

Are walleye from Lake Roosevelt contaminated with mercury?

TO FIND OUT, scientists from the U. S. Geological Survey (USGS) tested walleye and other sport fish from the upper Columbia River and Franklin D. Roosevelt Lake (Lake Roosevelt), the largest reservoir in Washington and a popular fishing spot.



Findings

- Walleye had higher concentrations of mercury than other sport fish.
- Larger walleye had higher mercury concentrations than smaller walleye.
- Mercury concentrations in walleye filets ranged from 0.11 to 0.44 parts per million (ppm). These concentrations do not exceed the current Federal standard (1.0 ppm of mercury) designed to protect the health of people who eat small amounts of fish.



After reviewing these findings, the Washington State Department of Health concluded that *people who regularly consume large amounts of Lake Roosevelt walleye may be at risk of adverse health effects from mercury and should limit their consumption of these fish* (see back for specific recommendations).

Why worry about mercury?

Mercury, a metal like lead or tin, comes from many natural sources, such as oceans, volcanoes, and the weathering of rock in mountains. Human activities like burning fossil fuels and discharging industrial waste into the air and water also add mercury to the air we breathe, the water we drink, and the food we eat. We all have mercury in our bodies, but at levels that are typically not high enough

to cause health concerns. It is possible, however, to accumulate too much mercury in the body.

The greatest source of mercury for most people is the fish they eat. Most mercury in fish is **methylmercury**, a highly toxic substance that can build up in predatory fish such as walleye, swordfish, and tuna, and in animals that eat these fish.

Methylmercury can damage the brain, nervous system, and kidneys. The risk is probably very low for adults who eat fish only occasionally. The risk is greatest for developing fetuses, children, and people who depend on sport fish for food.

Mercury also threatens the health of fish-eating wildlife such as loons, eagles, otters, and raccoons. Some evidence suggests that at very high concentrations it harms the fish themselves. And, mercury-contaminated sport fish may adversely affect a local economy that depends on recreational fishing.

It's the amount that counts

Your health risk depends on your age, weight, and health, in combination with

- how much fish you eat,
- how often you eat fish, and
- how much mercury is in the fish.

You can reduce your health risk from mercury-contaminated fish by following recommendations for eating local sport fish.



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Photograph by Dick Lee



A Spokane Walleye Club member shows off a walleye from Lake Roosevelt. Local people caught most of the fish for this study.

Why were fish from Lake Roosevelt tested for mercury?

All waterbodies contain some mercury, but not all sport fish are tested for mercury. People were concerned about fish from Lake Roosevelt because it's a popular fishing area and because

- a smelter in British Columbia discharged waste and slag into the Columbia River for many years, and the Spokane and Pend Oreille Rivers bring in waste from wastewater treatment plants and mining activities (mostly historical);
- earlier studies found that sediment and some fish in Lake Roosevelt were contaminated with toxic metals, including mercury.

Why focus on walleye?

- They're one of the most popular catches at Lake Roosevelt.
- Adult walleye are top-level predators, feeding on other fish, and thus are likely to be more contaminated than their prey because methylmercury *bioaccumulates* (is accumulated within organisms faster than it's eliminated) and *biomagnifies* (increases in concentration as it travels up the food chain).
- An earlier study found that walleye had more mercury than other sport fish in Lake Roosevelt.

How the study was done

"This study was a cooperative effort—other agencies and the public helped us out from the beginning," said USGS biologist Dr. Mark D. Munn.

Collecting a lot of fish was necessary because testing fish (not the water) is the only way to determine if they're contaminated. Mercury goes through a complex cycle in the environment (see illustration at right), and mercury levels in water vary. Because methylmercury bioaccumulates and biomagnifies in tissue, highly contaminated fish may be found in water that is very low in mercury.

