

# Great Lakes Concerns

## GLOSSARY

### **Atmospheric (air) deposition**

*Chemicals or substances in rain or snow or attached to dust-sized, airborne particles that fall to the earth; in an environmental context, usually refers to polluting materials deposited in a quantity sufficient to have a detrimental effect.*

### **Bioaccumulation**

*The increase in concentration of a substance by a biological organism above the level found in its food supply or environment; often the concentration increases through successive levels of the food chain (biomagnification).*

### **Council of Great Lakes Governors**

*An organization of Great Lakes governors that focuses on diversion and other issues of common interest to Great Lakes states.*

### **Ecosystem**

*The interdependent relationship among members of a biological community and their natural environment.*

### **Exotic species**

*Species not native to a locale.*

### **Great Lakes basin**

*A hydrological unit—the region drained by the Great Lakes; also referred to as the Great Lakes watershed.*

### **Great Lakes**

#### **Commission (GLC)**

*An information-sharing and advocacy compact formed by the eight Great Lakes states and recognized under federal law; two Canadian provinces participate informally.*

## BACKGROUND

The five Great Lakes—Erie, Huron, Michigan, Ontario, Superior—contain 20 percent of the world's fresh water. Eight states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin) border the lakes, directly deriving recreational, economic, and aesthetic benefits, but none more than Michigan, which has more than 3,200 miles of Great Lakes shoreline; the state borders on four of the five lakes (the exception is Lake Ontario). The lakes support manufacturing, technology, tourism, recreational and commercial fishing, and other industries.

In 1993 the Great Lakes provided more than 897 billion gallons of water a day for drinking and hydroelectric use. In Michigan, the lakes provide 4.5 million residents with drinking water.

The Great Lakes basin has more than 100,000 square miles of navigable water, which provide opportunities for recreation as well as commerce. It is estimated that nearly one million U.S. and Canadian boats operate annually on the lakes, directly spending more than \$2 billion. The lakes' sport fishery annually draws an estimated 2.6 million U.S. anglers, who spend an estimated \$1.3 billion on trips and equipment.

## Management

International efforts to protect and manage the Great Lakes began in 1909, when the Boundary Waters Treaty between the United States and Canada was signed. The treaty created the International Joint Commission (IJC), consisting of representatives appointed by the president of the United States and the prime minister of Canada. Accord was furthered with the Great Lakes Water Quality agreements of 1972 and 1978; the latter was revised in 1983 and 1987. The IJC works cooperatively to manage the lakes wisely and protect (sustain) them for future generations. The commission's responsibilities include

- authorizing uses of the Great Lakes, while protecting competing interests, and
- investigating air- and water-pollution problems that affect the lakes.

In 1955 Michigan entered a compact with the seven other Great Lakes states; two Canadian provinces (Ontario and Quebec) participate informally. The compact created the Great Lakes Commission, which

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- shares information among member states;
- coordinates state positions on issues of regional concern;
- advocates for positions on which member states agree; and
- makes recommendations to member states and to Congress about such matters as water diversion, pollution control, and navigation.

### Great Lakes

#### Fishery Commission

*United States–Canada treaty organization funded by the two nations to implement sea lamprey control in the Great Lakes, coordinate lake trout fishery rehabilitation and research, and facilitate cooperation among federal, provincial, and state fish-management agencies.*

#### Great Lakes resources

*The natural resources associated with the lakes—e.g., fish, wildlife, and water.*

#### Great Lakes states

*The eight U.S. states that border the Great Lakes: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin.*

#### Great Lakes Water Quality Initiative (GLI)

*An initiative by the U.S. Environmental Protection Agency and the Great Lakes states to reduce sources of water pollution to the lakes.*

#### International Joint Commission (IJC)

*United States–Canada treaty organization charged with recommending to the two nations measures to protect and manage the Great Lakes.*

#### Nonpoint source discharge

*A diffuse discharge (does not have a single point of origin)—e.g., rain or runoff from adjacent lands that enters a water body; may carry pollutants.*

#### Point-source discharge

*A single, identifiable source of a discharge (e.g., pipe or smokestack); may carry pollutants.*

#### Runoff

*The portion of precipitation that travels over the surface of the land, compared to that which permeates the soil.*

A current management issue is the complex interrelationship of the chemical, biological, and social aspects of the Great Lakes. This “ecosystem” approach recognizes that Great Lakes resources must be managed as a part of the larger complex and dynamic system. The Great Lakes Commission recently staffed development of an Ecosystem Charter, which will promote and assess efforts to implement a basin-wide ecosystem management approach and advocate for the ecosystem’s interests.

