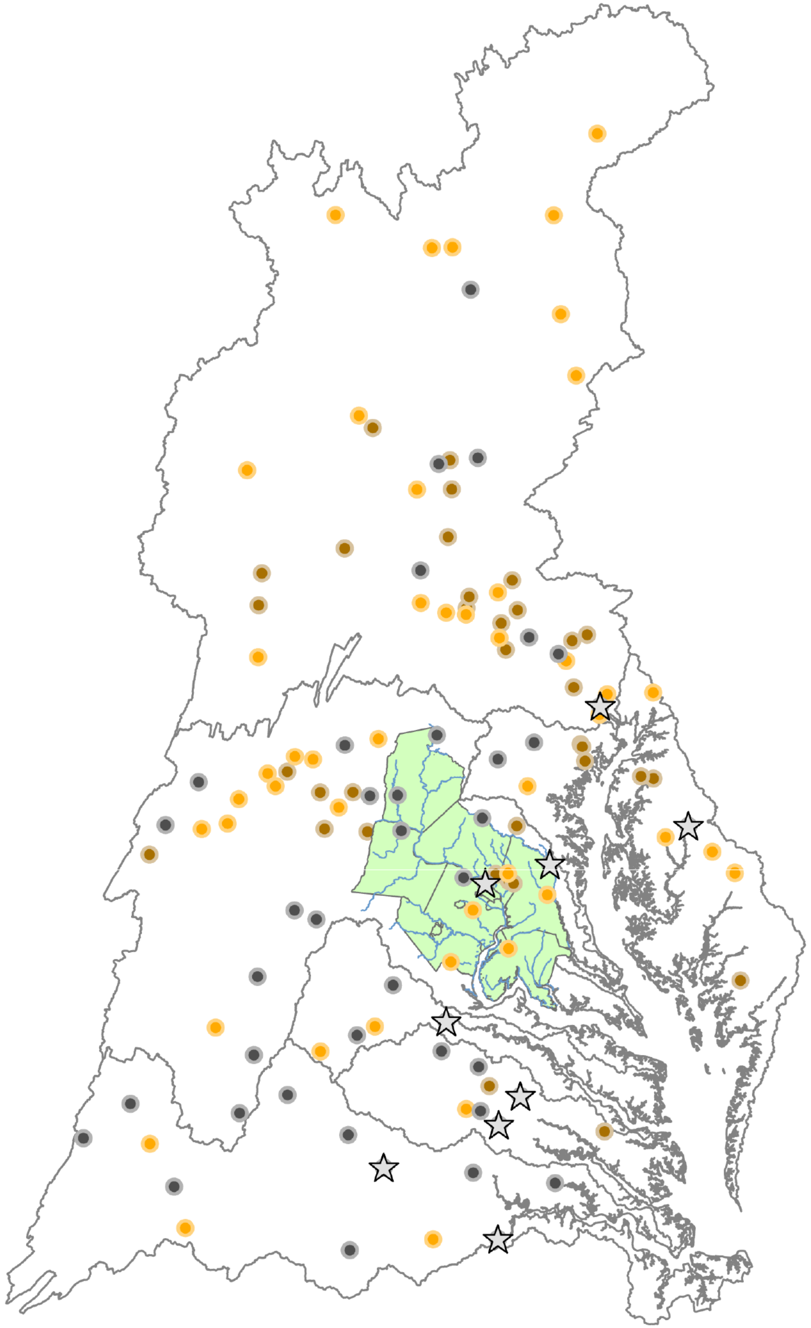
Nitrogen, Phosphorus, and Suspended-Sediment Loads and Trends

COG Region: Short-Term Results (2011 – 2020)

September 8th, 2023

Jimmy Webber jwebber@usgs.gov   Chris Mason camason@usgs.gov



Objective: to summarize results of short-term monitoring data that describe how total nitrogen (TN), total phosphorus (TP), and suspended sediment (SS) loads have changed over time in the COG region of the Chesapeake Bay nontidal network.

1. **Nontidal Network Overview:**
   Monitoring stations, data collection, and statistical methods
2. **Load and Trend Results:**
   TN, TP, and SS
3. **Communication Products:**
   Online data, project websites

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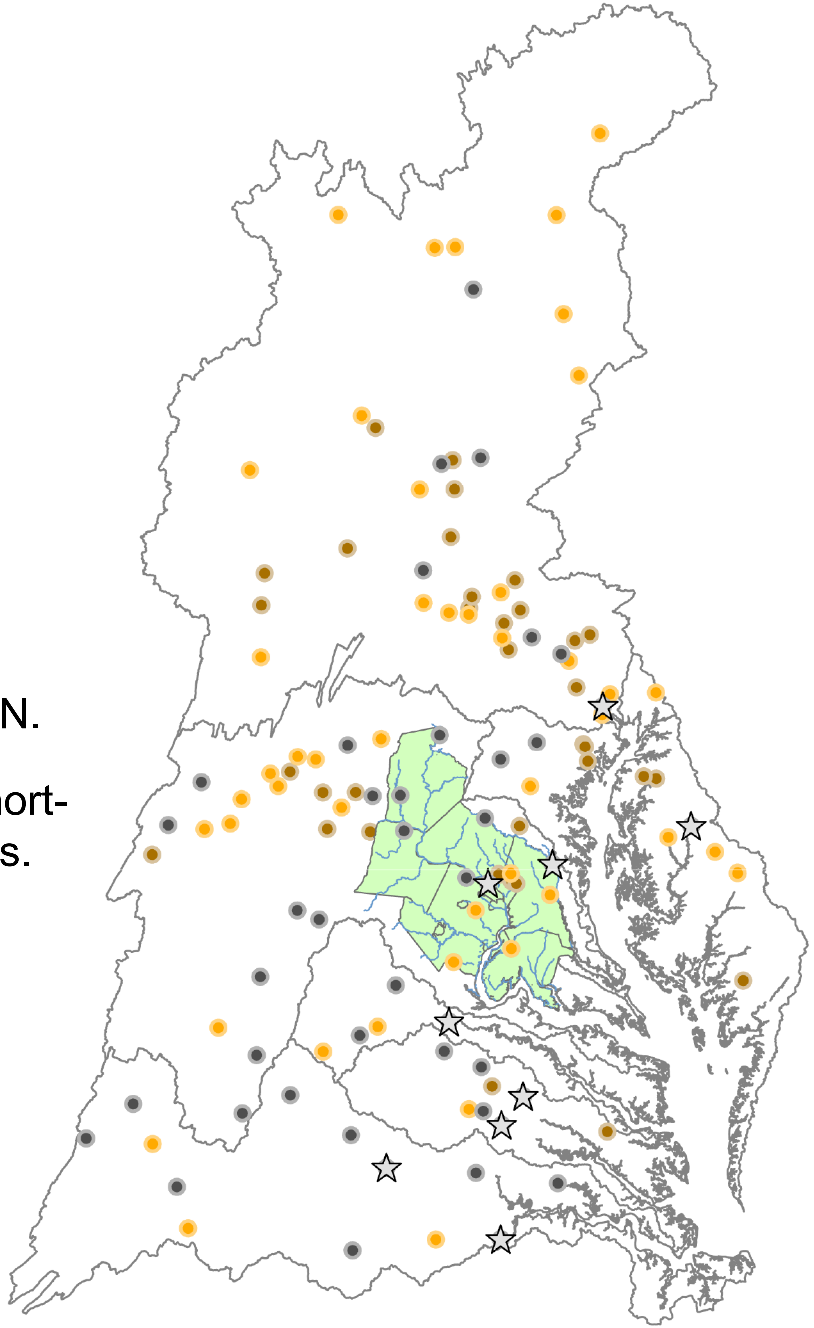

In the COG region[1]:

1. Median TN yields and short-term trends at the COG stations are similar to the entire NTN.
2. Median TP and SS yields in COG are higher than the entire NTN. Median TP and SS short-term trends are somewhat similar to the entire NTN, but two stations had large increases.
3. Accotink Creek and Difficult Run are two of the most urbanized NTN watersheds and had the largest percent increases of TP and SS in the entire NTN from 2011 - 2020.
4. Orthophosphate increased at Accotink Creek and Difficult Run, but TP increases were likely also caused by particulate phosphorus, delivered with increasing amounts of SS.
5. The USGS can work with you to help evaluate the drivers of changing nutrient and sediment loads in the COG region.

