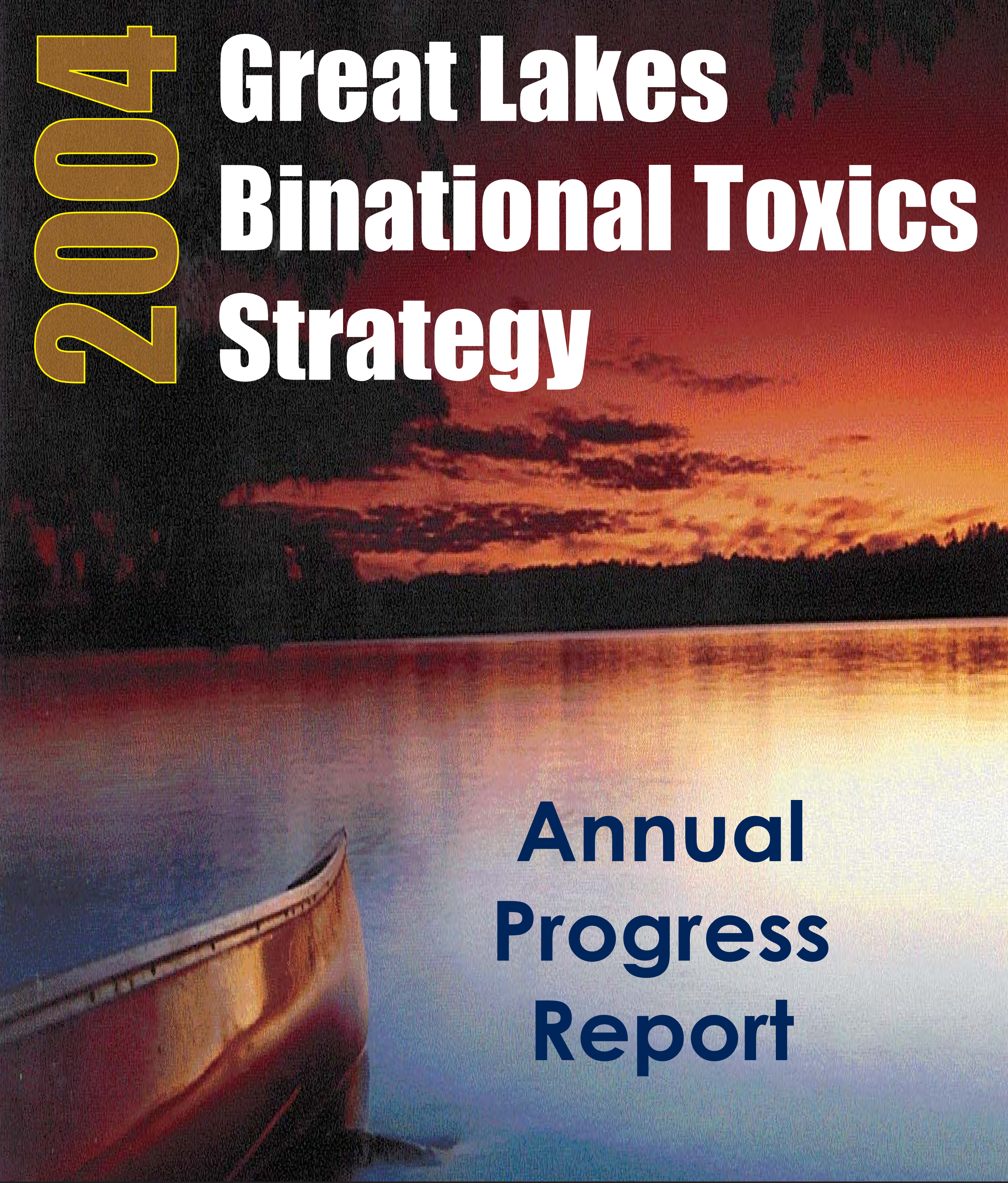
2004 Great Lakes Binational Toxics Strategy



Annual Progress Report

EPA

Canada

Great Lakes Binational Toxics Strategy

2004 Progress Report

Common Spiderwort
Photograph courtesy of the USEPA

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Acronyms

ADA	American Dental Association
AHA	American Hospital Association
AMRC	Association of Municipal Recycling Coordinators
AoC	Area of Concern
B(a)P	Benzo(a)pyrene
BFRs	Brominated Flame Retardants
BMPs	Best Management Practices
CAMNet	Canadian Atmospheric Mercury Measurement Network
CDD	Chlorinated dibenzo-p-dioxin
CDF	Chlorinated dibenzo-p-furan
CEPA	Canadian Environmental Protection Act, 1999
CGLI	Council of Great Lakes Industries
COA	Canada-Ontario Agreement
CWS	Canada-Wide Standards
DFO	Department of Fisheries and Oceans
DNAPL	Dense Non-Aqueous Phase Liquid
DNR	Department of Natural Resources
EC	Environment Canada
GLBTS	Great Lakes Binational Toxics Strategy
GLLFAS	Great Lakes Laboratory for Fisheries and Aquatic Sciences
GLNPO	Great Lakes National Program Office
GLWQA	Great Lakes Water Quality Agreement
HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
Hg	Mercury
HVAC	Heating, Ventilation, and Air-Conditioning
HWC	Hazardous Waste Combustors
HZE	Hospitals for a Healthy Environment
IADN	Integrated Atmospheric Deposition Network
IDEM	Indiana Department of Environmental Management
IJC	International Joint Commission
ISO	International Standards Organization
LaMPs	Lakewide Management Plans
LDR	Land Disposal Restrictions
MACT	Maximum Available Control Technology
MDEQ	Michigan Department of Environmental Quality
MDN	Mercury Deposition Network
MOE	Ministry of the Environment (Ontario)
MOU	Memorandum of Understanding
MPCA	Minnesota Pollution Control Agency
MWC	Municipal Waste Combustors MWI Medical Waste Incinerators
NAPS	National Air Pollution Surveillance Network
NDAMN	National Dioxin Air Monitoring Network
NDAP	National Atmospheric Deposition Program
NEMA	National Electrical Manufacturers Association
NORA	National Oil Recycler's Association
NPDES	National Pollutant Discharge Elimination System
NPRI	National Pollutant Release Inventory (Canada)
OCS	Octachlorostyrene
OME	Ontario Ministry of the Environment
OSPPERA	Ohio Spill Planning, Prevention, and Emergency Response Association
OTS	Ontario Tire Stewardship
P2	Pollution Prevention
PAH	Polycyclic Aromatic Hydrocarbon
PBDEs	Polychlorinated Brominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PFOS	Perfluorooctanesulfonate
PM	Particulate Matter
POPs	Persistent Organic Pollutants
POTW	Publicly Owned Treatment Works
PVOC	Polar Volatile Organic Compound
RAPs	Remedial Action Plans
RCRA	Resource Conservation and Recovery Act
SAB	Science Advisory Board
SOLEC	State of the Lakes Ecosystem Conference
SOP	Strategic Options Process
SVOC	Semi-Volatile Organic Compound
TEQ	Toxic Equivalent
TGM	Total Gaseous Mercury
TSMP	Toxic Substances Management Policy
TRC	Thermostat Recycling Corporation
TSCA	Toxic Substances Control Act
TRI	Toxics Release Inventory (U.S.)

UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
USWAG	Utility Solid Waste Management Group
VOC	Volatile Organic Compound
WDNR	Wisconsin Department of Natural Resources
WDO	Waste Diversion Ontario
WETT	Wood Energy Technology Transfer, Inc.
WG	Workgroup
WLSSD	Western Lake Superior Sanitary District

Bull Moose
Superior National Forest
Photo courtesy of USDA Forest Service

NOTES

INTRODUCTION

The Great Lakes Binational Toxics Strategy: *A Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances*[1] (GLBTS) was conceived in response to the International Joint Commission's (IJC) *1994 Seventh Biennial Report on Great Lakes Water Quality*. The IJC, an independent body of governmentally appointed commissioners with the responsibility to assist and evaluate U.S. and Canadian efforts under the Great Lakes Water Quality Agreement (GLWQA), called upon the two 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." Signed in 1997, the GLBTS is an agreement between Canada and the United States to virtually eliminate persistent toxic substances from the Great Lakes environment.

Environment Canada (EC), the United States Environmental Protection Agency (USEPA), and stakeholders from industry, academia, state/provincial and local governments, Tribes, First Nations, and environmental and community groups have worked together toward the achievement of the Strategy's challenge goals of preserving and protecting an invaluable ecosystem, which comprises over 20 percent of all fresh surface water world-wide and over 80 percent in North America.

This past year saw the continued use and emissions reductions of key Level 1 persistent toxic substances under the auspices of the GLBTS. Of the seventeen reduction goals set forth for the twelve Level 1 persistent toxic substances in April 1997, ten have been met, three will be met by the target timeline date of 2006, and the remaining four will be well advanced toward meeting their targets by 2006[2].

ABOUT THIS REPORT

This report represents a comprehensive summary of activities and accomplishments under the GLBTS for the year 2004. Chapters 1-4 present highlights of the active Substance Workgroups for mercury, PCBs, dioxins/furans, and HCB/B(a)P 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. Chapter 5 provides a synopsis of the three Integration Workgroup meetings and the two semi-annual Stakeholder forums, including a summary of presentations, policy discussions and key decisions. Chapter 6 details the 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 7 presents a synopsis of the work being done in the field of Long Range Transport.

Chapter 8 reprises the 2002 annual report of a number of the environmental indicators of progress used by the GLBTS and their associated monitoring programs. Additionally, the activities normally listed under the chapter titled Partners at Work, found in previous annual reports, have been separated by substance and are now integrated into the appropriate substance chapters. A summary of highlights in each chapter is provided below.

Mercury

The US has met its national mercury use reduction goal of 50 percent, and currently stands at over 50 percent (1990 baseline). Progress toward the national mercury emissions reduction goal of 50 percent (1995 baseline) currently stands at 45 percent and should be met by 2006. Canadian progress towards a 90 percent (1988 baseline) reduction of releases into the Great Lakes basin is well advanced and currently stands at 83 percent.

PCBs

As of April 2004, Canada reported that 88 percent of high-level PCB waste had been destroyed versus a reduction target of 90 percent. This is up from 40 percent in spring 1998 when the work of the GLBTS commenced. The US EPA is currently compiling PCB disposal information for 2003. According to annual reports submitted to the US EPA by PCB disposers about 87,000 PCB transformers and 143,000 PCB capacitors were disposed of between the 1994 baseline and the end of 2002. While this represents reductions of 43.5 percent and 10 percent respectively, there are indications that the disposal rates are actually much higher.

[1] GLTBS Level 1 substances are mercury, polychlorinated biphenyls (PCB), dioxins/furans, hexachlorobenzene (HCB), benzo (a) pyrene (B(a)P), octachlorostyrene (OCS), alkyl-lead, aldrin, dieldrin, mirex, chlordane, toxaphene, and DDT. These are linked to/or have the potential to cause detrimental 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 will phase out their use, generation or release in a cost-effective manner.

[2] Please see Appendix B for a list of reduction goal targets and current status.

Dioxins/Furans

The US and Canada have made significant progress towards reaching their respective emission reduction goals of 75 percent and 90 percent. The US projects a 92 percent reduction in nation-wide releases of dioxins and furans by the end of 2004, and Canada, which currently stands at 84 percent, expects to meet its target by 2005, consistent with its commitment under the Canada-Ontario Agreement with Respect to the Great Lakes Basin Ecosystem.

HCB/B(a)P

Canadian reductions in HCB and B(a)P emissions are well advanced at 62 percent and 45 percent respectively against a 90 percent challenge goal (1988 baseline). US emissions reductions are also well advanced against unspecified reduction goals, with a 52 percent overall reduction in HCB releases and a 74 percent reduction in B(a)P releases.

Integration Workgroup Meetings/ Stakeholder Forums

The Integration Workgroup met three times in 2004: twice in Toronto (June 18th and October 7th), and once in Chicago (December 1st). The Workgroup focused its activities this year on the implementation of the General Framework to Assess Management of GLBTS Level 1 Substances. Draft assessment reports were presented on OCS and Dioxin/Furans at the October 7th meeting as pilots for the application of the General Framework. A full management assessment review of all Level 1 substances will be conducted in 2005 to evaluate and recommend next steps for the GLBTS.

The two Stakeholder Forums held this year were highlighted by keynote addresses from Robert Telewiak, Vice President of Environment, Health and Safety at Noranda, Inc., on environmental performance at Noranda/ Falconbridge; and, from Dr. Dan Meyer of the American Dental Association on Best Management Practices for dental amalgam.

Sediment Challenge

In Chapter 6, an update is provided on the efforts of the US EPA and EC to remediate contaminated sediments from the Great Lakes basin. In the US, over 975,000 cubic yards of sediment were remediated in 2003 from eight sites around the Great Lakes, and since 1997, more than 3.4 million cubic yards of sediments have been remediated. In 2004, the US EPA also conducted integrated sediment assessment surveys at eight sites around the Great Lakes. In Canada, 9,800 cubic metres of sediment contaminated with GLBTS Level 1 substances such as mercury, HCB and OCS was remediated by Dow Chemical Canada Inc, from the St. Clair River adjacent to its industrial plant site in Sarnia, Ontario. This is in addition to continued work on the assessment of mercury accumulation at sites in the St. Lawrence River (near Cornwall), Thunder Bay and the Peninsula Harbour.

Long Range Transport Challenge

Chapter 7 provides an update on the work being done in Canada and the US to improve the understanding of the atmospheric science of toxic pollutant transport. Described within this chapter are the activities being undertaken to improve the Global/Regional Atmospheric Heavy Metals Model (GRAHM), as well as a summation of the research being done in the area of Progresses in Numerical Investigations of Long-range Transport of Toxaphene Emitted from the United States Soils to the Great Lakes Basin (J. Ma, Air Quality Research Branch, Meteorological Service of Canada, EC).

Environmental Indicators of Progress

The work of the GLBTS towards the virtual elimination of persistent toxic substances in the Great Lakes has long been supported by the works of the Great Lakes monitoring community. Chapter 8 presents data for environmental levels in the Great Lakes basin of GLBTS Level 1 and 2 substances in air and sediments, and in indicator species such as the Rainbow Trout, the Walleye, Lake Trout and Herring Gull eggs.

Looking Ahead

This year, 2005 presents interesting opportunities and challenges for the GLBTS. With a full review of the GLBTS Level 1 substances to be completed by 2005, and with a clearer understanding of the effectiveness of the GLBTS as a beyond compliance voluntary multi-partnership effort for the virtual elimination of Level 1 substances in the Great Lakes, the parties to the Strategy are looking forward to the next phase of the Strategy beyond 2006.

Chemicals of emerging concern continue to play a growing role in the development of environmental policy on both sides of the Great Lakes. Many of these contaminants have been in use for decades, such as brominated flame retardants (BFRs) and polychlorinated brominated diphenyl ethers (PBDEs), but evidence of build up in environmental media and biota, and potentially toxic effects have only come to light in the past few years.

The United States and Canada are currently planning to conduct a comprehensive review of the Great Lakes Water Quality Agreement (GLWQA). The ongoing success of the GLBTS as a beyond compliance voluntary multi-partnership effort, and the specter of new challenges on the horizon may present an opportunity for a new role under a revised GLWQA.

The continued success of the GLBTS will depend, in large part, on the continued commitment, diligence and creativity of all concerned. Working with our stakeholders and with national and international fora, the United States and Canada look forward to continuing the mission of the GLBTS well into the future.

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 45 percent between 1990 and 1999, according to the most recent estimates from the National Emissions Inventory. This inventory includes an estimate of 11.5 tons of mercury emissions from gold mining operations in the western United States, but no estimate for this category in 1990. Therefore, these figures underestimate the amount of mercury reduction that has occurred between 1990 and 1999. If an estimate of gold mining emissions is included in the 1990 inventory, the estimated reduction in U.S. mercury emissions between 1990 and 1999 is 47 percent (see Figure 1-1).

It is likely that some additional reductions have occurred since 1999, particularly in emissions from municipal waste combustors and medical waste incinerators. Significant reductions in emissions from these sectors had already taken place by 1999, but compliance with emissions regulations for these categories was not required until after 1999.

Although it is clear that mercury use has decreased since 1995, the trend is difficult to quantify because the U.S. Geological Survey (USGS) stopped reporting estimated U.S. mercury consumption after 1997. However, on the basis of data reported by the chlor-alkali industry and the lamp industry, it appears that mercury use declined more than 50 percent between 1995 and 2003, assuming that mercury use has remained constant since 1997 (see Figure 1-2). The chlor-alkali industry accounted for an estimated 35 percent of mercury use in 1995, and its total mercury use decreased 76 percent between 1995 and 2003 (including the impact of plant closures). The fluorescent lamp industry has reported that mercury use in 2003 was 6 tons, compared with 32 tons estimated by the USGS for 1997. These reductions are the result of reductions in the mercury content of lamps sold in the United States, as well as an increase in lamp imports and a decline in U.S. fluorescent lamp production. Lamp manufacturers use mercury both in lamps themselves and in the production process.

It is likely that mercury use has declined even more than portrayed in Figure 1-2 because mercury use in categories other than chlor-alkali and lamps also has decreased. While these reductions have not been quantified, reductions have been achieved in the use of mercury in measurement and control devices, switches and relays, and dental amalgam. These reductions are not visible in Figure 1-2.

In Canada, mercury releases were reduced by 85 percent between 1988 and 2002. Figure 1-3 illustrates the progress made toward the Canadian 90 percent reduction target. This figure shows that releases in Ontario have been cut

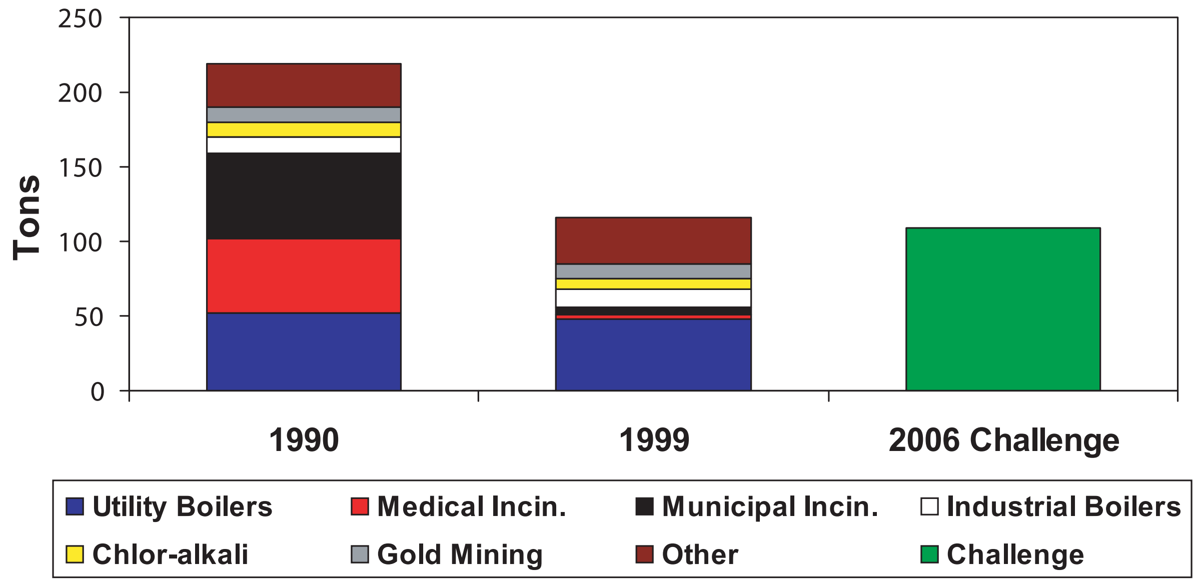


Figure 1-1. U.S. Mercury Emissions: 2006 Challenge, 1990 Baseline.Source: US EPA, Office of Air Quality Planning and Standards

by more than 11,900 kilograms since 1988, based on Environment Canada's 2002 mercury inventory. Figure 1-4 illustrates the 2002 sources of mercury releases in Ontario. This figure shows that the primary sources of releases are electric power generation, iron and steel, municipal (primarily land application of biosolids), cement and lime, and incineration.

Workgroup Activities

Workgroup Meetings

On December 16, 2003, the Mercury Workgroup meeting focused on reducing mercury in lighting, from cradle to grave, with presentations on emerging lighting technology, lamp industry product stewardship, efforts to increase lamp recycling, and studies of mercury releases from drum-top lamp crushing. In addition, the workgroup addressed mercury in dental offices, and efforts to remove mercury switches from autos and appliances.

On June 17, 2004, the Mercury Workgroup meeting focused on better understanding trends of mercury in the environment, with presentations on mercury in atmospheric deposition, water, and biota and on atmospheric mercury modeling. In addition, the workgroup meeting included presentations on:

- the US Defense National Stockpile Center's final environmental impact statement for the U.S. government's mercury stockpile
- a project to manage mercury in devices used at steel mills in Northwest Indiana
- efforts to reduce mercury in dental offices and the energy sector in Ontario
- the potential application of Ontario's Waste Diversion Act to mercury-containing devices.

U.S. Reduction Activities

US EPA Regulates Mercury Air Emissions

US EPA published a proposed regulation of mercury emissions from coal-fired electric utilities. The proposed regulation includes options for a traditional maximum available control technology (MACT) standard and for a mercury cap-and-trade program. A final rulemaking is scheduled for March 2005. The Wisconsin Department of Natural Resources finalized a regulation limiting mercury emissions from the state's power plants. US EPA also published final MACT standards for iron foundries; these standards include work practice standards that prohibit the use of auto scrap unless mercury lighting switches have been removed. Industry compliance with these work practice standards for iron foundries is required beginning in 2005. US EPA also finalized emissions standards for industrial boilers. US EPA is beginning to develop a proposal for regulating mercury emissions from electric arc furnace steel plants. In addition, US EPA has proposed regulation (12/9/04) of very small municipal incinerators and industrial incinerators, which is expected to result in one ton of mercury emissions reduction.

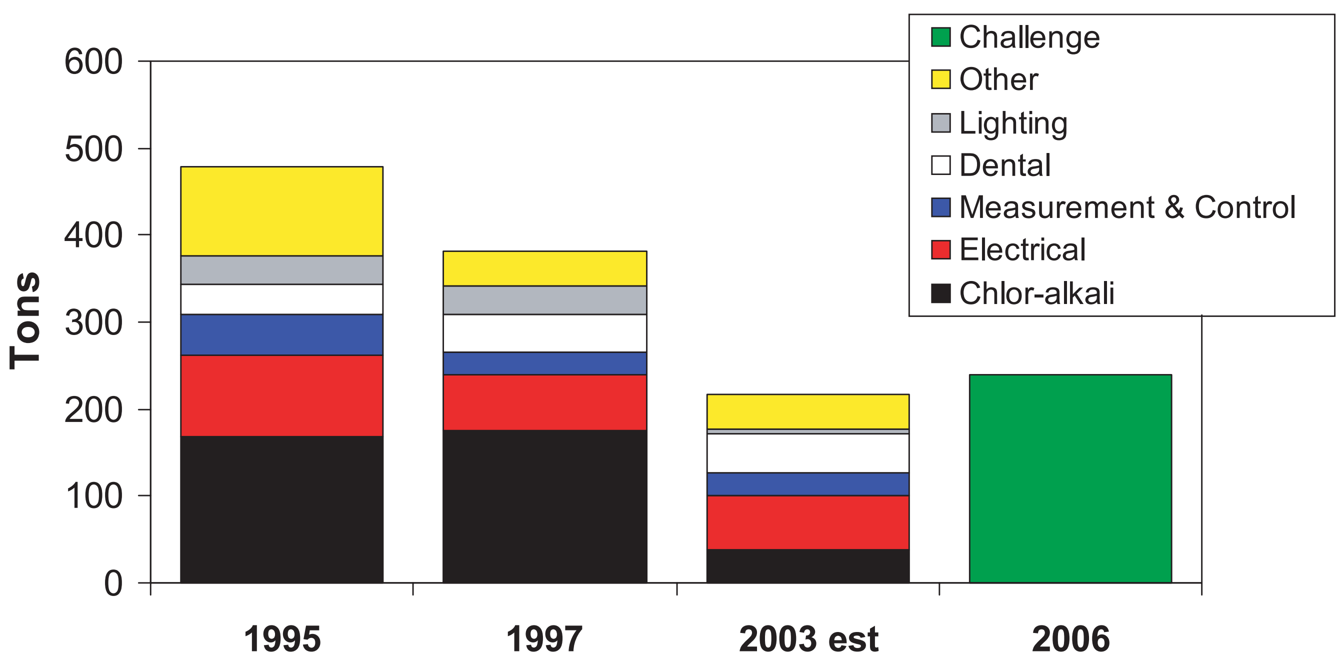


Figure 1-2. U.S. Mercury Use: 2006 Challenge, 1995 Baseline.[3]

[3]Sources: U.S. Geological Survey, Minerals Yearbook, 1996, 1997. Chlorine Institute Annual Report to EPA, 2004. National Electrical Manufacturer's Association, direct communication, 2004.

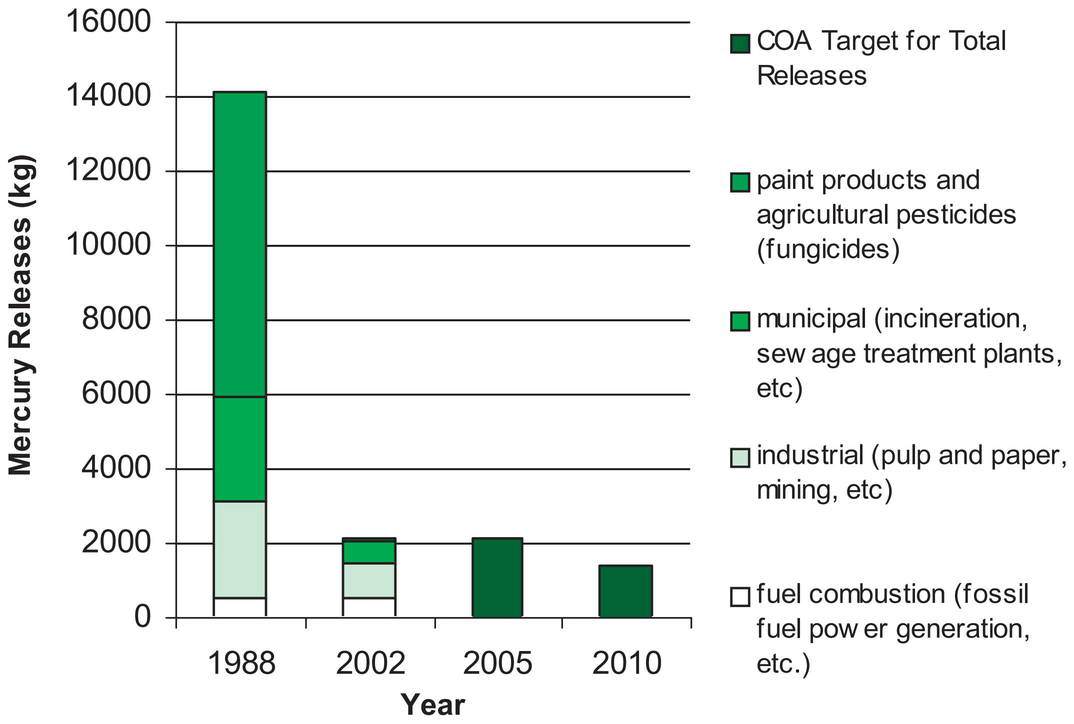


Figure 1-3. Reductions in Mercury Releases in Ontario from 1988 to 2002, by Sector.
Source: Canada-Ontario Agreement 2001

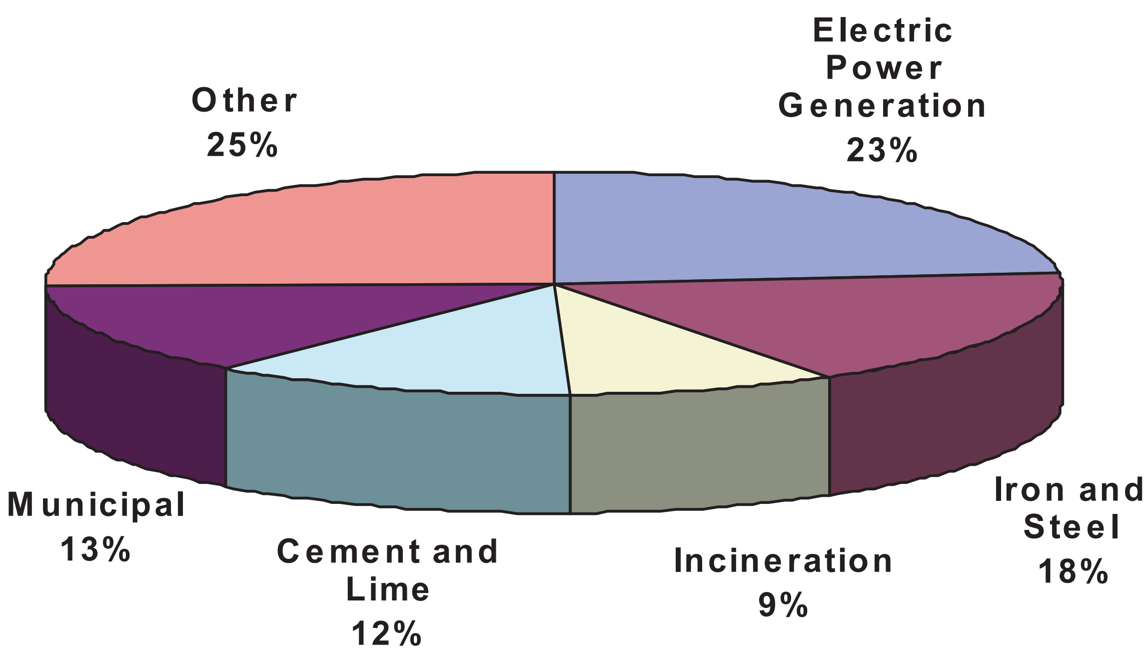


Figure 1-4. Sources of Mercury Releases in Ontario (2002).
Source: Canada-Ontario Agreement 2001

Hospitals for a Healthy Environment Program Enlists New Partners

The Hospitals for a Healthy Environment (H2E), a joint project of the American Hospital Association, Health Care Without Harm, the American Nurses Association, and the US EPA, is a voluntary program with 913 partners representing 3,136 facilities: 949 hospitals, 1,593 clinics, 219 nursing homes, and 375 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. This program is continuing to grow and has enlisted 539 new partners in the last year.

Chlorine Industry Continues Voluntary Mercury Reduction Commitment

The Chlorine Institute released its Seventh Annual Report to EPA, showing a 69 percent capacity-adjusted reduction in mercury consumption by the U.S. chlor-alkali industry between 1995 and 2003, exceeding this sector's commitment to reduce mercury use by 50 percent by 2005. Including shutdowns of mercury cell factories, mercury use has decreased by 76 percent. While the chlor-alkali industry has reduced mercury consumption and purchases significantly since 1995, the Seventh Annual Report shows that there have been small increases in mercury consumption by this industry between 2001 and 2003. Actual mercury purchases by the chlor-alkali industry increased in 2002 and 2003 because of decisions by some factories to increase the amount of mercury in use within the mercury cells, a change which is expected to increase efficiency and reduce mercury consumption.

Efforts to Reduce Mercury in Auto Scrap Continue

Use of mercury-containing switches in automobiles produced for the North American market ceased with the 2003 model year. Several Great Lakes States are implementing programs to remove mercury switches already placed in autos. The Michigan Department of Environmental Quality and the Alliance of Automobile Manufacturers signed a memorandum of understanding under which the auto industry will fund outreach to auto dismantlers as well as the cost of transporting mercury-containing switches to state recycling locations. US EPA has begun a dialogue with various stakeholders, including representatives of the auto and steel industries, in an effort to create a voluntary national program to promote the removal and recycling of auto mercury switches.

Three Northwest Indiana Steel Mills Voluntarily Remove Mercury

Since 1998, three Northwest Indiana steel mills have worked through the Lake Michigan Forum and cooperated with the Indiana Department of Environmental Management (IDEM) to inventory mercury uses/sources within these mills and develop a clean sweep/pollution prevention initiative to inventory, recycle, and substitute to the greatest extent practical mercury at their facilities. The three participating companies are: ISG-Burns Harbor, formerly Bethlehem Steel-Burns Harbor; Mittal Steel, formerly Ispat Inland Inc. Indiana Harbor Works; and U. S. Steel Gary Works. In recognition of their efforts as part of the Northwest Indiana Steel Industry Mercury Pollution Prevention Initiative, Ispat Inland Inc. Indiana Harbor Works received an award at the 2004 State of the Lakes Ecosystem Conference (SOLEC). To date, 3,751 pounds of mercury, or 80 percent of mercury inventoried at the three mills, has been removed. The results of the project are documented in the report, Mercury Agreement Reduction Program, dated January 2004, which is available at http://www.epa.gov/region5/air/mercury/nwindianareport3-17-04.pdf.

Western Lake Superior Sanitary District Effluent Values Approach GLWQA Standards

Western Lake Superior Sanitary District (WLSSD) in Duluth, Minnesota, has implemented a mercury minimization activity that includes amalgam separators in virtually all dental practices in the WLSSD service area. The overall mercury reduction effort has resulted in effluent values approaching Great Lakes Water Quality Agreement (GLWQA) standards.

Thermostat Recycling Corporation Increases Thermostat Collections

In the first half of calendar year 2004, the Thermostat Recycling Corporation (TRC) increased the rate of thermostat collections from heating, ventilation, and air-conditioning (HVAC) wholesalers by 36 percent and mercury recovery by 23 percent over collection rates in 2003. The TRC collected 44,070 thermostats and processed 386 pounds of mercury. The amount of recovered mercury collections has nearly doubled since 2001, the first year of nationwide TRC operation. The TRC has collected nearly 300,000 thermostats and processed over 2,600 pounds of mercury from HVAC contractors since it began operations in 1998. Over this same period, the TRC has collected more than 175,000 thermostats containing over 1,400 pounds of mercury in the eight states bordering the Great Lakes.

Product Stewardship Institute Undertakes Mercury Thermostat Project

The Product Stewardship Institute Mercury Thermostat project is funded by the Oregon Department of Environmental Quality, the US EPA Region V, the City of Seattle, and King County, Washington. As part of the project, interviews were conducted across EPA Region V states, Oregon, and Washington to evaluate existing collection and recycling programs, and to identify potential product stewardship solutions for thermostats. This information was discussed at two stakeholder dialogues conducted in the spring and summer of 2004.

Mercury Levels in Waste Stream from Old Batteries Continue To Decline

National Electrical Manufacturers Association (NEMA) analyses of batteries collected from the waste stream in three communities in the United States, including Hennepin County, Minnesota, continues to show a decline in mercury in batteries. Alkaline batteries historically contained 8,000-12,000 parts per million of mercury. The first battery sort conducted by NEMA in Hennepin County in 1997 collected alkaline batteries averaging 915 parts per million of mercury, a 90 percent reduction from historical levels. The 2004 survey showed levels continuing to drop - to 284 parts per million, or a 97 percent drop from historical levels. While 66 percent of collected alkaline batteries had no added mercury in 1997, 94 percent of collected alkaline batteries had no mercury in 2004.

Lamp Industry Continues To Reduce Use of Mercury; Lamp Recycling Increases

NEMA Lamp Section members have significantly reduced their use of mercury in lamps while increasing their production of lamps. In 1990, NEMA estimates that Lamp Section members used 23.6 tons of mercury in the production of slightly less than 500 million mercury-containing lamps. This mercury usage declined to 17 tons in 1994, 13 tons in 1999, 9 tons in 2001, and 7 tons in 2003. In the same time frame, sales by NEMA Lamp Section members increased to 650 million mercury-containing lamps. The Association of Mercury and Lamp Recyclers reports that lamp recycling has increased from less than 10 million in 1990, to 70 million lamps in 1997 and 156 million lamps in 2003. The Association of Lighting and Mercury Recyclers (ALMR) publishes an annual report estimating the recycling rate and trends in lamp recycling. The November 2004 report by ALMR estimates that the national recycling rate for all lamps in 2003 was 23 percent, up from 22 percent in 2001.

American Dental Association Promotes Best Management Practices

The American Dental Association (ADA) is the foremost professional association for dentistry in the world. Approximately 72 percent of all active dentists in the United States are members. The ADA actively educates and encourages dentists regarding best management practices for amalgam waste.

In the last year, the ADA updated its Best Management Practices (BMPs) based on the best available information to warn against the use of bleach on amalgam waste (which may have a tendency to liberate mercury from amalgam). The ADA also produced and distributed to every active dentist in the United States (not just to ADA members) a brochure and poster on BMPs for use by dentists and their staff.

In partnership with the Naval Institute for Dental and Biomedical Research, and partially through a grant from the US EPA, the ADA completed an educational video on BMPs for dentists and their staff. This video was distributed by the ADA to each of its constituent state dental societies and to many local dental societies for use by dentists nationwide. The video was highlighted at the ADA's Annual Session in October 2004 and also will be available to dentists on the ADA website (www.ada.org). The ADA applied for an additional US EPA grant to fund distribution of the video directly to every dentist in the Great Lakes Region. That grant application is pending.

The ADA is working with US EPA to develop a uniform system of recycling waste amalgam. The system will cover what may be recycled as well as how it should be collected and shipped. The process to develop this system is expected to involve the ADA, US EPA, recyclers, and perhaps state environmental regulators and other interested parties.

The ADA has in the past conducted extensive research on the impact of amalgam separators on Publicly Owned Treatment Works (POTW) influent. However, recognizing the lack of scientific research on the effect of amalgam separators on discharges (effluent) from POTWs, the ADA is working with the University of Missouri Extension, Office of Waste Management, on a scientifically valid research protocol. A grant application has been submitted to US EPA seeking funding for this work.

Bowling Green State University Collects and Reclaims Elemental Mercury

Bowling Green State University, a public university located in northwest Ohio, conducts an Elemental Mercury Collection and Reclamation Program. The program involves the collection and recycling of uncontaminated sources of elemental mercury. These sources of mercury include thermometers, manometers, barometers, sphygmomanometers (blood pressure measurement devices), mercury-containing heating thermostats, mercury switches, and individual containers of bulk elemental mercury. The program is available free of charge to individuals, academic institutions, small businesses, industries, medical and dental facilities, and any additional entity possessing unwanted, uncontaminated elemental mercury. Sources of elemental mercury have been removed from locations throughout Ohio, Indiana, southern Michigan, and western Pennsylvania.

Primary collaborative partners in the program include Bowling Green State University, the Ohio Environmental Protection Agency - Division of Emergency and Remedial Response, Rader Environmental Services, Toledo Environmental Services, and the Ohio Spill Planning, Prevention, and Emergency Response Association.

Elemental mercury is collected and brought to the university's hazardous waste storage facility. A bill-of-lading is used during the collection process to identify and track the sources collected. The mercury is consolidated at the facility and then sent to either Mercury Solutions in Union Grove, Wisconsin, or Bethlehem.

Elemental mercury is collected and brought to the university's hazardous waste storage facility. A bill-of-lading is used during the collection process to identify and track the sources collected. The mercury is consolidated at the facility and then sent to either Mercury Solutions in Union Grove, Wisconsin, or Bethlehem Apparatus Products in Hellertown, Pennsylvania.

The collection and reclamation program began in earnest in January of 1998 and, to this point, has been responsible for removing approximately 5 tons (~9,700 pounds) of elemental mercury. Since November of 2003, the program has collected over 1 ton (almost 2,700 pounds) of mercury for recycling.

Additional information on Bowling Green State University's elemental mercury collection program can be found at: http://www.bgsu.edu/offices/envhs/mercury.htm.

Canadian Reduction Activities

Mercury "Switch Out" Program Continues to Expand

The "Switch Out" program was initiated in June 2001 to recover mercury switches from end-of-life vehicles. The program started with eleven auto recyclers in Ontario who collected approximately 2,500 switches in 2001. In 2004, four hundred auto recyclers in three provinces (Ontario, Alberta, and British Columbia) participated in a "Switch Out Program" and over 58,000 switches have been collected.

Appliance Switch Collection Program in Several Ontario Communities

In 2002, the Regional Municipality of Niagara conducted a pilot program to collect mercury switches from white goods. Following a successful pilot program, an instruction manual and video were developed and the Association of Municipal Recycling Coordinators (AMRC) actively promoted the program with other municipalities. By 2003, several municipalities had adopted the program and AMRC estimated that 45 kg of mercury were collected in 2003. Several additional municipalities are planning to initiate similar programs and it is expected that two thirds of the mercury that is contained in appliances discarded in Ontario could be collected by 2005.

Communities Take Action

Community collection programs for mercury-containing household products, such as thermometers and thermostats, continue to be maintained and grow. EcoSuperior's program along the north shore of Lake Superior, which involves several partners from the retail sector as well as industry and municipalities, has been very successful. In Essex-Windsor, a mercury collection campaign conducted in the summer collected over 90 kg of mercury.

Work is continuing to promote programs with municipalities. In February 2005, the AMRC will host a mercury workshop for Ontario municipalities with a focus on programs that the municipalities could initiate.

Dental Clean Sweep Launched

Based on a survey conducted by the Ontario Dental Association in 2001, it is estimated that 9 percent of Ontario dental practices have elemental mercury in their offices.

A working group involving the Ontario Dental Association, The Ontario Ministry of the Environment, Environment Canada and waste carriers developed an Ontario Wide Dental Elemental Clean Sweep Project to remove stores of elemental mercury from Ontario dental practices. The program will run until March 2005.

Ontario Takes Actions to Improve Compliance

Regulatory efforts to reduce releases of harmful pollutants such as mercury have included the following:

- Ontario Regulation 196/03 required Ontario dental clinics (that place, repair, or remove amalgam) to install separators by November 15, 2003. Preliminary results from the Royal College of Dental Surgeons of Ontario indicate that approximately 99 percent of the 7,800 dentists in Ontario appear to be in compliance with the regulation. The installation of amalgam traps/filters reduces loadings to the municipal sewer systems substantially and immediately.
- Ontario Regulation 323/02 required existing hospital incinerators to close by December 6, 2003; these closures have been verified by Ministry of the Environment (MOE) staff. Hospital incinerators were the fourth largest emission source of mercury in the province.

Ontario has implemented the Canada Wide Standards (CWS) for mercury emissions from hazardous waste incinerators. Notices amending the Certificates of Approval for these facilities to include the mercury CWS limit (50 µg/m3) were issued prior to the end of December 2003.

Other Activities

US EPA Developing National Estimates of Mercury Releases from Products

US EPA Region 5 is working with Wisconsin Department of Natural Resources, Dane County, Wisconsin, and Barr Engineering to develop national estimates of mercury releases from products. This project, building on previous efforts that developed state-wide estimates for Minnesota and Wisconsin, calculates mercury releases by combining data on the amount of mercury in products produced or sold with distribution factors that indicate what happens to mercury though the product life-cycle. This technique yields estimates of the distribution of mercury-containing products, including what percentage are landfilled, versus incinerated or melted in a steelmaking furnace. These estimates can then be combined with release factors to calculate the amount of mercury released to air, water, and land. This approach results in an improved estimate of mercury releases and can also be used to predict the impacts of options that would decrease mercury use or improve management of mercury-containing wastes. The estimates are generated through spreadsheets that will be shared with the Mercury Workgroup in 2005.

Next Steps

The Mercury Workgroup will continue to focus on sharing information about cost-effective reduction opportunities, tracking progress toward meeting reduction goals, and publicizing voluntary achievements in mercury reduction. Particular attention will be paid to information-sharing in areas where mercury releases are significant but there are no existing federal regulations or regulations under development. For instance, the workgroup will attempt to focus on the contamination of metal scrap by mercury-containing devices, and the resulting emissions, and provide a forum for discussing cost-effective approaches to address this problem. In addition, the workgroup will focus on the issue of mercury releases from dental offices and will help state, provincial, and local governments identify cost-effective reduction approaches for this sector.

Cercropia Moth
Photo by David Jude,
courtesy of the Center for Great Lakes and Aquatic Sciences

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 (>500 ppm) 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 Canada-Ontario Agreement (COA).

As of April 2004, approximately 88 percent of Ontario's high-level PCB wastes in storage had been destroyed compared to 1993. Over the past year, approximately 815 tonnes (gross weight) of high-level PCBs in storage were destroyed (see Figure 2-1). PCBs are both moving into storage sites from service and moving out of storage to destruction. As of April 2004, approximately 122 additional storage sites (both federal and private) have become PCB-free (see Table 2-1) over the last fiscal year. The total number of storage sites still registered has gone down from over 1,500 to 433 (both federal and private sites included).

Rates of PCB phase-out have declined in recent years because the remaining PCB equipment in use 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 the PCB owners continues to increase due to continuing PCB outreach, the Canadian PCB Phase-Out Awards Program, sector mail-out of information, and voluntary commitment letters. Newer facilities and options are now available in Ontario for PCB decontamination and destruction, in addition to the Alberta Swan Hills incinerator. Owners of large quantities of PCBs have been able to incorporate PCB phase out/destruction activities into multi year operating plans, but smaller businesses have had difficulty absorbing a large capital expense in any one fiscal year.

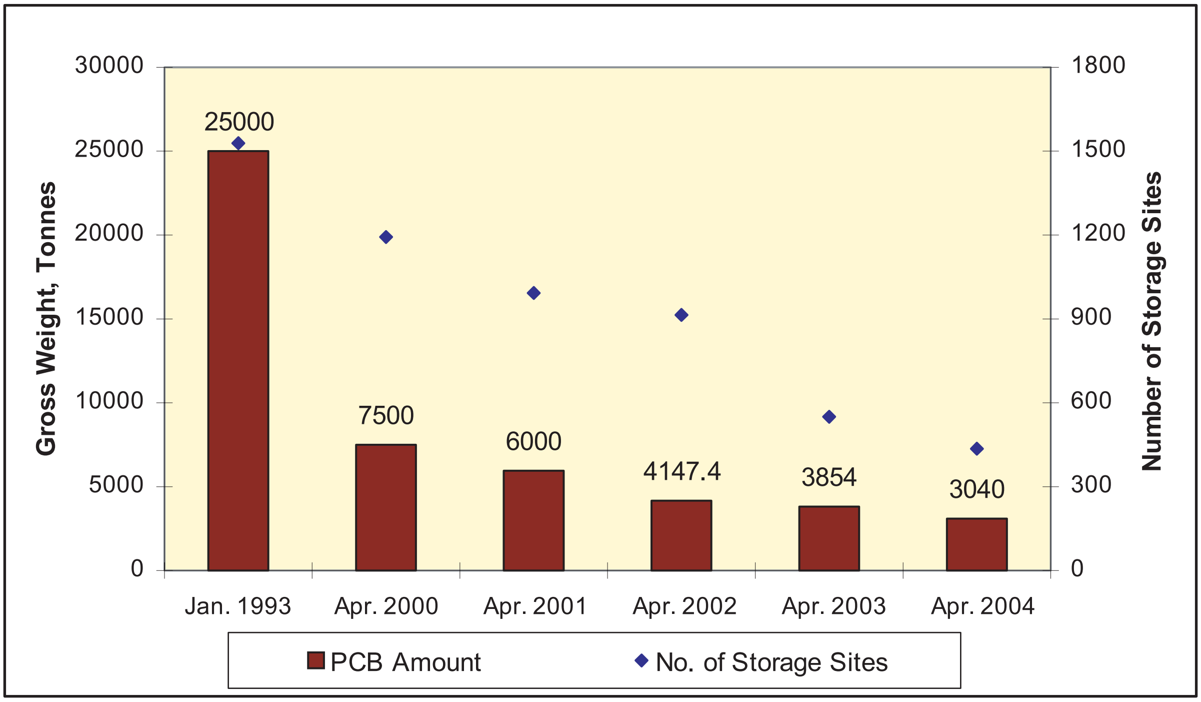


Figure 2-1. Trends in High-Level PCBs in Storage in Ontario.
Source: Environment Canada and Ontario Ministry of the Environment PCB Database

The priority sectors that still have a considerable amount of high-level PCBs in use include utilities, iron/steel, pulp and paper, school/care facility/food processing (sensitive areas), governments, and mining/smelting. These sectors have been targeted by the GLBTS PCB Workgroup for encouragement to phase-out their PCBs on a voluntary basis.

According to annual reports submitted to US EPA by PCB disposers, about 87,000 PCB transformers and 143,000 PCB capacitors were disposed of between the 1994 baseline and the end of 2002. As a result, approximately 113,000 PCB transformers and 1,330,000 PCB capacitors remained in use at the end of 2002 (see Figure 2-2). However, US EPA expects the amount of PCB equipment remaining in use to be much less since the disposal of every PCB transformer or capacitor may not be accounted for in the annual reports. An indication that the annual reports do not account for the disposal of every PCB transformer is that in 2000, as part of a regulatory requirement, 20,000 PCB transformers were registered with EPA. US EPA currently is compiling PCB disposal information for 2003 and drafting a paper for industry feedback on any data gaps with the inventory.

Workgroup Activities

Workgroup Meetings

The PCB Workgroup met on December 16, 2003, and on June 17, 2004. During the December 16 meeting, the discussions covered the following topics:

- an introduction and background information on dioxin-like (coplanar) PCBs
- an initiative to enhance outreach, compliance, and phase-out of PCBs, by having larger organizations work with their customers to exchange information
- a summary of the project on PCB Phase-out: The Business Case, being implemented by the Tellus Institute
- a status report of the study on PCB Emissions from Electrical Equipment: Source Emissions Study, being implemented by Dr. William Mills, University of Illinois at Chicago
- a summary of PCB Spill Cleanup Experiences by Jack Lewis, of Sunpro.

The June 17 meeting covered the following topics:

- Ministry of the Environment's Surface Water Monitoring in the Great Lakes Basin: Ontario
- Criteria to Assess the Status of PCBs in the Great Lakes Basin in Canada, by Craig Wardlaw of Headwater Environmental Services
- PCB Case Studies for Niagara Power and the City of Thunder Bay
- a Workshop and Compliance Promotion Strategy Survey from Ontario, Canada
- a PCB Re-Assessment for the Great Lakes Binational Toxics Strategy.

Reduction Activities

U.S. PCB Phasedown Program

In 2004, the US EPA Region 5 identified 25 facilities in the Region to which separate letters will be sent seeking voluntary reductions of their PCB electrical equipment. Letters are drafted and should be mailed by the end of the calendar year. In addition, the US EPA has begun to update its PCB Transformer Registration Database which identifies the owner, location, and size of each PCB transformer that was registered.

A scoping study and economic analysis on the voluntary phase-out of PCBs were begun as part of the US EPA's consideration of developing a more formal national voluntary PCB phase-out program. Over the next several months, the US EPA will continue to evaluate and consider the development and implementation of such a program.

U.S. PCB Phase-out at Federal Facilities

PCBs were included on the last list of the chemicals to be considered for reduction under a U.S. Executive Order on Greening the Government (E.O. 13148). US EPA will outreach to Federal facilities regarding the Order, and will share information on how to identify and dispose of PCB equipment.

Minnesota Removes Financial Barrier to Voluntary PCB Phase-out

A Minnesota regulatory change went into effect October 1, 2004 that removed a financial barrier to voluntary PCB phase-out. Prior to this change, generators of PCB waste in Minnesota who chose to proactively remove PCBs were subject to added regulations through generator size changes and increased licensing fees. In Minnesota, PCB wastes with concentrations of >50 ppm are subject to hazardous waste requirements. The generation of such

Table 2-1. PCB Storage Sites Remaining

	December 1994	April 2003	April 2004
Federal Sites	109	25	26
Non-federal Sites	1429	530	407
Total Sites Remaining	1538	555	433

Source: Environment Canada and Ontario Ministry of the Environment PCB Database

wastes by voluntary PCB phase-out contributed to hazardous waste generator size determination and the associated annual hazardous waste licensing fees, which are in part volume based. The change was incorporated into Minnesota Statute 116.07 (2) and provides a mechanism for the waiver of fees when >50 ppm PCBs are voluntarily removed.

The regulatory change was prompted by a request from Xcel Energy, which recognized that the old rule structure was counterintuitive - causing pollution prevention activities to increase cost and regulatory burden. Representatives of Xcel Energy, Minnesota Power, Ottertail Power, the Minnesota Cooperative Association, and the Minnesota Pollution Control Agency (MPCA) worked together in 2003 to develop the legislative language for the bill. Under the old rule structure, the MPCA PCB disposal project described below would have resulted in thousands of dollars of added cost for the utilities for added regulatory burdens and licensing fees, in addition to disposal and equipment replacement costs.

Minnesota Pollution Control Agency (MPCA) Small Quantity PCB Owner Disposal Cooperative

Overall Project Outcome and Results: PCBs are one of nine toxic chemicals targeted by the Lake Superior Zero Discharge Demonstration. This project's objective is to assist owners of small quantities of PCBs to remove contaminated pole-mounted transformers in the Lake Superior watershed.

- Four utilities shared their transformers' serial numbers with the MPCA. The agency compared their serial numbers to manufacturing serial numbers, and 720 transformers (about 4 percent) were on the manufacturers' list of transformers that may contain PCBs.
- The MPCA visited each of the suspect transformers in the Lake Country Power and Cooperative Power and Light districts within the Lake Superior watershed. The coordinates were entered into a GPS unit and the closest body of water also was entered. This allowed the MPCA to prioritize transformers using the distance to water.
- Lake Country Power volunteered to remove all of their 292 suspect transformers, although the contract could cover only a portion of the cost.
- Cooperative Power and Light contracted to replace 145 suspect transformers manufactured by GE that were closest to Lake Superior. (GE transformers are most likely to contain PCBs and are therefore a priority.)
- The City of Grand Marais contracted to replace 14 suspect transformers and test others.
- Summary: This project and voluntary actions by participants will result in the replacement of 82 percent of the transformers owned by the three facilities that participated and 64 percent of the suspect transformers originally identified.

Project Results Use and Dissemination: The project manager has been asked to assist the MPCA with PCB phase-out agreements as per Minnesota statute 116.07,

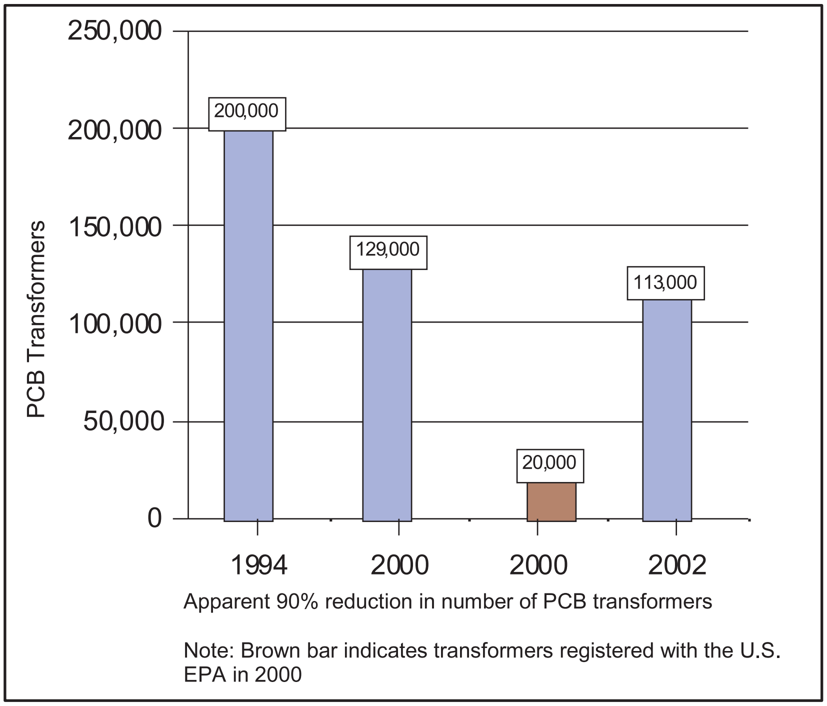


Figure 2-2. U.S. PCB Transformer Inventory Estimates. Source: US EPA, Office of Pollution Prevention and Toxics, Chemical Management Division

subd. 2b. Results will be distributed to other Great Lakes states when the project is completed at the end of the federal fiscal year.

International Steel Group Phase-out Efforts

The International Steel Group (ISG) was initially founded in the spring of 2002 as a private partnership for the purpose of purchasing the assets of the bankrupt LTV Steel Corporation. Since that time, the company has sought to aggressively acquire the assets of other bankrupt steel companies in order to further grow its market share and to improve production efficiencies. Today, ISG is, in terms of capacity, the largest and most efficient steel maker in North America. ISG is now a publicly traded company that contains the combined assets of Bethlehem Steel, Acme Steel, Weirton Steel, Georgetown Steel, and LTV Steel.

While ISG has spent billions of dollars over the last two years to acquire assets and become the largest steel company, it has not forgotten its environmental responsibilities. ISG operates facilities on Lake Erie at Lackawanna, New York, and Cleveland, Ohio, and on Lake Michigan at Burns Harbor and East Chicago, Indiana. During 2003 and 2004, these facilities combined have removed from service and destroyed the following PCB-containing equipment:

- 45 transformers containing approximately 117,539 kilograms of PCBs
- 38 capacitors containing approximately 1,469 kilograms of PCBs

ISG is committed to continue actively pursuing the removal of PCB-containing equipment from all of its operating facilities, in accordance with ISG's Environmental Policy.

Ispat Inland's Voluntary Commitment

In 2000, Ispat Inland agreed to participate in EPA Region 5's Voluntary PCB Reduction Challenge. Ispat Inland committed to reduce the amount of high-level PCB's (>500 ppm) used in electrical equipment by 95 percent.

In 1990, the starting inventory of PCB electrical equipment oils at Ispat Inland's Indiana Harbor Works in East Chicago, Indiana, and Minorca Mine in Virginia, Minnesota, was 143,700 gallons. A target of 7,200 gallons by 2006 was set. Ispat Inland's inventory of PCB electrical equipment oils as of January 1, 2005, was 8,541 gallons. This is a reduction of 94 percent from 1990 levels.

The initial inventory of PCB equipment also included 207 PCB transformers and 1,197 PCB capacitors. Ispat Inland now has 8 PCB transformers and 119 PCB capacitors remaining at Indiana Harbor Works.

Ford Motor Company Phase-out Efforts

Ford Motor Company committed to phase-out all PCB transformers globally by the end of 2010. Referencing a 1995 baseline, 79 percent of Ford's PCB transformers were phased-out by the end of 2004, and 95 percent of PCB transformers are scheduled to be phased-out by the end of 2006, financial conditions permitting.

USWAG Member Company PCB Reduction Efforts

Since the last update in 2003, electric and gas utility member companies of the **Utility Solid Waste Activities Group (USWAG)** have continued with a wide range of voluntary PCB reduction efforts, both within the Great Lakes Basin and in other regions of the U.S. At the last USWAG PCB Committee meeting in Dallas, Texas in December 2004, attendees reaffirmed that most USWAG companies have procedures in place to ensure that virtually all equipment containing PCBs in concentrations > 50 ppm, identified during repair or servicing, are disposed and/or retrofilled and not returned to service as PCB-regulated equipment. These procedures, combined with voluntary retrofill/reclassification programs, are resulting in the continued reduction of PCB-containing equipment from utility inventories across the country. This progress underscores the determined efforts of USWAG members to systematically remove PCB-containing equipment from their operating systems.

In addition to the systematic retirement of PCB-containing equipment identified during repair or servicing, USWAG member companies also undertake, where practical, dedicated efforts to identify and remove PCB-containing equipment from service. For example, **American Electric Power (AEP)**, with more than 5 million customers, continues to achieve excellent PCB use reductions in its 11-state service territory. Within the Great Lakes Basin, AEP has no known PCB transformers or large PCB capacitors. In calendar year 2004, AEP removed from its service territories in EPA Regions 3 through 5 the following items: 36 large PCB capacitors and 217 PCB items containing > 500 ppm PCBs, and 1,689 pieces of PCB-contaminated articles (between 50 and 499 ppm PCBs). In its EPA Region 6 territory, AEP has no known PCB transformers, and in 2004 removed 279 large PCB capacitors and 67 PCB items containing 500 ppm PCBs, and 508 PCB-contaminated articles.

Cinergy, which serves 1.5 million customers in Ohio, Kentucky, and Indiana through its subsidiaries Cincinnati Gas & Electric and PSI Energy, also has implemented a dedicated, voluntary PCB phase-down program. Because of these efforts, Cinergy currently has no known PCB (> 500 ppm) electrical equipment (transformers, capacitors, breakers, and regulators) in its system. Cinergy also has tested large transformers in its substations, power plants, and vaults and any PCB transformers (containing > 500 ppm PCBs) identified in these areas have been removed and replaced with units containing no PCBs or have been retrofilled. Further, Cinergy has tested all transformers on school properties (kindergarten through 12th grade) in Indiana, and any transformers containing > 50 ppm have been voluntarily removed and replaced with transformers containing no PCBs. In addition, as a matter of general policy, when Cinergy identifies equipment containing > 50 ppm PCBs, the company either replaces or retrofills the equipment as soon as practicable.

Another USWAG member in the Great Lakes Basin, **Consumers Energy**, has made dramatic progress in voluntarily phasing out PCB-containing equipment. In 1994, Consumers Energy entered into an agreement with EPA Region 5 to phase out known, large PCB capacitors and PCB transformers by 2005. That commitment was achieved by 2000 and included addressing additional equipment not included in the original agreement. All known PCB capacitors and transformers have been removed from service or retrofilled to non-PCB status. Since 1979, Consumers Energy's efforts have resulted in voluntarily removing from service (through disposal and/or reclassification) 30,600 large PCB capacitors, 755 large PCB transformers, and 1,700 PCB distribution transformers, and thousands of PCB-contaminated (50-499 ppm) distribution transformers. In addition, Consumers Energy has regularly and consistently communicated with EPA Region 5 regarding its progress in removing and properly disposing of equipment containing PCBs.

USWAG member **Xcel Energy (Xcel)**, which serves customers in the West and Midwest, including Michigan, Minnesota, and Wisconsin, also has undertaken voluntary PCB phase-out efforts. In 2004, Xcel removed 306 pieces of equipment including transformers, capacitors, bushings, and meters totaling 313,369 kilograms that contained 43,436 gallons of PCB-contaminated oil.

Exelon Energy (Exelon), through its subsidiaries ComEd and PECO, operates in northern Illinois and southeastern Pennsylvania. Exelon's phase-out plan for equipment containing PCBs, instituted more than a decade ago, has moved the company from among the largest users of such equipment to a position of operating only a few pieces. For example, in 2004, Exelon accelerated the phase-out process and removed 288 PCB capacitors from its system and disposed of the PCB fluid in accordance with applicable TSCA requirements. Due to these efforts, Exelon has removed or replaced almost all PCB (> 500 ppm) sources, including all known PCB transformers in commercial buildings, all known PCB distribution equipment outside of substations, 68 percent of all PCB capacitors in PECO substations, and 95 percent of all PCB capacitors in ComEd substations. A limited number of PCB transformers and/or capacitors remain in service at several of Exelon's fossil and nuclear plants. This equipment is monitored and periodically reviewed for replacement or retrofill.

Like other USWAG members, **Indianapolis Power & Light Co. (IPL)**, has had a program in place since the early 1990s to identify and remove from service PCB-containing electrical equipment (> 50 ppm). All of IPL's major substation equipment has been tested, and a program is in place to retrofill or replace any identified equipment containing > 50 ppm PCBs. In 2004, IPL voluntarily disposed of half of its PCB-containing bushings that the company had in storage for reuse. In addition, IPL has replaced all known Askarel transformers and large PCB capacitors with units containing no PCBs. As part of the phase-down efforts in 2004, IPL removed seven PCB transformers (> 500 ppm) and 59 PCB-contaminated transformers.

