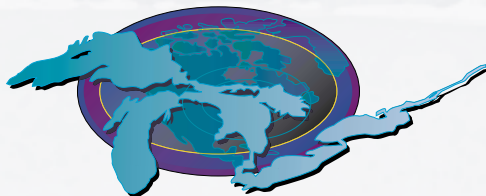




# Canada's RAP Progress Report 2003



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# The Great Lakes Water Quality Agreement and Remedial Action Plans



The Great Lakes are a rich and valuable natural resource. However, industrial, municipal, and recreational uses of the Great Lakes have imposed great stress on the Great Lakes ecosystem. Pressures arise from toxic substances in water, sediment, fish, and other organisms living in, or dependent on, the aquatic ecosystem; elevated levels of bacteria; and high levels of phosphorus and other nutrients. Native fish, bird, mammal and plant species have been lost due to inputs of chemical pollutants and the extensive destruction of habitat. Human health is potentially at risk due to contaminants in the ecosystem.

The Canada-U.S. Great Lakes Water Quality Agreement, first signed in 1972 and renewed in 1978, expresses the commitment of each country to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem and includes a number of objectives and guidelines to achieve these goals. It reaffirms the rights and obligations of Canada and the United States under the Boundary Waters Treaty of 1909.

In 1987, a Protocol was signed amending the 1978 Agreement. The amendments strengthened the programs, practices and technologies described in the 1978 Agreement and increased accountability for their implementation. One annex (Annex 2), added in 1987, incorporated the development and implementation of Remedial Action Plans (RAPs) for Areas of Concern (AOCs).

## AREAS OF CONCERN (AOCs) AND THE GREAT LAKE BASINS

There are currently 41 Areas of Concern in the Great Lakes, 15 of which are either wholly or partially in Canada (Figure I), five of the AOCs (St. Marys, St. Clair, Detroit, Niagara and St. Lawrence Rivers) are shared with the U.S. These problem areas or hot spots were designated based on environmental problems that have impaired the beneficial uses of the aquatic system e.g. swimming, fishing, drinking water, ecological health, fish and wildlife habitat.

## CANADIAN AOCs INCLUDE:

Thunder Bay	Wheatley Harbour
Nipigon Bay	Niagara River
Jackfish Bay	Hamilton Harbour
Peninsula Harbour	Toronto and Region
St. Marys River	Port Hope
Spanish Harbour	Bay of Quinte
St. Clair River	St. Lawrence River (Cornwall)
Detroit River	

Collingwood Harbour and Severn Sound were formerly Canadian AOCs that were delisted in 1994 and 2003 respectively.

Figure I. Areas of Concern in the Great Lakes-St. Lawrence Basin. Source: Environment Canada



Lake Superior is the largest freshwater lake in the world by area. By North



American standards it is relatively undeveloped and its mainly forested watershed is considered pristine. Nevertheless, five Canadian Areas of Concern associated with the forest product and steel making industries have been identified. The AOCs in this basin from west to east are Thunder Bay, Nipigon Bay, Jackfish Bay, Peninsula Harbour and St. Marys River which is binational (see Figure I for locations). There are three U.S. AOCs on Lake Superior.

Fed by the St. Marys River and Lake Michigan, Lake Huron is drained by the St. Clair River. The one remaining AOC on the Canadian side is Spanish Harbour. Severn Sound and Collingwood Harbour were restored and delisted in 2003 and 1994 respectively. The only AOC on the U.S. side of Lake Huron is at Saginaw Bay. Lake Michigan has ten AOCs around it.

The shallowest and warmest of the Great Lakes, Lake Erie is biologically highly productive and is subject to lake wide nutrient enrichment and rapid ecological changes. Lake Erie has the most highly populated basin and land use is a major issue. The water corridor running from the St. Clair River through Lake St. Clair and the Detroit River feeds into Lake Erie. The binational AOCs associated with this lake are the St. Clair River and the Detroit River. The sole Canadian AOC is Wheatley Harbour. There are eight U.S. AOCs on Lake Erie.

Lake Ontario is the furthest downstream of the Great Lakes and drains into the St. Lawrence River. The Canadian side is highly populated and the western end of the basin from Hamilton to Toronto is dominated by urban sprawl and industrial activity. The six Canadian AOCs from west to east are Niagara River, Hamilton Harbour, Toronto and Region, Port Hope Harbour, Bay of Quinte and Cornwall on the St. Lawrence River. On the U.S. side there are four more AOCs. Separate U.S. RAPs were undertaken for the Niagara River and the St. Lawrence River at Massena.

## DEVELOPMENT AND IMPLEMENTATION OF REMEDIAL ACTION PLANS (RAPs)

Canada, in partnership with Ontario and with extensive public consultation has developed Remedial Action Plans (RAPs) for all of the Canadian Areas of Concern. In 1987, federal and provincial agencies under the lead of Environment Canada and the Ontario Ministry of the Environment established scientific/technical RAP teams led by coordinators to identify environmental problems, determine sources and causes of the problems, involve the public to establish community and stakeholder goals and objectives and to develop consensus on recommended actions, implementation plans and monitoring strategies.



Remedial actions, because of their breadth and range, fall under the responsibilities of the three levels of government, industry and in some cases,

individuals within the urban or rural community. Because of the commitments and obligations in the Great Lakes Water Quality Agreement, the federal government has overarching responsibility for the restoration of Areas of Concern as well as some additional specific responsibilities. Examples of these specific obligations include those relating to federal lands including beds of harbours, federal legislation (i.e. Fisheries Act), international waterways, and scientific research and information/technology transfer.

Implementation of remedial actions is well underway in all AOCs and involves many sectors of society including all levels of government (federal, provincial, municipal, First Nations), industry, non-government organizations and individuals. The communities, in many cases have adopted RAPs and, with federal and provincial assistance and leadership, have formed locally-based implementation frameworks. Scientific and technical RAP teams and coordinators have largely been replaced by these local restoration councils and committees within communities which have benefited from local consensus for implementation. More work needs to be done however, to address the needs of individual AOCs for which there are no implementation structures and to provide scientific, technical, coordination and public involvement support in all AOCs as they tackle the remaining issues.

The ongoing challenge is to ensure progress in implementation through partnerships and to find creative solutions to issues that result from decades of environmental degradation, are costly, and not easily resolved.

## RAP IMPLEMENTATION AND THE GREAT LAKES SUSTAINABILITY FUND

Since 1990, the Great Lakes Sustainability Fund, (formerly the Great Lakes Cleanup Fund) has provided financial and technical support to assist AOCs in implementing actions to improve water quality and restore impaired beneficial uses. The focus of the Fund is to demonstrate and implement innovative and cost-effective technologies and methods for:

- urban stormwater control and enhancement of the performance of municipal Sewage Treatment Plants (STPs);
- remediation of contaminated sediments;
- control of rural non-point sources of pollution, and;
- rehabilitation of fish and wildlife habitat

Between 1990 and 2001, the GLSF contributed over \$74M to support work towards the restoration of impaired beneficial uses. Over 600 projects are underway or have been completed to rehabilitate fish and wildlife habitat (\$27M), remediate contaminated sediments (\$22M), control urban storm water (\$9M), optimize sewage treatment plants (\$8M), address rural non-point sources of pollutants to waterways (\$7M), and transfer new technologies (\$1M). Approximately 20 percent of these projects

are in support of applied research and are applicable to all AOCs. Funds are spent on monitoring and tracking the recovery of ecosystems once restoration decisions are made and implementation actions are completed.

The tally for the total value of the partnerships with GLSF is over \$220M with municipalities and provincial agencies contributing \$38 and \$35M respectively. Canadian private industry contributions have totaled \$17M over the time period.

In February 2000, the Government of Canada announced an additional \$40 million over five years specifically targeted to meeting federal requirements identified in Remedial Action Plans including \$30 million dedicated to the GLSF. Approximately \$24 million of this \$40 million has now been spent.



## THE CANADA-ONTARIO AGREEMENT (COA), RESPECTING THE GREAT LAKES BASIN ECOSYSTEM



Canada and Ontario renewed the Canada Ontario Agreement (COA), Respecting the Great Lakes Basin Ecosystem in March 2002.

The renewed agreement supports the restoration and protection of the Great Lakes ecosystem for which both governments have laid out environmental priorities and have set specific goals and actions. An Annex to the Agreement for Areas of Concern will be in effect for a five year period and outlines specific commitments for both federal and provincial governments to meet collective goals to restore at least 2 AOCs, complete required actions in at least 6 AOCs and make significant progress in the remaining AOCs.

As part of its ongoing commitment, the province of Ontario has secured \$50 Million to support COA objectives over the 5 year period of the COA annexes. Significant progress is expected to be made during this next phase of restoring AOCs and will be reported on again at the end of the COA timeframe.

## RECOVERY/RESTORATION

Once all remedial actions are completed, an AOC may be designated as being in recovery while the environment responds to source control, cleanup efforts, or habitat rehabilitation. If monitoring shows that the restoration targets for the impaired beneficial uses have been met, and the local community is in agreement, then the AOC will be delisted. In 1994, Collingwood Harbour was determined to be restored and became the first AOC to be delisted. In 1999, all implementation actions were completed in the Spanish Harbour AOC and the area is being monitored for recovery. The Severn Sound AOC was delisted in January 2003.

Canada and Ontario remain strongly committed to the protection of the Great Lakes Basin ecosystem and are demonstrating leadership in the cleanup and restoration of Areas of Concern. However, the federal and provincial governments cannot do the job alone. Municipalities, industry, community organizations and individuals must all do their share.



Together, we will restore environmental quality in Areas of Concern and achieve our goal of a healthy and sustainable Great Lakes Basin ecosystem. Cleaning up AOCs will not only restore environmental quality at the community level, it will help to restore the environmental quality of the entire Great Lakes Basin ecosystem.

## STATUS OF REMEDIAL ACTION PLANS

The section that follows presents 17 portraits formatted to provide background and environmental issues for each of the remaining and the two delisted AOCs; government and community achievements to date, the future activities that are planned or underway; and a delisting outlook. A summary is provided (Table I) that displays the beneficial use impairments found in each remaining AOC. The portraits are grouped by status of the AOC and then by lake basin beginning with Lake Superior and ending downstream with Lake Ontario and the St. Lawrence River.

The status of beneficial uses is based on the most recent documentation and monitoring information. Conditions are subject to change as new information becomes available and the impairments are re-assessed.

This progress report is intended to provide a snapshot of conditions and activities as they are known at present and are current up to January 2003.



Table I: Status of Beneficial Use Impairments in Canadian Areas of Concern. January, 2003

AREA OF CONCERN	BENEFICIAL USE IMPAIRMENTS (AFTER THE GREAT LAKES WATER QUALITY AGREEMENT OF 1987, ANNEX 2)													
	Restrictions on fish and wildlife consumption	Tainting of fish and wildlife flavour	Degradation of fish and wildlife populations	Fish tumours or other deformities	Bird or animal deformities or reproduction problems	Degradation of benthos	Restrictions on dredging activities	Eutrophication or undesirable algae	Restrictions on drinking water consumption or taste and odour	Beach closings	Degradation of aesthetics	Added costs to agriculture or industry	Degradation of phytoplankton or zooplankton populations	Loss of fish and wildlife habitat
Thunder Bay	•		•	•		•	•			•			•	•
Nipigon Bay			•			•		•			•			•
Jackfish Bay	•		•	•							•			•
Peninsula Harbour	•		•			•				•				•
St. Mary's River	•		•	•		•		•		•				•
Spanish Harbour	•					•								
St. Clair River	•		?			•		•		•				•
Detroit River	•	•	?	•	?	•		•	•	•				•
Wheatley Harbour			•		?			•						•
Niagara River	•		•		•	•				•			?	•
Hamilton Harbour	•		•	•	?	•		•	•	•			?	•
Metro Toronto	•		•	?	?	•		•	•	•			?	•
Port Hope								•						
Bay of Quinte	•		•	?		•		•	•	•				•
St. Lawrence River	•		•	?	?	•		•	•	•			?	•

## LEGEND

- Impaired
- ? Requires Further Assessment
- (Blank) Not Impaired



# Severn Sound

Severn Sound is located in the most southeastern part of Georgian Bay. It is a complex of bays and their collective watershed which covers an area of 1,000 square kilometers and extends into Central Ontario nearly as far as Lake Simcoe. Between one third and one half of the watershed is used for crop and livestock production and the immediate Severn Sound watershed is drained by six rivers flowing through the agricultural areas. Other features are the patchwork of woodlots including interior forest habitat and a variety of self-sustaining colonies of fish-eating bird species. There are significant human population centres in Midland and Penetanguishene.

## IMPAIRMENTS

The RAP originally identified eight beneficial use impairments (BUIs) in 1988 and these have now been restored to the extent possible at the local level.

In 1988, two primary issues were identified in the AOC:

- eutrophication reflected in excessive algal growth and other ecosystem alteration; and
- destruction of coastal, riparian and upland habitats with consequences to the diversity and balance of fish and wildlife communities.

Eutrophication, as a result of sewage treatment plant (STP) inputs, agricultural activities, and shoreline development, was especially evident in the constricted embayments on the south shore of the Sound. Another concern was the imbalance in the fish community of the Sound with a lack of top predator fish species (particularly walleye). Contributing factors to the degradation include loss of suitable habitat, angler pressure on walleye, three consecutive years of low water levels and the arrival of non-native aquatic species. A further challenge was the loss of riparian habitat in the watershed due to unrestricted livestock access to streams and shoreline marina construction in the embayments. Finally sport fish consumption advisories due to mercury were in effect for walleye, smallmouth bass, rainbow trout and white sucker although these were attributed to sources outside the AOC.

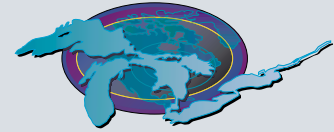
## RAP STATUS

The Severn Sound AOC was delisted in January 2003. A strategy for the restoration of the Severn Sound AOC was formulated by 1993 and the Stage 3 RAP report was completed in 2002. The Stage 3 gave the evidence of restoration of BUIs and the rationale for delisting of this AOC. The report also provides recommendations for monitoring. Between 1989 and 2002, 38 actions recommended in the RAP have been implemented.

## MAJOR ACHIEVEMENTS

Restoration of water conditions to delist the eutrophication impairment have been met as a result of source control of phosphorous. Loads were addressed by reducing total phosphorous from sewage treatment plant (STP) discharges, upgrading private sewage systems, eliminating sewage bypasses and combined sewer overflows, and reducing inputs from agricultural sources.

Actions were completed to improve STP efficiency that reduced the phosphorous loads to meet RAP targets and provided considerable cost savings to the municipalities. Through the Sewage Treatment Optimization Project, the federal and provincial governments provided technical support and training for municipal operators in all eight STPs in the AOC. In addition, Ontario MOE contributed \$23M to upgrade four of the eight STPs. The Severn Sound Urban Stormwater Strategy was developed by municipalities and enabling bylaws



have been passed to govern new construction, stormwater retrofits and sewer separation projects. Implementation will be ongoing. To reduce algal growth in Severn Sound, 3000 private shoreline sewage systems were inspected and improvements were applied to 600. Despite economic uncertainties in the agricultural sector, the loadings from agricultural sources to four tributaries have been reduced through farm level projects to manage manure runoff, treat direct milkhouse wastes, restrict livestock access to rivers and improve crop practices.

Since 1990, the Government of Canada's Great Lakes Sustainability Fund has provided \$3.4 M towards restoring environmental quality in support of 22 projects in the Severn Sound AOC. The return on this investment in partnerships has realized over \$4M in direct partner funding and nearly \$2M from in-kind contributions.

Through conservation agreements and wetland rehabilitation projects, 411 hectares of wetlands and their associated uplands have been protected to date. In streams flowing directly into the Sound, 132 projects have been completed creating vegetation buffers and linking habitat nodes. In addition, Natural Heritage Strategies are being adopted by townships and municipalities.

Beginning in 1991, Trumpeter Swans have been reintroduced to Wye Marsh and there is progress in their re-establishment although not all pairs have bred successfully. Until recently the success of the program was limited by the presence of toxic lead shot in the habitat. The lead shot ban in 1993 and an innovative technology to sink the pellets deep into sediment out of reach of the swans will assist in achieving the goal of a sustainable population.

The economic viability of the area has improved through upgraded infrastructure, local job creation, and cost-effective decisions assisted by RAP studies; volunteer participation; and positive media support indicate community acceptance of the RAP principles of maintaining a healthy environment including ensuring economic and environmental sustainability are built into municipal plans.

## PUBLIC INVOLVEMENT

The federal/provincial RAP team established the RAP in 1987 and the Stage I RAP (problem identification) was released in 1988 for public review. Since that time community involvement in Severn Sound has been both extensive and innovative. The highly diverse Public Advisory Committee (PAC) formed in 1989 had a wide range of opinion and expertise. The PAC lobbied persistently and was instrumental in bringing environmental improvements to the region and the inclusion of RAP guidelines into municipal Official Plans. The PAC assisted in public education and awareness, provided feedback for the final stage of the RAP, and has made recommendations for the future of Severn Sound. The lead for public involvement is now with the Severn Sound Environmental Association (see sidebar).

## DELISTING RATIONALE

The RAP process in Severn Sound has been a significant success. For each BUI the Stage 3 RAP report contains a status and rationale for delisting impairments. Restoration has been achieved based on implementation actions completed or ongoing and delisting objectives have been met. Two impairments were related to conditions outside of the AOC. Fish population degradation with respect to top predators remains impaired but delisting has proceeded with the proviso that agencies commit to a long term monitoring program that assesses the fish community in relation to those in Georgian Bay and that the results will be used to manage the fishery. Sportfish advisories remain in effect for walleye, small mouth bass and northern pike due to mercury contamination. These levels are similar to other areas of Georgian Bay and through the use of biomonitoring no local source of mercury has been found.



## RECOMMENDATIONS FOR FUTURE ENVIRONMENTAL MONITORING

With delisting the Severn Sound Area of Concern in 2003, coordination among all levels of government and the community is needed to plan sustained and scientifically defensible monitoring of Severn Sound. The Stage 3 RAP has recommended: long term monitoring of the trophic status of the Sound; a long term fish population monitoring program; fish habitat assessments; sportfish contaminant monitoring every five years; a benthic sediment assessment study in 2004; developing and using indicators of ecosystem health for monitoring and assessment; beach pollution surveys including monitoring for source discharges; and tracking historical contaminant problems using biological monitoring.

Currently, GLSF is funding a fish community assessment as a commitment under delisting. The expectation is that the Ontario Ministry of Natural Resources and the federal Department of Fisheries and Oceans will be involved in future monitoring of the fish community.

## OTHER FUTURE ACTIVITIES

To preserve the environmental gains made in the Severn Sound AOC and to protect the considerable investment of effort and funding, there is a need for long term sustainability. Socioeconomic development in the Severn Sound area will continue. Support will be required to engage property owners in projects for rural non-point source pollution control and to continue tributary and wetland rehabilitation.

## SEVERN SOUND ENVIRONMENTAL ASSOCIATION (SSEA)

A unique partnership was formed in 1997 among eight municipalities in southeast Georgian Bay, Environment Canada, Ontario Ministry of Environment and the Friends of Wye Marsh Inc. (an environmental non-profit organization) to provide support for RAP implementation. The PAC is represented on Severn Sound Environmental Association as a non-voting member.

The Association's goals are to oversee the delisting of Severn Sound as an AOC and then complete the transition from the RAP program to a locally sustained office to manage environmental improvements achieved by the RAP process. SSEA has consolidated support from the public and municipalities for RAP restoration projects.

In March 2001, member municipalities and Environment Canada signed a three year agreement for the Association to oversee delisting and continue long term monitoring. SSEA will provide:

- monitoring of environmental status to detect new problems;
- access to and coordination of government agency resources;
- expertise in planning, designing, funding and implementing environmental projects;
- a "neutral informed voice" that will assist the community in putting a priority on efforts, implementing inter-municipal projects and assist in planning and infrastructure decisions;
- coordination of the Severn Sound environmental database.

SSEA intends to continue its efforts towards a sustainable future by maintaining partnerships and implementing projects to protect and enhance the environmental gains that have been achieved to date. For example, SSEA is seeking to institutionalize the federal "no net loss" policy for fish habitat and will assist municipalities to incorporate the Fish Habitat Management Plan into municipal planning documents. SSEA activities will move well beyond the completion of the Remedial Action Plan for Severn Sound.



# Collingwood Harbour

Located on the southern tip of Georgian Bay in Lake Huron, Collingwood Harbour encompasses 0.8 square kilometres in a watershed that is approximately 33 square kilometres. The harbour is surrounded the town of Collingwood and includes a wetland complex, and former shipyards and grain terminal.

The harbour was highly eutrophic, with the principle source of nutrient loading being the sewage treatment plant (STP). Habitat destruction and contaminant inputs were largely historic and attributed to industrial activity.

## ACHIEVEMENTS

In 1994 Collingwood Harbour became the first Area of Concern in the Great Lakes to be delisted by Canada and Ontario.

A critical component of the Remedial Action Plan was a strategy to reduce phosphorus loads and control eutrophication and temporal anoxia. Technical solutions focussed on optimizing phosphorous removal at the Collingwood STP through an innovative demonstration project. The technology achieved an effluent quality comparable to that of tertiary treatment, but at less than 10 percent of the cost. In response to the loading reductions, the harbour is no longer eutrophic.

