

EPA United States
Great Lakes Program
Report On The Great Lakes
Water Quality Agreement



UNITED STATES GREAT LAKES PROGRAM REPORT ON THE GREAT LAKES WATER QUALITY AGREEMENT

United States Environmental Protection Agency
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INTRODUCTION

This is the fifth Biennial Progress Report to the International Joint Commission (IJC) and the citizens of the Great Lakes Basin on actions taken by the United States (U.S.) to protect and restore the Great Lakes ecosystem. This report reviews some principal challenges facing the ecosystem; outlines approaches taken by Basin stakeholders to address these challenges; highlights some historic and recent actions by Federal, State, and Tribal agencies, as well as their non-governmental partners, to implement these approaches; and outlines future activities on behalf of the Great Lakes.



Figure 1: The U.S. Great Lakes Region

This report is being issued at a propitious time as we celebrated, during the last biennium, the 25th anniversaries of the signing of the Great Lakes Water Quality Agreement (the Agreement), the creation of the U.S. Environmental Protection Agency (EPA, or the Agency), and the signing of the Clean Water Act. As we pause to reflect on the last two years of progress under the Agreement, we should recognize that what is being achieved today is built upon, and a direct result of, the last 25 years of binational cooperation on the Great Lakes. Indeed, we have achieved many significant environmental victories as we work to restore the ecosystem. A few prime examples include the following:

Since 1971, over \$8 billion worth of wastewater infrastructure improvements have been put in place throughout the Great Lakes Basin to upgrade sewage treatment plants in order to address excessive phosphorus and low dissolved oxygen levels in the lakes. This has been augmented by bans on high phosphate household detergents, and farm practices to reduce agricultural runoff. Partly as a result of these activities, Lake Erie returned from the “dead” to become a prized sportfishing location.



The United States and Canada signed the Great Lakes Water Quality Agreement on April 15, 1972.

Since a stretch of the Cuyahoga River caught fire in 1969 due to oil and debris present, water quality has improved dramatically, largely due to the passage of the 1972 Clean Water Act, requiring investments by public and private dischargers for treatment of their effluent. Because of these actions, many fish communities have returned to their natural abundance.

As a result of a combination of pollution prevention and site restoration, the release of toxic substances into the environment has been greatly reduced. Subsequently, levels of toxic contaminants have dropped dramatically in fish and wildlife, improving the health of many species.

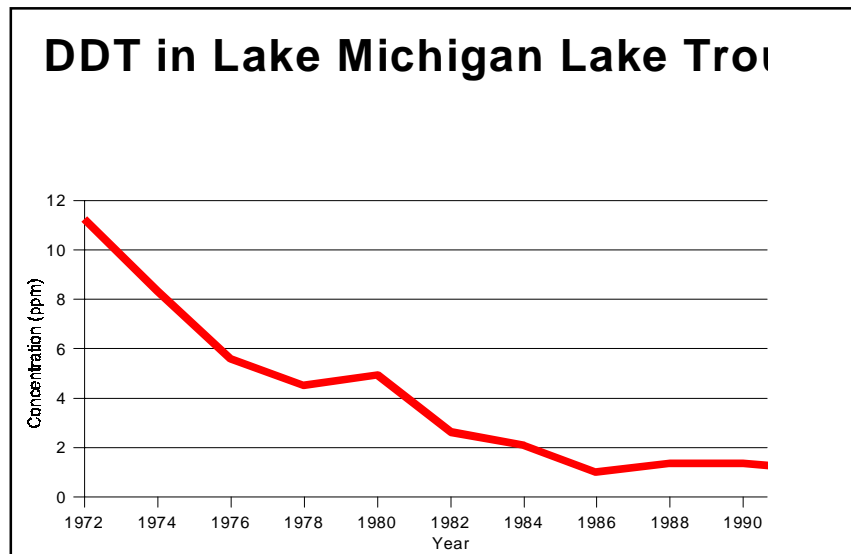


Figure 2: DDT in Lake Michigan Lake Trout

EPA's actions to get lead out of gasoline has dramatically decreased its levels in the environment. Lead is a toxic metal that presents environmental and human health risks, including brain and kidney damage, especially to children.

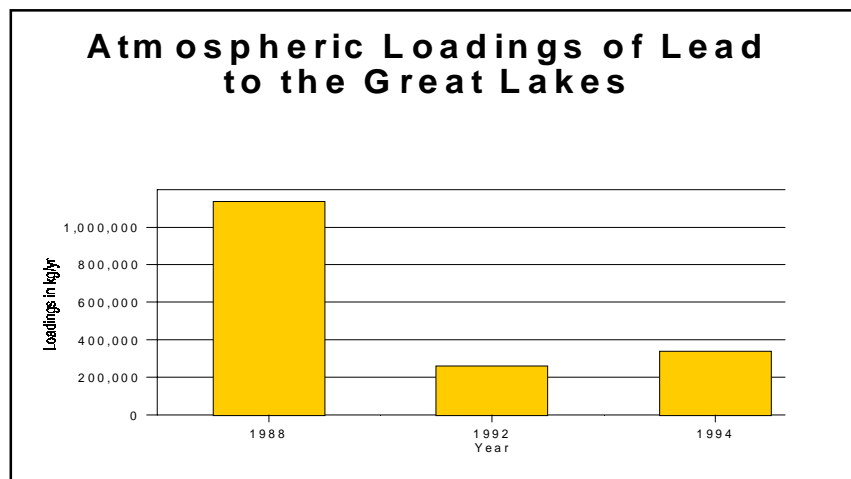


Figure 3: Atmospheric Loadings of Lead to the Great Lakes

Twenty-five years after the U.S. canceled the pesticide DDT, many fish-eating bird species have experienced remarkable recoveries. The ban has been characterized as one of history's great environmental success stories. Bald eagles, peregrine falcons, osprey, and double-crested cormorants, viewed as "DDT victims," have all experienced increases in breeding populations in the Great Lakes Basin. Other shorebirds have also experienced dramatic population rises.

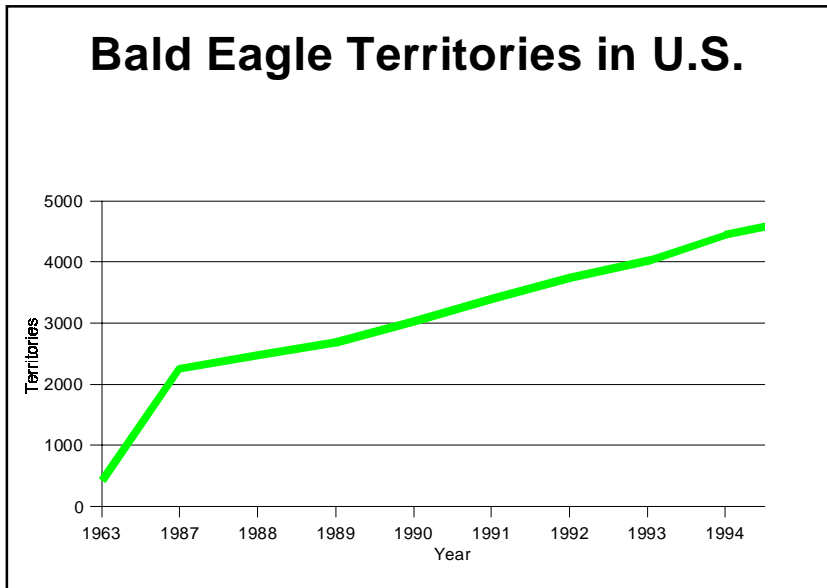


Figure 4: Bald Eagle Territories in U.S.



The bald eagle, our proud national symbol, has made a strong recovery in the Great Lakes

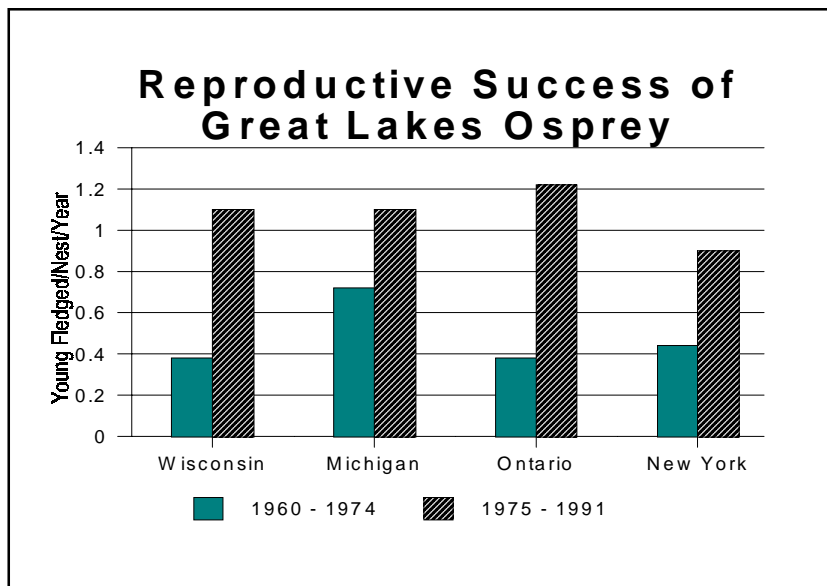


Figure 5: Reproductive Success of Great Lakes Osprey

Over one million pounds of polychlorinated biphenyls (PCBs), one of the compounds largely responsible for fish consumption advisories in the Great Lakes, were removed from the bottom sediments of Waukegan Harbor, Illinois. This mass represented one of the largest single sources of PCBs to the Great Lakes.



The non-native sea lamprey has had a significant impact on the Great Lakes fishery

Since 1958, the binational Great Lakes Fishery Commission has achieved a dramatic reduction in the numbers of sea lamprey, a non-native predator which had decimated populations of prized fish such as lake trout and lake whitefish.

These few examples do not do full justice to the variety of the major environmental achievements of the last 25 years. Nor does this document provide an exhaustive summary of all the important and impressive work undertaken by the community of Great Lakes stakeholders during the last biennium; rather, it offers representative actions being implemented to restore and protect the Basin. And indeed, it is heartening to see the scope and breadth of activities being implemented. The progress being achieved points to the existence of a strong Great Lakes stakeholder community, supported by dedicated government and private sector professionals, who are forging ahead with Great Lakes restoration and protection activities.

Innovative partnerships, projects, and research are the norms in the Great Lakes. We are working smarter and more efficiently to deliver on the promises made under the Agreement via the Lakewide Management Plan (LaMP), Remedial Action Plan (RAP), and other Agreement programs. New challenges and opportunities will continue to present themselves to the U.S. Great Lakes Program as it continues to make steady progress in improving the Great Lakes ecosystem for all of its inhabitants. With these thoughts in mind, EPA is proud to present this report to the IJC on behalf of the U.S. Great Lakes Program.

SIGNIFICANT EVENTS DURING THE LAST BIENNIUM

A variety of significant events have occurred during the last two years. Most of these environmental “victories” have been made possible through the collaborative efforts of a variety of Great Lakes stakeholders at the Federal, State, Tribal, local and non-governmental levels.

New Particulate Matter and Ozone Standards

In July 1997, EPA published final standards for particulate matter and ozone (otherwise known as soot and smog), a major step forward in protecting the public from the health hazards of air pollution. These updated standards, the product of many years of intensive scientific review, move us toward fulfilling the Clean Air Act’s goal of ensuring Americans that their air is safe to breathe. The new standards will provide new health protection to 125 million Americans, including 35 million children. EPA will issue guidance and rules designed to give States, local governments, and businesses the flexibility to meet these protective public health standards in a cost-effective manner.

Signing of the Great Lakes Binational Toxics Reduction Strategy

The Agreement calls for the “virtual elimination” of discharges of persistent toxic substances into the Great Lakes Basin. In keeping with this commitment, Prime

Minister Chrétien of Canada and President Clinton of the U.S. committed in February 1995 to the development of a coordinated strategy to virtually eliminate persistent toxic substances, particularly those which bioaccumulate, from the Great Lakes Basin. The Great Lakes Binational Toxics Strategy (the Strategy), signed on April 7, 1997 by EPA Administrator Carol Browner and then Canadian Minister of the Environment Sergio Marchi, fulfills that commitment. The Strategy sets reduction targets for the following persistent toxic substances: aldrin/dieldrin, benzo(a)pyrene, chlordane, DDT, hexachlorobenzene, alkyl-lead, mercury, mirex, octachlorostyrene, PCBs, dioxins/furans, and toxaphene. These substances have been associated with potential widespread long-term, adverse effects on wildlife and human health.

The Strategy sets ambitious reduction targets or “challenges” within a ten-year time frame for these substances, such as a 50 percent reduction target for the release of mercury and a 75 percent reduction target for the total releases of dioxins/furans for sources resulting from human activity. The Strategy concentrates on the long-range transport of these substances through the atmosphere, recognizing that the Great Lakes receives inputs of persistent toxic substances from both within and outside the Basin.

The Strategy presents a vision of a new, creative approach to environmental protection, inviting voluntary pollution prevention measures, while building upon existing regulatory programs. From the beginning, EPA and Environment Canada have involved State, Provincial, Tribal, industrial, environmental and other interested stakeholders, recognizing that the governments alone cannot achieve the goal of virtual elimination -- all parts of society must contribute to ensure success.

Protecting our Children -- Our Most Vital Resource

In September 1996, EPA issued a report entitled *Environmental Health Threats to Children* which highlighted the potential health threats faced by children from toxic contaminants in the environment. It argued for a comprehensive approach to providing children with stronger health protection and it set forth a new national agenda to protect children from those risks more comprehensively than before. Under its *National Agenda to Protect Children’s Health from Environmental Threats*, EPA’s policy will be to ensure that all standards that the Agency sets are protective enough to address the potentially higher risks faced by children, and that the most significant current standards are re-evaluated as new scientific knowledge emerges. Under this new policy, the Agency will select, with public input and environmental peer review, five of its most significant public health and environmental standards to reissue on an expedited basis.



The U.S. is focusing on environmental health threats to children

Protecting our children was made a national priority when President Clinton issued an April 1997 Executive Order requiring each Federal agency to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that their policies, programs, activities, and standards address any disproportionate risks. In support of this effort, the first Federal research centers dedicated to the protection of the health of children from environmental threats are being created. Research will be conducted on the possible environmental causes of children’s illnesses and disorders, especially respiratory diseases; the impact of common environmental contaminants, such as lead or mercury, on intellectual

development; and the influence on initial growth and development of exposure to certain environmental agents before or after birth.

In May 1997, EPA Administrator Browner expanded this Children's Agenda internationally by persuading environmental leaders of the world's leading industrialized nations to increase their commitment to protecting children from environmental risks when developing national regulations and international treaties; to work jointly to harmonize risk assessment procedures and protocols to address environmental risk to children; to develop mechanisms to share information on lead hazards in products designed for children; and to support an Organization for Economic Cooperation and Development initiative to develop more complete guidelines for testing potentially endocrine disrupting chemicals, with a particular emphasis on screening those that could specifically affect children.

At the State level, the Indiana Department of Environmental Management (IDEM), for example, has announced a new program to identify toxic hotspots that put children at risk in their communities from exposure to lead, mercury, nitrates, ozone, and E. coli.

State of the Lakes Ecosystem Conference and the State of the Great Lakes Report



The SOLEC conferences and papers have presented the leading scientific opinions on the state of the Great Lakes

The State of the Lakes Ecosystem Conference (SOLEC) is one of the principal means for the U.S. and Canada to report on the health of the Basin and its inhabitants. SOLEC '96 addressed the nearshore areas of the Great Lakes, the most biologically productive and the most heavily impacted part of the system. In September 1997, the Parties published the *State of the Great Lakes -- 1997* (SOGL Report) as a summary of the state of the Great Lakes at the end of 1996. It also contains updates to information presented at SOLEC '94. The first two SOLECs reviewed the state of various components of the Great Lakes ecosystem through the use of indicators and a subjective assessment of conditions. These indicators were developed through the best judgement of the scientists involved.

The SOGL Report serves as the most up to date and comprehensive collection of Great Lakes indicators to date and also as a jumping off point for SOLEC '98, whose theme is the establishment of a consistent, easily understood suite of indicators that will objectively represent the status of major ecosystem components across the Great Lakes Basin. SOLEC will use these indicators to report on progress every two years and to assess progress toward achieving the purpose of the Agreement. The indicators will also establish a benchmark against which Great Lakes ecosystem assessment, monitoring, and management efforts can be measured. The acceptance and use of a core set of indicators can drive data collection activities throughout the Basin and ultimately lead to better decision-making for its protection and restoration. It is important to note that the LaMPs are focusing on ecosystem objectives and lake-specific indicators which are serving these purposes at the individual lake basin level.

Lake Michigan Mass Balance Study/Enhanced Monitoring Program

The Lake Michigan Mass Balance Study/Enhanced Monitoring Program is the largest multi-media toxic contaminant monitoring and modeling project ever undertaken. It is designed to answer questions that will help environmental

managers make well informed, scientifically based decisions on reducing toxic pollutants in Lake Michigan. The mass balance model will determine what effects reduction in pollutant loads will have on the lake and, in particular, on contaminant levels in fish tissue. The model's findings will help target future Lake Michigan LaMP toxic load reduction efforts at the Federal, State, Tribal, and local levels.

Numerous State and Federal agencies and universities are participating in this EPA-sponsored effort. The chemicals being monitored are PCB congeners, trans-nonachlor, atrazine, and total mercury. Over 30,000 samples from the lake, tributaries, atmospheric deposition, biota, and sediments were collected during 1994 and 1995 and close to 1,000,000 analytical measurements are being reported to EPA where they will be quality assured by 1998 and made available via the Great Lakes Environmental Database. All methods used in collecting and analyzing samples have been made available in a "Methods Compendium". Data sets will soon be made available to the public, starting with atrazine. These data are feeding the current development of mathematical models to assist in making LaMP management decisions to reduce toxic pollutant concentrations. The first integrated model runs will be completed in 1999.



The R/V Lake Guardian is supporting the Lake Michigan Mass Balance and other monitoring activities

Implementing the Great Lakes Water Quality Guidance

The Great Lakes Water Quality Guidance aims for consistency in water quality standards and permitting procedures across the Great Lakes system. It was initially developed by the eight Great Lakes States, EPA, and other Federal agencies in consultation with citizens, local governments, and industries. It targets especially the long-lasting pollutants that accumulate in the Great Lakes food web. In addition, the Guidance helps establish consistent goals for state water quality management plans, which are critical to the success of the international multi-media efforts to protect and restore the Great Lakes ecosystem. Once the Guidance is implemented, EPA estimates that an annual reduction of almost **one million pounds** of contaminants entering the lakes is expected. Implementation of the Guidance will protect human health, expand commercial and recreational fishing, and improve the safety of recreational activities in the Great Lakes. To date, the States of Indiana, Ohio, Michigan, and Wisconsin have completed the adoption process of the Guidance. The remaining States are on schedule to complete the adoption process by the end of 1997.

Uniform Fish Consumption Advisory

In 1993, the eight Great Lakes States developed a protocol for development of a uniform fish consumption advisory. This provided a new scientific approach for determining the amount of fish that can be ingested without significant health risks. The higher rates of local fish consumption and effects upon the developing child were considered as well as potential cancer effects and impacts upon the immune system. The ultimate goal was to have consistent fish consumption advisories among States, which helps the public better understand the risks associated with consumption of contaminated sportfish. The Agency for Toxic Substances and Disease Registry (ATSDR) assisted EPA in encouraging a uniform fish advisory by providing recent preliminary findings from its Great Lakes Human Health Effects Research Program on increased body burden levels in at-risk populations, and observed neurobehavioral deficits from consumption of contaminated Great Lakes

fish. The protocol has undergone two independent scientific reviews. Currently, seven of the Great Lakes States apply the protocol or one which is equivalent.

Lake Trout Natural Reproduction in Lake Superior



Lake Trout are once again naturally reproducing in Lake Superior -- an environmental success story

Native lake trout in Lake Superior were severely depleted by the 1950s in part due to overharvesting and sea lamprey predation. Restoration efforts since the 1950s of the U.S. Fish and Wildlife Service (FWS), including researchers now with the U.S. Geological Survey (USGS), in concert with other Federal, Provincial, State and Tribal agencies, and the Great Lakes Fishery Commission (GLFC), have resulted in a 1996 declaration of victory in restoring lake trout in Lake Superior. Lake Superior lake trout populations have become self-sustaining in offshore areas and, accordingly, stocking of Federally reared lake trout has been discontinued in areas of the lake extending from the Apostle Islands in Wisconsin eastward to Grand Marais, Michigan. Some inshore stocks have also recovered. In Canadian waters, lake trout populations have improved in several areas such that stocking has been reduced to about a third of stocking levels in the 1980s. This major success is attributed to the combined management effects of reduced harvest, effective sea lamprey control, and a successful stocking program.

Update on Waste Incinerator Rules



New and pending regulations will help decrease emissions from waste incinerators

In September 1997, EPA issued rules to protect public health by significantly reducing the harmful air pollution that comes from medical waste incinerators, a major source of mercury and dioxin air emissions. When fully implemented, emissions will be reduced by 94 percent for mercury and 95 percent for dioxin. In addition, several other major air pollutants, some of which are suspected of causing cancer or other serious health effects, will be reduced by 75 to 98 percent. In a related activity, EPA and several of the Great Lakes States are engaged in a project to reduce sources of mercury in medical waste through targeted education and outreach activities and through direct mercury reduction assessments in hospitals. These activities will enhance the medical community's understanding of the dangers of mercury in the environment, particularly for certain high-risk populations.

In 1995 EPA issued separate air pollution standards for municipal waste combustors that will reduce dioxin from these sources by 99 percent and mercury by 90 percent; additionally, in 1998, the Agency intends to develop final rules for hazardous waste incinerators, which are expected to significantly reducing dioxin and mercury emissions.

