

## 1.0 Introduction






This **State of the Great Lakes 2007** report presents the compilation, scientific analysis and interpretation of data about the Great Lakes basin ecosystem. It represents the combined efforts of many scientists and managers in the Great Lakes community representing federal, Tribal/First Nations, state, provincial and municipal governments, non-government organizations, industry, academia and private citizens.

The seventh in a series of reports beginning in 1995, the **State of the Great Lakes 2007** provides an assessment of the Great Lakes basin ecosystem components using a suite of ecosystem health indicators. The Great Lakes indicator suite has been developed, and continues to be refined, by experts as part of the State of the Lakes Ecosystem Conference (SOLEC) process.





The SOLEC process was established by the governments of Canada and the U.S. in response to requirements of the Great Lakes Water Quality Agreement (GLWQA) for regular reporting on progress toward Agreement goals and objectives. Since the first conference in 1994, SOLEC has evolved into a two-year cycle of data collection, assessment and reporting on conditions and the major pressures in the Great Lakes basin. The year following each conference, a State of the Great Lakes report is prepared, based on information presented and discussed at the conference and post-conference comments. Additional information about SOLEC and the Great Lakes indicators is available at [www.binational.net](http://www.binational.net).

The **State of the Great Lakes 2007** provides assessments of 61 of approximately 80 ecosystem indicators and overall assessments of the categories into which the indicators are grouped: Contamination, Human Health, Biotic Communities, Invasive Species, Coastal Zones and Aquatic Habitats, Resource Utilization, Land Use-Land Cover, and Climate Change. Within most of the main categories are sub-categories to further delineate issues or geographic areas.

Authors of the indicator reports assessed the status of ecosystem components in relation to desired conditions or ecosystem objectives, if available. Five status categories were used (coded by color in this report):

-  **Good.** The state of the ecosystem component is presently meeting ecosystem objectives or otherwise is in acceptable condition.
-  **Fair.** The ecosystem component is currently exhibiting minimally acceptable conditions, but it is not meeting established ecosystem objectives, criteria, or other characteristics of fully acceptable conditions.
-  **Poor.** The ecosystem component is severely negatively impacted and it does not display even minimally acceptable conditions.
-  **Mixed.** The ecosystem component displays both good and degraded features.
-  **Not Assessed or Undetermined.** Data are not available or are insufficient to assess the status of the ecosystem component.

Four categories were also used to denote current trends of the ecosystem component (coded by symbol in this report):

-  **Improving.** Information provided shows the ecosystem component to be changing toward more acceptable conditions.
-  **Unchanging.** Information provided shows the ecosystem component to be neither getting better nor worse.
-  **Deteriorating.** Information provided shows the ecosystem component to be departing from acceptable conditions.
-  **Undetermined.** Data are not available to assess the ecosystem component over time, so no trend can be identified.

Each indicator report is supported by scientific information collected and assessed by Great Lakes experts from Canada and the United States, along with a review of scientific papers and use of best professional judgment. For many indicators, ecosystem objectives, endpoints, or benchmarks have not been established. For these indicators, complete assessments are difficult to determine. Overall assessments and management challenges were also prepared for each category to the extent that indicator

information was available.

For 2007, the overall status of the Great Lakes ecosystem was assessed as *mixed* because some conditions or areas were *good* while others were *poor*. The trends of Great Lakes ecosystem conditions varied: some conditions were *improving* and some were *worsening*.

Some of the good features of the ecosystem leading to the *mixed* conclusion include:

- Levels of most contaminants in herring gull eggs and predator fish continue to decrease.
- Phosphorus targets have been met in Lake Ontario, Lake Huron, Lake Michigan and Lake Superior.
- The Great Lakes are a good source for treated drinking water.
- Sustainable forestry programs throughout the Great Lakes basin are helping environmentally friendly management practices.
- Lake trout stocks in Lake Superior have remained self-sustaining, and some natural reproduction of lake trout is occurring in Lake Ontario and in Lake Huron.
- Mayfly (*Hexagenia*) populations have partially recovered in western Lake Erie.

