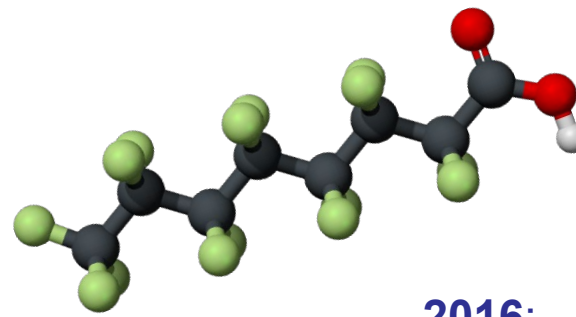


# Selected History of PFAS Per- and Polyfluoroalkyl Substances



**1934:**  
First form of PFAS, IG Farben, German Chemical Conglomerate

**1945:**  
3M began manufacturing PFOA for stain resistant carpet, AFFF, and Teflon. In 1953 invented PFOS, used in Scotchguard, AFFF

**2001:** Discovery of Teflon/PFOA in drinking water near WV DuPont plant. Civil suit resulted in \$670 Million payout

**2006:**  
EPA initiated reduction in long chain production by 8 producers

**2016:**  
US EPA issues Lifetime Health advisory, PFOA and PFOS, 70 ppt in drinking water

**2024:**  
US EPA issues limits of 4 ppt of PFAS in drinking water. Declares PFOA and PFOS hazardous chemicals

**2025:**  
3M to discontinue all PFAS production and use by end of 2025

**1938:**  
First PFAS compound used in U.S., PTFE by DuPont.

**1951:**  
DuPont opens Parkersburg, WV plant, cookware and fabrics

**1970s:**  
Detection of PFAS in blood of workers

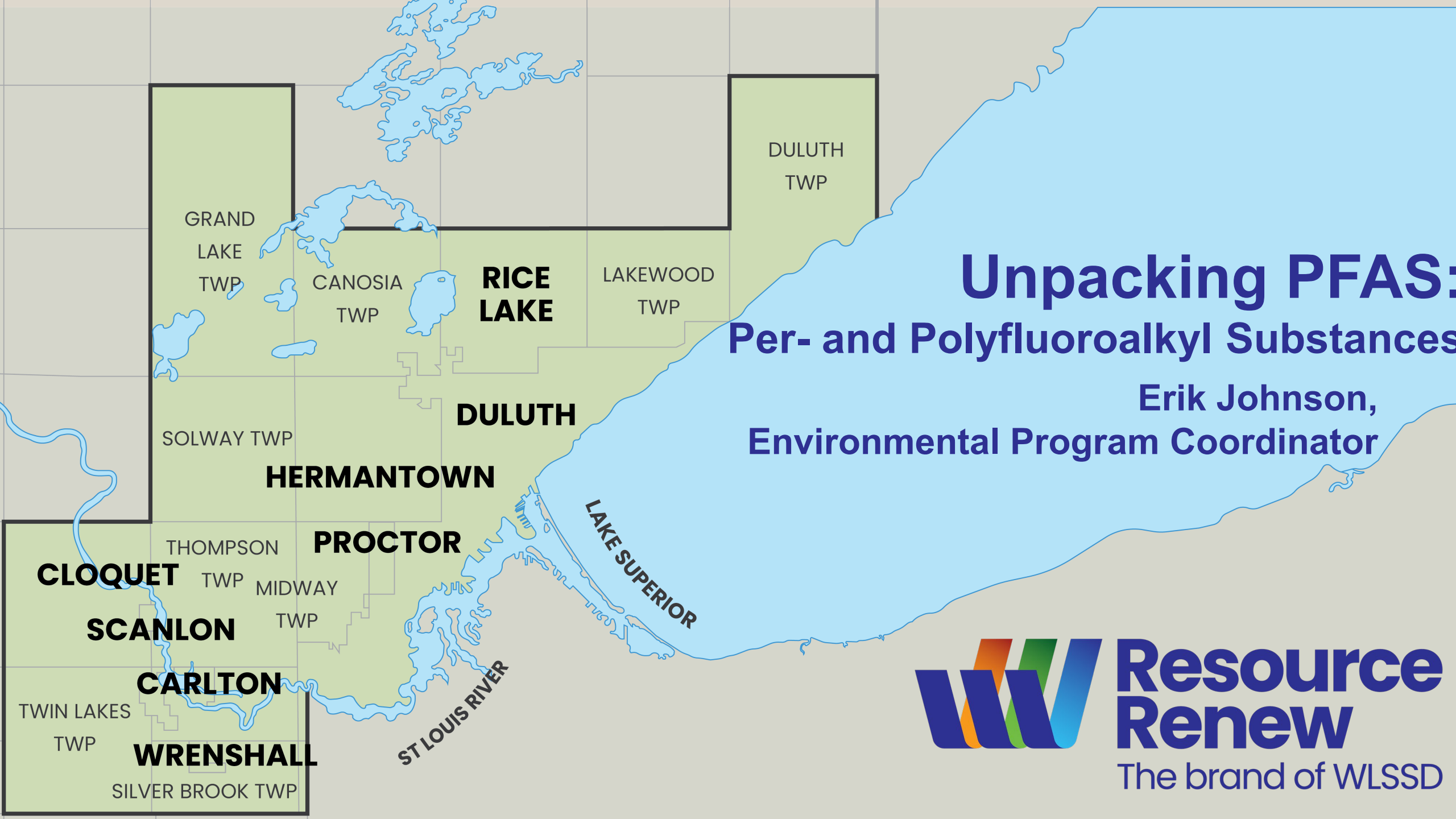
**1990s:**  
Detection of PFAS in blood of general population

**2002:**  
3M voluntary phase out of PFOS and PFOA

**2009:**  
Dupont developed GenX to replace PFOA

**2021:**  
EPA released PFAS Roadmap; MPCA released the *Minnesota PFAS Blueprint*

**2023:**  
3M reached a \$10.3 billion settlement with U.S. public water suppliers for PFAS remediation and drinking water testing. Dupont, Chemours, another \$1.2 billion settlement

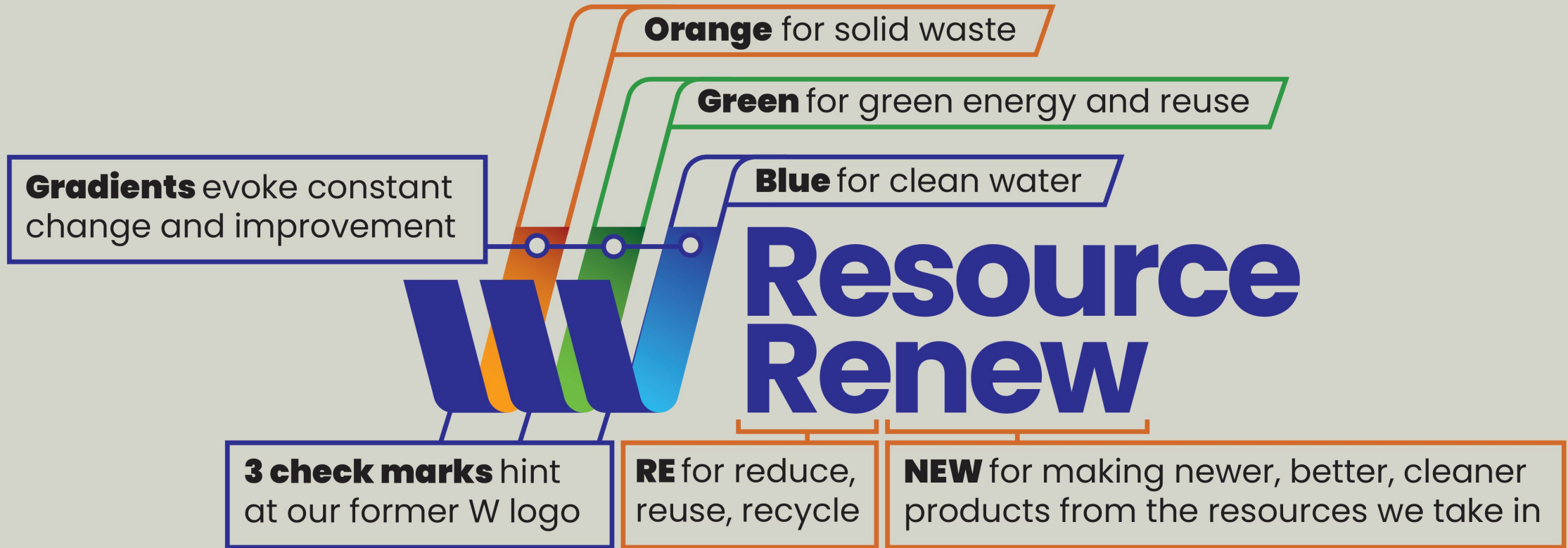


# Unpacking PFAS: Per- and Polyfluoroalkyl Substances

Erik Johnson,  
Environmental Program Coordinator



# What's in a name?



# Where we started



Lyell Brand of the United Northern Sportsmen examining sludge in the St. Louis River.



# Our History

**1971** – Minnesota State Legislature  
Creates Western Lake Superior  
Sanitary District

**1972** – Clean Water Act

**1973** – Oil Embargo

**1974** – Solid Waste Authority  
and Groundbreaking

**1978** – Opened Our Doors  
“First Flush”





**Mission:** Ensure responsible reuse and renewal of water, solid waste, and energy to advance the health and resiliency of our communities.

