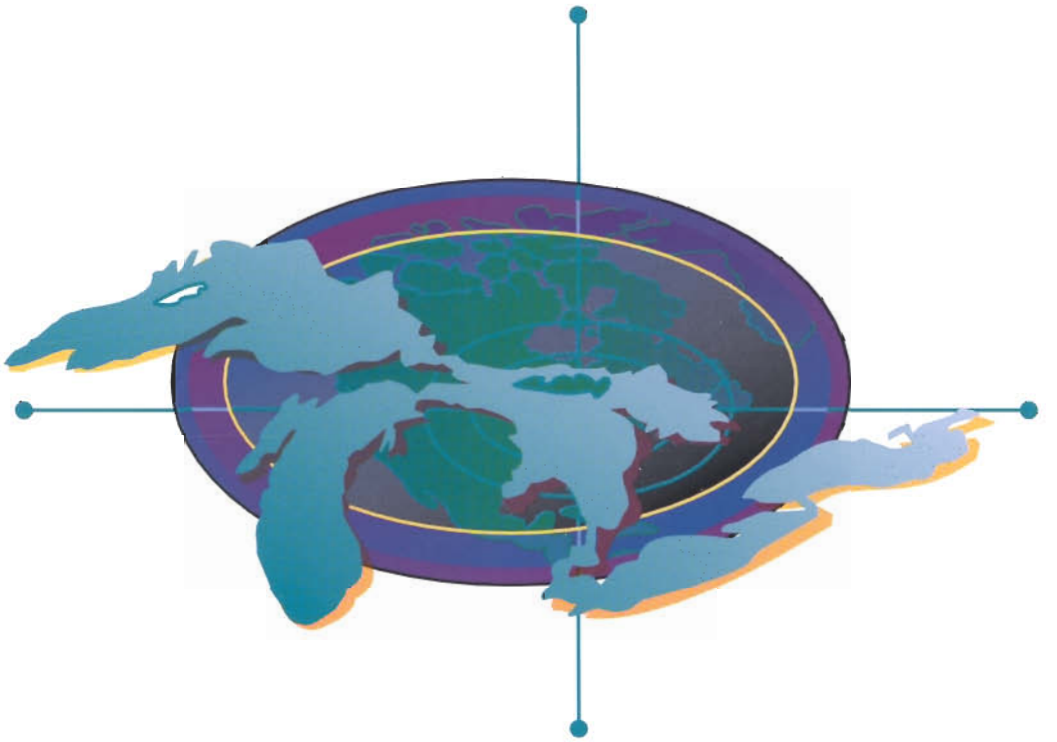
STATE OF THE GREAT LAKES 1997



Report Highlights

STATE OF THE GREAT LAKES 1997
Report Highlights

THE 1997 STATE OF THE GREAT LAKES REPORT

The Great Lakes ecosystem has improved vastly over the past 30 years, but we are still a long way from full restoration— this will take the cooperation not only of agencies, stakeholders and decision-makers from within the basin, but also those outside of it because of the global nature of pollutants. After decades of abuse to the ecosystem, dramatic successes achieved include: nutrient reductions; recovery of oxygen levels and of aquatic organisms that require higher levels of oxygen; declines in contaminant levels in fish and wildlife; a resurgence of some fish and wildlife populations; and improvements in public health. But much work remains to be done including halting the loss of wetlands, preserving and protecting remaining habitat, decreasing the amount of toxic contaminants released into the ecosystem so that fish consumption advisories are no longer required, and so that the subtle effects of these chemicals are no longer felt on the fish, wildlife and human populations within the basin.

The 1997 State of the Great Lakes Report summarizes information presented at the November 1996 State of the Lakes Ecosystem Conference (SOLEC 96), held in Windsor, Ontario. The Report examines the state of health of the Great Lakes nearshore ecosystem in two ways:

- A basin-wide examination of the condition of the nearshore ecosystem; and
- A lake-by-lake examination of the nearshore ecosystem.

The Report also gives a limited update of the subjects addressed in the 1995 State of the Great Lakes Report. The information in both these Reports assists the governments of Canada and the United States to fulfil their responsibilities under the 1987 Great Lakes Water Quality Agreement.