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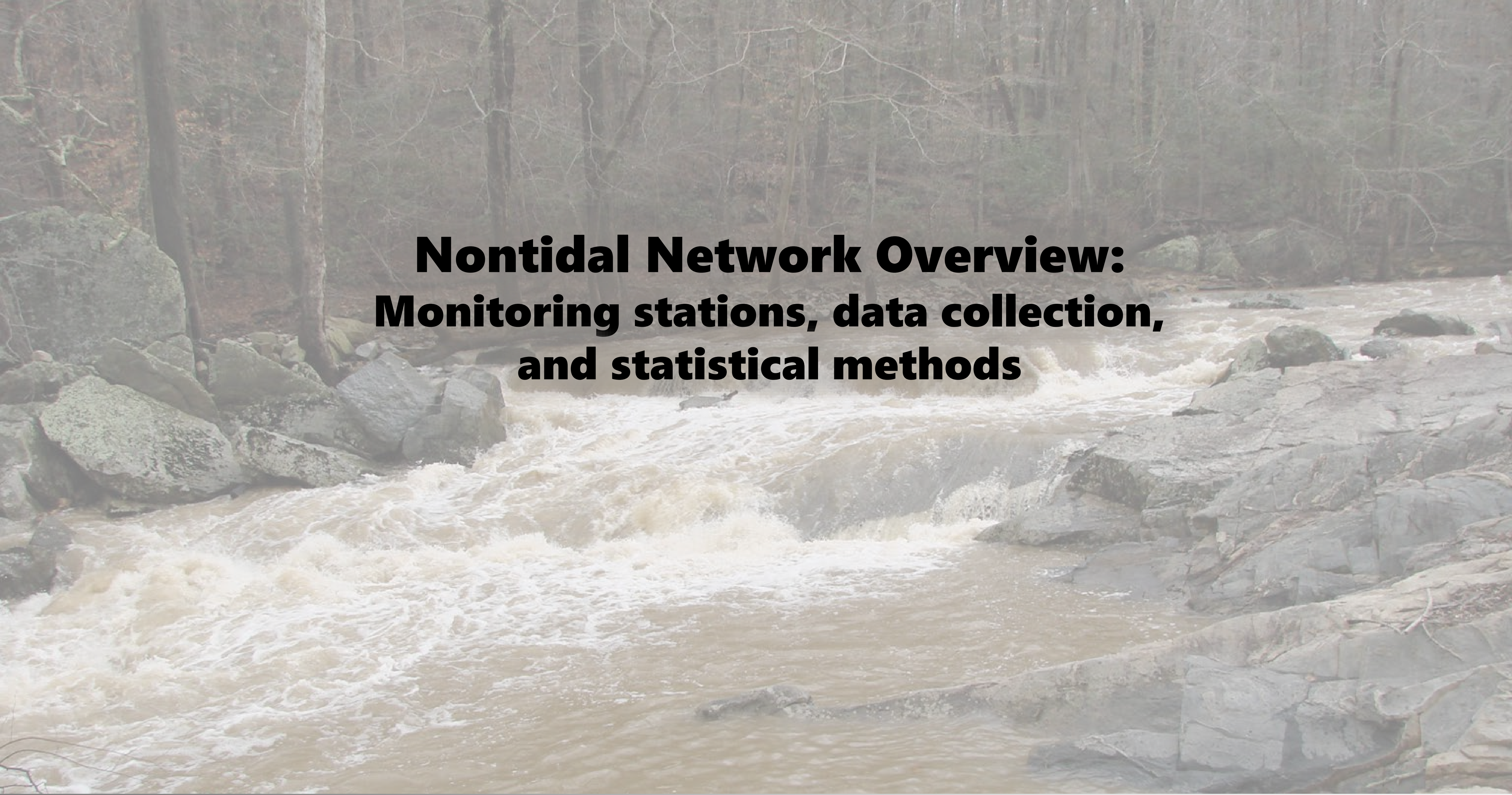
[1]15 monitoring stations, 12 stations that have TN trends and 10 stations that have TP and SS trends through water year 2020.

Nontidal Network Overview:
Monitoring stations, data collection, and statistical methods



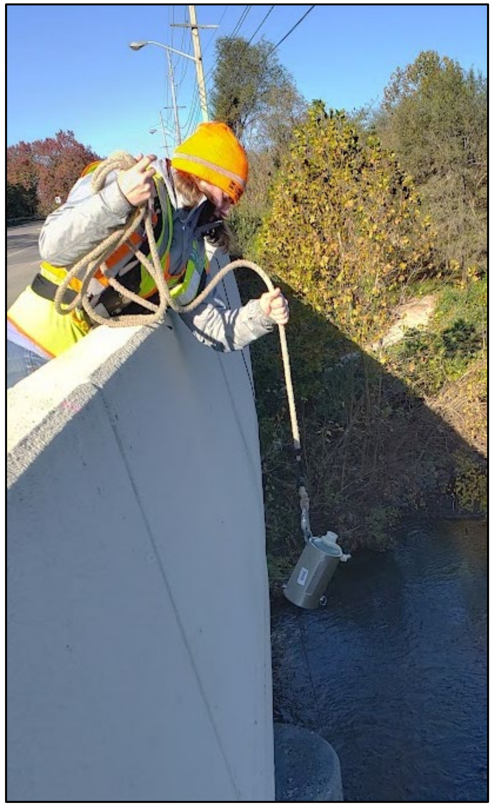
USGS science for a changing world *Difficult Run, near the Potomac River confluence*

The Chesapeake Bay nontidal network

The goal of the Chesapeake Bay nontidal network is to compute **loads** and **trends** of nitrogen, phosphorus, and sediment in nontidal rivers of the Chesapeake Bay watershed.

Load is the amount of nutrients or sediment in a river during a period of time (monthly, annually).

Trend is the change in load over multiple years.

