

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) in Fish and Wildlife

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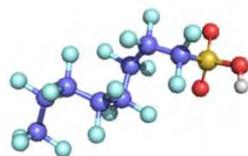
Today's Overview

- What is PFAS?
- What is the state of Michigan doing to protect public health?
- Is PFAS in Fish and Wildlife?
- How do we assess risk for the environment?



PFAS – What is it?

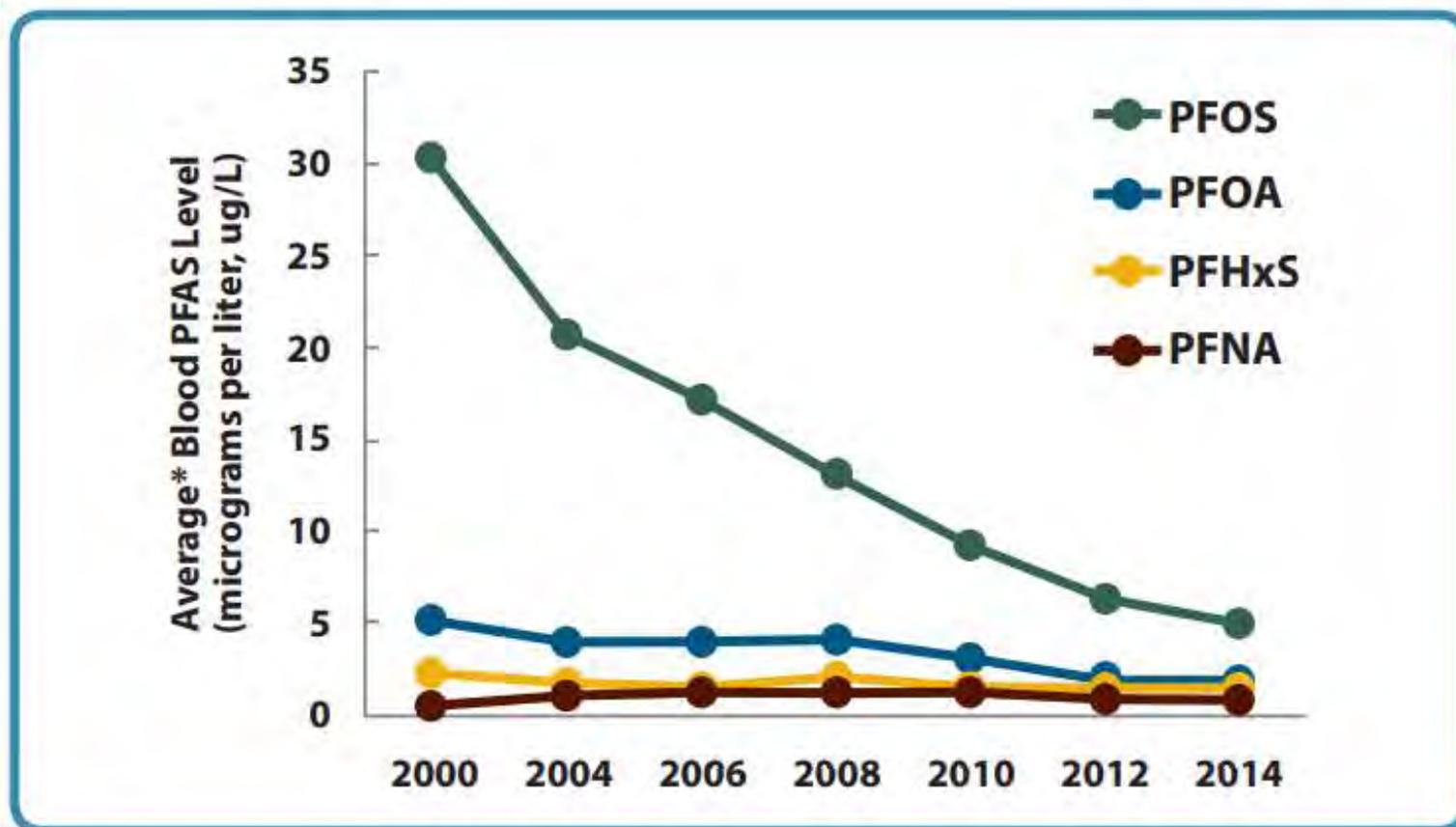
- Manmade compound that breaks down slowly
- Used in waterproofing, firefighting foams, household cleaning products, and many more items
- High concentrations and high exposure levels may result in public health risks
- Hear most about PFOS/PFOA



PFAS National Issue



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.



Michigan PFAS Action Response Team (MPART) & Interagency Coordination Team

- Governor Whitmer signed Executive Order 2019-3
- Establishes MPART as an enduring body within the DEQ
- Agency coordination and Citizen Advisory work group
- Focus is on:
 - Protecting public health
 - Investigating areas and reducing exposure
 - Assisting responsible parties in remediation efforts
 - Working with communities and other agencies
 - Implementing proactive efforts

