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EPA

Great Lakes Environmental Management Framework

An International Management Model For Environmental Protection

GREAT LAKES/NATIONAL ESTUARY PROGRAM TECHNOLOGY TRANSFER SERIES

Summary

The management framework for Great Lakes environmental programs has evolved from more than 80 years of interstate and international cooperation to protect the health and safety of people living in the Great Lakes region.

The framework focuses on *ecosystem management* to restore areas of concern to a full range of beneficial uses through cooperation on a number of governmental and geographic scales. Flexibility in the formal Great Lakes management framework has enabled the Great Lakes Water Quality Agreement to keep pace with the accelerating need to address new pollution threats, especially in the area of toxic substances. The current management framework provides a hierarchy of geographic focuses, from basin-wide goals, to special clean-up zones only a few acres in size.

This fact sheet describing the management framework of the Great Lakes National Program Office will be especially relevant to the needs of policy makers and staff involved in the early stages of organizing a National Estuary Program Management Conference or a Citizens Advisory Committee.

Introduction

The Great Lakes are the largest reservoir of freshwater in North America, constituting over 20% of the world's fresh surface water. Since the Boundary Waters Agreement of 1909, the United States and Canadian governments have formally cooperated to address problems of water quality and quantity all along their common border in the Great Lakes. This cooperation extends to a management program designed to monitor and control pollution and water quality on an international, basin-wide basis.

The agencies with lead responsibilities for implementing the coordinated pollution control program are the U.S. Environmental Protection Agency (EPA) and Environment Canada. Within EPA, Section 118 of the Clean Water Act (CWA) establishes the Great Lakes National Program Office (GLNPO) with responsibility for coordinating and reporting U.S. activity in support of the *Great Lakes Water Quality Agreement*.

The International Joint Commission (IJC) is authorized by the Boundary Waters Treaty and the Great Lakes Water Quality Agreement to provide independent, third party oversight of the activities of EPA and Environment Canada in the Great Lakes.

This fact sheet by the EPA Office of Marine and Estuarine Protection and the Great Lakes National Program Office describes GLNPO's *management framework* for this program. Other fact sheets cover key elements of the program in greater detail, including the use of the "mass balance" concept for lakewide management of major pollutants, and the multi-state (and international) fish monitoring program for measuring toxic chemicals in commercial and recreational fish species. An earlier fact sheet describes the Great Lakes National Program Office load management strategy for phosphorus.

Overview and Characteristics

The Great Lakes Basin contains 95% of the fresh surface water in North America; total water in the lakes exceeds 5,500 cubic miles. The Great Lakes drainage basin covers nearly 300,000 square miles in eight states and two provinces. It also contains the industrial heartland of both Canada and the United States, and is home to nearly 40 million people — 30% of the United States' population and nearly 70% of Canada's. Economic activity in the region exceeds $200 billion per year.

The pressure of population and industry has diminished water quality throughout the Great Lakes. Residents of the Great Lakes found their recreational, occupational and economic choices restricted by the loss of environmental quality, often the result of actions by people living hundreds of miles away, in another state or country. Examples dating back a generation or more include the infamous "burning rivers" (the Cuyahoga in Cleveland and Buffalo River in upstate New York), the destruction of commercial lake fisheries, and the predicted "death" through eutrophication of Lake Erie. Fortunately, a mechanism for addressing environmental issues of common concern throughout the Great Lakes Basin was already in place. The evolution of this institutional framework may serve as a model for other areas of the country to follow into the twenty-first century.

Historical Evolution

In 1909, the United States and Canada signed the Boundary Waters Treaty to provide principles of law governing uses of the international waters between the U.S. and Canada. The Treaty also created an international body (the International Joint Commission) to study and regulate their use. In signing the Treaty, Secretary of State Elihu Root stated:

> **We have undertaken this Treaty, with the consent of Great Britain, to create a commission which will enable Canada and ourselves to settle our own affairs to a very great degree without going through the long and serious circumlocution [of formal diplomacy].**

In 1964, as public awareness and concern grew about the deteriorating water quality and environmental conditions throughout the Great Lakes, the IJC was asked to recommend solutions for the most pressing problems. As a result of these and other recommendations, in 1972 the United States and Canada signed the Great Lakes Water Quality Agreement. This agreement provided the basic framework operating today to address water quality issues in the basin. The goal of the 1972 Agreement was to attain specified levels of water quality through the control or reversal of eutrophication. To achieve this goal the 1972 Agreement included a recommended program to limit the discharge of phosphorus to the lakes through proposals to ban phosphorus-containing detergents, and to impose strict standards on the effluent of municipal sewage treatment plants and industrial dischargers.

