOC reference locations on Lake Ontario (Mississauga Basin and Oakville);
- toxicity testing of Keating Channel sediment found no acute toxicity to a range of test organisms; and
- while high densities of oligocheates (freshwater worms) were found in sediment at the mouth of the Keating Channel, this appears to be related mainly to the influx of sediment and organic matter from the Don River.

More detail on the assessment can be found in the Toronto and Region RAP BUI Status Redesignation Document: Restrictions on Dredging Activities (Draft January 30, 2014)

#### 4.1.3. Fish Tumours or Other Deformities

In the Stage 1 RAP report *Environmental Conditions and Problem Definition*, the Fish Tumours or Other Deformities BUI was classified as "Requires Further Assessment". The 2001 RAP Progress Report, *Clean Waters, Healthy Habitats* recommended a study of liver tumours and external deformities in fish to determine if the BUI should be listed as impaired in the Toronto and Region AOC.

The 1991 IJC De-listing Guideline for the Fish Tumours or Other Deformities BUI is:

When the incidence rates of fish tumours or other deformities do not exceed rates at unimpacted control sites or when survey data confirm the absence of neoplastic or preneoplastic liver lesions in bullheads or suckers.

To determine if tumours in fish was an issue for the AOC, ECCC and TRCA conducted studies of brown bullhead captured in the Toronto nearshore and marshes in 2003 and 2006. A total of 213 samples were collected from the Toronto and Region AOC and analyzed for tumours. The total



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bullhead liver tumour prevalence was found to be 3.8% which is not significantly different from the liver neoplasm prevalence found in non-AOC Great Lakes reference locations. Accordingly, the conclusion of the assessment was that the Fish Tumours and Other Deformities BUI can be classified as "Not Impaired" in the Toronto and Region AOC.

More detail on the assessment can be found in the Toronto and Region RAP BUI Status Redesignation Document: Fish Tumours and Other Deformities (December 2011).

# 4.1.4. Bird or Animal Deformities or Reproductive Problems

In 1987, when Toronto and Region was designated an AOC there were concerns that persistent contaminants in sediment and water might be causing bird or animal deformities and reproductive problems. At the time, there was insufficient evidence to designate a status for the associated BUI, so it was designated as "Requires Further Assessment".

The Toronto and Region RAP De-listing Guideline for the Bird or Animal Deformities or Reproductive Problems BUI is:

The incidence rate of deformities and reproductive problems in "sentinel" wildlife species are the same as, or less than, background levels in populations from uncontaminated systems.

Between 2001 and 2005, TRCA and ECCC conducted two studies on top predator aquatic-feeding species known to be sensitive to the effects of contaminants. The first study examined reproductive success, morphological deformities and contaminants in eggs of five colonial waterbird species: the ring-billed gull, common tern, Caspian tern, black-crowned night-heron and double-crested cormorant. The second study examined wildlife health effects relating to reproduction and/or deformities in two indicator species, the herring gull and the common snapping turtle, which feed within the AOC. Results of the studies included:

- overall, levels of contaminants in eggs of colonial birds were below the thresholds associated with adverse effects on reproductive success;
- the rates of morphological deformities in chicks of colonial waterbird species were low, and the types observed were not consistent with contaminant-related deformities;
- contaminant-induced effects do not appear to be limiting factors at the population level for colonial waterbirds feeding in and around the AOC;
- the reproductive success of tern species and night herons appeared to be limited by external factors such as predation, competition and/or habitat deterioration;
- embryonic development appeared to be good in snapping turtles from the Humber River where hatching success was high and the rate of morphological deformities in hatchlings was low; and
- the endpoints associated with impaired reproduction and deformities in wildlife were similar between the AOC and selected lower Great Lakes non-AOC reference sites.

The conclusion of the assessment was that the Bird or Animal Deformities or Reproductive Problems BUI in the Toronto and Region AOC has been re-designated from "Requires Further Assessment" to "Not Impaired".

More detail on the assessment can be found in the Toronto and Region RAP BUI Status Redesignation Document: Bird or Animal Deformities or Reproductive Problems (December 2011).



#### 4.1.5. Degradation of Aesthetics

As outlined in section 2.1.5, degradation of aesthetics is one of the eleven BUIs that was identified in the Toronto AOC in 1989. Historically, the IJC's Degradation of Aesthetic BUI was focused on oil scum and unnatural foamy water, not weeds or litter. When the RAP Stage 1 Report was being developed for the Toronto and Region AOC, the aesthetics concern at that time related mainly to debris and litter along watercourses, weed growth along the western shoreline (which is addressed through the Eutrophication or Undesirable Algae BUI) and turbidity near river mouths.

The 1991 IJC De-listing Guideline for the Degradation of Aesthetics BUI is:

Waters that are free of any substance that produces a persistent objectionable deposit, unnatural colour or turbidity or unnatural odour (for instance, oil slick or surface scum).

One of the challenges for the Degradation of Aesthetics BUI is that perception of aesthetic quality is largely a subjective matter. To address this issue, in 2011 the Toronto and Region RAP developed a semi-quantitative protocol, Method to Assess Beneficial Use Impairment (BUI) Degradation of Aesthetics (Toronto) to assess aesthetics in the AOC in a less subjective manner. The aesthetics monitoring program was incorporated into TRCA's waterfront and watershed monitoring programs in 2012. Monitoring for aesthetics was carried during 2012, 2013 and 2015. In order to reduce subjective bias, technical staff members were trained to survey in a comparable and standardized manner using four aesthetic categories (non-natural debris, and the odour, colour and clarity of water). Monitoring was carried out throughout the watersheds and along the waterfront in both RAP and non-RAP areas and sites were rated as excellent, good, fair or poor. A total of 427 sites were surveyed over the three-year period, with 338 of these being in the Toronto RAP area. A total of 1,714 samples were collected from the sites in the Toronto RAP area.

As illustrated in Figure 9, the results from the three-year monitoring program showed that only 24 samples (1%) were assessed as "Poor", or having unacceptable aesthetic conditions. The remaining 1,690 samples (99%) were assessed as having acceptable aesthetics, with the majority of samples (88%) being assessed as "Excellent".

Of the 14 unique sites where samples were assessed as "Poor", only four – in the Lower Don River – are believed to have chronic aesthetic issues, because of their location at the mouth of a highly urbanized watercourse, the presence of the right angle bend to the Keating Channel and the presence of the Ports Toronto log boom that collects debris coming down the river for later disposal. The planned re-naturalization of the Don Mouth will lead to some aesthetics improvements in this area, but by itself will not completely address the cumulative effects of urbanization in the watershed.

The conclusion of the assessment is that the Degradation of Aesthetics BUI should be redesignated from "Impaired" to "Not Impaired" based on the following lines of evidence:

- the aesthetic conditions in the vast majority of sites in Toronto's watercourses and waterfront are excellent;
- there do not seem to be systemic aesthetic issues in the Toronto RAP area;
- the aesthetics conditions in the RAP area are comparable to those found in the non-RAP area; and
- the factors that exert influence over the aesthetics are either 'natural' (e.g., precipitation and stream flow) or the result of urbanization.

More detail on the assessment can be found in the Toronto and Region RAP BUI Status Redesignation Document: Degradation of Aesthetics (Draft February 2016).



## 4.1.6. Restrictions on Fish Consumption

When the RAP Stage 1 *Environmental Conditions and Problem Definitions* report was released in 1989, the concern about consumption of fish in the Toronto and Region AOC related to the presence of specific metals and persistent organic contaminants in surface waters and sediments and their subsequent accumulation in the tissues of fish. This included compounds such as PCBs, mirex and mercury. Restriction on the consumption of fish continues to be one of the major beneficial use impairments at many Great Lakes AOCs and remains a major focus of remedial actions. The Toronto and Region RAP re-designation target for this BUI is when:

There are no restrictions on fish consumption that are attributable to local sources.

