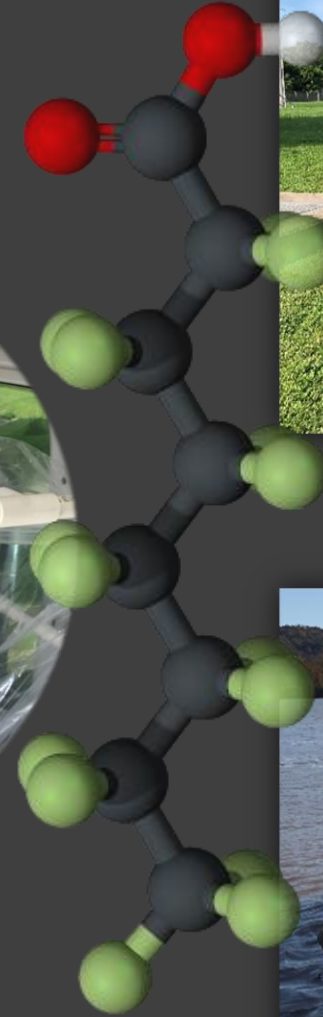
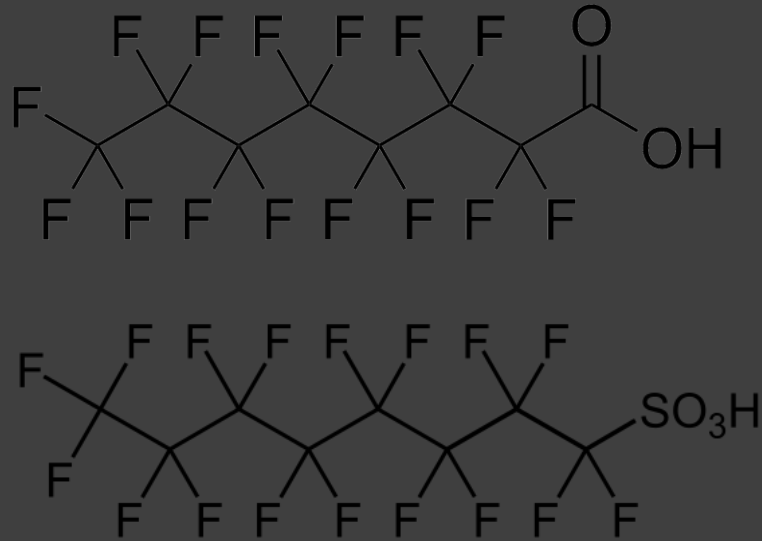


