Per- and Polyfluoroalkyl Substances (PFAS): Testing Implementation in the Southeast

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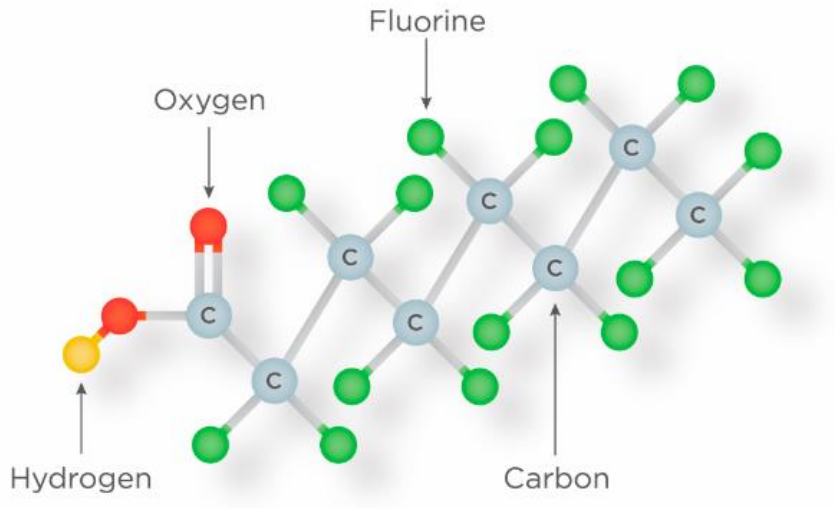
February 14, 2023

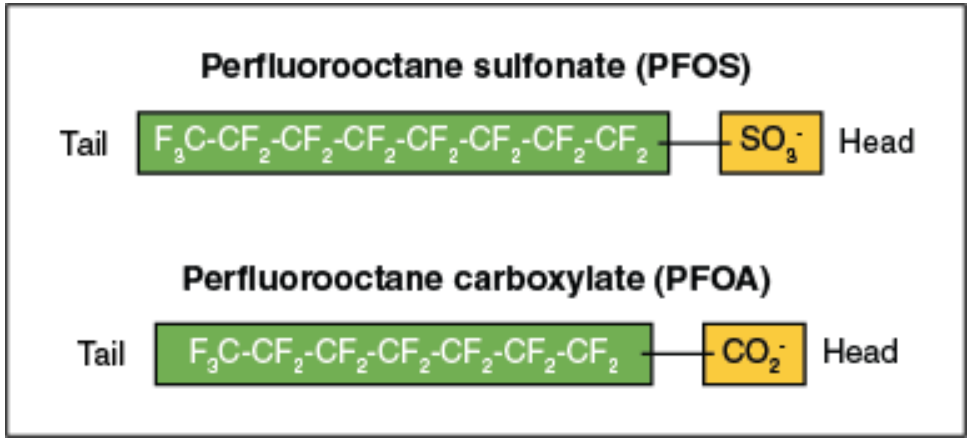
eurofins
Testing for Life

Background: What is PFAS?

What is PFAS, anyway?

- **PFAS** = **P**er- and poly**f**luoro**a**lkyl **S**ubstances
  - Highly fluorinated compounds with at least one -CF_2 or –CF_3 group.
  - These compounds have a reactive “head” with a highly fluorinated “tail”
  - > 5,000 named on the EPA master list
  - Hundreds have been detected in the environment





Where does PFAS come from?