The recent three-tier assessment of this BUI made a number of observations:

- The recent advisories published by MOECC in the *Guide to Eating Ontario Fish* (2015-2016) recommend "unrestricted" (8+ meals per month) consumption of most resident fish found along the Toronto Waterfront. However, the Guide also recommends restricting consumption of most migratory fish for the Toronto Waterfront and a few resident species. Although the contaminant burden of migratory species could have been influenced by their exposure in the Toronto RAP area, these fish may not appropriately reflect the true conditions of the AOC.
- A comparison was done between the consumption advisories for the Toronto Waterfront and those at other non-AOC locations in Lake Ontario. The analysis highlighted the fact that mercury is not a major contaminant of concern for fish in the Toronto and Region AOC. In contrast, consumption advisories due to elevated PCB levels were more restrictive than the reference locations for large sizes of white sucker and all sizes of common carp. It should be noted, however, that PCB levels are also high in carp from Frenchman's Bay, Lynde Creek Marsh, Whitby Harbour and Hamilton Harbour. Since carp can be migratory, it is possible that carp captured from the Toronto Waterfront area were influenced by these other locations. However, more restrictive advisories for the Toronto Waterfront compared to other non-AOC Lake Ontario locations remain a concern.
- Temporal trend analysis shows that the levels of both PCB and mercury in fish from the Toronto Waterfront have declined substantially (in some cases over 90%) over the last 30 plus years. Mercury concentrations in most species and sizes of fish are now within the "unrestricted" advisory classification. Despite the declines, levels of PCB remain elevated in many species, most of which are migratory.
- Substantial declines in PCB levels of forage fish at many locations in the Greater Toronto area (GTA) tributaries have also been observed. Although there were some locations with elevated PCB levels suggesting continued significance of historical sources or on-going releases, contribution of these tributaries to the contaminant levels in fish at the Toronto Waterfront is unclear at present and may be outside the scope of the RAP. Recent PCB trackdown and remediation activities in Etobicoke Creek (see feature box in section 2.4.2) may lead to continued declines in contaminant levels in tributary fish. As was done for Etobicoke Creek, MOECC has initiated studies at these other GTA tributaries where fish have high PCB levels to search for possible on-going sources of contamination.
- Brown bullhead, a sentinel species for PCB, demonstrated substantial (80-90%) declines in PCB concentrations and recent levels are well within the "unrestricted" advisory category. The current levels and half-life of PCB in white sucker indicate that the levels will fall within the "unrestricted" advisory classification within about a decade. This time period provides a favourable outlook for the re-designation of this BUI to "Not impaired".

- A 1995-1997 angler survey suggests that most anglers in the region do not frequently consume locally caught fish. Many fish present at the Toronto Waterfront can be consumed without any (meaningful) restriction, but the survey suggests that they are not the most popular species to anglers. Minor to severe restrictions have been advised on consumption of the five most popular fish species. It is recommended that this angler survey be updated to reflect current fishing and consumption patterns.
- PCB concentrations in the Toronto Waterfront sediments have declined since the 1970s, but the levels have remained largely unchanged in the last 25 years. It should be noted, however, that PCB levels in the sediments at the Toronto Waterfront are generally lower than the levels found lake-wide in Lake Ontario.

The balance of evidence shows that the restrictions on fish consumption for most resident fish species along the Toronto waterfront have improved along with environmental conditions such that they can be considered "Not Impaired". This conclusion, is confounded by the continued high PCB burdens in carp and larger sizes of white sucker, consumption of which clearly remain impaired in the AOC.

More detail on the assessment can be found in Assessment of Fish Consumption Beneficial Use Impairment at the Toronto and Region Area of Concern (Draft February 2016).

#### 4.1.7. Degradation of Phytoplankton and Zooplankton Communities

In the Stage 1 RAP report *Environmental Conditions and Problem Definition*, the Degradation of Phytoplankton and Zooplankton Communities BUI was classified as "Requires Further Assessment" because there was little data on plankton community composition available to designate a status.

The 1991 IJC De-listing Guideline for the Degradation of Phytoplankton and Zooplankton Communities BUI is:

When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters.

Unimpacted control sites rarely exist for AOCs because embayments are generally densely settled and most have similar impacts from urbanization. As a result, in the Remedial Action Plan process, researchers often use an approach that compares an AOC to a nearby coastal site, even though these sites generally have very different hydrological conditions. The distribution and composition of plankton communities are also notoriously variable in space and time, due in part to very rapid ecological dynamics. This high variability presents challenges to assessing impairment within plankton communities.

To lay the groundwork for an assessment of this BUI, in September 2013, the Great Lakes Laboratory for Fisheries and Aquatic Sciences of DFO carried out a spatial survey of the entire extent of the Toronto and Region AOC using towed instruments and station samples. The results of this survey, an analysis of the MOECC archived Nearshore Index plankton samples and documentation of past data from the literature were provided to the Toronto RAP Team in A *Report on the Sept 2013 Plankton Survey of the Toronto Region Area of Concern (2015)*.

The monitoring carried out in 2013 found lower densities of both phytoplankton and zooplankton in the Inner Harbour compared to the open lake, but the results were influenced by an upwelling event, which is common in late summer in the Toronto area. Because of variability, a single sampling event is not sufficient to understand the status of plankton communities. Accordingly, a full seasonal survey (May-October) has been proposed for 2016. The results of this seasonal survey will be combined with all other available data to provide an assessment of phytoplankton and zooplankton communities by 2018.

## 4.2. PROGRESS ON PRIORITY ACTIONS FROM THE 2007 RAP PROGRESS REPORT

ACTION	BUI*	PROGRESS MADE
CLEAN WATERS		
Wet Weather Flow		
Support the City of Toronto's EA process for the Don Trunk Sewer System and Waterfront Interceptors	10	The EA for the Don River and Central Waterfront Project (formerly referred to as the Don Trunk and Waterfront Interceptor and Combined Sewer Overflow Control Strategy) was completed in 2012. The Project is the City's most significant combined sewer overflow (CSO) control initiative and will address discharges from all the combined sewer outfalls to Toronto's Lower Don River, Inner Harbour and Taylor Massey Creek. The project will also provide longer-term servicing needs and operational improvements for the City's Don Trunk and Waterfront Interceptor Sanitary Sewer System. The project consists of an integrated system of three wet weather flow tunnels (22 km in total) and connected storage shafts that will intercept CSOs and convey them to a future wet weather flow high-rate treatment facility to be built at Ashbridges Bay. The project also includes offline storage tanks to store peak sanitary flows and to capture combined sewer overflows from remote outfall locations
		The preliminary design for the three tunnels and connections began in 2014 and the first phase of the project – a wet weather flow tunnel along the Lower Don River and Lake Ontario shoreline to Ashbridges Bay – is in detailed design. Once all phases of the project are fully implemented, this project will achieve significant water quality improvements.
Support the City of Toronto to further work on implementing the identified eight key projects under the WWFMP to clean up the waterfront including: • Etobicoke Waterfront Stormwater Management	8	<ul> <li><u>Constructed Wet Weather Flow Projects</u></li> <li>Coatsworth Cut CSO and Storm Outfall Control Plan - Conveyance controls and CSO storage tank were completed in 2012</li> <li>Ellis Ave/Colborne Lodge Drive SWM Wetlands – these stormwater ponds have been constructed</li> <li><u>Planned Projects in City's 10 Year Wet Weather Flow Program</u></li> </ul>
(SWM) Facilities (Class EA)		(2016-2025)
Bonar Creek Stormwater		Bonar Creek SW Quantity and Quality Treatment Pond (Class EA)
Quantity and Quality Treatment Pond (Class EA)		<ul> <li>Etobicoke Waterfront Stormwater Management Study</li> <li>Scarborough Waterfront CSO and Stormwater Outfalls Control</li> </ul>
<ul> <li>Ellis Ave/Colborne Lodge Drive SWM Wetlands (construction)</li> </ul>		(Class EA)
<ul> <li>Western Beaches Master Plan</li> </ul>		
• Coatsworth Cut CSO and Storm Outfall Control Plan (Class EA)		
<ul> <li>Eastern Beaches Storm Sewer Outfall (Class EA)</li> </ul>		
<ul> <li>Scarborough Waterfront CSO and Stormwater Outfalls Control (Class EA)</li> </ul>		