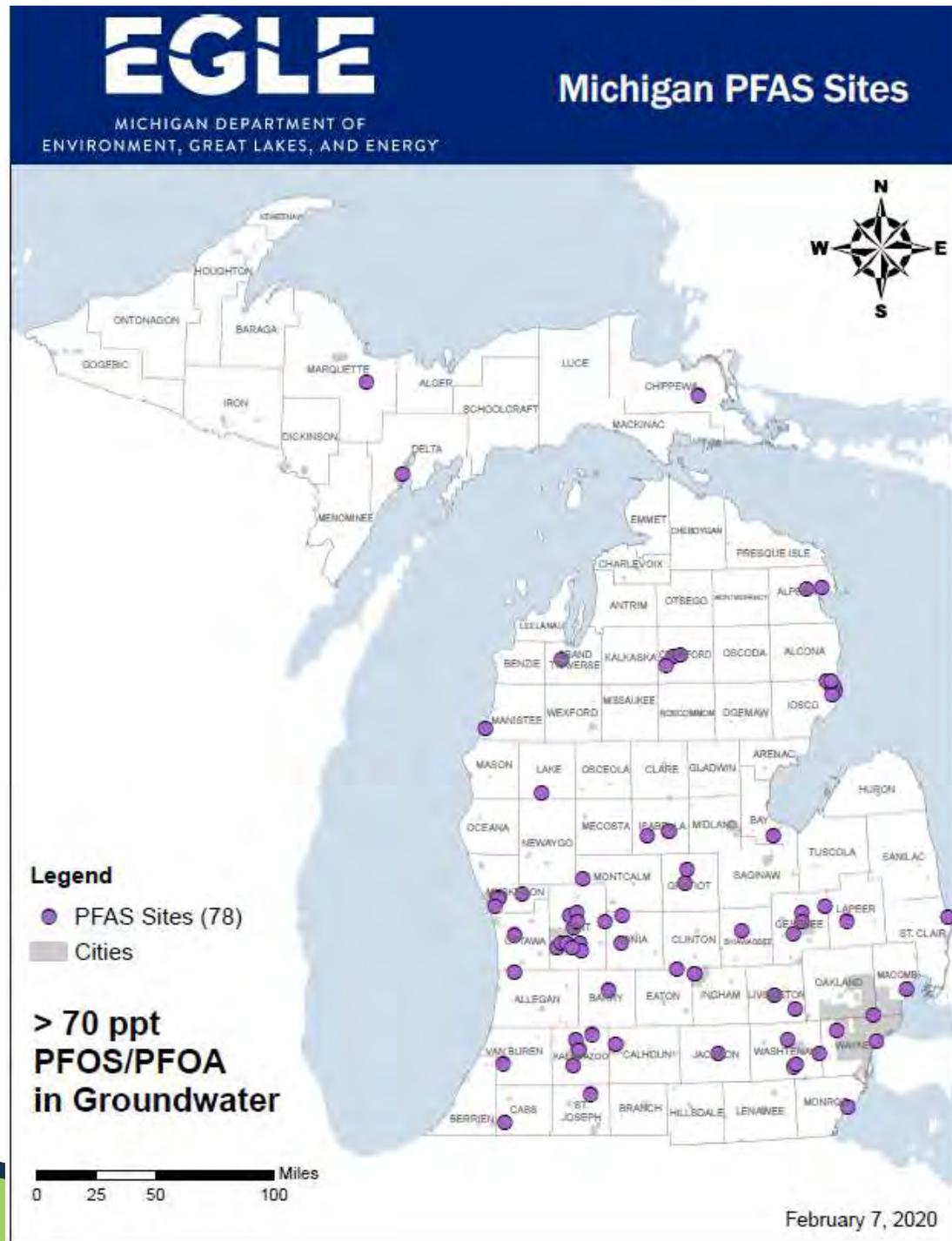


PFAS Criteria for Human Exposure

- 70 ppt PFOA and PFOS combined
- Based on EPA lifetime health advisory levels
- Effective January 10, 2018
- Allows state to mandate responsible parties conduct response activities and take legal action for those not complying
- New MCLs under review; 5 chemicals, individual levels, much lower than the 70 ppt