The agreement was revised in 1978, committing the U.S. and Canada to *restore* the "chemical, physical and biological integrity of the Great Lakes Basin Ecosystem." This ecosystem approach to management, and the formal commitment to "zero discharge" of persistent toxic substances are key elements of the current management framework. An ecosystem perspective requires a broad, systematic view of the interaction among the biological, chemical, and physical components of the Great Lakes Basin. The interdependence of life in the lakes and the chemical/physical characteristics of the water are used to define biological indicators to monitor water quality and changes in the aquatic ecosystem. For example, herring gull eggs are used as an indicator of toxic pollutants accumulating through the food chain.

In 1983 the agreement was refined to include the specification of levels of phosphorus in each major area of the lakes, including the definition of differential load reduction objectives for each area. This technically and politically difficult step marked the transition of the Water Quality Agreement from phosphorus discharge limits to more complicated system-wide water quality management and load reduction standards.

The Great Lakes Water Quality Agreement underwent major revisions to include specific management tasks in 1987. This shift committed the parties to action on managing toxics — it was a necessary complement to the 1978 shift from phosphorus and eutrophication to a broader focus on toxic chemicals. The main activities endorsed by the program recommended in the 1987 agreement include:

- Setting deadlines and establishing accountability for the achievement of objectives;
- Managing three lists of toxic substances, with varying priority, depending on actual or potential impact on the environment;
- Carrying out biennial reviews of the "Water Quality Objectives;"
- Identifying 14 categories of "beneficial use," which represent the biological and human health goals to be attained by the Water Quality Agreement;
- Designating 42 Areas of Concern (based on Water Quality Board nominations) and requiring "Remedial Action Plans," to restore these areas to beneficial uses; and
- Requiring Lakewide Management Plans for critical pollutants.

Great Lakes Environmental Management Chronology

1905 International Joint Commission: Management of Water Levels

1909 Boundary Waters Treaty: Study of Water Quality Problems

1912 IJC Recommendations for Water Treatment Programs

1964 IJC Study of Emerging Pollution Problems

1972 Great Lakes Water Quality Agreement

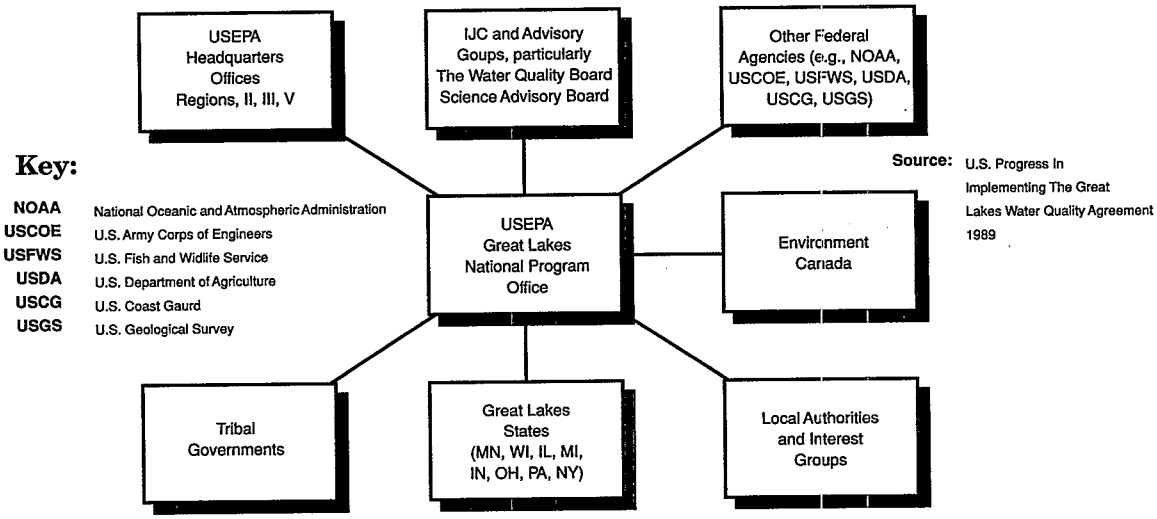
1978 Commitment to Restore Ecosystems.

1981 Designation of 42 Areas of Concern

1983 Specification of Phosphorus Loadings by Water Body.

1987 Integration of Lakewide Management Plans, Remedial Action Plans, and Point Source Impact Zones. Designated Management Goals.