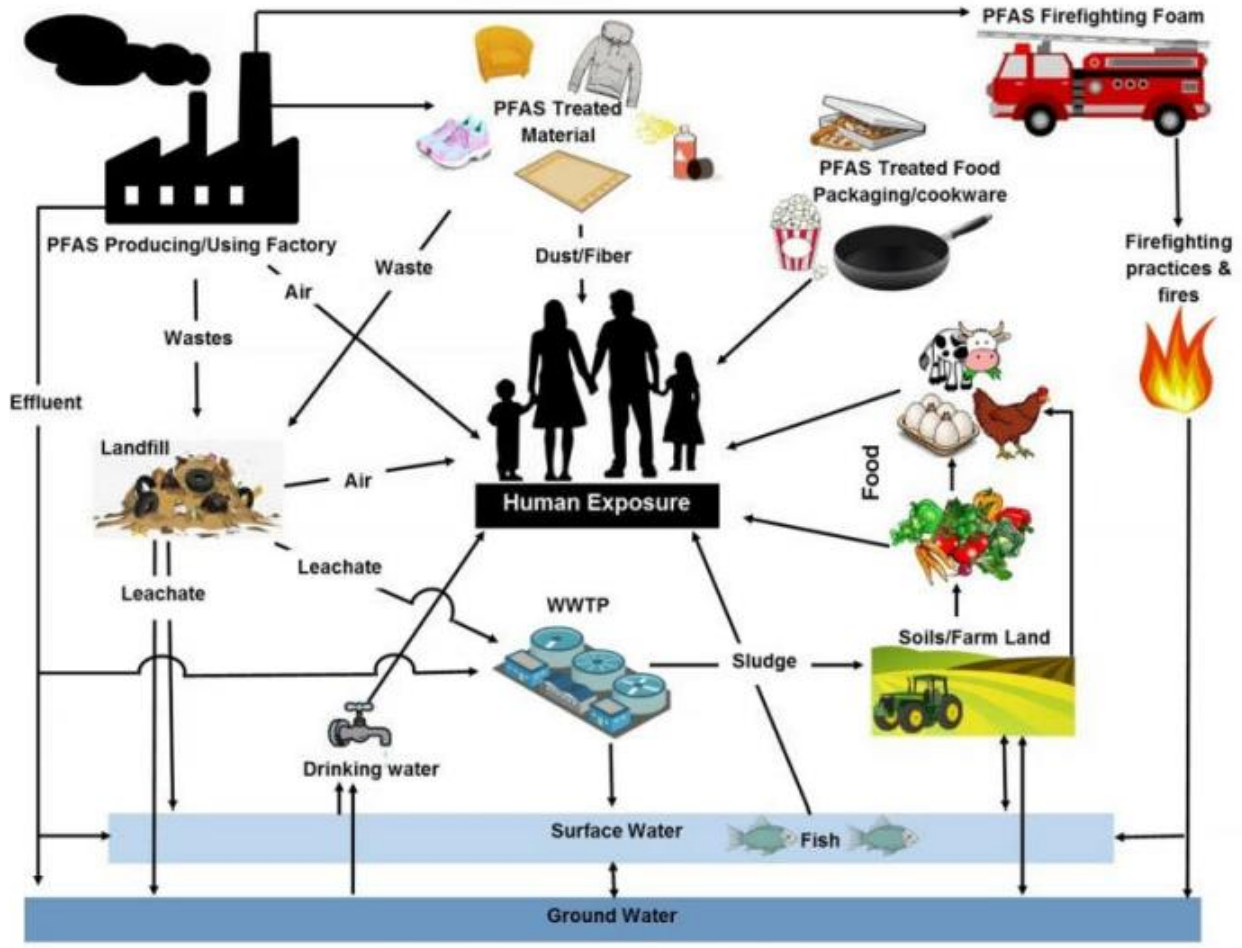
- Useful physical-chemical properties:
  - water, oil and grease repellant
  - thermally & chemically stable
  - surfactant behavior

- Industrial and commercial uses:
  - nonstick cookware & food packaging
  - waterproof & stain resistant products
  - personal care products
  - cleaners & paints
  - firefighting foams

How Are We Exposed to PFAS?

- Routes of exposure:
  - Oral ingestion (water, food)
  - Inhalation
  - Workplace exposure

