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Restoring the Great Lakes Areas of Concern Indicator

Data Sources and Methods

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List of acronyms

AOC: Area of Concern

AiR: Area in Recovery

BU: Beneficial Use

CESI: Canadian Environmental Sustainability Indicators

GLWQA: Great Lakes Water Quality Agreement

IJC: International Joint Commission

RAP: Remedial Action Plan

1. Introduction

This report is released under the Canadian Environmental Sustainability Indicators (CESI) initiative. Each indicator reported under CESI has an associated "data sources and methods" report to provide technical detail and other background to facilitate interpretation of each indicator or allow others to conduct further analysis using the CESI data and methods as a starting point.

This report addresses the underlying methods and data for the Restoring the Great Lakes Area of Concern indicator as published on the CESI website (www.ec.gc.ca/indicateurs-indicators/).

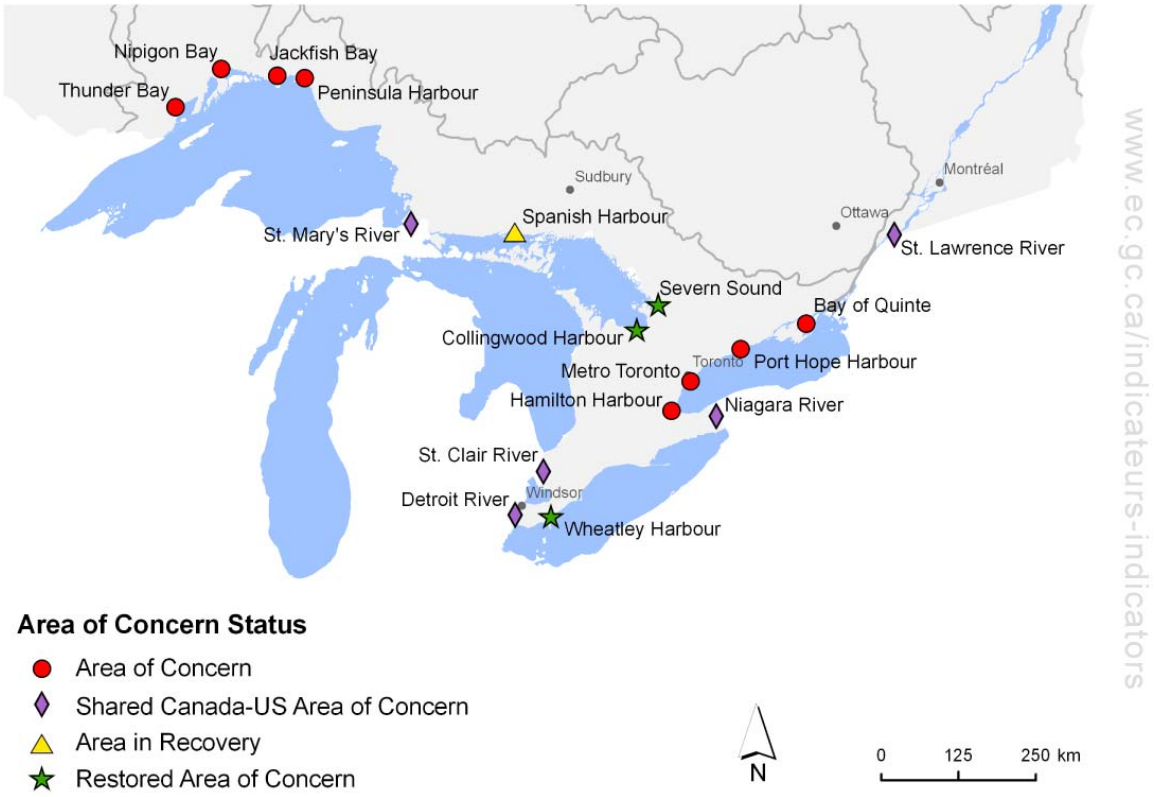
2. Great Lakes Areas of Concern Indicator

The Great Lakes Basin is Canada's most populous region supporting nine of Canada's 20 largest cities. This large population, and the industry, agricultural and urban development it supports, places a strain on the lakes' abilities to support viable ecosystems. The 1987 revision of the Canada – U.S. Great Lakes Water Quality Agreement (GLWQA) identified 43 Areas of Concern (AOCs) in Canadian and U.S. waters of the Great Lakes. The Great Lakes Areas of Concern Indicator assesses progress towards the restoration of the 17 Canadian AOCs (Figure 1).