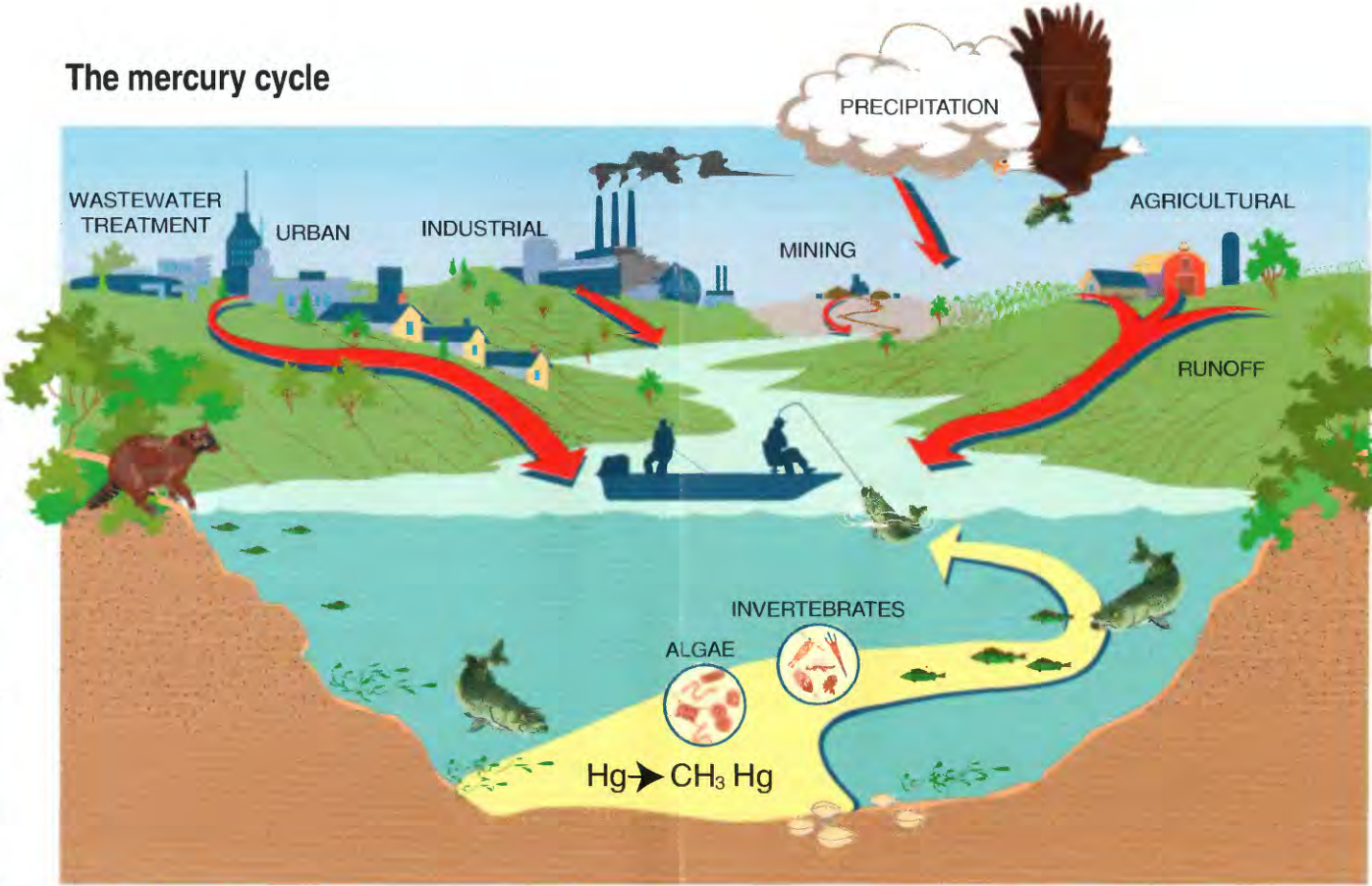
In the summer of 1994, USGS scientists and Spokane Walleye Club members collected fish from three areas where fishing is popular and where mature walleye spawn (see map). Most of the walleye caught were about 3 years old and 15 inches long; they also caught smaller numbers of smallmouth bass and rainbow trout, two other popular sport fishes in Lake Roosevelt, so they could be compared to walleye. (See yellow box below for more information.)

How do Lake Roosevelt walleye compare . . .

. . . to sport fish from the rest of the U.S.? Average mercury levels in local fish were generally similar to or less than levels in fish from across the country (see graph, next page). The average concentration of mercury in walleye from Lake Roosevelt was 0.3 parts per million (ppm),* less than 0.52 ppm, the national average for walleye in a 1992 study by the U.S. Environmental Protection Agency (USEPA). However, the USEPA fish probably had unusually high levels because most of the fish-collection sites were located near industrial sources of contaminants.

*Equivalent to 0.3 milligrams of mercury in a fish weighing 1 kilogram.