Other Toxic Emission Reduction Activities

EPA is also using its authorities under the Clean Air Act to reduce emissions of toxic air pollutants from many other sources. Maximum Achievable Control Technology (MACT) standards have been and are continuing to be developed to reduce emissions of 188 hazardous air pollutants from a diverse list of source types ranging from steel mills to synthetic chemical manufacturing to dry cleaners. Included on the list of pollutants are mercury, dioxins, PCBs, hexachlorobenzene, and other Great Lakes pollutants of concern. Other activities are focused on urban areas, electric utility steam generating units, and sources of mercury.

Waukegan Harbor Fish Consumption Signs Come Down

Signs warning anglers not to eat any fish caught at any time in Waukegan's North Harbor were removed on February 20, 1997, putting fish taken from the harbor in the same consumption categories applied to all Lake Michigan fish. Removal of the signs marks the end of nearly two decades of restrictions imposed after PCB contamination of the harbor was identified in 1981. The decision to remove the warning signs and withdraw warnings targeted specifically at fish taken from the North Harbor reflects continuing improvements at the site following the removal of approximately *one million pounds* of PCBs from bottom sediments in 1992. Following the removal, three years of annual fish sampling showed no violations of action levels for PCBs in alewife, coho salmon, chinook salmon, rainbow trout, and yellow perch. A lakewide fish advisory still remains in effect, but since sampling has shown no appreciable difference in PCB concentrations in fish taken from the harbor and those from the open lake, the local advisory is no longer needed.

Manistique River and Harbor Area of Concern (AOC) Superfund Site Remediation

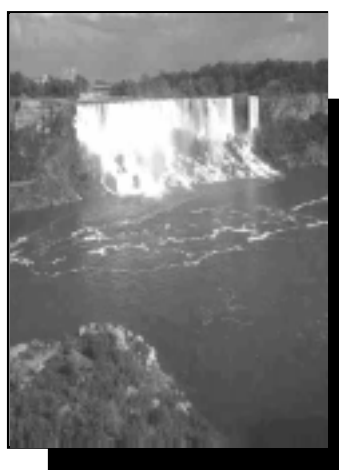
A Superfund removal action at the Manistique River/Harbor AOC site is ongoing, and will remove at least 122,000 cubic yards of PCB-contaminated sediments by 1998. This is a removal action in part, because an estimated 100 pounds of PCBs are being washed into Lake Michigan annually, and possibly more due to storm events. The removal action involves dredging, separation of the more highly contaminated sediments, and their proper disposal. After early disagreements with EPA's initial dredging proposal, the community supported the proposal and have continued to support EPA activities. Potentially Responsible Parties (PRPs) contributed over \$6.4 million to the site work as part of a mixed funding settlement with the Agency. To date, almost 60,000 cubic yards of river and harbor sediments have been removed. Turbidity measurements in the water column in close proximity to the dredged areas indicate that the dredging is not causing the resuspension of the contaminated sediments and that there are no localized impacts on water quality due to the dredging project. This project has demonstrated EPA's commitment to consider community preferences as well as the ability of the Agency to conduct environmental dredging projects in a cost-effective and environmentally sensitive manner. These lessons can be applied to many other contaminated sediment projects on the Great Lakes.

Second Great Waters Report to Congress

Under section 112(m) of the Clean Air Act (CAA), as amended in 1990, Congress authorized EPA to undertake the Great Waters Program to evaluate the atmospheric deposition of hazardous air pollutants (including mercury and PCBs) to the Great Lakes and other waters. The Program's Second Report to Congress (June 1997) found that levels of toxic pollutants are declining slightly or leveling off but remain a significant concern. It also reported that, at this time, no specific revisions to requirements, standards, and limitations pursuant to the CAA or other relevant federal statutes have been identified as necessary to assure protection of human health and the environment in response to EPA's assessments of deposition of hazardous air pollutants. In the future, as EPA evaluates progress of ongoing efforts and considers new information as it becomes available, new approaches may be pursued. In addition, the Report introduced a special inventory of emissions and list

of sources prepared under Section 112(c)(6). This inventory data shows that recent emissions of PCBs and hexachlorobenzene are extremely low, and all sources have been regulated. Emissions of mercury and dioxins show declines since 1990, due to activities by industry and municipalities. Additional rules and actions on incineration sources are expected to reduce mercury to less than half of 1990 emissions by 2005, and dioxins will also be down, from approximately 12.5 pounds (in toxic equivalency factors) in 1990 to under 4 pounds by 2005. Emissions of alkylated lead from onroad vehicles has stopped after the phaseout of leaded gasoline for onroad motor vehicles was completed in December 1995. EPA is actively developing ways to better integrate air and water programs to address air deposition to the Great Water bodies.

Niagara River Toxics Management Plan Targets



The flow of the four upper Great Lakes tumbles over Niagara Falls on its way to Lake Ontario

EPA and the New York State Department of Environmental Conservation (NYSDEC) have identified 26 hazardous waste sites on the Niagara River responsible for over 99 percent of the estimated input of 18 toxic chemicals from all such sites on the U.S. side of the river, and put them all on remediation schedules. Remediation of these sites is intended to virtually eliminate the migration of toxic pollutants into the river. All remedial construction has been completed at seven sites, with remedial construction underway at eleven more. For many of the sites, significant remedial controls are already operating, providing substantial load reductions. The remaining sites are under design or study. EPA estimates that remediations to date have reduced the potential inputs into the river by at least 25 percent. EPA also estimates that remedial activities to be completed in 1997 will reduce the potential inputs into the river by 80 percent. Revised remediation schedules call for all sites to be completed by 2001. EPA and NYSDEC are working to refine reduction estimates which may show even higher reductions to date.

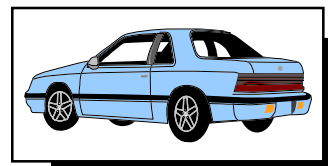
Niagara River Toxics Management Plan Priority Pollutants	
Benz(a)anthracene	Mirex
Benzo(a)pyrene	Octachlorostyrene
Benzo(b)fluoranthene	PCBs
Benzo(k)fluoranthene	DDTs
Chlordane	Dioxins
Chrysene	Tetrachloroethylene
Dieldrin	Arsenic
Hexachlorobenzene	Lead
Mercury	Toxaphene

Table 1: Niagara River Toxics Management Plan Priority Pollutants

In addition, upwards of ten sediment remediation projects in the Niagara River Basin have been completed between 1990 and 1996, accounting for the removal of well over 160,000 cubic yards of sediments contaminated by a variety of hazardous substances, including PCBs and heavy metals. An additional five projects, either planned or underway, will remove approximately 113,000 additional cubic yards of contaminated sediments.

Automotive Pollution Prevention Project Reductions

The third progress report for the U.S. Automotive Pollution Prevention Project, highlighting the progress made by America's car companies in reducing the use, generation and release of persistent toxic substances and other materials of concern, was released in June 1997. The Auto Project began in September 1991 as a Great Lakes regional effort and expanded to include pollution prevention and resource conservation activities at assembly and component manufacturing facilities nationwide. Combined pollution prevention achievements include: a 9.2 percent reduction in project targeted substances on a U.S. vehicle produced since the Project began in 1991. Two foundries recycling zinc galvanized sheet metal accounted for over 50 percent of the total targeted substances released in 1995. Excluding these, the Auto Project achieved, a 60.8 percent reduction in EPA 33/50 Program substances and a 53.2 percent reduction in EPA Toxic Release Inventory (TRI) reportable releases since the 1988 base year, and a 54.5 percent reduction overall since 1991.



The U.S. Automotive Pollution Prevention Project, piloted in the Great Lakes, has been expanded to facilities nationwide

Beach Closings

In 1997, EPA announced a new national program to reduce the potential public health risk of getting infectious diseases from swimming or playing in contaminated beach water. Through the Beaches Environmental Assessment, Closure and Health (BEACH) Program, EPA will work with State, Tribal and local governments to ensure effective beach monitoring and advisory programs are in place, that bacteriological criteria in water quality standards programs are protective, to improve detection methods and create predictive models, and to keep the public informed. EPA's Great Lakes National Program Office (GLNPO) has been conducting annual surveys of beach closings for the 582 recognized beaches along the U.S. coast of the Great Lakes. This information is now available in a document entitled *A Summary of U.S. Great Lakes Beach Closings 1981-1994*. The report finds that for the reporting years, on average, approximately 20 percent of the beaches experienced a period of closure. In addition, there are AOCs in eleven of the nineteen counties having beaches considered poor or deteriorating. The primary causes for these closures are overflows of combined stormwater and sewage systems with insufficient capacity to retain heavy rains for processing through sewage treatment plants. The information contained in this report is helping county health departments concentrate their monitoring efforts and remedial activities on those beaches which experience periodic closings.



Despite aggressive actions to protect human health, beach closings still affect some Great Lakes beaches.

In Northwest Indiana, the Inter-Agency Technical Task Force on E. coli (Task Force), consisting of technical experts from local, State, and Federal agencies, is seeking a comprehensive approach that addresses beach closings. As data is collected and analyzed, the Task Force will develop an implementation strategy that can address causes and solutions to periodic coliform bacterial contamination of Indiana's beaches on Lake Michigan. The strategy will include consistent methods of data collection, the development of a real-time forecasting system, identification of the sources and fate of the bacteria, and a systematic program of remediation.

ONGOING AND EMERGING ISSUES

Fish and Wildlife Consumption Advisories Still In Place



Not all Great Lakes fish are safe to consume; further toxic reduction efforts will help improve this situation

The Great Lakes food web remains contaminated by a variety of bioaccumulative toxic substances, causing unacceptable levels of these contaminants in some fish and wildlife. Levels are lower than in the early 1970s, but still justify the issuance of public health advisories regarding fish and wildlife consumption. Advisories especially apply to vulnerable consumers, such as children, women who anticipate bearing children, and frequent consumers, such as sport fishermen and Native Americans. EPA's 1996 summary of State-issued fish advisories showed an increase of 26 percent over 1995, largely as a result of better monitoring and reporting by States. As in prior years, 100 percent of the Great Lakes waters continue to be under advisory, most of which are due to mercury, PCBs, and dioxins.

Fish tissue sampling indicate that PCB levels in Lake Huron and Lake Michigan lake trout are generally declining. In Lake Ontario, PCB levels in salmon and trout are slowly declining, resulting in some less restrictive advisories. Contaminant levels remain low in most Lake Erie fish. For Lake Superior, toxaphene is the basis for a number of advisories issued by the Province of Ontario and the State of Michigan.

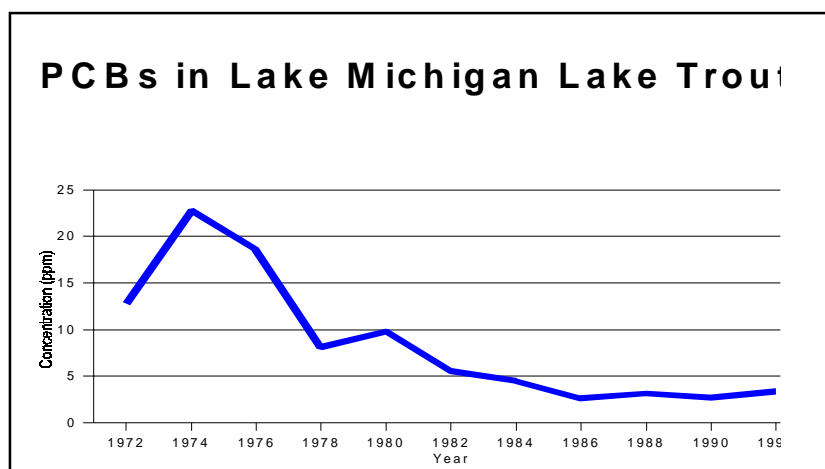


Figure 6: PCBs in Lake Michigan Lake Trout

Toxaphene Levels in Lake Superior

Toxaphene was a trade name for a pesticide once heavily used in the south on cotton crops and which was also used in the Great Lakes watershed. Because of its volatility and persistence, it has been recognized as pervasive in Arctic wildlife, owing to atmospheric transport. Since the pesticide was canceled in 1982, levels have fallen across the Great Lakes except in Lake Superior, which has the highest levels known anywhere. The State of Michigan and the Province of Ontario issue a number of consumption advisories for Lake Superior fish species because of toxaphene. The distribution of toxaphene in Duluth Harbor bottom sediments suggest a local source there in recent years.

EPA, Environment Canada, and State environmental agencies are working to achieve a better understanding of the persistence of toxaphene in Lake Superior. EPA's Office of Research and Development has awarded a grant to obtain sediment cores and measure the air/water exchange of toxaphene to the Great Lakes, so as to better determine the historical trend and atmospheric contribution. EPA is also collecting sediment cores from a number of tributaries to screen for local sources and is supporting a study of toxaphene in small inland lakes near Superior for comparison. Explanations for the persistence of toxaphene in Superior include the lake's relative coldness, atmospheric transport from the south, and local pesticide use. Ongoing studies should yield scientific data to test these hypotheses during the next two years.

Endocrine Disruptors

EPA is reviewing information indicating the possibility of adverse impacts on human health and the environment associated with exposure to endocrine disruptors. At the present time, however, there is little agreement on the extent of the problem. Based on the current state of the science, the Agency considers endocrine disruption to be a mechanism of action potentially leading to other outcomes (for example, carcinogenic, reproductive or developmental effects), routinely considered in reaching regulatory decisions. EPA thinks that identification of environmental agents that cause adverse effects as a result of endocrine disruption, as well as enhancement of our understanding of how these agents exert their effects, will improve the EPA's ability to reduce or prevent risks, particularly to children and vulnerable ecosystems. These considerations become increasingly important as we expand our risk assessment activities to incorporate a wider range of susceptible populations, multiple pathways of exposure, and mixtures of chemical substances. Further research and testing are needed to address existing gaps in knowledge concerning the consequences of endocrine disruption. Such knowledge will reduce uncertainties in the assessment of hazard, exposure, and risk.

The Agency formed the Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) to advise EPA on the screening and testing of pesticides and chemicals for their potential to disrupt the endocrine system. EDSTAC is comprised of representatives from a cross-section of public and private organizations, such as ATSDR. The Food Quality Protection Act (FQPA) and the amendments to the Safe Drinking Water Act (SDWA), both of which were passed in the summer of 1996, require the Agency to develop a screening and testing strategy for endocrine disruptors by August 1998, implement screening and testing by August 1999, and report progress to Congress by August 2000. All EDSTAC meetings are open to the public and are being held in various locations around the country to encourage public access and involvement.

In February 1997, Illinois became the first State to develop an Endocrine Disruptor Strategy under which Illinois EPA (IEPA) is beginning to assemble and analyze key information from existing data in order to identify those chemicals which may interfere with hormones, their sources, and their quantities. A preliminary list has been developed with chemicals identified as either known, probable or suspect endocrine-disrupting chemicals. The Strategy has built-in flexibility to allow it to evolve and adapt to new research and discoveries.

Malformed Amphibians



Scientists are unclear as to why some amphibians are exhibiting malformations

Reports of malformed amphibians are increasing throughout North America since they were first observed in Minnesota in the summer of 1995. There are confirmed reports of amphibian malformation in at least 23 States and four Canadian Provinces encompassing 12 different species of amphibians. Observed malformations include missing limbs, extra limbs, under-developed limbs, and missing eyes as well as internal abnormalities in bone, muscle and organ development. Reproductive effects have not been studied, but the nature of the malformations suggest possible impacts. Population effects are also uncertain, but field observations suggest that the malformations may result in significant mortality. Global reductions and local extinctions of amphibian populations support the inference of possible population-level effects. Possible reasons for these effects include: biological stressors such as parasites; xenobiotic chemicals; and ultraviolet (UV) light. There is rising public and scientific concern that these anomalies are related to one or more environmental factors and that they may portend a heightened risk to humans. While there are no scientific data supporting such a link, neither are there convincing data to lay this concern to rest. Several State and Federal agencies and universities are working together to gather data needed to help identify the causes of these malformations.

Addressing Urban Sprawl



Agricultural lands and other open spaces are being converted to urban areas

One of the Basin's most significant cross-cutting issues is the continuing growth of major metropolitan areas and the sprawl of residential areas and other development. This trend is having social, environmental, and economic impacts, many of which may threaten the long-term sustainability of the Basin's ecosystem. Urban sprawl contributes to polluted runoff by replacing green open spaces and farmland with paved surfaces and requiring the building of additional roads and commuter highways; it contributes to air pollution by boosting commuter distances and vehicle miles traveled per person; and it results in the loss of viable habitat for animals and plants. Between 1981 and 1992, for example, Basin farmland decreased by 9.6 percent. Areas of greatest decrease tend to be either in close proximity to major urban areas or towards fringe areas where farmland makes up less than 40 percent of the total land area.

FARMLAND CONVERSION IN THE GREAT LAKES BASIN (1982-92-U.S./1981-91-Canada)			
State/ Province	Land In Farms (Acres) 1992	Land in Farms (Acres) 1992	Percent Change
Illinois	114,059	141,617	-19.45
Indiana	2,661,712	2,848,900	-6.57
Michigan	10,008,170	10,942,172	-7.8
Minnesota	812,278	929,765	-12.63
New York	5,315,884	6,379,903	-16.67
Ohio	6,177,796	6,507,959	-5.99
Pennsylvania	468,965	559,383	-16.16
Wisconsin	5,929,887	6,602,153	-10.18
Ontario	11,238,115	12,363,916	-9.1
TOTAL	42,746,866	47,276,768	-9.57

Table 2: Farmland Conversion in the Great Lakes Basin: 1981-1992

Climate Change Impacts

The National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (NOAA/GLERL) is providing the U.S. leadership for the U.S./Canada Binational Great Lakes -- St. Lawrence Basin Climate Change and Variability Project to assess the physical, biological, hydrological, and socio-economic impacts of climate change and variability in the Great Lakes Basin. The Project is built around the themes of water use and management, land use and management, and ecosystem health and human health. Cross-cutting research topics include climate and physical systems, socio-economic impacts, adaptation, communication and education, and system integration. GLERL is also developing water resources models that couple the Great Lakes hydrologic cycle and atmospheric circulation, and simulate moisture storage and runoff from the 121 watersheds draining into the Great Lakes. A major achievement was the implementation of an Advanced Hydrologic Forecast System that produces probable water supply and lake level outlooks based on multiple 1 to 9 month climate projections from the National Weather Service.

PUTTING THE ECOSYSTEM APPROACH TO WORK

Environmental protection and natural resource agencies are working together in pursuit of the common goals of reducing the levels of toxic contaminants in the environment, protecting and restoring vital habitats, and protecting the health of the ecosystem's living resources. These goals drive the majority of actions highlighted in this report.

TOXIC CONTAMINANTS

Reducing the levels of toxic contamination in the Great Lakes environment and in its inhabitants is one of the major goals of the Great Lakes Program. Tools available to address this issue range from traditional "end-of-pipe" treatment technologies to innovative pollution prevention projects and unique partnerships amongst a variety of stakeholders.

Pollution Prevention

The Great Lakes is acting as a proving ground for innovative pollution prevention efforts. Prevention is the preferred means to avert the generation of harmful substances and thereby to reduce their release to the environment; it heads off ecological damage and saves resources otherwise needed to treat or clean up contaminants. EPA's Toxics Release Inventory (TRI) is a database which provides information to the public about releases, waste management, and waste transfers of toxic chemicals from certain manufacturing facilities into the environment and provides one method of measuring the effectiveness of pollution prevention efforts. The 1993 program data (released in 1995) illustrated that all of the Great Lakes Basin States and Counties had shown a decrease in releases of targeted chemicals between 1988 and 1993.

Some notable pollution prevention successes follow.

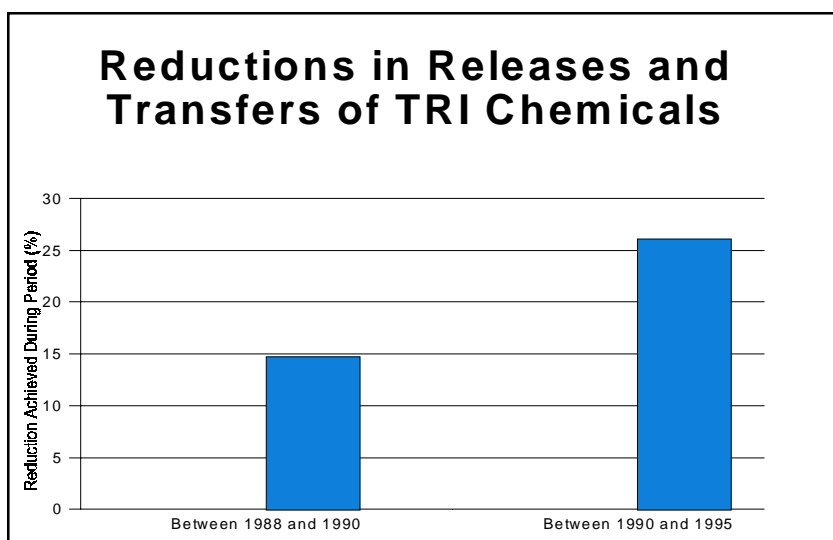


Figure 7: Reductions in Releases and Transfers of TRI Chemicals

EPA's 33/50 Program was a nationwide voluntary effort aimed at reducing the releases and transfers of 17 targeted chemicals (including PCBs, mercury, lead, and other heavy metals and organics) tracked under TRI, with a goal of a 50 percent reduction of these chemicals by the end of 1995. The program successfully achieved this goal on a nationwide basis, exhibiting a 55.6 percent decrease from the 1988 base year, which is equivalent to a reduction of over 664 million pounds of the targeted chemicals. In three areas of the Great Lakes Basin, (Southeast Chicago, Northwest Indiana, and Southeast Michigan), an average reduction of 62 percent was achieved.

