BATTELLE 2023 SEDIMENTS CONFERENCE

The Role of PFAS in Sediments in Fish Recovery

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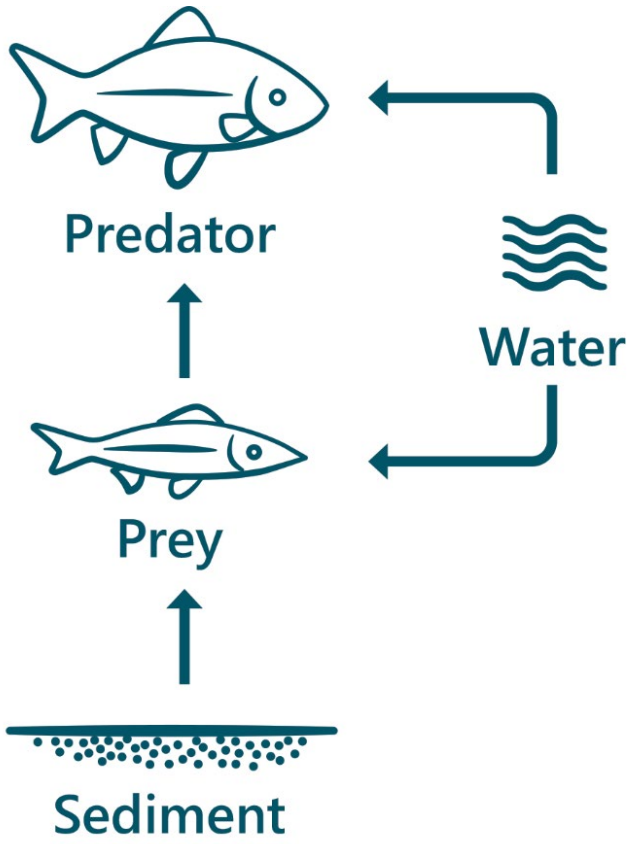
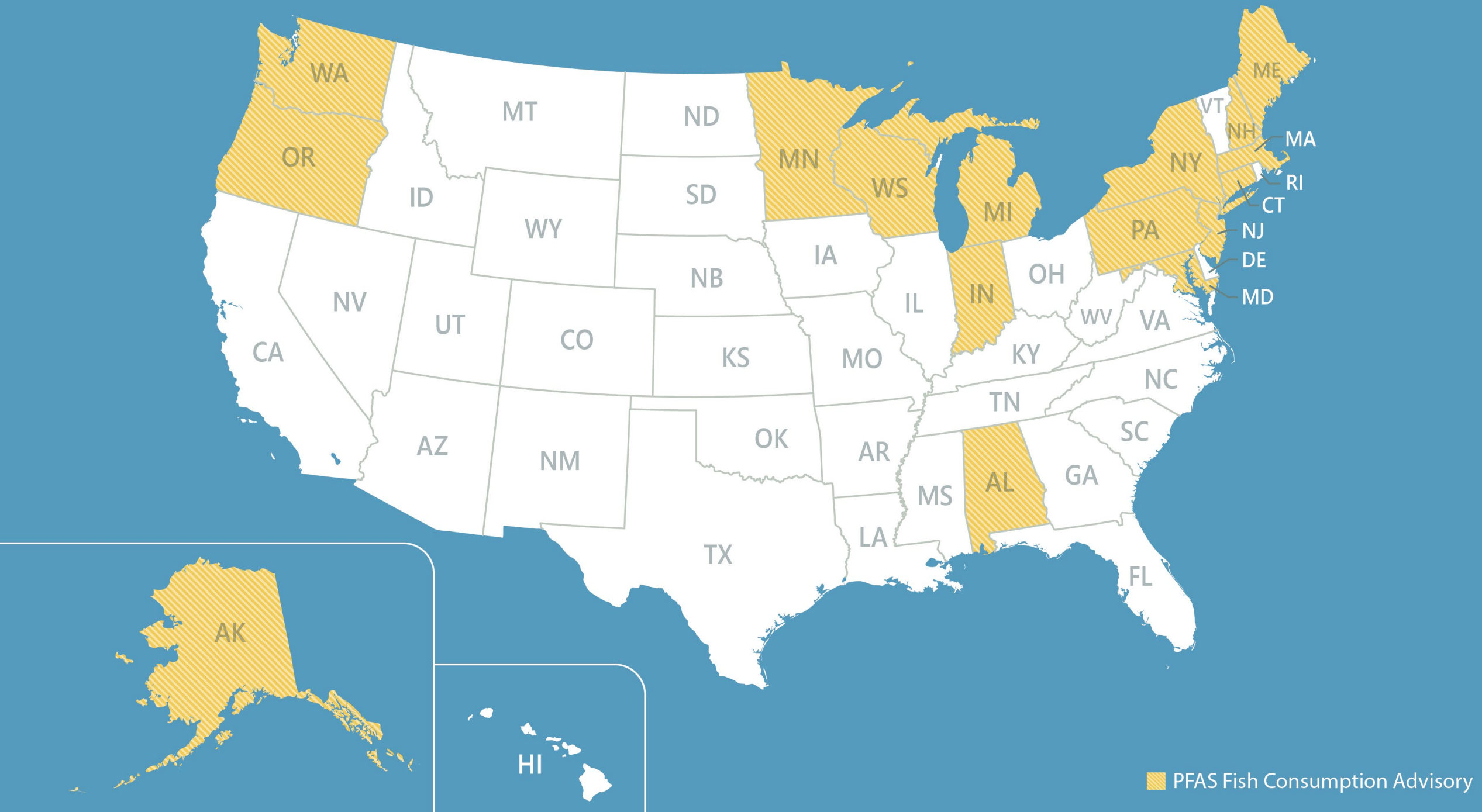


