



Catching the Limit

Mercury Contamination of America's Food
North Dakota

HEALTH CARE
WITHOUT
HARM
THE CAMPAIGN FOR
ENVIRONMENTALLY
RESPONSIBLE
HEALTH CARE

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Foreword

Mighty fine view up here at top of the food chain.

You'd think that we humans would do everything in our power to safeguard the bounty we enjoy as a species. Surely among the *last* things we would want to do would be to carelessly toxify, to the point of threatening our own health, the free swimming fish that humankind has forever harvested from the world's rivers, lakes, and seas.

But that is exactly what has happened. Mercury drifts out of incinerator smokestacks when batteries, thermometers and other items are burned, according to an exhaustive new review conducted by the Environmental Protection Agency (EPA) at the request of Congress. And as it settles back onto land and water it begins making its way up the food chain, building in concentration especially in fish.

How bad has it gotten? EPA says that by "disposing" of mercury-bearing products via incineration, we have put more than 1.6 million American women, infants and children at risk of neurological or reproductive problems simply from eating tuna, fish sticks, or a nice mess of fresh-caught bass, or salmon, or trout. Thousands of lakes and streams now carry government fish consumption "advisories" (read "warnings") about mercury. And EWG's analysis of Food and Drug Administration data found mercury in a number of foods other than fish.

It's outrageous. The fault does not lie with people who fish for sport or livelihood, of course. The problem is the failure of society to keep mercury from being disposed in ways that needlessly disperse it into the environment.

In the irony department it is hard to top the unfortunate fact that one of the biggest sources of health-threatening mercury pollution, EPA says, is the health care sector itself. Hospitals and other health care institutions still routinely burn far too much mercury because many of them toss medical devices and batteries into the med waste burn bag.

- EPA and FDA should require states to base fish consumption advisories on the most restrictive threshold available to ensure that populations who eat more than average amounts of fish are protected.
- State agencies should require stricter emissions limits, and waste segregation programs for mercury as part of their implementation plans for the medical waste incinerator rule.
- Medical facilities should begin a “mercury-free” campaign to phase out mercury containing products and segregate mercury waste as long as it remains in use.

The Health Care Without Harm Coalition is prepared to assist hospitals and states by providing expert advice from medical and environmental professionals who have a track record working with hospitals and other medical providers to reduce mercury emissions.

Executive Summary

A long-overdue report to Congress confirms that mercury pollution from power generation and waste incineration is a serious environmental and public health problem. Not only is mercury extremely toxic to the developing human brain and nervous system, but it has become ubiquitous in the environment and commonly contaminates many foods, particularly fish, at levels of public health concern. According to the EPA, more than 1.6 million pregnant women, children, and women of child bearing age are exposed to unsafe levels of mercury from fish alone (EPA 1996).

Mercury gets into the environment primarily from combustion of wastes, including medical and municipal wastes and sludge, and the combustion of coal for power generation. In spite of the nation's clean air and clean water laws, these major sources of mercury remain uncontrolled or poorly regulated. Mercury now contaminates fish so severely that it has triggered more than 1,600 government warnings against eating fish, so-called "fish consumption advisories", in 37 states. Indeed, fish consumption advisories for mercury are on the rise, nearly doubling from 1993 to 1996 (EPA 1997). Nine of those states: Connecticut, Florida, Indiana, Massachusetts, Maine, Michigan, New Hampshire, New Jersey and Vermont have some form of statewide restrictions or prohibitions on fish consumption due to mercury contamination (EPA 1997).

Mercury contaminated fish in North Dakota

The most likely source of human exposure to mercury is through the diet, specifically, through the consumption of fish.

In North Dakota, where recreational fishing contributes at least \$20 million dollars to the economy, a total of 35 different advisories have been posted, all of which are based on mercury contamination (Table 1). These fish advisories for mercury cover 90,309 acres of lake area and 141 river miles in North Dakota.

Since all of the advisories issued were the result of mercury contamination, reducing mercury releases to the environment would go a

long way toward making North Dakota's fish safe to eat again.

Mercury in the food supply

Locally caught fish are not the only sources of mercury. Many fish items purchased at the local grocery store such as canned tuna, haddock, fish sticks and shrimp also contain mercury. Other foods that are sources of mercury include: spinach, oatmeal, and eggs (Table 2). Notably, the EPA's estimate that 1.6 million women and children are at risk does not include consumption of foods other than fish.

