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

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Warner Robins, GA

February 14, 2023

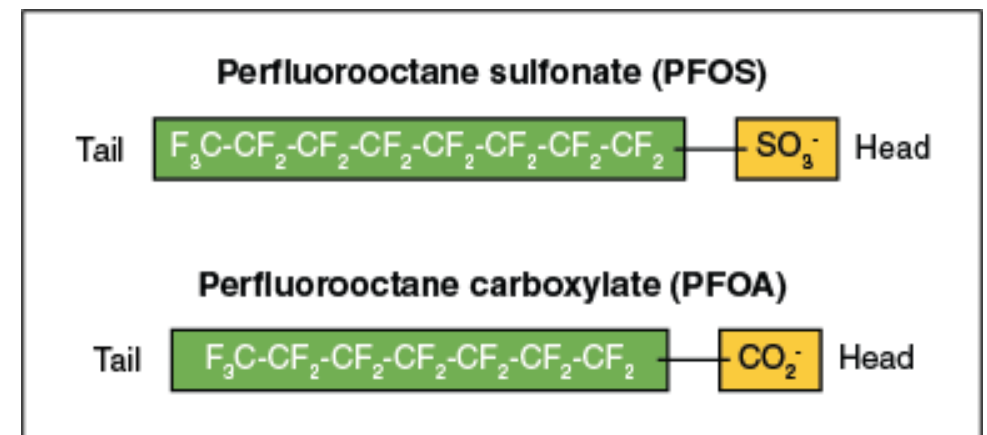
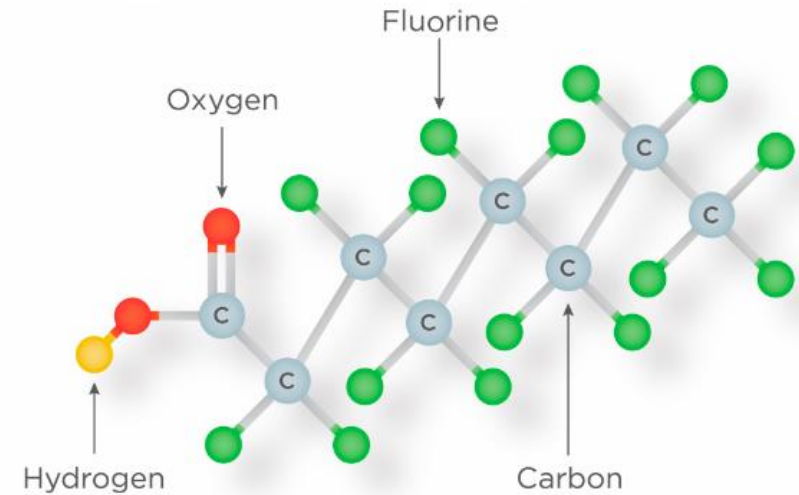
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# Background: What is PFAS?

# What is PFAS, anyway?

- **PFAS = Per- and polyfluoroalkyl Substances**
  - 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



