

St. Lawrence River

AREA OF CONCERN

STATUS ASSESSMENT

***Submitted to the Governments
of the United States and Canada
May 2003***

A report on the ongoing remedial and preventive efforts by responsible governments and organizations relative to restoring and protecting the water quality of the St. Lawrence River



International Joint Commission
Commission mixte internationale

St. Lawrence River Area of Concern Status Assessment

The **International Joint Commission** (Commission) was established by the 1909 Boundary Waters Treaty (the Treaty). The treaty recognizes that each country is affected by the other's actions in the lake and river systems along their common border, and provides that "boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health and property on the other." The primary purpose of the Treaty is to prevent and resolve disputes concerning these shared waters. In 1972, the governments of the United States and Canada signed the **Great Lakes Water Quality Agreement** (Agreement). In 1978, the two governments signed a new Agreement that included additional commitments to rid the Great Lakes of persistent toxic substances. Its purpose is to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes basin ecosystem. The Commission was given the responsibility to assess and evaluate the governments' programs and progress under the Agreement and assist in its implementation.

Glossary of Acronyms

ALCOA	Aluminum Company of America
AOCs	Areas of Concern
IJC	International Joint Commission
GM	General Motors
NRC	National Research Council (U.S.)
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCBs	Polychlorinated Biphenyls
RAP	Remedial Action Plan
U.S. EPA	United States Environmental Protection Agency

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Introduction

Remedial Action Plans and Areas of Concern

In 1987, the United States and Canada (Parties) signed a Protocol that included a commitment to develop and implement, in cooperation with state and provincial governments, Remedial Action Plans (RAPs). The goal of RAPs is to restore and protect beneficial uses in the 42 currently identified Areas of Concern (AOCs) in the Great Lakes basin. The AOCs are geographic areas where human activities have caused or are likely to cause impairment of beneficial uses or the area's ability to support aquatic life. The Protocol states that the Parties will report on progress in restoring AOCs and calls on the Commission to review RAPs being developed and implemented for the identified AOCs in the Great Lakes basin. Pursuant to the amended Agreement, the Commission reviews and comments on RAPs during three stages: first, when the definition of the problem has been completed; second, when remedial and regulatory measures are selected; and finally, when monitoring indicates that impaired beneficial uses have been restored.

The Protocol directs that each RAP embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses and serve as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical and biological integrity of the Great Lakes basin ecosystem. Further, the Parties, in cooperation with state and provincial governments, are to ensure that the public is consulted in all actions undertaken pursuant to Annex 2 of the Agreement.

For over a decade, the Commission has reviewed and assisted in the development of RAPs, and expressed concern with overall progress in the development and implementation of cleanup and prevention strategies in some AOCs. In 1996, the Commission adopted a new initiative called the Status Assessment process to further examine progress toward restoration of beneficial uses in specific AOCs or open lake waters.

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The Status Assessment Process

Status Assessments are intended to: examine and encourage progress toward restoration and protection of beneficial uses; assess program implementation relative to remedial and preventive actions; and identify and make recommendations on specific activities that could be taken to overcome obstacles and make measurable progress in restoring beneficial uses in the area. Status Assessments are not comprehensive environmental audits, but rather, assessments of ongoing efforts and activities of the responsible governments and organizations. The Status Assessment process is intended to promote the restoration of beneficial uses through the collection of information and transfer of successful methods and experiences among different AOCs, and facilitation of constructive interaction among various agencies and organizations that may have limited opportunity to exchange ideas. The Commission's evaluation of the St. Lawrence River Area of Concern is the fifth conducted through the Status Assessment process.

Current Status Assessment

The Status Assessment of the St. Lawrence River RAPs was conducted between May 2000 and February 2003 and included consultation between Commission representatives (including Commissioners, staff members and Great Lakes Science Advisory Board members) and citizens, representatives of government agencies, local industries, representatives of St. Lawrence River Restoration Council, representatives of the St. Lawrence River Remedial Advisory Committee, and representatives of the Mohawk Nation of Akwesasne. The consultation process included a public meeting that was conducted in Cornwall, Ontario.

