PFAS Overview, Regulations, and Port Operational Considerations

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WPPA Environmental Seminar
21 September 2023

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Agenda

1. Background chemistry
2. Regulatory status update
3. Ports, airports, and aviation considerations
4. Q/A

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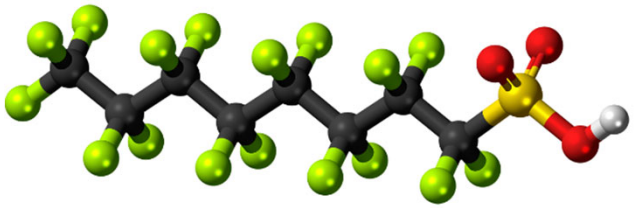

Background chemistry

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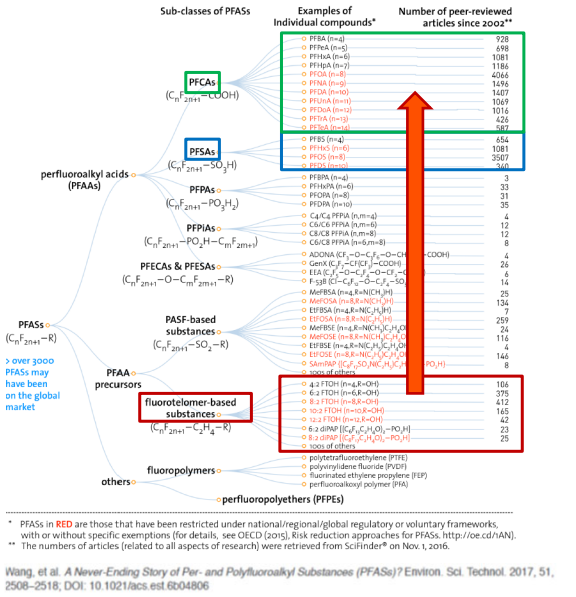
PFAS definitions

- Per- and polyfluorinated alkyl substances (PFAS)
- Broad class of chemistry with over 10,000+ known compounds
- Currently testing for up to 80 PFAS
- Precursor transformation to terminal products may occur – but do not completely mineralize (remain PFAS)



* PFASs in RED are those that have been restricted under national/regional/global regulatory or voluntary frameworks, with or without specific exemptions (for details, see OECD (2015), Risk reduction approaches for PFASs. http://oe.cd/rIAN).
** The numbers of articles (related to all aspects of research) were retrieved from SciFinder® on Nov. 1, 2016.

Wang, et al. *A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?* Environ. Sci. Technol. 2017, 51, 2508–2518; DOI: 10.1021/acs.est.6b04806

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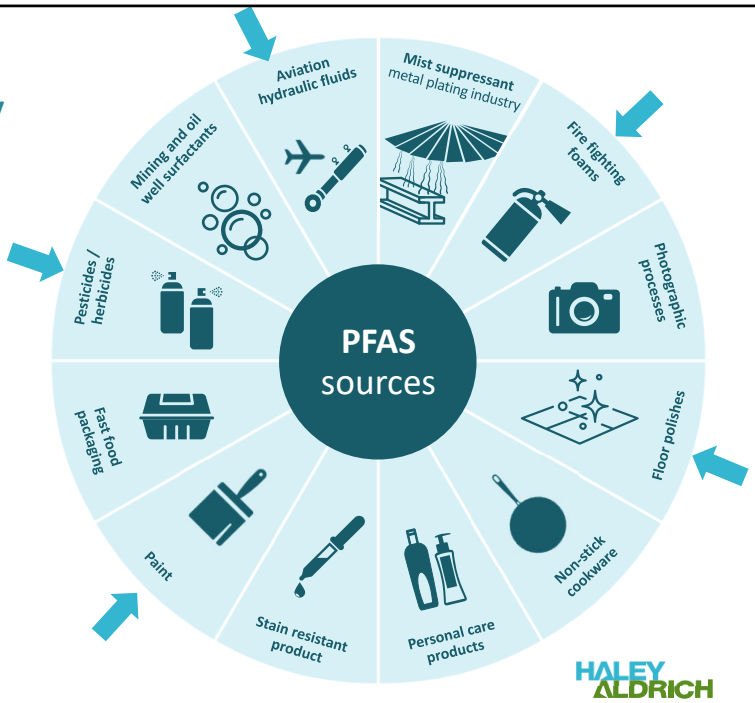
PFAS have been widely used in consumer and industrial products



