



Great Lakes Water Quality Initiative

A Summary

The Great Lakes, collectively, are one of the outstanding natural resources of the World. In recent years, Congress, the U.S. Environmental Protection Agency (EPA) and the States and local governments of the Great Lakes basin have devoted a great deal of scientific study and resources to the protection and restoration of these irreplaceable waters.

The Great Lakes Water Quality Initiative (the Initiative) is a key element of the environmental protection efforts undertaken in the Great Lakes basin. Through this Initiative, and with the joint cooperation of all of the States in the basin, EPA developed the final "Water Quality Guidance for the Great Lakes System" (the Guidance). This Guidance describes how the Great Lakes States and Indian Tribes will adopt consistent, Great Lakes-specific water quality criteria for toxic pollutants in their water quality standards. These standards establish the minimum water quality levels for the waters of the Great Lakes and their tributaries and are the basis for controlling discharges of pollutants throughout the basin. The new criteria will help restore, maintain, and protect the waters of this valuable and sensitive ecosystem.

EPA issued the Guidance under the terms of the Great Lakes Critical Programs Act. Now that the Guidance is available, the next step is for the States and Indian Tribes to incorporate provisions consistent with the Guidance into their laws and regulations within two years.

THE GREAT LAKES RESOURCE

The Great Lakes--Superior, Michigan, Huron, Erie, and Ontario--contain 20 percent of the world's and 95 percent of the United States' fresh surface water. The Great Lakes basin, the area that drains into these five lakes, includes parts of the States of Minnesota, Indiana, Ohio, Wisconsin, Michigan, Illinois, New York, and Pennsylvania, and part of the Canadian province of Ontario. More than 40 million people live in the basin, including nearly 20 percent of the U.S.

population and 50 percent of the Canadian population. Over 23 million people depend on the Great Lakes for drinking water.

The Great Lakes are a unique natural resource, affording habitat for a vast array of living organisms and providing both recreational opportunities and inestimable aesthetic beauty for people living in the region. Hundreds of species of mammals, birds, fish, reptiles and amphibians, and untold thousands of plant species are native to the Great Lakes basin.

Enormous economic benefits are derived from sport fishing, recreational boating, campgrounds, resorts, and lakefront real estate development throughout the region. The Great Lakes form the North Coast of the U.S. which includes over 4,500 miles of coastline, six national parks and lakeshores, six national forests, seven national wildlife refuges, and hundreds of State parks, forests, and sanctuaries. On this magnificent resource is founded the largest bilateral trade relationship in the world. Trade between Canada and the eight Great Lakes States in 1992 was valued at \$106 billion, or over 56 percent of the U.S. - Canada total. On the Great Lakes alone, between 900,000 and 1 million U.S. and Canadian boats operate each year, infusing more than \$2 billion into the regional economy. In 1991, over two and one-half million American anglers fished in the Great Lakes expending over \$1.3 billion.

THE SENSITIVITY OF THE GREAT LAKES ECOSYSTEM

Despite their great size, the Great Lakes are extremely sensitive to toxic pollutants because the water, and the pollutants, remain in the system for many years. Many of these toxic pollutants are a serious threat, even in small amounts, because they are harmful to humans, animals, and plants. They are generally long-lasting and some can become more concentrated as they move through the food chain from plants to fish and on to wildlife and humans. The waters of the Great Lakes basin are particularly vulnerable to toxic pollutants because of several important characteristics of the Lakes:

- The depth and size of the Lakes cause water to be retained in the basin for extremely long periods of time, which

make the Lakes essentially a closed system;

- Lake waters have relatively low suspended solids concentrations and low biological productivity making toxic pollutants more potent biologically; and
- Fish and wildlife populations in the basin are almost wholly dependent on the Great Lakes system for water, habitat, and food.

