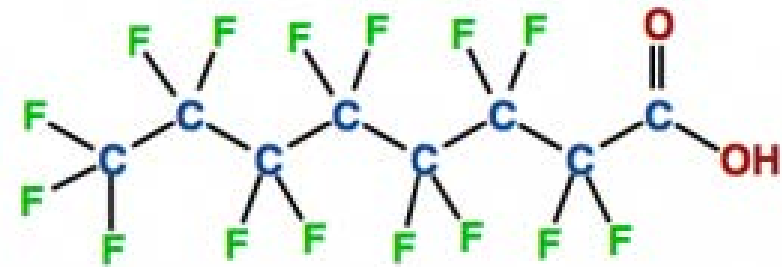




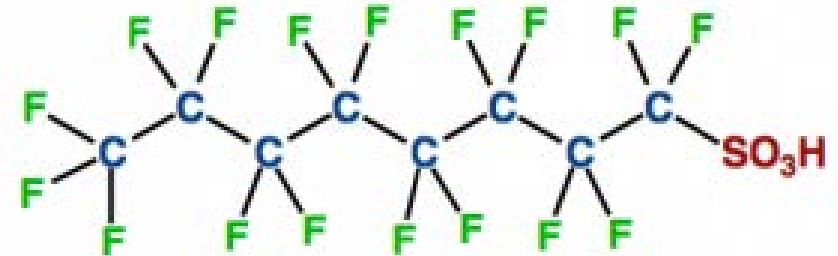
# Michigan Department of Health and Human Services (MDHHS)

# PFAS

- ▶ *Per-* and *poly-* fluoroalkyl substances
- ▶ Synthetic class of compounds
- ▶ About 3000 chemicals
- ▶ Well studied – PFOA and PFOS
- ▶ PFOA – perfluorooctanoic acid
  - manufactured starting in 1947 and phased out by 2015
- ▶ PFOS – perfluorooctane sulfonate
  - manufactured from 1949 – 2002



PFOA - perfluorooctanoic acid



PFOS - perfluorooctanesulfonic acid





**Semiconductor  
Manufacturing**



**Non-stick Coatings for  
Cookware and Small  
Electrical Appliances**



**Data  
Wire & Cabling**



**Low Permeable  
Automotive Fuel Hose**



**Electronics**



**Chemical and Pharma  
Processing Valves,  
Lined Piping, Tanks**



**Aerospace Materials -  
Hydraulic Tubing  
Wire & Cabling**

- <http://fluorocouncil.com/PDFs/Industrial-Reliance-on-FluoroTechnology.pdf>
- OECD (2013) Synthesis Paper on Per- and Polyfluorinated Chemicals (PFCs) ([https://www.oecd.org/env/ehs/risk-management/PFC\\_FINAL-Web.pdf](https://www.oecd.org/env/ehs/risk-management/PFC_FINAL-Web.pdf))



**Protective Health  
Care Garments**



**Architectural  
Coatings**



**Protective Finishes on  
Apparel and Textiles**



**Industrial Firefighting**



**Paint**

- <http://fluorocouncil.com/PDFs/Industrial-Reliance-on-FluoroTechnology.pdf>
- OECD (2013) Synthesis Paper on Per- and Polyfluorinated Chemicals (PFCs) ([https://www.oecd.org/env/ehs/risk-management/PFC\\_FINAL-Web.pdf](https://www.oecd.org/env/ehs/risk-management/PFC_FINAL-Web.pdf))



# Associated Health Outcomes (PFOS and PFOA)

## High-dose exposures in people:

- ▶ Higher cholesterol
- ▶ Thyroid disease (PFOA)
- ▶ Ulcerative colitis (PFOA)
- ▶ Testicular and kidney cancer (PFOA)
- ▶ Changes to the immune system
- ▶ Preeclampsia (PFOA)

## High-dose studies In laboratory animals:

- ▶ Developmental effects
  - ▶ Reduced growth of paw-bones
  - ▶ Lowered pup birth weight
  - ▶ Faster puberty in male pups
- ▶ Immune system did not work as well
- ▶ Changed liver and kidney weight



# EPA's Health Advisory Levels (PFOA and PFOS only)

- ▶ “Lifetime” Health Advisory
  - ▶ PFOA + PFOS = 70 ppt (ng/L)
  - ▶ Short-term and long-term exposure
- ▶ Based on reference doses (RfD) derived from developmental toxicity study in mice (PFOA) and rats (PFOS)
  - ▶ Offer a “margin of protection”
  - ▶ For the most sensitive population (developing fetus and newborns)
  - ▶ For an entire lifetime of potential exposure
  - ▶ For all potential health effects (non-cancer and cancer)
- ▶ Varying Drinking Water Standards/Guidelines - other states

