PFAS Program Management in a Rapidly Changing Regulatory Environment

Panel Moderators

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PFAS Program Management in a Rapidly Changing Regulatory Environment

Panel Members

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CDM Smith

The Fundamental Issues

- How "dirty" is "dirty"?
  - Thousands of AFFF-impacted source areas: When is remediation required?
  - Novel retention mechanisms
  - Background contamination from decades of atmospheric deposition
- How "clean" is "clean"?
  - What are realistic performance objectives for treatment systems?
  - Legal discharge requirements are highly variable
  - Long- versus short-chain treatment efficiencies
- Desire for destructive technologies
  - What premium are we willing to pay for destruction?
  - Mobile (on-site) versus regional (hub and spoke) capabilities

Focus on Porewater within Vadose Zones

Environmental Science & Technology
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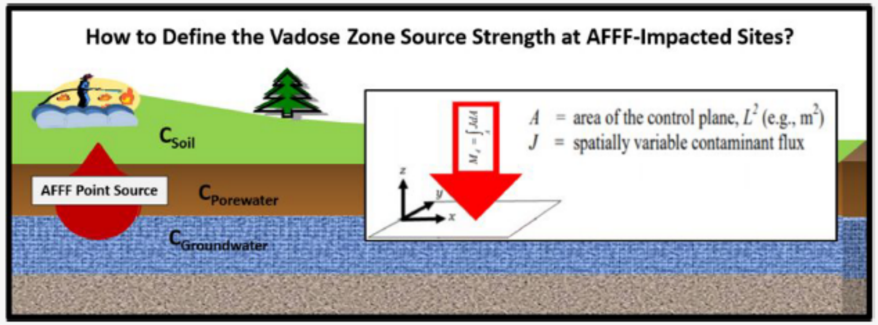
Perspective

The Case for Direct Measures of Soil-to-Groundwater Contaminant Mass Discharge at AFFF-Impacted Sites

Richard H. Anderson*

Cite This: https://doi.org/10.1021/acs.est.1c01543 Read Online



Contents lists available at ScienceDirect
Chemosphere
journal homepage: www.elsevier.com/locate/chemosphere
ELSEVIER

Assessment of PFAS in collocated soil and porewater samples at an AFFF-impacted source zone: Field-scale validation of suction lysimeters

Richard H. Anderson [a,*], James B. Feild [b], Heidi Dieffenbach-Carle [c], Omneya Elsharnouby [d], Rita K. Krebs [e]

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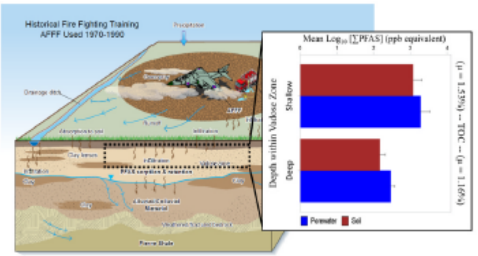
[e] Air Force Civil Engineer Center, Ellsworth AFB, SD, USA

HIGHLIGHTS

- ∑PFAS soil porewater concentrations were statistically identical over the course of a year.
- Net PFAS retention in surface soil was observed.
- Soil-to-porewater ratios significantly increased with soil concentration.

