Safe to Sip

in Buckingham

Penn State **Extension**

Forever Chemicals (PFAS) Should I be Concerned?

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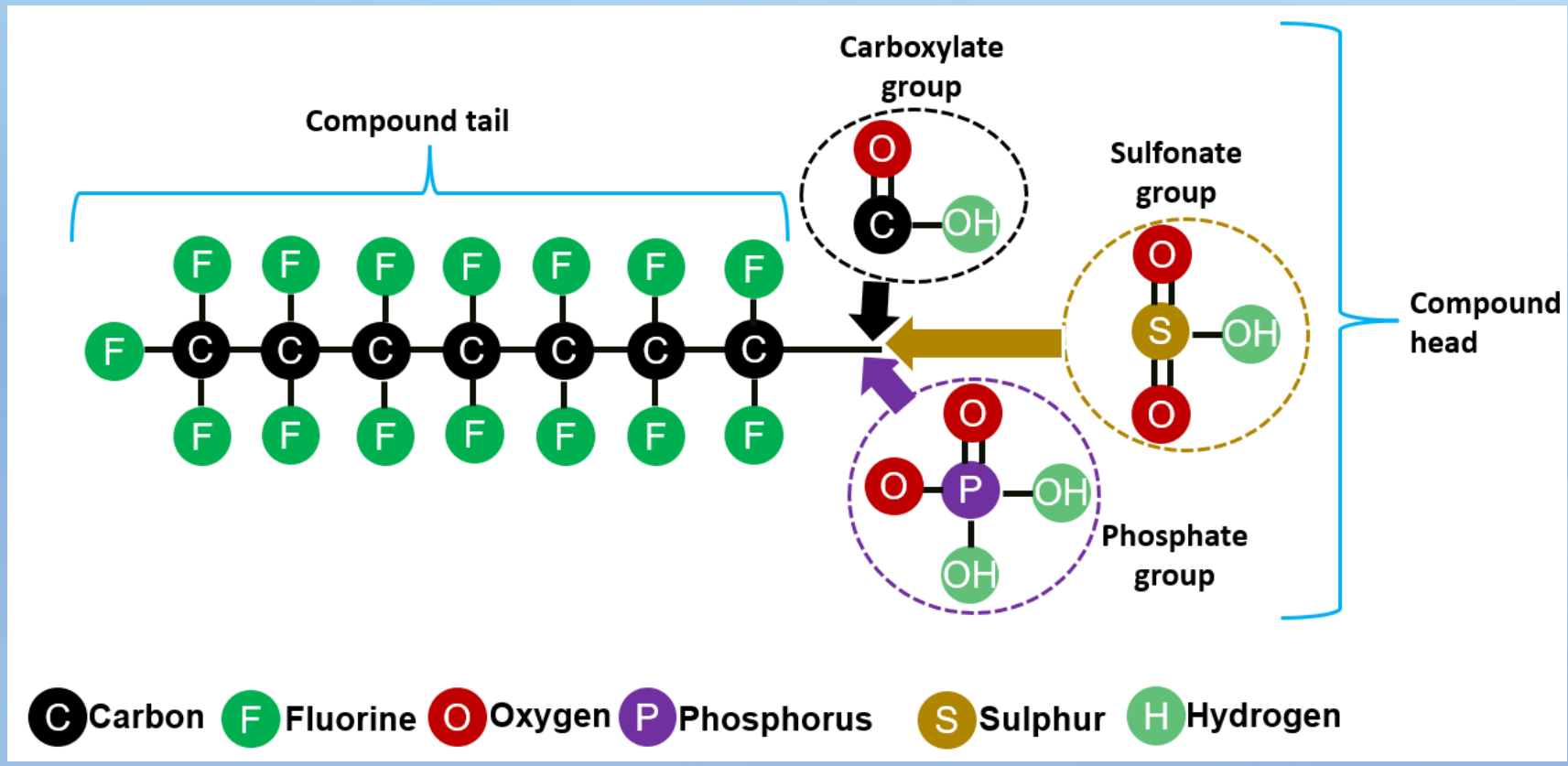
What is PFAS ?

