

What's PFAS, PFOS and PFOA ? How Do They Impact My Lake?

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CWC

**“Your Watershed in Focus”
NYSFOLA Central New York
Regional Conference
11 August 2023**



New York State Federation
of Lake Associations

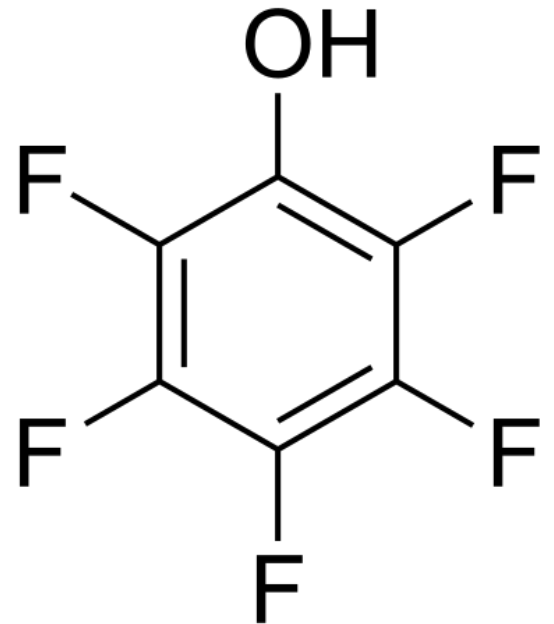


Alphabet soup of “forever chemicals”

Deciphering The Alphabet Soup

Fluorinated synthetic organic compounds with at least one fully fluorinated methyl or methylene carbon atom

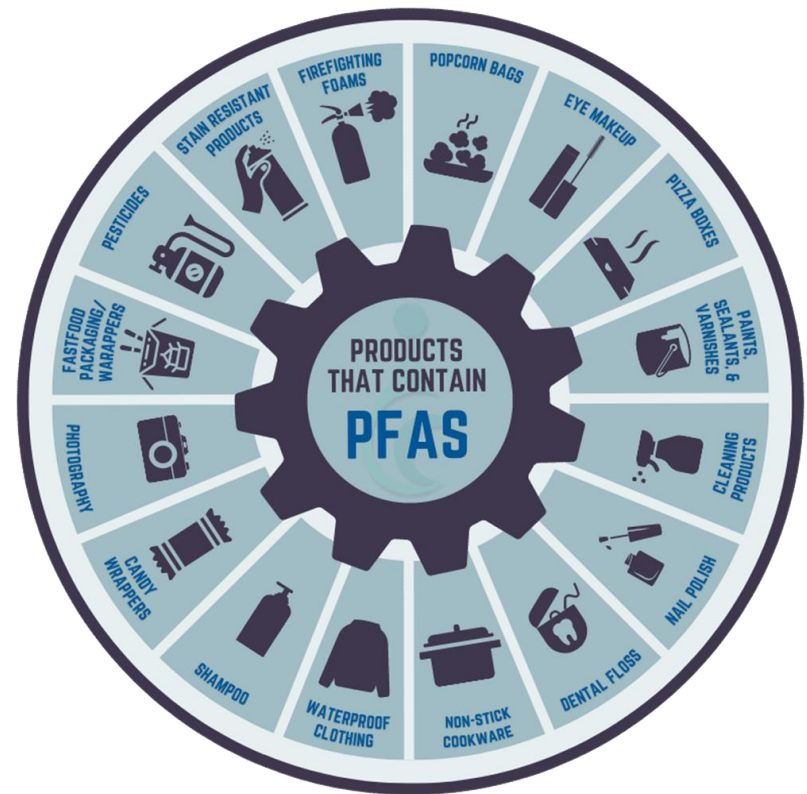
- PFAS = polyfluoroalkyl substances
- PFOA = perfluorooctanoic acid
- PFOS = perfluorooctanesulfonic acid



PFAS - The “Forever Chemicals”

PFAS compounds decompose very slowly... environmentally persistent contaminants

- Ubiquitous sources
 - Flame retardant clothing
 - Water / stain proofing products
 - Cosmetics and dental floss
 - Fire fighting foam
 - Non-stick cookware
 - Fast food packaging
 - Toilet paper

