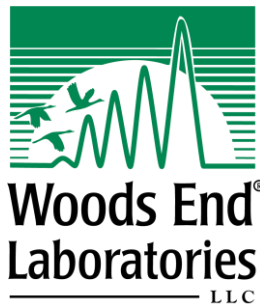


The Hows and Whys of PFAS Testing

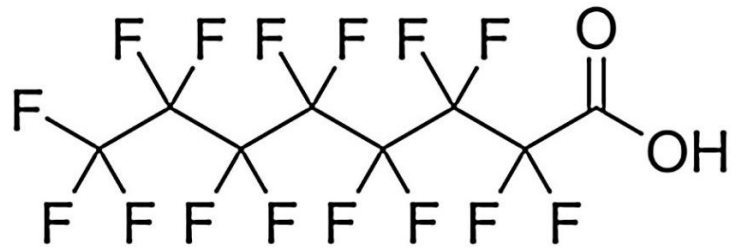
August 19, 2024

Presented by:

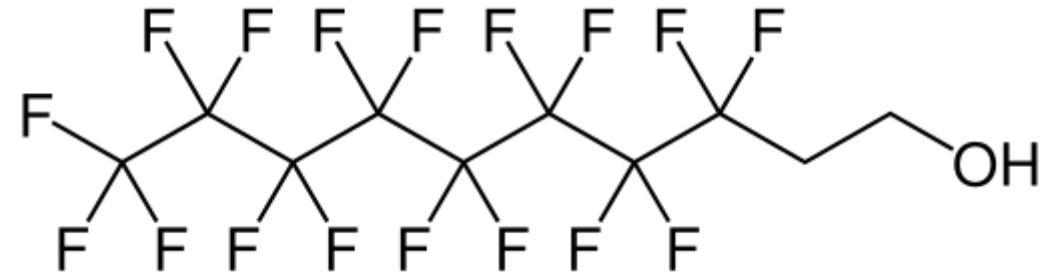
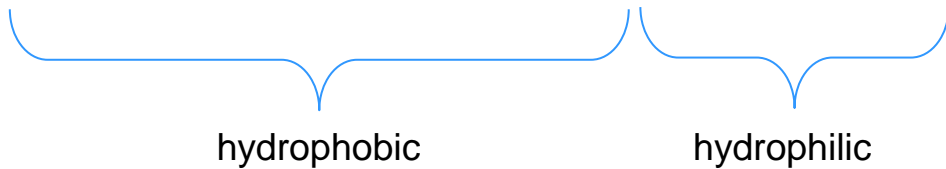
Rebecca Harvey, PhD
Woods End Laboratories



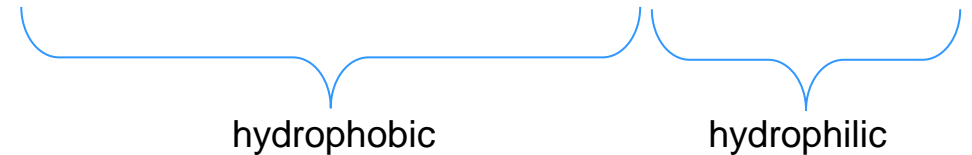
The Whats



Per- fluoroalkyl substances



Poly- fluoroalkyl substances



Surfactant

Non-Stick

The Wheres

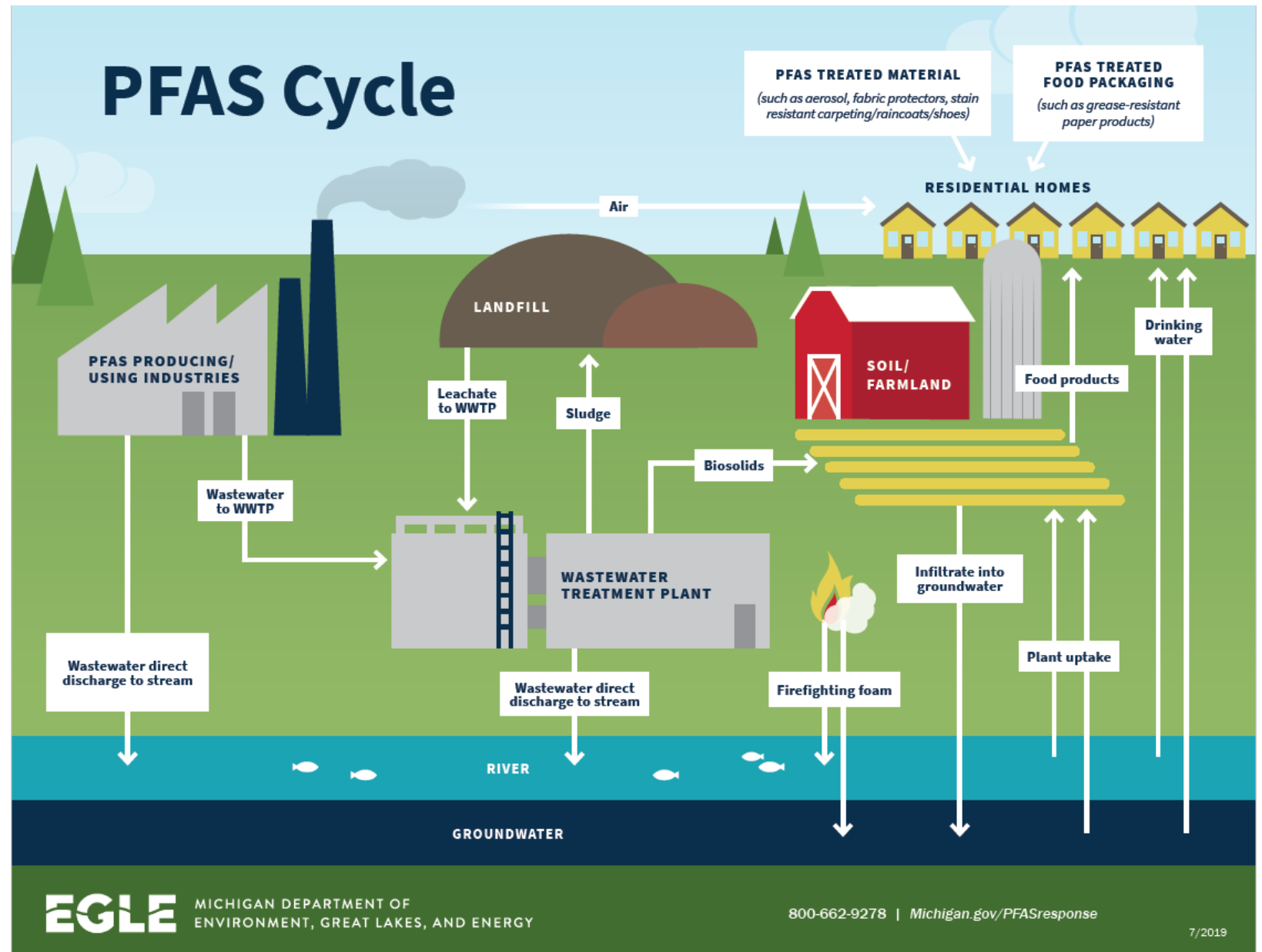
Created in the 1930s.

