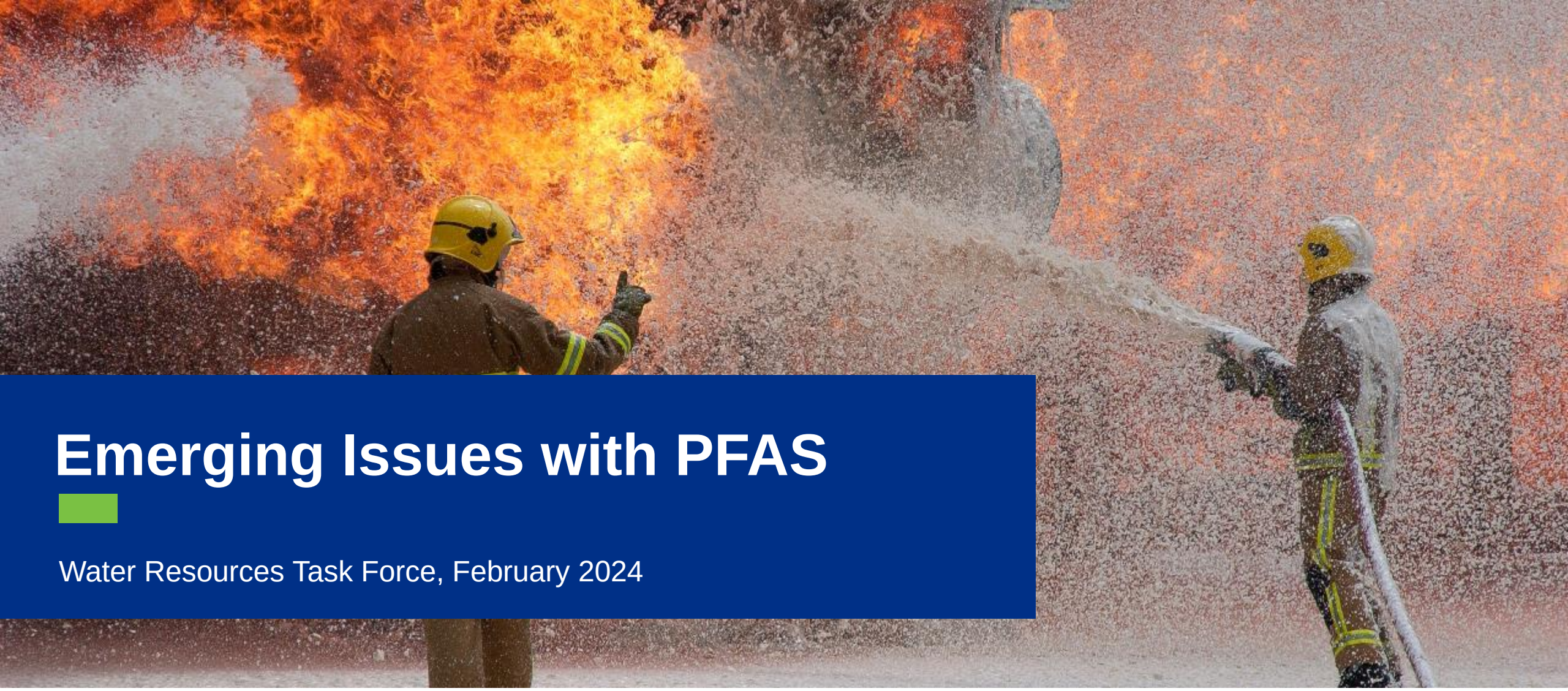


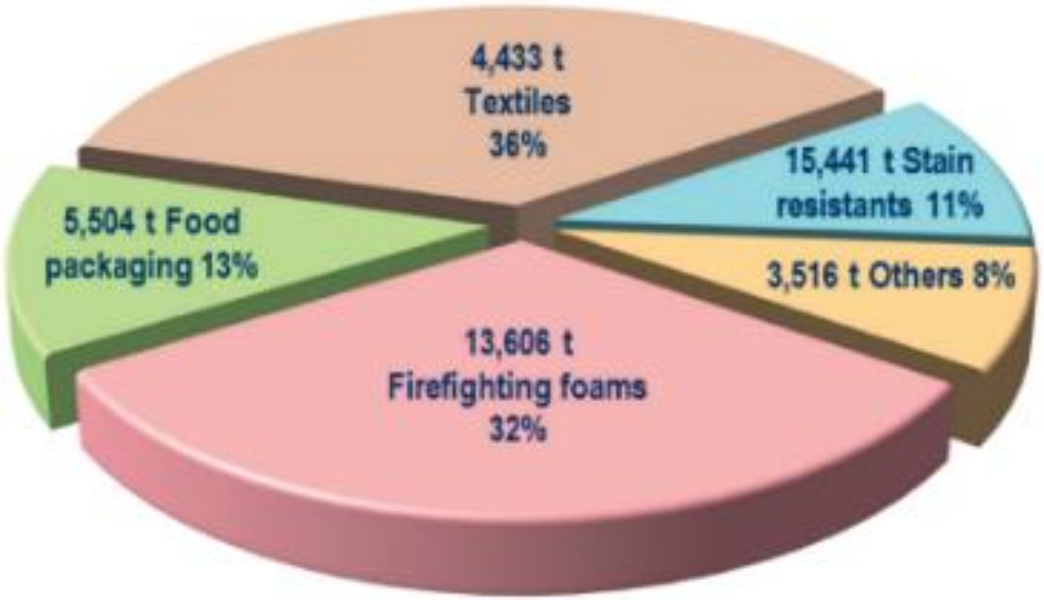
Emerging Issues with PFAS

Water Resources Task Force, February 2024

Poonam Kalkat, City of Boynton Beach
Suzanne Mechler, CDM Smith

Agenda

- What is PFAS?
- Characteristics and Sources of PFAS
- Overview of the Uses of PFAS
- Regulatory Developments
- Timelines and Compliance Requirements
- PFAS Treatment Options
- PFAS Myths
- Questions



Projected fluorotelomer production in 2019 of 42,500 tonnes.
After Global Market Insights, 2016. Projected compound annual growth rate of 12.5% from 26,500 tonnes in 2015.

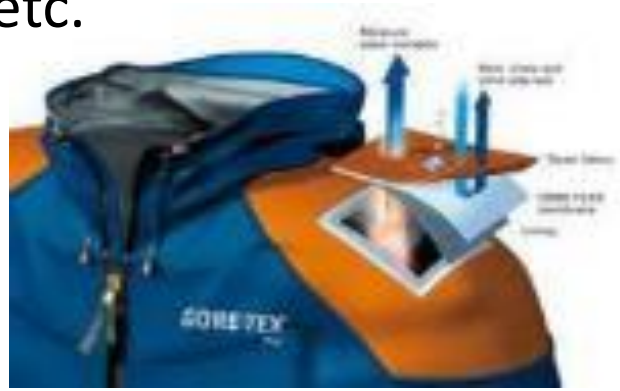
https://ipen.org/sites/default/files/documents/the_global_pfas_problem-v1_5_final_18_april.pdf

What is PFAS (per- and polyfluoroalkyl substances)?

- PFAS are a category of manufactured chemicals that have been used in industry and consumer products since the 1940s.
- PFAS have characteristics that make them useful in a variety of products, including nonstick cookware, waterproof clothing, and firefighting foam, as well as in certain manufacturing processes.
- PFAS tend to break down extremely slowly in the environment and can build up in people, animals and the environment over time.
- Even though some specific PFAS have been largely phased out due to health and environmental concerns, they may still be found in the environment and in drinking water.

