Section 5: Sources and Loads Update

5.1 Introduction

Monitoring programs provide insight into sources of pollutants to the Lake Erie ecosystem. The spatial distribution of pollutants in sediments and the tissues of benthic invertebrates and fish are a result of historical and ongoing inputs. When integrated with municipal and industrial discharge records and information on the use and pathways of chemicals in our society, managers can ensure that pollution prevention or remedial activities are focused in areas that warrant priority attention.

In the Lake Erie LaMP 2000 Report, the Sources and Loads Subcommittee of the Lake Erie LaMP reported on work completed to identify and review monitoring databases that might be of use in calculating loads and tracking down sources. As a continuation of the information integration efforts described in the "Characterization of Data and Data Collection Programs for Assessing Pollutants of Concern to Lake Erie" (Painter et al. 2000), and building on the efforts of the USGS described in "Areal Distribution and Concentrations of Contaminants of Concern in Surficial Streambed and Lakebed Sediments, Lake Erie - Lake Saint Clair Drainages, 1990-97 (Rheaume et al. 2001), the LaMP has expanded its information base of ambient environmental monitoring, discharge and emissions information.

The Lake Erie LaMP 2000 document identified the need to develop a "source track-down process" for the basin. The current project being guided by the Lake Erie LaMP Sources and Loads Subcommittee involves the collection, aggregation and analysis of emissions, bed-sediment, and fish-tissue data within the Lake Erie Basin for 1990-98. The goals of this effort are to generate a comprehensive database accessible by a Geographic Information System (GIS) in order to: 1) evaluate the spatial occurrence among these interconnected data types; 2) help track down and identify locations that are potential source areas for contaminants; and 3) assess whether the available data can be combined from various agencies across state and national boundaries to accomplish such an evaluation. Of particular concern are the Lake Erie LaMP critical pollutants mercury and polychlorinated biphenyls (PCBs). These contaminants are currently listed as "bioaccumulative chemicals of concern" by the U.S. Great Lakes Initiative and identified as "tier 1 contaminants" by the Canada-Ontario Agreement. Because of their persistence in the environment and their bioaccumulative nature, mercury and PCBs account for the majority of fish consumption advisories throughout the Great Lakes.

Photo: Gene Emond

To date, the project has compiled emissions data from 8,000 locations for a total of more than 2 million records. Figures 1 and 2 represent an evaluation of PCBs and mercury in bed-sediments as compared to predetermined aquatic biological effect levels (Smith et al. 1996). Fish-tissue data are in the process of being collected and aggregated, and will be mapped in 2002.

Integration of the available information identified data gaps, and several studies were initiated to ensure a more comprehensive information base. For example, when recent information on the spatial distribution of open lake sediment pollutant concentrations was

