

Mercury

Mercury is an element that persists in the environment and never breaks down. Mercury cycles from land to air to water, and can travel for years in the upper atmosphere. Although mercury occurs naturally, human activities and uses have caused a dramatic increase in mercury in the atmosphere and environment. Each year, Lake Michigan receives a total of approximately 1,375 kg (3,031 lbs) of mercury, of which approximately 86% enters the lake through direct atmospheric deposition¹.

Mercury is a potent neurotoxin in humans and wildlife². Methylmercury is a common and highly biologically available form of mercury, which quickly enters and accumulates in the aquatic food chain. Ninety to 100% of the mercury in fish is methylmercury. Concentrations of methylmercury in top predator fish are seven million times higher than dissolved methylmercury concentrations in the surrounding water, and 10 to 100 thousand times higher than total mercury concentrations in the water³.

The most common human exposure to mercury is through consuming contaminated fish. Mercury can pass through the bloodstream and breast milk of pregnant or nursing women, impacting fetal or infant development⁴. Mercury levels in one out of ten women of child-bearing age are within or above one tenth of hazardous levels, indicating a narrow margin of safety⁵. In January 2001 the Food and Drug Administration released an advisory due to dangerous mercury levels in four supermarket varieties of ocean dwelling fish: swordfish, shark, king mackerel, and tilefish⁶. In the Great Lakes region, each of the Great Lakes and thousands of additional waterbodies have fish consumption advisories for mercury. Many of these lakes and rivers are isolated from human influences, suggesting the significance of air deposition.

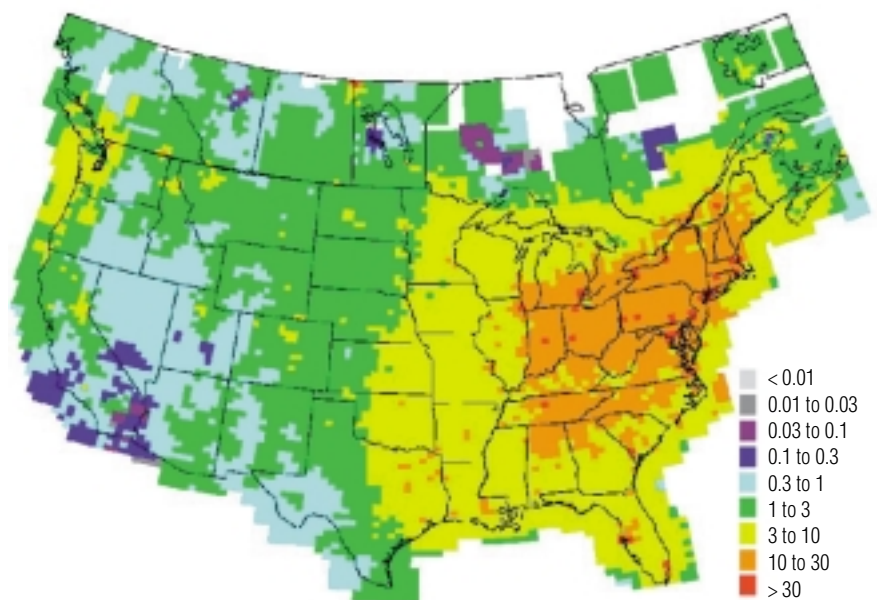
The map below⁷ demonstrates elevated levels of mercury in precipitation found in Lake Michigan and the Great Lakes region. Mercury levels measured from a downtown Chicago sampling site were an average of



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Wet Deposition – Total Hg from USA, Canada and Background

Micrograms per square meter



Mercury continued

Chicago Incinerator – Lake Michigan Federation

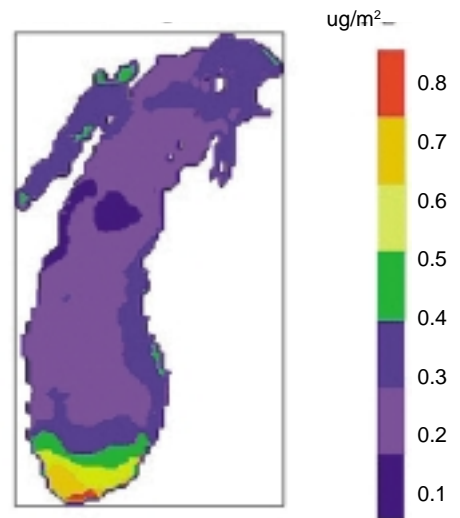


16 times higher than EPA surface water standards set for protection of wildlife⁸. According to the Lake Michigan Mass Balance Study, 30% of direct atmospheric deposition to Lake Michigan originates in the Chicago region⁹. The map at right¹ demonstrates a visible plume from the lake's southern tip of reactive gaseous mercury, the type of mercury that is most likely to be deposited locally.

As the loadings chart below shows, a total of 1,189 kg (2,622 lbs) of mercury is deposited annually directly from the atmosphere to the lake. Another 186 kg (410 lb) enters the lake through tributaries, much of that also due to atmospheric deposition¹.

According to 1995 National Toxics Inventory data, coal and other fossil fuel burning accounts for over half of mercury incineration and waste incineration accounts for close to 40%¹⁰. Hazardous, medical, and municipal waste incineration are subject to current or

Reactive Gaseous Mercury Deposition



upcoming emissions control requirements. EPA recently issued a decision, finding it necessary to regulate mercury emissions from coal- and oil-fired electric utilities, the largest human-generated source of mercury emissions. Proposed regulations are due in 2003¹¹.

Annual Loadings to Lake Michigan

Reactive gaseous mercury	500 kg	1,116 lb
Mercury in precipitation	614 kg	1,354 lb
Mercury associated with particles	69 kg	152 lb
Mercury in tributaries	186 kg	410 lb

(Landis 1998, EPA 2000b)

¹ EPA. 2000. *Lake Michigan Mass Balance Results*.

² ATSDR. 1999. *ToxFAQs Mercury*. U.S. Department of Health and Human Services, Public Health Service.

³ EPA. 1999. *Mercury Update: Impact on Fish Advisories*. Office of Water. EPA-823-F-99-016.

⁴ National Academy of Sciences. 2000. *Toxicological Effects of Methylmercury*. National Academy Press. Washington D.C.

⁵ Centers for Disease Control and Prevention. 2001. *National Report on Human Exposure to Environmental Chemicals*. March.

⁶ FDA. 2001. *FDA Announces Advisory on Methyl Mercury in Fish*. T01-04. January 12.

⁷ Bullock, O.R. 2000. *Modeling Assessment of Transport and Deposition Patterns of Anthropogenic Mercury Air Emissions in the United States and Canada*. Science of the Total Environment. Volume 259.

⁸ Landis, M.S. 1998. *Assessing the Atmospheric Deposition of Mercury o Lake Michigan: The Importance of the Chicago/Gary Urban Area on Wet and Dry Deposition*. PhD Thesis. University of Michigan. Ann Arbor, Michigan.

⁹ LaMP. 2000. *Lake Michigan Lakewide Management Plan (LaMP 2000)*.

¹⁰ BTS. 1999. *Mercury Report: Sources and Regulations*. Binational Toxics Strategy. (Draft). November.

¹¹ EPA. 2000. *EPA to regulate mercury and other air toxic emissions rom coal- and oil-fired power plants*. Fact sheet. December 14.