ΔΟΤΙΩΝ	RIII*	PROCRESS MADE
ACTION Increase grassroots involvement in the implementation of the City of Toronto's WWFMMP through the Community Program for Stormwater Management (CPSWM) Stormwater Management Continue to support STEP as it investigates new technologies that mitigate the impacts of stormwater and intensification. Projects will include: • Completing the assessment of permeable pavement and bioretention swale projects • Evaluating the design and performance of rainwater harvesting and demonstration sites • Demonstrating and evaluating BMPs identified in the Quidding for Erroice	<b>BUI</b> * 8	<ul> <li>PROGRESS MADE</li> <li>Between 2004 and 2009 the Community Program for Stormwater Management provided over \$1 million to fund 55 projects that included plantings of native trees and vegetation, creating educational websites and information kits; mall displays; rainwater harvesting projects and green roofs, etc.</li> <li>As noted in section 3.2.2, since 2007 STEP has monitored and evaluated several Low Impact Development (LID) technologies, augmenting previous evaluations of green roofs and other conventional stormwater technologies conducted prior to 2007.</li> <li>Rainwater harvesting technologies were evaluated at four sites across different land uses.</li> <li>STEP is in the process of finalizing two detailed inspection and maintenance guides on LID practices and conventional stormwater management facilities such as ponds and wetlands.</li> <li>With CVC, TRCA completed an LID design guide with CVC and the engineering group that is widely used by stormwater practitioners.</li> <li>STEP carried out several erosion and sediment control evaluations to help reduce erosion and clean water dewatered from ponds. Research was combined with the development of a literature review and guideline for safe and responsible use of polymers on</li> </ul>
<ul> <li>Completing the assessment of permeable pavement and bioretention swale projects</li> <li>Evaluating the design and performance of rainwater harvesting and demonstration sites</li> <li>Demonstrating and</li> </ul>		<ul> <li>across different land uses.</li> <li>STEP is in the process of finalizing two detailed inspection and maintenance guides on LID practices and conventional stormwater management facilities such as ponds and wetlands.</li> <li>With CVC, TRCA completed an LID design guide with CVC and the engineering group that is widely used by stormwater practitioners.</li> <li>STEP carried out several erosion and sediment control evaluations to help reduce erosion and clean water dewatered from ponds. Research was combined with the development of a literature review and guideline for safe and responsible use of polymers on construction sites. STEP hosts an erosion and sediment control field training day every two years, and leads a national accreditation program for ESC inspectors. STEP also offers other training and e-learning resources to help reduce stream impacts from construction site runoff.</li> <li>STEP is currently working on a tool using the EPA SWMM engine that will evaluate the effectiveness of SWM scenarios to meet site water quality, water balance and runoff reduction targets.</li> <li>The City of Toronto's Wet Weather Flow Management Guidelines were developed as a companion to the Wet Weather Flow Master Plan Policy (2003), which provides direction on how to manage wet weather flows on a watershed basis. First released in 2006,</li> </ul>
Encourage municipalities in the upper watersheds to implement retrofitting of SWM facilities and outfalls	8	the Guidelines harmonize stormwater management practices and provide guidance to industry and property owners on stormwater management requirements for new development and redevelopment. The Guidelines also identify performance objectives for site level stormwater management that address runoff from development sites, flood management, water quality and water balance (or annual runoff volume). The Guidelines are a "living" document that is updated to reflect new technologies, innovative solutions, and to better address new or existing performance objectives. The City is currently in the process of updating the Wet Weather Flow Management Guidelines, which are expected to be released in 2016. The TRCA engineering group has been working with municipalities to do this work.

ACTION	BUI*	PROGRESS MADE
Support TRCA and partners in their ongoing efforts to educate and assist urban and rural landowners with the implementation of best management practices for households, businesses and industries	8	<ul> <li>TRCA's Rural Clean Water Program continues to provide technical assistance and financial incentives to farm and rural non-farm landowners to assist them with implementing Best Management Practice projects. The program also continues to support education and outreach via workshops, farm tours, good news stories and attending agriculturally-related events. See detail in section 3.2.6.</li> <li>TRCA's Stewardship Program works with the municipal staff, interest groups and local community members to protect and restore water quality and wildlife habitat throughout the Toronto region along the waterfront and throughout the watersheds. The program helps TRCA and partners increase the engagement of citizens and businesses in lot-level stormwater management, water conservation, reduction in use of and proper disposal of household and garden chemicals. It also sustains key education and community stewardship initiatives.</li> <li>Through the Yellow Fish Road program participants learn about Storm Water Management education. This community-oriented campaign encourages residents to take an active role in the health of their watersheds. The key message is that only storm water should go down the storm drain.</li> <li>The Aquatic Plants Program provides an outdoor experience and teaches elementary school children about how their individual actions can improve storm water in the Toronto Region through the rehabilitation of wetlands.</li> <li>The Stewardship Program reaches out to multicultural communities through the Multicultural Connections Program providing English as Second Language and faith-based presentations. This enables newcomers to Canada to experience local green spaces and provides them with information to help them understand their individual and collective responsibility to protect the quality of water in our shared waters and streams.</li> </ul>
Support TRCA and partners in their continued efforts to promote the adoption of Low Impact Development approaches and efforts to restore and maintain water balance and a site level, including the completion of a LID pilot project	8	The implementation of Low Impact Development (LID) has grown substantially since 2007. Most new development sites have implemented one or more LID practices to meet erosion and water balance criteria, and there are now several full scale residential and commercial sites with LID practices used as the primary means of stormwater treatment. Examples are provided in section 3.2.2 of this report. TRCA's approach to encouraging broader adoption of LID has been to address perceived barriers and concerns through research, develop best practice guidance to facilitate implementation, develop erosion and water balance criteria that can only be met on new development sites through LID, and provide training and learning opportunities through various media (reports, in-class, e-learning, web postings, articles, etc.) On existing developments, Partners and Project Green (ICI sector), the Sustainable Neighbourhoods Action Plan (residential, mixed use) and TRCA Water Stewardship group have been encouraging LID retrofits, with several notable successes.

ACTION	BUI*	PROGRESS MADE
Spill Management		
Support the development of a Spill Response Decision Support System (web-based tool) to aid in the prevention and mitigation of spills.	1	TRCA has been working in partnership with the Region of Peel and a consultant to develop a web-based spills response tool. Consultation and testing with spills first responders from various municipalities in Peel are currently underway.
Beaches		
Encourage and provide support for the City of Toronto to develop and implement Integrated Beach Management Strategies for all waterfront beaches, with a goal of increasing the number of beaches with Blue Flag designations	10	<ul> <li>Since 2007, two additional beaches (Kew Balmy and Bluffers Park) have received this certification for a total of 8 of Toronto's 11 beaches having received Blue Flag certification. Other actions to improve beach water quality are identified in section 3.2.5.</li> <li>Key elements of actions to improve beaches include:</li> <li>A multi-agency Beaches Technical Expert Team has been formed to research and assess the causes and remedial measures required to improve Marie Curtis Beach, Sunnyside Beach and Rouge Beach which currently fail to achieve Blue Flag status because of their proximity to Etobicoke Creek, Humber River and Rouge River.</li> <li>ECCC is applying microbial and chemical source tracking techniques to identify sewage and other sources of fecal pollution causing <i>E. coli</i> contamination and beach closures at these Toronto sites. This research, carried out in close collaboration with the City of Toronto and TRCA, will guide their remediation programs towards cleanup of the worst stormwater outfalls and <i>E. coli</i> and nutrient sources and will deliver a practical cost-effective approach to reduce beach closures, and risk management strategies for intractable beach closure problems.</li> <li>ECCC is developing more accurate forecasting models for Marie Curtis Beach, Sunnyside Beach and Rouge Beach to reduce the beach closing time and improve beach management. The goal is to enhance the protection of public health while allowing maximum beach access.</li> </ul>
HEALTHY HABITATS		F
Terrestrial Habitat		
Support incorporation of the Terrestrial Natural Heritage System Strategy into municipal Official Plans	14, 3	TRCA has worked closely with all of its partner municipalities who have undertaken recent Official Plan reviews to incorporate natural heritage system principles and approaches into updated schedules and accompanying policies. This has included using the TRCA Terrestrial Natural Heritage System as a foundation from which a refined system is identified that addresses municipal objectives and priorities. This process has resulted in the majority of all partner municipalities within the Toronto RAP area adopting a natural systems approach to ecosystem protection. A Terrestrial Biological Inventory is underway to collect and analyze species, vegetation communities and natural system data in order to evaluate how the implementation of the TNHSS has and will contribute to addressing the Loss of Wildlife Habitat and Populations BUI in the Toronto and Region AOC. This includes monitoring of subsets of pre-established fixed plots and the setup of an additional 7 plots to ensure the appropriate number of plots in all land use zones; the comparison of natural systems delineated in Official Plans with the target terrestrial natural heritage system as identified in watershed plans and with existing natural cover; the development of a model for analysis of wildlife populations; and measurement of the implementation of the Terrestrial Natural Heritage System Strategy in the AOC and evaluation of wildlife habitat and population targets.