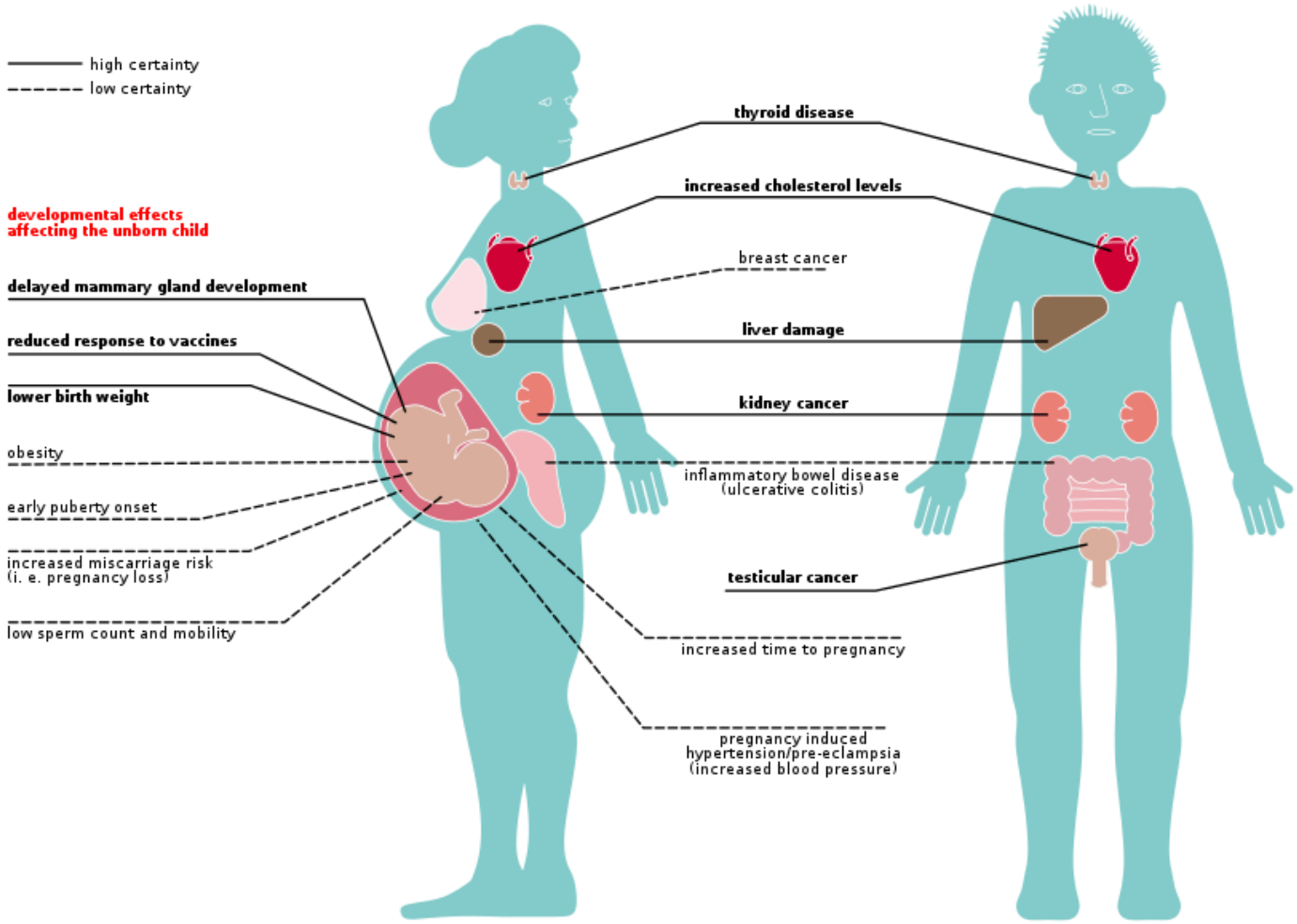
- PFOS, PFOA, PFNA and PFHxS are detected in humans globally



