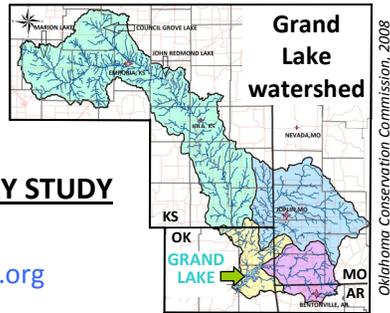




LEARN MORE



GRAND LAKE WATERSHED MERCURY STUDY

Our study website

<http://www.grandlakemercurystudy.org>

“What’s in your fish?” fact sheet

http://www.grandlakemercurystudy.org/Whats_In_Your_Fish.pdf

FISH CONSUMPTION ADVISORIES

Tar Creek Area and Grand Lake (zinc, lead and cadmium)

<http://www.deq.state.ok.us/2007TCFishReport.pdf>

State of Oklahoma

<http://www.deq.state.ok.us/csdnew/fish/index.htm>

National fish and shellfish advisory information

<http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories>

MERCURY, HEALTH, AND THE ENVIRONMENT

Oklahoma Department of Environmental Quality (ODEQ)

<http://www.deq.state.ok.us/factsheets/customer/Mercury.pdf>

U.S. Environmental Protection Agency (EPA)

<http://www.epa.gov/hg/>

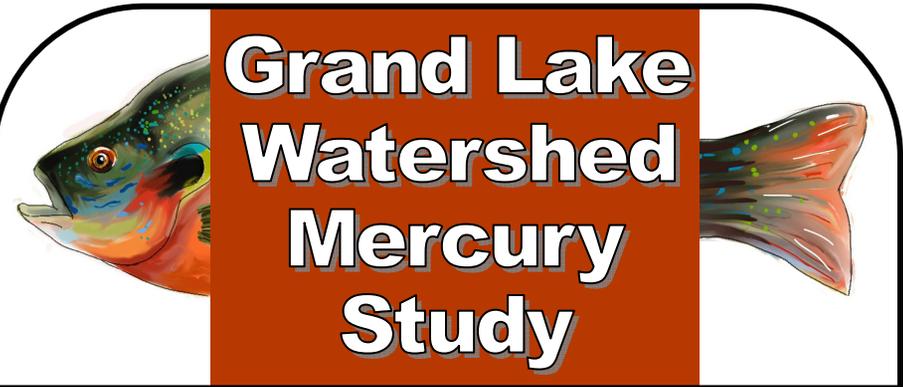
Agency for Toxic Substances and Disease Registry (ATSDR)

<http://www.atsdr.cdc.gov/toxprofiles/tp46-c1.pdf>

COMMENTS? QUESTIONS?

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OUR RESEARCH QUESTIONS

- Do fish caught in the Grand Lake watershed contain mercury levels of concern?
- Are people who eat fish from the watershed exposed to high levels of mercury in their diet?
- How much and what type of local fish is eaten by people living in the watershed?
- Where does the mercury in the diet of people living in the watershed come from?

WHAT WE DID

- Tested mercury levels in fish from Grand Lake watershed.
- Tested mercury exposure and evaluated fish consumption among people who eat fish from the watershed.

THIS BROCHURE

This brochure is designed to present our main study findings and to provide general information about mercury, health, and the environment.

This study was conducted by Harvard School of Public Health, LEAD Agency and OU Health Sciences Center and funded by the National Institute of Environmental Health Sciences, grant number 1R21ES017941.

Version date: 5-20-13



OUR STUDY FINDINGS: FISH

Do fish caught in the Grand Lake watershed contain mercury* levels of concern?

We tested over 1,100 fish from the Grand Lake watershed and Lake Hudson, including over 25 species of fish. In general, the fish we tested did not have high levels of mercury. However, 3% of the fish we tested did exceed EPA's guideline of 300 parts per billion for women of childbearing age and children. These included flathead catfish, drum, largemouth bass and blue catfish.

Are there any fishing locations I should avoid because of high mercury content in the fish?