The mercury cycle



Sources of mercury

Mercury enters the air as a gas from natural sources such as oceans and volcanoes and from human activities such as burning waste in municipal incinerators and burning coal to run power plants. Mercury travels through the atmosphere and falls back to the earth or is washed out by precipitation. Mercury also enters lakes and rivers from natural weathering of geologic materials and from human sources such as waste discharged from mines, smelters, and wastewater treatment plants, or in agricultural runoff from fields treated with pesticides that contain mercury.

Mercury in the aquatic food chain

In or near the sediments, a crucial transformation occurs: bacteria change some of the inorganic mercury (Hg) into the organic, more toxic, methylmercury (CH3Hg). Methylmercury is then accumulated by organisms all along the aquatic food chain—from tiny plants (algae) and animals (invertebrates), to smaller fish such as kokanee and perch, to larger fish such as adult walleye that eat other fish, and to fish-eating birds and mammals, including humans. Methylmercury is stored in the muscle tissue (the fillet) of fish, where it bioaccumulates and biomagnifies. Because humans eat from the top of the aquatic food chain, we can be exposed to high concentrations of methylmercury.

What is being done about mercury in fish?

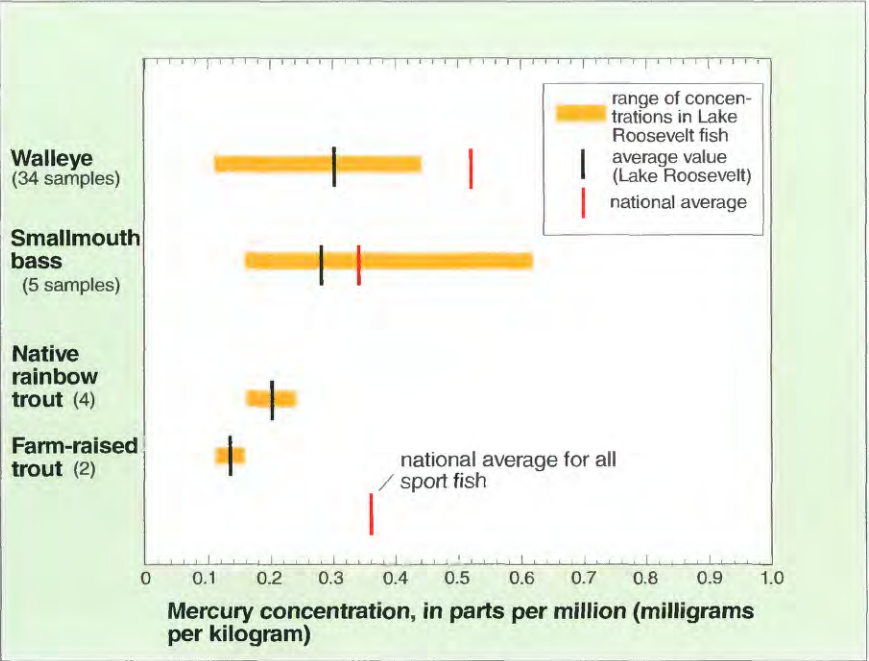
Because it's impractical to test fish everywhere, scientists are working to better understand (1) how mercury changes into methylmercury and (2) how methylmercury bioaccumulates in sport fish. This information will help identify waterbodies and fish that are likely to be contaminated.

According to the results of this study, fishing at a point far away from a known source of mercury doesn't mean the fish are less contaminated than at sites closer to a contamination source (fish from Kettle Falls Reach, closest to the smelter in Canada, had less mercury than fish farther downstream). Anglers and people who eat sport fish should be kept informed.

Although mercury can't be eliminated from lakes or rivers, human activities that add mercury to the environment can be controlled. For example, the Canadian smelter has stopped discharging slag to the Columbia River and has improved its waste treatment methods, thereby reducing its input of mercury and other metals to the river.



Areas where fish were collected: Kettle Falls Reach, Spokane Reach, and Sanpoil Reach.



Average mercury concentrations in Lake Roosevelt walleye were similar to the national average for all sport fish and lower than the national average for walleye. However, the national averages are from a U.S. Environmental Protection Agency study; fish in this study probably had unusually high levels of mercury because most of the fish-collection sites were near industrial sources of contaminants. Eating large amounts of Lake Roosevelt walleye may still be a health concern for some people (see back for details.)