PFAS= Per- and Polyfluoroalkyl Substances



- PFAS's were first developed in the 1930's , Specifically, DuPont developed the first PFAS tetrafluoroethylene for Teflon
- They were initial discovered at DuPont's labs in Deepwater NJ
- In 1945 3M developed PFOS for Scotchgard and firefighting foams
- Since the 1950s, many products commonly used by consumers and industry have been manufactured with or from PFAS.

Materials that contain PFAS

- Cosmetics
- Dental Floss
- Food Packaging
- Carpets
- Blankets
- Water repellant and Childrens clothing
- Cooking utensils
- Shampoos
- Electronics
- Upholstery
- Umbrellas
- Microwave Popcorn Bags
- Receipt Paper
- Electronics
- Fire Fighting Foam

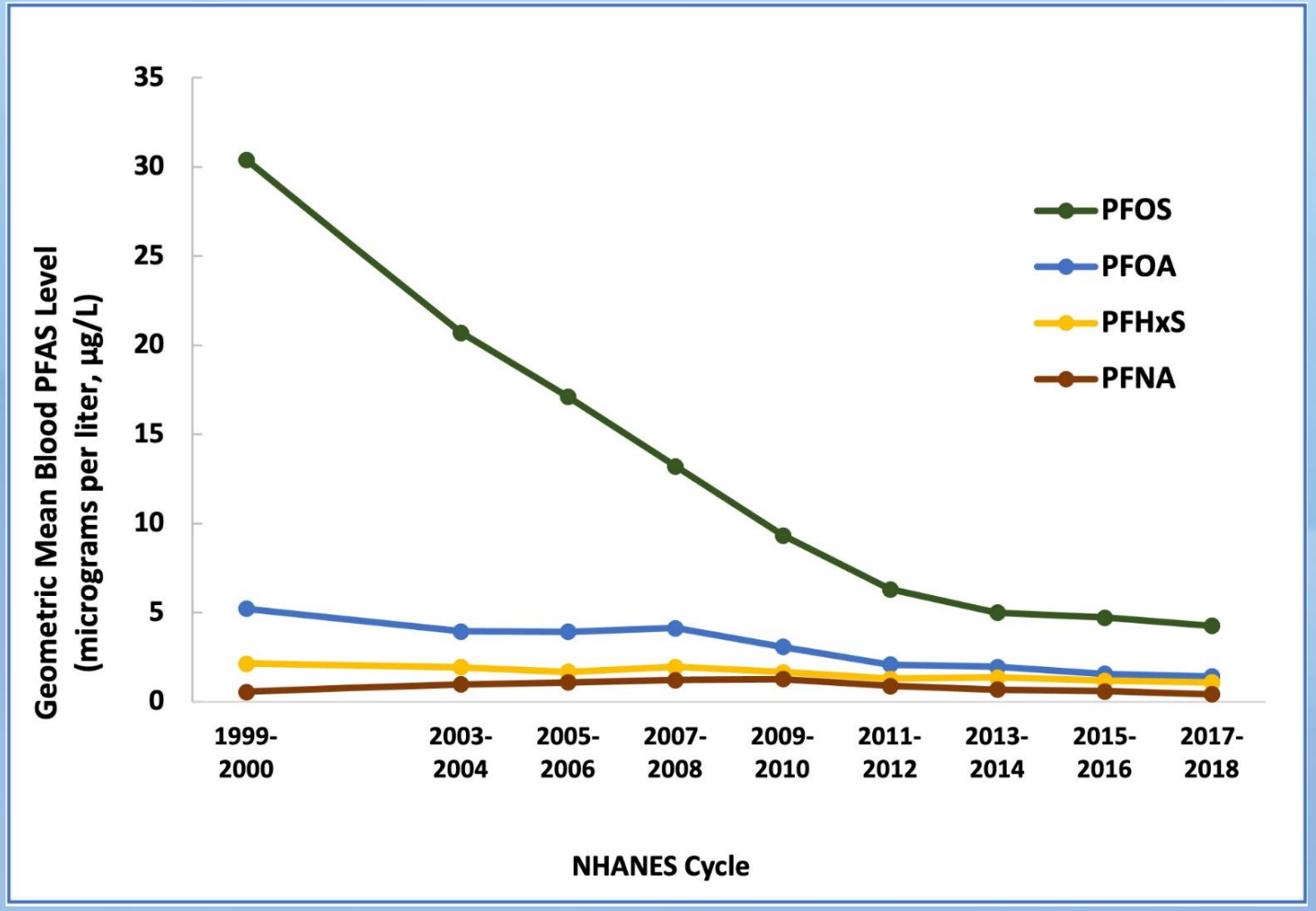
PFAS= Per- and Polyfluoroalkyl Substances –

