Proceedings of the Annual International Conference on Soils, Sediments, Water and Energy

Volume 12 Article 33

January 2010

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Recommended Citation
Rose, Jane (2010) "The Distribution Of Fish Advisories For Mercury In Massachusetts," *Proceedings of the Annual International Conference on Soils, Sediments, Water and Energy*: Vol. 12 , Article 33.
Available at: http://scholarworks.umass.edu/soilsproceedings/vol12/iss1/33

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Chapter 32

THE DISTRIBUTION OF FISH ADVISORIES FOR MERCURY IN MASSACHUSETTS

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Abstract: Fish have been tested for mercury in Massachusetts since the 1980s. So far, 234 waterbodies have been tested, resulting in 97 fish advisories where fish had mercury levels above 0.5 mg/kg. Fish from 113 waterbodies did not contain elevated concentrations of mercury. When mapped, the distribution of fish advisories presents a picture of the history of mercury pollution in the state.

Key words: Watersheds; mercury; fish advisories; geographic distribution.

1. INTRODUCTION

Fish are a gauge of environmental contamination. They are at the top of the food chain in the aquatic environment, which is a catchment for air pollutants and pollutants in runoff and storm drainage. In the early 1980s, MassDEP began investigating contaminants in fish. By the 1990s, it became apparent that the main fish contaminants are mercury, PCBs and pesticides. Mercury contamination accounts for over 80% of the fish advisories issued by the Massachusetts Department of Public Health.

In the last seven years, Massachusetts has had a major initiative to reduce mercury uses and emissions, including stringent mercury controls for incinerators.

2. MATERIALS & METHODS

Waterbodies are selected for fish testing each year because of watershed analysis needs, research needs and public requests. Mercury analysis of fish samples is conducted at MassDEP's Wall Experiment Station. Fish advisories are issued by the Department of Public Health when mercury exceeds 0.5 mg/kg in fish tissue. As of 2005, 234 waterbodies have been tested, resulting in 97 fish advisories. Fish from 113 waterbodies did not contain elevated concentrations of mercury. About 40% of the waterbodies tested received an advisory.

Fish advisories were grouped by watershed. The percentage of mercury advisories in a watershed was determined by dividing the number of advisories for lakes in a watershed by the number of lakes tested in the watershed. This helps control the bias associated with some watersheds having more lakes tested than others. The percentage of mercury advisories in a watershed was mapped to graphically display the distribution of fish advisories for mercury.

Fish in some lakes were subsequently retested as part of a long-term lake monitoring research program.

3. RESULTS

The percentage of lakes tested with mercury advisories in a watershed is shown in Figure 1. The map shows the range of the percentage of advisories in each watershed. The watershed table (Table 1) shows the exact percentage of advisories in watersheds where three or more waterbodies have been tested.

Twenty-six lakes have been retested since emissions controls began, of which twenty-four had advisories for mercury. Tests in 11 lakes (~46%) showed that mean mercury levels had fallen below 0.5 mg/kg. The watersheds that were retested are shown in Table 2, along with the lowered percentage of lakes with fish mercury levels >0.5 mg/kg.

