

# Rainer Lohmann

## STEEP Center Director

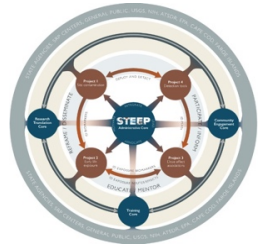
## University of Rhode Island

## Graduate School of Oceanography



# **Sources, Transport, Exposure and Effects of PFASs – An introduction**

Rainer Lohmann

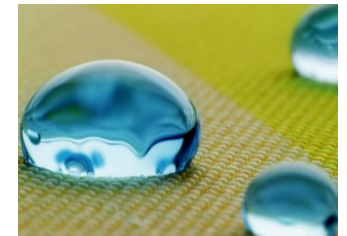


# Challenging compounds

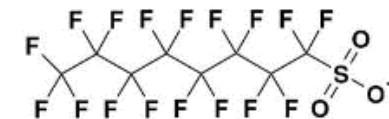
- 100s of contaminated sites in U.S.
  - PFAS production sites
  - Fire training sites, airports
  - Industrial Teflon users



- Everyday exposure for all
  - Consumer products/dust
  - Diet

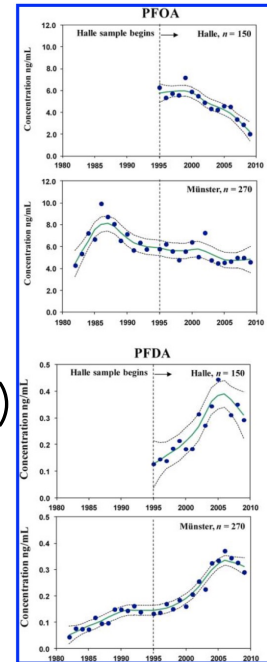
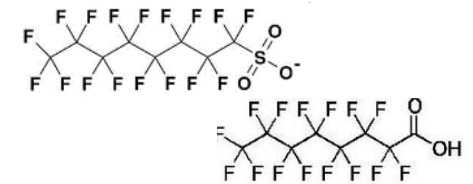


- Unique physical-chemistry, unlike traditional hydrophobic POPs
  - Amphiphilic compounds, ionized in solution
  - Bind to proteins & partition into cell membranes



# PFASs

- Widespread human and environmental exposure
  - Particularly perfluorinated C<sub>8</sub> 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 between [PFOA] in blood and insulin resistance (Timmermann et al., 2014)
  - Several cancers at high exposure (C8 Science panel)
- Regulatory action (PFOS withdrawal and PFOA action plan)
- Replacement with other fluorinated compounds (shorter, polyfluorinated; more complex molecules - precursors)



(Yeung et al., 2013)

# It's been a busy time for PFASs

- No recent action by EPA,
- But at state level
- NJ also issued for PFOS at 13 ng/L
- General consensus that Sum of PFOA + PFOS at 20 - 27 ng/L

## PERSPECTIVE

Key scientific issues in developing drinking water guidelines for perfluoroalkyl acids:  
Contaminants of emerging concern

Gloria B. Post<sup>1\*</sup>, Jessie A. Gleason<sup>2</sup>, Keith R. Cooper<sup>3</sup>

1 New Jersey Department of Environmental Protection, Trenton, New Jersey, United States of America,  
2 New Jersey Department of Health, Trenton, New Jersey, United States of America, 3 Rutgers University,  
New Brunswick, New Jersey, United States of America

Table 1. EPA and state health-based drinking water guidelines for long-chain PFAAs<sup>a</sup>.

PFAA	Source	Year	Guideline (ng/L)
PFOA	EPA [33]	2016	70 <sup>b</sup>
	Minnesota [54]	2017	35
	New Jersey [31]	2017	14 <sup>c</sup>
	North Carolina [55]	2006	2,000
	Texas [56]	2016	290
	Vermont [57]	2016	20 <sup>b</sup>
PFOS	EPA [33]	2016	70 <sup>b</sup>
	Minnesota [54]	2017	27
	Texas [56]	2016	560
	Vermont [57]	2016	20 <sup>b</sup>
PFNA	New Jersey [39]	2015	13 <sup>c</sup>
	Texas [56]	2016	290
PFHxS	Texas [56]	2016	93

