

**United States Response to Recommendations
in the International Joint Commission's
Tenth Biennial Report on Great Lakes Water Quality**



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and
US Environmental Protection Agency
Great Lakes National Program Office
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Glossary of Terms

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| ANS | Aquatic Nuisance Species |
| ANSTF | Aquatic Nuisance Species Task Force |
| AOC | Area of Concern |
| ARCS | Assessment and Remediation of Contaminated Sediments |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| BIA | Biodiversity Investment Area |
| BWSC | Ballast Water and Shipping Committee |
| CDF | Confined Disposal Facility |
| CEM | Coastal Environmental Management |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CMI | Clean Michigan Initiative |
| CWA | Clean Water Act |
| DDE | dichlorodiphenyl dichloroethene |
| DDT | 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane |
| DNR | Department of Natural Resources |
| DOH | Department of Health |
| EC | Environment Canada |
| GLBTS | Great Lakes Binational Toxics Strategy |
| GLC | Great Lakes Commission |
| GLEND A | Great Lakes Environmental Database |
| GLHHERP | Great Lakes Human Health Effects Research Program |
| GLISP | Great Lakes International Surveillance Plan |
| GLNPO | Great Lakes National Program Office |
| GLWQA | Great Lakes Water Quality Agreement |
| HC B | Hexachlorobenzene |
| HYSPLIT | Hybrid Single-Particle Lagrangian Integrated Trajectory |
| IADN | International Atmospheric Deposition Network |
| IJC | International Joint Commission |
| IMO | International Maritime Organization |
| LaMP | Lakewide Management Plan |
| LMMB | Lake Michigan Mass Balance |
| MDN | Mercury Deposition Network |
| NHANES | National Health and Nutrition Examination Survey |
| NBAS | Neonatal Behavioral Assessment Scale |
| NDAMN | National Dioxin Air Monitoring Network |
| NOAA | National Oceanic and Atmospheric Administration |
| NPL | National Priority List |
| NRDA | Natural Resource Damage Assessment |
| OCS | Octachlorostyrene |
| ORD | Office of Research and Development |
| PAC | Public Advisory Council |
| PBT | Persistent, Bioaccumulative, and Toxic |

Glossary Of Terms (concluded)

| | |
|--------|--|
| PCBs | Polychlorinated Biphenyls |
| PIEs | Partner Identified Ecosystems |
| PLUARG | Pollution from Land Use Activities Reference Group |
| QA/QC | Quality Assurance/Quality Control |
| QA | Quality Assurance |
| RAP | Remedial Action Plan |
| RCRA | Resource Conservation and Recovery Act |
| SOLEC | State of the Lakes Ecosystem Conference |
| SPAC | Statewide Public Advisory Council |
| SRI | Superfund Redevelopment Initiative |
| STORET | Storage and Retrieval |
| TMDLs | Total Maximum Daily Loads |
| USACE | United States Army Corps of Engineers |
| USCG | United States Coast Guard |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| USPC | United States Policy Committee |
| WIC | Women, Infants, and Children |

I. REMEDIAL ACTION PLANS

Given the public's right to know the achievements in each AOC and what actions to expect in the future, the Parties should prepare a consolidated report on RAP progress that lists the accomplishments to date, funds expended, what remains to be done and the funds and timing required to finish the necessary work. Governments must clearly state what role they will be playing with each AOC and what resources they will be dedicating to restoring the impaired beneficial uses.

The U.S. agrees that timely information on progress and needs associated with the Great Lakes Areas of Concern (AOC) should be made readily available to the public and important decision-makers. In the past, the U.S. and Canada co-produced a report on AOCs status. The U.S. does have several efforts in place or planned to improve our methods of remediation in these areas, as well as insuring that this information is widely distributed.

One of the primary avenues for distributing information is the “AOCs Online” website maintained by the United States Environmental Protection Agency’s (USEPA) Great Lakes National Program Office (GLNPO) with support from the Great Lakes Commission (GLC). Through the use of AOC summaries and periodic updates, information is being made available to the public in a timely manner. Much of what the International Joint Commission (IJC) is asking from the Parties regarding AOC activity is listed on these sites: accomplishments to date; funds expended; what remains to be done; and funds and timing required to finish the necessary work (if these can be identified), as well as links to Remedial Action Plan (RAP) documents, and supporting studies and contacts at the federal, state, and local levels. We will continue to work with the GLC and the states to firm up commitments for updating the site on a regular basis.

As the IJC is aware, contaminated sediments are the driving factor for many use impairments (see table 1). It is difficult at best to cite exact costs and time frames for remediating these sites. When such information is available and valid, it is of course made available. We will continue to assess the extent of these contaminants in order to determine the most expeditious and effective method of remediation, which will have a profound impact on potential cost estimates. As soon as available data and information allow, we will estimate costs and time frames involved in remediation. It is important to note that some AOCs have more information than others, some of which is readily available and may help expedite the process for assessing costs and defining remedial time frames.

TABLE 1: Fourteen Identified Beneficial Use Impairments

Impairment of beneficial uses means a change in the chemical, physical or biological integrity of the Great Lakes System sufficient to cause any of the following:

- restrictions on fish and wildlife consumption;
- tainting of fish and wildlife flavor;
- degradation of fish and wildlife populations;
- fish tumors or other deformities;
- bird or animal deformities or reproduction problems;
- degradation of benthos (bottom dwelling organisms);
- restrictions on dredging activities;
- eutrophication or undesirable algae;
- restrictions on drinking water consumption, or taste and odor problems
- beach closings;
- degradation of aesthetics;
- added costs to agriculture or industry;
- degradation of phytoplankton and zooplankton populations; and
- loss of fish and wildlife habitat.

There are additional sources of AOC information which are available and which are linked to the AOC Online website. These include:

- State-level AOC websites;
- State Public Advisory Council (PAC) newsletters which cover all AOCs in a given State (ex. Michigan SPAC); and
- RAP bulletins from individual AOCs, often published by public groups in the AOC with State and Federal support.

Each U.S. AOC has a variety of government agencies actively engaged in restoring beneficial uses. For some, the state environmental agency has the lead responsibility for drafting and implementing RAP priorities; often, these responsibilities are shared with actively engaged public stakeholder groups. RAP activities are funded through a variety of federal, state, local, and private resources which, depending on legal authorities and other requirements, may or may not be dedicated to AOCs. Some states have dedicated RAP program funding while others choose to implement RAP activities via traditional media-specific line programs (e.g., Superfund, Clean Water Act programs). Some states have also raised RAP funds by asking their voters to approve environmental bonds. In addition, USEPA has Coastal Environmental Management (CEM) funds which it makes available to the Great Lakes states to fund RAP and Lakewide Management Plan (LaMP) activities, although these have been significantly reduced in recent years.

Identifying the remedial activities required to restore beneficial uses is only half the battle; securing funds for what can often be multi-million dollar cleanups remains a significant barrier to restoration. RAP implementors consistently investigate and utilize both traditional and innovative funding mechanisms to achieve RAP goals. While not sufficient to cover all needs, resources are

already available or are being made available for some of the priority issues such as: RAP program funding, combined sewer overflow/waste water treatment plant improvements, storm water and nonpoint source reductions, habitat restoration, and sediment remediation.

The U.S. agrees that the roles and responsibilities should be more clearly identified and that investigating and putting together innovative funding requires tremendous effort and commitment. We will explore using the newly reconvened U.S. RAP Workgroup, which reports to the U.S. Policy Committee (USPC), to clarify roles and responsibilities and to aggressively pursue dedicated funding for cleaning up AOCs.

The U.S. is also aware that decreased funding of positions to coordinate RAP functions at the state level is a growing concern. These positions serve a very important coordinative function to insure that each state RAP program can successfully restore beneficial uses. There is a general acknowledgment that such funding is currently inadequate. Options to provide this funding are being explored at both the federal and state level.

II. THREAT TO HUMAN HEALTH

Governments should require that:

- (i) sport fish consumption advisories state plainly that eating Great Lakes sport fish may lead to birth anomalies and other serious health problems for children and women of child-bearing age. These advisories should be addressed and distributed directly to women, in addition to their general distribution,**
- (ii) consumption advisories clearly identify fish to be totally avoided in light of the precautionary approach, and preparation methods for any that may be consumed, and**
- (iii) consumption advisories are supported by culturally appropriate community education programs directed to those who are likely to consume these fish.**

General Summary

The IJC has expressed concern about the threats to human health from the consumption of contaminated fish in the Great Lakes. The IJC feels strongly that fish consumption advisories can only be an interim solution, and that ultimately the chemical integrity of the Great Lakes ecosystem must be restored to reduce exposure and subsequent bioaccumulation of persistent toxic substances in fish. Currently concentrations of some contaminants in some fish species are such that unlimited consumption may threaten human health, thus requiring the issuance of fish consumption advisories. The IJC recognizes that the Great Lakes states have made significant progress in harmonizing their fish advisories, but is concerned that they are not being distributed to certain sensitive subpopulations.

