



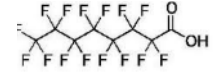
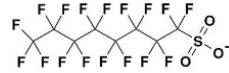
Sources, Transport, Exposure & Effects of PFASs
UNIVERSITY OF RHODE ISLAND SUPERFUND RESEARCH PROGRAM

URI Superfund Research Center: STEEP

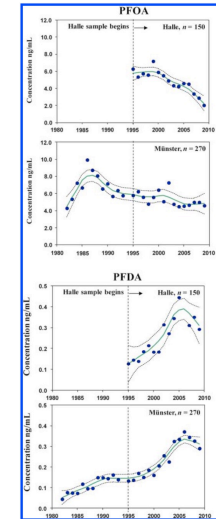
(Sources, Transport, Exposure and Effects of PFASs)



PFASs



- Widespread human and environmental exposure
 - Particularly perfluorinated C₈ compounds – PFOS and PFOA
- Wide range of adverse effects (humans/animals)
 - Immunosuppression (Grandjean et al., 2013)
 - More PFOA, higher risk of being overweight (Haldersson et al., 2012)
 - Link [PFOA] in blood and insulin resistance (Timmermann et al., 2014)
- Regulatory action (PFOS withdrawal and PFOA action plan)
- Replacement with other fluorinated compounds (shorter, polyfluorinated; more complex molecules - precursors)



(Yeung et al., 2013)

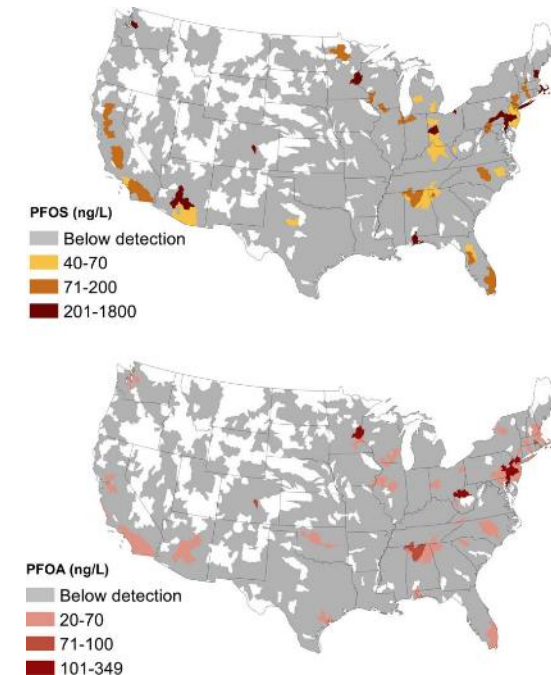


How about PFAS across the US?

Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S.
Drinking Water Linked to Industrial Sites, Military Fire Training Areas,
and Wastewater Treatment Plants

Xindi C. Hu,^{*,†,‡} David Q. Andrews,[§] Andrew B. Lindstrom,^{||} Thomas A. Bruton,[⊥] Laurel A. Schaider,[#]
Philippe Grandjean,[†] Rainer Lohmann,[@] Courtney C. Carignan,[†] Arlene Blum,^{⊥,▽} Simona A. Balan,[●]
Christopher P. Higgins,[○] and Elsie M. Sunderland^{†,‡}

- Based on UCMR3 data
- Long-chain PFASs (PFHxS, PFOS, PFOA, and PFNA) more in groundwater
- Short-chain compounds (PFHpA and PFBS) more in surface waters.





The recipe?

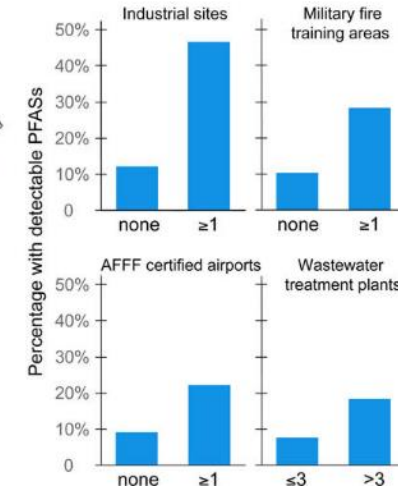
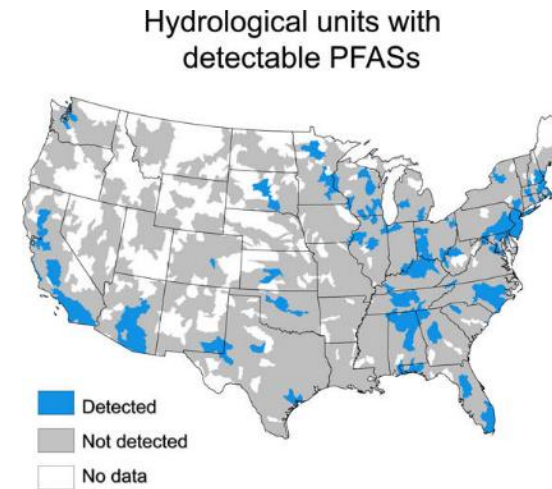
Take a PFAS production/
use facility and train
firefighting with AFFFs

Known knowns:

- 6 Mio w/ [PFAS] > EPA advisory

Unknowns:

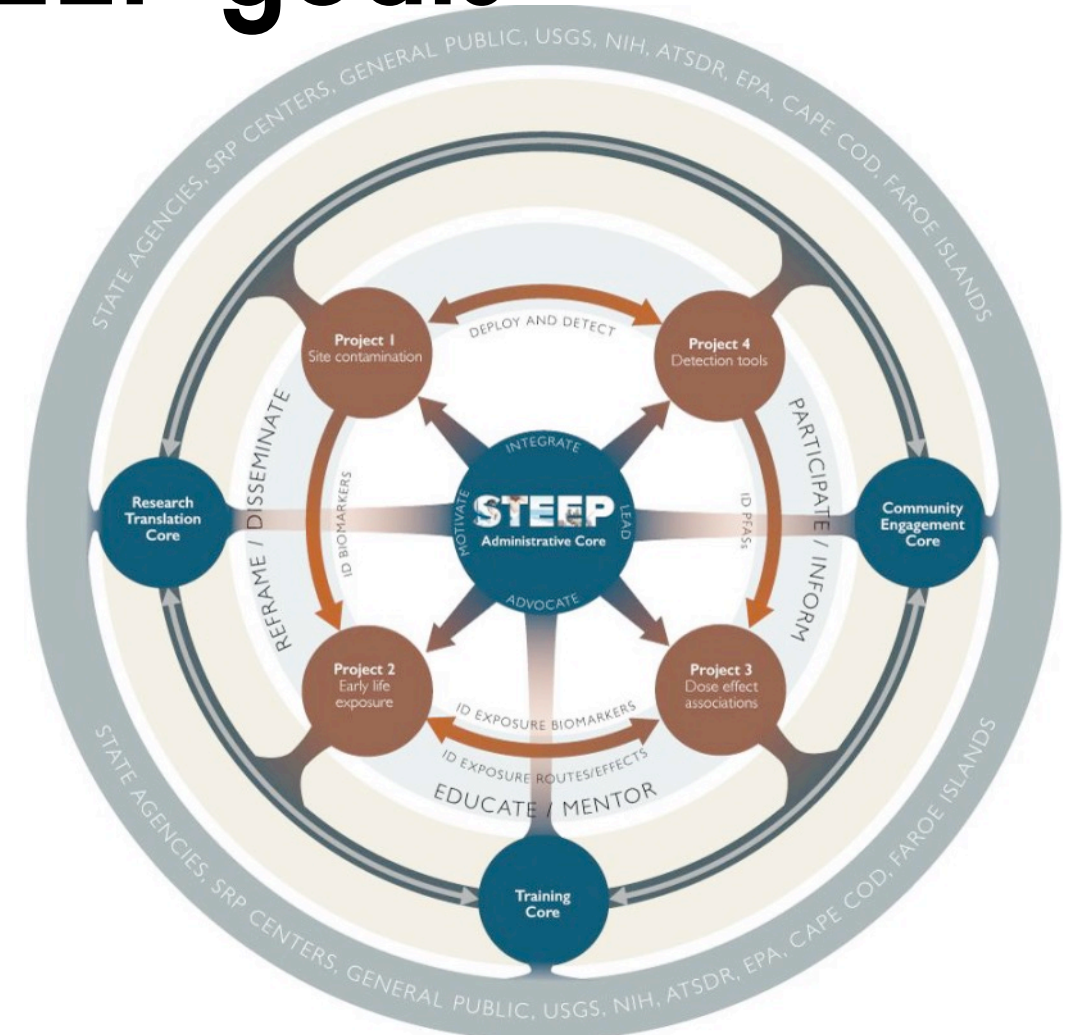
- Small public water suppliers; Private well owners
- Is the EPA advisory sufficient?
- Do we target all relevant PFASs? Totals?