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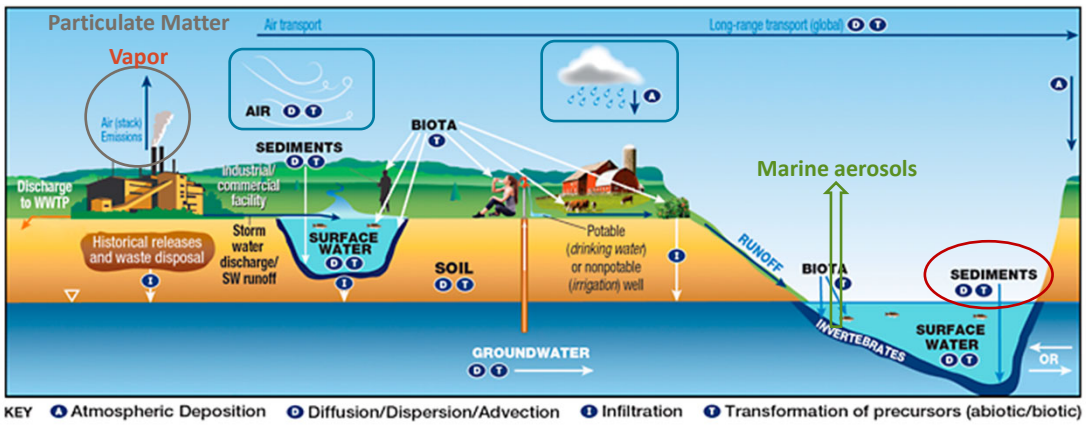
PFAS fate and transport



Ref: L. Trozzolo 2021

Sediments considered final repository of PFAS.

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Regulatory status update

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Federal regulations

FDA U.S Food and Drug Administration

In 2016, FDA revoked use of long-chain PFAS in food packaging

Toxics Release Inventory (TRI) Program

In 2020, EPA added 172 PFAS to list of chemicals with reporting requirements and implications for SDS inclusion

In December 2022, EPA proposed eliminating the "*de minimis*" exemption for "chemicals of special concern"

Toxic Substances Control Act

In July 2020, EPA issues Supplemental significant new use (SNUR) final rule:

- Rule restricts manufacture, use, and import of long-chain PFAS; requires degradation, bioaccumulation, and toxicity testing of short-chain PFAS

In June 2021, EPA proposed rulemaking under TSCA 8(a)(7) will require manufacturers to report the use and disposal of PFAS since January 2011.

In January 2023, EPA proposed SNUR to "prevent anyone" from resuming use of inactive PFAS without EPA Review.

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EPA's PFAS Strategic Roadmap

- Announced October 2021
- Approach
  - Consider PFAS' lifecycle
  - Get upstream of problem
  - Hold dischargers accountable for their actions
  - Ensure science-based decision-making
  - Protect disadvantaged communities
- Includes 31 specific actions from 2021-2024 across EPA's various offices

EPA United States Environmental Protection Agency

PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024

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EPA screening levels

- On May 18, 2022, EPA added five PFAS to Regional Screening Levels (RSLs) and Regional Management Removal Levels (RMLs)

Compound	Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Tapwater (ng/L)	Risk-Based SSL (mg/kg)
PFBS	19	250	6,000	1.9E-3
PFHxS	1.3	16	390	1.7E-4
PFNA	0.19	2.5	59	2.5E-4
PFOS	0.13	1.6	40	3.8E-5
PFOA	0.19	2.5	60	9.1E-4
HFPO-DA (GenX)	0.23	3.5	60	NA

SSL = soil screening level for groundwater protection

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Draft maximum contaminant levels (MCLs)