- PFAS are widely used, long lasting chemicals, components of which break down very slowly over time.
- Because of their widespread use and their persistence in the environment, many PFAS are found in the blood of people and animals all over the world and are present at low levels in a variety of food products and in the environment.
- PFAS are found in water, air, fish, and soil at locations across the nation and the globe.
- Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals.

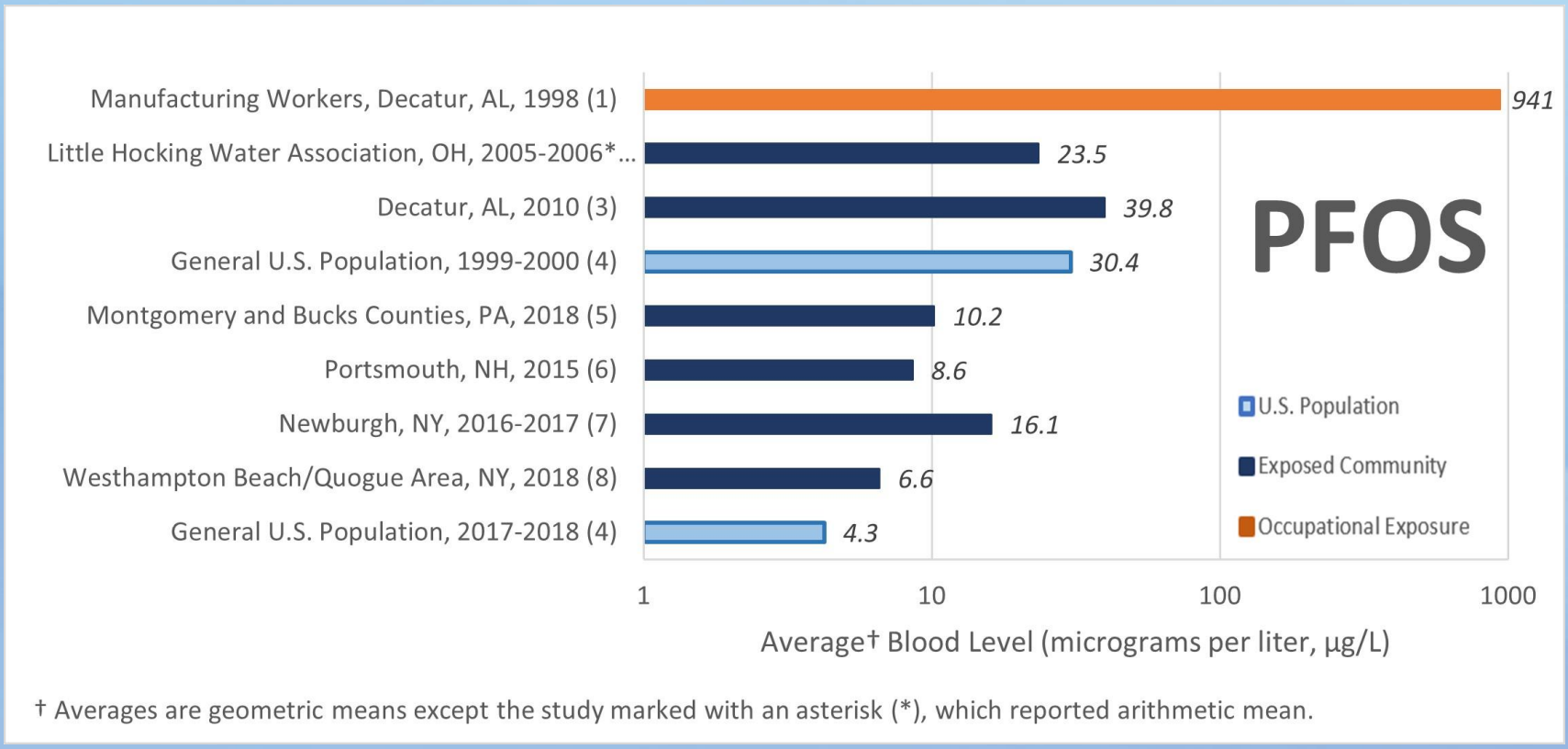
PFAS exposure in the Population

- First studies were occupational studies in the 1970s that found detections of some PFAS in the blood of exposed workers
- Further studies in the 1990s that reported detections in the blood of the general human population.
- In recent years, several long-chain PFAS's (PFOA, PFOS, PFNA, and PFHxS) have been measured in the low parts per million/parts per trillion range in the blood serum of almost all residents of the United States and other industrialized nations
- PFAS concentrations (especially PFOS) in human blood have decreased steadily since 2000 (ATSDR 2020a) with the voluntary phaseout of perfluorooctanyl chemistries by major U.S. manufacturers.

PFOS and PFOA blood concentrations in the general population have declined since manufacturing stopped in US.