Reducing mercury emissions

The EPA report identifies a serious public health problem from mercury in the environment and the food supply. Recent EPA rules to reduce emissions from medical waste incinerators, however, will do virtually nothing to reduce current levels of mercury pollution. In fact, these regulations actually encourage continued burning of mercury containing waste because they do not require separation of mercury containing devices from the waste stream.

Medical sources of mercury are the simplest to eliminate, via cost-effective source separation and substitution of non-mercury-containing products at medical facilities. Mercury-containing devices in the medical waste stream include batteries, thermometers, blood pressure cuffs, fluorescent lamps and feeding tubes. When incinerated, mercury is released into the air, or contained in the resulting ash destined for disposal on land. Mercury from other major sources also can be reduced dramatically with available pollution control technologies.

Recommendations

The EPA report should not cause most people to reduce their consumption of commercially caught fish although pregnant women should take the warnings quite seriously and limit consumption of all fish. The EPA report should serve as a call to arms for industry and government to slash mercury emissions and allow citizens to safely consume this important part of the diet.

- EPA and FDA should require states to base fish consumption advisories on the most restrictive threshold available to ensure that populations who eat more than average amounts of fish are protected.
- State agencies should require stricter emissions limits, and waste segregation programs for mercury as part of their implementation plans for the medical waste incinerator rule.

- Medical facilities should begin a “mercury-free” campaign to phase out mercury containing products and segregate mercury waste as long as it remains in use.

The Health Care Without Harm Coalition is prepared to assist hospitals and states by providing expert advice from medical and environmental professionals who have a track record working with hospitals and other medical providers to reduce mercury emissions.

The Health Effects of Mercury

Mercury is toxic to the human nervous system, causing permanent impairment of speech, hearing, movement, and vision, even when exposures occur at very low doses. Some of the most prominent symptoms include tremors, emotional lability (irritability, shyness, nervousness, and loss of confidence), insomnia, memory loss, neuromuscular changes, and headaches (ATSDR 1997). The most recent studies indicate that low doses during fetal development can cause learning and functional neurologic deficits. Severe effects of higher doses include reproductive and developmental defects, and even death.

The developing nervous systems of the fetus, infants and young children are especially vulnerable to mercury because they are incomplete and growing rapidly. The EPA report identifies pregnant women, children, and women of child-bearing age as high risk populations.

In humans, neuron growth is not complete until 12 months of age, whereas myelination (the formation of a protective fatty sheath around all nerves) is only 50 percent complete at 18 months after birth. Seventy five percent of brain growth occurs during the first two years of life, the remaining 25 percent is not completed until adulthood. Brain size in the newborn is proportionately greater than in adults, making the developing brain a prime target for any neurotoxin (ILSI 1992).

The blood brain barrier, which restricts the penetration of toxicants to the brain, is not fully developed in humans until about one year of age, and it is not known when the barrier becomes fully functional. Connections in the visual system are not fully achieved until three or four years of age (Schlichter 1996). In addition to these critical periods of development, a child is at greater risk than an adult because children eat more food, and are exposed to more mercury, relative to their size, than adults.

Methylmercury can cross the placental barrier and cause brain damage in the developing fetus. Infants born to mothers who were

known to have eaten mercury contaminated foods during their pregnancy have shown nervous system damage even though their mothers were only slightly affected.

Even women who are considering pregnancy in the near future should avoid mercury-containing fish. Methylmercury can reside in the body for months, harming the fetuses of women exposed to mercury before they know they are pregnant. By the time pregnancy is confirmed, the fetus may well have passed many of the critical and vulnerable stages of development.

Fish Advisories Fail to Protect the Public

Three federal agencies, the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the Agency for Toxic Substances and Disease Registry (ATSDR), have established different estimates of a safe level of mercury in the diet based on slightly different risk assessment methods and very different regulatory mandates.

The EPA encourages states to use a risk assessment model that accounts for highly exposed populations within the state, but this is not required. Instead, states are free to choose the federal mercury contamination level at which they see fit to establish local fish advisories. States have the authority to set advisories at lower levels of contamination to protect heavy fish consumers; however, they generally do not issue fish consumption limits or advisories unless fish contamination is severe enough to trigger FDA thresholds. The problem is that none of the levels established by either EPA, FDA, or ATSDR is completely protective of the public health. The FDA standard, which is used by many states, is particularly inappropriate for establishing local fish advisories.

EPA

The EPA has published a safe level of mercury at 0.1 ug/kg body weight per day (IRIS 1997), and is expected to reaffirm this level in its report to Congress. According to the EPA, the average fish consumer in the population is not exposed to levels that exceed this dose. But as the agency itself points out, two major groups within the population are routinely exposed to unsafe levels of mercury in fish. These include:

(1) 1.6 million children and women of child bearing age who are at elevated risk because they regularly eat far more than the average amount of fish. These 1.6 million people include 84,000 pregnant women, 887,000 women of child-bearing age, and 665,000 children (EPA 1996).

