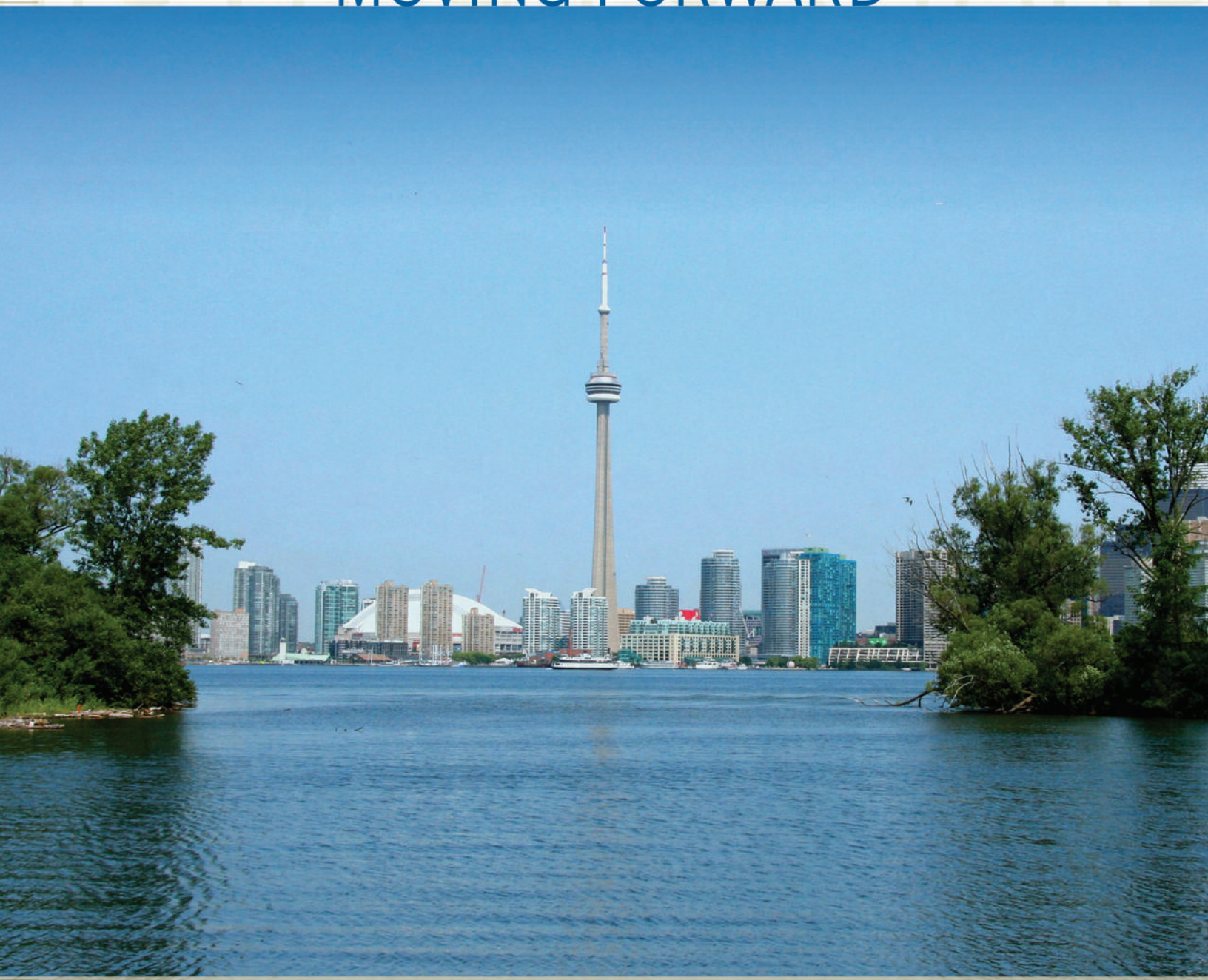
PROGRESS REPORT 2007

MOVING FORWARD



TORONTO & REGION REMEDIAL ACTION PLAN

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EXECUTIVE SUMMARY

This Lake is Great:

Lake Ontario is great. As one of the five North American Great Lakes; its greatness is reflected in its name, derived from the Huron word for great lake.

The lake provided the foundation upon which Toronto and Region was able to grow. Lake Ontario has shaped and enabled Toronto and Region to become the vibrant, diverse economic engine that it is. As great as the influence of the Lake has had in shaping this Region; this large Region also has the ability to influence the Lake.

Keeping it Great:

In earlier years, as Toronto and Region grew and became more urbanized in order to provide for its expanding population, environment protection was not at the forefront of planning and development. The results of extensive growth and urbanization were being clearly reflected along the Toronto waterfront and within the Regions' watershed; in 1987, the Toronto and Region was designated an Area of Concern by the Government of Canada as they recognized the need to focus attention on the area in order to improve environmental conditions. The Remedial Action Plan (RAP) was developed in consultation with a broad range of stakeholders and all levels of government.

Lot of work has been done, and many plans as well as legislation have been crafted and enacted to restore environmental conditions

This report is intended to provide the reader with a broad overview of existing conditions (as of 2006), key actions underway, measuring progress and moving forward.

Remediation is no small task:

Designated in 1987, the AOC emcompasses the Toronto Bay, as well as the six major watersheds that drain into the 45 kilometers of Toronto waterfront including the Rouge, the Don, the Humber, the Highland, Etobicoke and Mimico. Draining an area of over 2000 square kilometers and providing homes, roads and employment opportunities to over 3 million people, it is easy to see why restoring environmental conditions in an area this large, with this many people will be challenging. This area is over 47% urbanized, while 13% of the Region is considered urbanizing.

Are conditions getting better or worse?

This report intends to illustrate the staggering number of challenges Toronto and Region faces in order to restore environmental conditions, particularly those pertaining to water quality. In order to see real improvement in the environmental conditions in this Region, the Remedial Action Plan must contend both with historical issues relating to contaminated sediment, degrated benthos communuties, and loss of fish and wildlife habitat but must also address the present day stresses being placed on the Region's ecosystem which will continue to be degraded in light of the continued urbanization. Between 2006 and 2031, the popoulation of the City of Toronto, the Regions of Peel and York is expected to grow by additional 1.2 million people, or 26%. Meeting the needs of future residents of the area will lead to the continued losses of farmland, forests and wetlands, increasing pressures on wildlife and the continued degradation of terrestrial and aquatic resources.

Times are changing:

As outlined in this report, Toronto and Region does face significant challenges, but these challenges are being met with concerted and considerable efforts undertaken to protect and enhance

environmental conditions in the Region. Comprehensive monitoring programs provide vital information on the conditions of our watersheds, waterfront, and the natural resources, including the fish and wildlife that live within them. Bold, long-term plans and legislations have been developed and are being implemented; these measures will work to reduce and prevent pollution, and remediate degraded areas. Watershed and habitat plans are available to guide restoration activities. Strategies for remediating aging infrastructure and retrofitting stormwater management facilties are available. These plans and measures are big, bold and often complex - requiring significant resources. And while, we cannot expect to undo the centuries of pollution, land changes and urbanization in a few years; we all must continue *Moving Forward* to restore environmental conditions so that the Region is no longer considered an Area of Concern but one that supports a green, healthy, vibrant economy and community.

1 Introduction

This report, *Moving Forward*, updates the progress that has been made since 2001 in restoring the health of Toronto's waters and habitats consistent with the Toronto and Region Remedial Action Plan. The title has been chosen to emphasize the fact that there is clear momentum to move forward with the important work of cleaning up Toronto's watersheds and waterfront. A tremendous amount of work has taken place over the last number of years – everything from developing pollution reduction plans to restoring streams to creating new wetlands – and this work has been carried out by governments (federal, provincial and municipal), non-governmental organizations, businesses, schools and committed citizens.

As a result of this concerted effort, we have innovative and long-term plans in place to reduce and prevent pollution and remediate degraded areas. We also have watershed plans and habitat plans to guide restoration efforts. Comprehensive monitoring systems have been set up to give us timely and vital information on the conditions of our watersheds and waterfronts and the natural resources, fish and wildlife that lie within them. A new agency – WATERFRONToronto (formerly the Toronto Waterfront Revitalization Corporation) – has been created to coordinate intergovernmental efforts to transform and clean up the waterfront. Funds have been committed to implement waterfront projects, restore habitats and reduce pollution. And all this is being done at a time when public concern about the environment is at an all-time high in Canada. The time is indeed right for *Moving Forward*.

1.1 HISTORY OF THE TORONTO RAP

The beginning

The history of the Toronto and Region Remedial Action Plan (RAP) began in 1985. It was then that the International Joint Commission (IJC) officially recognized 42 areas within the Great Lakes in which water quality and other ecosystem functions were badly impaired, 17 of which – including Toronto – were in Canada. (A 43rd area was subsequently added to the list). In the 1987 Great Lakes Water Quality Agreement, Canada and the United States agreed to work together to restore these 43 hotspots, or "Areas of Concern" (AOC).

The Toronto and Region Area of Concern (or Toronto and Region 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 and the Rouge River. Together, these watersheds drain an area of 2,000 square kilometres and support a population of over 3 million people (based on 2001 consensus data).

While the Toronto and Region RAP area contains portions of the Oak Ridges Moraine and is about 40% rural, its southern part is heavily urbanized and the entire RAP area is growing rapidly. The Greater Toronto Area (GTA), which includes the Toronto and Region RAP area, is the third fastest growing metropolitan area in North America. Within the Toronto and Region RAP area, notable population growth has taken place over the last twenty years in the booming headwater areas in the Region of Peel to the west and Region of York to the north of the City of Toronto. More than half of the immigrants who come to Canada end up in the GTA, lured by its economic opportunities and multicultural composition.

Mimico Creek in Etobicoke, Ontario, as it passes south of Bloor Street West.

FIGURE 1
Great Lakes Areas of Concern

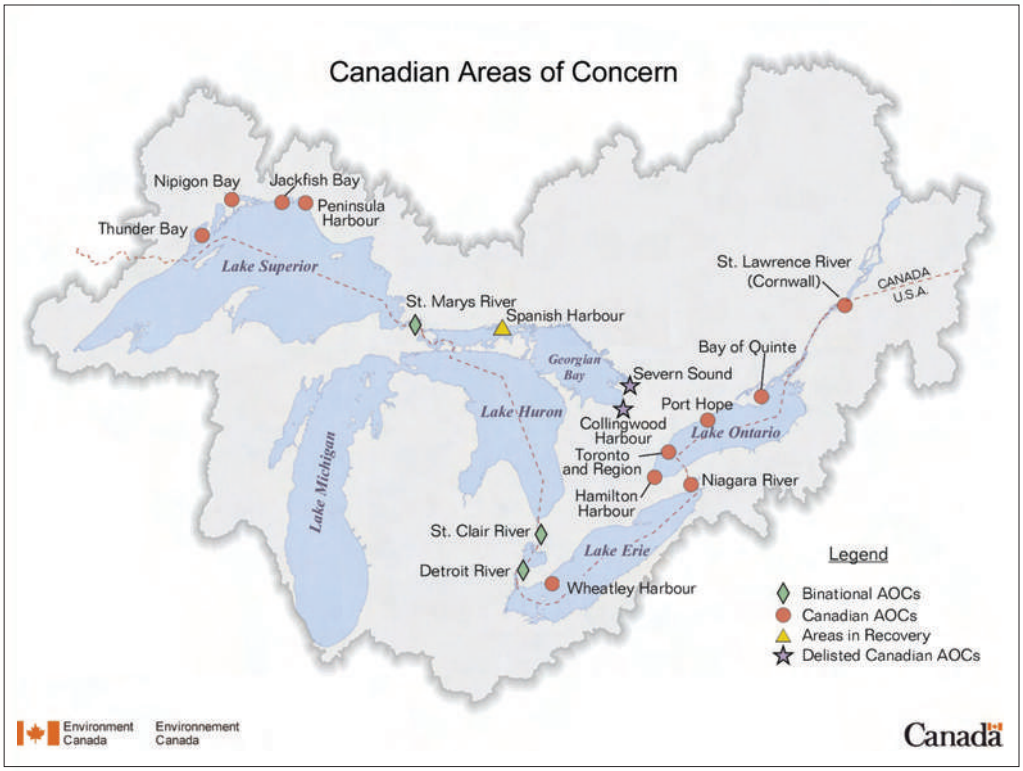
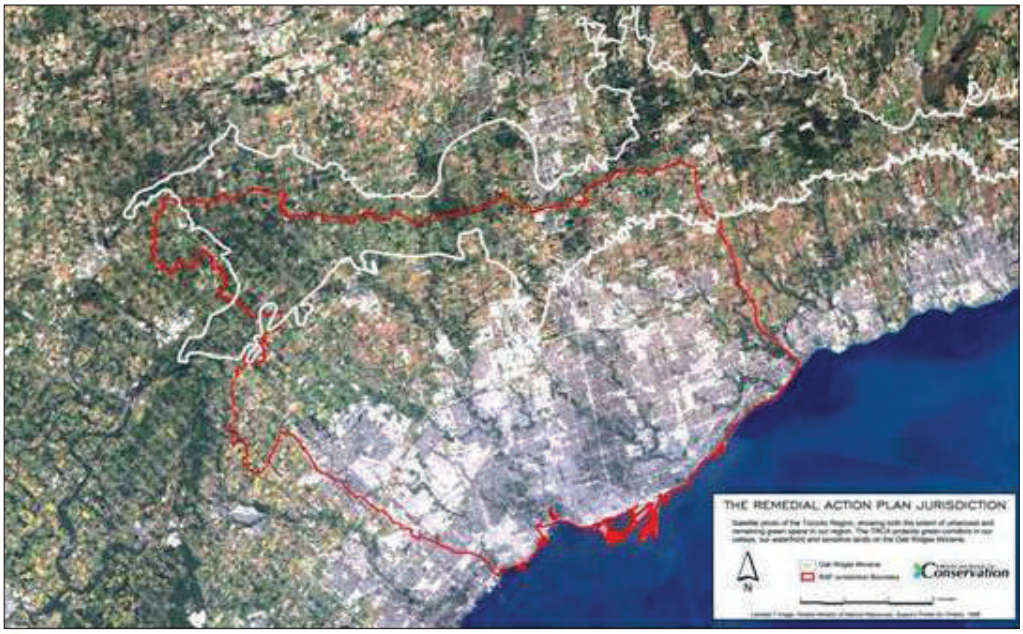


FIGURE 2
The Toronto and Region Area of Concern



The Toronto and Region RAP area includes the City of Toronto and portions of 11 other municipalities within the Regions of Peel and York.

FIGURE 3
The Growth of the Toronto Area

Why was Toronto identified as an Area of Concern?

When identified as an Area of Concern (AOC) in 1985, Toronto suffered from many of the ills associated with historic industrialization and continuing urbanization – poor water quality, contaminated sediments, loss of wildlife habitat, contaminants in fish, and beaches that were often closed due to pollution. This environmental degradation reflected the impacts of over 200 years of agriculture, industry and urbanization. The particular problems affecting Toronto as of 2007 are listed in Table 1. These "impaired uses" relate to the 14 criteria that were developed by the IJC to define environmental degradation in the Great Lakes.

TABLE 1
Impaired Uses in the Toronto and Region Area of Concern (as of 2007)

Potential Impaired Use (define 1985) (Criteria defined the Great Lakes Water Quality Agreement)	**Status**		
	Impaired	**Requires Further Assessment**	**Not Impaired**
Restriction on fish and wildlife consumption	X		
Degradation of benthos	X		
Restriction on dredging activities	X		
Eutrophication with undesirable algae	X		
Beach closures	X		
Degradation of aesthetics	X		
Degradation of fish and wildlife populations	X		
Loss of fish and wildlife habitat	X		
Fish tumours or other deformities			X*
Bird or animal deformities, reproductive problems			X*
Degradation of phytoplankton and zooplankton communities		X	
Tainting of fish and wildlife flavour			X
Restriction on drinking water; taste and odour problems			X
Added costs to agriculture and industry			X

** Likely not impaired -- see Section 3.7.4 for updated information on these issues*

What this table does not communicate is the unique and complex nature of the Toronto and Region Area of Concern. The problems seen in the Toronto and Region AOC area are multi-faceted and are exacerbated by the phenomenal population growth the area has experienced and will continue to experience. Meeting the needs of this burgeoning population for housing, employment, education, healthcare, transportation and other social goods has led to the continued loss of farmland, forests and wetlands, increased pressures on wildlife, and the continued degradation of terrestrial and aquatic resources.

TABLE 2
Population of Toronto and Region AOC

Actual and Projections Populations for the GTA, Toronto, Peel and York							
Area	**1996**	**2001**	**2006**	**2011**	**2021**	**2031**	**% change 1996-2031**
GTA	4,781,000	5,284,000	5,881,970	6,260,000	6,975,000	7,450,000	55.8%
Toronto	2,463,000	2,481,494	2,503,281	2,855,000	2,915,000	3,000,000	21.8%
Peel	882,000	1,000,000	1,159,405	1,185,000	1,350,000	1,400,000	58.7%
York	612,000	729,254	892,359	1,010,000	1,200,000	1,360,000	122.2%

Milestones for the Toronto and Region Remedial Action Plan

For the Toronto and Region RAP, a number of significant milestones have been reached (see Table 3). Stage 1 of the RAP process (the definition of the problems) was completed in 1989 and Stage 2 (the development of the strategy to address those problems) was completed in 1994. The Stage 2 document, *Clean Waters, Clear Choices* laid out a blueprint for how we can address the complex environmental problems in the Region. It set out broad restoration targets, recommended 53 actions to restore clean waters and healthy habitats in Toronto and Region, and set the stage for implementation to begin.

TABLE 3
Milestones in the Toronto and Region RAP

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)

As part of the Stage 3 RAP implementation process, four Progress Reports have been developed. The most recent of these, the 2001 RAP Progress Report, *Clean Waters, Healthy Habitats*, identified six areas for priority action. These were: wet weather flow management, pollution prevention, habitat restoration, smart growth, education, and monitoring. Progress made in these areas is covered in Section 3 of this report (Key Actions 2002 – 2007).

Who is in charge of the RAP?

Under the Great Lakes Water Quality Agreement and the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA), Environment Canada and the Ontario Ministry of the Environment (MOE) are responsible for ensuring progress in the Great Lakes Areas of Concern. The Toronto and Region RAP is managed by representatives from Environment Canada, MOE, Ministry of Natural Resources (MNR) and Toronto and Region Conservation Authority (TRCA). Since 2002, TRCA has led the administration of the RAP under an agreement with Environment Canada and MOE.

While the management of the RAP process is the responsibility of Environment Canada, MOE, MNR and TRCA, implementation and restoration activities are being carried out by government agencies, TRCA, the municipalities in the Toronto and Region AOC, watershed alliances and councils, industries, farmers, non-governmental organizations and individual homeowners and residents. One of the principles of the Toronto and Region RAP process is that ***we all have a role to play in restoring our waterfront and watersheds to health***.

1.2 VISION FOR THE FUTURE

The vision for Toronto and Region RAP has been forged through the efforts of many members of the public, scientists, government agencies, and non-governmental organizations. Their vision of a healthy, functioning ecosystem is expressed in the RAP Goals that were developed in 1994.

Selected RAP Goals for the Future (1994)

- Any fish species indigenous to the Toronto waterfront and its watersheds should be able to return to the region, to live and naturally reproduce here.
- Opportunities to sustain and create fish and wildlife habitat throughout the Toronto and Region watersheds should be pursued in parallel with water quality initiatives.
- Within the waterfront, watershed and headwaters protection of the remaining wetlands should be a primary concern.
- People should be able to consume fish from the Toronto waterfront and its watersheds without any restrictions resulting from contaminants of human origin.
- People should be able to swim at beaches and engage in water sports in Lake Ontario and Toronto and Region's watersheds without risk of disease or illness.
- Levels of potentially toxic chemicals in Toronto and Region's drinking water should not exceed acceptable standards.
- The aesthetic quality of the waterfront, river valleys, ravines, wetlands and water bodies in the watersheds should be of sufficient quality to enhance passive and active recreational uses for all people.
- Opportunities should be provided for residents and visitors to study or observe a functioning, healthy ecosystem.
- People should be able to swim and engage in water sports in Lake Ontario and Toronto and Region's watersheds without encountering dangerous or hazardous materials.

Clean Waters, Clear Choices (1994)

The development and articulation of this vision signified an important shift from "fixing a problem" to ensuring long-term sustainability. Early in the RAP process, it was realized that we could not fix the problems of the waterfront without addressing the rivers that flowed into it, and that we could not address the problems of the rivers without addressing the land uses in the Toronto and Region AOC. The vision of sustainability is anchored in the understanding that we cannot have continued economic growth and healthy communities without a healthy natural environment.

Since 1994, the RAP vision of a healthy functioning ecosystem has been reflected elsewhere in important policy documents such as the City of Toronto's 2000 Environmental Plan (*Clean, Green and Healthy*), its new Official Plan adopted in 2002, and the principles enshrined by the City in its Wet Weather Flow Master Management Plan. The Region of Peel's Liveable Peel Initiative, launched in 2006, aims to promote long-term planning by balancing the social, economic, environmental and cultural needs of Peel's residents and managing growth to achieve a balance between the natural and built environments. The Region of York, through its Vision 2026 Strategic Plan that was developed in 2001, emphasizes the importance of environmental protection to sustain liveable communities.

The RAP vision is also compatible with WATERFRONTToronto's vision for a revitalized Toronto waterfront. The vision is further expressed through TRCA's vision for The Living City, which aims for a cleaner, greener and healthier city region built upon a natural foundation of healthy rivers and shorelines, greenspace and biodiversity, and sustainable communities.

1.3 ABOUT THIS REPORT

This report updates the progress that has been made since 2001 in implementing the Toronto and Region Remedial Action Plan.