Coordination Responsibilities of the Great Lakes National Program Office



Key:

NOAA	National Oceanic and Atmospheric Administration
USCOE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Widlife Service
USDA	U.S. Department of Agriculture
USCG	U.S. Coast Gaurd
USGS	U.S. Geological Survey

Source: U.S. Progress In Implementing The Great Lakes Water Quality Agreement 1989

being adopted for toxic pollutants in all of the Great Lakes. In this approach, the net inflow of target pollutants is measured for each lake. Input streams are then analyzed to determine the most cost-effective control tactics. Lakewide Management Programs can specify different levels of loading and load reduction for different parts of a lake.

There are Lakewide Management plans currently under development for Lake Ontario and Lake Michigan. The *Lake Michigan Toxic Pollutant Control/Reduction Strategy* is an agreement among EPA Region V and the states of Illinois, Indiana, Michigan, and Wisconsin to restore the multiple uses of Lake Michigan and to protect human health and the ecosystem by achieving significant reductions in toxic pollutants. The planning process for the lakewide strategy will define the levels of pollution and the mechanisms by which these reductions are to be achieved.

The *Lake Ontario Toxics Management Plan* is an agreement among Environment Canada, the Ontario Ministry of the Environment, U.S. EPA, and the New York State Department of Environmental Conservation. The goals of the plan, expressed in ecosystem terms, seek to protect the quality of lake water which provides safe drinking water, nurtures fish fit for human consumption, and provides a healthful environment for natural reproduction within the ecosystem of the most sensitive native species, such as eagles and otters.

A strength of the Great Lakes environmental management model is its flexibility and adaptability to changing conditions and information. Therefore, as experience is gained with the Lake Michigan and Lake Ontario programs, and as the International Joint Commission has the opportunity to review future proposals for Lakewide Management Programs, details of the organization and implementation of the Lakewide Management Programs can be expected to evolve.

3. Areas of Concern/Remedial Actions Plans (AOCs/RAPs)

Forty-two Areas of Concern were originally designated by the Water Quality Board in 1981. Areas of Concern are defined by significant degradation of one or more of fourteen "beneficial uses," which are defined in the Water Quality Agreement. These uses include: basic biological activity; direct human consumption, such as eating fish and using beaches; industrial water uses; or municipal water supplies. Most Areas of Concern are harbors or bays with substantial toxic pollution and sediments. Remedial Action Plans are the most completely developed components of the Great Lakes management framework.

For each Area of Concern, the affected states are required to produce a Remedial Action Plan that must be reviewed by the International Joint Commission. In

GLNPO Cooperating Institutions

- The International Joint Commission
  - Water Quality Board
  - Science Advisory Board
- Great Lakes Fisheries Commission
- The Great Lakes National Program Office
- Numerous Federal Agencies and Offices
  - NOAA
  - U.S. Fish and Wildlife Service
  - Food and Drug Administration
  - Army Corps of Engineers
  - USDA, etc.
- Operating and Regulatory Agencies of Eight States
- Thousands of Local Governments and Special Purpose Districts

1. International/Multi-Lake Programs

At its highest policy levels, the Great Lakes management framework addresses two different functional needs: (1) setting and monitoring attainment of water quality standards, which is the province of the International Joint Commission; and (2) coordinating participants and providing access to information generated by the program. In the United States, the Great Lakes National Program Office (GLNPO) of the U.S. Environmental Protection Agency performs this latter function, as formally established by the Clean Water Act of 1987.

The International Joint Commission

The International Joint Commission (IJC) has six members, three appointed by the Prime Minister of Canada and three by the President of the United States. The Commissioners of the IJC are assumed to be individuals acting on their own (representing *neither* their respective institutions *nor* their home government) who come together to make *recommendations* to the signers of the agreement. The Commission is responsible for overseeing the following :

- Proposals for the uses of boundary waters;
- Studies of problems referred to it by the United States and Canadian governments; and
- Arbitration of disputes over boundary waters.

In addition, the Commission reports to both nations on progress toward the objectives and programs of the Water Quality Agreement. There are two boards that contribute to this monitoring and evaluation function:

- The Water Quality Board, which is the principal advisor to the IJC Commissioners. Members are appointed by the Commissioners. The Board is required to include representatives nominated by each nation and each of the state and provincial governments. Like the IJC Commissioners, members of the Water Quality Board are charged to act independently of their home government or sponsoring institution, as members of an objective international body.
- The Science Advisory Board, which advises both the IJC and the Water Quality Board on scientific findings and research needs. The Science Advisory Board is made up of senior scientists appointed by the IJC.

