

Regulatory Update: Washington Sediment PFAS Guidance

Presented by Julia Fitts, LG



What's happening?

Who: Washington Department of Ecology

What/Where: Developing new statewide sediment PFAS policy

When/How: Planned in next SCUM revision—by late 2027

Why: To address PFAS in the aquatic environment and protect human health and the environment

The issue: A 2027 SCUM revision may not provide sufficient time to develop durable statewide PFAS sediment guidance, given the state of the science

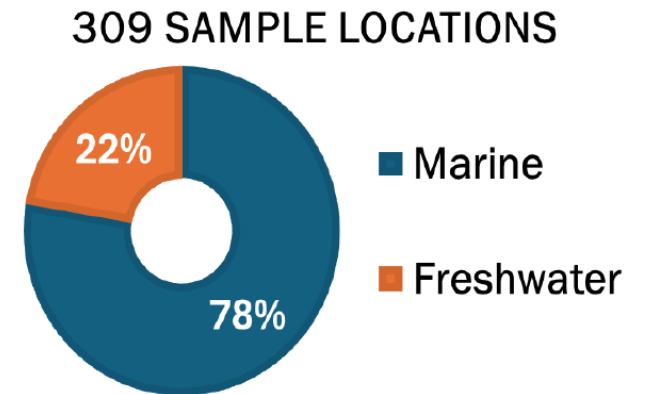
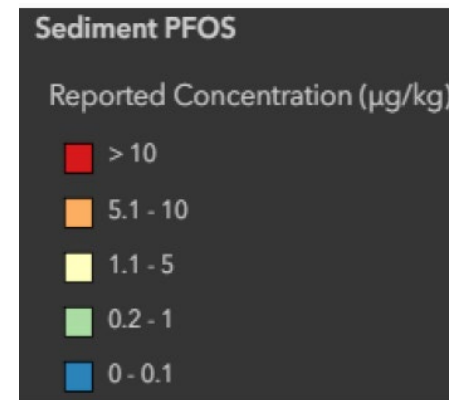
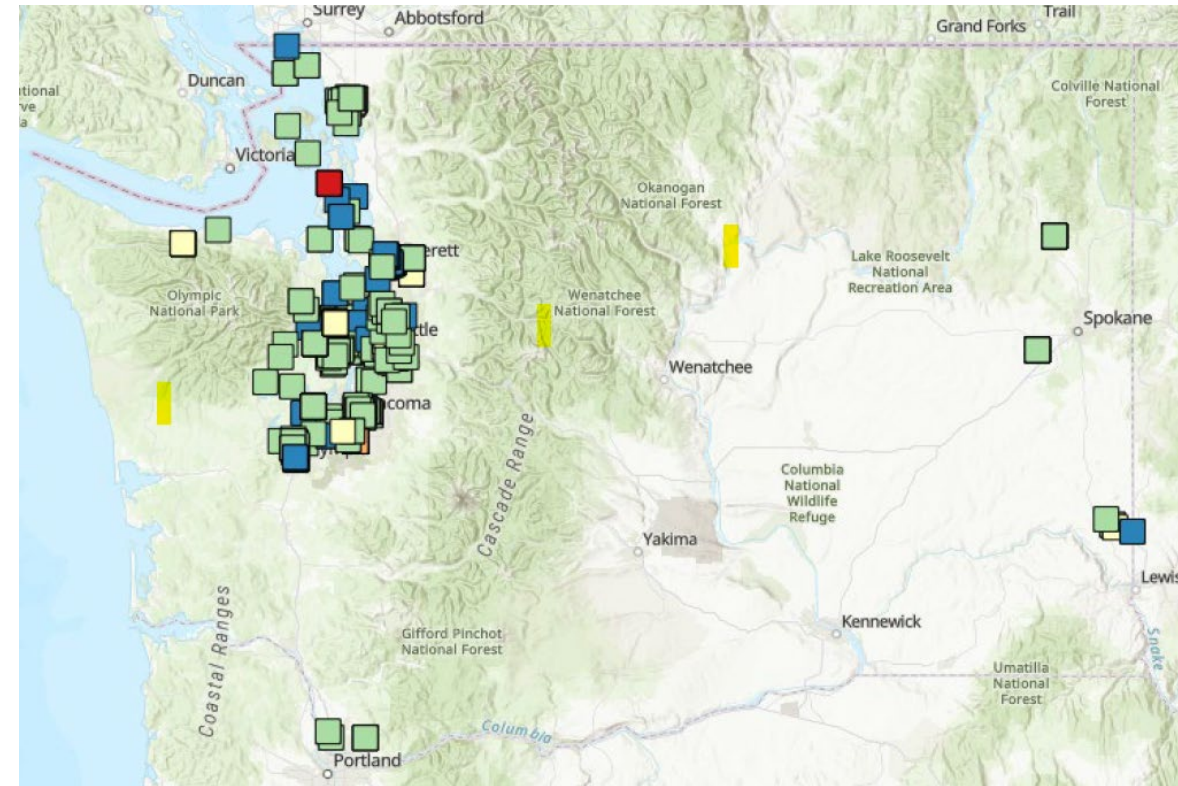
Why do we care?

- Establishing broad PFAS guidance and numeric criteria in Washington will impact sediment management and cleanup by Ports, Tribes, and other stakeholders for years to come
- There is limited precedent for broadly applicable PFAS sediment criteria in the United States
- Prematurely defining rigid sediment criteria for PFAS cleanup may create uncertainty and/or cause unintended delays at existing cleanup sites

Several key issues should be addressed before PFAS sediment guidance is finalized or applied broadly to sediment cleanup in Washington

Key Issues

- PFAS science is rapidly evolving
- PFAS are complicated and unique
- Limited technical studies are available, and questions remain
 - How do they bioaccumulate?
 - Relevant impact of sediment vs. water on resulting fish concentrations
 - Influence of precursors
 - What are the background levels?
 - What are the temporal trends?
 - What are the impacts of source control?



Ecology, 2026. *PFAS and Sediment Session Workshop*.
Sediment Management Annual Review Meeting. May 2026.



Recommendations

- PFAS sediment policy should be developed through a ***transparent and deliberate rule-making or formal guidance-development process*** that allows for technical review and stakeholder input
- Defer statewide numeric PFAS sediment screening levels
 - Continue to use site-specific weight-of-evidence approach
- Convene a technical advisory process including Tribal, port, municipal, academic, consultant, and federal participants
- Make supporting data and reports publicly available
- Develop interim site-specific evaluation guidance while regional data and peer-reviewed studies continue to mature
- **Ports: *Be prepared to engage in the process!***

CONTACT



Julia
Fitts, LG

Principal Scientist

jfitts@anchorqea.com



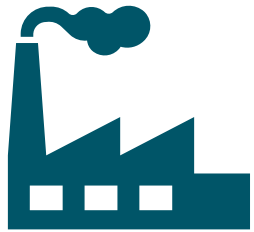
The State of Knowledge for Setting Guidance and Screening Levels for PFAS in Sediments

Presented by Sarah LaRoe, PhD



When are regulators likely to be concerned about PFAS in sediments?

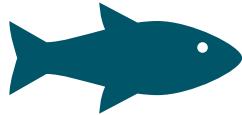
Today's Talk



Ongoing Source to the Water Column



Water Column
Exposure



Fish
Consumption



Direct Ecological Toxicity



Dredged Materials Management

*Additional Training
Available*

Do PFAS in
sediments pose
a risk via exposure
to water
concentrations?

