

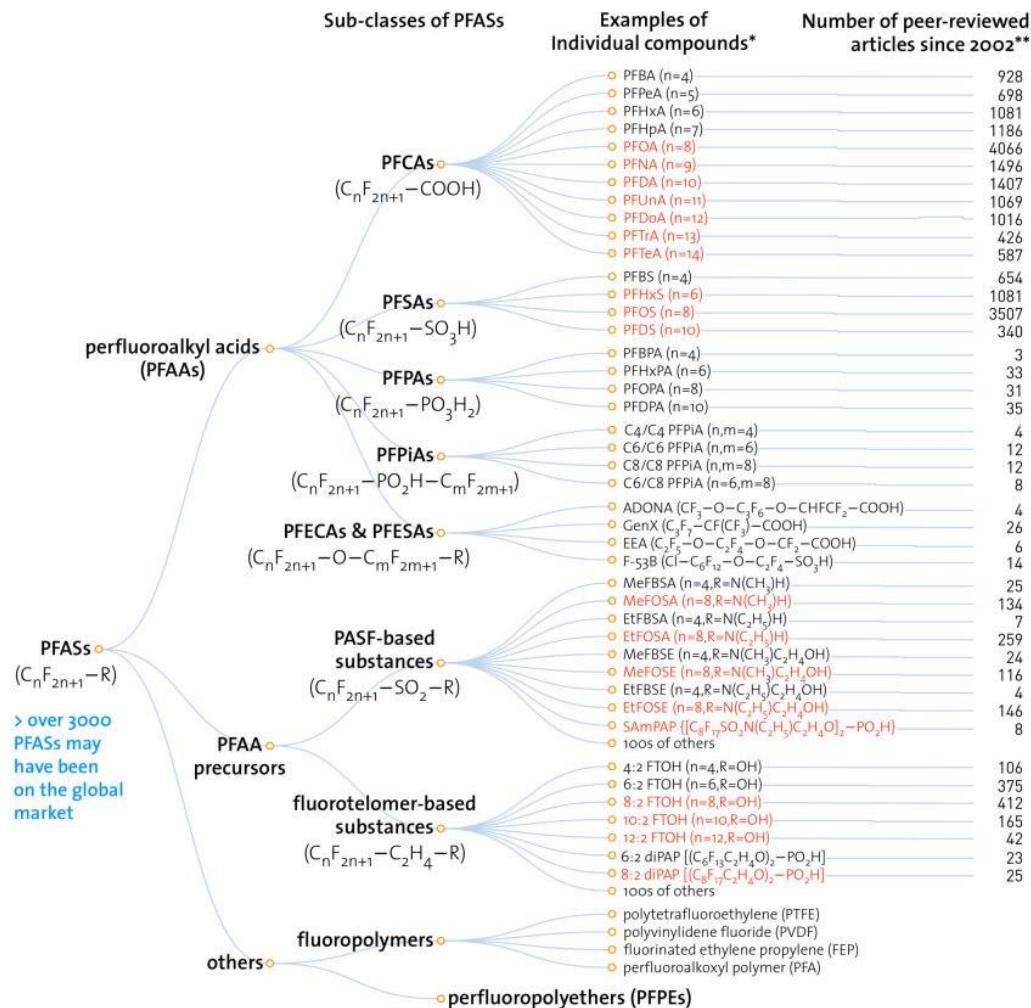


PFAS Update and Investigations at DEQ Division of Water Resources

*Julie Grzyb, Deputy Director
Division of Water Resources
September 18, 2023*



What are PFASs?



- PFAS - Per and Polyfluoroalkyl Substances - is a **class** of over 4,700 manufactured chemicals
- Synthetic, used extensively since late 1940s
- Useful properties: oil-and water-resistance
- **Emerging** pollutants: science about the chemicals and impacts is being developed



* PFASs in **RED** are those that have been restricted under national/regional/global regulatory or voluntary frameworks, with or without specific exemptions (for details, see OECD (2015), Risk reduction approaches for PFASs, <http://oe.cd/1AN>).

** The number of articles related to all compounds of PFASs were retrieved from Scopus database on March 2022.

*Pic from: A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?

- **Why Be Concerned About PFAS?**
- Concerns about the public health impact of PFAS have arisen for the following reasons:
- **Widespread occurrence.** Studies find PFAS in the blood and urine of people, and scientists want to know if they cause health problems.
- **Numerous exposures.** PFAS are used in hundreds of products globally, with many opportunities for human exposure.
- **Growing numbers.** More than 4,700 PFAS exist, an increasing number as industry invents new forms of this type of chemical.²
- **Persistent.** PFAS remain in the environment for an unknown amount of time and may take years to leave the body.
- **Bioaccumulation.** Different PFAS chemicals may enter the food chain in various ways, gradually accumulating and remaining in a body over time—a process due to more intake than excretion of the chemicals.



Consumer products containing PFAS:

- Non-stick coatings
- Grease- and oil-resistant coatings for paper products
- Water repellent fabrics
- Stain-resistant coatings for fabrics, carpets and leather
- Personal care products (shampoo, dental floss)



Sources of PFAS for POTWs

- Fume suppressants/demisters/wetting agents for plating tanks
 - Used primarily for tanks with hexavalent chromium
 - Banned from electroplating tanks from Sept 2015
 - Manufacture largely phased out in US
 - Potential source of PFOS to POTWs, surface waters
- Leather and fabric treaters, tanneries
- Paper and packaging manufacturers
- Manufacturers of parts with PTFE coatings(bearings, wire, etc)
- Landfill leachate (esp. from industrial wastes)
- Centralized Waste Treaters accepting above wastes
- AFFF fire fighting foam
- Groundwater Cleanup wastewaters from contaminated sites

Department of Environmental Quality



EPA PFAS Strategic Roadmap 2021 – 2024

- **EPA PFAS Strategic Roadmap 2021 – 2024**
published on Oct. 18, 2021

https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

Three essential directives

- ☐ Research. Invest in research, development, and innovation to increase understanding of PFAS exposures and toxicities, human health and ecological effects, and effective interventions that incorporate the best available science.
- ☐ Restrict. Pursue a comprehensive approach to 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.



North Carolina DEQ Action Strategy for PFAS (June 7, 2022)

- DEQ is committed to protecting the residents of North Carolina by addressing the threat of PFAS contamination.
- NC DEQ is prioritizing the reporting of PFAS emissions or discharges to air, surface water, or groundwater, and working to identify the potential sources of PFAS impacting communities.
- Investigation of biosolids is part of our potential source investigation and serves to expand the base of our scientific knowledge of PFAS in our state.

North Carolina DEQ Action Strategy for PFAS

June 7, 2022



PROTECTING COMMUNITIES

We will continue to identify and notify those who may be at risk of exposure, investigate the human health risks and expand the base of scientific knowledge for North Carolina-specific PFAS compounds.



PROTECTING DRINKING WATER

We will work to minimize future releases of PFAS to drinking water sources by setting regulatory standards and driving actions to prevent future PFAS pollution.



CLEANING UP EXISTING CONTAMINATION

We will continue to hold responsible parties accountable for remediating known PFAS contamination sites affecting drinking water supplies and other receptors to protect human health and the environment.

DWR PFAS Compounds Strategy

- **Groundwater** - DWR is expanding groundwater PFAS assessment utilizing the DWR ambient groundwater monitoring network to better understand the nature and extent of PFAS contamination in North Carolina's aquifers. This network consists of over 700 wells statewide.
- **Public Water Supply Systems** - DWR has through the NC PFAS Collaboratory Network obtained data from 380 sites in 97 counties. From this date DWR has prioritized additional sampling at 50 of the systems in 2022 that showed elevated levels of PFOA, PFOS and GENX. In 2023 DWR prioritized another 655 smaller privately owned systems, schools and daycares for sampling.
- **Surface Water** - DWR collected PFAS influent data from 27 POTWs in the Cape Fear River Basin. DWR NPDES is currently adding PFAS sampling requirements to Industrial discharges know to discharge PFAS or targeted by the EPA as having wastewaters containing PFAS. DWR NPDES is adding PFAS sampling to POTWs know to discharge PFAS or having SIUs targeted by EPA as having wastewaters containing PFAS.
- DWR's emerging compound strategy is focused on expanding our knowledge of the impacts PFAS and GENX contamination has on our groundwater, public water supply and surface water. Our goal is to better understand the extent of contamination in your area and across the state so we can identify and better support those that need assistance in providing safe drinking water, and to take action to reduce and eliminate the discharge of PFAS.

