

From: [Faye Yoshihara](#)
To: [Coffin Butte Landfill Appeals](#)
Subject: LU-24-027 - Coffin Butte Landfill CUP
Date: Monday, October 13, 2025 9:57:16 AM
Attachments: [FINAL Clean Water Symposium Corvallis April 17 2025 simplified.pdf](#)

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Dear Commissioners Wyse, Malone and Shepherd, I am writing in opposition to LU-24-027, the expansion of Coffin Butte Landfill CUP. I am deeply concerned about Republic Services' efforts to dismiss community members lived experiences by labeling our combined testimonies as anecdotal. In doing so, they are attempting to minimize or dismiss the known and emerging public health concerns related to the toxic chemicals spewing, leaking and leaching from Coffin Butte landfill into our air, soil and water. However, within our community, lives deep expertise on many of these environmental issues. I would like to bring your attention to just one class of toxic chemicals, PFAS, the forever chemicals.

Dr. Jennifer Field, Oregon State University professor in the Department of Environmental and Molecular Toxicology is recognized as a pioneer and national expert with over 30 years experience, including researching the occurrence and behavior of PFAS in landfill leachate and gas. She submitted testimony to the Planning Commission (#1730). I am submitting as testimony, Dr. Field's slide presentation, for her keynote lecture "Advancing Environmental Forensics of Per- and Polyfluoroalkyl Substances" on April 17, 2025 for the Clean Water Symposium, hosted by Oregon State University. In this lecture she discusses the documented issues of PFAS, landfill leachate & gas emissions and wastewater treatment plants & effluents. Her research has documented the persistent nature of PFAS from landfill leachate, which is known to continue for 40 years.

Please uphold your Planning Commission's unanimous denial of the Conditional Use Permit for LU-24-207. For the health and safety of Benton County residents and all those who live downstream, please vote to deny.

Thank you,
Faye Yoshihara
37461 Soap Creek Rd.
Corvallis, OR 97330

Advancing Environmental Forensics of Per- and Polyfluoroalkyl Substances

Clean Water Symposium
Oregon State University
April 17, 2025

Jennifer A. Field, Ph.D.
Department of Environmental and Molecular Toxicology

Outline

- What makes PFAS special?
- PFAS uses
- Landfill leachate & gas emissions
- Wastewater treatment plants & effluents
- PFAS forensics
- Acknowledgments



Outline



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College of Agricultural
Sciences

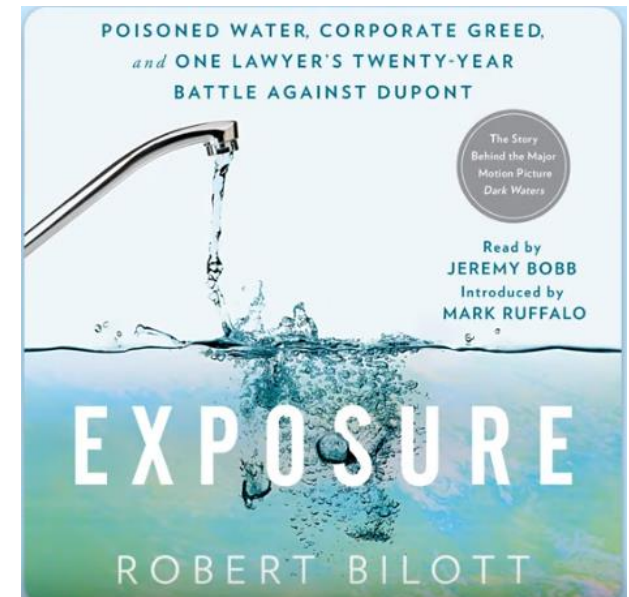
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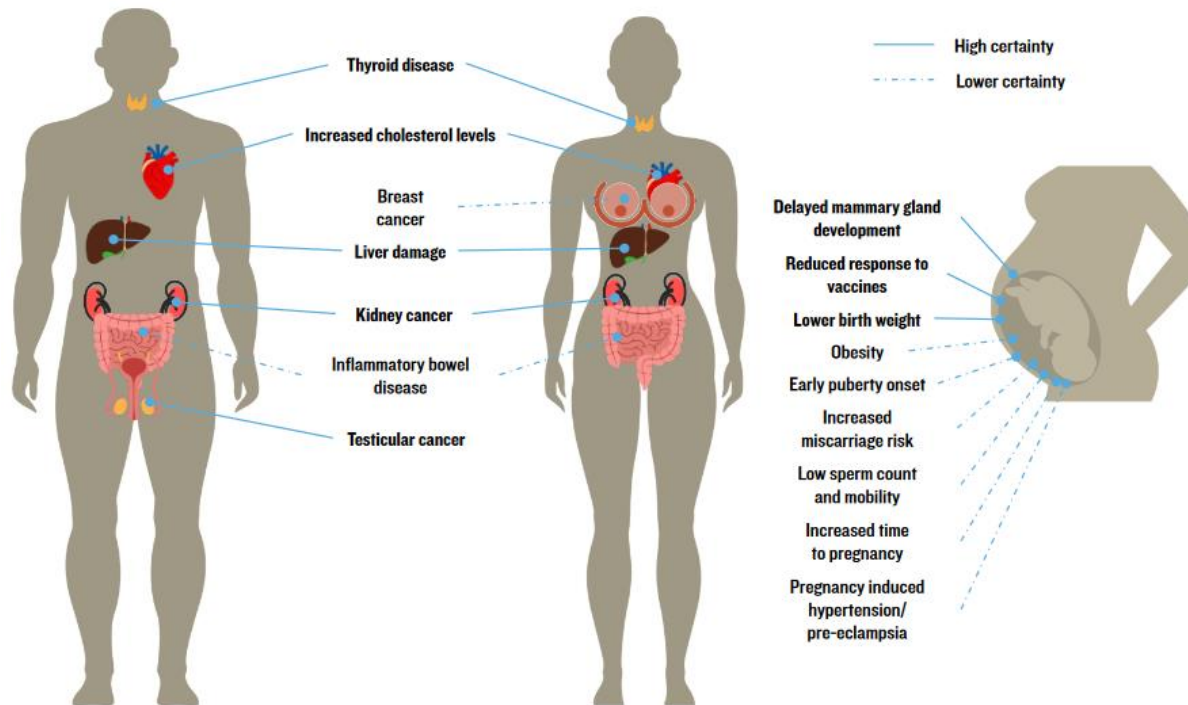
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PFAS in the Press

- Household word around the world
- Local, national, international news media, movies, books