Most AOCs have a Remedial Action Plan (RAP) to guide restoration and protection efforts targeting specific beneficial uses (BU). The RAPs are developed and implemented in three stages. Stage 1 identifies which of 14 BUs identified in the GLWQA are classified as "Impaired", "Requires Further Assessment" or "Not Impaired" and the sources and causes of the damage. A complete list of the 14 BUs can be found in Appendix 1. Stage 2 establishes the goals, objectives and actions required to restore the ecosystem back to a healthy state. Once all recommended actions have been put into action two things can happen: the AOC may become an Area in Recovery (AiR) or enter Stage 3 to move toward being declared restored. An AiR is an area originally identified as an Area of Concern where, based on community and government consensus, all scientifically-feasible and economically-reasonable actions have been implemented and additional time is required for the environment to recover. Once enough time has passed and the area achieves the criteria for the beneficial use to be considered restored it enters stage 3. During Stage 3, progress toward restoration and protection efforts in the AOC is measured against the objectives outlined in the Stage 2 report to ensure the local goals and targets have been met. When all the goals of the RAP have been achieved, and the BUs are considered unimpaired, Stage 3 is complete and the AOC is declared restored. The Port Hope AOC does not have a RAP as it follows a separate program under the guidance of Natural Resources Canada because of the nature of the BU at this site.

The indicator reports on the evolution of the number of BUs statuses listed as "Impaired" or "Requires Further Assessment" for Canada's 17 AOCs from their stage 1 report to the latest progress report published in 2010. An "impaired" BU indicates a change in the chemical, physical or biological integrity of an area of the Great Lakes sufficient to reduce human use of the lakes. A BU listed as "Requires Further Assessment" indicates further scientific study is required to determine whether the BU is impaired or not. Having a BU with these statuses suggests the health of the AOC is still of concern. Statuses are determined by monitoring and conducting scientific studies in the AOC and comparing the findings to reference sites and quantifiable targets documented in the RAP and other update reports.

Figure 1. Location of Canada's Great Lakes Areas of Concern.



Source: Environment Canada's Great Lakes Area of Concern Program

3. How the measure was calculated

3.1 Determining the Number of Beneficial Uses Listed as "Impaired" or "Requires Further Assessment"

To create this indicator, the total number of BUs listed as "Impaired" or "Requires Further Assessment" was counted for all RAPs and update reports for the 17 Canadian AOCs. This number is reported on a point on the time line corresponding to the year the report was published.

The number of BUs listed as "Impaired" or "Requires Further Assessment" varies for many reasons. A BU listed as "Not Impaired" in a report can be reclassified as "Requires Further Assessment" based on subsequent monitoring and research. An "Impaired" BU can be redesignated as "Restored" if all delisting requirements for that BU impairment have been met or if the assessment determines the BU was never impaired. BUs can be delisted if the impairment is found lake-wide and not solely within the geographic extent of the AOC and sources within the AOC are controlled. The impairment can also be delisted if the conditions are shown to be the result of natural conditions and not human influences. As a result, it is possible for an AOC to be delisted and still have impaired beneficial uses.

3.2 Time Period

The Great Lakes Areas of Concern Indicator begins with Severn Sound's Stage 1 report published in 1988 and the indicator includes data up to the 2010 progress report. The other AOCs released their Stage 1 reports between 1989 and 1993 with the majority being released in 1991. Wheatley Harbour released a combined Stage 1/2 report in 1998. Only the 2003 and 2010 progress reports were considered for Port Hope because it follows a separate program under the guidance of Natural Resources Canada and does not follow a RAP.