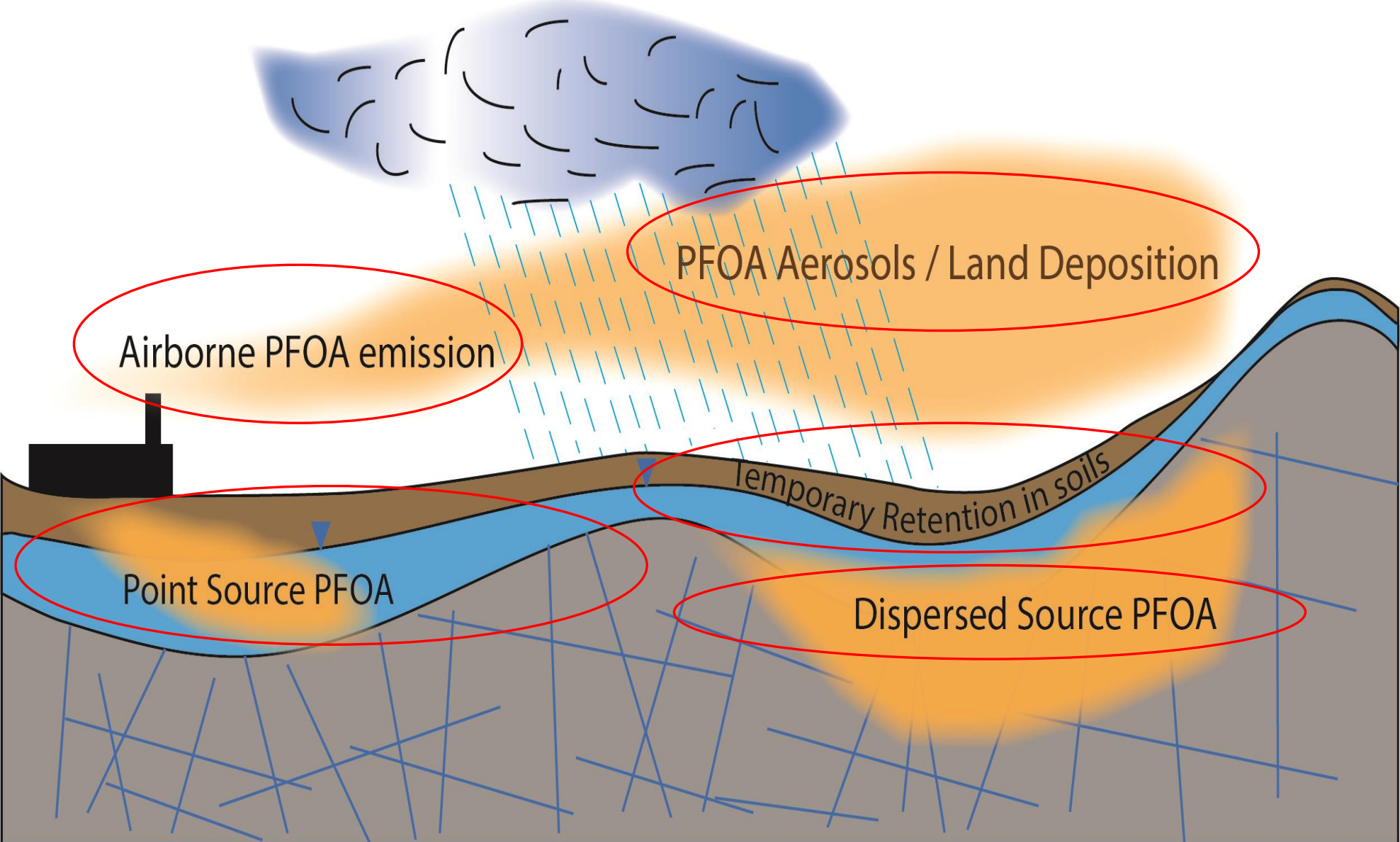


As a Result ... This Stuff Is Everywhere!

- Point Sources
- Diffuse (non-point) Sources
- Measurable concentrations
 - Ocean
 - Air
 - Soil
 - Rainwater
 - Freshwater
 - Groundwater