No, our study does not show that any locations in the watershed should be avoided because of high mercury levels in the fish. Most of the fish with high mercury levels were caught in the Neosho River. In particular, flathead over 40 inches and drum over 20 inches from the Neosho River tended to be high in mercury.

Which fish had the highest levels of mercury?

Flathead catfish, drum, largemouth bass, and blue catfish had the highest levels of mercury. Crappie, sunfish, spoonbill, white bass, channel catfish, and smallmouth buffalo had lower mercury. In general, longer fish and fish higher on the food chain tended to have more mercury. People concerned about mercury exposure may want to select fish with lower mercury or eat smaller fish. See pages 6 and 7 and the "Learn More" section on Page 12.

***PLEASE NOTE:** Most mercury in fish is in a form called methylmercury, which is the form of greatest concern for health. In this brochure, we will use the word "mercury" instead of methylmercury when we describe mercury in fish.



WHAT CAN I DO?

What can I do to prevent mercury pollution?

We can all take steps to reduce mercury emissions into the environment. Here are some examples:

- *Properly dispose of compact fluorescent light bulbs and old thermometers and thermostats.*
- *Reduce your household's energy consumption.*
- *Support legislation to reduce mercury emissions.*

What can I do to protect Grand Lake?

Residents who live near Grand Lake can take steps to protect water quality in Grand Lake and its tributaries:

- *Don't flush unused medications or hazardous waste.*
- *Avoid detergents and fertilizers with phosphorus.*
- *Properly maintain your septic system.*
- *Support efforts to preserve open space and prevent pollution.*
- *Join a local watershed group.*

Who can I contact for more information?

Recycling and household hazardous waste drop-off locations

- *City of Miami Recycling Centers: 1117 Veterans Boulevard and 206 D Street NE, 918-542-6685 (no hazardous waste)*
- *City of Joplin: 1310 W A Street, 417-624-0820*
- *Labette County: 1912 4th Street, Oswego, 620-421-4350*
- *Or, call your Tribal Environmental Department*

Compact fluorescent light bulb (CFL) recycling

- *Lowe's in Grove, Joplin, and Neosho*
- *Home Depot in Joplin*



CFLs save energy, but they can have trace amounts of mercury



PROTECTING GRAND LAKE

What can the Grand Lake Watershed Mercury Study teach us in the long run?

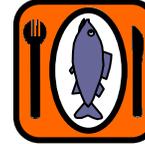
The mercury levels in commonly-consumed fish were generally low. However, there are other potential threats to the watershed from nutrients, such as phosphorus, and other types of pollution. We learned that the watershed is a valuable resource, and that if we protect it from pollution, it will provide us with healthy fish for years to come.

Is the release of mercury from coal-fired power plants regulated?

The EPA regulates power plant emissions by setting emissions standards. Standards for new coal- and oil-fired plants that were established by the Mercury and Air Toxics Standards (MATS) took effect in March 2013. Power plants that are currently in operation will have up to four years to comply with MATS. Nationwide, the new standards are expected to reduce mercury emissions from coal-fired electricity generating units by 90%.

What is the Grand River Dam Authority (GRDA) doing to reduce mercury emissions into the environment?

In 2011, GRDA voluntarily implemented new technology to reduce mercury emissions from its coal-fired generators by 50%. One GRDA facility is the only coal plant in the state with a scrubber device to remove sulfur dioxide gas. GRDA is installing new burners to reduce emissions of nitrogen dioxide. GRDA continues to fully cooperate with EPA and OK Department of Environmental Quality in meeting all new safety and health standards.



OUR STUDY FINDINGS: FISH CONSUMPTION

Are people who eat fish from the Grand Lake watershed exposed to high levels of mercury?

No, only around 5% of the people who ate fish from the Grand Lake watershed and participated in our study had mercury levels in hair that exceeded 1 part per million (ppm). This guideline was developed to protect unborn and young children. Our findings are consistent with other studies that show around 5% of the U.S. population has hair mercury levels above the guideline.

How much and what types of local fish are eaten by residents who live near the watershed?