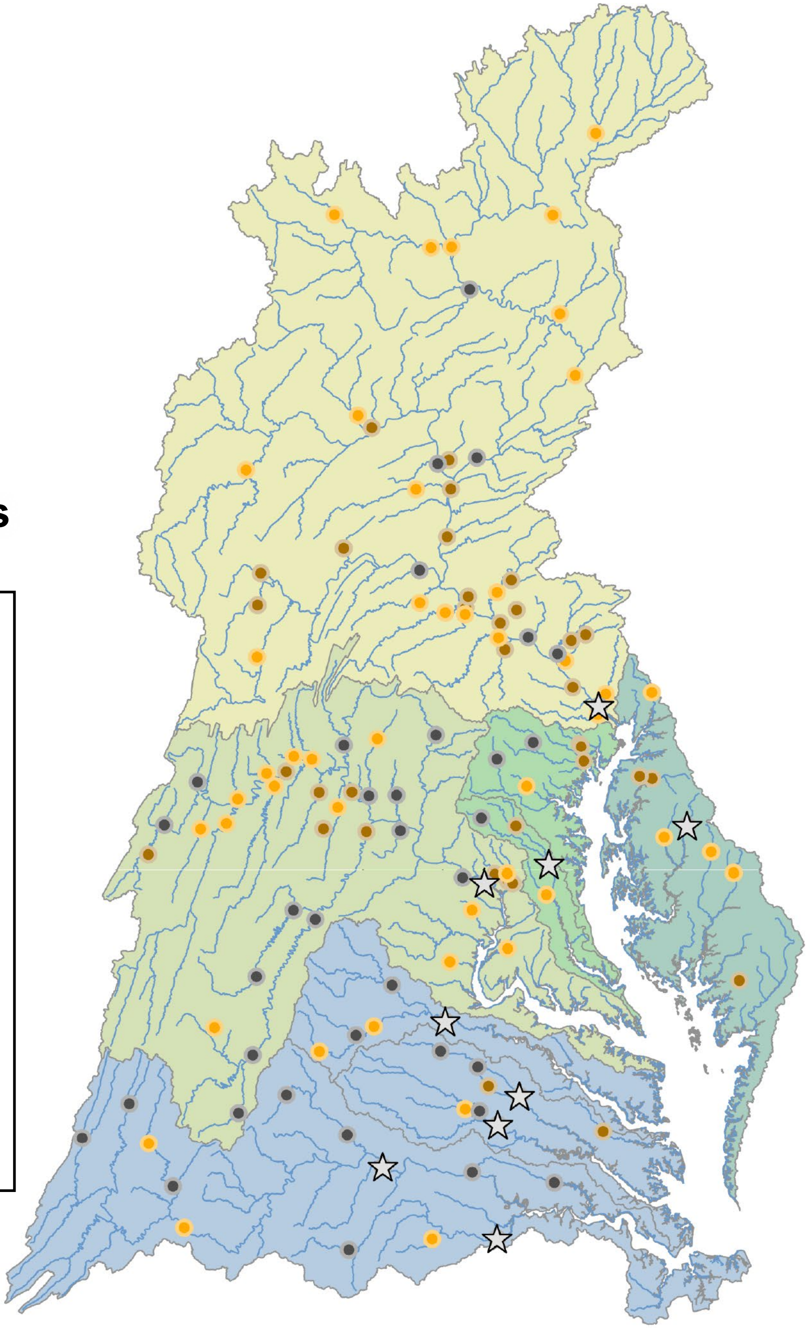


The nontidal monitoring network is made up of 123 stations

- 9 stations are part of the River Input Monitoring (RIM) network. These large rivers have been monitored since 1985.
- Over 2,400 water-quality samples are collected throughout the network each year.
- The network is a collaborative effort between the USGS, EPA, and agencies in Chesapeake Bay states.

Minimum Number of Monitoring Years[1]:

- Load = 5 years
- Short-term Trend = 10 years
- Long-term Trend = 30 years



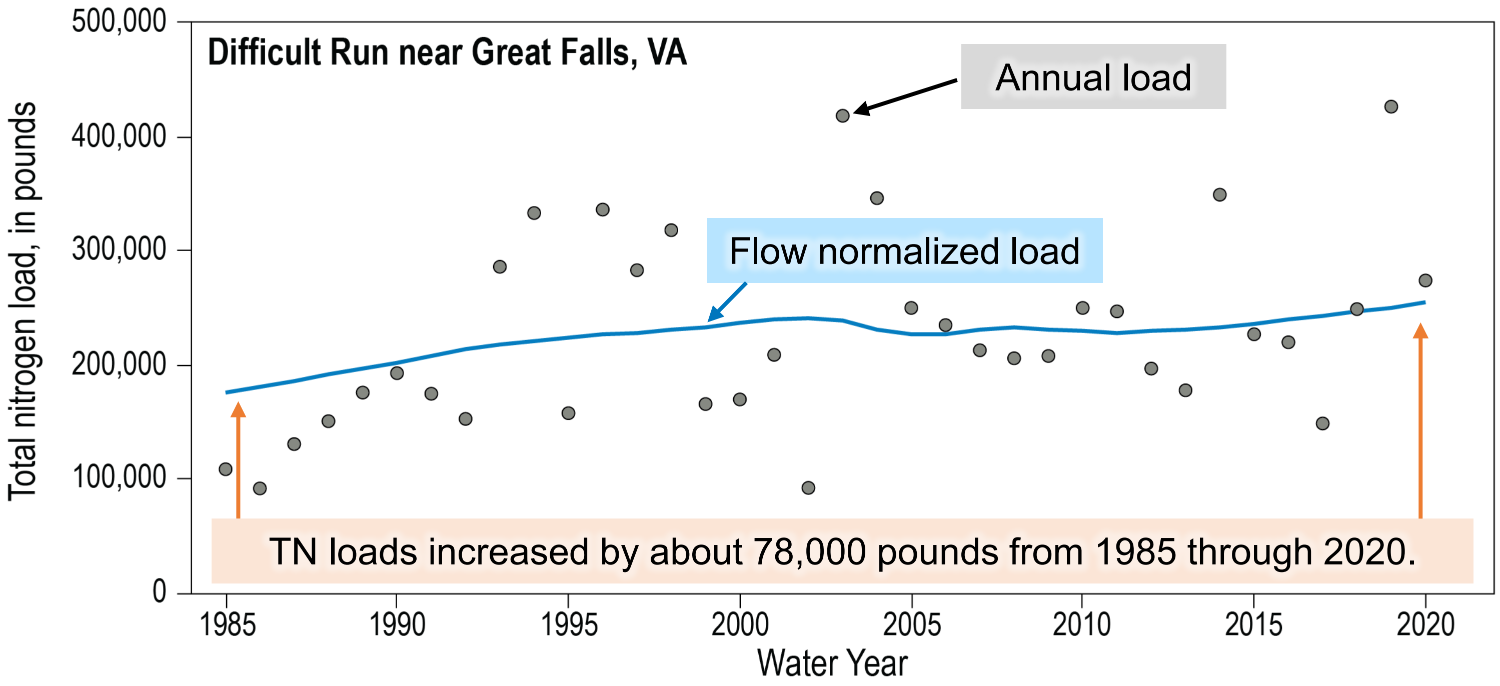
[1]**Loads and trends of TP, orthophosphate, and SS are only computed at stations with storm-targeted samples.**

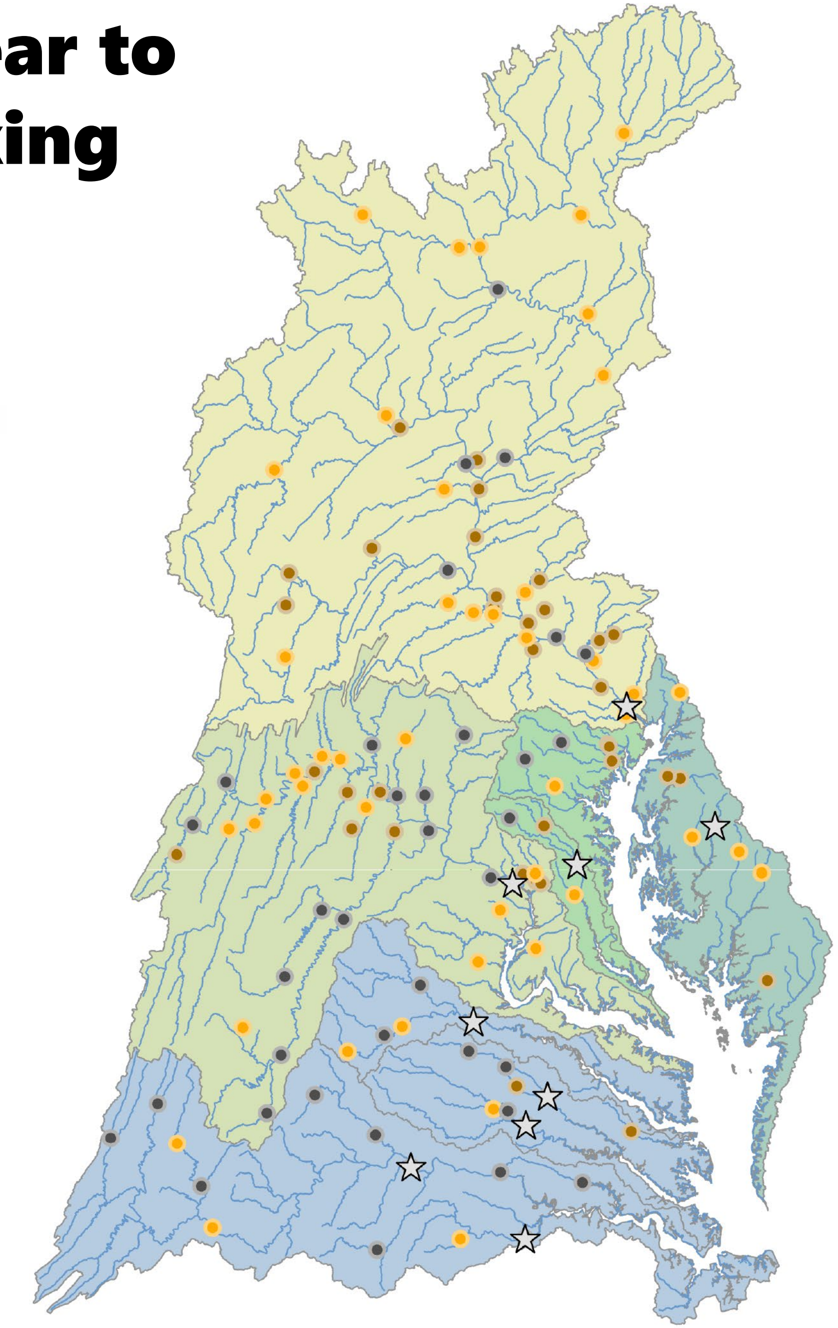
Loads and trends are computed every other year to provide timeline information for decision making