Exposure Pathways – Air, Soil, Water



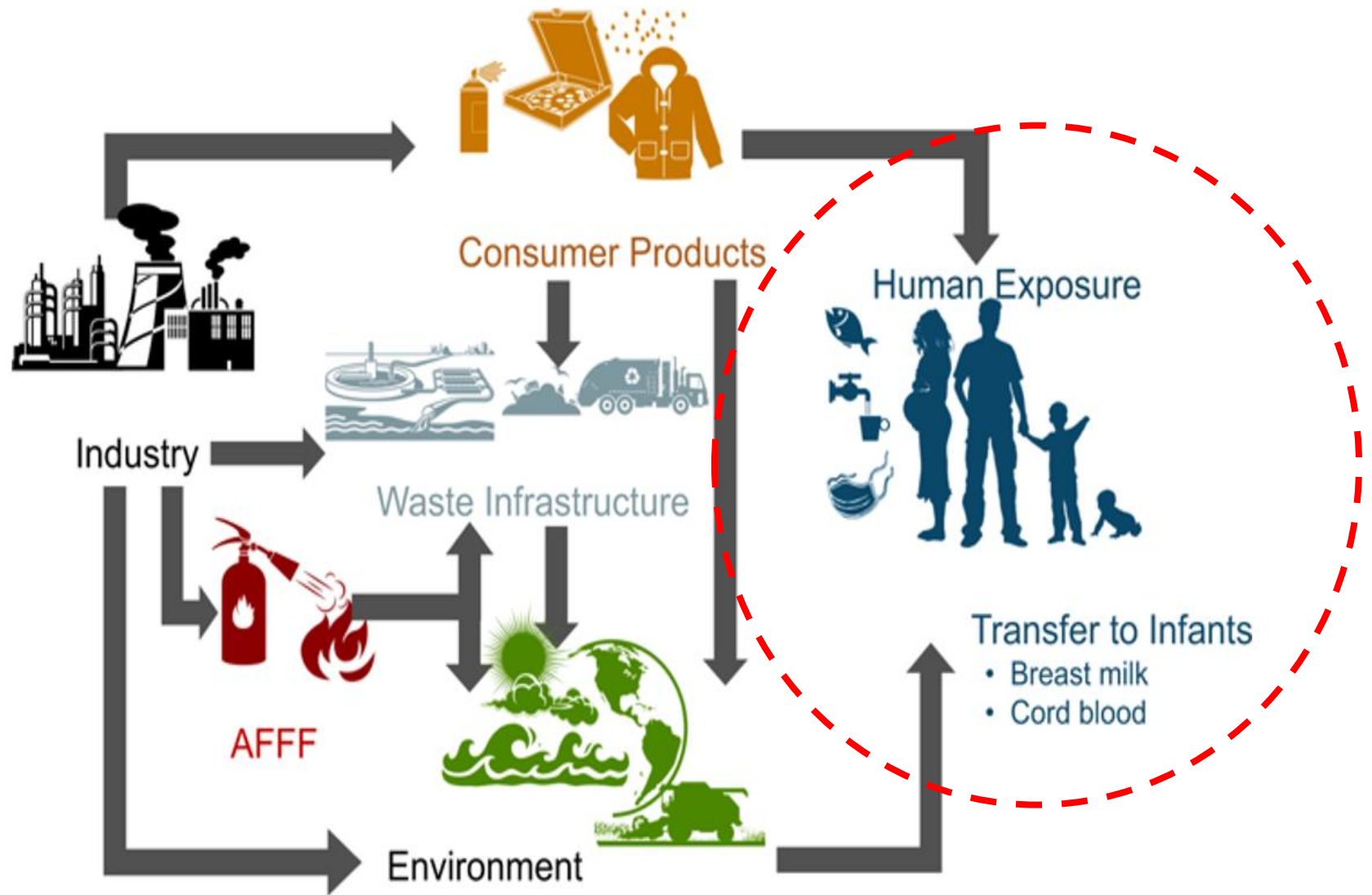
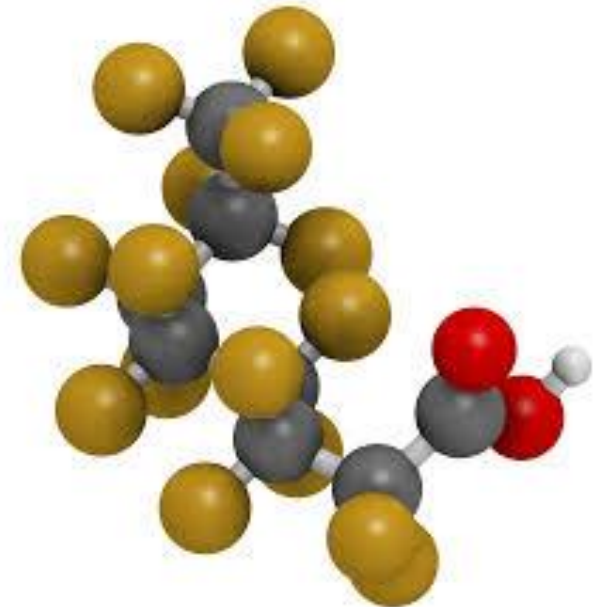


Figure 1 from Sunderland et al. (2019) *Journal of Exposure Science & Environmental Epidemiology* 29(2). doi:10.1038/s41370-018-0094-1

Health Concerns

U.S. National Health and Nutrition Examination Survey reported detectable blood serum PFAS concentrations in virtually all individuals (97%)

- Various cancers
- Male and female infertility
- Impaired natal health
- Elevated cholesterol
- Liver disease
- Thyroid disease



What Does The USEPA Say?

- In 2016 EPA issued lifetime health advisory of 70 parts per trillion (PPT) for long-term exposure to PFOA and PFOS in drinking water.
- Intended to protect humans from adverse health effects due to lifetime exposure via drinking water.
- Does boiling remove these chemicals? NO!
- Can they be removed by filtering/treatment? YES!

Fifth Unregulated Contaminant Monitoring (UCMR) Rule

- In 2021 via the Safe Drinking Water Act (SDWA) the EPA issued UCMR 5 requiring sampling of PHAS compounds between 2023 and 2025.
- Generates scientifically valid data of PFAS contaminants in drinking water.
- Data will ensure science-based decision-making and help prioritize protection of disadvantaged communities.

EPA PFAS Strategic Roadmap

- **RESEARCH** - Increase understanding of PFAS exposures and toxicities, human health and ecological effects, and effective interventions.
- **RESTRICT** - Proactively prevent PFAS from entering air, land, and water at levels that can adversely impact human health and the environment.
- **REMEDiate** - Broaden and accelerate the cleanup of PFAS contamination to protect human health and ecological systems.