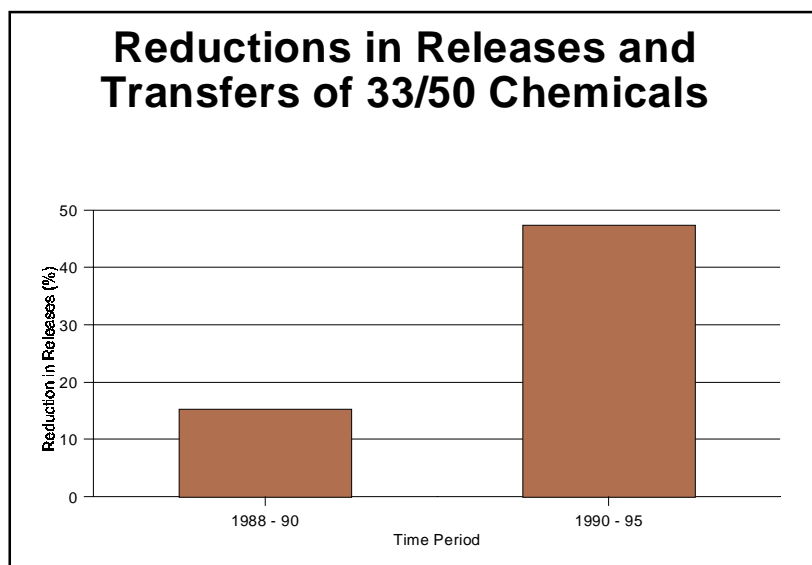


Figure 8: Reduction in Releases and Transfers of 33/50 Chemicals

For the last several years, EPA has incorporated pollution prevention training at pretreatment workshops for Publicly Owned Treatment Works (POTWs), to enable them to meet their water quality goals. Recent efforts include participating in the development of the Western Lake Superior Sanitary District's March 1997 manual entitled *Blueprint for Mercury Elimination: Guidance for Wastewater Treatment Plants*, as well as its distribution to POTWs throughout the region. Using methods outlined in the manual, the District's mercury discharge had decreased by over 90 percent by February 1996. Improvements in the sorting of refuse-derived fuel burned at the facility's sludge incinerator have also brought about almost a 70 percent reduction in the amount of mercury emitted.



Waste Water Treatment Plants are reducing mercury discharges via voluntary pollution prevention programs

The Pulp and Paper Pollution Prevention Project, a voluntary partnership launched in 1996 between the industry and the Michigan Department of Environmental Quality (MDEQ), is committed to go beyond efforts that already have resulted in dramatic reductions in waste generation. Fifteen mills, which account for about 75 percent of the total pulp and paper production in Michigan, showed that while production increased by 33 percent between 1987 and 1995, hazardous waste generation was reduced by 54 percent, air emissions were reduced by 21 percent, and water discharges were down 38 percent. During 1997, the mills have agreed to implement industry-wide pollution reduction goals to be achieved through pollution prevention efforts. For the first year of this project, mills are committing to reduce carbon monoxide by 1,900 tons, biochemical oxygen demand discharges by 50 tons, and hazardous waste generation by 9 tons.

The Council of Great Lakes Governors, the Environmental Defense Fund, and the Printing Industries of America spearheaded an effort to identify pollution prevention opportunities for the lithographic printing industry in the Great Lakes Basin. The Great Printers Project brought together representatives of government, industry, technical assistance programs, labor, and environmental groups to focus on the common goals of environmental protection and economic strength. The States of Illinois, Michigan, Minnesota and Wisconsin are currently conducting projects to implement project recommendations.

The goal of the Great Lakes Alternative Cleaning Education Program was to demonstrate the commercial viability of a water-based cleaning technique as an alternative to traditional dry cleaning that relies on chlorinated solvents. This was accomplished through the operation of a wet cleaning demonstration shop, which was used to actively promote an industry-wide shift in cleaning techniques.

Routine oil and hazardous chemical discharges from both commercial and recreational vessels in the Great Lakes are now at very low levels, and are having a minimal impact on Great Lakes resources. Marine use and transport of oil and chemicals is very tightly controlled by comprehensive and closely comparable U.S. and Canadian regimes in the Great Lakes. Oil spills had declined 61 percent over the period 1990-1994 while over the same period, chemical spills had been almost totally eliminated, decreasing from over 28,500 gallons in 1990 to just 91 gallons in 1994. During 1995 - 1996, no major chemical or oil spills originated from vessels or marine facilities in the Great Lakes (a "major" spill is any spill of more than 10,000 gallons or a chemical spill which presents a substantial threat to public health). Also, in cooperation with State, Provincial, and other Federal authorities (especially Environment Canada and EPA), the two Coast Guards have developed a highly refined, well-exercised, joint response system.



Major oil and chemical spills have dramatically decreased, making cleanups like the one pictured here a rarity

Reissuance of a permit for the Detroit Wastewater Treatment Plant is a major step in controlling water pollution in southeastern Michigan. The wastewater discharge permit contains new provisions for minimizing toxic pollutants and controlling industrial discharges into Detroit's sewage collection system. The permit also contains new schedules for the reduction of combined sewer overflows to the Rouge River. The Plant has the largest municipal wastewater discharge in Michigan, containing treated sewage and industrial wastewater from about half of the sewered population in the State. This is also one of the largest discharges of treated municipal wastewater in the Great Lakes system, as well as in the United States, and it has significant potential to affect the Detroit River and Lake Erie if not properly controlled.

Focus on Mercury

Mercury contamination is a potential threat to wildlife and human health. It is a potent neurotoxin that can produce irreversible brain damage, resulting in the loss of higher cognitive and motor functions, if ingested at high enough levels. The fetal nervous system is particularly vulnerable. Mercury contamination of aquatic ecosystems has become a problem of national and international concern; currently, consumption advisories for human health have been issued in at least 38 states.

Major reductions have been made in domestic mercury use from 1980 to 1995, with approximately an 82 percent decline due to bans in paint and pesticides, phaseouts in batteries (total phaseout from most types of batteries passed by Congress in May 1996), and reductions in industrial uses. Domestic demand declined from 720 tons in 1990 to 483 tons in 1994, a 33 percent reduction.

Continued effective control of mercury emissions may require a mix of strategies including pollution prevention, materials separation, and conventional regulatory approaches. Pollution prevention would be suitable for those processes or industries where a mercury substitute is demonstrated and available. Material separation is an appropriate approach for processes where mercury-containing products are disposed of by incineration, or where mercury can be reduced in the fuel prior to combustion (e.g., medical waste incineration). Conventional regulatory approaches may be applicable when mercury is emitted to the environment as a result of trace contamination in fossil fuel or other essential feedstock in an industrial process (e.g., smelting). Other non-traditional market-based approaches may also prove feasible.

Federal Actions

EPA has a variety of efforts underway to reduce mercury emissions from industrial sources. Specific actions being taken under the Clean Air Act Amendments of 1990 (CAAA) to achieve this include the following:

EPA is studying the impacts of mercury air pollution and will issue a report assessing the impact of air emissions of mercury from a variety of sources. This assessment will include judgments as to the potential hazard to humans and wildlife of methylmercury exposure which is largely via the consumption of contaminated fish.

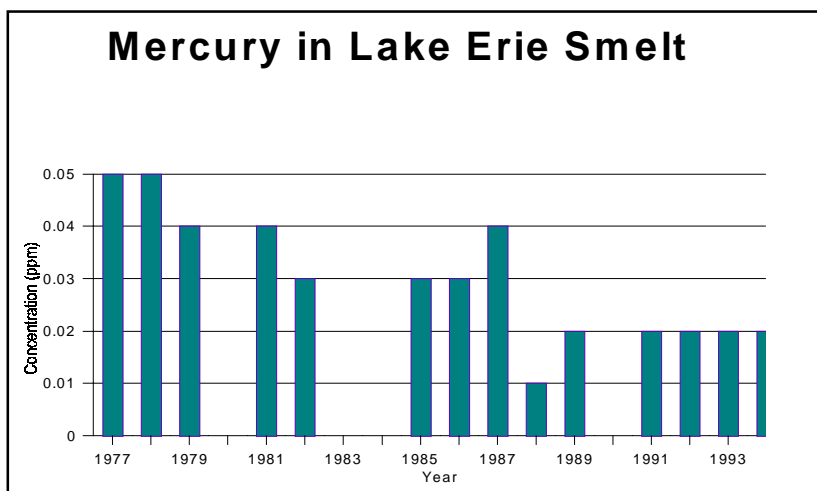


Figure 9: Mercury in Lake Erie Smelt

EPA is studying the hazards to public health reasonably anticipated to occur as a result of emissions by electric utility steam generating units of pollutants listed under Section 112(b), including mercury. The Utility Study is also required to offer regulatory determination with respect to utility boilers.

EPA is evaluating the impacts of hazardous air emissions, including mercury, for the following source categories: commercial/ industrial boilers, chlor-alkali plants using the mercury cell process, and portland cement kilns.

In 1994, EPA acted on a recommendation from the Minnesota Pollution Control Agency (MPCA) and asked the Defense Logistics Agency (DLA) to suspend sales of mercury, pending consideration of environmental consequences. Sales were suspended, and the DLA is conducting an environmental assessment. The Federal government holds about eleven million pounds of surplus mercury which it had been selling at auction. EPA is beginning to explore options for the long-term disposition for the mercury, and is developing an advanced notice of proposed rulemaking on options for stabilizing unwanted mercury, and for treating mercury-containing wastes.

EPA is facilitating the development of a mercury thermostat takeback and recycling program for the upper midwest, which could gradually be expanded to other parts of the country.

EPA, the USGS, the four Lake Michigan States, and a number of universities are participating in a multi-agency effort to determine mercury loads to Lake Michigan from tributary streams. This project is part of a larger effort to produce a mercury mass balance for Lake Michigan.

The USGS Wisconsin District Office has a state-of-the-art mercury research laboratory that helps facilitate cooperative projects across the nation dealing with mercury in the environment. Mercury studies require specific sampling methods and gear, as well as low-level analytical methods that the mercury lab supplies to the

cooperating parties. In addition, members of the Mercury Studies Program often provide expert consultation with potential project cooperators, including aiding in the drafting of proposals for study. To date, the lab is involved in studies from Alaska to Florida, and from east to the west coasts. Mercury Studies Program leaders are currently drafting work plans to initiate a national-scale effort to examine mercury contamination across a wide variety of ecosystems that receive mercury loads from a variety of sources.

State Actions

The eight Great Lakes States are implementing numerous innovative programs to reduce mercury. The following examples help illustrate this.

The MDEQ continues to place an emphasis on mercury identification, reduction, and pollution prevention programs. The Michigan Mercury Pollution Prevention (M2P2) Task Force report was completed and released in April 1996 and demonstrates what can be achieved by voluntary partnerships with the primary goal of prevention of mercury pollution. The M2P2 Task Force focused on a variety of sectors, including the general public, health care, dental, electrical manufacturers and users, chemical manufacturers and users, and the automobile sector. The utility sector was also identified as a top priority source category to identify opportunities to achieve mercury reductions.

MDEQ developed and widely distributed a “Merc Concern” brochure and other mercury pollution prevention materials for education and outreach to the general public and administered a grant to the Genesee County Environmental Health Department to conduct an education, outreach, and collection program for mercury-containing wastes in the Saginaw Bay watershed. An estimated 200 pounds of mercury was collected for proper management and disposal.

As part of a statewide emphasis on mercury pollution, the MPCA is developing a comprehensive mercury reduction initiative. A stakeholder advisory council has been formed to provide input to the agency concerning mercury reduction alternatives and the criteria that the agency should use to evaluate the alternatives. A “cap-and-trade” alternative is of special interest to participants. Since other States are interested in this program, an “ad hoc” committee of States (including Minnesota, Wisconsin, Michigan, Ohio, Maine and others) has met periodically to exchange information.

In 1995 and 1996, the State of Minnesota met with a Minnesota mercury relay manufacturer regarding a collection program for mercury relays. The manufacturer was interested in product stewardship. These discussions led to a State law passed in 1997 that prohibits disposal of mercury relays in the solid waste stream and requires a collection program administered by relay manufacturers. Also, the Minnesota Technical Assistance Program studied the use of mercury dairy manometers in Wabasha County in 1995 which laid the groundwork for a 1997 law prohibiting mercury dairy manometers from being sold, installed, or repaired and requires them to be removed from service. State funding has allowed the Minnesota Department of Agriculture to offer a \$100 bounty for each manometer that is recycled. This covers the replacement cost of a basic non-mercury manometer. In addition, the Minnesota law covering the disposal of mercury bearing products was

modified in 1995 to require removal of mercury switches from junked vehicles before they are crushed.

Core samples taken from Minnesota lakes shows that the amount of mercury entering into lakes in the northeastern and central portions of the State has declined substantially, indicating that the State's mercury reduction efforts are paying dividends. Regional emissions appear to have declined, with accumulation rates 25 percent lower today than in the 1960s and 1970s. However, no improvement was noted in lakes in western Minnesota and Alaska, suggesting that world background levels of mercury are stable.

The State of Wisconsin piloted a mercury reduction effort with the Milwaukee Metropolitan Sewage District, continued the implementation of a toxic contaminants reduction/pollution prevention effort in concert with the Milwaukee's Pollution Prevention Partnership, and is undertaking municipal mercury reduction efforts in Green Bay, Superior, and Madison.

The Indiana Department of Environmental Management (IDEM) has undertaken a project to gain pledges from heating, ventilation, and air conditioning contractors, suppliers, and wholesalers to ensure recycling of mercury thermostats, and to encourage the use of mercury-free thermostats.

Industry Actions

In 1996, the U.S. chlor-alkali sector voluntarily committed to reducing its emissions and use of mercury by 50 percent during the next decade. Emissions are thought to be relatively high on a per facility basis in the U.S. In Europe, where there are many more facilities, this sector is considered a dominant source of anthropogenic mercury emissions. The commitment by the U.S. chlor-alkali firms is one of the most significant pollution prevention projects underway in the U.S.

The momentum of pollution prevention initiatives within the Detroit Water and Sewerage Department (DWSD) has greatly increased. The impetus of the development and implementation of DWSD's PCB/Mercury Minimization Program began with a negotiated National Pollutant Discharge Elimination System permit provision which required DWSD to develop a minimization program to control PCB and mercury. As part of the effort to reduce/eliminate mercury loadings to the DWSD sewerage collection system, five categories of sources have been targeted for waste minimization efforts: dental offices, hospitals, industrial laundry facilities, laboratories, and households. In January 1995, the DWSD convened a Task Force on Mercury Minimization from Dental Facilities which implemented a highly successful statewide bulk dental mercury collection of over 1,300 pounds of surplus mercury.

The Big Three automakers are actively pursuing ways to voluntarily remove mercury from the automobile production process. As a first step, they are phasing out mercury switches from convenience lighting (accounting for approximately 87 percent of mercury used in autos) and are drafting a switch removal procedure for use at the end-of-life for a vehicle.

Focus on PCBs



Great Lakes utility companies have voluntarily accelerated the phasing out of PCBs from their equipment

PCBs, although banned or tightly restricted in almost all industrial and commercial uses because of their persistence and high toxicity, remain a major cause of contamination in the Great Lakes. All five of the lakes, as well as numerous inland lakes, have fish consumption advisories as a result of PCB contamination. A number of activities are addressing the removal of PCBs from the environment.

EPA has asked Great Lakes utility companies to accelerate their voluntary phasedown of electric equipment which contain PCBs to prevent the possibility of accidental spills. In response, twelve major utility companies reported that they are continuing to remove PCB equipment from service and that they have only about 600 PCB transformers and 40,000 PCB capacitors currently in use within EPA Region 5 States. In addition, recycling of over 12 million pounds of metal from PCB transformers, capacitors, and related components in 1996 saved over 66,500 cubic yards of landfill capacity that would have otherwise been used for the disposal of these PCB-contaminated materials.

In 1997, EPA Region 5 took the first step toward an innovative, public-private partnership when it funded, in part, the feasibility study phase of a PCB Used Oil Clean Sweep project proposed by a national not-for-profit trade association, the National Oil Recyclers Association (NORA). The project consists of the identification of potential PCB generators through a computer database; development and mailing of an information package; telephone follow-up; and analysis of findings. Region 5 will coordinate with EPA Headquarters on regulatory barriers to participation in a clean sweep program and the identification of incentives. Region 5 staff will be addressing NORA's annual conference in November 1997 and will solicit industry input. PCBs are a used oil recycling industry problem of national magnitude. If this project moves forward, Region 5 will serve as the pilot for a national program.

Since the implementation of the PCB Notification and Manifesting Rule in 1990, the amount of PCBs received at storage and disposal facilities have been tracked. From 1990 to 1994, over 7.5 billion pounds of PCBs were disposed of nationally from all sources, lessening the likelihood of further PCB contamination to the environment.

Sediments contaminated with PCBs are being removed from Great Lakes rivers and embayments. Many of these cleanups are highlighted in a later section entitled "Remediating Contaminated Sediments".

Focus on Pesticides

The Great Lakes Program has implemented a multi-faceted approach to address pesticides and the attendant potential for ground water contamination in the Great Lakes Basin. In Great Lakes Basin counties, the overall use of pesticides has decreased by almost ten million pounds from 1994 to 1995. Annual pesticide usage now stands at 57 million pounds. There is increasing concerns not only because of toxic contamination from these substance, but also because of their potentially endocrine disrupting properties.

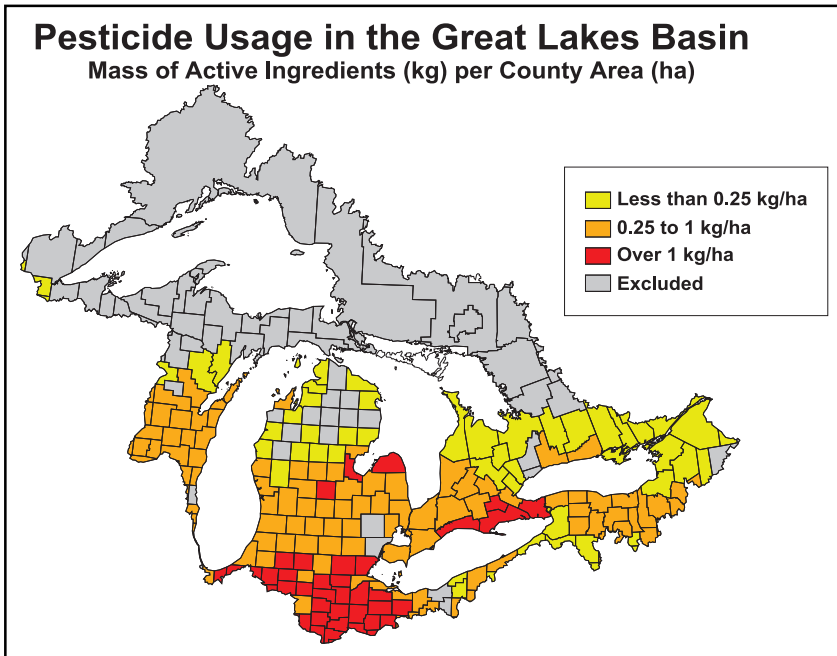


Figure 10: Pesticide Usage in the Great Lakes Basin

From 1993 to 1996, the voluntary collection Clean Sweeps Program has collected **nearly 100,000 pounds** of waste pesticides in the Great Lakes Basin. This number will increase as remaining Clean Sweeps reports are completed by various Great Lakes States. In such collections, 20 to 60 percent of the substances collected are suspended and canceled pesticides, some found on lists of contaminants of fish tissue and sediments. Basinwide amounts of several pesticides collected during this period include:

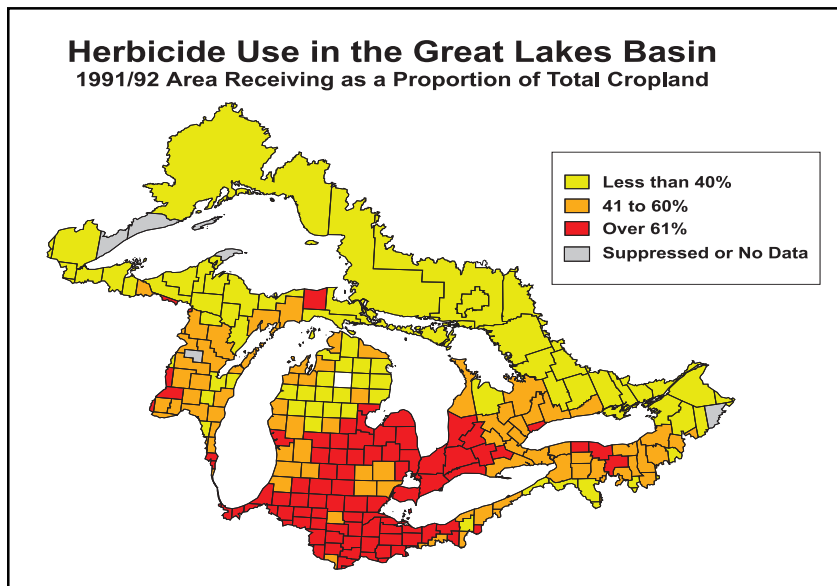


Figure 11: Herbicide Use in the Great Lakes Basin

2,343 pounds of aldrin	1,214 pounds of chlordane
22,019 pounds of DDT/DDE	1,054 pounds of dieldrin
995 pounds of heptachlor	4,432 pounds of lindane
1,435 pounds of mercurials	3,149 pounds of toxaphene
8,735 pounds of 2,4,5-T and Silvex	(<i>canceled because of dioxin contamination</i>)

A Great Lakes Basin Pesticide Report is being drafted by EPA and will be made available in 1998.

To help better understand pesticide use and a variety of other agricultural issues in the Great Lakes Basin, the Great Lakes Protection Fund funded a project entitled "An Agricultural Profile of the Great Lakes Basin: Characteristics and Trends in Production, Land Use and Environmental Impact." A comprehensive report and a complementary agri-environmental database were presented at the Great Lakes Agricultural Summit in April 1996. The information generated by this project will support the development of an agenda for Great Lakes agricultural research, human health research, and policy needs for consideration by the Great Lakes Protection Fund and other interested parties such as ATSDR.

