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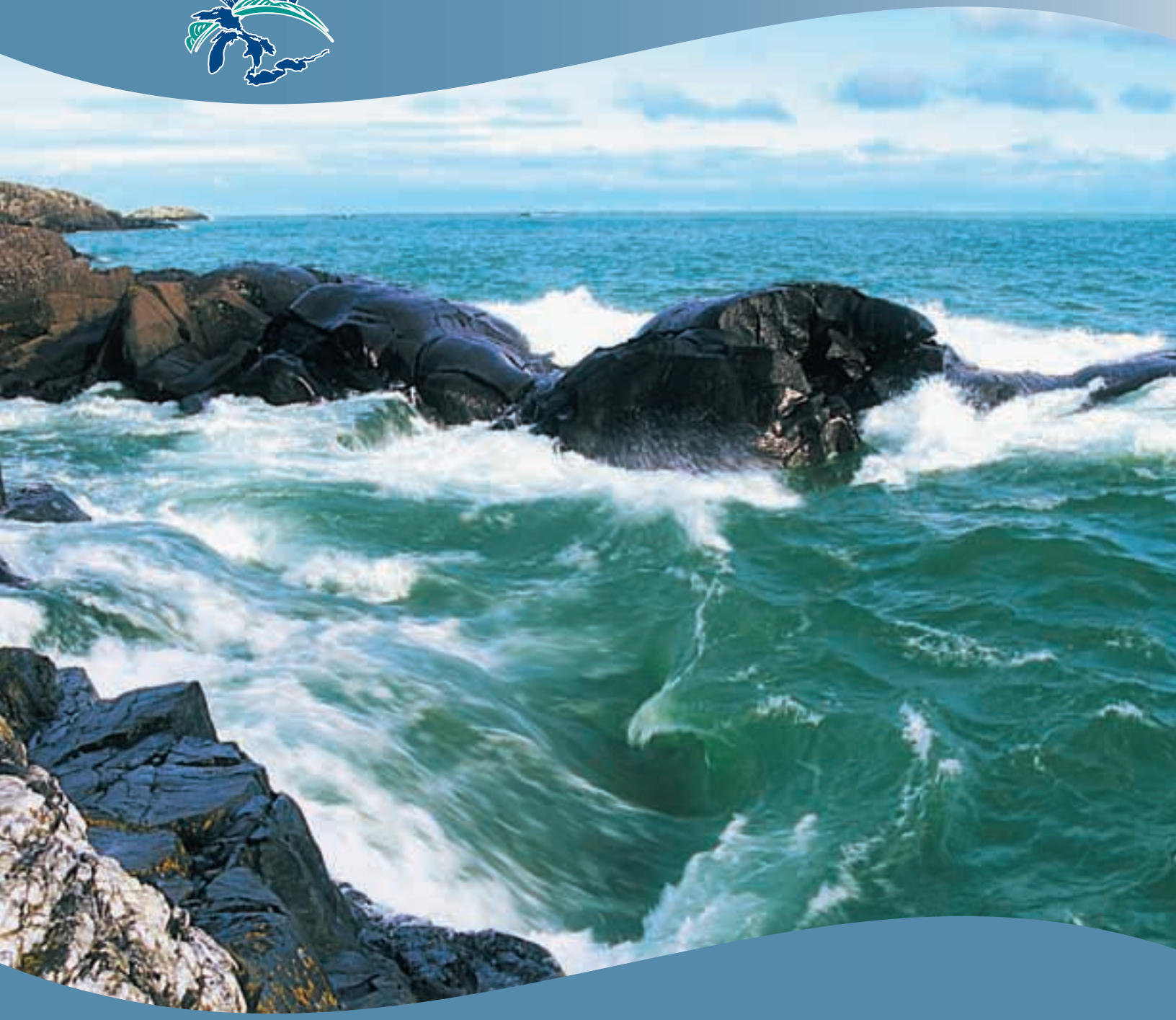

CANADA-ONTARIO AGREEMENT

RESPECTING THE GREAT LAKES BASIN ECOSYSTEM

2002–2003 BIENNIAL PROGRESS REPORT

Canada Ontario

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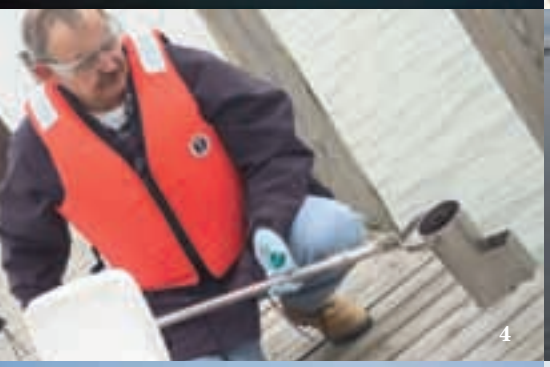
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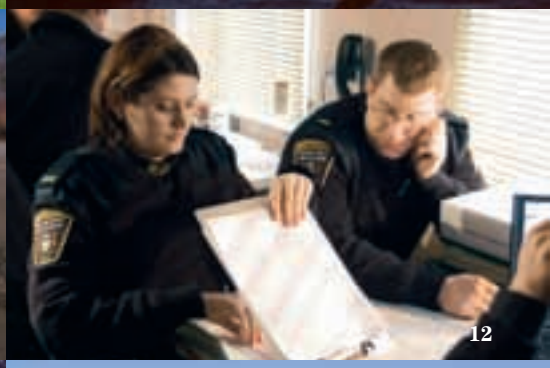
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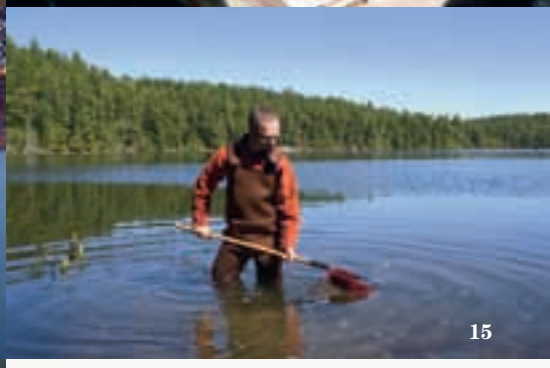
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Introduction

The 2002 Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA) commits the governments of Canada and Ontario to working together, as well as with other groups and individuals, in the Basin to achieve the vision of a healthy, prosperous and sustainable Great Lakes Basin Ecosystem for present and future generations.

Signatories to the Agreement are the federal Ministers of Agriculture and Agri-Food, the Environment, Fisheries and Oceans, Health, Heritage, Natural Resources, Public Works and Government Services, and Transport; and the provincial Ministers of Agriculture and Food, the Environment, and Natural Resources.

The 2002 COA is a five-year agreement that builds on the actions taken through previous Agreements. It focuses on the priorities for future actions and recognizes the need to continue to tackle the most pressing issues. These include the cleanup of Ontario's Areas of Concern (AOCs), investments in initiatives to respond to lakewide issues, the reduction of harmful pollutants and increased federal/provincial cooperation on a lake-by-lake basis.

The 2002 COA differs from previous agreements in several ways. It was designed to be flexible, accountable and responsive. New provisions, for instance, can be added at any time to bring attention to emerging issues. Further, the 2002 COA supports the use of proven technologies and new solutions to improve and sustain the health of the Great Lakes.

In addition, this COA marks a new era of cooperation between the federal and provincial governments. The document clearly defines who is accountable for what and sets out the specific commitments of each government.

The 2002 COA is also more focused than previous agreements. It has four annexes that address specific environmental issues or management functions in greater detail. These are:

1. The cleanup of the remaining AOCs within the Basin.
2. The virtual elimination and significant reduction of harmful pollutants within the Basin.
3. The implementation of a series of lakewide management initiatives to address problems unique to each Great Lake.
4. The improvement of the management of information and monitoring.

Finally, the 2002 COA recognizes the importance of partnership in protecting and conserving the Great Lakes. It emphasizes that everyone who lives, works or vacations in the Basin has a role to play. To this end, Ontario and Canada have enlisted the support of local and regional governments, industry, community and environmental groups. The COA helps ensure that government programs are better coordinated and more responsive in their support of the projects of various partners. As a result, entire communities are mobilized to tackle pressing area problems, benefiting the whole Great Lakes Basin ecosystem.

The Biennial Progress Report, 2002–2003

This is the first biennial Progress Report under the 2002 COA. The report describes Canada and Ontario's achievements in the first two years of COA and some of the hard work undertaken by governments, industries, non-government organizations and the public that is required to protect and conserve the Great Lakes Basin.

This report highlights the progress that has been made in meeting the goals, expected results and commitments set out in the 2002 COA. The report also describes some of the notable successes that have been achieved and provides an update of the work that has been completed or is currently underway. The report, however, does not constitute a complete listing of all the activities undertaken by the parties to the Agreement or by their partners.

The COA commits all parties to regularly produce progress reports on the Agreement as well as updates on the state of the lakes. The State of the Lakes Ecosystem reports are updated and published every two years in cooperation with U.S. federal and state agencies. The most recent report was released in September 2003 and is available online at www.binational.net.

Program Management

The COA Management Committee oversees the overall administration of the COA. The committee has two chairs – Environment Canada and the Ontario Ministry of the Environment – and includes representatives from all the participating departments, ministries and agencies.

In order to improve cooperation and coordination between government and interested parties, the COA Management Committee created the Great Lakes Innovation Committee (GLIC), a group comprised of representatives from municipalities, academia, forestry, fisheries, public health, conservation, industry, environmental, and other interested organizations. GLIC is mandated to bring innovative approaches to overcoming barriers and take advantage of opportunities to make progress on the COA goals and results.

An Annex Implementation Committee (AIC) was established, which coordinates the development and implementation of the multi-agency work planning process, as well as to report on the progress made under all four annexes. The AIC has established four taskforces to address specific issues, with eight federal and three provincial agencies taking leading or supporting roles in meeting responsibilities for the 181 commitments under the COA annexes.

Annex 1

AREAS OF CONCERN (AOC)

Thunder Bay – Environment Canada photo

Introduction

This annex focuses on the cleanup of the Areas of Concern (AOCs) in the Great Lakes Basin.

AOCs are locations where environmental quality is significantly degraded and beneficial uses to humans and wildlife are impaired. There are 15 Canadian AOCs, five of which Canada shares with the United States. The Canadian AOCs are:

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

Collingwood Harbour and Severn Sound are former Canadian AOCs that were delisted in 1994 and 2003, respectively.

Remedial Action Plans (RAPs) are being implemented in each AOC and considerable progress towards restoring environmental quality has been made. Ongoing activities include:

- Restoring and sustaining ecological systems.
- Fostering greater community participation.
- Increasing knowledge through monitoring and reporting.
- Communicating progress.

