Dear Great Lakes Colleague:

We are pleased to present enclosed the 2002 Annual Report of the Great Lakes Binational Toxics Strategy: *A Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances (GLBTS).* Thanks to the efforts of a wide range of dedicated Stakeholders in the Great Lakes Region, from industry, non-governmental organizations, local, State Provincial, Tribal and First Nation governments, and academia, 2002 saw continued reductions in key persistent toxics (or Level 1 substances) in the Great Lakes. Accomplishments to date from the baseline year (in parentheses) include:

Mercury emissions reduced by 78% in Ontario (1988) and 40% in US (1990);
Mercury use reduced by 50% in the US (1995);
Dioxin releases reduced by 92% in the US (1987) and 79% in Ontario (1988);
Hexachlorobenzene emissions reduced by 75% in the US (1990) and 65% in Ontario (1990);
Benzo(a)pyrene emissions reduced by 48% in Ontario (1990) and 25% in the US (1990); and,
400,000 cubic yards of sediments remediated including 100,000-200,000 lbs of persistent toxics.

These reductions are a result of a combination of regulatory and voluntary initiatives on both sides of the border. Some examples of voluntary reduction projects under the GLBTS in 2002 include:

Industry's ongoing efforts to phase-out the use of PCBs, with continuing reductions from companies such as Algoma Steel in Canada and Ford Motor Company in the US;
The "Burn-it-Smart!" campaign in Canada, promoting cleaner wood-burning technologies, in an effort to reduce emissions of B(a)P throughout Ontario; and,
The Burn Barrel and Household Garbage education outreach campaign, with Federal, Provincial, State, Tribal, First Nations, and local government working together to promote clean alternatives to household burning and reduce dioxin emissions. This campaign has recently gone national in the US.

These efforts have led to real reductions of persistent toxics in the environment, as shown in Chapter 9 of the report, which presents environmental trends of toxics in fish, gull eggs, sediments and air quality. Of course much remains to be done to achieve the ultimate goal of virtual elimination. Fish consumption advisories are still in place in all five lakes for mercury and PCBs; and, newer chemicals such as polybrominated diphenyl ethers have been detected and are building up in the Basin, calling for the need of the governments and partners to carefully consider how the GLBTS should respond.

All in all, this next year promises to be an important and exciting one for the GLBTS. The next Stakeholders Forum and Integration Workgroup Meeting will take place on May 14th and 15th

respectively, at the Delta Chelsea in Toronto. Thank you for your continued support of the GLBTS. If you have any questions, please contact Alan Waffle, Environment Canada at (416) 739-5854, or Ted Smith, USEPA, at (312) 353-6571.

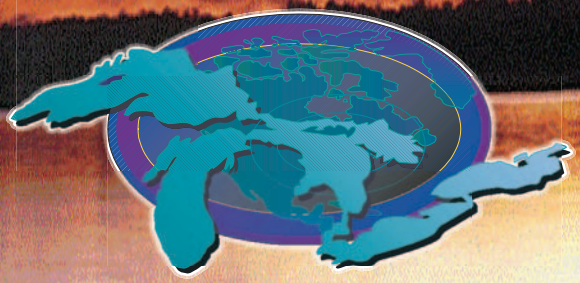
Sincerely,

Danny Epstein,
Canadian Co-Chair GLBTS
Regional Director
Environment Protection Branch
Ontario Region
Environment Canada

Gary Gulezian,
United States Co-Chair GLBTS
Director
Great Lakes National Program Office
USEPA

2002

GREAT LAKES BINATIONAL TOXICS STRATEGY



Annual Progress Report

EPA

Canada

Great Lakes Binational Toxics Strategy

2002 Progress Report

Beached Kayaks in Pukaskwa National Park
Ontario, Canada
Photo by Robert F. Beltran

TABLE OF CONTENTS

Page

NOTES

OVERVIEW

This past year, 2002, was a productive one for the Great Lakes Binational Toxics Strategy: A Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances (hereafter the GLBTS or Strategy). Thanks to the efforts of many dedicated stakeholders in industry, non-governmental organizations, academia, federal, State, Provincial, municipal, Tribal and First Nation governments, and other interested citizens, 2002 saw continuing progress in ongoing source reductions of key persistent toxic substances in the Great Lakes Basin. This year also marked the half way point in the ten-year time-line of the GLBTS, in which many of the interim challenge goals for Level I[1] persistent toxic substances have already been achieved. Of course the ultimate goal of the GLBTS remains the virtual elimination of persistent toxic substances into the Great Lakes Basin. As Canada and the United States, along with the many partners of the GLBTS take note of these achievements, attention now turns to the next five years, and the additional progress we can make toward virtual elimination.

BACKGROUND

Signed in April 1997, the GLBTS represents one recent chapter in a long history of cooperative partnership between the governments of Canada and the United States, to protect and sustain the overall health and integrity of the Great Lakes Basin Ecosystem. Recognizing the vital importance of this massive natural freshwater system, in 1972, Canada and the United States signed the Great Lakes Water Quality Agreement (GLWQA), which established a joint, bi-national commitment by the governments to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem. The GLWQA was amended in 1978, to include the goal to virtually eliminate persistent toxic substances in the Lakes, and again in 1987 to include Lakewide Management Plans (LaMPs) to identify and eliminate "critical pollutants" that pose a threat to human and ecosystem health.

The GLBTS was conceived specifically in response to the International Joint Commission's (IJC) 1994 Seventh Biennial Report on Great Lakes Water Quality. The IJC, an independent body of government appointed commissioners with responsibility to assist and evaluate

Cascade River Falls at Lake Superior
CascadeRiver, Ontario, Canada
Photo by Robert F. Beltran

both governments' efforts under the GLWQA, called upon the governments to "adopt a specific, coordinated strategy within two years with a common set of objectives and procedures for action to stop the input of persistent toxic substances into the Great Lakes environment."

IMPLEMENTATION

The GLBTS is co-chaired by Environment Canada and the U.S. Environmental Protection Agency (USEPA) and includes the active participation of many stakeholders in industry, non-governmental organizations, academia, State, Provincial, municipal, Tribal and First Nation governments, and other interested citizens. The GLBTS implements the intent of the GLWQA to virtually eliminate persistent toxic substances into the Great Lakes through the following four step process, which:

Identifies any and all sources of persistent toxic substances in the basin;

Assesses the effectiveness of existing programs for addressing those sources;

Identifies other "cost-effective" options for further reducing inputs of these substances from those sources; and,

Implements actions to work toward the goal of virtual elimination.

[1]GLBTS Level 1 substances are mercury, PCBs, dioxins/furans, hexachlorobenzene, benzo(a)pyrene, octachlorostyrene, alkyl lead, aldrin, dieldrin, mirex, chlordane, toxaphene, and DDT. They are linked to, or have the potential, to cause deleterious environmental impacts in the Great Lakes Basin. These substances occur in the water, sediment or aquatic biota of the Great Lakes Ecosystem and exert, singly or in a synergistic or additive combination, a toxic effect on aquatic, animal, or human life. They represent the immediate priority for virtual elimination through pollution prevention and other actions that phase out the use, generation or release of these substances in a cost effective manner.

Steps 1-3 have been completed and Step 4 is well underway for the twelve Level I substances. The GLBTS also calls upon the governments to address Level II[2] substances through pollution prevention activities. The Level II list includes substances that were nominated by one or both countries as having the potential to cause a significant impact in the Great Lakes Basin Ecosystem.

ABOUT THIS REPORT

This report presents a comprehensive summary of activities and accomplishments under the GLBTS for the year 2002. Chapters 1-4 present highlights of active Substance-Workgroups for mercury, PCBs, dioxins/furans, and HCB/B(a)Ps respectively, including a review of major projects, and progress in source reductions toward each of the interim challenge goals on both sides of the border. The GLBTS Challenges for Octachlorostyrene, Alkyl-Lead and the Level I Pesticides have been met and only limited Work Group activities are continuing. As a result, this Progress Report does not specifically report on these substances. Additional progress and information on these substance will be reported in the future as it becomes available. Chapter 5 provides a synopsis of the four quarterly Integration Workgroup meetings, including a summary of presentations, policy discussions and key decisions. Chapter 6 presents a summary of activities by some of the key stakeholders on the GLBTS, with a focus on mercury reduction projects. Chapter 7 provides a detailed account of sediment remediation projects to date, including an estimate of volumes remediated or capped and the remaining volumes of contaminated sediments in specific Areas of Concern (AOC) in the basin. Chapter 8 presents the scope of an upcoming long-range transport Workshop planned for summer 2003 in Chicago. Finally, Chapter 9 presents environmental indicators of progress in the Great Lakes basin, including trends of Level I substance concentrations in ambient air, fish tissue, herring gull eggs and sediments. A summary of highlights in each chapter is provided below.

MERCURY

Canadian progress toward of the challenge goal of 90 percent reductions in emissions is well advanced, currently standing at 78 percent. The U.S. goal of 50 percent reductions in national emissions are also well advanced at 40 percent, and the U.S. goal of 50 percent reductions in use nationally has been met. Mercury reduction activities continued unabated in 2002, on both sides of the border. On the Canadian side, the City of Toronto reported that in the past year, mercury loads to municipal treatment facilities fell 40-68 percent. The Mercury Switch-Out program, started by Pollution Probe in June 2001 to recover mercury from end-of life vehicles, has grown from eleven original participants to now include over 100 participants. On the U.S. side, the Chlorine Institute reported a 75 percent reduction in mercury use at chlor-alkali plants between 1995 and 2001, far exceeding the original goal of 50 percent. The Hospitals for a Healthy Environment Program (H2E) continued to recruit new members. In 2002, H2E reported a total of 335 volunteer partners, representing 1,019 facilities, 347 hospitals, and 618 clinics, all pledged to eliminate mercury in their respective facilities. A symposium on dental amalgam waste was held in Chicago on December 2, 2002. Proceeds of this symposium and a best management practices brochure will be widely disseminated on both sides of the border.

PCBs

Environment Canada reports that 84 percent of high-level PCB equipment has been destroyed as of 2002, against a challenge goal of 90 percent, with over 1,000 tonnes destroyed this past year. This is up sharply from 40 percent in 1998. On the U.S. side, estimates are being revised to include the disposal of non-registered transformers. Current reduction estimates are 30 percent for high-level transformers and 10 percent for high-level capacitors, against a challenge goal of 90 percent for each, however, it is thought that these figures are low, and will be amended in the near future. Environment Canada is in the process of amending three PCB regulations that will hasten the disposal of both high and low Level In-service PCB equipment. USEPA and Environment Canada continue to solicit reduction commitments from various sectors across the Basin. In 2002, Environment Canada conducted a mass mailing to 400 school boards and other sensitive sites seeking commitment to become PCB-free. USEPA is currently seeking similar commitments working with 30 trade associations representing a variety of industries across the Basin. With respect to industry actions in 2002, on the Canadian side, Algoma Steel reports having destroyed 13,300 kg of PCBs as of 2002 and intends to eliminate 71,103 kg by December 2005. On the U.S. Side, Ford Motor Company committed to phase-out all PCB transformers globally by 2010.

[2] Level II substances include cadmium and cadmium compounds, 1,4 dichlorobenzene, 3,3' dichlorobenzidine, dinitropyrene, endrin, heptachlor (and heptachlor epoxide),hexachlorobutadiene and hexachloro 1,3 butadiene, hexachlorocyclohexane, 4,4' methylenebis(2 chloroaniline), pentachlorobenzene, pentachlorophenol, tetrachlorobenzene (1,2,3,4 and 1,2,4,5), tributyl tin, and PAHs as a group, including anthracene, benzo(a)anthracene, benzo(ghi)perylene,perylene, and phenanthrene.

DIOXINS AND FURANS

The U.S. dioxin goal of 75 percent reductions in nation-wide releases has been surpassed and is predicted to be 92 percent by 2004. The Canadian goal of 90 percent reductions of releases in the Great Lakes Basin is well advanced at 79 percent. The Burn Barrel and Household Garbage education outreach campaign continued to be a top priority for the GLBTS Dioxin and Furan Workgroup in 2002. In April, a workshop, "Burning Household Garbage: Impacts and Alternatives" was held in Thunder Bay, and in May, a public web-site, www.openburning.org, was launched to provide educational information to the public on trash and open burning in the Great Lakes region. Also in 2002, USEPA's Office of Solid Waste commenced a nation-wide burn barrel campaign, patterned after the GLBTS campaign. Both countries added reporting requirements for dioxins and furans in reporting year 2000 to the Toxics Release Inventory (TRI - U.S.) and the National Pollutant Release Inventory (NPRI - Canada). This will greatly improve future tracking of dioxin and furan emission reductions.

HCB/B(a)P

The U.S. and Canada continue to make reductions in HCB and B(a)P emissions in 2002. Canadian HCB and B(a)P release reductions stand at 65 percent and 48 percent respectively, while U.S. reductions are 75 percent and 25 percent respectively. Canada Wide Standards developed for mercury, particulate matter, ozone and benzene, and under development for dioxins and furans, are expected to bring about reductions in HCB and B(a)P over the next 5-15 years. Canadian Council of Environment Ministers has agreed to undertake joint initial actions by 2005 to reduce emissions from residential wood burning appliances as well. A national roll out of Natural Resource Canada's "Burn it Smart!" pilot commenced in 2002. Free residential wood burning workshops will be held in 28 regions across Canada between September 2002 and March 2003, to help Canadians burn wood safer, cleaner and more efficiently. In the U.S., there has been a steady decrease in B(a)P emissions from wood stoves as a result of past change-out programs and outreach. Test data has confirmed that petroleum refineries are no longer a significant source of B(a)P emissions and emissions from coke ovens continue to decline. In addition, previously significant B(a)P emissions from primary aluminum reduction have been controlled. Chemical plants (Albemarle, Dow and Vulcan for the most recent period) continue to make changes resulting in greatly reduced HCB emissions. Efforts are continuing to determine the extent of HCB emissions from pesticide application, likely the largest source of HCB emissions.

INTEGRATION WORKGROUP/ STAKEHOLDER FORUM

The Integration Workgroup met four times in 2002, twice in Windsor (February 26 and May 30) and twice in Chicago (September 18 and December 4). Semi-annual Stakeholder Forums were held in Windsor (May 29) and Chicago (December 3). One of the highlights of 2002 was a five-year milestone event, held on May 29 and 30 in Windsor. The governments hosted a special reception for all stakeholders, past and present, in appreciation of their hard work on the GLBTS. The May 29 Stakeholder Forum featured a number of stakeholder-lead projects, a comprehensive progress report on the status of the Level I challenge goals, and a special State of the Lakes panel presentation on current trends of Level I substances in Great Lakes ambient air, fish tissue, gull eggs and sediments (an updated presentation of this information is presented in Chapter 9, further described below).

During the year, the Integration Workgroup discussed a number if issues, including: Level I challenge goals; current status and potential new challenge goals in the future; chemicals of emerging concern; and, new Publicaly Owned Treatment Works (POTW) and municipal sector pilot projects. Other major topics of discussion included: the special contribution of urban sources to the Basin; industry pollution prevention activities respecting GLBTS Level II substances; and, expanding GLBTS communications and outreach capacity.

PARTNERS AT WORK

This chapter presents some of the activities of key GLBTS stakeholders, with a focus on mercury reduction projects. These include projects by the National Wildlife Federation (NWF) on mercury reduction and phase out strategies in Michigan; the Michigan Department of Environmental Quality (MDEQ) P2 programs to reduce anthropogenic sources of mercury in the environment; WE Energies efforts to replace mercury containing equipment, and also reduce mercury in emissions in one of their power plants; Wisconsin Department of Natural Resources (WDNR) "Mercury Roundup" program; Superior Wastewater Treatment Plant (Superior WWTP) burn barrel program, sponsored mercury collection events, mercury free schools program and dental mercury best management practices education efforts; Western Lake Superior Sanitary District (WLSSD) work with local dentists to install dental amalgam separators, and other mercury source reduction programs; the National Electrical Manufacturers Association (NEMA) efforts to reduce the use of mercury in batteries, lamps and thermostats; the Indiana Department of Environmental Management (IDEM) Mercury Thermostat and Recycling Pledge Program; Great Lakes United's (GLU) Clean Car Campaign; the Canadian Steel Producers Association's (CSPA) numerous efforts to reduce mercury, PCBs,

dioxins/furans, and B(a)P; and, the Council of Great Lakes Industries (CGLI) numerous efforts as a key liaison between the governments and industry stakeholders.

SEDIMENTS CHALLENGE

Progress on sediment remediation in the Great Lakes Basin continued in 2002 with nearly 400,000 cubic yards of sediments remediated from five U.S. sites in the Great Lakes Basin. These sites include Harp, Fields Brooke Superfund Site, Reynolds Metals/Alcoa east, Saginaw River and Bay, and Pine River. The cumulative volume of remediated Basin sediments in the U.S., since 1997 are now estimated at approximately 2.4 million cubic yards. On the Canadian side, at Port Hope harbour, an agreement between the federal government and the Town of Port Hope was reached in March 2001, on the development of the harbour, which has led to environmental planning and assessment activities under the Canadian Environmental Assessment Act. At Thunder Bay Harbor (Northern Wood Preservers), 11,000 cubic metres of contaminated sediments were shipped to Princeton, BC for thermal desorption treatment, and in Severn Sound, sediment monitoring led to the conclusion that impairments related to the degradation of benthos and restrictions on dredging have been overcome. Residual sediment contamination will be left to natural recovery.

LONG-RANGE TRANSPORT

This chapter presents an update on the numerical investigation of the budget and loading of gamma - hexachlorocyclohexane (HCH) over the Great Lakes, developed by the Meteorological Service of Canada. Principal findings are that the HCH burden in the atmosphere around the Great Lakes depends primarily upon usage, volatilization and subsequent long-term transport from the canola fields in the Canadian prairie-provinces, whereas contributions from usage in the cornfields of Ontario and Quebec are negligible. This chapter also presents the preliminary scope of a long-range transport expert's workshop, being planned for summer 2003, in Chicago. The objective of this workshop is to address specific questions related to the long-range transport challenge goal regarding the relative contributions of Level I substances to the Great Lakes Basin from out-of-basin sources.

ENVIRONMENTAL INDICATORS

The efficacy of our efforts under the GLBTS is ultimately measured by reductions of Level I and II substance concentrations in the Great Lakes Basin Ecosystem. To that end, this year's annual report includes a special State of the Lakes review of Level I substances in the environment of the Great Lakes Basin. Canadian and U.S. monitoring data of environmental indicators are presented for Level I substances in ambient air, fish tissue, gull eggs and sediments. In general, concentrations of PCBs, DDT, dioxins and furans, HCB, and mercury in the environment have trended downward over the past 15-20 years, with some leveling off in recent years. However, fish advisories are still in place in all five lakes for PCBs and mercury, pointing out the need to continue to seek source reductions, and especially to continue to address the legacy of contaminated sediments in the Basin. The governments in 2003 will investigate some anomalous readings of increasing concentrations of OCS in gull eggs.

OUTLOOK 2003

This next year, 2003, presents a crucial opportunity for stakeholders to define the long-term future of the GLBTS. As current Level I substances continue to decline and current challenge goals are met and/or surpassed, stakeholders must consider next steps to move closer toward the ultimate goal of virtual elimination of persistent toxic substances in the Great Lakes Basin. This will require careful consideration of additional activities to effect reductions of active Level I substances (e.g., mercury, PCBs, dioxins/furans, HCB/B(a)Ps), especially where some of the "low hanging fruit" projects have already been accomplished. It may also mean acknowledging that there are Level I substances for which there are no further significant voluntary reduction opportunities within the GLBTS. This is because the issues at stake are being addressed in a another fora (e.g., alkyl lead in aviation fuel by national PBT programs) or because reservoir sources are being addressed over long time periods by other programs (e.g., pesticide stockpiles by State agricultural clean sweep programs). Of course the GLBTS will continue to monitor and report on the progress of these other efforts, as they proceed.

To ensure continuing progress, the GLBTS must continue to work closely with the national programs of each country, as well as larger multi-stakeholder geographic fora such as the Commission for Environmental Cooperation's Sound Management of Chemicals (CEC SMOC) and the United Nations Environment Program's Persistent Organic Pollutants (UNEP POPS) programs. Out-Basin sources of persistent toxic substances and their relative contributions to the Lakes must be reasonably well understood in order to set-forth realistic in-Basin reduction goals and to maintain realistic expectations of the attendant impacts to levels in the Ecosystem. The upcoming long-range transport workshop planned for the summer 2003 in Chicago is being designed to help answer these questions. The GLBTS intends to co-host its May 2003 Stakeholder Forum and Integration Workgroup Meetings with the CEC SMOC, in an effort to work more closely with this organization.

Stakeholders should also take consideration of new or emerging chemicals of concern in the Basin. With respect to chemicals of emerging concern, the GLBTS states that, "EC and USEPA in cooperation with their partners will

periodically examine the substances addressed by the Strategy to determine whether any Level II substances should be elevated to the Level I list, whether new substances which present threats to the Great Lakes Ecosystem should be considered for inclusion on the Level I or II lists, and whether any other changes should be made". It also states, "Existing processes for nominating or elevating substances will be used, e.g., Bioaccumulative Chemicals of Concern (BCCs) in the U.S., the Canadian Environmental Protection Act (CEPA) in Canada, or LaMP Critical Pollutants." To this end, the GLBTS Integration Workgroup intends to design a decision protocol for considering new substances through the GLBTS, which integrates the existing processes above, with some important Basin specific questions regarding the appropriate vehicles for seeking reductions of particular substances.

All in all, this next year promises to be a challenging and exciting one for the GLBTS.

For further information on the Great Lakes Binational Toxics Strategy contact:

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or access the GLBTS's website at
www.binational.net

Double Crested Cormorant
Lakeview Wildlife Management Area
New York

1.0 MERCURY

Canadian Workgroup co-chair: ***Robert Krauel***

U.S. Workgroup co-chair: ***Alexis Cain***

Progress Toward Challenge Goals

U.S. Challenge: Seek by 2006, a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity.

Canadian Challenge: Seek by 2000, a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin.

U.S. mercury emissions decreased approximately 25 percent between 1990 and 1996, with significant additional reductions occurring through the present as the result of regulatory controls on emissions from incineration of medical and municipal wastes. Estimated mercury emissions have decreased more than 40 percent between 1990 and 2001 (see Figure 1-1), although updated official inventories are not available. By 2006, additional regulations and voluntary activities are expected to reduce mercury emissions by 50 percent or more, achieving the reduction challenge. For more information, see http://www.epa.gov/region5/air/mercury/progress.html.

While U.S. mercury use declined in the late 1990s, progress since 1997 is difficult to gauge quantitatively given changes in the sources of data about mercury consumption. Available data indicate that mercury use declined more than 50 percent between 1995 and 2001; much of this decrease is attributable to decreased mercury use by the chlor-alkali industry, which accounted for an estimated 35 percent of mercury use in 1995. Figure 1-2 provides two different estimates of projected U.S. mercury use for 2001, in comparison to the Strategy goal of a 50 percent reduction by 2006 (from a 1995 baseline). For a more detailed evaluation of data and assessment of progress, see http://www.epa.gov/region5/air/mercury/progress.html.

In Canada, mercury releases have been reduced by 78 percent from the 1988 baseline. Figure 1-3 illustrates the progress made toward the Canadian 90 percent reduction target. This figure shows that releases in Ontario have been cut by more than 11,000 kilograms since 1988, based on Environment Canada's 2000 mercury inventory.

Workgroup Activities and the 4 Step Process

The focus of the Mercury Workgroup has been on Steps 3 and 4: the examination and implementation of reduction options, and the development of partnerships and commitments. The following draft reports have been

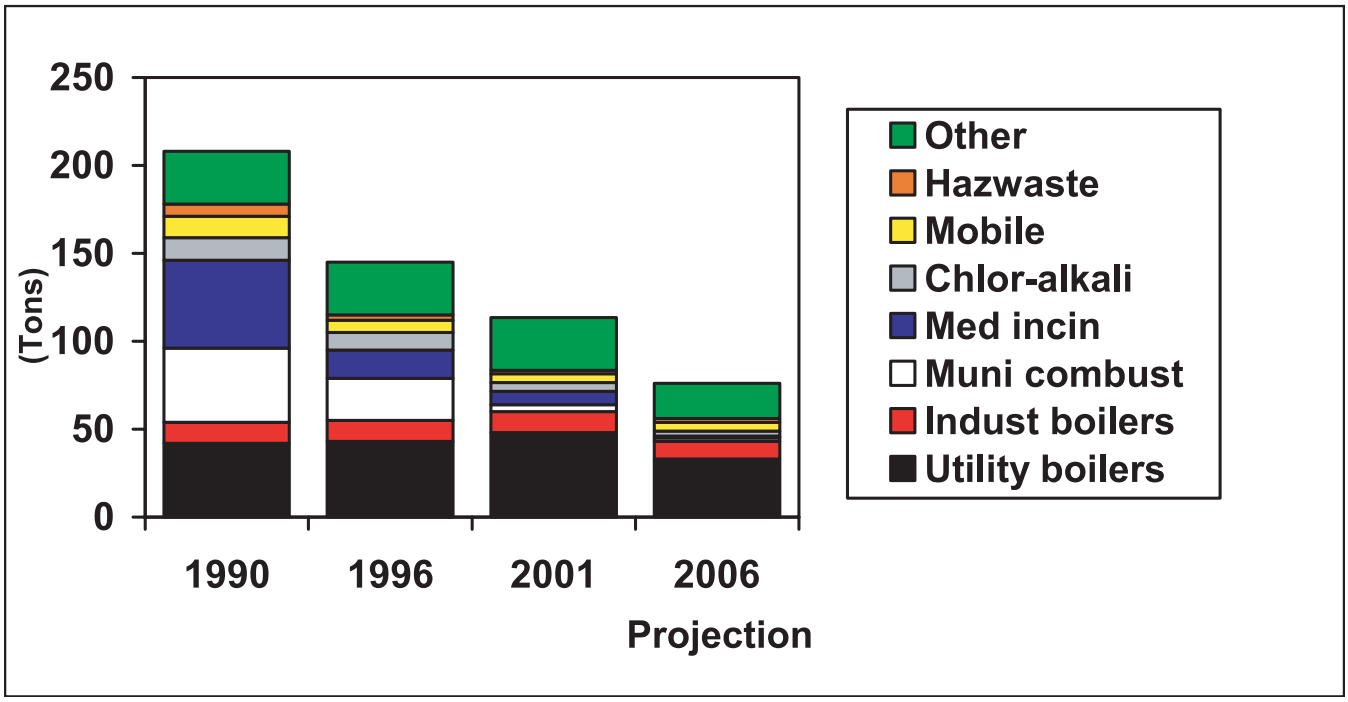


Figure 1-1. U.S. Mercury Emissions: 1990 Baseline, 2006 Challenge[3]

[3] Estimates are based on the 1993 and 1996 National Toxics Inventory data, with adjustments to this data as described in http://www.epa.gov/region5/air/mercury/progress.html.

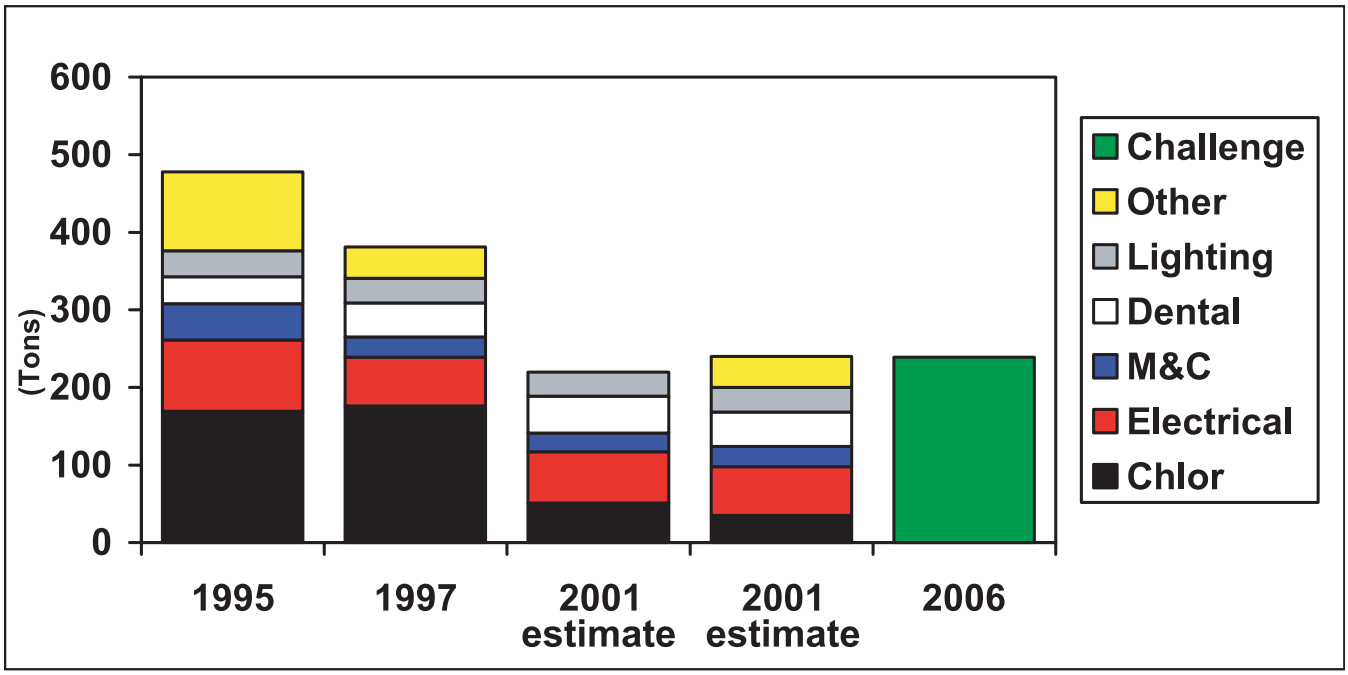


Figure 1-2. U.S. Mercury Use: 1995 Baseline, 2006 Challenge[4]

posted to the GLBTS web-site: U.S. Sources and Regulations (Steps 1 and 2) (http://www.epa.gov/glpno/bns/mercury/stephg.html), and Mercury Reduction Options (Step 3) (http://www.epa.gov/glnpo/bns/mercury/Draft_Report_for_Mercury_Reduction_Options.pdf).

Reduction Activities

Numerous mercury reduction activities are occurring in Canada to meet the goal of reducing releases of mercury in the Great Lakes Basin, and in the U.S. to meet the goal of reducing the deliberate use of mercury and releases of mercury nationwide. The following is a selection of activities reported by Mercury Workgroup participants. Links to web-sites with additional details about many of these activities can be found at http://www.epa.gov/Region5/air/mercury/mercury.html.

Chlorine Industry Voluntary Mercury Reduction Commitment: The Chlorine Institute released its Fifth Annual Report to EPA, showing a 75 percent capacity-adjusted reduction in mercury use by the U.S. chlor-alkali industry between 1995 and 2001, more than meeting this sector's commitment to reduce mercury use 50 percent by 2005. Including shutdowns of mercury cell factories, mercury use has decreased 81 percent. The Institute's Mercury Issues Management Steering Committee continues to work to promote mercury reduction at chlor-alkali facilities.

Hospitals for a Healthy Environment: The Hospitals for a Healthy Environment (H2E) program has 335 partners representing 1,019 facilities: 347 hospitals, 618 clinics, 22 nursing homes and 32 other types of facilities. These partners are health care facilities that have pledged to eliminate mercury and reduce waste, consistent with the overall goals of H2E. Region 5 hosted a H2E Conference for hospital representatives and Technical Assistance Providers, focusing on waste reduction tools available through the H2E program and compliance assistance information from USEPA, Illinois EPA, and the Metropolitan Reclamation District of Greater Chicago.

Healthcare EnviroNet: The Canadian Centre for Pollution Prevention, with support from Environment Canada, Health Canada, and the Canadian Coalition for Green Health Care, maintains online pollution prevention information to assist health care professionals at www.c2p2online.com.

Canadian Coalition for Green Health Care: The Coalition and the Ontario Hospital Association (OHA) organized seminars on environmental programs, products, and services during the OHA annual convention held November 18 to 20, 2002. The program included an exhibit area (the "Green Lane"). The Coalition also

[4] Estimates for 1995 through 1997 is from the US Geological Survey, 1997 Minerals Yearbook and 1996 Minerals Yearbook, at http://minerals.er.usgs.gov/minerals/pubs/commodity/mercury/. Estimates for 1999 are from Bruce Lawrence, "Sources, Demand, Price and the Impacts of Environmental Regulations," Paper Presented at the U.S. Environmental Protection Agency, Office of Research and Development, Workshop on Mercury in Products, Processes, Waste, and the Environment: Eliminating, Reducing and Managing Risks for Non-Combustion Sources, Baltimore, March 22, 2000. Estimates for 2001 are from Jeff Johnson, "The Mercury Conundrum," Chemical & Engineering News, February 5, 2001, p. 22. Further explanation of this data can be found at http://www.epa.gov/region5/air/mercury/progress.html

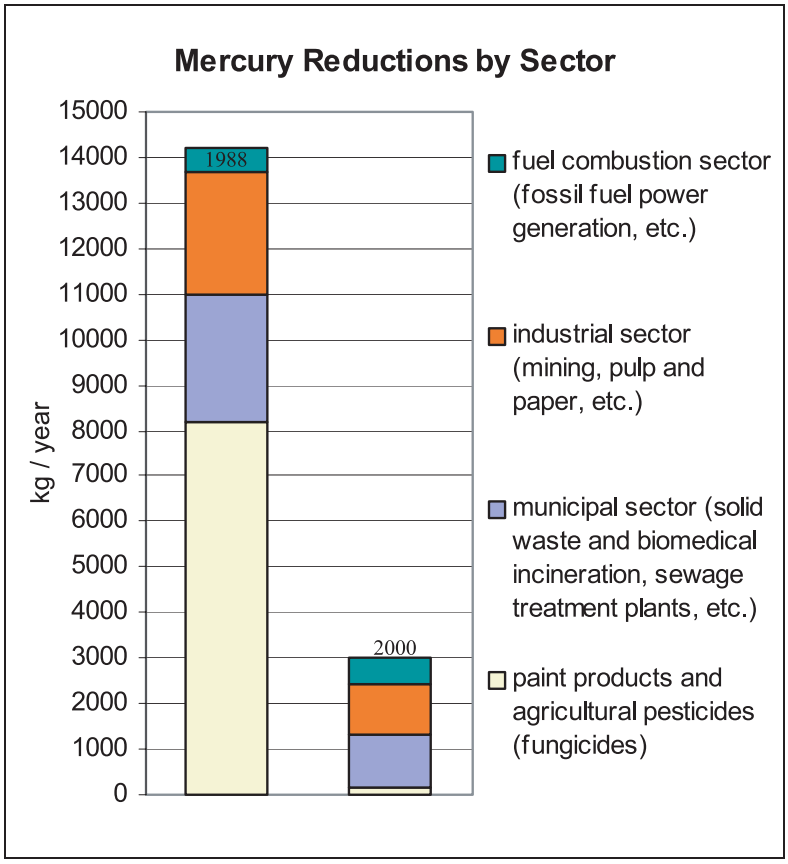


Figure 1-3. Reductions in Mercury Releases in Ontario from 1988 to 2000, by Sector. Source: Environment Canada

assisted in the organization of several mercury thermometer take-back events at affiliated hospitals.

Ontario Ministry of the Environment (MOE): Currently, 44 Ontario hospitals incinerate approximately 1,400 tonnes of biomedical waste and 700 tonnes of municipal solid waste each year. The majority of the hospital incinerators currently in operation are over 20 years old and not designed to handle the composition of biomedical waste currently generated. In December 2001 the Ministry announced that these existing hospital incinerators will be phased out within one year of the proposed regulation taking effect. The regulation has recently come into effect.

In Ontario, there are three waste management firms that operate incineration and non-incineration technologies (autoclave and hydroclave technologies). These facilities have the capacity to manage the increased waste volumes when the existing hospital incinerators close.

EcoSuperior: EcoSuperior has partnered with the Clean Air Foundation to develop the Merc Switch Out program along the north shore of Lake Superior. The program works with automotive recyclers to collect mercury switches from retired vehicles. EcoSuperior's collection programs for button batteries, thermostats, and fluorescent lamps are also continuing.

City of Toronto: Preliminary data indicate that the city's dental waste control efforts are having a positive effect. Although it is too early to say with confidence, mercury loadings to Toronto sewage treatment plants appear to have been reduced by 40 to 68 percent between 2001 and 2002.

Dental Waste Management Working Group: The Dental Waste Management working group is developing a Best Management Practices (BMP) training tool to help train new and practicing dentists, dental hygienists, and assistants on environmentally sensitive management of hazardous dental wastes, including waste dental amalgam. The members of the working group are Ontario Dental Association, Ontario Dental Hygienist Association, Ontario Dental Nurses & Assistants Association, OME, City of Toronto, George Brown College, Durham College, University of Toronto, University of Western Ontario, Royal College of Dental Surgeons of Ontario, College of Dental Hygienists of Ontario, and Environment Canada.

Association of Municipal Recycling Coordinators: The Association of Municipal Recycling Coordinators (AMRC) and the Regional Municipality of Niagara recently completed a nine-month pilot project on behalf of Environment Canada. Mercury-containing switches and sensors were removed from discarded appliances that had been segregated by the Region at two of its waste

handling facilities. The results of the pilot project and the subsequent instruction manual and video have been distributed to municipalities in order to help them set up similar mercury removal programs.

Regional Municipality of Niagara: The Regional Municipality of Niagara is developing a Mercury Elimination Policy and Plan that could be used as a template for use by other upper-tier Canadian municipalities (regions, districts, and counties) in their own operations. The project comprises a number of steps:

Step 1: Regional Council endorses a comprehensive review of its operations for opportunities to reduce/eliminate mercury.

Step 2: Activities and programs in regional departments will be assessed for current mercury management initiatives. This includes equipment purchasing, handling and disposal practices, quantification of mercury inputs/outputs, and an audit of mercury equipment and devices on hand.

Step 3: Mercury pollution prevention plans for each department will be developed and reviewed. Where appropriate, outreach to non-regional facilities that contribute to mercury loadings, such as industries, hospitals, marinas, and schools will be undertaken.

Step 4: Regional Council will be asked to review and finalize a mercury reduction/elimination policy statement, and to endorse the reduction/elimination plans developed for each department.

Merc Switch-Out Program: In June 2001, Pollution Probe initiated a switch-out program to recover mercury switches from end-of-life vehicles. With funding from the Ontario Power Generation, the MOE, and Environment Canada, and in partnership with the Ontario Automotive Recycling Association, the program began with 11 participating auto dismantlers across Ontario. The program has grown to include over 100 participating dismantlers. The program is currently being led by the Clean Air Foundation.

See Section 6.0 for additional information on recent stakeholder activities.

Monitoring

The IJC's *10th Biennial Report on Great Lakes Water Quality* recommended that mercury be added to the list of substances measured in the Integrated Atmospheric Deposition Network (IADN). As well, mercury had been cited since the inception of IADN as a key atmospheric constituent that should be monitored as soon as methods were available. In 2001, equipment was purchased and installed at the two IADN Canadian Master stations (Point Petre and Burnt Island) to measure gaseous and particulate mercury, as well as mercury in precipitation. The protocols employed are consistent with those of the Canadian (CAMNet) and U.S. (MDN) mercury deposition networks. These data will be used by the IADN Steering Committee to calculate updated mercury loading estimates for the Great Lakes.

Next Steps

The Workgroup will continue to share information-sharing about cost-effective reduction opportunities, track progress toward meeting reduction goals, and publicize voluntary achievements in mercury reduction. Particular attention will be paid to information-sharing in areas where mercury releases are significant but there are no federal regulations existing or regulations are under development. For instance, the Workgroup will attempt to focus attention on the contamination of metal scrap by mercury-containing devices, and the resulting emissions, and provide a forum for discussion of cost-effective approaches to addressing this problem. In addition, the Workgroup will focus on the issue of mercury releases from dental offices and will help state and local governments identify cost-effective reduction approaches for this sector. A Mercury Workgroup meeting was held on December 2, 2002 with a focus on this issue and will lead to the production of a report on dental sector mercury reduction options for State and local governments.

2.0 POLYCHLORINATED BIPHENYLS (PCBs)

Canadian Workgroup co-chair: ***Ken De***

U.S. Workgroup co-chair: ***Tony Martig***

Progress Toward Challenge Goals

U.S.Challenge: Seek by 2006, a 90 percent reduction nationally of high-level PCBs (>500ppm) used in electrical equipment. Ensure that all PCBs retired from use are properly managed and disposed of to prevent accidental releases within or to the Great Lakes Basin.

Canadian challenge: Seek by 2000, a 90 percent reduction of high-level PCBs (>1 percent PCB) that were once, or are currently, in service and accelerate destruction of stored high-level PCB wastes which have the potential to enter the Great Lakes Basin, consistent with the 1994 COA.

As of April 2002, approximately 84 percent of high-level PCB wastes had been destroyed, up from approximately 40 percent in the Spring 1998 when work in support of the GLBTS commenced. Over the past year, approximately 1,000 tonnes of high-level PCBs were destroyed (Figure 2-1), and as of April 2002, approximately 703 of those sites (both federal and private) are PCB-free (no PCBs in use or in storage, see Figure 2-2).

Rates of PCB phase-out have declined in recent years because remaining PCB equipment is difficult or expensive to replace and the fate of the Canadian PCB incinerator in Swan Hills, Alberta, is still uncertain. However, the Canadian government is planning to regulate PCB phase-out dates (see description under Regulatory Activities). Awareness among owners continues to increase due to continuing PCB outreach, sector mail-out of information, and voluntary commitment letters.

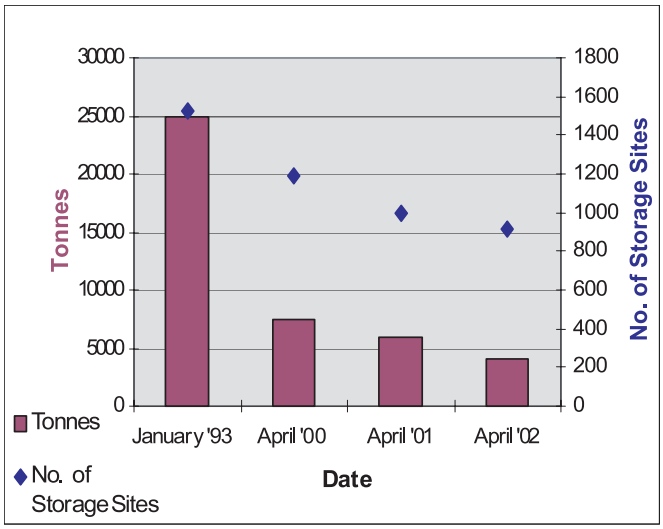


Figure 2-1. High-Level PCBs and Number of Storage Sites in Ontario. Source: MOE

In addition to the Alberta Swan Hills incinerator, newer facilities and options are now available in Ontario for PCB decontamination and destruction. Owners of large quantities have been able to incorporate PCB phase out/destruction activities into multi-year operating plans.

Distribution of PCBs In Use and In Storage by Industry Sector

The pie charts in Figure 2-3 identify the priority sectors that still have a considerable amount of high-level PCBs in use. These sectors include iron/steel, school/care, facility/food processing (sensitive areas), governments, and mining/smelting. These sectors need to be targeted for decommissioning PCBs.

Figure 2-3 identifies provincial (Ontario) and municipal governments, iron/steel, and forestry/pulp/paper as three major sectors that need to be targeted for destruction of high-level PCBs in storage.

According to annual reports submitted to USEPA by PCB disposers, about 71,000 PCB transformers and over 141,000 PCB capacitors were disposed of between 1994 and the end of 2000. After applying this to the 1994 baseline, the estimated amount remaining at the beginning of 2001 is less than 129,000 PCB transformers and less than 1,332,000 PCB capacitors. However, the amount of PCB equipment disposed since 1994 is likely higher and the amount remaining is likely lower. The reports do not include PCB transformers that have been reclassified or some capacitors which may be on the reports under the category of PCB article containers. The 1999 PCB Transformer Registration Database shows that there are approximately 20,000 PCB transformers currently registered and in-use in the U.S., but the actual number remaining in use is likely higher.

Nonetheless, reductions of PCB transformers and capacitors continue. USEPA continues to evaluate ways to try to better quantify data and help track progress toward meeting the U.S. challenge.

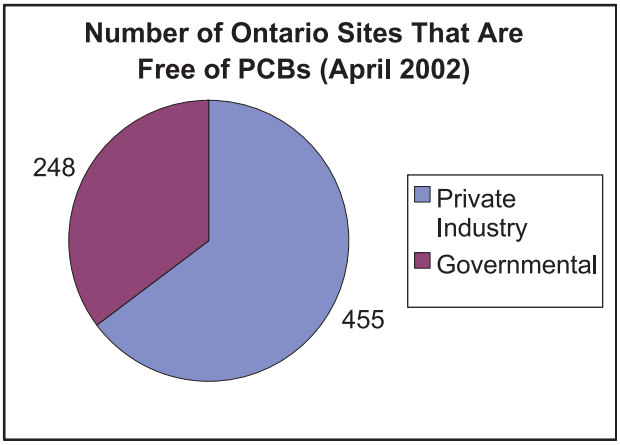


Figure 2-2. Number of Ontario Sites That Are Free of PCBs
Source: Environment Canada and MOE

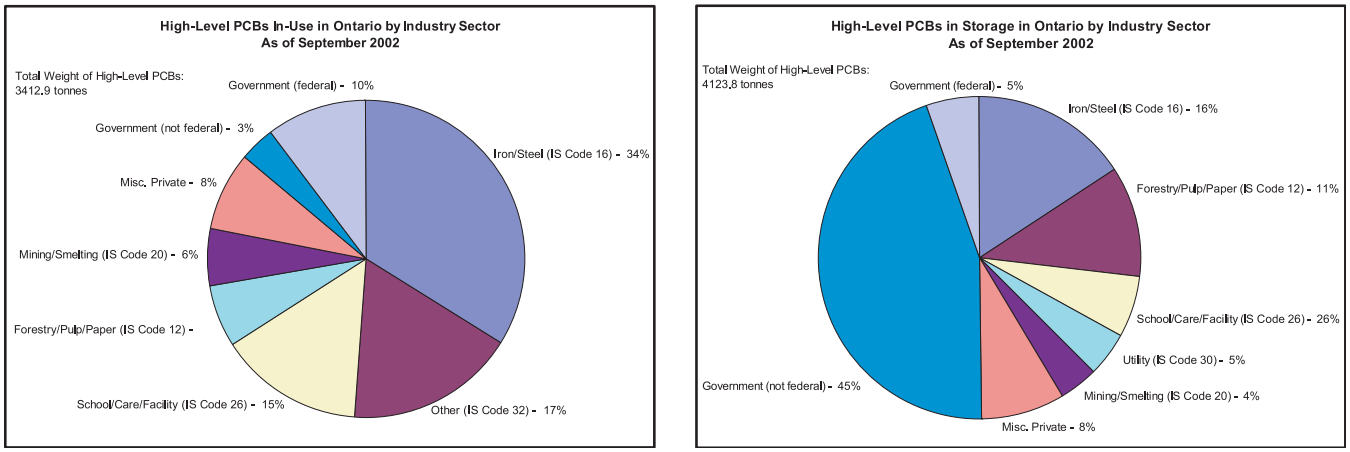


Figure 2-3. High-Level PCBs In Use and In Storage In Ontario
Source: Environment Canada and MOE

Workgroup Activities and the 4 Step Process

The focus of the PCB Workgroup in the past year has been on Steps 3 and 4: the identification and implementation of reduction options. Workgroup activities included continued development of an outreach and communication plan and the Workgroup web page: planning and implementation of outreach efforts; and, seeking voluntary reduction of PCB electrical equipment.

Reduction Activities

PCB Reduction Commitment Letters

Canada: PCB reduction commitment letters were first mailed in late 1999. Letters continue to be sent to new industry sectors. In October 2002, an additional 400 letters were sent to school boards and other sensitive sites (food, beverage, hospitals, care facilities, and water treatment industries).

U.S.: USEPA worked toward implementing a national mailing combined with an advertisement campaign. USEPA drafted information for the mailing and contacted many facilities on the PCB transformer registration database and approximately 30 national trade associations representing facilities from industry sectors associated with the companies that registered PCB transformers. USEPA also met with several States to confirm their PCB reduction status. The national mailing and advertisement campaign should be implemented in 2002. Current plans are to mail information on reducing PCBs to about 10,000 individual businesses and 30 national trade associations. Follow-up will be conducted with many of the individual facilities and all of the associations. Additional follow-up is needed with the States.

U.S. PCB Phasedown Program: USEPA began work to expand the offer of participation in the PCB Phasedown program to additional facilities in the Region, seeking their commitment to reduce high-level PCBs used in electrical equipment as part of the pilot project.

U.S. PCB Phase Out at Federal Facilities: In an effort to reduce the PCB equipment owned by the U.S. government, USEPA drafted a letter from a senior USEPA official to counterparts at the other federal departments and agencies seeking reductions of their PCBs. The draft letter is under review by USEPA Headquarters.

