PFAS and Biosolids

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Understanding the Benefits vs the Risks of PFAS

- The Role of Water Resource Recovery Facilities
- Biosolids Benefits
- PFAS
  - Sources
  - Relative concentrations (societal exposure)
  - DC Water's Research into PFAS presence in the sewer system
  - Alternatives Assessment
  - Product Bans

The Role of Water Resource Recovery Facilities

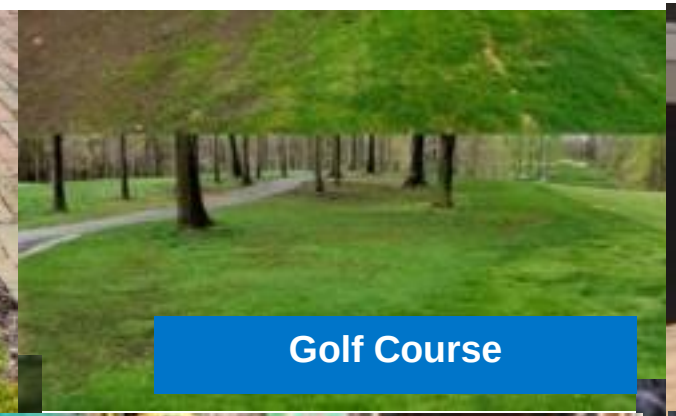
- Helps protect the environment by keeping pollutants out of waterways – e.g., Chesapeake Bay
- Carbon is energy; nutrients are fertilizer
- DC Water's Blue Plains: 97% of wastewater received comes from homes and businesses

Biosolids Benefits

- Great value to farmers
  - Soil health
  - Reduces costs
- Completes the nutrient and carbon cycles
- Reduce carbon footprint
- Protect the Chesapeake Bay by reducing the use of chemical fertilizers
- Helps preserve agriculture
- Reduces costs for our ratepayers


Hay Farm


Horticultural Society


Golf Course


Hobbyist Vintner/Grape Grower

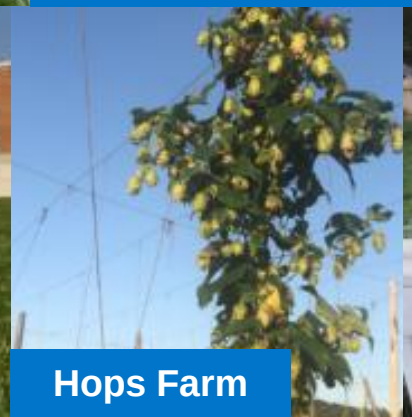

Cut Flower Farm

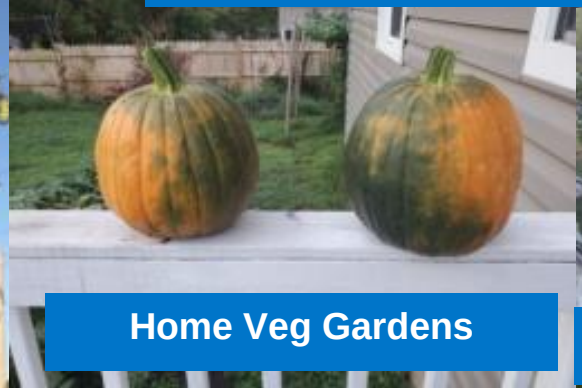
Street Tree Plantings

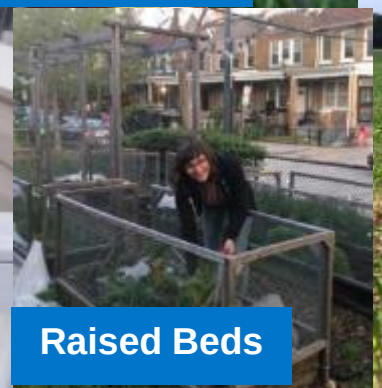
Elementary School Garden


Wetlands Restoration


School Landscaping


Hops Farm


Home Veg Gardens


Raised Beds


Commercial Corn

Program Benefits

Produce Bloom over 50,000 tons sold in FY 2025

Improve product quality (Class A and more)