The Status Assessment process included an examination of funding, institutional structure, roles of the Parties, jurisdictions and other sectors, and public consultation. This evaluation examines activities occurring within the AOC that foster restoration and protection of beneficial uses and those that may not be conducted or considered as RAP functions.



The St. Lawrence River Area of Concern

History of the St. Lawrence River Area of Concern

The Commission's first examinations of water quality conditions in the St. Lawrence River were in response to a reference from the governments dated August 1, 1912 to examine the extent and causes of pollution in the boundary waters between the United States and Canada. A final report in response to this reference was issued in 1918 (IJC 1918). The Commission determined that sewage pollution of the St. Lawrence River differed from that of the Detroit and Niagara Rivers in degree, but not in kind. More recently, problems including the presence of persistent toxic substances were identified in the St. Lawrence River [at Cornwall, Ontario and Massena, New York] as well as other Areas of Concern. These problems became the subject of the 1978 Agreement and the 1987 Protocol.

Stage 1 (problem identification) and Stage 2 (selection of remedial measures) RAPs have been prepared for both the Ontario and New York portions of the St. Lawrence River AOC and commented on by the Commission. Table 1, pursuant to Annex 2 of the Agreement, presents the 14 possible beneficial use impairments, their reported status by jurisdiction, and conclusions of the Commission concerning the reported status. Environmental problems include: contaminated sediment, inactive hazardous waste sites, and loss and degradation of fish and wildlife habitat.

Setting and Sources of Contamination

The St. Lawrence River drains the most industrialized region of North America (Carignan and Lorrain 2000). The St. Lawrence River Area of Concern includes about 80 kilometers (48 miles) of the river from the Moses-Saunders power dam to the eastern outlet of Lake St. Francis (Environment Canada 1997). Flow of the St. Lawrence River at Cornwall, Ontario/Massena, New York is composed mainly of the outflow from Lake Ontario. Between 1900 and 1986, the mean annual discharge of Lake Ontario was about 6,850 cubic meters per second (241,791 cubic feet per second). Lake Ontario outflows have been regulated since 1960, primarily through the Moses-Saunders power dam (International St. Lawrence River Board of Control 2001). At Cornwall, the presence of numerous islands, including Cornwall, St. Regis and Pilon islands, causes an uneven distribution of the water between the north and south shores of the St. Lawrence, with 29 percent of the fluvial discharge flowing on the north side of Cornwall Island and 71 percent on the south side (Lepage 1999).

*Table 1 Beneficial Use Impairments
in the St. Lawrence River Area of Concern*

CONDITION	Areas of Concern Reported Status		IJC Status Assessment Conclusions
	Ontario ¹	New York ²	
RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION	Impaired	Impaired	Enhanced risk communication within the AOC is needed
TAINTING OF FISH AND WILDLIFE FLAVOR	Impaired	Not impaired	-
DEGRADATION OF FISH AND WILDLIFE POPULATIONS	Impaired	Likely	Level of degradation should be detailed
FISH TUMORS OR OTHER DEFORMITIES	Impaired	Likely	-
BIRD OR ANIMAL DEFORMITIES OR REPRODUCTIVE PROBLEMS	Requires further assessment	Likely	Status should be confirmed and communicated to the public
DEGRADATION OF BENTHOS	Impaired	Likely	-
RESTRICTIONS ON DREDGING	Impaired	Not impaired	Restrictions regarding any activities areas subject to disturbance should be communicated to the public
EUTROPHICATION OR UNDESIRABLE ALGAE	Impaired	Not impaired	-
RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOUR PROBLEMS	Impaired	Not impaired	-
BEACH CLOSINGS	Not impaired	Not impaired	-
DEGRADATION OF AESTHETICS	Impaired	Not impaired	-
ADDED COST TO AGRICULTURE OR INDUSTRY	Not impaired	Not impaired	-
DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS	Requires further assessment	Unknown- requires assessment	-
LOSS OF FISH AND WILDLIFE HABITAT	Impaired	Impaired	Better quantification is needed