(2) An unknown but large number of subsistence fishers and recreational fishers who eat substantially more fish from contaminated wa-

ters than the average person in the population. These people were not even included in the EPA risk assessment.

FDA

The FDA has established 1 part per million (ppm) of mercury as the level at which they will seize fish in interstate commerce as adulterated and unsafe for human consumption. For the average person, this standard translates into about five times the level of mercury exposure allowed by the EPA standard. This standard is specifically designed for the regulation of commercially harvested fish, and is based on the assumption that most of the fish an average person consumes will be contaminated at levels below the 1 ppm standard. The FDA standard is inappropriate for use in local fish consumption advisories because it allows even more people, especially subsistence or recreational fishers, to eat unsafe levels of mercury than allowed by the EPA benchmark.

ATSDR

The Agency for Toxic Substances and Disease Registry (ATSDR) has published a draft mercury standard for public comment that is equivalent to the FDA standard. ATSDR is directed by the national Superfund law to develop a toxicological profile of highly hazardous compounds found at Superfund sites. These toxicological profiles recommend safe exposure levels for hazardous substances like mercury. The ATSDR mercury standard may be revised pending agency review of additional studies and further public comment.

Beyond fish

In fact, the average American's diet contains mercury, regardless of whether they eat fish from local waters where fish advisories are in place. The Food and Drug Administration's Total Diet Study characterized toxics in the diet by sampling store-bought foods that make up the "total diet" of the U.S. population as defined by two nationwide food consumption surveys (FDA 1997).

EWG's analysis of FDA diet data supports EPA's assumption that consumption of commercially harvested fish is the primary source of mercury in the American diet. All of the top 5 foods containing mercury are fish or fish-containing foods (Table 2). These include canned tuna, haddock, tuna-noodle casserole, shrimp, and fish sticks. In each case, at least 75 percent of the samples contained mercury. For canned tuna, 100 percent of the samples contained mercury. Based on the reference dose, a person who eats more than half a can of tuna per day could be at increased risk. Surprisingly, however, other foods containing some of the highest mercury levels are not fish. These include liver, spinach, oatmeal and eggs (Table 2.)

Table 2. Mercury contaminates commercially caught fish and many other foods.

Food	Percent Contaminated	Highest Mercury Contamination Level ug/g (ppm)	Average Mercury Level ug/g (ppm)
Tuna, canned in oil	100	.322	.171
Haddock, pan-cooked	94	.156	.065
Tuna Noodle Casserole	88	.063	.020
Shrimp, boiled	94	.053	.024
Fish Sticks, Frozen, Heat	75	.030	.009
Liver, Beef, Fried	31	.030	.003
Fish Sandwich, Fst Fd	44	.021	.004
Spinach, Fresh/Frozen	31	.018	.002
Oatmeal, Quick (1-3 min)	13	.012	.001
Eggs, fried	6	.010	.001
Eggs, boiled	6	.010	.001
Mushrooms, raw	38	.009	.002
Avocado, raw	38	.009	.001
Eggs, scrambled	13	.009	.001
Crisped Rice Cereal	31	.008	.001

Source: Environmental Working Group. Compiled from FDA Total Diet Study, 1991-1996.

The wide range of mercury containing foods shows that even where no fish advisories are issued, and where rivers, lakes and bays are not heavily contaminated with mercury, this toxic chemical finds its way to the table.

Other sources of uncertainty

The safety of mercury in the food supply depends on a variety of factors including the diet and sensitivity of the consumer, the presence of other toxic chemicals that may act additively, and the minimum level necessary to cause toxic effects. None of these factors are well understood, and thus the effects of mercury in the diet can not be accurately predicted.

In addition, the safe levels for these chemicals when they are present with other chemicals have not been determined. This means that the risks of consuming fish with multiple contaminants may be great, but no mechanism exists to quantify them or to warn the public. Currently, fish advisories cannot be posted due to multiple contaminants in fish unless one of the chemicals exceeds an advisory level.

In many states, fish advisories are not posted.

Clearly, where an advisory has been listed, it should be well posted and strictly obeyed. States like Minnesota and Wisconsin that have posted a large number of advisories should be credited for fulfilling their residents' right-to-know about fish contamination, and not necessarily chastised for the large number of advisories. In other states, however, the agencies may post fewer advisories than necessary, and the public may be eating unsafe fish. The public has no way of knowing whether their state officials are responsibly posting fish advisories.

