



PFAS Overview

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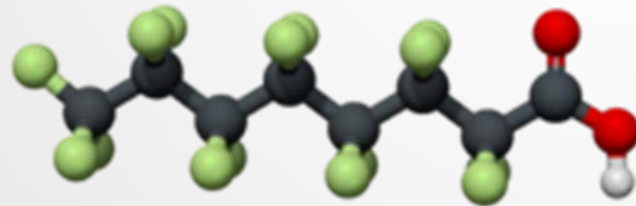
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Solid Waste Management Advisory Committee
June 25, 2019



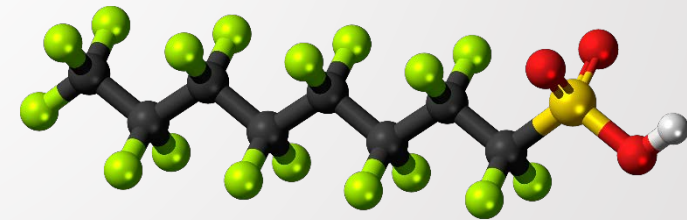
Overview

- What are PFAS and where are they found?
- Why should we care?
- What PFAS remediation technologies currently exist?
- What is EPA doing about PFAS?
- What is CT doing about PFAS?
- Resources



PFOA

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PFOS

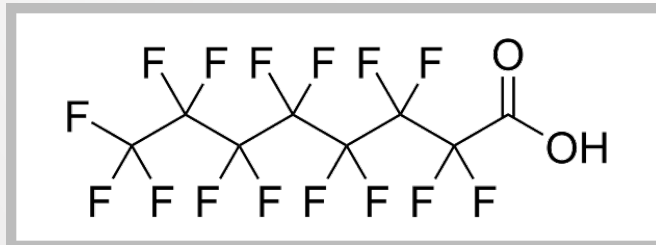


What Are PFAS?

PFAS = Per- and Polyfluorinated Alkyl Substances

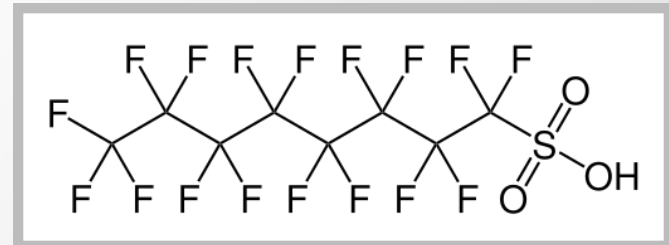
- ▶ Over 4,700 “forever chemicals”
- ▶ Developed in the 1940s
- ▶ Ubiquitous in consumer products and industry
- ▶ PFOA and PFOS most well-known