In November 1992, a demonstration project was initiated to safely remove sediments contaminated with heavy metals (copper, lead, zinc and chromium) using the Pneuma pump innovative dredge technology. The sediments were placed in a Confined Disposal Facility (CDF) which has since been decommissioned. The successful demonstration led to a full scale cleanup in the harbour in 1993 in order to rehabilitate the degraded benthic community, remove chronic toxicity, and lift restrictions on navigational dredging. This was the first time this dredge was used in North America, and the cleanup marked a crucial step towards the restoration of the harbour. The cost of the demonstration and cleanup was \$635K and 7300 cubic metres of contaminated sediments were removed. The project was successful in reducing ecological risk. With the closure of the Collingwood Terminals and the CDF, no further navigational dredging is anticipated.

Efforts were also directed at protecting the existing 96-hectare Collingwood Wetland Complex, controlling the invasion of Purple Loosestrife in the wetlands, and rehabilitating fish and wildlife habitat in the harbour and the watershed. Bass and pike spawning and rearing habitat was created, as were opportunities for osprey, water birds, amphibians, and reptiles, and a community volunteer network was mobilized to monitor wildlife populations. The Black Ash Creek Rehabilitation Project was designed to prevent erosion while incorporating habitat rehabilitation in a natural, bioengineering approach to bank stabilization. Fish populations responded to the initiatives, with successful recruitment documented for the first time in over 30 years. Wildlife populations are also considered unimpaired.

The RAP placed a strong emphasis on pollution prevention. The *Greening of Collingwood* continues as a community based action plan targeted at pollution prevention for residents, businesses, and industries. The first comprehensive "Green Home Tune-ups" in Ontario were completed in Collingwood in 1994 with incentives offered by the financial sector.



One of the most novel projects designed to raise awareness of the importance of pollution prevention is the environmental theme park: ENVIROPARK. Situated in Sunset Point Park, this unique network of play structures was designed to instill in children an understanding of how everyday life has a direct impact on our environment. Instead of the classroom setting, young people learn while they play.

As a result of the community's commitment to the RAP, environmental quality improved dramatically to the point where all the delisting targets were either met or surpassed.

## MONITORING

Monitoring data are critical in the tracking and confirmation of delisted AOCs. An agreed upon period of time needs to elapse to demonstrate that environmental conditions remained improved and the restoration of beneficial uses has been maintained. For Collingwood Harbour three years of monitoring on water quality and young of the year fish in the harbour and tributaries showed consistent attainment of RAP delisting targets. MOE will be undertaking water quality and sediment monitoring in Lake Huron, including Collingwood Harbour in 2003. Monitoring of fish and wildlife by the community continues.

Sediment monitoring in 1995 by Environment Canada found that benthic species in the harbour were different from those in reference sites however, it was due to the assemblage of organisms present which were reflective of nutrient conditions and not due to the presence of contaminants. Recommendations for further actions include repeating sediment toxicity tests and resampling of sites to determine if the benthic community is returning to reference conditions. A follow-up Environment Canada benthic sediment assessment survey is scheduled for 2004.



# Spanish Harbour

Spanish Harbour is located within the Canadian Shield on the northern shore of the North Channel of Lake Huron. The AOC extends from the mouth of the Spanish River upstream 53 km to the town of Espanola. Whalesback Channel adjacent to the harbour is also included as part of the AOC.

The river and harbour were designated as an AOC in 1985 due to historic log-driving operations and the discharge from the Domtar Inc. Eddy Specialty Papers (formerly E.B. Eddy Forest Products Ltd.) pulp and paper mill at Espanola. The Vermilion River, which enters the Spanish River above Espanola drains the Sudbury basin and there are additional impacts due to historic and on-going mining, milling and smelting activities of INCO Ltd. and Falconbridge Ltd. in the adjacent basin.

The Spanish River Delta Marsh is designated as a provincially significant wetland with only five percent lost to waterfront development. The watershed is primarily uninhabited forest with the forestry industry being the most important economic force in the area. Domtar is the largest employer in Espanola which is the largest town in the AOC. All municipalities in the AOC are expanding tourism opportunities within their jurisdiction. The Sagamok Anishnawabek First Nation is located in the AOC.

## IMPAIRMENTS

The first (Stage I) ecosystem assessment under the RAP process identified nine beneficial uses that were either impaired or required further scientific assessment. By 1997, many of the impacts were remediated and six of those impairments had been completely restored. The remaining use impairments included sport fish consumption restrictions due to mercury, degraded benthic communities in Spanish Harbour and Whalesback Channel and dredging restrictions related to elevated metal (nickel, copper, zinc) in the river and

harbour sediments. Although there did not appear to be any significant impairment of fish populations in the river, there was evidence in 1997 that the fish were exposed to bioactive compounds from the pulp mill and that physiological effects such as enzyme inductions and depressed serum steroid levels had occurred. This was tagged for follow-up monitoring after Domtar completed actions to eliminate chlorinated compounds from its effluent by 2002.



## ACHIEVEMENTS

The significant improvement in beneficial uses of the AOC is due to considerable efforts and financial investments by the communities, industry and governments. Environment Canada scientists conducted specific environmental assessments within the AOC related to fish and wildlife populations and the degraded benthic communities. The Government of Canada's Great Lakes Sustainability Fund (GLSF) contributed to the development of the sediment mass balance study which then provided the information required by the RAP Team to assess loading reduction scenarios, make determinations with respect to remedial options and to make the case for natural recovery.

One of the fish and wildlife impairments originally identified was the loss of muskellunge from the fish community. When it was determined that water quality had improved sufficiently to make the recovery of muskellunge feasible, GLSF and 12 other partners teamed together to undertake a muskellunge re-introduction program beginning with the release of hatchery reared fish. The long term goal is to re-establish a self-sustaining population of this species in the river.

Domtar Inc-Eddy Specialty Papers invested \$35 million in environmental control equipment and programs both within the watershed and upstream. These improvements include: the elimination of the final effluent foam pond and complete replacement of the old wood stove; effluent line installation of secondary treatment of discharge; elimination of hypochlorite bleaching; the replacement of the settling basins and spill liners and implementation of ozone bleaching on the hardware line; the construction of a state of the art Hardwood Chip Storage and Reclaim system with complete storm water containment and treatment; and the installation of permanent air diffusers in the Spanish River to maintain a minimum dissolved oxygen level. Upgrades will be continuing and the facility will use opportunities to reduce water and air emissions when possible.

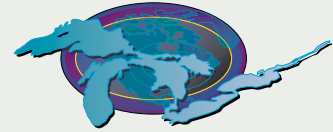
INCO Ltd. and Falconbridge Ltd. located in the Sudbury basin, upstream of the AOC, have completed a number of environmental initiatives in recent years. These include major modifications at both smelter facilities to meet emission levels

required by the Countdown Acid Rain program. Other regulatory requirements have resulted in initiatives to address effluent limits for metals, suspended solids and pH, elimination of bypasses and achievement of non-toxic effluent.

INCO Ltd. has begun a multi-year initiative of several million dollars to reduce effluent bypasses at their central tailings area and wastewater treatment facilities in Copper Cliff, in the City of Greater Sudbury. This will result in reduced metal loadings to the Spanish River system during high flow periods. Initiatives are also underway to reduce the discharge of uncontrolled runoff to the Spanish River system. Currently, Falconbridge Ltd. discharge points do not experience bypasses. Both companies are generally in compliance with the MISA limits for effluent parameters at their discharge points.

The new Espanola Sewage Treatment which opened in 1995, incorporated aerobic secondary treatment and ultra-violet disinfection to treat effluent prior to discharge. The selection of ultra-violet disinfection by the Town of Espanola, was based on the results of a project that evaluated alternatives to chlorine which would represent a reduced health and environmental risk. The study was requested by the RAP Team and Public Advisory Committee and supported by GLSF.





## PUBLIC INVOLVEMENT

During the development and implementation of the RAP there was an active Public Advisory Committee. In 1994 *Friends of the Spanish River* was formed to increase public and industry awareness and involvement. The Stage 2 RAP was completed in 1999 and was celebrated with a public event that included the launch of the Adopt a Musky program. Local school children participated in an “Adopt a Musky” contest which provided educational opportunities. Annual introduction of muskellunge yearlings to the river is an ongoing and highly visible activity in the community credited to Friends of the Spanish River.

## NATURAL RECOVERY OF THE SPANISH RIVER

A variation to the straight forward process of remediation followed by delisting is that of natural recovery. When all reasonable and practical interventions towards restoring an impaired beneficial use have been completed a further time period may be required for the environment to fully respond. Agencies commit to monitoring the recovery process and assess when the targets are met. The local public and PAC agree to a time scale with governments. In the interim a maintenance plan is put in place to ensure that no further degradation occurs. In the event that recovery does not occur, agencies would need to reconsider interventions. In other cases, the application of emerging technologies may be warranted.

In 1999, the Spanish River was the first AOC to be recognized as an Area in Recovery by the federal and provincial governments. All the recommended restoration activities have been completed, however ecosystem impairments still exist for the river and harbour sediments. Natural processes have the capacity over time to complete the restoration. This achievement would not have been possible without the actions that have been taken by the communities and industries to reduce or eliminate their impacts on the environment and their efforts were celebrated at a special event held in June 1999.

## FUTURE ACTIVITIES

Government agencies are continuing their support of the muskellunge re-introduction project. Further stocking of fingerlings is required and would be followed with monitoring of population size to determine if the re-introduction of this top predator fish species is a success. The completion of the muskellunge re-introduction program will form one element for the re-establishment of the historical fish community.

At present the sportfish consumption advisories in effect for mercury reflect lakewide conditions and are not a result of sources within the AOC. Monitoring of sport fish contaminant levels is continuing at regular intervals. Although dioxin levels do not trigger advisories, ecosystem impacts should be assessed by monitoring young of the year fish for dioxin and dioxin-like PCBs according to Canadian Council of Ministers of the Environment (CCME) guidelines.

The recognition of Spanish Harbour as an Area in Recovery still requires Environment Canada, the Ontario Ministry of the Environment and their community partners to be vigilant. There is a commitment to ensure that a monitoring plan is in place and that measurements of progress are reported to the public.

## DELISTING OUTLOOK

With the exception of the completion of muskellunge re-introduction program, all other actions to meet restoration targets within the boundaries of the AOC have been accomplished. Natural repopulation of muskellunge may require decades and ongoing monitoring will be required. The remaining impairments (fish consumption restrictions, degraded benthic communities and dredging restrictions) are related to historic and ongoing mining operations in the Sudbury basin, upstream of the AOC. Mining sources are being addressed by provincial programs. Estimates of 15-40 years, based on a computer model, are given for the attenuation of this load and natural recovery to occur.



## Thunder Bay

The Thunder Bay AOC extends approximately 28 km along the shoreline of Lake Superior and up to nine kilometres offshore from the City of Thunder Bay. The Thunder Bay watershed is drained by the Kaministiquia River system and a number of smaller rivers and creeks. The marsh area of the harbour represents a major portion of Canadian wetlands in the Lake Superior basin. The harbour wetlands provide habitat for nesting and migrating species of birds and a wide variety of native and non-native fish. There is both a commercial and sport fishery in the AOC.

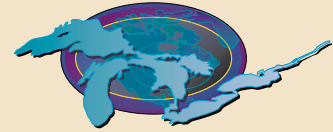
The City of Thunder Bay is the dominant economic centre in the area. Over the past 20 years there has been a reduction in the grain shipping activities in the port and a general economic decline in the area. While Thunder Bay remains one of Canada's largest shipping ports, public interest in diversification of the economy has stimulated harbourfront redevelopment.

### IMPAIRMENTS

Currently nine of 14 beneficial uses (GLWQA 1987) are impaired in the Thunder Bay AOC. The greatest impacts are a result of the industrial and urban development along the Thunder Bay waterfront and the Kaministiquia River (Kam) watershed. Much of the industrial land within the harbour has been constructed through a combination of draining and filling of shoreline areas, including wetlands which were degraded and reduced in area. Dredging, waste disposal, channelization, and the release of a number of pollutants have eliminated a significant portion of good quality habitat along the waterfront. The consequences have been a loss of species abundance and diversity, reduced recreational opportunities, and a decline in the aesthetic value of the area.

Improved effluent treatment and changes in industrial processes have significantly reduced impacts in recent years, however, the ecosystem remains impaired. Fish consumption restrictions are in place based on tissue concentrations of mercury and/or PCBs and toxaphene although no point source of toxaphene exists in the AOC or on the Canadian

side of Lake Superior. Studies by Environment Canada have shown that toxaphene formerly used in agricultural areas in the southern United States is transported through the atmosphere to the Great Lakes. Dioxin body burdens reported in 1994 in fish eating birds in harbour colonies exceed levels found in open lake colonies. Liver cancers have been reported in 1991 in white suckers although this may now be due to sources outside of the AOC since local sources have been remediated. Negative pressures on fish populations have occurred as a result of the introduction of exotic species, habitat loss, discharge of organic waste, and the in-place sediment contamination. Some areas of the AOC support only benthic communities tolerant of organic enrichment and/or contaminated sediments. Dredging activities have contributed to habitat loss and restrictions remain in effect due to sediment contamination in the harbour. Elevated bacterial levels force periodic closure of local beaches as they present potential health hazards for water based recreational activities. Abandoned buildings, waste disposal, refuse, and industrial and residential development have impaired river and harbourfront aesthetics.



## ACHIEVEMENTS

Strategies to address beneficial use impairments have been designed to increase aquatic and terrestrial habitat, enhance recreational opportunities, and to improve the aesthetic value of the harbour and its tributaries. The highest profile remediation project is the Northern Wood Preservers Alternative Remediation Concept (NOWPARC) designed to mitigate sediment contamination, renew habitat and improve aesthetic values of the site. Through a consortium of stakeholders, the remedial strategy to isolate the source of contamination and treat contaminated sediments has been completed with habitat restoration and revegetation activities continuing into 2003 (see sidebar).

Many water quality issues have been addressed as a result of process changes and improved effluent treatment at local pulp and paper mills. Secondary treatment and 100% chlorine dioxide substitution at the Bowater Canadian Forest Products Ltd. pulp and paper mill have resulted in dramatic improvements in effluent quality. Secondary treatment at Abitibi Consolidated Inc., Smurfit Stone, and Cascades Inc. has enabled the plants to meet requirements for loadings to Lake Superior. These improvements are expected to enhance sediment and water quality conditions and encourage the return of healthy biotic communities.

Various fish and wildlife habitat rehabilitation projects have been completed in the waterfront wetlands and along tributary streams. Projects have included improving walleye spawning habitat, restoring habitat diversity along floodways, enhancing habitat diversity within dredged navigation channels creating nearshore nursery habitat and wetland sites, and alleviating barriers to fish migration. These efforts will increase the extent of productive aquatic and terrestrial habitat by rehabilitating and protecting wetland and riparian environments. Attempts to improve salmon access to the upper reaches of the Current River have not been successful, however upgrades at the Bowater pulp and paper mill have improved water quality allowing fish migrations in the Kam River.

Since 1990, the Government of Canada's Great Lakes Sustainability Fund has provided \$8.6M towards 14 projects restoring impaired beneficial uses in the Thunder Bay AOC including \$5.6M for the Northern Wood Preservers sediment remediation project. The return on this investment in partnerships has realized an additional \$12.7M in direct partner funding.

Several ongoing projects are building on the notable successes in the Thunder Bay AOC. Several habitat rehabilitation projects for restoring wetland and riverine shoreline fish and wildlife habitat along the Thunder Bay waterfront and within the river mouths draining into Thunder Bay are nearing completion.

A pilot study to upgrade the City of Thunder Bay's primary sewage treatment plant was completed and the City is proceeding with plant expansion and an upgrade to secondary treatment that will use biological aeration filtration. Secondary treatment would reduce biological oxygen demand and annual loadings of dissolved solids to the Kam River and harbour. The total cost estimate is \$53M with a target set for completion in 2004.

## PUBLIC INVOLVEMENT

The involvement of the public and their commitment to rehabilitation, and continued vigilance with regard to the health of this ecosystem have been important to the success of the Thunder Bay RAP. The Public Advisory Committee (PAC) has played a lead role in such projects as organized cleanups of the Thunder Bay waterfront and participation in Lake Superior Day celebrations and waterfront development workshops. The cooperation and understanding that have been fostered will undoubtedly continue to affect the community and its outlook regarding environmental concerns.



## OUTSTANDING ISSUES

With the installation of municipal secondary sewage treatment, pulp and paper mill effluent improvements, completion of the NOWPARC sediment remediation, and numerous habitat creation projects in the AOC, it is expected that the resulting degree of restoration will allow Thunder Bay to fulfill the roles of a working harbour and a natural ecosystem. In this manner the harbour can provide a hospitable natural environment while making a crucial contribution to the local economy.

There are, however environmental issues remaining in the AOC that need attention.

### SEDIMENTS ADJACENT TO CASCADES INC.

Elevated mercury levels have been found in surficial sediments in the north end of the harbour adjacent to the Cascades Inc. property. Recent surveys indicate that sediment mercury concentrations are lower now than in the early 1970's, however, total mercury levels exceed Provincial Sediment Quality Guidelines severe effects level of 2.0 parts per million (2.0 µg/g) over an area of approximately three hectares adjacent to the Cascades Inc. effluent outfall. Biological assessment studies are planned to assist in identifying the volume of mercury contaminated sediment which may need to be remediated. One of those studies was undertaken by Environment Canada in 2002 to determine whether the mercury is bio-available and results are expected in 2003. Historic studies have estimated this volume to be approximately 20,000 cubic metres.

### SLATE RIVER WATERSHED MANAGEMENT PLAN

The plan recommends that agricultural management practices in the Slate River watershed be implemented that reduce the impact of organic enrichment, turbidity, and sedimentation in the adjoining Kaministiquia River. The plan is currently being reviewed by the Lakehead Region Conservation Authority due to the low water levels that have occurred over the past two years.

### CHIPPEWA BEACH

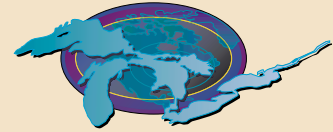
Elevated levels of faecal coliform bacteria in the water have resulted in frequent and continuing beach closures. A study has examined various remedial strategies to reduce bacterial levels. Although the preferred course of action has not yet been selected, a number of improvements have already been made to public washroom facilities and septic systems nearby, both of which were identified as contributory factors to the problem.

## FUTURE ACTIONS

To restore the nine impaired beneficial uses the RAP Stage 2 Report identifies 26 remedial actions of which 18 are completed. At the same time there are eleven required education and stewardship actions with four continuing. The restoration actions will be followed by 29 associated monitoring activities. In addition there are actions required to thoroughly document and report the status of the remedial and monitoring strategies to the public.

## DELISTING OUTLOOK

Delisting of the Thunder Bay AOC is conditional on implementing actions to remediate sediment contamination in a number of locations, secondary treatment of municipal sewage, additional improvement at Chippewa Park and the completion of habitat projects. Monitoring will verify the effectiveness of remedial measures in restoring beneficial uses.



## NORTHERN WOOD PRESERVERS ALTERNATIVE REMEDIAION CONCEPT (NOWPARC)

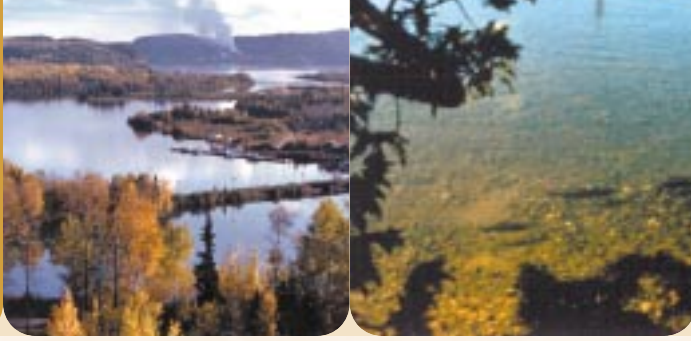
Thunder Bay Harbour sediment contamination of polycyclic aromatic hydrocarbons (PAHs), chlorophenols, dioxins and furans around Northern Wood Preservers contributed to the International Joint Commission's (IJC) identification of the Harbour as an AOC.

Abitibi Consolidated Inc., Northern Wood Preservers Inc., Canadian National Railway Co., Environment Canada and the Ministry of Environment worked together to remediate the area around Northern Wood Preservers. The goal of NOWPARC is to isolate the contaminant source, clean up the contaminated sediment, and enhance fish habitat. Between 1997 and 2003 over \$18 million was spent on the NOWPARC sediment remediation project.

A biological assessment study was conducted by the MOE to establish the site specific clean up criteria. Site-specific remediation criteria, based on sediment PAH concentrations, were developed from the biological tests. On the basis of measured biological effects, three cleanup zones were identified corresponding to areas of acute toxicity, chronic toxicity and no measurable toxicity

Major components of the project included:

- A **Rockfill Containment Berm** to protect the NWP site and to confine approximately 21 000 cubic metres of contaminated sediment.
- **Environmental Dredging** of approximately 11000 cubic metres of highly contaminated sediment for subsequent treatment. Marginally contaminated sediment was left outside the rockfill berm for natural recovery.
- **Sediment Treatment** on site and a further 17 000 tonnes of dredged sediment was successfully thermally treated in Princeton, B.C.
- **Isolation of on site contaminants** with the construction of an environmental clay isolation barrier adjacent to the NWP pier and a Waterloo Sheet Pile wall to ensure containment of the on site contaminants.
- **Clean Fill Placement** to create a buffer zone between the rockfill containment berm and the isolation barriers.
- A **Groundwater Treatment Plant** to treat contaminated groundwater that builds up behind the clay and steel pile wall barriers.
- **Fish Habitat Compensation** to replace lost fish habitat due to dredging and infilling operations.
- **Post Construction Monitoring** of groundwater conditions, fish habitat development, and sediment conditions outside the berm.