How much walleye can I eat?

What's important is *how much* walleye and other mercury-contaminated fish you eat, not *whether* you eat walleye from Lake Roosevelt. Because developing fetuses are especially sensitive to the toxic effects of methylmercury, pregnant women and women of childbearing years should watch their diet carefully.

According to the results of the U.S. Geological Survey study, the average amount of mercury in Lake Roosevelt walleye (approximately 0.3 parts per million) does not exceed federally allowed levels. However, these levels were set assuming people eat only a small amount of contaminated fish. If you eat large amounts of walleye frequently, you may be at risk of adverse health effects because the hazard of methylmercury depends on the amount you eat, how often you eat it, and your health. The Washington State Department of Health (DOH) advises you to follow the guidelines below, which are based on an evaluation of methylmercury toxicity by the U.S. Environmental Protection Agency. If you are exposed to mercury from other food sources, such as consumption of other predatory fish like swordfish and tuna, you should eat *less* walleye than recommended below:

Recommended Maximum Consumption of Walleye from Lake Roosevelt

Adults	Pregnant women and women in childbearing years	Children under 6 years of age
4 pounds per month (about 8 meals per month)	1 pound per month (about 2 meals per month)	1/3 pound per month

How can I reduce my risk?

Because methylmercury is distributed throughout the tissues of a fish, it cannot be removed by special cooking or trimming methods. *Reducing the amount of contaminated fish you eat is the only sure way to reduce exposure to methylmercury in fish.* However, eating smaller fish and eating a variety of species will likely help reduce exposure.

For more information, contact the Washington DOH at (888) 586-9427. Visit the DOH home page at <http://www.doh.wa.gov/>

This fact sheet is based on

Munn, M.D., Cox, S.E., and Dean, C.J., 1995, Concentrations of mercury and other trace elements in walleye, smallmouth bass, and rainbow trout in Franklin D. Roosevelt Lake and the upper Columbia River, Washington, 1994: U. S. Geological Survey Open-File Report 95-195, 35 p.¹

Munn, M.D. and Short, T.M., 1997, Spatial heterogeneity of mercury bioaccumulation by walleye in Lake Roosevelt and the upper Columbia River, Washington: Transactions of the American Fisheries Society, v. 126, no. 3, p. 477-487.

Other print sources

Studies of mercury and other contaminants

Krabbenhoft, D.P. and Rickert, D.A., 1995, Mercury contamination of aquatic ecosystems: U.S. Geological Survey Fact Sheet 216-95, 4 p.¹

U. S. Environmental Protection Agency, 1992, National study of chemical residues in fish: Washington, D.C., Office of Science and Technology, EPA 823-R-92-008b.²

World Wide Web sources

Effects of mercury on human health

Agency for Toxic Substances and Disease Registry, 1995, ToxFAQs—Mercury: Atlanta, Ga., U.S. Department of Health and Human Services, Public Health Service, from URL <http://atsdr1.atsdr.cdc.gov:8080/facts46.html>, accessed May 21, 1997, HTML format.

Foulke, J.E., 1994, Mercury in fish—Cause for concern?: Washington, D.C., U.S. Food and Drug Administration, from URL <http://vm.cfsan.fda.gov/~dms/mercury.html> accessed May 21, 1997, HTML format.

Contaminants in the Columbia River Basin

U. S. Environmental Protection Agency, 1996, Columbia River Basin contaminant aquatic biota and sediment data: Seattle, Wash., U. S. EPA, Region 10, from URL <http://www.epa.gov/r10earth/data/crbdata.html>, accessed May 21, 1997, HTML format.

Acknowledgments

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—Martha L. Erwin and Mark D. Munn*

¹**For copies, write or call:** Earth Science Information Center, Box 25286, MS517, Denver Federal Center, Denver CO 80225; (303) 202-4210 for Open-File Report; (303) 202-4700 for Fact Sheet.

²**For copies, write or call:** USEPA, National Center for Environmental Publications & Information, PO Box 42419, Cincinnati OH 42419; 1-800-490-9198.

***For more information, contact Dr. Munn:**

**U. S. Geological Survey
Water Resources Division
1201 Pacific Avenue, Suite 600
Tacoma, WA 98402
(253) 593-6510
email: pubinfo@maildwatcm.wr.usgs.gov**