

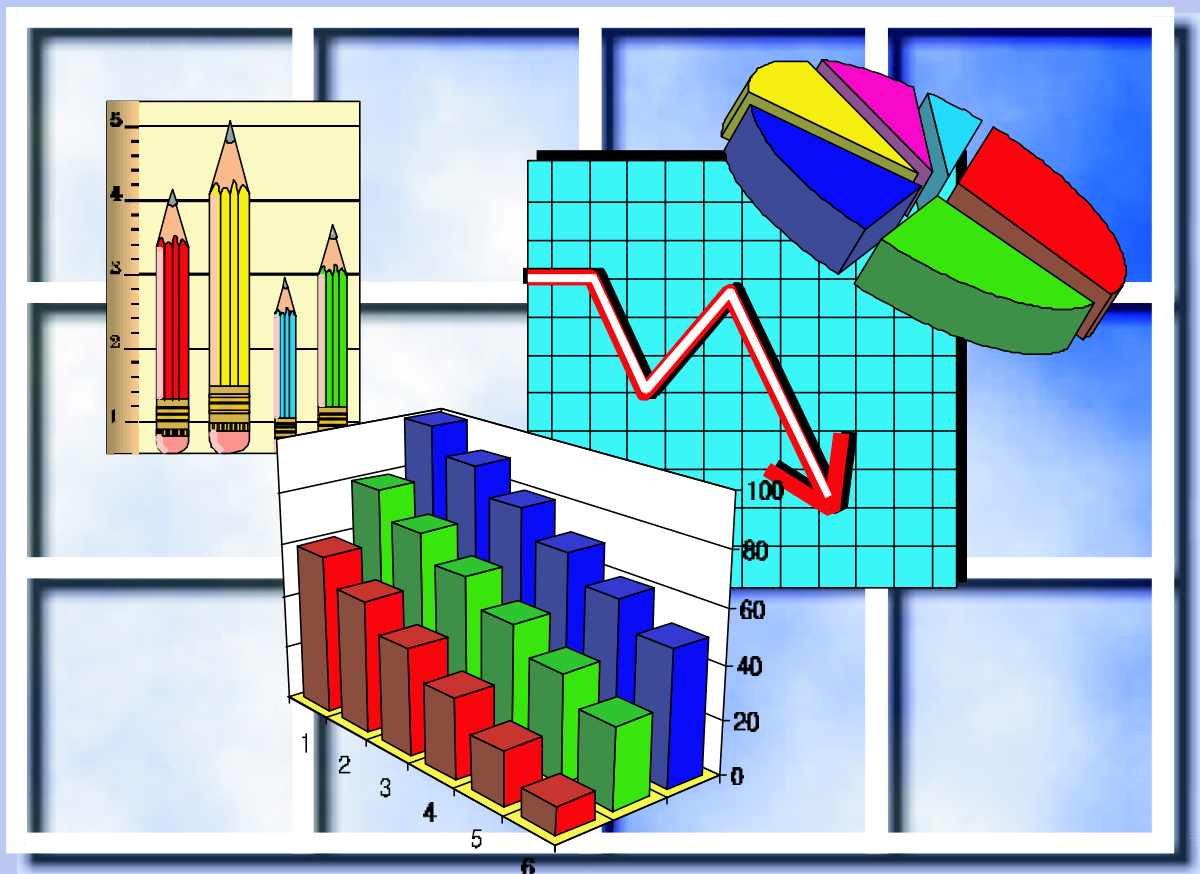


Environment  
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# The **ABC's** Of Indicators



# A PRIMER ON DEVELOPING AND USING INDICATORS

## Assessing Progress

The Great Lakes Water Quality Agreement (GLWQA) sets out the commitment of the United States and Canada to “restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes basin ecosystem”. The governments have been working towards achieving this vision over the past 25 years. The first GLWQA was signed in 1972 and focused on control of nutrients. In 1978, the GLWQA was renegotiated, with a focus on persistent toxic chemicals. The terms “virtual elimination” and “zero discharge” entered the vocabulary of Great Lakes managers, scientists, and citizens, as a lofty goal towards which we all need to strive. Finally in 1987, the 1978 GLWQA was amended, and called for the development of indicators of ecosystem health.

