9/14/20 – Staff Compilation

State PFOS Fish Tissue Advisory Values, Compiled June 2020

Introduction

This summary of fish tissue consumption advisory values for Perfluorooctane Sulfonate (PFOS), a key per- and polyfluoroalkyl substance (PFAS) was compiled jointly by staff in U.S. EPA Office of Water (OW), Office of Science and Technology (OST), Standards and Health Protection Division (SHPD), National Branch (NB) and Office of Research and Development (ORD) Center for Environmental Measurement and Modeling (CEMM), Watershed & Ecosystem Characterization Division (WECD), Watershed Management Branch (WMB).

OST's Fish Tissue Advisory Program endeavors to serve as a resource to state, tribal, and territorial human health fish consumption advisory programs. The rapid pace of state activity relating to PFAS and fish advisories, and primarily the compound PFOS, serves as the catalyst for this compilation.

In 2019, the Environmental Council of the States (ECOS) compiled information on a full range of state thresholds, guidelines, and advisories for PFAS across the range of environmental media- drinking water, surface water, soils, fish, air, and groundwater. EPA appreciates this effort by ECOS, and the February 2020 ECOS report *Processes & Considerations for Setting State PFAS Standards* was most helpful in providing direction for this compilation. The substantial increase in numbers of states with PFAS fish consumption advisories between the time ECOS compiled their information and June 2020 (ECOS 2020) was a primary motivating factor for this present compilation.

The scope of this document is limited to advisory values for the compound PFOS in fish caught from primarily fresh waters of the United States deemed by the states to exceed their levels for consumption advisories. This document contains no U.S. regulatory information and has been produced only for providing information to states and consumers of fish caught in their waters.

This compilation comes at a time of great activity at both the state and federal levels in addressing and assessing the problem of PFAS in fish. Activity in the areas of analytical methods for numerous PFAS compounds, assessment of the toxicities of these compounds relative to a range of toxicological endpoints, and the assessments of mixtures of PFAS compounds and other contaminant groups is intense. Much of the increase in the numbers of states with PFOS advisories relates to the release in November 2019 of the *Best Practice for Perfluorooctane*

Sulfonate (PFOS) Guidelines published by the Great Lakes Consortium for Fish Consumption Advisories. With adoption by many of the entities in the Consortium, which include the U.S. states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin, the Ministry of the Environment, Conservation and Parks of Ontario, Canada, and the Great Lakes Indian Fish and Wildlife Commission, the numbers of jurisdictions with PFOS fish advisories has, as of this writing, increased to include 11 U.S. states.

This Listing

The listing of states in the following table and the numerical content of their advisory values vary in completeness of the available information and the magnitude of the values. Every effort was made to access information through publicly accessible on-line means. In a few instances, EPA staff received information via direct communication with state staff. EPA was not always able to document the inputs used by states in calculating the state advisory values. This includes many inputs including body weight and variations in RfD values used in the calculations. This variation reflects both best professional judgment and the environmental needs and situations of the respective states. All states listed in the table below have used an 8-ounce (227 g) meal size when calculating PFOS advisory values for adults.

At the end of the listing of states' PFOS advisory values, the advisory values from the Great Lakes Consortium's *Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines* are included for comparison.

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Summary of State Advisory Values for PFOS

