FACT SHEET

Final Recommended Aquatic Life Criteria and Benchmarks for Select PFAS

September 2024

As part of the U.S. Environmental Protection Agency's commitment to safeguard the environment from per- and polyfluoroalkyl substances (PFAS), as laid out in the EPA's *PFAS Strategic Roadmap*, the agency has published final national recommended water quality criteria and benchmarks to help states and authorized Tribes protect aquatic ecosystems from several PFAS. For perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), the EPA published final recommended freshwater criteria for short-term (acute) and long-term (chronic) exposure, as well as saltwater benchmarks for acute exposures. The EPA also developed separate acute freshwater benchmarks for eight data-limited PFAS:

1) perfluorobutanoic acid (PFBA)
2) perfluorohexanoic acid (PFHxA)
3) perfluorononanoic acid (PFNA)
4) perfluorodecanoic acid (PFDA)
5) perfluorobutanesulfonic acid (PFBS)
6) perfluorohexanesulfonic acid (PFHxS)
7) hexadecafluoro-2-decenoic acid (8:2 FTUCA)
8) pentadecafluorodecanoic acid (7:3 FTCA)

The EPA's national recommended water quality criteria and benchmarks reflect the latest scientific knowledge regarding the effects of these PFAS on aquatic organisms, such as fish and aquatic insects. Concentrations of these individual PFAS in water bodies above the relevant criteria or benchmark level may harm the growth and reproduction of aquatic organisms or kill them. The EPA's recommended criteria and benchmarks are for individual PFAS and do not account for potential mixture effects (e.g., dose additivity). States and authorized Tribes can adopt the EPA's recommended criteria and benchmarks into their water quality standards or adopt other scientifically defensible values, including values based on local or site-specific conditions.

What are aquatic life water quality criteria and benchmarks?

The EPA's recommended water quality criteria and benchmarks for the protection of aquatic life represent the highest concentrations of pollutants in surface water that would allow fish and other aquatic species to live, grow, and reproduce. The EPA develops national recommended aquatic life ambient water quality criteria for pollutants under Section 304(a)(1) of the Clean Water Act to provide information that states and authorized Tribes can use when adopting water quality standards. The EPA develops informational numeric values called aquatic life benchmarks for select pollutants under Section 304(a)(2) of the Clean Water Act when there are limited high quality toxicity data available and data gaps exist for several families of aquatic organisms. The EPA's criteria and benchmarks are not regulatory, nor do they automatically become part of a state's water quality standards. States and authorized Tribes must adopt water quality criteria into their standards that protect the designated uses of their water bodies, including the use of those waters by aquatic life. States and authorized Tribes can establish water quality criteria based on the EPA's recommended criteria and benchmarks, modify these recommended criteria to reflect site-specific conditions, or develop criteria using other scientifically defensible methods. A state's or Tribe's water quality criteria are not applicable for the purposes of the Clean Water Act until they have been adopted into the state's or Tribe's water quality standards and are approved by the EPA.

What are PFAS, and how do they get into lakes and rivers?

PFAS have been manufactured and used by a broad range of industries since the 1940s and there are estimated to be thousands of PFAS present in the global marketplace. PFAS are used in many applications because of their unique physical properties such as resistance to high and low temperatures, resistance to degradation, and nonstick characteristics. PFAS can enter the aquatic environment during the manufacturing, use, and disposal of industrial and consumer products. Examples of sources include municipal and industrial wastewater treatment plant discharges, landfill leachate, runoff from areas where some firefighting foams have been used, and atmospheric deposition. PFOA and PFOS are two of the most widely used and studied PFAS.

How do PFAS affect aquatic life?

PFAS are not naturally occurring and have no biologically important functions or beneficial properties to aquatic life. At certain concentrations, PFAS can negatively affect the survival, growth, and reproduction of aquatic organisms like fish and aquatic insects. Aquatic plants seem to be more tolerant to PFAS and are less likely to be harmed than fish and other aquatic life.

What are the EPA's final recommended criteria for PFOA and PFOS to support aquatic life in freshwater?

The EPA's final recommended aquatic life criteria documents provide a critical review of PFOA and PFOS toxicity data and provide separate PFOA and PFOS criteria to help protect aquatic life from the effects of these chemicals. Table 1 provides a summary of the criteria components. The EPA derived the criteria recommendations based on the latest scientific knowledge, using available data on the toxicological effects of PFOA and PFOS on aquatic life. To develop the recommended criteria, the EPA followed the general approach outlined in the agency's *Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*. Additionally, the agency developed chronic criteria expressed as tissue-based concentrations to help protect aquatic life from PFOA or PFOS bioaccumulation.