More Recent Action By USEPA

- March 2023 EPA proposed a **National Primary Drinking Water Regulation** for six PFAS, including PFOA and PFOS.
- Includes both non-enforceable Maximum Contaminant Level Goals (MCLGs) and enforceable standards Maximum Contaminant Levels (MCLs).
- Expect regulations to be finalized by end of 2023.
- Once finalized, public water systems must:
 - Routinely measure PFAS contaminants in drinking water
 - Treat drinking water to PFAS MCL standards
 - Legally notify consumers when a PFAS MCL is exceeded

EPA's Proposed Action for the PFAS NPDWR

| Compound | Proposed MCLG | Proposed MCL (enforceable levels) |
|--|----------------|-----------------------------------|
| PFOA | 0 ppt* | 4.0 ppt* |
| PFOS | 0 ppt* | 4.0 ppt* |
| PFNA | | |
| PFHxS | 1.0 (unitless) | 1.0 (unitless) |
| PFBS | Hazard Index | Hazard Index |
| HFPO-DA (commonly referred to as GenX Chemicals) | | |

The Hazard Index is a tool used to evaluate potential health risks from exposure to chemical mixtures.

*ppt = parts per trillion (also expressed as ng/L)

https://www.epa.gov/system/files/documents/2023-04/PFAS%20NPDWR%20Public%20Presentation_Full%20Technical%20Presentation_3.29.23_Final.pdf

New York - National Leader in Regulating PFOA/PFAS

- 2016 NY petitioned USEPA to make PFOA contamination a national problem requiring federal guidelines applied uniformly by states.
- 2016 NY created the **Water Quality Rapid Response Team**, enabling NYSDEC and NYSDOH to quickly investigate PFAS contamination and implement corrective actions.
- 2017 NY's PFOA/PFOS rule authorizes clean up of contaminated sites via Superfund and holds polluters responsible.
- 2017 **Clean Water Infrastructure Act** makes \$2.5 billion available to upgrade drinking water infrastructure, update filtration systems and connect contaminated private wells to regulated public systems.

New York - National Leader in Regulating PFAS

- NY phasing out PFAS Class B fire fighting foam
- NY banning PFAS in textiles/clothing at end of 2023
- March 2023 issued final water quality guidance values (GVs) for PFOA and PFOS
- April 2023 PHAS Sampling, Analysis, And Assessment Protocols
- Testing procedures for PFAS compounds in soil, sediment, leachate, surface water, monitoring wells, potable water wells and fish

New York - National Leader in Regulating PFAS

- Senate Bill – S5648 / Assembly Bill - A3556T.... ACTIVE
- Phases-out sale of products with regulated amounts of PFAS or intentionally added PFAS by 1 January 2024.
- These include - architectural paint; cleaning products (not including personal care products), polish or floor maintenance products; cookware, fabric treatment, rugs, ski wax, textiles, non-wearable textile goods, outdoor apparel and PPE.
- Prohibits sale of certain products with intentionally added PFAS after 1 January 2025
- Requires manufacturers of PFAS products to provide notice of such to persons that offer the products for sale or distribution
- Provides penalties for violations.

NYSDEC PFAS Guidance

2021 NYSDEC Guidance On Regulation of PFOA and PFOS

Proposed Guidance Values

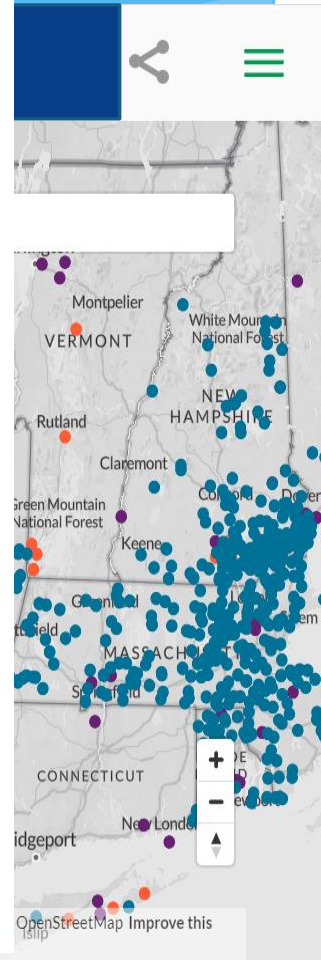
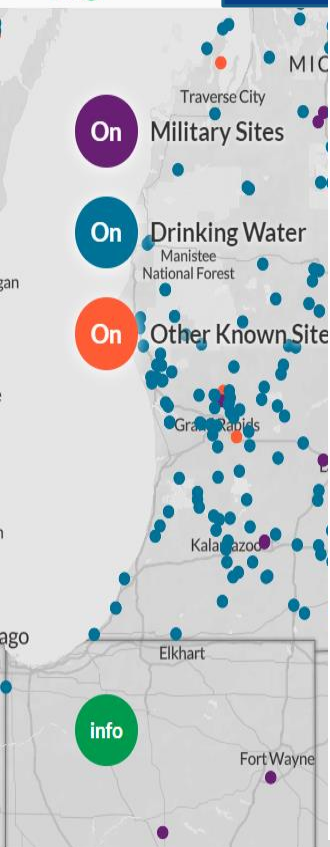
| Chemical | DEC - Raw Water Source | | Aquatic Life | |
|----------|------------------------|--------------|------------------------------------|-------------------------------------|
| | Drinking Water | Ambient | Chronic | Acute |
| | Adopted MCLs | Human Health | | |
| PFOA | 10 ppt | 6.7 ppt | N/A | N/A |
| PFOS | 10 ppt | 2.7 ppt | 160 ppb (fresh) 41 ppb (saline) | 710 ppb (fresh) 190 ppb (saline) |