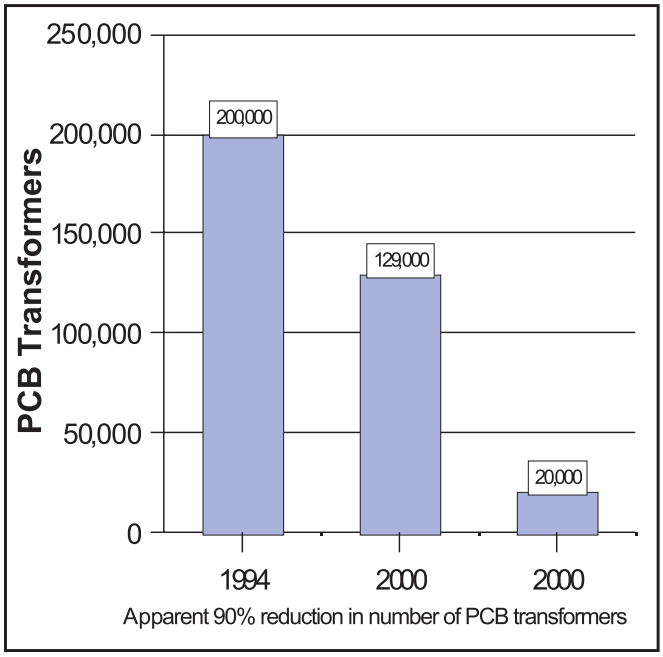


Figure 2-4. Estimated In-Service U.S PCB Transformers, Source: USEPA

Information Resources: The web-site for the PCB Workgroup was updated, and information that the Workgroup had been working on was posted (see www.epa.gov/glnpo/bns/pcb). The new information included photographs of transformers and capacitors, which should help increase the awareness of the types of equipment that may contain PCBs by displaying actual examples of the equipment; a fact sheet on submersible well pumps; and a case study on the removal of PCBs provided by Bethlehem Steel, which is intended to promote the removal of PCBs by companies that have not yet done so by providing examples of beneficial factors considered when companies decided to remove their PCBs. In addition, the Workgroup is updating the standard presentation that can be used by members and non-members to help describe the GLBTS, the PCB challenges, Workgroup actions, and PCB reduction commitments being sought when they meet and associate with other potential stakeholders. All of this information is intended to encourage and facilitate the identification and removal of PCB equipment.

Outreach and Communication: A survey was sent to PCB Workgroup members on the utility of the PCB website, which was reformatted in 2001 (http://www.epa.gov/glnpo/bns/pcb). While respondents were satisfied with many aspects of the website, suggestions for further improvements were made. These included, for example, providing more information on health and environmental impacts of PCBs, more information on reduction activities, and additional links to other websites. Many of the suggestions made are being implemented.

The Workgroup previously decided to try to publish an article on PCB disposal trends (e.g., disposal costs are expected to continue to rise), based on a compelling presentation made to the Workgroup. The Workgroup has made initial contacts to several environmental management journals.

The Workgroup has developed a standard presentation that can be used by members and non-members to help describe the GLBTS, the PCB Workgroup challenges, actions, and PCB reduction commitments being sought when they meet and associate with other potential stakeholders.

The Canadian Workgroup lead has developed a new (draft) plan of outreach in an effort to increase the rate of PCB phase-out. The main elements of the draft plan are to identify and recognize contributions by an individual company, or their industry association, that go beyond regulatory requirements and to publicize success stories. Details of this plan are under discussion by the Workgroup.

Minnesota Pollution Control Agency (MPCA) Small Quantity PCB Owner Disposal Cooperative: The MPCA continues to work with municipalities and rural electric cooperatives, and other small owners of PCB equipment, to accelerate disposal of this equipment. Since receiving a grant, MPCA has secured manufacturers' lists of serial numbers of distribution transformers and has contacted, via letter and phone, nine facilities that were identified as high priorities through a voluntary 1997 PCB survey in northeastern Minnesota. One business reported removing four high-level transformers, and one city reported being PCB-free. Another city is close to being PCB-free (final report expected in January). The other municipalities and co-ops has expressed great interest in the program.

From discussions with transformer owners, it seems likely that the project will mostly deal with PCB-contaminated transformers (i.e., 50-500 ppm) rather than high-level transformers (>500 ppm). Follow-up calls will begin in early December to discuss PCB inventories in detail. Subsequent matching against the manufacturers' lists will further define this issue.

U.S. PBT National Action Plan for PCBs: USEPA continued to work on the draft PBT National Action Plan for PCBs. The draft plan should be released for public comment in 2003. Reducing high-level PCBs used in electrical equipment is one the priorities identified in the plan. USEPA is currently evaluating several proposed projects related to the GLBTS PCB challenge on the phase-out of PCB equipment. These include several outreach initiatives and a project to measure PCB concentrations in ambient air around in-use and in-storage electrical equipment.

Regulatory Activities

Canadian Regulatory Activities: Environment Canada's three PCB regulations are being amended and targeted for Canada Gazette publication in 2002 and 2003. These regulations are:

1) The Chlorobiphenyl Regulations (1977);
2) The Storage of PCB Material Regulations (1992); and,
3) Export of PCB Regulations (1996).

Environment Canada is currently drafting revisions to the Chlorobiphenyl Regulations and Storage of PCB Materials Regulations under the Canadian Environmental Protection Act. The most significant revision proposed within the regulation is the imposition of strict phase-out dates for certain categories of PCBs. Specifically, the following dates are proposed:

- Phase-out of most high-level (>500 ppm) PCBs in-service by the end of 2007;
- Phase-out of most low-level (50-500 ppm) PCBs in-service by 2014;
- Phase-out of all PCBs in storage by the end of 2009 and allow in-service PCBs to be transferred to storage for one year or less;
- Phase-out of most high-level and low-level PCBs from sensitive locations within three years of the proposed regulations coming into force; and,
- Decontamination of all out-of-service liquids containing PCBs to less than 2 ppm (previously liquids and solids up to 50 ppm could be re-used, recycled or disposed in a landfill).

Extensive public consultation was conducted, and the revised regulations should be published in the Canada Gazette by the end of 2003. More information and updates can be found on the Environment Canada website at http://www.ec.gc.ca/pcb/

Related Activities

PCB Federal Databases in Canada: Federal PCB databases can now be accessed and read from the greenlane website: http://www.ec.gc.ca/PCBDatabase/ . The site has several features including:

- Basic and advanced search capabilities for finding company and PCB inventory information from the PCB databases;
- Detailed search criteria to find specific information on companies and their PCB inventories; and
- A report generator that allows users to format the results of a search and save their reports in either a grid format, Microsoft Excel format, or a printer friendly version format.
- Access to these draft databases is currently restricted. Access to the databases by the general public is anticipated in 2003.

Industry Sector PCB Success Stories

CANADA

Utilities:

- 42 electrical utilities submitted voluntary commitment letters to Environment Canada
- A number of small-to-medium sized utilities in Ontario have achieved 90 percent or better high-level PCB reduction targets:
- Festival Hydro (Stratford, Ont.) – has eliminated all high-level PCBs
    - Hydro Hawkesbury – eliminated all PCBs by 1999
    - Hydro Ottawa – removed all high-level PCBs from service and is planning to remove and treat all low-level PCBs
    - Hydro One (formerly of Ontario Hydro) is free of all high-level PCBs, but still has several small stations and other sources of low-level PCBs. The company has introduced a PCB management program that extends to the year 2020.
- Follow-up will be conducted with utilities with PCBs remaining in use/in storage, that will be asked to commit to develop voluntary destruction plans.

Steel Sector:

- Four steel companies have signed commitment letters.
- Algoma Steel destroyed 13,300 kilograms (8,300 litres) of PCBs as of 2002, and voluntarily committed to eliminate 71,103 kilograms (44,000 litres) of PCBs by December, 2005.
- Stelco achieved a 91 percent reduction of PCBs in storage and a 41 percent reduction of PCBs in service.
- Slater Steel finished removal of all PCBs in 1998.
- Follow-up is being conducted to obtain progress updates and to seek participation of other steel companies.

Automotive:

- The Canadian automotive industry destroyed 4,359 kilograms (133,495 litres) of high-level PCBs in Ontario.
- General Motors, St. Catherines in Ontario is now PCB-free.
- Daimler-Chrysler Canada removed all high-level PCBs from transformers and capacitors and sent them to Swan Hills for destruction.
- Follow-up is being conducted with key companies that may still have PCBs.

Government:

- Windsor and local municipalities in Essex County sent 65,000 kilograms of PCB-contaminated materials to Swan Hills for destruction.
- The federal government has aggressively phased-out PCBs, providing necessary funding to all departments. The Ontario provincial government sites need to become PCB-free as soon as possible. The PCB Workgroup will identify the list of remaining Canadian government sites that need to be PCB-free.

Sensitive Areas:

- In response to an October 2002 mail-out for voluntary PCB reduction commitments, a number of hospitals, schools, and food processing facilities have recently reported being "PCB-free" (see a few sites listed below). Responses were collected in November 2002 and will be followed up.
- Conestoga College and Wilfrid Laurier University have eliminated all high-level PCBs from their inventories.
- Norfolk General Hospital, St. Joseph's Hospital, Sault Area Hospital, Mohawk Hospital in Hamilton, and the London District School Board are PCB-free.
- Shur-Gain, Floradale Feed Mill Ltd, Schneiders Food, St. Lawrence Starch, Coca Cola, Chatham, Elliot Brothers Grain and Feed, and Canamera Foods-Hamilton Plant are PCB-free.
- The Frito Lay, Canada, Cambridge plant is PCB-free.

Others:

- CPPI (Canadian Petroleum Producers Association) and its members have eliminated 90 percent of PCBs thus far.
- General Electric Canada operated a transformer manufacturing facility in Toronto from 1904 until 1991. During 1997-1998, approximately 5,700 tonnes of soil were transported to the Bennett Environmental facility in St.Ambroise, Quebec, for treatment and disposal. In addition, approximately 15 tonnes of other PCB materials were transported to Swan Hills in Alberta for treatment and disposal.

Industry Sector PCB Success Stories

U.S.

General Motors. For several years, General Motors (GM) has been phasing out PCBs from North American facilities. GM's goal is to remove, replace, retrofill, or decontaminate all GM-owned PCB and PCB-contaminated transformers in the U.S. by 2003. In 2001, GM completed the removal of all PCB transformers from its U.S. plants. Consequently, GM estimates that the company saved $5.5 million, with an additional savings of $1.5 million per year in operating costs.

GM conducted two life-cycle cost analyses: 1) retaining the transformers, and 2) replacing or retrofilling them. The life-cycle analyses estimated the costs for compliance, preventative maintenance, repairs, energy losses, spill clean-up, and removal and disposal of the transformer and fluid at the end of its life. GM estimated that it would cost approximately $150 million to replace or retrofill its PCB transformers, and approximately $300 million to retain them. The high costs associated with accidental releases and subsequent clean-ups were the driving force behind GM's decision to phase out PCB materials.

Ford Motor Company. Ford Motor Company committed to phase out all PCB transformers globally by the end of 2010. Referenced to a 1995 baseline, 62 percent of the PCB transformers were phased out in 2001, and 95 percent of the PCB transformers are scheduled to be phased out by the end of 2006, financial conditions permitting.

Cleveland-Cliffs. Cleveland-Cliffs is the leading supplier of iron ore products to the North American steel industry. A voluntary PCB reduction program was initiated by Cleveland-Cliffs several years ago. At its U.S. operations, PCBs have been eliminated at five facilities. Two other facilities have achieved reductions of approximately 50 percent and 25 percent, respectively.

American Electric Power. Since the promulgation of regulations banning the manufacture and limiting the use of PCBs, American Electric Power (AEP) has systematically reduced PCB containing electrical equipment use as system reliability and economics allow. Much of the reduction comes from the process of systematically retiring or decommissioning electrical equipment. Company policy calls for the eventual retrofilling or replacement of known PCB-containing equipment. As a result of these actions and policies, within the Great Lakes Basin, AEP has no known PCB transformers, PCB T/R sets, PCB capacitors on the distribution line system, or PCB capacitors in AEP substations.

Exelon Energy Corporation. Exelon Energy's PCB phase-out plan continued in 2001. Sixty-two pieces of PCB equipment were retro-filled with non-PCB fluid, and 518 PCB capacitors were removed from its system. All of the PCB fluid from the equipment was disposed of in accordance with Federal PCB regulations.

Instituted by Exelon's predecessor companies more than a decade ago, this voluntary program has achieved the removal–or replacement of PCB-filled (fluid with greater than 500 parts per million of PCBs) equipment–of the following:

- almost all transformers;
- all known PCB transformers in commercial buildings;

- all known PCB distribution equipment outside of substations; and,
- 53 percent of all PCB capacitors in PECO Energy substations and 80 percent of all PCB capacitors in ComEd substations.

Exelon continues to explore opportunities for replacing its remaining PCB-filled equipment with advanced, energy-efficient, non-PCB filled alternatives.

USWAG (Utility Solid Waste Activity Group) PCB Reduction Efforts. Over the last year, USWAG electric and gas utility companies continued to conduct a variety of PCB reduction efforts. Many members voluntarily removed virtually all known PCB transformers. Similar voluntary reduction efforts continue with primary PCB capacitors, with many members having removed virtually all large PCB capacitors from their systems or continuing with programs to systematically achieve this result. For example, Detroit Edison is in year 8 of a 10-year commitment to phase out all large substation PCB capacitors. Last year, Detroit Edison removed a total of 869 capacitors from its system, resulting in the removal of approximately 28,400 kilograms of PCB oils from the company's inventory. These efforts are representative of many USWAG member company PCB reduction programs throughout the country.

Additionally, most USWAG companies have systems in place to ensure that any PCB-contaminated equipment identified during repair/servicing is automatically disposed of and not returned to service. For example, Duke Energy identifies and voluntarily disposes over 500 PCB-contaminated transformers per year. Such disposal efforts, combined with voluntary retrofill/reclassification programs, result in the continued reduction of PCB-containing equipment from utility inventories across the country.

Next Steps

The Workgroup plans to continue its core activities, including the following:

PCB Reduction Commitments: The Workgroup will continue seeking commitments to reduce PCBs through PCB reduction commitment letters and other PCB phase-out efforts.

Outreach/Sharing Information: The Workgroup will continue to develop, distribute, and post on the Workgroup website, information which can facilitate and promote, as applicable, the identification and removal of PCB equipment. These include photographs of electrical equipment, fact sheets, case studies which identify reasons companies remove PCBs, and a standard presentation of the PCB Workgroup's challenges and activities. The Workgroup will also continue to consider incentives for removing PCB equipment.

Common Merganser (male and female)
Photograph by Don Breneman

3.0 DIOXINS/FURANS

Canadian Workgroup co-chair: ***Anita Wong***

U.S. Workgroup co-chair: ***Erin White Newman***

Progress Toward Challenge Goals

U.S. Challenge: Seek by 2006, a 75 percent reduction in total releases of dioxins and furans (2,3,7,8-TCDD toxicity equivalents) from sources resulting from human activity. This challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin.

Canadian Challenge: Seek by 2000, a 90 percent reduction in releases of dioxins and furans from sources resulting from human activity in the Great Lakes Basin, consistent with the 1994 COA.

Both countries have made significant progress toward reaching the dioxin/furan reduction goals outlined in the Strategy. Based upon the 1987 baseline inventory, known U.S. dioxin emissions were reduced 77 percent by 1995 and are projected to be reduced 92 percent by the end of 2004. These reductions are primarily the result of implementing the Maximum Achievable Control Technology, or MACT, program under the Clean Air Act. Reductions in the largest inventory categories are shown in Figure 3-1. Once the MACT program has been fully implemented, the largest dioxin source in the U.S. will be household garbage burning.

The U.S. is also investigating numerous dioxin sources that have not yet been added to the inventory. While the U.S. challenge goal for dioxin was met under the Strategy, according to our current inventory, USEPA is concerned about sources not yet quantified. Many of these sources are difficult to inventory, such as forest fires and other uncontrolled combustion sources.

Canada has made significant progress toward meeting the goal of a 90 percent reduction in releases of dioxins and furans, achieving a 79 percent reduction, relative to the 1988 Canadian baseline. Much of the reductions achieved are attributable to the pulp and paper sector after federal regulations were imposed. Figure 3-2 illustrates reductions in the top Canadian (Ontario) dioxin/furan emission sources from 1990, 1997, and 1999 (based on "Inventory of Releases - Updated Edition", February 2001, Environment Canada). The figure also includes a forecast for 2005. The renewed Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem commits to a 90 percent reduction in the release of dioxin/furans by the year 2005, from a baseline of 1988. Based on current initiatives underway or proposed for dioxins/furans, such as Canada Wide Standards for waste incineration, iron sinter and electric arc furnaces, and Ontario's proposal to phase out hospital incinerators, it is expected that Canada will meet this commitment by 2005 within the Great Lakes Basin.

Workgroup Activities and the 4-Step Process

In the past year, the Workgroup has made the following progress in the 4-step process:

- The Workgroup held a teleconference call to discuss the ash management issue on April 24, 2002.
- The Workgroup met on May 30, 2002 at the GLBTS Stakeholder Forum in Windsor. The Workgroup meeting was held jointly with the HCB/B(a)P Workgroup to discuss common issues of interest to both Workgroups.
- The Workgroup held teleconference calls to discuss the treated wood issue on July 24, 2002 and November 13, 2002.
- The Burn Barrel Subgroup was formed in the Spring of 2000 to address the emerging issue of residential "backyard" garbage burning. Through conference calls, surveys, and research, the Subgroup developed a strategy in May 2001 to seek reductions in backyard trash burning. The strategy is currently being implemented by both national governments along with partners in States, Provinces, Tribes, First Nations, municipalities, industries, and environmental and health organizations.

Reduction Activities

Burn Barrels and Household Garbage Burning

Burn barrels and other household garbage burning methods remain a high reduction priority for the Workgroup. Formation of a Burn Barrel Subgroup was initiated in the Spring of 2000 to address the issue of residential garbage burning. The Subgroup is currently led by Bruce Gillies of Environment Canada. This source category is estimated to emerge as the largest source of dioxin emissions after air emissions standards for industrial sources are in place. The practice of household

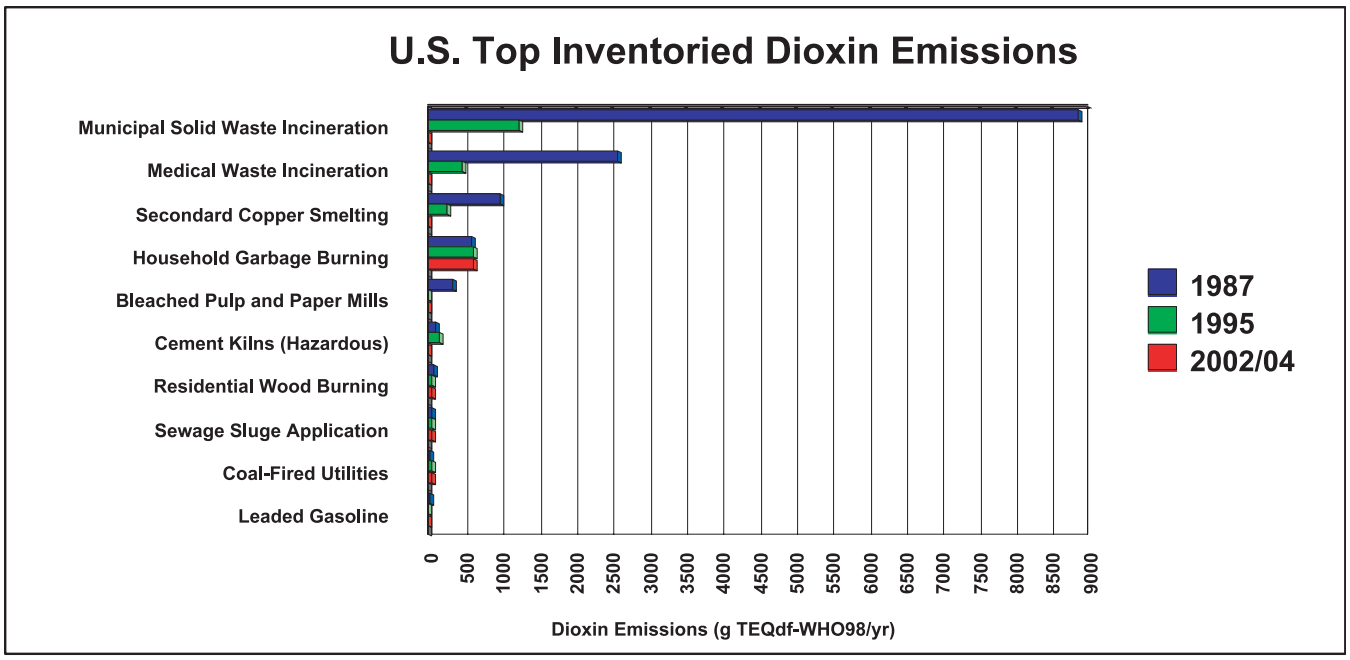


Figure 3-1. U.S. Top Inventoried Dioxin Emissions - Inventory of Sources of Dioxin in the U.S. - May, 2002. Source: USEPA

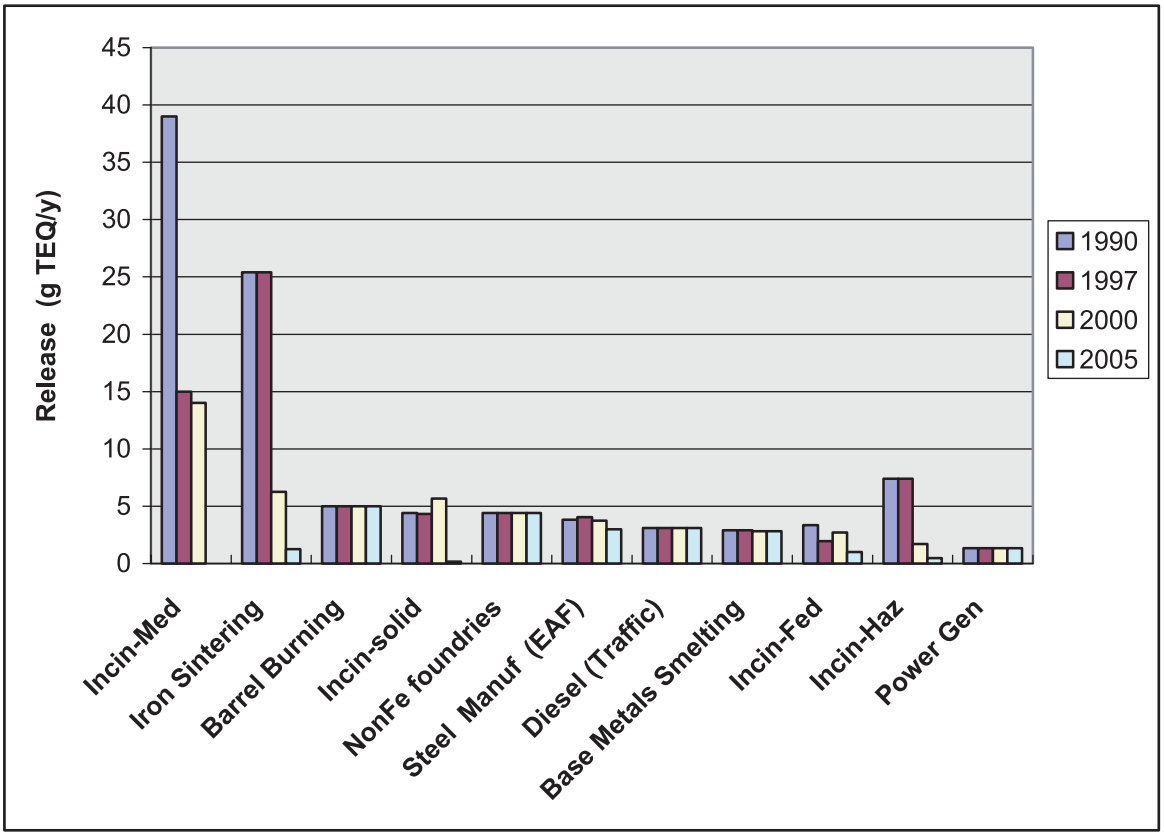


Figure 3-2: Top Canadian (Ontario Region) Dioxin/Furan Emission Sources Inventory of Releases - Updated Edition, February 2001. Source: Environment Canada

garbage burning is typically carried out in old barrels, open pits, woodstoves, or outdoor boilers. Through surveys and research conducted over the past two years, the Subgroup developed the Household Garbage Burning Strategy in May 2001 for seeking reductions in backyard trash burning.

In 2002, the Subgroup developed education and outreach materials, and contacted decision- makers and outreach partners. A workshop on "Burning Household Garbage: Impacts and Alternatives" was held in April 2002 in Thunder Bay, Ontario, in conjunction with the Lake Superior Binational Forum. In May 2002, the Subgroup launched a public website, www.openburning.org, to provide information and educational materials on trash and open burning in the Great Lakes region. A broad public outreach program on both sides of the Canada/U.S. border is taking place in 2002-2003, beginning in the Lake Superior region. The U.S. and Canada are looking to the Household Garbage Burning Strategy in the Great Lakes Basin as a model for other parts of the two countries.

Wood Preservation

The Dioxin Workgroup has been working to address treated wood life-cycle management practices for utility poles. When poles reach their end life for utilities, they are typically resold into a secondary market. The Workgroup is focusing on an outreach effort to this secondary market on the appropriate use and care of treated wood.

Canada and the U.S. have gathered information on the management of out-of-service treated wood. In the U.S., the Utility Solid Waste Management Group (USWAG) leads this activity. In Canada, the wood preservatives issue is being managed as a national issue under the EC-led Strategic Options Process. Both countries are exploring pilot project opportunities to improve public awareness on safe and environmentally responsible handling of used treated wood in the Great Lakes Basin.

Incinerator Ash Disposal

The significance of dioxins/furans in landfill leachates generated by disposed incinerator ash is uncertain. How well these leachates are contained at existing landfills is also in question. Improved air pollution control at waste incinerators can result in the transfer of toxic substances from air to ash. Recent amendments made to the Ontario Waste Management Regulation (Regulation 558) set more stringent requirements for hazardous waste management, and facilities are required to conduct leachate tests using the Toxicity Characteristic Leaching Procedure (TCLP). The new regulation is also expected to result in more wastes being characterized as hazardous. In the U.S., ash is not tested for dioxin/furans in most of the Great Lakes States, except Minnesota. In addition, information on testing after implementation of the U.S. incinerator MACT standards is not available. Further information is needed regarding dioxins and furans in both bottom and fly ash generated at waste incinerators.

According to past analyses conducted on leachates (NITEP report, CORRE, mostly using obsolete techniques), the dioxin/furan levels measured were low, at concentrations less than 1 ppb. The available literature does not provide evidence that disposal of municipal waste incinerator ash leads to dioxin leaching. Canada will conduct a study in an attempt to answer these questions.

Landfill Fires

Preliminary USEPA estimates showed that landfill fires are a potential source of significant dioxin/furan release. A discussion paper has been prepared by the Workgroup co-chairs that presents the current situation and the requirements to prevent landfill fires in the Great Lakes Basin. Preliminary investigation has shown that landfill fires appear to be infrequent, but additional information is required to fully characterize the significance of this source.

In Ontario, landfill fires at municipal landfills are infrequent due, in part, to existing regulations that ban the burning of garbage at landfill sites. It is suspected that landfill fires exist on First Nations lands, but more information needs to be collected on their waste management practices. Canada will be conducting a study to gather information on open burning practices on First Nations lands in Ontario. In addition, a national study to gather information on trench burning is underway, under the dioxin/furan Canada Wide Standard process.

Based on information gathered from the majority of Great Lakes States (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin), landfill fires seem to be infrequent. Information gathered from the Ohio Fire Marshall's office, however, indicates that landfill fires are common. USEPA is currently gathering more information regarding this issue.

Inventory Improvements

USEPA maintains and annually updates the TRI, a publicly available database that contains information on toxic chemical releases and other waste management activities. Due to the toxicity of dioxin and furans to humans, USEPA added these as chemicals that facilities are required to report for the 2000 inventory, which was released in May of 2002. According to the TRI, 99,814 grams of total releases of dioxin and dioxin-like compounds were reported for 2000 in the U.S. More information is available on the website at www.epa.gov/tri.

In addition to the TRI, the eight Great Lakes States and the Province of Ontario maintain a regional emissions inventory for hazardous air pollutants, which includes

dioxins and furans. USEPA also continues to update the National Dioxin Emissions Inventory, which indicates that over 90 percent of all dioxin releases in the U.S. are from air sources.

For the reporting year 2000, Environment Canada added dioxins and furans to the NPRI list of substances. The NPRI is available on the Environment Canada website at www.ec.gc.ca/pdb/npri. Dioxin/furan data are available on the website for reporting years 2000 and 2001. Environment Canada will use the NPRI data to update the point source information in the National Dioxin/Furan Release Inventory.

Since the initiation of the Voluntary Stack Testing Program in the Spring of 2000, Environment Canada has conducted stack tests for dioxins and furans and many other substances of concern at five volunteer facilities in Ontario. Stack tests were conducted at Falconbridge Kidd Creek-a nickel base metal smelter, Toronto Hospital for Sick Children-a medical waste incinerator, Wescast Industries-a steel foundry, Norampac-a Kraft boiler, and Upper Canada Cemeteries-a crematorium. Results are available for the first three facilities. Results from two facilities are under review. Results of these tests were presented at the GLBTS stakeholder meetings. Canada also conducts stack tests under other programs. These programs are currently underway in the base metal smelter and electric arc furnace sectors.

Ambient Air Monitoring

USEPA conducts air monitoring for dioxin under the National Dioxin Air Monitoring Network (NDAMN), in order to track fluctuations in atmospheric deposition levels. In addition, USEPA is planning to fund a two-year dioxin monitoring project at IADN (Integrated Atmospheric Deposition Network) sites near Lake Michigan, beginning in 2003.

Ambient air monitoring of GLBTS substances has been conducted in Canada since 1996 through the National Air Pollution Surveillance Network (NAPS). Dioxins and furans were monitored at seven stations, comprised of four urban and three rural sites. Results show elevated levels at urban sites compared to rural sites with mean concentrations ranging from 741 to 2,096 femtograms per cubic metre (TEQ) at urban sites, and from 182 to 442 femtograms per cubic metre (TEQ) at rural sites (1996 to 1999). These concentrations remain below the Ontario Ministry of Environment ambient air quality criteria of 5 picograms per cubic metre (TEQ), 24-hour average.

Joint Priorities

The Dioxin/Furan Workgroup has been coordinating efforts with the HCB/B(a)P Workgroup on issues that concern both chemical workgroups, including wood stoves, treated wood, and tire fires.

Next Steps

Backyard trash burning is expected to emerge as the largest source of dioxins and furans as other sector reductions continue. Accordingly, the Workgroup will focus its efforts on the implementation of the strategy developed by the Burn Barrel Subgroup. Both countries are looking to the burn barrel activities in the Great Lakes Basin, especially in the Lake Superior region, as a potential model for other parts of each country. For other priority sectors, the Workgroup will continue to monitor and update the Workgroup on progress made. Most of these sectors are being addressed through existing national or regional programs.

To fill information gaps identified in pollutant inventories for dioxins and furans, the Workgroup will engage sectors to collect or develop release information. In Ontario, these sectors include pulp and paper (wood waste combustion boilers, Kraft liquor boilers), foundries, petroleum refineries, secondary aluminum smelting, secondary copper smelting, the steel sector (cokemaking, blast furnaces, steelmaking), and land application of sewage sludge. The TRI in the U.S. and the NPRI in Canada may provide additional information to help improve the release profiles for dioxins and furans.

El Dorado Beach Preserve, Black Pond Wildlife Management Area
Lake Ontario Easter Basin
Photograph by M. Knutson, The Nature Conservancy, Central and Western New York Chapter

4.0 HEXACHLOROBENZENE/ BENZO(a)PYRENE (HCB/B(a)P)

Canadian Workgroup co-chair: ***Tom Tseng***

U.S. Workgroup co-chair: ***Steve Rosenthal***

Progress Toward Challenge Goals

U.S. Challenge: Seek by 2006, reductions in releases, that are within, or have the potential to enter the Great Lakes Basin, of HCB and B(a)P from sources resulting from human activity.

Canadian Challenge: Seek by 2000, a 90 percent reduction in releases of HCB and B(a)P from sources resulting from human activity in the Great Lakes Basin, consistent with the 1994 COA.

The U.S. has taken steps toward the goal of seeking (unquantified) reductions of HCB and B(a)P releases to the Great Lakes Basin. Figure 4-1 illustrates the trends in HCB air and water releases reported to TRI from 1990 to 2000. Figure 4-2 illustrates approximate HCB emission reductions achieved in the U.S. from 1990 to 1997, by source category, both with and without the assumption that all of the HCB contaminant in pesticides is released subsequent to the pesticide application. While USEPA uses a volatilization rate of approximately 8 percent in inventory calculations, recent studies suggest that 100 percent of the HCB contaminant volatilizes.[5,6] Figure 4-3 presents estimated B(a)P emissions in the Great Lakes Basin for 1996, 1997, and 1998, by source category, as reported by the Great Lakes Regional Air Toxic Emissions Inventory project. This inventory reflects emissions from eight Great Lakes States and the Province of Ontario.

The latest release inventory estimates show that Canada is making progress toward its 90 percent reduction goals. Between 1988 and 2001, Canadian releases in the Great Lakes Basin have been reduced approximately 65 percent for HCB (Figure 4-4[7]), and 48 percent for B(a)P (Figure 4-5[8]).

Workgroup Activities and the 4 Step Process

Emission Inventories

Efforts to resolve disputed HCB emission levels from utility coal combustion and rubber tire manufacturing continued in 2002. A review of test data indicates that utility coal combustion does not appear to be a significant source of HCB, and the Rubber Manufacturers Association has performed testing which has shown that rubber tire manufacturing is not a source of HCB.

In the U.S., a MACT standard for primary aluminum plants has reduced emissions of B(a)P and other air toxics released during the production of molten aluminum metal. B(a)P emissions from the single primary aluminum plant located in the Great Lakes, the Alcoa plant in Indiana, have been reduced to approximately 150-250 pounds per year. Also, the petroleum refining sector expressed concern that the B(a)P release estimates for fluid catalytic cracking units had been grossly overestimated. A subsequent review of test results confirmed that these units are no longer major B(a)P sources in the basin.

U.S. Step 1 & 2 B(a)P and HCB reports on sources and regulations and a Step 3 report on reduction options have been completed and posted on the GLBTS website. In addition, a draft addendum to the HCB Step 1 and 2 report has been prepared to incorporate the 1996 National Toxics Inventory results (NTI) released around September 2000. This is especially significant because it was prepared using a "bottom-up" approach in which the States determined emission levels from sources located within their boundaries using a common set of emission factors that were used by all States. USEPA and the Workgroup have been going through the 1996 NTI to check the accuracy of the HCB emission levels and to identify any emission reduction opportunities.

[5] Benazon Environmental Inc., "Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000 Draft Report (No.1), July 13, 2000" prepared for Environment Canada.

[6] Bailey, R.E. (2001) Global hexachlorobenzene emissions, Chemosphere 43:167-182.

[7] Ontario HCB release estimates in the Great Lakes Basin are based on the "Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000 Draft Report (No.1), July 13, 2000" prepared for Environment Canada by Benazon Environmental Inc., and updated with facility release data from the NPRI.

[8] Ontario B(a)P release estimates in the Great Lakes Basin are based on the "B(a)P/PAH Emissions Inventory for the Province of Ontario 1988, 1998, and 2000 Draft Report (No.1) May 16, 2000" prepared for Environment Canada by Benazon Environmental Inc., and updated with facility release data from the NPRI.

Draft HCB and B(a)P (including polycyclic aromatic hydrocarbons, or PAHs) release inventories for Ontario were circulated to workgroup members and affiliates for review and input in 2000. New facility release data for years 2000 and 2001 have since become available through Canada's NPRI, which now requires lower micro-pollutant reporting threshold levels. This new information has been used to update the HCB and B(a)P inventories for Ontario.

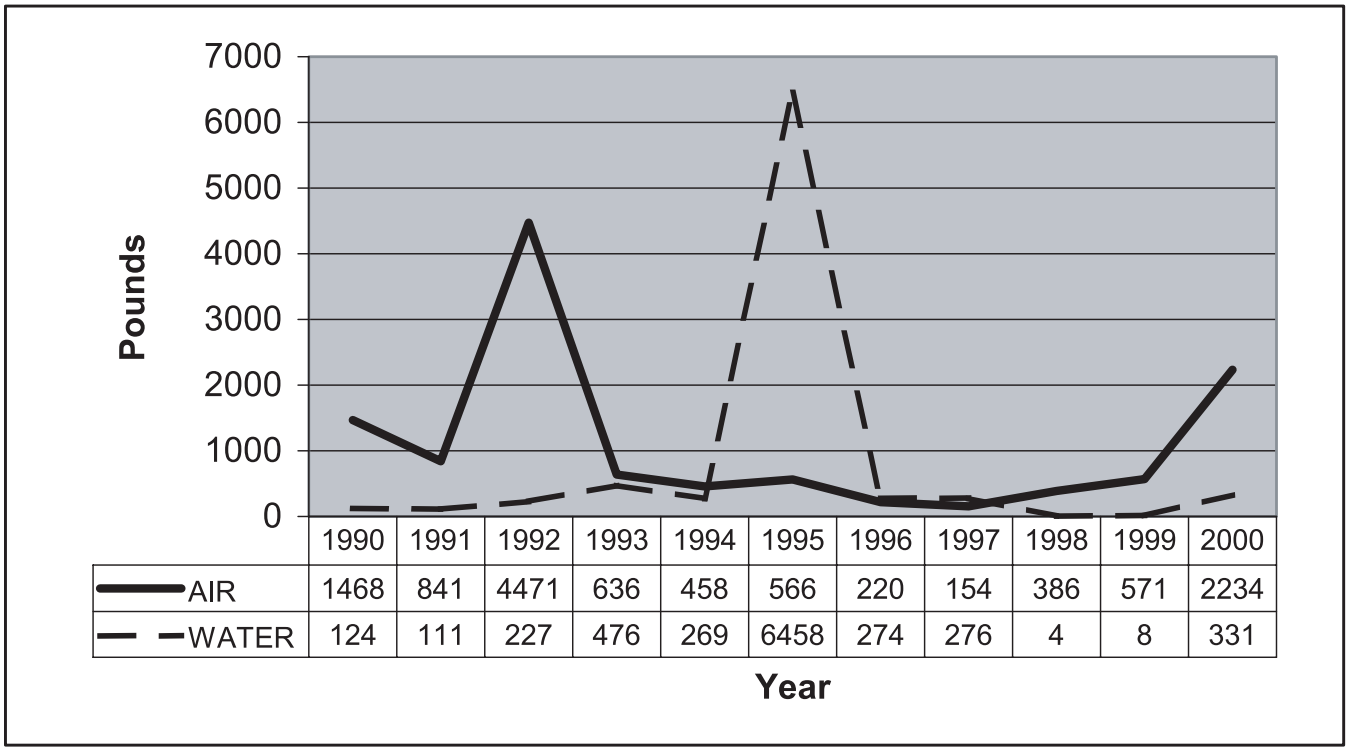
A review is underway to confirm the current significance of trace HCB levels in some seven pest control products following manufacturers' initiatives over the last decade to reduce HCB levels. Estimates using maximum USEPA HCB product content limits and assuming all applied HCB is volatilized suggest that pesticide application is the overwhelming source of HCB release in the Great Lakes Basin. Protecting the confidentiality of business information on product formulation/use, while deriving more accurate release numbers for the sector, is at the center of ongoing discussions between pesticide manufacturers and various government agencies. The HCB Workgroup has received assistance from the Pesticide Workgroup and pesticide manufacturers in an effort to resolve this important issue.

Voluntary Stack Testing

Ten Ontario facilities have responded thus far to the call for voluntary stack testing (base-metal smelters, steel mill and foundry, hospital incinerators, cement plant). Testing was completed at the Toronto Hospital for Sick Kids, Falconbridge-Kidd Creek, Wescast Industries, Norampac (pulp mill), Hamilton Health Sciences, Biomedical Incinerators, and Upper Canada Cemeteries (crematoria). This Environment Canada initiative will continue to focus on facilities where little or no accurate release data are available.

Scrap Tires

Millions of scrap tires burned in several catastrophic U.S. fires in 1999. More than 800 million scrap tires accumulated in stockpiles throughout the U.S. presenting a potential threat to human health and the environment. Tire fires are typically caused by wildfires, lightning strikes and arson. These fires are nearly impossible to extinguish and can burn for months, generating considerable B(a)Ps in air emissions, groundwater contamination and oily runoff. The scrap tire managers for the Great Lakes States and the Scrap Tire Management Council were contacted to learn how each state is handling its scrap tires and potential ways that these fires can be minimized.



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
AIR	1468	841	4471	636	458	566	220	154	386	571	2234
WATER	124	111	227	476	269	6458	274	276	4	8	331

Figure 4-1. Trends in U.S. HCB Air and Water Releases Reported to TRI from 1990 to 2000, lbs/year[9]

[9] USEPA TRI database, October 2002. Note that in 2000 the TRI reporting threshold changed from 100 lb to 10 lb and the number of facilities reporting HCB to TRI increased.

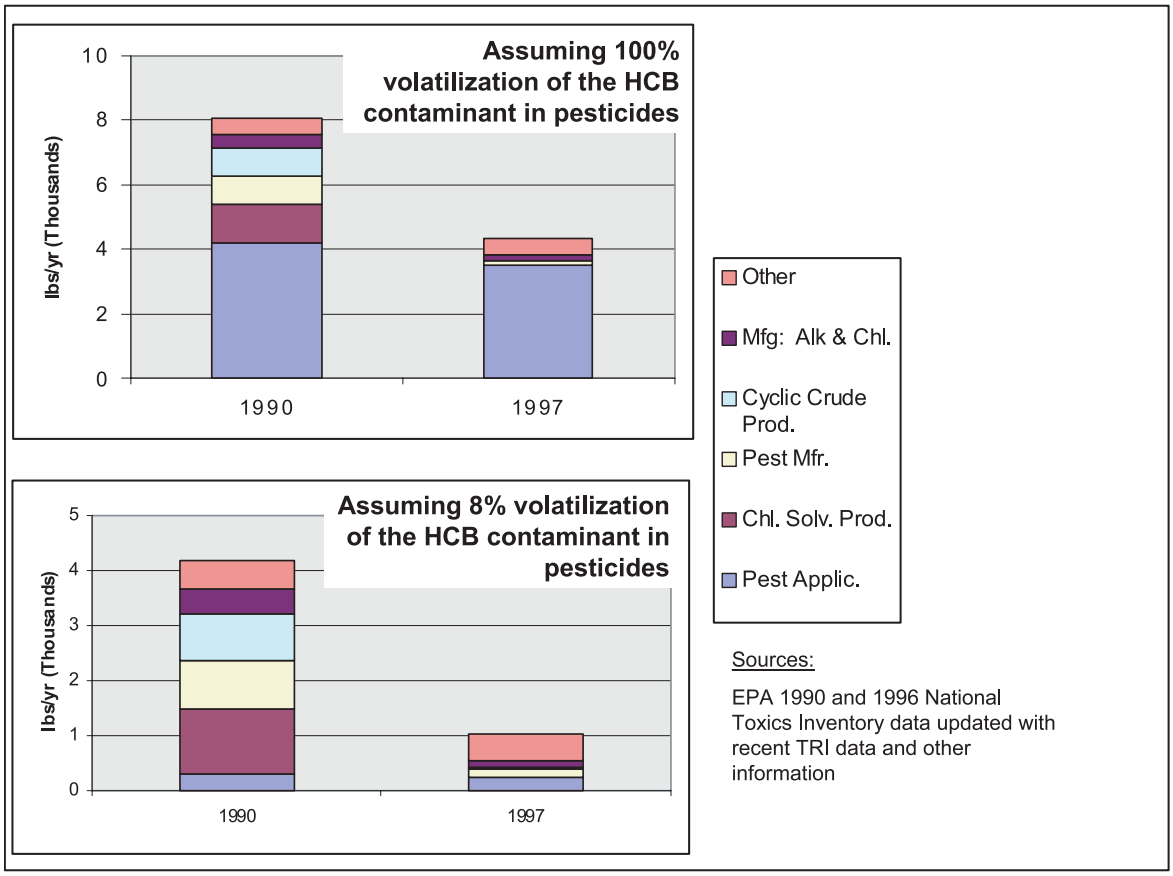


Figure 4-2. U.S. HCB Emissions, lbs/year

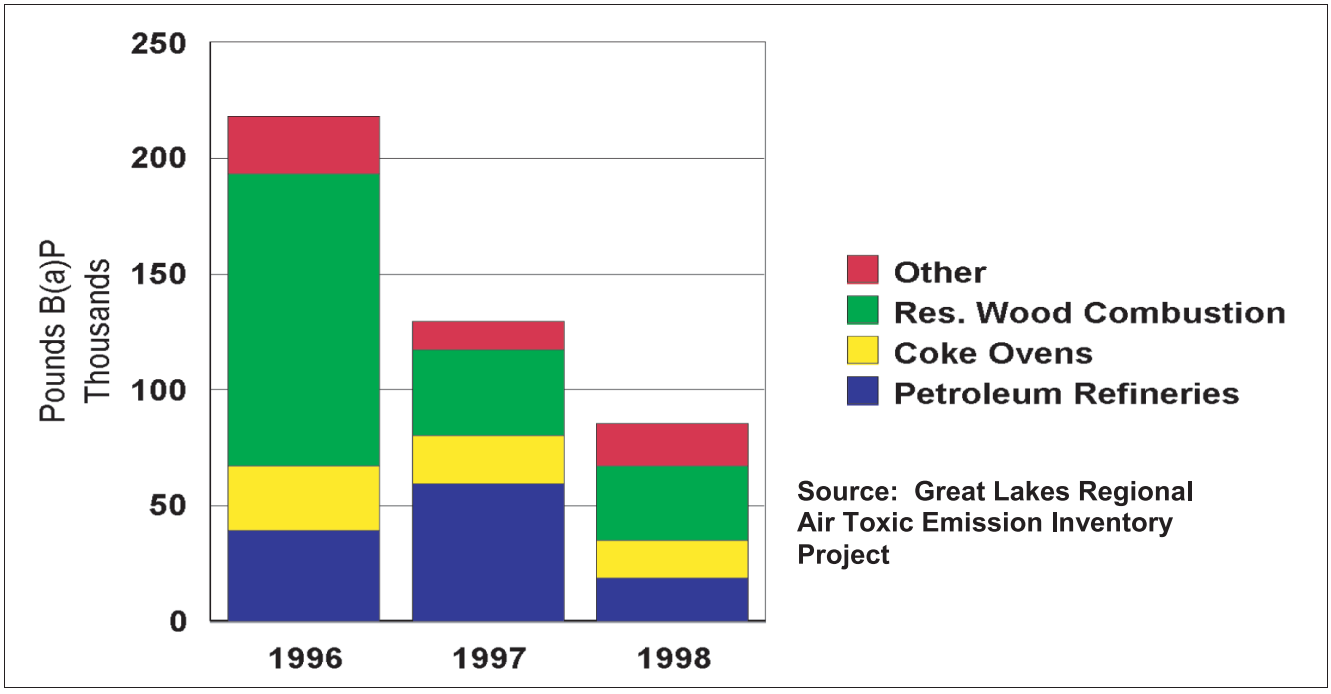


Figure 4-3. B(a)P Emissions from the States and Province around the Great Lakes (lbs/year)

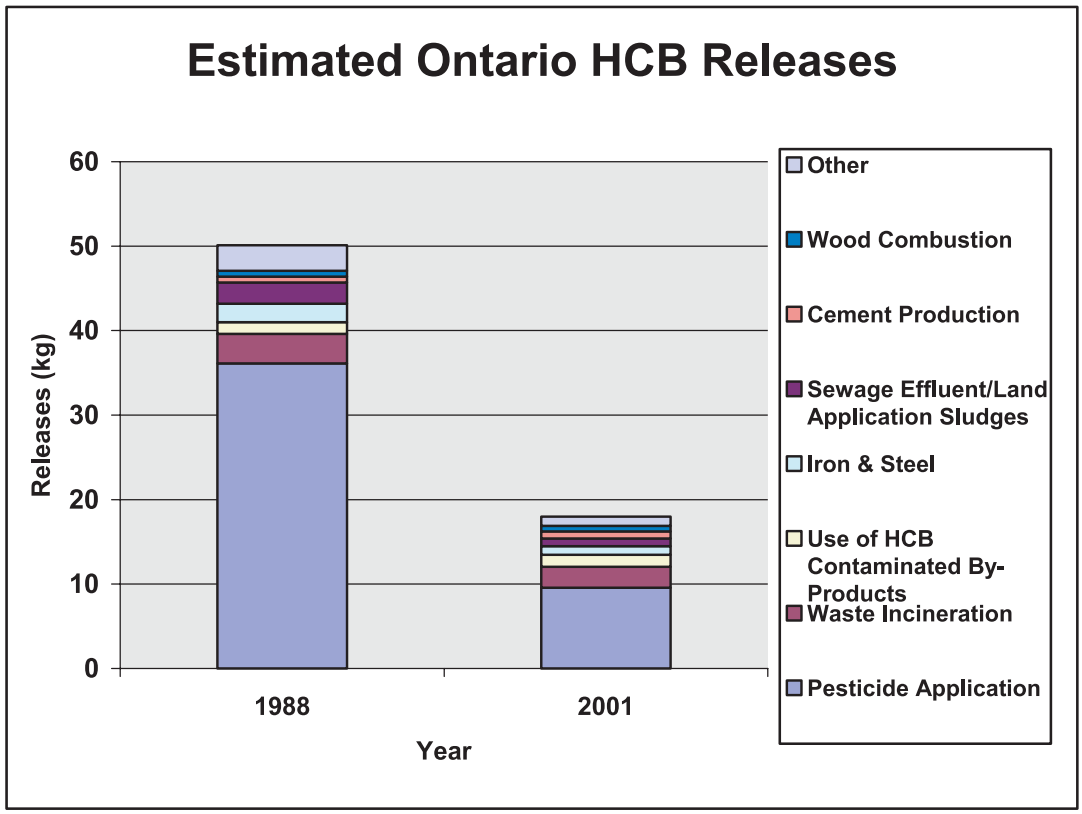


Figure 4-4. Estimates Reductions in HCB Releases (kg/yr) in Ontario from 1988 to 2001, by Sector.
Source: Environment Canada

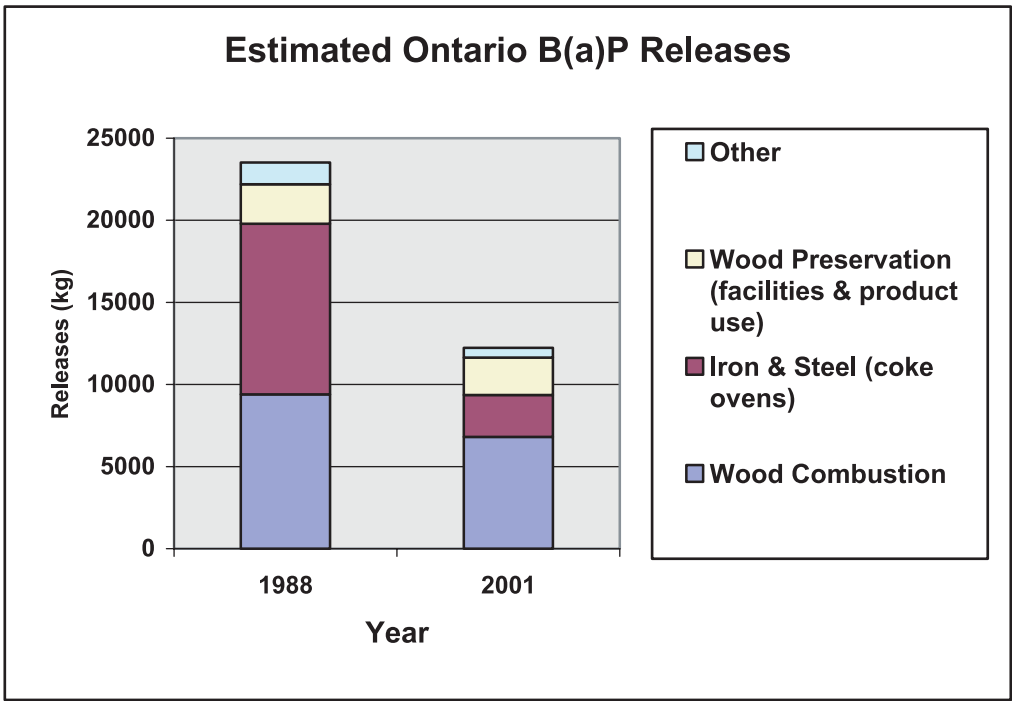


Figure 4-5. Estimated Reduction in B(a)P Releases (kg/year).
Source: Environment Canada

Reduction Activities

Wood Stoves

The purpose of a wood stove change-out program is to encourage people to turn in pre-1992 wood stoves for newer wood stoves that meet USEPA standards or for pellet or gas stoves. A wood stove change-out program is the most effective way to reduce B(a)P emissions from residential wood combustion because USEPA-certified stoves generate only about 15 percent of the emissions of older stoves, which account for about 90 percent of existing wood stoves. At least 1,200 old stoves or stove inserts were replaced, through "The Great Wood Stove & Fireplace Change-out Program," held in 2001 in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, New York, North Dakota, Ohio, South Dakota and Wisconsin.

