Preventing Pollution from Toxic Substances

GOAL

Reduce toxic contamination to protect public health and the Lake Champlain ecosystem.

Lake Champlain Committee

Storm drain stenciling helps inform Basin residents about properly disposing toxic materials.

Toxic substances are elements, chemicals, or chemical compounds that can poison plants and animals, including humans. Recent efforts to improve our understanding of toxic pollution in Lake Champlain suggest that while levels are low compared to more industrialized areas, such as the Great Lakes, there is still cause for concern. Certain toxic substances may come from natural sources. However, the increasing use and release of chemicals in our daily lives may threaten the high quality of our Lake environment.

Health advisories have been issued in both New York and Vermont regarding the consumption of fish species with elevated levels of mercury and polychlorinated biphenyls (PCBs). An extensive survey of lake-bottom sediments has revealed elevated levels of mercury in many parts of the Lake and several other toxic substances in specific locations. The presence of toxic substances raises concern about their impacts on the Lake ecosystem, as well as on drinking water and the Lake's other uses.

Issues

Focusing Efforts on Sites of Concern and Substances of Concern

Contaminants that are released and transported to the lake can accumulate in lake-bottom sediments. The levels of contaminants in these sediments at different depths provide a picture of the history of pollution at particular site. Initial research and sampling of lake sediments has demonstrated that sediments at three sites in Lake Champlain—Cumberland Bay, Inner Burlington Harbor, and Outer Malletts Bay—had elevated levels of some toxic contaminants. Toxic reduction and prevention actions have been targeted to these areas, including completion of a $35 million cleanup of sediments in Cumberland Bay and a follow-up ecological study in Burlington Harbor (Figure 4, page 26).

The LCBP has reviewed the substances found to date in Lake Champlain and has ranked them based on the extent and levels at which they are found and the risk that they may pose to human health and the ecosystem.

Groups 1 and 2 include toxic substances of concern (See Table 2) that merit highest priority for management action because they are found in Lake Champlain sediment, water, or biota at levels above appropriate standards or guidelines, indicating potential risks to human health or the ecosystem. The rankings must be periodically evaluated in light of new data.

Identifying Sources and Quantifying Loads of Toxic Substances

Although researchers have begun to identify sources of toxic substances within the Basin, they have identified few active sources. Major questions remain concerning the sources, routes of transport, and delivery of toxic substances within and outside the Basin. Current information suggests that regulated point source wastewater discharges are not the primary sources of PCBs and mercury—PCBs have been banned from discharges and mercury limited to very low levels. Remaining questions include: 1) how much of these substances comes from outside the Basin, and 2) what role do historical sources and contaminated sediments play. These information gaps on sources and transport of toxic substances pose significant questions with respect to future management options. Recent monitoring suggests that urban stormwater and atmospheric sources may be more significant than previously thought. Additional investigation should focus on further characterizing and quantifying these sources. Post-cleanup monitoring planned for Cumberland Bay should provide critical information on the role of this formerly contaminated site as a source of PCBs to the rest of the Lake.

Priority	Toxic Substances	Criteria for Selection
Group 1	PCBs, mercury[1]	Persistent contaminants found Lake-wide (in either sediment, water, or fish) at levels above standards, indicating potential risk to human health, wildlife, or aquatic biota. These are highest priority for management action.
Group 2	Arsenic, cadmium, chromium, dioxins/furans, lead, nickel, PAHs, silver, zinc, copper, persistent chlorinated pesticides[2]	Persistent contaminants found in localized areas (in either sediment, water, or fish) at levels above standards or guidelines, indicating potential risk to human health, wildlife, or aquatic biota. These are next highest priority for management action.
Group 3	Ammonia, phthalates, chlorinated phenols, chlorine, atrazine, alachlor, and pharmaceuticals	Contaminants found above background levels in localized areas of the Lake, but below appropriate standards or guidelines.
Group 4	VOCs, such as benzene, acetone, pesticides, strong acids and bases, and other potential pollutants, such as fluoride	Contaminants known to be used or known to occur in the Lake Champlain Basin environment.