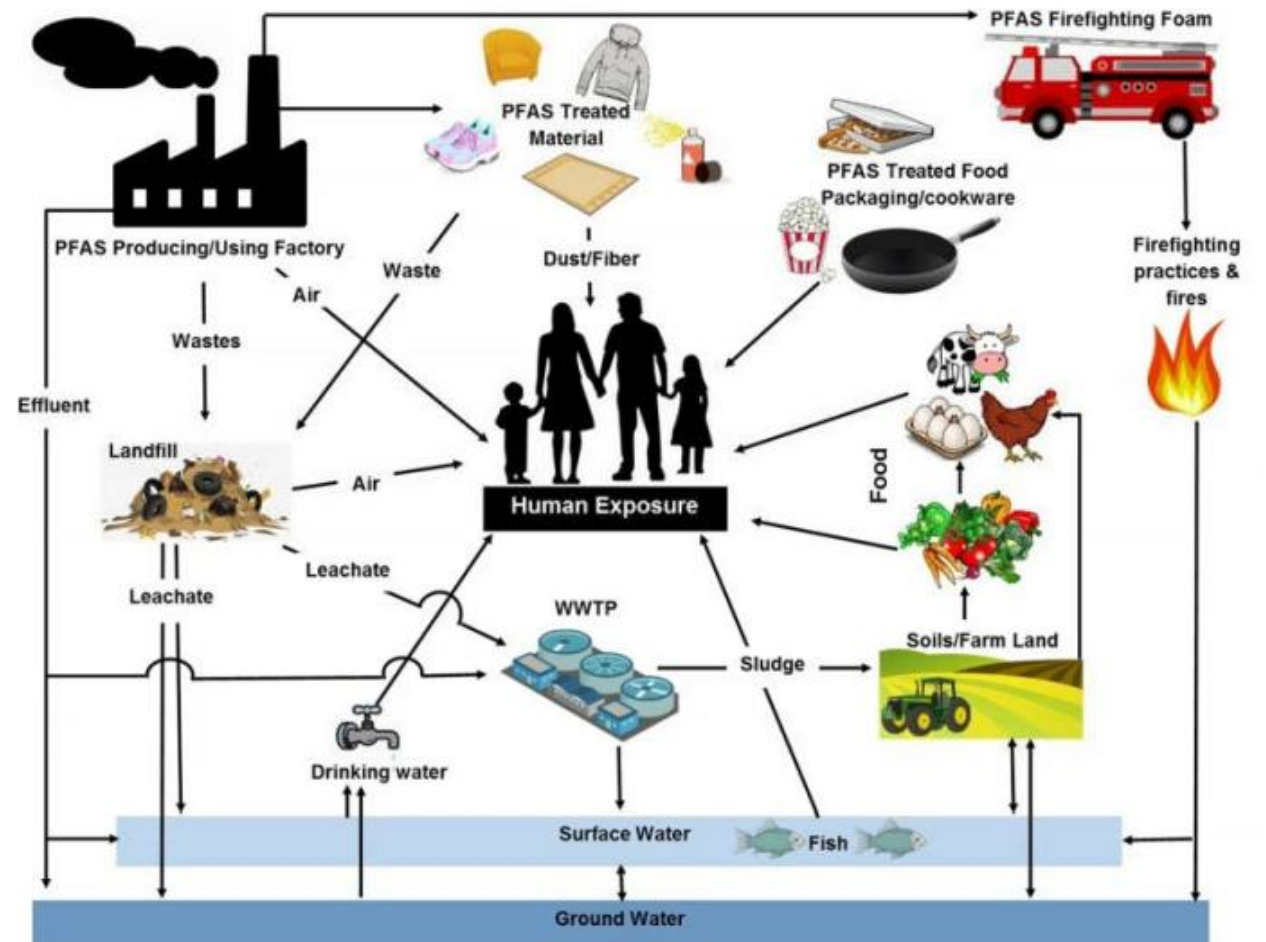
# Where does PFAS come from?

- Useful physical-chemical properties:
  - water, oil and grease repellent
  - 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