Human Toxicology



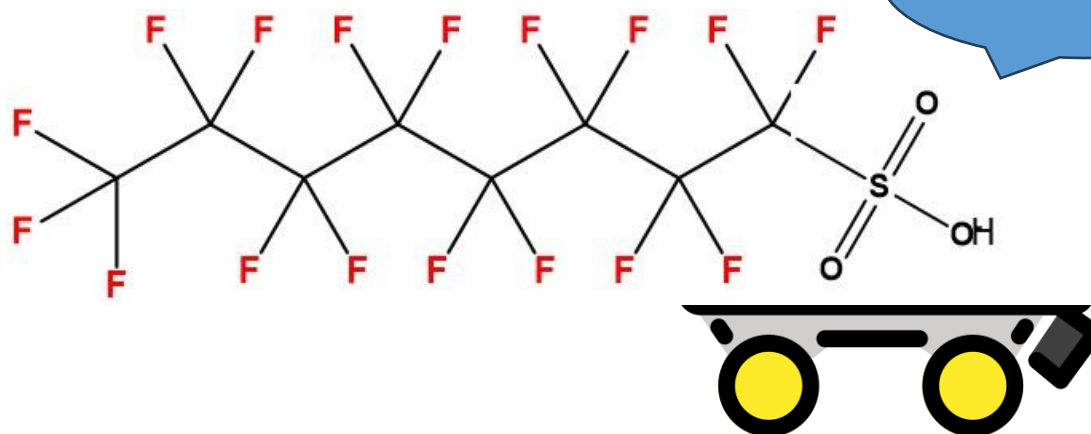
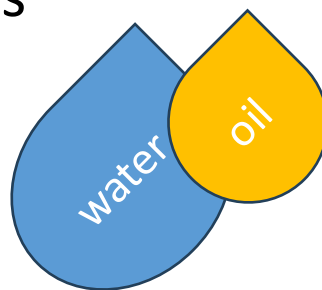
- PFAS half lives: days to years
- PFAS bind to protein
 - blood-rich tissues (liver, kidney, and blood)
- PFOA & PFOS have been shown to induce tumors in rodents and fish



Jamie DeWitt

PFAS Anatomy & Nomenclature

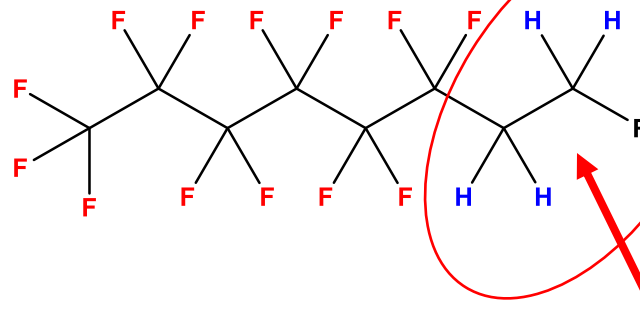
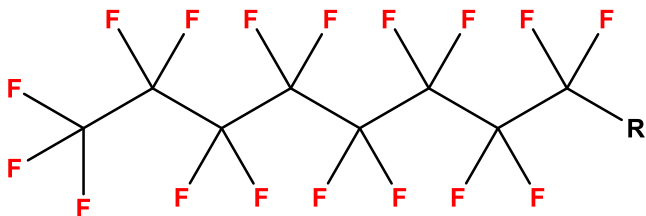
- (per)**F**luorinated tail
 - low van der Waal forces¹
- 'R' group
 - source of PFAS variety



¹Goss and Bonner 2006 J Phys Chem A

PFAS Anatomy & Nomenclature

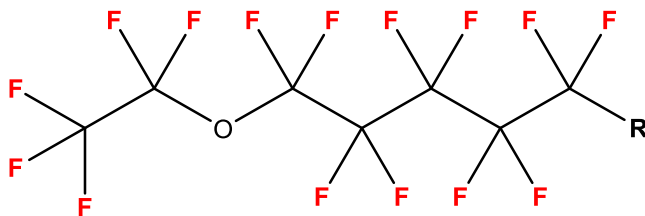
- Perfluorinated vs. polyfluorinated...



... a big difference to a mass spectrometer!!

'Weak spot'

- Similar function, avoid patents
- Adds a 'weak' spot...
- Slip in an oxygen....

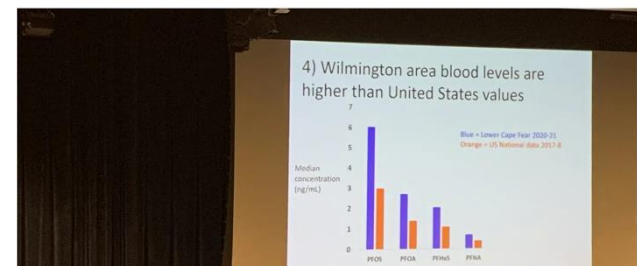


GenX study finds Chemours-specific chemicals in residents

A recent GenX exposure study found high levels of four highly fluorinated compounds in volunteers living in the Cape Fear River basin.

by Coastal Review Online
December 12, 2022

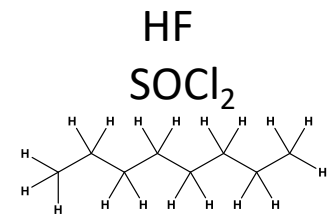
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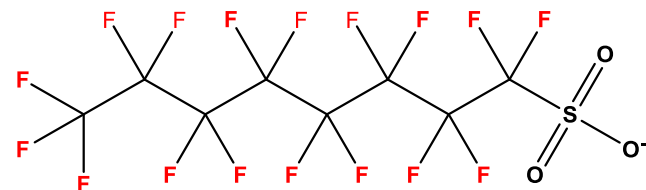
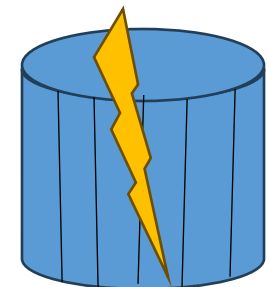


How PFAS are Made

- 3M electrofluorination chemistry
 - Hydrocarbon feedstock
 - ✓ biodegradable
 - HF (handle me with care!!)
 - Products = PFOS + a lot of by products
 - ✓ not biodegradable



It's me again
(PFOS)!



Elk photo: David J. Stang (Wikimedia Commons)



PFAS as 'Forever Chemicals'

- Microbes can't use perfluorinated PFAS for carbon or energy

- puts the 'P' in Persistent Bioaccumulative and Toxic criteria (Stockholm Convention)
- persistence alone basis for regulation¹

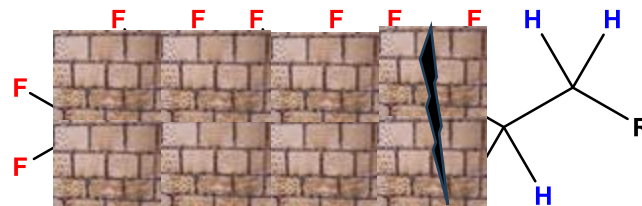
PBT chemicals,
Maybe not a
great idea....