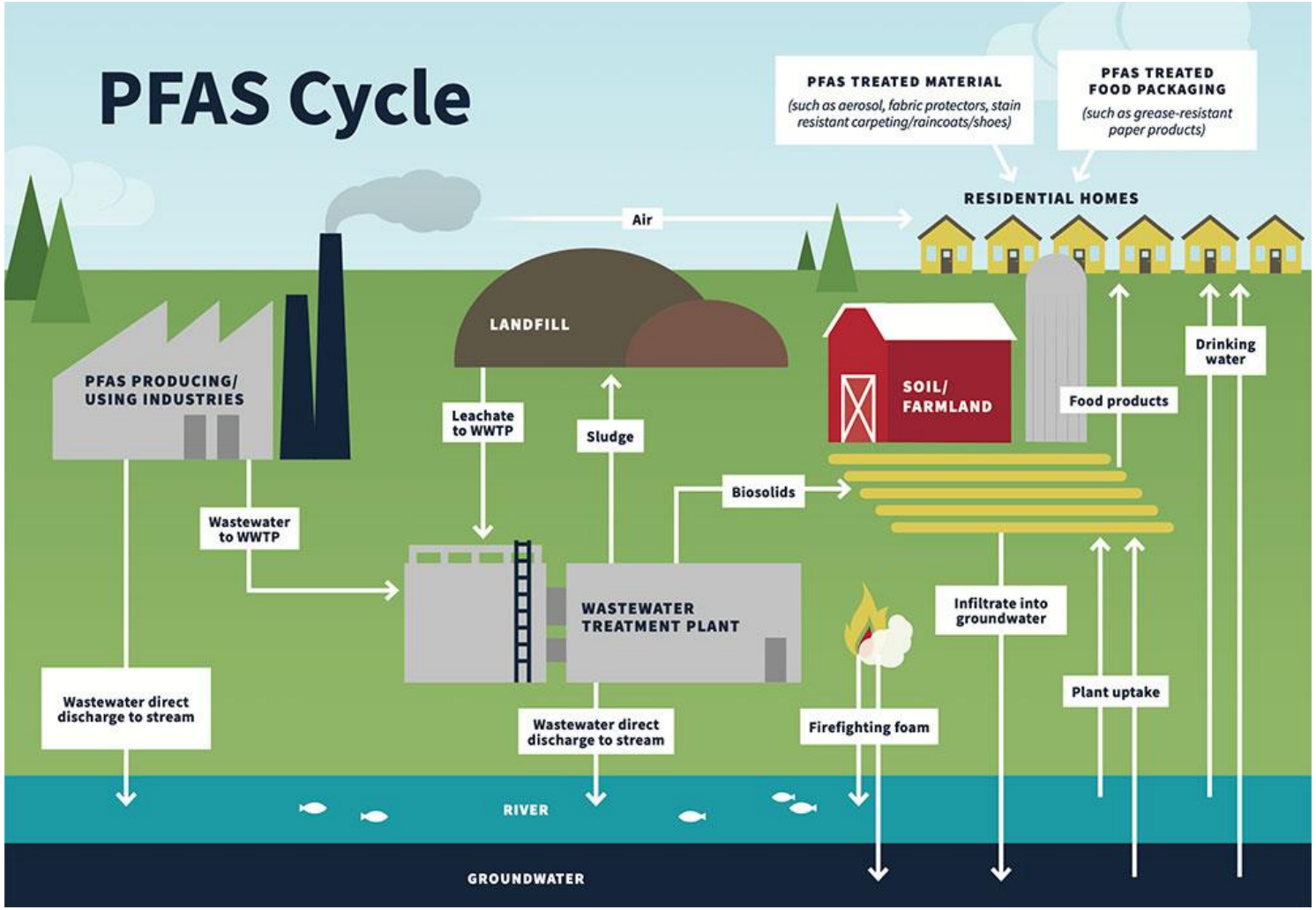
Human Exposure and sources of PFAS
Image: DWP, adapted from Oliaei et al. 2013.

Why Do We Care About PFAS?

- Possible Health Effects Include:
  - Liver damage
  - Immunological effects
  - Low birth weight
  - Thyroid disease
  - Decreased fertility
  - Increased hypertension
  - Kidney & testicular cancers



PFAS are the “Forever Chemicals”



- Persistent
- Bioaccumulative
- Toxic
- Mobile
- Ubiquitous

PFAS Regulation & Distribution

Federal & State regulations

PFAS is NOT federally regulated!

EPA HAL for ∑(PFOS+PFOA) = 70 ppt

EPA HAL for GenX = 10 ppt

EPA HAL for PFBS = 2,000 ppt

*Many states have enacted or proposed MCLs, HALs, and discharge limits for drinking water

- HOWEVER, the US EPA (finally) released its PFAS Strategic Roadmap, 2021-2024:
  - **Research.** Invest in research, development, and innovation to increase understanding of PFAS exposures and toxicities, human health and ecological effects, and effective interventions that incorporate the best available science.
  - **Restrict.** Pursue a comprehensive approach to proactively prevent PFAS from entering air, land, and water at levels that can adversely impact human health and the environment.
  - **Remediate.** Broaden and accelerate the cleanup of PFAS contamination to protect human health and ecological systems.

  https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024

PFAS monitoring draws public attention

EPA Unregulated Contaminant Monitoring Rule:

UCMR3:

- 2013-2015
- 6 PFAS (PFOS, PFOA, PFNA, PFHxS, PFHpA, PFBS)
- **Results: 6M US residents' drinking water exceeds the EPA lifetime HAL of 70 ppt for PFOA + PFOS**

UCMR5:

- 2023-2025
- ALL 29 PFAS included in EPA Methods 533 and 537.1

Environmental Science & Technology Letters

Letter

pubs.acs.org/journal/estlcu

Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina

Mei Sun, Elisa Arevalo, Mark Strynar, Andrew Lindstrom, Michael Richardson, Ben Kearns, Adam Pickett, Chris Smith, and Detlef R. U. Knappe

Discovery of 40 Classes of Per- and Polyfluoroalkyl Substances in Historical Aqueous Film-Forming Foams (AFFFs) and AFFF-Impacted Groundwater

