# PFAS in Coastal NH Waterways:
# Applications for the Hampton-Seabrook Estuary

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**School of Marine Science and Ocean Engineering, and**

**Civil and Environmental Engineering**

# Agenda

*PFAS 101: Uses, Sources, and Fate*
*PFAS Research in Great Bay*
- *Atmospheric Deposition*
- *Surface Water Foam*
- *Community Septic Systems*

*Tie to HSE Collaborative*



# PFAS Defined

"PFAS" stands for **Perfluoroalkyl & Polyfluoroalkyl Substances**.

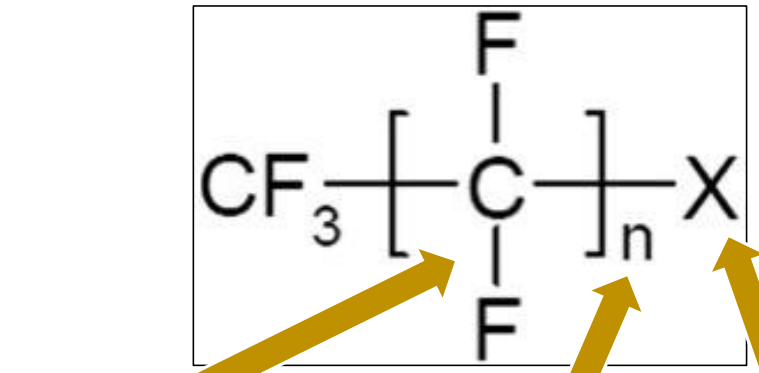
All PFAS contain a chain of carbon atoms bonded to fluorine atoms

**> 10,000 compounds**, formerly called Perfluorochemicals (PFCs).

Their organic fluorine chemistry makes these **highly durable chemicals**.

Certain PFAS have been classified as **persistent, bioaccumulative and toxic**.

General form of a perfluoroalkyl substance




Organic = carbon based

Alkyl = missing one H, replaced with another group

Backbone = chain of Cs connected to mostly Fluorine

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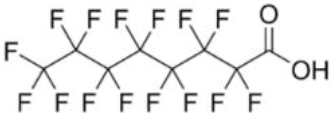
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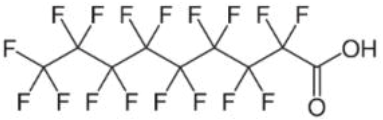
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**Perfluorocarboxylic Acids (PFCAs)**