Federal Safe Drinking Water Act (SDWA)

Congress enacted the **Safe Drinking Water Act (SDWA)** in 1974 and amended and reauthorized it in 1986 and 1996.

- Authorizes EPA to set national standards for drinking water to protect against health effects from exposure to naturally-occurring and man-made contaminants
- Applies to Public Water Systems:
 - Water system serving 15 or more connections, or 25 or more people 60 or more days per year
 - Community
 - Non-transient non-community
 - Transient non-community



- Health advisory levels (HALs): In June 2022, EPA releases Lifetime Drinking Water HALs for PFOA, PFOS, GenX, PFBS.
 - PFOA: .004 ppt (interim)
 - PFOS: .02 ppt (interim)
 - GenX: 10 ppt (final)
 - PFBS: 2,000 ppt (final)
- These levels informed the Maximum Contaminant Level Goals or MCLGs which are not regulatory and are lower than the proposed MCLs.

March 2023: Proposed Maximum Contaminant Levels (MCLs).
MCLs are the Maximum Contaminant Levels and are regulatory values.
Expected to be finalized in late 2023, in effect in 2026.

Compound	Proposed MCLG	Proposed MCL (enforceable levels)
PFOA	Zero	4.0 (ppt or ng/L)
PFOS	Zero	4.0 ppt
PFNA	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index
PFHxS		
PFBS		
HFPO-DA (GenX Chemicals)		

The proposed rule would also require public water systems to:

- Monitor for these PFAS
 - Community and Non-Transient Non-Community
 - Entry Points (similar to SOCs, VOCs)
- Notify the public of the levels of these PFAS
 - *CCR – consumer confidence report, annually*
 - *Tier 2 PN 30-days to notify consumers level > MCL*
- Reduce the levels of these PFAS in drinking water if they exceed the proposed standards.
 - Running Annual Average

Hazard Index Calculation:

$$\text{Hazard Index} = \left(\frac{[\text{GenX}_{\text{water}}]}{[10 \text{ ppt}]} \right) + \left(\frac{[\text{PFBS}_{\text{water}}]}{[2000 \text{ ppt}]} \right) + \left(\frac{[\text{PFNA}_{\text{water}}]}{[10 \text{ ppt}]} \right) + \left(\frac{[\text{PFHxS}_{\text{water}}]}{[9.0 \text{ ppt}]} \right)$$