The U.S. agrees that the chemical integrity of the Great Lakes ecosystem needs to be restored so that contaminants in fish decrease to levels that no longer require the issuance of fish consumption advisories for certain species and sizes of Great Lakes fish. Our long-term goal is for safe and unlimited fish consumption throughout the Great Lakes. It is also important to note that there are some Great Lakes fish species that are currently safe to eat at table-size which provide a variety of health benefits. In the interim, the issuance of fish consumption advisories is an important tool for reducing the exposure of the Great Lakes community to persistent toxic substances. The U.S. also agrees that more needs to be done to reach the sensitive subpopulations in the Great Lakes. Women and children need to be targeted by fish consumption advisories, as well as minorities who may not be able to read English versions of fish advisories. Although programs to address these subpopulations are in place at the federal, state and tribal levels, the U.S. needs to do more to protect these sensitive subpopulations from contaminant exposure. A study published in 1997 found that only half of Great Lakes sport fish consumers reported awareness of a health advisory concerning the consumption of Great Lakes fish. Eighty percent of minorities who had eaten Great Lakes sport fish were unaware of the advisory and awareness was found to be especially low among women (Tilden, J., L.P. Hanrahan, H. Anderson, C. Palit, J. Olson, W. MacKenzie and the Great Lakes Sport Fish Consortium. *Environmental Health Perspectives* 105(12):1360-1365, 1997).

Responses to Specific Recommendations

In the U.S., the States, U.S. Territories, and Native American Tribes have primary responsibility for protecting their residents from the health risks of consuming contaminated non-commercially caught fish and wildlife. They do this by issuing consumption advisories for the general population as well as for sensitive populations, such as subsistence fishers, women and children. These advisories are only for certain species and sizes of Great Lakes fish. One specific recommendation of the IJC is that fish consumption advisories state plainly that eating Great Lakes sport fish may lead to birth anomalies and other serious health problems for children and women of child-bearing age. These may include neuro-developmental deficiencies and/or developmental delays. Advisories currently issued by the Great Lakes states and tribes address these sensitive populations with language that warns of potential birth anomalies and other serious health problems associated with the consumption of Great Lakes fish. Minnesota, for example, states in its advisory, "exposure to PCBs is linked to infant development problems in children whose mothers were exposed to PCBs before becoming pregnant." Wisconsin states, "high consumption of PCB-contaminated fish has been linked to slower development and learning disabilities in infants and children born to women who have regularly eaten highly contaminated fish for many years before becoming pregnant." The other Great Lakes states and tribes also include similar messages of concern for women and children in their advisories.

The second part of this recommendation is that fish consumption advisories need to be distributed directly to women. The U.S. agrees that this is important. The federal government, states and tribes have been addressing this issue, and need to continue addressing it in the future. For example, the States of Minnesota and Indiana distribute the brochure "An Expectant Mother's Guide to Eating Fish" to health professionals in their states. Also, USEPA and the Agency for Toxic Substances and Disease Registry (ATSDR) are sponsoring a nationwide effort to inform health professionals and their patients about the dangers of eating fish harvested from contaminated waters. Through letters to health care professionals and health care providers

across the nation, doctors and care givers are asked to advise their patients to pay attention to state or tribal-issued fish consumption advisories. Brochures in three different languages (English, Spanish, and Hmong) describing how to safely consume fish and minimize exposure to contaminated fish were sent to doctors, state and tribal environmental and public health professionals, along with a paper summarizing the latest research on the dangers of eating PCB-contaminated fish. The brochure's publication in Korean, Vietnamese and Cambodian was scheduled for April 2001.

Fish consumption advisory information is also distributed to women who participate in the Women, Infants, and Children (WIC) Program, which is administered by the U.S. Department of Agriculture (USDA), and had an average monthly participation of 7.31 million people for FY1999. The WIC Program offers low-income, nutritionally at risk pregnant women and children services such as supplemental nutritious foods, nutrition education, and counseling. These services are provided at places such as county health departments, hospitals, mobile clinics and community centers.

This past year, the Lake Erie Forum of the Lake Erie LaMP worked with a number of local health departments around the lake on the U.S. side to specifically reach minorities and women who might be more susceptible to contaminants in fish. This was done by distributing materials at many public events that focused on minority groups or women in particular. The program was very successful and funding is being sought to continue this effort next year.

The IJC's second specific recommendation is that consumption advisories should clearly identify fish to be totally avoided, in light of the precautionary approach, and that preparation methods should be included for any fish that may be consumed. Currently, the Great Lakes states and some Tribes clearly identify the species and size of fish that should be completely avoided. This information is included in the advisory charts, and is oftentimes also summarized in the introductory sections of the advisory. For example, Michigan's advisory explains in its introductory pages that because of high levels of PCBs and dioxins, no one should "eat any carp or catfish from the Saginaw River or the Tittabawassee River downstream from Midland." Regarding mercury in inland lakes, Michigan states "no one should eat more than one meal a week of these kinds and sizes of fish from any of Michigan's inland lakes: rock bass, perch, or crappie over 9 inches in length; any size largemouth bass, smallmouth bass, walleye, northern pike or muskie. Nursing mothers, pregnant women, women who intend to have children, and children under age 15 should not eat more than one meal per month of these fish."

All of the Great Lakes States also do an excellent job of identifying the appropriate preparation methods for any fish consumed. Fish preparation and cooking advice is included in the "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory," which the Great Lakes states use for their PCB advisories. For example, the state of Ohio explains, "...many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish-meal by properly trimming, skinning, and cooking your catch." The advice then explains that the best way to cook the fish is to broil, grill or bake it so that the fat drips away. It is important to note that this preparation method does not reduce the amount of mercury contamination, since mercury accumulates throughout the fish, including muscle and fat.

Another example is the New York State Department of Health (DOH) "Chemicals in Sportfish and Game Health Advisories 2000-2001", with details on health benefits, contaminants in fish and game, general advisories, specific advisories, cooking instructions and other advice for reducing exposure to chemical contaminants from fish and game. Health advice is also given for infants, children under the age of 15 and women of childbearing age. DOH recommends that these groups not eat any fish from the specific water bodies listed in the advisory. The recommendation for Lake Ontario including Niagara River below Niagara Falls, for American eel, channel catfish, carp, lake trout over 25", brown trout over 20" and chinook salmon, is "eat none", because of PCBs, mirex and dioxin; for white sucker, rainbow trout, smaller lake trout, smaller brown trout and coho salmon over 25", the recommendation is to "eat no more than one meal per month."

A complete list of every state, federal, tribal, territorial, and Canadian fish consumption advisory can be found on USEPA's website at:

<http://fish.rti.org/>

The IJC's third recommendation is to support fish consumption advisories with culturally appropriate community education programs directed to the people most likely to consume the fish. The U.S. agrees that this is important, and the federal government, states and tribes have been addressing this issue. The U.S. agrees that we can definitely make improvements with our cultural outreach, and will continue to support this effort. Currently, the Great Lakes states and tribes have various programs in place to address these concerns. Minnesota, for example, publishes fact sheets with advisory information in various Southeast Asian languages, which are distributed at educational programs sponsored by the Minnesota DNR. In addition, their brochure "An Expectant Mother's Guide to Eating Fish," is published in Spanish. There is also a simplified brochure explaining the fish advisories to lower literacy groups. Other examples of cultural outreach include programs run by New York, such as the broadcast of public service announcements over the radio in both English and Spanish, and the distribution of magnets, memo pads, posters, t-shirts, bandannas and other promotional items to food pantry sites, WIC clinics and other organizations that serve a clientele that may be doing more subsistence angling than the general population.

Based on recent research and in response to findings which showed that body burden levels of some persistent toxic substances in vulnerable populations are higher than in the general U.S. population and that body burdens for some of these contaminants are two to four times higher than those of the general U.S. population (Anderson et al., 1998; Hanrahan et al., 1999; Schantz et al., 1996, 1999), ATSDR's Great Lakes Human Health Effects Research Program (GLHHERP) has been very proactive in providing support to develop culturally appropriate fish advisories and risk communication messages for sensitive populations. For example, regional maps have been developed with Native Americans which indicate which lakes, rivers and/or streams to avoid or to limit their fish consumption. Clinics were held in areas with large minority populations to ensure they are able to identify fish listed in health advisories. In addition, classes were held to discuss fish cleaning, preparation, and cooking practices to reduce exposure to contaminants. These activities and others within the communities have helped to reduce elevated body burden levels to levels at or near background.

