



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

Pollution prevention & sustainability 4-06 • February 2009

Reducing mercury contamination of Minnesota's surface waters and the fish in them is a high priority for the Minnesota Pollution Control Agency (MPCA).

Mercury contamination of fish in Minnesota is a well-documented problem. Because of this contamination, the Minnesota Department of Health (MDH) advises people to restrict their consumption of some fish from Minnesota lakes and rivers (see www.health.state.mn.us/divs/eh/fish/index.html).

Where does the mercury come from?

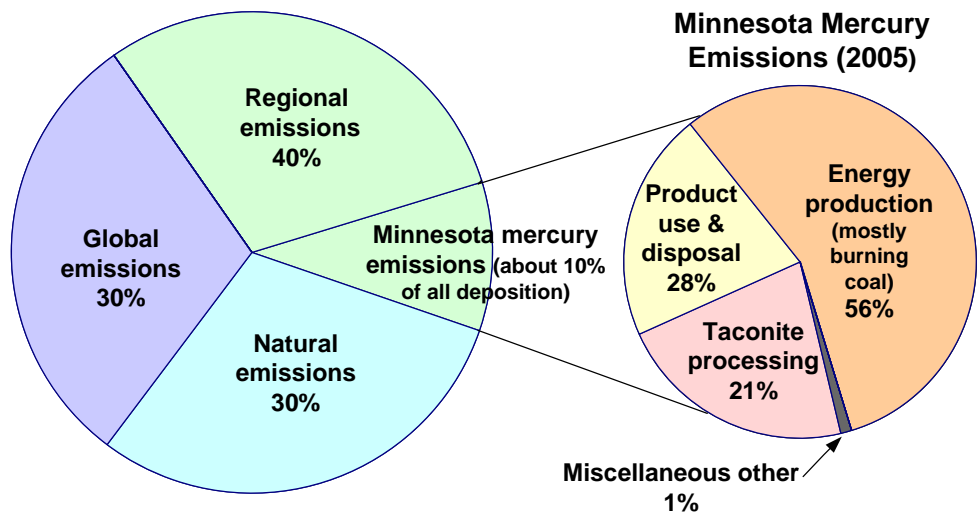
With some exceptions, almost all of the mercury that contaminates Minnesota's lakes, rivers, and fish comes from the air. Mercury can be carried great distances

on wind currents before it is deposited on our land and surface waters. As a result, about 90% of the mercury deposited from the air in Minnesota comes from other states and countries, and about 90% of Minnesota's mercury emissions are deposited on 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 environment originates from 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 manufacturing processes. And, about a third of the mercury in the environment comes from naturally occurring sources, such as minerals in rocks and volcanoes.

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Sources of Atmospheric Mercury Deposition to Minnesota



How mercury comes to contaminate fish

Aquatic bacteria convert some of the mercury that falls from the air onto our water bodies to methylmercury, a very potent neurotoxin. Zooplankton pick up the methylmercury as they filter the water, and when these microscopic animals are eaten by small fish, the methylmercury is incorporated in their flesh. These small fish are eaten by increasingly larger fish. The concentration of methylmercury increases at each step in the aquatic food chain, and 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 fish consumption advice that encourages people to eat fish while maintaining exposure to contaminants, including 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

When the MDH fish consumption advisory is more restrictive than one meal per week, a water body is considered "impaired." Mercury impairments account for two-thirds of the surface waters in Minnesota that did not meet the federal water-quality standards in 2006 (see www.pca.state.mn.us/water/tmdl/tmdl-mercuryplan.html).

For larger predatory fish to be safer to eat, MPCA scientists calculate 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.

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 these fish began to increase in the mid-1990s. During the last decade of the period, 1996-2006, average mercury concentrations increased 15%. This is surprising because emissions in Minnesota and the

nation declined sharply during this period. MPCA scientists believe that 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 coal-fired power plants, products, mining and manufacturing. The MPCA 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 United States is working 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 demonstrate that reductions are feasible. Eventually, the level of mercury in Minnesota's water bodies should be lowered 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 is working with schools in Minnesota to remove the mercury from them and to educate students and staff about the dangers to health that mercury poses. Visit the MPCA's Web site at www.pca.state.mn.us/programs/mercury-free/index.html to learn more about the Mercury-Free Zone Program.

For more 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 Ned Brooks (call 651-296-7242, e-mail ned.brooks@pca.state.mn.us).