MCL = Maximum Concentration Level

Data Compiled By Environmental

KEY FINDINGS

- ① PFAS compounds are a class of non-stick, waterproof, stain-resistant compounds used in consumer products and industry. Best known are PFOA, formerly used to make DuPont's Teflon, and PFOS, formerly in 3M's Scotchgard.
- ② Very low exposure to some PFAS chemicals has been linked to cancer, thyroid disease, weakened childhood immunity and many other health problems.
- ③ Tests of tap water, military bases and industrial sites have found PFAS contamination in more than 712 locations in 49 states. Drinking water for up to 110 million Americans may be contaminated with PFAS.



Closer Look At New York

DETAILS

Contamination site: Plattsburgh Air Force Base

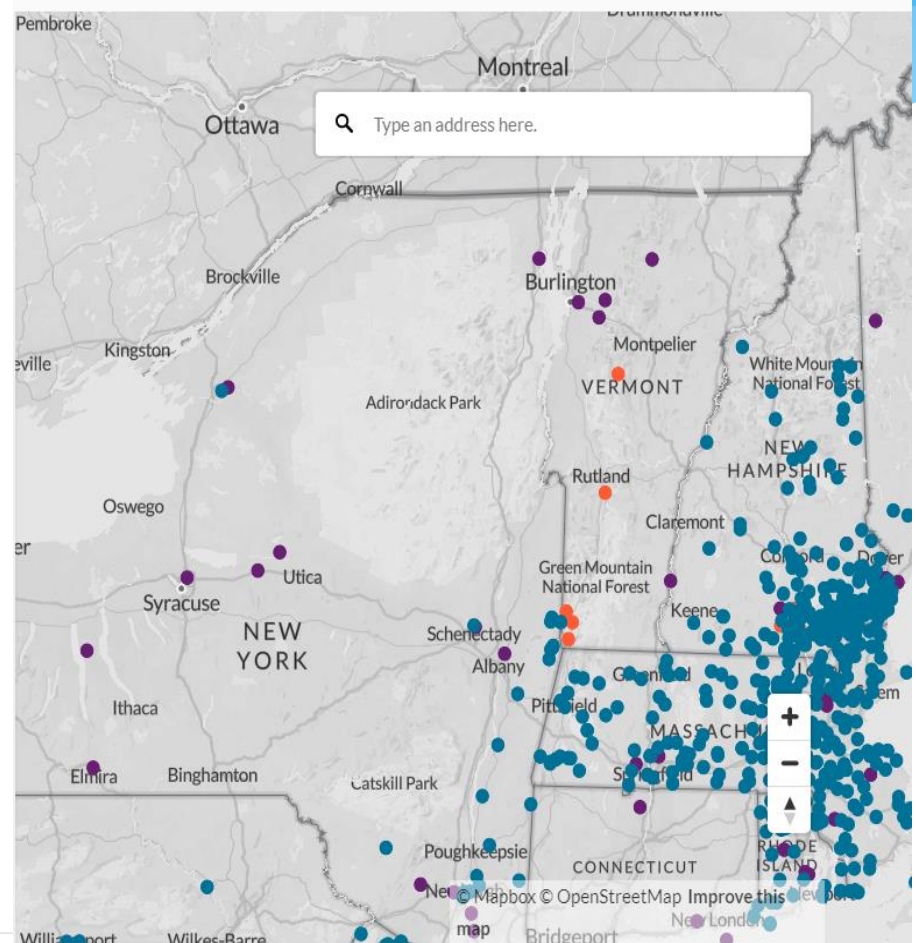
Location: Plattsburgh, New York

ENVIRONMENTAL CONTAMINATION

Suspected Source: Firefighting foam

Test Results:

| PFA | Location detected | Maximum Level (ppt) | Years tested |
|----------|------------------------|---------------------|--------------|
| NEtFOSAA | Groundwater On-base | 64 | 2018 |
| NMeFOSAA | Groundwater On-base | 64 | 2018 |
| PFBS | Groundwater On-base | 15,800 | 2018 |



How Is PFAS Affecting Lake Communities?

- Primary means of exposure:
 - Drinking water – well water and public water supplies (not so much)
 - Fish consumption
- Good news swimming, bathing and other typical dermal contact NOT a mode of major exposure



Elevated Concentrations In Potable Water

- Public water supply systems monitor for PFAS products as required nationally by USEPA 2013 UCMR 3 and UCMR 5
- USEPA proposed MCL 4.0 ppt
- New York DOH MCL ≤ 10 ppt
- But private wells not monitored
- If you live near possible PFAS source test your potable water



Database of Known New York Contamination Sites

- Statewide database:

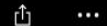
<https://storymaps.arcgis.com/stories/f3b905cc113c4b94911283716a7b583d>

- Based on sites where PFAS products historically or currently being used (e.g., fire stations, airports, and military bases).
- Also accounts for NYSDEC Environmental Remediation Site Database, Exploratory USEPA, DEC, and DOH sampling events, and water quality reports from local utilities.