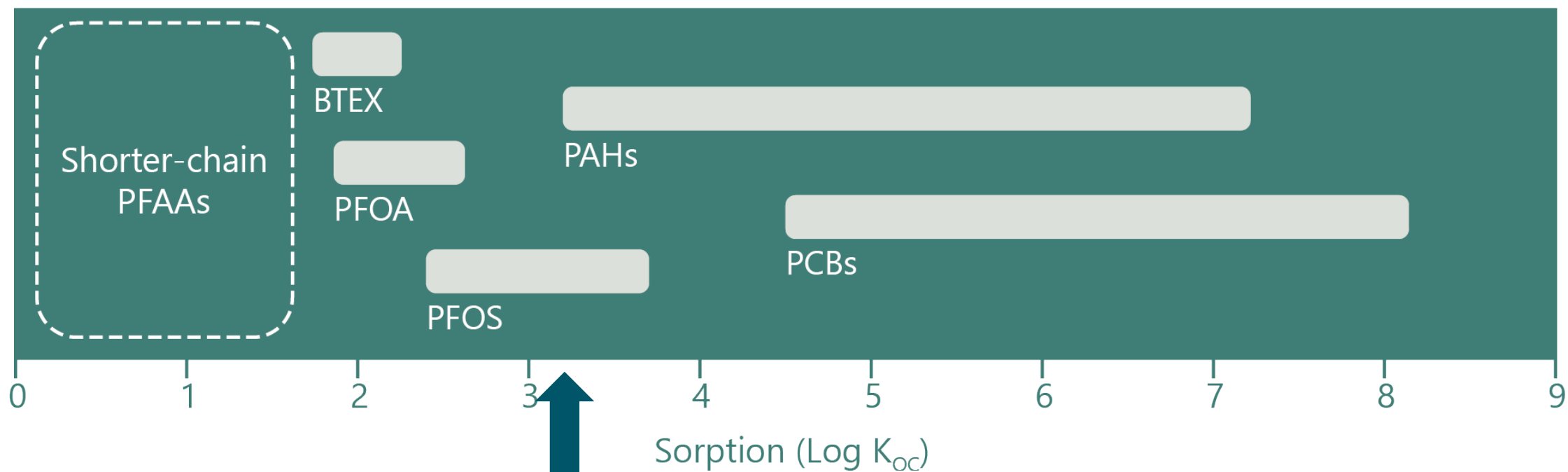


Sediments are considered long-term ongoing sources to the water column for hydrophobic contaminants

Key Question

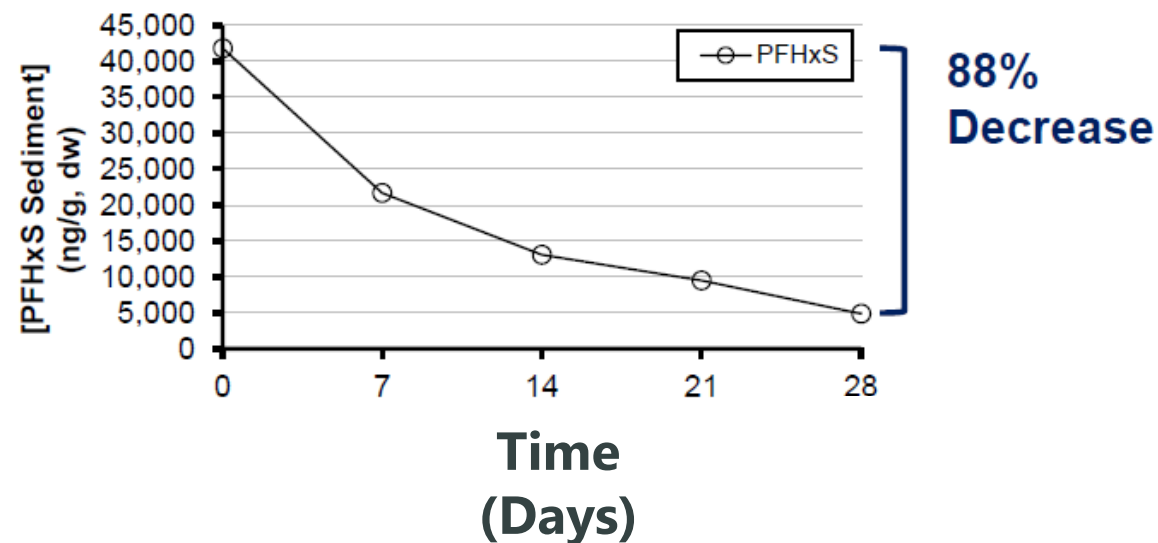
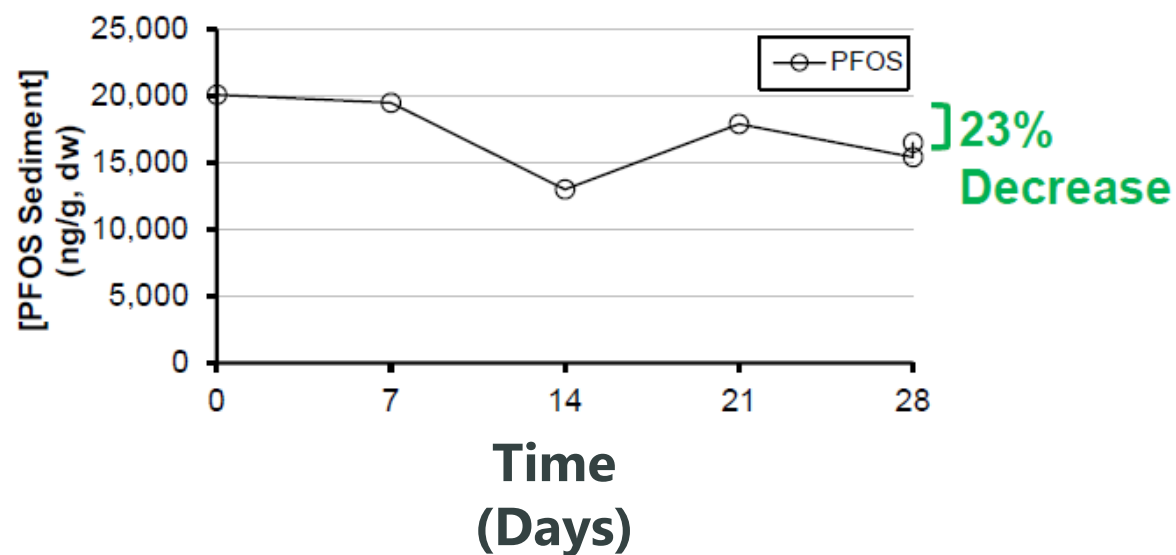
Are PFAS “hydrophobic”?

