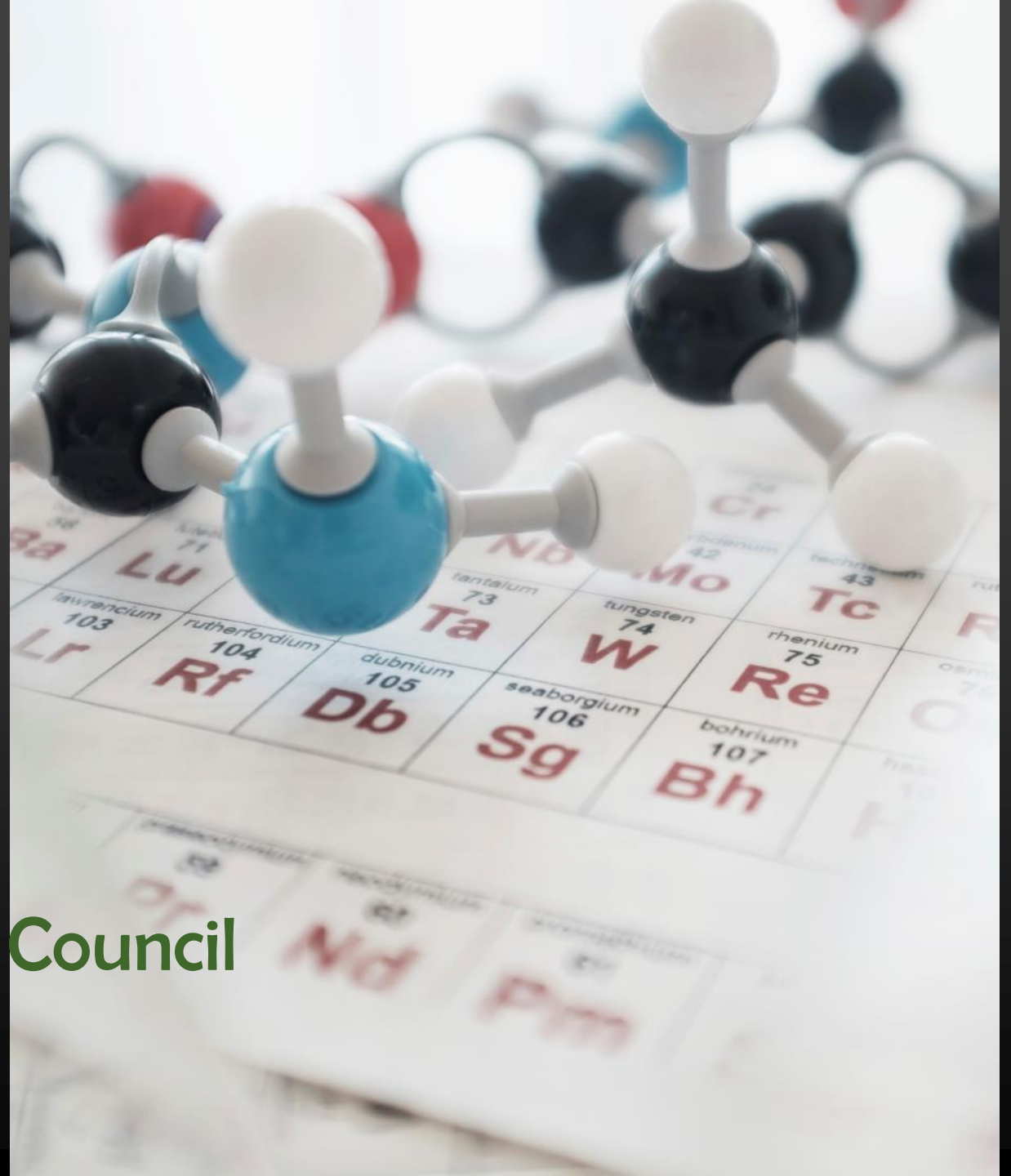


Per – and Polyfluoroalkyl Substances (PFAS)