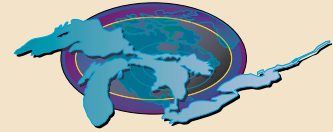


## Nipigon Bay

Nipigon Bay occupies the most northerly area of Lake Superior. The Area of Concern encompasses a large portion of Nipigon Bay and, its most notable feature, the Nipigon River. Originating at the outflow of Lake Nipigon, the river is the largest single tributary to Lake Superior and is an important source of hydroelectricity. While the northern demarcation of the AOC is the first Ontario Hydro dam on the river upstream from the bay, the AOC informally includes the watershed of Lake Nipigon. The two communities associated with the AOC are the Towns of Red Rock and Nipigon Bay.

The area supports a variety of wetlands and a bird community that is more diverse than is typical for this latitude. Colonial birds and raptors are plentiful and healthy. One of the two known pelican colonies in Ontario is located here. The presence of this integrator species is indicative of a healthy ecosystem. Licensed trapping of fur-bearing mammals continues today and no declines in abundance are reported.

The watershed forests on both sides of the Nipigon River have been allocated to forestry companies and employment in the area is dependent on the forest-based industry. While there has been a 15 percent decline in the populations of Red Rock and Nipigon Bay communities in the past 30 years, there are now hopeful signs of socio-economic diversification through marinas and tourism. Environmental restoration projects carried out in the area between 1991 and 1997 such as the Nipigon and Red Rock Marina created temporary jobs, long-term employment and some new business investment. Nipigon and Red Rock figure prominently in the National Marine Conservation Area proposal by Parks Canada. If approved, Nipigon will be home to Central Administration for the Park, and Red Rock will host the Marine Operations Base.



## IMPAIRMENTS

The main stresses on the ecosystem are related to water level and flow fluctuations in Lake Nipigon and the Nipigon River. The stresses result from the generation of hydroelectricity, the accumulation of wood fibre, bark and other organic matter from historic log drives, effluent discharge from the linerboard mill (Norampac) and from the primary sewage treatment plants in Nipigon and Red Rock.

There are five beneficial use impairments remaining in the Nipigon Bay AOC. Three others have been fully restored. The five impairments for the Nipigon Bay AOC are:

- degradation of fish and wildlife populations – particularly the loss of walleye and yellow perch fisheries and decline in the brook trout attributed to degraded water quality; habitat loss; over exploitation; invasion of exotics; and sea lamprey predation. Lake trout stocks have also declined largely because of overfishing and sea lamprey predation;
- degradation of benthos in the vicinity of the Nipigon water pollution control plant outfall;
- undesirable algal growth on substrates in the lower Nipigon River;
- degradation of aesthetics on the waterfront caused by the buoyant mill effluent (foam) from the mill and by industrial development along the waterfront; and
- losses of habitat in the Nipigon River because of historical log drives that caused physical scouring, transport of substrate, and removal of instream habitat. Water level fluctuations from the generation of electricity continue to affect streambank erosion and sediment load.

## ACHIEVEMENTS

Federal and provincial agencies have been working for a number of years to restore environmental quality in the Nipigon AOC. This has involved projects and cooperative activities with the Towns of Red Rock and Nipigon and other agencies and local environmental groups located in the AOC.

Most of the 18 remedial actions recommended in the 1995-96 Stage 2 RAP report have been implemented and federal actions have been completed in Nipigon Bay.

Since 1990, the GLSF has provided \$1.4M towards eight projects restoring impaired beneficial uses in the AOC primarily for habitat rehabilitation. To date 18 partnerships have leveraged more than \$4.3M in partner contributions. A notable success has been the development of a marina at Red Rock that incorporates public access and fish and wildlife habitat into armour stone breakwalls.

A number of other projects have been completed to enhance fish and wildlife communities and to rehabilitate degraded aquatic and terrestrial habitat. Logs and debris were removed from historic spawning areas in the lower Nipigon River. Clean up of a former wetland site has resulted in natural regeneration of wetland features. A fish stocking program was used to rejuvenate the walleye population in Nipigon Bay over a three year period. A community based effort was instrumental in the clean up and restoration of habitat in and around a once productive and aesthetically acceptable coaster brook trout stream. With the exception of the Clearwater Creek rehabilitation, all projects recommended in the Stage 2 RAP are completed and monitoring is ongoing. Work to rehabilitate brook trout and lake trout is continuing under the mandates of the Great Lakes Fishery Commission and the Lake Superior Lakewide Management Plan (LaMP).

The Nipigon River Water Management Plan (NRWMP) was established through public involvement in 1994 to reduce the impacts of the operation of hydroelectric dams on the Lake Nipigon and the Nipigon River watershed and particularly on the Nipigon River fishery. The Ontario Power Generation Operating Plan was released in 2000. The plan was established in response to water level fluctuations that resulted in the exposure of coaster brook trout spawning beds and affected the groundwater supply critical to the survival of the trout embryos. The plan expands on an interim agreement between the Ministry of Natural Resources and Ontario Power Generation to maintain minimum flows. By actions directed at coaster brook trout, other fish, wildlife, and benthic populations in the ecosystem will benefit by a more natural cycle of river flow. The NRWMP has provided a workable solution to water use conflicts arising from regulated flows and a restored brook trout population at Clearwater Creek.



Norampac at a cost of \$25M has installed secondary treatment for its mill effluent using aeration stabilization basin technology. This has greatly reduced the contaminant loads to the Nipigon River from the mill and monitoring of fish populations in the vicinity of the outfall show that they are now generally unaffected. The effluent meets Provincial MISA requirements but occasional upsets do occur and their nature is currently being investigated by the MOE.

## PUBLIC INVOLVEMENT

The Nipigon Bay PAC represented a spectrum of interests from the community and was actively engaged in developing the recommendations for the RAP. The stage 2 RAP report was completed in 1996 and includes an implementation annex.

## OUTSTANDING ISSUES

The Town of Nipigon has completed an environmental study to identify options for upgrading its primary municipal wastewater treatment plant. By way of background a preliminary study which looked at connecting the Town of Red Rock's sewage with the Norampac pulp and paper mill sewage treatment lagoon was completed. The GLSF may consider supporting a detailed assessment of options. The Towns of Red Rock and Nipigon are positioned to take advantage of available federal/provincial infrastructure funding to make improvements to their wastewater sewage treatment systems. Costs are estimated to be \$500K to \$2M for Red Rock and up to \$3M for Nipigon and full implementation could be possible within the next three years contingent on funding availability. If these upgrades do not proceed, the area will continue to remain an Area of Concern.

The discovery of a mineral deposit under Nipigon Bay containing nickel raises the potential for mining in the AOC.

## FUTURE ACTIONS

The Nipigon River population of coaster brook trout is a remnant of the former extensive range of this species. Knowledge of the range, population and lifecycle of this species is critical to its enhancement and protection. Habitat projects and rehabilitation methods for brook trout and walleye will be assessed. Sampling of sport fish for contaminant burdens is underway to confirm that levels continue to be below guidelines set for contaminants with local sources. Complete removal of sportfish consumption advisories will depend on the attenuation of out of basin sources of toxaphene, however this does not affect the status of the BUI.

## DELISTING OUTLOOK

Substantial improvements in the environmental conditions in the Nipigon Bay AOC have occurred due to implementation of the RAP recommendations. The status of the five BUIs needs to be reviewed to determine if delisting of individual BUIs is now possible:

- degradation of fish and wildlife populations – progress has been made through habitat and stocking programs to rehabilitate walleye and brook trout populations. Lake trout rehabilitation and sea lamprey control are ongoing;
- degradation of benthos – with the installation of secondary treatment at the Norampac mill the remaining link to this impairment is the Town of Nipigon sewage treatment plant;
- undesirable growth of algae – not currently considered an issue;
- degradation of aesthetics – with the upgrade to secondary treatment at the mill, foam along the waterfront is no longer an issue;
- loss of fish and wildlife habitat – there is no longer evidence of physical scouring or substrate removal.

Full delisting of the Nipigon Bay AOC is conditional on the completion of upgrades to the Red Rock and Nipigon sewage treatment plants to provide full secondary treatment and correcting the inflow and infiltration problems in the sewer systems of these two municipalities. Financial support is needed from federal/provincial infrastructure funding programs to expedite these actions.





# Jackfish Bay

The Jackfish Bay AOC is located on the north shore of Lake Superior. The town of Terrace Bay is the closest community. The AOC consists of a 14 kilometre stretch of Blackbird Creek and two small lakes (Moberly and A) between the Kimberly-Clark pulp mill and Jackfish Bay itself. Historically the bay supported small commercial lake trout and whitefish commercial fisheries. Kimberly-Clark Canada Inc. is the largest industry and primary source of employment for the area.

## IMPAIRMENTS

The most critical issue for the AOC is the use of the Blackbird Creek system by Kimberly Clark Inc. as a route to discharge its effluent to Lake Superior. Blackbird Creek has received wastewater discharge from the mill since 1948 and its two lakes have experienced significant infilling with wood fiber and other solids.

There are six beneficial use impairments in this AOC. Mill effluent, spills, and sediment contamination have deteriorated the ecosystem of the AOC. Sportfish consumption restrictions are based on a variety of chemicals, including dioxins and furans attributed to mill effluent. White suckers collected from Jackfish Bay prior to the installation of secondary effluent treatment at the mill had an increased incidence of liver cancer. Reproductive failure and elevated contaminant levels in herring gulls have been reported. Sediments in Moberly Lake remain acutely toxic to bottom dwelling organisms. Lake trout spawning habitat in Moberly Bay has been destroyed through the deposition of organic materials and chemical contamination of sediments. Over-fishing and sea lamprey predation have also contributed to the decline of trout populations.

## ACHIEVEMENTS

Dioxin and furan contaminant levels in effluent and receiving waters have decreased since the installation of secondary treatment and changes in mill processes to chlorine dioxide bleaching. Mill effluent presently tested has significantly reduced biological effects and is characterized as non-acutely toxic to aquatic test organisms. Previously Lake A was clogged with extensive accumulation of organic material. Ten years ago effluent flow was diverted away from the lake, recovery has occurred and the lake is now a productive wetland.

## OUTSTANDING ISSUE

The Kimberly-Clark Inc. pulp and paper mill currently meets all Provincial MISA and federal *Canadian Environmental Protection Act* (CEPA) requirements. Blackbird Creek continues to receive treated mill effluent and this liquid comprises most of its flow. The creek bottom sediments remain contaminated with dioxin and furan along its entire length.

The Great Lakes Sustainability Fund and its partners have spent \$265K on sediment rehabilitation options for Blackbird Creek. There are a variety of restoration options available ranging from extensive physical alterations of the Blackbird Creek system, to allowing the area to undergo natural recovery, or installing a technically advanced closed loop system at the mill. The Remedial Action Plan concluded that the AOC should be monitored for incremental improvements but recommended no further intervention at this time. Over time the deposition of cleaner sediments will stabilize and physically isolate the contaminated sediments. Ecosystem recovery is expected within 30-60 years.



## PUBLIC INVOLVEMENT

Through a series of public meetings, the Public Advisory Committee (PAC) established water use goals designed to restore and protect the Jackfish Bay AOC. The PAC agreed with government agencies in 1997 to follow the natural recovery option for Blackbird Creek.

## FUTURE ACTIVITIES

Under the federal Environmental Effects Program and a federal research grant, Kimberly Clark Inc. is expected to participate in a study planned for 2003 to determine the cause for the effects on fish reproductive parameters in Jackfish Bay. Habitat restoration work in Blackbird Creek associated with the input of organic materials is also being considered.

## DELISTING OUTLOOK

The natural recovery process for Blackbird Creek is predicted to require 30-60 years after which delisting can be considered. The implementation of new technology in the future may accelerate the natural recovery process.



## Peninsula Harbour

Peninsula Harbour is located on the northeastern shore of Lake Superior midway between Sault Ste. Marie and Thunder Bay. The AOC is roughly bounded by the watershed of the harbour and Pebble Beach, includes the Town of Marathon and extends four kilometres into Lake Superior.

The immediate area surrounding the AOC has a limited variety of habitat types and consequently does not support diverse wildlife communities. Nonetheless, a database has been compiled for breeding birds, mammals, herptofauna, and plants and their corresponding aquatic and terrestrial habitats.

The principal industry in Marathon is a bleached Kraft pulp mill complex (Marathon Pulp, Ltd.). Mining of the Hemlo gold deposit is the other main economic driver for the Peninsula Harbour region. To encourage recreation and tourist uses in the area, a marina development is proposed for Peninsula Harbour at Carden Cove.

### IMPAIRMENTS

The Peninsula Harbour AOC has levels of toxic contaminants in fish and bottom sediments that exceed environmental guidelines, and degraded fish and benthic (lake bottom) communities. Harbour dredging is restricted due to contamination of the bottom sediments. Surveys of the harbour focusing on the area adjacent to a former chlor-alkali plant have determined that large areas of the harbour exceed background mercury levels found in unimpacted regions of Lake Superior.

Mercury concentrations in longnose suckers are high enough to restrict consumption of this fish suggesting that nearshore mercury is bioavailable. Mercury levels in offshore fish (whitefish and lake trout) have declined significantly since the closure of the chlor-alkali plant in 1977 and now approach average concentrations found across Lake Superior. Aquatic insects are absent from the shallow water areas of Peninsula Harbour suggesting a water quality impairment remains. These changes in the bottom communities are consistent with elevated levels of organic materials (log booms) rather than

mercury toxicity. Dredging restrictions are in effect for sediments in Peninsula Harbour where levels of mercury, PCB, chromium, iron, copper, and nickel exceed provincial sediment quality guidelines for dredging and open water disposal. Due to the scale of industrial activity in the AOC, fish habitat has been reduced and historic lake trout spawning grounds have been destroyed through the accumulation of wood fibre and bark from log booming activities and effluent discharge.

Since 1991, the Government of Canada's Great Lakes Sustainability Fund has contributed approximately \$210K and its partners have contributed over \$1M to assess the nature and extent of contaminated sediment and develop remedial options for Peninsula Harbour.



## ACHIEVEMENTS

The former chlor-alkali plant (American Can of Canada), which operated adjacent to the pulp mill from 1952 to 1977, was the main source of mercury contamination to the harbour. Mercury contaminated material has since been removed from the plant and safely deposited at a mercury disposal site now owned by Georgia Pacific.

Effluent from the Marathon Pulp Inc. kraft mill is now treated using a secondary treatment process (aeration and microorganisms) to remove organic pollutants and reduce the biological oxygen demand. In 1991, the mill switched to 100% chlorine dioxide bleaching effectively eliminating dioxins and furans from the effluent. In 1995, the Lake Superior LaMP Workgroup presented the mill with an environmental achievement award for incorporating pollution prevention principles into its operations.

## OUTSTANDING ENVIRONMENTAL ISSUES

Remedial strategies for Peninsula Harbour focus on the shallow water areas of the harbour in Jellicoe Cove where mercury levels in bottom sediments exceed 6 micrograms/gram while leaving remediation of the deeper areas to natural sedimentation processes. The high levels of mercury found in the nearshore areas may provide a reservoir for the contamination of offshore sediments, and contribute to long term restrictions on fish consumption. Remediating sediments in the area of highest contamination could prevent further migration of nearshore mercury to offshore areas. The need for dredging and disposal of sediments from this area is now being considered.

In Jellicoe, Carden and Beatty Coves, bottom sediments are also contaminated by the accumulation of woody materials from log booming activities that began in the 1950s. Although the practice was discontinued in 1983, the remaining organic matter remaining continues to impair fish habitat. The RAP considered removal of accumulated woody materials through conventional dredging but there was a risk of resuspending contaminated sediments and the dredged materials would require confined disposal. The preferred option selected was to monitor natural processes of decomposition and dispersion without intervention. The loss of these local lake trout spawning grounds is not considered detrimental to the lake fishery of this species.

In 2002, the provincial government conducted its biennial sportfish contaminant survey for shoreline sectors of the Great Lakes. Results for Peninsula Harbour indicate that mercury levels in longnose suckers are two to three times higher than Lake Superior background locations; however, concentrations of PCBs in the same species are now the consumption limiting contaminant. PCB levels are elevated and do not appear to be declining. An investigation to determine the PCB source in Peninsula Harbour may be warranted.

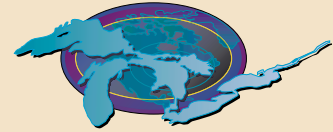
## PUBLIC INVOLVEMENT

In 1999, the Peninsula Harbour RAP Public Advisory Committee supported an option for contaminated sediments that combines harbour clean up with the Town of Marathon's interest in completing a marina. The town has established a project implementation team that will direct an investigation of a possible site for the marina and options for managing contaminated sediment.

If dredging is required an engineered confined disposal facility will be built as part of the proposed marina design. Any public concerns over the construction, monitoring or long term integrity of the structure will be addressed through a federal Environmental Assessment process. Members of the Pic River First Nation will also be consulted.

## FUTURE ACTIONS

The GLSF is a partner with the Ontario Ministry of the Environment, the Town of Marathon, FEDNOR (Federal Economic Development Initiative for Northern Ontario) and the Great Lakes Renewal Foundation in a multi-year study to determine the extent and depth of mercury contamination in Jellicoe Cove, and the feasibility of removal, stabilization, and disposal of the contaminated sediments. Environment Canada is conducting a further study in Jellicoe Cove to determine if methyl mercury in benthic invertebrates is also bio-available



to higher trophic levels and whether methyl mercury concentrations exceed criteria for the protection of aquatic organisms. The Environment Canada study will be used to determine if removal of the contaminated sediment is warranted and the results will then be incorporated into a multi-year study to develop a remedial design for the site to present to the public and Pic River First Nation.

A 40 berth marina is proposed for the Carden Cove area of Peninsula Harbour. As part of this proposal, dredged harbour sediments would be placed within a CDF which would also provide the parking area and a section of the breakwall for the marina development. Total cost for dredging and marina construction are currently estimated at \$5M.

## DELISTING OUTLOOK

Restoration of the impairment of fish habitat in the bottom sediments of coves within the harbour will rely on the process of natural recovery. Determination of the time period will depend on the results of periodic monitoring of the sediments in these locations. The path forward to address the impairments due to mercury contamination of the sediments in Jellicoe Cove has not been selected. Regardless of the option chosen and completing all remedial activities, the timeline for recovery may exceed five years.



## St. Marys River

The 112 kilometres long St. Marys River drains Lake Superior and flows into the North Channel of Lake Huron. This binational AOC extends from the head of the river at Whitefish Bay downstream to Quebec Bay and Hay Point in Ontario and Detour Passage in Michigan. The largest communities in the AOC are Sault Ste. Marie, Ontario and Sault Ste. Marie, Michigan. Both cities serve as industrial and commercial centres for a large portion of northern Michigan and the Algoma District of Ontario. The First Nation communities in Canada are Batchewana and Garden River. In the United-States, the tribal communities are the Bay Mills Indian Community and the Sault Ste. Marie Tribe.

The St. Marys River watershed, wetlands, and riparian areas provide habitat for a number of fish and wildlife species including 186 resident and migrant bird species. The river has some of the highest biodiversity in the Great Lakes Basin. The watershed supports a diverse fish community. Whitefish Bay and the river also support subsistence fisheries and a popular sport fishery. Only limited commercial fishing occurs in Whitefish Bay.

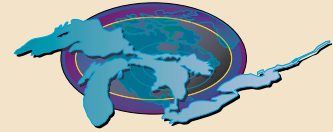
The St. Marys River is a key element in the Great Lakes-St. Lawrence Seaway. Extensive alterations to the river have been undertaken to facilitate ship navigation between Lakes Huron and Superior, enhance rail and vehicular traffic, and provide hydroelectric power. Water level fluctuations for the upper Great Lakes are moderated by the regulation of the flow of the St. Marys River.

### IMPAIRMENTS

While much of the river is unaffected by human influence, other portions are heavily impaired due to point source discharges and contaminated sediments. The St. Marys River was identified as an AOC because of impairment of nine of the 14 beneficial uses as defined by the GLWQA (see Table I). Although ambient water quality is not a use impairment under the GLWQA, the St. Marys River Binational Public Advisory Council established a goal that the natural high water quality that enters the river from Lake Superior should be the minimum water quality standard to be achieved in the AOC.

Restrictions on fish consumption are due to mercury (Ontario and Michigan) and PCBs (Michigan). Organisms living in the river bottom sediments on the Canadian side are exposed to PAH and PCB contamination. White suckers have exhibited liver tumors – another sign of exposure to contaminated sediments. Total body contact activities on the river are periodically impaired due to levels of E. coli bacteria in excess of provincial and state guidelines.

Fish populations have been heavily impacted by the predation from sea lamprey. Significant loss of fish and wildlife habitat has occurred as a result of shoreline alteration, industrialization, urbanization, and shipping activities, particularly in the St. Marys rapids.