Progress has been made by COA agencies working alone, together and through partnerships with local communities, municipalities, conservation authorities and non-government organizations. It is an ongoing challenge to find solutions to problems that are costly, not easily resolved, and are a result of decades of environmental degradation.

On a regular basis, information on ongoing activities, current knowledge and practices as well as successes and challenges in all the AOCs has been regularly exchanged in workshops and training sessions attended by COA agencies and their partners.

About AOCs

Remediation of the AOCs began in 1987. It is a high priority for the Canadian federal, provincial and local governments and the U.S. federal and state governments, as well as others who are partners in restoring beneficial uses within the listed areas. The cleanup, restoration and conservation projects are extensive and complex. All of the undertakings predate the 2002 COA and will extend beyond its five-year time frame. Over the course of the Agreement, the parties will focus their attention on continuing remediation projects. They will also:

- Promote monitoring and reporting initiatives that will have both local and broader applications throughout the Basin.
- Forge productive and enduring partnerships in order to ensure the long-term protection of these threatened ecosystems.
- Engage the public in community-based projects that support the overall objectives of the Agreement.

Progress Report 2002–2003

Annex 1 addresses Canadian and Ontario initiatives that directly support the restoration and protection of environmental quality and beneficial uses in the 15 AOCs.

Under the COA Agreement, Canada and Ontario have identified three five-year goals and seven results that are to be achieved as a part of restoring environmental quality in the Areas of Concern.

The Goals and Progress Made

To restore environmental quality and beneficial uses in at least two locations, resulting in the removal of the AOC designation.

Goal 1

- Environmental quality and beneficial uses were restored in Severn Sound. This AOC was formally delisted by Canada and Ontario in January 2003.

To complete all required actions for RAPs in at least six AOCs (and continue to monitor recovery).

Goal 2

- Required actions were completed in Spanish Harbour and monitoring is ongoing. This AOC has been recognized by Canada and Ontario as an area in recovery since 1999. Delisting is contingent on monitoring, which will demonstrate that beneficial uses have been restored.

- Work plans have been prepared, and are being implemented, that identify required actions in the remaining AOCs. Good progress is being made toward achieving this goal.

To make progress towards rehabilitation of ecological systems in the remaining AOCs.

Goal 3

- Significant gains have been made toward rehabilitating ecological systems in all AOCs. These are summarized in Canada's RAP Progress Report 2003.

Severn Sound Environmental Association photo

The Expected Results and Progress Made

Result 1

Reduced pollutant discharges from municipal sewage treatment plants and combined sewer overflows.

- Identified five AOCs (Thunder Bay, Nipigon Bay, St. Marys River, Detroit River and St. Lawrence River) requiring sewage treatment plant upgrades as priorities for federal-provincial infrastructure funding. Funding was granted in three of the five AOCs (Thunder Bay; St. Marys River – Sault Ste. Marie East Plant; and Detroit River – Windsor Plant) for sewage treatment plant upgrades to secondary treatment standards.
- Completed the Class Environmental Assessment to determine the most environmentally sound and cost-effective means of increasing the ability of the Woodward Avenue Wastewater Treatment Plant to treat wet weather peak flows to Hamilton Harbour.
- Completed the Class Environmental Assessment for upgrading the Red Rock Wastewater Treatment Plant in Nipigon Bay to secondary treatment.
- Developed and implemented demonstration projects for high-rate treatment of combined sewer overflows in three AOCs (Niagara River – Niagara Falls and Welland, Toronto, and the Detroit River – Windsor).
- Implemented a demonstration project on low-cost sewage treatment for communal systems.
- Published the UV Manual for Municipal Wastewater Treatment Plants in Canada to provide information on disinfection technology.

Result 2

Reduced loadings of nutrients, pathogens and trace contaminants from urban storm water.

- Published the Stormwater Management Planning and Design Manual and the Stormwater Pollution Prevention Handbook. These manuals provide technical and procedural guidance to municipalities, conservation authorities, developers and consultants about the planning, design and review of stormwater management practices, as well as the prevention of pollution from stormwater.
- Published reports on the performance of stormwater treatment technologies.
- Evaluated the performance of five stormwater treatment technologies.
- Supported the City of Toronto in completing their Wet Weather Flow Management Master Plan.

Result 3

Reduced nutrient, microbial and trace contaminants from agricultural sources.

- Provided financial and technical assistance to rural landowners, farmers and stewardship councils to improve water quality in eight AOCs (Toronto and Region, Bay of Quinte, Hamilton Harbour, Niagara River, St. Clair River, Detroit River, Wheatley Harbour and

St. Lawrence River). Through these community stewardship projects, nutrient loading impacts from agricultural sources have been reduced, best management practices have been promoted, watershed planning has been undertaken, and work has been carried out with landowners to rehabilitate streambanks and remove barriers to fish movement.

Management strategies for contaminated sediment.

Result 4

- Drafted a risk-based decision-making framework for managing contaminated sediment.
- Developed sediment management strategies in two AOCs, including Hamilton Harbour (Randall Reef site) and St. Clair River (Zone 1, adjacent to Dow Chemical property).
- Sediment management strategies are being developed for seven AOCs including Hamilton Harbour (Windermere Arm and Dofasco Boat Slip sites), St. Lawrence River (Cornwall, 3 zones), Niagara River (Lyon's Creek East and other sites to be determined), St. Marys River, Thunder Bay (Cascades site), St. Clair River (zones 2 and 3) and Peninsula Harbour (Jellicoe Cove).
- Completed sediment remediation activities at Northern Wood Preservers in the Thunder Bay AOC. Follow-up monitoring is ongoing.

Rehabilitated aquatic and riparian habitat leading to the reestablishment of fish and wildlife populations.

Result 5

- Updated the Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern (targets areas for habitat rehabilitation). New rehabilitation science required that some of the guidelines be revised. For details, visit Environment Canada's website: www.on.ec.gc.ca/wildlife.
- Constructed and repaired fishways to improve fish migration in the Niagara River and Toronto and Region AOCs.
- Initiated coaster brook trout rehabilitation projects in the tributaries of Nipigon Bay.
- Supported fish community assessment and restoration of the muskellunge population in Spanish Harbour.
- Supported habitat rehabilitation and wetland restoration projects in the St. Clair River and in the Rouge and Upper Humber Rivers in the Toronto and Region AOC.
- Participated in the development of, and endorsed, the Toronto Waterfront Aquatic Habitat Restoration Strategy.

Result 6

Collaborative action among government, local organizations and Basin residents.

- Provided technical support and funding to local organizations for facilitating local RAP implementation in St. Marys River, Detroit River, Niagara River, Hamilton Harbour, Toronto and Region, Bay of Quinte and St. Lawrence River AOCs.
- Published Canada's RAP Progress Report 2003.
- Revised the RAP website in 2004. Visit the site at www.on.ec.gc.ca/water/raps/.

Result 7

Publicly available environmental monitoring information for evaluating environmental recovery and adjusting remediation strategies.

- Supported sportfish collections in St. Lawrence River (Cornwall), Toronto, Bay of Quinte, Thunder Bay, Peninsula Harbour and Nipigon Bay AOCs.
- Published the *Guide to Eating Ontario Sport Fish*.
- Monitored fish communities in St. Clair River, St. Lawrence River, Detroit River, Bay of Quinte, Severn Sound, Spanish River and Niagara River AOCs.
- Completed assessments of fish communities, habitat rehabilitation and bioaccumulation of mercury in the food chain in the St. Lawrence AOC.
- Provided technical support and water quality monitoring in St. Lawrence, Toronto, Hamilton Harbour, St. Clair River and Severn Sound AOCs.
- Published a report on seasonal impacts of trace organics.
- Complete second year of a five-year study of fish and wildlife health effects in the AOCs of the lower Great Lakes (Lake Erie and Lake Ontario). A fact sheet is available at www.on.ec.gc.ca/wildlife.
- Continued the Herring Gull Egg Monitoring program, which shows a sustained decline in contaminant levels. An exception was the increase throughout the Basin in the level of polybrominated diphenyl ether flame retardants (PBDEs), which are compounds of increasing concern.

Delisting of Severn Sound: An AOC success story

2003 was a great year for Severn Sound. It began with Canada advising the International Joint Commission (IJC) that the Sound could be removed from the list of AOCs. It finished with the IJC completing its review of the Severn Sound RAP report and announcing that the environmental quality in the Sound had been fully restored.

About Severn Sound

Severn Sound is located in southeastern Georgian Bay. Situated between Canadian Shield country to the north and rich agricultural land to the south, the watershed covers more than 1,000 square kilometres and is a patchwork of farms, forests, parks, and urban centres.

The Sound is dotted with thousands of rocky islands with small inlets, bays, and harbours along its edges. It is a popular tourist spot with its shores ringed with cottages, marinas, and resorts.

Today, its waters sparkle, its wildlife is healthy and locals and visitors are enjoying some of the finest recreational fishing in the Great Lakes. But it wasn't always so.

The Sound in the 1980s

"By the late 1980s, the Sound was in bad shape," says Keith Sherman of the Severn Sound Environmental Association.

There were restrictions on fish and wildlife consumption. The aquatic habitat was badly degraded and most game fish had abandoned the murky, algae-choked waters. Slime covered much of the shallows and suspended algae clouded the water. When the massive algae blooms died back, the decomposing mass stripped much of the oxygen from the water.

In 1987, under the Great Lakes Water Quality Agreement, Canada and the United States designated AOCs in the Great Lakes Basin. Severn Sound was listed as one of 17 AOCs on the Canadian side of the border.

The Severn Sound RAP

The Severn Sound RAP is considered a model among AOCs because of the extraordinary level of support from local municipalities and the public. This energy was harnessed through a Public Advisory Committee (PAC) and the SSEA. In partnership with federal and provincial agencies, local municipalities, businesses and concerned citizens, the PAC and the SSEA worked tirelessly for 13 years to bring the Sound back to its former glory.

Cooperative projects that relied on local support and expertise were launched throughout the Sound to:

- Reduce phosphorus levels by controlling stormwater and rural runoff.
- Restore and protect tributaries, wetlands, shorelands, and other threatened habitat.
- Prevent pollution, including the lead shot and tackle that were poisoning the fish and wildlife.
- Prepare planning strategies to protect fish habitat, groundwater sources, and drinking water supplies.
- Undertake environmental monitoring of water and sediment quality, tributary flows, beach areas, and overall ecosystem health.

The results

By June 2003, when a party was held in Penetanguishene to celebrate reaching the RAP objectives, the phosphorous loadings had been reduced by approximately 8,000 kilograms per year, more than 129,000 native trees had been planted, 2,400 cows and other livestock had been fenced off from the watercourses, and 132 kilometres of stream habitat had been restored.

"This milestone demonstrates what can be accomplished when we all work together," said David Anderson, the federal environment minister of the day, at the Penetanguishene celebration. "This is an example of civic engagement at its finest."

The Sound joined Collingwood Harbour as the only other delisted AOC in the Great Lakes.