Federal Rules Do Little to Reduce Mercury Pollution

The Clean Water Act of 1972 envisioned that the nation's waters would be fishable (and swimmable) by 1983. That was nearly fifteen years ago. As of 1994, 57 percent of the nation's estuaries, rivers and streams, 2 percent of the Great Lakes, and 50 percent of other lakes, ponds and reservoirs still do not meet that goal (EPA 1995). Many non-fishable waters, such as the San Francisco Bay and the Great Lakes, are in areas where people continue to fish to feed their families, or places where the inability to do so limits their ability to provide food or to recreate (SSFBA 1997).

Most of the mercury contaminating America's waters is deposited from the air. According to the draft EPA Report to Congress, waste incinerators (municipal waste combustors, and medical waste incinerators) and coal-burning power plants make up the bulk of the mercury load to the environment.

While EPA acknowledges both the threat and the sources, the Agency has passed up numerous opportunities to clean up this pollution. No better example exists than the recent rule defining maximum achievable control technology (MACT) for medical waste incinerators. At a time when EPA could have all but stopped mercury releases from these facilities, they settled instead for minimal controls that will cost many hospitals that incinerate their waste hundreds of thousands of dollars, without solving the mercury problem.

Many diverse organizations have told EPA that the mercury limits in the MACT rule are far too high. The State of New Jersey's Department of Environmental Protection commented to EPA:

"NJDEP believes this is a needlessly high standard. Much lower mercury emission levels can be achieved with simple mercury waste separation" (NJDEP 1997).

And the Natural Resources Defense Council believes the MACT rule to be illegal due to the high limits which do not conform with the intent of the Clean Air Act. This, however, will be decided by the courts, as NRDC and the Sierra Club have filed suit on the matter.

As a result of EPA's failure to regulate mercury emissions, in spite of its stated concern for mercury in the environment, the solution to the medical mercury problem lies in the hands of the states and America's hospitals, clinics, and other medical service providers.

What a Hospital Can Do

Hospitals should begin mercury segregation programs, whereby mercury is collected, rather than being disposed of in either regular trash or in red-bagged "infectious" wastes. The mercury can then be recycled, or disposed of as hazardous waste, thus avoiding the medical waste or municipal waste incinerator. Recycling the mercury is the most environmentally sound practice, since landfilled mercury and used mercury-containing products can still lead to mercury releases to the environment.

In New Jersey, mercury segregation programs have cut mercury emissions from some hospital incinerators significantly. Those that practice source separation release as much as 900 times less mercury than those that do not segregate. Clearly, if source separation was practiced routinely across the country, medical waste incinerators could become an insignificant source of mercury to the environment. According to the state of New Jersey:

"It is clear from actual test data, that mercury waste separation has far better success in controlling mercury emissions than add on controls" (NJDEP 1997).

Another solution to the mercury problem is to minimize its use at the source. Virtually every mercury-containing product used in a hospital has a mercury-free alternative (MERC 1996). Products such as thermometers, batteries, dental amalgams, esophageal devices, lamps, and others can be made without mercury. The use of these alternative products simplifies the mercury segregation process and reduces the risks of mercury in the environment. Costs of clean-up, storage and disposal of mercury and hazardous waste trainings can be alleviated when mercury is phased out.

While the EPA did not require hospitals to conduct source separation or mercury phase-out programs, the state of New Jersey has learned that requiring such programs is a win-win proposition for the hospitals, their staffs, and the environment. Emissions from medical waste incinerators in New Jersey where facilities are segregating mercury range from 1.8 to 88 ug/dscm (significantly below EPA's new standard of 550 ug/dscm) while those without source segregation release nearly 100 fold more, ranging from 110 to 1916 ug/dscm (NJDEP 1997). For comparison, New Jersey requires municipal incinerators to emit less than 65 ug/dscm.

State Implementation of the Medical Waste Incineration Rule

State agencies will be required to design plans to implement the MACT rule. The EPA's Mercury Report to Congress gives a clear message that such state-level programs are sorely needed. This is especially true due to the leniency of the federal MACT rule. State programs can include additional or varied elements, as long as they are at least as stringent as the federal rule.

States should consider setting stronger emissions limits, and requiring 1) continuous monitoring for some pollutants, 2) source segregation of mercury wastes, and 3) implementation of waste management plans. The experience in New Jersey shows that state programs can easily reduce mercury emissions to levels even lower than EPA guidelines. New Jersey medical facilities practicing mercury segregation are meeting the emissions requirements for municipal waste combustors, which are nearly 10 times stricter than the federal medical waste emissions limits for mercury.