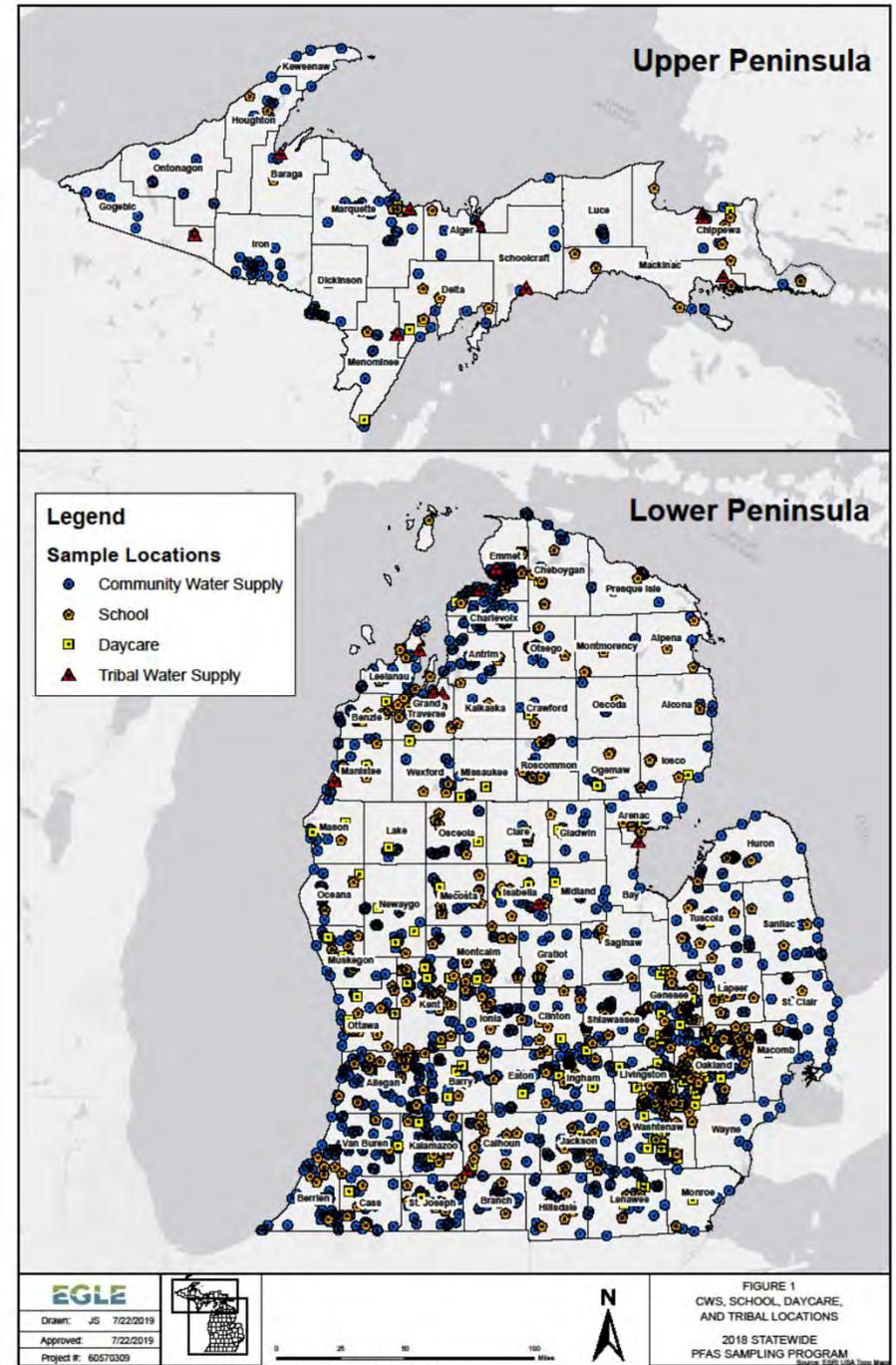


Confirmed PFAS Sites

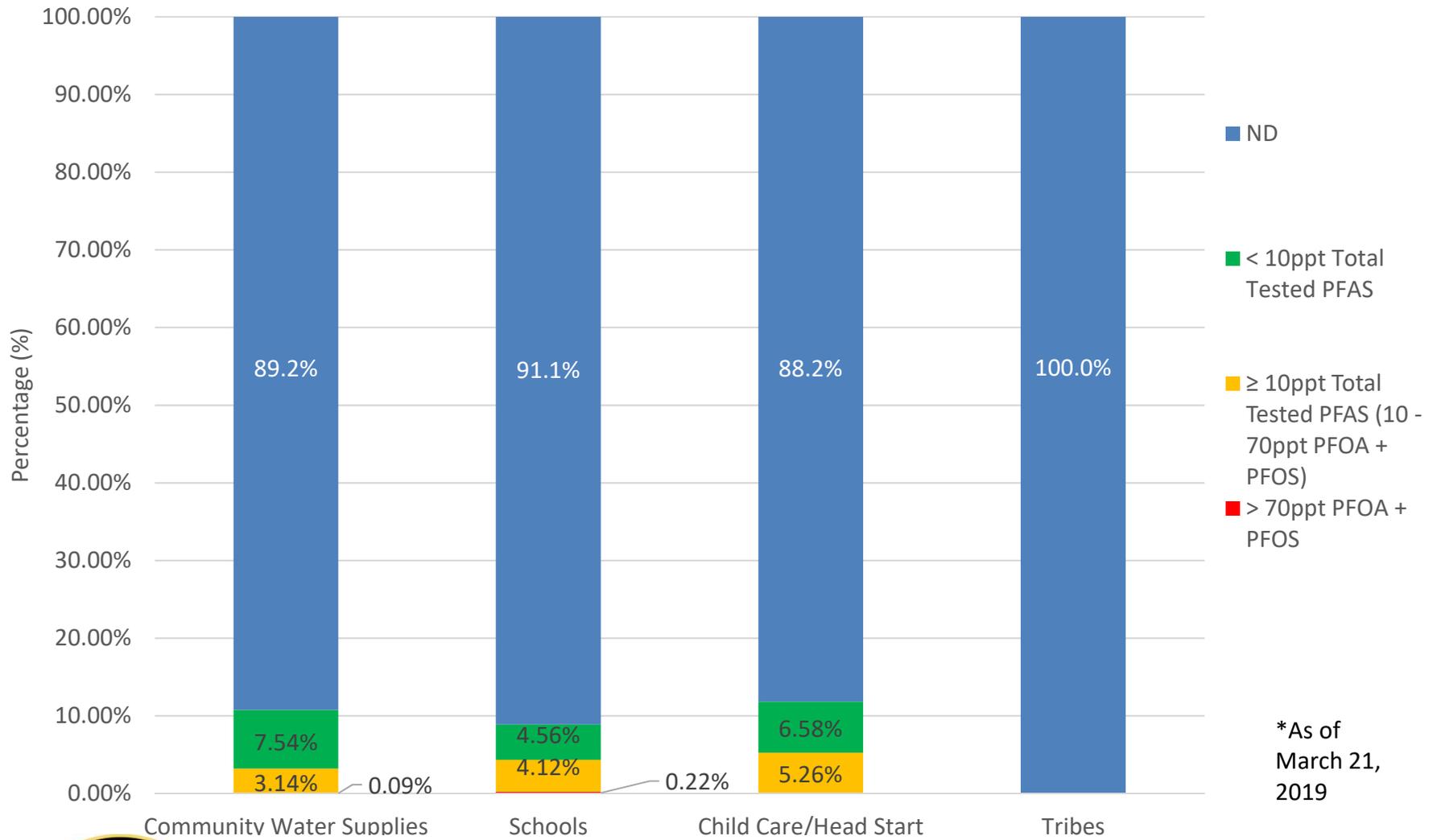


MI Public Water Supply Testing Phase I (2018)

- Supplies selected for the Statewide Survey included:
 - Community Water Supplies with their own source
 - Select Noncommunity Water Supplies serving Schools/Child Care
 - 12 Federally Recognized Tribes in Michigan
- Supplies sampled serve approximately 75% of the total population of our state.



Statewide Public Water Supply PFAS Survey Results*

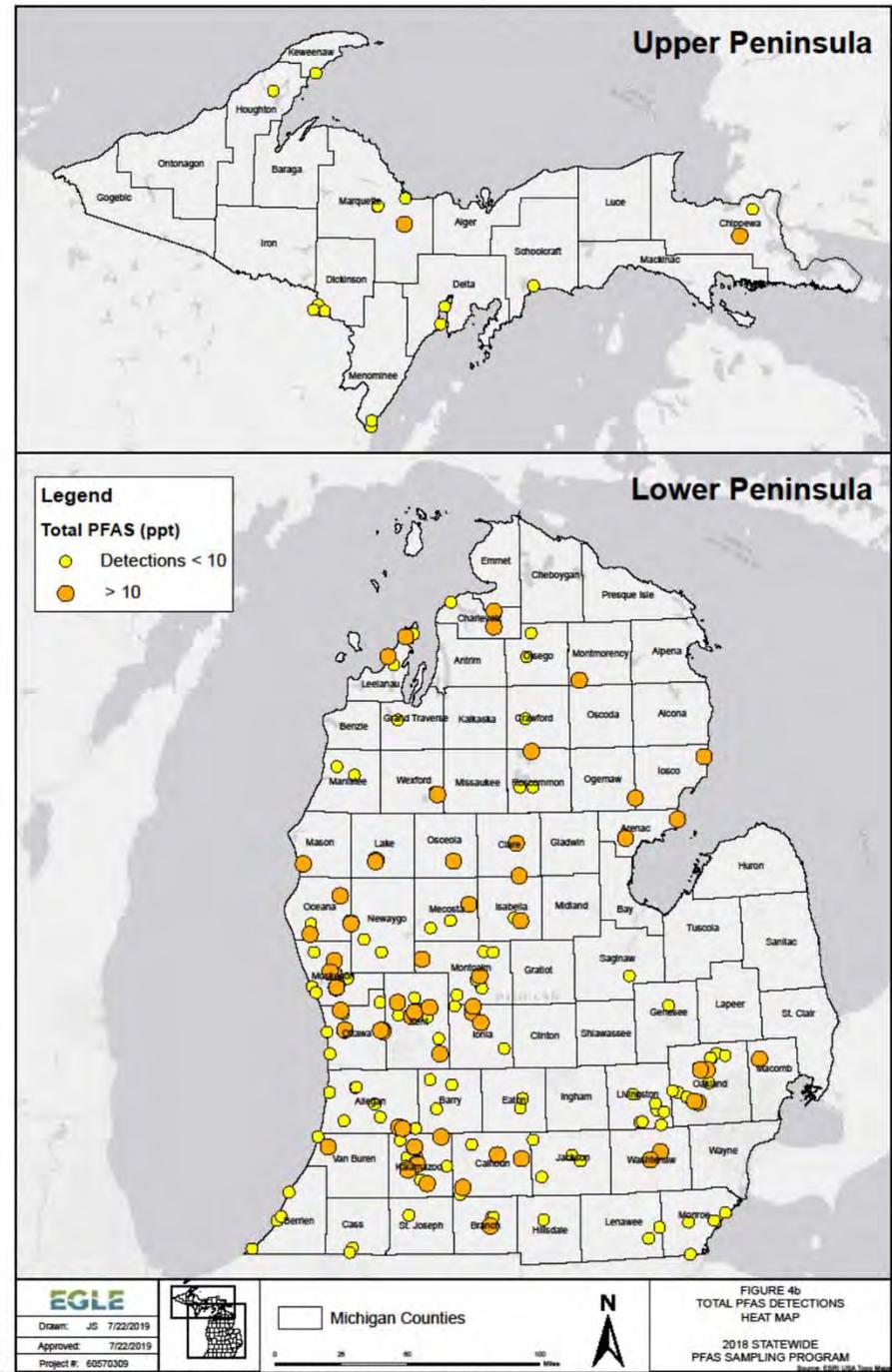


*As of March 21, 2019



Phase I Results

- 90% ND for all PFAS analytes tested
- 10% with at least one detection
 - 64 systems returned a detection of ≥ 10 ppt for at least one PFAS analyte
 - US EPA LHA exceedance at Parchment, MI and Robinson Elementary (> 70 ppt PFOA + PFOS)



Statewide Survey Phase II and Monitoring Programs (2019)