As mentioned above, USEPA and ATSDR have also been trying to target various minority groups by sending fish consumption brochures in three different languages (English, Spanish, and Hmong) to health professionals who can give them to the fish consuming public. In addition, both agencies help fund various outreach and educational programs. Also, USEPA and the Minnesota Department of Health jointly sponsored a national conference on communicating health risks from contaminated fish to at-risk, hard to reach populations. The conference, "Effectively Communicating Health Risks from Fish Contaminants," took place in Chicago, Illinois, on May 7 and 8, 2001. The purpose of the conference was to examine, discuss, and evaluate risk communication methods designed for fish eaters. The focus was on risk communication barriers (such as cultural practices, nutritional needs, or language). Speakers included experienced risk communicators and community and tribal spokespersons with various outlooks on health risks from fish contaminants. An output of this conference will be EPA recommendations to state fish advisory programs for strengthening outreach to vulnerable and hard-to-reach populations.

Despite all of the ongoing efforts to inform sensitive populations about the risks of consuming contaminated fish from the Great Lakes, the message is not being heard by the majority of its target population. As previously mentioned in the publication by Tilden et al., 1997, 80% of minorities were unaware of the fish advisories and awareness was especially low among women. The U.S. needs to determine ways to improve risk communication and implement public health intervention strategies that work. Presently, the ATSDR is developing a paper to determine the effectiveness of fish advisories in the Great Lakes states. The information in the ATSDR paper should help all agencies and groups to develop methods that will make messages simple but easy to understand by the targeted audience with their involvement, and at the same time, explain the benefits gained from fish consumption.

The IJC may also want to compare the Great Lakes data put forward in the ATSDR and future reports to the ongoing biomonitoring database being assembled by the National Health and Nutrition Examination Survey (NHANES) of the Center for Disease Control. The NHANES and Great Lakes data together should allow for a more thorough monitoring of trends over time that may help scientists better understand the impact of environmental chemicals on our health. Information on the NHANES can be found at:

<http://www.cdc.gov/nchs/nhanes.htm>

III. CONTAMINATED SEDIMENT

Governments should immediately develop a comprehensive, binational program to address the full scope of the contaminated sediments problem over the long term, setting appropriate priorities and defining the resources required for completion. As part of this comprehensive program, governments should ensure that:

- (i) **programs and cost estimates are in place and made public for fully addressing contaminated sediments in Areas of Concern,**
- (ii) **timetables for fully implementing those programs are established and made public,**
- (iii) **resources are provided to fully implement the programs in accordance with the established timetables, and**
- (iv) **progress reports are issued at least biennially.**

Contaminated sediments are a significant problem in the U.S. AOCs. They pose concerns from both ecological and human health standpoints. The U.S. concurs with the IJC on the need for additional work on this very significant issue.

On the U.S. side, much work and substantial progress has taken place over the past 10 years. Beginning with the Assessment and Remediation of Contaminated Sediments (ARCS) Program, much knowledge was developed for both assessing and remediating contaminated sediments. Recent sediment assessments have been conducted at almost all of the U.S. AOCs. The Research Vessel *R/V Mudpuppy* has to date visited 23 of the 31 U.S. AOCs, and provided support to better assess and characterize the nature and extent of the contamination at these sites. Many of these locations have been visited more than once, with the ultimate goal of this work to make informed, cost-effective decisions on sediment clean-ups. On the remedial side, millions of cubic yards of contaminated sediments have been removed over the past ten years. For the past three years alone, over 1 million cubic yards of sediment have been removed from U.S. AOCs. A summary of sediment remediation activities in the Great Lakes basin is contained in *Realizing Remediation: A Summary of Contaminated Sediment Remediation Activities in the Great Lakes Basin (March 1998 -USEPA/GLNPO)*. This document was recently updated and will be available soon. Additional information can be found in the *Great Lakes Binational Toxics Strategy 2000 Annual Progress Report* available on the Internet at:

http://www.epa.gov/glnpo/bns/press/GLBTS_2000.PDF

In addition, five years ago USEPA Region 5 elevated the contaminated sediment problem to an Environmental Focus Area. Regional programs and offices have responded by better focusing attention and resources to address the sediment problem. USEPA headquarters also recognizes the problem of contaminated sediments and the priority need to address them, as evidenced most recently with the formation of a Contaminated Sediment Management Committee whose purpose is to develop a National Contaminated Sediments Action Plan.

The IJC recommends that:

Governments should immediately develop a comprehensive, binational program to address the full scope of the contaminated sediment problem over the long term, setting appropriate priorities and defining the resources required for completion. As part of this comprehensive program, governments should ensure that:

(i) programs and cost estimates are in place and made public for fully addressing contaminated sediments in Areas of Concern

The U.S. believes that this request has merit. In response to an action item from the November 28, 2000 U.S. Policy Committee meeting, USEPA inquired about the readiness of each of the Great Lakes states to help determine sites, volumes, costs, and time lines for contaminated sediments in AOCs. What was learned was this information was not readily available at this time. We will collect and collate this information as it becomes available and we will continue to explore avenues for developing such a list. One option to explore is using the Great Lakes Strategy (currently being drafted) as a framework for analysis of contaminated sediment needs and for developing a cooperative approach to remediation. And while it is important to develop such an inventory, the U.S. feels that it is equally important to inform the IJC regarding many other ongoing contaminated sediment activities as listed below.

There have been a number of efforts and programs over the past 15 years to provide guidance for addressing contaminated sediments. The first was an IJC report published in 1989 titled *Procedures for the Assessment of Contaminated Sediment Problems in the Great Lakes*. This document advocates the use of an integrated sediment assessment approach, in which an emphasis is placed on collecting information on both the biological and chemical conditions at a site. This approach was further developed by the ARCS Program as documented in the Assessment Guidance Document. Similar approaches were concurrently developed by Canada. In December 1998, the IJC conducted a binational workshop to evaluate data interpretation tools used to make sediment management decisions. This workshop confirmed the efficacy of an integrated sediment assessment approach, including the collection of data for chemistry, toxicity and benthic community evaluations.

On the treatment technology side, both the ARCS Program and Canada's Contaminated Sediment Treatment Technology Program have provided valuable information on the use of various technologies to treat contaminated sediments. The ARCS Program has published many documents on this topic.

The efforts of the Great Lake Binational Toxics Strategy (GLBTS) also need to be acknowledged. It has a goal to "Complete or be well advanced in remediation of priority sites with contaminated bottom sediments in the Great Lakes basin by 2006." The GLBTS is the mechanism for tracking and reporting progress toward this goal, drawing upon the ongoing efforts in the U.S. and Canada. Beginning in 2000, the GLBTS annual progress report began tracking sediment remediation activities in the Great Lakes basin. The U.S. and Canada also conducted a contaminated sediments technology workshop in April 2001.

Developing reliable and accurate cost estimates for sediment remediation is a very inexact science. Different types of contaminated sediment sites raise different problems that complicate this. For example, areas such as Ashtabula, Waukegan Harbor, and portions of the Ottawa River in the Maumee AOC have pockets of contamination that can be cleaned up or remediated by dredging or some type of treatment technology. However, many of the Great Lakes harbor sites will continue to be sediment sinks for all the contamination that comes down a watershed, and most likely maintenance dredging materials will have to be deposited in confined disposal facilities (CDFs) for years to come. Until the sediment assessment work is completed, the

pockets of sediments that need to be remediated are delineated, and the disposal/treatment methods are developed, coming up with costs on a large scale basis will be tenuous. As a specific site moves towards remediation and after feasibility studies are conducted, realistic cost estimates can be developed. Therefore, we favor compiling high quality cost information as it becomes available, and including such information in progress reports. This has been or is being done at 8 of the 31 U.S. AOCs. We have reviewed the information presented in the 10th Biennial Report, and subsequent correspondence providing background information for the estimates of volumes of contaminated sediments in AOCs. Based upon our review, we believe that there are excessive data gaps in this IJC analysis, and that accurate site by site assessments are needed to better estimate total volumes.

The U.S. would like to point out that contaminated sediments are also present in Great Lakes areas that do not carry the AOC designation. We are equally concerned about these areas and are addressing them to mitigate and remove risks to human health and the environment. USEPA Programs and Offices are focusing their efforts on the highest priority contaminated sediment sites. Prioritization factors include contribution of substantial risks to human health or the environment, location within Great Lakes AOCs, location where delay could result in the spread of toxic chemicals into areas where remediation is no longer feasible, and adverse impacts on resources. USEPA Programs and Offices coordinate their efforts cross-media and with external partners and stakeholders to address sediment problems.

USEPA continues to vigorously enforce Federal authorities to address the contaminated sediment problem. While Federal authorities are used both singly and jointly, the authorities available under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) are utilized to the greatest extent. Many contaminated sediment sites have been nominated for or placed on the National Priority List (NPL) (such as the Sheboygan River and Harbor, WI; Allied Paper site (Kalamazoo River), MI; Cannelton Industries site on the St. Marys River, MI; Fox River, WI; St. Lawrence River at Massena - ALCOA; Interlake/Duluth Tar and USX/St. Louis River sites; Moss American in the Milwaukee Estuary AOC; Outboard Marine in the Waukegan Harbor AOC; and Torch Lake.) Several others have been/are being addressed utilizing removal authorities (for ex., Pine River in the Saginaw AOC, MI; Bryant Mill Pond on the Kalamazoo River, MI; Deposits 56/57 on the Fox River, WI; Ford Outfalls site on the River Raisin, MI; Manistique River and Harbor, MI). Other authorities being utilized include Natural Resource Damage Assessment (NRDA) authority under CERCLA (Saginaw River settlement); Resource Conservation and Recovery Act (RCRA) (Ansul Incorporated, Menominee River AOC; DuPont Co., Grand Calumet River, IN); Clean Water Act (CWA) (LTV Steel, Grand Calumet River/Indiana Harbor and Ship Canal AOC); and multiple authorities (USX Gary Works and Inland Steel, both in Grand Calumet River/IHSC AOC).