## ACHIEVEMENTS

Since 1990, the GLSF has spent over \$800K for ten projects towards restoring the ecosystem, with partner contributions exceeding \$1M. A notable success was the sanitary sewer investigative study to reduce City of Sault Ste. Marie untreated sewer overflows to the St. Marys River. As a result, work is now underway to eliminate or treat sanitary to storm sewer overflows through upgrading pumping stations and containment tanks, and re-routing sewers. The project is funded in partnership with the city by the Canada-Ontario Infrastructure Program (total \$60M) and includes upgrading the East End Water Pollution Control Plant to secondary treatment.

The GLSF has also contributed to wetland protection strategies, fostering the recovery of walleye populations and supporting the design of habitat features in the city's waterfront development. In-kind contributions were valued as the largest single funding category for this AOC.

In 1995, the St. Marys Paper Ltd. mechanical pulp mill installed an activated sludge treatment facility at a cost of \$14M which resulted in a reduction of the biological oxygen demand and suspended solids in its discharge water. The mill effluent now meets all provincial and federal effluent regulations.

## OUTSTANDING ISSUES

The bottom sediments of the river including the Algoma Steel Inc. boat slip are extensively contaminated with PAHs up to four km downstream from the facility. The century-old Algoma slag site continues to be a chronic contaminant source to the river. While historic leachate is now buried in downstream sediments, the present inputs need to be controlled. A coal tar barrier was installed in 1990 to protect the river from one area formerly owned jointly by Algoma Steel and Domtar.

A survey of bottom sediments and benthic invertebrates reveals continued and extensive contamination of the sediments and impairments of benthic communities adjacent to the Algoma slag dump, in the boat slip, in the Lake George Channel, Little Lake George and the Northern portion of

Lake George. Other Canadian sites identified with contaminated sediments are the Bellevue Marine Park area and the river sediments immediately upriver as far as the Purvis Marine Ltd. dock.

Although there are no guidelines for the consumption of wildlife, Ontario MNR has advised against the consumption of organ meats from moose, black bear and deer throughout Ontario due to elevated levels of cadmium. Waterfowl samples from the St. Marys River contain mercury and PCBs, however no assessment criteria are in place at this time. This will be addressed through a Stage 2 report recommendation to produce a set of precise, objectively defined delisting criteria that are numerically quantified wherever possible. These criteria will provide the necessary decision framework that will govern the delisting of each impaired beneficial use and, ultimately, the delisting of the AOC itself.

Sea lamprey originating in the St. Marys River are the major contributor to the infestation in Lake Huron and the high annual mortality of Lake Trout. Sea lamprey control efforts through the Great Lake Fishery Commission will help restore impaired fisheries in the St. Marys River as well as northern Lake Huron and Lake Michigan. A long term, continuing effort is needed since the opportunistic lamprey can take quick advantage of any lapse in larvae and adult control measures.

## PUBLIC INVOLVEMENT

The original role of the Binational Public Advisory Council as reviewer of RAP documents and advisor of the program has shifted to a broader involvement. BPAC members sit now on the Algoma Steel Environmental Management Agreement advisory committee (see sidebar), participate in the St. Marys River Fisheries Task Group and support local watershed groups.



## FUTURE ACTIVITIES

The Stage 2 RAP document contains an extensive compilation of recommended actions.

In addition to the large number of actions already completed or underway, the report also contains over 60 new recommended actions, some of which contain numerous sub-components. Twenty-six of these actions focus on the remediation of point and non-point sources (e.g., contaminated sediment) and on the remediation of fish and wildlife habitat. In addition, there are 31 monitoring actions designed to provide baseline information, measure compliance, and assess the effectiveness of remedial actions. Finally, there are five actions relating to general reporting and education. It should be noted that several of the recommended actions have been designed to address a number of human health concerns within the AOC.

The following actions are in priority areas and are required to address the outstanding Canadian issues.

### CONTAMINATED SEDIMENTS

A comprehensive multi-agency contaminated sediment management plan for the AOC is needed to finalize sediment assessment and to implement possible remedial actions.

Although sediment contaminant levels have declined, the sediments in three areas of the river exceed the provincial sediment quality objectives lowest effect level and they remain acutely toxic to indicator test organisms in the Algoma boat slip. There are also data gaps for the Bellevue Park site.

A closure plan has been prepared by Algoma Steel for its slag storage landfill. An MOE control order is required to initiate the necessary remediation.

### FISH CONSUMPTION RESTRICTIONS

The provincial government will continue to report sport fish monitoring program results to the public in the AOC. Lake Superior State University plans to investigate areas of the river for possible sources of mercury in an attempt to track down the cause of sportfish advisories.

### FISH TUMOURS

There is a need to identify causal factors for the incidence of fish tumours including likely sediment contaminant sources.

### LOSS OF FISH AND WILDLIFE HABITAT

Under review is a detailed watershed management plan that has been prepared for the Bennett and West Davignon Creeks, tributaries of the St. Marys River. The plan contains 23 recommended actions ranging from wetland development for both fish and wildlife to enhancing fish migratory passages to addressing contamination issues. Plans are recommended for three other watersheds in the AOC.

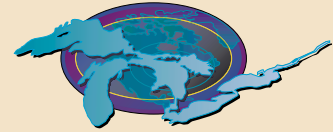
The GLSF is funding a project by Ducks Unlimited (DU) to seek long-term protection for wetlands along the St. Marys River. The two year partnership will enable DU to market funding instruments (e.g. EcoGifts, Land Tax Incentive Programs), negotiate land use agreements and bring influence to municipal official plan development.

The St. Marys River Fisheries Assessment Plan identifies the need to establish a baseline for evaluating current and future habitat conditions through documenting the current and historical habitats in the river.

### BEACH CLOSINGS

It is expected that the upgrades by the city to its sewage treatment plant will reduce the incidence of beach closures in the river, however storm sewer discharges remain a bacterial source. Planning studies related to the control of storm sewer discharges may be initiated. Routine monitoring is carried out by the Algoma Health Unit and beach water quality monitoring is expected to continue. The Garden River First Nation's capacity to conduct monitoring is based on funding availability.





## ALGOMA STEEL INTERNATIONAL ENVIRONMENTAL MANAGEMENT AGREEMENT (2000-2005)

Algoma Steel (ASI) has recently renewed its environmental commitment by signing a three party Environmental Management Agreement (EMA) with Environment Canada and the Ontario Ministry of the Environment. The EMA provides a voluntary mechanism for ASI to commit to environmental initiatives that exceed regulatory requirements. Over the past decade, ASI achieved full compliance with provincial MISA regulations for discharges to water. In total ASI committed \$100M for capital improvements related to water and air discharges in this AOC.

Goals and objectives of the EMA include: the de-listing of the beneficial use impairment associated with the ASI boat slip; improved management of solid wastes and contaminated sediments; the reduction or elimination of air discharges which exceed or are inconsistent with existing limits or guidelines or are the subject of pollution reports to MOE; and participation in the discussion and resolution of local trans-boundary air issues.

The RAP has identified impairments associated with the PAH contamination of the ASI boat slip. In 1995, 11 500 cubic metres of dredge materials were removed from the slip and placed in the ASI waste disposal site. The sediment in 2000 has considerably lower PAH levels than in 1993 and

there appears to be an overall improvement in sediment toxicity despite significant impairment of the benthic communities. With regard to the requirements of the EMA, the company has advised that dredging is not warranted at this time and will conduct a repeat survey and assessment before 2005. The time elapsed will also allow for a quantitative determination of the rate of sediment accumulation and whether further dredging is indeed warranted.

Under the EMA, Algoma Steel has prepared a closure plan for its slag storage landfill. Groundwater surveys conducted by the company during the 1990s adjacent to the landfill report that there was little impact on the river water quality. Results of the survey completed in 2001 indicate stable or improving conditions. The present contribution of the site via groundwater to the total chemical loading to the river is less than one percent. Another survey is planned for 2005 and in the interim Algoma has committed to re-establishing the required monitoring wells.

The company has established an air quality monitoring station to record dustfall and total suspended particulates from the steel plant. An Ontario MOE monitoring station records emissions of polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds. Efforts by ASI have considerably reduced benzene and PAH air emissions from the steel making process. The current PAH emission rate is already below the 2005 target. ASI will continue to report on these parameters under the EMA.

Despite difficult financial times, ASI continues to report progress semi-annually and has met expectations for its environmental initiatives.

## US ACTIONS

The Cannelton Tannery operated in Michigan from 1900-1958 and contributed considerable metal contamination to the sediments. The site has been remediated under the USEPA Superfund program. The RAP Stage 2 report recommends that monitoring of surface and groundwater, wetlands soils and biota be undertaken at the Cannelton site to ensure protection of the food chain. A complete site review should be conducted every five years.

## DELISTING OUTLOOK

Delisting of the St. Marys AOC will require the completion of a number of costly remedial measures, including:

- 1) remediation of contaminated sediments;
- 2) completion of the upgrade to Sault Ste. Marie sewage treatment plants (funded);
- 3) separating combined sanitary and storm sewers (funded).

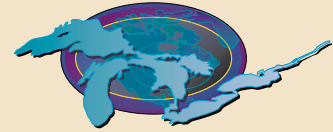
Less costly commitments for further wetland restoration and protection will likely be delivered by the end of 2007.



## St. Clair River

The St. Clair River flows 64 kilometres in a southerly direction from Lake Huron to Lake St. Clair. The binational AOC includes the main river, its delta channels, and both coastal watersheds covering over 335 000 hectares.

The St. Clair River is a link in the Great Lakes Seaway system and serves as a shipping channel for local industries. The river is also a source of cooling and process water for industry and thermal generating stations. It serves as a source of drinking water for a population of more than 170 000. While Sarnia and Port Huron are the main population centres, a large portion of the population of the AOC is located in rural areas. The Chippewas of Sarnia Band Reserve (Aamjiwnaang) and the Walpole Island First Nation are located in the AOC. In Ontario, 78 percent of the land area is dedicated to agricultural activities. The wetlands and associated open waters of the lower St. Clair River and Lake St. Clair provide habitat for many species and are considered some of the most important wetland areas in the Great Lakes basin. Sport-fishing is popular on the St. Clair River, and hunting and trapping are significant uses, particularly for the First Nations people living on the River. The River also supports a number of parks and areas affording recreational opportunities including swimming, boating and naturalist activities.



## IMPAIRMENTS

The primary sources of contaminants to the river have come from the discharges of a complex of 27 industrial facilities in Ontario focused in Sarnia and six in the US together with ten municipal point sources and associated lagoons. Urban storm water and rural runoff are also contributors. There are zones of contaminated bottom sediments in the river downstream from the industrial area.

The binational RAP process identified nine beneficial use impairments (BUIs) in 1991. Today six remain impaired with the other three designated as not impaired. The remaining impairments are: fish consumption advisories in effect in Ontario and Michigan; the quality of benthic communities as a result of contaminated sediments; restrictions on dredging activities due to contamination by toxic chemicals; public beach closures due to bacterial contamination and the overall aesthetic value of the river needs improvement; and degraded fish and wildlife habitat. Restrictions on drinking water and added costs to agriculture and industry are no longer impairments as a result of a significant decline in the volume and frequency of industrial spills to the river. From 1994-2000, there have been no instances where a downstream water treatment/filtration plant was ordered to be shutdown as a result of a spill. Recent studies of Forster's Terns and snapping turtles by the Canadian Wildlife Service have confirmed that there are no bird or animal deformities and it is expected that this BUI will be declared not impaired for the St. Clair River in the near future.

## RAP STATUS

Work on the St. Clair River RAP began in 1988. Thirty-eight remedial actions were identified by the RAP in 1995 that require specific actions either in Canada or the US. Thirty-seven of these have specific activities underway or completed. Remedial actions will continue to be implemented and contaminant levels in the environment continue on a downward trend.

A Letter of Commitment was signed by Governments of Canada, US, Ontario and Michigan in 1998 that outlines responsibilities for implementation and restoration of the St. Clair River, Detroit River and St. Marys River Binational AOCs (see sidebar).

## PUBLIC INVOLVEMENT

The St. Clair River Binational Public Advisory Council (BPAC) with cross border and broad community representation, has been encouraging the co-operative effort of government, industry, municipalities and all interested community groups in addressing environmental issues in the river. BPAC members have collectively supported conclusions reached in the documents. With support from Environment Canada and the Ontario Ministry of Environment, the BPAC public outreach program has made the RAP available in CD-ROM format and on the Internet at [www.friendsofthestclair.ca](http://www.friendsofthestclair.ca). The non-profit organization, *Friends of the St. Clair River*, formed in Michigan (1994) and Ontario (1997), actively seeks and obtains funds to assist with implementation activities. Projects undertaken with landowners include habitat improvements, sport fish monitoring, creating wetland based septic systems and various watershed erosion control measures. *Friends* have also produced fact sheets on achievements and remaining work as part of their "Countdown to Delisting" project.

## ACHIEVEMENTS AND SUCCESSES

Since 1990, the GLSF has contributed \$ 2.5M to support over 70 partnerships implementing 31 projects with the aim of restoring impaired beneficial uses in the St. Clair River AOC. This investment in partnerships has realized an additional \$4.8M in direct partner funding, a \$3.4M in-kind contribution and personnel participation valued at over \$1M. The largest project categories are habitat restoration and non-point source control. Support to community groups has been provided by Environment Canada through its EcoAction program and by the Ontario provincial government through the Trillium Foundation.



Virtually all of the major industrial and municipal facilities in both Michigan and Ontario have shown significant progress in implementing remedial actions related to the control and reduction of chemical and bacterial contaminants from point sources. Contaminant levels are reduced in water, sediments, air and biota. Notable environmental successes have included:

#### MUNICIPAL/COUNTY LEVEL ACTIONS:

The City of Sarnia has recently completed a \$30M upgrade of its sewage treatment plant. The facility now uses secondary treatment with ultraviolet disinfection and a state of the art sludge management system. The City of Port Huron, MI has embarked on a US\$180 million, 15 year sewage separation program begun in 1995. With regard to urban runoff, actions have been undertaken for each non-point source recommendation. Some of the actions implemented are at the level of policy definition, such as those included in the Lambton County Official Plan relating to urban runoff for new developments and the Sombra Township Official Plan requiring erosion control measures at new developments. County level organizations with the support of Environment Canada and USEPA funding, have leveraged over \$1M since 2000 to engage landowners in habitat and rural non-point source improvement projects.

#### REDUCTION OF SPILLS TO THE ST. CLAIR RIVER:

There has been a significant reduction in the frequency and size of industrial chemical spills since the 1980s and the impairment for restriction of drinking water has been restored. Current data show less than ten spills per year occur from Ontario chemical and petroleum facilities and large spills are now infrequent.

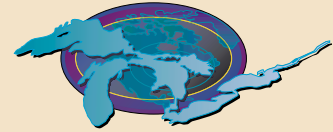
#### ACTIONS BY THE PETROCHEMICAL SECTOR:

- Dow Chemical Canada, Inc. removed approximately 175 cubic metres of highly contaminated sediments at the Cole drain discharge in 1996 and capped its Scott Road landfill in 2000, thus eliminating the area as a source of contaminants to the river;
- In a pilot project 220 cubic metres of contaminated sediments was removed in 2002 from the St. Clair River in an area adjacent to the Dow manufacturing site in Sarnia (zone I). This is the first of a two phase approach to remediate historically contaminated sediments in the upper river adjacent to the Dow property. Pending evaluation of the hydraulic dredge, dewatering and water treatment technologies employed in the pilot phase, full scale cleanup of approximately 22000 cubic metres in the area is expected to commence in the summer of 2003.
- Significant reductions from 1994-1999 of air emissions for nine of the ten most prevalent chemicals as self-reported by 23 facilities in the National Pollutants Release Inventory;

#### HABITAT RESTORATION:

Numerous habitat restoration projects and enhancement programs are ongoing in both Ontario and Michigan and the effort continues to grow. In Canada:

- over \$2M has been spent through partnerships on habitat restoration and streambank erosion programs;
- 70 percent of the target area for riparian and upland habitat has been enhanced and 23 km of riparian habitat restored;
- 30 percent of the target area of the Darcy McKeough Floodway were enhanced;
- a total of 500 hectares of habitat have been enhanced in the St. Clair region since 1992.
- a 300 hectare woodlot (Bickford Oaks Woods) was acquired in 2002 protecting Carolinian forest diversity. Funds were contributed by Nature Conservancy Canada (\$1.2M), MNR (\$300K) and other partners.



## FUTURE ACTIVITIES

There are six remaining impairments to beneficial uses. The impairments pertaining to fish and wildlife consumption, degradation of benthos, and restrictions on dredging activities are affected by both current point and non-point sources of contamination, as well as by *in situ* sediment conditions. Remedial actions for these sources are ongoing. Implementing non-point source actions (e.g. watershed management of urban and agriculture runoff) will have a direct bearing on beach closings. A long term habitat management plan for both Michigan and Ontario is needed to ensure further habitat protection, restoration, and enhancement implementation actions. Potential activities for support under the GLSF would relate to planning studies to address outstanding urban runoff issues and the development of a long-term strategy for implementing the habitat management plan.

A zone of sediment with elevated mercury and organic contaminant levels extends in an intermittent fashion several kilometres south from the Sarnia industrial complex to the east of Stag Island along the Ontario shoreline. The most highly contaminated section of the river is a 2 kilometre section starting at the upper portion of the Dow Chemical Inc. property line. Dow Chemical is expected to complete remediation of sediments adjacent to their property in 2003. Environment Canada and MOE, with industry participation, are investigating the best approaches to managing the remaining contaminated sediment.

## FOUR PARTY AGREEMENT

In 1998 Environment Canada, Ontario MOE, USEPA and Michigan Department of Environmental Quality signed a Letter of Commitment that delineates agency roles and responsibilities for the St. Clair River, Detroit River and St. Marys River Binational AOCs. The agencies agree to provide leadership for RAP implementation and restoration, involve the public, monitor and report on progress and ultimately delist these AOCs. In 2000 the agencies clarified areas of joint responsibility for the RAPs in a Compendium of Position Papers available on the web at:

[http://www.on.ec.gc.ca/water/greatlakes/raps/connecting/detroit/detroit\\_compend12.pdf](http://www.on.ec.gc.ca/water/greatlakes/raps/connecting/detroit/detroit_compend12.pdf).

The Four Agencies are using the Letter of Commitment to address water quality concerns for Lake St. Clair using a watershed approach and treat the St. Clair River, Lake St. Clair, and the Detroit River holistically. A monitoring program to track the restoration of beneficial uses is being developed for the corridor and will inventory existing Federal, State, Provincial and local monitoring efforts, determine where gaps exist and how to fill them, establish a compatible format, and enable all parties to have access to monitoring information.



## DELISTING OUTLOOK

Intensification of actions regarding remediation of sediment contamination, control of stormwater/urban runoff, and rehabilitation of habitat may result in delisting the remaining BUIs on the Canadian side but full delisting of this binational AOC is not expected to occur in the near term.

Recent studies by the Canadian Wildlife Service have shown no deformities or reproductive impairments in terns or snapping turtles. This BUI has been recommended for delisting. The status of the BUI fish tumours and other deformities is being discussed after a recent study suggests that liver tumour incidence is not higher than in control populations.

Planned ongoing improvements to sewage treatment and stormwater systems in Ontario and Michigan will contribute significantly to delisting the beach closing and aesthetic impairments. Reconversion of agricultural land to wetlands is scheduled over this decade and will help restore the loss of fish and wildlife habitat impairment. Addressing sediment contamination in priority areas and improving the St. Clair, MI waste water treatment will collectively contribute to resolving the impairments of dredging restrictions, benthic population dynamics and restrictions to sport fish consumption.



## Detroit River

The Detroit River is the 51 kilometre connecting channel between Lake St. Clair and Lake Erie. The binational AOC includes the Detroit River and its watersheds covering an area over 2000 square kilometres including the City of Detroit “sewershed” area. The AOC is home to more than 4 million people with population concentrated in the cities of Detroit, MI and Windsor, ON. Nearly 100 communities rely on the river as a source of drinking water. Seventy-six industries and ten municipalities discharge waste water into the river or its tributaries. Detroit is the busiest port in the Great Lakes and the river is used extensively for navigation. The largest tributary on the U.S. side is the Rouge River, draining more than half of the watershed. Agriculture is a major activity in the watershed. Greater than 50 per cent of the Canadian shoreline is occupied with industrial, commercial and residential development and consequently the abundance and variety of fish and wildlife have declined. The largest tributary on the Canadian side is the Canard River.

Since the Rouge River is also a U.S. AOC and has developed its own Remedial Action Plan (RAP) it is treated as a point source for the Detroit RAP.

### IMPAIRMENTS

The RAP has identified nine beneficial use impairments in the Detroit River (see Table I). There are sportfish fish consumption advisories in both Ontario and Michigan. Some fish have tumours and their flavour is tainted. The quality of bottom-dwelling animal communities has declined, and some animals have deformities and/or reproductive problems. Fish and wildlife populations have declined, habitat is endangered and significant amounts of it have been lost. Dredging activities are restricted because sediments are contaminated by toxic chemicals. There are taste and odour problems with drinking water. Public beaches are closed at times and the overall aesthetic value of the river is low. Water quality objectives are exceeded.

