

An Introduction to PFAS

Metropolitan Washington Council of Governments

Board of Directors Meeting

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Presented by

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What makes PFAS a 4-letter word?

WHAT ARE PFAS?

- Per- and polyfluoroalkyl substances
- Class of thousands of synthetic compounds
- Resist thermal, chemical, and biological degradation
- Many act as surfactants
- Used in broad range of commercial applications



Toxic



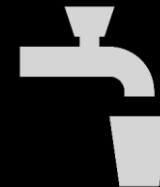
Mobile



Regulated



Researched



Consumed



Costly

WHY ARE PFAS PROBLEMATIC?

- Appear in environmental media around the globe
- Are found in the drinking water of millions of people
- Bioaccumulate in humans, plants, and animals
- Occur in the blood of >98% of the US population
- Regulations are stringent based on toxicity
- Liability is incurred in absence of destructive

Presumptive PFAS Contamination Sites in the US

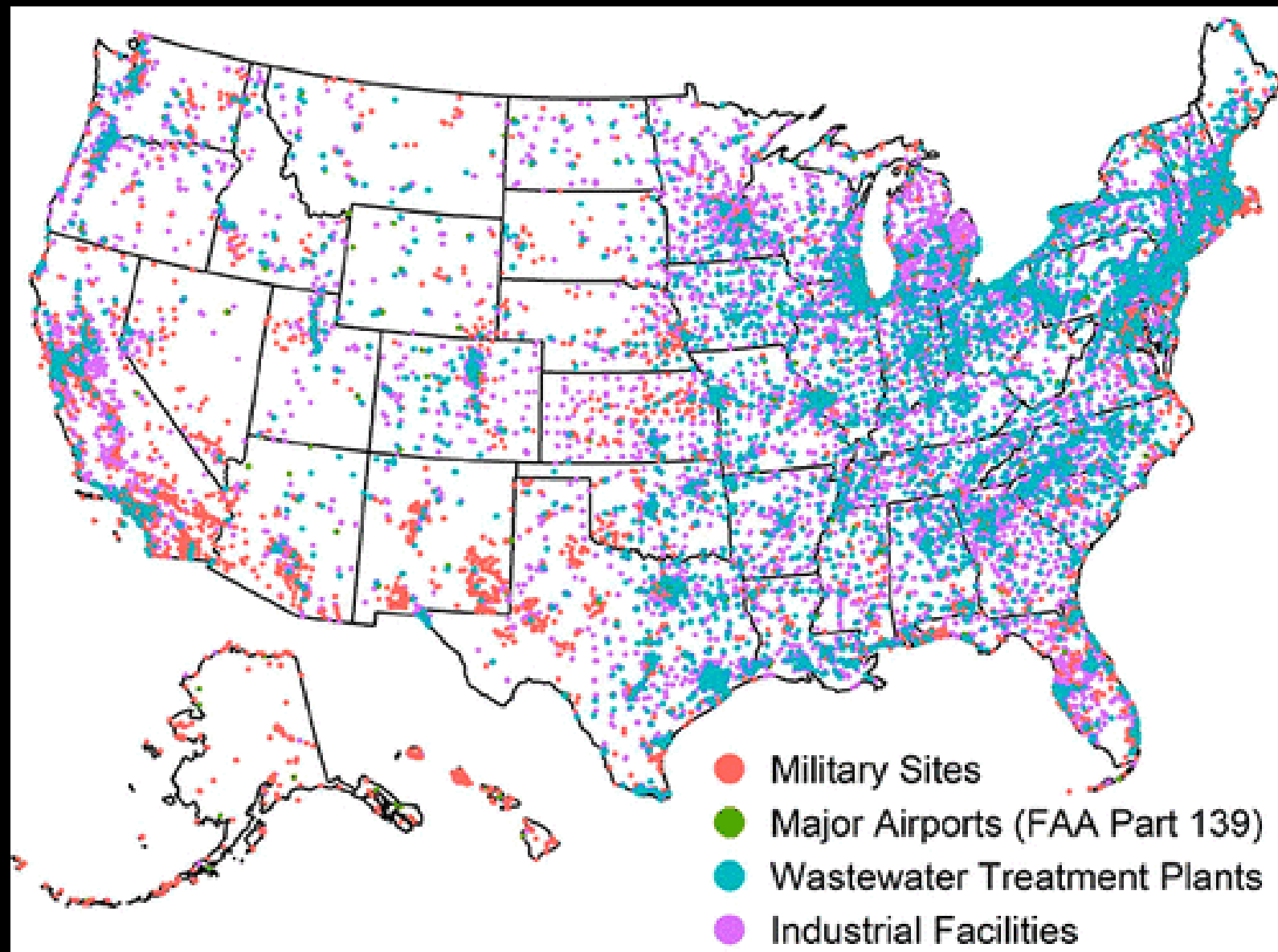
57,412 total sites

49,145 industrial facilities

4,255 wastewater treatment plants

3,493 current / former military sites

519 major airports



PFAS Sources and Concerns



Firefighting

Photo by Lance Cpl. Shawn Valosin USMC



Metals Plating

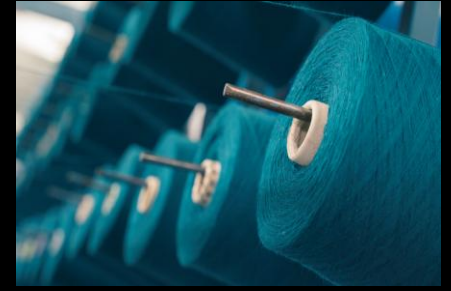
Source: USEPA



Production



Personal Care



Textiles



Food Packaging



Landfills and Leachate



Drinking Water



Agriculture



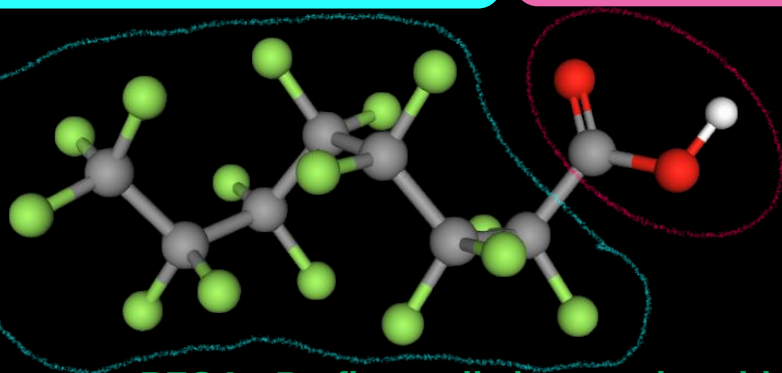
Waste Treatment

PFAS: Some gentle chemistry

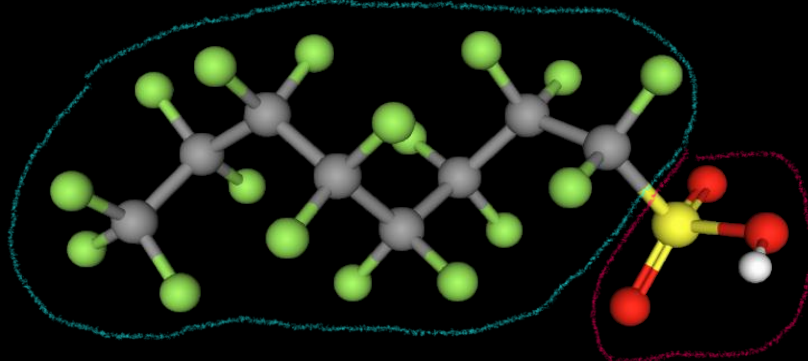
Perfluorinated compounds

Fully fluorinated carbon chain "tail"

Functional group "head"



