

State of the Great Lakes

2007



Environment Canada
and
United States Environmental Protection Agency

ISBN 978-0-662-47328-2

EPA 905-R-07-003

Cat No. En161-3/1-2007E-PDF

Front Cover Photo Credits:

Blue Heron, Don Breneman

Sleeping Bear Dunes, Robert de Jonge, courtesy of Michigan Travel Bureau

Port Huron Mackinac Race, Michigan Travel Bureau

Milwaukee Skyline, Visit Milwaukee

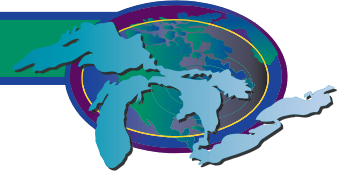
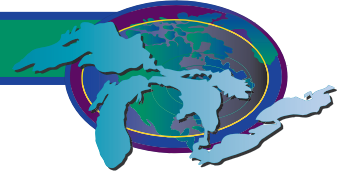


Table of Contents

Preface	1
1.0 Introduction	2
2.0 Assessing Data Quality	10
3.0 Indicator Category Assessments and Management Challenges	12
Contamination	12
Chemical Integrity of the Great Lakes - What the Experts are Saying	15
Biotic Communities	16
Invasive Species	18
Coastal Zones And Aquatic Habitats	20
Human Health	22
Land Use - Land Cover	24
Resource Utilization	27
Climate Change	28
4.0 What is Being Done to Improve Conditions	29
5.0 Indicator Reports and Assessments	32
Indicator #8 - Salmon and Trout	32
Indicator #9 - Walleye	39
Indicator #17 - Preyfish Populations	43
Indicator #18 - Sea Lamprey	50
Indicator #68 - Native Freshwater Mussels	55
Indicator #93 - Lake Trout	59
Indicator #104 - Benthos Diversity and Abundance - Aquatic Oligochaete Communities	63
Indicator #109 - Phytoplankton Populations	67
Indicator #111 - Phosphorus Concentrations and Loadings	70
Indicator #114 - Contaminants in Young-of-the-Year Spottail Shiners	74
Indicator #115 - Contaminants in Colonial Nesting Waterbirds	81
Indicator #116 - Zooplankton Populations	87
Indicator #117 - Atmospheric Deposition of Toxic Chemicals	91
Indicator #118 - Toxic Chemical Concentrations in Offshore Waters	97
Indicator #119 - Concentrations of Contaminants in Sediment Cores	103
Indicator #121 - Contaminants in Whole Fish	106
Indicator #122 - <i>Hexagenia</i>	115
Indicator #123 - Abundances of the Benthic Amphipod <i>Diporeia</i> spp.	120
Indicator #124 - External Anomaly Prevalence Index for Nearshore Fish	124
Indicator #125 - Status of Lake Sturgeon in the Great Lakes	128
Indicator #3514 - Commercial/Industrial Eco-Efficiency Measures	134
Indicator #4175 - Drinking Water Quality	137
Indicator #4177 - Biological Markers of Human Exposure to Persistent Chemicals	144
Indicator #4200 - Beach Advisories, Postings and Closures	150
Indicator #4201 - Contaminants in Sport Fish	161
Indicator #4202 - Air Quality	169
Indicator #4501 - Coastal Wetland Invertebrate Community Health (progress report)	179
Indicator #4502 - Coastal Wetland Fish Community Health (progress report)	181
Indicator #4504 - Coastal Wetland Amphibian Diversity and Abundance	185
Indicator #4506 - Contaminants in Snapping Turtle Eggs	189
Indicator #4507 - Wetland-Dependent Bird Diversity and Abundance	193
Indicator #4510 - Coastal Wetland Area by Type	198
Indicator #4858 - Climate Change: Ice Duration on the Great Lakes	202
Indicator #4861 - Effect of Water Level Fluctuations	206
Indicator #4862 - Coastal Wetland Plant Community Health	210

