

Appendix A

Lake Huron Critical Pollutants - Uses and Problem Areas

PCBs (POLYCHLORINATED BIPHENYLS)

PCBs were widely used in electrical equipment such as transformers and capacitors; some equipment was filled with PCBs, while other equipment was contaminated with PCBs during testing and maintenance. PCBs are carcinogens and probable endocrine disrupters. Human poisoning has occurred. Some 1.4 billion pounds of PCBs were manufactured in the U.S. before such manufacture was banned in 1978; Canada imported 0.9 billion pounds before this manufacturing ban took effect. PCBs in Lake Huron fish have caused fish consumption advisories; PCBs have also been detected in Lake Huron water, sediment and wildlife. Also, dredging activities are impaired on the Ontario shoreline of the St. Clair River due to PCBs.

CHLORDANE

Chlordane was used to control pests on crops (corn, grapes, strawberries, etc.), and to control fleas, ticks and mange on pets. It is a probable human carcinogen. The U.S. banned most uses in 1978 and all uses except termite control in 1987. Canada discontinued use in 1990. Chlordane has been detected in Lake Huron water, fish and wildlife.

2,3,7,8-TCDD (TETRACHLORODIBENZO-P-DIOXIN)

There is no known use of dioxins; it is a by-product of processes involving chlorine, organic chemicals and heat, including incineration, pulp and paper bleaching with elemental chlorine, and chemical manufacturing. Dioxins are extremely toxic. It is a carcinogen and may be an important endocrine disrupter. Concentrations from pulp and paper bleaching are dropping as mills switch to alternative technologies. Other processes, including incineration of medical and solid waste, continue to produce significant amounts. Dioxins have been detected in Lake Huron fish and wildlife.

MERCURY (Hg)

Mercury is widely used in batteries (use in alkaline batteries has been banned in most batteries, limited in others), electrical equipment (switches), medical equipment, thermometers, thermostats and preservatives -- even in the silver amalgam dentists use for fillings. Many former uses (i.e., as a fungicide, pesticide and in latex paint) have been discontinued, but mercury is still needed in some products and processes. Its largest U.S. use today is at chlor alkali plants that produce chlorine gas and caustic soda. Small concentrations of mercury that exist in natural materials such as coal, wood and metal ore are released when these materials are processed; because such huge quantities of these materials are processed, much mercury is released. Mercury is also released when garbage is burned, and it vaporizes from landfills. It is not known to be a carcinogen, but is toxic to the fetuses of humans and animals. Human poisoning has occurred. U.S. use dropped from 2,649 tons in 1980 to 690 tons in 1993. The last registered use of mercury as a pesticide in the U.S. was voluntarily cancelled by the manufacturer in 1994. Mercury in Lake Huron fish has caused fish consumption advisories and has been detected in Lake Huron water, sediment and wildlife. Also, dredging activities are impaired on the Ontario shoreline of the St. Clair River and Severn Sound.

TOXAPHENE

Toxaphene, also known as camphechlor, was one of the most heavily used insecticides in the United States. The primary application of toxaphene was for insect pest control on cotton, although it was also used on other agricultural crops, livestock, and in the northern United States and Canada to kill unwanted fish in lakes. All uses are currently canceled in the United States. Despite the fact that toxaphene is no longer used, measurable amounts of toxaphene are still found in the air, water, sediment and soil. Long-range atmospheric transport from the southern United States has been identified as the major pathway of toxaphene input to the Great Lakes. Fish tissue concentrations exceed the Ontario sport fish consumption guidelines in Lake Huron, Georgian Bay, and North Channel and St. Marys River.

DDT (DICHLORO-DIPHENYL-TRICHLORO-ETHANE)

This pesticide was used in large quantities in the 1950s and 1960s on cotton fields, orchards and other crops, and in unsuccessful extermination campaigns against the Japanese beetle, spruce budworm, gypsy moth and Dutch elm disease bark beetle. DDT was also an ingredient in the pesticide Kelthane (Dicofol). DDT breaks down into toxic metabolites, primarily DDE. DDT and DDE are probable human carcinogens and endocrine disrupters. The United States banned DDT (except for public health emergencies) in 1973, and banned Kelthane (unless it contained less than 0.1% DDT) in 1988. Canada discontinued DDT in 1985. DDT is still used in other countries, mostly for insect control. A major source of DDT in the Lake Huron watershed in the Pine River near St. Louis, Michigan at a now closed chemical processing plant. Remediation of contaminated sediment was initiated at the site in the spring of 1999. Also, some DDT has been stockpiled in the Lake Huron Basin, as it still shows up when agricultural pesticides are collected. DDT has been detected in Lake Huron water, fish and wildlife.

PBB

Polybrominated biphenyl (PBB), a flame-retardant material, was introduced into the food chain in Michigan in 1973 due to a manufacturing and distribution mistake. A major source of PBB in the Lake Huron watershed in the Pine River near St. Louis, Michigan at a now closed chemical processing plant.

Appendix A (continued)

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LEAD, NICKEL, COPPER, ZINC, CADMIUM

Lead, nickel, copper zinc and cadmium are heavy metals common hazardous waste and can damage organisms at low concentrations and tends to accumulate in the food chain. These heavy metals are found in sediment in Lake Huron and are associated with degradation of benthos, and planktonic communities and result in restrictions on dredging in navigation harbors. In most cases, existing concentrations are due to historical discharges. Also, dredging activities are impaired on the Ontario shoreline of the St. Clair River and at Severn Sound.

NUTRIENTS

Nutrients such as phosphorus and nitrogen, in excessive quantities can cause eutrophication problems. Sources of nutrients include municipal wastewater treatment plants, some industrial discharges, runoff from agricultural and urban area, and the atmosphere.

PATHOGENS

Pathogens refer to bacterial organisms typically found in the intestinal tracts of mammals, capable of producing disease. Sources of pathogens include municipal wastewater treatment plants, septic systems, and agricultural runoff. Areas of Lake Huron where pathogens are of concern are Saginaw Bay, Severn Sound and the eastern shore of the Lake Huron Basin.

SEDIMENT/SUSPENDED SOLIDS

Sediment is solid material, either suspended or settled and both mineral and organic, that has been deposited within a water channel or impoundment. Sediment is a pollutant originating primarily from nonpoint sources such as agricultural runoff, urban runoff or from stream banks. Sediment usually occurs due to human-induced changes to the landscape. Sediment causes harm through a number of actions including carrying pollutants downstream and, covering fish spawning and aquatic invertebrate habitat. Excessive Sediment is a problem in many Lake Huron streams in that it impedes fishery restoration by degrade spawning habitat and lower or change food web productivity, both in Lake Huron (especially Saginaw Bay) and in the tributaries.

TRITIUM

Tritium is a by-product of light-water and heavy-water nuclear reactor operation. In their coolants, these reactors produce about 500 to 1,000 and 2×10^4 Ci/yr, respectively, for every 1,000 MW(e) of power. Tritium is a fission product within nuclear fuel, generated at a rate of $1-2 \times 10^4$ Ci per year/1000 MW(e). Also, tritium occurs naturally in the environment. Reactions between cosmic radiation and gases in the upper atmosphere produce most of the world's natural tritium.
