

## **Mercury in North Carolina**

In several lakes and rivers in eastern North Carolina, small white signs labeled “WARNING” tell you to limit your consumption of certain species of fish to just a few meals per month, and tell pregnant women and children to avoid eating some fish at all. The concern here is mercury. And while there are no postings in western North Carolina to date, and the fish there are safe to eat, mercury is a problem even in the mountains.

Mercury, sometimes known as quicksilver, is a naturally occurring metal. It is released into the environment by volcanoes, forest fires, and other natural sources, as well as by human activities such as burning coal, smelting ore, and mining. Although mercury has always existed in our natural systems, evidence indicates that human activity over the past 150 years has increased atmospheric and surface water levels.

Once released into the atmosphere, elemental mercury vapor is capable of long-range transport through the upper atmosphere over thousands of miles. It can then be “washed” out of the air by precipitation “scrubbing,” or fall out in dry conditions through a process called dry deposition. This means that although a local mercury source may very well increase mercury levels in local rivers and lakes, the lack of a local source does not mean that mercury will be nonexistent in the water.

The North Carolina Division of Air Quality (DAQ) has been actively monitoring mercury levels in air and rainwater at two sites in eastern North Carolina since 1996: Pettigrew State Park in Washington County, and Waccamaw State Park in Columbus County. These sites were chosen for their proximity to lakes and rivers with methylmercury contaminated fish. It was hoped that data from these stations would help determine any local impacts on mercury levels in the environment.

When mercury is released into the atmospheric environment, either from natural or human-made sources, it can eventually deposit into surface waters, where bacteria convert the metal into the organic form, called methylmercury. This form of the metal is assimilated by larger organisms when they consume the bacteria, and mercury begins its journey up the food chain.

Methylmercury, unlike its elemental counterpart, can penetrate into mammalian cells because it mimics a common amino acid. Methylmercury interferes with nerve cell division, making prenatal and childhood exposure more damaging than adult exposure. Methylmercury affects the visual, auditory, and motor centers of the brain. At higher doses, it can also adversely affect the kidneys and cardiovascular system.

Eastern North Carolina’s waters are particularly sensitive to mercury. Due to the large number of wetlands, there is significant bacterial conversion of mercury to methylmercury. This problem is enhanced by the acidity of the coastal blackwater rivers. The result is elevated levels of mercury in certain species of fish.

Fish are tested in North Carolina rivers for mercury content. When fish test above the state action level, that species is posted for that waterway. Due to food-chain biomagnification, it is the largest fish that contain the highest levels of mercury, so fish postings are often tied to the size of the fish.

North Carolina has had freshwater fish postings since the program was started in 1981. The first postings were based on local sources of contamination, and were for pollutants such as dioxins. Today, mercury is the leading cause of consumption advisories. Due to its chemical properties, which allow it to be transported over long distances, mercury can be found even where there is no local source of contamination. Forty-one states now have consumption advisory postings for methylmercury in fish.

Ten of North Carolina's waterways are currently posted due to elevated levels of mercury in the fish. In 1997, a statewide consumption advisory was added for bowfin (blackfish) due to elevated levels found statewide. Last year, for the first time, postings were issued for a saltwater species. Consumption advisories for king mackerel were posted in all coastal states in the Southeast, based on fish size. King mackerel less than 33 inches in length are considered safe for all. Those 33-39 inches should only be eaten in limited portions (one eight ounce portion per month) by sensitive populations, such as children and women of childbearing age. King mackerel greater than 39 inches should not be eaten by anyone. Complete fish postings can be found at <http://www.schs.state.nc.us/epi/fish/>.

EPA recommends that sensitive populations (women who are pregnant or may become pregnant, nursing mothers, and young children) limit their consumption of freshwater fish caught by friends and family. In January 2001, EPA added to that a public endorsement of the Food and Drug Administration's advisory warning against commercially available saltwater fish. The FDA advisory recommends that the same sensitive populations limit their consumption of saltwater fish purchased in stores and restaurants, including shark, swordfish, tilefish, and king mackerel. According to the FDA, these populations can safely eat 12 ounces per week of cooked saltwater fish (a normal serving is 3-6 ounces), and recommends eating a variety of different species.