Used in consumer products and industrial processes since the 1940s.

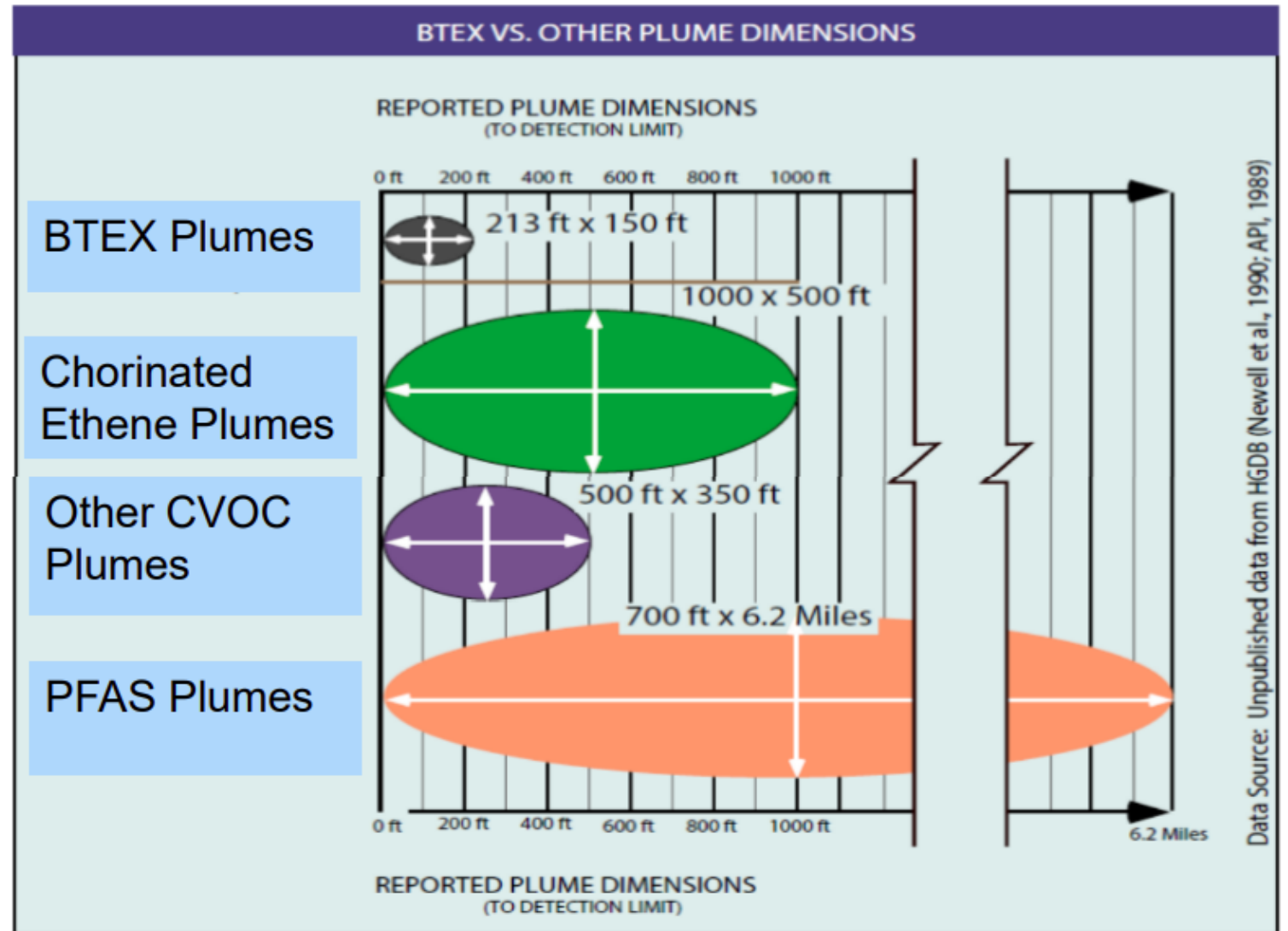
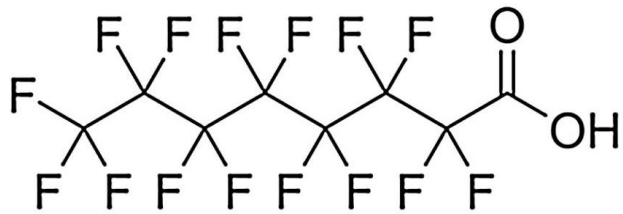
Found in the environment in the 2000s.