# PFASs fever scaled new heights in DC

## Shaheen secures funding for national PFAS health study



May 22, 2018





# Grounding some numbers

- We typically measured in the ng/L range
- about 10 grains of table salt ...
- ~ dissolved in an Olympic pool



# STEEP

## Overall center structure

Leadership  
Director Lohmann (URI)  
Co-Director Grandjean (HU)

Community  
engagement core  
McCann (URI)/  
Schaider (Sil Spr)

Research  
translation core  
Swift/Rohr/Neville  
(URI)

Training core  
Cho, Stevenson  
(URI)

Admin core  
Lohmann (URI)  
STEEP Coordinator  
McConnell (URI)

Biomedical II  
Epi-study of  
metabolic effects on  
PFASs Grandjean (HU)

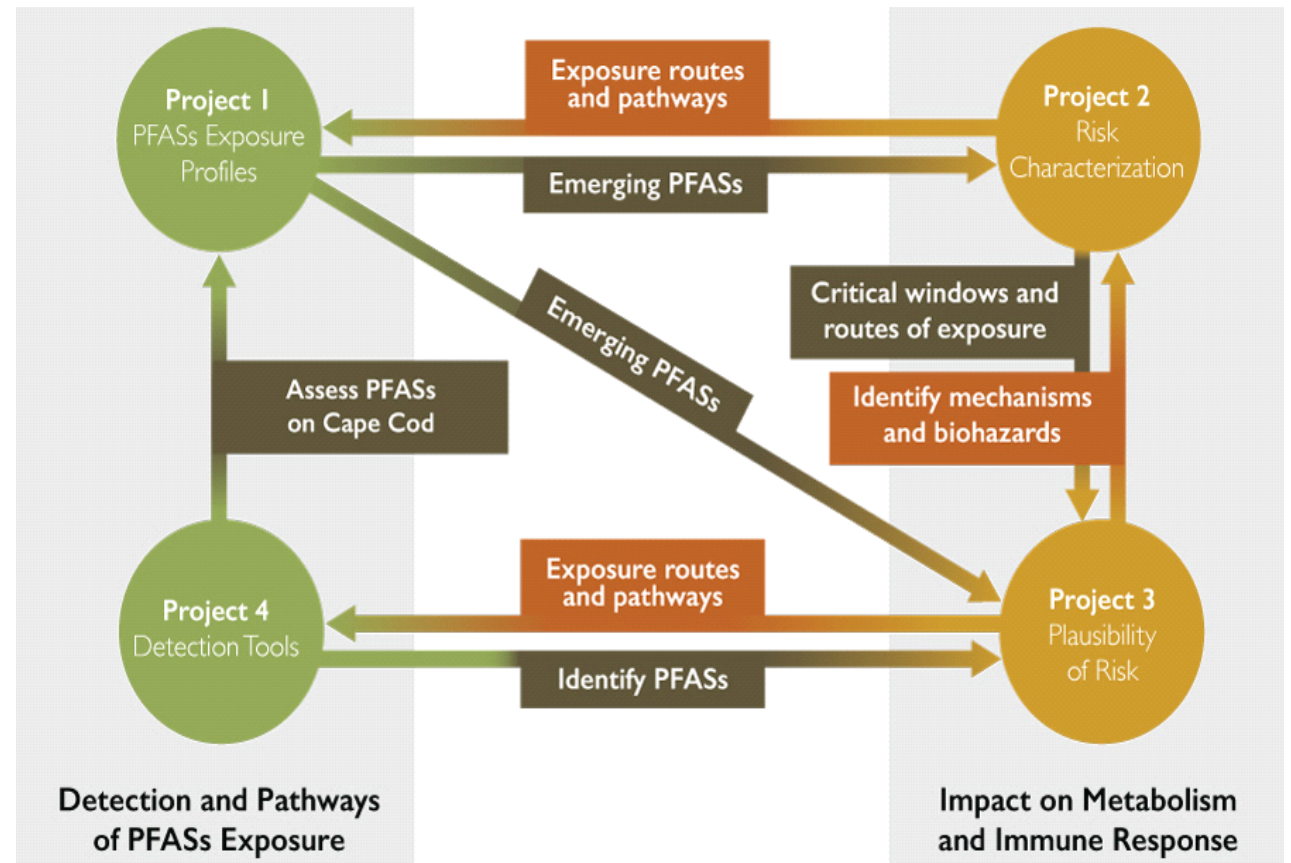
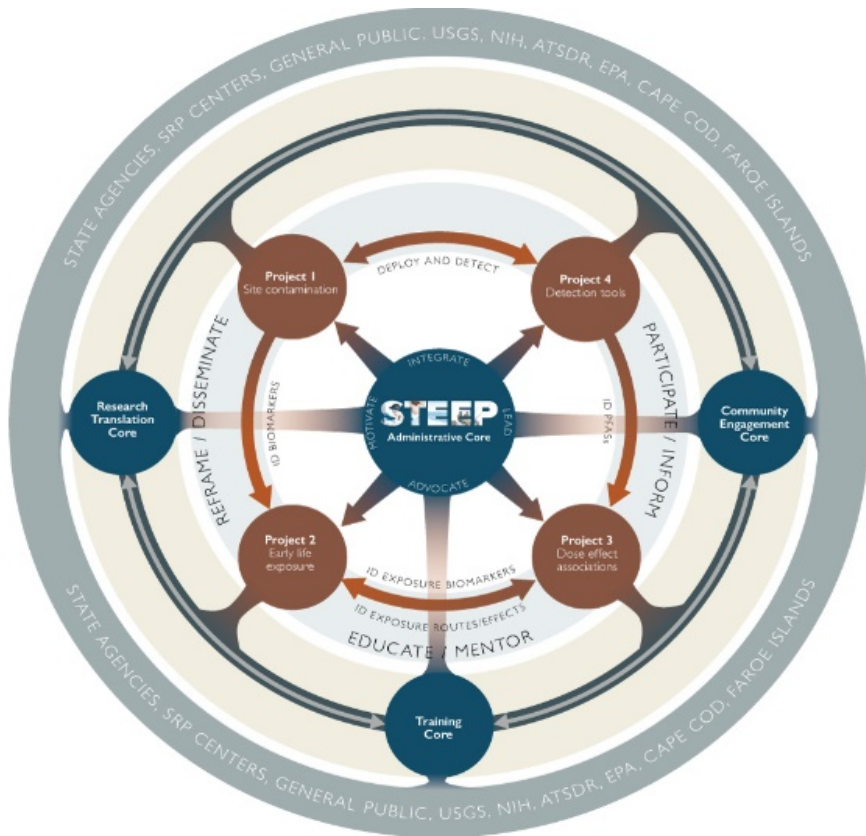
Biomedical II  
Metabolic effects  
of PFCs in mice  
Slitt, Bothun (URI)