Minnesota Power (MP) is continuing with its voluntary PCB phase-down project initiated in 1994. In 2004, 139 large PCB capacitors with a total estimated gross weight of 9,940 pounds were voluntarily removed from service. Since the program began in 1994, nearly 3,140 large PCB capacitors have been removed. One bank of large PCB capacitors remains in the MP system and is scheduled for removal in 2005. MP has already removed all of its known PCB transformers and sources of PCB oil > 500 ppm. MP continues to remove PCB-contaminated oil in electrical equipment. Additionally, MP has entered into an understanding with Square Butte Electric Cooperative to phase-out about 2,300 large PCB capacitors over an approximate four-year period starting in 2005 at the Arrowhead DC Terminal facility operated and maintained by MP outside Duluth.

Detroit Edison, a subsidiary of DTE Energy, serves more than 2.1 million customers in southeastern Michigan. In 2004, Detroit Edison successfully completed a voluntary 10-year program involving the removal of large PCB capacitors. As a result of this voluntary initiative, nearly 22,000 large PCB capacitors have been removed from transmission substations and replaced with PCB-free units. In 2004, 25 known Askarel precipitator transformers containing 20,408 kilograms of PCBs were removed from the power generating system. An additional 777 units of PCB-contaminated equipment, 84 PCB transformers, and 10 PCB bushings identified during equipment servicing have been removed from the distribution system. Detroit Edison also continues to pursue PCB reduction activities through retrofilling and reclassification of identified PCB-containing equipment.

In 2004, **Dairyland Power Cooperative's** PCB reduction program continued to make progress through the removal of the final 27 PCB transformers from its Alma, Wisconsin, generating facilities. Dairyland has now removed all high-level PCB transformers from its system. Dairyland also removed three PCB-contaminated transformers, three PCB-contaminated precipitator transformers, and 12 tar-filled bushings from its transmission system in 2004. Over the past year, Dairyland has retrofilled and reclassified five voltage regulators, one transformer, and three oil-filled circuit breakers. This brings Dairyland's overall inventory of PCB-contaminated equipment to 20 voltage regulators (100-219 amps), seven transformers (100 kva), and two oil-filled circuit breakers. These figures are a decline from its 2000 inventory of approximately 150 pieces of PCB-contaminated equipment (50-499 ppm) and 50 PCB transformers (> 500 ppm).

In March 2001, **Madison Gas and Electric Company (MGE)** initiated a voluntary PCB sampling program. Six thousand six hundred (6,600) never-before-tested distribution and network transformers manufactured before 1980 were sampled within a two-year period. Eighty-five (85) of these units contained PCBs at > 500 ppm and were removed from service and disposed. Since 2001, an additional 456 transformers containing PCBs between 50 and < 500 ppm, as well as 1,211 transformers containing PCBs at < 50 ppm, were also removed from service and disposed. Forty-two (42) transformers were retrofilled with new mineral oil containing no PCBs and reclassified as non-PCB units.

Great River Energy (GRE) continues to maintain a proactive PCB phase-down program. When GRE was formed in 1999, with the consolidation of Cooperative Power Association and United Power Association, much of the PCB (> 500 ppm) and PCB-contaminated (> 50 to < 499 ppm) equipment in the system had already been removed or retrofilled. Since its formation, GRE has continued to evaluate and remove or retrofill PCB and PCB-contaminated equipment in its generation and transmission systems. At this time, GRE has evaluated greater than 99 percent of its testable in-service equipment. By the end of 2004, much of the known PCB and PCB-contaminated equipment in the Minnesota system was removed or retrofilled. With the exception of large capacitors at GRE's DC substation, the final piece of known PCB-contaminated equipment in the Minnesota system is scheduled for removal in the spring of 2005.

These PCB reduction efforts are not limited to USWAG members in the Great Lakes Basin. For example, New York-based **Consolidated Edison (ConEd)** has enhanced its comprehensive testing records by taking a physical inventory of formerly suspect PCB pole top transformers on its suburban system and testing all questionable units. Three transformers were identified and removed as a result of this testing. ConEd continued its phase-down of PCB rectifiers in Manhattan, and three units were removed for disposal. Additionally, two large unit substation padmount transformers were found to be PCB units because of elevated PCB concentrations in components. These were removed for disposal. Ongoing maintenance and repair identified PCB-contaminated distribution transformers and an additional two PCB pole top units. In 2004, ConEd removed over 39,000 pounds of PCB (> 500 ppm) equipment and 42,000 pounds of PCB-contaminated equipment (> 50 and < 500 ppm).

USWAG member **TXU** has, since the early 1990s, aggressively pursued removal of PCBs from its system and, since 1993, has retired 3,308 pieces of PCB equipment (> 500 ppm). With the exception of a small quantity of specialized equipment, TXU has a policy of retiring all distribution equipment identified for repair or service with PCB concentrations = 1 ppm. During 2004, TXU retired 200 pieces of electrical equipment containing > 500 ppm PCBs, and 536 pieces of electrical equipment that were PCB-contaminated (50- 499 ppm PCBs).

Since 1986, **Tampa Electric Company (TEC)** has actively pursued the removal of PCBs from its electrical distribution operating system and today has no known PCB units (i.e., > 500 ppm) in service. When TEC discovers a PCB-contaminated unit, the unit is removed from service and properly disposed. TEC has removed all PCB transformers from high-risk areas such as schools, hospitals, shopping centers, and indoor vaults. TEC's efforts to date have resulted in: the replacement of 138 PCB transformers from 66 downtown network sidewalk vaults; the reclassification of 11 PCB substation transformers; the replacement of 2,673 large PCB capacitors in 20 substations; and the removal of all known PCB distribution system large capacitors (65 units) from service areas.

National Grid, New England, through its subsidiary companies of Massachusetts Electric Company, Granite State Electric Company, Narragansett Electric Company, and Nantucket Electric Company, continues with its ongoing efforts to reduce the number of PCB articles in its service territories in Massachusetts, Rhode Island, and New Hampshire. For example, during calendar year 2004, National Grid, New England systematically retired or decommissioned approximately 544 pieces of PCB-contaminated or PCB electrical equipment (> 500 ppm) for a PCB reduction totaling over 145,000 kilograms. Additionally, National Grid USA – New England managed the proper disposal of significant quantities of PCB bulk waste and PCB remediation waste. These quantities are in addition to the above-stated PCB reduction totals.

PSE&G, which operates primarily on the East Coast, has a policy, like many USWAG members, to voluntarily retire or retrofill electric distribution equipment containing > 50 ppm PCBs identified during servicing operations. Since 1978, PSE&G has removed over 107,000 PCB transformers and capacitors, resulting in a reduction of more than 99 percent of known PCB equipment. Since 1998, PSE&G has also removed over 2,300 PCB-contaminated transformers. PSE&G also has voluntarily removed PCB capacitors from its substation banks and replaced or retrofilled approximately 2,000 PCB and PCB-contaminated 4-kv voltage regulators.

Pacificorp, which operates primarily in the Northwest and Intermountain West, also has a program in place that automatically retires from service equipment brought in from the field that is found to contain > 50 ppm PCBs. Such equipment is disposed by either draining and scrapping (< 500 ppm) or draining, flushing, and landfilling (> 500 ppm). Most recently, since the spring of 2003, Pacificorp has recycled or disposed of 425,471 gallons of electrical equipment oil, including 41,291 gallons containing > 50 ppm PCBs.

In South Carolina, **South Carolina Electric & Gas (SCE&G)** has an ongoing, voluntary PCB reduction effort to remove PCBs from electrical equipment. Due to these efforts, all known PCB transformers (> 500 ppm PCBs) have been retrofilled with non-PCB oils or such units have been disposed. In addition, all known large PCB capacitors in SCE&G's system have been replaced. Like many other USWAG members, SCE&G also has a long-standing policy to remove from service transformers that are identified as PCB-contaminated (> 50 to 499 ppm PCBs) and replace this equipment with units containing no PCBs.

USWAG member **Entergy** has invested substantial resources in implementing a successful PCB phase-out program. In 1998, Entergy dedicated approximately $2 million for the removal of PCB transformers from its fossil generating plants. From 1999 to 2001, Entergy voluntarily opted to phase-out all PCB transformers from its fossil fleet. During that span of time, approximately 105 PCB transformers were removed from service as well as a number of large PCB capacitors. Of Entergy's Fossil Operations in EPA Regions 4 and 6, only 17 large PCB capacitors remain in service. Fossil Operations continues to phase-out PCB electrical equipment when possible. Based on analyses of PCB electrical equipment managed for repair or recycle in 2004, approximately 99 percent of this equipment was shown to be non-PCB.

Further, Entergy's Transmission and Distribution system has adopted the policy of many other USWAG members; specifically, no oil-filled electrical equipment brought in for service is returned to operation if it is found to be PCB-contaminated. Entergy's Transmission and Distribution system also has an aggressive program for phasing out large PCB capacitors in its substations. Over the past 10 years, Entergy has replaced all large PCB capacitors in its Arkansas, Texas, and Mississippi substations, and has significantly reduced the number in Louisiana.

Arizona Public Service (APS) is Arizona's largest and longest-serving electric utility, serving more than 975,000 customers in 11 of the State's 15 counties. APS owns, operates, and maintains more than 40,000 miles of transmission and distribution lines throughout Arizona. Over the past five years, APS has been successful in reducing the use of PCBs in electrical equipment by targeting suspected equipment based on manufacturer name and serial numbers. Since 2000, APS has removed over 2,896 pieces of PCB (> 500 ppm) or PCB-contaminated (> 50 to 499 ppm) equipment from service, resulting in the disposal of 390,521 kilograms of PCB materials. These efforts continued in 2004, reflecting the company's continuing program to seek out and phase-out PCBs from APS's transmission and distribution systems. In 2004, APS removed 316 pieces of PCB-containing equipment from service, or 34,815 kilograms of materials, including the following: 86 PCB-contaminated transformers (22,744 kg), eight PCB transformers (855 kg), 39 compound-filled bushings containing >500 ppm PCBs (2,862 kg), 30 PCB-contaminated bushings (2,323 kg), 152 large PCB capacitors (5,949 kg), and one large PCB-contaminated capacitor (82 kg).

The **Orlando Utilities Commission (OUC)** has had an active and continuous PCB reduction program in place since 1979. OUC's program began by surveying the largest oil-filled equipment in its system, including over 300 large substation and indoor pad-mounted transformers and capacitors in the company's substation, power plant, and distribution systems. Phase one of the program initially focused on large indoor transformers and capacitors containing > 50 ppm PCBs, resulting in the eventual phase-out or reclassification of such equipment by 1989. Phase two of OUC's PCB reduction efforts began in 1989 with the survey of 1,800 three-phase, pad-mounted transformers of 150 kva or higher, and continues today with efforts to identify and phase-out any transformers containing > 50 ppm PCBs. To date, OUC has surveyed over 10,000 pole and pad-mounted transformers and has disposed of over 4,500 units containing regulated levels of PCBs.

Ameren, which serves 2.3 million customers in Missouri and Illinois, has voluntarily removed all large PCB capacitors from its system. Large oil-filled in-service electrical equipment (i.e., substation, network transformers, and generating station equipment) has been tested for PCB concentration and either replaced or reclassified to at least < 499 ppm PCB and in most cases < 49 ppm PCB. Large equipment in storage for reuse has been reclassified to < 49 ppm PCB. Large spare bushings have been tested for PCB content, if possible. The majority of the spare bushings with a PCB content > 49 ppm PCBs (tested and assumed) were sent for disposal. Distribution electrical equipment removed from service is not placed back into service or in storage for reuse unless it has a manufacturer-certified non-PCB label. Only verified non-PCB distribution equipment is sent for repair.

Pacific Gas & Electric (PG&E) has had a dedicated PCB reduction program in place for over two decades. As a result, PG&E has removed from service more than 99 percent of the PCBs that previously existed in PG&E's electric distribution system (including PCBs contained in large capacitors and network transformers). PG&E also has an ongoing program through which approximately 40,000 transformers are tested for PCBs annually as part of the equipment maintenance program. Transformers tested at or above 50 ppm PCBs are either retrofilled or replaced with equipment containing no PCBs. PG&E's recent PCB reduction effort includes the continuation of the multi-year series capacitor bank removal project. Since 2000, this project has resulted in the systematic removal of over

15,000 individual large PCB capacitors at several major transmission substations. In 2004 alone, over 9,000 individual large PCB capacitors were removed from service. PG&E is also actively involved in an effort by EPA Regions 9 and 10 to develop a PCB Voluntary Accelerated Reduction Program, which will encourage and track voluntary PCB reduction efforts by industry.

Central Maine Power Company (CMP) has voluntarily undertaken a multi-year effort to remove PCB-containing equipment from its system. CMP has removed all of its known PCB transformers and sources of PCB oil > 500 ppm, as well as transformers suspected of being PCB-contaminated (50-499 ppm PCBs) near schools and waterways. CMP continues to actively seek out and remove transformers it believes are most likely to be PCB-contaminated. Since 1999, CMP has removed over 7,700 targeted transformers, of which approximately half were actually PCB-contaminated.

During the mid-1980s to early 1990s, the operating companies of **Progress Energy (PE)** (Carolina Power & Light and Florida Power Corporation) made significant advances towards identifying and removing PCBs from their systems. PE has continued to promote these practices to date. Like many other USWAG members, PE has a policy of retiring all distribution transformers with > 50 ppm PCBs identified for repair or service. Voluntary removal efforts included identifying and removing or retrofilling equipment known to contain > 50 ppm PCBs. Based upon historical knowledge, PE identified a specific population of distribution transformers with a high probability of containing > 50 ppm PCBs. PE removed 270 of those transformers in 2003, removed 255 in 2004, and plans to remove the remainder in 2005. PE has also been successful in removing or retrofilling almost all transformers containing > 50 ppm PCBs at its power plants and continues efforts to reduce PCB-containing equipment in storage for reuse. For example, a PE warehouse reduced its PCB-containing equipment stored for reuse from 78 pieces to 10 pieces in 2004.

Source Profiles and Emissions Quantitation of PCB to Ambient Air from Transformers

Samples of ambient air around operating PCB Askarel transformers were collected in January and October 2004. The samples were collected as part of the US EPA Great Lakes National Program Office-funded project to study emissions of PCBs from in-service PCB transformers. Plans also are being made to collect samples of ambient air at a commercial PCB transformer storage facility. The study, Source Profiles and Emissions Quantitation of PCB to Ambient Air from Transformers, is being conducted by Dr. William J. Mills of the University of Illinois. Preliminary results and other findings will be presented by Dr. Mills at the PCB Workgroup meeting in November 2004.

Accelerating Phase-out of PCB Transformers: The Business Case

The US EPA Great Lakes National Program Office funded a project in 2003 to study the costs associated with the continued use and disposal of PCB transformers. Under this project, case studies on cost estimates of PCB transformer management and disposal will be developed and incorporated into a spreadsheet tool that is intended to assist other PCB transformer owners in estimating their costs/savings for the phase-out of their PCBs. Information for the case studies currently is being compiled, with a project completion date of September 2005.

PCB Reduction Commitment Letters (Canada)

Commencing in 1999, PCB reduction commitment letters were mailed to priority industry sectors including school boards and other sensitive sites (food, beverage, hospitals, care facilities, and water treatment industries). This was followed-up in 2003 and continues in 2004. A number of companies in the iron and steel, utilities, pulp and paper, and metals and mining sectors, as well as some sensitive areas, have undertaken initiatives voluntarily to eliminate (particularly) high-level PCBs in use and/or storage.

Phasing-out PCBs in the Canadian Steel Industry

Canadian Steel Producers Association member companies continue to remove and decommission equipment containing PCBs. In 2003, 55 percent fewer pieces of equipment containing PCBs were in use compared to 1990, and ten of nineteen companies reported having no PCB equipment or waste on-site. Compared to 1990, 95 percent less low-level PCB waste and 80 percent less high-level PCB waste was in storage. Levels of PCB waste in storage will fluctuate year-to-year as inventories increase in preparation for sending PCB material for destruction.

PCB Phase-out Awards Program (Canada)

The Canadian workgroup has developed a plan of outreach and recognition to try to increase awareness and the rate of PCB phase-out. The main elements of the plan are to:

- Present award of a plaque to each eligible company that becomes PCB-free or reaches a major PCB target (90 percent reduction and above)
- Take a photograph of the award presentation and develop a case study (success story)
- Post the photograph and case study or success story on the website and make copies available for distribution
- List the names of award winners in Great Lakes Binational Toxics Strategy (GLBTS), International Joint Commission (IJC), government and trade association publications
- Make presentations at Trade Association meetings and conferences.

Table 2-2. PCB Phase-out History of Canadian Companies Receiving PCB Phase-out Awards

Company	Initial High-Level PCB Inventory	Phase-out History	% Elimination High-Level PCB
City of Thunder Bay	44 drums containing over 25 tonnes of high-level PCB wastes	Removed from service between 1994 and 1998. Sent for destruction in 2001.	100%
Canadian Niagara Power	2 large Askarel transformers, 95 capacitors	Removed from service between 1993 and 2003. All sent for destruction by 2003.	100%

Source: Environmental Protection Branch, Ontario Region, Environment Canada

At the May 2004 Stakeholders Meeting in Toronto, two awards were presented to the City of Thunder Bay and to Canadian Niagara Power. Table 2-2 describes the PCB phase-out history of these companies.

A number of other PCB owners (e.g., City of Hamilton, Ontario Power Generation (OPG), General Motors) have expressed interest in the awards program, and applications are actively in progress. The next award presentation ceremony will likely take place at the GLBTS Stakeholders Meeting in Toronto in the spring of 2005.

Canadian Case Studies

Environment Canada is developing Case Studies (success stories) for each company that receives a PCB Phase-Out Award. Case Studies for Stelco Steel (Can.), Hydro One (Can.), Slater Steel (Can.), and Enersource Hydro Mississauga (Can.) have been completed and printed in hardcopy. Copies may be requested from Ken De, the workgroup co-chair, by e-mail to ken.de@ec.gc.ca or by phone at (416)739-5870. The Case Studies also will be posted on the GLBTS PCB website when the revisions to the website are completed. The goal of the case studies is 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.

Canadian GLBTS PCB Newsletter

The second edition of the Environment Canada GLBTS PCB Newsletter has been published. The Newsletter will be used to promote the PCB elimination and award programs. The purpose of the Newsletter is to summarize the information about the GLBTS, PCBs as an environmental hazard, the Phase-Out Awards Program and other issues in an eye-catching, simplified format. The main target audience is PCB-owning industry, in particular industrial environmental managers. The first and second editions of the Newsletter have been published and are available from Ken De, Environment Canada.

Canadian Regulatory Activities

Environment Canada's PCB regulations are being amended and targeted for Canada Gazette publication in 2005. These regulations are:

1) The Chlorobiphenyl Regulations (1977)
2) The Storage of PCB Material Regulations (1992)
3) Export of PCB Regulations (1996)
4) Federal PCB Destruction Regulations (1989).

The most significant revisions to the regulations will be the imposition of strict phase-out dates for certain categories of PCBs. Revisions to the Federal PCB destruction regulations will see the strengthening of emissions release provisions to bring the federal regulations in line with existing provincial requirements. More information and updates can be found on the Environment Canada web site at http://www.ec.gc.ca/pcb/.

Outreach/Sharing Information

An outline for the PCB phase-out guidance document was developed and distributed at the June 17, 2004, PCB Workgroup meeting for comments. The outline will be used to prepare a first draft of a guidance document, which is intended to provide information on identifying and disposing of PCBs that can be used by industry, for industry, to encourage and assist facilities in phasing out their PCBs.

Next Steps

The workgroup and agencies plan to continue their core activities noted above and 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.

ISO 14000 and PCBs

The workgroup will consider the most effective way to incorporate the voluntary reduction of PCB equipment in a facilities' ISO (International Standards Organization) 14001 program. The workgroup and agencies are considering the use of a letter intended to be sent to applicants for ISO status, encouraging them to plan for the elimination of their PCBs as part of their ISO program.

PCB Facility Audit

Environment Canada would like to conduct a trial facility PCB audit and prepare a Case Study with the results. A document titled "Scope of Work for a PCB Audit Programme" for small- and medium-sized industries has been prepared. The project will use the services of a contractor with electrical skills, experience with PCBs, and experience in evaluation of the electrical systems in buildings. The facility will be inspected for the presence of PCBs; then, an assessment will be made of the costs to replace the equipment and destroy the PCBs, along with the benefits of replacing the equipment (improved efficiency, reduced liability and insurance). A candidate facility is being sought at this time.

Information Resources (Canada and United States)

The web site for the PCB Workgroup has not been updated recently. A major effort will be made in 2005 to re-design the website and add all relevant information.

Fowler's Toad
Indiana Dunes National Lakeshore
courtesy of the National Park Service

3.0 DIOXINS/FURANS

Canadian Workgroup co-chair: Anita Wong
U.S. Workgroup co-chair: Erin 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 Canada-Ontario Agreement.

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 by 92 percent by the end of 2004. These reductions are primarily the result of implementing the Maximum Achievable Control Technology (MACT) program under the Clean Air Act. Projected U.S. reductions in the largest inventory categories are shown in Figure 3-1. When the MACT program is fully implemented, the largest dioxin source in the United States will be household garbage burning.

The United States also is 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 the current inventory, US EPA is concerned about sources not yet quantified. Many of these sources are difficult to inventory, such as forest fires and other uncontrolled combustion sources. US EPA currently is finalizing a 2000 Dioxin Inventory, the most comprehensive dioxin inventory to date. This inventory will be used by the workgroup to investigate sources directly within the Great Lakes Basin.

Canada has made significant progress toward meeting its challenge goal of a 90 percent reduction in releases of dioxins and furans. At the present time, Canada has achieved an 84 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 1997 and 2001 (based on "Inventory

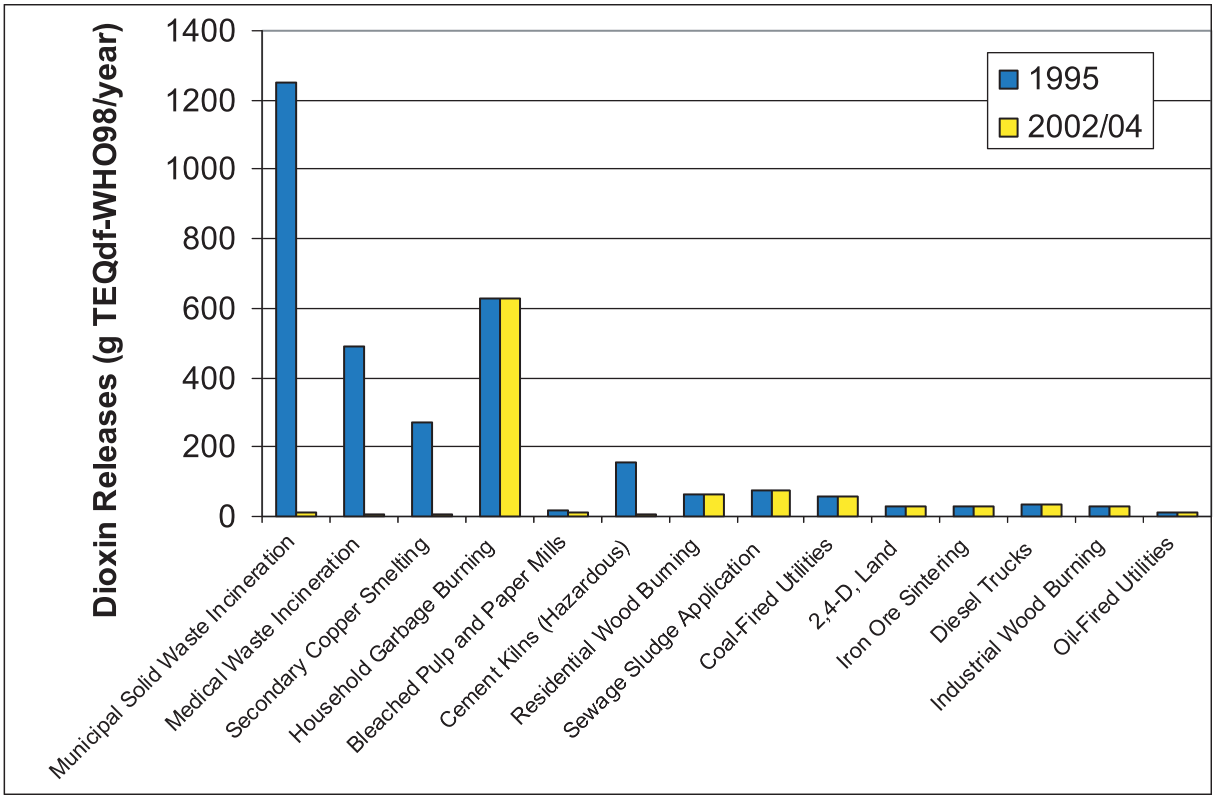


Figure 3-1. Top U.S. Inventoried Dioxin Emissions with Projected Estimates for 2002/04. Source: Inventory of Sources of Dioxin in the U.S., US EPA, March 2000, External Review Draft

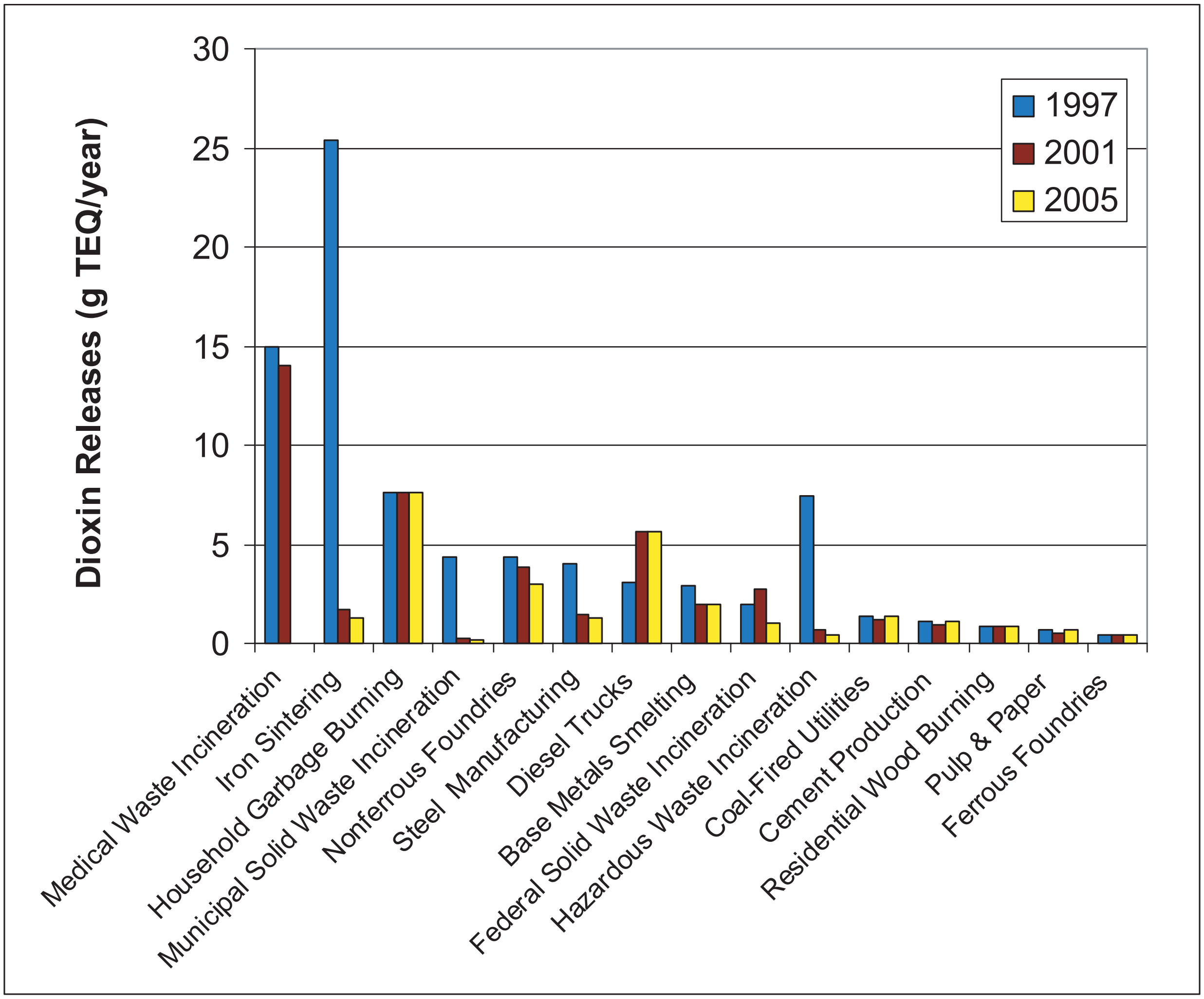


Figure 3-2. Top Canadian (Ontario Region) Dioxin/Furan Emission Sources.
Source: "Inventory of Releases - Updated Edition", February 2001, Environment Canada

of Releases - Updated Edition", February 2001, Environment Canada), and also includes a forecast for 2005. The renewed Canada-Ontario Agreement (COA) with Respect to 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 under way for dioxins/furans, such as Canada-Wide Standards for waste incineration, iron sinter and electric arc furnaces, and Ontario regulation to phase out hospital incinerators, it is expected that Canada will meet this commitment within the Great Lakes Basin by 2005.

Workgroup Activities

Workgroup Meetings

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

- The workgroup continues to follow the Dioxin/Furan Workplan formally adopted in December of 2003.
- The workgroup held a conference call on March 2, 2004, to discuss developing issue papers on uncontrolled combustion sources and receive comments from members.
- The workgroup developed four issue papers on uncontrolled combustion sources: agricultural burning, wildfires and prescribed burning, tire fires, and structural fires.
- The workgroup met on June 17, 2004, at the Binational Toxics Strategy Stakeholder Forum in Toronto, Ontario, to discuss the development of draft issue papers and inventory updates.
- The workgroup is developing a Management Assessment for Dioxins and Furans using the General Framework to Assess Management of GLBTS Level 1 Substances. The assessment will investigate available environmental data for dioxins in the Great Lakes Basin and utilize this data in determining recommendations for the group beyond the 2006 GLBTS deadline.

- The draft Management Assessment was presented to the Integration Group on October 7, 2004, and on October 14, 2004, the workgroup had an initial discussion via a conference call. Comments are being submitted to the co-chairs.
- The Burn Barrel Subgroup was formed in the spring of 2000 to address the emerging issue of household garbage burning. Through conference calls, surveys, and research, the subgroup developed a draft strategy in May 2001 to seek reductions in household garbage burning. The strategy was finalized in February 2004 and is 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. Household garbage burning 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 garbage burning typically is carried out in old barrels, open pits, woodstoves, or outdoor boilers. The Burn Barrel Subgroup, led by Bruce Gillies of Environment Canada (EC), is addressing this issue. Through surveys and research, the subgroup developed the Household Garbage Burning Strategy in May 2001 for seeking reductions in household garbage burning. The subgroup maintains a web site for information sharing at www.openburning.org.

The United States 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. EC-Ontario Region continued its partnership with EcoSuperior Environmental Programs for education and outreach in the Lake Superior Region. EC-Ontario Region also has supported a community education program in Eastern Ontario by Lanark and Leeds Green Community. In 2004, EC developed a new education program in partnership with Ontario First Nations Technical Services Corp. and EcoSuperior to work with First Nation communities in the Lake Superior Region.

This year, in addition to the available brochures, US EPA Region 5 developed a formal presentation on backyard burning issues for use at public meetings. Subgroup members assisted US EPA in developing a draft set of case studies for successful reduction of backyard burning. In the future, the case studies will be promoted as options for reducing burn barrels around the country. US EPA continues to maintain a web site of burn barrel information at www.epa.gov/msw/backyard.

Great Lakes States (including Illinois, Indiana, Minnesota, New York, Michigan, and Wisconsin) are continuing activities consistent with the Household Garbage Burning Reduction Strategy to educate and influence behavior change, supported by infrastructure and local by-laws.

Wood Preservation

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

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

Incinerator Ash Disposal

Questions regarding incinerator ash disposal have been raised by some Dioxin Workgroup members in the past. These issues include the significance of dioxins/furans in landfill leachates generated by disposed incinerator ash and how well these leachates are contained at existing landfills, both of which are uncertain. Improved air pollution control at waste incinerators can result in the transfer of toxic substances from air to ash. As a result, both the Canadian and U.S. co-chairs prepared a Discussion Paper on the current management system for incinerator ash. The ash is not routinely tested for dioxins/furans in either jurisdictions, and further information needed to be gathered. Available information showed that measured dioxin/furan levels were low, at concentrations less than 1 ppb, but measurements were taken using outdated techniques. In addition, the available literature does not provide evidence that disposal of municipal waste incinerator ash leads to dioxin leaching.

In 2003, Canada conducted a study in an attempt to answer these questions. Information was compiled on the management and disposal practices of residues generated from waste incinerators and coal-fired power plants in Ontario. Most of the residues generated are sent to a municipal landfill. Flyash that is designated as hazardous is sent to a hazardous waste landfill. Based on analytical data collected by EC in the late 1980s, the most significant source of dioxin/furan loading was from the SWARU municipal waste incinerator (over 200 grams (ITEQ) per year). Residues from this facility were disposed of at the local landfill site in Hamilton. Dioxin/furan levels in residues were below the detection limit for sewage sludge incinerators, and measurements were not available for hazardous waste and biomedical waste incinerators. For coal-fired power plants, the dioxin/furan loading in the coal ash was estimated to be 0.04 grams per year.

The study also concludes that non-polar organic compounds, including PCDD/PCDFs, are not readily soluble in water and remain strongly sorbed to particulate matter. The only potential migration pathway identified for these compounds is through sub-surface transport of colloidal particles, in which case the residues would have to be deposited with other materials containing a high organic content, such as compost or municipal solid waste. Although a well-engineered sanitary landfill should provide adequate control measures for the capture and treatment of any leachate generated, the most sound disposal option is the use of a monofill.

Other Activities

Inventory Improvements

US EPA maintains and annually updates the Toxics Release Inventory (TRI), a publicly available database that contains information on toxic chemical releases and other waste management activities. Due to the high toxicity of dioxins and furans to humans, US EPA added these as chemicals that facilities are required to report for the 2000 inventory. According to TRI, 140,291 grams of total releases of dioxin and dioxin-like compounds were reported for 2002 in the United States. More information is available on the web site at www.epa.gov/tri.

In addition to TRI, the eight Great Lakes States and the Province of Ontario maintain a regional emissions inventory for hazardous air pollutants, including dioxins and furans. US EPA also continues to update the National Dioxin Emissions Inventory, which indicates that over 90 percent of all dioxin releases in the United States are from air sources. US EPA is separately tracking emission reductions from the MACT program requirements for municipal waste combustors (MWCs) and medical waste incinerators.

PCDD (dioxin) and PCDF (furan), as a group, have been included in the list of substances for reporting under Environment Canada's National Pollutant Release Inventory (NPRI), beginning with the reporting year 2000. The reported information is made available to the public on an annual basis through the Environment Canada web site at www.ec.gc.ca/pdb/npri. Environment Canada will use the NPRI data to update the point source information in the Ontario Dioxin/Furan Release Inventory.

Since the initiation of the Canadian Voluntary Stack Testing Program in the spring of 2000, EC has conducted stack tests for dioxins and furans and many other substances of concern at eight volunteer facilities in Ontario. Between 2000 and 2002, a nickel-base metal smelter, two medical waste incinerators, a steel foundry, a Kraft boiler, and a crematorium were tested. In 2003, an additional Kraft boiler located in Marathon and two animal carcass

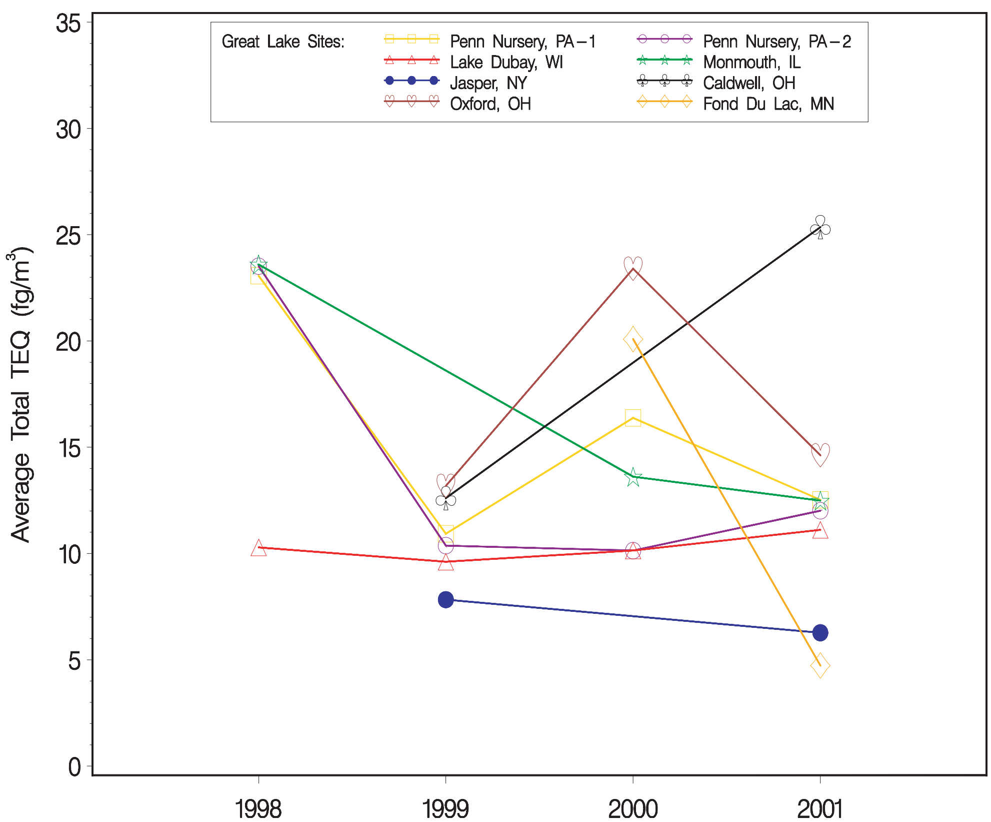


Figure 3-3. NDAMN Average Total TEQ Concentrations, including Dioxin, Furans, and Dioxin-like PCBs, for Sites in the Great Lakes Region, 1998-2001. Source: Original data from David Cleverly, US EPA, Office of Research and Development National Center for Environmental Assessment

incinerators (Ecowaste and Burneasy) were tested. The information gathered through this program will help improve release inventories for dioxins/furans as well as other Strategy substances.

Ambient Air Monitoring

US EPA conducts air monitoring for dioxin under the National Dioxin Air Monitoring Network (NDAMN), in order to track fluctuations in atmospheric deposition levels. NDAMN was initiated in year 1998. Results for years 1998 through 2001 are currently available (see Figure 3-3), and are discussed in section 8.0 of this report (see Figure 8-A16). No clear trends over time are apparent from the NDAMN data.

Ambient air monitoring of GLBTS substances has been conducted in Canada since 1996 through the National Air Pollution Surveillance Network (NAPS) (see Figure 3-4). Dioxins and furans have been monitored at seven stations in Ontario, comprised of four urban and three rural sites. Results show elevated levels at urban sites compared to rural sites but a decreasing trend in concentrations overall. All concentrations remain below the Ontario MOE ambient air quality criteria of 5 picograms per cubic metre (TEQ), 24 hour average. In 2002, the highest mean concentration in Ontario was 77 femtograms per cubic metre (TEQ), measured in Hamilton near the SWARU municipal waste incinerator. This incinerator was shut down in December 2002. In August 2003, PCDD/PCDF sampling began at an IADN site located at Burnt Island.

Western Lake Superior Sanitary District

Western Lake Superior Sanitary District's (WLSSD) discharge permit includes a requirement to implement a pollutant minimization plan for dioxin and PCBs. WLSSD

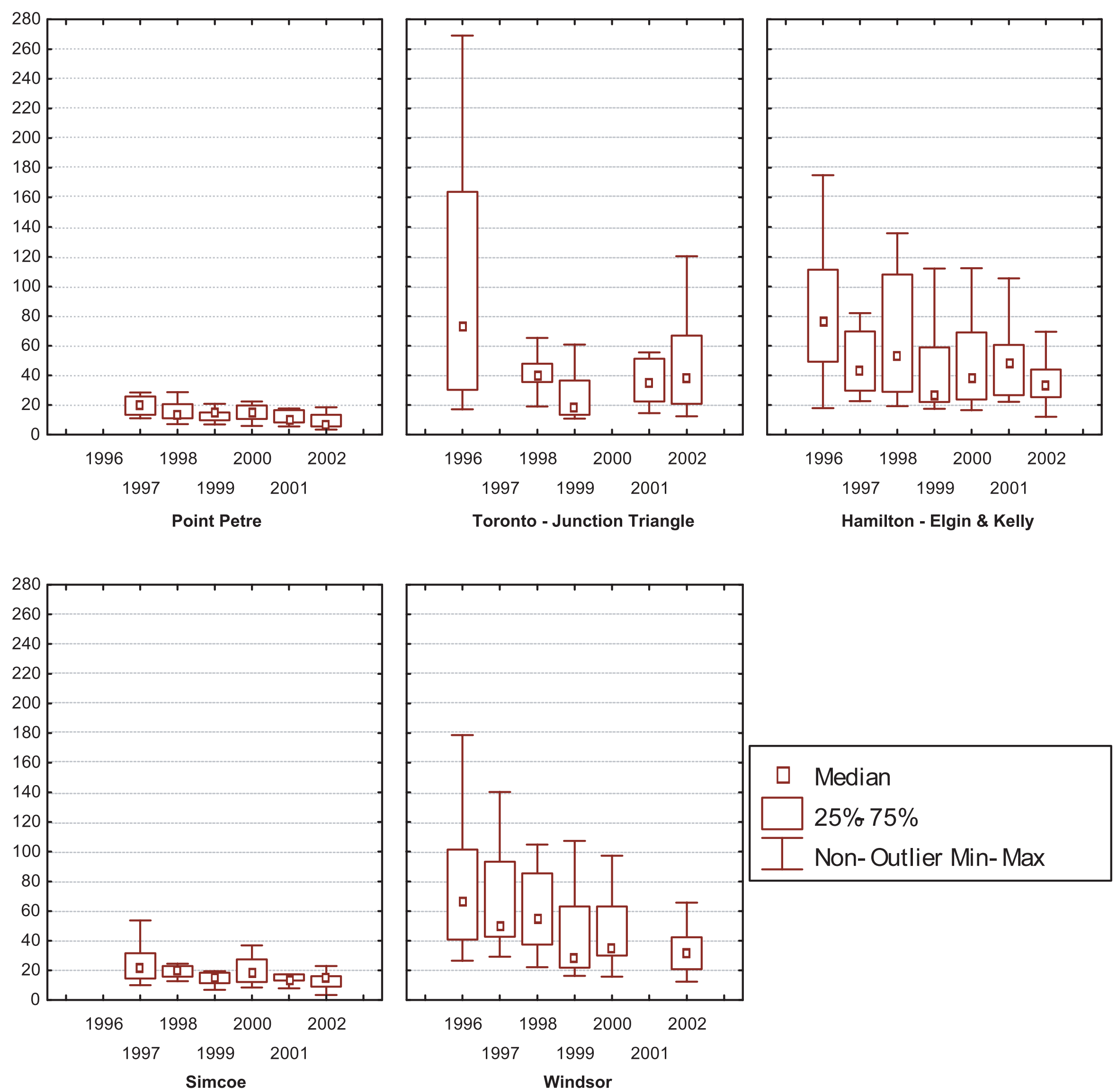


Figure 3-4. Trends in Median Annual TEQ Concentrations in Ambient Air at Ontario Sites, 1996-2002. Source: Environment Canada

has begun using high-resolution testing to conduct a treatment plant mass balance analysis. WLSSD also has measured major industrial and non-industrial customers to identify where progress could be made in reducing pollutant discharges.

To measure the amount of dioxin in WLSSD's effluent, a 300-liter sample was concentrated for analysis. Results have shown that the effluent is close to the GLWQA standard of 0.0043 picograms per liter TEQ. The removal rate of dioxin across the activated sludge treatment plant is about 99 percent, when the influent is compared to the effluent. WLSSD has shown that paper mills in its service area are not large dischargers of dioxin. Through the use of high-resolution testing, WLSSD has found that some areas of the wastewater collection system have elevated levels of dioxin and PCBs. This may present opportunities for future pollution prevention opportunities. The data show a general downward trend of dioxin in the influent going to the treatment plant and the biosolids. In a previous study of biosolids conducted by the US EPA and the Association for Metropolitan Sewerage Agencies, WLSSD had the lowest dioxin TEQ value of over 200 wastewater treatment plants.

Joint Priorities with Other GLBTS Workgroups

The Dioxin/Furan Workgroup has been coordinating efforts with the HCB/B(a)P Workgroup on issues that concern both chemical workgroups. Joint sources in the past included wood stoves and treated wood. The two workgroups are reviewing new sources with information gaps that have potential for joint work.

The Dioxin/Furan Workgroup is gathering information on co-planar PCBs, which are dioxin-like compounds, and will also be exploring potential joint activities with the PCB Workgroup.

Next Steps

In the past three years, the workgroup has focused its efforts on dioxin/furan releases from priority sectors identified through a Decision Tree process undertaken in 1999-2000. At this point, many of the sectors have been addressed through a combination of regulations, national and regional programs, and outreach efforts. However, information gaps on dioxin/furan releases remain for a number of other sources. The workgroup has agreed that it is now appropriate to develop a workplan to guide the workgroup in addressing new sources and issues for the next two years. A new workplan was finalized in December 2003 to set directions for the workgroup until 2005. This workplan includes: continued reporting of national/regional programs, characterizing new sources of concern, outreach efforts on new sources, continued implementation of the Burn Barrel Strategy by the Burn Barrel Subgroup, exploring pathway intervention, pursuing potential joint work with the B(a)P/HCB and PCB Workgroups, and tracking environmental monitoring information. The Management Assessment report is expected to set recommendations for the Dioxin/Furan Workgroup after 2005. This report is being reviewed and the management outcomes will be developed in consultation with the workgroup and interested stakeholders.

Rough Blazing Star
Photo courtesy of the USEPA

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.

From a 1990 baseline, the United States has significantly reduced their HCB releases from approximately 8,055 pounds in 1990 to 2,911 pounds in 1999. Figure 4-1[4] shows HCB release estimates and progress achieved since 1990. Most of this reduction has been obtained by lower levels of residual HCB in pesticides as well as from chlorinated solvent production and pesticide manufacture. These three categories have combined for roughly 5,000 lbs per year of HCB reductions.

It should be noted however that there are differences between the 1990 and the 1999 inventory and emission categories. For example, open burning represents an instance of an emission source included in the 1999 data that was not included in the 1990 inventory. The 1990 and 1999 inventories represent the best inventory information that is available and provide a useful snapshot of HCB emissions in 1990 and 1999. However, due to inconsistencies in how they were prepared, they cannot be used to establish a specific reduction in HCB emissions between 1990 and 1999.

Figure 4-2[5] shows B(a)P release estimates and reduction progress within the Great Lakes Basin from 1996 through 2001. Emissions of B(a)P from the eight Great Lakes states have been reduced by approximately 74 percent during that time. Petroleum refinery emissions have been nearly eliminated, and emissions from primary aluminum manufacture and coke ovens have been substantially reduced. Residential wood combustion emissions, which have declined significantly since 1996, remain the largest source of B(a)P emissions.

From a 1988 baseline, Canada has reduced HCB releases to the Great Lakes Basin by 62 percent, and B(a)P releases by 45 percent. Figure 4-3[6] shows HCB release estimates and progress achieved towards meeting the 90 percent reduction target. Lower HCB levels in agricultural pesticides are responsible for over 80 percent of the HCB reductions achieved in Ontario since 1988; however, current release estimates still point to this sector as a dominant HCB source in the basin. Similarly, Figure 4-4[7] shows B(a)P release estimates and reduction progress. Improvements in cokemaking operations are responsible for over 70 percent of the B(a)P reductions achieved in Ontario since 1988. Ninety percent of the remaining B(a)P releases are from residential wood combustion, cokemaking, use of creosoted wood products, and motor vehicle emissions.

Prairie Phlox
Photo courtesy of the USEPA

[4] Based on EPA's 1990 National Toxics Inventory and 1999 National Emissions Inventory updated with 1999 pesticide application emissions data.

[5] Based on the Great Lakes Regional Air Toxic Inventory for 1996 through 2001, which includes B(a)P releases from the eight Great Lakes States and the Province of Ontario.

[6] Based on "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., updated by Environment Canada, Ontario Region, sector release estimates, and by NPRI facility release data.

From a 1988 baseline, Canada has reduced HCB releases to the Great Lakes Basin by 62 percent, and B(a)P releases by 45 percent. Figure 4-3[8] shows HCB release estimates and progress achieved in meeting the 90 percent reduction target. Lower HCB levels in agricultural pesticides are responsible for over 80 percent of the HCB reductions achieved in Ontario since 1988; however, current release estimates still point to this sector as a dominant HCB source in the basin. Similarly, Figure 4-4[9] shows B(a)P release estimates and reduction progress. Improvements in cokemaking operations are responsible for over 70 percent of the B(a)P reductions achieved in Ontario since 1988. Ninety percent of the remaining B(a)P releases are from residential wood combustion, cokemaking, use of creosoted wood products, and motor vehicle emissions.

Workgroup Activities

Workgroup Meetings

In the past year, the Hexachlorobenzene/Benzo(a)pyrene Workgroup has focused on:

- Promoting existing residential wood combustion programs and proposed initiatives aimed at providing consumers with information on clean and safe wood burning practices, and promoting US EPA-certified wood stoves over uncertified models.
- Resolving a critical inventory issue concerning releases attributed to the application of pesticides containing trace levels of HCB. Current estimates, using maximum US EPA HCB product content limits and assuming all applied HCB is volatilized, suggest that pesticide application is a dominant HCB source in the Great Lakes Basin.
- Promoting scrap tire pile inventory and mapping, and clean-up initiatives currently under way in the Great Lakes Region, i.e., US EPA Scrap Tire Pile Mitigation Support Project and Ontario Tire Stewardship Plan. Actions taken to eliminate scrap tire piles lessen the potential for toxic releases, including B(a)P, as a result of fires at scrap tire sites.
- Other actions aimed at updating and refining HCB and B(a)P release inventories have included:
    - Issue paper prepared in March 2004 with new toxic release estimates, including B(a)P estimates, for uncontrolled combustion sources (i.e., wildfires, prescribed burning, tire fires, and structural fires)
    - Ontario's on-road motor vehicle sector B(a)P releases updated based on use of more recent emission factors
    - Reassessments under way on HCB releases from use of pentachlorophenol-treated wood products, and B(a)P releases from use of creosoted-treated wood products;
    - Since spring of 2000, Environment Canada's voluntary stack testing initiative has generated information on the release of GLBTS substances from 10 priority sources, with the latest tests carried out at an animal crematorium in November 2003.

Minutes of HCB/B(a)P Workgroup meetings are located on the GLBTS web site www.binational.net.

U.S. Reduction Activities

Wood Stoves and Fireplace Initiatives in Progress

US EPA wood stoves/fireplace initiatives under way or being considered are summarized as follows:

- A ready-to-go media outreach package for pre-wood stove fireplace wood-burning seasons and pre/post-storm news for national distribution.
- A Fireplace/Wood Stove Website to provide consumers with information on health effects of wood smoke, benefits of using EPA-certified stoves, how to burn efficiently and safely.
- A Wood Stove/Fireplace Fact Sheet to provide information on clean burning, fuel use, and safety; and backgrounder directed towards State, local and tribal agencies interested in developing wood stove/fireplace emission reduction programs.
- Additional Wood Stove Change-out Programs being considered for the next few years, i.e., 1 to 3 pilot projects. It is estimated that 85 to 90 percent of operating wood stoves are still uncertified with replacement costs running in the order of $1,000 to $2,000 for a new wood stove, and $1,500 to $2,500 for a gas-fired stove.
- "Green" Stoves Labeling Program
- Fireplace Consensus Test Method for testing fireplace emissions. This could lead to a fireplace emission standard and/or national building code and lower emissions.

[7] Based on "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., updated by Environment Canada, Ontario Region, sector release estimates, and by NPRI facility release data.

[8] Based on "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., updated by Environment Canada, Ontario Region, sector release estimates, and by NPRI facility release data.

[9] Based on "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., updated by Environment Canada, Ontario Region, sector release estimates, and by NPRI facility release data.

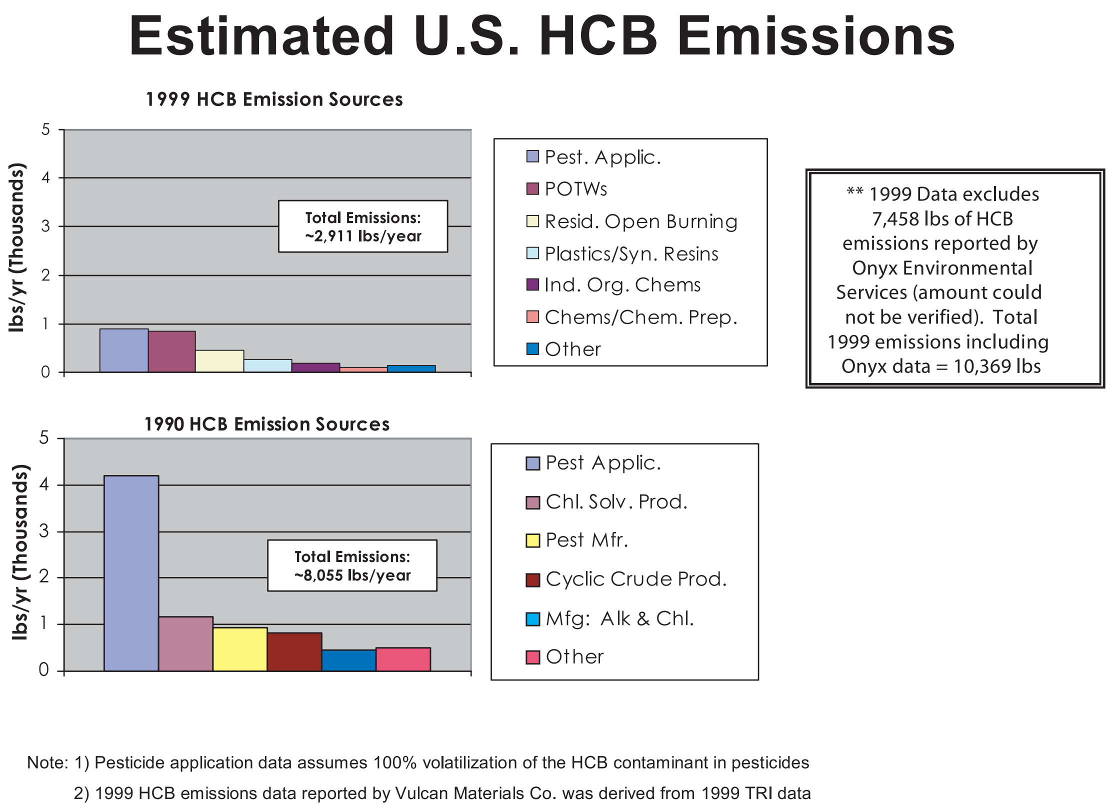


Figure 4-1. Estimated U.S. HCB Releases for 1990 and 1999 (lbs/year). Source: US EPA 1990 National Toxics Inventory and 1999 National Emissions Inventory data updated with 1999 pesticide application emissions data

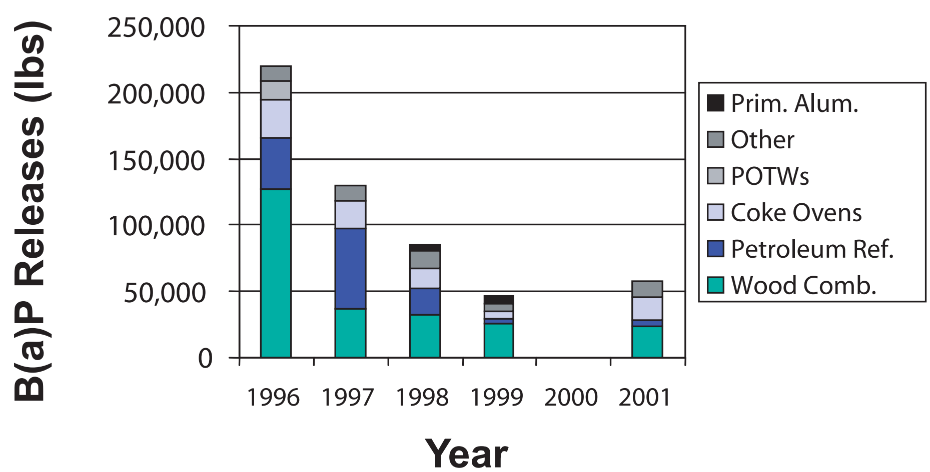


Figure 4-2. B(a)P Releases from the States and Province around the Great Lakes, 1996-2001 (lbs/year). Source: Great Lakes Regional Air Toxic Emission Inventory Project

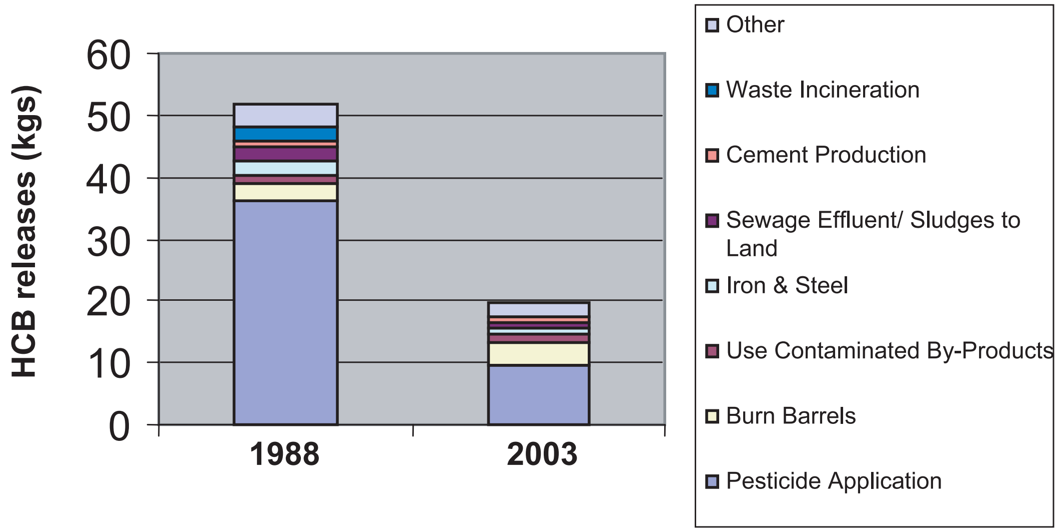


Figure 4-3. Estimated HCB Releases in Ontario by Sector, 1988 and 2003 (kg/year). Source: Environment Canada (Environmental Protection Branch - Ontario Region, Toxics Prevention Division) Inventory as of October 13, 2004

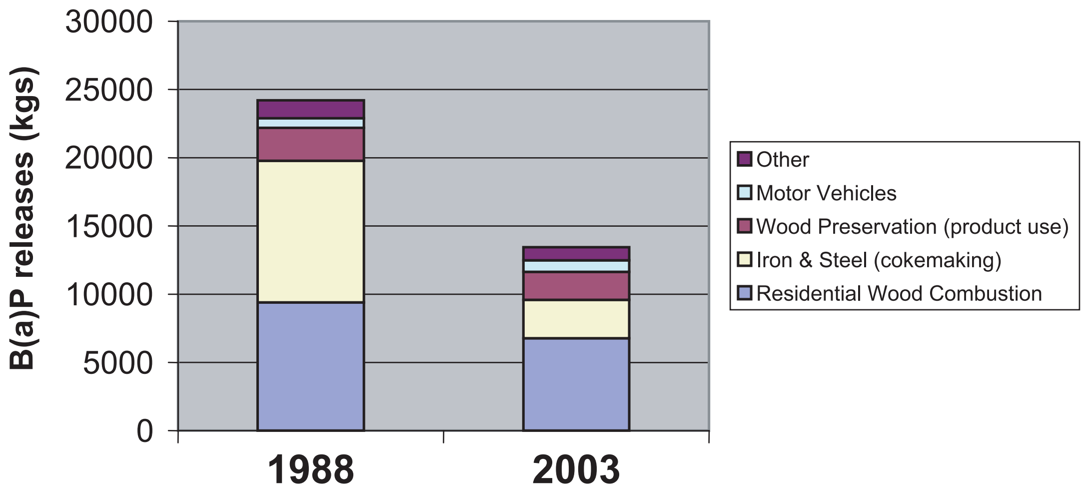


Figure 4-4. Estimated B(a)P Releases in Ontario by Sector, 1988 and 2003 (kg/year). Source: Environment Canada (Environmental Protection Branch - Ontario Region, Toxics Prevention Division) Inventory as of October 13, 2004

Scrap Tire Mapping and Inventory Initiative

Under a Scrap Tire Pile Mitigation Support Project, US EPA has developed a scrap tire pile inventory, along with GIS mapping, and has prepared training and marketing outreach documents on stock pile mitigation. About 90 percent of the GIS mapping of large tire piles (> 500 tires) has been completed in 10 states including the Great Lake States of Indiana, Michigan, Ohio, New York, and Pennsylvania. The mapping and inventory initiative has consistent database fields (e.g., location coordinates, number of stored tires), which facilitates the tracking and prioritizing of mitigation efforts. A "best practices" guidebook for stockpile mitigation is being developed and will be completed by the end of 2004, and a scrap tire pile cleanup forum was held in Chicago on February 23-24, 2004 for scrap tire program managers and clean-up experts to discuss and share strategies. The goal is for 50 percent of the stockpiles to be gone by 2007-2008, and the rest by 2015.

US EPA Promulgates Final Rule for Coke Ovens

US EPA's final rule, National Emissions Standards for Hazardous Air Pollutants for (NESHAP) for Coke Ovens: Pushing, Quenching and Battery Stacks has been promulgated with a compliance deadline three years from April 2003; the rule will result in additional B(a)P emission reductions. There are two tracks for residual risk standards for coke oven batteries: 1) residual risk standards are being developed for 10 percent of the coke oven batteries (plants which have met the 1993 MACT standards), which will further tighten emissions from around door, lids, etc.; and 2) the remaining coke oven batteries will be subject to a continual tightening of standards within a 2010 timeframe. In addition, US EPA has finalized rules on wastewater discharges from iron and steel facilities.

Canadian Reduction Activities

Wood Stove Educational Workshops Well Received

Residential wood combustion is responsible for an estimated 50 percent of B(a)P releases in the basin. Ontario's residential wood combustion program is based on a three-pronged approach to reduce emissions: (1) good equipment; (2) good fuel; and (3) smart consumers and users.

Fifty-one Burn it Smart public education workshops were delivered in 2003-2004 in 40 Ontario rural and First Nations communities by health, fire safety, and wood burning experts. The Burn it Smart campaign has been well received with an average of 42 attendees per workshop and an overall attendance of more than 2,100. The campaign features presentations, educational material on good wood burning practices, along with displays and demonstrations, such as the use of "burn trailers" to promote EPA-certified stoves. Recently, the Burn it Smart core presentation has been updated and a "train the presenter" workshop held; also, a technology demonstration video is now available showing the environmental impact of certified versus uncertified wood stove, and "Good Firewood" and "Don't Burn Garbage" fact sheets have been prepared. In addition, 12 Wood Energy Technology Transfer Inc. (WETT) training workshops have been held in Ontario. WETT is a non-profit training and educational association promoting safe and efficient use of wood burning system in Canada.

Toxic Emissions from Scrap Tire Fires Documented

Ontario has in the order of 5 to 6 million stockpiled scrap tires. Tire fires can release enormous quantity of toxic contaminants, including the GLBTS priority contaminants B(a)P and HCB, but little information existed on the significance of this source within the Great Lakes Basin. In March 2004, Environment Canada prepared an issue paper documenting the information available on toxic emissions from tire fires in the basin for the province of Ontario and the eight Great Lake States. The paper concluded that no significant tire burning activity has occurred in Ontario in the recent past.