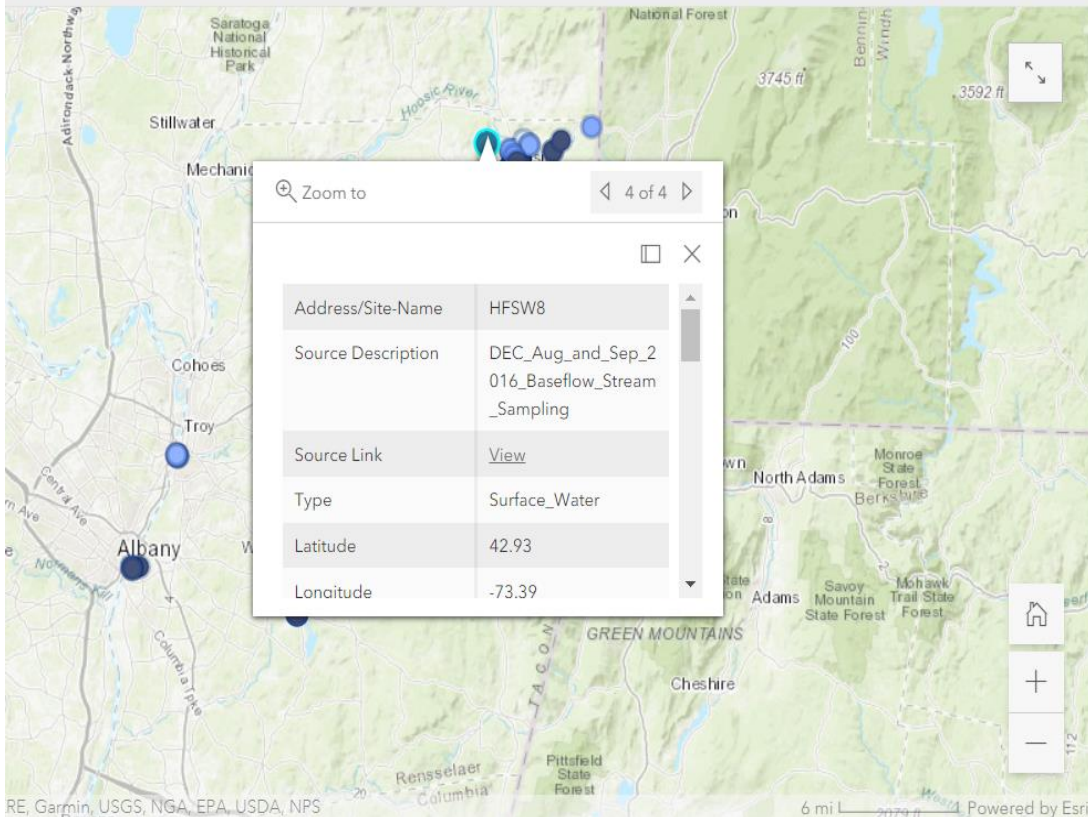
Database of Known New York Contamination Sites



PEAS in NYS



Background Case Studies Remediation Measures Regulations Conclusion References



| | |
|-----------------------|---|
| Address/Site-Name | The address or name of the sampling location |
| Source Description | A description of the data's source |
| Source Link | A link to the data's source |
| Type | Type of water sampled |
| Latitude | Location latitude in NAD83 coordinates |
| Longitude | Location longitude in NAD83 coordinates |
| Date | Date the sample was taken |
| PFOA | Concentration of perfluorooctanoic acid in ppt |
| PFOS | Concentration of perfluorooctane sulfonic acid in ppt |
| PFBA | Concentration of perfluorobutanoic acid in ppt |
| PFBS | Concentration of perfluorobutane sulfonic acid in ppt |
| PFHpA | Concentration of perfluoroheptanoic acid in ppt |
| PFHxS | Concentration of perfluorohexane sulfonic acid in ppt |
| PFHxA | Concentration of perfluorohexanoic acid in ppt |
| PFNA | Concentration of perfluorononanoic acid in ppt |
| PFDA | Concentration of perfluorodecanoic acid in ppt |
| PFDS | Concentration of perfluorododecane sulfonic acid in ppt |
| PFDoA | Concentration of perfluorododecanoic acid in ppt |
| PFPA | Concentration of perfluorophosphonic acid in ppt |
| PFPeA | Concentration of perfluoropentanoic acid in ppt |
| PFPeS | Concentration of perfluoropentane sulfonic acid in ppt |
| PFHPS | Concentration of perfluoroheptane sulfonic acid in ppt |
| HFPODA | Concentration of hexafluoropropylene oxide-dimer acid, also known as GenX, in ppt |
| FOSA | Concentration of perfluorooctane sulfonamide in ppt |
| PFTA | Concentration of perfluorotetradecanoic acid in ppt |
| PFUnA | Concentration of perfluoroundecanoic acid in ppt |
| PFTnA | Concentration of perfluorotridecanoic acid in ppt |
| NEFOSAA | Concentration of N-Ethyl perfluorooctanesulfonamidoacetic acid in ppt |
| N-MeFOSAA | Concentration of N-Methyl perfluorooctanesulfonamidoacetic acid in ppt |
| 6:2 FTS | Concentration of 6:2 fluorotelomer sulfonic acid in ppt |
| 8:2 FTS | Concentration of 8:2 fluorotelomer sulfonic acid in ppt |
| Available Sum of PFAS | The sum of all PFAS concentrations in ppt available for the sample |
| NA | This PFAS was not tested for in the sample |
| BDLU | This PFAS was tested for in the sample but not detected |