* accessed on January 7, 2003:

¹ <http://www.on.ec.gc.ca/water/greatlakes/raps/beneficial-use.html>

² <http://www.epa.gov/glnpo/aoc/stlawrence.html>

Industrial facilities located in Cornwall, Ontario and Massena, New York historically discharged significant quantities of contaminants to the St. Lawrence River (Lepage *et al.* 2000). Current dischargers in Cornwall, Ontario include Domtar Papers Ltd. and the city of Cornwall's primary technology wastewater treatment plant. Former dischargers in Cornwall include Courtaulds Fibres (closed in November 1992), Cornwall Chemicals (closed in 1995), and ICI Forest Products (closed in March 1995). Studies from 1970 to 1997 show that sediment was contaminated with mercury and zinc and, to a lesser extent, lead and copper along the Cornwall, Ontario waterfront (Richman and Dreier 2001). In these studies, mercury contamination was greatest at two depositional zones: downstream of the Cornwall canal discharge near the Lamoureux Park boat launch and downstream of Windmill Point (Richman and Dreier 2001).

Major industrial dischargers located within the New York portion of the AOC include: the Aluminum Company of America (ALCOA), Reynolds Metal Company (now ALCOA), and a General Motors (GM) facility. The ALCOA facility, part of which has been in operation since 1903, has discharged to the Grasse River and the Massena Power Canal. The Reynolds facility (now ALCOA), which began operation in 1958, has discharged through four permitted outfalls to the St. Lawrence River. Discharges to surface waters and onsite waste disposal at the 270 acre GM facility have resulted in contamination of sediment in the St. Lawrence and Raquette rivers with polychlorinated biphenyls (PCBs). Groundwater has been contaminated by PCBs and volatile organic compounds. In addition, soil and sediment on the St. Regis Mohawk Reservation has been contaminated by runoff from the adjacent GM site (U.S. EPA 2002). These sites have contributed to groundwater contamination and contaminated sediment problems that have adversely influenced water quality in the New York portion of the St. Lawrence River AOC.

Intensive characterization surveys of sediment quality in Lake St. Francis were conducted between 1975 and 1990. These surveys were conducted to determine the extent of mercury and PCB contamination, as well as levels of polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides, aluminum, cadmium, copper, chromium, iron, manganese, nickel, lead and zinc (Lepage 1999).

These studies found the northern portion of Lake St. Francis is affected by high concentrations of mercury and the southern portion contaminated by PCBs (Lepage 1999) with little mixing across the shipping channel. Mercury and PCB levels in sediment of Lake St. Francis appeared to peak in the 1970s and fell by about five and seven fold, respectively, by 1989 (Lepage 1999).

PCBs and metals (including mercury) exhibit a decreasing gradient from west to east suggesting that major contaminant sources are upstream of Lake St. Francis (Lepage 1999). Filion and Morin (2000) determined that the spatial distribution of metal levels in sediment and invertebrates suggests local sources of mercury and zinc have contributed to the contamination of littoral sediment and macroinvertebrates in the Cornwall area. Measured PCB concentrations on the south shore of Lake St. Francis are five to six times higher than those found in the center and the north shore (Lepage 1999). The mean value of measurements on the south shore was 0.30 micrograms/gram. In Lake St. Francis, the highest mercury concentrations were measured on the north shore with a mean value of 0.33 micrograms/gram. These values are about 1.5 times higher than those measured in the central portion of the lake and twice as high as on the south shore (Lepage 1999).