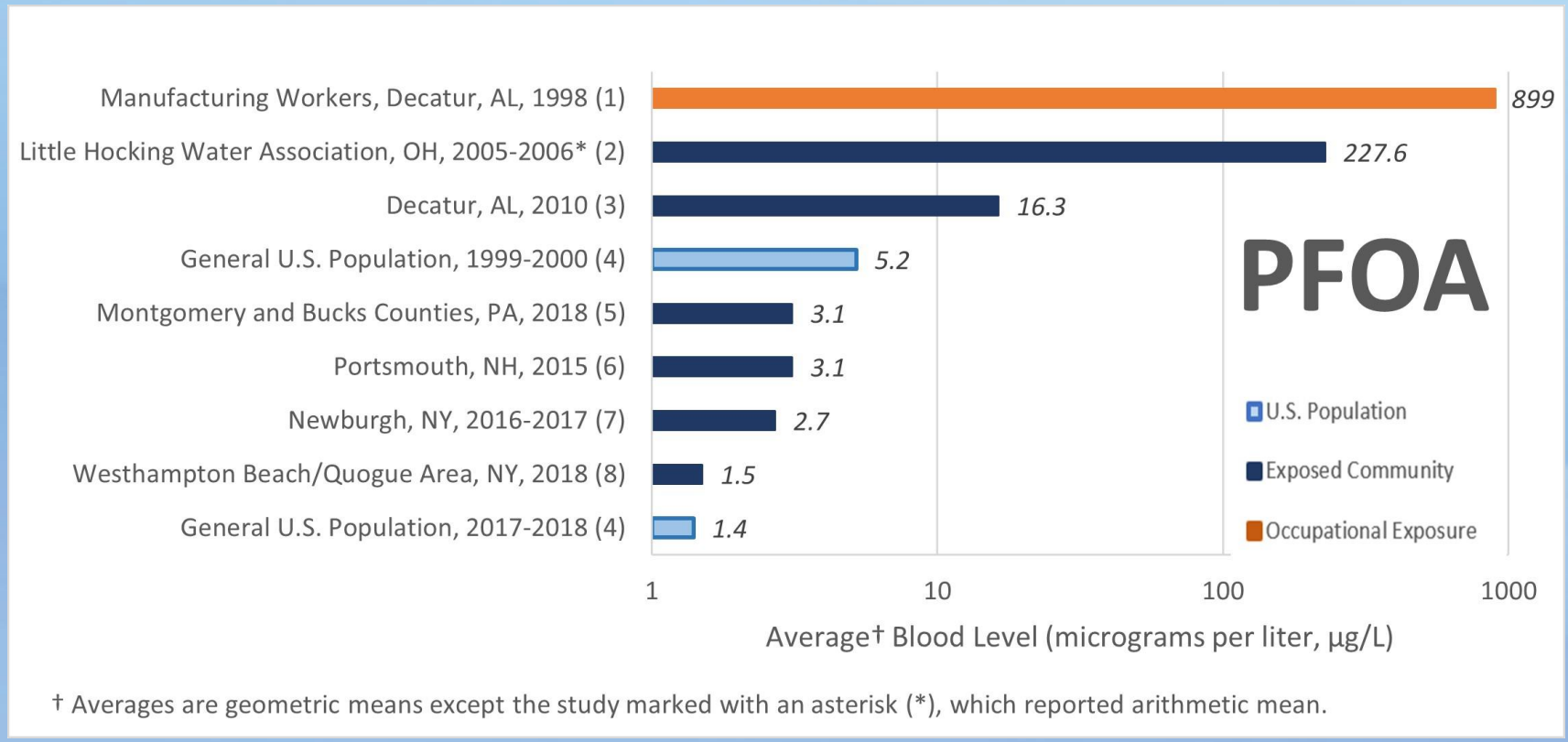


PFOS concentrations in Blood



† Averages are geometric means except the study marked with an asterisk (*), which reported arithmetic mean.