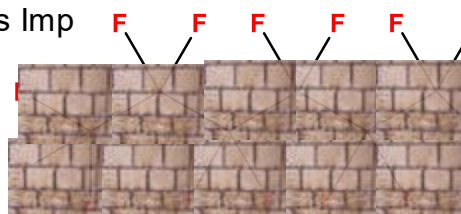
- Polyfluorinated 'spacer' + R (C, N, P, S)



you can call me
a 'precursor'
(not forever)



¹Cousins et al. 2019 Environ Sci Process Imp



linear

back to a forever
chemical...



Precursors to Persistent PFAS

Interstate Technology and Regulatory Council – a valuable resource!

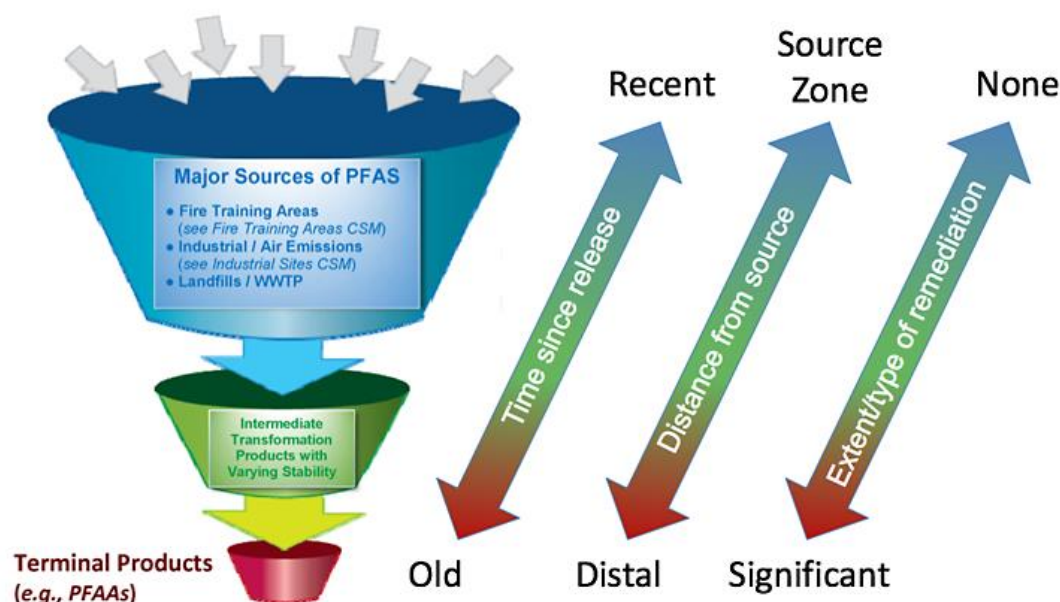


Figure 5-4. Illustration of precursor transformation resulting in the formation of PFAAs.

Source: L. Trozzolo, TRC, and C. Higgins, Colorado School of Mines. Used with permission and based on [This Photo](#) by Unknown Author is licensed under [CC BY-SA](#).



Outline



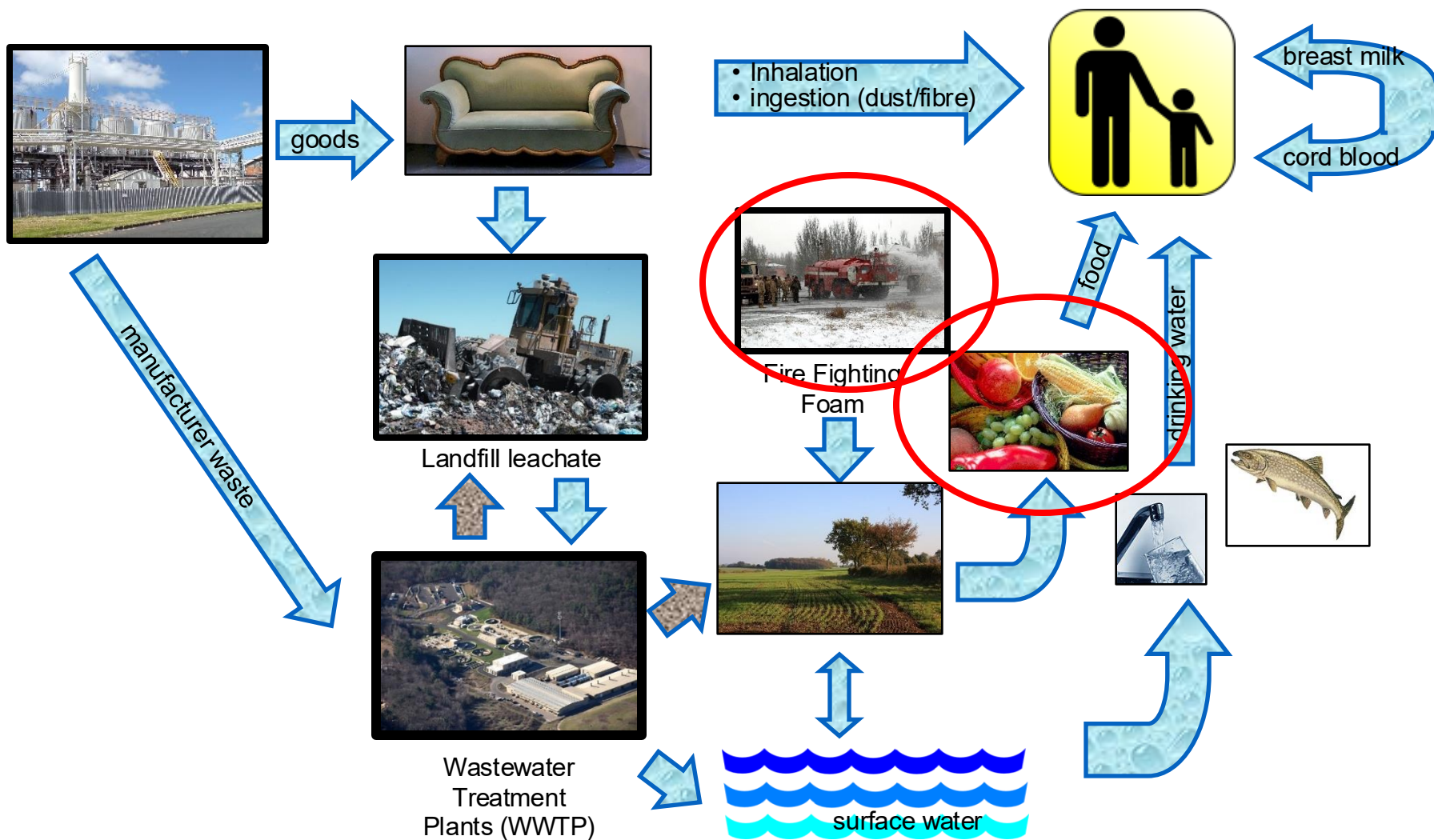
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- What makes PFAS special?
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PFAS Uses & Routes of Exposure