ACTION	BUI*	PROGRESS MADE
Complete the refinement of the THNSS at the watershed scale for all watersheds	14, 3	The TNHSS has been refined for all of the watersheds within the RAP AOC.
Support the development of a methodology and framework to be applied when determining compensation for land development	14, 3	An Ecosystem Compensation Protocol has been drafted and circulated to all of TRCAs municipal partners, neighbouring CAs and Provincial Ministries for review and comment. The protocol outlines a transparent and equitable approach to restoring ecosystem functions and services when losses to the natural system occur. TRCA is currently working to improve the protocol based on the feedback received. TRCA is also providing support to those municipalities currently developing their own compensation frameworks. Although not finalized, the compensation protocol, and the discussion it has prompted, has already resulted in significant improvements in the habitat restoration outcomes when losses to the natural system occur.
Support the development of the Recovery Planning Project that will prioritize ecosystem restoration and identify opportunities that will offer the greatest ecological benefits	14, 3	Restoration project selection now utilizes the Integrated Restoration Prioritization (IRP) framework and the Restoration Opportunities Bank (ROB) to identify areas that are in the most need for restoration and can contribute most to the Natural Heritage Network values. The IRP and ROB have been formalized as stand-alone geospatial databases.
<b>Riparian Regeneration</b>		
Support the regeneration of stream corridors to meet targets established in Watershed Strategies and reports	14, 3	Watershed priorities related to natural cover, aquatic conditions, hydrologic factors, and terrestrial natural heritage values are now identified through the Integrated Restoration Prioritization process to select important restoration areas. The Restoration Opportunities Bank is now used to develop reach based restoration plans that target specific restoration actions around stream corridors. Deliverables in 2015 are estimated to be 3.5 km of riparian habitat, 2000m of restored instream habitat, and 10 stream barriers removed.
Support development of the Riparian Restoration Strategy (test project for Etobicoke- Mimico) and implementation of priority sites	14, 3	A Riparian Restoration Strategy has been developed and priority sites have been identified. Implementation of priority sites is currently underway.
Wetlands		
Develop wetland restoration projects in the upper Rouge and Humber watersheds through the Ontario Headwaters Restoration Initiative	14, 3	Humber - Class EA completed in 2010. Rehabilitation completed in two lagoons in 2012-2013 by TRCA. Invasive species removals completed by Ontario Streams in 2012 and 2013. Further restoration work required to complete recommendations of Class EA
Complete the final phase of the Rouge Marshes rehabilitation	14, 3	Completed
Construct Newbury Park wetland in the Rouge River Watershed	14, 3	Completed

ACTION	BUI*	PROGRESS MADE
Aquatic Habitat		
Mitigate barriers to facilitate the passage of native fish species (non-jumpers) in the Humber River	14, 3	Class EA completed in 2007. Detailed design for fishway at Old Mill Dam completed in 2010. On hold pending funding and approvals In 2012 the Lower Humber Weirs Mitigation Project evaluated ten weirs
		on the Lower Humber that were installed in response to Hurricane Hazel starting in the late 1950s. The current configuration of weirs, if left unaltered in the Lower Humber River, will continue to prevent the upstream movement of non-jumping and jumping fish species, which limits access to upper reaches of the river for forage, nursery and spawning opportunities. The goal the project is to mitigate these barriers where feasible.
		The feasibility study evaluated a number of remediation options to connect existing aquatic habitats while considering impacts to channel stability, protection of infrastructure, public safety and the movement of fauna. The mitigation of the weirs would provide ecological improvements to the Humber River by creating improved conditions with regard to water temperature, habitat connectivity, river hydrology, bank erosion and sediment transport. The study supported the MNR's Humber River Fisheries Management Plan (2003) which identified the mitigation of barriers between Bloor Street and Highway 401 as a high rehabilitation priority for the Lower Humber River subwatershed.
Complete spawning surveys and assess road culverts in the Humber headwaters in preparation for Atlantic salmon re-introduction	14, 3	Completed in 2008. Atlantic salmon habitat restoration ongoing with instream barrier mitigation. Stocking of Atlantic salmon fry undertaken annually with Islington Sportsmen's Club and Ontario Streams
Complete and implement Fish Management Plans for all the watersheds	14, 3	Don, Highland, Etobicoke/Mimico Fish Management Plans (FMPs) are outstanding. An Update of the Rouge FMP is in draft form. The Humber FMP was completed in 2005. The Humber River has an approved Fisheries Management Plan (2008) and there is an approved Recreational Fisheries Management Plan that includes the Toronto waterfront.
		Over the years, implementation of FMPs or Aquatic Habitat Management Plans has largely taken the form of in-stream barrier mitigation projects, stream or riparian habitat improvements across watersheds, and as a resource for guiding the land use planning process. Atlantic Salmon stocking has occurred, but only in the Humber River. For more detail, see section 3.4.1.

ACTION	BUI*	PROGRESS MADE
Waterfront		
Support the implementation of priority projects in the Toronto Waterfront Aquatic Habitat Restoration Strategy through Aquatic Habitat Toronto (i.e., Spadina Slip, Central Waterfront, Lake Ontario Park, East Bayfront, Lower Don Lands)	Aquatic Habitat Toronto (AHT) continues to provide support for priority waterfront projects through the implementation of the Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS) particularly as it relates to Waterfront Toronto district planning initiatives. AHT consists of multiple agencies including the TRCA, DFO, ECCC, MNRF, the City of Toronto, Ports Toronto and Waterfront Toronto. AHT uses the expertise of its partner agencies to create and restore aquatic habitat and fisheries resources to create a more liveable and sustainable waterfront with the ultimate goal of delisting Toronto as an Area of Concern under the GLWQA and the Canada-Ontario Agreement. See section 3.3.4 for an overview of aquatic habitat restoration and creation projects in the Toronto and Region AOC.	
		In the early 20th century, the Ashbridges Bay Marsh was filled and the mouth of the Don River straightened and channelized to form the Keating Channel in what is now the Portlands. The loss of this large 428 ha coastal wetland in Toronto and the development of Toronto Harbour negatively impacted fish and wildlife populations and is one of the reasons Toronto is listed as an AOC. AHT and the Toronto RAP have identified the Naturalization of the Mouth of the Don River and the restoration of priority coastal wetland habitat as keys to delisting Toronto as an AOC.
		Involved throughout the early planning stages of the naturalization of the Don River, AHT has worked with Waterfront Toronto to ensure the project achieves its habitat and water quality objectives. The new river mouth will be created by rerouting the existing river from its current location at the Keating Channel on the eastern side of Toronto's inner harbour, to the middle of the Port Lands between the ship channel and the Keating Channel. The project will create a new river outlet to Lake Ontario, provide continuous riverfront open space and provide expanded opportunities for interaction with the water. It will also enhance habitat for fish and wildlife species and will re-establish wetlands in the area, which provide social and environmental benefits and naturally moderate the effects of flooding and erosion.
		When Waterfront Toronto was first established in 2001, the Naturalization of the Mouth of the Don River and flood protection of the Portlands was a top priority of the all three levels of government. With some of the flood protection work now completed, the project remains a high priority for the Toronto RAP. With detailed planning underway and the phased project set to begin in the near future AHT will continue its collaborative work with Waterfront Toronto.
Support the development and implementation of the Toronto Beaches Plan	10	Certification of beaches in the Blue Flag program is central to the Toronto Beaches Plan. Since 2007, two additional beaches (Kew Balmy and Bluffers Park) have received this certification for a total of 8 of Toronto's 11 beaches. Other actions to improve beach water quality are identified in section 3.2.5.