- PFAS fish consumption advisories in the United States
- PFOS (or PFAA) behavior in sediments
- Impact of precursors
- Benefit of sediment remediation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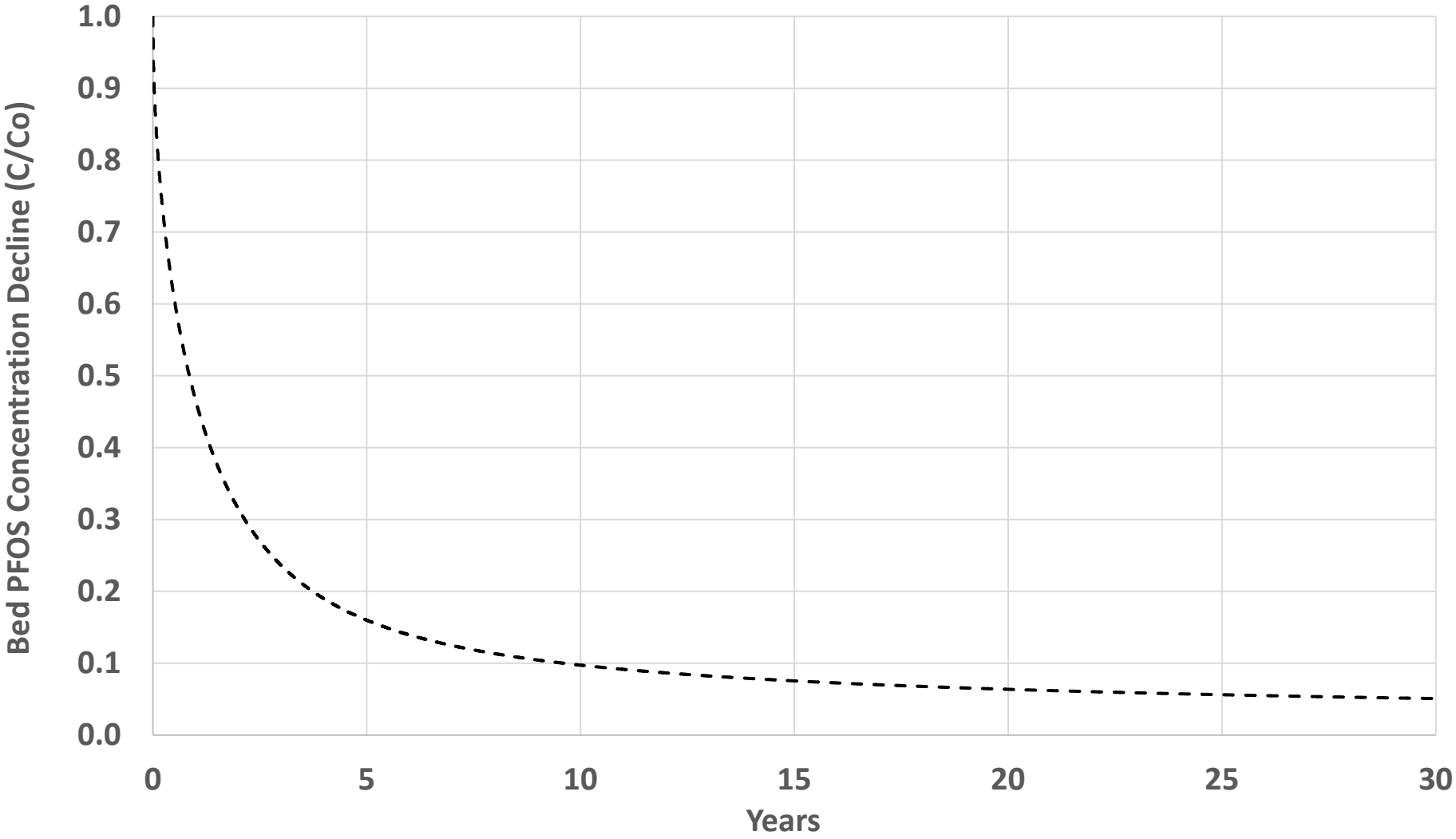
PFAS Fish Consumption Advisory