Generate 8 MW & Tier 1 RECs of clean, green, renewable power

Cut GHG emissions dramatically (50k MT C02 EQ)

Saves millions of dollars annually

PFAS sources

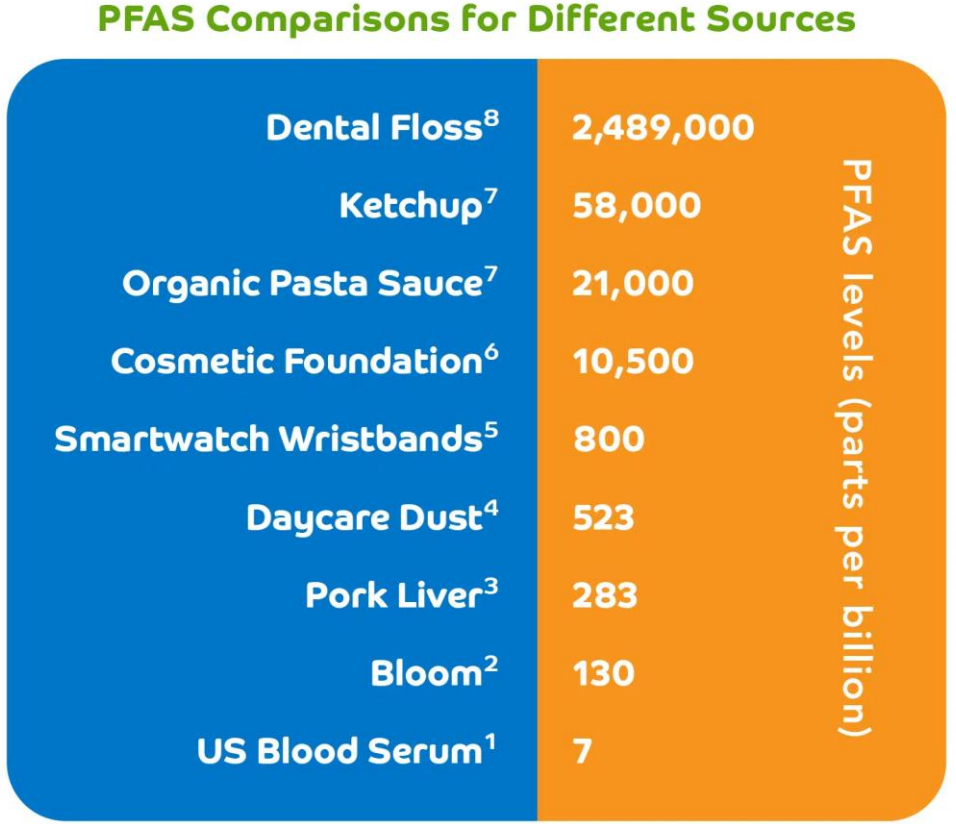
PFAS is ubiquitous

In high concentrations, potential adverse health effects include:

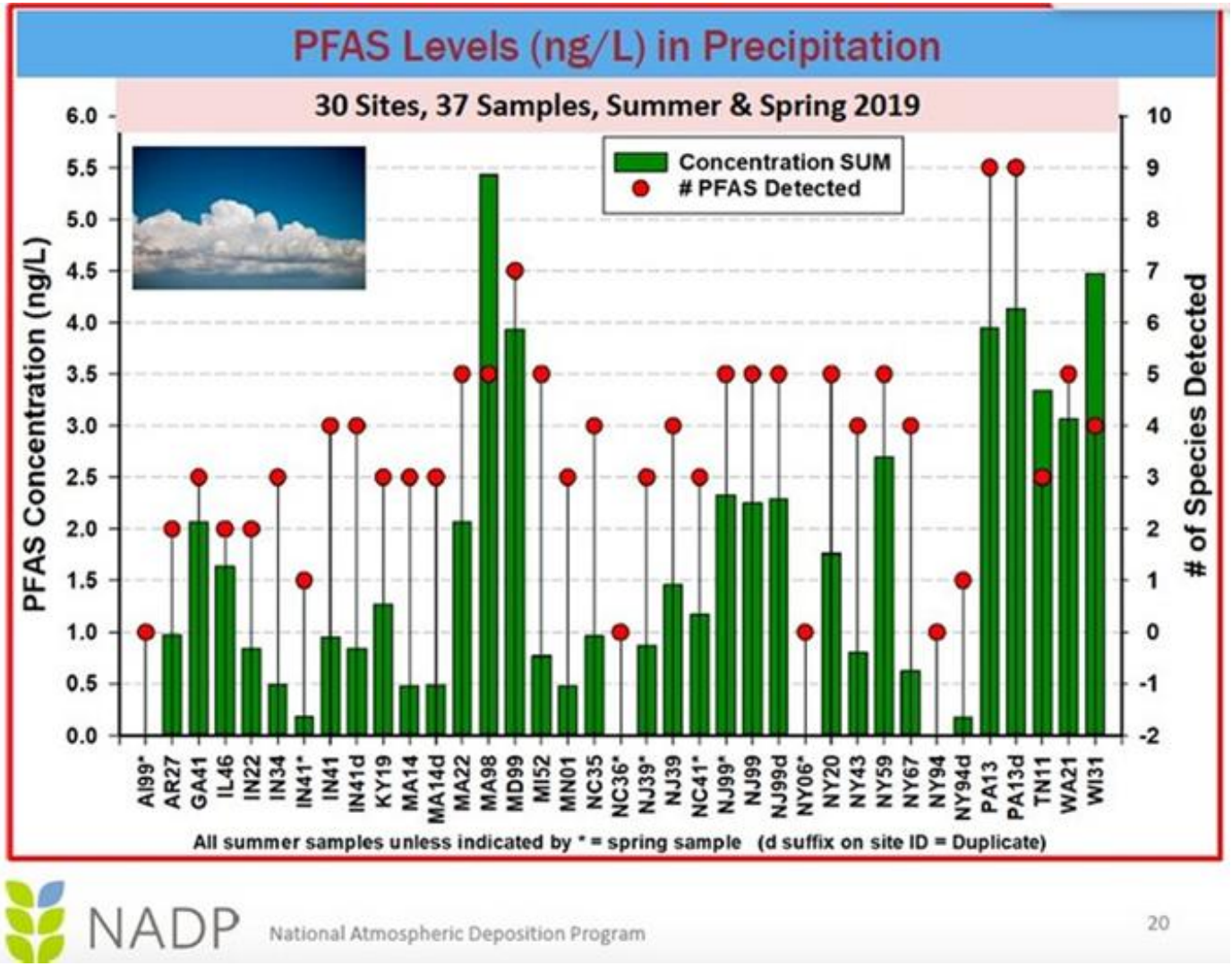
- immune suppression
- changes in liver function
- lower birth weight
- kidney cancer

Household Products are the Real Source of Human PFAS Exposure

- Bloom's concentrations of PFOA and PFOS are within ranges up to 3.68 parts per billion (ppb) and up to 15.5 ppb respectively
- Dental floss has 20,000 times higher concentrations than Bloom
- Products like ketchup, organic tomato sauce, and cosmetics have concentrations of 50 times higher than Bloom
- Household dust has 10 times higher concentrations of PFAS
- Bloom's total combined PFAS levels average 130 ppb; 2023 food packaging limits set in California are 800X higher.
- The way to get these small traces of PFAS out of our bloodstream and resulting municipal biosolids is by controlling them at the source