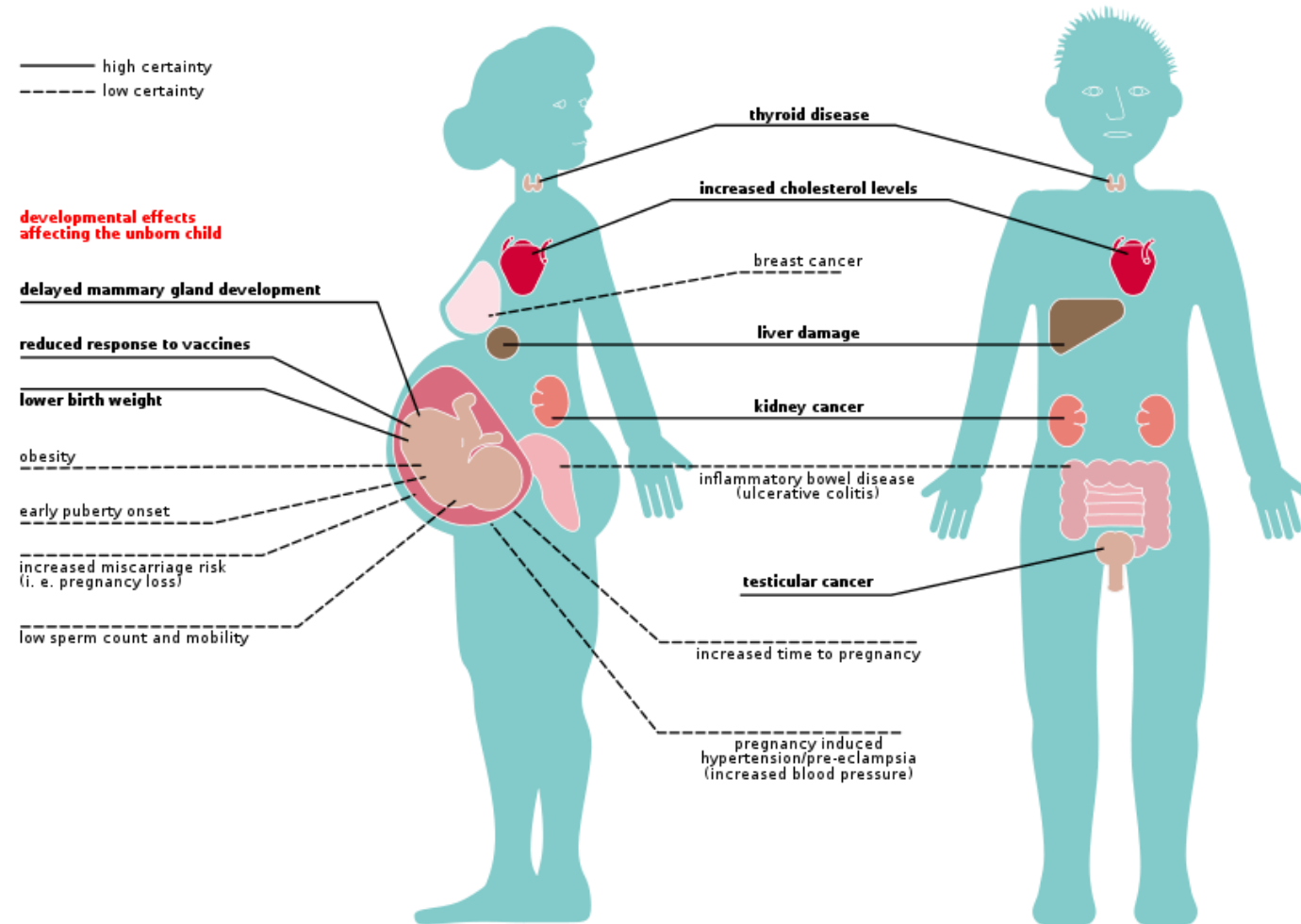


*Human Exposure and sources of PFAS  
Image: DWP, adapted from Oliaei et al. 2013.*