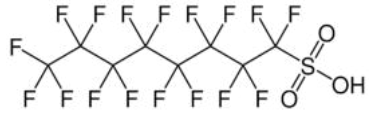


**Perfluorooctanoic acid (PFOA)**

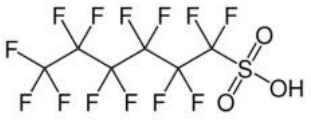


**Perfluorononanoic acid (PFNA)**

**Perfluorosulfonic Acids (PFSAs)**



**Perfluorooctane sulfonic acid (PFOS)**



**Perfluorohexane sulfonic acid (PFHxS)**

**These are *examples* of PFAS.**

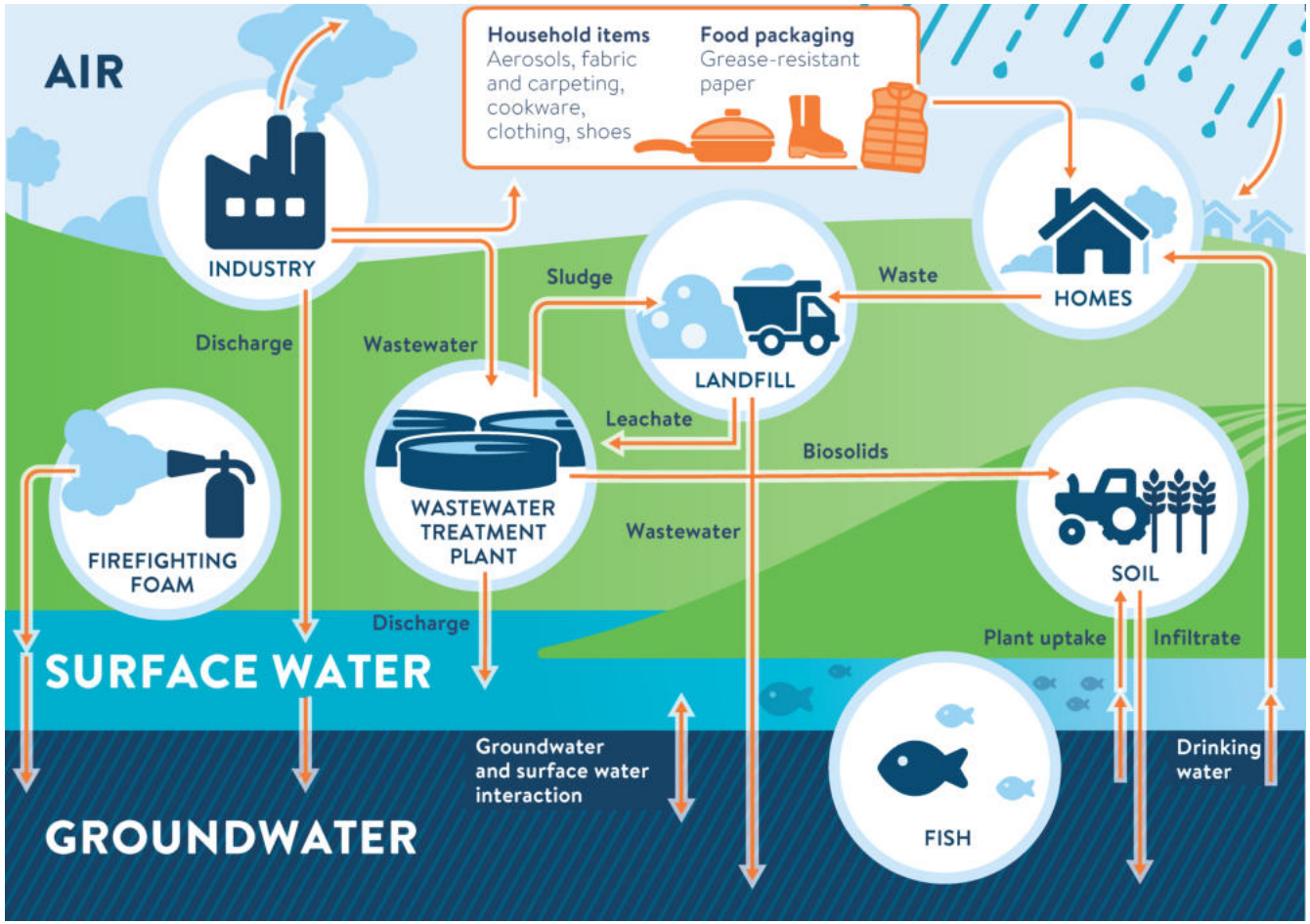
**The ability to measure PFAS in water, soil and other media is constantly changing, challenging, and costly.**