Some of the negative features of the ecosystem leading to the *mixed* conclusion include:

- Concentrations of the flame retardant PBDEs are increasing in herring gull eggs.
- Nuisance growth of the green alga *Cladophora* has reappeared along the shoreline in many places.
- Phosphorus levels are still above guidelines in Lake Erie.
- Non-native species (aquatic and terrestrial) are pervasive throughout the Great Lakes basin, and they continue to exert impacts on native species and communities.
- Populations of *Diporeia*, the dominant, native, bottom-dwelling invertebrate, continue to decline in Lake Michigan, Lake Huron, and Lake Ontario, and they may be extinct in Lake Erie.
- Groundwater withdrawals for municipal water supplies and irrigation, and the increased proportion of impervious surfaces in urban areas, have negatively impacted groundwater.
- Long range atmospheric transport is a continuing source of PCBs and other contaminants to the Great Lakes basin, and can be expected to be significant for decades.
- Land use changes in favor of urbanization along the shoreline continue to threaten natural habitats in the Great Lakes and St. Lawrence River ecosystems.
- Some species of amphibians and wetland-dependent birds are showing declines in population numbers, in part due to wetland habitat conditions.

A complete list of the Great Lakes indicators in the SOLEC suite is provided in the following table, which is organized by indicator categories. Also included are the 2007 indicator assessments for the **State of the Great Lakes 2007** indicator reports with previous assessments from 2005, 2003, and 2001 where available.

# STATE OF THE GREAT LAKES 2007

ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>CONTAMINATION</b>					
<b>Nutrients</b>					
111	Phosphorus Concentrations and Loadings	Open Lake: Mixed, Undetermined Nearshore: Poor, Undetermined	Mixed, Undetermined	Mixed	Mixed
4860	<i>Phosphorus and Nitrogen Levels (Coastal Wetlands)</i>				
7061	Nutrient Management Plans	N/A (2005 report)	N/A	N/A	
<b>Toxics in Biota</b>					
114	Contaminants in Young-of-the-Year Spottail Shiners	Mixed, Improving	Mixed, Improving	Mixed Improving	
115	Contaminants in Colonial Nesting Waterbirds	Mixed, Improving	Mixed, Improving	Mixed Improving	Good
121	Contaminants in Whole Fish	Mixed, Improving	Mixed, Improving	N/A	
124	External Anomaly Prevalence Index for Nearshore Fish	Poor, Unchanging	Poor-Mixed, Undetermined	N/A (#101)	
4177	Biologic Markers of Human Exposure to Persistent Chemicals	Not Assessed, Undetermined	Mixed, Undetermined		
4201	Contaminants in Sport Fish	Mixed, Improving	Mixed, Improving	Mixed Improving (#4083)	Mixed Improving (#4083)
4506	Contaminants in Snapping Turtle Eggs	Mixed, Undetermined	Mixed, N/A	Mixed	Mixed
8135	Contaminants Affecting Productivity of Bald Eagles	Mixed, Improving (2005 report)	Mixed, Improving	Mixed Improving	Mixed Improving
8147	Population Monitoring and Contaminants Affecting the American Otter	Mixed, Undetermined (2003 report)	Mixed, Undetermined (2003 report)	Mixed	N/A
<b>Toxics in Media</b>					
117	Atmospheric Deposition of Toxic Chemicals	Mixed, Improving & Mixed, Unchanging/ Improving	Mixed, Improving & Mixed, Unchanging	Mixed	Mixed Improving
118	Toxic Chemical Concentrations in Offshore Waters	Mixed, Undetermined	Mixed, Improving	Mixed Improving	Mixed
119	Concentrations of Contaminants in Sediment Cores	Mixed, Improving/ Undetermined	Mixed, Improving	Mixed Improving	
4175	Drinking Water Quality	Good, Unchanging	Good, Unchanging	Good	Good
4202	Air Quality	Mixed, Improving	Mixed, Improving	Mixed (#4176)	Mixed (#4176)
9000	Acid Rain	Mixed, Improving (2005 report)	Mixed, Improving	Mixed Improving	Mixed
<b>Sources and Loadings</b>					
117	Atmospheric Deposition of Toxic Chemicals	Mixed, Improving & Mixed, Unchanging/ Improving	Mixed, Improving & Mixed, Unchanging	Mixed	Mixed Improving
4202	Air Quality	Mixed, Improving	Mixed, Improving	Mixed (#4176)	Mixed (#4176)
7065	Wastewater Treatment and Pollution	N/A Progress Report			
9000	Acid Rain	Mixed, Improving (2005 report)	Mixed, Improving	Mixed Improving	Mixed

N/A = Not Assessed; Number in brackets indicates related indicator; Reports are currently unavailable for the indicators in italics.