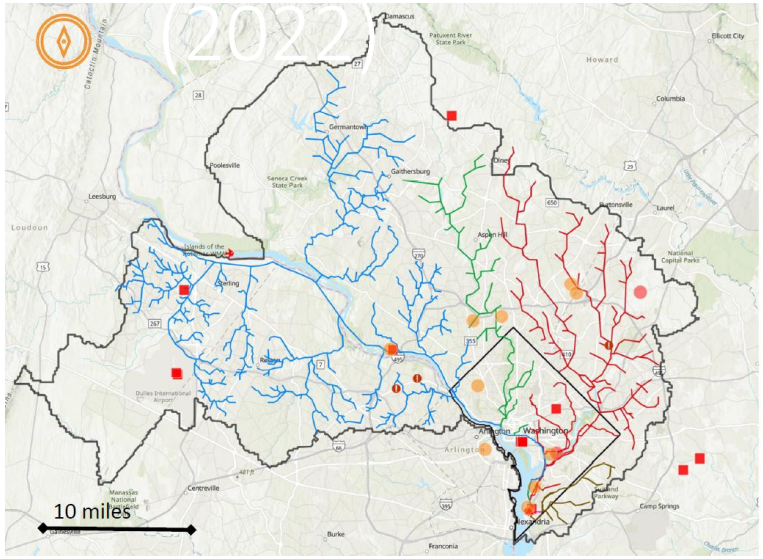


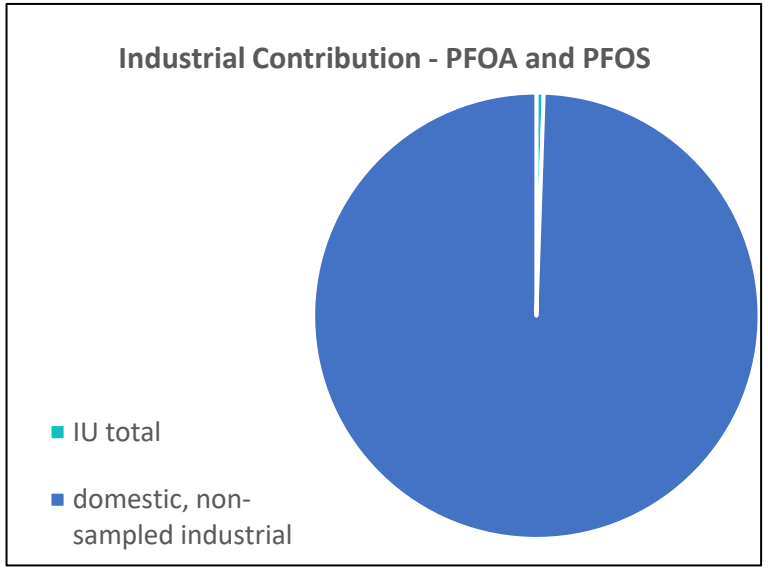
PFAS levels in precipitation: 5000X higher than EPA advisory levels for drinking water



- EPA Health Advisories:
  - PFOA: 0.004 ppt
  - PFOS: 0.02 ppt
- EPA draft drinking water limits:
  - PFOA: 4 ppt
  - PFOS: 4 ppt

Blue Plains – Industrial User (IU) Survey





- A 2022 study with Purdue University identified 12 potential industrial sources in the watershed.
- Results show industrial discharges account for only a small fraction of total PFAS loadings to Blue Plains. 0.5% of PFOA/PFOS loading was from IU.
- Majority of PFAS originates from diffuse, non-industrial sources (e.g., residential, commercial).

Pre-treatment is not a viable strategy for reducing PFAS in DC Water's biosolids.

Primary Biosolids Management Options

1. Land Application (Reuse)

2. Landfilling

3. Destruction

2. Landfilling

Significant Cost and Environmental Issues with landfilling:

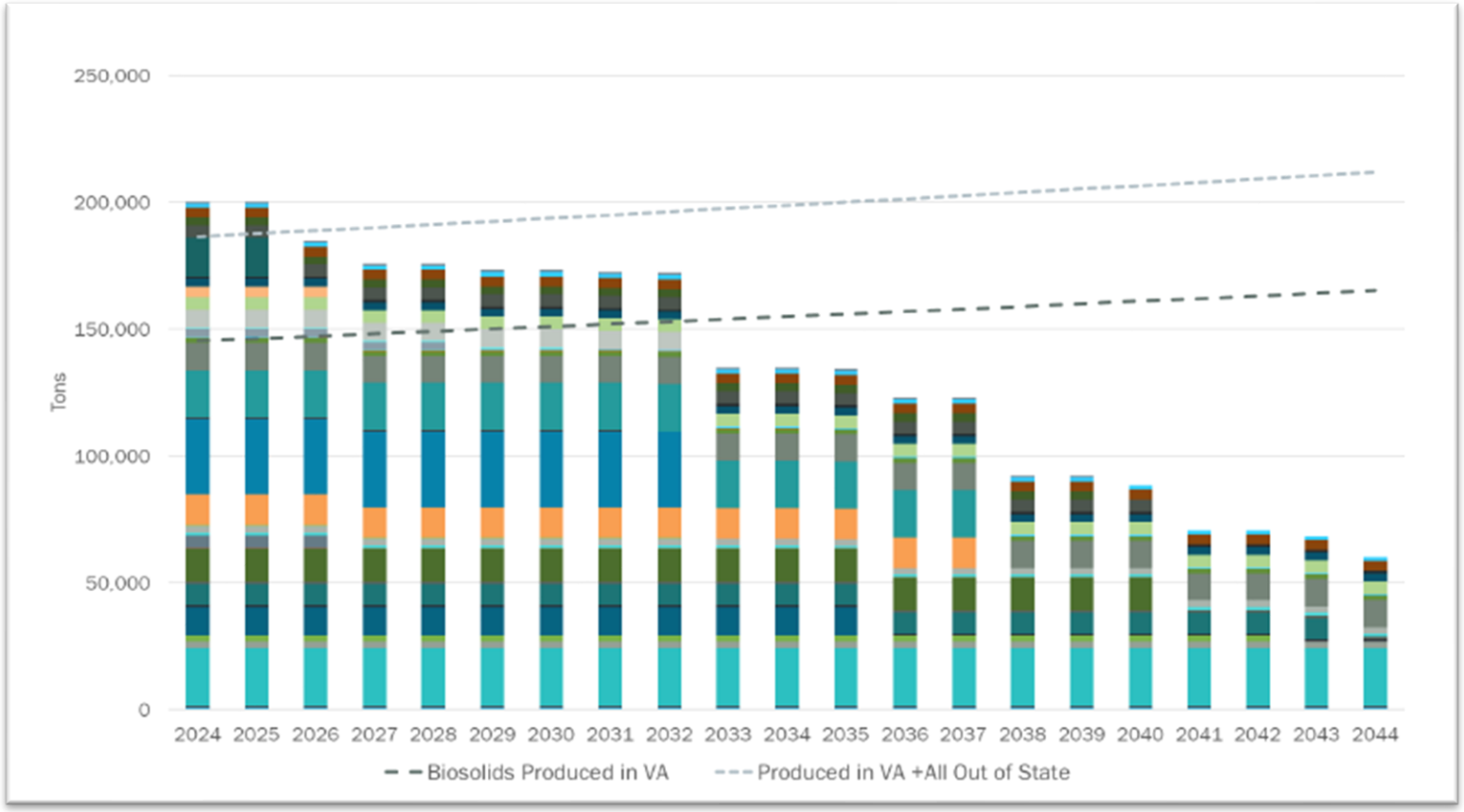
- Leachate
- Methane production
- Land Use

2. Disposal - Landfilling Impacts

A land application ban due to PFAS would result in landfilling biosolids.

