SOLEC 2002

State of the Lakes Ecosystem Conference

U.S. EPA - Courtesey of Minnesota Extension Service

SOLEC 2002

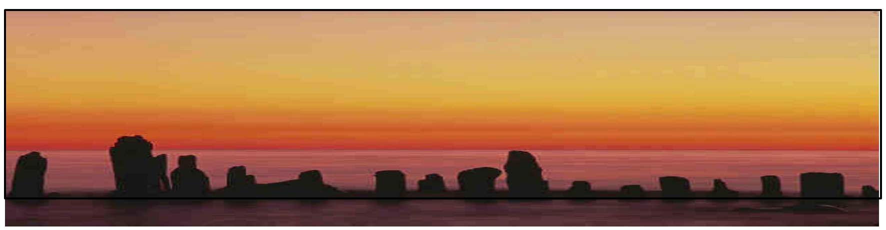
State of the Lakes Ecosystem Conference 2002
Biological Integrity of the Great Lakes

Overview

As parties to the Great Lakes Water Quality Agreement, the governments of Canada and the United States are responsible for accurate reporting on the state of the Great Lakes. The State of the Lakes Ecosystem Conference is a result of this commitment for reporting. With the establishment of a consistent suite of ecosystem indicators, the health of the Great Lakes basin can be objectively assessed. Regular reporting of a core set of indicators will promote more efficient and successful management as well as creating more accessible information for policy makers and the public.

The first two conferences in 1994 and 1996 developed a series of *ad hoc* indicators to evaluate the state of various Great Lakes ecosystem components. SOLEC 98 went beyond the previous SOLECs and presented a comprehensive list of ecosystem indicators for review and discussion. This suite of indicators objectively represents the state of the Lakes while establishing consistent biennial reporting. SOLEC 2000 began the actual assessment of the state of the Great Lakes using the suite of indicators.

SOLEC 2002 will focus on continuing to update and assess the state of the Great Lakes using the suite of indicators with an emphasis on biological integrity.



U.S. EPA - Courtesy of Michigan Travel Bureau

Biological Integrity

The theme for SOLEC 2002 is biological integrity; "Integrity" is not specifically defined in the Great Lakes Water Quality Agreement (GLWQA), therefore the following definition will be used during SOLEC 2002:

> *"biological integrity is the capacity to support and maintain a balanced integrated and adaptive biological system having the full range of elements (the form) and processes (the function) expected in a region's natural habitat."*
>
> -by James R. Karr, modified by Douglas P. Dodge

The challenge for SOLEC 2002 and beyond, is to prepare a list of indicators that integrate information collected at all trophic levels in the basin. This integration will provide indicators to measure the state of biological integrity in the Great Lakes.

Indicator Assessment*

SOLEC Assessment Scheme

- Good
- Mixed, Improving
- Mixed
- Mixed, Deteriorating
- Poor

This executive summary presents assessments on 19 of the 45 indicators from the following categories: (1) ecosystem health (2) human health (3) chemical/ physical and biological stressors and (4) human response/activities. The authors of the indicator reports were asked to assess, in his or her best professional judgment, the overall status of the ecosystem component in relation to established endpoints or ecosystem objectives, when available. Five broad categories were used:

GOOD – the state of the ecosystem component is presently meeting ecosystem objectives or otherwise is in acceptable condition.

MIXED, IMPROVING – the ecosystem component displays both good and degraded features, but overall, conditions are improving toward an acceptable state.

MIXED – the state of the ecosystem component has some features that are in good condition and some features that are degraded, perhaps differing between lake basins.

MIXED, DETERIORATING – the ecosystem component displays both good and degraded features, but overall, conditions are deteriorating away from an acceptable state.

POOR - the ecosystem component is severely negatively impacted and does not display even minimal acceptable conditions.

*** The assessments are extracted from the <u>2002 Implementing Indicators Report</u> which is avaliable at SOLEC 2002.**

Management Challenges

HABITAT ALTERATIONS

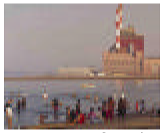
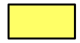
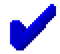
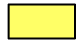
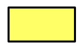
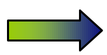
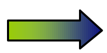
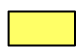
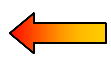
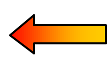
- Encourage place-based stewardship activities
- Control suburban sprawl; minimize human habitation impacts
- Identify, protect, rehabilitate critical habitats, both aquatic and terrestrial

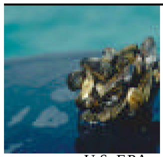
CONTAMINANTS AND PATHOGENS

- Emphasize agricultural best management practices
- Foster contaminant reducing activities, mass transit; energy efficiency; recycling
- Encourage brownfield redevelopment