In a related manner, under the auspices of the North American Agreement on Environmental Cooperation, Mexico has agreed to an 80 percent reduction in DDT over the next five years, at which time they will assess whether further reductions are necessary. This assessment will take into account the availability of alternatives, and the prevalence of malaria at that time. If warranted, further reductions will be achieved over the subsequent five years. Mexico has also agreed to cancel the registration for chlordane in 1998.

Federal Actions

The Food Quality Protection Act of 1996 established a new standard of safety for pesticide residues in food. EPA must conclude with "reasonable certainty" that "no harm" will come to infants and children or other sensitive individuals exposed to pesticides. All pesticide exposure -- from food, drinking water, and home and garden use -- must be considered in determining allowable levels of pesticides in food. EPA has met an important deadline in the new law by issuing a schedule showing how the Agency will reassess the more than 9,700 existing "tolerances" -- or maximum pesticide residue limits for foods -- by August 2006, considering the pesticides that appear to pose the greatest risk first. Protection of infants and children is a high priority. Of the approximately 1,800 organophosphate tolerances receiving priority review, over 300 are for residues on crops that are among the top 20 foods consumed by children.

As a key component of EPA's 1991 Pesticides and Ground Water Strategy, EPA is proposing to restrict the use of certain pesticides through the development and use of State Management Plans (SMPs). This approach provides States with the flexibility to protect ground water by utilizing knowledge of local hydrogeology, soils, agronomic practices, climate, pesticide use, and land use trends to develop state-specific management plans. In the proposed rule, EPA is proposing to restrict the legal sale and use of five pesticides that have been identified as either "probable" or

“possible” human carcinogens: alachlor, atrazine, cyanazine, metolachlor, and simazine. Because of their potential to contaminate ground water, EPA has determined that these pesticides may cause unreasonable adverse effects on the environment in the absence of effective management measures provided by a SMP. EPA is currently working with the States to develop generic SMPs prior to the passing of the rule.

The USGS currently has two National Water Quality-Assessment (NAWQA) Program studies underway in the Great Lakes area -- the Western Lake Michigan Drainages and the Lake Erie - Lake St. Clair Basin. Both of these NAWQA program efforts are coordinated closely with the Lake Michigan and Erie LaMPs. The long-term goals of the NAWQA Program are to describe the status and trends in the quality of a large representative part of the nation’s surface and ground water resources and to identify the natural and human factors that affect their quality. In particular, the USGS is measuring the concentrations in surface and ground waters of pesticides used in agricultural and urban areas to determine their distribution and frequency of occurrence. The presence and distribution of nutrients (nitrogen and phosphorus) also are being studied to determine if the major sources of these are agricultural practices, discharges from sewage treatment plants, or combined sewer overflows. The NAWQA program will produce water quality information that will be useful to policymakers and water managers at the local, State, and national levels of government.

Industry Actions

The manufacturer of the pesticides chlordane and heptachlor (Tier 1 and Tier 2 substances respectively under the Binational Toxics Reduction Strategy), announced that it will halt production of these two pesticides that were voluntarily canceled in the U.S. in 1988 but which are still sold overseas. After the remaining stocks are depleted, the company will retain control of the technology and will not allow the pesticides to be manufactured by another company.

ADDRESSING ATMOSPHERIC DEPOSITION

Integrated Atmospheric Deposition Network (IADN)

During the 1980s, studies in the Great Lakes showed that atmospheric deposition may be a major pathway of some toxic contaminants to the Great Lakes. As a result of this and other findings, the U.S. and Canada established the Integrated Atmospheric Deposition Network (IADN), a joint monitoring network designed to assess the magnitude and trends of atmospheric deposition of target chemicals (PAHs, PCBs, DDE, DDT, lindane, lead, mercury, and more recently, toxaphene) to the Great Lakes, and to determine emission sources whenever possible. The first binational report on IADN data, published in December 1994, indicated that there is little spatial variability in many of the critical chemical species across the Basin, although the influence of urban areas is clearly substantial, especially in heavily developed areas such as the southwestern shores of Lake Michigan. IADN will undergo a technical review in late 1997 to evaluate whether the network has met its mandates. Comments from this review will be incorporated into an Implementation Plan to be signed by the U.S. and Canada for continuation of the IADN program.

Great Lakes Emissions Inventory

In response to the 1986 Great Lakes Governors' Toxic Substances Control Agreement's specified provisions to address atmospheric deposition, and in support of Annex 15 of the Great Lakes Water Quality Agreement, the Great Lakes States and the Province of Ontario, in cooperation with EPA and the Great Lakes Commission, are working together to create the Great Lakes Regional Air Toxics Emissions Inventory, and the Regional Air Pollutant Inventory Development System (RAPIDS), a computerized inventory which will house the emissions data. RAPIDS has been developed to identify the sources that are the largest contributors to the total emissions in a given geographic area. Using RAPIDS, State air regulatory agencies are building statewide air toxic contaminant inventories for point, area, and mobile sources for 49 air pollutants of potential concern to the Great Lakes, including mercury, PCBs, and dioxin. These inventories will help guide the States in future regulatory efforts. The first regional inventory for point sources of air emissions is scheduled for completion in 1997. Emissions data from mobile sources will be developed in 1997-1998. Data from RAPIDS will also be made available to meet the modeling needs of Great Lakes air quality researchers.

REMEDIATING CONTAMINATED SEDIMENTS



The dredging and safe disposal of contaminated sediments is a major step towards restoring the health of the Basin

The cleanup of contaminated sediments is another essential element of addressing toxic contamination in the Basin. EPA and its Federal and State partners have a program for remediating these sites, using a wide range of regulatory approaches and an increasing emphasis on partnerships.

A Great Lakes Dredging Team was established in 1996 to provide a mechanism for the coordination and decision-making among local, State, Tribal, and Federal agencies responsible for maintaining and regulating dredging-related activities on the Great Lakes. The objectives of the Great Lakes Dredging Team are to: 1) contribute to the national goal of assuring that the dredging of U.S. harbors and channels is conducted in a timely and cost-effective manner while meeting environmental protection, restoration, and enhancement goals; 2) facilitate the resolution of dredging issues common to the Great Lakes region among participating agencies; 3) promote implementation of the relevant portions of the recommendations of the interagency report on the dredging process; and 4) facilitate effective communications and decision-making among Federal and State agencies represented on the Dredging Team and between the Team and key stakeholders in the dredging process.

During the last two years, several significant contaminated sediment remediation activities were undertaken, some of which are highlighted below.

Under the terms of a Clean Water Act consent decree, a northwest Indiana steel company adjacent to the Indiana Harbor conducted a dredging project of its water intake flume in 1996. Approximately 120,000 cubic yards of oil and grease-contaminated sediments were removed. Over 30,000 gallons of petroleum product was separated from the sediment, and all dredged materials were properly managed and disposed.

In 1997, EPA completed the cleanup of oil and PCB-contaminated sludge from the Gary Lagoons site in Gary, Indiana. The two unlined lagoons were situated in sandy soil, surrounded by marshes and wetlands. After draining water from the lagoons, 9,000 gallons of PCB-contaminated oil and 8,700 tons of contaminated sediments were removed. With the cooperation of FWS, the Indiana Department of Natural Resources (IDNR), and IDEM, a ten acre area at the site was seeded with native plants.

At the Ford Outfalls Site in the River Raisin, Michigan AOC, the removal of 28,000 cubic yards of PCB-contaminated sediments was completed over the summer of 1997. These sediments contained the highest concentrations of PCBs in the Great Lakes, with concentrations measuring as high as approximately 42,000 parts per million.

At the Evans Product Ditch in Plymouth, Michigan, located on Newburgh Lake in the Rouge River AOC, PCB-contaminated sediments were totally remediated in May 1997. Approximately 9,500 tons of sediments and soil were removed. This action will now allow for the remediation of PCBs in Newburgh Lake to commence, leading to an eventual elimination of fish consumption advisories.

At Monguagon Creek, Michigan, a tributary to the Trenton Channel (within the Detroit River AOC), the dredging of approximately 20,000 cubic yards of sediments heavily contaminated with PCBs, lead, zinc, and phenolic compounds was completed in July 1997.

At the Ruck Pond Impoundment in Cedar Creek, Wisconsin (a tributary to the Milwaukee River AOC and the major source of PCBs to the river), a State-led project under Wisconsin's Voluntary Cleanup Program led to the removal of approximately 5,900 cubic yards of contaminated sediments.

At the Willow Run Industrial Park in Ypsilanti, Michigan, a sludge lagoon, an outfall ditch, several ponds, and a stream below the sludge lagoon are being stabilized and excavated. Approximately 60,000 pounds of PCBs out of a total of approximately 100,000 pounds of PCBs have been removed to date. In addition, 133,000 cubic yards of sludge and sediments out of a total of 330,000 cubic yards have been removed thus far.

Many more sediment remediation actions are planned for the near future, including the following:

In accordance with an August 1991 Memorandum of Understanding, EPA and the Army Corps of Engineers (COE) are cooperating agencies on the Indiana Harbor Ship Canal dredging and sediment disposal project. The Federal Navigation Channel has not been dredged since 1972, and an estimated 150,000 cubic yards of sediments are washed from it into Lake Michigan each year. The project calls for dredging 4.6 million cubic yards of contaminated sediments out of the harbor and ship canal over a 30 year period, and construction of a confined disposal facility (CDF). The draft Environmental Impact Statement (EIS) was released in the fall of 1995. It recommended the CDF site be located at a former oil refinery site adjacent to the Canal. The CDF construction at that location could include RCRA closure of the site, thus resolving two environmental problems. The final EIS is expected to be released in 1998, and dredging to begin two to three years later.

U.S. Steel will fund the dredging of a five mile stretch of the Grand Calumet River, which will remove approximately 700,000 cubic yards of contaminated sediments, beginning in 1998.

On July 1, 1997, a facility on the Menominee River was ordered by EPA to remove a total of 10,000 cubic yards of arsenic-contaminated sediments found in four areas of the river. The facility has seven months from this date to remove the sediments.

The removal of between 50,000 and 150,000 cubic yards of sediments contaminated with DDT, PBB and HBB is planned for Michigan's Pine River.

By the end of 1998, the removal of approximately 50,000 cubic yards of heavy metal-contaminated soil and waste from the Cannelton Tannery site is planned, thus eliminating source materials to the St. Marys River AOC.

In the Saginaw River, Michigan AOC, an expected Natural Resources Damage Assessment (NRDA) settlement will fund the removal of 291,000 cubic yards of PCB-contaminated sediments, beginning in 1998, along with land acquisition for habitat enhancement and restoration.

The remediation of an unnamed tributary to the Ottawa River (in the Maumee River AOC), spurred on by a unique Federal/State/private partnership, will eventually remove 10,000 cubic yards of PCB-contaminated sediments.



The R/V Mudpuppy conducts sediments assessments throughout the Great Lakes

The Wisconsin Department of Natural Resources (WDNR) completed plan approval and authorized the implementation of a project by Murphy Oil to restore the upper Newton Creek ecosystem, comprised of the Newton Creek Impoundment, Newton Creek, and Hog Island Inlet. The project will include a \$200,000 contribution by Murphy Oil in support of WDNR's sediment remediation effort in the Hog Island Inlet. Approximately 4,100 cubic yards of contaminated sediments from the impoundment and 100 cubic yards of contaminated sediment from the first reach of Newton Creek will be removed. This material will be combined with cement and disposed of on Murphy Oil's property. This work began in August 1997 and will be completed in November 1997.

During the 1996 and 1997 field seasons, through the use of the EPA's *R/V Mudpuppy*, a sediment assessment vessel, GLNPO staff assisted States and Tribes in determining the nature and extent of sediment contamination at: Waukegan Harbor, Illinois; Indiana Harbor, Indiana; White Lake, River Raisin, Saginaw River, Trenton Channel, Pine River, St. Marys River, Grand River, Clinton River, and the Detroit River in Michigan; the Menominee River, Michigan/Wisconsin; the St. Louis River in Minnesota; and the Maumee and Black Rivers in Ohio.

GLNPO has released a report entitled *Moving Mud -- Remediating Great Lakes Contaminated Sediments, A Report on the Sediment Assessment and Remediation Program in the Great Lakes Basin*. This report highlights sediment projects, including assessments, feasibility studies, remedial designs, and remediations, funded during FY 1993 to 1996. These projects continue the work of the Assessment and Remediation of Contaminated Sediments (ARCS) Program. The report also provides recommendations for future efforts to remediate contaminated sediments in the Great Lakes Basin. The document can be accessed via the Internet at:

<http://www.epa.gov/glnpo/sediment/movemud/>

New York State and EPA Region 2 are creating an electronic database of contaminated sediments in the New York Great Lakes Basin. The database is being used to prioritize areas of contaminated sediments for remediation. A sediment assessment is underway for the Erie Canal in the vicinity of Lockport, New York by the New York State Canal Corporation. Erie Canal sediments are thought to be a source of dioxins to the Eighteenmile Creek AOC.

Ohio EPA is working to complete a sediment and fish tissue database of all the information the State has for the Lake Erie watershed. Over the last two years, Ohio has also conducted a sediment assessment program to try to develop background concentrations of the various chemicals in the Lake Erie Basin as related to unimpacted areas, eco-regions, and sites where biological data exists.

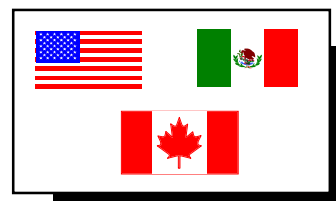
In 1993 and 1994, the *R/V Mudpuppy* conducted sediment assessments at eight hotspots in the St. Louis River AOC. In addition, a two year Regional Environmental Monitoring and Assessment Program Surveying, Sampling, and Testing project (1995 to 1996) was being conducted as a collaborative effort between EPA, MPCA, and the Natural Resources Research Institute. A statistically-based sampling plan has been used to identify areas having acceptable and subminimal quality with respect to surficial sediment contamination, sediment toxicity, and benthic community structure. Statistical analyses are being used to associate sediment contaminants with observed ecological effects. This project will establish a baseline for status and trend monitoring and will attempt to determine the sampling intensity required to survey a complex Great Lakes AOC. A report on the sampling results will be finalized in Winter 1997. The four years of data collected will greatly improve the understanding of sediment contamination in the Harbor, leading to better decisions about remediation.

MULTILATERAL INTERNATIONAL COOPERATION

The U.S. and Canada are cooperating in the following multilateral international and global efforts to address toxic contaminants.

The North American Agreement on Environmental Cooperation and its Secretariat, the Commission for Environmental Cooperation (CEC), were established to address transboundary and regional environmental concerns in North America. The CEC plans to develop cooperative long-term air quality monitoring, modeling, and assessment programs in North America through the promotion, collection, and exchange of data and through the development and application of appropriate models between Canada, Mexico and the U.S. The CEC has facilitated the development of regional action plans for the phaseout or management of PCBs, DDT, chlordane, and mercury, pursuant to a resolution on the Sound Management of Chemicals adopted by the U.S., Canada, and Mexico in October 1995.

Protocols on persistent organic pollutants (POPs) and heavy metals are being developed as part of the United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution. The POPs protocol will



Canada, Mexico and the U.S. are working together to address toxic chemicals



Various U.N. activities are addressing transboundary environmental issues

potentially be concluded within a year. The heavy metals protocol, which is currently expected to cover lead, mercury, and cadmium, is anticipated to be completed in 1998. Both protocols will consider a variety of response action obligations, such as banning some pesticides, use restrictions, or requiring best available technology for emissions control.

Member governments of the United Nations Environment Programme (UNEP) decided at the 19th Session of the UNEP Governing Council to begin formal negotiation of a global treaty on POPs. Negotiations are to begin in 1998, taking into account the conclusions and recommendations of the Ad Hoc Working Group on POPs of the Intergovernmental Forum on Chemical Safety, and are to be concluded in the year 2000. POPs targeted for initial action are PCBs, dioxins/furans, aldrin, dieldrin, DDT, endrin, chlordane, hexachlorobenzene, mirex, toxaphene, and heptachlor. The UNEP Governing Council has directed the formation of an International Negotiating Committee and the formation of an expert group to develop science-based criteria and a procedure for identifying additional POPs as candidates for future international action.

NONPOINT SOURCE POLLUTION

Most point sources of toxic loadings to the Great Lakes Basin are well understood and controlled. The biggest remaining water quality problem is polluted runoff (so-called nonpoint source pollution) that carries pollutants from many diverse sources into our streams, lakes, and rivers. These pollutants can be pesticides, fertilizer nutrients, household chemicals, gasoline, and used motor oil. Source areas include farm fields, urban streets and parking lots, suburban lawns, golf courses, construction sites, and atmospheric deposition. To help address this issue, EPA's national water program is making a major transition from a program based on technology-based controls, to one based on water quality-based controls implemented on a watershed basis. This shift is known as the Healthy Watershed Strategy. Technology-based controls, such as secondary treatment of sewage, effluent limitations guidelines for industrial sources, and management practices for some nonpoint sources, have dramatically reduced water pollution and laid the foundation for further progress. The next step is the establishment of Total Maximum Daily Loads (TMDLs) for toxics entering into water bodies from both point and nonpoint sources. TMDLs will help manage water quality on a watershed scale. EPA, working in full partnership with States and Tribes, will work to establish TMDLs for all listed waters, and will work with these partners to ensure that all load allocations established by TMDLs are implemented by point and nonpoint sources alike.

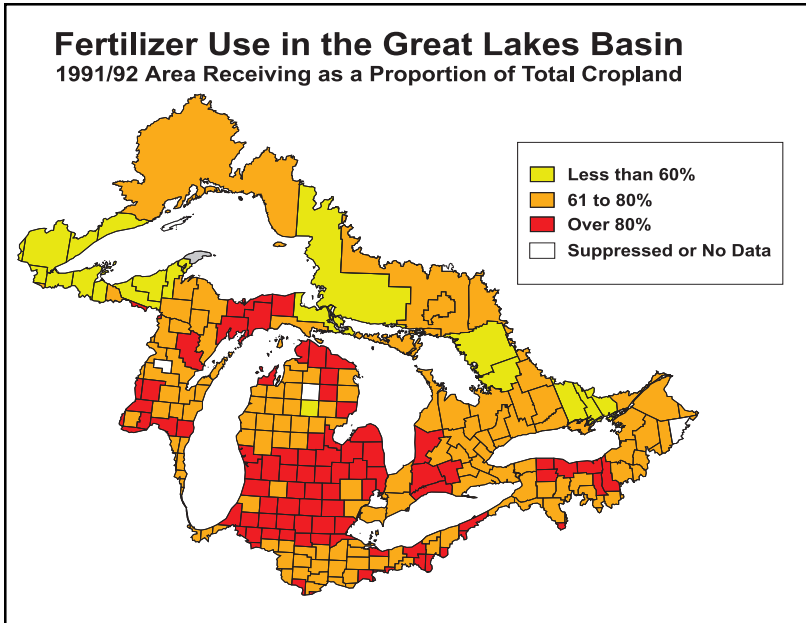


Figure 12: Fertilizer Use in the Great Lakes Basin

EXCESSIVE NUTRIENT LOADINGS

As reported in the 1995 Biennial Progress Report, all of the U.S./Canadian open water phosphorus target levels have been achieved through the combined efforts to improve the performance of sewage treatment plants, reduce levels of phosphorus in detergents, and the implementation of agricultural Best Management Practices. Current loads are clearly below the target loads of the 1978 Agreement for Lakes Superior, Huron and Michigan, and are at or near target limits for Lakes Erie and Ontario. Lake Erie still is experiencing brief periods of anoxia in some areas in its central basin. The 1997 State of the Great Lakes Report reviewed nutrient data since 1994 and concluded that no appreciable change has occurred in the nutrient status of the lakes and that they continue to meet the targets for phosphorus reduction in the Agreement. This continuing success is due to the implementation of a number of programs to control soil erosion, sedimentation, and other forms of nonpoint source control.

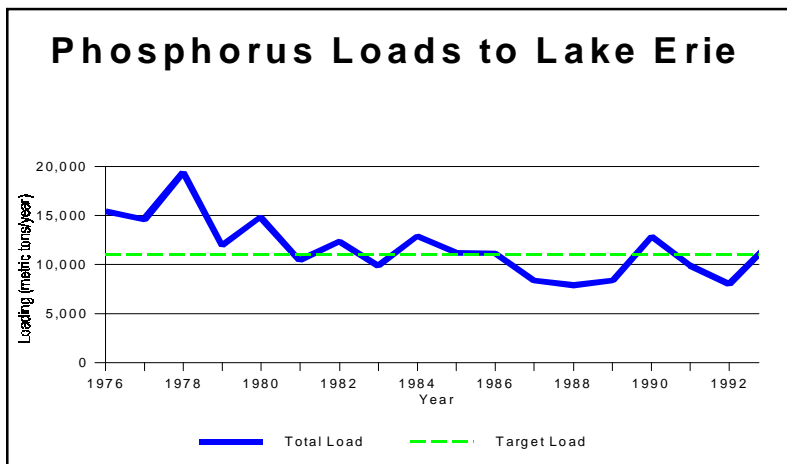


Figure 13: Phosphorus Loads to Lake Erie

Conservation tillage is rapidly becoming the primary cultivation practice in the Basin, affecting more than 70 percent of the total acreage in many counties, and 48 percent of the acreage basinwide. This has resulted in decreased erosion rates and chemical losses. Here is but one example.

