PROJECT UPDATE

August 2005

New York State Energy Research and Development Authority

Environmental Monitoring, Evaluation, and Protection Program

Strategic Monitoring of Mercury in New York State Fish

PROJECT FOCUS

The New York State Department of Environmental Conservation (NYS DEC), supported by NYSERDA, is currently conducting a comprehensive monitoring program to determine mercury (Hg) concentrations in New York State fish. As part of this four-year project, which began in June 2003, data is being collected that is critically needed for establishing baselines and for assessing progress under proposed mercury emission control policies. Specifically, the project team is:

- Sampling fish mercury concentrations in selected NYS waters that have never been surveyed;
- Monitoring fish from lakes for which historical mercury data is available, to determine any possible trends;
- Providing data to improve our understanding of mercury bioaccumulation in lakes;
- Evaluating the possible use of a simple model to predict mercury levels in fish, based on lake pH and other variables; and
- Summarizing the statewide database of mercury concentrations in freshwater fish.

Dustin Edwards and Erik Latremore setting a gill net to collect fish for the mercury monitoring project.
Photograph by: Howard Simonin

CONTEXT

In the past century, anthropogenic emissions of mercury have caused an increase in the atmospheric deposition of this toxic chemical. In the northeastern United States, this has resulted in higher levels of mercury in freshwater ecosystems. Major sources of mercury emissions are electricity production and industrial processes that involve the combustion of mercury-containing fuels or materials, such as coal. Inventories indicate that ~150 tons of mercury are emitted from U.S. anthropogenic sources each year. As a result of emission controls, a moderate reduction has been recorded recently in atmospheric mercury deposition and acidic deposition in the Northeast. It is important to determine whether mercury concentrations in fish are following these trends.

As it accumulates in aquatic organisms such as fish (bioaccumulation), mercury also poses a danger to organisms higher up in the food chain (biomagnification). An issue of particular concern for human health is the accumulation of mercury in fish muscle tissue, which is eaten by human beings. Large predatory fish are known to bioaccumulate high concentrations of mercury, and the highest concentrations are found in older fish. In human beings, when mercury concentrations accumulate to high enough levels, the chemical can impair neurological development in fetuses and young children, and damage the central nervous system of adults. In response to these pronounced dangers, the U.S. Food and Drug Administration has decreed that fish with higher concentrations than one microgram of mercury per gram (i.e., 1 ppm) of wet weight are hazardous and are banned from interstate commerce. Additionally, 45 states have issued fish consumption advisories. In New York, fish consumption advisories for over 70 lakes are currently in place owing to high mercury levels. However, only ~200 of New York's ~4,000 lakes have been sampled for mercury concentrations.

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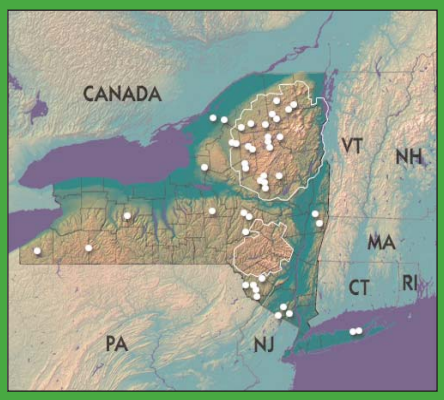
Project Location



Adirondack and Catskill regions outlined.

Contact Information

For more information on this project see:
www.nyserda.org/programs/environment/emep

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Keywords

- Atmospheric deposition
- Bioaccumulation
- Biomagnification
- Fish consumption advisories
- Mercury

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Yellow perch (top) and *walleye* (bottom), as pisciverous fish, are useful in the study of mercury bioaccumulation.

Credit:
Http://interactive.usask.ca/ski/fisheries/fish/index.html

Project Status

- Initiated 2003
- Project ongoing

New York Energy Smart℠
Public Service Commission — NYSERDA

Since 1975, the New York State Energy Research and Development Authority (NYSERDA) has developed and implemented innovative products and processes to enhance the State's energy efficiency, economic growth, and environmental protection. One of NYSERDA's key efforts, the Environmental Monitoring, Evaluation, and Protection (EMEP) Program, supports energy-related environmental research. The EMEP Program is funded by a System Benefits Charge (SBC) collected by the State's investor-owned utilities. NYSERDA administers the SBC program under an agreement with the Public Service Commission.

METHODOLOGY

In this and a companion project conducted by the Adirondack Lakes Survey Corporation (ALSC), a total of 126 lakes are being sampled over three years. For these sites (see map), the concentrations of mercury in fish as well as water-chemistry variables and other watershed attributes are being analyzed. Sampling is conducted in cooperation with regional DEC fisheries staff and with the assistance of the ALSC. In addition to including a number of previously unsampled lakes, this project is also surveying lakes from an existing NYS DEC fisheries database, which contains information on mercury and other data for fish from 166 lakes, ponds, and reservoirs. Overall, waters in three categories are being surveyed:

- Lakes that have been previously surveyed; new data will supplement the existing database and allow evaluation of changes in mercury concentrations.
- Lakes that have not been surveyed for mercury, but have data available for related criteria.
- Lakes and ponds in the Adirondacks, Catskills, and Hudson River valley that have never been surveyed, but based on water chemistry are believed to have high mercury levels in the larger predatory fish (perch, bass, and/or walleye).

In its study of bioaccumulation, the project will focus on largemouth and smallmouth bass, walleye and yellow perch, since these piscivorous fish have been shown to accumulate high mercury concentrations and are therefore useful indicators of potential problems.

Erik Latremore setting a gill net to collect fish for the mercury monitoring project
Photograph by: Jeff Loukmas

Erik Latremore and Dustin Edwards removing fish from a gill net.
Photograph by: Jeff Loukmas

RECENT FINDINGS

Currently, fish and water samples have been collected from 117 lakes across New York State. More than 1700 fish samples and over 100 water samples have been analyzed. The data set has been provided to the NYS Department of Health, which has recently added waterbodies to their fish consumption advisories based on this data.

PROJECT IMPLICATIONS

Coal-fired power plants, which are responsible for ~30 % of U.S. industrial emissions, are the largest unregulated source of mercury emissions. In the absence of regulations and/or better control technologies, mercury emissions from coal-fired power plants are expected to increase as the demand for energy production and coal combustion increase. Policymakers at the state and federal levels are currently considering regulations of mercury emissions from the utility sector and other control mechanisms. Information is therefore critically needed for evaluating the impacts of recent and potential reductions in mercury deposition on aquatic resources.

This project's analyses should greatly improve our understanding of mercury concentrations in NYS waters. Ultimately the project will provide information about fish mercury concentrations in over 100 lakes for which no data are currently available. The results will constitute a major addition to the available mercury database, which currently includes information on fish for only ~5% of NYS lakes. With this baseline data, potential trends in mercury concentrations in fish can be evaluated and determinations made as to whether there have been any significant changes in mercury concentrations in the recent 10–15 years. This information will benefit the choice of mercury controls and the assessment of their effectiveness in the future. Determining the status of mercury in particular lakes will assist resource managers and the NYS Department of Health in deciding whether additional fish consumption advisories are needed.