CHALLENGE

When might active sediment remediation for PFAS help fish recovery?

PFOS Sediment Recovery: 1D Model Insights



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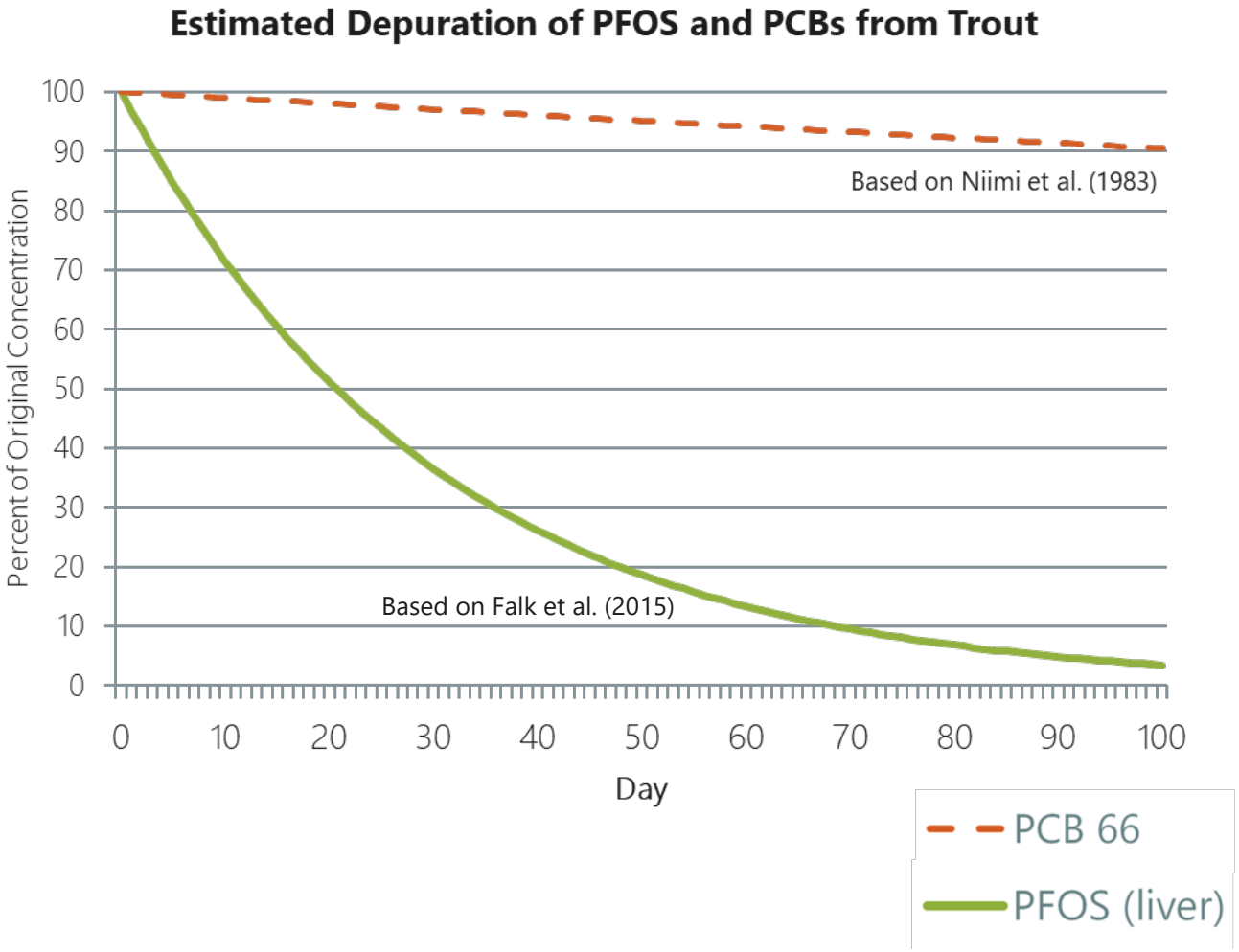
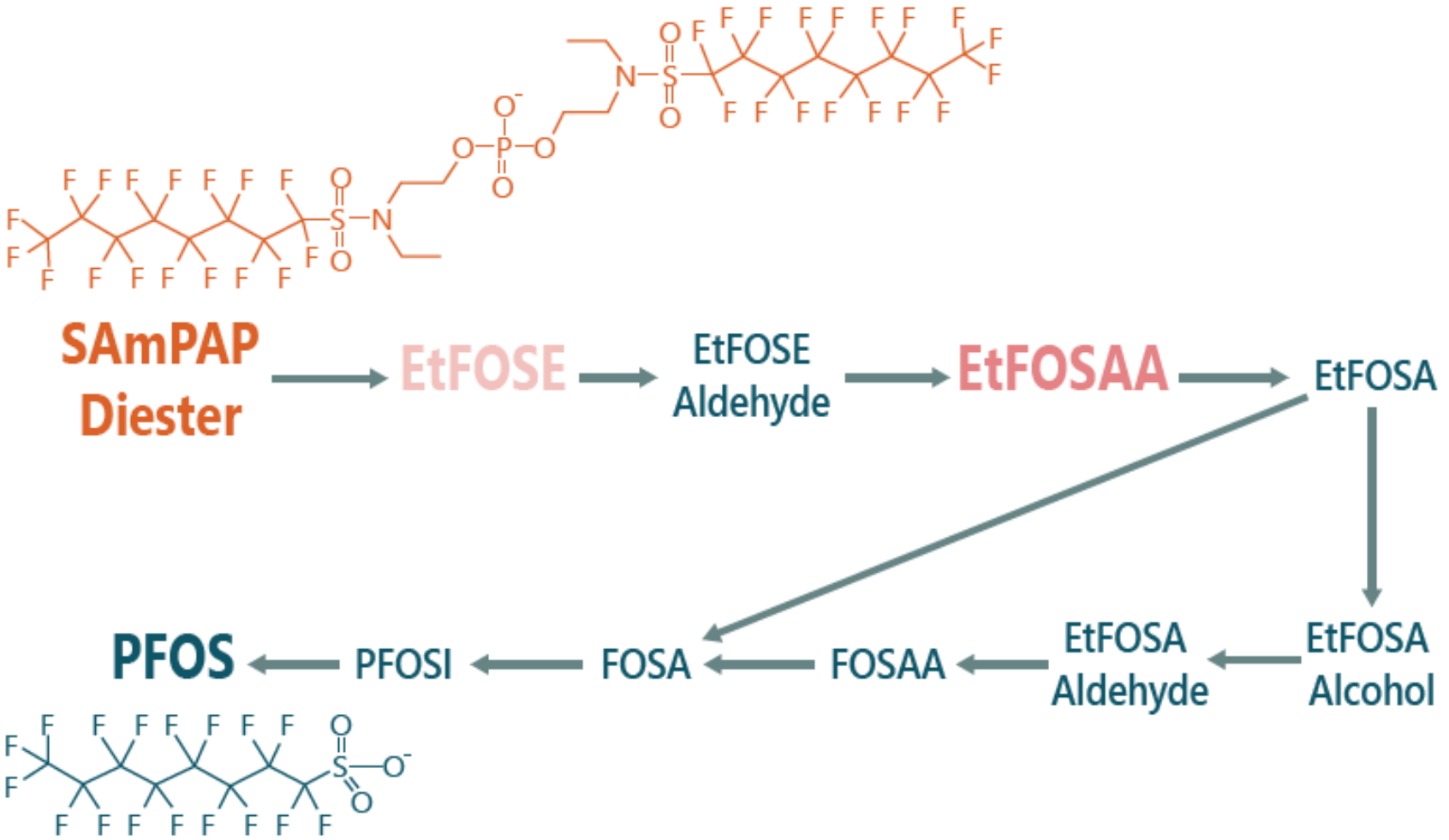
PFOS Is Rapidly Depurated by Fish