### Directional Drilling

Directional drilling is a technique by which a well may be started at a land location and directed toward a subsurface oil and/or gas-bearing formation several thousand feet under an environmentally sensitive area such as the Great Lakes. Since 1984 seven oil wells have been drilled directionally from land to locations under Lake Michigan, and several others have been drilled directionally to locations under Lake Huron. Applications for permits to drill additional directional wells raised public concern about potential danger to the environment (e.g., from leaking oil and the disposal of the “mud” displaced by the drilling), and Gov. John Engler ordered the Michigan Environmental Science Board to study the issue. The board reports that directional drilling generally poses “little or no risk” of contaminating the Great Lakes, although there is greater risk where well heads and other drilling apparatus and infrastructure are close to the shoreline. To protect critical and sensitive areas, the panel recommends requiring a 1,500-foot set-back from the shoreline and prohibiting drilling within designated flood risk and critical dune areas. The panel also recommends that well and surface facilities be situated so as not to be visible from the shoreline or public recreation areas and that drilling mud be contained and disposed of off site.

### Water Quality

Water quality and toxic chemical discharges have been a significant concern in the Great Lakes for decades. Contamination occurs from point-source sanitary, storm-water, and industrial discharges. But nonpoint sources, such as agricultural and urban runoff and atmospheric deposition, also contribute to pollution of the lakes. Atmospheric deposition (toxic materials in rain, snow, or wind-blown particles) is believed to be a primary source of certain contaminants in the Great Lakes. Some contaminants become concentrated in aquatic organisms from the body of water in which they live and/or through their food supply; animals at the top of the food chain often show contaminant concentrations several times greater than those found in their food supply.

Bioaccumulation of such contaminants as certain pesticides and industrial chemicals is cited as a possible cause of impaired health and reproductive success of Great Lakes fish and wildlife as well as a threat to human health.

To protect people from harm from ingesting bioaccumulative chemicals, Michigan (and other Great Lakes states) for several years have issued advisories that recommend limiting one's consumption of certain size and species of Great Lakes fish. In January the Michigan Environment Science Board approved the 1998 sport-fish consumption advisory for two groups: (1) adult males and women beyond childbearing years and (2) population segments more sensitive than others to these contaminants, e.g., pregnant or nursing women, women of childbearing age, and children aged under 15. The 1998 advisory is available to anglers where fishing licenses are sold, physicians' offices, and public health departments.

To address the problem of toxics in the Great Lakes, the 1990 federal Clean Water Act required the eight Great Lakes states to adopt water-quality standards consistent with the Great Lakes Water Quality Initiative (GLI) by March 1997: minimum standards, anti-degradation policies, and management methods to protect human health, aquatic life, and wildlife. One GLI objective is to reduce 22 bioaccumulative chemicals of concern (BCC) and about 100 other toxic chemicals. Only one state met the March deadline; Michigan submitted its plan for compliance in July 1997.

### **Exotic Species**

Since the early 1800s, 136 exotic (nonnative) species have been introduced into the Great Lakes. Thirty correspond with the St. Lawrence Seaway's opening; it is thought that many entered the lakes when ocean vessels discharged ballast water—and the aquatic species it contained—that had been taken on in the Baltic area of northern Europe.

Exotic species pose a threat to native Great Lakes species and have seriously altered the Great Lakes ecosystem. Once established, an exotic species' population can explode because such natural controls

as predators and pathogens are not present. Examples of exotic species accidentally introduced into the Great Lakes are sea lamprey, alewife, spiny waterflea, round goby, Eurasian ruffe, and zebra mussel. Introducing exotic aquatic plants also can seriously affect and sometimes change an ecosystem's character and quality.