Billions of dollars have been invested by the two countries to improve the health of the Great Lakes and to strive towards the Agreement’s goals. Policies, regulations and programs have been developed to address the complex problems facing the Lakes,

including: nutrient pollution, persistent toxic chemicals, habitat destruction, loss of native species and introduction of exotic ones, shoreline alterations, atmospheric deposition of pollutants, and many others.

What is needed is an easily understood way of reporting on progress. A comprehensive set of Great Lakes indicators will help assess progress towards the binational commitment in the GLWQA, and determine how much farther we have to go to meet the goals of the Agreement.



## What is an indicator?

An indicator is a piece of evidence or signal that tells us something about the conditions around us. It is a tool which provides information about the state of large systems – such as the environment, the economy, the weather, or even human

health. It gives a clue about the “bigger picture” by looking at a small piece of the puzzle, or at several pieces together.

To a sailor or a pilot, for example, atmospheric pressure is an indicator of the weather. To a doctor, blood pressure provides a clue about the overall health of a patient. To an economist, Gross Domestic Product (GDP) gives a snapshot of the state of a country’s economy.

Each of these indicators provides information about conditions at a particular point in time. To be really useful, however, we need indicators to give us information about trends over time. Is the barometric pressure rising, falling or staying the same? Is our blood pressure higher or lower than it was the last time we visited the doctor? Is the GDP growing or shrinking?

One of the best ways to track trends in the condition of a *system* is through the development and use of a set or “suite” of indicators. By looking at a number of indicators together, we can see which way a *system* is going: up or down, forward or backward. We can then assess whether it is getting better or worse or staying the same.

# FOR THE GREAT LAKES BASIN ECOSYSTEM

## Why do we need indicators for the Great Lakes basin ecosystem?

Simply put, we need Great Lakes indicators because it is only through a comprehensive set of environmental indicators that we can get a “big picture” perspective on the state of the entire system.

Assessing the health of something as big and complex as the Great Lakes basin ecosystem, which contains one fifth of the world’s fresh water, 10,000 miles (16,000 kilometres) of shoreline, and 33.5 million residents, is a significant challenge. No one organization has the resources or the mandate to examine the state of the entire system. However, dozens of organizations and thousands of individuals routinely collect data, analyze it, and report on parts of the ecosystem.

Developing a set of Great Lakes indicators will enable the Great Lakes community – government and non-government organizations, industry and individual citizens – to work together within a consistent framework to assess and monitor changes in the state of the Great Lakes basin ecosystem.

## How will Great Lakes indicators be used?

Through the development and use of a set of indicators for the Great Lakes basin ecosystem, we can:

- assess changes in the state of the ecosystem and progress towards achieving the goals of the GLWQA;
- understand better how our actions affect the ecosystem, and determine the types of programs, policies or regulations needed to address the environmental impacts;
- gain a clearer understanding of existing (and emerging) environmental problems and their solutions;
- provide information that will help managers better assess the success of current programs and provide a rationale for future ones; and
- provide information that will help set priorities for research, data collection, monitoring and clean-up programs.

### GLOSSARY

**Goal:** A condition or state desired to be brought about through a course of action or program. Goals are usually qualitative statements that provide direction for plans and projects. Goals are not specific numerical limitations, but conditions or states which can be obtained through careful planning and implementation.

**Indicator:** In the context of SOLEC, it is a measurable feature (or features) that provides outcome-oriented, managerially and scientifically useful evidence of environmental and ecosystem quality or reliable evidence of trends in quality.

**Lakewide Management Plans (LaMPs):** A comprehensive strategy developed jointly by the United States and Canada to restore and protect

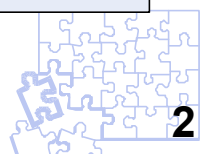
beneficial uses in the open waters of each Great Lake.