What is SOLEC?

- The State of the Lakes Ecosystem Conferences (SOLEC), are a series of science-based meetings, held biennially, to review and assess the state of the Great Lakes from an ecosystem perspective.

- SOLEC 94 focussed on the overall health of the Great Lakes basin ecosystem at the end of 1994 while SOLEC 96 narrowed the scope to summarize the health of the nearshore ecosystem and to examine the effects of land use practices on ecosystem health.

- Led by Environment Canada and the United States Environmental Protection Agency, SOLEC 94 was the first binational scientific meeting of its kind. SOLEC 96 continued in the same vein.

SOLEC 96 Participants

Nearly 500 participants attended SOLEC 96 representing:

- Federal Governments
- Provincial/State/Tribal Governments
- Local Governments
- Conservation/Wildlife/Environmental Groups
- Industry/Agriculture/Commercial Fishing
- Academia/Research
- Health Groups
- Citizens/Public Advisory Groups

Why Nearshore?

One of the findings of SOLEC 94 was that these areas represent the most diverse and productive parts of the Great Lakes ecosystem, and, at the same time, support the most intense human activity. As a result, *the areas that contain the greatest biological resources are subject to the greatest stress.*

Information for the 1997 Report can be found in five supporting documents presented at SOLEC 96:

- Nearshore Waters of the Great Lakes;
- Coastal Wetlands of the Great Lakes;
- The Land by the Lakes: Nearshore Terrestrial Ecosystems;
- Impacts of Changing Land Use; and
- Information and Information Management.

Land use is by far the largest source of stress to the system and warranted special attention. Additionally, because of the importance of information and information management, and because of the rapid changes in electronic data systems, a separate paper on this topic was prepared.

SOLEC 96 MAJOR FINDINGS: A SUMMARY

1. Importance of Locally Based Action

It is essential that ecosystem management happen at the local/community level, with support from all levels of government and the public. Municipal governments play a key role in determining the health of the nearshore.

2. Resources are Declining

At this time, both financial and human resources are in short supply. Public and private sector budgets are shrinking, and it is becoming increasingly important to prioritize where the remaining resources will be dedicated. Cost effectiveness of restoration will be factored into decision-making processes, and programs must be shown to get the required results in a cost effective manner. Agencies must work together and share data.

3. Need a Long Term Perspective

In order to recognize changes in the health of the Great Lakes nearshore, it is necessary to compare the current state of the ecosystem with earlier states. Commitments to long term monitoring and data collection are necessary for assessing progress and, if necessary, re-prioritizing efforts.

4. Need Ecosystem Goals

   We must agree on what end state would be most desirable for the Great Lakes ecosystem before we can work toward a desirable end state. It must also be recognized that with respect to ecosystem health, end results are difficult to predict because of the extreme number of variables.

5. Focus on Prevention and Preservation

   Years of reactive measures to ecosystem problems have provided results. The time has come to build on the success of restoration efforts, and focus on preserving and protecting the less impacted areas which remain.

6. Need to Improve Communication

   Communication within agencies and between agencies needs to be improved. Using a common vision and common vocabulary to define and address key issues can help to achieve this goal.

7. Non-Point Sources of Pollution

   Action is well underway to address point sources of pollution. Now is the time to focus more efforts on non-point sources.

8. Urgency for Action

   Immediate action is needed on three fronts. Where there is agreement on steps needed to protect and restore the ecosystem, those steps should be taken now. Where existing information is not sufficient to support decisions and implementation, immediate action must be taken to identify information gaps and obtain the information needed. Action is also needed to protect areas where restoration efforts have already yielded successful results.

9. Land Use

   SOLEC 96 carried out a major analysis of land use in the Great Lakes basin and found that poor land use practices are the major source of stress. Action to address this must occur at the local level (see SOLEC 96 Major Finding #1).

INDICATORS OF STRESS

Some preliminary indicators to measure both the state of health of the total ecosystem and the stressors that influence that health were developed and assessed in SOLEC 94. SOLEC 96 continued this process by developing indicators to measure the state of health of the nearshore ecosystem.

