The Title Wave of Issues - PFAS

Leland J. Myers

Wasatch Front Water Quality Council


PRODUCTS THAT CONTAIN PFAS
Pesticides
Stain Resistance Products
Firefighting Foams
Microwave Popcorn Bags
Eye Makeup
Pizza Boxes
Paints, Sealants, and Varnishes
Cleaning Products
Nail Polish
Dental Floss
Non-Stick Cookware
Water Resistant Clothing
Shampoo
Candy Wrappers
Fast Food Packaging/ Wrappers

History of Select PFAS

PFAS[1]	Development Time Period							
	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s
PTFE	Invented	Non-Stick Coatings			Waterproof Fabrics			
PFOS		Initial Production	Stain & Water Resistant Products	Firefighting Foam				U.S. Reduction of PFOS, PFOA, PFNA (and other select PFAS[2])
PFOA		Initial Production		Protective Coatings				
PFNA					Initial Production	Architectural Resins		
Fluoro-telomers					Initial Production	Firefighting Foams		Predominant form of firefighting foam
Dominant Process[3]		Electrochemical Fluorination (ECF)						Fluoro-telomerization (shorter chain ECF)
Pre-Invention of Chemistry			Initial Chemical Synthesis / Production			Commercial Products Introduced and Used		

CARPETS


CARPET CLEANING
PRODUCTS


FOOD PACKAGING


FURN


COSMETICS


OUTDOOR GEAR


CLOTHING


ADHESIVES AND SE


PROTECTIVE COATINGS


NON-STICK COOKWARE


CARSEATS


FIREFIGHTIN

PFAS - key properties

- Water soluble, water resistant, grease resistant, bind to proteins
- Persistent – the defining fluorocarbon tail does not degrade
- Most are not volatile, resist photolysis & hydrolysis
- Transport pathways: air deposition, leaching & groundwater, surface water, sediment & soil, plant & animal uptake
- Human exposure through drinking water (current major focus), food & food packaging, indoor dust & product exposure, use of consumer products, industrial/use exposures
- Sorption & solubility differences
- 4700+ varieties, co-contaminants
- Destroyed at ~1000° C
- No natural counterparts

