

2.0 Lake Michigan Subgoals 2002

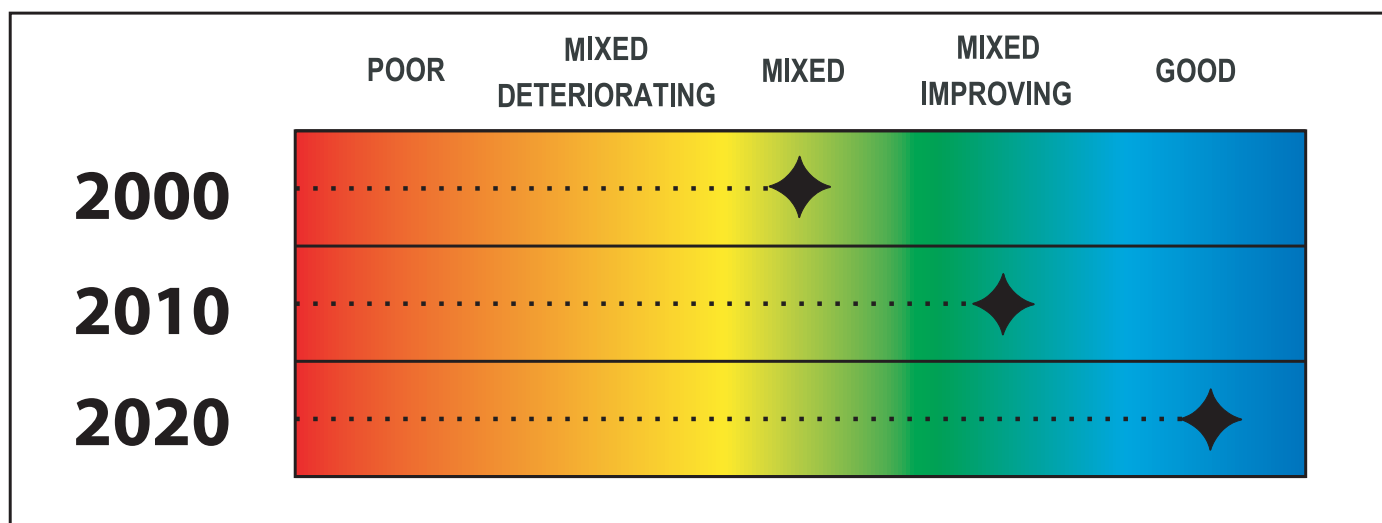
The following section describes the status of the 11 Lake Michigan LaMP subgoals. The targets for each subgoal are depicted graphically, followed by a short description of the status of the subgoal and the challenges facing the LaMP process to improve the status of the subgoal. Key activities or updates relevant to the subgoal that have occurred over the past 2 years are then described, followed by a brief description of key next steps to achieve the subgoal targets. Details appear in each subgoal section.



Fishing from the Shore of Lake Michigan
Photograph courtesy of USDA Natural Resources Conservation Service*



Subgoal 1 Can we all eat any fish?



Status

About 40 species of fish currently inhabit Lake Michigan, most of which are native to the lake. Over 43 percent of all Great Lakes fishing is done in Lake Michigan, and both commercial fishing and sport fishing are significant contributors to the overall economies of the states in the basin. Commercial fish production (both nontribal and tribal) reaches over 14.6 million pounds of fish annually.

While fishing is an important Lake Michigan resource, the need exists for all four Lake Michigan states to maintain advisories to warn the public about potential health effects resulting from consuming

certain species of fish in the lake. As a result, achievement of the goal in Lake Michigan is mixed.

Challenges

- (1) To determine the source of toxic atmospheric deposition to Lake Michigan.
- (2) Secure resources to clean up contaminated sediment sites.
- (3) To make fish consumption advisory data widely accessible and user-friendly.