- Section 2 outlines the **Existing Conditions** of the surface waters, sediments, habitats and wildlife in the Toronto and Region AOC.
- Section 3 reviews the **Key Actions** that have taken place since 2001 in the Toronto and Region AOC. These actions include legislative, policy, remediation, restoration, watershed planning, education, stewardship, science and monitoring activities.
- Section 4 assesses the **Progress** that has been made in the RAP measuring against the Beneficial Use Impairments and the RAP Interim Targets that were set in 2001. This section also discusses how to move towards de-listing.
- Section 5 is focused on **Moving Forward** and includes recommended Key Actions for 2007-2012 and the next steps for the Toronto and Region RAP.

This Progress Report is not intended to be an all-encompassing State of the Environment Report. It therefore does not examine issues such as solid waste generation or emissions into the air. It focuses specifically on those environmental issues that relate directly to the RAP and the impaired uses that have been identified (see Table 1). In other words, the focus is on measuring how we are doing in terms of achieving healthy waters and healthy habitats in the Toronto and Region AOC.

2 Existing Conditions

2.1 WATER QUALITY

Assessing water quality in the Toronto and Region watersheds is a challenge because the area is large, the water bodies are very diverse, and the types and levels of pollutants vary both spatially and temporally. In general, water quality decreases as one moves downstream in the area's rivers, and can be poor near point sources of pollution or in areas that are not flushed often like the Ship Channel in Toronto's Portlands. Water quality can be severely affected by rainfall events, when stormwater and combined sewer overflows discharge into the area's watersheds and waterfront.

This report focuses on five aspects of water quality that relate to the RAP water use impairments:

- nutrients;
- bacteria;
- heavy metals and persistent organic compounds;
- chlorides; and
- aesthetics.

2.1.1 Nutrients and Conventional Pollutants

Phosphorus

Phosphorus is an essential nutrient for all living organisms and is naturally occurring. However, if the concentration of phosphorus in surface waters is too high, it can lead to a proliferation of plant and algae growth that lead to reduced oxygen levels in the water. In extreme cases this process, called eutrophication, can lead to unsightly mats of algae and the death of fish. The phosphorus that is found in the surface waters of the Toronto and Region AOC comes from both natural and anthropogenic (manmade) sources. The key anthropogenic sources are stormwater, combined sewer overflows, discharges from sewage treatment plants, septic systems and fertilizers.

Photo © Photos.com

In Toronto, as elsewhere in the Great Lakes, phosphorus levels in surface water declined significantly in the 1970s and 1980s because of improved sewage treatment and regulation of phosphate levels in detergents. Concentrations of phosphorus in surface waters levelled off in the 1990s and have remained in the same general range since 1987. (The main exception to this is the Don River, in which concentrations have dropped over this period). Currently, phosphorus concentrations in streams and rivers frequently exceed the interim Provincial Water Quality Objective (PWQO) for rivers of 0.03 mg/L, in both rural and urban parts of the watersheds (see Figure 5). Despite these exceedances, few streams have visible excess algae growth and nuisance growth of algae. Dissolved oxygen levels remain consistently above the standards for receiving waters at all the Regional Watershed Monitoring Network (RWMN) sites in the Toronto and Region AOC.

Top: Zebra mussel, Bottom: Quagga mussel

Zebra and Quagga Mussels

Zebra mussels, and its close relative quagga mussels, are relatively recent invader, in the Great Lakes. Scientists believe that the small, striped mussels were transported in the ballast water of an ocean-going freighter and discharged into the Great Lakes in the late 1980s. Since that time, zebra and quagga mussels have spread rapidly to all of the Great Lakes (zebra mussels are now widely distributed throughout waterways in the U.S.). They have been implicated in the decline of native shellfish in Lake Erie and cost municipalities millions of dollars annually because of clogged water intakes. In Lake Ontario, scientists have identified mussels as a main culprit responsible for the collapse of the lower food web and the mussels are thought to be part of the causal mechanism of the botulism outbreaks that are responsible for the death of thousands of fish and fish-eating seabirds.

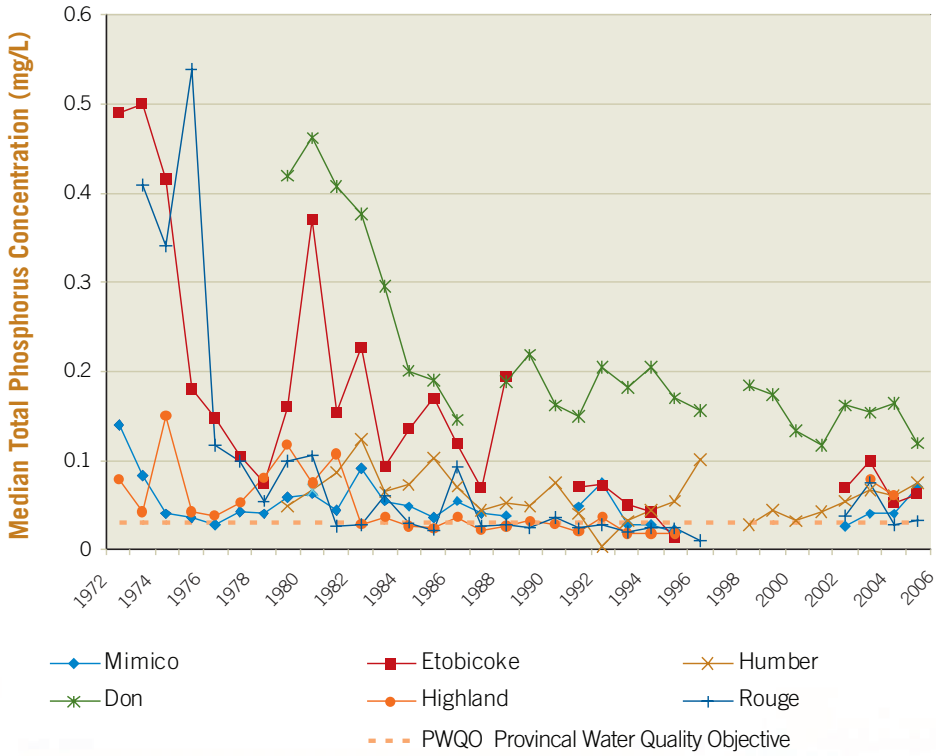
Voracious filter feeders, zebra mussels have dramatically improved water clarity in many areas. This permits sunlight to penetrate deeper into the water, which fuels the growth of aquatic plants and algae.

The accumulation of mussel shells is altering the physical nearshore structure (i.e. covering soft and hard bottom aquatic habitats and shells accumulating on beaches). Furthermore, scientists believe these mussels are altering the flow of phosphorus – trapping the nutrient in the nearshore – providing additional fuel for aquatic plant and algal growth while starving the open waters of phoshorus, a phenomenon referred to as the Nearshore shunt .

In recent years, phosphorus concentrations in Humber Bay and Toronto Bay have generally fluctuated around 0.01 mgL, which is the PWQO for lakes.[1] Excess growth of algae is prevalent along the western Toronto waterfront where there is a natural rock substrate, which is preferred by *Cladophora*, the most common form of nuisance algae.

The key actions being taken to address the phosphorus issue are covered in this report in Sections 3.2.1 (Wet Weather Flow and Stormwater Management) and 3.2.2 (Eliminating Dry Weather Flows). Improved stormwater management, which includes the adoption of low impact development practices, and the virtual elimination of combined sewer overflows are expected to reduce phosphorus levels in the watersheds, especially in Taylor Massey (tributary of the Don River) and Black Creek (tributary to the Humber River), two subwatersheds in which nutrient levels are particularly high. In the long term, however **it is unlikely that levels of phosphorus**

FIGURE 5
Annual Median Total Phosphorus Concentrations in Toronto Watersheds (1972-2006)
(Breaks in the data lines are due to disruptions in the monitoring program)



in Toronto's streams and rivers will ever consistently meet the PWQO due to continuing urbanization and the fact that even the most effective stormwater management ponds will continue to discharge phosphorus at concentrations well above the receiving water standard.[2] Recognizing that the standard methods for dealing with stormwater is will not be sufficient to restore beneficial uses in the Region, this RAP has encouraged the establishment and evolution of the Sustainable Technologies Evaluation Program (STEP); see Section 3.2.7 for more details regarding STEP.

Nitrogen

Like phosphorus, nitrogen is an essential nutrient for plant growth but can contribute to excess growth of phytoplankton and nuisance algae if too much is present in surface waters. At elevated levels, certain forms of nitrogen (un-ionized ammonia, nitrate and nitrite) can be toxic to aquatic life. Elevated levels of un-ionized ammonia are typically associated with industrial or municipal discharges of wastewater and with manure or fertilizer runoff from farms. In Toronto, the only area with ammonia levels occasionally above the PWQO of 0.02 mg/L is on the Don River, downstream of the North Toronto sewage treatment plant.[3]

As with phosphorus, nitrate levels have remained within the same general range over the past 15 years. The lowest nitrate levels are found in the Upper Main Humber, and the highest levels in the highly urbanized portions of the Lower Don and Lower Humber.[4] At the levels found in Toronto's rivers, nitrate is generally not toxic to fish, bottom-dwelling invertebrates or aquatic plants. Nitrate concentrations as low as 2.5 mg/L are associated with chronic toxicity effects in some amphibian species[5]; fortunately, nitrate levels in Toronto watersheds rarely exceed this threshold.

Trend for Nutrients: Levels of phosphorus in watersheds frequently exceed PWQO; waterfront levels generally meet PWQO. Overall levels steady since 1990.

2.1.2 Bacteria

Human sewage is a major source of bacteria in surface waters, and can come from Combined Sewer Overflows (CSOs), stormwater, illegal cross-connections between sanitary and storm sewers, improper manure storage, and septic systems. Direct faecal matter inputs from pets, livestock and wildlife can also be a significant contributor. The presence of high levels of bacteria in surface water makes body contact recreation (such as swimming) a health risk. The current PWQO for water contact recreation is 100 counts of *E. coli* per 100 mL of water.

In the watersheds, *E. coli* is monitored at about half of the stations in the RWMN. Monitoring data show that levels of *E. coli* are typically lower and less variable in rural areas than in urbanized parts of the watersheds. The highest *E. coli* levels are found at the lower portions of the Humber and Don Rivers (both rivers, as well as the waterfront, are impacted by CSOs). Elevated levels are also found near the mouths of the other rivers in the Toronto area. In general, many of the samples taken in the Toronto and Region watersheds exceed the provincial objective of 100 counts of *E.coli* per 100 mL of water. This is not unexpected because the rivers receive untreated stormwater, and are not considered to be appropriate areas for swimming[6].

Peel Public Health monitors the beaches at Albion Hills Conservation Area (Humber River watershed), and Heart Lake Conservation Area (Etobicoke Creek watershed); these beaches are sampled on a weekly basis. Public Health Services for the Region of York undertakes weekly sampling of the other watershed beaches found in the AOC: Cedar Beach at Musselmans Lake and Shadow Lake (Rouge watershed) and Recreation Island and Sunset Beach at Lake Wilcox (Humber Watershed).

Along the waterfront, the City of Toronto monitors *E. coli* levels at swimming beaches to ensure that water is safe for people swimming and engaging in watersports. Samples are

also taken at areas like Coatsworth Cut, west of Ashbridge's Bay Park, where water quality is known to be poor. Data collected since the mid-1980s show that areas such as Coatsworth Cut that are close to uncontrolled discharges of stormwater and CSOs frequently experience high bacterial counts. The construction in 1990 and 1995 of two underground storage tanks in the Eastern Beaches to intercept and treat stormwater has significantly improved water quality in the Eastern Beaches. The construction in 2002 of a similar facility in the Western Beaches has improved water quality somewhat, but bacterial levels continue to be high because of the influence of the nearby Humber River and other sources including waterfowl and pet wastes.

A sign is posted at each Toronto beach to advise swimmers that water quality conditions are considered unsafe by the Public Health Unit. The summary of beach postings for 2005 is presented below in Table 4.[7] It shows that the cleanest beaches are two of those on the Island (Hanlan's Point and Ward's Island), Cherry Beach, and two of the Eastern Beaches (Kew/Balmy and Woodbine/Ashbridge's Bay). The most frequently posted beaches are Bluffer's Park and Rouge Beach, which are posted 95% and 87% respectively of total swimming days. Three beaches are within the areas of influence of river discharges (Marie Curtis Park is close to Etobicoke and Mimico Creeks, Sunnyside is close to the Humber River, and the Rouge Beaches are close to the mouth of the Rouge River. Presently, the City of Toronto is trying to track down the true sources of e.coli at the beaches (see Box: Identifying Sources of Bacteria at Beaches pg. 35).

Cathedral Scarborough Bluffs
Photo © Photos.com

TABLE 4
Summary of Beach Postings 2005 (by % of total swimming days posted)

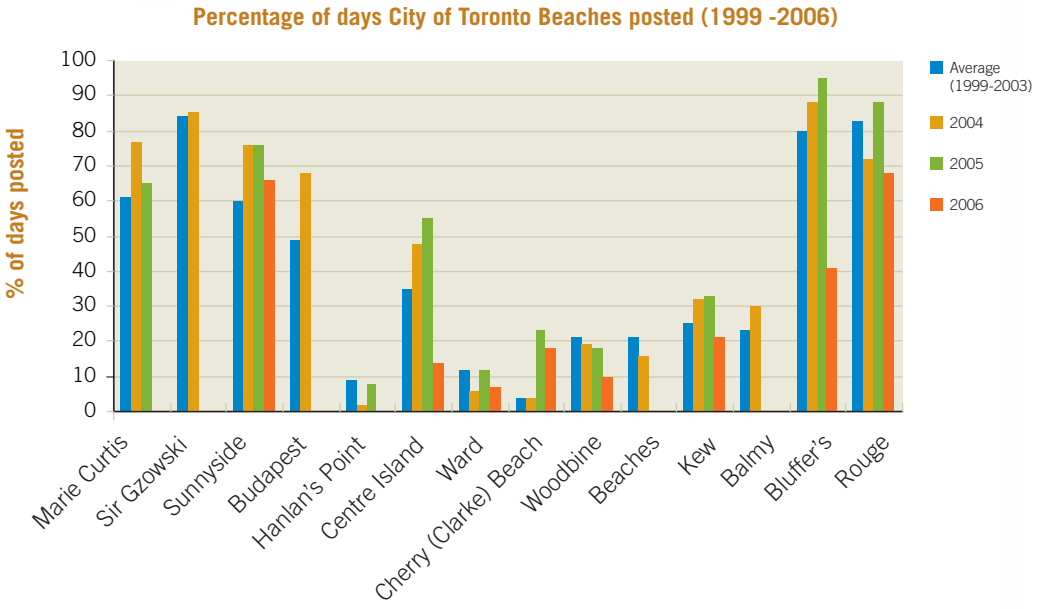
Area	Beach	% of swimming days posted
Etobicoke	Marie Curtis Park East	61%
Western	Sunnyside	69%
Islands	Hanlan's Point	7%
	Centre Island	50%
	Ward's Island	11%
Outer Harbour	Cherry Beach	19%
Eastern	Kew/Balmy	21%
	Woodbine/Ashbridge's Bay	14%
Scarborough	Bluffer's Park Beach	95%
	Rouge Beach	87%

City of Toronto (2006). Wet Weather Flow Master Plan Implementation Report 2004-2005.

Identifying temporal trends in beach postings is difficult because of the influence of weather, particularly rainfall and temperature, which can dramatically affect bacterial levels and growth (see Figure 6).

The key actions taken since 2001 to improve water quality at beaches are covered in Sections 3.2.1 (Wet Weather Flow and Stormwater Management) and 3.2.5 (Improving Beach Water Quality).

Trend for Bacteria: Temporal trends influenced heavily by weather. Overall, there is a better understanding of the sources of E.coli on the beaches thus improving the management of beaches.



2005 - Woodbine and Beach Park combined to make Woodbine Beaches - data represented under Woodbine Beach
2005 - Kew and Balmy combined to make Kew-Balmy Beach - data represented under Kew Beach

FIGURE 6
Trends in Beach Postings (1995-2006)

2.1.3 Heavy Metals and Persistent Organic Compounds

Heavy Metals

Heavy metals such as copper, lead, aluminum and zinc are naturally present at trace levels in the environment. However at higher concentrations these substances can be toxic to aquatic life. Sources of heavy metals include industrial discharges, stormwater runoff, wind-blown dust, roof runoff, and road surface materials.

At most of the RWMN stations, the levels of heavy metals are very low and meet the PWQO during dry weather conditions. Levels are higher in urbanized subwatersheds than those that are rural. The highest levels of copper and zinc are found in heavily urbanized watersheds that have little or no stormwater control, such as Black Creek, Taylor Massey Creek and the Lower Don. Aluminum levels are elevated in the Lower Don and Lower Humber watersheds, and in the West Humber, where clay soils containing aluminosilicate minerals dominate. The MOE carried out a Tributary Study from 2003-2005 to examine differences in pollutant levels

The Story of Lead

The significant reduction in lead in the environment over the last 30 years provides a good example of how substantial change is possible if society identifies removal of a contaminant as an important priority. The move to reduce levels of lead in the environment stemmed from research that linked lead exposure to human cognitive abnormalities, memory impairment and learning disabilities. As an outcome of this research, programs and regulations were introduced in Canada in the 1970s and 1980s to eliminate lead from gasoline, paints, water pipes and solders. As a result of this, lead levels in air and water declined precipitously. Health Canada reported a 76% decrease in the concentrations of lead in the air of major Canadian cities between 1973 and 1985. In 1971, Toronto tree leaves contained 65 ppm of lead; by 2004, these levels had declined to only 1 ppm. In Toronto area streams, ambient concentrations of lead now rarely exceed provincial guidelines, and further declines will likely result from continued efforts to reduce human exposure to this contaminant.

during storm events. This study found that the PWQOs for most metals were exceeded during wet weather events.

Levels of most heavy metals in Toronto area streams have declined or remained constant since the 1970s. This is especially true for lead: average concentrations in some monitoring stations have been below detection limits since 2001. Additional monitoring, particularly during wet weather flow conditions, is needed to better understand trend for heavy metals in AOC's surface waters.

Trend for Metals: Low concentrations except during wet weather events. Overall levels are declining or constant since 1970s.

Persistent Organic Compounds

Limited data are available on the levels of persistent organic compounds in the AOC's surface waters. Monitoring of Toronto's rivers was carried out in 1991-1992 and in 2000-2001 by the MOE, but comparisons cannot be made between the two sets of data as different sampling methodologies and analytical procedures were used. In the Don River, 2000-2001 levels of PCBs met the PWQO 92% of the time and levels of polycyclic aromatic hydrocarbons (PAHs) and benzo(a)pyrene met the objective 54% of the time. Levels of persistent organic compounds (pesticides, herbicides and PCBs) are generally low in the Rouge River but levels of PAHs frequently exceed the PWQO, especially on the main Rouge River.

In the fall of 2006, the MOE began a two-year sampling program for a range of organic compounds at 10 monitoring stations in Toronto's tributaries. The results of this monitoring, when available, will add to the understanding of conditions in the watersheds.

Trend for Persistent Organic Compounds: Insufficient data to identify trends.

2.1.4 Chlorides

Chlorides in our surface waters come mainly from the application of road salts. Some 130,000 to 150,000 tonnes of road salts are applied to City of Toronto area roads every year to protect motorists from accidents caused by icy and snowy conditions – The amount of road salt applied on an annual basis will depend on weather conditions. Salt is also applied in the upstream Regions of York and Peel. Unfortunately, while this salt protects drivers in treacherous winter driving conditions, it also seeps into groundwater and runs off into rivers and streams. Because of concerns that road salts are having adverse effects on freshwater ecosystems, soil, vegetation and wildlife, road salts were added to the Canadian Environmental Protection Act's Priority Substance List in 2001.

Chlorides-the primary constituent of road salt – are a useful indicator of the impacts of urbanization. Background concentrations of chlorides in natural areas are typically below 10 mg/L.

As illustrated in Figure 7, the concentrations of chlorides have been steadily increasing since the late 1960s, as urbanization has spread in the Toronto and Region AOC. In all 6 watersheds in the AOC, current winter concentrations of chlorides exceed 210 mg/L, which Environment Canada and Health Canada have identified as the threshold for chronic toxicity effects on 5% of sensitive organisms. Monitoring shows that concentrations of chlorides are higher in urbanized and urbanizing subwatersheds than in those that are largely rural, reflecting traffic volumes and the density of road networks. Areas that are classified as urban but have significant rural areas upstream have chloride concentrations similar to rural areas. Actions being taken to address the chloride issue are covered in Section 3.2.6 of this report (Salt Management Plans).

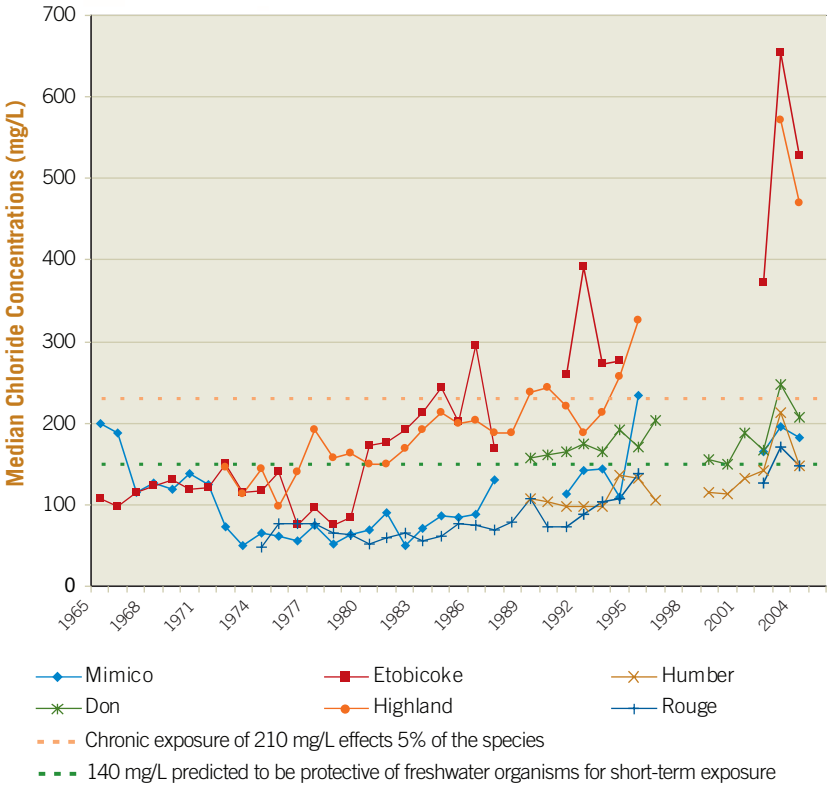


FIGURE 7
Median Chloride Concentrations at RAP Watersheds (1965-2006)

Trend for Chlorides: Levels are increasing.