The indicator ratings assess the condition of the ecosystem or the stressor in three broad categories: *poor*, *mixed* or *good*. A trend statement indicates whether things are getting better, worse or remaining stable.

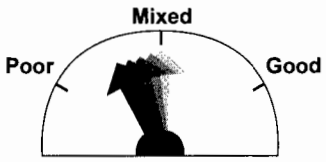
In addition, the Land by the Lakes paper used a ratings system of *A to F* for the ecoregions and special ecological communities. However, on a lake-by-lake basis the health of the nearshore terrestrial ecosystems were rated as above.

In general, the ratings have the following meanings:

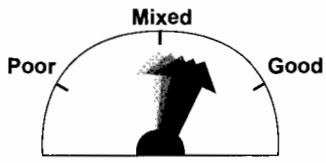
- *Poor*—significant negative impact.
- *Mixed*—the impact is less severe.
- *Good*—the impact or stress is removed and the state of the ecosystem component has been restored (or remains) at a presently acceptable state.

In general, the trends have the following meanings:

- *Deteriorating*—the trend is towards greater impact.
- *Stable*—no change in the impact.
- *Improving*—the trend is towards less impact.



The diagram at the left indicates that the environmental conditions started as Mixed and are deteriorating.

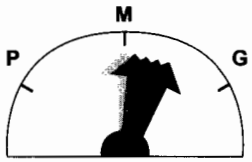


The diagram at the left indicates that the environmental conditions started as Mixed and are improving.

The Information and Information Management paper used the ratings of *good* (G), *fair* (F) and *poor* (P) to describe the indicators of the nearshore information needs.

Nearshore Waters

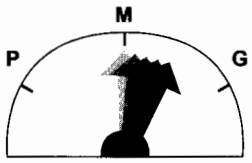
Overall State of the Great Lakes Aquatic Nearshore Ecosystem



Mixed/Improving

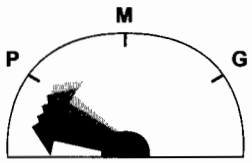
Healthy Fish and Wildlife:

1. *Status of native species and their habitat*



Mixed/Improving

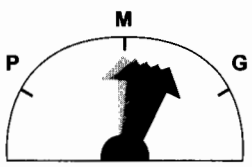
2. *Status of exotic species*



Poor/Deteriorating

Virtual Elimination of Persistent Toxic Substances:

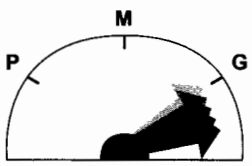
1. *Levels of persistent toxic substances in water and sediment*
2. *Concentrations of persistent toxic substances in fish and wildlife*



Mixed/Improving

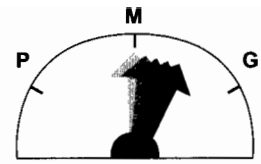
Reduced Nutrient Loading, Eliminating Eutrophication:

1. *Dissolved oxygen concentrations of bottom waters*



Good/Improving

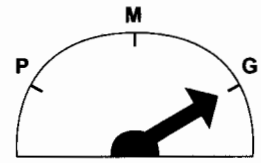
2. *Water clarity / algal blooms*



Mixed/Improving

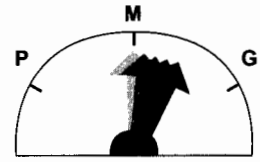
Healthy Human Populations:

1. *Drinking water quality*



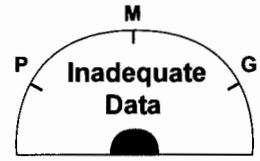
Good/Stable

2. *Fish consumption advisories*



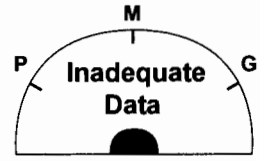
Mixed/Improving

3. *Beach closures*
4. *Acute human illness (associated with locally high levels of contaminants)*
5. *Chronic human illness*



