Chesapeake Bay Nontidal Network Nitrogen and Phosphorus Loads and Trends: An Update of Results through 2018

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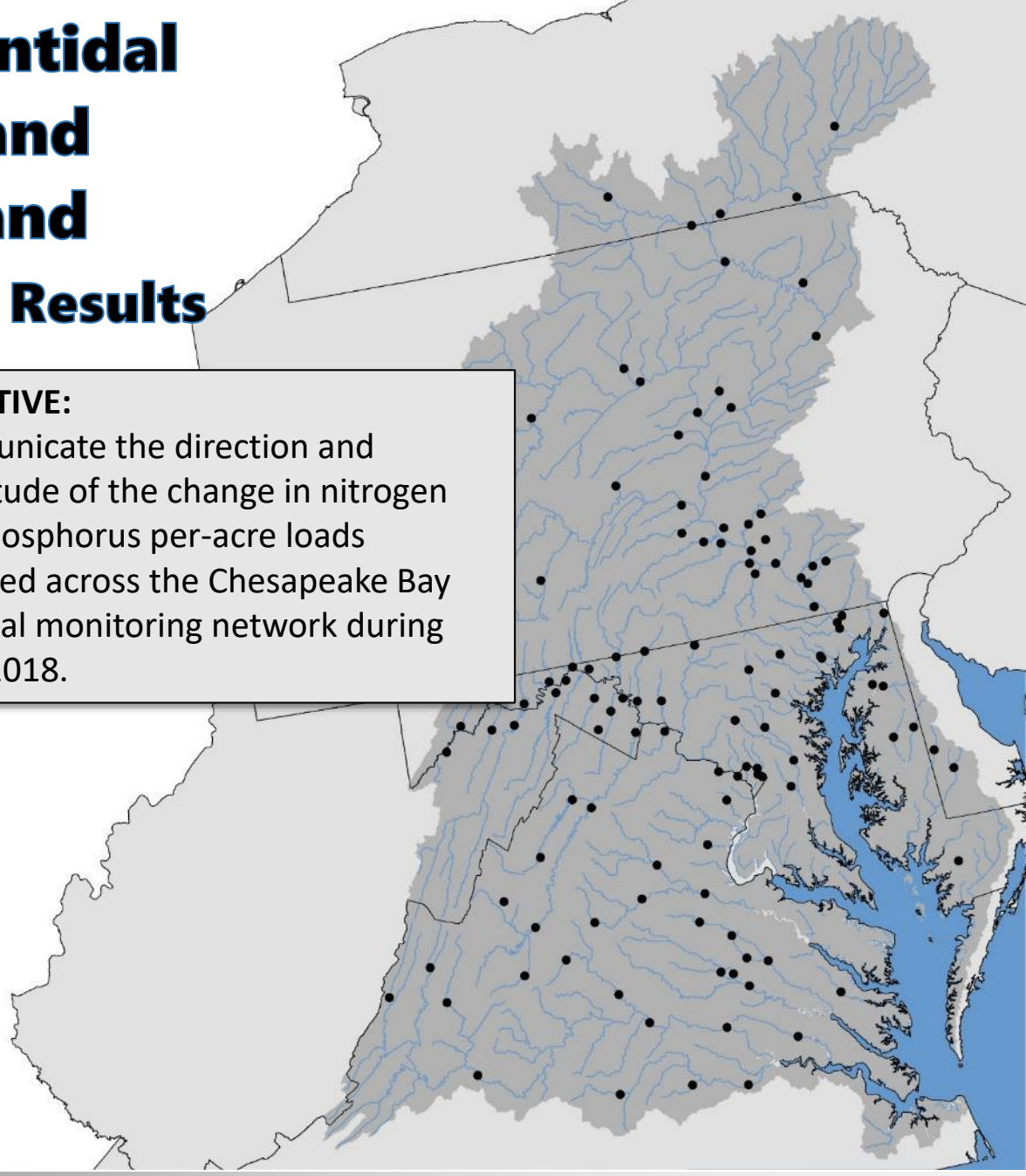
Doug Moyer

dlmoyer@usgs.gov

Scott Phillips

swphilli@usgs.gov

OBJECTIVE:
Communicate the direction and magnitude of the change in nitrogen and phosphorus per-acre loads observed across the Chesapeake Bay Nontidal monitoring network during 2009-2018.



Loads and trend results determined from foundation of monitoring data

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Loads and trend results determined from foundation of monitoring data

Our load and trend analyses are based on **water-quality** and **stream-discharge** measurements made across the 123-station nontidal network.

Over **2,400** water-quality samples are collected each year!

- Load and Trend (10 years)
- Load only (5-9 years)
- New Station (<5years)
- Discontinued

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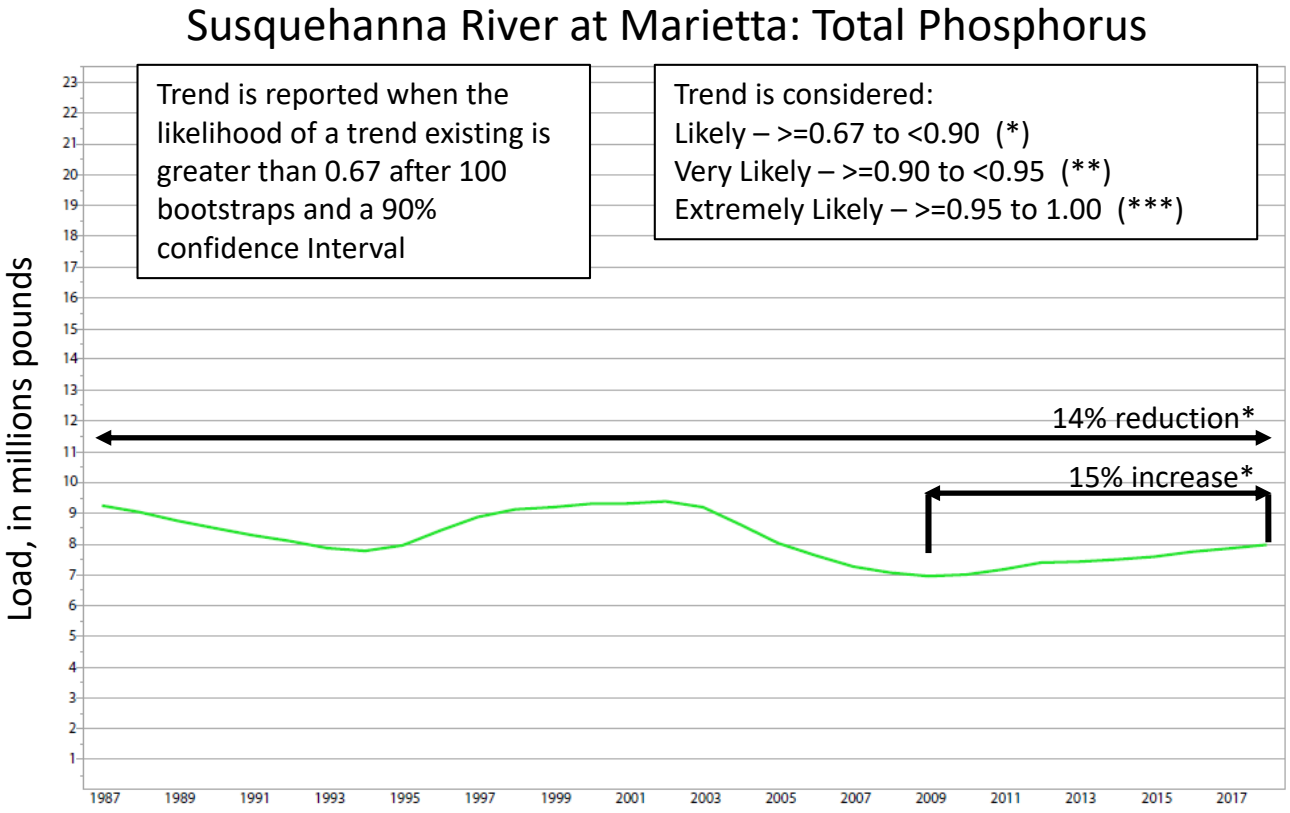
Load and trend results have been computed through 2018 to provide timely information available for decision making

Load is a measure of the

Flow-normalized loads results by removing most of the hydrologic variability associated with loads. Important for understanding water-quality responses to watershed changes

response.