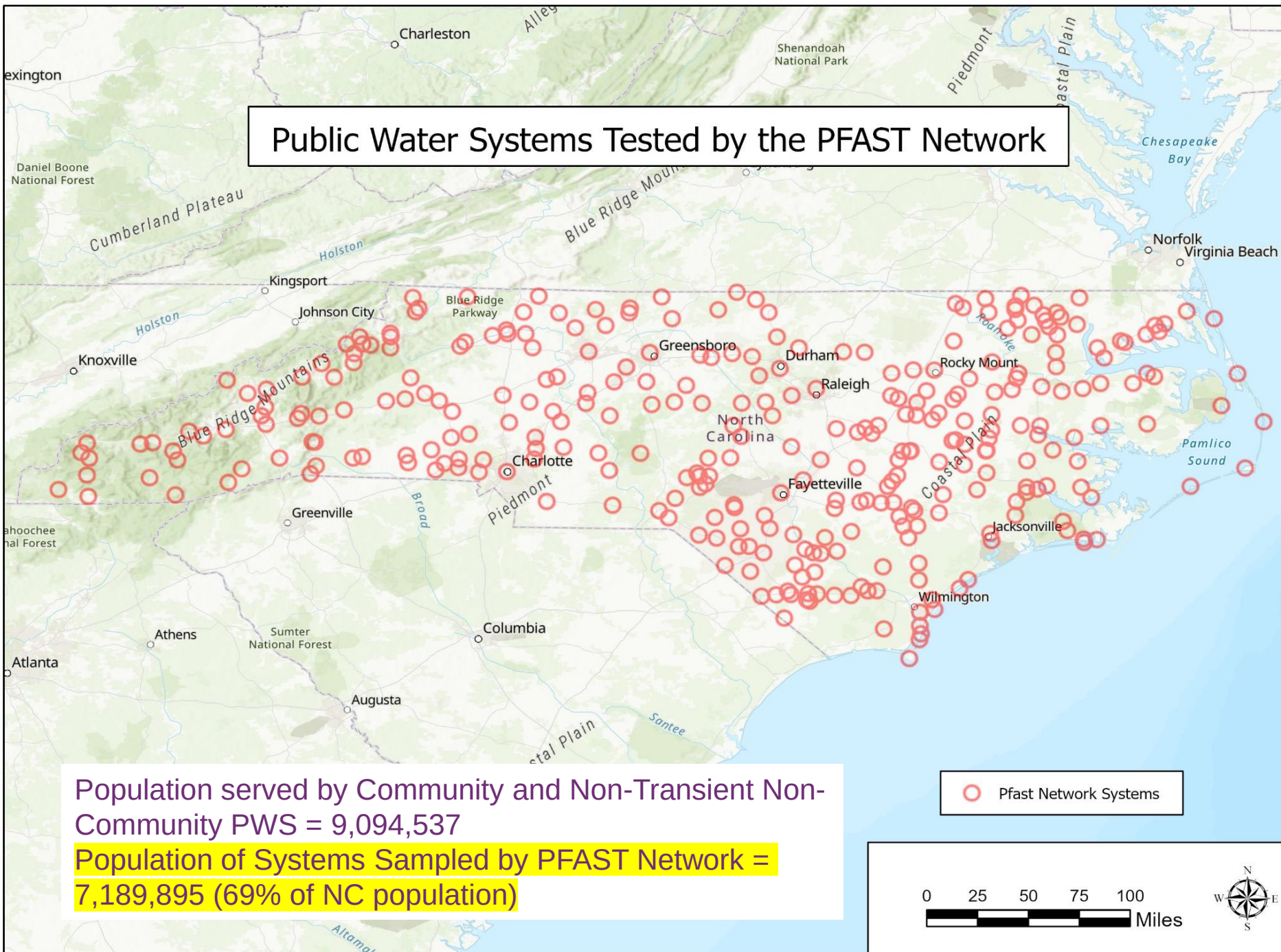


Public Water System Sampling in NC

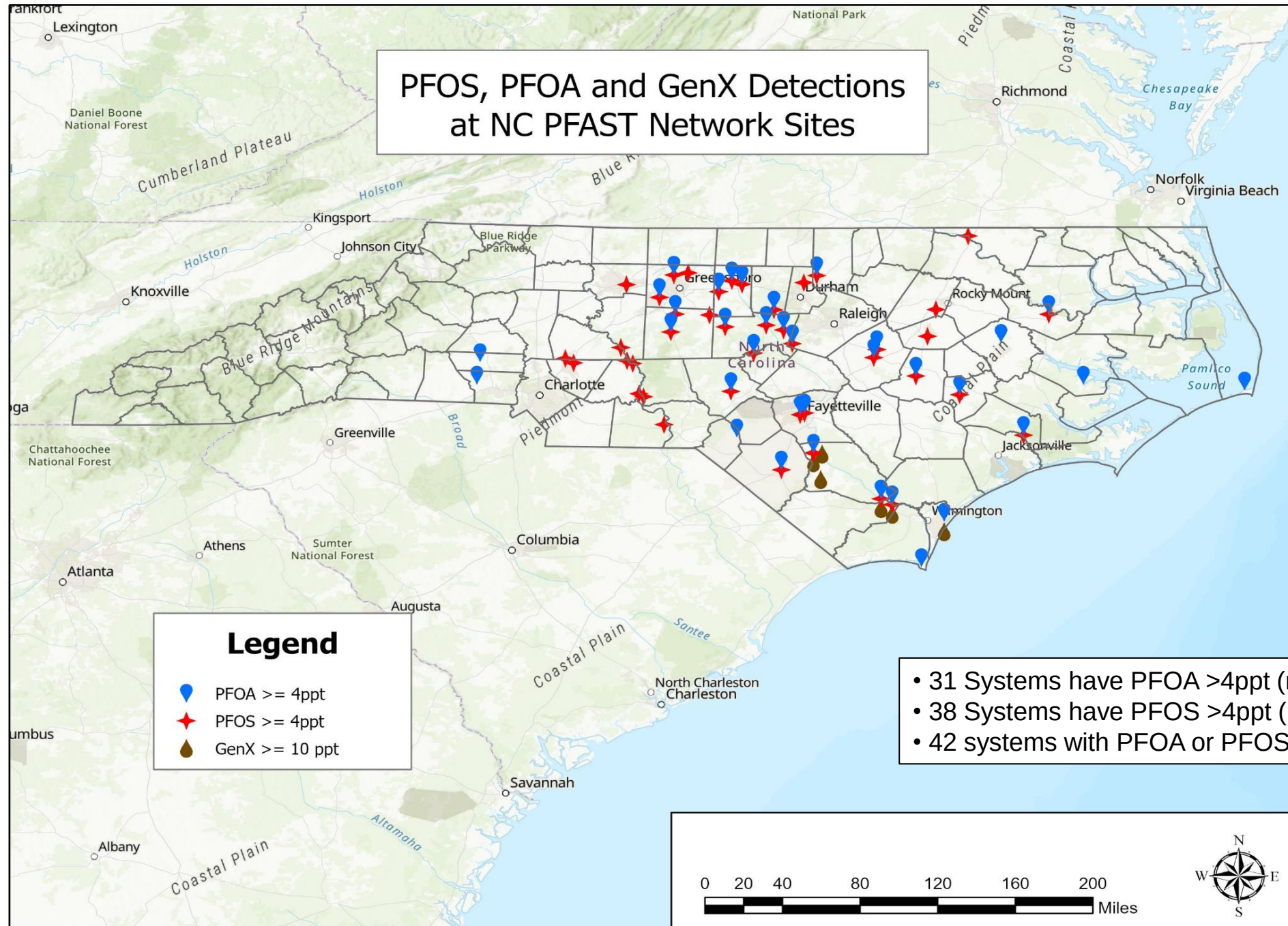


- Public Water Systems (PWS)
 - Public drinking water utilities
 - Systems serve large areas, many residents
 - >5,000 total Serves >7 Million residents
 - PWS defined as > 15 connections or serves > 25 people
- Community Water Systems (CWS) about 1,900 total in NC
- Non-transient Non-community systems about 325 total in NC (workplaces and schools)
- Transient Non- community (rest areas)

- In 2019 the PFAST Network sampled 326 PWS for PFAS
 - 50 PWS had detections above 4 ppt for PFOA and/or PFOS
- In late 2022, DEQ resampled those 50 PWS for PFOS and PFOA
 - 42 had either PFOS and/or PFOA above 4 ppt
 - 8 had either no detections or PFOA and PFOS below 4 ppt
- DWR staff sampled these facilities 3 times, raw and treated water samples. One time per month in September, October, and November for 57 different PFAS compounds.

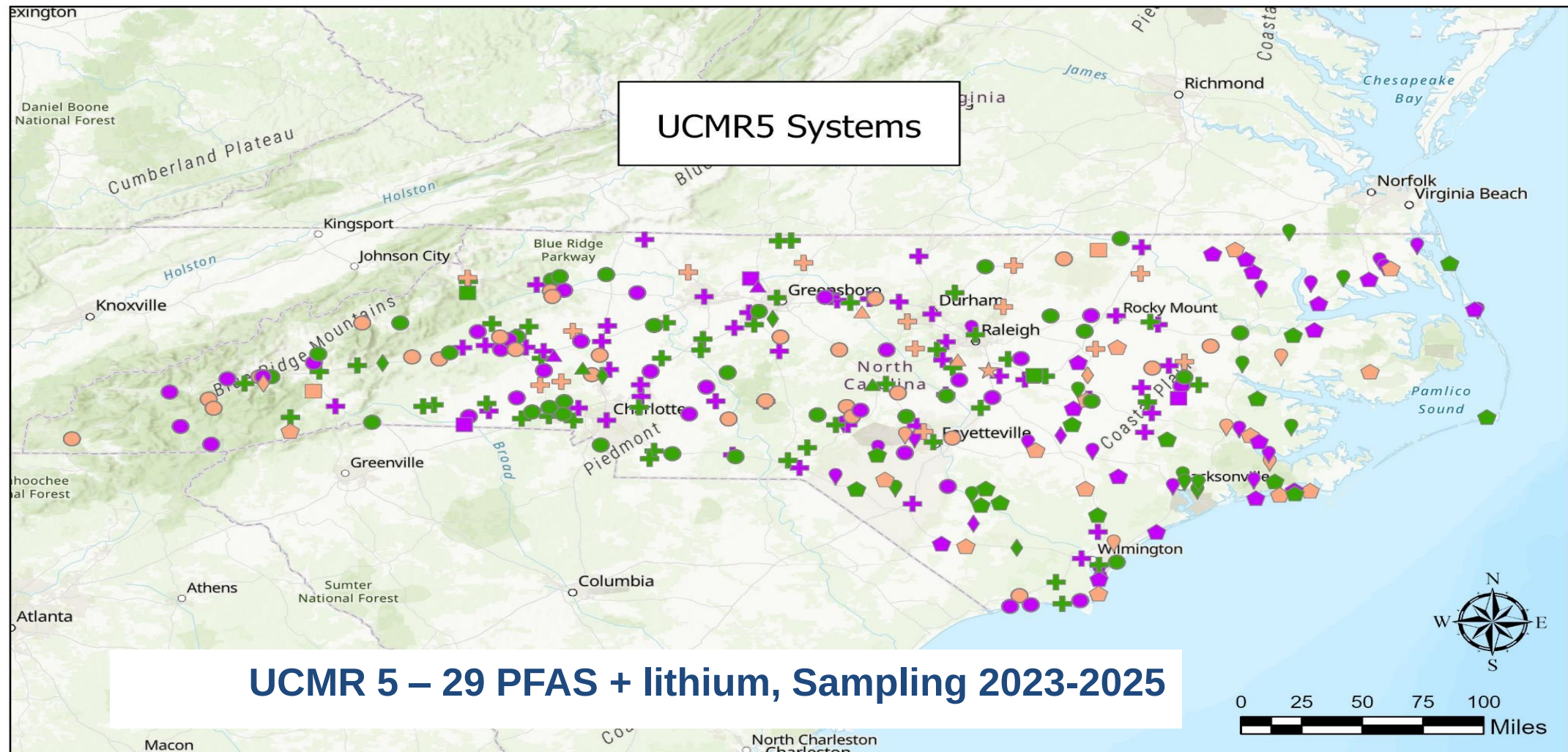


PFOS, PFOA and GenX Detections at NC PFAST Network Sites



Federal Development of Regulations: Unregulated Contaminant Monitoring Rule

- SDWA requirements for UCMR Program
 - Occurrence monitoring for up to 30 unregulated contaminants, every 5 years
 - **UCMR 5 – 29 PFAS + lithium, Sampling 2023-2025**
 - Collect data for unregulated contaminants suspected to be present in drinking water
 - Require PWSs serving population >3,300 people as well as a nationally representative sample of PWSs serving < or = 3,300 people to monitor
- EPA manages program in partnership with states