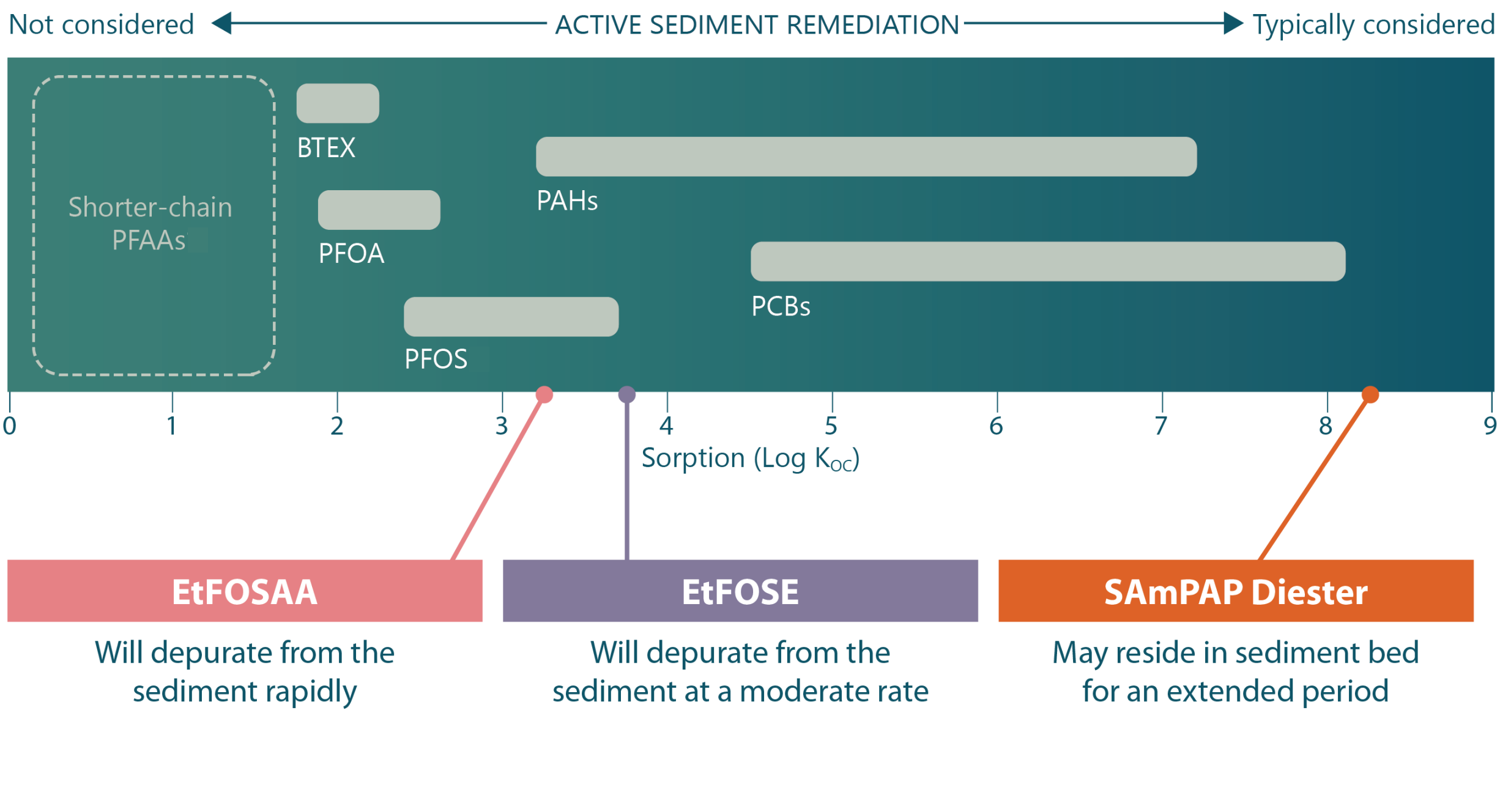
- Much faster than for most PCBs
- Elimination via gills is more significant than for other bioaccumulative chemicals
- Without precursors, PFAA concentrations decline quickly due to low sorption to sediments and high depuration in fish