PFOA concentrations in Blood-



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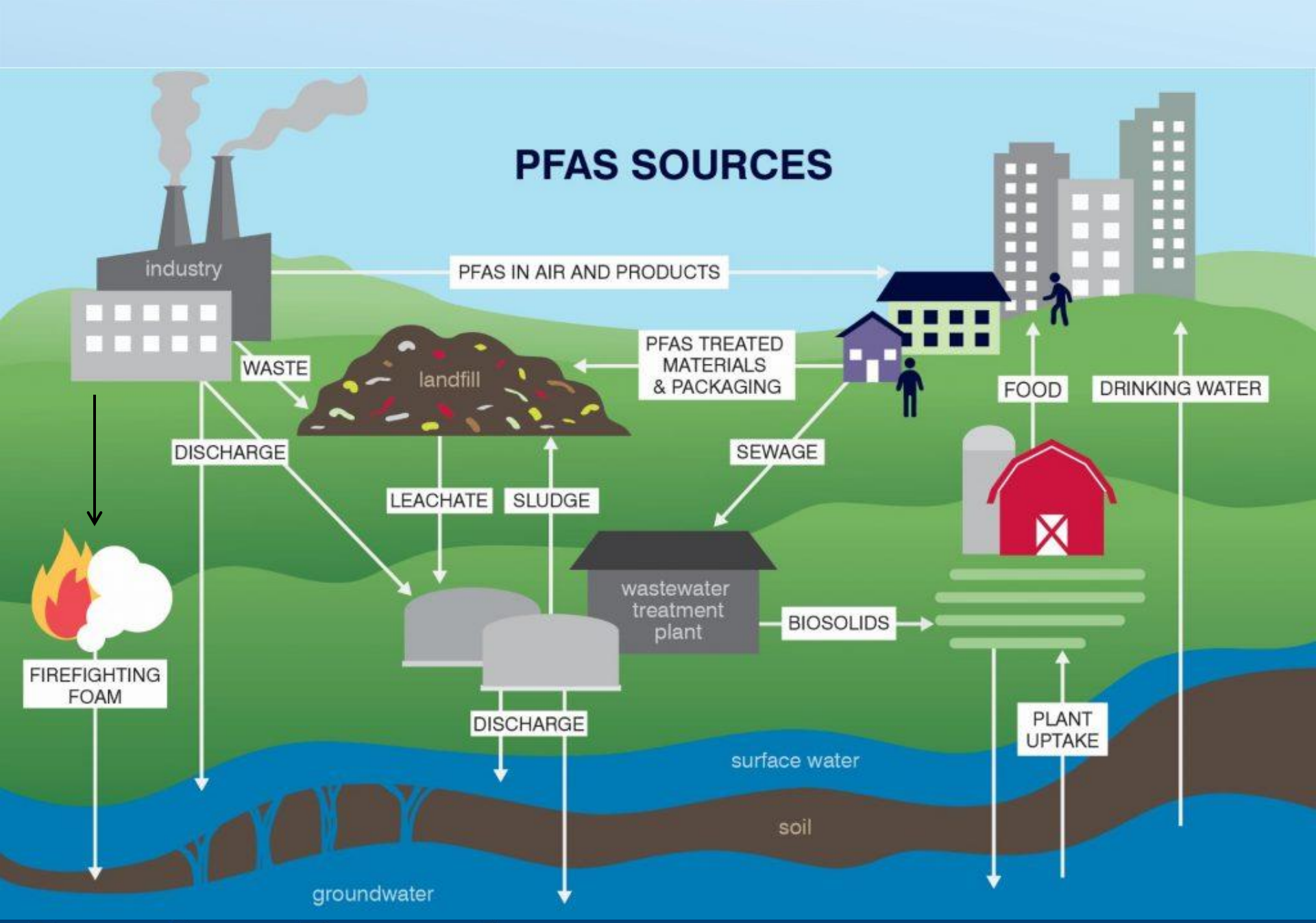
PFAS in the Environment