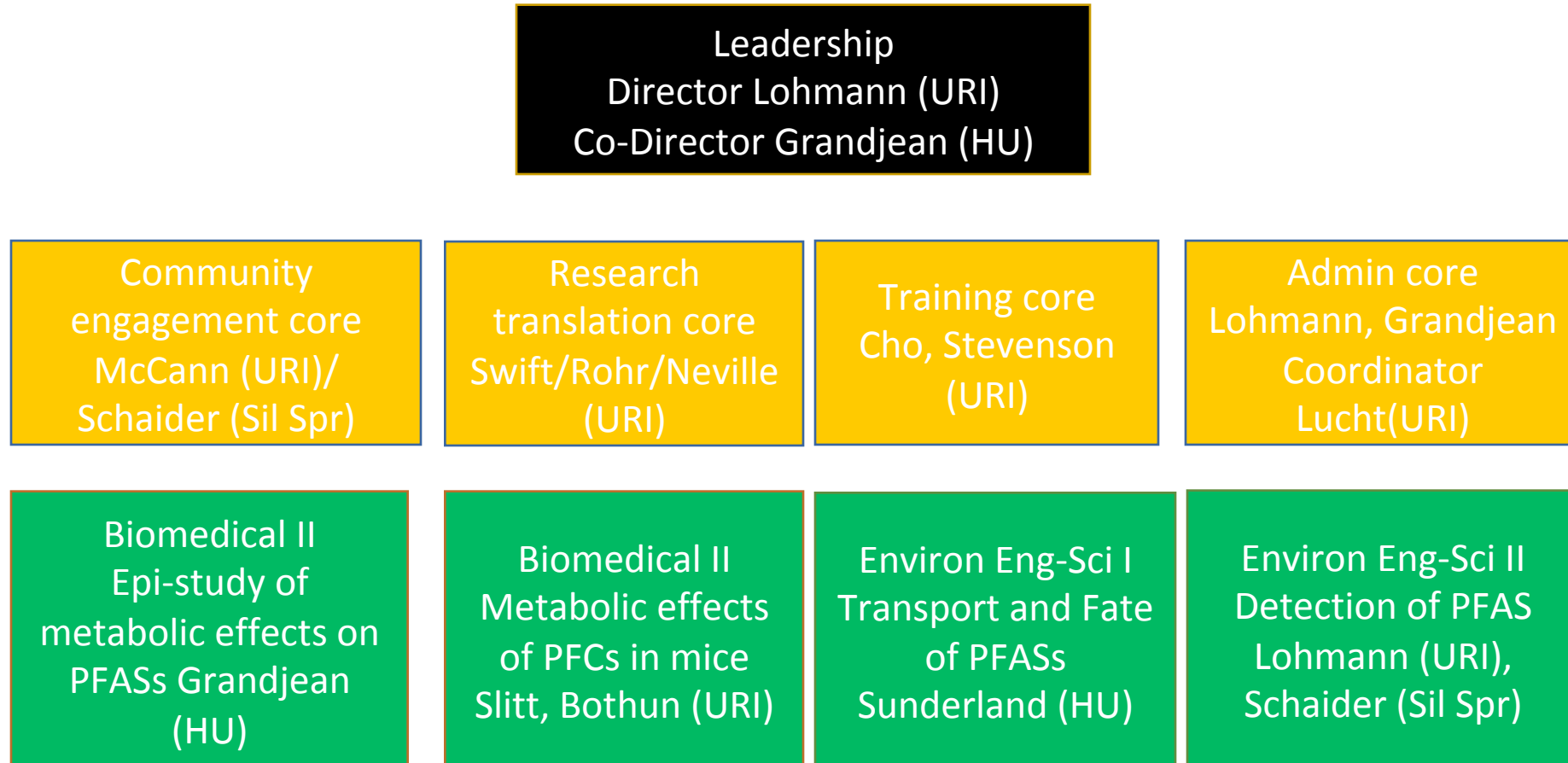
Present concerns / STEEP goals

- Fate and transport of PFASs in groundwater plume
- Availability and uptake of PFASs by animals
- Human health effects of PFASs
- Novel sampling approaches for PFASs
- Engage communities to reduce exposure
 - Water testing...
- Safe chemicals for wanted applications?
 - Various replacement compounds





Overall center structure

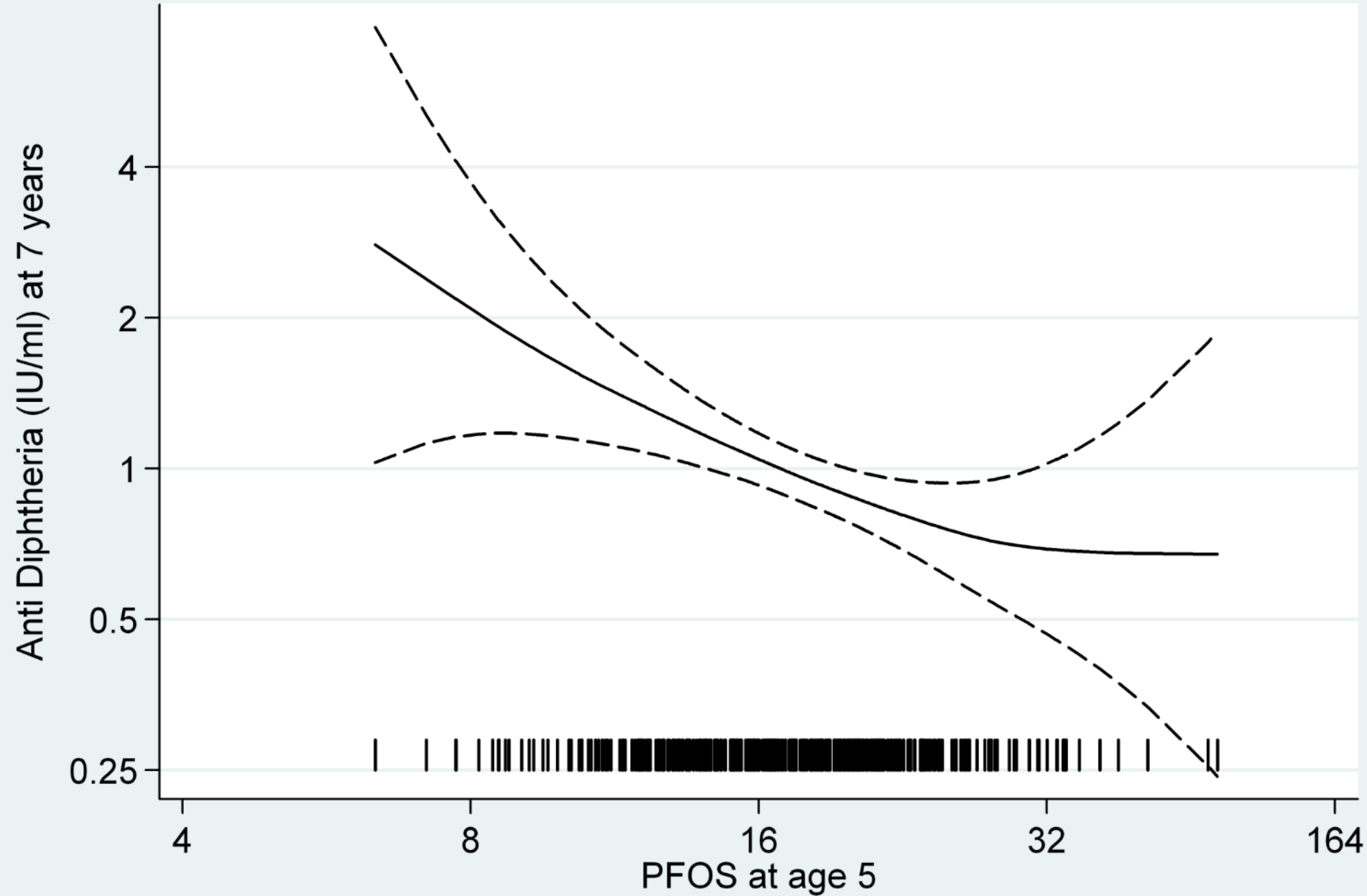


Project 2: Health effects

- determine the possible links between exposure profiles for PFASs
- key outcomes, i.e., immune dysfunction and metabolic abnormalities in 8-to-9-year-old children
- already established birth cohort at the Faroe Islands (N = 490).