Building on Natural Resources Canada's pilot "Burn it Smart!" campaign, the national roll-out of the program commenced in 2002. Across Canada, a series of evening workshops will be provided to help Canadians who heat with wood, or who use it for recreational purposes, to make their wood-burning habits safer, cleaner, and more efficient. Free residential wood burning workshops will be held in 28 regions across Canada between September 2002 and March 2003. The following is a list of the four participating regions in Ontario, and a non-governmental organization that is organizing the workshops:

- Blue Mountain Cottagers - The Environmental Network;
- Central Ontario Cottagers - Canadian Centre for Pollution Prevention (C2P2);
- First Nations Communities of Southern Ontario - Elora Center for Environmental Excellence; and,
- Southern Ontario - Elora Center for Environmental Excellence

Each organization will sponsor a minimum of 12 workshops spread throughout many locations in southern and central Ontario. A demonstration "burn trailer" is often used outside a workshop venue to showcase the difference between the old and new technologies in wood stoves. A website has been set up for the campaign at www.burnitsmart.org.

This is an extremely important program because residential wood combustion contributes over 50 percent of the B(a)P emitted to the Great Lakes Basin. Persuading Great Lakes residents to turn in their old wood stoves and inserts for cleaner burning appliances, whether USEPA-certified wood stoves or gas or pellet burning appliances, is one of the most effective strategies for achieving reductions.

Environment Canada is considering how best to increase the profile of the campaign in Ontario in order to maximize public participation, which will hopefully increase the number of old wood stoves that are replaced.

Voluntary Actions

In January 2001, an Environmental Management Agreement (EMA) between Environment Canada, MOE, and Algoma Steel (a major Ontario steel mill) was finalized and signed. Under the EMA, Algoma agreed to develop a facility-based approach to address environmental priorities. The project is similar to Dofasco's EMA and is expected to bring about significant reductions of priority substances, including B(a)P.

Four facilities reporting HCB releases to USEPA's TRI have reported reductions in HCB emissions. These reductions are a result of facilities shutting down HCB-emitting operations (e.g., magnesium processing) or refining their emission estimates through stack testing or improved sampling methods.

Standards Development and Implementation

Canada Wide Standards (release limits) have been developed for mercury, particulate matter, ozone, and benzene. Canada Wide Standards are being finalized for dioxins and furans. Implementation of Canada Wide Standards by the major source sectors and the province is expected to bring about HCB and B(a)P release reductions in the next 5-15 years.

Canadian Council of Environment Ministers have agreed to undertake joint initial actions by 2005 to reduce emissions from residential wood burning appliances by: (1) updating standards for new wood-burning appliances; (2) exploring options for the development of a national regulation for new, clean-burning residential wood heating appliances; (3) developing and implementing a national public education program on residential wood combustion; and, (4) assessing options for a national wood stove upgrade or change-out program.

Recommendations from two Strategic Option Reports for the iron and steel and wood preservation sectors are in place. Audits against the Codes of Good Practice have been conducted for all three pentachlorophenol (PCP) and creosote facilities in Ontario. Based on the audit assessment findings, each facility has developed a 5-year implementation plan, to improve environmental performance. These plans were submitted by December 31, 2001, in accordance with the deadline set out in the voluntary program. Facilities are now implementing their plans to meet the objectives of the Codes. Codes of practice for the iron and steel sector have been finalized for implementation by the Ontario steel mills.

A USEPA-proposed rule to control emissions of toxic air pollutants during hydrochloric acid production is expected to reduce HCB emissions.

Next Steps

The HCB and B(a)P Workgroup will continue to fill data gaps and obtain voluntary reductions from major source sectors. A critical area being focused on is the application of pest control products, where there is an urgent need to confirm HCB release numbers. If current release numbers are correct, an effective reduction strategy must be developed with stakeholders. In addition, wood combustion appears to be the dominant source of B(a)P in the Basin. Increased efforts will be made to promote and support wood stove change-out initiatives and other campaigns underway to reduce wood-smoke pollution. Although B(a)P inventories indicate significant reductions, ambient levels of B(a)P in the Great Lakes have been fairly constant since the early 1990's, indicating a need to better identify B(a)P emitting sources. In addition, an effort will be made to provide incentives, such as maps showing the location of tire piles, for scrap tire recyclers to process (e.g., shred and bale) exiting scrap tire piles before they catch fire.

Achieving Canadian reduction targets will prove challenging since many of the remaining sources are at trace levels and are ubiquitous across a number of sectors associated with fuel and waste combustion processes. Significant technological and societal changes are needed to effect meaningful reduction.

Sailboat at Presque Isle
Marquette, Michigan
Photo by Carole Y. Swinehart, Michigan Sea Grant

5.0 INTEGRATION WORKGROUP/STAKEHOLDER FORUM

The Integration Workgroup formally met for the first time on June 9, 1998, In Romulus, Michigan. The Integration Workgroup, co-chaired by Environment Canada and the USEPA, was formed to provide guidance to the governments with the organizational, administrative, policy, process, and other cross-cutting GLBTS issues, which are relevant to but outside the scope of the Substance-Workgroups.

At each meeting, the substance-specific workgroups provide updates with details of their progress in achieving the Strategy's goals. The Integration Workgroup suggests strategic pathways forward for the GLBTS and works to ensure that the Strategy remains focused on achieving reductions of toxic substances. The Integration Workgroup also strives to:

- Broaden awareness of the GLBTS and its goals through public outreach;
- Maintain a balanced, well-informed group of active stakeholders, and recruit new members as necessary;
- Receive progress reports from Substance-Workgroups on information gathered and reductions achieved based on Workgroup activities;
- Assess and communicate Substance-Workgroup progress toward goals;
- Review and target for attention multi-group or multi sector technical issues referred by the Substance-Workgroups on recommended solutions;
- Identify and develop options for resolving issues arising from differences in GLBTS implementation by the U.S. and Canada;
- Serve as a central point of information about the range of ongoing toxics reduction efforts, both domestic and international;
- Identify efforts that may enhance GLBTS implementation such as the sector-based or targeted multi-chemical approaches, currently being evaluated; and,
- Identify incentives for voluntary reductions/virtual elimination, assess the effectiveness of voluntary project, and as appropriate, identify alternatives to achieve GLBTS goals.

During the first half of 2002, the Workgroup met twice in Windsor, Ontario. The Workgroup conducted its first meeting of the year on February 26, and then convened again on May 30 to review the Strategy achievements and future challenges at the midpoint of the program. During the later half of the year, the Integration Workgroup met in Chicago, Illinois, on September 18 and December 4, 2002.

Integration Workgroup Meeting February 26, 2002, Windsor, Ontario

The first Integration Workgroup meeting, held on February 26, 2002, in Windsor, included a presentation entitled "Sector Subgroup Report on Findings and Discussion," based on the results of the work of the Sector Subgroup. The Integration Workgroup then participated in a facilitated discussion based on these findings.

At the Integration Workgroup's February 2001 meeting, the Sector Subgroup held a facilitated brainstorming discussion session entitled "Transition into New Ideas," from which emerged suggestions on new ways to move the Strategy forward. Beginning with a list of twenty-seven candidate sectors, and utilizing decision tree criteria, the Subgroup narrowed the candidate sectors to a short list of six where multiple substances could be identified. Six members of the Subgroup each addressed one of the short-listed sectors, included Automobile and Related Manufacturing, Secondary Copper Smelting, Government Facilities, Municipal Waste Combustion, POTWs, and Electric Utilities.

The February 26th meeting also included three presentations on urban and rural emissions of toxic substances. Presentations addressed toxics monitoring and modeling on both the large scale and more regional levels. These presentations were:

- *Urban/Rural Air Toxics – Setting the Context* – Dr. S. Venkatesh, EC
- *Urban Toxics Monitoring in Chicago and New Jersey* – Todd Nettesheim, USEPA
- *Urban Toxics Monitoring in Toronto* – Dr. Miriam Diamond, University of Toronto

In addition to the sector and urban/rural toxics presentations, the Integration Workgroup was given progress updates from the substance-specific workgroups and from Integration Workgroup member, including:

- *GLBTS Communications Plan* – Madhu Kapur Malhotra, EC

- *Five Year Mid-Program Workshop May 29-30, 2002* – Madhu Kapur Malhotra, EC
- *Value Added Role of the GLBTS Respecting Contaminated Bottom Sediments* – Dave Cowgill, USEPA
- *LRT Workshop Status* – Todd Nettesheim – USEPA

Stakeholder Forum: Strategy Achievements and Future Challenges May 29, 2002, Windsor, Ontario

The Spring GLBTS Stakeholder Forum meeting, held in Windsor on May 29, 2002, marked the mid-point of the Strategy's ten-year mandate. The theme of this meeting was "Strategy Achievements and Future Challenges". Presentations focused on a review of progress to date against the Strategy challenge goals and next steps on the road to virtual elimination.

A number of GLBTS Stakeholders gave presentations, including:

- *Reporting on the Strategy's Achievements and Challenges* – PCB Challenge, Ken De, EC; Dioxin Challenge, Anita Wong, EC; B(a)P/HCB Challenge, Tom Tseng, EC; Mercury Challenge, Alexis Cain, USEPA; and the OCS, Pesticides, & Alkyl Lead Challenges, Ted Smith, USEPA.
- *GLBTS Process Allowing Imaginative Solutions by Industry* – Robert Stempel, Chairman, Council of Great Lakes Industries, and Chairman, Energy Conversion Devices Inc.
- *State of Michigan Mercury Reduction Program* – Andy Buchsbaum, National Wildlife Federation
- *The Role of Industry in the Lake Superior Binational Program* – Nick Lewis, Manager, Environment, Cascades Fine Paper
- *Panel presentation on Indicators–SOLEC In Relationship to Current Ambient Monitoring Practices and Results* – Harvey Shear, EC, and Paul Horvitin, USEPA
- *Panel presentation on Ambient Environmental Monitoring Results*:
  - Integrated Atmospheric Deposition Network (IADN) – Todd Nettesheim, USEPA;
  - National Air Pollution Surveillance Networks (NAPS) – Tom Dann, EC;
  - Sediment Monitoring of Toxics in the Great Lakes – Scott Painter, EC;
  - Mercury, PCB & Dioxin Trends in Herring Gull Eggs – Chip Weseloh, EC; and,
  - Trends in PBTs in Whole Trout and Salmon – Sandy Hellman, USEPA.

A special evening reception and recognition dinner was held for present and past GLBTS participants in appreciation of all of their hard work and of the progress achieved to date.

Key note speakers included Mr. John Mills, Regional Director General, Environment Canada, The Honourable Herb Gray, Chairman, IJC, Canadian Section, Mr. Dennis Schornack, Chairman, IJC, U.S. Section, and, David Ullrich, Deputy Regional Administrator USEPA Region 5.

Integration Workgroup Meeting May 30, 2002, Windsor Ontario

The theme of this Integration Workgroup meeting was "Strategy Achievements and Future Challenges". This reflective session of the GLBTS marked the mid-point, or five-year mark, of the ten-year mandate of the GLBTS. During this session, the Integration Workgroup discussed chemicals of emerging concern to the Great Lakes Basin, potential approaches to pollution prevention within the Basin, and presentations made at the previous day's Stakeholder Forum. The Workgroup leads also presented progress updates.

Presentations at this meeting included:

- *Chemicals of Emerging Concern in the Great Lakes Basin* – Jim Maguire, of the National Water Research Institute
- *Polybrominated Diphenyl Ethers (PBDEs): State of Science* – Michael DeVito, Office of Research and Development, USEPA
- *The Contribution of Small and Medium Sized Enterprises (SMEs) to Toxic Loadings* – Ian Orchard, EC

A presentation was made by Jim Maguire of the National Water Research Institute on chemicals of emerging concern in the Great Lakes Basin. Five classes of chemicals were discussed: Brominated Fire Retardants (PBDEs), Perfluorinated Organic Acids (POA), Medium Chain Chlorinated Paraffins (MCCPs), Polychlorinated Naphthalenes, and Silicones. Following this overview, Mike DeVito from the Office of Research and Development, USEPA, provided an in-depth discussion of Polybrominated Diphenyl Ethers (PBDEs).

The Integration Workgroup heard a presentation by Ian Orchard of Environment Canada on Pollution Prevention, with a focus on the contribution of SMEs to toxic loadings. Mr. Orchard presented the results of a preliminary study to test the hypothesis that a majority of Ontario's industrial sources of toxics come from small and medium sized operations (i.e., with less than 500 employees). The Integration Workgroup discussed the necessity of a stronger focus on SMEs in relation the GLBTS level 1 substances of concern.

During the afternoon session, the Integration Workgroup reflected on the discussions of the Stakeholder Forum the previous day and on the future direction for the Strategy. The Workgroup participated in a facilitated feedback sessions focusing on the current state and future directions of the Strategy.

The Integration Workgroup received reports from each of the Substance-workgroups. In keeping with the reflective spirit of the mid-program review, the Substance-workgroups presented progress to date and discussed moving beyond the current goals of the GLBTS toward the ultimate goal of virtual elimination.

Integration Workgroup Meeting September 18, 2002, Chicago, Illinois

The Integration Workgroup began its Fall meeting by revisiting on the work of the Sector Subgroup.

Five presentations were delivered at this meeting:

- *Rural POTW Outreach Project* – Jack Annis, University of Wisconsin Stevens Point
- *Severn Sound Initiative – Municipal P2 Project* – Alan Waffle, EC
- *Next Steps for Substance-Workgroups: Responses to Current Level 1 Challenge Goal Queries* – Alan Waffle, EC, and Ted Smith, USEPA
- *Industrial Boiler Energy Efficiency Project* – Tim Brown and Abby Jarka, Delta Institute
- *Overview of Current US and Canadian Programs/ Process for Listing PBTs* – John Menkedick, Battelle

At the May 18, 2001, Integration Workgroup meeting in Toronto, the Sector Subgroup was established as a temporary initiative to explore and develop options for a sector approach to the achievement of reductions of multiple Strategy substances. The Subgroup met throughout 2001 to identify a potential candidate sector from an initial list of 27 candidates. At the first meeting of 2002, the Integration Workgroup heard a presentation from the Subgroup on the findings of each of the six sectors; a short list of candidate sectors that it had examined in greater depth. Two sectors in particular appeared to be most promising: POTWs and Municipalities.

Two sector projects were presented to the Integration Workgroup. The first presentation was given by Jack Annis of the Solid and Hazardous Waste Extension Service at the University of Wisconsin (UW) Stevens Point. Mr. Annis received funding from USEPA in 2002 to conduct this project. The scope of this project is to work with approximately 500 small and medium sized POTWs in Wisconsin to provide knowledge of general pollution prevention, training, and to provide the necessary tools required to promote and encourage PBT reductions.

A second project was presented to the Integration Workgroup on the Severn Sound Initiative. The Severn Sound Environmental Association (SSEA) is a partnership of local municipalities in the Severn Sound area of Ontario working together with Environment Canada to protect and sustain the Severn Sound Ecosystem. The area has been identified by the United Nations Environment Program (UNEP) and is located within a Canadian Area of Concern (AOC) (see Section 7.0). Prior to the Integration Workgroup meeting, the Sector Subgroup had held a discussion of potential ways to help information-gathering needs of the Severn Sound community, while compiling an inventory of GLBTS-related toxics in the region, as a potential sector pilot project.

Following up on the mid-program reflection begun at the May 30, 2002, Integration Workgroup meeting, the group received a status update on the progress of the GLBTS workgroups from Canadian co-lead Alan Waffle and the U.S. co-lead Ted Smith. Alan Waffle presented the status of the OCS, Pesticides, Alkyl-Lead, Sediments, and Long Range Transport Workgroups. Ted Smith presented the status of the Mercury, PCB, Dioxin/Furan, HCB/B(a)P, and OCS Workgroups.

Stakeholder Forum Tuesday December 3, 2002, Chicago, Illinois

The topic of the December Stakeholder Forum was "Linkages." There were three key-note speakers reflecting linkages between the GLBTS and United Nations programs, North American programs, and a municipal initiative. These were:

- *The Commission for Environmental Cooperation (CEC) Smart Management of Chemicals Program (SMOC)* - Victor Shantora – Acting Executive Director, North American Commission for Environmental Cooperation;
- *Stockholm Convention on POPs, UNECE POPs and HM Protocols and the Global Mercury Assessment* - Greg Filyk, Acting Chief, Hazardous Air Pollutants Group Environment Canada; and,
- *City of Chicago's Corridor Initiative* - Kevin Schnoes, City of Chicago, Department of Environment

Victor Shantora presented an overview of the CEC SMOC, a North American three-country cooperative program concerned with the elimination of chemical substances of mutual concern; persistent toxic substances including PCBs, DDT, chlordane, mercury; and developing the North American Regional Action Plans (NARAPs). The substance selection process requires all three countries to agree on the selection of a substance. Regionally based assessments of persistent toxic substances consider persistence, bioaccumulation, toxicity and transboundary movement of substances.

Greg Filyk introduced linkages between GLBTS and three Major International Agreements: Stockholm Convention on POPs, UNECE POPs and HM Protocols and the Global Mercury Assessment. These international agreements and the GLBTS deal with similar issues of hazardous air pollutants (HAPs); they set goals and targets for specific action; they control intentionally and unintentionally produced substances; manage waste; and provide for adding new substances in the future. Mr. Filyk stressed that regional and local action is really were all the work occurs even though agreements are executed globally. Regional and local work is critical to achieving international standards.

Kevin Schnoes presented the City of Chicago's Corridor Initiative, a voluntary, non-regulatory program offered to local industry. This program offers free technical assistance to identify and implement pollution prevention and energy efficiency (P2/E2) improvements to facilities, with a focus on GLBTS Level I and II substances. Industrial facilities received a one day free audit which cost approximately $25,000 each. The auditors then provided the facility with a comprehensive audit report that includes P2/E2 opportunities and recommendations for implementing proposed measures with estimated cost savings.

Substance-Workgroup updates were also provided by Erin Newman, Dioxins/Furans, Robert Krauel, Mercury, Steven Rosenthal, HCB/B(a)P, Anton Martig, PCBs, and Edwina Lopes, OCS, Alkyl Lead, and Pesticides. Todd Nettesheim also gave an update on a planned Long Range Transport Workshop, to he held in Chicago, summer 2003.

Integration Workgroup Meeting Wednesday December 4, 2002, Chicago, Illinois

The Integration Workgroup meeting continued the previous day's theme of linkages. There were four presentations:

- *GLBTS Communications and Outreach Plan* – Madhu Kapur Malhotra, Environment Canada and Tony Kizlauskas, USEPA;
- *Great Lakes Pollution Prevention Roundtable* – Jinni Cook and Joy Scrogum, Waste Management Resource Center;
- *Level II Substances – An Industry Perspective* – Dale Phenicie, Council of Great Lakes Industries; and,
- *Administrative Processes – Linkages between Binational Executive Committee (BEC), IJC and the GLBTS* - Susan Nameth, Environment Canada

Tony Kizlauskas began by explaining the goal of the communications strategy; to promote GLBTS's activities, its successes, the positive relationships between the partners, and to engage new stakeholder involvement and sustain and broaden the involvement of existing stakeholders. A number of potential outreach projects were discussed as well.

Jinni Cook and Joy Scrogum presented an overview of the services and resources that the Great Lakes Regional Pollution Prevention Roundtable (GLRPPR) has to offer to the GLBTS. Their website is located at www.glrppr.org. GLRPPR goals include:

- Resource coordination and information sharing exchange;
- Network with peer organizations;
- Conference organization;
- Develop and maintain a roster of members; and,
- Enhance and support regional technical resources

Next, Dale Phenicie gave an industry perspective on Level II substances and P2. Currently there are 18 substances on the Level II substances list. Dale noted that these substances either need to be addressed by pollution prevention activities, need more study or understanding, or are substances that are regulated via the national programs with permit limits. CGLI conducted an industry P2 program review through an online literature review. The following conclusions were made:

- TRI reports show downward trends for Level II substances;
- In-Basin TRI-reporting facilities are a minor sub-set of national set;
- Industry P2 programs are addressing Level II substances;
- Literature reports Level II substance reductions and low levels of concern for Level II substances; and,
- A basis for Level II compound de-listing can be drawn from P2 review information

Finally, Susan Nameth presented linkages between the GLBTS and other administrative or direction-setting bodies in the Great Lakes Region. The GLBTS was initiated after an IJC call for governments to virtually eliminate the persistence of toxic substances in its 7th Biennial Report in 1994. The GLBTS was singed in April 1997. The IJC takes advice from the Great Lakes Water Quality Board, the Great Lakes Science Advisory Board and the International Air Quality Advisory Board in order to develop its reports and recommendations. Various domestic policies and programs including the GLBTS report to the IJC on the progress of its programs and measures to reduce toxic substances. The Binational Executive Committee (BEC) is co-chaired by EC and USEPA. Parties in cooperation with State and Provincial governments meet twice a year to coordinate their respective work plans and evaluate progress made. Decision-making and strategic direction setting for the GLBTS is done by BEC.

The first meeting of the Integration Workgroup in 2003 is planned for February 25 at the Cleary International Centre in Windsor, Ontario.

6.0 PARTNERS AT WORK

This section presents summaries of some of the key stakeholder activities that have contributed to the progress in achieving Strategy goals. These summaries focus primarily on efforts to reduce mercury from the environment.

National Wildlife Federation

Excellent progress has been made in enhancing state-level pollution prevention work.

- Mercury reduction scenarios demonstrating how Michigan can achieve 90 percent mercury reduction by 2010 and virtual elimination by 2020 have been drafted and refined.
- A report has been drafted that explores different mercury reduction strategies feasible in each source sector and the comparative costs of each. This report should be available for peer review soon.
- Based on the research conducted for the report, NWF presented the mercury reduction and cost research to a binational Stakeholder Forum sponsored by USEPA and Environment Canada in May 2002. Much lively debate and feedback to improve the report was received.
- Michigan leaders, including Lieutenant Governor Richard Posthumous, Attorney General Jennifer Granholm and State Senators Joe Schwartz and Stille, endorse a mercury phaseout.
- In related work that supports this progress, NWF has published two reports entitled, "Getting Serious About Mercury: A Guide for Developing Comprehensive Mercury Reduction Programs" and "Mercury Products Guide: The Hidden Dangers of Mercury". Both are available from NWF's Great Lakes office. Contact Kathleen Eales at 734-769-3351, eales@nwf.org, or National Wildlife Federation, Great Lakes Natural Resource Center, 213 W. Liberty St, 2nd Floor, Ann Arbor, MI 48104-1398 to request copies.

Michigan Department of Environmental Quality

Pollution prevention continues to be the primary strategy for reducing anthropogenic (human derived) sources of mercury within Michigan. MDEQ documented more than 11,000 pounds of mercury that have been reduced by P2. MDEQ predicts additional reductions will exceed 114,000 pounds by 2005. Activities being undertaken by the Environmental Science and Services Division, MDEQ, to reduce mercury include:

- Mercury Switch Study – MDEQ staff is participating in a study with auto companies to evaluate the technical, logistical, and procedural factors associated with the removal of mercury convenience light switches from scrapped automobiles. More than 1,200 vehicles will be evaluated for mercury switches and catalogued. Switch removal times will be correlated with make, model, and year of vehicle. The most efficient tools and techniques will also be reported. The final report is due December 2002.
- Legislation – HB 4599 (passed by both House and Senate) will ban the sale of mercury thermometers in Michigan after January 1, 2003.
- Education/Outreach Tools – MDEQ developed an award-winning video and interactive compact disk for schools. The Mercury P2 CD received a National NPPR MVP2 (Most Valuable P2 Program/Publication) Award. The CD was sent to 11,000 school libraries and 500 school superintendents. Nearly 2,000 schools have already reported eliminating mercury, well in advance of the 2004 statutory requirement.
- Thermometer Exchange – The highly popular "Catch the Fever", Thermometer Exchange Program, has recovered over 29,000 mercury thermometers through 44 exchange 'events'. Participants turn in mercury thermometers and receive a free digital thermometer in its place. In addition, people are also turning in jars of liquid elemental mercury, switches, thermostats, relays, manometers, barometers, and other devices containing mercury.
- Mercury Spill Workshops – Nine workshops were conducted during which 386 first responders were trained on proper procedures and techniques for addressing mercury spills. This training effort is a cooperative partnership with MDEQ, Michigan Department of Community Health, USEPA, and the Detroit Medical Center.

WE Energies

Pollution Prevention Work

- A resurvey completed in 2001 showed that mercury-containing equipment in WE Energies' power plants and Steam Services System totaled approximately 150 pounds and 59 pounds, respectively. The remaining mercury-containing equipment in WE Energies' power plants is largely contained in hundreds of switches and thermostats located throughout the five major coal-fired power plants and three combustion turbine complexes. The remaining mercury-containing equipment in the Steam Services System is comprised of flow meters. One-half of these meters were scheduled for replacement in 2002.

Emission Reduction Work

- A key assumption used by USEPA in their assessment of costs to reduce mercury emissions from coal-fired

boilers involves the perceived "collateral benefits" of NOx and SO2 control strategies to also control mercury. Preliminary work completed at WE Energies' Pleasant Prairie Power Plant suggested that catalysts employed by an SCR (NOx control) can oxidize elemental mercury, thus making it more likely to be captured by wet scrubbers or existing particulate collectors (e.g., ESPs or fabric filters). However, research at operating SCRs funded by the Electric Power Research Institute (EPRI), USEPA, and the Department of Energy (DOE) in 2001 found that SCR oxidation of elemental mercury appeares to be fuel-specific and SCR-design-specific. More research was conducted in 2002 to better understand this very important reaction, including a long-term evaluation of catalyst performance using a slip-stream of flue gas at the Pleasant Prairie Plant.

- In 2001, a "full scale" test of activated carbon was conducted at Pleasant Prairie Power Plant. This site was selected by the DOE to be one of four existing power plants where sorbent injection was tested as a potential mercury control strategy. The results of this test are as follows:
  1. It is possible to design, build, and operate equipment at a scale capable of treating power plant flue gas.
  2. Depending on the amount of sorbent injected, between 40 percent and 70 percent of mercury is removed from the plant. Beyond 50 percent removal, the mercury reduction benefit of increased carbon injection begins to rapidly decrease.
  3. Between 1 and 10 pounds of activated carbon per million cubic feet of flue gas is required to remove 40-70 percent of the mercury.
  4. While flue gas cooling enhanced mercury removal efficiency under laboratory and limited field testing conditions at other sites, it has minimal effect at the test site.
  5. No adverse impacts on ESP performance were found during the week-long testing.
  6. Injection of even small amounts of activated carbon will prevent fly ash from being beneficially re-used in concrete and may require that the ash be landfilled instead.

Wisconsin Department of Natural Resources

WDNR started a mercury reduction program in 1998. Its goals are to: 1) reduce the public's use of mercury-containing products by promoting alternatives, 2) promote recycling of mercury products that continue to be used, and 3) reduce the potential for mercury spills. The program focuses on sectors where mercury products have historically been used. These include healthcare facilities, dental facilities, schools, HVAC contractors, dairy farms, auto scrap yards, and households. The WDNR is partnering with 22 of Wisconsin's largest municipalities in implementing mercury education and recycling programs.

During 1998-1999, a "Mercury Roundup" was conducted in the communities participating in the mercury reduction program. Free recycling of mercury and mercury devices was offered to medical, dental, and educational facilities. The total amount of mercury collected was 5,100 pounds. During 2000-2001, a similar "Wisconsin Mercury Recycling Program" was offered to households and businesses in the mercury reduction communities. All devices were accepted except fluorescent bulbs; the recycling was offered for free or low cost. This collection generated a total of 6,600 pounds of mercury.

In the dairy manometer program, over 500 manometers have been removed or replaced by non-mercury manometers and about 375 pounds of mercury have been collected. The auto switch sector recently completed their first round of collections, which totaled 4,980 auto switches or 11 pounds of mercury from auto scrap yards. A substantially greater number of switches are anticipated to be collected in the next collection. All of these programs are supported by federal and state grants, both to WDNR and to the mercury reduction communities.

Superior Wastewater Treatment Plant

The Superior WWTP has been a motivated participant in mercury and other toxin reduction activities in the past year.

- Targeting dioxin, Superior WWTP developed a program to discourage the use of burn barrels. A unique PowerPoint presentation was created and recorded onto CDs that are given to any interested parties.
- Many of Superior WWTP's programs target mercury. To date, over 7,200 items (estimated 363 pounds of mercury) have been collected from various mercury sectors. Superior WWTP hosts various mercury collections, including: fever thermometer exchanges at fairs and other events, thermostat collections at eight local businesses, and a permanent mercury drop-off site at the Superior Wastewater Treatment Plant. Superior WWTP has also gathered 120 mercury fever-thermometers from 17 northern Wisconsin camps.
- Over 50 schools have participated in Superior WWTP's Mercury-Free Schools program. The program offers a mercury curriculum, class presentations, collection and recycling of any mercury items, and rewards for mercury items turned in. All five new-car auto dealers in Superior began to switch out mercury switches in the hoods and trunks of all cars sold at their lots. The City of Superior and Douglas County have removed switches from their auto fleets as well.
- Superior recently passed an ordinance banning the land-filling of fluorescent bulbs. Superior WWTP sent

coupons (funded by two local businesses) to residents to cover the cost of recycling 10 fluorescent bulbs.

- Recently, Superior WWTP initiated a Dental Mercury program to educate dental offices on Best Management Practices, in order to reduce amalgam in the waste stream. Education certificates are rewarded to those who participate, and one participant will win an amalgam separator.

Western Lake Superior Sanitary District Near Achieving Great Lakes Mercury Limit

A newly approved low-level test method for mercury (USEPA Method 1631) shows that the WLSSD in Duluth, Minnesota, is approaching the water quality-based limits described in the Great Lakes Water Quality Agreement. The new method, which can measure mercury concentrations under one part per trillion in water, has been a useful tool in showing how close WLSSD's effluent is to meeting the limit. The old test method could not accurately measure mercury concentrations as low as that in the WLSSD effluent and skewed the old data high. WLSSD was pleasantly surprised by the new data.

The lower mercury concentrations in WLSSD's effluent are not only due to the new testing method. Comprehensive programs at all levels are starting to show their effects. Federal regulation of mercury in paint, batteries, and mildewcides and reduced use of mercury in consumer products are starting to show benefits. WLSSD has been working with customers of all sizes to reduce or eliminate mercury discharges at the source. Demonstration grants from USEPA, Great Lakes Protection Fund, and the Great Lakes National Program Office (GLNPO) have allowed WLSSD to demonstrate that source reduction can be effective.

WLSSD has several source reduction programs. The latest effort is the voluntary installation of amalgam removal equipment at dental offices. Presently, 80 percent of dental practices in the WLSSD service area are using simple on-site treatment that captures 95-99 percent of the mercury that historically would have been discharged to the sewer. WLSSD is also working with industrial customers to substitute cleaner raw materials containing less mercury. In addition, a large educational effort is being directed to households and schools to promote the use of alternatives to mercury-containing products.

National Electrical Manufacturers Association

NEMA reports the following mercury reduction accomplishments.

Batteries

The NEMA battery section continues to document the decline in mercury levels from batteries in the waste stream. In the 1980s the battery industry used over 1,000 tons of mercury in household batteries, well over half of the mercury used in consumer products. The industry eliminated its use of mercury in all batteries except button cells by 1993. In an analysis of batteries collected in Hennepin County, Minnesota, conducted in Fall 2001, mercury levels dropped to 336 ppm, down from the historical level of 10,000 ppm, and 91 percent of collected batteries were mercury free. NEMA projects the remaining old batteries will be out of the waste stream by 2008.

Lamps

NEMA lamp manufacturers continued to reduce their use of mercury in energy efficient mercury-containing lamps. Manufacturers used nine tons of mercury in lamps sold in the US in 2001, down from an estimated 27 tons in 1990. The average mercury Level In a standard four-foot lamp declined to 8.2 mg in 2001, in contrast to 41.6 mg in 1990 and 23 mg in 1994. NEMA lamp manufacturers were also instrumental in obtaining Congressional appropriation of $2 million to promote lamp recycling.

Thermostats

In 2001, the Thermostat Recycling Corporation (TRC) recovered over 48,000 thermostats containing over 400 pounds of mercury nationwide. In the first half of 2002, the TRC collected nearly 29,000 thermostats containing 231 pounds of mercury. To date the TRC has recovered nearly 1,300 pounds of mercury.

Indiana Department of Environmental Management

IDEM continues to hold mercury thermometer exchanges with various partners. For three years (since 2000) Cinergy has partnered with IDEM and Eli Lilly to purchase thermometers for exchanges held around the state. These exchanges were held at Earth Day celebrations, child care facilities, Cinergy offices, health fairs, county fairs, and the Indiana State Fair, at hospitals, solid waste management districts, Black Expos, and many more unique places. Since 2000, more than 45 mercury exchange events have been held, and more than 8,800 mercury fever thermometers have been collected. Other mercury devices, including 154 large thermometers and 89 thermostats, and more than 172 pounds of elemental mercury have also been collected. Visit www.in.gov/idem/mercury for a detailed list of events for 2000-2002 and the amount of mercury-containing items that were collected at each event.

The Indiana Mercury Reduction Pledge Program for Hospitals has transitioned into a national program, and IDEM no longer has its own separate hospital pledge program for mercury.

IDEM, in partnership with the Indiana Department of Health, the Indiana Dental Association, and Indiana Solid

Waste Management Districts, is working to schedule an elemental (liquid) mercury sweep for Indiana dentists in early 2003. IDEM and its partners have also agreed to work together to create an environmental pledge program for Indiana dentists. The anticipated completion date of the pledge is late 2003. More information can be found at: http://www.in.gov/idem/mercury/programs/dentalmercury.html

IDEM, in partnership with the U.S. Geological Survey (USGS), has set up four mercury deposition stations throughout Indiana. Data are being collected for both wet and dry deposition. Mercury released into the air (from natural sources and from human sources such as coal-fired power plants, municipal incinerators, and industrial boilers) is for the most part transported to the surface of the earth through precipitation. Mercury has been detected at precipitation monitoring stations throughout North America. The USGS, in cooperation with IDEM, established and currently operates the precipitation-monitoring network for mercury in Indiana. This monitoring program is coordinated through the IDEM Mercury Workgroup and is funded by USGS and IDEM's Office of Air Quality and Office of Water Quality. An overview of the IDEM/USGS Monitoring Program, as well as currently available data summaries for the Indiana monitoring network, are available at: http://www.in.gov/idem/mercury/air/index.html

IDEM created a mercury cleanup and spill guidance document that can be found at: http://www.in.gov/idem/ctap/mercury/spill.pdf

The Indiana Mercury Reduction and Recycling for Schools pledge includes 58 Indiana schools.

The Mercury Thermostat Reduction and Recycling Pledge Program is the beginning of several initiatives to voluntarily reduce the amount of mercury-containing devices that may be found in homes. Since the beginning of the program in September 1997, nearly 200 Heating, Ventilation and Air-Conditioning (HVAC) suppliers and contractors have signed up to participate in the voluntary program. Program participants are working with the Thermostat Recycling Corporation to utilize free recycling of discarded mercury-containing thermostats

Great Lakes United

Due in part to the outreach efforts of GLU and the Clean Car Campaign, including the 2001 report Toxics in Vehicles: Mercury, the North American auto industry has committed to phasing out mercury switches from all models by the end of 2002.

In 2002, GLU continued to pursue a comprehensive solution to the problem of mercury in automobiles through the development of an action plan calling for: 1) a manufacturer-sponsored collection and recovery program to capture mercury switches currently in commerce; 2) a manufacturer commitment to design for recycling and stop the introduction of new mercury uses; and, 3) leadership on the issue by government entities through adoption of "mercury free" preferential purchasing policies.

GLU also set up a workgroup to determine the best means for recapturing mercury in existing vehicles before they are scrapped and recycled. The workgroup, comprised of non-governmental organizations, end-of-life industry, and state agency partners, developed model legislation for mercury recovery from automobiles, surveyed U.S. States for their mercury and "extended producer responsibility" regulations and programs, and developed a toolbox of legislative and incentive opportunities for States to pursue mercury reductions. The "toolbox" will be used in a series of video-conferencing sessions being held to help the stakeholders determine next steps for achieving high recovery rates of mercury from vehicles.

Through 2003,GLU and its partners will continue to work with governments and the auto sector on cost-effective ways to eliminate mercury from cars.

Canadian Steel Producers Association

In 1998, CSPA formalized a commitment to a cleaner environment and responsible environmental stewardship in its Statement of Commitment and Action for Environmental Protection (SCA). The SCA sets goals for environmental performance, undertakes pollution prevention and commits to report annually on progress.

Progress related to GLBTS substances is reported here.

Dioxins and Furans

The CSPA participated in multi-stakeholder consultations on the development of Canada Wide Standards for electric arc furnaces (EAF) and sinter plants.

In 2002, to assist in implementing the Canada Wide Standards, the CSPA completed a second round of EAF stack testing and research designed to provide better data on emission levels, assess control technologies and develop a standardized sampling methodology.

The one operating sinter plant was tested for a second time since installing a new-technology emission control system in 2001; results are expected early in 2003.

B(a)P

In 2001, CSPA coke producers achieved a 67 percent reduction in PAH emissions per tonne of coke produced compared to 1993 and a 50 percent improvement from 2000.

Verified by annual, independent third-party audits, reductions were accomplished voluntarily through the implementation in 1999 of an industry-developed

environmental best practice manual for controlling PAH emissions from coke batteries.

The SCA reduction targets extend to 2015 and satisfy recommendations of a 1997 Environment Canada report on steel industry toxic emissions.

PCBs

Between 1990 and 2001, CSPA members reduced the total number of pieces of PCB-containing equipment in service by 40 percent and destroyed 95 percent of high-level and 90 percent of low-level PCB waste in storage.

Mercury

In June 2001, CSPA endorsed a Switch-Out pilot program in Ontario aimed at removing mercury switches from end of life automobiles before shredding and delivery to steel plants for recycling.

To assist with the Switch Out goal to enlist one hundred auto recyclers and collect 30,000 switches by April 2003, the CSPA is supplying their scrap suppliers with a brochure and waste containers.

Council of Great Lakes Industries

CGLI has worked in partnership with USEPA since 1997 to facilitate implementation of the GLBTS. CGLI continues to conduct awareness efforts, recruit Workgroup participants, gather data for release inventory building, has helped implement a decision tree process for sector significance determinations, has researched incentives which attract industry to GLBTS participation, serves as a liaison between USEPA and industry stakeholders, and seeks substance release reduction commitments from industry stakeholders. Recent highlights include:

- Continued Substance-Workgroup support activities and awareness efforts with emphasis on industry sectors which have not yet become involved in the Strategy. These include the primary and secondary aluminum and copper smelters, pesticides manufacturers, and small industries.

- Increased Strategy awareness and participation among industry suppliers. CGLI has provided awareness materials to facilitate supplier contact by industry participants.

- Work directed towards charting a course for future efforts once current Strategy goals have been fully met. CGLI has reviewed accomplishments with industry, explored potential next steps, and provided recommendations to the governments. This effort has included a study of existing pollution prevention programs, especially those which include Level II substances within their scope, an evaluation process regarding proposed additional Strategy substances, a risk based approach to selecting management options for chemicals remaining in the environment – including those associated with sediments and those circulated within the Region via atmospheric transport.

Black Bear
Photograph by Don Breneman

7.0 SEDIMENTS CHALLENGE

Under the GLBTS, EC and USEPA committed to:

"Complete or be well-advanced in remediation of priority sites with contaminated bottom sediments in the Great Lakes Basin by 2006."

Highlights of sediment remediation activities undertaken in the U.S. and Canada are described below.

2002 Sediment Assessments with USEPA's Research Vessel Mudpuppy

Contaminated sediments are a significant concern in the Great Lakes Basin. Although toxic discharges have been reduced over the past 30 years, high concentrations of contaminants still remain in the sediments of many rivers and harbors. These sediments are of potential risk to the health of aquatic organisms, wildlife, and humans.

To assist in determining the nature and extent of sediment contamination at these polluted sites, USEPA's GLNPO provides the Research Vessel (R/V) Mudpuppy. The R/V Mudpuppy is a 32-foot-long, flat-bottom boat that is specifically designed for sampling sediment deposits in shallow rivers and harbors. The boat is able to sample at water depths between 2 feet and 50 feet. Using a vibro-coring unit, the R/V Mudpuppy can take sediment core samples of up to 15 feet in depth.

To adequately characterize a site, GLNPO uses an integrated sediment assessment approach. This involves collecting data for sediment chemistry, toxicity, and the benthic community at a specific site, and then using the results to determine the extent of contamination that could be impacting the aquatic ecosystem.

Since 1993, the R/V Mudpuppy has conducted surveys at 38 locations, including 27 of the 31 Great Lakes AOCs. So far in 2002, the following surveys have been conducted with the assistance of the R/V Mudpuppy:

- Cuyahoga River, OH - Screening level assessment of old river channel as part of a GLNPO grant with the Ohio Environmental Protection Agency;
- Rochester Embayment, NY - Assessment of AOC, including the Genesee River, as part of a GLNPO grant/interagency agreement with New York State Department of Environmental Conservation and U.S. Fish and Wildlife Service;
- Lake St. Clair, MI - Collected samples to determine if the release of high levels of PCBs in the 10-mile drain area in St. Clair, Michigan, had extended out into Lake St. Clair;
- Lake Macatawa, MI - Screening level assessment conducted as part of a GLNPO grant to Grand Valley State University;
- Duluth Harbor, MN - Assisting the U.S. Corps of Engineers with sampling for navigational dredging purposes; and,
- Milwaukee Harbor, WI - Assisting the U.S. Corps of Engineers with sampling for navigational dredging purposes.

U.S. Great Lakes Sediment Remediation Projects - 2001[10]

During 2001, nearly 400,000 cubic yards of sediment were remediated from five U.S. sites in the Great Lakes Basin. Several of these projects are in various phases of remediation, with work continuing, while the Hayton Area Remediation Project (HARP) project, Fields Brook site, and the Reynolds Metals/Alcoa site began work for the first time in 2001. The following is a description of each remediation project:

HARP OU1-Source Abatement: In 2001, Tecumseh Products Company, in partnership with the Wisconsin Department of Natural Resources (WDNR) and GLNPO, completed the removal of approximately 11,800 cubic yards of contaminated sediments from Operable Unit (OU)-1 of the HARP project area. This site is located in New Holstein, Wisconsin, within the Manitowoc River watershed. The project was partially funded through a $250,000 GLNPO grant to WDNR. The company is currently pursuing additional remedial actions at downstream Operational Units (OU-2 through OU-4), while seeking official closure documentation from the regulatory agencies for the completed work.

Fields Brook Superfund Site: This project, led by USEPA Superfund, removed approximately 42,000 cubic yards of sediments contaminated with PCBs, HCB, and radium from the Fields Brook and adjacent floodplains. Fields Brook is a tributary of the Ashtabula River in Ohio. The remaining sediment to be removed in 2002 has been impacted by Dense Non-Aqueous Phased Liquid (DNAPL).

Reynolds Metals/Alcoa East: USEPA Superfund was involved in the remediation of roughly 86,000 cubic yards of PCB-contaminated sediment in this 33-acre site along the St. Lawrence River in Massena, New York. Over 4,000 cubic yards of PCB-impacted sediment with levels greater than 10 part per million were capped.

[10] Sediment remediation data for 2001 are presented because data lag a year behind in reporting (e.g., 2002 data will become available in 2003).

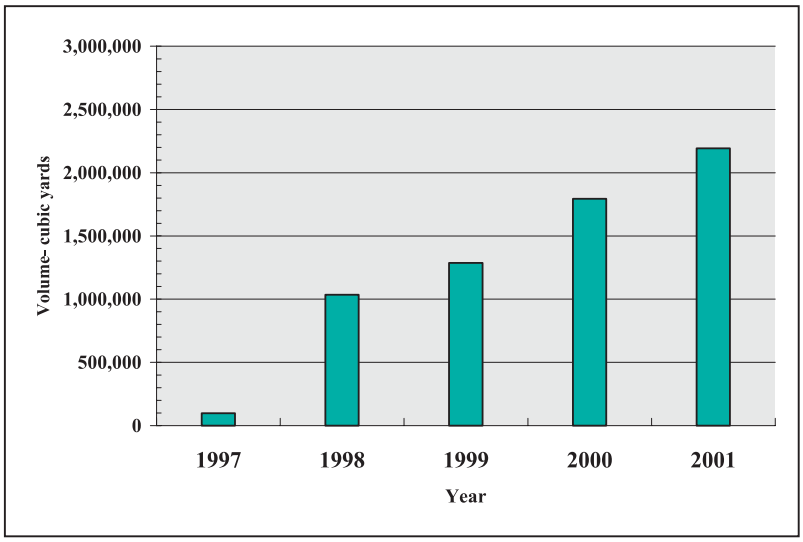


Figure 7-1. Cumulative Volume of Sediment Remediated in the U.S. Since 1997
Data. Source: USEPA

Saginaw River and Bay: USEPA Superfund completed this project on the Saginaw River and Saginaw Bay in Michigan in July 2001. Over 137,000 cubic yards of sediment were removed from this area in 2001, eliminating approximately 4,500 pounds of PCBs.

Pine River: During the third year of progress on the Pine River, in Michigan, approximately 120,000 cubic yards of contaminated sediment were removed by USEPA Superfund. This remedial action eliminated roughly 50,300 pounds of DDT from the river.

Figure 7-1 presents the cumulative volume of sediment remediated in the U.S. since 1997.

Great Lakes Legacy Act

On November 27, 2002, U.S. President George W. Bush signed the Great Lakes Legacy Act into law, authorizing appropriations of up to $54 million each fiscal year from 2004 through 2008, to fund remediation of the most polluted sediments in the Great Lakes AOCs. The funding is also intended to encourage development and use of innovative technologies and research in the clean up of contaminated sediments, and to provide public information programs at the clean up sites.

Update on Sediment Issues in Areas of Concern (Canada)

The following information identifies some of the sediment assessment and remediation related activity carried out in Canadian AOCs during 2001. The previous GLBTS progress reports of 2000 and 2001 should be referred to for additional information on sediment issues in the Canadian AOCs.

Port Hope Harbour: Sediments in the harbour are, in part, contaminated by uranium-series radionuclides, and remediation is linked to the development of facilities in the Port Hope area for the long-term management of low-level radioactive waste. An agreement between the federal government and the Town of Port Hope and adjacent municipalities was reached in March 2001 on the development of these facilities, and environmental planning and assessment activities have been initiated under the requirements of the Canadian Environmental Assessment Act.

Thunder Bay Harbour (Northern Wood Preservers): Approximately 11,000 cubic metres of contaminated sediment (above 150 ppm PAH) had been dredged at this site and placed in an engineered bioremediation cell on site. Remediation criteria were not being met over the period September 1998 - February 2000, and the decision was made to utilize an alternate technology. In 2001, the sediments were shipped by environmental rail cars to Princeton, British Columbia, for thermal desorption. Full treatment is expected to be completed by August 2002.