Summary of nitrogen and phosphorous trends: 2009-2018[2]

Trends in total nitrogen

- 41% of NTN stations showing reductions in nitrogen loading (median change 7%)
- 40% of the NTN stations showing degradation in nitrogen loading (median change 10%)
- Good news – Majority of improvements occur in agricultural areas of the lower Susquehanna and Potomac.

Trends in total phosphorus

- 44% of NTN stations showing reductions in phosphorus loading (median change 15%)
- 32% of the NTN stations showing degradation in phosphorus loading (median change 28%)
- 12 of 18 stations in the Potomac watershed are showing significant reductions; no stations are showing degradation
- Continued degradation in the high loading areas of the lower Susquehanna and Eastern Shore

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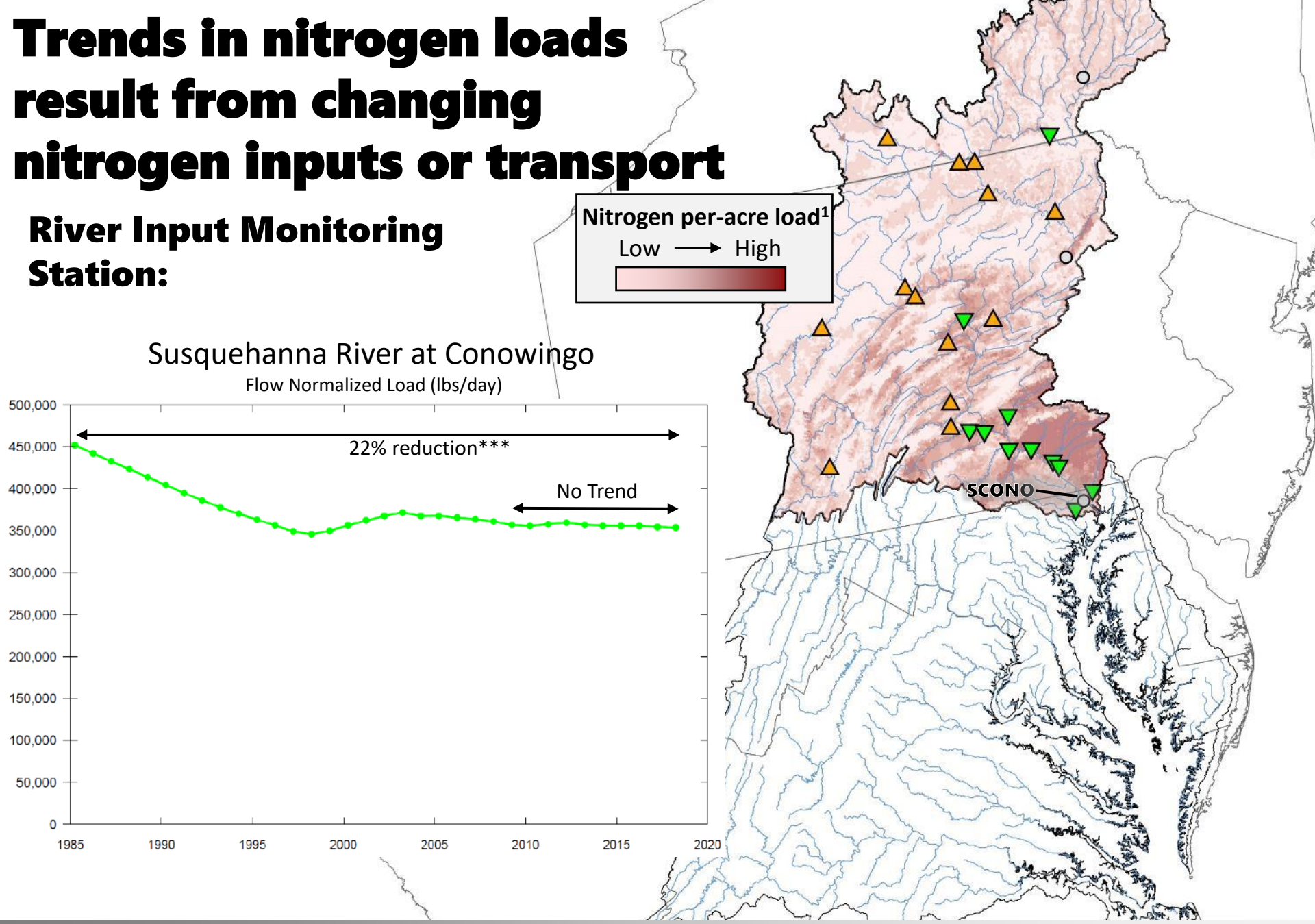
[2]Moyer and Langland, 2020

Trends in nitrogen loads result from changing nitrogen inputs or transport

River Input Monitoring Station:



Susquehanna River at Conowingo

Flow Normalized Load (lbs/day)