On March 14, EPA announced the following draft MCLs:

PFAS	Proposed MCL (enforceable level)	Proposed MCL goals (MCLGs)
PFOA	4.0 ppt	Zero
PFOS	4.0 ppt	Zero
PFNA	Hazard index = 1.0 (calculated as a mixture)	Hazard index = 1.0 (calculated as a mixture)
PFHxS		
PFBS		
HFPO-DA (commonly referred to as GenX)		

ppt = parts per trillion or nanograms per liter (ng/L)

EPA anticipates finalization by end of 2023

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EPA Health Advisory Levels (HALs) for PFAS

- On 15 June 2022, the EPA published HALs including
  - PFOA, 0.004 ppt (17,500x drop from 2016 level) – interim HAL
  - PFOS, 0.02 ppt (3,500x drop from 2016 level) – interim HAL
  - GenX, 10 ppt – final HAL
  - PFBS, 2,000 ppt – final HAL
- HALs are NOT legally enforceable limits.
- The new interim HAL numbers for PFOA and PFOS are below laboratory reporting limits.

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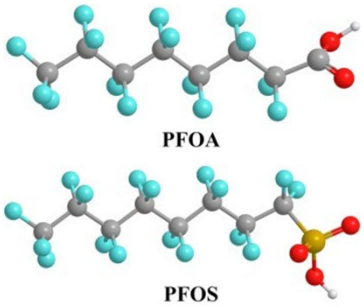
Proposed rule to designate PFOA and PFOS as hazardous substances

- Facilities would be required to **report on PFOA/PFOS releases**
- **Due diligence (ASTM)** during real estate transaction would require evaluation of PFAS
- New PFAS CERCLA/Superfund sites
- **Treatment system upgrades**
- EPA or other agencies could seek **cost recovery** from PRPs for PFOA/PFOS at contaminated sites
- Many **PRPs may be added** due to many sources of PFAS
- implications to existing **litigation and settlements**
- **Reopeners** or prolonged site actions



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CERCLA update – EPA listening sessions

- Intent to focus on manufacturers, federal facilities, and other industrial parties
- EPA stated intent to use "discretionary enforcement" under **CERCLA** for
  - Water providers/utilities
  - Public landfills
  - State, tribal, or municipal airports
  - POTWs
  - Farms that apply biosolids
  - Tribal or local fire departments
- May settle and provide CERCLA contribution protection to some parties
- Retains ability to address imminent and substantial endangerment
- Policy contingent upon party's cooperation

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Use of NPDES permits to regulate PFAS discharges from industrial and other sources

- In December 2022, EPA issued guidance to states on how to use NPDES permit requirements to restrict PFAS discharges
- Notices of Violations already issued under NPDES in other states (e.g., Michigan)
- EPA is updating Effluent Limitation Guidelines (ELGs) to limit PFAS discharges from industrial facilities
  - In January 2023, EPA announced the Effluent Guidelines Program Plan 15
  - PFAS data collection for other industries including electrical and electronic components, textile mills, landfills, leather tanning and finishing, plastics molding and forming, and paint formulating (based on NAICS codes)

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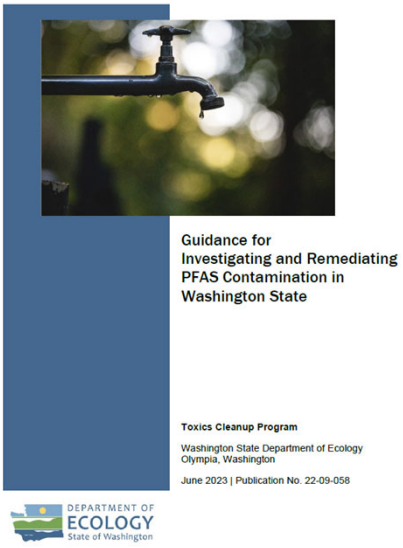
Washington state laws

- Bans purchase of AFFF for non-mandated purposes, except for
  - FAA Part 139 facilities
  - Petroleum refineries and terminals
  - Certain chemical plants
- Finalized Guidance in June 2023…