**Objective:** Specific descriptions of the state or condition that must be met in order to achieve goals and vision.

**Remedial Action Plans (RAPs):** Plans that embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern throughout the Great Lakes ecosystem basin.

**Target (or endpoint):** Specific, attainable, quantitative endpoints for indicators that determine achievement of objectives.

**Vision:** A general description of the desired state of a lake, geographical area, or region that is expressed by a group of stakeholders. A vision statement provides a description of a desired state – it provides direction and establishes a horizon to be sought.



# A PRIMER ON DEVELOPING AND USING INDICATORS

## An Example of a Great Lakes Indicator

In order to understand how we use indicators, it is important to see how indicators fit into the hierarchy of a vision, goals, objectives and targets for the ecosystem.

The GLWQA sets an overall **vision** that we will “restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes basin ecosystem.” The Agreement also sets a **goal** (called a General Objective) that the waters should be “free from nutrients...in

**The indicator**, phosphorus concentration in the waters, tells us something about the Lakes in relation to the objective. Scientists have estimated that if Lake Erie received 11,000 tonnes of phosphorus per year, the concentration of phosphorus in the Lake’s central basin would be measurable at about 10 parts per billion. This concentration, then, is the **target** or **end point** for the indicator. It provides a frame of reference to evaluate the **measurement** of phosphorus concentrations. Therefore, knowledge of the concentration of phosphorus in the waters of the Great Lakes can help us assess progress towards achieving the GLWQA vision, goals and objectives.

**What are the main considerations in selecting Great Lakes indicators?**

When we are looking for indicators to give us information on complex systems – such as the Great Lakes basin ecosystem – there are several key considerations.

The most important of these are identifying a model or framework for indicator development, keeping an “ecosystem perspective”, and establishing criteria for indicator selection.



One potential indicator to assess the health of the nearshore and open water areas of the Great Lakes is the concentration of phosphorus in the water. High levels of phosphorus can accelerate the natural aging of a lake, lead to nuisance blooms of algae, depletion of oxygen in water, and other problems.

amounts that create growths of aquatic life that interfere with beneficial uses.” Annex 3 of the Agreement lists specific **objectives** for the annual loading of phosphorus to each of the Great Lakes (e.g. 11,000 tonnes for Lake Erie). If the annual loadings are no more than these specified amounts, the Lakes would be expected to be free of nuisance growths of algae.



## Model for Indicator Development

One model for developing environmental indicators is the “State-Pressure-Activities” model. The underlying concept for this model is that human actions create pressures on the environment around us, leading to changes in the state or conditions in the environment, which in turn leads us to respond with various activities to reduce the impacts of our actions. Using the model as a starting point, indicators are developed for each of the three components:

**State:** Indicators can help us assess the state of the environment by providing information to answer questions that concern us such as: Can we eat the fish? Can we swim at the beaches? Can we drink the water? Is the ecosystem healthy and functioning as we would expect?

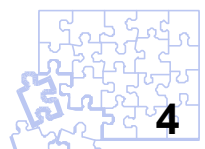
**Pressure:** Human actions – how we build, how we alter or degrade the environment, the resources we consume – can have a dramatic, and sometimes irreversible effect on the state of the environment. For this reason, we use indicators to give us information about the

pressures we put on the environment through our actions. Some common examples of these pressures are the amount of pollutants discharged to the environment, the rate of urbanization, the presence of exotic species such as zebra mussels, and the amount of wetlands filled in.