# Water Resource Recovery

- 13 billion gallons of clean water
- 13 million kWh clean energy
- 1,500 acres of land fertilized
- 530 square miles
- 75 miles of pipes
- 17 communities
- 4 major industries



# Solid Waste Facilities

Transfer Station



Materials Recovery Center



Yard Waste Compost Site

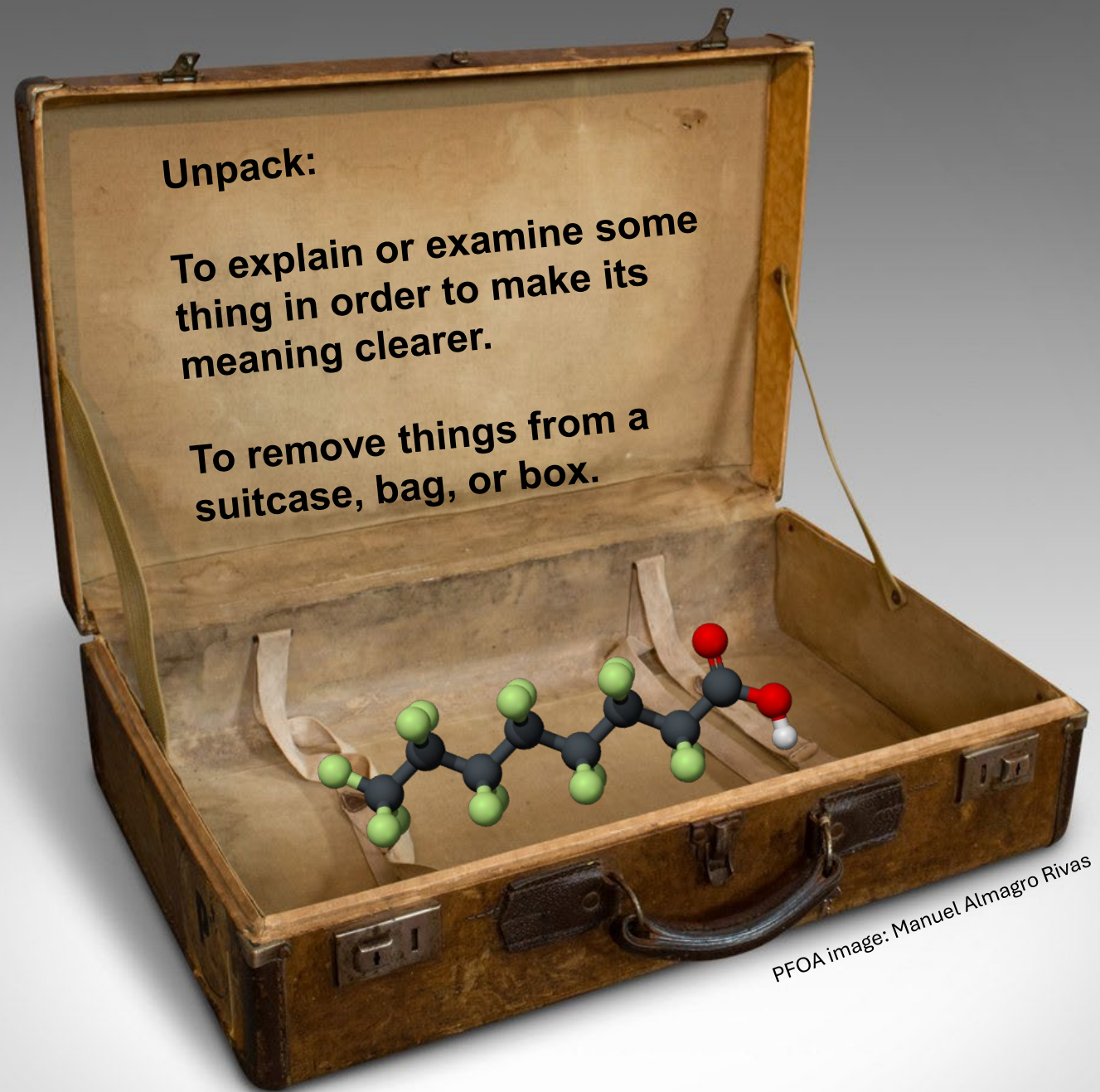


Household Hazardous Waste



# Unpacking PFAS

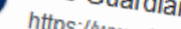
- What are PFAS?
- Why at Resource Renew?
- Laws and actions
- What is Resource Renew doing?
- What can you do?
- Unpacking PFAS from your home





## Chemical spill released PFAS, toxic metals into Warren drain

WARREN, MI — An electroplating chemical spill which turned a metro Detroit creek a bright shade of turquoise contained toxic PFAS and heavy...



## Pfas detected in US beers in new study, raising safety ...

3 days ago — Researchers point to contaminated water after 'forever chemicals' found in 23 sampled beers.



## 'Forever chemicals' found to rain down on all five Great Lakes

May 16, 2024 — Perfluoroalkyl and polyfluoroalkyl substances, also known as PFAS or "forever chemicals," have become persistent pollutants in the air, water ...



## Cities grapple with costs of removing PFAS from drinking water

The U.S. Environmental Protection Agency has proposed new, enforceable limits on some PFAS that are much lower than the state's current...



## 'Forever chemicals' remain in Minnesota, but Pentagon says PFAS are crucial to national security

Forever chemicals remain in Minnesota, but Pentagon says PFAs are crucial to national security ... For several Minnesota families, the "forever..."



## Toxic PFAS chemicals are in all our blood. Here's what that means

Toxic PFAS chemicals are in the environment all around us, and even in us. Some states are tightening regulations; Indiana wants to...



## Consumption of teas, takeout, hot dogs could come with a side of 'forever chemicals'

Young adults whose diets are rich in unsweetened teas, processed meats and takeout foods could be increasing their exposure to "forever..."



## Minnesota puts a cost estimate on getting toxic PFAS out of wastewater: At least \$14 billion

Minnesota puts a cost estimate on getting toxic PFAS out of wastewater: At least \$14 billion ... The St. Cloud Wastewater Treatment Plant seen in...

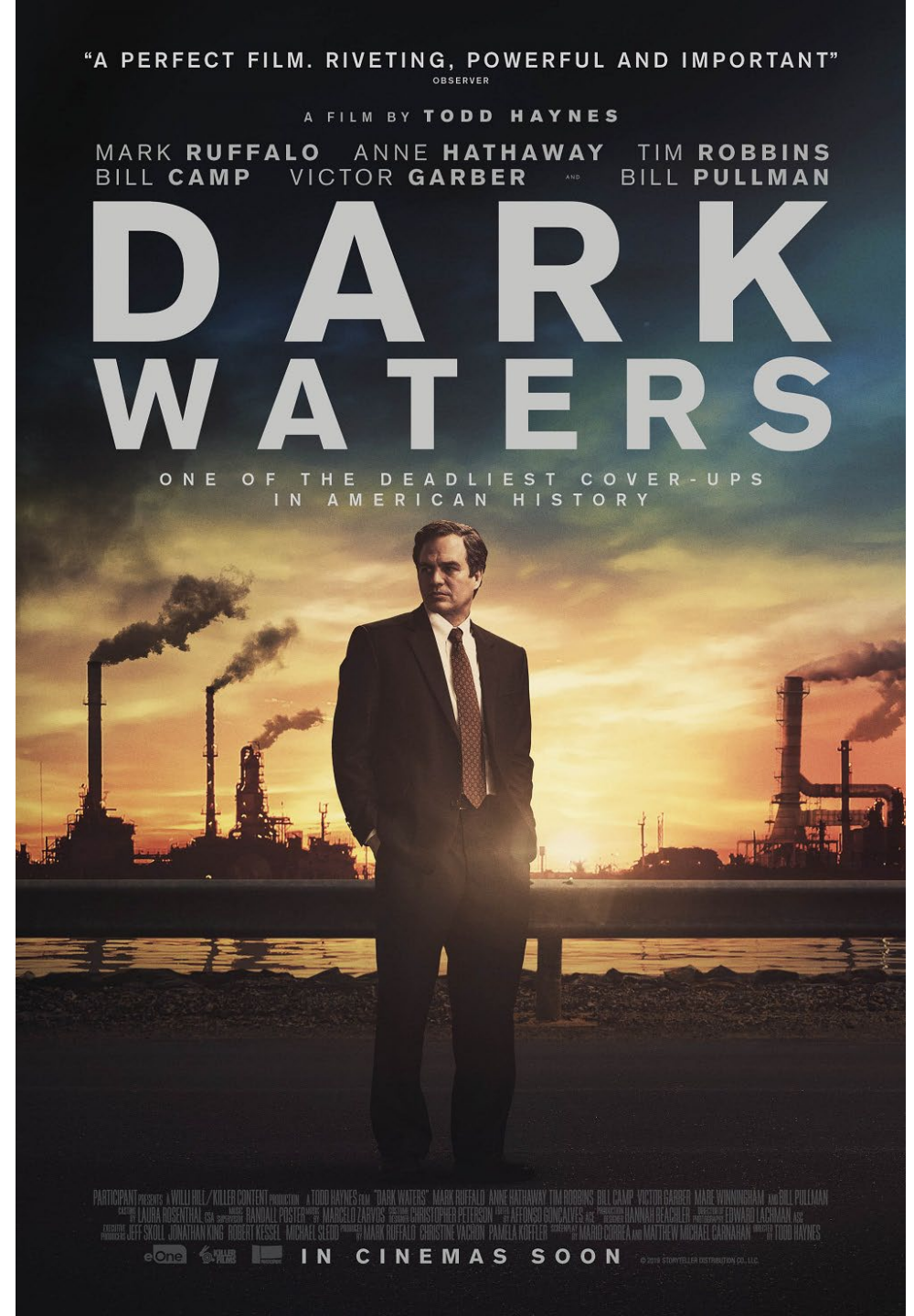




How One Company Secretly Poisoned The Planet

Veritasium 18.9M subscribers [Subscribe](#) 664K [Share](#) [Ask](#) [Download](#)

23M views 4 months ago [Ask & learn](#)



