



## Contaminants in Fish and the Human Health Perspective



Angler Fishing High Mountain Lake

Photo by Anja Fredericks

### Introduction

Glacier National Park is an area of high conservation value, with numerous lakes and streams whose waters feed three different oceans. A drop of water falling on Triple Divide Pass may enter the Columbia, Missouri, or Hudson Bay river systems. Until recently, the waters of the park were thought to be pristine, with little impact from contaminants. However, the more we learn about transport of airborne pollution and contaminants, as well as food-chain effects, the more we become aware of issues that impact even those areas we thought were relatively secure from contamination, like Glacier.

### Western Airborne Contaminants Assessment Project

The National Park Service (NPS), Parks Canada, and the State of Montana have recently evaluated mercury levels in fish tissues in a few of Glacier's waters. Fish have been tested from Lake McDonald, Upper Two Medicine, Oldman, and Snyder Lakes, as well as in Waterton Lakes in Waterton Lakes National Park in Canada. Upper Waterton Lake is a transboundary water spanning the border between Glacier and Waterton Lakes National Park in Canada.

Elevated levels of mercury, resulting in fish consumption advisories, were detected in lake trout Upper Two Medicine Lake in Glacier, and in lake trout and lake whitefish in Waterton Lakes in Canada. Results for Lake McDonald are less clear with only 1 of 10 lake trout and 0 of 10 lake whitefish collected containing mercury at concentrations detectable by the testing equipment. We will be re-sampling Lake McDonald in 2008 to further evaluate these results.

In addition to sampling Lake McDonald, Upper Two Medicine and Waterton Lakes, through the six-year, interagency Western Airborne Contaminants Assessment Project (WACAP), cutthroat trout from Snyder and Oldman Lakes in Glacier were analyzed for semi-volatile organic compounds (e.g., current and historic-use pesticides, combustion and industrial by-products), and metals such as mercury. WACAP was initiated by NPS in 2002 to determine the risk to ecosystems and food webs from airborne contaminants, and to determine probable sources of contaminants. Glacier was one of eight "core" national parks studied, where researchers analyzed air, water, snow, sediment, lichen, conifer needles, and fish. More limited sampling focusing on vegetation was conducted at twelve secondary parks. The study results, which looked at parks from northern Alaska to southern Texas, were released in February 2008.

WACAP results showed mercury levels did not exceed human consumption thresholds for cutthroat trout in Oldman or Snyder lakes. However, in Oldman and Snyder lakes dieldrin (a pesticide banned in 1987) and DDT (a pesticide banned in 1972) were measured in these fish. One fish (out of 10) from Oldman Lake exceeded the dieldrin human consumption cancer risk threshold for recreational fish consumption. Other pesticides were also measured in fish at both lakes, at concentrations well below U.S. EPA human health thresholds. The combined effects of these contaminants in Oldman Lake correspond to a 1 in 100,000 increase in lifetime cancer risk over a lifetime of fish consumption, at or above 2.3 meals/month (8 ounce fillet, cooked = 1 meal). One would have to consume greater than 30 meals/month of cutthroat trout fillets over a lifetime from Snyder Lake to reach the same cancer risk. Therefore, it is recommended that individuals consume less than these amounts from these waters to minimize any risk. Due to the complexity of the findings, we urge you to look at the study summaries and health advisory explanations available on the NPS website at: <http://www.nature.nps.gov/air>, which also has links to other informative sites about WACAP.

Due to the expense of this type of evaluation, we cannot sample additional lakes in Glacier for the broad suite of contaminants evaluated in the WACAP study, but it is expected that these contaminants may be in other park waters. However, the NPS, in cooperation with the Glacier Fund, the University of Montana, and Montana Fish, Wildlife, and Parks are planning additional fish tissue testing for mercury in 2008.