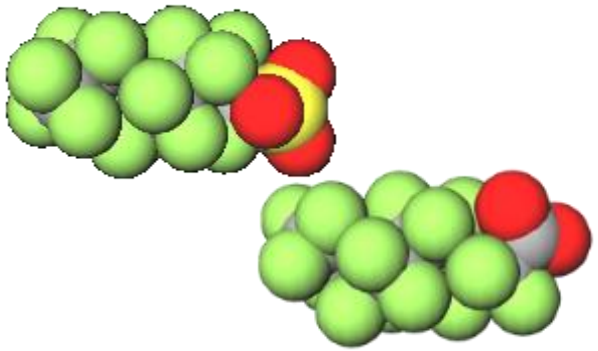
PFAS Sources and Exposures

- Facilities using or storing aqueous film forming foams (AFFF), such as DoD installations, airports, oil refineries, fire training facilities, fire stations, etc.
- Textiles, Carpets, etc.
- Paper/ Cardboard
- Metal Plating
- PFAS in daily life



Characteristics of PFAS

- **Extreme Persistence**
  PFAS show no sign of biodegradation and have been termed “forever chemicals” –due to multiple robust C-F bonds
- **Mobility**
  PFAS tend to be very mobile in the environment as they are soluble in water
- **Bioaccumulation**
  Some PFAS bioaccumulate and biomagnify - long chain PFAS concentrate humans via renal reabsorption
- **Toxicity**
  Diminishing regulatory acceptance criteria (drinking water standards) as more is known about the toxicity
- **Surfactants**
  Amphiphilic PFAS stick on surfaces / interfaces when at higher concentrations



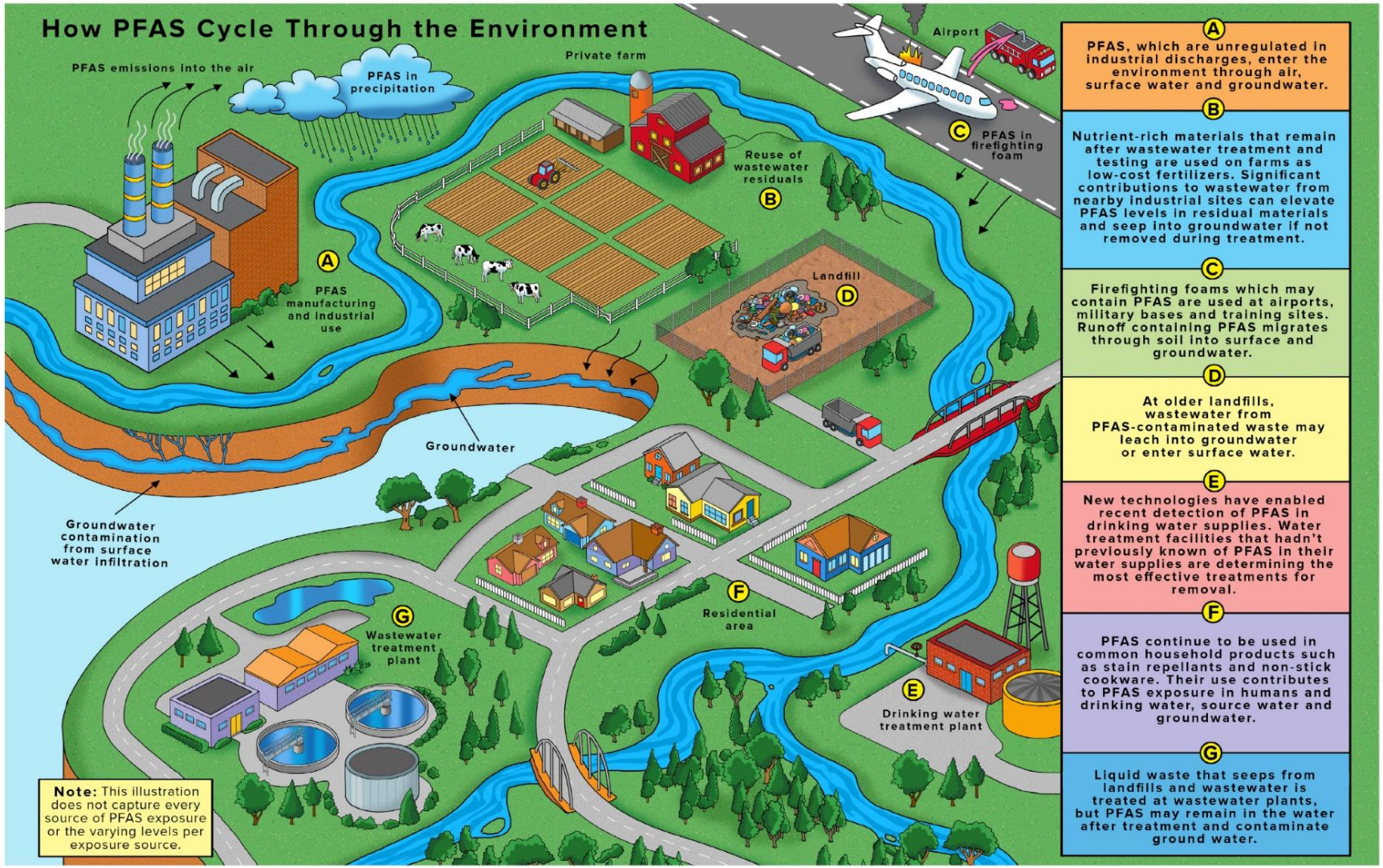
EPA United States Environmental Protection Agency