Going forward

"Delisting marks the end of the beginning," says Sherman. "There is a lot more work to be done to safeguard and improve on the gains already made."

In the past the focus was on remedial action. Now it is on pollution prevention and sustaining the improvements that have been achieved through the RAP process. The community is continuing to work together to make Severn Sound a model Canadian sustainable community.

Thunder Bay harbour cleanup: The birds are back

Once again, Thunder Bay harbour is looking good to people and to wildlife.

Eleven thousand cubic metres of contaminated sediment have been removed, over 30,000 seedlings and trees have been planted, and fish habitat has been greatly improved.

The restoration and remediation of the Northern Wood Preservers site is a major milestone in the overall cleanup of the Thunder Bay AOC.

The AOC runs approximately 28 kilometres along the shoreline of Lake Superior and up to nine kilometres offshore from the City of Thunder Bay.

The harbour before the cleanup

Like all harbours, rivers and estuaries in Great Lakes AOCs, Thunder Bay harbour suffered from a legacy of decades of industrial pollution and municipal wastewater discharge. There were regular fish consumption advisories and declining populations of fish and other species. General water quality had worsened. Beaches were regularly closed.

There were approximately 60,000 cubic metres of contaminated sediment, containing a mixture of polycyclic aromatic hydrocarbons (PAHs), pentachlorophenols and dioxins and furans, with the problem being most severe around the Northern Wood Preservers pier.

How best to address this was a complicated and vexing environmental challenge.

"There's no single remediation approach that applies to all contaminated sites," says Environment Canada's Roger Santiago. "Contaminated sites require a biologically based assessment study to establish site-specific criteria for cleanup. This allows evaluation of sediment management options so the most appropriate remedial design for that site can be selected."

The cleanup

"The sheer size of the area to be remediated was a challenge," says Patricia Inch, the Ontario Ministry of the Environment's project engineer. "The shipping channel water depth made it difficult to dredge. The liquid contaminants, the variety of debris mixed in with the sediments, and the space limitations at the site for dewatering the material once it was brought up from the bottom made the project far from routine. Cleanup activities were taking place while attempting not to disrupt the industrial site."

The project began in 1997 with the construction of an 800-metre-long rockfill containment berm. Then the dredging began. A precision environmental clamshell dredge, enhanced with global positioning system equipment, was used to minimize sediment re-suspension to prevent the spread of contaminants.

Of the 60,000 cubic metres of contaminated sediment, 11,000 cubic metres were removed, treated and reused as clean fill. About 28,000 cubic metres with low concentrations of contaminants, and considered to be of minimal biological risk, were left for natural recovery and monitoring. The remaining 21,000 cubic metres were contained and capped with clean fill.

An innovative approach to remediation was used at this site involving several remedial technologies.

It took the latest testing equipment and remediation techniques to make this project a success. However, it was the working partnership between Abitibi Consolidated, Northern Wood Preservers, Canadian National Railways, the Ontario Ministry of the Environment and Environment Canada that made it happen. Public support and involvement was also essential.

Storm water control improvements were established at the Northern Wood Preservers site, and a program to replace lost fish habitat implemented. Trees have been planted to provide a natural buffer between the industrial site and the fish habitat. These initiatives are working and, according to Pat Inch, "lots of geese, ducks and gulls are enjoying the site and deer have been seen feeding in the reclaimed area."

"At each stage of the process, extensive consultation was undertaken to ensure public acceptance of the plan," says Bob Hartley, a member of the Thunder Bay Public Advisory Committee (PAC).

Other activities in the community included organized cleanups of the Thunder Bay waterfront, Lake Superior Day celebrations, and waterfront development workshops.

The remediation work was finally completed in 2004. The project is a major achievement in the restoration and remediation of a highly contaminated sediment site.

A post-construction study will determine the level of improvement in the sediment left in place for natural recovery. Long-term monitoring will continue.

Challenges along the way

Many large-scale remediation projects have some project modifications along the way.

"The PAH concentrations in the dredged sediment were higher than anticipated," explains Roger Santiago. "As a result, the on-site biological treatment process was not able to meet the site-specific treatment requirements. The sediment was therefore shipped to a thermal treatment facility in British Columbia."

Some sections of the clay isolation barrier, which was designed to prevent migration of contaminants into the lake, did not create the seal needed and a steel sheet piling wall was installed as a contingency measure to contain on-site contaminants.

"These modifications," says Santiago, "and the associated extra costs, might have been enough to sink the project but the partners worked together to find solutions."

Ongoing work

The harbour cleanup is a significant part of the overall remedial action plan for the Thunder Bay Area of Concern. Other improvement projects are underway, including:

- the City of Thunder Bay's $97 million upgrade to the wastewater treatment plant, with its state-of-science secondary treatment process, ammonia removal and ultraviolet disinfection.
- abatement projects and process improvements at a number of pulp mills and other area industries, which are producing dramatic improvements in effluent quality.
- several rehabilitation projects for restoring wetland and shoreline fish and wildlife habitat along the Thunder Bay waterfront and within the river mouths draining into the bay, which are nearing completion.

"Delisting is still a ways off," says Ginette Brindle, assistant director, Ontario Ministry of the Environment, Northern Region. "We're making great progress and, with this sort of cooperation and dedication, we'll stay the course and in time join Severn Sound and Collingwood as a delisted Area of Concern."

Environment Canada photo

Annex 2

HARMFUL POLLUTANTS

Sarnia industrial area – Tony Walton for the Ontario Ministry of the Environment

Introduction

This annex addresses the work that has been done towards the elimination of high-profile harmful pollutants such as mercury, dioxins, furans and polychlorinated biphenyls (PCBs). Also included are other pollutants that seriously affect the health and/or functioning of the Great Lakes Basin ecosystem.

Considerable progress has been made in addressing the release of many of these pollutants. But the Great Lakes continue to suffer from contamination due to the persistence of these chemicals and other substances of concern.

The annex contains three overall goals, 10 projected results and 65 specific commitments.

Continued threats and new challenges

Persistent bioaccumulative toxic substances continue to threaten fish, wildlife and human health by virtue of their long-term accumulation in aquatic sediments, which act as reservoirs for the contamination of aquatic organisms.

Even though water concentrations may be extremely low, sediment-associated contaminants may be accumulated by organisms and continue to be problematic through food chains. Additionally, the Great Lakes continue to be threatened by pollutants deposited from air, as well as from industrial and municipal effluent discharges.

Newer challenges include the impacts of hormone-mimicking chemicals and pharmaceuticals on the health of fish, wildlife, and humans.

Canada and Ontario remain committed to the virtual elimination of persistent bioaccumulative toxic substances, such as those mentioned above, as well as to the significant reduction of other harmful pollutants from effluent discharges and air deposition. The focus on reductions of emissions and releases will yield environmental benefits over the long-term, as contaminant levels in fish, wildlife and sediments may remain for many decades.

It takes partnerships to succeed

Many commitments under COA are delivered through a variety of partnerships between agencies (both domestic and international), communities and non-government organizations.

For example, progress on reducing the release of harmful pollutants is being made through the actions of the United States Environmental Protection Agency (U.S. EPA) and the partnership of the Great Lakes Binational Toxics Strategy (GLBTS).

Achieving reductions and results through building these partnerships is a benefit of the continued federal/provincial focus on the Great Lakes.

The challenge of the last 10 per cent

For more than 25 years, policies and programs designed to reduce society's reliance on persistent, toxic and bioaccumulative chemicals have been a cornerstone of federal and provincial environmental efforts.

Effective pollution control and pollution prevention instruments, both regulatory and non-regulatory, have been augmented by restrictions, bans and phase-outs of specific compounds (or classes of compounds) where appropriate. As a result, reductions in the production, use, release and/or unsafe disposal of many listed chemicals of concern have been pursued to the extent technologically and economically practicable. In a number of cases, usage and associated environmental releases in Ontario have decreased by 90 per cent or more. However, it is an axiom of environmental management that eliminating that last 10 per cent may require an even greater investment in effort, resourcefulness and ingenuity than has been expended to date.

The goals set out in the 2002 COA relating to harmful pollutants are both ambitious and challenging. Some pollutants that reach the Great Lakes through transboundary transport and atmospheric deposition may require action beyond the scope of COA. Success will only be achieved through the dedicated application of the commitments made by the parties and their partners over the full five-year time frame of the Agreement.

Progress Report 2002–2003

Annex 2 addresses Canadian and Ontario initiatives that support the virtual elimination of persistent bioaccumulative, toxic substances and the significant reduction of other harmful pollutants.

Under the COA Agreement, Canada and Ontario have identified three five-year goals and 10 results to be achieved through working with producers and addressing other sources of pollutants.

The Goals and Progress Made

Have in place policies and programs to make progress towards virtual elimination for persistent bioaccumulative toxic substances such as mercury, dioxins, furans and PCBs.

Goal 1

- Results 1, 2 and 3 of this annex are dedicated to the elimination of PCBs, mercury and dioxins/furans, respectively. They reflect a variety of mature programs, as well as some newer initiatives. Regulatory as well as voluntary measures by the public and industry have resulted in significant reductions to date (compared to 1988 figures), including 86% for PCBs, 85% for mercury and 84% for dioxins/furans. The variety of programs in place today will yield additional emissions reductions over the next few years.

Goal 2

Reduce other harmful pollutants that have a significant environmental impact.

- Other harmful pollutants include criteria air contaminants (including sulphur dioxide and volatile organic compounds), Tier I and II substances (including benzo(a)pyrene, hexachlorobenzene and cadmium) and pollutants in municipal effluents and biosolids. When fully developed, actions identified under Results 4, 5, and 6 will contribute to reductions in the use, generation and release of harmful pollutants. Examples of reduction success to date (compared to 1988 figures) include 45% for benzo(a)pyrene and 62% for hexachlorobenzene.

Goal 3

Have comprehensive knowledge of the sources, movement, fate and impact of harmful pollutants, including persistent bioaccumulative toxic substances, for policy and program development purposes.

Research is required to determine sources, fate and impact of many contaminants of concern in order to develop sound approaches to reduction. This need is addressed in Results 7, 8, 9 and 10 of the annex, which focus on pollutant transport and loadings, as well as research towards understanding impacts of pollutants on human health and the environment. A key factor in successfully achieving this goal is the collaborative nature of the federal and provincial commitments to integrate reporting and data storage systems.

Progress on Achieving the Projected Results

Result 1

The virtual elimination of high-level PCBs.