Scope of the C8 Health Project

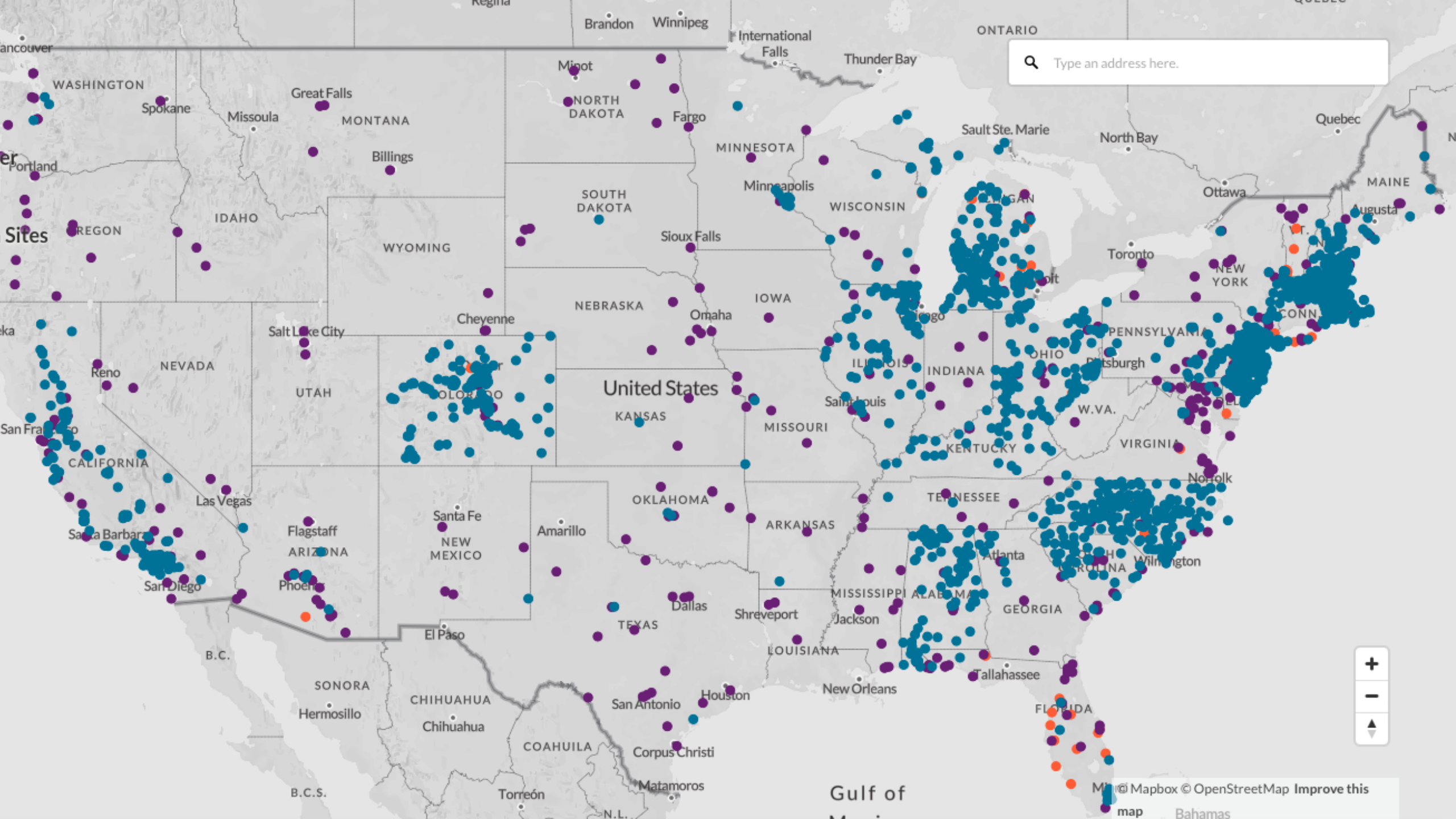
- 69,030 adults and children enrolled
- Extensive health survey with validation for 18 health outcomes
- 10 PFAS; >50 clinical laboratory tests
- Secure data base
- Website with summary health communications
- Banked serum

Selected Health Outcomes of Concern Identified by the C8 Study

Topic	Example	Evidence Basis
Altered lipid handling	↑ Cholesterol	Strong, Near Certain
Liver functions	↑ ALT (aka SGPT)	Strong, Near Certain
Uric acid handling	↑ Uric acid	Strong, Near Certain
PIH	BP in Pregnancy	More likely than not