Environ Eng-Sci I  
Transport and Fate of  
PFASs  
Sunderland (HU)

Environ Eng-Sci II  
Detection of PFAS  
Lohmann (URI),  
Schaider (Sil Spr)



# So what do we actually do?



# The STEEP family?







# The STEEP team !

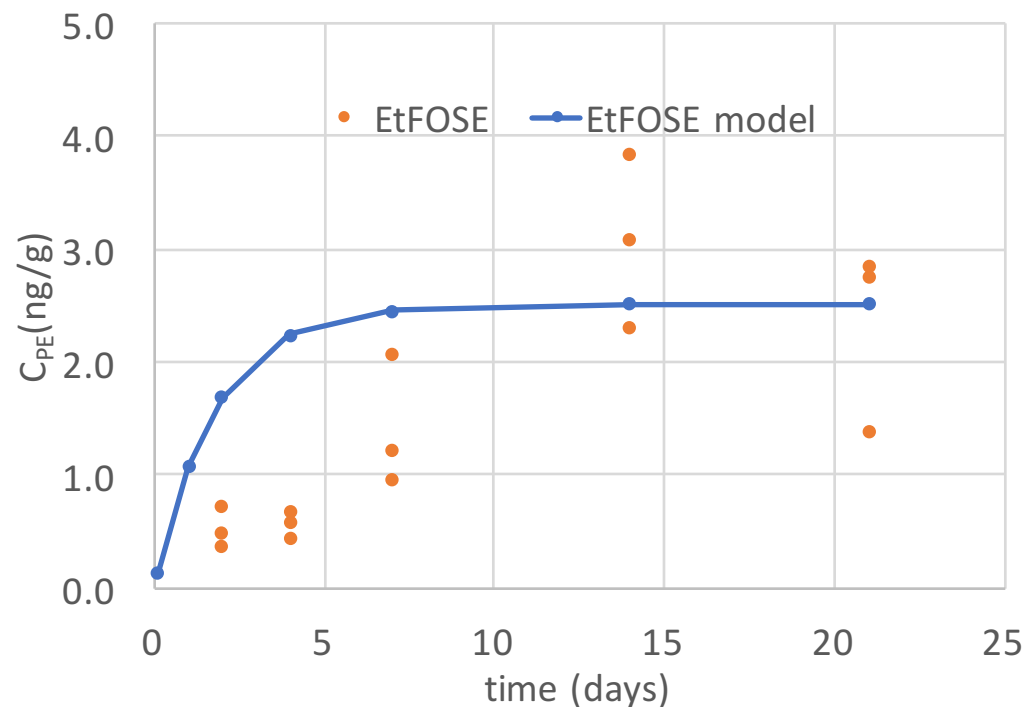


# Project: Detection and bioaccumulation

Some news..