RE, Garmin, USGS, NGA, EPA, USDA, NPS

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PFAS in Fish

- FW fish potential significant source of PFAS exposure
- Median conc of PFAS in fish fillets from US rivers and streams 9,500 ng/kg (9,500 PPT)
- Median conc of PFAS in Great Lake fish 11,800 ng/kg
- PFOS on ave. 74% of PFAS levels
- CBS News – 1 fish meal = 1 month of drinking PFAS contaminated water!



PFAS Bioaccumulation in Fish

World-wide studies of fish and aquatic food web

- Uptake from sediments via benthic invertebrates¹
- PHAS evidence of food web bioaccumulation and biomagnification²
- Lab exposure of carp³
 - Rapid (7-10 day) accumulation in blood and liver
 - Higher concentrations in fish tested in more acidic waters

1 – Chemosphere Volume 155, July 2016, Pages 380-387

2- Environmental Pollution Volume 309 (15) September 2022, 119739

3 -Science of The Total Environment Volume 861, 25 February 2023, 160567

PFAS in NY Fish

- Majority of NY data for Lake Erie, Lake Ontario and major rivers... PFAS in lake trout from Seneca Lake
- EWG - Lake Erie fish have some of highest PFAS concentrations nationally; 11 parts per trillion
- Buffalo Niagara Water Keeper - detected PFAS in 100% of waterways along the Lake Erie waterfront
- PFAS advisory in place for Onondaga Lake
- Hoosick Falls and Newburgh waterways of concern due to proximity to commercial and military sources

Env Working Group - <https://www.ewg.org>

Peter Mantius – Water Front Blog

NYSDEC -

www.health.ny.gov/environmental/outdoors/fish/health_advisories/regional/fingerlakes.htm

PFAS in Fish

- NYS Bureau Ecosystem Health comprehensive state-wide study
- Examined both game and forage fish
- Sampled blood, flesh and viscera (guts)
- Concluded
 - PFAS compounds present in food chain
 - PFAS compounds pervasive and often at high concs.
 - Highest concs. in viscera but also high in edible flesh
 - Species lower on food chain as well as small or young fish can have high concentrations
 - Catfish and bullhead low conc, even in polluted sites
 - Concs. can vary in sampled fish over relatively short spatial distance

Data Compiled By Environmental Working Group (EWG)