UCMR 5 – 29 PFAS + lithium, Sampling 2023-2025

Legend

NC UCMR5 Information

Size Group and Year

- Very Small Groundwater (1 to 500 population) 2023
- Very Small Groundwater (1 to 500 population) 2024
- Very Small Groundwater (1 to 500 population) 2025

- Very Small Groundwater (1 to 500 population) 2025
- Small Groundwater (501 - 3299 population) 2023
- Small Groundwater (501 - 3299 population) 2024
- Small Groundwater (501 - 3299 population) 2025

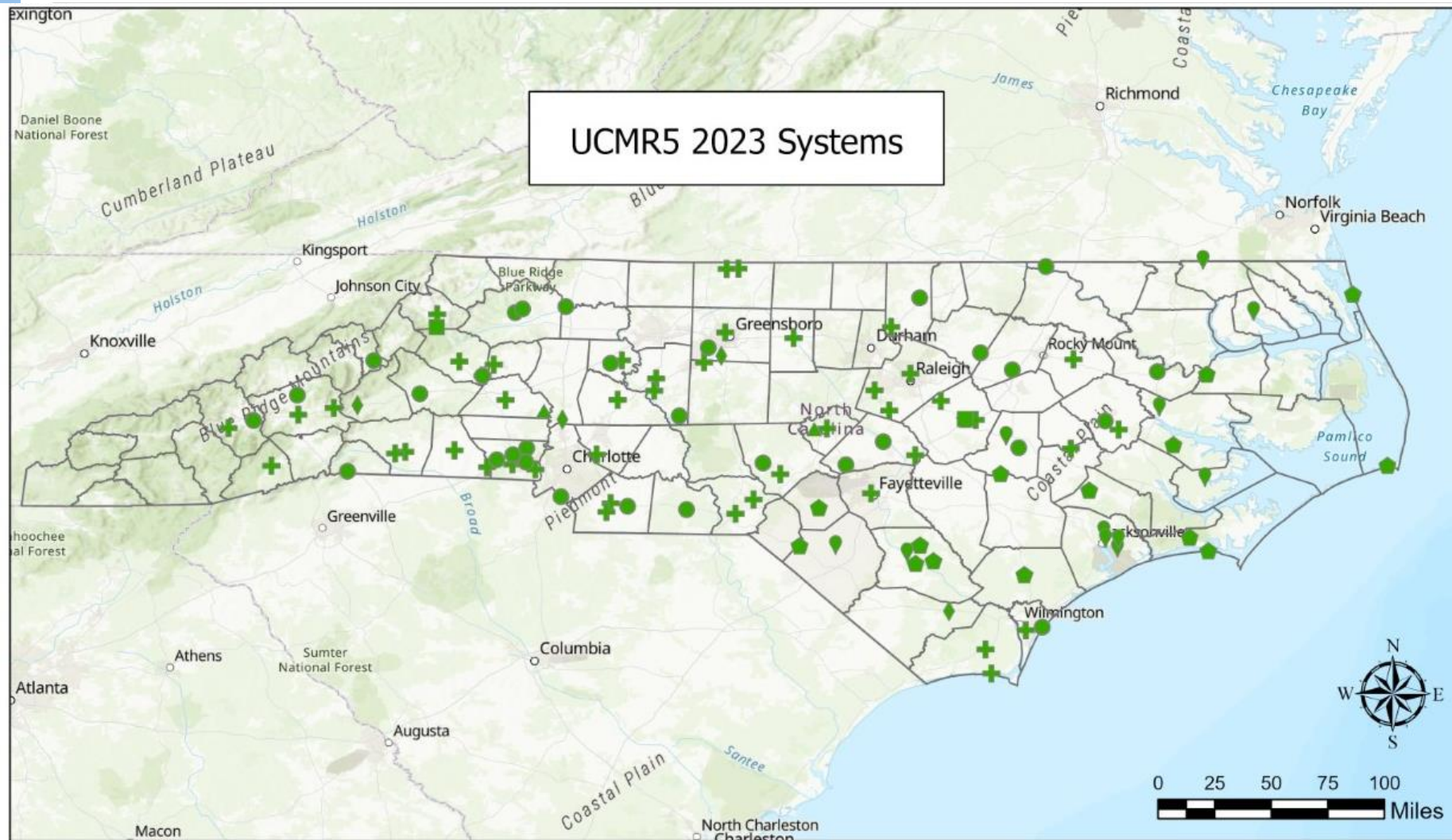
- Medium Groundwater (3,300 to 10,000 population) 2023
- Medium Groundwater (3,300 to 10,000 population) 2024
- Medium Groundwater (3,300 to 10,000 population) 2025
- Large Groundwater (Over 10,000 population) 2023

- Large Groundwater (Over 10,000 population) 2024
- Large Groundwater (Over 10,000 population) 2025
- Very Small Surface Water (1 to 500 population) 2025
- Small Surface Water (501 - 3299 population) 2023

- Small Surface Water (501 - 3299 population) 2024
- Small Surface Water (501 - 3299 population) 2025
- Medium Surface Water (3,300 to 10,000 population) 2023
- Medium Surface Water (3,300 to 10,000 population) 2024

- Medium Surface Water (3,300 to 10,000 population) 2025
- Large Surface Water (Over 10,000 population) 2023
- Large Surface Water (Over 10,000 population) 2024
- Large Surface Water (Over 10,000 population) 2025





Legend

NC UCMR5 2023 Size Group and Year

	Large Groundwater (Over 10,000 population) 2023		Large Surface Water (Over 10,000 population) 2023		Medium Surface Water (3,300 to 10,000 population) 2023		Small Surface Water (501 - 3299 population) 2023
	Very Small Groundwater (1 to 500 population) 2023		Medium Groundwater (3,300 to 10,000 population) 2023		Small Groundwater (501 - 3299 population) 2023		



- 298 NC systems to sample between 2023 and 2025
- Results for 70 systems (as of 8/31/23)
- PFAS
 - 15 systems (21%) have a result exceeding a proposed MCL or Hazard Index
 - 45 systems (64%) have all Non-Detect measurements for PFAS
- Lithium
 - 24 systems (34%) have a lithium detection
 - 17 systems (24%) have a lithium result greater than 10ppb
 - Max lithium results 60.3 ppb

Systems Exceeding Proposed MCL and/or Hazard Index

System Name	Source Water Type	Population	Sample Date	County	River Basin	Total PFAS [ppt]	HI	PFOS [ppt]	PFOA [ppt]
ROBESON COUNTY WATER SYSTEM	GW	65,303	2/14/23	ROBESON	Lumber	155.8	4.3	6.1	22
BRAGG COMMUNITIES/NTA	SW	3,733	3/14/23	HARNETT	Cape Fear	58		10.5	7.8
DUNN, CITY OF	SW	12,334	4/24/23	HARNETT	Cape Fear	57.5		10.5	6.9
LILLINGTON WATER SYSTEM	SW	3,883	3/20/23	HARNETT	Cape Fear	56.7		11.3	7.9
BRUNSWICK COUNTY WATER SYSTEM	SW	113,207	4/5/23	BRUNSWICK	Lumber	51.8		10.2	6.3
JAMESTOWN, TOWN OF	SW	6,543	2/14/23	GUILFORD	Cape Fear	51.5		8.7	4
SELMA, TOWN OF (COUNTY LINE)	SW	642	3/15/23	JOHNSTON	Neuse	35.7		6.5	5.4
SEYMOUR JOHNSON AFB	SW	6,875	3/14/23	WAYNE	Neuse	30.6		6.7	4.3
UNION COUNTY WATER SYSTEM	SW	134,066	4/10/23	UNION	Yadkin	28.2		4.9	4.2
SOUTH GRANVILLE WTR&SEWER AUTHORITY	SW	19,216	5/30/23	GRANVILLE	Neuse	19		12	7
DURHAM, CITY OF	SW	292,743	5/9/23	DURHAM	Cape Fear	17.5		5.8	
ROCKINGHAM, CITY OF	SW	12,131	5/24/23	RICHMOND	Yadkin	14.7		4.2	
BLADEN CO WTR DIST-EAST BLADEN	GW	3,889	3/15/23	BLADEN	Cape Fear	13.6	1.36		
CENTRAL NASH WATER & SEWER	SW	5,883	3/15/23	NASH	Tar	10.5		5.2	5.3
NORTHAMPTON--LAKE GASTON	SW	3,784	1/9/23	NORTHAMPTON	Roanoke	6.2		6.2	