Informational Presentation to

Environmental Advisory Council

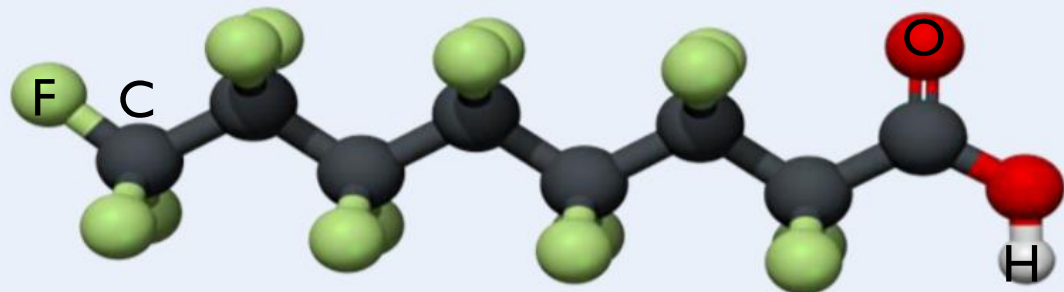
April 19, 2023



Today's Topics

- What are PFAS?
- PFAS in the Environment
- Rationale for Concern about PFAS
- Evolution of PFAS Regulations
- Impact of Proposed Regulations in Carroll County





EXAMPLE: 3D model of a PFOA (perfluorooctanoic acid) molecule, in its acid form.

Source: Manuel Almagro Rivas (Own work using: Avogadro, Discovery Studio, GIMP) [CC BY-SA 4.0] (<https://creativecommons.org/licenses/by-sa/4.0/>), via Wikimedia Commons. <https://commons.wikimedia.org/wiki/File:PFOA-3D.png>



What are PFAS?

- Family of thousands of man-made chemicals. We can only analyze a handful.
 - Vary widely in chemical & physical properties, as well as potential risks to human health & environment
- Multiple classes, subclasses and groups within family
 - Perfluoroalkyl acids (PFAAs) group and their polyfluoroalkyl precursors are generally of greatest concern
- Manufactured and used in various industries since the 1940's
- At their core, consist of strong carbon-fluorine bonds
 - Makes them persistent and bioaccumulative
 - Can have different chain lengths, fluorine vs. other element counts and functional groups



What have PFAS been used in?

- Aviation & Automotive Industries (fluid additives)
- Herbicides & Pesticides
- Construction Materials (paints, coatings)
- Cosmetics & Personal Care Products
- Firefighting/Safety (Class B firefighting foams)
- Food Processing (packaging coatings)
- Textile Treatment (furniture, carpets, vehicles)
- Metal Plating (suppressant for harmful vapors)
- Household products (waxes, cleaning products, polishes)
- Manufacturing (semiconductors, other PFAS)



PFAS in the Environment

Alarming levels of PFAS in Norwegian Arctic ice pose new risk to wildlife

Oxford University-led study detects 26 types of PFAS compounds in ice around Svalbard, threatening downstream ecosystems



📷 A polar bear in Svalbard, Norway. 'As a polar bear, you have exposure to toxic man made chemicals, and stresses from a changing habitat.' Photograph: Paul Souders/Getty Images

Norwegian Arctic ice is contaminated with alarming levels of toxic PFAS, and the chemicals may represent a major environmental stressor to the region's wildlife, new research finds.

... BBC

Pollution: 'Forever chemicals' in rainwater exceed safe levels

New research shows that rainwater in most locations on Earth contains levels of chemicals that "greatly exceed" safety levels.