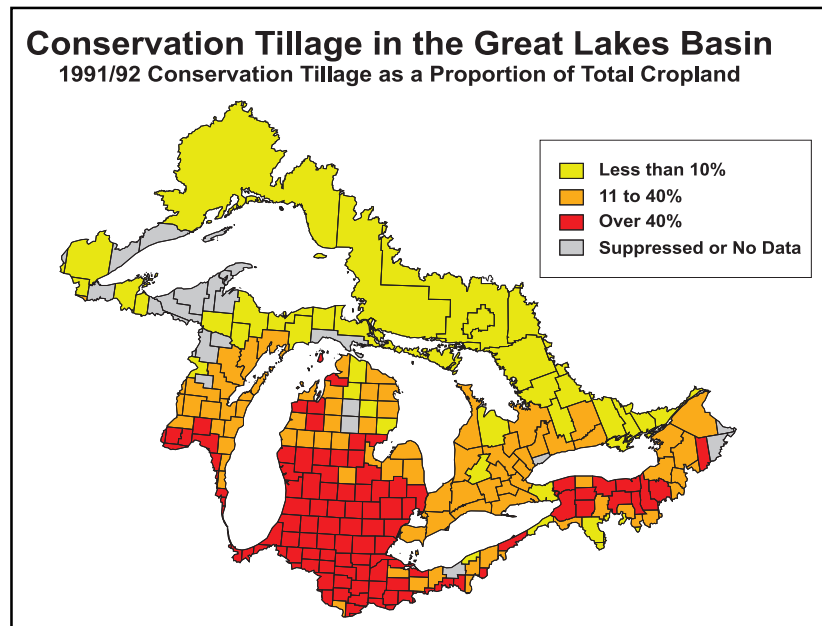


Figure 14: Conservation Tillage in the Great Lakes Basin

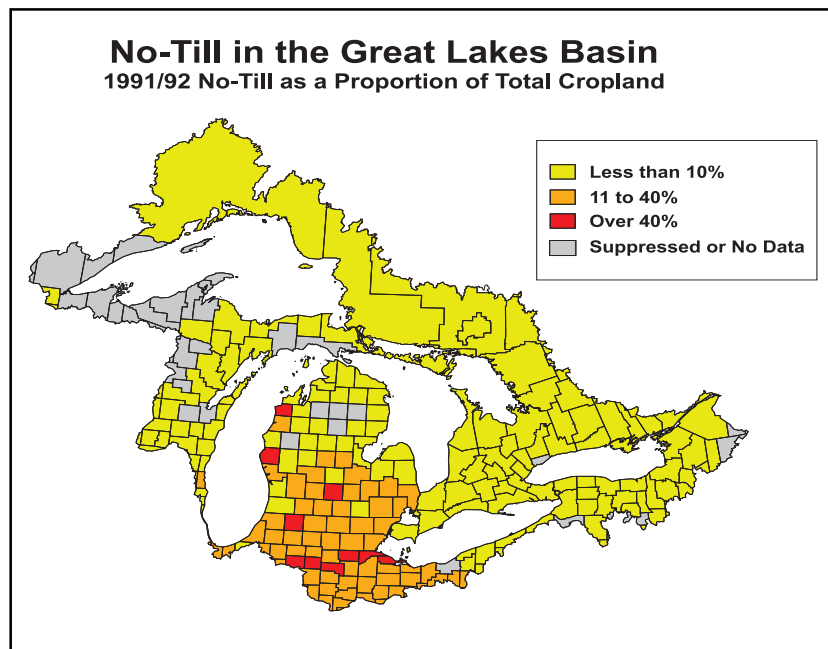


Figure 15: No-Till in the Great Lakes Basin

Agricultural runoff is a top priority for the Maumee River AOC, with 75 percent of the watershed in agricultural use. Every year, 10.3 million tons of soil erodes in the Basin, carrying more sediment than any other Great Lakes tributary, much of which settles in the Toledo Harbor shipping channel, which needs to be dredged of 500,000 tons of sediment annually at a cost of \$3.4 million. Many agencies are partnering with local landowners to reduce sediments, nutrients and pesticide runoff. EPA, the Natural Resources Conservation Service (NRCS), and Soil and Water Conservation District programs combine financial and technical resources to address runoff issues. Just one of these programs, NRCS's Western Lake Erie Environmental Quality Improvement Program, if implemented as proposed, would help meet phosphorus reduction goals, decrease Toledo Harbor sedimentation by 15 percent, alleviate the need for the construction of a new CDF, reduce annual dredging costs by approximately \$270,000, limit nitrate in drinking water, restore acres of wetlands, and improve fish spawning habitat.



Agricultural practices are being implemented to reduce runoff of chemicals and soil from farmland

Ohio's Coastal Management Program (CMP) was approved in June 1997. The program allows a more coordinated approach to activities conducted in the coastal area. It also makes Ohio eligible for additional Federal and State funding to protect Ohio's Lake Erie coast and control erosion. An additional goal of the CMP is to improve public access to the lake and to preserve the natural areas along the lake.

ENVIRONMENTAL REGULATION AND COMPLIANCE

The commitment to ecosystem protection is buttressed by strong compliance with and enforcement of environmental laws. State and Federal agencies continue to develop necessary regulations and take enforcement actions around the Great Lakes region. Some examples follow:

Significant decreases in point source discharges have been brought about through the Great Lakes Enforcement Strategy, an important Federal/State partnership to protect the Great Lakes. Point source discharges of selected pollutants such as PCBs, PAHs, lead, cadmium, chromium, and mercury have dramatically decreased during the six years of the Strategy. When violations are found during Strategy activities, EPA can use Supplemental Environmental Projects (SEPs) and injunctive relief to correct the problem and to improve the environment. A SEP is a project, not strictly necessary for compliance, that a violator agrees to undertake as part of a settlement, to better the environment. Injunctive relief requires the violator to cease the environmentally injurious behavior. Between FY 1993 and FY 1996, Great Lakes Basin SEPs have yielded \$59 million in environmental protection (pollution reduction, pollution prevention, etc.) while injunctive relief has yielded \$943 million during the same period. These totals include \$49 million in injunctive relief and \$28.2 million in SEPs in northwest Indiana and \$180 million in injunctive relief at a POTW in southeast Michigan.

EPA's pulp and paper industry "cluster rule" will combine efforts to control both air and water pollution from the pulp, paper, and paperboard industry. The air standards aim to reduce toxic emissions by 70 percent from current levels and would also reduce emissions of volatile organic compounds, which are prime ozone precursors. The water provisions of the proposal would significantly reduce dioxin discharges. The rule is anticipated to be finalized by the end of 1997.

Two oil and natural gas pipeline companies will spend almost \$3 million to restore fish, wildlife, and other natural resources of Fish Creek (from Dekalb County, Indiana to Williams County, Ohio) injured by the release of more than 30,000 gallons of diesel fuel when an underground pipeline ruptured in September 1993. Money resulting from the settlement, which included the two companies, the States of Indiana and Ohio, the FWS, and the Department of Justice, will be devoted to improving water quality in Fish Creek, returning fish, mussel, and wildlife populations to pre-spill levels, implementing local educational programs, and protecting the waterway from future harm. Fish Creek is considered one of the Great Lakes region's most diverse and ecologically important streams and is the only known habitat for the endangered white cat's paw pearly mussel.

The Great Lakes Fishery Trust (the Trust) was created in 1996 as part of a settlement agreement addressing fish losses at the Ludington, Michigan Pumped Storage Hydroelectric Project. Many millions of fish have been killed by the project, which has been in operation since 1973. The U.S. Department of the Interior, the Michigan Department of Natural Resources (MDNR), several Indian Tribes, Michigan United Conservation Clubs, and the National Wildlife Federation reached a negotiated settlement with the owners in 1994, resolving outstanding issues. Major components of the settlement include: maintenance of a seasonal net at the project intake to minimize the number of fish killed by the facility; annual compensation payments by the utility, based on the net's effectiveness, to the Trust; provision of improved angler access at the utility's properties at several sites and payment for improvements to public access for pier fishing on Lake Michigan; and transfer of ownership of 10,800 acres of land in Michigan by the owners to the Trust. The Trust will use proceeds from the sale of transferred lands and compensation payments to make grants for projects that benefit the Great Lakes fishery.

The U.S. is pursuing cleanup and restoration of natural resources at sites impacted by contaminants through Natural Resource Damage Assessments (NRDAs). The major goals of NRDAs are to eliminate or reduce the impact of persistent contaminants on natural resources, to restore the services and benefits provided to the public by natural resources, and to collect monetary damages for injuries to natural resources. NRDAs are being conducted in Northwest Indiana, Saginaw River, Michigan, and the Fox River, Wisconsin.

In 1996, a NRDA Pre-Assessment Screen was signed for the Grand Calumet area in northwest Indiana. The Trustees, which include IDEM, IDNR, FWS, and the National Park Service (NPS), determined that damage to natural resources occurred in the area due to releases of hazardous substances and oil, and have to date identified 16 PRPs. The final assessment plan which will serve as the guiding document for all damage assessment activities was completed in October 1997 with implementation beginning immediately thereafter.

The pace of Superfund site cleanups in the Great Lakes and throughout the nation has greatly increased. More Superfund sites have been cleaned up in the past three years than in all of the prior years of the program combined. In 1996, while visiting Kalamazoo, Michigan, President Clinton announced the "Kalamazoo Initiative" whose goal is to have 900 National Priorities List (NPL) sites completely remediated by the year 2000. Of the approximately 112 sites in EPA Region 5's part of the Great Lakes watershed, all cleanup construction has been completed at 55 sites, which means all long-term response actions are in place. Many of these sites have been

completely remediated. In New York State at the St. Lawrence River - Massena AOC, cleanup activities at three industrial sites are in the process of removing tens of thousands of cubic yards of PCB-contaminated sediments.

PROTECTING THE HEALTH OF BASIN RESIDENTS

EPA is continuing to compile health information from various studies being implemented by the Great Lakes Human Health Effects Research Program. This program, mandated by Congress, addresses the potentially adverse human health effects from consuming Great Lakes fish on particularly sensitive populations. This group includes pregnant women, nursing mothers, fetuses and nursing infants, infants and children, Native Americans, sport anglers, urban poor, and the elderly. The program is being administered by ATSDR. A Report to Congress was produced in 1995, which described the research program, and summarized the literature on this subject in both the Great Lakes and internationally. The findings from the program, when finalized, will be issued in a new report which will provide key information that Great Lakes policymakers need to further protect the health of the citizens of the Basin.

Recent preliminary findings from ATSDR's Great Lakes Human Health Effects Research Program support earlier reports of an association between the consumption of contaminated Great Lakes fish and body burdens of persistent toxic substances (PTSs). The body burdens of consumers are two to four times higher than those in the general population. These findings also indicate:

- ◆ susceptible populations (Native Americans, sport anglers, the elderly, pregnant women, and fetuses and nursing infants of mothers who consumed contaminated Great Lakes fish, continue to be exposed to PTSs including PCBs, dioxins, chlorinated pesticides, and mercury;
- ◆ fish consumption appears to be the major pathway of exposure to PTSs;
- ◆ a significant trend of increasing body burden is associated with increased fish consumption;
- ◆ sport fisheaters consumed two to three times more fish than the general population;
- ◆ levels of certain contaminants in Great Lakes fish are above the advisory limits set by State and Federal governments;
- ◆ individuals who consumed Great Lakes sport fish for more than 15 years have two to four times more pollutants in their blood serum than nonfisheaters;
- ◆ men consumed more fish than women; and
- ◆ women consume Great Lakes fish during most of their reproductive years.



A variety of research programs are working to help protect the health of Basin residents

ATSDR, Health Canada, and the Quebec Ministry of Health and Social Services co-sponsored in May 1997, an International Scientific Conference on the effects of the Environment on Human Health in the Great Lakes and St. Lawrence River basins. The sponsors and participants concluded that the weight of evidence based on the findings of wildlife biologists, toxicologists, and epidemiologists clearly indicates that at-risk populations continue to be exposed to PTSs. These exposures to PTSs have the potential to cause adverse human health outcomes, i.e., reproductive, developmental, neurobehavioral, and immunologic effects. Although the levels of some of these chemicals have declined, they are still a cause of great concern to the Great Lakes ecosystem and human health.

Improved Protection for Drinking Water and Ground Water



The Great Lakes continue to provide an excellent source of drinking water

EPA continues to promote the Partnership for Safe Water, a non-regulatory approach to reducing the potential risk from *Cryptosporidium* and other microbial contaminants in community drinking water supplies. This is a joint effort between EPA, drinking water associations, and community drinking water suppliers. In 1996, over 79 million people nationwide received their water from a participating supplier, nearly a threefold increase over the previous year. Outbreaks of cryptosporidiosis in several municipalities in the Great Lakes Basin due to contaminated drinking water indicate that infectious diseases can still pose serious problems. However, the Great Lakes continue to provide an excellent source of drinking water.

The “Milwaukee Nearshore Study” was initiated between GLERL, the University of Wisconsin, and the City of Milwaukee from 1994 to 1996 in response to the *Cryptosporidium* contamination of Milwaukee’s drinking water supply in 1993. The goals of the study were to evaluate alternatives for improving the quality of the source water, and to identify and evaluate possible new water intake locations. It was found that the Spring 1993 contamination was associated with highly turbid, contaminated river water that discharged into the harbor and periodically flowed from the harbor as a plume that covered the site of the water intake. In order to prevent similar contamination events in the future, it was recommended that the present Texas Avenue Water Intake be relocated by adding a 4,000 foot extension pipeline, and that the municipal water filtration system be upgraded. The City of Milwaukee adopted these recommendations in 1996.

Programs under the SDWA of 1996 are providing a new era of cost-effective protection of drinking water quality, State flexibility, and citizen involvement. The Act’s overall goal is that by the year 2005, 95 percent of the U.S. population served by public water supply systems will have drinking water that meets all SDWA standards. Programs under the SDWA offer tools and opportunities to build a prevention barrier to drinking water contamination. The centerpiece of the SDWA is the Drinking Water State Revolving Fund (DWSRF), a mechanism to assist public water systems to finance the costs of infrastructure improvement.

State Source Water Assessments (funded by the DWSRF) will similarly identify those areas that are sources of public drinking water (ground water and surface water), assess water systems’ susceptibility to contamination, and inform the public of the results. Though not required in the SDWA, EPA is encouraging States to utilize these assessments to develop protection programs. The SDWA amendments allow States to transfer funds from the DWSRF to the Waste Water State Revolving

Fund, thus allowing the targeting of these funds for those projects which will provide the most environmental benefits.

There is also a major shift in focus in the new SDWA for achieving better drinking water protection through prevention rather than treatment. This builds upon the existing Wellhead Protection Program (WHPP), which protects ground water sources of drinking water through identification of well recharge areas, as well as potential contamination sources, and developing management plans to minimize the threats. All of the EPA Region 5 States have approved WHPPs and are at various stages of implementation at the local level. Efforts are being made to educate the public about protecting their ground water resources and to provide communities with technical assistance in developing their WHPPs.

During FY 1996, in EPA Region 5, more than 1,100 public water systems returned to compliance, either through formal enforcement actions or through compliance assistance means. For example, in cooperation with IDEM, EPA participated in workshops targeted to 900 violators of nitrate monitoring requirements. To date, 780 systems have voluntarily returned to compliance.

In 1994, five companies, IDEM, and EPA agreed to work on the Grand Calumet Cooperative Project, a voluntary cleanup of petroleum contaminated ground water adjacent to the Indiana Harbor Ship Canal. The three companies which found onsite contamination are engaged in ongoing remediation. In 1997, a similar effort was initiated with petroleum pipeline owners in the area, with the intent of identifying leaking and unused pipelines which contribute to ground water contamination.

HABITAT PROTECTION AND ENHANCEMENT

Native Great Lakes ecosystems, including forests, rivers, lakes, wetlands, dunes, savannas, and prairies, provide habitats upon which a diversity of plant and animal species depend. Whereas the absolute number of acres undergoing habitat conversion today is much less than in prior eras, the current percentage rate of loss of the little natural habitat that remains is quite high and threatens the health and survival of many Great Lakes species. Under a variety of unique programs and partnerships at the Federal, State, and local landowner levels, a large number of wetland and upland habitat creation, protection, restoration, and enhancement activities are being conducted. The following examples describe a broad range of actions by a variety of agencies and organizations which are protecting significant ecosystems and restoring degraded areas. Much of the needed work is being done as stewardship of the Great Lakes ecosystem orients itself towards the goal of protecting and restoring ecosystem health. This is important in both environmental and economic terms. Fishing, hunting, bird-watching and other wildlife-related recreation continue to be enjoyed by 77 million Americans annually, with wildlife remaining a remarkable engine for economic growth and job creation, accounting for approximately \$104 billion (1.4 percent of the U.S. economy) in 1996.

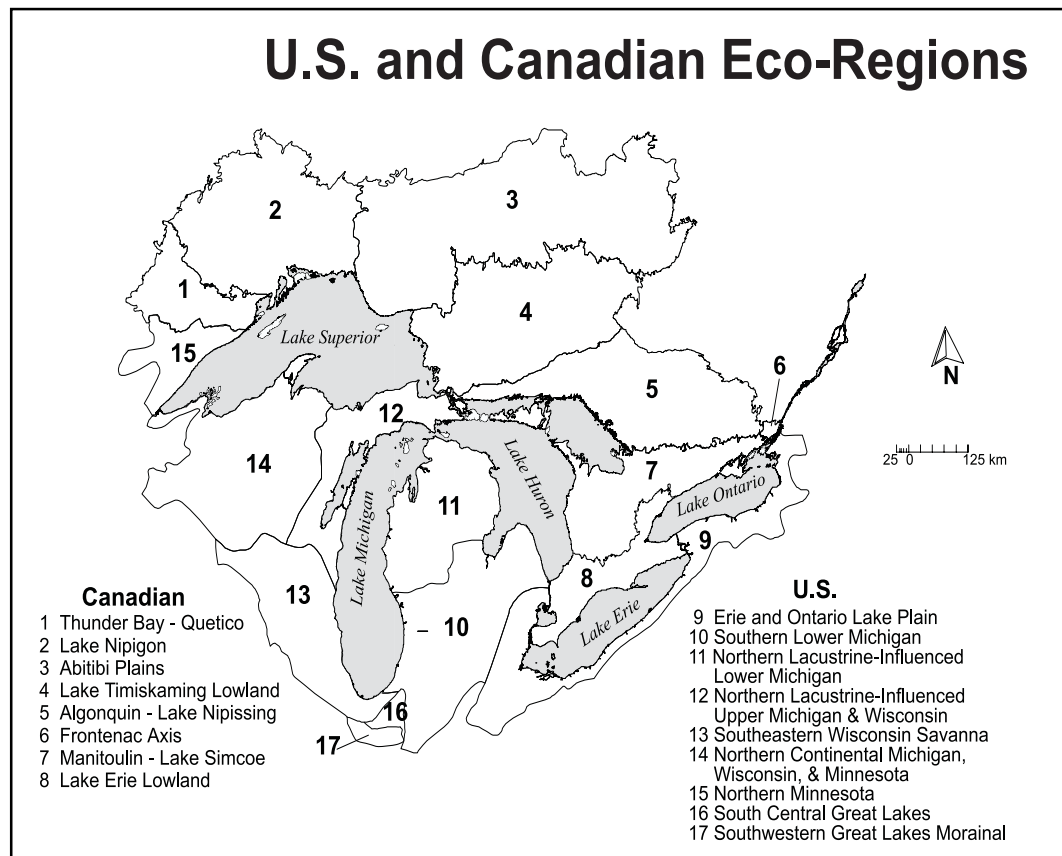


Figure 16: U.S. and Canadian Eco-Regions

A variety of provisions contained in the 1996 Farm Bill such as the Conservation Reserve Program (CRP) and the Wetland Reserve Program have provided significant acreage of wildlife habitat in recent years. The Swampbuster provision of the Farm Bill and the wetland protection provisions of the Clean Water Act have also helped conserve waterfowl habitat. And sportsmen and conservation organizations such as Ducks Unlimited have conserved and restored millions of acres of prime habitat. These types of actions have helped duck breeding populations rise sharply in 1997 with most species currently above the numerical goals of the North American Waterfowl Management Plan.

In addition to rural areas, much important habitat is located in urban and urbanizing areas. An example is in the greater Chicago region where an innovative approach is being taken to address the loss of natural habitat and biodiversity. The region covers the lakebed of glacial Lake Chicago and extends from Chiwaukee Prairie in southeastern Wisconsin to the Indiana Dunes National Lakeshore. It contains eight million people together with a surprisingly rich mix of prairies, woodlands, dunes, beaches, streams and wetlands, 200,000 acres of which is in public ownership and provides habitat for many rare plants and animals.



Figure 17: Protected Lands in Chicago Wilderness Region

To save this natural legacy, 36 governmental and non-governmental organizations have joined to form the Chicago Region Biodiversity Council which in turn has created “Chicago Wilderness”, a program devoted to protecting and restoring the biodiversity of the region. The Council and the Chicago Wilderness program are actively working to involve a wide network of people to build support for a locally based ecosystem approach to restoring the ecological integrity of the region. A major step is the publication of *Chicago Wilderness: An Atlas of Biodiversity* which seeks to inform the public of the wonders of the region. It is intended to form the base for a biodiversity recovery plan now in development for the region. The intent is to assess all of the naturally occurring ecological communities of the region and to ensure that they are sustained on a permanent basis.

In the southeast Lake Michigan region, the National Park Service (NPS) has been directed by Congress to study portions of the Lake Calumet area to determine the feasibility of establishing an urban ecological park. The “Calumet Ecological Park”

feasibility study was initiated in May 1997 and will assess the area's natural and cultural resources, the physical and cultural relationships between these resources, and how these resources portray the area's changing landscape.

An area of approximately 15 acres across the street from the Gary, Indiana Airport, had hazardous wastes (PCBs and petroleum wastes) illegally disposed of on site into a wetland associated with a relatively large tract of remnant dune and swale habitat. In 1996, EPA spent \$4 million removing 10,250 tons of TSCA level PCB wastes from the wetlands at this site as part of its Superfund removal program. In addition, more than 500,000 gallons of contaminated water was removed and treated at the site. With a tremendous amount of effort on FWS and IDEM's part, including almost weekly site visits to assist them, EPA recreated two dune ridges and planted the site to oak savannah prairie. This property is a restoration show case for how EPA and natural resource trustees can cooperate on Superfund actions for the benefit of an area's natural resources.