Prospective

1 Part per million (PPM)	1 Part per billion (PPB)	1 Part per Trillion (PPT)
• 1 inch in 16 miles • 1 second in 11.5 days • 8.34 lbs in 1 million gallons of water	• 1 inch in 15,800 miles ($^{2}/_{3}$ around the earth) • 1 second in 32 years • 1 lb in 120 million gallons of water	• 1 inch in 15,783,000 miles (634 times around the earth) • 1 second in 32,000 years • 1 oz in 7.5 billion gallons of water (4 grains of sugar in Olympic swimming pool)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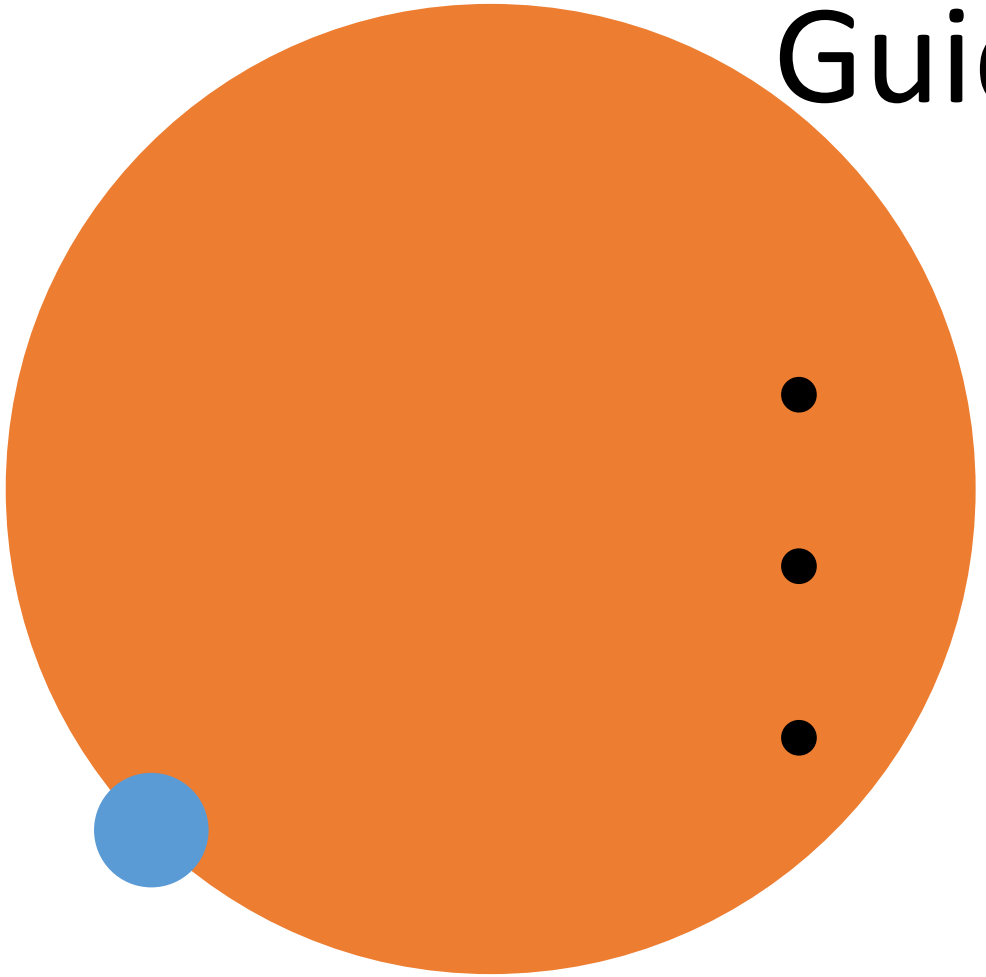
EPA Health Actions

Year	EPA Action Source	Regulatory Limit	Other Actions	Source of Information
2006	Order of Consent	500 PPT of C-8 (PFOA)	Required to provide drinking water treatment	EPA Order of Consent Docket # SDWA-03-2007-039-DS
2009	Order of Consent	400 PPT of C-8 (PFOA)	Temporary Alternate Drinking Water Provision	EPA Order of Consent Docket # SDWA-03-2009-0127-DS
2016	Lifetime Health Advisories	70 PPT PFOA and PFOS	Lifetime Health Advisories	EPA Fact Sheet 2016 PFOA & PFOS Drinking Water Adv.
2022	Lifetime Health Advisories	PFOA - 0.004 PPT PFOS - 0.02 PPT Gen X - 10 PPT PFBS - 2,000 PPT	PFOS/PFOA Interim Health Advisory GenX/PFBS Final Health Advisory	EPA Fact Sheet 2022 Drinking Water Advisories

PPT – Parts Per Trillion

WHO Provisional Guideline Values:



- PFOS 0.1 ug/L
- PFOA 0.1 ug/L
- PFAS 0.5 ug/L

QUALITY CRITERIA FOR WATER

U.S. ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

Table 1. Draft Recommended Freshwater Aquatic Life Water Quality Criteria for PFOA and PFOS

Criteria Component	Acute Water Column (CMC)[1]	Chronic Water Column (CCC)[2]	Invertebrate Whole-Body	Fish Whole-Body	Fish Muscle
PFOA Magnitude	49 mg/L	0.094 mg/L	1.11 mg/kg ww	6.10 mg/kg ww	0.125 mg/kg ww
PFOS Magnitude	3.0 mg/L	0.0084 mg/L	0.937 mg/kg ww	6.75 mg/kg ww	2.91 mg/kg ww
Duration	1-hour average	4-day average	Instantaneous[3]		
Frequency	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in ten years, on average		

Notes:

[1] Criterion Maximum Concentration

[2] Criterion Continuous Concentration

[3] Tissue data provide instantaneous point measurements that reflect integrative accumulation of PFOA or PFOS over time and space in aquatic life population(s) at a given site.

mg/L = milligram per liter

mg/kg =milligram per kilogram

ww = wet weight

So, How Do You Reconcile These Differences?