Krista A. Barzen-Hanson, Simon C. Roberts, Sarah Choyke, Karl Oetjen, Alan McAlees, Nicole Riddell, Robert McCrindle, P. Lee Ferguson, Christopher P. Higgins, and Jennifer A. Field

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

So many questions to answer…

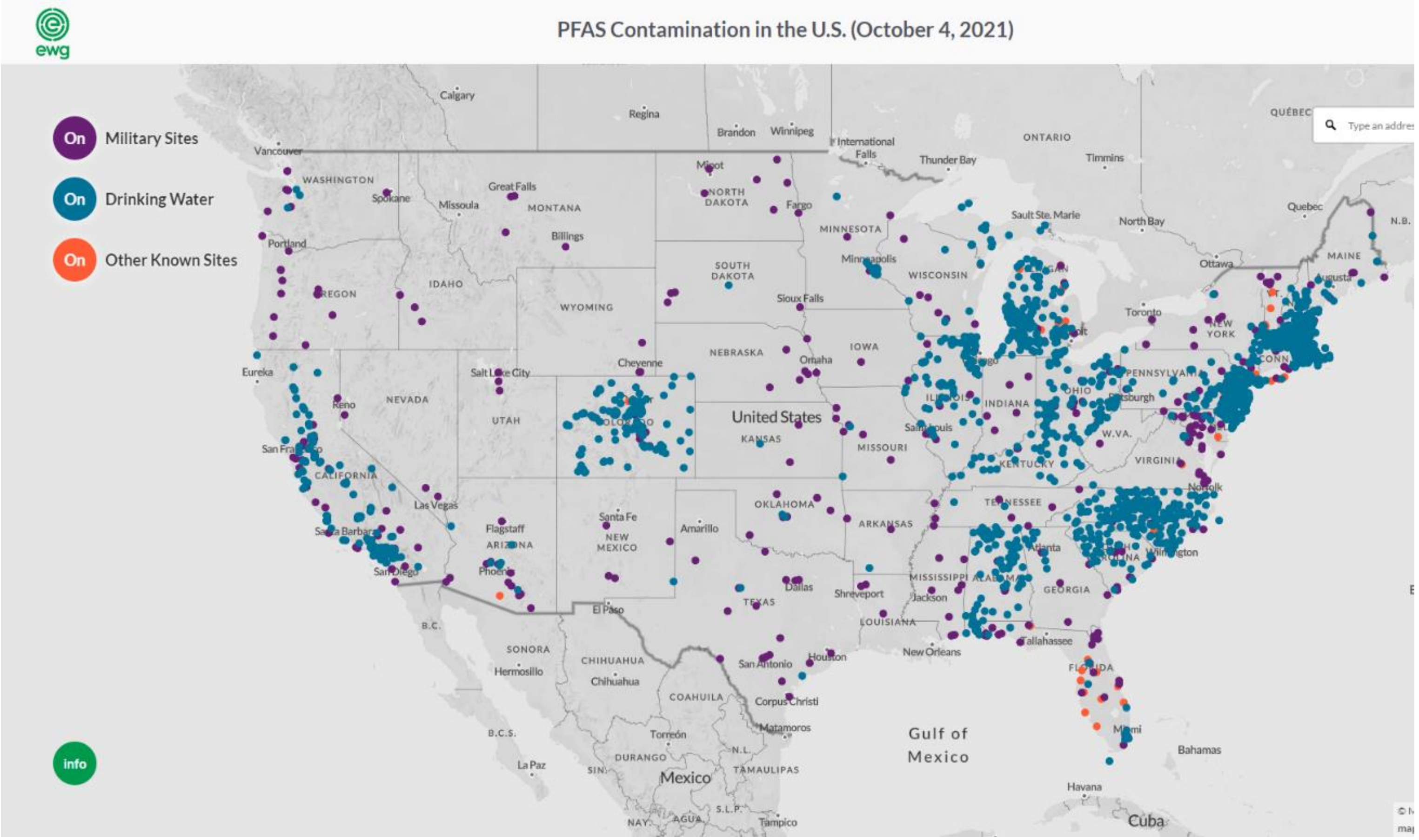
- Public concerns:
  - Is PFAS in my water, food and products?
  - Will exposure affect my children and grandchildren?

- Scientific concerns:
  - Are there additional PFAS that we haven't detected yet?
  - How can we remove and destroy the "forever chemicals"?