The Long Point Bird Observatory (LPBO) takes advantage of its location on the north shore of Lake Erie to collect a wealth of information about North American birds and their movements. By the end of 1995, LPBO had banded over 260 species. The recapture or recovery of songbirds at sites across the continent has added greatly to our understanding of bird migration and biology. In addition, LPBO is conducting the Marsh Monitoring Program. In each of the 42 AOCs, volunteers monitor bird and amphibian populations. Spatial and temporal comparisons of marsh bird and amphibian populations in AOCs versus other marshes, both on a local and basinwide scale, provide an indication of the success of habitat rehabilitation activities and an ongoing measure of the health of the marshes and wildlife communities.

GLNPO's April 1996 report, *Mining Ideas*, shows that from 1992 through 1995, GLNPO awarded over \$8.5 million in grants for 87 projects to 36 local, Tribal, State, and Federal agencies and non-governmental organizations which collaborated with some 240 partners to protect and restore habitats. By funding demonstration projects, GLNPO helped to increase the quality and extent of native ecosystems of the Great Lakes Basin and fostered a greater understanding of ecosystem processes and functions, greater participation by partners in on-the-ground protection and restoration activities, and a dawning awareness by the public of the special and valuable nature of Great Lakes systems, communities, and species.

During 1995, The Nature Conservancy (TNC) and NYSDEC joined to develop a management plan for the stretch of beach along the eastern shore of Lake Ontario. By encouraging people to stay on the beach, TNC and NYSDEC provided ecologically sensitive access between Sandy Pond and the Lake Ontario beach. TNC, NYSDEC, and the volunteer Friends of Sandy Pond Beach share management responsibilities. In July 1996, all parties joined together to dedicate the recent beach/dune access improvements at Sandy Pond and at Lakeview Wildlife Management Area, Deer Creek Marsh Wildlife Area, and Southwick Beach State Park, all part of the 17-mile stretch of Lake Ontario shoreline that is considered the eastern Lake Ontario "megasite".

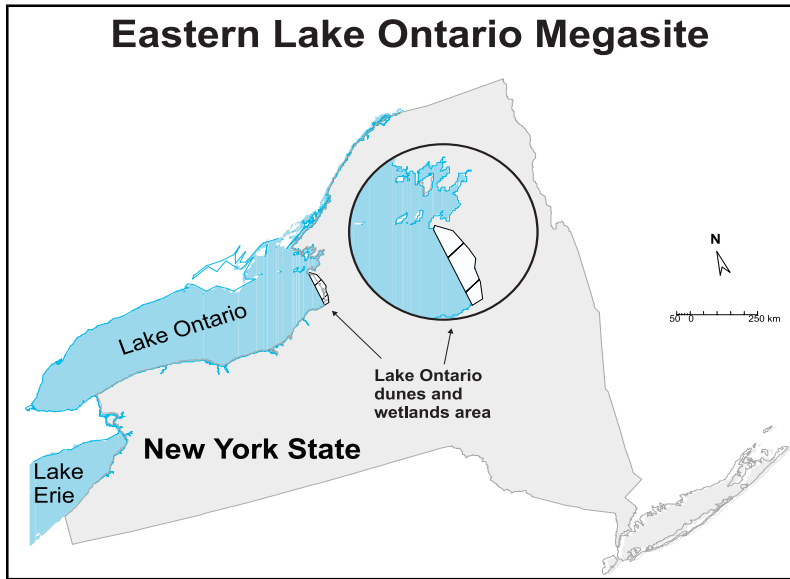


Figure 18: Eastern Lake Ontario Megasite

The loss of coastal marsh habitat for fish and wildlife in the Great Lakes has occurred at an alarming rate during the 20th century as a result of both human and natural causes. Today, there is less than 10 percent remaining of the 300,000-acre “Great Black Swamp” that bordered western Lake Erie before 1800. A partnership consisting of the FWS, the Ohio Division of Wildlife, EPA, Ducks Unlimited, and other private conservation groups, with the support of locally elected members of Congress, has completed construction associated with the restoration of Metzger Marsh, which may serve as a model for coastal wetland restoration in other parts of the Great Lakes. Construction of water level/fish control structures and other features will protect this 900 acre wetland from storm damage and will allow this area to once again provide a diverse aquatic plant community and habitat for a diversity of fish and wildlife species. The Metzger Marsh project is one of ten flagship projects of the North American Waterfowl Management Plan which was created to protect, restore, and enhance wetlands from Mexico to Canada.

Double-crested cormorant populations have increased dramatically in the Great Lakes in the last two decades. Many citizens and interest groups believe the species is adversely impacting sport fisheries. The FWS helped support a study by the Michigan Department of Natural Resources (MDNR) to determine the impacts of cormorants on a yellow perch fishery in Lake Huron. Preliminary results show that the cormorants have little overall impact on the perch, which confirms patterns found in similar studies elsewhere. FWS is monitoring cormorant populations throughout the Great Lakes to better understand population trends and distribution, is working with the Minnesota Department of Natural Resources on a cormorant informational brochure for the public, and has organized a symposium to be held in December 1997 on cormorant biology and management in the Midwest.



Double-crested cormorant populations have increased dramatically over the last two decades

Saginaw Bay, a major stopover site for three million waterfowl that migrate annually through the Great Lakes region, is getting a major cleanup. The U.S. Migratory Bird Conservation Commission approved more than \$750,000 for wetlands restoration

on and in 22 counties that drain into Saginaw Bay. That makes more than \$3 million in local, State and private money earmarked for restoration of more than 2,500 acres. A partnership of the FWS, Ducks Unlimited, and the MDNR will select private property eligible for wetlands restoration.

The Lake Erie water snake, which occurs only on the islands of western Lake Erie in Ohio and Canada and on some shorelines of Ohio's Catawba-Marblehead Peninsula, is currently proposed to be listed as threatened or endangered under the Endangered Species Act. The FWS and the Ohio Department of Natural Resources have been encouraging island residents and visitors in 1996 and 1997 to "live and let live" in sharing the islands with these water snakes. Efforts have included increasing public awareness, improved landowners stewardship, and positive media attention. If these conservation efforts are successful, FWS may not need to list the snake or it may recover and allow delisting more quickly.

Some 22,600 acres of privately held heavily forested land in northeastern Minnesota has been acquired by the State for preservation and public enjoyment in what has been described as a "win-win" situation for all parties involved. Minnesota Power decided that it no longer needed the shoreline property for hydroelectric purposes and announced its sale, giving the State and counties first option. The State raised \$4.2 million for about 80 percent of the land and Minnesota Power donated the remaining 20 percent, valued at \$1.1 million. The purchase by the State of this property along the St. Louis, Cloquet, and Whiteface Rivers means that most of the 150 miles of shoreline along the three rivers, which drain 3,500 square miles of northeastern Minnesota before emptying into Lake Superior, will remain largely undeveloped and mostly preserved in a natural state. Minnesota has also completed restoration of plant and animal habitat at Grassy Point, an estuarine wetland in the St. Louis River at Duluth.

The U.S. Department of Agriculture's U.S. Forest Service (USFS) has a number of programs for protecting water quality and aquatic habitat in the Great Lakes. During FY 1995, USFS completed a variety of inventories on stream, lake, and terrestrial ecological units; completed 150 miles of stream and 1,370 acres of lake habitat restoration; continued working with State and non-profit organizations on ecological classification, inventory, and mapping of watersheds and aquatic environments; began compiling geo-spatial databases for terrestrial ecological units, streams, and lakes in national forests in the Basin; compiled a geo-spatial database on human and natural conditions in the Upper Great Lakes; worked with States on nonpoint water pollution control, as affected by forest management practices; and continued research and technology transfer on watershed processes, forest health, landscape ecology, atmospheric deposition, managing riparian resources, and fish habitat.

The Nature Conservancy is undertaking an eco-regional prioritization effort with the support of the Mott Foundation and EPA. The goals are to develop clear objectives and recommendations for conservation of natural communities and vulnerable species at a regional level, to identify a portfolio of conservation sites within ecologically defined local areas, and to engage local partners in conservation planning and activities.

During the 1996 SOLEC, the Land by the Lakes paper identified 20 "biodiversity investment areas" on the Great Lakes shoreline having clusters of exceptional

biodiversity value. These areas present opportunities to create large protected areas that will preserve ecological integrity and, ultimately, help protect the health of the lakes themselves. For SOLEC 1998, the 20 nearshore terrestrial biodiversity investment areas will be described more fully. In addition, biodiversity investment areas for coastal wetland and nearshore aquatic areas will be identified.

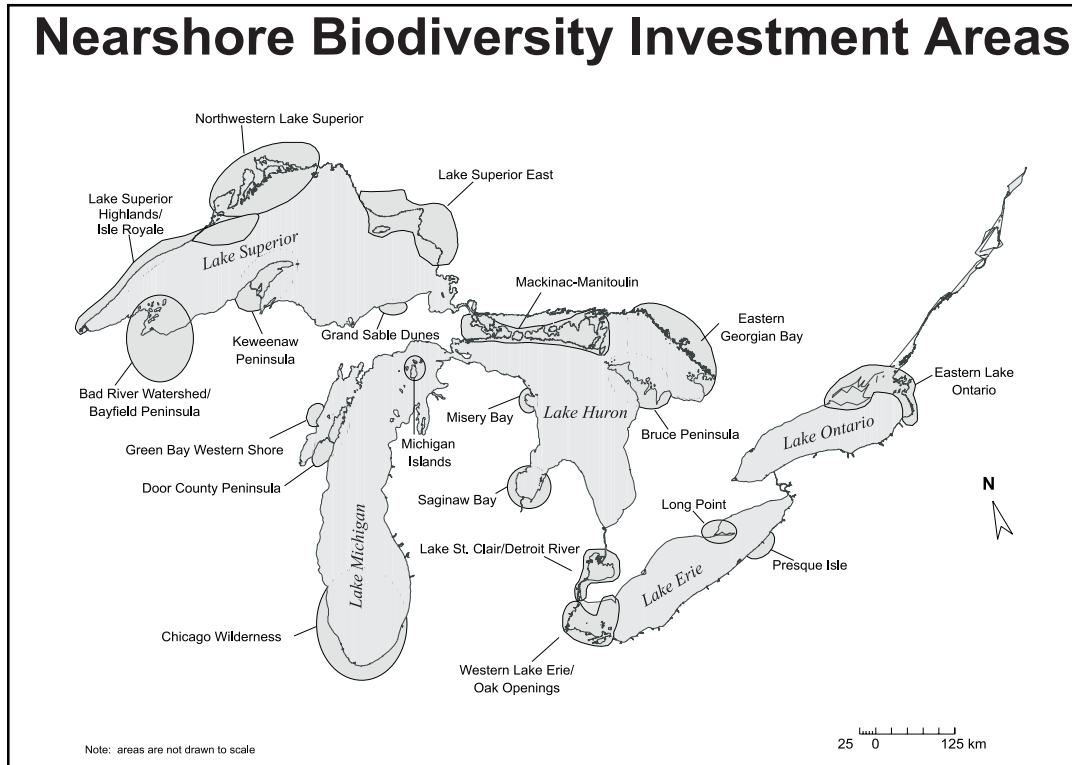
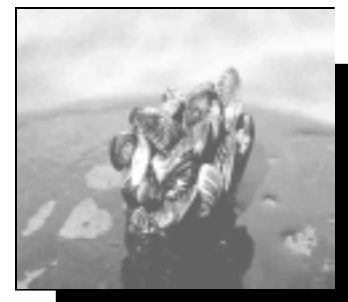


Figure 19: Nearshore Biodiversity Investment Areas

EXOTIC SPECIES

The Great Lakes sport and commercial fishing industry, valued at almost \$4.5 billion annually, is at risk due to growing numbers of nonindigenous mussels and fish, such as the zebra and quagga mussels, sea lamprey, ruffe, and round goby. Populations of native fish, including lake trout, walleye, yellow perch and whitefish are threatened by the establishment of these exotic species. There is also a concern that juvenile specimens of freshwater species that are not native to the Great Lakes are still being found in the Basin, indicating that all sources of introduction have not been controlled.

Zebra mussels continue to profoundly affect the Great Lakes ecosystem. This prolific mollusk filters microscopic algae from the water column, diverting nutrients from open water to lake bottom systems, thus favoring bottom-feeding fish (and their predators) over those such as alewife and smelt (and their predators) which feed in the open water. Aquatic rooted plants (macrophytes) and their communities (e.g. large mouth bass) thrive in water cleared by zebra mussel, while habitat is reduced for species adapted for turbid waters (e.g. walleye). Zebra mussels, accidentally



The impact of the zebra mussel is being felt throughout the Great Lakes Basin

transported by recreational boaters, are now turning up in inland waters in all eight Great Lakes States. Municipalities and larger industries in the Great Lakes each pay, on average, \$360,000 per year to control zebra mussels, with documented cumulative basinwide costs of \$120 million from 1989 to 1994.

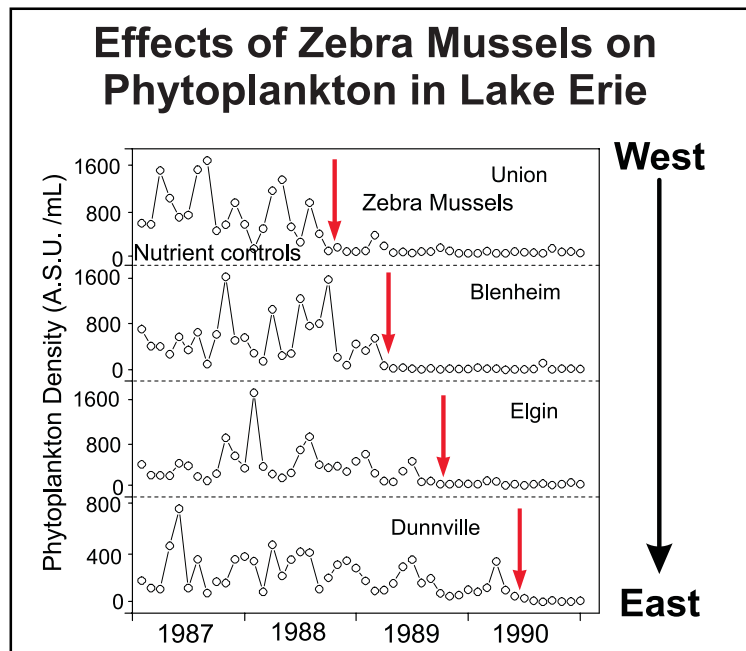
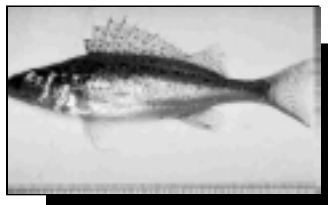


Figure 20: Effects of Zebra Mussel on Phytoplankton in Lake Erie

For the first time in the Great Lakes, quantitative data were collected on bottom dwelling protozoa and on the effects of zebra mussels on their populations and on nutrient transport at the sediment-water interface. In regions where zebra mussels were present, common algivorous species of microbenthos were replaced by opportunistic omnivorous and bacterivorous species. In general, community abundances tended to increase at zebra mussel sites, but the diversity within those communities decreased. This study was undertaken by NOAA's Great Lakes Environmental Research Laboratory (GLERL).



The ruffe (top) and the round goby, recent invaders to the Great Lakes, are impacting the ecosystem



The ruffe, a spiny fish with minimal food value, continues to pose a major threat to the Great Lakes ecosystem. Native species such as troutperch have trouble competing with the prolific ruffe. Introduced to Duluth Harbor in the early 1980s, the ruffe has spread much more gradually than the zebra mussel. In western Lake Superior the ruffe has become the predominant fish species in bays and estuaries. Ruffe have now extended its range from Lake Superior to northern Lake Huron and pose a threat to native species, especially yellow perch.

The latest fish invader, the round goby, was found in the St. Clair River in 1990 and has already spread to lakes Erie, Huron, Michigan, and Superior. To date, only Lake Ontario has not reported any goby sightings, nor have they yet been documented outside of the Great Lakes Basin. Efforts are underway to prevent their spread to the Mississippi River system via the I&M Ship Canal in Illinois. A \$250,000 congressional add-on will be used to construct an electronic barrier to their passage through the Canal.

Successful management of the last remaining uncontrolled population of Great Lakes sea lamprey -- that of the St. Marys River -- is within reach of the binational Great Lakes Fishery Commission (GLFC) and its agents and cooperators. Control strategies should reduce sea lamprey populations in Lake Huron and northern Lake Michigan by at least 85 percent. Such a reduction will allow for the resumption of lake trout stocking in Lake Huron and for the implementation of other fishery rehabilitation efforts. Trapping, release of sterile males, and a new bottom formulation of lampricide for targeting larval hot spots are tools that, applied in an optimal mix, can effect a significant level of cost-effective, environmentally sensitive control.



Sea lamprey predation

Once established, exotic species cannot be eradicated. Nor is there any practical means to control their eventual spread throughout the Great Lakes ecosystem and the continent. Therefore, the primary imperative is to prevent new invasions of the continent. The primary vector for unintentional intercontinental invasions of aquatic exotics, or aquatic nuisance species (ANS), is ballast water in ships. Controls on ballast water present a technically feasible opportunity for protecting the continent from new invasions. Other vectors, such as intentional fish stocking, aquaculture, and ornamental plant nurseries also need to be better understood and controlled.



Lampricide is applied to spawning areas to help control sea lamprey populations

The problem of exotics in ballast water has risen to attention in the United Nations International Maritime Organization (IMO) as a serious environmental issue and has now received attention from a number of the maritime nations. The maritime nations taking the lead are Australia, Canada, and the U.S. The Great Lakes regime established under the U.S. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (which took effect in 1993) is as yet the only general, mandatory control regime which is based on research and guidelines previously developed by Canada and Australia. Amendments to the 1990 U.S. legislation, in the form of the National Invasive Species Act of 1996 (NISA), provide for nationwide guidelines which may be followed later by mandatory controls.

The 1990 legislation also provided for the creation of a national ANS Task Force including all the responsible Federal agencies (NOAA, FWS, the U.S. Coast Guard [USCG], EPA, COE, etc.) and a regional ANS Panel supported by the Great Lakes Commission (GLC), which includes regional representatives of the Federal agencies, representatives of the Great Lakes States, representatives of commercial and public non-governmental organizations, and observers from binational and Canadian agencies. The GLC ANS Panel has played an essential role in coordinating regional work and setting the agenda for the National ANS Task Force. The GLC ANS Panel has addressed control of introduced species such as the zebra mussel and the ruffe, coordination of research on all exotics, development of educational materials and policy structures, and support for the effort to prevent new invasions.

The existing Great Lakes regime depends on open ocean exchange as the primary (virtually exclusive) means of controlling new invasions in ballast water, and open ocean exchange is the only measure currently being recommended in the non-mandatory guidelines being promulgated by IMO, the U.S., Canada, Australia, and other nations. However, it is now widely recognized that ballast exchange is not safe or practical for a significant number of ships without some alteration of tanks or piping systems. Therefore, it is imperative to develop improvements in the design of ballast systems allowing for either improved exchange or treatment of the water.

The most recent and authoritative review of potential ballast water control options conducted by the U.S. National Research Council Marine Board indicated that four options should be given priority consideration: 1) filtering; 2) nonoxidizing biocides; 3) heat; and 4) retrofitting or redesign of ballast systems to allow safe and effective exchange. These approaches are addressed in a “Binational Ballast Water Research Strategy and Plan” laid out in the **1996-1997 Binational Report on Protection of Great Lakes Water Quality** submitted by Canada’s Department of Fisheries and Oceans, Transport Canada Marine Safety, and the USCG in October 1997. This report (and the extensive appendices on the subject of exotics in ballast water) reviews all the current work on the subject, including the \$1 million Great Lakes Ballast Demonstration Project on filtering funded by the Great Lakes Protection Fund with the support of the Council of Great Lakes Governors, the studies of chemical controls conducted by both the Michigan Office of the Great Lakes and Canadian agencies, and other work being conducted in Canada, the United States, and around the world. Most importantly, the binational report presents a clearly focused plan, supported by both the Canadian and U.S. agencies responsible for regulating ballast water, for conducting the additional work which needs to be done to raise the level of protection for the Great Lakes watershed and the North American continent in the near future.

The States of Michigan and Ohio announced the completion and submission of a **Nonindigenous Aquatic Nuisance Species State Management Plan** to a National Task Force in fulfillment of the requirements of NISA. The plans emphasize prevention as the key for long-term protection of State waters from harmful invaders such as the zebra mussel, Eurasian ruffe, gobies, and many others.

GLERL’s long-term research monitoring program in Lake Michigan was expanded to examine the impacts of nonindigenous species. A new nearshore monitoring program was added to the existing Lake Michigan monitoring program in order to more thoroughly study ecosystem trends in central Lake Michigan. In addition, the results from a three year study designed to compare the structure and productivity of the lower food webs across the Great Lakes documented unprecedented changes in the lower food web of Lakes Ontario and Erie. Nutrient concentrations in the lower lakes are approaching those in the upper lakes and the biological community appears to be in transition, as present communities are very different from those previously documented.

GLERL’s nonindigenous species program continued to assess the ecosystem in Saginaw Bay, and GLERL now has seven consecutive years of ecosystem measurements from the system, covering the period before, during, and after the peak invasion of zebra mussels. Data through 1995 reveal that abundances and biomass have not changed since 1993. This may indicate that the population has stabilized and assumed an “equilibrium” with the surrounding environment. A particular emphasis of GLERL’s nonindigenous species research from 1995 to 1997 has been examining the role of the zebra mussel in promoting nuisance blooms of the potentially toxic blue-green algae *Microcystis* on Saginaw Bay and the effects of these blooms on the ecosystem and the mussels themselves. *Microcystis* blooms have also been recently experienced in Lake Michigan and Lake Erie. These blooms are associated with taste and odor problems in drinking water.