ACTION	BUI*	PROGRESS MADE		
SCIENCE AND MONITORING				
Monitoring				
Sustain the Regional Watershed Monitoring Network	Many	The Regional Watershed Monitoring Program has been in place since 2001 with funding support from the Toronto and Region RAP and funds from the Regions of Toronto, York, Peel and Durham. The monitoring network includes more than 500 sites that are used for the collection of long-term data related to water quality, hydrology, stream temperature, groundwater and aquatic communities and habitat. See section 3.5.1 for additional detail.		
Work with partners to establish a regular water quality and sediment monitoring program for the Toronto Waterfront	Many	TRCA, City of Toronto and Ports Toronto continue to annually monitor water and sediment quality across the Toronto Waterfront. The MOECC's Provincial Water Quality Monitoring Network allows comparisons of water quality between Toronto and sites across the Great Lakes.		
Continue to collect samples in Etobicoke Creek, Mimico Creek, Humber River, Don River, Rouge River and Highland Creek to determine concentrations and loading estimates of priority contaminants to the nearshore of Lake Ontario in the Toronto and Region AOC	1	Network of surface water quality sites has grown to 46 sampling sites sampled on a monthly basis following the Provincial Water Quality Monitoring Network (PWQMN) protocol in partnership with the MOECC and the City of Toronto.		
Continue sediment and water sampling to study concentrations of current-use chemicals in the Toronto and Region waterfront	1	TRCA continues to sample sediment annually across the Toronto waterfront including intensive sampling of the Keating Channel during dredging operations by Ports Toronto		
Conduct a pilot study on Etobicoke Creek to continuously monitor water quality during storm events (capturing peak flows and "first flush" levels)	8	Monitoring stations have been installed at select sites. Data collection and analysis is ongoing and used to support watershed plan updates.		
Continue the Etobicoke Creek PCB Trackdown Project by investigating a potential local hotspot to determine if this area is acting as a source of bioavailable PCBs to the watershed	1	MOECC carried out a study to identify the source of PCBs and determined that it was contaminated soil from an easement. In 2014, over 2,000 m <sup>3</sup> of PCB impacted soil was removed and sent for disposal. An engineered channel was constructed to limit exposure to residual contaminated soil. See section 2.4.3 for more detail.		

ACTION	BUI*	PROGRESS MADE
Report on the watershed health in the Area of Concern	Many	Reporting since 2006 has included: • Annual summary reporting on status of RWMP (posted on TRCA Web Site)
		<ul> <li>10 year data roll-up of Fish Community, Water Quality, and Benthic conditions based on RWMP data (Posted on Web)</li> </ul>
		<ul> <li>Living City Report Card – published 2011</li> </ul>
		<ul> <li>Watershed Report Cards for the Etobicoke Creek, Mimico Creek, Humber River, Don River, Highland Creek, Rouge River and the Toronto Waterfront published in 2013</li> </ul>
		<ul> <li>Annual Water Quality summary reporting (2011-2014) based on RWMP data (on Web)</li> </ul>
		• Various presentations of results – Latornell, IAGLR,
		<ul> <li>Posters – Urban Stream Syndrome (2013), Water Quality (IAGLR 2010)</li> </ul>
		• Oak Ridges Moraine/Greenbelt Report Card (2013)
Beneficial Use Impairments		
Complete the assessment of all impaired beneficial uses including: status of, gap analysis of information, indicators of progress (action and environmental conditions)	AII	As detailed in section 4.1, since 2007 the following BUIs have been assessed and re-designated as 'not impaired': Fish Tumours and other Deformities, Bird or Animal Deformities or Reproduction Problems, Degradation of Benthos, Restrictions on Dredging Activities and Degradation of Aesthetics.
and monitoring data, and where possible determine environmental end points		A preliminary assessment of the Eutrophication or Undesirable Algae BUI has been completed.
		Assessments for the BUI relating to Restrictions on Fish Consumption will be completed in 2016-17 and the assessment of the Degradation of Phytoplankton or Zooplankton Communities will be completed in 2017-18.
SUSTAINABLE WATERSHEDS		
Support the development of Integrated Watershed Management Plans for the Don and Etobicoke-Mimico, and the implementation of the Integrated Watershed Management Plans for the Rouge and Humber Rivers	Many	Watershed Plans and associated updates for the Don and Etobicoke- Mimico watersheds were most recently completed in 2009 and 2010, respectively. TRCA is currently reviewing its watershed planning process to outline what the next generation of watershed plans will look like. The Authority is currently developing new approaches to improve efforts to address watershed priorities. Most municipalities have now incorporated policies within their updated Official Plans to provide for watershed plan recommendations to be considered in planning decisions. Regeneration projects, including trail and greenspace planning, have been informed by technical information and priorities identified in the watershed plans. The monitoring network continues, and stewardship programs and celebration events seek opportunities to raise awareness of watershed plan directions.

ACTION	BUI*	PROGRESS MADE
Support the City of Toronto's plans to integrate the Highland Creek Geomorphic Master Plan, the WWFMMP, and other plans to provide comprehensive direction for management of Highland Creek	Many	The Highland Creek Geomorphic Systems Master Plan EA study was completed in 2011, which defined a set of stream restoration projects needed in the watershed, as well as updated the locations of end of pipe facilities in the watershed. The stream restoration projects restore the stream to a more natural condition, improve channel stability, and reduce hazards to existing sewer infrastructure, forest cover, local wildlife and corridor use. Based on the locations of stream restoration projects, a draft of a Greening Strategy for the watershed has been developed by TRCA. Approximately 2.5 km of reconstructed stream channels were completed between 2007 and 2015 within the Highland Creek watershed. The process to develop a comprehensive direction for the management of the Highland Creek watershed has been initiated through the development of the Highland Creek Greening Strategy. This document, scheduled for completion in Q1 2016, will provide a series of management objectives and opportunities associated with the recommendations outlined in the strategies developed by the City of Toronto, TRCA, and other partners that relate to the conservation of the Highland Creek watershed.
SUSTAINABLE WATERSHEDS	I	
Support the development of Integrated Watershed Management Plans for the Don and Etobicoke-Mimico, and the implementation of the Integrated Watershed Management Plans for the Rouge and Humber Rivers	Many	Watershed Plans and associated updates for the Don and Etobicoke- Mimico watersheds were most recently completed in 2009 and 2010, respectively. TRCA is currently reviewing its watershed planning process to outline what the next generation of watershed plans will look like. The Authority is currently developing new approaches to improve efforts to address watershed priorities. Most municipalities have now incorporated policies within their updated Official Plans to provide for watershed plan recommendations to be considered in planning decisions. Regeneration projects, including trail and greenspace planning, have been informed by technical information and priorities identified in the watershed plans. The monitoring network continues, and stewardship programs and celebration events seek opportunities to raise awareness of watershed plan directions.
Support the City of Toronto's plans to integrate the Highland Creek Geomorphic Master Plan, the WWFMMP, and other plans to provide comprehensive direction for management of Highland Creek	Many	The Highland Creek Geomorphic Systems Master Plan EA study was completed in 2011, which defined a set of stream restoration projects needed in the watershed, as well as updated the locations of end of pipe facilities in the watershed. The stream restoration projects restore the stream to a more natural condition, improve channel stability, and reduce hazards to existing sewer infrastructure, forest cover, local wildlife and corridor use. Based on the locations of stream restoration projects, a draft of a Greening Strategy for the watershed has been developed by TRCA. Approximately 2.5 km of reconstructed stream channels were completed between 2007 and 2015 within the Highland Creek watershed. The process to develop a comprehensive direction for the management of the Highland Creek watershed has been initiated through the development of the Highland Creek Greening Strategy. This document, scheduled for completion in Q1 2016, will provide a series of management objectives and opportunities associated with the recommendations outlined in the strategies developed by the City of Toronto, TRCA, and other partners that relate to the conservation of the Highland Creek watershed.