PFOS/PFOA Have Low Sorption to Sediment Particles



***PFOS sorption
overlaps with the
least sorptive PAHs***

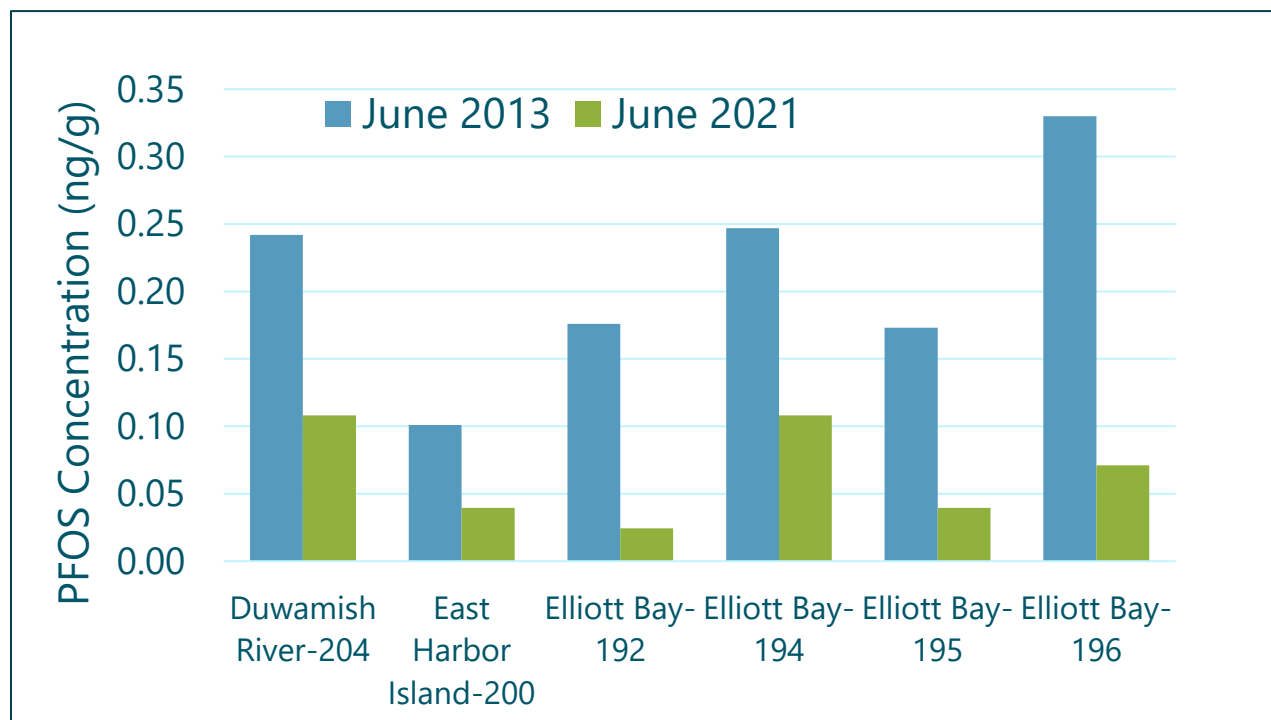
Regulated PFAS Decrease Rapidly in Sediments



Source: Geosyntec, 2026. *Investigation and Risk Assessment of Sediment Per- and Polyfluoroalkyl Substances (PFAS)*. Sediment Management Annual Review Meeting, Washington State Department of Ecology PFAS and Sediment Session Workshop. May 6, 2026.

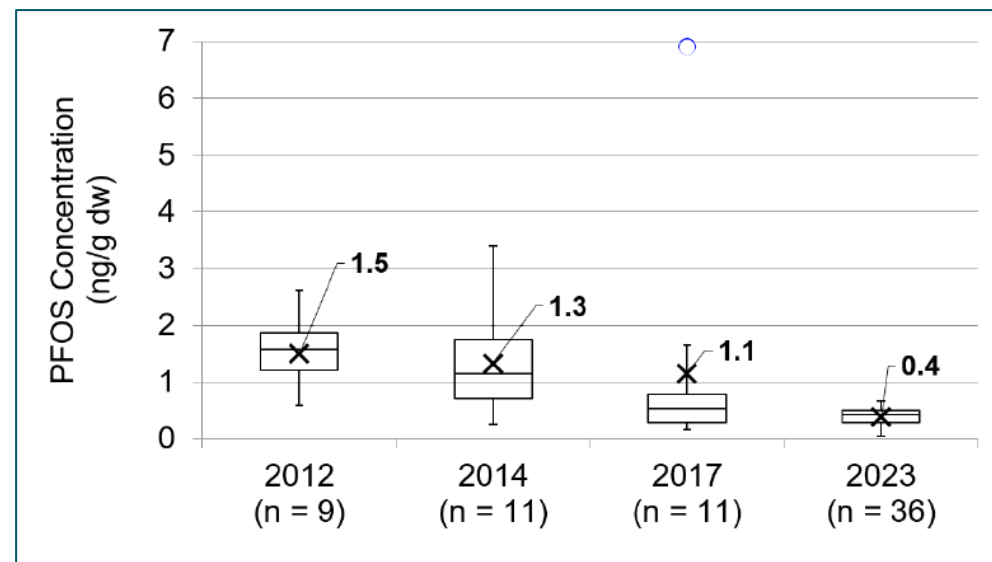
Sediment PFOS Environmental Data Show Declines

Paired Sediment Samples in Washington Surface Waters



Samples data-mined from Washington State Department of Ecology's EIM database. Accessed June 1, 2026. <https://ecology.wa.gov/research-data/data-resources/environmental-information-management-database>.