Figure 1: Total PCBs in Bed Sediments

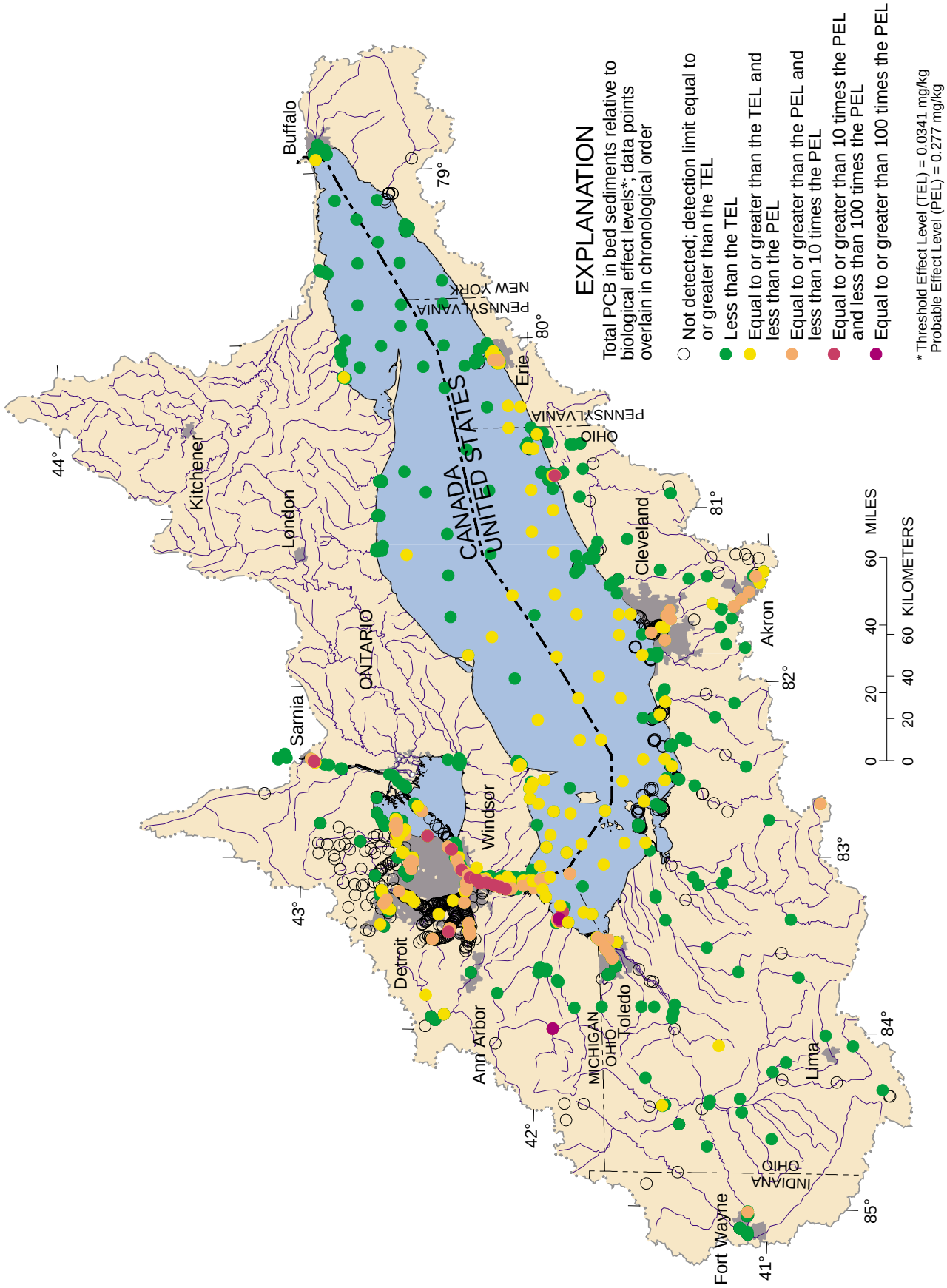
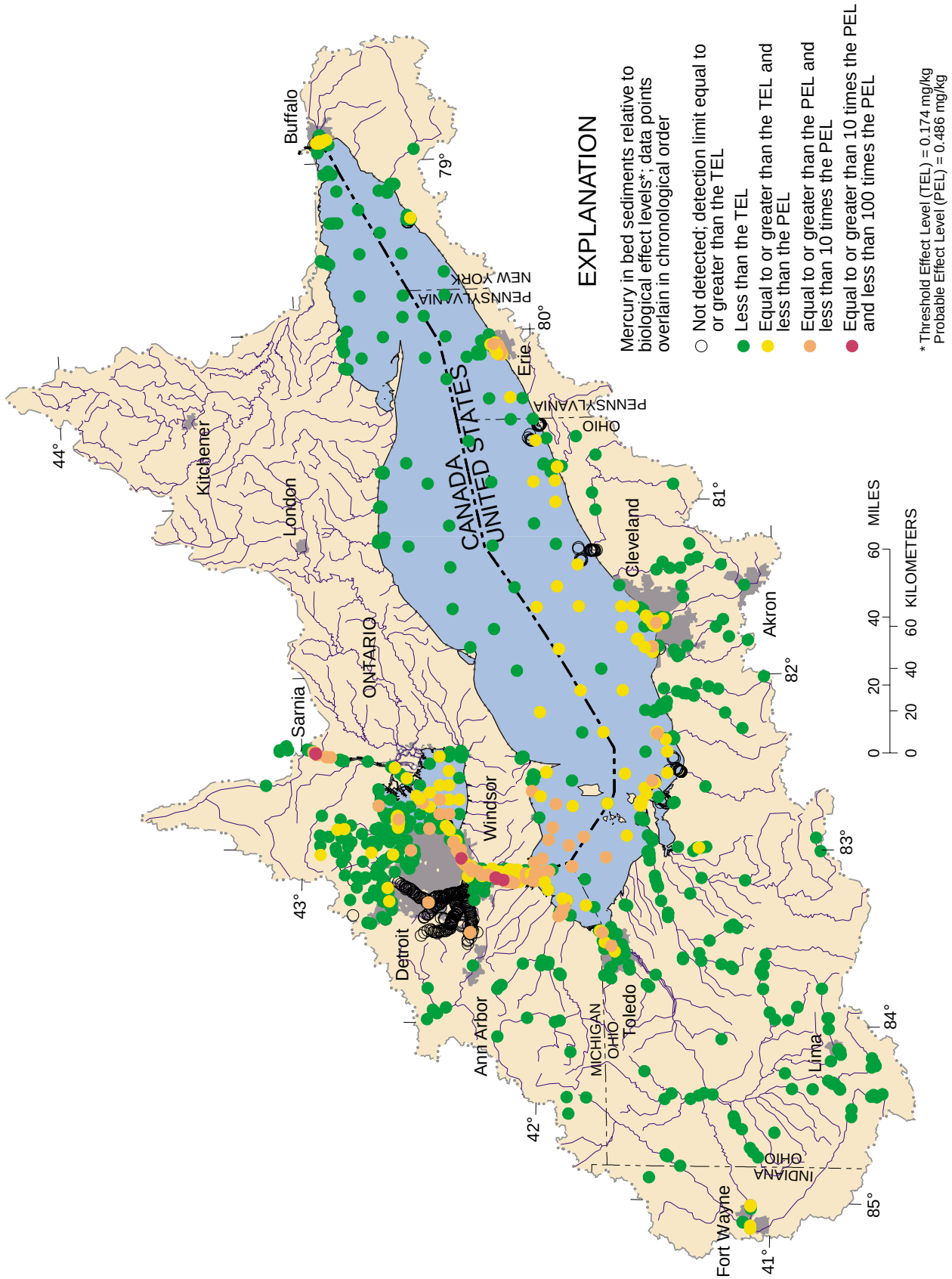