4. Data source(s)

Data were gathered from progress reports, RAPs and stage reports for all 17 Canadian AOCs (Table 1). In 2003 and 2010, progress reports were released by Environment Canada. These reports summarize the status of all BUs for all Canadian AOCs for those two years. For "Impaired" and "Requires Further Assessment" statuses established prior to 2003, summary tables or lists provided in RAPs and update reports were consulted.

Table 1. Canada's 17 AOCs and their associated Remedial Action Plan reports.

AOC name	Report	Reference	Notes
Bay of Quinte	Stage 1	Environment Ontario, Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Nautral Resources, Ontario Ministry of Agriculture and Food. 1990.	Released July 1990
	Stage 2	Bay of Quinte RAP Coordinating Committee, Bay of Quinte Pubic Advisory Committee. 1993	Released September 1993
	Update	Murray German Consulting. 2006.	Released September 2006
Collingwood Harbour	Stage 1	Environment Ontario, Environment Canada. 1989.	Released March 1989
	Stage 2	Collingwood Harbour RAP Team, Public Advisory Committee. 1992.	Released August 1992
	Stage 3	Collingwood Harbour Action Team, Public Advisory Committee. 1994.	Released June 1994
Detroit River	Stage 1	Ontario Ministry of the Environment, Michigan Department of Natural Resources. 1991.	Released in 1991
	Update	Leney, J., Haffner, G.D., Great Lakes Institute for Environmental Research. 2006.	Released December 2006
Hamilton Harbour	Stage 1	Ontario Ministry of the Environment, Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Agriculture and Food, Royal Botanical Gardens, Ontario Ministry of Natural Resources. 1992	Released October 1992
	Stage 2	Hamilton Harbour Remedial Action Plan Technical Team and Stakeholders, Public Advisory Committee. 1992.	Released November 1992
Jackfish Bay	Stage 1	Ontario Ministry of the Environment, Environment Canada, Ontario Ministry of Natural Resources, Department of Fisheries and Oceans Canada. 1991a.	Released September 1991
	Stage 2	Jackfish Bay Remedial Action Plan Team, Jackfish Bay Public Advisory Committee. 1998.	Released February 1998

AOC name	Report	Reference	Notes
Niagara River	Stage 1	Ontario Ministry of the Environment and Energy, Environment Canada, Ontario Ministry of Natural Resources, Fisheries and Oceans Canada. 1993.	Released September 1993
	Stage 2	Ministry of Environment and Energy, Niagara River Restoration Council. 1995.	Released April 1995
	Update	Niagara River (Ontario) RAP Coordinating Committee. 2009.	Released December 2009
Nipigon Bay	Stage 1	Ontario Ministry of the Environment, Environment Canada, Ontario Ministry of Natural Resources, Department of Fisheries and Oceans Canada. 1991b.	Released September 1991
	Stage 2	Nipigon Bay Remedial Action Plan Team, Nipigon Bay Public Advisory Committee. 1995.	Released October 1995
Peninsula Harbour	Stage 1	Ontario Ministry of the Environment, Environment Canada, Ontario Ministry of Natural Resources, Department of Fisheries and Oceans Canada. 1991c.	Released September 1991
	Stage 2	Taillon, K. Personal Communication. Environment Canada, 2010.	Draft report; not released. Statuses are from 2000
Port Hope Harbour		Not applicable	RAP reports are not release because this AOC follows a different program under Natural Resources Canada. The evolution of BUs is reported in the 2003 and 2010 progress reports.
St. Clair River	Stage 1	St. Clair River RAP Team, Ontario Ministry of the Environment, Michigan Department of Natural Resources. 1991.	Released December 1991
	Stage 2	St. Clair River RAP Team, St. Clair River BPAC, Ontario Ministry of Environment and Energy, Michigan Department of Natural Resources. 1995.	Released March 1995
	Update	Geomatics International Inc. 1998.	Released February 1998
	Summary	Mayne, G, Environment Canada. 2005.	Summary table with data from three previous reports. Released in 2005

