



Sources of mercury pollution and the methylmercury contamination of fish in Minnesota

Reducing mercury contamination of the fish in Minnesota's lakes and streams is a high priority for the Minnesota Pollution Control Agency (MPCA). Because this mercury poses a health threat, the Minnesota Department of Health (MDH) advises people to restrict their consumption of fish that have higher mercury concentrations (see www.health.state.mn.us/divs/eh/fish/index.html).

Where does the mercury come from?

Almost all of the mercury that contaminates Minnesota's lakes and rivers is delivered by the atmosphere. Mercury can be carried great distances on wind currents before it is brought down to earth in rain and snow. As a result, about 90% of the mercury deposited on Minnesota comes from other states and countries. Similarly, the vast majority of Minnesota's mercury emissions are carried by wind to other states and countries. These facts are critical to developing solutions to the mercury problem, and make it impossible for Minnesota to solve this problem by acting alone.

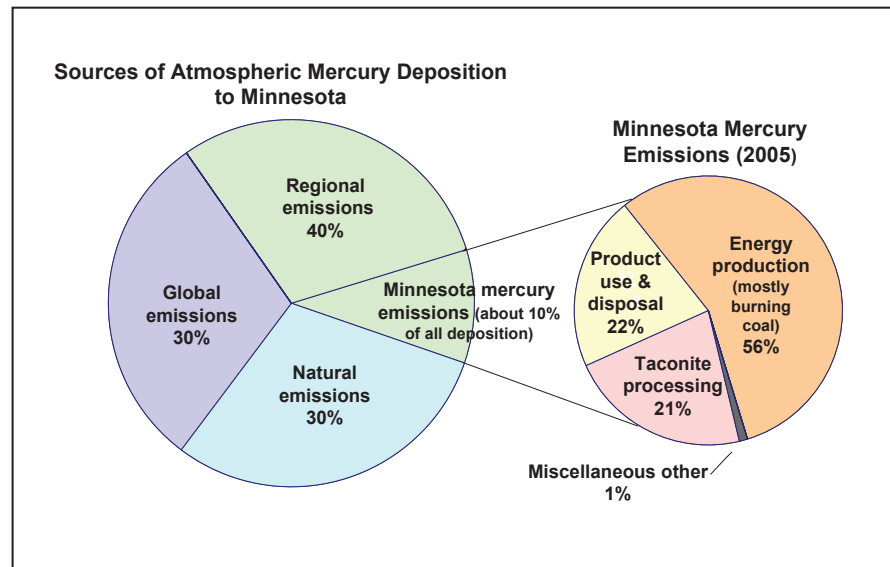
Most of the mercury in the atmosphere is a consequence of human activities, including burning coal to produce electricity, processing taconite, and using mercury in products, such as fluorescent lights, dental fillings, and some types of thermostats and switches. Mercury is used also in older manufacturing processes. And about a third of the mercury in the atmosphere comes from naturally occurring sources, such as minerals in rocks and volcanoes.

How mercury comes to contaminate fish

The mercury that contaminates lakes, streams and wetlands only accumulates in fish after it has been converted to the chemical compound methylmercury; other forms of mercury do not magnify in concentration up the food chain. Methylmercury is created by bacteria in highly organic portions of aquatic systems, such as the sediment of lakes and wetlands. Zooplankton pick up the methylmercury as they filter the water and feed on algae. When small fish eat zooplankton, the methylmercury builds up in their bodies as the fish grow bigger and older. Small fish are eaten by larger fish, and the concentration of methylmercury

increases at each step in the aquatic food chain. It is highest in large walleye, northern pike, and other predatory fish.

It's the methylmercury in these fish that poses the greatest threat to human health. Fetuses, nursing infants, children under age 15, and people who rely on fish for much of their diet are most at risk from methylmercury, which can hamper normal development of the central nervous system. In adults,



exposure to methylmercury can result in damage to the nervous system and organs. The MDH provides advice that encourages people to choose fish to eat that have concentrations of mercury below a level that could cause adverse health effects (see www.health.state.mn.us/divs/eh/fish).

Minnesota's plan for reducing mercury in surface waters and fish

A water body is considered "impaired" when more than 10% of a fish species in a lake or river have a mercury concentration in fillets that exceeds 0.2 parts per million. If the mercury level is below 0.57 ppm, the impaired waters are included under the Statewide Mercury Total Maximum Daily Load, or TMDL (see www.pca.state.mn.us/water/tmdl/tmdl-mercuryplan.html). Lakes and rivers with mercury levels in fish above 0.57 ppm require additional reductions and another TMDL is required for them.

For larger predatory fish to be safer to eat, MPCA scientists say that significant reduction in mercury deposition in Minnesota is needed. They calculate that, to do our part, Minnesota sources of mercury should reduce emissions to 789 pounds per year, a 76% reduction from 2005 levels. Working with stakeholders, the MPCA has developed a plan to meet this goal by 2025 (see <http://www.pca.state.mn.us/index.php/topics/mercury/plan-to-reduce-mercury-releases-by-2025.html>).

A recent analysis of 25 years of data has found an unexpected rise in average mercury levels in northern pike and walleye from Minnesota lakes. After declining by 37% from 1982 to 1992, average mercury concentrations in Minnesota fish began to increase in the mid-1990s. In the 1996-2006 decade, average mercury concentrations increased 15%. This is surprising because mercury emissions to the atmosphere in Minnesota and the nation declined sharply during this period. MPCA scientists believe the most likely cause for the reversal is either increased mercury emissions by sources outside the United States or factors associated with global climate change or both, underscoring the need to address both of these problems.

What we do is only part of the solution

The problem of mercury contamination in Minnesota will not be solved until the United States and other countries greatly reduce mercury releases from all sources, including mining, product disposal, and coal-fired power plants. Minnesota is a national leader in reducing mercury emissions, and it and other states have urged the federal government to develop a solution to the mercury problem. Toward that end, the U.S. Environmental Protection Agency has adopted national standards for controlling mercury emissions from coal-fired power plants, which will help reduce mercury deposition. And Minnesota has joined other states in urging the federal government to work through the United Nations to negotiate a binding treaty to reduce mercury pollution worldwide.

In the meantime, the MPCA will work with Minnesota sources to continue to reduce their mercury releases to meet our 2025 goal and to demonstrate that reductions are feasible. Eventually, the level of mercury in Minnesota's water bodies should be low enough that the fish in them can be eaten once a week. But even when all these sources of mercury are eliminated, the third of the mercury that comes from natural sources will remain, and people will likely need to continue to monitor their fish consumption because of this mercury.

The MPCA worked with Minnesota schools to remove the mercury in them and to educate students and staff about the dangers to health that mercury poses. See the fact sheet at www.pca.state.mn.us/programs/mercury-free/index.html to learn more about the Mercury-Free Zone Program.

For information about how the departments of Health, Natural Resources, and Agriculture work with the MPCA to monitor levels of mercury and other contaminants in fish from Minnesota water bodies, see the fact sheet, *Minnesota's Fish Contaminant Monitoring Program*, at www.pca.state.mn.us/publications/p-p2s4-05.pdf.

For more information about how the MPCA is addressing mercury pollution, contact Rebecca Place (call 651-757-2807, email Rebecca.Place@pca.state.mn.us).