"A PERFECT FILM. RIVETING, POWERFUL AND IMPORTANT" - OBSERVER

A FILM BY TODD HAYNES

MARK RUFFALO ANNE HATHAWAY TIM ROBBINS  
BILL CAMP VICTOR GARBER AND BILL PULLMAN

# DARK WATERS

ONE OF THE DEADLIEST COVER-UPS  
IN AMERICAN HISTORY

PARTICIPANT presents a WILL BILL MILLER CONTENT production a TODD HAYNES film "DARK WATERS" MARK RUFFALO ANNE HATHAWAY TIM ROBBINS BILL CAMP VICTOR GARBER MARE WINNINGHAM AND BILL PULLMAN  
CASTING BY LAURA ROSENTHAL COSTUME DESIGNER RANDALL POSTER MUSIC BY MARCELO ZARUVIS EDITOR CHRISTOPHER PETERSON PRODUCTION DESIGNER AFFONSO GONCALVES ACE PRODUCTION DESIGNER HANNAH BEACHEL PRODUCTION DESIGNER EDUARDO LACHMAN ACE  
EXECUTIVE PRODUCERS JEFF SKOLL JONATHAN KING ROBERT KESSEL MICHAEL SLEDO PRODUCED BY MARK RUFFALO CHRISTINE VACHON PAMELA KOFFLER WRITTEN BY MARIO CORRICA AND MATTHEW MICHAEL CANNIHAN DIRECTED BY TODD HAYNES  
eOne PALMO IN CINEMAS SOON © 2019 STUPPELLER DISTRIBUTION CO. LLC

# ProPublica article – May 2024



≡ PROPUBLICA

Donate

Environment

## How 3M Executives Convinced a Scientist the Forever Chemicals She Found in Human Blood Were Safe

Decades ago, Kris Hansen showed 3M that its PFAS chemicals were in people's bodies. Her bosses halted her work. As the EPA now forces the removal of the chemicals from drinking water, she wrestles with the secrets that 3M kept from her and the world.

by Sharon Lerner, photography by Haruka Sakaguchi, special to ProPublica

May 20, 6 a.m. EDT



The New York Times

## Something's Poisoning America's Land. Farmers Fear 'Forever' Chemicals.



Fertilizer made from city sewage has been spread on millions of acres of farmland for decades. Scientists say it can contain high levels of the toxic substance.

# Still relatively unknown

## PLOS ONE

RESEARCH ARTICLE

### Let's talk about PFAS: Inconsistent public awareness about PFAS and its sources in the United States

T. Allen Berthold, Audrey McCrary, Stephanie deVilleneuve \*, Michael Schramm 

Texas Water Resources Institute, Texas A&M AgriLife, College Station, Texas, United States of America

\* [s.deVilleneuve@ag.tamu.edu](mailto:s.deVilleneuve@ag.tamu.edu)



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Cleaner Production

journal homepage: [www.elsevier.com/locate/jclepro](http://www.elsevier.com/locate/jclepro)

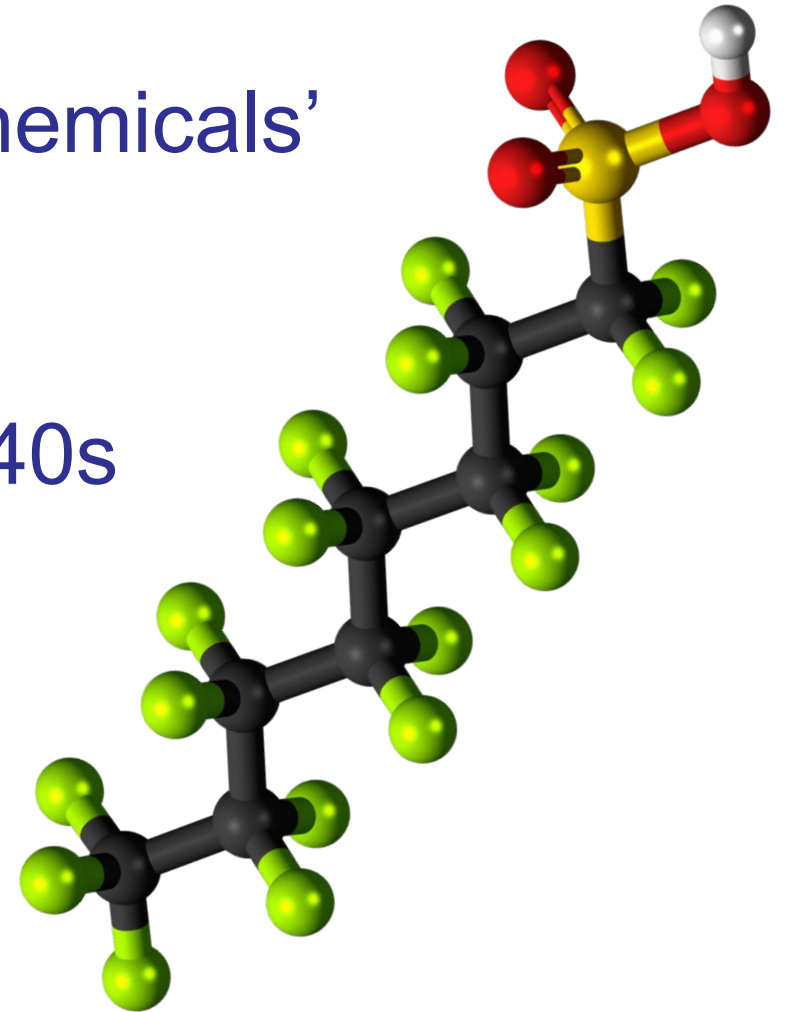


Public perceptions of per- and polyfluoroalkyl substances (PFAS):  
Psycho-demographic characteristics differentiating PFAS knowledge  
and concern

Joya A. Kemper <sup>a,\*</sup>, Emma Sharp <sup>b</sup>, Shan Yi <sup>c</sup>, Erin M. Leitao <sup>d,i</sup>, Lokesh P. Padhye <sup>e</sup>,  
Melanie Kah <sup>b</sup>, Jack L.-Y. Chen <sup>f,g,i</sup>, Kanish Gobindlal <sup>h</sup>

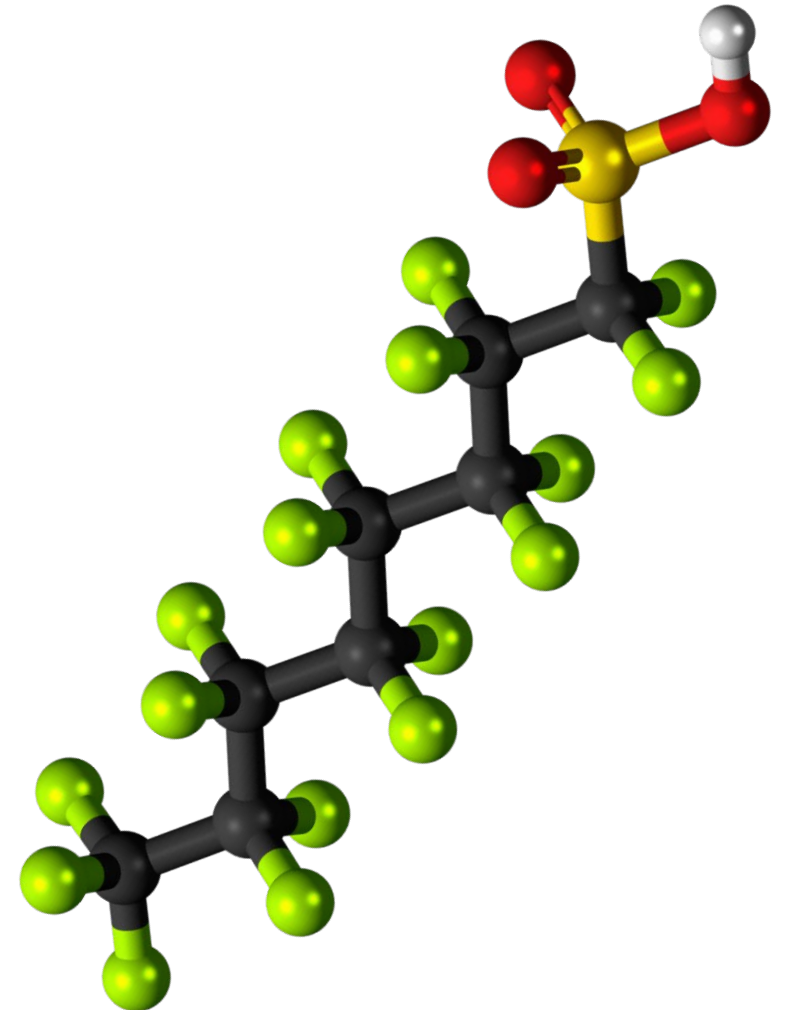
# Per- and Poly-fluoroalkyl Substances

- Commonly called PFAS or 'Forever Chemicals'
- Class of 15,000+ lab-made chemicals
  - Majority of these are theoretical
- Originally developed in the 1930s - 1940s beneficial for the Manhattan Project



# Per- and Poly-fluoroalkyl Substances

- 3M and Dupont were major producers
- Found in many household products
  - Stain resistant
  - Water resistant
  - Grease resistant
  - Heat resistant