USEPA and the States are also making greater use of coordinating complementary Federal and State authorities, and leveraging government and private resources to address the contaminated sediment problem and its sources. Such approaches and partnerships include the use of:

- federal/state dollars as “seed” money to leverage corporate participation for a federal/state/private mix of resources and to ensure long-term corporate commitment (Fraleigh Creek, a.k.a. Unnamed Tributary to the Ottawa River, OH);
- enforcement authorities to leverage corporate participation and/or resources and ensure long-term corporate commitment (Ashtabula River Partnership, OH, Fox River, WI);
- partnership approach (RAP Program model; for example, Ottawa River Remediation Team, and Duck and Otter Creek Partnership in the Maumee River AOC); and
- coordinating with federal and state agencies who bring additional authorities to address contaminated sediments. For example, U.S. Army Corps of Engineers (USACE) Water Resource Development Act authorities; state cleanup/superfund programs; state voluntary cleanup programs (Indiana Harbor Ship Canal, Ruck Pond, WI).

Although comprehensive magnitude and cost estimates are not presently available, it should be noted that the Superfund Program develops cost estimates and timetables (made available to the public) routinely to address remediation of sites, including contaminated sediment sites. Superfund work routinely develops cost estimates for each of the remedial alternatives in the Feasibility Study at NPL sites.

(i) timetables for fully implementing those programs are established and made public

While developing timetables for contaminated sediment clean-ups is a valid suggestion, it is very difficult task. There are many variables and unknowns that could greatly impact any type of timetable, not the least of which is the uncertainty of long-term funding needed to address many of these sites. As with cost estimates, timetables might be developed on a site by site basis, but to do this on a large, AOC-wide scale would be very difficult. Adding another level of complexity is the fact that many AOCs consist of many “hot spots” that require remediation. Each hot spot may be potentially addressed through different statutory authorities and programs, and some may not be readily dealt with by current programs, so trying to predict when they all might be remediated would be extremely difficult.

The RAP program was established to address the impaired uses at AOCs, including the impairments due to contaminated sediments, through a watershed-based approach. RAPs are being developed for each AOC and some of the RAPs describe how, when, and by whom each of the impaired uses will be addressed, including plans for projects to mitigate problems at specific sites within the AOC. We anticipate that future timetables will continue to be developed on a site by site and project-specific basis. Progress achieved and projected will be compiled for GLBTS progress reports and will be made publicly available via the Internet or in a paper version upon request.

(iii) resources are provided to fully implement the programs in accordance with the established timetables

There is no doubt that more resources are needed and we agree with this recommendation. Over the last five years there has been a large investment by federal and state agencies to move forward with sediment clean-ups. Some large scale infusions of resources are being directed towards this problem. Of particular note is the State of Michigan's \$650M Clean Michigan Initiative (CMI) which targets \$25M for contaminated sediment cleanups (particularly those contaminated with PCBs, DDT, and mercury), many of which have occurred in AOCs (Detroit River, Muskegon Lake, White Lake, Deer Lake, River Raisin, and Rouge River); the CMI also includes \$5M to provide funding to local units of government and non-profit entities to implement water quality protection or improvement recommendations in LaMPs and RAPs, other than the recommendations that involve remediation of contaminated sediments. And in the three EPA Regions that border on the Great Lakes (Regions 2, 3, and 5), for the four years covering FY1997 - FY2000, the Superfund Program has spent over \$127M on sediment cleanups in Great Lakes AOCs (this total does not include FY2000 totals for Region 2, which are unavailable at this time).

(iv) progress reports are issued at least biennially

As part of the GLBTS, progress reports on sediment remediation are being prepared by the U.S. and Canada on an annual basis, which began in the year 2000 and in subsequent RAP progress reports and in the U.S. Biennial Progress Report to the IJC. In addition, there are other reporting mechanisms in place, such as, Superfund (and other program) fact sheets and press releases, USEPA's Sediment Information Management System (publicly accessible in the near future), the effort underway to develop a contaminated sediment database, the 1st *Report to Congress on the Extent and Severity of Contaminated Sediment*, and an upcoming 2nd *Report to Congress* expected to be published in 2001.

IV. AIRBORNE TOXIC SUBSTANCES

The Parties should take the following measures to deal with airborne pollutants:

- (i) identify both in-basin and out-of-basin sources of atmospheric deposition of persistent toxic substances to the Great Lakes, quantify their contribution to the total burden of these substances to the lakes, and use this information to formulate and implement appropriate prevention and control measures; and**
- (ii) adopt a source-receptor computer model, improve emissions inventory information, and add dioxin and mercury to the Integrated Atmospheric Deposition Network to improve the data bases for these two substances.**

The Commission recommends that emissions inventory information be improved. USEPA recognizes the importance of emissions inventories for mercury and other substances. USEPA prepares a national emission inventory, with input from numerous state and local air agencies, which is updated periodically. Information from these inventories is used for air dispersion

modeling, regional strategy development, regulation setting, air toxics risk assessment, and tracking trends in emissions over time. More information for this National Emissions Inventory and related information can be found at:

<http://www.epa.gov/ttn/chief/net/index.html>

Emission inventories are also an important tool in the Great Lakes. A 1997 update to the Great Lakes Regional Air Toxic Emissions Inventory, funded primarily by USEPA, was released in April 2001, targeting 82 toxic air pollutants from point, area, and mobile sources. Through the efforts of this inventory project, the Great Lakes States plan to enhance the 1999 regional inventory for mercury emissions to address quality assurance and quality control issues, additional sources, speciation, and emission factors and estimation. In addition, the 1999 inventory will extend the pollutant list to include all 188 hazardous air pollutants identified in Section 112(b) of the Clean Air Act. Dioxin is also a targeted pollutant of the inventory. Improvement and refinement is a continuous goal of the inventory effort.

The United States considers that improved characterization of known and potential emission sources, as well as transformation and fate in ecosystems, of persistent toxic substances to be a high priority and a necessary prerequisite for virtual elimination of these substances. Both categories of information will contribute to the formulation of appropriate prevention and management strategies.

The following projects address sources and fate of mercury and other persistent substances:

- The Lake Michigan Mass Balance (LMMB), undertaken by USEPA-GLNPO, includes a major effort for quantifying and modeling airborne toxic substances. Preliminary results of the LMMB indicate that the atmospheric pathway is significant for both PCBs and mercury and that elevated levels of these substances exist in the Chicago, Illinois-Gary, Indiana area. Subsequent modeling analyses of fate and transport of the LMMB substances (mercury, PCBs, atrazine, and trans-nonachlor) are underway. The ultimate goal of the project is to examine load reduction scenarios through these models. A list of LMMB-related publications is available at:

<http://www.epa.gov/glnpo/lmmb/pubs.html>

- In a joint effort with the State of Wisconsin, USEPA is studying the relationship between air emissions and water quality in Devil's Lake, Wisconsin in a pilot Total Maximum Daily Loads (TMDL) project. This project will use modeling to track emissions from sources to the lake and provide a foundation of information for developing mercury TMDLs for other water bodies.
- In FY2000, USEPA funded the National Oceanic and Atmospheric Administration (NOAA) to develop, test, and perform analyses with the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model to estimate source-receptor relationships for atmospheric deposition of mercury to the Great Lakes. This information will help to determine major sources to the Great Lakes region, which will in turn advise reduction measures.

- The EPA Office of Research and Development (ORD) has funded national and regional atmospheric modeling projects which describe and simulate the deposition and interactions of anthropogenic substances in the Great Lakes. Projects include a study to determine the current magnitude of toxaphene inputs from the atmosphere to Lakes Superior and Michigan, and putting this in perspective with non-atmospheric sources using a mass balance model, as well as a project to assess the importance of watersheds in controlling sources, transport, fate, and bioavailability of mercury in Lake Superior.

Other projects funded include a cooperative mercury air emissions study with a chlor-alkali facility, and studies examining mercury fate in watersheds and associated biota. These projects and other such research will help trace the paths of persistent toxic substances from sources to environmental compartments so that proper reduction recommendations can be devised.