Presence of Precursors

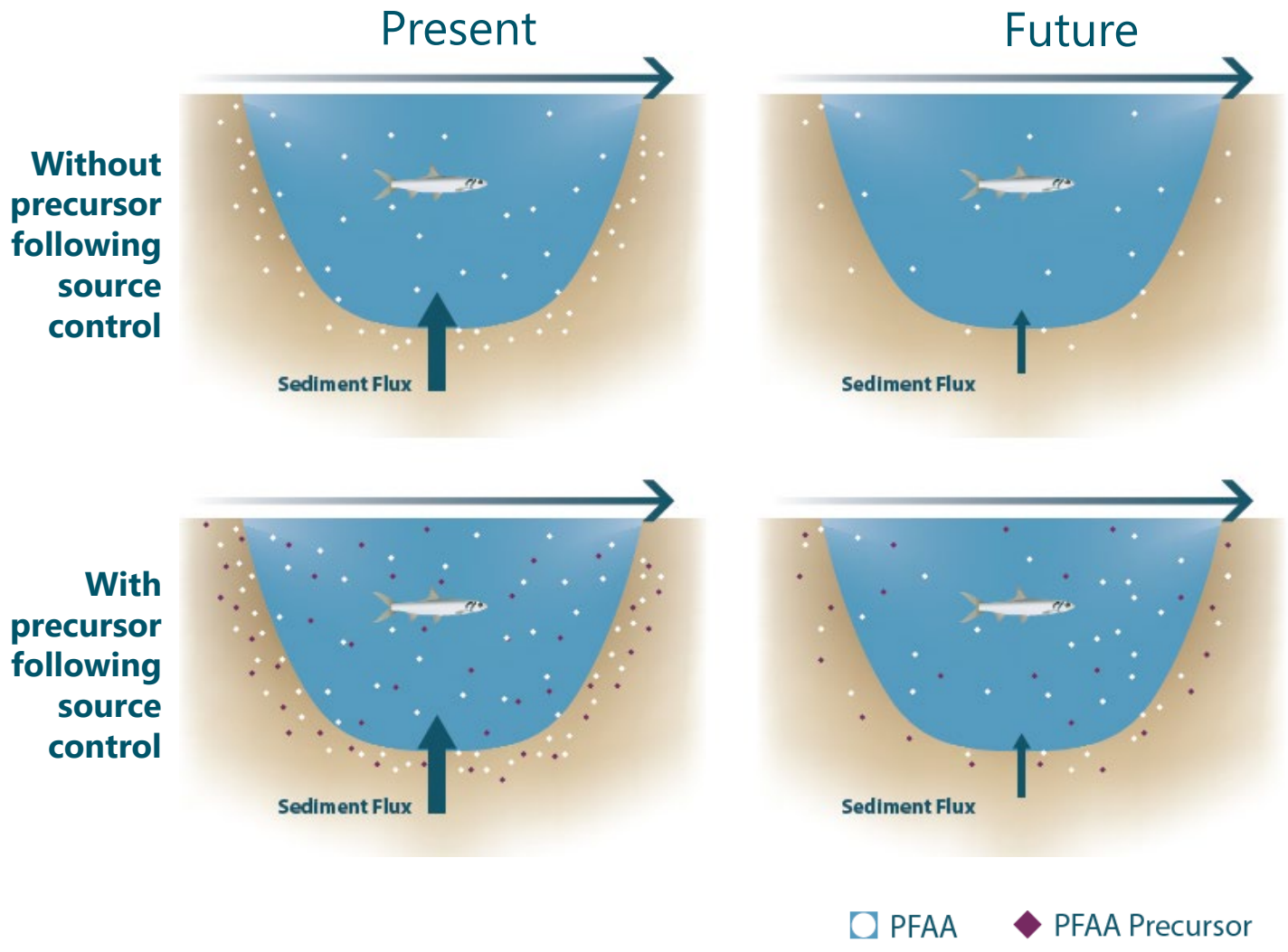


Source: Liu and Avendaño (2013)


Not considered
ACTIVE SEDIMENT REMEDIATION
Typically considered
Shorter-chain PFAAs
BTEX
PFOA
PFOS
PAHs
PCBs
0
1
2
3
4
5
6
7
8
9
Sorption (Log K_{OC})
EtFOSAA
Will depurate from the sediment rapidly
EtFOSE
Will depurate from the sediment at a moderate rate
SAmPAP Diester
May reside in sediment bed for an extended period