Figure 2: Total Mercury in Bed Sediments



required for the project described above, Environment Canada and Ohio EPA collaborated on a study that provided open lake pollutant concentrations in surficial sediments for many historical and emerging chemicals of concern. The 1997/98 survey conducted by Environment Canada and Ohio EPA not only provided valuable information on the open lake spatial distribution of contaminants, but because an earlier 1971 Environment Canada survey had been conducted, a retrospective analysis of the trends over time was also possible (Painter et al. 2001). Encouragingly, PCB concentrations have declined lakewide. Concentrations are one third of what they were 30 years ago. Mercury concentrations have also similarly declined.

Dioxin concentrations in surficial sediments of Lake Erie were unavailable prior to the study conducted by Environment Canada and Ohio EPA. The Canadian probable effect level (21.5 pg/g TEQ) was exceeded at 40% of the sites, all in the western and south-central basins of the lake (Figure 3).

Figure 3: Surficial Sediment Concentrations of Dioxin (pg/g TEQ)

During the data compilation for the above-mentioned source track-down GIS database, an absence of information for the Canadian tributaries was evident. Environment Canada and the Ontario Ministry of Environment have since initiated "Project Track-down" to provide additional sediment contaminant data for north shore tributaries, and to follow-up on clues that would suggest local sources. Sediment, forage fish and clams are excellent screening tools to track down remaining sources of bioaccumulative chemicals of concern, such as PCBs.

Collecting ambient concentration and source information are two parts of a three-part strategy to reduce contaminants in Lake Erie. The third piece is the source reduction and remediation efforts underway. Complementary to the Lake Erie LaMP are remedial actions in the Lake Erie Areas of Concern, state and provincial pollution prevention activities, and the efforts under the Great Lakes Binational Toxics Strategy. Although no contaminated sediment sites were cleaned up during the last two years, progress continues on efforts to remediate and restore these sites. Most of these ongoing efforts are being done at the Areas of Concern and are highlighted in the RAP Update Section of this report. Integration of this ongoing work will permit the LaMP to evaluate gaps and plan new activities based on a solid foundation. Per concerns of the New York Department of Environmental Conservation, as work on sources and loads continues, the Lake Erie LaMP will consider the potential for Lake Erie to be a source of the priority toxics identified in the Niagara River Toxics Management Plan.

5.2 Mercury and PCB Reduction Initiatives

To date, the Lake Erie LaMP has designated mercury and PCB as critical pollutants in the lake. Consequently, the LaMP 2002 concentrates on tracking activities underway around the lake that are reducing loading of these pollutants or removing them from the lake ecosystem via some type of remedial action. There are a number of mainly pollution prevention based initiatives currently ongoing under the Great Lakes Binational Toxics Strategy for mercury and PCB, as well as other contaminants of concern. Many of the actions are common to both the U.S. and Canada.