The Commission advises that mercury and dioxin be added as parameters to the Integrated Atmospheric Deposition Network (IADN). In 2002, the United States will undertake mercury monitoring at one IADN master station through the Mercury Deposition Network (MDN). Mercury monitoring at IADN stations may be enhanced as resources allow. The MDN includes wet deposition sampling stations around the United States and Canada, including four in Wisconsin, four in Minnesota, one in Illinois, three in Pennsylvania, and one in New York. In 2001, four Indiana sites will be added, as well as another Wisconsin site at Devil's Lake State Park. This will contribute to available data on mercury levels in the Great Lakes region. A description of this program can be found at:

<http://nadp.sws.uiuc.edu/mdn>

The Great Lakes states are in the process of enhancing their own ambient mercury monitoring efforts, using fixed and portable instrumentation, for the purposes of determining trends over space and time and for characterizing sources. Work has also been done in Minnesota and Wisconsin to study mercury levels in dated sediment cores from lakes.

The United States also agrees with the general view that policymakers should be advised of the geographic distribution and temporal trends in atmospheric deposition of dioxin. The addition of dioxin to IADN has been taken under consideration; however, the expense of dioxin monitoring and limited resources have not allowed dioxin measurements to be added at this time. It should be noted that USEPA is currently conducting a research effort for ambient air monitoring of dioxin and dioxin-like compounds called the National Dioxin Air Monitoring Network (NDAMN). NDAMN is designed to examine levels and trends of dioxin-like compounds, as well as to provide data on transport. This effort will provide information that can help determine how future monitoring resources should be utilized, including resources for the enhancement of IADN. Additional information about the network can be found at:

www.epa.gov/nceawww1/1page.htm

V. GREAT LAKES BINATIONAL TOXICS STRATEGY

The Parties should strengthen the Great Lakes Binational Toxics Strategy by fully addressing all sources of persistent toxic substances, such as atmospheric transport and deposition and in situ contaminants in sediments. In order to include the air pathway, the Parties should:

- (i) establish an inventory of baseline air emissions for toxics for all of the United States and Canada**
- (ii) undertake a complete analysis of emission reduction scenarios for key source regions and determine their effectiveness in reducing contamination of the Great Lakes from the air.**

The Parties should ensure that the Strategy is truly both strategic and binational by strengthening the integration and priority-setting component and establishing a full-time binational secretariat.

The U.S. agrees with the IJC regarding the desirability of improving knowledge about air emissions of substances targeted by the Great Lakes Binational Toxics Strategy (GLBTS). USEPA has conducted regular updates to a national inventory for estimated air emissions for dioxins and mercury, with plans for additional updates. In addition, USEPA has analyzed source contributions for hexachlorobenzene (HCB), PCBs, and alkyl-lead through its National Toxics Inventory, with the most recent release resulting in national inventory estimates for 1996. Given the similarity in chemical structure and in emission sources, the HCB analysis pertains to understanding air emissions of co-generated octachlorostyrene (OCS).

In addition, the Great Lakes State environmental agencies have developed the Great Lakes Regional Air Toxic Emissions Inventory for many other substances which are emitted to the air in much greater quantities than those targeted by the GLBTS. It also sheds additional light on air quality issues in the Great Lakes region. It is accessible to the public via the Internet at:

<http://www.epa.gov/ARD-R5/glakes/einven.htm>

Canada has recently completed the inventory process for releases of several GLBTS substances in Ontario. The Lake Michigan LaMP has collected information for mercury.

Emissions inventories are subject to intrinsic uncertainties, such as the representativeness of one facility to others in its sector; the representativeness of a facility's operations during a short duration emissions test; and for some industries, limited data, especially for fugitive emissions. Therefore, we also believe it is important that inventories be updated, in keeping with advances in information.

Analyzing emission reduction scenarios for key source regions and determining their effectiveness in reducing contamination of the Great Lakes from the air, requires a combination of necessary air monitoring data and air transport modeling. Both USEPA and Environment Canada (EC) have ongoing efforts to meet these needs, including USEPA's National Dioxin Ambient Air Monitoring effort and associated dioxin air deposition modeling.

The U.S. agrees that it is desirable to identify strategic priorities and to strengthen integration in promoting reductions of GLBTS substances. The GLBTS has used its binational Integration Workgroup, composed of government and stakeholder members from both countries, to discuss and inform priority setting. To date, this has led to emphasis on Level I substance reductions and integration of efforts across chemicals and borders, where possible. This integration has been applied to the hospital, utility, steel, wood treatment, and residential wood combustion sectors where efforts have been coordinated between chemical groups across international borders.

In another example of binational integration, after separately investigating sources of OCS and HCB and recognizing their structural similarities, reduction efforts for these two substances have been coordinated. Since OCS and HCB may also be co-generated with dioxins/furans as trace byproducts in processes combining energy, chlorine, and carbon, the U.S. and Canada are evaluating opportunities to encourage coordinated virtual elimination efforts for these substances. In another effort to integrate and address a high priority cross-cutting sector, the GLBTS held an incineration workshop in May 2000 to focus both countries on the incineration sector.

The U.S. supports priority setting and integration through USEPA's Persistent, Bioaccumulative, and Toxic (PBT) Pollutants Strategy. USEPA is using the PBT Strategy to guide its PBT priority-setting and integration nationwide, and to expand the U.S. regionally-based reduction efforts under the GLBTS to other regions of the U.S. in order to decrease atmospheric inputs to the Great Lakes from U.S. regions other than those adjacent to the Great Lakes.

The U.S. agrees with the IJC's recommendation that the strategic and integration aspects of the GLBTS merit some strengthening. In conjunction with Canada, the U.S. is taking steps to strengthen these components. We are not sure what the IJC envisions to be the role of the recommended full-time binational secretariat. Both the U.S. and Canada have full-time senior level staff devoted to the GLBTS. Their respective offices function as a secretariat with extensive contractor support and through other vehicles. We feel that the GLBTS is receiving and will continue to receive ample secretariat support.

VI. LAND USE

The Governments should provide for a binational study of the effects of changes in land use on Great Lakes water quality to determine the measures that should be taken to address these changes, including:

- **the effects of urban and residential growth,**
- **the effectiveness of existing policies and programs in controlling pollution from land use in all sectors, and**

- **the identification of measures that should be taken by provincial and state governments, with appropriate assistance from the Parties, to prevent adverse effects.**

The U.S. agrees that land use is an important determinant of water quality. In fact, the Lake Erie LaMP has identified loss of natural land (described as an increase in imperviousness and loss of habitat) as the single most important factor controlling the state of the lake. The U.S. notes that a binational study has already taken place. The Pollution from Land Use Activities Reference Group (PLUARG) study (final report issued in 1987) could provide a baseline and an important historical touchstone for any future large-scale studies of this type. There are no plans at this time to spend new resources on such a study. Rather, we will continue to focus resources on all of the implementation and planning efforts already underway to address land use issues.

Many reports have identified appropriate measures, tools, and policies to promote and implement environmentally-preferable land use practices. The U.S. is acting as a clearinghouse of this information through various Smart Growth and Sustainable Development efforts within several federal agencies. EPA's Office of Policy, Economics and Innovation has created a large network of federal, state, and local governments and organizations for the purpose of sharing this information at every appropriate level. Perhaps most appropriate to local governments in the Great Lakes basin, is the Smart Growth Network (www.smartgrowth.org), which is supported by EPA and run by the International City/County Management Association. The U.S. also conducts outreach and education efforts on appropriate measures, tools, and policies for environmentally-preferable land use practices by funding and distributing reports and conferences. EPA Region 5 has also identified Sustainable Urban Environments as one of its planning priorities and has created an inter-programmatic team to conduct such education, outreach, clearinghouse and other functions at a regional level.

The U.S. is aware that urbanization can have significant impacts on water quality, and the rate and volume of runoff. A number of efforts are underway around the Great Lakes to identify, measure, and mitigate these effects.

A wide range of existing programs and initiatives address components of this problem, including watershed planning and mitigation programs, computerized modeling of the impacts of urbanization, the use of remote sensing to measure land-use change due to urbanization trends (for example, the growth in impervious surface area), smart growth initiatives, brownfield programs, non-point and coastal nonpoint source pollution programs, and storm water management strategies.

One example of a program to address urban and residential growth is the re-use of abandoned or contaminated industrial sites known as brownfields. The Federal Government, states and localities have been active in the cleanup of brownfields around the Great Lakes. The ensuing brownfields redevelopment, a process driven by local governments and private and not for profit organizations, helps control land pollution that can impair water quality. An essential element of successful smart growth strategies, brownfields reuse provides an outlet for development pressure that protects the environment and revitalizes abandoned areas. In many communities around the Great Lakes, brownfields-powered economic redevelopment has helped improve water quality

and provide green space by reorienting economic, residential and recreational activity back to waterfront areas.

Another example is the Superfund Redevelopment Initiative (SRI). SRI is a national initiative to return Superfund sites to productive use, achieve cleanups that are consistent with the anticipated land use, and to facilitate reuse of sites where appropriate. Superfund has SRI programs in several Great Lakes cities, including the City of South Milwaukee, WI, which includes 13 acres of vacant land on the Michigan shore line; the City of Allegan, MI; the Chicago Department of Environment; and the City of Waukegan, IL.