Diphtheria

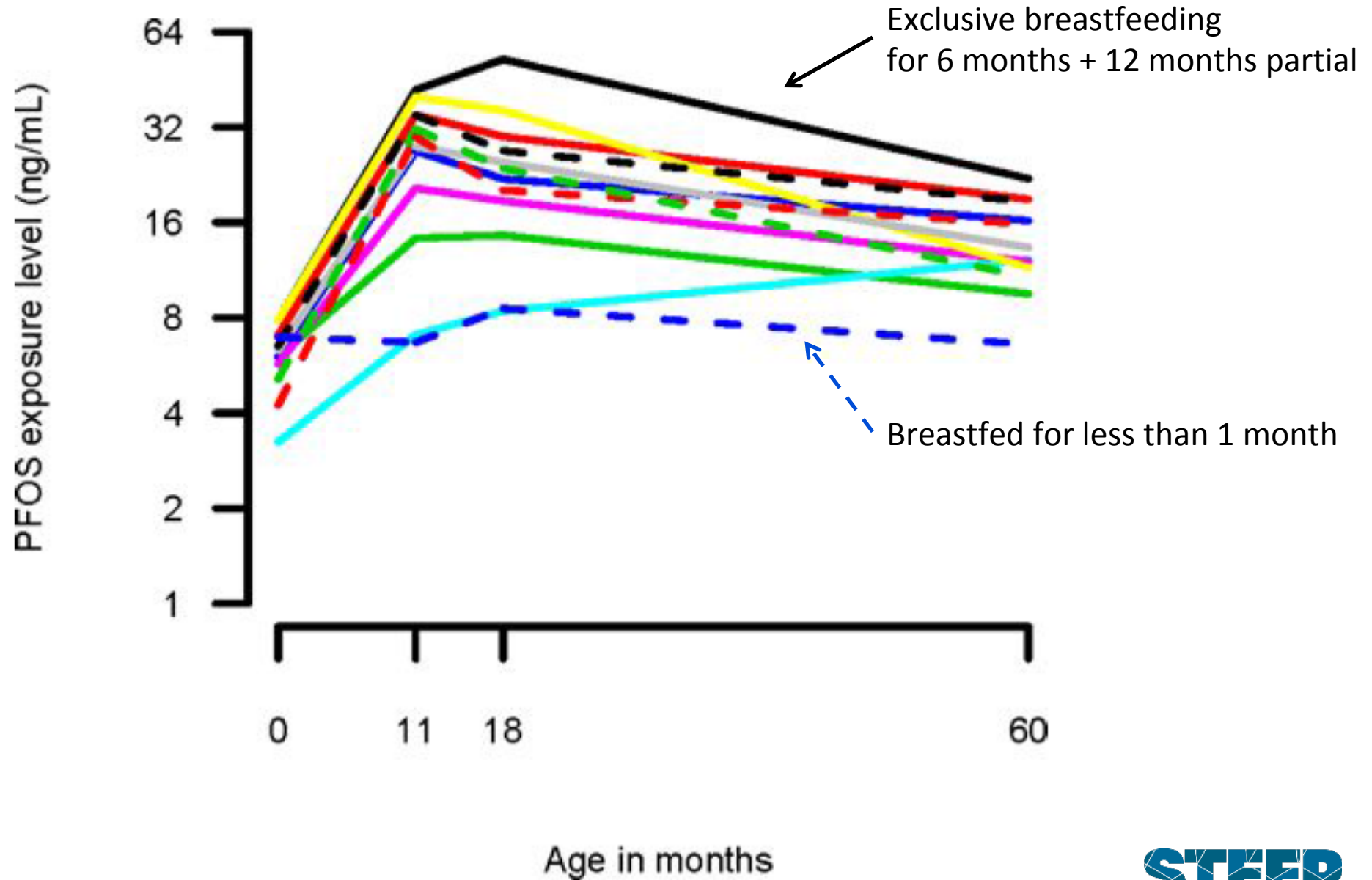


Exposure at age 5
Outcome at age 7

Grandjean et al., JAMA (2012)



Infancy is critical for risk assessment due to peak PFAS exposure and crucial development of the adaptive immune system



Mogensen et al., ES&T, 2015

Significance

The needs for Project 2 are four-fold:

1. Redefinition of **Benchmark Dose Levels (BMDLs)**
2. Address **developmental vulnerability**
3. Address possible impact on **inflammation and metabolic disturbances**
4. Provide insight into **pathogeneses**





Angela Slitt,
College of Pharmacy,
URI (co-lead)



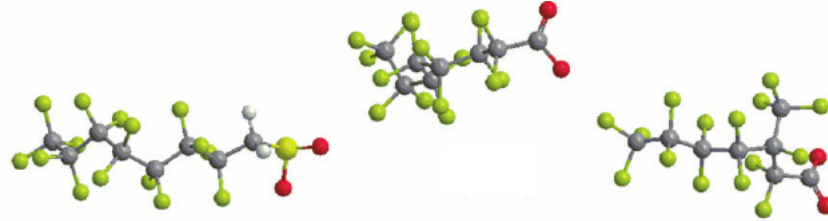
Geoff Bothun,
College of
Engineering, URI
(co-lead)

Project 3: New mechanisms

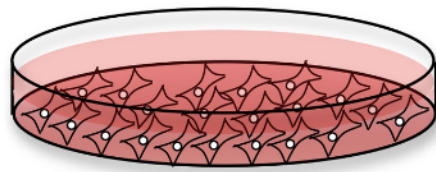
Aim 3 (Bothun)
physiochemical properties

PFASs to be tested:

Legacy and some emerging (based
on Projects 1 and 4)



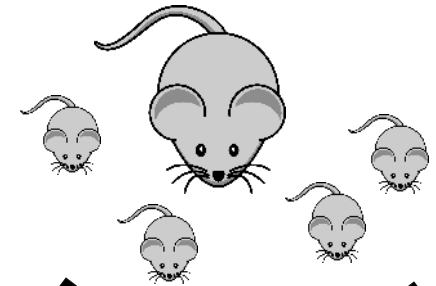
Aim 1 (Slitt)
In vitro assays
Adipocytes
Hepatocytes



Measures related to Project 2:
Immune: cytokine/adipokine secretion
Obesity: adipogenesis & lipid
accumulation

Reveal known versus
novel/new pathways
Using targeted
transcriptomics and
proteomics