The Great Lakes Binational Toxics Strategy created a U.S. mercury reduction challenge calling for a 50 percent reduction in the nationwide use and emissions of mercury by 2006. A work group of stakeholders from federal, state and local government, industry, and non-government organizations meets twice annually to share information about mercury reduction opportunities. More information on this group is available at: www.epa.gov/Region5/air/mercury/mercury.html. With respect to small mercury source activities, there are far too many to report on in the Lake Erie LaMP 2002 report. For example, many municipalities have initiated or passed ordinances prohibiting sale of mercury fever thermometers. The Lake Erie LaMP 2000 document listed a number of specific actions that the U.S. and Canada had committed to or proposed to undertake. Tables 5 and 6 update the status of some of these key actions.

In both Canada and the U.S., several regulations are under development to strengthen existing regulations related to the control, treatment and release of PCB and mercury. Only those that have been finalized are specifically mentioned in Tables 4 and 5. A compilation of U.S. legislative actions relating to mercury reduction in products is at: www.mercury-k12.org/legisbystate.htm.

5.3 U.S. EPA Mercury Phase-out Proposal

The development of Total Maximum Daily Loads (TMDL) is a statutory requirement under Section 303(d) of the U.S. Clean Water Act. It mandates restoration of impaired waters through reduction of pollutant loadings. Lake Erie, as well as many of the U.S. Lake Erie tributaries, is listed as impaired waters under Section 303(d). The States are responsible for preparing TMDLs for their impaired waters.

In an effort to address the universal mercury contamination problem, the National Wildlife Federation developed a proposal to explore implementing a pollution control program in lieu of a TMDL for mercury in the Great Lakes. Using the basic framework suggested by the National Wildlife Federation, U.S. EPA released a mercury phase-out proposal in January 2002 that meets the technical and regulatory requirements of an alternative to a TMDL. The proposal would allow the Region 5 states to forgo developing TMDLs for all mercury impaired waters, including those waters with only fish consumption advisories for mercury, if they commit to a mercury reduction program. The U.S. EPA mercury phase-out proposal envisions reductions in emissions of mercury through incorporation of new Maximum Achievable Control Technology (MACT) standards in air permits, inclusion of Great Lakes Initiative (GLI) standards and pollution prevention measures for mercury in water discharge permits, acceleration of projects to clean up mercury-contaminated sediments, and implementation of voluntary mercury collection, reduction and pollution prevention programs on an expedited schedule. Such programs can include mercury thermometer exchanges, source identification and reduction programs for wastewater treatment plants, and negotiation of voluntary elimination of mercury switches in automobiles. The proposal also allows states flexibility to develop or expand mercury reduction programs. In addition, each state would need to develop benchmarks and a monitoring program to determine the effectiveness of the reduction efforts. The proposal is currently being reviewed by the states.