1 *Based on US FDA standards*
2 *Based on a variety of guidelines (NOAA, Ontario, USEPA) regarding toxics in sediments*

Table 2. Toxic substances of concern found in the Lake's biota, sediment, and water.

Limitations of Current Information on Fate and Effects of Toxic Substances

Even if all sources of toxic substances were eliminated tomorrow, it would take a very long time to rid the ecosystem of these pollutants. Toxic substances accumulate in lake-bottom sediments, where they remain for long periods if undisturbed. They may be resuspended, consumed, or absorbed directly into organisms and enter the food web. Since scientists do not know much about these interactions, additional research is needed.

Questions also remain about human and ecosystem health effects from toxic substances in the Basin environment. While some toxicity to aquatic animals has been observed in areas with elevated contaminant levels, the ecosystem effects of persistent, low-level exposure to toxic substances are not well understood. These unknowns, including the risk to humans from eating contaminated fish, complicate decisions regarding the appropriate public policy response. Public awareness and understanding of fish consumption advisories must be improved, along with coordination of state and federal fish tissue monitoring programs. The impacts of toxic substances on sites of concern and on the Lake's ecosystem also need to be evaluated. Important information can be gained from other ecosystems, including the Great Lakes and the Chesapeake Bay, that have benefited from long-term monitoring and research.

Setting Appropriate Goals and Standards

Despite the success of current programs to reduce toxic substances in the environment, some problems, such as PCBs and mercury in fish, continue to defy easy solutions. These and other contaminants that are persistent and tend to bioaccumulate challenge the existing regulatory structure because: 1) existing programs were designed to deal primarily with fewer contaminants; 2) certain sources of these contaminants are unregulated; and 3) significant quantities of these substances have built up in the environment (in sediment, biota, etc.) and continue to cycle through the ecosystem.

Managers charged with solving pollution problems in the Great Lakes and Chesapeake Bay regions have adopted a general, long-term goal to "virtually eliminate" sources of certain high priority toxic substances with the participation and support of business and industry. Confronting the challenges posed by persistent and bioaccumulating contaminants in the Lake Champlain Basin requires establishing firm and defensible toxic reduction goals, identifying priorities to minimize or prevent contamination, and implementing actions capable of attaining these goals.

Adopting a Strategy to Prevent Pollution Rather than Manage It

Faced with the increasing costs and liabilities associated with end-of-pipe waste management practices, agencies and waste generators are turning to pollution prevention as a cleaner, safer, and more cost-effective strategy. Pollution prevention means altering methods and processes so a pollutant is never generated, rather than treating or controlling the contamination after generation and disposal. It includes such techniques as reducing the use of toxic substances, substituting non-toxic raw materials, if available, and modifying manufacturing processes.

OBJECTIVES

(not listed in priority order)

1) Prevent pollution from toxic substances in the Lake Champlain Basin.

2) Focus management efforts on reducing those toxic substances (such as PCBs and mercury) found at or above levels known to exceed human health standards or adversely affect aquatic life.

3) Identify and target sites of concern for toxic contamination, and make these areas or watersheds high priorities for management activities.

4) Reduce all types of toxic substances from point sources.

5) Reduce nonpoint sources of toxic substances to the Lake.

6) Meet all existing human health standards for drinking water and guidelines for fish consumption.

7) Protect living resources from the effects of toxic substances by meeting all existing standards for aquatic life.

8) Improve public understanding of the impacts of toxic substances in Lake Champlain and the research and management programs related to toxics substances.

Figure 4. Sites of concern and cleanup actions as of 2001.