# STATE OF THE GREAT LAKES 2007

ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>BIOTIC COMMUNITIES</b>					
<b>Fish</b>					
8	Salmon and Trout	Mixed, Improving	Mixed, Improving	Mixed	
9	Walleye	Fair, Unchanging	Good, Unchanging	Mixed	Good
17	Preyfish Populations	Mixed, Deteriorating	Mixed, Deteriorating & Mixed, Improving	Mixed Deteriorating	Mixed Improving
93	Lake Trout	Mixed, Unchanging	Mixed, Improving & Mixed, Unchanging	Mixed	Mixed
125	Status of Lake Sturgeon in the Great Lakes	Mixed, Improving	Mixed, Undetermined	N/A	
4502	Coastal Wetland Fish Community Health	N/A Progress Report	N/A		
<b>Birds</b>					
115	Contaminants in Colonial Nesting Waterbirds	Mixed, Improving	Mixed, Improving	Mixed Improving	Good
4507	Wetland-Dependent Bird Diversity and Abundance	Mixed, Deteriorating	Mixed, Deteriorating	Mixed Deteriorating	Mixed Deteriorating
8135	Contaminants Affecting Productivity of Bald Eagles	Mixed, Improving (2005 report)	Mixed, Improving	Mixed Improving	Mixed Improving
8150	<i>Breeding Bird Diversity and Abundance</i>				
<b>Mammals</b>					
8147	Population Monitoring and Contaminants Affecting the American Otter	Mixed, Undetermined (2003 report)	Mixed, Undetermined (2003 report)	Mixed	N/A
<b>Amphibians</b>					
4504	Coastal Wetland Amphibian Diversity and Abundance	Mixed, Deteriorating	Mixed, Deteriorating	Mixed Deteriorating	Mixed Deteriorating
7103	Groundwater Dependant Plant and Animal Communities	N/A (2005 report)	N/A		
<b>Invertebrates</b>					
68	Native Freshwater Mussels	N/A (2005 report)	N/A	N/A	Mixed Deteriorating
104	Benthos Diversity and Abundance - Aquatic Oligochaete Communities	Mixed, Unchanging/ Deteriorating	Mixed, Undetermined (2003 report)	Mixed	
116	Zooplankon Populations	Mixed, Undetermined	N/A (2003 report)	N/A	Mixed
122	Hexagenia	Mixed, Improving	Mixed, Improving	Mixed Improving	Mixed Improving
123	Abundances of the Benthic Amphipod <i>Diporeia</i> spp.	Mixed, Deteriorating	Mixed, Deteriorating	Mixed Deteriorating	Mixed
4501	Coastal Wetland Invertebrate Community Health	N/A (2005 Progress Report)	N/A Progress Report		
<b>Plants</b>					
109	Phytoplankton Populations	Mixed, Undetermined (2003 report)	Mixed, Undetermined (2003 report)	Mixed	Mixed
4862	Coastal Wetland Plant Community Health	Mixed, Undetermined	Mixed, Undetermined		
8162	<i>Health of Terrestrial Plant Communities</i>				
8500	Forest Lands - Conservation of Biological Diversity	Mixed, Undetermined	Mixed, Improving		

N/A = Not Assessed; Number in brackets indicates related indicator; Reports are currently unavailable for the indicators in italics.

# STATE OF THE GREAT LAKES 2007

ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>BIOTIC COMMUNITIES (continued)</b>					
<b>General</b>					
8114	<i>Habitat Fragmentation</i>				
8137	<i>Nearshore Species Diversity and Stability</i>				
8161	<i>Threatened Species</i>				
8163	<i>Status and Protection of Special Places and Species</i>				
<b>INVASIVE SPECIES</b>					
<b>Aquatic</b>					
18	Sea Lamprey	Good-Fair, Improving (2005 Report)	Good-Fair, Improving	Mixed Improving	Mixed
9002	Non-Native Species (Aquatic)	Poor, Deteriorating	Poor, Deteriorating	Poor	Poor
<b>Terrestrial</b>					
9002	Non-Native Species (Terrestrial)	N/A, Undetermined			
<b>COASTAL ZONES</b>					
<b>Nearshore Aquatic</b>					
6	<i>Fish Habitat</i>				
4860	<i>Phosphorus and Nitrogen Levels (Coastal Wetlands)</i>				
4861	Effects of Water Level Fluctuations	Mixed, N/A (2003 Report)	Mixed, N/A (2003 report)	Mixed	Mixed Deteriorating
4864	<i>Human Impact Measures (Coastal Wetlands)</i>				
8131	Extent of Hardened Shoreline	Mixed, Deteriorating (2001 Report)	Mixed, Deteriorating (2001 report)	Mixed Deteriorating (2001 report)	Mixed Deteriorating
8142	<i>Sediment Available for Coastal Nourishment</i>				
8146	<i>Artificial Coastal Structures</i>				
<b>Coastal Wetlands</b>					
4501	Coastal Wetland Invertebrate Community Health	N/A (2005 Progress Report)	N/A Progress Report		
4502	Coastal Wetland Fish Community Health	N/A Progress Report	N/A		
4504	Coastal Wetland Amphibian Diversity and Abundance	Mixed, Deteriorating	Mixed, Deteriorating	Mixed Deteriorating	Mixed Deteriorating
4506	Contaminants in Snapping Turtle Eggs	Mixed, Undetermined	Mixed, N/A	Mixed	Mixed
4507	Wetland-Dependent Bird Diversity and Abundance	Mixed, Deteriorating	Mixed, Deteriorating	Mixed Deteriorating	Mixed Deteriorating
4510	Coastal Wetland Area by Type	Mixed, Deteriorating	Mixed, Deteriorating	(2001 report)	Mixed Deteriorating
4511	<i>Coastal Wetland Restored Area by Type</i>				
4516	<i>Sediment Flowing into Coastal Wetlands</i>				
4860	<i>Phosphorus and Nitrogen Levels</i>				
4861	Effects of Water Level Fluctuations	Mixed, N/A (2003 Report)	Mixed, N/A (2003 report)	Mixed	Mixed Deteriorating
4862	Coastal Wetland Plant Community Health	Mixed, Undetermined	Mixed, Undetermined		
4863	Land Cover Adjacent to Coastal Wetlands	N/A Progress Report			
4864	<i>Human Impact Measures</i>				
8142	<i>Sediment Available for Coastal Nourishment</i>				