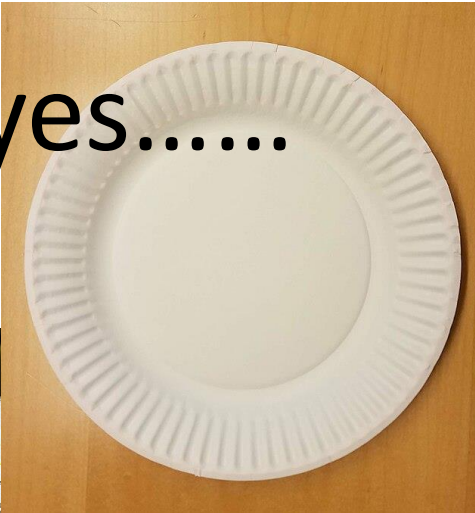


Adapted from Oliaei 2013, Environ Pollut Res; By Ingolfson - Self-photographed, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=3746726>; By Loriots_Sofa_(Homage_in_Bonn).jpg: Elke Terstegen (el-ter)derivative work: Miss-Sophie - This file was derived from: Loriots Sofa (Homage in Bonn).jpg; CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=22147686>
 By Ezra Katz - File:ParentChildIcon.svg, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=19136021>; By Bob Jones, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=13130171>; By USEPA Environmental-Protection-Agency - Water pouring from a faucet into a clear glass cup., Public Domain, <https://commons.wikimedia.org/w/index.php?curid=51969746>
 By Unknown photographer - This image was released by the National Cancer Institute, an agency part of the National Institutes of Health, with the ID 2451 (image) (next), Public Domain, <https://commons.wikimedia.org/w/index.php?curid=24047554>; Public Domain, <https://commons.wikimedia.org/w/index.php?curid=2144107>; By Master Sgt. Daniel Nathaniel, U.S. Air Force - <http://www.manas.afcent.af.mil/>; gallery; exact Source, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=4209968>



So now, let's get personal...

and yes.....



...even toilet paper



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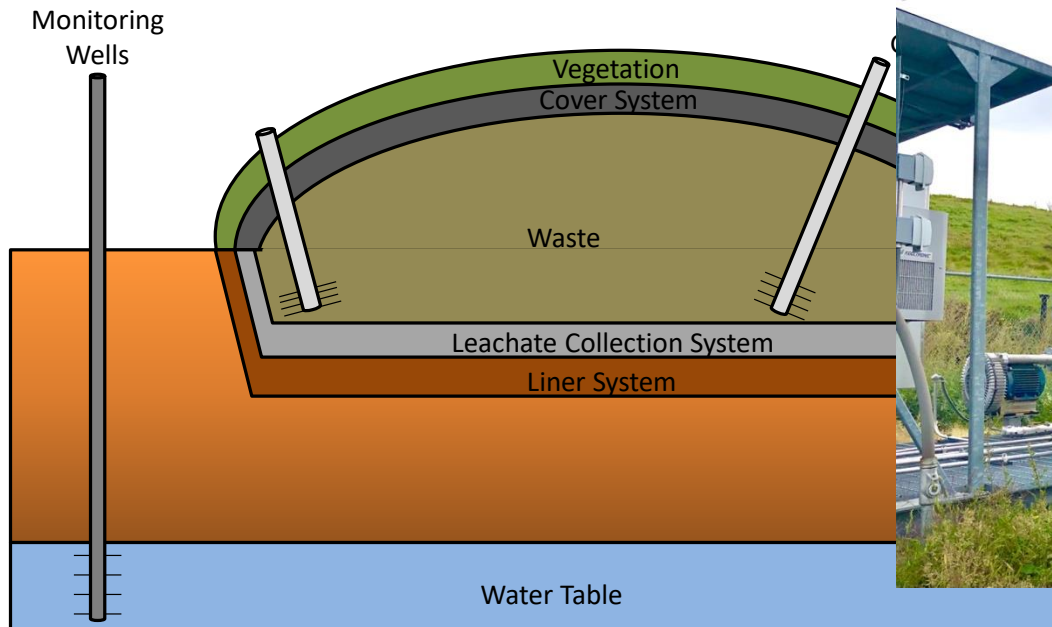
Ideal Landfill

- Engineered system: isolate waste from environment

...Real Landfills



Mort Barlaz



Florentino de la Cruz



US National Survey of Landfill Leachate

- 17 municipal solid waste landfills
- 41 Cells (1–6 cells/landfill)
- 1–3 samples per cell

	TOC (mg/L)	Conductivity (mS)
Leachate	7.5 – 22,000	1.2–18 (SeaH ₂ O=55)
WWTP effluent	15	0.9

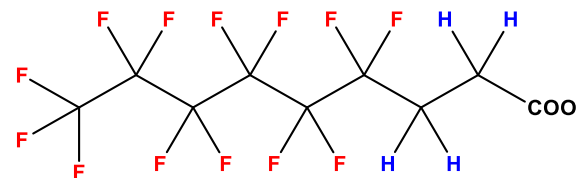


Landfill Leachate

- No such thing as a 'blank' landfill leachate (they all contain PFAS)¹⁻³
- 2nd most concentrated (ug/L) PFAS
 - No.1: AFFF groundwater (μg/L-mg/L)
 - No. 3: WWTP effluent (ng/L)
 - much higher than EPA MCLs (4-10 ng/L)
- Short-chain PFAS most abundant regardless of refuse/cell age (*leachate*)
- Transformation products, some unique (diagnostic) to landfills
- Long residence time (decades)
- PFAS leach for 40 yr



its me again...!
(5:3 FTCA)



Landfills are long-term PFAS sources

Where does all that leachate go?

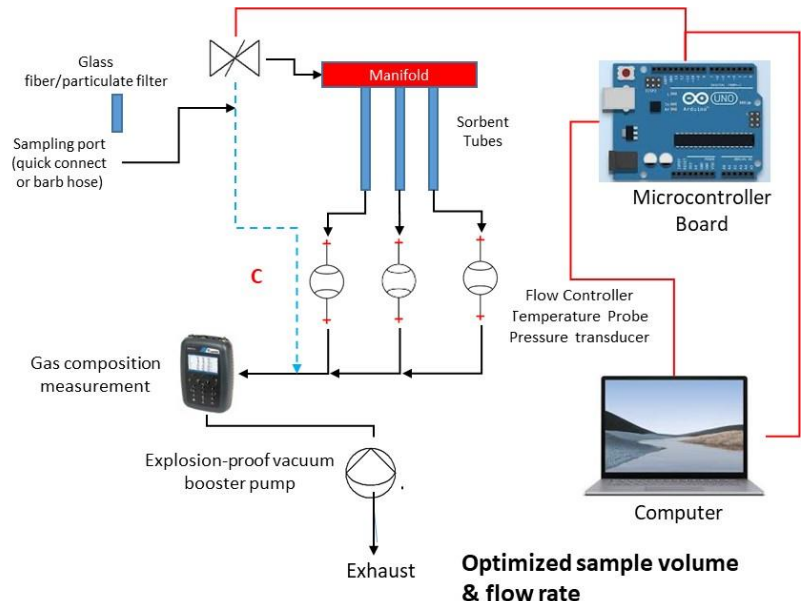


Landfill Gas Sampling

- 30 sites throughout the US
- Annual precipitation (arid to wet)
- Waste Types
 - municipal, construction, demolition, ash, biosolids
- Disposal: 1950s – recent
- Waste Decomposition State
 - fresh (< 5 yr) to old (> 10 yr)



