3.0 Conclusions and Recommendations

LaMP 2002 builds on LaMP 2000 and the Lake Michigan Mass Balance Study preliminary model runs to propose pollutant reduction targets. LaMP 2002 applies adaptive management approaches to the list of LaMP pollutants and stressors and proposes list changes based on the review that proposes adding certain stressors to the level of pollutants of concern. 1994 is established as the base line for measuring activity results and a monitoring dialogue will provide better coordinated efforts in data collection and dissemination.

LaMP 2002 provides an update on the activities that have been completed over the past two years to improve the Lake Michigan ecosystem. Overall, progress has been under all of the LaMP subgoals:

- More information regarding fish advisories is being disseminated to the public, while plans to control sources of contaminants in fish such as PCBs in sediments are moving forward.
- Drinking water quality in the lake remains good, although the potential for isolated contamination events still needs to be assessed and controlled through source water protection.
- Beach closures are a growing concern, but new resources available under the Federal Beach Bill and information and networking resources, such as those provided through the Great Lakes Beach Conference, are helping communities manage this problem.
- Lake Michigan habitat continues to be threatened by fragmentation, urban sprawl, wetlands loss, and changes in biological community structure. A number of new programs are collecting data and refining indicators .
- Open space preservation is increasing in importance. State coastal zone management programs will need to work to ensure that public access to the lake is balanced with protection of the ecosystem.
- Sustainable management of the Lake Michigan ecosystem faces new challenges with regard to declining lake levels, water diversions, and other concerns.
- The Lake Michigan Mass Balance Study revealed the importance of the air deposition pathway as a source of pollutant loading to the lake as sediment sites are remediated. PCB levels in Lake Michigan fish continue to decline, but additional controls on PCB sources will be needed to attain reduced fish consumption advisory levels targeted for 2020. Atrazine loadings through tributaries will also need to be reduced to simply maintain atrazine levels at current levels in the open waters of the lake.
- Aquatic nuisance species continue to enter the lake, although new agreements and pilot control programs including the ballast water reporting program in Michigan, may help pave the way to new management practices.
- New ecosystem stewardship activities are being undertaken throughout the basin, including establishment of a Lake Michigan Watershed Academy in 2002.
- Opportunities for collaborative decision making and information sharing are available through the Great Lakes Strategy, the Binational Executive Committee, the Great Lakes Binational Toxics Strategy, and others.
- More information is also becoming available to support collaborative data collection and reporting through the Lake Michigan Monitoring Coordinating Council, SOLEC, IADN, and the Great Lakes Wetland Consortium.

While much progress has been made, more work is needed to achieve the management recommendations outlined by the Lake Michigan Technical Coordinating Committee in LaMP 2000. These recommendations are reiterated below.

1. Ballast Water Control. The Great Lakes are not only impacted by aquatic nuisance species causing irreversible damage, but also serve as a pathway to other connected ecosystems. Standards or guidelines should be developed for ballast water treatment, working toward zero discharge.
2. Clean Up Legacy Sites. The Lake Michigan Mass Balance Study has confirmed that

contaminated sediment sites in the lake remain an ongoing source of contamination into the food web, causing fish consumption advisories and delaying dredging of navigable waterways, thereby affecting the local economies. In order to move swiftly to clean up contaminated legacy sites, both on land and in the water, we will convene federal and state Superfund, RCRA Corrective Action, Drinking Water, and Surface Water programs for planning discussions focused on the Lake Michigan ecosystem. The goal is to complete most of the plans by 2005 and cleanup actions by 2010. A few of the major sediment sites may require additional time.

3. Protect Source Water. As the drinking water source for 10 million people, it is important to determine if the current level of protection is sufficient. This can be done utilizing the state source water assessments that delineate source water areas and assess significant potential contaminant sources. Consideration should also be given to the issue of exporting the water.