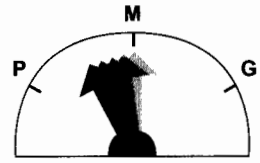
Coastal Wetlands

Overall State of the Great Lakes Coastal Wetlands Ecosystems



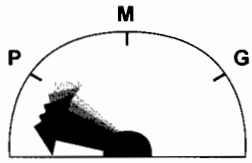
Preserve or Restore Wetland Area:

1. *Wetland size or abundance - Upper Lakes*



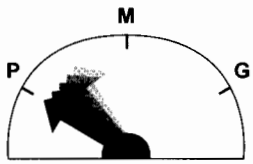
Mixed/Deteriorating

2. *Wetland size or abundance - Lower Lakes*
3. *Land use adjacent to wetland*
4. *Land use changes, encroachment, and development*



Poor/Deteriorating

5. *Shoreline modification*

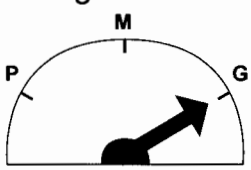


Poor–Mixed/Deteriorating

Preserve or Restore Wetland Quality:

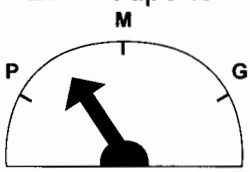
1. *Water level fluctuation*

Unregulated lakes



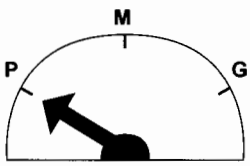
Good/Stable

Lake Superior



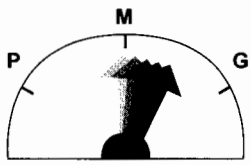
Poor–Mixed/Stable

Lake Ontario



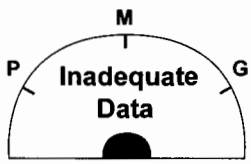
Poor/Stable

2. *Levels of nutrients and persistent toxic substances*



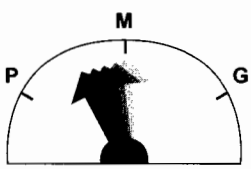
Mixed/Improving

3. *Protection from erosive forces*



Preserve or Restore Health of the Habitat:

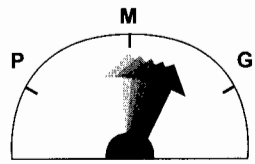
1. *Status of plant communities*
2. *Status of individual plant species*



Mixed/Deteriorating

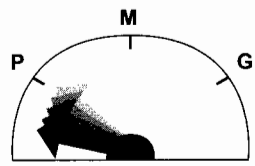
Preserve or Restore Healthy Fish and Wildlife Populations:

1. *Concentration of persistent toxic substances in biota*



Mixed/Improving

2. *Effect of exotic species*

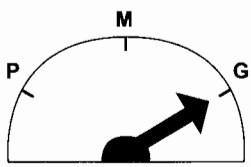


Poor/Deteriorating

Land by the Lakes - Nearshore Terrestrial Ecosystems

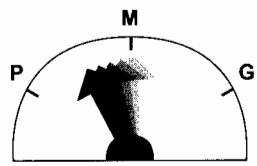
1. *Retention of shoreline species and/or communities*

Lake Superior



Good/Stable

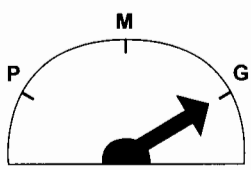
Remaining Lakes



Mixed/Deteriorating

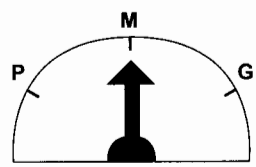
2. *Retention of natural shoreline processes (un-armored shoreline)*

Lake Superior



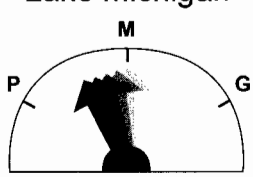
Good/Stable

Lake Huron



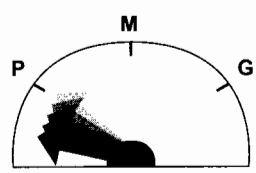
Mixed/Stable

Lake Michigan



Mixed/Deteriorating

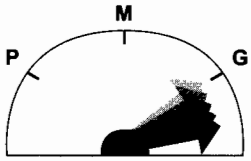
Lakes St. Clair, Erie and Ontario



Poor/Deteriorating

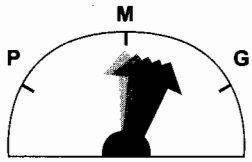
3. *Representation of biodiversity in lakeshore parks and protected areas*