The Wheres

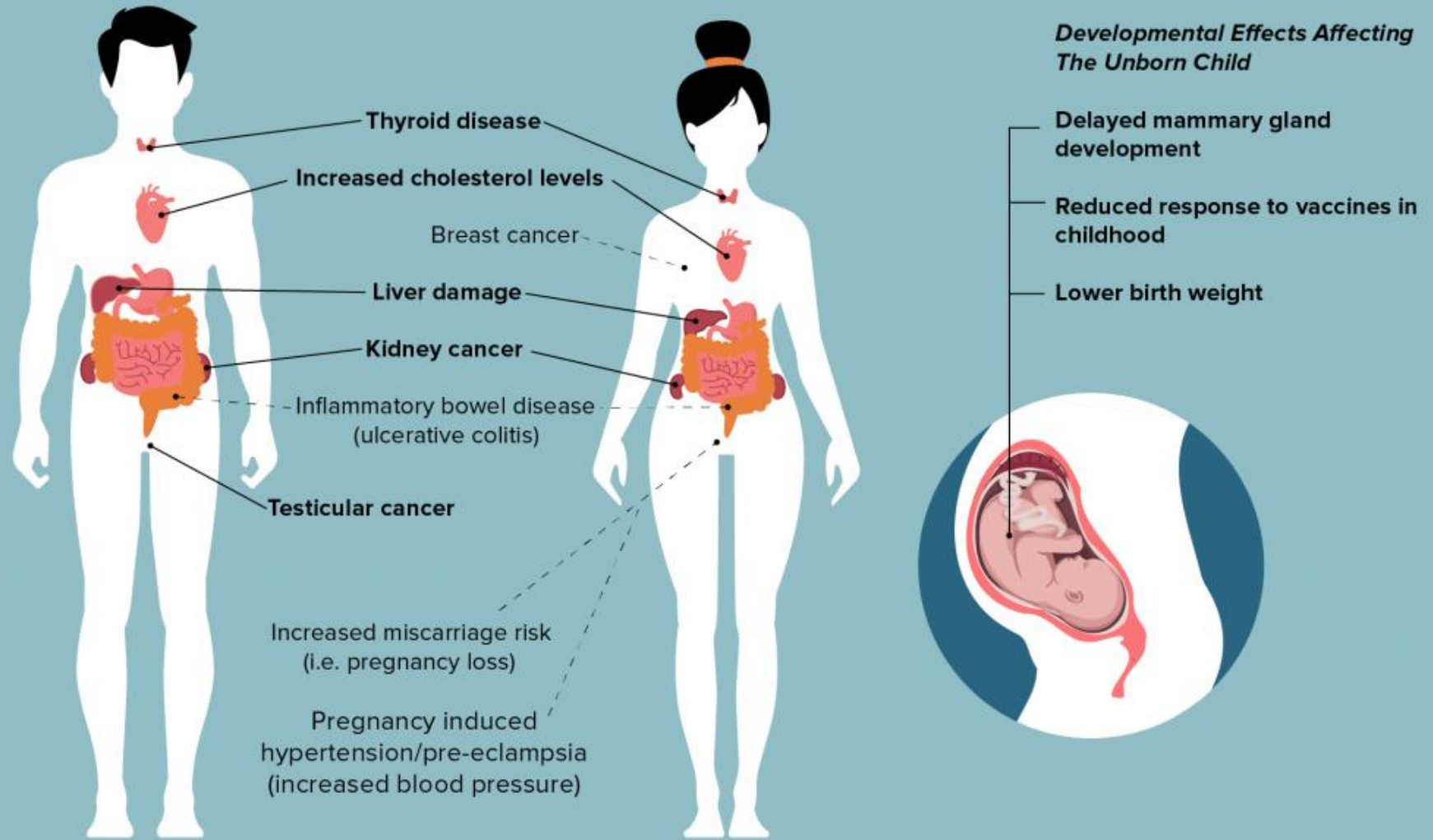


The Wheres

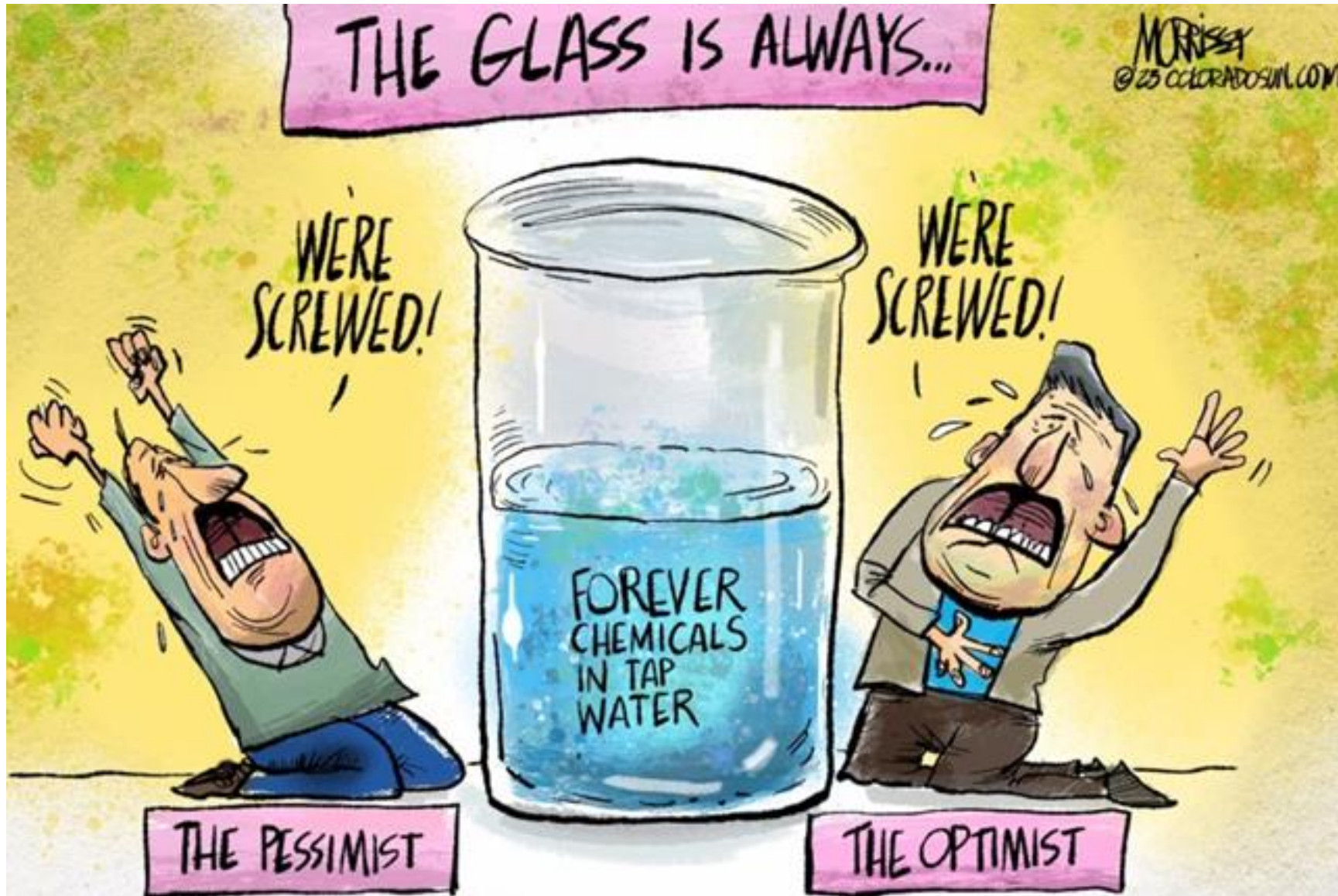


The Whys

PFAS Impact On Human Health