State[^]	Advisory value/ range	Units	Frequency	Target population	Do not eat	Units	Normalized advisory values (ppb)
AL	41-200	µg/kg (ppb)	1 meal/wk	General[#]	>800	µg/kg (ppb)	41-200
CT	20 - <40	ppb	1 meal/wk	General	≥159	ppb	20 - <40
IN[+]	>20-50	µg/kg (ppb)	1 meal/wk	General	>200	µg/kg (ppb)	>20-50
ME	34.1	µg/kg (ppb)	1 meal/wk	Sensitive*	>145.8	µg/kg (ppb)	34.1
	79	µg/kg (ppb)	1 meal/wk	General	>338.2	µg/kg (ppb)	79
MI	>19-38	ppb	1 meal/wk	General	>300	ppb	>19-38
MN[+]	>20-50	ppb	1 meal/wk	General	>200	ppb	>20-50
NJ	3.9	ng/g (ppb)	1 meal/wk	High Risk*	>17	ng/g (ppb)	3.9
	3.9	ng/g (ppb)	1 meal/wk	General	>204	ng/g (ppb)	3.9
NY[+]	≤50	µg/kg (ppb)	1 meal/wk	General	>200	µg/kg (ppb)	≤50
OR	0.200	mg/kg (ppm)	1 meal/wk	General	N/A		200
WI[+]	>20-50	µg/kg (ppb)	1 meal/wk	General	>200	µg/kg (ppb)	>20-50
GLC[+]	>20-50	µg/kg (ppb)	1 meal/wk	General	>200	µg/kg (ppb)	>20-50

[^] *New Hampshire has a site-specific advisory but does not provide associated values.*

[#] *General denotes general population.*

**High risk individuals or sensitive populations are considered to be at higher risk from contaminants in fish than members of the general public. This group includes infants, children, pregnant women, nursing mothers and women of childbearing age, unless otherwise noted.*

[+] *GLC is the Great Lakes Consortium; see end of document for information on their best practices. States with a [+] are following that protocol.*

Advisory values for fish tissue PFOS concentrations given in this table (Advisory value/range) are for the 1 meal/week consumption frequency. The "Do not eat" column includes fish tissue PFOS concentrations above which no fish should be consumed. Concentrations corresponding to other consumption frequencies for these states are listed in *Details and available sources of confirmed State PFOS Consumption Advisories.*

New Hampshire has differing meal frequencies depending on the target population and contaminant; see next table and *Details* section.

State	Advisory value/range	Frequency	Target population
NH	Site-specific values for Squam Lake	4 meals/mo	General [#]
		3 meals/mo	WCA[&]
		2 meals/mo	Child

[#]*General denotes general population*
[&]*Women of childbearing age*

Details and available sources of confirmed State PFOS Consumption Advisories

1. Alabama

State fish website:

https://www.alabamapublichealth.gov/tox/fish-advisories.html

2019 Fish Consumption Advisory Guidelines
http://www.adph.org/tox/index.asp?ID=1360

How much PFOS in fish tissue is safe to eat?
Using the RfD and some standard information based on national body weight and food consumption patterns, the following values were determined.

Link to flyer with table:
adph.org › epi › assets › PFOS_Flyer

Based on a reference dose (RfD) of 0.077 µg/kg-day for calculating the allowable limit of PFOS in fish tissue:

- No restriction = 0 – 40 µg/kg
- 1 meal/week = 41 – 200 µg/kg
- 1 meal/month = 201 – 800 µg/kg
- Do Not Eat = >800 µg/kg

2. Connecticut

State fish website:

http://www.ct.gov/dph/cwp/view.asp?a=3140&q=387460&dphNav_GID=1828&dphPNavCtr=|#47464

Table 5. Fish Meal Frequencies and Risk-Based PFAS Fish Concentrations Cutoffs (CT DPH 2017)

PFAS Level (ppb*)	Consumption Advisory
< 20	No consumption advice
20 to < 40	1 meal per week
40 to < 159	1 meal per month
≥ 159	Do Not Eat

*Parts per billion

Based upon the USEPA RfD of 0.00002 mg/kg/day and an assumed meal size of ½ pound (227 grams)

References:

CT DPH 2017. PFAS Fish Sampling Results Summary, prepared by Gary Ginsberg, November 13, 2017. *portal.ct.gov › DPH › dph › environmental_health › eoha › ATSDR*

HEALTH CONSULTATION
Public Health Evaluation of Fish Tissue from O'Sullivan's Island Site, Derby CT
January 23, 2018; Connecticut Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

3. Indiana

State fish websites:

http://www.in.gov/isdh/23650.htm
https://www.in.gov/isdh/26877.htm

PFOS advisories follow Great Lakes Consortium's PFOS Best Practices document (IDEM 6/10/20); see end of document