[1]Ator and others, 2011

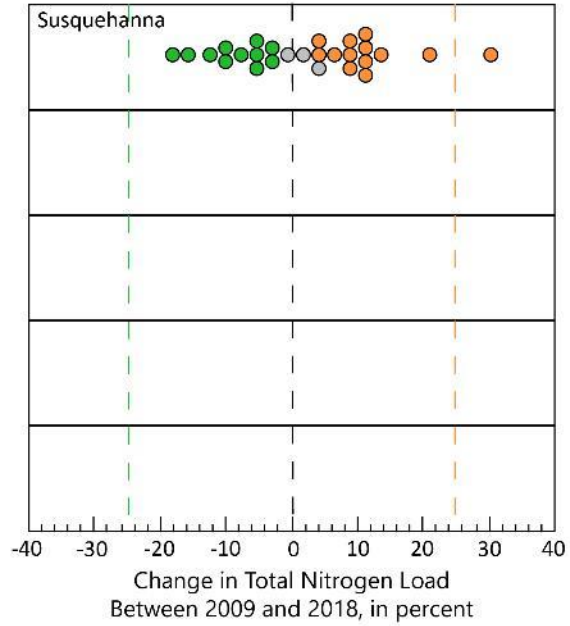
[2]Moyer and Langland, 2020

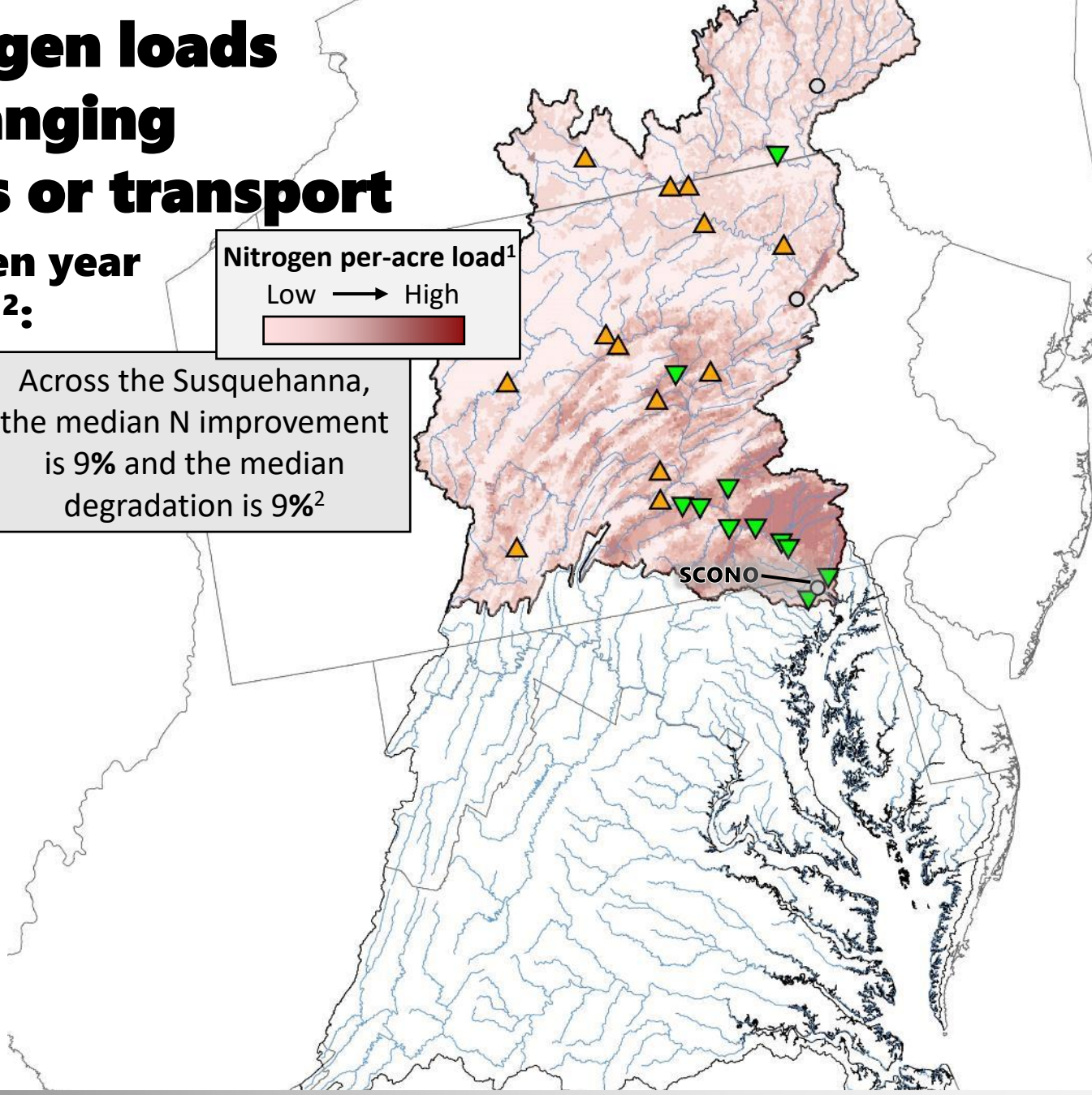
Trends in nitrogen loads result from changing nitrogen inputs or transport

In the most recent ten year period (2009 – 2018)[2]:

Nitrogen loads **(n=27)** have improved at **11**, degraded at **13**, and have no trend at **3** stations[2].

Across the Susquehanna, the median N improvement is **9%** and the median degradation is **9%**[2]





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Trends in phosphorus loads result from changing phosphorus inputs or transport

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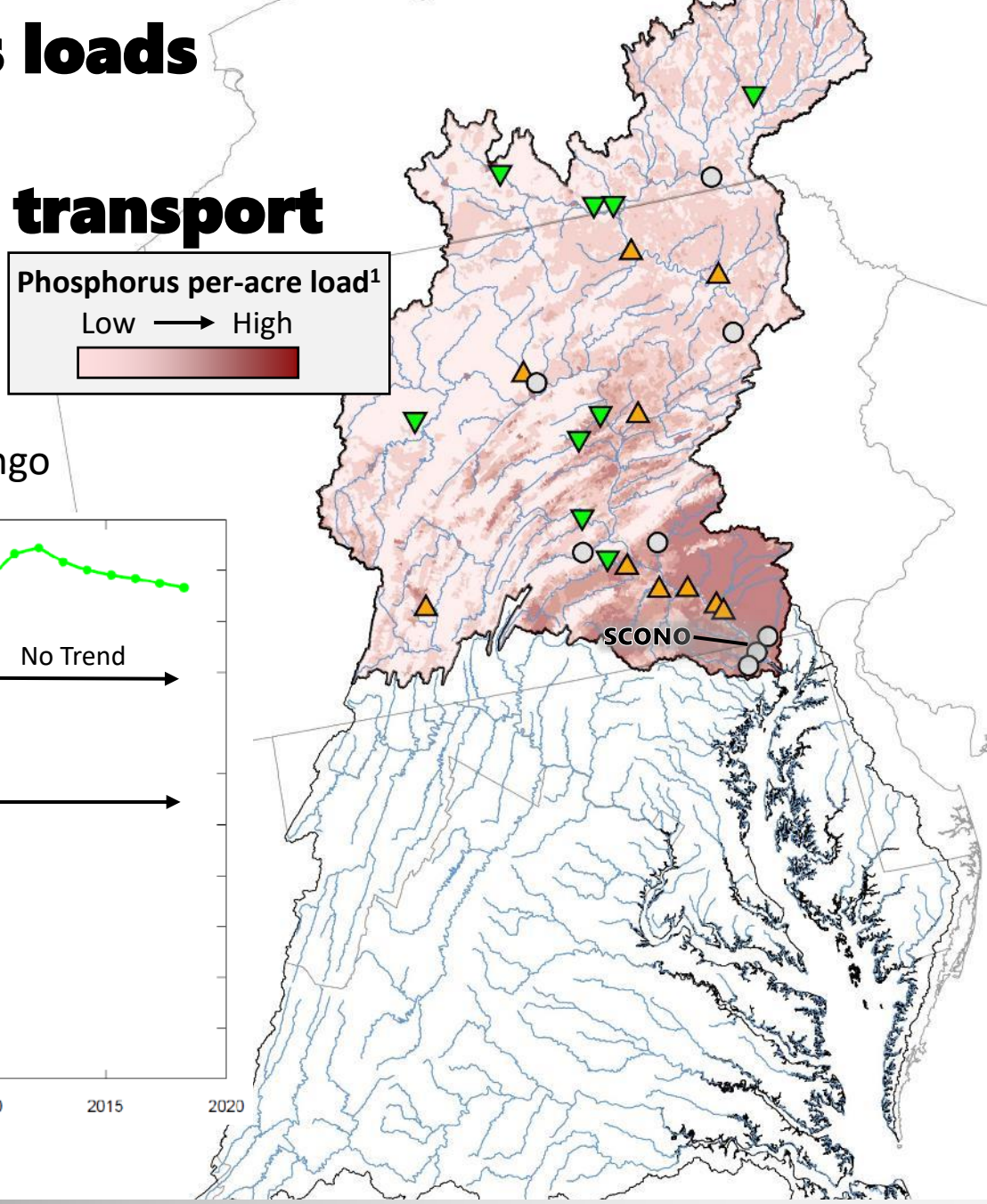
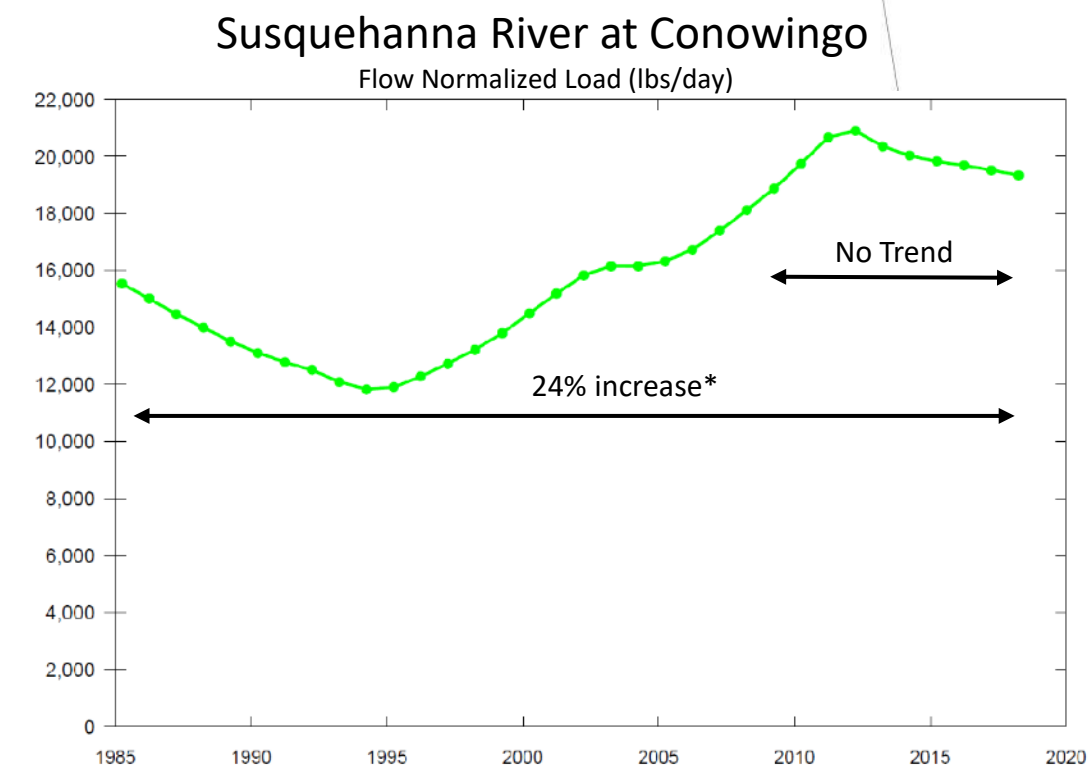