Quarterly monitoring of PWS with “mid-tier” results

Monthly monitoring of PWS utilizing surface water as a source

Approximately 600 additional Type II noncommunity public water supplies

- Includes systems to address sensitive populations
 - Adult Foster Care Providers
 - Medical Care Providers
 - Children’s Camps
- Includes systems to address non-transient consumers (employees)
 - Industry/Offices

Hotels/Resorts



PFAS in Wildlife and Aquatic Ecosystems

Surface Water Workgroup

Wildlife Workgroup



The Michigan Fish and Wild Game Consumption Advisory Program



History of the Michigan Fish Consumption Advisory Program

- 1970 Mercury
- 1977 PCBs & DDT
- 1979 Dioxin & PBB
- 1984 Dieldrin, Chlordane, & Toxaphene
- 1989 Statewide Mercury Advisory for Inland Lakes
- 1990 Great Lakes Consortium
- 2011 Selenium
- 2012 PFOS

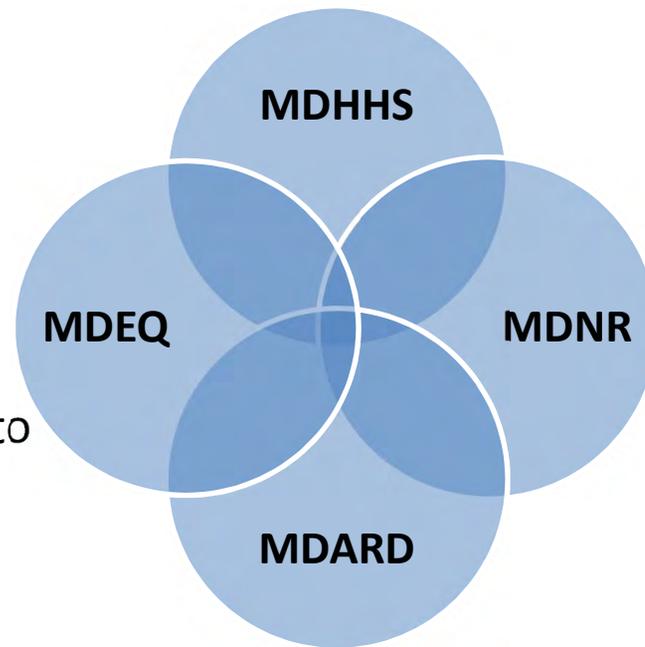


Children with Congenital methylmercury poisoning



Fish and Wildlife Consumption Advisory Committee (FAWCAC)

- Evaluation of data for human health
- Set fish and wildlife consumption advisories



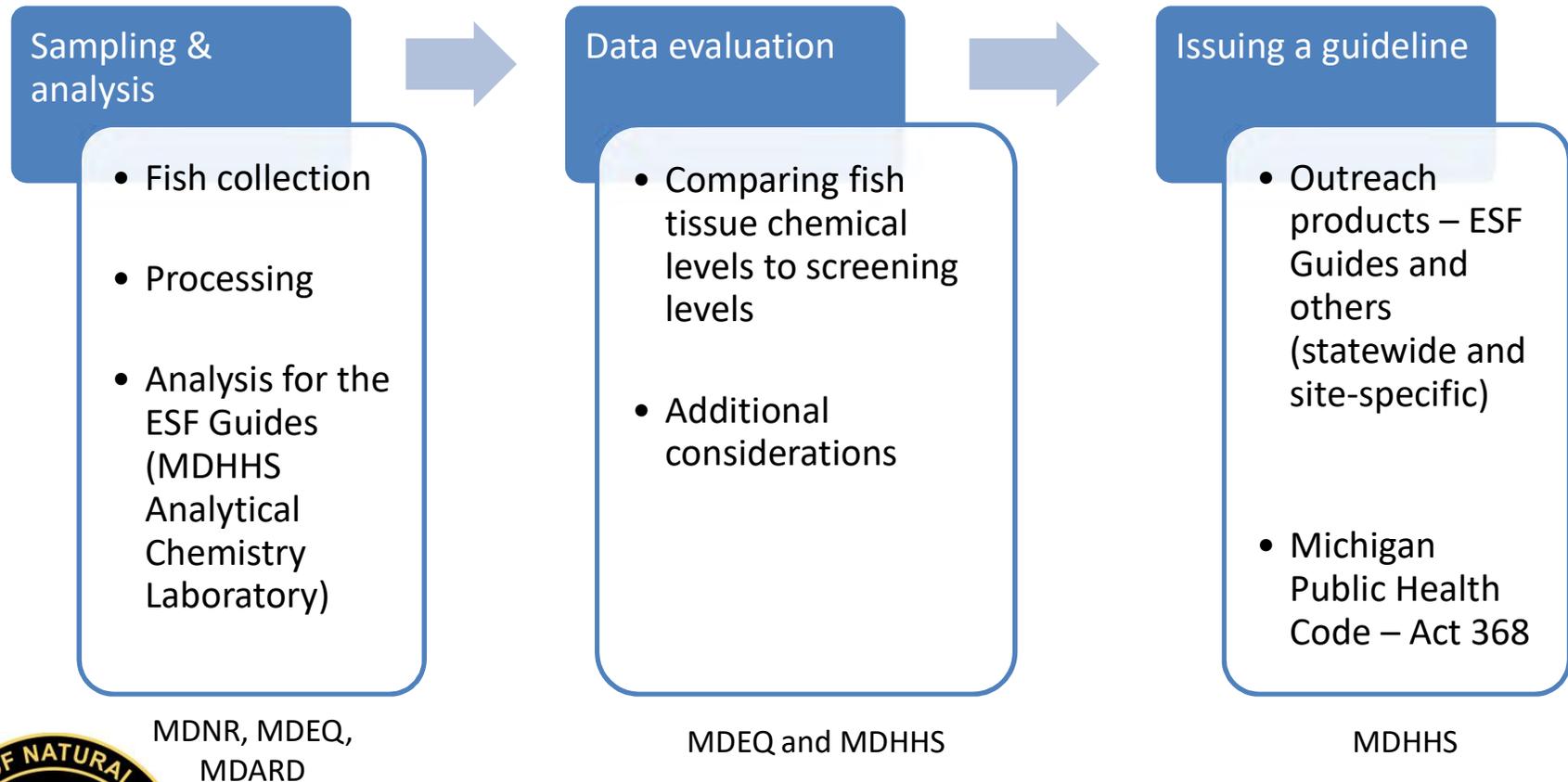
- Environmental protection programs
- Fish and wildlife sampling, including caged organisms to measure uptake of contaminants

- Management of fish and wildlife
- Fish and wildlife sampling

- Commercially sold or raised fish and wildlife
 - Fish and wildlife sampling (commercial products)