ACTION	BUI*	PROGRESS MADE
Support TRCA and partners as they continue studies and evaluations that contribute to the development of technologies and strategies that help mitigate the impacts of growth in the Toronto and Region AOC	Many	See above under "Stormwater Management" for examples of STEP's activities relating to technology evaluations, guides etc. STEP has also developed an LID costing tool to help facilitate planning of LID in new and retrofit developments and has conducted over 10 studies and evaluations on different LID practices.
Support the use of established mechanisms such as watershed plans, task forces, councils and alliances to identify policies and facilitate projects that contribute to successful watershed protection, RAP implementation and the attainment of COA and GLWQA targets	Many	Through its Partners in Project Green program, TRCA has been actively working to help organizations across the GTA to engage their staff, better manage water on their site, reduce energy consumption and reduce waste. Over the last two years, Partners in Project Green has engaged close to 650 businesses every year and helped them save over \$7 million in annual energy costs, install 100 electric vehicle charging stations, complete a rainwater infrastructure project, and divert close to 5,000 tons of materials away from landfill. Close to 3,000 people have participated in the program's events and workshops and our now better equipped to play a meaningful role in resolving the environmental challenges facing the region.
Encourage and support the development of business outreach and Eco-Industrial Networking opportunities within the AOC (i.e., Partners in Project Green)	Many	Through its Partners in Project Green program, TRCA has been actively working to help organizations across the GTA to engage their staff, better manage water on their site, reduce energy consumption and reduce waste. Over the last two years, Partners in Project Green has engaged close to 650 businesses every year and helped them save over \$7 million in annual energy costs, install 100 electric vehicle charging stations, complete a rainwater infrastructure project, and divert close to 5,000 tons of materials away from landfill. Close to 3,000 people have participated in the program's events and workshops and our now better equipped to play a meaningful role in resolving the environmental challenges facing the region.
EDUCATION AND INVOLVEMENT		
Support Watershed Advisory Councils	Many	Watershed Advisory Councils have continued to play an important role in community engagement. The RAP continues to support Watershed Advisory Councils to advance the development and implementation of important and innovative plans and projects that have a direct bearing on the health of the Toronto and Region AOC watersheds and Lake Ontario. TRCA is currently reviewing the model for the councils to ensure that they are best meeting the needs of the watershed communities.
Sustain key education and community stewardship initiatives (e.g., Watersheds on Wheels) including tree planting on private land, the development of Environmental Farm Plans	Many	Outreach education continues through our mobile education programs including Watershed on Wheels and the Aquatic Plants Program. Curriculum links include science and technology, local outdoor environment and physical education.

ACTION	BUI*	PROGRESS MADE
Support TRCA and partners to increase the engagement of citizens and business in lot-level stormwater management, water conservation, reduction in use of and proper disposal of household and garden chemicals	Many	Greening Your Grounds, a homeowner's guide to stormwater landscaping projects is used as a teaching tool and take away for addressing stormwater at the source. The Yellow Fish Road TM program engages students and community groups in hands-on outdoor programming that makes the connection between what goes down storm drains in residential communities and local rivers and Lake Ontario.
Facilitate the transfer of technology (i.e., construction of green technologies, improved erosion control measures) to local municipal staff, developers, etc.	Many	STEP holds an annual two day international conference and trade show on innovative stormwater management and erosion and sediment control (TRIECA) that offers learning and networking opportunities for practitioners. STEP also offers four e-learning courses on various aspects of LID and erosion and sediment control, as well as in-class training for professionals several times a year. The CISEC courses are offered across the country.
Continue to build public, agency and municipal awareness of and support for the implementation of the RAP and its goals	Many	TRCA in partnership with the RAP Team initiated the popular 'Lake Ontario Evenings' speaker series to build public, agency and municipal awareness of and support for the implementation of the RAP and its goals.
Continue to position the Toronto and Region AOC as an area with significant challenges and opportunities in light of the area's unprecedented growth and development and its impact on Lake Ontario	Many	This is thematic in the work of the RAP.
Continue to build federal and provincial support for sustainability initiatives	Many	Federal and provincial support has been instrumental to the successful sustainability initiatives of Waterfront Toronto. Funding through programs such as MOECC Great Lakes Guardian Community Fund and ECCC's Great Lakes Action Plan and Great Lakes Sustainability Fund has allowed municipalities and NGOs to address sustainability issues related to water.

\* BUI Numbering refers to:

1. Restrictions on Fish Consumption

3. Degraded Fish and Wildlife Populations

4. Fish Tumors or Other Deformities

5. Bird or Animal Deformities or Reproductive Problems

6. Degradation of Benthos

7. Restrictions on Dredging Activities

8. Eutrophication or Undesirable Algae

10. Beach Closings

11. Degradation of Aesthetics

13. Degradation of Phytoplankton and Zooplankton Communities

14. Loss of Fish and Wildlife Habitat

# **5 KEY ACTIONS FOR DE-LISTING (2016-2020)**

The key actions needed to address the remaining four BUIs in the Toronto and Region AOC are presented in this section of the report, along with the timeframes in which the actions are expected to take place. The targets for these BUIs are presented in Appendix A.

These actions will be concurrent with continued (and important) efforts to monitor key environmental indicators, implement sustainability actions, and educate and involve agencies, municipalities, industries, farmers, non-governmental agencies and the public in activities relating to the Remedial Action Plan.

When the Toronto and Region AOC has been delisted there will still be a responsibility for agencies to carry out environmental monitoring, management and reporting measures as required in Goal 3 of Annex 4 of the Canada Ontario Agreement.

## 5.1. ADDRESSING EUTROPHICATION AND UNDESIRABLE ALGAE

- Continue to support upgrades to the City of Toronto's Ashbridges Bay Treatment Plant including the construction of a high rate treatment facility, a treatment wetland, and a new outflow pipe extension with diffusers (2016-2020)
- Continue development of integrated watershed loading and lake models to characterize nutrient dynamics and potential growth of undesirable algae and *Cladophora* in the Lake Ontario nearshore region (2017-2020)
- Complete development of a three dimensional hydrodynamic model of Toronto Harbour to assess the frequency, magnitude, extent and duration of upwelling events and their influence on water quality conditions in the Harbour (2016-2017)
- Continue the STEP Program including key projects relating to:
  - o Completion of effectiveness monitoring and research into LID practices in urban areas (2016-2018)
  - o Continuation of communication, information and synthesis and outreach LID Practices in Urban Areas (2016-2018)
- Update the TRCA/CVC LID Planning and Design Guide (2016-2018)
- Monitor LID projects and stormwater management facilities to improve the understanding of the effects of wet weather discharges on receiving waters and the issues and challenges of monitoring and maintenance (2016-2020)
- Continue the Rural Clean Water Program to improve water quality by partnering with agricultural and rural communities to reduce water contamination on agricultural and rural lands (2016-2020)
- Continue water quality monitoring in the AOC (2016-2020)

## **5.2. IMPROVING CONDITIONS AT WATERFRONT BEACHES**

- Continue to support the planning, design and implementation of the City of Toronto's Don River and Central Waterfront Combined Sewer Overflow Project (2016 to 2020)
- Continue Toronto Health Department monitoring of bacterial levels at all waterfront beaches during the June to September swimming season (2016-2020)
- Continue to support the City of Toronto and Environmental Defence's Blue Flag Beach Program (2016-2020)
- Continue to support the City of Toronto's Beaches Plan which includes beach grooming (2016-2020)
- Conduct regular meetings of the Beaches Technical Expert Advisory Team to continue to develop remediation strategies for Toronto beaches and communicate human health risk effectively (2016-2020)
- Identify the key factors causing elevated bacterial levels in beach water in the Toronto and Region AOC and develop more accurate forecasting models to reduce periods of beach closure (2016-2020)
- Complete analysis of microbial and chemical source tracking on Etobicoke Creek and Marie Curtis Beach (2016)
- Continue to apply microbial and chemical source tracking techniques to identify sewage and other sources of fecal pollution causing *E. coli* contamination and beach closures and sources of elevated nutrients in the Toronto and Region AOC. This includes Sunnyside Beach and the Humber River (2016-2017), Rouge Park Beach and the Rouge River (2018-2019) and Toronto Harbour and the Don River watershed (2020)
- Continue development of a Microbial Predictive Model for Marie Curtis Beach, Sunnyside Beach and Rouge Park beach (2016-2020)
- Continue the Canada Goose relocation program along the Toronto Waterfront and Toronto Island beaches (2016-2020)
- Carry out Status Assessment of Beach Closings BUI in the AOC (2018)