Other states already require medical facilities to implement pollution prevention plans. For example, Wisconsin's Medical Waste Rules require generators of medical waste to set waste reduction goals, prepare and implement medical waste reduction programs, and examine alternatives to using disposable items. If source segregation were part of a facility's waste reduction program, stricter emissions for mercury could be met easily.

The Institute for Clean Air Companies has recommended that continuous monitoring of emissions is necessary, because the requirements for maintaining certain "operating parameters" are not sufficient to insure adequate combustion. As a result the Institute has suggested that state rules should require continuous emissions monitoring for some pollutants to ensure that MACT limits are met (ICAC 1997).

Summary

States like Wisconsin and New Jersey that have taken the lead in regulating medical facilities have begun to address the most preventable source of mercury emissions to the environment. However, mercury pollution does not recognize state boundaries. To alleviate fish advisories, and allow the public to fish without fear of contamination, mercury emissions will need to be reduced nationally.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological Profile for Mercury. Draft for Public Comment. August, 1997.

Institute for Clean Air Companies (ICAC). 1997. Air Emissions Monitoring for Safe and Efficient Medical Waste Incinerator Operation. September, 1997.

ILSI, 1992. Similarities and Differences between Children and Adults: Implications for Risk Assessment. P. Guzelian, C. Henry, S. Olin, eds. ILSI Press, Washington, DC.

Mercury Elimination and Reduction Challenge (MERC). 1996. Mercury in the Health Care Sector: The Cost of Alternative Products. November, 1996.

New Jersey Department of Environmental Protection (NJDEP). 1997. Letter from William O'Sullivan, Administrator of the Air Quality Permitting Program, Re: Proposed New Source Performance Standards and Emissions Guidelines for Medical Waste Incinerators, to Fred Porter, EPA. July 7, 1997.

Save San Francisco Bay Association (SSFBA). 1997. Fishing for Food in San Francisco Bay: Part II. An environmental health and safety report from Save San Francisco Bay Association.

Schilter, B., A. G. Renwick, and A.C. Huggett. 1996. Limits for Pesticide Residues in Infant Foods: A Safety-Based Proposal. *Regulatory Toxicology and Pharmacology*, 24:126-140.

U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. 1993. 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Government Printing Office, Washington, DC, 1993.

U.S. Environmental Protection Agency. 1995. National Water Quality Inventory. 1994 Report to Congress. Office of Water. EPA841-R-95-005. December 1995.

U.S. Environmental Protection Agency. 1996. Mercury Study Report to Congress. Volume 1: Executive Summary. SAB Review Draft. EPA-452/R-96-001a. June 1996.

U.S. Environmental Protection Agency. 1997. National Listing of Fish Consumption Advisories Database version 2.1. Office of Science and Technology. EPA-823-C-96-011.

U.S. Food and Drug Administration. (1997). Total Diet Study Database, 1991-1996.



Table1: Fish Advisories Due to Mercury Contamination in North Dakota

Total revenues generated by recreational fishing in North Dakota: \$20,872,000

Total number of advisories due to mercury in 1996: 35

Total number of advisories due to all chemicals in 1996: 35

Total number of river miles under mercury advisory: 141

Total number of lake acres under mercury advisory: 90,309

Location	Species	Population
Blacktail Dam	Walleye < 20"	Restricted Consumption/Populations at Risk* **
Bowman-haley Dam	Walleye	Restricted Consumption/Populations at Risk* **
Braddock Dam	Walleye < 21"	Restricted Consumption/Populations at Risk* **
Brewer Lake	Bass-largemouth < 15"	Restricted Consumption/Populations at Risk* **
	Bass-smallmouth < 13"	Restricted Consumption/Populations at Risk* **
	Walleye < 19"	Restricted Consumption/Populations at Risk* **
	Walleye > 21"	Restricted Consumption/All Consumers**
Devils Lake: (44,260 Acres)	Pike-northern > 33"	No Consumption/Populations at Risk*
	Walleye > 21"	No Consumption/Populations at Risk*
	Walleye < 21"	Restricted Consumption/Populations at Risk* **
	Pike-northern < 33"	Restricted Consumption/Populations at Risk* **
	Bass-white < 15"	Restricted Consumption/Populations at Risk* **
	Bass-white > 15"	No Consumption/Populations at Risk*
	Bass-white >15"	Restricted Consumption/All Consumers**
	Pike-northern > 33"	Restricted Consumption/All Consumers**
East Park Lake	Walleye < 20"	Restricted Consumption/Populations at Risk* **
	Walleye > 20"	Restricted Consumption/All Consumers**
	Walleye > 20"	No Consumption/Populations at Risk*
	Pike-northern < 30"	Restricted Consumption/Populations at Risk* **
Epping-springbrook Dam	Pike-northern < 13"	Restricted Consumption/Populations at Risk* **
	Pike-northern < 13"	Restricted Consumption/Populations at Risk* **
	Pike-northern < 13"	Restricted Consumption/Populations at Risk* **
Fordville Dam	Pike-northern < 31"	Restricted Consumption/Populations at Risk* **
	Walleye < 21"	Restricted Consumption/Populations at Risk* **