Taken together, these characteristics result in a natural system that retains persistent pollutants for exceptionally long periods of time. The effects of some of these toxic pollutants on humans and wildlife potentially include increased risk of cancer, birth defects, kidney disorders, reproductive system and developmental damage. Studies show that women of child-bearing age may store these pollutants in their bodies, and nursing mothers may, in turn, pass them on to their children. Other studies have also shown that animals that depend on fish for food, such as mink, gulls, and bald eagles, can experience birth defects and reduced populations due to consuming long-lasting pollutants that are stored in the fish. These occurrences have been documented for a wide range of species throughout the Great Lakes ecosystem and it is for these reasons and the related impact on human populations that the Great Lakes Water Quality Initiative was begun and the Water Quality Guidance for the Great Lakes System was developed.

THE GREAT LAKES WATER QUALITY GUIDANCE

The purpose of the Guidance is to put in place programs that will reduce the kinds and amounts of toxic chemicals and other pollutants that are released into the Great Lakes System. These programs are to be applied consistently by all of the Great Lakes States and Indian Tribes to maintain, protect, and restore water quality throughout the entire basin and preserve the economic foundation of the region.

The Guidance consists of five protective elements that States and Tribes will incorporate into their water pollution control programs:

- Water quality criteria that will protect human health;
- Water quality criteria that will protect wildlife;
- Water quality criteria that will protect aquatic life;
- Anti-degradation requirements to maintain water quality where current water quality is better than minimum requirements; and
- Requirements that will ensure more consistent implementation throughout the basin.

The Guidance defines minimum levels of protection that are needed for pollutants that might threaten water quality. It is an important part of a comprehensive, place-based partnership involving federal, State, tribal, and local governments to protect and restore the Great Lakes ecosystem.

DEVELOPMENT OF THE GUIDANCE

Efforts to reduce the amount of persistent toxic chemicals introduced into the Great Lakes environment have been under way for many years. The Great Lakes Water Quality Agreement, which was signed by the U.S. and Canada in 1978, had as a goal the virtual elimination of toxic substances in the region. This agreement called for the development of Lakewide Management Plans (also called "LaMPs") for the open waters of the Great Lakes and Remedial Action Plans (or "RAPs") for designated Areas of Concern.

While this agreement remains in effect and real environmental gains are being achieved, studies have shown that more needs to be done to further reduce the inflow of persistent toxic chemicals into the environment.

In the late 1980's, a major effort was undertaken to further assess the presence of toxic chemicals in the Great Lakes environment and review the risks that they presented to humans and the environment. This effort led to the formation of the Great Lakes Water Quality Initiative which was organized by EPA at the request of the Great Lakes States in 1989. The Initiative was designed to assemble the best, most up-to-date scientific information on persistent toxic chemicals in the Great Lakes basin. A great deal of data were collected and analyzed, regulations were reviewed, and health risks were assessed with the goal of developing new approaches to reduce the flow of persistent toxic chemicals into the basin's ecosystem.

The management structure for the Initiative includes a Steering Committee, a Technical Work Group, and a Public Participation Group. The three groups worked together to produce the basic

technical contents of the Guidance which, at that time, was to be implemented voluntarily throughout the Great Lakes basin.

- A *Steering Committee* of the Great Lakes State water program directors and staff from EPA Regional and Headquarters offices. This committee discussed policy issues, directed the Technical Work Group, and ratified work group products for EPA consideration.
- A *Technical Work Group* of staff from the Great Lakes State water program agencies, EPA, the U.S. Fish and Wildlife Service, and the U.S. National Park Service. This work group prepared the various proposals and submitted them for consideration by the Steering Committee.
- A *Public Participation Group* of representatives from environmental groups, municipalities, industries, and academia that were located in the region. This group monitored the deliberations of the Steering Committee and the Technical Work Group, advised them of the public's concerns, and kept its many constituencies apprised of the activities associated with the Initiative.

The Initiative was well underway in 1990 when Congress amended the Clean Water Act. In so doing, Congress formalized the process for developing the Guidance and the way it was to be adopted in the region. The Act requires EPA to publish the Guidance and requires the Great Lakes States to adopt provisions consistent with the Guidance into their water quality standards within two years after the Guidance is published. Congress also required that the Guidance conform with

the objectives of the U.S./Canadian Great Lakes Water Quality Agreement of 1987 and that it be no less restrictive than current U.S. national water quality criteria guidance.