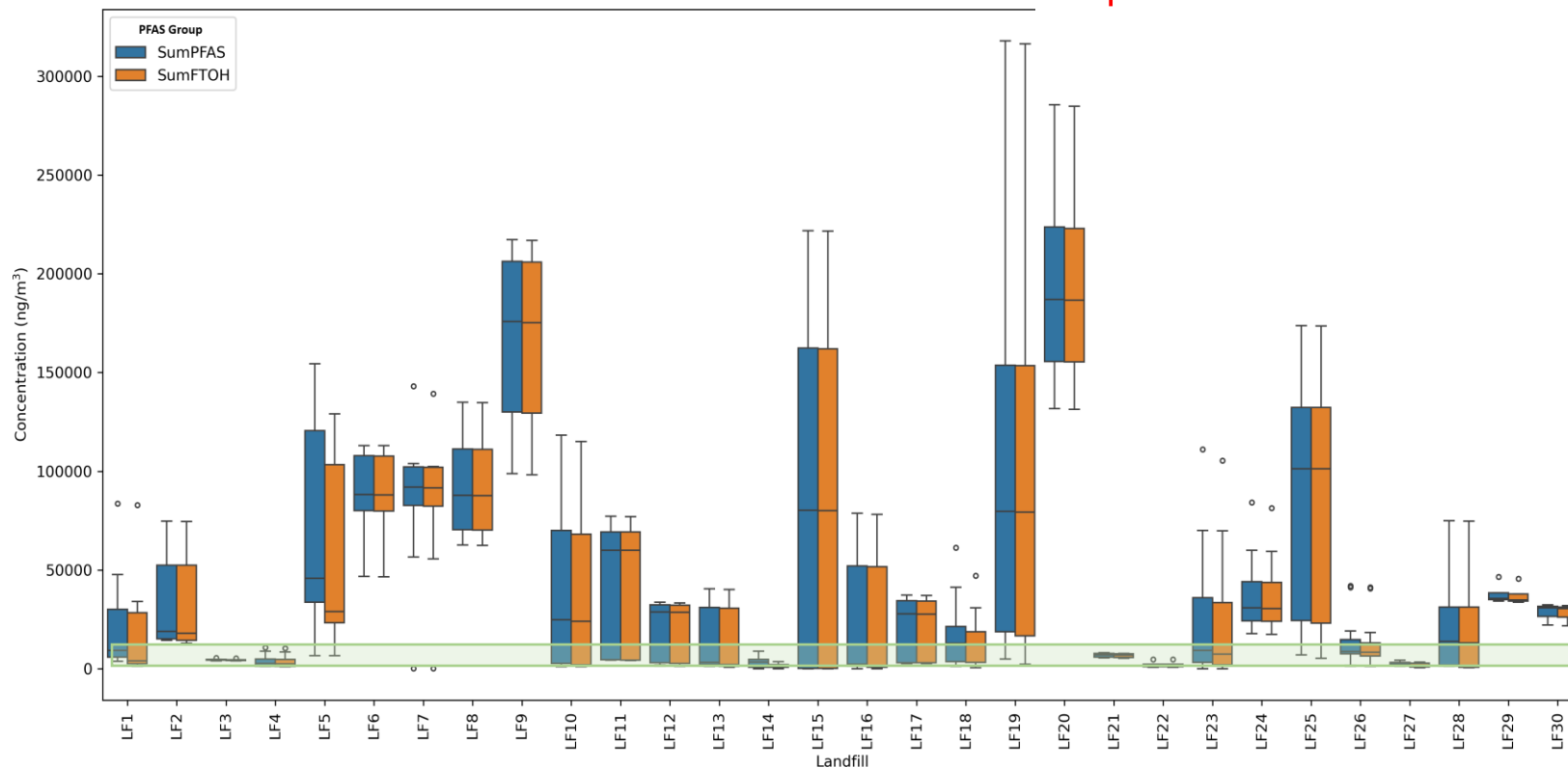
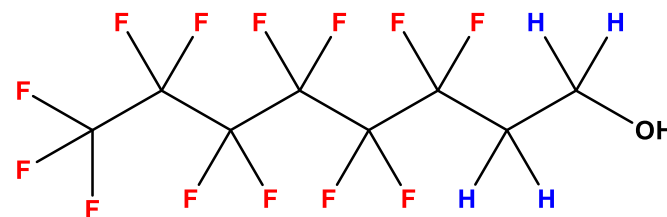
Main Header



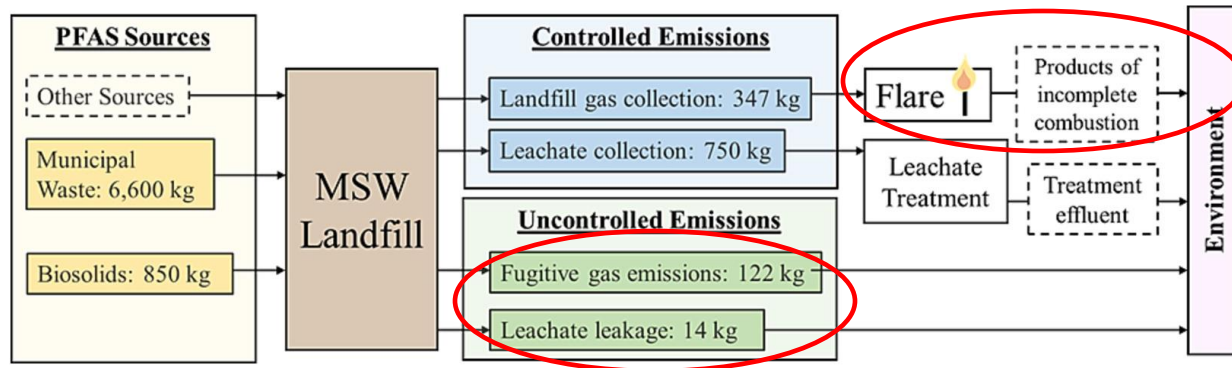
PFAS in Landfill Gas

- FTOHs - major PFAS
- Orders of magnitude above ambient air
- FTOHs degrade to PFOA