- Although some PFAS have been manufactured since the 1930s, PFAS were not widely documented in environmental samples until the early 2000s, as PFAS testing was not widely available until that time.
- Since the 2000s, methods have been, and continue to be, developed with lower detection limits in water that are commensurate with levels of potential human health effects.
- With more sensitive analytical methods available, PFAS (especially PFOA and PFOS) have been widely detected around the world.
- Nationwide testing in 2012 of drinking water supplies led to four additional PFAAs (PFHpA, PFNA, PFBS, PFHxS) gaining greater attention.



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Health Impacts

- According to a review of literature conducted by the US EPA, exposure to certain PFAS at certain levels may pose some health impacts,
  - Reproductive effects,
  - Increased risk for cancer,
  - Suppression of the body's immune system
  - Interference with the body’s hormone system.
- Knowledge gaps on specific human health effects exist given that there are a wide variety of PFAS chemicals in use and overall individual exposure routes and exposure durations can vary.

Health effects of specific PFAS compounds

- Increases in cholesterol levels (PFOA, PFOS, PFNA, PFDA).
- Lower antibody response to some vaccines (PFOA, PFOS, PFHxS, PFDA).
- Changes in liver enzymes (PFOA, PFOS, PFHxS).
- Pregnancy-induced hypertension and preeclampsia (PFOA, PFOS).
- Small decreases in birth weight (PFOA, PFOS).
- Kidney and testicular cancer (PFOA).

PFAS in Drinking Water

- On January 14, 2023, PA DEP published the PFAS MCL Rule for public water suppliers.
- This rule set a maximum contaminant level (MCL) for two PFAS: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), two of the more common and persistent PFAS chemicals.
- The MCL for PFOA was set at 14 parts per trillion (ppt) and the MCL for PFOS was set at 18 ppt.
- The required monitoring was set to begin in 2024 continuing through 2025

PFAS in Water-US EPA regs

- On April, 2024, US EPA established drinking water maximum contaminant levels (MCL) for five PFAS compounds and combinations to be implemented over the next 5 years.
- When fully implemented, the proposed rules will become enforceable federal drinking water standards requiring **public drinking water treatment** plants to reduce levels of PFAS to meet the standard.

PFAS Compound	Proposed MCL
Perfluorooctanoic acid (PFOA)	4 PPT
Perfluorooctane sulfonic acid (PFOS)	4 PPT
Perfluorononanoic acid (PFNA)	10 PPT
Perfluorohexane sulfonic acid (PFHxS)	10 PPT
Hexafluoropropylene oxide dimer acid (HFPO-DA) (commonly referred to as a GenX chemical)	10 PPT
Mixtures containing two or more PFHxS, PFNA, HFPO-DA and perfluorobutane sulfonic acid (PFBS)	1 (unitless) Hazard Index

We have PFAS in Local Streams!