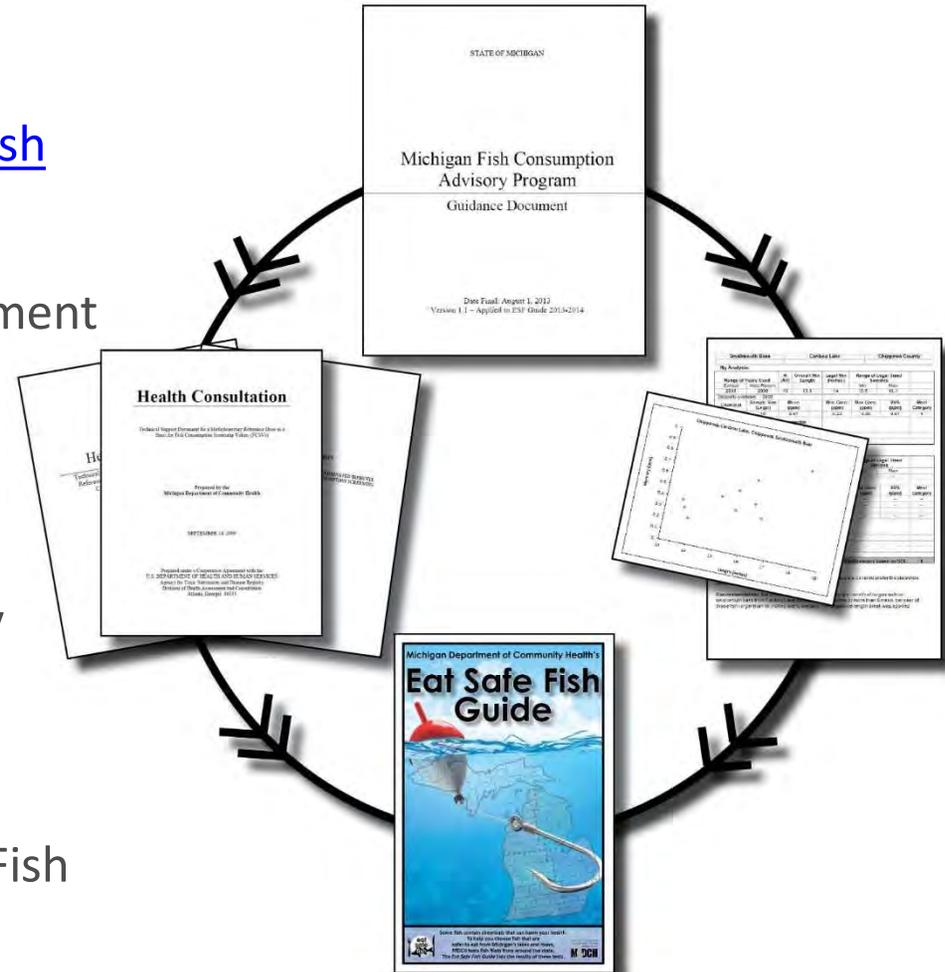


General Process for Consumption Guideline Development



Eat Safe Fish Program Attributes

- **Transparent**
 - Documentation online
www.michigan.gov/eatsafefish
- **Consistent**
 - US EPA & ATSDR Risk Assessment Methodologies
 - One set of guidance
- **Current Science**
 - Toxicology and Epidemiology
 - Update with new science
- **Building Consensus**
 - Great Lakes Consortium for Fish Consumption Advisories



Example of Eat Safe Fish Guidelines

Au Sable River

(downstream of Foote Dam; includes Van Etten Creek)

Type of Fish	Chemicals of Concern	Size of Fish (length in inches)	MI Servings per Month*
Bluegill	PFOS	Any	Do Not Eat [▲]
Brown Trout	PCBs	Any	6 Per Year ^{2x}
Carp	PCBs	Any	Limited [▲]
Chinook Salmon	PCBs	Any	6 Per Year ^{2x}
Coho Salmon	PCBs	Any	6 Per Year ^{2x}
Largemouth Bass	PFOS	Any	Do Not Eat [▲]
Rainbow Trout	PCBs	Any	6 Per Year ^{2x}
Rock Bass	PFOS	Any	Do Not Eat [▲]
Smallmouth Bass	PFOS	Any	Do Not Eat [▲]
Steelhead	PCBs	Any	6 Per Year ^{2x}
Suckers	PFOS	Any	Do Not Eat [▲]
Sunfish	PFOS	Any	Do Not Eat [▲]
Walleye	Dioxins	Any	6 Per Year ^{2x}
All Other Species	PFOS	Any	Do Not Eat [▲]

PFOS can't be reduced by trimming and cooking. Do not double MI Servings.



PFAS in Fish

- PFOS shows up the most in fish
- Some places, PCBs, dioxins, and mercury are high than PFOS
- Species include bluegill, sunfish, largemouth bass, smallmouth bass, suckers, crappie
- Range from Do Not Eat to limited portions of meals



PFAS in Fish

- **DO NOT EAT:** Huron River below Wixom to Lake Erie, Clark's Marsh in Oscoda, Allen Lake in Iosco County, Au Sable below Foot Dam (nonmigratory fish), Kent County Freska Lake, ponds
- Eat Safe Fish guidelines and MPART website



PFAS in Deer

- Hunters asked, “What about PFAS in deer?”
- What deer were tested and how?
- Results from those deer
- Conclusions
- Next steps



The Michigan Department of Health and Human Services has issued consumption guidelines for wild game taken from the floodplain areas around the Saginaw and Tittabawassee Rivers.

Map of Area Affected

These guidelines are for the floodplains and nearby connected areas surrounding the Tittabawassee and Saginaw Rivers downstream of Midland.



Why are there guidelines?

Harmful chemicals called **dioxins** and **polychlorinated biphenyls (PCBs)** are found in and around the Tittabawassee and Saginaw Rivers (south of the Midland area).



These chemicals can build up in wild game through their food chain.

The **MDHHS Wild Game Guidelines** make it easy to enjoy the wild game you and your family like to eat without getting exposed to too many chemicals.

Photos by Michigan Department of Natural Resources, Greta Fiedler, and the Michigan Department of Health & Human Services.

Wild Game Guidelines

for the Saginaw & Tittabawassee Rivers' floodplains and connected areas

Type of Game	Chemicals of Concern	MI Servings per Month
Duck (with skin)	Dioxins	6 per year
Duck (without skin)	Dioxins	2
Deer	Dioxins	8
Goose (with or without skin)	Dioxins	4
Rabbit	Dioxins	4
Squirrel	Dioxins	8
Turkey (with skin)	Dioxins	6 per year
Turkey (without skin)	Dioxins	1

My Michigan, MI Serving Size

- ☑ 8 ounces = 1/2 pound of meat (large oval, slightly larger than two decks of cards)
- ☑ 4 ounces = 1/4 of pound of meat (small circle; about the size of one deck of cards)
- ☑ 2 ounces = size of half a palm of an adult's hand (rectangle)



How much is MI Serving?

Weight of Person	MI Serving Size
45 pounds	2 ounces
90 pounds	4 ounces
180 pounds	8 ounces

For every 20 pounds **less** than the weight listed in the table, subtract 1 ounce of meat.

For example, a 70 pound child's MI Serving size is 3 ounces of meat.
 $90 \text{ pounds} - 20 \text{ pounds} = 70 \text{ pounds}$
 $4 \text{ ounces} - 1 \text{ ounce} = 3 \text{ MI Serving size of } 3 \text{ ounces}$

For every 20 pounds **more** than the weight listed in the table, add 1 ounce of meat.

For example, a 130 pound person's MI Serving size is 5 ounces of meat.
 $90 \text{ pounds} + 20 \text{ pounds} = 110 \text{ pounds}$
 $4 \text{ ounces} + 1 \text{ ounce} = 5 \text{ MI Serving size of } 5 \text{ ounces}$



NO ONE should eat any organs - like the liver, heart, brains, or gizzards - from wild game taken from the Saginaw and Tittabawassee River areas.