Lake Superior



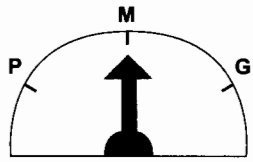
Good/Improving

Lake Huron



Mixed/Improving

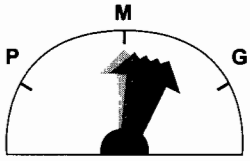
Remaining Lakes



Mixed/Stable

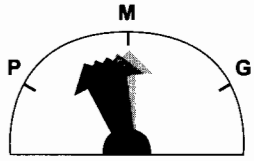
4. *Gains in biodiversity investment areas*

Lakes Superior & Michigan



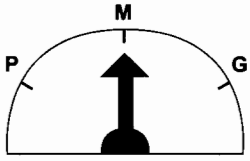
Mixed/Improving

Lake Huron



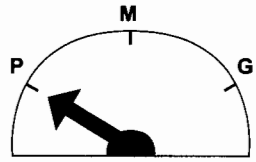
Mixed/Deteriorating

Lake Ontario



Mixed/Stable

Lakes St. Clair & Erie

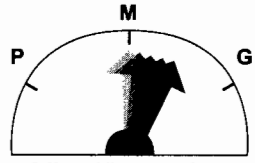


Poor/Stable

Land Use Stressors

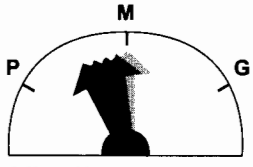
Efficient Urban Development:

1. *Recreation opportunities (number & area of parks)*
2. *Wastewater quality (based on nutrient & toxic loadings)*
3. *Industrial water use*



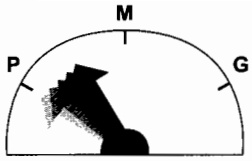
Mixed/Improving

4. *Center-town economy (based on fiscal condition, vacancies, etc.)*



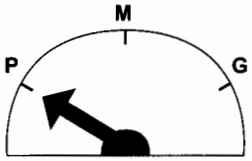
Mixed/Deteriorating

5. *Energy use (per capita)*
6. *Waste created (residential & industrial)*



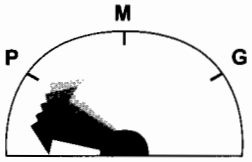
Poor/Improving

7. *Urban population density*
8. *Brownfields (number & area)*
9. *Residential water use*



Poor/Stable

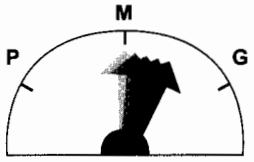
10. *Suburban land conversion*
11. *Traffic congestion*
12. *Transit use*



Poor/Deteriorating

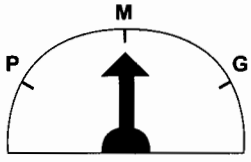
Protection of Human Health:

1. *Sewage quality (based on nutrient & toxic loadings)*
2. *Pollution-prevention programs*
3. *Fish advisories*
4. *Outdoor recreation (based on opportunities & participation)*



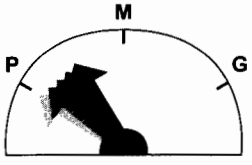
Mixed/Improving

5. *Land-fill capacity*
6. *Respiratory illness (based on hospital admissions & death records)*