EPA’s PFAS Strategic Roadmap:
Second Annual Progress Report

December 2023

PFAS, It's Everywhere

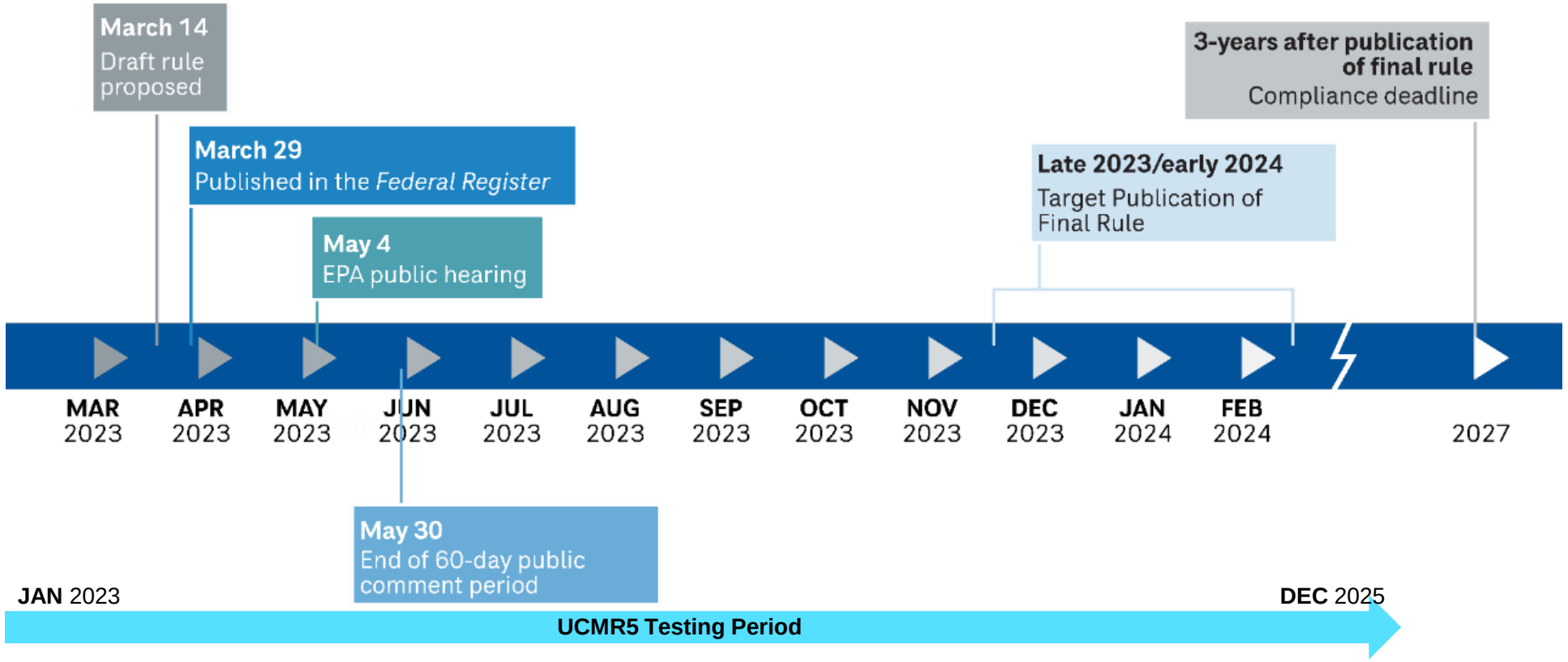
- Industrial discharges
- Airports
- Fire stations and training facilities
- Daily PFAS exposure through common household products
- Wastewater through washing machine, shower, etc.
- Rainfall