PFOS

PFOA

Cancer

# PFAS

Perfluoroalkyl  
and  
Polyfluoroalkyl  
Substances

Stain  
Resistant  
Products

Water  
Resistant  
Clothing

Water  
Resistant  
Fabrics

Hazard

Fast Food  
Packaging

Non-Stick  
Cookware

Personal  
Care

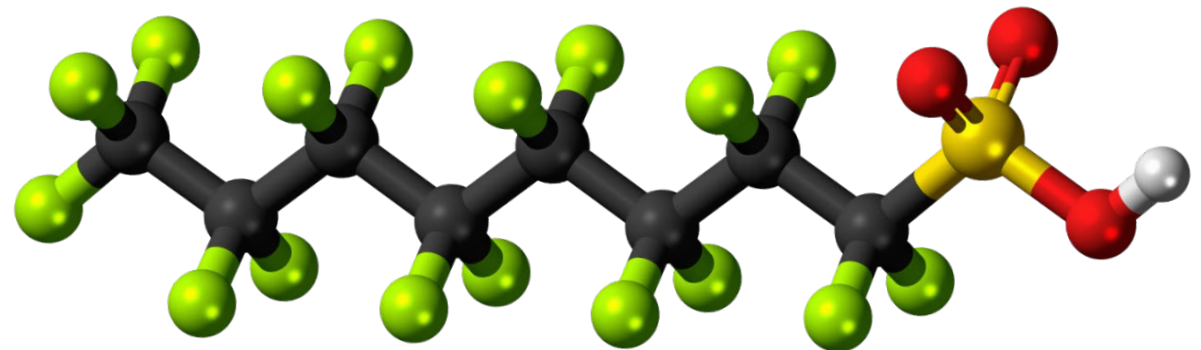
Cleaning  
Products

Pesticide



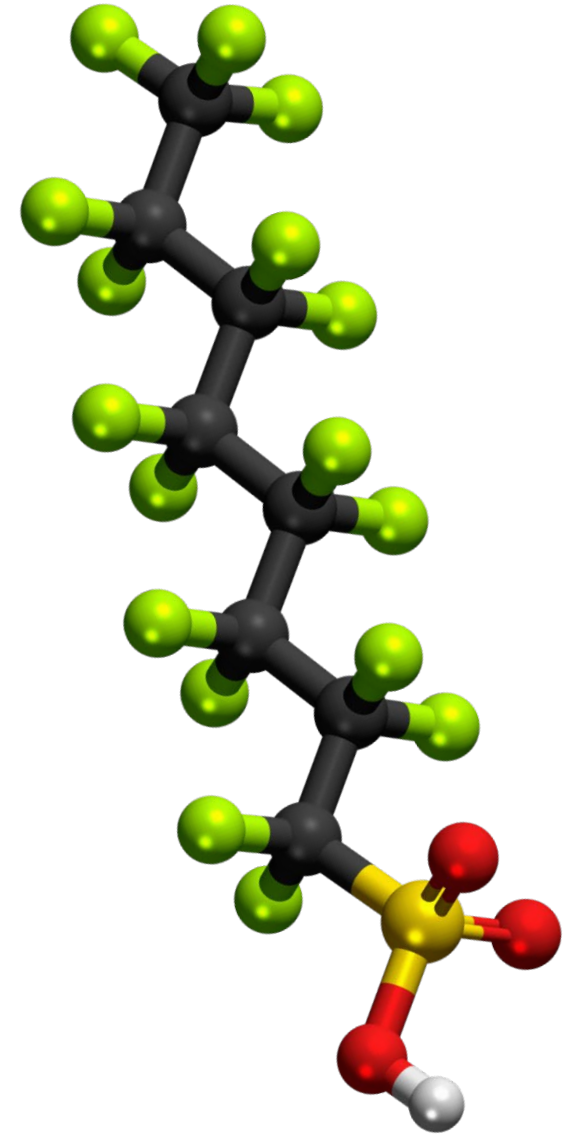
# Per- and Poly-fluoroalkyl Substances

- New technologies allow low level detection
- Certain PFAS are being phased out (PFOA, PFOS)
- Regulations are being proposed and implemented



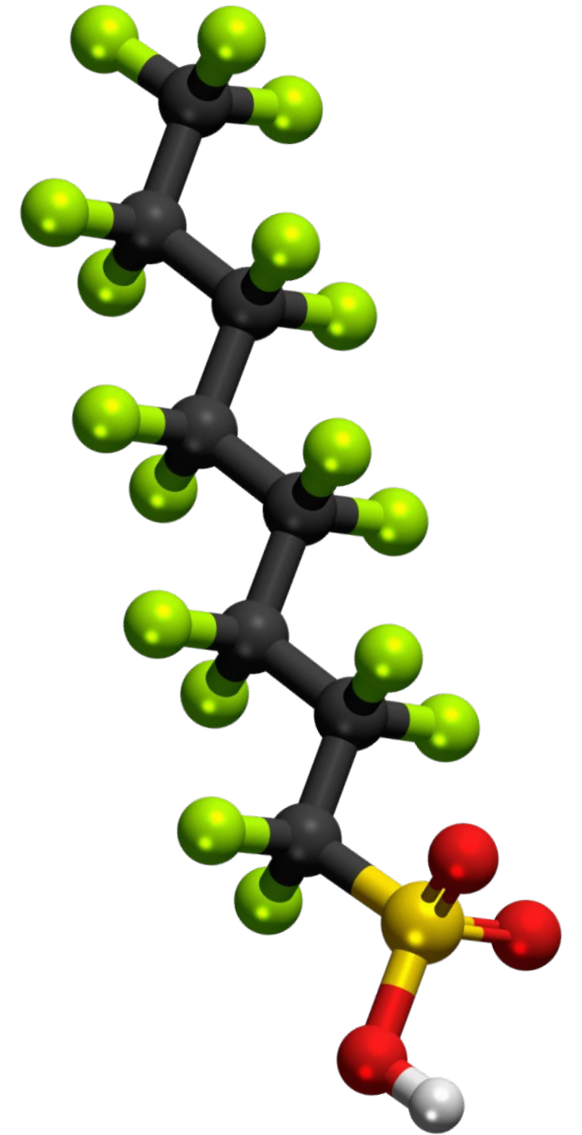
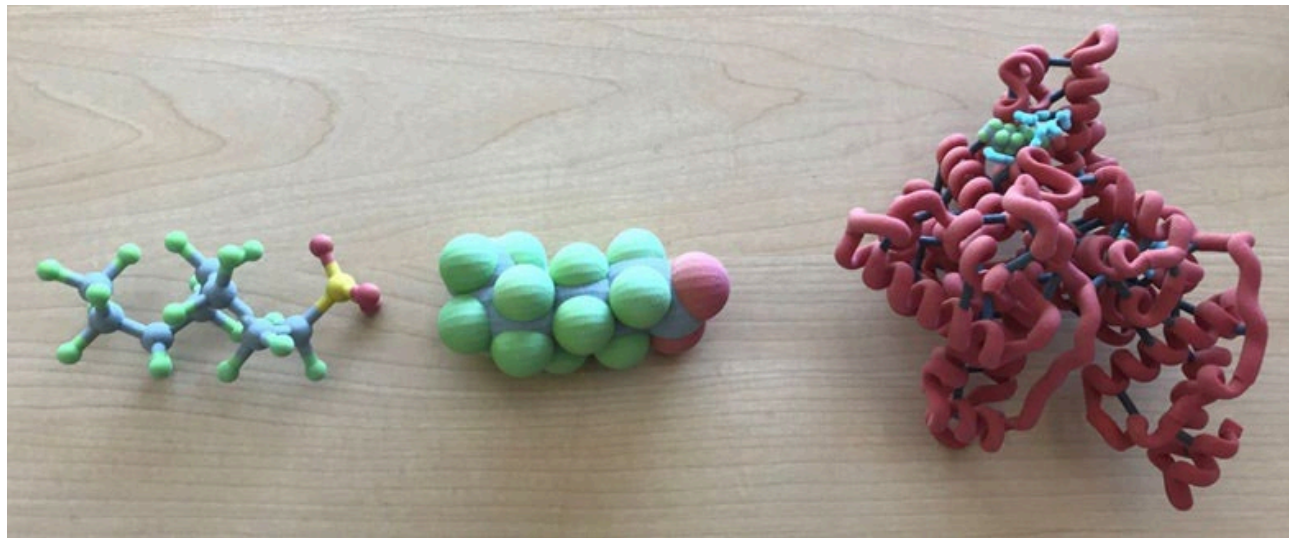
# Why are PFAS a problem?

- Carbon-Fluorine bond is very strong
- Difficult to break down – energy of lightning
- Bioaccumulate in organisms
- Found worldwide – even remote regions



# Why are PFAS a problem?

- Shape and chemical properties allows it to interact with proteins in our body



# Why are PFAS a problem?

Associations between increases in certain PFAS exposure and health effects:

- Increase in cholesterol levels
- Small decreases in birth weight
- Lower antibody response to vaccines
- Kidney and testicular cancer
- Pregnancy-induced hypertension and preeclampsia
- Changes in liver enzymes

The risk of health effects depends on exposure factors, individual factors, and other determinants of health.

1/18/2024, CDC and ATSDR



**U.S. Department of Health and Human Services**  
Centers for Disease Control and Prevention  
Agency for Toxic Substances and Disease Registry



# PFAS are measured in very small quantities

parts per billion (ppb)

