

**STATE  
OF THE  
GREAT LAKES  
1995**

**Report Highlights**

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# REPORT HIGHLIGHTS

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## The 1995 State of The Great Lakes Report

The State of the Great Lakes Report summarizes information presented at the October, 1994 State of the Lakes Ecosystem Conference, held in Dearborn, Michigan. The Report examines the state of the health of the Great Lakes in two ways:

- ▶ By examining the basin-wide state of health of the ecosystem; and
- ▶ On a lake by lake basis.

## What was SOLEC '94?

- ▶ The State of the Lakes Ecosystem Conference (SOLEC), was a binational meeting to review and assess the state of the Great Lakes from an environmental perspective, including human health.
- ▶ Participants reviewed progress to date on cleanup and restoration.
- ▶ Led by the federal governments of Canada and the United States, SOLEC was the first scientific meeting of its kind. The information in the Report is assisting the governments to fulfil their responsibilities under the 1987 Great Lakes Water Quality Agreement.

## SOLEC '94 Participants

Over 500 participants attended SOLEC '94 representing:

- Federal Governments
- State/Provincial/Tribal Governments
- Conservation/Environmental/Remedial Action Plans
- Local Governments
- Health Groups
- Agriculture/Labour/Industry
- Academia/Research
- Foundations
- Citizens

## **SOLEC '94 Guiding Questions**

Organizers identified some basic, frequently-asked questions to guide decision-makers and just plain folks in assessing the state of the Lakes.

- ▶ Can we swim in the Lakes, eat the fish that we catch, and drink the water?
- ▶ Are the Lakes affecting human health?
- ▶ Are the Lakes getting better?
- ▶ Are the fish and birds healthy?
- ▶ How are endangered species doing?
- ▶ What are we doing about exotic (non-native) species?

## **STRESS INDICATORS**

Some preliminary indicators to measure both the state of health of the ecosystem and the stressors that influence that health, were developed and assessed. These will be refined over time:

### **Ecosystem Health Indicators:**

- ▶ the state of aquatic communities
- ▶ human health and health risks
- ▶ aquatic habitat

### **Categories of stresses:**

- ▶ nutrients
- ▶ persistent toxic contaminants
- ▶ economic activity

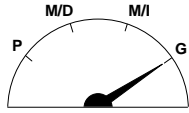
Each indicator was assessed in four broad categories: poor (P), mixed/deteriorating (M/D), mixed/improving (M/I), and good/restored (G).

**Aquatic Community Health**  
**M/I=mixed/improving, G=good)**

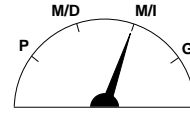
**(P=poor,**

**M/D=mixed/deteriorating,**

1. Native species loss

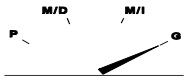


*Lake Superior*

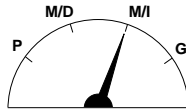


*Lakes Huron, Michigan, Erie and Ontario*

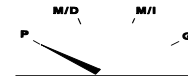
2. Ecosystem Imbalance



*Lake Superior  
Ontario*

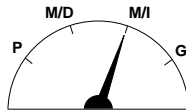


*Lake Huron*



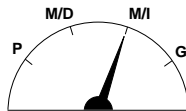
*Lakes Michigan, Erie and  
Ontario*

3. Reproductive Impairment for all Great Lakes



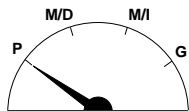
**Human Health**

1. Overall state of the Great Lakes basin

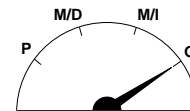


**Habitat and Wetlands**

1. Habitat Loss (quality and quantity)



*Overall*

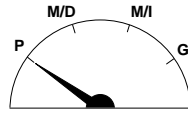


*Upper Lakes brook trout stream habitat*

## Habitat and Wetlands (cont'd)

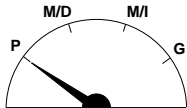
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### 2. Encroachment/development (overall)

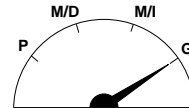


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### 3. Habitat gains (quality and quantity)



*Overall*

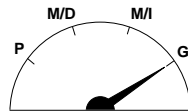


*Protected areas under NAWMP*

## Nutrients

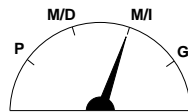
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### 1. Phosphorus targets for all Great Lakes