# How are PFAS Used?

- Industrial Use
- Commercial Use
- Household Products



# How have PFAS Entered the Environment?

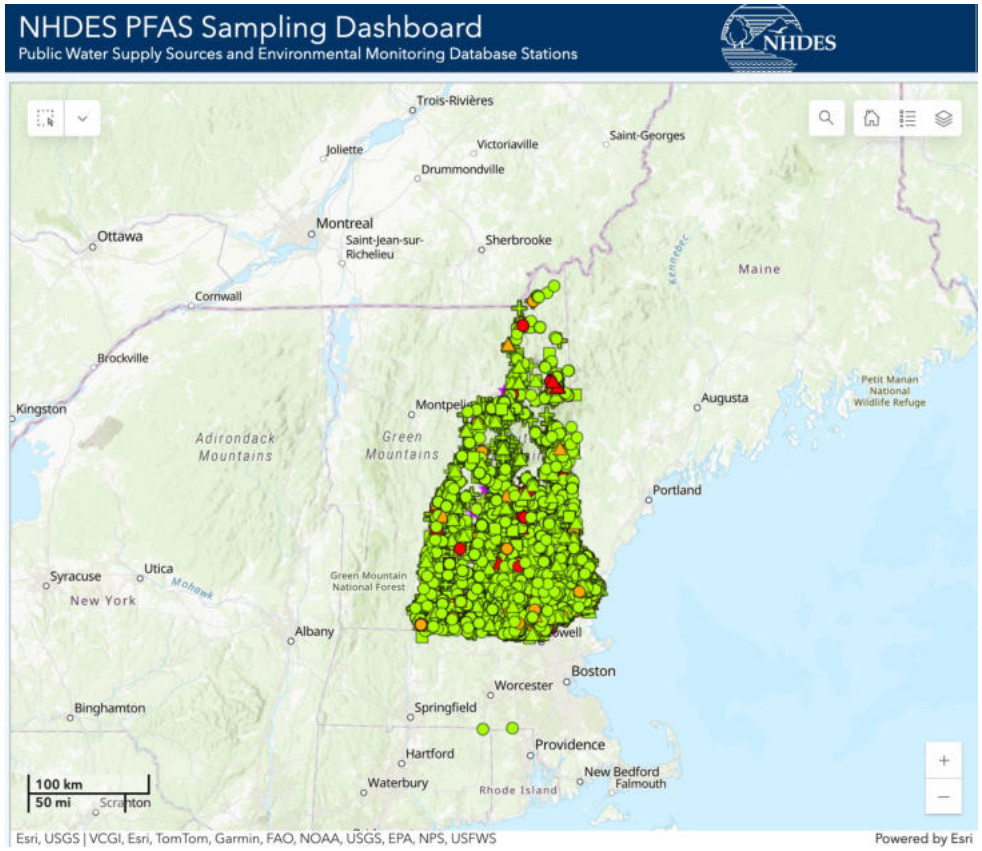



From UNL Water, Scherman
https://water.unl.edu/article/drinking-water-wells/and-polyfluoroalkyl-substances-pfas-facts-related-drinking-water

# Where are PFAS in New Hampshire?

- NHDES, MDEP, MaDEP, VTDEC have conducted several PFAS investigations in water, soil, biota, and more.

- NHDES has made this information publicly available on the PFAS Sampling Dashboard and OneStop Database.