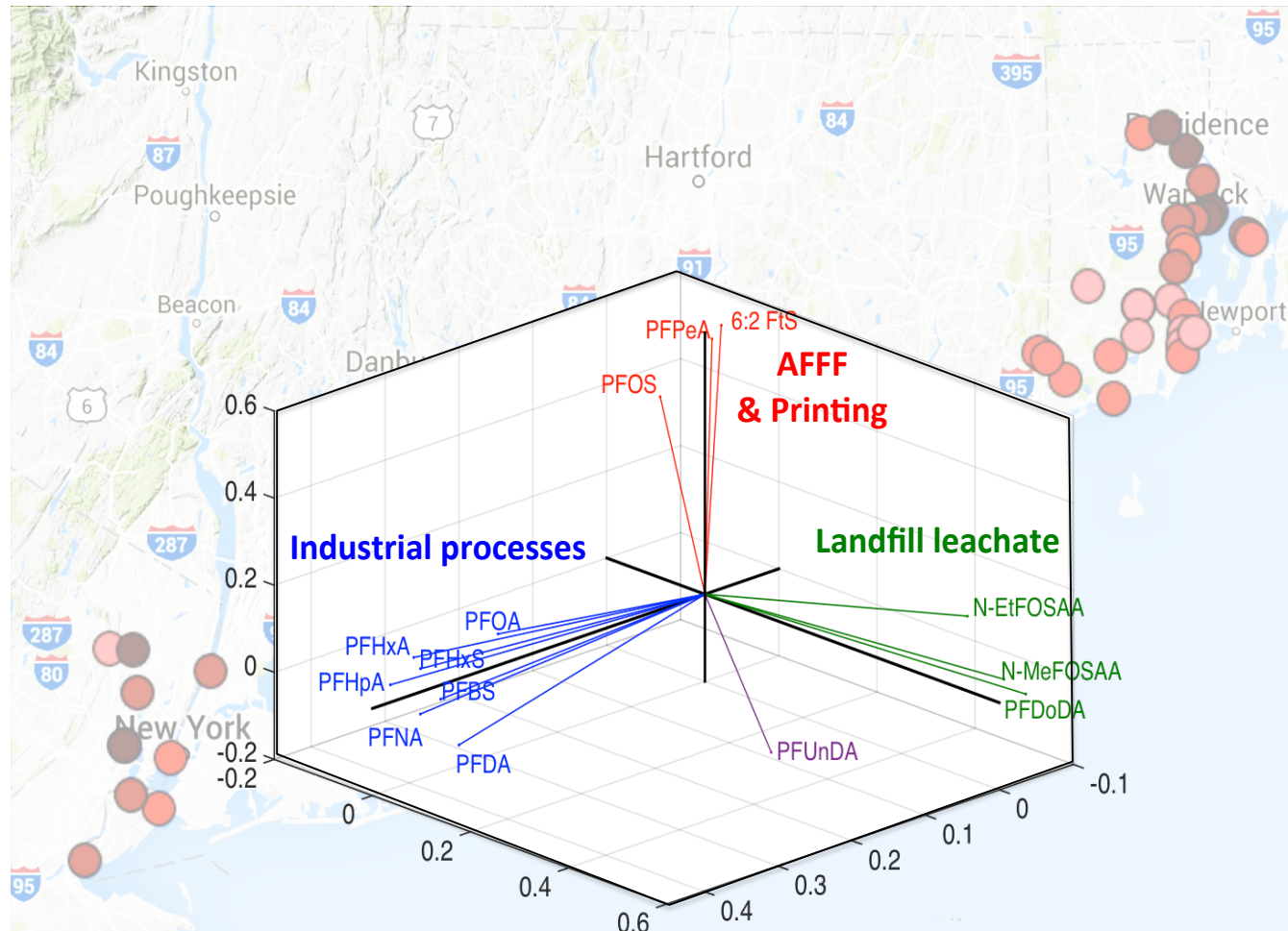
Aim 2 (Slitt)
In vivo developmental exposure
PFAS-Diet interactions
Does mom's diet impact PFAS risk?



Measures in pups and
dams related to immune
response and liver
endpoints

Serum measures to
uncover new biomarkers
--Lipidomics

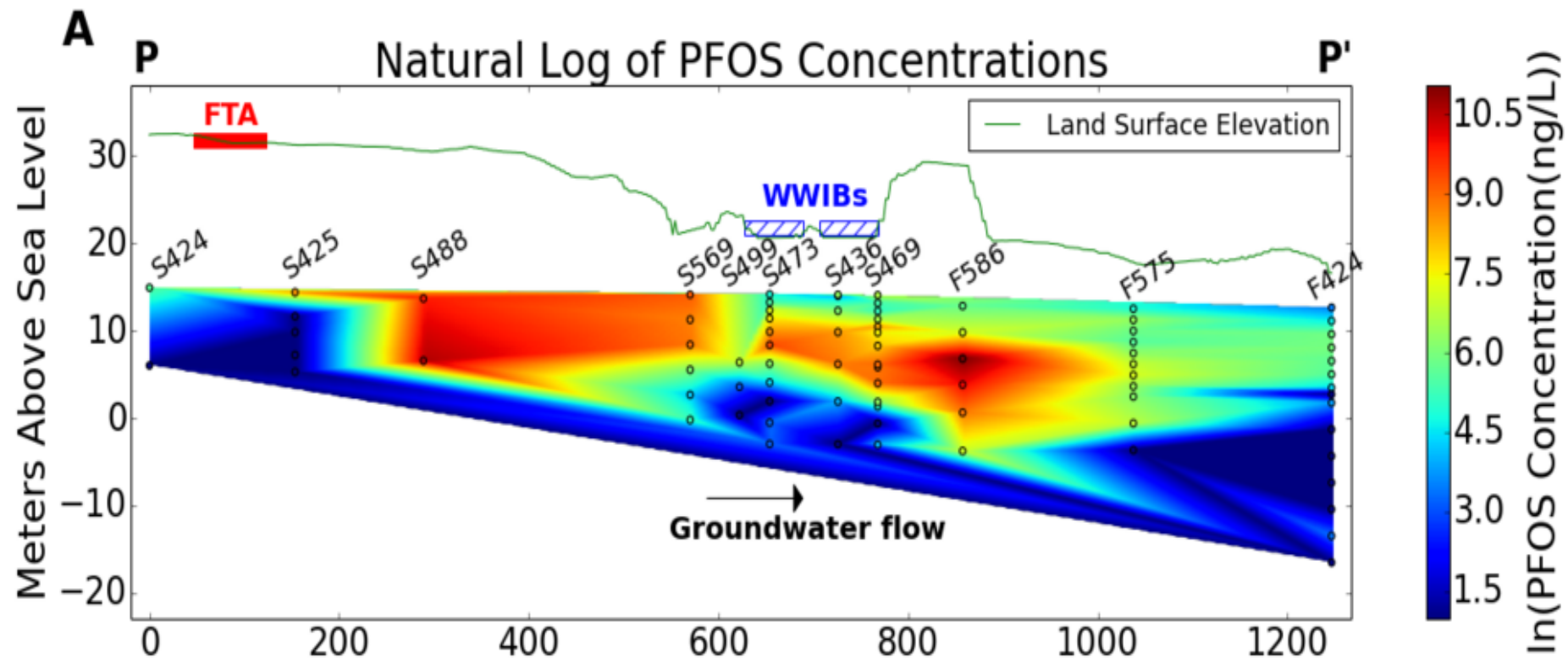
Project 1: Fingerprinting PFAS Sources in Water and Fish