PFOA - Perfluoroalkyl octanoic acid



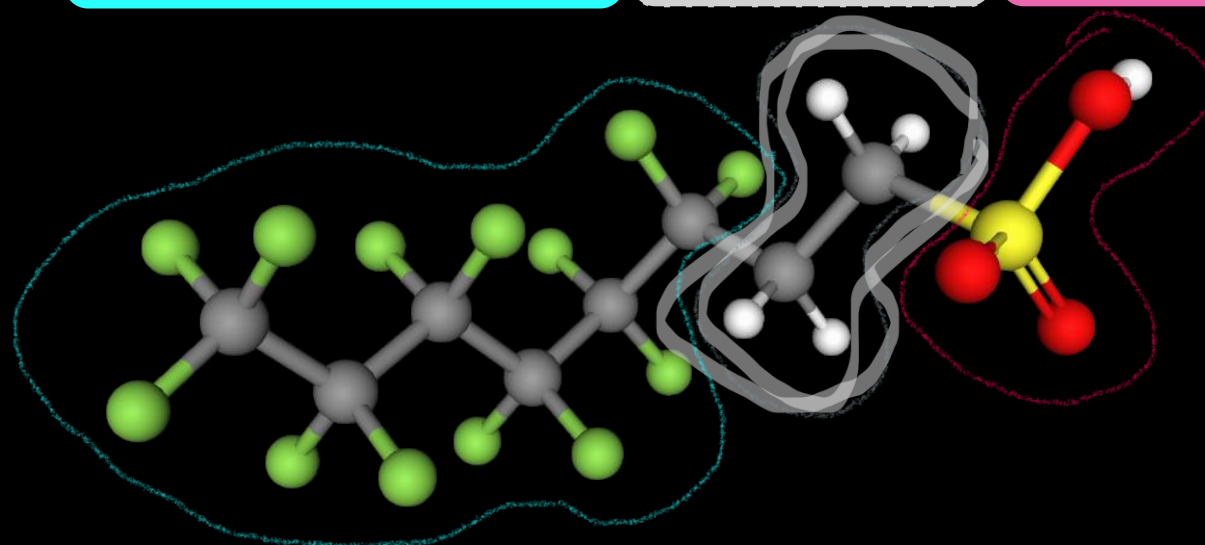
PFOS - Perfluoroalkyl sulfonic acid

Polyfluorinated compounds

Fully fluorinated carbon chain "tail"

Hydrogenated "spacer"

