United States Environmental Protection Agency
Office of Water 4305
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Fact Sheet

Mercury Maps: Linking Air Deposition and Fish Contamination on a National Scale

Summary

Mercury Maps is a tool that relates changes in mercury air deposition rates to changes in mercury fish tissue concentration on a national scale. ***Mercury Maps*** shows:

- Where fish tissue concentrations exceed the new national methylmercury criterion;
- How fish tissue concentrations relate to air deposition rates;
- Which watersheds have air deposition as their sole significant source of mercury;
- Which watersheds contain potentially significant sources of mercury loads other than air deposition; and
- Estimates of mercury air deposition reductions needed to meet the new criterion.

Background

As of December 2000, 41 states had issued 2,242 fish advisories for mercury. In most cases, EPA's information indicates that elevated mercury fish tissue concentrations result primarily from atmospheric deposition. Mercury air emissions from coal-fired power plants, waste incinerators, mercury cell chlorine manufacturing facilities, and other sources can be transported long distances before ultimately depositing on watersheds and waterbodies. Much of the mercury deposited within state boundaries is generated from emission sources outside the state. ***Mercury Maps*** can be used to coordinate EPA's efforts to address mercury contamination in water quality, wastewater permitting, and air emission programs.

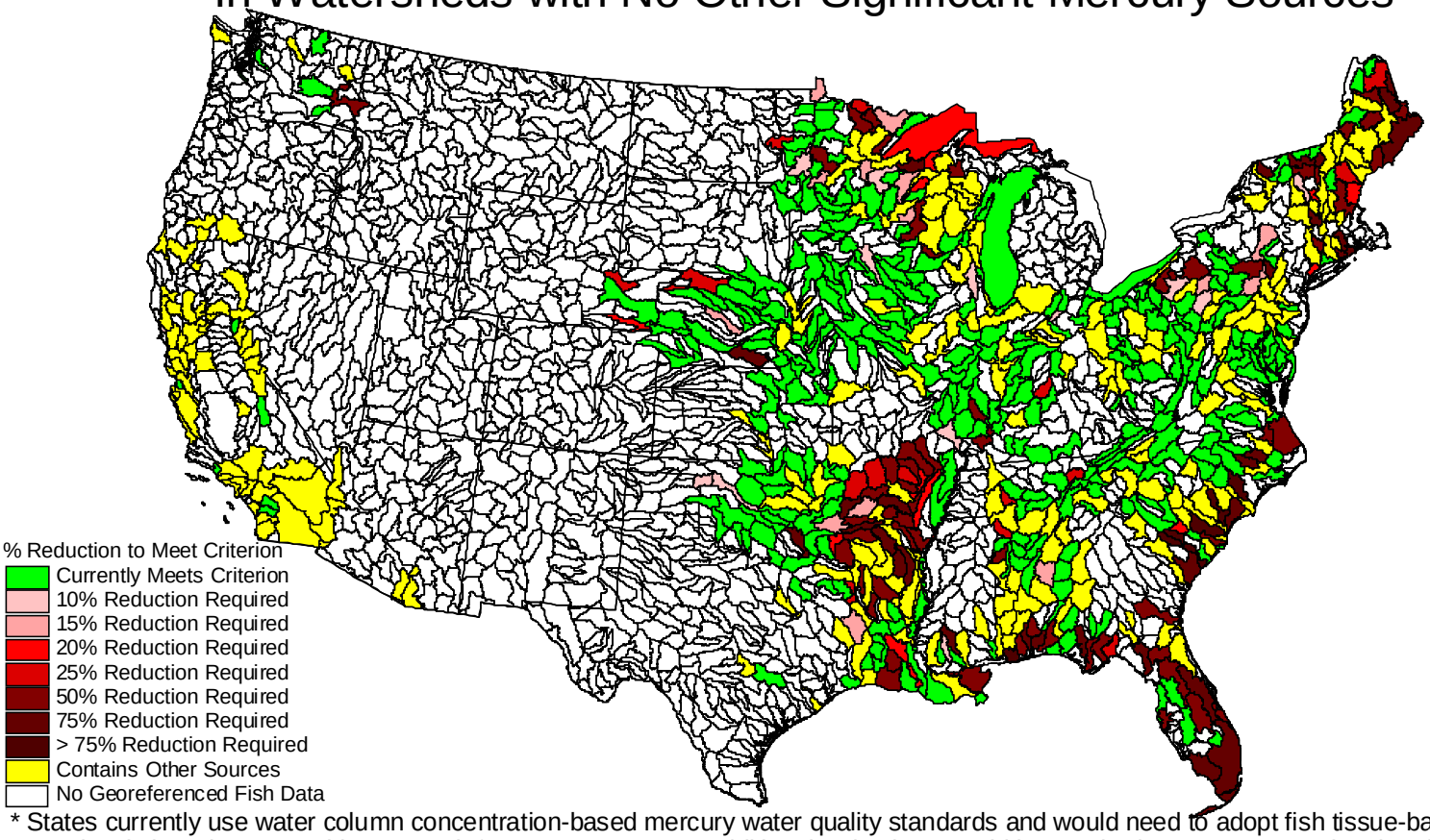
Environmental and Public Health Benefits