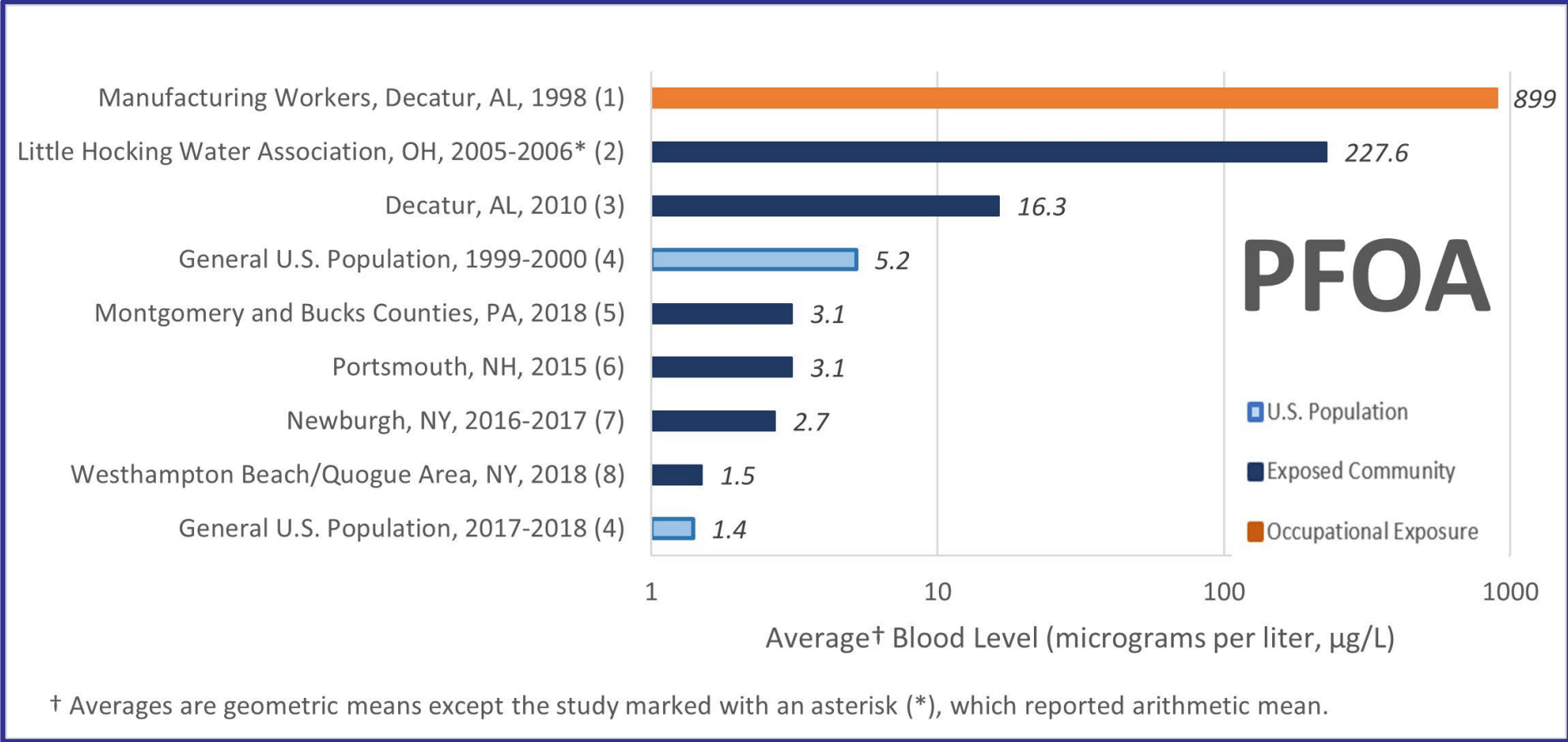
1 ppb = ~1 drop in backyard pool

parts per trillion (ppt)

1 ppt = ~20 Olympic sized pools



# Blood Levels in People Who Were Exposed to PFAS

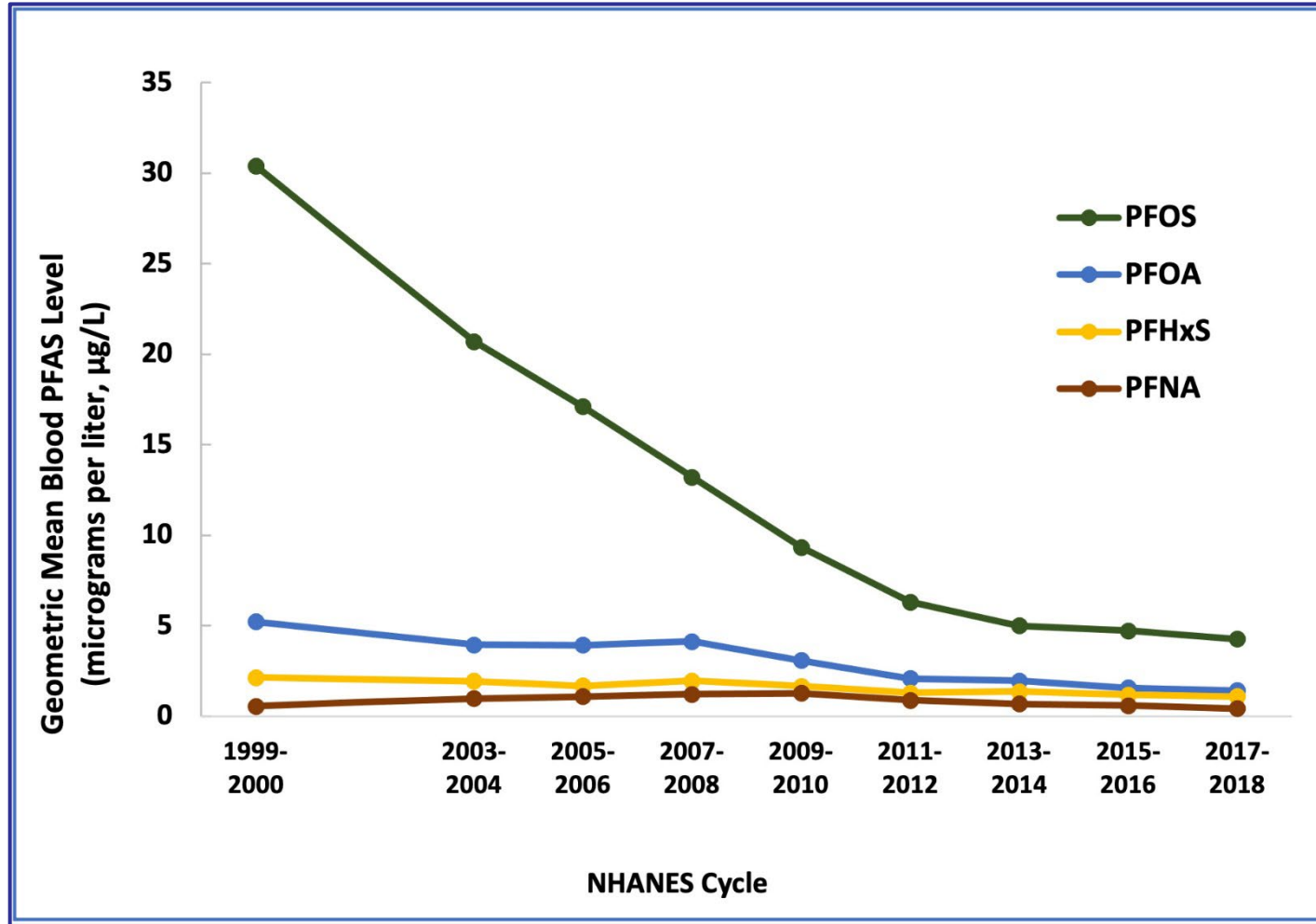


### Data Source

Centers for Disease Control and Prevention. [National Report on Human Exposure to Environmental Chemicals, Biomonitoring Data Tables for Environmental Chemicals](#). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.



# Blood Levels of the Most Common PFAS in People in the United States Over Time



## Data Source

Centers for Disease Control and Prevention. [National Report on Human Exposure to Environmental Chemicals, Biomonitoring Data Tables for Environmental Chemicals](#). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

# Why at Resource Renew?

Wastewater treatment plants are passive receivers of pollutants such as PFAS from the community.

“Looking in the sewer is like looking in the mirror of society”