Functional group "head"



6:2 Fluorotelomer sulfonic acid

Resources:

Molecule models: www.molview.org

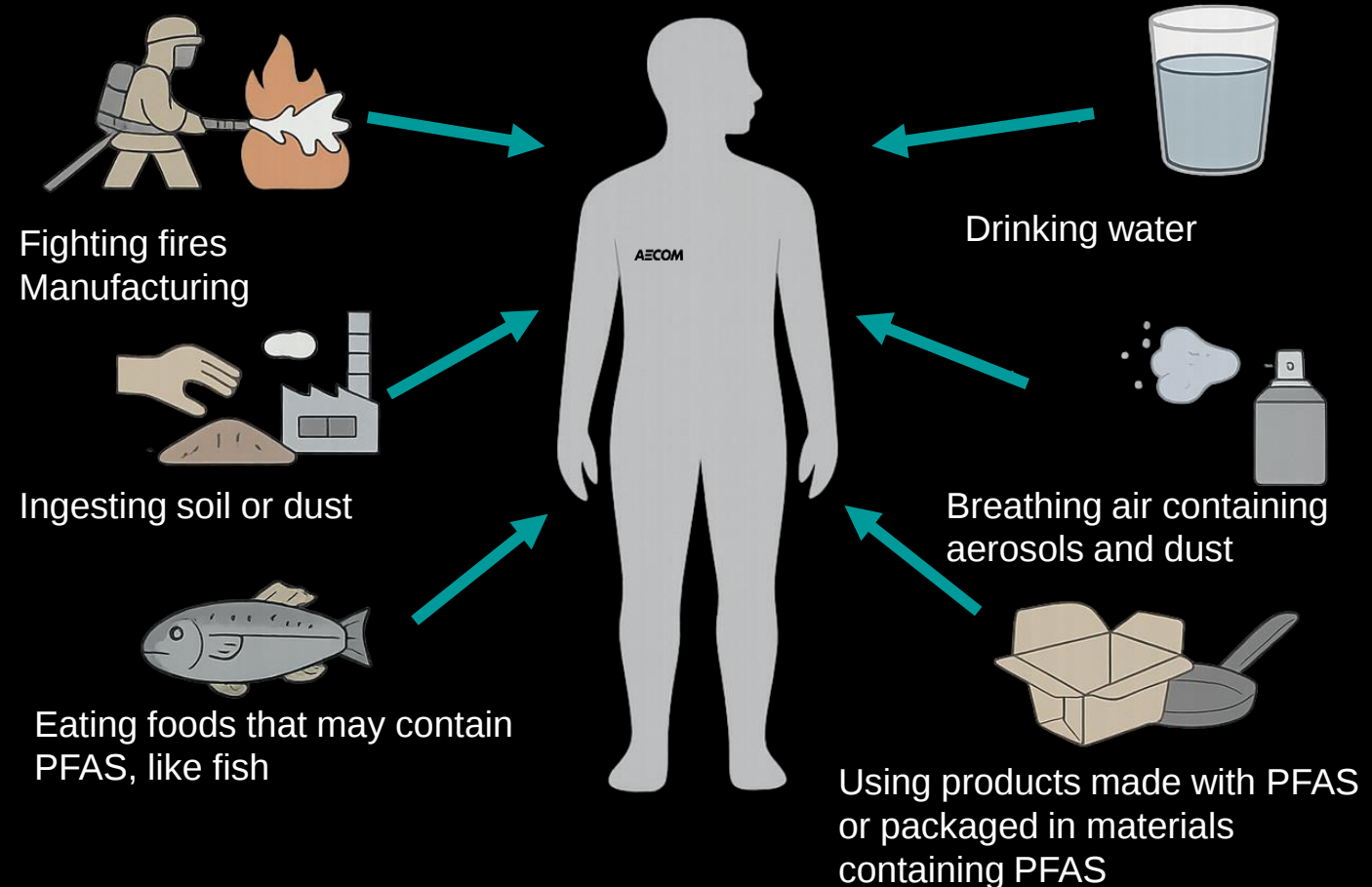
ITRC PFAS: <https://pfas-1.itrcweb.org/2-2-chemistry-terminology-and-acronyms/>