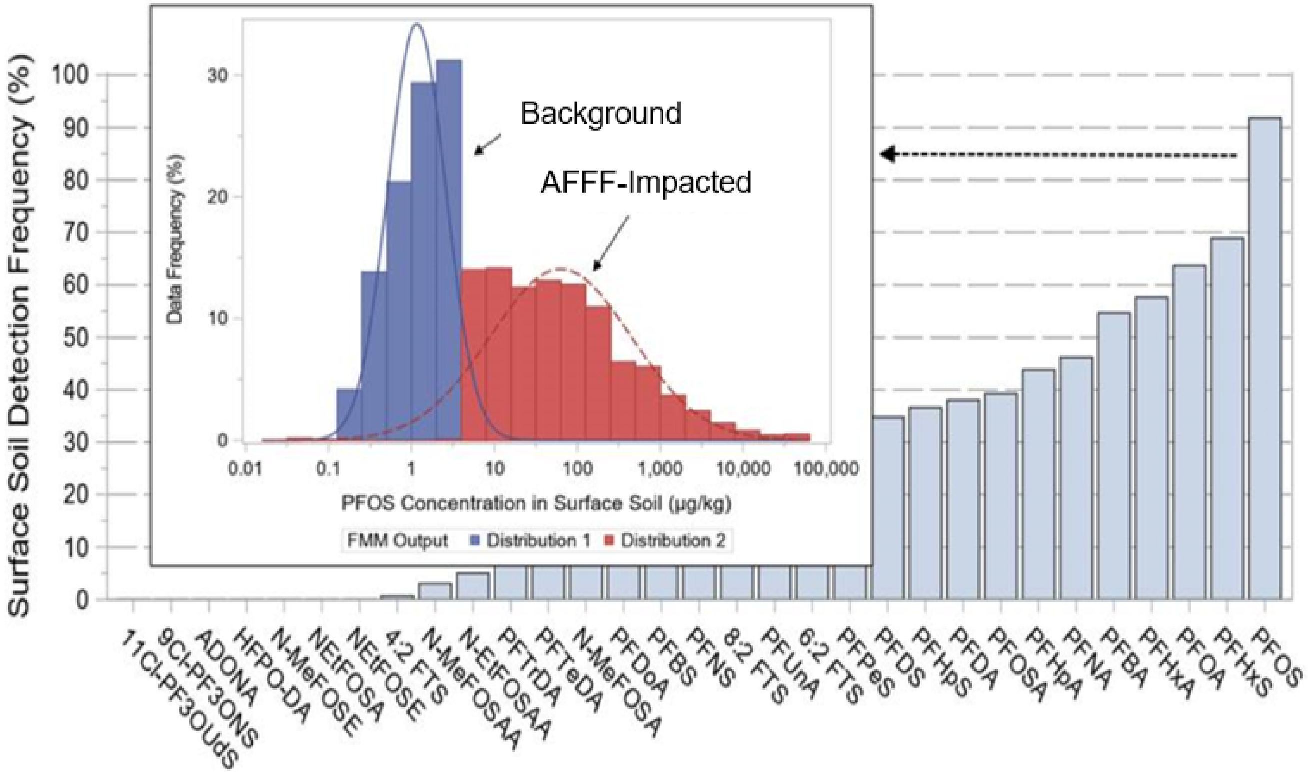
GRAPHICAL ABSTRACT



Background Levels are "Environmentally-Relevant"

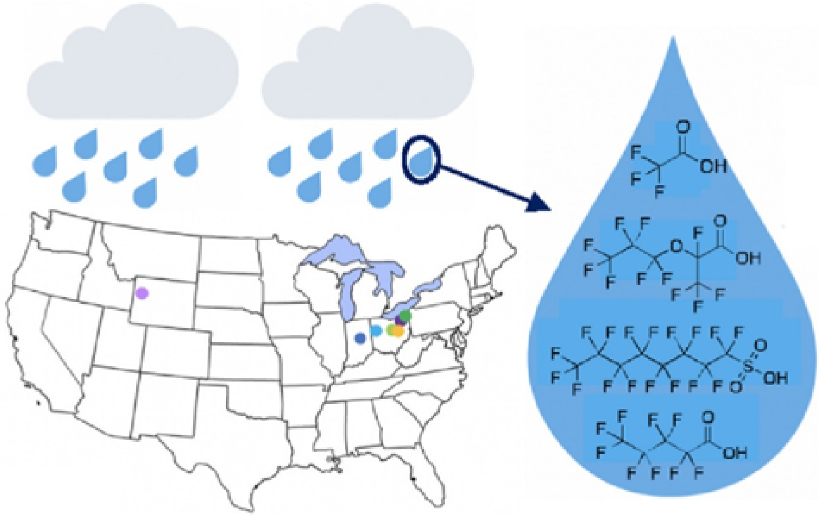
- Global atmospheric deposition (i.e., background contamination)
  - Mostly surface soil and surface water issue but could affect groundwater)