Zhang et al., 2016



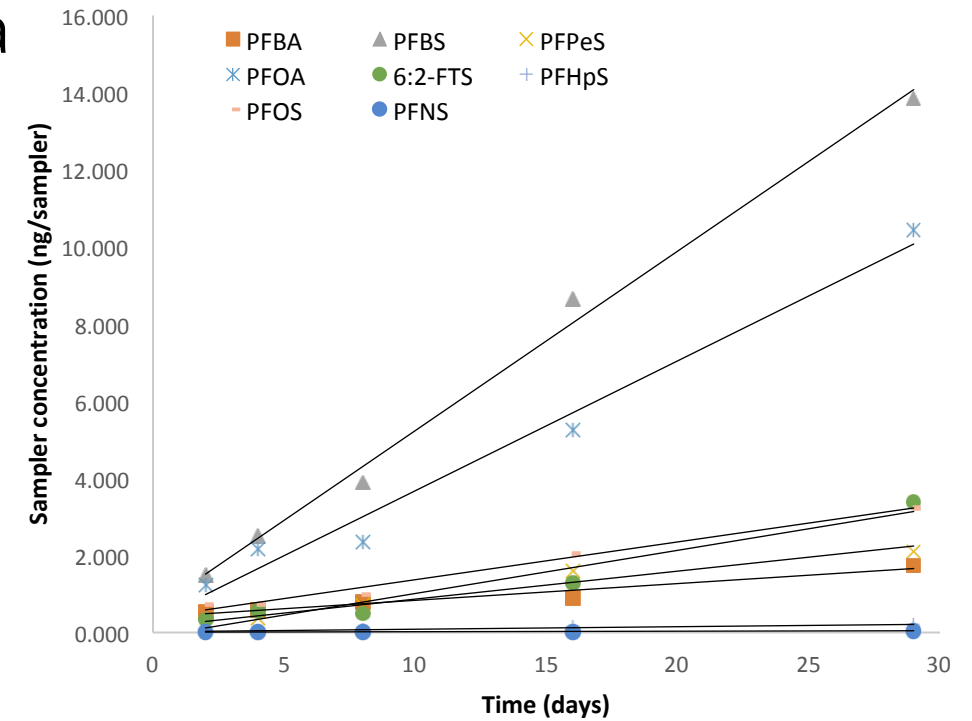
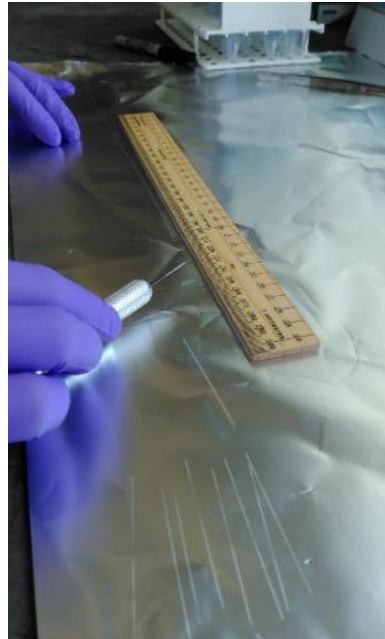
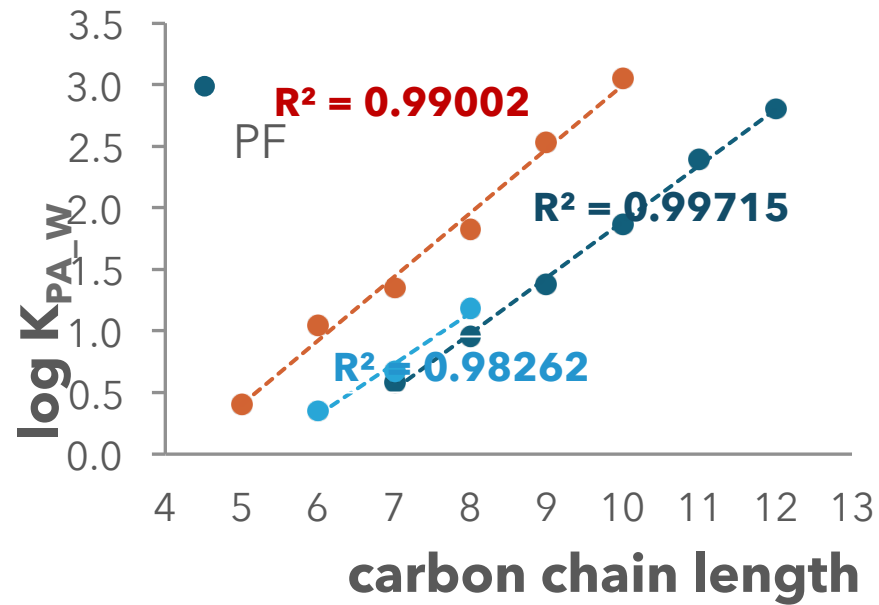
Project 1: Understanding Geochemical Factors Affecting PFAS Mobility