STATE OF THE GREAT LAKES 2007

Indicator #4863 - Land Cover Adjacent to Coastal Wetlands (progress report)	215
Indicator #7000 - Urban Density	219
Indicator #7002 - Land Cover - Land Conversion	223
Indicator #7006 - Brownfields Redevelopment	228
Indicator #7028 - Sustainable Agricultural Practices.	233
Indicator #7043 - Economic Prosperity	236
Indicator #7054 - Ground Surface Hardening (progress report)	239
Indicator #7056 - Water Withdrawals	241
Indicator #7057 - Energy Consumption	246
Indicator #7060 - Solid Waste Disposal	253
Indicator #7061 - Nutrient Management Plans	259
Indicator #7062 - Integrated Pest Management	262
Indicator #7064 - Vehicle Use.	265
Indicator #7065 - Wastewater Treatment and Pollution (progress report)	269
Indicator #7100 - Natural Groundwater Quality and Human-Induced Changes	278
Indicator #7101 - Groundwater and Land: Use and Intensity.	283
Indicator #7102 - Base Flow Due to Groundwater Discharge	288
Indicator #7103 - Groundwater Dependant Plant and Animal Communities	296
Indicator #8129 - Area, Quality and Protection of Special Lakeshore Communities - Alvars	300
Indicator #8129 - Area, Quality and Protection of Special Lakeshore Communities - Cobble Beaches	303
Indicator #8129 - Area, Quality and Protection of Special Lakeshore Communities - Islands.	307
Indicator #8129 - Area, Quality and Protection of Special Lakeshore Communities - Sand Dunes (progress report).	313
Indicator #8131 - Extent of Hardened Shoreline.	315
Indicator #8135 - Contaminants Affecting the Productivity of Bald Eagles	318
Indicator #8147 - Population Monitoring and Contaminants Affecting the American Otter	321
Indicator #8164 - Biodiversity Conservation Sites	325
Indicator #8500 - Forest Lands - Conservation of Biological Diversity	329
Indicator #8501 - Forest Lands - Maintenance of Productive Capacity of Forest Ecosystems	337
Indicator #8503 - Forest Lands - Conservation and Maintenance of Soil and Water Resources.	341
Indicator #9000 - Acid Rain	347
Indicator #9002 - Non-native Species – Aquatic	353
Indicator #9002 - Non-native Species – Terrestrial	358
6.0 Acronyms and Abbreviations	363
7.0 Acknowledgments	368



Preface

The Governments of Canada and the United States are committed to providing public access to environmental information about the Great Lakes basin ecosystem through the State of the Great Lakes reporting process. This commitment is integral to the mission to protect ecosystem health. To participate effectively in managing risks to ecosystem health, all Great Lakes stakeholders (e.g., federal, provincial, state and local governments; non-governmental organizations; industry; academia; private citizens; Tribes and First Nations) should have access to accurate information of appropriate quality and detail.

The information in this report, **State of the Great Lakes 2007**, has been assembled from various sources with the participation of many people throughout the Great Lakes basin. The data are based on indicator reports and presentations from the State of the Lakes Ecosystem Conference (SOLEC), held in Milwaukee, Wisconsin, November 1-3, 2006.

SOLEC and the subsequent reports provide independent, science-based reporting on the state of the health of the Great Lakes basin ecosystem. Four objectives for the SOLEC process include:

- To assess the state of the Great Lakes ecosystem based on accepted indicators
- To strengthen decision-making and environmental management concerning the Great Lakes
- To inform local decision makers of Great Lakes environmental issues
- To provide a forum for communication and networking amongst all the Great Lakes stakeholders

The role of SOLEC is to provide clear, compiled information to the Great Lakes community to enable environmental managers to make better decisions. Although SOLEC is primarily a reporting venue rather than a management program, many SOLEC participants are involved in decision-making processes throughout the Great Lakes basin.

The current information about Great Lakes ecosystem and human health is presented in several levels of detail, in both print and electronic formats.

State of the Great Lakes 2007. This technical report contains the full indicator reports as prepared by the primary authors, the indicator category assessments, and management challenges. It also contains detailed references to data sources.

State of the Great Lakes 2007 Highlights. This report highlights key information presented in the main report.

State of the Great Lakes Summary Series. These summaries provide information about a variety of indicators and issues such as: the quality of drinking water, swimming at the beaches, eating Great Lakes fish, air quality, aquatic invasive species, amphibians, birds, forests, coastal wetlands, the Great Lakes food web and special places such as islands, alvars and cobble beaches. In addition there is a summary for each of the Great Lakes, plus the St. Clair-Detroit River ecosystem and the St. Lawrence River.

For more information about Great Lakes indicators and the State of the Lakes Ecosystem Conference, visit: www.binational.net or www.epa.gov/glnpo/solec or www.on.ec.gc.ca/greatlakes.