Other Ontario actions include the passing of the Ontario Waste Diversion Act in June 2002. Waste Diversion Ontario (WDO), a multi-stakeholder board was established to develop, implement, and operate a scrap tire program. Ontario Tire Stewardship (OTS), a not-for-profit organization, composed of an industry board is now in place, with one of its missions being to maximize the number of scrap tires processed and eliminate scrap tire stockpiles and landfill disposal. A proposed OTS scrap tire diversion program has been approved by the WDO in late September 2004, and is awaiting approval from the Ontario Ministry of the Environment. More information on this initiative can be found at their web site www.ontariotirestewardship.ca.

Coke Ovens Achieve B(a)P Reductions with Environmental Best Practices Manual

Over 70 percent of the B(a)P reductions on the Ontario side of the basin have been achieved by four metallurgical coke producers. Each coke producer operates in accordance with the Canadian Steel Producers Association's Environmental Best Practice Manual (EBPM) for Controlling and Reducing Emissions of Polycyclic Aromatic Hydrocarbons (PAH) from Metallurgical Coke Production, which is consistent with Environment Canada's Environmental Code of Practice for Integrated Steel Mills. Independent third-party audits verify that the sector is meeting its targeted PAH reduction goals set out in the EBPM; to date, PAH reductions are estimated at 74 percent of the 1993 base year release, or 56 tonnes. B(a)P is one of the 10 PAHs targeted in the EBPM.

Implementation of Standards Reduce Waste Incinerator Releases

Due in large part to the implementation of Canada-Wide Standards for municipal solid waste, sewage sludge, and hazardous waste incinerators, this sector is no longer a major HCB source in Ontario. The most recent reduction action was the enactment of Ontario regulations in December 2003 requiring the closure of older hospital incinerators, i.e., those approved prior to December 6, 2002. Overall, it is estimated that Ontario HCB releases from waste incineration has been reduced by 80 to 90 percent.

Next Steps

U.S. and Canadian national emissions inventory programs have greatly refined the accuracy of HCB and B(a)P release inventories within the basin; however, releases are still considered order of magnitude estimates for a number of sectors. The HCB and B(a)P Workgroup efforts will continue on filling data gaps with a focus on non-point source sectors such as: the application of pesticides, use of creosoted-treated wood products, use of pentachlorophenol-treated wood products, residential wood combustion, wastewater releases from sewage treatment plants, and motor vehicles.

Next steps include the following actions:

- Continue to provide outreach on residential wood combustion.

  US EPA wood stove/fireplace initiatives being considered or under way include development of a media outreach package for national distribution prior to the wood burning season; a website to provide consumers with information on health effects of wood smoke, benefits of using EPA-certified stoves; fact sheets on clean and safe wood burning practices; additional wood stove change-out initiatives; development of a "Green" stove labeling program; and development of a testing method for fireplace emissions.

  Ontario Region's residential wood combustion program will deliver more "Burn it Smart" workshops in rural and First Nations communities; prepare additional fact sheets promoting clean and safe wood burning practices; and develop visual aids/videos for public events and tradeshows. Also, Ontario Region will conduct a survey to identify the impact of previous change-out programs in northern Ontario, and work with US EPA to conduct a study to measure the emissions from burning artificial logs in a fireplace setting.

- Confirm HCB release estimates for the pesticide sector, and if needed, start discussion with stakeholder on reduction strategies
- Complete Best Practices Guidebook for Scrap Tire Pile Clean-up. In addition, two scrap tire pile training sessions are planned on tire pile cleanup and on putting out tire fires.
- Continue to support GLBTS initiatives promoting alternatives to the burning of household waste.
- Track HCB and B(a)P releases reported by national release inventories.

Aside from several industrial sectors that are fully engaged in priority national or regional toxic reduction strategies or programs, where little GLBTS opportunity exists to affect further reductions, the majority of the HCB and B(a)P releases in the basin are associated with non-point sources, e.g., residential wood combustion, vehicle emissions, open burning, combustion of fossil fuels, and use of products with trace HCB contaminant levels. The workgroup must focus on these non-point sources to effect meaningful reductions in the future.

Grand Haven Lighthouse in Storm
Photo by Carl Ter Haar,
courtesy of the Michigan Travel Bureau

[10] From Canadian Steel Producers Association web page at: www.canadiansteel.ca/newsroom/reports 2004_CSPA_Achievements%20challenges%20and%20opportunities.pdf and www.canadiansteel.ca/newsroom/reports/ 2002_SCA_Final_e_Report.pdf.

5.0 INTEGRATION WORKGROUP

Integration Workgroup Highlights 2004

Management Framework

The Great Lakes Binational Toxics Strategy identifies specific reduction challenges or goals for each Level 1 substance for the U.S. and Canada. The time frame for achieving the Strategy's challenge goals expires in 2006. As 2006 approaches, an analysis of progress and determination of the next steps is needed to respond to the mandate set forth in the Strategy. To accomplish this, in 2002, the Integration Workgroup began to develop a process or framework that is both transparent to stakeholders and consistent for all Level 1 substances. After a number of iterations with the involvement of GLBTS stakeholders, Lakewide Management Plan (LaMP) representatives, environmental and health monitoring managers, and GLBTS workgroup co-chairs and program coordinators, the result is the General Framework to Assess Management of GLBTS Level 1 Substances. The framework is a flow diagram that provides a tool to guide the Parties (Environment Canada and US EPA) and stakeholders in evaluating progress and the need for further action by the GLBTS on Level 1 substances. Details on the background and objectives of the framework, as well as the framework itself, are provided in Appendix B.

As part of the process to develop the General Framework to Assess Management of GLBTS Level 1 Substances, a workshop was held in Chicago on April 14-15, 2004, with representatives from EC, US EPA, the Ontario Ministry of the Environment, and the Canadian Department of Fisheries and Oceans. The framework is comprised of two main parts: an environmental analysis and a GLBTS management assessment. The involvement of monitoring program managers and Lakewide Management Plan representatives was sought to assist in implementing the environmental analysis part of the framework.

At the June 18, 2004 Integration Workgroup meeting, the workgroup agreed to commence pilot assessments for OCS and dioxins/furans, using the general framework, by the end of 2004. Drafts of the OCS and dioxin/furan assessments were presented at the October 7, 2004, Integration Workgroup meeting.

Brief summaries of the Integration Workgroup meetings held over the past year are presented below.

Integration Workgroup Meeting – June 18, 2004, Toronto

The first Integration Workgroup meeting was held on June 18, and focused on the development of the General Framework to Assess Management of GLBTS Level 1 Substances. The history of the development of the framework was described, beginning in 2002 and ending with changes made as a result of the April 2004 workshop with environmental and health monitoring managers, LaMP representatives, and GLBTS workgroup co-chairs and program co-ordinators. The following timetable for implementing the framework using a pilot approach was presented: complete a draft for OCS by September 2004, a draft for dioxins/furans by December 2004, and drafts for the other Level 1 substances by February 2005. Finally, a panel of experts presented their views on the potential impact on the GLBTS of substances designated as toxic under CEPA.

Presentations at this meeting included:

- Framework to Assess Management of GLBTS Level 1 Substances – An update – Alan Waffle, EC
- Next Steps for Framework Implementation – Ted Smith, US EPA
- Potential Impact of Designated CEPA Toxics on the GLBTS – Panel Discussion – Moderated by Allan Jones
    - Existing Substances Program – Janet Beauvais, Director, Risk Assessment Directorate, EC
    - CEPA Assessment for Human Health for Existing Substances The Path to 2006 & Beyond – Bette Meek, Manager, Environmental Substances Division, Health Canada
    - Possible Future Linkages Between CEPA and the GLBTS – Jim Smith, Manager, Integrated Programs Division, EC

Integration Workgroup Meeting – October 7, 2004, Toronto

The second Integration Workgroup meeting was held in conjunction with the State of the Lakes Ecosystem Conference (SOLEC) in Toronto on October 7. The focus of this meeting was the pilot assessments for OCS and dioxins/furans that were prepared using the General Framework to Assess Management of GLBTS Level 1 Substances. In addition, EC presented a proposed format for Internet access of environmental quality trends of GLBTS substances.

Presentations at this meeting included:

- Substance Pilot Updates - General Framework to Assess Management of GLBTS Level 1 Substances
  - OCS – Frank Anscombe, US EPA
  - Dioxins/Furans – Anita Wong, EC
- Application of the General Framework to All Remaining GLBTS Level 1 Substances: Timeline – Alan Waffle, EC
- Substance Profiles – Scott Painter, EC

Integration Workgroup Meeting – December 1, 2004, Chicago

The final meeting of the year for the Integration Workgroup was held in Chicago on December 1, 2004. This meeting focused on completing the pilot GLBTS management assessments for OCS and dioxins/furans.

Presentations at this meeting included:

- Substance Pilot Updates - General Framework to Assess Management of GLBTS Level 1 Substances
  - OCS – Tom Tseng, EC
  - Dioxins/Furans – Anita Wong, EC
- SOLEC - Chemical Integrity Workshop – Dale Phenicie, CGLI
- International Toxics Reduction Efforts – Engaging GLBTS Stakeholders – Luke Trip, CEC SMOC and Angela Bandemehr, US EPA Office of International Affairs

Outlook for 2005

In 2005, the Integration Workgroup will work to complete GLBTS management assessments for all Level 1 substances and to outline next steps for 2006 and beyond.

Stakeholder Forum Highlights 2004

Stakeholder Forum

A GLBTS Stakeholder Forum is convened biannually with the purpose of highlighting issues and initiatives of relevance to the Strategy. In response to comments from stakeholders, the format of the Stakeholder Forum was changed in 2004 by shortening the plenary session to allow more time for the workgroups to meet. The following GLBTS Stakeholder Forum meetings were convened in 2004:

- June 17, 2004, Toronto, and
- November 30, 2004, Chicago.

Stakeholder Forum Meeting – June 17, 2004, Toronto

Robert Telewiak, Vice President of Environment, Health and Safety at Noranda, Inc. / Falconbridge, Ltd., provided the keynote address. Mr. Telewiak described the environmental performance at Noranda/Falconbridge, giving an overview of the company, its emission reductions of various GLBTS substances, recycling efforts, and some thoughts on virtual elimination and the path forward. As part of the PCB Workgroup's PCB Reduction Recognition Program, Ken De (EC) presented awards to Ken McWhirter of the City of Thunder Bay, and Scott Cox of Canadian Niagara Power. The PCB Reduction Recognition Program recognizes organizations that have reduced high-level PCBs and have voluntarily met or exceeded the GLBTS challenge goal.

Workgroup co-chairs from each of the active substance workgroups (mercury, PCBs, dioxins/furans, and HCB/B(a)P) presented information on the status of the GLBTS with respect to the challenge goals. Following the report of progress on the dioxins/furans challenge, Anita Wong (EC) and Erin Newman (US EPA) presented an award to Bruce Gillies (EC) for his ongoing efforts and dedication as chair of the Burn Barrel Subgroup of the Dioxins/Furans Workgroup. The plenary session was followed by workgroup break-out sessions for mercury, PCBs, dioxins/furans, and HCB/B(a)P.

Stakeholder Forum – November 30, 2004, Chicago

The second Stakeholder Forum meeting of 2004 featured a keynote address by Dr. Dan Meyer of the American Dental Association on Best Management Practices for dental amalgam. The workgroup leaders also reported on progress toward the strategy challenges for mercury, dioxins/furans, PCBs, HCB/B(a)P, and OCS. The forum was followed by substance workgroup break-out sessions for mercury, PCBs, dioxins/furans, and HCB/B(a)P.

6.0 SEDIMENTS CHALLENGE

Under the Great Lakes Binational Toxics Strategy, EC and US EPA 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 assessment and remediation activities undertaken in the U.S. and Canada are described below.

2004 Sediment Assessments with US EPA'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, US EPA's Great Lakes National Program Office (GLNPO) has provided 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 two and 50 feet. Using a vibrocoring 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, 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 39 locations, including 27 of the 31 Great Lakes Areas of Concern (AOCs). In 2004, the following surveys were conducted with the assistance of the R/V Mudpuppy:

- **Indiana Harbor and Canal, IN** – Assisted U.S. Army Corps of Engineers with field support to conduct a wastewater treatment study;
- **Clinton River, MI** – Provided field support to Oakland University and Wayne State University researchers to assess the impact of contaminated sediments on water quality and ecosystem health within the AOC;
- **Detroit River** – Trenton Channel, MI – Collaborative effort between GLNPO and the Michigan Department of Environmental Quality (MDEQ) to determine the extent and magnitude of sediment contamination at the Firestone Steel Site in the Trenton Channel of the Detroit River;
- **River Raisin, MI** – Assisted the MDEQ with field support to determine PCB concentrations in sediments underlying the federal navigation channel;
- **Rouge River, MI** – Collaborative effort between GLNPO and the MDEQ to delineate contamination and to determine contamination levels in sediments underlying the federal navigation channel;
- **Saginaw River and Harbor, MI** – Assisted MDEQ with field support to characterize the distribution of dioxin, co-planar PCBs, and dioxin-like toxicity in sediments and floodplain soils of the Saginaw Bay Watershed;
- **Torch Lake, MI** – Assisted MDEQ with collection of samples to determine the magnitude and extent of contamination in Torch Lake;
- **White Lake, MI** – Assisted MDEQ with field support to conduct a post-remediation monitoring study at the Occidental site and an off-site release assessment at the Dupont site; and
- **Kinnickinnic River, WI** – Assisted U.S. EPA Region 5 Superfund and Wisconsin Department of Natural Resources with sampling to evaluate the extent of contamination upstream and downstream of the Solvay Superfund site.

Great Lakes Sediment Remediation Projects - 2003[11]

In 2003, more than 975,000 cubic yards of sediment were remediated from eight U.S. sites and one Canadian site in the Great Lakes Basin. Four of these sites initiated work for the first time in 2003; these four, and one other site, completed their remedial actions in 2003. The Pine River site was in its fifth year of operation and continued with the remediation of contaminated sediment into 2004. One large-scale project, U.S. Steel – Gary Works, made up approximately 80 percent of the total volume of contaminated sediment remediated in 2003.

The following is a list of details relating to remediation sites in the U.S. and Canada:

[11] Sediment remediation data for 2003 is presented because data lag a year behind in reporting (e.g., 2004 data will become available in 2005).

U.S. Sites

Newton Creek: The Wisconsin Department of Natural Resources determined in its study titled Newton Creek System Sediment Contamination Site Characterization Report (WDNR, 1995) that ecological impacts to Newton Creek and Hog Island Inlet were severe. Contaminants found at that time included diesel range organics, oil and grease, polynuclear aromatic hydrocarbons, lead, mercury, and chromium. In 2003, the Department of Natural Resources dredged 4,000 cubic yards of visually contaminated sediments from Segments B-K of Newton Creek.

Occidental Chemical Corporation: As part of the final remedy of the RCRA Corrective Action Order, contaminated sediment in White Lake containing >2 ppm PCBs and >0.45 ppm HCB was dredged below the Occidental outfall. Dredging was performed from July 21, 2003 to September 10, 2003, using a cable crane equipped with a Cable Arm environmental bucket. Confirmation sampling showed that clean-up performance standards were achieved.

White Lake Tannery Bay: The Whitehall Leaver Company (Genesco, Inc.) operated a former tannery in the city of Whitehall on the shore of White Lake in an area known as Tannery Bay, Muskegon County. Since 1944, Genesco conducted a chrome tanning process at its facility that involved treating leather with chromic sulfate solution in order to replace protein in animal hides with chromium. From 1944 through 1976, in operation-related activities, the tannery released hazardous substances including, but not limited to, arsenic, mercury, chromium, and organic chemicals to the soils, sediments, surface water, and groundwater in and around White Lake. Remediation involved the removal of this waste material from Tannery Bay.

Velsicol Chemical - Pine River: During the fifth year of sediment work on the Pine River in Michigan, the US EPA Superfund removed 62,000 cubic yards of contaminated sediment.

TPI Petroleum, Inc.-Pine River: During the summer of 2003, 48,101 cubic yards of petroleum-contaminated sediments were removed from Horse Creek and the Pine River. Approximately 32,000 cubic yards of the petroleum-contaminated sediments were removed from the Pine River with a hydraulic dredge.

Black River: Seven areas within the former Bangor Millpond were identified for clean-up based on their contamination with PCBs and/or chromium. The clean-up level was determined by site-specific toxicity testing. The affected area included marshland and stream sediments in the former impoundment near the outfall of the former Du-Wel plant, now owned by Bangor Industries, and downstream as far as the dam at Second Street. The plant historically was a metal finishing, plating, and painting facility. From the fall of 2002 to December of 2003, the clean-up included mechanical and hydraulic dredging of sediments with dewatering using geobags. Sediments were taken to a licensed landfill for disposal. The remediation work was completed in the spring of 2004. Because of serious erosion concerns and concerns for the safety of the Center Street Bridge, final restoration included the use of rip rap to stabilize the riverbank near the Center Street Bridge.

Wolf Creek: During the fall of 2003, 1,948 cubic yards of mercury-contaminated sediment was removed from two small ponds and a stream downstream from an industrial point source.

U.S. Steel: The Grand Calumet Sediment Remediation Project was conducted pursuant to a RCRA Order and Clean Water Act Decree. The order and decree required U.S. Steel to remove all non-native sediments from the first five miles of the Grand Calumet River. The sediments were placed in a corrective action management unit on U.S. Steel property.

Fields Brook Superfund Site (completed, but not reported, in 2002): Remedial action work began in the field on May 25, 2000 with the construction of an on-site "TSCA-equivalent" landfill. Excavation began in the brook on September 22, 2000. Excavation of contaminated floodplain soil and sediment continued until October 16, 2000, when dense non-aqueous phase liquid (DNAPL) was discovered under brook sediment and floodplain soils in the upper industrial reaches of the brook. On May 7, 2001, excavation work recommenced in other areas of the brook, while work within the DNAPL-impacted areas remained on hold. Ultimately, the DNAPL-impacted material was thermally treated on-site. The excavation of Fields Brook sediment and floodplain soils continued until December 16, 2002. Site mitigation in the brook and floodplain was performed in late 2002 and completed in March 2003. Vegetation and wildlife have begun to return to the area.

Figure 6-1 presents the cumulative volume of sediment remediated in the U.S. since 1997. Information included in the bar graph are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the Great Lakes Sediment Remediation Project Summary Support, Quality Assurance Project Plan. Detailed project information is available upon request from project managers.

Canadian Sites

St. Lawrence River (Cornwall), Thunder Bay, and Peninsula Harbour: Work continued on the assessment of mercury bioaccumulation at these three locations. Technical assessments are being used as the basis for consultations with local stakeholders to determine the basis and need for any remedial interventions. The work is being undertaken coincident with the development of a Canada-

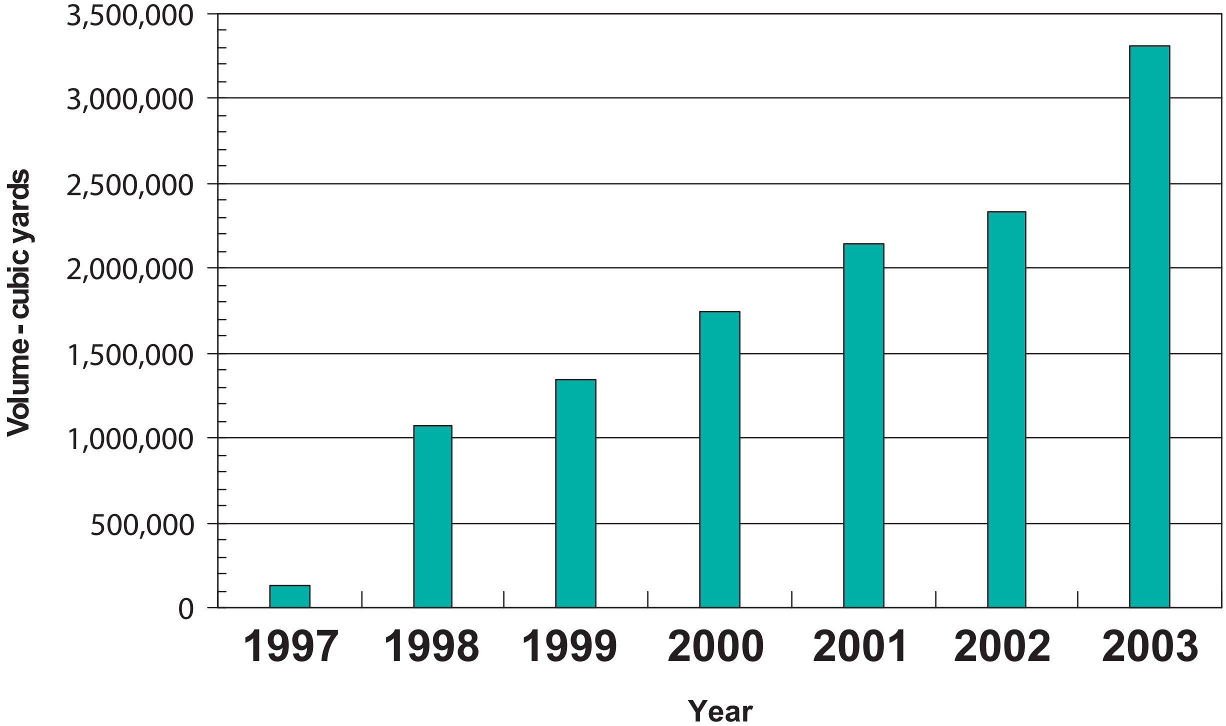


Figure 6-1. Cumulative Volume of Sediment Remediated in the U.S. Since 1997.[12] Source: US EPA – Great Lakes National Program Office

Ontario risk-based, decision-making framework for contaminated sediments, which is anticipated to be completed in 2004.

Hamilton Harbour (Randle Reef): A conceptual design and scoping document for the preferred remedial option for Randle Reef was prepared, and comments were solicited at a public open house, held in June 2003. The proposed remedial design involves a dry cap diked containment facility about 9.5 hectares in size. This would cover in-situ approximately 130,000 cubic metres of sediments and contain approximately 500,000 cubic metres of contaminated sediments from the immediate surrounding project area, as well as other toxic sites in the harbour. Sediments at Randle Reef have particularly high levels of PAHs and metals. Work on project feasibility and engineering is anticipated to get underway in 2004-2005 (for additional information on this project see http://sustainabilityfund.gc.ca/backgrounder_e.html).

St. Clair River: Between May and October 2003, Dow Chemical Canada Inc. completed Phase 2 of its sediment remediation project in the St. Clair River adjacent to its industrial plant site at Sarnia, Ontario. Approximately 9,800 cubic metres of sediment were hydraulically dredged from an area covering approximately 252,000 square feet. Sediment and approximately 55 million gallons of water were processed at an on-shore facility. Most of the sediment, following dewatering, was disposed of as non-hazardous waste at the company's landfill. The third and final phase of this remedial project was scheduled for 2004. The total volume of sediment associated with the three-year project is estimated at 15,000 cubic metres. Contaminants found in the sediment include the GLBTS Level I substances mercury, HCB and OCS, and the Level II substance hexachlorobutadiene.

Supporting Table and Graphics

Table 6-1 reports progress on sediment remediation projects at both Areas of Concern and non-Areas of Concern in the U.S. and Canada, from 1997 through 2003. The maps on the following pages illustrate the progress and achievements made in sediment remediation activities in the Great Lakes from 1997 to 2003. Information included in the tables and maps are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the Great Lakes Sediment Remediation Project Summary Support Quality Assurance Project Plan. Detailed project information is available upon request from project managers. On occasion, project managers may submit to GLNPO updated sediment remediation estimates on projects previously reported on. Always refer to the most current version of the GLBTS Progress Report for the most up-to-date sediment remediation estimates.

[12] U.S. EPA Great Lakes National Program Office. 2005. Quality Assurance Project Plan for "Great Lakes Sediment Remediation Project Summary Support." Unpublished. Available from Mary Beth G. Ross (ross.marybeth@epa.gov).

Table 6-1. 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 2003 (y^3**)	Volume Sediments Removed 2003 (y^3**)	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															
Black River, MI															
- CR 681													25,000	25,000	landfilled
Buffalo River, NY															
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													53,094		landfilled
Fox River, Green Bay, WI										22,865			87,500		landfilled
- Deposit 56/57										22,815			80,300		
- Deposit N										50			7,200		
Grand Calumet, IN													812,200		
- U.S. Steel/Gary Works							369			7,193	0.03		802,200	788,000	corrective action management unit
- U.S.S. Lead													10,000		
Kalamazoo River, MI															
- Bryant Mill Pond										10,000			150,000		landfilled
Manistee Lake, MI															
Manistique River, MI										4,771			186,162		landfilled
Manitowoc River, WI															
- HARP										425			11,800		landfilled
Maumee River, OH										25,400			8,000		landfilled

Table 6-1. 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 2003 (y^3**)	Volume Sediments Removed 2003 (y^3**)	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															
- Fraleigh Creek (Unnamed Tributary)															
Menominee River, MI/WI - Ansul Eighth Street Slip													 13,000		landfilled/awaiting further mgmt
Milwaukee Harbor, WI - North Ave. Dam - Moss American													18,000 8,000 10,000		landfilled
Muskegon Lake, MI															
National Gypsum - Alpena, MI															
Niagara River, NY - Scajaquada Creek - Buffalo Color - Area D - Gill Creek - Cherry Farm/River Road - Niagara Transformer													130,870 17,500 45,000 14,870 42,000 11,500		landfilled/capped
Pine River, MI - Velsicol Chemical SF Site - TPI Petroleum, Inc.				 470,569									442,201 394,100 48,101	 62,000 48,101	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			406,900 6,900 400,000		off-site TSCA facility and landfilled
Saginaw River/Bay, MI										4,500			342,433		off-shore CDF
Sheboygan Harbor, WI															

Table 6-1. 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 2003 (y^3**)	Volume Sediments Removed 2003 (y^3**)	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															
St. Clair River, MI															
St. Lawrence River, NY															
- Reynolds Metals/Alcoa East										10,000			86,000		landfilled/capped
St. Louis River/Bay, MN/WI															
- Newton Creek/Hog Island Inlet													5,855	4,055	landfilled
St. Marys River, MI													3,000		landfilled
Ten Mile Storm Drain															
- St. Clair Shores, MI													18,500		landfilled
Torch Lake, MI															
Waukegan Harbor, IL															
Waxdale Creek, WI															
White Lake, MI													105,500		
- Tannery Bay													95,000	35,000	landfilled
- Occidental Chemical Corp.					495†					495†			10,500	10,500	landfilled
Willow Run Creek, MI										200,000			450,000		on-site TSCA facility
Wolf Creek															
- Unnamed Tributary, MI													1,948	1,948	landfilled
TOTALS				**470,569**	**495**		**369**			**547,673**	**0.03**		**3,409,963**	**974,604**	

† Mass displayed is the combined total of PCBs and HCB.

* Information included in the matrix are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the *Great Lakes Sediment Remediation Project Summary Support* Quality Assurance Project Plan. Detailed project information may be available upon request from project managers.

** Denotes cubic yards

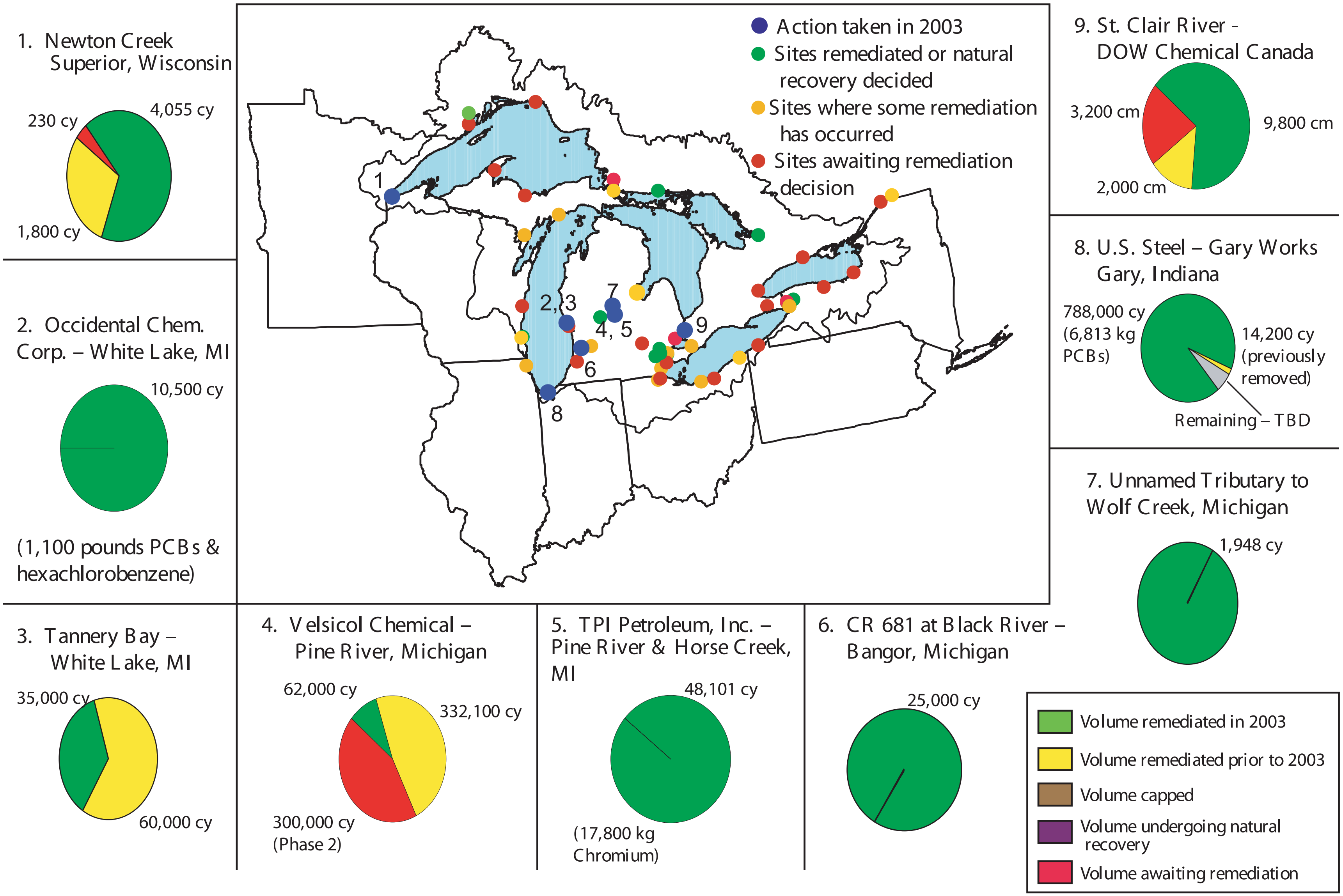
Table 6-1. Progress on Sediment Remediation in the Great Lakes since 1997*

Site/AOC/non-AOC	Cumulative Mass of Contaminant Removed (kg)												Cumulative Volume Sediments Removed 1997 to 2003 (m^3**)	Volume Sediments Removed 2003 (m^3**)	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		Thermal treatment Berm enclosed & capped
Nipigon Bay															
Jackfish Bay															
Peninsula Harbour															
St. Marys River															
Spanish River															
Severn Sound															
St. Clair River							19.3						11,800	9,800	
Detroit River															
Wheatley Harbour															
Niagara River (Ontario)															
Hamilton Harbour															
Metro Toronto															
Port Hope															
Bay of Quinte															
St. Lawrence River (Cornwall, Ontario)															
TOTALS		**2,700**					**19.3**						**43,800**	**9,800**	

*Information included in the matrix are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the *Great Lakes Sediment Remediation Project Summary Support* Quality Assurance Project Plan. Detailed project information may be available upon request from project managers.
**Denotes cubic meters

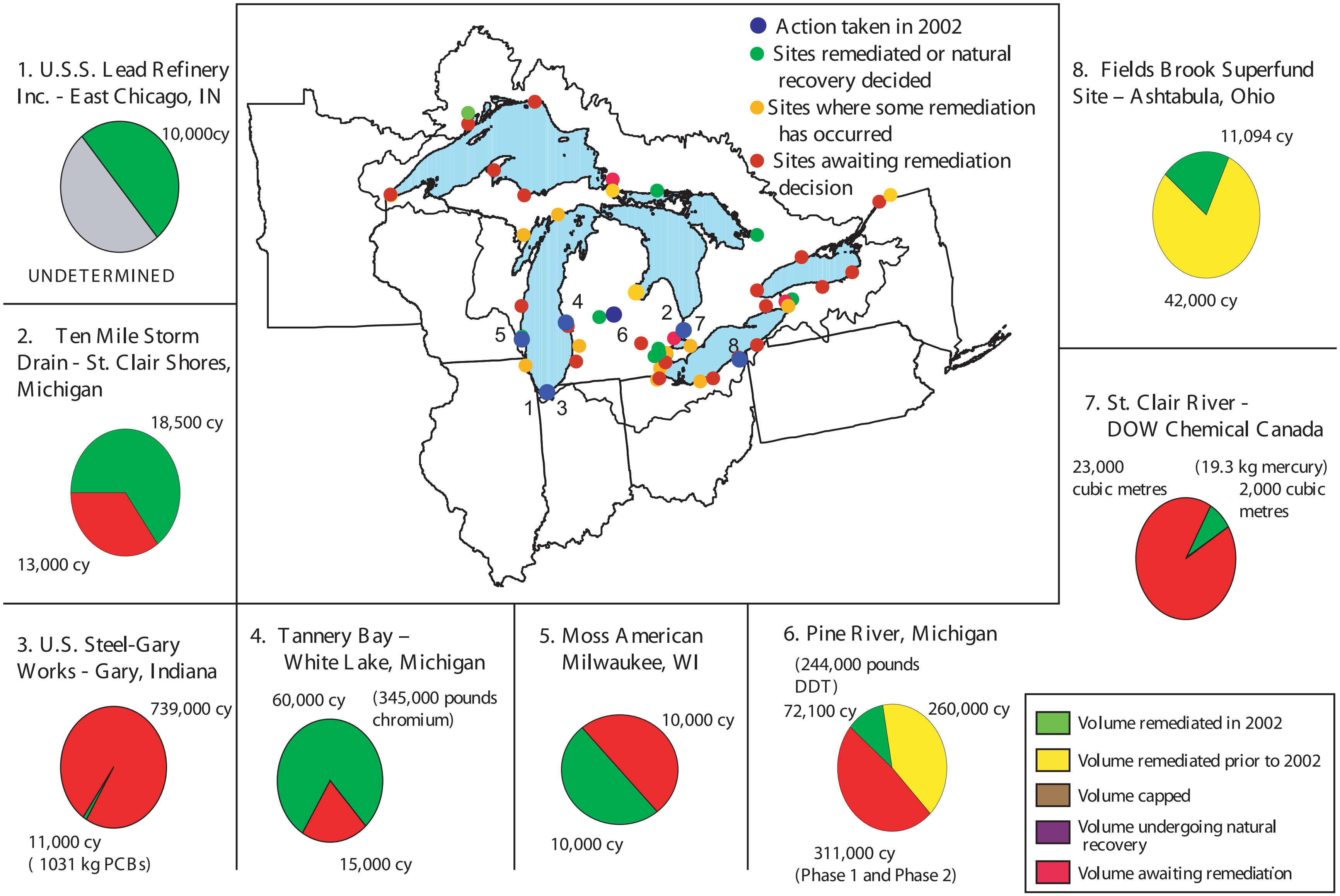
Great Lakes Sediment Remediations in 2003*

*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.



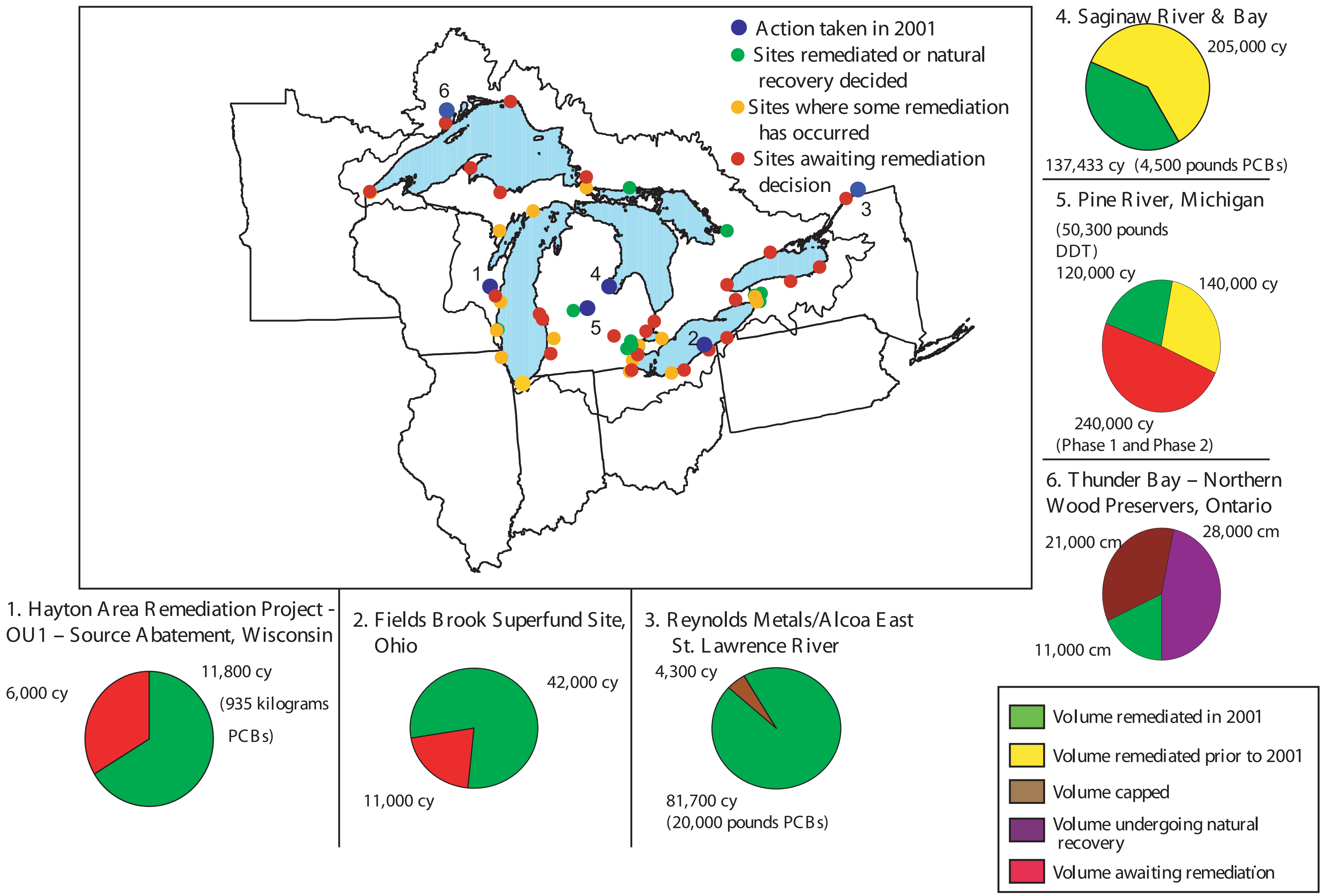
Great Lakes Sediment Remediations in 2002*

*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.



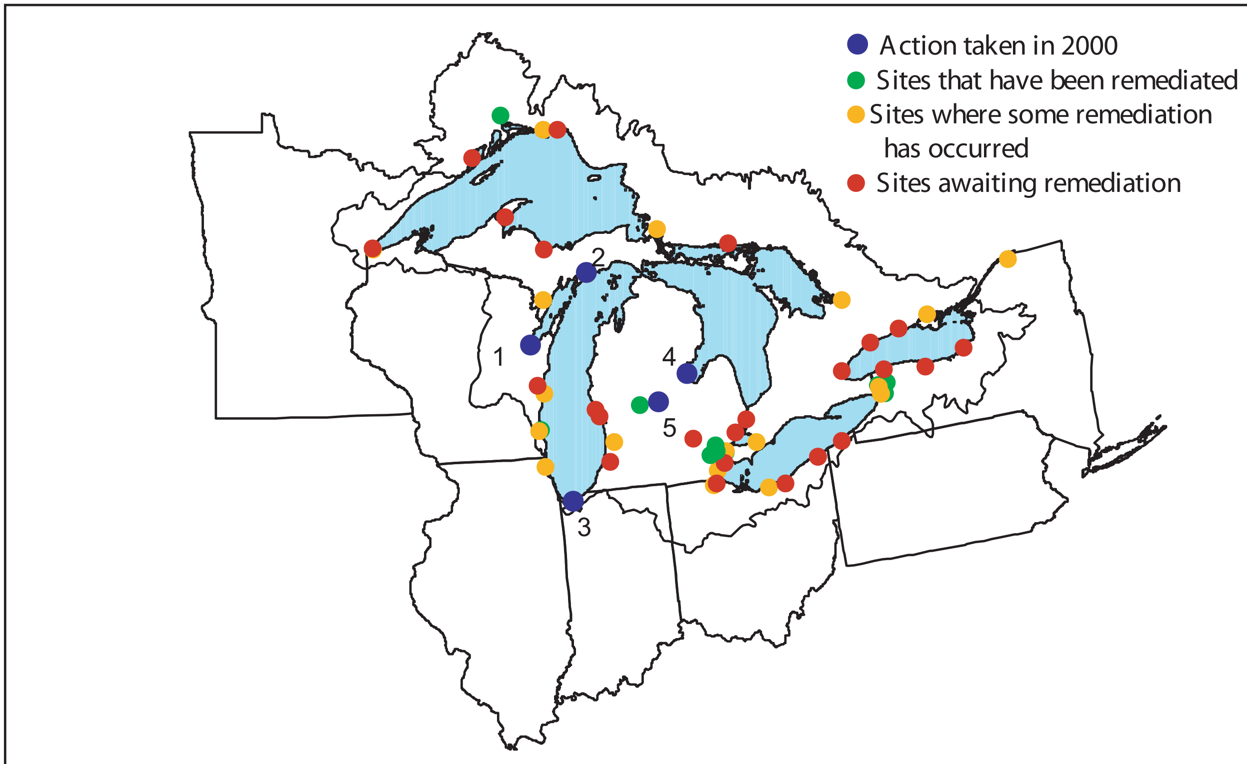
Great Lakes Sediment Remediations in 2001*

*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.

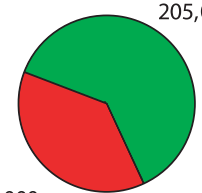


Great Lakes Sediment Remediations in 2000*

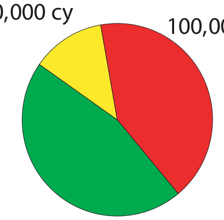
*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.



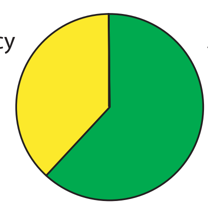
4. Saginaw River & Bay



5. Pine River

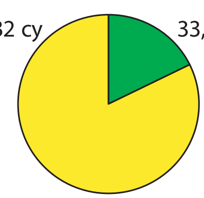


1. Fox River – Deposit 56/57



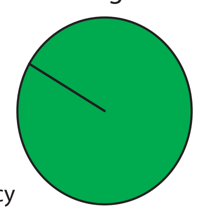
10,900,000 cy total in Fox River

2. Manistique River & Harbor Emergency Removal



(10,600 pounds of PCBs)

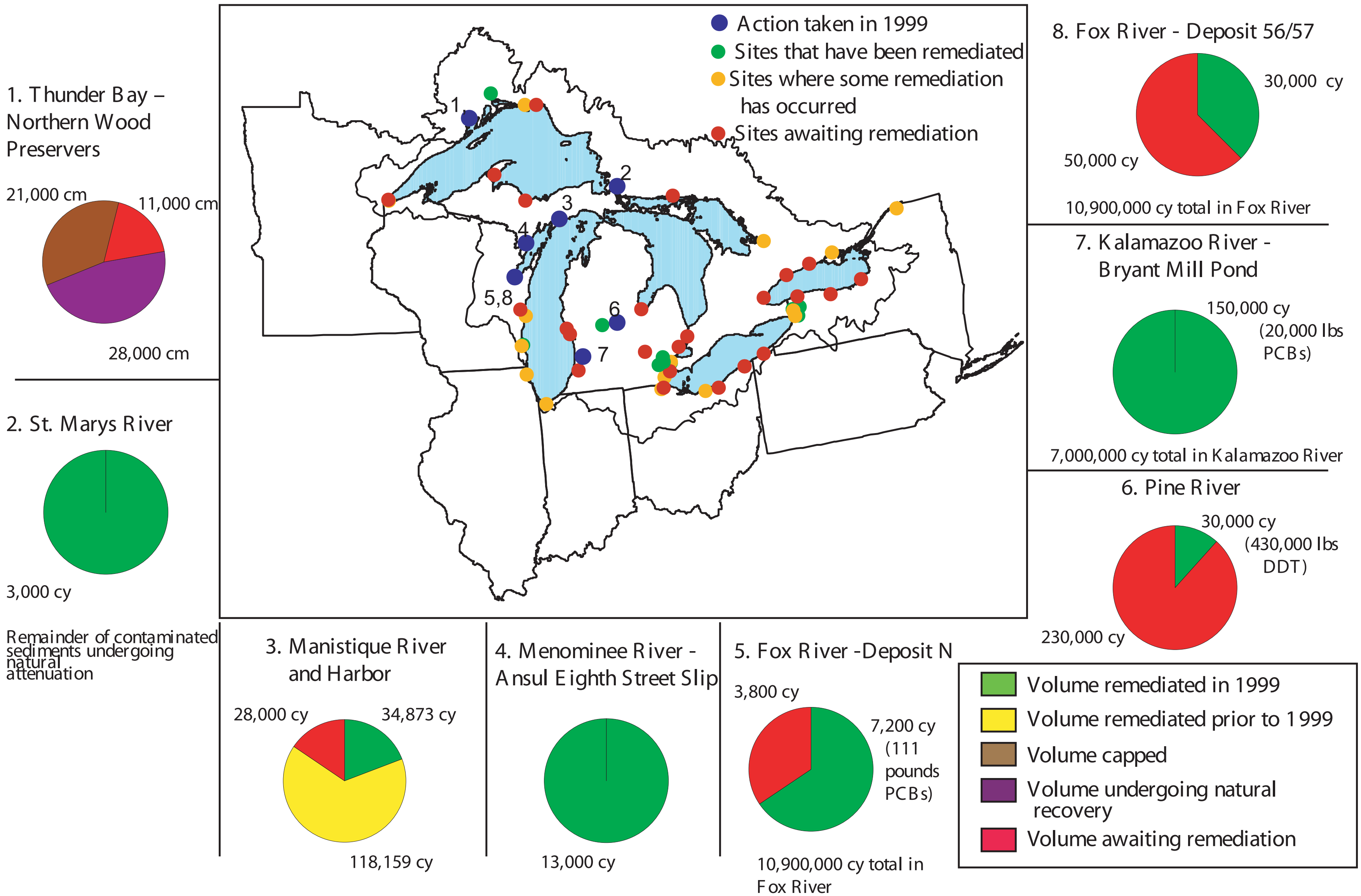
3. USX Vessel Slip Project – Lake Michigan



- Volume remediated in 2000
- Volume remediated prior to 2000
- Volume awaiting remediation

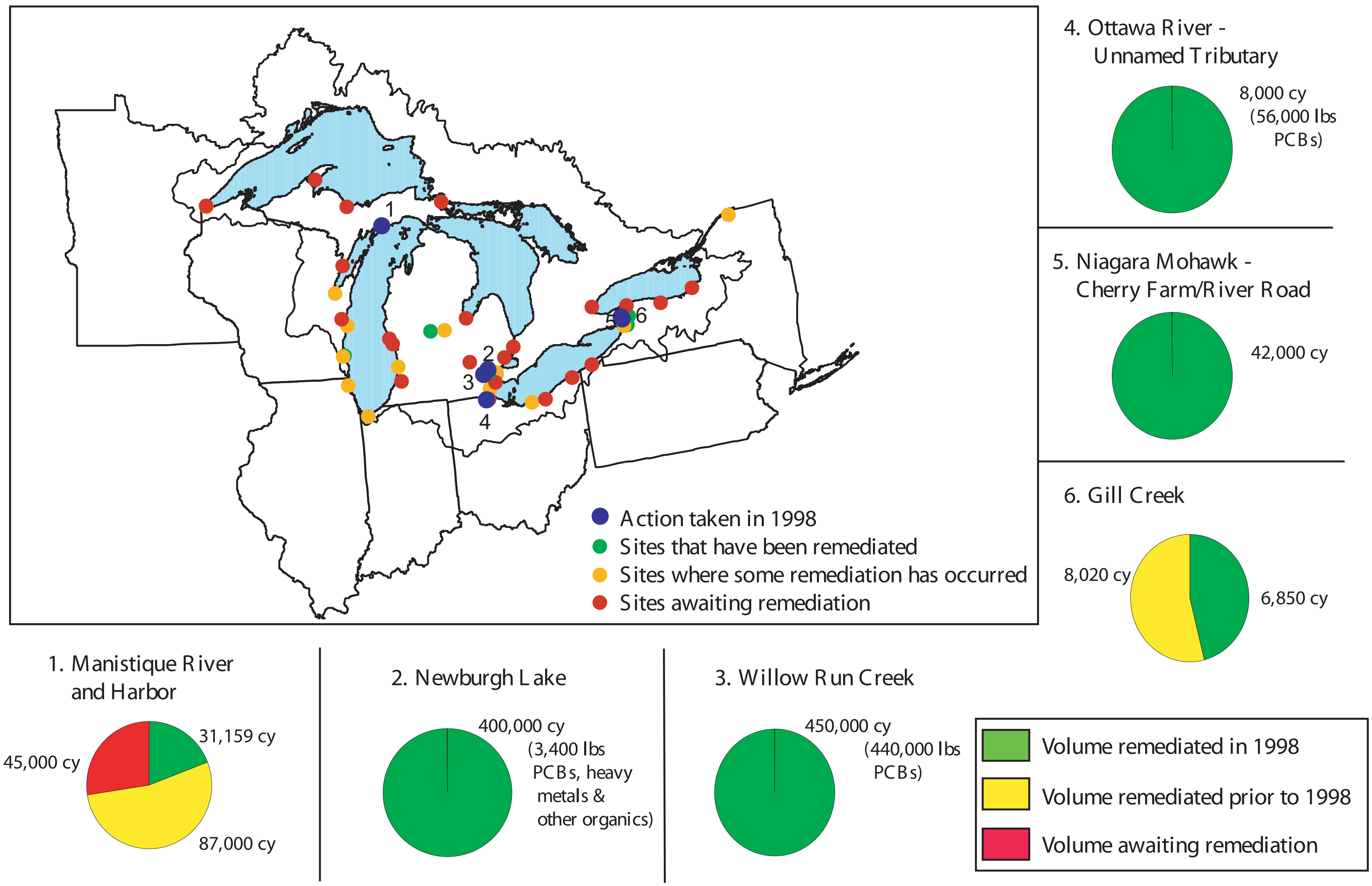
Great Lakes Sediment Remediations in 1999*

*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.



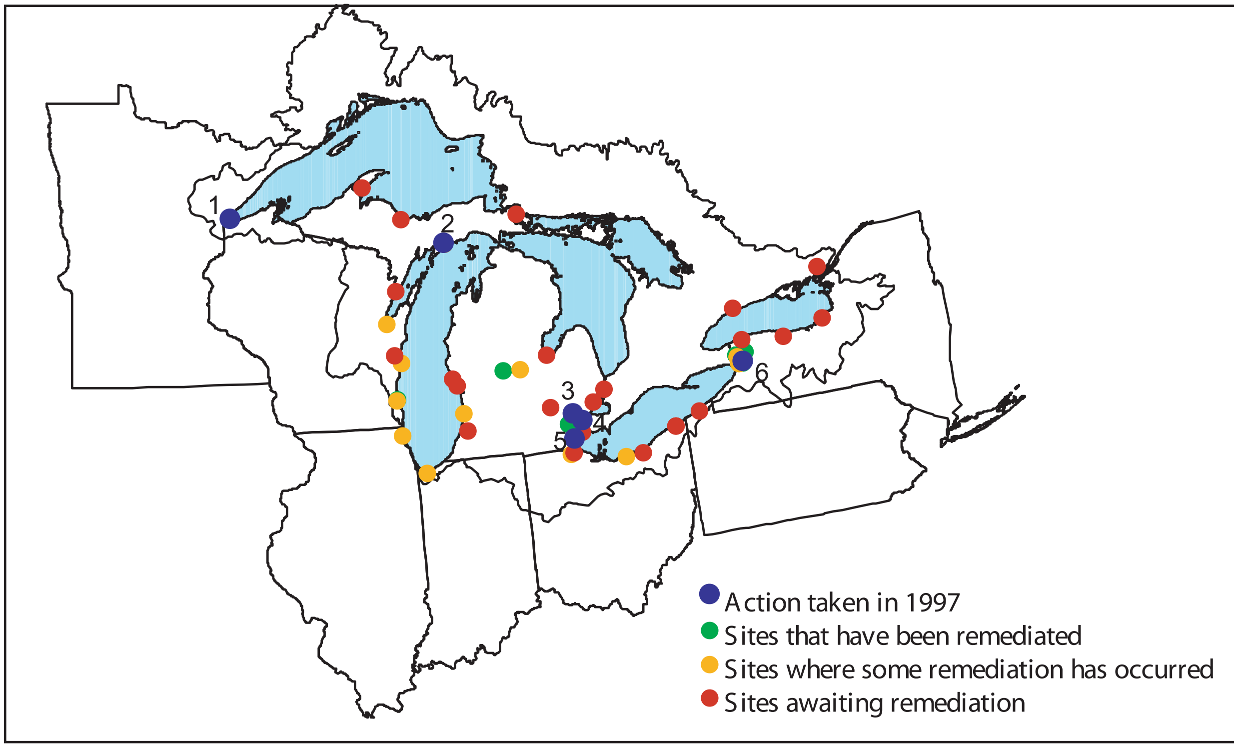
Great Lakes Sediment Remediations in 1998*

*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.

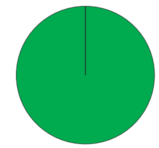


Great Lakes Sediment Remediations in 1997*

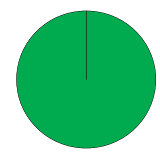
*Information included in the pie charts are quantitative estimates as reported by project managers. Data collection and reporting efforts are described in the "Great Lakes Sediment Remediation Project Summary Support" Quality Assurance Project Plan (GLNPO, January 2005). Detailed project information may be available upon request from project managers.



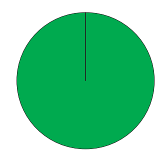
4. Monguagon Creek



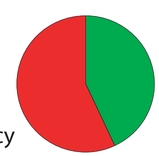
5. River Raisin – Ford Monroe Outfall



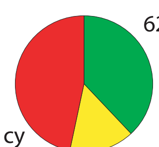
6. Niagara Transformer



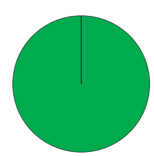
1. Newton Creek/ Hog Island Inlet



2. Manistique River and Harbor



3. Evans Product Ditch – Upper Rouge River



Volume remediated in 1997

Volume remediated prior to 1997

Volume awaiting remediation

7.0 LONG-RANGE TRANSPORT CHALLENGE

Canadian Workgroup co-chair: S. Venkatesh
U.S. Workgroup co-chair: Todd Nettesheim

Under the Great Lakes Binational Toxics Strategy, EC and US EPA 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 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.

Canadian Activities

Global/Regional Atmospheric Heavy Metals Model (GRAHM): Update October 2004 – by A. Dastoor, Meteorological Service of Canada

During the period of 2003-2004, Canadian efforts continued on further development, testing and application of the global model for atmospheric transport of mercury (GRAHM – Global and Regional Atmospheric Heavy Metals model). A new version of GRAHM was developed which includes a limited area model (LAM-GRAHM) for mercury. During the last couple of years several new studies on atmospheric mercury chemical reactions in the gas and aerosol phase have emerged. Some of these reactions reveal a much shorter life span of elemental mercury in the atmosphere in the order of months compared to previously known life spans that were measured in the order of a year. The chemical kinetics of GRAHM is being updated to reflect these changes. Mercury emissions input to the model were also updated to reflect the most recently available emissions, which are for the year 2000.

During this period, there were also a number of other activities related to GRAHM:

- The mechanism describing the Arctic mercury depletion cycle was included in GRAHM and the impact on mercury deposition in the Arctic as well as on the global scale was estimated. An article describing the results from this study has been accepted for publication in the journal Tellus.
- GRAHM is one of the models participating in an ongoing EMEP mercury models intercomparison study. LAM-GRAHM, which is the regional version of GRAHM, is being applied to simulate monthly wet and dry deposition budgets over Europe for the year 1999. The model results will be compared with observations and other regional models.

At the Mercury Workgroup meeting at the GLBTS Stakeholder Forum on June 17, 2004, discussions were held where some of the impacts of the transport of mercury emissions from global sources on the Great Lakes were highlighted. The following two graphs show some of the global impacts on the Great Lakes. Figure 7-1 shows the seasonal contributions (by %) from the different continents to surface air elemental mercury concentrations over the Great Lakes. Seasonal differences are noticeable. For

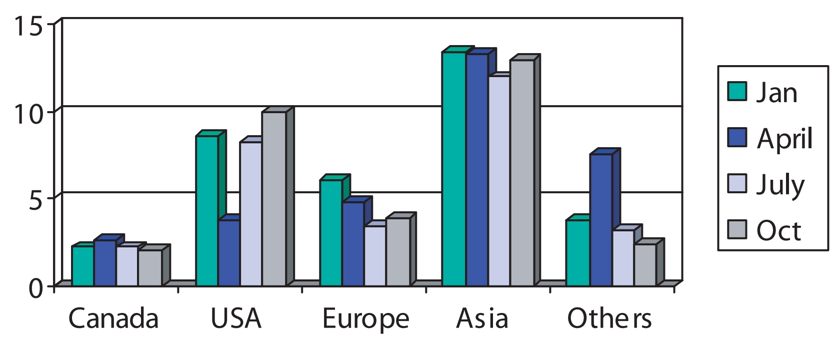


Figure 7-1. Percentage Contributions to Surface Air Elemental Mercury Concentrations over the Great Lakes. Source: Meteorological Service of Canada

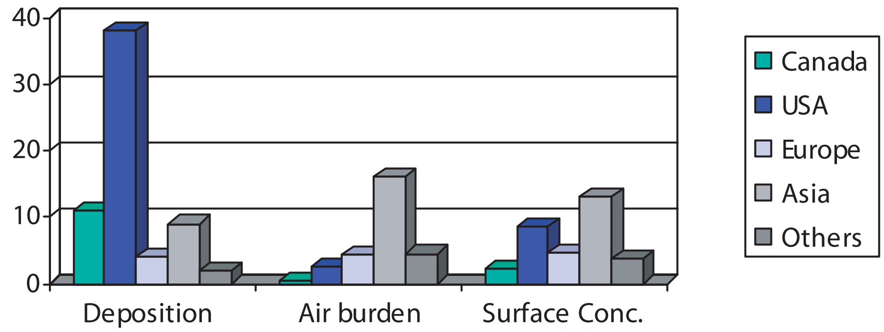


Figure 7-2. Percentage Annual Average Contributions from Global Sources to Elemental Mercury over the Great Lakes. Source: Meteorological Service of Canada

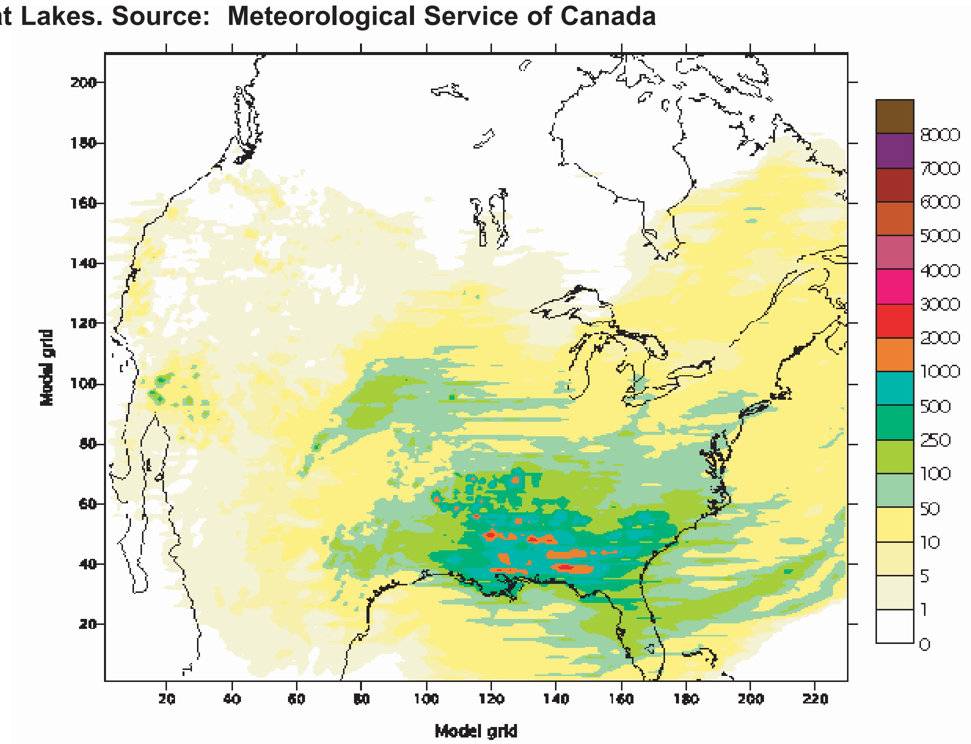


Figure 7-3. Modeled Monthly Averaged Daily Air Concentration (pg/m3). Source: Meteorological Service of Canada

example, while Asian contributions are the highest overall, during April contributions from the 'Others' category - which includes sources in the southern hemisphere - are high.

Figure 7-2 shows annual average contribution from global sources to the deposition, air burden and surface air concentrations of elemental mercury over Great Lakes. This graph illustrates the importance of differences in contributions from global sources in different media. For example, contribution to the air burden is highest from Asia, but deposition is highest from North American sources.