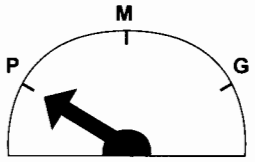
Mixed/Stable

7. *Air pollution levels (based on particulates & ozone levels)*



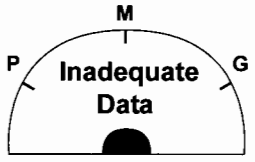
Poor/Improving

8. *Stormwater quality (based on nutrient & toxic loadings)*



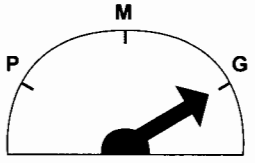
Poor/Stable

9. *Beach closings (number of unswimmable days)*



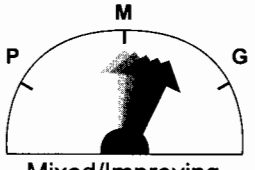
Protection of Resource Health:

1. *Hunting pressure*



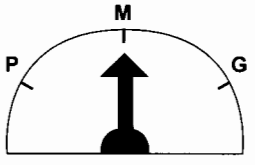
Good/Stable

2. *Agriculture pesticide/fertilizer use*
3. *Conservation tillage*
4. *Contaminated sites (area & number)*



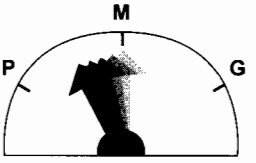
Mixed/Improving

5. *Wildlife populations*
6. *Forest clearing (based on cutting rates), replanting and renewal*
7. *Mineral extraction*



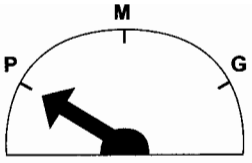
Mixed/Stable

8. *Wetland habitat (number & area)*
9. *Fishing pressure*
10. *Groundwater quality (based on area/number of contaminated wells)*



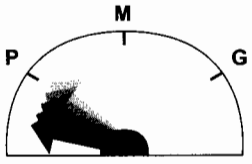
Mixed/Deteriorating

11. *Municipal pesticide/fertilizer (usage)*



Poor/Stable

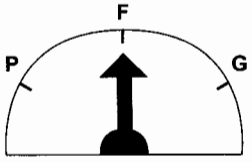
12. *Agricultural & natural land loss (area lost to rural development)*
13. *Hardening of land surface (based on area of roads & buildings)*
14. *Cottage & second homes (number per coastal area)*



Poor/Deteriorating

Information and Information Management

1. *Data coverage (how well data covers the Great Lakes nearshore area)*
2. *Data time frame (how recent the data are)*
3. *Data applicability (how well data can be used to measure the indicators discussed above)*
4. *Data usability (how well data can be used across disciplines)*



Fair

ANALYSIS OF THE LAKES AND CONNECTING CHANNELS

1. Lake Superior

- Lake Superior is the only lake in which the overall health of the nearshore terrestrial zone was rated positively.

- Development pressures are not as intense in the Lake Superior basin as they are in the other Great Lake basins, and the land use activities in the Lake basin have had a relatively low impact on Lake Superior's nearshore ecosystem. However, shoreline development on the U.S. portions of the north shore is increasing rapidly.

- Non-point source pollution deposited from the atmosphere is a large source of pollution in Lake Superior, and it has been determined that non-point sources actually have a bigger influence over nearshore water quality in the Lake than do point sources. Atmospheric sources account for 93% of total mercury, and 98.8% of PCBs loadings to the Lake.

- The lake trout fishery is now maintained through natural reproduction from wild fish. This represents the first successful rehabilitation of lake trout stocks in the Great Lakes.

- Ongoing control of the sea lamprey continues to be very important to ensure the preservation of lake trout stocks.

- Lake Superior's coastal wetlands are in comparatively good condition, and less affected by human stressors than those of the other Great Lakes. However, some local areas are degraded and regulation of lake levels is having negative effect on coastal wetlands lakewide.

2. Lake Michigan

- Lake Michigan is the most diverse of any of the Lakes. Its shoreline changes continuously from one major landform to another, with each major type extending for hundreds of miles.

- Lake Michigan's coast contains about 40%of all U.S. Great Lakes coastal wetlands. These wetlands are as equally diverse as the shoreline.

- Contributors of point source pollution include paper mills in the northern basin, and steel related industry in the south. However, in the past two decades, implementation of pollution control policies have dramatically reduced the amount of pollution being discharged from these sources, and currently non-point pollution sources are the primary cause of degraded water and air quality in the basin.