USEPA Region 5's Critical Ecosystems Team (which covers all the basin states except for Pennsylvania and New York) is identifying ecologically significant places that have high ecological diversity, high potential for self-sustainability, and rare species or features. A map indicating the locations of these places will be available in the summer of 2001 and then be targeted for elevated protective and restorative efforts.

The Critical Ecosystems Team is also creating the Partner Identified Ecosystems (PIEs) database, which contains information concerning approximately 3000 ecosystems identified by over 60 partner agencies and organizations across the region. Ecologically Rich Regions are large geographic areas that contain clusters of PIEs. Currently, Ecologically Rich Regions are being organized by county, but work is being done to organize these data by the more ecologically relevant ecoregions and watersheds. Identification of these locations for targeting purposes is considered a key milestone for improving EPA Region 5's capacity to protect and restore healthy natural ecosystems.

There are a number of other programs throughout the U.S. that could be transferable to the Great Lakes basin. These include conceptual work being done on specific economic incentives (e.g., volume-based storm water fee structures, transfer of development rights, nutrient trading regimes, etc.) and specific local policy options (e.g., urban service areas which limit funding to areas preferred for development, urban growth boundaries which help local communities restrict development to more desirable areas, state planning legislation, model zoning ordinances, etc.). More specific local initiatives could also be promoted via facilitation, technical assistance, direct participation, or funding. These include the 1000 Friends of Wisconsin, the Chicago Campaign for Sensible Growth, and Chicago Wilderness. The U.S. can also promote the dissemination of specific decision-making tools like the EPA-Purdue Long-Term Hydrological Impact Assessment, which can help local planners analyze the water quality and quantity impacts of different development scenarios.

These and other programs are administered in the U.S. by the various branches of the federal government, states, cities, watershed groups, and local planning organizations. Indeed, local authorities have the greatest control over land use decisions. Most Great Lakes states do not have the authority to impose local land use ordinances.. But some states, such as Wisconsin, do have legislation that requires local governments to have growth and land use plans if they are requesting state funds. States can support the IJC's recommendations by educating local planners about the impacts associated with various land uses. And if federal funds are involved, an environmental assessment may be required by the federal agency, which can impose some level of constraint on scope and direction of land use issues. Further, decisions on an environmental

assessment may result in the preparation of an environmental impact statement, which considers land use issues more broadly.

As the public and private sectors and citizens within the Great Lakes basin learn more about how land use management and planning can help achieve the Great Lakes Water Quality Agreement's (GLWQA) sound ecosystem protection goals, governments at all levels can, and hopefully will, increasingly implement more ecologically sensitive land use policies and practices, which can temper and help manage growth to help ensure improved environmental protection throughout the basin.

Governments should proceed with implementation of the SOLEC work on Biodiversity Investment Areas, emphasizing the preservation and rehabilitation of wetlands.

The U.S. agrees that the preservation and rehabilitation of Great Lakes wetlands is of paramount importance for maintaining a healthy ecosystem. Sound land use planning decisions at the local and regional levels is of particular importance. The importance of wetlands is further emphasized in the federal government's goal of achieving a net increase of 100,000 acres per year nationwide through wetland restoration. This is a coordinated effort among key Federal programs including the USDA's Wetland Reserve and Conservation Reserve programs, the USACE Environmental Restoration programs, the Department of Interior's Partners for Fish and Wildlife program, and the North American Wetlands Conservation Act. Under this effort:

- agricultural programs will yield an estimated gain of 125,000 to 150,000 acres of wetland per year by the year 2005;
- other federal programs will yield an estimated gain of 40,000 to 60,000 acres per year by the year 2005; and
- non-federal programs will contribute approximately 35,000 acres per year by 2005.

Biodiversity Investment Areas (BIAs) provide another potential tool for rehabilitating wetlands in both domestic and binational arenas, which the Parties will continue to consider as we address wetlands rehabilitation. As defined in the *Land by the Lakes, Nearshore Terrestrial Ecosystems* paper (Reid and Holland 1996) for SOLEC 1996, BIAs were defined for nearshore terrestrial coastal areas as areas that contain clusters of exceptional biodiversity values. Expanded to include coastal wetlands and nearshore aquatic areas for SOLEC 1998 and SOLEC 2000, BIAs highlight sections of Great Lakes shoreline that sustain rare and diverse plant and animal communities, contain landscape features of special quality, and are productive. Protecting the ecological richness of these areas is an essential facet of maintaining the integrity of the Great Lakes basin ecosystem.

The BIA concept recognizes and complements the IJC's recommendation (8th Biennial Report) which outlines the Areas of Quality idea calling for the protection of high quality areas that had not been heavily impacted. The BIA concept fully recognizes that protecting these areas is much less costly in the long run than restoration and, therefore, embraces a pro-active approach for conserving Great Lakes wetlands and other important areas.

It is important to remember that BIAs are not meant to be another regulatory program. Rather, the purpose of the BIA concept is to identify important areas to help guide existing protection regimes. The U.S. and Canada will continue to refine and enhance the BIA concept for the preservation and rehabilitation of wetlands and other critical parts of the Great Lakes ecosystem and to determine how to best utilize this important tool as a potential guide, both for binational programs under the terms of the GLWQA, and in their separate domestic regulatory regimes. One effort currently underway is the organization of a coastal wetlands consortium, composed of Great Lakes coastal wetland scientists and resource managers, to develop a suite of basinwide coastal wetland indicators and monitoring program. A geographic information system is one of many tools in this binational effort.

In this context, the U.S. supports the statement that the Governments should proceed with implementation of the SOLEC work on BIAs, emphasizing the preservation and rehabilitation of wetlands. The U.S. is also giving increased attention and resources to correcting nonpoint source problems, which should contribute to the protection of the impacted Great Lakes BIAs.

VII. ALIEN INVASIVE SPECIES

The U.S. welcomes the IJC's attention to the threat of invasive species and its recommendations on this matter. Although the U.S. partially agrees with the recommendations, as detailed below, we believe it is appropriate and desirable for the IJC to play a role in efforts to prevent and control invasive species. Invasive species are a serious threat to the Great Lakes basin ecosystem. Control measures are available only in rare circumstances and are very costly to implement. We believe that the prevention of new introductions of invasive species is a necessary component of an ecosystem approach to protecting and restoring the integrity of the Great Lakes.

We consider the Great Lakes Panel on Aquatic Nuisance Species (ANS) the primary U.S. forum for the development and coordination of technical and policy issues regarding freshwater nuisance species and we encourage the IJC to support its ongoing activities. The panel was convened in response to section 1203 of the U.S. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646). The panel is hosted by the Great Lakes Commission and its membership is drawn from U.S. and Canadian federal agencies, the eight Great Lakes states and the Province of Ontario, regional agencies, user groups, local communities, tribal authorities, commercial interests, and the university/research community. The panel also works in close coordination with the national Aquatic Nuisance Species Task Force (ANSTF), also established via P.L. 101-646. Since 1991, the Great Lakes Panel on ANS has accelerated the development of strategies for the prevention and control of aquatic nuisance species in the Great Lakes, including ballast water management.

A further description of our ballast water management strategy is presented below.

The Commission recommends that the Parties should take the following measures to deal with alien invasive species:

- (i) adopt and implement the binational ballast water research strategy and plan described in the 1996-1997 Binational Progress Report on Protection of Great Lakes Water Quality.**

The U.S. agrees with this recommendation, but notes that this strategy was essentially adopted in February 1998, and has since been elaborated and refined in subsequent years.

The “binational ballast water research strategy” mentioned above was developed by the U.S. Coast Guard (USCG), Canadian Coast Guard, Canadian Department of Fisheries and Oceans, and Transport Canada Marine Safety. This work was highly valued by the Great Lakes Panel on ANS. In fact, the components of the strategy (along with associated work sponsored by the Great Lakes Protection Fund, the Michigan Office of the Great Lakes, and other agencies around the world) were adopted and reflected in a February 1998 policy statement issued by the panel. Please see:

<http://www.glc.org/ans/ballastwaterpolicyposition.pdf>

The Great Lakes Panel on ANS further refined their strategy in April 1999 during a symposium sponsored by USEPA-GLNPO titled “Ballast Water Management and Aquatic Nuisance Species: Setting A Research Agenda for the Great Lakes.” The symposium was held in conjunction with the Ninth International Zebra Mussel and Aquatic Nuisance Species Conference in Duluth, MN. An important framework for the symposium discussions was provided by the “binational ballast water research strategy” mentioned in the IJC’s recommendation. The final draft of the panel’s strategy was released in March 2000. For a summary of the proceedings, please refer to:

<http://www.glc.org/ans/BWsummarydoc.pdf>

The supporting text of the IJC’s recommendation indicates that a letter was sent in November 1998, urging the Parties to adopt the “binational ballast water research strategy”, but this letter was unanswered. Although this letter arrived after the Great Lakes Panel on ANS formally adopted the strategy (February 1998), we regret that this letter went unanswered. In August 2000, USCG and USEPA-GLNPO participated in a meeting of the IJC’s Water Quality Board to address the threat of invasive species, and we look forward to further communication and collaboration in this area.