Progresses in Numerical Investigations of Long-range Transport of Toxaphene Emitted from the United States Soils to the Great Lakes Basin – by J. Ma, Meteorological Service of Canada

Before its ban in late 1982, toxaphene was the most widely used insecticide in the United States. It was estimated that as of the year 2000 there were still 364 tons of toxaphene being emitted to the atmosphere from the U.S. soils, 70 percent of which were from the southeast U.S. and Mississippi River Delta states (Arkansas, Alabama, Illinois, Mississippi, Missouri, Kentucky, Louisiana, and Tennessee). A coupled atmospheric transport, soil-air, water-air exchange model was employed to investigate the effects of emission and atmospheric transport of toxaphene from U.S. sources on its budget over the Great Lakes for the period January 1 to December 31, 2000. Six different scenarios were studied to identify the contributions of different toxaphene source regions in the U.S to its distribution over the Great Lakes. These scenarios consisted of: 1) all sources in the U.S., 2) southeast sources only, 3) northeast sources only, 4) northwest sources only, 5) southwest sources only, and 6) west-coast sources only. Figure 7-3 shows daily air concentrations (pg/m3) of toxaphene averaged over August 2000 at the first model level above the ground surface (1.5 m). High concentrations (> 1000 pg/m3) are seen in the southeast

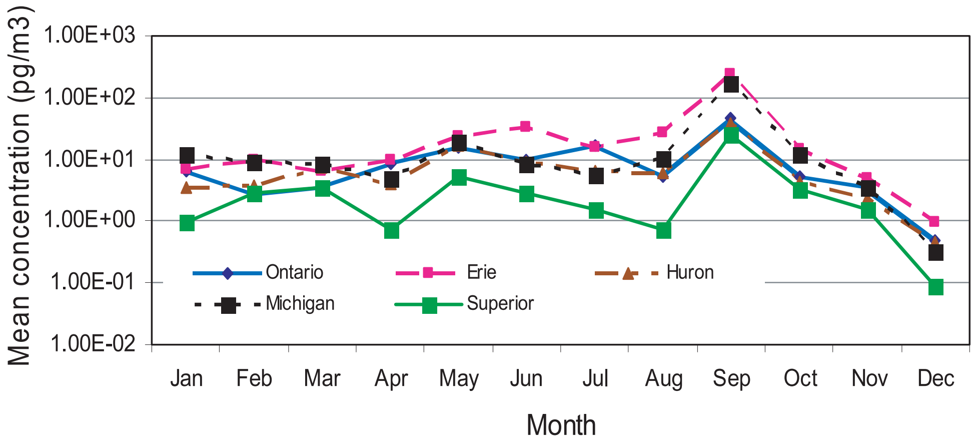


Figure 7-4. Modeled Monthly Averaged Daily Air Concentration at Model Grids Selected Within Each Lake (pg/m3). Source: Meteorological Service of Canada

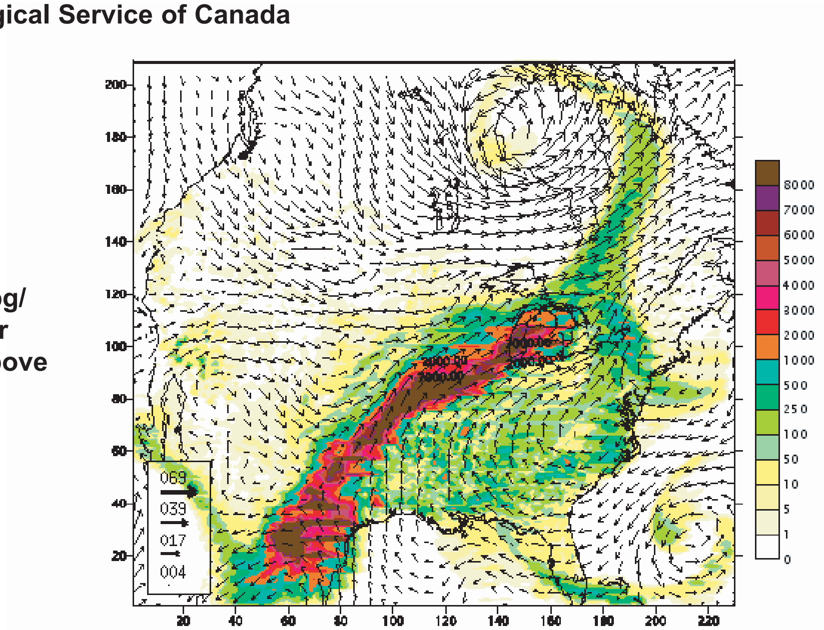


Figure 7-5. Modeled Air Concentration (pg/m3) on Sept. 11, 2000. (Vector winds are at 1000m height above the ground.) Source: Meteorological Service of Canada

U.S. and the Mississippi Delta states, consistent with strong emissions occurring in these regions. Air concentrations range from less than 5 pg/m3 over the upper Great Lakes to several tens of pg/m3 over the lower Great Lakes. Seasonal change in air concentrations at both source grids and receptor grids (e.g., over the Great Lakes region) is determined largely by air temperature. However, modeling results show that the changes in daily wind and pressure systems in the U.S. can lead to substantial changes in temporal trends of toxaphene over the Great Lakes. Figure 7-4 shows monthly averaged daily air concentrations at 1.5 m at the model grid at the centre of each Great Lake. The highest mean concentrations over each of the five Great Lakes occurs in September, with the highest value of 243 pg/m3 occurring in Lake Erie, followed by Lake Michigan at 174 pg/m3, Lake Ontario at 48 pg/m3, Lake Huron at 39 pg/m3 and Lake Superior at 25 pg/m3. These September highs were caused primarily by the extension of a North Atlantic high pressure system to the U.S starting from early September, which led to strong wind convergence and convection from the southern U.S. (major source region) to the Great Lakes. Daily air concentrations and wind vector analyses from September 1 – 15 indicate this system transported toxaphene efficiently from the southern U.S. sources to the Great Lakes, as shown in Figure 7-5. Overall results revealed that the southeast U.S. sources (from model scenario 2) made the largest contribution to the budget of toxaphene over the Great Lakes. Lakes occurs in September, with the highest value of 243 pg/m3 occurring in Lake Erie, followed by Lake Michigan at 174 pg/m3, Lake Ontario at 48 pg/m3, Lake Huron at 39 pg/m3 and Lake Superior at 25 pg/m3. These September highs were caused primarily by the extension of a North Atlantic high pressure system to the U.S starting from early September, which led to strong wind convergence and convection from the southern U.S. (major source region) to the Great Lakes. Daily air concentrations and wind vector analyses from September 1 – 15 indicate this system transported toxaphene efficiently from the southern U.S. sources to the Great Lakes, as shown in Figure 7-5. Overall results revealed that the southeast U.S. sources (from model scenario 2) made the largest contribution to the budget of toxaphene over the Great Lakes.

8.0 ENVIRONMENTAL INDICATORS OF PROGRESS

The efficacy of efforts to reduce GLBTS Level 1 and 2 substances is ultimately measured by corresponding trends of levels of these substances in the environment. In conjunction with the 2004 State of the Lakes Ecosystem Conference (SOLEC), a conference hosted by US EPA and EC every two years in response to a reporting requirement of the GLWQA, environmental indicators of progress are presented in this report. SOLEC conferences provide a forum for the exchange of information among Great Lakes decision makers on the state of the Great Lakes ecosystem and the major factors impacting it.

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, the Department of Fisheries & Oceans, and US EPA's Great Lakes Fish Monitoring Program. Progress in reducing GLBTS substances is evidenced in Great Lakes herring gull eggs collected and analyzed by the Canadian Wildlife Service. Spatial and temporal trends in Great Lakes sediment are described 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 Melissa Hulting, US EPA – Great Lakes National Program Office

Integrated Atmospheric Deposition Network (IADN)

The Integrated Atmospheric Deposition Network (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, organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs) and trace metals are measured in ambient air (gas phase), suspended particles and precipitation at each station. These data are used to examine spatial and temporal trends of toxic contaminants in air and precipitation in the Great Lakes.

Figure 8-A1 illustrates that there has generally been a decline in total PCB concentrations in the air collected at the rural master stations near each of the Great Lakes over the past 25 years. Half-lives for temperature-corrected data over this time period have generally been in the range of 5-10 years (Buehler et al. 2002). When only IADN data from the early 1990s to the present is included in the analysis, calculated half-lives increase to 8-18 years (Buehler et al. 2004).

Some increases in concentrations are seen during the late 1990s for Lakes Michigan and Erie and during 2000-2001 for Lake Superior. These increases remain unexplained, although there is some evidence of connections with atmospheric circulation phenomena such as El Nino (Ma et al., 2004). Levels decrease again by 2002. It is assumed that PCB concentrations will continue to decrease slowly, though as concentrations decrease, the absolute size of subsequent decreases will diminish, as shown by the somewhat plateauing values from the mid-1990s to 2002 (with resultant increases in half-lives). Further data will confirm whether concentrations continue to decline and whether remaining sources of PCBs, including residual sources in the United States and long-range transport from other countries, may be contributing to plateauing PCB levels in the Great Lakes region.

The Lake Erie master station consistently shows relatively elevated PCB concentrations compared to the other master stations. Back-trajectory analyses have shown that this is due to possible influences from upstate New York (the site is 20 km southwest of Buffalo) and the East Coast (Hafner and Hites 2003). Figure 8-A2 shows that PCB concentrations at the satellite station in downtown Chicago are about 10 times higher than at the more remote master stations. It is expected that PCB concentrations should be elevated in the Chicago urban area because of the

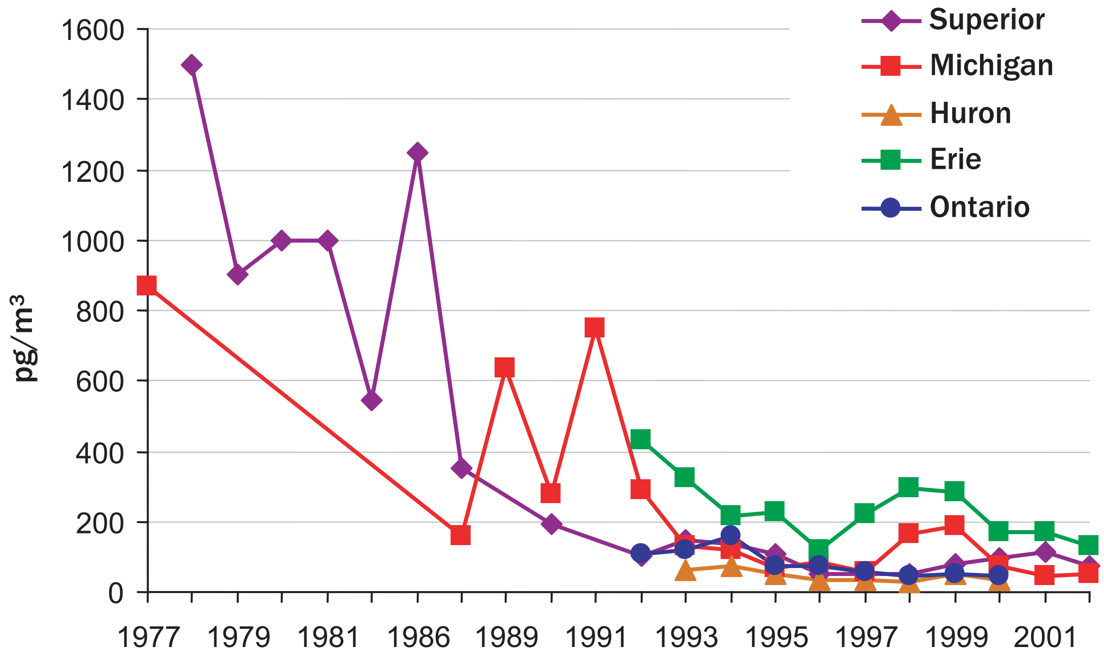


Figure 8-A1. **Long-term Atmospheric Gas-Phase Annual Average Total PCB Concentrations (pg/m3).[13]**

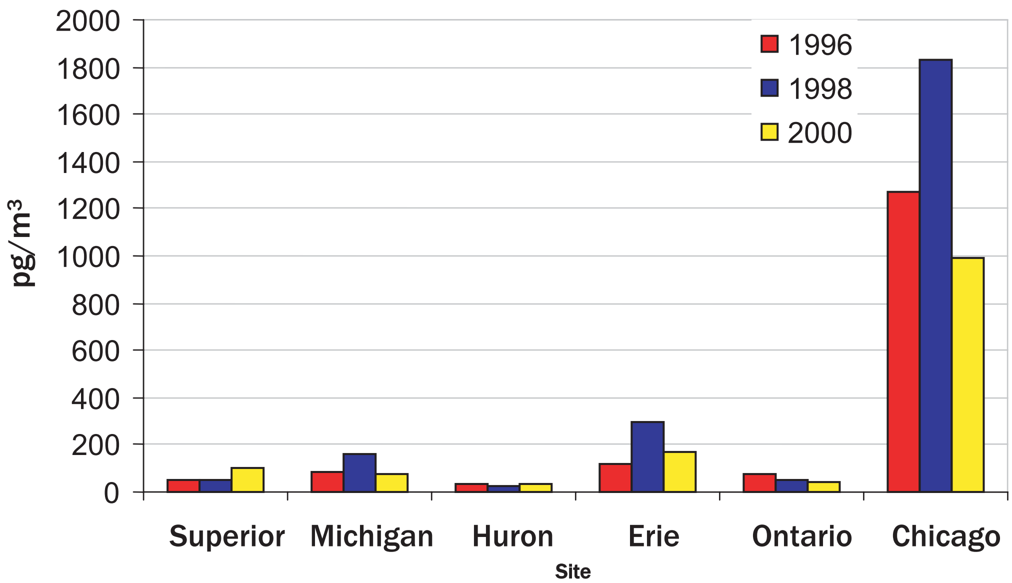


Figure 8-A2. **Annual Average Total PCB Concentrations at Rural Master Stations vs. Chicago (pg/m3).[14]**

[13] IADN Steering Committee, unpublished data, 2004. Sources for pre-1992 PCB data: Achman et al., 1993; Baker and Eisenreich, 1990; Cotham and Bidleman, 1995; Doskey and Andren, 1981; Eisenreich et al., 1981; Eisenreich, 1987; Hornbuckle et al., 1993; Hornbuckle et al., 1994; Manchester-Neesvig and Andren, 1989; Monosmith and Hermanson, 1996.

[14] IADN Steering Committee, unpublished data, 2004.

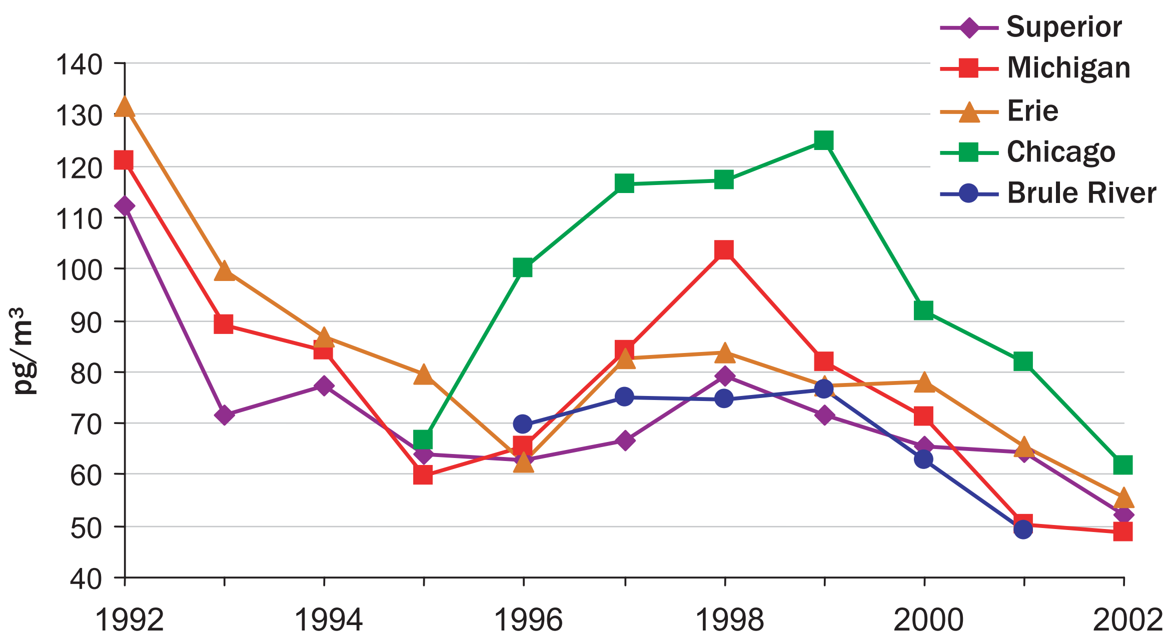


Figure 8-A3. **Annual Average Gas-Phase Hexachlorobenzene Concentrations (U.S. sites only) (pg/m3).[15]**

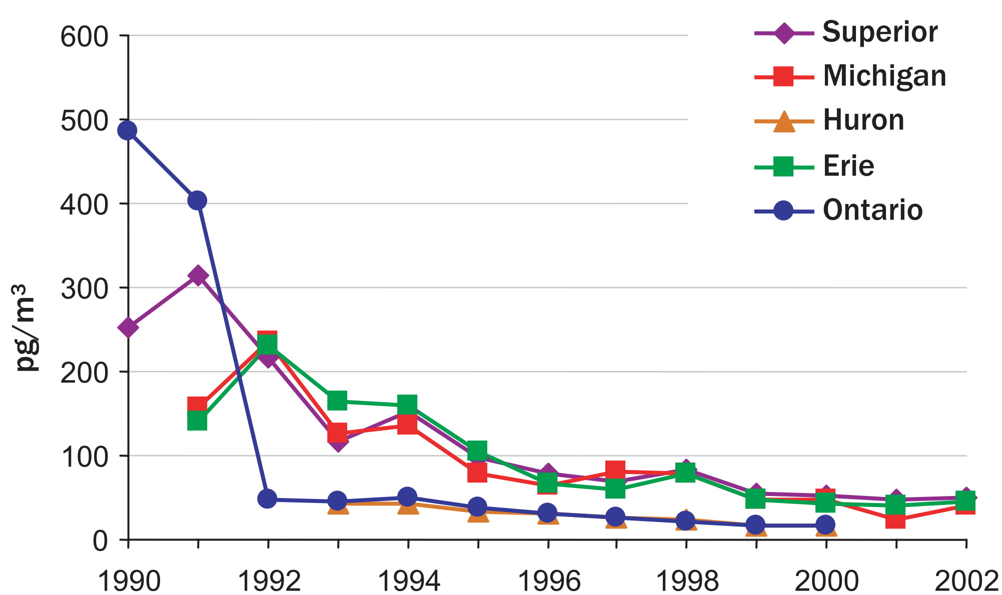


Figure 8-A4. **Annual Average Atmospheric Gas-phase a-HCH Concentrations (pg/m3).[16]**

[15] IADN Steering Committee, unpublished data, 2004. Chicago and Brule River (on Lake Superior, now closed) are satellite stations. HCB data not available for Canadian stations due to breakthrough on polyurethane foam (PUF) sampling media.

[16] IADN Steering Committee, unpublished data, 2004.

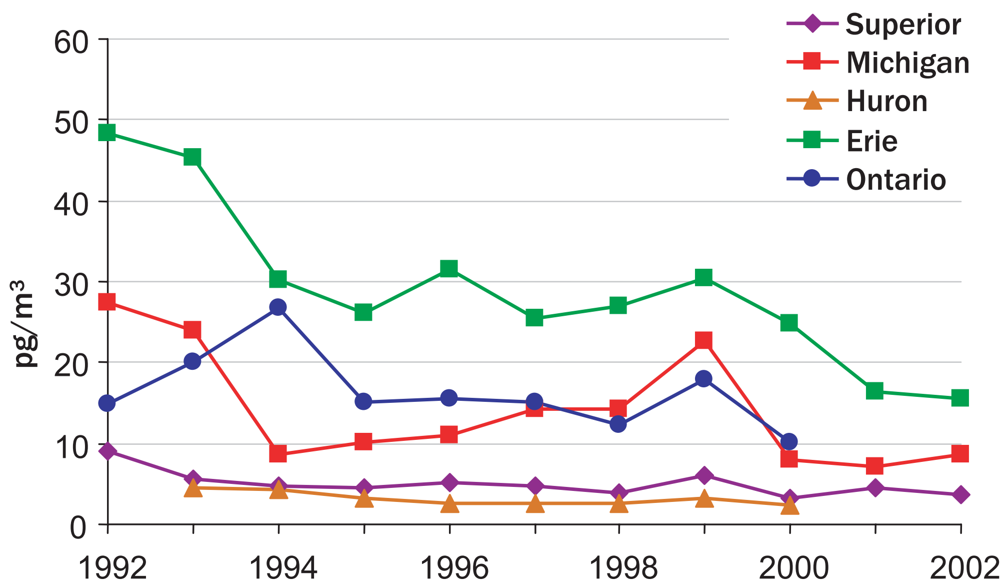


Figure 8-A5. **Annual Average Atmospheric Gas-phase Total DDT (p,p'-DDT+DDE+DDD) Concentrations (pg/m3).[17]**

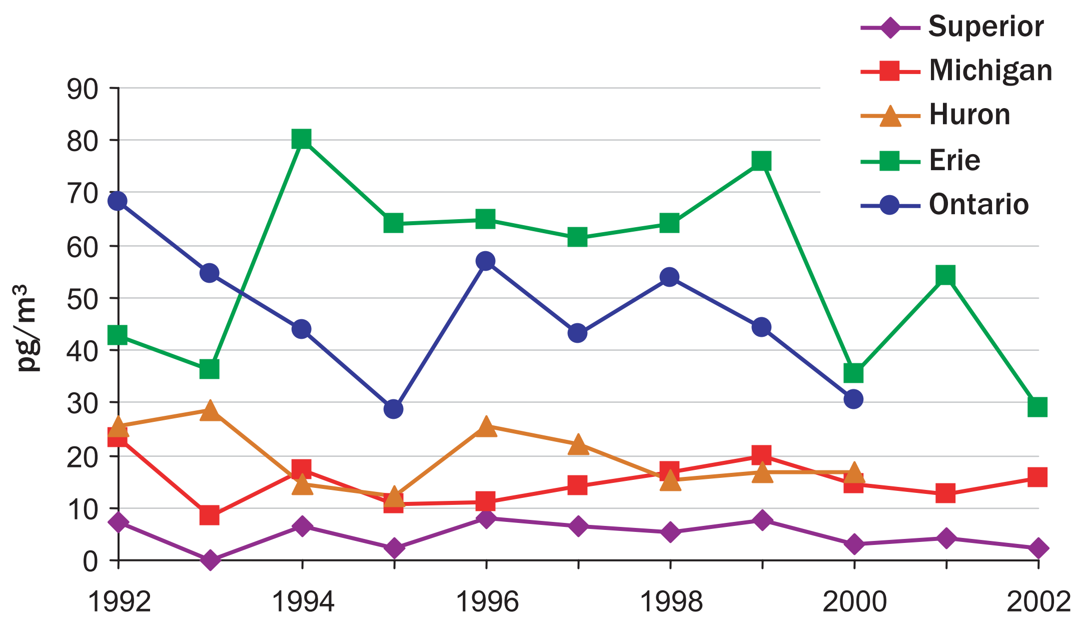


Figure 8-A6. **Annual Average Particle-phase B(a)P Concentrations (pg/m3).[18]**

[17] ibid

[18] ibid

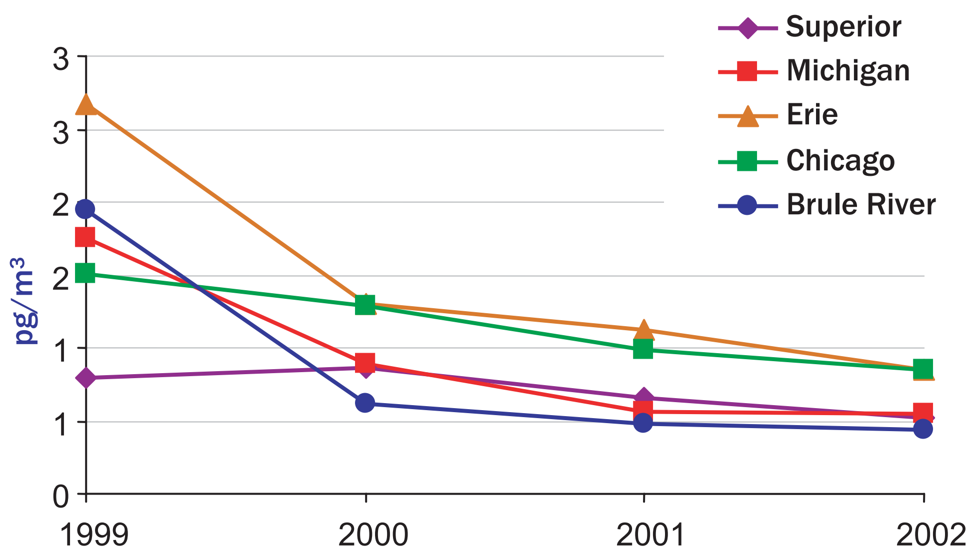


Figure 8-A7. Annual Average Gas-phase Octachlorostyrene Concentrations (pg/m3).[19]

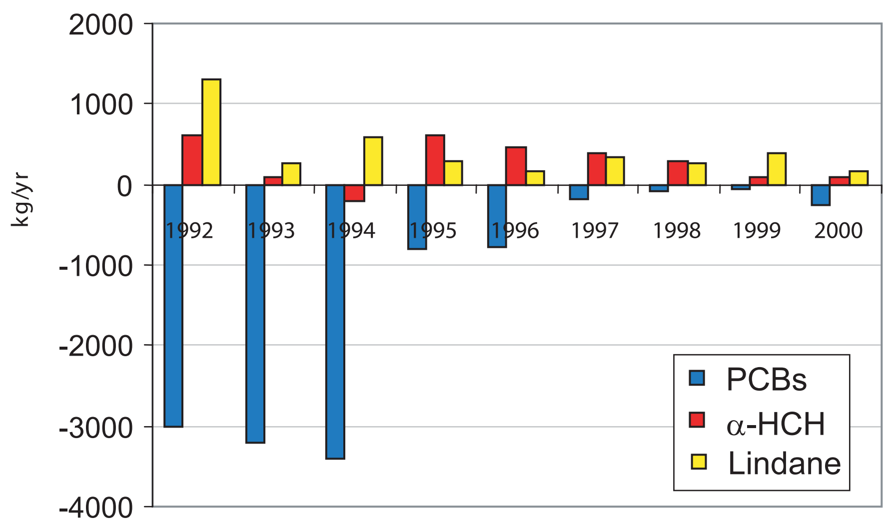


Figure 8-A8. Net Gas Exchange Atmospheric Loadings to Lake Michigan (kg/yr).[20]

[19] ibid

[20] Adapted from Blanchard et al., unpublished data, 2004

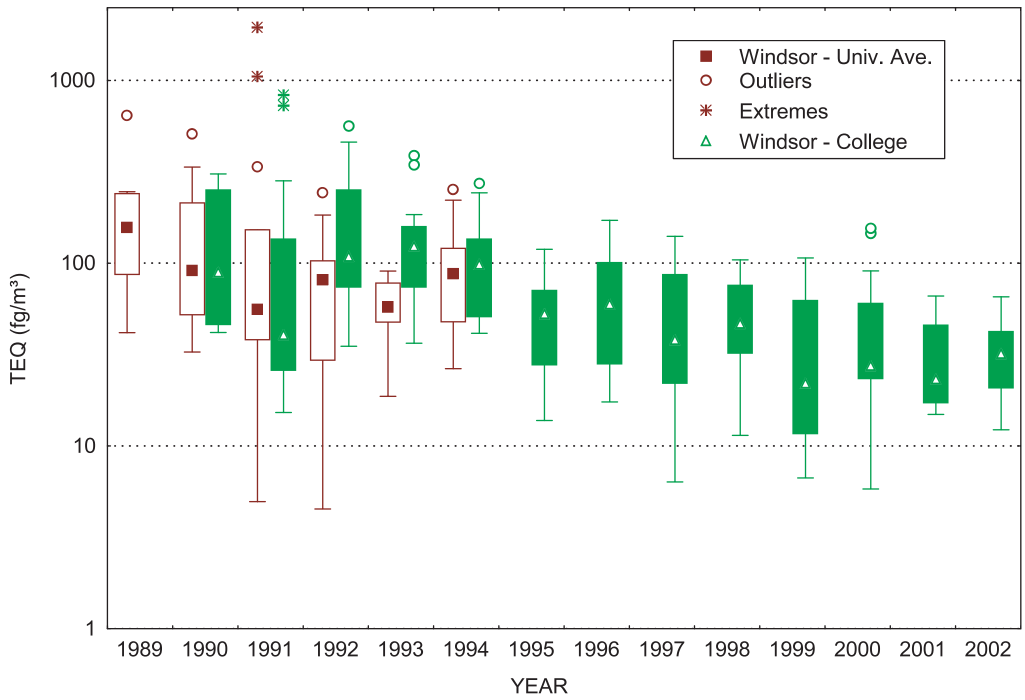


Figure 8-A9. Trend in 2,3,7,8-TCDD Toxic Equivalents (fg/m³) at Windsor, Ontario (1989-2002).[21]

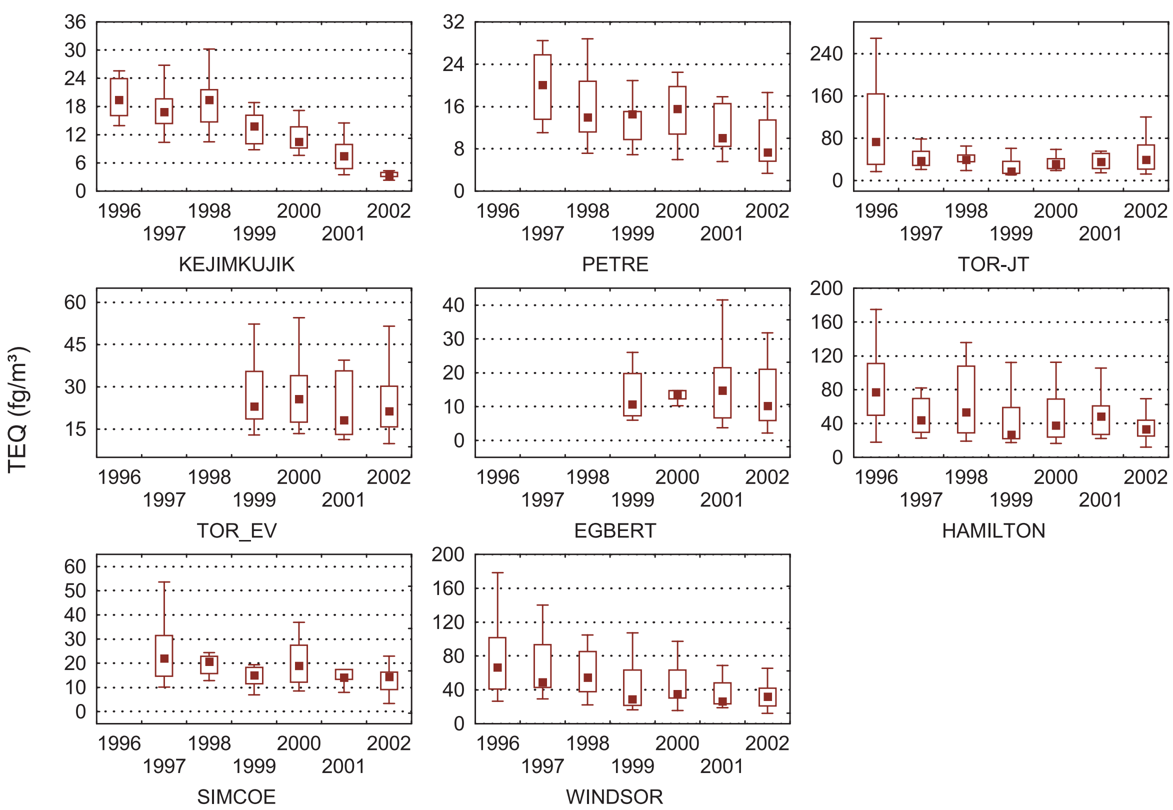


Figure 8-A10. Trend in 2,3,7,8-TCDD Toxic Equivalents (fg/m³) at NAPS sites. [22]

[21] Source: Tom Dann, Environment Canada Analysis and Air Quality Division

[22] ibid

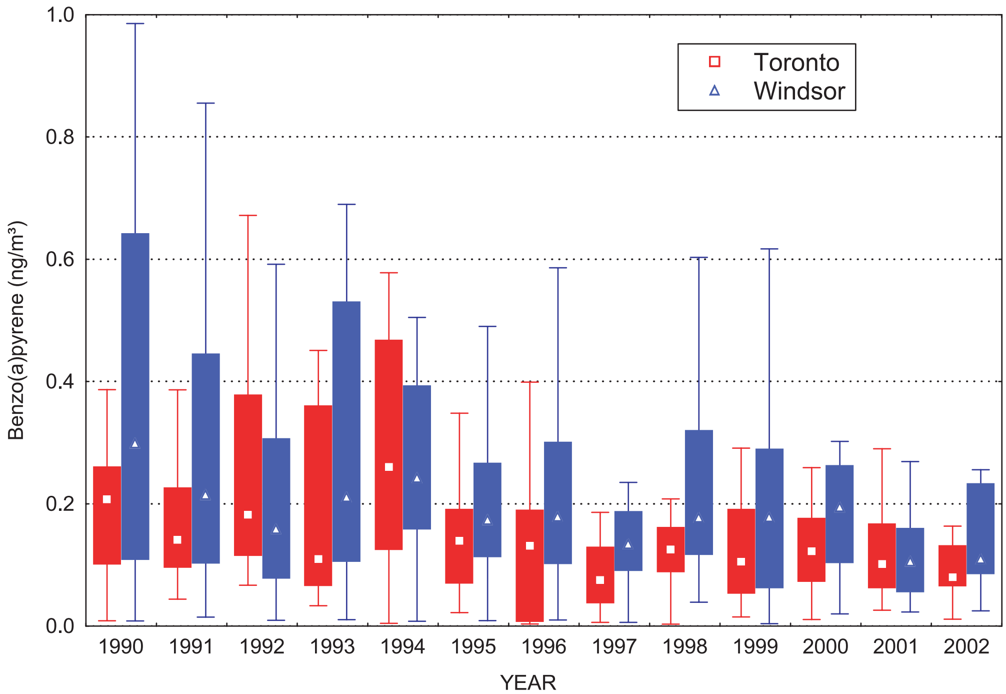


Figure 8-A11. Trend in B(a)P Concentrations (ng/m³) at Urban Sites (1990-2002). [23]

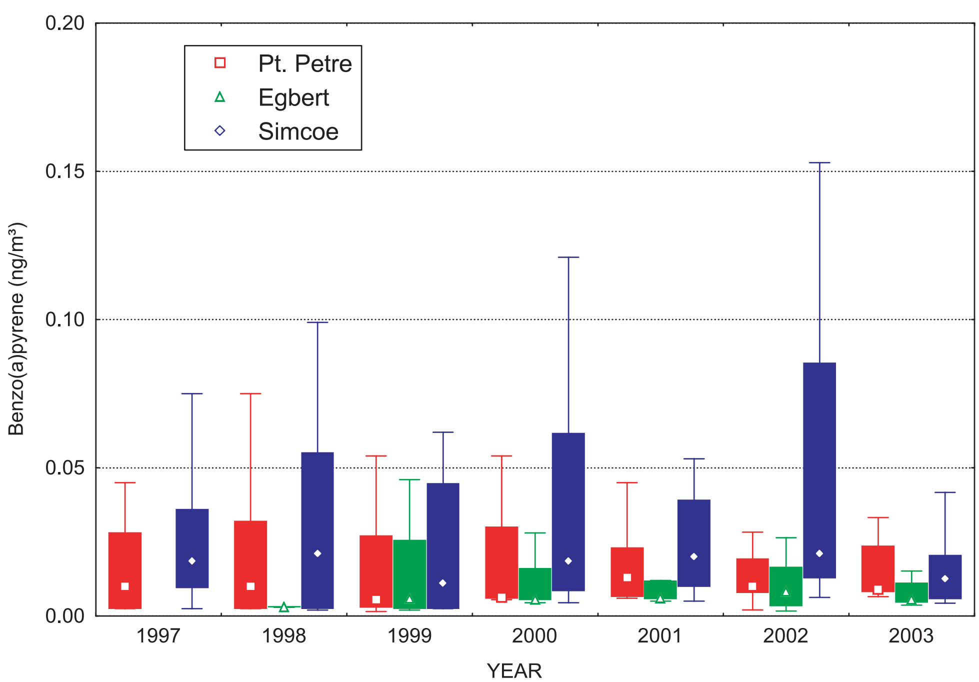


Figure 8-A12. Trend in B(a)P Concentrations (ng/m³) at Rural Sites (1997-2003). [24]

[23] ibid

[24] ibid

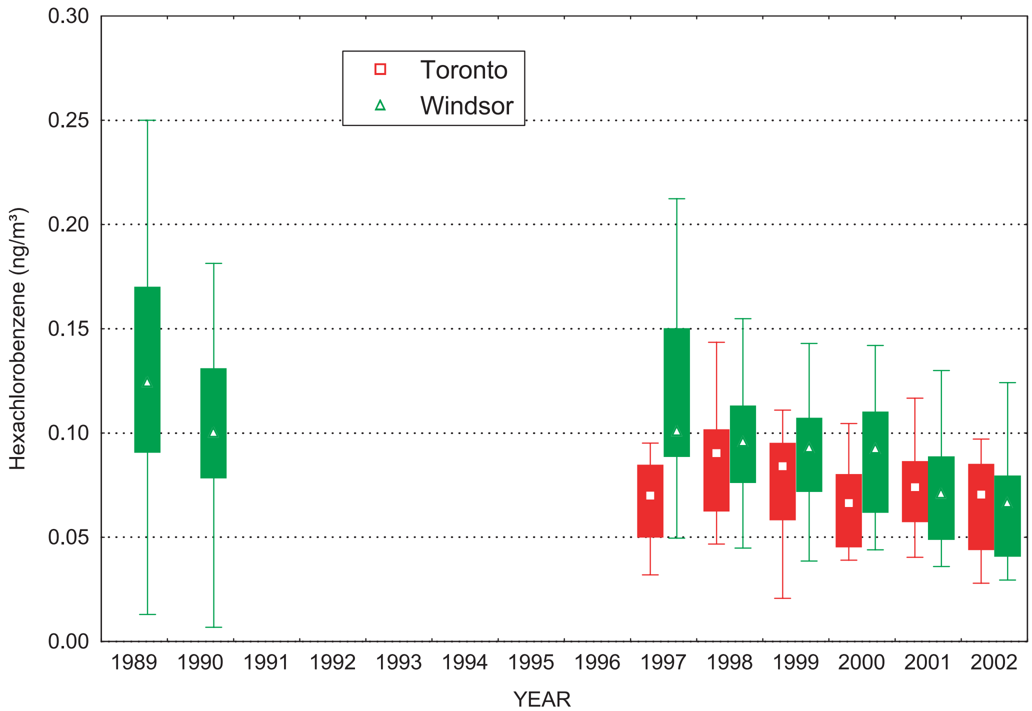
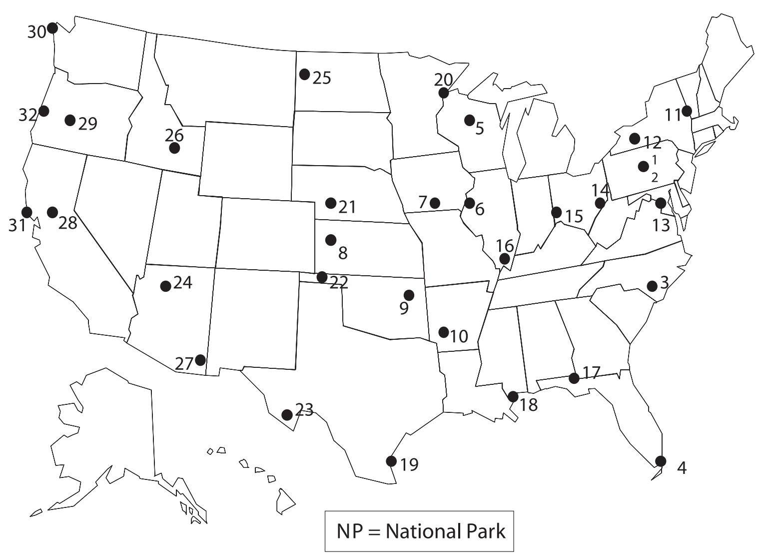


Figure 8-A13. Trend in HCB Concentrations (ng/m³) at Windsor, Ontario (1989-2002). [25]



1. Penn Nursery, PA
3. Clinton Crops, NC
4. Everglades National Park, FL
5. LakeDubay, WI
6. Monmouth, IL
7. McNayIA
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. Chiricahua National Mom, AZ
28. Rancho Ceco, CA
29. Hyslop Farm, Benton, OR
30. Lake Ozette, Olympic NP, WA
31. Fort Cronkhite NP, CA
32. Newport, OR

Figure 8-A14. Locations of NDAMN Stations in the United States. [26]

[25] ibid

[26] Cleverly et al. 2002

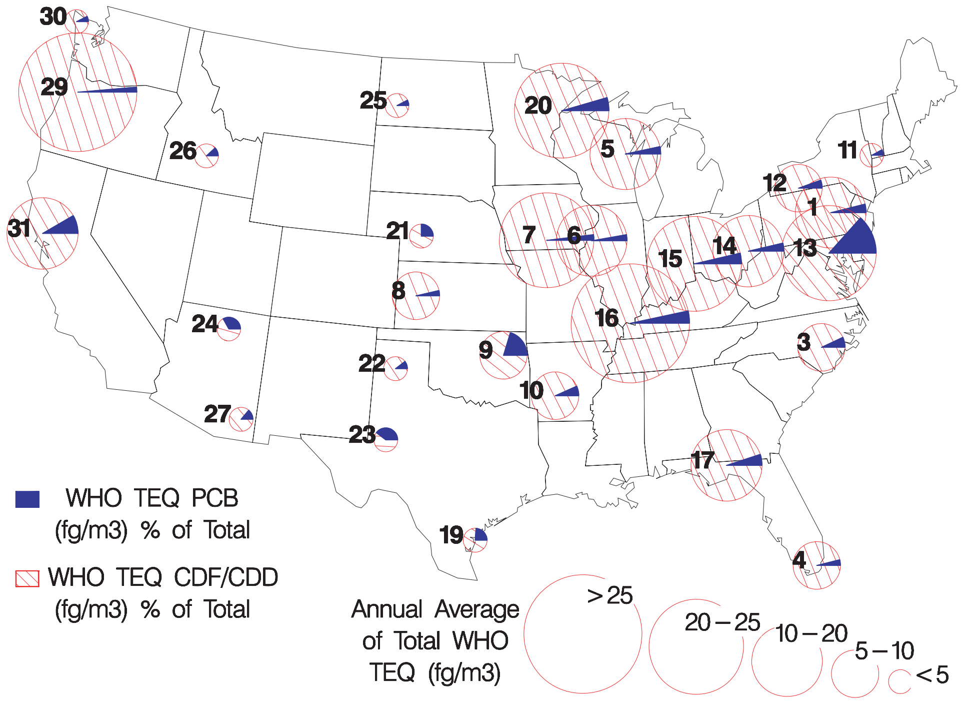


Figure 8-A15. Average Atmospheric Concentrations of Dioxin TEQ (from PCDDs, PCDFs, and Coplanar PCBs) in fg/m3 for the Year 2000.[27]

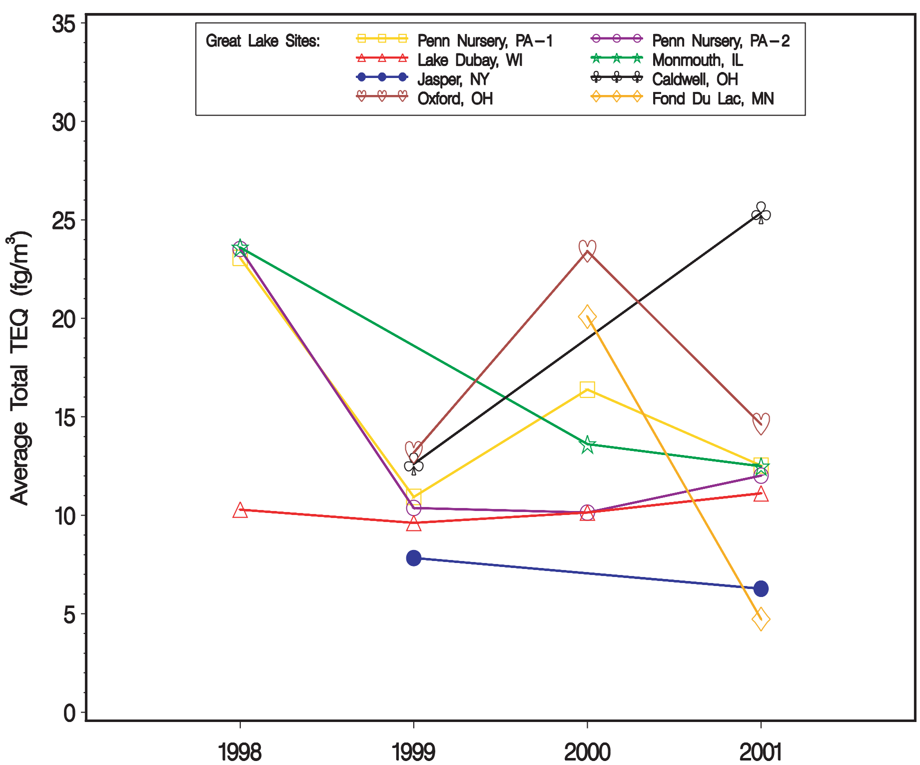


Figure 8-A16. NDAMN Average Total TEQ Concentrations, including Dioxins, Furans, and Dioxin-like PCBs, for Sites in the Great Lakes States, 1998-2001. [28]

[27] ibid

[28] Great Lakes Binational Toxics Strategy Draft Management Assessment for Dioxins, September 2004. Original data from David Cleverly, US EPA ORD National Center for Environmental Assessment.

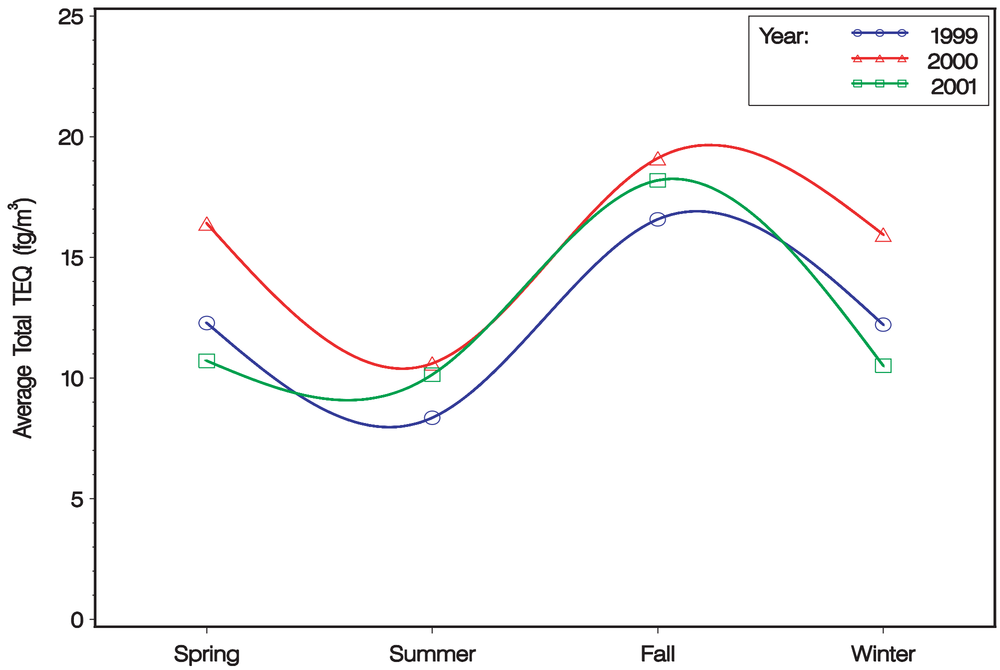


Figure 8-A17. Seasonal Variation in NDAMN Average Total TEQ Concentrations at Great Lakes Sites, 1999-2001.[29]

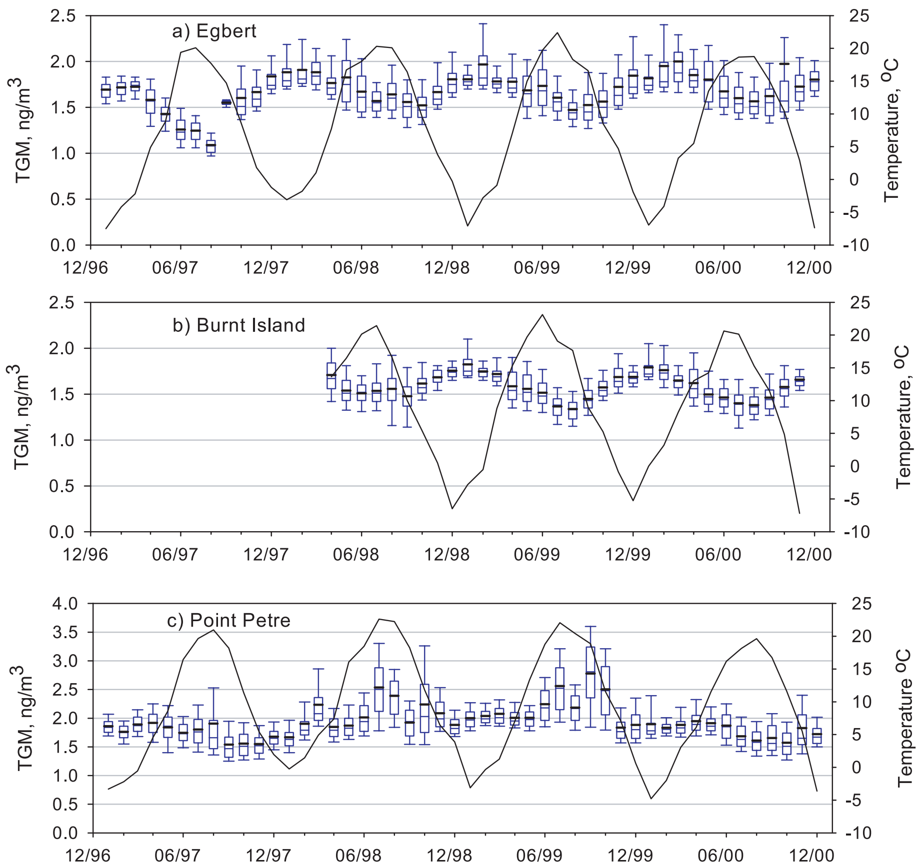


Figure 8-A18. Monthly TGM and Temperature Means at Canadian IADN Stations.[30]

[29] ibid

[30] Blanchard et al., 2002

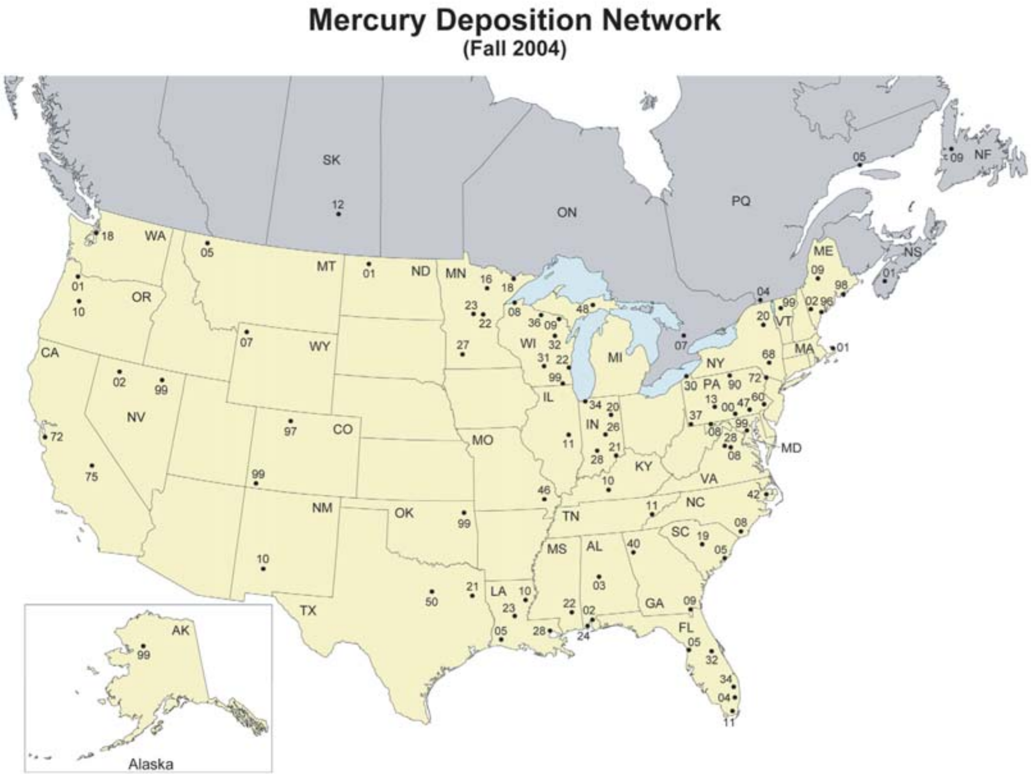


Figure 8-A19. The Mercury Deposition Network (Fall 2002). [31]

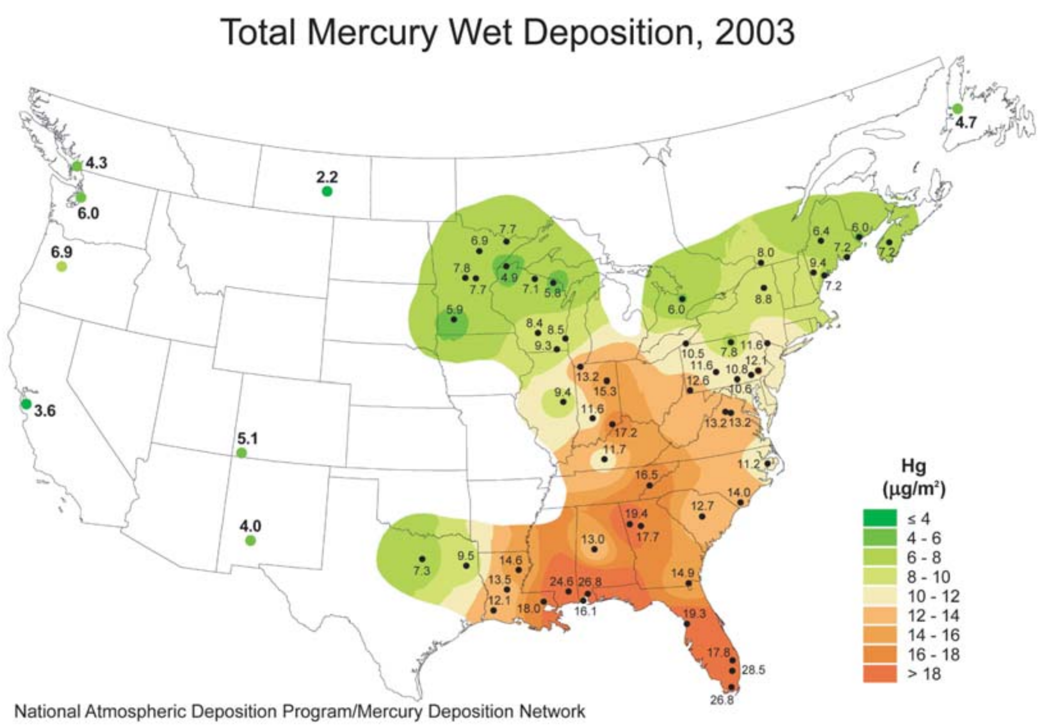


Figure 8-A20. Wet Deposition of Total Mercury in the United States and Southern Canada.[32]

[31] Roger Claybrooke, Illinois State Water Survey

[32] ibid

widespread use of PCBs in industrial applications in the mid-20th century. Back-trajectory analyses also have revealed that the influence of the Chicago urban area may reach as far away as Lake Superior. Preliminary data from the new Cleveland station indicate that PCB levels in that city are lower than those in Chicago, but higher than at the master stations.

IADN data for hexachlorobenzene (HCB) from the three U.S. master stations on Superior, Michigan, and Erie show decreasing trends with long half-lives of 15-29 years (Buehler et al. 2004), though, like PCBs, concentrations increased somewhat during the late 1990s (Figure 8-A3). The longer half-lives may be due to continued releases of HCB into the environment as a byproduct of manufacturing processes. HCB also has an atmospheric lifetime of about 2 ½ half years (Brubaker and Hites 1998), making it capable of global transport and therefore making the Great Lakes susceptible to inputs from global emissions.

In general, gas-phase concentrations of banned or restricted pesticides measured by the IADN (such as α-HCH and DDT) are decreasing over time in the air (Figures 8-A4 and 8-A5). These declining trends correlate well with declining global use of these pesticides. Buehler et al. (2004) found decreasing trends for all gas-phase pesticides measured by IADN except endosulfan, which showed evidence of a decrease only at the Lake Superior master station. Endosulfan currently is used on crops in the Great Lakes Basin, including apples and cherries. The Lake Superior site is more distant from agricultural areas than the other master stations, which may explain why the decreasing trend is at that station only.

Analyses of temporal trends for organochlorine pesticide concentrations in precipitation obtained via data through 1997 revealed decreases (Simcik et al. 2000), but subsequent analyses for data from 1997 through 2002 revealed no significant decreases in levels in precipitation except for p,p'-DDE and p,p'-DDD (Carlson et al. 2004). This generally parallels patterns we are seeing with PCBs: decreases through the mid-1990s and seemingly leveling off concentrations from that point on.

Concentrations of PAHs (with B(a)P used as an example in Figure 8-A6), on the other hand, show no real trend up or down. The concentrations of B(a)P (and PAHs in general) are relatively high at Lakes Erie and Ontario, which are sites near major population centers. Concentrations in Chicago (not shown) are approximately 10 to 100 times higher than concentrations at the IADN master stations.

Figure 8-A7 shows the first four years of gas-phase octachlorostyrene (OCS) data, available for the U.S. stations only. OCS concentrations are low, in the single pg/m3 range, and appear to be decreasing.

The IADN routinely releases atmospheric loadings reports for the pollutants it monitors. 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. Absorption minus volatilization equals net gas exchange, which is the most significant part of the loadings for most IADN pollutants. Figure 8-A8 shows net gas exchange loadings for Lake Michigan for PCBs, α-HCH, and α-HCH (lindane). A bar pointing downward indicates that the net loading is negative, and the compound is volatilizing into the atmosphere. This occurs after the main sources to the air have been cut off and the air becomes "cleaner" relative to the water. The figure shows that the absolute values of the loadings are getting smaller, which indicates that the lake water and the air above it are close to being in equilibrium.

PCBs continue the trend of volatilizing out of the Lakes, but tending towards equilibrium (Blanchard et al., 2004). Like concentrations, loadings of banned organochlorine pesticides continue to decline. Current-use pesticides, such as g-HCH (lindane) and a-endosulfan, are still being deposited to the Lakes from the atmosphere. In general, for trace metals wet deposition is more important than dry deposition and there is a lack of trend over time. Loadings of PAHs also have remained constant over time. This is consistent with continuing emissions of trace metals and PAHs.

A report on the atmospheric loadings of these compounds to the Great Lakes has recently been published for data through 2000. It and other loadings reports are available online at http://www.epa.gov/glnpo/monitoring/air/iadn/iadn.html.

National Air Pollution Surveillance (NAPS) Network

Through the National Air Pollution Surveillance (NAPS) network, data is 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 co-operation with provincial environmental and municipal agencies. The program includes measurement of volatile organic compounds (VOC), including toxics, and ground-level ozone precursors; polar volatile organic compounds (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 polychlorinated dibenzo-p-dioxins (CDDs) and furans (CDFs). 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 the Canada-Ontario Agreement (COA) respecting the Great Lakes Basin Ecosystem.

Some examples of trends in selected species are shown in Figures 8-A9 to 8-A13. The box plots show median, 25th and 75th percentiles, and non-outlier minimum and maximum. In some cases outliers and extremes also are provided.

Ambient concentrations of dioxins, furans, and coplanar PCB represented as TEQ have decreased over time (Figures 8-A9 and 8-A10), with the largest declines in areas with the highest concentrations (personal communications with Tom Dann). Like the IADN data, the NAPS data show little change over time in B(a)P concentrations (Figures 8-A11 and 8-A12) and a slow decline in HCB concentrations (Figure 8-A13).

National Dioxin Air Monitoring Network (NDAMN)

Atmospheric concentrations of dioxins, furans, and coplanar PCBs are monitored by the National Dioxin Air Monitoring Network (NDAMN). The US EPA established NDAMN to determine the temporal and geographical variability of atmospheric dioxins, furans, and coplanar (dioxin-like) PCBs at rural and remote locations throughout the United States. Currently operating at 32 sampling stations (Figure 8-A14), 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 United States; and (3) to provide information regarding the long-range transport of dioxin-like compounds in air over the United States.

Figure 8-A15 presents annual ambient air concentrations of dioxin and dioxin-like PCBs (expressed as TEQ or Toxic Equivalence to 2,3,7,8-TCDD) collected at all rural NDAMN locations operating in the year 2000 (The numbers in the figure refer to the location of NDAMN stations, rather than dioxin concentrations). These data suggest that atmospheric dioxin concentrations at some Great Lakes sites are higher than in other parts of the country. This may be a reflection of population density and/or the impact of proximate sources in the Great Lakes Basin.

Data collected from NDAMN have not provided any conclusive evidence that supports the long-range transport of dioxins/furans. Southern sites in Texas and Arizona that were expected to capture transboundary fluxes from Mexico have shown low levels of dioxins/furans that are similar to levels in national parks (Cleverly et al., 2002).

Figure 8-A16 presents average total TEQ concentrations from 1998 to 2001 for seven rural and urban sites (and one duplicate analysis) in the Great Lakes States. No trends over time are discernible. This does not necessarily contradict the NAPS results, which found decreases over a longer period of time (from the early- to mid-1990s up to the present) and more so at urban sites.

Figure 8-A17 illustrates the seasonal variation in average total TEQ concentrations collected at NDAMN sites in the Great Lakes from 1999 to 2001. Concentrations in the fall are slightly higher than concentrations in the other seasons. The data were categorized into winter, spring, summer, and fall using the season assignments provided in the Final NDAMN 2000 Annual Report (US EPA 2003). For these data, fall consists of sampling moments collected in Nov/Dec; winter consists of moments collected in Jan/Feb; spring consists of moments collected in Mar/Apr, Apr/May, and May/Jun; and summer consists of moments collected in Jun/Jul, Jul/Aug, and Aug/Sep. (Each sampling moment consists of 20 or 24 days of sampling over a 28-day period.)

Canadian Atmospheric Mercury Measurement Network (CAMNet)

In 1996, Environment Canada initiated the Canadian Atmospheric Mercury Measurement Network (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 8-A18 illustrates that concentrations of TGM have remained relatively stable between 1997 and 2000.

Mercury Deposition Network (MDN)

Another very important North American monitoring network is the Mercury Deposition Network (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 United States 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 more than 75 sites in the United States, Canada, and more recently, Mexico (see Figure 8-A19, which does not include the new Mexican stations). MDN collects weekly precipitation samples at sites in the United States 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. Figure 8-A20 shows spatial trends of wet deposition of mercury in the United States and Canada.

Acknowledgements

Melissa Hulting of the US EPA Great Lakes National Program Office coordinated this section of the report. The work of the IADN Steering Committee heavily contributed to the IADN section. Tom Dann of Environment Canada provided updated figures for the NAPS section. Pierrette Blanchard provided the material for the CAMNet section. Roger Claybrooke and David Gay of the Illinois State Water Survey contributed text and figures for the MDN section.

Much of the NDAMN section was taken from the Great Lakes Binational Toxics Strategy Draft Management Assessment for Dioxins drafted by Battelle Memorial Institute; David Cleverly of the US EPA Office of Research and Development contributed the original data and some figures for this section.

For Additional Information

- The IADN web site: http://www.msc.ec.gc.ca/iadn/
- Great Lakes National Program Office Atmospheric Deposition Environmental Indicator: http://www.epa.gov/glnpo/glindicators/air/airb.html
- Draft State of the Great Lakes 2005 Report, Indicator #117: http://www.solecregistration.ca/en/reports/sogl/default.asp
- The National Air Pollution Surveillance (NAPS) Network: http://www.etcentre.org/naps/
- The Canadian Atmospheric Mercury Network web site: http://www.msc-smc.ec.gc.ca/arqp/camnet_e.cfm
- The Mercury Deposition Network web site: http://nadp.sws.uiuc.edu/mdn/
- The National Dioxin Air Monitoring Network: http://www.epa.gov/ncea/pdfs/dioxin/dei/NDAMN_PAPER3a.pdf and http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=54811.

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.

Blanchard, P. et al. 2004. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results Through 2000. United States Environmental Protection Agency and Environment Canada, Tro129 pp. (ISBN# 0-662-37467-3. Public Works and Government Services Canada Catalogue Number En56-156/2000-1E. US EPA Report Number 905-R-04-900.)

Brubaker, Jr., W.W. and Hites, R.A. 1998. OH reaction kinetics of gas-phase a- and g-hexachlorocyclohexane and hexachlorobenzene. Environ. Sci. Technol. 32:766-769.