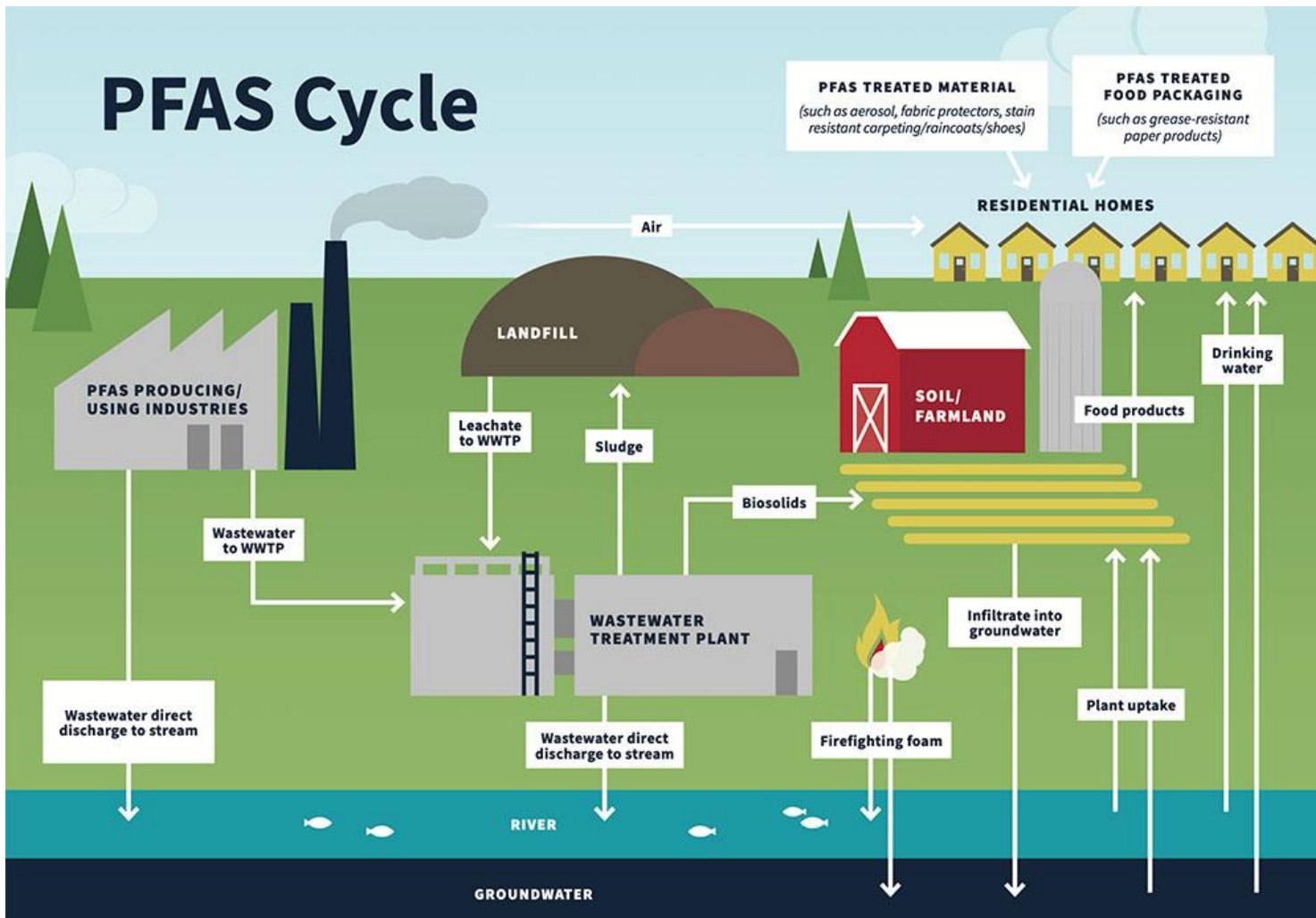
# Why Do We Care About PFAS?

- 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”



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Persistent

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Bioaccumulative

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Toxic

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Mobile

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Ubiquitous

# PFAS Regulation & Distribution



## PFAS is NOT federally regulated!

EPA HAL for  $\sum(\text{PFOS}+\text{PFOA}) = 70 \text{ ppt}$

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



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,<sup>\*,†,‡,§</sup> Elisa Arevalo,<sup>‡</sup> Mark Strynar,<sup>§</sup> Andrew Lindstrom,<sup>§</sup> Michael Richardson,<sup>||</sup> Ben Kearns,<sup>||</sup> Adam Pickett,<sup>⊥</sup> Chris Smith,<sup>#</sup> and Detlef R. U. Knappe<sup>‡</sup>

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

Krista A. Barzen-Hanson,<sup>†,⊕</sup> Simon C. Roberts,<sup>∇,‡</sup> Sarah Choyke,<sup>§</sup> Karl Oetjen,<sup>‡</sup> Alan McAlees,<sup>||</sup> Nicole Riddell,<sup>||</sup> Robert McCrindle,<sup>⊥</sup> P. Lee Ferguson,<sup>§</sup> Christopher P. Higgins,<sup>\*,‡</sup> and Jennifer A. Field<sup>\*,#</sup>