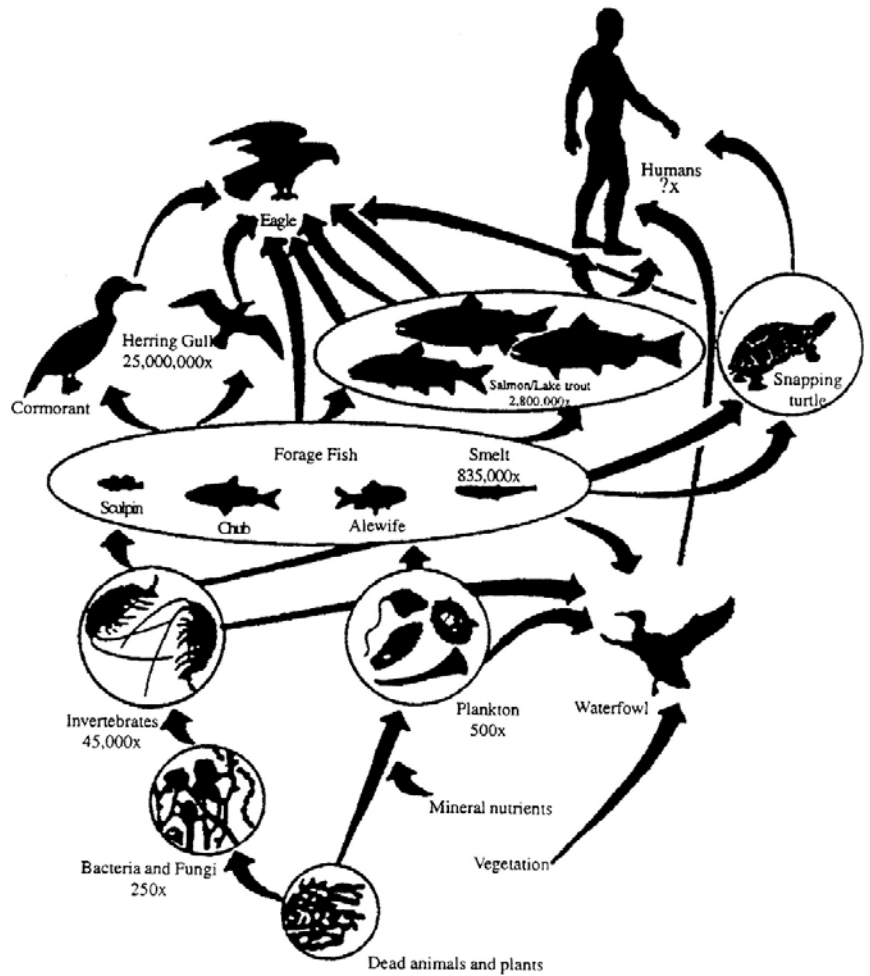


Fish Consumption Advisories

Fish accumulate contaminants and become a further source of contamination for larger predator fish. Fish consumption has been shown to be a major pathway of human exposure to persistent toxic substances such as PCBs and mercury because the contaminants biomagnify as they move up the food web (Figure 1). The state fish consumption advisories are necessary to protect people from potential adverse health effects associated with contaminants found in fish. Fish consumption advisories may also include information to educate the public on how to minimize exposure to certain contaminants through proper preparation and cooking of fish.

PCBs are the primary contaminant causing the consumption advisories for fish in Lake Michigan. Mercury is also a cause of Lake Michigan fish advisories, and all four Lake Michigan states have issued warnings about the consumption of mercury-contaminated fish from inland lakes as well. Dieldrin was previously a pollutant contributing to fish consumption advisories, but the Lake Michigan states no longer identify dieldrin as a concern (Figure 2). States frequently use fish consumption advisories as indicators of whether their waters are meeting designated uses, triggering the need for investigation and setting a total maximum daily load (TMDL) for contaminants. TMDLs for PCB and mercury are therefore required for Lake Michigan. The fish consumption advisories are updated annually and can be found at the following web sites:

- Illinois: www.idph.state.il.us/envhealth/fishadv/fishadvisory02.htm
- Indiana: www.in.gov/isdh/programs/environmental/fa_links.htm
- Michigan: www.michigan.gov/mdch/1,1607,7-132-2944_5327-13110--,00.html