Mercury Maps can be used to help evaluate the benefits of technology-based air emission reduction standards. One component of an overall benefits analysis, ***Mercury Maps*** relates reductions in air deposition rates to reductions in fish tissue concentrations, by watershed, nationwide. ***Mercury Maps*** could also be used to perform individual Total Maximum Daily Load (TMDL) analyses and/or to perform TMDL analyses for multiple watersheds at a time. States could use this approach to develop state-wide approaches for addressing the fish mercury contamination problem. While ***Mercury Maps*** addresses only effects on inland freshwater fish and is based on the new methylmercury criterion, most state standards are water column concentration-based. States would need to adopt fish-tissue based target levels in order to benefit from this approach. In addition, most state fish consumption advisories are set at target levels that are about half the criterion concentration.

Technical Approach

Mercury Maps is a peer-reviewed geographic information system (GIS) tool with national data coverages for watersheds, fish tissue concentrations, and non-air-deposition source locations. The model used in this project is a reduced form of the watershed and aquatic ecosystem effects models used in the 1997 Mercury Study Report to Congress. The equations from these models have been reduced to a single equilibrium-state equation and applied directly in the GIS. The ***Mercury Maps*** model concludes that for long-term equilibrium conditions, the ratio of current to future air deposition rates will equal the ratio of current to future fish tissue concentrations. Estimates of percent air deposition reductions, by watershed, as generated from a regional air deposition model would be needed to predict fish concentration reductions.

Estimated Percent Reductions in Air Deposition Load Necessary to Meet New Methylmercury Criterion* In Watersheds with No Other Significant Mercury Sources



* States currently use water column concentration-based mercury water quality standards and would need to adopt fish tissue-based target levels in order to use this approach for mercury TMDLs. Additional reductions would be required to meet EPA national and most state fish advisory levels, which are often set below the methyl-mercury criterion.

Note: Watersheds highlighted yellow have "significant" mercury sources other than deposition, defined as where the total estimated load from Publicly Owned Treatment Works (POTWs) and pulp and paper mills is greater than 5% of estimated waterbody delivered mercury at a typical air deposition load (10 g/km2/yr), and/or where mercury cell chlor-alkali facilities, mercury mines, or significant past producer gold mines are present. See text of report for data sources for point source dischargers and mines.

Source: National Listing of Fish and Wildlife Advisories (NLFWA) Mercury Fish Tissue Database (June, 2001).

Mercury Maps is based on the 22,000 records of fish tissue mercury concentrations in 35 states (west coast and states in the eastern two thirds of the U.S.) from the National Listing of Fish and Wildlife Advisories (NLFWA) Fish Tissue Database. ***Mercury Maps*** is designed to work only with watersheds where air deposition is the sole significant source of mercury. Watersheds are eliminated from the analysis if they contain potentially significant, but unquantified, runoff and effluent loads from: mercury mines, large-producer gold mines, and mercury-cell chlor-alkali facilities. Watersheds are also eliminated when the total screening level effluent load estimates for municipal wastewater treatment plants and pulp and paper mills are above five percent of the estimated waterbody-delivered air deposition load.

Additional Information

For further information concerning this report, please see the Mercury Maps web page at: http://www.epa.gov/waterscience/maps. If you have any questions, please contact Paul Cocca at the U.S. Environmental Protection Agency, Office of Water, Standards and Health Protection Division (4305T), 1200 Pennsylvania Ave., Washington, DC 20460. He may be contacted by phone at 202/566-0406 or by email at: cocca.paul@epa.gov.