Regulatory Environment and Consumer Expectations

- EPA anticipates full implementation of the rule will prevent tens of thousands of serious PFAS attributable illnesses and deaths.
- The rule will establish a national standard for PFAS in public water supplies bringing uniformity throughout the country.
- Health Advisories:
  - 2009: PFOA at 400 ppt; PFOS at 200 ppt
  - 2016: PFOA at 70 ppt; PFOS at 70 ppt
  - 2022: “some negative health effects may occur with concentrations of PFOA or PFOS in water that are near zero”
- March 14, 2023 Draft MCLs
  - Final rule expected March 2024 and effective date three years following final rule promulgation
  - Public push for more stringent levels in drinking water

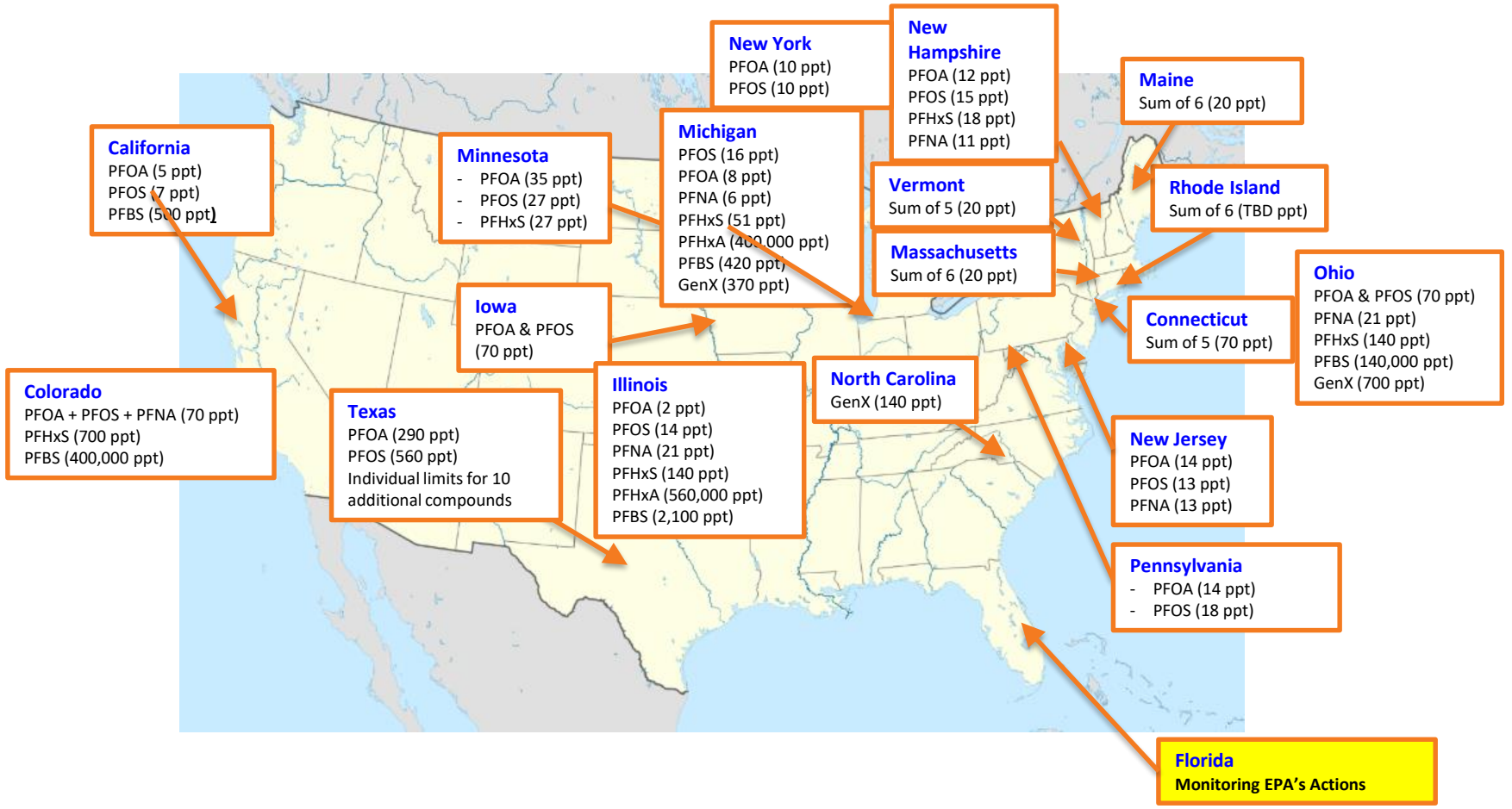
Regulatory Timeline



EPA's PFAS Strategic Road Map

- **CERCLA (Superfund Act)**
  - EPA released Advance Notice of Proposed Rulemaking for potential future hazardous substance designations of 7 additional PFAS compounds under CERCLA (comments due June 12, 2023).
  - Water sector seeking Congress to pass a CERCLA Exemption Law
- **Biosolids**
  - By Winter 2024, EPA will finalize risk assessment for PFOA and PFOS.
  - Will serve as the basis for determining whether regulation of PFOA/PFOS in biosolids is appropriate.
  - EPA's Scientific Advisory Board for EPA's Draft Standardized Framework for Biosolids Chemical Risk Assessment kicked off April 2023 and may influence PFAS studies.