The most recent data have been computed through water year[1] 2020 for the 123-station monitoring network.

RIM loads and trends are computed annually and are available through water year 2022.

Trends are computed from flow normalized loads. Flow-normalized loads remove most variability in load caused by streamflow. Therefore, trends can help identify nutrient and sediment changes caused by landscape activities.





[1]A water year is an annual period from October – September.
Water year 2020 = October 1, 2019 through September 30, 2020.

There are 15 nontidal network COG monitoring stations

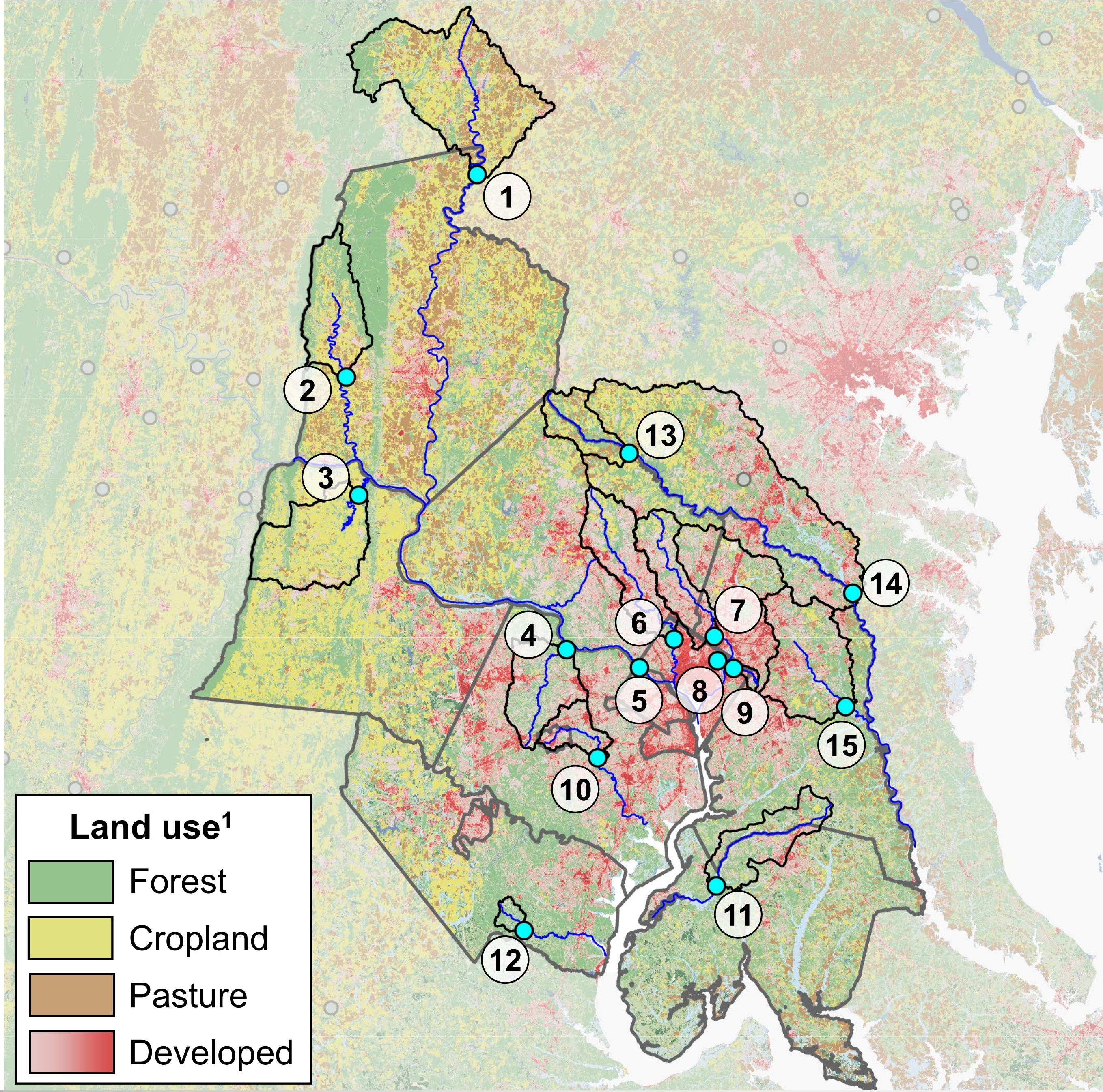
Stations that drain to the Potomac River:

1. Monocacy River at Bridgeport, MD………………..173 mi^2
2. Catoctin Creek nr Middletown, MD…………………67 mi^2
3. Catoctin Creek at Taylorstown, VA………………....90 mi^2
4. Difficult Run nr Great Falls, VA…………………..…58 mi^2
5. Potomac River at Chain Bridge, DC…………...11,570 mi^2
6. Rock Creek at Sherill Drive, DC……………………...64 mi^2
7. NW Branch Anacostia River nr Hyattsville, MD…....49 mi^2
8. Hickey Run at New York Ave, DC…………………….1 mi^2
9. Watts Branch, DC……………………………………3 mi^2
10. Accotink Creek nr Annandale, VA…………………...24 mi^2
11. Mattawoman Creek nr Pomonkey, MD…..............…55 mi^2
12. SF Quantico Creek nr Independent Hill, VA………....8 mi^2

Stations that drain to the Patuxent River:

13. Patuxent River nr Unity, MD…………………………35 mi^2
14. Patuxent River nr Bowie, MD……………………...348 mi^2
15. Western Branch at Upper Marlboro, MD…………..90 mi^2

Stations listed in blue have less than 10 years of data: trends have not been computed at these stations.