Table: Frank Kummer Source: U.S. Geological Survey

Stream	PFOA (PPT)	PFOS (PPT)	Hazard Index
Neshaminy Creek in Langhorne PA	11.0 PPT	23.0 PPT	1.4
PA MCL	14.0	18.0	-
USEPA MCL	4.0	4.0	-

PFAS in Local Water Systems

Water source	PFOA (PPT)	PFOS (PPT)
Doylestown Borough Water Department	11.6	13.7
Upper Southampton Municipal Authority system	12.8	16.1
Solebury/Lahaska EP101*	11.2	15.0
Solebury/Lahaska EP102*	7.6	14.3
Cold Spring Water system Buckingham	14.35	14. 42
Furlong Water system Buckingham	5.6	7.07
Bucks County Water and Sewer Authority-Main lower south (Woodbourne road)	5.8	6.4
Plumstead Northern System	4.6	4.9
Bucks Community College (Newtown)	3.6	6.5
PA MCL	14.0	18.0
USEPA MCL	4.0	4.0

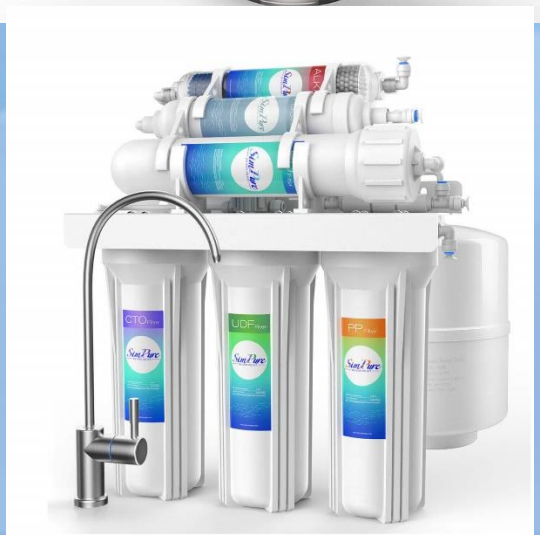
Table: Oliver Morrison Source: Pennsylvania DEP * Bucks County Water Authority

How to remove PAS in Residential Systems?

- **Activated Carbon Treatment**: This method uses activated carbon to adsorb PFAS from water. It's particularly effective for longer-chain PFAS like PFOA and PFOS. Granular activated carbon (GAC) is commonly used in a flow-through filter mode after particulates have been removed[1].Carbon must be replaced periodically.

- **Ion Exchange Resins**: Similar to water softeners these resins can capture PFAS molecules, effectively removing them from the water[1].

- **Reverse Osmosis**: Technologies like reverse osmosis can remove PFAS by forcing water through a semipermeable membrane, which leaves contaminants behind[1].Creates a large waste stream



Activated Carbon Systems

- Like a sponge, Carbon will capture the PFAS, removing it from the water. This is the same technology in refrigerator filters and in some water pitcher filters, like Brita or PUR. Note that many refrigerator manufacture's filters are not certified for PFAS, so don't assume they will remove PFAS to safe levels.
- Whole house or point of use systems available
- Two point of use systems tested by the US EPA removed PFAS to non-detectable levels

Reverse Osmosis

- **Reverse osmosis** is a membrane technology that only allows water and select compounds to pass through the membrane, while PFAS are blocked. This is commonly installed at the kitchen sink and has been found to be very effective at removing most PFAS in water. It is not practical for whole house treatment, but it is likely to remove a lot of other contaminants as well.
- EPA evaluated 2 systems that provided complete removal

