



PREDICTING MERCURY LEVELS IN New England Wildlife through Modeling

U.S. EPA | SCIENCE AT THE EPA NEW ENGLAND REGIONAL OFFICE

SCIENCE lies at the heart of the mission of the U.S. Environmental Protection Agency (EPA). The Agency must rely on cutting edge research, accurate measurements and effective technology to implement its programs to protect the environment and human health. Without sound science and credible data, EPA can not wisely set environmental and health standards, clean up contaminated sites, measure ambient air and water quality conditions, or identify the new technologies or practices that will reduce releases to the environment. These fact sheets share with you some of our EPA New England's laboratory capabilities and exemplify some of the very best science we do to meet our agency mission.

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GOAL:

Data from field sampling indicate that many fish in New England lakes and streams have mercury levels that are unsafe for human consumption. As a result, all six New England states have issued fish-consumption advisories, and have cooperatively developed a Mercury Total Maximum Daily Load plan outlining a strategy for reducing mercury in fish in New England waterbodies. Data from field sampling also show elevated mercury in many piscivorous (fish-eating) birds (e.g., loons), which can affect behavior and cause physiological defects, reduced fertility, and increased rates of mortality. EPA is leading a team of mercury researchers in developing a GIS-based model (Mercury Geospatial Assessments for the New England Region or "MERGANSER") to identify aquatic ecosystems where fish and birds and, ultimately, humans (via fish consumption) are at risk for contamination by mercury.

PROGRESS:

Since 2001, EPA New England, in partnership with the EPA Office of Water and the U.S. Geological Survey, have collaborated with mercury researchers to gather data and information on mercury, including its sources, transport and deposition, and environmental responses. Although these data have many uses, EPA New England scientists continued to work toward developing a regional mercury model with the realization that this might be a one-time opportunity to integrate such a rich body of data. In 2006, EPA New England was awarded a grant to complete MERGANSER through EPA's Advanced Monitoring Initiative (AMI). AMI projects "showcase" approaches suitable for broad EPA application. MERGANSER, which is expected to be completed in 2010, builds off of experience gained in developing the New England SPARROW model, which predicts nutrient loadings in rivers. Success with SPARROW suggested that a modified model could be used to assess another widespread pollutant, mercury. MERGANSER will link atmospheric mercury-deposition models with data on mercury sources, mercury levels in fish and birds, and ecosystem features that may be associated with elevated mercury in biota. The model will identify variables (e.g., low pH, watershed area) that are significantly correlated with mercury levels in fish and birds, and use this information to predict contaminant levels in aquatic ecosystems throughout New England.

Once data pertaining to independent and dependent model variables are gathered and quality-assured, the project team will begin building the MERGANSER multivariate regression model for predicting mercury levels in fish tissue. A second modeling activity will develop an empirical linkage between mercury levels in fish and birds and associated species population effects, such as reproductive impairment and behavioral abnormalities. These two models will be a major step in understanding how regional and local mercury deposition and sources, as well as landscape features, influence mercury levels in biota.

BENEFITS:

The MERGANSER model will provide a statistically valid tool for EPA and its partners to identify aquatic ecosystems at risk for mercury contamination, and likely sources of this mercury. Predicted contamination will be expressed as mercury levels above or below fish-consumption advisory levels or in terms of ecological risk to birds. MERGANSER is being developed using a GIS so that data and maps can be displayed at various scales. Powerful model features will include the ability to predict changes in mercury levels in biota resulting from implementing various policy options and the identification of optimal monitoring locations. Additionally, the model will be useful for developing mercury models in other areas of the US where this level of mercury data is not available.