2.1.5 Aesthetics

In terms of surface water, "aesthetics" refers to how it appeals to the senses – whether it contains unsightly litter or debris, whether it contains algae blooms or overgrown weeds, whether it is turbid (murky) or whether it smells bad. Under the RAP, aesthetics have been identified as one of the impaired uses in Toronto and Region AOC.

Information on aesthetics is not collected in any rigorous way in the Toronto and Region AOC. As noted in Section 2.1.1 (Nutrients), few streams in the Toronto area have visible algae growth, but visible algae is a concern along the waterfront, particularly in the western part of the Toronto and Region RAP area. Aesthetics continue to be a challenge for Toronto area beaches, but programs like Blue Flag will help remedy this. In addition to bacterial contamination, water quality at area beaches is affected by nuisance algae growth (caused by elevated nutrient levels), faeces of gulls and waterfowl, and litter and debris[8]. Actions to address these issues are primarily addressed in Sections 3.2.1 (Wet Weather Flow and Stormwater Management) and 3.2.5 (Improving Beach Water Quality).

Algae and weeds choke reconstructed stream.
© Friends of the Rouge Watershed

Trend for Aesthetics: Insufficient information.

2.1.6 Overall Water Quality Trends

Have things changed in terms of water quality in the twenty years since 1987? The levels of most parameters have remained the same or have shown small improvements. The exceptions to this are chlorides, which continue to rise in the rivers in the Toronto and Region AOC as urbanization increases and persistent organic compounds, for which there are insufficient data to allow statements about trends to be made.

The lack of marked improvement since 1987 does not reflect a lack of action to control pollution. In the last twenty years, the municipalities in the Toronto and Region AOC have made significant improvements in sewage treatment, stormwater management and pollutant regulation in sewers. During this time progressively tougher provincial and federal regulations have led to dramatically reduced direct discharges from industrial sources. Residents of the Toronto and Region AOC are more aware of the links between their actions and water quality. The benefits, however, of these positive actions have been in part offset by increased population growth. Between 1996 and 2006, for example, the City of Toronto alone grew by 368,281 residents, which represents a 17.2% increase in population. As noted in Section 1.1, the population growth in the upper watershed Regions of York and Peel was greater still over this period. Addressing the impacts of this continued growth is a major challenge for the Toronto and Region RAP.

2.2 BOTTOM SEDIMENTS AND BENTHOS

2.2.1 Bottom Sediments

Bottom sediments have been sampled in Toronto Harbour since the 1970s, and many early studies found areas of highly contaminated sediments in the Keating Channel and in the immediate vicinity of combined sewer outlets. These studies attributed the contamination by heavy metals to ongoing sources. Since the 1970s, there have been significant reductions in the concentrations of metals in bottom sediments – particularly lead, copper and zinc – due to the introduction of pollution prevention programs and sewer use bylaws which have led to cleaner sediments being deposited on top of historic ones.

Despite this general improvement in sediment quality, some hotspots still exist – for example, levels of copper near Mugg's Island – that suggest the possibility of local sources such as anti-fouling paints used on the hulls of boats. There continue to be areas of contamination and organic enrichment near storm sewer and combined sewer outlets. Contaminant levels have improved in surficial sediments; historical contamination may still be present at deeper levels. When navigational dredging is required, contaminant levels and bioavailability are evaluated to determine if material is required to be contained in the Confined Disposal Facility at Tommy Thompson Park. Dredgeate which meets the guidelines is used in the creation of waterfront parks.

The key to continued improvement in sediment quality is to reduce the volume and improve the quality of storm sewer discharges and combined sewer overflows in those areas where sediment quality is poor.[9]

Trend for Sediments: Improving; still some hotspots.

2.2.2 Benthic Communities

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

TRCA has two ongoing programs to monitor the health of benthic communities. The programs use the composition of the invertebrate community (the number and type of species present) as an indicator of benthic community health. Beginning in 2001, invertebrates were monitored annually at 150 stations throughout the TRCA jurisdiction as part of the Regional Watershed Monitoring Network. Prior to 2001, benthic monitoring was not carried out in a standardized way in the watersheds. Over time, this monitoring will allow benthic communities to be assessed across the Toronto and Region AOC.

The benthic community in Highland Creek is the most impaired, all stations showing some degree of impairment. The least impaired watersheds are the Humber and the Rouge. Generally, the longer a subwatershed has been urbanized, resulting in changes to water quality and flow regime, the more severe the level of impairment. Over the five years of monitoring from 2001 to 2006, there was no evidence of changes in benthic community structure in the watersheds; continued monitoring will allow temporal trends to be observed.

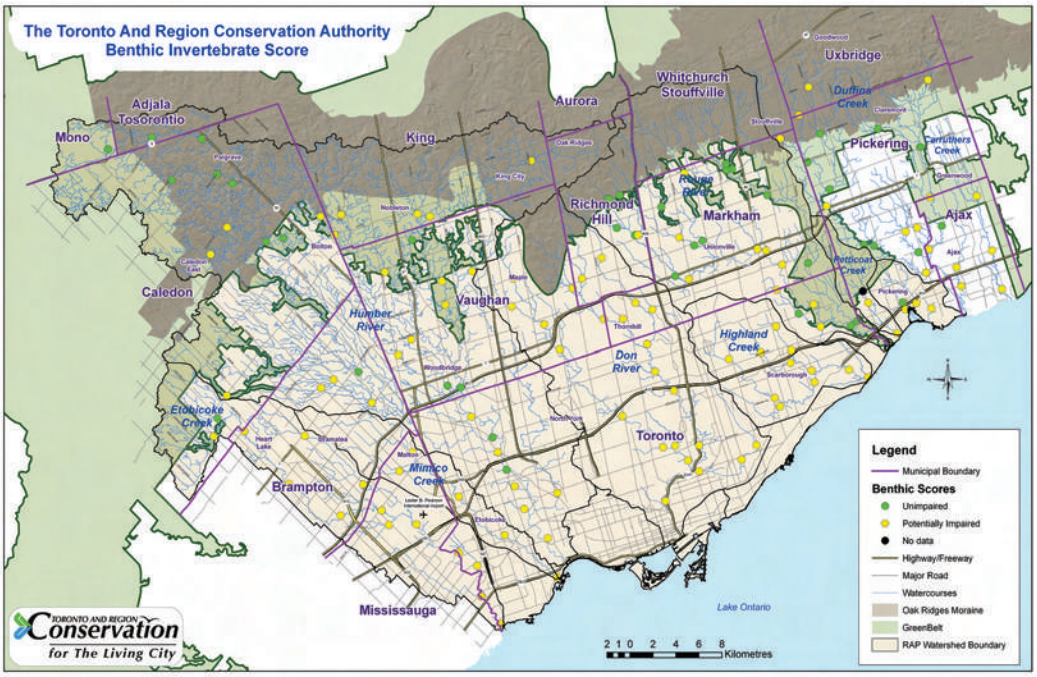
TABLE 5
Watershed Assessment of Benthic Community Health (2001-2006)

Watershed	No. of Stations	% Samples Impaired	% Samples Moderately Impaired	% Samples Unimpaired
Etobicoke	14	43	50	7
Mimico	5	80	20	0
Humber	38	8	32	60
Don	23	39	57	4
Highland	11	91	9	0
Rouge	26	4	27	69

Benthic monitoring is sporadic along the waterfront and has been carried out by MOE and TRCA. In 2001 and 2003, TRCA sampled benthic communities at 20 stations along the waterfront. This monitoring showed that the benthic community is not adversely affected by metals in sediments. However, impairment of the benthic community is seen in areas where the sediments are enriched with nutrients (including areas around Combined Sewer Outfalls, the Keating Channel and Ashbridge's Bay). This is similar to the findings in the 2001 RAP Progress Report. As in the watersheds, there was no evidence of changes in benthic community structure along the waterfront between 2001 and 2006.

Trend for Benthic Communities: Level of impairment related to level of urbanization. Temporal trends uncertain because of lack of historical data.

FIGURE 8
Health of the Benthic Communities in the Toronto Watersheds



2.3 HABITATS

2.3.1 Extent and Quality of Natural Cover

Natural cover includes forests, meadows, wetlands and coastal habitats. The quantity of natural cover on the landscape is important, but so to is the quality of the habitat and its distribution across the landscape. The most recent data on the extent of natural cover are presented in Table 6. It should be noted that this is for the entire TRCA jurisdiction, including Duffins and Carruthers Creeks, which are not within the Toronto and Region AOC.

TABLE 6
Existing Natural Cover in the TRCA Jurisdiction by Planning Area (2002)

Planning Area	Extent of Area		Extent of Natural Cover within the Planning Area	
	Hectares	% of Region	Hectares	% of Planning Area
Greenbelt	78,008	31%	34,596	44%
Agricultural and Rural	23,298	9%	2,824	12%
Designated Greenfield Development Areas	28,527	11%	10,694	37%
Built-Up	119,393	48%	15,231	13%
Total	249,225	100%	63,345	25%

Taken from TRCA (2007) Toronto and Region TNHS Strategy

It can be seen from Table 6 that there is 25% natural cover in the TRCA jurisdiction. Almost half of the TRCA jurisdiction is built up, and in this built up area there is only 13% natural cover. By contrast, about 44% of the area designated Greenbelt is natural cover. This includes parts of the Oak Ridges Moraine.

Type of Habitat	Extent in Hectares	% of Jurisdiction
Forest	33,851	14%
Meadow	23,615	9%
Successional	3,150	1%
Wetland	2,572	1%
Beach/Bluff	162	<1%
Total	63,350	25%

TABLE 7
Existing Natural Cover in the TRCA Jurisdiction by Type (2002)

Taken from TRCA (2007) Toronto and Region TNHS Strategy

The quality of the existing natural cover in the TRCA jurisdiction is illustrated in Figure 9.

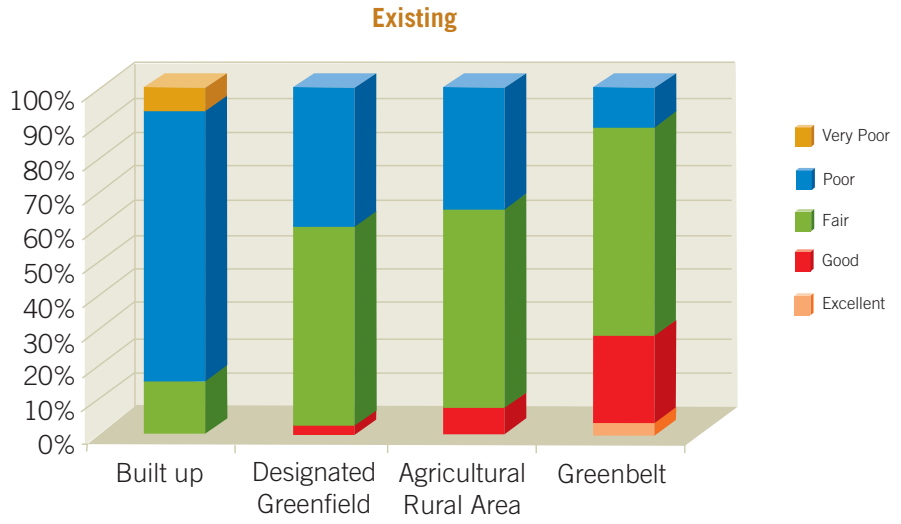


FIGURE 9
Quality of Existing Natural Cover in the TRCA Jurisdiction by Planning Area (2002)

Taken from TRCA (2007) Toronto and Region TNHS Strategy

Figure 9 demonstrates the poor quality of natural cover in built up areas, in which quality ranges from fair to very poor. This is due to fragmentation, lack of connectivity between habitat patches, the small size of these patches and the influence of surrounding land uses on natural areas. By contrast, about 30% of the cover in the Greenbelt area is considered to be good or excellent quality, and there is relatively little poor quality habitat.

Trend for Natural Cover: Lowest amount and poorest quality in urbanized areas. Continued losses in terms of quantity and quality.

2.3.2 Wetlands

Riverine wetlands serve a number of vital functions – they can recharge groundwater, mediate stormwater flows, improve water quality, and provide habitat for a wide range of fish, amphibians, birds and mammals. Southern Ontario once had an estimated 2.4 million hectares of wetlands prior to European settlement, with wetlands making up about 25% of the land base. Most of these wetlands have been lost due to filling for development and draining to improve lands for agriculture. In the Toronto and Region AOC, the percentage of wetlands lost has been higher still. In the Humber River watershed, for example, there was once over 3,800 hectares of wetlands; today only 980 hectares of evaluated wetlands remain. In subwatersheds such as the Black Creek and West Humber, over 90% of the historic wetlands have been lost. The amount of remaining wetlands by watershed is shown in Table 8.

TABLE 8
Percentage of Watershed with Wetland Cover (2007)

Watershed	% of Watershed with Wetland Cover
Etobicoke	1.0
Mimico	0.1
Humber	3.4
Don	0.4
Highland	0.4
Rouge	3.3

Based on Ministry of Natural Resources data (2007). Includes wetlands which have been identified, but not yet evaluated as well as those which are considered locally and provincially significant.

Protecting the wetlands that remain and restoring wetlands where feasible is key to restoring the health of the watersheds in the Toronto and Region AOC. Targets for wetland restoration are being set through the Integrated Watershed Planning process. The target established in the plans is 10% of the watershed should be wetland cover; this target was adopted from Environment Canada's *How Much Habitat is Enough?* document. As an example, in the Rouge River watershed, the target would be approximately 33.6km^2 – therefore, there is a considerable amount of work to be done in order to achieve this target.

Trend for Wetlands: Continued losses partly offset by wetland creation. New legislation such as Conservation Authority Generic Regulations strengthens the protection of wetlands from development

2.3.3 Riparian Vegetation

Riparian cover is the vegetation that is found along the banks of a river or stream. This cover, whether it is forest, shrub, meadow or wetland, plays an important role in the health of rivers and streams. Riparian vegetation improves water quality in streams, retains stormwater, protects against erosion, provides shade that keeps water temperatures low, and provides shelter and food for fish and wildlife.

Environment Canada's *How Much Habitat is Enough?* document recommends that ideally streams should have a 30-metre wide, naturally vegetated buffer on both sides. Thirty-metres is a guideline, the actual width of the buffer is dependant on what is necessary to protect the ecological function of the river. The generally accepted target for RAP areas is that 100% of the riparian zone should be covered with vegetation, with 75% of the vegetation being forest. Forested riparian habitat is most desirable as it provides greatest benefits in terms of improving water quality. The most recent data on riparian cover by watershed are presented below. It can be seen that this varies from a low of 35% in Etobicoke Creek to 65% in the Rouge River and does not meet the RAP target.

In highly urbanized watersheds such as Mimico and Highland Creeks, it is likely not possible to meet the target of 100% natural cover in the riparian zone. Guided by the Terrestrial Natural Heritage Strategy, TRCA is setting specific targets for riparian vegetation in each watershed.

TABLE 9
Riparian Cover by Watershed

Watershed	% of Riparian Zone with Natural Cover (i.e meadow/shrubs)	% of Riparian Zone with Forest Cover	Year of Data
Etobicoke	35	16	1997/2002
Mimico	46	22	1999
Humber	39	34	1999
Don	63	43	unknown
Highland	No evaluation at present time		
Rouge	65	38	2002

Trend for Riparian Vegetation: Increasing due to restoration efforts and regulations which protect the floodplain from development.

2.3.4 Waterfront Habitats

Coastal Wetlands

Mouth of Rouge River, at Lake Ontario.

In over 200 years of urbanization, there has been a significant loss of wetlands along the Toronto waterfront due to dredging and filling. Of the 835 hectares of productive waterfront marshes that once existed along the shore, only 124 hectares remain in the Toronto and Region AOC. This is found at four provincially significant wetlands: the Humber River Marshes, the Toronto Island Wetlands, the Highland Creek Wetland Complex, and the Rouge River Marshes.

Although these wetlands remain rich centres of productivity, they continue to be threatened by turbidity and the deposition of sediment. Aquatic vegetation in coastal wetlands is disturbed by the feeding habits of carp and Canada geese, and the amount of emergent vegetation present has dramatically declined in the last 50 years.[10] These wetlands are also adversely affected by regulation of water levels in the Great Lakes.

Over 20 hectares of new wetlands were created along the waterfront in the 1990s at Colonel Sam Smith Park, the Mimico Creek Estuary, Humber Bay Park, Toronto Bay, and Bluffers Park. Construction of a 7.7-hectare wetland has been completed in Tommy Thompson Park (see Section 3.3.2 Habitat Protection, Creation and Enhancement).

River Mouths

The rivers that do not have coastal wetlands at their mouth have more limited habitat than those with wetlands. The mouth of the Etobicoke Creek is channelized with vertical concrete walls where it enters the lake. In 1992, the habitat potential at the mouth of Mimico Creek was improved by the addition of lakefill and the creation of 1.93 hectares of wetland. Habitat potential at both creeks continues to be limited by sediment loading from upstream.

The channelized Don River mouth provides poor habitat. It has limited structure and poor water quality, especially when it rains. Consequently, it currently supports only a limited number of species of fish. The idea of building a new, more functional and less artificial mouth for the Don has been around since the early 1990s, and it is one of the key projects being undertaken by WATERFRONToronto. This initiative, to build a new, more natural mouth for the river, is addressed in Section 3.3.2 (Habitat Protection, Creation and Enhancement).

Embayments

Artificial embayments for habitat were created during the development of the Tommy Thompson Park and the lakefill parks such as Humber Bay Park, Ashbridge's Bay Park and Bluffers Park. These embayments and the lagoons of the Toronto Islands provide sheltered habitats where fish can spawn, forage and be protected from predators and the cold waters of the open lake. As noted in Section 2.4.1 (Fish Communities), these areas support diverse fish communities. The embayments in recently created waterfront parks, such as Humber Bay Shores, provide a greater variety of new habitat features and are designed to eliminate the potential for contaminated sediments to be dispersed into the Lake.

Trend for Waterfront Habitats: Wetland creation remains on-going since 1990s; many embayments along the waterfront have been created in last 20 years

2.4 FISH AND WILDLIFE

2.4.1 Fish Communities

Watersheds

The fish communities of the Toronto and Region AOC watersheds are influenced to a large degree by the quality and quantity of water they receive from neighbouring tablelands. Generally, water quality is better in the upper rural areas of watersheds and becomes increasingly degraded as one moves downstream towards urban centres. This is because of the impacts of urbanization (stormwater inputs, loss of baseflow, stream erosion, habitat modifications and the removal of riparian vegetation). The relatively clean and cold water found in some headwater streams of the Rouge and Humber continues to support naturally reproducing populations of brook trout.[11] By contrast, the degraded conditions found at the mouth of the Don River support only limited diversity in the fish community (i.e., relatively few fish species).

Current information is limited on the health of fish communities in the watersheds as only two data sets have been collected through the Regional Watershed Monitoring Network, which was established in 2001 (see Section 3.7.1). However, the available information allows for comparisons to be made with historical conditions and provides useful insights into the current status of fish populations.

In 2004, monitoring found three "new" species in the Etobicoke Creek. One sensitive indicator species – the redside dace – is still found in the East and West Humber, but is threatened by the negative impacts of urban development. The Humber watershed has great diversity, but there has been a noted decline in the health of fish communities in the West Humber because of urbanization that is taking place. The Don, Etobicoke and Mimico watersheds show the greatest diversity in the middle to upper reaches and not, as expected, in the lower reaches. This may be due to poor water quality in the lower reaches due to urban stormwater runoff and chemical spills. The Rouge watershed still contains populations of redside dace in the upper, middle and lower reaches, and populations of brook trout in parts of the upper watershed. It has been a priority of agencies to improve habitat connections among aquatic habitats within these watersheds, as well as improve access to headwaters from Lake Ontario.

Atlantic salmon, which once thrived in Lake Ontario and its tributaries prior to becoming extirpated in 1896, is being restored through a cooperative effort of partnerships. Humber River has been selected as one of the six best options for re-introduction; however, there is still much work to be done to improve habitat connection from Lake Ontario to the headwaters of the river.

Continued monitoring through the RWMN will improve our understanding of the health of fish communities in the watersheds and changes that may be taking place.

Redside dace

TABLE 10
Number of Fish Species per Watershed

Watershed	# of Fish Species
Etobicoke Creek	30
Mimico Creek	11
Humber River	42
Don River	22
Highland Creek	15
Rouge River	43
Waterfront	47
AOC Total	74

**TRCA Communication*

Trend for Watershed Fisheries: Mixed. Fisheries affected by urbanization. Populations of sensitive cold and coolwater fish are still found in some headwater areas.