N/A = Not Assessed; Number in brackets indicates related indicator; Reports are currently unavailable for the indicators in italics.

# STATE OF THE GREAT LAKES 2007

ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>COASTAL ZONES (continued)</b>					
<b>Terrestrial</b>					
4861	Effects of Water Level Fluctuations	Mixed, N/A (2003 Report)	Mixed, N/A (2003 report)	Mixed	Mixed Deteriorating
4864	<i>Human Impact Measures (Coastal Wetlands)</i>				
8129	Area, Quality, and Protection of Special Lakeshore Communities - Alvars	Mixed, Undetermined (2001 Report)	Mixed, Undetermined (2001 report)	Mixed (2001 report)	Mixed
8129	Area, Quality, and Protection of Special Lakeshore Communities - Islands	Mixed, Undetermined			
8129	Area, Quality, and Protection of Special Lakeshore Communities - Cobble Beaches	Mixed, Deteriorating (2005 Report)	Mixed, Deteriorating		
8129	Area, Quality, and Protection of Special Lakeshore Communities - Sand Dunes	N/A (2005 Progress Report)	N/A Progress Report		
8131	Extent of Hardened Shoreline	Mixed, Deteriorating (2001 Report)	Mixed, Deteriorating (2001 Report)	Mixed Deteriorating (2001 Report)	Mixed Deteriorating
8132	<i>Nearshore Land Use</i>				
8136	<i>Extent and Quality of Nearshore Natural Land Cover</i>				
8137	<i>Nearshore Species Diversity and Stability</i>				
8142	<i>Sediment Available for Coastal Nourishment</i>				
8149	<i>Protected Nearshore Areas</i>				
<b>AQUATIC HABITATS</b>					
<b>Open Lake</b>					
6	<i>Fish Habitat</i>				
111	Phosphorus Concentrations and Loadings	Open Lake: Mixed, Undetermined Nearshore: Poor, Undetermined	Mixed	Mixed	Mixed
118	Toxic Chemical Concentrations in Offshore Waters	Mixed, Improving	Mixed, Improving	Mixed Improving	Mixed
119	Concentrations of Contaminants in Sediment Cores	Mixed, Improving/ Undetermined	Mixed, Improving	Mixed Improving	
8131	Extent of Hardened Shoreline	Mixed, Deteriorating (2001 Report)	Mixed, Deteriorating (2001 Report)	Mixed Deteriorating (2001 Report)	Mixed Deteriorating
8142	<i>Sediment Available for Coastal Nourishment</i>				
8146	<i>Artificial Coastal Structures</i>				
<b>Groundwater</b>					
7100	Natural Groundwater Quality and Human-Induced Changes	N/A (2005 Report)	N/A	N/A	
7101	Groundwater and Land: Use and Intensity	N/A (2005 Report)	N/A	N/A	
7102	Base Flow Due to Groundwater Discharge	Mixed, Deteriorating	Mixed, Deteriorating	N/A	
7103	Groundwater Dependant Plant and Animal Communities	N/A (2005 Report)	N/A		