Systems Exceeding 20 ppt Total PFAS

System ID	System Name	Source Water Type	Population	Sample Date	County	River Basin	Total PFAS [ppt]
NC0378055	ROBESON COUNTY WATER SYSTEM	GW	65,303	2/14/23	ROBESON	Lumber	155.8
NC5043001	BRAGG COMMUNITIES/NTA	SW	3,733	3/14/23	HARNETT	Cape Fear	58
NC0343010	DUNN, CITY OF	SW	12,334	4/24/23	HARNETT	Cape Fear	57.5
NC0343025	LILLINGTON WATER SYSTEM	SW	3,883	3/20/23	HARNETT	Cape Fear	56.7
NC0410045	BRUNSWICK COUNTY WATER SYSTEM	SW	113,207	4/5/23	BRUNSWICK	Lumber	51.8
NC0241030	JAMESTOWN, TOWN OF	SW	6,543	2/14/23	GUILFORD	Cape Fear	51.5
NC0136025	BESSEMER CITY, CITY OF	SW	5,500	3/29/23	GASTON	Catawba	41.1
NC4051009	SELMA, TOWN OF (COUNTY LINE)	SW	642	3/15/23	JOHNSTON	Neuse	35.7
NC0496055	SEYMOUR JOHNSON AFB	SW	6,875	3/14/23	WAYNE	Neuse	30.6
NC0190413	UNION COUNTY WATER SYSTEM	SW	134,066	4/10/23	UNION	Yadkin	28.2
NC0136065	DALLAS, TOWN OF	SW	7,422	5/16/23	GASTON	Catawba	25.2



655 systems included in current round of DWR sampling (2023)

- Privately owned community water systems (excludes those owned by Aqua NC and Carolina Water)
- School and daycare non-transient non-community water systems
- 3 systems previously sampled by the PFAST Network as requested by SSAB

2023 Sampling Effort of 655 smaller systems

- 1 round of sampling
 - Additional sampling potential for detections or results above MCLs
- 1 sample from 1 entry point for each system
- Analyze for same 57 PFAS as our 2022 sampling
 - Using modified Method 537.1
- Sampling began in the Raleigh Region in May
- Currently scheduling sampling now in all regions
- Sampling will be completed by the end of 2023

*Department of Environmental Quality
Division of Water Resources*



Private Community and NTNC Schools and Daycares

Legend

Private Community
and NTNC Schools
and Daycares 2023

● Private Community and
NTNC Schools and
Daycares 2023

NC River Basins

▭ NC River Basins

DEQ Regions

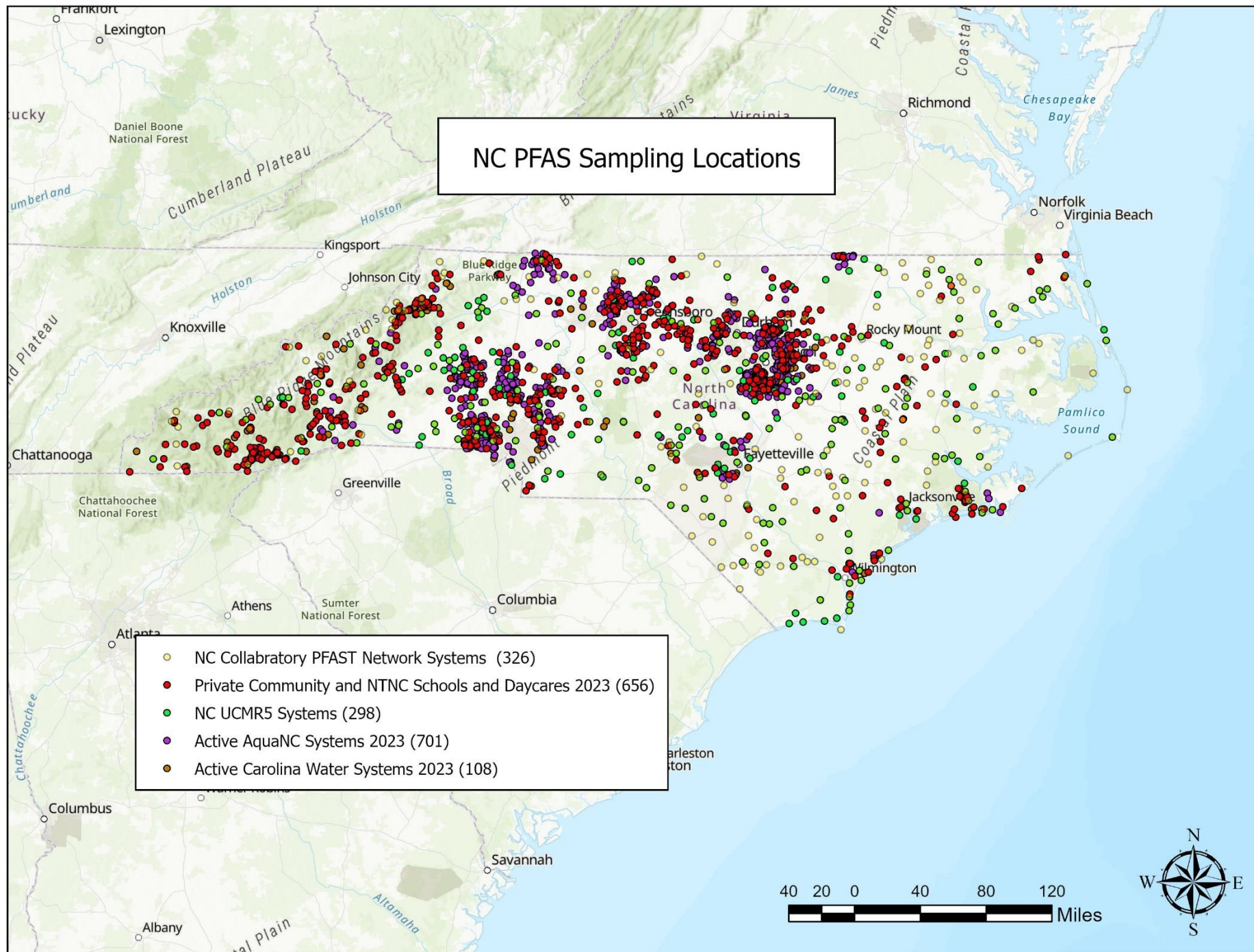
Asheville
Fayetteville
Mooreville
Raleigh
Washington
Wilmington
Winston-Salem

0 25 50 100 150
MILES



General Summary of Data

- Based on single sample results ~20% of systems have results greater than an MCL or HI
- PFOA and PFOS most prominent of the contaminants > MCL
- We are seeing exceedances of the HI
- We are finding PFAS other than the 6 compounds in the proposed regulation.



More key points:

- DEQ is working with water systems on meeting all regulatory requirements and sharing data. DEQ will continue to collect data from systems across the state.

- The USGS just announced the results of a nationwide study on PFAS in tap water -

<https://www.usgs.gov/news/national-news-release/tap-water-study-detects-pfas-forever-chemicals-across-us>

At least 45% of the nation's tap water is estimated to have one or more types of the chemicals known as per- and polyfluorinated alkyl substances, or PFAS, according to a new study by the U.S. Geological Survey. This research marks the first time anyone has tested for and compared PFAS in tap water from both private and government-regulated public water supplies on a broad scale throughout the country.

- Proposed MCLs/rulemaking are a first step in concrete solutions to a problem we have only recently begun to fully understand.