Severn Sound: The Severn Sound AOC is principally an area impacted by excessive nutrient enrichment and eutrophication. Remedial activities have focused on sewage treatment plant upgrades, improvements in private sewage systems, urban stormwater management and stream and shoreline habitat rehabilitation. Various assessments and monitoring of sediments have been undertaken, and in 2001, it was concluded that impairments relating to degradation of benthos and restrictions on dredging have been overcome. No sediment interventions are planned, and residual sediment contamination will be left to natural recovery.

Table 7-1 reports progress on sediment remediation projects at both AOCs and non-AOCs in the U.S. and Canada, from 1997 through 2001. The maps on the following pages illustrate the progress and achievements made in sediment remediation activities in the Great Lakes from 1997 to 2001.

Table 7-1. Progress on Sediment Remediation in the Great Lakes Since 1997*

Site/AOC/non-AOC	Cumulative Mass of Contaminant Removed (kg)												Cumulative Volume Sediments Removed 1997 to 2001 (cy)	Volume Sediments Removed 2001 (cy)	Ultimate Disposition
	aldrin/ dieldrin	benzo(a) pyrene	chlordane	DDT (+DDE/DDD)	hexachlorobenzene	alkyl-lead	mercury & compounds	mirex	octachloro styrene	PCBs	dioxins and furans	toxaphene			
U.S. Sites															
Ashtabula River, OH															
Black River-S. Branch, MI															
Black River, OH															
Buffalo River, NY - Buffalo Color - Area D													45,000		capped
Clinton River, MI															
Cuyahoga River, OH															
Deer Lake-Carp River, MI															
Detroit River, MI - Monguagon Creek													25,000		landfilled
Eighteen Mile Creek, NY															
Fields Brook Superfund, OH													42,000	42,000	landfilled
Fox River, Green Bay, WI - Deposit 56/57 - Deposit N										22,865 22,815 50			87,500 80,300 7,200		landfilled
Grand Calumet, IN															
Kalamazoo River, MI - Bryant Mill Pond										10,000			150,000		landfilled
Manistee Lake, MI															
Manistique River, MI													123,000		landfilled
Manitowoc River, WI - HARP										425			11,800	11,800	landfilled

*Information included in matrix reports quantitative as reported by project managers. No attempt has been made to evaluate chemical data quality or verify calculations of mass removed.

Table 7-1. Progress on Sediment Remediation in the Great Lakes Since 1997*

Site/AOC/non-AOC	Cumulative Mass of Contaminant Removed (kg)												Cumulative Volume Sediments Removed 1997 to 2001 (cy)	Volume Sediments Removed 2001 (cy)	Ultimate Disposition
	aldrin/ dieldrin	benzo(a) pyrene	chlordane	DDT (+DDE/DDD)	hexachlorobenzene	alkyl-lead	mercury & compounds	mirex	octachloro styrene	PCBs	dioxins and furans	toxaphene			
U.S. Sites															
Maumee River, OH - Fraleigh Creek										25,400			8,000		landfilled
Menominee River, MI/WI - Ansul Eighth Street Slip													13,000		landfilled
Milwaukee Harbor, WI - North Ave. Dam													8,000		landfilled
Muskegon Lake, MI															
National Gypsum - Alpena, MI															
Niagara River, NY - Scajaquada Creek - Cherry Farm/River Road - Niagara Transformer													71,000 17,500 42,000 11,500		landfilled
Pine River, MI				226,569									260,000	120,000	landfilled
Presque Isle Bay, PA															
River Raisin, MI										16,795			27,000		on-site TSCA facility
Rochester Embayment, NY															
Rouge River, MI - Evan's Product Ditch - Newburgh Lake										250,000 4,000 246,000			407,000 7,000 400,000		off-site TSCA facility and landfilled
Saginaw River/Bay, MI										4,500			342,500	137,500	off-shore CDF
Sheboygan Harbor, WI															
St. Clair River, MI															
St. Lawrence River, NY - Reynolds Metals/Alcoa										10,000			86,000	86,000	landfilled and

*Information included in matrix reports quantitative as reported by project managers. No attempt has been made to evaluate chemical data quality or verify calculations of mass removed.

Table 7-1. Progress on Sediment Remediation in the Great Lakes Since 1997*

Site/AOC/non-AOC	Cumulative Mass of Contaminant Removed (kg)												Cumulative Volume Sediments Removed 1997 to 2001 (cy)	Volume Sediments Removed 2001 (cy)	Ultimate Disposition
	aldrin/ dieldrin	benzo(a) pyrene	chlordane	DDT (+DDE/DDD)	hexachlorobenzene	alkyl-lead	mercury & compounds	mirex	octachloro styrene	PCBs	dioxins and furans	toxaphene			
U.S. Sites															
East															capped
St. Louis River/Bay, MN/WI															
St. Marys River, MI													3,000		landfilled
Torch Lake, MI															
USX Vessel Slip Project, IN													3,200		solid, special and hazardous waste landfilled
Waukegan Harbor, IL															
Waxdale Creek, WI															
White Lake, MI															
Willow Run Creek, MI										200,000			450,000		on-site TSCA facility
Wolf Creek - Tributary, MI															
TOTALS				**226,569**						**539,985**			**2,191,800**	**397,300**	

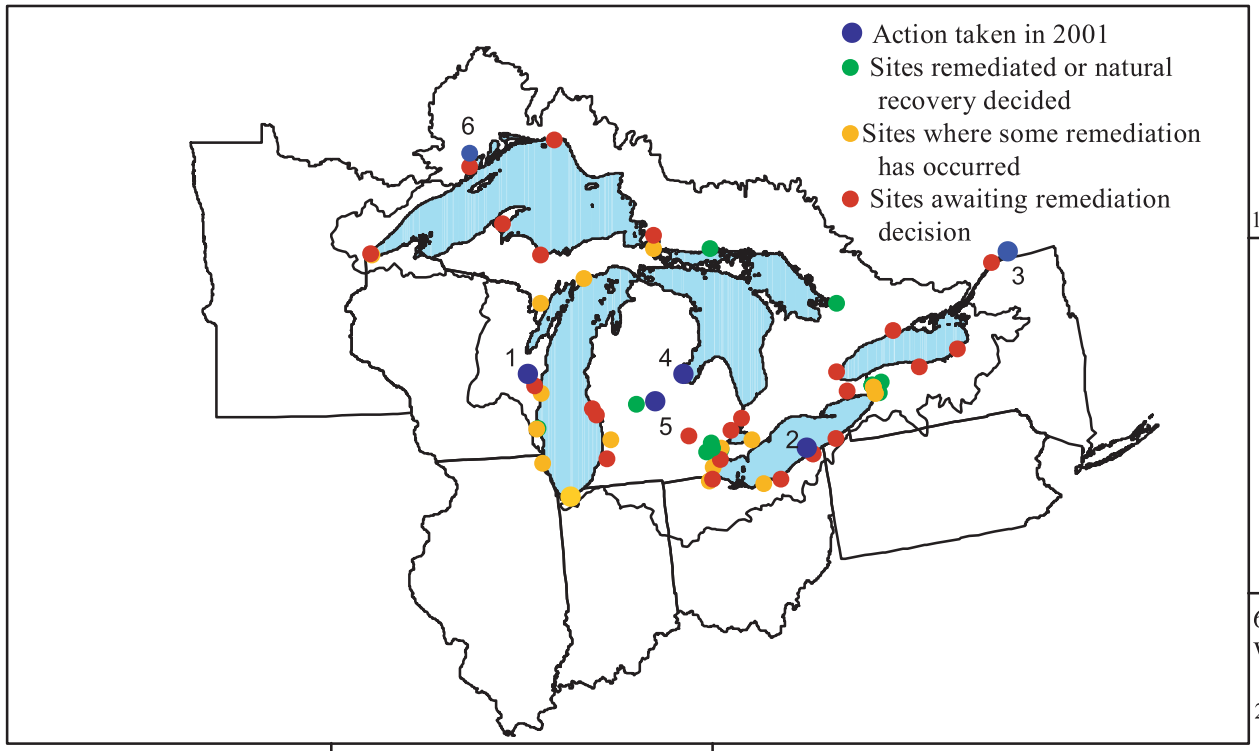
*Information included in matrix reports quantitative as reported by project managers. No attempt has been made to evaluate chemical data quality or verify calculations of mass removed.

Table 7-1. Progress on Sediment Remediation in the Great Lakes Since 1997*

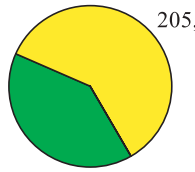
Site/AOC/non-AOC	Cumulative Mass of Contaminant Removed (kg)												Cumulative Volume Sediments Removed 1997 to 2001 (cm)	Volume Sediments Removed 2001 (cm)	Ultimate Disposition
	aldrin/ dieldrin	benzo(a) pyrene	chlordane	DDT (+DDE/DDD)	hexachlorobenzene	alkyl-lead	mercury & compounds	mirex	octachloro styrene	PCBs	dioxins and furans	toxaphene			
Canadian Sites															
Thunder Bay - Northern Wood Preservers		2,700											11,000 21,000	11,000	Thermal treatment Berm enclosed & capped
Nipigon Bay															
Jackfish Bay															
Peninsula Harbour															
St. Marys River															
Spanish River															
Severn Sound															
St. Clair River															
Detroit River															
Wheatley Harbour															
Niagara River (Ontario)															
Hamilton Harbour															
Metro Toronto															
Port Hope															
Bay of Quinte															
St. Lawrence River (Cornwall, Ontario)															
TOTALS		**2,700**											**32,000**	**11,000**	

*Information included in matrix reports quantitative as reported by project managers. No attempt has been made to evaluate chemical data quality or verify calculations of mass removed.

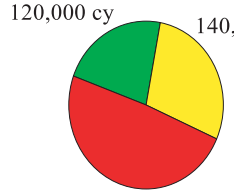
Great Lakes Sediment Remediations in 2001



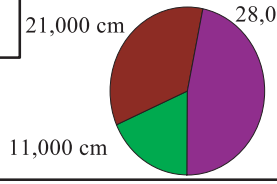
4. Saginaw River & Bay



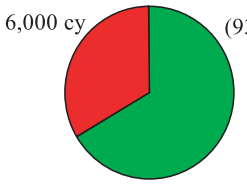
5. Pine River, Michigan
(50,300 pounds DDT)



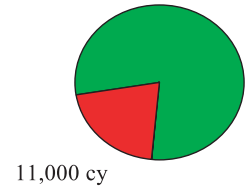
6. Thunder Bay – Northern Wood Preservers, Ontario



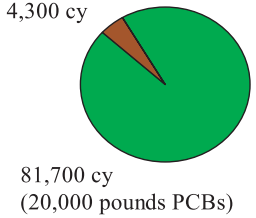
1. Hayton Area Remediation Project - OU1 – Source Abatement, Wisconsin

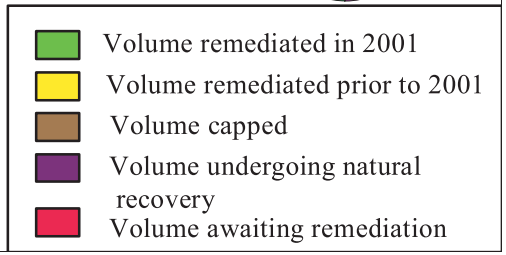


2. Fields Brook Superfund Site, Ohio

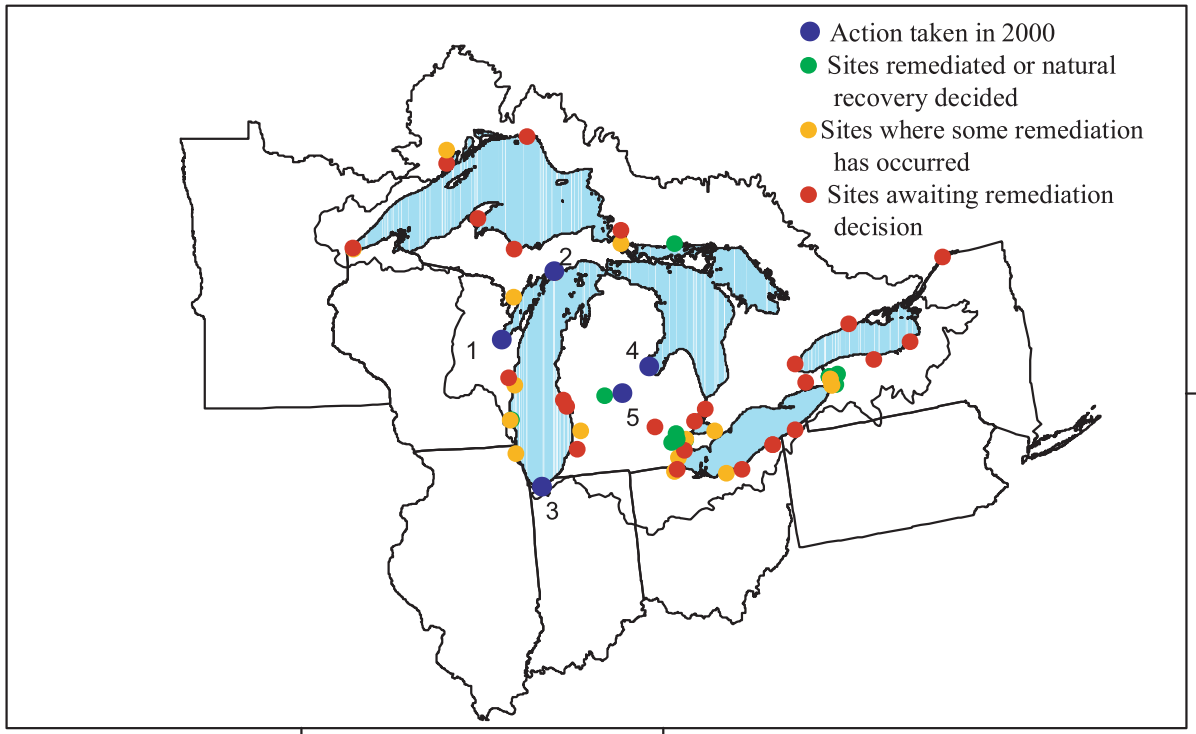


3. Reynolds Metals/Alcoa East St. Lawrence River

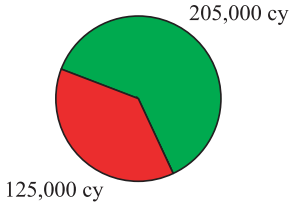




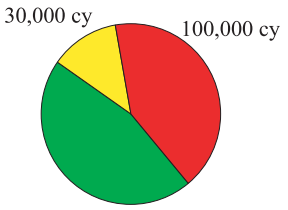
Great Lakes Sediment Remediations in 2000



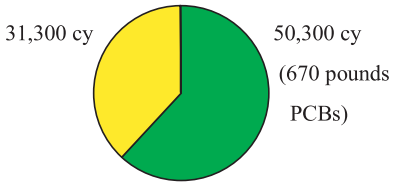
4. Saginaw River & Bay



5. Pine River

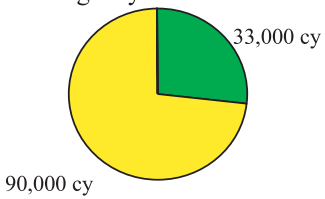


1. Fox River – Deposit 56/57

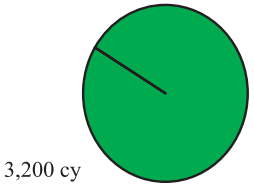


10,900,000 cy total in Fox River

2. Manistique River & Harbor Emergency Removal

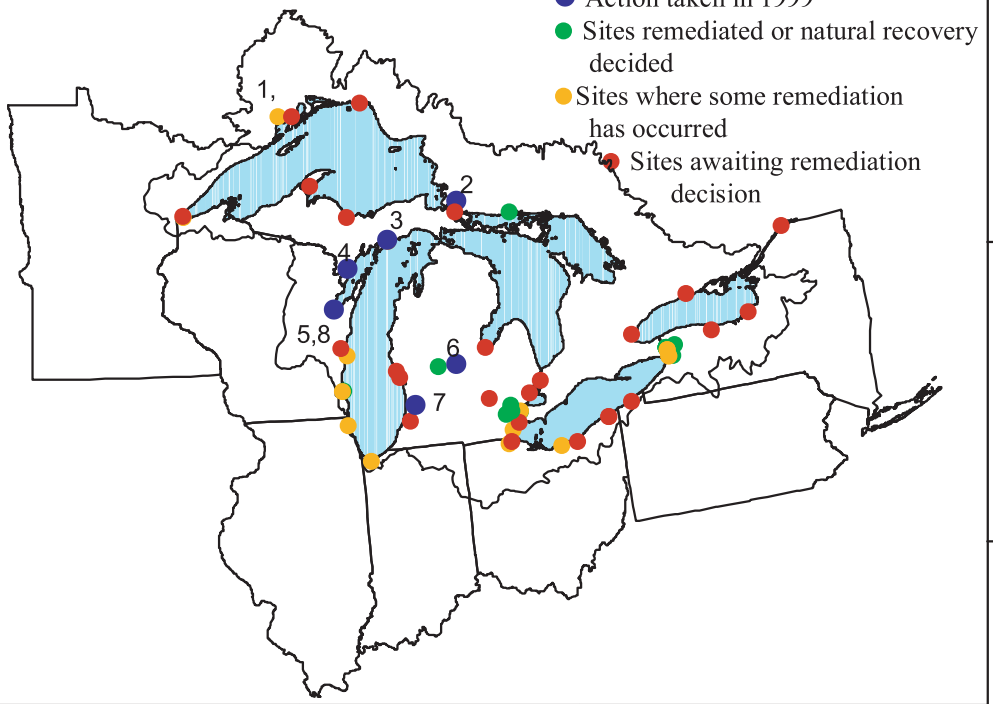


3. USX Vessel Slip Project – Lake Michigan

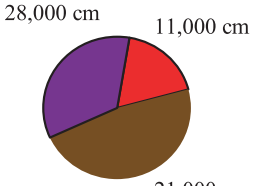


- Volume remediated in 2000
- Volume remediated prior to 2000
- Volume capped
- Volume undergoing natural recovery
- Volume awaiting remediation

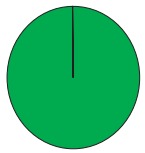
Great Lakes Sediment Remediations in 1999



1. Thunder Bay – Northern Wood Preservers



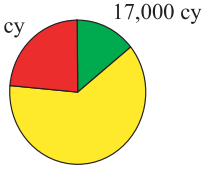
2. St. Marys River



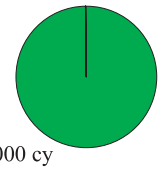
3,000 cy

Remainder of contaminated sediments undergoing natural attenuation

3. Manistique River and Harbor

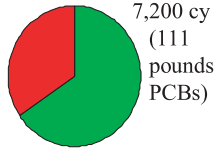


4. Menominee River - Ansul Eighth Street Slip



13,000 cy

5. Fox River -Deposit N

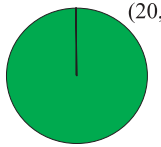


10,900,000 cy total in Fox River

8. Fox River - Deposit 56/57

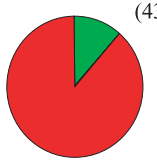
10,900,000 cy total in Fox River

7. Kalamazoo River - Bryant Mill Pond



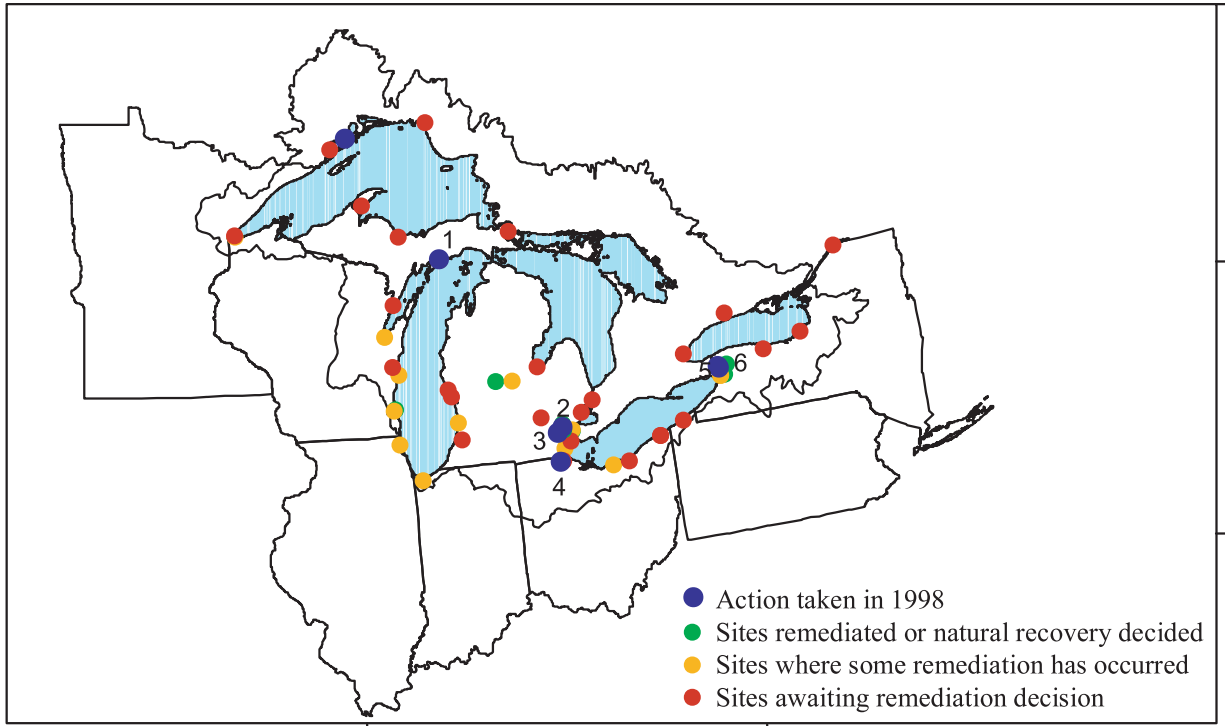
7,000,000 cy total in Kalamazoo R.

6. Pine River

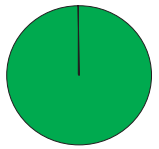


- Volume remediated in 1999
- Volume remediated prior to 1999
- Volume capped
- Volume undergoing natural recovery
- Volume awaiting remediation

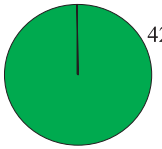
Great Lakes Sediment Remediations in 1998



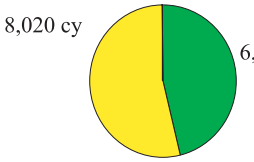
4. Ottawa River - Unnamed Tributary



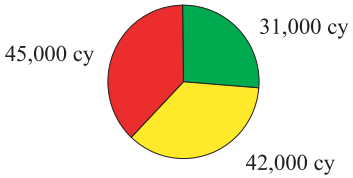
5. Niagara Mohawk - Cherry Farm/River Road



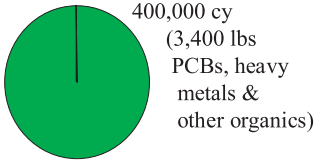
6. Gill Creek



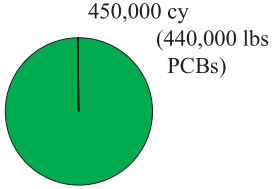
1. Manistique River and Harbor

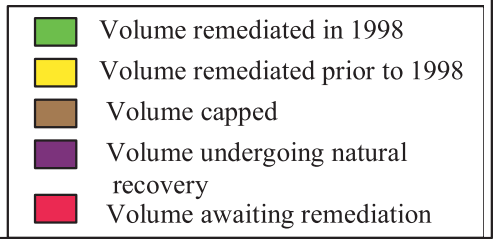


2. Newburgh Lake

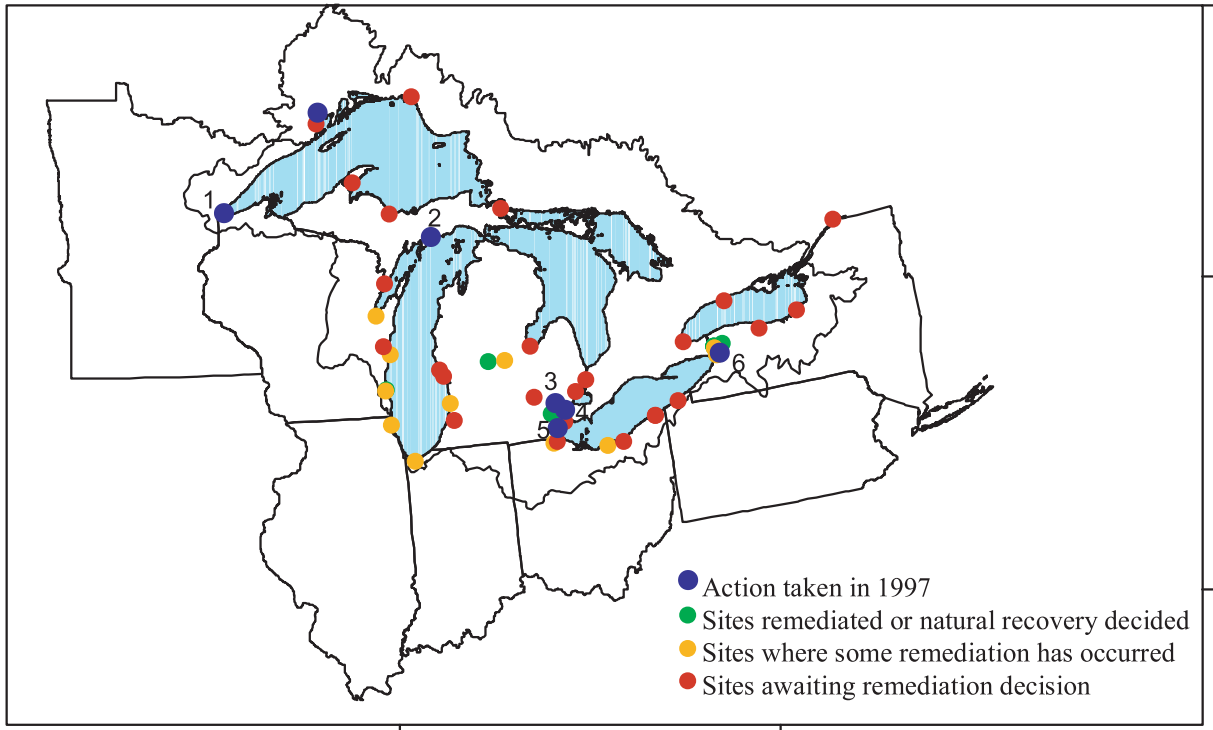


3. Willow Run Creek

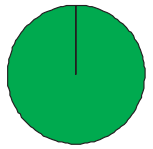




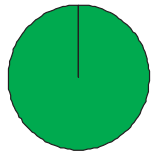
Great Lakes Sediment Remediations in 1997



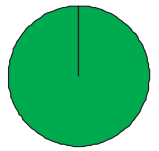
4. Monguagon Creek



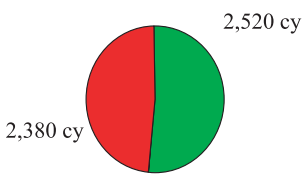
5. River Raisin – Ford Monroe Outfall



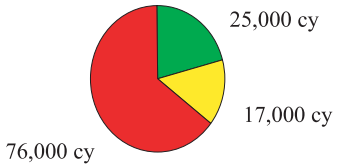
6. Niagara Transformer



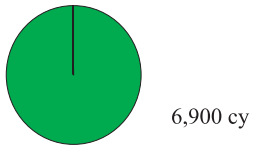
1. Newton Creek/ Hog Island Inlet



2. Manistique River and Harbor



3. Evans Product Ditch – Upper Rouge River



Volume remediated in 1997
Volume remediated prior to 1997
Volume capped
Volume undergoing natural recovery
Volume awaiting remediation

8.0 LONG-RANGE TRANSPORT CHALLENGE

Canadian Workgroup co-chair: ***S. Venkatesh***

U.S. Workgroup co-chair: ***Todd Nettesheim***

Under the GLBTS, EC and USEPA committed to:

"Assess atmospheric inputs of Strategy substances to the Great Lakes. The aim of this effort is to evaluate and report jointly on the contribution and significance of long-range transport of Strategy substances from worldwide sources. If ongoing long-range sources are confirmed, work within international frameworks to reduce releases of such substances."

In support of this challenge, the U.S. and Canada have:

- Maintained the Integrated Atmospheric Deposition Monitoring Network (IADN);
- Improved the integration of monitoring networks and data management;
- Continued research on the atmospheric science of toxic pollutant transport; and,
- Worked through existing international frameworks to reduce releases of Strategy substances and better assess the significance of long-range transport.

Workshop on Long-Range Transport of Toxic Substances

Following the Strategy's 4-step analytical framework to evaluate and report jointly on the contribution and significance of long-range transport of Strategy substances from worldwide sources, EC and USEPA are organizing a workshop on the long-range transport of toxic substances to the Great Lakes. The long-range transport workshop will further EC's and USEPA's progress toward addressing Steps 1 (Information Gathering) and 2 (Analysis). The workshop will convene worldwide experts on long-range transport to address specific questions related to the long-range transport challenge. These questions include:

- Do we have enough information and data to evaluate the impact of long-range atmospheric transport on loadings and the achievement of GLBTS challenges?
- What is the contribution of long-range transport on loadings to and burdens in the Great Lakes? What contribution is intra-continental transport (outside of Great Lakes Basin) and what contribution is global transport (outside of North America)?
- What are the knowledge gaps and uncertainties that limit the ability of EC and USEPA to assess the significance of long-range transport of Level I and II Strategy substances?
- What emerging chemicals should we be most concerned about with respect to their long-range transport characteristics and use worldwide?
- Based on what we can definitively say about the impacts of long-range transport to the Great Lakes, how can the GLBTS best integrate this knowledge into current and future management strategies for the Great Lakes?

EC and USEPA are currently planning to hold this workshop in the summer of 2003.

LRT Update 2002 – Canadian Activities

Numerical Investigation of Budget and Loading of y-hexachlorcyclohexane over the Great Lakes Ecosystem - by J. Ma and S.M. Daggupaty, Meteorological Service of Canada

A coupled regional scale atmospheric transport, soil-air, and water-air exchange model was developed to investigate the effects of atmospheric transport, reemission, and loadings of g-hexachlorcyclohexane (g-HCH) to the Great Lakes. Numerical experiments were conducted for the period May 1, 1998 to April 30, 1999 in a region of Canada and part of the United States. The coupled model was executed with two g-HCH emission (usage) scenarios–one with all sources in the Canadian portion of the model domain and a second excluding sources in the cornfields of Ontario and Quebec provinces. Model results show that strong soil-air exchange occurs during the warm period of the year. Strong net outgasing from soils (volatilization) into the air takes place in the source regions (croplands) where g-HCH was applied as an insecticide. In non-source regions where soil was assumed to be not contaminated initially, deposition is stronger during the tilling and warm periods than during the cold period of the year. Air concentrations decrease considerably in autumn and winter seasons, and increase during the following Spring, indicating that the change in the air temperature plays an essential role in the reduction and increase of soil-to-air transfer of g-HCH (Figure 8-1). It was found that changes in g-HCH burden in the atmosphere around and over the Great Lakes depend primarily upon the g-HCH usages and volatilization in the canola fields in Canadian prairie-provinces and upon subsequent long-range transport from this source region. The contribution from g-HCH

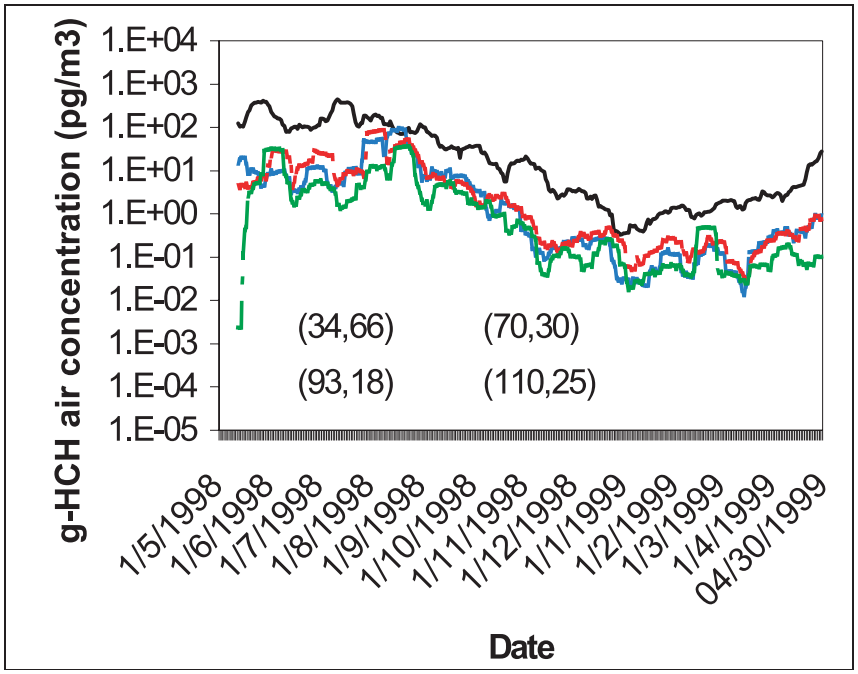


Figure 8-1. **Modeled Running Average Daily Air Concentrations at Selected Grids from May 1, 1998 to April 30, 1999. Grid (34,66) is located at a canola field in Saskatchewan. Grid (93,18) is located at a cornfield in Ontario. Grids (70,30) and (110,25) are located at the west of Lake Michigan and St. Lawrence valley where g-HCH was not applied.**

Table 8-1. **Modeled and Measured Air Concentrations (pg m-3) Averaged over Summer 1998 from Two Runs**

	PPT	BNT	STP	SBD	EGH
IADN	19.0	15.2	51.4	42.5	28.1
RUN1	26.6	17.6	25.6	29.0	26.5
RUN2	26.1	17.6	24.8	28.9	26.3

**PPT: Point Petre, model grid (101,23)*
BNT: Burnt Island, model grid (87,29)
STP: Sturgeon Point, model grid (96,18)
SBD: Sleeping Bear Dunes, model grid(78,25)
EGH: Eagle Harbor, model grid (74,35)

usage in the cornfields of Ontario and Quebec to the overall g-HCH budget and to the Great Lakes is negligible. Table 8-1 lists measured (from IADN network) and modeled (from two model runs) daily g-HCH concentrations averaged over the summer of 1998. Modeled dry and wet depositions to the Great Lakes are higher in the summer than those in the autumn and winter seasons. The upper Great Lakes (Lakes Superior, Michigan, and Huron) receive more g-HCH due to deposition. Absorption due to net gas exchange occurs in Lakes Michigan, Huron, and Ontario in the summer, and volatilization occurs in the autumn and winter seasons of the year in all five lakes.

Lindane Transport to the Great Lakes Region from Application Areas in Saskatchewan

A journal paper on the Multi-compartment Environmental Diagnosis and Assessment (MEDIA) model was published in Chemosphere. The citation for this article is provided below.

Koziol A. & J. Pudykiewicz, 2001: Global-scale environmental transport of persistent organic pollutants. Chemosphere, Volume 45, Issue 8, December 2001, p. 1181.

9.0 ENVIRONMENTAL INDICATORS OF PROGRESS

The efficacy of our efforts to reduce GLBTS level I and II substances is ultimately measured by corresponding trends of levels of these substances in the environment. This section presents monitoring data for environmental indicators in the air over the Great Lakes and in Great Lakes fish, gull eggs, and sediment. Trends in atmospheric concentrations are described by ambient air monitoring data collected by the Integrated Atmospheric Deposition Network (IADN), the National Air Pollution Surveillance (NAPS) network, the Canadian Atmospheric Mercury Measurement Network (CAMNet), the Mercury Deposition Network (MDN), and the National Dioxin Air Monitoring Network (NDAMN). Levels in fish tissue are illustrated by data collected from the Great Lakes Laboratory for Fisheries & Aquatic Sciences, Department of Fisheries & Oceans, and USEPA's Great Lakes Fish Monitoring Program. Contaminant trends in Great Lakes herring gull eggs is described by data collected through the Canadian Wildlife Service Herring Gull Egg Monitoring Program. Spatial and temporal trends in Great Lakes sediment are indicated by data collected from various water and sediment contaminant monitoring programs operating in the Great Lakes.

Trends in Ambient Air

Ambient Air Monitoring of Great Lakes Toxics
Submitted by Todd Nettesheim, USEPA/GLNPO

Integrated Atmospheric Deposition Network

The IADN is a joint United States-Canada atmospheric monitoring network that has been in operation since 1990. The IADN consists of five master stations, one near each of the Great Lakes, and several satellite stations. Concentrations of PCBs, pesticides, polycyclic aromatic hydrocarbons (PAHs), and trace metals are measured in ambient air, suspended particles, and precipitation at each station. These data are used to estimate the spatial and temporal trends of toxic contaminants in air and precipitation and loadings to the Great Lakes.

Figure 9-A1 illustrates that there has generally been a decline in total PCB concentrations in the air near each of the Great Lakes over the past 10 years. A review of pre-1990 PCB data collected near Lakes Superior and Michigan from the literature further supports the notion that total PCB concentrations are declining and approaching equilibrium around the Great Lakes (see Figure 9-A2). Data from more recent years (1997-1999) suggest a change to this trend; however, data from 2000 and 2001 (preliminary) show a decrease in PCB concentrations. It is assumed that PCB concentrations will continue to decrease slowly.

Figure 9-A1 also clearly illustrates the spatial variations of gas-phase total PCB concentrations in air near the Great Lakes. Note the logarithmic scale for concentrations in Figure 9-A1, which shows that total PCB concentrations at the Chicago satellite station have been about an order of magnitude higher than at all the other sites. It is expected that PCB concentrations should be elevated in the Chicago urban area because of the widespread use of PCBs in industrial applications in the middle of the 20th century. However, the IADN also measures an "urban effect" on the PCB concentrations at the Sturgeon Point master station, which is approximately 20 kilometers southwest of the Buffalo urban area. Furthermore, recent research is revealing that the influence of the Chicago urban area may reach as far away as Lake Superior.

Gas-phase α-hexachlorcyclohexane (HCH) concentrations are also decreasing at IADN stations (see Figure 9-A3). This declining trend also correlates well with declining global use trends of a-HCH. This downward trend is, in general, the case for the other banned or restricted pesticides measured by IADN. Concentrations of organochlorine pesticides in precipitation have also decreased over time.

Concentrations of B(a)P, on the other hand, show no real trend up or down (see Figure 9-A4). B(a)P concentrations are higher near major population centers (Lake Erie and Lake Ontario stations). Concentrations in Chicago (not shown) are about 1-2 orders of magnitude higher than concentrations at the IADN master stations.

An atmospheric loading is the amount of a pollutant entering a lake from the air through precipitation, falling particles, and gaseous absorption into the water, minus the volatilization of the pollutant out of the water column. Figure 9-A5 shows total basinwide loadings for alpha-HCH, gamma-HCH (lindane), and total PCBs from the

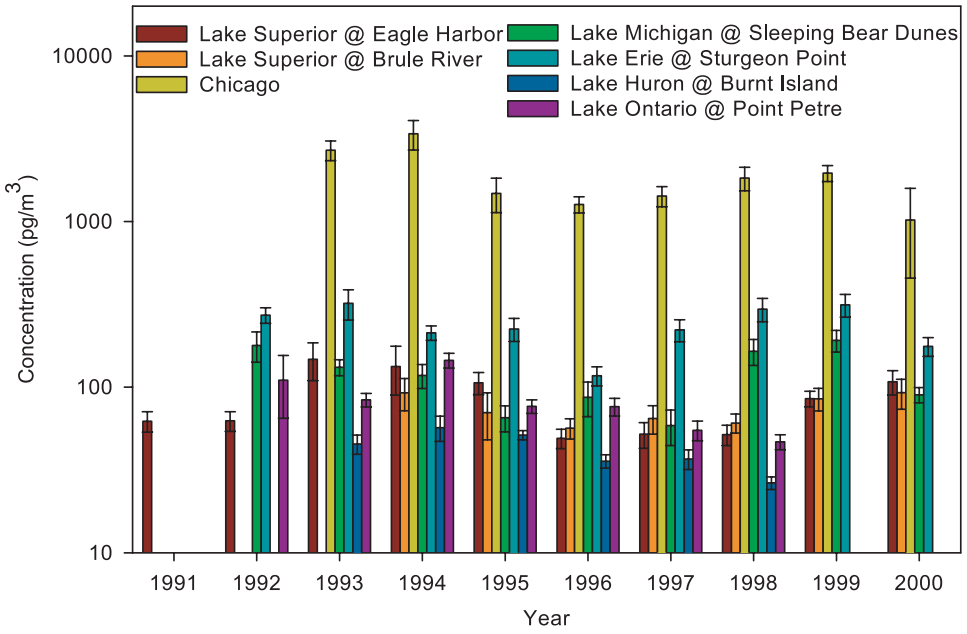


Figure 9-A1. Annual Average Atmospheric Gas-phase Total PCB Concentrations[11]

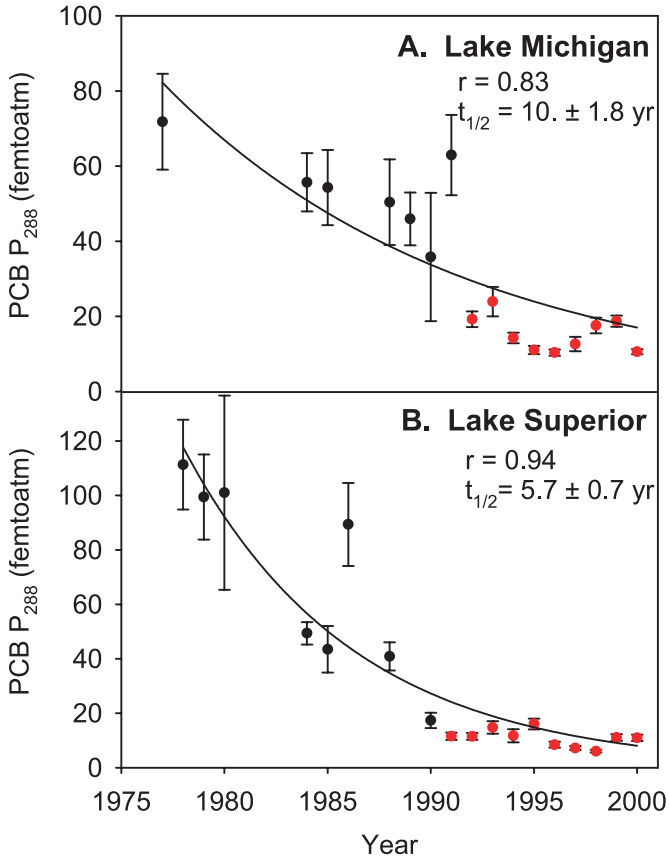


Figure 9-A2. Long-term PCB Concentrations[12]

[11] Buehler, S. and Hites, R.A. 2002. The Great Lakes' Integrated Atmospheric Deposition Network: The United States and Canada continue an effective partnership that measures nonpoint source pollution. Environ. Sci. Technol. 2002, 36, 354A-359A.

[12] United States/Canada IADN Scientific Steering Committee. Cooperating to Implement the Great Lakes Water Quality Agreement: Technical Summary of Progress of the Integrated Atmospheric Deposition Network (IADN) 1997-2002. October 2002.

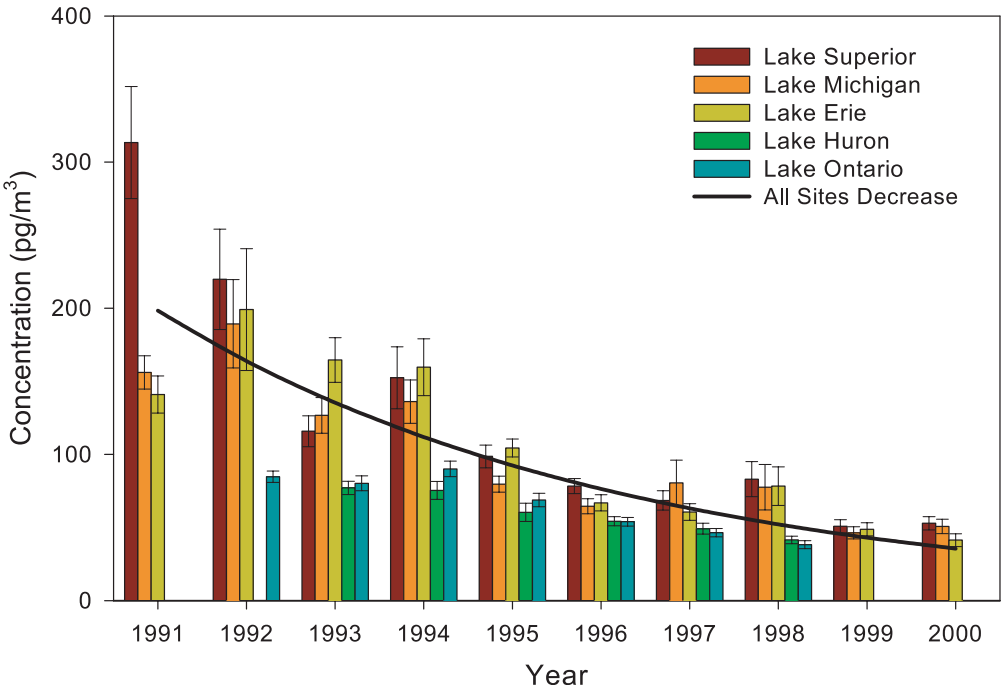


Figure 9-A3. Annual Average Atmospheric Gas-phase a-HCH Concentrations[13]

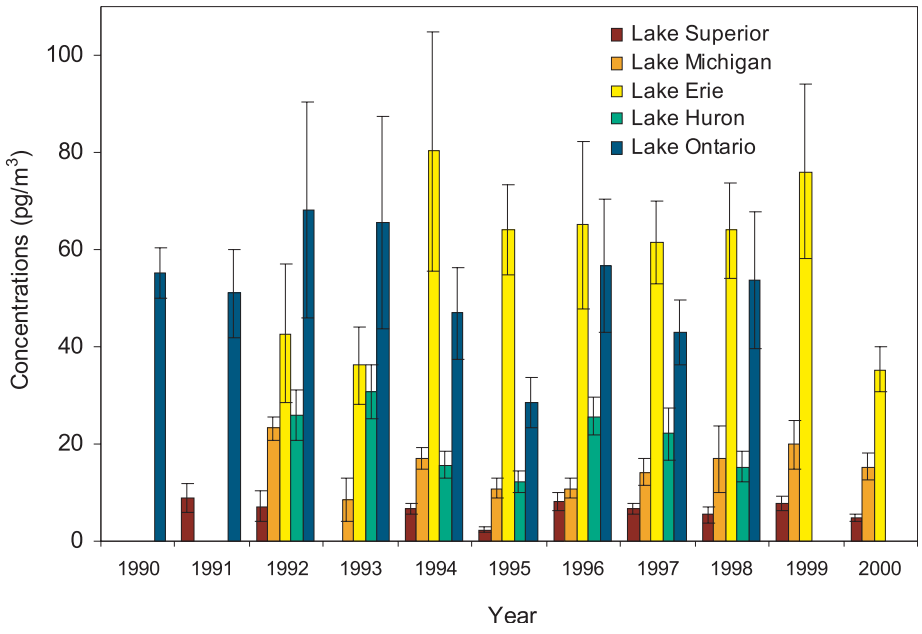


Figure 9-A4. Annual Average Particle-phase B(a)P Concentrations[14]

[13] Buehler, S. and Hites, R.A. 2002. The Great Lakes'Integrated Atmospheric Deposition Network: The United States and Canada continue an effective partnership that measures nonpoint source pollution. Environ. Sci. Technol. 2002, 36, 354A-359A.

[14] Hulting, M. Atmospheric Deposition of Toxic Chemicals: SOLEC Indicator #117. SOLEC 2002. Implementing Indicators: Draft for discussion at SOLEC 2002. October 2002.