Are you pregnant?

Wild game can still be a healthy meal. Use your pre-pregnancy weight to find your MI Serving size. These amounts are safe even if you're pregnant or breastfeeding.

Game Weight Totals

Because dioxins and PCBs do not cause immediate health effects, you can calculate how much wild game is safe to eat based on either monthly or yearly amounts - whichever is preferred.

The Game Weight Totals listed here are for a 180-pound adult on a yearly basis. For a monthly breakdown of *MI Servings*, see above.

Weigh more or less than 180? Customize your serving size, based on your weight, using "How much is MI Serving?". These guidelines are safe for children, pregnant women, and people with chronic health conditions to use, just customize the serving size based on their weight.

Type of Game	Yearly Total Amount by Weight (for a 180-pound adult)
Duck (with skin)	48 ounces or 3 pounds (6 MI Servings per Year)
Duck (without skin)	192 ounces or 12 pounds (24 MI Servings per Year)
Deer	768 ounces or 48 pounds (96 MI Servings per Year)
Goose (with or without skin)	384 ounces or 24 pounds (48 MI Servings per Year)
Rabbit	384 ounces or 24 pounds (48 MI Servings per Year)
Squirrel	768 ounces or 48 pounds (96 MI Servings per Year)
Turkey (with skin)	48 ounces or 3 pounds (6 MI Servings per Year)
Turkey (without skin)	96 ounces or 6 pounds (12 MI Servings per Year)

Eat Safe Wild Game



Do not eat wild game organs

Hunting in Michigan can be a lifelong hobby and a great source of food for you and your family. Eating meat from wild game can provide you with a lean source of protein. However, wild game organs can have much higher amounts of chemicals and metals than the meat. Eating wild game organs should always be avoided.

Why should I avoid eating wild game organs?

Chemicals used in manufacturing and industry can get into the environment where wild game live. Some chemicals last a long time in the environment and can build up in wild game. Listed below are some of the chemicals and metals that can build up to high levels in wild game organs.

- Dioxins
- Polychlorinated biphenyls (PCBS)
- Cadmium
- Per- and polyfluoroalkyl substances (PFAS)
- Lead
- Mercury

Wild game organs can have higher amounts of chemicals and metals than the meat:

- The **liver** and **kidneys** filter chemicals and metals from the blood. This can lead to high amounts of chemicals and metals in the organs.
- Some chemicals can build up in the **brain** of animals.
- The **gizzard** helps the bird with mechanical breakdown of food. Birds may store contaminated food in this organ, which can lead to build up of chemicals and metals in the gizzard.

What health concerns are related to these chemicals and metals?

Eating wild game organs can cause some chemicals to build up in your body. This could lead to health concerns such as:

- Development of cancer
- Development of diabetes
- Problems with fertility
- Reduced thyroid and immune system function
- Disrupted brain development in fetuses and children



Deer Tested for PFAS 2018

Volunteer program for disease testing (48)

- muscle for over 10 PFAS

Alpena, Oscoda, Rockford, Grayling (80)

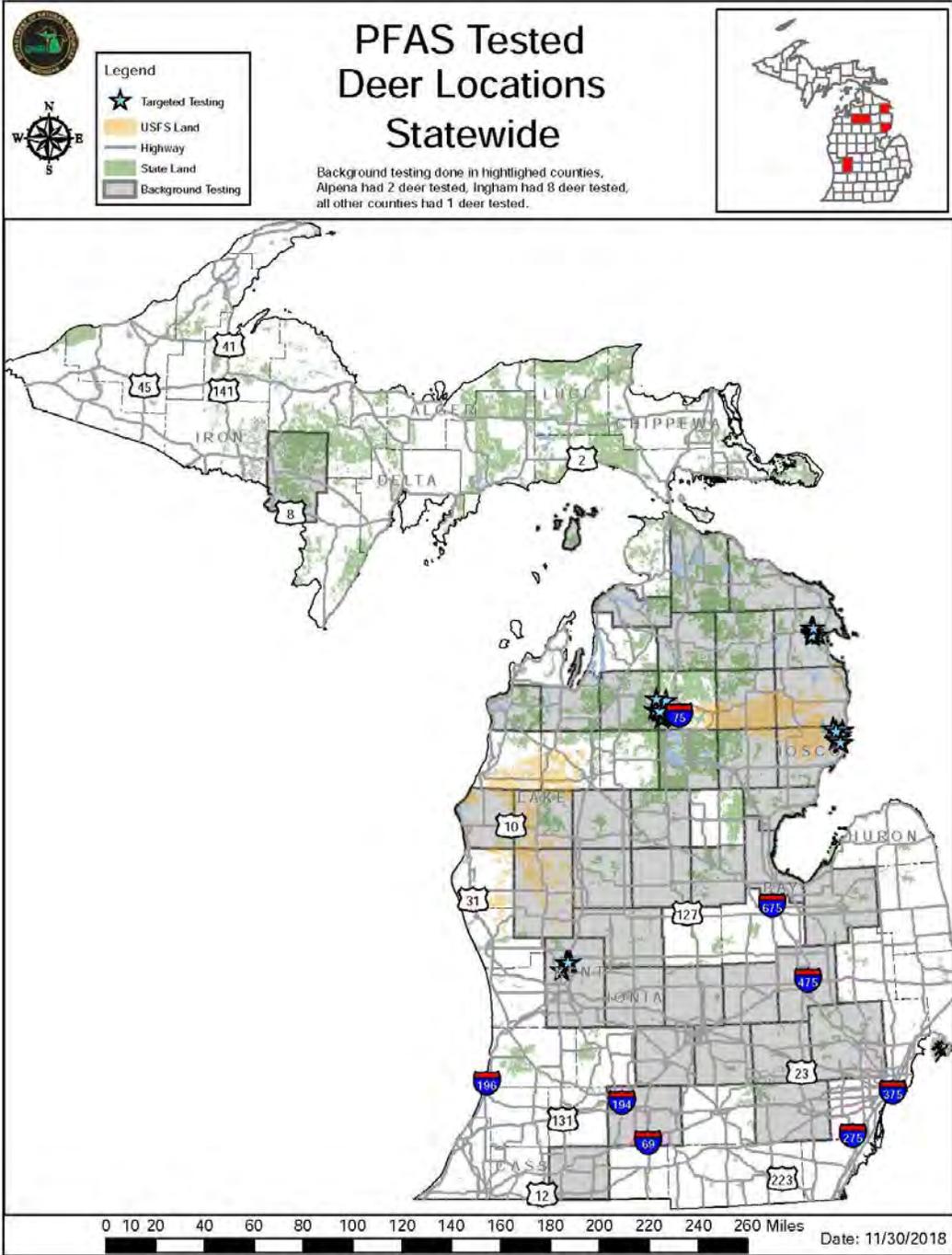
- muscle, liver, kidney, fat for over 10 PFAS

Proud Lake State Recreation Area, near Norton Creek (20)