Human Health Considerations

In the early 1980s, elevated concentrations of PCBs were found in the breast milk of Mohawk women residing on Cornwall Island (Chiarenzelli *et al.* 2000). Despite widespread compliance with a New York State Department of Health advisory against eating fish from the river, elevated PCB levels persisted (Fitzgerald *et al.* 1992). Sampling on Mohawk Nation lands at Akwesasne during 1993 confirmed elevated PCB concentrations comparable with those of areas impacted by PCBs (Chiarenzelli *et al.* 2000). Ninety-three Mohawk women who gave birth from 1998 to 1992 were interviewed and their breast milk sampled (ATSDR 1995). Mohawk mothers who gave birth early in the study had a geometric mean total PCB concentration of 0.602 parts per million (fat basis) in their breast milk, compared to 0.375 parts per million for women in a comparison group. Mothers, who gave birth later in the study period, did not have elevated average levels of total PCBs relative to the comparison group (ATSDR 1995). Unlike PCBs, the average concentration of mirex in breast milk of the Mohawks remained relatively constant over time, and were approximately twice that of the comparison group, regardless of when they gave birth (ATSDR 1995). Mohawk women who never ate local fish had significantly higher levels of mirex than the comparison group (ATSDR 1995). Thus, in certain instances, an exposure route other than fish consumption may be of importance.

At Akwesasne, concerns about potential human health impacts due to PCB exposure extend to several subpopulations. In addition to pregnant women, these subpopulations include elders, young children, persons who are ill, and individuals who have compromised immune systems (Arquette *et al.* 2002). In addition, exposure routes other than fish consumption may contribute to the body burdens of persistent toxic substances. Several industrial facilities are located upriver of Akwesasne (Chiarenzelli *et al.* 2000). Although fish consumption has been regarded as the primary PCB exposure route, investigation of alternative exposure routes, such as airborne PCBs, was warranted (Chiarenzelli *et al.* 2000). Comparison with PCB concentrations in air samples from the Great Lakes region indicates that the values measured at Akwesasne sites are considered relatively high with maximum concentrations at each site generally occurring during the warmer months (Chiarenzelli *et al.* 2000).

The risks of PCB-contaminated sediment extend beyond direct health effects to humans and wildlife. The National Research Council (NRC 2001) notes that PCB contamination might result in various economic, social, and cultural impacts on the affected entities. Reductions in property values, health effects due to changes in diet from a fish-based diet to a less healthy diet, loss of benefits due to avoidance of swimming or boating, and increased costs due to purchase of bottled water are among issues noted by the NRC. The definitions of health used by Native people are strikingly different from that of risk assessors (Arquette *et al.* 2002). Risk assessment methods fail to include a holistic approach for assessing the society, cultural, and spiritual values, beliefs, and practices that link the Mohawks to their environment (Arquette *et al.* 2002). Significant changes in Mohawk lifestyle, such as a reduced reliance on the traditional fish-based diet due to fish consumption advisories, have resulted from the PCB contamination within the AOC. These changes may increase the possibility that more subtle human health impacts may exist but, to date, these effects have not been adequately studied.

Generally, bioavailable mercury levels in the St. Lawrence River are very low (Lean 2000). However, concentrations of methylmercury, total mercury, zinc, copper and lead have been historically elevated in sediment at locations near the Cornwall, Ontario waterfront. Concentrations of methylmercury in biota, particularly in sport caught fish, are of ongoing interest in the Area of Concern.

Findings



The Commission's Status Assessment revealed successes as well as challenges in the restoration of beneficial uses within the St. Lawrence River Area of Concern. The Commission made observations during the Status Assessment information gathering process. To document and further encourage successful activities, as well as to help meet any remaining challenges, the Commission's comments on selected activity areas are outlined in the following sections.

Notable Successes

Advances toward restoration of the St. Lawrence River Area of Concern were recognized during the Status Assessment. Notable successes are detailed below:

1. Remedial efforts by New York industries have significantly reduced the volume of contaminated sediment in the Area of Concern.

In 2001, approximately 50,358 cubic meters (66,000 cubic yards) of sediment contaminated with 9163 kilograms (20,200 pounds) of polychlorinated biphenyls (PCBs) were removed from the St. Lawrence River at the Reynolds site [now ALCOA] near Massena, New York. Previously, 13,734 cubic meters (18,000 cubic yards) of PCB-contaminated sediment were removed from the St. Lawrence River at the General Motors Powertrain Division plant.