* Populations at risk include children, pregnant women and women of child-bearing age (EPA 1996).

** Limited Consumption indicates that the quantity and frequency of consumption should be restricted (e.g.; maximum of one meal per month).

Source: Environmental Working Group. Based on data from EPA's Fish Consumption Advisory Database Economic value of recreational fishing based on the U.S. Department of the Interior, Fish and Wildlife Service, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Location	Species	Population
Hechers Lake	Walleye < 20"	Restricted Consumption/Populations at Risk* **
	Walleye > 20"	No Consumption/Populations at Risk*
	Walleye > 20"	Restricted Consumption/All Consumers**
Indian Creek Dam	Pike-northern < 30"	Restricted Consumption/Populations at Risk* **
	Walleye < 16"	Restricted Consumption/Populations at Risk* **
	Walleye < 16"	Restricted Consumption/Populations at Risk* **
Jamestown Reservoir: (2,086 Acres)	Walleye < 16"	Restricted Consumption/Populations at Risk* **
	Crappie-black < 10"	Restricted Consumption/Populations at Risk* **
	Buffalo-bigmouth < 23"	Restricted Consumption/Populations at Risk* **
	Carp-common < 20"	Restricted Consumption/Populations at Risk* **
	Buffalo-bigmouth < 23"	Restricted Consumption/All Consumers**
	Pike-northern < 32"	Restricted Consumption/Populations at Risk* **
Kolding Dam	Crappie-white < 10"	Restricted Consumption/Populations at Risk* **
Kulm -edgeley Dam	Trout-rainbow < 17"	Restricted Consumption/Populations at Risk* **
	Walleye < 9"	Restricted Consumption/Populations at Risk* **
Lake Ashtabula: (5,430 Acres)	Pike-northern < 27"	Restricted Consumption/Populations at Risk* **
	Pike-northern > 33"	No Consumption/Populations at Risk*
	Perch-yellow < 10"	Restricted Consumption/Populations at Risk* **
	Walleye > 21"	No Consumption/Populations at Risk*
	Walleye > 21"	Restricted Consumption/All Consumers**
	Walleye < 21"	Restricted Consumption/Populations at Risk* **
	Sucker-white < 20"	Restricted Consumption/All Consumers**
	Sucker-white < 20"	Restricted Consumption/Populations at Risk* **
	Bass-white < 15"	Restricted Consumption/Populations at Risk* **
	Perch-yellow < 10"	Restricted Consumption/All Consumers**
	Bass-white < 15"	Restricted Consumption/All Consumers**
	Catfish-bullhead-brown < 12"	Restricted Consumption/All Consumers**
	Catfish-bullhead-brown < 12"	Restricted Consumption/Populations at Risk* **
	Pike-northern > 33"	Restricted Consumption/All Consumers**
	Pike-northern < 33"	Restricted Consumption/Populations at Risk* **
Lake Audubon: (20,000 Acres)	Carp-common < 28"	Restricted Consumption/Populations at Risk* **
	Carp-common < 28"	Restricted Consumption/All Consumers**
	Perch-yellow < 11"	Restricted Consumption/Populations at Risk* **
	Perch-yellow < 11"	Restricted Consumption/All Consumers**
Lake Darling: (9,458 Acres)	Perch-yellow < 13"	Restricted Consumption/All Consumers**
	Walleye < 21"	Restricted Consumption/All Consumers**
	Walleye < 21"	Restricted Consumption/Populations at Risk* **
	Sucker-white < 21"	Restricted Consumption/All Consumers**
	Sucker-white < 21"	Restricted Consumption/Populations at Risk* **
Pike-northern < 28"	Restricted Consumption/Populations at Risk* **	

* Populations at risk include children, pregnant women and women of child-bearing age (EPA 1996).

** Limited Consumption indicates that the quantity and frequency of consumption should be restricted (e.g.; maximum of one meal per month).