Reference:

Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines (Nov 2019)
https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

4. Maine

State fish website:

http://www.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/

MeCDC Human Health Fish Tissue PFOS Action Levels (µg/kg)

Number of Meals	Daily Fish Consumption Rate (kg/day)	Sensitive Population FTAL (µg/kg wet weight)	General Population FTAL (µg/kg wet weight)
One meal per week	0.0324	34.1	79.0
Two meals per month	0.0162	68.1	158.0
One meal per month	0.00757	145.8	338.2

Reference:
MEDEP presentation to Governor's PFAS Task Force 9/25/2019
https://www.maine.gov/pfastaskforce/materials/20190925/BMower-presentation-PFAS-in-Maine.pdf

5. Michigan

State fish website:

http://www.michigan.gov/eatsafefish

PFOS (ng/g)

Michigan Fish Consumption Screening Values	
Meals per Month	PFOS (ppb)
16	≤ 9
12	> 9 to 13
8	> 13 to 19
4	**> 19 to 38**
2	> 38 to 75
1	> 75 to 150
6 meals per year	> 150 to 300
Do Not Eat	> 300

Reference:
Michigan Fish Consumption Advisory Program Guidance Document Sep 14, 2016

https://www.michigan.gov/mdhhs/0,5885,7-339-71548_54783_54784_54785-170340--,00.html (at the top of the list)

6. Minnesota

State fish website:

http://www.health.state.mn.us/divs/eh/fish/index.html

Table 1. Levels of PFOS in Fish and Corresponding Meal Advice Categories for all Populations

PFOS in Fish (µg/kg)	Meal Frequency
≤ 10	Unrestricted
> 10-20	2 meals/week
> 20-50	**1 meal/week**
> 50-200	1 meal/month
> 200	DO NOT EAT

Reference:
Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines (Nov 2019)
https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

7. New Hampshire

State fish website:

http://www.wildlife.state.nh.us/fishing/consume-fresh.html

	Adults and children >7 years of age (8 oz. meal)	Women of childbearing age (8 oz. meal)	Children <7 years of age (4 oz. meal)
Recommended consumption limit Polychlorinated Biphenyls (PCBs)	3 meals per year	2 meals per year	1 meal per year
Recommendations for other contaminants Per- and polyfluoroalkyl substances (PFAS)*	48 meals per year (4 meals per month)	36 meals per year (3 meals per moth)	24 meals per year (2 meals per month)
Methyl Mercury (State-wide advisory**)	48 meals per year (4 meals per month)	12 meals per year (1 meal per month)	12 meals per year (1 meal per month)

*Based on concentrations of perfluorooctane sulfonic acid (PFOS) in smallmouth bass.
**Applies to freshwater fish caught in NH. More restrictive advisories, such that at Squam Lake, may exist for some waterbodies. For more information, see:
http://www.eregulations.com/newhampshire/fishing/19nhfw/fish-consumption-guidelines/

Reference:
www4.des.state.nh.us › uploads › Squam-Lake-PFAS-HHRA-2020

8. New Jersey

State fish website:

http://www.state.nj.us/dep/dsr/njmainfish.htm

Table 8: DRAFT Preliminary Fish Consumption Advisory Triggers (ng/g)

	General Population			High Risk Population*		
	PFOA (ng/g; ppb)	PFNA (ng/g; ppb)	PFOS (ng/g; ppb)	PFOA (ng/g; ppb)	PFNA (ng/g; ppb)	PFOS (ng/g; ppb)
Unlimited	0.62	0.23	0.56	0.62	0.23	0.56
Weekly	**4.3**	**1.6**	**3.9**	**4.3**	**1.6**	**3.9**
Monthly	18.6	6.9	17	18.6	6.9	17
Once/3 months	57	21	51	N/A	N/A	N/A
Yearly	226	84	204	N/A	N/A	N/A
Do Not Eat	**>226**	**>84**	**>204**	**>18.6**	**>6.9**	**>17**