https://nhdes.maps.arcgis.com/apps/dashboards/78fe1cb292af4cefbd49f281c43c658d



Source: NHDES

# PFAS Research – Mouser Lab

PREP Piscataqua Region Estuaries Partnership

Sea Grant NEW HAMPSHIRE

1. PFAS in Precipitation

Across urban, rural, & coastal areas















2. PFAS in Estuarine Foams

Research in partnership with community scientists

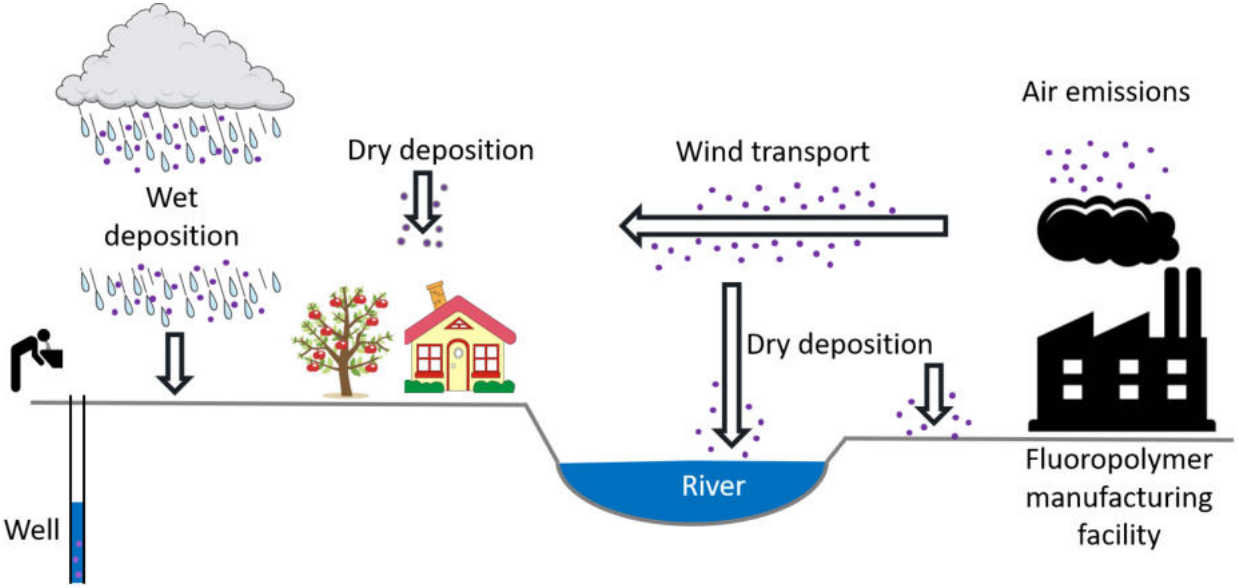
3. PFAS in Wastewater Systems

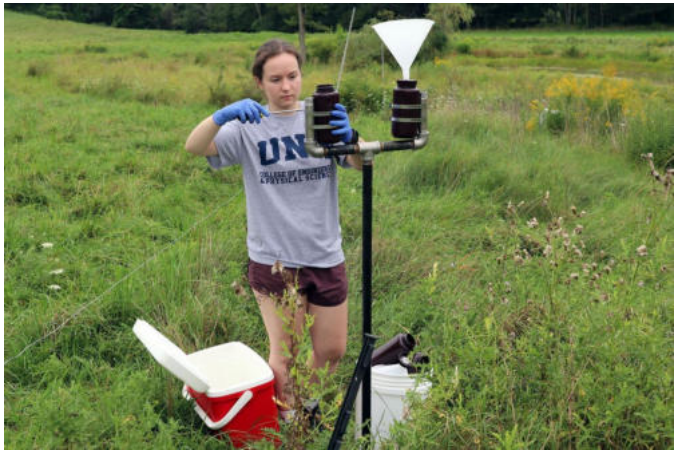
Sampling community systems





# 1. PFAS in Wet Deposition (aka precipitation)



Research by Katherine Wieck, MS 2025
(now at GZA Environmental)

Is precipitation a source of PFAS to water resources?

Design: precipitation samplers were set up in the Great Bay watershed.
Compared land use, rain versus snow, wet vs bulk deposition

# Study Sites & Samplers




- Dark bottles to prevent algal growth
Large funnels, dual bottles to collect adequate samples
Integrated screw-cap funnel to provide stability
All materials PFAS-free (HDPE, stainless steel, black iron)



# 2. PFAS in Surface Water Foam

UNH - Community Member Collaboration

- A. Amico reached out July 2024
- Gathered a team, submitted proposal for funding
- Proposal funded October 2024
- Sampling began November 2024
- Community members report foam sightings and assist with sampling events
- Team engaged in communicating real-time information through news, podcasts, town meetings