- Reduced the number of PCB storage sites (both federal and private) from 1,555 in 1993 to 550 in 2003. The amount of high-level PCB waste in storage was reduced by some 86%.
- Through separate initiatives, Canada and Ontario worked on regulations for PCB phase-out, destruction and/or harmonization of import and export regulations/policies.
- Under the GLBTS, fact sheets, brochures and websites for owners of PCBs are being developed to promote PCB phase-out/destruction activities.
- Hydro One, Stelpipe (a subsidiary of Stelco), Slater Steel, and Enersource Hydro (Mississauga) were awarded the first award plaques under Environment Canada-Ontario Regions Recognition Program for their excellent accomplishments in phasing out PCBs through voluntary efforts. Hydro One shipped approximately 3,200 tonnes of PCB waste during 1995–2001 and decontaminated an estimated 6.5 million litres of low-level mineral oil. Enersource (Mississauga) Hydro eliminated 100% of high-level PCBs (about 100 tonnes).

Result 2

An 85% reduction in mercury releases (compared to 1988) by 2005, and a 90% reduction by 2010.

- Reduced mercury releases by 85% by the end of 2002. The amount of mercury released into the Great Lakes Basin has dropped from more than 14,000 kilograms a year in 1988 to just under 2,100 kilograms annually.

- Passed a regulation in Ontario (O. Reg 196/03) making installation of dental amalgam separators required in all dental offices where dental amalgams are repaired, placed or removed, and that are maintained by members of the Royal College of Dental Surgeons of Ontario (RCDSO).

- A multi-stakeholder group developed best-practices flowcharts for the management of dental amalgam and mercury wastes within dental practices. These were published in October 2003.

- Prepared a draft document, the Model Municipal Mercury Policy. When finalized, the policy will help municipalities eliminate the use of mercury in equipment or materials (such as thermostats and lights) from municipal operations.

- Carried out public outreach on mercury awareness and elimination strategies in Lake Superior North Shore communities, hospitals, and federal facilities.

- Produced a COA fact sheet on mercury for use by the public, which is available from Publications Ontario and Environment Canada.

- Removed 20,000 mercury switches from cars before disposal, under the mercury switch-out program.

- Required mercury control equipment to be installed at a number of potential emission sources, reducing mercury emissions by almost 400 kilograms/year from 2000 levels.

A 90% reduction in the release of dioxins and furans (compared to 1988) by 2005, and the reduction of other persistent bioaccumulative toxic substances.

Result 3

- Reduced the releases of dioxins and furans by 84%, through the end of 2003, from a baseline of 1988.

- The Canadian Council of the Ministers of the Environment (CCME) agreed to Canada-wide standards for dioxins/furans from steel manufacturing and iron sintering plants in March 2003. Compliance with these standards by 2010 will result in reductions of 72% in Ontario.

- Passed a regulation in Ontario (O. Reg 323/02) requiring hospital incinerators to close by December 6, 2003. The elimination of this source has resulted in significant reductions of dioxins and furans, as well other bioaccumulative and persistent pollutants.

Reductions in the use, generation, and release of other harmful pollutants.

Result 4

- Conducted 60 Burn it Smart! workshops in 2002/03 to encourage the use of EPA/CSA-certified, low-emission wood stoves and promote good wood-burning practices in Ontario communities. Approximately 1,300 people attended these workshops.

- Passed a regulation in Ontario (O. Reg. 397/01), setting caps on electricity sector emissions. The regulation requires a 53% reduction in nitrogen oxides and a 25% reduction in sulphur dioxide emissions from Ontario Power Generation's six coal- and oil-fired generating stations

by the year 2007. In addition, Ontario has committed to stop burning coal at the Lakeview Generating Station in Mississauga by April 2005. The move will stop thousands of tonnes of pollutants from entering Ontario's air and the Great Lakes.

- Expanded Ontario's *Drive Clean* program, as of July 1, 2002, to cover the entire southern Ontario smog zone from Windsor to Ottawa: an area that includes about 5.5 million vehicles.

- Ontario's Smog Patrol conducted more than 28,000 inspections of heavy- and light-duty vehicles, and issued over 5,000 tickets to those driving polluting vehicles, from 1998 until the end of December 2003.

Reductions in the release of harmful pollutants in municipal wastewater discharges.

Result 5

- Released a federal regulation in 2003 (SOR/2003/99) outlining specific conditions that must be met regarding the content of hexachlorobenzene in products, including coagulants used in municipal wastewater treatment.

- Formed a Municipal Wastewater Task Group under the CCME. A long-term, nationwide strategy for reducing releases from municipal wastewater systems will be developed by this task group.

- The Ontario Municipal Discharge Strategy is being developed.

- Canada and Ontario continued working together with municipalities on several separate technical studies to evaluate new treatment technologies for the removal of ammonia, pathogens and other harmful pollutants in municipal wastewater.

Voluntary reductions in the release of harmful pollutants by targeted stakeholders and sectors.

Result 6

- Environment Canada and the Automotive Parts Manufacturers Association signed an Environmental Performance Agreement in 2002. The agreement aims to achieve verifiable reduction in the use, generation and release of specified harmful pollutants.

- Ontario continued the development of environmental management agreements with industry to encourage further reductions of harmful pollutants beyond compliance requirements.

- Ontario continued discussions with the Canadian Steel Producers Association, the Clean Air Foundation and the Canadian Vehicle Manufacturers Association on an agreement to address mercury emissions from scrapped cars that are melted down to produce recycled steel products.

A common approach for effective emissions reporting.

Result 7

- Integrated reporting requirements under Ontario's Mandatory Monitoring and Reporting Regulation with the Federal National Pollutant Release Inventory.
- Continued collaborative work to ensure integrated reporting requirements, including discussions on shared monitoring for greenhouse gas emissions.

Improved quantification of in-Basin and out-of-Basin sources of harmful pollutant releases.

Result 8

- Canada and Ontario completed a secondary smelting operations emission inventory project in 2003.
- Ontario continues to maintain a public database and website for online air quality information and smog alerts. This informs people about smog days so that they can take appropriate action to reduce health risks.
- Conducted voluntary stack testing at two facilities in 2002 and three facilities in 2003. Nine stack tests have been conducted at voluntary facilities since 2000.
- Under the GLBTS, Canada continued development of a cadmium release inventory.
- Initiated a harmful pollutant-tracking project in 2002 to update emissions inventories, fill in data gaps and track reduction progress.
- Ontario Power Generation initiated an intensive investigation of mercury within their facilities to aid in developing emissions limits.

Knowledge of the occurrence, fate and impact of harmful pollutants on human and environmental health to be gathered and communicated to the public.

Result 9

- Started a collaborative four-year project in 2002 to help develop a best management practices manual for biosolids and manure application to agricultural land.
- Ontario posted 15 Air Standards Information draft documents on the Environmental Registry (ER) for 90 days of public comment.
- In 2003, approximately 3,900 facilities submitted both annual reports and smog-season emission reports under the Airborne Contaminant Discharge Monitoring and Reporting Regulation (O. Reg. 127/01), which requires the mandatory tracking and public reporting of over 350 air pollutants.
- Continued a technical review of national standards for particulate matter to determine whether updated standards are needed to reflect emerging scientific evidence on the human health impacts of fine particulate.

Result 10

An understanding of the ecological and human health risks of priority chemicals.

- Continued multiple investigations by Canada and Ontario on the occurrence and fate of emerging chemicals of concern, including endocrine-disrupting chemicals, pharmaceuticals and veterinary drugs, fire retardants, siloxanes, perfluorooctane sulfonate (PFOS) and perfluoroalkanoic acids, and halogenated phenolics. Synthesis reports of key findings to be compiled for decision-making purposes.

- Initiated studies to evaluate the effects of priority chemicals and effluents on thyroid and retinoid function, and continued assessment of Great Lakes fish health to determine if there is evidence of effects from endocrine disruption.

Phasing out polychlorinated biphenyls (PCBs): 25 years of effort paying off

What are PCBs?
Polychlorinated biphenyls (PCBs) are a class of manufactured chemicals that last for many years. They do not break down easily on their own and they are difficult to destroy.

From the 1930s to 1970s, PCBs were used as ingredients in a number of industrial materials, including sealing and caulking compounds, inks and paint additives. They were mostly used to make coolants and lubricants for certain kinds of electrical equipment, including transformers and capacitors in fluorescent lights, before being banned in 1978.

High-level PCBs are defined as fluids that contain more than one per cent PCB or 10,000 parts per million.

Of all the man-made toxic chemicals, polychlorinated biphenyls (PCBs) may have the worst reputation and, as a result, have received the most regulatory attention over the years.

Back in the early 1970s, the emerging environmental movement focused on PCBs when scientists tracked the persistent compounds through the food chain, and warned they were responsible for the disappearance of the bald eagle and other large predators from the Great Lakes Basin.

Swinging into action

Twenty-five years ago governments began to take action. Canadian regulations were put in place to ban the import, manufacture and sale (for re-use) of PCBs, and to severely restrict their use to in-service electrical transformers and capacitors.

Strict federal and provincial regulations were introduced to control the handling and storage, import and export, packaging and labelling, treatment and destruction of PCBs. Management programs to track and monitor the use, storage, transportation, and ultimate disposal of PCBs have supported these regulations. As well, research programs have studied the environmental impacts, long-range transport, absorption into the food chain, and ultimate fate.

COA and the GLBTS have called for the virtual elimination of the high-level PCBs that are currently in use or storage. The Canadian PCB Workgroup, established under the GLBTS, is also working to accelerate the destruction of high-level PCB wastes that have the potential to enter the Great Lakes Basin.

Big reductions in the last 10 years

In January 1993, there were more than 1,500 active storage sites registered with either the Ontario Ministry of the Environment (MOE) for storage or registered with Environment Canada for in-service PCB equipment. Approximately 25,000 tonnes of high-level PCB wastes were stored in these sites throughout Ontario at that time.

Ten years later, the number of active sites has been cut by nearly two-thirds, and the amount of waste in storage reduced by some 86 per cent. As of April 2003, there were 555 sites in the Ontario inventory, including 25 federal sites and 530 non-federal sites.

Work continues

Approximately 3,854 tonnes of high-level PCBs remain in storage and another 3,596 tonnes are in service (in use for operation equipment) at sites across the province.

Regulators have increased efforts to capture the interest and involvement of PCB owners and users. Starting in 1999, Environment Canada sent out request letters urging voluntary decommissioning and destruction of high-level PCBs in storage to owners of selected (priority) industry sectors that have large stocks of high-level PCBs in use and/or in storage.

Selected sectors operate in sensitive areas and include schools and educational institutes, food processing/water treatment facilities and firms, health care facilities, government facilities and firms in the mining/smelting sectors, the iron and steel industry and automotive, pulp and paper companies.

Recognition award
Environment Canada instituted a PCB Recognition and Award Program in 2002 to identify individual companies or industry associations that go beyond the basic regulatory requirements.

The program recognizes the contribution that responsible PCB owners are making to finally remove these toxic materials from storage sites and in-service equipment and publicizes their success stories.

In September 2003, at the Binational Toxic Strategies Integration meeting in Toronto, the first four companies received their PCB recognition plaques.