FIGURE 10
Health of Fish Communities in the Toronto and Region AOC

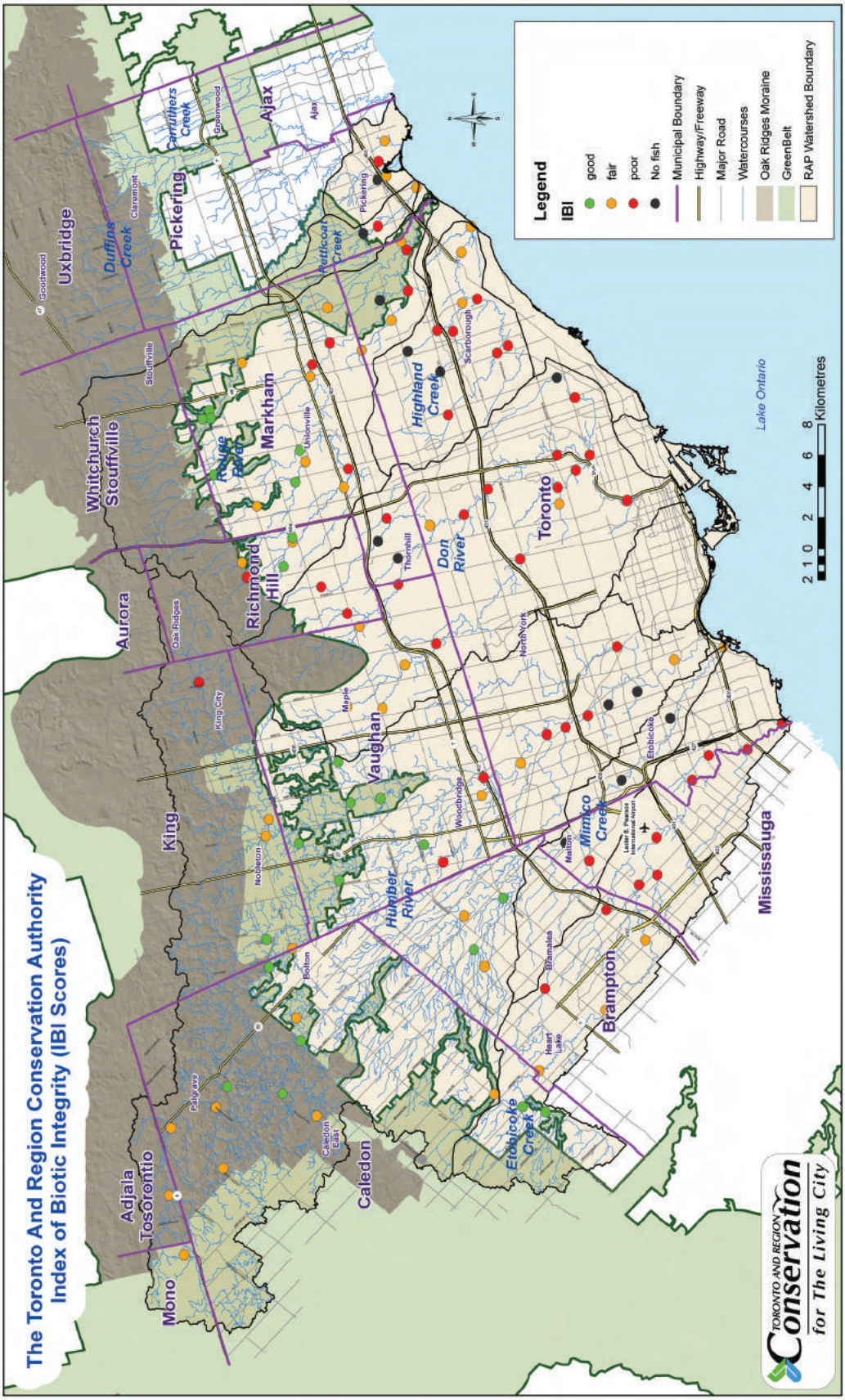


TABLE 11
List of Fish Species Found in the Toronto and Region AOC watersheds

COMMON FISH NAME	LOCATION	COMMON FISH NAME	LOCATION
LAMPREY FAMILY		**MINNOW FAMILY continued....**	
american brook lamprey	H D R	fathead minnow	W E M H D Hi R
STURGEON FAMILY		blacknose dace	W E H D Hi R
lake sturgeon	W	longnose dace	W E M H D Hi R
BOWFIN FAMILY		creek chub	W E M H D Hi R
bowfin	W	pearl dace	E R
GAR FAMILY		central stoneroller	H R
longnose gar	W	grass carp	D
HERRING FAMILY		**CATFISH FAMILY**	
alewife	W E R	yellow bullhead	W
gizzard shad	W R	brown bullhead	W E M H R
SALMON FAMILY		stonecat	H R
chinook salmon	W	**EEL FAMILY**	
coho salmon	W	american eel	W
rainbow trout	W E H D Hi R	**KILLIFISH FAMILY**	
atlantic salmon	R	banded killifish	H
brown trout	W H D R	**TEMPERATE BASS FAMILY**	
brook trout	W H R	white perch	W
lake trout	W	white bass	W
WHITEFISH FAMILY		**SUNFISH FAMILY**	
round whitefish	W	rock bass	W E M H D R
SMELT FAMILY		green sunfish	E H
rainbow smelt	W	pumpkinseed	W E M H D Hi R
PIKE FAMILY		bluegill	W Hi
northern pike	W	smallmouth bass	W D R
MUDMINNOW FAMILY		largemouth bass	W E H R
central mudminnow	E H	black crappie	W M R
SUCKER FAMILY		**PERCH FAMILY**	
white sucker	W E M H D Hi R	yellow perch	W H R
northern hog sucker	E H	walleye	W
shorthead redhorse	W	rainbow darter	H Hi R
MINNOW FAMILY		Iowa darter	W H R
goldfish	W D Hi R	fantail darter	E H
northern redbelly dace	E H D R	johnny darter	W E H D R
redside dace	H D R	logperch	W E H R
lake chub	W R	blackside darter	H
common carp	E H D R	tesselated darter	E M
brassy minnow	H	**SILVERSIDE FAMILY**	
hornyhead chub	H R	brook silverside	W
river chub	H R	**GOBY FAMILY**	
golden shiner	W E H R	round goby	W H R
emerald shiner	W E H	**DRUM FAMILY**	
common shiner	W E M H D Hi R	freshwater drum	W E
blacknose shiner	E D	**SCULPIN FAMILY**	
spottail shiner	W E H R	mottled sculpin	W H D R
rosyface shiner	H R		
spotfin shiner	E H R	**Species Total**	**74**
sand shiner	Hi R		
bluntnose minnow	W E H D Hi R		

W –Waterfront, E-Etobicoke, M-Mimico, H – Humber, D-Don, Hi- Highland Creek, R-Rouge

Waterfront

The recent 15-year assessment of fish communities on the Toronto Waterfront by TRCA and MNR provides a picture of the dynamics of the waterfront fisheries.[12] The report summarizes data collected from 1989 to 2005 and examines the changes in the fish community over that period for three kinds of habitat – open coast, embayment and river mouth habitats.

The results of the study are mixed, with some observations suggesting negative impacts on the fisheries and some suggesting positive. (See Table 12).

TABLE 12
Observations on Waterfront Fish Communities Over Period 1989 to 2005

Observations Suggesting Negative Impacts	Observations Suggesting Positive Impact
• Overall reduction in fish abundance (biomass) although reduction in abundance has been greater in open coast and river mouths than in embayments • High percentage of benthivores (fish that eat from the lake bottom) • Increase in abundance of non-native (invasive) species • Increase in biomass of generalist species (i.e. Brown Bullhead) • Decrease in biomass of specialist species (i.e. Large Mouth Bass) • Decrease in biomass of cool water fish and increase in warm water fish in embayments	• No significant changes to species richness • Marked increase in species richness in embayments and gradual increase in open coasts • Decline in non-native species in embayments and open coasts • Recent increase in biomass of native species • Fluctuating dynamics of piscivores (fish that eat fish) (i.e. Northern Pike) • Relatively large increase in abundance of walleye • Reduction in the percentage of species that are tolerant of degradation (i.e. white sucker and carp)

Overall, composition of the fish community on the waterfront has changed very little between 1989 and 2005, with total biomass continuing to be dominated by the common carp and white sucker. Between 71 and 74% of biomass is represented by these species. There has been a decrease in total abundance of fish along the Toronto waterfront, which may be indicative of environmental degradation or may be indicative of lakewide changes. However, on the other side of the ledger, species richness (the number of species) has not changed, and some new native species (such as brook silverside and the pollution-intolerant longnose gar) are now found (see Table 11). Overall, there has been an increase in the abundance of native species, and a relatively large increase in the abundance of walleye in the last few years. There has been a marked increase in species richness and a decline in non-native species in embayments and to a lesser degree in open coast habitats.

Continued monitoring will shed additional light on the health of the fish communities on the Toronto waterfront.

Trend for Waterfront Fisheries: Mixed. Some negative trends, some positive.

2.4.2 Contaminants in Fish

The contaminants that are found in the surface waters and sediments in the Toronto and Region AOC lead to restrictions on fish consumption. Contaminants (such as some heavy metals) may come from local sources; others (such as mirex) may come from distant sources such as the Niagara River. The MOE carries out testing across Ontario to determine the levels of contaminants present in sport fish and publishes the results every two years. In general, the level of contaminants increases with the size of the fish – the older the fish, the more time there is for bioaccumulation to take place.

The most recent data on contaminant levels in fish in Toronto's watersheds and waterfront are found in the *2007-2008 Guide to Eating Sport Fish*, which is widely available for anglers to use. The Guide lists the species of fish at various locations that have restrictions on the amount that should be eaten. These restrictions are specific to the lengths of fish and advise the number of meals of that size of fish that can be safely eaten. This may be 8, 4, 2, 1 or no meals a month. Table 13 lists the particular species and sizes that should not be eaten at all.

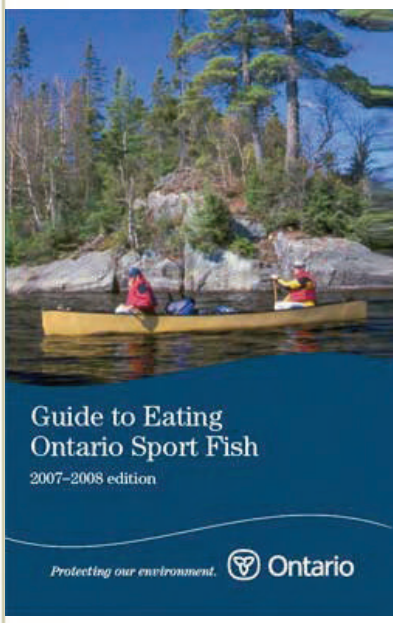


TABLE 13
Fish from the Toronto and Region RAP area that should not be eaten

Body of Water	Species	Size of Fish That Should Not Be Eaten	
		General Population	Sensitive Population*
Toronto Waterfront Offshore	Chinook salmon	>65 cm	>35 cm
	brown trout	>35 cm	>35 cm
	lake trout	>45 cm	>45 cm
	carp	>65 cm	>45 cm
	white sucker	NA	>45 cm
Toronto Waterfront Nearshore	brown trout	>40 cm	>40 cm
	lake trout	>40 cm	>35 cm
	white perch	>25 cm	>15 cm
	rock bass	NA	>20 cm
	largemouth bass	NA	>40 cm
	northern pike	NA	>70 cm
	white sucker	>50 cm	>35 cm
	rainbow smelt	>15 cm	>15 cm
	carp	>65 cm	>60 cm
Don River (Pottery Road)	white sucker	NA	>35 cm
Humber River (Old Mill)	Chinook salmon	>55 cm	>55 cm
	rainbow trout	>70 cm	>35 cm
	brown trout	>55 cm	>40 cm
Humber River Marsh	northern pike	NA	>75 cm
	rock bass	NA	>20 cm
	carp	>65 cm	>40 cm
	white sucker	NA	>35 cm
Rouge River	Chinook salmon	>70 cm	>55 cm
	coho salmon	NA	>40 cm
	rainbow trout	>60 cm	>40 cm
	brown trout	>40 cm	>35 cm
Rouge River Marsh	smallmouth bass	NA	>35 cm
	largemouth bass	NA	>35 cm
	carp	NA	>50 cm

** Sensitive populations are defined as women of childbearing age and children under 15. NA Not applicable; all lengths can be eaten; consult Guide for number of meals a month*

The contaminants of concern in the Toronto and Region AOC continue to be mercury, PCBs, mirex, photomirex, and dioxins and furans. As in other Areas of Concern around the Great Lakes, PCBs and dioxins and furans remain the major contaminants of concern here. More stringent health guidelines have been set recently by Health Canada for PCBs, and dioxins and furans, which has resulted in an increase in consumption restrictions in the Toronto area.

Overall, levels of contaminants have generally dropped since the 1980s, although the rate of decrease has slowed in the last decade or so.

In addition to testing sport fish, the MOE tests "young-of-the-year" (YOY) forage fish for contaminants. Unlike trout or salmon that can range great distances, forage fish tend to live in a small area, and therefore can provide useful information about local sources of pollution. Forage fish collected recently from some locations in the Humber and Don Rivers contain PCB levels that exceed the IJC Wildlife Protection Guideline of 100 ng/g. In comparison, the levels of PCBs in YOY fish recently collected from the Toronto waterfront did not exceed the Wildlife Protection Guideline. This suggests that there are continuing sources of PCBs in the Toronto and Region AOC and that these PCBs are finding their way into some of the tributaries here. (See Section 3.7.5 Urban Metabolism Studies for research into this).

TRCA has been conducting research since 2001 to determine whether contaminant levels in water and sediments are causing tumours or other deformities in fish. This research is addressed in Section 3.7.4 (Assessment of Beneficial Use Impairments).

Trend for Contaminants in Fisheries: Levels of contaminants have decreased since the 1980s; rate of decrease has slowed in the last decade. More stringent health guidelines have been set recently for PCBs, and dioxins and furans, which has resulted in an increase in consumption restrictions.

2.4.3 Wildlife

When Toronto was identified as an Area of Concern in 1987, there were concerns that contaminants in the water and sediments might be affecting wildlife other than fish. Since 2001, TRCA has carried out research to determine whether contaminants are causing tumours and other deformities in fish, or are causing reproductive effects and other deformities in birds that eat fish. The results of this research are presented in Section 3.74. In brief, the evidence suggests that levels of contaminants in water and sediments are not causing such effects in fish or the birds that eat them.

Contaminants aside, there is cause for concern about the impacts of continued urbanization on wildlife populations in the Toronto and Region AOC. Urbanization causes the direct loss of habitat when woodlands, wetlands, hedgerows and meadows are removed from the landscape. Urbanization also degrades the quality of habitat that remains on the landscape as natural areas are fragmented into small pieces, connections are lost between habitat blocks, and humans and pets invade natural areas. Table 14 shows the number of species of animals found in the Toronto and Region AOC. It can be seen that three quarters of the species present are at risk of regional concern or are of concern for their ability to survive within urban areas.

TABLE 14
Status of Fauna in Toronto and Region RAP area (2007)

Type	Total # Species	# Species of Regional Concern	# Species of Concern in Urban Areas
Birds	169	89	36
Mammals	44	15	15
Amphibians	16	14	2
Reptiles	14	10	3
Total	243	128	56

Trend for Other Biota: Levels of contaminants in water and sediment are not affecting colonial birds and fish. Wildlife species are at risk because of continuing urbanization.

3 Key Actions 2001-2006

3.1 KEY LEGISLATIVE AND POLICY CHANGES

Since 2001 when the last RAP Progress Report was issued, many important legislation and policy changes have taken place that will help to improve the health of the watersheds and waterfront in the Toronto and Region AOC. These provide guidance and context for the actions that are taking place with the AOC and include:

- **Greenbelt Legislation:** The Ontario Government enacted the *Greenbelt Act* in February 2005. The Act is intended to protect up to 1.8 million acres of greenspace and contain urban sprawl in the Golden Horseshoe. The objectives of the Act include establishing a network of countryside and open spaces, preserving agricultural land, and promoting river connections between the Oak Ridges Moraine, the Niagara Escarpment and Lake Ontario. In the AOC, the "protected countryside" identified under the Act lies in the upper watersheds.

- **Growth Plan for the Greater Golden Horseshoe:** In February 2005, the Ontario government released its Draft Growth Plan for the Greater Golden Horseshoe, following on the heels of the Places to Grow Legislation that was introduced in Queen's Park in 2004. One of the major aims of the Draft Growth Plan is to use intensification in existing urban areas to direct growth away from agricultural areas and natural lands. In the 905 area, greenfield lands will continue to be urbanized outside the Greenbelt area where they have been approved for development in current Official Plans.

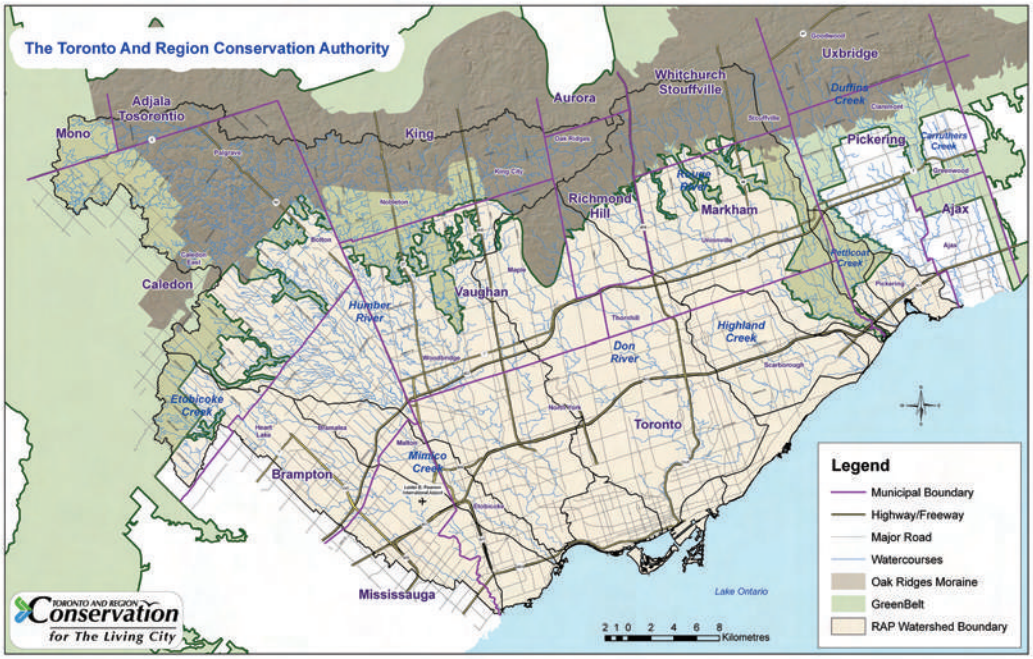


FIGURE 11
Designated Greenbelt Area and Oak Ridge Moraine within the Toronto and Region AOC

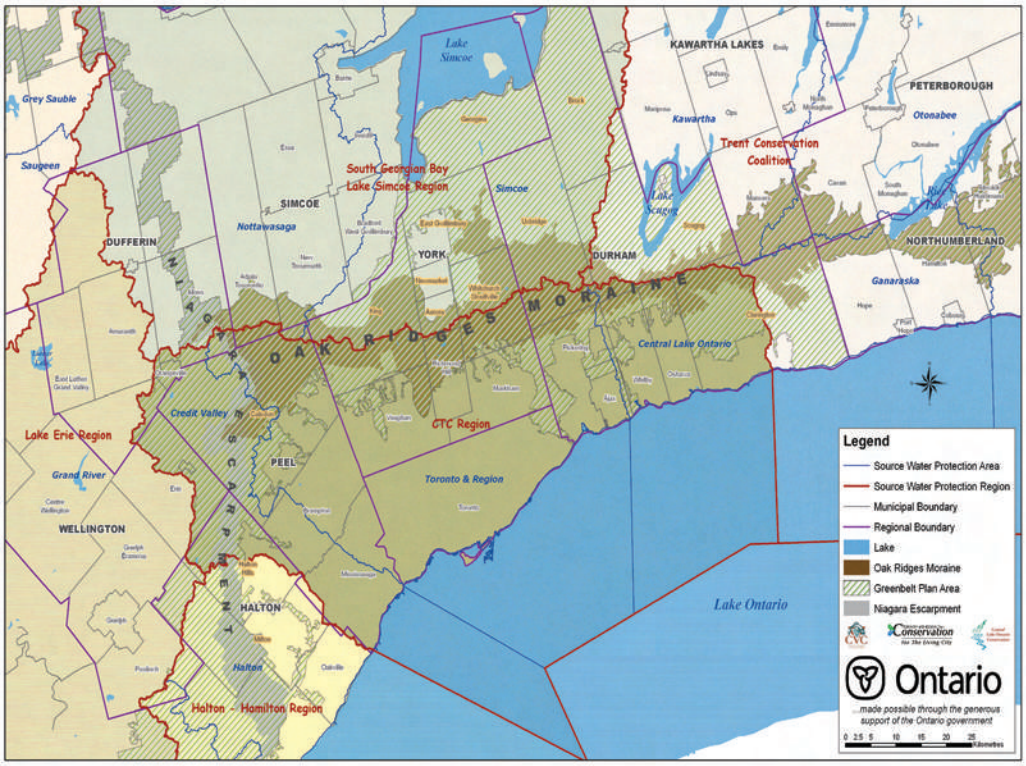
- **Provincial Policy Statement:** The Province introduced a revised Provincial Policy Statement (PPS) in March 2005, replacing the original issued under the *Planning Act* in 1996. The new PPS is stronger in that it requires planners to be consistent with provincial policies rather than just having regard for them. The strengthened PPS is expected to improve environmental protection by encouraging more compact development and infill development, better planned employment lands, densities that support transit, and land use patterns that support energy conservation.

- **Oak Ridges Moraine:** The Ontario government enacted the *Oak Ridges Moraine Act* in 2001 to preserve the Moraine, one of Ontario's most significant landforms, a major ecological resource and the headwaters of the rivers in the Toronto and Region AOC. In 2002, the Province followed up with the Oak Ridges Moraine Conservation Plan that provides direction to ministries, municipalities, landowners and stakeholders on how to protect the Moraine's natural heritage features and hydrologic functions. The Plan defines how various parts of the Moraine can be used, and emphasizes the protection of key natural features such as wetlands, woodlands, and hydrologically sensitive features such as kettle lakes and springs. The Plan requires municipalities to develop Official Plan Amendments to bring their Official Plans into conformity with the Act.

- **Safe Drinking Water Act:** In response to the recommendations of the Walkerton Inquiry, in 2002 the Ontario government enacted the *Safe Drinking Water Act*. The Act created legally binding standards for contaminants in drinking water and set tough new testing standards for water systems, including small systems serving schools, daycares and retirement homes.