All AFCEC Data: Finite Mixture Model (FMM) Results



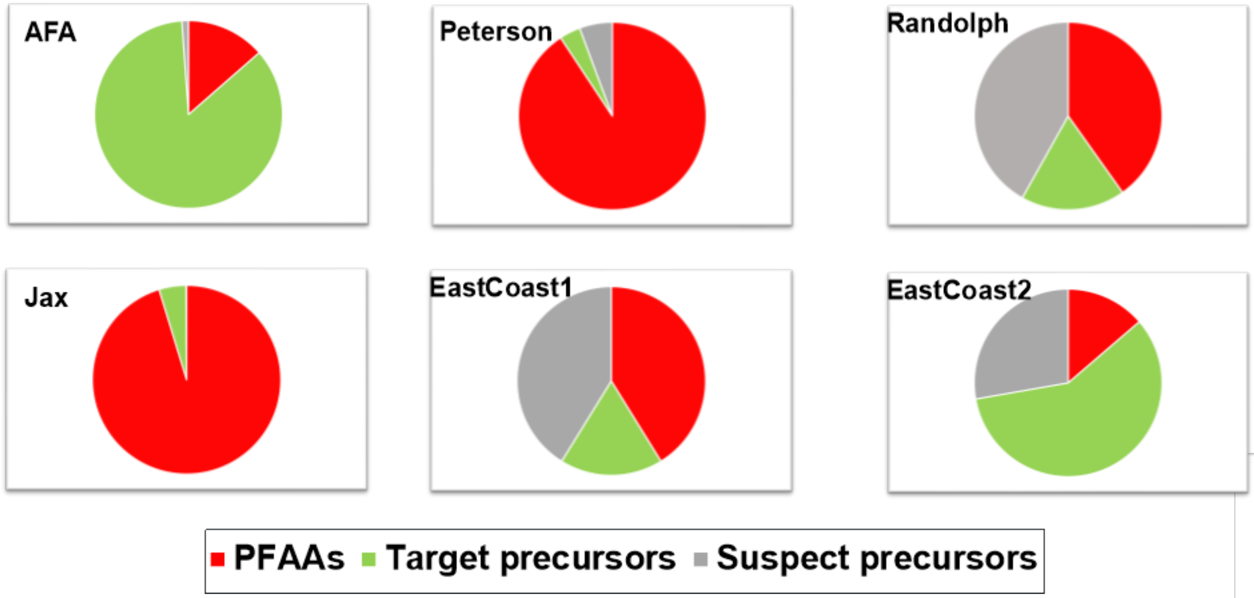
Pike et al. 2020

- 100% PFAS detection frequency
- Total PFAS ΣPFAS = 50-850 ηg/L (ppt)
- PFOA = 0.2-30 ppt
- PFOS = 2-50 ppt