Fish and Wildlife Communities

In comparison with two centuries ago, the populations of many native fish species are greatly reduced. Their depletion can be attributed to food chain disruptions, habitat loss and degradation, over-fishing, and exotic species, among other factors. Damage to once abundant native fish populations has been profound. Non-native alewife and smelt have replaced lake herring and bloater chub as the predominant forage fish since the late 1960s and 1970s. Sturgeon survive today in much depleted numbers, although a significant recovery may be occurring in the upper Niagara River where for the first time in many decades, several year classes, including young-of-the-year, have been found. The following variety of important actions are examples of the many steps being taken to aid in the recovery of Basin populations of native species.

The landmark *Joint Strategic Plan for the Management of Great Lakes Fisheries*, the plan under which the Great Lakes fishery is collectively managed as an ecosystem, was endorsed by those Federal, Tribal, Provincial, and State agencies with fishery management authority on the Great Lakes. This latest edition of the Plan expands the commitment that fisheries managers have made to work together to influence all management activities which affect fish and to create stronger links to coordinate fishery management objectives with environmental objectives. LaMPs and RAPs are identified as processes in which fishery management agencies can work more effectively with their environmental counterparts. The Plan also identifies the five Lake Committees of the Great Lakes Fishery Commission as the major action arms for the agencies to achieve their joint objectives for sustaining and enhancing the fishery.

FWS took a lead role in coordinating a binational, multi-basin, interagency effort to better understand the current status and trends of lake sturgeon in the Lake Huron, Lake St. Clair, and the western Lake Erie region. Studies to define seasonal movement, relative abundance, life history, and habitat selection within this region are continuing to be conducted by this interagency workgroup. Efforts such as these to establish baseline information will be critical to efforts to restore the lake sturgeon at this and other “hot spots” on the U.S. side of the Great Lakes, including Lake Superior, Green Bay, and the Niagara River.

FWS continued to assess progress in lake trout restoration efforts in Lake Huron. This included conducting spring and fall assessments at the Six Fathom Bank Refuge, through a collaborative effort between FWS and the USGS’s Great Lakes Science Center.

Recent data indicates that the structure of Lake Ontario’s offshore fish community is changing in response to improved environmental conditions, and that the direction of that change is towards a fish community that more closely resembles that which existed historically. Lake trout are now showing increasing natural reproduction in Lake Ontario for the first time in 50 years. As of August 1995, the number of naturally reproduced lake trout collected during routine New York State fishery survey trawls was eight times greater than the total number collected by New York State and Ontario efforts in 1994. Wild lake trout were caught in every area of the lake in 1994, indicating that successful natural reproduction and survival in the early stages occurred lakewide from 1993 to 1994. Whitefish and burbot populations, native species that require habitat similar to that required by lake trout, have made



The reintroduction of the Atlantic salmon is being studied in the Lake Ontario basin

significant recoveries. And a recent sighting of a deepwater sculpin indicates that this formerly “extirpated” native species may be recovering. Once indigenous to Lake Ontario and its tributaries, the Atlantic salmon disappeared by 1900 due to mill dams obstructing spawning migrations, and overfishing, as well as deforestation and pollution. The FWS is participating in the investigation of the feasibility of restoring Atlantic salmon populations in historic spawning tributaries that flow into Lake Ontario and in the upper St. Lawrence River.

Studies on the population dynamics of burrowing mayflies conducted by the Pennsylvania Department of Environmental Protection (PADEP), the Biological Resources Division of the USGS, Heidelberg College, the Ohio State University, and Penn State University have indicated that the mayfly populations in western Lake Erie and the Presque Isle Bay AOC are presently experiencing exponential growth. Based on population models, the mayfly population is predicted to attain full recovery by the year 2002. Mayflies were virtually eliminated from the western basin of Lake Erie by 1960, but recolonization began during the 1990s and spread throughout most of the lake by 1996. The recovery of the mayfly augers well for the yellow perch population which is expected to grow as the density of mayfly nymphs continues to rise in western Lake Erie. The re-emergence of the mayfly is seen as a prime indicator of improved water and sediment quality in Lake Erie.

Lake trout were, historically, the sole coldwater predatory fish species in Lake Erie. However, human-induced stresses resulted in the decline or disappearance of many of the highly valued native species, including lake trout. In recent years, large amounts of resources have been expended to clean up and rehabilitate this ecosystem. As nutrient loadings, the depletion of dissolved oxygen, contaminant levels and sea lamprey-induced fish mortalities have declined, the lake’s environmental quality has improved which has contributed to the recovery of several native fish species, including lake whitefish, burbot, and a worldclass walleye fishery as well as increased sightings of sturgeon. The stocking of lake trout in the lake has resulted in the successful production of a broodstock that is now producing and depositing eggs in the lake, though successful hatching in the lake has not yet been documented.



Walleye caught in the western basin of Lake Erie

For Lake Michigan, the LaMP Program and the Lake Michigan Committee (LMC) of the Great Lakes Fishery Commission are planning to work in close cooperation. The LMC has perhaps the best fish community objectives of any of the Great Lakes which will help the LaMP set ecosystem objectives for Lake Michigan.

In 1997, FWS initiated a three year project to survey all colonial waterbird nesting sites in the U.S. portion of the Great Lakes. This was last done in the late 1980s. The present survey will allow the FWS to determine changes in the numbers and distribution of gulls, terns, double-crested cormorants, herons, and egrets. This information will be useful in developing conservation strategies for these species, which include declining (terns) as well as super-abundant (gulls and cormorants) species.

The common tern has declined dramatically in the Great Lakes in recent years. Primary causes include predation, competition for nest sites from ring-billed gulls, habitat loss, and human disturbance. FWS funded a project that is reviewing all available scientific information about their biology and population status in the Great Lakes. In addition, a field survey of all common tern colonies in the U.S.

portion of the Great Lakes was conducted in 1997 and a three year study was funded to determine factors limiting common tern nesting success in Saginaw Bay. FWS also provided support to MDNR to restore critical habitat for terns at Lime Island, Michigan, one of the largest colonies in the Great Lakes. These efforts will allow the FWS to formulate conservation strategies that ensure the future well-being of this species.

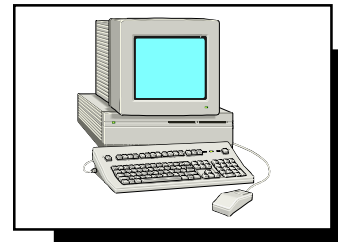
Success continues for one of the oldest interagency, cooperative endangered species recovery programs in the nation. The recent increase in numbers of the Kirtland's warbler is a result of extensive habitat management by MDNR, the USFS, and FWS. These agencies have worked in partnership with a variety of public and private groups to promote education and support for the Kirtland's warbler recovery program.

A major North American Waterfowl Management Plan project is underway in northwestern Indiana. The Southern Lake Michigan Project is unique in that its purpose is to acquire, protect, and restore natural areas in the southern Lake Michigan watershed. This project is focusing more on the protection of the globally significant biodiversity of the Indiana Dunes, such as habitats supporting the endangered Karner blue butterfly, and rare types of prairies, rather than on restoration of drained wetlands for waterfowl.

The State of Wisconsin and the Bad River Tribe completed a project to reintroduce trumpeter swans into Lake Superior's Kakagon Sloughs on the Bad River Indian Reservation.

PUBLIC ACCESS TO ENVIRONMENTAL INFORMATION

EPA and its partners are vigorously pursuing greater public access to relevant Great Lakes environmental information through the Internet. Active participation in the Great Lakes Information Network (GLIN) and various agency homepages contribute to a large set of information about the Great Lakes available to the public. The Great Lakes GIS Online project builds upon GLIN to provide Internet-based access to, and online mapping capability for a variety of consistent spatial data layers covering the Great Lakes Basin. Based on GLIN's formula for building online partnerships among U.S. and Canadian agencies and organizations, the Great Lakes GIS Online project will provide a solid foundation for interagency spatial data sharing and collaboration.



Increased public access to environmental information is a hallmark of the U.S. Great Lakes Program

EPA's "Surf Your Watershed" Internet Site (<http://www.epa.gov/surf>), which houses the Agency's first comprehensive assessment of U.S. watersheds, allows the public to locate, use, and share environmental information on a particular watershed or community. The driving force behind Surf Your Watershed is to get environmental information into the hands of citizens and groups active in protecting and managing the environment. Providing the public with this information is an extremely important step in improving our nation's water quality and protecting the health of the American public. A particular watershed can be selected by using maps or searching by State, Indian Tribe, County, or zip code. A search can also be based on local stream names, water bodies, or even large-scale ecosystems. At the state or watershed level, there is information regarding protection efforts, environmental/public health conditions, fish advisories, drinking water, land use, population, Superfund sites, and effluent dischargers. The public also will be able retrieve the

overall score for a watershed, reflecting condition and vulnerability, additional information provided by states, and links to public and volunteer organizations working to protect and restore water at the regional, State, and watershed level. A map of the watershed or area can also be requested. An index of watershed indicators is located at:

<http://www.epa.gov/surf/iwi>

The Great Lakes Computer Center provides a database to support regional information systems including Great Lakes Envirofacts, which consists of EPA facility information in an easily accessible format, RAPIDS, and the database of the Lake Michigan Mass Balance. The public is now able to easily search Great Lakes Envirofacts through the Internet at:

<http://www.epa.gov/enviro>

GLNPO, through a grant to the Great Lakes Commission, is developing a publicly-accessible homepage to provide information for those AOCs which are within the U.S. or are shared with Canada. This site will provide a uniform format for displaying information and will allow the Great Lakes States to easily provide updated information as it becomes available. The site should be up and running by the end of 1997.

EPA continues to distribute large numbers of the popular third edition of *The Great Lakes: An Environmental Atlas and Resource Book*, which was co-authored with Environment Canada. This excellent resource has been distributed to many of the Basin's schools and libraries as well as to a variety of other public and private institutions. The Atlas is also available on the Internet at:

<http://www.epa.gov/glnpo/atlas/intro.html>

Cleveland's Great Lakes Science Center, a museum dedicated to educating the public on science and the Great Lakes in a hands-on, interactive manner, opened in July 1996 to throngs of school children and others, pushing first year attendance numbers well above the goal of 650,000. Aided by a \$2 million grant from EPA, the museum will use the hands-on approach to serve one of its primary goals of being an engine for science education for school-aged children.

EPA has initiated the Sector Facility Indexing Project to make it easier for the public to evaluate the environmental records of facilities and compare their environmental performance. Data collected under the Clean Water Act, Clean Air Act, Resource Conservation and Recovery Act, and the Toxic Release Inventory for five industry sectors (petroleum refining, iron and steel, pulp mills, primary nonferrous metals, and automobile assembly) relating to past compliance history, facility size, pollutant releases and toxicity, and surrounding population has been aggregated, and is being prepared for public release in late 1997. This initiative is the first time that cross-program EPA data has been compiled in one place in a manner that will allow examination of facility-level environmental records.

GLERL and the Ohio State University have successfully developed and implemented the Great Lakes Coastal Forecasting System which makes regularly scheduled forecasts of the physical and related variables, such as surface water temperature, vertical temperature structure, water surface elevation, and currents for Lake Erie; and wind fields and wave heights for all the Great Lakes.

GREAT LAKES GEOGRAPHIC INITIATIVES

One of the mainstays of the Great Lakes Program is its use of geographic initiative to address environmental impacts at varying scales around the Basin. Examples of these initiatives range from the basinwide level (the Binational Toxics Reduction Strategy and the Great Waters Study), to individual lake basin programs (the LaMPs and the Lake Michigan Mass Balance), to regional ecosystems (the Eastern Lake Ontario Megasite and the Southeast Michigan Initiative), to local watersheds (the RAP Program and other various watershed initiatives), and finally, to site-specific projects (a particular sediment removal or habitat restoration project). This “nested approach” ensures that environmental impacts are being reviewed by the program working at the proper scale to address the issues. The following discussion of the LaMP and RAP programs and other geographic initiatives highlights this approach.

PROGRESS UNDER THE LAKEWIDE MANAGEMENT PLANS

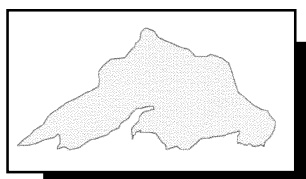
Annex 2 of the Agreement established the LaMP Program to restore and protect the beneficial uses of Great Lakes waters on an individual lake basin scale. The LaMP Program emphasizes and puts great value in local public stakeholder involvement. The Program seeks to empower stakeholders at the local levels to help define and address environmental problems which are impacting their particular lake basin. The LaMPs are also helping to increase local capacity so that the public groups have the ability to be full and active LaMP partners. The U.S. Great Lakes Program is looking to the LaMPs to be one of the primary vehicles for achieving environmental improvements at the individual lake basin level. Many of the achievements highlighted in this report have been implemented through the cooperation of the governmental and non-governmental agencies working on the LaMPs.

The direct and important involvement of public groups in the LaMPs (and in a variety of other programs including RAPs) is illustrative of one of the major cornerstones of the Great Lakes Program -- the promotion of public stewardship and direct involvement. Community stakeholders are strongly involved in a variety of planning processes from the public forums or other forms of public involvement on the LaMPs, to the Public Advisory Committees (PACs) which are participating in RAP development. These methods of public involvement are all examples of Community-Based Environmental Protection (CBEP), an approach which is results oriented, which has a geographic focus, and which has a practical advantage in that definable geographic areas have proven to be effective units of work, as measured in environmental results. Communities are manageable entities for defining collaborative goals and developing plans and implementation strategies tailored to specific ecological systems, economic circumstances, and socio-cultural situations. Stakeholder involvement brings in knowledge and expertise about local conditions and ensures that those who live with the environmental decisions being made are involved in the process. This also creates a sense of local ownership of the issues and solutions. The CBEP process fosters unique programs, can leverage funding, and helps reconnect government agencies and their employees with the people and places they serve. The CBEP approach, piloted in the Great Lakes, is now being implemented agency-wide by EPA.

Public and private agencies working on the LaMPs are developing strategic management plans to streamline and strengthen the integration and application of environmental programs and to create strategic monitoring plans to aide in the analysis

and use of environmental data in making decisions regarding the lakes' ecosystems. The LaMPs are also developing ecosystem objectives and indicators as measures of progress. LaMPs have established productive working relationships with fish manager counterparts on the Lake Committees of the Great Lakes Fishery Commission. Efforts are underway to reconcile ecosystem, fish community, and environmental objectives, and to select indicators that are consistent with lakewide assessments conducted by Lake Committees. In addition to activities already highlighted under specific topics of this report, a variety of other significant LaMP accomplishments have occurred during the last two years.

Lake Superior



Lake Superior

For Lake Superior, the LaMP is part of an agreement, the ***Binational Program to Restore and Protect the Lake Superior Basin***, between Canada and the U.S. This program has two major areas of activities: a Zero Discharge Demonstration Program which is devoted to the goal of zero discharge of nine persistent bioaccumulative toxic substances, and the broader program, which involves efforts to restore and protect the Lake Superior ecosystem.

The completed Stage 1 LaMP identified 22 critical pollutants that either impaired beneficial uses or exceeded certain environmental criteria, including the nine pollutants targeted by the Zero Discharge Demonstration Program. Nonpoint source pollution deposited from the atmosphere is a proportionately large source of pollution in Lake Superior, and it has been determined that nonpoint sources have a bigger influence over water quality in the lake than do point sources.

The draft Stage 2 LaMP which presents load reduction schedules and targets was released in October 1996. Public comments have been reviewed and summarized and a draft Responsiveness Summary is currently being reviewed by the governmental agencies. Chapter 3 of the LaMP, "Reduction Targets for Lake Superior Pollutants", contains consensus-based recommendations for load reduction targets and was the product of the Lake Superior Binational Forum, the citizen stakeholder group. Revisions to the Binational Forum's recommendations will be included. The Stage 2 LaMP should be completed by March 1998. Activities to be utilized in the development of the draft Stage 3 LaMP -- "Management Strategies for Implementation of the Pollutant Load Reduction" -- have already begun.

The draft Ecosystem Principles and Objectives, Targets and Indicators document was released in October 1996 for public review. This document includes environmental quality indicators covering six categories. It was developed in coordination with several binational partners as part of the Binational Program.

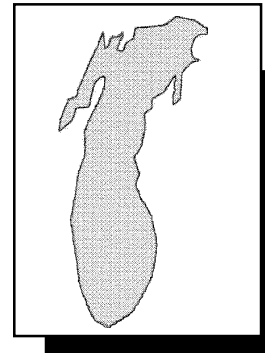
As part of the Lake Superior Binational Program, the Habitat Committee developed criteria for the identification of important habitat sites in the Lake Superior Basin. They have released a map of known sites of important habitats that meet these criteria along with a summary of the condition of habitats in the Lake Superior Basin. In addition, they have completed ongoing habitat restoration and protection projects that will, individually and cumulatively, improve the health of the Lake Superior ecosystem.

Through a grant from EPA, the Binational Forum hosted a workshop on sustainability within the Lake Superior Basin. The workshop focused on three areas within the Basin from which case studies were developed and conference participants discussed aspects of the areas and ways in which communities and the Binational Program partners might work together to promote sustainability community development.

Lake Michigan

The Lake Michigan LaMP has identified lakewide critical pollutants and the four Lake Michigan States have completed their assessments of beneficial use impairments due to all stressors. As of August 1997, a document which will serve as a preliminary Stage I LaMP was being drafted with a targeted release date of December 1997. In the interim, a number of fact sheets were produced which updated the status of a variety of environmental issues in the Lake Michigan Basin, such as RAP status, critical pollutants, and the Lake Michigan Mass Balance. The Lake Michigan Fellows compact disc and interactive software was produced to put LaMP issues and activities in context and to prepare audiences for understanding what the goals of the LaMP are.

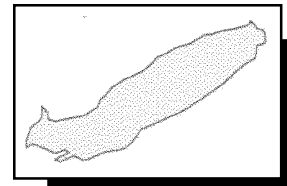
The Lake Michigan Public Forum has secured private funding to support a pollution prevention project in the primary metals industry to address Lake Michigan LaMP pollutants. As source reduction in a primary metal industry is quite difficult, the project may result in the identification of practices to increase off-site transfers or recycling, and opportunities to decrease releases. The Forum is targeting facilities within the watershed and may work with trade associations and technical assistance programs within each State.



Lake Michigan

Lake Erie

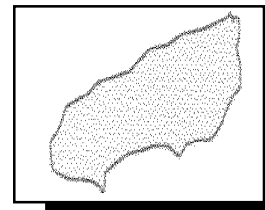
A Lake Erie LaMP Status Report is currently being produced with a targeted completion date of late 1997. This Status Report addresses a variety of issues, including historic trends of PCB and phosphorus loadings, beneficial use impairment assessments for each of the three sub-basins, sources and loadings for a limited set of “fast-track” pollutants, and ongoing programs. The Status Report will be produced in an “Executive Summary” format. Ecosystem objectives are under development using models to create possible outcomes which will be publicly reviewed and finalized in the fall of 1998.



Lake Erie

Lake Ontario

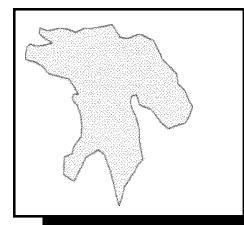
The draft Stage I (problem definition) document for Lake Ontario was drafted and sent out for a two month public review period, which ended on June 30, 1997. During the public comment period, 10 public meetings were held around the US and Canadian sides of the Lake Ontario Basin. The document is in the process of being revised based upon public comment.



Lake Ontario

Lake Huron

EPA, Environment Canada, the State of Michigan, the Province of Ontario, and other Federal agencies are looking to develop and implement a LaMP for Lake Huron, based on the lessons learned in developing LaMPs for the other Great Lakes.



Lake Huron

PROGRESS ON REMEDIAL ACTION PLANS

Annex 2 of the Agreement called for the development of Remedial Action Plans (RAPs) to address the impairment of beneficial uses at forty-three localized “hot spots” throughout the Great Lakes. Highlights of current and planned activities to implement these RAPs have been incorporated throughout this report.



Figure 21: Areas of Concern in the Great Lakes Basin

At the Deer Lake-Carp River/Creek, Michigan AOC, mercury levels in fish have declined substantially and are almost to the point where the fish are safe to eat. The mercury source has been cut off through the installation of a closed loop system. Recovery of fish populations from what was once a grossly contaminated site is a clear measure of success.

At the Presque Isle Bay, Pennsylvania AOC, nonpoint source pollution appears to be the largest contributor of contaminants. The City of Erie entered into a Consent Decree with PADEP to spend an estimated \$90 million to upgrade and double the capacity of the POTW, construct an overflow retention basin, and eliminate the remaining 42 Combined Sewer Overflows in the City's system. These efforts, along with additional nonpoint source control measures, should allow for natural recovery of the system. This option for sediment management has been presented to the RAP Public Advisory Committee for their consideration. This decision appears to be the most viable, both environmentally and economically, in areas such as Presque Isle Bay which are characterized by widespread, low levels of contamination with no known hot spots.

The Black River RAP has concluded that the biggest sources of impact to the river are from nonpoint sources. Thus, the AOC includes the entire watershed. In an effort to better coordinate implementation of nonpoint source control efforts, the RAP developed a five year strategic plan based on improvements needed to ultimately improve the riparian corridor. One of the efforts underway is a partnership with the Conservation Fund to implement innovative methods to control nonpoint source runoff in developing and urban areas. Several grants have been received to support watershed plan development at a township level, further implement agricultural and construction Best Management Practices, restore riparian habitat using biotechniques for erosion control, and increased public awareness of the river and the need to connect with it. Ohio has also prepared an "Activities and Accomplishments Report" for all 1996 RAP activities and plans to produce this on an annual basis.