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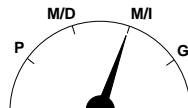
### 2. Oxygen in bottom waters of Lake Erie's central basin



## Contaminants

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### 1. All indicators for Great Lakes

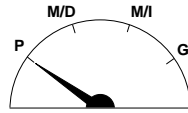


**Economy**  
**G=good)**

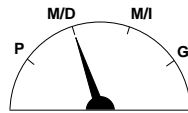
(P=poor, M/D=mixed/deteriorating, M/I=mixed/improving, G=good)

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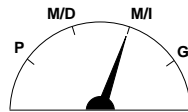
1. Infrastructure investment, land use of the Great Lakes basin



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2. Employment, research and development, population growth, personal income of the Great Lakes basin



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3. Pollution prevention, stewardship, conservation, energy use of the Great Lakes basin



# LAKE BY LAKE ANALYSIS

## 1. Lake Superior

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### SOLEC Findings for Lake Superior:

- ▶ Good environmental quality compared to the other Lakes because of small populations and limited industry.
- ▶ The most severe and permanent loss in the aquatic community has been to the lake trout population.
- ▶ Many species of fish and some distinct groups within species (races) have been lost to the Lake. Despite these losses, biodiversity (the variety of plant and animal life on Earth) within Lake Superior remains quite high compared to the other Lakes. Stream habitat is degraded in many areas, but there are also large tracts of very high quality habitat.
- ▶ The greatest threats to the aquatic community are the river herring and sea lamprey (exotic or non-native species).
- ▶ Chemical stressors of concern in Lake Superior are toxic. They concentrate in animal tissues, and persist in the environment for a long time. These substances include mercury, DDT, PCBs and toxaphene-like substances (a family of pesticides).
- ▶ Fish consumption advisories are in effect for many Lake Superior fish because of the contaminants they contain. For example, the public has been advised not to eat the siscowet form of lake trout at any time and to limit consumption of other species.
- ▶ Deposits from the atmosphere account for approximately 90% of toxic contaminants entering Lake Superior. An estimated 58% of the total nitrogen load to the Lake comes from precipitation.

### **SOLEC Challenges for Lake Superior:**

- ▶ We've made progress. One of the challenges in Lake Superior is to preserve the relatively high quality areas that exist throughout the lake, including near shore lake habitats and river habitats.
- ▶ The Lake Superior Binational Program must continue to deliver its action plan and move towards zero discharge of persistent toxic substances. We must also deal with airborne pollution, since such a large portion of the contamination comes from the atmosphere.
- ▶ Maintain sea lamprey control to ensure continuation of self-sustaining lake trout populations.



## 2. Lake Michigan

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### **SOLEC Findings for Lake Michigan:**

- ▶ Environmental quality in the basin generally is best in the north, and deteriorates as we move south.
- ▶ Of the ten Areas of Concern (AOCs - the most degraded areas) Indiana Harbor, Milwaukee and Green Bay AOCs are the largest and most degraded, although the Kalamazoo River contains very large quantities of PCBs.
- ▶ The sea lamprey has eliminated all stocks of lake trout, and severely depressed whitefish and other aquatic populations. We don't know what the future holds for the aquatic community.
- ▶ The sport fishery remains productive, although based upon hatchery-reared salmon and lake trout. The goal of self-sustaining lake trout populations through natural reproduction remains elusive. Whitefish populations, on the other hand, are increasing and support a valuable commercial fishery.
- ▶ Habitat loss (especially wetlands) is widespread in Lake Michigan, particularly in the southern portion of the Lake. Urban sprawl and recreational development continue to destroy habitat and biodiversity.
- ▶ Bioaccumulative, persistent toxic substance levels in fish are similar to levels in Lake Ontario, and are among the highest in the Great Lakes basin.
- ▶ A Mass Balance Study is currently underway to determine how toxic contaminants move into and travel through the Lake ecosystem.

### **SOLEC Challenges for Lake Michigan:**

- ▶ Make use of information from the Mass Balance Study to gain better control/remediation of contaminants.
- ▶ Maintain existing high quality areas of habitat.
- ▶ Restore some degree of ecosystem balance to the Lake's aquatic communities.