PFOA



Perfluorooctanoic acid

PFOS



Perfluorooctane sulfonic acid

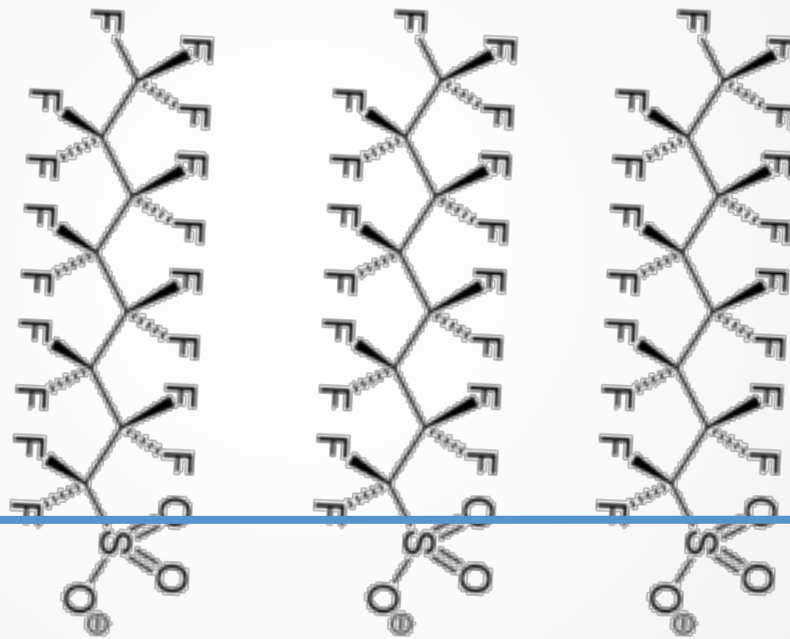
Image Sources: Bing Creative Commons



PFAS Characteristics

Air

Water



Tail –
Not soluble in
oil or water

Head –
Water-soluble

Image Source: Bing Creative Commons



PFAS Characteristics

GOOD

- Resist oil, grease, water, heat
- Stable

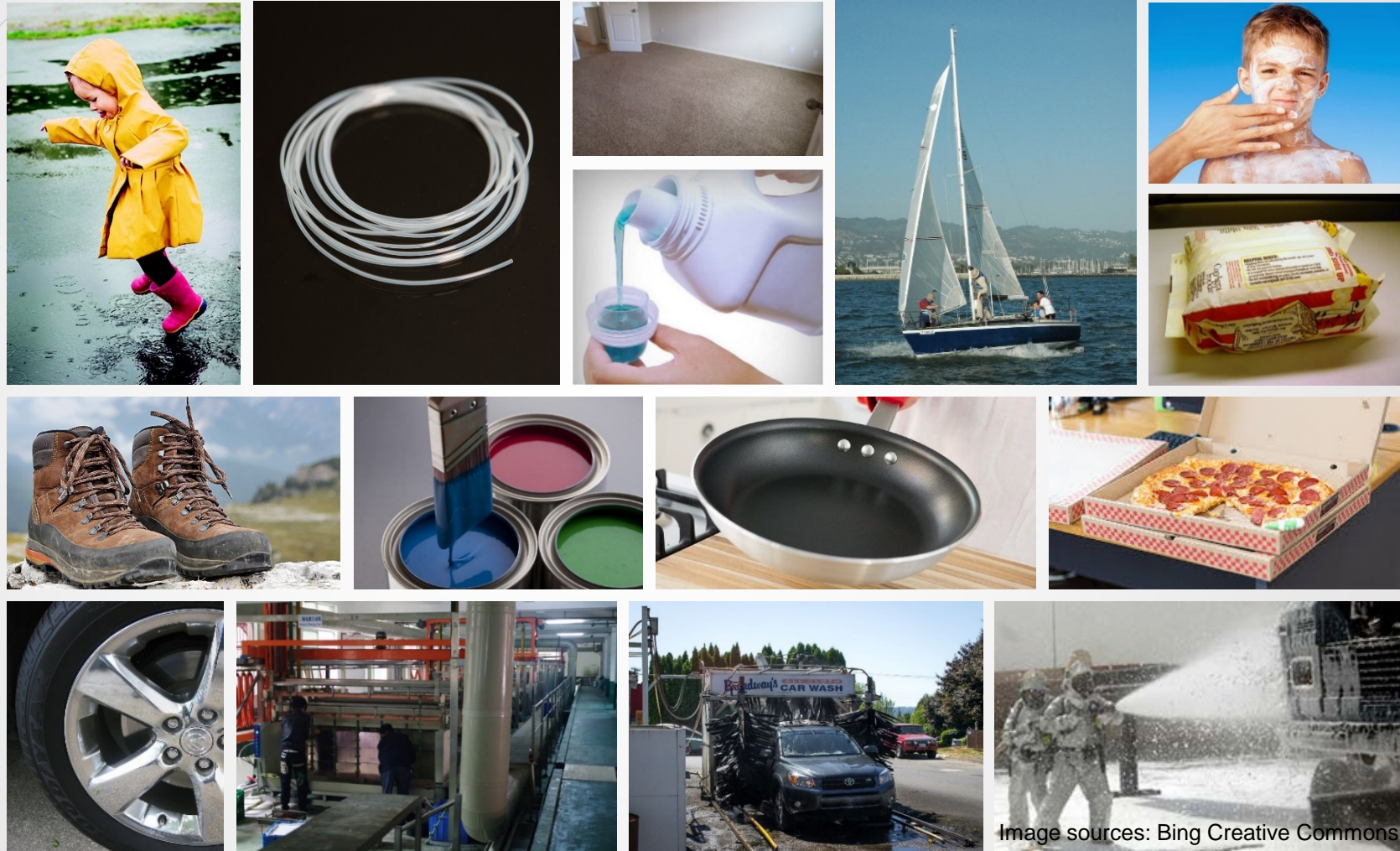
BUT....