- Spawning and fry production by stocked fish have been recorded at several locations, and wild yearling and older lake trout have also been found in the Lake. Substantial numbers of adult wild lake trout have not been produced as yet.

- The predominant development trend in the Lake Michigan basin is continued low-density sprawl which consumes vast amounts of agricultural lands and open space. Counties in the eastern Lake Michigan basin, for example, experienced reductions in farmland acreage from 7 to more than 15% from 1982 to 1992, exceeding the average loss rates for the State of Michigan during that period (7.8%).

- The Lake Michigan basin economy supports more than twice as many jobs as the next largest economy among Great Lakes basins (Lake Erie). The basin has the most manufacturing jobs among the individual Great Lakes basins, but employment in the sector has been declining while employment in the service sector has been on the rise. Between 1970 and 1990, the service sector in Lake Michigan's drainage basin grew nearly 100%, and today, over 2 million service jobs are located there.

3. Lake Huron

- Lake Huron boasts the only Area of Concern that has been delisted to date - Collingwood Harbour, Ontario.

- Within the last ten years, along the Canadian shore of Lake Huron, there has been incremental and site-specific loss of wetland area from agricultural encroachment and cottage development.

- The fish community in Lake Huron is recovering after decades of overharvest and the effects of introduced species, but remains unstable. Modest numbers of stocked lake trout are reproducing in the Lake, and populations of whitefish are more abundant than at any other time in this century. Starting in the 1980s, the sea lamprey increased in abundance in the northern end of the Lake, imposing high mortality on lake trout and reversing gains that had been made in lake trout restoration in that area.

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4. Lake Erie

- Of all the Great Lakes, Lake Erie is exposed to the greatest stress from both urbanization and agriculture. The Lake Erie basin has the largest percentage of land use in agriculture of any Lake basin, but agriculture is experiencing intense competition with other land uses, especially from urban sprawl and scattered rural development.

- The economies of the Lake Erie basin are markedly different in their range and type. They include the Detroit, Cleveland and Buffalo urban-industrial complex, rural agricultural villages, commercial and recreational fisheries, and the water-based cottage and recreational industry. Along the shoreline itself, except for metropolitan areas, the economy is generally driven by recreation and tourism including cottages, marinas, and fishing.

- Lake Erie has shown low concentrations of toxic contaminants in water and fish. This is due to the sedimentation of fine soil particles and algae, which tend to adsorb pollutants from the water.

- Beaches all along the shoreline have experienced high bacterial levels leading to closures, but those in the Western and Central Lake basins are particularly affected.

- The near total removal of native vegetation from the basin and the severe exploitation of fisheries followed by exotic species invasions have devastated the original aquatic community of the Lake.

- The long-term impact of exotic species, such as zebra mussels, is unknown. Although mussels have increased water clarity by approximately 75% between 1988 and 1991, their feeding habits have led to large changes in the food web which may result in undesirable changes in fish species populations.

- They are also suppressing and may be completely destroying populations of native mussels. In addition, blooms of blue green algae have started to occur in Western Lake Erie. This may be the result of zebra mussels causing an imbalanced ecosystem.

- The round goby, another exotic fish species, has now expanded its range into Lake Erie.

- The coastal wetlands of Lake Erie support the largest diversity of plant and wildlife species in the Great Lakes.

- The status of 34 species of Lake Erie fish is are either rare, threatened, endangered, extirpated, extinct, or of special concern. Lake whitefish, however, are continuing to recover and walleye and yellow perch are intensively managed to provide productive recreational and commercial fisheries in the U.S. and Canada.

5. Lake Ontario

- Wetlands of Lake Ontario have suffered severe loss over the last two centuries. The main causes have been agricultural drainage and urban encroachment.

- A major source of stress to Lake Ontario coastal wetlands is lack of normal water level fluctuation. Water levels have been regulated in the Lake since the construction of the St. Lawrence Seaway in 1959. Prior to regulation, the range of water level fluctuations during the 20th century was about 2 meters (6.5 feet). However, since 1976 the range has been reduced to about 0.9 meters (2.9 feet).