- Dr. Gertjan Medema

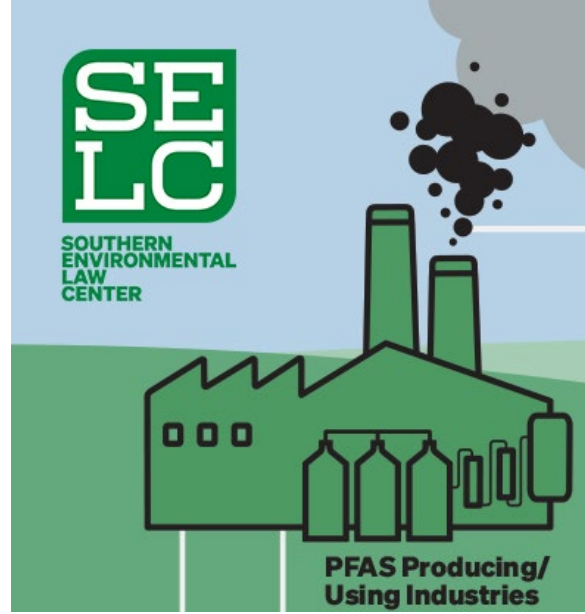


# Why at Resource Renew?

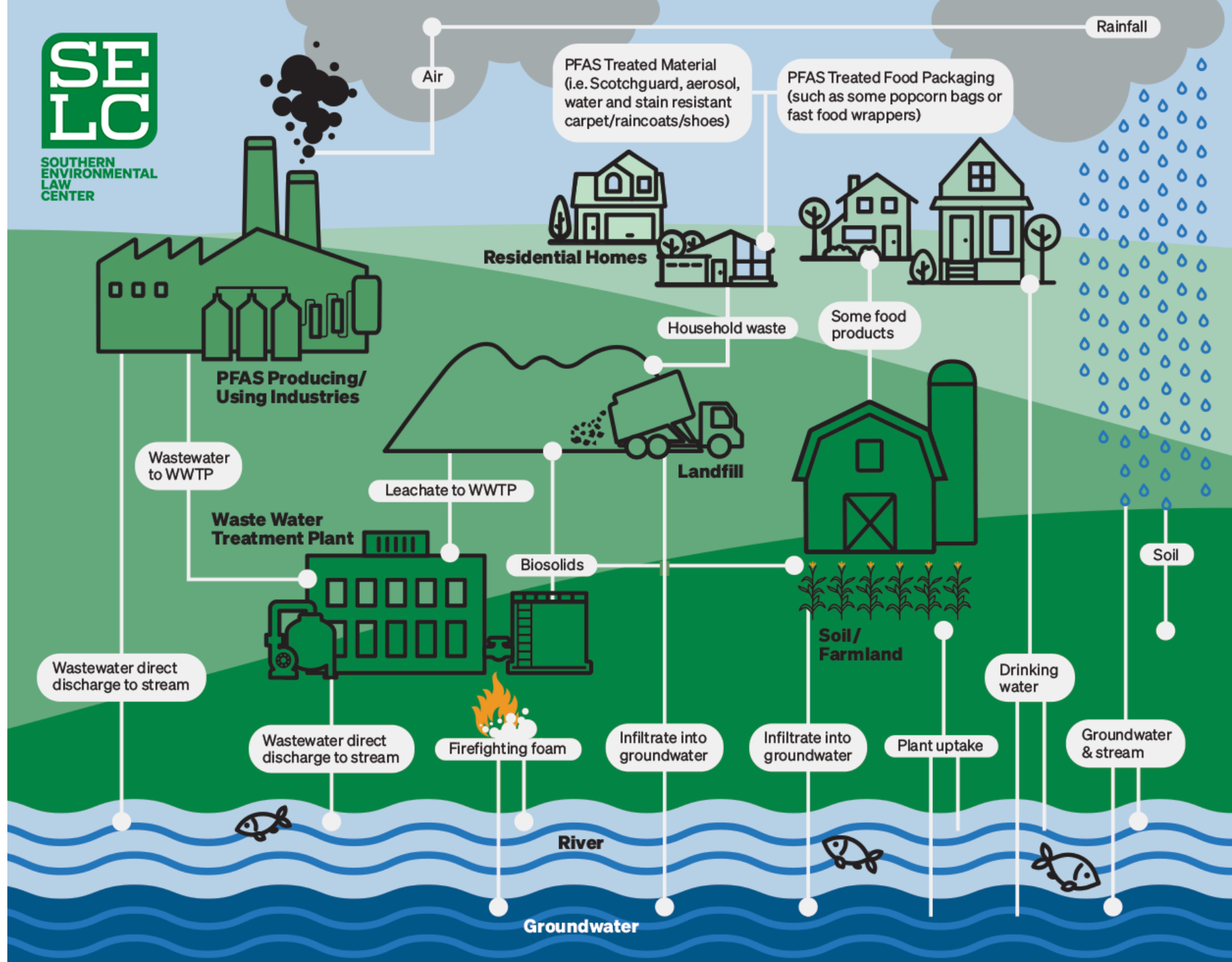
**Mission:** Ensure responsible reuse and renewal of water, solid waste, and energy to advance the health and resiliency of our communities.

- Public health is important
  - Wastewater infrastructure prevents disease
  - Partnered in research on sampling for SARS-CoV-2
- Pollution prevention is key
  - certain pollutants are difficult to remove
  - strong success with mercury reduction

# PFAS Cycle



# PFAS Cycle



# Water Resource Recovery

Receive wastewater from homes, businesses, and industry



Three Products

- Clean Water
- Energy
- Biosolids fertilizer

If PFAS are present, clean water and biosolids are impacted

# So what is being done about it?

# National Level Regulations

- FDA – February 2024
  - Bans PFAS for food contact use
- EPA – Drinking Water
  - April 2024
  - Drinking water 4.0 ppt
- EPA – CERCLA
  - July 2024
  - PFOA and PFOS hazardous substances
- EPA Risk Assessment in Biosolids
  - Draft released in January 2025
- EPA – RCRA
  - February 2024 proposal to list PFOA and PFOS as hazardous constituents



# Laws and actions in Minnesota

## Minnesota Pollution Control Agency

- Amara's Law
  - Prohibits PFAS from 11 product categories, January 1, 2025
- PFAS Use Prohibitions Timeline
- Minnesota PFAS in Biosolids Strategy
  - Jan. 2025



# What is Resource Renew doing?

- **Solid Waste Management**

- Disposal recommendations and options.  
[Disposing of PFAS products | Minnesota Pollution Control Agency \(state.mn.us\)](#)
- Compost quality control
  - BPI-certified compostable products only
  - No paper products, wrappers, food contact materials



# What is Resource Renew doing?

- **Wastewater Sampling**

- 2008: Minnesota Pollution Control Agency (MPCA) sampling Wastewater
- 2019: MPCA Compost pond water
- 2022: WLSSD signed a Memorandum of Understanding (MOU) with MPCA to measure PFAS in the wastewater we receive.

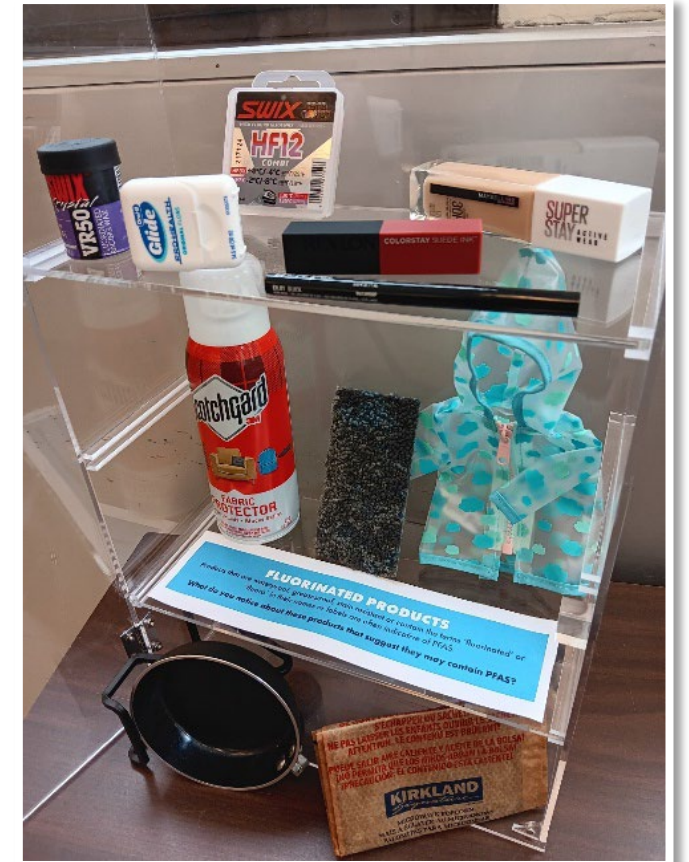
# What is Resource Renew doing?

- **Wastewater Sampling**
  - 2023: Continued sampling for MOU
  - 2024: PFAS Pollution Management Plan
    - Pollution prevention
  - 2025: continued sampling and pollution preventions efforts
    - Awarded a grant to increase sampling in community



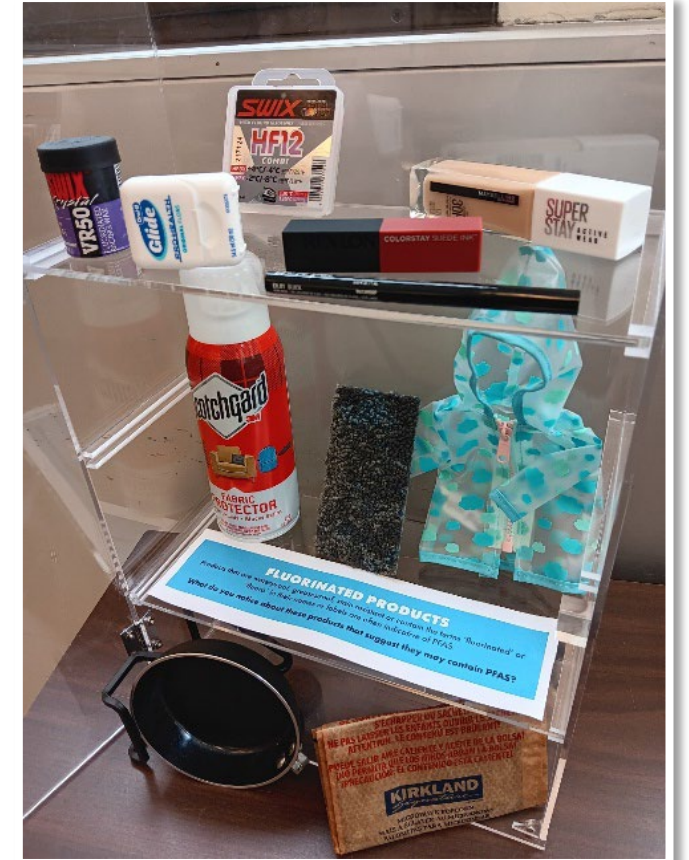
# What is Resource Renew doing?

- **PFAS Pollution Management Plan**
  - Industrial Pretreatment Program
    - Surveys for PFAS use
    - Annual visits, include PFAS education and discussions
    - Permits require sampling data



# What is Resource Renew doing?

- **PFAS Pollution Management Plan**
  - Community Education
    - Helping residents reduce PFAS exposure in homes
    - Use fewer PFAS containing product

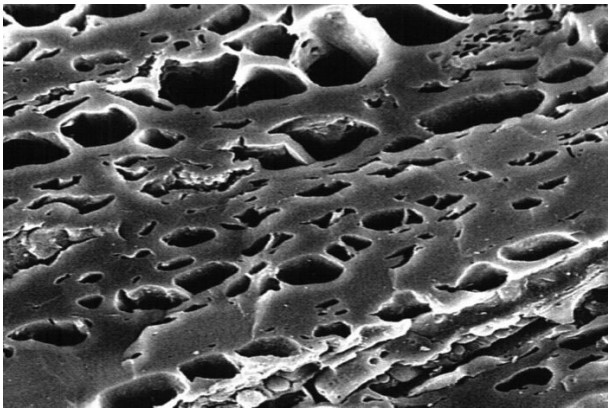


# What more can Resource Renew do?

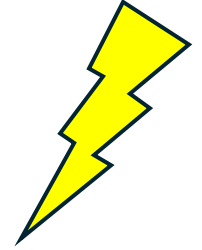
# PFAS Treatment Technologies

## PFAS Removal

- Reverse Osmosis
- Granular Activated Carbon
  - Adsorption, catches chemicals in pores and surfaces



## PFAS Destruction



- Incineration
- Pyrolysis

PFAS-containing liquids brought to our Household Hazardous Waste Facility are delivered for incineration