EPA proposed the Guidance in the *Federal Register* in April 1993 and encouraged public comment. Along with the proposed Guidance, EPA also published for comment a preliminary analysis of the expected costs and benefits associated with its implementation. During the comment period that followed, the States and EPA conducted public meetings throughout the Great Lakes States, and EPA held public hearings on the proposed regulations in August 1993 and April 1994. As a result of this public process, EPA considered over 26,500 pages of comments from over 6,000 commenters in preparing the final Guidance.

The following sections describe the protective features of the Guidance.

CRITERIA TO PROTECT HUMAN HEALTH

The Guidance contains numeric human health criteria for 18 pollutants. It also includes Tier I and Tier II methodologies for States to derive cancer and non-cancer human health criteria for additional pollutants. Tier I human health criteria are used to establish ambient concentrations of chemicals which, if not exceeded in the Great Lakes System, will protect humans from adverse health impacts from that chemical due to consumption of aquatic organisms and water.

For each chemical, the chronic criteria reflect long-term consumption of food and water from the Great Lakes System. Human health criteria in the Guidance are based on fish consumption rates that are higher than the rates used elsewhere in the country to reflect more accurately the fish consumption rates of people in the basin.

CRITERIA TO PROTECT AQUATIC LIFE

Aquatic life criteria, developed by EPA, are used to establish ambient concentrations for pollutants, which, if not exceeded, will protect fish and other aquatic life from adverse effects. The Guidance contains numeric, Great Lakes specific, criteria to protect aquatic life for 15 pollutants. These are referred to in the Guidance as *Tier I* criteria. They are based on an extensive amount of laboratory toxicity data for a variety of aquatic species (e.g., fish, benthic invertebrates, and plants) that are representative of aquatic species as a whole.

The Guidance also includes *Tier II* methodologies so that the States and Tribes may develop consistent values for chemicals when not enough data for Tier I criteria exist. Both criteria and values are used to set water quality-based effluent limits in permits that are issued to dischargers.

Use of the two-tiered methodologies in these situations improves the current practice where regulatory authorities translate narrative criteria in their standards on a case-by-case basis to calculate total maximum daily loads and individual discharge permit limits. The Guidance will help States do this more uniformly throughout the basin.

Both acute and chronic criteria to protect aquatic life from short and long-term exposures to pollutants are addressed in the Guidance. The *acute* criterion sets the maximum concentration of a chemical that can exist in a water body and still protect organisms from short exposures. A *chronic* criterion sets the maximum concentration of a chemical that can exist in a water body that will protect organisms from exposures over an entire lifetime.

CRITERIA TO PROTECT WILDLIFE

Wildlife criteria are used to establish ambient concentrations of chemicals which, if not exceeded, will protect mammals and birds from adverse impacts due to consumption of contaminated food or water. The Guidance contains numeric, Great Lakes specific, criteria for four chemicals (PCBs, mercury, DDT, and dioxin) and provides a methodology for deriving criteria for other bioaccumulative chemicals.

In developing wildlife criteria, EPA used pollutant-specific hazard data and species-specific exposure parameters for mammals and birds that reside in the basin. For each chemical, only a chronic (long duration) criterion is expressed because adverse effects to wildlife normally occur only over relatively long periods of time through continued exposure.

BIOACCUMULATION FACTORS (BAFs)

A major innovation in the Guidance is the use of *Bioaccumulation Factors (BAFs)* in calculating wildlife and human health criteria. BAFs are used to account for the property of certain chemicals to concentrate at higher levels in the food chain than may be found in the water.

For example, a plant species may concentrate a chemical from the water, and an invertebrate species may further concentrate the chemical by eating that species of plant. A bottom-feeding fish species may concentrate the chemical even further by eating that invertebrate and a predator fish may concentrate it even further by eating that fish.