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Washington Ecology Guidance excerpts

- Ecology will consider the EPA MCLs as ARARs and SALs once promulgated with additional possibility for site-specific considerations (Section 3.2.2)
- Adjustments to the cleanup levels will be made to so that the total Hazard Index is less than 1. (Section 3.2.3)
- *Unless it can be demonstrated that the hazardous substances are not likely to reach surface water, the groundwater cleanup level must be at least as stringent as the surface water cleanup level established in accordance with WAC 173-340-730 (Section 3.2.4)*

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Washington Dept of Ecology Guidance - Groundwater

PFAS Chemical	State Action Level (ng/L)	MTCA Method B (ng/L)	MTCA Method C (ng/L)	Preliminary GW Cleanup Levels (ng/L)
PFBA	--	8,000	18,000	8,000
PFHxA	--	8,000	18,000	8,000
PFOA	10	48	110	10
PFNA	9	40	88	9
PFBS	345	4,800	11,000	345
PFHxS	65	160	340	65
PFOS	15	48	110	15
HFPO-DA	NA	24	53	24
Reference	Table 2	Table 3	Table 3	Table 3

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Washington Dept of Ecology Guidance – Surface Water

	Marine (µg/L)				Freshwater (µg/L)			
PFAS Chemical	Invert.	Fish	Other	Total	Invert.	Fish	Other	Total
PFBA	--	--	--	--	830	--	--	830
PFHxA	--	--	--	--	724,000	6,280	50,000	6,280
PFOA	594	1,500	119	119	49.1	8.28	5,000	8.28
PFNA	10.4	--	--	10.4	8.00	10.0	--	8.00
PFDA	78.0	--	--	78.0	10.0	--	--	10.0
PFUnA	--	--	--	--	10.0	--	--	10.0
PFDoA	--	--	--	--	20.0	--	--	20.0
PFBS	127,000	--	--	127,000	502,000	888,000	1,080,000	502,000
PFHxS	--	--	--	--	--	--	10.0	10.0
PFOS	33.0	15.0	1.10	1.10	2.30	5.00	100	2.30
Reference	Table 6	Table 6	Table 6	Table 6	Table 6	Table 6	Table 6	Table 6

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Washington Dept of Ecology Guidance - Soil

PFAS Chemical	**Direct Contact**		**Vadose Zone**		**Saturated Zone**	
	Method B (mg/kg)	Method C (mg/kg)	Method B (µg/kg)	SAL based (µg/kg)	Method B (µg/kg)	SAL based (µg/kg)
PFBA	80	3,500	44		2.9	
PFHxA	40	1,800	35		2.5	
PFOA	0.24	11	0.30	0.063	0.019	0.0040
PFNA	0.2	8.8	0.36	0.080	0.021	0.0048
PFBS	24	1,100	25	1.8	1.7	0.12
PFHxS	0.78	34	0.97	0.41	0.062	0.026
PFOS	0.24	11	0.55	0.17	0.032	0.0099
HFPO-DA	0.24	11	0.10		0.0072	
Reference	Table 4	Table 4	Table 5	Table 5	Table 5	Table 5

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Washington Dept of Ecology Guidance – Upland Soil

PFAS Chemical	State Action Level (ng/L)	MTCA Method B (ng/L)	MTCA Method C (ng/L)	Preliminary GW Cleanup Levels (ng/L)
PFBA	--	8,000	18,000	8,000
PFHxA	--	8,000	18,000	8,000
PFOA	10	48	110	10
PFNA	9	40	88	9
PFBS	345	4,800	11,000	345
PFHxS	65	160	340	65
PFOS	15	48	110	15
HFPO-DA	NA	24	53	24
Reference	Table 2	Table 3	Table 3	Table 3

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Ports, airports, and aviation action items