[1]Based on the 2016 National Land Cover Dataset

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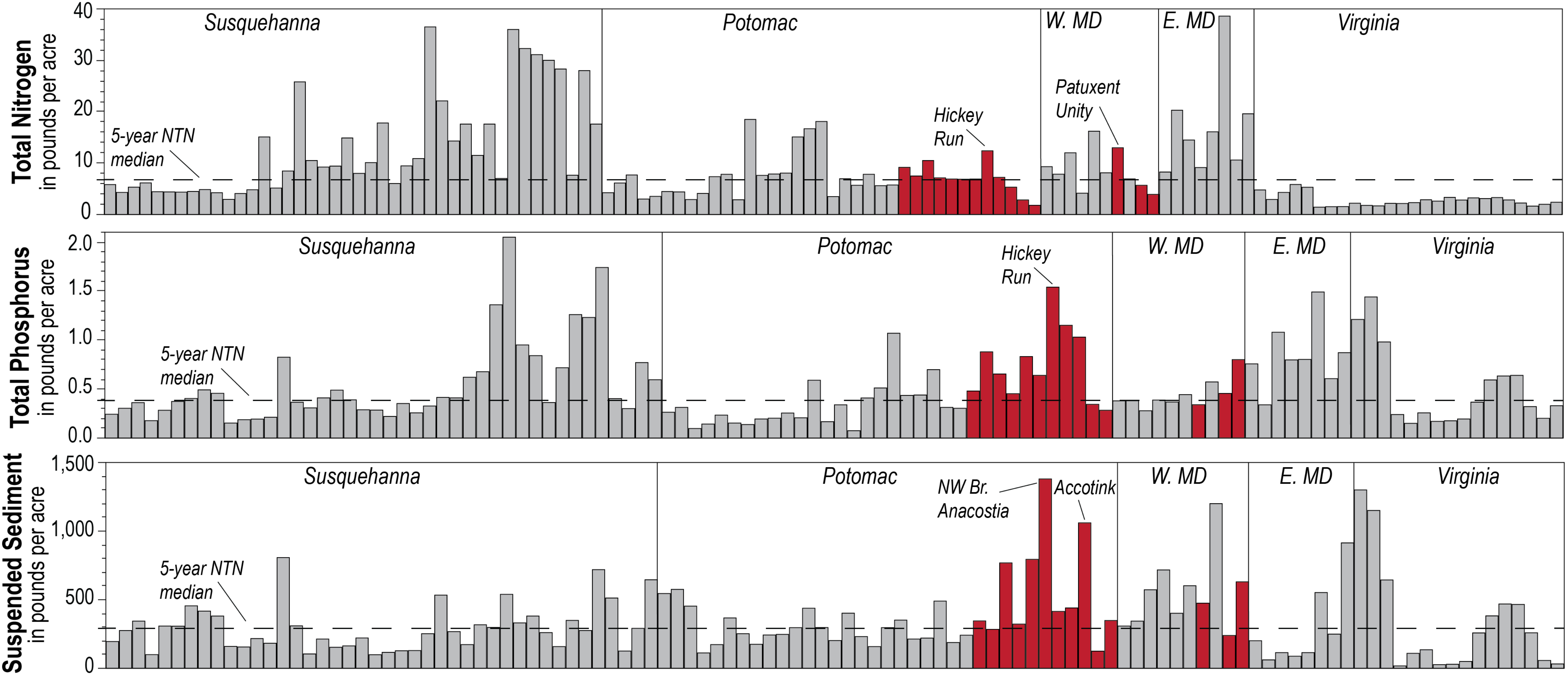
Load and Trend Results:
TN, TP, and SS

Difficult Run, near the Potomac River confluence

Nutrient and sediment yields (2016 – 2020)

<u>In the below plots:</u> NTN stations are ordered left to right from upstream to downstream. COG stations are in red.

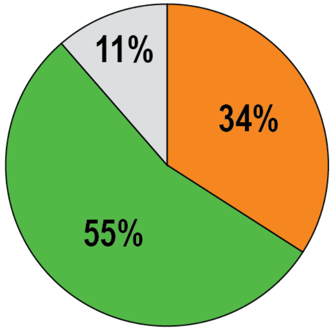


Summary of NTN Trends

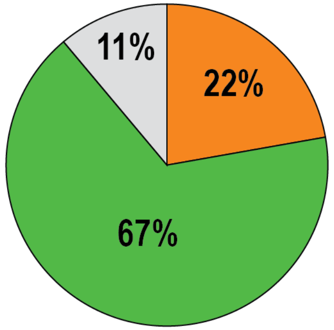
Improving | Degrading | No Trend

Long-Term Trends (1985-89 through 2020)

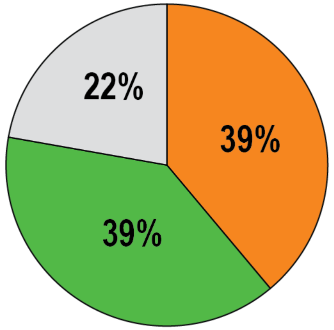
TN (n=44)



TP (n=18)

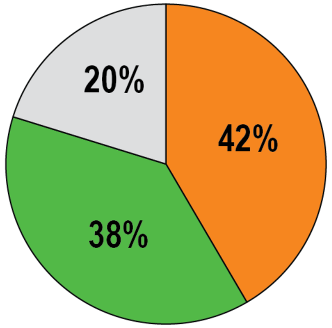


SS (n=18)

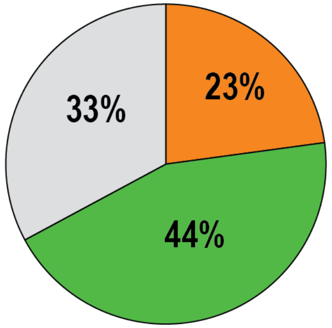


Short-Term Trends (2011 through 2020)

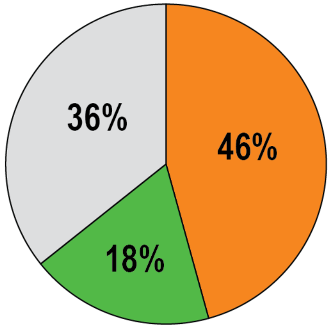
TN (n=89)



TP (n=70)



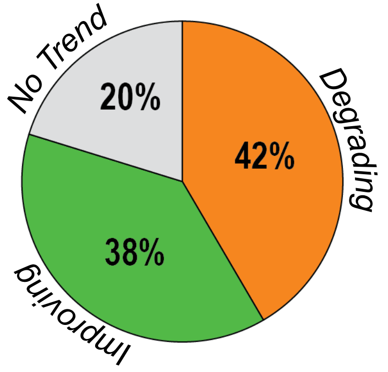
SS (n=70)



Total Nitrogen Trends

COG Region: 2011 - 2020

Trends in the NTN (n=89)