Introducing exotic species also has economic and social costs. For example, sea lamprey—each of which kills up to 40 pounds of Great Lakes fish in its 12–20-month adult parasitic life—have had a devastating effect on Great Lakes lake trout, salmon, steelhead, and whitefish. Sea lamprey control conducted under the auspices of the Great Lakes Fishery Commission costs several million dollars annually. Zebra mussels have caused substantial damage to water intake systems throughout the Great Lakes basin and substantially altered the aquatic ecosystem in portions of Lake Erie, Lake St. Clair, and the Saginaw Bay.

## **DISCUSSION**

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The Great Lakes are both a significant natural resource and a substantial source of economic and social opportunity. The challenge to Great Lakes states, provinces, and the two federal governments is to find the appropriate balance between a healthy ecosystem and a healthy economy. Clearly, one economic advantage the Great Lakes region has over other areas of the nation is its abundant fresh water and the benefit this natural resource provides to the residents and businesses located in the basin.

### **Water Quality**

As mentioned, the purpose of the Great Lakes Initiative is to protect the Great Lakes ecosystem from toxic contamination, but it primarily addresses point-source pollution; atmospheric deposition of toxics is not addressed by the initiative, despite the U.S. Environmental Protection Agency's acknowledgment that "regulation of point sources alone cannot address all existing or future environmental problems from toxic pollutants in the Great Lakes."

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In their GLI plans, several Great Lakes states are addressing both point and nonpoint contamination by emphasizing pollution-prevention programs that can reduce or eliminate the use and discharge of toxic chemicals at their source. This usually is much more cost effective than having to invest in the technology necessary to treat them at industrial or municipal wastewater treatment facilities. Environmental organizations point out that pollution prevention can be a *permanent* means to reduce bioaccumulative toxic chemicals reaching the Great Lakes, whereas the traditional “end-of-the-pipe” pollution-control methods are not. The National Wildlife Federation has brought legal action to force the Environmental Protection Agency to enforce the GLI toxic-discharge requirements (by establishing federal standards) where states fail to take appropriate action; the case is pending.

### Exotics

The zebra mussel invasion of the Great Lakes brought the exotic species problem to public attention. The mussels were introduced into the lakes when ocean-going vessels discharged ballast water containing mussels into lake waters. New regulations require ocean vessels, if they are carrying fresh-water ballast taken on in another part of the world, to exchange it for sea water before entering the St. Lawrence Seaway; the sea water also may contain exotic species, but few will survive when discharged into the fresh water of the lakes. There still is a problem, however, with vessels entering the Great Lakes with empty ballast tanks: Even emptied tanks contain residual fresh water and mud, and this may harbor exotic species that will be released when ballast tanks are alternately filled and emptied with Great Lakes water as the ships unload and reload at various Great Lakes ports. The search continues for better ways to control the entry into the lakes of exotic species carried in ocean-going ships. Although zebra mussels are the best known aquatic invader, they are not the lakes’ only problem species.

While public information and education may prevent some exotic species from spreading, some control mechanism usually is necessary. Management

authorities and research organizations are devoting considerable time and resources to investigating the biology and ecology of these organisms, searching for effective management tools that will have minimal detrimental effect on the lakes. Potential controls include installing physical barriers, introducing predator species and naturally occurring pathogens, and using biocides.

### Directional Drilling

Directional drilling in the Great Lakes has roused the interest of environmentalists across the state, who fear the potential for contamination. The state panel charged by the governor with studying the issue finds that with certain precautionary measures, directional drilling beneath the Great Lakes will not threaten the ecosystem. Such drilling may, however, come into conflict with public use at areas such as state parks, and the panel calls for public participation in determining where directional drilling shall occur. (In response, the Michigan departments of Natural Resources and Environmental Quality have implemented a 30-day public comment period prior to the state’s making a decision on whether to issue a Great Lakes bottomlands oil and gas lease that would involve directional drilling.) The Senate Local, Urban and State Affairs Committee approved a resolution supporting the Science Board’s findings.

*See also* Agriculture; Air Quality; Water Quality.

## FOR ADDITIONAL INFORMATION

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