[1]Ator and others, 2011

[2]Moyer and Langland, 2020

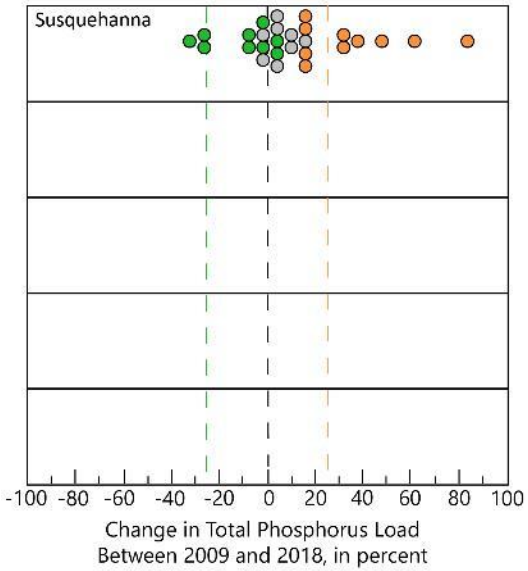
Trends in phosphorus loads result from changing phosphorus inputs or transport

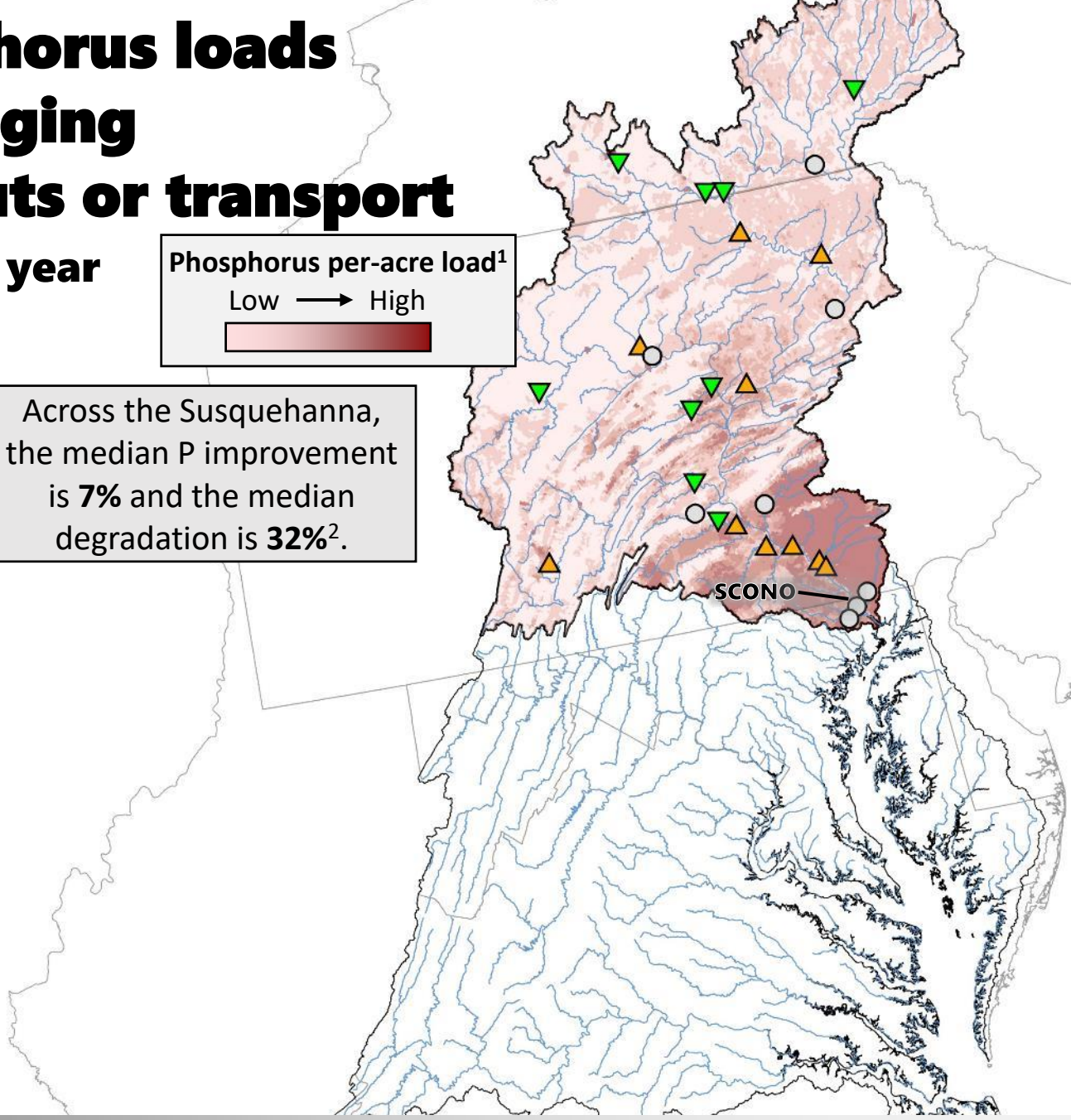
In the most recent ten year period (2009 – 2018)[2]:

Phosphorus per-acre load[1]
Low → High

Phosphorus loads **(n=27)** have improved at **9**, degraded at **10**, and have no trend at **8** stations[2].

Across the Susquehanna, the median P improvement is **7%** and the median degradation is **32%**[2].