Forever Chemicals in Freshwater Fish



Source: https://www.ewg.org/interactive-maps/pfas_in_US_fish/map/

PFOS Contamination - Freshwater Fish

Documented Contamination Walleye In Hudson River

DETAILS

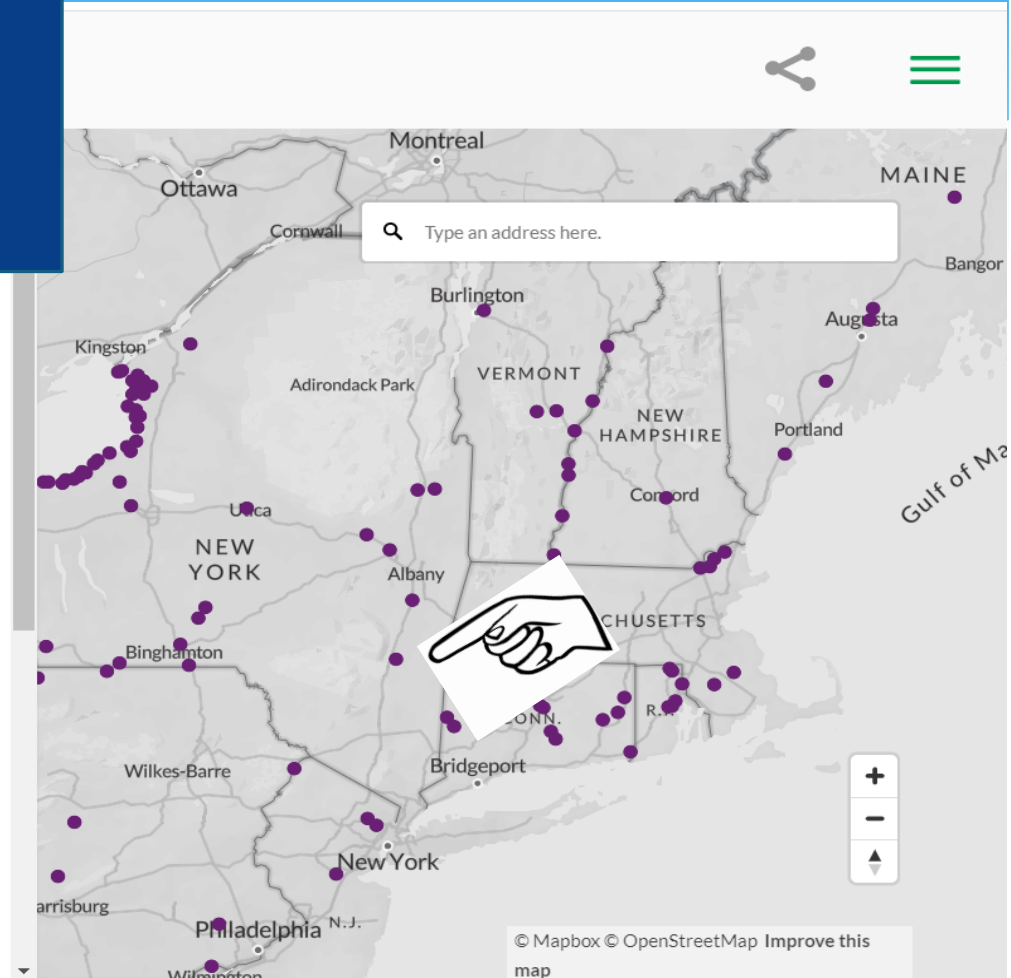
State: New York

Waterbody: Hudson River

Fish species: Walleye
Sample taken: 2014

| PFAS | Result (ppt) |
|------------|--------------|
| PFOS | 2,370 |
| PFUnA | 491 |
| PFDODA | 265 |
| PFDA | 216 |
| FOSA | 143 |
| Total PFAS | 3,485 |

Source: Environmental Protection Agency (EPA)



Source: https://www.ewg.org/interactive-maps/pfas_in_US_fish/map/

Proactive Tracking of PFAS

- Literature focuses on reported detected PFAS compounds occurrences in water or biota... reactive monitoring
- Walled Lake, WI. initiated proactive tracking program
- Located in area with no known major PFAS sources
- Goal - avoid creating env exposure pathway via WWTP biosolids (sludge) applied to nearby farm fields (PFOS binds to biosolids)
- Sub-sample wastewater stream at select locations for PHAS before wastewater enters WWTP
- Similar approach could be taken for lakes via stream and stormwater sampling

What Can Lake Communities Do?

- Educate yourselves about PFAS and its environmental and health impacts
- Engage and share information with other lake communities through NYSFOLA and NALMS
- Use DEC tools to ID known PHAS sites and actions to contain PFAS or remediate PFAS problem sites
- Test potable water if you are located near a contamination site or potential source
- Implement PROACTIVE monitoring... map watershed
- Adopt/follow fish consumption guidelines

Filter Your Drinking Water

- Public potable water sources tested and regulated
- If using well water or lake water in area with known contamination protect yourself
- As per NYSDOH:
 - Filter water using point of entry (POE) or point of use (POU) filter to remove and retain chemicals
 - Activated carbon (charcoal) water filters
 - Reverse osmosis (RO) units

Limit Fish Consumption

- Environmental behavior of PFAS still large unknown, but data shows to some extent “dilution” helps decrease concentration
- BUT... Don't eat fish from known contamination sites
- If near or down stream of known or suspected (e.g., wastewater plant) source best to limit consumption of fish.
- Guidance 1 fish / month

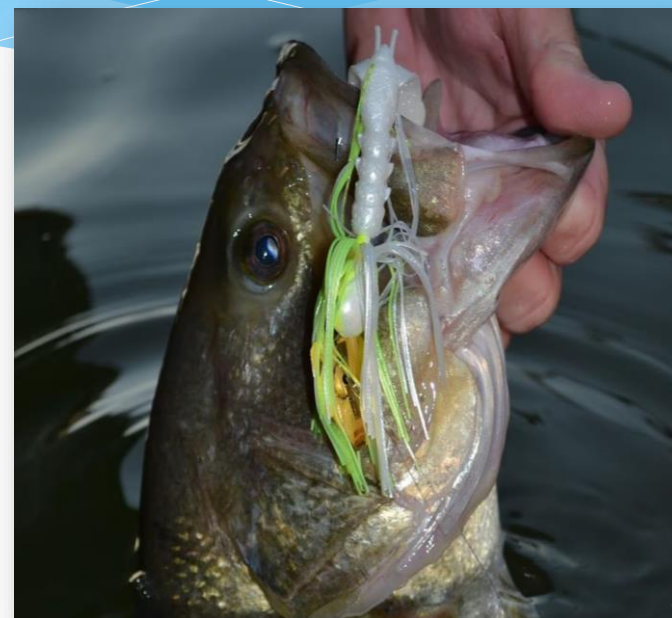


Photo Source:
[PennLive.com/sports](https://pennlive.com/sports) Jan 2023

Let's End On A High Note

- NY is leading the way nationally through education, outreach and legislation
- By close of 2023 USEPA should have in place federal primary drinking water regulations for six PFAS compounds... community water systems must comply
- Numerous examples of water treatment plants across the US with great success (90%) removing PFAS from drinking water using GAC, ion exchange and membrane technology
- PFAS/PFOS source tracking procures being used to proactively ID and address threats to potable water... could do same for lakes
- More states adopting fish consumption advisories

Thank You
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