- muscle, liver, kidney, heart for over 10 PFAS
- also tested for PCBs

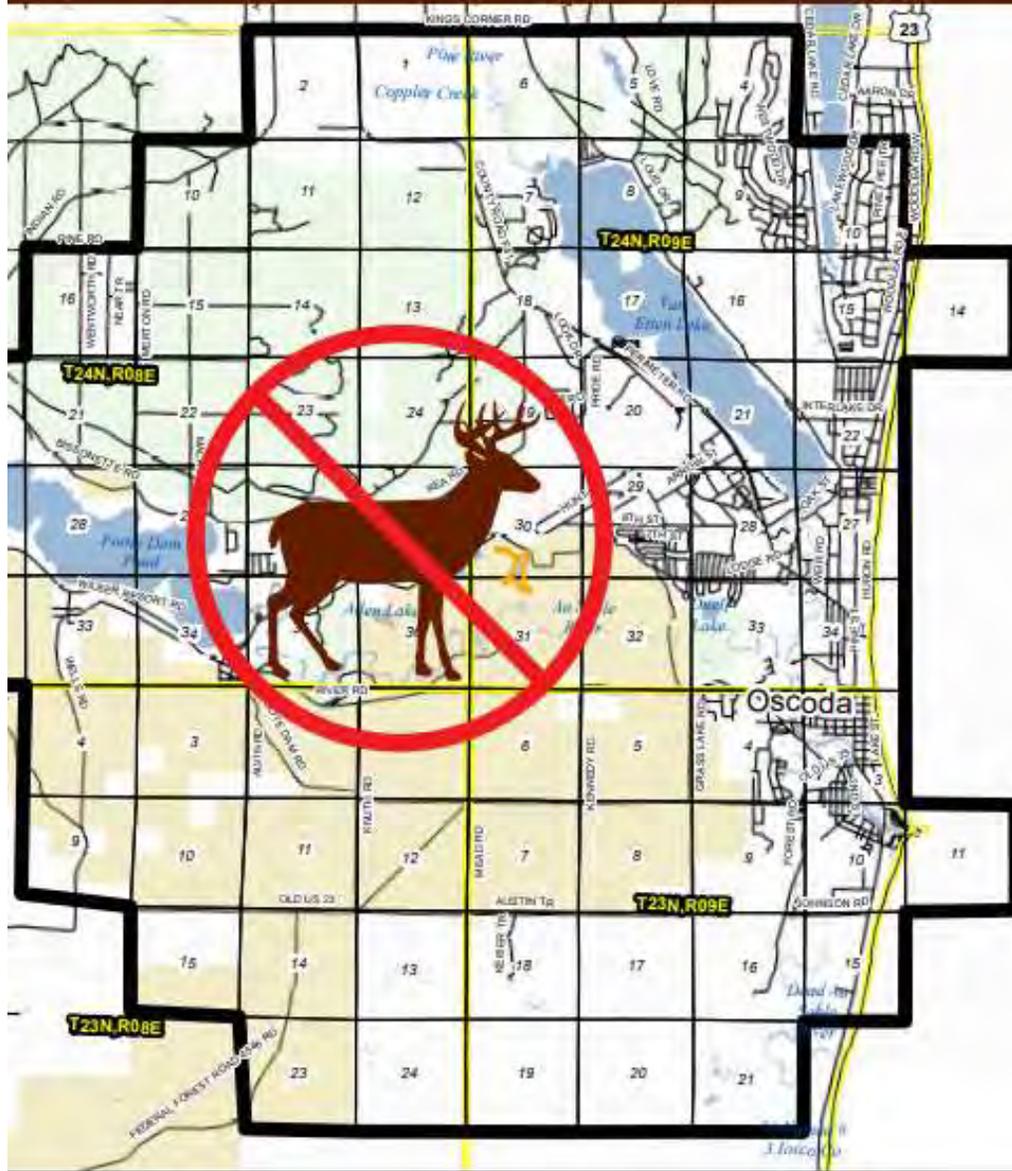


2018 Deer Testing Results

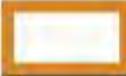
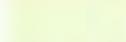


HEALTH ADVISORY

Do not eat deer from the advisory area. High amounts of PFAS may be found in deer and could be harmful to your health.



Map Legend

	Clark's Marsh		Town Range
	Advisory Area		USFS Land
	Sections		State Land

For more information, call MDHHS at 800-648-6942 or visit Michigan.gov/PFASresponse.



Deer Tested for PFAS 2019

Proud Lake State Recreation Area, near Norton Creek (20)

- muscle, liver, kidney, heart for over 10 PFAS
- also tested for PCBs
- All nondetects in the muscle

Oscoda Area

- Sampling in 5 mile area (40)
- Spring testing Clark's Marsh (20)



Deer Tested for PFAS

Information on deer and wildlife testing along with final reports on MPART website:

https://www.michigan.gov/pfasresponse/0,9038,7-365-86512_88981_88982---,00.html



EGLE

Next Steps

- Other Wildlife
 - In January, begin interagency discussions related to risk in other wildlife such as waterfowl
- For Aquatic Organisms
 - Look to Clark's Marsh and Huron River – ecosystem approach



PFAS Impacts on Fish and Wildlife

- Developmental effects on exposed organisms and offspring
- Adverse effects on embryo development
- Decreased survival
- Altered lipid metabolism and liver cell development
- Disrupts intracellular communication and mitochondrial function
- Causes neural and endocrine disruption
- Liver, testicular, pancreatic tumors
- Immunotoxicity
- Wasting syndrome
- ...Affects a wide range of biological processes