AOC name	Report	Reference	Notes
St. Lawrence River	Stage 1 Stage 2	St. Lawrence RAP Team. 1992. Raisin Region Conservation Authority. undated.	Released August 1992 Report not available online. BU impairment status on website Report released in 1997
St. Marys River	Stage 1	Ontario Ministry of the Environment, Michigan Department of Natural Resources. 1992..	Released March 1992
	Stage 2	Environment Canada, Environmental Protection Agency, Ontario Ministry of Environment, Michigan Department of Environmental Quality. 2002.	Released December 2002
Severn Sound	Stage 1	Environment Ontario, Environment Canada, Ontario Ministry of Natural Resources Huronia District, Ontario Ministry of Agriculture and Food. 1988.	Released September 1988
	Stage 2	Environment Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture and Food, Department of Fisheries and Oceans. 1993.	Released April 1993
	Stage 3	Environment Canada, Ontario Ministry of Environment and Energy. 2002.	Released June 2002
Spanish Harbour	Stage 1	Taillon, K. Personal Communication. Environment Canada, 2010.	Released in 1993
	Stage 2	Taillon, K. Personal Communication. Environment Canada, 2010.	Released in 1999
Thunder Bay	Stage 1 Stage 2	Taillon, K. Personal Communication. Environment Canada, 2010. Lake Superior Programs Office, Vander Wal, J., Cullis, K., Chase, M., Morash, M., Cano, T. 2004.	Released in 1991 Released May 2004
Toronto and Region	Stage 1 Stage 2	Environment Canada, Environment Ontario, Ministry of Natural Resources, Metropolitan Toronto and Region Conservation Area. 1989. Metro Toronto and Region RAP Team. 1994.	Released May 1989 Released in 1994
	Update	Toronto and Region Conservation Authority. 2010	BU status in report is from 2007 Report was released 2010

AOC name	Report	Reference	Notes
Wheatley Harbour	Stage 1/2	Zaranko Environmental Assessment Services, The Citizens of Wheatley Harbour. 1998.	Released March 1998
	Stage 3	Ontario Ministry of the Environment, Environment Canada, Essex Region Conservation Authority, Ontario Ministry of Natural Resources, Essex County Stewardship Network. 2010.	Released January 2010
All AOCs	Progress Report	Environment Canada. 2003.	Released in 2003
	Progress Report	Gee, J., Personal communication, Environment Canada, 2010,	Draft report; not released BU statuses are from 2010

4.1 Station Selection and Spatial Coverage

To calculate the Great Lakes AOC indicator all current and delisted Canadian AOCs were included (Figure 1). Canadian AOCs refer to AOCs in the Canadian portion of the Great Lakes (12) and shared Canada-US waterways (5).

4.2 Data Quality and Completeness

Between the Stage 1 and Stage 2 reports, each AOC following a RAP is required to create delisting requirements and water use goals for each BU impairment affected in that region. Delisting requirements are required for all new BU impairments as well. These delisting requirements contain guidelines and targets designed by scientists with either local knowledge or expertise and technical subcommittees. The requirements and guidelines are reviewed with each report, excluding the final Stage 3 report.

For a BU status to change there must be monitoring data to indicate whether the water quality or health of the AOC has changed. In the absence of monitoring data, the designated status might not reflect current environmental conditions.

Some stage reports do not include a specific list or table detailing the status of the BUs. In this case, statuses were determined based on descriptions provided on the BU's status or delisting requirements and data from previous and subsequent reports.

5. Caveats and Limitations

5.1 Reliance on Reports for Data

As the BU statuses were gathered from the RAPs and update reports published by the groups working to delist the AOCs, the statuses can only change when new reports are published. This situation does not represent the continuous nature of the lake rehabilitation process and creates staggered, inconsistent status changes. With future progress reports to be released every two years, the staggered change should not be as evident.