- Hydro One and Enersource (Mississauga) Hydro were among a small group of utilities that eliminated all of the high-level PCBs they had in service. Hydro One shipped approximately 3,200 tonnes of PCB waste during 1995–2001 and decontaminated an estimated 6.5 million litres of low-level mineral oil. Enersource (Mississauga) Hydro eliminated all of its high-level PCBs (about 100 tonnes). Enersource destroyed over 30 tonnes of high-concentration PCB equipment by the year 2000.
- Slater Steel (Bar Division) in Hamilton, was recognized for being completely PCB-free in 1998.
- Stelco's Steel Pipe Division in Welland was recognized for destroying all of its high-level PCBs by 2001.

Reducing PCBs through regulations

Currently there are four federal PCB-related regulations in force – the Chlorobiphenyls Regulation (1977), the Storage of PCB Material Regulations (1992), the Export of PCB Regulations (1996) and the Federal Mobile PCB Treatment and Destruction Regulations (1990).

The first three are being amended. The PCB (revised) regulations and PCB storage regulations have gone through extensive public consultation and comments, and are scheduled for publication in the Gazette in 2005. In addition, the federal Export and Import of Hazardous Wastes Regulations are being amended to bring them in line with international standards. Further information can be obtained from Environment Canada's website, www.ec.gc.ca/pcb.

The proposed revisions include strict phase-out dates for certain categories of PCBs. Both high- and low-level PCBs would have to be phased out from sensitive locations within three years of the proposed regulations coming into force.

The PCB Workgroup is also looking at new initiatives, including PCB audits for small and medium-sized companies, and possible financial incentives. The federal government also intends to develop a national compliance promotion workshop to support the implementation of the forthcoming PCB regulations.

Drumming up support for local action: Reducing the release of dioxins and furans

What are dioxins and furans?
Dioxins and furans are formed when certain organic materials burn slowly at high temperatures. In Canada, dioxins and furans are created by the fires in waste incinerators, iron ore sintering plants, steel manufacturing plants, and pulp and paper mills, to name a few of the industrial sources.

The two toxic and cancer-causing chemicals are also created when people burn their waste in burn barrels. Household garbage now includes plastic packaging, disposable items such as razors, treated wood and junk mail. When these items are burned, dioxins, furans, arsenic, barium, mercury, lead, formaldehyde, PCBs and particulate matter are just some of the toxic chemicals that are released.

Once released, the dioxins and furans can contaminate water, soil and plants. Toxins are then taken up into the food chain, accumulating in the fat of animals, which are ultimately eaten by humans.

In addition to increasing the risk of cancer, dioxins have also been linked to diabetes, cardiovascular disease, and developmental problems in children. These toxins may also compromise the immune system and disrupt the endocrine system, which includes the hypothalamus, pituitary, thyroid, parathyroid, adrenal and reproductive glands.

Under COA, the two governments are committed to slashing the release of dioxins and furans by some 90 per cent by the year 2005 from a baseline of 1988. In the past several years, they have capped or have made plans to reduce the dioxins and furans produced by waste incinerators, iron ore sintering plants, steel manufacturers, and pulp and paper mills. By the end of 2003, emissions had been reduced by 84 per cent.

Tackling backyard burning

The ubiquitous 55-gallon drums used by thousands of rural residents in this country to burn their garden garbage and household waste produces about 10 per cent of the man-made dioxins and furans released into Canada's atmosphere every year. In Ontario, studies show that burning garbage at home or the cottage is the fourth-largest source of dioxins and furans in the province.

Surveys of Ontario's residents in small cities and rural areas show that almost 25 per cent routinely burned their household trash in backyard barrels, firepits and outdoor furnaces. Burning agricultural and household waste, some of which includes plastic containers, chlorine-soaked plastics and wrappings from bales of hay, offers the ideal conditions for forming dioxins and furans.

"If you are burning garbage at home, you're making poison," says Environment Canada's Bruce Gillies, who heads the team tackling the problem of burn barrels. Dioxins and furans are known carcinogens and the cause of developmental, respiratory and cardiovascular problems. In addition, the toxic compounds are also known to interfere with the immune and reproductive systems. The *Canadian Environmental Protection Act, 1999* has designated dioxins and furans for "virtual elimination".

To reduce the emissions from burn barrels, the Ontario and Canadian governments, and their counterparts in U.S. federal and state governments, set up a burn barrel team under the GLBTS. Representatives from all three levels of government on both sides of the border worked with representatives from industry, academia, environmental organizations and community groups, as well as with Aboriginal peoples, to design a multimedia public education campaign on the dangers of burn barrels and about dioxins and furans.

Thunder Bay's community organization EcoSuperior ran the first pilot project. The group produced television and radio advertisements, as well as flyers and posters, to explain the dangers of burning waste in open barrels. These media items showed how dioxins and furans are formed, and the reasons they pose a problem to the health of humans and the environment.

As well, EcoSuperior arranged to have leaflets inserted into property tax bills and the permits issued by local fire departments for controlled burns. Over the course of the pilot project, which ran from early spring 2002 until late fall 2003, the group also held information meetings in schools, with community groups and at town councils. It provided special garbage bags and educational material to visitors to the areas' parks. EcoSuperior also set up a website to provide background information, technical studies, hands-on advice and outreach materials in cyberspace. The website is located at www.openburning.org.

In October 2003, the campaign was extended to the Lake Ontario region when the Lanark and Leeds Green Community Program launched its burn barrel program. The burn barrel team plans to use the Household Garbage Burning Strategy now tested in two locations on the Great Lakes as the model for similar programs in Canada and United States.

"We'll be looking at the barriers that may stand in the way of waste diversion, as well as to improving our education and outreach efforts," says Gillies. "We will also work closely with our local partners to make the rollout a success. This means working closely with local public officials and decision-makers to get them to buy into the program. Where necessary, municipal bylaws that would prohibit the burning of garbage may be considered as a tool to persuade those individuals who will not change their habits voluntarily."

Other sources of dioxins and furans

The governments of Ontario and Canada have tackled other sources of dioxins and furans, besides burn barrels, since they signed the COA in 2002. Under the new Canada-wide standards developed by the Canada Council of Ministers of the Environment, emissions of dioxin and furans from iron sintering plants are slated to drop by 90 per cent, and from steel manufacturing electric arc furnaces by 60 per cent by the year 2010. The council of environment ministers also endorsed Canada-wide standards for incineration and for the coastal pulp and paper sectors.

In Ontario, the provincial government put in place a regulation to close all existing hospital incinerators by December 6, 2003. The closures were confirmed through site visits by the ministry. It is now examining ways to divert more waste, including regulatory and non-regulatory initiatives to promote recycling and other ways to reduce the amount of garbage going to landfill sites. The province's waste diversion strategy calls for 60 per cent diversion of non-hazardous waste from Ontario's landfills by expanding recycling programs and supporting initiatives to manage waste more effectively.

Cooperative programs rein in mercury releases: Cutting Mercury in the Great Lakes

About mercury

Mercury is a heavy metal that is listed as a "toxic substance" under the *Canadian Environmental Protection Act, 1999*. Once in the environment, mercury takes years to degrade and accumulates in vegetation, crops, fish, wildlife, and humans. It has long been recognized as a serious threat to the environment and to human health. In most chemical forms, mercury is a neurotoxin. This means it can cause damage to the brain and central nervous system and harm the kidneys and lungs. Methylmercury, one of the most toxic forms of mercury, is known to affect learning ability and neuro-development in children.

Mercury, a silvery liquid metal, has a number of unusual properties, such as conducting electricity and combining readily with other metals that make it useful for a variety of products. Mercury has been, and in some cases still is, used in batteries, thermometers, switches, thermostats, smoke detectors, fluorescent lights, medical instruments, high-intensity discharge lamps and dental amalgams for fillings.

Two-thirds of the mercury released into the atmosphere comes from the fuels burned in steel mills, cement plants and coal-fired power plants. Mercury is also released from the smokestacks of incinerators burning municipal solid waste, sewage sludge, and hazardous waste. Airborne mercury is a particular concern because the prevailing winds carry mercury compounds for hundreds of kilometres until they drift down to earth or are washed down in rainstorms.

Today, atmospheric deposition is one of the major sources of mercury to Ontario's lakes, streams and eventually fish.

Under the 2002 Canada-Ontario Agreement, the two governments worked on two fronts to reduce the amount of mercury released into the atmosphere.

First, the federal and provincial governments developed new regulations and standards to cut emissions of the toxic chemical. Second, the two governments formed partnerships with industrial and professional associations to reduce the use of mercury and ensure products that contain mercury are collected and disposed of safely.

Standards and regulations to cut emissions

To reduce emissions of mercury, the CCME adopted three countrywide standards for mercury. These standards target fluorescent lamps, waste containing dental amalgams and emissions from incinerators.

For its part, the Ontario government is putting into place the new standards for incinerators and has already amended a number of Certificates of Approval (which are needed to operate an incinerator) to include the new standards.

"By installing the mercury control equipment, operators of these incinerators have cut mercury emissions by an estimated 400 kilograms a year from 2000 levels," says Ian Smith of the Standards Development Branch of the Ontario Ministry of the Environment.

Of equal importance, provincial regulations have also closed 70 hospital incinerators. The result is that all of Ontario's biomedical and other hospital waste – once the fourth-largest source of mercury releases in the province – is treated at state-of-the-art waste management facilities, which effectively eliminates mercury emissions from these sources.

In addition, new Ontario regulations require dental offices to install equipment that captures the mercury-based dental amalgams that used to go down the drain. To support the province, some municipalities, such as Toronto and Ottawa, have passed bylaws to reduce the amount of mercury entering municipal sewer systems.

The Ministry of the Environment is encouraging the use of mercury-free products, alternative fuels and better technology to reduce and to monitor mercury pollution. The ministry is also expanding recycling programs, decommissioning current sources of mercury and cleaning up sediments containing mercury.

Partnerships and cooperation

Cooperation among governments, non-government organizations and industrial and professional associations is essential in reducing mercury use. A number of cooperative partnerships are in place. For example:

- The COA partners have worked with manufacturers to reduce the amount of mercury used in lamps.
- The federal government and the Canadian Dental Association have signed a Memorandum of Understanding to reduce the amount of mercury discharged from dentists' offices to local sewer systems by some 90%.

- The Clean Air Foundation is managing the Switch Out program, a partnership of the federal and provincial governments as well as industry and non-government organizations. The program focuses on the switch that turns on the light in automobile trunks. These switches contain minute amounts of mercury, which add up to large amounts of the toxic chemical when cars reach the end of their useful lifespan, and are taken to the scrapyard to be crushed or recycled in electric arc furnaces. To date, more than 130 scrapyards and auto dismantlers in Ontario have joined the program. Plans are now afoot to expand Switch Out across the country.