Pollutant and Type of Standard	Concentration
PFOA Drinking Water Lifetime Health Advisory Level	0.004 PPT
WHO Provisional Guideline Values	100 PPT
PFOS Drinking Water Lifetime Health Advisory Level	0.02 PPT
WHO Provisional Guideline Values	100 PPT
PFOA Draft Recommended Freshwater Aquatic Life Water Quality Criteria	94,000 PPT
PFOS Draft Recommended Freshwater Aquatic Life Water Quality Criteria	8,400 PPT

Biosolids

PFOA/PFOS in biosolids/ residuals

vs.

PFOA/PFOS in other media

Biosolids & Residuals	**PFOA (ppb)**	**PFOS (ppb)**	
Regulatory standards	**none**	**none**	
Sampling of U. S. biosolids, 2001 (Venkatasen and Halden, 2013)	**34**	**403**	
A northern New England biosolids compost, 2017	**8.3**		
NH land applied solids, 2017, n=20, non-detects included at detection limit	**2.3**	**5.3**	Mean (includes 17 wastewater biosolids, 2 paper mill residuals, & 1 water treatment residual)
Northeast paper mill residuals	**1.6**	**25**	
Other media			
Household organic waste compost	**6** (median) **3.4 – 35** (range)		all PFAS combined
Dust in U.S. daycare centers, median values (Strynar and Lindstrom, 2008)	**142**	**201**	
Human blood, U. S. population 1999 average (CDC NHANES)	**5**	**30**	
Human blood, U. S. population 2012 average (CDC NHANES)	**2**	**6**	

District Results – Aerobic/Anaerobic 5.9/ND 25/ND

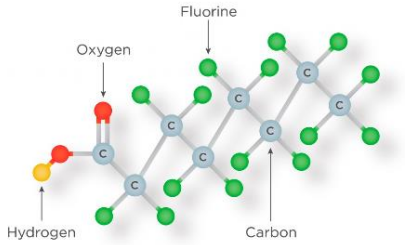
May 18, 2022 Nathan Bernard

After historic passage, new laws battling PFAS enter implementation phase

On May 9, Maine Gov. Janet Mills signed LD1911 into law, officially banning the spread of fertilizer infused with PFAS, toxic substances more commonly known as “forever chemicals,” on Maine’s farmland. The bill’s passage made Maine the first state in the U.S. to ban the use of industrial and municipal sewage sludge as fertilizer.


TIME TO
ACT

PFAS Environmental and Health Information and Recommended Actions for Water Reclamation Facilities in Utah



Joint Preliminary Recommendation from:

WASATCH FRONT WATER QUALITY COUNCIL

PROTECTING WASATCH FRONT WATERS THROUGH COLLABORATIVE, APPLIED RESEARCH

UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY

WATER QUALITY

PFAS and Wastewater

Executive Summary

Per and polyfluoroalkyl substances (PFAS) are a group of manmade fluorinated compounds which are used for a variety of applications by both industry and residential households. PFAS have been designed by scientists not to break down in the environment, which is why they are often called "forever chemicals." PFAS are in countless commercial, consumer, and industrial products and are acknowledged by the EPA to be widely present in the environment. PFAS enter public wastewater treatment systems through industrial, commercial, and domestic sources. Activities ranging from washing PFAS-treated pots and pans to putting out fires with certain foams can all introduce PFAS into the sewers. As receivers of PFAS, wastewater facilities can leave PFAS in the water or sequester it in the biosolids. Treatment does not change PFAS.

Health impacts from high doses of PFAS have been found to have a probable links between exposure and six diseases: testicular cancer, kidney cancer, ulcerative colitis, thyroid disease, pregnancy-induced high blood pressure, and an excess of cholesterol in blood.

In 2022 EPA took the following action relative to PFAS.