PFAS Exposure: How and how much?

The risk to human health depends on:

- Exposure factors (dose, frequency, route, and duration)
- Individual factors (sensitivity and disease burden)
- Other determinants of health (access to safe water and quality healthcare)

Modes of PFAS Exposure



PFAS Health Effects

Epidemiological studies suggest exposure to PFAS can cause these health effects:



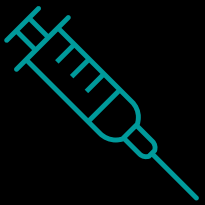
Increases in cholesterol levels (PFOA, PFOS, PFNA, PFDA)



Changes in liver enzymes (PFOA, PFOS, PFHxS)



Small decreases in birth weight (PFOA, PFOS)



Lower antibody response to some vaccines (PFOA, PFOS, PFHxS, PFDA)



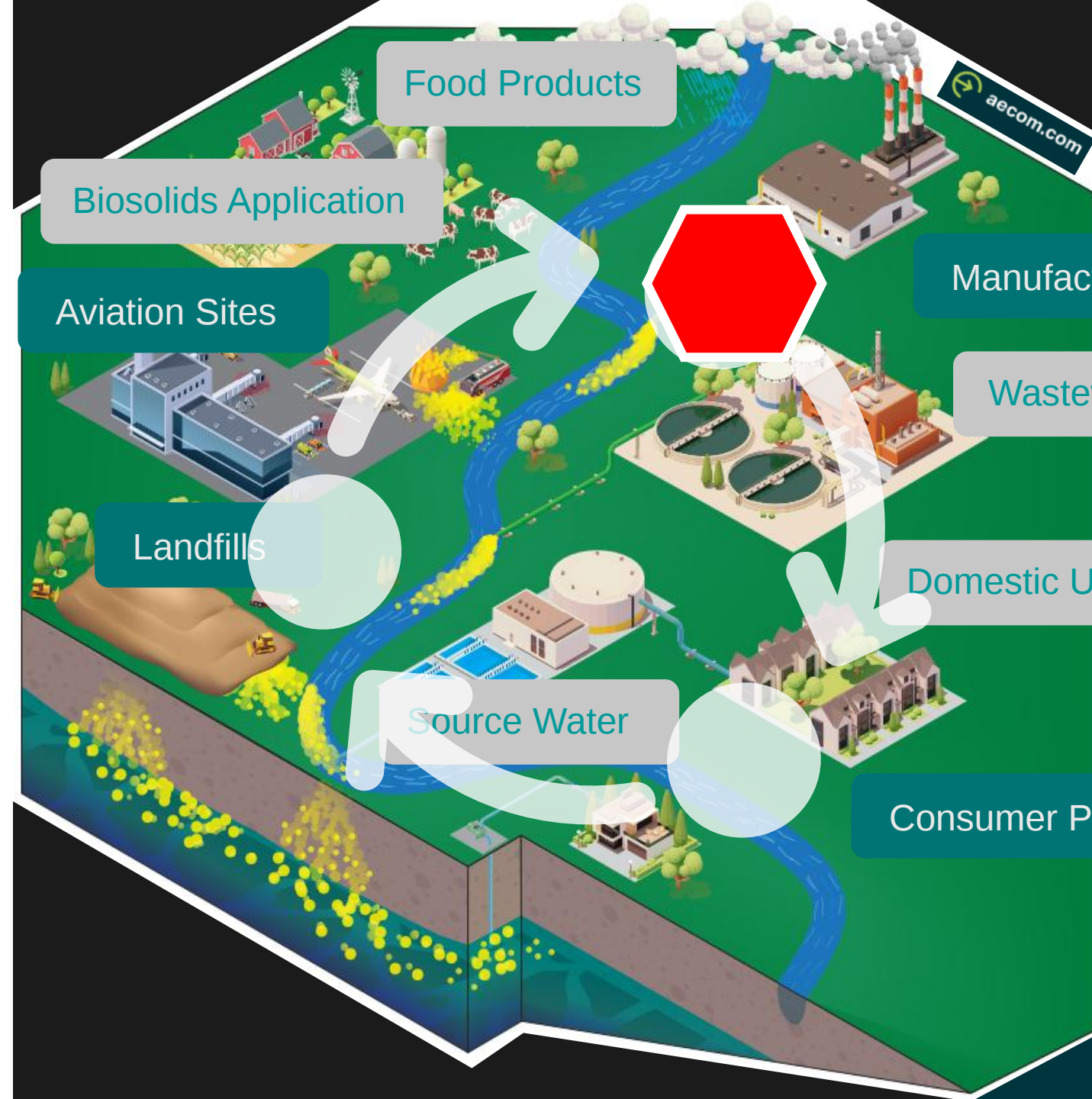
Pregnancy induced hypertension and preeclampsia (PFOA, PFOS)