Great Lakes food web. Heavy metals and many synthetic chemicals are absorbed by organisms and bioaccumulate, with concentrations reaching toxic levels if exposure is great enough. The concentration is magnified at each step of the food web as large organisms eat many small ones. Numbers = Biomagnification of PCBs in Lake Ontario. Source: Johnson et al. 1999. (reprinted with permission)

- Wisconsin: www.dnr.state.wi.us/org/water/fhp/fish/advisories

Mercury Advisories

Mercury is emerging as a growing concern in fish in Lake Michigan, inland lakes in the basin, and in the ocean. To address this concern, the states and the U.S. Food and Drug Administration (FDA) have issued advisories governing the consumption of fish. States recommend that if a woman is pregnant or could become pregnant, if a woman is nursing or in child-bearing years, consumption of freshwater sportfish caught by family and friends should be limited to one meal per week. For adults, one meal is 6 ounces of cooked fish or 8 ounces of uncooked fish; for a young child, one meal is 2 ounces of cooked fish or 3 ounces of uncooked fish.

The FDA has issued advice concerning mercury in commercial fish in stores and restaurants, which



Lake Michigan Fish Consumption Advisories

1993 to 2001, with deletions in strike out font and additions in italics font



~~Text~~ = no longer a basis for a Lake Michigan open water fish consumption advisory in 2001

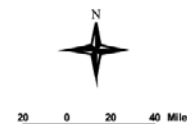
Text = new 2001 fish consumption advisory for Lake Michigan open water

Text = fish consumption advisory for open waters of Lake Michigan

The font indicates changed State fish consumption advisories (FCA) for the open waters of Lake Michigan from 1993 to 2001. The strike out font represents toxic chemicals that were the basis for a State FCA in 1993, but are no longer the basis for a State FCA in 2001. The italic font represents toxic chemicals that are the basis for new State FCA in the open waters of Lake Michigan, compared to 1993. The normal font represents no change from 1993 to 2001.



Data source: Revised draft Lake Michigan Lakewide Management Plan for Toxic Pollutants in 1993 and States Fish Consumption Advisories 2001.



Map created by: Martha Aviles-Quintero
ORISE Research, US EPA Region 5, 03/21/02



Mercury Methylation

The global cycling of mercury and its transformation to methylmercury is a complex process. Mercury evaporates from soils and surface waters to the atmosphere, is redeposited on land and surface water, and then is absorbed by soil or sediments. After redeposition on land and water, mercury is commonly volatilized back to the atmosphere as a gas or as adherents to particulates.

Once released into the environment, inorganic mercury can be converted to organic mercury (methylmercury) which is the primary form that accumulates in fish and shellfish. Methylmercury biomagnifies up the food chain as it is passed from a lower food chain level to a subsequently higher food chain level through consumption of prey organisms or predators. Fish at the top of the aquatic food chain, such as pike and bass in lakes, and shark and swordfish in oceans, bioaccumulate methylmercury approximately 1 to 10 million times greater than dissolved methylmercury concentrations found in surrounding waters.

includes ocean and coastal fish as well as other types of commercial fish. FDA advises that women who are pregnant or could become pregnant, nursing mothers, and young children not eat shark, swordfish, king mackerel, or tilefish. FDA also advises that women of childbearing age and pregnant women may eat an average of 12 ounces of fish with advisories purchased in stores and restaurants each week. It is important to control the total level of methylmercury consumed from all fish; therefore, in a given week a woman of child bearing age should not eat more than 12 ounces of cooked fish that have advisories

Addressing PCB Sources

Since LaMP 2000, data collected from the Lake Michigan Mass Balance Study (discussed below) and other sources indicate that PCBs entering the lake from contaminated sediments and air deposition continue to be the significant contributor resulting in fish consumption advisories for the lake. As a result, controlling these PCB sources will be critical to eliminating fish consumption advisories in the future and meeting the goal of restoring the fish to

good condition by 2020. Cleanup of contaminated sites has been undertaken at 5 of the 10 Lake Michigan Areas of Concern.