- **Drinking Water Source Protection:** The *Clean Water Act, 2006* was proclaimed and the first set of regulations were promulgated on July 3, 2007 in response to the recommendations of the Walkerton Inquiry. The goal of the Act is to protect current and future sources of drinking water from potential contamination and depletion. It provides the framework for the development of source protection plans across Ontario. In the Toronto and Region AOC, source protection plans for the watersheds are being developed for the three source

FIGURE 12
CTC Source Water Protection Area



protection areas that are part of the CTC Source Protection Region--**C**redit Valley Source Protection Area, **T**oronto and Region Source Protection Area, and **C**entral Lake Ontario Source Protection Area. The **CTC** Source Protection Committee (SPC) has been established Terms of Reference for each of the three source protection areas have been prepared. The CTC SPC is responsible for developing a Terms of Reference, Assessment Report and Source Protection Plan for each of the source protection areas in the CTC Region.

- **Nutrient Management Act:** The *Nutrient Management Act* is another piece of legislation that emerged in response to the recommendations of the Walkerton Inquiry. Introduced by the Ontario government in June 2002, the Act provides a nutrient management framework for the agricultural industry, municipalities and other generators of nutrients. It includes new standards for the application of nutrient-laden material to lands, requires the development of nutrient management plans, and requires the certification of land applicators who apply sewage sludge and other materials to land.

- **Spills Bill:** The Government of Ontario enacted the "Spills Bill" (Bill 133, the *Environmental Enforcement Statute Law Amendment Act*) in June 2005. The Act encourages the prevention of spills and gives the MOE the power to impose tough environmental penalties on companies that cause unlawful spills and emissions. The Act is initially applied to the nine industrial sectors regulated by the Municipal-Industrial Strategy for Abatement (MISA) regulations. The maximum penalty under the Act for a second offence is set at $100,000 a day.

3.2 CLEAN WATERS

3.2.1 Wet Weather Flow and Stormwater Management

The City of Toronto Wet Weather Flow Management Master Plan

Stormwater is the single biggest stress on the water resources of the Toronto and Region AOC. Stormwater impairs water quality, puts people, structures and buildings at risk from flooding, causes erosion of stream banks, and degrades fish habitats. The completion and implementation of the Wet Weather Flow Management Master Plan (WWFMMP) was a priority action identified in the 2001 RAP Progress Report.

The City of Toronto began developing its plan to manage stormwater and combined sewer overflows in 1997. The City completed the comprehensive WWFMMP along with a 25-year Implementation Plan in 2002 and City Council approved it in September 2003. The estimated cost of the first phase of implementation is $42 million annually over 25 years, or $1 billion. The principles of the WWFMMP include consider stormwater as a resource, while managing it on a watershed basis and use of a hierarchy of options starting with "at source", then "conveyance", and finally "end-of-pipe" controls.

The goal of the WWFMMP is to:

"Reduce and ultimately eliminate the adverse effects of wet weather flow on the built and natural environment in a timely and sustainable manner and to achieve a measurable improvement in ecosystem health of the watersheds."

TABLE 15
Statistics relating to WWFMMP

Item	Scale
Watersheds	6 plus the waterfront
Length of Watercourses	370 km
Length of Sewer pipes	10,400 km
Combined Sewer Outfalls	79 (33 directly to Lake Ontario)
Storm Sewer Outfalls	2600 (70 directly to Lake Ontario)

Stormwater Management Pond in Headwaters Park, Richmond Hill.

Implementation of the WWFMMP is now underway. Implementation is multi-faceted and includes the following elements:

- **Public education and outreach:** This includes multi-media advertising campaigns that reach out to residents to adopt good practices to reduce the impacts of stormwater. Education and outreach also includes the Blue Flag Program for beaches (see Section 3.2.5 Improving Beach Water Quality), and the Community Program for Stormwater Management (a grant program).
- **Source control measures:** These measures include initiatives such as the Green Roofs Strategy and Green Roof Incentive Pilot Program, which are designed to encourage the use of Green Roofs. The City has also carried out workshops and a Rainwater Harvesting project is planned for the Better Living Centre at Exhibition Place to encourage the use of rainwater on-site for uses such as irrigation and toilet flushing. Through the City's Downspout Disconnection Program, residents in 3,400 homes had their downspouts disconnected between 2004 and 2006.
- **Municipal operations:** This includes the Priority Outfall Monitoring Program (see Section 3.2.2 Eliminating Dry Weather Flows), enhanced catchbasin cleaning, street cleaning, beach monitoring and environmental monitoring.
- **Basement flooding remediation:** A major priority in the WWFMMP, this program is aimed at preventing basement flooding in areas where this is a known problem. New clusters of houses with basement flooding were identified after the August 19, 2005 storm, which dropped as much as 155 mm of rain in some parts of North York in a very short period of time.
- **Conveyance control:** This includes the installation of perforated pipes to infiltrate stormwater into the ground, opportunistic separation of storm sewers, and the use of grass swales and roadside ditches to infiltrate stormwater, slow down its flow and remove contaminants.
- **Waterfront shoreline management:** This involves eliminating combined sewer overflows and treating stormwater discharges to the waterfront, tracking sources of bacterial pollution, and programs to improve water quality at beaches (see Section 3.2.5 Improving Beach Water Quality).

- **Stream restoration:** Work has been carried out since 2004 to restore Toronto area streams using natural channel design and soil bio-engineering techniques. Some of this restoration work is being carried out by TRCA and non-governmental organizations.
- **End-of-pipe facilities:** The WWFMMP includes a wide range of stormwater management facilities, from underground tanks to infiltration basins to wetlands. The priority projects underway were selected based on a number of factors such as the size of the facility and its potential environmental benefits. (See Table 16 and Figure 13).
- **Research and development on end-of-pipe technologies:** This involves research to assess the performance of facilities such as the North Toronto High Rate Treatment Facility, the Terraview Filtration project and the Dunker's Flow Balancing System at Bluffer's Park, and use of floating vegetative mats at the Etobicoke Stormwater Management Facility.
- **Environmental monitoring:** This includes monitoring of both water quality in streams and monitoring of the effectiveness of elements of the WWFMMP as they are implemented.

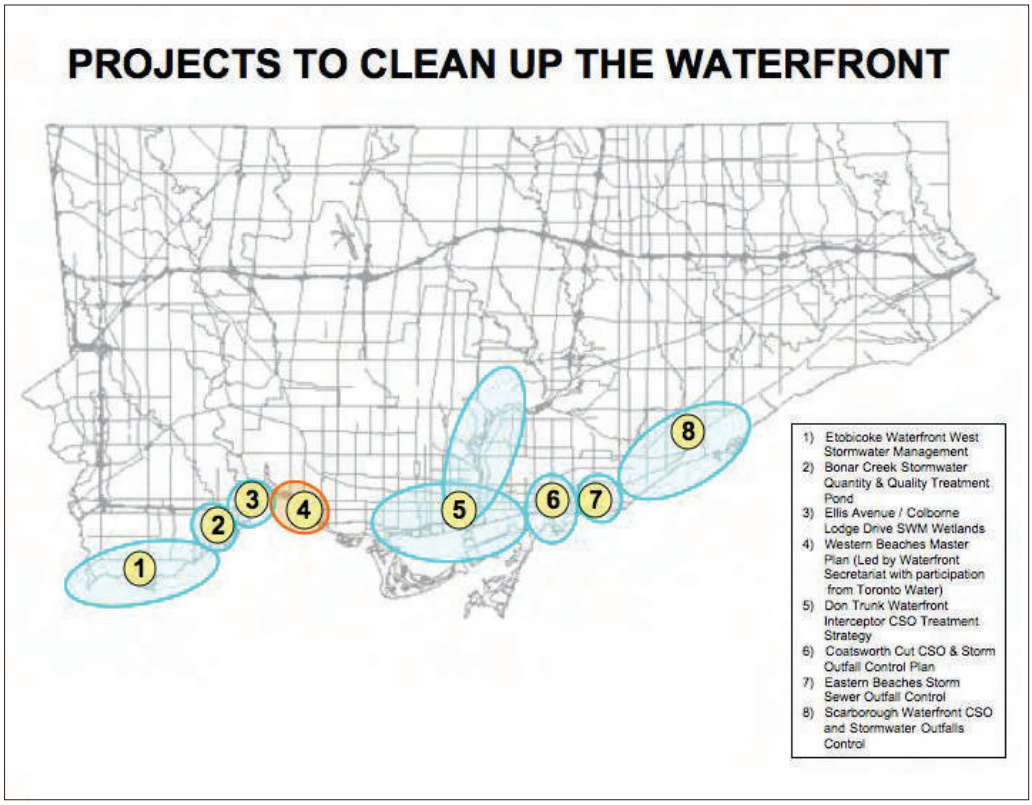
Only selected highlights are presented in this report. More detailed status on the first two years of implementation can be found in the City's Wet Weather Flow Master Plan Implementation Report 2004-2005, which is available at http://www.toronto.ca/water/protecting_quality/wwfmmp/pdf/implementation-report-2004-2005.pdf

Rainharvesting and reuse is an integral part of a sustainable community.

TABLE 16
Status of WWFMMP End-of-Pipe Control Projects (as of December 2006)

Project	Status
Coatsworth Cut CSO and Storm Outfalls Control Project	EA started in 2005
Scarborough Waterfront CSO and Stormwater Outfalls Control Study	EA started in 2006
Eastern Beaches CSO and Storm Outfall Control Study	EA started in 2006
Etobicoke Waterfront Stormwater Management Study	EA started in 2006
North Toronto Treatment Plant High Rate Treatment	EA started in 2006
Don Trunk and Wet Weather System System-Wide Treatment Study	EA started in 2006
Bonar Creek Stormwater Management Facility	EA started in 2006
Saskatoon Drive Stormwater Management Facility	EA started in 2006
Ellis Avenue and Colborne Lodge Drive Stormwater Treatment Facility	Complete
Earl Bales Park Stormwater Management Facility	Construction started
Emery Creek Stormwater Quality Control Ponds Facility	Construction started in 2006

FIGURE 13
Geographic Location of Priority WWFMMP Projects to Clean Up the Waterfront



Stormwater Management in Peel and York Regions

Reflecting the importance of stormwater in the RAP, another of the priority actions identified in the 2001 RAP Progress Report was to complete and implement stormwater retrofit strategies in the middle and upper watersheds. In Peel and York Regions, development that took place after 1975 required the use of stormwater management ponds. These original stormwater ponds, however, were only designed to provide "quantity control" by retaining stormwater and releasing it gradually to streams and rivers. Modern stormwater management facilities control both the quantity and the quality of the water released.

TRCA has been working with municipalities to retrofit old stormwater ponds and stormwater outfalls in older urban areas so that they will control both quantity and quality and therefore do a better job at protecting water quality. The Retrofit Studies are typically undertaken in 3 phases:

- Phase 1 provides an inventory of stormwater management ponds and storm outfalls;
- Phase 2 assesses the potential to retrofit stormwater management ponds and storm outfalls; and
- Phase 3 develops an implementation strategy that sets priorities for retrofitting, estimates costs and investigates funding opportunities. The implementation strategy considers factors such as constraints (land availability and space), the ecological significance of the receiving stream, and the benefits that may accrue with respect to erosion control, water quality, and flood control.

With funding from the RAP, Richmond Hill, Markham and Brampton have completed Phase 3 Retrofit Studies and the City of Vaughan has recently begun Phase 3. The City of Mississauga completed its study in 1996 (the Mississauga Storm Water Quality Control Study), but is currently updating it. Within the City of Toronto, stormwater is addressed through the Wet Weather Flow Management Master Plan; this is covered above.

Water withdrawal for irrigation.

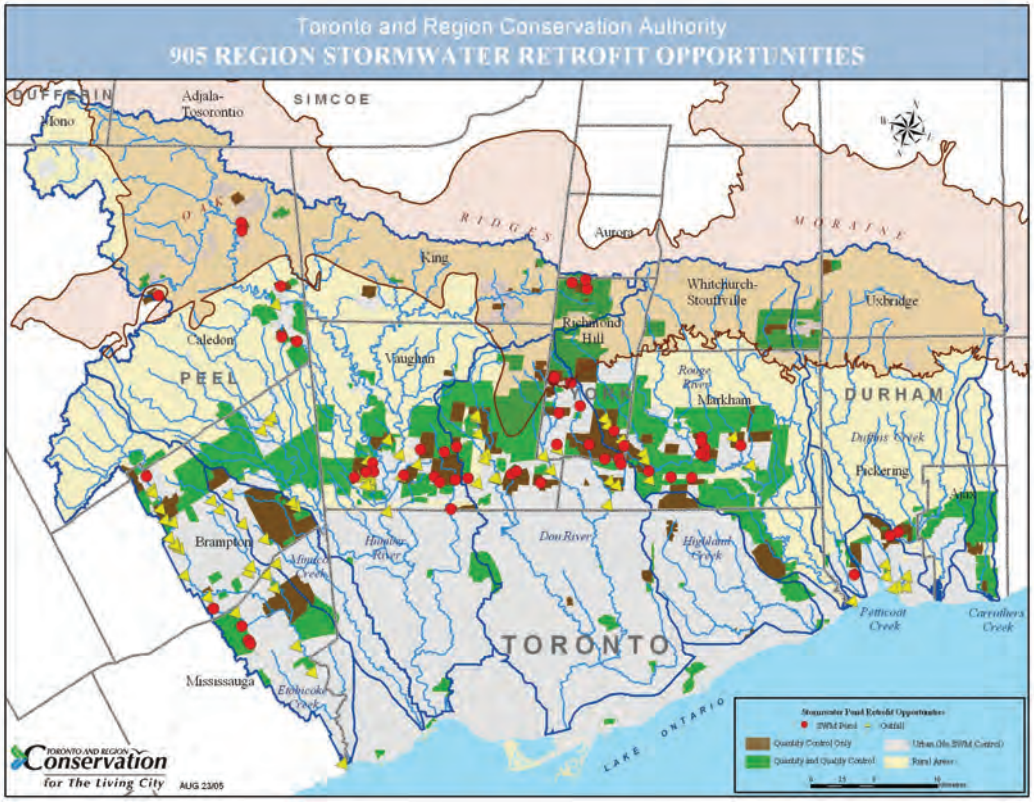


FIGURE 14
Stormwater Pond Retrofitting in the RAP Watersheds

The priority now is to focus on the implementation of these Retrofit Studies (see Figure 14) and to address related issues such as the long-term maintenance of the stormwater management ponds. The adoption of Low Impact Development practices will also be critical to reducing the impacts of stormwater on water quality.

3.2.2 Eliminating Dry Weather Flows

One of the key actions identified in the 2001 RAP Progress Report was the elimination of dry weather flows from storm sewers by eliminating spills and illegal cross connections from sanitary sewers. As part of the Wet Weather Flow Master Plan, in 2005 the City of Toronto began a program 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. It will also identify all outfalls discharging to a water body so that spill response can be improved.[13]

The first subwatershed to be investigated was the Taylor-Massey Creek, which is a tributary of the East Don. City staff identified all the outfalls in the watershed and sampled flows during dry weather for E. coli bacteria, nutrients and metals. As of September 2006, a total of 252 outfalls had been identified. Of these, 144 were found to be discharging contaminants such as E. coli bacteria, phenols and metals into the creek. Twenty-eight of these were designated "priority outfalls" because of the high levels of pollutants. The highest level of pollutants was found at two outfalls where there was 2 million e.coli per 100 mL of water, more than 20,000 times the Provincial objective for safe water quality at beaches. Subsequent efforts by City staff identified many of the sources of the dry weather flows in Taylor-Massey Creek. These included a home, a strip mall and an apartment building in which toilets were connected to storm sewers instead of sanitary sewers. Property owners were notified about these violations and ordered to remedy them.[14]

After the investigations on Taylor-Massey Creek are completed, City staff will expand the program to other subwatersheds in Toronto, beginning with Black Creek. This subwatershed, which drains into the Humber River, is considered to be a major contributor to the frequent

beach closings at Sunnyside Beach.[15] The City's goal is to have every subwatershed monitored for dry weather flow by 2011.

3.2.3 Sewer Use By-Laws

One of the key actions in the 2001 RAP Progress Report was to increase pollution prevention through improvements to sewer use by-laws. In 2000, Toronto City Council passed a new Sewer Use By-Law with a two-year phase-in period. The By-Law set stricter limits on waste discharges and required certain business sectors to develop and submit a Pollution Prevention Plan to the City of Toronto.

York Region passed a new Sewer Use By-Law in January 2005. It sets limits on the types and concentration of discharges that can be made to the sewer system. By-Law enforcement officers randomly sample industries to check compliance with the By-Law. The Region can require non-compliant industries to develop a compliance program. Individuals found to be discharging illegally can be fined up to $25,000 and corporations can be fined up to $100,000.[16]

Peel Region is currently in the process of updating its Sewer Use By-Law, which is expected to be finalized soon.

Sewer Construction discharge leaves brown metallic stain as it runs towards sensitive Rouge stream (September 2003).

3.2.4 Spills Management

The 2001 RAP Progress Report identified the improvement of spills prevention as a priority action for improving water quality in the Toronto area. To address this, interim targets were developed in 2002 to:

- develop and implement a multi-stakeholder strategy to enhance watershed and waterfront spills prevention and response programs; and
- develop a sewershed management database to help direct response and mitigation efforts.

Since 2001, TRCA and partners have taken the following spill-related actions:

Spills Backgrounder

A spills background report was prepared in 2004 by Toronto and Region Conservation (TRCA), Environment Canada, Ontario Ministry of the Environment (MOE), City of Toronto, Region of Peel, York Region and Region of Durham. The Report highlighted responsibilities, described current spills management and listed the number of spills in the Toronto and Region AOC between 1998 and 2000 (see:www.torontorap.ca for more information)

Spills Management Workshop

In 2004, the RAP partners held a workshop to share ideas and identify issues relating to spill response and prevention in the Toronto area. The discussion included ways in which stakeholders could improve coordination and collaboration. The participants at the workshop developed a number of recommendations dealing with policy, advocacy, education and outreach, and enhanced tools and database information.

Sewershed Management Database

TRCA has been working on the development of a Sewershed Management Database since 2005. Such a database will help in spill and clean up response by permitting spills to be traced through the storm system. First responders would then have the ability to identify the source of a spill and perhaps intercept it before it reaches a river system. To date, TRCA has gathered information on municipal storm sewer systems and is in the process of developing a spatially referenced sewershed data model.

TABLE 17
Number of Spills in Toronto Area (2003-2005)

Watershed	# of Spills
Etobicoke	247
Mimico	117
Humber	225
Don	361
Highland	85
Rouge	56
Waterfront	220
Total	**1,311**

Spills Spatial Analysis

Using Ministry of the Environment spills data from 2003 to 2005, TRCA spatially referenced spills in the RAP area as an aid to identify hotspots, contaminant type, and the nature and cause of spills.

However, because of limitations in the data, the Spatial Analysis only represents about 60% of the spills that took place. Through this exercise, TRCA has developed recommendations on spill data collection. These include providing first responders with Global Positioning System units, improving the type of data collected, and harmonizing the reporting structure. Improving the understanding of how and why spills occur will help in designing spill prevention plans.

Spills Response and Mitigation Technology Transfer Seminar

This seminar, held in 2006, was aimed at improving the information and tools available to spills first responders. The utility of digitizing sewersheds for spills response was demonstrated.

3.2.5 Improving Beach Water Quality

The extensive efforts being made by municipalities to improve the management of stormwater and eliminate combined sewer overflows are the key actions that will improve water quality at Toronto's beaches over time. These have been described in Section 3.2.1 of this report. There are other actions being taken as well to improve beach water quality.

As noted in Section 2.1.1, the proliferation of algae and phytoplankton along the waterfront is not widespread. Nevertheless, where this happens – predominantly along the western shore – it is unsightly and aesthetically unpleasing. The City of Toronto has adopted a proactive approach to deal with algal mats and litter at area beaches. This involves mechanically harvesting algae and increasing the frequency of beach grooming. To address the issue of faeces from gulls and waterfowl (predominantly geese and ducks), in 2006 the City expanded its existing gull and waterfowl management programs to all waterfront beach areas. It has also enhanced waste collection, recycling and beachcombing programs at beaches, and is moving towards developing an Integrated Beach Management Strategy for every waterfront beach.[17]

Another major action since 2001 is the arrival in 2005 of the Blue Flag program. Toronto is the first municipality in Canada to have beaches recognized by the Blue Flag Program, an internationally recognized award given to beaches that achieve high standards for water quality, environmental management, environmental education and safety. The designation is awarded by the Foundation for Environmental Education, an NGO based in Denmark and coordinated locally by Environmental Defence. The four City beaches that were designated in 2005-2006 under the Blue Flag are: Hanlan's Point, Ward's Island, Cherry Beach and Woodbine Beach.[18] There are now six Blue Flag beaches in Toronto.

Toronto beach
© Blue Flag Canada

Identifying Sources of Bacteria at Beaches

In 2004, the City of Toronto in collaboration with Environment Canada's National Water Research Institute began studying the sources of bacterial contamination at beaches on the waterfront. Using DNA fingerprinting and antibiotic resistant arrays, researchers were able to determine that faecal droppings from gulls and Canada geese were the predominant source of bacteria at Centre Island Beach and Kew Beach.

In 2005, the study was expanded to Sunnyside Beach and Bluffer's Park, the beaches that are most frequently posted. The preliminary results for Sunnyside indicated that there were many sources of bacteria, with the Humber River being the dominant source. Overflows from the Western Beaches Storage Tunnel due to operational problems were a significant source, as was the faeces from waterfowl

The preliminary results from Bluffer's Park showed that there are many sources for the bacteria there. Faeces from gulls and Canada geese are a major source and *E. coli* levels are not associated with a human or wastewater source.

City of Toronto (2006)

Ward's Beach is one of Lake Ontario's Toronto's Blue Flag Beaches. It is located on Toronto Island.
© Blue Flag Canada

The Blue Flag

The Blue Flag is an international eco-certification program that awards beaches that meet strict criteria. Flying a Blue Flag means the beach has excellent water quality, environmental education, a well managed environment as well as safety and services. The Blue Flag is a highly respected and recognized award given to over 2,400 beaches throughout the world.