Source: European Environment Agency



Jim Morrissey

Regulation



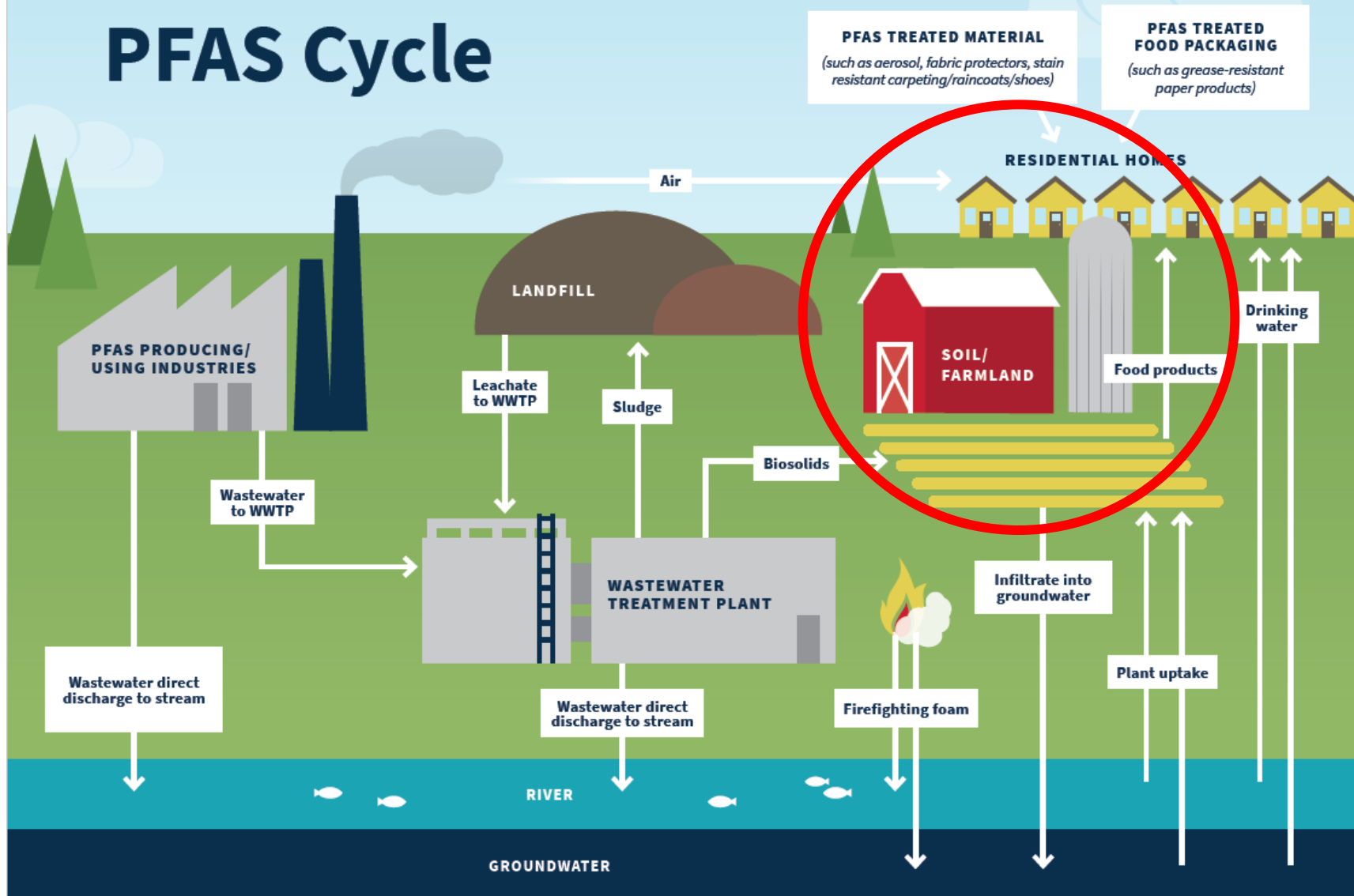
April 2024 - EPA Set MCLs in Drinking Water:

PFOA and – 4.0 ppt

PFNA, PFHxS, and HFPO-DA (GenX Chemicals): 10 ppt

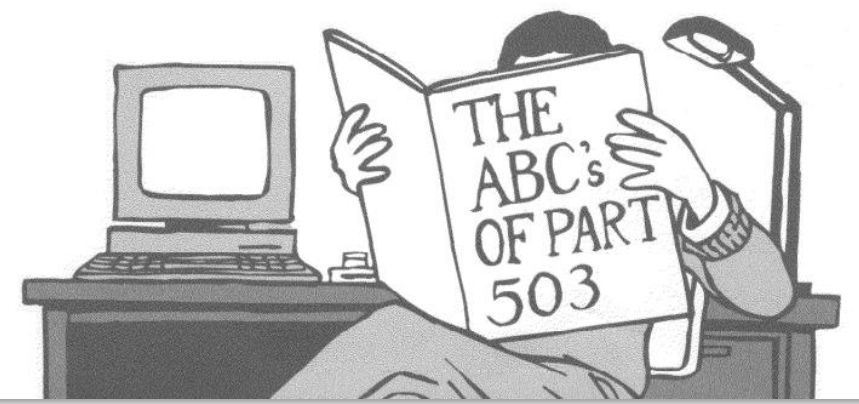
Water systems must begin monitor PFAS by 2027 and inform public of results.

PFAS Cycle





A Plain English Guide to the EPA Part 503 Biosolids Rule



Q: Does EPA believe there is an environmental or public health problem related to the beneficial use of biosolids in accordance with the Part 503 rule?

A: It is EPA's long-standing position that the beneficial application of biosolids to provide crop nutrients or to condition the soil is not only safe but good public policy, so long as preparers and land appliers comply with all applicable requirements of the Part 503 rule. Among other things, those requirements address the quality of biosolids allowed for land application, the rates of application of biosolids under various circumstances, and monitoring. Beneficial use of biosolids reclaims a

The Hows

Sample Collection

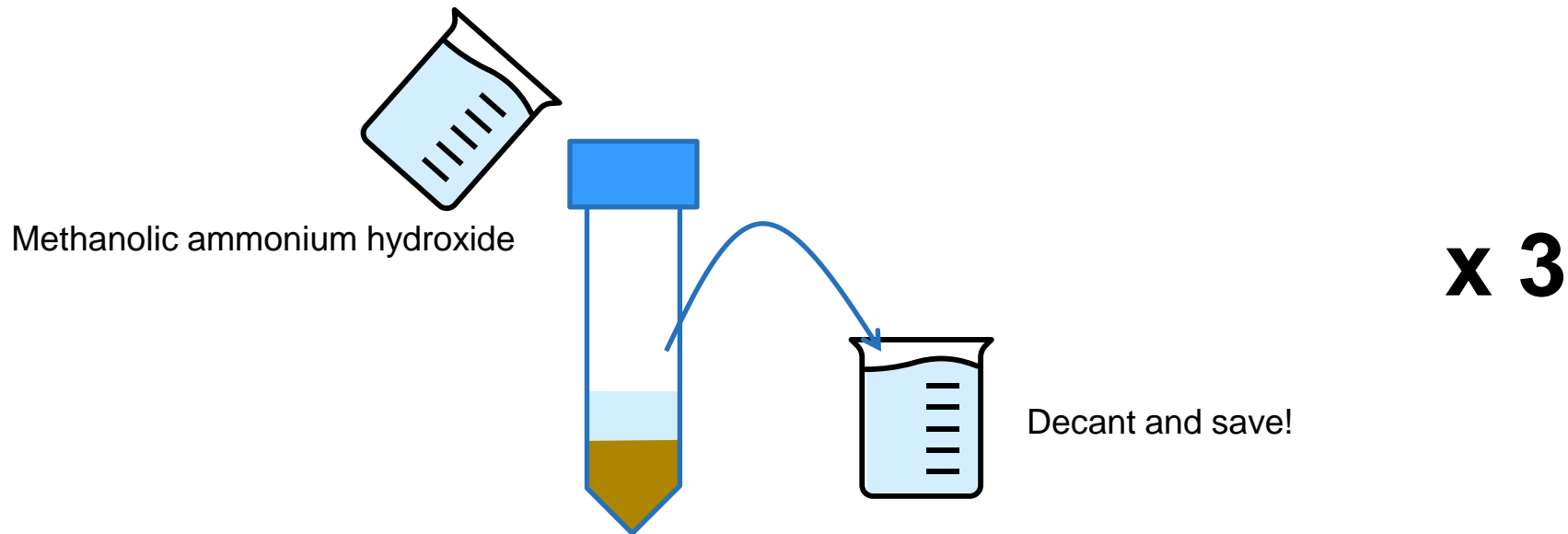
Contamination is difficult to avoid.