### 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,<sup>\*,†,‡</sup> David Q. Andrews,<sup>§</sup> Andrew B. Lindstrom,<sup>||</sup> Thomas A. Bruton,<sup>⊥</sup> Laurel A. Schaidler,<sup>#</sup> Philippe Grandjean,<sup>†</sup> Rainer Lohmann,<sup>@</sup> Courtney C. Carignan,<sup>†</sup> Arlene Blum,<sup>⊥,∇</sup> Simona A. Balan,<sup>•</sup> Christopher P. Higgins,<sup>○</sup> and Elsie M. Sunderland<sup>†,‡</sup>

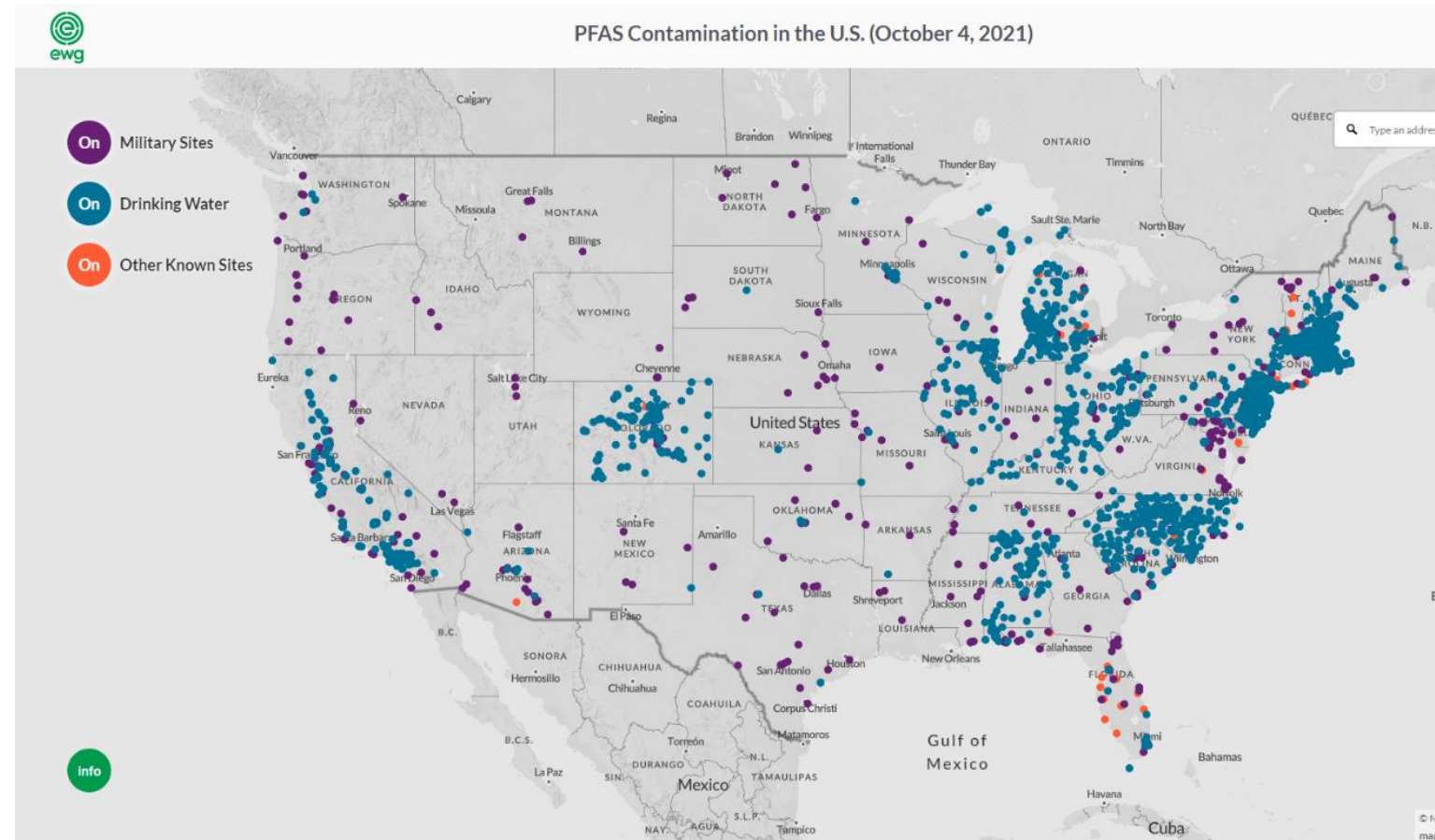
# So many questions to answer...