We found that 84% of our study participants ate fish at least 2 to 3 times per month, and 16% ate fish at least 2 to 3 times per week. On average, our participants ate 1.8 ounces of fish per day, compared to the consumption rate of the general U.S. population of 0.7 ounces per day. Thus, the participants in our study reported eating around twice as much fish as the general U.S. population.

Our participants fished throughout Grand Lake, Lake Hudson, and the Neosho River. The most frequently eaten local fish were catfish, crappie, and bass. The most frequently eaten saltwater fish were tuna, shrimp and salmon.

Where does most of the mercury in the diet of people living in the Grand Lake watershed come from?

Our results suggest that among people who regularly ate fish from the Grand Lake watershed, just over half of the mercury in their diet came from local fish, mainly catfish and bass. Around 40% came from saltwater fish, mainly from store-bought tuna.



MAKING FISH A HEALTHY CHOICE

What are the guidelines for fish consumption?

The U.S. Environmental Protection Agency (EPA) recommends that women of childbearing age and children who eat 2 to 3 servings of local fish a month should select fish with less than 300 parts per billion of methylmercury. The EPA has not developed any guidelines for the general population. The Oklahoma Department of Environmental Quality (ODEQ) set a guideline of 500 parts per billion for women of childbearing age and children and 1000 parts per billion for the general population. ODEQ's guideline estimates that people eat 2 fish servings a month and does not take into account the saltwater fish in people's diet.

What is a serving size of fish?

The number of servings of fish recommended each month depends on the amount of mercury in the fish. A serving is about the size of one's hand. For a 150 pound adult, a serving is around 8 ounces; for a child, a serving is around 4 ounces.

How can I follow EPA guidelines when eating fish from the Grand Lake watershed?

Around 97% of the fish samples we tested did not exceed the EPA's guideline for women of childbearing age and children of 300 parts per billion of methylmercury. According to the EPA, this means that these populations can safely eat two to three portions of Grand Lake watershed fish per month.

3% of the fish we tested had mercury above 300 parts per billion. They included flathead catfish, largemouth bass, drum, and blue catfish. Eating younger, shorter fish of these species can reduce the mercury in your diet. See pages 6 and 7 for more information.



MERCURY AND OUR HEALTH

What are the health effects of methylmercury?

Methylmercury can harm the brain, heart, kidneys, lungs and immune system. In unborn children, nursing infants, and children, methylmercury can affect brain development, motor skills, and learning. In adults, methylmercury can cause movement disorders, such as impaired walking and problems with speech and vision.

What happens to the methylmercury in our bodies?

Methylmercury that enters our bodies from eating fish or shellfish is absorbed into the bloodstream. It circulates throughout the body and can end up in various organs, including the brain. Methylmercury can also pass from pregnant women to unborn children, whose brains are especially sensitive to methylmercury. It also can be passed along to infants through breastmilk. For these reasons, many fish advisories are specifically directed toward women who are, or may become, pregnant.

How long does methylmercury stay in our bodies?

Methylmercury is excreted over time; generally half of what was in our bodies is gone within 45-70 days. However, it may remain longer in some organs in the body. For instance, methylmercury in the brain can be converted to other forms of mercury that can remain for a long time (because they are essentially "trapped").

Some methylmercury ends up in our hair, and the level in our hair is a good indication of the level in our blood. That is why we can use hair as a measure of how much methylmercury a person is exposed to.



MERCURY IN THE ENVIRONMENT

What are the potential sources of mercury in the Grand Lake watershed?

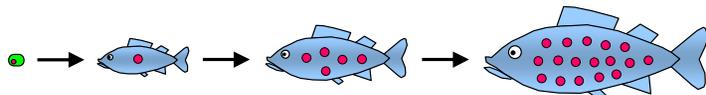
Mercury occurs naturally in the environment - in water, soil, rocks and air. Human activities, such as burning coal in coal-fired power plants, incinerating waste, and using cement kilns, have released large amounts of mercury into the atmosphere. Some of this mercury will fall on land within tens or hundreds of miles from a power plant, incinerator, or cement kiln. There are six coal-fired power plants within a 60-mile radius of the Grand Lake. Mercury can also come from other regions of the U.S. and other countries.

Where does methylmercury come from?