Project 4: Novel Detection Tools

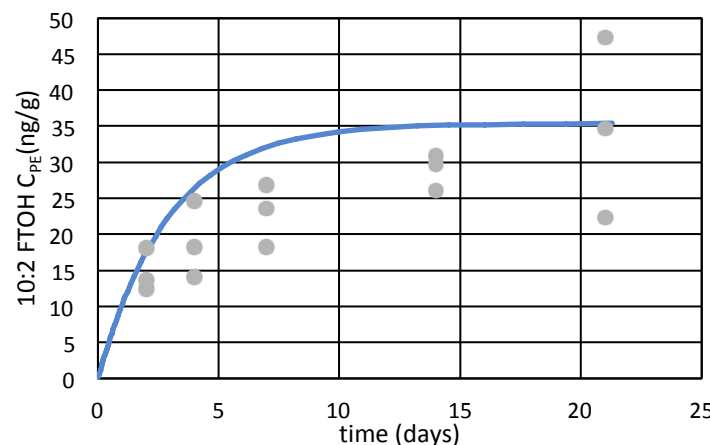
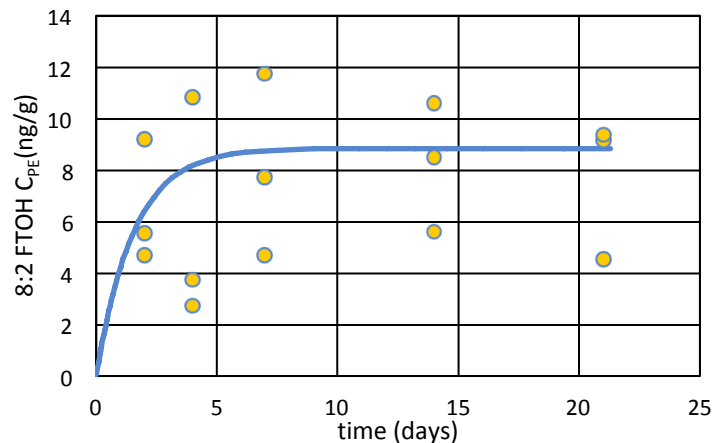
Lohmann (URI), Schaider (SSI)

- Testing various passive samplers for the detection and quantification of dissolved PFASs – link to bioava



Project 4: A PE-based sampler for (volatile) precursor PFASs

- Other than AFFFs, there are also precursor compounds
- Also indoor exposure to PFASs
- Testing of simple polymer sheets to detect these compounds in air and



Training Core

Bongsup Cho, John Stevenson, Alicia Crisalli

- Spring 2018 PFAS Colloquium: STEEP & guest speakers (Knappe & Guelfo)
- Monthly Trainees Group Meetings
- URI STEEP trainees visited Harvard on 8/23 for seminar and facilities tour
- STEEP trainees attended 2018 Northeast SRP Meeting



Community Engagement Core

Alyson McCann
University of Rhode Island

Laurel Schaidler, Ph.D.
Silent Spring Institute

STEEP
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WHAT'S IN YOUR WELL WATER?

Find out! Volunteer for FREE private well testing.

Why study well water?
In some areas of Cape Cod, PFASs have been found in drinking water.

What are PFASs?
PFASs are chemicals found in household products and firefighting foam. They've been around for 60 years, but their harmful health effects have only drawn concern in the last 20 years.

How can PFASs get into my well water and what are the harmful effects?
They can seep into the ground and move through groundwater to your well. They suppress certain immune system functions, particularly in kids, impact metabolic and liver functions, and are linked to some cancers and adverse effects on pregnancy, such as low birth weight.

Who can participate and how much time will it take?
Private well owners who live in Barnstable County on Cape Cod are eligible to participate, and participation will take about three hours.

What's the purpose of this study?
To test 50 private wells on Cape Cod each year over the next 5 years. Wells will be chosen from areas in Barnstable County that may be impacted by PFASs. The benefit to Cape Cod residents is a better understanding of PFAS exposure and contamination.

Who is doing the study?
The STEEP project is part of a National Institutes of Health Superfund Research Project led by the University of Rhode Island. URI and Silent Spring Institute will collect well water samples and Harvard University will analyze them.

Will I receive the test results?
We will report individual results and interpret them for each participant. We will share summaries of our findings with Cape residents in reports and public meetings. Names and addresses of participants will be kept confidential.

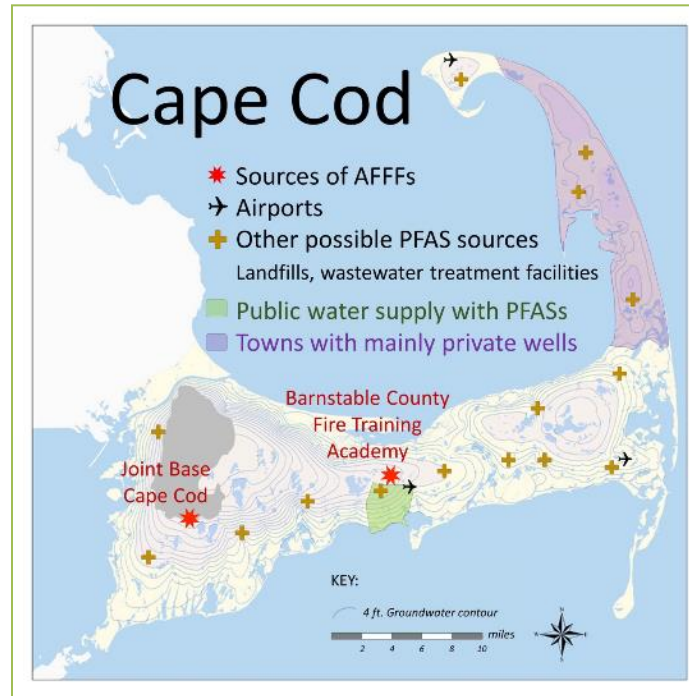
For more info, or to apply, contact either:

Laurel Schaidler, Ph.D. Research Scientist Silent Spring Institute schaidler@silentspring.org (617) 332-4288 x224	Alyson McCann Water Quality Program Coordinator University of Rhode Island alyson@uri.edu (401) 874-5398
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www.uri.edu/stEEP

THE UNIVERSITY OF RHODE ISLAND
HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH
SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

NIH STEEP is funded by the Superfund Research Program, National Institute of Environmental Health Sciences under award number P42ES027726. This is URI research approved by URI's Institutional Review Board.