## 5.3. IMPROVING THE HEALTH OF FISH AND WILDLIFE POPULATIONS AND HABITATS

#### Fish Populations and Habitat

- Continue to support AHT in the implementation of TWAHRS projects, research and monitoring initiatives for the Toronto and Region RAP (2016-2020)
- Continue site prioritization and plan development for the TWAHRS (2016-2017)
- Continue to support planning and habitat restoration for the Don River Mouth Naturalization Project (2016-2020)
- Continue to implement high priority coastal wetland creation and restoration projects such as the 9.3 ha Cell 2 coastal wetland in Tommy Thompson Park (2016-2020)

- Continue to implement high priority TWAHRS nearshore habitat projects such as the Tommy Thompson Park West Shoreline Enhancement Project (2016-2017
- Continue to develop a three dimensional hydrodynamic model of Toronto Harbour to assess the effects of upwelling events on important thermal refuge habitat for local fish populations and provide insight into the design of warm water habitat (2016-2017)
- Measure improvements to fish passage and connectivity achieved through mitigation of instream barriers and prioritize existing instream barriers for future mitigation (2017)
- Continue work on mitigation of the Lower Humber Fish Barrier (2016-2020)
- Continue Watershed Aquatic Habitat and Species Monitoring (2016-2020)
- Complete development of Stormwater Balance Criteria for the protection of natural features in urbanizing settings (2016)
- Continue Fish Habitat Assessment along the waterfront (2016-2017)
- Continue Fish Community Monitoring along the waterfront as well as monitoring of invasive species (2016-2020)
- Continue with the acoustic telemetry project in Toronto Harbour to assess the effectiveness of TWAHRS aquatic habitat restoration projects (2016-2020)
- Complete assessment of wetland fish communities and habitat along the waterfront (2016)
- Complete Nearshore Trawl Netting surveys (2017)
- Continue Nearshore Fish Community Index Netting and Assessment (2016, 2018 and 2020)
- Carry out status assessment for the Degradation of Fish Populations and Loss of Fish Habitat BUIs in the tributaries and waterfront (2017)

#### Wildlife Populations and Habitat

- Continue to collect and analyze species, vegetation communities and natural system data in order to evaluate how the Terrestrial Natural Heritage System has and will contribute to addressing the Loss of Wildlife Habitat and Degradation of Wildlife Populations BUIs in the Toronto and Region AOC (2016-2017)
- Continue to undertake a strategic process to prioritize restoration within the Toronto and Region AOC to be used by interested stakeholders (TRCA, municipalities, MNRF and NGOs) to implement priority restoration projects identified by the Integrated Restoration Planning process (2016-2017)
- Develop reach-based plans for selected priority restoration areas under the Integrated Restoration Planning process and plan, design and implement priority projects in the Toronto and Region AOC (2017-2020)
- Continue monitoring of contaminants in herring gull eggs (2016-2020)
- Continue work on restoration of the Gatineau Hydro Corridor (2016-2020)

- Continue work to update terrestrial inventory data (2016-2017)
- Continue monitoring nesting populations of colonial waterbirds (2016-2020)
- Continue to implement the Cormorant Management Strategy (2016-2020)
- Carry out status assessment of waterfront and terrestrial wildlife for the Degradation of Wildlife Populations and Loss of Wildlife Habitat BUIs (2019)

## 5.4. RESTRICTIONS ON FISH CONSUMPTION

- Sample young of the year (YOY) fish near the mouths of the major tributaries to gather the most up-to-date information on potential contaminant loading to the Toronto and Region AOC (2017-2020)
- Update the angler survey to determine which fish species are targeted and eaten within the Toronto and Region AOC (2017)
- Update sediment sampling in targeted tributaries within the Toronto and Region AOC for potential indicators of PCB loading (2018-2019)
- Complete capping of Cell 2 in Tommy Thompson Park, formerly a confined disposal facility, to seal dredgate and create a wetland on top (2016)
- Completion by Waterfront Toronto of a Community-Based Risk Assessment of contamination in the Port Lands and development and implementation of risk management measures for construction of the new Don River Mouth (2016-2017)
- Repeat status assessment of Restrictions on Fish Consumption BUI (2019)

## 5.5. DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON COMMUNITIES

- Carry out full seasonal survey of plankton communities (May-October) (2016)
- Carry out assessment of Degradation of Phytoplankton and Zooplankton Communities BUI (2018)

# 6 LOOKING TOWARDS 2020

## **KEY ACTIONS**

This report sums up the key actions that have been carried out as part of the Toronto and Remedial Action Plan since 2007. These include:

- extensive work by the City of Toronto and other municipalities to address wet weather flow and stormwater and improve sewage treatment;
- continued work to identify and eliminate dry weather flows of sewage;
- continued efforts to fund and implement Best Management Practices in rural and agricultural areas;
- the creation and restoration of terrestrial habitats (wetlands, forest and riparian vegetation);
- the creation and restoration of aquatic habitats in the watersheds and along the waterfront;
- continued work on sustainability initiatives such as watershed plans;
- extensive monitoring to collect long-term data related to water and sediment quality, hydrology, stream temperature, groundwater, terrestrial and aquatic communities and habitat;
- the application of science to address critical questions relating to water quality, habitats and the health of fish and wildlife communities; and
- stewardship and education initiatives to inform and engage the public and stakeholders in protection and restoration activities.

These activities have been supported by legislation, regulations and bylaws aimed at reducing the use of toxic chemicals, preventing spills, protecting the Great Lakes, and protecting greenspace.

## **KEY RESULTS**

The work carried out by the RAP partners from 2008 to 2015 builds on that which was carried out from 1994 (when implementation of remedial actions started) to 2007. Key outcomes of this work include:

- phosphorus levels along the waterfront are now not an issue and meet the mesotrophic target set for the RAP (although continued work on critical wet weather flow infrastructure projects is needed to ensure that this does not change);
- there has been a substantial reduction in loadings of *E*. *coli* to the waterfront which has resulted in a steady decline in beach closings and the awarding of Blue Flag status to eight of Toronto's eleven waterfront beaches;
- there has been some improvement in tributary loadings of copper and lead;
- the aesthetics of watercourses and the waterfront in the Toronto RAP area are acceptable (meaning the water in rivers and along the waterfront is generally free of substances such as oil slicks or surface scum);

- bottom sediments along the waterfront are getting cleaner and will continue to improve as critical wet weather flow infrastructure is completed;
- the health of benthic communities has improved as a result of cleaner sediments;
- after decades of declines due to urbanization, the amount of habitat (natural cover) is relatively stable in the TRCA jurisdiction;
- the restoration of habitats and the creation of hundreds of hectares of terrestrial and aquatic habitat along streams and along the waterfront have improved conditions for both fish and wildlife;
- aquatic habitat improvements including the creation and restoration of habitats for migration, spawning, nursery, feeding, shelter and overwintering support an increased diversity of fish species along the waterfront and along the north shore of the Inner Harbour;
- in terms of ecosystem health, the fish community along the waterfront is "fair", with a proportion of top predator fish that is approaching (or perhaps is at) a healthy level;
- levels of contaminants (mercury and PCBs) in fish continue to decline and there are no restrictions on consumption of many resident fish due to contaminants; and
- fish-eating wildlife in the Toronto RAP area are not at risk from contaminants.

For the RAP, a key outcome is that five of the original eleven BUIs have now been re-designated as "Not Impaired." Although there is some evidence to suggest that two additional BUIs can be re-designated as "Not Impaired", more study is needed to confirm this status. These are major accomplishments for the RAP.

Of course, all is not good news. Levels of chloride in the watersheds continue to rise in relation to the amount of urbanization that has taken place. In the watersheds there has been a decrease in native fish species and an increase in degradation tolerant species. Levels of PCB in migratory fish species and in two resident species continue to restrict consumption. Along the waterfront, fish populations are dominated by degradation tolerant species. And wildlife species continue to be adversely affected by urbanization, with continuing loss of species.

The take home message is this: In many fundamental ways the conditions of Toronto's waters, fish, wildlife and habitats have improved since 1994, in part due to actions taken under the Remedial Action Plan. But the work is not yet completed. It will take continued efforts to get ready for de-listing as an AOC, and continued vigilance after that to preserve the gains that have been made, given continued population growth in the Toronto RAP area.