Two of the sites most highly contaminated with PCBs in the sediments are found in the Fox River in Wisconsin and the Grand Calumet River in Indiana. Progress has been made in planning for cleanup of these sites, also classified as Areas of Concern (AOC), over the past 2 years.

In 2001, plans were announced for the Fox River/Green Bay AOC. The proposed \$310 million plan calls for the removal of about 7.25 million cubic yards of contaminated sediment containing more than 64,200 pounds of PCBs from the lower Fox River. The plan divides the river into four sections, three of which would be dredged to remove the contamination. The fourth area, between Appleton and Little Rapids, would not be dredged. Instead, the PCB levels would be monitored in that part of the river. The plan also calls for removing the water and stabilizing the dredged sediment from the river, and disposing of it off site at licensed solid-waste disposal facilities, including a possible new disposal facility in the Fox River Valley.

With 24 paper and pulp mills on 39 miles of the Fox River, it is the largest concentration of mills in the world. The Fox River Intergovernmental Partners (partners) signed a proposed agreement with Appleton Papers, Inc. (API) and NCR Corporation (NCR) to provide funding for interim cleanup and natural resource restoration projects on the Fox River and Green Bay while comprehensive cleanup and restoration plans are being developed as part of a remedial investigation/feasibility study (RI/FS)

Using Fish Advisories

Methylmercury is found primarily in the fish muscle (fillets) bound to proteins. Skinning and trimming the fish does not significantly reduce the mercury concentration in the fillet, nor is it removed by cooking processes. Because moisture is lost during cooking, the concentration of mercury after cooking is actually higher than it is in the fresh uncooked fish. In contrast, PCBs adhere to fat, so the removal of skin and fat, as well as broiling the meat, removes up to 90 percent of the contamination.



and natural resources damage assessment (NRDA). Appleton Papers, Inc. reached an agreement with environmental officials in June 2001 to begin paying for its portion of the cleanup. Negotiations with the other six mills are continuing.

Under the agreement, API and NCR will make:

- (1) Payments totaling up to \$40 million over the next 4 years, based on estimates provided by the partners, to fund cleanup and restoration projects as they are identified.
- (2) Four payments of \$375,000 over the next 4 years, for a total of \$1.5 million, to go to DOI to help pay back expenses it has incurred in putting together the NRDA.

The long-awaited Grand Calumet sediment cleanup will begin in 2002. U.S. Steel has agreed to put the cleanup on the fast track, with construction beginning in January 2002 on a corrective action management unit (CAMU) to contain the dredgings on company property north of the river between Bridge Street and the former American Juice factory.

Removal of PCB-contaminated sediment will start in October 2002 along the eastern 11 miles below the lagoons in Marquette Park at the 16-mile long river's headwaters. Another 575,000 tons of less hazardous waste from the next 31 miles to the Gary Sanitary District will also be piped to the site from two hydraulic dredges that will run 24 hours a day to vacuum the river bottom. PCB dredging is scheduled to be completed in May 2003, 3 months ahead of the compliance date in the federal court decree, dictating the cleanup.

To save money starting and stopping the dredges, they will run 24 hours a day, allowing the completion of the 5-mile Gary stretch by July 2003. Water and air quality will be monitored before, during, and after the cleanup, and efforts will be made to keep noise away from homes along the south side of the river.

To make up for 14 acres of wetlands that will be disturbed by dredging, 32 acres of undeveloped dunes and swales on U.S. Steel's land will be restored and donated to the National Lakeshore in 5 years.

Updates on these and other Areas of Concern are included in Appendix C.