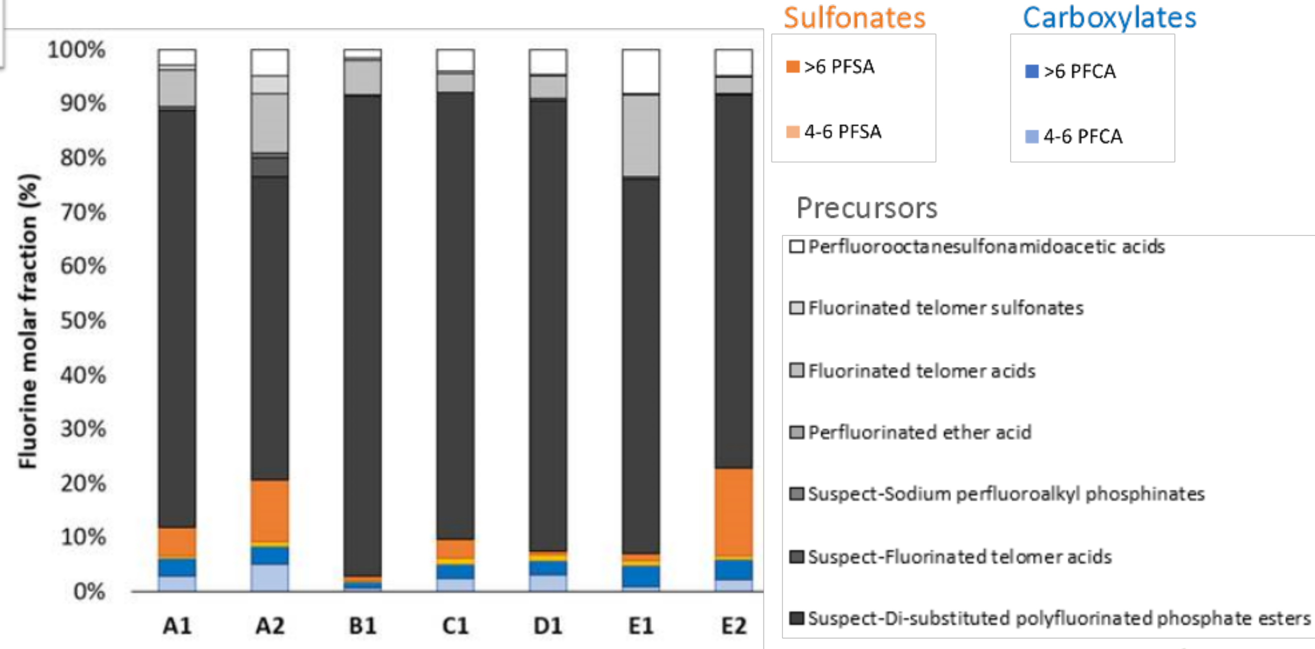
Precursors

Vadose Zone Porewater at AFFF-Impacted sites



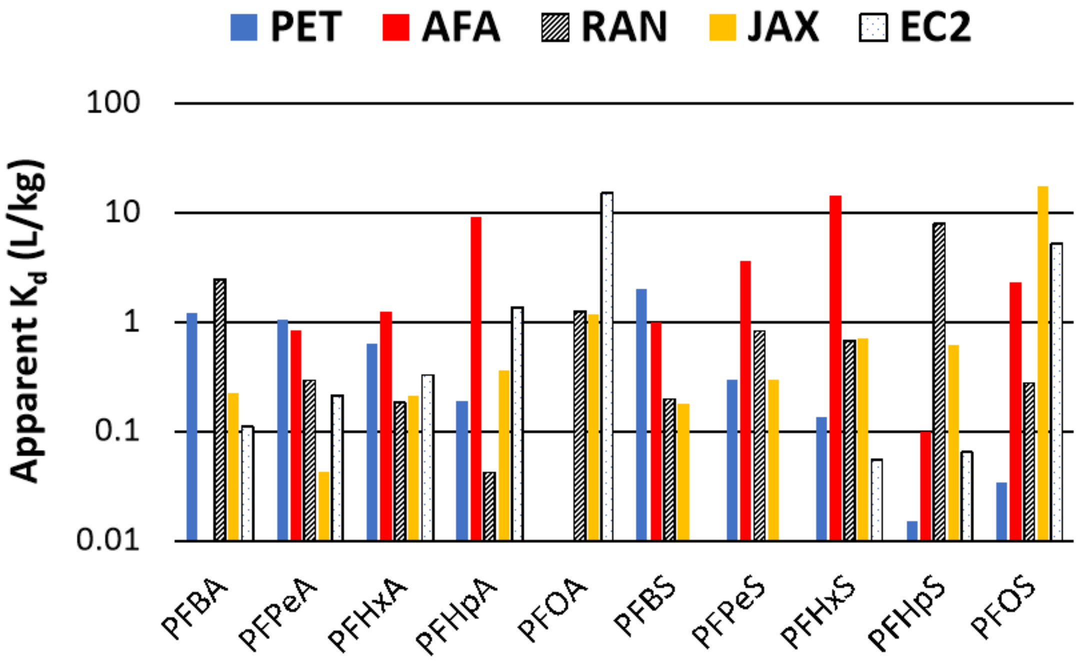
- ***To what extent is precursor transformation an issue?***
- ***How should precursors be addressed when considering treatment strategies***