- The Regional Municipality of Niagara and the Association of Municipal Recycling Coordinators have developed a collection program for the mercury-containing switches in household appliances. Further, the regional municipality is working on a mercury elimination policy and plan. When finished, it can be used as a template by other upper-tier municipalities.

- Lake Superior's north shore communities from Thunder Bay to Sault Ste. Marie are serving as a model of environmental leadership. A public education and outreach program coordinated by EcoSuperior, a non-government organization based in Thunder Bay, kept local businesses and residents informed of the uses and dangers of mercury. EcoSuperior then followed this with extensively promoted programs for recycling button batteries, thermostats, fluorescent lamps and other consumer products that might contain mercury.

"Cooperative programs with business, industry and local community groups are essential to the success of mercury reduction efforts," says Jim Bailey of EcoSuperior.

Getting the numbers down

Releases of mercury in the Great Lakes Basin have been cut by 83 per cent, in 2004, from the baseline set in 1988. That translates to 2,400 kilograms a year in 2004 from 14,000 kilograms a year in 1988.

"We will continue to build on the gains achieved so far," says Environment Canada's Robert Krauel. "We anticipate a reduction of 90 per cent of the 1988 baseline by 2010."

Toronto Harbour – Tony Walton for the Ontario Ministry of the Environment

Annex 3

LAKEWIDE MANAGEMENT

Introduction

This annex focuses on the efforts Canada and Ontario are making to manage the individual lakes in the Great Lakes Basin and to reduce their ecological and human use impairments. The annex contains three goals, seven projected results and 61 commitments. This section of the report outlines the progress made on the projects and programs that were designed to meet the goals and results.

The goal of Canada and the United States is to "restore the chemical, physical and biological integrity of the Great Lakes ecosystem." To reach it, the five Great Lakes and Lake St. Clair must be managed individually. Although they are connected, they differ physically, biologically, chemically and geographically. The uses of the land surrounding each lake also differ.

Not surprisingly, these differences are reflected in the stresses to the ecosystems of the individual lakes. These stresses include harmful pollutants, the loss of habitat for fish and wildlife, the loadings of nutrients such as phosphorus, and the presence of invasive species including zebra mussels. To reduce these stresses, agencies of Canadian federal and provincial governments and those of American federal and state governments have developed binational action plans known as Lakewide Management Plans or LaMPs.

Many of these activities included in the LaMPs were delivered through a variety of inter-agency and community-based partnerships. That is one of the hallmarks of the Canadian partners in COA, their agencies and stakeholders. Their work together is characterized by building consensus, collaborative decision-making and joint implementation of actions in the LaMPs.

To this end, the partners, agencies and stakeholders regularly share information in workshops, seminars and training sessions about their activities, their successes, and their challenges as well as about current knowledge and practices. The partners recognize that ongoing dialogue is required to successfully carry out the activities listed in this annex.

In addition, the COA partners have established task forces to identify and coordinate federal and provincial initiatives for protected areas and for invasive species. These task forces report regularly to the Annex Implementation Committee on the activities that are underway. When required, the task forces also steer the work needed to meet the commitments in the COA to establish a viable network of protected areas and to reduce the entry and spread of invasive species.

This annex lists the goals, results and some of the activities undertaken in 2002–2003, as well as two articles about notable achievements under this COA. The first article is called Building Partnerships that Really Work and the second is called How-to Guide Helps Shoreline Protection Efforts.

Planning to succeed
In the past, plans to restore the environment focused on reducing, if not eliminating, specific problems in an area, such as curbing emissions from a factory or improving the performance of a sewage treatment plant.

Today, the focus is broader, extending beyond the borders of individual lakes to the boundaries of the Great Lakes Basin, and in some cases to other parts of North America and the world.

Understanding emerging environmental problems, such as the effect of invasive species on a lake or how much airborne pollution adds to the loadings of pollutants, requires a holistic or integrated lakewide management approach. This approach includes examining how the land in the watersheds and the tributaries is used, as it affects the water quality and the biodiversity in the Great Lakes Basin.

Some of the issues in the LaMPs extend beyond the boundaries of the Great Lakes Basin and must be dealt with at national and international levels. Air pollution is one example. Planning at this level is complex and requires attentive management, a high degree of cooperation and coordination, and dedicated resources – financial and otherwise.

In the first two years of this COA, the partners, their agencies and stakeholders planned and created the structures required to provide the cooperative partnerships and the many tools needed to meet the lakewide goals, projected results and 61 commitments of this five-year agreement.

Progress Report 2002–2003

Annex 3 looks at the collaborative management and decision-making processes in both Canada and the United States that address lake-specific ecological impairments.

This annex contains three goals and seven projected results.

The Goals and Progress Made

Clearly understanding the environmental problems and causes of ecological impairment.

Goal 1

Completed biennial LaMP reports by Canada and the United States in 2002 for lakes Superior, Erie and Ontario, with the second biennial reports on schedule to be completed in 2004. These describe the state of each lake, the causes of ecological impairment, and the actions required to restore environmental quality. The first biennial document for Lake Huron was on schedule to be completed in 2004. A Canadian management plan report for Lake St. Clair is currently being produced by provincial and federal agencies.

Reaching consensus on and having broad-based support for direction and priority actions for environmental restoration, protection and conservation.

Goal 2

- Established a binational partnership to address priority issues on Lake Huron in 2002, and continued discussions to establish a binational program for Lake St. Clair.
- Prepared multi-year binational and domestic work plans identifying required actions for lakes Superior, Huron, Erie, and Ontario and achieved consensus on priority actions required.
- Implemented a binational, multi-agency monitoring strategy in Lake Ontario, which is being considered as a model for the other lakes.

Goal 3

Making progress on habitat restoration, conservation and protection, and reducing the impact of harmful pollutants with a lake-by-lake focus.

- Made progress toward habitat restoration, conservation and protection for lakes Superior, Erie, Ontario, and Huron.
- Developed and implemented various fisheries, watershed, habitat and species at risk recovery plans, largely through local, cooperative actions.
- Established the *Nutrient Management Act* in June 2002. This provided for the phasing in of mandatory regulatory requirements beginning in September of 2003 for new and expanding livestock facilities and allowing for future phasing in of existing large livestock farms.

Progress on Achieving the Projected Results

Result 1

Reductions in the release of harmful pollutants on a lake-by-lake basis.

- Completed activities supporting non-point source PCB trackdown, biomonitoring, and watershed investigations in Lake Ontario, Lake Erie and Lake Huron.
- Completed analysis and reporting on pesticides in sediments from Lake Huron and in the water of its major tributaries.
- Negotiated the Lake Huron Binational Partnership between federal, state, and provincial agencies.
- Through the Environmental Farm Plan incentive program and the Healthy Futures program supported adoption of environmentally sound farm practices. These included the cleanup of unwanted pesticides, creation of water quality initiatives, and creation of farm buffer strips.
- Implemented two new provincial regulations – one to address dental amalgam (mercury) and another to phase out hospital incinerators (mercury and dioxins/furans).

Result 2

Rehabilitated, conserved and protected fish and wildlife habitats and protected areas.

- The Ecological Gifts Program helped to protect almost 1,400 hectares of habitat.
- Partners to the Great Lakes Wetlands Conservation Action Plan launched Phase Two of their strategy, which includes monitoring, protecting, and restoring wetlands.
- A multi-agency study continued assessing impacts of the Lake Ontario/St. Lawrence River water level regulation on shoreline habitats.
- Developed and implemented watershed plans to support the habitat rehabilitation of major tributaries.

- Continued development and implementation of recovery actions for species at risk (e.g., peregrine falcon, eastern spiny softshell turtle), and continued work on the Thames River Recovery Plan.

- Species at risk recovery strategies are underway in the Sydenham, Ausable, and Grand rivers and within the Essex Region watershed.

- Initiated identification and mapping of habitats and ecosystems for rare aquatic species and communities across the Great Lakes Basin.

- Continued rehabilitation of native fish species – such as Atlantic salmon and lake trout in Lake Ontario and coaster brook trout and walleye in Lake Superior.

Reduced entry and spread of non-native invasive species.

Result 3

- Ballast water management regulations have been drafted. Current ballast water guidelines were expected to be replaced by ballast water management regulations in late 2004.

- Helped reduce the spread of invasive species by developing and distributing public awareness and education materials.

- Initiated the development of an invasive species monitoring program to track their introduction and spread.

- Initiated an ongoing biological control program for purple loosestrife in affected wetland and nearshore areas.

- Placed restrictions on the buying and selling of live invasive species, including two species of goby, four species of invasive carp and 28 species of snakehead.

Reduced human health risk from contaminants in the Great Lakes.

Result 4

- Initiated the multi-agency binational Great Lakes Human Health Network. The network is a voluntary partnership of governments and their agencies to exchange information pertaining to health matters by working through the existing RAP and LaMP processes. Health information and advice is communicated to stakeholders through their member organizations. The network also supports the coordination of public health and environmental management systems.

- Worked on the establishment of the Canada-Ontario Public Health Network. The network facilitates communication on human and environmental health issues among government agencies involved in public health in the Great Lakes Basin and complements the binational Great Lakes Human Health Network.

Result 5

Collaboration between government, organization and Basin residents.

- Held a binational workshop on coordination of monitoring programs, with participation from agencies and organizations across the Great Lakes.
- Continued to provide collaborative direction through binational multi-agency LaMP management committees and working groups.
- Provided ongoing Basin stakeholder input through public forums for Lake Superior and Lake Erie.
- Continued to report on populations of birds and amphibians, using volunteers, through the binational Marsh Monitoring Program.
- Continued participation in the Great Lakes Coastal Wetland Monitoring Consortium Project to integrate provincial, state, and federal wetland monitoring programs.
- Continued working with landowners across southern Ontario to rehabilitate fish and wildlife habitat.
- Continued joint projects with Lake Superior agencies and public forums, including mercury awareness/outreach, a newspaper insert and a stewardship program.
- Supported farmers, food, and rural businesses and organizations, through the Rural Water Quality initiative of Healthy Futures for Ontario Agriculture, to implement best management practices and agri-food technologies to safeguard water quality and quantity. Approximately $25 million was invested to support rural water quality programs. Initiatives included cleaning up obsolete and unwanted pesticides, improving storage methods for paper mill waste for poultry operations, and supporting rural water quality programs within the Great Lakes Basin. A program to support the proper decommissioning of abandoned wells was also completed.

Result 6

Improved scientific understanding of the fate and effects of harmful pollutants and the causes of ecological impairments for each lake.

- Completed a research study on organic content residuals in agricultural ecosystems.
- Initiated studies on the impact of forestry practices and pesticides on aquatic ecosystems.
- Completed the final report in a series on the potential effects of endocrine disruptors in wildlife from the use of selected urban and agricultural pesticides.
- Continued collecting fish samples and analyzing data to support the Ontario Sport Fish Consumption Advisory Program across the lakes.
- Conducted research on wildlife health effects associated with contaminant exposure.
- Undertook research to improve the knowledge of the impacts of invasive species and changing ecosystems on foodweb interactions.