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ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>HUMAN HEALTH</b>					
4175	Drinking Water Quality	Good, Unchanging	Good, Unchanging	Good	Good
4177	Biologic Markers of Human Exposure to Persistent Chemicals	N/A, Undetermined	Mixed, Undetermined		
4179	<i>Geographic Patterns and Trends in Disease Incidence</i>				
4200	Beach Advisories, Postings and Closures	Mixed, Undetermined	Mixed, Undetermined	Mixed (#4081)	Mixed (#4081)
4201	Contaminants in Sport Fish	Mixed, Improving	Mixed, Improving	Mixed Improving (#4083)	Mixed Improving (#4083)
4202	Air Quality	Mixed, Improving	Mixed, Improving	Mixed (#4176)	Mixed (#4176)
<b>LAND USE - LAND COVER</b>					
<b>General</b>					
4863	Land Cover Adjacent to Coastal Wetlands	N/A Progress Report			
7002	Land Cover - Land Conversion	Mixed, Undetermined	N/A		
7101	Groundwater and Land: Use and Intensity	N/A (2005 Report)	N/A	N/A	
8114	<i>Habitat Fragmentation</i>				
8132	<i>Nearshore Land Use</i>				
8136	<i>Extent and Quality of Nearshore Natural Land Cover</i>				
<b>Forest Lands</b>					
8500	Forest Lands - Conservation of Biological Diversity	Mixed, Undetermined	Mixed, Improving		
8501	Forest Lands - Maintenance and Productive Capacity of Forest Ecosystems	N/A, Undetermined			
8502	<i>Maintenance of Forest Ecosystem Health and Vitality</i>				
8503	Forest Lands - Conservation & Maintenance of Soil & Water Resources	Mixed, Undetermined			
<b>Agricultural Lands</b>					
7028	Sustainable Agriculture Practices	N/A (2005 Report)	N/A	N/A	Mixed
7061	Nutrient Management Plans	N/A (2005 Report)	N/A		
7062	Integrated Pest Management	N/A (2005 Report)	N/A		
<b>Urban/Suburban Lands</b>					
7000	Urban Density	Mixed, Undetermined	Mixed, N/A	Mixed Deteriorating	Unable to Assess
7006	Brownfields Redevelopment	Mixed, Improving	Mixed, Improving (2003 report)	Mixed Improving	Mixed Improving
7054	Ground Surface Hardening	N/A (2005 Progress Report)	N/A Progress Report		

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# STATE OF THE GREAT LAKES 2007

ID #	Indicator Name	2007 Assessment (Status, Trend)	2005 Assessment (Status, Trend)	2003 Assessment	2001 Assessment
<b>LAND USE - LAND COVER (continued)</b>					
<b>Protected Areas</b>					
8129	Area, Quality, and Protection of Special Lakeshore Communities - Alvars	Mixed, Undetermined (2001 Report)	Mixed, Undetermined (2001 report)	Mixed (2001 report)	Mixed
8129	Area, Quality, and Protection of Special Lakeshore Communities - Islands	Mixed, Undetermined			
8129	Area, Quality, and Protection of Special Lakeshore Communities - Cobble Beaches	Mixed, Deteriorating (2005 Report)	Mixed, Deteriorating		
8129	Area, Quality, and Protection of Special Lakeshore Communities - Sand Dunes	N/A (2005 Progress Report)	N/A Progress Report		
8149	<i>Protected Nearshore Areas</i>				
8163	<i>Status and Protection of Special Places and Species</i>				
<b>RESOURCE UTILIZATION</b>					
3514	Commercial/Industrial Eco-Efficiency Measures	N/A (2003 Report)	N/A (2003 report)	N/A	
3516	<i>Household Stormwater Recycling</i>				
7043	Economic Prosperity	Mixed, Undetermined (2003 Report)	Mixed, Undetermined (2003 report)	Mixed (L. Superior basin)	Mixed
7056	Water Withdrawals	Mixed, Unchanging (2005 Report)	Mixed, Unchanging		
7057	Energy Consumption	Mixed, N/A (2005 Report)	Mixed, N/A	Mixed Deteriorating	
7060	Solid Waste Disposal	N/A, Undetermined	Mixed (2003 report)	Mixed	
7064	Vehicle Use	Poor, Deteriorating			
7065	Wastewater Treatment and Pollution	N/A Progress Report			
<b>CLIMATE CHANGE</b>					
4858	Climate Change: Ice Duration on the Great Lakes	Mixed, Deteriorating	Mixed, Deteriorating (2003 report)	Mixed Deteriorating	
9003	<i>Climate Change: Effect on Crop Heat Units</i>				
<b>PROPOSED INDICATOR</b>					
8164	Biodiversity Conservation Sites	N/A, Undetermined			

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