Highest Priority Action

1) Develop and Implement a Comprehensive Toxic Substance Management Strategy Emphasizing Pollution Prevention while Continuing to Mitigate Pollution Problems throughout the Lake

This action represents the commitment of the Steering Committee to 1) restoring areas where pollution is a problem, and 2) preventing future problems by reducing the use of toxic substances at their source. This Comprehensive Strategy will be developed through a stakeholder process facilitated by the LCBP and will include many of the specific actions and initiatives listed in this section. The comprehensive strategy will address:

a) An iterative process for revising the list of Toxic Substances of Concern based on new data (using risk-based criteria).

b) An aggressive pollution prevention strategy that works to implement common-sense, "low cost/low tech" pollution prevention measures immediately.

c) Incentive programs for business and citizen participation in pollution prevention.

d) A focus on mercury, PCB's and other toxic substances of Basin-wide significance.

e) A continued program of research to examine the impacts of new generation pesticides, endocrine disrupting chemicals, pharmaceuticals, and other chemicals in widespread use.

f) Coordination of ongoing pollution prevention programs.

g) Continued coordination of spill response activities between jurisdictions in the Basin, such as emergency response trials and training.

h) Coordination with regional programs to reduce atmospheric sources of contaminants, including mercury and acid rain.

Potential key LCBP partners: Partnership of federal, state, and local agencies, QC MENV, research institutions, LCRC, private and nonprofit entities
Cost estimate: $90,000 per year for coordinator, with in-kind participation of agency and research representatives
Potential funding source: Federal appropriations
Timeframe: Ongoing
Benchmark: Adoption of toxic substances reduction strategy by key partners

High Priority Action

2) Continue Monitoring and Restoration Efforts in Sites of Concern

For sites of concern identified by ongoing research and monitoring (Inner Burlington Harbor, Outer Malletts Bay, Cumberland Bay,* and other sites as appropriate), characterize the extent of contamination, evaluate alternative remedial actions, and make recommenda-

tions to the states of New York and Vermont and the USEPA based upon findings.

Recommendations should:

a) Identify sites based on new research or monitoring data.

b) Characterize the extent and severity of contamination and effects.

c) Consider restoration alternatives that may be applicable to each site, including no action, source identification, pollution prevention, remediation, dredging, containment, in situ treatment and other alternatives.

d) Recommend the best management alternative to local governments, states, USEPA, and US Army Corps of Engineers (USACOE).

* The remediation project in Cumberland Bay is complete. See the Accomplishments sidebar in this section for more information.

Potential key LCBP partners: For a-b) LCRC with NYSDEC and VTDEC, USEPA, USFWS, and other federal agencies; for c-d) a partnership of interested parties
Cost estimate: For a-b) $200,000 or more per site; for c-d) cost of supporting coordinating committee and studies.
Potential funding sources: USEPA, VTANR, NYSDEC, and federal appropriations
Timeframe: 3-5 years per site, with ongoing process for site identification
Benchmark: Report documenting above elements a-d

Priority Actions

(not listed in priority order)

3) Facilitate the Redevelopment of Contaminated Sites (Brownfields) in the Lake Champlain Basin

Former industrial sites that are either contaminated or suspected of being so are often not redeveloped because of liability or other concerns. Many of these sites are located in areas of importance to local communities, such as town centers, and their redevelopment could turn an eyesore into a community asset. Towns, local organizations, and businesses should be encouraged and offered assistance in seeking federal programs to assist with the cleanup and redevelopment of brownfields.

Potential key LCBP partners: NYSDEC, VTDEC, USEPA, interested local parties
Cost estimate: $60,000 per year and $500,000 per year for site assessments
Potential funding sources: USEPA
Timeframe: Ongoing
Benchmark: Successful redevelopment of sites

4) Further Characterize and Manage Toxic Substances In Urban Stormwater

Urban stormwater is a significant source of metals, combustion product contaminants, oil and grease, pesticides, and other toxic substances. Following on previous LCBP studies, the occurrence of these contaminants in urban stormwater should be better documented and their loads to the Lake estimated where appropriate. Sources of specific contaminants

Accomplishments

Cleaning Cumberland Bay

High levels of polychlorinated biphenyls (PCBs) were discovered near Wilcox Dock in Cumberland Bay, NY, during LCBP sponsored monitoring. In 2000, NYSDEC completed a three-year, $35 million restoration project that removed contaminated sediment and restored affected shoreline and wetland areas. A temporary sediment dewatering and wastewater treatment facility was constructed onsite during hydraulic dredging operations, which removed more than 140,000 tons of PCB-contaminated sludge from the bottom of the bay. Also, 37,000 cubic yards of contaminated soil, 34,700 tons of PCB hazardous waste, and 80,200 tons of non-hazardous waste were disposed offsite. Follow-up monitoring will characterize the continued site influence on water quality lake-wide.