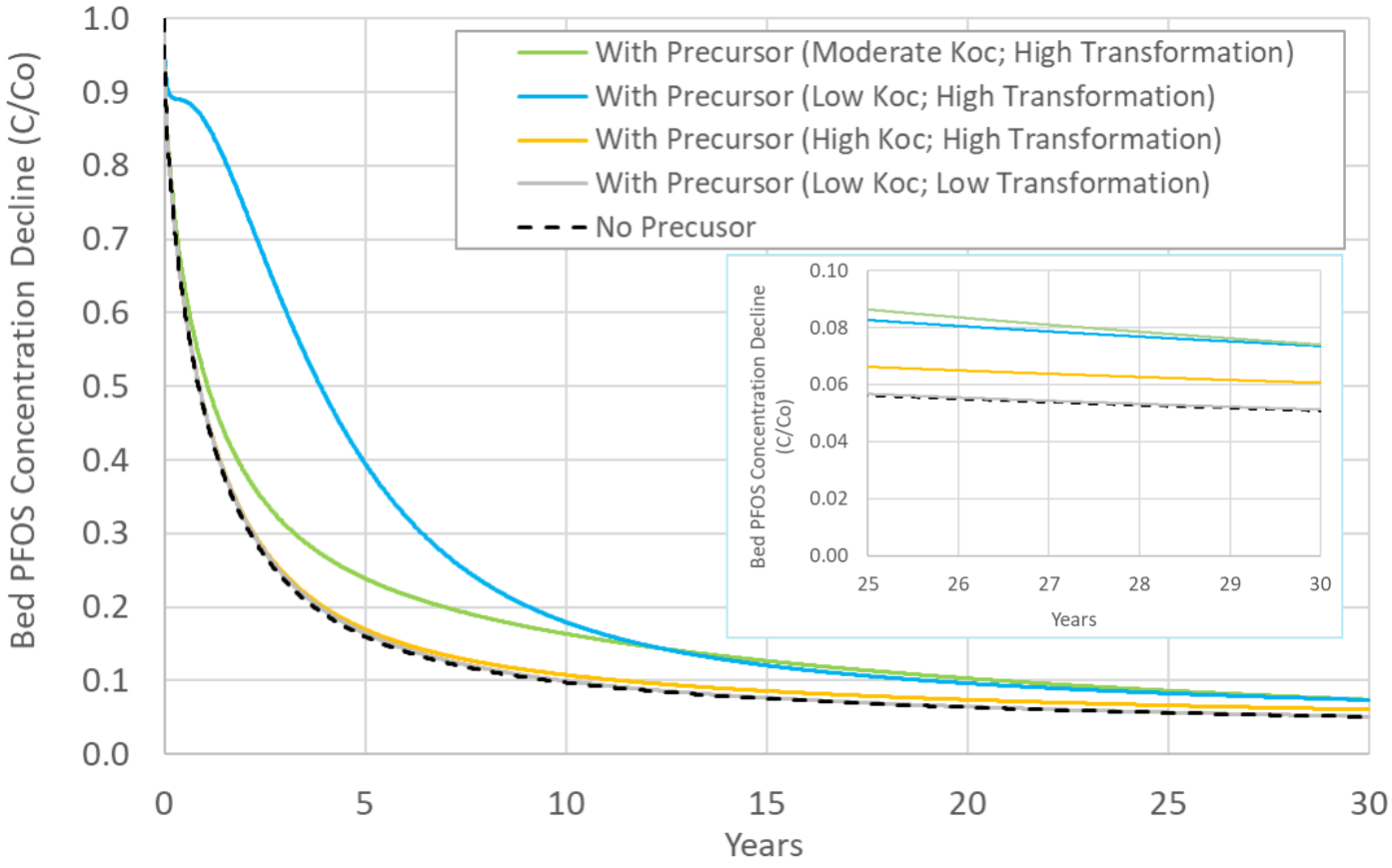
Change in PFAA Concentration

- Precursors in sediments may provide a long-term source of PFOS and other PFAAs
- With precursors, PFAA concentrations are controlled largely by two properties
  - Sorptive strength
  - Precursor transformation rate