**6,000,000\* ppt**  
(1,000,000 ng/kg/day)



Rodent to human  
conversion



**98,000 ppt**  
(5,300 ng/kg/day)



Human  
protections



**350 ppt**  
(20 ng/kg/day)



Accounting for  
other exposures  
in the  
environment



**70 ppt**  
(ng/L)

Lowest dose that causes  
an effect in rat pups

Human equivalent  
dose

Dose that is safe in the most vulnerable  
people (like developing babies)

Lifetime Health Advisory  
for PFOA in drinking water

## Illustrating the concept behind a Lifetime Health Advisory: Perfluorooctanoic acid (PFOA)

\* Exact numbers have been generalized for illustration  
ppt = Parts per trillion

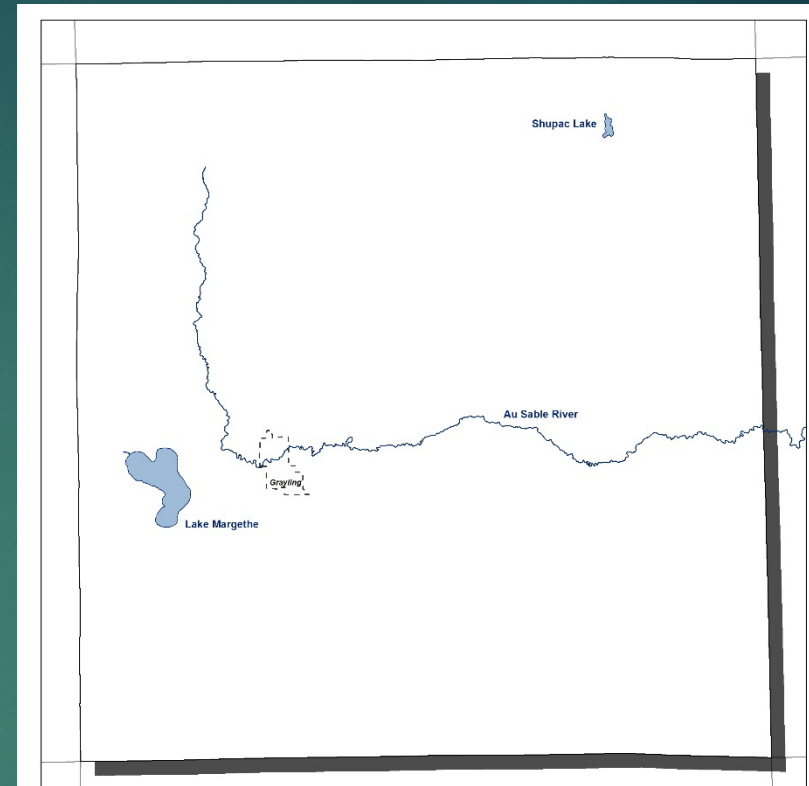


# Camp Grayling/Lake Margrethe

Site Name	Result Letters Mailed	Filters Distributed	Water Coolers
Camp Grayling	727	304	27
Lake Margrethe	249	43	1

- ▶ Interim alternate water is being provided while the MDEQ continues its investigation

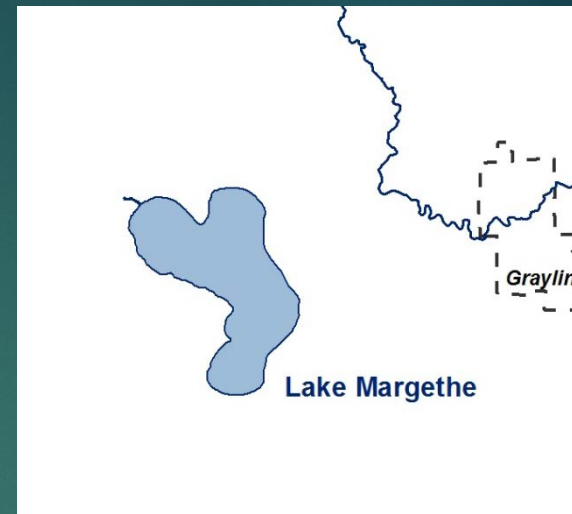
# Au Sable River Upstream of Mio Dam– Eat Safe Fish Guide



Type of Fish Tested	Chemical Causing MI Serving Recommendation	Size of Fish	Recommended MI Servings Per Month
Brown Trout	Mercury	Any	4
Northern Pike	Mercury	Under 30"	2
Northern Pike	Mercury	Over 30"	1