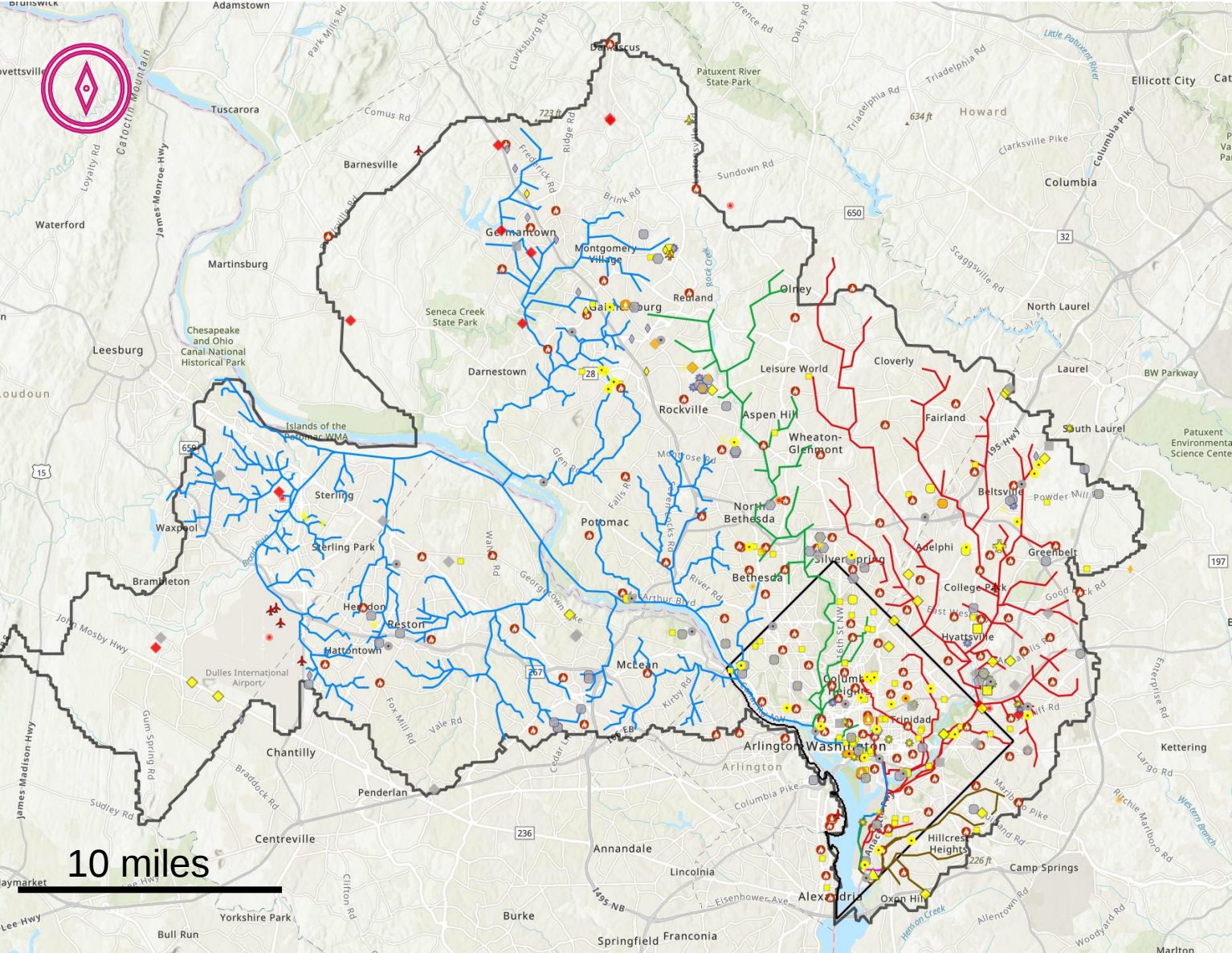
Kidney and testicular cancer (PFOA)

Source: <https://www.atsdr.cdc.gov/pfas/health-effects/index.html>

One Water Perspective



2023 AECOM Study – DC Water Sewershed Sources



Map Layers

PFAS SamplingLocations

DC Water Facilities

US EPA Potential PFAS Source | PFAS Source Category

No | Very Low/Unlikely

No | Low

No | High

Yes | Low

Yes | Medium

Yes | High

EPA Facilities

Airports

Cement

ChemicalMFG

CleaningProducts

Electronics

Furniture

IndustrialGas

MetalMachinery

NationalDefense

Paper

PlasticsResins

Printing

TextilesLeather

MetalCoating

PaintingCoating

Petroleum

Waste

Fire Stations

Superfund Sites

Compilation of DC Water customer data and AECOM researched information on sources

U.S. Federal Regulations

National Primary Drinking Water Regulation - 2024

- Requires public drinking water systems to reduce PFAS below the MCLs

Hazardous Substance Designations PFOS and PFOA – 2024

- Requires notification of any sizeable release
- Grants EPA power to investigate and compel potentially responsible parties (PRPs) to remediate releases