5.2 Data Inequalities

The reporting process is different for each AOC and, as a result, data availability differs among AOCs. For most AOCs the only available data is from their Stage 1 and 2 reports and the 2003 and 2010 Progress Reports. The Bay of Quinte has two update reports, equalling six data sources. Metro Toronto and St. Clair River have five reports each. Hamilton Harbour and Port Hope Harbour both have fewer than four data sources. Port Hope Harbour follows a separate program under the guidance of Natural Resources Canada, and therefore only has updates from the Progress Reports. Hamilton Harbour released both its Stage 1 and Stage 2 reports in 1992 (data from the Stage 2 report was used) and released an update report in 2002.

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Appendix 1: Beneficial Uses for Areas of Concern and their Listing and Delisting Requirements

BU	Listing Guideline	Delisting Guideline
1. Restrictions on fish and wildlife consumption a) Fish b) Wildlife	When contaminant levels in fish or wildlife populations exceed standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.	When contaminant levels in fish and wildlife populations do not exceed standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife are not due to contaminant input from the watershed.
2. Tainting of fish and wildlife flavour	When ambient water quality standards, objectives, or guidelines, for the anthropogenic substance(s) known to cause tainting, are being exceeded or survey results have identified tainting of fish or wildlife flavour.	When survey results confirm no tainting of fish or wildlife flavour.
3. Degradation of fish and wildlife populations a) Fish population b) Fish body burden c) Wildlife population d) Wildlife body burden	When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when tests confirm significant toxicity from water column or sediment contaminants.	When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. Further, in the absence of community structure data, this use will be considered restored when tests confirm no significant toxicity from water column or sediment contaminants.
4. Fish tumours or other deformities	When the incidence rates of fish tumours or other deformities exceed rates at control sites or when survey data confirm the presence of liver tumours in indicator species.	When the incidence rates of fish tumours or other deformities do not exceed rates at control sites and when survey data confirm the absence of liver tumours in indicator species.
5. Bird or animal deformities or reproductive problems	When wildlife survey data confirm the presence of deformities or other reproductive problems in indicator wildlife species.	When the incidence rates of deformities or reproductive problems in indicator wildlife species do not exceed background levels in inland control populations

BU	Listing Guideline	Delisting Guideline
6. Degradation of benthos a) Population b) Body burden	When the benthic macroinvertebrate community structure significantly diverges from control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity of sediment associated contaminants at a site is significantly higher than controls.	When the benthic macroinvertebrate community structure does not significantly diverge from control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls.
7. Restrictions on dredging activities	When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.
8. Eutrophication or undesirable algae	When there are persistent water quality problems attributed to cultural eutrophication.	When there are no persistent water quality problems attributed to cultural eutrophication.
9. Restrictions on drinking water consumption – Taste/odour problems	When treated drinking water supplies are impacted to the extent that: 1) densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odour problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded	For treated drinking water supplies: 1) when densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health objectives, standards or guidelines; 2) when taste and odour problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in comparable portions of the Great Lakes which are not degraded
10. Beach closings	When waters, which are commonly used for total-body contact or partial-body contact recreation, exceed standards, objectives, or guidelines for such use.	When waters, which are commonly used for total-body contact or partial body-contact recreation, do not exceed standards, objectives, or guidelines for such use.
11. Degradation of aesthetics	When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odour.	When the waters are clear of any substance which produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odour.

BU	Listing Guideline	Delisting Guideline
12. Added costs to agriculture or industry	When there are additional costs required to treat the water prior to use for agricultural or industrial purposes	When there are no additional costs required to treat the water prior to use for agricultural and industrial purposes
13. Degradation of phytoplankton and zooplankton populations	When phytoplankton or zooplankton community structure significantly diverges from control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when tests confirm toxicity in ambient waters.	When phytoplankton and zooplankton community structure does not significantly diverge from control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when tests confirm no significant toxicity in ambient waters.
14. Loss of fish and wildlife habitat	When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a disturbance in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands.	When the amount and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.

Note: Delisting guidelines in this list represent the common goals of all AOCs. Updated lists of AOC specific delisting guidelines are available from individual Stage 2 and update reports or the International Joint Commission (IJC) website.
Source: International Joint Commission. 2009.