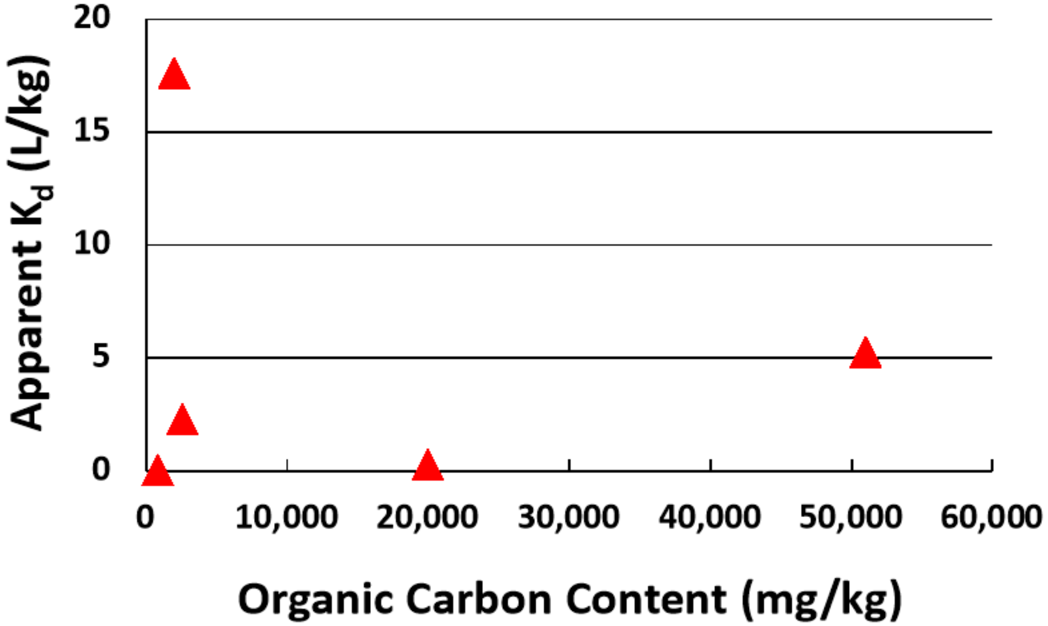
Fished Biosolids from US WTTPs



Soil Clean-Up Levels

Apparent K_d: PFAS Soil-Water Partitioning in the Unsaturated Zone

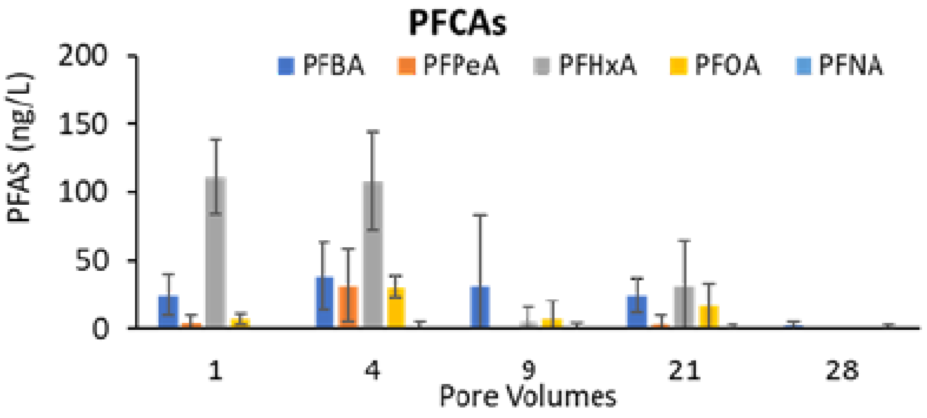




- ***How should target clean-up levels for soils be established?***
  - ***Models?***
  - ***Leaching tests?***
  - ***Field lysimeters?***

PFAS Background Levels

PFAS concentrations in urban rainwater



Schaefer et al., Water Res., 2022

Science of The Total Environment
Volume 740, 20 October 2020, 140017

PFAS concentrations in soils: Background levels versus contaminated sites

Mark L. Brusseau [a b], R. Hunter Anderson [c], Bo Guo [b]

- ***How should background levels be established?***
- ***How should background PFAS levels impact remedial goals?***

EPA Office of Research and Development

ORD Actions:

I. Develop and validate methods to detect and measure PFAS in the environment, including additional targeted methods for detecting and measuring specific PFAS, non-targeted methods for identifying unknown PFAS in the environment, and exploring “total PFAS” methods.

II. Advance the science to assess human health and environmental risks from PFAS by developing human health toxicity assessments under EPA’s Integrated Risk Information System program; by compiling and summarizing available and relevant scientific information; by identifying PFAS sources, transport, and exposure pathways; and by characterizing how exposure to PFAS may contribute to cumulative impacts on communities.

III. Evaluate and develop technologies for reducing PFAS in the environment to inform decisions on drinking water and wastewater treatment, contaminated site cleanup and remediation, air emission controls, and end-of-life materials management.

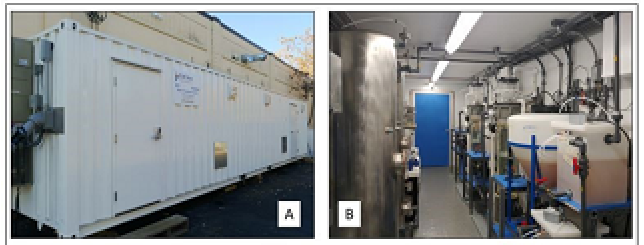
EPA Office of Research and Development

Our team specifically works to:

- Develop analytical approaches to characterize sources and evaluate management of PFAS in multimedia.
- Conduct research to assess sources of PFAS to the environment.
- Evaluate the efficacy of treatment and remediation of:
  - Conventional technologies
  - Innovative technologies

NIEHS Superfund Research Program

- NIEHS funds over 70 active academic PFAS research projects
  - Scope: mechanistic and epidemiology studies, fate and transport, detection approaches, novel remediation technologies, risk communication approaches, and occupational safety training.
  - Coordination between grantees, esp analytical methodologies.
  - Research translation and technology transfer for new approaches.