BAD

- Extremely persistent – resist degradation
- Bioaccumulative
- Toxic
- Migrate easily
 - High solubility, low volatility, mobile in soil, leach to groundwater
 - Air emissions a source of soil & groundwater pollution



Some PFAS Uses





Places Where We Might Find PFAS



Image sources: Bing Creative Commons



Aqueous Film-Forming Foam (AFFF)



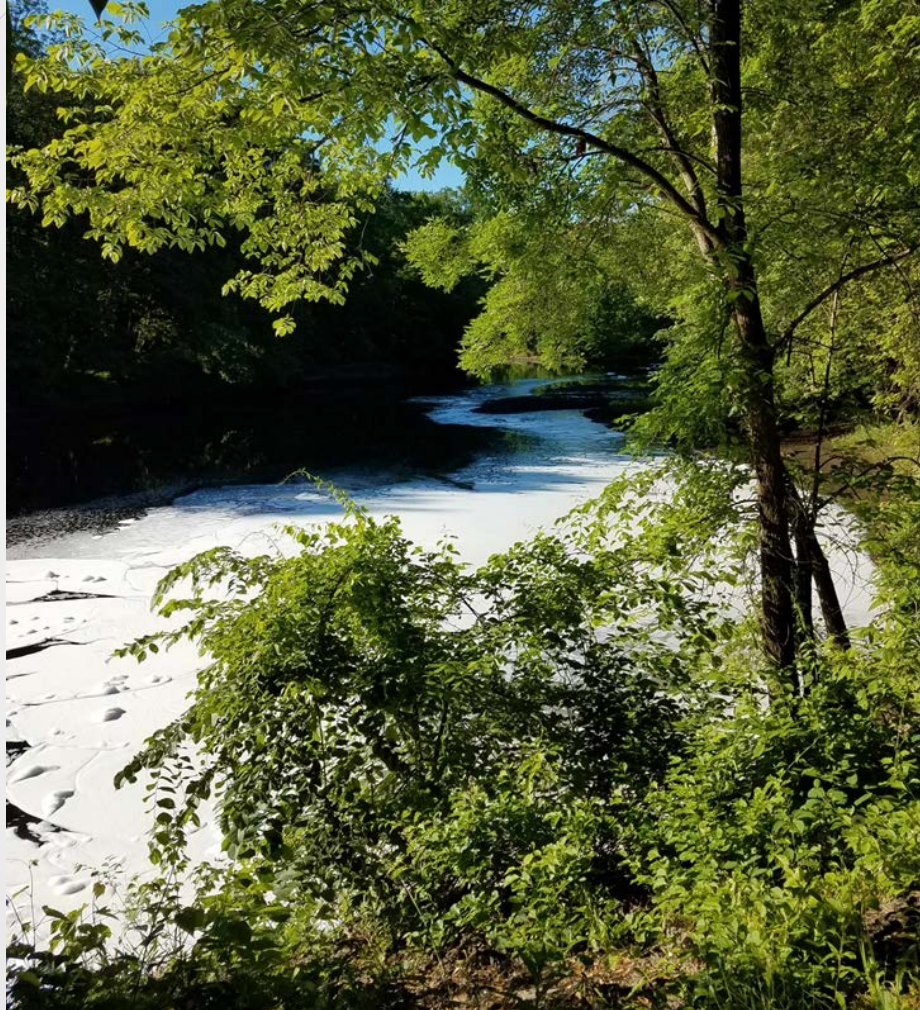
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Aqueous Film-Forming Foam (AFFF)

Farmington River, 6/9/19





Why Should We Care?

- Possible health effects
 - Developmental effects to fetuses and infants
 - Kidney and testicular cancer
 - Liver, thyroid, cholesterol, immune system effects
- Present in human blood worldwide
- Have polluted drinking water supplies worldwide
- Discovery in wastewater treatment plants, biosolids, landfills, soil, surface water, fish tissue, animals, cow's milk, and plants
- Replacement chemicals also a problem (GenX)



How Can PFAS Be Remediated?