Sample Analysis

Matrix	Method	# of compounds
Drinking Water	EPA Method 533 and 537.1	29
Surface Waters	EPA 1633	40
	ASTM D8421-22	44
Soils, Biosolids	EPA 1633	40
	ASTM D8535-23	44
Plant Tissue	EPA 1633	40

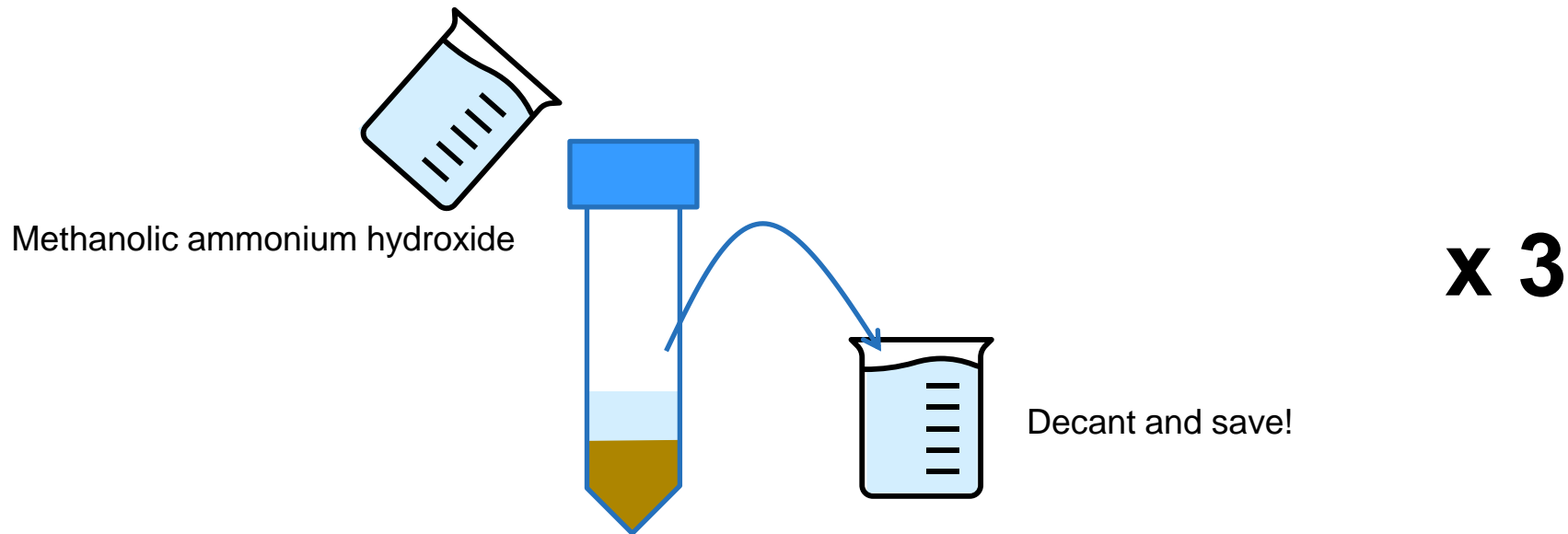
The Hows

Step	Time
Homogenize, subsample, spike, let set	30 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min



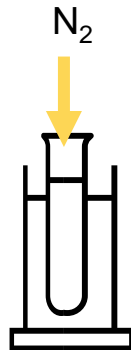
The Hows

Step	Time
Homogenize, subsample, spike, let set	30 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min



The Hows

Step	Time
Homogenize, subsample, spike, let set	30 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add graphitized carbon, shake, centrifuge, decant	15 min
Condense with N-Evap	30 min



The Hows

Step	Time
Homogenize, subsample, spike, let set	30 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add graphitized carbon, shake, centrifuge, decant	15 min
Condense with N-Evap	30 min
Solid Phase Extraction	30-60 min