Buehler, S. et al. 2002. Gas-Phase Polychlorinated Biphenyl and Hexachlorocyclohexane Concentrations near the Great Lakes: A Historical Perspective. Environ. Sci. Technol. 36:5051-5056.

Buehler, S. et al. 2004. Causes of Variability in Pesticide and PCB Concentrations in Air Near the Great Lakes. Enviro. Sci. Technol. 38:414-422.

Carlson, D. et al. 2004. Annual variations of pesticide concentrations in Great Lakes precipitation. Enviro. Sci. Technol. 38:5290-5296.

Cleverly, D., D. Winters, J. Ferrario, K. Riggs, P. Hartford, D. Joseph, T. Wisbith, A. Dupuy, and C. Byrne. 2002. The National Dioxin Air Monitoring Network (NDAMN): Measurements of CDDs, CDFs, and Coplanar PCBs at 18 Rural, 8 National Parks, and 2 Suburban Areas of the United States: Results for the Year 2000. Organohalogen Compounds 56:437-450. Access: http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=54811.

Dann, Tom. Personal communication, July 19, 2004.

Hafner, W. and Hites, R. 2003. Potential Sources of Pesticides, PCBs, and PAHs to the Atmosphere of the Great Lakes. Enviro. Sci. Technol. 37 (17):3764-3773.

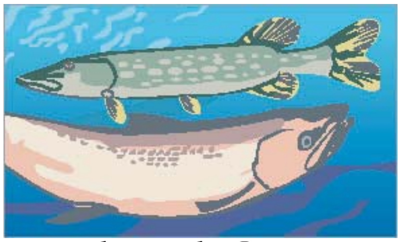
Ma et al. 2004a. How Do Climate Fluctuations Affect Persistent Organic Pollutant Distribution in North America? Evidence from a Decade of Air Monitoring. Enviro. Sci. Technol. 38 (9):2538–2543.

Simcik, M. et al. 2000. Temporal trends of semivolatile organic contaminants in Great Lakes precipitation. Enviro. Sci. Technol. 34:361-367.

US EPA. 2003. National Dioxin Air Monitoring Network (NDAMN) Annual Report of Results of Atmospheric Measurements of PCDDs, PCDFs, and Dioxin-Like PCBs in Rural and Nonimpacted Areas of the United States: 2000. US Environmental Protection Agency. EPA/600/P-02/001A

US EPA. September 2004. Great Lakes Binational Toxics Strategy Draft Management Assessment for Dioxins.

Trends in Great Lakes Fish



Open Lake Fish Contaminants Monitoring Program – Great Lakes: Contaminants in Whole Fish

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Great Lakes National Program Office*

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PURPOSE

Annual or biennial analysis of contaminant burdens in representative open water fish species from throughout the Great Lakes provides data to describe temporal and spatial trends of bioavailable contaminants. These contaminants are both a measure of 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 this biota. Data on status and trends of contaminant conditions, using fish as biological indicators, supports the requirements of the Great Lakes Water Quality Agreement (GLWQA) Annex 1 (Specific Objectives), Annex 2 (Remedial Action Plans and Lakewide Management Plans), Annex 11 (Surveillance and Monitoring), and Annex 12 (Persistent Toxic Substances).

STATE OF THE ECOSYSTEM

Long-term (>25 years), basinwide monitoring programs measuring whole body concentrations of contaminants in top predator (lake trout and/or walleye) and forage fish (smelt) are run by the Canadian Department of Fisheries and Oceans (DFO) and US Environmental Protection Agency's Great Lakes National Program Office (GLNPO). These programs develop trend data on bioavailable toxic substances in the Great Lakes aquatic ecosystem. DFO reports contaminant burdens annually in similarly aged fish (4+ to 6+ range), while GLNPO reports contaminant burdens annually in similarly sized fish (lake trout 600-700 mm and walleye 400-500 mm total length). Since the late 1970s, concentrations of historically regulated contaminants such as PCBs, DDT, and mercury have generally declined in most monitored fish species. Some other contaminants, both currently 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 to both the specific characteristics of the substances involved and the biological conditions of the fish community surveyed.

CRITERIA

The GLWQA, first signed in 1972 and renewed in 1978, expresses the commitment of Canada and the United States to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem. The GLWQA criterion for PCBs states that "the concentration of total polychlorinated biphenyls in fish tissues (whole fish, calculated on a wet weight basis) should not exceed 0.1 micrograms per gram for the protection of birds and animals which consume fish." The GLWQA criterion for DDT and metabolites states that "the sum of the concentrations of DDT and its metabolites in whole fish should not exceed 1.0 microgram per gram (wet weight basis) for the protection of fish-consuming aquatic birds." The GLWQA criteria for mercury state that "the concentration of total mercury in whole fish should not exceed 0.5 micrograms per gram (wet weight basis) to protect aquatic life and fish-consuming birds." Table 8-F1 defines species and locations where GLWQA criteria are exceeded based on current data collected by the DFO and GLNPO's Great Lakes Fish Monitoring Program. DFO collects lake trout and smelt from all lakes and walleye from Lake Erie. GLNPO collects lake trout from all lakes except Lake Erie, where walleye are collected. Tables 8-F2 and 8-F3 list the percent change in total PCBs, SDDT, and mercury concentrations for GLNPO and DFO fish collections, respectively. Temporal trend data for the individual DFO and GLNPO fish monitoring programs are found in Figures 8-F1 through 8-F34.

Lake Michigan – ΣDDT and total PCB lake trout concentration data show consistent declines through 2000 with the second lowest concentration of ΣDDT recorded since the beginning of the program and the lowest concentration of total PCB ever. While a consistent decline has been observed for both contaminants since the 1970s, there has been very little movement in more recent years. GLNPO-recorded concentrations of ΣDDT have remained near or below the GLWQA criteria since 1986. Recorded concentrations of total PCBs in Lake Michigan lake trout remain above the GLWQA criteria.

Lake Superior – ΣDDT: Both GLNPO and DFO lake trout data display a general fluctuation in concentrations from year to year with a recent increase in concentration. However, DFO concentrations recorded in 2002 are within the range of concentration means reported between 1996 and 2002. The increased concentration in the US EPA 2000 collections compared to the 1998 collections may be due to this change in collection sites. One possible explanation is that the population sampled in 2000 was consuming more contaminated prey than the population collected in 1998, which led to higher contaminant concentrations in those lake trout. DFO smelt data show a steady decline through 2002. GLNPO-recorded concentrations of ΣDDT in Lake Superior lake trout have remained below the GLWQA criteria since 1989, and DFO lake trout and smelt concentrations have never been observed to be above GLWQA criteria.

Total PCBs: GLNPO lake trout data show some fluctuation with movement toward a leveling off beginning in the 1980s. DFO lake trout data show very little recent change in the mean PCB concentrations of this age class cohort of Lake Superior lake trout through 2002. DFO smelt show a steady decline in PCB concentrations through 2002. After peaking in 1985, the 2002 level was the lowest recorded concentration since monitoring at Lake Superior began in 1981. Recorded concentrations of total PCBs in both GLNPO and DFO Lake Superior lake trout collections remain above the GLWQA criteria. DFO-collected Lake Superior smelt have consistently remained below GLWQA criteria since 1993.

Mercury: DFO smelt data continue to display a steady decline in mercury concentrations through 2002, with the lowest recorded concentration since 1981; they have consistently remained below the GLWQA criteria.

Lake Huron – ΣDDT: Both GLNPO and DFO lake trout data show a general decline in temporal trends. Both programs display large fluctuations in the early years of analysis followed recently by a relatively consistent year-to-year decline in mean ΣDDT concentrations. DFO Lake

Table 8-F1. Current Exceedances of GLWQA Objectives in Whole Great Lakes Fish

Lake	Species	Hg	PCB	ΣDDT [1]	ΣDDT [2]
Ontario	Smelt	√	X*	√	
	Lake Trout	No Data	X	√	√
Erie	Smelt	√	√*	√	
	Lake Trout	No Data	X*	√	
	Walleye	√	X	√	√
Huron	Smelt	√	√*	√	
	Lake Trout	No Data	X	√	√
Superior	Smelt	√	√*	√	
	Lake Trout	No Data	X	√	√
Michigan	Lake Trout		X		√

[1] *ΣDDT = (p,p' DDD + p,p'DDT + o,p 'DDT + p,p' DDE) - DFO*

[2] *ΣDDT = (p,p' DDD + p,p'DDT + p,p' DDE) - GLNPO*

√ – Below Agreement Objective

X – Exceeds Agreement Objective

*All concentrations based on whole fish samples

Source: **DFO Fish Contaminants Surveillance Program and GLNPO Great Lakes Fish Monitoring Program**

Table 8-F2. Percent Change in Total PCB/ SDDT/Hg Concentrations for GLNPO Fish Collections, Based on Whole Fish Samples (Size - Lake Trout: 600-700mm, Walleye: 450-550mm)

Lake	Contaminant	Species	Recorded Concentration (ug/g)				Most Recently Measured Concentration		% of Highest Recorded Conc'n	% of 1990 Recorded Conc'n
			High	Value	1990	Value	Year	Value		
Superior	ΣDDT	Lake Trout	1977	1.2	1990	0.18	2000	0.567	47%	315%
	Total PCBs	Lake Trout	1980	1.89	1990	0.45	2000	0.784	41%	174%
Michigan	ΣDDT	Lake Trout	1970	19.19	1990	1.39	2000	1.056	6%	76%
	Total PCBs	Lake Trout	1974	22.91	1990	2.72	2000	1.614	7%	59%
Huron	ΣDDT	Lake Trout	1979	3	1990	1	2000	0.557	19%	56%
	Total PCBs	Lake Trout	1979	3.66	1990	1.5	2000	0.779	21%	52%
Erie	ΣDDT	Walleye	1977	0.51	1990	0.17	2000	0.085	17%	50%
	Total PCBs	Walleye	1977	2.64	1990	1.35	2000	1.241	47%	92%
Ontario	ΣDDT	Lake Trout	1977	1.93	1990	0.99	2000	0.864	45%	87%
	Total PCBs	Lake Trout	1977	8.33	1990	2.18	2000	1.174	14%	54%

Increase in concentration most likely due to change in sampling location and food web.

*All concentrations based on whole fish samples

Source: **DFO Fish Contaminants Surveillance Program and GLNPO Great Lakes Fish Monitoring Program**

Table 8-F3. Percent Change in Total PCB/ SDDT/Hg Concentrations for DFO Fish Collections, Based on Whole Fish Samples (Age 4+ - 6+ range)

Lake	Contaminant	Species	Highest Recorded Concentration		Most Recently Measured Conc'n		% of Highest Recorded Concentration
			Year	Value (µg/g)	Year	Value (µg/g)	
Superior	ΣDDT	Lake Trout	1981	0.36	2002	0.10	28%
		Smelt	1982	0.09	2002	0.01	12%
	Total PCBs	Lake Trout	1988	1.91	2002	0.33	17%
		Smelt	1985	0.30	2002	0.03	10%
	Mercury	Smelt	1981	0.10	2003	0.02	20%
Huron	ΣDDT	Lake Trout	1981	1.10	2003	0.16	15%
		Smelt	1982	0.12	2003	0.02	17%
	Total PCBs	Lake Trout	1982	2.52	2003	0.43	17%
		Smelt	1982	0.29	2003	0.03	10%
	Mercury	Smelt	1980	0.07	2003	0.05	74%
Erie	ΣDDT	Walleye	1977	0.90	2003	0.06	7%
		Lake Trout	1989	0.83	2003	0.07	8%
		Smelt	1980	0.12	2003	0.01	8%
	Total PCBs	Walleye	1979	3.11	2003	1.08	35%
		Lake Trout	1990	1.75	2003	0.70	40%
		Smelt	1990	0.76	2003	0.08	11%
	Mercury	Walleye	1977	0.37	2003	0.12	32%
		Smelt	2002	0.05	2003	0.02	40%
Ontario	ΣDDT	Lake Trout	1977	4.54	2003	0.36	8%
		Smelt	1977	0.60	2003	0.06	10%
	Total PCBs	Lake Trout	1977	9.05	2003	1.17	13%
		Smelt	1988	2.15	2003	0.18	8%
	Mercury	Smelt	1982	0.09	2003	0.04	44%

*All concentrations based on whole fish samples

Source: DFO Fish Contaminants Surveillance Program

Table 8-F4. Lake Ontario Food Web Bioaccumulation of HBCD Isomers

SPECIES	ΣHBCD (α+γ isomers) (ng/g wet wt ±S.E.)
Lake Trout	1.68± 0.67
Sculpin	0.45± 0.10
Smelt	0.27± 0.03
Alewife	0.13± 0.02
Mysis	0.07± 0.02
Diporeia	0.08 ±0.01
Plankton	0.02± 0.01

Source: Tomy, G.T., W. Budakowski, T. Halldorson, D.M. Whittle, M. Keir, C. Marvin, G. MacInnis & M. Alaee. 2004

Huron smelt data for total DDT concentrations also display fluctuating concentrations with a recent downward trend. GLNPO- and DFO-recorded concentrations of ΣDDT in Lake Huron lake trout have consistently remained at or below the GLWQA criteria since 1988 and 1984, respectively. DFO-collected Lake Huron smelt have never been observed to be above GLWQA criteria.

Total PCBs: Both GLNPO and DFO lake trout data show a general decline in concentrations, with some occasional fluctuations upward. Concentrations in 2003 DFO lake trout samples are the second lowest ever recorded since the program was initiated in 1980 and concentrations in 2000 GLNPO lake trout samples are the lowest ever recorded. DFO smelt data show significant fluctuations between 1979 and 2003. Total PCB concentrations recorded in GLNPO and DFO recorded concentrations of total PCBs in Lake Huron lake trout remain above the GLWQA criteria. DFO-collected smelt have consistently remained below GLWQA criteria since 1997.

Mercury: DFO smelt data show that mercury concentrations have fluctuated considerably over the period between 1979 and 2003. However, samples collected in 2003 DFO smelt have the highest lakewide concentration recorded since 1984. DFO-collected smelt have never been observed to be above the GLWQA criteria.

Lake Erie - ΣDDT: All monitored species in Lake Erie display a similar pattern of general decline in concentration. Each species displays fluctuation in concentration, followed by a moderate increase in ΣDDT concentration in the mid-to-late 1980s, and then a sharp decline in concentration. Recent concentrations of ΣDDT in GLNPO walleye show little change in more recent years, with the lowest concentration recorded occurring in 1996 and the second lowest recorded in 2000. The sharp increase corresponds to the period of the rapid proliferation of the zebra mussel population within the lake basin. Both GLNPO and DFO walleye data follow the common pattern of annual concentration increases linked to changes in the zebra mussel population. It is important to note that DFO walleye collected in Lake Erie primarily represent conditions in the western and central basins of the lake. Fall DFO collections occur in the western basin, but fish migrate between the western and central basins at points during each year; in the fall, GLNPO walleye demonstrate similar characteristics. DFO lake trout data and smelt data trends also follow the fluctuating concentration pattern influenced by zebra mussel infestation. It is important to note that DFO lake trout collections in Lake Erie were only initiated in 1985. Therefore, the limited number of samples available in the selected age cohort over time makes rigorous temporal trend assessment difficult. Lake trout primarily represent conditions in the eastern basin of the lake, as their movement is restricted by generally higher water temperatures prominent outside this basin. GLNPO- and DFO- recorded concentrations of ΣDDT in Lake Erie walleye have never been observed to be above GLWQA criteria. DFO- recorded concentrations of ΣDDT in Lake Erie lake trout and smelt have never been observed to be above GLWQA criteria.

Total PCBs: Total PCB concentrations were also affected by the introduction of zebra mussels into Lake Erie and led to a general increase in organic contaminant concentration in fish. GLNPO walleye demonstrate a period of increase in concentration from the late 1980s through the early 1990s, in correlation with the introduction of zebra mussels, followed by sharp declines in total PCB concentration. The lowest total PCB concentration ever recorded for GLNPO walleye occurred in 1999. DFO walleye demonstrated a period of annual increases from 1985 through 1993, associated principally with the proliferation of the zebra mussel population in the lake basin. This was followed by a decline in PCB concentration and then remained relatively steady over the past four years through 2003. DFO lake trout data show a decrease in concentration between 1990 and 2001, followed by a slight increase in concentration through to 2003. DFO smelt data show a decline in concentration between 1990 and 2001, followed by a sharp increase in 2002 and an 80 percent decrease in 2003. GLNPO- and DFO- recorded concentrations of Lake Erie walleye and lake trout are above GLWQA criteria. DFO- measured Lake Erie smelt PCB concentrations have never been observed to be above GLWQA criteria.

Mercury: After a period of rapid decline from 1977 through 1983, mercury concentrations in Lake Erie walleye have remained steady. After 1996, the frequency of annual measurements of mercury burdens in walleye by DFO was reduced. The mean of two recent measurements made in 1999 and 2003 was ~ 15 percent greater than the five year mean of the period 1992 through 1996. DFO smelt data show that concentrations of mercury measured in samples collected in 2002 had the highest concentrations reported since the whole lake survey was initiated in 1977. Subsequently, the 2003 concentrations were the second lowest concentrations reported since 1977. DFO- recorded concentrations of Lake Erie smelt are below GLWQA criteria.

Lake Ontario - ΣDDT: Both GLNPO and DFO lake trout data show a period of small fluctuation through the mid-1990s. Both programs identify a declining trend in ΣDDT concentration, beginning in 1994 through the present. Concentrations in 1999 GLNPO lake trout are the lowest ever recorded. DFO smelt data has shown consistent decline between 1998 and 2002. There was a slight increase in reported 2003 smelt concentrations, but this was still an order of magnitude less than the value reported in the initial 1977 collection. GLNPO- and DFO- recorded concentrations of ΣDDT in Lake Ontario lake trout have consistently been below the GLWQA criteria since 1995 and DFO smelt have never been observed to be above GLWQA criteria.

Total PCBs: Both GLNPO and DFO lake trout data show a consistent decline in PCB concentrations through the present, with very little change in concentration since the late 1990s. Concentrations in 200 GLNPO lake trout are the lowest ever recorded. DFO smelt data show that there have been minor declines in PCB concentrations between 1999 and 2003, with a mean value of 0.21 ±0.02 µg/g. GLNPO- and DFO- recorded concentrations of Lake Ontario lake trout and smelt are above the GLWQA criteria.

Mercury: DFO smelt data show that there has been very little change in the annual mean mercury level reported for smelt since the mid- 1980s. Conversely, though, the 2003 level of 0.04 µg/g is the highest mercury concentration in smelt samples recorded since 1984 (0.67 µg/g). DFO- reported concentrations of Lake Ontario smelt have never been observed to be above the GLWQA criteria.

DFO Data

The following figures provide temporal trends collected by the DFO monitoring program. Figure 8-F1 illustrates the trend in total PCB levels in Lake Ontario lake trout from 1977 to 2003, while Figure 8-F2 illustrates the trend in total DDT levels in Lake Ontario lake trout from 1977 to 2003.

Lake trout collections in Lake Erie were initiated by DFO in 1985. Therefore, the limited number of samples available in the selected age cohort makes rigorous assessment difficult. Figure 8-F6 illustrates the trend in total PCB levels in Lake Erie lake trout from 1985 to 2003. Most notable in this time series (1985 – 2003) is the sharp period of increase in mean DDT concentrations culminating in 1989, as the full impact of the zebra mussel proliferation on the form and function of the Lake Erie ecosystem was evident. Figure 8-F7 illustrates the trend in total DDT levels in Lake Erie lake trout from 1985 to 2003.

GLNPO Data

The following figures provide temporal trends collected by the US EPA - GLNPO Great Lakes Fish Monitoring Program. Figures 8-F24 through 8-F28 illustrate SDDT levels in whole lake trout in Lakes Superior, Michigan, Huron, and Ontario; and walleye in Lake Erie from 1972 to 2000 and how they relate to the Great Lakes Water Quality Agreement DDT criteria of 1 µg/g[33] Figure 8-F24 illustrates the trend of SDDT in Lake Superior lake trout. The increase in the concentration of SDDT from 1998 to 2000 is most likely due to the change in collection site or food web and not an increase in contaminant loading.

The following figures provide temporal trends collected by the US EPA - GLNPO Great Lakes Fish Monitoring Program. Figures 8-F29 through 8-F33 illustrate total PCB levels in whole lake trout in Lakes Superior, Michigan, Huron, and Ontario, and walleye in Lake Erie from 1972 to 2000 and how they relate to the Great Lakes Water Quality Agreement criteria of 0.1 µg/g.[34] Figure 8-F29 illustrates the trend of total PCBs in Lake Superior lake trout. The increase in the concentration of total PCBs from 1998 to 2000 is most likely due to the change in collection site or food web and not an increase in contaminant loading.

EMERGING CONTAMINANTS

There are a number of emerging contaminants reported in Great Lakes fish. The foremost is the group of brominated flame retardants (BFRs) that have been reported in fish tissues for several years throughout the Great Lakes basin. Retrospective analyses of archived samples confirm the continuing increase in concentrations of polychlorinated brominated diphenyl ethers (PBDEs) in lake trout from Lake Ontario. Concentrations have increased exponentially from 0.54 ng/g in 1988 to 190 ng/g wet weight in whole fish samples collected in 2002 (Whittle et al., 2004). Figure 8-F34 illustrates temporal trends in total PBDE concentrations in Lake Ontario lake trout from 1978 to 2002.

One of the most widely used BFRs is hexabromocyclododecane (HBCD). Based on its use pattern, as an additive BFR, it has the potential to migrate into the environment from its application site. Recent studies have confirmed that HBCD isomers do bioaccumulate in aquatic ecosystems and do biomagnify as they move up the food chain. Recent studies by Tomy et al. (2004) confirmed the food web biomagnification of HBCD isomers in Lake Ontario. Table 8-F4 presents total HBCD concentrations (α and γ isomers) for various species in the Lake Ontario food web.

Perfluoroctanesulfonate (PFOS) has also been detected in fish throughout the Great Lakes and has also demonstrated the capacity for biomagnification in food webs. PFOS is used in surfactants such as water repellent coatings (i.e., Scotchguard®) and fire suppressing foams). PFOS has been identified in whole lake trout samples from all the Great Lakes at concentrations from 3 ng to 139 ng (wet weight) (Stock et al., 2003). In addition, retrospective analyses of archived lake trout samples from Lake Ontario have identified a 4.25-fold increase (from 43 - 180 ng/g wet weight, whole fish) from 1980 to 2001 (Martin et al., in press).

The toxicological effects of these compounds are not yet completely known. However, the evidence of exponential increases in concentration over time, the ability to biomagnify in aquatic food webs, and the documented presence in fish throughout the Great Lakes make these compounds prime candidates for toxic chemical monitoring program parameters of interest.

[33] Lake Trout is in the 600 - 700 mm size range; Walleye is in the 450 - 550 mm size range. µg/g wet weight +/- 95% C.I., composite samples. Note the different scales on Y axis between lakes.

[34] ibid

PRESSURES

Current - The impact of invasive nuisance species on toxic chemical cycling in the Great Lakes is still an expanding topic. The numbers of both exotic invertebrates and fish species proliferating in Great Lakes ecosystems continue to increase in temporal and spatial manners. Changes imposed on the form and function of native fish communities by exotics will subsequently alter ecosystem energy flow. As a consequence, the pathways and fate of persistent toxic substances will be altered, resulting in different accumulation patterns, particularly at the top of the food web, with the proliferation of zebra mussels witnessed in Lake Erie. Some contaminant concentrations peaked for short periods in fish and subsequently decreased. Each of the Great Lakes is currently experiencing changes in the structure of the aquatic community and, henceforth, there may be periods of increases in contaminant burdens of some fish species.

A recently-published, 15-year Great Lakes study showed that lake trout embryos and sac fry are very sensitive to toxicity associated with maternal exposures to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and structurally related chemicals that act through a common aryl hydrocarbon receptor (AHR)-mediated mechanism of action (Cook et al. 2003). The increase in contaminant load of TCDD may be responsible for declining lake trout populations in Lake Ontario. The models used in this study can be used in the remaining Great Lakes.

Future - Added stressors in the future will arise from the issue of climate change, with the potential for warming effects to change the availability of Great Lakes critical habitats, change the productivity of some systems, accelerate movement of contaminants from abiotic sources into the biological community, and further affect the composition of biological communities. In addition, associated changes in water concentrations, critical habitat availability and aquatic ecosystem reproductive success are also factors influencing contaminant trends of the Great Lakes in the future. Researchers are also discovering that pharmaceuticals, such as endocrine disruptors, may be a factor in declining populations of some fish species. As more work is conducted on this topic in the future, State, Federal, Provincial and Tribal governments will need to be prepared to react.

MANAGEMENT IMPLICATIONS

Much of the current basinwide persistent toxic substance data that is reported focuses on legacy chemicals whose use has been previously restricted through various forms of legislation. There are a variety of emerging chemicals that are reported in literature at various locations throughout the Great Lakes. There is a need for a comprehensive basinwide assessment program to be developed to acquire data on the presence and concentrations of these recently identified compounds in the Great Lakes ecosystems. The existence of long-term specimen archives (>25 years) in both Canada and the U.S. could allow for the establishment of trends for emerging contaminants in the Great Lakes. Retrospective analyses of samples contained in these archives can define whether concentrations of recently detected contaminants are changing and identify whether further control legislation is required for the management of specific chemicals.

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- D. Michael Whittle, DFO - Great Lakes Laboratory for Fisheries & Aquatic Sciences

Contributors:

- Michael J. Keir, DFO - Great Lakes Laboratory for Fisheries & Aquatic Sciences
- J. Fraser Gorrie, Bio-Software Environmental Data

Data Sources:

- US EPA - GLNPO Great Lakes Fish Monitoring Program
- DFO - Great Lakes Laboratory for Fisheries & Aquatic Sciences

REFERENCES

Cook, P.M., Robbins, J.A., Endicott, D.D., Lodge, K.B., Guiney, P.D., Walker, M.K, Zabel, E.W., and Peterson, R.E. 2003. Effects of Aryl Hydrocarbon Receptor-Mediated Early Life Stage Toxicity on Lake Trout Populations in Lake Ontario during the 20th Century. Environmental Science and Technology. 37(17) 3878 – 3884.

Great Lakes Water Quality Agreement of 1978. International Joint Commission, United States and Canada. September, 1989. http://www.ijc.org/rel/agree/quality.html.

Martin, J.W., D. M. Whittle, D.C.G. Muir & S.A. Mabury. 2004 Perfluoroalkyl Contaminants in the Lake Ontario Food Web. Environ. Sci. Technol. 38 (in press).

Stock, N.L. J. Bonin, D.M. Whittle, D.C.G. Muir & S.A. Mabury. 2003. Perfluoronated Acids in the Great Lakes. SETAC Europe 13th Annual Meeting, Hamburg, Germany, April 27 - May 1, 2003.

Tomy, G.T., W. Budakowski, T. Halldorson, D.M. Whittle, M. Keir, C. Marvin, G. MacInnis & M. Alaee. 2004. Biomagnification of α and γ-Hexabomocyclododecane in a Lake Ontario Food Web. Environ. Sci. Technol. 38 (2298-2303).

Whittle, D.M. D.C. MacEachen, D.B. Sergeant, M.J. Keir & M.D. Moles. Food Web Biomagnification of Brominated Diphenyl Ethers in Two Great Lakes Fish Communities. 3rd International Workshop on Brominated Flame Retardants (pp 183-186). Toronto, ON June 6-9, 2004.

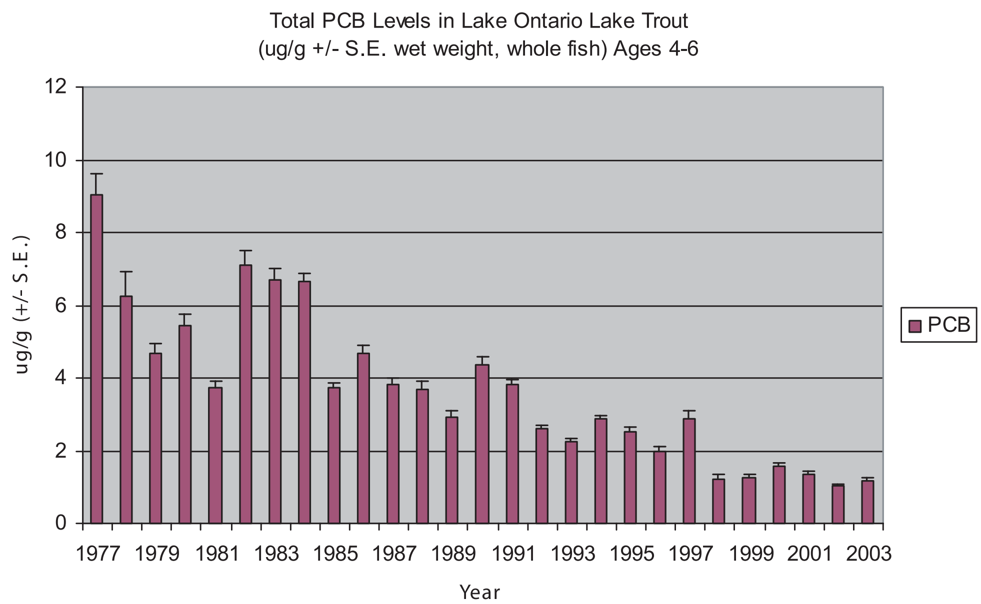


Figure 8-F1. Total PCB Levels in Lake Ontario Lake Trout (1977-2003). Source: Department of Fisheries and Oceans/Great Lakes Laboratory for Fisheries and Aquatic Sciences (DFO/GLLFAS)

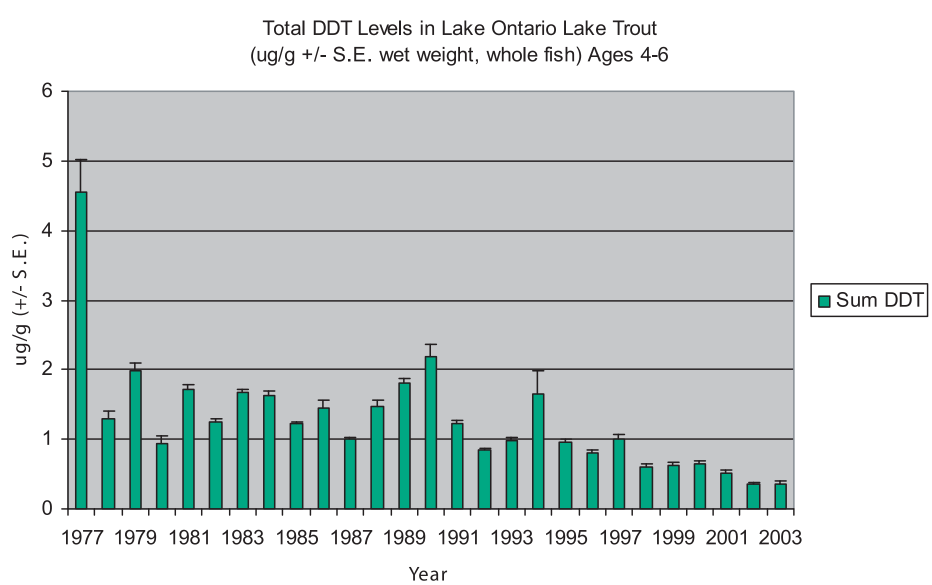


Figure 8-F2. Total DDT Levels in Lake Ontario Lake Trout (1977-2003).Source: Department of Fisheries and Oceans/Great Lakes Laboratory for Fisheries and Aquatic Sciences (DFO/GLLFAS)

Figures 8-F3, 8-F4, and 8-F5 illustrate the trend in total PCB levels, total DDT levels, and total mercury levels in Lake Ontario rainbow smelt from 1977 to 2003, respectively.

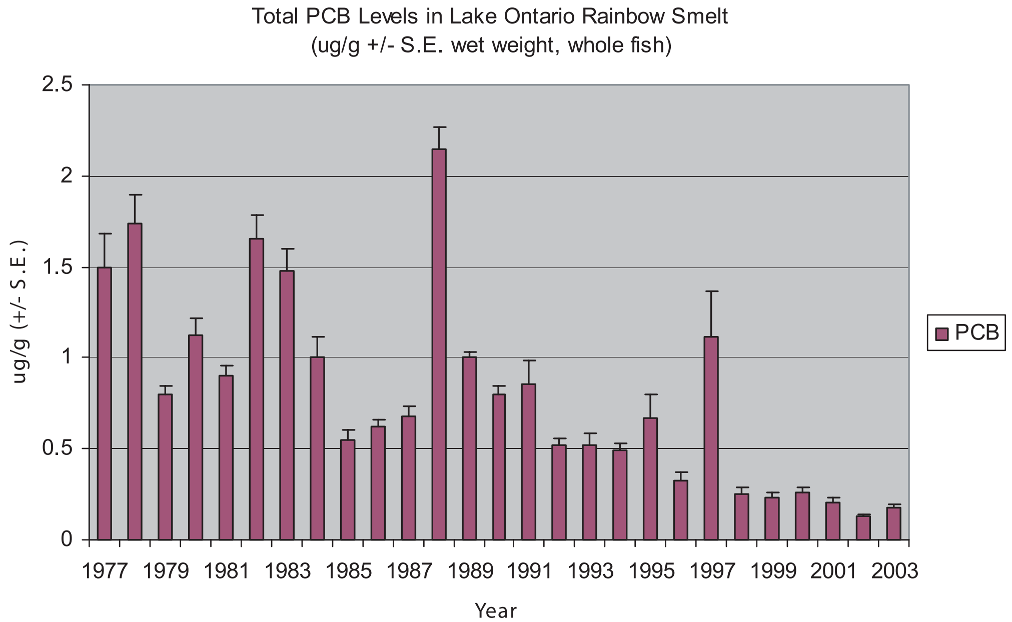


Figure 8-F3. Total PCB Levels in Lake Ontario Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

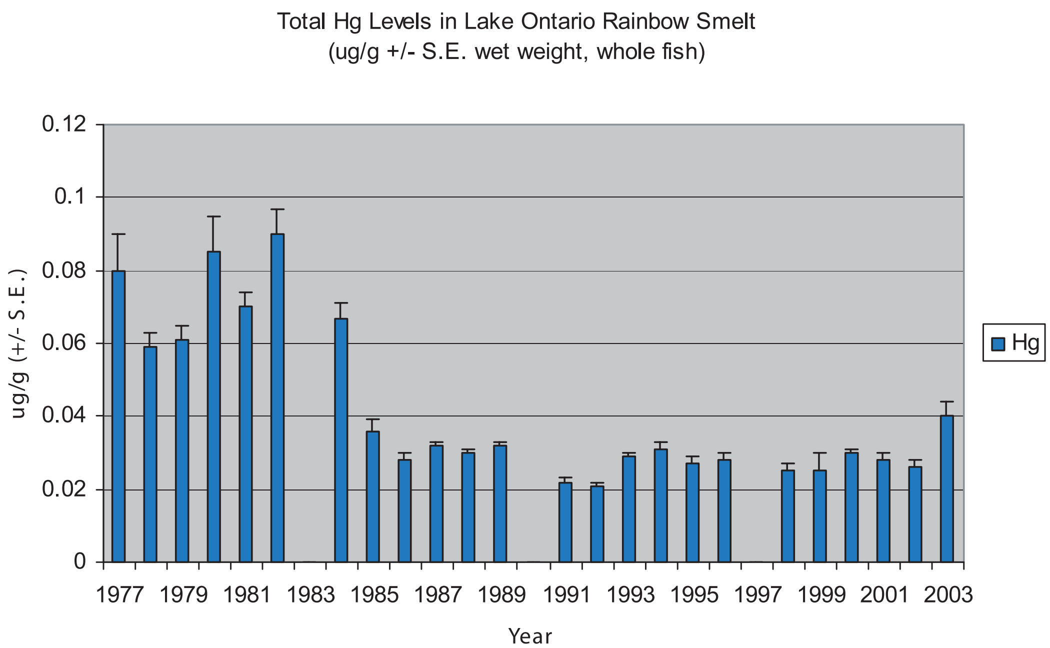


Figure 8-F4. Total DDT Levels in Lake Ontario Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

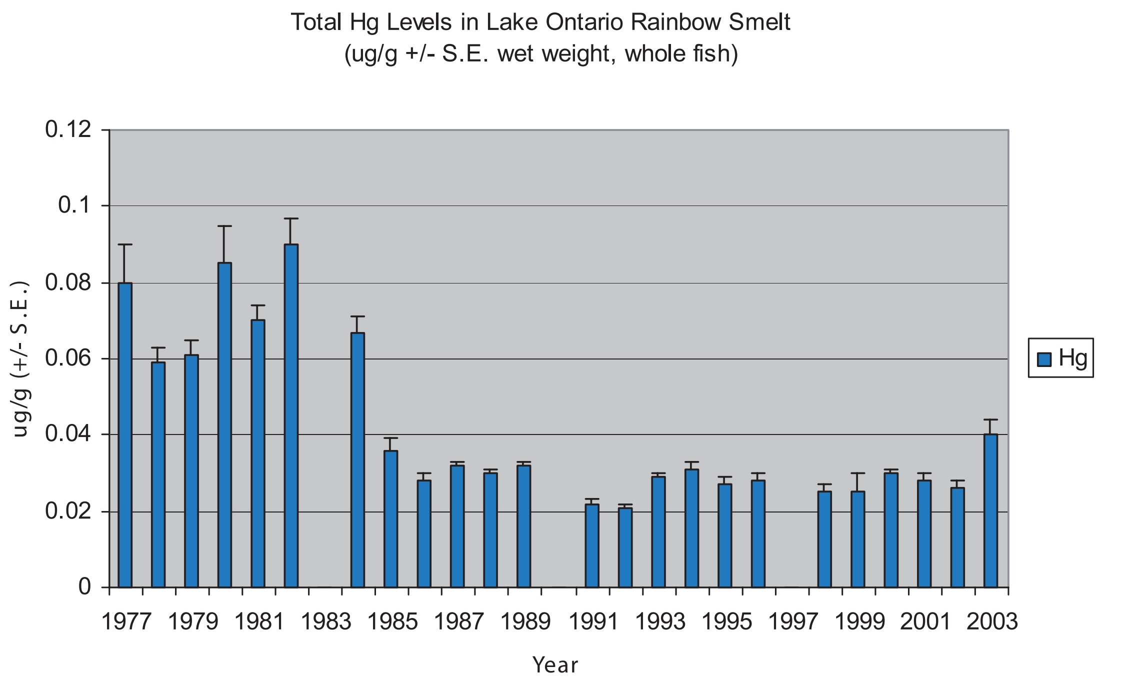


Figure 8-F5. Total Mercury Levels in Lake Ontario Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

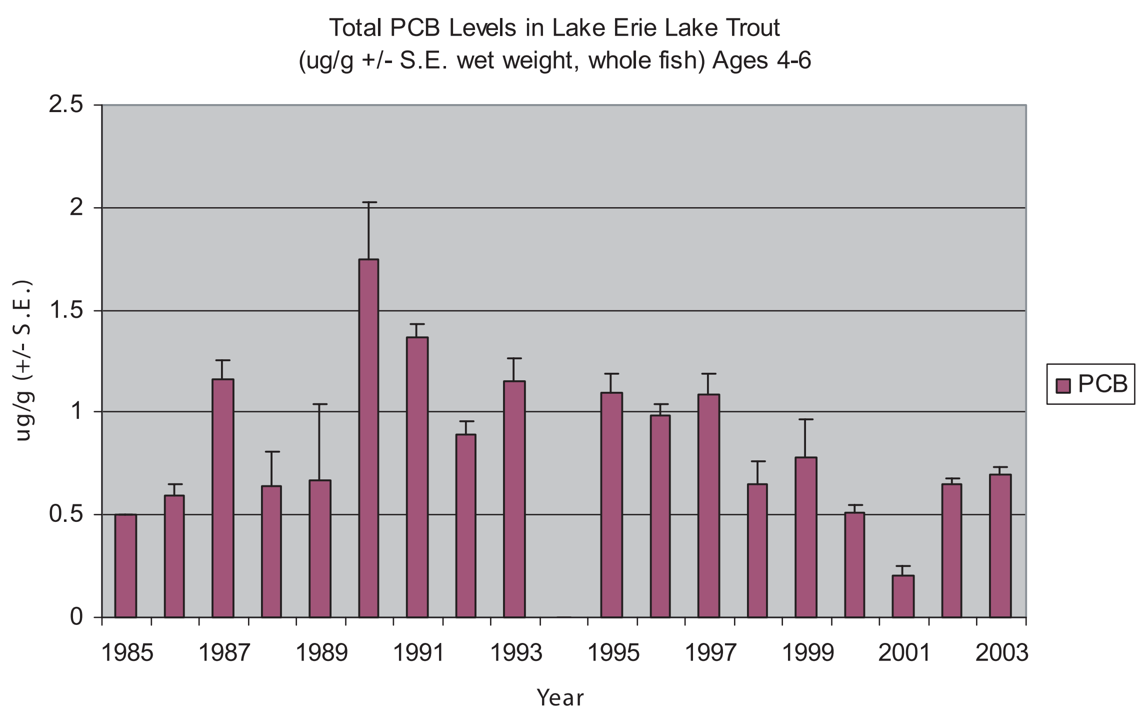


Figure 8-F6. Total PCB Levels in Lake Erie Lake Trout (1985-2003). Source: DFO/GLLFAS

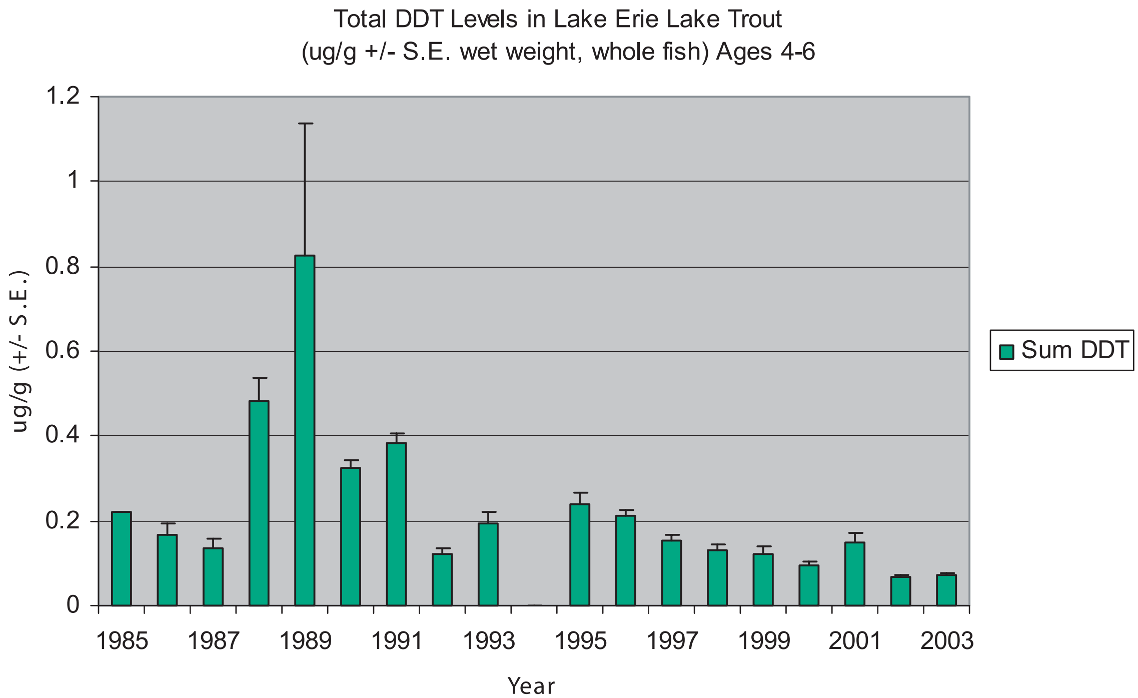


Figure 8-F7. Total DDT Levels in Lake Erie Lake Trout (1985-2003). Source: DFO/GLLFAS

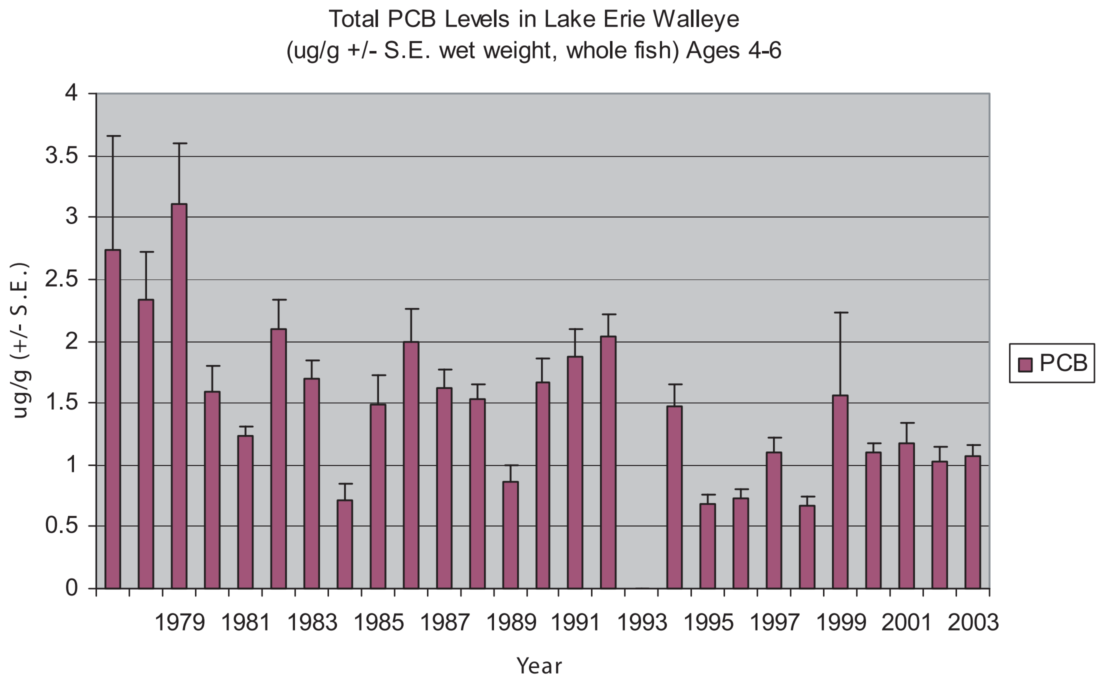


Figure 8-F8. Total PCB Levels in Lake Erie Walleye (1977-2003). Source: DFO/GLLFAS

Figure 8-F8 illustrates the trend in total PCB levels in Lake Erie walleye from 1977 to 2003.

Figure 8-F9 and 8-F10 illustrate the trend in total DDT levels and total mercury levels in Lake Erie walleye from 1977 to 2003, respectively. Total DDT levels in walleye have declined by more than an order of magnitude since monitoring commenced in 1977. Levels increased modestly during the period 1987 through 1989, which was coincidental with the zebra mussel invasion period. Since 1989, total DDT levels have declined consistently in walleye samples, and the 2003 mean concentration (0.06 µg/g) is the lowest measured since the initiation of the DFO monitoring program in 1977.

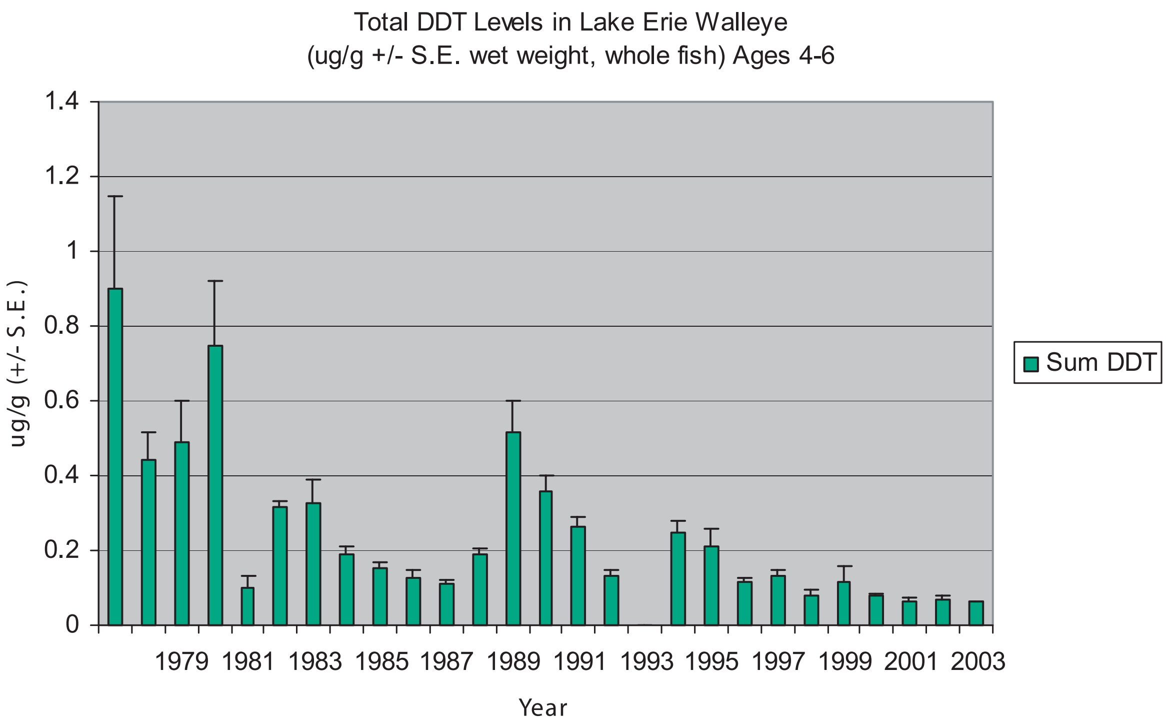


Figure 8-F9. Total DDT Levels in Lake Erie Walleye (1977-2003). Source: DFO/GLLFAS

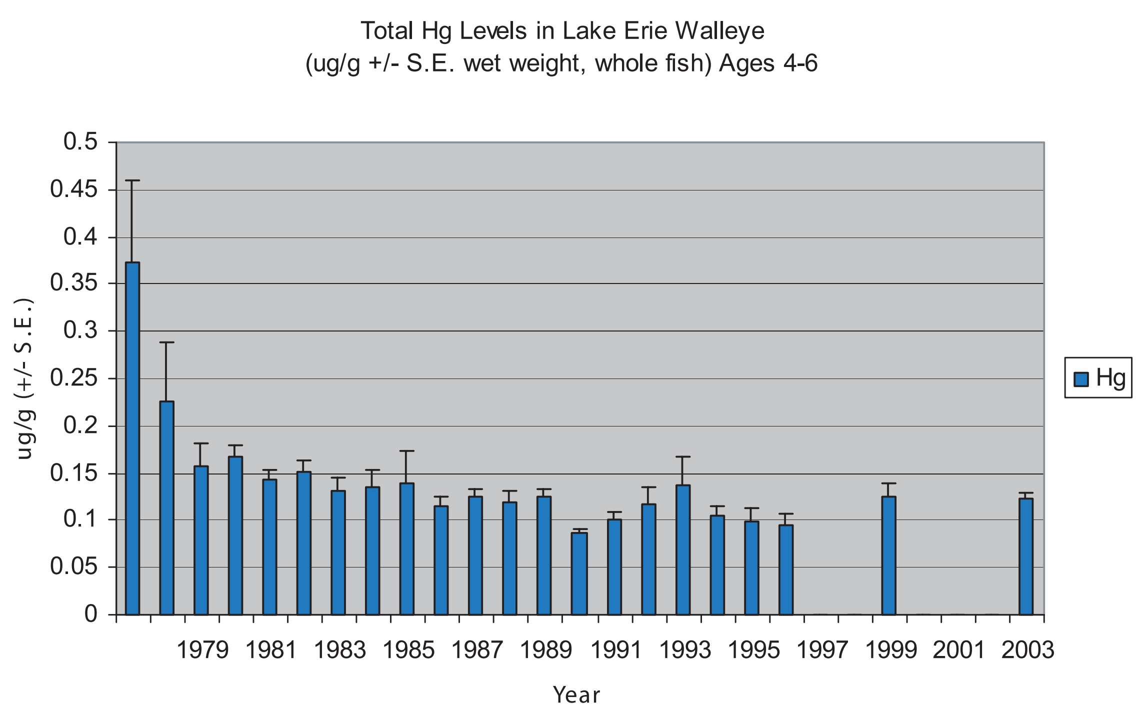


Figure 8-F10. Total Mercury Levels in Lake Erie Walleye (1977-2003). Source: DFO/GLLFAS

Figures 8-F11, 8-F12, and 8-F13 illustrate the trend in total PCB levels, total DDT levels, and total mercury levels in Lake Erie rainbow smelt from 1977 to 2003, respectively.

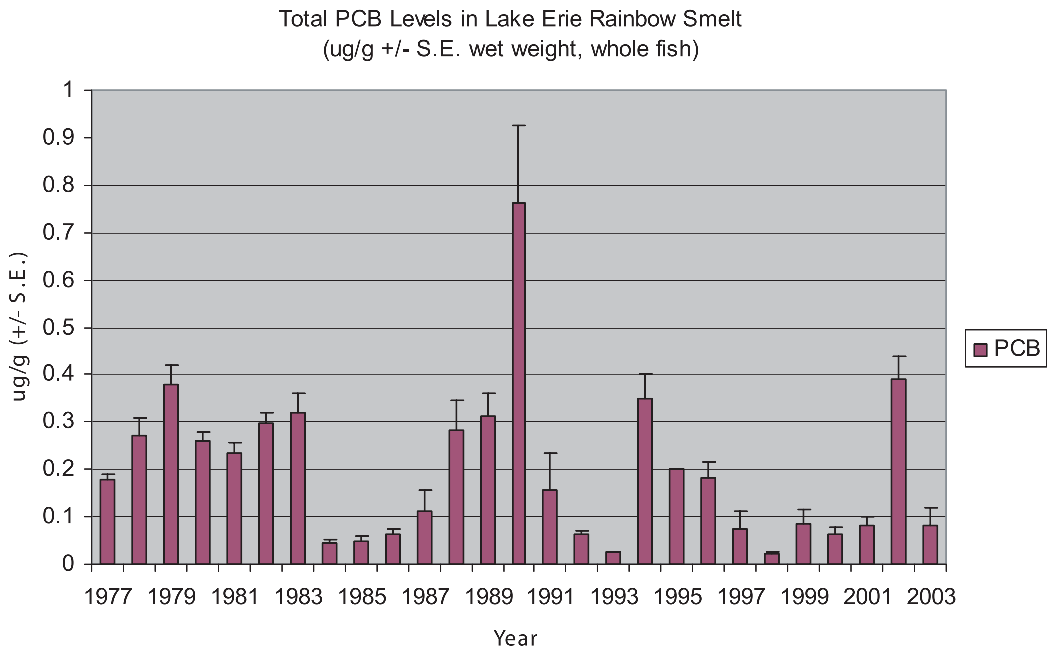


Figure 8-F11. Total PCB Levels in Lake Erie Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

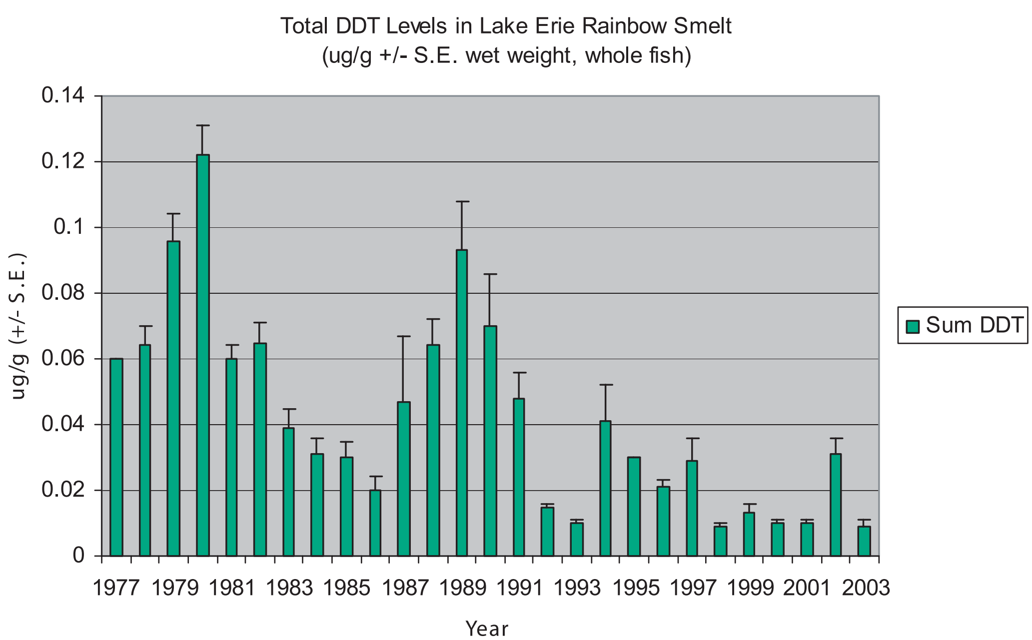


Figure 8-F12. Total DDT Levels in Lake Erie Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

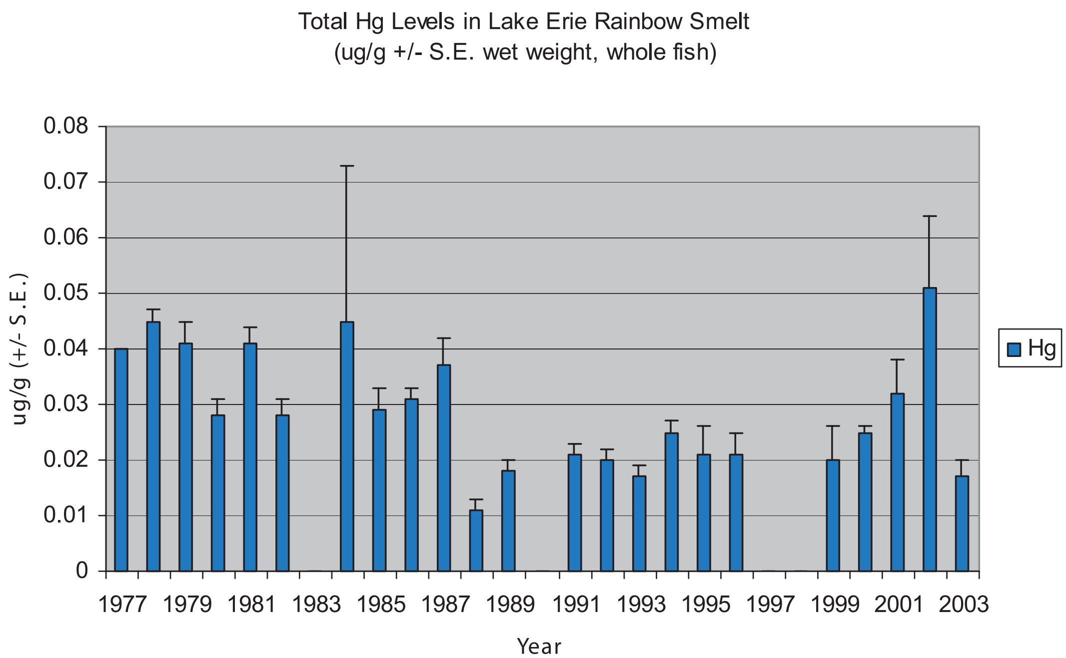


Figure 8-F13. Total Mercury Levels in Lake Erie Rainbow Smelt (1977-2003). Source: DFO/GLLFAS

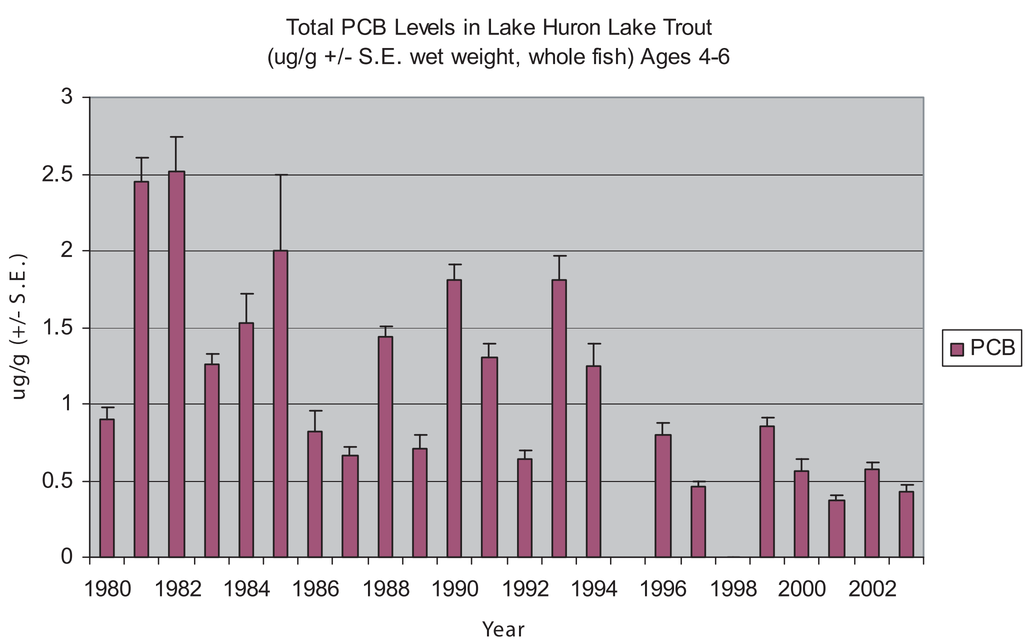


Figure 8-F14. Total PCB Levels in Lake Huron Lake Trout (1980-2003). Source: DFO/GLLFAS

Figure 8-F14 illustrates the trend in total PCB levels in Lake Huron lake trout from 1980 to 2003. The mean PCB concentration in 2003 collections declined to the second lowest level (0.43 µg/g) measured in Lake Huron lake trout since monitoring began in 1980. Figure 8-F15 illustrates the trend in total DDT levels in Lake Huron lake trout from 1980 to 2003.