Dr. Gangadhar Andaluri, CEE, Temple U



Andrea Amico
Community Scientist, Portsmouth



Dr. Ashley Bulesco, Biological Sciences UNH



Dr. Rosalie Lopresto
Community Scientist, Rye

# Foams are Fascinating Phenomena

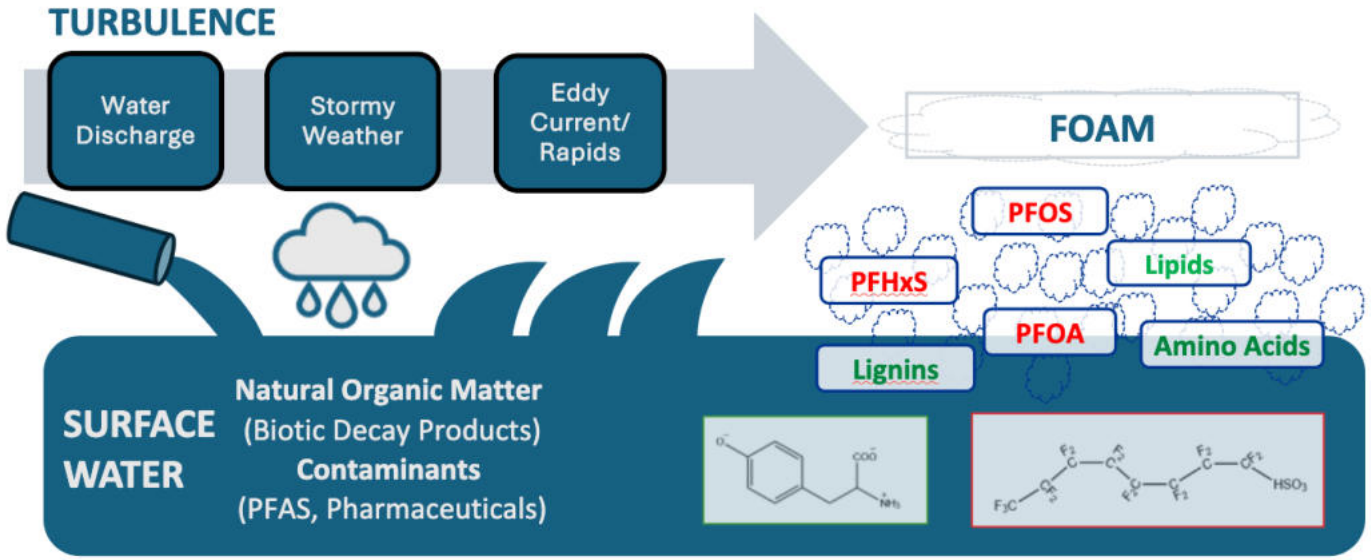



Image: Deangelis and Mouser, 2025

**Science Questions**

-Where and when do foams form?

-How and why do foams form?

-What are foams made from?

-How are foams dissipated?

**Public Health Questions**

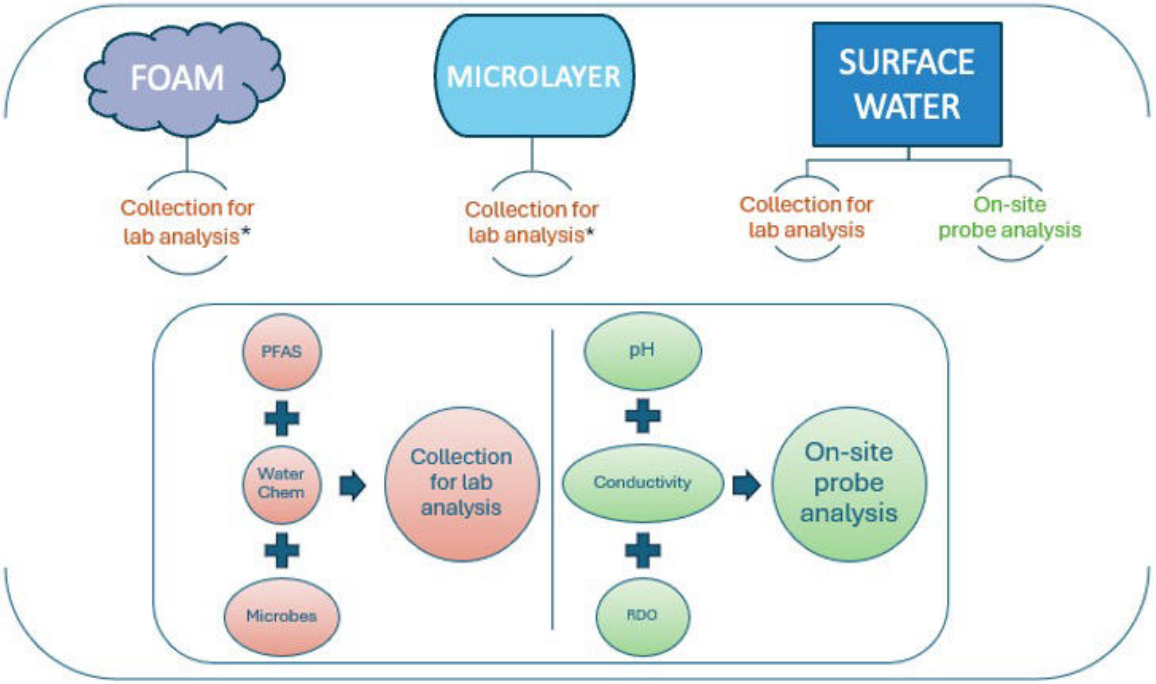
-Is foam composition harmful?

-Should contact with foam be avoided everywhere?

# Sampling Approach



Gabby DeAngelis, MS student
(now at Underwood Engrs.)