PFOS in San Francisco Bay Sediment

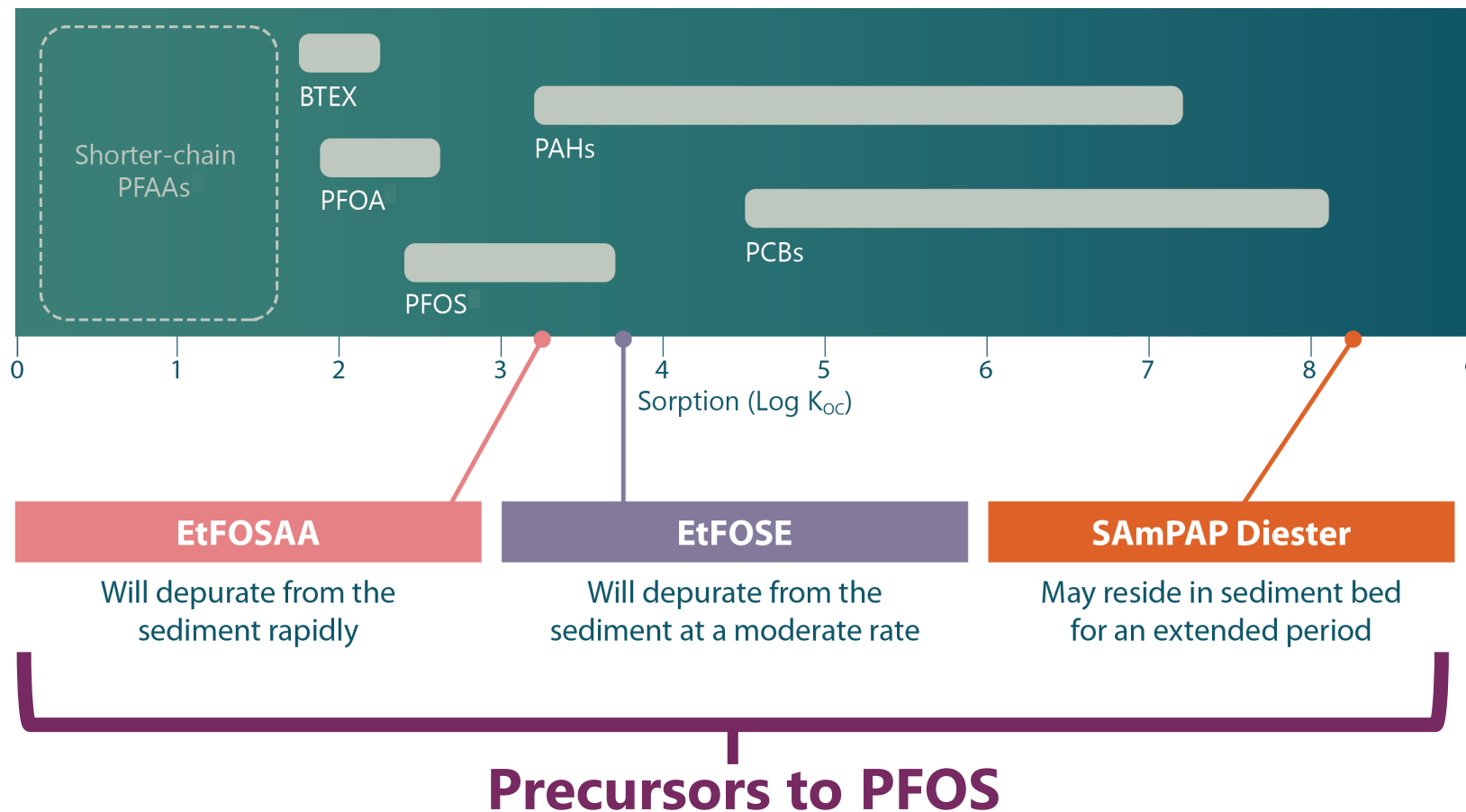


Mendez et al., 2025. *Emerging PFAS Trends in Water and Sediment from San Francisco Bay*. San Francisco Estuary Institute, Contribution No. 1245. August 2025.

UNCERTAINTY

Precursors May Change the Picture

Precursor = PFAS compound that can transform to another PFAS



What We Know

- Regulated PFAS generally have low sorption properties
- Regulated PFAS in sediments have the capacity to recover quickly
- Precursors can have higher sorption properties and may present an ongoing source

What We Don't Know

- Occurrence of precursors in the environment
- The pace and capacity of precursors to form those PFAS that are currently being regulated

How to Move Forward



- Increased analysis of precursor occurrence
- Additional studies on precursor transformation and sorption

Strategic Insights

Source control will likely have large effects on regulated PFAS sediment concentrations

- Occurrence in sediments is not, in itself, a long-term risk to water column concentrations

Further studies should be done on a site-specific basis to understand if precursors could present a long-term source

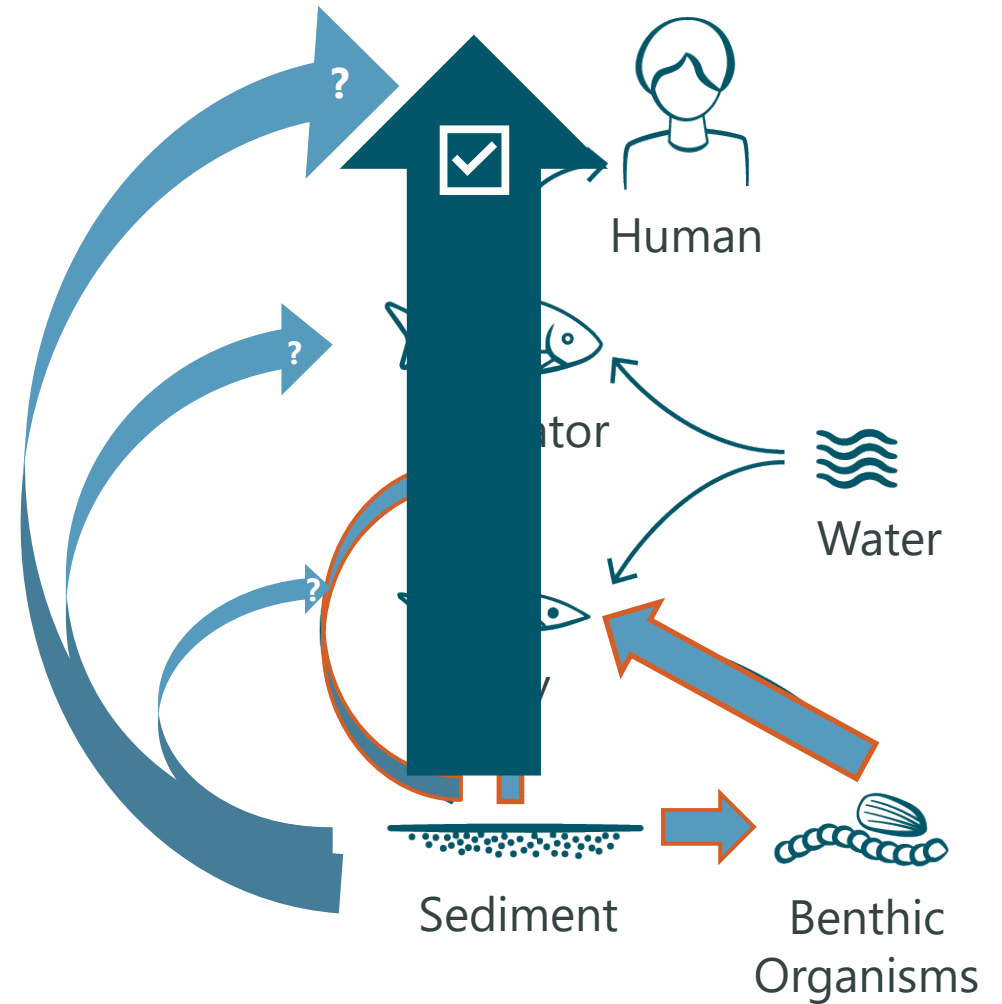
Do PFAS in
sediments pose a
risk via fish
consumption?



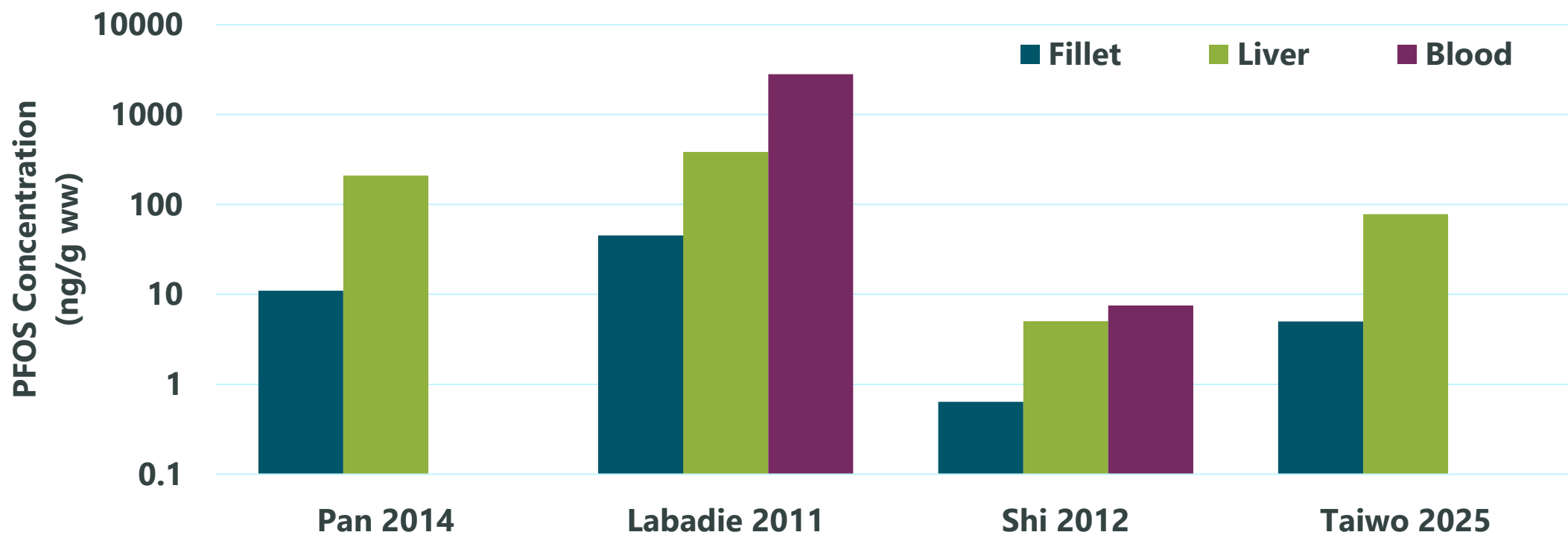
Sediment Guidance Depends on the Linkage of Sediment Concentrations to Fish Concentrations