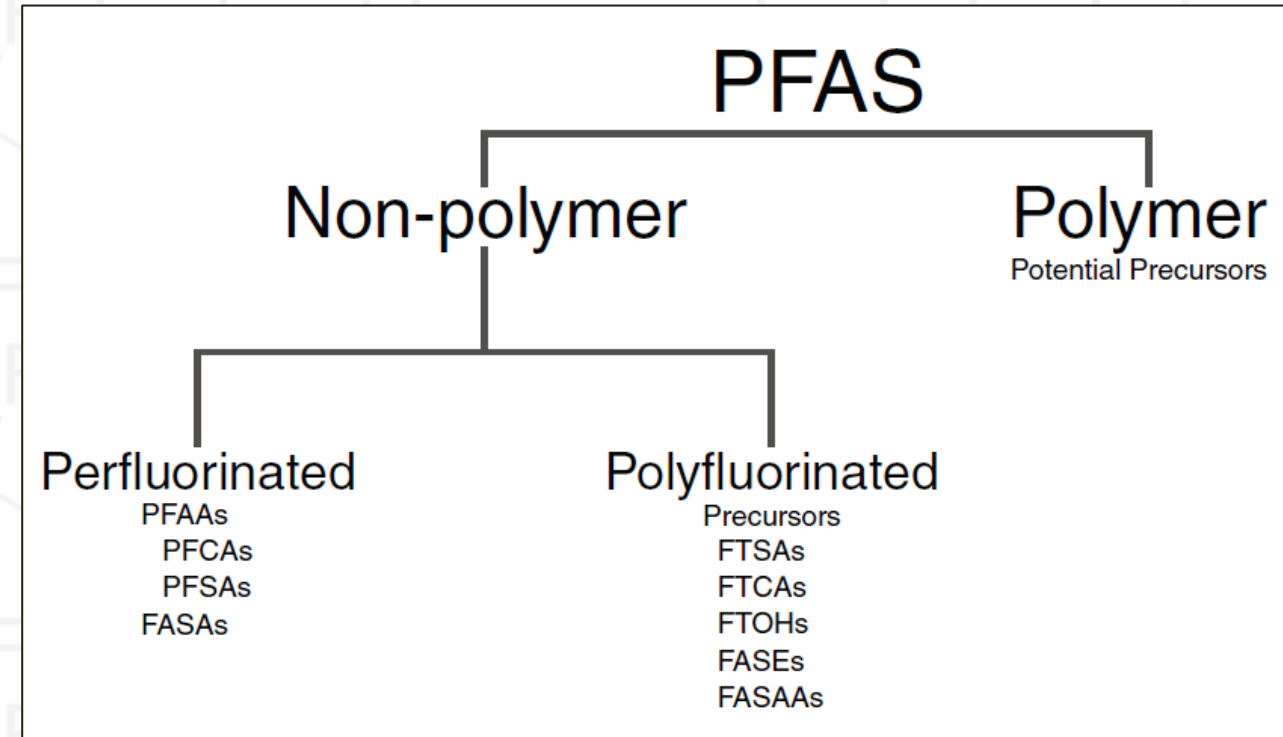
Per- and Polyfluoroalkyl Substances in West Virginia's Public Source Water

Mitch McAdoo, Hydrologist

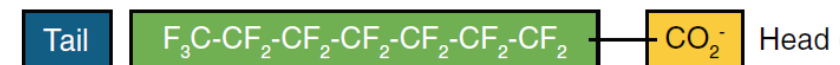


What are Per- and Polyfluoroalkyl substances (PFAS)?

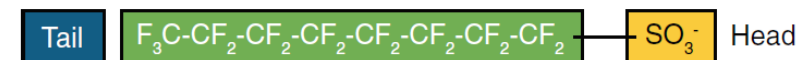
- Family of synthetic organic compounds first developed by 3M in the 1940's
- Used in industry as surfactants and in friction reduction applications
- Used in consumer products
 - Nonstick cookware, food packaging, water resistant applications, and many others
- Used in aqueous film forming foam (AFFF)
- Persistent in the environment
- Some PFAS have been shown to be bioaccumulative and toxic
- PFOA and PFOS are the most widely studied and the subject of ongoing regulation by the EPA



Perfluorooctane carboxylate (PFOA)



Perfluorooctane sulfonate (PFOS)



Why study PFAS in West Virginia's Public Source Water?

SENATE CONCURRENT RESOLUTION 46

Known PFAS Contamination sites

- Dupont Washington Works Facility near Parkersburg WV
- Air Guard Base near Martinsburg WV

EPA Actions and Regulations

- 2016 EPA set combine PFOA+PFOS lifetime Health Advisory level of 70 ng/l
- EPA analytical methods developed
- 2019 EPA issued a PFAS action plan to begin the regulation process and creation of MCLs for certain PFAS

USGS sampling: NAWQA and Ohio River Alluvium

- USGS sampled 23 groundwater sites in the Ohio river alluvium in 2019
- Resulted in several detections for PFAS in PWS's
- Showed that PFAS is present in the Ohio River Valley and demonstrated the need for further investigation throughout the state

Protect Public Health

- 2019 Creation of the WV PFAS Work Group
- Coordinated effort to understand PFAS contamination in WV
- WV legislature passed Senate Concurrent Resolution 46 (SCR46) which directed the WVDEP and WVDHHR to do a statewide PFAS study