- The fish community has improved considerably from a low point in the 1960s. Alewife and rainbow smelt abundance declined in the 1980s in response to increased trout and salmon predation and less nutrients in the Lake. In the 1990s, stocking of trout and salmon was reduced to bring them into better balance with their food supply. Lake whitefish, were nearly absent in the 1970s, but began increasing in the 1980s, and were 30- to 40- fold more abundant in the 1990s than in the 1970s. In addition in 1995, lake trout which had been eliminated from the Lake by sea lamprey, habitat loss and overfishing, began to reproduce naturally after an absence of some 45 years.

- The most significant land use change in the Lake Ontario basin for the past forty years has been, and continues to be, the urban expansion of the Greater Toronto Area. Low net population growth has been replaced by suburban and rural expansion, extension of the urban fringe, and development of adjacent rural areas.

6. Connecting Channels

- The connecting channels of the Great Lakes consist of the St. Marys River, the St. Clair River, Lake St. Clair, the Detroit River, the Niagara River and the St. Lawrence River. They are the vital links between the Lakes carrying the surface-water outflow from one Great Lake to the next and are nearly always considered "nearshore".

- The connecting channels are affected by the impacts of urbanization, industry and agriculture, as well as the impacts of physical alterations for shipping, water level management and power generation. Connecting channels are often the most heavily utilized areas by humans within the basin, causing impaired habitat in all, and contaminated sediments in most. Therefore, part or all of each connecting channel has been designated as an Area of Concern.

- In many cases, shoreline hardening (such as bulkheading and diking) is the common solution to erosion. Where this hardening occurs adjacent to remaining wetlands, it restricts their connection to upland habitats and limits the landward migration of wetlands during high water periods. This causes a backstopping effect, reducing the size and diversity of wetland communities.

- About half the wetlands in Lake St. Clair and the St. Clair Delta have been diked. Recreational and urban developments also fragment the remaining habitats.

- Many connecting channel wetlands have been identified as significant areas of waterfowl production in the Great Lakes basin, are important migratory staging areas and are used as habitat or breeding areas by other birds (non-waterfowl). The St. Clair River Delta has been identified as one of the most significant areas for waterfowl production, staging and migration in the Great Lakes.

OVERALL MANAGEMENT CHALLENGES

The fundamental challenge is to be able to understand that the nearshore is an ecosystem, and to obtain enough relevant information to make informed decisions. Although the ecosystem is complex, there is an urgent need to agree upon the present state, desired states, and the key steps needed to attain what is desired.

Information: The challenge is to develop a common set of indicators and then to bring together available information on the state of the nearshore ecosystem into accessible formats and systems.

Ecosystem Integrity: The challenge is to integrate the concepts of biodiversity and habitat into existing programs traditionally devoted to pollution control or natural resource management for harvest.

Integrative Management: The challenge is to integrate LaMPs (Lakewide Management Plans), RAPs (Remedial Action Plans), fisheries management plans, and other planning activities so that they become fully viable management mechanisms, useful for decision-makers throughout the Great Lakes basin ecosystem in taking action and assessing results.

Efficient Land Use: The challenge is to find ways to promote efficient land use, and land use that is protective of high value habitat.

Priority Areas: The challenge is to identify areas of unusual importance to the health and integrity of the Great Lakes ecosystem for priority attention.

Indicators: The challenge is to develop easily understood agreed-upon indicators to support an understanding of the state of the system and to obtain wide-spread agreement on what needs to be done to measure progress.

Research and Monitoring: 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; the implications on the fishery of changing the amount of phosphorus entering the lakes; and the subtle effects of long-term exposure to toxic substances on humans and wildlife. Prioritizing research will also help determine monitoring programs.

Sustainability: The challenge is to create ways of life and communities within which we humans prosper while our actions restore the natural life support system upon which all life and prosperity depends.

THE FUTURE OF SOLEC

- SOLEC will convene every two years to provide information on the state of the Great Lakes ecosystem.
- SOLEC 98 will be held in Buffalo, New York, in October, 1998.
- SOLEC 98 is being designed around an indicators theme and seeks to develop Great Lakes indicators that can be used by managers to track progress in overall ecosystem health.