Members of both boards serve without compensation. Technical support and a secretariat is provided in the IJC Regional Office in Windsor, Ontario.

Great Lakes National Program Office

Within the United States, the GLNPO leads efforts to ensure compliance with the Great Lakes Water Quality Agreement and coordinates the efforts of many federal, state and local institutions with operational responsibilities in the Great Lakes region. The diagram below illustrates the relations among GLNPO and many of its constituencies. The eight Great Lakes states, however, have primary responsibility for implementing regulatory and management programs for controlling water quality. (In Canada, Environment Canada coordinates the Canadian Government's participation in the Great Lakes Water Quality Agreement. There is, however, no Canadian institution comparable to the GLNPO.) The relationship of the GLNPO to other institutions is summarized in the diagram on the next page.

An important function of GLNPO is the design and supervision of applied research and development programs, such as the Green Bay Mass Balance Study. This project will provide analytical data and methods to support the dynamic lake pollutant models necessary for designing and monitoring Lakewide Management Programs.

2. Lakewide Management Programs (LAMPs)

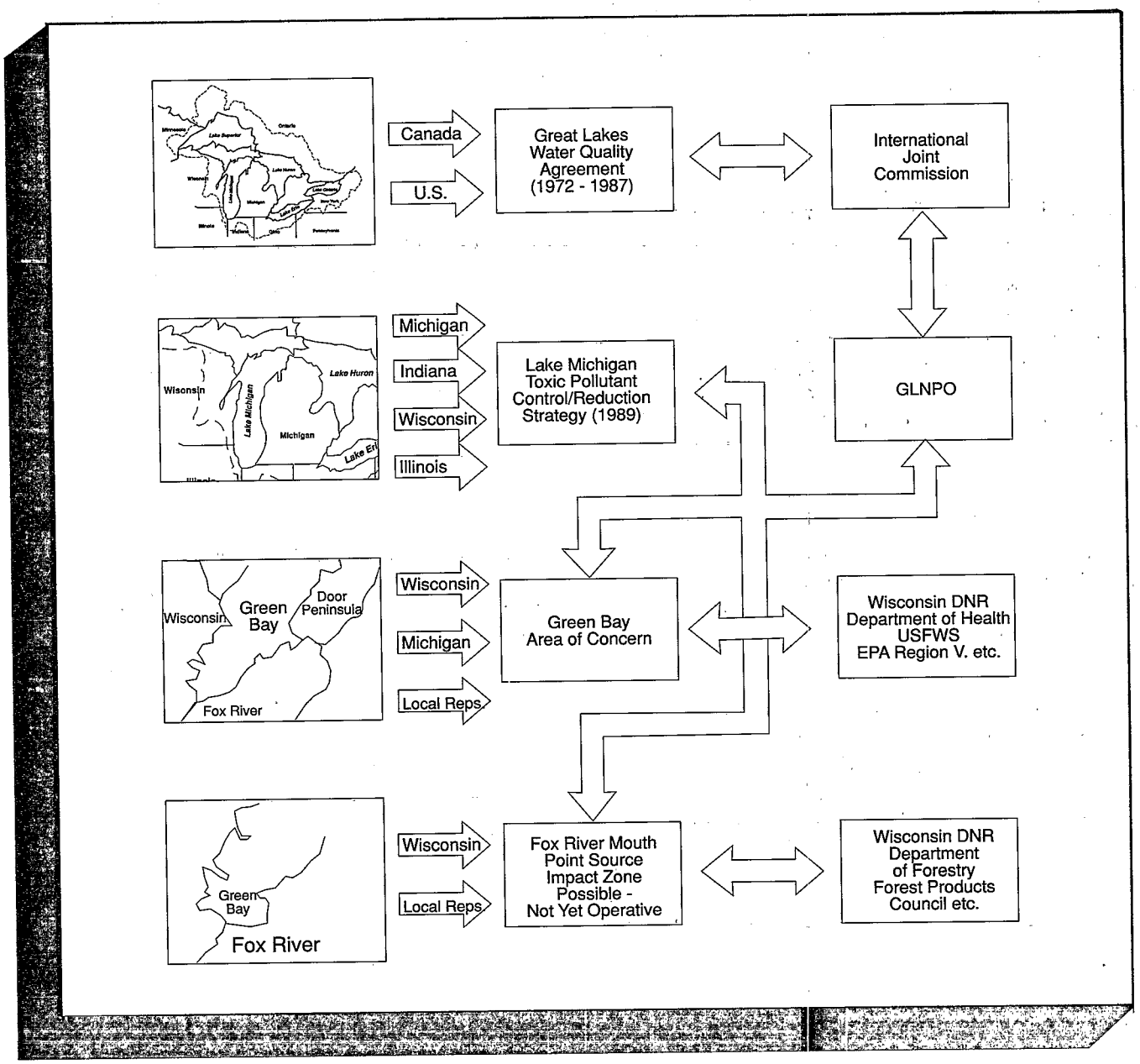
The goal of Lakewide Management Programs is to reduce total pollutant loads. First developed in the 1970s to reduce the phosphorus inputs, which were causing eutrophication, this "load reduction" approach is now