*Department of Environmental Quality
Division of Water Resources*



- DEQ has information on end-user filtration options (via DHHS) on its website. We will provide it and encourage systems to do so as well.

https://epi.dph.ncdhhs.gov/oeepfas/PFAS_TestingFiltration.pdf

- Funding is available through state/federal government for water system upgrades and filtration.

<https://deq.nc.gov/about/divisions/water-infrastructure/i-need-funding>

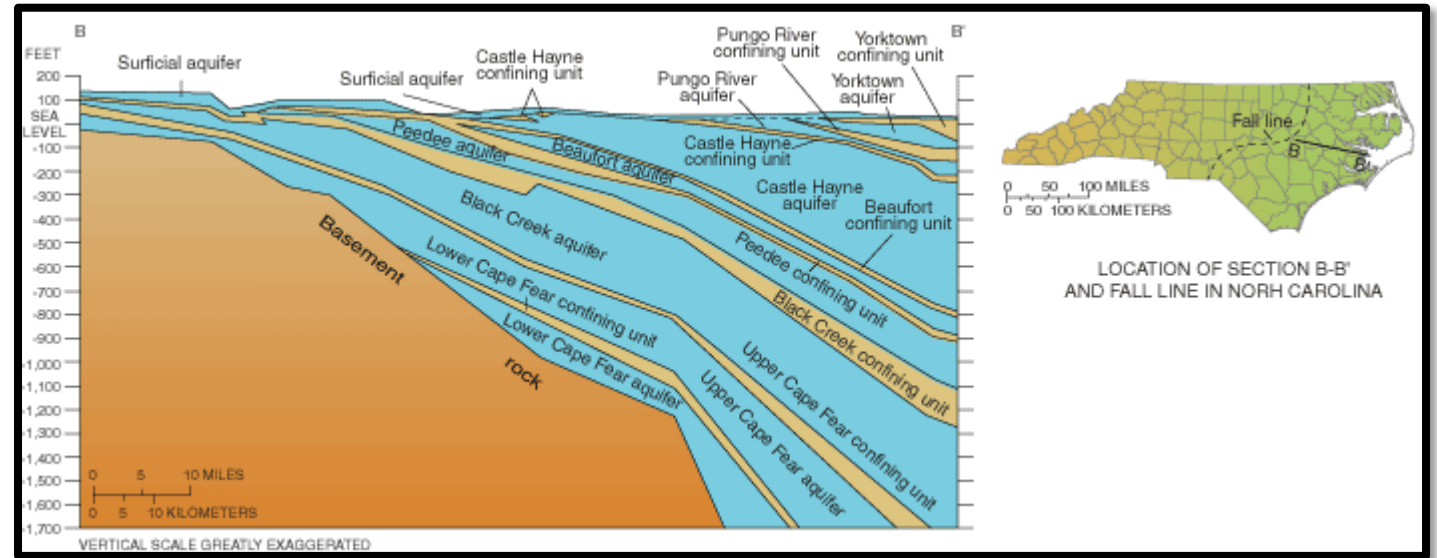


Groundwater Sampling in NC



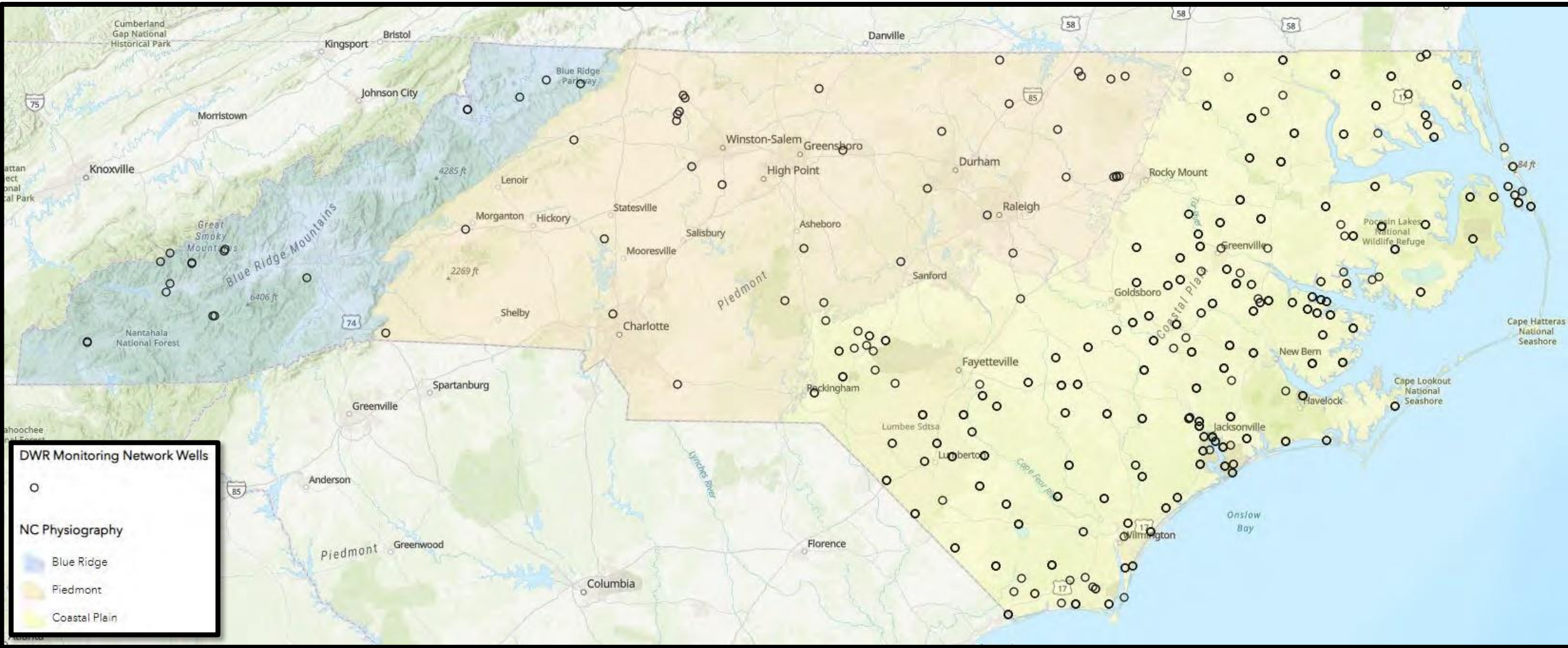
NCDEQ Groundwater Monitoring Network

- The State of North Carolina relies on groundwater for approximately 50% of drinking water use.
- Since the 1960s, NCDEQ has installed, maintained, and monitored a statewide monitoring well network of 700 wells at 235 locations.



<https://pyramidenvironmental.com/wp-content/uploads/2015/08/Coastal-aquifers.gif>

NCDEQ Groundwater Monitoring Network



[NCDEQ Ambient Groundwater Quality Monitoring Network](#)