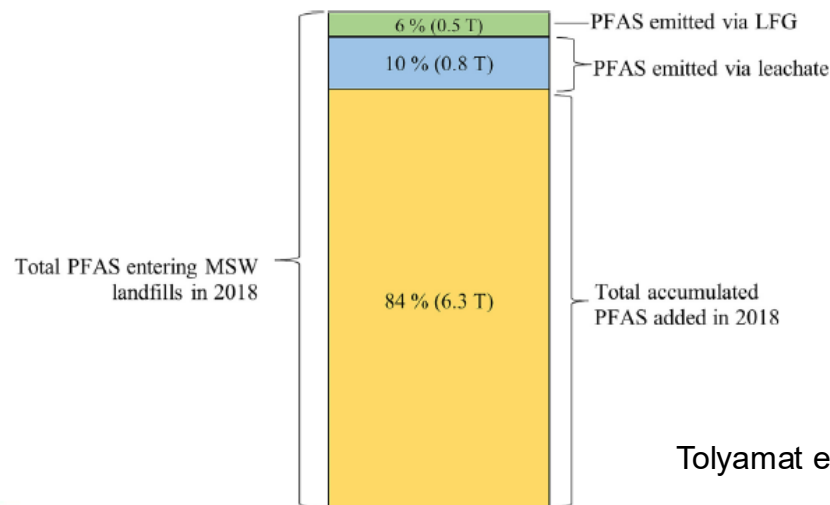
I'm volatile



US Landfill Inventory



- 11% of emissions are uncontrolled
- few data on fate during flaring
- leachate and gas emissions (kg/yr) are equal



Tolyamat et al. 2023 Sci Tot Environ

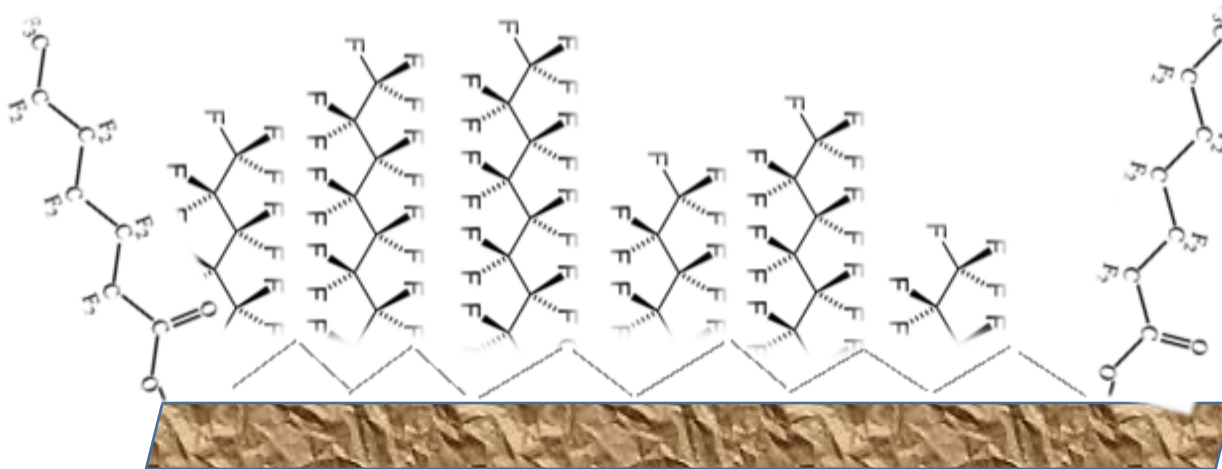
Model Landfill Reactors





Reactor Studies

- Loss of unbound residuals
- Substrates (paper) degrade, further PFAS release



¹Kim et al. 2015 ES&T; ²Allred et al. 2015 ES&T; ³Lang et al. 2016 ES&T



Outline

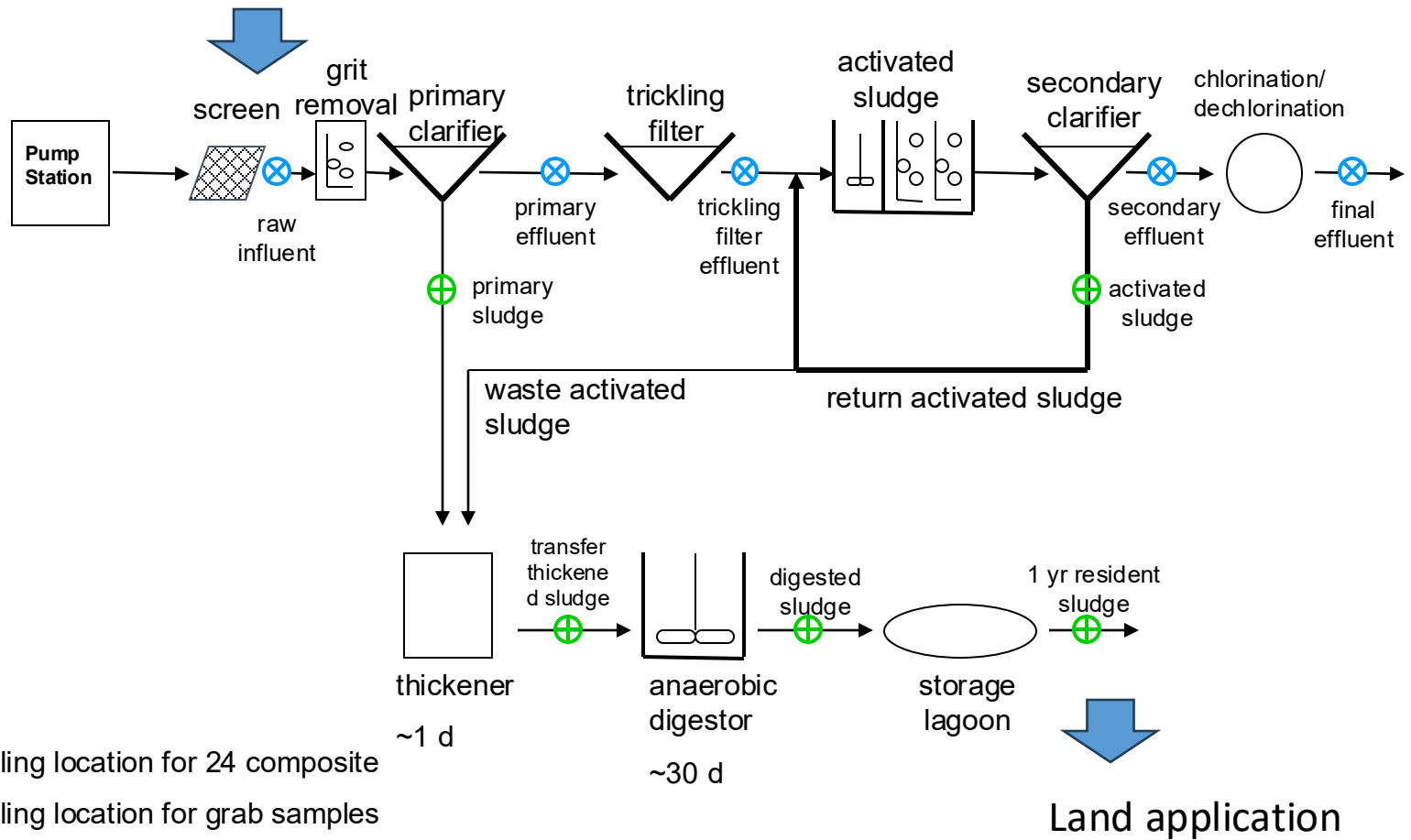
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WWTP Mass Flow Study