The known causes of impairments are historical and current industrial activity, agricultural practices and urban development in the watershed. Combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and municipal and industrial discharges are major sources of contaminants within the AOC. Stormwater runoff into tributaries in Michigan is also a major source of contaminants. Due to the high volumes of water entering the river via Lake St. Clair, upstream sources also contribute considerable loads of contaminants to the AOC. The river is the single largest source of contaminants to Lake Erie.

Additional environmental concerns include the presence of exotic species, changes in the fish community structure, and reductions in wildlife populations. AOC problems are less severe on the Canadian side, but a major restoration effort is still required.



## RAP STATUS

The Detroit River RAP was drafted in 1996 by professionals and community representatives to address the environmental issues associated with the Detroit River. Implementation of the RAP will require addressing over 100 recommendations in the binational AOC. The goal of ecosystem restoration is to achieve a standard that will provide a safe, clean, and self-sustaining natural environment, such that

- 1) self-reproducing diverse biological communities are restored and maintained, and
- 2) the presence of contaminants does not limit the use or appreciation of fish, wildlife or waters of the river.

## PUBLIC INVOLVEMENT

A Binational Public Advisory Committee (BPAC) was in place during the years of RAP development (1987-1996). Unfortunately, differences of opinion led to some members of the Binational Public Advisory Committee leaving the process. This temporarily stalled progress in the Detroit River AOC. In 1998, the process was re-established and a new partnership was created among the four principal government agencies. The Four Party Letter of Agreement was signed for the Detroit River and the other connecting channels, St. Clair and St. Marys Rivers, to coordinate efforts leading to implementation and eventual delisting for each AOC (see sidebar in St. Clair River section).

In 1998, the public process was reinvigorated in Canada with the formation of the Detroit River Canadian Cleanup Committee (DRCCC). This group was established to cleanup, enhance and sustain the ecosystem of the Detroit River and its watersheds. DRCCC is a community based partnership of industry, government, academic, environmental and community organizations with an interest or mandate in the environmental quality of the Detroit River and its watershed. Its sub committees conduct the work in specific issue areas: contaminated sediments; combined sewer overflows; point source pollution; non-point source pollution remediation; habitat; and, public involvement and communication. Environment Canada and the Ontario MOE provide monetary and staff support to the DRCCC.

A parallel organization to DRCCC has been formed in Michigan and distinct RAP implementation frameworks have been developed for the Canadian and American sides of the Detroit River AOC that reflect local needs.

Credit: Essex Region Conservation Authority

## ACHIEVEMENTS

The 1996 RAP made 31 priority recommendations for the Canadian portion of the AOC. Programs and projects have been undertaken or completed in 21 of these areas and planning is underway for the remainder. To date, over 70 restoration projects have been undertaken or supported by various DRCCC stakeholders and partners.

Since 1990, the GLSF has contributed \$ 3.6M in support of 31 projects to restore impaired beneficial uses in the Detroit River AOC. The partnerships created have realized over \$6M in direct partner funding, with partner in-kind contribution and personnel participation valued at nearly \$3M. Habitat followed by non-point source projects are the two areas with the largest contributions.

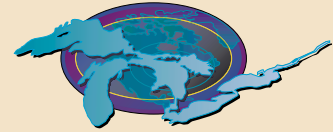
The Windsor Riverfront Pollution Control Planning Study was completed and adopted by the City. This \$1M study (funded jointly by the City, MOE and EC) developed an implementation strategy for the Riverfront Districts which satisfies regulatory guidelines for CSO control and would reduce the pollutant loading to the Detroit River to levels consistent with the RAP objectives.

Notable environmental successes have included:

- identifying significant cost savings for the City of Windsor towards the upgrade of its primary sewage treatment plant to secondary standards as a result of pilot evaluation of innovative treatment technologies;
- protecting or restoring 524 hectares of wetland since 1990;
- implementing conservation tillage techniques on over 15 000 hectares of agricultural lands that have reduced nutrient, sediment and chemical inputs to the local water courses;
- developing and implementing a rural non-point source control strategy.

Major DRCCC projects which have received funding include: the Detroit River Rural Non-Point Source Remediation Program; the Windsor Combined Sewer Overflow (CSO) Effluent Characterization and Modeling Project; Biodiversity Conservation Strategy Implementation; Detroit River Shoreline Habitat Enhancement Plans Project; and various Shoreline Stabilization, Habitat Enhancement and Restoration projects throughout the watershed.





## FUTURE ACTIVITIES

There is a recognized need for agencies to communicate and work more cooperatively on binational issues such as monitoring, progress reporting and public involvement and outreach. The development of binational delisting criteria led by the Detroit River Canadian Cleanup Committee is expected to be finalized in 2003.

Significant investment is required for major capital works to restore impairments on the Canadian side of the Detroit River AOC. For example, the total estimated cost for upgrading the West Windsor Pollution Control Plant to secondary treatment, eliminating combined sewer overflows and controlling stormwater runoff is \$184M. The City has requested one-third funding from both the federal and provincial governments. To date, approximately \$30M has been secured to upgrade the Wastewater Pollution Control Plant (WWPCP) with contributions from federal, provincial and municipal governments.

Habitat and non-point source strategies have been developed and are being implemented. The GLSF has identified ongoing rural non-point source pollution control, implementation of the Biodiversity Conservation Strategy; and sediment remediation as candidate areas for its support.

The Great Lakes Institute for Environmental Research (GLIER) at the University of Windsor has completed a modeling study of the entire Detroit River. This "Data Management and Modeling Framework for the Detroit River" will be used to help formulate and guide cleanup objectives. The project has produced three interrelated components: a Environmental Update Report describing the current environmental health of the river; a Data Compendium of trends and ecosystem linkages; and, a Geographic Information System (GIS) and Decision Support System to quantify contaminant loadings from the Canadian side of the river.

## RELATED U.S. ACTIVITIES

In response to USEPA rules regarding total maximum daily loadings (TMDLs) to receiving waters, the City of Detroit is actively pursuing source trackdown of PCBs within its sewershed.

Considerable effort is being directed towards the task of CSO remediation in Michigan. Scheduled projects on the horizon include upstream CSO treatment, constructing detention basins at various locations, installing storage dams in major sewers (at 33 sites) by 2004/05, and treatment of Rouge River CSOs by 2012.

The Detroit River is the first river with a binational heritage designation. The Detroit River was designated as an American Heritage River in 1998 and a Canadian Heritage River in 2000. RAP implementation is a significant tool described within the Canadian Heritage River vision.

## DELISTING OUTLOOK

A Four Party Letter of Agreement has been signed by agencies and parallel stakeholder groups have been established. These will be used to strengthen binational cooperation. Broader public involvement and community support are also needed to move the implementation process forward. Efforts to develop a binational delisting framework have been productive and agency agreement on criteria is likely.

On the Canadian side of the Detroit River, federal actions for certain BUIs may be completed within a few years. Continued funding support and attention will be needed for the development of fish management plans for watersheds, identification of habitat goals and implementation of a biodiversity conservation strategy. Given the magnitude of the loading of persistent bioaccumulative toxic substances to the river, regular monitoring of sources, contaminant levels in water, sediments and biota together with toxicity testing is necessary.

Delisting on the U.S. side is not expected to occur in the near term. Dredging and removal of highly contaminated bottom sediments associated with current and historical industrial activity will require large funding allocations. Remediation of six sites in the Detroit River/Trenton Channel are targeted and their remediation is contingent on negotiation of an acceptable disposal site. Control of current U.S. sources will also be necessary to prevent recontamination of dredged locations.



# Wheatley Harbour

Wheatley Harbour is located on the north shore of Lake Erie just east of Point Pelee. AOC includes the harbour, its upstream wetlands and the Muddy Creek watershed. The watershed is approximately ten square kilometres in size. The nearest population centre is the village of Wheatley.

Wheatley Harbour is home to the largest commercial fishing fleet in the Great Lakes. It is a major fish processing port for the western and central basins of Lake Erie and is the location of fish and vegetable processing facilities which have contributed historical discharges to the harbour. Wheatley Harbour is a federally operated Small Craft Harbour. Land use in the watershed is predominantly agricultural and much of the original Carolinian forest has been cleared.

## IMPAIRMENTS

The RAP process has identified four beneficial uses as impaired in the AOC. Restrictions on dredging activities, eutrophication or undesirable algae, fish and wildlife population degradation, and loss of fish and wildlife habitat are currently recognized as impairments. The sport fish consumption restrictions that apply to fish are a result of lakewide contaminant levels; studies are assessing whether there are any contributions due to PCB sources in the harbour sediments.

The impairments are linked to the environmental concerns that follow and these will require resolution before delisting can be accomplished. Contaminant levels in the sediment of some metals and PCBs, exceed Provincial Sediment Quality Guidelines. The source of PCBs in the sediments have been tracked to an historic concentrating effect from the fish processed in Wheatley Harbour. The metal concentrations are attributed to non-point sources including run-off from agriculture in the area.

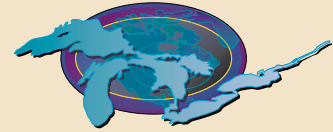
The total phosphorus concentration in the sediments and waters of most of the AOC exceed provincial guidelines. Present sources of phosphorus include Omstead Foods Ltd., agricultural runoff and leaking septic tanks. With upgrades to the Omstead Foods Ltd. wastewater treatment facility over the past 20 years, agricultural runoff to Muddy Creek is now the main source of phosphorus.

Although there are no beaches in the AOC, levels of *E. coli* bacteria in the harbour periodically exceed Provincial Water Quality Objectives due to leaky septic tanks and agricultural runoff. Beaches immediately outside the AOC are subject to summer closures.

Habitat loss has resulted from the construction of the original harbour and with each subsequent expansion. Hardening of the shoreline and filling in of the wetlands to create industrial, residential and farm land have altered many components of the natural ecosystem in the harbour and Muddy Creek watershed. The wetland immediately north of the harbour is often nearly dry during the summer months from lack of stream flow and lake level variations. However, the Muddy Creek wetland is still a feeding area to numerous provincially significant fish and wildlife species and the area is used for bird watching.

## PUBLIC INVOLVEMENT

The community around Wheatley Harbour decided that a standing public advisory committee was not required. RAP communications with the community has relied on newsletters, public meetings and through school libraries. Local residents would like the harbour to remain an active commercial and fishing port, and have identified wildlife as a feature that is worthy of protection.



In 1995, a prioritized list of nine remedial measures was endorsed by the public for implementation to address contaminated sediments, eutrophication or undesirable algae and loss of fish and wildlife habitat. Additional measures address public education of boaters, swimmers and fishers.

The Essex County Stewardship Network (ECSN) is working to bring landowners together to raise awareness of RAP goals and an understanding of the contribution of agricultural activities to non-point source pollution in the watershed.

## ACHIEVEMENTS

Since 1990, GLSF has contributed \$409K to six projects in the categories of non-point source pollution control and habitat restoration. Partnerships with local stakeholders have realized an additional \$395K in direct funding and in-kind contributions of over \$470K.

Environmental successes include:

- The annual reduction in sediment entering local streams from the rural watershed is estimated at 6 000 tonnes;
- Upgrade of Omstead Foods Ltd. (in excess of \$4M) to an advanced wastewater treatment system including sand filtration following full biological treatment prior to its discharge to Muddy Creek. The company's discharge passes toxicity tests and is the sole direct discharger to the harbour area;
- The remaining processing facilities in Wheatley Harbour along with the residential area on the east side of the harbour are now serviced by a municipal sewage treatment plant which discharges directly into Lake Erie east of the harbour and which is located approximately 1/2 kilometre offshore;
- The existing wastewater treatment plants serving the fish processing industries in Wheatley Harbour now typically remove the concentration of PCBs down to non-detectable levels in their effluent discharges;
- A bilge pump-out facility and waste oil storage tank have been installed in the harbour and public information materials have been distributed to boaters using the harbour.

## FUTURE ACTIVITIES

Significant improvements have been made in wastewater treatment. Elevated phosphorus levels are now primarily due to agricultural runoff in the Muddy Creek watershed. The ECSN rural non-point source program is in the process of

gathering data for water and sediments, developing a management plan and a landowner contact program that will foster an understanding of environmental responsibility among farmers and bring changes to agricultural practices that load phosphorus and bacteria into the watershed.

Environmental sampling conducted in 1998 concluded that the AOC does not yet meet the water use goals as defined by the local residents. Further work was undertaken by EC and MOE between 2000 and 2002 to better characterize water quality, sediments and biota. The information will be used to assess the status of beneficial use impairments.

Implementation of the Biodiversity Conservation Strategy for the AOC is underway and will serve to improve an area that has fewer bird species than other nearby shoreline locations, provide baseline data for wetland reptiles and amphibians, and be a component to a larger undertaking for the Canadian Carolinian Zone.

Potential candidate projects for support from GLSF would include native tree planting that will expand and link existing woodlots in order to address the fish and wildlife habitat BUI, and upgrading septic systems to address water quality issues.

## DELISTING OUTLOOK

There is a need to address the nine remedial measures associated with contaminated sediments, high phosphorus concentration, poor water clarity, bacterial contamination and habitat loss that together form the delisting strategy.

A decision is needed regarding the moderate levels of historical PCBs in the harbour sediment. The preferred remedial option for the contaminated sediments is natural recovery with continued navigational dredging, however recovery is not occurring as quickly as anticipated and other options may need to be considered.

All actions in Wheatley Harbour are expected to be completed by 2007. Following the evaluation of existing data, further remedial actions will be undertaken as required. Delisting will occur when water use goals and delisting criteria have been met and monitoring demonstrates that beneficial uses have been restored.



## Niagara River

The Niagara River flows 60 kilometres from Lake Erie to Lake Ontario. Downstream from Niagara Falls the river flows for a 15 kilometre stretch through a 100 metres deep and 1 kilometre wide gorge. The binational AOC extends the entire length of the Niagara River and includes the Welland River drainage basin on the Canadian side. The Niagara River passes through heavily industrialized areas, residential and parkland interspersed with remnant natural areas, and drains extensive farmland on the Canadian side. More than half of the flow of the river is diverted for electric power generation on both sides of the river. The gorge and cliff face are habitat for some of the highest concentrations of rare plant species in Ontario. The Niagara River annually supports one of the largest and most diverse concentrations of gulls in the world.

### ENVIRONMENTAL ISSUES

Much of the impact to the river is from the U.S. side, specifically from past industrial management practices. Efforts on the US side are addressing the seepage of toxic waste from chemical dumps. Over 200 hazardous wastes sites have been identified including 33 major sources of toxic contamination to the river. Nine municipalities in New York State discharge municipal wastes to the river. The Niagara River Toxics Management Plan (NRTMP) is the mechanism used by the two countries to address toxic loadings.

Most of the environmental issues on the Canadian side of the river are associated with non-point sources within the rural watersheds of the Niagara-Welland basin. Pesticide use, nutrient runoff, wetland and habitat loss, riparian zone impacts and the health of fisheries all remain concerns. The Niagara-Welland basin contributes less than 0.1 percent of the total flow of the river.

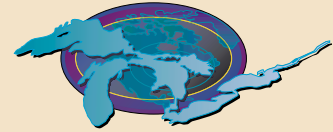
There are eight impaired beneficial uses in the Canadian portion of the AOC (Table I). These include restrictions on fish consumption, degradation of fish populations, bird or animal deformities, bird or animal reproductive problems, degradation of benthos, restrictions on dredging activities, eutrophication, beach closings, and loss of fish and wildlife

habitat. The status of the following four impairments is not fully known: restrictions on wildlife consumption, degradation of wildlife populations, fish tumours and deformities, degradation of phyto/zooplankton populations.

### RAP STATUS

Canada and the United States have agreed to develop Remedial Action Plans independently for the Niagara River within a broader context of intergovernmental cooperation. Joint participation includes the Niagara River Toxics Management Plan (NRTMP), Important Bird Area program and the International Board of Control under the Niagara River Treaty. The Canadian RAP was initiated in 1989.

The NRTMP was established in 1987 and specifically targets 18 priority toxics for reduction. Monitoring results show that there have been statistically significant reductions in the concentrations in the river for most of these 18 substances. In many cases reductions have been more than 50 percent. The results of monitoring Ontario point sources for ten years between 1986 and 1995 show loading reduction estimates of 99 percent for the 18 chemicals of concern.



Environment Canada and MOE are the agencies responsible for the delivery of the Canadian RAP. To facilitate RAP implementation an agreement was signed in 1999 with the Niagara Peninsula Conservation Authority (NPCA) to assume responsibility for coordinating the continued development and implementation of the RAP. The NPCA with public input developed an *Implementation Annex* that provides a practical strategy for local implementation.

## PUBLIC INVOLVEMENT

In 1995, following consultation with the Public Advisory Committee (PAC) and public review, a set of 36 recommendations was officially adopted for the RAP to restore the desired beneficial uses and achieve environmental goals. The Niagara Restoration Council (formerly known as the PAC) continues to play a role as the RAP moves into the implementation phase. The council now focuses on specific projects within the AOC, including the naturalization of Baden Powell Park, Grassybrook Creek Watershed Regeneration Project and fundraising activities. The Conservation Authority also plays a role encouraging community involvement and monitoring progress towards restoring the beneficial uses in the Niagara River AOC.

## ACHIEVEMENTS

Since 1990, the GLSF has provided \$3.9M towards 24 restoration projects in the AOC. More than 41 partnerships have been created with \$12.8M in direct partner funding, \$2.3M through in-kind contribution and personnel participation valued at \$234K.

### CITY OF NIAGARA FALLS

To reduce stormwater flows, 4300 urban homeowners in Niagara Falls were asked to disconnect their roof downspouts. A survey by the City, followed by an intensive public education campaign gained an 85 percent response rate and was more effective than using a non-voluntary legislative approach. The City continues to actively promote water conservation through a newly developed corporate water conservation strategy. Ongoing homeowner projects include a rain barrel subsidy and a weeping tile disconnection program (each \$100K annually). Through technology demonstrations,

the City of Niagara Falls was able to identify a significant savings for innovative High Rate Treatment of combined sewer overflows (CSOs) and is now proceeding with full scale implementation. Another large scale initiative is an ongoing program (\$2M annually) to separate domestic and storm sewers to reduce combined sewer overflow events.

### WELLAND RIVER WATERSHED STRATEGY

Under the Welland River Strategy a rural watershed heritage strategy is being implemented. Actions have included the planting of more than 96 000 trees, rehabilitation of 10.5 hectares of wetland habitat, the installation of over 18 kilometres of fencing to protect riparian habitat adjacent to watercourses and the reduction of phosphorus entering local watercourses by more than 1 500 kilograms per year. In 1995, approximately 10 000 cubic metres of contaminated sediments were remediated in a section of the Welland River adjacent to Atlas Specialty Steels. Biological sampling since the sediments were remediated indicates that this section of the river is recovering as anticipated.

The NPCA has been actively involved with local landowners since 1994 to improve water quality in streams. Each year the NPCA strives to increase forest cover by 100 acres, establish five additional kilometres of riparian buffer strips and restore five acres of wetlands. At present nearly 15 percent of the Welland River watershed is forest cover and eight percent of the area is wetland. By 2002, 135 projects were completed with a total cost of \$2.9M including in-kind contributions from local landowners valued at \$1.1M. Activities to date have increased forest cover on 90 hectares of land, restored 21 kilometres of riparian habitat and seven hectares of wetlands. Nutrient and bacterial loadings have been reduced through livestock fencing and manure storage projects.



## REMOVAL OF NIAGARA RIVER WATERSHED FISH BARRIERS

The Niagara Restoration Council is undertaking a project to remove all barriers to fish passage in the watersheds within the Niagara AOC. In 2001, all barriers to fish passage were identified, mapped and classified by type and size. Removal of these barriers began in 2002 and it is anticipated that the majority of barriers will be removed or mitigated by 2005, thus making hundreds of kilometres of upstream fish habitat available to spawning fish. A public outreach campaign is being conducted in conjunction with this work to educate the public about the effects of these barriers and encourage voluntary removal of existing privately owned barriers.

## FUTURE ACTIVITIES

### RAP IMPLEMENTATION ANNEX

The development of the *Implementation Annex* is a concrete step in moving towards restoring impaired beneficial uses in the AOC. A major strength of the Annex is in the use of established partnerships that will enable integration of the RAP with activities of the NPCA, the NRTMP, and the two senior levels of government. A strategic implementation workplan has been developed to:

- address toxic contaminant discharges;
- improve sediment quality and benthic health;
- reduce nutrient and bacterial loadings;
- protect and restore fish and wildlife habitat;
- reduce agricultural non-point sources;
- improve groundwater quality;
- sustain the recreation amenities of the area, and
- extend education and outreach.

Total estimated costs of proposed partnerships exceed \$6M.

The NPCA is taking a lead role for implementation in a number of the areas. Through a grant program, the NPCA will provide incentives to local landowners within the Niagara-Welland basin in order to foster best management practices for agriculture, create habitat and protect ecologically sensitive land. To assess overall progress, the NPCA will develop and administer a tributary water quality monitoring program. Government partners will continue the Niagara River point source monitoring program. The City of Welland will undertake to remove sediments in the Old Welland Canal siphons. Ontario Power Generation will assess impacts of its water fluctuations and review options to implement solutions in the Welland River.

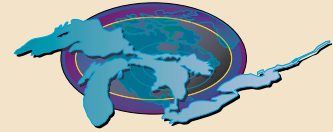
Potential projects for the future are development of CSO control strategies throughout the Region, a study to identify options to upgrade the Welland STP and a program to assist rural landowners with upgrading failing septic systems.