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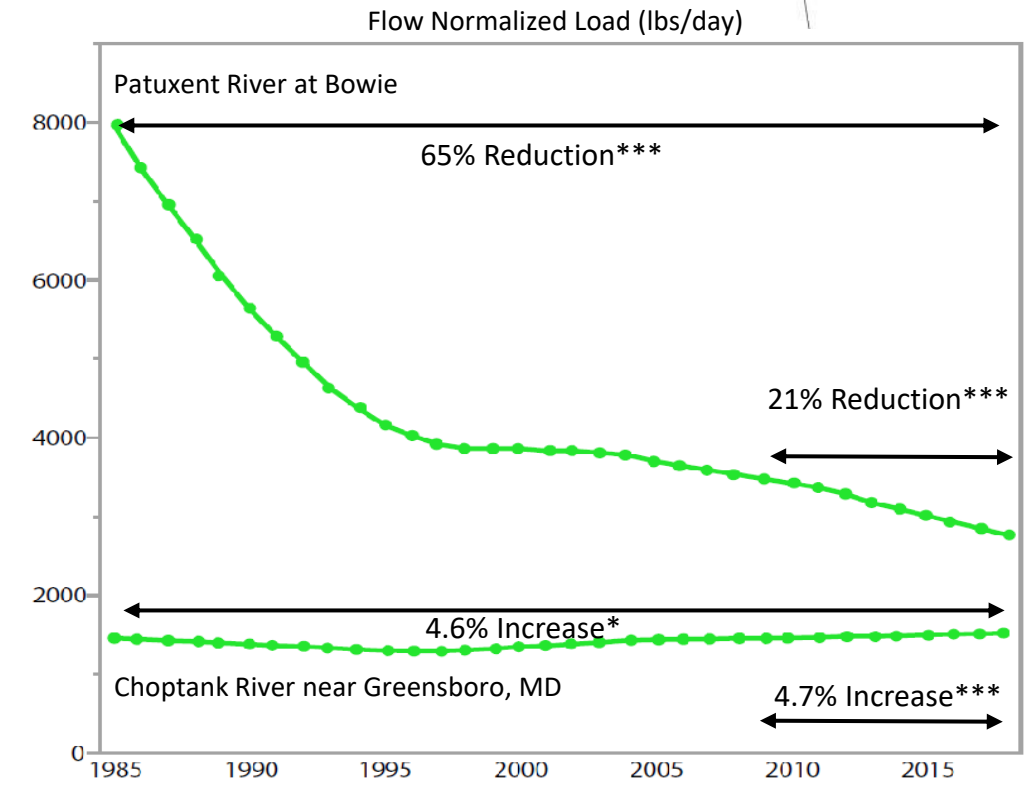
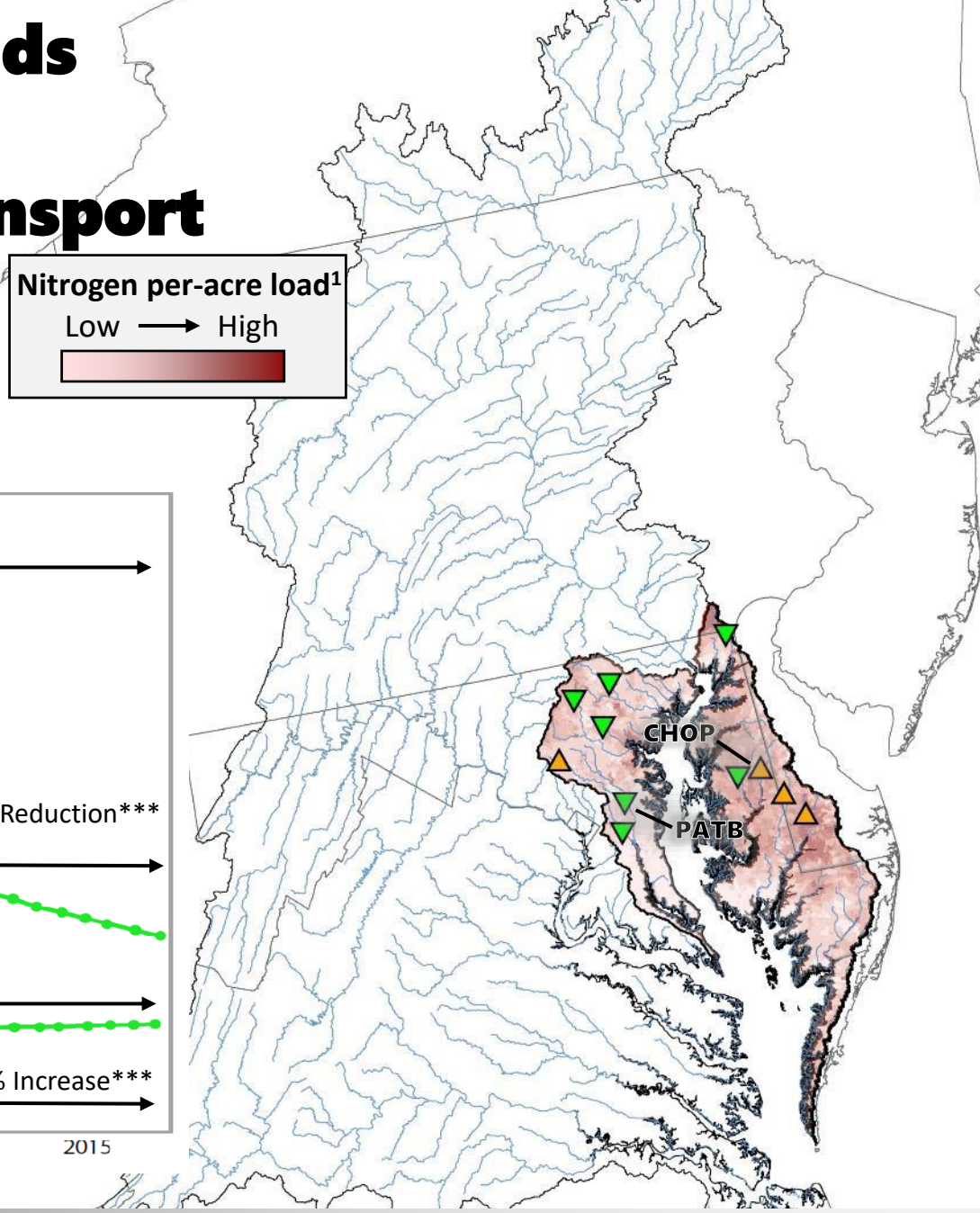
Trends in nitrogen loads result from changing nitrogen inputs or transport

River Input Monitoring Stations:





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[1]Ator and others, 2011

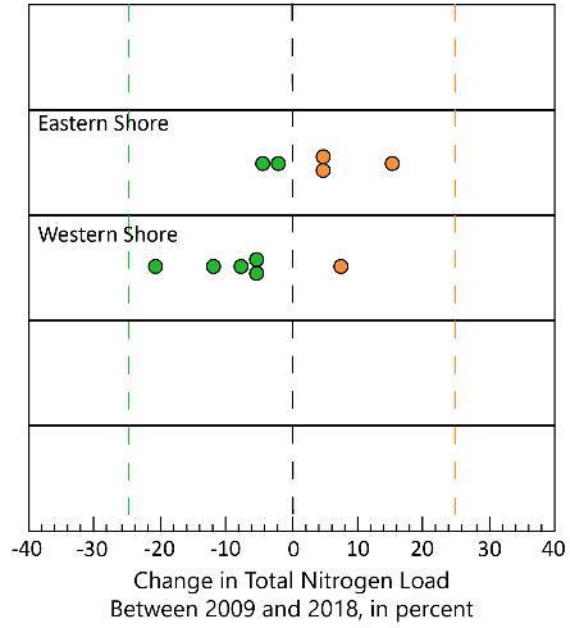
[2]Moyer and Langland, 2020

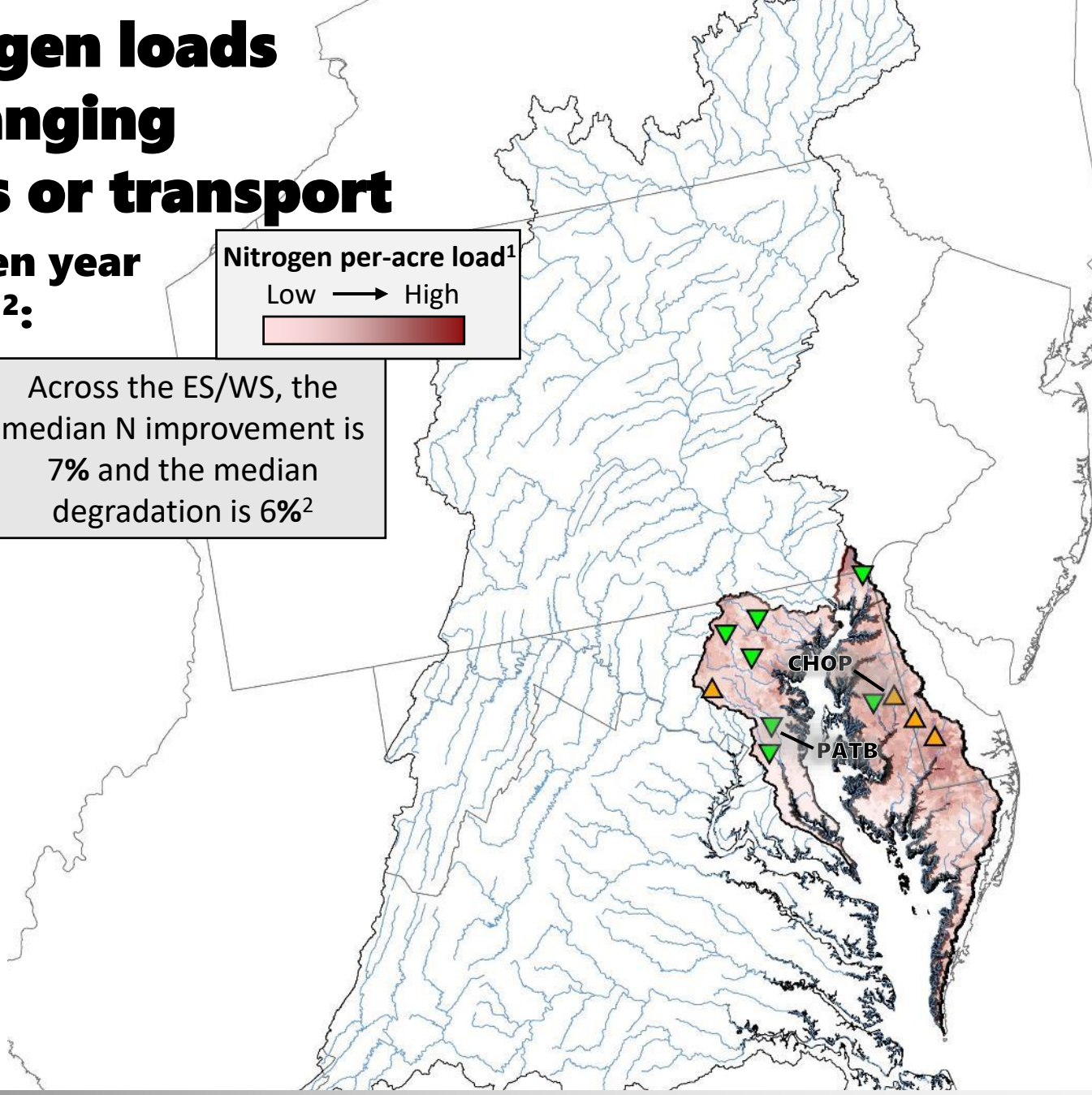
Trends in nitrogen loads result from changing nitrogen inputs or transport

In the most recent ten year period (2009 – 2018)[2]:

Nitrogen loads **(n=11)** have improved at **7 and** degraded at **4** stations[2].

Across the ES/WS, the median N improvement is **7%** and the median degradation is **6%**[2]





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Trends in phosphorus loads result from changing phosphorus inputs or transport

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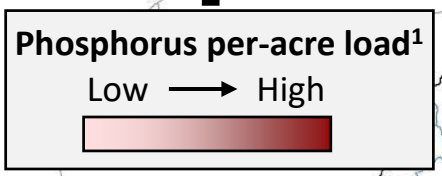
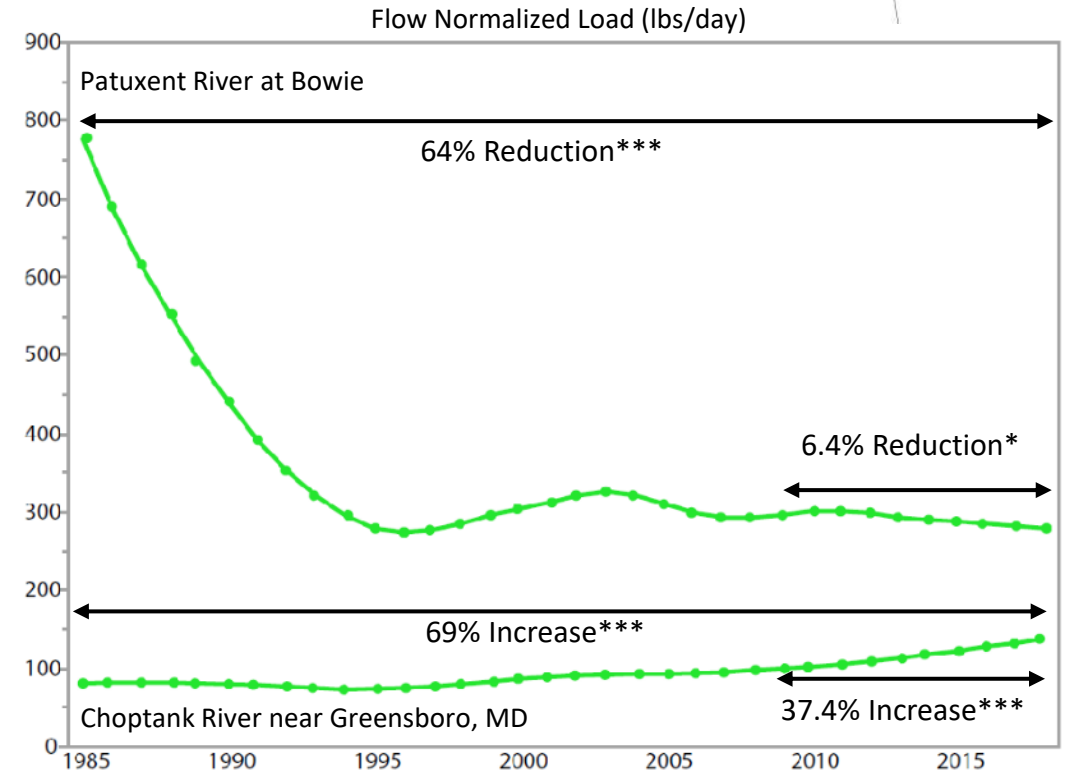
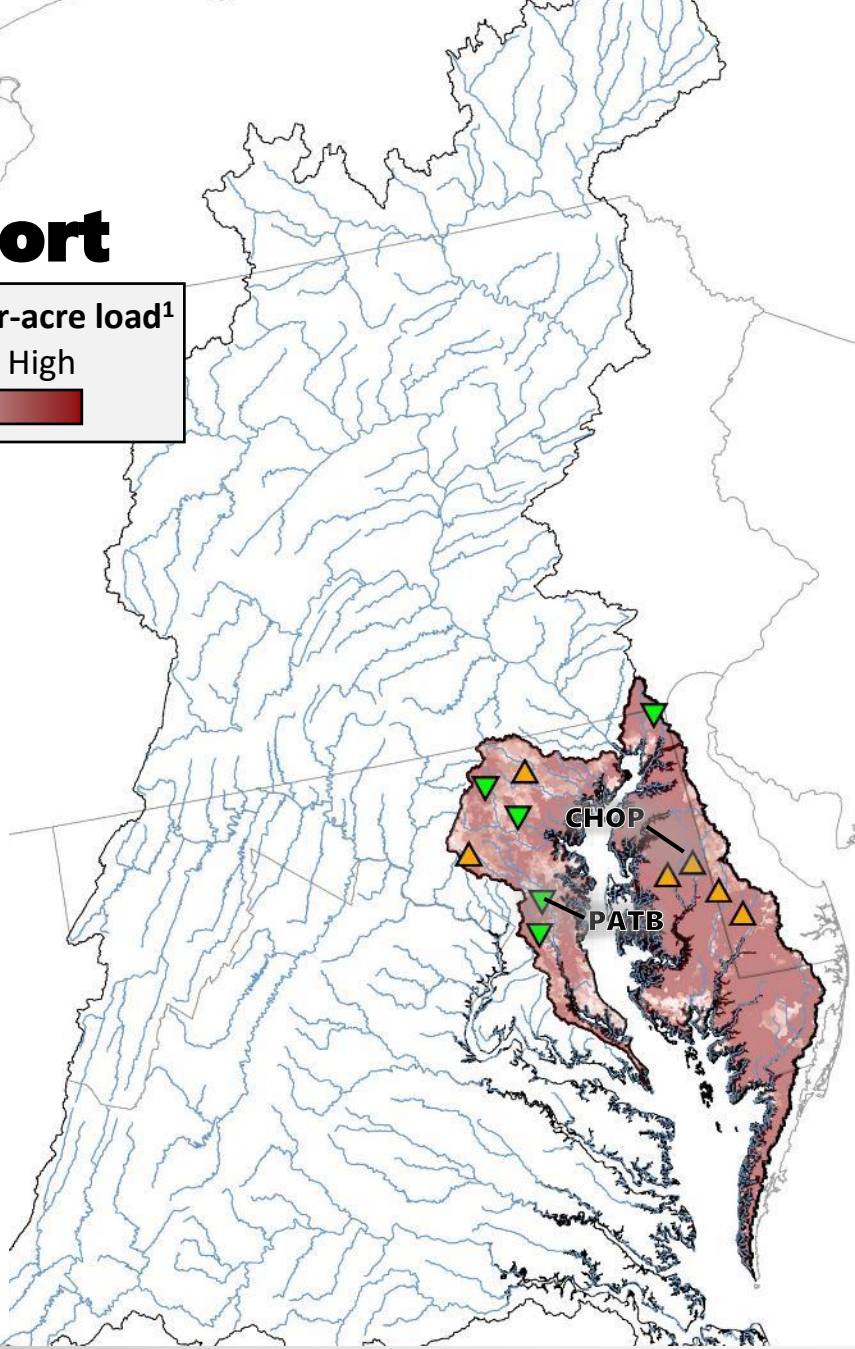