Massachusetts Breast Cancer Coalition
invites you to attend a
FREE WEBINAR

**Highly Fluorinated Chemicals in Drinking Water
– Update on Regulations and New Research**

**Join us on
Tuesday, May 22
12:30 pm**

Dr. Laurel Schaidler, Research Scientist at Silent Spring Institute, and Alyson McCann, Water Quality Program Coordinator at the University of Rhode Island Cooperative Extension, will discuss the challenges and concerns associated with water contaminants and provide an update on water quality research in Massachusetts.



Research Translation Core

Judith Swift, Nicole Rohr, Amber Neville

www.uri.edu/stEEP

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STEEP

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Mission & Vision

Take a deeper dive into STEEP's plans for research,




Partners

A partnership of the University of Rhode Island,



Team

Meet the directors, project and core leaders, and



Support

STEEP is funded through a Multiproject Center Grant

Transtheoretical Model of Behavior Change

- 5 Maintenance**
Doing a new behavior for more than six months
- 4 Action**
Have made overt lifestyle changes in the past six months
- 3 Preparation (READY)**
Ready to take action in the next thirty days
- 2 Contemplation (GETTING READY)**
Intending to take action in the next six months
- 1 Precontemplation (NOT READY)**
Not intending to take action in the next six months

Broad-spectrum outreach



@steepsuperfund



@steepsuperfund



@steepsuperfund



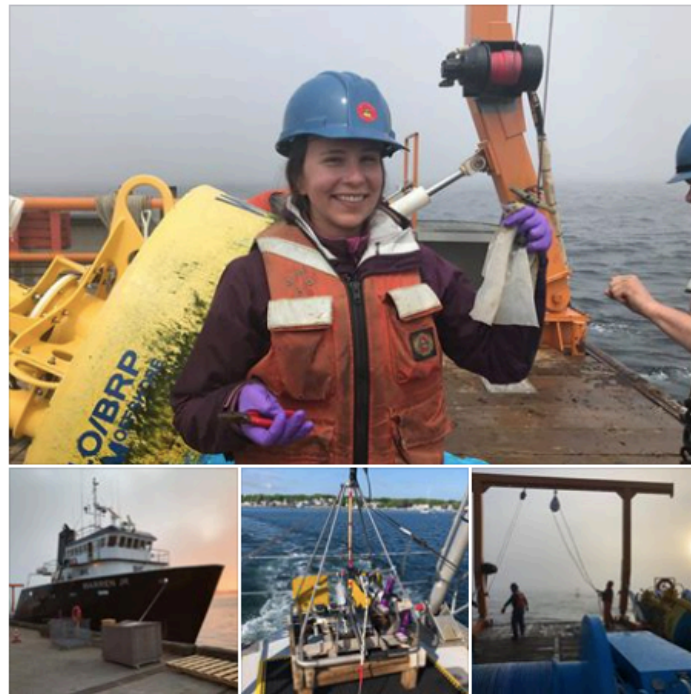
STEEP Superfund



STEEP Superfund

Published by Amber Neville [?] · 4 hrs ·

STEEP trainee and NOAA Nancy Foster Scholar [Anna Ruth Robuck](#) aboard the R/V Warren Jr. collecting passive samplers for #PFAS from across Massachusetts Bay on a series of acoustic moorings, as well as gathering water samples from across Stellwagen Bank as part of STEEP's Detection Tool's research: <https://web.uri.edu/steep/steep-research/detection-tools/>



steepsuperfund • Following

steepsuperfund @steepsuperfund invites #capecod residents to participate in well water study to test for #PFASs Learn more: <https://bit.ly/2vEZWyX>

♡ Q michaelfedorenko, marthamcconnell, ayfx and amcrisall like this

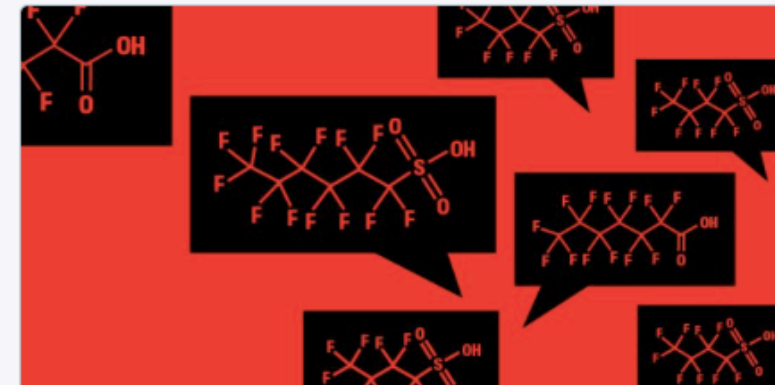
APRIL 24

Add a comment...



URI STEEP Superfund @steepsuperfund · May 18

EPA's "Leadership Summit" on PFOA pollution to exclude victims and community groups. Grandjean, "EPA today is at least 10 years behind the scientific evidence." intercept.pt/2k8fG4Y by @fastlerner @NIH_STEEP #PFAS @SilentSpringIns @HarvardChanSPH @universityofri @SRP_NIEHS



The EPA's "Leadership Summit" on PFOA Pollution Will Exclude Victi...

The EPA doesn't want to hear from people who have PFOA and other PFAS chemicals in their drinking water.

theintercept.com



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Thanks – Questions?

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Philippe Grandjean

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www.uri.edu/stEEP

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SCHOOL OF PUBLIC HEALTH
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More information about STEEP is available at: <https://web.uri.edu/stEEP/>

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