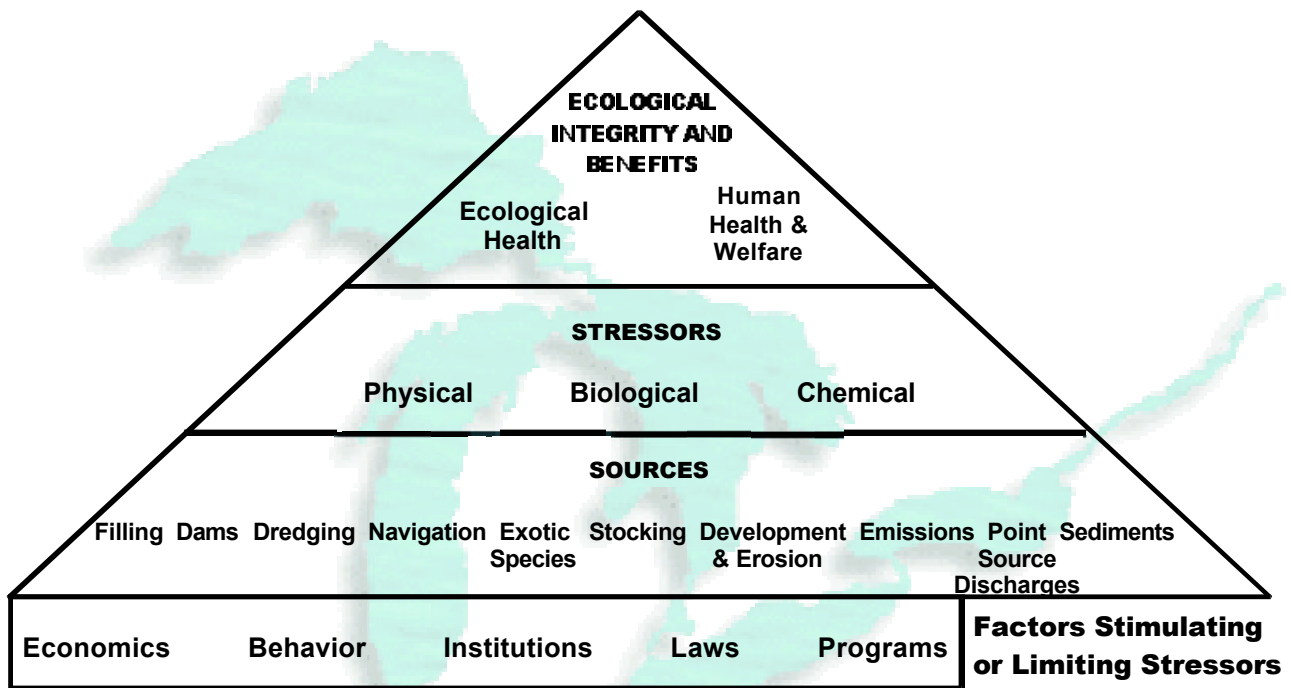
**Activities:** Indicators that address societal responses give us valuable information about what we are doing to prevent, reduce or eliminate the stresses, and whether we are achieving what we set out to do. Are sewage treatment plants meeting the targets laid down in regulations? Have we met local targets for restoring wildlife habitat? Are we teaching young people about the environment through our schools? Have municipalities adopted and implemented sediment control programs to reduce erosion from construction sites?

## Keeping an “Ecosystem Perspective”

In addition to the “State-Pressure-Activities” model, it is important to keep an ecosystem perspective in developing indicators. One way of doing this is to view the ecosystem in layers, with human and aquatic health at the top as the highest level of ecosystem integrity. The second layer is the chemical, physical and biological environment, including the various stresses – such as chemical pollutants and exotic species – that affect the environment. The third layer consists of human activities which are the sources of the stresses. Programs to address the sources can be seen as part of this layer, or as an underlying fourth layer. In developing indicators, it is important that a full representative spectrum of indicators be selected to examine the state of all layers of the ecosystem.



# A PRIMER ON DEVELOPING AND USING INDICATORS



## Indicator Selection Criteria

A third key consideration in selecting indicators is the development of a list of factors or criteria that will be used to select the most appropriate indicators. Important factors that could be used to select a set of indicators for the Great Lakes basin ecosystem include:

**Necessary:** Are the indicators *necessary* to give us the information we need to assess the state of the ecosystem;

**Sufficient:** Will the indicators provide *sufficient* information to give a picture of the overall health of the ecosystem; and

**Feasible:** Is it *feasible* (economically and in terms of human resources) to collect measurement information needed for the indicators.