## 3. Lake Huron

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### **SOLEC Findings for Lake Huron:**

- ▶ Lake Huron is considered to be the lake in the middle, both geographically and in environmental quality. It has relatively good water quality and wetlands, except in four Areas of Concern.
- ▶ Because of the large amounts of industry and intensive agriculture in the Saginaw Bay watershed, the Lake has received heavy loadings of nutrients and toxic contaminants. The most recent problem, zebra mussels, may significantly damage biological communities and affect contaminant cycling in Saginaw Bay.
- ▶ Aquatic community health and biodiversity are considered relatively good in comparison to the other Lakes.
- ▶ Lake Huron is the most important Lake in terms of having the highest number of fish-eating birds that breed along the shorelines. Most populations of these birds are increasing.
- ▶ Loss of shoreline marshes and wetlands has been moderate compared to the other Lakes, except in Saginaw Bay.
- ▶ Exotic (foreign or non-native) species such as sea lamprey, zebra mussels, and purple loosestrife pose major threats to aquatic communities.
- ▶ Shoreline development is a growing stress on habitat and aquatic communities. An emerging issue is how public and private natural resource lands within Lake Huron are being managed.

### **SOLEC Challenges for Lake Huron:**

- ▶ A Lakewide Management Plan that includes both environmental quality and fisheries management is needed for Lake Huron.
- ▶ Control of sea lamprey from the St. Marys River is critical to the survival of fish populations in the Lake.
- ▶ Control of other exotic species, such as purple loosestrife, is essential.
- ▶ We must conserve high quality areas of habitat.

## 4. Lake Erie

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### **SOLEC Findings for Lake Erie:**

- ▶ Of all the Great Lakes, Lake Erie is exposed to the greatest stress from urbanization and agriculture.
- ▶ In terms of environmental quality, Lake Erie is severely degraded with respect to habitat. Massive investment in municipal and industrial waste treatment, and voluntary programs to control agricultural land runoff have produced excellent results in improving the water quality.
- ▶ The original aquatic community of the Lake has been devastated; recovery is underway but the long-term future of the resulting community is unknown. Species having particularly heavy impact include zebra mussels and carp. Although not yet established in Lake Erie, another non-native species to be concerned about is the ruffe.
- ▶ High levels of mercury in the 1970's led to the closure of the commercial walleye fishery. This action and the quotas imposed after reopening the Canadian fishery, led to a spectacular recovery of the walleye fishery.

### **SOLEC Challenges for Lake Erie:**

- ▶ More research is needed to understand better the effects of exotic species on the Lake Erie ecosystem, including the effects of these species on the movement of contaminants through the Lake.
- ▶ Four critical pollutants have been identified for immediate action: PCBs, DDT and related compounds, chlordane and dieldrin.
- ▶ Begin implementing an ecosystem-based Lakewide Management Plan.

## 5. Lake Ontario

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### **SOLEC Findings for Lake Ontario:**

- ▶ The aquatic community of Lake Ontario has been severely damaged as a result of urbanization and agriculture, with large losses of habitat and biodiversity.
- ▶ Contaminant levels in fish are high and similar to those of Lake Michigan.
- ▶ Persistent toxic contaminants in Lake Ontario remain a big problem and have led to the development of the Lake Ontario Toxics Management Plan. The most significant source of contaminants to the Lake is from the Niagara River.
- ▶ Contaminant concentrations in fish were declining but have levelled off in recent years, possibly as a result of changes in the food chain.

### **SOLEC Challenges for Lake Ontario:**

- ▶ Stop further habitat loss.
- ▶ Rehabilitate near shore and river habitat wherever feasible.
- ▶ Restore some ecosystem balance in the Lake Ontario aquatic community.
- ▶ Begin work on understanding hormone mimicry (the effects of chemicals in the environment acting as hormones on fish, wildlife and humans).
- ▶ Move toward a sustainable fishery.

## **OVERALL MANAGEMENT CHALLENGES**

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The SOLEC Report identifies several management challenges for the future of organizations, primarily the governments of Canada and the United States. These are challenges that must be met in order to move ahead in cleaning up the Great Lakes.

**Research:** Research should be prioritized in order to fill the many gaps that exist, such as: the global nature of contamination; the effects of changes in the food chain on contaminant movement within the Lakes; and the implications on the fishery of changing the amount of phosphorus entering the lakes.

**Information Management:** Data possessed by hundreds of organizations must be consolidated, standardized and made accessible.