Foam/Microlayer Sampling



# Sample Image Summary – Marine Sites

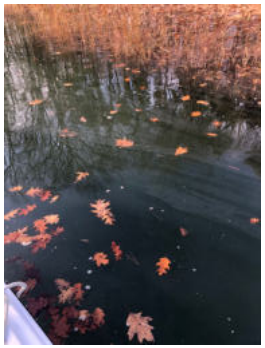
Near Broad Cove (BC)
Considered visible "Surface Active Layer"



Fall 2024



Spring 2025



Fall 2025

Outside Broad Cove (OBC)
Foam patches where tides mix

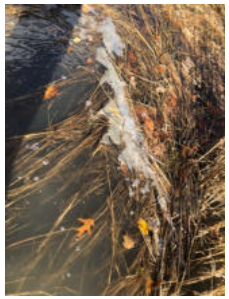


Spring 2025

Near Grafton Ditch (GD)
Below Fabyan Point

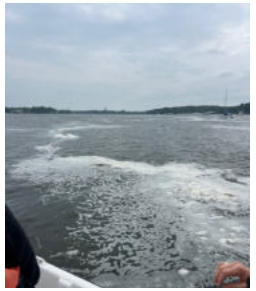


Fall 2024



Fall 2025

Outside Fabyan Point (OFP)
Foam patches where tides mix



Spring 2025

**Key Observations:**

-Generally found after rain storms

-Foams all look very different

-Foams were spread out on surface, pushed up against rocks/tree debris, and free floating in water.

# Data Metric: Partition Coefficient $K_{f/w}$

| Location | Foam-Water Partition Coefficient $K_{f/w}$ | | Water Source |
|---|---|---|---|
| | PFOS | ΣPFAS | |
| #1 BC-A | **24** | 7 | Marine/Estuary |
| #8 BC-B | **2.4** | 7 | Marine/Estuary |
| #7 OBC | **NA** | 2 | Marine/Estuary |
| #2 GD | **35** | 10 | Marine/Estuary |
| #9 OFP | **5** | 3 | Marine/Estuary |
| #3 SP | **44** | 24 | Marine |
| #4 BB | **161** | 71 | Freshwater/Estuarine |
| #6 CB | **27** | 6 | Freshwater |
| #10 BC | **300** | 32 | Marine/Estuary |
| #11 GD | **74** | 25 | Marine/Estuary |

**Key Findings:**

-Foams always had higher PFOS than surface water beneath

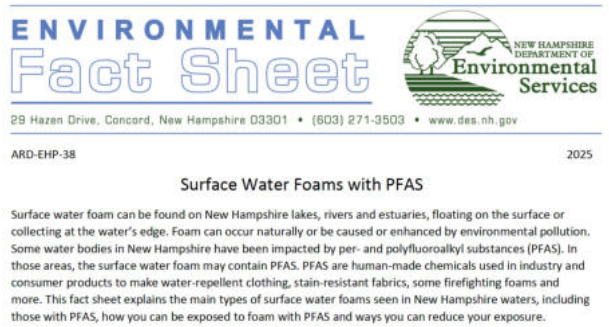
-PFOS in foams concentrated 2–300 fold, ΣPFAS 2-71 fold

-In some cases, foam concentrations were in ppb, compared with ppt in surface waters

-Some samples had considerable DOC, which may influence foaming

# Outreach & Project Impacts

- Project Began Oct 2024; Data Released Feb 2025
- NHDES Fact Sheet on PFAS and Foam 2/25
- Press & Co-Presentations with Team
  - Boston Globe Article, WMUR interview 2/25
  - Newington Board of Commissioners 2/25
  - Env. Triggered Chronic Illness HB1171 Committee 5/25
  - NHSG “Time and Tide” Podcast 6/25
  - Newscenter Maine Sampling Video 6/25
  - NHDES Source Water Conference 6/25
  - Newington Community Meeting 10/25