Drinking Water Health Advisories:

PFAS Type	Concentration
PFOA	0.004 PPT
PFOS	0.02 PPT
GenX	10 PPT
PFBS	2,000 PPT

PPT – Parts per trillion

Draft Fresh Water Aquatic Life Criteria (Chronic):

PFAS Type	Concentration
PFOA	94 PPB
PFOS	8.4 PPB

PPB – Parts per Billion

Conclusions:

1. Exposure to PFAS is virtually universal and safe levels are not well defined.
2. Drinking water and reclaimed water will need high level filtration to remove PFAS, but residuals still remain in the solids/biosolids.
3. The Pretreatment Program will probably be used to reduce PFAS to treatment facilities.
4. The is significant potential for cost increases in rates to pay for PFAS in wastewater or biosolids.

PFOA or PTFE in Non-Stick Frying Pans

Recommended Actions:

1. WRF (Water Reclamation Facilities) should test influent, effluent, and biosolids for PFAS frequently.
2. In the effluent concentrations of PFOA and PFOS are below the draft EPA Freshwater Aquatic Life WQ Criteria for chronic water column, then continue to test. If the concentration exceeds the chronic water column concentration, develop a source tracking program to investigate for sources.
3. For biosolids, if the concentration is below 20 µg/kg PFOS, continue testing. If it is over 20 µg/kg concentration of PFOS in the biosolids, develop a source tracking program to investigate sources. If the biosolids concentration exceeds 50 µg/kg, inform the owner of the land where biosolids are being applied.
4. Inform the Division of Water Quality of test results at least annually.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

December 5, 2022

MEMORANDUM

SUBJECT: Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs

FROM: Radhika Fox
Assistant Administrator

TO: EPA Regional Water Division Directors, Regions 1-10

3. **Pretreatment program activities:**
   a. Update IU Inventory: Permits to POTWs should contain requirements to identify and locate all possible IUs that might be subject to the pretreatment program and identify the character and volume of pollutants contributed to the POTW by the IUs (*see* 40 CFR 403.8(f)(2)). As EPA regulations require, this information shall be provided to the pretreatment control authority (*see* 40 CFR 122.44(j) and 40 CFR 403.8(f)(6)) within one year. The IU inventory should be revised, as necessary, to include all IUs in industry categories expected or suspected of PFAS discharges listed above (*see* 40 CFR 403.12(i)).[6]

b. Utilize BMPs and pollution prevention to address PFAS discharges to POTWs. EPA recommends that POTWs:
   i. Update IU permits/control mechanisms to require quarterly monitoring. These IUs should be input into the Integrated Compliance Information System (ICIS) with appropriate linkage to their respective receiving POTWs. POTWs and states may also use their available authorities to conduct quarterly monitoring of the IUs (*see* 40 CFR 403.8(f)(2), 403.10(e) and (f)(2)).
   ii. Where authority exists, develop IU BMPs or local limits. 40 CFR 403.5(c)(4) authorizes POTWs to develop local limits in the form of BMPs. Such BMPs could be like those for industrial direct discharges described in A.3 above.
   iii. In the absence of local limits and POTW legal authority to issue IU control mechanisms, state pretreatment coordinators are encouraged to work with the POTWs to encourage pollution prevention, product substitution, and good housekeeping practices to make meaningful reductions in PFAS introduced to POTWs.

TOP INDUSTRIES FOR PFAS RULEMAKING

At the top of the EPA's priorities is proposed rulemaking for industries in which it has the data to do so.

Organic Chemicals

Proposed rule expected summer 2023

Plastics

Proposed rule expected summer 2023

Synthetic Fibers

Proposed rule expected summer 2023

Metal Finishing

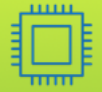
Proposed rule expected summer 2024

Electroplating

Proposed rule expected summer 2024

INDUSTRIES TARGETED FOR MORE STUDY

The EPA has PFAS data on several more industries but has deemed those data sets insufficient for rulemaking. The 2021-2024 Strategic Plan calls for filling in the gaps by fall of 2022 with proposed rulemaking to follow by the end of the year.