## NEXT STEPS

Over the next five years, the Toronto and Region RAP will focus primarily on the remaining four BUIs that continue to be designated as "Impaired". These are:

- Eutrophication or Undesirable Algae;
- Beach Closings;
- Degradation of Fish and Wildlife Populations; and
- Loss of Fish and Wildlife Habitat.

This Report identifies the targets that need to be reached for these BUIs to be re-designated as "Not Impaired", along with the key actions that need to be carried out to meet these targets. It also identifies actions that will be taken relating to the BUIs for Restrictions on Fish Consumption and Degradation of Phytoplankton and Zooplankton Communities. More study needs to be done for these to demonstrate that they are also "Not Impaired".

The goal – to be ready for delisting the Toronto and Region AOC by 2020 – will be challenging to meet, but it is within reach.

## REFERENCES

#### Toronto and Region RAP Reports

Stage 1 Problem Definition Report Environmental Conditions and Problem Definition (1989)

#### Stage 2 Strategy Development Reports

Strategies for Restoring Our Waters (1993) Clean Waters, Clear Choices: Recommendations for Action (1994)

#### Stage 3 Progress Reports

A Path to Clean Waters: Actions for Ecosystem Protection and Restoration (1996) Clean Waters, Clear Choices: Progress Report (1998) Progress Report: Clean Waters, Clear Choices: Progress Report (1999) Progress Report: Clean Waters, Healthy Habitats: Progress Report (2001) Progress Report: Moving Forward: Progress Report (2007)

### Stage 3 BUI Re-Designation Reports

Toronto and Region RAP BUI Status Re-designation Document: Fish Tumours and Other Deformities (December 2011) Toronto and Region RAP BUI Status Re-designation Document: Bird or Animal Deformities or Reproductive Problems (December 2011) Toronto and Region RAP BUI Status Re-designation Document: Degradation of Benthos (April 2013) The Toronto and Region Remedial Action Plan is About to Change: Guide to the RAP Technical Review and Update (2013) Toronto and Region RAP BUI Status Re-designation Document: Restrictions on Dredging Activities (Draft January 30, 2014) Toronto and Region RAP Preliminary Assessment of the Eutrophication or Undesirable BUI along the Toronto and Region Waterfront (August 2015) A Report on the Sept 2013 Plankton Survey of the Toronto Region Area of Concern (2015) Toronto and Region RAP BUI Status Re-designation Document: Degradation of Aesthetics (Draft February 2016) Assessment of Fish Consumption Beneficial Use Impairment at the Toronto and Region Area of Concern (Draft February 2016)

#### **Other Reports**

TRCA. Regional Watershed Monitoring Program: Surface Water Quality Summary 2006-2010 (2011) TRCA. Regional Watershed Monitoring Program: 2013 Surface Water Quality Summary (2014) Waterfront Toronto. 2015 Corporate Social Responsibility and Sustainability Report (2015)

## **APPENDIX A**

## **RE-DESIGNATION TARGETS FOR REMAINING BUIS**

BUI	BACKGROUND	RE-DESIGNATION TARGETS
BUI #1: Restrictions on Fish Consumption	This BUI addresses only the consumption of fish, which was identified as impaired in the report, Stage 1: Environmental Conditions and Problem Definition (MOE and EC 1989). Wildlife consumption was not considered an impaired beneficial use in the Toronto and Region AOC.	There are no restrictions on fish consumption that are attributable to local sources.
BUI #8: Eutrophication or Undesirable Algae	The Great Lakes Water Quality Agreement recognizes the importance of managing eutrophication and has set interim substance objectives for TP and chlorophyll a concentrations in the open waters of the Great Lakes. In Lake Ontario, the interim objectives for TP (10 $\mu$ g/l) and chl a (2.6 $\mu$ g/l) concentrations were developed with the goal of reaching a meso- oligotrophic state in the open lake (IJC, 1978).	Measures of key water quality parameters: Total phosphorous, chlorophyll a, dissolved oxygen and secchi depth (a measure of water clarity) with the goal of a mesotrophic system. The quality of stormwater run-off is protected and enhanced. 90% of the wet weather flow in the combined sewer system is controlled. Sanitary sewage receives secondary treatment with phosphorus removal and disinfection and produces non-toxic and non-mutagenic effluent with the following characteristics: Biochemical Oxygen Demand: 25mg/L Total Suspended Solids: 25 mg/L Total Phosphorus: 0.5 mg/L

BUI	BACKGROUND	RE-DESIGNATION TARGETS
BUI #10: Beach Closings	In 2005, Toronto became the first Canadian community to certify its beaches under the international Blue Flag Program. This eco-label is awarded to beaches that meet high standards for water quality, environmental management, environmental education, and safety. The Toronto and Region RAP has adopted this internationally recognized criteria for assessing whether the 'Beach Closings' Beneficial Use is impaired.	<ul> <li>Water quality at AOC bathing beaches meets the provincial recreational body contact water quality guideline of 100 <i>E. coli</i> per 100ml of water over 80% of the swimming season (June 1 to September 30).</li> <li>Primary sources of fecal pollution, particularly sewage, must be identified and Pollution Prevention Control Plans (PPCPs) developed and implemented (or initiated)</li> <li>At beaches where attainment of the provincial water quality guideline for recreational body contact of over 80% of the swimming season cannot be achieved the following conditions must be met:</li> <li>All sources of fecal pollution, particularly sewage, must be identified and, where practical, pollution prevention and control plans have been developed and implemented.</li> <li>The conditions under which beach water quality is adversely impacted must be well understood and appropriate risk management strategies and communication plans are in place to protect</li> </ul>
BUI #3: Degradation of Fish and Wildlife Populations	The re-designation targets for 'Degradation of Fish and Wildlife Populations' are mainly focused on fish. Wildlife populations were addressed in the assessment of BUI #5 ('Bird or Animal Deformities or Reproductive Problems') as chemical pollutants that accumulated through the food web were affecting reproductive success of some fish eating birds and causing deformities in their offspring. The impacts on reproductive success of these birds was mainly caused by the wide spread dispersion of the insecticide DDT which was an issue throughout the Great Lakes and not solely a symptom of pollution from within the AOC.	human health. Restore aquatic ecosystem conditions capable of supporting native fishes in a more diverse and stable community structure that includes a top- level predator assemblage of native species (e.g. northern pike, smallmouth bass, and walleye). Formerly abundant fish populations are rehabilitated where locally depressed or extinct. Specific targets contained in watershed plans should be used. Where no plans exist they should be developed

BUI	BACKGROUND	RE-DESIGNATION TARGETS
BUI #13: Degradation of Phytoplankton and Zooplankton Communities		<ul> <li>When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics.</li> <li>Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters.</li> </ul>
BUI #14: Loss of Fish and Wildlife Habitat	The 'Loss of fish and wildlife habitat' re-designation targets are mainly focused on fish, however wildlife habitat is addressed through the development and implementation of the Terrestrial Natural Heritage Strategy (TNHS) and Watershed Management Plans which have resulted in similar benefits to fish and wildlife populations and habitats. In addition, major initiatives like the Oak Ridges Moraine Protection Act, Greenbelt legislation and establishment of the Rouge National Urban Park have provided, and will continue to provide, protection for large areas of natural cover within the AOC beyond completion of the RAP.	<ul> <li>Implement Toronto Waterfront Aquatic Habitat Restoration Strategy:</li> <li>Open coast habitat is rehabilitated suitable for populations of cold water fishes</li> <li>Sheltered bays are rehabilitated to improve and increase habitat suitability and supply suitable for the life cycle requirements of warm and cool water fishes (e.g., northern pike, smallmouth bass and largemouth bass)</li> <li>River mouths and estuaries are rehabilitated to improve and increase habitat suitability and supply suitable for resident and migratory fishes (e.g., walleye, largemouth bass, Northern pike and smallmouth bass)</li> <li>Biotic corridor linkages are protected, enhanced or rehabilitated across the waterfront and throughout the stream and valley system.</li> <li>Remaining and created wetlands are protected. A significant amount (e.g. a preliminary target of 75 hectares) of wetland areas should be restored to the waterfront and protected.</li> <li>Specific wetland targets contained in watershed</li> </ul>
		plans should be used. Where no plans exist they should be developed.



## WITHIN REACH:

2015 TORONTO AND REGION Remedial Action Plan Progress Report

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