Assessing Burlington Harbor

LCBP monitoring found potentially harmful levels of contaminants in Burlington Harbor. A follow-up study, completed in 1999, measured sediment contaminant levels and tested whether or not the contaminants are harmful to aquatic animals. Study results indicate that long-term exposure to toxic substances in sediments may be affecting aquatic organisms living there, especially in the south-

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ACCOMPLISHMENTS

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ern harbor. The chemicals of concern are primarily hydrocarbons and metals, whose sources may include historic activities, stormwater runoff, and sewage treatment plant discharges. Cleaner, more recent sediments may be covering older, more contaminated sediments.

REMEDIATING TOXIC SITES

Plattsburgh Air Force Base, the Air National Guard site in Colchester, and the Pine Street Barge Canal have toxic remediation efforts underway. The Air Force Base and/or the Plattsburgh Airbase Redevelopment Corporation (PARC), for example, have removed 139 underground fuel tanks, installed a new 60,000-gallon fuel system, and developed an environmental management system that PARC and its tenants must follow.

IMPLEMENTING POLLUTION PREVENTION

- The nonprofit organization Lake Champlain Committee (LCC), completed several LCBP-funded projects in New York and Vermont to reduce the amount of toxic substances reaching Lake Champlain. Events included toxic reduction demonstration projects, community stream cleanups, and stormdrain stenciling programs.

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found at high levels should be identified. For example, sources of PCBs in tributaries to Cumberland Bay and sources of pesticides and metals in tributaries to Burlington Harbor need to be identified.

Potential key LCBP partners: NYSDEC, VTDEC, USEPA, LCRC
Cost estimate: $200,000 per year
Potential funding source: USEPA
Timeframe: Ongoing
Benchmark: Completion of characterization and source identification

5) Support and Continue Programs to Encourage Homeowners, Industries, Businesses, and Public Institutions to Implement Pollution Prevention and Recycling Measures

Pollution prevention or source reduction measures include:

a) Switching to nontoxic or less toxic products and raw materials.

b) Promoting the development and implementation of pollution prevention plans and activities for direct and indirect dischargers of toxic substances of concern.

c) Conducting public education programs on source reduction, use of nontoxic alternatives, and recycling measures for residential properties, municipalities, and businesses, such as golf courses, marinas, homeowners, universities, and schools.

d) To reduce water and air pollution from inefficient 2-cycle motors, promote the general use of 4-cycle motors and fuel injected 2-cycle motors for boats and personal watercraft. All motors should comply with new federal regulations on or before the 2006 deadline.

Recycling measures include:

a) Recycling mercury from light switches and fluorescent light bulbs.

b) Initiating periodic collection programs for mercury and PCB-bearing substances.

Potential key LCBP partners: NYSDEC and VTDEC (including Pollution Prevention and Solid/Hazardous Waste Management Divisions), QC MENV, municipalities, industries, nonprofit entities, USEPA
Cost estimate: $50,000 to $100,000
Potential funding sources: State, provincial, and federal appropriations.
Timeframe: Ongoing
Benchmark: Commitment from municipalities, businesses, and industries to prevent pollution

6) Continue Research and Monitoring of the Distribution, Fate, and Effects of Mercury, PCBs, and Other Toxic Substances

Major information gaps exist regarding the fate and effects of toxic substances in the Lake Champlain ecosystem. Initial results of research indicate that toxic substances, such as PCBs in lake-bottom sediments, can enter the food web. However, researchers do not fully understand the impacts of toxic substances on the Lake Champlain ecosystem. Specific studies include:

a) The assessment of mercury cycling in the basin. USGS and its partners are conducting the initial phase of this assessment. Funding should be continued and additional funding should be sought to support a comprehensive assessment.

b) Additional monitoring of current-use chemicals. A number of pesticides and other chemicals are in widespread use in the Basin, although their fate and effects in the environment are not monitored or studied regularly.