4. Protect Habitat. Determine a priority for preservation sites within the recently mapped bio-rich clusters as well as the sites identified in the North American Waterfowl Management Plan, including connected corridors between clusters. Wetland areas, particularly those connecting to the lake that are important to many species, and restoration of coastal brownfields to greenfields, should be highlighted. Natural areas not only provide habitat, but also serve to filter sediments and runoff, as well as store flood waters and recharge ground water. This information should be provided online.

5. Collaborate on Fish Projects. Develop joint projects with the Great Lakes Fishery Commission that implement both the LaMP and the Joint Strategic Plan for Management of Great Lakes Fisheries. Collaborate on the development of fish spawning maps to aid protection activities and provide adjacent land use planners with protection tools and data.

6. Match Decision Makers with Issues. The appropriate level of government and other nontraditional groupings should be convened and engaged to accomplish LaMP goals. The following should be promoted within these groups: 1) national dialogue for control of aquatic nuisance species and atmospheric deposition of toxics; 2) academic and agency dialogue to promote data sharing, to define research needs, and to develop lake-related courses; and 3) local dialogue to provide protection tools and a lakewide perspective to land use planners.

7. Control Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs). The mixed discharge of storm water and domestic waste causes beach closings and is also a pathway for pathogens to enter the lake. Tools, training, and data should be provided to local governments to promote full compliance with CSO, SSO, and storm water regulations, and sewer system maintenance with awareness of land use planning on a watershed basis.

8. Develop an Agriculture Pollution Prevention Strategy. The strategy should include and coordinate among states, Natural Resource Conservation Service (NRCS), and the Lake Michigan Forum's Agriculture Task Force, promoting nonpoint source pollution prevention. Such activities may include using planted stream buffer strips, and pollution prevention strategies for pesticides, confined animal feed operations, and nutrient controls. Food web disruptions in Lake Michigan relate to sedimentation and continuing nutrient pollution.

9. Implement Area of Concern (AOC) Remedial Action Plans (RAPs). AOC RAPs are in various stages of completion. Many RAP and watershed groups, as well as local communities, have included the watershed in their planning and have developed a list of priorities (found in Addendum 6-B of the LaMP). These groups need support that includes tools, technical assistance and training, and some level of funding to leverage scarce resources.

10. Fill Data Gaps. Promote research with the following goals: 1) define in-basin and out-of-basin air pollution; 2) develop technology to control aquatic nuisance species in ballast water; 3) understand pesticides, pathways, and longevity in open water; 4) reuse contaminated sediments; 5) understand endocrine disrupters and their effects, sources, and possible controls; 6) identify fish spawning site locations; and 7) review and refine the Lake Michigan pollutants list.
11. Clean Sweep Strategy. Years after some pesticides were canceled and restricted (such as DDT/DDE, dieldrin, chlordane) they are still recovered in clean sweep operations, indicating the effectiveness of the tool. However, there is no specific funding source for these activities. Therefore, there is a need to develop a strategy to ensure long-term consistent funding or ownership of annual pesticide, household hazardous waste, and small business PCB/mercury Clean Sweep programs for each state.
12. Measure and Report. Continue development of the Lake Michigan Monitoring Coordinating Council and jointly develop a Monitoring Plan for Lake Michigan that includes expanding the United States Geological Service (USGS) National Water Quality Assessment Program (NAQWA) monitoring to Lake Michigan's eastern shore and drainage. Develop a strategy for duplicating the coordinated monitoring (simultaneous air, water, land, open water, and tributary mouths) of the Lake Michigan Mass Balance Project (LMMB, 1994) in 2004 to have data for a 10-year analysis. Establish a beach community monitoring network and a volunteer basin monitoring network.
13. Provide on-Line Information, Public Involvement Activities. Promote sharing of public information and public involvement by providing the following: 1) on-line data site that includes public health information; 2) an on-line habitat atlas of the basin showing ecologically-rich areas; and 3) a running summary of comments and responses. Continue the Forum's public meetings, workshops, and boat tour in partnership with organizations such as Grand Valley State University, which also sponsors the State of Lake Michigan Conference.
14. TMDL Strategy. Total Maximum Daily Loads (TMDLs) must be developed when waters do not meet state-adopted water quality standards, even after the implementation of technology-based controls. TMDLs are calculated to return waters to their designated uses. States develop TMDLs for their tributaries, but a strategy for cooperative TMDL work for Lake Michigan that includes a public involvement process is needed.
15. Stewardship Actions. The majority of the land that drains into the lake is privately owned and managed. America's cities and towns account for 80 percent of energy use. Of that 80 percent, land use planning and urban design affect about 70 percent, or 56 percent of the nation's total energy use. Energy production and transportation are major sources of air pollution. The message from these statistics is that every basin resident is a "Lake Michigan Manager." We need to strengthen partnerships with other education and outreach efforts to promote the activities necessary to accomplish the following: 1) promote recycling efforts, energy and water conservation, and trash barrel burning awareness; 2) place special emphasis on preventing the spread of aquatic nuisance species by boat owners for the next two years; 3) communicate the importance of private efforts in habitat preservation on both public and privately owned land; and 4) develop an Areas of Stewardship program for local communities and watersheds.