The Commission recommends that the Parties should also take the following measures to deal with alien invasive species:

- (ii) give a Reference to the Commission to develop:**
- a. binational standards that should be applied to discharges of ballast water, and**
 - b. recommendations on the most appropriate methods for implementing those**

- c. **standards including, for example, the possibility of on-board treatment of ballast water and residual ballast sediment and the possibility of establishing ballast water and residual ballast sediment treatment facilities in the lower St. Lawrence River.**

The U.S. believes that a coordinated binational approach is essential to address alien invasive species. The U.S. commits to enter into discussions with Canada and the IJC on the development of a regional approach to ballast water management. However, due to technical initiatives already in place (explained below), it is not evident that a technical Reference as proposed will advance the state of knowledge. Rather, we believe the IJC has a key role to help harmonize binational efforts in this matter.

The national Aquatic Nuisance Species Task Force (ANSTF), through its Ballast Water and Shipping Committee (BWSC), has formed a workgroup to develop a draft standard for ballast water discharge and treatment. The USCG leads this effort. In November 2000, the BWSC provided the ANSTF a comprehensive set of recommendations on the development of ballast water discharge standards. Upon their recommendation, the ANSTF set in place a two component approach to continuing this effort. The recommendations are expected to be published in the Federal Register for broader comment and suggestions. In addition, panels will be formed to address the technical issues involved with standard development and compliance determination.

The ANSTF is paying close attention to similar international efforts currently underway by the International Maritime Organization (IMO). The USCG leads U.S. participation in the development of a legally binding instrument at the IMO. Once approved, the instrument is expected to contain the requirements for management of ballast water, including discharge standards.

With respect to the potential scope of a reference, we feel that technical matters can be addressed by the members of both the Great Lakes Panel and national Aquatic Nuisance Species Task Force. However, we believe that the IJC is well-suited to advise on how equitable standards could be implemented given the different structures of governance in the U.S. and Canada. In its position as an impartial advisor to the Parties, the IJC can be instrumental in helping to ensure that sufficient and equivalent measures to prevent and control introductions of invasive species are adopted by both countries. This may include an analysis of existing domestic laws and programs -- and the identification of regulatory or programmatic gaps -- that form the foundation for each nation's long-term approach reducing the risk of future introductions of invasive species.

VIII. INFORMATION AND DATA MANAGEMENT

The Parties should develop and maintain the full range of monitoring and surveillance programs necessary to enable them to fulfill their commitments under the Great Lakes Water Quality Agreement.

There are many gaps in existing Great Lakes monitoring programs, which may lead to incorrect assessment of environmental problems, and their scope, in major portions of the Great Lakes

basin. Existing programs do not address all chemicals of current or potential concern, nor do they attempt to assess biological diversity or biological stressors in all ecosystem components. The U.S. program attempts to coordinate monitoring activities through its various partners to achieve as much as possible. However, existing programs must be better coordinated and standardized (at a minimum, methods comparable in performance) for comparability of information.

The majority of monitoring has taken place in the offshore areas of the lakes. Reports from these efforts lead to the conclusion that, at least for chemical pollution, the lakes are becoming cleaner. This is the case for many persistent toxic substances and for phosphorus in most of the lakes. However, nearshore areas that continually or episodically receive higher concentrations of contaminants, receive little attention. Long term, offshore monitoring is still critical to our understanding of the lakes, but nearshore data might present a much different picture of the state of the Great Lakes. And quality data for both areas is needed to validate various models being used in the basin.

There is an active and comprehensive monitoring program in place in the basin sponsored by USEPA-GLNPO. While it could be better coordinated (and efforts are underway to achieve this), it is still a robust program that is continuing to provide important and credible scientific information for use by Great Lakes decision-makers. The following are examples of these efforts:

- USEPA-GLNPO's monitoring program has focused on evaluation of water quality trends, concentration and loads of persistent toxic substances and the health of plankton and benthos communities. Persistent toxic substances are monitored through a long term fish tissue contaminants program, and through GLNPO participation in the Integrated Atmospheric Deposition (IADN) program. A long term open lake program also gathers data on nutrients and plankton in offshore waters, and benthos in nearshore and offshore waters. These monitoring programs provide high quality information in their subject areas. GLNPO, however, has curtailed monitoring in some areas due to budget shortfalls.
- As proponents of the ecosystem approach, GLNPO, in partnership with USEPA-ORD, has undertaken mass balance studies on Green Bay and Lake Michigan. These studies have provided monitoring and research data on many ecosystem components, and enhanced our understanding of the Great Lakes ecosystem. These studies are an attempt to address the monitoring and research recommendations of Annexes 11 and 12 of the GLWQA. This approach, which provides data and information on the loads of contaminants to the lakes, from many routes, may be appropriate for other Great Lakes as well.
- USEPA-ORD has also awarded a four year \$6,000,000 cooperative agreement to a consortium of eight Great Lakes Universities in the U.S. and Canada. In partnership with ORD's Laboratories and GLNPO, the consortium will develop nearshore monitoring designs and indicators that provide the means to report on the health of individual lakes, and the entire Great Lakes basin. This research effort will also provide a rigorous evaluation and refinement of proposed SOLEC indicators of biological condition for use by states, provinces, tribes and other environmental management agencies.

- Other data is also available to the public including, but not limited to: data collected by USEPA programs to address sites and facilities (CERCLA, RCRA, NRDA, etc.) within the AOCs; Toxic Release Inventory data for facilities within the Great Lakes basin; USEPA's report to Congress, *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States*; data supporting CWA Section 303(d) impaired waters lists; and data collected by other federal agencies (USACE, USGS, NOAA).
- The states are also addressing the need for monitoring. Under Michigan's Clean Michigan Initiative, for example, over \$45 million is anticipated to be spent on monitoring over the next 15 years. This has already led to a large increase in water quality monitoring.
- In development of the Lake Ontario Mass Balance Model, the Lake Ontario LaMP has synthesized available sediment, water, and fish tissue data. The LaMP intends to use the model to support the development of load reduction targets. One use of the model under consideration by New York State, is support for the development of TMDLs.
- Some LaMPs, such as the one of Lake Ontario, are planning cooperative monitoring between the U.S. and Canada, to take advantage of existing monitoring programs.

In fulfilling the commitments under the GLWQA, ATSDR's Great Lakes Human Health Effects Research Program (GLHHERP) is providing a crucial link between monitoring and surveillance as it determines the status of human health in the Great Lakes. The status of human health must be a vital component of the Parties' programs as they work together to restore the Great Lakes ecosystem (which includes human health). The GLHHERP has provided significant human health findings to help the Parties monitor exposure pathways, body burden levels, and potential adverse health effects in the citizens of the Great Lakes, and at the same time, filled important data gaps.

The GLHHERP has established 10 year duration and 25 year duration unique cohorts. These cohorts include over 14,000 individuals such as young children first studied at birth, male and female subsistence anglers, men and women of reproductive age, and a second generation of children potentially exposed *in utero* to persistent toxic substances. The elderly cohort was established in the early 1970s and their exposure data serve as a monitor to track body burden levels of different persistent toxic substances over time.

In addition, ATSDR has provided human health information to support the LaMPs and RAPs activities as a part of the GLWQA. Some of these recent findings are included in Appendix 1.

The Parties should provide adequate access to data while protecting confidentiality agreements and waiving cost recovery policies that contradict the intent of Article IX of the Great Lakes Water Quality Agreement.

Through its homepage and free of charge, GLNPO makes all data available from the LMMB Project as well as summary and individual data from its base monitoring program. Further, GLNPO has a tracking and inventory accounting system for these releases. GLNPO will continue

to provide data upon request. The USGS makes its tributary monitoring flow and water quality data available, as well.

Online geographic information systems are increasingly used as a tool for accessibility of data. Work done by the Great Lakes Commission (funded by USEPA-GLNPO), for example, has led to an online version of a Lake Michigan atlas.

The Parties should correct existing problems with the collection, analyses and reporting of data, including establishing sampling protocols, filling data gaps and ensuring the quality of data.