The City of Toronto, was the first municipality to receive this exclusive eco-label in 2005 when four of its beaches attained certification including, Woodbine, Cherry (Clarke), Hanlan's Point, and Ward's Island Beach. Six of the city's beaches have now been awarded certification for the 2008 swimming season. Please visit www.BlueFlag.ca for more information.

The City of Toronto has one of the most stringent recreational water quality testing regime throughout North America and quite possibly the world. Ontario also has the strictest water quality guideline at 100 counts of E. coli per 100ml of water. Toronto's Blue Flag beaches meet this recreational water quality guideline for more than 80% of the swimming season.

3.2.6 Salt Management Plans

Since 2001, Environment Canada has recommended that municipalities using more than 500 tonnes of road salt a year develop Salt Management Plans. These plans identify the actions municipalities will take to improve salt storage, application and snow disposal practices.

The City of Toronto began improving salt management in 1999 and completed its Salt Management Plan in 2004. The comprehensive plan addresses everything from vehicle washing to salt storage to alternative salt application practices to snow removal procedures and training of staff. Early results indicate that the implementation of the Salt Management Plan has reduced average salt use by close to 37,000 tonnes over two winter periods, which is roughly equivalent to a decrease in salt use of 13% per year.

York Region launched its Salt Management Program in 2004. It includes an advanced Road Weather Information System in which five weather stations in key parts of the Region provide information on temperature, pavement condition, salt concentration and precipitation to more accurately identify when the usage of salt is necessary. It also includes a Global Positioning System (GPS) to monitor road coverage by vehicles and track the application rate of both sand and salt, spreader controls to more precisely spread sand and salt, and drive-through storage sheds to minimize the exposure of sand and salt to the environment. Through the Salt Management Program, the Region reduced its overall salt use by 7% and its "per application" use of road salt by 14% between 2000 and 2004.[19]

Peel Region developed its first Salt Management Plan in 2003 and updated the plan in 2006. The updated Salt Management Plan includes action plans for level of service, policies and guidelines, equipment calibration and washing, material storage and handling, decision-making support technology and other matters. The update also included recommendations for a Road Weather Information System Network and a strategy for salt management on parking lots and private land. As part of the Update, the Region examined surface and subsurface environmental conditions at its Salt Management Facilities and reviewed the vulnerability of the Region to salt impacts.[20]

The concern over the environmental impacts of road salt has led to widespread adoption of advanced practices for salt management. These include:

- optimizing equipment through the use of improved spreader controls on vehicles, infrared thermometers, and pre-wetting to avoid loss from bouncing, blowing and sliding of salt;
- employing advanced road weather information systems to provide precise information on temperature, pavement conditions, the presence and concentration of salt on the road, and precipitation prior to spreading; and
- using alternatives to rock salt, including salt brine and implementing anti-icing programs to assist melting and resist the formation of a bond between ice and the pavement surface.

All of these practices help to ensure that road salt is applied at the right time, in the right place and in the right quantities to minimize impacts to the environment, while ensuring road safety. Continued monitoring is needed to determine how effective these practices are, and whether they are resulting in measurable reduction of chloride levels in Toronto's rivers. These reductions and efficiencies will become increasingly important as the amount of roads will likely continue to increase as development continues.

3.2.7 Sustainable Technologies Evaluation Program

The Sustainable Technologies Evaluation Program (STEP) is a multi-agency effort led by TRCA. STEP partners include: City of Toronto, Regions of Peel and York, MOE, Seneca College, Environment Canada, Great Lakes Sustainability Fund, Fisheries and Oceans Canada. STEP aims to support the development and use of sustainable technologies and practices. STEP's objectives are to:

- monitor and evaluate sustainable technologies that contribute to cleaner water and air;
- develop strategies to overcome barriers to implementation of sustainable technologies;
- develop tools, policies and guidelines; and
- disseminate study results and promote the use of effective technologies through education and advocacy.

Three STEP projects are discussed briefly below:

The **Permeable Pavement and Biorentention Swale Demonstration Project** was initiated in August 2004. The project was designed to evaluate the long-term effectiveness of permeable pavement and bioretention swales in stormwater management in Toronto's climate. A parking lot on Seneca's King City campus was reconstructed with modular interlocking permeable pavement, a bioretention swale and underground tanks and the quantity and quality of the surface runoff and infiltrated water was monitored year round. The results showed that both permeable pavement and bioretention swales reduced peak flows by over 90% and were effective at removing several key pollutants from the stormwater. The levels of contaminants in the infiltrated water met the Provincial Water Quality Objectives for most contaminants.

The **Evaluation of Design Criteria for Construction Sediment Control Ponds Project** was to monitor the effectiveness of a temporary sediment control pond. The discharge of sediment from construction sites can cause significant damage to streams, lakes and reservoirs. To avoid such impacts, building contractors are required to implement detailed erosion and sediment control plans. Construction sediment control ponds are a key element of these plans because they provide the last line of defence before stormwater is discharged to receiving waters, unfortunately, current design criteria for sediment control ponds do not provide adequate control. The STEP project examined an "enhanced" sediment control pond. Through monitoring and modelling, the study team was able to make recommendations on how the construction sediment control pond guideline can be changed to reduce the impacts of construction sediment on water quality downstream and protect aquatic ecosystems. These improved design criteria have been incorporated into the new Erosion and Sediment Control Guidelines for Urban Construction prepared by the Greater Golden Horseshoe Area Conservation Authorities.

STEP also carried out an **Evaluation of an Extensive Green Roof.** Interest is growing in the use of green roofs to mitigate the enviromental impacts of stormwater. They do this by temporarily retaining rainwater and promoting evapotranspiration. Green roofs have other benefits, too – they improve air quality, reduce energy use, increase biodiversity and modify summer temperatures. The STEP study was initiated in 2002 to evaluate the performance of a green roof in Toronto's climate. The study was conducted on the Computer Science and Engineering Building at York University. Half the roof was covered with a suitable substrate and vegetated with native wildflowers and half was left as a conventional shingle roof. The green roof and the conventional roof were monitored for three years to measure the quantity of rainfall, the quan-

tity and quality of surface runoff, air temperature, relative humidity, and the temperature and moisture levels of the soil. The study found that the green roof increased biodiversity, reduced runoff volumes by 63% during spring, summer and fall rainfall events, and improved water quality in terms of suspended solids, nitrates, *E. coli*, heavy metals and PAHs.

More information on these and other STEP projects can be found at: www.sustainabletechnologies.ca

3.2.8 Rural and Agricultural Activities

The goal of TRCA's Rural Clean Water Program (RCWP) is to reduce the bacteria, nutrient and phosphorous loading to water courses and ultimately Lake Ontario. The program encourages rural landowners to use Best Management Practices (BMPs), provides technical and financial assistance to landowners, and recognizes the efforts of rural landowners to protect the environment. Activities such as restricting livestock access to streams, disposing of milkhouse washwater, managing manure, controlling field and stream bank erosion, protecting wells and repairing septic systems qualify for financial and technical assistance under the RCWP. Increasing public awareness of rural pollution sources and environmentally sound land management practices to protect surface and groundwater are also key elements of the program. The RCWP has developed effective partnerships with similar community groups, organizations and not-for-profits within the Toronto and Region AOC to promote public awareness of the program, acknowledge good stewardship practices, and enhance the transfer of technology and information on BMPs.

The achievement of the Rural Clean Water Program between 2002 and 2007 include:

- Presentations on the Rural Clean Water Program, stewardship and BMPs to various audiences and attendance at agricultural group meetings, events, youth organizations, workshops and fairs;
- Collaboration with Conservation Ontario's Watershed Working Group to develop the seamless delivery of the RCWP across Ontario's Conservation Authorities;
- partnership with Ontario Soil and Crop Improvement Association (OSCIA) staff to complement the parallel delivery of the Canada-Ontario Environmental Farm Plan and provide on-farm technical assistance to landowners through the Greencover Canada program; and
- implementation of over 25 Beneficial Management Practices projects leading to:
    - protection of over 10 hectares (24 acres) of woodlot;
    - protection of over 7.0 kilometres of streams;
    - creation of 4.4 kilometres of windbreaks;
    - buffer strip and windbreak plantings of more than 5,900 trees and shrubs;
    - protection of over 2.28 hectatres (5.65 acres) of wetlands; and
    - protection of ground and surface water through the effective use and application of nutrients on agricultural lands.

Type of Project	Total	Since 2001
Livestock restriction projects	15	4
Manure storage upgrade projects	10	3
Farm washwater upgrade projects	4	2
Septic system upgrade projects	17	6

TABLE 18
Rural and Agricultural Pollution Reduction Projects in the Toronto and Region AOC

3.3 HEALTHY HABITATS

3.3.1 Terrestrial Natural Heritage System Strategy

The natural areas in the Toronto and Region AOC comprise a patchwork of scattered and isolated features. The quality and function of these features is often reduced because of their small size, the negative effects of surrounding land uses, and lack of connections between natural areas, which prevents the movement of species. One of the priority actions in the 2001 RAP Progress Report was to complete and implement a Natural Heritage Strategy to protect, restore and create terrestrial habitat in all watersheds. TRCA approved its Terrestrial Natural Heritage System Strategy (TNHSS) in January 2007.

The TNHSS is a blueprint that identifies the land base that needs to be protected and restored to form the terrestrial natural heritage system in the TRCA jurisdiction, which includes the AOC and areas to the east (Duffins, Carruthers, and Petticoat Creeks and Frenchman's Bay). The Strategy identifies existing natural areas, evaluates their quality, and sets targets for the amount and distribution of natural cover needed to promote biodiversity and a sustainable city region. The Strategy maps out the areas that should be included in the expansion of the natural heritage system (see Figure 18).

In the Strategy, TRCA defines the terrestrial natural cover as those lands that are covered by forests, successional plant communities (i.e., fields that are naturalizing), wetlands, meadows and coastal habitats. There is 25% natural cover in the entire TRCA jurisdiction, which includes the AOC plus Duffin's and Carruther's Creeks. The existing percentage of natural cover in the Toronto and Region AOC varies widely from 10% on the waterfront to 32% in the Humber watershed (see Table 19). The TNHSS has a target to increase natural cover in the TRCA jurisdiction from 25% overall to 30%. This would increase the health of the system from "fair" to "good".

TRCA's Objectives for the TNHSS

- To increase the quality, distribution and quantity of natural cover in order to promote and sustain natural processes across the region.
- To establish conditions that allow terrestrial natural communities and native species to evolve and flourish throughout the region as development and intensification continue.
- To contribute to the social and environmental well being of the Toronto and Region through integration of the TNHSS into other natural heritage and sustainability initiatives.

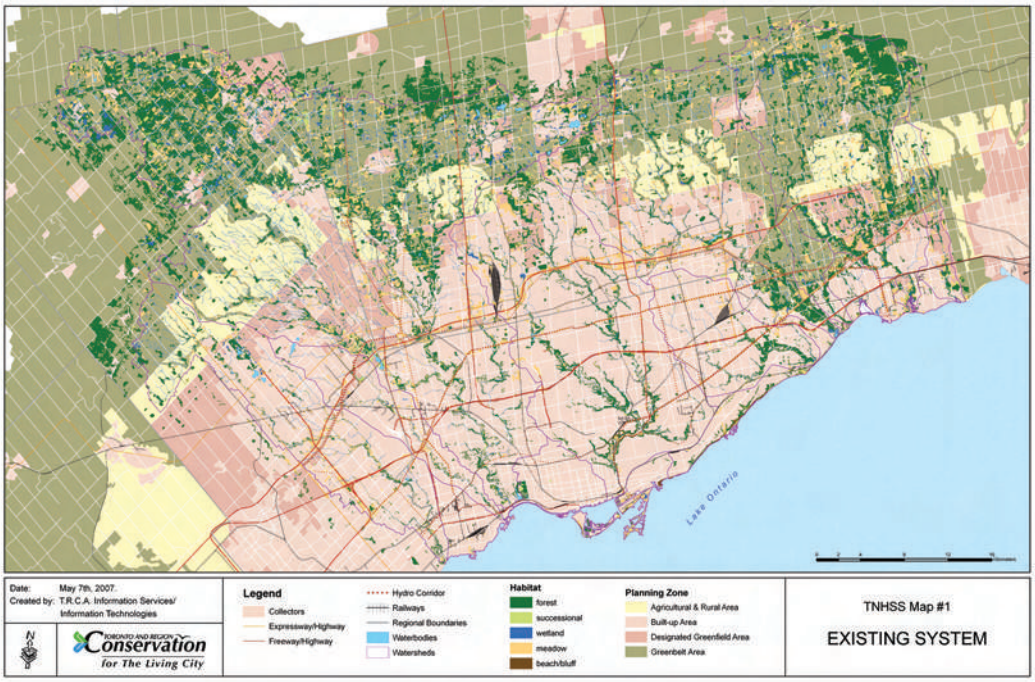
TABLE 19
Quantity of Existing Natural Cover by Watershed (RAP Area only, 2002)

Watershed	Existing Natural Cover	
	Hectares	% of Watershed
Etobicoke	2,953	14
Mimico	865	11
Humber	29,266	32
Don	5,620	16
Highland	1,328	13
Rouge	8,018	24
Waterfront	1,270	10

The TNHSS is a guide for planning, restoration and land acquisition decision-making. With the targeted terrestrial system identified, the emphasis is now on implementing the TNHSS recommendations to achieve a robust natural heritage system that can sustain us into

the future. This has already begun: TRCA has incorporated TNHSS mapping of target lands into its Land Acquisition and Securement Project (2006-2011) and the TNHSS has been used to prioritize habitat implementation projects in the Humber, Don, Etobicoke and Mimico watersheds. The Regions of Peel, York, and City of Toronto have set aside funds for land acquisition that is supportive of the THNSS.

TRCA is using the TNHSS at a watershed scale in the development of Watershed Plans for the Humber, Don and Rouge watersheds. The City of Toronto has completed its own Natural Heritage Strategy using TRCA's approach and the resultant policies form the basis for designations in the City's new Official Plan. The TNHSS approach used by TRCA has also been used to refine the implementation guidelines for the Rouge Park North boundary.



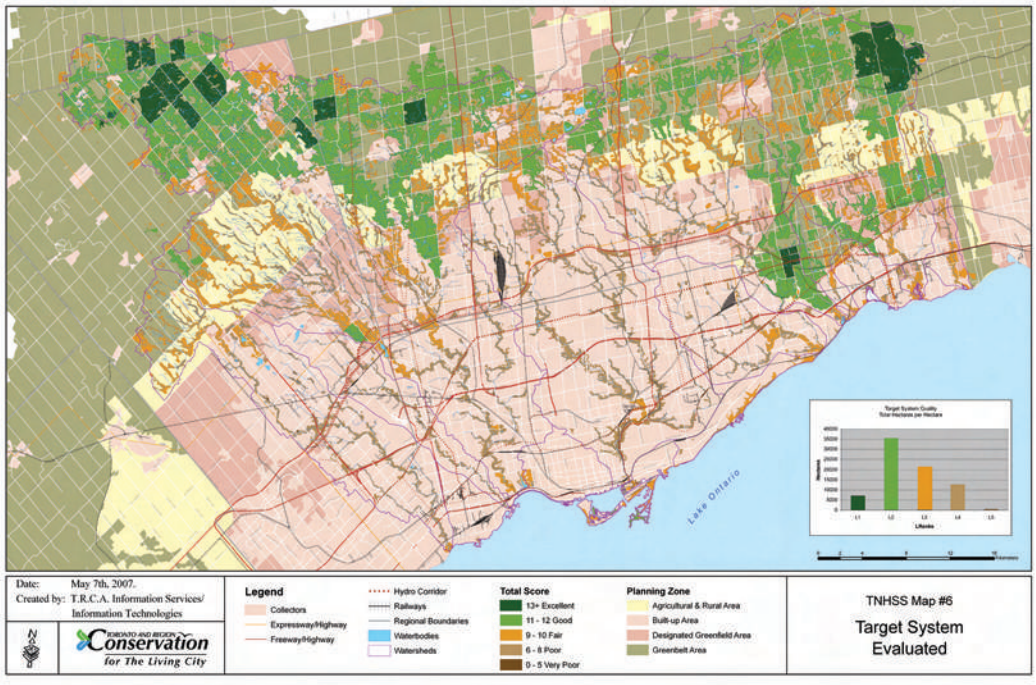


FIGURE 15
Existing and Targeted Natural Heritage System

3.3.2 Habitat Protection, Creation and Enhancement

One of the priority actions identified in the 2001 RAP Progress Report was the implementation of habitat projects contained in various plans. Overviews of some of the major habitat protection, creation and enhancement projects since 2001 are provided below.

- **Evaluation of Wetlands in the Watersheds:** Since 2001, MNR has been identifying and evaluating wetlands within the Toronto and Region AOC. An evaluation will determine the significance of the wetland (i.e. provincially or locally significant) and verify wetland boundaries – thus ensuring their protection.

- **Rehabilitation of the Rouge River Marshes:** This habitat project began with the development of a comprehensive rehabilitation plan developed cooperatively by the City of Toronto, the Rouge Park, Ontario Streams and local ratepayer's associations under the leadership of the Ministry of Natural Resources. Re-grading, protective fencing and wetland plantings carried out since 2001 have resulted in a flourishing natural shoreline. Several species of wildlife have recently colonized the new natural area and the City of Toronto is now constructing the parking and trail elements of the rehabilitation plan.

- **Rouge River Watershed Wetlands Restoration:** Ontario Streams, in association with the Rouge Park, York Environmental Stewardship and MNR undertook a large-scale wetland restoration project in the headwaters of the Rouge River near Stouffville. Approximately 8 hectares of marsh habitat was restored over a three-year period with the donation of over 500 truckloads of peat from the York Region.

- **Port Union Waterfront Improvement Project:** This project was designed to create a unique park on the Lake Ontario waterfront between the mouths of Highland Creek and the Rouge River. When completed, the Park will provide 3.6 km of waterfront trail, and will include shoreline protection measures, five cobble beaches, a bridge at the mouth of the Highland Creek, and extensive terrestrial and aquatic habitat. After approval of the Environmental Assessment for the project, TRCA began construction in 2002 on behalf of the Toronto Waterfront Revitalization Corporation (Now known as WATERFRONTToronto). Phase 1 was completed in 2006, and includes a pedestrian bridge over Highland Creek, 1.4 km of multi-use waterfront trail and the construction of both on-site and off-site fish habitat compensation projects.

- A New Wetland at Tommy Thompson Park: In 2003, TRCA began the transformation of Cell 1 in the Confined Disposal Facility in Tommy Thompson Park into a sizeable coastal marsh. The cell had previously been used for the disposal of contaminated dredgeate from the Keating Channel and other waterfront areas. The project started with the construction of a clay cap to hold dredged material in place. TRCA staff then planted extensive amounts of emergent aquatic vegetation and shoreline plants, added structures such as root balls and nesting boxes, and then filled the area with water. Construction on the wetland was completed in 2005. At 7.7 hectares in size, the wetland represents the largest wetland ever constructed in the Toronto waterfront area. When the plant communities mature, the new wetland is expected to provide functional habitat for a wide range of wetland dependent species of fish and wildlife. Plans are also being developed to turn the neighbouring Cell 2 into a wetland in the near future.

- **A New Mouth for the Don River:** The dream of a new mouth for the Don River to replace the concrete-sided Keating Channel has held a powerful hold on the imagination of Toronto residents since it was first proposed by the Task Force to Bring Back the Don in 1991. A new mouth for the Don was one of four priority projects identified by TWRC in 2001 to jumpstart the transformation of Toronto's unattractive and underdeveloped central waterfront into a vibrant residential, economic and recreational centre. TRCA is carrying out the project for TWRC through an Environmental Assessment (EA) process that links the planning for a new Don Mouth with that for floodproofing the surrounding area. The aim of the EA is to identify the best solution for re-establishing a natural, functioning wetland at the mouth of the Don, while providing flood protection to about 230 hectares of land to the south and east. By the end of 2006, the Terms of Reference for the Don Mouth EA were complete, and TRCA staff had started work on the environmental assessment.

- **Mimico Waterfront Linear Park:** This project is designed to create a linear park on the shores of Lake Ontario between Norris Crescent Parkette in the west and Humber Bay Park in the east. Phase 1 of the project is focused on the Section from Superior Avenue to Norris Crescent Parkette; Phase 2 will extend the park east to Humber Bay Park once properties are secured. Phase 1 includes the resolution of land ownership issues and the removal of physical barriers to create a safe and accessible waterfront. It will include 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 other habitat features. TRCA began construction of this project in 2006 on behalf of TWRC. Phase 1 was completed and open to the public in 2008.

3.3.3 Reforestation and Riparian Vegetation

One of the priority actions identified in the 2001 RAP Progress Report was to continue the planting of woody vegetation in riparian zones along streams and rivers in the Toronto and Region AOC. For 40 years, MNR, TRCA and other environmental stewardship organizations have played a major role in the planting of trees and shrubs and the management of forests in the Toronto and Region AOC and beyond. Each year, TRCA staff, conservation partners, and landowners plant an average of 165,000 trees and shrubs. Table 20 shows the number of number of trees, shrubs and other plants planted by TRCA since 2001. The total amount planted by TRCA corresponds to 302.6 hectares in size. Within the AOC, TRCA's plantings have been augmented by other reforestation and planting efforts carried out by municipalities, such as the City of Toronto's Tree Advocacy Program (see Section 3.6.2).

TABLE 20
Summary of TRCA Plantings* in the Toronto and Region AOC (2002-2006)

Area	2002	2003	2004	2005	2006	5 Year Total
York Region	74,533	69,525	67,553	61,800	71,645	345,056
Toronto	12,734	11,786	20,629	32,497	43,387	121,033
Peel Region	55,345	21,251	34,303	40,288	63,499	214,686

**Includes trees, shrubs, seedlings, bioengineering and aquatics.*

Over the last twenty years, resource managers have shifted reforestation efforts to focus more closely on restoring riparian vegetation in stream and river valleys. TRCA is currently developing a pilot Riparian Reforestation Strategy which will identify and prioritise planting locations along Etobicoke Creek.