1. Establish fish tissue concentration guidance (e.g., FCAs)
2. Establish *significance* of link between sediment and fish concentrations
3. Establish metrics for prediction of fish concentrations
4. Derive sediment concentration threshold

Paradigm = Hydrophobic Contaminants



Fish Uptake PFAS Differently Than Other Chemicals



PFAS associate with proteins and phospholipids, not lipids/fats

Pan et al., 2014. "Bioaccumulation and Risk Assessment of Per- and Polyfluoroalkyl Substances in Wild Freshwater Fish from Rivers in the Peral River Delta Region, South China." *Ecotoxicology and Environmental Safety* 107:192-199.

Labadie and Chevreuil, 2011. "Corrigendum to 'Partitioning Behavior of Perfluorinated Alkyl Contaminants Between Water, Sediment and Fish in the Orge River.'" *Environmental Pollution* 159:1452-1453.

Shi et al., 2012. "Tissue Distribution of Perfluorinated Compounds in Farmed Freshwater Fish and Human Exposure by Consumption." *Environmental Toxicology and Chemistry* 31(4):717-723.

Taiwo et al., 2025. "Bioaccumulation Patter of Per- and Polyfluoroalkyl Substances (PFAS) in Fish Tissues from Two Freshwater Systems." *Journal of Hazardous Materials Advances* 20:100875.

UNCERTAINTY

Using BSAF to Explain the Sediment-Biota Connection

$$\text{BSAF} = \frac{C_{\text{biota}}}{C_{\text{sediment}}}$$

~~Assumption~~

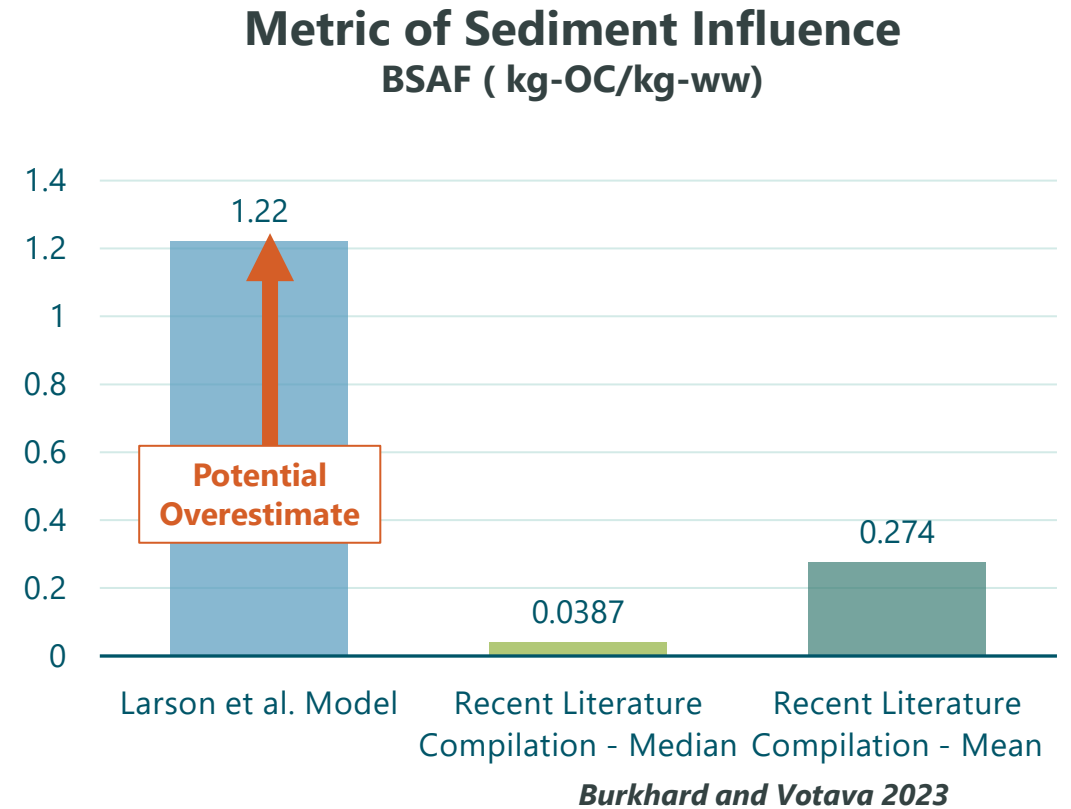
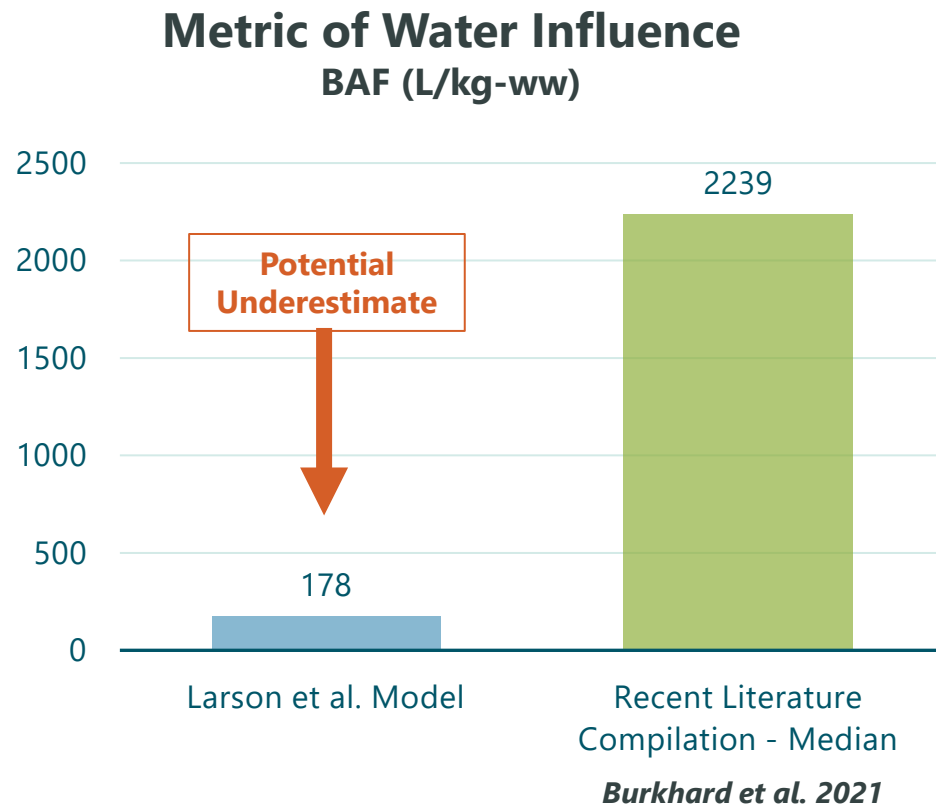
We understand uptake enough to not normalize the biota concentration by a controlling variable (like lipids)

Assumption?