SCR 46: https://www.wvlegislature.gov/bill_status/bills_text.cfm?billdoc=SCR46%20ORG.htm&yr=2020&sesstype=RS&i=46&houseorig=s&billtype=cr

Project Objectives

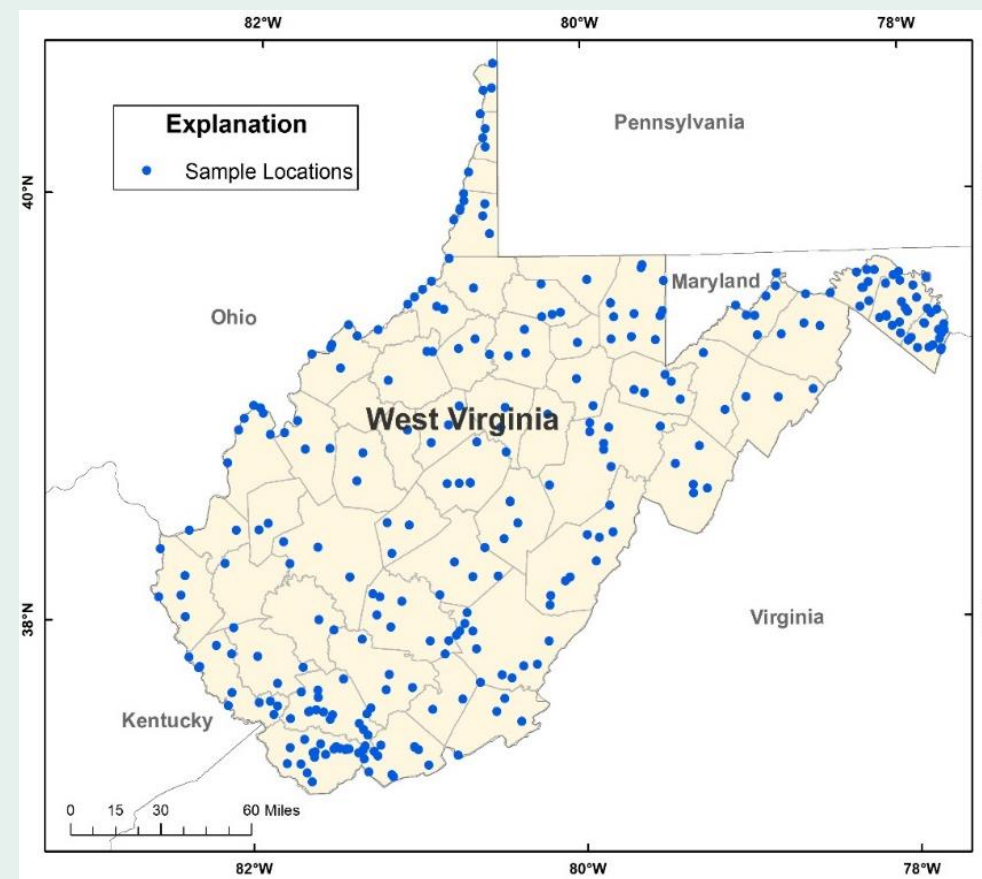
Meet the Requirements of SCR46

1. Identify drinking water sources with measurable amounts of PFAS
2. Determine processes or land use factors affecting PFAS concentrations
3. Inform state agencies of any need for additional PFAS investigation
4. Assist state regulatory agencies in protecting public health by providing information on statewide PFAS distribution in source water



Approach

- Sample all community public water systems including schools and daycares using USGS personnel and standard methods across the state
- Communicate with cooperators and notify state regulatory agencies of exceedances as results come back from the lab
- Publish a USGS Data Release to release data from proprietary PWS sites in a timely manner
- Publish a peer reviewed USGS report that summarizes the results and addresses the study objectives



Analytes

- Field Parameters (6)
- Major Inorganics (9)
- Nutrients (5)
- Trace Metals (23)
- PFAS (28)