ENVIRONMENTAL
Fact Sheet

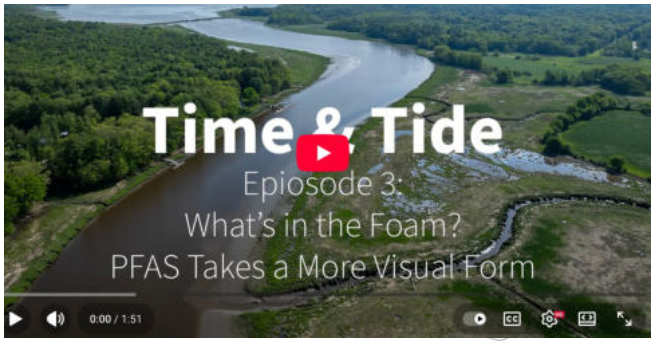
NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

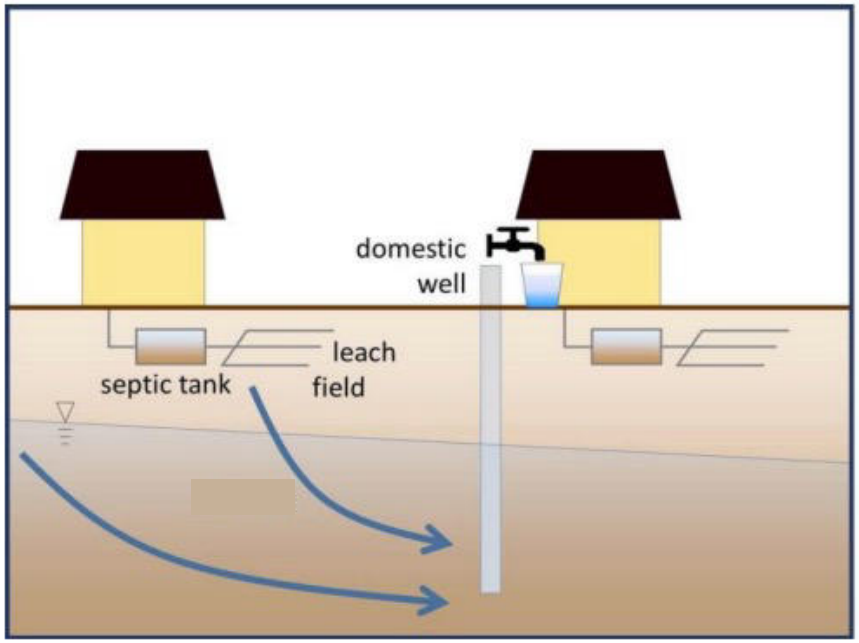
ARD-EHP-38 2025

Surface Water Foams with PFAS

Surface water foam can be found on New Hampshire lakes, rivers and estuaries, floating on the surface or collecting at the water's edge. Foam can occur naturally or be caused or enhanced by environmental pollution. Some water bodies in New Hampshire have been impacted by per- and polyfluoroalkyl substances (PFAS). In those areas, the surface water foam may contain PFAS. PFAS are human-made chemicals used in industry and consumer products to make water-repellent clothing, stain-resistant fabrics, some firefighting foams and more. This fact sheet explains the main types of surface water foams seen in New Hampshire waters, including those with PFAS, how you can be exposed to foam with PFAS and ways you can reduce your exposure.