# Lake Margrethe– Eat Safe Fish Guide

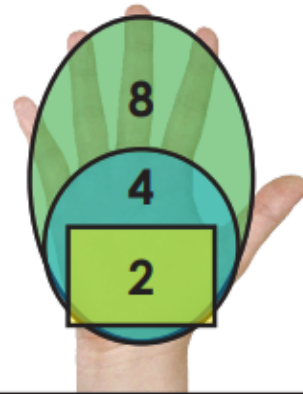


Type of Fish Tested	Chemical Causing MI Serving Recommendation	Size of Fish	Recommended MI Servings Per Month
Bluegill	PFOS	Any	8
Sunfish	PFOS	Any	8
Largemouth and small mouth bass	Mercury	Under 18"	2
		Over 18"	1
Walleye	Mercury	Under 20"	1
		Over 20"	6 per year

# "MI Serving"

## My Michigan, MI Serving Size

- ☑ 8 ounces of fish = size of an adult's hand (large oval)
- ☑ 4 ounces of fish = size of the palm of an adult's hand (small circle)
- ☑ 2 ounces of fish = size of half a palm of an adult's hand (rectangle)



## How much is *MI Serving*?

Weight of Person	<i>MI Serving Size</i>
45 pounds	2 ounces
90 pounds	4 ounces
180 pounds	8 ounces



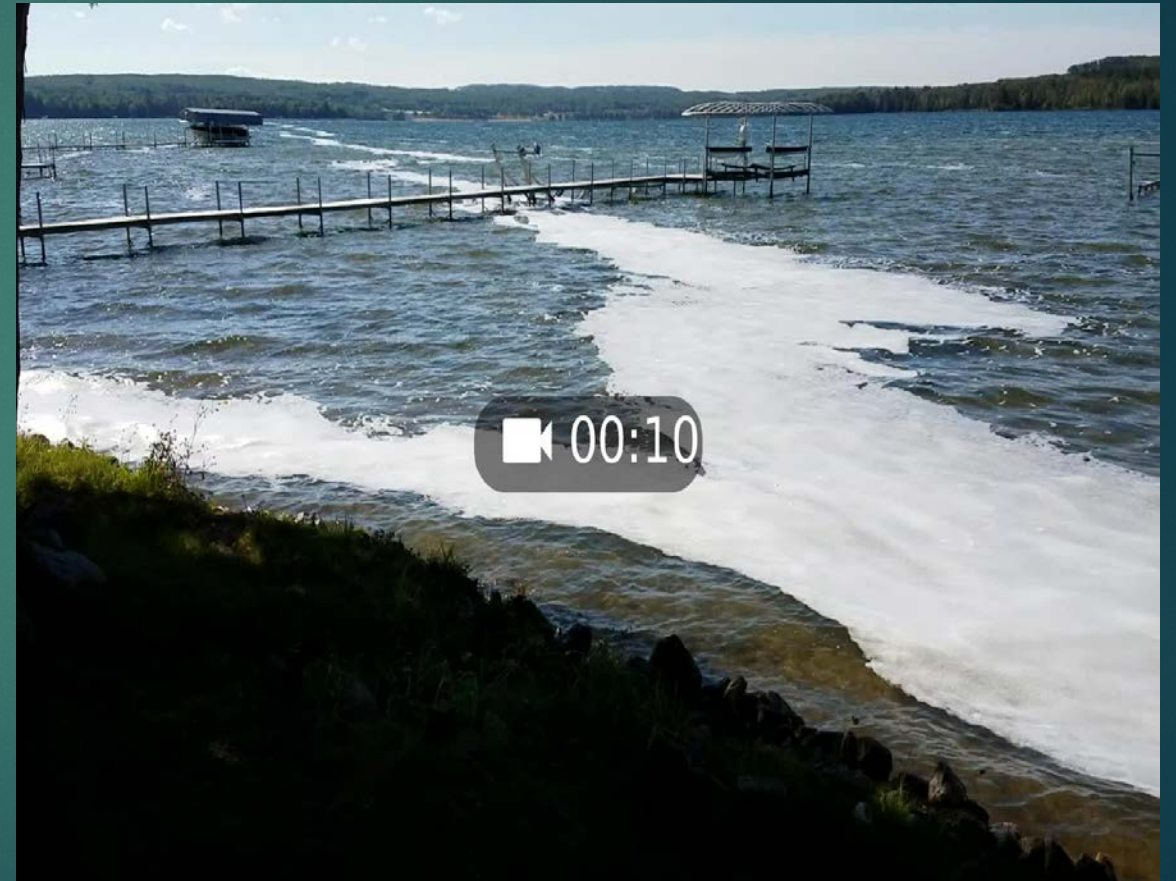
# Eat Safe Fish – Website

- ▶ Current guidelines relating to PFAS contamination in Fish → [www.michigan.gov/pfasresponse](http://www.michigan.gov/pfasresponse)
- ▶ More info about ESF guidelines → [www.michigan.gov/EatSafeFish](http://www.michigan.gov/EatSafeFish)



# Lake Margrethe - Foam

- ▶ Not on Au Sable River
- ▶ Skin contact or incidental swallowing of water → OK
- ▶ Skin contact with Foam → OK
- ▶ Incidental Swallowing of Foam → NOT OK