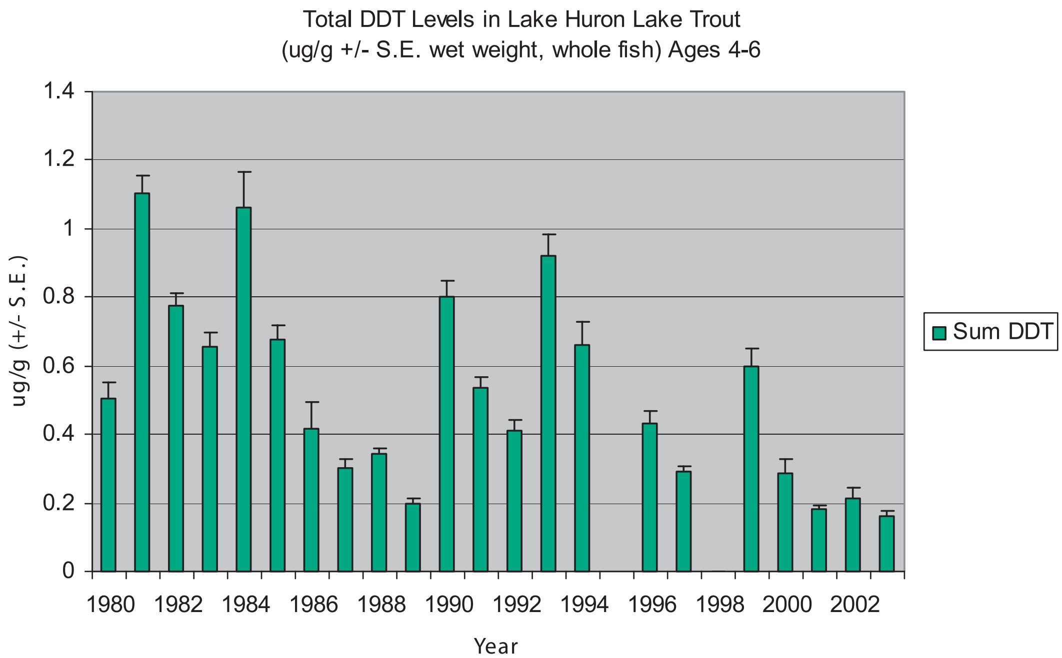


Figure 8-F15. Total DDT Levels in Lake Huron Lake Trout (1980-2003). Source: DFO/GLLFAS

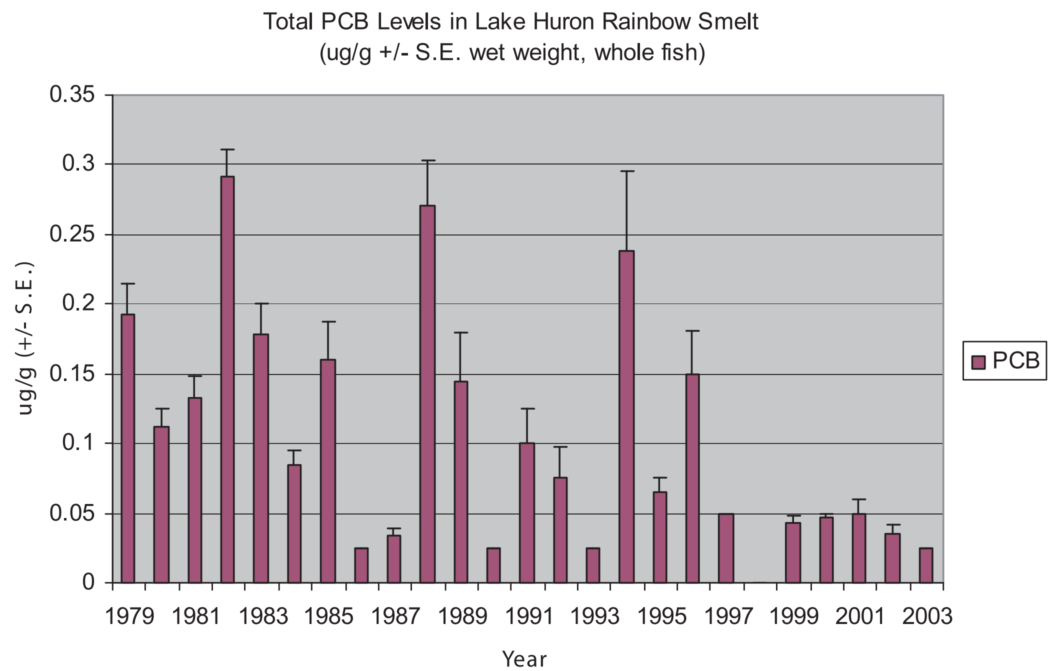


Figure 8-F16. Total PCB Levels in Lake Huron Rainbow Smelt (1979-2003). Source: DFO/GLLFAS

Figure 8-F16 illustrates the trend in total PCB levels in Lake Huron rainbow smelt from 1979 to 2003, while Figure 8-F17 illustrates the trend in total DDT levels in Lake Huron rainbow smelt from 1979 to 2003.

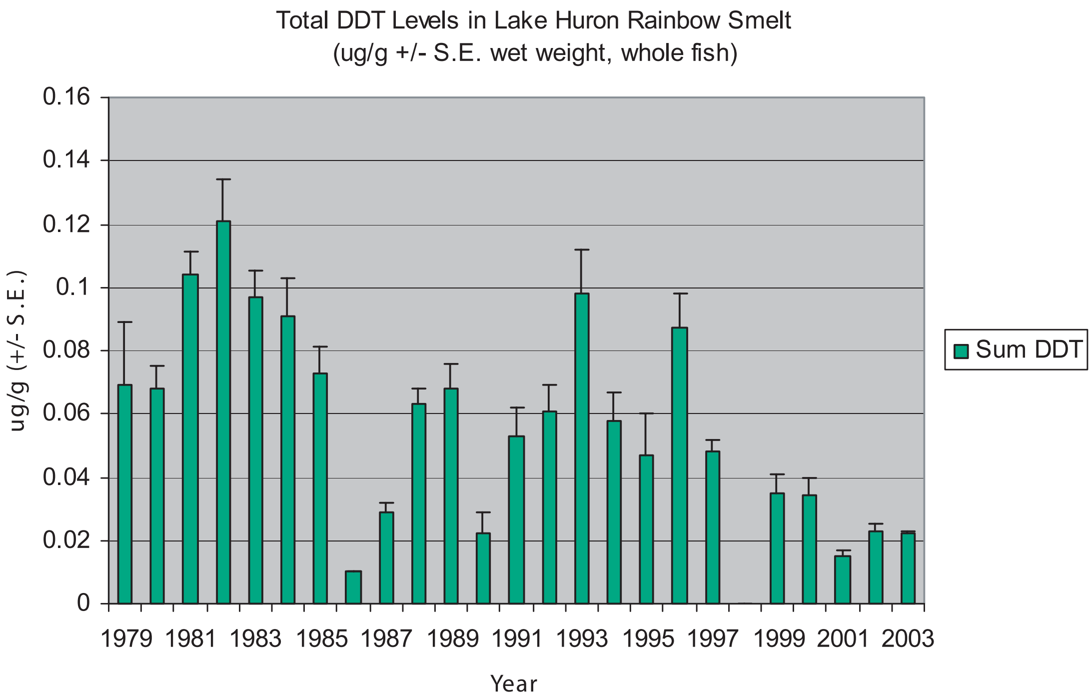


Figure 8-F17. Total DDT Levels in Lake Huron Rainbow Smelt (1979-2003). Source: DFO/GLLFAS

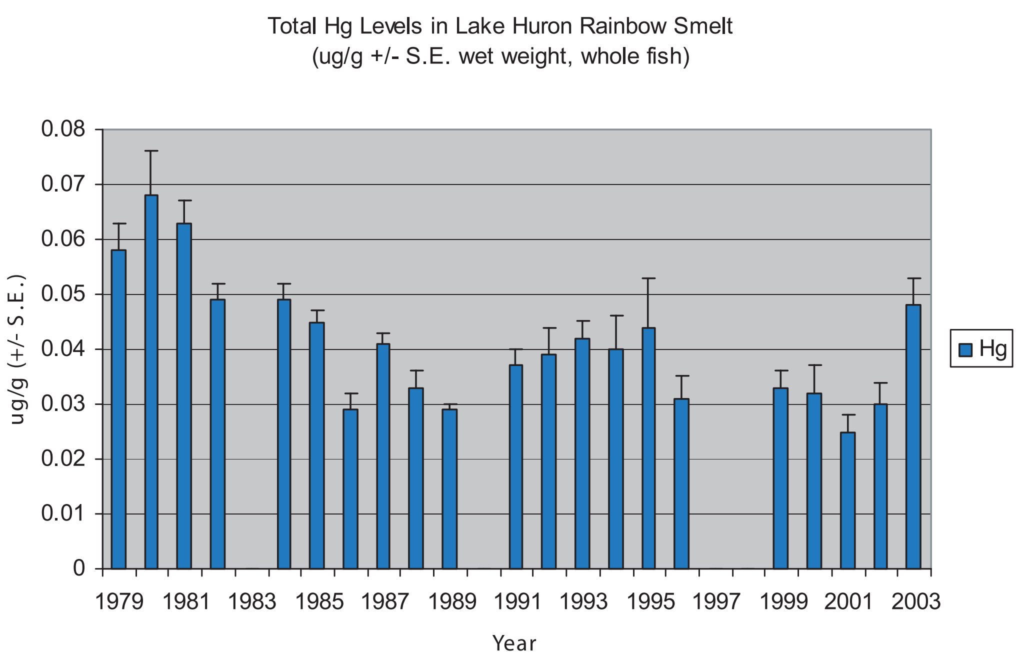


Figure 8-F18. Total Mercury Levels in Lake Huron Rainbow Smelt (1979-2003). Source: DFO/GLLFAS

Figure 8-F18 illustrates the trend in total mercury levels in Lake Huron rainbow smelt from 1979 to 2003. The mean 2003 value of 0.05 µg/g represents approximately 70 percent of the highest mean survey concentration measured in the1980 samples, and the 2003 concentration is the highest lakewide level recorded since 1984.

Figure 8-F19 illustrates the trend in total PCB levels in Lake Superior lake trout from 1980 to 2002, while Figure 8-F20 illustrates the trend in total DDT levels in Lake Superior lake trout from 1980 to 2002.

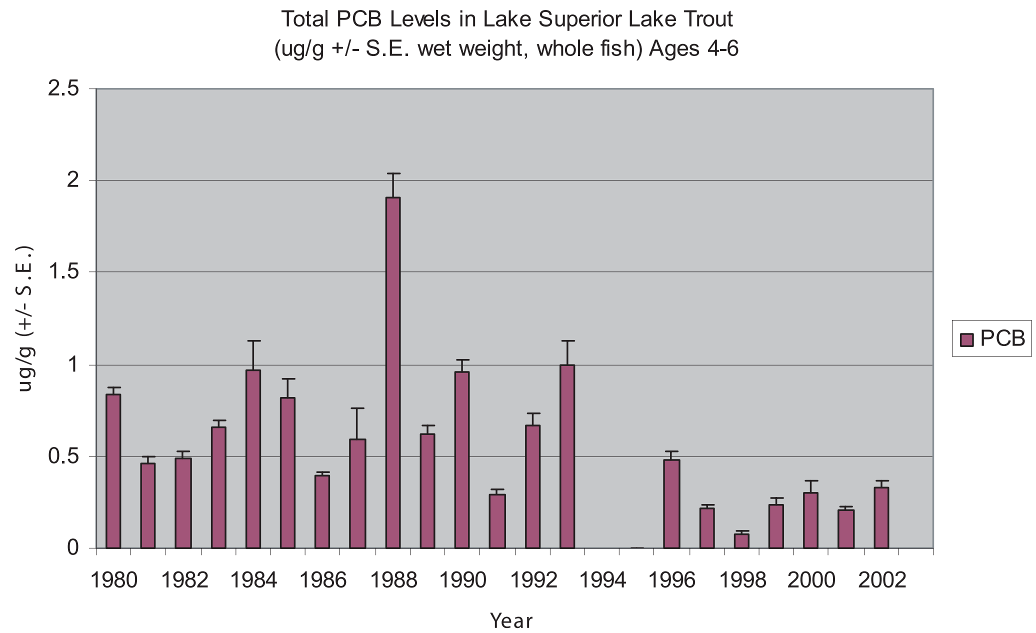


Figure 8-F19. Total PCB Levels in Lake Superior Lake Trout (1980-2002). Source: DFO/GLLFAS

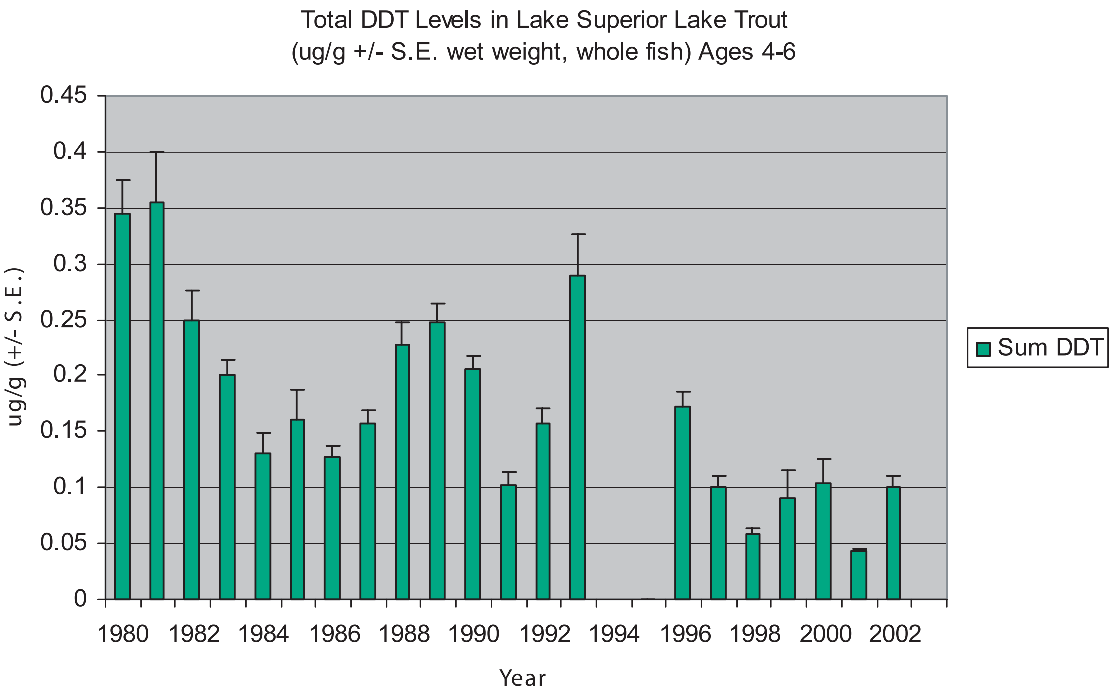


Figure 8-F20. Total DDT Levels in Lake Superior Lake Trout (1980-2002). Source: DFO/GLLFAS

Figures 8-F21, 8-F22, and 8-F23 illustrate the trend in total PCB levels, total DDT levels, and total mercury levels in Lake Superior rainbow smelt from 1981 to 2002, respectively.

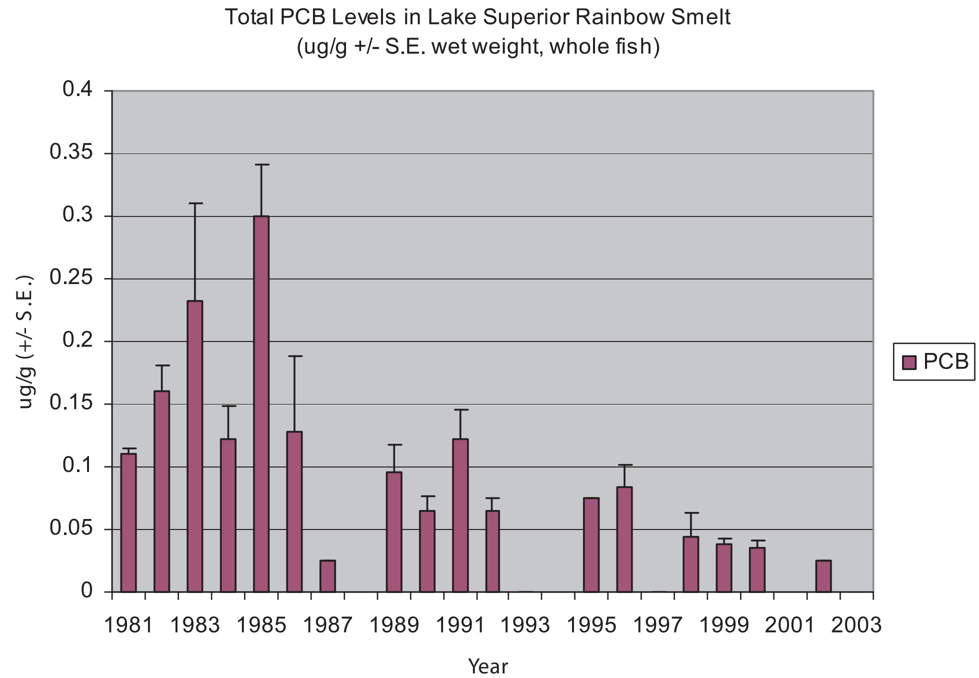


Figure 8-F21. Total PCB Levels in Lake Superior Rainbow Smelt (1981-2002). Source: DFO/GLLFAS

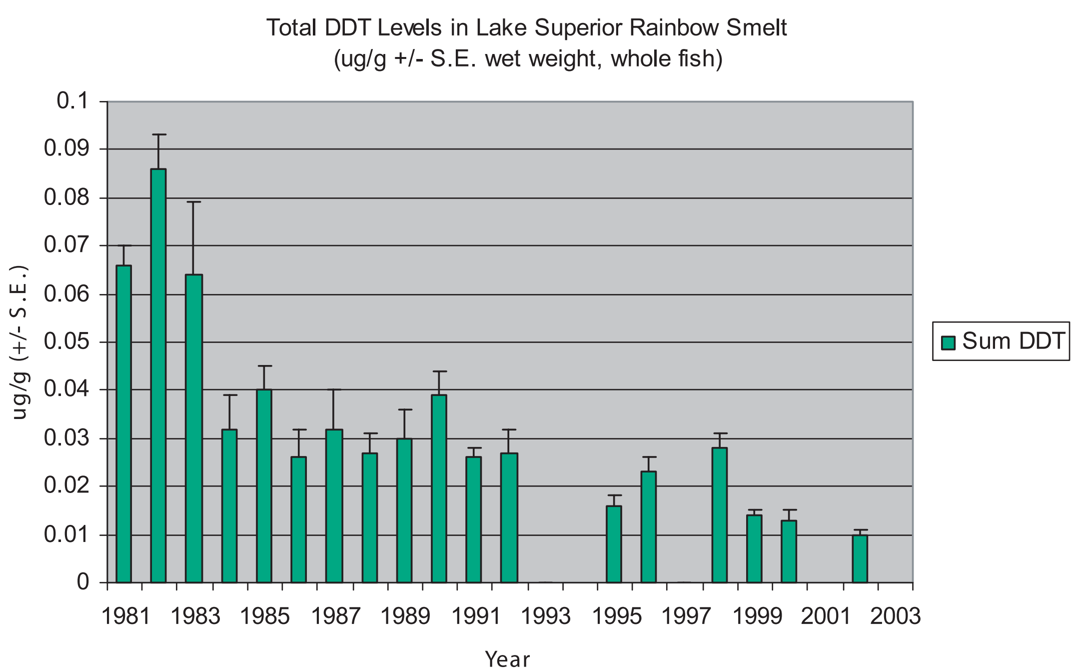


Figure 8-F22. Total DDT Levels in Lake Superior Rainbow Smelt (1981-2002). Source: DFO/GLLFAS

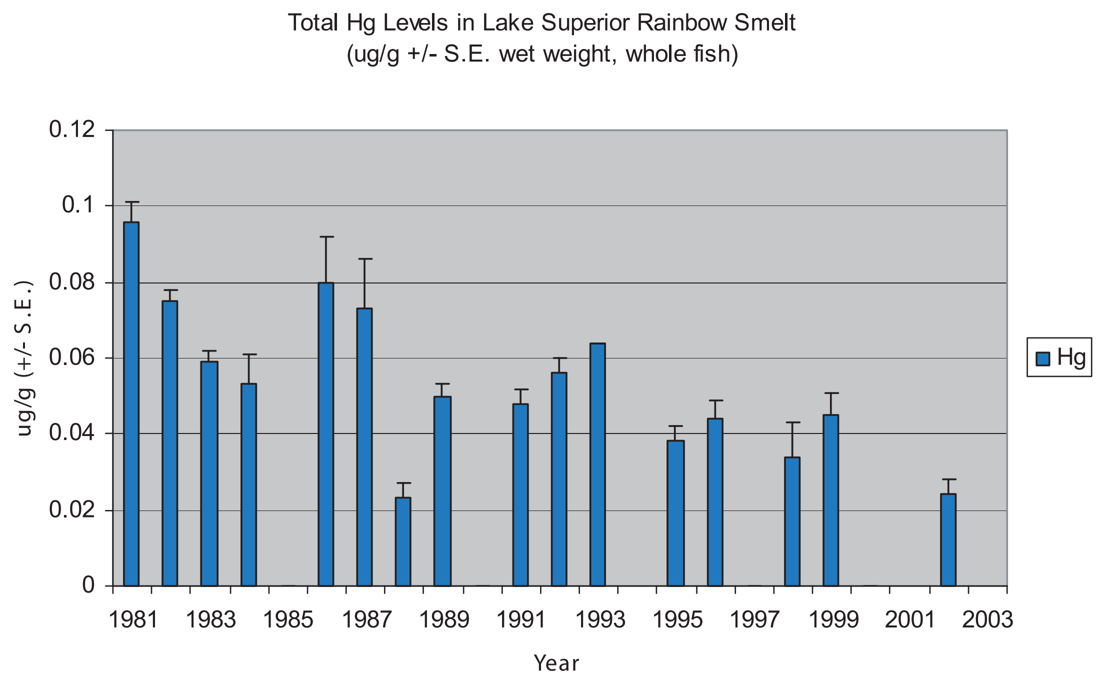
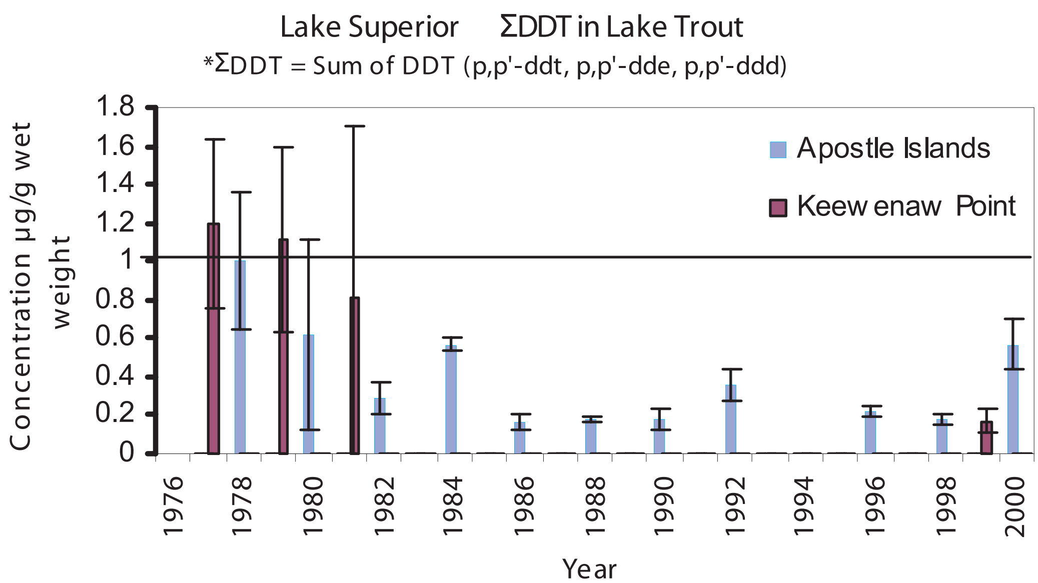


Figure 8-F23. Total Mercury Levels in Lake Superior Rainbow Smelt (1981-2002). Source: DFO/GLLFAS



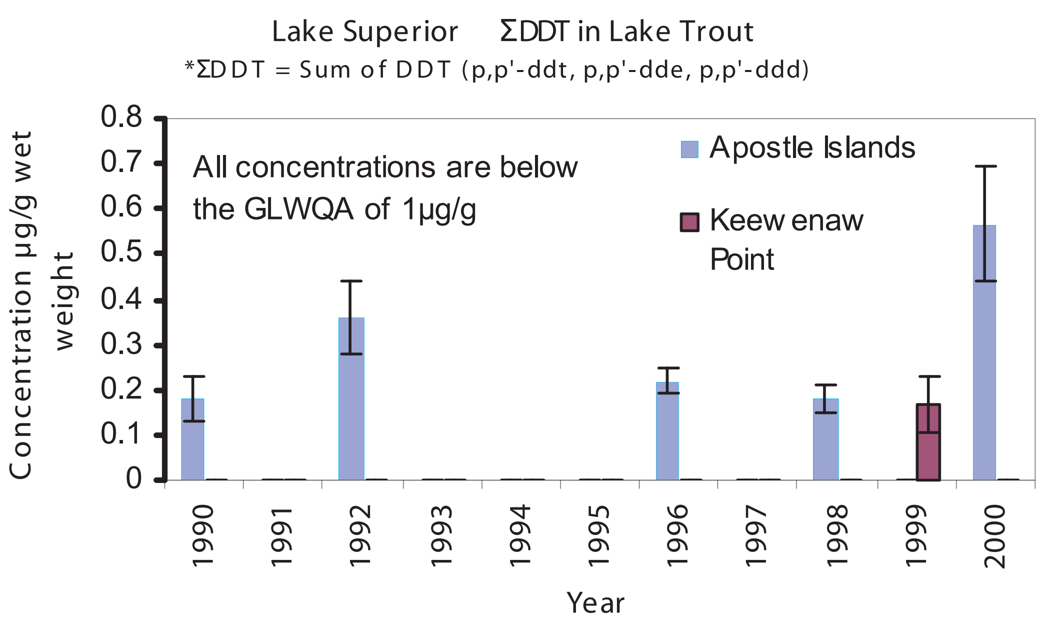
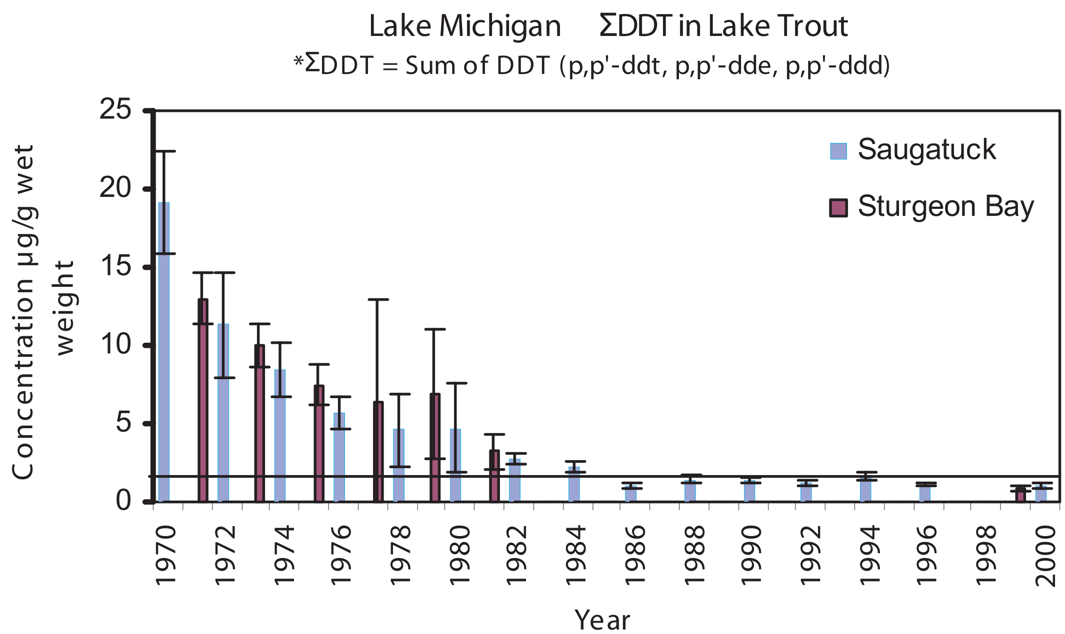


Figure 8-F24a-b. ΣDDT Levels in Lake Superior Lake Trout (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program[35]

[35] Lake Trout is in the 600 - 700 mm size range; Walleye is in the 450 - 550 mm size range. µg/g wet weight +/- 95% C.I., composite samples. Note the different scales on Y axis between lakes.



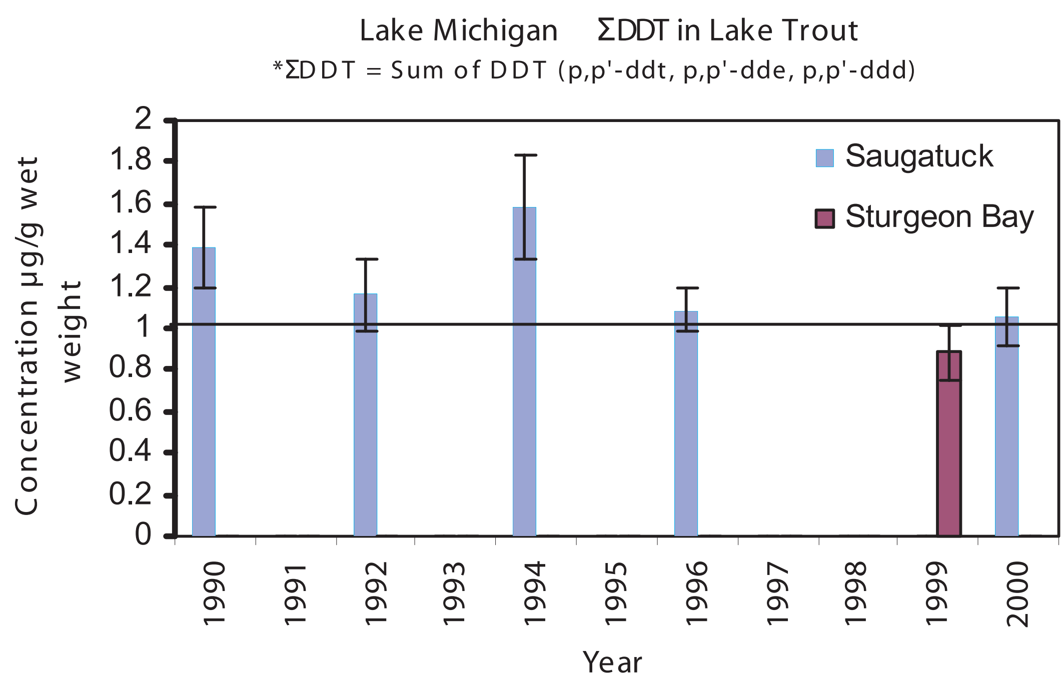
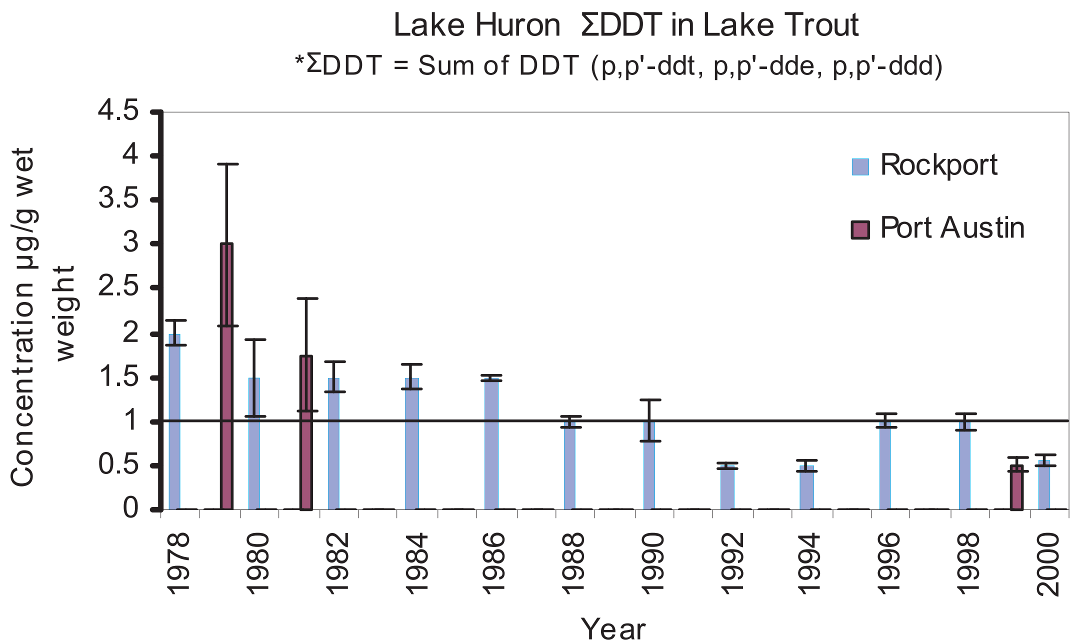


Figure 8-F25a-b. ΣDDT Levels in Lake Michigan Lake Trout (1970-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



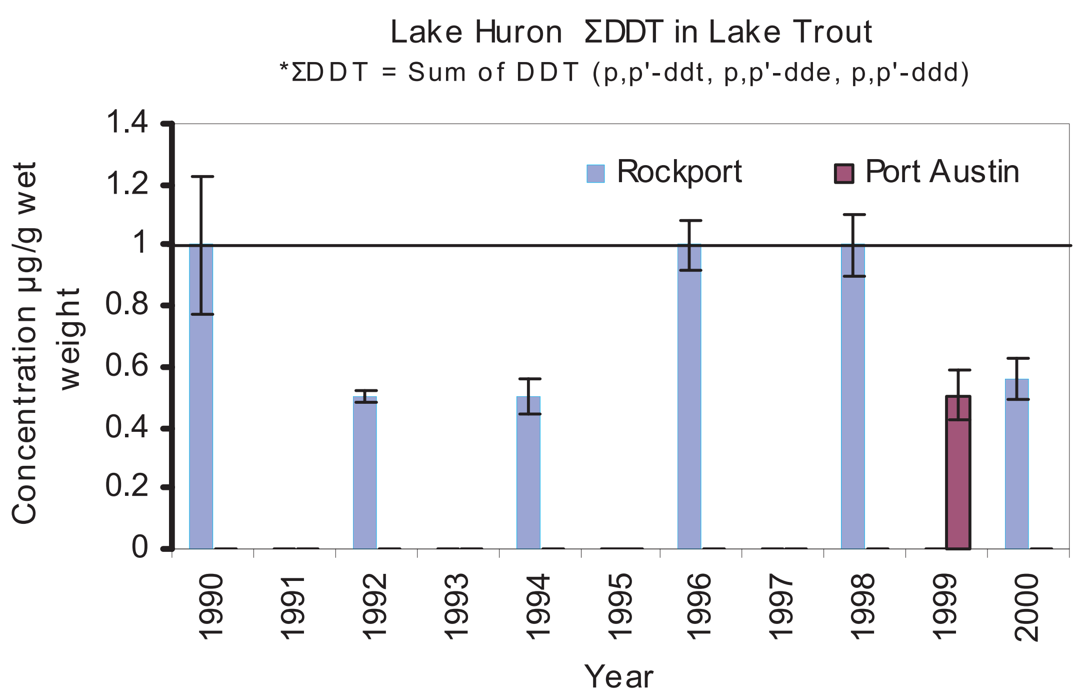
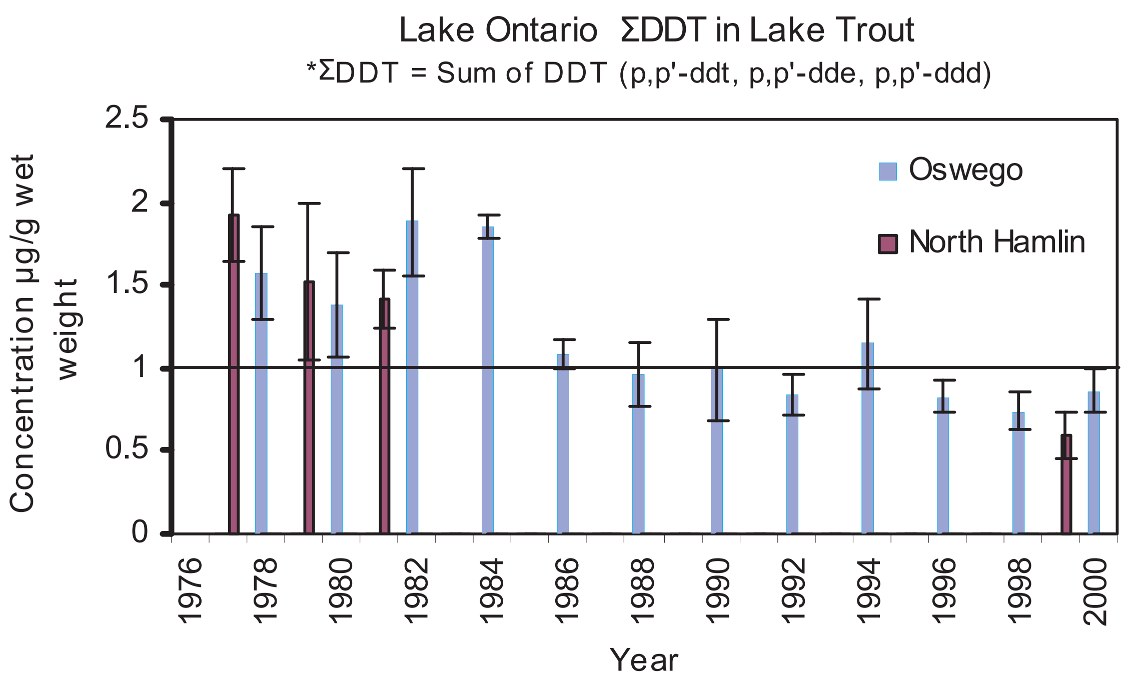


Figure 8-F26a-b. ΣDDT Levels in Lake Huron Lake Trout (1978-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



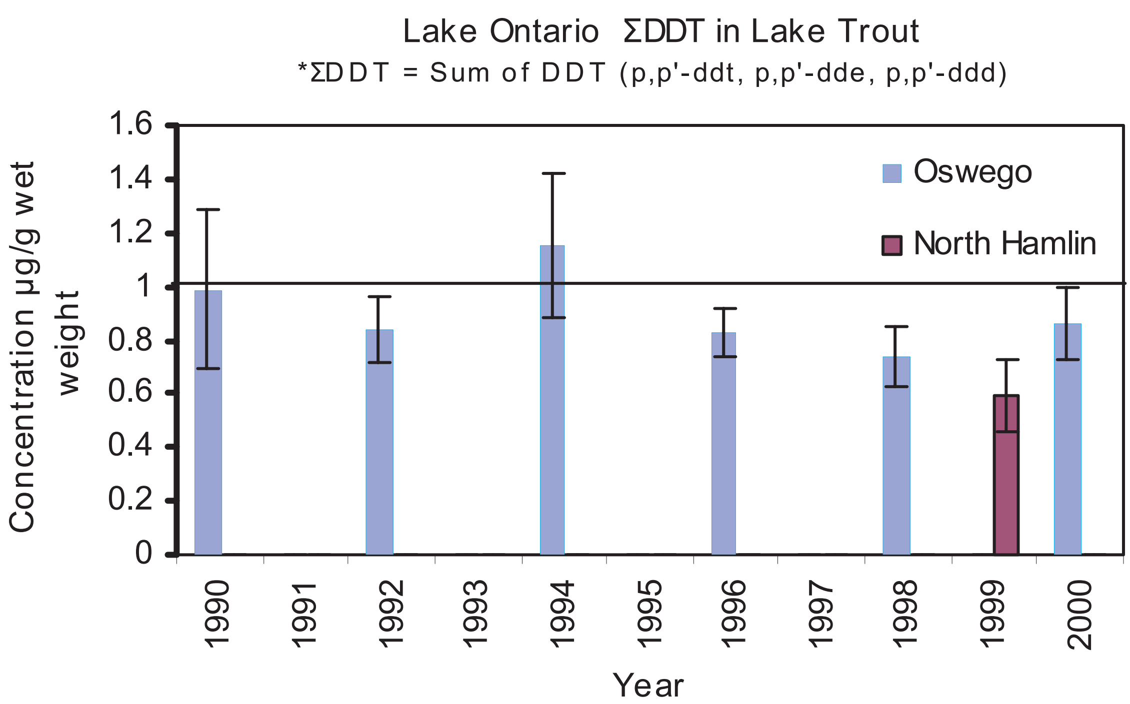
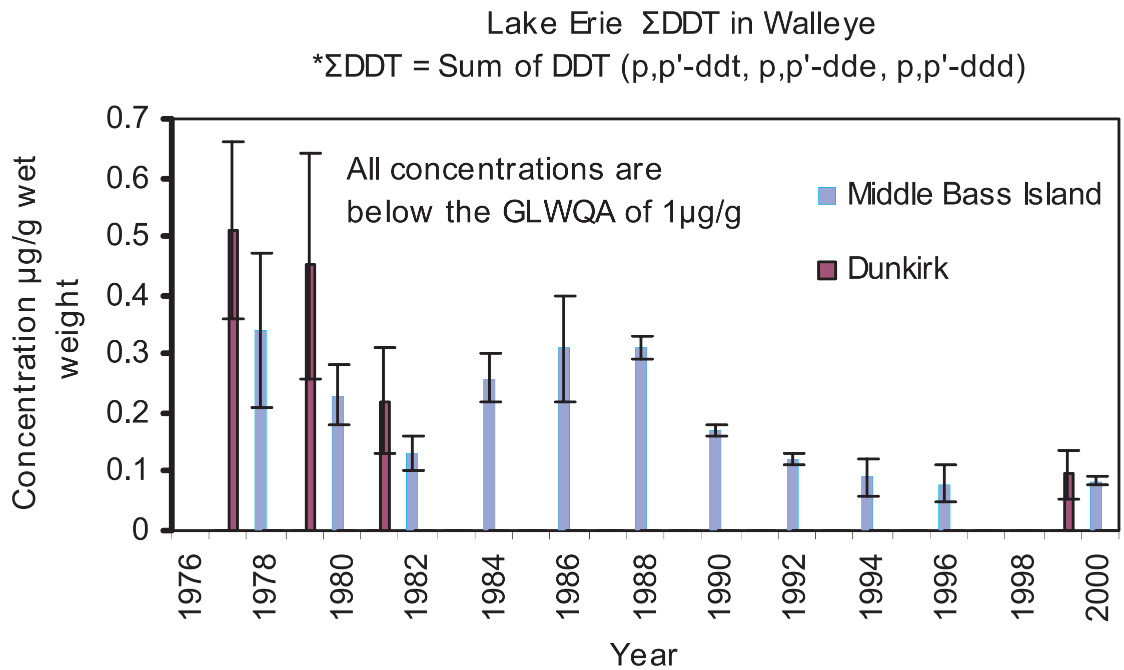


Figure 8-F27a-b. ΣDDT Levels in Lake Ontario Lake Trout (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



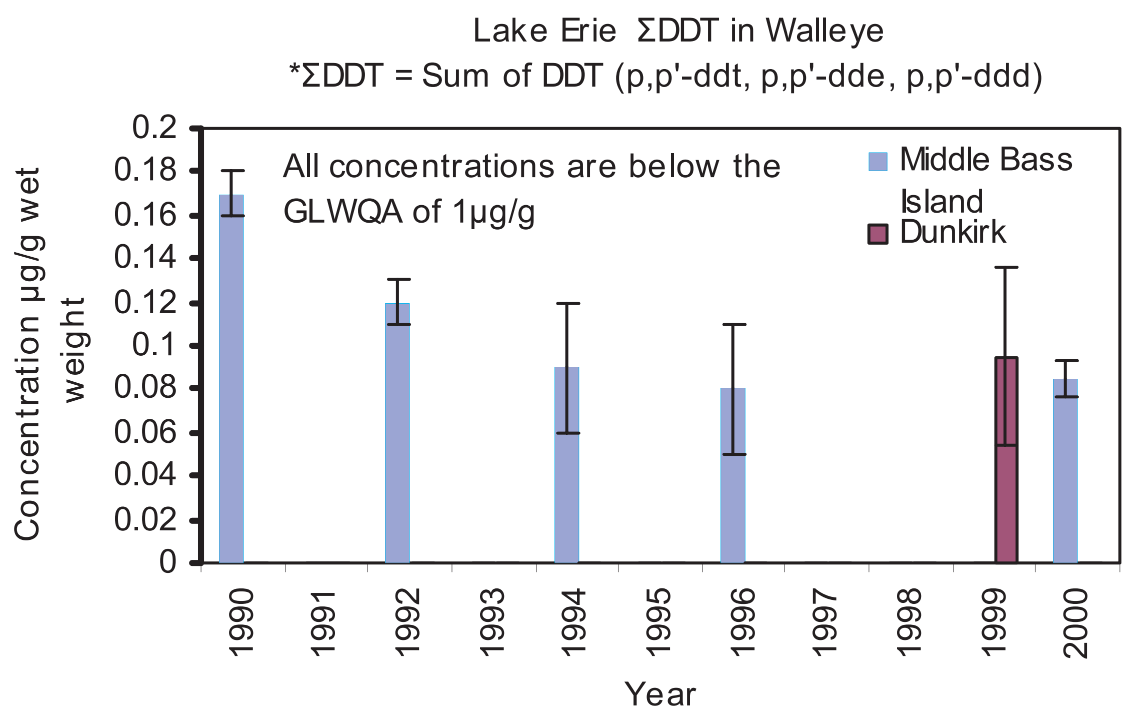
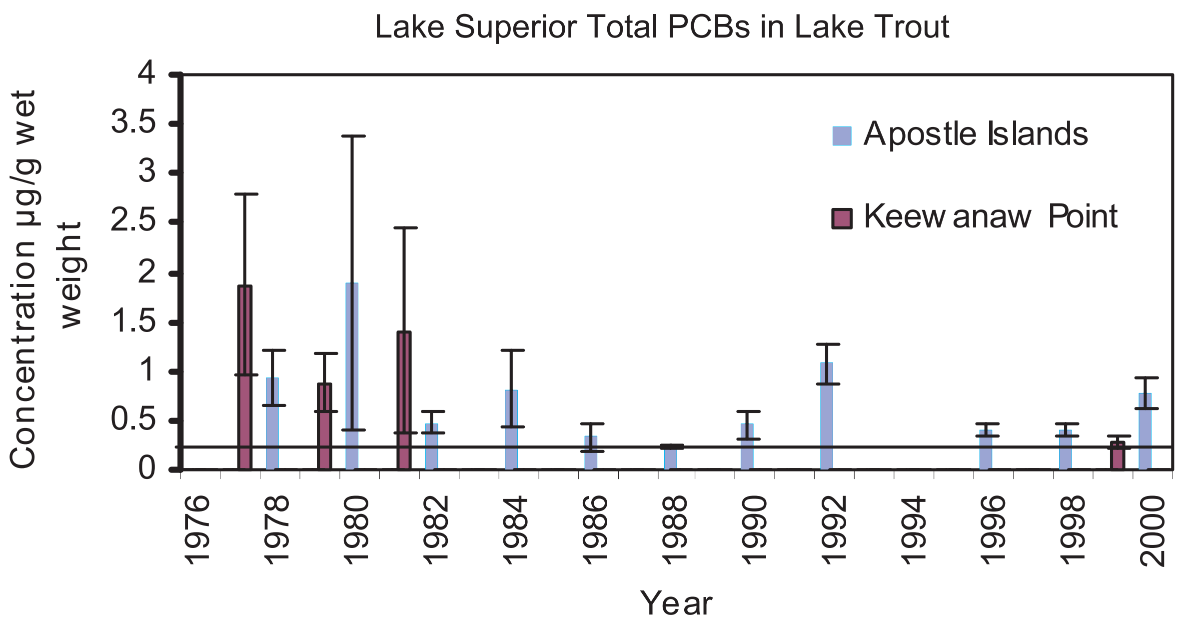


Figure 8-F28a-b. ΣDDT Levels in Lake Erie Walleye (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



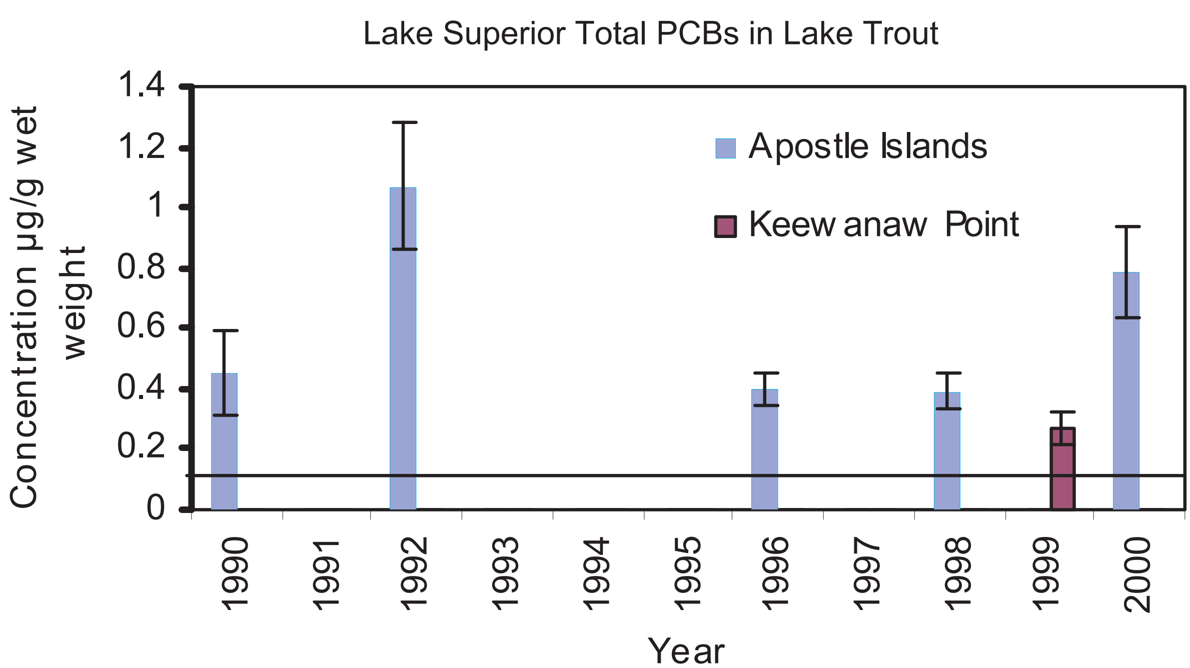
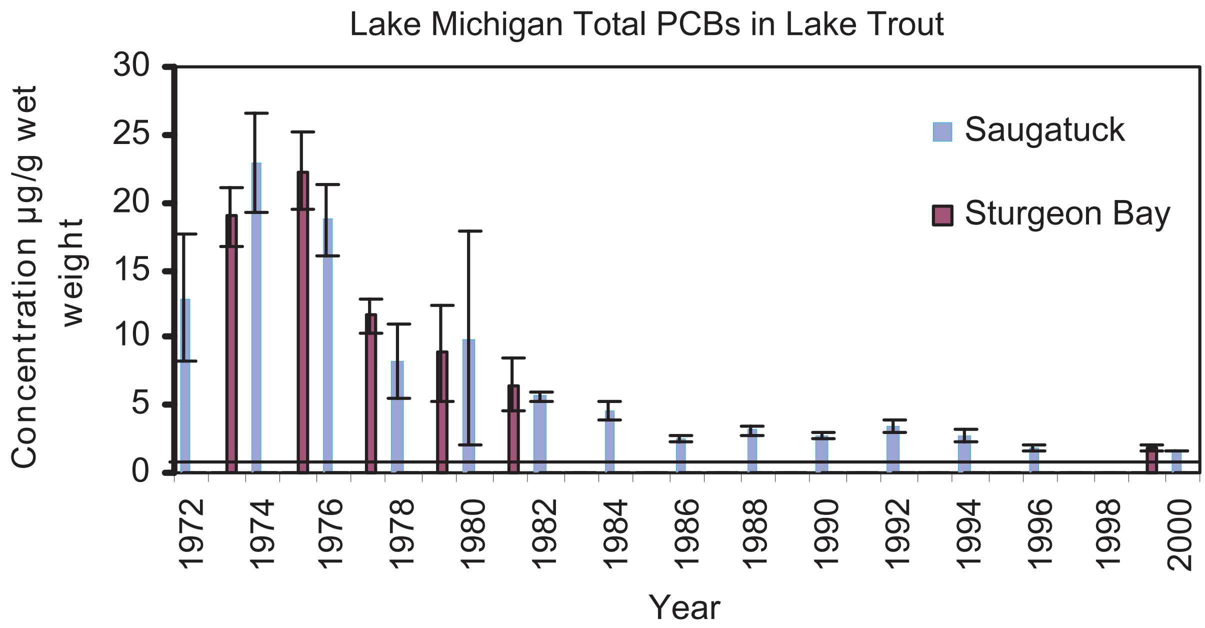


Figure 8-F29a-b. Total PCB Levels in Lake Superior Lake Trout (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



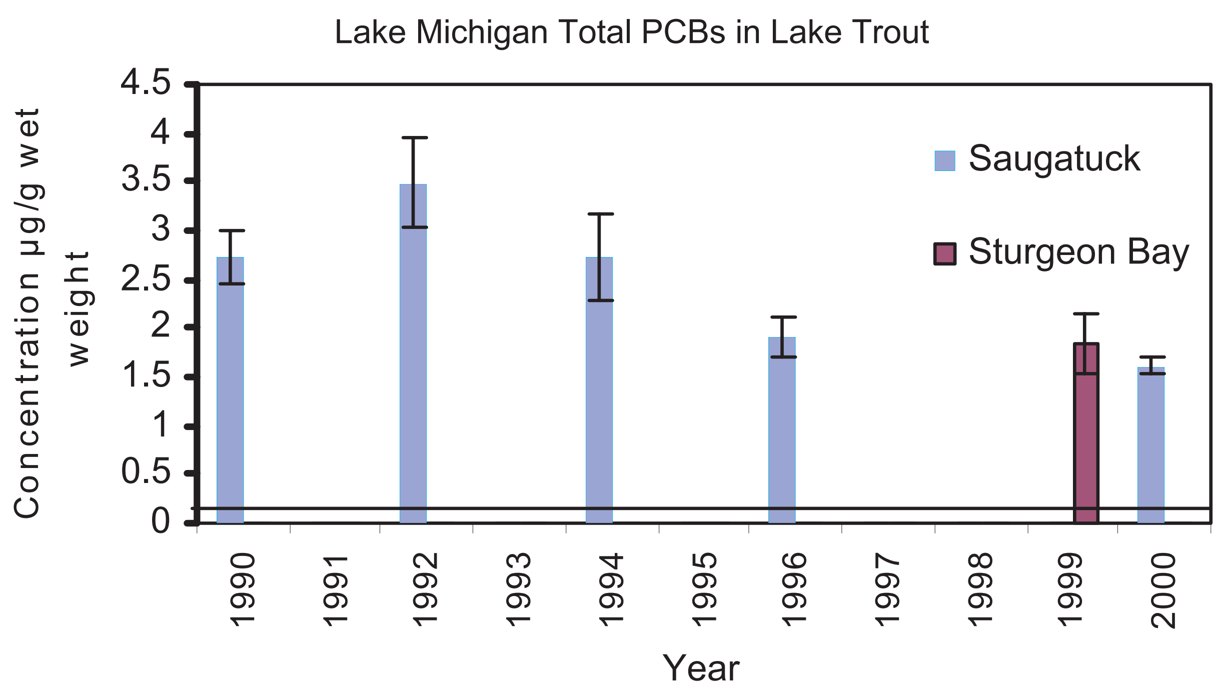
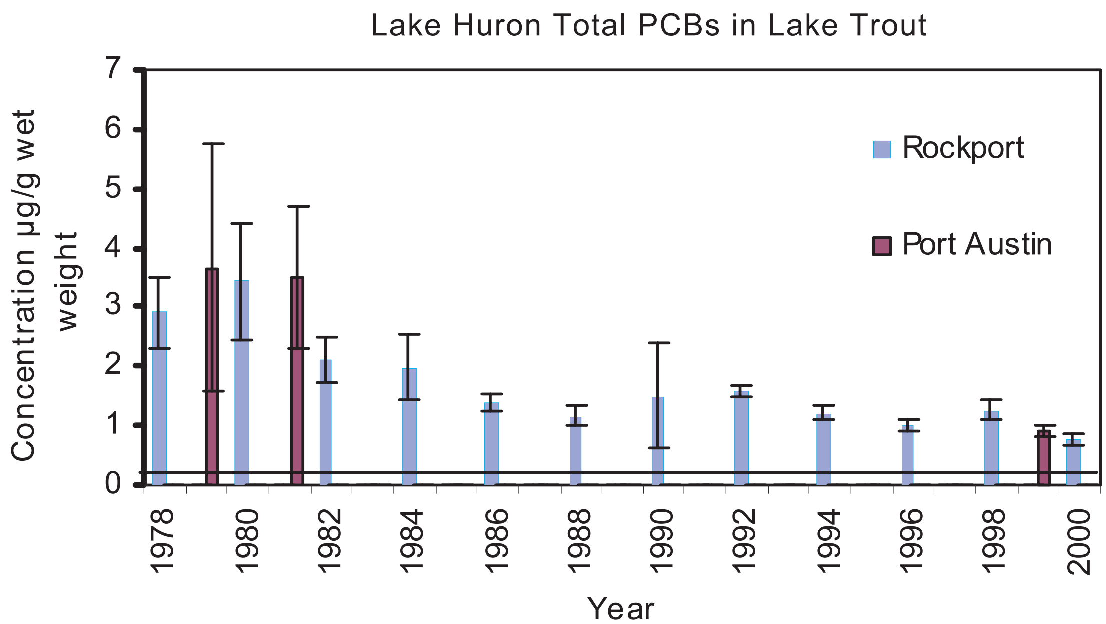


Figure 8-F30a-b. Total PCB Levels in Lake Michigan Lake Trout (1972-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



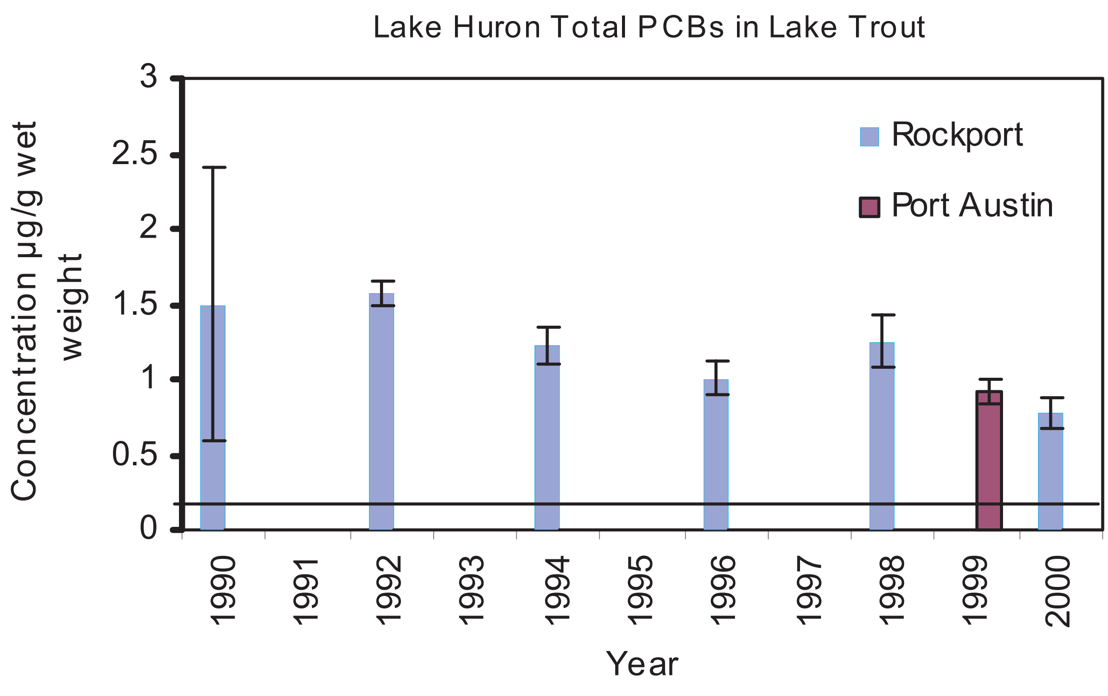
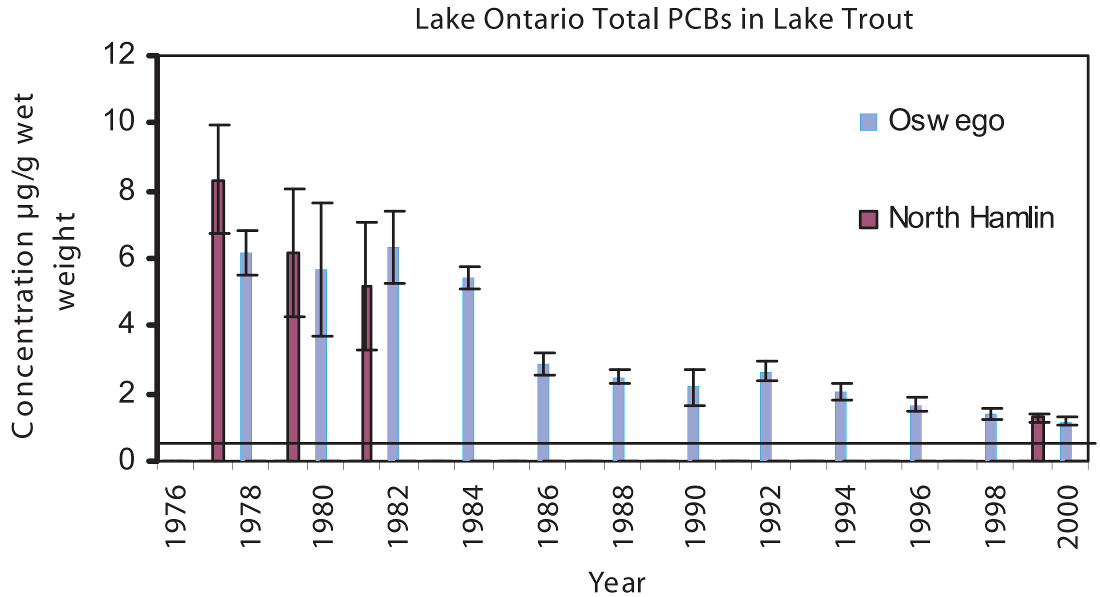


Figure 8-F31a-b. Total PCB Levels in Lake Huron Lake Trout (1978-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



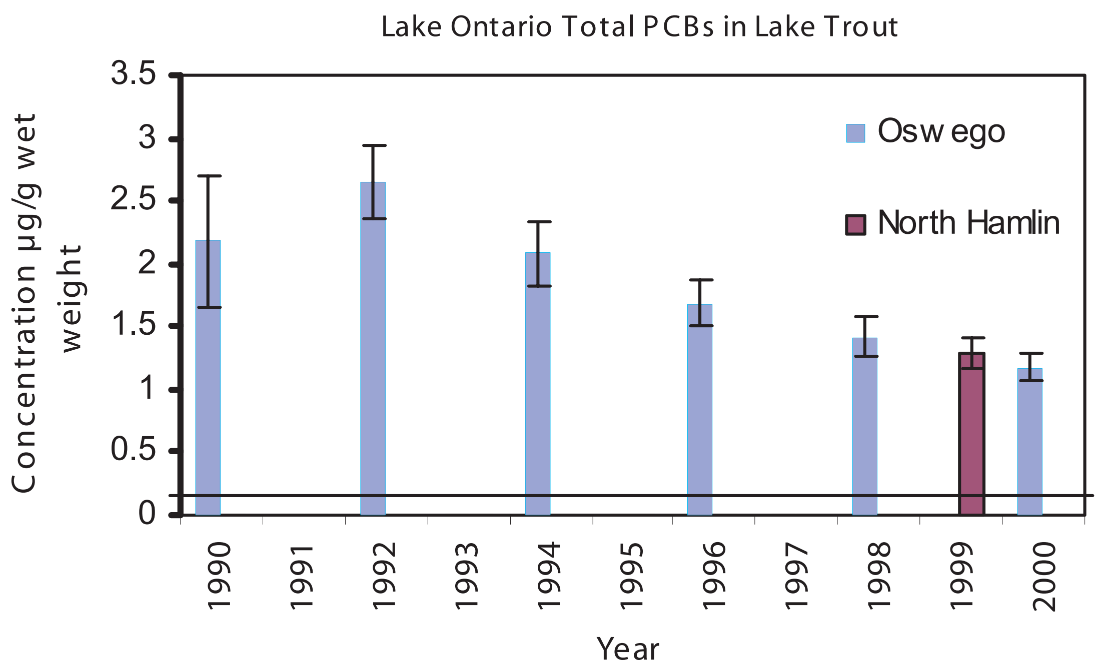
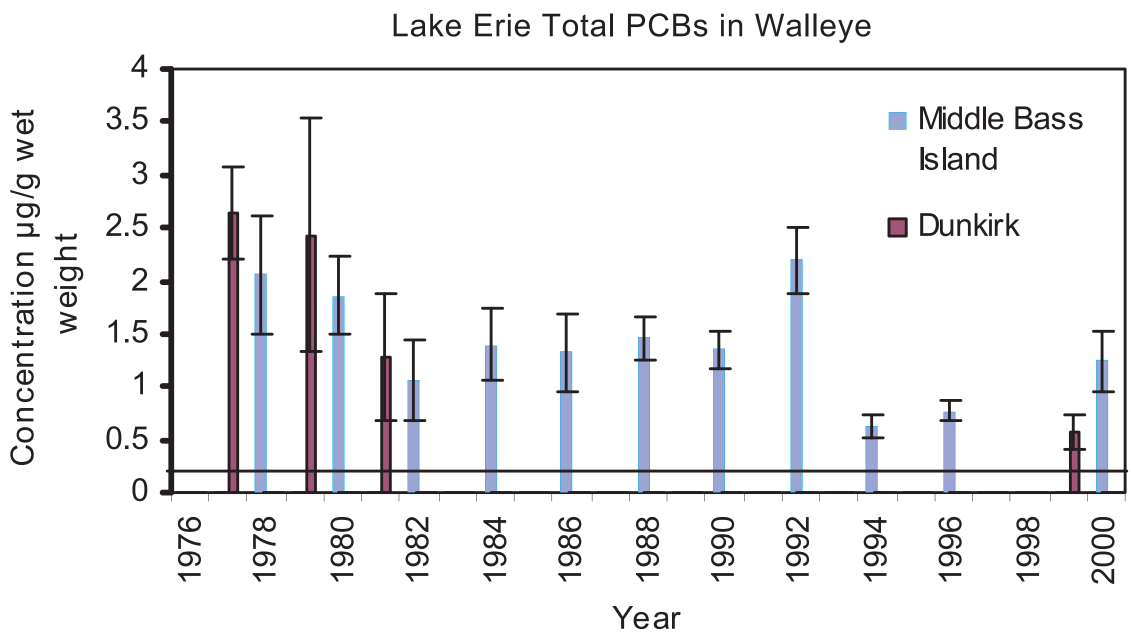


Figure 8-F32a-b. Total PCB Levels in Lake Ontario Lake Trout (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program



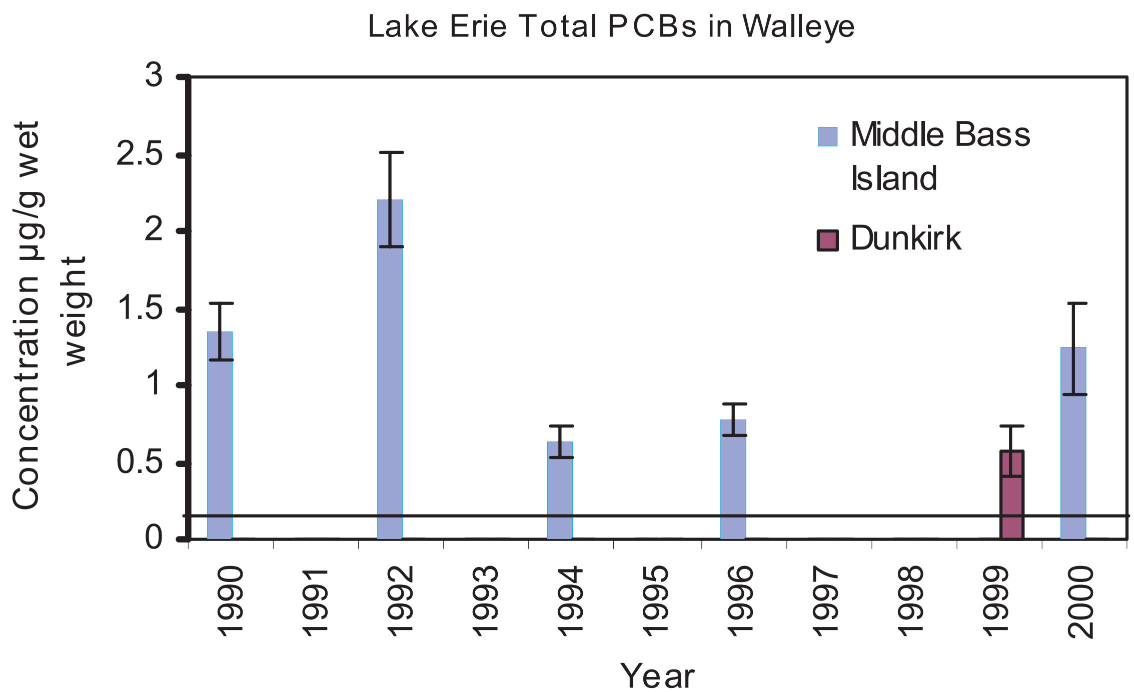


Figure 8-F33a-b. Total PCB Levels in Lake Erie Walleye (1976-2000). Source: US EPA - GLNPO Great Lakes Fish Monitoring Program

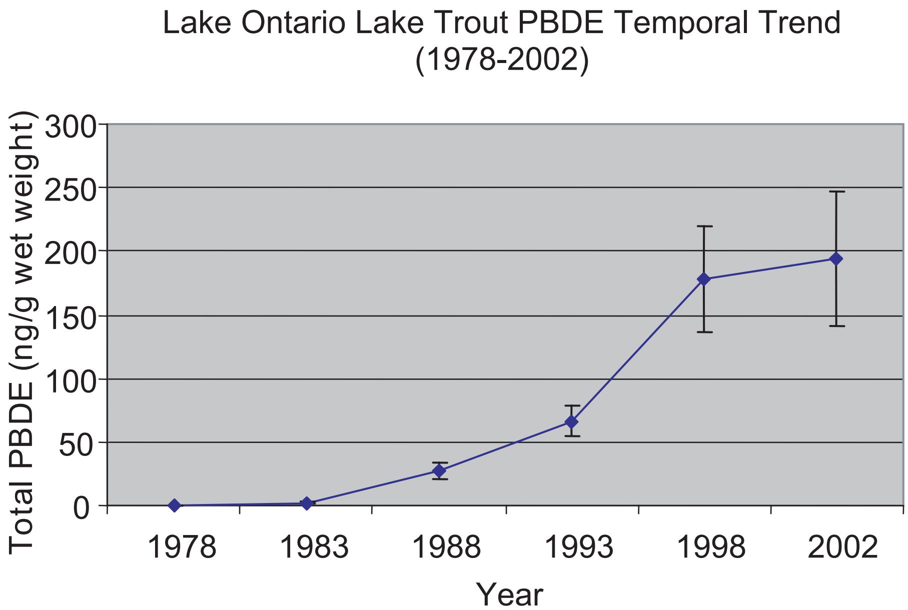


Figure 8-F34. Temporal Trends in Total PBDE Concentrations in Lake Ontario Lake Trout (1978-2002).
Source: Great Lakes Laboratory for Fisheries & Aquatic Sciences, Dept of Fisheries & Oceans

Trends in Great Lakes Herring Gull Eggs

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

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Canadian Wildlife Service
Environment Canada – Ontario Region

The Canadian Wildlife Service (CWS) has analyzed temporal trends in contaminant levels in herring gull eggs from 15 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 concentrations levels are leveling off. Recent results have been published in Pekarik and Weseloh (1998), Weseloh et al. (2003) and Hebert et al. (in review).