# Simple tools for complex chemistry

- Uptake of compounds by PE sheets

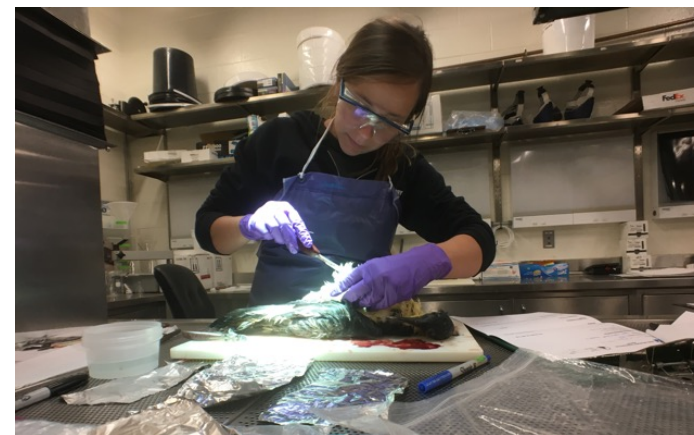




# Recently in the news..

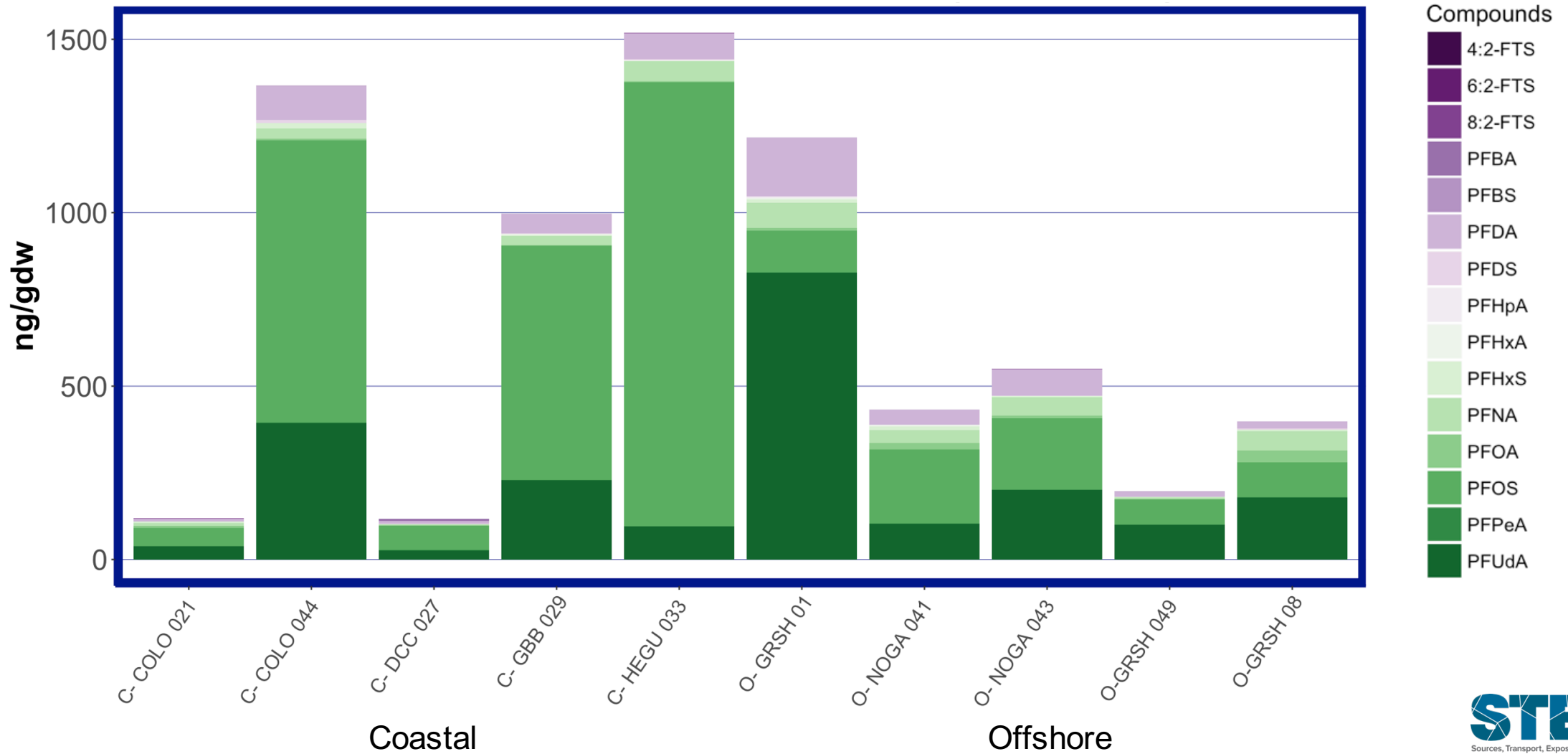


- Anna will be looking at PFASs in birds





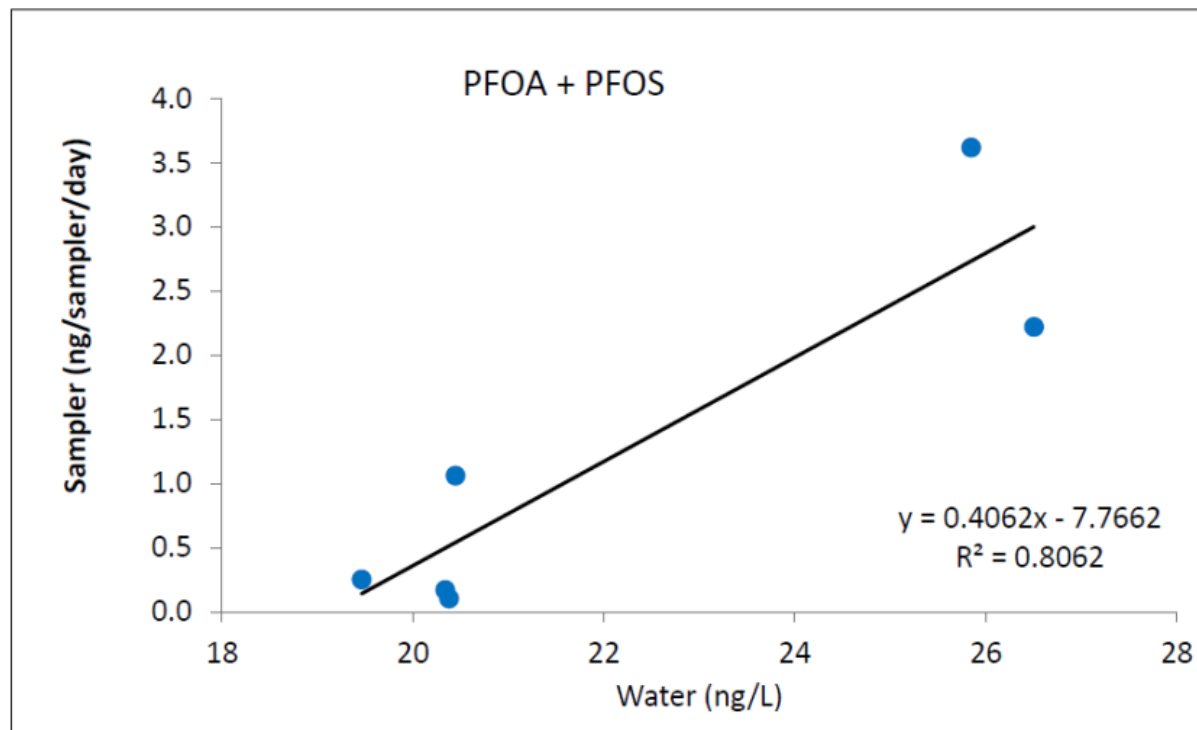
# PFASs are everywhere





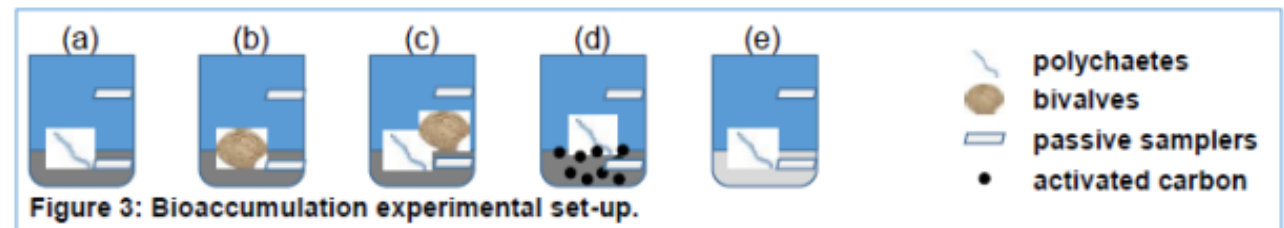
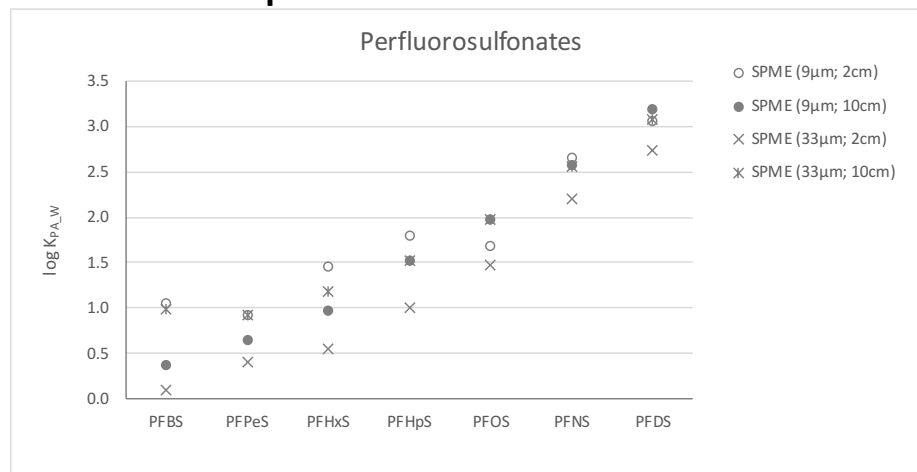
# Tube-spothers aware:

- Soon to be tested in surface waters on the Cape:



# Small fibers – big effects.

- Validating thin fiber sampler for PFASs
- Main use to assess contamination in soil and sediment, both in field and lab
- Lab experiments with US EPA on bioaccumulation of PFAS



# So how does this affect you?

- Air

- Outdoor
- Indoor



- Water

- Stream/pond



- Soil/sediment



[123RF.com](http://123RF.com)

- The STEEP team for spending years together
- To NIEHS, **5P42ES027706**
- To Michelle Heacock, Bill Suk, the NIEHS team and reviewers
- HanseWissenschaftsKolleg Delmenhorst for sabbatical funding
- All of you..

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THE  
UNIVERSITY  
OF RHODE ISLAND



SCHOOL OF PUBLIC HEALTH  
Department of Environmental Health



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More information about STEPP is available at: <https://web.uri.edu/steep/>