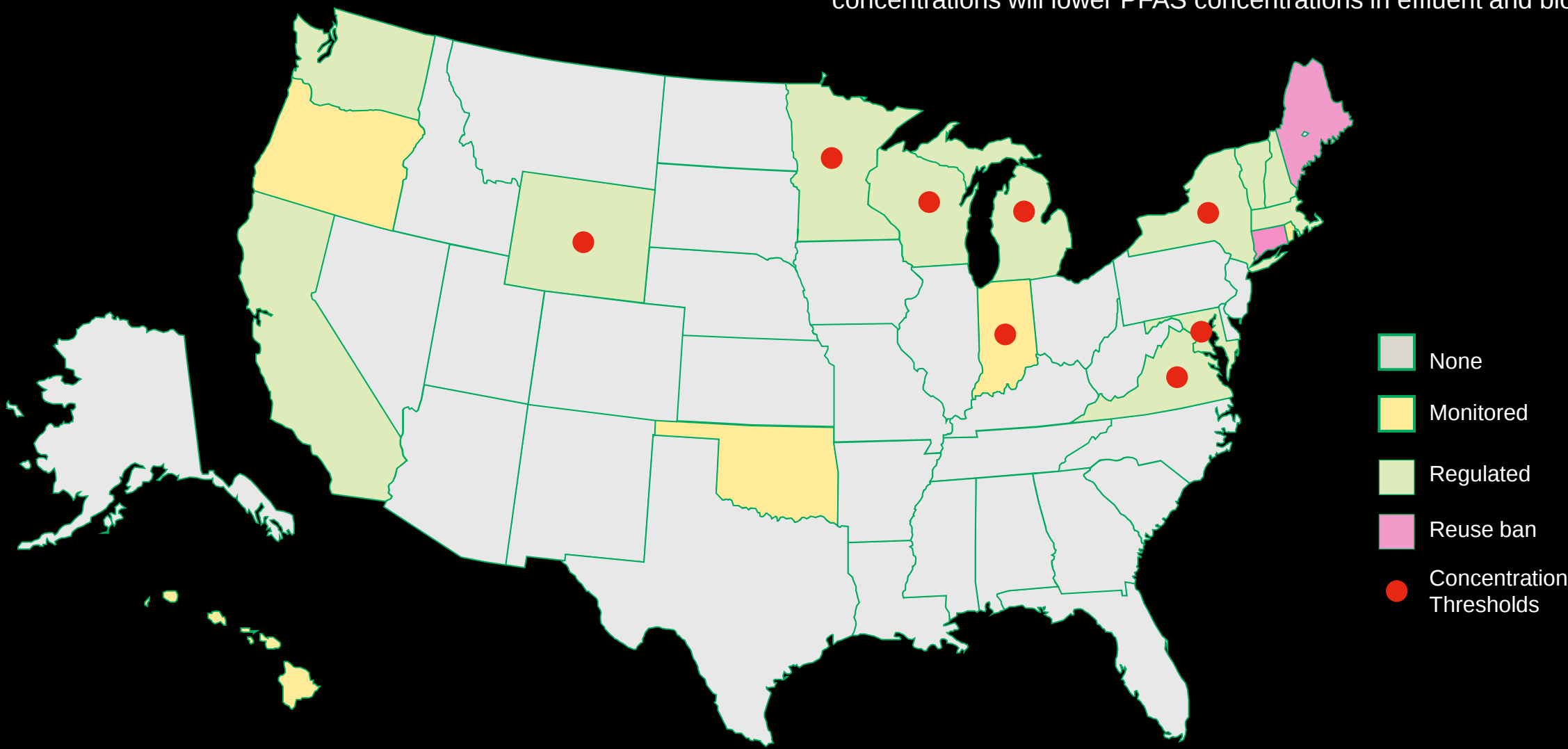
Effluent Limitation Guidelines and National Pollution Discharge Elimination System (NPDES)

- Discharge PFAS monitoring increasingly part of federal and state NPDES permit renewal requirements