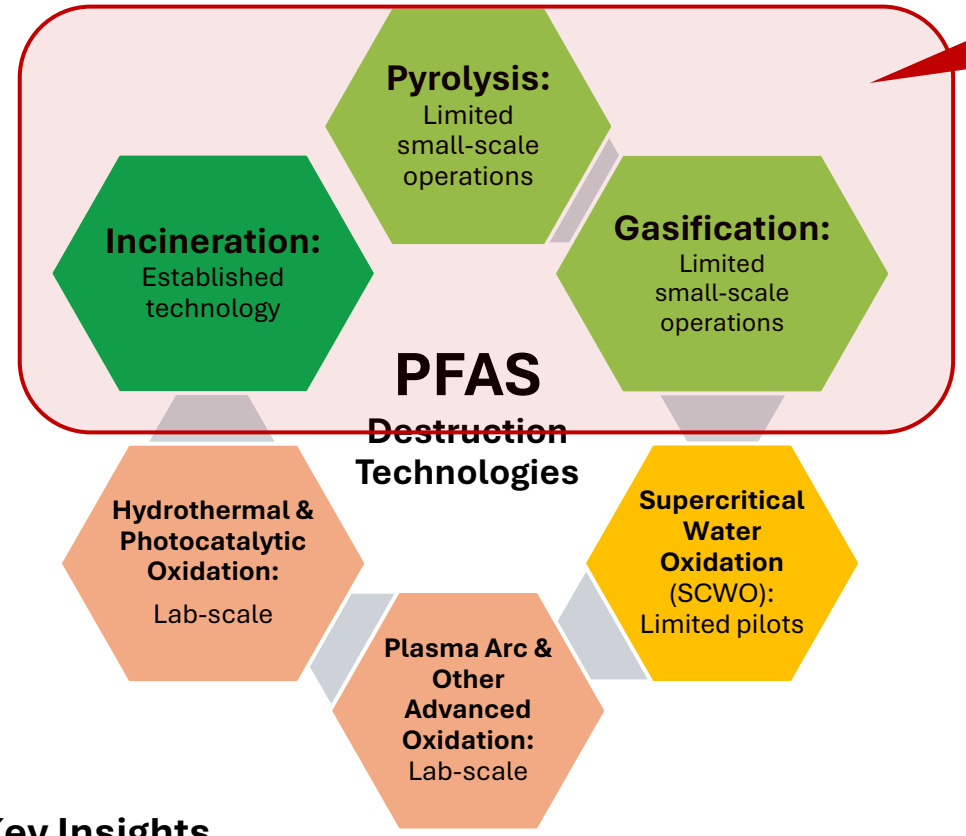
Impacts to DC Water:

- Operational costs increase from $6M/yr to $32M.
- Virginia estimates running out of landfill capacity in 2 years.
  - Maryland has little to no landfill capacity for biosolids, requires out of state disposal
- Carbon footprint increased by 80k MT/year.



Estimated biosolids management at Virginia landfills including additional out of state sludge

3. Destruction - Treatment Technology Options



Only matured technology

Small-scale implementation

Technology	Facility / Location	Status	Scale (Approx.)
Pyrolysis	Silicon Valley Clean Water, CA	Full-scale Operational	~1 dry tpd
	Clear Creek WWTP, CA	Full-scale, Under construction	~1 dry tpd
	Borough WWTP, PA	Full-scale, Commissioning	<1 dry tpd
	City of Brentwood, CA	Full-scale, Under construction	NA
	Baltimore City DPW, MD	Pilot Operational	~4 dry tpd
Gasification	Edmonds Regional WWTP, WA	Full-Scale, Operational	~6 dry tpd
	Linden Roselle Sewerage Authority, NJ	Full-Scale, Operational	-
	Merchant plant, Bethel, PA	Full-Scale, Operational	~8 dry tpd
	Morrisville Municipal Authority, PA	Pilot Operational	-
Supercritical Water Oxidation (SCWO)	OC San, CA	Pilot Operational	~1 dry tpd
	Merrell Brothers site, IN	Manufacturing unit	~1 dry tpd
	Orlando Utility WPC, FL	Pilot Operational	~1 dry tpd

Key Insights

- Most are **pilot/demo stage** with very limited full-scale municipal deployments
- No long-term data on **cost, emissions, or operational reliability** at Baltimore's scale
- Technology is still evolving