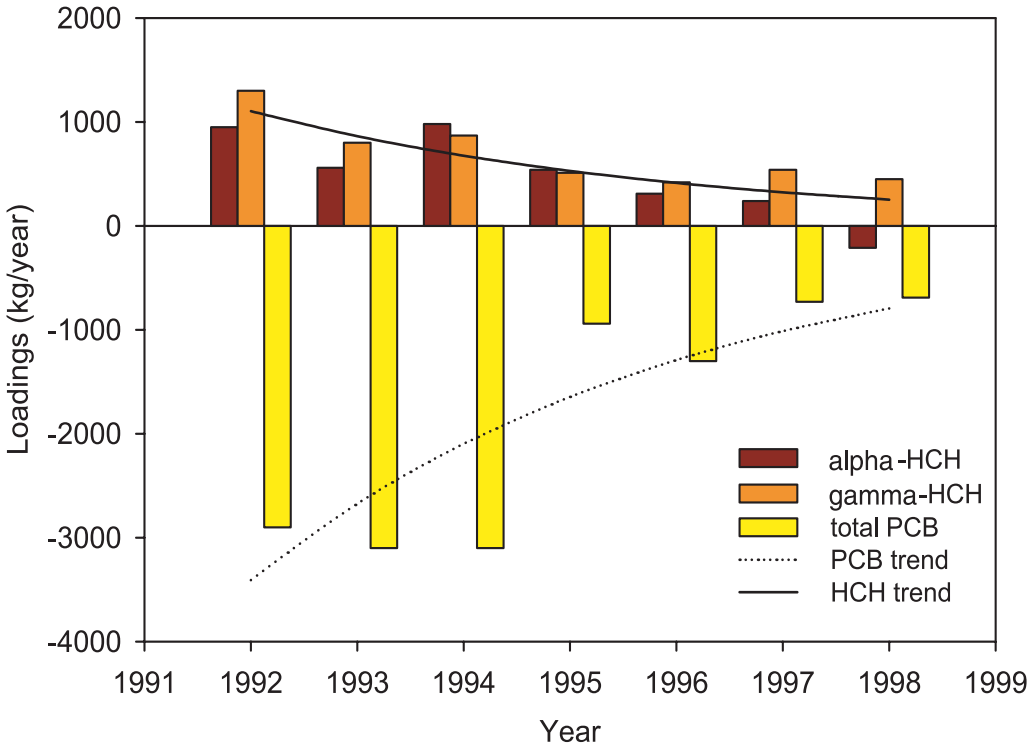


Figure 9-A5. PCB and HCH Loadings to the Great Lakes Basin[15]

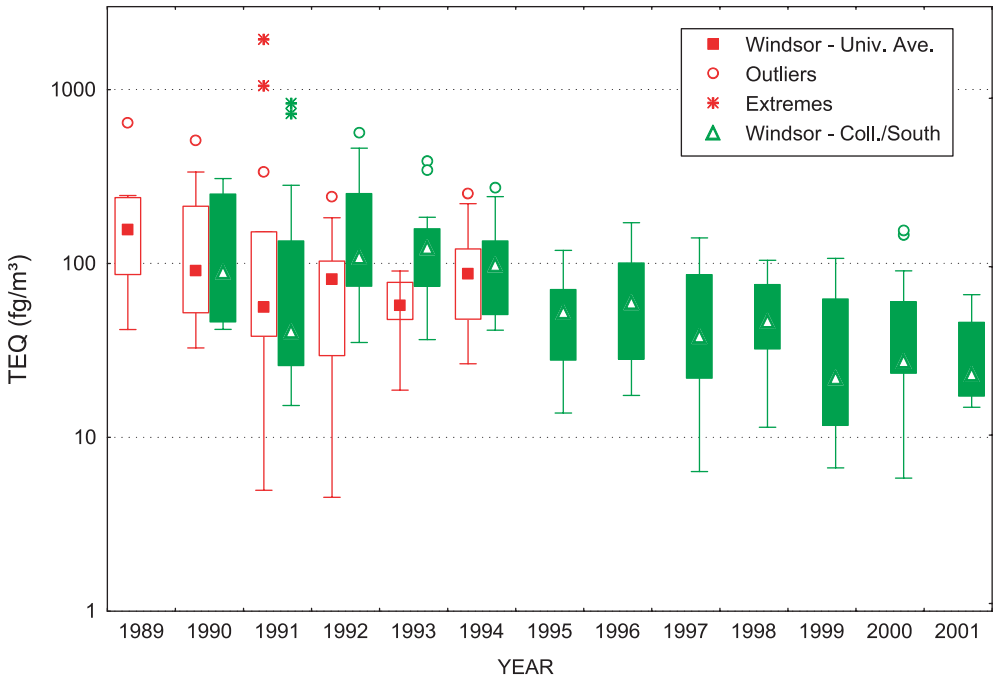


Figure 9-A6. Trend in 2,3,7,8-TCDD Toxic Equivalents (fg/m³) at Windsor, Ontario (1989-2001)[16]

[15] Buehler, S. and Hites, R.A. 2002. The Great Lakes'Integrated Atmospheric Deposition Network: The United States and Canada continue an effective partnership that measures nonpoint source pollution. Environ. Sci. Technol. 2002, 36, 354A-359A.

[16] Source: Environment Canada Analysis and Air Quality Division

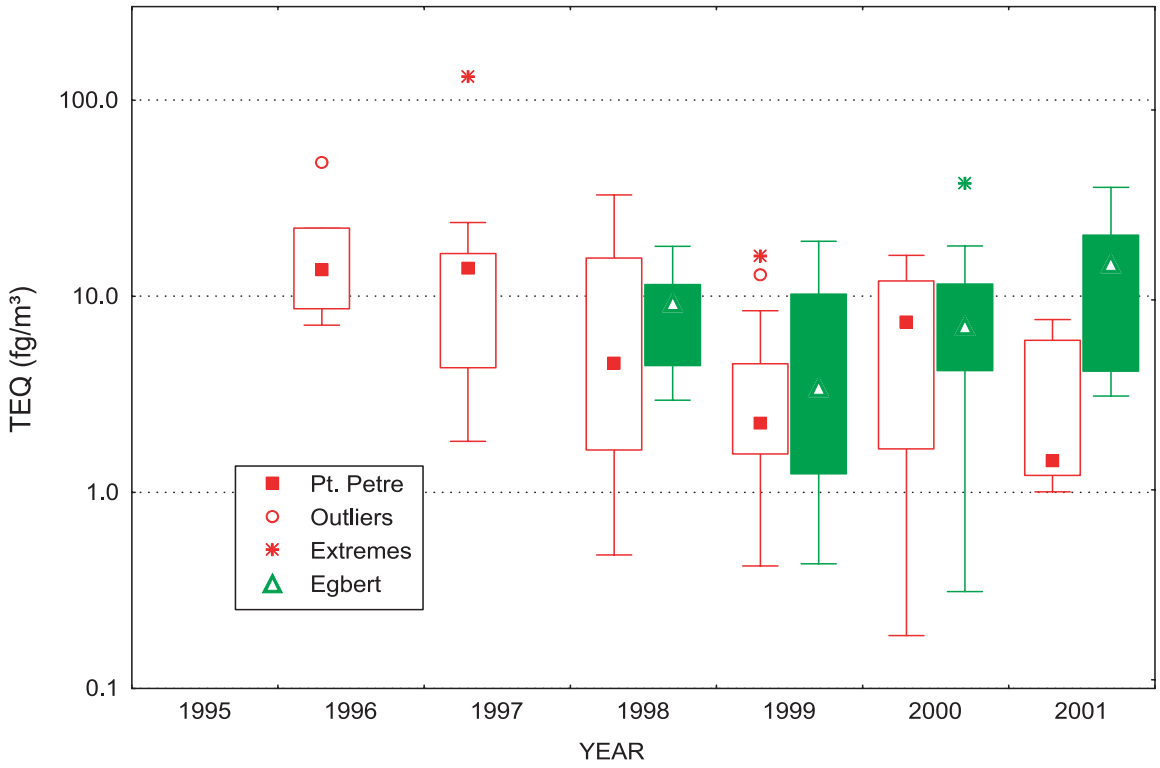


Figure 9-A7. Trend in 2,3,7,8-TCDD Toxic Equivalents (fg/m³) at Two Rural Ontario Sites (1995-2001)

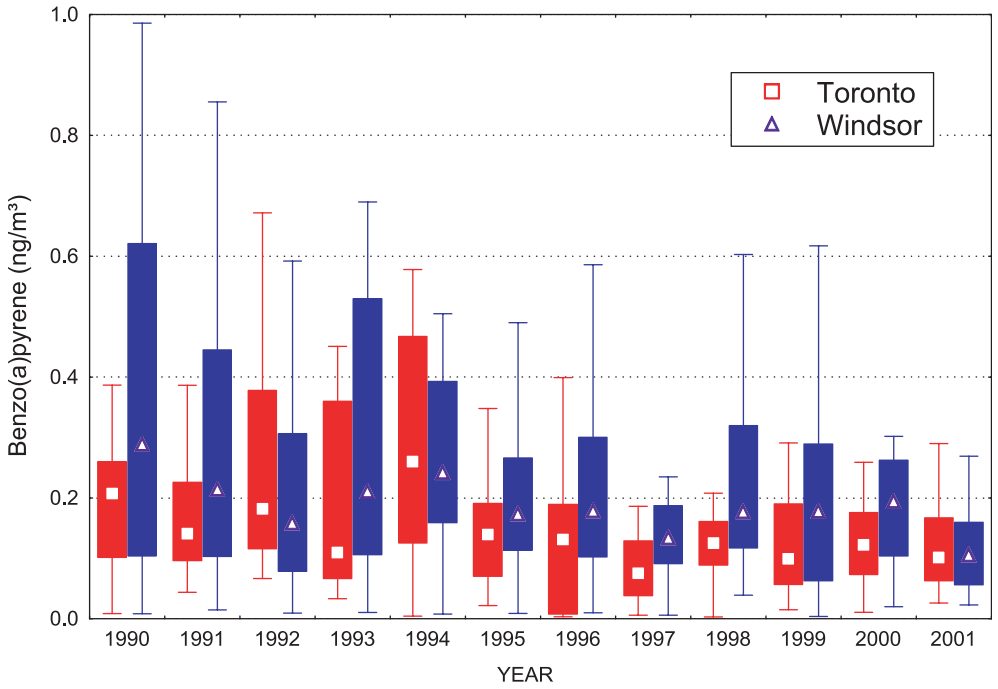


Figure 9-A8. Trend in Benzo(a)pyrene Concentrations (ng/m³) at Urban Sites (1990-2001)

[17] ibid

[18] ibid

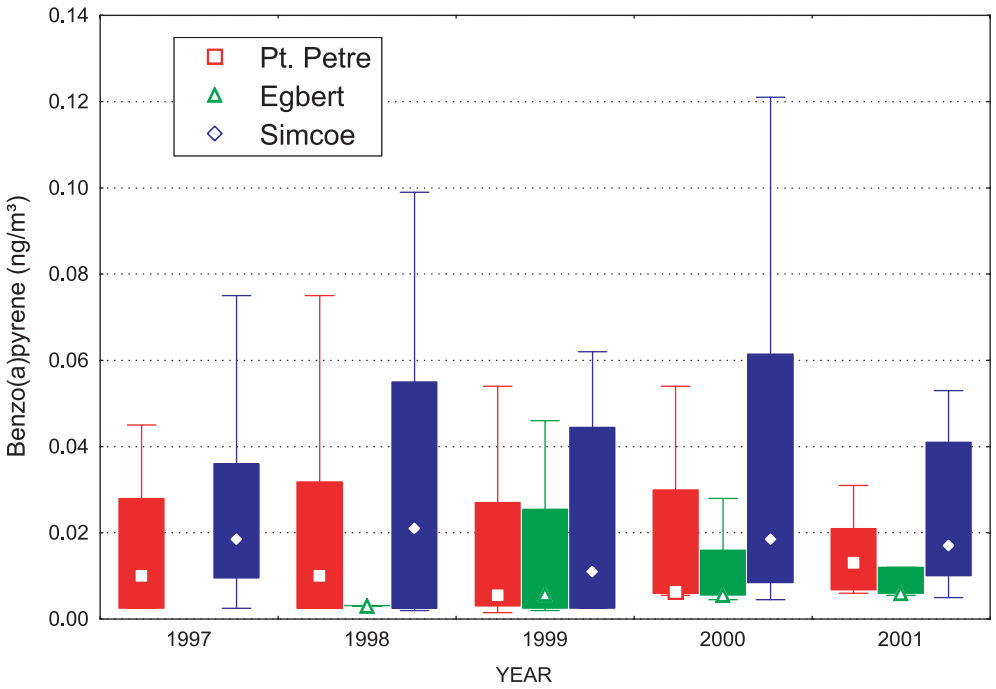


Figure 9-A9. Trend in Benzo(a)pyrene Concentrations (ng/m³) at Rural Sites (1997-2001)[19]

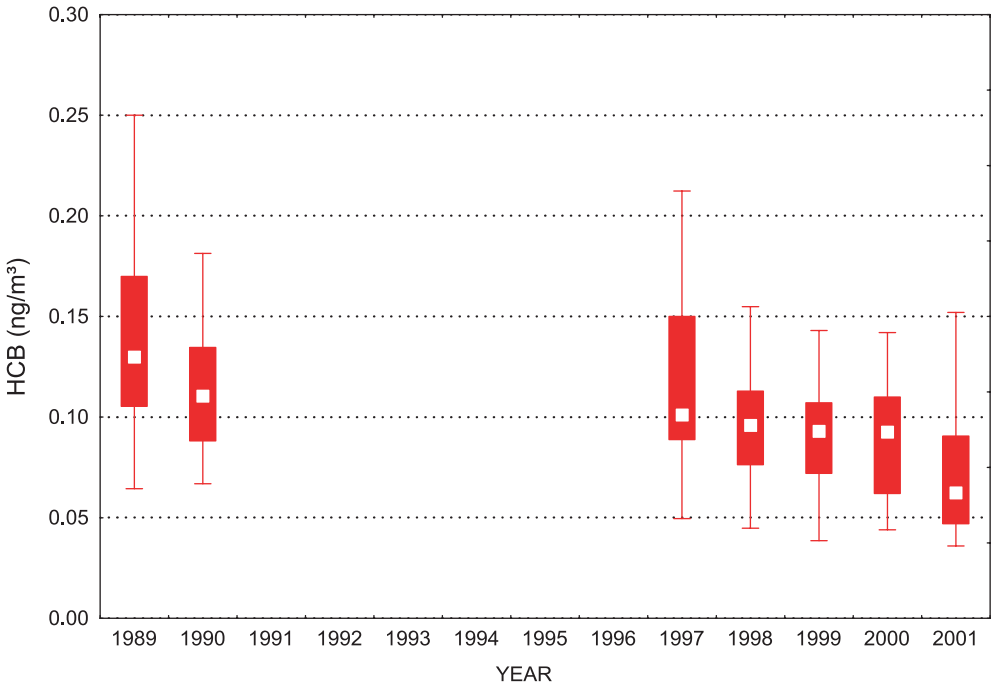


Figure 9-A10. Trend in Hexachlorobenzene Concentrations (ng/m³) at Windsor, Ontario (1989-2001) [20]

[19] ibid

[20] ibid

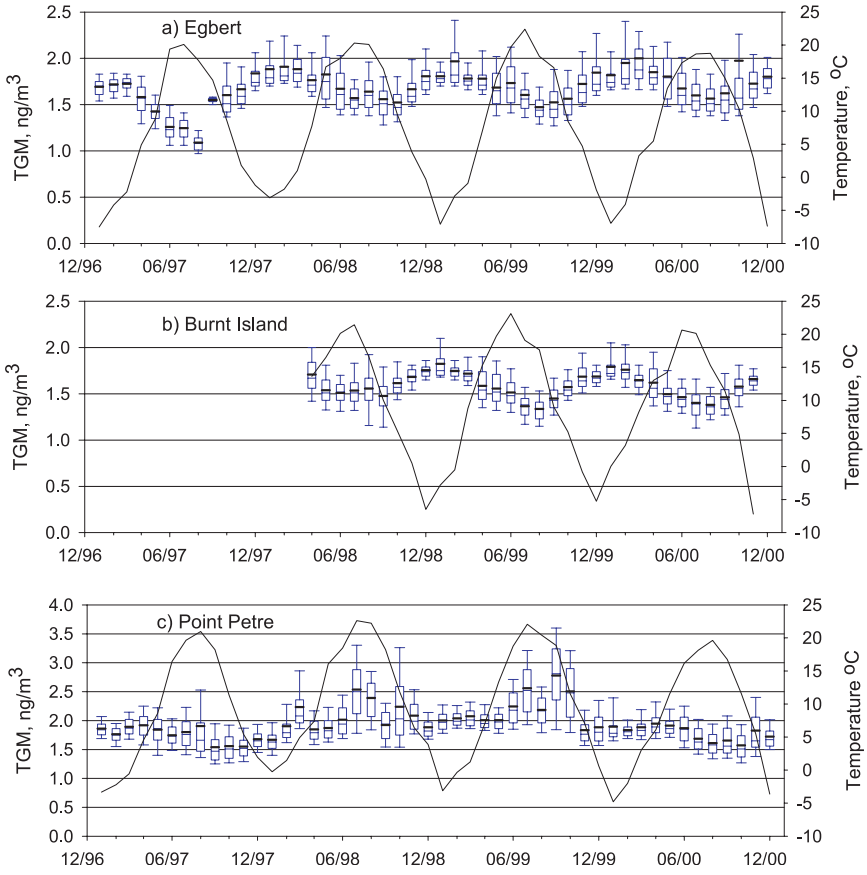


Figure 9-A11. Monthly TGM and Temperature Means at Canadian IADN Stations [21]

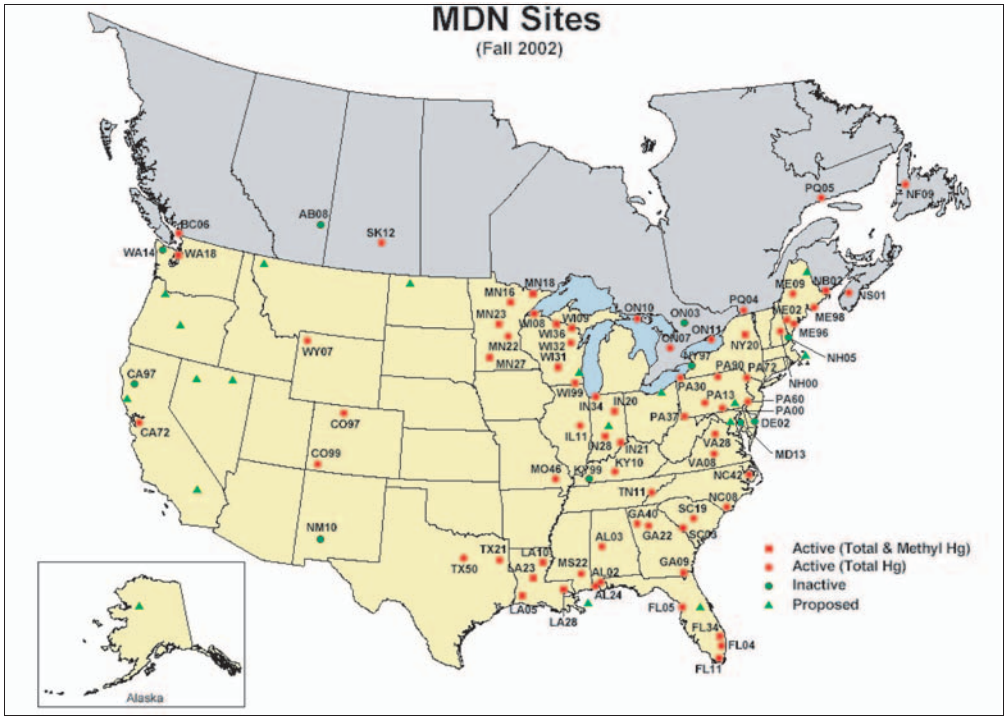
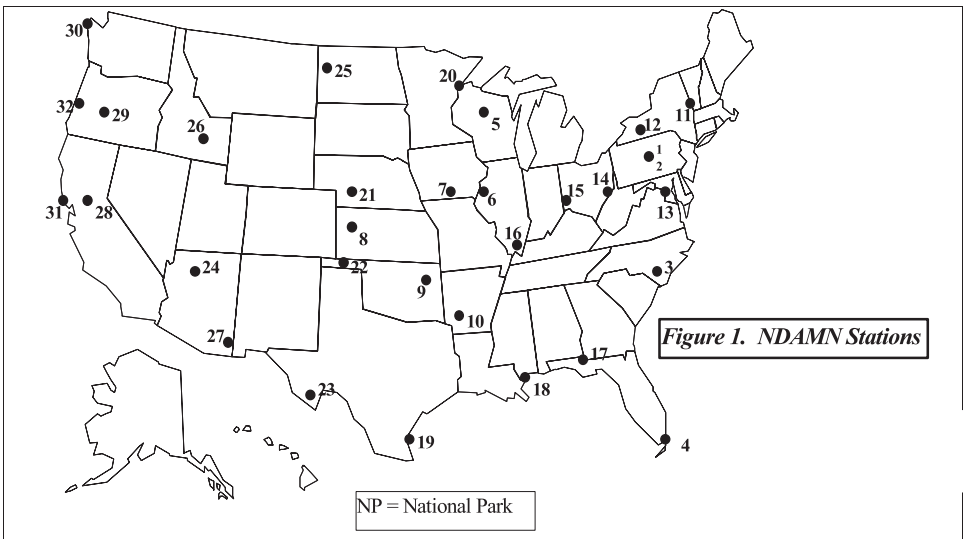


Figure 9-A12. The Mercury Deposition Network (Fall 2002)[22]

[21] Blanchard, P.; Froude, F.A.; Martin, J.B.; Dryfhout-Clark, H.; Woods, J.T. 2002. Four years of continuous total gaseous mercury (TGM) measurements at sites in Ontario, Canada. Atmos. Environ. 2002, 36, 3735-3743.

[22] http://nadp.sws.uiuc.edu/mdn/



1. Penn Nursery, PA
2. Jasper, NY
3. Clinton Crops, NC
4. Everglades National Park, FL
5. LakeDubay, WI
6. Monmouth, IL
7. McNay, IA
8. Lake Scott State Park, KS
9. Bixby, OK
10. Arkadelphia, AR
11. Bennington,VT
12. Jasper, NY
13. Beltsville, MD
14. Caldwell, OH
15. Oxford, OH
16. Dixon Spring, IL
17. Quincy, FL
18. Bay St. Louis, MS
19. Padre Island NP,TX
20. Fond Du Lac, MN
21. North Platte, NE
22. Goodwell, OK
23. Big Bend NP, TX
24. Grand Canyon NP, AZ
25. Theodore Roosevelt NP, ND
26. Craters-of-the-Moon NP, ID
27. ChiricahuaNational Mom, AZ
28. Rancho Ceco, CA
29. HyslopFarm, Benton, OR
30. LakeOzette, Olympic NP, WA
31. FortCronkhiteNP, CA
32. Newport, OR

Figure 9-A13. Locations of NDAMN Stations in the U.S.[23]

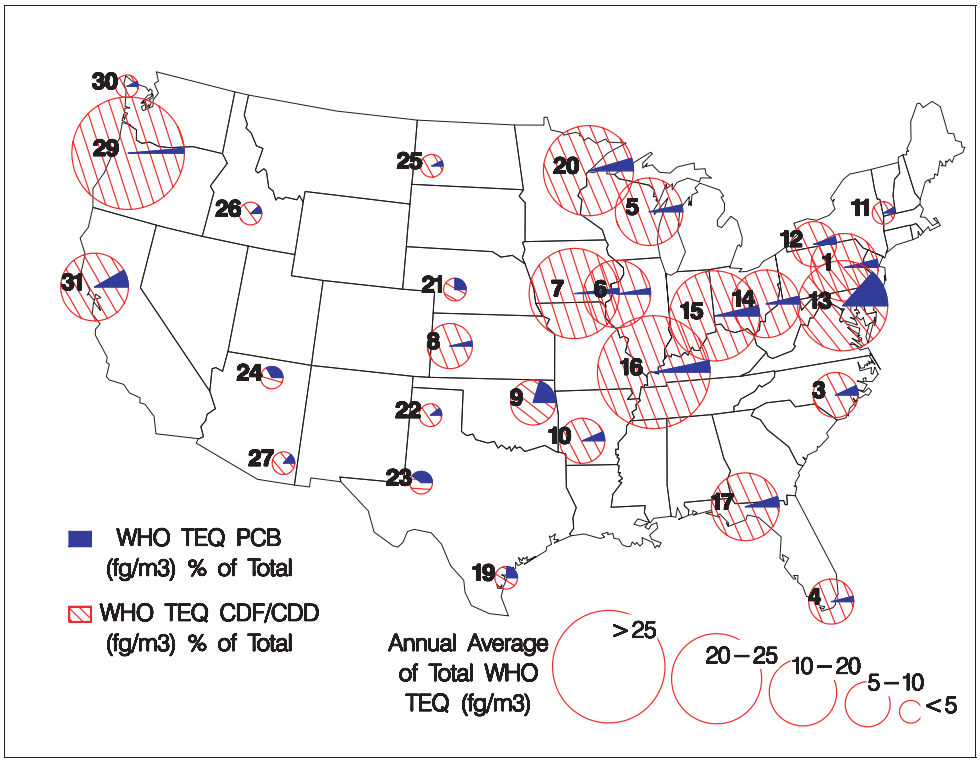


Figure 9-A14. Average Atmospheric Concentrations of Dioxin TEQ (from PCDDs, PCDFs, and Coplanar PCBs) in femtograms (10-15 grams) per cubic meter for the Year 2000, Collected by the National Dioxin Air Monitoring Network (NDAMN)[24]

[23] Source: USEPA Office of Research and Development National Center for Environmental Assessment

[24] Source: USEPA Office of Research and Development National Center for Environmental Assessment

five master stations. A bar pointing down indicates that the net loading is negative and the compound is volatilizing into the atmosphere. On a basinwide scale, the absolute values of the loadings are generally getting smaller, which indicates that the lake water and the air above it are moving closer to being in equilibrium.

National Air Pollution Surveillance Network

Through the NAPS network, data are collected on ambient air levels for a variety of toxics at rural, suburban, city-centre, and industrial sites in Canada. This effort is carried out in cooperation with provincial environmental and municipal agencies. The program includes measurement of volatile organic compounds (VOC), including toxics and ground-level ozone precursors, polar volatile organics (PVOC) such as aldehydes and ethers, components of fine particulate matter (PM), including metals and inorganic and organic ions, and persistent, toxic semi-volatile organic compounds (SVOC) such as B(a)P and dioxins and furans. One of the purposes of the monitoring effort is to provide data on trends in air concentrations of toxics and thus measure the success of initiatives carried out under the Toxic Substances Management Policy (TSMP) and under the Canada-Ontario Agreement (COA) respecting the Great Lakes Basin Ecosystem.

Some examples of trends in selected species are shown in Figures 9-A6 to 9-A10. The box plots show median, 25th and 75th percentiles, and non-outlier minimum and maximum. In some cases outliers and extremes are also provided.

Canadian Atmospheric Mercury Measurement Network

In 1996, Environment Canada initiated CAMNet to provide a better understanding of mercury trends and processes in the environment. Currently, there are four stations in Ontario (three at IADN stations and one on a buoy in Lake Ontario). CAMNet stations measure total gaseous mercury (TGM), mercury in precipitation, and reactive gaseous mercury and particulate mercury (though NOT all parameters are measured at each station). Figure 9-A11 illustrates that concentrations of TGM have remained relatively stable between 1997 and 2000.

Mercury Deposition Network

Another very important North American monitoring network is MDN, which is part of the National Atmospheric Deposition Program (NADP). This program began monitoring pH and major inorganic ions related to "acid rain" in the U.S. in 1978. In 1995, NADP began an experimental monitoring program for wet deposition of mercury, the MDN. This program has grown into an international network with over 75 sites in the U.S. and Canada (see Figure 9-A12). NADP will soon be participating in a new acid rain and mercury wet deposition monitoring program in Mexico starting in 2003. MDN collects weekly precipitation samples at sites in the U.S. and Canada and analyzes them for total mercury. At the option of the sponsoring agency, samples from some of the sites are also analyzed for methylmercury. With many of the MDN sites being established in the last few years, it is too early to discern national spatial or long-term temporal trends.

National Dioxin Air Monitoring Network

In June 1998, USEPA established the NDAMN. The primary goal of NDAMN is to determine the temporal and geographical variability of atmospheric CDDs, CDFs, and coplanar PCBs at rural and nonimpacted locations throughout the U.S. Currently operating at 32 sampling stations (Figure 9-A13), NDAMN has three primary purposes: (1) to determine the atmospheric levels and occurrences of dioxin-like compounds in rural and agricultural areas where livestock, poultry and animal feed crops are grown; (2) to provide measurements of atmospheric levels of dioxin-like compounds in different geographic regions of the U.S.; and, (3) to provide information regarding the long-range transport of dioxin-like compounds in air over the U.S. Sampling proceeded with a regime of sampling 24 days, every other month. This produced four sampling moments over the 12 months: (1) January/February; (2) April/May; (3) August/September; and, (4) November/December. Although not perfectly aligned with seasons, such a scheme has encompassed different climatic conditions.

Figure 9-A14 is a summary of annual average ambient air concentrations of dioxin (expressed as TEQ or Toxic Equivalence to 2,3,7,8-TCDD) and dioxin-like PCBs (expressed as TEQ) collected at all rural NDAMN locations operating in the year 2000. These data suggest that atmospheric dioxin concentrations in the southern, western, and eastern Great Lakes States are somewhat higher than in other parts of the country. This may be a reflection of the population density and locations of certain heavy industries and incineration sources within urban areas.

Acknowledgements

Todd Nettesheim of the USEPA Great Lakes National Program Office coordinated this section of the report. The work of the IADN Steering Committee heavily contributed to the IADN section, with Stephanie Buehler, Ron Hites, and Ilora Basu of Indiana University contributing figures. Tom Dann of Environment Canada provided the summary and figures for the NAPS section. Pierrette Blanchard of Environment Canada reviewed the CAMNet section and contributed a figure. Clyde Sweet of the Illinois State Water Survey contributed text and figures for the MDN section. David Cleverly of the USEPA

Office of Research and Development contributed text and figures for the NDAMN section. Melissa Hulting of the USEPA GLNPO also reviewed this section of the report.

For Additional Information

The IADN website: http://www.msc.ec.gc.ca/iadn/

Great Lakes National Program Office Environmental Indicators: http://www.epa.gov/grtlakes/glindicators/air.html

The National Air Pollution Surveillance (NAPS) Network: http://www.etcentre.org/naps/

The Canadian Atmospheric Mercury Network website: http://www.msc-smc.ec.gc.ca/arqp/camnet_e.cfm

The Mercury Deposition Network website: http://nadp.sws.uiuc.edu/mdn/

The National Dioxin Air Monitoring Network: http://www.epa.gov/ncea/pdfs/dioxin/dei/NDAMN_PAPER3a.pdf

References

Blanchard, P.; Froude, F.A.; Martin, J.B.; Dryfhout-Clark, H.; Woods, J.T. 2002. Four years of continuous total gaseous mercury (TGM) measurements at sites in Ontario, Canada. Atmos. Environ. 36: 3735-3743.

Buehler, S. and Hites, R.A. 2002. The Great Lakes' Integrated Atmospheric Deposition Network: The United States and Canada continue an effective partnership that measures nonpoint source pollution. Environ. Sci. Technol. 36: 354A-359A.

Buehler, S.; Hafner, W.; Basu, I.; Audette, C.V.; Brice, K.A.; Chan, C.H.; Froude, F.; Galarneau, E.; Hulting, M.L.; Jantunen, L.; Neilson, M.; Puckett, K.; Hites, R.A. 2001. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results Through 1998; United States Environmental Protection Agency and Environment Canada: Chicago, IL and Toronto, ON.

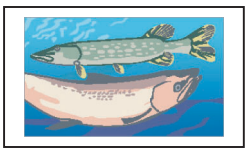
Cleverly, D.H.; et al. The National Dioxin Air Monitoring Network (NDAMN): Results of the First Year of Atmospheric Measurements of CDDs, CDFs, and Dioxin-like PCBs in Rural and Agricultural Areas of the United States: June 1998-1999. Presented at Dioxin '00, 20th International Symposium on Halogenated Environmental Organic Pollutants & POPs, held Aug. 13-17 at Monterey, CA. Short paper in Organohalogen Compounds 45:248-251.

Galarneau, E.; Audette, C.V.; Bandemehr, A.; Basu, I.; Bidleman, T.F.; Brice, K.A.; Burniston, D.A.; Chan, C.H.; Froude, F.; Hites, R.A.; Hulting, M.L.; Neilson, M.; Orr, D.; Simcik, M.F.; Strachan, W.M.; Hoff, R.M. 2000. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results Through 1996; United States Environmental Protection Agency and Environment Canada: Chicago, IL and Toronto, ON.

Hulting, M. Atmospheric Deposition of Toxic Chemicals: SOLEC Indicator #117. SOLEC 2002. Implementing Indicators: Draft for discussion at SOLEC 2002. October 2002.

United States – Canada IADN Scientific Steering Committee. Cooperating to Implement the Great Lakes Water Quality Agreement: Technical Summary of Progress of the Integrated Atmospheric Deposition Network (IADN) 1997-2002. October 2002.

Trends in Great Lakes Fish



2002 SOLEC REPORT: Trends in Contaminant Burdens of Great Lakes Fish (1977 - 2001) July 25, 2002

Submitted by D.M. Whittle, M.J. Keir, A.A. Carswell
Department of Fisheries & Oceans
Great Lakes Laboratory for Fisheries & Aquatic Sciences
Burlington, ON L7R 4A6

Purpose

Annual analysis of contaminant burdens in representative fish species from throughout the Great Lakes provides data to describe temporal and spatial trends of bioavailable contaminants, which is a measure of both the effectiveness of remedial actions related to the management of critical pollutants and an indicator of emerging problems.

Ecosystem Objective

Great Lakes waters should be free of toxic substances that are harmful to fish and wildlife populations and the consumers of these biota. Data on status and trends of contaminant conditions, using fish as biological indicators, supports the requirements of GLWQA Annex 1 (Specific Objectives), Annex 2 (Lakewide Management Plans/ Remedial Action Plans), Annex 11 (Surveillance & Monitoring), and Annex 12 (Persistent Toxic Substances).

State of the Ecosystem

Long-term (>25 yrs), basinwide monitoring programs measuring whole body levels of a variety of contaminants in top predator lake trout or walleye and forage fish species (i.e., smelt) have provided temporal and spatial trend data on bioavailable toxic substances in the Great Lakes aquatic ecosystem. Since the late 1970's levels of historically regulated contaminants such as PCBs, DDT, and mercury have generally declined in most fish species monitored. Some other contaminants, both currently

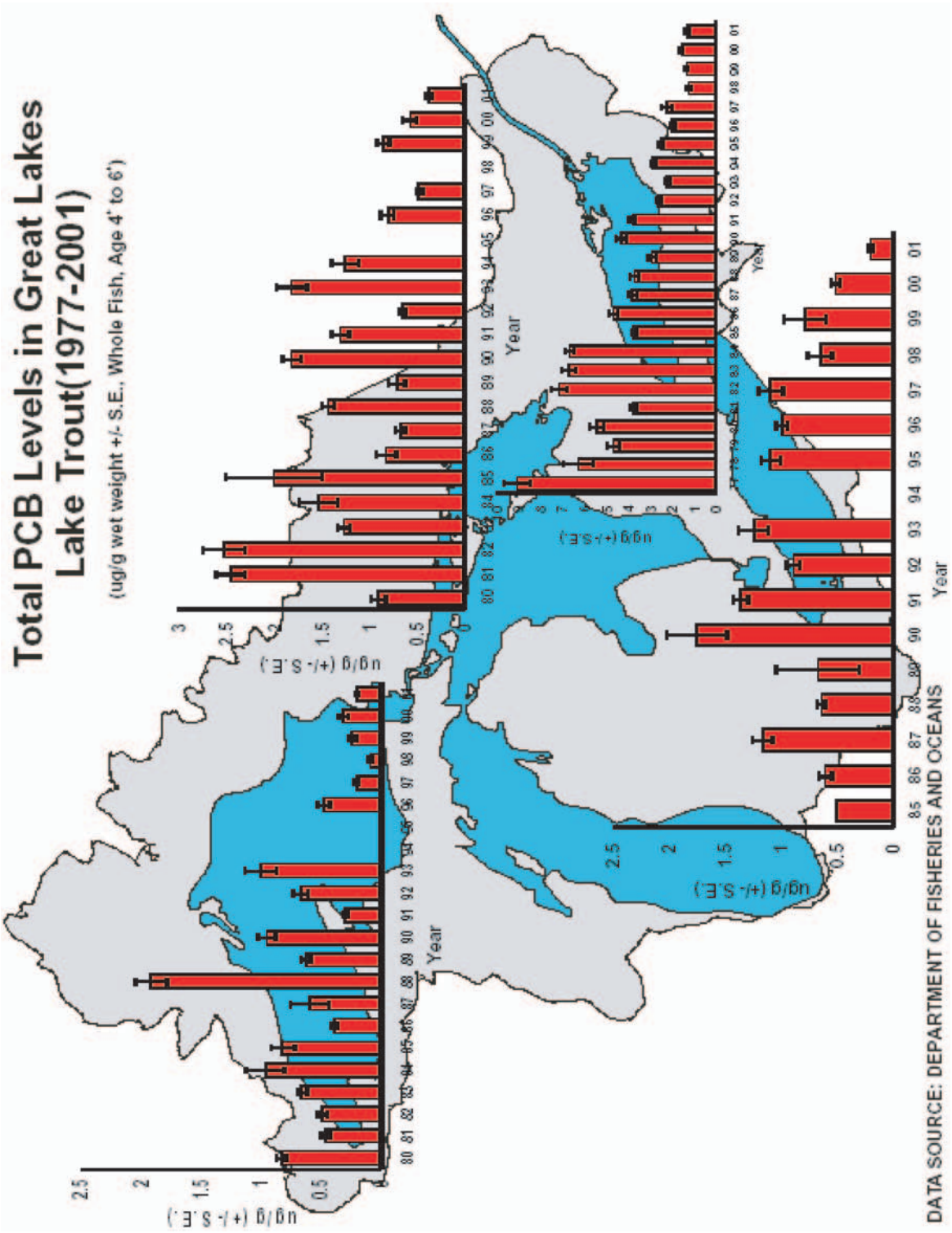


Figure 9-F1. Total PCB Levels in Great Lakes Lake Trout (1977-2001)

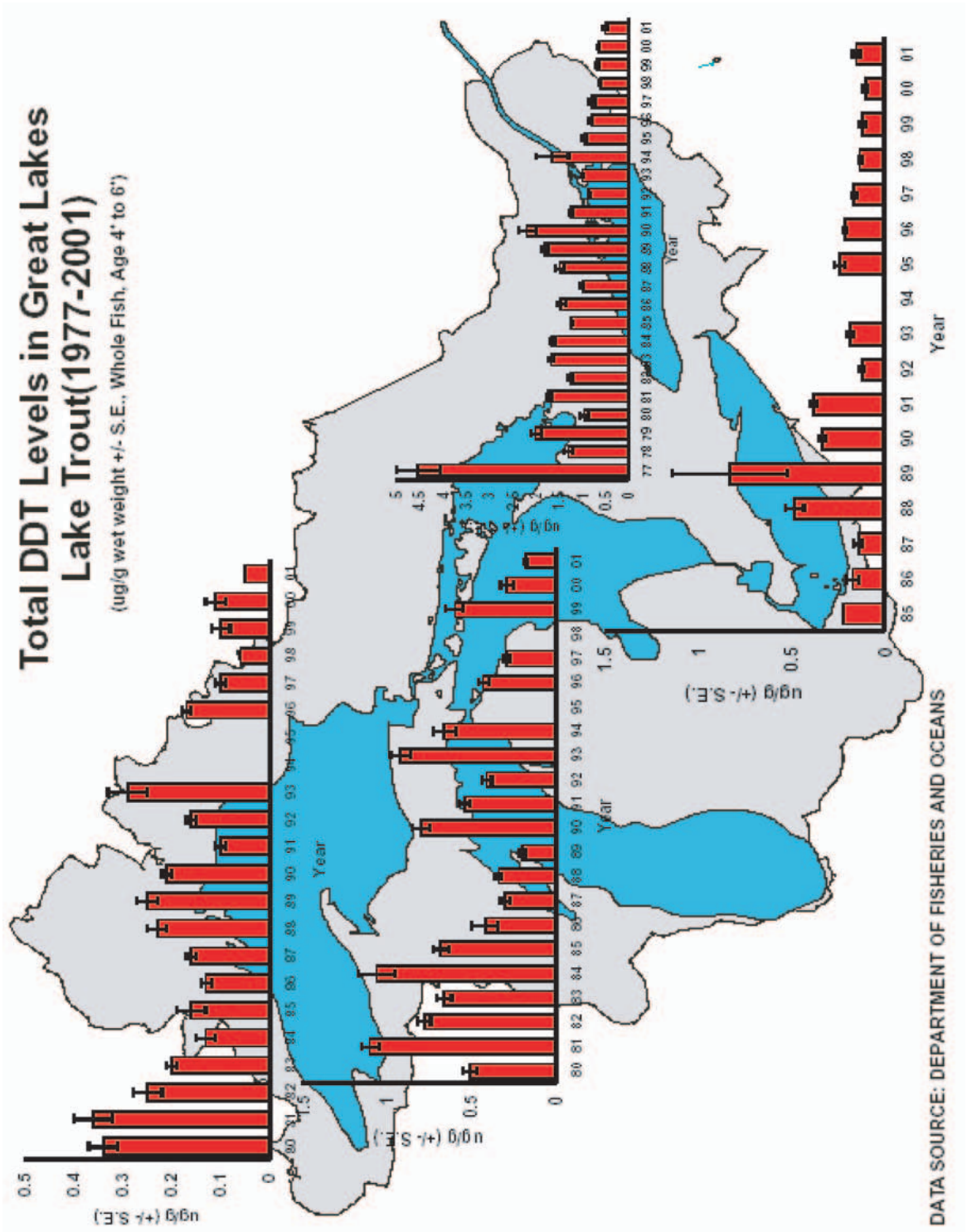


Figure 9-F2. Total DDT Levels in Great Lakes Lake Trout (1977-2001)

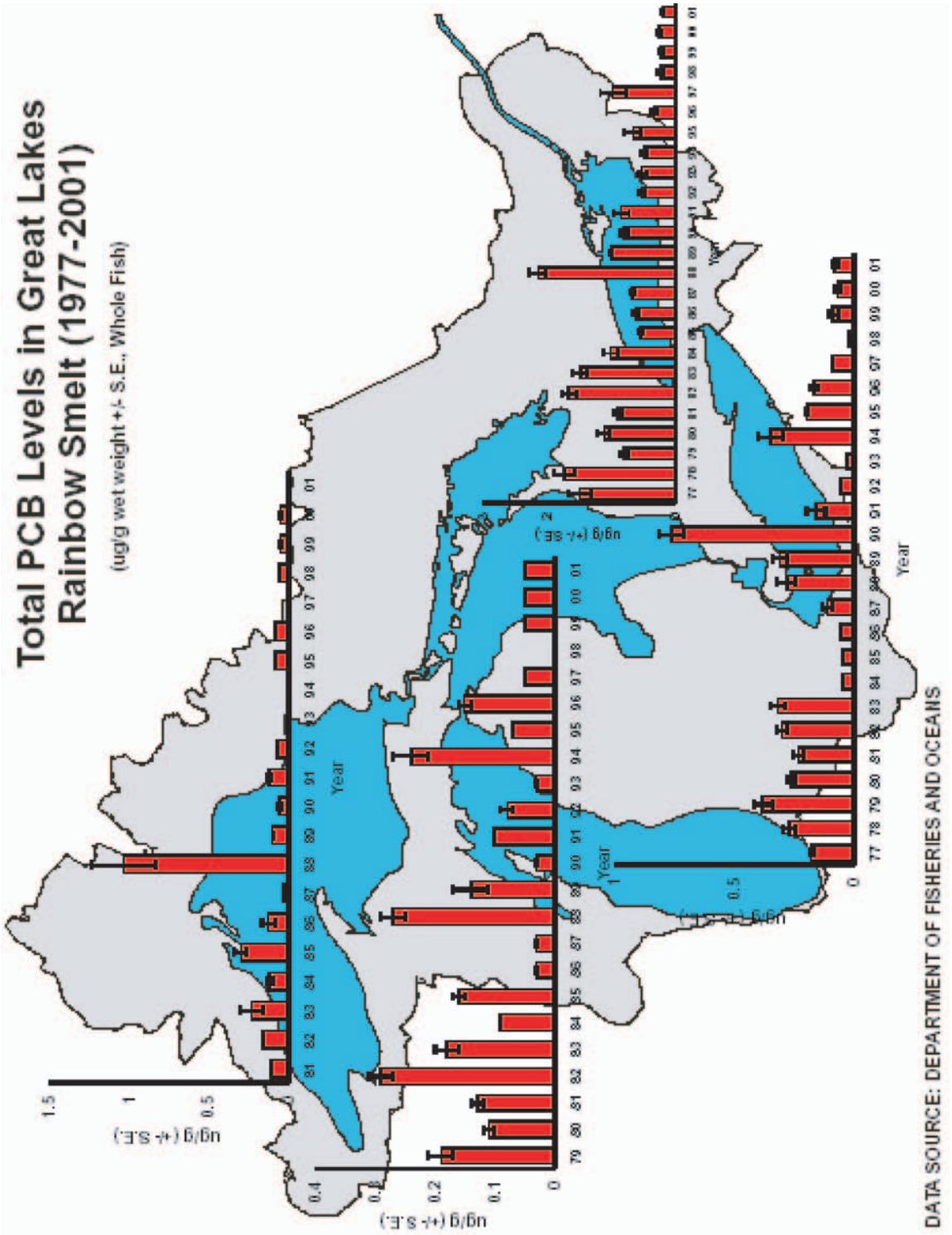


Figure 9-F3. Total PCB Levels in Great Lakes Rainbow Smelt (1977-2001)

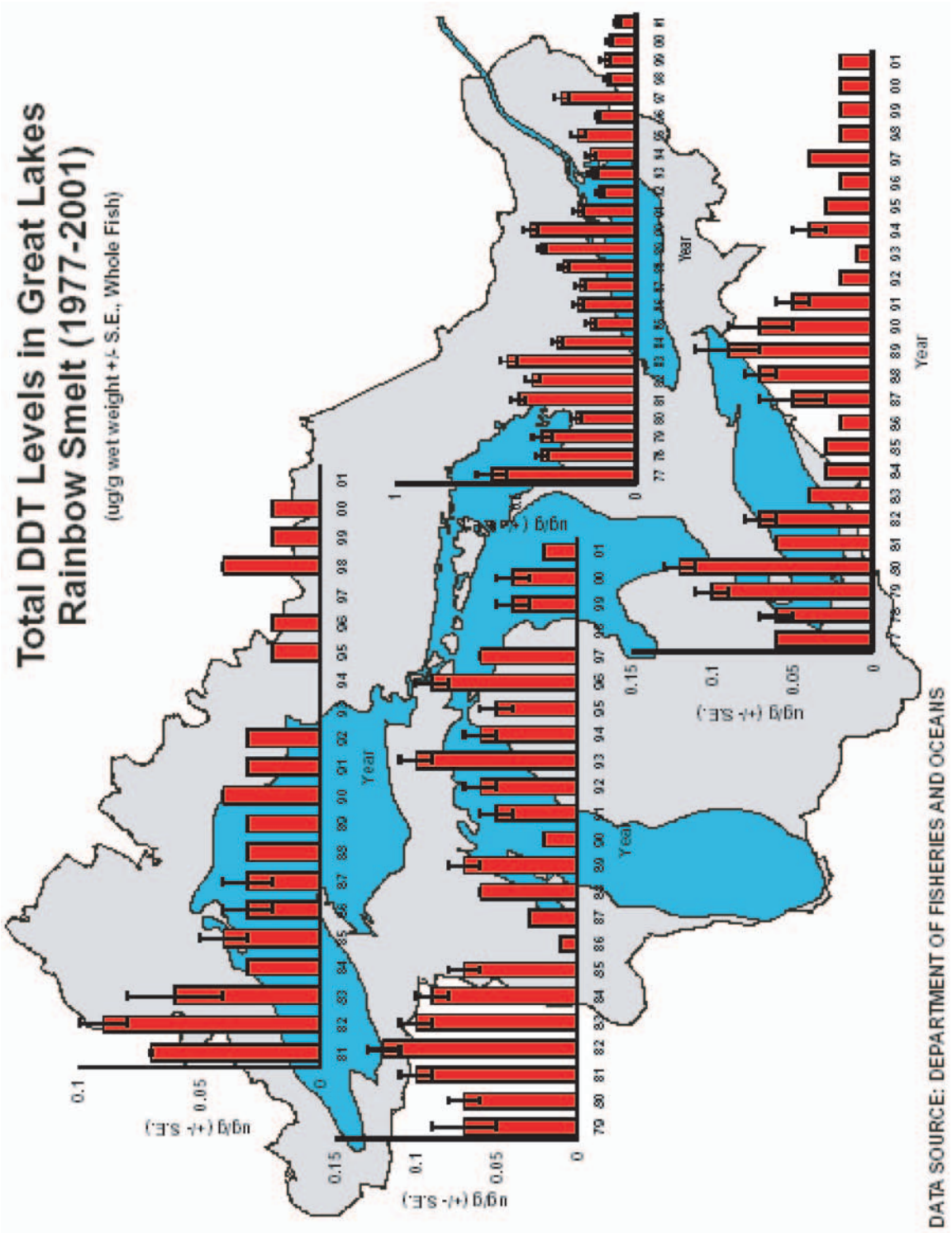


Figure 9-F4. Total DDT Levels in Great Lakes Rainbow Smelt (1977-2001)