**High risk individuals are considered to be at higher risk from contaminants in fish than members of the general public. This group includes infants, children, pregnant women, nursing mothers and women of childbearing age.*

Reference:
Investigation of Levels of Perfluorinated Compounds in New Jersey Fish, Surface Water, and Sediment New Jersey Department of Environmental Protection Division of Science, Research, and Environmental Health SR15-010 June 18, 2018 Updated April 9, 2019
https://www.nj.gov/dep/dsr/publications/Investigation%20of%20Levels%20of%20Perfluorinated%20Compounds%20in%20New%20Jersey%20Fish,%20Surface%20Water,%20and%20Sediment.pdf

9. New York

State fish website:

https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/

PFOS (µg/kg)
In 2018, the Minnesota (MN) and New York fish advisory programs independently adopted the 2016 US EPA RfD of 2 x10^{-5} mg/kg/day and corresponding advisory guidelines of up to 50 µg/kg for *one meal per week* advice and 200 µg/kg for triggering *don't-eat* advice. (GLC BPD)

NYSDOH did develop guidelines for PFOS in fish based on the 2016 EPA RfD. We also helped draft the Consortium Best Practices document which arrived at the same guidelines. (NYSDOH 6-15-22)

References:
Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines (Nov 2019)
https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/additional_information.htm

10. Oregon

State fish website:

http://public.health.oregon.gov/HealthyEnvironments/Recreation/FishConsumption/Pages/index.aspx

PFAS (mg/kg)

Perfluorochemicals (PFCs)	Congener-specific analysis	Oral Reference Dose (mg/kg-day)	Screening Value (mg/kg fish tissue)
Perfluorooctane Sulfonate (PFOS)		0.00008	0.2
Perfluorooctanoic Acid (PFOA)		0.00008	0.2

Screening values were developed from the listed RfD assuming 4 eight-ounce fish meals per month using the equation below:

$$SV = \frac{RfD \times BW}{IR \times CF}$$

Where:
SV = Screening value (mg/kg)

RfD = Oral reference dose (mg/kg-day)
BW = Bodyweight (70 kg for all but mercury which used 60 kg for pregnant women)
IR = Intake rate of fish (30 grams per day)
CF = Unitless conversion factor (0.001) to convert grams of fish to kilograms of fish

Reference:
Fish Consumption Advisory Standard Operating Guidance (SOG)
Oregon Health Authority (OHA) Fish Advisory Program (2018)
https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/RECREATION/FISHCONSUMPTION/Pages/fishadvisories.aspx/fishscreeninglevels2.pdf

11. Wisconsin

State fish website:

http://dnr.wi.gov/topic/fishing/consumption/

DNR/DHS January 2020
DNR has recently adopted meal threshold values developed by the Great Lakes Consortium for Fish Consumption Advisories, of which Wisconsin is a member (see below). These revised values incorporate additional research on the toxicity of PFAS that has occurred in the intervening years.

Levels of PFOS in Fish and Corresponding Meal Advice Categories for all Populations

PFOS in Fish (µg/kg)	Meal Frequency
≤ 10	Unrestricted
> 10-20	2 meals/week
> 20-50	1 meal/week
> 50-200	1 meal/month
> 200	DO NOT EAT

Reference:
Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines (Nov 2019)
https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

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Advisory from the Great Lakes Consortium's *Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines*

Table 1. Levels of PFOS in Fish and Corresponding Meal Advice Categories for all Populations

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> 200	DO NOT EAT

Reference:
Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines (Nov 2019)
https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

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References

ECOS (Environmental Council of the States) Sarah Grace Longsworth, ECOS Project Manager, in conjunction with the ECOS PFAS Caucus (2020). *Processes & Considerations for Setting State PFAS Standards* https://www.ecos.org/documents/ecos-white-paper-processes-and-considerations-for-setting-state-pfas-standards/

Great Lakes Consortium for Fish Consumption Advisories (2019) *Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines* https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf

State websites, as listed