### IMPORTANT BIRD AREA DESIGNATION

The Niagara River corridor was named as a binationally Important Bird Area (IBA) in 1996. As much as 20 percent of the global population of gulls use the corridor over the fall and winter months. The large populations of gulls that use the river will face increasing pressures from urbanization. A conservation plan for this IBA is being developed through a coalition of interested groups. Important considerations in the plan are the retention of habitat and land use planning.

## OUTSTANDING ISSUES

Based on the contaminated sediments sites identified in the Stage 2 Niagara River RAP report, the NPCA has submitted a management proposal for all known sites. Recently government agencies have assessed Lyon's Creek for PCB contamination of sediments to accurately pinpoint locations and to assess the quality of the sediments to determine if remediation is warranted. Pending the results, agencies will develop recommendations for remediation.



Full implementation of remedial actions in the Niagara River AOC will require many years and is contingent on federal, provincial and/or municipal funding availability and in some cases private sector involvement. Environment Canada is working to complete federal actions by 2007. Participation of the conservation authority and other local partners is expected to continue beyond that date.

A current large scale initiative for Niagara Region and the City is the Niagara Falls-Muddy Run CSO treatment facility. Muddy Run is the largest volume CSO in the Niagara Region. Other smaller CSOs in the Region will be addressed, as resources are available. Total project costs including the High Rate Treatment (vortex technology), construction of a pumping station, and property acquisition are estimated at \$13M. The CSO project at Muddy Run is in the design phase and the City of Niagara Falls is seeking funding. The project is expected to be completed within five years.

The City of Welland has begun to address its wet weather flow bypass problem. In cooperation with the Regional Municipality of Niagara, the City is undertaking a study to investigate high-rate treatment options for combined sewer overflow and determine the most suitable technology for treating CSOs within the City of Welland. The knowledge gained from this work will also be used in the development of a Combined Sewer Overflow Treatment Manual that can be used by other AOC municipalities to address their CSO problems. CSO characterization and the initial phases of the Environmental Assessment process have been completed, however the municipality will need to raise \$13M for construction of a new facility.

## U.S. ACTIVITIES

Activities to clean up seeping hazardous wastes have led to a reduction in contaminant levels in Niagara River water approaching 60 percent. The work to construct isolation barriers has now been completed at 16 of 26 sites identified for remediation. The barriers effectively isolate the sites preventing further migration of toxic contaminants to the river. The effort has cost over US \$380M with most of this paid for by the companies responsible, with the remainder funded by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. EPA. Improvement to the remaining ten sites are estimated to be US \$250 M and will be addressed by 2003. Although contaminant levels in Niagara River fish are lower, sportfish consumption advisories continue to be issued. Considerable quantities of contaminants remain in the sediments and these will continue to be available to the food chain.

## DELISTING OUTLOOK FOR THE CANADIAN SIDE

The process to refine delisting criteria and set more specific targets on the Canadian side is now underway and will be conducted with public input. Monitoring information will be required to support decisions regarding the delisting targets.

The extensive loss of fish and wildlife habitat in the AOC is being addressed by the NPCA and the Niagara Restoration Council. Habitat restoration is ongoing and significant progress has been made towards meeting delisting criteria. Following the completion of recommended projects, time will still be required for the natural environment to recover.

Remediation of CSO discharges is essential to complete RAP implementation and several large infrastructure needs have been identified. Infrastructure costs are estimated at \$26M for high rate treatment of combined sewer overflows for the cities of Niagara Falls and Welland. A full-scale demonstration project is underway for Niagara Falls with funding from the Provincial Water Protection Fund. These projects are long term and will require significant investment from the community and all levels of government.



## Hamilton Harbour

Hamilton Harbour is a 2 150 hectare embayment located at the western tip of Lake Ontario. It is connected to the lake by a ship canal across the sandbar that forms the bay. The Area of Concern includes the harbour, Cootes Paradise wetland and open water, and the surrounding watershed drained by three main tributaries: Grindstone Creek; Red Hill Creek; and Spencer Creek, covering a total of 50 000 hectares. The watersheds are divided by the Niagara Escarpment giving rise to scenic waterfalls with the urban centres of Hamilton, Burlington, Stoney Creek, Dundas and Ancaster largely below the escarpment. The urban population is growing rapidly and exceeds 700 000. While the economic structure of the region was historically based on the iron and steel industries, it is rapidly diversifying with the services sector now providing the most jobs. Health and educational institutions are now among the top five employers of the region. About 30 percent of the watershed is designated as an Environmentally Significant/Sensitive Area and development is subject to a range of controls in an attempt to minimize damage and retain intrinsic values.

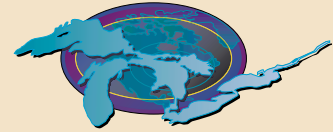
### ENVIRONMENTAL ISSUES AND IMPAIRMENTS

The ecosystem of the harbour reflects its natural conditions (a small, shallow water body with a long retention time), a high volume of sewage treatment plant discharges, large scale industrial activities and extensive land use changes. Hamilton Harbour is a major shipping centre and supports the largest concentration of heavy industry in Canada. The water and sediments are contaminated by metals, pesticides, PCBs and PAHs. The sediments of Randle Reef and industrial boat slips are highly contaminated with PAHs and have an adverse effect on the local ecosystem. In addition, the shoreline has been radically transformed with 75 percent of wetlands eliminated and 25 percent of the shoreline filled in. Habitat for fish and wildlife is greatly reduced and resident species are exposed to toxic contaminants.

Hamilton Harbour is the main recipient of the waste water treatment plant discharges and urban runoff from the cities of Hamilton and Burlington and the treated sewage from Stoney Creek and Burlington--large portions of which are not in the natural watershed of the harbour but considered within the RAP. The water quality of the harbour continues to be characterized by poor water clarity, low oxygen levels, high nutrient levels and high bacterial levels resulting from a combination of soil erosion in the watershed, industrial particulate discharges, partial treatment of urban sewage, urban runoff and combined sewer overflows.

Hamilton Harbour AOC has nine beneficial use impairments. The discharge of toxic substances to the harbour from industry, waste sites and agriculture and the contaminated sediment deposited from a century of these discharges has resulted in four impairments: restrictions on eating fish from the harbour; reported fish tumours; animal (snapping turtle) deformities; and restrictions on dredging activities.





The poor water and sediment quality contribute to four additional impairments: a degraded bottom-dwelling invertebrate community (which serve as a food source for fish populations); eutrophication and undesirable algae; beach closures due to bacteria; and degraded aesthetics.

The presence of contaminants, lack of oxygen and high sedimentation together with shoreline restructuring and infilling also play a major role in the loss of habitat and reduced populations of fish and wildlife.

Further assessment of impairments is required for bird and animal deformities and for degradation of plankton populations of the harbour.

## STRUCTURE OF THE RAP

RAP planning for Hamilton Harbour AOC began in 1986 with the formation of a stakeholders group and writing team. In 1991, stakeholders organized into two distinct groups: the Bay Area Restoration Council (BARC) and the Bay Area Implementation Team (BAIT). BARC, created as an independent non-profit organization, strives to maintain a balanced voice for all stakeholders of the harbour, perform a watchdog role by monitoring RAP progress, and to keep the public informed. The BAIT is composed of the major implementors of the RAP. A public group, the RAP Forum, was established in 1998 to provide input to the update of the Stage 2 RAP document. Their work was completed in 2002.

The Hamilton Harbour RAP Office was created in 1992 by Environment Canada to serve as liaison among BAIT and BARC, the RAP Forum and the RAP Technical Team, and provides secretariat support to the BAIT and during its term, the RAP Forum.

## PUBLIC INVOLVEMENT

Since its inception, a commitment to public involvement has been one of the strengths of the Hamilton Harbour RAP process. Today BARC is a confederation of community stakeholders and is the largest centre for dissemination of information on harbour conditions and RAP progress. BARC has held over 40 public meetings and numerous other venues, publishes an annual report *Toward Safe Harbours* and produces a quarterly newsletter. In 2002, BARC published a report card on the status of the RAP, giving “fair to middling” letter grades for 17 desired outcomes. Environment Canada has supported BARC since its creation in 1991.

The RAP Forum is a broader group of stakeholders and citizens that was called together to evaluate the remedial actions undertaken to date and to draw up a set of new recommendations and timelines for RAP implementation. The RAP Forum was assisted by technical teams and the draft RAP Stage 2 Update was prepared by the RAP Office as a result of this consultation.

## ACCOMPLISHMENTS

Pre-RAP expenditures for Hamilton Harbour calculated in 1990 dollars are in the range of \$500M for Stelco and Dofasco for toxics reductions, and \$100M for the municipalities for improvements to wastewater treatment plants. Total RAP spending since 1990 is estimated at over \$205M comprising \$145M for industrial abatement and municipal wastewater treatment, and \$30M each from the senior levels of government. Between 1990 and 2001 the GLSF has spent \$15.4M towards restoring impaired beneficial uses in the Hamilton Harbour AOC. Partner funding and in-kind contributions exceeds \$25M. The largest funding category is habitat restoration where GLSF contributed \$8.6M and partners \$13.1M to projects. Significant progress has been made in the AOC particularly in the areas of fish and wildlife habitat enhancement and restoration, and public access to the shoreline and watershed.

## WATER QUALITY

Progress has been made on reducing the phosphorus, chlorophyll and bacteria levels in the harbour. The main improvement in water quality in the west end of the harbour has been the reduction of bacterial contamination. This was achieved by the installation of CSO tanks, which store the excess combined storm sewage and sanitary sewage and channel the effluent to the Woodward Wastewater Treatment Plant (WWTP). As a result of these improvements, two beaches were opened in 1993 after a 50-year long swimming prohibition in Hamilton Harbour. Another notable success was at the Region of Halton's Skyway Sewage Treatment Plant where low-cost optimization techniques were introduced that resulted in improved effluent quality and considerable savings for the Region.



## URBANIZATION AND LAND MANAGEMENT

The Hamilton Harbour Watershed Stewardship Project is a joint program of the conservation authorities and BARC to educate and engage the community in the restoration of local water resources. Since 1994, over 6500 hectares of land have been protected through verbal stewardship agreements in the Spencer and Grindstone Creek watersheds including 120 kilometres of riparian habitat and 2900 hectares of significant wetland and upland habitat. The program is ongoing.

## TOXIC SUBSTANCES AND SEDIMENT REMEDIATION

The waters of the harbour now meet water quality guidelines for toxic metals although the load reductions occurred prior to the beginning of the RAP. Environment Canada is working with its government and industrial partners on the Randle Reef Sediment Remediation Project to remove and contain approximately 50 000 cubic metres of contaminated sediment from Hamilton Harbour. To date total expenditures to conduct environmental site assessments, investigate remedial options and technologies amount to \$3-4 million. Work to remediate Randle Reef is planned for 2004. Decisions on other harbour hotspots are still pending.

## FISH AND WILDLIFE

Very positive, visible progress has been made in restoring fish and wildlife habitat. Work at six sites has resulted in: restoration of 340 hectares of habitat; secured habitat for 670 nesting pairs of Caspian and common terns; considerable shoreline rehabilitation; at Cootes Paradise the return of amphibians and reptiles once considered extirpated, and increased diversity of native plants and waterfowl partially as a result of a successful program of carp exclusion.

Habitat restoration activities have had the added benefit of involving many volunteers and bringing work on the harbour to the attention of the public. Volunteer plantings and growing of marsh plants in schools across Hamilton-Wentworth Region have involved thousands of individuals in "hands-on" restoration work. For example, the Hamilton Harbour Waterfront Trail was opened in 2000 with over 600 people volunteering their time to plant thousands of rootstocks, trees and plants over a four day period. The trail has also increased public access to the shoreline to 21 percent. This is a considerable achievement considering that there was essentially no public access to the harbour when the RAP began.

## RESEARCH AND MONITORING

Considerable scientific research and monitoring has been conducted in Hamilton Harbour and Cootes Paradise by governments, local conservation authorities, McMaster University and the Royal Botanical Gardens. A research and monitoring workshop was held in 2001 providing scientists with an opportunity to share their understanding of the harbour ecosystem. Scientists at the National Water Research Institute of Environment Canada have investigated the response of harbour water quality to changes in sewage discharge and continue to provide advice and input to sewage issues, non-point source pollution, Randle Reef and Windermere Basin dredging plans and the Cootes Paradise Fishway.

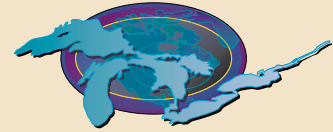
## FUTURE ACTIVITIES

The Hamilton Harbour AOC cannot be delisted in the short-term. Many of the issues affecting the harbour require significant capital costs and 10-15 years or longer to complete. For the immediate future, there are many activities and initiatives that are underway.

The RAP Office has recently completed a draft *RAP Stage 2 Update* that provides the current status of the RAP and identifies recommendations from the public. The Update was reviewed by the public and presented to the governments in early 2003.

Sediment remediation is one of the priorities for Environment Canada in this AOC. Efforts will continue on Randle Reef and for the Dofasco boat slip to reach an agreement on timelines and funding commitments to clean up known sediment hotspots. The City of Hamilton is leading efforts to establish an ongoing dredging program for the Windermere Basin to remove contaminated sediments, investigate for unknown hotspots and restore the effectiveness of the settling basin.

More effort is required to address direct discharge of toxic substances from the steel sector. While control of direct discharges from the steel sector has improved in the 1990-1997 period, some of this was achieved by re-routing effluents through the Woodward Avenue Wastewater Treatment Plant.



It is expected that the City of Hamilton's new sewer by-law will address this issue. In addition, loadings from the plant are not monitored well enough to allow a calculation of the net effects in the harbour. The GLSF is a partner in several studies addressing the management of CSOs at the Woodward Avenue Wastewater and within City's infrastructure of sewer networks and existing and proposed CSO tanks; communication of the issues related to CSOs to the public; and the optimization of the Waterdown sewage treatment plant. Other areas of support could potentially include optimization of the remaining STPs, and performance evaluation of CSO treatment technologies.

There is a need to include RAP objectives in the Official Plans of local municipalities. Attention will be drawn to urban boundaries, regional transportation corridors and the control of construction practices to limit the effects of site alterations to watersheds. The Halton Conservation Authority, with GLSF support, is working together with other conservation authorities and municipalities to implement watershed plans and shoreline stewardship initiatives at the end of a five-year period (2006). This initiative will likely result in sensitivity to planning new development with regard to the environment and goals of RAP.

Potential candidate projects for GLSF support include fish and wildlife habitat projects that are expected to be completed by 2005/6, such as the re-introduction of southern wild rice and fish/wildlife habitat restoration projects in Cootes Paradise. Full recovery of Cootes Paradise and Grindstone Creek is not expected until 2014.

Parks Canada has committed \$10M for the Canadian Marine Discovery Centre, a major new environmental interpretive facility located in Hamilton Harbour focussing on the history, development and existing conditions of the Great Lakes with particular emphasis on Lake Ontario and Hamilton Harbour. The Discovery Centre is scheduled to open in 2003 and is expected to raise the level of public education and awareness of the RAP and operate as a centre for information dissemination.

## DELISTING OUTLOOK

The Hamilton Harbour RAP Office, together with the RAP Forum, have prepared a preliminary capital cost estimate to complete all remedial actions in the AOC. Funding would be required between the present time and 2015 to achieve delisting of the AOC. The total of \$650M includes \$543M for upgrades to Hamilton and Halton's Waste Water Treatment Plants and the Hamilton CSOs to meet RAP water quality targets. The other major capital cost is to remediate PAH contaminated sediments in the area of Randle Reef estimated at \$25 million. Some costs for remedial activities have not yet been determined. Smaller capital costs are: \$9M for City of Hamilton water metering; \$9M for further creation and maintenance of fish and wildlife habitat; and an additional \$10M for recreational trail development of and enhancement of lands recently transferred from the Port Authority to the City of Hamilton.



## Toronto and Region

The Toronto and Region AOC extends from the Rouge River in the east to the Etobicoke Creek in the west and includes six tributary watersheds which drain into Lake Ontario: Etobicoke Creek, Mimico Creek, Humber River, Don River, Highland Creek and Rouge River. The drainage basin of these watersheds covers 2 000 square kilometres and over 40 percent of the AOC is still classified as rural. The headwaters of the Don, Humber and Rouge Rivers are in the rolling hills of the Oak Ridges Moraine to the north. The Rouge River watershed contains one of the world's largest natural parks in an urban/agricultural setting and is an enclave for a highly diverse Carolinian ecosystem.

The AOC includes the City of Toronto and encompasses 11 other municipal jurisdictions within the neighbouring Regions of Peel and York. Toronto is part of a band of almost complete urbanization running along the shoreline of Lake Ontario from Hamilton on the west to Oshawa on the east. More than four million people reside in the Greater Toronto Area – 40 percent of the people in Ontario inhabiting one percent of the land.

### ENVIRONMENTAL ISSUES

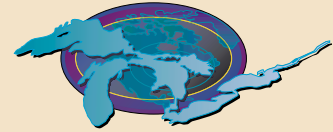
The growth of the city from its earliest settlement to the present day is a chronicle of extensive physical restructuring of the shorelines, watersheds and landscapes, the subsequent alteration of existing water flow regimes and the attempt to manage the flow of wastes from individual and industrial activities. In the process, wetlands, forests, fish and wildlife habitat in the urbanized portion of the AOC were for the most part lost. Rivers and streams were piped and channelized.

The continued urban growth pressures in the region and the legacy of past activities have contributed specifically to beach closures, fish consumption restrictions, habitat loss, degraded fish and wildlife populations, elevated nutrient levels and contaminated sediments. Most of the stormwater in the city is discharged through 2600 outfalls and 79 combined sewer overflows (CSOs) into rivers, creeks and Lake Ontario. The discharge contains high levels of bacterial and nutrients, heavy metal and organic chemical contamination, and this remains

the single biggest cause of a degraded aquatic environment. In addition, the many industries of the region discharge into municipal sewage systems which are not designed to removed chemical contaminants. Agricultural non-point sources of sediments, nutrients and pesticides are have been identified in the upper watersheds and contribute to the loads measured at the river mouths. Consequently the RAP has designated eight beneficial uses of the waters of the AOC as impaired and three more requiring further assessment. (Table I).

### IMPLEMENTATION STRUCTURE

The RAP process for the Toronto and Region AOC is complex. The RAP was initiated in 1986, with the formation of a RAP team comprised of federal, provincial and Toronto and Region Conservation Authority (TRCA) officials. After intensive study of the ecosystem and public consultation, the RAP Clean Waters, Clear Choices was released in 1994. The plan outlines 53 recommendations for restoring and protecting water quality in the Area of Concern.



The structure of the RAP team evolved to include municipalities, representatives of the Public Advisory Committee (PAC) and the Waterfront Regeneration Trust (WRT). In 1997, Environment Canada and the Ontario Ministry of the Environment signed an MOU with the TRCA and the WRT to facilitate RAP implementation using an integrated watershed approach. Between 1997 and 2002, annual Clean Waters Summits and follow-up with issue specific meetings and workshops were held for the Oak Ridges Moraine (1999) and the Wet Weather Flow Master Plan for the City of Toronto (2000).

A new five year Memorandum of Understanding between Environment Canada, the Ontario Ministry of the Environment and TRCA was signed in 2002. The TRCA is now taking the lead in the implementation of the RAP and will develop a five year plan for the RAP. Through the MOU, the RAP is continuing to support the various watershed alliances and councils that are working to improve key watersheds. Recent progress includes the release of revitalization strategies and a report card for the Etobicoke and Mimico Creeks. Expanding the water quality and habitat opportunities through the development plans for the revitalization of the Toronto Waterfront and the implementation of the City of Toronto's Wet Weather Flow Management Master Plan (WWFMMP) will continue to be a major focus for the RAP.

## ACCOMPLISHMENTS

Since 1990, the GLSF has provided \$10.7M towards 133 projects aimed mainly at restoring impaired beneficial uses related to habitat projects and urban stormwater issues. The projects funded have involved more than 105 partnerships among federal and other levels of government, and the private sector. The return on this investment in partnerships has achieved \$32M in direct partner funding (including nearly \$14M for urban runoff projects), \$2.3M in-kind contribution and personnel participation in habitat restoration projects valued at \$4.0M.

An additional \$1.5M has been provided by Environment Canada's Eco-Action Program. The federal government has also contributed approximately \$6M for municipal sewage and water improvements in the AOC under the Canada-Ontario Infrastructure Works Program.

The province of Ontario through MOE, MNR, OMAF and other agency funding programs, including infrastructure and stewardship funding have provided close to \$60M to the Toronto AOC since the inception of the RAP program.

There have been notable successes in the Toronto and Region AOC. Bacterial conditions have improved in the Eastern Beaches with the installation of two stormwater detention tanks that hold the water until it can be treated at the Ashbridge's Bay STP. Construction of a detention tunnel and treatment facility for combined sewer/stormwater has partly relieved the bacterial problems at the Western Beaches. In addition, various innovative and cost effective stormwater treatment systems such as exfiltration and flow balancing systems, were installed in the City of Toronto.

Other promising signs of progress include: removal of stream barriers returning historical access for salmon to the upper reaches of the Don River; the creation of 20 hectares of new waterfront fish and wildlife habitats during the 1990s; the presence of rainbow trout in the East Humber; and the first Ontario nesting of Canvasback Ducks.