2. A framework has been established for the Ontario portion of the Area of Concern and implementation is underway.

Environment Canada and the Ontario Ministry of Environment in cooperation with the St. Lawrence River Institute of Environmental Sciences formed the St. Lawrence River Restoration Council (Council) in October 1998 to oversee the implementation of the remedial actions described in the Stage 2 report. The Council members represent a broad range of community

interests. In September 2000 they issued a five-year work plan addressing each of the 64 recommendations in the RAP stating for each the response of the provincial and federal governments, actions to date and the work remaining for the Council. This document serves as both a status report and a guide for the work of the Council and its partners toward the restoration of the St. Lawrence River Area of Concern. It is expected to evolve significantly over its five year duration and allow for new opportunities as they arise. Specific efforts were also made to include public outreach activities and the Mohawk Council in the implementation process. In the fall of 2002, the coordination responsibilities were transferred from the St. Lawrence River Institute to the Raisin River Conservation Authority.

3. Development of a Cornwall sediment management strategy has provided a framework for decision-making.

The decision-making framework provides an opportunity to strategically evaluate mercury-contaminated sites situated at the Cornwall, Ontario waterfront. The strategy provides an unique opportunity for agency, industry and public collaboration. Consultation with the general public is planned for 2003.

Challenges to Restoring Beneficial Uses and Commission Recommendations

Challenges to a timely restoration of beneficial uses in the St. Lawrence River Area of Concern were noted during the Commission's Status Assessment process. Key challenges and Commission recommendations are presented below.

4. The management of contaminated sediment.

The team working on the Cornwall waterfront sediment is taking a measured approach and has yet to determine a course of action. Considerable study and analysis has been undertaken and the participants are to be commended for their thoroughness. The first public workshop was held in June 2000. Upon release of the results on the significance of mercury bio-accumulation at these sites, the Commission urges a timely decision on what is the most appropriate course of action for any sites with significant mercury contamination.

Remediation of remaining polychlorinated biphenyl-contaminated sites associated with ALCOA and General Motors facilities on the U.S. side of the Area of Concern is ongoing or under consideration. Remediation of these sites remains an important environmental issue in the Area of Concern. For example, remedial options under consideration to address the polychlorinated biphenyl contamination of the Grasse River sediment range from natural recovery to dredging of over 1.2 million cubic

meters (1.6 million cubic yards) of sediment at a cost of over \$525 million (U.S.). The Commission is interested in learning which option is selected upon completion of public consultation.

Methylmercury and polychlorinated biphenyl concentrations in sport fish within the St. Lawrence River AOC and their potential threat to human health are continuing concerns of the Commission. Downstream locations, such as Lake St. Francis, are of particular interest. Long-term monitoring of the aquatic ecosystem recovery as a result of the removal of contaminants is extremely important.



Recommendation

Make decisions regarding potential remedial actions for the remaining contaminated sediment sites in both the U.S. and Ontario portions of the Area of Concern. As remediation is completed, ensure that suitable monitoring of reductions in contaminant levels in fish tissue is undertaken and maintained.

5. Prioritization of remedial actions and tracking of the restoration of beneficial uses.

As shown in Table 1, there are four potential beneficial use impairments in the New York portion of the AOC for which there is uncertainty regarding their status. In the Ontario portion of the AOC, two potential beneficial use impairments require further assessment. It is difficult to assess progress or prioritize potential remedial actions without confirmation of the existing environmental conditions.

The Stage 2 RAP Report for the Ontario portion of the AOC details 64 actions that are recommended as a result of extensive technical investigation and consultation with the public. Priority setting among the recommended actions needs to occur and could improve the pace of RAP implementation. For example, there are 11 recommendations dealing with the control of rural and small community pollution sources. Without a strategic ranking of these items, it is difficult to judge what environmental benefits would accrue through the completion of a subset of the recommendations. Priority setting could mobilize support from the smaller communities for necessary actions and help allocate scarce resources to speed implementation.