The Four-Level Program

The 1987 revisions to the Water Quality Agreement also provide the conceptual basis for integrating many of the environmental management strategies which had been evolving in the Great Lakes. For the first time, GLNPO had a consistent framework for identifying problems and planning solutions, from the macro level to individual point sources of pollution. On an operational level, it will take several years of experience to fully integrate 1987 innovations such as the "Point Source Impact Zones" with the more established programs, such as the Areas of Concern, which have been operational since 1981.

The diagram below sketches the conceptual integration of the four levels of the Great Lakes environmental framework.

The four elements of the Great Lakes management framework cover the program at four distinct geographic scales: basin-wide; lakewide; areas of concern; and special impact zones. The heart of the Great Lakes management framework for the Water Quality Agreement is *ecosystem management* to *restore* areas of concern to beneficial use through multi-level cooperation.



addition, the Remedial Action Plan will be incorporated into each statewide water quality management plan. Beyond identifying problems, sources, and causes, each Remedial Action Plan must identify when specific remedial actions will be taken to resolve the problems, and who is responsible for implementing the actions.

Financing is an important element of the Remedial Action Plans. In general, implementation is financed out of established state resources or special bond issues for infrastructure construction.

Most remedial actions needed to fulfill RAPs are required under existing U.S. laws and regulations. The RAPs give visibility to the actions and clarify accountability for decision-makers and the public.

Of the 42 Areas of Concern, five are shared between the U.S. and Canada, and 26 are entirely within the U.S. portion of the Great Lakes Basin. Seven Remedial Action Plans were submitted to the International Joint Commission in 1988, six were submitted in 1989, and seventeen are scheduled for submission in 1990.

4. Point Source Impact Zones

The last of the major environmental management tools provided by the 1987 Protocol to the Great Lakes Water Quality Agreement is the designation of Point Source Impact Zones — areas of polluted water adjacent to pollutant point sources. The agreement requires the IJC to list these zones and to reduce their size and effect as much as possible through the application of special regulatory procedures to be designed by the affected states. The Great Lakes National Program Office is working with the states to establish consistent definitions and methods of reporting Point Source Impact Zones.

Lessons Learned

Three elements of the environmental management framework for the Great Lakes are important to its success. These three principles may be useful to other National Estuary Programs.

1. Independent Policy Setting and Monitoring Board

The International Joint Commission is effective because it maintains credibility as a neutral third party and because its functions are limited to measuring progress in attaining the goals of the agreement. The support of its secretariat, and the technical and scientific guidance of the Water Quality and Scientific Advisory Boards are necessary inputs to an informed decision-making process.

2. Autonomous National Research and Coordinating Organizations

The Great Lakes National Program Office is important to the success of the Great Lakes Water Quality Agreement in the United States because it is an autonomous organization committed exclusively to working with federal and state agencies to implement the Water Quality Agreement. It conducts demonstration projects essential to developing effective remedial programs and coordinates environmental surveillance to measure progress. It also coordinates applied research in cooperation with EPA's Office of Research and Development, the U.S. Fish and Wildlife Service, and the National Oceanographic and Atmospheric Administration. The scientific and bureaucratic attributes are necessary and complementary: the scientific and technical value of its research enhances the Great Lakes National Program Office's management capabilities.

3. Multiple Levels of Problem Definition and Remediation

In the Great Lakes Water Quality Agreement, the seemingly redundant provision for "Lakewide," "Area of Concern," and "Point Source" levels of problem definition and remedial planning are important because pollution problems need to be addressed at dramatically different scales. Analysts, program designers, and policy makers need to be sensitive to these questions of scale if they are to design effective and efficient control strategies.

For further information on the Great Lakes Management Framework, contact the Great Lakes National Program Office (312/353-3503) or the Office of Marine and Estuarine Protection, Technical Support Division (202/475-7102).