The concentration in the fish is primarily from sediment exposure

Conventional legacy-contaminant paradigms for bioaccumulation may not hold for PFAS

Assumptions Can Influence Our Understanding of the Importance of Sediment to Fish Concentrations

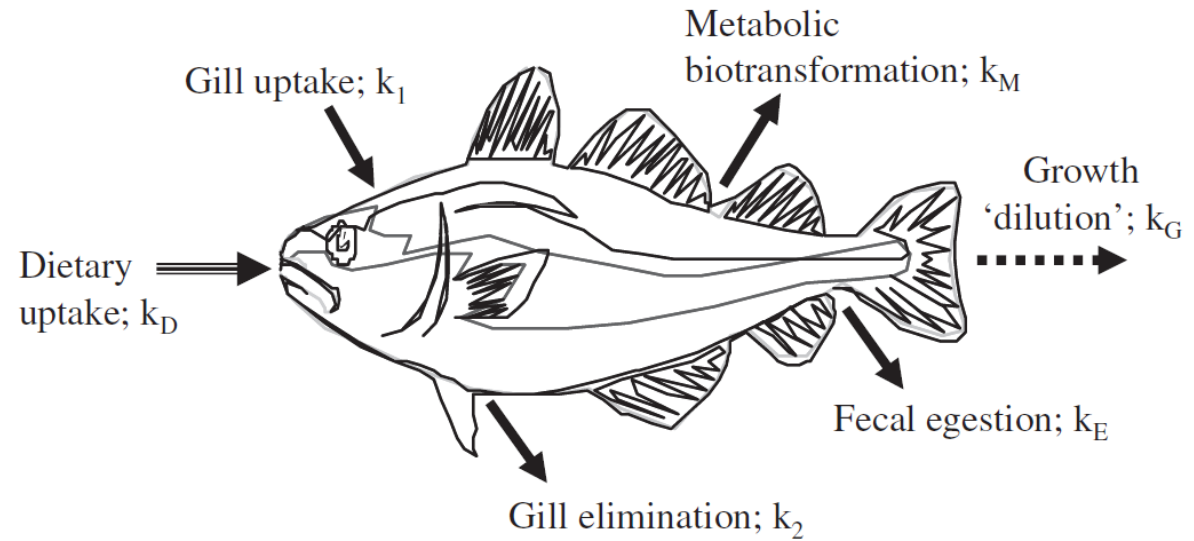


Larson et al. Conclusion:
Sediment-associated PFAS were the source of the highest predicted PFAS exposures

UNCERTAINTY

Using Aquatic Food Web Simulations to Establish the Sediment-Biota Connection

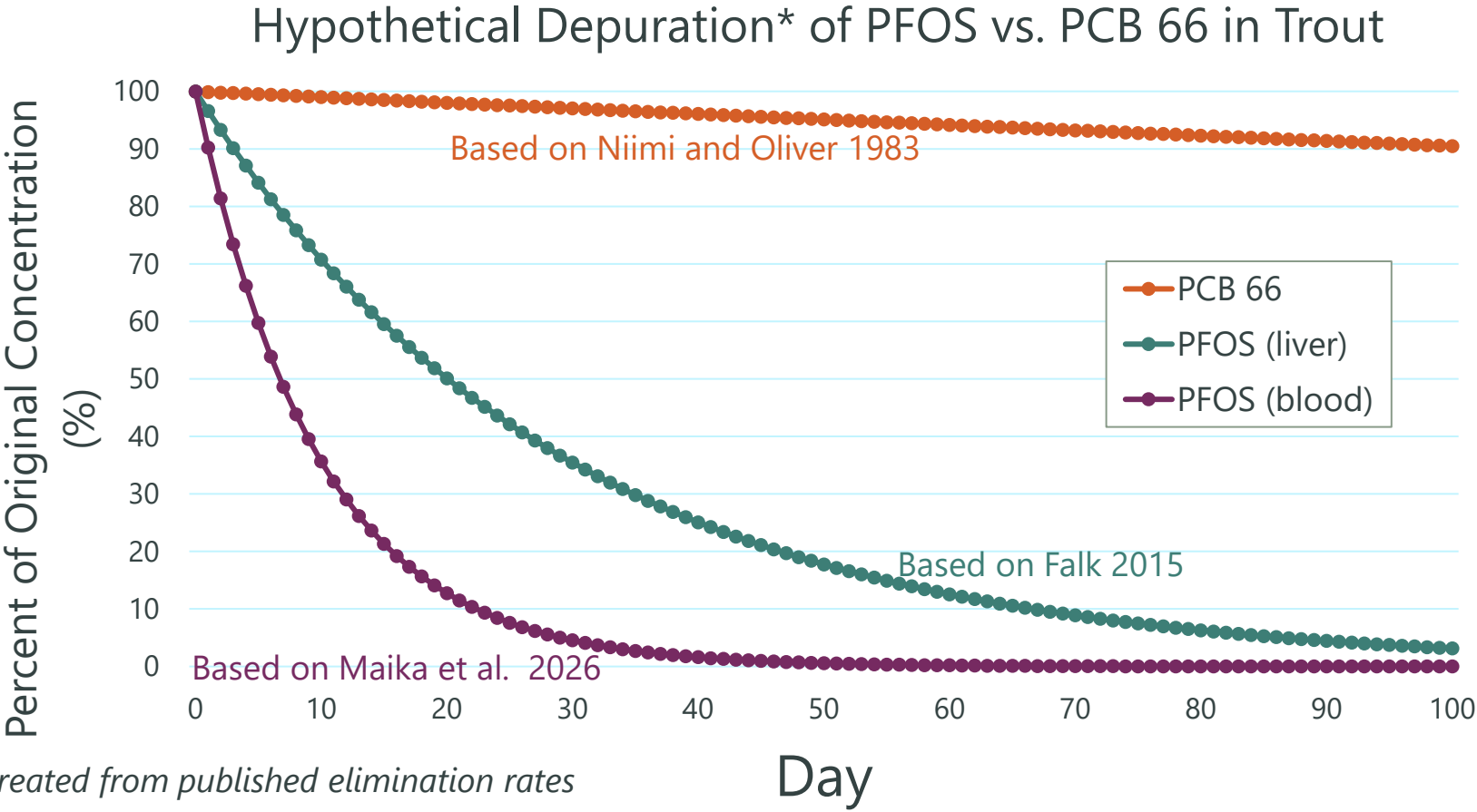
Modelers are calling for more data on model parameters



"These parameters are among the most sensitive model parameters for all PFAS, but are highly variable and poorly characterized"

Sun et al., 2022. "A Food Web Bioaccumulation Model for the Accumulation of Per- and Poly fluoroalkyl Substances (PFAS) in Fish: How Important is Renal Elimination?" *Environmental Science: Processes & Impacts*. 24(8):1152–1164.