WATER

- ▶ Granular activated carbon (GAC)
 - Shorter-chain PFAS break through faster
 - Effectiveness depends on type of GAC
- ▶ Ion-exchange resins
- ▶ Reverse osmosis



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S. Pociu, CT DEEP

SOIL

- ▶ Capping
- ▶ Excavation and disposal
- ▶ Sorption and stabilization (e.g., PlumeStop)TM



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EPA Actions Related to PFAS



- Beginning in 2000 – Phase-out of PFOA and PFOS
- 2013-2015 – Third Unregulated Contaminant Monitoring Rule (UCMR3)
 - Nationwide testing of large public water systems for 6 PFAS
 - 1.3% of all public water systems had PFOA + PFOS > 70 ppt
- 2014 - Added fish tissue monitoring to survey of urban rivers
- May 2016 - Lifetime Health Advisory for **PFOA + PFOS** in drinking water
 - **70 nanograms per liter (ng/L)** or parts per trillion (ppt)... **BUT NO MCL**
- National Leadership Summit convened in May 2018 followed by regional listening sessions



National PFAS Action Plan - February 2019 – Highlights



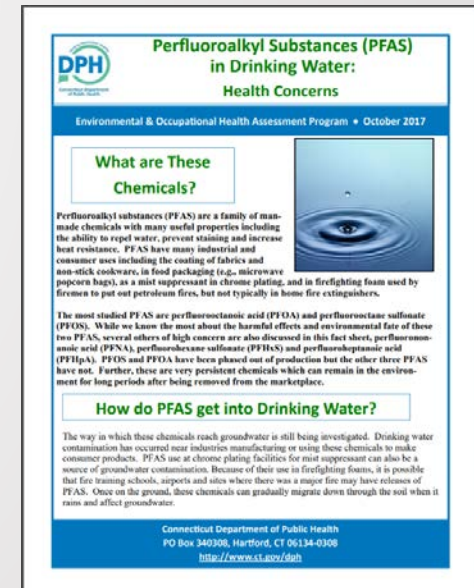
- Propose regulatory determination for PFOA/PFOS by end of 2019 (MCL process)
- Move forward with listing as “hazardous substance” under CERCLA
- Develop interim groundwater cleanup standards (May)
- Consider use reporting on Toxics Release Inventory
- Continued new chemical review under Toxic Substances Control Act
- Expand PFAS research
- Develop PFAS Communication Toolbox

Will take time...



CT DPH Actions for Drinking Water

- ▶ Drinking Water Action Level for the Sum of 5 PFAS (Nov. 2016)
 - 70 parts per trillion (ppt) or nanograms per liter (ng/L)
 - PFOA, PFOS, PFNA, PFHpA & PFHxS
 - May change in the future as new toxicological data is developed and reviewed
- ▶ Fact sheets and new webpage
- ▶ DPH now granting provisional certification for labs based on proficiency testing
- ▶ DPH Lab not currently equipped to test for PFAS





CT Public Water Systems



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- ▶ **2013-2015 – UCMR3 results for large CT systems**
 - No PFAS detections in 40 large water systems serving >10,000 people
 - Represents service to more than 2.4 million customers
- ▶ **DPH Drinking Water Section Circular Letter (Sept. 2018)**
 - Requires Source Water Protection Plan updates for systems serving >1,000 people by 3/31/19
 - Sanitary inspections of suspect PFAS facilities by 3/1/20
 - Recommends all source waters be sampled

Regional Drinking Water Standards as of 6/7/19



State	Standard/Guidance Nomenclature	Drinking Water Level (ppt)
Connecticut	Action Level	70 Σ (PFOA, PFOS, PFNA, PFHxS, PFHpA)
Maine	Health Advisory	70 Σ (PFOA, PFOS)
Massachusetts	Proposed Groundwater Quality Standard (currently in rulemaking process)	20 Σ (PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA)
New Hampshire	Proposed Maximum Contaminant Level (MCL)/ Ambient Groundwater Quality Standards (currently in rulemaking process)	38 PFOA 70 PFOS / Σ (PFOA, PFOS) 85 PFHxS 23 PFNA
New Jersey	Drinking Water Quality Institute Recommended MCL (currently in rulemaking process)	13 PFOS, PFNA 14 PFOA
New York	Drinking Water Quality Council Recommended MCL (currently in rulemaking process)	10 PFOA 10 PFOS
Rhode Island	Groundwater Quality Standard	70 Σ (PFOA, PFOS)
Vermont	Health Advisory	20 Σ (PFOA, PFOS, PFNA, PFHxS, PFHpA)



CT DEEP PFAS Actions

- ▶ **Initial evaluation of possible PFAS sites** based on AFFF use and SIC codes for industry
 - Military sites prioritizing PFAS investigation through DoD
- ▶ **Working closely with DPH**
 - Drinking Water Section, Private Well Program, and Environmental & Occupational Health Assessment Program
 - Drinking water sampling in Greenwich, Windham - community and private wells
 - Joint outreach to CT Airport Authority and Dept. of Emergency Services and Public Protection regarding AFFF
- ▶ **Involvement in Regional and National workgroups**



CT DEEP PFAS Actions (cont.)