Electrical & Electrical Components

Textile Mills

Landfills

INDUSTRIES TARGETED FOR PFAS DATA REVIEW

Some industries are known users of PFAS, but the impact of PFAS discharge on the environment from these industries is not well understood. The EPA plans to review the available data for these industries by winter of 2023 and decide whether sufficient data exists to initiate rulemaking.

Leather Tanning & Finishing

Plastics Molding & Forming

Paint Formulating

INDUSTRIES TARGETED FOR PFAS MONITORING

Several industries are voluntarily phasing PFAS out by 2024. The EPA will continue to monitor progress in these sectors.

Pulp & Paper

Paperboard

Airports

EPA

United States
Environmental Protection
Agency

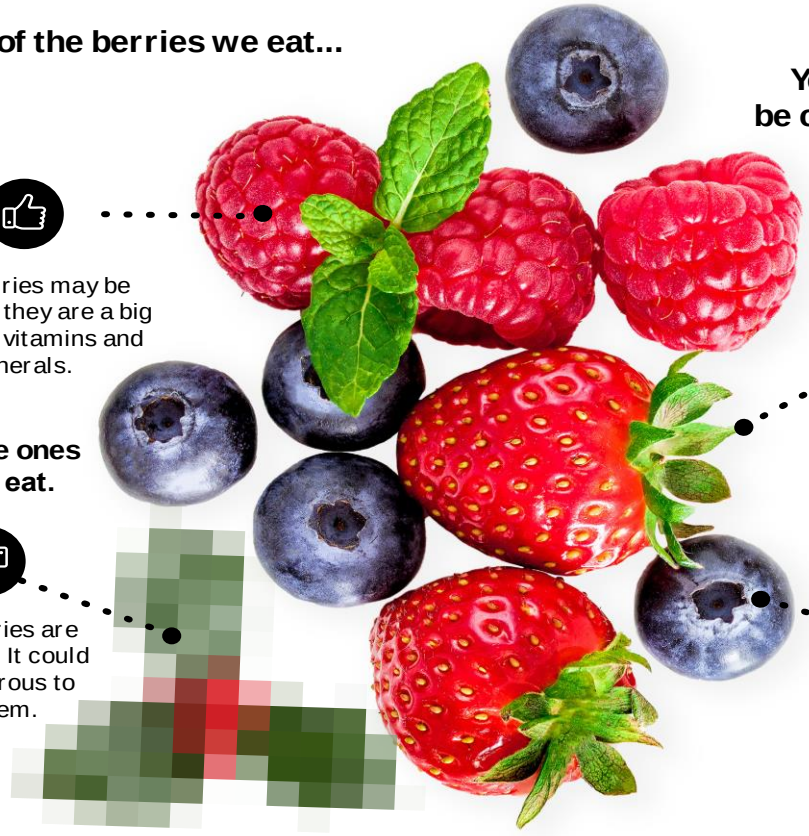
Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Repor

WHY CHEMICAL FAMILIES ARE LIKE BERRIES

Lately, there has been a push for one-size-fits-all policies banning, restricting, or regulating entire chemical families. A one-size-fits-all approach is neither scientifically accurate, nor appropriate. The truth is, just like in our own families, every individual chemical in a family has its own unique set of qualities and behaviors that can provide important benefits. Here's a sweet example:

Think of the berries we eat...

Yes, they may all be called "berries" but they are all very different.



Raspberries may be small, but they are a big source of vitamins and minerals.

Strawberries are juicy and an excellent source of vitamin C.

...and the ones we don't eat.

Holly berries are poisonous. It could be dangerous to eat them.

Blueberries are sweet, nutritious, and have many health benefits.

Banning all berries -- because one presents a potential risk -- is groundless and illogical. The same goes for our chemicals.

While the names of chemicals may be similar, the differences in their use, structure, health, and environmental profiles make them unique. A National Academies of Sciences, Engineering, and Medicine study evaluated the plausibility of applying a single class approach to regulate an entire family of chemicals and determined that differences between chemicals in the same chemical family can be too great for a single class approach to work. The study recommends using information like chemical structure, physical and chemical properties, toxicology data, and predicted biologic activity to facilitate decision-making.