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., 1999). 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., 2001). 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 total PCBs (estimated 1:1 ratio of Aroclors 1254:1260, based on levels of PCB 138), DDE, HCB, OCS, total mercury, 2,3,7,8-TCDD and 2,3,7,8-TCDF. 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 ng/g (wet weight). Temporal trends and changes within the time series were determined by change-point (piecewise) regression (Draper and Smith, 1981; Pekarik and Weseloh, 1998). In addition, data for mercury was also analyzed by the simpler linear regression for the time period 1992-2003. Individual annual data for all compounds and sites can be found in Bishop et al. (1992), Pettit et al. (1994), Pekarik et al. (1998) and Jermyn et al. (2002).

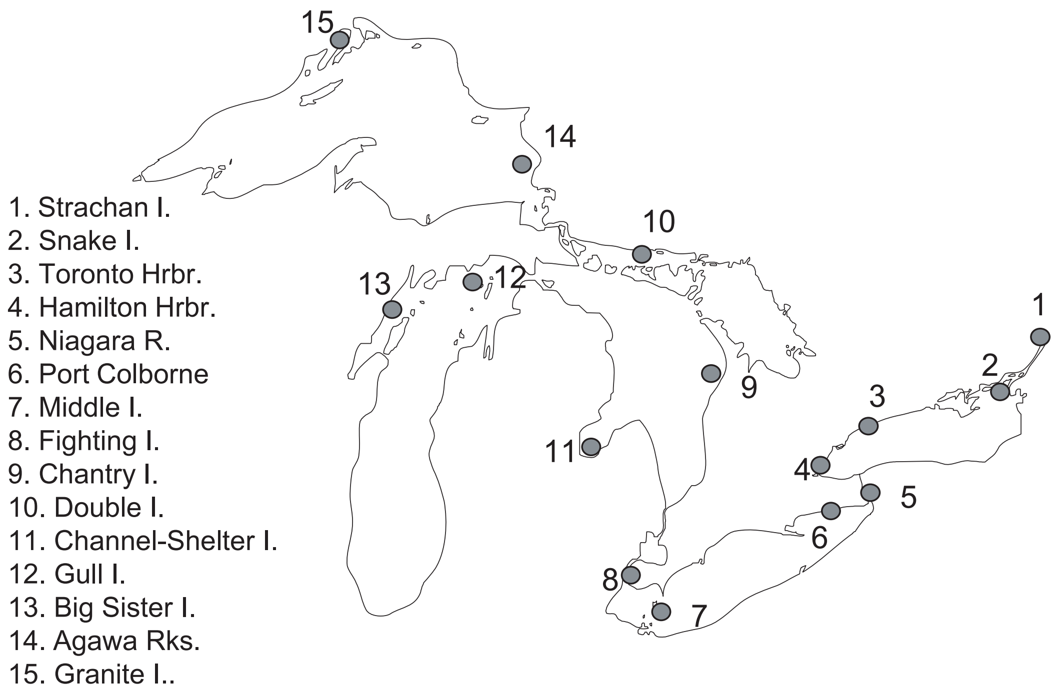

Figure 8-H1. Location of the 15 Herring Gull Colonies Sampled in This Study. Source: Canadian Wildlife Service

Herring gull eggs were collected from the following sites (Figure 8-H1):

- St. Lawrence River – Strachan Island (near Cornwall)
- Lake Ontario – Snake Island (near Kingston), 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 concentrations and percentage 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, site #4) and one in Lake Huron (Saginaw Bay, site #11) were not included for this calculation because their time series were not continuous with the two other sites from each of those lakes.

REFERENCES

Bishop, C.A., Weseloh, D.V., Burgess, N.B., Norstrom, R.J., Turle, R. and Logan, K.A. 1992. An atlas of contaminants in eggs of colonial fish-eating birds of the Great Lakes (1970-1988): Vols. I and II. Canadian Wildlife Service, Technical Report Series, No.153.

DiMao, J., Pekarik, C. and D.V. Weseloh. 1999. Contaminant levels in Herring Gull eggs from Lake Erie and the Detroit and Niagara Rivers: change-point regression analysis, 1974 to 1996. In State of Lake Erie - Past, Present and Future. M Munawar, T. Erdsall and I.F. Munawar, eds., pp. 399-416.

Draper, N.R. and H. Smith. 1981. Applied Regression Analysis. New York: John Wiley and Sons.

Ewins, P.J., Weseloh, D.V. and P. Mineau. 1992. Geographical distribution of contaminants and productivity measures of herring gulls in the Great Lakes: Lake Huron 1980. J. Great Lakes Res. 18:316-330.

Hebert, C.E., D.V. Weseloh, T. Havelka, C. Pekarik and F. Cuthbert. In review. Lake Erie Colonial Waterbirds: Trends in Populations, Contaminant Levels, and Diet. In: Munawar, M. (ed.). State of Lake Erie (SOLE) – Past, Present and Future. Ecovision World Monograph Series, Aquatic Ecosystem Health & Management Society,

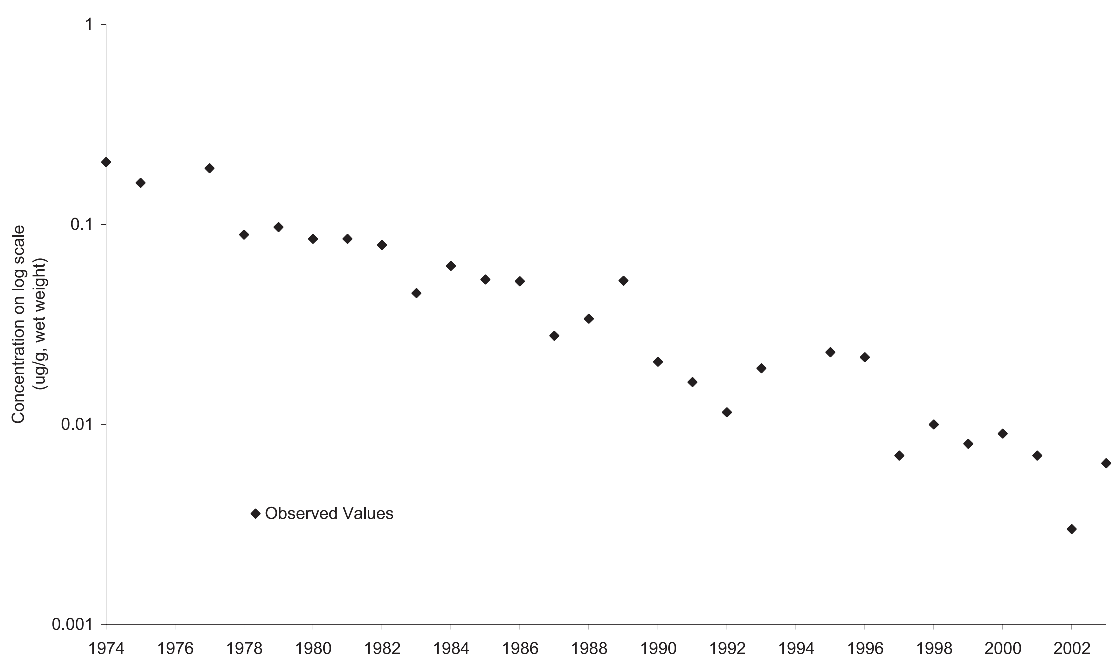

Figure 8-H2. HCB in Herring Gull Eggs, Port Colborne Lighthouse, Lake Erie, 1974-2003. Source: Canadian Wildlife Service

Table 8-H1. Percentage Decline in Concentrations of Seven Contaminants in Herring Gull Eggs from 1974 (or year of first analysis) to 2003^

Water Body	Year	PCBs	DDE	HCB	OCS[a]	Mercury[b]	2,3,7,8-TCDD[c]	2,3,7,8-TCDF[c]
Lake Superior	1974*	62.8	16.7	0.253	0.0052	0.362	16.0	4.00
n=2	2003	5.22	0.907	0.012	0.0024	0.186	9.87	1.41
	% decline	91.7%	94.6%	95.1%	53.4%	48.6%	38.3%	64.9%
Lake Michigan	1976/77*	108	29.2	0.128	0.0047	0.424	15.0	6.00
n=2	2003	10.0	2.30	0.016	0.0013	0.220	2.72	1.44
	% decline	90.8%	92.1%	87.2%	73.6%	48.1%	81.9%	76.1%
Lake Huron	1974*	71.0	17.4	0.383	0.0052	0.215	29.0	3.50
n=2	2003	4.31	0.791	0.011	0.0033	0.176	11.5	0.950
	% decline	93.9%	95.5%	97.1%	35.9%	18.4%	60.4%	72.9%
Detroit River	1978*	115	9.44	0.281	0.055	0.210	33.0	3.00
n=1	2003	17.6	0.798	0.0094	0.0076	0.178	19.2	2.13
	% decline	84.7%	91.5%	96.7%	86.2%	15.2%	41.9%	29.0%
Lake Erie	1974*	72.5	7.13	0.291	0.017	0.217	22.0	4.00
n=2	2003	15.0	0.629	0.011	0.0076	0.183	6.68	1.75
	% decline	79.3%	91.2%	96.1%	56.2%	15.7%	69.7%	56.3%
Niagara River	1979*	50.5	4.01	0.173	0.0052	0.236	41.0	2.00
n=1	2003	5.68	0.630	0.011	0.0037	0.165	14.7	2.85
	% decline	88.7%	84.3%	93.8%	28.2%	30.1%	64.1%	-42.5%
Lake Ontario	1974*	153	22.3	0.580	0.017	0.479	80.5	1.50
n=2	2003	13.7	1.04	0.015	0.0096	0.237	27.6	0.420
	% decline	91.0%	95.4%	97.5%	42.9%	50.6%	65.8%	72.0%
St. Lawrence R.	1986*	28.9	3.59	0.052	0.026	0.300	57.0	1.00
n=1	2003	7.80	0.931	0.0093	0.0034	0.246	18.5	0.650
	% decline	73.0%	74.1%	82.1%	86.9%	18.0%	67.6%	35.0%

^All concentrations reported in ug/g wet weight except TCDD and TCDF in pg/g wet weight. 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.

*1974 not year of first analysis for some compounds. See notes

[a]OCS first analysed in 1987 at all sites except at Strachan Island, St. Lawrence River (1st yr = 1988).

[b]First year of mercury analysis on Lake Michigan = 1982; Detroit River = 1981 and Niagara River = 1981

[c]TCDD and TCDF first analyzed in 1984 at all sites except at Strachan Island, St. Lawrence River (1st yr = 1986).

Source: Canadian Wildlife Service

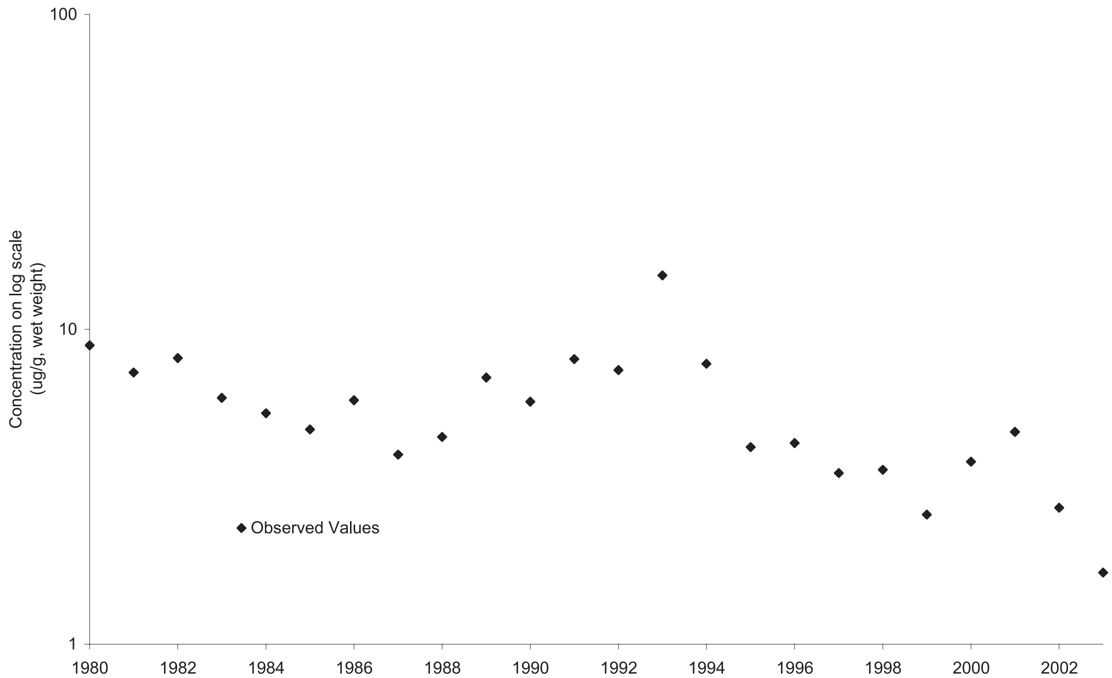

Figure 8-H3. DDE in Herring Gull Eggs, Channel-Shelter Island, Saginaw Bay, Lake Huron, 1980-2003. Source: Canadian Wildlife Service

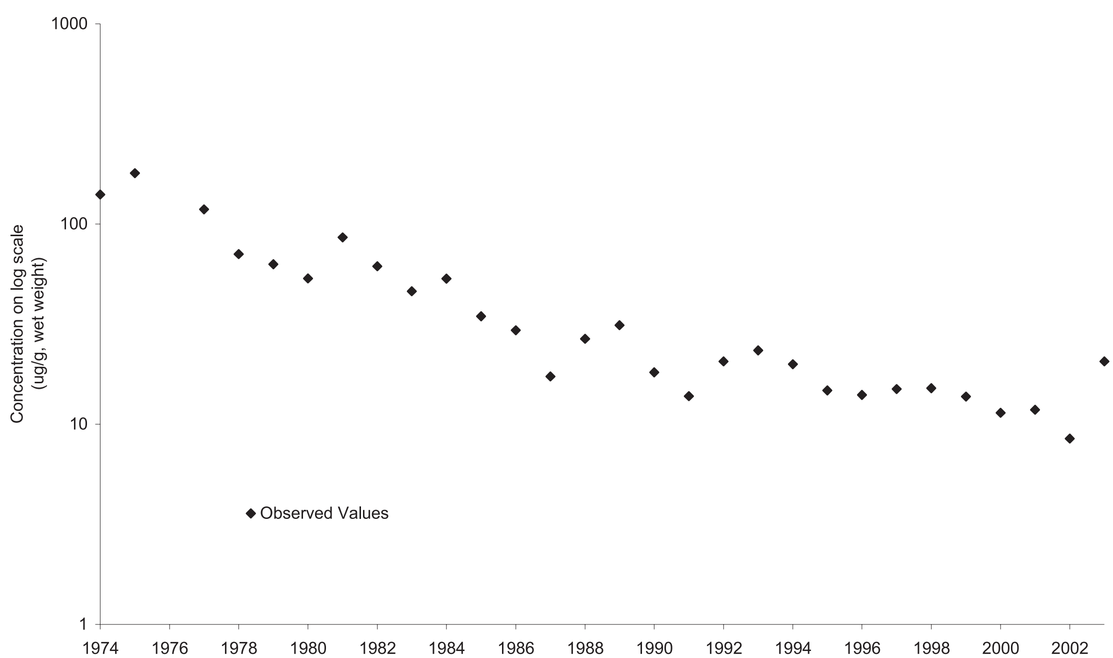

Figure 8-H4. PCBs in Herring Gull Eggs, Snake Island, Lake Ontario, 1974-2003. Source: Canadian Wildlife Service

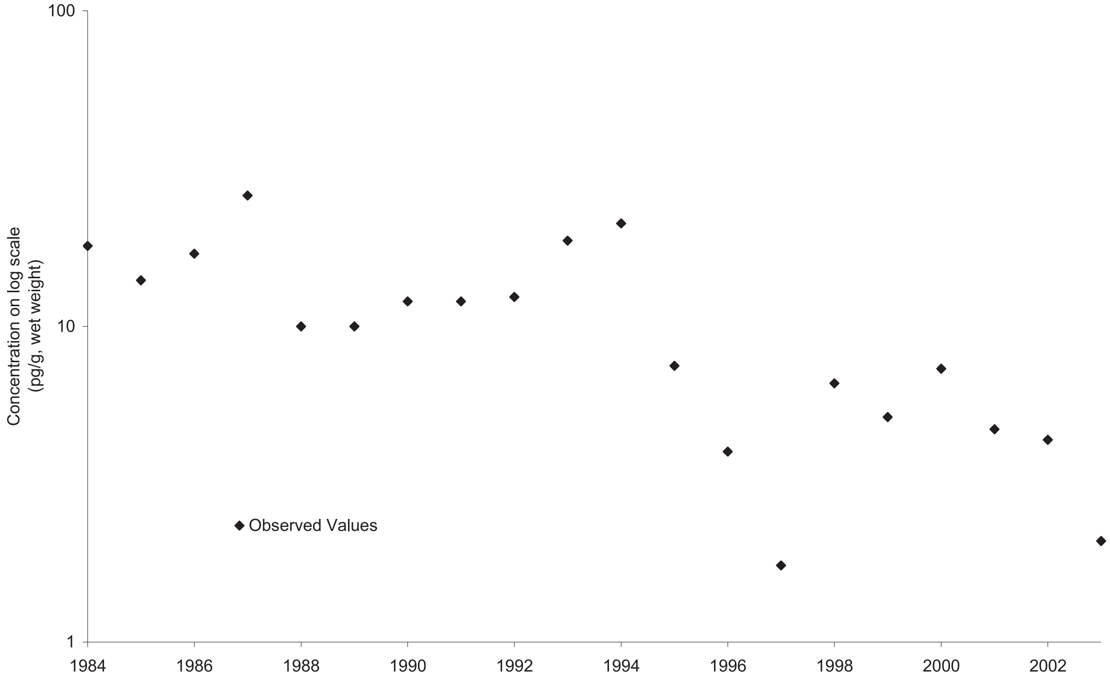

Figure 8-H5. **TCDD in Herring Gull Eggs, Big Sister Island, Lake Michigan, 1984-2003. Source: Canadian Wildlife Service**

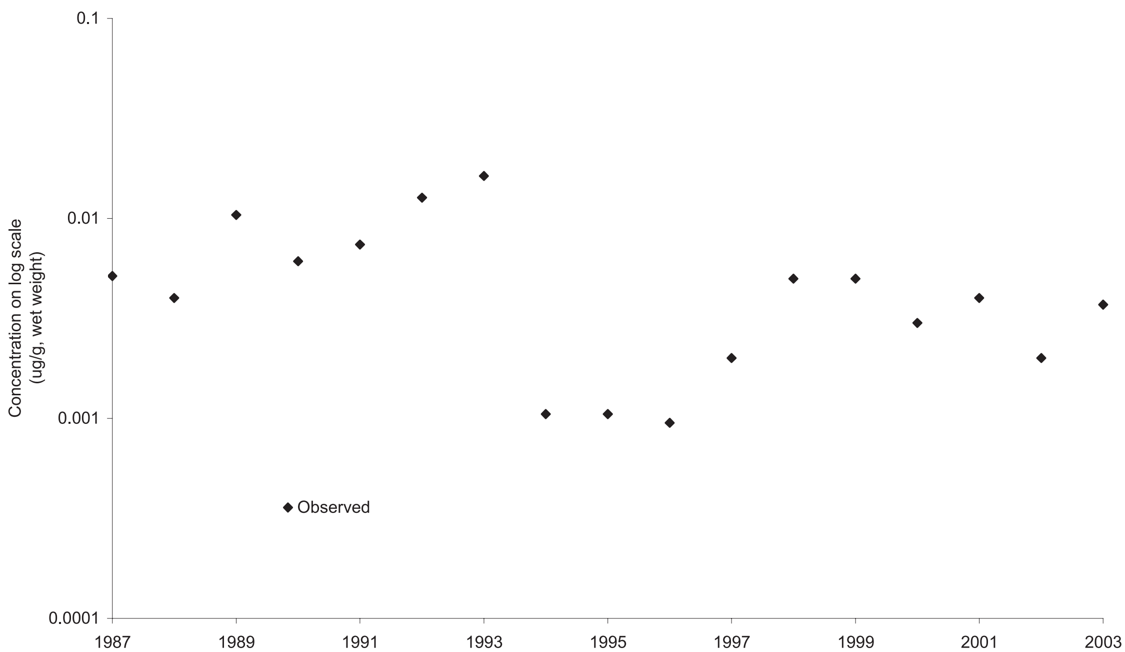

Figure 8-H6. **OCS in Herring Gull Eggs, Niagara River, 1987-2003. Source: Canadian Wildlife Service**

Jermyn, K., Pekarik, C., Havelka, T., Barrett, G. and D.V. Weseloh. 2002. An atlas of contaminants in eggs of colonial fish-eating birds of the Great Lakes (1998-2001): Vols I and II. Unpublished report to CWS, Downsview, Ontario.

Mineau, P., Fox, G.A., Norstrom, R.J., Weseloh, D.V., Hallett, D., Ellenton, J.A. 1984. Using the Herring Gull to monitor levels and effects of organochlorine contamination in the Canadian Great Lakes. In Toxic Contaminants in the Great Lakes. Edited by J.O. Nriagu and M.S. Simmons. John Wiley and Sons, Inc. pp. 425-52.

Pekarik, C. and D.V. Weseloh. 1998. Organochlorine contaminants in Herring Gull eggs from the Great Lakes, 1974-1995: Change point regression analysis and short-term regression. Environ. Monitor. Assess. 53: 77-115.

Pekarik, C., Weseloh, D.V., Barrett, G.C., Simon, M., Bishop, C.A., Pettit, K.E. 1998. An atlas of contaminants in the eggs of fish-eating colonial birds of the Great Lakes (1993-1997): Vols I and II. Canadian Wildlife Service, Technical Report Series, No.321.

Pettit, K.E., Bishop, C.A., Weseloh, D.V., Norstrom, R.J. 1994. An atlas of contaminants in eggs of colonial fish-eating birds of the Great Lakes (1989-1992): Vols I and II. Canadian Wildlife Service, Technical Report Series, No.193.

Weseloh, D.V., C. Pekarik, R. Joos, J.F. Farquhar, J.L. Shutt, T. Havelka, I. Mazzocchi, G. Barrett, R. McCollough, R.L. Miller and A. Mathers. 2003. Monitoring Lake Ontario's waterbirds: contaminants in Herring Gull eggs and population changes in the Lake's nearly 1,000,000 colonial waterbirds. In: Munawar, M. (ed.). State of Lake Ontario (SOLO) – Past, Present and Future. pp 597-631. Aquatic Ecosystem Health & Management Society.

Won, H.T., M.J. Mulvihil and B.J. Wakeford. 2001. Multiresidue methods for the determination of chlorinated pesticides and polychlorinated biphenyls (PCBs) in wildlife tissues by gas chromatography/mass spectrometry. Technical Report Series Number 335E. Canadian Wildlife Service, Headquarters, Hull, Quebec, Canada.

Trends in Great Lakes Sediments and Surface Waters

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

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Virtual elimination of discharges of persistent toxics into the Great Lakes environment is the goal of the GLBTS. Monitoring and research programs underway in the Great Lakes can illustrate the ambient environmental, spatial and temporal response to the GLBTS initiatives at local and regional scales. As well, some programs can illustrate spatial patterns that speak to the local, regional or global nature of past sources and their historical impact on the Great Lakes.

Water and sediment contaminant monitoring programs are ongoing in the open waters and interconnecting channels of the Great Lakes (Figures 8-S1a and b). Due to the ongoing 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 programs are also ongoing in the Areas of Concern (AOCs); however, the focus of this analysis is to provide an overview of trends of surface water and sediment quality in the open lakes and connecting channels for comparison with other media (i.e., air/precipitation, herring gulls, and open-lake fish).

Environment Canada began surface water monitoring in the open lakes and interconnecting channels in the late 1970s through the mid 1980s. The best sources of temporal data, which provide information suggestive of local sources, are the interconnecting channels programs in the St. Clair and Niagara Rivers. 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 for OCS, PCBs, HCB, B(a)P and DDT are shown in Figures 8-S2a, b, c, d, and e, respectively. OCS, PCBs and HCB have been decreasing over time. DDT and B(a)P levels appear more consistent over time. St. Clair and Niagara River upstream/downstream comparisons for OCS and HCB suggest historical local sources are still capable of impacting downstream water quality (Figures 8-S3a, b, c and d).

However, the influence of these local sources has decreased substantially over the past 15 years.

The interpretation of temporal trends in contaminants associated with surface waters in the connecting channels is complemented by monitoring programs in open lake areas. Dieldrin concentrations in the Great Lakes, and the associated temporal trends in the interconnecting channels, are shown in Figure 8-S4. Concentrations in Lakes Superior (lake-wide average 0.11 ng/L) and Huron (0.04 ng/L) were lower, compared with Lakes Erie (0.21 ng/L) and Ontario (0.18 ng/L). Current loadings of dieldrin to Lakes Superior and Huron result from atmospheric deposition. The relatively higher concentrations in the lower lakes are the result of a combination of sources, including historical usage in the watersheds, loadings from the upstream lakes and connecting channels, and atmospheric deposition. The annual mean whole water concentrations of dieldrin at both Fort Erie and Niagara-on-the-Lake showed distinct downward trends over the period 1986 – 2001; concentrations declined by roughly 70 percent over this period. Data from the upstream/downstream stations in the St. Clair River and a monitoring station at Wolfe Island in the St. Lawrence River showed a similar trend. Integration of information from both the open lake and interconnecting channels programs allows assessment of trends in toxics in the major rivers as a means of assessing the efficacy of control measures to reduce discharges and can assist in identification of probable sources, both locally and regionally, through comparison of upstream/downstream concentrations.

Bottom sediment contaminant surveys conducted in the Great Lakes from 1997 to 2002 provide a good illustration of the spatial distribution of contaminants and, in concert with sediment cores, also provide a temporal perspective. Comparisons of surficial sediment contaminant concentrations with sub-surface maximum concentrations indicate that contaminant concentrations have generally decreased by more than 35 percent, and, in some cases, by as much as 80 percent. Table 8-S1 presents percentage reductions in contaminant concentrations (surface vs sub-surface) in Lakes Ontario, Erie, and St. Clair from available sediment core data.

Table 8-S1. Percentage Reductions in Contaminant Concentrations in Lakes Ontario, Erie, and St. Clair Estimated from Sediment Cores.

Parameter	Ontario	Erie	St. Clair
	%Reduction	%Reduction	%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

Source: Ecosystem Health Division, Environment Canada

Sediment contamination also provides an indication of the impacts of local historical sources and, through comparison to surveys conducted in the late 1960s and early 1970s, a regional perspective of the ambient environmental response to management initiatives. Open-lake bottom sediment contaminant information has been collected for all the Great Lakes (Figure 8-S5). Historical sources and their impacts are evident through comparison to earlier work and by analysis of archived samples. PCBs, for example, have decreased in Lake Erie by 80 percent since 1971. The average lakewide concentration is converging on desirable U.S. and Canadian sediment quality guidelines (Figure 8-S6). Future surveys will continue to track the response in lakewide concentrations to contaminant reduction initiatives.

Figure 8-S7 shows the available open-lake sediment data for dioxins/furans, B(a)P, HCB, and total DDT in the lower Great Lakes. These spatial maps, and those for PCBs, mercury and lead, illustrate a common theme. In general, the western basin of Lake Erie and the depositional basins of Lake Ontario exhibit the highest concentrations of these pollutants. These regional patterns reflect sediment characteristics, depositional processes, bathymetry, and location of historical sources.

Substantial additional information is available from work in AOCs; these datasets are invaluable in assessing the potential of local sources to impact open lake environments over large geographical areas. For example, US EPA operates a sediment assessment program within the U.S. AOCs. Figure 8-S8 illustrates a comparison between surface and sub-surface sediment mercury and PCB concentrations in 10 AOCs. Surface concentrations are still enriched in many areas, compared to sub-surface concentrations, although these results could be influenced by the sampling procedures. A primary issue in most data integration exercises is the validity of comparing data from different programs based on different sampling and analytical procedures. However, these exercises can produce invaluable decision-making tools. For example, the U.S. Geological Survey, on behalf of the Lake Erie Lakewide Management Plan (LaMP), has integrated the available data from numerous federal, state and provincial agencies within the Lake Erie and Lake St. Clair drainages (Figure 8-S9). The integrated information provides a more complete understanding of contaminated sediment issues and provides a holistic perspective. This type of data integration exercise will be extended to include Lake Ontario.

Contaminated sediments, as they are re-suspended, can become a source of contamination. An ongoing Environment Canada suspended sediment contaminant program in the lower Great Lakes and the St. Clair River/Detroit River corridor further refines our knowledge of localized sources. Figure 8-S10 illustrates mercury concentrations in suspended sediments within the corridor. The correspondence between bottom sediment contamination and suspended sediment contamination, combined with our knowledge of historical sources, shows that the major Agency monitoring programs are well placed to assist in development of mitigative measures to further reduce impacts of persistent toxics in both AOCs and open lake areas. In general, there is a consistency in the spatial and temporal trend information among these individual programs, which enables an overall weight-of-evidence approach to assessment of contaminants in the Great Lakes Basin.

The presence of new persistent toxics represents an emerging threat to the health of the Great Lakes ecosystem. These compounds include the brominated flame retardants (BFRs), which are heavily used globally in the manufacturing of a wide range of consumer products and building materials. The BFRs have been found to be bioaccumulating in Great Lakes fish and in breast milk of North American women. Assessment of the occurrence and fate of these new compounds has recently been incorporated into the surface water, suspended sediment and bottom sediment monitoring programs. For example, archived suspended samples from the Niagara River upstream/downstream program have been used to establish the temporal trend in the occurrence of polybrominated diphenyl ethers (PBDEs, a major class of BFRs). There is a trend toward increasing levels of PBDEs since the late 1980s (Figure 8-S11), which is similar to the trend for PBDEs in Lake Trout in the Great Lakes.

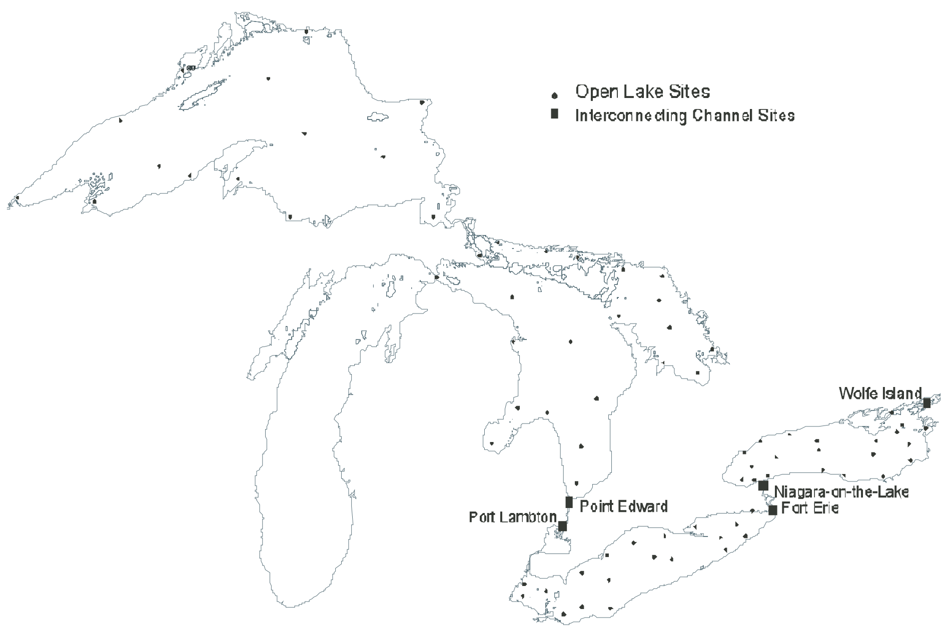


Figure 8-S1a. Open-lake and Interconnecting Channel Water Quality Sites Monitored for Persistent Toxic Substances. Source: Ecosystem Health Division, Environment Canada

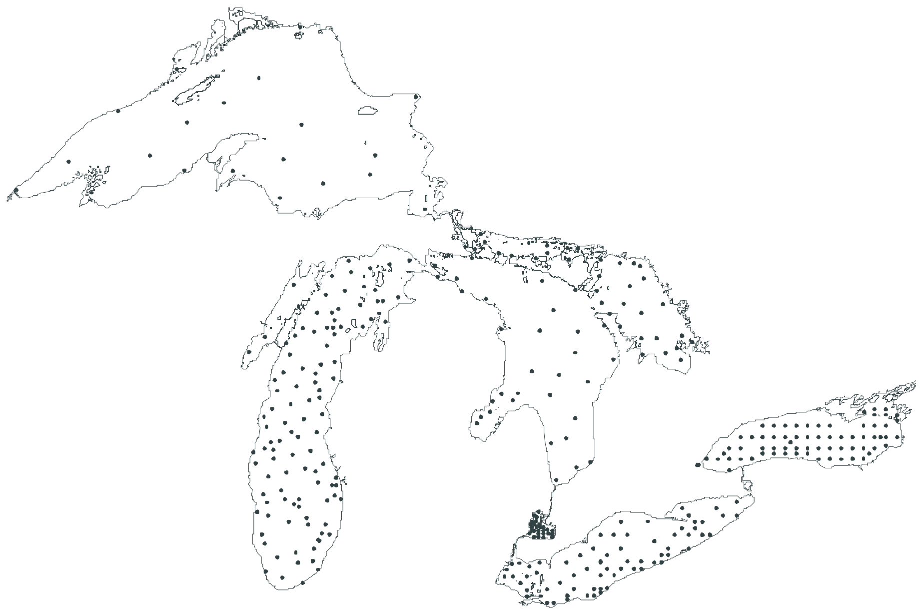


Figure 8-S1b. Open-lake Bottom Sediment Sites Monitored for Persistent Toxic Substances. Source: Great Lakes Sediment Assessment Program, Environment Canada[36]

[36] Marvin, C.H., Painter, S., Williams, D.J., Richardson, V., Rossmann, R. and Van Hoof, P. 2004. Spatial and temporal trends in surface water and sediment contamination in the Laurentian Great Lakes. Environmental Pollution. 129: 131-144.

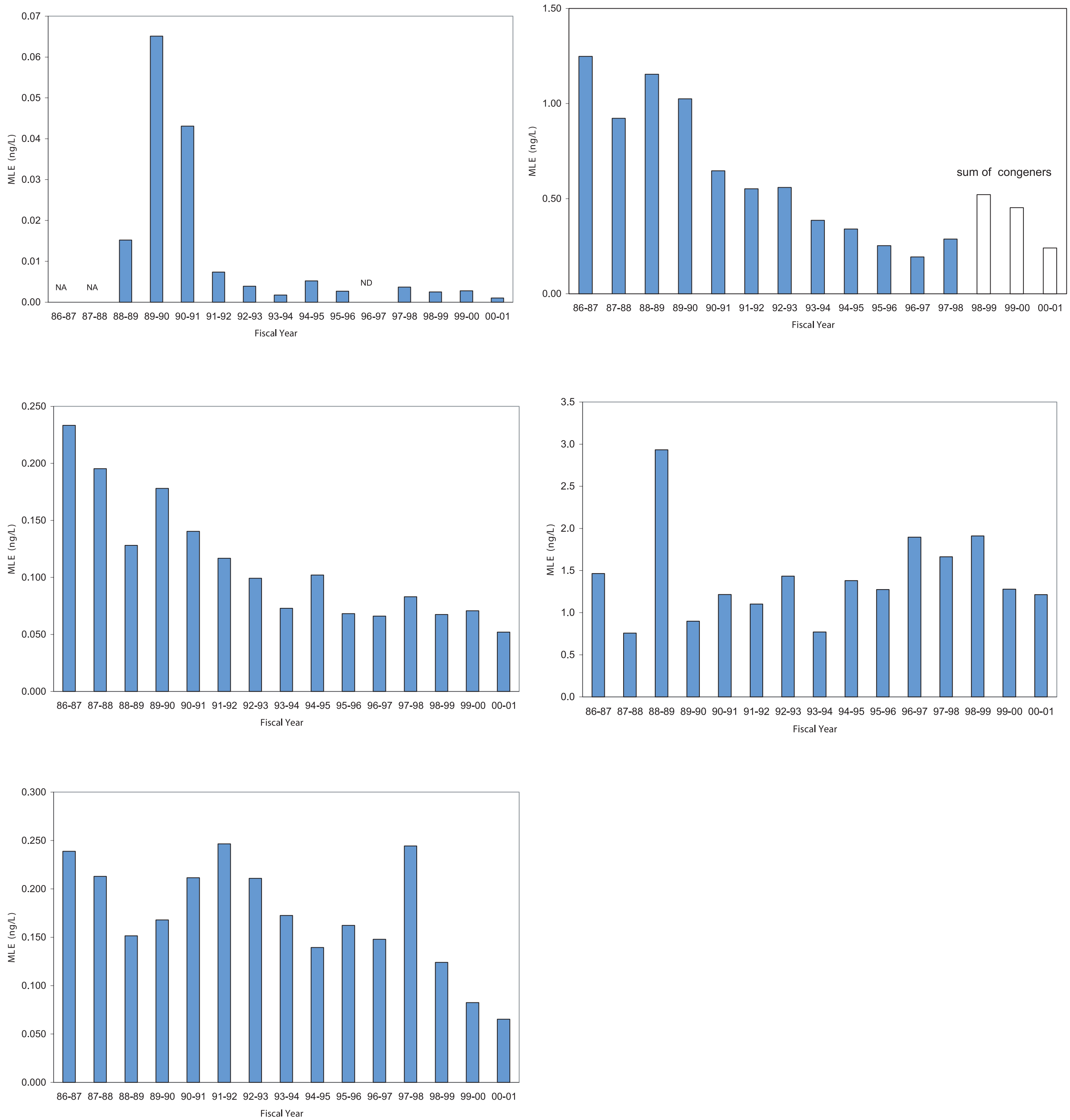


Figure 8-S2. Whole Water OCS (ng/L, upper left), PCBs (particulate phase only, ng/L, upper right), HCB (ng/L, mid left), B[a]P (ng/L, mid right), and Total DDT (ng/L, lower left) at Niagara-on-the-Lake. Source: Niagara River Upstream/Downstream Program, Environment Canada[37]

[37] ibid

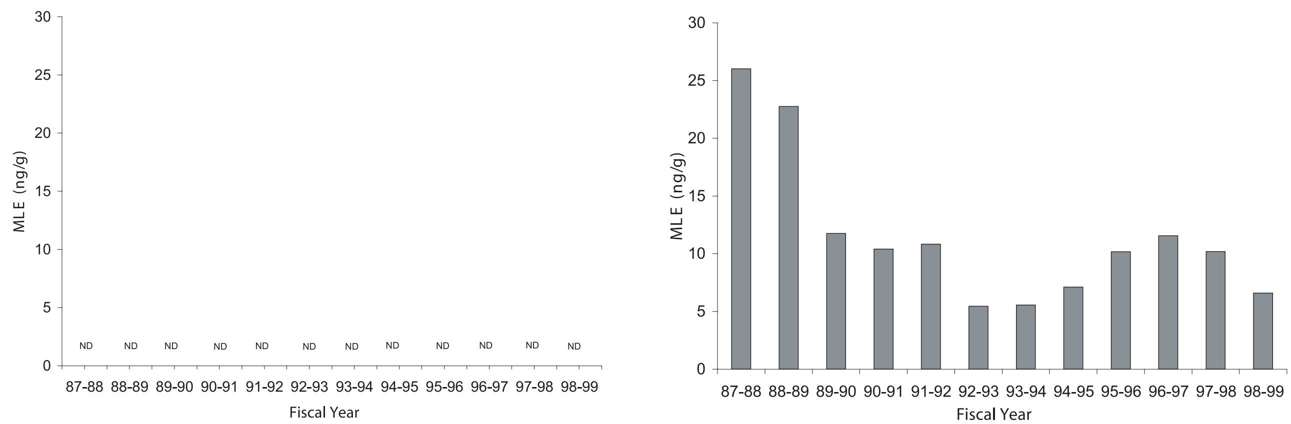


Figure 8-S3a. **Upstream (Point Edward) and Downstream (Port Lambton) St. Clair River OCS Particulate Phase Concentrations Over Time. Source: St. Clair River Upstream/Downstream Program, Environment Canada[38]**

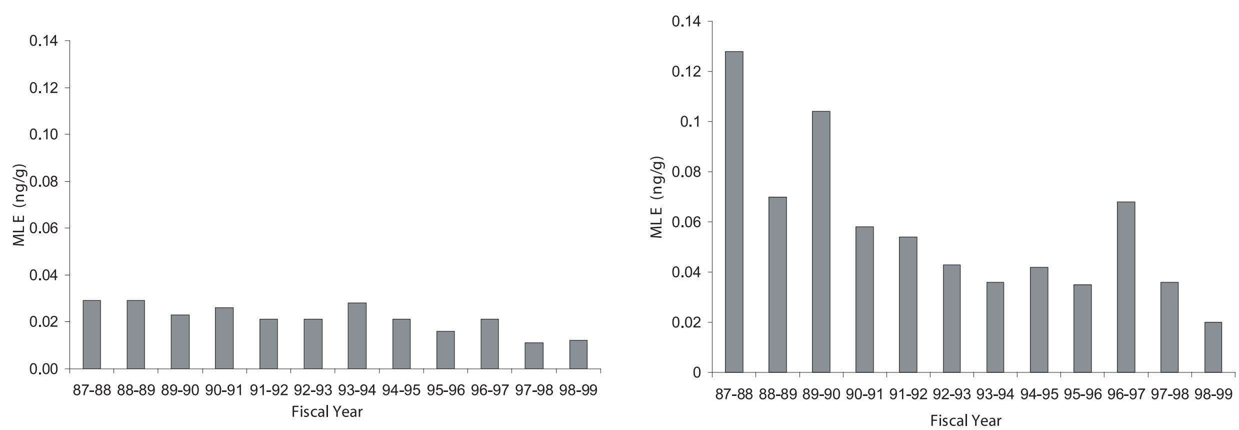


Figure 8-S3b. **Upstream (Point Edward) and Downstream (Port Lambton) St. Clair River HCB Particulate Phase Concentrations (ng/g) Over Time. Source: St. Clair River Upstream/Downstream Program, Environment Canada[39]**

[38] ibid

[39] ibid

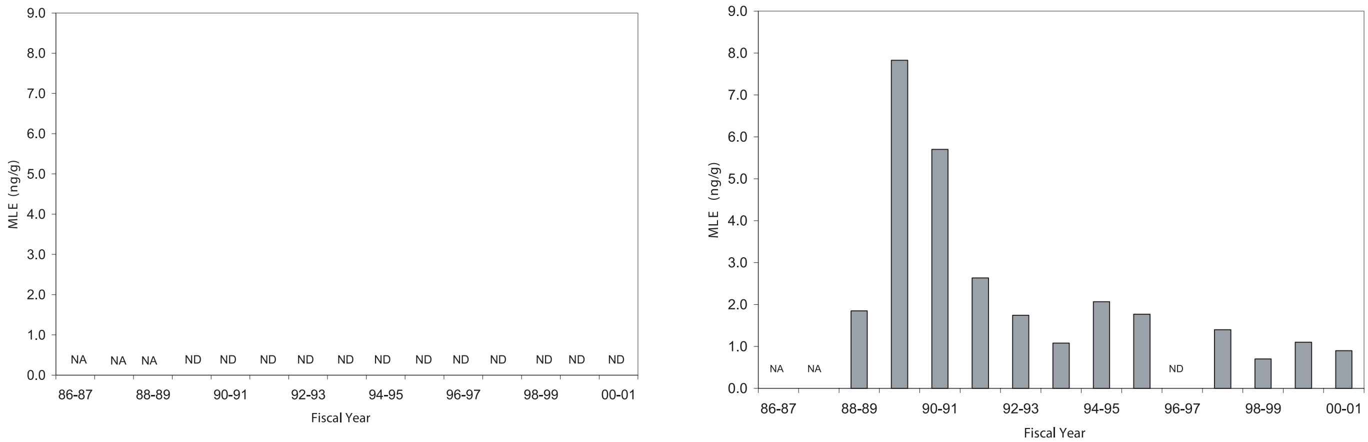


Figure 8-S3c. Upstream (Fort Erie) and Downstream (Niagara-on-the-Lake) Niagara River OCS Particulate Phase Concentrations (ng/g) Over Time. Source: Niagara River Upstream/Downstream Program, Environment Canada[40]

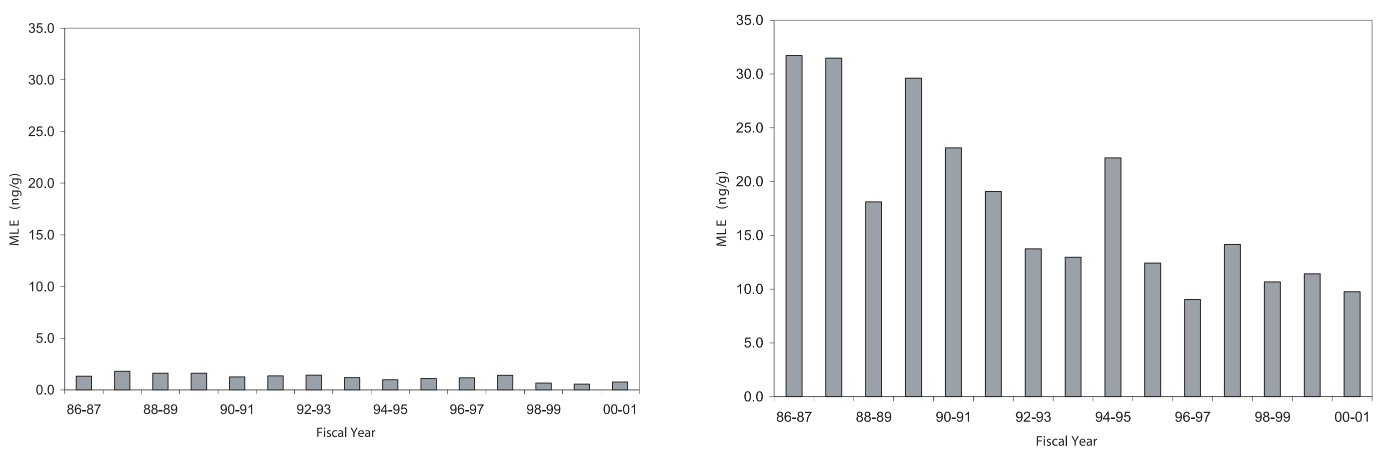


Figure 8-S3d. Upstream (Fort Erie) and Downstream (Niagara-on-the-Lake) Niagara River HCB Particulate Phase Concentrations (ng/g) Over Time. Source: Niagara River Upstream/Downstream Program, Environment Canada[41]

[40] ibid

[41] ibid

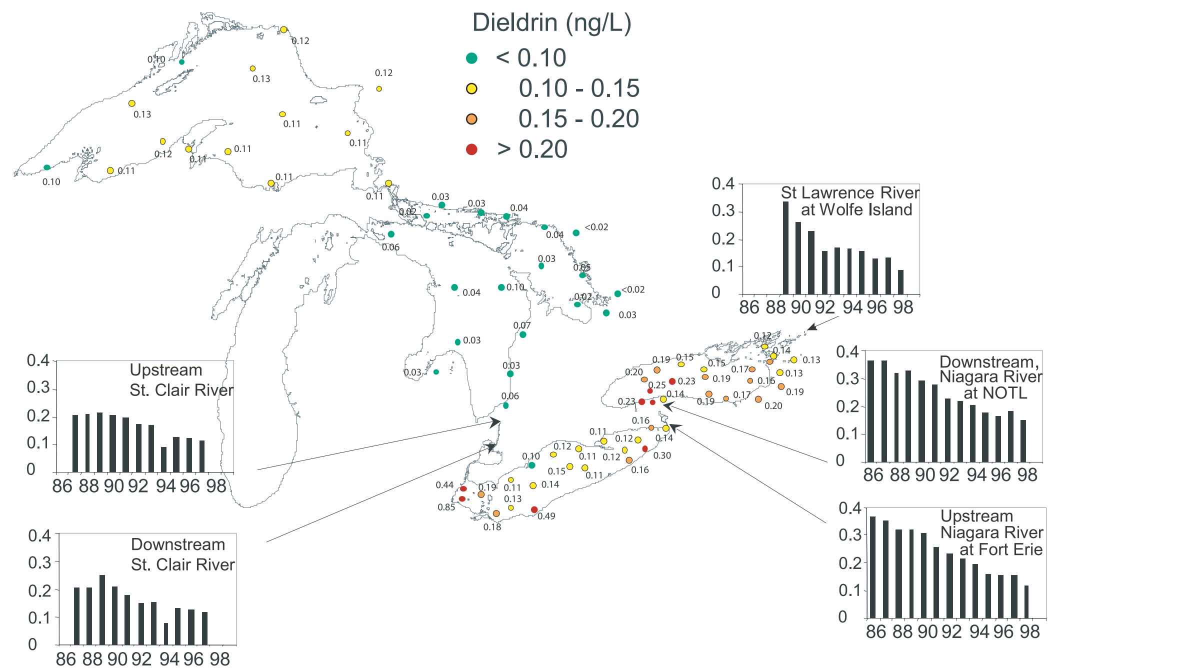


Figure 8-S4. Distribution of Dieldrin in Surface Water (dissolved phase in ng/L), and Annual Mean Concentrations (ng/L) in the Interconnecting Channels from 1986 to 1998 (whole water in ng/L). Source: Great Lakes Surface Water Surveillance Program, Environment Canada[42]

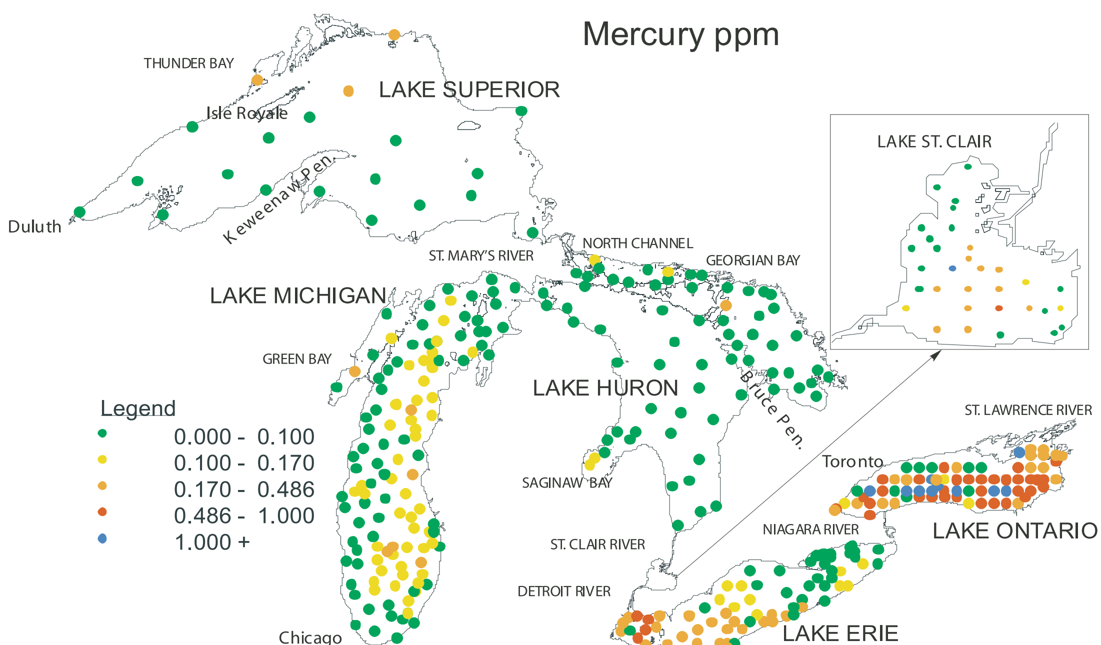


Figure 8-S5. Open-lake Bottom Sediment Mercury Concentrations (µg/g or ppm).Source: Great Lakes Sediment Assessment Program, Environment Canada[43]

[42] ibid

[43] ibid

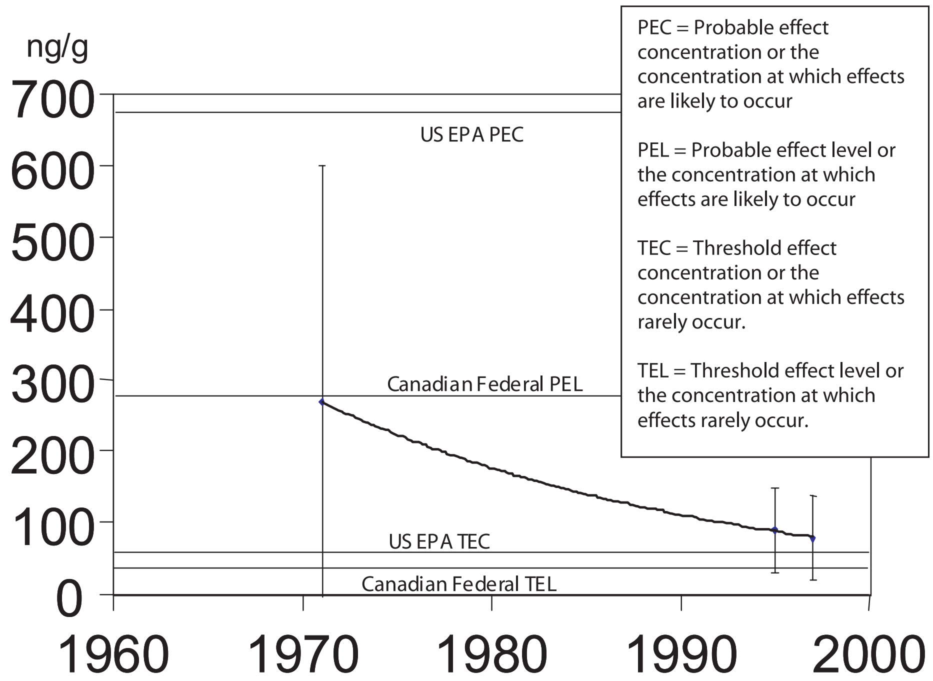


Figure 8-S6. Lake Erie Bottom Sediment Lakewide PCB Average Concentration Over Time. Source: Great Lakes Sediment Assessment Program, Environment Canada[44]

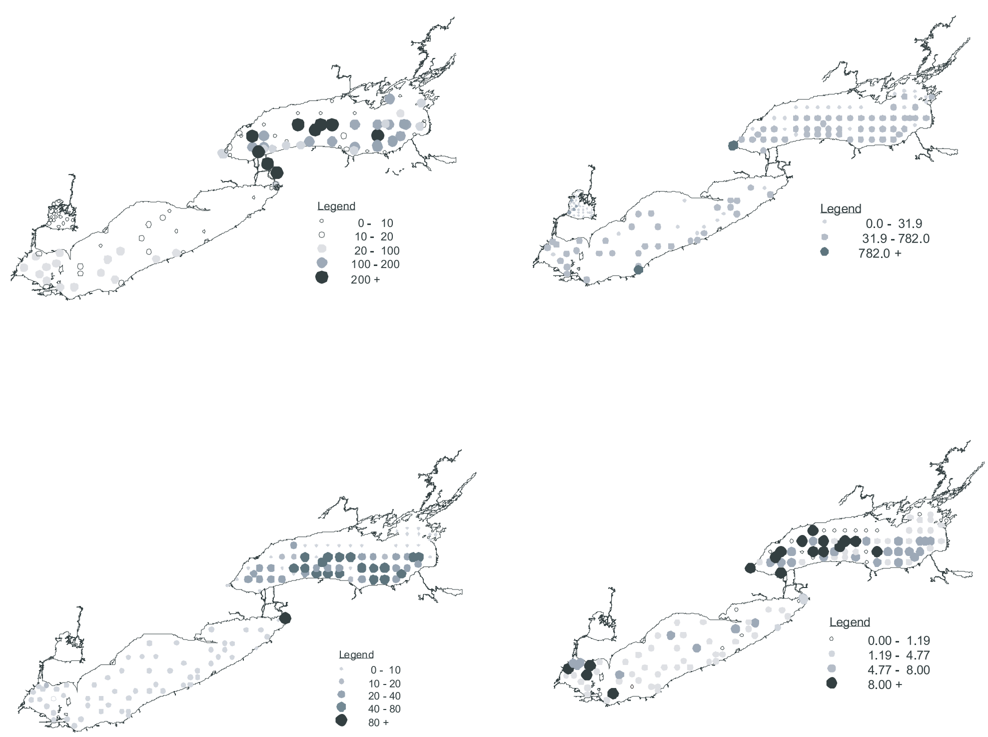


Figure 8-S7. Available Open-lake Sediment Data for Dioxins/Furans (pg/g TEQs, upper left), B(a)P (ng/g, upper right), HCB (ng/g, lower left) and Total DDT (ng/g, lower right). Source: Great Lakes Sediment Assessment Program, Environment Canada[45]