Glossary

Aquatic Nuisance Species (ANS)
Water-borne plants or animals that pose a threat to humans, agriculture, fisheries, and/or wildlife resources.

Area of Concern (AOC)
Areas of the Great Lakes identified by the International Joint Commission as having serious water pollution problems requiring remedial action and the development of a Remedial Action Plan. AOCs are defined in the Great Lakes Water Quality Agreement as: "a geographic area that fails to meet the general or specific objectives of the Great Lakes Water Quality Agreement, or where such failure has caused or is likely to cause impairment of beneficial use or of the area's ability to support aquatic life." Initially, there were 43 AOCs in the Great Lakes Basin.

Area of Stewardship
An Area of Stewardship watershed focus is an area, most often a watershed, for which a level of ecosystem integrity has been established as a goal and where an integrated, multi-organizational initiative or partnership is actively working to achieve that goal. The Lake Michigan Watershed Academy is being established to promote the concept of stewardship. Examples of such areas include the Chicago Wilderness, the Kalamazoo Multi-Jurisdictional Watershed Agreement, and the work in Grand Traverse Bay, Michigan and Door County, Wisconsin.

Basin
The land area that drains into a lake or river. This area is defined and bounded by topographic high points around the waterbody.

Beneficial Use
The role that the government decides a waterbody will fulfill. Examples of these uses include healthy fish and wildlife populations, fish consumption, aesthetic value, safe drinking water sources, and healthy phytoplankton and zooplankton communities. Restoring beneficial uses is the primary goal of the Remedial Action Plans for the Areas of Concern and of the Great Lakes Water Quality Agreement.

Beneficial Use Impairment
A negative change in the health of a waterbody making it unusable for a beneficial use that has been assigned to it. Examples of the 14 use impairments designated in the Great Lakes Water Quality Agreement include: restrictions on fish and wildlife consumption, beach closings, degradation to aesthetics, loss of fish and wildlife habitat, and restrictions on drinking water consumption. Local use impairments occur in Areas of Concern or other areas affecting the lake. Regional use impairments occur in an Area of Concern cluster or multi-jurisdictional watershed. Open water or lakewide impairment is a condition of pervasive impairment.

Binational Executive Committee (BEC)
The Binational Executive Committee (BEC) is a high-level forum composed of senior-level representatives of the USPC and Canadian counterpart agencies who are accountable for delivering major programs and activities to fulfill the terms of the GLWQA. The BEC derives its mandate from the provisions of the GLWQA which relate broadly to notification, consultation, coordination, and joint activity. In particular, Article X specifies the commitments of the Parties to consultation and review: "The Parties (U.S. and Canada), in cooperation with State and Provincial Governments, shall meet twice a year to coordinate their respective work plans with regard to the implementation of this Agreement and to evaluate progress made."