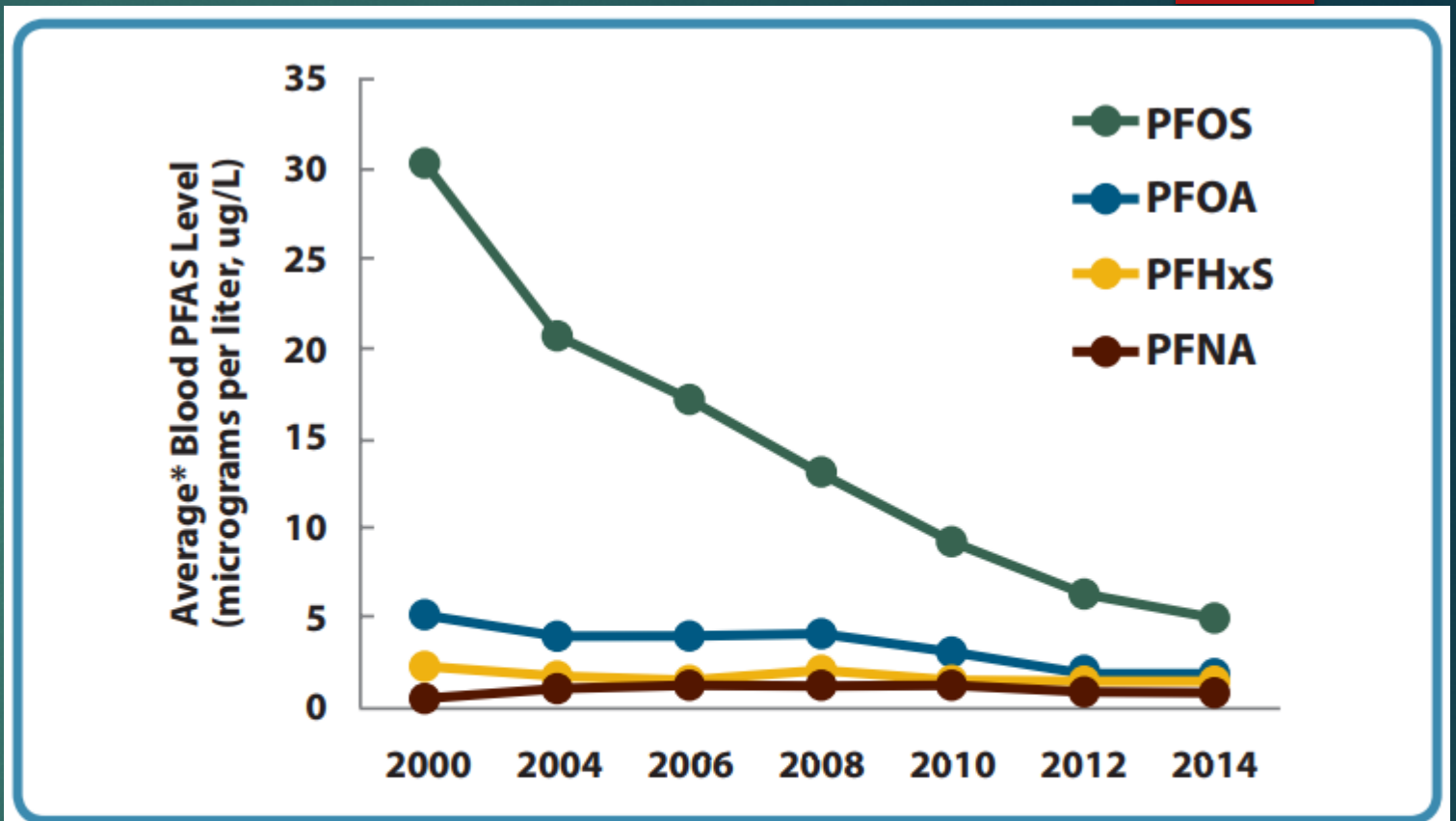




# Blood Testing

- ▶ PFAS are in many products commonly used
- ▶ People are expected to have some level of PFAS in their blood
- ▶ Blood testing:
  - ▶ CAN tell you the concentration in your blood at time of test
  - ▶ CANNOT tell you if current or future health conditions are due to PFAS or how you were exposed (where the PFAS came from)

# Blood Levels of the Most Common PFAS in People in the United States from 2000-2014



\* Average = geometric mean

**Data Source:** Centers for Disease Control and Prevention. Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, (January 2017). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.



# More Information:

- ▶ Sesha Kallakuri
- ▶ Toxicologist
- ▶ MDHHS Toxicology and Response Section
- ▶ (800) 648-6942
- ▶ [KallakuriS@michigan.gov](mailto:KallakuriS@michigan.gov)