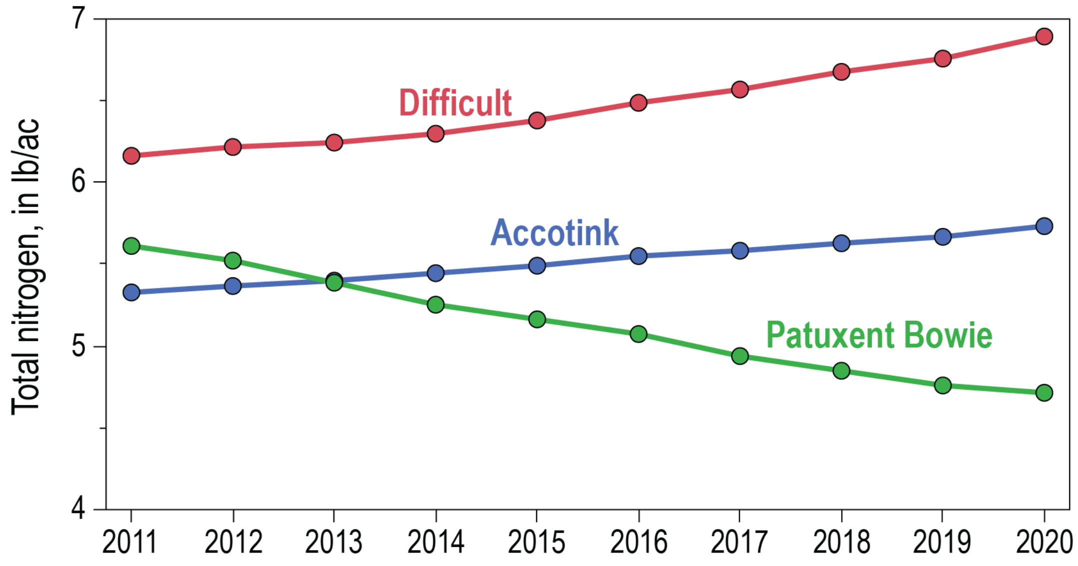


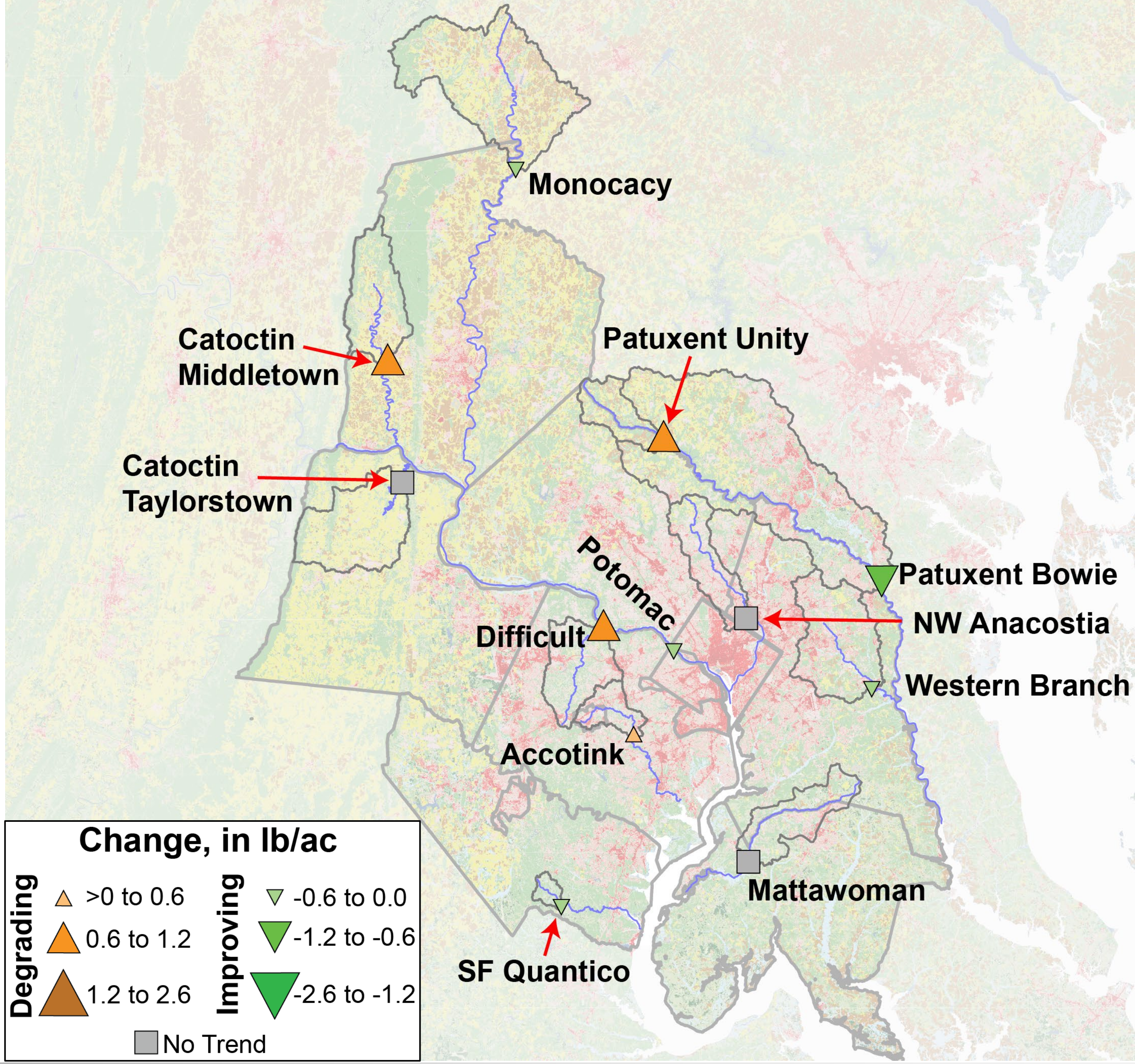
Trends in COG (n=12)

- **Improving**: 5 stations
- **Degading**: 4 stations
- **No Trend**: 3 stations

Median change:

- NTN: +0.04 lb/ac (+1.7%)
- COG: -0.06 lb/ac (-0.8%)



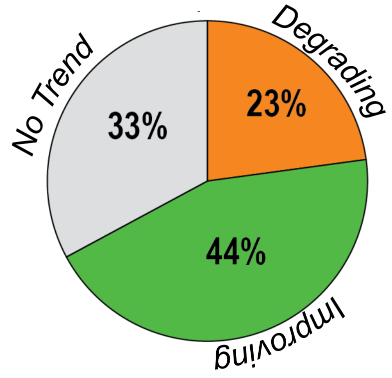


All changes are calculated using flow-normalized load.

Total Phosphorus Trends

COG Region: 2011 - 2020

Trends in the NTN (n=70)

