



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 relatively free of contamination. However, the more we learn about transport of airborne pollution and contaminants, as well as food-chain effects, the more we become aware that even remote areas such as Glacier can be impacted.

Western Airborne Contaminants Assessment Project

The National Park Service (NPS), Parks Canada, and the Environmental Protection Agency (EPA) have recently evaluated mercury levels in fish tissues in a number of Glacier's waters. Fish have been tested from Lake McDonald, as well as Bowman, Harrison, St. Mary, Upper Two Medicine, Oldman, and Snyder Lakes, as well as in Waterton Lakes, 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. Mercury levels of concern, resulting in fish consumption advisories, were detected in these waters.

In addition to the recent mercury testing, the six-year, interagency Western Airborne Contaminants Assessment Project (WACAP), evaluated cutthroat trout from Snyder and Oldman Lakes in Glacier for the presence of semi-volatile organic compounds (e.g., current and historic-use pesticides, combustion and industrial by-products), as well as 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. Subsequent to the WACAP study, Glacier National Park in collaboration with the Glacier National Park Fund and the University of Montana, sampled additional lakes in the park for mercury concentrations in fish tissue. The results prompted additional guidance for anglers who wish to consume fish caught in the park.

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 atmosphere through processes such as burning coal, mining/smelting operations, 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 particularly in fetuses, infants, and children. Among fish species, mercury risk generally is highest in larger, slow growing, long lived, and fish eating species such as lake trout. In

general, the characteristics of species that make them susceptible to mercury contamination will also put them at risk for other biomagnified contaminants such as PCBs, DDE (a breakdown product of DDT), and dieldrin. Thus, by following the consumption guidance for mercury, you will generally reduce your risk from biomagnified contaminants which have not yet been tested in the lower elevation lakes of the park. The presence of current and historic use pesticides (such as DDE and dieldrin) in Glacier in part 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?

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. Individuals at high-risk, such as young

children, nursing mothers, pregnant women, and women who may become pregnant should be far 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, focus your consumption on species that are likely to be less contaminated. Within a species, keep smaller, younger fish for eating. Younger fish have had less time to accumulate contaminants and eat less contaminated prey/foods than older, larger fish. Contaminants such as mercury and PCB's build up in large predatory fish. Cleaning and cooking your fish properly can reduce your exposure to certain contaminants in fatty fish tissue like PCBs, DDE,

and dieldrin, but not mercury which is distributed throughout the flesh. 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
Lakes west of the Continental Divide	Lake Trout	M	--	--	U	9	6	6	5
		WC	--	--	6	3	2	2	2
Lake McDonald	Lake Whitefish	M	--	--	U	U	--	--	--
		WC	--	--	8	8	--	--	--
St. Mary Lake	Lake Trout	M	--	--	9	9	9	9	--
		WC	--	--	3	3	3	3	--
	Lake Whitefish	M	--	--	U	U	--	--	--
		WC	--	--	8	8	--	--	--
	Burbot	M	--	--	11	11	6	6	--
		WC	--	--	4	4	2	2	--

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