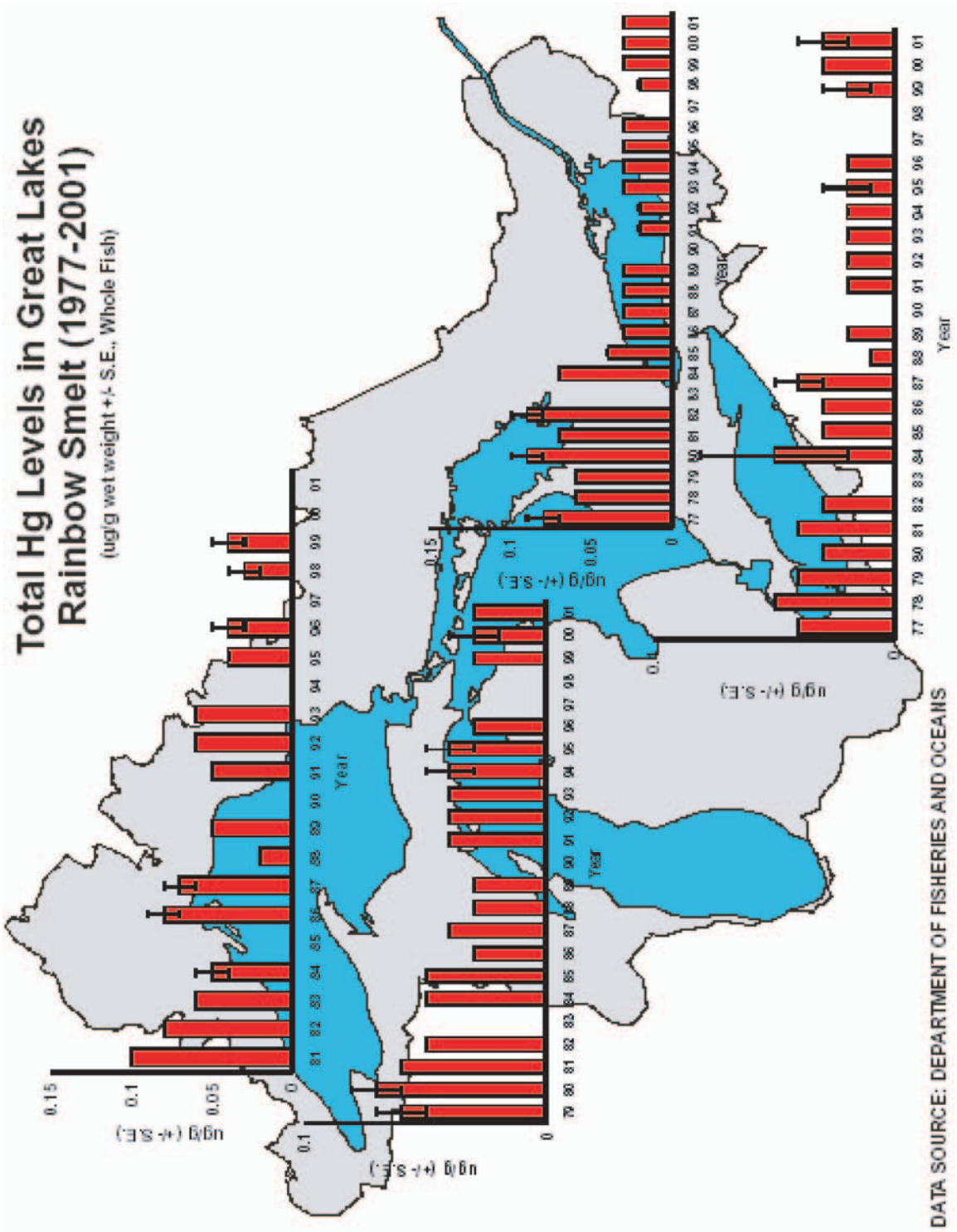


Figure 9-F5. Total Mercury Levels in Great Lakes Rainbow Smelt (1977-2001)

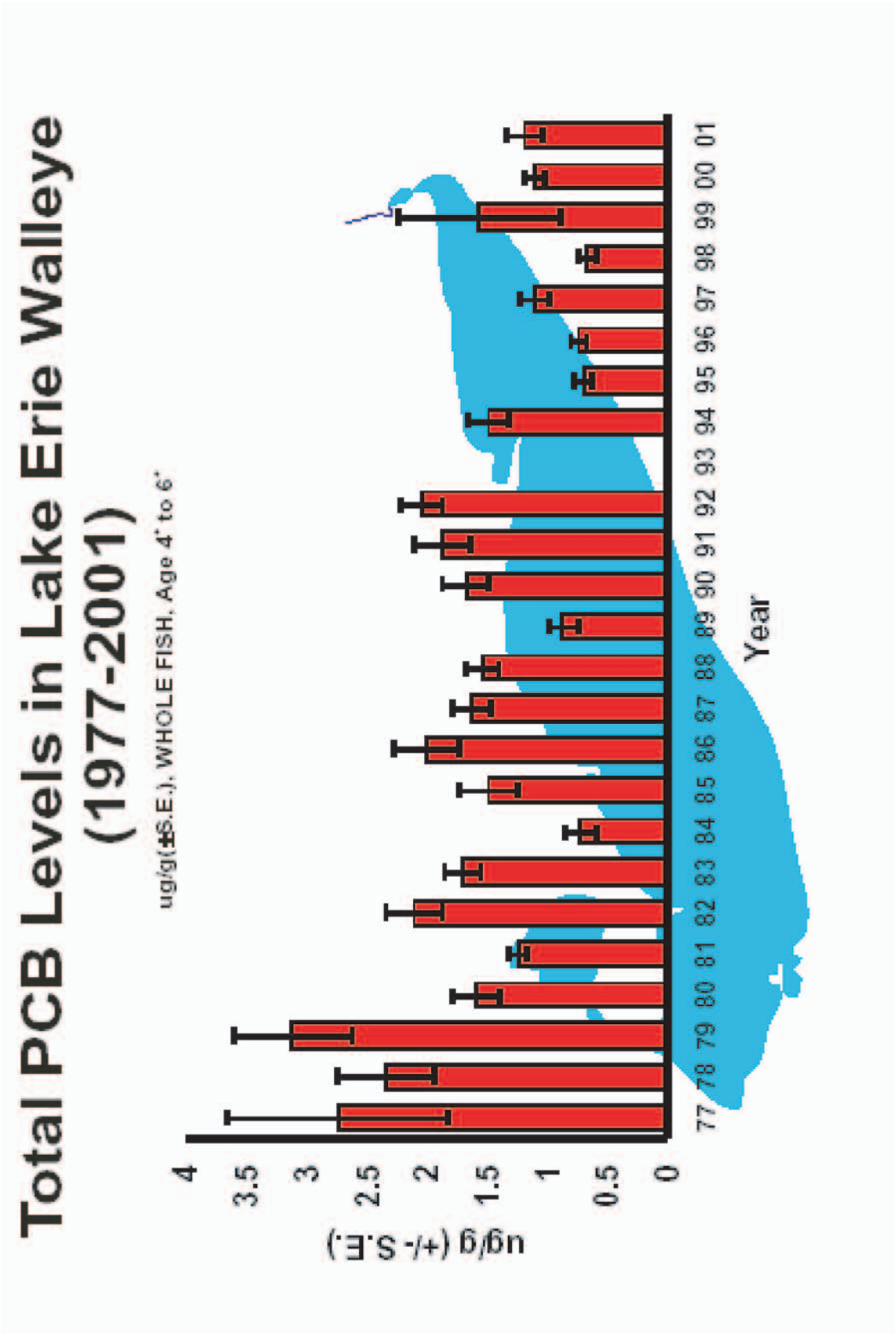


Figure 9-F6. Total PCB Levels in Lake Erie Walleye (1977-2001) Source: Department of Fisheries and Oceans

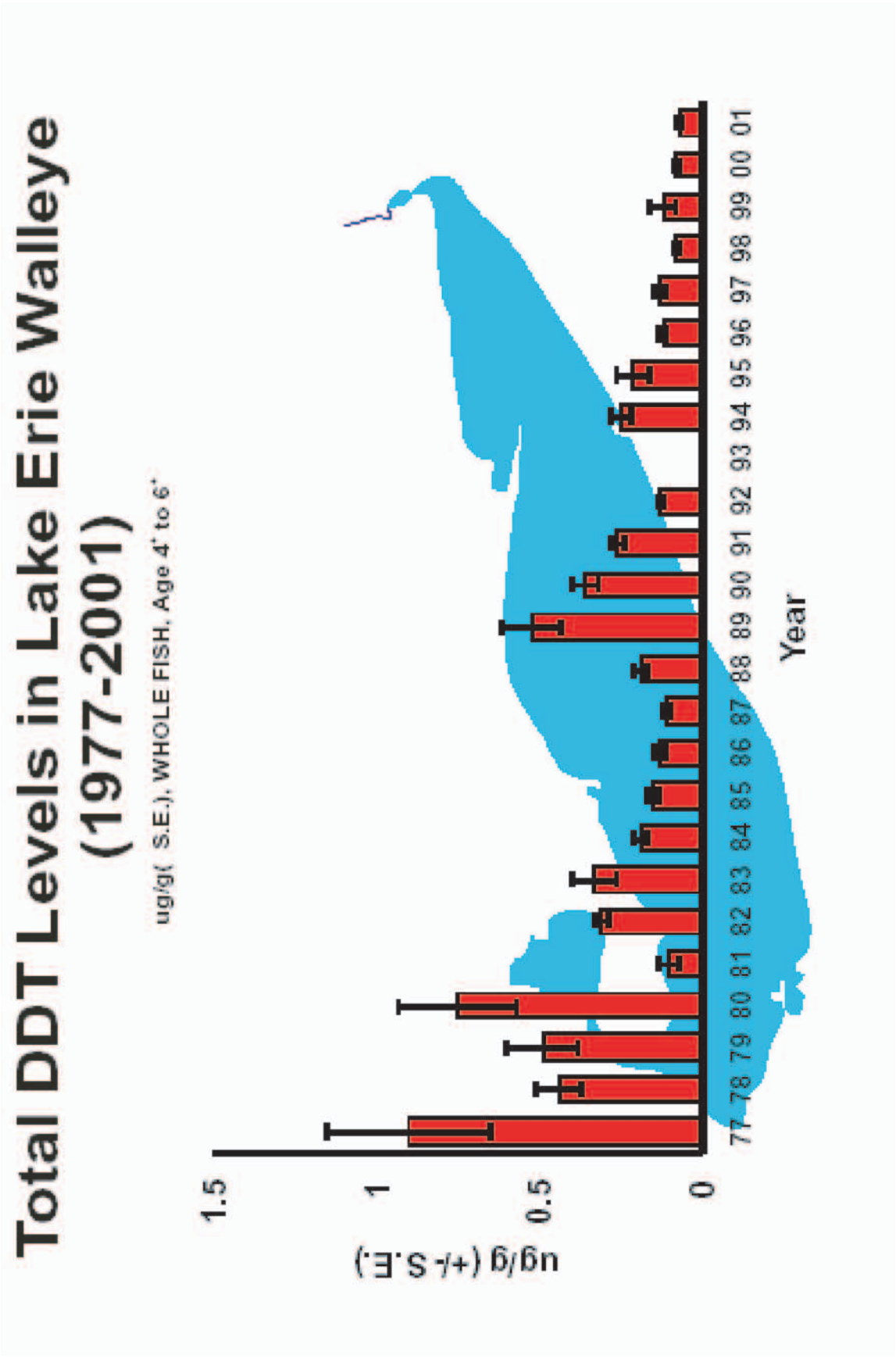


Figure 9-F7. Total DDT Levels in Lake Erie Walleye (1977-2001) Source: Department of Fisheries and Oceans

regulated and unregulated, have demonstrated either slowing declines, or in some cases, increases in selected fish communities. The changes are often lake specific and relate both to the specific characteristics of the substances involved and to the biological condition of the fish community surveyed.

Trends

Lake Ontario

PCB levels in Lake Ontario lake trout (4+ - 6+ age class) have declined consistently through 2001 (Figure 9-F1). Similarly S DDT levels have also steadily declined in this same cohort of fish from the most recent peak measured in 1994 (Figure 9-F2). Levels of both PCBs and S DDT in smelt samples have declined significantly through 2001 since the most recent peak in 1997 (Figures 9-F3 & 9-F4). Concentrations of mercury in smelt populations have remained virtually unchanged since 1985 (Figure 9-F5).

Lake Erie

PCB levels in Lake Erie lake trout (4+ - 6+ age class) have declined consistently, with levels measured in 2001 approximately 16 percent of those concentrations found in the same age class from 1993 (Figure 9-F1). Modest increases in S DDT levels were observed in 2001 lake trout samples (4+ - 6+) (Figure 9-F2). PCB concentrations in walleye (4+ - 6+) have continued to increase over the period 1995 to 2001, but recent levels are still ~ 60 percent of those measured in similarly aged fish in 1992 (Figure 9-F6). In 2001, S DDT levels in samples of walleye (4+ - 6+) were 15 percent of maximum levels recorded in 1989, soon after the arrival of zebra mussels in Lake Erie (Figure 9-F7). Total PCB and S DDT levels in smelt peaked in 1990 and 1989, respectively (Figures 9-F3 & 9-F4). Since that time, concentrations of both contaminants have steadily declined through 2001. Mercury concentrations in smelt samples have seen a modest increase in the past two years, 2000 and 2001 (Figure 9-F5).

Lake Huron

For both PCBs and S DDT, as measured in Lake Huron lake trout (4+ - 6+ age class), concentrations have declined steadily through 2001 from the most recent peaks measured in 1993 in similarly aged fish (Figures 9-F1 & 9-F2). Similarly, most recent peak concentrations of PCB and S DDT, measured in 1994 and 1993 samples of smelt, were followed by a period of steady decline in concentrations; 2001 levels were the lowest in the past decade (Figures 9-F3 & 9-F4). Mercury levels in Lake Huron smelt populations have remained virtually unchanged since 1985, with 2001 concentrations less than 50 percent of maximum levels measured throughout a 24-year period (Figure 9-F5).

Lake Superior

Total PCB levels measured in a specific lake trout age class (4+ - 6+) have fluctuated significantly over the past six years, but 2001 concentrations were ~ 20 percent of 1993 levels and 10 percent of 1988 maximum concentrations measured in this same age class of fish (Figure 9-F1). S DDT levels for the 4+ - 6+ age class of lake trout have declined relatively constantly to a concentration in 2001 samples which was less than 20 percent of a recent maximum observed in 1993 samples (Figure 9-F2). Apart from an anomalously high peak (> 1.0 µg/g) measured in smelt collections from 1988, total PCB levels have remained virtually unchanged through 2000 at levels of near 0.02 µg/g (Figure 9-F3). Over the period 1981 to 2000, S DDT concentrations observed in smelt populations have remained unchanged since a significant decline occurred in 1984 (Figure 9-F4). An exception was a single-year modest increase seen in 1998 samples. Mercury concentrations in Lake Superior smelt populations have exhibited a reasonably steady decline over the period 1981 through 1999 (Figure 9-F5). There was a six-year period, from 1988 through 1993, of increasing concentrations of mercury, but levels measured from 1995 through 1999 were consistently lower.

Toxaphene levels measured in the Lake Superior lake trout community have either increased slightly or ceased to decline despite the fact that use of the compound has either been banned or severely restricted within the Great Lakes Basin since the early 1980's (Whittle et al., 2000). Evidence suggests that declines in the abundance of smelt populations, subsequent diet shifts by lake trout to more contaminated lake herring, and the increase in atmospheric deposition may have accounted for the trend in toxaphene burdens measured in Lake Superior.

Similarly, in Lake Erie after the late 1980's invasion and proliferation of zebra and quagga mussels, contaminant levels measured in top predator walleye did increase for a short period of time. The influence of exotic dreissenid invaders such as zebra and quagga mussels, round gobys, Eurasian ruffe, or invertebrate species such Echinogamarus or Cercopagis is to change the form and function of existing food webs (Morrison et al., 1998, 2002). This change alters the food web energy dynamics, as well as the pathways and fate of contaminants, which in turn can result in shifts in bioaccumulation patterns.

Future Pressures

Probably one of the most immediate pressures impacting contaminant dynamics in the Great Lakes relates to the increasing proliferation of exotic nuisance species. Their increasing presence has altered both fish community composition and food web energy flows. Thus, subsequent changes to the pathways and fate of contaminants have resulted in altered bioaccumulation rates in portions of fish communities, as evidenced by recent spikes in contaminant burdens. Alterations to the forage base of fish communities have resulted in diet shifts and, in some cases, the consumption of a more contaminated prey, which produces elevated body

burdens of contaminants. Other pressures relate to the issue of climate change, which includes a warming trend. This change in the thermal regime of the Great Lakes will directly influence the thermodynamics of contaminants and alter bioaccumulation rates. Associated changes in water levels, critical habitat availability, and aquatic ecosystem reproductive success will all be future factors influencing contaminant trends in the Great Lakes.

Further Work Necessary

Future contaminant monitoring studies focusing on the Great Lakes should include more detailed examination of contaminant levels and dynamics in aquatic food webs. These data could be utilized to further develop predictive models to understand the potential changes to contaminant fate and pathways, together with alterations in energy flow. If there is a more complete comprehension of possible future scenarios related to changes in environmental conditions and contaminant impacts, there is the potential to develop compensatory management strategies for both remediation of contaminated ecosystems and utilization of existing fish stocks for recreational and commercial harvest.

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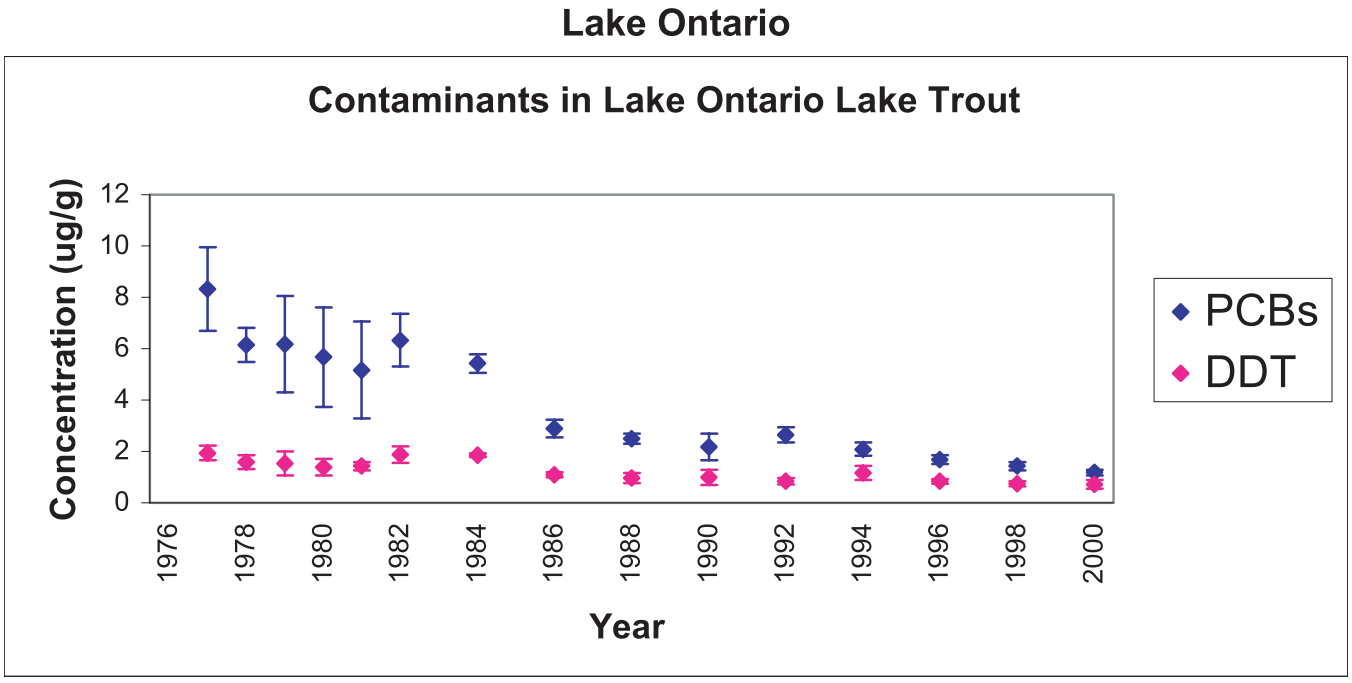
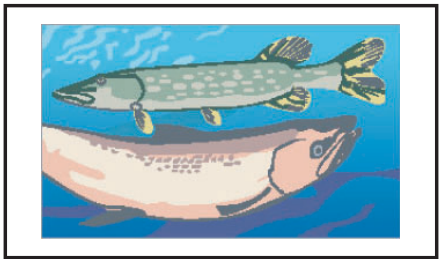


Figure 9–F8. Contaminants in Lake Ontario Lake Trout PCB and S DDT data: ug/g wet weight +/- 95 percent C.I., whole fish, composite samples, 600-700 mm size range

Great Lakes Fish Monitoring Program



Submitted by Sandy Hellman
USEPA/GLNPO

Background

The Great Lakes Fish Monitoring Program (GLFMP) has been monitoring the presence of toxic contaminants in fish since the 1970's. The measurement of whole body levels of contaminants in top predator fish has provided temporal and spatial trend data on bioavailable toxic substances in the Great Lakes Ecosystem. The GLFMP is a cooperative program involving the U.S. Fish and Wildlife Service (currently the U.S. Geological Survey-Great Lakes Science Center), the U.S. Food and Drug Administration (no longer participating), the eight Great Lakes States, and GLNPO, U.S. Environmental Protection Agency.

Trends

The following graphs show PCB and S DDT (total DDT) trends for whole fish lake trout (walleye in Lake Erie) in each of the Great Lakes. Fish samples are collected in the Fall of the year and then composited into five fish composites, using fish of similar size to reduce the impact of size variation on contaminant trend data. The data are reported in units of microgram per gram (ug/g) wet weight with a +/- 95 percent confidence interval (C.I.).

Lake Ontario

In Lake Ontario, PCB and S DDT levels in lake trout have declined consistently through 2000. PCB levels in 2000 lake trout are approximately 21 percent of those found in 1977. Current S DDT levels are approximately 37 percent of concentrations found in lake trout in 1977.

Lake Erie

Following initial declines, PCB concentrations in Lake Erie walleye have continued to increase over the period 1995-2000, but recent levels are still ~ 60 percent of those measured in similarly sized fish in 1992. SDDT levels in walleye have declined consistently through time with year 2000 levels approximately 23 percent of levels recorded in 1988.

Lake Michigan

PCB and SDDT levels in Lake Michigan lake trout have declined consistently through 2000. PCB levels in 2000 lake trout are approximately 8 percent of those found in 1974. Current SDDT levels are approximately 5 percent of concentrations found in 1970.

Lake Huron

In Lake Huron, PCBs have steadily declined through 2001. SDDT showed large declines in the 1970s and 1980s with levels in the 1990s staying level at concentrations approximately 18 percent of 1979 levels.

Lake Superior

Total PCB levels in Lake Superior lake trout are currently fluctuating from year to year and appear to be leveling off. The data demonstrate initial declines in concentrations from the 1970s with a leveling off starting in the late 1980s. Current levels are approximately 30 percent of maximum levels. The data for SDDT show a pattern similar to the PCB data, with initial declines in the late 1970s and early 1980s and then a leveling off in the late 1980s to about 15 percent of maximum levels.

Isle Royale National Park
Lake Superior, Michigan
Photograph by Mark E. Hodgkins
U.S. Fish and Wildlife Service

Lake Erie

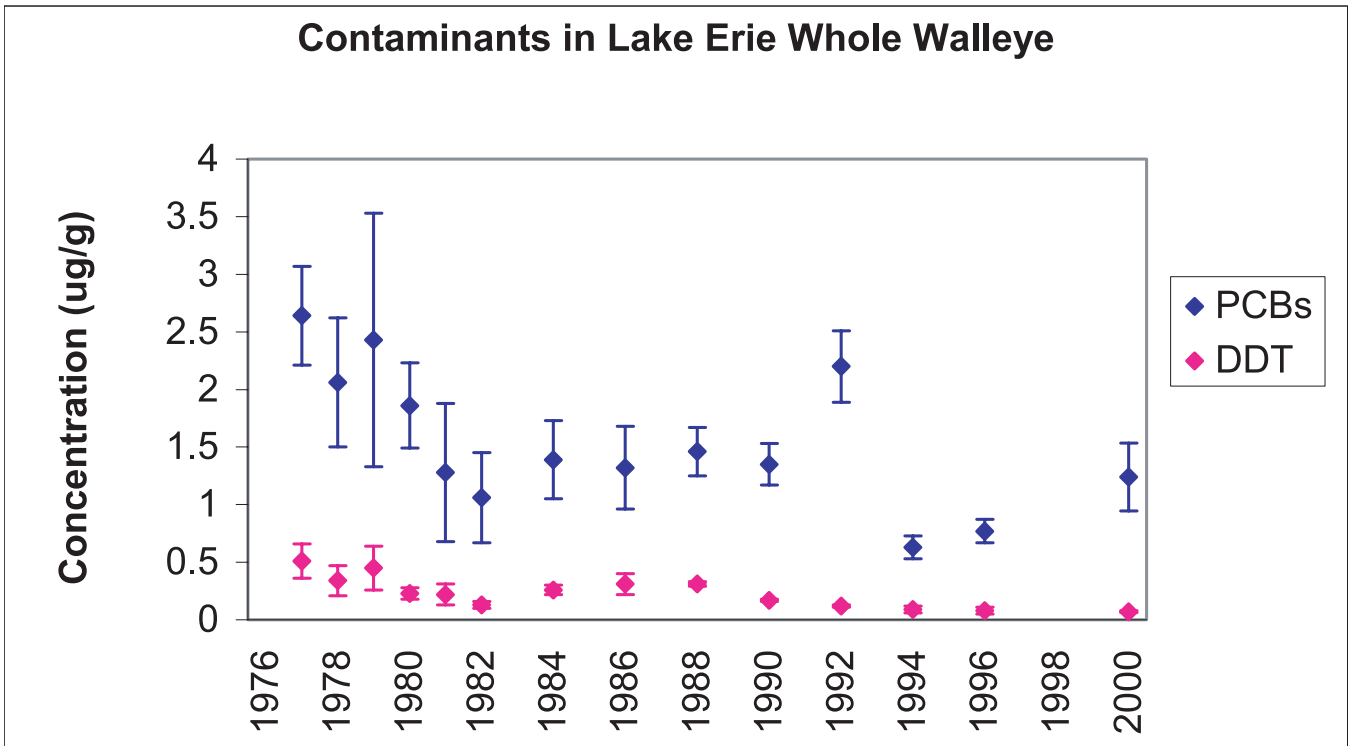


Figure 9-F9. Contaminants in Lake Erie Whole Walleye. PCB and S DDT data: ug/g wet weight +/- 95 percent C.I., whole fish, composite samples, 400-500 mm size range

Lake Michigan

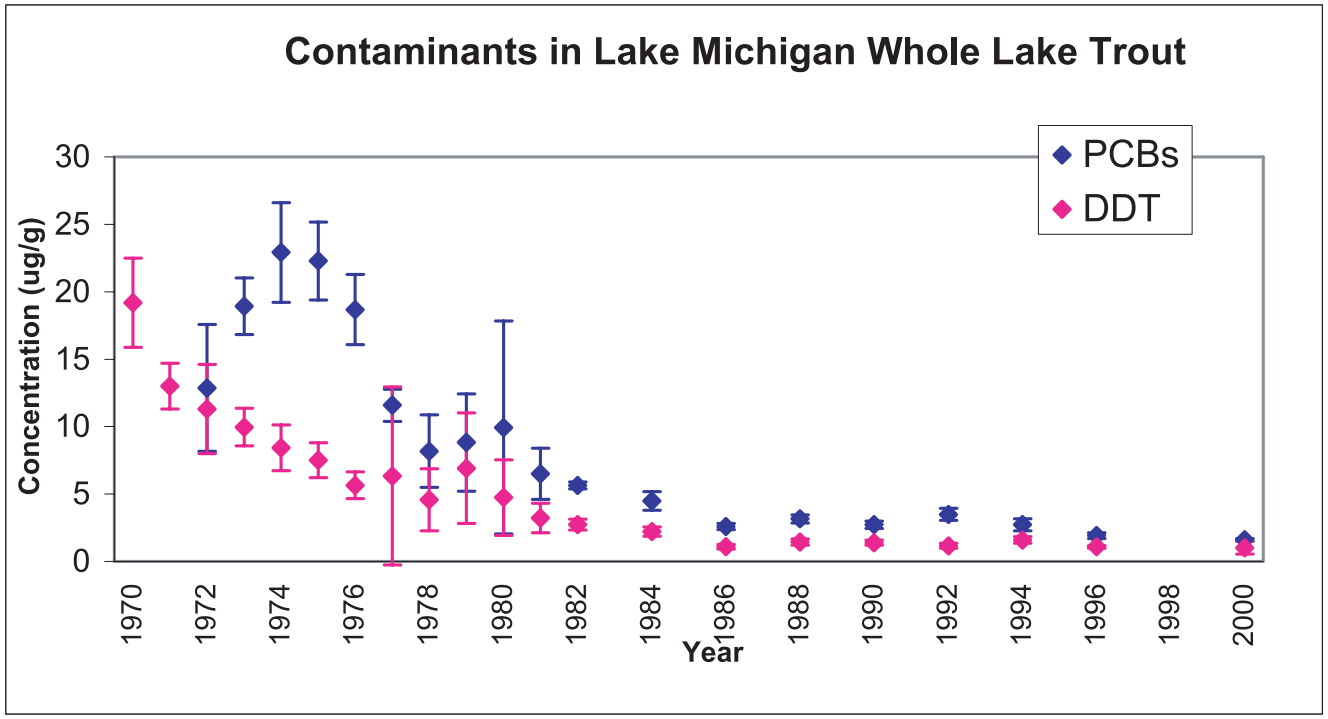


Figure 9-F10. Contaminants in Lake Michigan Whole Lake Trout. PCB and SDDT data: ug/g wet weight +/- 95 percent C.I., whole fish, composite samples, 600-700 mm size range

Lake Huron

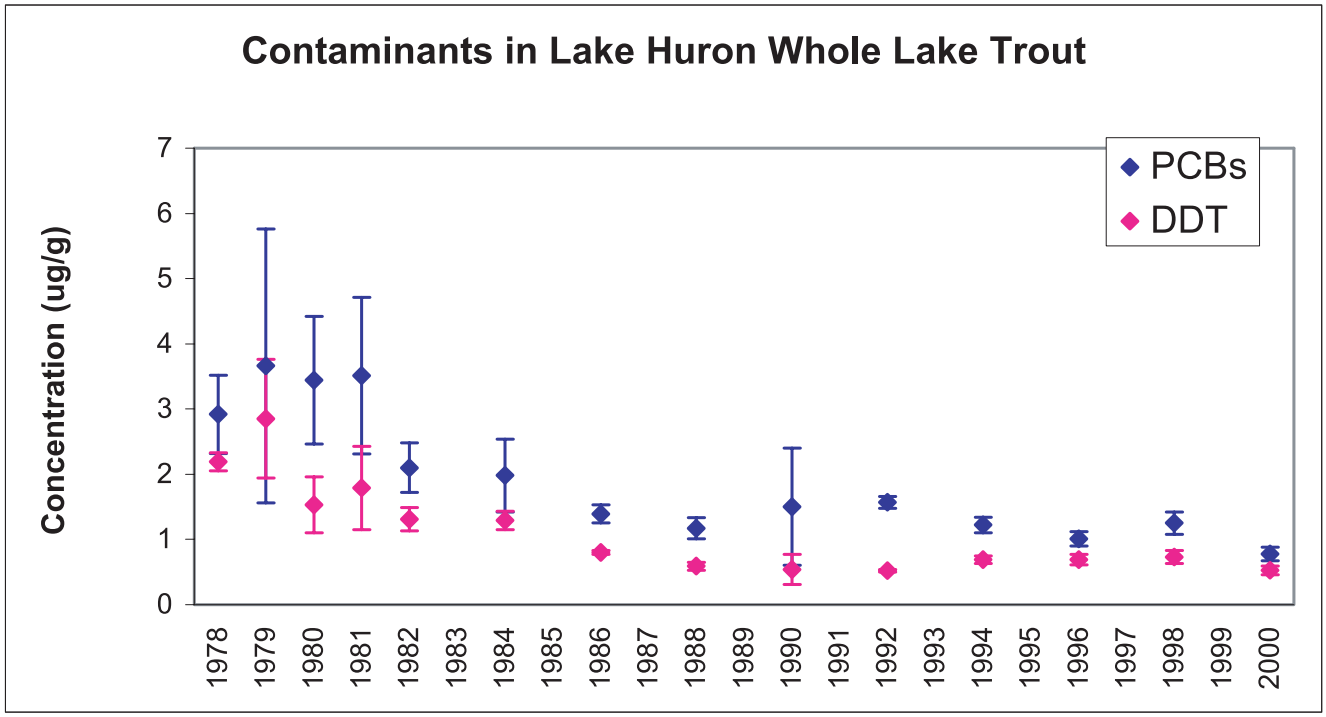


Figure 9-F11. Contaminants in Lake Huron Whole Lake Trout. PCB and SDDT data: ug/g wet weight +/- 95 percent C.I., whole fish, composite samples, 600-700 mm size range

Lake Superior

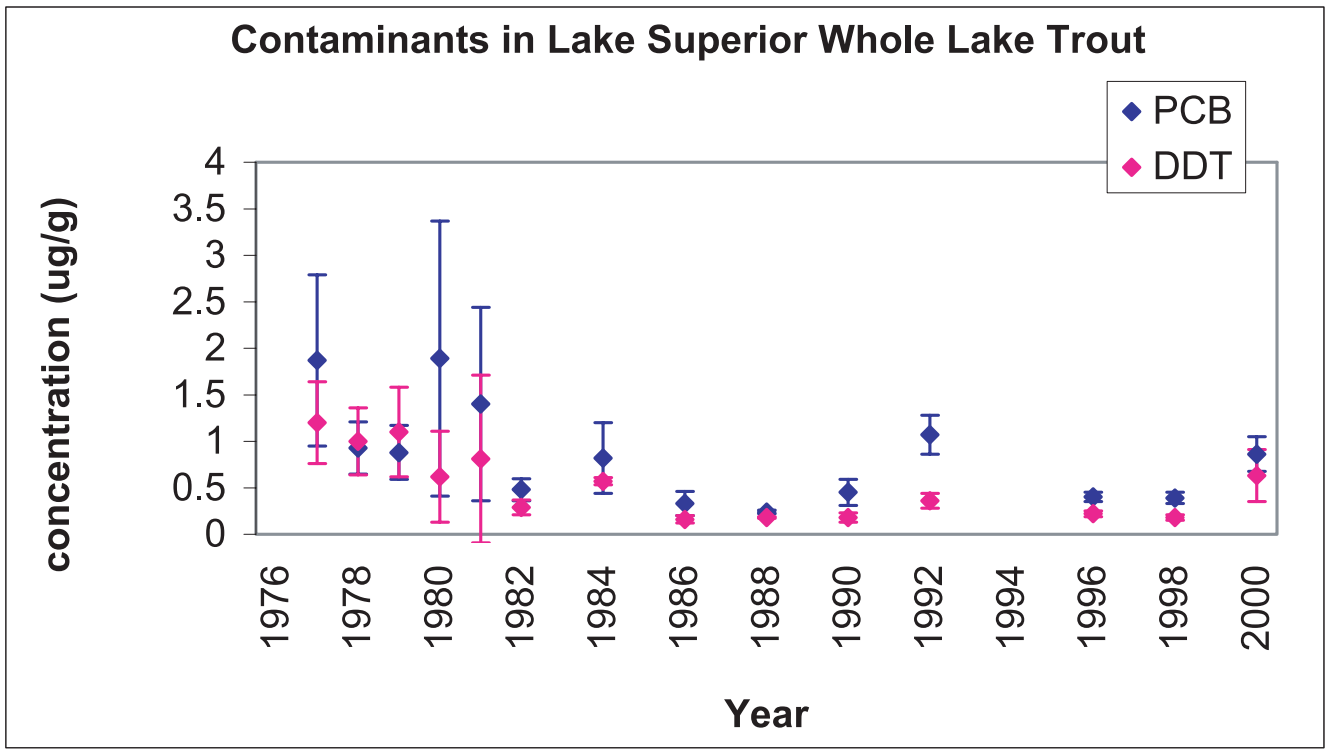


Figure 9-F12. Contaminants in Lake Superior Whole Lake Trout. PCB and SDDT data: ug/g wet weight +/- 95 percent C.I., whole fish, composite samples, 600-700 mm size range

Trends in Great Lakes Herring Gull Eggs

Temporal Trends in Contaminant Levels in Herring Gull Eggs from Great Lakes Colonies

Submitted by D.V. Chip Weseloh, Tania Havelka and Cynthia Pekarik
Canadian Wildlife Service
Environment Canada – Ontario Region

The Canadian Wildlife Service (CWS) has analyzed temporal trends in contaminant levels in herring gull eggs from fifteen colony sites on the Great Lakes. Eggs have been collected since the early 1970s from up to eight water bodies within the Great Lakes Basin: the St. Lawrence, Niagara, and Detroit Rivers and Lakes Ontario, Erie, Huron, Michigan, and Superior. A key question to be answered is whether trends in contaminant levels are leveling off.

Study Areas and Methods

The methods and protocol for the Herring Gull Egg Monitoring Program have been described previously (Mineau et al., 1984; Ewins et al., 1992; DiMao et al., 1998). Briefly, 10-13 fresh herring gull eggs were collected, one per completed clutch, from the sites listed below. Collections were made in late April and early May. Eggs were sent to the CWS National Wildlife Research Centre, where they were refrigerated, prepared, and analyzed by gas chromatography within eight weeks of collection (Won et al., 2000). Prior to 1986, all eggs were analyzed individually. Although they are still prepared individually, since 1986 a subsample from each egg has been taken to form a single site pool, which is then analyzed.

Compounds presented in this report are DDE, HCB, total PCBs 1:1 (estimated 1:1 ratio of Aroclors 1254:1260, based on levels of PCB 138), 2,3,7,8-TCDD, 2,3,7,8-TCDF, OCS, and total mercury. For all compounds except 2,3,7,8-TCDD and –TCDF, concentrations are given in ug/g (wet weight); for 2,3,7,8-TCDD and –TCDF, concentrations are given in pg/g (wet weight). Temporal trends and changes within the time series were determined, for all compounds except mercury, by change-point (piecewise) regression (Draper and Smith, 1981; Pekarik and Weseloh, 1998). Because mercury was only analyzed in ten of the years between 1974 and 2000, those data were analyzed by simple linear regression. Individual annual data for all compounds and sites can be found in Bishop et al. (1994), Pettit et al. (1997), Pekarik et al. (1998), and Jermyn et al. (2002).

Herring gull eggs were collected from the following sites (Figure 9-H1):

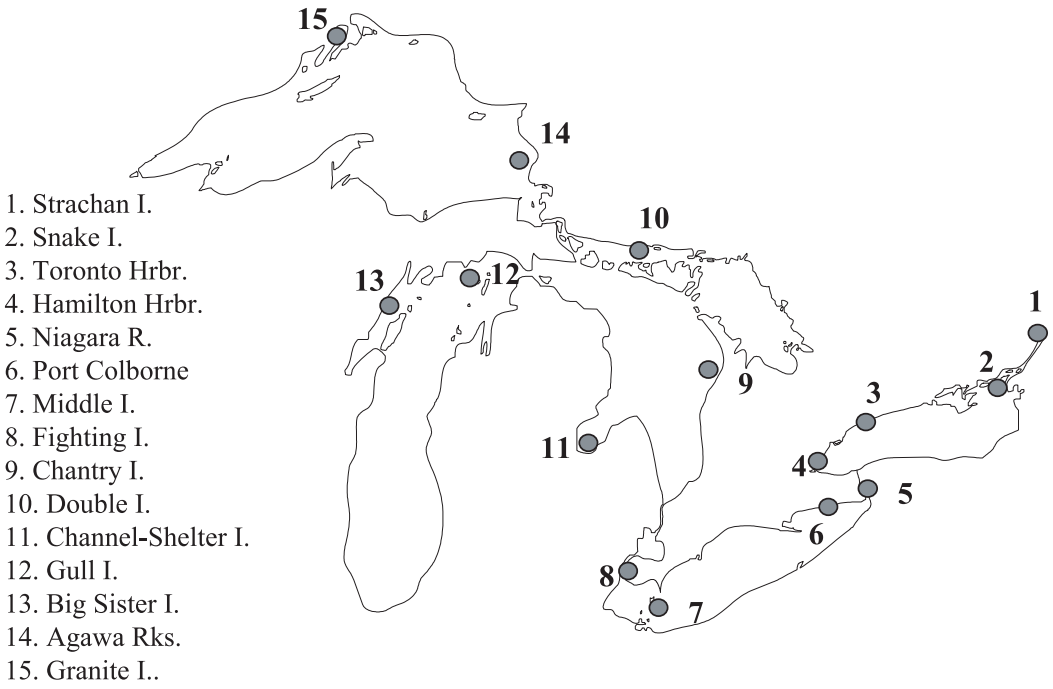


Figure 9-H1. Location of the 15 Herring Gull Colonies Sampled in this Study. Source: Environment Canada

Table 9-H1. Results of Change-Point Regression Analysis, 1974-2001 (unless indicated otherwise). Source: Environment Canada

WATER BODY	SITE	COMPOUND					
		DDE	HCB	PCB 1:1	TCDD	TCDF	OCS
SLR	Strachan I. (1986-2001)						
LO	Snake I.						
LO	Toronto Harbour						
LO	Hamilton Harbour (1981-2001)						
NR	Unnamed I. (1979-2001)						
LE	Port Colborne					L	
LE	Middle I.						
DR	Fighting I. (1978-2001)			L			L
LH	Chantry I.						
LH	Double I.					L	
LH	Channel-Shelter I. (1980-2001)				L		L
LM	Gull I.			L			
LM	Big Sister I. (1971-2001)					L	
LS	Agawa I.						
LS	Granite I.						

SLR = St. Lawrence River, LO = Lake Ontario, NR = Niagara River, LE = Lake Erie, DR = Detroit River, LH = Lake Huron, LM = Lake Michigan, LS = Lake Superior

L = no trend after change point, values have leveled off

Legend

- constant rate of decline (with or without change point)
- declining faster after change point
- declining slower after change point
- no trend throughout study
- increasing after change point

The range in percent decline for contaminants on each water body was as follows (see Table 9-H2):

St. Lawrence River: 49.03 percent – 76.92 percent
Lake Ontario: 39.17 percent – 98.45 percent
Niagara River: 22.33 percent – 89.02 percent
Lake Erie: 48.84 percent – 96.90 percent
Detroit River: -152.43 percent (OCS increased) – 94.66 percent
Lake Huron: 32.56 percent – 97.39 percent
Lake Michigan: 28.24 percent – 92.55 percent
Lake Superior 44.44 percent – 96.45 percent

Table 9-H2. Percent Decline in Concentrations of Seven Contaminants in Herring Gull Eggs from 1974 (or date of first analysis) to 2001*, Source: Environment Canada

		DDE	PCB	HCB	2,3,7,8,TCDD[a]	2,3,7,8 TCDF[b]	OCS[c]	Mercury[d]
St. Lawrence River	**1986**	3.59	28.90	0.052	57.00	1.00	0.026	
N = 1	**2001**	1.83	13.73	0.015	16.39	0.32	0.006	
	percent Decline	49.03	52.49	71.15	71.25	68.00	76.92	
Lake Ontario	**1974**	22.35	153.04	0.580	80.50	1.50	0.017	0.480
N = 2	**2001**	1.89	10.89	0.009	19.80	0.91	0.006	0.160
	percent Decline	91.54	92.88	98.45	75.41	39.17	67.26	66.67
Niagara River	**1979**	4.01	50.47	0.173	41.00	2.00	0.005	0.24[e]
N = 1	**2001**	0.77	6.55	0.019	15.25	0.32	0.004	0.120
	percent Decline	80.80	87.02	89.02	62.80	84.00	22.33	50.00
Lake Erie	**1974**	7.13	72.46	0.29	22.00	4.00	0.017	0.215
N = 2	**2001**	0.74	15.71	0.009	6.88	1.02	0.006	0.110
	percent Decline	89.69	78.32	96.90	68.75	74.50	68.08	48.84
Detroit River	**1978**	9.44	115.09	0.281	33.00	3.00	0.005	0.21[e]
N = 1	**2001**	1.13	26.33	0.015	8.65	1.09	0.013	0.150
	percent Decline	88.03	77.12	94.66	73.79	63.67	-152.43	28.57
Lake Huron	**1974**	17.40	71.01	0.38	29.00	3.50	0.005	0.215
N = 2	**2001**	0.99	4.95	0.010	8.71	2.36	0.002	0.145
	percent Decline	94.34	93.04	97.39	69.98	32.57	61.17	32.56
Lake Michigan	**1977**	29.18	107.99	0.13	15.00	6.00	0.005	0.425[f]
N = 2	**2001**	3.39	15.89	0.010	4.16	1.17	0.001	0.305
	percent Decline	88.38	85.28	92.55	72.30	80.58	78.84	28.24
Lake Superior	**1974**	16.73	62.75	0.25	16.00	4.00	0.005	0.360
N = 2	**2001**	1.05	6.06	0.009	7.00	0.21	0.003	0.200
	percent Decline	93.75	90.34	96.45	56.28	94.70	51.46	44.44

* All units are mg/g except 2,3,7,8 TCDD and 2,3,7,8 TCDF, which are ng/kg. The average contaminant levels were calculated from the sites for each water body as listed under Study Areas and Methods, except for Lake Ontario, where only samples from Snake Island and Tommy Thompson Park (Toronto Harbour) were used, and Lake Huron, where only samples from Chantry and Double Islands were used.