Aug 2, 2022

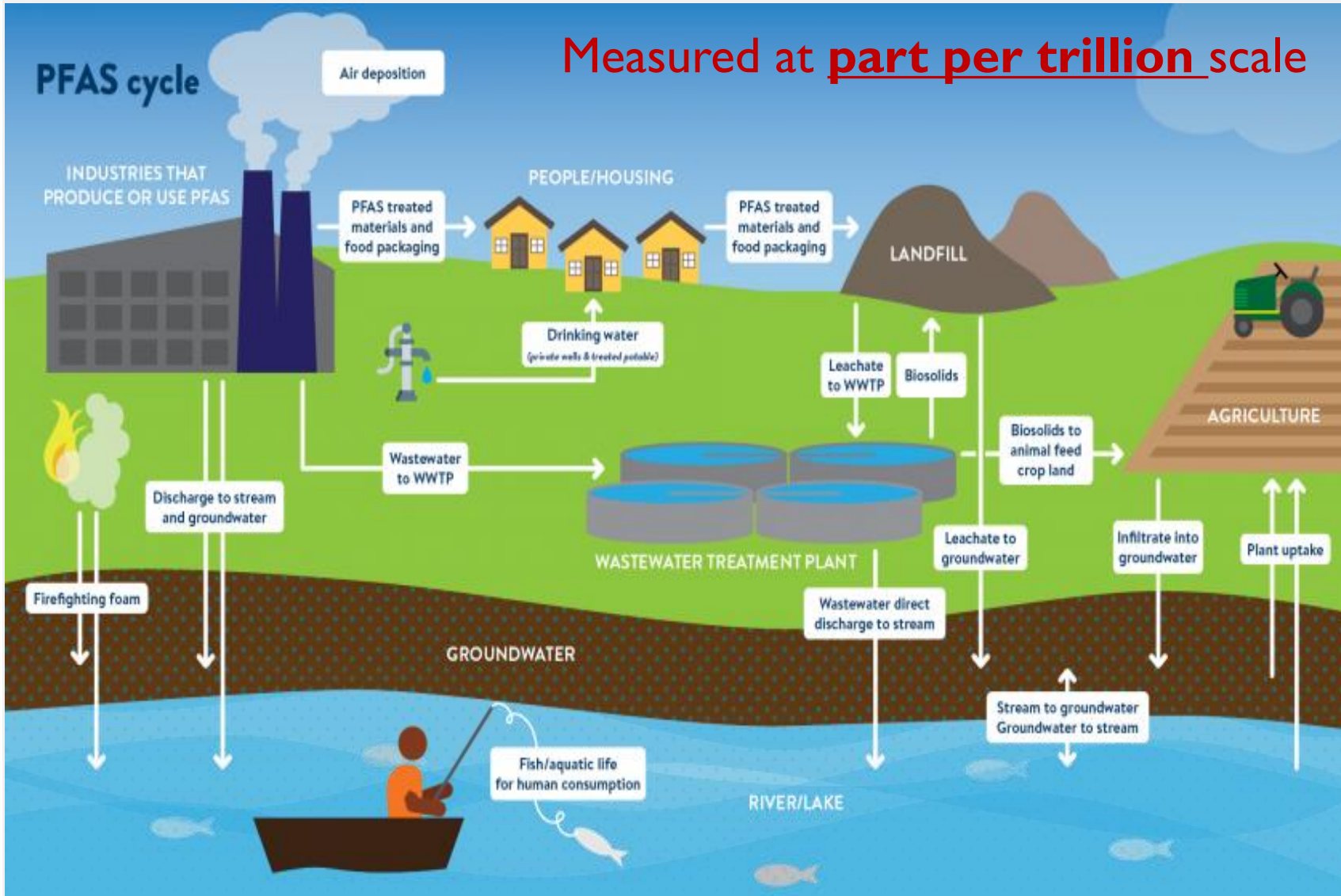


PFAS is so ubiquitous that water systems that test for it tend to find it – this has proven to be the case in states that already have PFAS MCLs, such as California, Massachusetts and New York. As water providers across the nation discover these contaminants in relative unison, the demand for treatment technologies and infrastructure upgrades are likely to rise. Large, unexpected costs are hard for water utilities to manage as they are already tasked with doing more with tightening budgets.

“We haven’t really seen a contaminant with such a combination of dangerous attributes before. It is scientifically established that exposure is dangerous even at very low concentrations,” said Ken Sansone, partner at SL Environmental Law Group. “The contaminant is incredibly widespread because it has been used in so many different products for decades and PFAS does not break down naturally. The new MCLs are a clear indication of these facts, and that we likely have a public health emergency.”



Environmental Transport & Persistence



- Finding more ubiquitously, but point sources remain critical
- Consumption & inhalation are major exposure pathways
 - Drinking water
 - Food
 - Treated materials
- PFAS are resistant to conventional water and wastewater treatment processes
 - Can cycle between pathways
- Relatively mobile in groundwater
- Can sorb to and slowly release from soils, particularly carbon rich soils
- Bioaccumulate in humans, fish etc.



Why the Concern?

Historic Unpublished & Recently Published Studies

- Found in blood of workers in the late 1960's and early 1980's (study not published)
- Manufacturers observed immunotoxicity in other animals (monkeys) as early as 1978 (not published)
- Changes to white blood cells of exposed workers (1992)
- Breastfeeding shown to be major pathway for infants in 2015

Toxicology studies ongoing, but may lead to:

- Decreased vaccine response in children
- Increased risk of kidney, testicular & other cancers
- Changes in liver enzymes
- Increased cholesterol
- Increased risk of high blood pressure

Found in most people's blood, though concentrations have been generally decreasing