**Decision-Making:** The ecosystem approach aims to have everyone working together to clean up the Great Lakes.

**Partnerships:** Organizations must remain flexible in achieving their individual mandates and must work closely with other interested parties.

**Biodiversity:** Effective strategies to protect biodiversity need to be developed.

**Measurable Conditions:** Benchmarks for cleanup, restoration, and human health need to be fully developed.

**The "Individual" Approach:** Local systems vary from place to place - this must be taken into consideration during cleanup; avoid a blanket approach.

**Effects of Toxic Substances:** The subtle effects of long-term exposure to toxic substances is a threat to people and wildlife - prevention is key.

**Sustainability:** Sustaining the economy while preserving the environment is crucial to competitiveness in industry and growth in the economy; the Great Lakes region has to be a world leader in clean, sustainable production.

## **THE FUTURE OF SOLEC**

- ▶ SOLEC will be convened every two years to provide useful information on the state of the Great Lakes ecosystem.
- ▶ SOLEC 1996, to be held in Windsor, Ontario, is being designed around a nearshore theme.
- ▶ The ongoing, day-to-day jobs of determining responsibility for cleaning up and restoring the Great Lakes; of reviewing progress on recovery of the Lakes; and of encouraging feedback from all sectors are tremendous tasks. The governments of Canada and the United States recognize that SOLEC will help in furthering this work.

## **SOLEC MAJOR FINDINGS: A SUMMARY**

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Generally, the Great Lakes ecosystem has improved significantly but we are still a long way from full restoration. An overall assessment of the state of the Great Lakes over the past 30 years indicates a variety of dramatic achievements such as: nutrient reductions; improvements in public health; declines in contaminant levels in fish and wildlife; and a resurgence of some fish and wildlife populations. However, problems continue in several areas including the continuing loss of wetlands, fish consumption advisories, and subtle effects of chemicals on fish, wildlife and humans. Some of the more specific findings are:

### **1. Importance of Habitat to Ecosystem Health**

Approximately 80% of coastal wetlands have been lost in the lower lakes basin; near shore habitat has been destroyed, including spawning and nursery areas for fish, nesting sites for birds, hunting and feeding areas for mammals. Losses still occur at an unacceptable rate. Some progress has been made at rehabilitation.

### **2. Importance of Non-Native Species to Ecosystem Integrity**

Zebra mussels, sea lamprey, purple loosestrife, river huffe and countless other invaders have upset the food web and compete for habitat. This results in loss of native species and of genetic stocks within surviving species.

### **3. Global Nature of Contamination**

Up to 90% of some contaminants entering Lake Superior do so from the atmosphere. Much of this is from sources far outside the Great Lakes basin, including Europe and Asia.

### **4. Food Chain Effects on Contaminant Movement**

Fish and wildlife show no decrease in contaminant levels recently. This could be caused by different food sources being consumed. These changes in food sources could be a result of zebra mussels upsetting the food chain.

## **5. Hormone Mimicry**

SOLEC identified a potential new problem in the Lakes, namely certain chemicals, such as some pesticides which mimic hormones in aquatic organisms and in humans. This issue appears to be global in nature.

## **6. Phosphorus Control Strategy**

Control strategies adopted in the 1970s have paid off. Phosphorus levels are at or very near target levels, but some people are asking that more phosphorus be added to Lake Erie, to "grow more fish". Zebra mussels have depleted the algal food supply for fish in the Lake, and the idea is more phosphorus=more algae=more fish.

## **7. Socio-Economics**

SOLEC integrated socio-economics into a conference of traditional natural sciences. This integration was important because one must understand the social and economic pressures that result in degraded ecosystems. It was also recognized that a strong economy provides the resources, both people and dollars, to protect and restore the environment.

## **8. Loss of Biodiversity**

There has been an irreversible loss of native species and subspecies. 17 species of fish are listed as either extinct, extirpated (ie. not found in their former geographic range) or depleted. Only 20 stocks of river spawning lake trout now exist in Lake Superior. There has been a major loss of bald eagle and peregrine falcon nesting habitat. Recovery actions are underway.

## **9. Human Health**

Human health effects are difficult to relate directly to specific Great Lakes ecosystem conditions. Contaminant levels in Great Lakes residents are generally similar to levels of other populations in industrialized areas. Human health has improved dramatically since the early pioneering days as a result of better sanitation, better medical care and better food.