[a] 2,3,7,8 TCDD first analyzed in 1984

[b] 2,3,7,8 TCDF first analyzed 1984

[c] OCS first analyzed in 1987

[d] most recent mercury values are for 2000

[e] 1981

[f] 1982

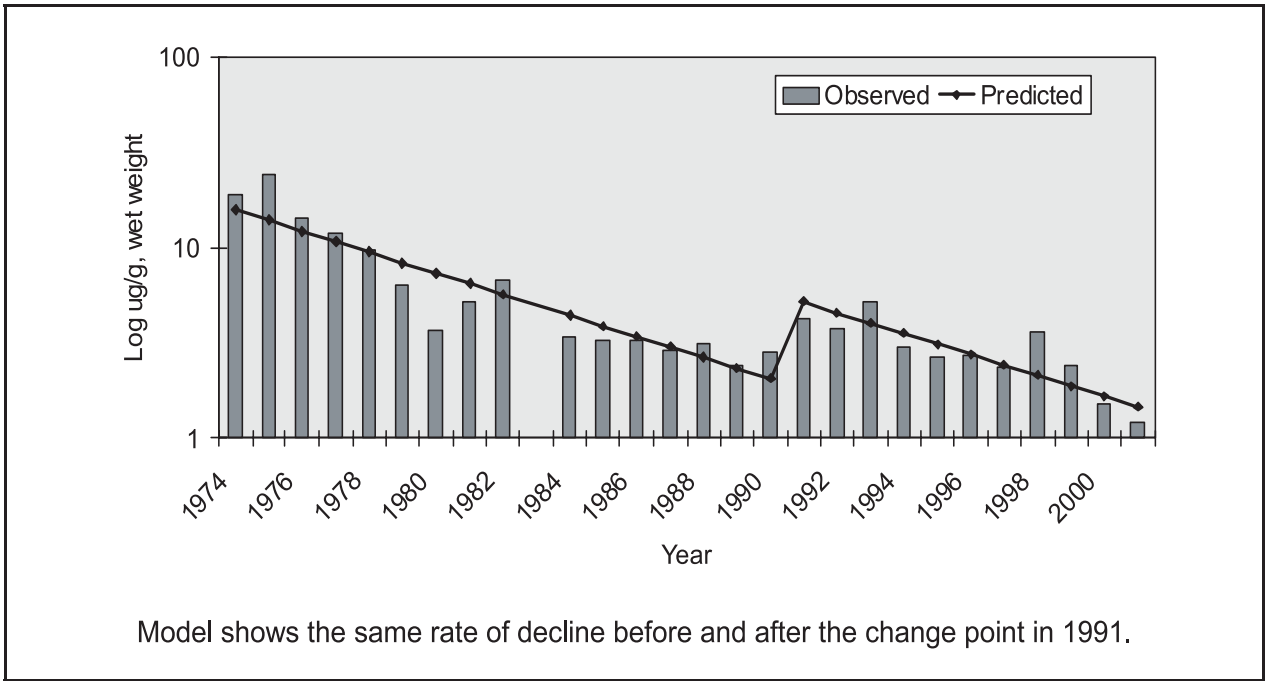


Figure 9-H2. DDE in Herring Gull Eggs - Granite Island, 1974-2001, Source: Environment Canada

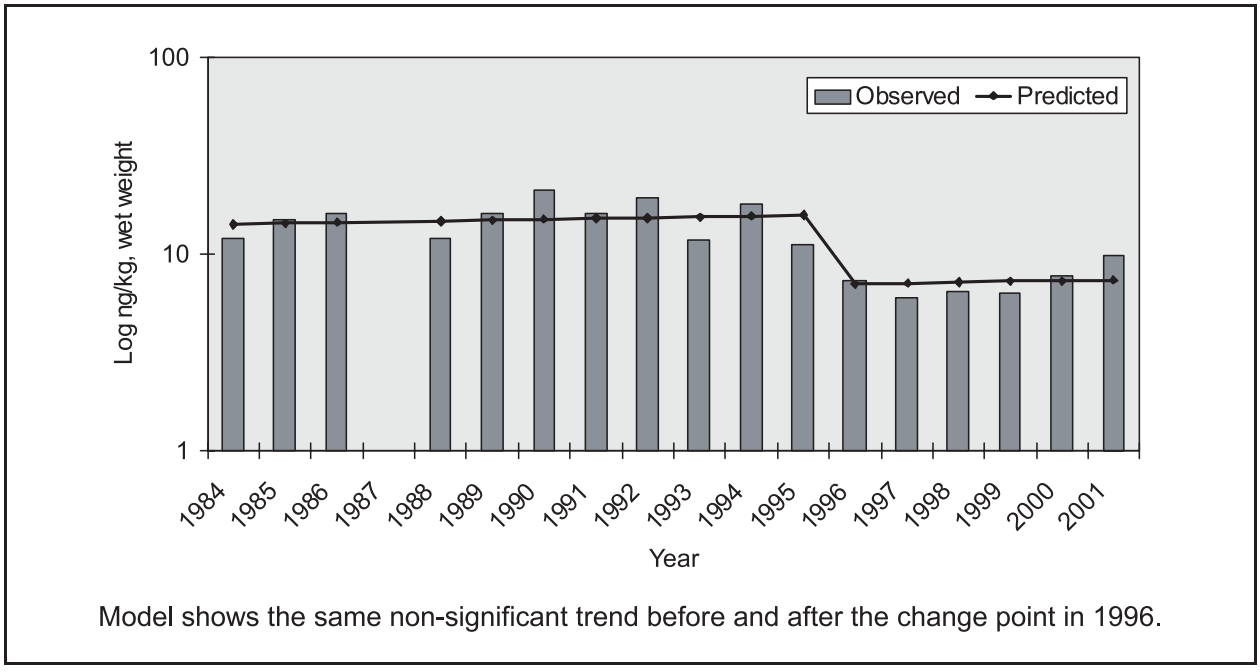


Figure 9-H3. 2,3,7,8-Dioxin in Herring Gull Eggs - Middle Island, Lake Erie, 1984-2001, Source: Environment Canada

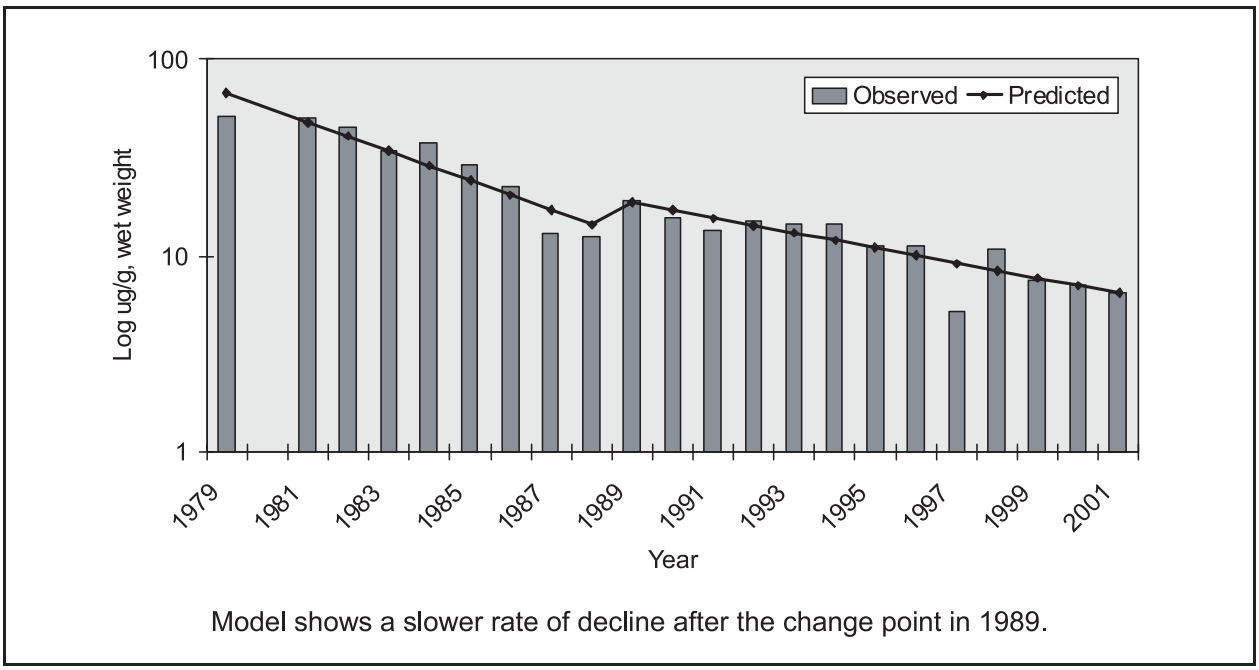


Figure 9-H4. PCB 1:1 in Herring Gull Eggs - Niagara River, 1979-2001. Source: Environment Canada

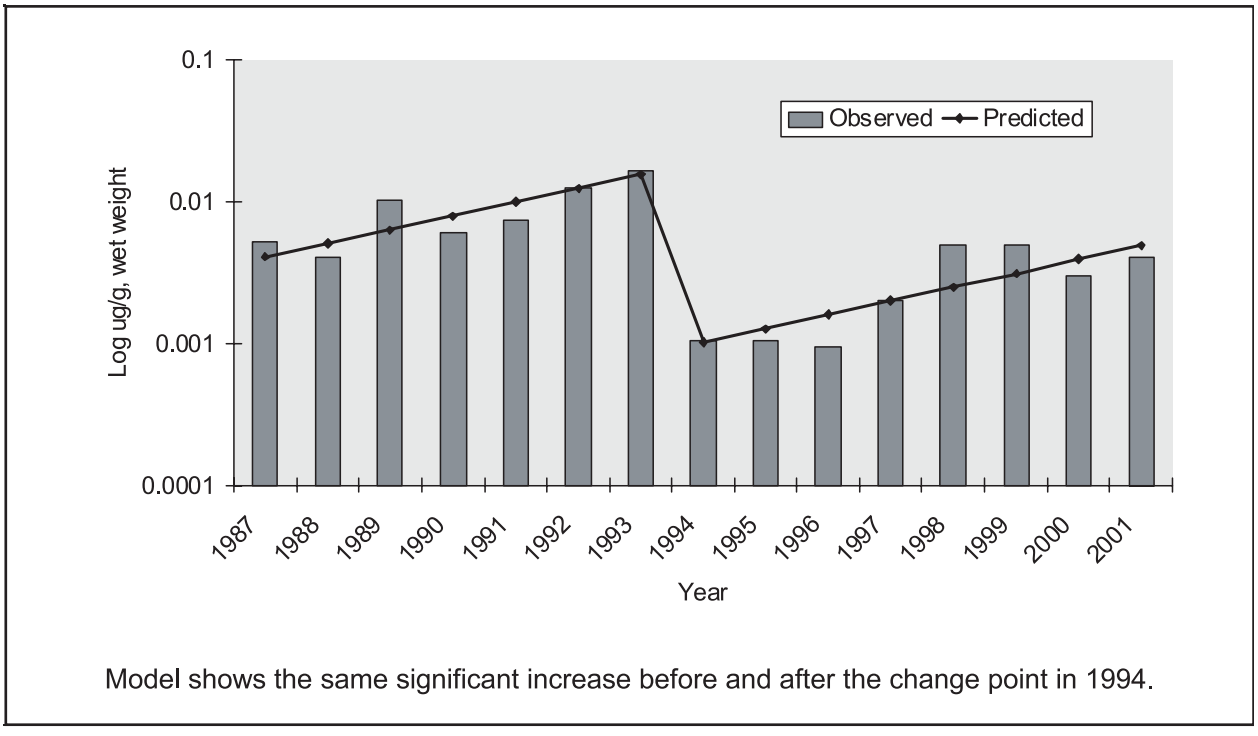


Figure 9-H5. OCS in Herring Gull Eggs - Niagara River, 1987-2001 Source: Environment Canada

- St. Lawrence River – Strachan Island
- Lake Ontario – Snake Island, Tommy Thompson Park (Toronto Harbour) and Neare Island (Hamilton Harbour)
- Niagara River - an unnamed island 300 m above Niagara Falls
- Lake Erie – Port Colborne Lighthouse and Middle Island
- Detroit River – Fighting Island
- Lake Huron – Chantry Island, Double Island (North Channel) and Channel-Shelter Island (Saginaw Bay)
- Lake Michigan – Big Sister Island (Green Bay) and Gull Island
- Lake Superior – Granite Island (Black Bay) and Agawa Rocks

Current contaminant levels and percent change during the study period were calculated as the average value of the sites within each water body. One site in Lake Ontario (Hamilton Harbour) and one in Lake Huron (Saginaw Bay) were not included for this calculation because their time series were not continuous with the two other sites from each of those lakes.

Results

A summary of the results of the regression analyses for all temporal trends is presented in Table 9-H1. Examples of selected change-point regression models are shown in Figures 9-H2 through 9-H5. Current concentrations (2000 for mercury, 2001 for all others) as well as percent change of the seven contaminants, on the basis of water body, are shown in Table 9-H2.

The results of the 90 change-point regression analyses (six compounds at 15 sites) were distributed into five model types. The type of model (i.e., temporal pattern) and number (and percent) of regressions distributed in each type are as follows (Table 9-H1): 1) a constant rate of decline, with or without a change point, over the entire course of the study, 33/90 or 36.7 percent; 2) a faster rate of decline after the change point, i.e. in more recent years, than previously, 5/90 or 5.6 percent; 3) a slower rate of decline after the change point than previously, 20/90 or 22.2 percent; 4) no trend over time (the slope of the regression line was not different from zero), 22/90 or 24.4 percent; or 5) an increasing trend after the change point, 10/90 or 11.1 percent. No pattern or obvious significance of the change-point year has yet been detected.

The most frequently occurring model for each compound was as follows (see Table 9-H1): DDE – 10/15 or 66.7 percent declining at a constant rate; HCB – 9/15 or 60 percent declining at a constant rate; PCBs – 8/15 or 53.3 percent declining at a slower rate after the change point; TCDD – 6/15 or 40 percent showed no trend; TCDF – 5/15 or 33.3 percent showed no trend or increasing after the change point; and OCS – 9/15 or 60 percent showed no trend.

The most common model type in all water bodies except Lake Michigan was that showing a constant rate of decline (see Table 9-H1); in the Detroit River, that model occurred as often as the models showing a slower rate of decline and those showing a faster rate of decline. In Lake Huron, the model showing a constant rate of decline also occurred as often as that showing no trend. In Lake Michigan, the most common model type was that showing a slower rate of decline after the change point.

Mercury values showed significant declines from 1973/74 to 2000 at five sites: Snake Island and Toronto Harbour in Lake Ontario, Middle Island in Lake Erie, Chantry Island in Lake Huron, and Granite Island in Lake Superior. Recent patterns (1992–2000) showed continued declines at the two Lake Ontario sites above, as well as at the Niagara River, the Lake Erie sites, the Canadian Lake Huron sites, and Big Sister Island in Green Bay. There were slight increases at the Gull Island, Lake Michigan site, and the two sites in Lake Superior.

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Trends in Great Lakes Sediment

Spatial and Temporal Trends in Selected Pollutants in Great Lakes Waters and Sediments

Submitted by Scott Painter, Environment Canada
Burlington, ON

The virtual elimination of discharges of persistent toxic substances into the Great Lakes environment is the goal of the GLBTS. Monitoring programs underway in the Great Lakes can illustrate the ambient environmental spatial and temporal response to the GLBTS initiatives at a local and regional scale, for example, in eastern Lake Erie. As well, some programs can illustrate spatial patterns that speak to the local, regional, or global nature of past sources and their historical impact in the Great Lakes environment.

Water and sediment contaminant monitoring programs are presently underway in the open waters and interconnecting channels of the Great Lakes (Figures 9-S1a and b, respectively). Due to the on-going and comprehensive nature of these programs, spatial and temporal trends can be assessed over the breadth of the entire Great Lakes Basin. Federal, state, and provincial environmental monitoring programs are also underway in the AOCs; however, the focus of this first analysis is a review of the trends in the open lakes to ensure consistency with the other media included in this chapter (i.e., air/precipitation, herring gulls, and open-lake fish).

Environment Canada began monitoring open lakes and interconnecting channels for contaminants in 1986. The best temporal data as well as data suggestive of local sources are the interconnecting channels programs in the St. Clair River and the Niagara River. Most contaminants have decreased in concentration over time, typically in the 50-90 percent range. Trends over time at the downstream station in the Niagara River are illustrated for OCS, PCBs, HCB, B(a)P, and DDT in Figures 9-S2a, b, c, d, and e, respectively. OCS, PCBs, and HCB have been decreasing over time, although the last year's data for OCS bear watching. DDT appears to be stable, and B(a)P

Table 9-S1. Percent Reductions in Contaminant Concentrations (Surface vs. Sub-surface) in Lakes Ontario, Erie, and St. Clair from Available Core Data. Source: Environment Canada

Parameter	Ontario	Erie	St. Clair
	percent Reduction	percent Reduction	percent Reduction
Mercury	73	37	NA
PCBs	37	40	49
Dioxins	70	NA	NA
B(a)P	NA	35	NA
HCB	38	NA	49
Total DDT	60	42	78
OCS	NA	NA	74

would appear to be increasing over this time period. St. Clair and Niagara River upstream/downstream comparisons for OCS and HCB suggest local sources, probably historical, still impacting downstream water quality (Figures 9-S3a, b, c and d).

Bottom sediment contaminant surveys throughout the Great Lakes from 1997 to 2002 provide the best illustration of spatial patterns, and as well, sediment cores provide a more complete temporal perspective. Comparisons of surficial sediment contaminant concentrations with sub-surface maximum concentrations indicate that contaminant concentrations have decreased by over 35 percent and in some cases by as much as 80 percent. Table 9-S1 presents percent reductions in contaminant concentrations (surface vs. sub-surface) in Lakes Ontario, Erie, and St. Clair from available sediment core data.

Bottom sediment contaminant concentrations give the best spatial information and an indication of the impact of local and historical sources, and by comparison to previous surveys in the late 1960's and early 1970's, a regional perspective of the ambient environmental response to management initiatives. To date, open-lake bottom sediment contaminant information has been collected from three or four of the Great Lakes for mercury and PCBs (Figures 9-S4a and b). Historical sources and their impacts are evident, however, by comparison to earlier work and through the analysis of archived samples. PCBs, for example, have decreased in Lake Erie by 80 percent. The decline in the lakewide concentration is converging on several desirable U.S. and Canadian sediment quality guidelines (Figure 9-S5). Future surveys will continue to track the response in lakewide concentrations.

Figure 9-S6 illustrates the available open-lake sediment data for dioxins/furans, B(a)P, HCB, and total DDT. These spatial maps, as well as the PCB and mercury maps, illustrate a common theme but also a chemical-specific theme. Western and southwestern Lake Erie and the depositional basins of Lake Ontario, generally speaking, have the highest concentrations of the six pollutants. These regional patterns reflect lake bottom sediment characteristics, depositional processes, and location of historical sources. Locally affected areas are also evident of dioxin, B(a)P, and HCB, suggestive of proximity to sources.

The focus of this analysis is on the open-lake data for consistency with the other information provided. However, so much more information is available, especially in the AOCs, and when the interest is in spatial information that would provide knowledge regarding sources, these datasets are invaluable. For example, USEPA operates a sediment assessment program within the U.S. AOCs (Figure 9-S7). Figure 9-S7 also illustrates a comparison between surface and sub-surface sediment mercury and PCB concentrations in ten of the AOCs. It would appear that surface concentrations are still enriched in many of the AOCs compared to sub-surface concentrations, although this could be an artifact of the sampling procedure. The challenge with most data integration exercises is wrestling with the inter-comparability of the various programs, their sampling procedures, and their analytical procedures. Nevertheless, the effort is worth the challenge. For example, the USGS, on behalf of the Lake Erie LaMP, has integrated the available data from numerous federal, state, and provincial agencies within the Lake Erie Basin (Figure 9-S8). The integrated information provides a more complete understanding of the sediment "issue" and provides management with a holistic perspective. This activity will be extended to include Lake Ontario in the near future.

Contaminated sediments, as they are re-suspended, become a source of contamination. An Environment Canada suspended sediment contaminant program in the lower Great Lakes and specifically in the St. Clair/Detroit corridor illustrates the utility of suspended sediment traps to further refine knowledge of localized sources. Figure 9-S9 illustrates mercury concentrations in suspended sediments within this corridor. The correspondence between bottom sediment concentrations, as illustrated in Figure 9-S8 (top map), and suspended sediment contaminant information and historical knowledge of original sources is encouraging.

In general, there is a consistency in spatial and temporal trend information among the various programs, which enables an overall weight-of-evidence assessment of contaminants in the Great Lakes Basin.

Acknowledgement

Scott Painter of Environment Canada was responsible for organizing this chapter. Other contributers include Chris Marvin, Don Williams, Melanie Nielson, Ken Kuntz, CH Chan, all of Environment Canada, Dan Button, USGS, Pat Van Hoof, NOAA, Scott Cieniawski, Marc Tuchman, Ron Rossman and Richard Coleates, all of USEPA, and Lisa Richman and Duncan Boyd of MOE.

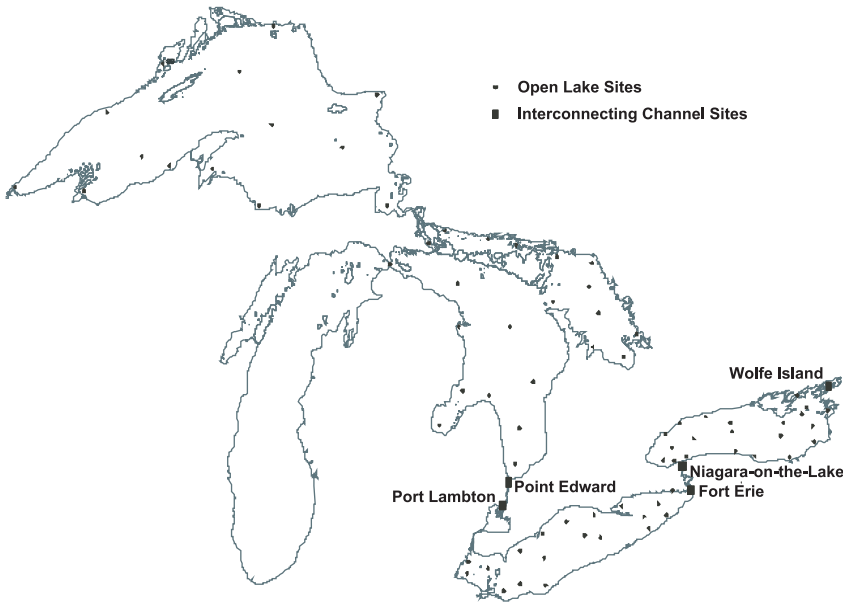


Figure 9-S1a. Open-lake and Interconnecting Channel Water Quality Sites Monitored for Persistent Toxic Substances. Source: Environment Canada

Figure 9-S1b. Open-lake Bottom Sediment Sites Monitored for Persistent Toxic Substances (Lake Huron underway). Source: Environment Canada

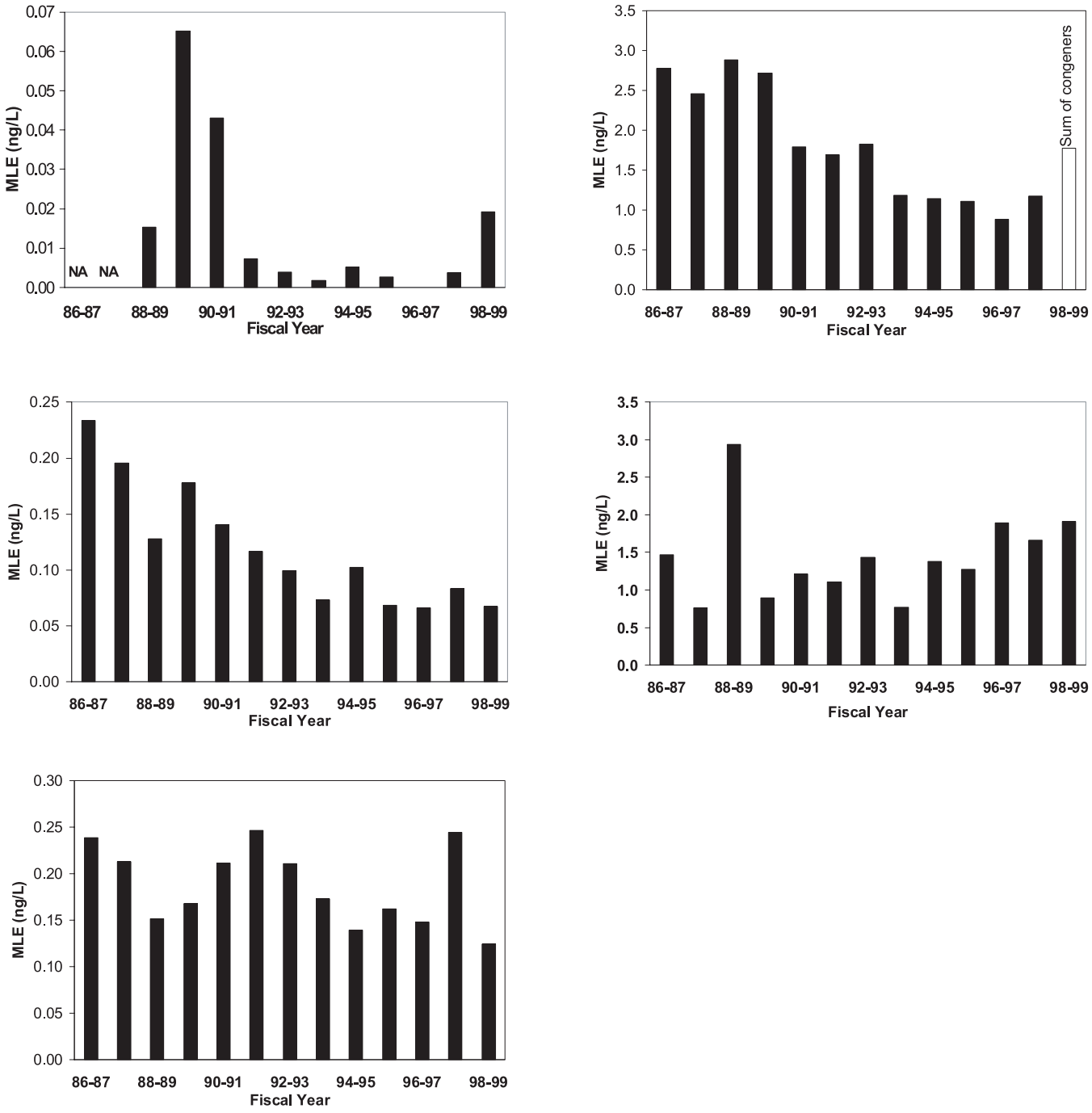


Figure 9-S2. OCS (upper left), PCBs (upper right), HCB (mid left), B(a)P (mid right), and Total DDT (lower left) at Niagara-on-the-Lake. Source: Environment Canada

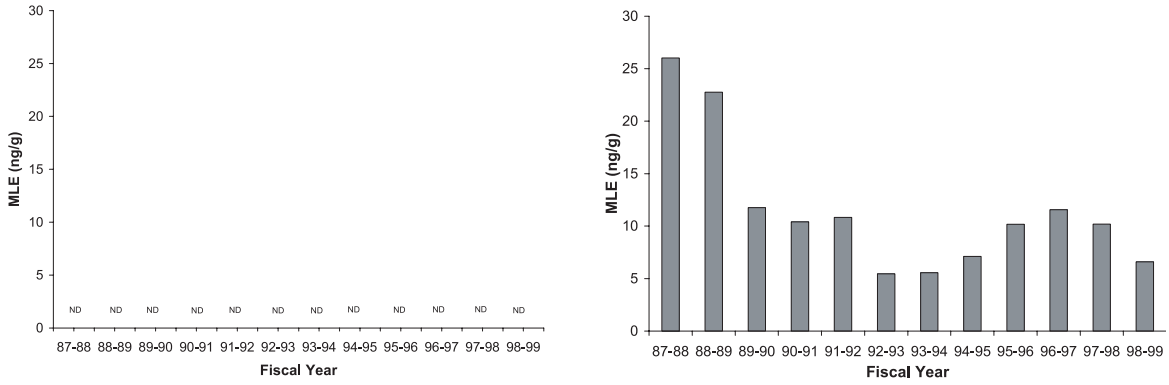


Figure 9-S3a. Upstream (Pt. Edward) and Downstream (Port Lambton) St. Clair River OCS Particulate Phase Concentrations over Time Source: Environment Canada

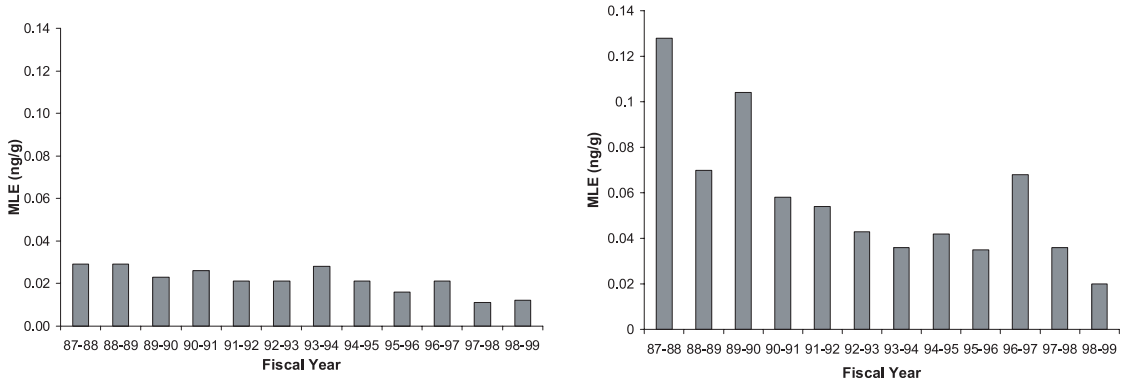


Figure 9-S3b. Upstream (Pt. Edward) and Downstream (Port Lambton) St. Clair River HCB Particulate Phase Concentrations over TimeSource: Environment Canada

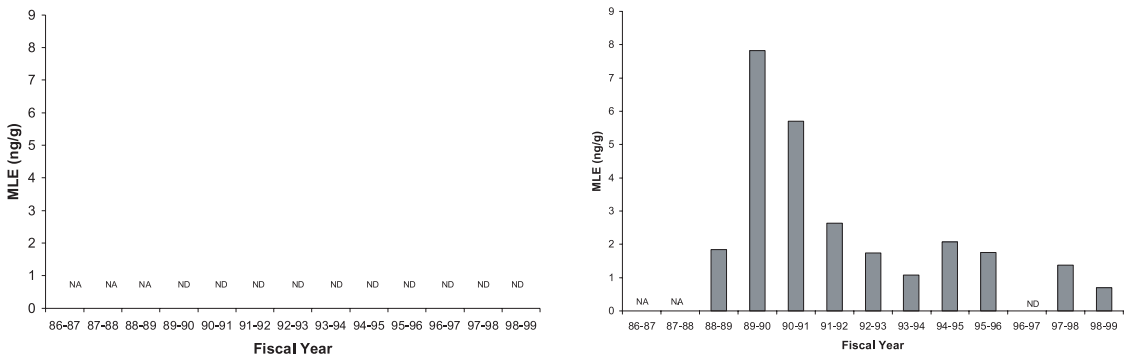
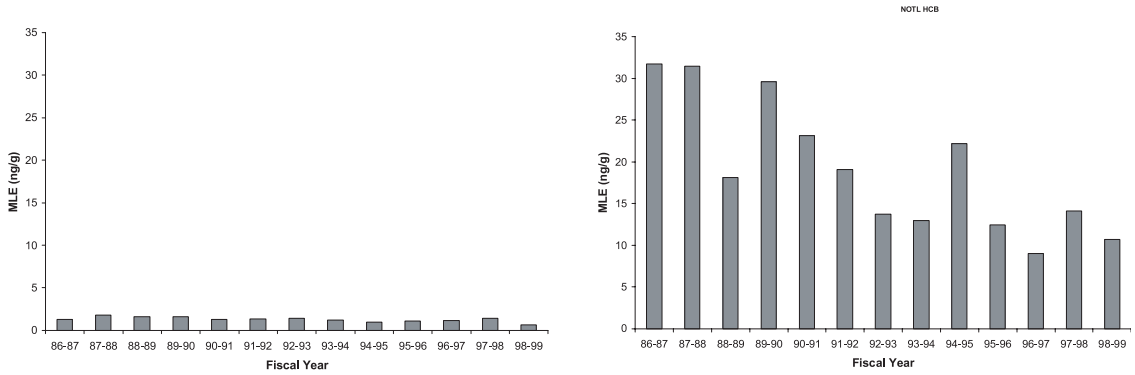


Figure 9-S3c. Upstream (Fort Erie) and Downstream (Niagara on the Lake) Niagara River OCS Particulate Phase Concentrations over Time. Source: Environment Canada



Fort Erie Niagara-on-the-Lake

Figure 9-S3d. Upstream (Fort Erie) and Downstream (Niagara-on-the-Lake) Niagara River HCB Particulate Phase Concentrations over Time. Source: Environment Canada

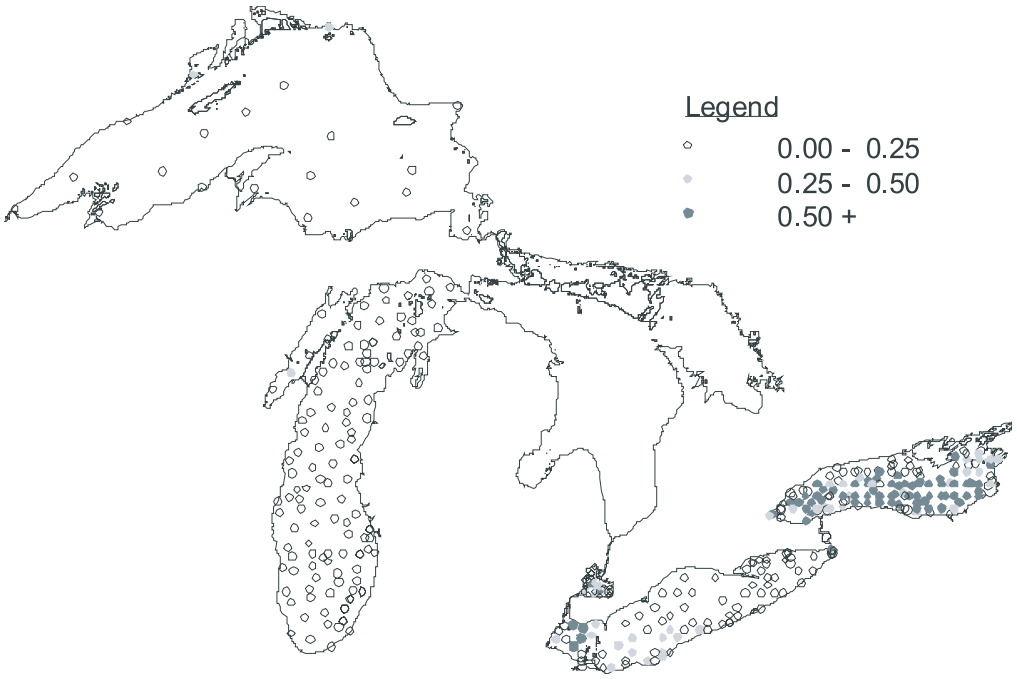


Figure 9-S4a. Open-lake Bottom Sediment Mercury Concentrations (ug/g).
Source: Environment Canada and USEPA

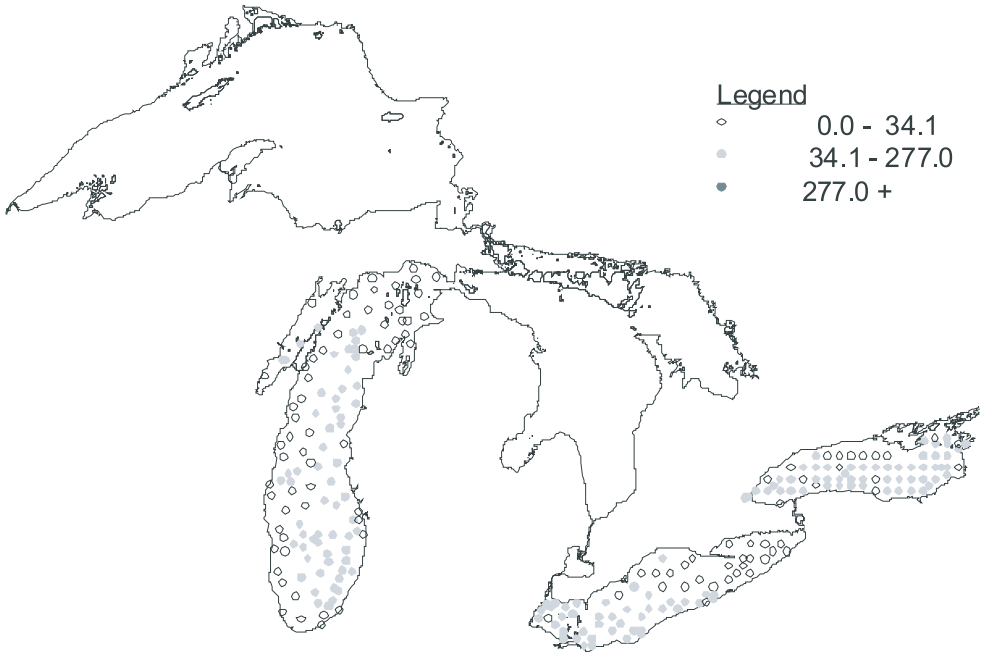


Figure 9-S4b. Open-lake Bottom Sediment PCB Concentrations (ng/g).
Source: Environment Canada, USEPA and NOAA

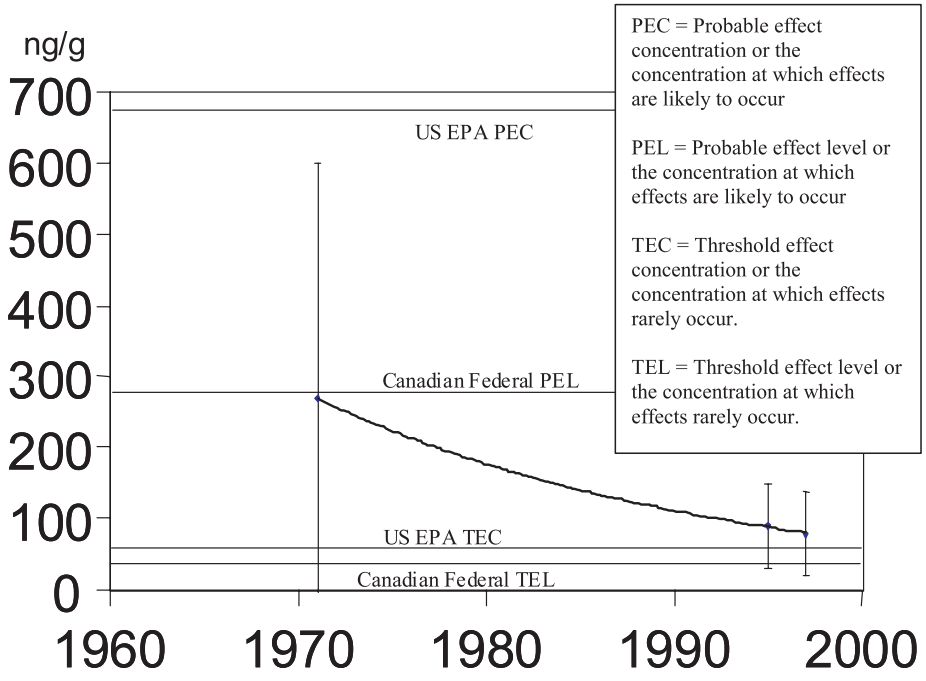
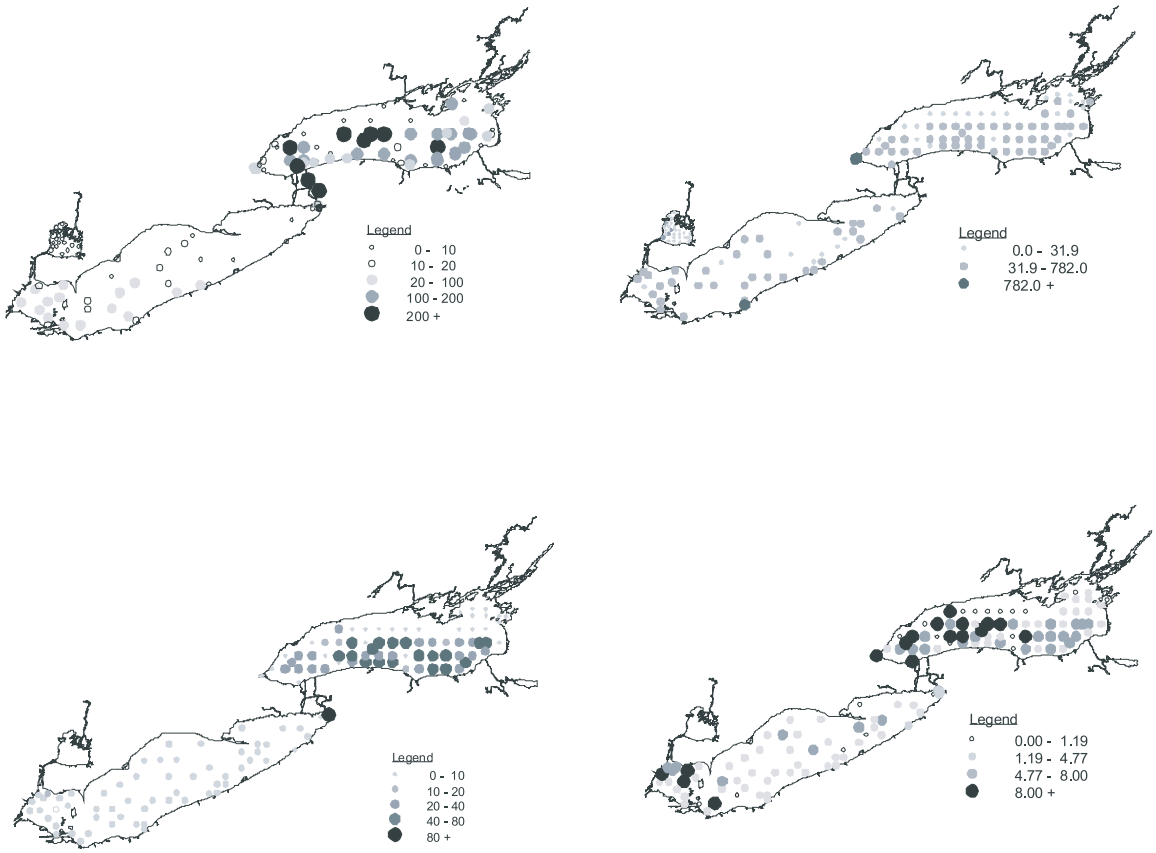


Figure 9-S5. Lake Erie Bottom Sediment Lake-wide PCB Average Concentration over Time. Source: Environment Canada



Figures 9-S6. Available Open-lake Sediment Data for Dioxins/Furans (pg/g, upper left), B(a)P (ng/g, upper right), HCB (ng/g, lower left), and Total DDT (ng/g, lower right). Source: Environment Canada, USEPA and MOE

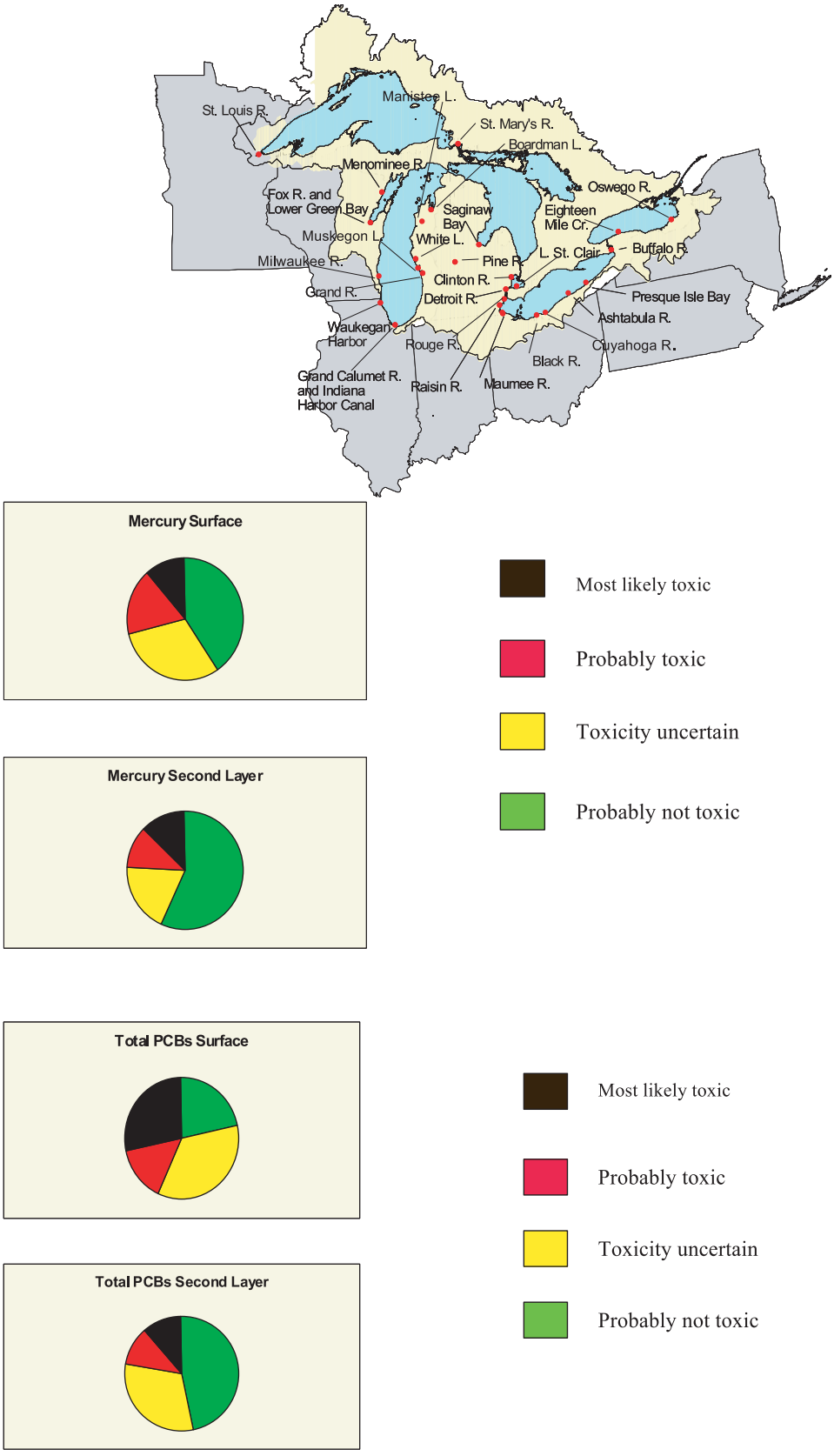


Figure 9-S7. USEPA Surface and Sub-surface Sediment Assessment Results for Mercury and PCBs in Ten U.S. AOCs. Source: USEPA

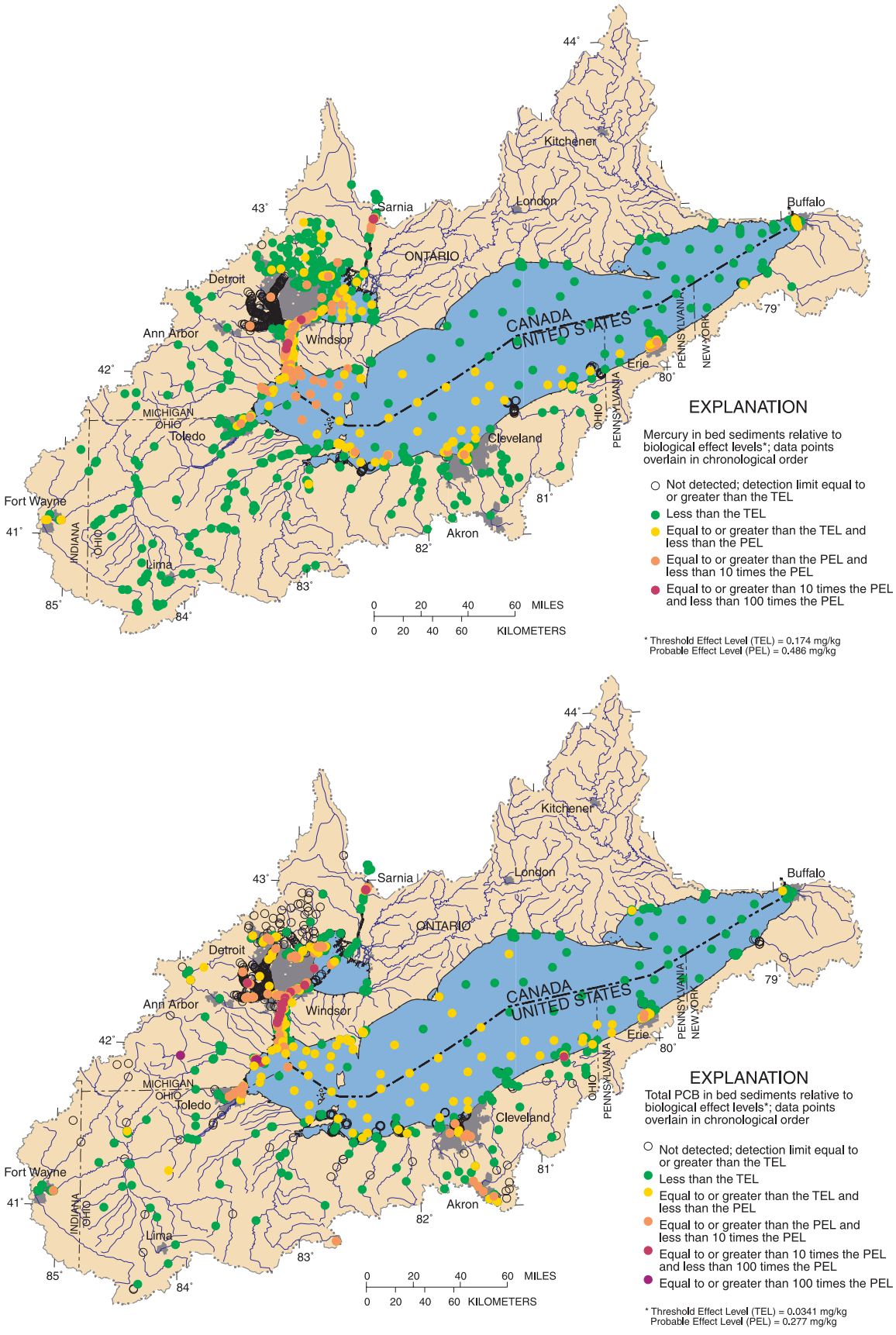


Figure 9-S8. Mercury and PCB Surficial Sediment Concentrations from Multiple Agency Programs within the Lake Erie Basin. Source: USGS Compilation of Multiple Sources

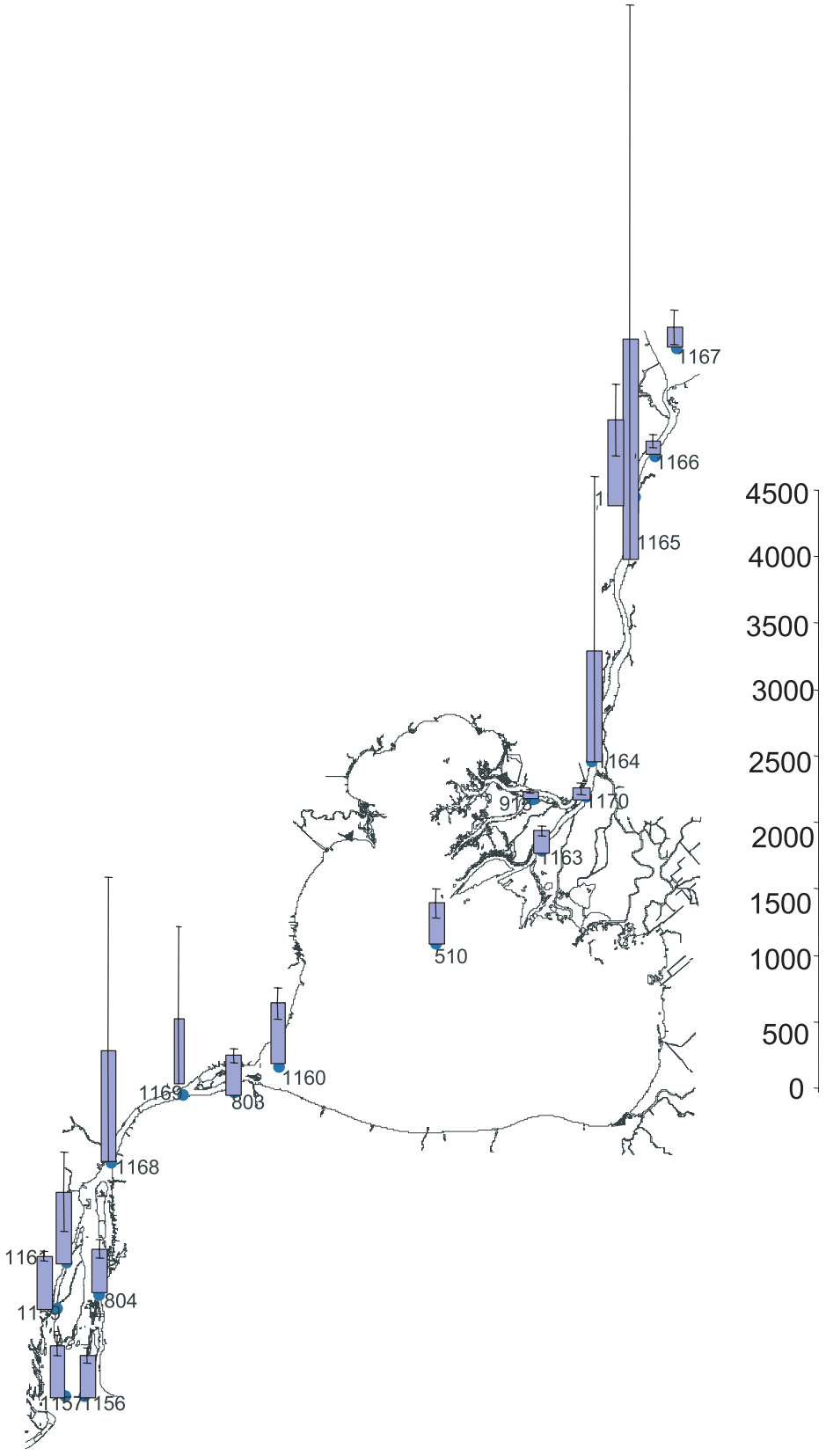


Figure 9-S9. Mercury Concentrations (ng/g) in Suspended Sediments within the St. Clair/ Detroit River Corridor, 2001. Source: Environment Canada