Table 5: PCB Reduction Plan Activities Update

Committed Action *From the Lake Erie LaMP 2000 Rpt	Status (2002)	Lead Agency
POLLUTION REDUCTION		
Work with automotive, iron and steel sector and electrical facilities in the Lake Erie basin to establish voluntary commitments to reduce the use, discharge or emissions ofPCBs.	Canada: 4 steel companies and 3 automotive industries initiating phase outs. U.S.: 3 automotive industries committed to voluntary reduction of high level PCBs.	EC and U.S. EPA
Coordinate LaMP and GLBTS efforts with all related partners in order to produce a cohesive, unified program to address PCBs in the Great Lakes.	Ongoing	EC and U.S. EPA
U.S. EPA Superfund commits to completing the remedies for Springfield Township Dump (MI); G&H Landfill (MI); Metamora (MI); and Fields Brook (OH) by the end of 2002.	Springfield Township Dump - Construction of remediation systems is complete, including the treatment and/or removal of 12,000 cubic yards of PCB-laden soil; operation and maintenance is expected to continue for the next several years (1-4 years). G&H Landfill - Construction of remedial technologies is complete (landfill cap and slurry wall), as well as wetlands restoration; groundwater extraction system will be operated for at least 30 years. Metamora - Landfill cap construction is complete. Fields Brook - Construction of remedial technologies at 2 PCB-contaminated operable units has been completed (Acme Scrap and Millennium Inorganic Chemicals). The cleanup of Fields Brook sediments and floodplain soils, and source controls are nearly complete.	U.S. EPA
Formalize the PCB Phasedown Program pilot project with the major utilities in the Great Lakes basin that is designed to encourage the utilities to phase out their remaining PCB equipment.	In November 2000, U.S. EPA presented the final PCB phasedown program to 11 of the major electric utilities in the Great Lakes basin. 3 of the 4 major electrical utilities in the Lake Erie basin have committed to voluntarily phase down their remaining PCB electrical equipment.	U.S. EPA
Identify federally owned PCBs in the Lake Erie basin and seek their removal by the departments or agencies that own the PCBs.	U.S. EPA has identified 9 federal facilities (with a combined total of 214 PCB transformers) in states that border the Great Lakes. Next step is to determine most effective way to seek reductions.	U.S. EPA
Organize small PCB owner workshops in the Lake Erie basin to exchange information on PCB management, decommissioning and destruction.	Information packages distributed in Sept. 2001 included PCB Owner Outreach Brochure, GLBTS-PCB Workgroup Activity Regional Update, and fact sheet on Ontario PCB In Use Inventory survey and a map showing PCB quantity and location in the Lake Erie basin.	EC and Ontario MOE
Encourage PCB owners to destroy PCBs in use or storage.	PCB phase out commitment letters have been received from Ontario Power Generation to phase out and destroy approx. 81% of their high level PCB by 2001 and 100% by 2015. PCB phase out commitment letter requests have been sent to the Council of Great Lakes Industry trade associations including: Aluminum Association of Canada and the Canadian Petroleum Products Institute.	EC

Committed Action *From the Lake Erie LaMP 2000 Rpt	Status (2002)	Lead Agency
INFORMATION		
Finalize the PCB Sources and Regulations Background Report.	The report is available at www.epa.gov/glnpo/bns/pcb/index.html	EC and U.S. EPA
Finalize the PCB Options Paper under the GLBTS that identifies options that can be undertaken to reduce PCBs in the environment.	The report is available at www.epa.gov/glnpo/bns/pcb/index.html	EC and U.S. EPA
REGULATION		
	Canada: Proposed revisions to strengthen federal regulations regarding PCB management have been initiated. Further Information can be obtained from Environment Canada PCB Website at www.ec.gc.ca/pcb/ Canada: PCB Waste Export Regulation (SOR/97 – 108) is being amended and to be published in Gazette I in 2002. Canada: A notice with respect to Polychlorinated Biphenyls in Automotive Shredder Residue was published in Gazette I on July 7, 2001 for facilities that generated residue contaminated with PCBs during 1998 – 2000.	EC
	U.S.: In the December 26, 2000 Federal Register a final rule was published temporarily deferring a portion of the original rule applying Land Disposal Restrictions under the Resource Conservation and Recovery Act (RCRA) when PCBs are present in soils contaminated with metals. The soils must still be treated for metals, but Generators are required to treat PCBs only if the total concentration of halogenated compounds exceeds 1,000 parts per million.	U.S.EPA

Table 6: Mercury Reduction Plan Activities Update

Committed Action *From the Lake Erie LaMP 2000 Rpt	Status (2002)	Lead Agency
POLLUTION REDUCTION		
Provide Pollution Prevention training at hospitals in London, Ontario with emphasis on the removal of mercury containing devices.	March 2001 training was completed for health care professionals in London, Ontario. A resource guide has been developed and is available at www.c2p2online.com. Hospitals in the Lake Erie basin with mercury reduction programs include: Cambridge Memorial Hospital and St. Mary's Hospital, Kitchener.	EC
Green Community thermostat and thermometer collection program for the City of London, Ontario.	A new organization, Canadian Coalition for Green Health Care has been established to reduce the environmental impact of Canada's health care system. The web site www.greenhealthcare.ca provides information on Cdn suppliers of mercury free medical devices including thermometers. EC is working with retailers and distributors to implement a program to encourage the public to return their mercury-containing thermometers to pharmacies. A pilot program started in February 2002, in London, Ontario in the Lake Erie basin.	EC