New York remedial activities have appropriately focused on the remediation of contaminated sediment and hazardous waste sites. While remediation continues to progress, disputes over selection of remedial actions and access to Mohawk lands adjacent to the GM site have unnecessarily delayed remediation. As this and other actions are completed, other initiatives are

required to fully restore beneficial uses. As in Ontario, these actions should be prioritized based on their likely contribution to the restoration of beneficial uses.

Recommendation

Implement remedial actions that will provide the greatest contribution to restoration of beneficial uses at the lowest costs. Confirm time frames for remedial actions such as the completion of remedial measures at Cornwall's sewage treatment plant. Ensure the timely and appropriate remediation of the GM hazardous waste site. Agencies should undertake monitoring suitable for tracking the restoration of beneficial uses.



Observations and Commission Recommendation

6. Enhancing and Protecting the Health of the Akwesasne Community

Residents of the Area of Concern including the Mohawk Nation community of Akwesasne have faced and continue to face a threat to human health due to the exposure to persistent toxic substances. Historically, most exposure to these substances has occurred through the consumption of locally-caught fish. Detailed environmental monitoring is needed to confirm contaminant levels in media and fish tissue. The continuing exposure of Akwesasne to PCBs and other persistent toxic substances should emphasize the need for appropriate and timely remediation of environmental contamination. Restricting consumption of sport caught fish remains a long-term management issue that addresses one route of human exposure although at the expense of the Mohawks' cultural traditions. The Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYSDOH) and others have cooperated in efforts to document the exposures of Akwesasne residents to PCBs. Continuation of such efforts is uncertain. Data derived from such efforts could allow the projection of potential human health benefits that can accrue as a result through reductions in contaminant levels within the AOC.

Recommendation

Encourage cooperative efforts to address outstanding issues that impede remediation of PCB-contaminated areas. Ensure support for continued monitoring of human exposure at Akwesasne to persistent toxic substances by ATSDR, NYSDOH or others.



Concluding Remarks

Remediation of PCB-contaminated sediment and waste sites in the vicinity of Massena, New York represents a significant step toward reducing the level of PCB-contamination in fish, its associated human health risk, and long-term impacts to local cultures and lifestyles. Close, continued scrutiny of the health of the Mohawk Nation community at Akwesasne is warranted.

The Commission wishes to remain fully apprised regarding progress toward an informed decision regarding the mercury-contaminated sediment at the Cornwall, Ontario waterfront and progress toward a timely remediation of the GM hazardous waste site and associated contamination of Akwesasne lands. In particular, the Commission is interested in the time frame of necessary remediation at GM and the type of public consultation that is undertaken on the Cornwall Sediment Management Strategy as well as its outcome.

Schedule of Consultations

May 24, 2000	Representatives of New York State Department of Environmental Conservation, IJC Commissioner, Secretary of IJC's U.S. Section and IJC staff member
May 25, 2000	Representatives of U.S. Environmental Protection Agency, Region II, IJC Commissioner, Secretary of IJC's U.S. Section, and IJC staff member
February 28, 2001	Representatives of the Ontario Ministry of Environment, Environment Canada and IJC staff members
March 1, 2001	Members of the St. Lawrence River Remedial Advisory Committee (New York), a representative of the New York State Department of Environment Conservation and IJC staff members
March 1, 2001	Representatives of the Mohawk Community of Akwesasne and IJC staff members
March 1, 2001	Member of the St. Lawrence River Restoration Council and IJC staff members
March 28, 2001	Citizens, representatives of Environment Canada, Ontario Ministry of Environment, U.S. Environmental Protection Agency, New York State Department of Environmental Conservation, IJC Commissioner, and IJC staff members
May 23, 2001	Representatives of General Motors, ALCOA, the Canadian Chair of the IJC, Secretary of the IJC's Canadian Section, members of the IJC's Science Advisory Board and IJC staff members
August 14, 2002	Conference call with representatives of Environment Canada, Ontario Ministry of Environment, U.S. Environmental Protection Agency, Region II, New York State Department of Environmental Conservation and the IJC (staff members)

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St. Lawrence River Area of Concern (Cornwall/Massena)