- **Toxic Substances Control Act (TSCA)**
  - Final rule will require all manufacturers (including importers) of PFAS and PFAS-containing articles in any year since 2011 to report information to EPA on PFAS uses, production volumes, disposal, exposures, and hazards.

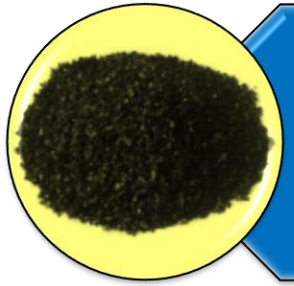
State Regulatory Environment



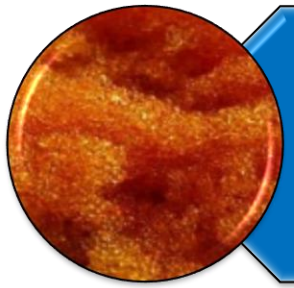
Estimated Cost of Implementation

- AWWA Study (March 2023) estimated national cost for water systems to install treatment systems to remove PFOA and PFOS to levels required by EPA proposal >$3.8 billion annually.
- Most of this cost will be borne by rate payers and communities.
- Federal Government funding- $9 billion in Bipartisan Infrastructure law funding through the State Revolving funds program for drinking water and emerging contaminants in small and disadvantaged communities grant program as well as $12 billion in DWSRF funds for safer drinking water.

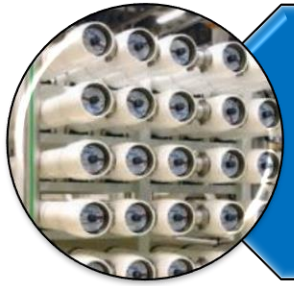
PFAS Treatment Approaches



Granular Activated Carbon (GAC)



Anion Exchange (AIX)



Reverse Osmosis / Nanofiltration Membrane

- ✓ Groundwater in Florida commonly has elevated “Natural Organic Matter” which interferes with PFAS adsorption by GAC and AIX
- ✓ Membrane solutions achieve multiple benefits in Florida groundwaters.