Coordinated and integrated monitoring for scientific interpretative reporting, decision-making and reporting on progress.

Result 7

- Completed shoreline water quality assessments in Lake Erie and Lake Huron, as well as fish community monitoring in all five Great Lakes.
- Undertook fish contaminant monitoring studies in support of the Great Lakes Surveillance Program, an ongoing program to collect information on Great Lakes water quality.
- Developed a binational fish assessment program to ensure compatible lakewide data quantifying Lake Superior's fish community.
- Continued to develop methods to characterize and identify rare species habitats basin-wide.
- Supported activities related to environmental assessments and groundwater monitoring at federal ports and harbours.
- Monitored and assessed trends in contaminant levels in herring gull eggs in all the Great Lakes. Completed a database of results for 1998–2001.
- Published the book Where Land Meets Water: Understanding Wetlands of the Great Lakes, a summary of wetland science and conservation actions.
- Initiated regionally based integrated monitoring on Lake Ontario to assess coastal wetland conditions.

Lake Ontario Binational Cooperative Monitoring: Building partnerships that really work

For years, Canadian and U.S. research ships passed each other like strangers in the night, collecting data and gathering samples on the Great Lakes. There was a lot of important work being done by Canadian and U.S. federal, provincial, and state agencies, but much of it was conducted in isolation. Today, thanks to the Lake Ontario Binational Cooperative Monitoring initiative, the research scientists are not only talking to each other, they are sharing data and working together to answer some complicated and difficult environmental questions:

- How are exotic invaders, like the zebra and quagga mussels, upsetting the foodweb lakewide?
- Are exotic invaders threatening our efforts to restore naturally reproducing populations of native fish?
- How significant are the loadings of critical air pollutants, including pesticides, mercury and PCBs, to the health of the lake?
- How do the airborne pollutants compare to other sources of contamination, such as industrial and municipal effluents or urban and rural runoff?
- How well does the data coming out of Canadian and U.S. labs compare?
- Will different sampling and testing techniques produce compatible results?

Partnership the key to success

"Partnership is the key to success," says Environment Canada's Melanie Neilson. "Cooperative monitoring will improve our understanding of the Lake Ontario ecosystem, help fill some key information gaps, and improve communication among researchers working on both sides of the border.

"The Lake Ontario Atmospheric Deposition Study (LOADS) will give us a better understanding of how airborne pollutants are affecting the lake. The Lake Ontario Lower Aquatic Foodweb Assessment (LOLA) will tell us more about how invasive species are disrupting both the bottom dwelling and the nearshore phytoplankton communities. And the Interagency Laboratory Comparison Study will show us how well we can combine the analytical results produced by different research teams."

To see the big picture, you first have to piece together a complex scientific puzzle from millions of individual bits of data.

"This kind of coordination and data synthesis takes time and effort, and the project partners are committed to making this happen," says Vi Richardson from Environment Canada. "We have the support of Environment Canada, Fisheries and Oceans, the Ontario Ministry of the Environment, the Ontario Ministry of Natural Resources, the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the New York State Department of Environmental Conservation. We are also working with academics and institutions on both sides of the border."

Identifying priorities

The priorities were identified and coordinated through the Lake Ontario LaMP, which broadened its base of partners to help support and strengthen the ongoing investigative efforts. For example, the Lake Ontario LaMP's partnership with the Great Lakes Fishery Commission has brought together water quality and fishery managers. The 2003 sampling year is the first step in developing a long-term binational strategy for Lake Ontario that meets the needs of water quality and fishery managers.

"There has been serious concern that important food chain species were in decline," explains Scott Millard, a scientist with Fisheries and Oceans Canada. "The cooperative monitoring program will give us a one-year snapshot on the general health of bottom-dwelling organisms and those that support the food chain," he says.

All the raw data is being fed into a central database – a very complicated program to manage – that shows how these new and invasive species are changing and upsetting the foodweb that serves as fish food for the species at the top of the chain.

It takes time

A big project like this doesn't come together overnight. "We first started talking about this monitoring program five years ago," says the U.S. Environmental Protection Agency's Fred Luckey. It took time to get all the parties coordinated, to get the funding in place, and to set up the data-sharing protocols and all the other technical details needed to make this work.

Often the hardest part of this kind of work is bringing the researchers and their findings together and then communicating the big picture to all the stakeholders – the various levels of government and their agencies, the private sector and the non-government organizations – as well as the general public.

Instead of issuing the scientific findings piecemeal in dozens of separate papers and reports, "we will evaluate all the data collected and issue a comprehensive report that incorporates and integrates all the findings to create a more complete picture of the lake," says Environment Canada's Neilson.

"This is not a one-year, one-shot wonder," says Management Committee member Simon Llewellyn. Instead, the Lake Ontario Cooperative Monitoring initiative is a cornerstone model for conducting future monitoring throughout the Great Lakes. Next year, attention will shift to Lake Erie, and then year after year, to the other lakes in rotation. "We'll be back to Lake Ontario in four years to continue the work, looking for trends and changes. The partnerships being formed today will produce results for years to come."

Annex 4

MONITORING & INFORMATION SHARING

Water sampling in Hamilton Harbour – Tom Walton for the Ontario Ministry of the Environment

Introduction

Annex 4 is driven by the information sharing and monitoring requirements of the other three annexes as well as the need to manage the information required to help meet the projected results listed in this annex. Annex 4 includes two goals, two projected results and 11 commitments.

The 2002 COA has a vision of a healthy, prosperous, and sustainable Great Lakes Basin. To turn that vision into reality, the Agreement commits its partners to gathering the data needed to track environmental change and progress within the Great Lakes Basin.

The 2002 COA recognizes the important role that monitoring plays in detecting emerging issues and in characterizing historic issues that require action. Monitoring is also the key to tracking the progress made in reaching the environmental goals and results listed in the COA. Monitoring also helps define the actions required to remediate problem areas and then to protect them from further environmental harm.

Many agencies and individuals are involved in collecting, analyzing and reporting the data gathered through the monitoring systems in the Great Lakes Basin under this COA.

The Agreement commits its partners to sharing the data collected through the monitoring networks with all levels of government as well as with organizations and individuals in the Basin. To this end, the COA partners publish information about trends in environmental quality on the Internet and in written reports.

The focus of the work plans under this annex has been on sharing information and setting up a comprehensive management system.

A multi-agency task force has been established to examine strategies for integrating existing systems for managing information and for facilitating the sharing of information.

Progress Report 2002–2003

Annex 4 looks at the monitoring and reporting necessary to ensure that governments, organizations and residents have access to accurate information regarding the trends in environmental quality in the Great Lakes Basin.

This annex has two goals and two projected results.

Goals and Progress Made

Coordinated and efficient federal/provincial scientific monitoring.

Goal 1

- COA signatories and local communities monitored the quality of water, air and sediments in the Great Lakes Basin, on a lakewide basis and in specific AOCs.

- Monitoring programs tracked wildlife and fish populations, measured tissue concentrations of contaminants, monitored industrial emissions and sewage discharge, mapped the impacts

of land use on water quality, assessed changes in habitat, and assessed impacts of restoration activities.

- A combination of general (ambient) environmental monitoring and investigative monitoring programs determined long-term changes in environmental quality, and ecosystem composition and function. These programs also tracked the effectiveness of remediation and protection actions, and identified new issues to be addressed.

Goal 2

An information management system for tracking environmental change and progress.

- Established a task force to examine strategies for integrating the existing information management systems of all the COA partners. A framework for an information management system is in the early planning stages.

The Expected Results and Progress Made

Result 1

Responsive and comprehensive monitoring program.

- Developed and maintained an inventory of ongoing monitoring programs and activities to achieve the goal of coordinated and efficient federal/provincial scientific monitoring that provides accurate and timely information regarding trends in environmental quality. This inventory of monitoring programs will be linked to other inventories that describe programs conducted by other partners in Great Lakes monitoring – such as U.S. federal and state agencies collaborating with Canada and Ontario on specific LaMPs.

- Initiated reviews of monitoring needs for individual technical committees (for Annexes 1–3) for the development and implementation of LaMPs, the tracking of harmful pollutant loadings and reductions, and the assessment of progress in restoring impaired uses in AOCs. Federal and provincial COA partners continued to compile and review monitoring needs, as identified by these committees in order to formulate a multi-year monitoring plan that meets the needs of COA.

- Analyzed the COA work planning database. This will identify any gaps in agency programs, as well as any outstanding initiatives.

- Began the task of identifying existing monitoring databases and requirements.

- Collected monitoring data specific to evaluating the restoration of Beneficial Use Impairments (BUIs) and delisting criteria.

Result 2

Scientific data and information shared among government, organizations and Basin residents.

Initiated the development of *Lakeviews* – a geospatial data and information access system – to provide easy access to federal and provincial Great Lakes information databases. Initially, *Lakeviews* will serve the COA community, but will be expanded to serve the general public. Engaged Land Information Ontario (LIO) and the Water Resources Information Project (WRIP) in

the development of *Lakeviews* to ensure compatibility with current provincial information management systems. Great Lakes data being prepared for inclusion includes near-shore water quality, sediment and tissue monitoring results, digital elevation models, watershed boundaries, land cover, soil types, roads, streams, etc.

- Engaged the federal Canadian Information Systems for the Environment (CISE) through its regional arm, the Ontario Regional Information Systems for the Environment (ORISE) in the development of *Lakeviews* using federal Great Lakes databases.

- Adopted CISE best practices and the principles of free exchange of information. Data will be collected in the most efficient manner possible, and will then be shared with the broader environmental management community.

- Continued development of the ORISE website to provide monitoring information on environmental quality and trends. A provincial site will offer similar information, with the two sites complementing one another.

- Continued the development of the content and structure of a unified website (federal/provincial).

Information sharing supports better decisions: The *Lakeviews* story

In recent years, the federal and provincial governments, conservation authorities and other investigators have made heavy investments in Great Lakes research. They have been collecting data, monitoring environmental conditions, tracking trends, and analyzing ecosystem events throughout the Basin. All that activity is generating an enormous amount of environmental data, but the problem has been how to coordinate the myriad of detail in a meaningful and useful format.

Enter *Lakeviews*

Lakeviews is an online system offering integrated, web-based access to a growing mountain of data that is providing the answer.

"Tracking environmental change and progress is vital to COA's success," says Ian Parrish, coordinator of water monitoring services for the Ontario Ministry of the Environment.

"It's so crucial that information management is the subject of its own annex in the Agreement. *Lakeviews* will allow the seamless integration of environmental information gathered throughout the Basin," Parrish says, "and allow users to process data from diverse sources."

The user-friendly computer interface will eventually serve the general public free of charge, as well as COA participants and program staff working to protect the Great Lakes.