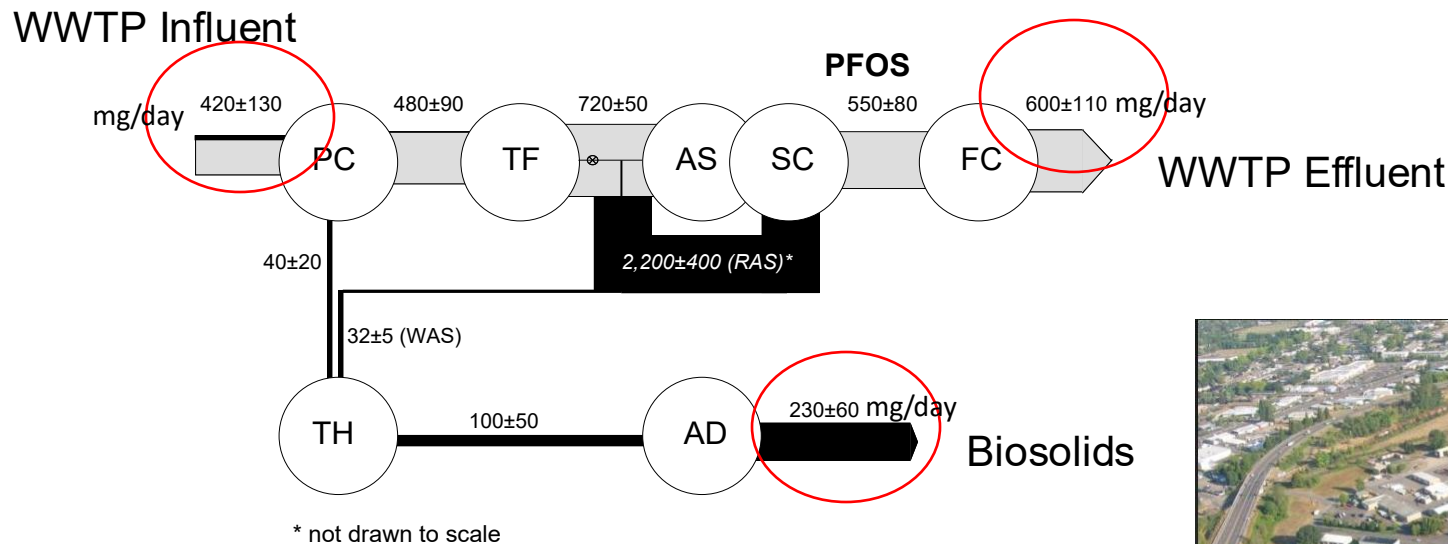


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PFAS Mass Flow

- When it come to PFAS.... what goes in ...goes out¹
- PFAS 'exported' to surface water & biosolids land applied



- Ineffective for removing PFAS
- Leachate dilution increases volume and mass requiring treatment



A Recent Decision

CORVALLIS
Gazette-Times

Search Gazette-Times



E-edition News Obituaries Sports Opinion Puzzles Lifestyles Public Notices Jobs Wildfires 57° Sunny

ALERT FEATURED TOP STORY

Corvallis to stop accepting chemical soup from Coffin Butte Landfill

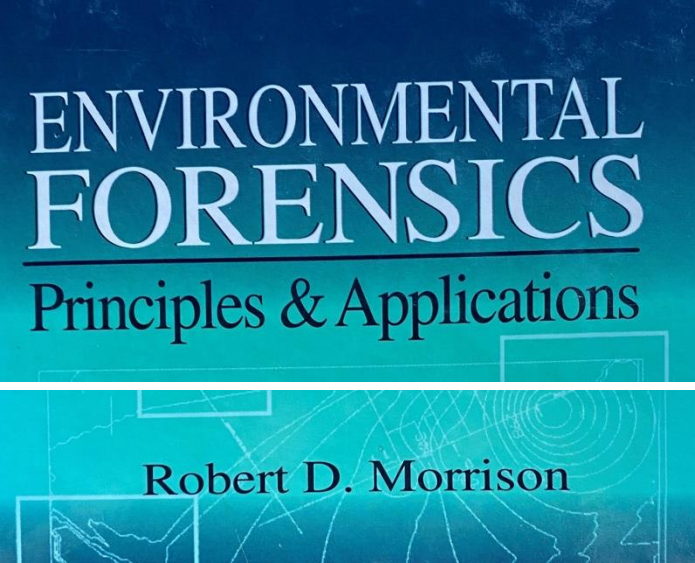
Ella Hutcherson Oct 24, 2024 Updated Apr 9, 2025 0



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Environmental Science

Occurrence
Transformation
Transport

“Systematic evaluation of environmental information used in litigation”
Morrison 2000

Analysis of evidence
at crime scene

Forensics Science

Environmental Forensics



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Legal frameworks: seeking remedy or compensation

- cost allocation (who is responsible)?
- site investigation for property transfer
- insurance litigation –identify all responsible parties, equity of liability allocation
- toxic tort – probability of chemical exposure caused injury



¹Murphy, B.; Morrison, *Introduction to Environmental Forensics*; Hester and Harrison 2008 *Environmental Forensics*; Photo Credit:Content Providers(s): CDC/ - This media comes from the Centers for Disease Control and Prevention's Public Health Image Library (PHIL), with identification number #1530;Mampato - Own work, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=6532914>

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Sources & Fingerprinting

Goal: establish relationship between contaminant sources and impacted site

Diagnostic features:

- need fingerprinting of sources to identify diagnostic features with potential specificity
- *ideally* independent or resistant to weathering/aging and impacts of transport
- ultimately placed into context of mixing & dilution, combined with (bio)transformation and transport
- fingerprinting leads to....