Analyte	Unit
pH	pH
Dissolved Oxygen	mg/l
Conductivity	µS/cm
Turbidity	NTU
Water Temp	°C
Alkalinity	mg/l
Calcium	mg/l
Magnesium	mg/l
Potassium	mg/l
Silica	mg/l
Sodium	mg/l
Bromide	mg/l
Chloride	mg/l
Fluoride	mg/l
Sulfate	mg/l

Analyte	Unit
Ammonia	mg/L
Nitrite	mg/L
Nitrate	mg/L
Orthophosphate	mg/L
Total Nitrogen	mg/L
Aluminum	ug/L
Antimony	ug/L
Arsenic	ug/L
Barium	ug/L
Beryllium	ug/L
Boron	ug/L
Cadmium	ug/L
Chromium	ug/L
Cobalt	ug/L
Copper	ug/L

Analyte	Unit
Iron	µg/l
Lead	ug/L
Lithium	ug/L
Manganese	µg/l
Molybdenum	ug/L
Nickel	ug/L
Selenium	ug/L
Silver	ug/L
Strontium	ug/L
Thallium	ug/L
Uranium	ug/L
Vanadium	ug/L
Zinc	ug/L

PFAS Analytes	Abbreviation	Unit
Perfluorobutanoate	PFBA	ng/l
Perfluoropentanoate	PFPeA	ng/l
Perfluorohexanoate	PFHxA	ng/l
Perfluoroheptanoate	PFHpA	ng/l
Perfluorooctanoate	PFOA	ng/l
Perfluorononanoate	PFNA	ng/l
Perfluorodecanoate	PFDA	ng/l
Perfluoroundecanoate	PFUnA	ng/l
Perfluorododecanoate	PFDoA	ng/l
Perfluorotridecanoate	PFTTrDA	ng/l
Perfluorotetradecanoate	PFTeDA	ng/l
Perfluorobutanesulfonate	PFBS	ng/l
Perfluoropentanesulfonate	PFPeS	ng/l
Perfluorohexanesulfonate	PFHxS	ng/l
Perfluoroheptanesulfonate	PFHpS	ng/l
Perfluorooctanesulfonate	PFOS	ng/l
Perfluorononanesulfonate	PFNS	ng/l
Perfluorodecanesulfonate	PFDS	ng/l
Perfluorooctanesulfonamide	PFOSA	ng/l
N-Methylperfluorooctanesulfonamidoacetate	N-MeFOSAA	ng/l
N-Ethylperfluorooctanesulfonamidoacetate	N-EtFOSAA	ng/l
4:2 Fluorotelomersulfonate	4:2 FTS	ng/l
6:2 Fluorotelomersulfonate	6:2 FTS	ng/l
8:2 Fluorotelomersulfonate	8:2 FTS	ng/l
Perfluoro-2-propoxypropanoate (GEN X)	HFPO-DA	ng/l
4-Dioxa-3H-perfluorononanoate	ADONA	ng/l

Timeline

- Project started on July 1, 2020

Task	QTR	Year 1				Year 2			
		1	2	3	4	1	2	3	4
Develop sampling plan		X							
Site access and coordination		X	X	X	X				
Sampling		X	X	X	X				
QA/QC data as analyses are completed			X	X	X				
Data analysis				X	X	X			
Prepare and Publish Data Release					X	X			
Prepare initial draft of investigative report					X	X	X		
Report review and approval							X	X	
Publish investigative report									X