Work led by the TRCA has resulted in watershed plans for the Humber and Don Rivers and Etobicoke and Mimico Creeks. The Humber Watershed Alliance, a community-based action group was formed in the 1997 to implement the watershed strategy for the river. The first of a series of Humber River report cards released in 2000 uses an indicator approach to identify reasons for cautious optimism (outdoor recreation and greenspaces) and for concern (stormwater management). The Don Watershed Regeneration Council in its 2000 report card concludes that the Don River is still turning the metaphorical "corner" towards recovery. The Council notes that while over 100 small scale regeneration projects have been initiated in the watershed with the help of volunteers, unless there are solutions to the large scale problem of combined sewer/stormwater control, the benefits of the project level work will not be realized.

The Etobicoke and Mimico Creek revitalization strategies report released in 2002 presents a 25 year vision for the watershed. A coalition has been established to guide implementation of remediation activities and pertinent social and economic issues for the watershed.



## FUTURE ACTIVITIES

The foundation has been laid by the RAP and its partners for continuing the ecosystem approach and building sustainable communities. There is a new and credible vision for the region, The Living City and an integrated approach to decision making has emerged at the watershed level. The WWFMMP will provide the blueprint for solving the central problem of combined sewer/stormwaters for the City of Toronto. Many of the recent initiatives within the region share the recognition that a strong economy and vibrant communities depend on a healthy environment.

Most of the causes of environmental degradation remain in place--the Toronto Region loses 24 hectares of land to development every day. Urbanization and the large population base of the AOC are the largest challenge to restore the beneficial uses which are impaired. Implementation of the RAP requires a long-term commitment.

The 2001 RAP progress report, Clean Waters, Healthy Habitats identifies six areas for priority action: wet weather flow management; pollution prevention; habitat restoration; smart growth; education; and monitoring. Three areas are highlighted below.

### WET WEATHER FLOW MANAGEMENT

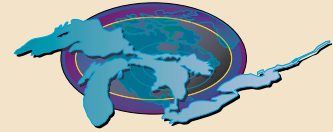
Costly remedial actions will fall largely within the municipal mandate and municipalities are looking to the federal and provincial governments for enhanced support in implementing stormwater and combined sewer overflow control, and enhanced sewage treatment. The City of Toronto WWFMMP is based on the hierarchy of source control, pollution prevention and infrastructure improvement. Implementation will require a paradigm shift in wastewater management. The Master Plan will identify the most effective means to introduce controls into the stormwater regime (both remedial and preventative) and will take advantage of new technologies for sewage/stormwater treatment. Appreciable gains from technology can only be maintained though; introducing stormwater management at the level of individual properties; enforcing industrial sewer use throughout the region; ensuring that municipalities upstream of the city manage their stormwater; and applying a range of best management practices to municipal infrastructure. Potential upcoming projects include performance evaluations of CSO and stormwater technologies in support of the implementation of the Master Plan; and planning studies to address stormwater runoff from municipalities within AOC boundaries.

The preferred WWFMMP option will be going before Toronto City Council in 2003. The preferred option is based on expenditures of \$1B over 25 years. It focuses on swimmable waterfront beaches; eliminating discharges of CSOs; protection against basement flooding and meeting the province's CSO policy; protection of the City's infrastructure from stream erosion; restoration of degraded local streams and improvement of stream water quality; reducing the extent of algal growth along the waterfront and in streams; and the restoration of aquatic habitat.

While the selected option represents an important step, implementation plans for the full restoration of water quality related impaired beneficial uses are currently based on a 70-100 year timeframe at a cost of approximately \$10B.

### HABITAT RESTORATION

The rivers, streams and lakeshores that support most of the fish and wildlife habitats in the AOC have become degraded from the high volumes of sediments and contaminants due to sewer discharge, urbanization and stream modification, and several centuries of agriculture. Many rehabilitation and regeneration projects have been undertaken and now the priority is to implement more comprehensively. Partnerships among GLSF, TRCA, Ontario Ministry of Natural Resources, Department of Fisheries and Oceans, the City of Toronto and other municipalities, and community groups have been formed to facilitate watershed fish management plans, maximize waterfront habitat, undertake further planting of riparian vegetation and implement a Natural Heritage Strategy for terrestrial habitats. There is an increasing recognition that improving habitat structure must occur in conjunction with improving water quality and flow patterns and that success will depend on CSO/stormwater remediation. Habitat acquisition, stewardship agreements and conservation easements (e.g., federal Eco Gifts program) will continue to be a key component in protecting ecosystem health.



## MONITORING

Continued monitoring will enable agencies to quantify progress and more clearly report on watershed health to the public. In collaboration with stakeholders, the TRCA has developed a watershed monitoring framework that incorporates relevant ongoing programs, introduces new ones and includes community monitoring. The TRCA has secured funding for the first year of monitoring however, long term funding is needed to provide comparative data for individual impairments. For example, to fully understand the restriction on fish consumption in the AOC, the following would be needed: trackdown of PCB sources; adjustment of sportfish monitoring to include river sites; and selection of sentinel sites for repeated sampling.

## PUBLIC INVOLVEMENT

While public involvement and awareness may not directly restore the beneficial uses in the Toronto AOC in every case, a public that is educated about the RAP program and its objectives can have considerable influence. Individuals may get involved at the level of their own properties, through local groups, by making informed choices or by promoting the RAP. The RAP has a number of initiatives to gain public profile including a RAP forum; Clean Water Summit, Watershed on Wheels and brochures and progress reports.

With dozens of community groups working towards the RAP goals, there are many opportunities for citizens to get involved: habitat restoration, fund-raising, strategic planning activities, education and outreach, as well as making a donation or sponsoring a project or event. Every year, tree and shrub planting projects are conducted in all watersheds by the TRCA, municipalities and community groups on public and private lands.

## THE LIVING CITY

In 2000, the TRCA and the Conservation Foundation of Greater Toronto launched a vision for a new relationship within the rapidly expanding city and the ecosystems on which it depends. The Living City Campaign has set an aggressive target of \$35M to support its programs for healthy rivers, regional biodiversity and education for sustainable living. As it is implemented, the Living City Campaign will help support the work of the TRCA and advance the goals of the RAP on both a watershed and regional basis. In 2001 \$2.5M was spent by the Foundation on land acquisition, local projects and new education programs.

## DELISTING OUTLOOK

Implementation of the Toronto and Region RAP will be a decades-long undertaking. The City of Toronto is now considering a 100 year plan for the control of water pollution sources. The preliminary projection of capital costs for implementation of the wet weather flow recommendations of the Toronto RAP (excluding industry) is \$1 billion over a 20 to 25 year period, with another \$30M annually for operation and maintenance.

As in all AOCs, verification of RAP progress towards restoration of impaired beneficial uses is obtained through data collection. Agency participation in an integrated monitoring approach is especially necessary for Toronto and Region given that very large allocations of money are required to bring results.

The RAP program is only one participant in a complex of agencies, large scale plans and external forces affecting Canada's largest city. The challenge facing the RAP and its management is to coordinate participation from others in achieving RAP goals while not being subsumed by larger scale economic activities and social trends.



## Port Hope Harbour

Port Hope Harbour is located at the mouth of the Ganaraska River on the north shore of Lake Ontario 100 kilometres east of Toronto. The Town of Port Hope is built on rising land north of the harbour. The AOC includes the harbour area and extends 300 metres from the lower Ganaraska River to the confluence area bounded by breakwalls. Presently the harbour is used as a receiving waterbody for cooling waters from Cameco Corporation a uranium conversion facility. Historically, Port Hope harbour was a major Great Lakes port: today, the harbour serves as a boat mooring area for the local yacht club.

### IMPAIRMENTS

Eldorado Nuclear Limited, a federal Crown corporation and its private sector predecessors, generated radioactive wastes at its Port Hope refinery beginning in 1933. Low-level Radioactive Wastes (LLRW) were initially stockpiled or disposed in ravines and vacant lots in Port Hope. During the 1940s and 50s LLRWs were placed in waste management facilities in the nearby Township of Hope and in the Municipality of Clarington, near the Hamlet of Port Granby. There is an estimated 1 to 1.5 million cubic metres of LLRW and contaminated soils in the area. The immediate health and safety risks have been assessed as minimal. In recent years, leaching of radioactive wastes and overflow of drainage ponds at these facilities during heavy rains has been observed and contamination has entered the local groundwater and Lake Ontario.

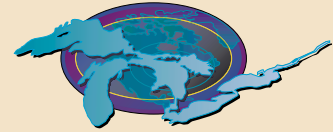
Port Hope Harbour was designated an AOC due to restriction of dredging activities. There are no other impaired beneficial uses. Most of the contaminant input to the harbour occurred between 1933 and 1953 resulting from operations and waste management practices of the Eldorado refinery. Process wastes were stored at the site and it is likely that surface runoff was the route of contamination for the harbour. An estimated 85 000 – 90 000 cubic metres of sediment containing low-level radioactive material is located within the turning basin and west slip of the harbour. The contaminants

include uranium and thorium series radionuclides, heavy metals, and PCBs. The contamination of the sediments halted the maintenance dredging in this area. It was determined that continued sedimentation would leave the turning basin inoperative as a boat mooring facility. To continue the operation of the harbour, the sediment must be removed.

### ACHIEVEMENT

In March 2001, the Government of Canada, represented by Natural Resources Canada, and the three communities of the Town of Port Hope, the Township of Hope and the Municipality of Clarington, entered into a legal agreement for the clean-up and long-term management of local historic LLRW, including radioactive wastes found within Port Hope Harbour. The legal agreement is based on community-developed concepts for the local, long-term management of the wastes. With the signing of the legal agreement, the Government of Canada began the 10-year, \$260M Port Hope Area Initiative, to develop and implement a long-term solution. Since that time, the Town of Port Hope and the Township of Hope have been amalgamated into one community, the Municipality of Port Hope.





## PUBLIC INVOLVEMENT

Public perception of the risks posed by LLRW in the Port Hope area and the concerns about long-term safety brought considerable pressure on the federal government outside of the RAP context. In 1982, the federal government created the Low-Level Radioactive Waste Management Office to discharge its responsibilities for the management of historic wastes in Port Hope and throughout Canada. The office in Port Hope assisted the RAP in developing the preliminary estimates for cleanup. Currently, the office handles public information requests and offers assistance to residents to assess and remediate their properties. The Low-Level Radioactive Waste Management Office has been designated by Natural Resources Canada as the proponent of the Port Hope Area Initiative.

## RECENT AND FUTURE ACTIVITIES

The implementation of the legal agreement for the Port Hope cleanup will be carried out in four phases. The first two phases, now underway, require the site characterization and environmental assessment of the proposed facility, and subsequent regulatory review. The third phase expected to take five years, involves removing the wastes, including those found in the harbour, constructing new management facilities and emplacing the wastes. The final phase provides for maintenance and long-term monitoring beyond 2011.

The agreement includes a hosting fee of \$10M to each of the three communities where the LLRW are located. The community-developed concepts propose to establish long-term radioactive waste facilities in each of the communities to properly contain the wastes and the hosting fee is intended to enable the municipalities to address impacts associated with the long-term facilities. A property value protection program for residents has also been set up in accordance with the agreement.

In November 2001, the environmental assessment of the Port Hope Area Initiative was initiated as two projects based on current municipal boundaries; the Port Hope Project and the Port Granby Project. As part of the environmental assessments the Low-Level Radioactive Waste Management Office will be conducting extensive public information and consultation programs related to the proposed projects.

Natural Resources Canada is working in cooperation with Environment Canada to develop the remediation of Port Hope Harbour AOC within the larger LLRW cleanup.

## DELISTING OUTLOOK

Natural Resources Canada is the lead for the clean up of all historic radioactive wastes found within the municipalities of Port Hope and Clarington, including those within the Port Hope Harbour, and will work with Environment Canada to ensure the requirements of the RAP are followed. The development of the LLRW waste facilities will require licenses from the Canadian Nuclear Safety Commission and are subject to the Canadian Environmental Assessment Act. It is expected that the regulatory review process will be completed by 2006. An additional five years will be required for the physical cleanup and emplacement of wastes in the newly constructed long-term management facilities. The RAP, therefore, follows a modified process, as progress is dependent upon selection and approval of an appropriate waste facility.

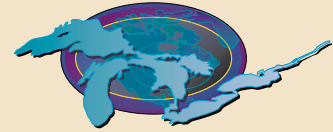


## Bay of Quinte

The Bay of Quinte is a narrow Z-shaped inlet, 100 kilometres in length, on the north shore of Lake Ontario towards the eastern end of the lake. The drainage basin is the largest in southern Ontario 17 520 square kilometres and is comprised of an extremely diverse landscape. The AOC contains the Bay and its tributaries. Of greatest interest to the RAP is the area bounded by the MacDonald Cartier Freeway on the north and Prince Edward County on the south. Emphasis is on land in Prince Edward County that drains directly into the Bay including the beef and dairy farms of Prince Edward County. Forest cover in the basin north of the Bay, including the largely undeveloped Precambrian Shield exceeds 30 percent. The shoreline of the Bay itself includes 22 provincially significant wetlands. The cities of Peterborough, Trenton and Belleville and the towns of Napanee, Picton and Deseronto, and four First Nations are located within the drainage basin.

The Bay has supported a large sportfishery based primarily on walleye valued at over \$3M annually. In recent years the ecosystem of the Bay has been greatly influenced by invasive species, such as the zebra mussel which by ingesting plankton has diverted this food source from fish. Ironically, remedial actions that have reduced the nutrient inputs to the Bay are acting in combination with the zebra mussel to alter the aquatic environment. As a result, the sustainability of walleye, a long time favorite of the sport fishery, is now in question.

The Trent River is the largest tributary entering the Bay of Quinte, influencing its water quality and water flow regimes. Parks Canada manages the Trent-Severn Waterway, of which the Trent River is a part. The Bay of Quinte is a unique ecosystem within Lake Ontario basin. Shallow and flushed up to 10 times per year, in some respects the Bay behaves like a riverine estuary.



## ENVIRONMENTAL ISSUES AND IMPAIRMENTS

The upper reaches of the Bay are shallow and susceptible to local nutrient inputs from sewage treatment plants and surface run off from agricultural and rural lands. Cultural eutrophication was one of the reasons the Bay of Quinte was listed as an AOC. The Remedial Action Plan for the Bay identifies ten impaired beneficial uses that result from four ecosystem issues: 1) excessive nutrients; 2) habitat loss, in particular wetlands, due to shoreline development; 3) contaminated sediment from historical mining and industrial activities along the shore of the Bay and in the watershed and; 4) bacterial contamination from sewage treatment plants, stormwater discharges and run-off from agricultural and rural lands which resulted in beach closings. The incidence of fish tumours and other deformities requires further assessment (Table I).

## THE SHARED ROLE OF GOVERNMENTS AND THE COMMUNITY

Work on water quality issues in the Bay of Quinte was already underway prior to the AOC designation. By 1993, the RAP had defined the issues and developed 80 clean-up recommendations through public consultation. In 1997, the community based Bay of Quinte Restoration Council was formed with a mandate to continue and support the work of the RAP. Membership on the Council includes but is not limited to the federal and provincial governments, local conservation authorities and the public advisory group Quinte Watershed Cleanup (formerly the Public Advisory Committee). The Council's primary goals are to expedite the delisting of the RAP and to provide sustainable environmental benefits. Activities include the implementation of restoration projects, "sustaining the gains" realized to date and ensuring that local stakeholder involvement is encouraged and valued.

To focus its efforts, the Bay of Quinte Restoration Council undertook a major public consultation effort in 2000 to inform the community at large of its efforts to renew AOC restoration targets. The public input was supportive of the proposed delisting targets which formed the basis for the *Bay of Quinte Five Year Action Plan*. Contained in the plan is a strategy for each impaired beneficial use together with a detailed list of 24 recommended environmental actions which when completed should lead to delisting. The preliminary cost estimate to implement all recommended actions is \$3M.

While the future plans are for the Council to be financially independent, Environment Canada with the additional resources from Ministry of the Environment is offsetting the operating expenses and provides staff participation on a number of activities.

Working with the Restoration Council are the scientists of Project Quinte, a multi-agency, long term research and monitoring project, led by Fisheries and Oceans Canada. Project Quinte has contributed a wealth of understanding on the aquatic ecology of the Bay since 1972. Research includes how the Bay's ecosystem responds to phosphorus controls and more recently to changes such as zebra mussel infestation. Findings are reported periodically and help support the Restoration Council in its formulation of remedial actions.

## ACHIEVEMENTS

Total phosphorus loadings from the five municipal STPs and the military base bordering the Bay of Quinte have declined over the past 35 years. Since 1990, there has been a 50 percent reduction of phosphorus loads from these sewage treatment plants and significant operational cost savings have been realized through plant optimization at four facilities.

It was recognized early in the process that partnerships would be the key to RAP progress and success. Since 1990 GLSF has been instrumental in securing 61 partnerships leading to environmental benefits. GLSF contributed \$4.3M to 45 projects with the majority of the money going to habitat restoration and non-point source remediation projects.



The return on this investment in partnerships has realized \$13.2M in direct partner funding including \$2.1M in-kind contributions, and personnel participation valued at over \$19M in agricultural diffuse source control.

Since 1993, the Bay of Quinte Rural Diffuse Source Control Project (with \$2M in support from GLSF) has completed 461 farm scale projects with successes in the watershed highlighted below:

- conversion of 27 000 ha of agricultural lands from traditional to conservation tillage,
- reduction of annual phosphorus load entering streams by 16 500 kilograms;
- rehabilitation of 256 hectares of wetland and protection of an additional 385 hectares of wetlands;
- protection of 40 kilometres of riparian zones.

The Government of Ontario has contributed approximately \$1M over the past decade to the implementation of remedial measures to address non-point sources in the basin and to develop farm based programs to improve water quality.

Complementing the RAP specific actions of the Restoration Council, a recent synthesis of the economic benefits of the environmental remediation efforts in the Bay of Quinte calculates local investment of \$121M and the creation of 302 jobs in the 1990-1999 period. This amount includes \$88 million in pollution abatement for sewage treatment plant expansions and industry upgrades and \$10M for stormwater controls within the Bay of Quinte watershed.

Significant progress has been made in the “Big Cleanup” of the Bay of Quinte. There are more species of game fish present in the Bay, nutrients loads have been reduced, phosphorus concentration in the Bay are approaching RAP targets, and habitat has been protected. A strong sense of stewardship has already been realized within communities and building on this will bring a shared vision of sustainability closer to reality.

## FUTURE ACTIVITIES

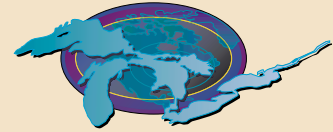
The *Bay of Quinte Five Year Action Plan* includes 24 recommended environmental actions to be completed by 2005 to restore the impaired beneficial uses. The actions range from planning, to ecosystem modeling to fish habitat restoration projects. Below are critical activities that are planned or underway.

### STP OPTIMIZATION

Although there has been a dramatic reduction of phosphorus loads from municipal STPs, the data do not reflect the “bypassing” that continues to occur at some STPs thus adding phosphorus to the bay. Efforts from STPs are required to control the variability in wastewater flow and to implement an area-wide optimization program. GLSF is undertaking a study to build on the STP optimization work completed previously in AOC municipalities in Ontario and to develop a plan to assist in meeting the RAP goals for optimizing sewage treatment plants in the Bay of Quinte.

### BENTHIC ASSESSMENT

The most recent scientific analysis using Benthic Assessment of Sediment (BEAST) methodology conducted by Environment Canada with MOE participation emphasized the Belleville waterfront. The findings show that the MOE sediment guideline “severe effect level” is exceeded at a majority of sites for total nitrogen and total organic carbon indicating excessive nutrient enrichment. Species composition of invertebrates confirms nutrient enrichment. The information will be used to support decisions regarding future activities to limit nutrient inputs.



## NATURAL HERITAGE STRATEGIES

To meet the delisting target for habitat loss and to provide direction to stakeholders, natural heritage strategies are proposed for Prince Edward County, the Mohawks of the Bay of Quinte (Tyendinaga) First Nation and some areas not fronting on the Bay of Quinte. Efforts will be made to facilitate incorporating the strategies into municipal Official Plans. To support the strategies, the landowner stewardship program includes incentives for habitat protection and restoration projects.

## BELLEVILLE WATERFRONT

Environment Canada is supporting the City of Belleville in partnership with the Waterfront Regeneration Trust and Quinte Conservation in the development of a conceptual plan for the East Bayshore, the waterfront running from the Moira River to the eastern city limits. Broad public input has been sought and a community workshop was held in October 2002. Results from the workshop and a public survey are to be compiled for a presentation before Belleville City Council.

## POLLUTION PREVENTION AND CONTROL PLANS

Stormwater and combined sewer overflows are sources of nutrients and bacteria that contribute to the poor water quality in the Bay of Quinte. Pollution Prevention and Control Plans (PPCP) are tools that municipalities can use to identify the priority locations for stormwater and CSO discharges and to determine the optimum approach to resolve the environmental impacts from these discharges. The BQ RAP Work Plan recognizes the need to advance recommended actions of PPCPs completed for the shoreline municipalities of Belleville in 1993 and Trenton (Quinte West) in 1995. The Restoration Council, in partnership with the municipalities will review the studies, and facilitate implementation of priority actions. In addition, work is ongoing to support the development of PCPS for the shoreline municipalities of Deseronto, Greater Napanee and Picton.