Other criteria which can be used to select indicators include: scientific validity, understandability, relevance, representativeness, interpretability, data availability, timeliness and cost considerations.

These criteria provide an effective basis for comparing various candidate indicators that could be included as part of the set of Great Lakes indicators. Those indicators that rate highly for all or most of the factors would be the best candidates for inclusion in the set.

# FOR THE GREAT LAKES BASIN ECOSYSTEM

## Why is it important to get agreement on indicators?

When agreement is reached on a common set of indicators for the Great Lakes basin ecosystem, a number of important benefits will follow. The set will:

- help focus government agencies' efforts related to Great Lakes data collection, research, monitoring and reporting, thus improving the allocation of government resources, and harmonizing activities;
- improve the quality of data and the ability to share information through the use of consistent protocols and common databases;
- create a better foundation for environmental managers and resource planners to assess

progress towards environmental management objectives, and to create programs, policies and regulations to meet these objectives; and

- provide the Great Lakes community, including the general public, with more consistent and effective reporting on the state of the Great Lakes and on progress towards achieving the goals of the GLWQA.

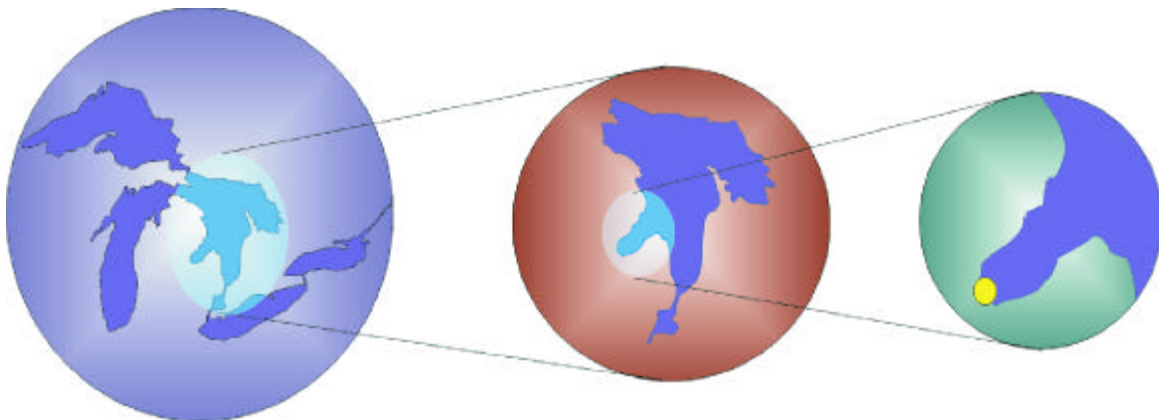
## What is the role of SOLEC in developing Great Lakes indicators?

The State of the Lakes Ecosystem Conference (SOLEC) was created by the United States and Canada to report every two years on the state of the Great Lakes basin ecosystem, and on progress made toward reaching the goals of the GLWQA. Through SOLEC, the governments of the United States and Canada are striving to establish a

consistent, easily understood set of candidate indicators that will enable effective reporting on the state of the Great Lakes and on progress toward GLWQA goals at the basin-wide scale.

These candidate indicators will be the subject of extensive review and discussion at SOLEC 98. Following the conference, a revised list of candidate indicators will be included as part of the binational State of the Lakes report, scheduled for release in the summer of 1999.

The SOLEC indicators will complement and build on the work done through Lakewide Management Plans (LaMPs) and Remedial Action Plans (RAPs) to develop indicators at the lake and local levels respectively. Similarly, SOLEC will draw upon the extensive work done by others, including the International Joint Commission and the Great Lakes Fishery Commission.



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