Source: *Environmental Working Group. Based on data from EPA's Fish Consumption Advisory Database Economic value of recreational fishing based on the U.S. Department of the Interior, Fish and Wildlife Service, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*

Location	Species	Population	
Lake Holmes	Perch-yellow < 13"	Restricted Consumption/Populations at Risk* **	
	Pike-northern < 28"	Restricted Consumption/All Consumers**	
	Trout-rainbow < 13"	Restricted Consumption/Populations at Risk* **	
Lake La Moure	Trout-brown < 18"	Restricted Consumption/Populations at Risk* **	
	Pike-northern < 16"	Restricted Consumption/Populations at Risk* **	
	Walleye < 21"	Restricted Consumption/Populations at Risk* **	
	Walleye > 21"	No Consumption/Populations at Risk*	
Lake Metigoshe	Walleye > 21"	Restricted Consumption/All Consumers**	
	Crappie-black < 9"	Restricted Consumption/Populations at Risk* **	
Lake Sakakawea	Pike-northern < 25"	Restricted Consumption/Populations at Risk* **	
	Sucker-white < 16"	Restricted Consumption/All Consumers**	
	Catfish-channel < 22"	Restricted Consumption/All Consumers**	
	Pike-northern > 33"	Restricted Consumption/All Consumers**	
	Pike-northern < 33"	Restricted Consumption/Populations at Risk* **	
	Pike-northern > 33"	No Consumption/Populations at Risk*	
	Sauger < 22"	Restricted Consumption/Populations at Risk* **	
	Sucker-white < 16"	Restricted Consumption/Populations at Risk* **	
	Sauger < 22"	Restricted Consumption/All Consumers**	
	Perch-yellow < 8"	Restricted Consumption/Populations at Risk* **	
	Goldeye < 13"	Restricted Consumption/Populations at Risk* **	
	Catfish-channel < 23"	Restricted Consumption/Populations at Risk* **	
	Carp-common < 20"	Restricted Consumption/All Consumers**	
	Carp-common < 20"	Restricted Consumption/Populations at Risk* **	
	Bass-white < 11"	Restricted Consumption/All Consumers**	
	Bass-white < 11"	Restricted Consumption/Populations at Risk* **	
	Goldeye < 13"	Restricted Consumption/All Consumers**	
	Perch-yellow < 8"	Restricted Consumption/All Consumers**	
	Lake Tschida: (5,018 Acres)	Walleye > 25"	No Consumption/Populations at Risk*
		Perch-yellow < 12"	Restricted Consumption/Populations at Risk* **
Sucker-white < 13"		Restricted Consumption/All Consumers**	
Sucker-white < 13"		Restricted Consumption/Populations at Risk* **	
Pike-northern < 31"		Restricted Consumption/All Consumers**	
Pike-northern < 31"		Restricted Consumption/Populations at Risk* **	
Carp-common < 24"		Restricted Consumption/All Consumers**	
Carp-common < 24"		Restricted Consumption/Populations at Risk* **	
Perch-yellow < 12"		Restricted Consumption/All Consumers**	
Walleye < 25"		Restricted Consumption/Populations at Risk* **	
Goldeye < 16"		Restricted Consumption/All Consumers**	
Goldeye < 16"		Restricted Consumption/Populations at Risk* **	
Catfish-channel < 22"		Restricted Consumption/All Consumers**	
Catfish-channel < 22"		Restricted Consumption/Populations at Risk* **	
Carp-sucker-river < 14"		Restricted Consumption/All Consumers**	

* Populations at risk include children, pregnant women and women of child-bearing age (EPA 1996).

** Limited Consumption indicates that the quantity and frequency of consumption should be restricted (e.g.; maximum of one meal per month).