- 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!



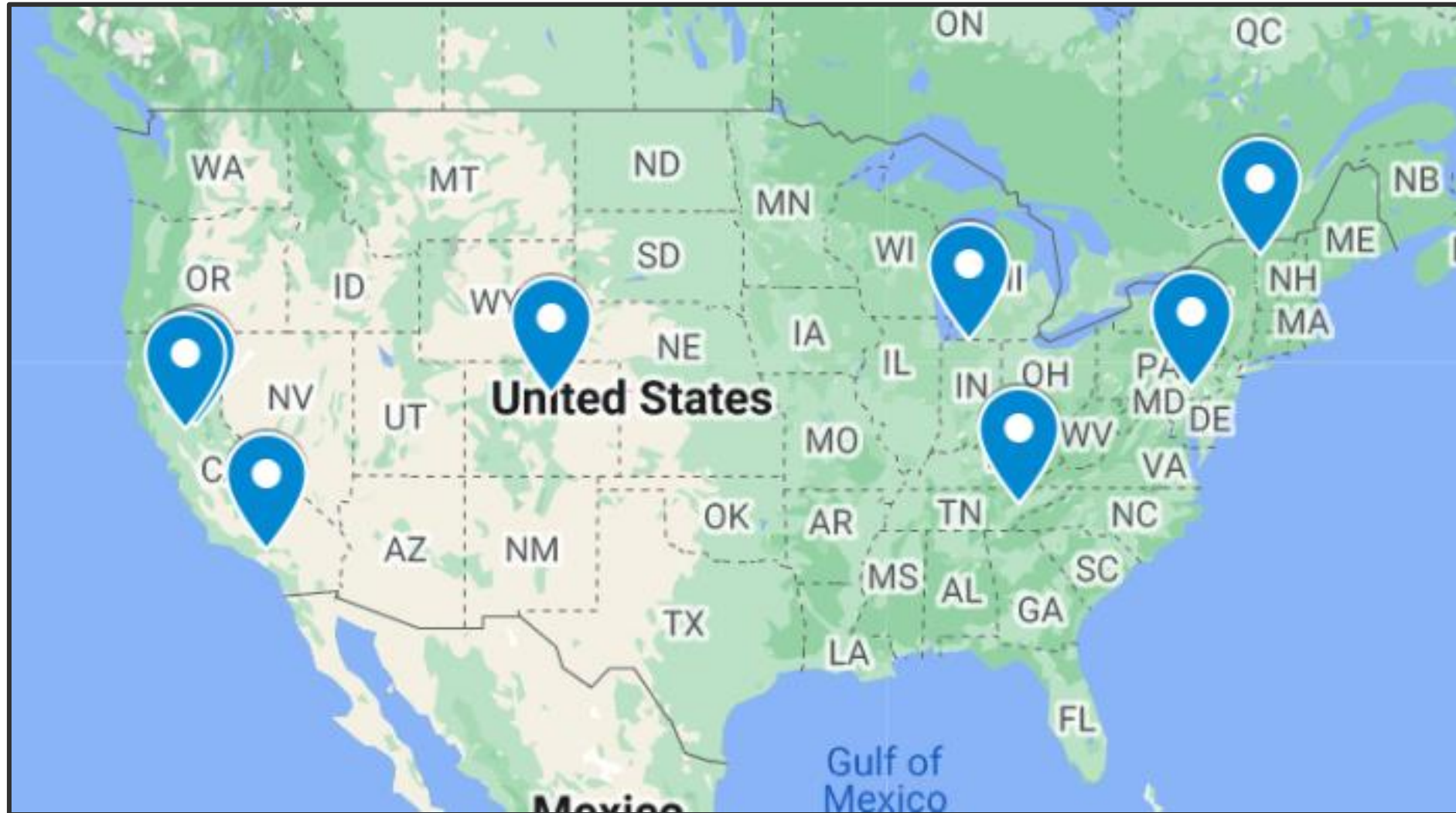
# What does this mean for testing?