APPENDIX A: GLBTS TIME LINE

The following section presents an overview of GLBTS progress and includes not only activities undertaken by the workgroups and the governments since the Strategy was signed in 1997, but also various activities related to the goals and objectives of the GLBTS

GREAT LAKES BINATIONAL TOXICS STRATEGY (GLBTS)
PROGRESS OVERVIEW 1997 - 2002

	YEAR			
	1999 and earlier	2000	2001	2002
General GLBTS Activities				
GLBTS Development, the Integration Workgroup, and the Stakeholders Forum	- 4/7/97 U.S. and Canada sign the *GLBTS: Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes* - 6/26/97 Stakeholders invited to workshop to develop a draft GLBTS Implementation Plan - 12/97 GLBTS Implementation Plan distributed and substance-specific participation solicited - 12/97 GLBTS web page is developed - 3/23/98 Kick-off implementation meeting in Chicago to form seven substance-specific workgroups - 6/19/98 The first GLBTS Integration Workgroup meeting is convened in Romulus Michigan - 6/98 GLBTS web-site is redesigned; PCBs and Hg Workgroup pages added - 7/98 GLBTS web-site is redesigned; integration, dioxins, pesticides, HCB/B(a)P, alkyl-lead, and OCS Workgroup pages added - 10/21-23/98 GLBTS display and presentation (including GLBTS handouts, a brochure, website cards, GLBTS progress timeline and activity sheets) at SOLEC in Buffalo, NY	- 9/24/99 A preliminary draft GLBTS Progress Report issued at IJC meeting in Milwaukee, WI - 10/99 GLBTS main and mercury Workgroup web pages are redesigned - 10/7/99 A Canadian GLBTS *Report on Level II Substances* is posted on the GLBTS web page - 11/18/99 GLBTS Stakeholder Forum is held in Chicago, Illinois - 11/19/99 GLBTS Integration Workgroup meets in Chicago, Illinois - 1/28/00 Municipal Solid Waste and Incineration Workgroup planning conference call - 2/11/00 Municipal Solid Waste and Incineration Workgroup planning conference call - 2/15/00 GLBTS Integration Workgroup meets in Windsor, Ontario - 5/15/00 Protecting the Great Lakes, Sources of PBT Reductions Workshop on Municipal Solid Waste Management is held in Toronto, Ontario - 5/16/00 GLBTS Stakeholder Forum is held, with the theme “Meeting the Challenge”	- 2/20/01 GLBTS Integration Workgroup meets in Windsor, Ontario - 2/21/01 GLBTS 2000 Progress Report is posted to web-site - 5/17/01 GLBTS Stakeholder Forum is held in Toronto, Ontario - 5/18/01 GLBTS Integration Workgroup meets in Toronto, Ontario - 06/18/01 GLBTS Sector Subgroup begins a series of conference calls to select a short list of sectors for a pilot effort - 8/28/01 GLBTS Integration Workgroup meets in Chicago, Illinois - 9/19/01 GLBTS Sector Subgroup begins information-gathering phase focusing on the short list of sectors - 11/14/01 GLBTS Stakeholder Forum is held in Chicago, Illinois, with the theme “Implementation – Partners in Progress” - 11/15/01 GLBTS Integration Workgroup meets in Chicago, Illinois	- 1/25/02 GLBTS Sector Subgroup begins summarizing findings - 1/29-30/02 GLBTS Presentation at BEC Monitoring Workshop – Chicago, IL - 2/21/02 GLBTS Presentation at BEC Monitoring Conference – Niagara-on-the-Lake, Ontario - 2/26/02 GLBTS Sector Subgroup presents summary of findings to Integration Workgroup - 2/26/02 GLBTS Integration Workgroup meets in Windsor, Ontario - The GLBTS EC/USEPA web-site “binational.net” is created - 4/02-05/02 GLBTS Display at the US National P2 Roundtable – Portland, OR - 4/24-26/02 GLBTS Display at the Canadian P2 Roundtable – Quebec City, Quebec - 5/29/02 GLBTS Stakeholder Forum and Five-Year Anniversary event are held in Windsor, Ontario - 5/29/02 GLBTS Five-Year Perspective report issued - 5/30/02 GLBTS Integration Workgroup meets in Windsor, Ontario - 6/26/02 GLBTS Presentation and Display at Shared Waters Conference – Hamilton, Ontario

	YEAR			
	1999 and earlier	2000	2001	2002
GLBTS Development, the Integration Workgroup, and the Stakeholders Forum	- 11/16/98 The first GLBTS Stakeholder Forum is convened in Chicago, IL - 11/16/98 The first GLBTS progress report is distributed - 1/26/99 GLBTS Integration Workgroup meets in Windsor, Ontario - 4/27/99 GLBTS Stakeholder Forum is held in Toronto, Ontario - 4/28/99 GLBTS Integration Workgroup meets in Toronto, Ontario - EC and USEPA develop draft communications strategy, present it to Integration Workgroup, and revise strategy based on stakeholder comments - 12/99 Preliminary planning initiated for a PCP Workshop (to include the GLBTS pesticides, HCB and dioxins/furans Workgroups) - 12/3/99 A U.S. *GLBTS Report on Level II Substances* is posted on the GLBTS web page - 12/15/99 Draft (Full) 1999 GLBTS Progress Report issued - 1999 (various dates) Development of a Canadian GLBTS communications plan - 8/24/99 GLBTS Integration Workgroup meets in Detroit, Michigan - 9/23-26/99 USEPA, EC and invited speakers give GLBTS Session presentation at the IJC Great Lakes Water Quality Forum in Milwaukee, WI	- 9/22/00 GLBTS Integration Workgroup meets in Chicago, Illinois - 2000 (various dates) GLBTS communications plan is finalized by EC; "key messages" finalized; various communications products in development (brochure, business cards, display unit, letterhead, web-site improvements, success stories)	- 11/16/01 GLBTS/LaMP Workshop in Chicago, Illinois, with the theme of "Program Synergies – Partners in Progress Exploring how we can mutually support the pollutant reduction needs and efforts of each program synergistically"	- 8/27/02 GLBTS Presentation and Display at GLPPR – Toronto, Ontario - 9/11-12/02 GLBTS Presentation at Lake Superior LaMP Workgroup Meeting – Thunder Bay - 9/16/02 GLBTS Sector Subgroup holds conference call to discuss a pilot sector project - 9/18/02 GLBTS Integration Workgroup meets in Chicago, Illinois - 10/15-18/02 GLBTS Display at SOLEC – Cleveland, OH - 12/3/02 GLBTS Stakeholder Forum is held in Chicago, Illinois - 12/3/02 Draft GLBTS 2002 Progress Report issued - 12/4/02 GLBTS Integration Workgroup Meeting is held in Chicago, Illinois - GLBTS Outreach Materials in 2002 – Binational.net desk coffee coaster, GLBTS coffee mug, Generic GLBTS Poster and Hg, PCB, D/F Posters, GLBTS Recognition Certificates, GLBTS CD, GLBTS Activity Update Fact Sheet

	YEAR			
	1999 and earlier	2000	2001	2002
Substance-Specific Activities				
Mercury (Hg)				
GLBTS Workgroup Activities	- 3/23/98 WG is formed at the first implementation meeting - 5/5/98 WG conference call is held - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 11/17/98 GLBTS workshop on Potential Mercury Reductions at Electric Utilities is held in Chicago - 4/99 Workshop on community initiatives for reducing Hg - 1/99 GLBTS web postings include: *Wisconsin Mercury Source Book* on community Hg reduction plans, findings of the *Mercury Reduction at Electric Utilities* workshop, and *Mercury Success Stories* - 2/99 Information and FAQs on mercury fever thermometers posted on the GLBTS web page - 3/99 GLBTS web postings include: The WDNR guide, *Mercury in your Community and Environment,* and a manual for hospitals, *Reducing Mercury Use in Health Care* - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois	- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 6/00 GLBTS web page on Mercury Thermometers and Frequently Asked Questions is updated - 8/00 Memo on progress in reducing mercury use posted on the GLBTS web page - 10/17/00 Expansion of mercury web page links - 11/18/00 WG meeting at the GLBTS Stakeholder Forum in Toronto	- 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto - 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois	- 5/29/02 – 5/30/02 WG meeting at the GLBTS stakeholder forum in Windsor, Ontario - 12/2/02 WG meeting in Chicago, Illinois on reducing impact of dental mercury - 12/3/02 WG meeting at the GLBTS stakeholder forum in Chicago, Illinois
GLBTS Reports	- 8/24/98 Background Information on Mercury Sources and Regulations is posted on the GLBTS web page - 9/10/98 Options Paper *Developing a Virtual Elimination Strategy for Mercury* is posted on the GLBTS web page - 11/99 Draft GLBTS Step 1&2 *Sources and Regulations* report for mercury is posted on the GLBTS web page	- A final draft GLBTS *Reduction Options* (Step 3) report for mercury is prepared (9/1/00) and posted (9/29/00) on the GLBTS web page		

	YEAR			
	1999 and earlier	2000	2001	2002
Other Related Activities	- Chlorine Institute voluntary mercury commitment to reduce mercury use by 50 percent by 2005 - 12/97 *Mercury Report to Congress* is released by USEPA - 5/8/98 Chlorine Institute releases progress report on voluntary mercury commitment - 6/25/98 USEPA and AHA sign a MOU on reducing medical wastes - 9/15/98 Three northwest Indiana steel mills commit to developing mercury inventories and reduction plans - 10/98 IDEM household mercury collection efforts - Dow Chemical Company commits to mercury reductions - PBT Strategy grant to the Northeast Waste Management Officials' Association to encourage state mercury reduction efforts - 8/99 As part of 1998 agreement, mercury inventories at Indiana steel mills are completed - 10/99 Mercury waste collection component of the Cook County (Illinois) Clean Sweep pilot begins	- Chlorine Institute reports 42 percent reduction, production-adjusted, in mercury use - USEPA, States agencies, and academic researchers conduct meetings with chlor-alkali industry representatives to coordinate mercury reduction projects - Olin Corp. cooperates with USEPA, State, and academic researchers on mercury monitoring project at chlor-alkali plant - Indiana steel mills complete mercury reduction plans; extend invitation to suppliers to commit to developing mercury inventories and reduction plans - Auto Alliance commits to eliminate mercury switches in auto convenience lighting; New York DEC and Michigan DEQ implement mercury removal programs at auto scrap yards - Hospitals for a Healthy Environment produces a Mercury Virtual Elimination Plan for hospitals under the AHA-USEPA MOU. State and local governments provide technical assistance to hospitals, and the National Wildlife Federation (NWF) continues its outreach and education efforts, signing up nearly 600 medical facilities to NWF's "Mercury Free Medicine Pledge." - Wisconsin DNR and Department of Agriculture conduct a dairy mercury manometer replacement program; approximately 375 mercury manometers are recycled	- 651 hospitals join the National Wildlife Federation's Mercury-Free Hospitals campaign - Ispat-Inland Indiana Harbor Works, Bethlehem Steel Burns Harbor Division, US Steel Gary Works, the Delta Institute, and Lake Michigan Forum create a Guide to Mercury Reduction in Industrial and Commercial Settings - Merc Switch-out Pilot Program launched by Pollution Probe, Ontario Power Generation, MOE, and Environment Canada to collect mercury switches from old vehicles - 2/21/01 A workshop entitled "Extended Producer Responsibility and the Automotive Industry" is sponsored by the Canadian Autoworkers Union's Windsor Regional Environment Council and Great Lakes United	- 2/27/02 Great Lakes United kicks off series of information-sharing sessions about auto mercury-switch removal programs for State agency staff - 4/5/02 Chlorine Institute releases its *Fifth Annual Report to EPA*, showing a 75 percent reduction in mercury use by the U.S. chlor-alkali industry between 1995 and 2001, more than meeting this sector's commitment to reduce mercury use 50 percent by 2005 - 10/1/02 Thermostat Recycling Corporation announces that it collected 28,000 thermostats and 231 pounds of mercury in the first half of 2002, a 15 percent increase from mercury collections in the first half of 2001. The program began to serve the 48 continental U.S. States in the Fall of 2001. - 10/18/02 The Hospitals for a Healthy Environment (H2E) program has 335 partners representing 1,019 facilities: 347 hospitals, 618 clinics, 22 nursing homes and 32 other types of facilities. These partners are health care facilities that have pledged to eliminate mercury and reduce waste, consistent with the overall goals of H2E.

	YEAR			
	1999 and earlier	2000	2001	2002
Other Related Activities	- Six Ontario hospitals sign MOU to voluntarily reduce Hg - Pollution Probe investigates Hg reduction options for electrical products sector in Ontario - Automotive Pollution Prevention Project efforts to phase out Hg - USEPA grant to Ecology Center of Ann Arbor: promoting mercury P2 in the health care industry - WLSSD begins multimedia zero discharge pilot / focus on Hg - Michigan Mercury Pollution Prevention Task Force - 11/16/98 A draft PBT National Action Plan for Mercury is released by USEPA - Total mercury used in lamps declines from an estimated 17 tons in 1994 to an estimated 13 tons in 1999, even though significantly more mercury containing lamps are sold in 1999 than in 1994.	- University of Wisconsin extension creates a website and list server to share information about mercury in schools. - The Thermostat Recycling Corporation collects over 500 lbs of mercury from over 57,000 thermostats collected and processed from January 1, 1998 to June 30, 2000. The program is expanded to the Northeast and will gradually be expanded to include the entire U.S. - The Great Lakes Dental Mercury Reduction Project funded by the Great Lakes Protection Fund produces a brochure template: Amalgam Recycling and Other Best Management Practices. Great Lakes Dental Associations reprint and distribute this document to their memberships. The University of Illinois-Chicago dental school and the Naval Dental Research Institute conduct research on controlling mercury in dental wastewater and help to educate dentists about best management practices. - Coalitions including Health Care Without Harm and the National Wildlife Federation successfully encourage several national retailers to stop the sale of mercury-containing thermometers to the public. Duluth, Minnesota, Ann Arbor Michigan, unincorporated areas of Dane County, Wisconsin, and several Dane Country municipalities, ban the sale of mercury thermometers.		

YEAR				
	1999 and earlier	2000	2001	2002
Polychlorinated Biphenyls (PCBs)				
GLBTS Workgroup Activities	- 3/23/98 WG is formed at the first implementation meeting - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 6/15/98 WG requests that the IG develop a strategy on sediments - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - WG solicits and gains commitment of 3 U.S. auto manufacturers to reduce PCBs - WG solicits commitment of steel producers to reduce PCBs - As of January 1993, approximately 25,000 tonnes of high-level PCBs are either in use or in storage in Ontario; 1529 active PCB storage sites in Ontario	- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - WG continues to use PCB reduction commitment letters, through EC and US USEPA, to seek commitments to reduce PCBs, targeting specific companies, primarily major owners of PCB transformers and capacitors, and associations, such as CGLI - WG solicits and gains commitment of 2 Canadian auto manufacturers, 4 Canadian steel producers, and over 30 municipal electrical utilities in Ontario to reduce PCBs - WG leaders and Council of Great Lakes Industries (CGLI) finalize outreach letters used to seek PCB reduction commitments from trade associations. CGLI identifies specific trade associations to begin outreach. EC mails letters to trade initial associations. USEPA mailings to follow. - WG begins to compile case study reports on reasons why companies remove their PCBs - WG begins to collect photographs of PCB-containing electrical equipment to assist potential owners with identification of equipment which may contain PCBs - WG drafts a fact sheet on PCB containing submersible well pumps to be used for outreach to potential users of wells and servicers of well pumps. - As of April 2000, approximately 7,500 tonnes of high-level PCBs are either in use or in storage in Ontario; 1191 active PCB storage sites in Ontario	- WG continues to mail letters to companies and trade associations seeking commitments to phase out PCBs - WG prepares case studies submitted by Bethlehem Steel Corporation's Burns Harbor Division and ComEd Energy Delivery, a unit of Chicago-based Exelon Corporation, for posting on the GLBTS web page - 01/01 PCB Federal Databases are updated for Canada. -05/01 PCB WG progress meeting held in Toronto, Canada. WG discusses two reasons that companies are unable to commit immediately to PCB reductions: 1) reduction/replacement is dependent on companies' internal planning and budgeting cycle; 2) reduction/ replacement is tied to market conditions. USEPA and EC will continue mailing out the voluntary reduction and commitment letters to the priority sectors and associations seeking additional commitments to reduce PCBs. - 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto - 7/01 USEPA compiles and analyzes data for 1995-1999 submitted by U.S. PCB disposers - 8/29/01 WG posts photographs of electrical equipment which may contain PCBs (transformers, and capacitors) to GLBTS web page to help increase awareness of the types of equipment that may contain PCBs	- WG continues to modify BNS-PCB website based on recommendations received in an email survey conducted by EC and US EPA in November 2001 - 05/02 WG meeting is held at the GLBTS Stakeholder Forum in Windsor - 05/02 Hydro One representative states that the company is free of all high-level PCBs but still has several small stations and other sources of low-level PCBs. Hydro One has introduced a PCB management program that extends to the year 2020. - 05/02 MOE representative presents a strategy to implement an annual charge for having equipment with PCBs. Amendments for regulation 362 are proposed, including the addition of a schedule of destruction targets. - 10/02 Approx. 400 PCB commitment letters are sent to school boards and other sensitive sites in Ontario. - 10/02 Canada develops a new (draft) plan of outreach and recognition to try to increase the rate of PCB phase-out in Canada. The main elements of the draft plan are to identify and recognize contributions made by individual companies or their industry associations that go beyond regulatory requirements and to publicize success stories.

	YEAR			
	1999 and earlier	2000	2001	2002
GLBTS Workgroup Activities (cont.)			- 09/01 In coordination with LaMP activities, EC mails a package of information to all small quantity PCB owners (over 300 owners) in the Lake Superior and Lake Erie Basins to help raise awareness of PCB initiatives underway in support of the GLBTS. The information package contained a copy of PCB Owners Outreach Bulletin, fact sheets, and maps of PCB Storage sites in the Lake Erie and Lake Superior Basins. -11/01 PCB WG meeting is held in Chicago, Illinois. WG discusses the need for more outreach, especially toward small and medium sized companies. Representatives of GM outline the company's plan to phase-out all PCB materials from its North American facilities. - As of April 2001, 80 percent of high-level PCBs (Askarel > 1 percent, 10,000 ppm) had been destroyed in Ontario, Canada; however only 25 percent of low-level PCBs were destroyed, mostly from stored contaminated soil from a contaminated site clean-up in Ontario. - As of April 2001, approximately 6,000 tonnes of high-level PCBs are either in use or in storage; 992 active PCB storage sites in Ontario. - 8/30/01 PCBs in Submersible Well Pumps fact sheet posted to GLBTS web page - 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois	- As of April 2002, 84 percent of high-level PCBs (Askarel > 1 percent, 10,000 ppm) had been destroyed in Ontario, compared to 1993. - As of April 2002, approximately 4,147.4 tonnes of high-level PCBs are either in use or in storage in Ontario; 916 active PCB storage sites in Ontario.

	YEAR			
	1999 and earlier	**2000**	**2001**	**2002**
GLBTS Reports	- 11/10/98 Options Paper *Virtual Elimination of PCBs* is posted on GLBTS web page - 11/99 Draft GLBTS Step 1&2 *Sources and Regulations* report for PCBs is posted on the GLBTS web page	- Final draft GLBTS Step 3 *Reduction Options* report for PCBs is prepared (7/14/00) and posted (9/29/00) on the GLBTS web page		
Other Related Activities	- USEPA finalizes PCB regulations which include a requirement for U.S. owners to register their PCB transformers - EC and Ontario government hold two workshops on PCB management in the Toronto area - 10/99 PCB waste collection component of the Cook County (Illinois) PCB/Hg Clean Sweep pilot begins - U.S. PCB transformer registration database is updated - Requests for voluntary PCB reduction commitments are mailed to automotive, iron & steel, and municipal electrical power utilities in Ontario	- Region 5 PCB Phasedown Program and pilot phasedown enforcement policy are finalized - A PBT workgroup continues to work on a National Action Plan for PCBs - 2/00 EC mails survey to approximately 500 registered owners of in-use PCB equipment in Ontario, requesting updated information - Cook County PCB/Hg Clean Sweep pilot concludes - 11/00 Canada mails letter to over 2000 registered PCB waste storage owners/managers in Ontario for a recent update of their stored PCB inventory which will be used to modify federal databases for better tracking and monitoring - Update and modification of Federal PCB databases started in 2000 and will continue until completion in 2003 - Three Canadian Federal PCB Regulations are being amended: 1) Chlorobiphenyl Regulation 2) Storage of PCB Material Regulations 3) PCB Export Regulations Extensive Public Consultation is conducted during summer and fall of 2000 and will continue	- 5/2/01 Final Reclassification of PCB and PCB-contaminated Electrical Equipment rule becomes effective - USEPA finalizes a rule on Return of PCB Waste from U.S. Territories Outside the Customs Territory of the U.S. The rule clarifies that PCB waste in U.S. territories and possessions outside the customs territory of the U.S. may be moved to the customs territory of the U.S. for proper disposal at approved facilities. - EC updates National PCB In-Service Inventory from survey of registered owners and prepares fact sheet - EC's regulatory amendment process proposes the strengthening of federal regulations regarding PCB management	- 42 electrical utilities submit voluntary reduction commitment letters to Environment Canada - Algoma voluntarily commits to eliminate 71,103 kgs (44,400 litres) of PCBs by Dec. 2005 - Approximately 27 school boards and sensitive sites respond to PCB commitment letters; 18 of those companies reported that all PCBs were eliminated from their inventories; 3 reported that all high-level PCBs were eliminated from their inventories - Amended Canadian PCB regulations are expected to be published in the Canada Gazette I and II in 2003. These regulations will target phase-out of high-level PCB use by 2007, low-level PCB use by 2014, and prohibit storage after 2009.

	YEAR			
	1999 and earlier	2000	2001	2002
Dioxins/Furans				
GLBTS Workgroup Activities	- 3/23/98 WG is formed at the first implementation meeting - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 6/1/99 WG Conference call: sources discussions - 7/7/99 WG Conference call: sources discussions - 9/7/99 WG Conference call: developing a decision tree source prioritization process - 10/5/99 WG Conference call: finishing development of a decision tree process - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - 12/7/99 WG Conference call: application of the decision tree process	- 1/11/00 WG Conference call: continuing the decision tree process - 2/1/00 WG Conference call; decision made to initiate a Burn Barrel Subgroup - 3/7/00 WG Conference call: continuing the decision tree process - 4/4/00 WG Conference call: continuing the decision tree process - 4/4/00 Burn Barrel Subgroup has inaugural teleconference - 4/25/00 Burn Barrel Subgroup teleconference: strategy matrix discussed - 5/2/00 WG Conference call: continuing the decision tree process - 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario > decision tree process is completed - 7/11/00 WG Conference call: developing reduction projects for high priority sectors - 8/1/00 Burn Barrel Subgroup teleconference: discussion Terms of Reference; link to Lake Superior LaMP - 9/12/00 WG Conference call: developing reduction projects - 9/12/00 Burn Barrel Subgroup teleconference: discussion of Chisago County "Buyback" program; discussion of survey questions regarding state/local regulatory frameworks, and garbage quantity/quality questions. - 11/14/00 Burn Barrel Subgroup teleconference: outline of a strategy document prepared.	- The WG continues to collect information regarding emissions from steel manufacturing, landfill fires, and incinerator ash management - 1/16/01 Burn Barrel Subgroup teleconference: Burn Barrel Strategy - 2/6/01 WG Conference call - 2/13/01 Burn Barrel Subgroup teleconference: Review presentation for Integration Workgroup - 3/13/01 Burn Barrel Subgroup teleconference: Status of efforts to prepare regulatory profile - 4/10/01 Burn Barrel Subgroup teleconference: Proposal for USEPA funding of subgroup activities - 5/8/01 Burn Barrel Subgroup teleconference: Review Strategy/ Implementation Plan document - 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto: WG approves Burn Barrel Strategy/ Implementation Plan document; Canadian and US presentations on wood preservation - 6/12/01 Burn Barrel Subgroup teleconference: Implementation activities for Summer/Fall - 6/22/01 Burn Barrel Subgroup receives $55k of USEPA PBT funding - 10/9/01 Burn Barrel Subgroup teleconference: Regional Lake Superior campaign - 11/6/01 Burn Barrel Subgroup teleconference: Sharing information	- 2/12/02 Burn Barrel Subgroup teleconference: webpage initiation, bylaws/ordinance discussion. - 3/19/02 Burn Barrel Subgroup teleconference: webpage & list serve development, outreach updates - 4/5/02 Lake Superior Region workshop on household garbage burning issue – Thunder Bay, ON - 4/16/02 Burn Barrel Subgroup teleconference: webpage & list serve development - 4/24/02 WG Conference call: discussing ash management - 5/14/02 Burn Barrel Subgroup teleconference: finalize webpage, prepare for Windsor GLBTS meeting - 5/30/02 WG meeting at the GLBTS Stakeholder Forum in Windsor: demonstration of newly launched subgroup website "Trash and Open Burning in the Great Lakes". The WG meeting was held jointly with the HCB/B(a)P WG due to common issues that are of interest to both workgroups. - 6/18/02 Burn Barrel Subgroup teleconference: Planned activities for summer, addressing "burners" for sale; purchase website domain name www.openburning.org - 7/24/02 WG Conference call: discussing the treated wood issue - 9/10/02 Burn Barrel Subgroup teleconference: Updates on activities in various jurisdictions

	YEAR			
	1999 and earlier	2000	2001	2002
GLBTS Workgroup Activities		- 11/00 Discussion papers on Landfill Fire and Incinerator Ash Management prepared for Workgroup review.	- 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - 12/18/01 Burn Barrel Subgroup teleconference: Sharing information	- 11/13/02 WG Conference call: discussing a pilot project on the treated wood issue
GLBTS Reports		- 5/26/00 GLBTS draft Step 1&2 *Sources and Regulations* report is prepared - 8/18/00 An addendum to the GLBTS Draft *Sources and Regulations* report is prepared to addressed the newly released U.S. Dioxin Reassessment and the draft report is posted (9/29/00) on the GLBTS web - Final GLBTS Step 3 *Reduction Options* report is prepared (9/27/00) and the report is posted (9/29/00) on the GLBTS web page		
Other Related Activities	- WLSSD begins multimedia zero discharge pilot / focus on dioxins - Two Ontario utilities eliminate use of PCP in treated poles	- 1/00 WLSSD report on open barrel burning practices is released - 2/00 Wood stove changeover pilot programs in Traverse City, MI, and Green Bay, WI - 6/12/00 draft chapters of the *U.S. Dioxin Reassessment* for external scientific review are released - 9/28/00 Three draft chapters of the *U.S. Dioxin Reassessment* for SAB review are released	- February 2001, Release of "National Inventory of Releases of Dioxins and Furans, Updated Edition", by EC - May 2001, Release of report "Characterization of Organic Compounds from Selected Residential Wood Stoves and Fuels" by EC	- PCP re-registration review proceeding as joint Canada/U.S. endeavor

	YEAR			
	1999 and earlier	2000	2001	2002
Pesticides				
GLBTS Workgroup Activities and Reports	- 3/23/98 WG is formed at the first implementation meeting - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 12/31/98 Draft GLBTS Challenge report for the Level 1 pesticides is posted on the GLBTS web page - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois	- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - GLBTS U.S. Pesticides Challenge Report: *The Level 1 Pesticides in the Binational Strategy* is finalized (3/1/00) and posted (9/29/00) - 05/00 EC announces that with the cooperation of PMRA they have reevaluated their position on Level I pesticides and that based on all available information have met the Level I challenge.	- WG reviews pollution prevention opportunities for Level II pesticides (endrin, heptachlor, lindane and HCH, tributyl tin, and pentachlorophenol) and begins preparing report	
Other Related Activities	- 10/96 EC prepares report: *Canada-Ontario Agreement Objective 2.1: Priority Pesticides Confirmation of No Production, Use, or Import in the Commercial Sector in Ontario* - USEPA funding to four existing Clean Sweep programs for pilot data collection efforts for Level 1 pesticides	- Draft National Action Plan for Level 1 Pesticides under the U.S. National PBT Initiative completed and released for review and public comment - PBT Pesticides Workgroup reviewing toxaphene remediation in Brunswick, GA - Level 1PBT pesticides (except mirex) are regularly collected by ongoing Clean Sweep programs - Phase out of the Level 2 Pesticides lindane and tributyl tin compounds are the subject of bi-national negotiations through Pesticide Regulatory Agencies in the U.S. and Canada	- Waste pesticide collections (Clean Sweeps) continue - 10/5/01 Members of the world's primary maritime organization, the International Maritime Organization, adopt the International Convention on the Control of Harmful Anti-fouling Systems on Ships. The agreement calls for a global prohibition on the application of organotin compounds by January 1, 2003, and a complete prohibition by January 1, 2008.	- PCP re-registration review proceeding as joint Canada/U.S. endeavor

YEAR				
	1999 and earlier	2000	2001	2002
Hexachlorobenzene (HCB) / Benzo(a)pyrene (B(a)P)				
GLBTS Workgroup Activities and Reports	- 3/23/98 WG is formed at the first implementation meeting - 9/98 & 10/98 Discussions are held with the pesticide manufacturing, chlorinated solvent manufacturing, and petroleum refinery industries regarding their emission levels, and to determine any success stories, pollution prevention opportunities, and other planned or possible emission reduction actions - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - 11/99 Draft GLBTS Step 1&2 *Sources and Regulations* Reports for B(a)P and HCB are posted on the GLBTS web page	- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - Discussions held with the U.S. Scrap Tire Management Council and scrap tire managers in the Midwest - 6/15/00 Final drafts GLBTS Step 3 *Reduction Options* reports for B(a)P and HCB are prepared - 7/12/00 Final drafts GLBTS Step 3 *Reduction Options* reports for B(a)P and HCB are posted on the GLBTS web page - 9/21/00 WG conference call is held - 10/00 draft Canadian Steps 1& 2 reports for HCB and B(a)P (PAHs) circulated to stakeholders and Workgroup members for comments	- 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto - 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - Canada implements Strategic Options Processes with steel mills and wood preservers - Algoma Steel signs an Environmental Management Agreement with EC and MOE to address environmental priorities - A Wood-stove Changeout Program is held in Georgian Bay, Ontario, in conjunction with the Hearth Products Association of Canada	- 5/30/02 WG meeting at the GLBTS Stakeholder Forum in Windsor, Ontario - Wood stove change-out outreach material in development, a web-site may be developed to promote change-outs and share information with stakeholders - Petroleum refinery B(a)P emissions analysis completed - Preparation of incentives for scrap tire pile recycling begins - Status and potential for reduction of newly inventoried primary aluminum B(a)P emissions determined - Work with CGLI and pesticide industry continues to determine pesticide HCB contaminant levels - Success stories of reductions in HCB TRI releases from the chemical industry are identified - Outreach activities (e.g., web-site development, preparation of consumer information sheets) are conducted to increase public awareness of environmental impacts, safe handling, and applications of used treated wood - WG seeks to improve linkages and integration of release information and environmental data on persistent toxics - WG works to fill release data gaps, resolve questions about company NPRI release estimates for Level 1 substances, and develop reduction projects with stakeholders - 12/3/02 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois

	YEAR			
	1999 and earlier	2000	2001	2002
Other Related Activities	- Dow Chemical Company commits to HCB reductions - Two Ontario utilities eliminate use of PCP in treated poles - U.S. chlorothalonil manufacturer reduces HCB content through process improvements - 10/99 Draft Report, *Global HCB Emissions* (Robert Bailey, 1999), is distributed to the WG - 01/99 wood stove changeover pilot program for Eastern Ontario	- 1/00 WLSSD report on open barrel burning practices is released - 2/00 Wood stove changeover pilot programs in Traverse City, MI, and Green Bay, WI - PBT workgroups continue to work on draft National Action Plans for HCB and B(a)P - 5/5/00 Robert Bailey prepares report, *HCB Concentration Trends in the Great Lakes*, for the WG	- 2/01-4/01The Hearth Products Association expands the Great Lakes Great Stove Changeout to 12 States - 6/01 USEPA issues an administrative order requiring Magnesium Corporation of America (Rowley, UT) to ensure proper handling, containment, and disposal of anode dust found to contain high levels of HCB (>12,000 ppm), as well as dioxins, PCBs, and chromium	- Source release information to improve inventories collected through voluntary stack testing - An emission testing program for wood burning in fireplaces, woodstoves, and pellet stoves developed and implemented with partners to fill information gaps - PCP re-registration review proceeding as joint Canada/U.S. endeavor

	YEAR			
	1999 and earlier	2000	2001	2002
Alkyl-lead				
GLBTS Workgroup Activities and Reports	- 3/23/98 WG is formed at the first implementation meeting - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 12/31/98 Draft GLBTS Challenge report for alkyl-lead is posted on the GLBTS web page - 1/99 EC prepares *Alkyl Lead Inventory Study - Sources, Uses and Releases in Ontario, Canada: A Preliminary Review*, and posts report on the GLBTS web page. The report concludes that the Canadian challenge of reducing alkyl-lead use by 90 percent between 1988 and 2000 has been exceeded. - 9/8/99 GLBTS and PBT workgroups meet with National Motor Sports Council to discuss voluntary phase-out of leaded gasoline - 10/29/99 draft GLBTS *Sources, Regulations and Options* (Steps 1, 2 & 3) Report for Alkyl-Lead is posted on the GLBTS web page	- GLBTS *Sources, Regulations, and Reduction Options* (Step 1, 2 & 3) report for alkyl-lead is finalized (6/00) and posted (9/29/00) on the GLBTS web page - GLBTS U.S. Challenge on Alkyl-lead: *Report on the Use of Alkyl-lead in Automotive Gasoline* is finalized (6/00) and posted (9/29/00) on the GLBTS web page	- The U.S. meets the challenge of confirming no use of alkyl-lead in automotive gasoline. The USEPA PBT Program takes the lead for the U.S. in coordinating stakeholder efforts to reduce remaining alkyl-lead releases	
Other Related Activities	- Work begins on a draft National PBT Action Plan for Alkyl-lead	- 8/25/00 A Draft PBT National Action Plans for alkyl-lead is posted on the PBT web page for public review and comment - Auto racing industry expresses interest in working with USEPA to find lead-free gas substitutes	- USEPA begins working with NASCAR to permanently remove alkyl-lead from racing fuels used, specifically, in the Busch, Winston Cup, and Craftsman Truck Series	-7/23/02 Final PBT National Action Plan for Alkyl-lead published

	YEAR			
	1999 and earlier	2000	2001	2002
Octachlorostyrene (OCS)				
GLBTS Workgroup Activities and Reports	- 3/23/98 WG is formed at the first implementation meeting - 6/16/98 Background Paper and Draft Action Plan for OCS posted on GLBTS web - 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL - 12/31/98 Draft GLBTS Challenge report for OCS is posted on the GLBTS web page - 4/27/99 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 11/18/99 WG meeting at the GLBTS Stakeholder Forum in Chicago, Illinois - Data on OCS trends in fish is assessed by the WG	- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario - 6/30/2000 EC draft report on Octachlorostyrene Sources, Regulations and Programs for the Province of Ontario 1988, 1998, and 2000 forwarded to interested stakeholders - 9/22/00 Draft GLBTS Stage 3 report for OCS is distributed at the 9/22 Integration Workgroup meeting and e-mailed to the OCS Workgroup - 12/00 USEPA and EC convene a meeting of North American magnesium producers to promote sharing of lessons regarding methods for preventing and managing OCS and other chlorinated hydrocarbon wastes		
Other Related Activities	- 3/10/99 CGLI report, *OCS and Suggested Industrial Sources: A Report to the GLBTS Workgroup*, is submitted to the Workgroup	- 8/25/00 A Draft PBT National Action Plan for OCS is posted on the PBT web page for public review and comment		-4/02 TRI data for 2000 is publicly available

	YEAR			
	1999 and earlier	2000	2001	2002
Sediments				
Canadian and U.S. Activities	- 6/15/98 PCB WG requests that the IG develop a strategy on sediments - 6/19/98 Integration WG discusses sediments challenge - USEPA provides guidance to workgroups on how to deal with sediments within chemical-specific workgroups - 1/26/99 Overview and presentation of IJC SedPAC Activities given at Integration WG meeting - 2/99 Integration WG members develop a draft charge for a sediments subgroup - 4/28/99 Draft Sediments subgroup charge presented at Integration WG meeting	- 2/15/00 USEPA and EC present a draft sediment reporting format at the Integration WG meeting. The proposed format will map progress and report annually on sediment remediation in the Great Lakes Basin using 1997 as the baseline year - 5/16/00 At the Stakeholder Forum, USEPA and EC present the draft sediment reporting format and commit to hold a sediment technology workshop	- 4/24/01 USEPA and EC host a two-day workshop on "Removing and Treating Great Lakes Contaminated Sediment," presenting sediment remediation technologies and case studies	- On-going assessments and remediations in both the U.S. and Canada within the Great Lakes watershed (see Section 7.0)
Related Activities	- 11/97 The IJC's Sediment Priority Action Committee (SedPAC) issues draft white paper *Overcoming Obstacles to Sediment Remediation in the Great Lakes Basin* - 12/1-2/98 IJC SedPAC holds "Workshop to Evaluate Data Interpretation Tools Used to Make Sediment Management Decisions" in Windsor, Ontario			- 1/02 The second National Sediment Quality Survey report to Congress, *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey: Second Edition*, is released for review by USEPA

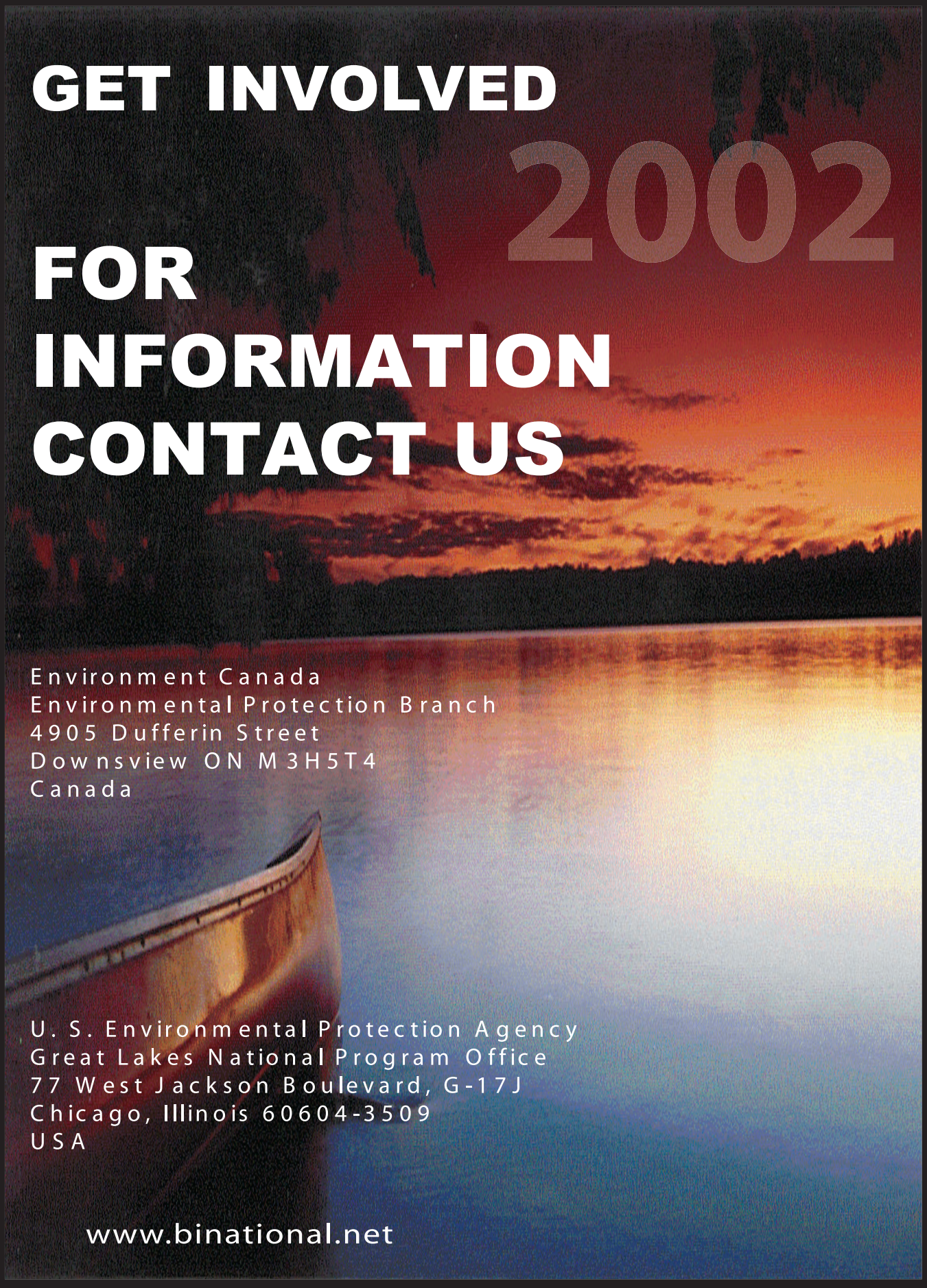
	YEAR			
	1999 and earlier	**2000**	**2001**	**2002**
Long-Range Transport				
Activities	- 11/19/99 EC presents the status of their LRT effort at the Integration WG meeting	- 3/27/00 EC prepares report: *Long-range Transport of Persistent Toxic Substances to the Great Lakes: Review and Assessment of Recent Literature* (Ortech Environmental)	- Several studies are undertaken in the U.S. and Canada to characterize global transport processes.	
General Activities Related to Reductions in GLBTS Substances				
USEPA Regulatory Determinations	- 12/95 MACT rules for large MWC are promulgated - 9/97 MACT rules for MWI are promulgated - 4/15/98 Pulp, Paper, and Paperboard Cluster Rule is promulgated - 6/29/98 Amendments to the PCB Disposal Regulations are finalized - 11/12/98 Federal Plan for MACT Implementation for large MWCs is finalized - 5/28/99 An Advance Notice of Proposed Rulemaking is released for the RCRA LDR for Mercury-Bearing Hazardous Wastes - 7/6/99 Federal Plan for MACT Implementation for MWI is proposed - 8/30/99 MACT for small MWCs are proposed (expected to be final in 2000) - 9/30/99 Final Standards for Hazardous Air Pollutants for HWC are promulgated 10/29/99 TRI Amendments: new PBT reporting thresholds	- 12/00 Compliance deadline for large MWC MACT - 9/02 Compliance deadline for MWI MACT - 1/1/00 New TRI reporting thresholds for PBTs become effective	- USEPA finalizes the Reclassification of PCB and PCB-contaminated Electrical Equipment rule and a rule on Return of PCB Waste from U.S. Territories Outside the Customs Territory of the U.S.	- PCP re-registration review proceeding as joint Canada/U.S. endeavor - 4/02 the first year of data reported under TRI PBT rule become available - 2/14/02 President Bush announces Clear Skies Initiative to cut mercury emissions from power plants by 70 percent

	YEAR			
	1999 and earlier	**2000**	**2001**	**2002**
USEPA Activities	- 6/97 *Deposition of Air Pollutants to the Great Waters: Second Report to Congress* is released - 12/97 *Mercury Report to Congress* is released - 4/98 *Final Emission Inventory Data for Section 112(c)(6) Pollutants* is released - 11/16/98 USEPA's Multimedia PBT Strategy is announced - 11/16/98 Under the PBT Strategy, a draft National Action Plan for Mercury is released - PBT Strategy grant awarded to WLSSD to work on reducing open trash burning - U.S. PCB transformer registration database is updated - Sample collection begins for the National Study of Chemical Residues in Fish - U.S. GLBTS workgroup leaders participate in development of Draft National Action Plans of part of PBT Strategy	- 6/00 *Deposition of Air Pollutants to the Great Waters: Third Report to Congress* is released - 6/12/00 draft chapters of the *U.S. Dioxin Reassessment* for external scientific review are released - 9/00 USEPA's 1996 National Toxics Inventory is released - 9/28/00 Three draft chapters of the *U.S. Dioxin Reassessment* for SAB review are released - PBT workgroups continue to work on National Action Plans for HCB, B(a)P, the Level 1 pesticides, and PCBs - USEPA's Office of Air and Radiation and Office of Water collaborate on an Air-Water Interface Workplan to address atmospheric deposition of toxics and nitrogen to U.S. water bodies.	- 5/23/01 U.S. signs the United Nation's global treaty on Persistent Organic Pollutants (POPs)	- 1/02 *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey: Second Edition* is released for review - 7/23/02 Final PBT National Action Plan for Alkyl-lead published - Preliminary data from first year of National Study of Chemical Residues in Lake Fish Tissue released
EC Regulatory Determinations	- Canadian Environmental Protection Act is renewed	- Canada Wide Standards (release limits) are developed for mercury, particulate matter, ozone, and benzene, and are being developed for dioxins/furans. - Canadian SOPs are under development for the Iron and Steel Manufacturing sector and finalized for the Wood Preservation sector - 6/19/00 EC solicits public comments on proposed amendments to the PCB regulations under CEPA	- 2/19/01 Canada announces $120.2 million in new regulatory and other measures to accelerate action on clean air - 7/7/01 A notice with respect to Polychlorinated Biphenyls in Automotive Shredder Residue is published in the Gazette, Part I, for automobile shredding facilities that generated PCB-contaminated residue during 1998, 1999, or 2000. - EC proposes amendments to the Chlorobiphenyl Regulations and Storage of PCB Material Regulations promulgated in 1977 and 1992, respectively - Canada's PCB Waste Export Regulations (SOR/97-108) are being amended	

	YEAR			
	1999 and earlier	2000	2001	2002
EC Activities	- Ontario "Drive Clean" program - 1/99 The Canadian *Dioxins and Furans and Hexachlorobenzene Inventory of Releases* is finalized. - EC upgrades and digitizes its National PCB database	- Draft HCB, B(a)P (PAH), and OCS release inventories for Ontario are updated and circulated for review - EMA with Algoma Steel being finalized. - EC, in coordination with the Hearth Products Association, conducts testing of conventional and USEPA-certified wood stoves to investigate releases of dioxins/furans, PAHs, HCB, and particulate matter		
Other Activities	- CEC issues Continental Pollutant Pathways Initiative - 7/98 UNEP POPs Negotiations initiated - Under the GLWQA, The Lake Ontario Lamp Stage 1 report is released - By the end of 1999, emission control retrofits either completed or underway at all large MWC in the U.S. - The initial Great Lakes Regional Air Toxics Emissions Inventory, using 1993 data, is released - The Lake Ontario Lamp Update 1999 is released	- Under the GLWQA, Canada and the U.S. work on restoring beneficial uses to 43 AOCs in the Great Lakes Basin through the RAP program - The Lake Erie, Lake Michigan, and Lakes Superior LaMPs 2000 are released - The Lake Ontario Lamp Update 2000 is released - The Lake Huron Initiative Action Plan is released - Numerous pilot projects and pollution prevention/reduction agreements relevant to toxics of concern are underway with the steel, automobile, and other manufacturing industries and utilities in Ontario and the U.S. Great Lakes States - 11/8-9/00 Atmospheric deposition workshop held, *Using Models to Develop Air Toxics Reduction Strategies* - 12/00 Final POPs negotiations - The 1996 Great Lakes Inventory of Toxic Air Emissions is prepared by the Great Lakes Commission	- 2/01 21st session of the UNEP Governing Council is held: UNEP will undertake a global study on the health and environmental impacts of mercury - 8/22/01 The IJC issues a Review of Progress under the Canada-United States Great Lakes Binational Toxics Strategy - Monitoring of air deposition of toxic pollutants in the Great Lakes Basin under IADN	- Monitoring of air deposition of toxic pollutants in the Great Lakes Basin continues under IADN

Abbreviations

AHA	American Hospital Association
AOC:	Area of Concern
B(a)P:	Benzo(a)pyrene
CAMNet:	Canadian Atmospheric Mercury Measurement Network
CDD:	Chlorinated dibenzo-p-dioxin
CDF:	Chlorinated dibenzo-p-furan
CEPA:	Canadian Environmental Protection Act
CGLI:	Council of Great Lakes Industries
COA:	Canada-Ontario Agreement
CWS:	Canadian Wildlife Service
DNR:	Department of Natural Resources
EC:	Environment Canada
GLBTS:	Great Lakes Binational Toxics Strategy
GLNPO:	Great Lakes National Program Office
GLWQA:	Great Lakes Water Quality Agreement
HCB:	Hexachlorobenzene
Hg:	Mercury
HWC:	Hazardous Waste Combustors
IADN:	Integrated Atmospheric Deposition Network
IDEM:	Indiana Department of Environmental Management
IJC:	International Joint Commission
LaMPs:	Lakewide Management Plans
LDR:	Land Disposal Restrictions
MDN:	Mercury Deposition Network
MOU:	Memorandum of Understanding
MWC:	Municipal Waste Combustors
MWI:	Medical Waste Incinerators
NAPS:	National Air Pollution Surveillance Network
NDAMN:	National Dioxin Air Monitoring Network
NORA:	National Oil Recycler's Association
NPDES:	National Pollutant Discharge Elimination System
NPRI:	National Pollutant Release Inventory (Canada)
OCS:	Octachlorostyrene
MOE:	Ontario Ministry of the Environment
P2:	Pollution Prevention
PAH:	Polycyclic Aromatic Hydrocarbon
PCBs:	Polychlorinated Biphenyls
POPs:	Persistent Organic Pollutants
RAPs:	Remedial Action Plans
RCRA:	Resource Conservation and Recovery Act
SAB:	Science Advisory Board
SOP:	Strategic Options Process
TRI:	Toxics Release Inventory (U.S.)
UNEP:	United Nations Environment Programme
USEPA:	United States Environmental Protection Agency
WDNR:	Wisconsin Department of Natural Resources
WG:	Workgroup
WLSSD:	Western Lake Superior Sanitary District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