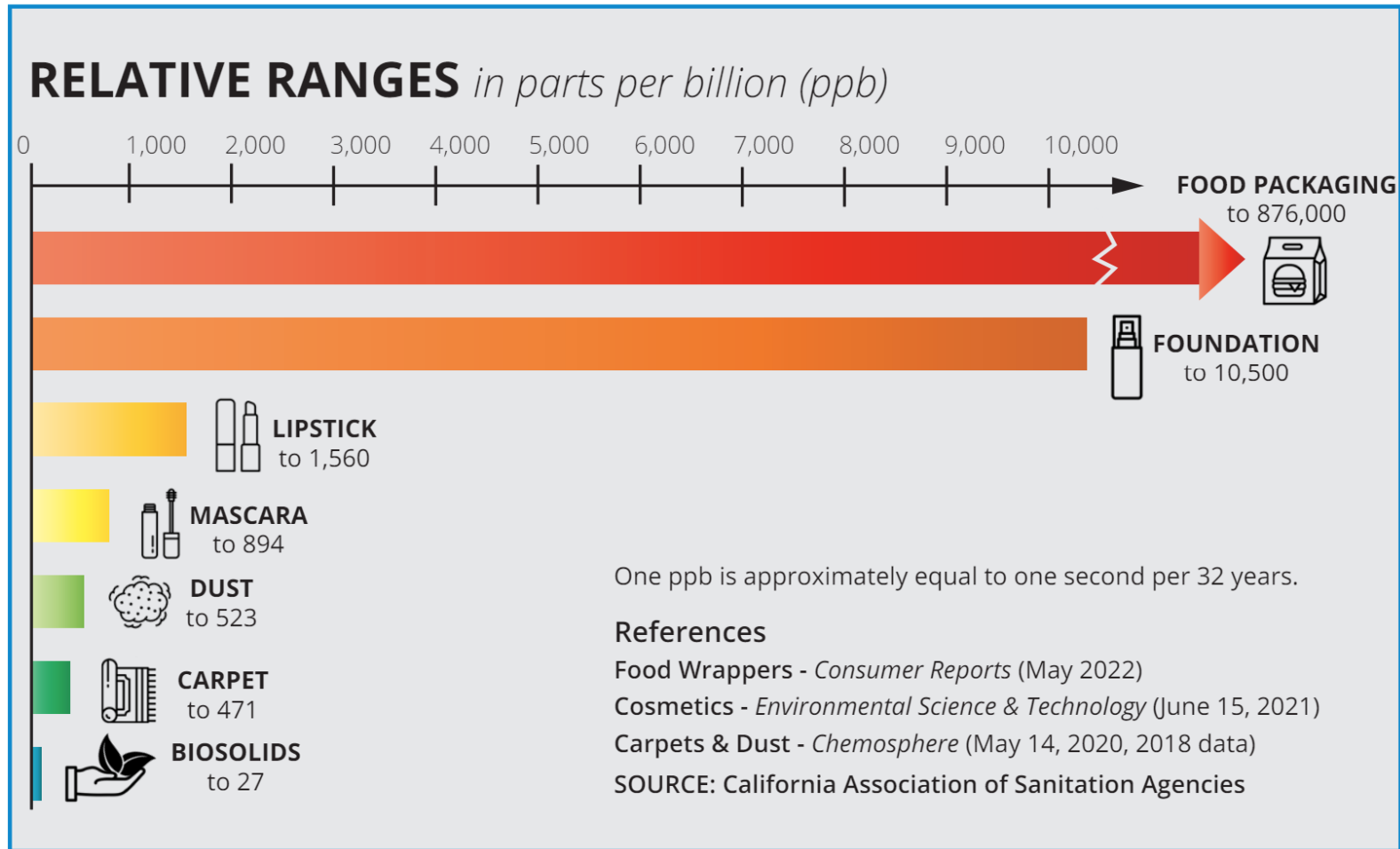
# Technologies - Cost

- MPCA and Barr Engineering 2023 study
- \$14-28 billion for PFAS treatment technologies in MN
- PFAS cost between \$2.7 million and \$18 million per pound to remove and destroy from municipal wastewater, depending on facility size.

\$ \$ \$

# What can you do?

# Unpacking PFAS from your home



## Potential Exposure Routes:

- Ingestion
- Inhalation
- Absorption

# Unpacking PFAS from your home

Look at the 11 categories MN will regulate, consider evaluating in your home

- Carpets or rugs
- Cleaning products
- Cookware
- Cosmetics
- Dental floss
- Fabric treatments
- Juvenile products
- Menstruation products
- Textile furnishings
- Ski wax
- Upholstered furniture

Are they stain resistance?

Water resistant?

Do I need the convenience?

# Unpacking PFAS from your home

Look at the 11 categories MN will regulate, consider evaluating in your home

- Carpets or rugs
- Cleaning products
- Cookware
- Cosmetics
- Dental floss
- Fabric treatments
- Juvenile products
- Menstruation products
- Textile furnishings
- Ski wax
- Upholstered furniture



# Five Steps for reducing PFAS exposure:

1. Reduce the use of food contact materials and packaging containing PFAS. Three places to start:
  - Make the transition away from microwavable popcorn bags.
  - Go packaging-free as often as possible: grocery stores, restaurants, and fast-food choices.
  - Ditch the single-use plates and cups for reusable serve ware and containers.



# Five Steps for reducing PFAS exposure:

## 2. Research your drinking water sources.

- Public drinking water treated in Duluth facility was tested for PFAS, non-detect.
- Testing can be done on private wells.
- Filters are available to reduce PFAS.



# Five Steps for reducing PFAS exposure:

3. Read product labels and look for ingredients that have “fluorinated” or “fluoro” in their names. Shop for products sold as PFAS-free.

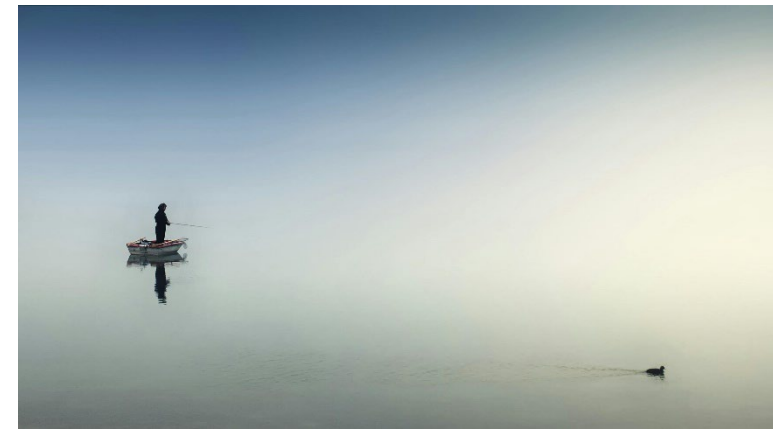
- Avoid water resistant cosmetics
- Research businesses/products that are PFAS-free:

Environmental Working Group



# Five Steps for reducing PFAS exposure:

4. Stay up to date on fish consumption advisories
  - 2021: Wisconsin issued a consumption advisory for smelt, one meal per month. MN followed based on WI findings. **2025: Update to once per week.**
    - Local lakes have consumption advisories:
      - Minnesota Department of Natural Resources, [“Lake Finder”](#)
      - [Fish Consumption Guidance - MN Dept. of Health \(state.mn.us\)](#)



# Five Steps for reducing PFAS exposure:

5. Swap out non-stick cookware for pans that are PFAS-free.



# Resource Renew – Sampling Data

# What does our sampling data show?

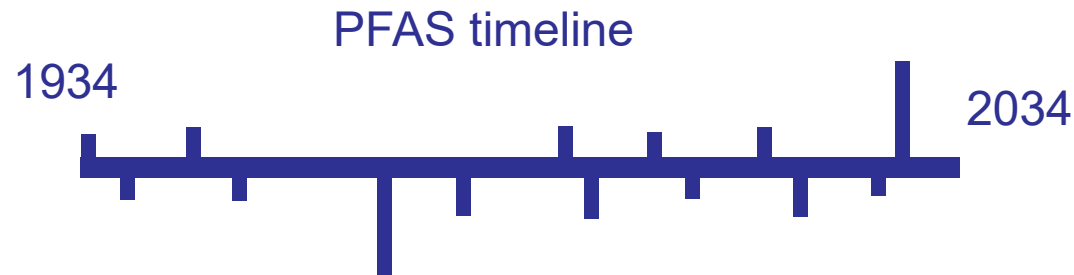
- PFAS are measured in very small quantities

parts per billion (ppb)

1 ppb = ~3 seconds in a century

parts per trillion (ppt)

1 ppt = ~3 seconds in 100,000 years



# PFAS are measured in very small quantities

parts per billion (ppb)

1 ppb = ~1 drop in backyard pool

parts per trillion (ppt)