PFAS Myths (As Identified by Water Coalition against PFAS)

- **PFAS Myth #1-The cost to clean up forever chemicals can be easily borne by water sector utilities and their customers**
  - American public will essentially be subsidizing the private, for-profit companies that made and profited from PFAS chemicals.
  - According to a report commissioned by the American Water Works Association (AWWA) and prepared by Black & Veatch, **drinking water utilities will need to invest more than $50 billion to install and operate treatment technology over the next 20 years in order to comply with new PFAS standards.**
  - **operational costs for individual clean water utilities will increase by up to 60% as a direct result of new PFAS regulations.**
  - The disposal of PFAS-contaminated waste posed a much larger cost consideration.

- **PFAS Myth #2-New EPA regulations will help clean water utilities to curtail costs associated with PFAS remediation**
  - new rule proposal from EPA created to identify PFAS substances in drinking water may wind up shifting the financial burden even more onto clean water utilities and ratepayers.
  - The EPA rule as proposed would require more than 5,000 water systems to develop new water sources or install advanced treatment technologies. Another 2,500 water systems in states with established standards would need to adjust their existing PFAS treatment systems.
  - “polluter pays” principle, whereby those responsible for releasing hazardous substances into the environment are held liable for the cost of cleaning up contaminated sites.

PFAS Myths Contd.

- **PFAS Myth #3-Drinking water, wastewater and stormwater utilities are sources or "polluters" of PFAS**
  - PFAS compounds are discharged into water bodies as part of industrial processes or from manufacturing facilities. They can also be discharged from industrial facilities as well as from homes using the products. into municipal sewer systems.
  - chemicals are ultimately discharged from wastewater treatment plants to local receiving water bodies that may serve as sources of drinking water PFAS can contaminate groundwater due to releases, accidental spills, or improper disposal practices. Water utilitiesthat rely on groundwater sources may unintentionally extractwater containing PFAS and subsequently distribute it to consumers.

- **PFAS Myth #4-Water utilities – and the communities they serve – will not be saddled with legal liability for PFAS cleanups**
  - Clean water utilities collect, manage, treat, and sustainably reuse the billions of gallons of wastewater and stormwater and tons of biosolids generated throughout the country each day.
  - These services fall within CERCLA's broad categorizations of "disposal" and "releases," and therefore can lead to clean water utilities being incongruously labeled as CERCLA "potentially responsible parties" (PRPs).
  - absent action from Congress to change the way CERCLA works in the context of PFAS, there is a significant risk that clean water utilities and the public they serve will be burdened with the costs of PFAS cleanups and legacy pollution, not polluters.

PFAS Myths Contd.

- PFAS Myth #5 **New technologies being developed will mitigate PFAS clean-up costs for the water sector in the future**
  - New technologies being proposed can be very expensive and can vary based on the extent of contamination and cost of remediation
  - Some of the technologies being studied include- Advanced Oxidation Processes like UV, Ozone or Hydrogen Peroxide
  - Electrochemical methods
  - Novel absorbent materials-modified clays, activated carbon based materials and nanomaterials
  - Membrane based separation processes like Reverse Osmosis (RO) and Nanofiltration (NF)

Questions?

Overview of the Uses of PFAS

- **Firefighting Foams (Class B) and Aviation/ Aerospace Industries**
  - Aqueous Film Forming Foams (AFFF), hydraulic systems, lubricants.
- **Textiles, Carpet and Leather Industries for water- and stain-repellents**
  - Outdoor clothing and workwear, umbrellas, bags, sails, tents, car seat covers, shoes, etc.
  - 3M Scotchgard Product (used to protect surfaces since the mid-1950's through 2002). Reformulations since continues to include precursors to perfluorobutane sulfonate (PFBS).
- **Paper and Cardboard Manufacturing**
  - Fluorochemicals are used to manufacture grease- and water- repellent materials - plates, popcorn bags, burger wrappers, pizza boxes, microwavable containers, etc.
- **Metal Plating/ Electroplating Sites, Electronics Industries, Fluorochemical, Rubber, and Plastics, and Printing Industries**
  - Computer chip manufacturing; Teflon™, Dyneon®, Fluon™; film, photographic development, printing, and additives in printing inks.
- **Surface Cleaners, Car Waxes and Treatments**
  - Commercial car washes with use of car waxing products (e.g., Simoniz), Turtle Wax, etc.