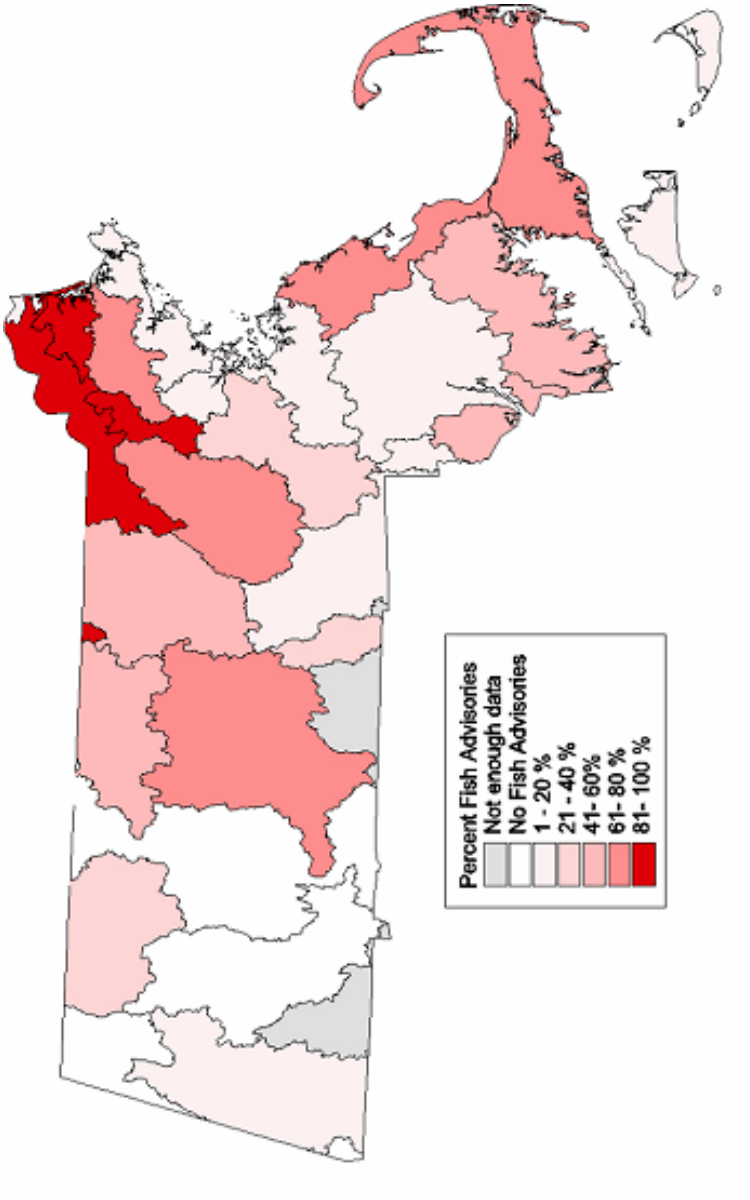

Figure 1. The Percentage of Mercury Advisories in Massachusetts Watersheds

Table 1. N=Number of waterbodies tested for fish mercury

Watershed	N	% Advisories
HUDSON	7	0
HOUSATONIC	8	11
DEERFIELD	5	40

Watershed	N	% Advisories
WESTFIELD	7	0
FARMINGTON	2	Too few tests
CONNECTICUT	3	0
MILLERS	9	60
CHICOPEE	8	75
QUINEBAUG	2	Too few tests
FRENCH	5	40
NASHUA	17	59
BLACKSTONE	16	6
MERRIMACK	21	95
SUASCO*	13	77
SHAWSHEEN	6	83
PARKER	3	100
IPSWICH	9	67
NORTH COASTAL	5	20
BOSTON HARBOR	15	20
CHARLES	11	36
SOUTH COASTAL	6	67
CAPE COD	7	71
ISLANDS	15	20
BUZZARDS BAY	9	56
TAUTON	18	17
NARRAGANSETT	5	60
TEN MILE	5	20

Table 2. N=Number of retested waterbodies where mercury in fish was lowered to <0.5mg/kg.

Watershed	N	% Reduction
MERRIMACK	7	From 95% to 62%
BOSTON HARBOR	1	From 20% to 13%
SUASCO*	1	From 77% to 69%
CHICOPEE	1	From 75% to 63%
HOUSATONIC	1	From 11% to 0%

* Sudbury, Assabet and Concord

4. DISCUSSION

The map of fish advisory distribution presents a historical picture of data collected from 1982 – 2005. It depicts peak fish mercury contamination in northeastern watersheds, where industrialization occurred in the 19th century, and four incinerators were operating in the 1980s and 1990s. The watersheds surrounding the area of peak fish contamination have the next highest percentage of fish advisories, along with south coastal watersheds, including Cape Cod, and the centrally located Chicopee watershed, which includes the Quabbin Reservoir. The western watersheds have relatively fewer fish advisories. The picture is one of fish mercury advisories corresponding to local, historic industrial sources, population density and urbanization.

Two of the incinerators (a municipal solid waste combustor and a medical waste facility) in northeast Massachusetts have closed. Emissions controls were integrated into the other two incinerators. Seven of the re-tested lakes in the vicinity of the incinerators have shown a decrease in mercury in fish (Table 2).

An interpretation of the pattern of fish advisories in the western part of the state could be that the hilly topography of Massachusetts prevents windborne mercury contamination from sources to our west from reaching our lakes. Wind patterns in Massachusetts are predominantly westerlies. Biester et al (2002) has shown that mountains, especially when forested, have higher net rates of mercury deposition than areas of lower elevation. The watersheds in western Massachusetts may be protected from airborne mercury contamination by a rainshadow-type effect from the Taconic Mountains to the west.

The fish advisory map is available online at the MassDEP website at http://mass.gov/dep/toxics/stypes/hgres.htm. The website also provides a list of all the waterbodies where fish have been tested, along with fish advisories that have been issued. The Massachusetts DPH website, http://db.state.ma.us/ dph/fishadvisory/, provides more detailed information on fish advisories, including which species to avoid consuming in lakes with fish advisories.

5. CONCLUSIONS

Fish advisories are more prevalent in the watersheds of the northeast section of Massachusetts, where a long industrial history exists, and a concentration of major waste combustion sources operated in recent times. Controlling mercury emissions on a local scale has been accompanied by lowered levels of mercury in fish in about half of the re-tested lakes. Fewer lakes in the western part of Massachusetts have fish advisories compared to central and eastern Massachusetts lakes.

REFERENCE

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