Biological Integrity
The ability of an ecosystem to support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to the best natural habitats within a region.

Boundary Waters Treaty
The international treaty between the United States and Great Britain signed on January 11, 1909, regarding the waters joining the United States and Canada and relating to questions arising between the two nations. It gave rise to the International Joint Commission.

Designated Uses
The role that a waterbody is slated to fulfill, such as a drinking water source. Uses are specified in water quality standards for each waterbody or segment, whether or not the current water quality is high enough to allow the designated use. Other typical uses of a waterbody include propagation of fish and wildlife, recreation, agriculture, industry, and navigation.

Ecosystem
A biological community and its environment working together as a functional system, including transferring and circulating energy and matter. It is an interconnected community of living things including humans, and the physical environment with which they interact.

Ecosystem Indicator
An organism or community of organisms that is used to assess the health of an ecosystem as a whole. When tracked over time, an ecosystem indicator provides information on trends in important characteristics of the system. Also known as an environmental indicator.

Ecosystem Integrity
A measure of the capacity of ecosystems to renew themselves and continually supply resources and essential services. Ecosystem integrity is the degree to which all ecosystem elements-species, habitats, and natural processes-are intact and functioning in ways that ensure sustainability and long-term adaptation to changing environmental conditions and human uses.

Ecosystem Management
The process of sustaining ecosystem integrity through partnerships and interdisciplinary teamwork. Ecosystem-based management focuses on three interacting dimensions: the economy, the social community, and the environment. Ecosystem-based management seeks to sustain ecological health while meeting economic needs and human uses.

Emerging Pollutant
The Lake Michigan Lakewide Management Plan addresses emerging pollutants, which include those toxic substances that, while not presently known to contribute to use impairments or to show increasing loadings or concentrations, have characteristics that indicate a potential to impact the physical or biological integrity of Lake Michigan. These characteristics include presence in the watershed, ability to bioaccumulate, persistence (greater than 8 weeks), and toxicity. Emerging pollutants include atrazine, selenium, and PCB substitute compounds.

End Point Subgoal
End point subgoals describe the desired levels of ecosystem integrity and ecological services required to restore beneficial uses and provide for healthy human natural communities in the basin.

Fish Consumption Advisory (FCA)
An advisory issued by a government agency recommending that the public limit their consumption of fish. Advisories are issued to limit

exposure to toxic substances in the fish that have the potential to impact human health. A fish consumption advisory is prepared annually by each state. Fish caught from selected lakes and streams are tested for toxic substances.

Great Lakes Water Quality Agreement (GLWQA)
An international agreement signed by the United States and Canada in 1972 and updated in 1978 and 1987. The Agreement seeks to restore and maintain full beneficial uses of the Great Lakes system. Language committing the two nations to virtually eliminate the input of persistent toxic substances in order to protect human health and living aquatic resources was included when the Agreement was updated in 1978. The philosophy adopted by the two governments is zero discharge of such substances.

Habitat
That space that is or can be successfully occupied (inhabited) by a species or biotic community or some broader (taxonomic or phylogenetic) entity. Habitat is simply the place where an organism or group of closely related organisms live.

Lake Michigan
Lake Michigan is the only one of the five Great Lakes wholly within the U.S. border. It is bounded by the states of Michigan, Indiana, Illinois, and Wisconsin. It is connected with and flows into Lake Huron through the Straits of Mackinac.

Lake Michigan Basin
Used to describe Lake Michigan and the surrounding watersheds emptying into the lake.

Lake Michigan Lakewide Management Plan (LaMP)
This document is both a reference document and a proposal for a process that will guide remediation of past errors and the achievement of sustainable integrity of the basin ecosystem. It contains clear, comprehensive goals, specific objectives, a strategic plan, and a system of indicators and monitoring for use in judging environmental status and effectiveness of current actions.