Cost and Analysis of Treatment Options

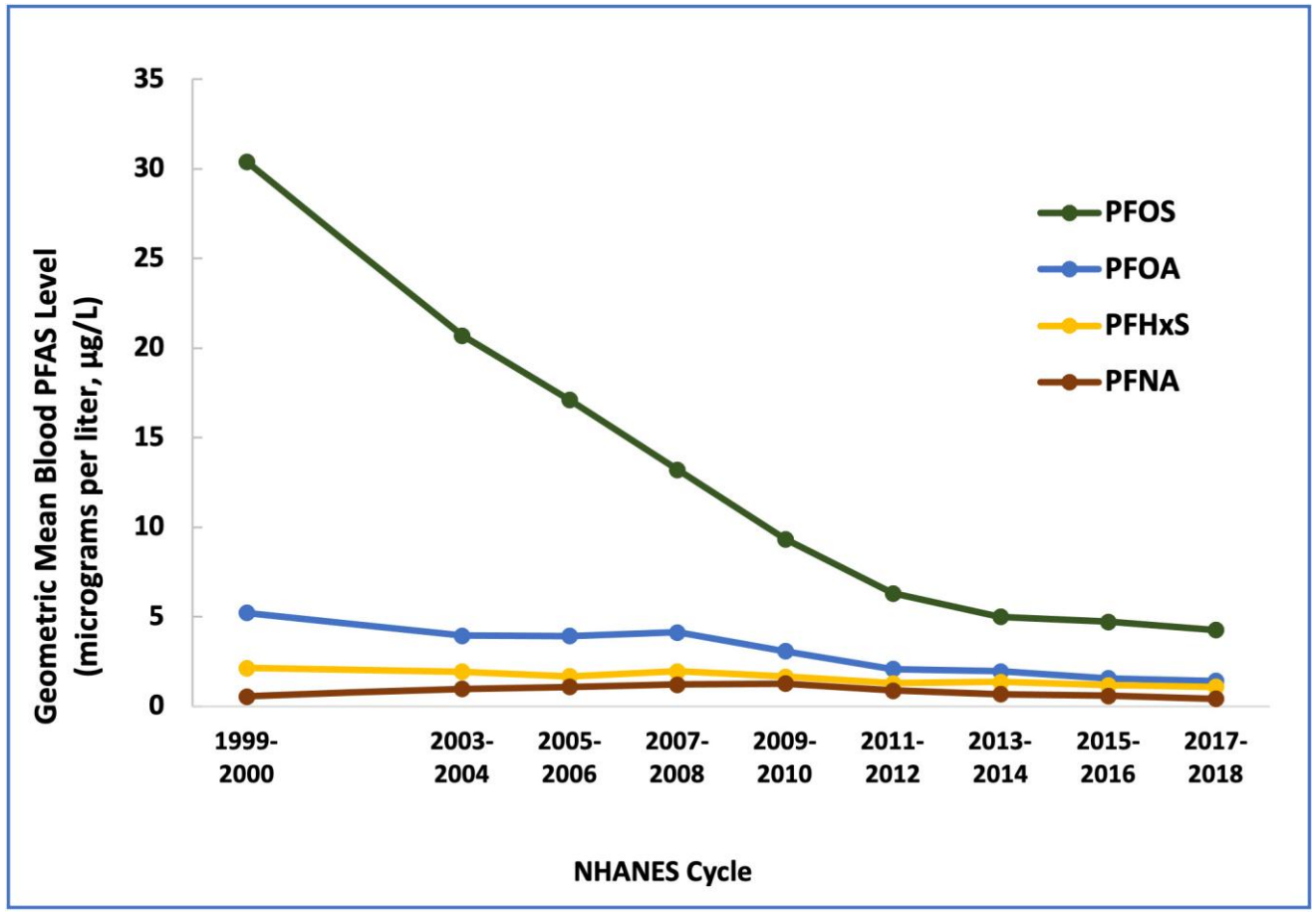
Costs and Technology Viability:

- Cost estimate of thermal destruction options: $100-$200M (AECOM 2023).
  - Detailed cost estimate was for incineration only, given lack of full-scale units for other technologies.

Challenges:

- Site constraints at Blue Plains, footprint is fully built out.
- New Title V Air Permit (Clean Air Act) required. Will be a lengthy process: 5-10 years. Uncertainty likely due to public opposition.
  - Saratoga Biochar project did not receive environmental approval from NYDEP due to public pressure.
- Proximity to low-income areas of DC (Ward 7/8) and PG County (Oxen Hill).