Lakeviews is "an interoperable system of distributed databases," says Scott Painter, manager of Environment Canada's ecosystem health division. "That means that the basic data is maintained and updated by the people who compiled it in the first place, but it is available to anyone who is interested."

The databases will be linked by web services and supported by geospatial mapping technologies that serve as a discovery, access, visualization and decision support tool for federal and provincial monitoring activities and priorities in the Great Lakes Basin.

Lakeviews will also contribute to broader environmental information systems, nationally and internationally. Decisions about protecting and conserving ecosystem resources must be made based on the most complete information available. *Lakeviews* will support better decision-making.

"We don't want to re-invent the wheel," says Painter. "Everything we are doing is based on best operating practices, on international standards, and on practical and proven technologies that are already being used," he explains. *Lakeviews* will ensure that information management resources are employed efficiently and effectively, and protocols are consistent with other information management activities. "We are building the system in, on, and around existing information services."

The federal government's initiative, the Canadian Information System for the Environment (CISE), plays a prominent role in delivering COA's Annex 4 objectives through *Lakeviews*. Meanwhile, Ontario is relying on its Water Resources Information Project (WRIP), Land Information Ontario (LIO) and environet, an MOE information system that is under development.

Linking COA information development with these initiatives will allow the Great Lakes partners to converge information more effectively and efficiently.

"The whole point of *Lakeviews* is to optimize the existing information investments of both jurisdictions," says Parrish. "The project is harnessing the resources and capacities of the federal and provincial information resource initiatives, and providing decision makers with access to a more sophisticated picture of the Great Lakes ecosystem."

Buffer Strips: How-to guide helps shoreline protection efforts

Life is richest along the shoreline in the transition zone – the buffer strips – between land and water. That's where wildlife scavenges, water birds nest and search for food, frogs find shelter, and many species of fish come to spawn. A thick, permanent strip of aquatic and terrestrial vegetation along the waterfront or a stream's banks also acts as a stabilizing influence. It helps prevent erosion, can restrict livestock from wetlands and streams, provides shade to keep the water cool, and filters out many of the nutrients and other contaminants in the runoff that eventually could make its way to the lake.

The importance of restoring and protecting the buffer strips

"Restoring and protecting these vital buffer strips adjacent to farming operations, feeder streams and the open water is a key element in many Great Lakes environmental projects," says Mike Hicknell of Agriculture and Agri-Food Canada.

To support this important work, a multi-disciplinary team of government and non-government stakeholders coordinated by the Ontario Cattlemen's Association has produced a booklet, *Buffer Strips*. This full-colour, 141-page guide shows landowners how to establish, enhance and retain these protective barriers as part of the natural environment. The booklet was produced under the auspices of the Ontario Best Management Practices (BMP) program, a partnership of Agriculture and Agri-Food Canada, the Ontario Federation of Agriculture, and the Ontario Ministry of Agriculture and Food.

Planning and implementing shoreline protection projects

The publication is helping farmers and rural landowners plan and implement a variety of shoreline protection projects. It shows how to plan, establish, and maintain an effective and hardy buffer strip around wetlands and ponds, and alongside streams and lakes using locally available trees, shrubs and grasses.

Buffer Strips also illustrates how to expand and manage existing buffers by restricting livestock access, rethinking mowing patterns, using conservation-based tillage systems, and limiting the use of pesticides and fertilizers. The publication shows how to calculate the optimum width of a buffer zone, and whether or not fencing is recommended.

Positive results

The results being achieved by better-designed buffers in hundreds of sites in many Ontario watersheds will help reduce contaminant and nutrient loadings. By providing more shade, cleaner and cooler water, and greater plant diversity, the work is also improving and creating fish and wildlife habitat.

In addition, a well-designed buffer strip will protect the adjoining farmlands from wind damage while harbouring birds, insects, and other wildlife that have the potential to eliminate many crop pests. The establishment of buffer strips on farms also fulfills a shared COA responsibility for providing suitable conditions for rehabilitated, conserved, and protected fish and wildlife habitats and protected areas.

"*Buffer Strips* demonstrates best management practices and shows what can be achieved when 25 representatives from a wide range of organizations and disciplines – each with their own perspectives and expertise – collaborate with a common goal in mind," says Ted Taylor of the Ontario Ministry of Agriculture and Food.

These best management practices present affordable and practical options that allow farmers and rural landowners to protect soil and water resources on the farm.

"They are designed to support individual farm planning and decision-making over the short and long-term," says Hicknell of Agriculture and Agri-Food Canada. "Publications like *Buffer Strips* show farmers and rural landowners how they can harmonize productivity, business objectives, and environmental concerns."

Winning publications

Buffer Strips is just one of a growing catalogue of award-winning publications, videos, CD-ROMs and slide shows produced under the BMP program. Each of the practices and publications is designed and reviewed by a team of farmers, researchers, natural resource managers, regulatory agency staff, and agribusiness professionals.

Five of the BMP books have won Blue Ribbon Awards from the American Society of Agricultural Engineers for excellence in extension materials. And they are making an impact out in the field where it really counts. Market research suggests that most Ontario farmers are aware of the publications and approximately two-thirds of the farmers who have read them have undertaken some action to make environmental improvements on their farms.

How to get a copy

To date, more than 49,000 copies of *Buffer Strips* have been distributed to farmers and rural landowners in the Great Lakes Basin. To obtain a copy (free of charge for Ontario residents) or learn about the other publications and resources available through the Best Management Practices program, visit the Ontario Ministry of Agriculture and Food online at: www.gov.on.ca/OMAF or telephone the Ontario Federation of Agriculture at 416-485-3333.

Conclusion

The 2002 Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem is an ambitious and complex undertaking.

In the years 2002 and 2003 much was achieved thanks to the dedication and hard work of hundreds of individuals and groups; federal, provincial and municipal employees; and numerous partnerships between governments, agencies, the private sector, non-profit organizations and others.

While much has been accomplished, there remains a great deal left to do. The challenges are often difficult to understand, take years to fix and cost a great deal of money.

The governments of Canada and Ontario as well as other groups and individuals in the Basin remain committed to the cleaning up of the Basin and continue to strive to meet the vision a healthy, prosperous and sustainable Great Lakes Basin Ecosystem for present and future generations.

GLOSSARY OF TERMS

Tony Walton for the Ontario Ministry of the Environment

Areas of Concern (AOC)
The 42 severely degraded geographic areas in the Great Lakes Basin where beneficial uses for humans and wildlife (e.g., fish consumption and habitat degradation) are impaired.

Atmospheric Deposition
The deposit of airborne toxic substances, particularly persistent toxic substances that may have significant adverse effects on environment quality.

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).

Beneficial Use Impairment (BUI)
The inability of an Area of Concern to support aquatic life or other beneficial uses for humans and wildlife.

Benthic
Refers to the bottom zone of a body of water or the aquatic life that lives in the bottom zone of a body of water.

Biosolids
Waste that is predominantly organic that has been treated by aerobic or anaerobic digestion or other means of stabilization. Biosolids include residue from sewage works.

CCME
Canadian Ministers of the Environment.

CISE
Canadian Information Systems for the Environment.

Criteria Air Pollutants
Nitrogen oxides (NOx).
Volatile organic compounds (VOCs).
Sulphur dioxide (SO2).
Particulate matter less than 10 microns (PM10).
Particulate matter less than 2.5 microns (PM2.5).

Ecosystem and Ecosystem Approach
Ecosystems are composed of a variety of organisms including plants, fish and wildlife, and people that function in an interrelated way with one another and to the surrounding environment (air, water and land).

An 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.

Endocrine Systems and Endocrine Disrupting Substances
Endocrine systems are complex mechanisms coordinating and regulating internal communication among cells.

Endocrine disrupting substances interact with endocrine systems and can cause a disruption to

normal functions, adversely affecting their growth, reproduction and development. Even at very low levels many of these chemicals may have biological impacts on the health and sustainability of wildlife populations.

Fish Community Objectives
The objectives relate to desirable fish community habitat. They provide a common framework for agencies to develop and implement complementary fishery management programs.

GLBTS
Great Lakes Binational Toxics Strategy.

GLIC
Great Lakes Innovation Committee: a group of representatives from municipalities, academia, forestry, fisheries, public health, conservation, industry, environmental and other interested organizations, which provides advice to the COA Management Committee.

GLWCAP
Great Lakes Wetlands Conservation Action Plan.

Great Lakes Basin
The five main Great Lakes (Ontario, Erie, Michigan, Huron and Superior) and the St. Lawrence River, as well as the surrounding lands, rivers and streams that flow into them.

Harmful Pollutants
The substances that have a damaging impact on the health/functioning of the ecosystem. The harmful pollutants are substances on the Tier I and Tier II substance list, as well as the Criteria Air Pollutants (information available online at www.on.ec.gc.ca/coa).

Impaired Use
The impact of environmental problems that interfere with beneficial uses and which must be addressed through remedial measures. When beneficial uses are no longer impaired and an area is restored, it can be removed from the list of AOCs.

LaMP
Lakewide Management Plan

LIO
Land Information Ontario

Loading
The amount (concentration multiplied by flow rate) of a substance being emitted or discharged.

Non-Point Source
This is the diffuse sources of pollution, including combined sewer overflows and urban and rural runoff (that is, not attributable to one specific source).

ORISE
Ontario Regional Information Systems for the Environment.

PAH
Polycyclic aromatic hydrocarbons.

PDBE
Polybrominated diphenyl ether flame retardants.

PCBs
Polychlorinated biphenyls.

Particulate Matter
Particulate Matter is the mixture of solid particles and liquid droplets in the air, including aerosols, smoke, fumes, dust ash and pollen. A major component of smog, particulate matter presents a health risk as well as having environmental impacts, such as corrosion and damage to vegetation.

Remedial Action Plan (RAP)
Remedial Action Plans are set up to restore severely degraded areas within the Great Lakes Basin. RAPs are being developed and implemented at 42 AOCs on the Great Lakes.

Remediation
Any actions that help to minimize, remedy or mitigate significant harm or pollution of waters or land, or the act of restoring the land or waters to their former state.

Riparian
The areas of vegetation on the banks/sides of streams, rivers and other bodies of water. These areas help remove sediments from water, reduce erosion and flooding and support wildlife populations, including providing fisheries habitat.

Trace Organics
Industrial contaminants formed during the incomplete combustion of organic carbons, e.g., polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hydrocarbons, and chlorinated organics.

Transboundary Transport
The movement of pollutants across political and geographic borders and boundaries. Transboundary transport can result in the creation of pollution problems over which a jurisdiction may have little control since the source is outside its boundaries.

Virtual Elimination
Means that there is no measurable release of a substance to the environment.

Volatile Organic Compounds
Chemicals that contain carbon and elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulphur or nitrogen. Examples are gasoline, benzene, formaldehyde and toluene, as well as chemicals used in dry cleaning.

WRIP
Water Resources Information Project.