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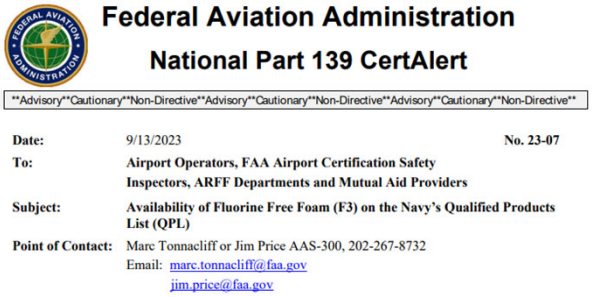
AFFF Replacement with Fluorine-Free Foam (F3)

- January 2023 – Updates to MILSPEC finalized
- March 2023 – DoD began screening F3 products for MILSPEC compliance
- September 13, 2023 –
  - First F3 product approved by DoD
    - Solberg 3% MIL-SPEC SFFF
  - CertAlert 23-07 issued



Federal Aviation Administration

National Part 139 CertAlert

AdvisoryCautionary**Non-Directive**Advisory**Cautionary**Non-Directive**Advisory**Cautionary**Non-Directive**

Date:	9/13/2023	**No. 23-07**
To:	**Airport Operators, FAA Airport Certification Safety Inspectors, ARFF Departments and Mutual Aid Providers**	
Subject:	**Availability of Fluorine Free Foam (F3) on the Navy's Qualified Products List (QPL)**	
Point of Contact:	Marc Tonnacliff or Jim Price AAS-300, 202-267-8732 Email: marc.tonnacliff@faa.gov jim.price@faa.gov	

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Foam transition logistical work-flow

1. Inventory systems for AFFF stockpiles, infrastructure, etc.
2. Evaluate cleaning, retrofit, replacement, and disposal options
3. Coordinate with tenants to ensure site-wide compliance
4. Begin budget projections and set transition milestones

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PFAS compliance – NPDES and stormwater

EPA draft guidance memo to states released in December 2022

1. Review NPDES permit language and renewal timelines – Consider receiving facilities (e.g. municipal POTWs) and their requirements
2. Evaluate drainage and discharge system
3. Perform sub-basin sampling *as needed* to identify "problem areas"
4. Coordinate with tenants *as needed*
5. Design treatment as needed (include consideration of infrastructure replacement, lining, etc.)

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Programmatic support

- SOP updates – emergency response, materials handling, etc.
- Tenant lease & legal agreement modifications
- Modifications to other monitoring programs/requirements
- Review of drinking water systems in hydraulic connectivity to site
- Identification of other PFAS-related industries in vicinity

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Questions?

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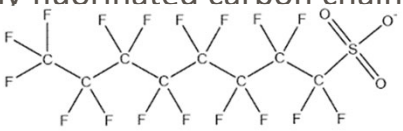
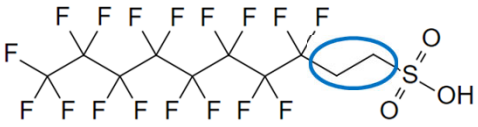
PFAS types and manufacturing sources

- **Electrochemical fluorination (ECF)**
  - Branched and linear structures (~70% linear, ~30% branched)
  - Fully fluorinated carbon chain



PFOS – perfluorooctanoic sulfonate

- **Fluorotelomerization (FT)**
  - Linear structures only
  - Partially fluorinated carbon chain



8:2 fluorotelomer sulfonate

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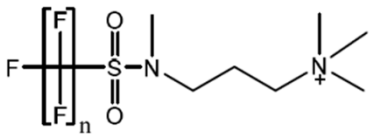
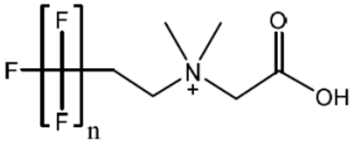
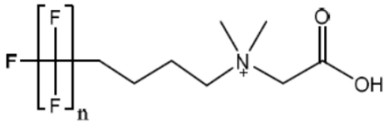
Source Material --Manufacturer-specific compound



N-Trimethyl**Am**monio**P**ropyl **N-Me**thyl per**F**luoro**A**lkane**S**ulfon**A**mide
(N-TAmP-N-MeFASA) – 3M 1988 AFFF