USGS science for a changing world

[1]Ator and others, 2011

[2]Moyer and Langland, 2020

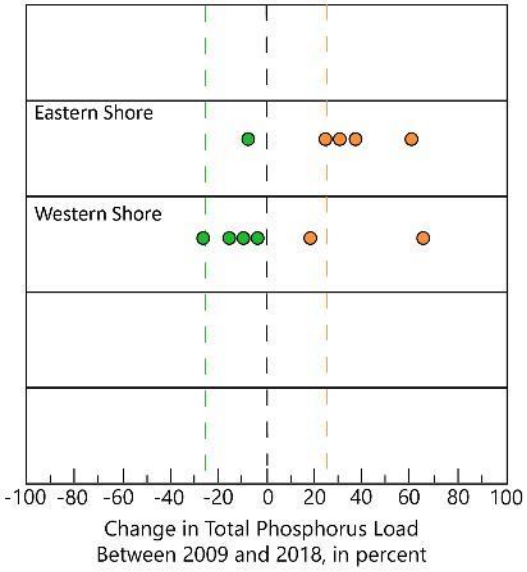
Trends in phosphorus loads result from changing phosphorus inputs or transport

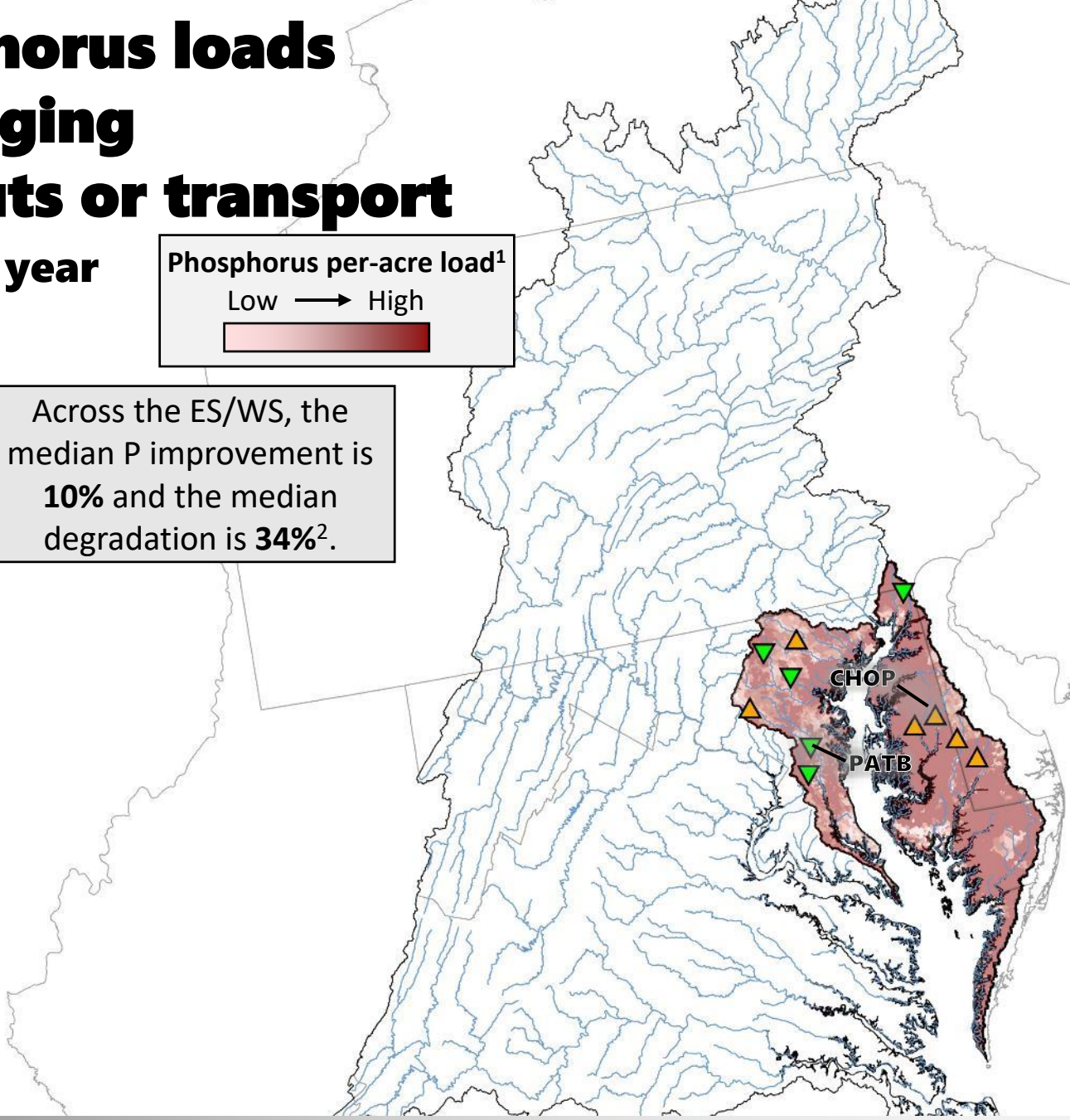
In the most recent ten year period (2009 – 2018)[2]:

Phosphorus per-acre load[1]
Low → High

Phosphorus loads **(n=11)** have improved at **5** and have degraded at **6** stations[2].

Across the ES/WS, the median P improvement is **10%** and the median degradation is **34%**[2].





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Trends in nitrogen loads result from changing nitrogen inputs or transport