- Industrial / manufacturing concerns:
  - How do I prevent catastrophic environmental contamination?
  - What can I do to get ahead of regulations and fines?

Where is PFAS Now?

- PFAS is present in our water, soil, humans, animals/fish, crops – it's everywhere.
- Yet so much is still unknown
- Now that PFAS is finally receiving regulatory attention – testing is in demand!



What does this mean for testing?

- Skyrocketing demand for PFAS testing in environmental matrices:
  - Drinking water
  - Non-potable water (wastewater, leachate)
  - Solids (soil, sediment)
  - Biosolids
  - Tissue
  - Air and particulates
- Data needed to support:
  - Baseline environmental measurements
  - Destruction technique efficacy
  - Evidence / absence of contamination
  - Regulatory initiatives

Analytical Testing:
Expanding Eurofins Capabilities

Nationwide PFAS Testing

EPA Methods for PFAS Analysis

Media	Method	Description
Drinking (Potable) Water: Supports the Safe Drinking Water Act (SDWA)	**Method 537.1**: Determination of Selected PFAS in Drinking Water by SPE and LC/MS/MS (2018/2020)	18 PFAS in drinking water, including HFPO-DA, uses internal standard quantitation
	Method 533: Determination of PFAS in Drinking Water by Isotope Dilution Anion Exchange SPE and LC/MS/MS (2019)	25 PFAS in drinking water, uses isotope dilution method, greater flexibility over 537.1
Non-Potable Water and Other Environmental Media: Supports the Clean Water Act (CWA) and Resource Conservation and Recovery Act (RCRA)	**Draft Method 1633** (2022) *Currently on Draft 3	40 PFAS in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue

Adapted from: https://www.epa.gov/water-research/pfas-analytical-methods-development-and-sampling-research

Draft Method 1633

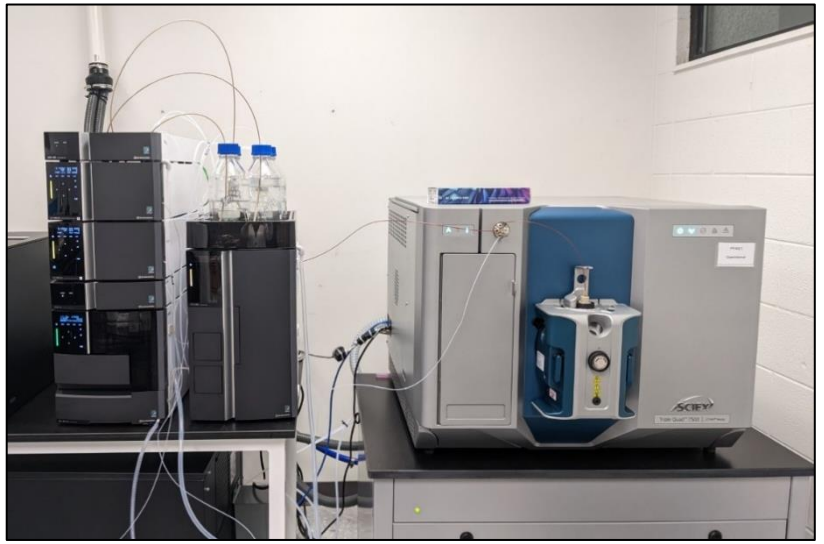
PROS
- Standardized
- Extended analyte list
- Performance-based
- Similar to 537 Mod

CONS
- In draft / evolving
- Limits on TSS
- Complicated extraction
- High potential for re-prep

Expanding PFAS Analysis into Savannah

- Automated SPE units
  - Reduced sample preparation time
  - Increased daily capacity

- SciEx 7500 Liquid Chromatography Triple Quadrupole Mass Spectrometer (LC-TQ/MS)
  - First system currently in validation for 1633
  - Second system expected at the beginning of March
  - Certifications for 1633, 537.1 and 533 expected by June
  - The most sensitive TQ/MS on the market:
    - Reduced sample volume required



Investing in PFAS Work

- North America's largest capacity dedicated to PFAS analysis
- Dedicated teams, laboratory space and instrumentation
- State-of-the-art prep and analytical instrumentation for trace-level results
- Analysis for up to 75 PFAS at detection limits below state and federal screening levels
- Accreditation through the Department of Defense (DoD ELAP) program
- Advanced analytical and forensic tools (TOF, TOP, Non-Target Analysis)
- Ongoing educational webinars and webinar series

RESOURCES

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