- ▶ **Cleanup Criteria** for soil and groundwater at Remediation Sites available for use
- ▶ **Outreach** at Remediation Roundtable, June 2017–
Treat as a Contaminant of Concern if warranted based on site history
- ▶ **AFFF Initiatives**
 - Coordination with DESPP Commission on Fire Prevention and Control – Committee established to select a fluorine-free firefighting foam
 - Possible AFFF Take-Back Program?



PFAS Resources on the Web

[DPH Drinking Water Section PFAS webpage](#)

[DEEP Emerging Contaminants webpage](#)

[EPA PFAS webpage](#)

[EPA PFAS Action Plan](#)

[Interstate Technology and Regulatory Council \(ITRC\)
PFAS Fact Sheets](#)



Closing Remarks on PFAS

- ❖ PFAS have emerged! Many possible sources!
- ❖ We need to be alert for releases in areas with wells. This includes areas with public water where not everyone has connected.
- ❖ Analysis is tricky, but costs are coming down over time as more labs come online.
- ❖ Expect standards to change in the future – possibly lower numeric standards or additional PFAS included as new toxicological data is developed.
- ❖ Future legislation is possible.



Questions or Comments?

Thanks for your attention!

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Remediation Standard Regulations

- ▶ If PFAS are COCs based on site history/operations, they should be included in site characterization.
- ▶ PFAS must be addressed as Additional Polluting Substances at Remediation Sites.
 - ▶ Utilize EPA's RfD of 0.00002 mg/kg/day
 - ▶ Soil Direct Exposure Criteria – use equations in RSR Section 22a-133k-2(b)(5)
 - ▶ Groundwater Protection – Adopts CT DPH's DWAL of 70 ppt for \sum PFOA, PFOS, PFHxS, PFNA, and PFHpA
- ▶ OR Calculate Site-Specific Criteria for DEEP review and approval

From June 20, 2017
Remediation
Roundtable Meeting



Additional Polluting Substance Criteria

Remediation Standard	Criterion
Residential Direct Exposure Criterion	1.35 mg/kg
Industrial/Commercial Direct Exposure Criterion	41 mg/kg
GA Pollutant Mobility Criterion	1.4 µg/kg
GB Pollutant Mobility Criterion	14 µg/kg
Groundwater Protection Criterion (Adopting DPH's Drinking Water Action Level for ∑ PFOA, PFOS, PFHxS, PFNA, and PFHpA)	70 ng/L
Surface Water Protection Criterion	In Development

Applies to ∑ PFOA, PFOS, PFHxS, PFNA, & PFHpA



Significant Environmental Hazards

CGS Section 22a-6u(c) – Drinking Water Well has Contamination Detected at Any Level

After July 1, 2015, if a TEP in the course of investigating and remediating pollution on or emanating from a parcel determines pollution has affected a public or private drinking water supply well...with any substance from the release for which there is no RSR criterion,

- ▶ TEP shall notify client and owner of property within 7 days of finding well contamination.
- ▶ Owner of parcel that is source of pollution to a drinking water well shall
 1. Notify Commissioner in writing within 30 days of becoming aware, and
 2. Perform confirmatory sampling of well and submit report to Commissioner with a plan for further action within 30 days.



General Permit for Groundwater Remediation Wastewater

- ▶ Issued 2/21/18, includes Emerging Contaminants
- ▶ Authorization Sec. 3(b)(1)(B)(xii) – Requires:
 - 1) Complete and sufficient registration, AND
 - 2) Commissioner issues an Approval of Registration if the commissioner determines ECs “are present at levels that require development of site specific monitoring requirements and/or discharge limitations.”
- ▶ Conditions Sec. 5(a) Screening Analysis Requirements
 - ▶ Sec. 5(a)(2)(F) – Requires screening analysis for ECs with Clean Water Act approved methods. On-going screening or effluent monitoring required if directed in writing by Commissioner.
 - ▶ Sec. 5(a)(2)(G) – Requires analysis of wastewater for any pollutant “toxic, hazardous, or detrimental” or “having the potential to bioaccumulate, bioconcentrate or adversely affect aquatic life” that has been “handled, stored, released, or disposed of at or adjacent to the site where wastewater originates.”