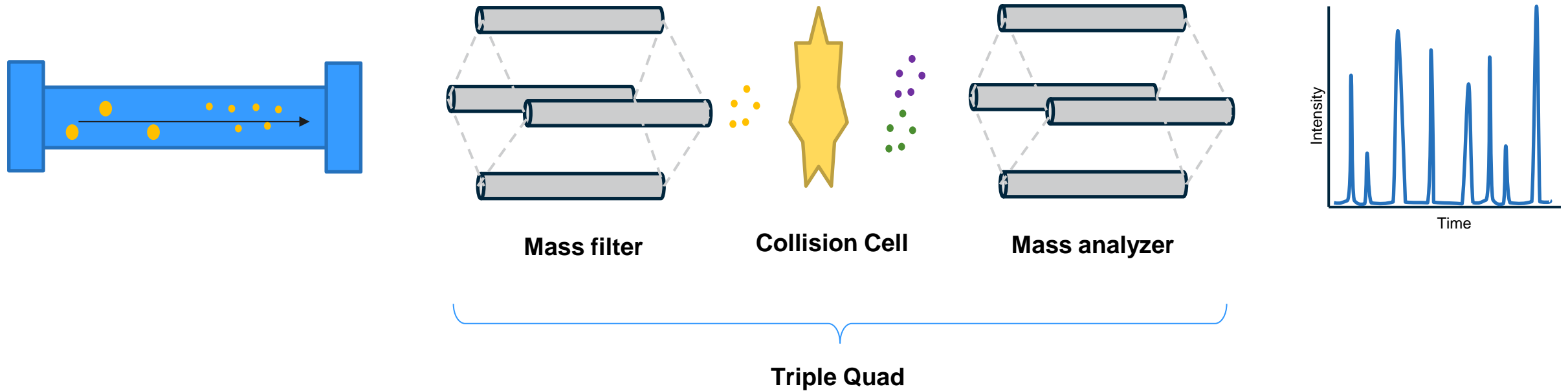


The Hows

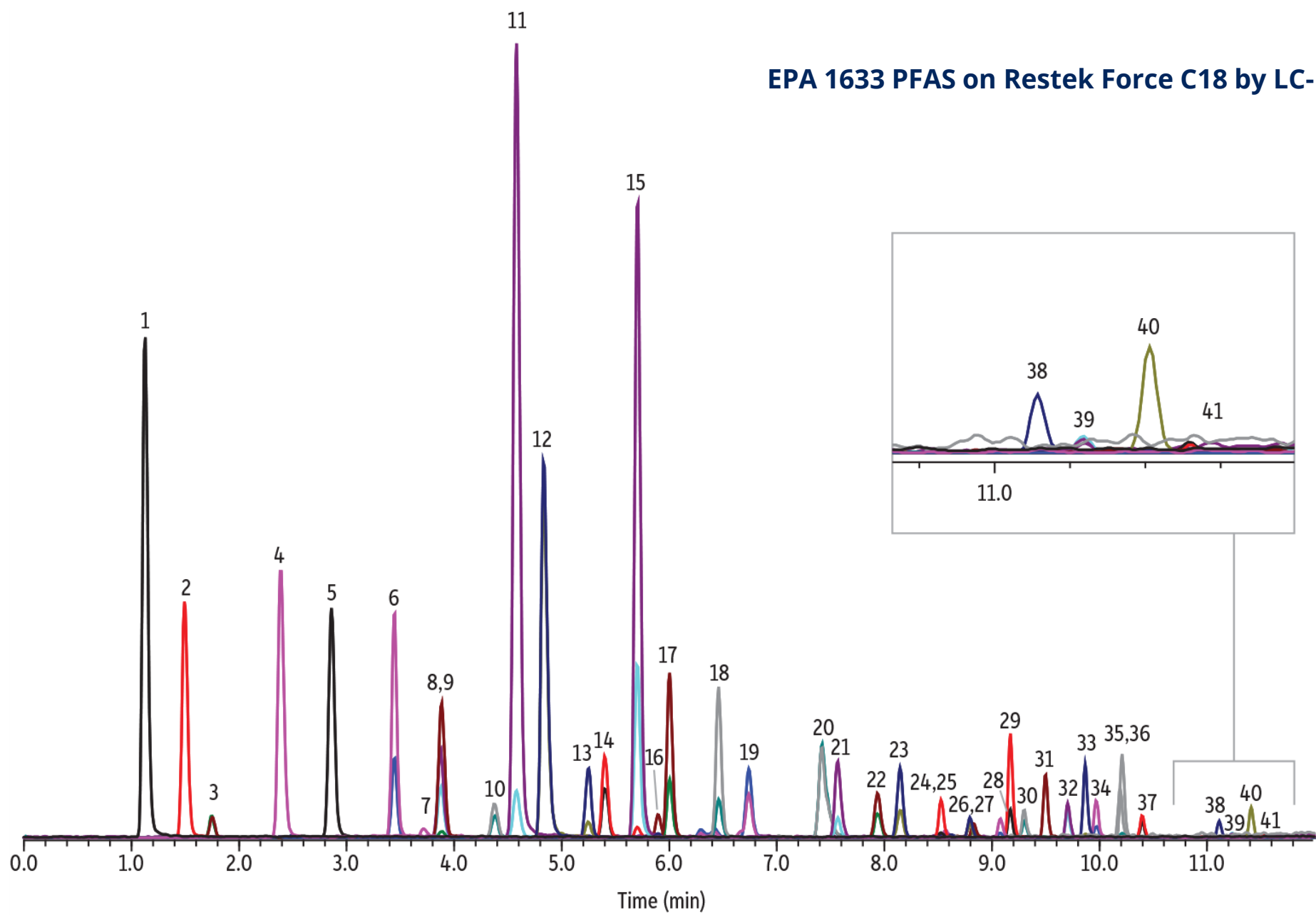
Step	Time
Homogenize, subsample, spike, let set	30 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add Methanolic ammonium hydroxide, vortex, shake, centrifuge, decant	40 min
Add graphitized carbon, shake, centrifuge, decant	15 min
Condense with N-Evap	30 min
Solid Phase Extraction	30-60 min
Total Time	225-255 min

The Hows

Liquid Chromatography Tandem Mass Spectrometry (LC MS/MS):



EPA 1633 PFAS on Restek Force C18 by LC-MS/MS



Challenges and Considerations

Dedicated, expensive, complex instruments

Contamination

Time consuming

Lab Accreditation

Misses short chain PFAS (<math><C_5</math>)

Targeted analysis



Photos courtesy of Maine Laboratories

Challenges and Consideration

Difficult analysis, dearth of labs

High ROI

Instrumentation	\$ 575,000	
Instrument PM Plan	\$ 57,500	annually
Consumables	\$ 25,000	annually
Chemist	\$ 100,000	annually
	\$ 757,500	