Dioxins Sources – Burn Barrels

Dioxins has also been identified as a fish tissue contaminant resulting in fish consumption advisories. Dioxins is created as a by-product of the manufacture, molding, or burning of organic chemicals and plastics that contain chlorine. Many large combustion sources are now controlled to prevent dioxins formation. One of the major sources of dioxins found in Lake Michigan is the



Photo courtesy of U.S. EPA*

Tribes Address Burn Barrels

The Sokaogon Chippewa Community (Mole Lake Reservation) in Crandon, Wisconsin has made progress in raising awareness about illegal dumping and open burning. The tribe revised their old solid waste ordinance and researched the tribal court authority to hear and rule on violations of the revised ordinance. The Tribal Council then banned the use of burn barrels on the reservation. The burn barrel ban, increased enforcement against illegal dumping, and strong youth and community education have improved proper solid waste disposal and recycling for the tribe. Within the past 2 years, the annual tonnage of solid waste generated on the reservation has averaged about the same, but the annual tonnage of recyclables diverted has nearly tripled.

The Grand Traverse Band of Ottawa and Chippewa Indians also adopted a ban on burning any trash/garbage on all tribal lands.



backyard burning of trash in “burn barrels.” The “Burning Household Waste” brochure developed by the Michigan Department of Environmental Quality (MDEQ) lists pollutants emitted from burn barrels, some of the health consequences, and national household burn barrel emissions. It is available at the MDEQ Environmental Assistance Center, from district staff, or at www.deq.state.mi.us/aqd/publish/95sblist.html

Lake Michigan TMDL Strategy

EPA is also moving forward with a TMDL strategy to address sources of PCB and mercury load to the lake that result in fish consumption advisories. The overall goals for fishable, swimmable, and drinkable water are present in both the federal Clean Water Act (CWA) and GLWQA, with each taking a different approach.

Under the Clean Water Act, the states and tribes use the regulatory process to designate water body uses and to set the standards necessary to support those uses. Any request for a permit to discharge into a water body is judged based on the designated use of the receiving water body and state water quality standards. Within the Great Lakes basin, state water quality standards have been upgraded to meet the Great Lakes Water Quality Guidance objectives, which call for the standards to (1) be no less restrictive than the pollutant limits that protect human health, aquatic life, and wildlife; (2) encompass antidegradation policies; and (3) incorporate implementation procedures.

The LaMP process, which implements the GLWQA at the lake level, addresses the goals by bringing together both the public and private sectors to implement voluntary pollution reduction programs

TABLE 1
TMDL/LaMP COMPARISON

	TMDL	LaMP
Scope	Water body quality	Ecosystems
Goals	State designated uses and standards	Adopted goals, beneficial uses
Problem Identification	Problem identification and documented source assessment	Problem identification and documented source assessment
Targets	Numerical targets for loadings	Endpoint target reductions and ecosystem objectives
Research and Development	Link targets/sources = load and waste load allocations	Link target/sources = projects
Tools/Impacts	Monitoring plan for stream reach	Ecosystem monitoring plan
Point Source	Permit limits (per effluent guidelines)	Indicators, compliance assistance projects
Non-point Sources	Voluntary, best management practices, pollution prevention, education	Voluntary, best management practices, pollution prevention, education
Follow-up Plan	Permit/stream specific regulated entity	Sector specific, both public and private projects
Process	CWA, defined in regulation, technical calculation reviewed by EPA	CWA and GLWQA partnership approach to manage pollutants
Tribes	Must have treatment as a State- adopted water quality standards	LaMP committee membership



and strategies in order to reduce pollutant loading to the lakes.

Water bodies are monitored, and when a water body is determined to not be meeting quality standards—even after application of permit-required wastewater treatment technology—regulations require the state to list the water as impaired (Section 303(d) list), collect additional data, and calculate a TMDL.

The Great Lakes and many inland water bodies appear on the Section 303(d) lists of most Region 5 states as impaired by mercury and PCBs based on fish consumption advisories. Given the size and complexity of the Great Lakes and the experience in developing a mass balance model for Lake Michigan, it will take many years and be resource-intensive for the states to collect the necessary data and develop TMDLs for all of their impaired waters. After the TMDLs are developed, their implementation for the Great Lakes will take much longer and will require additional resources.

LaMP 2000 contained a draft strategic planning document that outlined a number of issues to be addressed in developing a final TMDL framework for the lakes by 2004. Workshops held in 2001 for regulators and stakeholders highlighted their common desire to more efficiently address impaired waters. The TMDL strategy development process will continue through 2004 and will include

ongoing stakeholder consultation. While the LaMP and TMDL processes are seeking to achieve improvements in the lake, the processes are designed to achieve different end points. The similarities and differences between the two processes are summarized in Table 1.