PFOS Is Eliminated Quickly from Fish



*Depuration plots created from published elimination rates

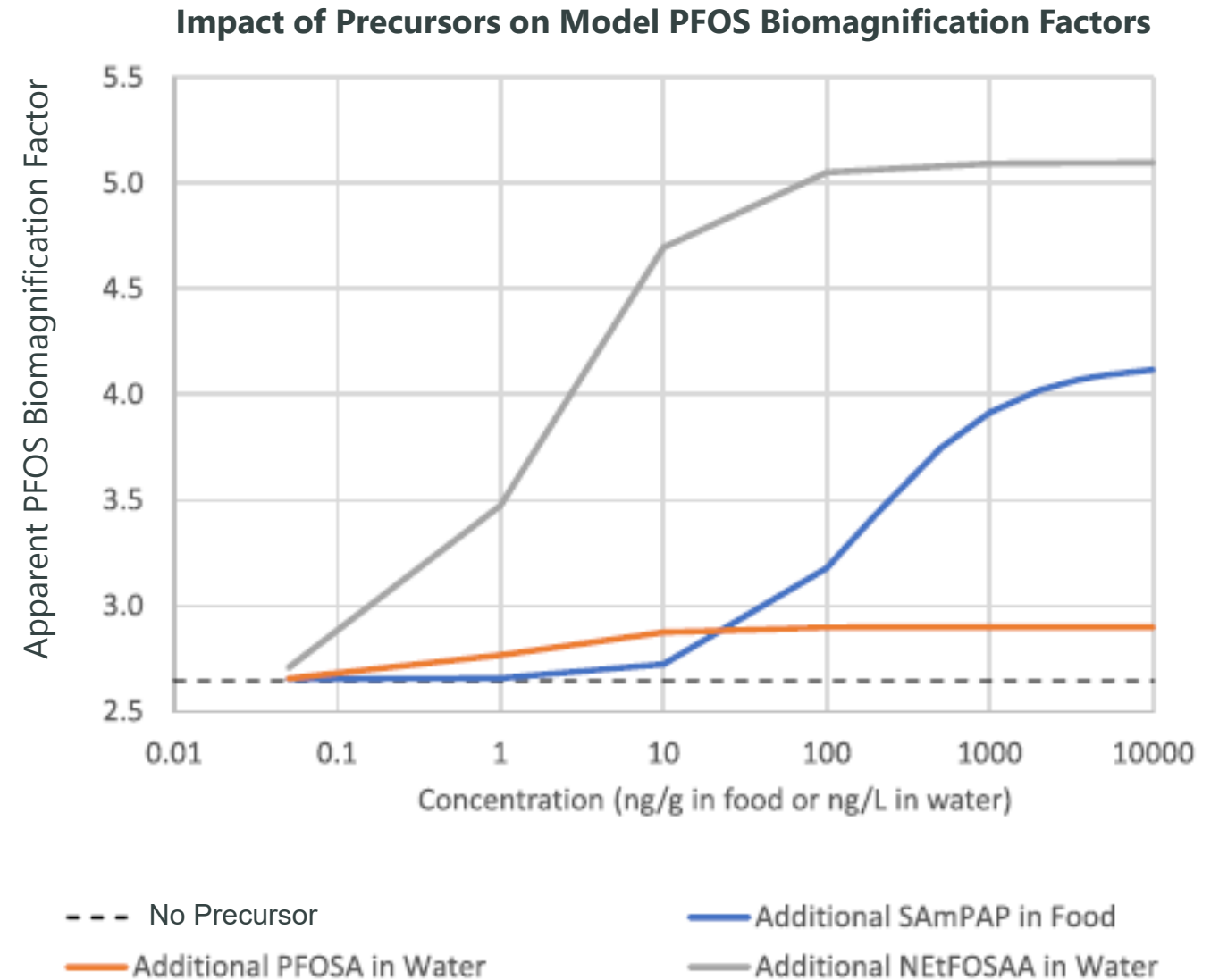
Niimi and Oliver, 1983. "Biological Half-Lives of Polychlorinated Biphenyl (PCB) Congeners in Whole Fish and Muscle of Rainbow Trout." *Canadian Journal of Fisheries and Aquatic Sciences*. 40:1388-1394.

Falk et al., 2015. "Tissue Specific Uptake and Elimination of Perfluoroalkyl Acids (PFAAs) in Adult Rainbow Trout (*Oncorhynchus mykiss*) After Dietary Exposure." *Chemosphere* 129:150-156.

Maika et al., 2026. *Modeling the Bioconcentration of Per- and Polyfluoroalkyl Substances (PFAS) in Rainbow Trout (Oncorhynchus mykiss) Using a Chemical Activity-Based Approach*. Annual Meeting of the SETAC Pacific Northwest Chapter. (Leavenworth, Washington); April 15, 2026.

UNCERTAINTY

Precursors May Impact the Concentration of Regulated PFAS in Fish



What We Know

- PFOS is eliminated quickly from fish
- PFAS accumulate in different tissues than other legacy chemicals
- Precursors have the capability of affecting bioaccumulation metrics

What We Don't Know

- Relative importance of uptake through water vs sediment
- Applicability of BSAF metric
- Key bioaccumulation parameters for models, like PFAS absorption efficiencies
- Direct effects of precursors on bioaccumulation metrics

How to Move Forward

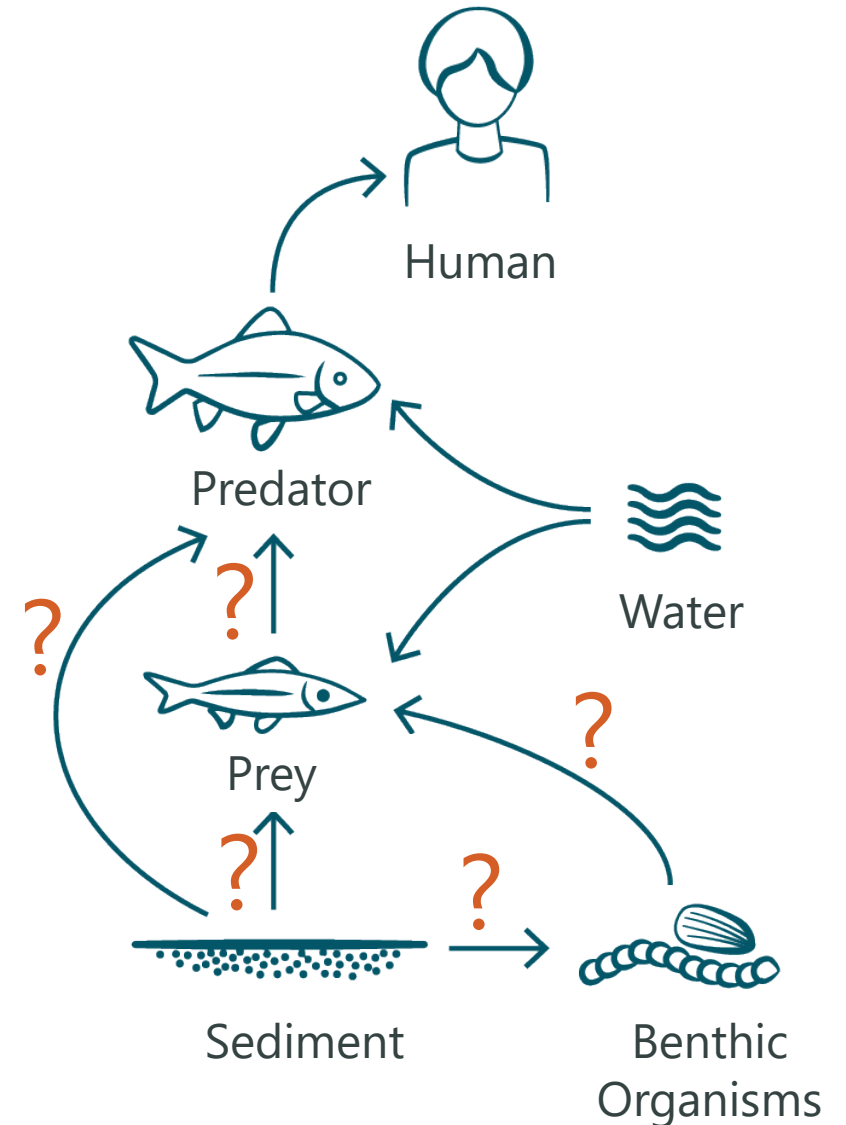


- Research on bioaccumulation parameters like gill/gut absorption
- Research on in vivo formation of regulated PFAS from precursors

Strategic Insights

Broadly applicable sediment screening levels for the reduction of fish concentrations are premature because of scientific uncertainty.