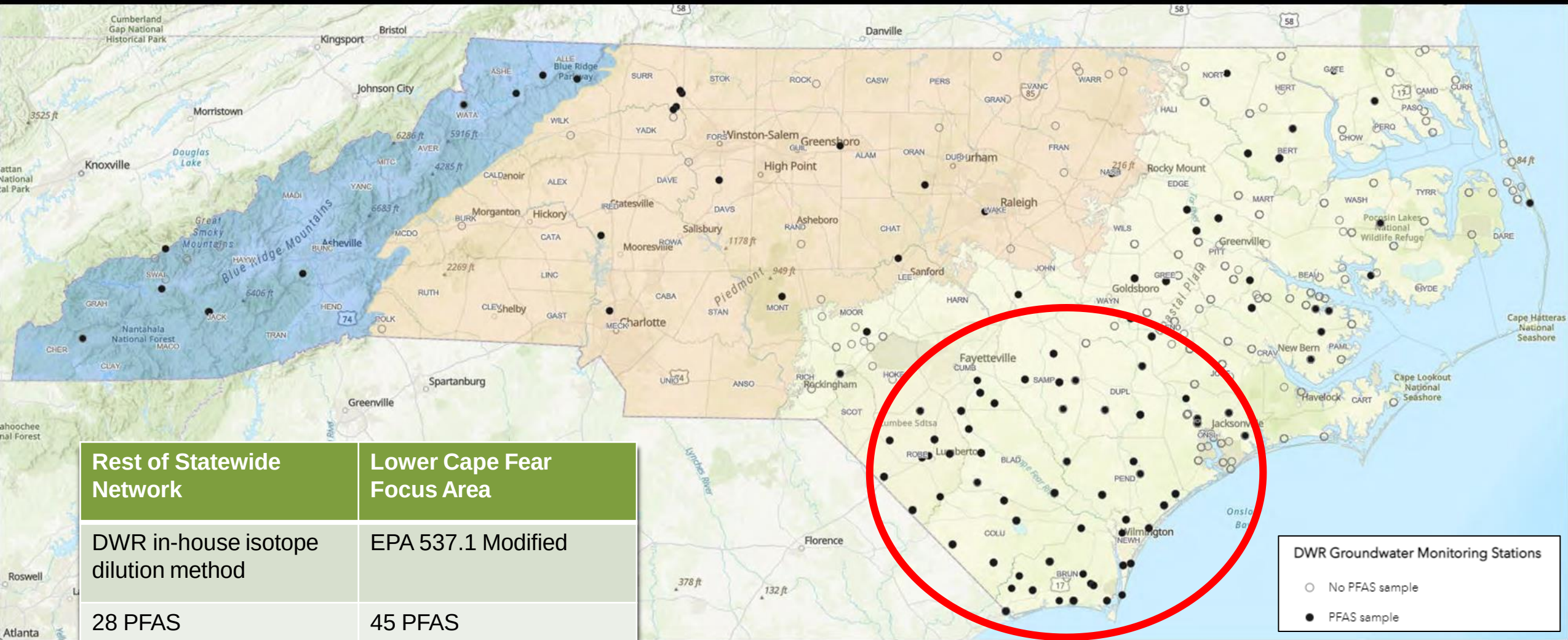
NCDEQ Ambient Groundwater PFAS Sampling

As of July 2023:

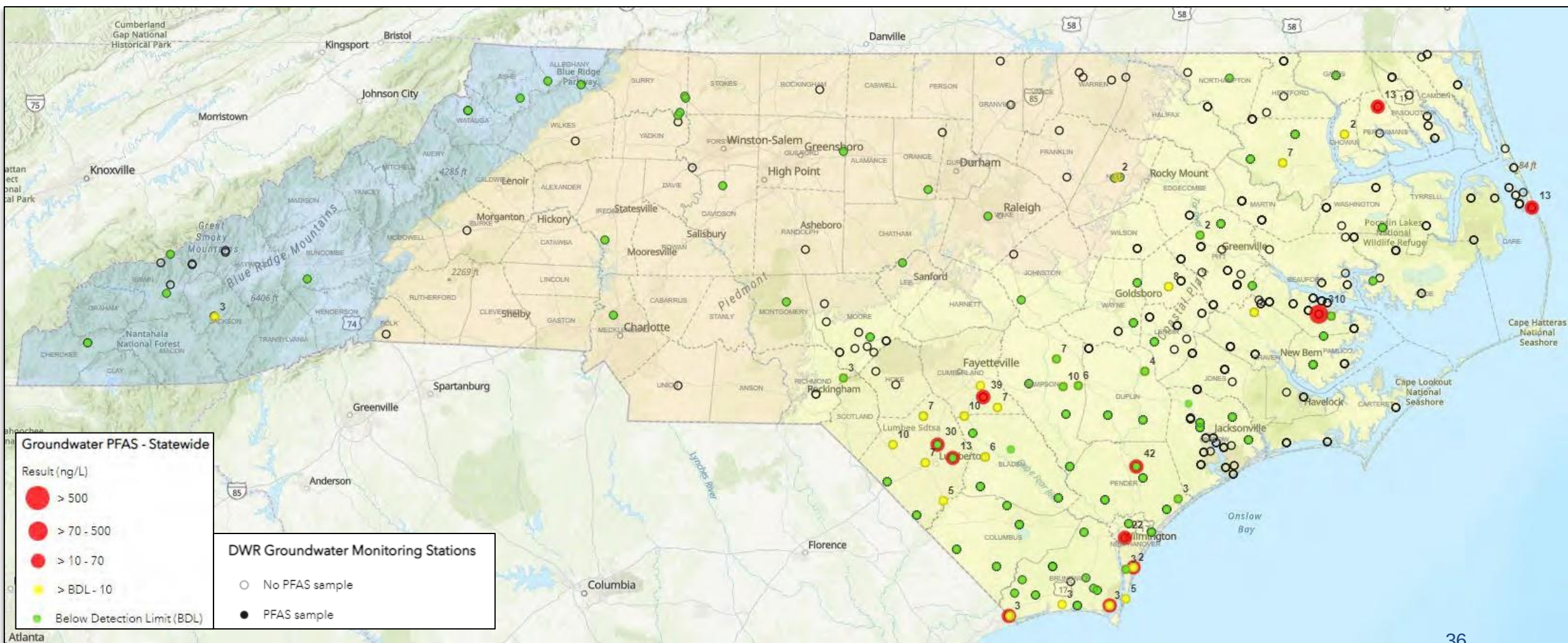
- 290 individual monitoring wells sampled in 48 counties
- 115 locations sampled
- ~400 groundwater PFAS samples collected



Groundwater PFAS Sampling Locations



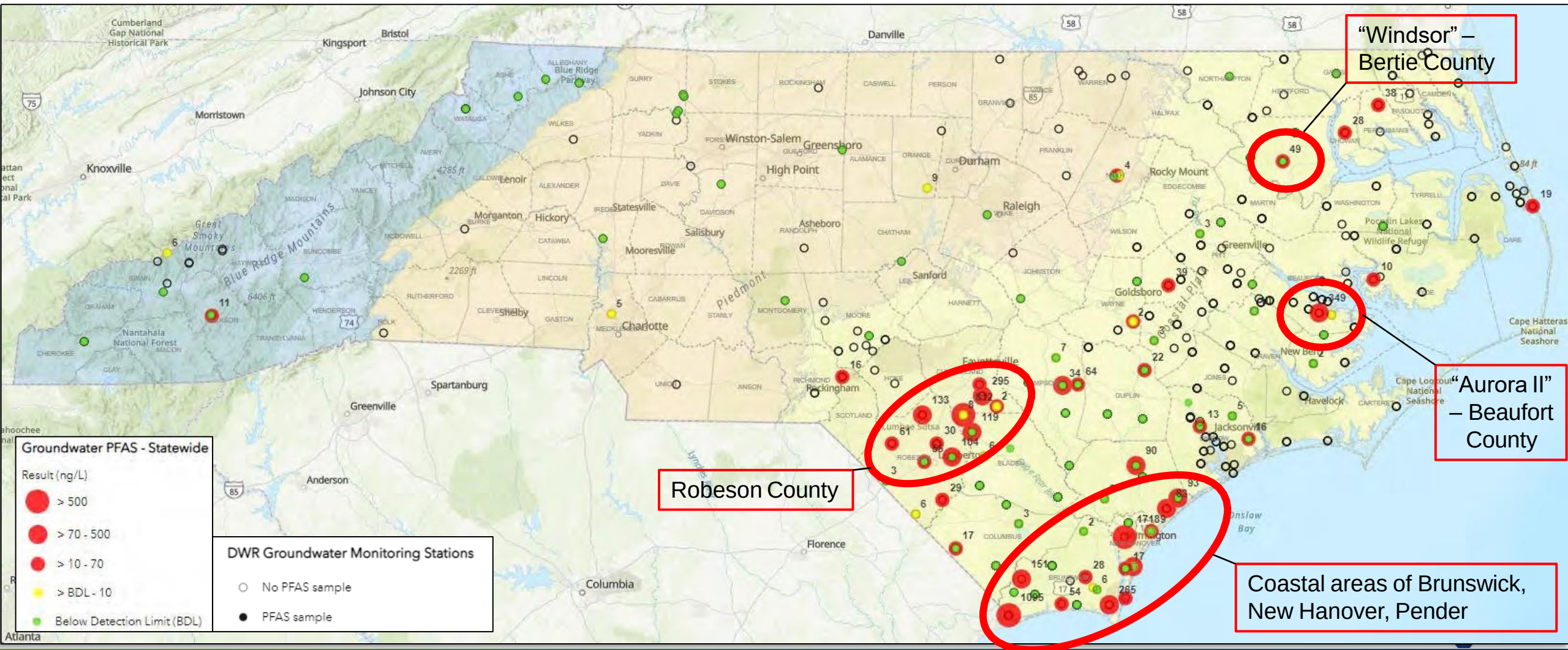
PFOA concentrations (ng/L)