Lake Michigan Management Committee (LMMC)
The LMMC guides the overall development and implementation of the Lake Michigan LaMP. The current membership includes: EPA (Lake Michigan Team, Great Lakes National Program Office, and Office of Research and Development), U.S. Fish and Wildlife Service, Army Corps of Engineers, U.S. Geological Survey, U.S. Department of Agriculture (Natural Resources Conservation Service), Illinois Environmental Protection Agency, Indiana Department of Environmental Management, Michigan Department of Environmental Quality, Wisconsin Department of Natural Resources, Great Lakes Fishery Commission, Chippewa/Ottawa Treaty of Fishery Management Authority, and the Grand Traverse Band of Ottawa and Chippewa Indians, Michigan.

Lake Michigan Mass Balance Study (LMMB)
This mass balance research project begun in 1994 is part of the Lake Michigan Lakewide Management Plan and is designed to develop a sound, scientific base of information that will guide future toxic pollutant load reduction and prevention activities.

Lake Michigan Monitoring Coordinating Council (LMMCC)
The Council provides a forum for identifying gaps and establishing monitoring priorities, exchanging information, and forming partnerships. It responds to the need for enhanced coordination, communication, and data management among the many agencies and organizations that conduct or benefit from environmental monitoring efforts in the basin.

LaMP Technical Coordinating Committee (TCC)
The TCC develops documents and programs, and recommends strategies, goals, and objectives. The current membership includes the same agencies/entities as the Management Committee, plus the Oneida Tribe of Wisconsin. There is a steering committee and six subcommittees under the TCC.

Methyl Mercury
Any of several extremely toxic compounds formed from metallic mercury by the action of microorganisms and capable of entering the food chain. Methyl mercury is an organic form of mercury created when inorganic mercury is released into the environment where it volatilizes back to the atmosphere as a gas or as adherents to particulaltes. Methylmercury biomagnifies up the food chain as it is passed from a over food chain level to a higher food chain level through consumption of prey organisms or predators.

Pressure-State-Response Approach
The pressure-state-response approach involves linking environmental indicators to stressors that impact the environment and to program activities. The use of this approach should promote consistency in the development and application of environmental indicators. It is an organizing framework used by U.S. EPA Region 5 in its "Guide for Developing Environmental Goals, Milestones and Indicators," found in LaMP Appendix H.

Remedial Action Plan (RAP)
These are federally-mandated local plans designed to restore environmental quality to Areas of Concern on the Great Lakes (there are 10 in Lake Michigan and there were initially 43 throughout the Great Lakes). The Areas of Concern were identified for their persistent pollution problems. Remedial Action Plans were called for by a protocol added to the Great Lakes Water Quality Agreement in 1987.

Stressor
Any chemical, physical, or biological entity that can induce adverse effects on individuals, populations, communities, or ecosystems and be a cause of beneficial use impairments. Examples of stressors include: pathogens; fragmentation and destruction of terrestrial and aquatic habitats; exotic nuisance species; and uncontrolled runoff and erosion.

Sustainable Development
Sustainable development is the process of economic development to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Total Maximum Daily Load (TMDL)
TMDLs are set by regulators to allocate the maximum amount of a pollutant that may be introduced into a waterbody and still assure attainment and maintenance of water quality standards.

U.S. Policy Committee
The U.S. Policy Committee is a forum of senior-level representatives from the Federal, State, and Tribal governmental agencies that share responsibility for environmental protection and natural resources management of the Great Lakes – to advance the restoration and protection of the Great Lakes Basin Ecosystem. U.S. Policy Committee Partners include the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Coast Guard, U.S. Department of Agriculture, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, U. S. Geological Survey, Agency for Toxic Substances and Disease Registry, U.S. Forest Service, Great Lakes Fishery Commission, Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, Great Lakes Tribal Governments.