## DELISTING OUTLOOK

Further work is required to determine and implement a municipal phosphorus loadings “cap” that would protect the Bay against potential backsliding that could occur as a result of population growth. Detailed delisting criteria for fish and wildlife communities and habitats still need to be developed. Monitoring will be required to determine the status of wildlife populations. Based on natural heritage strategies and the fish habitat management plan currently under development, there is a likelihood that additional habitat conservation and protection measures will be required.

In addition to the necessary pollution prevention and habitat protection measures, a challenge to delisting will be to develop and nurture a broader ethic of sustainability in this AOC. This will be imperative, as the predominant stresses on the Bay of Quinte ecosystem have shifted to small, numerous diffuse sources arising from habitat destruction and/or faulty septic systems on privately held lands.



## CONTAMINATED SITES

### ZWICK'S ISLAND REHABILITATION

The City of Belleville has been monitoring the leachate and groundwater flow into the Bay of Quinte from a closed municipal landfill on Zwick's Island. During 2001, a cost-shared pilot testing and engineering study between the Fisheries and Oceans Canada and the City was conducted to more fully evaluate and model groundwater flow and quality. Results will be used to evaluate the need and options for treatment and management of the leachate. If required, treatment options include containment and pumping the leachate to the sewage treatment plant for treatment or constructing a shoreline marsh to act as a biofilter. No offshore impacts on bottom sediment have been identified that would warrant remediation. Part of the landfill is on federal property and the investigations are being undertaken in conjunction with the anticipated divestiture of the property to the City. It is planned to have the studies finalized for discussion with City Council in 2003.

### MEYERS PIER

The City of Belleville and Fisheries and Oceans Canada have been cost sharing remedial investigations and feasibility studies on Meyers Pier in anticipation of the divestiture of the property from the federal government to the City. Historic land use practices at the former commercial harbour of fuel and coal storage have resulted in contamination buried in the site including various heavy metals, polycyclic aromatic hydrocarbons and petroleum hydrocarbons. An environmental site assessment, including risk characterization and remedial needs and options, will be finalized for presentation to Belleville City Council and public consultation in 2003. Remedial needs are focused on the land-based portion of the site and no impacts on sediment have been identified that require remedial interventions.

### DELORO MINE SITE

Arsenic and heavy metal discharges associated with the abandoned Deloro mine have contaminated the Moira River system and raised concerns in the communities in the Bay of Quinte watershed. The Ontario MOE, since assuming control of the site in 1979 as a "remediator of last resort", has invested in a multi-million dollar program towards mitigating the impacts. This has involved the management of mine tailings, control of site runoff and treatment of leachate, demolishing contaminated buildings, sealing mine shafts and removing sludge. An overall final cleanup plan for the site is being developed by MOE for release and further public consultation in 2003. Regulatory requirements are being addressed during project development, including those under the Canadian Environmental Assessment Act due to a requirement for a federal license for the management of some radioactive contaminated materials on site.

Members of the Restoration Council participate in the framework that manages the site investigation/cleanup and are diligent in making information available to the public.

### MOIRA RIVER

A Moira River Study has been conducted and the final report was released by MOE in April 2001. The study concluded that water quality has greatly improved and there was little or no health concerns for residents and cottagers along the river. Heavy metal residues are found in the sediments of the river but sediment quality is improving and aquatic life is not impacted. Further investigations and the evaluation of remedial options are being undertaken for contaminated sediments in Young's Creek, within and beyond the boundaries of the mine site.



## St. Lawrence River (Cornwall)

The St. Lawrence River drains the Great Lakes and is among the largest rivers of the world. The Area of Concern is an 80 kilometre stretch of the river that extends upstream from the Moses-Saunders power dam in Cornwall, Ontario, downstream to the eastern outlet of Lake St. Francis controlled by the Beauharnois Power Dam in Quebec. The watershed of the AOC, which includes tributaries entering the St. Lawrence along this stretch, is mainly agricultural and woodland. Urban areas account for less than five percent of the AOC with the City of Cornwall forming the largest community. The AOC is a complex jurisdictional area involving Canada, United States, Ontario, Quebec, New York State and Mohawks of Akwesasne interests. Separate RAPs were developed for the Canadian (Cornwall) and U.S. (Massena) sides of the St. Lawrence River however a binational Joint Problem Statement document was prepared in 1994.

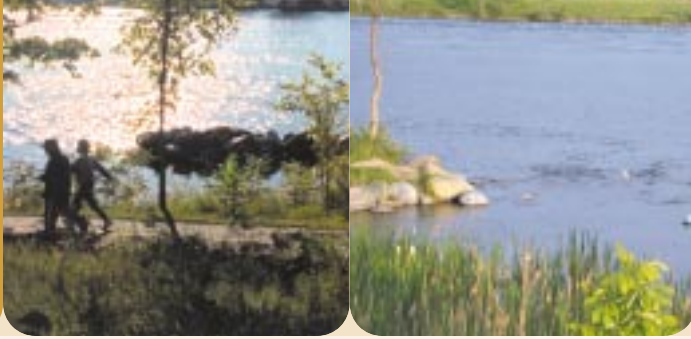
### ENVIRONMENTAL ISSUES AND IMPAIRMENTS

The Cornwall waterfront has been the location of industrial activities for more than 100 years. Although many of the contaminant sources have been eliminated (see below), historical inputs have continued to impact the aquatic environment as contaminated sediment and organisms transfer and cycle mercury and other metals. Local contaminant sources include industrial and municipal discharges, and diffuse sources such as urban stormwater and agricultural runoff. Contaminants also enter the AOC from upstream and from the Great Lakes via Lake Ontario and, finally, from air deposition. Land use practices, shipping and the extensive shoreline and water flow alteration that resulted from the construction of the St. Lawrence Seaway, continue to alter the natural ecosystem.

Major environmental issues of concern in the area include:

- mercury, PCBs and other contaminants in water, sediments and fish;
- fish and wildlife health effects related to contaminants;
- bacterial contamination leading to beach closings;
- habitat destruction and degradation;
- excessive growth of nuisance aquatic plants;
- exotic species.

The RAP has identified seven impaired beneficial uses in the Canadian portion of the AOC (Table I). Three more, fish tumours and other deformities, bird and animal deformities, and degradation of plankton populations require further assessment.



## RAP DEVELOPMENT

A federal/provincial RAP team with membership from Environment Canada, the Ontario Ministry of the Environment and the Ontario Ministry of Natural Resources led the development of the RAP since its formation in 1986. The Mohawks of Akwesasne participated actively during initial phases of the RAP and are currently engaged in implementation activities. The Public Advisory Committee (PAC) formed to provide input to the development of the plan and build community support has been reconstituted into the Cornwall and District Environment Council (CDEC) in a “watchdog” role for the RAP and additional environmental issues in the area.

## RAP IMPLEMENTATION STRUCTURE

There were 64 RAP recommendations for improving the aquatic environmental conditions in the AOC most of which have been implemented or are in progress. To implement the RAP, a local group of implementers with representation from EC, MOE, MNR, the Mohawks of Akwesasne, local municipalities, the St. Lawrence River Institute of Environmental Sciences (SLRIES), the Raisin Region Conservation Authority (RRCA), the CDEC and other and public groups have formed the St. Lawrence River Restoration Council. The role of the council is to provide the local lead for RAP implementation, track and initiate projects, gather the range of opinions from the community and engage key organizations and individuals.

The activities of the council are being coordinated by the RRCA through an agreement with Environment Canada and the Ontario Ministry of the Environment. The RRCA is also leading activities dealing with rural non-point source and habitat issues. Through another agreement, SLRIES is also tackling public outreach, fish habitat and population recovery and a number of research and monitoring activities.

## RAP ACCOMPLISHMENTS

Since 1990, the GLSF has provided over \$2.3M towards 25 restoration projects in the AOC. Partnerships have achieved over \$5.6M in direct partner funding including \$3.8M for urban infrastructure improvements, \$1.8M in-kind contributions and citizen participation valued at \$900K.

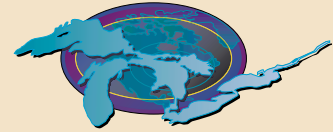
There have been several notable implementation actions in the St. Lawrence AOC. The retrofit of the City of Cornwall's Fly Creek stormwater treatment pond is a multi-phase project under the 1997 pollution control plan for the City of Cornwall to reduce contaminant loadings to the river via Fly Creek and Gray's Creek. Three phases have been completed including three settling chambers, with the two most downstream chambers being separated by a biofilter (peat).

There are no longer any significant sources of mercury or other heavy metals to the river in the Cornwall area. Regarding the three historical sources: the Domtar Fine Papers pulp and paper mill has installed a \$60M secondary wastewater treatment facility; Courtaulds Fibres and Courtaulds Films Canada closed in 1989 and 1992 respectively and the site decommissioned and restored to industrial land quality; and ICI Forest Products has ceased operating its chlor-alkali plant which used a mercury cell process. Decommissioning has also been completed at ICI and an associated chemical packaging plant.

The littoral zone habitat strategy has been implemented along an eight kilometre stretch on the Cornwall waterfront between Moses-Saunders Dam and Windmill Point. Designed to redress the hardening of the river shoreline and the resulting loss of habitat for fish, 16 projects were completed between 1994 and 2002. The projects restored habitat diversity to the area through the construction of artificial reefs, shoals, islands and small wetlands. Preliminary monitoring indicates a dramatic increase in fish abundance and diversity. A full assessment is underway and the result will likely show the effectiveness of artificial reefs in restoring littoral habitat in large rivers.

Cooper Marsh is a wetland area adjacent to Lake St. Francis. Environmental pressures and unchanging water levels have led to the development of a cattail monoculture that provides a poorer quality habitat than that found in areas with more diverse plants species. Under the Cooper Marsh Enhancement Project, sections of the cattail mat are cut away and winding channels are created in a section of the marsh. The material





removed from the channels is used to create loafing sites for birds and animals that live in the marsh. The result is an increase in the amount of spawning and nursery habitat for fish and breeding habitat for migratory birds. The first phase of this work has been completed and preliminary monitoring is showing an increase in the numbers of fish and wildlife in the marsh. Completion of the Coopers Marsh habitat restoration work is considered a potential candidate for future GLSF support.

Government agencies, the Raisin Region Conservation Authority, land owners and community groups working together to address RAP recommendations have planted over 85,000 trees and installed more than 49 kilometres of fencing to protect riparian habitat near watercourses and restrict livestock access to streams. These actions will reduce the watershed sedimentation rates and reduce nutrient and bacterial loadings to the river.

## FUTURE ACTIVITIES

There remain a number of outstanding concerns in the AOC: the development of a sediment management strategy; heavy metals (including mercury) and oils and grease in sediments along the Cornwall waterfront; the incidence and causes of tumours in fish and deformities in wildlife (mudpuppies); sources and levels of bacterial pollution in waters used for body contact recreation; the degree of impairment of phytoplankton and zooplankton populations; and the restoration and protection of fish and wildlife habitat, particularly coastal wetlands. Currently, the RAP is renewing its focus on delisting in a number of important ways: a process to review and refine delisting criteria to incorporate new science, link with other planning processes, and make it easier to measure progress towards achieving them is ongoing. A five year work-plan and monitoring plan is being developed; and the local conservation authority, RRCA, has become more involved in implementation. The latter is important because of the Authority's links to local governments and their planning and project management expertise.

## CORNWALL SEDIMENT STRATEGY

EC and MOE have been jointly working on development of a strategy for managing contaminated sediment in the AOC since the release of the *Stage 2 Report*. The first step was to assess the state of current knowledge about the sediment contamination. Existing information was consolidated into two reports – a technical review (*Cornwall Waterfront Sediment: Review of Environmental Studies*) summarizing 30 years of environmental research on the St. Lawrence River at Cornwall, and an *Overview: Historical Discharges* of contaminants to the river from Cornwall sources. These documents form the basis for the development of a *Conclusions* report. The *Conclusions* report outlines the status of sediment contamination in the four depositional zones along the Cornwall waterfront.

The two agencies used these three documents as the starting point for public discussion leading to a decision on appropriate action for managing affected sediments along the Cornwall waterfront.

Through consultation with a working group made up of key industry and public stakeholders, the need to gather more information on the potential biomagnification of mercury, and sediment stability along the Cornwall waterfront was identified. Two studies were conducted in the fall of 2001 to assess these issues. These results will be used to determine the severity of sediment contamination and to develop an appropriate sediment management strategy.

## FISH HABITAT MANAGEMENT PLAN

Although significant works have been undertaken to improve fish habitat in the AOC, continuing loss of habitat may be contributing to what appears to be a decline in pickerel and yellow perch populations. Habitat reassessment is needed to establish how well the restoration projects are performing and what features are presently missing. With an increasing number of developments occurring along the shoreline, a more integrated approach is needed to establish fish habitat compensation. A comprehensive fisheries habitat management plan is needed in the Lake St. Francis area and is one of the priority projects under consideration. Activities under this project will include research and compilation of existing information on fish and wildlife species, habitat types, shoreline alteration, nearshore currents, erosion and water quality into a GIS-based database to identify and prioritize data needs.



## HEALTHY WATERWAYS PROJECT

Activities to improve rural water quality since 1994 will now be coordinated and expanded by the RRCA in partnership with the Ontario Ministry of Agriculture and Food under the Healthy Waterways Project. Land owners will be eligible for funding to carry out erosion control, reducing excess nutrient and bacteria runoff into creeks, and improving water well functions on their property. Water quality will be monitored at selected projects to gauge effectiveness of the techniques.

## MUNICIPAL WASTEWATER ISSUES

A number of issues regarding treatment and management of municipal wastewater, stormwater and combined sewer overflows are outstanding in this AOC. Candidate projects include: 1) facilitating upgrades of smaller, downstream STPs by providing technical assistance or assistance in obtaining infrastructure financing; 2) the completion of pollution prevention and control plans to manage stormwater and combined sewer overflows for communities within the AOC (e.g. South Glengarry); 3) assisting small and rural communities in the AOC address issues of potential water contamination caused by inadequate septic systems.

## MUNICIPAL PLANNING

The RAP contains recommendations to control municipal and rural pollution sources for Cornwall and other shoreline communities. In addition, the RAP recommendations encourage municipalities to protect wetlands through development constraints and property acquisition, and there are delisting criteria that pertain to watershed forest cover. The Restoration Council has linked these with the local planning process and is seeking consideration of RAP goals and objectives in the Official Plan for the United Counties of Stormont, Dundas and Glengarry. This regional approach to planning incorporates planning policies for natural heritage features. Although the official plan may be completed prior to the Natural Heritage Strategy, it is anticipated that the detailed information and recommendations produced will be incorporated into the Official Plan and utilized by municipal officials in the application of planning policies through zoning by-laws.

## US ACTIVITIES IN THE MASSENA, NEW YORK RAP

The Massena RAP is led by the New York State Department of Environmental Conservation. PCB contamination of water, fish and sediment by three industrial plants, General Motors Powertrain, ALCOA Inc. and the ALCOA Massena East Smelter Plant (formerly Reynolds Metals) is being addressed by Federal and State Superfund processes.

At the General Motor's facility, a dredging project was undertaken in the St. Lawrence River in 1995. The ALCOA Massena East Smelter Plant (formerly Reynolds Metals Company) also dredged the St. Lawrence River adjacent to their property in 2001. Currently, the ALCOA Inc. facility on the Grasse River (a tributary to the St. Lawrence) is working with U.S.EPA to develop a plan for addressing another large scale sediment contamination issue in that river. Ongoing contaminated soil remediation on the industrial properties are also under Superfund processes.

These actions are a major component of restoring environmental quality overall in the St. Lawrence River. Canadian concerns regarding the potential for transboundary contamination are being addressed through direct involvement of a Canadian federal/provincial review panel with the Federal and State Superfund project personnel.

## DELISTING OUTLOOK (CORNWALL)

When a sediment management plan is developed and implemented, the RAP will be well on its way towards meeting its goals. A targeted approach over the next few years to complete all non-point source and habitat projects, and a dedicated effort to put mechanisms in place to maintain environmental quality is critical. Municipal infrastructure upgrades will also be required to address the management of sewage and wastewater in some communities within the AOC. When RAP implementation actions have been successfully completed, it will be imperative to monitor the recovery. This may be one AOC which becomes an Area in Recovery while the environment needs time to respond to the actions that have taken place.

## GLOSSARY

**AREA OF CONCERN** A geographic area that fails to meet the General or Specific Objectives of the Canada-United States Great Lakes Water Quality Agreement, where such failure has caused or is likely to cause impairment of beneficial use or of the area's ability to support aquatic life.

**AREA IN RECOVERY** A geographic area, identified as an Area of Concern, where, based on community and government consensus, all scientifically feasible and economically reasonable actions have been implemented and monitoring continues to track the restoration of beneficial uses.

**BENEFICIAL USE** The ability of living organisms to use the Great Lakes Basin Ecosystem without adverse consequence (includes the 14 uses identified in Annex 2 of the GLWQA).

**BENTHOS** Benthos (adj. Benthic) refers to the community of invertebrate organisms that dwell either entirely or for part of their life cycle in the bottom sediments of lakes and rivers. The health and abundance of certain worms and insect larvae and nymphs are used as indicators of contaminant toxicity.

**DELISTING** Meeting the objectives for the restoration of beneficial uses as defined by the RAP and agreed upon by the agencies.

**DELISTED AREA OF CONCERN** Officially delisted by the agencies through notification to the IJC. All beneficial uses have been restored to the satisfaction of all parties including the AOC community.

## LIST OF ACRONYMS

AOC	- area of concern
ASI	- Algoma Steel
BAIT	- Bay Area Implementation Team
BARC	- Bay Area Restoration Council
BEAST	- benthic assessment of sediment
BOD	- biological oxygen demand
BPAC	- binational public advisory committee
BUI	- beneficial use impairment
BUIA	- beneficial use impairment assessment
CCME	- Canadian Council of Ministers of the Environment
CDEC	- Cornwall and District Environment Committee
CDF	- confined disposal facility
CEPA	- Canadian Environmental Protection Act
COA	- Canada-Ontario Agreement Respecting the Great Lakes Ecosystem
CSO	- combined sewer overflow
DRCCC	- Detroit River Canadian Cleanup Committee
DU	- Ducks Unlimited
EC	- Environment Canada
ECSN	- Essex County Stewardship Network
EMA	- environmental management agreement
GIS	- geographic information system
GLIER	- Great Lakes Institute for Environmental Research at University of Windsor
GLSF	- Government of Canada's Great Lakes Sustainability Fund
GLWQA	- Great Lakes Water Quality Agreement
IBA	- Important Bird Area
IJC	- International Joint Commission
LaMP	- lakewide management plan

**ECOSYSTEM APPROACH** Recognizes the interactive system of biological communities, their non-living components, their associated activities and the interconnectedness of and linkages occurring among air, water, land and living things. Ecosystems include humans and their activities and institutions.

**FISH COMMUNITY OBJECTIVES** The objectives describe desirable fish community structure for nearshore and offshore habitat zones. The objectives provide a common framework for agencies to develop and implement complementary fishery management programs and serve as an interface with other environmental planning initiatives, including Remedial Action Plans and the Lakewide Management Plans.

**RESTORATION OF BENEFICIAL USES** Meeting locally defined objectives designed to be rigorous and realistic.

**NON POINT SOURCE** Diffuse sources of pollution including combined sewer overflows and urban and rural runoff.

**UPSTREAM/DOWNSTREAM MONITORING** Measurement of environment quality upstream and downstream of a particular source or stress to the Ecosystem for the purposes of defining whether the source is causing environmental harm.

**TROPHIC STATUS** The level of productivity in an aquatic system based on nutrient loadings and availability, and the structure of the fish and algal community. Eutrophic refers to a highly productive and possibly overloaded system.

LLRW	- low level radioactive waste
MISA	- municipal- industrial strategy for abatement
MNR	- Ontario Ministry of Natural Resources
MOE	- Ontario Ministry of the Environment
MOU	- memorandum of understanding
NOWPARC	- Northern Wood Preservers Alternative Remediation Concept
NPCA	- Niagara Peninsula Conservation Authority
NRTMP	- Niagara River Toxics Management Plan
NRWMP	- Nipigon River Water Management Plan
NSERC	- National Sciences and Engineering Research Council of Canada
NYSDEC	- New York State Department of Environmental Conservation
NWP	- Northern Wood Preservers
OMAF	- Ontario Ministry of Agriculture and Food
PAC	- public advisory committee
PAH	- polycyclic aromatic hydrocarbon
PCB	- polychlorinated biphenyls
PPCP	- pollution prevention and control plan
RAP	- remedial action plan
RRCA	- Raisin Region Conservation Authority
SLRIES	- St. Lawrence River Institute of Environmental Sciences
SSEA	- Severn Sound Environmental Association
SSO	- sanitary sewer overflow
STP	- sewage treatment plant
TMDL	- total maximum daily loading
TRCA	- Toronto and Region Conservation Authority
U.S. EPA	- United States Environmental Protection Agency
WRT	- Waterfront Regeneration Trust
WWFMP	- wet weather flow management master plan
WWPCP	- West Windsor Pollution Control Plant
WWTP	- wastewater treatment plant

## FOR MORE INFORMATION

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