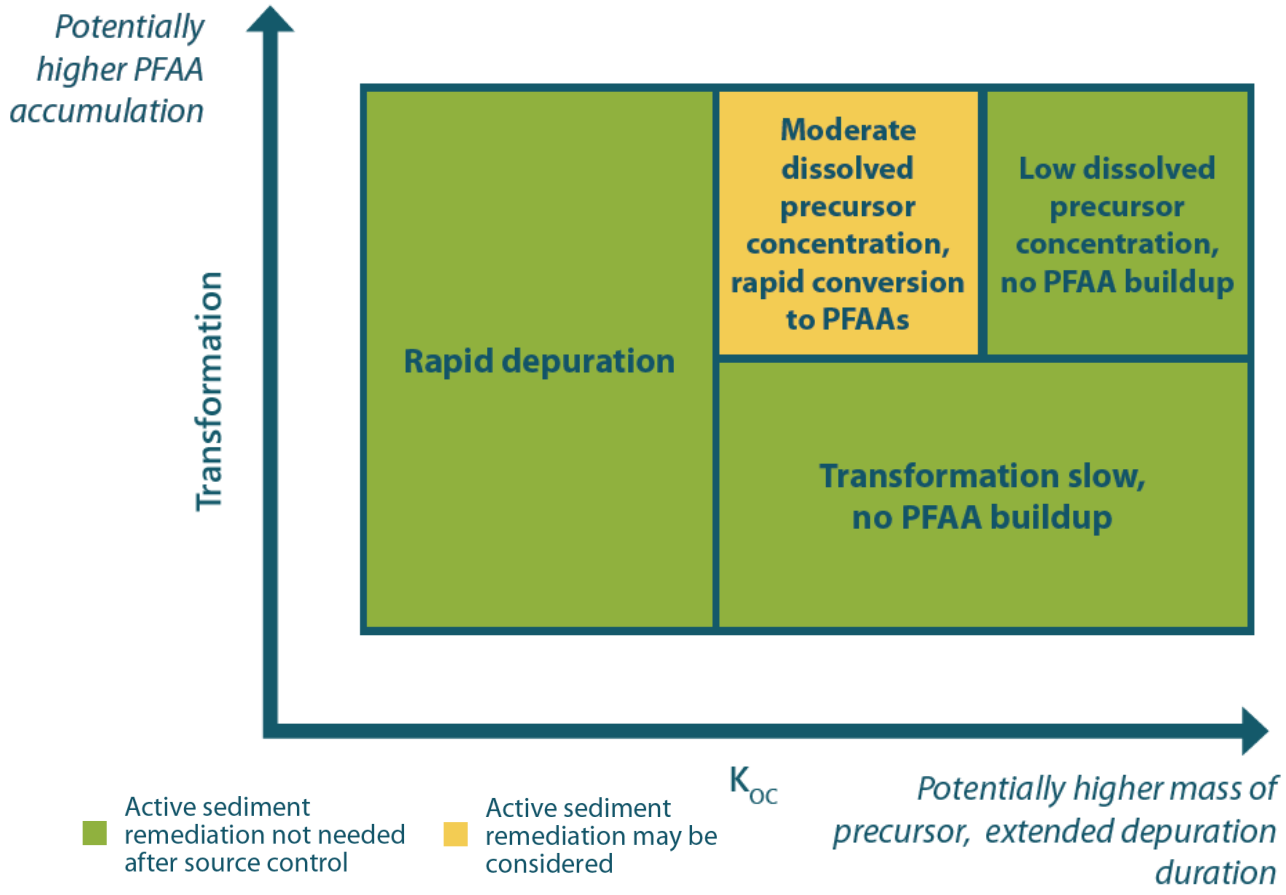
Sediment Recovery of PFOS with Precursors Present: 1D Model Insights

- Precursors may be a consequential long-term source of PFOS under certain conditions
- Relevance of residual PFOS levels will depend on site-specific factors



Influence of Transformation Rate and Sorption on Utility of Active Sediment Remediation

- Active sediment management might be beneficial with the presence of precursors
- Focus on log K_{oc} (range of 4 to 5) and high transformation rates
- Anchor QEA has a bioaccumulation model to understand the impact of precursors on fish concentrations



THANK YOU

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REFERENCES

Falk, S. K. Failing, S. Geogii, H. Brunn, and T. Stahl, 2015. Tissue specific uptake and elimination of perfluoroalkyl acids (PFAAs) in adult rainbow trout (Oncorhynchus mykiss) after dietary exposure. Chemosphere 129:150–156. (Slide 6)

Liu, J., and S. Mejia Avendaño, 2013. "Microbial Degradation of Polyfluoroalkyl Chemicals in the Environment: A Review." *Environment International* 61:98–114. (Slide 7)

Niimi, A.J., and B.G. Oliver (1983). "Biological Half-lives of Polychlorinated Biphenyl (PCB) Congeners in Whole Fish and Muscle of Rainbow Trout (*Salmo gairdneri*)" *Canadian Journal of Fisheries and Aquatic Sciences* 40(9):1388–1394. (Slide 6)