NIEHS Superfund Research Program

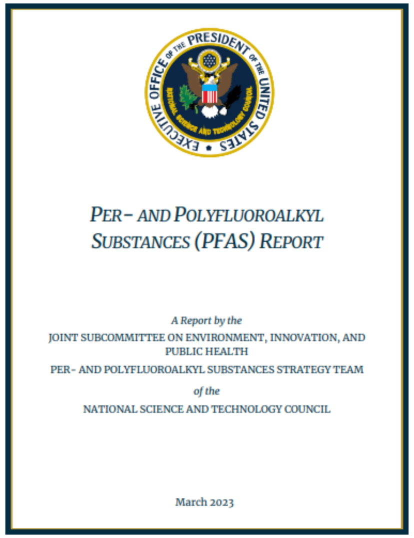
- Recent PFAS Features:
  - SRP Science Digest March 2022 - features SRP grantee innovative approaches to understand impacts of PFAS and PFAS replacements and to develop new technologies for detection and remediation to better protect human health.
  - Public Health Impact Story: SRP Researchers Inform Health-Related Decision Making on PFAS – summarizes SRP grantee recipient involvement in policies and guidances related to PFAS and PFAS replacement compounds.
  - PFAS Conference Supported by NIEHS Engages Key Stakeholders: Funded in part by SRP, the 3rd National PFAS Meeting in Wilmington, North Carolina, brought together SRP grantees and their collaborators, other scientists, community members, and policymakers to share research and personal stories about the chemicals.
  - Two recent NIEHS SRP Progress in Research webinars, grantees discussed innovative strategies for bioremediation — the process of using bacteria, fungi, and plants to break down contaminants, including PFAS.

NIEHS Superfund Research Program

- Funding Opportunities:
  - Small Business Innovative Research Grants (due Sept 5, Jan 5, April 5).
  - Superfund Center Grants, P42, (due October 2, 2023). Funding Opportunity Webinar for this RFA on May 15, 2023, 12-1 p.m. ET.
  - All other Funding Opportunities: https://www.niehs.nih.gov/research/supported/centers/srp/funding/index.cfm.

NIEHS Superfund Research Program

- National Toxicology Program
  - Looking at potential adverse effects associated with PFAS exposure and to identify safer alternatives.
  - Nomination process to nominate a substance or model to NTP for testing.
- Supported “Guidance on PFAS Testing and Health Outcomes”
  - Study by the National Academies of Science, Engineering, and Medicine (NASEM) that examines PFAS human health effects and sources of exposure to inform potential changes to PFAS clinical guidance (collaboration with CDC/ATSDR).
  - Identified clinical guidance for patients based on ranges of PFAS blood levels.
- Coordination in Federal Government:
  - Report to Congress “PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) REPORT” by the Joint Subcommittee on Environment, Innovation, and Public Health (JSC EIPH or “the JEEP”). Report details state of science, current federal investments, and gaps/research needs. Next steps to develop a strategic plan.
  - Federal Remediation Technology Roundtable (https://www.frtr.gov/).



NIEHS Superfund Research Program

- Impacts of a Rapidly Changing Regulatory Environment
  - Do we have an adequate pipeline of trained professionals / infrastructure to keep up with the analytical chemistry demands from new reports like NASEM Clinical Guidance and other regulatory guidances/rules?
  - How do technology developers build in plasticity (to go after new compounds), and/or improve effectiveness of technology to adhere to lower regulatory levels (for both remediation and detection technologies?

NIEHS Superfund Research Program

- NIEHS Strategic Plan 2024-2028 is underway
  - Information: https://www.niehs.nih.gov/about/strategicplan/strategicplan2024/index.cfm.
  - Updates on the Strategic Planning process will be shared at the next NAEHSC meeting on June 6-7, 2023. This meeting is open to the public via webcast. Check back for details on this event on the NIEHS Live Webcast site.

Questions:
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919-609-6061 heather.henry@nih.gov

Please Contact SRPinfo@nih.gov
to receive monthly Research Briefs, quarterly Science Digests, etc.