Fourteen of the twenty largest sources of mercury emissions in N.C. are coal-fired power plants. The largest of these is Carolina Power & Light Co.'s Roxboro plant, the tenth largest in the nation. In 1999, this plant released 731 pounds of mercury to the air.

On the national level, President George W. Bush's campaign promises to regulate the emissions of mercury from power plants and improve air quality have done an about-face in recent weeks. Despite support by Bush's EPA appointee, Christine Todd Whitman, Bush chose not to support the Kyoto Treaty, an important agreement to reduce air pollution worldwide.

Bush also plans to remove requirements for improving the efficiency of heating and cooling systems and other household appliances such as hot water heaters and washing machines, thus increasing future demand for electricity. Meanwhile, the bipartisan Clean

Power Act of 2001, which seeks to control emissions from coal-fired power plants, and the similar Clean Smokestacks Act of 2001 are now pending in Congress.

People may be the only species benefiting from power plants, but we are not the only species being harmed by mercury emissions. A bald eagle found last year near Aurora, in Beaufort County, was treated for mercury poisoning but ultimately died from the effects. Other species affected include raccoons, otters, ducks, loons, and other fish-eating birds.

Last year, North Carolina's Scientific Advisory Board (SAB) concluded their review of mercury in the environment. Their observations included a recognition of the need for improved awareness of mercury as an important health issue in North Carolina and the need for better scientific information on mercury levels in North Carolina's environment. The state's Division of Water Quality has since been awarded a grant by the Environmental Protection Agency to perform comprehensive testing of the fish and waters of Eastern North Carolina.

The Department of Environment and Natural Resources also created a Mercury Task Force last year to address mercury issues in North Carolina, including those identified by the SAB. The Task Force is comprised of members from many divisions, including Air Quality, Water Quality, Health and Human Services, Waste Management, and Pollution Prevention and Environmental Assistance. Additionally, a resolution passed by the state's Environmental Management Commission in February requested the state to provide funding for enhanced monitoring and increased public education efforts on mercury.

In the past, North Carolina's largest non-power plant coastal source of mercury was Holtrachem, a coastal facility in Riegelwood, Columbus County that manufactured chlorine and sodium hydroxide. When the facility switched to a mercury-free process last year, mercury levels at the nearby Lake Waccamaw air quality monitoring site immediately dropped. However, because of significant historical mercury emissions and mercury's persistence in the environment, it will take years before the ecosystems in eastern N.C. show visible signs of recovery.

“We could remove all the sources of mercury out there, all the power plants and trash burners, and there would still be a lot of mercury in the fish for five, ten years or more,” said Jeff Hayward, a toxicologist for the Division of Air Quality. “But the important point here is that there is a problem, and while we can't remove all of the sources, we can certainly work to reduce mercury emissions.”

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Possible Breakout Text Box: (with pie chart):  
Mercury Air Emissions in North Carolina

The largest anthropogenic (human-made) source of mercury is the coal-fired power plants of electric utilities (see pie chart). President Bush recently reneged on his campaign promise to improve air quality when he failed to support the Kyoto Treaty last month, despite strong support of the treaty from Bush's EPA appointee, Christine Todd Whitman. Bush is also not expected to support the Clean Power Act of 2001, which seeks to control emissions from coal-fired power plants, and the similar Clean Smokestacks Act of 2001, which seeks to control other sources of emissions.

Other significant sources of mercury include industrial boilers, medical and hazardous waste incineration, municipal waste combustion, and manufacturing processes. One such process is the chlor-alkali process used in making chlorine. A chlor-alkali plant on the North Carolina coast recently closed, reducing the potential local sources of mercury in North Carolina.

Pie Chart:

Data source: 1998-99 DAQ and Local Program Emissions Inventories, 1999 EPA Information Collection Request.

Cumulative emissions: 4,626 lbs.

Represents >95% of statewide emissions from >500 sources

Title: Top 50 Mercury Air Emission Point Sources by Industrial Category, 1998-99

Electric Utility: 62%

Industrial Boilers: 18%

Medical/Hazardous Waste Incineration: 11%

Municipal Waste Combustion 8%

Manufacturing Processes 1%