¹Hester and Harrison 2008 Environmental Forensics; Image credit [https://commons.wikimedia.org/wiki/File:Uncle_Sam_\(pointing_finger\).png](https://commons.wikimedia.org/wiki/File:Uncle_Sam_(pointing_finger).png);
https://commons.wikimedia.org/wiki/File:Fingerprint_Whorl.jpg



PFAS Sources in Watersheds

Correlations: PFAS concentrations & sources

- number of military bases
- wastewater treatment plants
- municipal airports

¹Hu et al. 2016 Environ Sci Technol Lett



PFAS Sources in Watersheds



PFAS Source Data

- Separate studies
- Limited number of PFAS
- Different analytical methods
- Smaller/variable data sets
- Data not analyzed by same method or only traditional statistical approaches^{1,2}



Gerrad
Jones



Boris
Droz

Challenge: compare data across methods, locations, time

¹Benotti et al. 2020 Environ Forensics;²Kibbey et al. 2020 Chemosphere

PFAS Sources

- AFFFs (1974-2021)
- AFFF-impacted groundwater (1988-2020)¹
- Landfill leachate (1966-2013)^{2,3}
- Biosolid-soil leachate (2008-2016)⁴
- Effluents
 - ✓ WWTP (2019)⁵
 - ✓ power generation (2021)
 - ✓ pulp and paper mill (2021)⁶



¹Backe et al. 2013 Environ Sci Technol; ²Benskin et al. 2012 Environ Sci Technol; ³Allred et al. Environ Sci Technol; ⁴Sepulvado et al 2011 Environ Sci Technol; ⁵Schultz et al. 2006 Environ Sci Technol

PFAS Source Fingerprinting

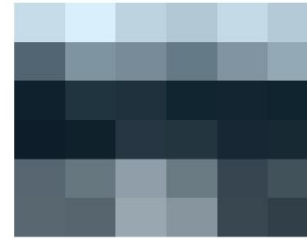
PFAS fingerprinting

- Target PFAS (EPA methods) common to many sources/processes
- Adding 'suspect' PFAS (no standard) adds information
- High resolution datasets contain *much more (100x)* information
- Multivariate statistical & machine learning workflows needed for better resolution & prioritization

Applications

- PFAS forensics & source apportionment

Target PFAS
(EPA methods)



Target + Suspect
PFAS



All 'features' increases
resolution



Mt. Hood



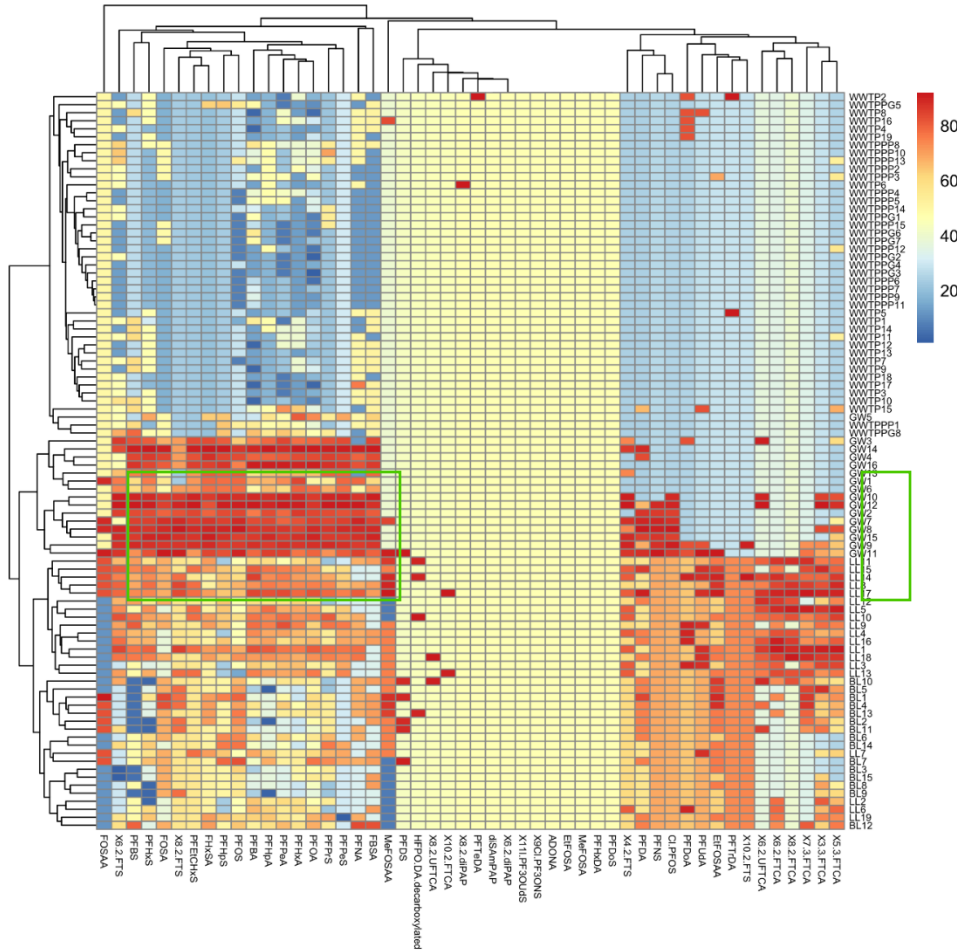
Mt. Bachelor



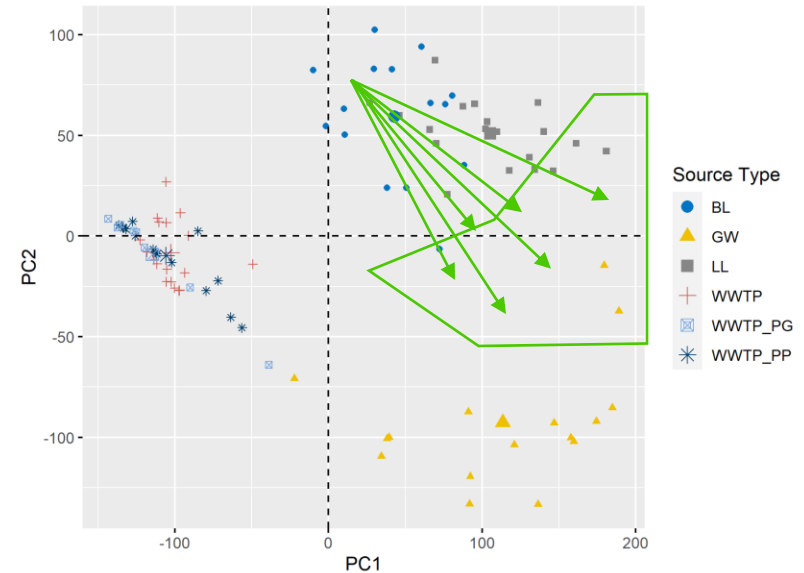
Mt. St. Helens

Multiple Source Fingerprinting

Hierarchical Clustering Analysis



Principal Component Analysis



Joseph et al. Environ. Sci. Technol. 2023

Current work: adding all features in data set further increases ability to differentiate sources

Conclusions

- PFAS are associated with innumerable materials and products
- Product use and disposal results in sources with unique fingerprints that enter the air and terrestrial environment
- Transport, transformation, metabolism alters signatures, next step in development of forensics tools for source apportionment

Acknowledgements

- Environmental Security Technology Certification Program (**ESTCP**) and Strategic Environmental Restoration and Development Program (**SERDP**)



Thank you!