Other key research should include:

a) Assessment of the effects of chronic and low-level exposure on key food web components, particularly during vulnerable life stages.

b) Determination of how toxic substances, such as PCBs and mercury, cycle through the Lake and investigation of their potential effects on aquatic life, human health, and the Lake's ecosystem.

c) Coordinated, cooperative data exchange and analysis.

d) Continuation of sediment surveying and biological monitoring programs.

e) Continuation of atmospheric monitoring program for mercury.

f) Identification of and response to emerging issues.

NYSDEC

The Cumberland Bay cleanup, led by the NYSDEC, removed 140,000 tons of PCB-contaminated sludge from the Bay.

ACCOMPLISHMENTS

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- The Northwest Vermont Solid Waste Management District teamed up with the VT Department of Agriculture, Food, and Markets and others to collect 80 mercury-containing manometers used by dairy farmers to monitor pressure in their milking systems. The manometers were replaced with non-mercury alternatives at no charge to the participating farmers. More than 40 pounds of mercury were collected.

- The National Wildlife Federation's Northeast Natural Resource Office has worked to inform Basin towns about effective stormwater management. They have produced workshops for nearly a dozen towns explaining stormwater issues, providing resources, and examining town policies. The NWF also held a workshop for town officials and planners focusing on "smart growth" strategies for protecting water quality.

- The Town of North Elba and the Village of Lake Placid, NY, along with the Mirror Lake Watershed Association and NYSDEC, are inventorying stormwater facilities for Mirror Lake. Volunteers are collecting information about stormwater discharge points. An engineering consultant will then develop recommendations for actions, such as cleaning, repairing, or replacing existing structures.

Potential key LCBP partners: Research institutions and the LCRC, in coordination with NYSDEC and VTDEC, USGS
Cost estimate: $250,000 per year (minimum)
Potential funding sources: Federal and state appropriations
Timeframe: Ongoing
Benchmark: Completion of research elements a-b) and publication of results

Other Actions for Consideration

(not listed in priority order)

7) Establish or Enhance Agricultural and Household Hazardous Waste Collection Programs

This action recommends that municipalities within the Basin collect and dispose of household hazardous waste properly and regularly. The action also recommends more effective disposal options for agricultural, lawn, and garden pesticides, herbicides, and metals.

Potential key LCBP partners: NYSDEC and VTDEC, VTDAFM, NYDAM, USEPA, QC MENV, municipalities, solid waste districts, nonprofit entities
Cost estimate: $50,000 for seed money to New York communities, and $50,000 for disposal costs in Vermont; $50,000 for technical assistance, including staff support; in-kind participation of local, state, and federal agencies
Potential funding sources: USEPA, federal, and state appropriations
Timeframe: Ongoing
Benchmark: Establishment of several community-based collection programs

8) Continue to Review Discharge Data for Sources of Toxic Substances of Concern, Including Wastewater Treatment Plant Discharges

This action would include the following elements:

a) Screen all existing data for known or suspected sources of these substances.

b) Encourage enforcement of all existing programs.

c) Evaluate the Toxic Substances Release Inventory data for the Lake Champlain Basin for additional sources.

Potential key LCBP partners: NYSDEC and VTDEC, USEPA, Province of Québec
Cost estimate: In-kind participation of state and federal agencies
Potential funding sources: NYSDEC and VTDEC, USEPA
Timeframe: Ongoing
Benchmark: Completion of report detailing the identification and remediation/control of sources of toxic substances of concern