[44] ibid

[45] ibid

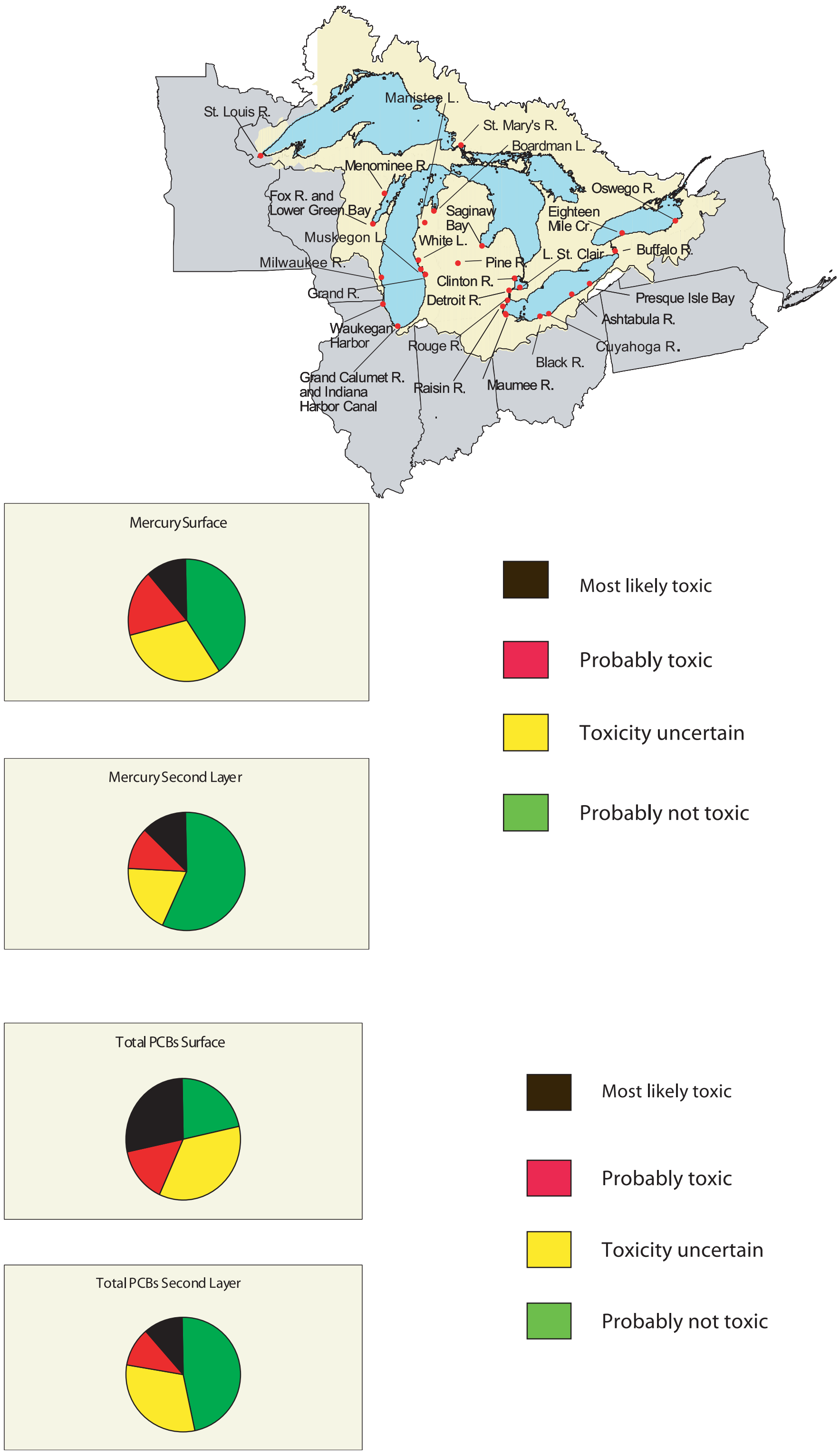
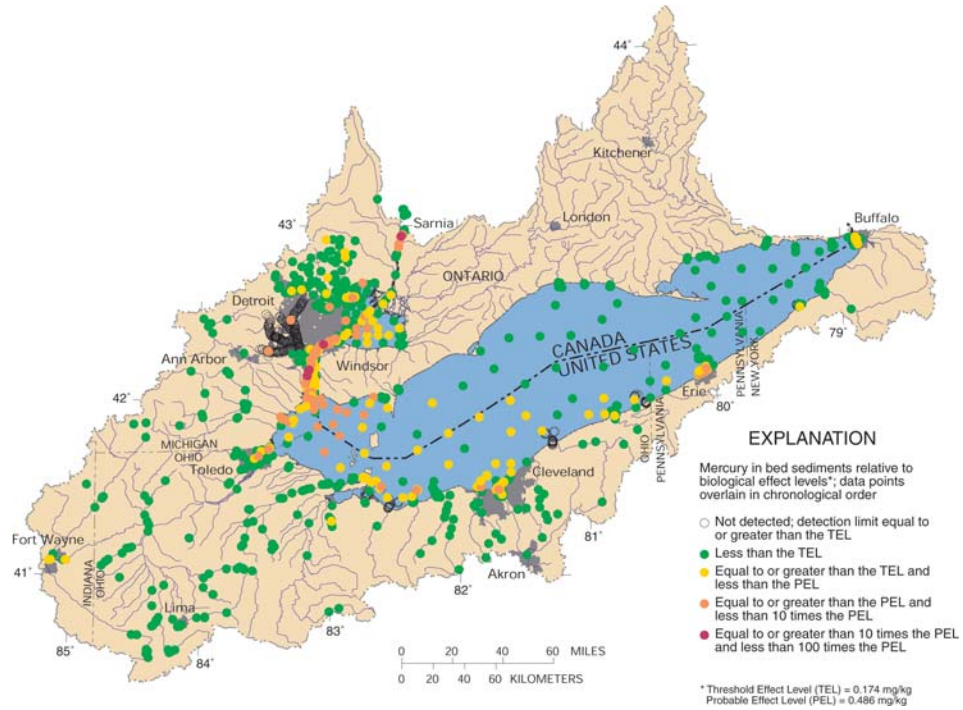


Figure 8-S8. **US EPA Surface and Sub-surface Sediment Assessment Results for Mercury and PCBs in 10 U.S. Areas of Concern. Source: Source: US EPA**



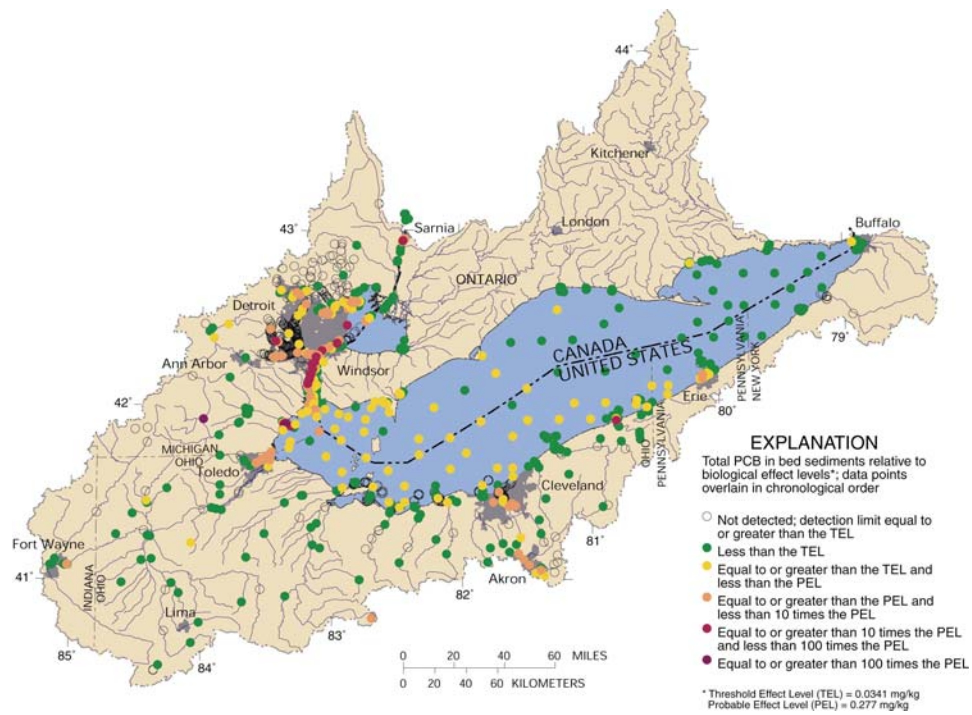


Figure 8-S9. Mercury and PCB Surficial Sediment Concentrations from Multiple Agency Programs within the Lake Erie Basin. Source: USGS Compilation of Multiple Sources

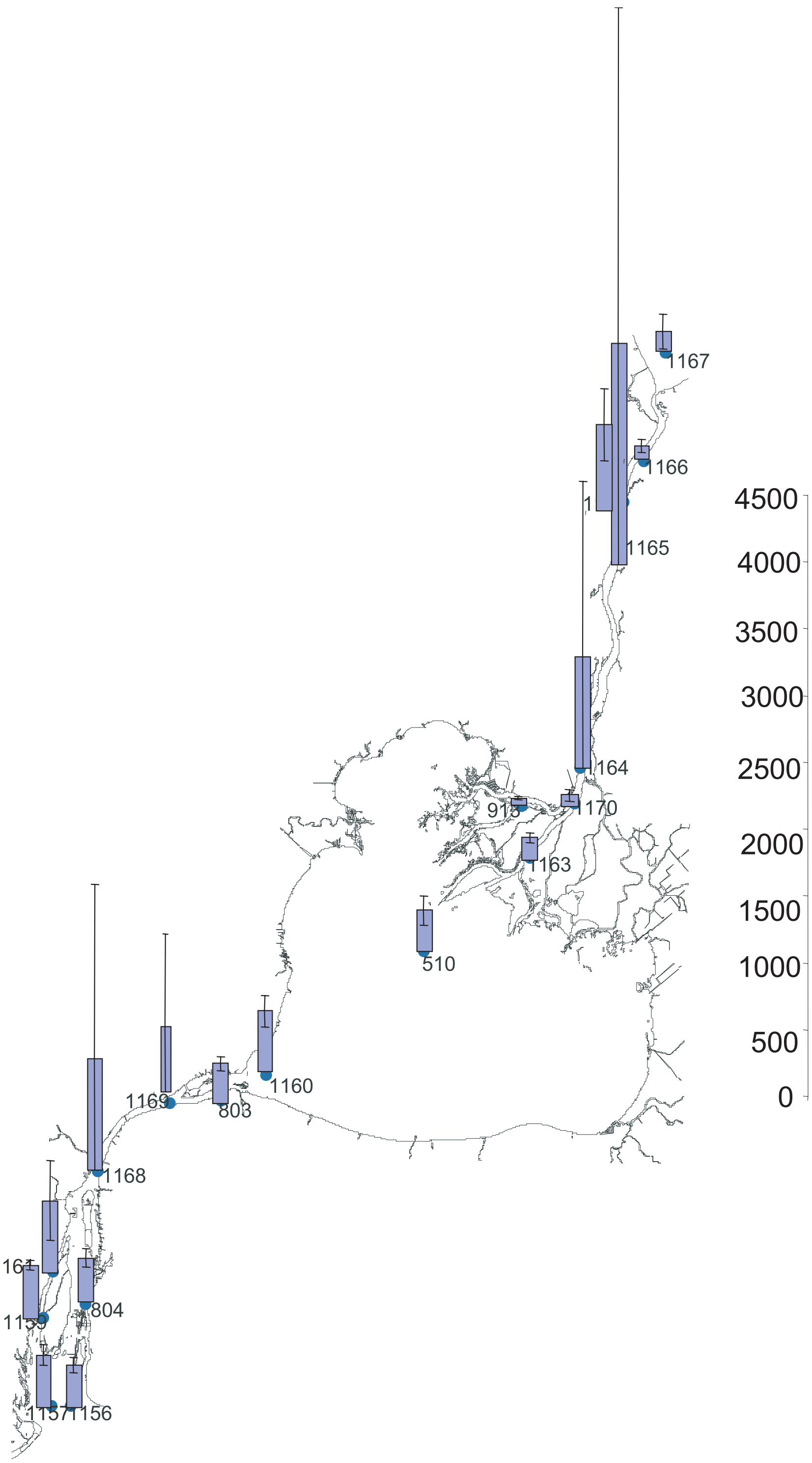


Figure 8-S10. Mercury Concentrations in Suspended Sediments (ng/g) in the St. Clair / Detroit River Corridor. Source: Great Lakes Sediment Assessment Program, Environment Canada[47]

[47] ibid

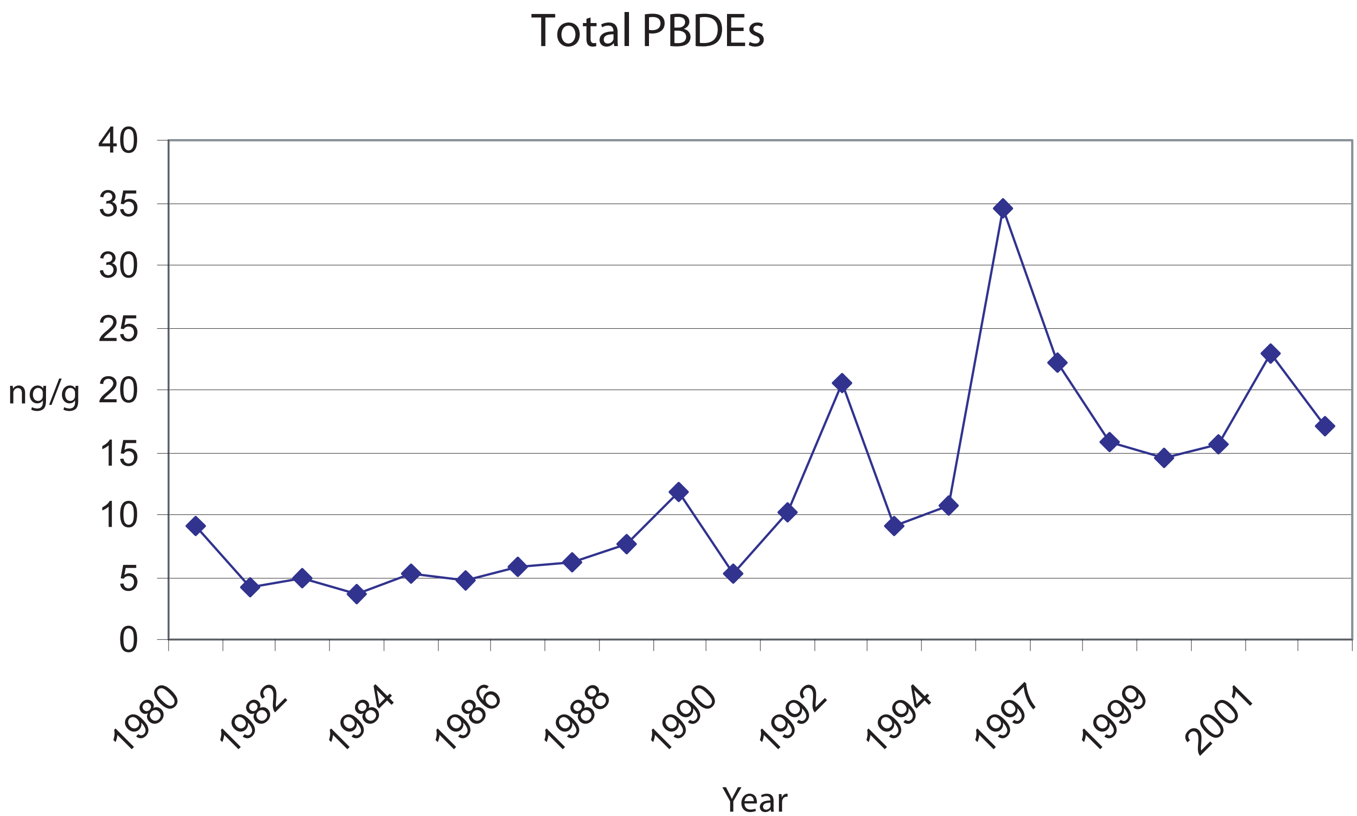


Figure 8-S11. Concentrations of PBDEs (ng/g) in Niagara River Suspended Sediments Over the Period 1980 – 2002 at Niagara-on-the-Lake. Source: Environment Canada and Ontario Ministry of the Environment

APPENDIX A:
GREAT LAKES BINATIONAL TOXICS STRATEGY (GLBTS) PROGRESS OVERVIEW 1997 - 2004

GREAT LAKES BINATIONAL TOXICS STRATEGY (GLBTS)
PROGRESS OVERVIEW 1997 - 2004

GLBTS Development, Integration Workgroup, and Stakeholder Forum
1997
- 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 participation solicited - 12/97 GLBTS web site is developed
1998
- 3/23/98 Kick-off implementation meeting in Chicago to form seven substance workgroups - 6/19/98 The first GLBTS Integration Workgroup meeting is convened in Romulus, Michigan - 6/98 GLBTS web site is redesigned; PCBs and Mercury 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, web site cards, GLBTS progress timeline and activity sheets) at SOLEC in Buffalo, NY - 11/16/98 The first GLBTS Stakeholder Forum is convened in Chicago, IL - 11/16/98 The first GLBTS Progress Report is distributed
1999
- 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 US EPA develop draft communications strategy, present it to Integration Workgroup, and revise strategy based on stakeholder comments - 8/24/99 GLBTS Integration Workgroup meets in Detroit, Michigan - 9/23-26/99 US EPA, EC and invited speakers give GLBTS session presentation at the IJC Great Lakes Water Quality Forum in Milwaukee, WI - 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 site - 11/18/99 GLBTS Stakeholder Forum is held in Chicago, IL - 11/19/99 GLBTS Integration Workgroup meets in Chicago, IL - 12/99 Preliminary planning initiated for a PCP Workshop (to include the GLBTS pesticides, HCB and Dioxin/Furan Workgroups) - 12/3/99 a U.S. *GLBTS Report on Level II Substances* is posted on the GLBTS web site - 12/15/99 Draft (Full) 1999 GLBTS Progress Report issued - 1999 (various dates) Development of a Canadian GLBTS communications plan

GLBTS Development, Integration Workgroup, and Stakeholder Forum
2000
- 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" - 9/22/00 GLBTS Integration Workgroup meets in Chicago, IL - 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)
2001
- 2/20/01 GLBTS Integration Workgroup meets in Windsor, Ontario - 2/21/01 GLBTS 2000 Progress Report is posted to GLBTS web site - 5/17/01 GLBTS Stakeholder Forum is held in Toronto, Ontario - 5/18/01 GLBTS Integration Workgroup meets in Toronto, Ontario - 6/18/01 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, IL - 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, IL, with the theme "Implementation – Partners in Progress" - 11/15/01 GLBTS Integration Workgroup meets in Chicago, IL - 11/16/01 GLBTS/LaMP Workshop in Chicago, IL, 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"
2002
- 1/25/02 GLBTS Sector Subgroup begins summarizing findings - 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/US EPA web site "binational.net" is created - 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 - 9/16/02 GLBTS Sector Subgroup holds conference call to discuss a pilot sector project - 9/18/02 GLBTS Integration Workgroup meets in Chicago, IL - 12/3/02 GLBTS Stakeholder Forum is held in Chicago, IL - 12/3/02 Draft GLBTS 2002 Progress Report issued - 12/4/02 GLBTS Integration Workgroup meets in Chicago, IL

GLBTS Development, Integration Workgroup, and Stakeholder Forum
2003
- 2/25/03 GLBTS Integration Workgroup meets in Windsor, Ontario - 3/01/03 GLBTS Binational.net bookmark created as a marketing tool - 4/01/03 GLBTS CD ROM containing the Strategy, annual progress reports (1998, 1999, 2000, 2001, & 2002), Five-Year Perspective, and various Strategy Updaters (all in both French and English) is created and 5,000 copies are sent to basin stakeholders and Washington and Ottawa government officials - 4/03/03 GLBTS presentation to the Lake Superior LaMP Forum in Duluth, Minnesota - 5/05/03 GLBTS presentation to International Pulp and Paper Conference in Portland, Oregon - 5/13/03 GLBTS presentation to Commission for Environmental Cooperation, Sound Management of Chemicals (SMOC) meeting in Windsor, Ontario - 5/14/03 Final GLBTS 2002 Progress Report posted at www.epa.gov/glnpo/bns and binational.net - 5/14/03 GLBTS Stakeholder Forum held in Windsor, Ontario, in conjunction with CEC SMOC public meeting - 5/15/03 GLBTS Integration Workgroup meets in Windsor, Ontario - 6/01/03 GLBTS Update prepared, as well as GLBTS displays in French, Spanish, and English - 6/11/03 GLBTS presentation to Canadian P2 Roundtable in Calgary, Alberta - 6/16/03 Conference call with Agricultural Subgroup of Integration Workgroup - 6/23/03 GLBTS presentation to IAGLR in Chicago, Illinois - 7/31/03 GLBTS Public outreach tent set up at Chicago Tall Ships event in Chicago, Illinois - 8/11/03 GLBTS presentation at Emerging Chemicals Workshop in Chicago, Illinois - 8/19/03 Conference call with LaMP leads to discuss GLBTS/LaMP Crosswalk of priorities - 9/01/03 *GLBTS 2003 Activity Update* prepared - 9/04/03 Conference call held with small number of Integration Workgroup members to discuss draft GLBTS Level I Substance Assessment Process - 9/11/03 GLBTS Integration Workgroup meets in Toronto, Ontario - 9/11/03 *GLBTS Fall 2003 Workgroup Activity Update* distributed - 9/18/03 GLBTS attendance at the IJC Public Forum in Ann Arbor, Michigan - 10/24/03 GLBTS presentation to European delegation at EU REACH Program in Chicago, Illinois - 11/25/03 Conference call with LaMP and GLBTS Stakeholders to discuss GLBTS Level I Substance Assessment Process - 12/02/03 GLBTS presentation to Lake Superior LaMP Task Force in Thunder Bay, Ontario - 12/16/03 GLBTS Stakeholder Forum is held in Chicago, IL - 12/16/03 Draft *GLBTS 2002 Progress Report* issued - 12/17/03 GLBTS Integration Workgroup meets in Chicago, IL

GLBTS Development, Integration Workgroup, and Stakeholder Forum

2004 and Ongoing

- 2/04 Final *GLBTS 2003 Progress Report* posted at www.epa.gov/glnpo/bns and binational.net
- 4/13/04 – 4/15/04 GLBTS Management Framework Workshop in Chicago, Illinois
- 6/17/04 GLBTS Stakeholder Forum is held in Toronto, Ontario
- 6/18/04 GLBTS Integration Workgroup meets in Toronto, Ontario
- 10/07/04 GLBTS Integration Workgroup meets in Toronto, Ontario: Draft Management Assessments for OCS and dioxin presented
- 10/07/04 GLBTS Fall 2004 Workgroup Activity Update distributed
- 11/16/04 – 11/18/04 Presentation at Workshop on Environmental Health Effects of Persistent Toxic Substances – Hong Kong: "The GLBTS as a Governance Model to reduce PTS"
- 11/30/04 GLBTS Stakeholder Forum is held in Chicago, IL
- 12/01/04 Draft *GLBTS 2004 Progress Report* issued
- 12/01/04 GLBTS Integration Workgroup meets in Chicago, IL

Substance Activities: Mercury (Hg)

GLBTS Workgroup Activities and Reports

1998

- 3/23/98 Workgroup (WG) is formed at the first implementation meeting
- 5/5/98 WG conference call is held
- 8/24/98 *Background Information on Mercury Sources and Regulations* is posted on the GLBTS web site
- 9/10/98 Options Paper *Developing a Virtual Elimination Strategy for Mercury* is posted on the GLBTS web site
- 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

1999

- 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 site
- 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*
- 4/99 Workshop on community initiatives for reducing Hg
- 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, IL
- 11/99 Draft GLBTS Step 1&2 *Sources and Regulations* report for mercury is posted on the GLBTS web site

Substance Activities: Mercury (Hg)

2000

- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- 6/00 GLBTS web page on Mercury Thermometers and FAQs is updated
- 8/00 Memo on progress in reducing mercury use posted on the GLBTS web site
- 9/1/00 A final draft GLBTS *Reduction Options* (Step 3) report for mercury is prepared and posted on the GLBTS web site on 9/29/00
- 10/17/00 Expansion of mercury web page links
- 11/18/00 WG meeting at the GLBTS Stakeholder Forum in Toronto

2001

- 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto
- 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2002

- 5/29/02 – 5/30/02 WG meeting at the GLBTS Stakeholder Forum in Windsor, Ontario
- 12/2/02 WG meeting in Chicago, IL on reducing impact of dental mercury
- 12/3/02 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2003

- 5/14/03 – 5/15/03 WG meeting at the GLBTS Stakeholder Forum in Windsor, Ontario
- 12/16/03 – 12/17/03 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2004 and Ongoing

- 6/17/04 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- 8/04/04 Workgroup report revised: *Options for Dental Mercury Reduction Programs: Information for State and Local Governments*
- 11/30/04 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

Other Mercury Related Activities

1997 and Earlier

- Chlorine Institute voluntary mercury commitment to reduce mercury use by 50% by 2005
- 12/97 *Mercury Report to Congress* is released by US EPA

1998

- 5/8/98 Chlorine Institute releases progress report on voluntary mercury commitment
- 6/25/98 US EPA and AHA sign an MOU on reducing medical wastes

Substance Activities: Mercury (Hg)
- 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
1999
- 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 - 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 - US EPA grant to Ecology Center of Ann Arbor: promoting mercury P2 in the health care industry - Western Lake Superior Sanitary District (WLSSD) begins multimedia zero discharge pilot / focus on Hg - Michigan Mercury Pollution Prevention Task Force - 11/16/98 Draft *PBT National Action Plan* for Mercury is released by US EPA - 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.
2000
- Chlorine Institute reports 42% reduction, production-adjusted, in mercury use - US EPA, state agencies, and academic researchers conduct meetings with chlor-alkali industry representatives to coordinate mercury reduction projects - Olin Corp. cooperates with US EPA, 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-US EPA 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. - University of Wisconsin extension creates a web site 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.
2001

Substance Activities: Mercury (Hg)

- 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 created the *Guide to Mercury Reduction in Industrial and Commercial Settings*
- Mercury Switch-out Pilot Program launched by Pollution Probe, Ontario Power Generation, Ontario Ministry of the Environment, 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

2002

- 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% 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% 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% 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.

Substance Activities: Polychlorinated Biphenyls (PCBs)

GLBTS Workgroup Activities and Reports

1998 and Earlier

- 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
- 3/23/98 WG is formed at the first implementation meeting
- 6/15/98 WG requests that the IG develop a strategy on sediments
- 11/10/98 Options Paper *Virtual Elimination of PCBs* is posted on GLBTS web site
- 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

1999

- 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, IL
- 11/99 Draft *GLBTS Step 1&2 Sources and Regulations* report for PCBs is posted on the GLBTS web site
- WG solicits and gains commitment of 3 U.S. auto manufacturers to reduce PCBs
- WG solicits commitment of steel producers to reduce PCBs

Substance Activities: Polychlorinated Biphenyls (PCBs)

2000

- 5/16/00 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- Final draft GLBTS Step 3 *Reduction Options* report for PCBs is prepared (7/14/00) and posted (9/29/00) on the GLBTS web site
- WG continues to use PCB reduction commitment letters, through EC and US US EPA, to seek commitments to reduce PCBs. Specific companies are targeted, primarily major owners of PCB transformers and capacitors, and associations, such as CGLI
- WG solicits and gains commitment to reduce PCBs from 2 Canadian auto manufacturers, 4 Canadian steel producers, and over 30 municipal electrical utilities in Ontario
- 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. US EPA 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; 1,191 active PCB storage sites in Ontario

2001

- 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 site
- 1/01 PCB federal databases are updated for Canada.
- 5/01 PCB WG progress meeting held in Toronto, Ontario, 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. US EPA 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 US EPA 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 site to help increase awareness of the types of equipment that may contain PCBs
- 9/01 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, IL. WG discusses the need for more outreach, especially toward small and medium sized companies. Representatives of General Motors outline the company's plan to phase-out all PCB materials from its North American facilities.
- As of April 2001, 80% of high-level PCBs (Askarel > 1%, 10,000 ppm) had been destroyed in Ontario, Canada; however only 25% 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 Fact sheet posted to GLBTS web site: PCBs in Submersible Well Pumps
- 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

Substance Activities: Polychlorinated Biphenyls (PCBs)

2002

- WG continues to modify BNS-PCB web site based on recommendations received in an email survey conducted by EC and US EPA in November 2001
- 5/02 WG meeting is held at the GLBTS Stakeholder Forum in Windsor, Ontario
- 5/02 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.
- 5/02 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.
- As of April 2002, 84% of high-level PCBs (Askarel > 1%, 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.

2003

- 5/14/03 WG meeting at the GLBTS Stakeholder Forum in Windsor, Ontario
- 9/11/03 PCB Reduction Recognition Awards presented to Enersource Hydro, Hydro One, Slater Steel, and Stelpipe Ltd.
- 12/16/03 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2004 and Ongoing

- 6/17/04 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- 6/17/04 PCB Reduction Recognition Awards presented to City of Thunder Bay and Canadian Niagara Power
- 11/30/04 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

Other PCB Related Activities

1999 and Earlier

- US EPA 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

2000

- 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

Substance Activities: Polychlorinated Biphenyls (PCBs)

- 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

2001

- 5/2/01 Final Reclassification of PCB and PCB-contaminated Electrical Equipment rule becomes effective
- US EPA 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

2002

- 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

2003 and Ongoing

- 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.

Substance Activities: Dioxins/Furans

GLBTS Workgroup Activities and Reports

1998

- 3/23/98 WG is formed at the first implementation meeting
- 11/16/98 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

1999

Substance Activities: Dioxins/Furans

- 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, IL
- 12/7/99 WG Conference call: application of the decision tree process

2000

- 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
- 5/26/00 GLBTS draft Step 1&2 *Sources and Regulations* report is prepared
- 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
- 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 site
- 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.
- Final GLBTS Step 3 *Reduction Options* report is prepared (9/27/00) and the report is posted (9/29/00) on the GLBTS web site
- 11/14/00 Burn Barrel Subgroup teleconference: outline of a strategy document prepared.
- 11/00 Discussion papers on Landfill Fire and Incinerator Ash Management prepared for workgroup review.

2001

- 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 US EPA 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

Substance Activities: Dioxins/Furans

- 6/22/01 Burn Barrel Subgroup receives $55k of US EPA PBT funding
- 10/9/01 Burn Barrel Subgroup teleconference: Regional Lake Superior campaign
- 11/6/01 Burn Barrel Subgroup teleconference: Sharing information
- 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL
- 12/18/01 Burn Barrel Subgroup teleconference: Sharing information

2002

- 2/12/02 Burn Barrel Subgroup teleconference: web page initiation, bylaws/ordinance discussion.
- 3/19/02 Burn Barrel Subgroup teleconference: web page & 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: web page & list serve development
- 4/24/02 WG Conference call: discussing ash management
- 5/14/02 Burn Barrel Subgroup teleconference: finalize web page, prepare for Windsor GLBTS meeting
- 5/30/02 WG meeting at the GLBTS Stakeholder Forum in Windsor: demonstration of newly launched subgroup web site “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 web site 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
- 11/13/02 WG Conference call: discussing a pilot project on the treated wood issue

2003

- 3/18/03 Burn Barrel Subgroup teleconference: Exploring partnerships with health organizations
- 5/14/03 WG meeting at the GLBTS Stakeholder Forum in Windsor, Ontario
- 6/3/03 Burn Barrel Subgroup teleconference: EPA Office of Solid Waste outreach materials
- 7/31/03 WG teleconference: Draft two-year workplan
- 9/9/03 Burn Barrel Subgroup teleconference: WDNR’s “Air Defenders” kit
- 11/4/03 Burn Barrel Subgroup teleconference: Addressing suppliers of small backyard incinerators
- 11/4/03 WG teleconference: Draft two-year workplan; finalizing the Burn Barrel Strategy
- 12/16/03 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2004 and Ongoing

- 3/02/04 WG teleconference: Progress on issue papers
- 3/09/04 Burn Barrel Subgroup teleconference
- 5/11/04 Burn Barrel Subgroup teleconference
- 6/04 Draft issues papers prepared on *Emissions from Agricultural Burning, Structure Fires, Tire Fires, and Wildfires* and *Prescribed Burning*
- 6/17/04 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- 9/14/04 Burn Barrel Subgroup teleconference
- 9/09/04 Burn Barrel Subgroup teleconference

Substance Activities: Dioxins/Furans

- 10/14/04 WG teleconference: *Draft Management Assessment for Dioxins*
- 11/30/04 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

Other Dioxin/Furan Related Activities

1999 and Earlier

- WLSSD begins multimedia zero discharge pilot / focus on dioxins
- Two Ontario utilities eliminate use of PCP in treated poles

2000

- 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

2001

- 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

2002

- PCP re-registration review proceeding as joint Canada/U.S. endeavor

2003

- 7/18/03 CEC draft Phase One North American Regional Action Plan on Dioxins and Furans, and Hexachlorobenzene available for public comment
- *Ash Characterization Study* in Ontario
- Secondary metal smelter release inventory study in Ontario
- EPA develops Backyard Trash Burning web site and brochures available at www.epa.gov/nsw/backyard
- Public release of first US National Dioxin Air Monitoring Network (NDAMN) ambient air monitoring data
- Canada-wide Standards for iron sintering and steel manufacturing endorsed in March 2003
- Release of Wisconsin "Air Defenders" Kit for Burn Barrel education
- Dioxin sampler added at an Integrated Atmospheric Deposition Network (IADN site), Burnt Island

2004 and Ongoing

- US EPA compiles case studies of open burning reduction efforts

Substance-Specific Activities: Pesticides

GLBTS Workgroup Activities and Reports

1998

- 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 I pesticides is posted on the GLBTS web site

1999

- 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, IL

2000

- 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)
- 5/00 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.

2001

- WG reviews pollution prevention opportunities for Level II pesticides (endrin, heptachlor, lindane and HCH, tributyl tin, and pentachlorophenol) and begins preparing report

Other Pesticide Related Activities

1999 and Earlier

- 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*
- US EPA funding to four existing Clean Sweep programs for pilot data collection efforts for Level I pesticides

2000

- 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 I PBT pesticides (except mirex) are regularly collected by ongoing Clean Sweep programs
- Phase out of the Level II Pesticides lindane and tributyl tin compounds are the subject of bi-national negotiations through pesticide regulatory agencies in the U.S. and Canada

Substance-Specific Activities: Pesticides

2001

- 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.

2002

- PCP re-registration review proceeding as joint Canada/U.S. endeavor

Substance-Specific Activities: Hexachlorobenzene (HCB) / Benzo(a)pyrene (B(a)P)

GLBTS Workgroup Activities and Reports

1998

- 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

1999

- 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, IL
- 11/99 Draft GLBTS Step 1&2 *Sources and Regulations* Reports for B(a)P and HCB are posted on the GLBTS web site

2000

- 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 site
- 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

2001

Substance-Specific Activities: Hexachlorobenzene (HCB) / Benzo(a)pyrene (B(a)P)

- 5/17/01 WG meeting at the GLBTS Stakeholder Forum in Toronto
- 11/14/01 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL
- Canada implements Strategic Options Processes with steel mills and wood preservers
- Algoma Steel signs an *Environmental Management Agreement* with EC and OME to address environmental priorities
- A Wood-stove Changeout Program is held in Georgian Bay, Ontario, in conjunction with the Hearth Products Association of Canada

2002

- 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 Council of Great Lakes Industries (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 I substances, and develop reduction projects with stakeholders
- 12/3/02 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2003

- 5/14/03 WG meeting at GLBTS Stakeholder Forum in Windsor, Ontario
- Work with CGLI and pesticide industry, to determine pesticide HCB contaminant levels, continues
- Rubber Manufacturers Assn. provides detailed information on scrap tire management in the Great Lakes Basin
- Resource needs identified to successfully implement a Scrap Tire Outreach Plan
- B(a)P emissions from coke ovens in basin continue to decline as a result of shutdowns and regulations
- Work on more accurate B(a)P inventory (especially for air emissions)
- Several conference calls held on Woodstove Smoke Reduction contract to encourage best practices and develop outreach materials
- Natural Resources Canada *Burn it Smart*! campaign conducts over 300 residential wood-burning workshops across Canada; campaign presentation to be updated to include wood stove change-out and more workshops planned for Ontario
- Initial discussions held with Canadian Vehicle Manufacturers' Association on verification of B(a)P release estimates for the on-road motor vehicle sector
- 12/16/03 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

2004 and Ongoing

- 6/17/04 WG meeting at the GLBTS Stakeholder Forum in Toronto, Ontario
- US EPA wood stove/fireplace initiatives: media outreach package, web site, fact sheets and labeling program promoting EPA-certified stoves and clean/safe wood burning practices.
- Fifty-one *Burn it Smart* public education workshops delivered in 40 Ontario rural and First Nations communities in 2004

Substance-Specific Activities: Hexachlorobenzene (HCB) / Benzo(a)pyrene (B(a)P)

- Work with CGLI and pesticide industry to determine pesticide HCB contaminant levels, continues
- Re-assessment of Ontario HCB and B(a)P releases from use of pentachlorophenol-treated and creosote-treated wood products.
- 11/30/04 WG meeting at the GLBTS Stakeholder Forum in Chicago, IL

Other HCB/B(a)P Related Activities

1999 and Earlier

- 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
- 1/99 wood stove changeover pilot program for Eastern Ontario

2000

- 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

2001

- 2/01-4/01The Hearth Products Association expands the Great Lakes Great Stove Changeout Program to 12 states
- 6/01 US EPA 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

2002

- 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

2003

- 7/18/03 CEC draft Phase One North American Regional Action Plan on Dioxins and Furans, and Hexachlorobenzene available for public comment
- An EPA rule to control emissions (including HCB) from hydrochloric acid production is promulgated
- The "Voluntary Woodstove/Fireplace Smoke Reduction Activities and Outreach Materials" contract awarded by EPA
- An EPA rule for the control of coke oven battery stack emissions (including B(a)P) is promulgated

Substance-Specific Activities: Hexachlorobenzene (HCB) / Benzo(a)pyrene (B(a)P)
- HCB added to CEPA listing of prohibited toxic substances; proposed regulation published to prohibit products with concentrations greater than 20 ppb
2004 and Ongoing
- Twelve Wood Energy Technology Transfer Inc. training workshops held in Ontario - USEPA *Scrap Tire Pile Mitigation Support Project* underway promoting mapping and clean-up of tire piles. - Scrap tire pile cleanup forum held in Chicago on February 23 – 24, 2004. - Proposed Ontario Tire Stewardship scrap tire diversion program awaiting approval from OME. - Independent third party audits verify Ontario's four metallurgical coke producers meeting reduction goals set out in best practice manual for controlling PAH (includes B(a)P) releases).

Substance-Specific Activities: Alkyl-lead
GLBTS Workgroup Activities and Reports
1998
- 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 site
1999
- 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 site. The report concludes that the Canadian challenge of reducing alkyl-lead use by 90% 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 site
2000
- 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 site - 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 site
2001
- The U.S. meets the challenge of confirming no use of alkyl-lead in automotive gasoline. The US EPA PBT Program takes the lead for the U.S. in coordinating stakeholder efforts to reduce remaining alkyl-lead releases

Substance-Specific Activities: Alkyl-lead

Other Alkyl-lead Related Activities

1999 and Earlier

- Work begins on a draft *National PBT Action Plan* for Alkyl-lead

2000

- 8/25/00 A Draft *PBT National Action Plans* for alkyl-lead is posted on the PBT web site for public review and comment
- Auto racing industry expresses interest in working with US EPA to find lead-free gas substitutes

2001

- US EPA begins working with NASCAR to permanently remove alkyl-lead from racing fuels used, specifically, in the Busch, Winston Cup, and Craftsman Truck Series

Substance-Specific Activities: Octachlorostyrene (OCS)

GLBTS Workgroup Activities and Reports

1998

- 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 site
- 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 site

1999

- 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, IL
- Data on OCS trends in fish is assessed by the WG

2000

- 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

Substance-Specific Activities: Octachlorostyrene (OCS)
- 12/00 US EPA 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
2004
- 8/04 Draft *Management Assessment for OCS* (Step 4) Report prepared
Other OCS Related Activities
1999 and Earlier
- 3/10/99 CGLI report, *OCS and Suggested Industrial Sources: A Report to the GLBTS Workgroup*, is submitted to the workgroup
2000
- 8/25/00 A Draft PBT National Action Plan for OCS is posted on the PBT web site for public review and comment
2002
-4/02 Toxics Release Inventory data for 2000 is made available to the public

Sediments
Canadian and U.S. Activities
1998 and Earlier
- 6/15/98 PCB WG requests that the IG develop a strategy on sediments - 6/19/98 Integration WG discusses sediments challenge - US EPA provides guidance to workgroups on how to deal with sediments within chemical-specific workgroups
1999
- 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
2000

Sediments

- 2/15/00 US EPA 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, US EPA and EC present the draft sediment reporting format and commit to hold a sediment technology workshop

2001

- 4/24/01 US EPA and EC host a two-day workshop on "Removing and Treating Great Lakes Contaminated Sediment," presenting sediment remediation technologies and case studies

2002 and Ongoing

- Ongoing assessments and remediations in both the U.S. and Canada within the Great Lakes watershed (see Section 7.0)

Related Sediment Activities

1998 and Earlier

- 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

2002

- 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 US EPA

Long-Range Transport (LRT) Activities

1999

- 11/19/99 EC presents the status of their LRT effort at the Integration WG meeting

2000

- 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)

2001

- Several studies are undertaken in the U.S. and Canada to characterize global transport processes.

2003 and Ongoing

Long-Range Transport (LRT) Activities

- 9/16/03 - 9/17/03 EC and USEPA sponsor LRT Workshop in Ann Arbor, MI, with support of the CEC, the IJC, and the Delta Institute
- 9/03 LRT workshop background paper, the workshop program, presentations, and draft summary document are posted on the Internet at http://delta-institute.org/pollprev/lrtworkshop/_workshop.html
- Research into long-range transport of persistent toxic substances to the Great Lakes continues

General Activities Related to Reductions in GLBTS Substances

US EPA Regulatory Determinations

1998 and Earlier

- 12/95 Maximum Available Control Technology (MACT) rules for large Municipal Waste Combustors (MWC) are promulgated
- 9/97 MACT rules for Medical Waste Incinerators (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

1999

- 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

2000

- 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

2001

- US EPA 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.

2002

General Activities Related to Reductions in GLBTS Substances

- 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%

US EPA Activities

1999 and Earlier

- 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 US EPA'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

2000

- 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 US EPA'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 I pesticides, and PCBs
- US EPA'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.

2001

- 5/23/01 U.S. signs the United Nation's global treaty on Persistent Organic Pollutants (POPs)

2002

- 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

2004

- 5/18/04 Great Lakes Interagency Task Force created by U.S. Executive Order

General Activities Related to Reductions in GLBTS Substances

EC Regulatory Determinations

1999 and Earlier

- *Canadian Environmental Protection Act* is renewed

2000

- Canada-Wide Standards (CWS) (release limits) are developed for mercury, particulate matter, ozone, and benzene, and are being developed for dioxins/furans.
- Canadian Strategic Options Processed (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

2001

- 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

EC Activities

1999 and Earlier

- 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

2000

- 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 US EPA-certified wood stoves to investigate releases of dioxins/furans, PAHs, HCB, and particulate matter

Other Activities

1998 and Earlier

- CEC issues Continental Pollutant Pathways Initiative - 7/98 UNEP POPs negotiations initiated
1999
- 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
2000
- 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 - 11/8/00 – 11/9/00 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
2001
- 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
2002
- Monitoring of air deposition of toxic pollutants in the Great Lakes Basin continues under IADN
2003
- 9/19/03 – 9/20/03 IJC 2003 Great Lakes Conference and Biennial Meeting in Ann Arbor, MI - Monitoring of air deposition of toxic pollutants in the Great Lakes Basin continues under IADN
2004 and Ongoing
- 4/23/04 Great Lakes Commission releases 2001 Great Lakes Regional Air Toxic Emissions Inventory, available online at www.glc.org/air - 10/6/04 – 10/8/04 State of Lakes Ecosystem Conference (SOLEC) held in Toronto, Ontario - Monitoring of air deposition of toxic pollutants in the Great Lakes Basin continues under IADN

APPENDIX B

BACKGROUND

Over the past thirty years, the governments of Canada and the United States have joined together with industries, citizen groups, and other stakeholders in a concerted effort to identify and eliminate threats to the health of the Great Lakes ecosystem resulting from the use and release of persistent toxic substances. A major step in this process was the enactment of the Revised Great Lakes Water Quality Agreement (GLWQA) of 1978 which embraced, for the first time, a philosophy of "virtual elimination" of persistent toxic substances from the Great Lakes. In 1987, the GLWQA was amended, establishing Lakewide Management Plans (LaMPs) as a mechanism for identifying and eliminating any and all "critical pollutants" that pose risks to humans and aquatic life. In 1994, the International Joint Commission's Seventh Biennial Report under the GLWQA called for a coordinated binational strategy to "stop the input of persistent toxic substances into the Great Lakes environment." This led to the signing of the Great Lakes Binational Toxics Strategy (GLBTS, or Strategy) in 1997. The Strategy specifies Level 1 substances, each targeted for virtual elimination and each with its own specific challenge goals, along with Level 2 substances targeted for pollution prevention. The substances were selected on the basis of their previous nomination to lists relevant to the pollution of the Great Lakes Basin, and the final list was the result of agreement on the nomination from the two countries. The specific reduction challenges for each substance include individual challenge goals for each country, within a time frame that expires in 2006.

Significant progress has been made toward achieving the Strategy's challenge goals. As 2006 approaches, an analysis of progress and determination of next steps is needed to respond to the mandate set forth in the Strategy. The purpose in developing the General Framework to Assess Management of GLBTS Level 1 Substances is to provide a tool to assist the Parties (Environment Canada and the United States Environmental Protection Agency) and stakeholders in conducting a transparent process to assess the Level 1 substances.

OBJECTIVE

The framework presents a logical flow diagram for evaluating progress and the need for further action by the GLBTS on the Level 1 substances in order to meet the following objective:

Evaluate the management of GLBTS Level 1 substances with the following potential outcomes:

1) Active Level 1 Status & Periodic Reassessment by GLBTS
2) Consider Submission to BEC[35] for New Challenge Goals
3) Engage LaMP Process
4) Suspend GLBTS Workgroup Activities. Where warranted, refer to another program and/or participate in other fora. Periodic Reassessment by GLBTS, until Parties determine substance has been virtually eliminated.

Additional outcomes that may result from the framework are:

- Recommend benchmark or criteria development as a high priority; and
- Recommend additional environmental monitoring as a high priority.

The framework is intended to serve as a guide in determining the appropriate management outcome(s) for the Level 1 substances: mercury, polychlorinated biphenyls (PCBs), dioxins and furans, hexachlorobenzene (HCB), benzo(a)pyrene (B(a)P), octachlorostyrene (OCS), alkyl-lead, and five cancelled pesticides: chlordane, aldrin/dieldrin, DDT, mirex, and toxaphene. The framework is not intended to specify details of how a Level 1 substance should be addressed once a management outcome is determined.

STRUCTURE OF THE FRAMEWORK

The framework is set up in a hierarchical fashion to allow efficiencies in the decision process. The hierarchy of the framework is to first consider progress toward the challenge goals committed to in the Strategy, then to conduct an environmental analysis and finally, a GLBTS management assessment which leads to various potential management outcomes for a substance.

The environmental analysis (depicted in green) and the GLBTS management assessment (depicted in blue) comprise the two main parts of the framework. The environmental analysis considers available Canadian and U.S. monitoring data and established human health or ecological criteria as the primary basis for an objective

[35] The Binational Executive Committee (BEC) is charged with coordinating implementation of the binational aspects of the 1987 Great Lakes Water Quality Agreement, including the GLBTS. The BEC is co-chaired by EC and US EPA and includes representatives from the Great Lakes states and the Province of Ontario, as well as other federal agencies in Canada and the U.S.

evaluation of a substance's impact on the Basin. For substances lacking sufficient risk-based criteria or environmental monitoring data, the framework recommends the development of benchmarks or criteria and additional monitoring as a high priority. While the environmental analysis places emphasis on good monitoring data, evidence of use, release, exposure, or precautionary concerns may also be considered.

If the environmental analysis concludes that there is no basis for concern, GLBTS workgroup activities may be suspended, with periodic reassessment of the substance until the Parties determine that the substance has been virtually eliminated. If, on the other hand, the environmental analysis concludes that there is a reason for concern, the GLBTS management assessment evaluates the ability for the GLBTS to effect further improvements in and out of the Basin. The GLBTS management assessment also considers whether the impact of a substance is basinwide or restricted to a single lake. In cases where the GLBTS can effect further reductions, consideration will be given as to whether new Strategy challenge goals can be established. Virtual elimination is an underlying tenet of the Strategy and should be kept in mind throughout the assessment process.

The GLBTS management assessment can result in a number of potential management outcomes; the outcomes provided in the framework allow a substance to remain in active Level 1 status or GLBTS workgroup activities to be suspended. The outcomes also recognize that it may be appropriate to more actively involve a LaMP process, to refer a substance to another program, to represent GLBTS interests in other fora (e.g., international programs), or to consider proposing new challenge goals. All outcomes include a periodic reassessment by the GLBTS (approximately every two years).

While it is recognized that the Parties have an ongoing responsibility to promote GLBTS interests in other arenas, a potential outcome of the framework is to recommend referral to another program and/or GLBTS representation in other fora. In the GLBTS framework, this option is presented when there is no evidence of Basin effects, or when the GLBTS cannot effect further significant reductions on its own, but can advocate substance reductions in other programs and in international fora.

It should be noted that, in using the framework to conduct assessments for the Level 1 substances, it may not be possible to definitively answer "YES" or "NO" to all questions. It is not necessary to have a definitive answer to proceed in the framework. For example, in assessing whether there is environmental or health data to assess the impact of the substance in the Basin, it may be determined that, while additional data would be helpful, there is some data on releases and environmental presence in certain media with which to assess the status of the substance. In this case, judgment is needed to decide whether these data are sufficient to proceed along the "YES" arrow or whether the available data are not adequate and the analysis should proceed along the "NO" arrow, placing the substance on a high priority list for monitoring. As a general guide, the framework allows flexibility and judgment in interpreting environmental data and in determining the most appropriate management outcome(s).

Each decision node, or shape, in the framework is illustrated below along with a brief explanation that describes, in further detail, the question to be assessed.

Fringed Gentian
Photograph courtesy of the USEPA

GLBTS Level 1 Substances

All 12 Level 1 substances will be assessed.

Have the challenge goals for the substance been met?

The first question to consider in assessing the GLBTS status and future management of a Level 1 substance is whether the challenge goals agreed to in the Strategy have been met. The answer to this question informs the subsequent assessment in many ways, not only indicating progress, but also revealing issues associated with the ability to pursue further reductions. Progress toward the U.S. and Canadian goals will be considered jointly. Challenge goals will be evaluated with the best data presently available. Note that some challenge goals target "releases" of a substance while others target its "use". As a result, different types of data may be required to evaluate challenge goal status (e.g., "use" data vs. environmental "release" data). The framework continues with both the environmental analysis and GLBTS management assessment, notwithstanding the status of the challenge goals.

ENVIRONMENTAL ANALYSIS

Do we have environmental or health data to assess the impact of the substance in the Basin?

Characteristics of acceptable monitoring data to assess the temporal, spatial, and population representativeness of a substance in the Great Lakes Basin ecosystem include (but are not limited to) basin-specific measures in water, air, sediment, soil, indoor environments (e.g., dust), fish, biota, or human biological samples. If necessary, use or release data may be used as surrogates (e.g., in the case of alkyl-lead).

High Priority for Monitoring

"What gets measured gets managed." Substances entering this box will be recommended as a high priority for monitoring to the Parties. The intent is that these GLBTS substances will be considered by a wide range of government or private agencies when they make decisions regarding which analytes to monitor in the environment. As sufficient monitoring data is developed, substances will be re-evaluated.

Have sufficient risk-based criteria been established (e.g., GLI or other)?

Relevant criteria include, but are not limited to:

- Water quality criteria
- Fish tissue concentrations
- Ambient or indoor air standards
- Sediment or soil standards
- Limits based on reference doses
- Health-based standards for human biota measurements

High Priority for Benchmark or Criteria Development

If there are no criteria against which to evaluate current levels, the GLBTS will consider whether there is a need for the Parties to recommend the development of human health or ecological criteria. This box effectively creates a GLBTS list of substances that are in need of human health or ecological criteria with which to identify exceedances in the environment.

Do levels in biota, air, water, etc. exceed criteria?

As the framework is intended to be flexible in its implementation, the choice of criteria to use in answering this question may vary. For example, the most strict criteria in one or more media may be used to evaluate environmental levels.

Is the trend decreasing?

If there are no criteria, or if current levels do not exceed criteria, this box considers whether there is a decreasing trend. A decreasing trend could be defined as a statistically significant negative slope. If the trend is decreasing, the substance is evaluated for evidence of concern based on use, release, exposure, or the precautionary approach. If a decreasing trend cannot be established, then the substance moves directly to the GLBTS management assessment to determine the ability of the GLBTS to effect further reductions.

* Note that, in the event that there are established criteria and the GLBTS substance is below those criteria but not decreasing in trend, further analyses may be required to estimate when criteria might be exceeded.

Is there a reason for concern based on use/release/exposure data or the precautionary approach?

In cases where sufficient monitoring data is not available, or where environmental trends are decreasing and criteria have either not been established or are not being exceeded, the relevant question is whether there is evidence of Basin effects based on documented use, release, or exposure data, or from a precautionary point of view. An example of a precautionary point of view would be documented evidence of significant impact in another geographic location with the same sources and use patterns as in the Basin, or because the effects of a pollutant would be significant by the time it was able to be measured through monitoring.

GLBTS MANAGEMENT ASSESSMENT

Ability for GLBTS to effect further reductions?

Answering this question involves an accelerated version of the first three steps of the GLBTS 4-step process,[36] looking at sources and current programs and regulations to see where the reduction opportunities lie. Part of the assessment will involve consideration of whether the reduction opportunities will be significant enough to merit the effort.

[36] The GLBTS four-step process to work toward virtual elimination is: 1) Information gathering; 2) Analyze current regulations, initiatives, and programs which manage or control substances; 3) Identify cost-effective options to achieve further reductions; and 4) Implement actions to work toward the goal of virtual elimination.

Principally lake specific?

Based on a joint GLBTS-LaMP determination that the impact of a substance is restricted to a single lake, the appropriate LaMP will be engaged for coordination of leadership for reduction actions to be undertaken by the responsible organizations.

Can new challenge goals be established?

The GLBTS will assess the practicality of setting forth new challenge goals.

GLBTS MANAGEMENT ASSESSMENT

Active Level 1 Status & Periodic Reassessment by GLBTS

The substance will continue as a Level 1 with reduction actions addressed by the appropriate process and with periodic reassessment, approximately every two years, using the General Framework to Assess Management of GLBTS Level 1 Substances.

Consider Submission to BEC for New Challenge Goals

The GLBTS will consider recommending new challenge goals to BEC. The justification for new challenge goals will incorporate the findings of the framework analysis and will include assessment of the desired environmental improvement and feasibility. If the GLBTS decides to propose new challenge goals, the recommendation to BEC will include a reduction percentage, reduction timeline, and baseline for the proposed new challenge goals.

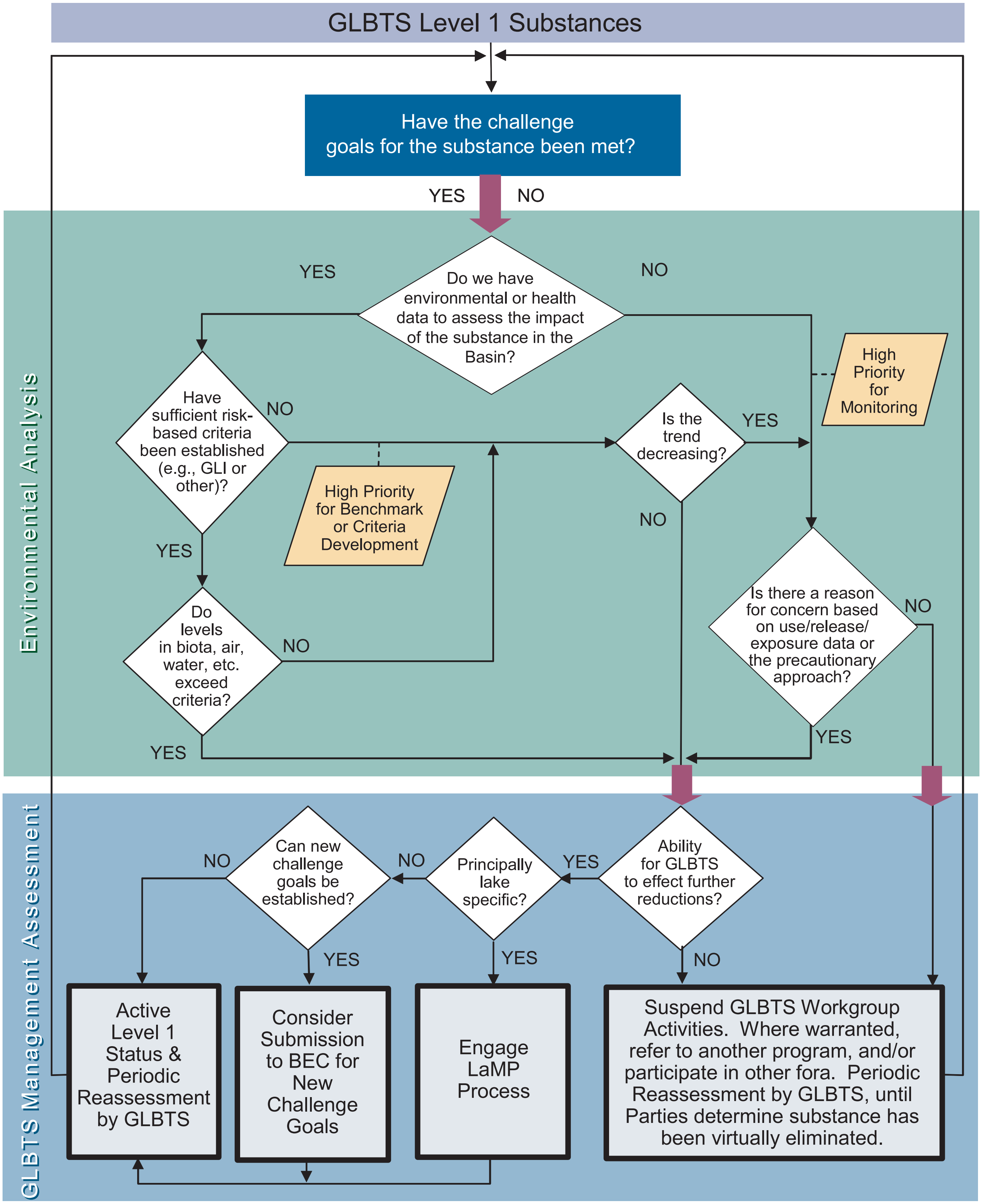
Engage LaMP Process

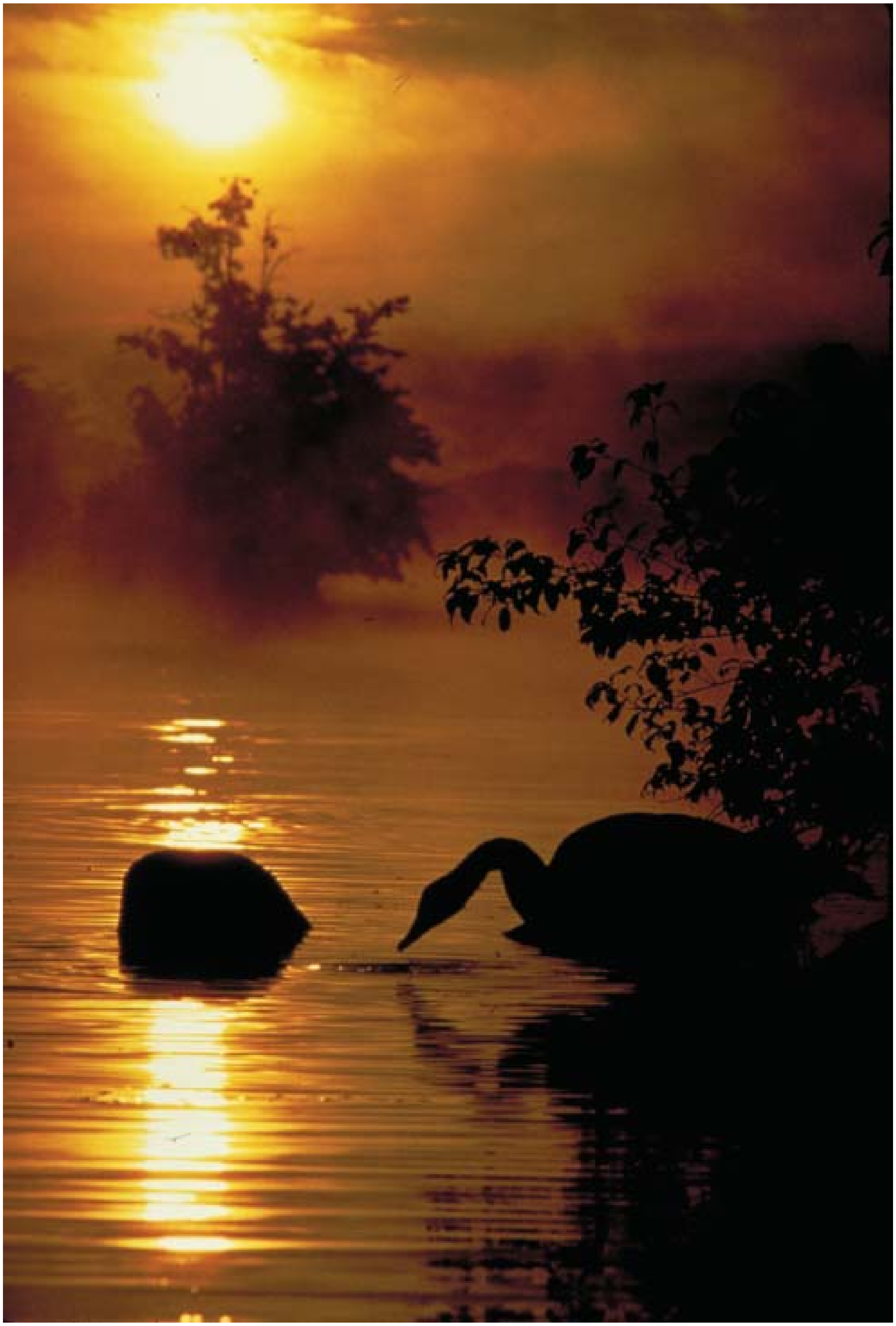
For substances whose impact is lake-specific, the appropriate LaMP will be engaged to coordinate substance reduction activities with continued support from the GLBTS, recognizing the limited direct implementation capacity of the LaMPs. It is understood that much of the actual implementation would be carried out by the agencies with responsibility to address these substances. A joint review of progress would be undertaken periodically.

Suspend GLBTS Workgroup Activities. Where warranted, refer to another program, and/or participate in other fora. Periodic Reassessment by GLBTS, until Parties determine substance has been virtually eliminated.

In the event that the GLBTS is not able to effect further reductions, or there is no evidence of Basin effects, GLBTS workgroup activities will be suspended. Where warranted, a recommendation will be made to a) refer reduction efforts for the substance to another program, and/or b) represent GLBTS interests in other fora (e.g., Commission for Environmental Cooperation, United Nations Environment Programme). There will be no ongoing workgroup involvement with these substances, though each one will undergo periodic reassessment, approximately every two years, using the General Framework to Assess Management of GLBTS Level 1 Substances, until the Parties determine that virtual elimination has been reached.

General Framework to Assess Management of GLBTS Level 1 Substances





Kent Lake Kensington Metro Park,
Milford, Michigan
Photo by Thomas A. Schneider
courtesy of Michigan Travel Bureau

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