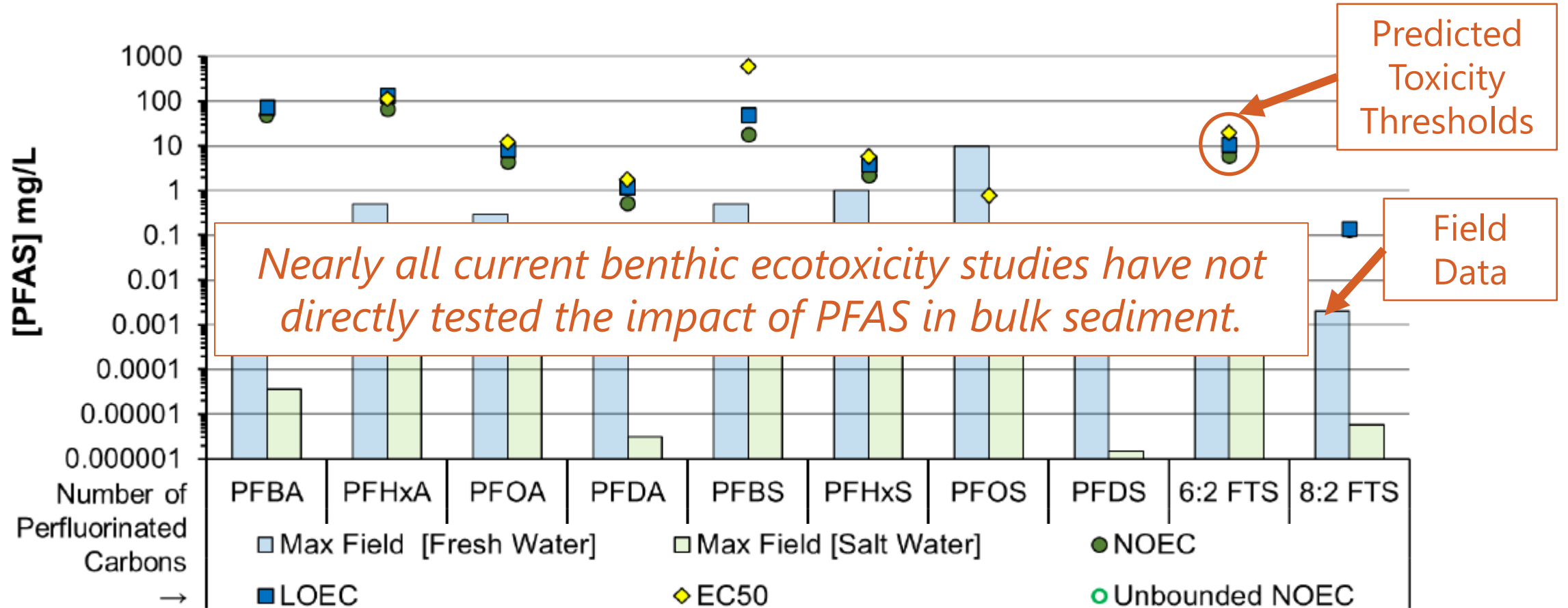
In the meantime, we should advocate for a site-specific approach to understand trophic-level interactions and precursor occurrence to determine PFAS exposure risks.



Do PFAS in
sediment pose a
risk via ecological
toxicity?



Current Concentrations << Benthic Toxicity Values for Pore Water



What We Know

- There is evidence of some toxicological effects on aquatic and benthic species at relatively high dissolved porewater concentrations
- Most assessments found toxicity levels much higher than usual environmental concentrations

What We Don't Know

- Limited studies on direct bulk sediment toxicity
- We don't have consistent results

How to Move Forward



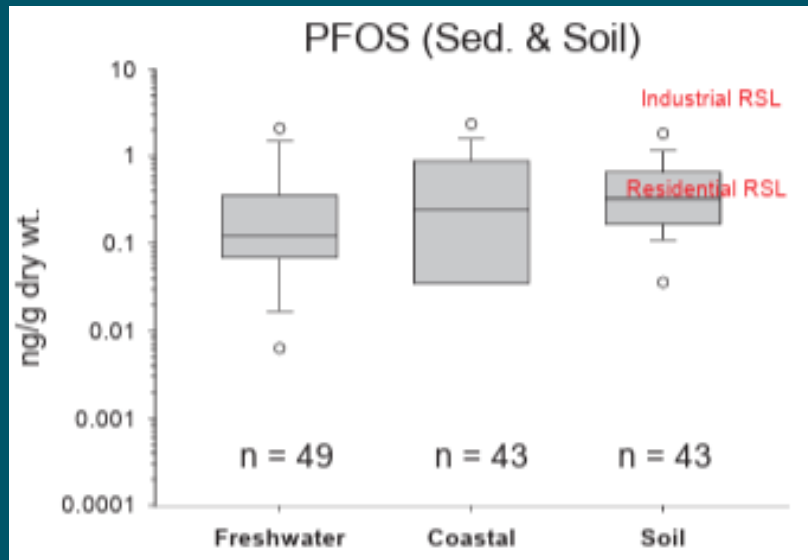
More research to holistically understand if PFAS in sediment poses a risk to the benthos



Strategic Insights

- Sediment ecotoxicity research is in its infancy
- Site-specific determinations should be made until overarching conclusions are available in the literature

Understanding Background Concentrations as a Starting Point



- Background studies for sediment are in progress
- Sediment concentrations are changing rapidly due to phase-outs and rapid depuration
- Regulatory approaches to account for regional background levels are still developing

The State of the Science for PFAS in Sediments

Source control and natural recovery may be a sound strategy for sediment remediation

- *Sediments may not be a long-term sink for regulated PFAS, differing from legacy hydrophobic chemicals*

Establishing the sediment-biota linkage is challenging for PFAS

- *Much of our knowledge of bioaccumulation of legacy chemicals may not apply to PFAS*

Benthic toxicity does not currently appear to be a driver of aquatic eco-risk

The Path Forward

Rely on site-specific assessments

- *Current and trending PFAS concentrations in water, sediment, and biota*
- *Source identification and methods of control*
- *Potential recovery after source control*

Distinguish between direct ecological toxicity and human-health/wildlife health exposures

Do not apply blanket assumptions to PFAS risk assessments

What questions do you have?

CONTACT



Sarah
LaRoe, PhD

Managing Scientist

slaroe@anchorqea.com