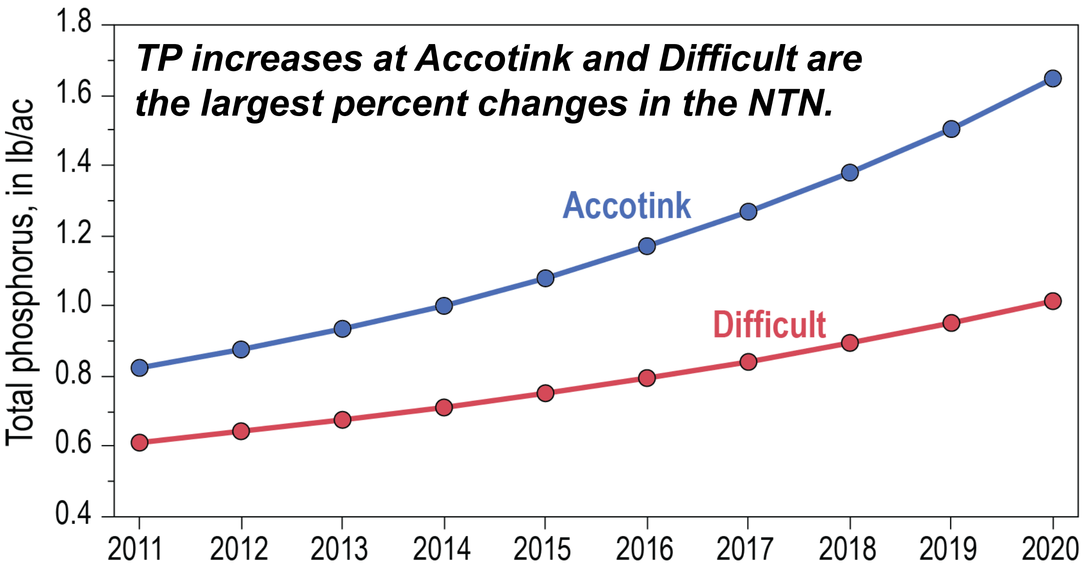


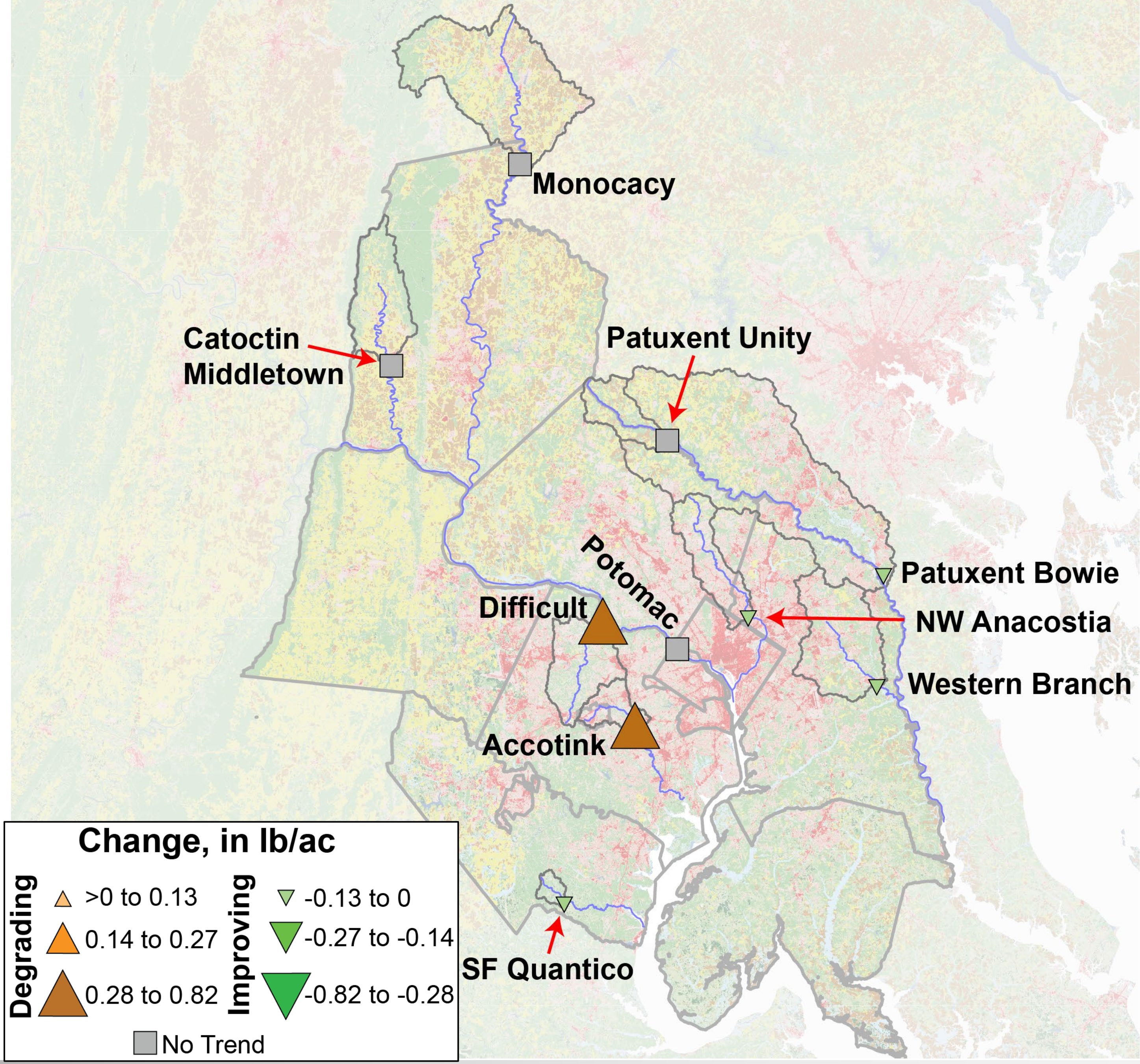
Trends in COG (n=10)

- Improving: 4 stations
- Degading: 2 stations
- No Trend: 4 stations

Median change:

- NTN: -0.02 lb/ac (-4.6%)
- COG: -0.03 lb/ac (-6.7%)

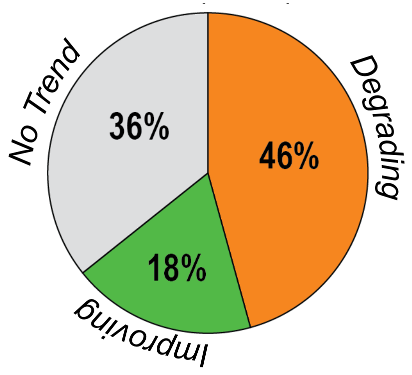




Suspended Sediment Trends

COG Region: 2011 - 2020

Trends in the NTN (n=70)

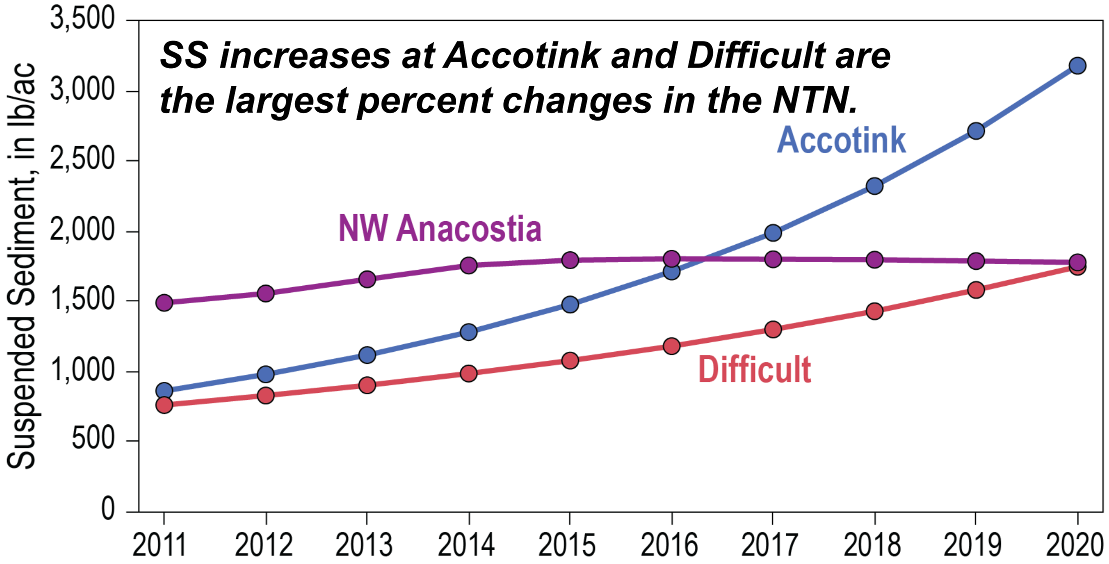


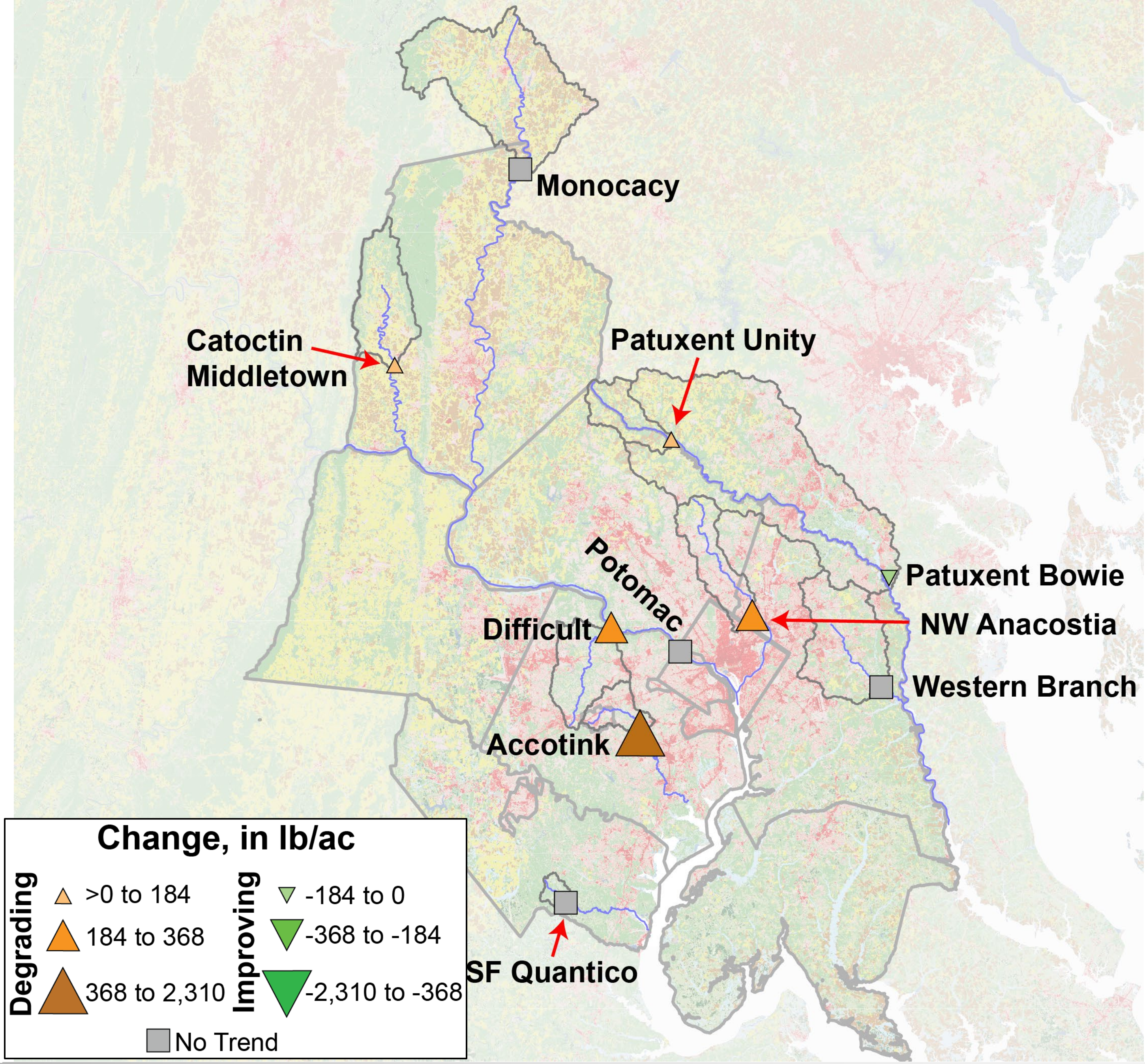
Trends in COG (n=10)