Where does that leave us? Source Control

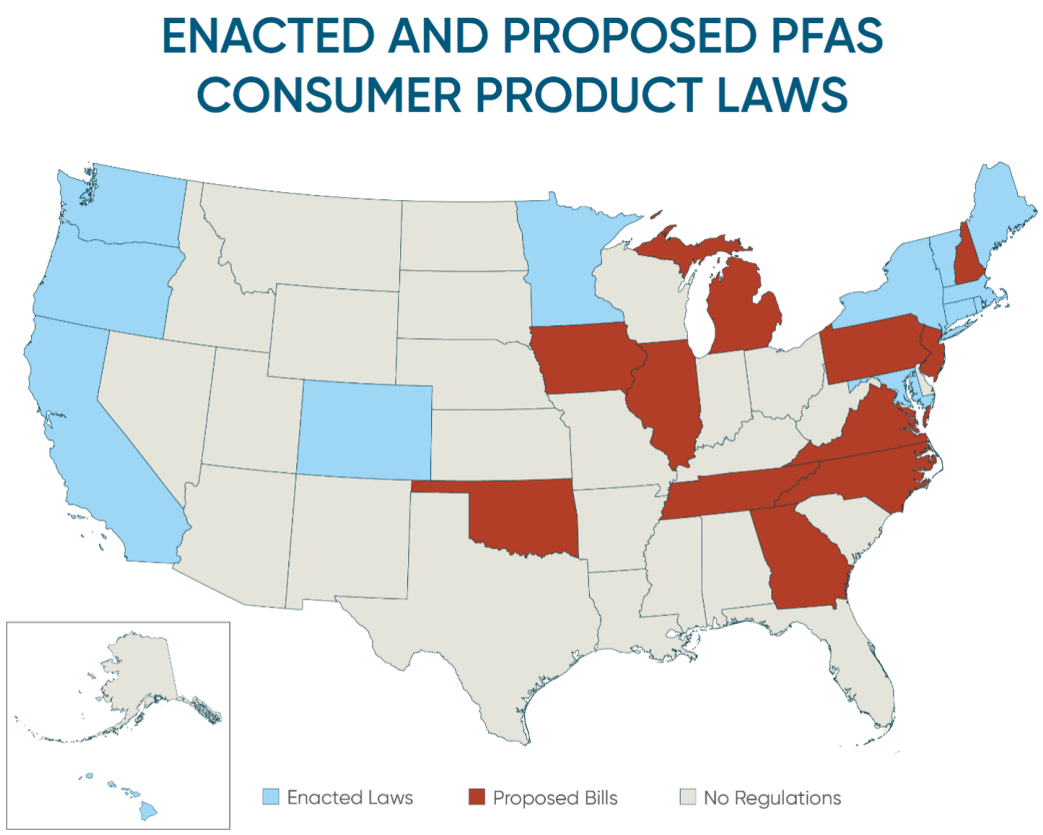


Source Control Shows Results

- 2000 EPA issued a voluntary phase of PFOA/PFOS in TEFLON
- Subsequent blood panels show 80% reduction in US population blood PFOS
- Still exposure sources remaining among many other product groups causing.

Consumer Product Bans

- If we remove upstream, then it's reduced in biosolids
  - Removing the high exposure pathways before it even gets to DC Water.
- Minnesota has enacted one of the most ambitious product bans in the United states.
  - Ban went in effect Jan 1st 2025
  - Testing by the Minnesota start tribune saw 80% of products had met the new TOF concentrations threshold (10ppm)



Product categories that must generally be made without PFAS to be sold in Minnesota beginning in 2025

Carpets or rugs
Examples: carpets, rugs, car floor mats, outdoor rugs, synthetic turf

Cleaning products
Examples: detergent, stain removers, glass cleaner, hard surface cleaners

Cookware
Examples: Baking sheets, electric woks, pots, pans, skillets, grills, waffle makers

Cosmetics
Examples: Blushes, foundations, lip sticks, mascaras, nail polish

Dental floss
Examples: Dental floss, dental picks, interdental brushes

Fabric treatments
Examples: Spray-on water repellants, stain protectors, flame retardants

Children's products
Examples: Products for children under 12 years old, including car seats, children's clothing, highchairs, playpens, toys

Menstruation products
Examples: Pads, tampons, period underwear, menstrual cups

Textile furnishings
Examples: Draperies, rugs, furnishings, bedding, towels, tablecloths

Ski wax
Examples: Ski and snowboard waxes plus related tuning products

Upholstered furniture
Examples: Cushioned chairs, mattresses, recliners, sofas