Potential Areas of Concern

Total PFAS concentrations (ng/L)



Summary of some key PFAS detections by Aquifer

Aquifer	# samples	Total PFAS		Attachment C PFAS		PFOA		PFOS		Hazard Index
		# wells with detections of any PFAS (%)	# wells with detections > 70 ng/L (%)	# wells with detections of any Att. C PFAS (%)	# wells with detections > 70 ng/L (%)	# wells with detections (%)	# wells with detections > 4 ng/L (%)	# wells with detections (%)	# wells with detections > 4 ng/L (%)	>1 (%)
Surficial	80	42 (53)	13 (16)	23 (29)	7 (9)	26 (33)	18 (23)	24 (30)	20 (25)	7 (9)
Yorktown	11	2 (18)	1 (9)	0 (0)	0 (0)	2 (18)	2 (18)	1 (9)	0 (0)	0 (0)
Castle Hayne	20	5 (25)	1 (5)	2 (10)	1 (5)	3 (15)	1 (5)	2 (10)	1 (5)	1 (5)
Beaufort	6	1 (17)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Peedee	35	6 (17)	1 (3)	0 (0)	0 (0)	2 (6)	1 (3)	3 (9)	2 (6)	0 (0)
Black Creek	48	9 (19)	2 (4)	4 (8)	1 (2)	5 (10)	4 (8)	1 (2)	1 (2)	0 (0)
Upper Cape Fear	39	9 (23)	0 (0)	1 (3)	0 (0)	6 (18)	6 (18)	2 (5)	1 (3)	0 (0)
Lower Cape Fear	13	1 (8)	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)	1 (8)	0 (0)	0 (0)
Lower Cretaceous	2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Basement saprolite	4	2 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	0 (0)
Basement rock	22	4 (18)	0 (0)	0 (0)	0 (0)	2 (9)	0 (0)	3 (14)	1 (5)	0 (0)
Total	280	81 (29)	18 (6)	30 (11)	9 (3)	48 (17)	33 (12)	39 (14)	26 (9)	8 (3)

Summary

- Groundwater samples collected across the statewide groundwater monitoring well network indicate detections of PFAS are widespread, but generally in lower concentrations
- Surficial aquifer impacts usually more significant than deeper aquifers
- Most significant impacts appear to be in the SE portion of the State

Next Steps

- Continue sampling NCDEQ monitoring wells, focusing on eastern NC counties
- Following completion of sampling eastern NC counties, sample remaining counties across the state
 - All groundwater samples will now include analysis of “Attachment C” compounds
- Confirmation sampling at sites/wells with unexpected results
- Collaboration across NCDEQ Divisions



Emerging Compounds Strategy: Surface Water

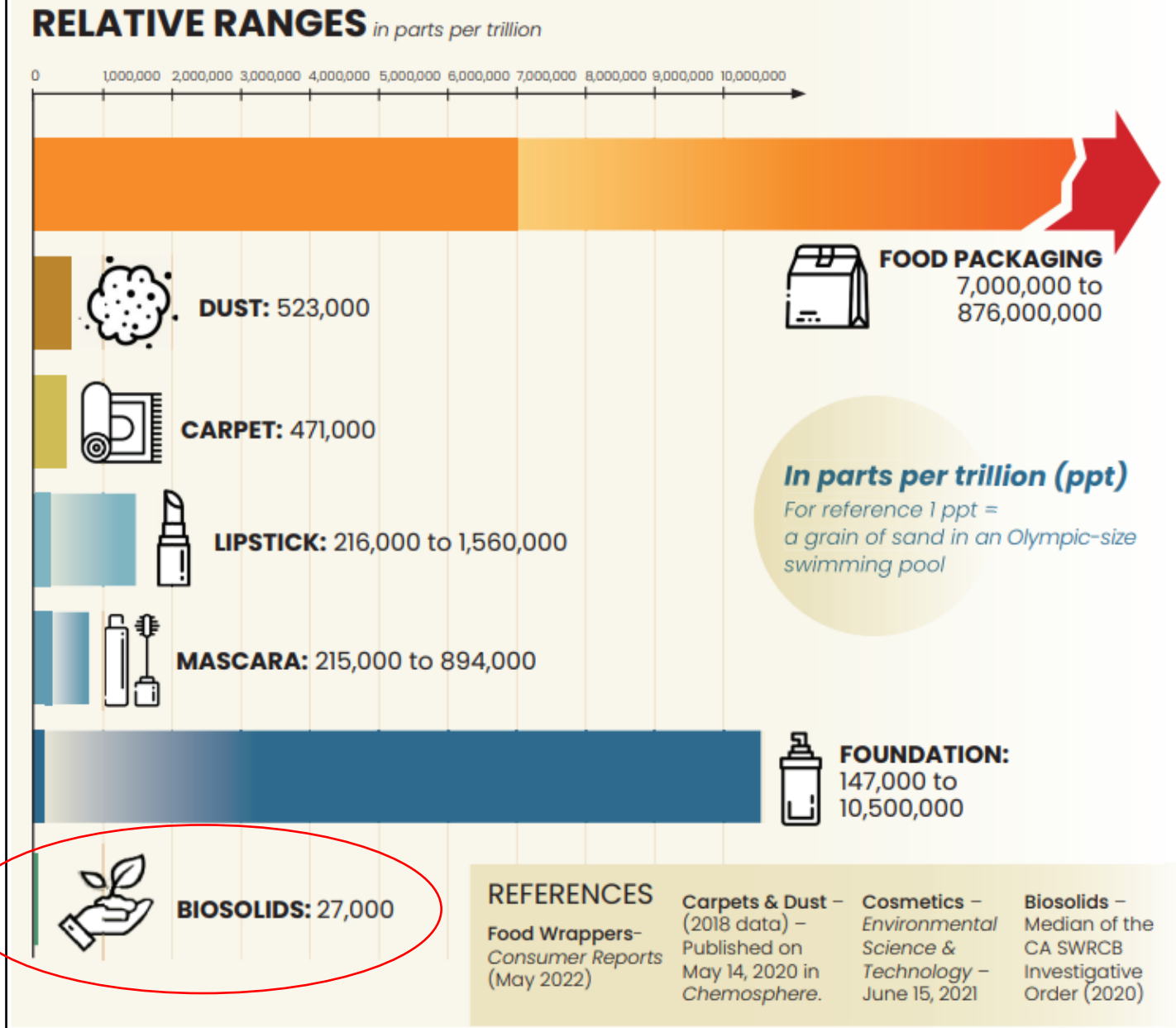
Industry and Wastewater System Sampling

April 2022: EPA issued a Memorandum outlining its approach to use federally-issued permits to reduce PFAS discharges.

- Federally-issued permits will include requirements to monitor for PFAS, to use best management practices like product substitution and good housekeeping practices and establish practices to address PFAS-containing firefighting foams in stormwater.
- These conditions and PFAS monitoring requirements will also apply to Industrial Direct Dischargers and Publicly Owned Wastewater Treatment systems receiving wastewaters from industries known or suspected of discharging wastewaters containing PFAS compounds.

December 5, 2022 EPA memorandum Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs





Risk Assessment?

Questions?