At the Milwaukee River, Wisconsin AOC, the removal of the North Avenue Dam restored the lower stretch of the river to a free flowing stream. By returning the river to its channel, the exposure of the waters to 700,000 square yards of contaminated sediments was reduced.

Spotlight on the Fox River/Green Bay, Wisconsin Area of Concern

Along a 39 mile portion of the Fox River from Lake Winnebago to Green Bay, and at the southern portion of Green Bay, industry and agriculture are highly concentrated, along with the greatest concentration of pulp and paper mills on the Great Lakes. The contaminants of greatest concern are PCBs, as paper companies have released 125 tons of this substance to the Fox River, of which about 40 tons remain, contaminating 11 million cubic yards of river sediments. Consumption advisories are in effect for a number of fish and wildlife species. A number of actions are being implemented to remediate the area:

The Fox-Wolf 2000, a locally based watershed association, is working in partnership with the State of Wisconsin to implement an accelerated management plan to reduce urban and rural nonpoint sources of pollution to the AOC.

The Fox River Coalition, a public-private partnership dedicated to contaminated sediment remediation planning and implementation, continues to work to implement a locally driven sediment cleanup effort.

The State of Wisconsin has negotiated an interim agreement with seven PRPs to fund the remediation of two contaminated sediment sites on the Fox River.

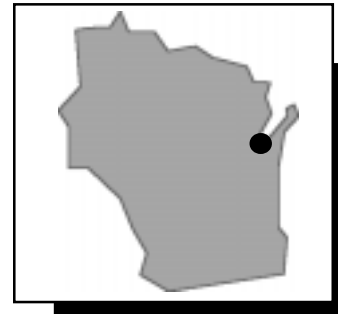
The FWS, acting on behalf of the Federal natural resource trustees, has undertaken one of the largest and most complex NRDA's in the U.S. This assessment now forms the nucleus of a joint trustee-EPA-State-Tribal effort to understand, remediate, and restore the lower Fox River, Green Bay, and Lake Michigan, particularly as related to Fox River PCBs. The assessment is based on the goals and information developed by, and on behalf of, the Green Bay RAP and the Lake Michigan LaMP, and will lead to real reductions of PCB loadings to the Great Lakes, as well as significant restoration of the Fox River and Green Bay environment.

The State of Wisconsin and the COE have initiated a feasibility study on the restoration of the Cat Island Chain in lower Green Bay. This project could restore upland terrestrial habitat and protect the soft shoreline of lower Green Bay from wave action.

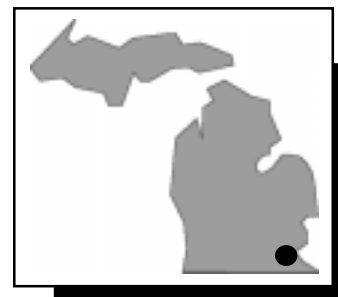
The State completed Phase One of a northern pike habitat restoration project and initiated a Phase Two project. When implemented, this project will allow for a more balanced, diverse, sustainable fishery within lower Green Bay.

Spotlight on the Southeast Michigan Initiative (SEMI)

EPA continues to focus on the eight county area in southeast Michigan which includes five designated AOCs, two of which are binational. In addition to added emphasis and coordination of the RAP processes for these AOCs, there are many other projects in the area that the Agency continues to support. One of the primary



Fox River/Green Bay, Wisconsin



Southeast Michigan Initiative

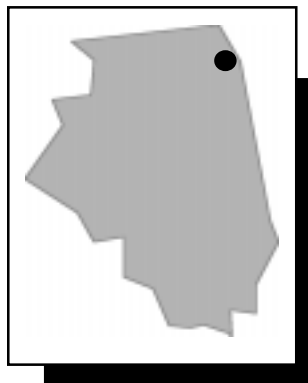
goals of SEMI is to build capacity at the local level and to empower local stakeholders to address environmental problems in order to be sustainable beyond Federal involvement. A major focus is on public and stakeholder involvement whereby local input drives priorities through the SEMI Environmental Forum. These priority issues include Brownfields redevelopment, urban sprawl, land use, environmental justice, people at risk, water quality, contaminated sediments, air quality, and toxic contaminant reduction.

SEMI has focused Agency resources on several community-based environmental projects in the area over the past year. These include a major soil sampling effort in the vicinity of a municipal waste combustor and the implementation of a “Good Neighbor” project with several General Motors facilities in Pontiac, Michigan. EPA is also developing a comprehensive strategy on lead outreach, education and abatement for the urban area.

The SEMI Environmental Indicators Profile will develop a baseline of environmental indicators against which to measure trends in environmental quality. The database will be maintained to provide a “State of the Environment” report for the public and decision-makers.

Lastly, in 1997, SEMI funded nine individual grant projects totaling \$350,000 in the areas of water quality, land use, toxic contaminant reduction, air quality, indoor air, Brownfields redevelopment, habitat restoration, and pollution prevention.

Spotlight on the Southwestern Coast of Lake Michigan



Southwestern Lake Michigan efforts

Urban areas along the southwestern coast of Lake Michigan contain eight million people and are the historical home of heavy industrial activity. The ecosystem is recovering from industrial impacts and a new focus on sustainable development is taking form. To support locally based efforts, EPA is coordinating its efforts and is offering support through three area teams: the Greater Chicago Team is focusing on the southeast portion of Chicago including Lake Calumet; the Northwest Indiana Team includes the Indiana Harbor/Grand Calumet River AOC; and the Lake Michigan Team is coordinating the LaMP and related activities. All of these efforts relate to coordinating remaining clean up activities and the emerging sustainable development of the region. Specific activities range from innovative projects to address slag and contaminated sediment to habitat restoration demonstrations.

INNOVATIVE PARTNERSHIPS

Partners to the U.S. Great Lakes Program have long recognized the need to create new and innovative solutions to the impacts affecting the Basin and that new ideas are needed among all sectors of society to achieve the goals of the Program. The following activities present highlights of this approach.

In 1996, the North American Waterfowl Management Plan (NAWMP) celebrated ten years of habitat accomplishments to benefit waterfowl, other migratory bird populations, and wetlands and related habitats. Within the Great Lakes Basin, thousands of acres of coastal habitats have been acquired, restored and/or enhanced by Federal, State, Tribal and private natural resource organizations to benefit wetland wildlife and to improve water quality. Combined with beneficial climate patterns, these

habitat gains have allowed most targeted species of waterfowl to meet or exceed their population level objectives under the NAWMP. Notable NAWMP project areas include the Lake Erie coastal marshes of Ohio, Lake Michigan coastal wetlands at Green Bay and southeastern Wisconsin, the Saginaw Bay watershed, and the St. Louis River watershed in Minnesota.

The Grand Calumet Area Partnership is a voluntary effort among a broad range of Northwest Indiana stakeholders who share the common goal of cleaning up and revitalizing the environment of the Grand Calumet River. The Partnership takes a comprehensive approach to cleanup, embracing sediment remediation, river corridor planning, Brownfields redevelopment, NRDAs, and restoration of impaired uses in the area. The Partnership includes people from local industry, environmental groups, State and Federal agencies, and municipalities. The Partnership will balance the goals and objectives of the participants, provide a forum for coordinated planning and implementation, and provide a communications network that links individual efforts.

The Great Lakes Protection Fund, created by the Governors of the Great Lakes States in 1989, is offering \$2 million to fund proposals to demonstrate how non-regulatory, market-based solutions can work to improve the health of the Great Lakes. The new program, called the Great Lakes Power Challenge, seeks projects which will help implement business plans that provide consumers with scientifically sound and objective ways to use the health of the Great Lakes ecosystem as a criterion in their selection of electric power products and services. Deregulation of the electric utility industry will allow many consumers the choice to select 'cleaner and greener' companies. Projects that aggregate consumer demand for environmentally benign sources of energy are ones that the Power Challenge will support to demonstrate that consumer demand can affect environmental protection.

EPA, the COE, the State of Ohio, and a large number of diverse public and private organizations at the Federal, State and local levels have formed the locally based Ashtabula River Partnership. The Partnership, an outgrowth of the Ashtabula River RAP process, is seeking to address and implement an ambitious, comprehensive 1995 and April 1996, respectively.

Through the Strategy and Implementation Plan, EPA illustrates its commitment to promoting and supporting equitable environmental protection and its intent to continue its pursuit of environmental justice. To this end, EPA has set a goal of virtually eliminating disproportionate environmental impacts on low-income and people of color communities. Efforts toward reaching this goal are exemplified in the number of cleanup, restoration, community outreach and education, and Brownfields projects the Agency has undertaken in the Great Lakes Basin urban environmental justice areas of Greater Chicagoland, Northwest Indiana, Northeast Ohio, and Southeast Michigan, among others.

Sustainable Development

EPA Region 5 made 'Promoting Sustainable Urban Development and Reuse of Brownfields' one of its five Regional Environmental Priorities for FY 1998. Sustainable development seeks to meet the present needs of society without compromising the ability of future generations to meet their own needs. Agency staff are in the forefront promoting planned development.

The Cleveland metro area's Regional Environmental Priorities Project (REPP) was an exercise in environmental priority setting and local consensus building to set environmental priorities for the region and to develop coalition approaches and action strategies for addressing environmental problems. The REPP concluded that many of their highly ranked problems were directly or indirectly driven by urban sprawl. It was thus decided that urban sprawl — which was not on the originally compiled working list of 16 problems — should take priority as the “umbrella issue” to be addressed during the implementation phase of the project. The REPP was recently recognized by EPA as one of ten “success story” examples of community-based environmental protection (CBEP) at work.

EPA's Northeast Ohio Initiative Team has taken the results of the REPP as a primary focal point for its CBEP work in that metropolitan area. Other EPA regional teams in the Great Lakes Basin have also begun to incorporate this issue into their work. The Southeast Michigan Team is funding a grant that is working to increase one community's involvement in local land use development and watershed protection decisions; the Northwest Indiana Team is participating in a local council on sustainable development; the Lake Michigan Team is assisting the Lake Michigan Public Forum in promoting better land use planning; the Lake Superior Team is sponsoring a land use conference promoting better nearshore development practices; and the Lake Erie Team is currently studying how to incorporate sprawl and sustainable development issues into its planning process.

The Menominee, Wisconsin Tribal People have long recognized the need for balance among environment, community, and economy, both in the short term and for future generations. Menominee culture and traditions teach never to take more resources than are produced within natural cycles so that all life can be sustained. Cultural and traditional beliefs are the foundation of the management practices and principles of today's Menominee Tribal Enterprise operations and their forest-based sustainable development project, parts of which were funded by EPA's Great Lakes National Program Office. The concept of sustainability in the management of the forest allows the Tribe to experience a traditional quality of life from an intact, diverse, productive and healthy forest ecosystem on the Reservation. In September 1996, Menominee Tribal Enterprises hosted a conference to showcase the Menominee tradition of sustainable forestry and to promote safe timber harvest practices.

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RAP process, is seeking to address and implement an ambitious, comprehensive full-scale cleanup of the contaminated sediments in the Ashtabula River and Harbor. Signatories to the Partnership are strongly committed to investigating the extent of contaminated sediments, to developing a plan for the dredging and disposal of river sediments, to identifying resources necessary to carry out the cleanup, and to generate a timeline of milestones and activities. The sediments are contaminated with PCBs, other chlorinated organic compounds, and heavy metals which have limited the amount of dredging and which precludes open water disposal. The Partnership plans to remove and properly dispose of roughly 1.1 million cubic yards of contaminated sediments through the innovative use of multiple authorities. The Partnership is drafting an Environmental Impact Statement (EIS), with a draft due to be released to the public for review early in 1998. The EIS will discuss several possible remedial dredging alternatives of varying amounts and costs. Whichever alternative is chosen, the Partnership's goal remains the same -- the removal of the largest PCB mass as possible and the restoration of beneficial uses.

A 40-year landmark agreement signed in February 1997 involving eight of Wisconsin Electric Power Company's 13 hydroelectric projects and 160 river miles in the Menominee River Basin, a tributary to Lake Michigan, represents the first time that potentially conflicting issues have been resolved prior to the start of the hydro project relicensing process administered by the Federal Energy Regulatory Commission. This agreement allows the projects to continue operating profitably on behalf of its thousands of customers while protecting and enhancing outstanding environmental and recreational natural resources on nearly 23,000 acres of public utility-owned land in northern Wisconsin and Michigan's Upper Peninsula. As non-Federal hydroelectric projects are normally relicensed individually, this pioneering agreement has resulted in greatly increased efficiency and time savings for all signatories, which include the company, FWS, NPS, the States of Wisconsin and Michigan, the Michigan Hydro Relicensing Coalition, and the River Alliance of Wisconsin.

FWS continues to actively pursue efforts to restore and protect habitat for Federal trust species on private lands through its Partners for Wildlife program. The restoration and enhancement of wetlands and associated upland habitats on private lands continues to be an important activity as these habitats are valuable for migratory birds, endangered species, anadromous and native fish, and for the many functions they provide. In fiscal years 1996 and 1997, over 275 wetland sites encompassing more than 870 acres were restored or enhanced in upper Great Lakes counties; an additional 63 upland sites totaling almost 500 acres of upland habitats were restored or enhanced.

The State of Pennsylvania has put together a five year plan to address habitat needs of the Presque Isle Bay AOC as they relate to fish species habitat diversity and angler use. A local fishing group, the S.O.N.S (Save Our Native Species) of Lake Erie, has stepped forward with the resources and volunteers needed to complete the project. And while neither 'Loss of Fish Habitat' or 'Degradation of Fish Population' are considered impairments in the AOC, the habitat enhancement projects under this plan will improve existing fisheries and result in positive steps towards restoration of the Bay.



Great Lakes Tribes have been using the resources of the Basin for many generations

TRIBAL ACTIVITIES

EPA's July 1994 Action Plan for the Agency's Indian Program made Tribal Environmental Agreements (or TEAs) the cornerstone of the Tribal/EPA partnership to improve public health and the environment in Indian country. The key elements of a TEA includes a description of environmental conditions, a description of Tribal environmental priorities, and a workplan for addressing these environmental problems. EPA and Federally recognized Tribes in the States of Michigan, Minnesota, Wisconsin and New York have initiated a formal process to develop TEAs for 1995-1997. For FY 1998, 27 TEAs had been completed, including those for seven Michigan Tribes and all the ones for the Wisconsin and Minnesota Tribes.

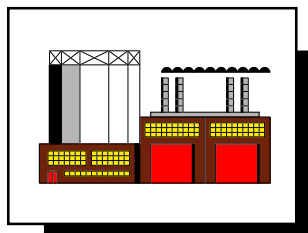
The Great Lakes Indian Fish and Wildlife Commission completed a EPA-funded project entitled "Building Great Lakes Tribal Capacity". The purpose of this project was to assist the Tribes in the Great Lakes Basin to raise their levels of awareness regarding the variety of programmatic activities occurring in the Basin, and to help them determine the level of involvement they would like to have in these programs. These include, but are not limited to, LaMPs, RAPs, and the Binational Toxics Reduction Strategy.

Members of the St. Regis Mohawk Indian Nation have expressed concerns about their observations of an increasing rate of disease in their community, especially among younger age groups, which they attribute to environmental pollution. In response, EPA Region 2 and the NYSDEC embarked on a compliance and enforcement initiative in the Massena, New York area to ensure that the St. Regis Mohawk Indian Nation are given equal protection under Federal environmental statutes. This initiative involved a direct commitment to the community by the Regional Administrator, close collaboration between EPA Region 2 and NYSDEC, targeted compliance monitoring and enforcement actions, work with stakeholders to address problems presented by the regulated community, and a high priority assignment to site cleanups in the area.

Several Lake Superior Tribes have joined the partners of the Binational Program and are participating in the development of the LaMP and broader program for Lake Superior.

NEW APPROACHES TO OLD PROBLEMS

Brownfields Redevelopment



Brownfields redevelopment can improve local environments and economies

Brownfields are abandoned, idled, or underused industrial and commercial properties where expansion or redevelopment is complicated by real or perceived contamination. Redevelopment of these sites is a promising way to revitalize communities and can reduce suburban sprawl. Through the development of programs between Federal, State and local governments and public and private organizations, Brownfields benefits the environment and economies of communities by assessing the extent of contamination at a site, cleaning up a site protectively if necessary, and by addressing liability issues. A number of notable activities have taken place in support of reviving Brownfields:

President Clinton signed into law a Brownfields Tax Incentive in August 1997 of approximately \$1.4 billion over three years which will aid in the cleanup of almost 14,000 sites nationwide.

In May 1997, Vice President Gore announce the Brownfields National Partnership Action Agenda with more than \$300 million in commitments from more than fifteen different Federal agencies.

EPA has awarded 121 grants to State and local governments for site planning, inventorying, and assessment. In 1997, EPA provided 23 grants to capitalize revolving loan funds for cleanup. EPA Region 5 helped establish the Great Lakes Finance Center at Cleveland State University, the Agency's first Brownfields Finance Center for redevelopment research.

More than 30,000 sites were removed from the inventory of potential Superfund sites, making them available for Brownfields redevelopment activities

EPA awarded grants of up to \$200,000 for Brownfields pilots in a number of Great Lakes communities, including the Region 5 areas of Cuyahoga County and Lima, Ohio; Chippewa County and Detroit, Michigan; Milwaukee County and the WDNR Land Recycling Pilot; Kalamazoo and the Downriver Community Conference in Michigan; and the Tri-City area (East Chicago, Gary, and Hammond) of Northwest Indiana. EPA Region 2 has initiated three Brownfields pilot projects in the New York State portion of the Great Lakes Basin, in the cities of Buffalo, Rochester, and Niagara Falls.

In 1995, EPA Region 5 and the IEPA signed an innovative agreement to help redevelop hundreds of Brownfields. It is the first such agreement in the nation to cover Federal and State requirements for hazardous wastes, toxic wastes, and underground storage tank cleanup. This reduces the uncertainties for lenders, property owners, developers, and the regulated community and provides an incentive for cleaning up and redeveloping these contaminated sites. Similar agreements have been signed with Indiana, Michigan, Minnesota, and Wisconsin.

Environmental Justice

In February 1994, President Clinton issued an Executive Order entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* and an accompanying Presidential memorandum to focus Federal attention on the environmental and human health conditions in minority communities and low-income communities. The Executive Order, as amended, directs Federal agencies to develop an Environmental Justice Strategy that identifies and addresses disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. EPA has designated the pursuit of environmental justice as one of the Agency's top priorities and released its Environmental Justice Strategy and Implementation Plan in April 1995 and April 1996, respectively.

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Environmental Justice concerns are being addressed in minority and low-income communities

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CONCLUSION

In the years ahead, the U.S. Great Lakes Program will continue to evolve to address ever changing challenges in partnership with our Canadian counterparts, the International Joint Commission, and other stakeholders. One constant emphasis, however, will be to inform the public about the state of the ecosystem. Individuals are vital to further environmental progress through their purchases of products, choices of lifestyles, and

expectations of their civic and private institutions, including businesses, environmental organizations, universities, and governments. The U.S. Great Lakes Program will continue to promote public awareness through education and public participation. Though the region's human inhabitants have often wrought harm to this extraordinary ecosystem during the last several centuries, we still hold the key to its future within our collective grasp.

REPORT GLOSSARY

ANS	Aquatic Nuisance Species
AOC	Area of Concern
ARCS	Assessment and Remediation of Contaminated Sediments
ATSDR	Agency for Toxic Substances and Disease Registry
BEACH	Beaches Environmental Assessment, Closure and Health Program
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CBEP	Community-Based Environmental Protection
CDF	Confined Disposal Facility
CEC	Commission for Environmental Cooperation
CMP	Coastal Management Program
COE	United States Army Corps of Engineers
CRP	Conservation Reserve Program
DLA	Defense Logistics Agency
DWSD	Detroit Water and Sewerage Department
DWSRF	Drinking Water State Revolving Fund
EDSTAC	Endocrine Disruptor Screening and Testing Advisory Committee
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency (the Agency)
FQPA	Food Quality Protection Act
FWS	United States Fish and Wildlife Service
GLC	Great Lakes Commission
GLERL	Great Lakes Environmental Research Lab
GLFC	Great Lakes Fishery Commission
GLIN	Great Lakes Information Network
GLNPO	Great Lakes National Program Office
GLWQA	Great Lakes Water Quality Agreement (the Agreement)
IADN	Integrated Atmospheric Deposition Network
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
IJC	International Joint Commission
IMO	United Nations International Maritime Organization
LaMP	Lakewide Management Plan
LPBO	Long Point Bird Observatory
M2P2	Michigan Mercury Pollution Prevention
MACT	Maximum Achievable Control Technology
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
NAWMP	North American Waterfowl Management Plan
NAWQA	National Water Quality-Assessment Program
NISA	National Invasive Species Act
NOAA	National Oceanic and Atmospheric Administration
NORA	National Oil Recyclers Association
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRDA	Natural Resources Damage Assessment
NYSDEC	New York State Department of Environmental Conservation
PADEP	Pennsylvania Department of Environmental Protection
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
POPs	Persistent Organic Pollutants
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party

PTSs	Persistent Toxic Substances
RAP	Remedial Action Plan
RAPIDS	Regional Air Pollutant Inventory Development System
REPP	Regional Environmental Priorities Project
SDWA	Safe Drinking Water Act
SEMI	Southeast Michigan Initiative
SEP	Supplemental Environmental Project
SMPs	State Management Plans
SOGL	State of the Great Lakes
SOLEC	State of the Lakes Ecosystem Conference
TEAs	Tribal Environmental Agreements
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TRI	Toxics Release Inventory
U.S.	United States
UNEP	United Nations Environmental Programme
USCG	United States Coast Guard
USFS	United States Forest Service
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
WHPP	Wellhead Protection Program