- Improving: 1 stations
- Degaging: 5 stations
- No Trend: 4 stations

Median change:

- NTN: +36 lb/ac (16%)
- COG: +82 lb/ac (13%)





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Communication Products:
Online Data, Project Websites

Difficult Run, near the Potomac River confluence

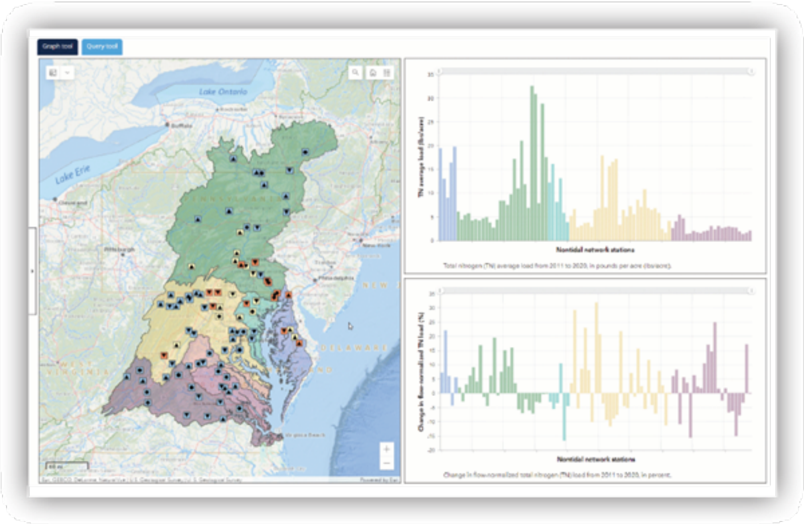
Load and trend data are available online

USGS data releases

doi.org/10.5066/P96H2BDO (NTN 2020)

doi.org/10.5066/P90CZJ1Y (RIM 2021; Patuxent and Potomac)

doi.org/10.5066/P97IFYES (RIM 2022; Patuxent and Potomac)

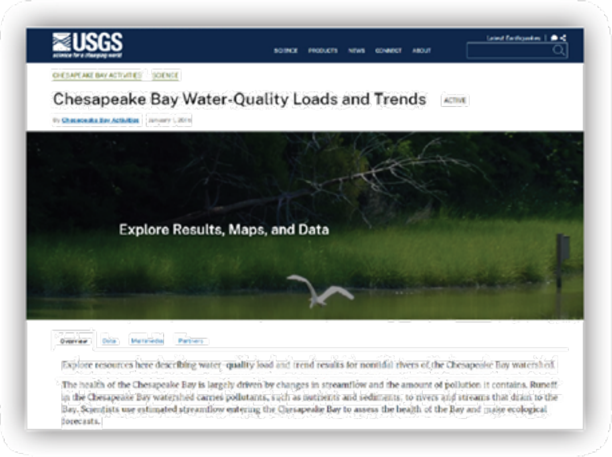


USGS interactive geonarrative

va.water.usgs.gov/geonarratives/ntn

USGS monitoring website

usgs.gov/CB-wq-loads-trends



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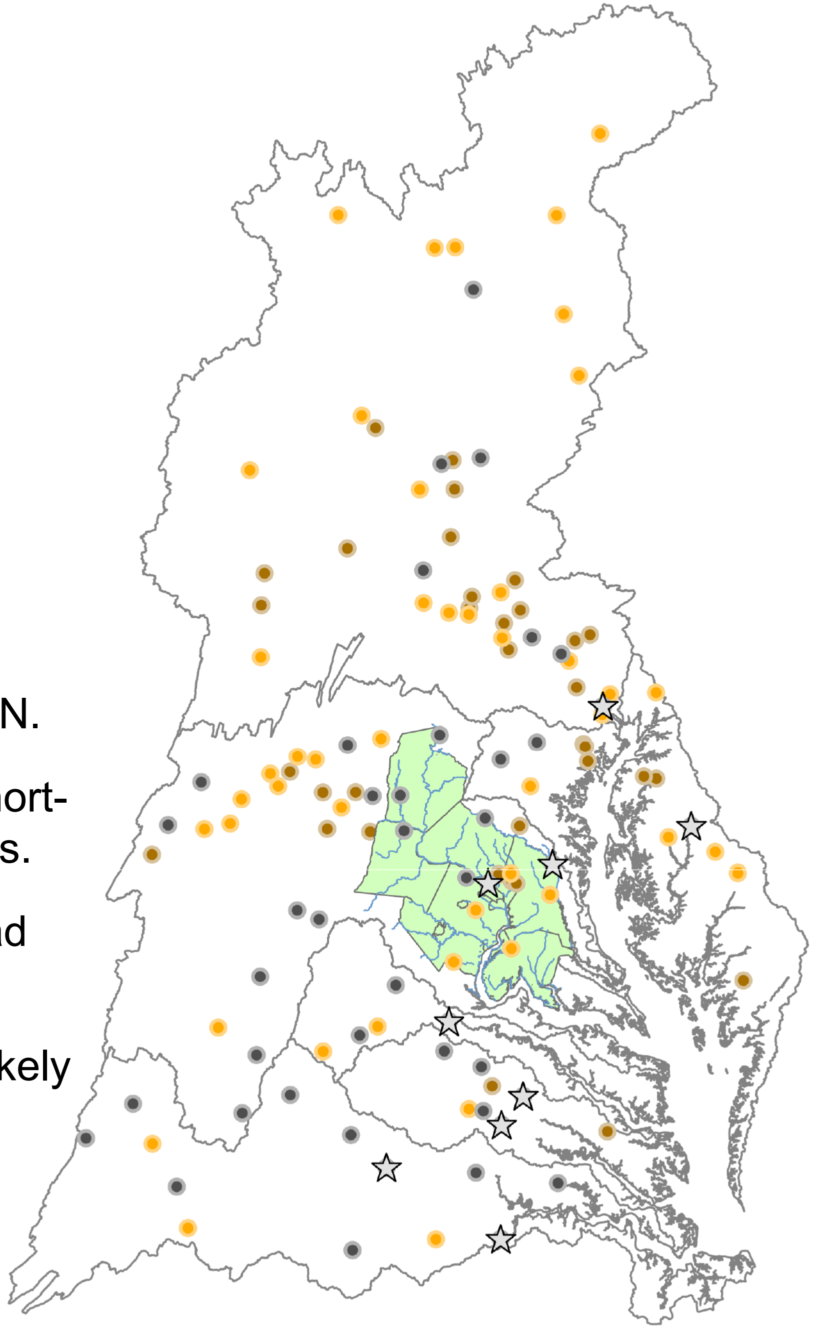

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