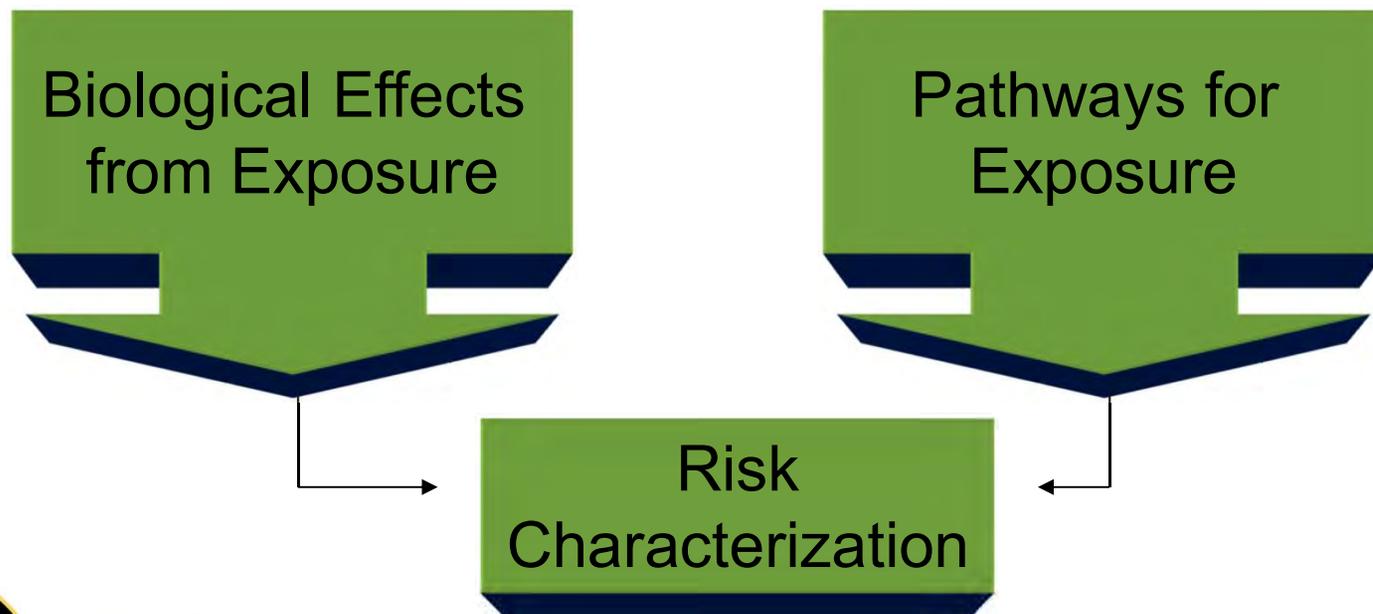


What is Unknown about PFAS in Fish and Wildlife

- Exposure pathways
- Biomagnification in food web
- Understanding of risk



Assessing Risk to Fisheries and Wildlife Populations Through Ecological Risk Assessment

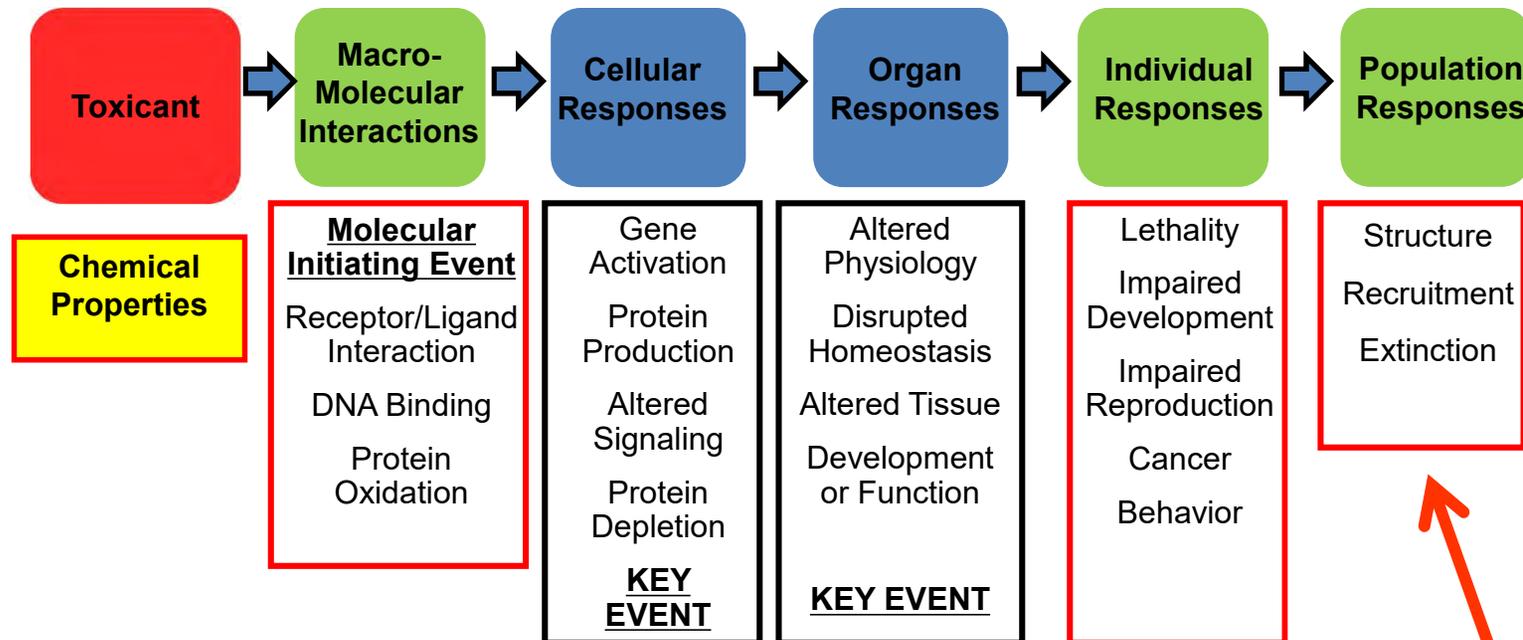


Ecological Risk Assessment

A combination of biological effects and exposure determines risk, and this risk can be used to prioritize monitoring and evaluation.



Adverse Outcome Pathway Framework for Ecological Risk Assessment



ADVERSE OUTCOMES
IMPORTANT FOR ECOLOGICAL
RISK ASSESSMENT

Modified from Ankley et al (2010)



Ecological Risk Assessments Inform...

- Status of the issue for fish and wildlife
- Prioritization for monitoring and evaluation
- Better understanding of the potential for human health effects
- Understanding of potential population outcomes for key sport & commercial fisheries and other wildlife of interest



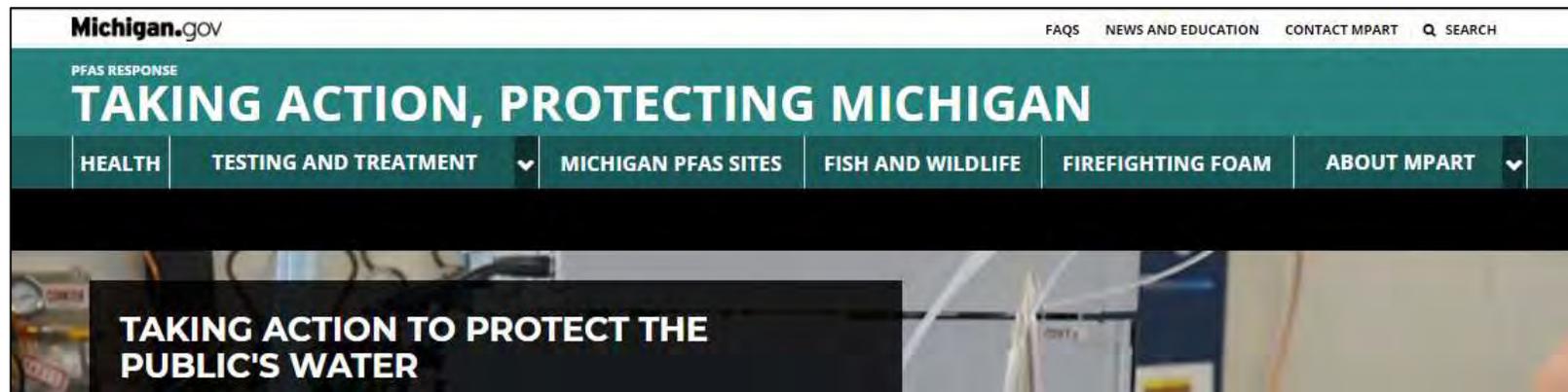
Take Away Messages

- PFAS is not everywhere
- Michigan is working urgently to protect public health
- Fish Consumption Guidelines are important to know
- Other than Oscoda, deer do not seem to be an issue
- DNR will work scientifically to further evaluate the risks to wildlife populations and to understand PFAS movement in the environment



More Information:

www.michigan.gov/pfasresponse



Questions?

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