CL:AIRE technical bulletin, CDM Smith. 2023 An overview of the uses of PFAS to assist with identification of sites of concern

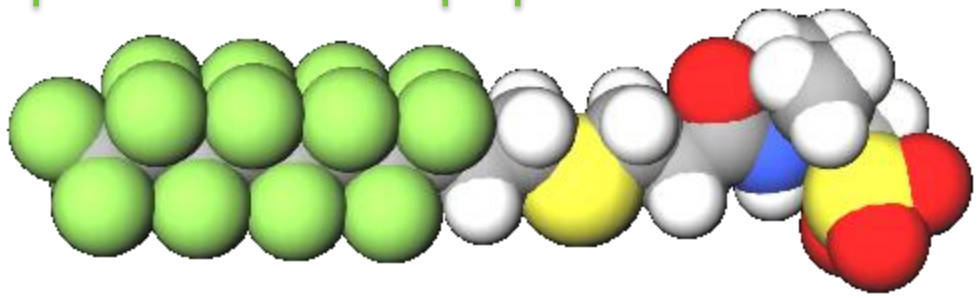
Persistent perfluorinated

Non-fluorinated - Biologically/Chemically removed

Poly-

(Precursors)

Biotransformation / Chemical Oxidation



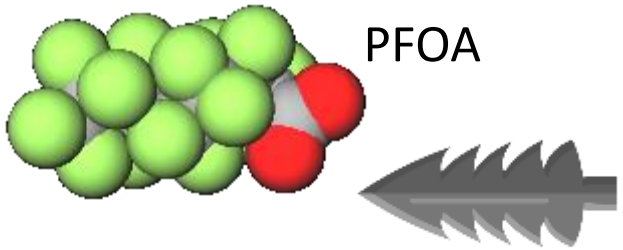
8:2 FTAoS

Stone arrowhead, like perfluorinated section of molecule, persists forever

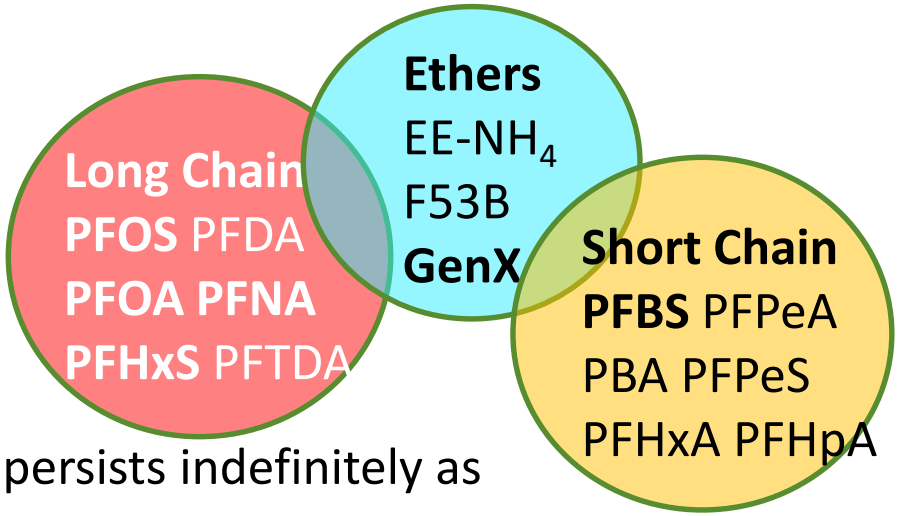
Wooden shaft, non-fluorinated, is degraded

Per-

(Terminal products)



PFOA



Perfluoroalkly acid formed from precursor persists indefinitely as "chemical rocks", like stone arrowheads