**What are the contaminants, and where do they come from?**

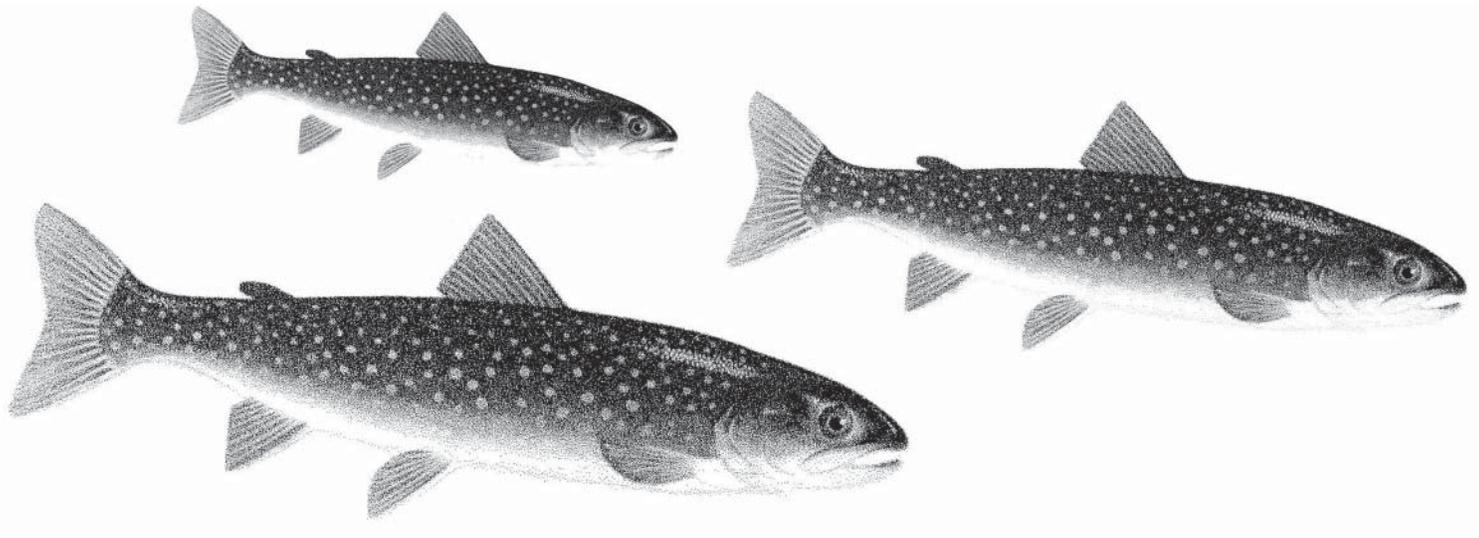
Mercury is a naturally occurring element found in rocks, soil, water, and air. However, human activities have greatly increased the amount of mercury cycling in the environment through processes such as burning coal for electricity, mining, and burning household and industrial waste. When mercury is deposited in water, bacteria convert inorganic mercury into methylmercury, the toxic form that accumulates in fish and other aquatic organisms. Fish consumption is the most important pathway for human and wildlife exposure to methylmercury. Methylmercury impairs neurological development in fetuses, infants,

and children. Larger, longer-lived fish, such as lake trout, which eat other fish, accumulate more methylmercury than smaller, younger fish which eat less contaminated prey. Fish at the top of the food-chain will generally contain the most mercury in any given system. The presence of current and historic use pesticides likely results from the disturbance of agricultural areas with previously contaminated soils, and subsequent atmospheric transport and deposition to Glacier's waters by wind and precipitation patterns. Many pesticides can also accumulate in fish.

**Are the fish safe to eat?**

The health risks of eating highly contaminated fish are likely low, but each person should make his or her own decision about eating fish that were caught in Glacier. Glacier has a fish consumption advisory for Upper Two Medicine and Waterton Lakes (see

below). Individuals at high-risk, such as young children, nursing mothers, pregnant women, and women who may become pregnant should be more conservative in their fish-eating habits.



**Health benefits of fish**

Due to body size, weight, and other factors, risks and benefits from eating fish vary from person to person. When properly prepared, fish provide an excellent source of protein that is low in saturated fat

and sugar, and is also a good source of Vitamin E and omega-3 fatty acids. Some researchers suggest that eating a half-pound of properly prepared fish each week is helpful in preventing heart disease.

**General guidelines to reduce your health risk**

In general, eat fish that are likely to be less contaminated. Keep smaller, younger fish for eating. Younger fish have had less time to accumulate contaminants than older, larger fish. Contaminants such as mercury and PCB's build up in large predatory fish. Clean and cook your fish properly. Certain contaminants, such as PCB's, accumulate in fatty areas of the fish.

Trim off the skin and other fatty portions of the fish such as the back, side, and belly fat. Bake or broil your fish on a rack to allow any remaining fat to drip away. Fish are part of a healthy diet, and by following these guidelines, you can pursue the dietary benefits of fish while reducing the amount of unwanted contaminants in your diet.

**Fish consumption guidelines (for mercury contamination) as meals/month defined as an 8 oz. serving for a man, and a 6 oz. serving for women and children**

Water	Species	Person	Total fish length in inches						
			6 - 10	10 - 14	14 - 18	18 - 22	22 - 26	26 - 30	30 +
Upper Two Medicine Lake	Lake Trout	M	--	--	U	--	--	--	--
		WC	--	--	8	--	--	--	--
Waterton Lakes	Lake Trout	M	--	U	12	8	4	--	4
		WC	--	7	4	3	1	--	1
	Lake Whitefish	M	U	U	U	U	U	--	U
		WC	U	U	9	7	7	--	8

M = Men and women not of reproductive age  
 WC = women of reproductive age and children  
 U = unlimited  
 -- = no data