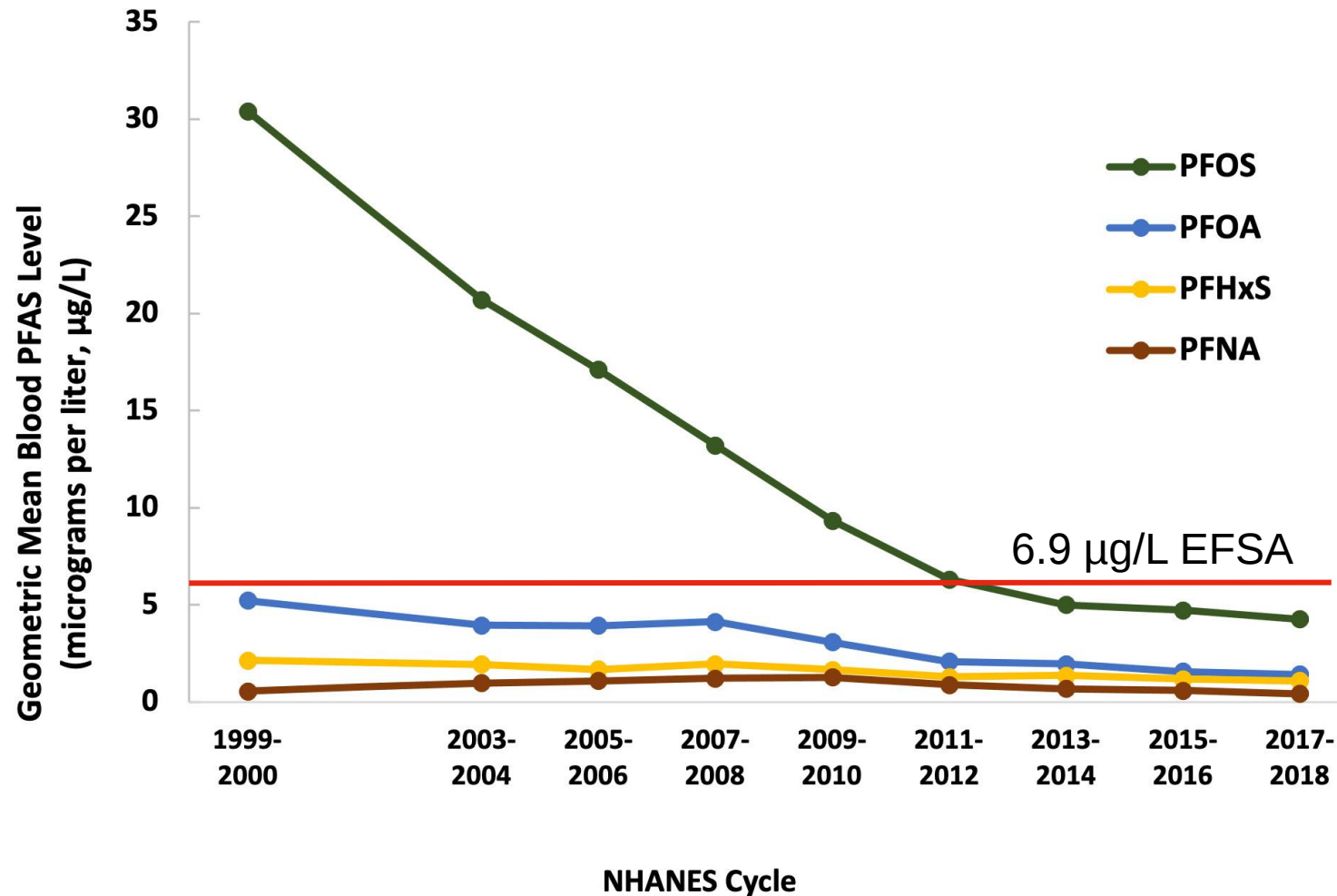
Compound	MCL (ppt*)
PFOA	4.0 ppt
PFOS	4.0 ppt
PFNA	10 ppt
PFHxS	10 ppt
HFPO-DA**	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	Hazard Index (HI) = 1 (unitless)

State Biosolids Reuse Regulations

Industrial source control and / or pretreatment to limit PFAS influent concentrations will lower PFAS concentrations in effluent and biosolids



Biomonitoring: A little bit of good news...



National Health and Nutrition Examination Survey (NHANES) reports
PFOS, PFOA, PFHxS, and PFNA
in the blood serum of 99% of those
tested

From 1999 to 2018:
PFOA and PFOS serum levels
declined by more than 60% and
80%, respectively

www.cdc.gov/exposurereport

Source: Agency for Toxic Substances and Disease
Registry
[https://www.atsdr.cdc.gov/pfas/health-effects/us-
population.html](https://www.atsdr.cdc.gov/pfas/health-effects/us-population.html)



Please contact me with questions

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