PFAS Program Management in a Rapidly Changing Regulatory Environment

Grand Challenges for Practitioners

Analytical	Adaptive Site Management	Site Closure
Prioritization	Treatment	Fate & Transport

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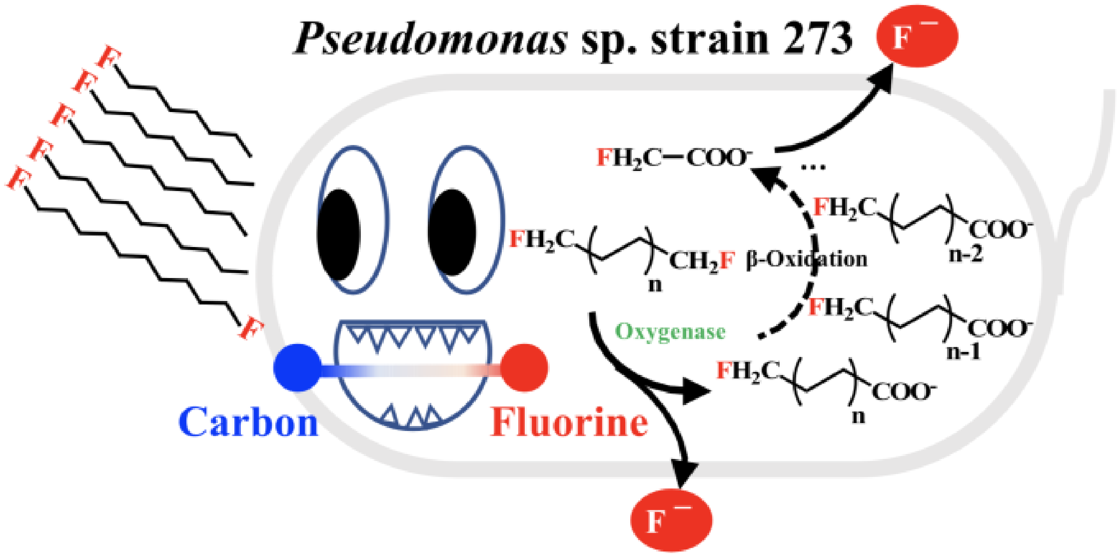
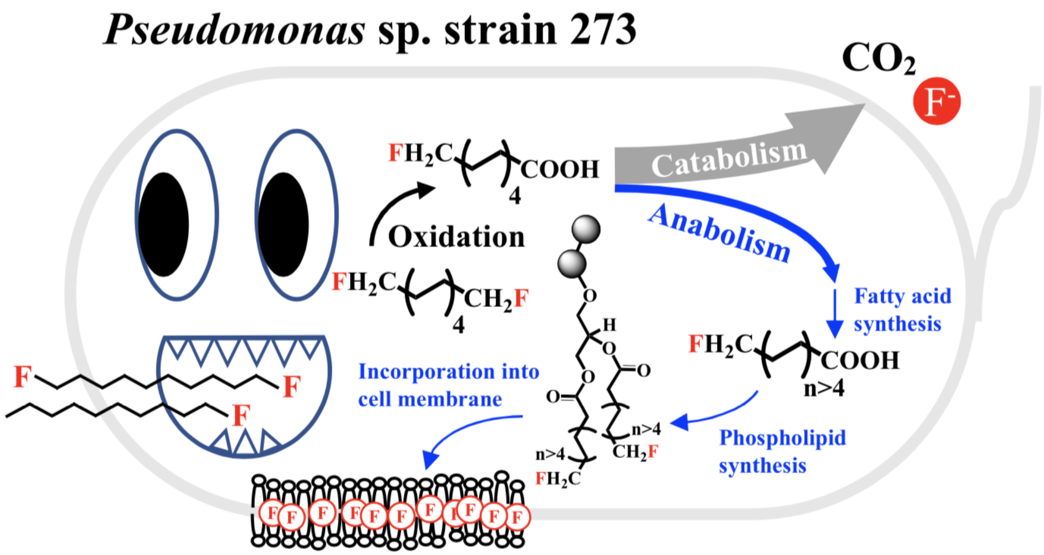
Fate of PFAS – Expect the Unexpected





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Pseudomonas sp. Strain 273 Degrades Fluorinated Alkanes

Yongchao Xie, Gao Chen, Amanda L. May, Jun Yan, Lindsay P. Brown, Joshua B. Powers, Shawn R. Campagna, and Frank E. Löffler*

Cite This: Environ. Sci. Technol. 2020, 54, 14994−15003 Read Online

Environmental Science & Technology
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Pseudomonas sp. Strain 273 Incorporates Organofluorine into the Lipid Bilayer during Growth with Fluorinated Alkanes