GLNPO developed a quality management system that covers all environmental data collected through in house extramural activities. This system, initially drafted in 1993, has undergone annual enhancement, and includes annual reporting. The program is led by a GLNPO Quality Assurance (QA) Manager who reports directly to the GLNPO Director, and staffed by an in-house team of six employees, with contractor support. The system includes the following program elements:

- a. Quality Management and Organization
- b. Program Description and QA System
- c. Personnel Qualifications and Training
- d. Procurement of Items and Services
- e. Document Control and Records
- f. Computer Hardware and Software
- g. Quality Planning
- h. Quality Implementation of Work Processes
- i. Quality Assessment and Response
- j. Quality Improvement

(Note: Peer Review and Data Security concerns will be addressed in the FY2001 version of the GLNPO Quality Management Plan)

Through the QA system, GLNPO recently published Sampling and Analytical Protocols for most of its base program monitoring operations. For the LMMB Project, GLNPO made all data and all the sampling and analytical Protocols available through its web site. Additionally, a QA Project Plan was developed through ORD and published to address all model calculations and calibrations for the LMMB. Data collected for the above mentioned programs was done in support of the LaMPs and RAPs Great Lakes stakeholders, including the research community. GLNPO conducted external peer reviews on data quality and the tools they are using to assess this information. Peer reviews affirm high quality work is being done.

Other USEPA program offices have sampling and QA/QC protocols, as do other Federal Agencies and states. In addition, USEPA is completing the final draft of: *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses* and plans to release it in 2001.

GLNPO retains historical biology and limnology data sets that are being made widely available. The bulk of this data is publicly available on the Storage and Retrieval (STORET) database. It has been difficult to standardize terminology and techniques on this multi-year data to allow annual comparisons for trend monitoring, and making data available from automated sampling devices that record numerous real time observations. Because GLNPO samples contaminants and nutrients at trace levels, there are concerns that the methods are not sensitive enough to detect low level concentrations.

The Parties should, within two years, develop and implement a binational information policy employing advanced technology to support implementation of the Great Lakes Water Quality Agreement. This policy should include provision for:

- (i) accessibility of data and information,**
- (ii) organization and management of data bases,**
- (iii) protocols to ensure compatibility and comparability of data for weight of evidence and ecosystem integrity analysis,**
- (iv) support of indicator development, and particularly indicators that support the goals of drinkability, swimmability, and edibility of fish, and**
- (v) principles for evaluating information for decision-making.**

GLNPO is developing a state of the art multi-media relational data-base called "GLENDA" which stands for the Great Lakes Environmental Database. This system includes a data dictionary that covers standard naming conventions and definitions for all information collected, as well requiring all associated metadata that is typically not available with historical data sets. The database includes a flexible data reporting standard and coded remarks for field, laboratory and interpretative assessments. The system was developed in conjunction with the revision of USEPA's STORET database and is applicable to programs outside of the Great Lakes basin.

The system was developed for GLNPO's LMMB Project and currently contains about 60% of that data. During the FY2000 sampling season, GLNPO developed input screens for GLENDA, on the research vessel the *R/V Lake Guardian*, for real time data entry. GLNPO currently has the database set up to handle all fish, limnology, sediments, and atmospheric data, and is currently developing a way to transfer all phytoplankton and zooplankton data into GLENDA.

GLNPO's air deposition program collects information jointly with Canada through the IADN program. For now, our Canadian partners are housing all of the data, which is not currently compatible with the GLENDA database. Perhaps by working through this program, GLNPO can gain agreement on a compatible "data dictionary" that satisfies the data requirements of both Parties.

While GLENDA supports goals (i) thru (v) listed above, it was designed to be used with USEPA databases. A true binational database will take awhile to develop. The U.S. should explore improving coordination with Canadian monitoring efforts. This will require a movement of the monitoring efforts of both countries toward an agreed set of indicators and chemicals. SOLEC indicators may be an area of agreement from which a coordinated program could develop. The Great Lakes International Surveillance Plan (GLISP) is another historical effort which should be reviewed. There are recommended monitoring plans in the document which, if implemented, could expand our knowledge of ecosystem trends in the Great Lakes. While much of GLNPO open lake monitoring is based on GLISP recommendations, as modified over the years, an overall implementation of recommended monitoring would require federal and state/provincial cooperation at a level not previously attempted. The U.S. will look for opportunities to discuss such a policy with our Canadian colleagues. For now, USEPA is taking steps with Environment Canada to establish a binational GLWQA information site on the Internet.

IX. SOLEC AND INDICATORS

The Parties should report on indicators for the three Desired Outcomes of drinkability, swimmability and fish edibility beginning with the SOLEC 2000 conference and biennially thereafter.

The Parties are happy to report that the three indicators recommended by the IJC to be reported were presented at the recently completed SOLEC 2000, and will continue to be presented biennially.

The Parties should report on indicators for the Desired Outcome of virtual elimination of inputs of persistent toxic substances beginning with the SOLEC 2002 conference and biennially thereafter.

The SOLEC indicator process is designed to monitor and report on trends in various media (air, water, sediments, biota) for a variety of stressors, including persistent toxic substances. The Parties recognize that persistent toxic substances are one of the major stressors affecting human health and the Great Lakes ecosystem. Over 20% of the SOLEC indicators relate specifically to loadings, concentrations, or effects of contaminants in the Great Lakes ecosystem. Atmospheric loadings have been calculated and reported through the IADN program, and also through SOLEC. Loadings from tributaries are sometimes available, as through the LMMB Project. Trends in the concentrations of contaminants in several media, especially biota, reflect the degree to which active sources have been reduced or eliminated. The Parties are committed to continuing monitoring and reporting of the status of contaminants in the Great Lakes ecosystem. For example, the Lake Ontario LaMP proposed indicators of contaminants in fish and water were presented at SOLEC 2000. Once these indicators are adopted, the LaMP plans to report on these indicators, as appropriate, to the public in a timely manner.

The Parties should develop and report on three specific indicators for the Desired Outcome of physical environment integrity beginning with the SOLEC 2002 conference and biennially thereafter.

Beginning with SOLEC 2000 and biennially thereafter, the Parties will report on indicators which illustrate the status of physical environmental integrity. Indicators such as aquatic ecosystem health, and others under development, will address this Desired Outcome.

APPENDIX 1

Recent Findings of ATSDR Human Health Effects Study in the Great Lakes

Exposure

- A significant trend of increasing body burden is associated with increased fish consumption (Fitzgerald et al., 1996a,b, 1999; Falk et al., 1999; Hanrahan et al., 1999)
- Men eat more fish than women; men and women eat Great Lakes sport fish during most of their reproductive years (Courval et al., 1996; Fitzgerald et al., 1996a,b, 1999; Lonky et al., 1996; Waller et al., 1996; Hanrahan et al., 1999).
- Consumption of Lake Ontario Great Lakes sport fish by women of childbearing age increases the risk for prenatal exposure to the most heavily chlorinated PCBs (Stewart et al., 1999).

Socio-behavioral and demographics Data

- A recent survey of adult residents of the eight Great Lakes states estimated that 4.7 million people consumed Great Lakes sport fish in a given year; and 43.9% of the respondents were women (Tilden et al., 1997).
- Knowledge of and adherence to health advisories for Great Lakes sport caught fish varies across different genders and populations., e.g., men versus women and whites versus Native Americans, respectively (Fitzgerald et al., 1996 a,b, 1999; Waller et al., 1996; Tilden et al., 1997)
- Fifty percent of respondents to the survey who had eaten Great Lakes sport fish were aware of the health advisory for fish, and awareness differed significantly by race, sex, educational level, fish consumption, and state of residence (Tilden et al., 1997).

Health Effects

- Conception rate and the incidence of a live birth are lower in some women who are sport fish consumers (Courval et al., 1999; Buck et al. 2000).
- An association was found between men who consumed large amounts of sport fish and the risk of delayed conception in their spouses (Courval et al., 1999).
- Significant menstrual cycle reductions were indicated in women who reported consuming more than 1 meal per month of contaminated Great Lakes sport fish (Mendola et al., 1997).

- In the Oswego study neurobehavioral and developmental deficits have been observed in newborns (12 to 24 hours after birth and again 25 to 48 hours after birth) of mothers who consumed approximately 2.3 meals per month of contaminated Lake Ontario fish (Lonky et al., 1996).
- The relationship between prenatal exposure to PCBs and performance on the Neonatal Behavioral Assessment Scale (NBAS) was assessed in newborns of the Oswego study. The results indicated significant relationships between the most highly chlorinated PCBs and performance impairment on the habituation and autonomic tests of the NBAS at 25 - 48 hours after birth. No significant relationship was found between PCBs of lesser chlorination, DDE (dichlorodiphenyl dichloroethene), hexachlorobenzene, mirex, lead or mercury on any NBAS performance test. (Stewart et al., 2000).
- Some of exposed newborns in the Oswego study are three years of age and initial test results for memory, verbal, and perceptual performance indicate their score is lower than children from mothers who consumed lower amounts or no Great Lakes sport fish (Stewart et al., 1998).
- Self-reported liver disease, diabetes, and muscle/joint pain may be associated with exposure to PCBs and other contaminants via fish consumption (Dellinger et al., 1997).
- PCB concentrations were significantly associated with poorer pegboard performance. The pegboard performance test evaluates visual motor coordination and spatial orientation (Dellinger et al., 1995a).
- PCBs and DDE were markedly elevated in an adult fish eating cohort. Exposure to PCBs, not DDE was associated with lower scores on several measures of memory and learning (Schantz et al., 2001).

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