Carboxy**M**ethyldimethyl**Am**monio-
Ethyl-per**F**luoro**A**lkane
(CMAmEt-FA) – Buckeye 2009 AFFF



Carboxy**M**ethyldimethyl**Am**monio-
Butyl-per**F**luoro**A**lkane
(CMAmB-FA) – Buckeye 2009 AFFF

Source: Barzen-Hanson et al., 2017

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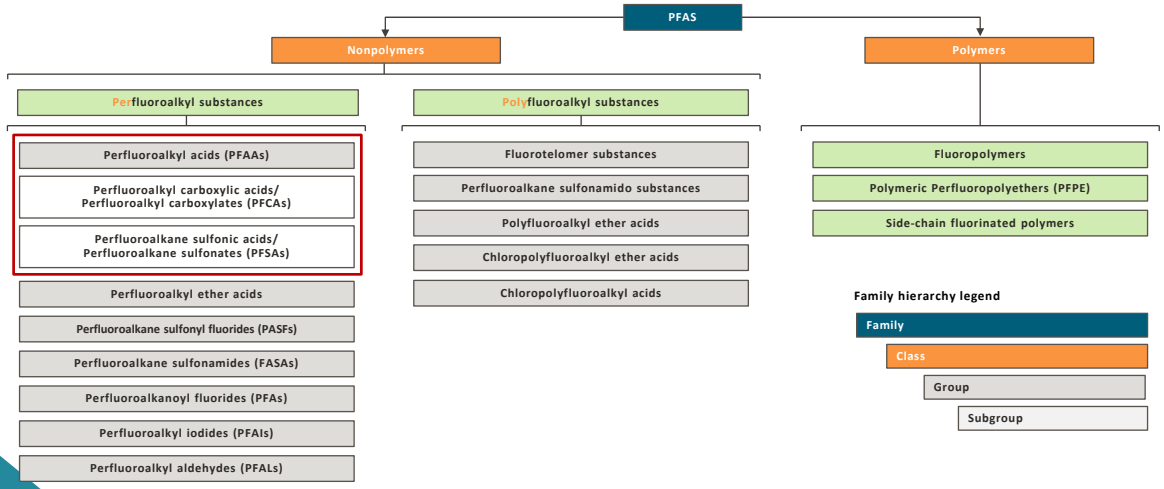
Poly- and perfluoroalkyl substances (PFAS) family tree



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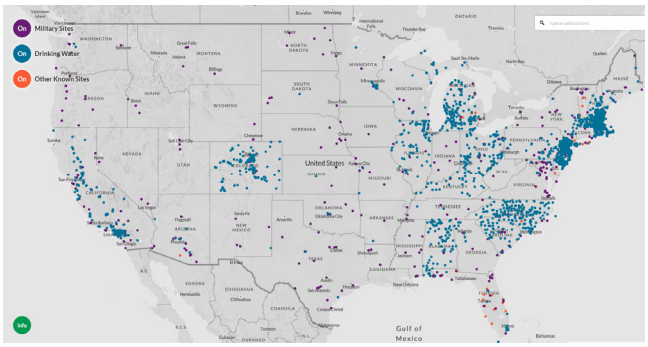
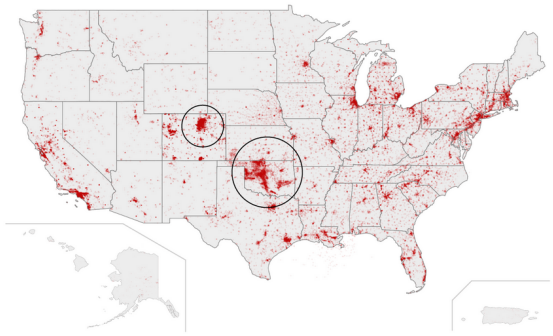
There are potentially tens of thousands of PFAS-impacted sites in the United States alone

Known PFAS-contaminated sites



The EPA identified more than 120,000 facilities that may expose people to PFAS

The biggest clusters of facilities are in Oklahoma and Colorado



Guardian graphic. Source: US Environmental Protection Agency

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