NON-NATIVE SPECIES

- Understand relationship between economic well being and increased threat of introducing non-native species
- Prevent non-native species introductions
- Continue maintenance of sea lamprey control

	Indicator	Ecosystem Objective	Assessment	State of the Ecosystem
Human Health  U.S. EPA	*E.coli* and Fecal Coliform Levels in Nearshore Recreational Waters	• Waters used for recreational activities involving bodily contact should be substantially free from pathogens, including bacteria, parasites and viruses, that may harm human health		• Recreational waters have become contaminated with animal and human feces from sources such as combined sewer overflows, that occur in certain areas after heavy rains, agricultural runoff and poorly treated sewage • From 1998-2000 both U.S. and Canada, showed some variation in beach closures as a result of changing sampling regimes. • It has been observed in the Great Lakes basin that unless new contaminant sources are removed or introduced, beaches tend to respond with similar bacterial levels after events with similar precipitation and meteorological conditions
	Drinking Water Quality	• To have all treated drinking water safe to drink and free from chemical and microbial contaminants		• Overall the quality of the drinking water in the Great Lakes basin is good. This is in large part due to our current technologies • Minimal risk of human exposure to chemical contaminants • Turbidity levels are declining in source water • Total coliform and *E.coli* levels are highest in raw waters especially during the spring, summer and early fall
	Air Quality	• Air should be safe to breathe, and thus air quality in the Great Lakes ecosystem should be improved and protected		• Overall there has been significant progress in reducing air pollution in the Great Lakes basin • For most substances of interest, both emissions and ambient concentrations have decreased over the last 10 years or more, however these concentrations depend on weather and climate conditions
	Chemical Contaminants in Edible Fish Tissue	• The health of humans in the Great Lakes ecosystem should not be at risk from contaminants of human origin. Fish and wildlife in the Great Lakes ecosystem should be safe to eat; consumption should not be limited by contaminants of human origin.		• Since the 1970s, there have been declines in many persistent bioaccumulative toxic (PBT) chemicals in the Great Lakes basin • However, PBT chemicals, because of their ability to bioaccumulate and persist in the environment, continue to be a significant concern • Fish Consumption Advisory Programs are well established in the Great Lakes. All jurisdictions have extensive fish contaminant monitoring programs and issue advice to their residents about how much fish and which fish are safe to eat
Ecosystem Health	Walleye	• To restore and protect historically important, mesotrophic habitats that support natural stocks of walleye as the top predator fish		• Reductions in phosphorus loadings in the 1970's and fishery management programs in the 1980's both led to increased adult survival of Walleye, especially in Lake Erie • Declines after the mid 1990's through to 2001 occurred in most areas due to shifting environmental states and changing fisheries
	Hexagenia	• To restore and maintain a balanced, stable, and productive Great Lakes basin ecosystem with *Hexagenia* as the dominant, large, benthic invertebrate		• Historical declines in the abundance of *Hexagenia* in some Great Lakes habitats • Declines linked to eutrophication, low dissolved oxygen in bottom waters and pollution of bottom sediments • Strong recovery in western Lake Erie shows that properly implemented pollution controls can bring back recovery of a major Great Lakes mesotrophic ecosystem
	Sea Lamprey	• To control sea lamprey in supporting fish community objectives, in particular objectives for lake trout, the top native predator		• The first complete round of stream treatments with the lampricide TFM, as early as 1960 in Lake Superior, successfully suppressed sea lampreys to less than 10% of their pre-control abundance in all of the Great Lakes • Recent increases in sea lamprey in the Great Lakes have signaled a need for increased stream treatments; however it will take another 2-4 years to see any significant effect on lamprey populations
 U.S. EPA	Lake Trout	• To restore lake trout as a principal salmonine predator in the coldwater communities of the Great Lakes		• Lake trout abundance dramatically decreased in the Great Lakes after the introduction of sea lamprey • Rehabilitation will not be achieved until natural reproduction is established, and to date, sustained natural reproduction is only occurring in Lake Superior, and some areas of Lake Huron
	Diporeia	• To maintain a healthy, stable population of the benthic macroinvertebrate *Diporeia* in offshore regions of the main basins of the Great Lakes		• Populations are currently in a state of decline in portions of Lakes Michigan, Ontario, Huron and Eastern Lake Erie • In areas of the Lakes where *Diporeia* is still present, abundances are much lower than the 1970's and 1980's • Declines coincide with introduction of non-native mussel species
	Amphibian Diversity and Abundance	• To maintain diversity of Great Lakes wetland amphibian communities, and to sustain breeding amphibian populations across their historical species range		• Some amphibian populations are declining (American toad, Chorus Frog, and Green Frog), but this could be a natural periodic fluctuation. Only continued monitoring will tell us the real trend