TABLE 21
Habitat Projects in the Toronto and Region AOC Funded by the Great Lakes Sustainability Fund

Type of Project	Total Funded	Funded Since 2001
Tree planting	205.3 hectares	165.5 hectares
Prairie planting/restoration	19.8 hectares	18 hectares
Riparian planting/restoration	54.3 km	43 km
Wetland creation/restoration	115 hectares	72 hectares
Fish barrier removals	12	12

3.3.4 Toronto Waterfront Aquatic Habitat Restoration Strategy

The waterfront in the Toronto and Region AOC has been dramatically altered in over 200 years of tree cutting, marsh filling, stonehooking, harbour building and lakefilling and this has led to a decline in the amount and quality of aquatic habitat available. Although there have been many isolated projects in the last twenty years to improve aquatic habitat, these initiatives were carried out in the absence of an overall strategy. This situation was remedied in 2003, when TRCA completed the Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS). The goal of TWAHRS is to develop and achieve consensus on a strategy to improve the ecological health of the waterfront by restoring aquatic habitat along the waterfront from Etobicoke Creek

in the west to the Rouge River in the east. TWAHRS has four main objectives. These are to:

- identify the potential for self-sustaining aquatic communities in the open coast, sheltered embayments, coastal wetlands and estuaries;
- identify limiting factors, evaluate opportunities and propose actions to protect and enhance nearshore habitats and restore ecological integrity;
- develop sustainability indices to evaluate the success of the Strategy; and
- develop an implementation plan to restore aquatic habitats on the Toronto waterfront.

TWAHRS provides a synopsis of existing conditions along the waterfront, includes a compendium of habitat restoration techniques that can be used to improve habitats, and contains a habitat plan that matches up habitat restoration techniques with various sites along the waterfront. The section on the existing conditions provides good baseline information on physical processes (such as the nearshore geology, sediment transport and human influences that have affect the waterfront). It also provides baseline information on the status of aquatic communities, including phytoplankton, algae, invertebrates, aquatic vegetation, fish, reptiles, amphibians, birds and mammals.

TWAHRS provides a strong foundation for restoring the aquatic ecosystem along the waterfront. Some of the projects that have emerged from the Strategy are:

- Port Union Waterfront Improvement Project;
- Mimico Waterfront Linear Park;
- HTO Park at Harbourfront;
- wetlands at Bluffer's Park;
- shoreline restoration and carp barriers at Ontario Place; and
- reefs and structural fish habitat along the Western Beaches.

TWAHRS is now referred to as Aquatic Habitat Toronto.

Newly created sheltered wetland embayment at Mimico Waterfront Park.

3.4 FISH AND WILDLIFE

3.4.1 Fisheries Management Plans

One of the key actions identified in the 2001 RAP Progress Report was the development and implementation of Fisheries Management Plans for the watersheds in the Toronto and Region AOC. Fisheries Management Plans are designed to protect and enhance aquatic habitat. They contain information on the historical and contemporary fish communities, describe the physical conditions in a watershed, set management direction for the future, and map the course for rehabilitation projects and monitoring. Fisheries Management Plans are developed cooperatively by TRCA and MNR, with MNR being the approval agency for the Plans. In 2005, MNR released draft guidelines for Watershed-Based Fisheries Management Plans, and expects that these guidelines will be applied to Fisheries Management Plans that are currently being developed or updated.

Significant progress has been made on the development of Fisheries Management Plans in the Toronto and Region AOC. The status of the plans is presented below.

TABLE 22
Status of Fisheries Management Plans as of April 2007

Watershed	Status of Fish Management Plans	Notes
Etobicoke Creek	Draft completed	Not yet reviewed by MNR
Mimico Creek	Draft completed	Not yet reviewed by MNR
Humber River	Complete	Undergoing public review on EBR
Don River	Under development	Draft
Highland Creek	Development suspended in 2005	Development suspended to undertake channel morphology study following storm of August 2005; draft is expected
Rouge River	Completed in 1992; now being updated	Development of implementation strategy completed and is being reviewed by MNR

3.4.2 Fish Barrier Mitigation

In-stream barriers such as dams and weirs block fish such as lake-run trout and salmon from being able to migrate up rivers in the Toronto and Region AOC to spawn. The removal of high priority fish barriers was identified as a key action in the 2001 RAP Progress Report.

Since 2001, a number of critical barriers have been removed or modified to permit fish passage in the Toronto and Region AOC. Because of this work, lake-run fish such as rainbow trout can now migrate:

- up the Humber River into the East Humber subwatershed;
- up the Don River into the Upper East Don and German Mills subwatersheds; and
- up the Rouge River into the headwaters within the Towns of Richmond Hill and Markham.

Significant progress has been made since 2001 in the identification of in-stream barriers. This has been accomplished largely through field assessments. Where field assessments were not possible, GIS assessments have been done. The status of fish barrier mitigation is presented below.

TABLE 23
Status of Fish Barrier Assessment and Mitigation of Barriers in the Toronto and Region AOC

Watershed	Status of Barrier Assessment	Barriers Mitigated
Etobicoke Creek	Field survey completed on 24% of watershed; 8 priority barriers identified	None
Mimico Creek	Field survey identified 231 confirmed barriers	Design completed for mitigation of furthest downstream barrier
Humber River	Total of 1201 potential barriers identified	11 mitigation projects carried out between 2000 and 2005
Don River	Field survey identified 62 barrier in East Don and German Mills subwatersheds; GIS identified 290 barriers in the rest of the watershed	2 mitigation projects completed in late 1990s (Pottery Road); 1 in 2000 (Donalda Club)
Highland Creek	Field survey of entire watershed identified 128 barriers and 52 potential barriers under low flow conditions	Direction to flow from Fisheries Management Plan
Rouge River	Field survey completed; data being analysed	2 large-scale mitigation projects completed – Milne Fishway in 2003 and Toronto Zoo Fishway in 2004

Upper Rouge Valley, Richmond Hill.

3.5 SUSTAINABLE WATERSHEDS AND WATERFRONT

3.5.1 Watershed Planning

Stream monitoring.

Watershed planning is the development of strategies to protect, maintain and restore healthy natural watershed systems. Watershed plans typically describe the natural features and functions of a watershed, set targets for desired future conditions, and map out strategies to achieve those conditions. The notion of monitoring and reporting on progress is integral to the watershed planning process. In the Toronto and Region AOC, reporting has been done through the preparation of Report Cards and Progress Reports at 3 to 5 year intervals after implementation of the watershed strategy has begun.

The 2001 RAP Progress report identified the implementation of watershed strategies for the watersheds in the Toronto and Region AOC as a priority action. Watershed strategies were developed for the Don, Humber and Etobicoke-Mimico watersheds before 2001. Since that time, in partnership with stakeholders, TRCA has developed a Watershed Strategy for the Rouge. The development of a Watershed Plan for Highland Creek has been superseded by other strategies developed by the City of Toronto, including the Highland Creek Geomorphic Master Plan, the WWFMMP, and others.

TABLE 24
Status of Watershed Planning in the Toronto and Region RAP area

Watershed	Watershed Strategy	Report Cards
Etobicoke-Mimico	Completed 2001	Completed 2006
Humber	Completed 1997. Updated 2008	Completed 2000, 2007
Don	Completed 1994	Completed in 1997, 2000 and 2003. Update in 2007
Highland Creek	Replaced by City strategies*	--
Rouge	Completed	--

** This includes the Highland Creek Geomorphic Master Plan, the WWFMMP, etc.*

3.5.2 WATERFRONToronto's Sustainability Framework

After extensive consultation, WATERFRONToronto (formerly TWRC) released its final Sustainability Framework in 2004.[21] The goal of the Framework is to ensure that sustainability principles are integrated into all facets of waterfront revitalization, including management, operations and decision-making. The Sustainability Framework identifies concrete short, medium and long-term actions that will lead to remediated brownfields, reduced energy consumption, the construction of green buildings, improved air and water quality, expanded public transit, and diverse, vibrant downtown communities. Some of the desired actions that will contribute to improved water quality and habitats are:

- incorporating measures (such as green roofs) to help absorb rainwater;
- instituting best practice guidelines for the control of herbicides, salt, animal waste and other pollutants;
- reducing the quantity and improving the quality of stormwater runoff by implementing the recommendations of the City's Wet Weather Flow Management Master Plan;
- enhancing habitat along the water's edge;
- creating and maintaining networks of natural systems that link the waterfront with river valleys and other natural areas; and
- creating infrastructure that facilitates understanding, appreciation and use of fish and wildlife resources.

The Sustainability Framework will guide the actions of WATERFRONToronto to ensure that, in their words, the "revitalization of the Toronto waterfront results in Toronto becoming a world leader in sustainability".

A restored Cattail Marsh.

3.6 EDUCATION, INVOLVEMENT AND STEWARDSHIP

3.6.1 TRCA Activities

TRCA provides environmental educational activities through three major avenues:

- three Residential Field Centres (Albion Hills, Lake St. George and Claremont) where participants stay overnight, learn about the environment, and take part in outdoor activities;
- day facilities at thhe Living City Campus (Kortright Centre), Black Creek Pioneer Village and the TRCA Conservation Areas geared to students; and
- The Watershed On Wheels Program that take conservation programs to schools and community groups.

TRCA runs a host of stewardship programs that encourage people and groups to become involved in activities that improve the environment. These include:

- stewardship programs in each of the watersheds in the Toronto and Region AOC;
- outreach programs to new Canadians;
- stewardship programs aimed at land owners, such as the Rural Clean Water Program and the Private Tree Planting Program; and
- a Healthy Yards Program that works with homeowners to reduce pesticide use, compost, garden with native plants and create wildlife habitat.

Through its programs, TRCA helps people in the Toronto and Region AOC get involved with hands on initiatives that improve water quality and habitat. These initiatives include:

- trail building;
- tree planting, reforestation and shoreline re-vegetation;

- stream and shoreline clean ups; and
- fisheries habitat improvement.

3.6.2 Municipal Activities

Through the Toronto District School Board, the City of Toronto provides environmental education in two ways. The Board:

- runs 5 residential and 5 day use Outdoor Education Schools that provide environmental education and nature studies to 90,000 students and 3500 teachers a year; and
- participates in the EcoSchools Program, which provides information to schools and encourages them to become involved in hands on projects to improve the environment.

The City of Toronto itself runs a number of programs that provide opportunities for people to improve water quality and habitats. These include:

- the Tree Advocacy Program, formed in 2000, that works with City staff, neighbourhood groups and NGOs to plant trees along streets, arterial roads, in parks and in ravines; since its founding, the Program has planted more than 400,000 trees, shrubs and herbaceous plants in over 300 sites across the region;
- the Community Stewardship Program that involves community volunteers in park naturalization projects across the City;
- the Ravine Trail Management Program that involves community volunteers in building and maintaining trails in the ravine system;
- the WaterSaver Program that helps home owners reduce water use; and
- the Downspout Disconnection Program.

The Region of Peel has a number of programs that involve people in protecting water quality. These include the Peel Water Festival, a six-day festival that involves students for 5 days and residents for one. Students from grade 5 attend to learn about water, its importance and what individuals can do to protect it. Peel Region also has an active water conservation program (Water Smart Peel), aimed at both residents and businesses.

Claremont Field Centre

The Region of York also has a Children's Water Festival, aimed at grade 4 and 5 students. In 2006, about 5,400 students attended to learn about water issues. The Region of York also has a comprehensive water conservation program (Water for Tomorrow) that aims to reduce water use inside and outside the house, and in businesses throughout the region.

3.6.3 NGO Activities

Across the Toronto and Region AOC, non-governmental organizations (NGOs) play an important role in helping to improve water quality and habitats in the Toronto and Region AOC. Reporting on the important and extensive role played by NGOs is beyond the scope of this report. Some highlights of some of the NGO activity include:

- the Great Canadian Shoreline Clean Up;
- the RiverSides Stewardship Alliance programs that reach out to homeowners to conserve water, reduce stormwater runoff, naturalize gardens and reduce their use of toxic products; and
- Toronto Environmental Alliance's Beach Watch Program, which supports residents cleaning up area beaches and promotes actions to improve water;
- Ontario Streams which works with agencies and local groups to restore streams;
- Friends of the Rouge Watershed who work to protect and enhance the Rouge River Watershed though planting and habitat projects; and

Hatching a Plot?

Students at Chaminade College School near Black Creek in North York won a 2007 Green Toronto Award for their stewardship of the Humber River tributary. Beginning in 1998, the students started converting an abandoned greenhouse into a brown trout fish hatchery.

Part of "Adopt A Stream", the school program now raises and stocks 5000 brown trout a year in the Black Creek. The students have also added logs to the creek to improve habitat, tackled eroded riverbanks, and hauled out litter and garbage from the Creek, including a whopping 450 shopping carts.

- Black Creek Conservation Project works with local schools, communities and individuals to help protect and restore the Black Creek.
- Evergreen who engages schools, communities and individuals in the greening of urban areas.

3.7 SCIENCE AND MONITORING

3.7.1 Regional Watershed Monitoring Network

From 1964 to 1995, the MOE carried out routine water quality sampling at over 20 locations in the Toronto and Region AOC through its Provincial Water Quality Network (PWQN). This program was reduced to only 2 stations in 1996. From 1996 to 1998, the only source of monthly monitoring data was the City of Toronto's Lake and Stream Sampling Program, which only analysed a small number of parameters at 13 of the 30 stations monitored.

The 2001 RAP Progress Report identified the need to develop an integrated region-wide monitoring program as a priority action. TRCA launched its Regional Watershed Monitoring Network (RWMN) in 2001. The extent of the monitoring network, the variables being monitored, and the frequency of monitoring are shown in Table 25. The information collected through the RWMN augments that collected by other agencies, municipalities and others in the AOC, much of which is collected in specific geographic areas or for specific parameters.[22]

TABLE 25
Regional Watershed Monitoring Network

Parameter	Number of Sites	Frequency
Surface water quality	36	Monthly
Basic water quality, benthic invertebrates and algae	150	Annual
Fish community, aquatic habitat and thermal stability	150	Every 3 years
Fluvial geomorphology	150	Every 3 years
Groundwater levels	22	Hourly
Groundwater quality	22	Limited
Stream flow	63	Continuous
Precipitation	101 (65 seasonal)	Continuous
West Nile vector	79	Annual
Volunteer terrestrial natural heritage	66	Annual

Additional data on persistent organic compounds and metals are collected by the MOE as part of its Tributary Priority Pollutant Monitoring Program. The MOE also collects information on contaminant levels in fish through the Sport Fish Monitoring and Young-of-the-Year Biomonitoring programs.

While there are limitations to the RWMN – for example, there is little sampling done during wet weather events and few data on *E. coli*– it provides a good base of information to assess the health of the watersheds in the Toronto and Region AOC over time. Because 11 of the surface water quality sites are part of the PWQN and many of the remaining 25 sites were formerly part of that network, there is a significant amount of historical data available to analyse long-term trends. TRCA with partner agencies are proposing to review the RWMN in line with recommendations stemming from the watershed plans to adjust monitoring activities.

3.7.2 15-Year Waterfront Fishery Assessment

In 2006, TRCA in partnership with MNR, completed a 15-year assessment of the fisheries along the Toronto waterfront.[23] The report summarizes and assesses the changes in the fish community over the period from 1989 to 2005 for three kinds of habitat – open coast, embayment and river mouth habitats. It is based on 16 years of electrofishing during which TRCA staff conducted 425 transects. The key findings of the waterfront fishery assessment are summarized in Section 2.4.1 of this report.

3.7.3 Terrestrial Monitoring

TRCA's terrestrial monitoring began in 1996 under the Terrestrial Natural Heritage Program and continues as part of the Regional Watershed Monitoring Network. Some 34,000 hectares of natural lands have been surveyed since 2000, which represents about 60% of the natural cover within TRCA's jurisdiction. Because of this effort, TRCA now holds one of the largest databases of terrestrial cover in southern Ontario. The monitoring program collects data on six key indicators of terrestrial natural heritage:

- the amount of natural areas;
- the distribution of natural areas;
- the influence of surrounding land uses on natural areas;
- size and shape of natural patches;

- connectivity between natural patches; and
- biodiversity on the region (e.g. the number of plant and animal species found).

The information is collected through remote sensing, field visits and species inventories from various sources. It is mapped digitally and has been used to identify the existing and proposed Terrestrial Natural Heritage System for the Toronto area.

3.7.4 Assessment of Beneficial Use Impairments

As illustrated in Table 1, the Toronto and Region Area of Concern was identified in 1987 as having 8 impaired uses, 3 uses that were not impaired, and 3 uses that required further assessment to determine if they were impaired or not. The 2001 RAP Progress Report recommended that specific studies be carried out to confirm the status of the three beneficial uses that were listed as requiring further assessment. Since then, TRCA has carried out research on two of these potential impaired uses to understand if contaminants in the aquatic environment are causing tumours and other deformities in fish, or are causing reproductive effects and other deformities in birds.

Tumours and Other Deformities in Fish

In 2003 and 2004, TRCA carried out sampling of fish from five sites within the Toronto and Region AOC. The sites chosen were expected to exhibit varying degrees of chemical stress and included the Toronto Islands, the Lower Don River, the Humber River Marshes, Ashbridge's Bay and the Rouge Marsh. A bottom-feeding native species, brown bullhead, was chosen for the study and 257 bullhead were collected from the sampling areas in Toronto in 2003. A further 50 bullhead were collected in 2004 from a "clean" reference area, Prince Edward Bay which is southeast of Picton in Eastern Ontario.

Following capture, the fish were examined for any external abnormalities including deformities, lesions and raised lesions. The internal organs were also examined for abnormalities, and sections of the liver were taken for histopathological examination by an expert.

Levels of external deformities were higher in the Toronto samples than in those taken from Prince Edward Bay. Within the Toronto samples, the highest frequency of deformities, lesions and raised lesions was found in fish from the Ashbridge's Bay site. Overall, however,

researchers found a very low incidence of liver tumours in the fish from the Toronto and Region AOC – only 3 of the 257 fish sampled or 1.2%. This is consistent with the relatively low levels of PAHs found in bottom sediment in this area.[24] The authors of the study concluded that "fish tumours" are not an impaired use in the Toronto and Region AOC.

Reproductive Effects and Deformities in Colonial Waterbirds

There is a well-known association between environmental levels of persistent organic compounds such as PCBs, DDE and mirex and health impacts in fish-eating colonial waterbirds such as ring-billed herring gulls. In the Great Lakes, exposure to persistent organic compounds has been linked to reproductive failure and deformities such as crossed bills in these waterbirds because they bioaccumulate persistent environmental contaminants.

In 2004, TRCA carried out a study to determine whether the existing levels of environmental contaminants in the Toronto and Region AOC are indeed affecting the health of colonial waterbirds[25]. Five species of birds that nest in colonies in Tommy Thompson Park (TTP) were studied including double-crested cormorant, black crowned night heron, ring-billed gull, Caspian tern and common tern. Researchers looked at reproductive success, examined fledglings for abnormalities, and sampled levels of contaminants in eggs.

The results of the study suggest that reproductive success is good for ring-billed gulls and double-crested cormorants. Reproductive success is somewhat lower for common terns, Caspian terns and black-crowned night herons, but this is attributed to predation and habitat factors, not contaminants. Researchers found few abnormalities in chicks and determined that levels of contaminants in eggs are low in comparison to many other Great Lakes Areas of Concern and are significantly lower than historical levels. The drop in levels of contaminants parallels that found by the Canadian Wildlife Service in twenty years of monitoring contaminants in herring gull eggs from TTP. The conclusions of the study are that reproductive effects and deformities due to contaminants are not an issue in colonial waterbirds in the Toronto and Region AOC and should not be considered an impaired use in the Toronto and Region AOC.

3.7.5 Urban Metabolism Studies

Chris Kennedy from the University of Toronto completed on a study to determine the urban metabolism of Toronto and Region. This study uses material flow analysis to examine both the inputs and outputs of water, nutrients, energy and materials in the Toronto region. Such stud-

Left: ring-billed gull. Right: black crowned night heron.

ies are conducted for many reasons – to protect human health, to protect the environment, to conserve resources or to recover materials. When complete, the study should provide information that can be used to guide actions to reduce undesirable flows (e.g., flows of copper into the environment).

Other researchers at the University of Toronto have been conducting a related urban metabolism analysis of two toxic chemicals in Toronto.[26] Through the study, they are attempting to quantify the overall fluxes of the chemicals into and out of the city. The chemicals being studied – PCBs and polybrominated diphenyl ethers (PBDEs) – are ubiquitous in our environment, persistent and toxic.

PCBs are a family of chemicals that were used extensively in a variety of products including transformers, capacitors, hydraulic fluids, sealants, caulking, paints, coatings and flame retardants in lubricating oils. Because of concerns about their toxicity and persistence in the environment, Canada banned the use of PCBs in new products manufactured or imported into the country in 1977. Continued use is allowed only in existing closed electrical and hydraulic systems until such equipment reaches the end of its service life. PBDEs are a group of chemicals that are used as flame retardants in a variety of polymer resins and plastics. They are found in many products such as furniture, TVs, stereos, computers, carpets and curtains. Concern about rising levels of PBDEs in the environment has led to bans on some commercial mixtures in the European Union and some US states. Environment Canada is working with industry and stakeholders on a strategy to minimize the impact of PBDEs on the environment.[27]

Preliminary results suggest that the per capita emissions of PBDEs from Toronto are 10 to 50 times greater than Birmingham, England. Off gassing from consumer products is a major source of these PBDEs. Most of the PBDEs emitted in Toronto remain in the air and are carried away from the city. With respect to PCBs, the researchers estimate that 12,000 kg remain in use in Toronto, and an additional 20,000 kg remain in place in sealants used in the construction of buildings during the 1960s and 1970s. The continued presence of the PCBs in sealants may be responsible for the continued levels of PCBs in the local environment. Levels of PCBs in the environment generally declined after they were banned from new uses in 1977, but have remained relatively stable since the mid-1990s.