1 ppt = ~20 Olympic sized pools



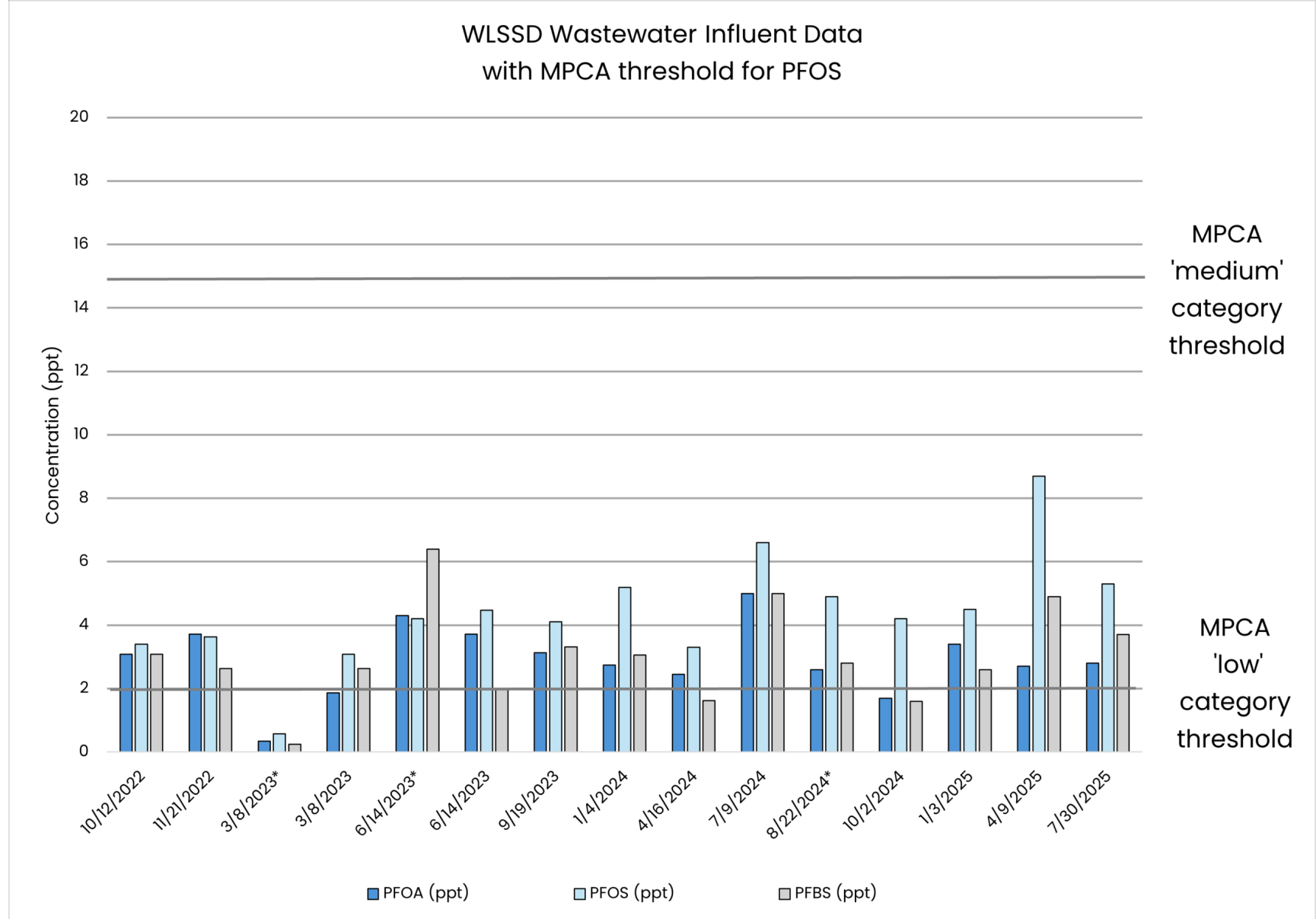
# What does the data show?

- MPCA developed three priority categories for source identification and reduction work based on sampling results from over 80 wastewater treatment plants in MN.

## PFAS levels in wastewater in Minnesota

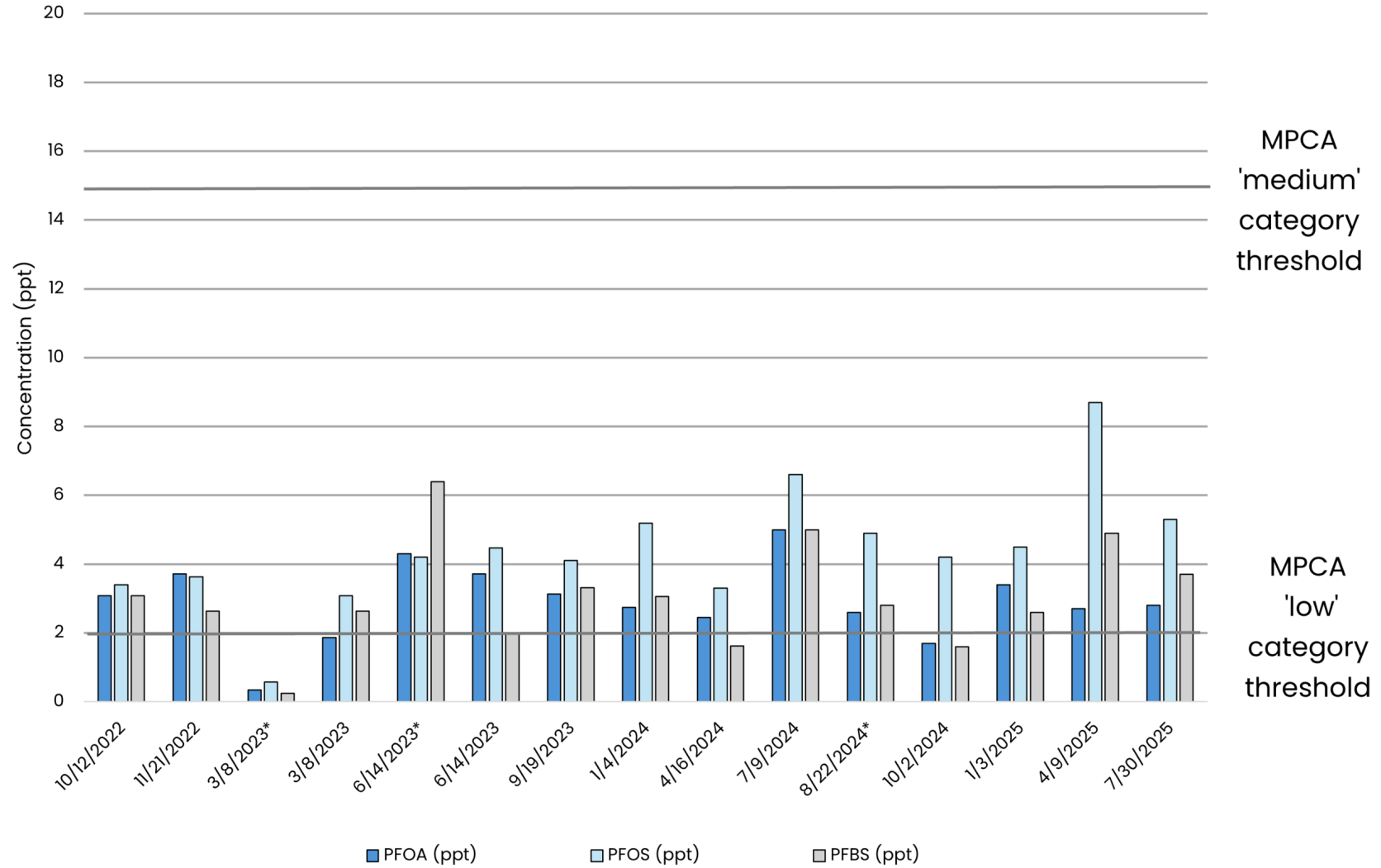
	Low	Medium	High
PFOA (ppt)	up to 2.0	between 2.1 and 34.9	35 or greater
PFOS (ppt)	up to 2.0	between 2.1 and 14.9	15 or greater
PFBS (ppt)	up to 2.0	between 2.1 and 99.9	100 or greater

# What does the data show?



# What does the data show?

WLSSD Wastewater Influent Data  
with MPCA threshold for PFOS



	10/12/22	11/21/22	3/8/23*	3/8/23	6/14/23*	6/14/23	9/19/23	1/4/24	4/16/24	7/9/24	8/22/24*	10/2/24	1/03/25	4/09/25	7/30/25
PFOA (ppt)	3.08	3.71	0.34	<1.87	4.3	3.71	3.13	2.74	2.45	< 5.0	2.6	<1.7	3.4	2.7	2.8
PFOS (ppt)	3.4	3.63	0.573	3.08	4.2	4.47	4.1	5.19	3.3	6.6	4.9	4.2	4.5	8.7	5.3
PFBS (ppt)	3.08	2.63	0.243	2.63	6.4	1.97	3.31	3.06	< 1.62	< 5.0	2.8	<1.6	< 2.6	4.9	3.7

< = less than

# What does the data show?

## Domestic Wastewater Sources

Very similar to overall concentrations entering Resource Renew

Landfill Leachate also contributes to the PFAS load.



# What does the data show?

## Biosolids

	7/19/2023	9/19/2023	1/4/2024	4/16/2024	7/12/2024	10/2/24	1/03/25	4/09/25	7/30/25
PFOA (ppb)	0.396	0.472	0.538	<2.0	<1.9	<0.71	<0.70	<0.50	<0.50
PFOS (ppb)	6.85	7	7.92	5.5	7.7	6.4	7.2	4.4	3.7

< = less than

Minnesota	Wisconsin	Approach to reduce risk
If PFOA <b>or</b> PFOS concentrations is:	If sum of PFOA <b>and</b> PFOS concentrations values is:	
≥ 125 ppb	≥ 150 ppb	<ul style="list-style-type: none"> <li>Land application not allowed</li> <li>Implement PFAS source investigation and reduction efforts</li> </ul>
51 – 124 ppb	50-149	<ul style="list-style-type: none"> <li>Reduce application rate</li> <li>Implement PFAS source investigation and reduction efforts</li> </ul>
21-50 ppb	21-49	<ul style="list-style-type: none"> <li>Implement PFAS source investigation and reduction efforts</li> </ul>
≤ 20 ppb	≤ 20 ppb	<ul style="list-style-type: none"> <li>Land apply per normal approach</li> </ul>

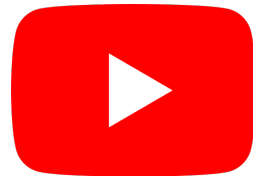
# Questions?

Erik Johnson

[erik.johnson@wlssd.com](mailto:erik.johnson@wlssd.com)

Resources provided in today's talk:

[Ready to reduce PFAS in your home? Five steps to a healthier household - WLSSD](#)



ResourceRenew.com (218) 722-3666

Info@wlssd.com