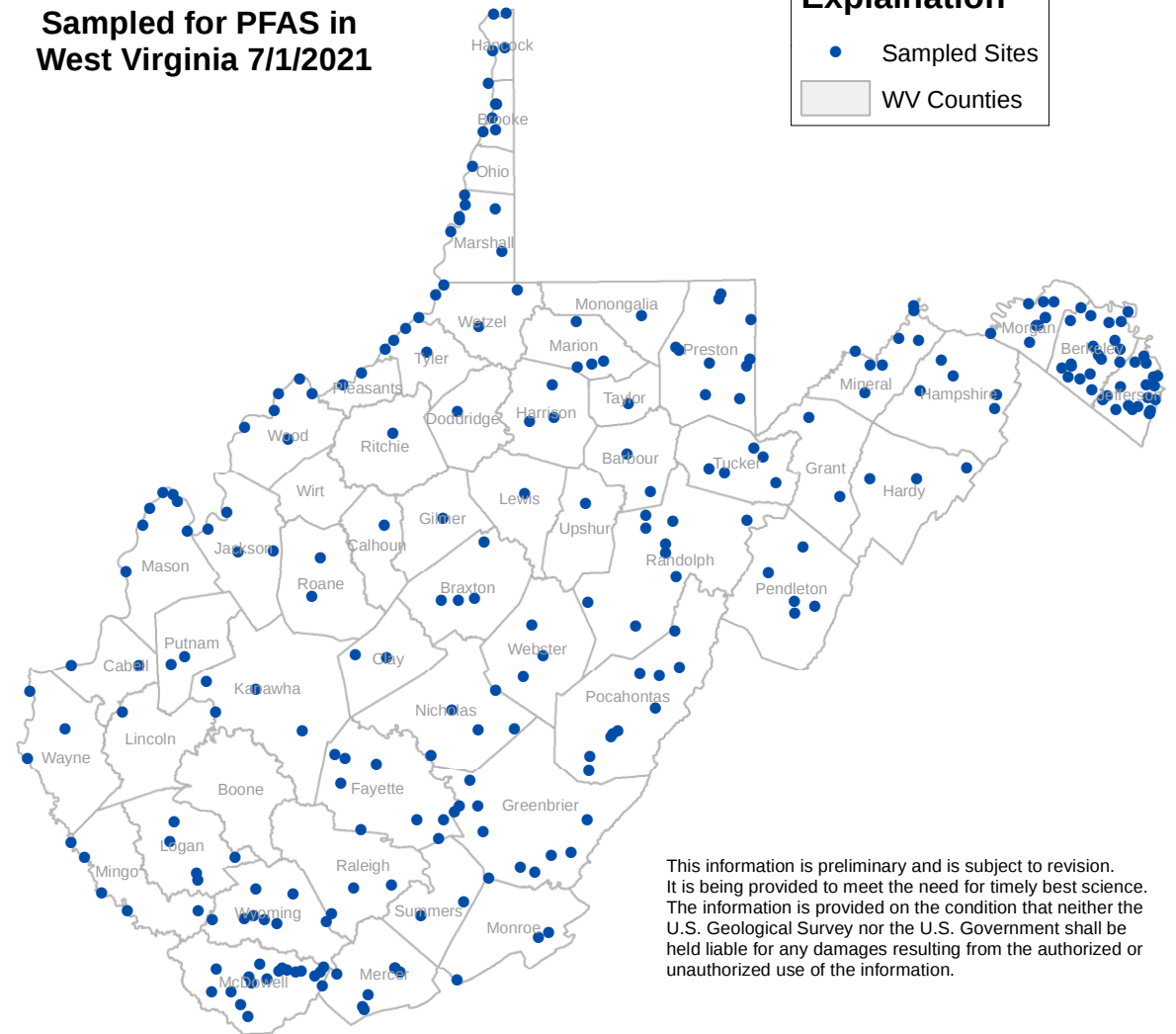
Progress

- 277 sites have been sampled
- 101 Surface Water
- 168 Groundwater

Public Source Water Sampled for PFAS in West Virginia 7/1/2021

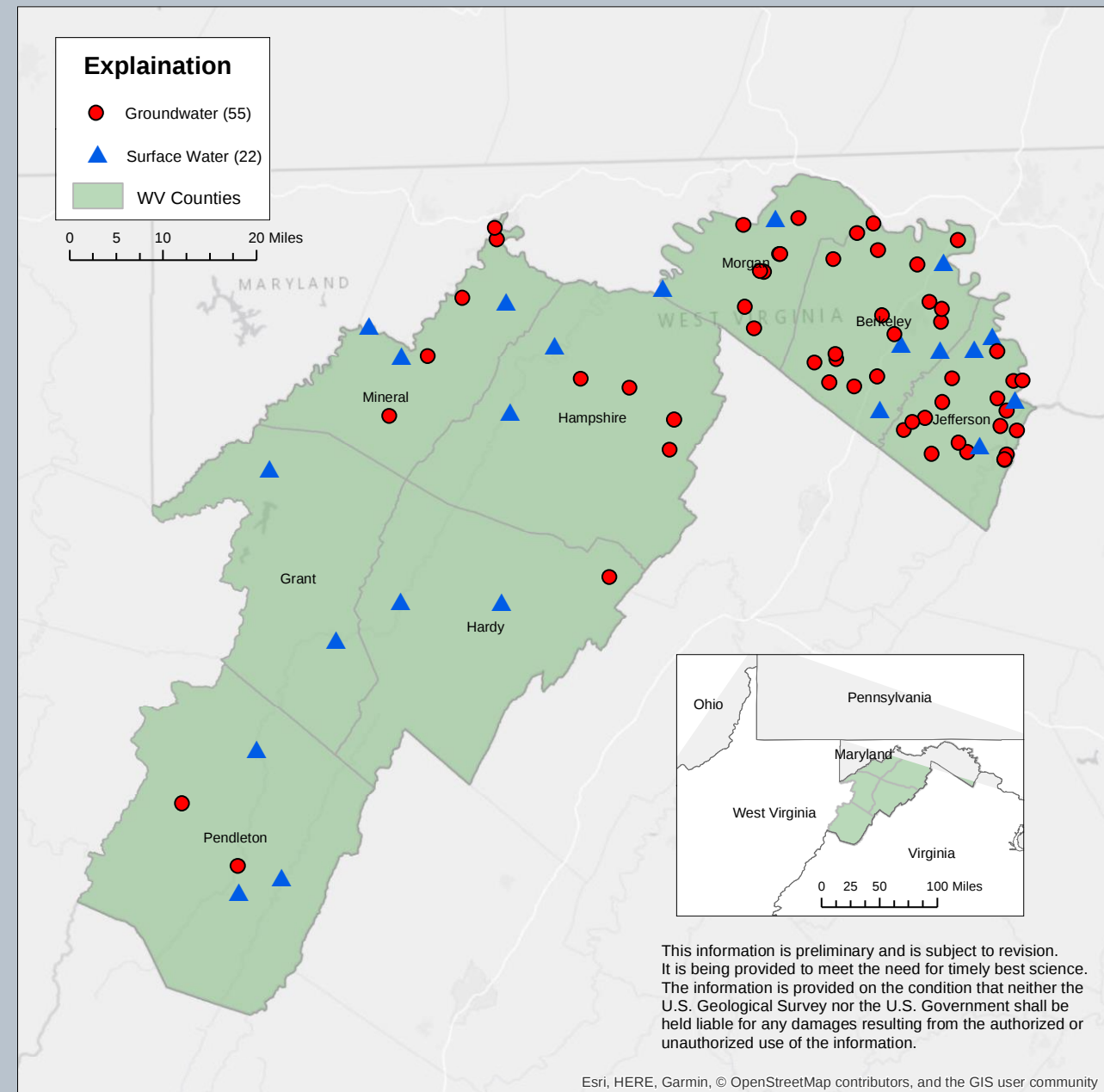
Explanation

- Sampled Sites
- WV Counties



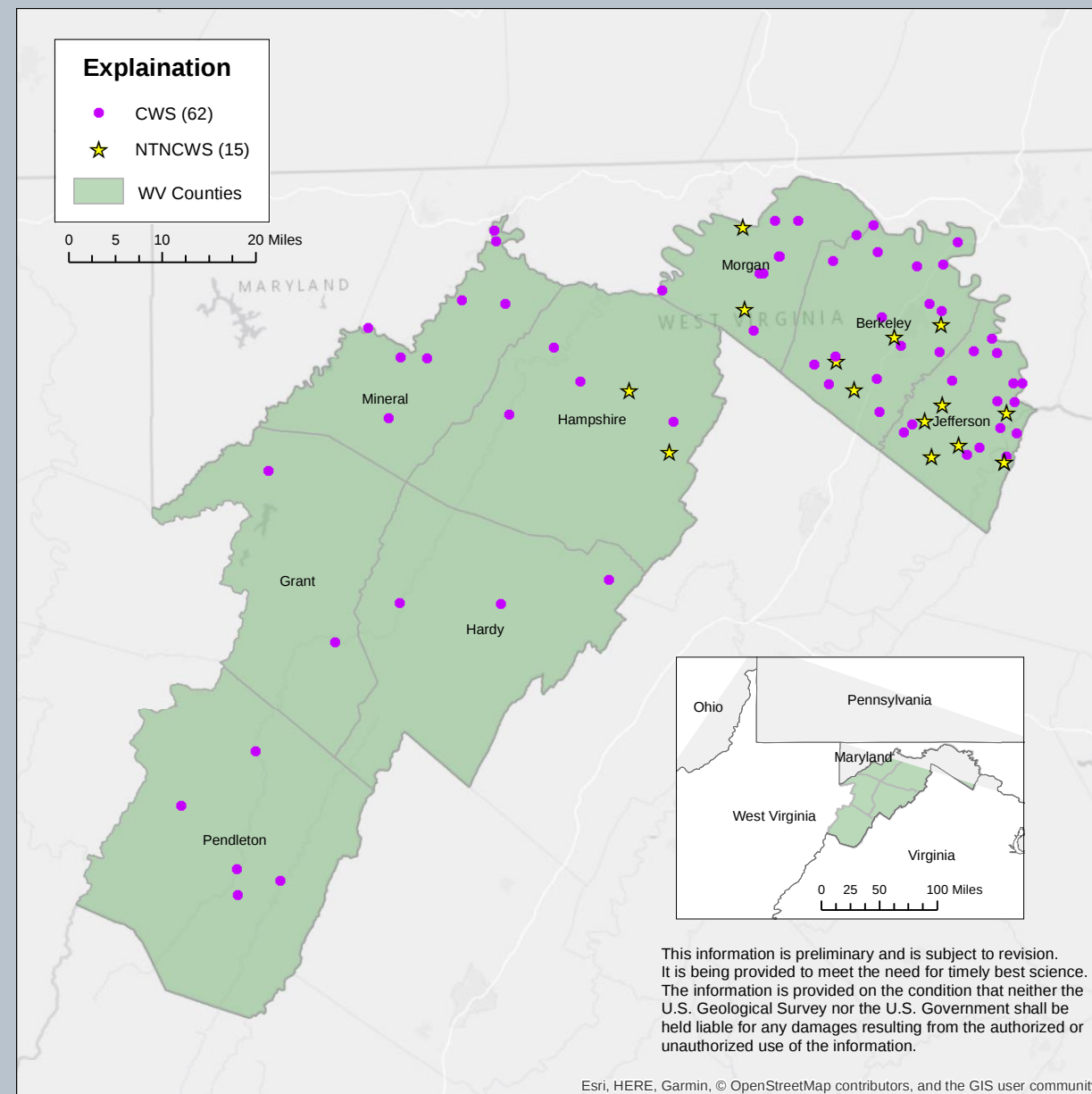
Potomac Watershed

- 77 sites in counties specific to the Potomac Watershed
- 55 sites from groundwater sources
- 22 sites from surface water sources
- Majority of GW sites located in carbonate aquifers



Potomac Watershed

- 62 Samples were from Community Water Systems (CWS)
- 15 Sites were at Non-transient Noncommunity Water Systems (NTNCWS)



Future Project Plans

- QAQC results and discuss preliminary data with cooperators and PWS's
- Analyze data
- Publish USGS Data Release (Estimated Sep 2021)
- Publish interpretive report (Estimated June 2022)



Acknowledgments

WV PFAS Work Group
WV Public Water Systems

USGS OKI

USGS PA

USGS MD

USGS VA/WV

Special Thanks:
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Questions?

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