Committed Action *From the Lake Erie LaMP 2000 Rpt	**Status** **(2002)**	**Lead Agency**
As of early 2000, federal, provincial, and territorial environmental departments are investigating the releases of mercury to the environment from various commercial products and from some forms of waste. A focus on dental amalgam, fluorescent lamps, and sewage sludge that is land-applied is expected to result in Canada-wide standards in late 2000.	The federal, provincial and territorial environment ministers across Canada have agreed to a harmonized standard for managing dental amalgam waste across the country. Ministers signed the standard on September 23, 2001. The Canada-wide standard is the application of best management practices to achieve a 95% national reduction in mercury releases from dental amalgam waste discharges to the environment from a base year of 2000. Pollution Probe Switch Out program initiated in June 2001 recovers mercury switches from end-of-life automobiles before the mercury contained in these vehicles could be released into the environment. Eleven auto dismantlers in Ontario are participating including facilities in the City of Windsor and Caistor Centre in the Lake Erie basin. More information: http://www.pollutionprobe.org	Ontario MOE
The Ontario Ministry of the Environment along with Environment Canada have been working with the Ontario Dental Association to develop a "best management practices" document for dentists, scheduled for completion in May 2000.	Completed, see above.	Ontario MOE
Establish a household hazardous waste collection facility to collect and recycle household products containing mercury in the Cities of London and Waterloo.	Lamp collection facilities are available to households in London, Chatham-Kent, Guelph, Brantford, and Wellington County.	EC
By December 2000, the U.S. EPA will make a determination about whether to regulate mercury emissions from electric utilities.	In December 2000, the U.S. EPA committed to regulating mercury emissions from coal-fired power plants. U.S. EPA will propose regulations by the end of 2003, and promulgate final rules by 2004. The President has committed to proposed legislation that would reduce mercury emissions from power plants as part of a multi-pollutant strategy to reduce air pollution from the power generation sector.	U.S. EPA
Agencies will work with communities to provide sector-specific pollution prevention outreach such as workshops for the medical and dental communities, and other important sectors.	Chlor-Alkali Industry through the Chlorine Institute committed in 1996 to reduce mercury use by 50% by 2006. The industry reported in April 2001 to the U.S. EPA a reduction of 44% between 1995 and 2000. The Institute has produced "Guidelines for Mercury Cell Chlor-Alkali Plants Emissions Control: Practices and Techniques" and in cooperation with the U.S. EPA has developed draft proposed maximum available control technology regulations for chlor-alkali plants. The American Hospital Association and U.S. EPA through the Hospitals for a Healthy Environment (H2E) program have produced a Mercury Virtual Elimination Plan for U.S. hospitals. In addition, workgroups are implementing work plans on various aspects of hospital waste reduction. This year the American Hospital Association reconfirmed its commitment to the H2E program.	U.S.EPA
A mercury reduction strategy is being developed for Ohio	The Ohio Mercury Reduction Work Group was officially formalized in May. They are evaluating mercury programs and regulations; promoting the use of mercury alternatives and collection of retired mercury; and educating industry, government and the general public on ways to reduce sources of mercury. A particular focus is on mercury reduction in schools.	Ohio EPA

Committed Action *From the Lake Erie LaMP 2000 Rpt	Status (2002)	Lead Agency
U.S. EPA commits to ensuring that all Region 5 states will have enforceable regulations and the permit applications that are required to be submitted for municipal waste combustors and for hospital/ medical/ infectious waste incinerators by December 2000.	U.S. EPA has promulgated regulations controlling emissions of mercury and other Hazardous Air Pollutants from municipal waste combusters (MWCs) and Medical Waste Incinerators (MWIs). Large MWCs needed to be in compliance by December of 2000, while small MWCs will need to comply by December of 2005, at the latest. MWIs will need to be in compliance by September of 2002, at the latest.	U.S. EPA
INFORMATION		
Promote to school boards in the Lake Erie basin a mercury stewardship school curriculum program (Pilot being developed in the Toronto School Board).	Project materials and workshops were delivered in over 20 schools across the Thames Valley District School Board and London District Catholic School Board. Mercury lessons and activities for grades 4-8 are available at: www.on.ec.gc.ca/glimr/classroom/millenium/mercury/intre.html.	EC
PROPOSED ACTIONS		
Agencies will provide indirect or direct financial support to businesses, organizations and local governments for pollution prevention projects.	Great Lakes Mercury Clearinghouse: A partnership among Minnesota, U.S. EPA, the Dept. of Energy and EC to develop a prototype web-based clearinghouse on mercury pollution prevention and reduction information, "How to" resource tools, and regulatory information. Project is scheduled to be on-line by Spring 2002.	U.S. EPA EC and states