Source: AAFP Foundation



Regulatory Landscape

- Federal Level:
 - Currently, no federal regulations for PFAS in drinking water.
 - EPA published non-enforceable health advisories (HA) for two PFAAs, perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) in 2009. In 2016, EPA replaced the 2009 guidance lifetime HA via drinking water exposure for combined PFOA and PFOS to 70 parts per trillion (ppt). In June 2022, these HAs were lowered to 0.004 and 0.02 ppt, respectively.
 - EPA worked with eight major manufacturers as part of a Stewardship Program to reduce and phase out PFOA and PFOS emissions and product content.
 - Unregulated Contaminant Monitoring Rule (UCMR) 3 – Preliminarily assessed some water systems nationwide for unregulated contaminants, including six PFAS.
 - UCMR 5 – Will be carried out 2023-2025 and include 29 PFAS.
 - EPA working towards issuing enforceable Maximum Contaminant Levels (MCLs) for PFOA, PFOS, and a mixture of 4 other PFAS. Final MCLs are anticipated by the end of 2023.
 - EPA Proposing:
 - 4 ppt PFOA
 - 4 ppt PFOS
 - 1.0 Hazard Index for PFHxS, PFNA, PFBS and HFPO-DA (based on running averages of concentrations, with 4 numerators and denominators in the equations)



Regulatory Landscape Continued

- State Level:
 - Maryland has not adopted a regulatory threshold, and is generally awaiting federal rulemaking
 - The Maryland Department of Health issued a non-enforceable health advisory for Perfluorohexane sulfonate (PFHxS); the HA was set at 140 ppt.
 - By comparison, the recent Hazard Index from EPA under the proposed PFAS regulations utilizes a denominator of 9 ppt for PFHxS specifically.
 - MDE sampled community water systems in three separate phases.
 - Phase 1 – 2020 – 129 public water treatment systems sampled
 - Phase 2 – 2021 – 65 public water treatment systems sampled
 - Phase 3 – 2021 – 2022; 313 community water systems sampled, including mobile home parks, etc.
 - MDE asked that municipalities with drinking water sources with elevated PFAS concentrations take those sources offline. This initially started with wells exhibiting concentrations greater than the 70 ppt HA in effect before June 2022.
 - Additional notifications have been sent to water consumers in municipalities as health advisories have been lowered.
 - MDE requested that entities suspected of potential PFAS contamination begin investigating specific sites, though remedial criteria have not yet been established.
 - MDE working on studying PFAS in: WWTP effluent, landfills, biosolids, fish, seafood, etc.



What Do We See in Carroll County?

Municipal Focus

- Nearly every municipality will be grappling with PFAS in some way
 - At least one PFAS compound proposed for regulation has been detected in at least one water supply well serving each municipality
 - MDE Sampling of community water supply systems showed that concentrations in municipal supplies ranged from non-detect (less than 4 ppt) to >270 ppt.
 - The highest concentrations observed were in specific wells in Westminster and Hampstead
 - Affected wells were taken offline
 - Lower concentrations (many detections still above proposed MCLs) are generally observed throughout the County, while elevated concentrations observed in select wells are suspected of being associated with point sources of potential contamination.
- Under the proposed federal PFAS regulations, municipalities will have to:
 - Perform routine monitoring for PFAS
 - Notify consumers if/when levels exceed standards
 - Reduce PFAS levels via treatment (granular activated carbon, ion exchange, etc.)
- The cost of producing and treating water will likely increase, as will the burden (time and training) on municipal staff for treatment, maintenance, monitoring and reporting.



What Do We See in Carroll County?

County Focus

- County mains groundwater systems for Bark Hill and Pleasant Valley
 - Both water systems came back non-detect during MDE PFAS Sampling efforts
- Freedom District (Eldersburg & Sykesville) predominantly utilizes water from Liberty Reservoir purchased from Baltimore City. County also has groundwater wells.
 - Groundwater wells are not currently online, and haven't been screened for PFAS
 - MDE sampling has shown low concentrations of PFOA and PFOS in Liberty Reservoir; the PFOS concentration still exceeded the proposed MCL in that sample.
- County Properties
 - Carroll County Public Safety Training Center
 - Given the proximity to the affected Vo-Tech well, MDE hypothesizes the PSTC may be a source of PFAS contamination and requested the County initiate a study in 2021.
 - Work was performed in late 2021. Preliminary results detected elevated PFAS concentrations in groundwater under the site, as well as measurable concentrations in on-site soils and concrete.
 - Soil standards have not yet been proposed for PFAS.
 - Additional investigative and characterization work to take place





Questions?

Additional Resources

EPA Website: *Per- and Polyfluoroalkyl Substances (PFAS)*

www.epa.gov/pfas

Interstate Technology Resource Council Website: *PFAS Home*

<https://pfas-1.itrcweb.org/>

CDC: *Per- and Polyfluoroalkyl Substances (PFAS) Factsheet*

[https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html#:~:text=Many%20PFAS%2C%20including%20perfluorooctane%20sulfonic,bioaccumulate\)%20in%20fish%20and%20wildlife.](https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html#:~:text=Many%20PFAS%2C%20including%20perfluorooctane%20sulfonic,bioaccumulate)%20in%20fish%20and%20wildlife.)