# 3. PFAS in Community Septic Systems

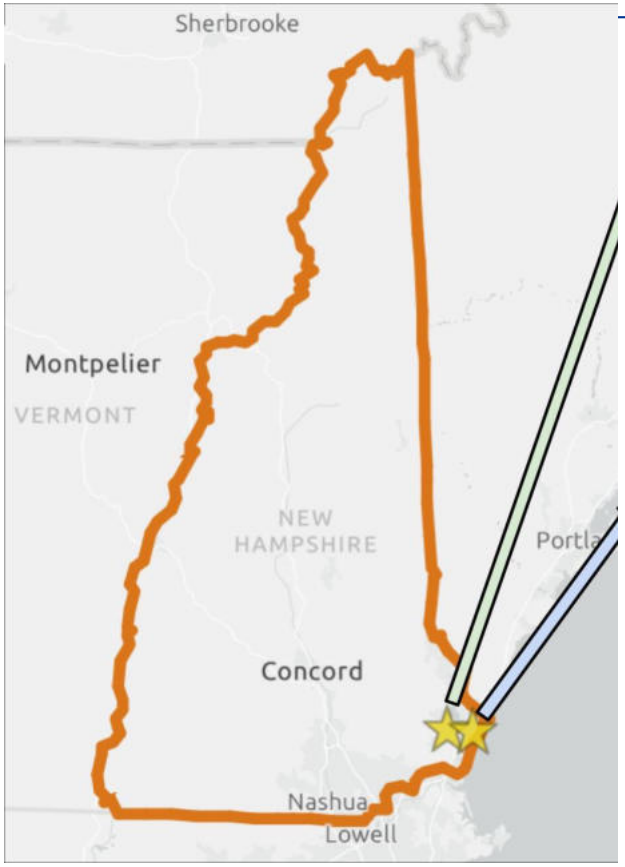



NHDES - UNH Collaboration

- Led by Dr. Jennifer Harfmann, Steve Roy, Drinking Water and Groundwater Division through EPA Funding
- UNH is focused on 2 of 4 systems located in coastal NH

- About 60% of NH residents rely on septic systems to manage sewage
- About 50% rely on groundwater wells
- PFAS can migrate from leach fields to domestic groundwater wells

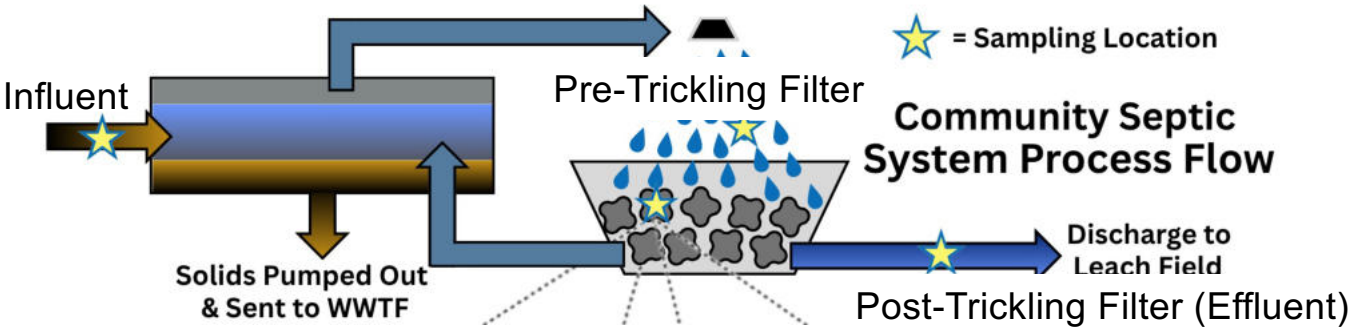
# Community Septic Systems – Study Design




Are septic systems a source of PFAS to water resources?

Design: compared processes, operation, season, type of community

# Community Septic Systems – “Mini-WW Treatment”







Research by Alexis Eaton, MS 2026
(now at Brown University)

Sampling monthly for PFAS and water chemistry in influent, denitrification zone, effluent

Quantified PFAS sorbed to media during warm and cold seasons.

Assessed microbial community members across sites



# Relevance of Research to HSE Management Plan and Monitoring Activities

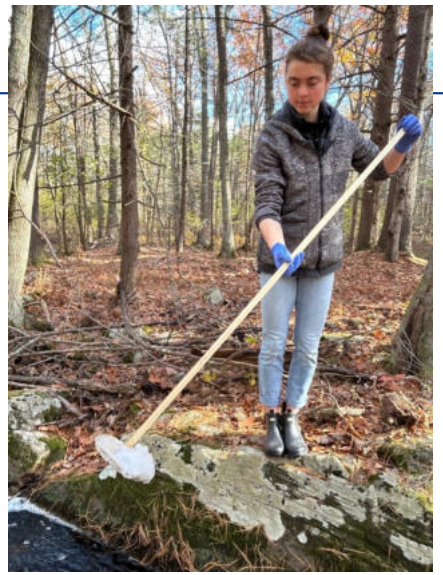
Protecting drinking water sources and ecosystems from pathogens and pollutants

Understanding impacts of emerging contaminants to ecosystems

Pollutant reduction measures for nutrients and emerging contaminants. Specific relevance to wastewater and septic systems

Engagement, information sharing, and collaboration with community members, leaders, policy makers, and volunteers
















# Thank you! Please reach out with questions or to collaborate!

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