Source: Environmental Working Group. Based on data from EPA's Fish Consumption Advisory Database
Economic value of recreational fishing based on the U.S. Department of the Interior, Fish and Wildlife Service,
1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Location	Species	Population
	Carp-sucker-river < 14"	Restricted Consumption/Populations at Risk* **
	Bass-white < 14"	Restricted Consumption/Populations at Risk* **
	Walleye > 25"	Restricted Consumption/All Consumers**
	Bass-white < 14"	Restricted Consumption/All Consumers**
Mcgregor Dam	Walleye < 24"	Restricted Consumption/Populations at Risk* **
Mcville Dam	Pike-northern < 36"	Restricted Consumption/Populations at Risk* **
Missouri River: At Stanton	Pike-northern < 33"	Restricted Consumption/Populations at Risk* **
	Pike-northern < 33"	Restricted Consumption/All Consumers**
	Sauger < 18"	Restricted Consumption/Populations at Risk* **
	Sauger < 18"	Restricted Consumption/All Consumers**
	Walleye < 19"	Restricted Consumption/Populations at Risk* **
	Walleye < 19"	Restricted Consumption/All Consumers**
	Paddlefish < 69"	Restricted Consumption/Populations at Risk* **
	Paddlefish < 69"	Restricted Consumption/All Consumers**
Mount Carmel Dam	Walleye < 20"	Restricted Consumption/Populations at Risk* **
Nelson Lake	Bass-largemouth < 22"	Restricted Consumption/Populations at Risk* **
New Johns Lake	Walleye > 20"	Restricted Consumption/All Consumers**
	Walleye < 20"	Restricted Consumption/Populations at Risk* **
	Walleye > 20"	No Consumption/Populations at Risk*
	Pike-northern < 30"	Restricted Consumption/Populations at Risk* **
Pheasant Lake	Walleye > 15"	Restricted Consumption/All Consumers**
	Walleye < 15"	Restricted Consumption/Populations at Risk* **
	Walleye > 15"	No Consumption/Populations at Risk*
Pipestem Reservoir: (892 Acres)	Walleye < 22"	Restricted Consumption/Populations at Risk* **
	Perch-yellow < 9"	Restricted Consumption/Populations at Risk* **
	Walleye > 22"	Restricted Consumption/All Consumers**
	Perch-yellow < 9"	Restricted Consumption/All Consumers**
	Carp-common < 17"	Restricted Consumption/All Consumers**
	Sunfish-bluegill < 9"	Restricted Consumption/Populations at Risk* **
	Crappie-black < 10"	Restricted Consumption/All Consumers**
	Carp-common < 17"	Restricted Consumption/Populations at Risk* **
	Crappie-black < 10"	Restricted Consumption/Populations at Risk* **
	Walleye > 22"	No Consumption/Populations at Risk*
	Sunfish-bluegill < 9"	Restricted Consumption/All Consumers**
	Crappie-white < 10"	Restricted Consumption/Populations at Risk* **
	Crappie-white < 10"	Restricted Consumption/All Consumers**
Red River: Wahpeton To Grand Forks	Walleye < 17"	Restricted Consumption/Populations at Risk* **
	Catfish-channel < 22"	Restricted Consumption/Populations at Risk* **
	Walleye < 17"	Restricted Consumption/All Consumers**
	Catfish-channel > 22"	Restricted Consumption/All Consumers**
	Catfish-channel > 22"	No Consumption/Populations at Risk*
Silver Lake	Walleye < 10"	Restricted Consumption/Populations at Risk* **

* Populations at risk include children, pregnant women and women of child-bearing age (EPA 1996).

** Limited Consumption indicates that the quantity and frequency of consumption should be restricted (e.g.; maximum of one meal per month).

Source: *Environmental Working Group. Based on data from EPA's Fish Consumption Advisory Database Economic value of recreational fishing based on the U.S. Department of the Interior, Fish and Wildlife Service, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*

Location	Species	Population
Spiritwood Lake: (412.4 Acres)	Walleye > 20"	Restricted Consumption/All Consumers**
	Walleye < 20"	Restricted Consumption/Populations at Risk* **
	Perch-yellow < 10"	Restricted Consumption/All Consumers**
	Perch-yellow < 10"	Restricted Consumption/Populations at Risk* **
	Bass-smallmouth < 17"	Restricted Consumption/All Consumers**
	Bass-smallmouth < 17"	Restricted Consumption/Populations at Risk* **
Sweetbriar Dam	Walleye > 20"	No Consumption/Populations at Risk*
	Walleye < 17"	Restricted Consumption/Populations at Risk* **
Tolna Dam	Walleye < 20"	Restricted Consumption/Populations at Risk* **
West Park Lake	Pike-northern < 30"	Restricted Consumption/Populations at Risk* **
	Walleye < 20"	Restricted Consumption/Populations at Risk* **
	Walleye > 20"	Restricted Consumption/All Consumers**
	Walleye > 20"	No Consumption/Populations at Risk*

* Populations at risk include children, pregnant women and women of child-bearing age (EPA 1996).

** Limited Consumption indicates that the quantity and frequency of consumption should be restricted (e.g.; maximum of one meal per month).

Source: *Environmental Working Group. Based on data from EPA's Fish Consumption Advisory Database Economic value of recreational fishing based on the U.S. Department of the Interior, Fish and Wildlife Service, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*