Table 1. Final Recommended Freshwater Aquatic Life Water Quality Criteria for PFOA and PFOS

Criteria Component	Acute Water Column (CMC)[1] (mg/L)	Chronic Water Column (CCC)[2] (mg/L)	Invertebrate Whole-Body (mg/kg ww[3])	Fish Whole-Body (mg/kg ww[3])	Fish Muscle (mg/kg ww[3])
PFOA Magnitude	3.1	0.10	1.18	6.49	0.133
PFOS Magnitude	0.071	0.00025	0.028	0.201	0.087
Duration	1-hour average	4-day average	Instantaneous	Instantaneous	Instantaneous
Frequency	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in three years, on average	Not to be exceeded	Not to be exceeded	Not to be exceeded

[1] Criterion Maximum Concentration.
[2] Criterion Continuous Concentration.
[3] Wet Weight.

What are the EPA's acute benchmarks for PFOA and PFOS to support aquatic life in saltwater?

Toxicity data on saltwater organisms were limited relative to the data requirements used to develop the separate freshwater aquatic life criteria for PFOA and PFOS. Therefore, the EPA derived acute PFOA and PFOS aquatic life benchmark values for saltwater environments under Clean Water Act Section 304(a)(2) using the best available data on the effects of these PFAS (see Table 2). Benchmarks are estimates of the concentrations below which chemicals are not expected to present a risk of concern for aquatic organisms. These benchmarks provide information that states and Tribes may consider in their water quality protection programs, including establishing their own water quality criteria. The EPA derived these acute benchmarks using laboratory-based toxicity data on the individual effects of PFOA and PFOS in saltwater species that were supplemented with acute toxicity data from computer-based toxicity estimation tools (the EPA's web-based Interspecies Correlation Estimate (Web-ICE) tool, Version 3.3). The Web-ICE tool and the PFOA and PFOS saltwater benchmarks have both undergone external peer review. There were insufficient data to develop recommended chronic saltwater criteria or benchmarks for PFOA and PFOS.

Table 2. Acute Saltwater Aquatic Life Benchmarks for PFOA and PFOS

Chemical	PFOA (mg/L)	PFOS (mg/L)
Magnitude	7.0	0.55
Duration	1-hour average	
Frequency	Not to be exceeded more than once in three years on average	

What are the EPA's acute benchmarks for eight additional PFAS to support aquatic life in freshwater?

The EPA's aquatic life acute benchmarks document provides a critical review of available toxicity data for eight PFAS, describes estimated toxicity values generated using the EPA's Web-ICE tool, and includes benchmark values to help protect aquatic life from the acute effects of these chemicals in freshwater (Table 3). There were insufficient data to develop chronic saltwater benchmarks for these PFAS. These benchmarks provide information that states and Tribes may consider in their water quality protection programs, including establishing their own water quality criteria.

Table 3. Acute Freshwater Aquatic Life Benchmarks for Eight PFAS

Chemical	PFBA (mg/L)	PFHxA (mg/L)	PFNA (mg/L)	PFDA (mg/L)	PFBS (mg/L)	PFHxS (mg/L)	8:2 FTUCA (mg/L)	7:3 FTCA (mg/L)
Magnitude	5.3	4.8	0.65	0.50	5.0	0.21	0.037	0.012
Duration	1-hour average							
Frequency	Not to be exceeded more than once in three years on average							

How do the EPA's PFAS aquatic life criteria and benchmarks help complete actions in the agency's *PFAS Strategic Roadmap*?

In October 2021, EPA Administrator Michael Regan announced the agency's *PFAS Strategic Roadmap*—laying out a whole-of-agency approach to addressing PFAS. The Roadmap identified development of Clean Water Act recommended aquatic life criteria for PFOA and PFOS as well as the development of aquatic life benchmarks for PFAS with limited aquatic toxicity data as priority actions by the EPA.

Where can I find more information?

- View the EPA's final recommended freshwater aquatic life criteria and saltwater benchmarks for PFOA.
    - Please email PFOA-related questions to James Justice at justice.jamesr@epa.gov
- View the EPA's final recommended freshwater aquatic life criteria and saltwater benchmarks for PFOS.
    - Please email PFOS-related questions to Amanda Jarvis at jarvis.amanda@epa.gov
- View the EPA's final freshwater acute aquatic life benchmarks for eight data-limited PFAS.
    - Please email data-limited PFAS questions to Mike Elias at elias.mike@epa.gov