Historically, most States and EPA have generally used the concept of "bioconcentration" instead of "bioaccumulation." Bioconcentration considers only uptake from the water, not the food chain steps discussed above. EPA believes that using BAFs is more appropriate and protective of the Great Lakes System.

PROTECTION OF CURRENT WATER QUALITY - ANTIDegradation

The term *antidegradation* refers to the policy that a State or Tribe must follow when an action, such as construction of a new facility that will discharge into a water body or increased discharges from an existing facility, is proposed that may lower the quality of water in a river, stream, or lake. The Guidance reinforces national regulations and underscores the importance of ensuring that such actions are carefully weighed against the benefits of the proposed actions -- with full public participation in that process.

The Guidance includes instructions on the kinds of reviews and public participation that must be carried out so that all States and Tribes implement these requirements in a consistent and environmentally protective manner. For example:

- If a State or Tribe has designated a water body as an *Outstanding National*

Resource Water (ONRW), then no permanent lowering of water quality is allowed under any circumstances. This designation is reserved for waters of exceptional importance or sensitivity, such as those in national parks or wildlife refuges.

- The Guidance provides procedures on how the States and Tribes are to determine when a proposed action involving persistent bioaccumulative Chemicals of Concern (BCCs) will result in a significant lowering of water quality, and outlines the procedures to be followed in determining whether such lowering is necessary.
- Water quality can not be degraded below existing uses (i.e., any uses that a water body has actually supported since 1978). For example, if a water body has supported a fishery, no pollutant can be discharged at a level that would harm that fishery and thereby ensure that use.

IMPLEMENTATION: TRANSLATING WATER QUALITY STANDARDS INTO REGULATORY CONTROLS

The Clean Water Act requires all dischargers to surface waters in the U.S. obtain a permit from the appropriate permitting authority. The permit specifies the pollutants and the amounts of each that may be discharged by a facility to ensure that water quality standards are met in the receiving waters. Until this Guidance was developed, the *process* for determining these amounts, however, has varied from State to State in the basin.

The implementation procedures included in the Guidance are designed to bring a more consistent method of calculating

allowable pollutant discharges based on water quality standards.

Selected implementation procedures are addressed in the Guidance, but they are not meant to address the entire water pollution control program. The procedures included are the ones that were identified by the Technical Work Group and the Steering Committee of the Great Lakes Water Quality Initiative as most critical to assuring consistency. Specific implementation procedures included in the Guidance are:

- How much *mixing and dilution*, if any, is to be allowed in calculating discharge permit limits;
- How discharge permit limits should be *expressed, monitored, and evaluated* when the amount that can be discharged is below levels that can be quantified by analytical techniques;
- How *Total Maximum Daily Loads* (TMDLs) should be calculated for waters not expected to meet water quality standards after the implementation of technology-based controls. This is a computation of the amounts of pollutants that can be added to a water body while still, with a margin of safety, maintaining water quality standards. They are the basis for limiting point and nonpoint source discharges;
- How adjustments to water quality criteria should account for the *unique characteristics* of particular locations within the basin;
- How *background concentrations* (i.e., chemicals already in a water body) should be considered when determining discharge limits;

- How and when *variances* from water quality standards should be granted;
- When *water quality-based permit limits* will be required for dischargers;
- How the various water quality criteria will be *applied* to different types of water bodies; and
- How much time dischargers will be given to come into compliance with new controls.

The water quality criteria and implementation procedures contain special provisions for Bioaccumulative Chemicals of Concern, including phasing out of mixing zones whenever possible. They also include provisions to account for pollutants present in intake waters, so that dischargers are provided some relief for pollutants in their wastewater that they did not generate.

FOR ADDITIONAL INFORMATION

For additional information on the Great Lakes Water Quality Initiative process or the Water Quality Guidance for the Great Lakes System, please contact the EPA offices listed below:

Contact for the Great Lakes basin State of New York:

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Contact for the Great Lakes basin State of
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Contact for the Great Lakes basin States
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