	Indicator	Ecosystem Objective	Assessment	State of the Ecosystem
	Coastal Wetlands Area by Type	• Reverse the trend toward loss of Great Lakes coastal wetlands, ensuring adequate representation of wetland types across their historical range		• Wetlands continue to be lost and degraded, yet the ability to track and determine the extent and rate of this loss in a standardized way is not yet feasible • Efforts are under way to assess the use of remote sensing technologies to determine the extent of wetland loss.
Chemical / Physical and Biological Stressors	Phosphorus	• The goals of phosphorus control are to maintain an oligotrophic state in Lakes Superior, Huron and Michigan; and to maintain algal biomass below nuisance condition in Lakes Erie and Ontario		• Strong efforts begun in the 1970's to reduce phosphorus loadings have been successful in maintaining or reducing nutrient concentrations in the lakes, although high concentrations still occur in some local embayments, and in Lake Erie • Phosphorus loads have decreased due to changes in agricultural practices and improvements in sewage treatment • Average concentrations in open waters of Lakes Superior, Michigan, Huron and Ontario are at or below target levels
	Contaminants in Snapping Turtle Eggs	• To assess the sensitivity of wildlife species to contaminants		• Snapping turtle eggs with the highest contaminant levels also show the poorest developmental success • Contaminant levels decreased in snapping turtle eggs from 1984 to 1999, except for two Lake Ontario sites, Cootes Paradise and Lynde Creek
	Contaminants Affecting Productivity of Bald Eagles	• To assess the potential harm to wildlife eating contaminated prey, and to assess the success rates of nesting attempts and the number of developmental deformities in young bald eagles		• Concentrations of organochlorine chemicals are decreasing or stable but still above No Observable Adverse Effect Concentrations (NOAEC's) for the primary organic contaminants DDE and PCBs • The number of bald eagle territories has increased markedly from the population decline caused by DDE • The percentage of nests producing one or more fledglings and the number of young produced per territory have risen • Established territories in most areas are now producing one or more young per territory indicating that the population is healthy and capable of increasing; recently, an active territory was also reported from Lake Ontario
 U.S. EPA	Non-Native Species	• Reporting non-native species introductions into the Great Lakes ecosystem will highlight the need for more effective safeguards to prevent the introduction and establishment of new non-native species		• Since the 1830s, there have been 63 non-native aquatic animal (fauna) species introduced into the Great Lakes • In almost the same time frame there have been 83 non-native aquatic plant species (flora) introduced into the Great Lakes ecosystem • Ship ballast water is the major vector transporting unwanted organisms into the Great Lakes
	Contaminants in Whole Fish	• Great Lakes waters should be free of toxic substances that are harmful to fish and wildlife populations and the consumers of these biota		• Since the late 1970's levels of historically regulated contaminants in such as PCBs, DDT and Hg have generally declined in most fish species monitored
Human Responses / Activities	Mass Transportation	• To promote sustainable development by increasing public transit use, to decrease pollution emissions and energy consumption		• The observed trend from transit authorities in Ontario from 1993-2000 shows an increase in public transit ridership in established urban areas in Southern Ontario, but the converse for rural areas of Northern Ontario • Visible increase in ridership for transit agencies serving inter-regional areas • Public transit ridership increases with increased urban density • U.S. public transit ridership has remained relatively constant from 1996 to 2000, with Chicago having the largest percent of transit use
	Water Use	• To promote sustainable development, by advocating resource conservation specifically to reduce the amount of water used and the amount of wastewater generated in the Great Lakes basin		• Per capita municipal water use in Canadian municipalities has decreased by 15% from 1983-1999, where as the U.S. per capita use has increased by 10% from 1985-1995 • By category hydroelectric use continues to be the largest; residential, commercial and industrial water use increased by ~50% in the Canadian side of the Great Lakes basin from 1983-1999
 UK Department of Environment, Transport and Regions	Solid Waste Generation	• In order to promote sustainable development, the amount of solid waste generated, which provides a measure of the inefficiency of human land based activities, needs to be reduced		• In Ontario the per capita municipal solid waste generation (MSWG) has decreased ~45% from 1991 to 2001 • MSWG in Minnesota has increased by ~10% from 1994 to 2000 • At the same time the amount of residential recycling in Ontario has increased 41% from 1992-2000