The mercury in the environment is converted to methylmercury by bacteria that live in soils and sediments, especially where dissolved oxygen levels are low, such as in wetlands.

How does methylmercury get into fish?

Plants, algae, and microscopic organisms found in wetlands, lakes, and rivers can absorb methylmercury from the water and sediments. Methylmercury ends up in the tissues of insects, fish, and other small animals that eat these plants. As bigger fish eat smaller fish – a process that continues up the food chain – the methylmercury accumulates in larger fish. Fish that are higher on the food chain, such as largemouth bass and flathead catfish, tend to have higher levels of methylmercury in their bodies than fish and other organisms that are lower on the food chain.



MAKING FISH A HEALTHY CHOICE (continued)

What about saltwater fish?

Around 40% of the fish consumed by our participants was saltwater (marine) fish. Studies have found that large saltwater fish contain higher levels of mercury. According to the EPA, saltwater fish to avoid are shark, swordfish, king mackerel, and tilefish. The EPA lists shrimp, canned light tuna, salmon, and pollock as commonly-eaten saltwater fish low in mercury.

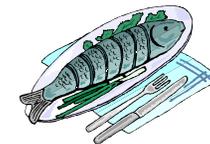


BENEFITS OF EATING FISH

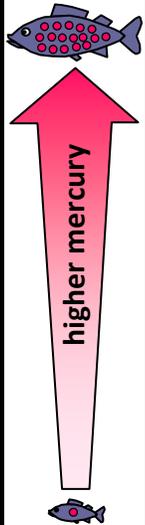
What are the benefits of eating fish?

Fish are a very healthy food. The American Heart Association recommends eating fish at least twice a week. Fish are generally low in fat and are an excellent source of protein and other nutrients. Some fish provide omega-3 fatty acids, which are needed by our bodies and are thought to protect against heart disease and to promote development of the brain and eye.

Eating fish is good for you as long as the fish do not contain unsafe levels of mercury. Eating less fried fish will lower your fat intake. Local fish consumption advisories from the Department of Environmental Quality (ODEQ) provide general recommendations. See the “Learn More” section for links to ODEQ guidelines.



Mercury levels in Grand Lake watershed fish



	Average amount of mercury in one 8-ounce serving (in micrograms)	How often can women of childbearing age and children eat 8-ounce servings of this fish and stay below EPA's guideline?		
		50 lbs	150 lbs	200 lbs
flathead catfish				
30" or longer	59	once a month	twice a month	once a week
under 30"	38	once a month	once a week	once a week
drum	29	twice a month	once a week	twice a week
largemouth bass	18	twice a month	twice a week	twice a week
blue catfish	13	once a week	twice a week	4 times a week
smallmouth buffalo	11	once a week	4 times a week	4 times a week
channel catfish	11			
white bass	11			
spoonbill	9			
sunfish	7	twice a week	4 times a week	once a day
crappie	6	twice a week	once a day	once a day

ADD IT UP!



Rule of thumb for women of childbearing age and children:

According to EPA's guideline, take your weight in pounds, and that tells you how many micrograms of mercury you can have each month from local fish.

Then use the numbers above to figure out how many servings of these fish you can have and stay below the guideline.



I weigh 150 lbs, so I can have 150 micrograms of mercury each month and stay below EPA's guideline for women of childbearing age and kids.

That means each month I can eat up to 25 servings of crappie (25 x 6 = 150)...

...or, 4 servings of largemouth bass and 6 servings of blue catfish (that adds up to 150 too!)

What does EPA's guideline mean?

EPA developed a guideline for mercury intake intended to protect **women of childbearing age and children**. Unborn and young children are most sensitive to mercury.

There is currently no EPA guideline for men and older women.

Size matters!



For most types of fish, size matters: *longer fish generally have higher mercury*. Fish higher on the food chain tend to have higher mercury too.

Tip: Eat smaller fish. Fish lower on the food chain can reduce the amount of mercury in your diet.

What about Lake Hudson? We tested over 200 fish from Lake Hudson. All of these fish had mercury levels below the EPA guideline for children and women of childbearing age. We did not test any flathead catfish from Lake Hudson.