Certification of Devices for removing PFAS

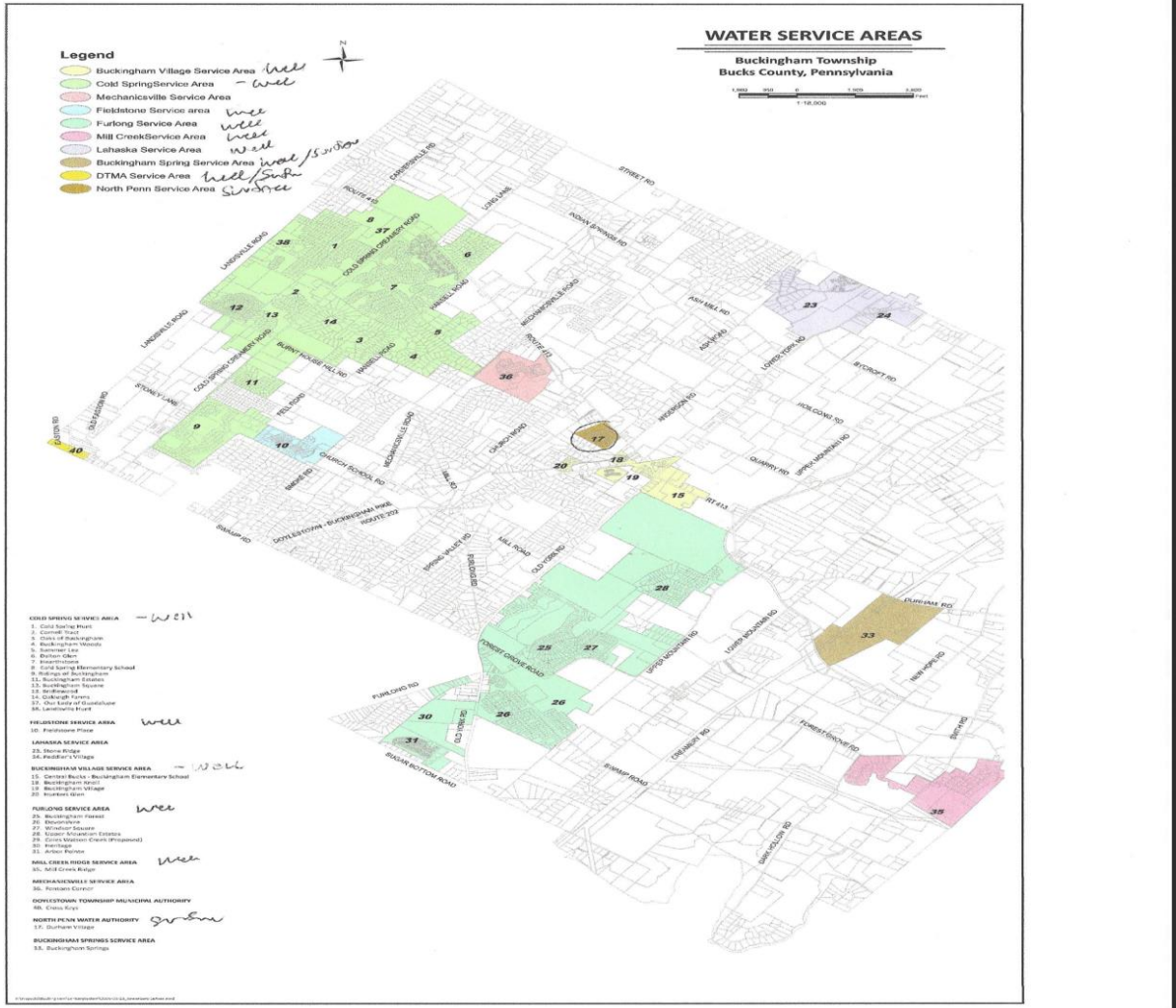
- Two Independent third party testing services certify PFAS removal devices
- National Sanitation Foundation/American National Standards Institute (NSF/ANSI)
- Water Quality Institute
- Current Certification indicates that device will remove PFOS and PFOA to below a total 20 PPT

Resources

- Master Well Owner Network (psu.edu)
- Water Testing — Agricultural Analytical Services Lab — Penn State College of Agricultural Sciences (psu.edu)
- Https://extension.psu.edu/testing-and-treating-pfas-chemicals-in-pennsylvania-water-wells
- Water & Wastewater | Buckingham Township (buckinghampa.org)

Thank You !

Public Water systems in Buckingham



Wells and Springs Utilize Groundwater Aquifers