The National Wildlife Federation proposed an alternative mercury control program in lieu of a mercury TMDL and Region 5 responded by working with its states to develop a mercury phase-out proposal. Implicit in the alternative approach is a monitoring and reporting schedule that measures progress or alerts the public to lack of progress.

Next Steps

- By 2003, hold a mercury phaseout TMDL stakeholder meeting
- By 2004, a TMDL Strategy will be developed for Lake Michigan.
- By 2006, the Binational Toxics Strategy goals of 90 percent reduction of high-level PCBs, 75 percent reduction of total dioxins and furan releases, and 50 percent reduction of mercury use and release will be reached.
- By 2007, concentrations of PCBs in lake trout and walleye will be reduced by 25 percent. These results are based on early Lake Michigan Mass Balance model runs.



Sunset at Indiana Dunes

Photo courtesy of the National Park Service Indiana Dunes National Lakeshore*



Mercury Phase-Out Proposal: Working Draft

The states and EPA have developed a working draft Mercury Phase-Out Proposal that may be accepted in lieu of a TMDL. This working draft is still in discussion. A final proposal will be presented to stakeholders for comments in Spring 2003. EPA has issued guidance indicating that waters may be removed from a Section 303(d) list on the basis that “other pollution controls” are in place that will attain water quality standards within a reasonable time. Existing regulations and guidance will allow implementation of an alternative to a TMDL provided that the alternative will result in the water body attaining water quality standards within a reasonable time.

In brief, the basic concept of the phase-out proposal is to allow the Region 5 states to forgo developing TMDLs for mercury-impaired waters, including those waters with only fish consumption advisories for mercury, if they commit to perform the following actions:

- Expedite air and National Pollutant Discharge Elimination System (NPDES) permitting for mercury sources incorporating the most stringent standards (for example, Maximum Achievable Control Technology [MACT] standards or Great Lakes Initiative [GLI]). All new and existing NPDES permits will incorporate GLI standards by 2006.
- Expedite contaminated sediment remediation activities so that all sites are cleaned up by 2025. The states and Region 5 will work together to finalize a mercury source and sediment strategy by 2004.
- Implement voluntary mercury collection, reduction, and pollution prevention programs on an expedited schedule. Such programs can include mercury thermometer exchanges, source identification and reduction programs for publicly owned treatment works (POTW), and negotiation of voluntary elimination of mercury switches in automobiles. Region 5 expects that to have an approvable reduction program, a state would need to address in some way the following mercury-containing products: fluorescent lamps, thermostats, thermometers, dairy manometers, auto switches, switches used in household appliances, and electrical devices and measurement and control devices used in industry. In terms of source categories, a state would need to address households and small businesses (for instance, by providing free or low-cost mercury collection), schools, hospitals, automobile scrapping operations, dental offices, and the construction and demolition industry. The programs should be based on the objective of virtual elimination of mercury use and release. Where possible, a state should encourage discontinuation of mercury use and employment of processes that eliminate mercury releases. Where mercury use and release cannot be avoided, a state should seek to minimize releases through best management practices, improved waste management, and pollution controls.
- Develop and implement a monitoring plan to assess progress in reaching program goals. The monitoring plan should specify which parameters will be monitored and at what frequency. The plan should also indicate what benchmarks must be achieved to certify that progress is being made toward eliminating mercury impairments or fish consumption advisories for mercury in Region 5 waters.

EPA would forge individual state agreements through Memoranda of Understanding (MOU) to allow states to conduct the actions described above in lieu of developing mercury TMDLs; each LaMP would incorporate the actions. The phase-out proposal supports the Great Lakes Strategy, LaMP mercury reduction targets, and Binational Toxics Strategy mercury goals.

The phase-out proposal will be discussed at upcoming LaMP and Binational Toxics Strategy meetings and at a special stakeholder meeting.