Yongchao Xie, Amanda L. May, Gao Chen, Lindsay P. Brown, Joshua B. Powers, Eric D. Tague, Shawn R. Campagna,* and Frank E. Löffler*

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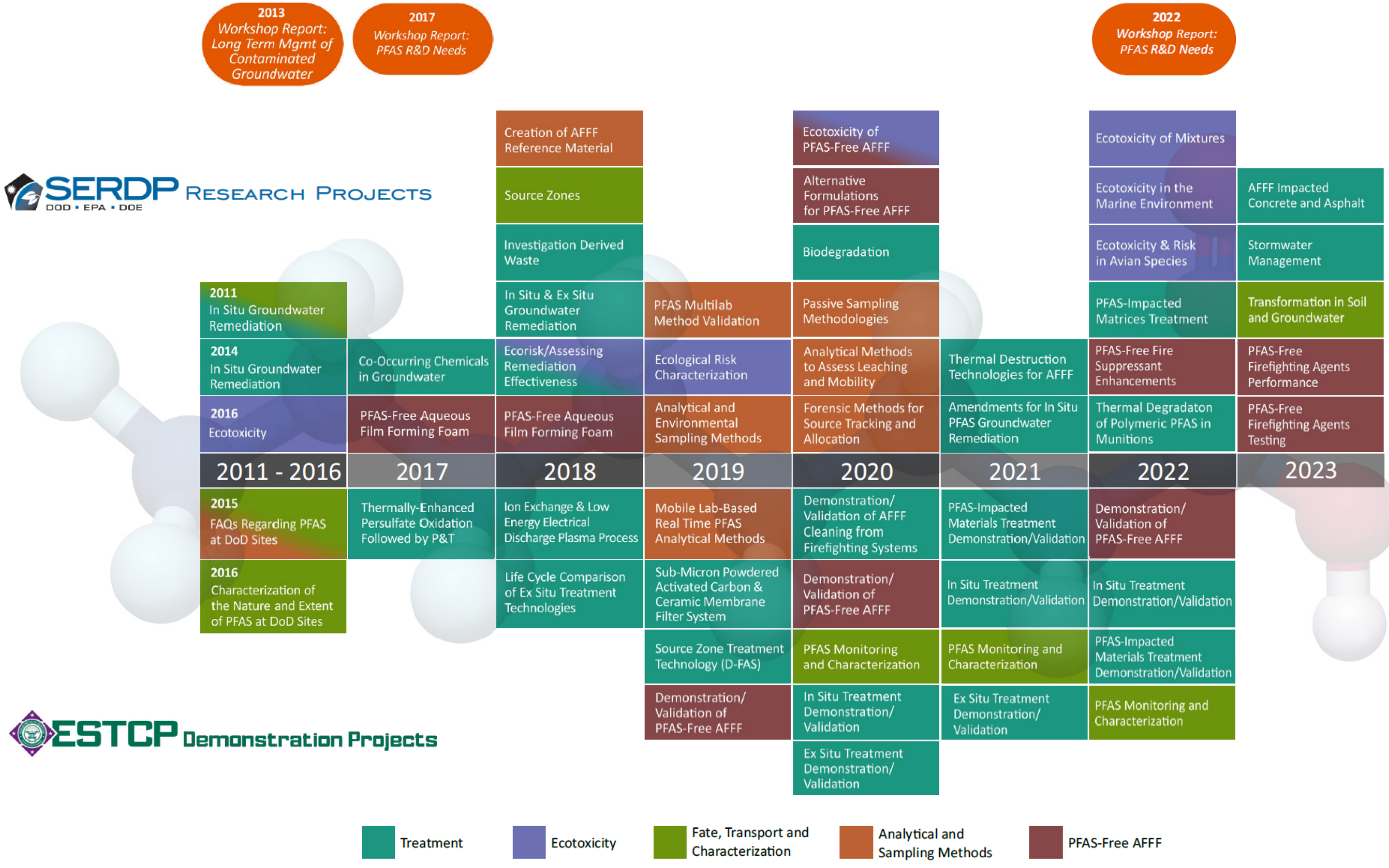
Treatment Opportunities

- Next generation technologies
  - Both in-situ and ex-situ approaches
    - Treatment trains
    - PFAS destruction
    - Lines of evidence approach to demonstrate treatment efficacy
  - Significant R&D investments by the Department of Defense



https://map.serdp-estcp.org/Featured-Initiatives/Per-and-Polyfluoroalkyl-Substances-PFASs/pfas_efforts.pdf