Sample Capacity	40	Daily
Price per sample	\$300	
Annual Revenue*	\$1,872,000	

*assuming 3-day week

Alternative Methods

F-NMR

Total Fluorine (TF) by CIC

Total Oxidizable Precursors (TOP)



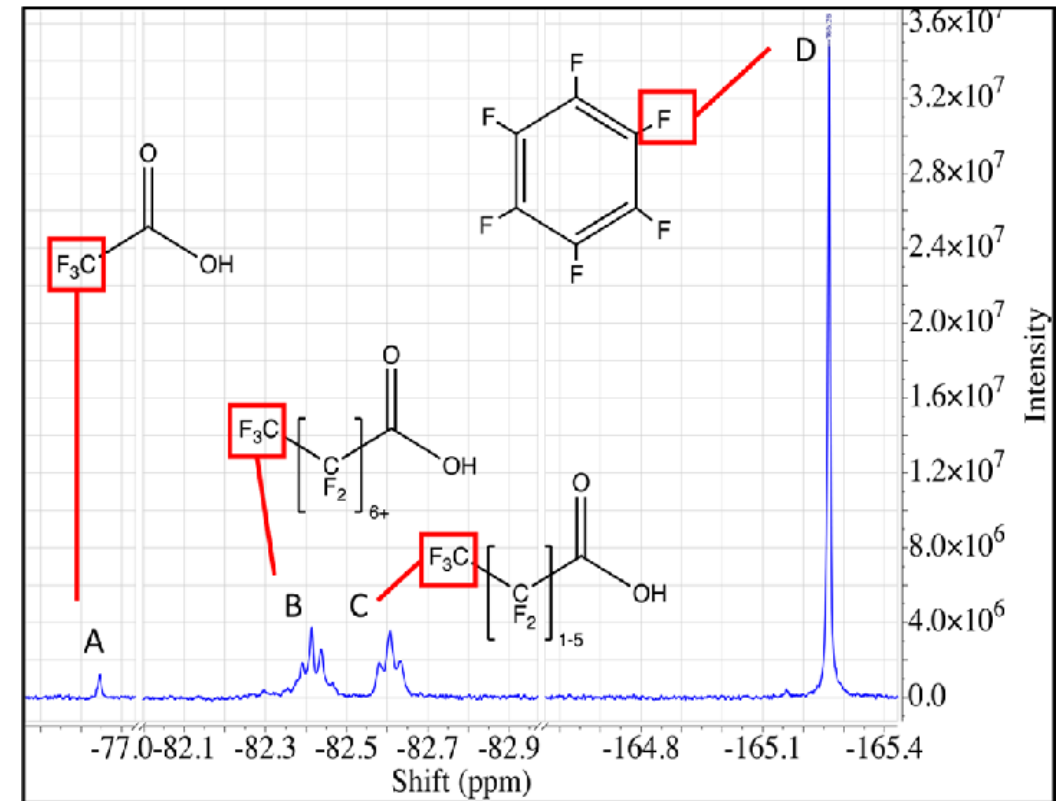
Alternative Methods

F-NMR

Reduced background

Can measure short chain PFAS

Less sensitive



Alternative Methods

Total/Extractable/Organic Fluorine by Combustion Ion Chromatography

Low price, fast, less sample prep

Cannot distinguish between other fluorinated compounds

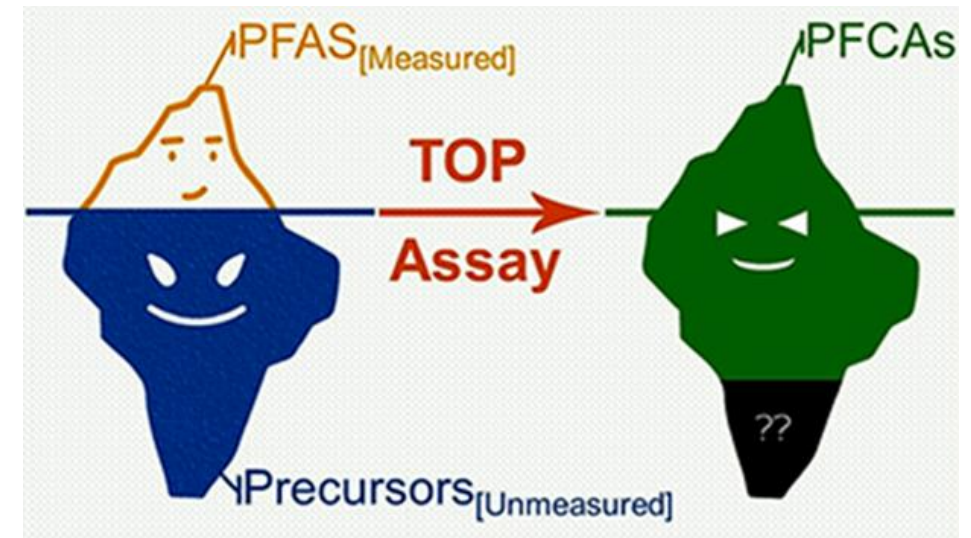
Misses short chain PFAS ($< C_5$)

Alternative Methods

Total Oxidized Precursors

Still relies on LC MS/MS technology

Conversion efficiency unknown



The Bottom Line

PFAS

- are still being used, released to environment.
- pose a threat to human and environmental health.
- pose a threat to agriculture.

Monitoring/screening efforts will continue to increase.

EPA methods are the standard.





Thank You

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