- 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



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# EPA Methods for PFAS Analysis

Media	Method	Description
<b>Drinking (Potable) Water:</b> Supports the Safe Drinking Water Act (SDWA)	<b>Method 537.1:</b> 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
	<b>Method 533:</b> 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
<b>Non-Potable Water and Other Environmental Media:</b> Supports the Clean Water Act (CWA) and Resource Conservation and Recovery Act (RCRA)	 <b>Draft Method 1633</b> (2022) *Currently on Draft 3	40 PFAS in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue



## Draft Method 1633

**PROS**

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

**CONS**

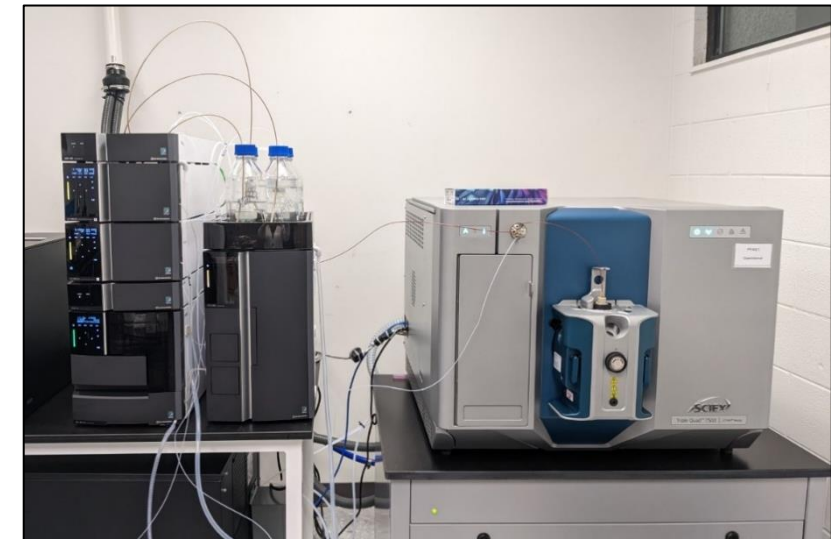
- In draft / evolving
- Limits on TSS
- Complicated extraction
- High potential for re-prep