3.8 RAP Funding

Between 2002 and 2007, a total of $2,500,000 has been provided jointly by Environment Canada and the MOE for funding RAP projects, with an additional $3.6 million provided via the Great Lakes Sustainability Fund. In many cases, this funding has leveraged matching funding from other sources that has allowed projects to proceed. While the federal and provincial funding for RAP projects has been significant, it is a drop in the bucket compared to the money currently being spent by agencies and municipalities on RAP-related activities, or that which is needed to restore the waters and habitats of the Toronto and Region AOC.

Projects funded through the RAP program since 2002 include:

- operation of the Regional Watershed Monitoring Network;
- development of TRCA's Terrestrial Natural Heritage System Strategy (TNHSS);
- implementation of the TNHSS including monitoring;
- development of Fisheries Management Plans;
- study on reproductive effects and deformities in colonial birds;
- study on fish tumours;
- study on urban habitat for migratory shorebirds;
- support to complete the stormwater retrofit studies;

- RAP-related projects carried out under the Sustainable Technology Evaluation Program;
- development of watershed plans and report cards on the health of the watersheds; and
- watershed stewardship and education programs including:
  - Watershed on Wheels;
  - Yellow Fish Road;
  - Aquatic Plants Program;
  - Multicultural Environmental Stewardship;
  - Healthy Yards;
  - Conservation Seminars.

4 Measuring Progress

4.1 PROGRESS ON BENEFICIAL USE IMPAIRMENTS

The progress made with respect to the identified Beneficial Use Impairments is presented in Table 26.

TABLE 26
Summary of Progress On the Beneficial Use Impairments

Use Impairment	Stage 1 Analysis (1989)	Progress/Status (2006)
Water		
Eutrophication or undesirable algae	Phosphorus often exceeds Provincial Water Quality Guideline of 0.02 mg/L across the waterfront. Algal and weed problems are restricted to the western shoreline because of a lack of suitable substrate and wave action in other areas.	Phosphorus levels in the watersheds frequently exceed the PWQO. Along the waterfront, phosphorus levels generally meet the PWQO. Algal growth continues to be a problem along the waterfront, especially in the western part of the AOC. **Mixed. Improvement in regulations; however, complex issues in nearshore have exacerbated levels of nutrients.**
Beach closings	Frequent beach closings as a result of stormwater and CSO contamination	City of Toronto now has six beaches that have been awarded international Blue Flag status,recognizing their good water quality. City of Toronto beaches are closed due to high bacterial levels from multiple sources. Microbial trackdown helps pinpoint the sources (i.e sewage, birds, pets, etc.). Wastewater infrastructure improvements (ie. construction of the Western and Eastern tunnels) also helps improve water quality at Toronto beaches as does educating residents as to the implications of feeding the birds. **Better understanding of the sources of bacteria has helped improve management of the beaches.**
Restrictions in fish consumption	Human consumption advisories exist for the larger sizes of several species because of mercury, PCB and mirex levels. Evidence indicates that this is not attributable to local causes and needs to be dealt with on a lake-wide level.	Levels of contaminants have decreased since the 1980s but the rate of decrease has slowed in the last decade. Consumption advisories persist; generally the larger sizes of some fish species and top predators are of more concern due to the bioaccumulation of toxics. Mercury, PCBs, dioxins and furans cause major consumption restrictions throughout Lake Ontario, further assessment is needed to confirm that these advisories are due to lakewide concern rather than a regional one. **While contaminant levels have declined somewhat; Health Canada recently issued more stringent consumption guidelines pertaining to PCBs, dioxin and furans.**

Hanlan's Point Beach.
© Blue Flag Canada

Use Impairment	Stage 1 Analysis (1989)	Progress/Status (2006)
Sediment and Benthos		
Degradation of benthos	Benthic communities in embayments and near river mouths are dominated by species indicative of organic enrichment. Densities are lower than in the past, suggesting some improvement. Benthos bioaccumulate metals and trace organics.	In the watersheds, impairment of benthic communities varies, with Highland Creek showing the most impairment and the Rouge and Humber Rivers showing the least. Along the waterfront impairment of benthic communities is still seen in areas enriched with nutrients (e.g., near CSOs, in the Keating Channel and in Ashbridge's Bay). **Monitoring programs are in place to obtain better data and determine trends**
Restrictions on dredging activities	Sediments in most embayment areas exceed Ontario's open water disposal guidelines. Dredging has been subject to Environmental Assessment in the past and is likely to be in the future.	Contaminant levels have improved in surficial sediments. When navigational dredging is required, contaminant levels and bioavailability is sampled to determine if material is required to be contained in the Confined Disposal Facility in Tommy Thompson Park. Dredgeate which meets guidelines is used in the creation of waterfront parks. Hotspots of contaminated sediment are often associated with sewer outfalls. **Some progress made since 1989.**
Habitat and Wildlife		
Loss of fish and wildlife habitat	Historic loss of habitat. Loss of riverine habitat continues. Contamination of existing or newly created habitats is of concern.	Watersheds: Uplands and upstream riverine habitat continues to decline due to urbanization, in particular in headwater or intermittent streams; however, regulations have recently been strengthened to better protect floodplains and wetlands from development. Waterfront: Habitat improvement and creation are major considerations of the waterfront revitalization effort, resulting in significant gains in fish and wildlife habitat. **Mixed. Gains from habitat restoration and creation are outweighed by continued urbanization. Need to improve tracking of habitat gains and losses.**
Degradation of fish and wildlife populations	Historic degradation and loss of species dating back to the 1800s. Continued impact from urbanized area today.	Fish and wildlife populations continue to decline in general due to the impacts of urbanization in the watersheds. This is being partly offset through stream restoration, wetland creation and barrier mitigation projects. However, of the 243 species found in the RAP Region 128 are of Regional concern. **Declining. Gains from habitat restoration and creation are outweighed by continued urbanization.**
Fish tumours or other deformities	Requires more assessment. Visual inspection of captured fish in recent studies has indicated no evidence of tumours. Tests of Main STP effluent have shown it to be mutagenic.	Studies carried out by TRCA in 2003 and 2004, along with historical evidence and data suggest that liver tumours are not impaired in the Toronto and Region Area of Concern. ***Likely not impaired.**

Use Impairment	Stage 1 Analysis (1989)	Progress/Status (2006)
Bird or animal deformities of reproductive problems	Requires more assessment. Current reproductive rates of herring gulls and other species are normal. Incidence of deformities has declined. Organochlorine residues in gull eggs have declined.	Studies carried out by TRCA in 2004 suggest that reproductive effects and deformities in colonial waterbirds due to contaminants are not an impaired use in the Toronto and Region Area of Concern. ***Likely not impaired.**
Degradation of phytoplankton and zooplankton communities	Requires more assessment. Lake-wide factors, physical factors and local pollution sources influence communities. Information is currently insufficient to determine the relative significance of local sources.	Definitive assessment has not been done. **Requires further Assessment.**
Human Use		
Degradation of aesthetics	Aesthetic concerns relate primarily to debris and litter. Turbidity is also a concern near river mouths and in the vicinity of lakefilling operations. Weed growth is a concern along the western shoreline.	No formal assessment done. Anecdotal evidence suggests that algae growth continues to be a problem, especially along the western shoreline. While water appears "clearer" it is due to the invasive and problematic zebra and quagga mussels. Several initiatives are on-going to help improve aesthetics (namely debris and litter clean-ups). **Some progress made since 1989.**

4.2 PROGRESS ON PRIORITY ACTIONS FROM 2001 RAP PROGRESS REPORT

The 2001 RAP Progress Report, *Clean Waters, Healthy Habitats* identified 16 Priority Actions that are needed to move towards healthy waters and healthy habitats. Progress on achieving these actions is presented below.

TABLE 27
Progress Made on Priority Actions from 2001 RAP Progress Report

Priority Actions	Progress Made
Clean Waters	
Complete and implement the City of Toronto Wet Weather Flow Management Master Plan.	The WWFMMP was approved by City Council in 2003 and requires $42 million annually over 25 years, or $1 billion to be implemented as scheduled. Implementation of the 25-year plan is currently underway (see Section 3.2.1) and includes: • Public education and outreach • Source control measures • Municipal operations • Remediation of basement flooding • Conveyance control • Waterfront shoreline management • Stream restoration • End-of-pipe facilities • R&D on end-of-pipe technologies • Environmental monitoring

Complete and implement stormwater retrofit strategies in middle/upper watersheds.	The Town of Richmond Hill, the Town of Markham and the City of Brampton have completed Phase 3 Stormwater Retrofit Studies and are beginning implementation. The City of Mississauga is currently updating its 1996 Storm Water Quality Control Study and the City of Vaughan is developing Phase 3 of its Retrofit Study (see Section 3.2.1).
Remediate dry weather flows from waterfront outfalls by eliminating sanitary cross connections.	The City of Toronto has identified and is remediating dry weather flows in Taylor Massey Creek and will expand the program to other subwatersheds in Toronto, beginning with Black Creek (see Section 3.2.2).
Increase implementation of best management practices for urban and rural businesses.	The RAP provided the tools for increased implementation through technology transfers focusing on sustainable technologies
Increase pollution prevention through improvements to sewer use bylaws and stormwater policies where necessary, increased by-law enforcement, and better spills prevention.	The City of Toronto passed a new Sewer Use By-Law in 2000, York Region passes a new Sewer Use By-Law in 2005, and Peel Region is currently updating its Sewer Use By-Law (see Section 3.2.3).
Healthy Habitats	
Complete implementation of the Port Union Waterfront Implementation Project, the Integrated Shoreline Management Plan, A Living Place, the Coastal Wetlands Rehabilitation Plan and other plans for maximizing habitat (including a wetland at the mouth of the Don River).	In 2003, TWRC embraced TRCA's Toronto Waterfront Aquatic Habitat Restoration Strategy (see Section 3.3.4) and has subsequently implemented or begun to implement a number of waterfront projects under the strategy, each of which has a habitat component (see Section 3.3.2). Port Union Waterfront Improvement Project resulted in the creation of the Port Union Waterfront Park –Phase 1 opened in 2006 and Phase 2 is underway. The key management recommendations from Integrated Shoreline Management Plan (Dec. 1996) continue to be considered in waterfront development initiatives from Tommy Thompson Park to Frenchman's Bay (i.e. through the implementation of the Tommy Thompson Park Master Plan and the realization of the Port Union Waterfront Park-Phase 1). Plans laid out in A Living Place: Opportunities for Habitat Regeneration in Toronto Bay have been incorporated into TWAHRS. See Section 3.3.2 for information regarding the naturalization of the Mouth of the Don River.
Complete and implement watershed fish management plans.	Fishery Management Plans have been drafted or completed for 3 of the 6 watersheds (Etobicoke Creek, Mimico Creek and the Humber River). The Fishery Management Plan for the Don is drafted. The Rouge River Plan, first developed in 1992, is now being updated. Development of the draft Highland Creek Fishery Management Plan is anticipated.
Continue woody riparian vegetation planting and the mitigation of priority barriers.	With funding from the GLSF, 43 km of riparian planting or restoration has been carried out and 12 fish barriers have been removed or mitigated since 2001 (see Section 3.3.3).
Complete and implement the Natural Heritage Strategy to protect, restore and create habitat in all watersheds	In 2006, TRCA released its Terrestrial Natural Heritage System Strategy. Implementation has begun: the Strategy is providing direction for land acquisition and the prioritisation of habitat projects in the Humber, Don, Etobicoke and Mimico watersheds. It is also being used to guide the development of watershed management plans for the Humber, Don and Rouge watersheds, and its approach has been adopted by the City of Toronto, and the Regions of Peel and York (see Section 3.3.1).

Sustainable Watersheds	
Implement watershed strategies for Etobicoke-Mimico, Humber, Don, Highland and Rouge.	Watershed plans have been completed for all watersheds except for Highland Creek, where the watershed plan is being replaced by the City of Toronto's Highland Creek Geomorphic Master Plan, the WWFMMP, and other planning tools (see Section 3.5.1)
Develop and implement strategies related to the Oak Ridges Moraine and Ontario Smart Growth.	The Province of Ontario enacted the Oak Ridges Moraine Act in 2001 and released the Oak Ridge Moraine Conservation Plan in 2002, which provides direction on how to protect the Moraine's ecological and hydrological functions. The Province released the Places to Grow Act in 2004, and followed with the Draft Growth Plan for the Greater Golden Horseshoe in 2005. The Draft Growth plan focuses on using intensification in existing urban areas to direct growth away from agricultural areas and natural lands.
Integrate sustainability principles and RAP objectives into Toronto Waterfront Revitalization, official plan reviews, and other municipal planning and development approval processes.	WATERFRONToronto released its comprehensive Sustainability Framework in 2004. The Framework addresses water quality, water quantity and habitat issues.
Education and Involvement	
Increase activities to engage citizens and businesses in lot-level water management, water conservation, reduction and proper disposal of household and garden chemicals, and improved habitat and shoreline management.	Since 2001, there has been increased activity from TRCA, municipalities and NGOs to engage citizens in lot level management of stormwater, conservation of water, and reductions in the use of pesticides.
Build public and political support for remedial action.	TRCA's watershed groups are active in building support for remedial action. Support for remedial action and restoration also comes from schools, NGO, ratepayer organizations, and some parts of the business community.
Assessing Progress	
Implement the integrated Toronto and Region watershed monitoring program, developed by TRCA and its partners, to provide a complete picture of watershed health.	The RWMN has been operating since 2001 at 150 stations across the TRCA jurisdiction. The RWMN gathers data on a number of important variables including surface water quality, benthic invertebrates, fish communities, fluvial geomorphology, groundwater levels and quality, stream flow and precipitation (see Section 3.7.1).
Undertake the specific studies to confirm the status of the three beneficial uses currently listed as "Requires Further Assessment".	Two of the three studies have been completed (see Section 3.7.4)

Created from the construction debris of an urbanizing City core, Tommy Thompson Park has become an internationally recognized urban wilderness, providing refuge for fish and wildlife and is the centerpiece for Toronto's waterfront revitalization.

5 Moving Forward

As illustrated throughout this Progress Report, the Toronto and Region AOC faces a staggering number of problems. Not only must the RAP address historical issues relating to contaminated bottom sediments, degradation of benthos, and loss of fish and wildlife habitat, but it must also contend with issues relating to continued urbanization. Between 2006 and 2031, the population of the City of Toronto, the Region of Peel and York Region is expected to grow by an additional 1.2 million people, or 26%. Meeting the needs of future residents of the area will lead to continued losses of farmland, forests and wetlands, increasing pressures on wildlife, and the continued degradation of terrestrial and aquatic resources.

Chapter 3 of this report outlines the concerted and considerable efforts that are being made to protect and enhance the environment in the Toronto and Region AOC. The Toronto RAP Team believes that the blueprint for remedial action is complete. There are long-term plans in place to reduce and prevent pollution and remediate degraded areas. There are watershed plans and habitat plans to guide restoration efforts. There are comprehensive monitoring systems to give us timely and vital information on the conditions of our watersheds and waterfronts and the natural resources, fish and wildlife that lie within them. Funding is being committed to implement waterfront projects, restore habitats and reduce pollution. And implementation is well underway. The Toronto and Region AOC is indeed *Moving Forward*.

But we should not imagine that two centuries of pollution, land use change and urbanization can be undone with a mere two decades of action. Urbanization and runoff will remain a challenge into the future. It will take continued concerted efforts of remedial action, and time beyond that, for the waters and habitats of the Toronto and Region AOC to be restored to health. The time is right to transition the Toronto and Region AOC into a status more reflective of its current state of progress; one that recognizes perpetual issues that will continue to impact this Region. This involves asking and answering the following questions:

- How will we know when all of the required remedial plans and actions have been implemented?
- What are the key indicators we need to measure to ensure that progress is being made in restoring waters and habitats to health?
- What are the desired endpoints for these indicators?
- How should consultation and reporting be done?

These questions need to be addressed in a process that is both rigorous (from a planning and technical point of view) and open (in terms of consultation). The aim is not to replace the original goals of the Toronto and Region RAP that relate to de-listing Toronto as an Area of Concern, but to create interim benchmarks that relate to and reflect efforts that are on-going in the Region.

Developing criteria to be used in this Region to measure progress against should begin first with a technical discussion that reflects the challenges, changes, progress and scientific advancements made since the RAP Stage 2 Report was developed in 1994. A public discussion of this criteria and what this RAP, along with its partners, can realistically achieve (bearing in mind economic and time scales) needs to take place.

5.1 KEY ACTIONS FOR 2007–2012

Wet Weather Flow

- Support the City of Toronto's Environmental Assessment Process for the Don Trunk Sewer System and Waterfront Interceptors. This project will deal with the outfalls discharging to the Lower Don River, the Inner Harbour, and Taylor-Massey Creek.
- Support the City of Toronto to furthering work on implementing the identified eight key projects under the WWFMMP to clean up the waterfront including:
  - *Etobicoke Waterfront Stormwater Management Facilities (Class EA)*,
  - *Bonar Creek Stormwater Quantity and Quality Treatment Pond (Class EA)*,
  - *Ellis Ave./Colborne Lodge Drive SWM Wetlands (construction)*,
  - *Western Beaches Master Plan*,
  - *Don and Waterfront Interceptor Trunk Capacity and CSO control (Class EA)*,
  - *Coatsworth Cut CSO and Storm Outfall Control Plan (Class EA)*,
  - *Eastern Beaches Storm Sewer Outfall (Class EA)*,
  - *Scarborough Waterfront CSO and Stormwater Outfalls Control (Class EA)*.
- Increase grassroots involvement in the implementation of the City of Toronto's Wet Weather Flow Management Master Plan through the Community Program for Stormwater Management (CPSWM).

Stormwater Management

- Continue to support the Sustainable Technologies Evaluation Program (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 a rainwater harvesting at demonstration sites.
  - Demonstrating and evaluating Best Management Practices identified in the *Guideline for Erosion and sediment control for Urban Construction*.
  - Supporting and providing training opportunities to various groups that would be involved in the design and implementation of an Erosion and Sediment Control Plan at urban construction sites.
  - Support the development of a water balance model.
- Encourage municipalities in the upper watersheds to implement retrofitting of stormwater management facilities and outfalls.
- 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, business and industries.
- 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 at a site level. Including the completion of a low-impact development pilot project.

Spill Management

- Support the development of a Spill Response Decision Support System (web-based tool) to aid in the prevention and mitigation of spills. TRCA will continue to work with municipal partners and other agencies to prevent spills and improve spill response.

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 designation.

HEALTHY HABITATS

Terrestrial Habitat

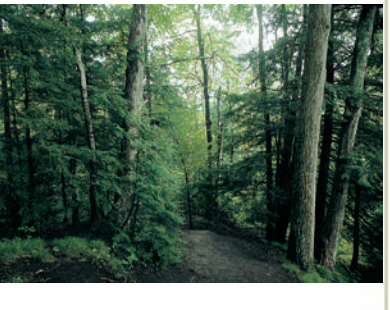
- Support incorporation of the Terrestrial Natural Heritage System Strategy into municipal Official Plans

The following projects are considered necessary components to the successful implementation of the TNHSS:

- Complete the refinement THNSS at the watershed scale for all watersheds.
- Support the development of a methodology and framework to be applied when determining compensation for land development.
- Support the development of the Recovery Planning Project that will prioritize ecosystem restoration and identify opportunities that will offer the greatest ecological benefit.

Riparian Regeneration

- Support the regeneration of stream corridors to meet targets established in Watershed Strategies and reports.



- Support development of the Riparian Restoration Strategy (test project for Etobicoke-Mimico) and implementation of priority sites.

Wetlands

- Develop wetland restoration projects in the upper Rouge and Humber watersheds through the Ontario Headwaters Restoration Initiative.
- Complete the final phase of the Rouge Marshes rehabilitation.
- Construct Newbury Park wetland in Rouge River Watershed.

Aquatic Habitat

- Mitigate barriers to facilitate the passage of native fish species (non-jumpers) in Humber River.
- Spawning surveys to be completed and road culverts to be assessed in the Humber headwaters in preparation for Atlantic Salmon re-introductions.
- Complete and implement Fish Management Plans for all the watersheds.

Waterfront

- Support the implementation of priority projects as identified in Aquatic Habitat Toronto (formerly referred to as: Toronto Waterfront Aquatic Habitat Restoration Strategy) (i.e. Spadina Slip, Central Waterfront (West Eight), Lake Ontario Park, East Bayfront, Lower Don Lands).
- Support the development and implementation of the Toronto Beaches Plan.

SCIENCE AND MONITORING

Monitoring

- Sustain the Regional Watershed Monitoring Network.
- Work with partners to establish a regular water quality and sediment monitoring program for the Toronto Waterfront.
- 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.
- Continue sediment and water sampling to study concentrations of current-use chemicals in the Toronto and Region waterfront.
- Conduct a pilot study on Etobicoke Creek to continuously monitor water quality during storm events (capturing peak flows and “first-flush” levels).
- 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.
- Report on the watershed health in the Area of Concern.

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) and monitoring data, and, where possible, determine environmental end points.

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.
- 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 (*A Green Strategy for Highland Creek*).
- Support TRCA and partners as they continue studies and evaluations that contribute to the development of technologies and strategies which help mitigate the impacts of growth in the Toronto and Region AOC.
- Support the use of established mechanisms such as watershed plans, task forces, councils and alliances to identify policies and facilitate projects which contribute to successful watershed protection, RAP implementation and the attainment of COA and Great Lakes Water Quality Agreement targets.
- Encourage and support the development of business outreach and Eco-Industrial Networking opportunities within the AOC (i.e. Partners in Project Green).

Education and Involvment

- Support Watershed Advisory Councils.
- Sustain key education and community stewardship initiatives (e.g. Watersheds on Wheels, etc.) including tree planting on private land, the development of Environmental Farm Plans.
- Support TRCA and partners to 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.
- Facilitate the transfer of technology (i.e. construction of green technologies, improved erosion control measures) to local municipal staff, developers, etc.
- The Toronto and Region RAP Team will continue to build public, agency and municipal awareness of and support for the implementation of the Toronto and Region RAP and its goals.
- The Toronto and Region RAP Team will 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.
- The Toronto and Region RAP Team will continue to build federal and provincial support for sustainability initiatives.

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