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



# 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

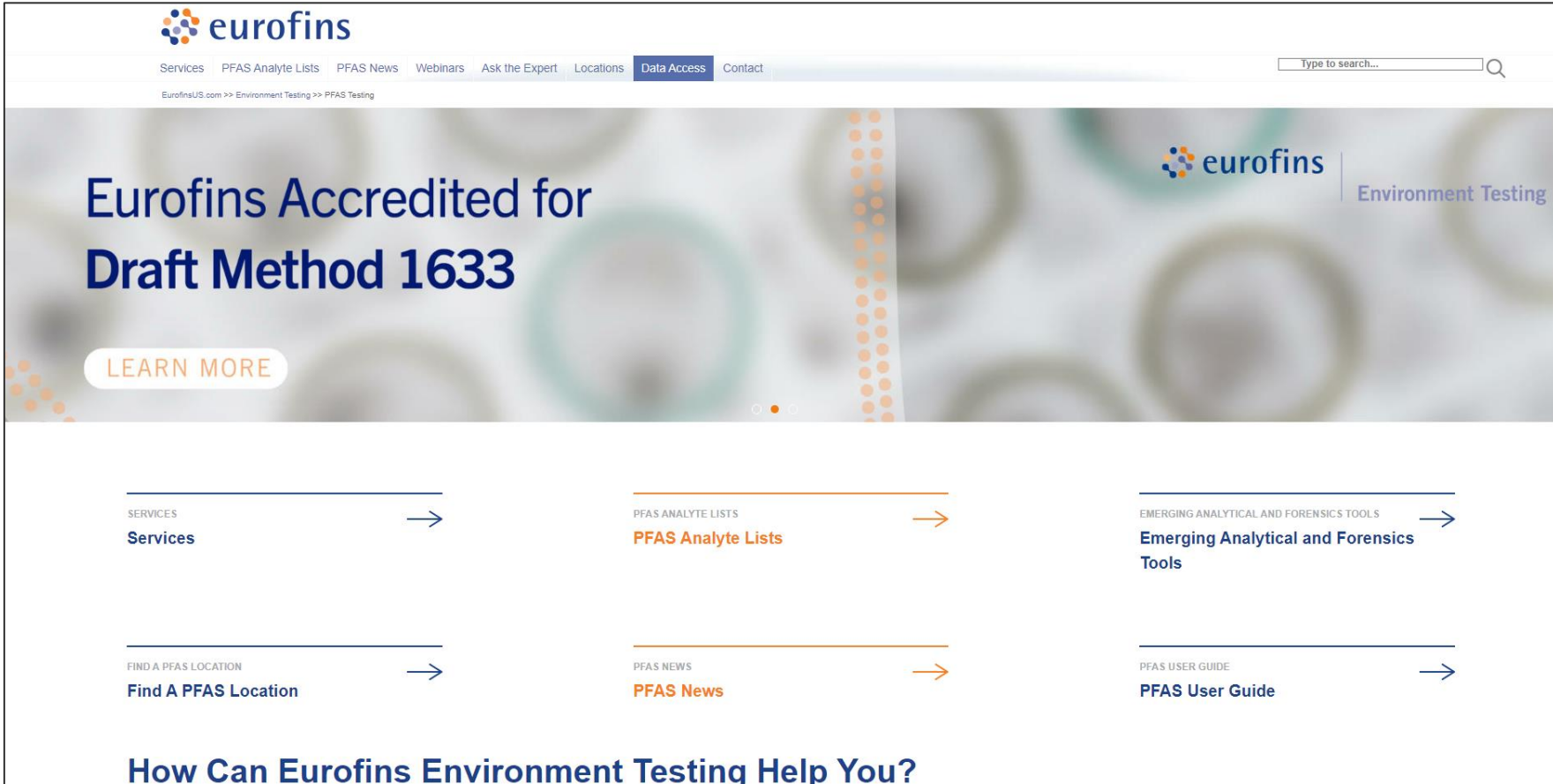


# Investing in PFAS Work



- 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

[www.EurofinsPFAS.com](http://www.EurofinsPFAS.com)



The screenshot shows the Eurofins website interface. At the top left is the Eurofins logo. A navigation menu includes: Services, PFAS Analyte Lists, PFAS News, Webinars, Ask the Expert, Locations, Data Access (highlighted), and Contact. A search bar on the right contains the text "Type to search...". Below the navigation is a breadcrumb trail: "EurofinsUS.com >> Environment Testing >> PFAS Testing".

The main banner features the text "Eurofins Accredited for Draft Method 1633" in large blue font, with a "LEARN MORE" button below it. The background of the banner shows laboratory equipment like beakers and test tubes. In the top right of the banner area, there is a smaller Eurofins logo and the text "Environment Testing".

Below the banner is a grid of six service links, each with a horizontal line above it and a right-pointing arrow:

- SERVICES → **Services**
- PFAS ANALYTE LISTS → **PFAS Analyte Lists**
- EMERGING ANALYTICAL AND FORENSICS TOOLS → **Emerging Analytical and Forensics Tools**
- FIND A PFAS LOCATION → **Find A PFAS Location**
- PFAS NEWS → **PFAS News**
- PFAS USER GUIDE → **PFAS User Guide**

At the bottom of the grid is the heading "How Can Eurofins Environment Testing Help You?"