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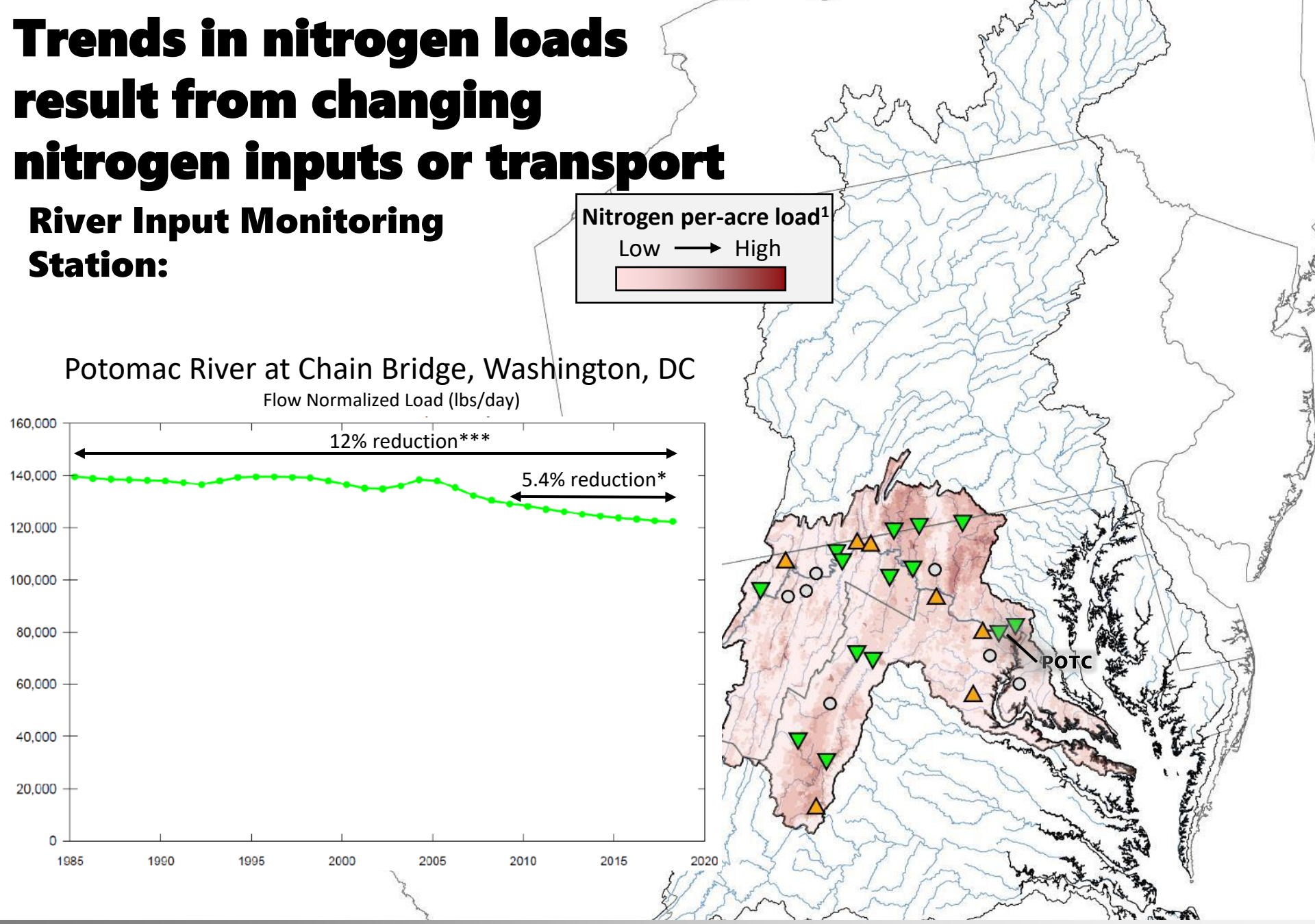

Potomac River at Chain Bridge, Washington, DC

Flow Normalized Load (lbs/day)

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[1]Ator and others, 2011

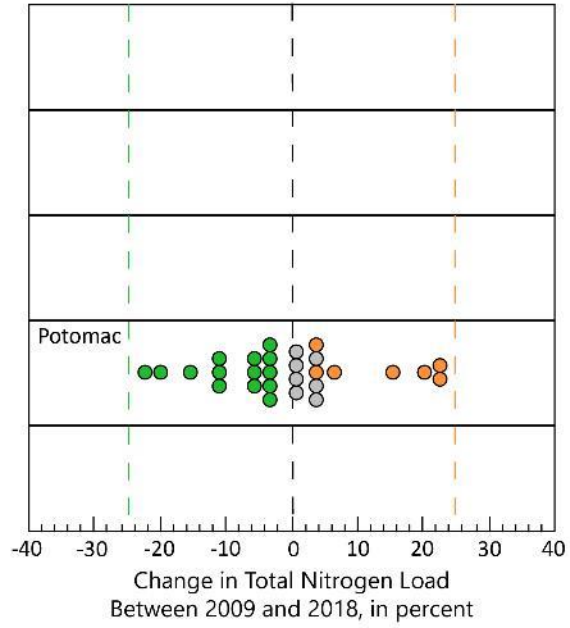
[2]Moyer and Langland, 2020

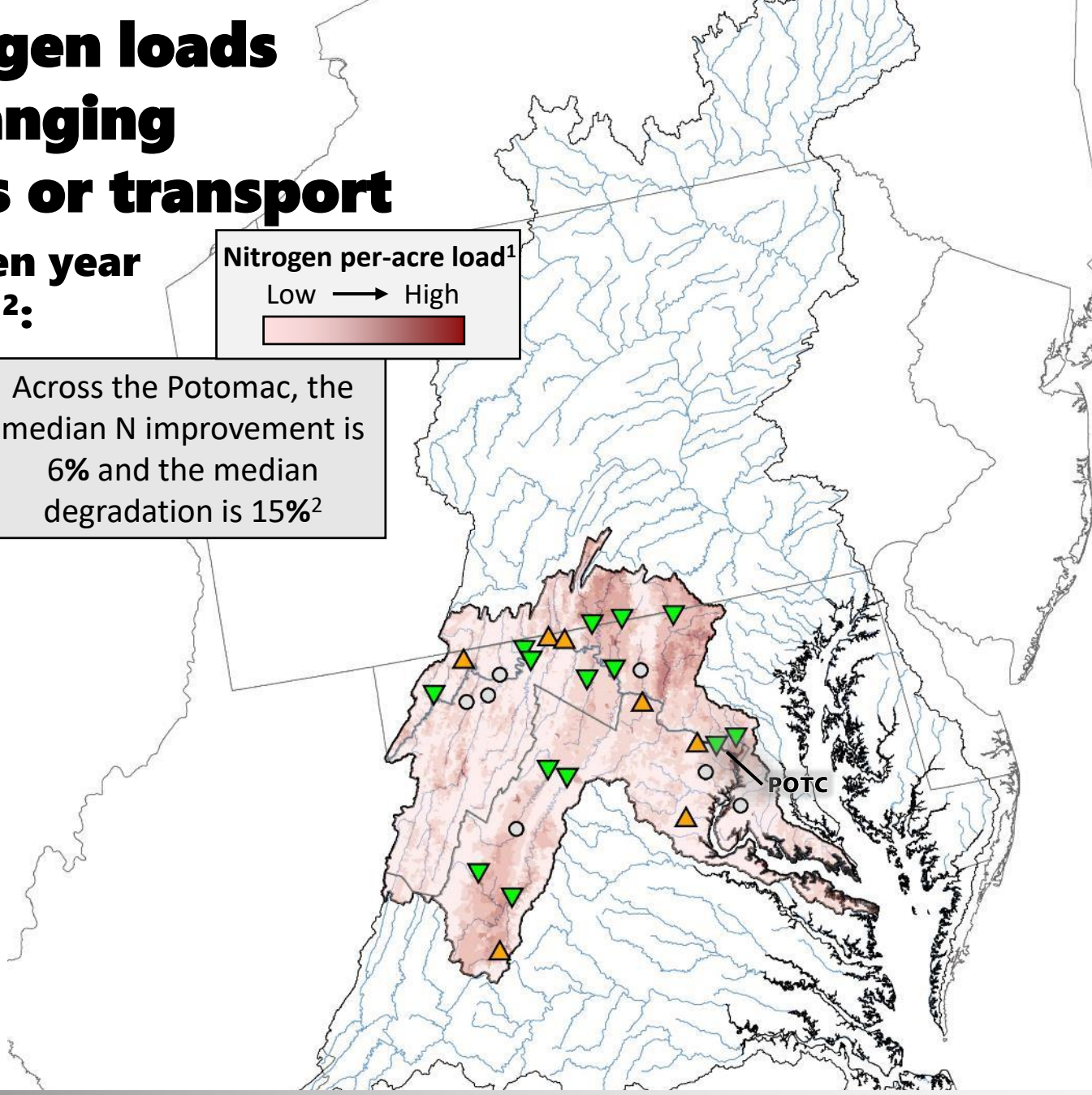
Trends in nitrogen loads result from changing nitrogen inputs or transport

In the most recent ten year period (2009 – 2018)[2]:

Nitrogen loads **(n=28)** have improved at **14,** degraded at **7**, and have no trend at **7** stations[2].

Across the Potomac, the median N improvement is 6**%** and the median degradation is 15**%**[2]





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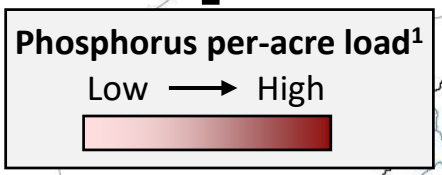
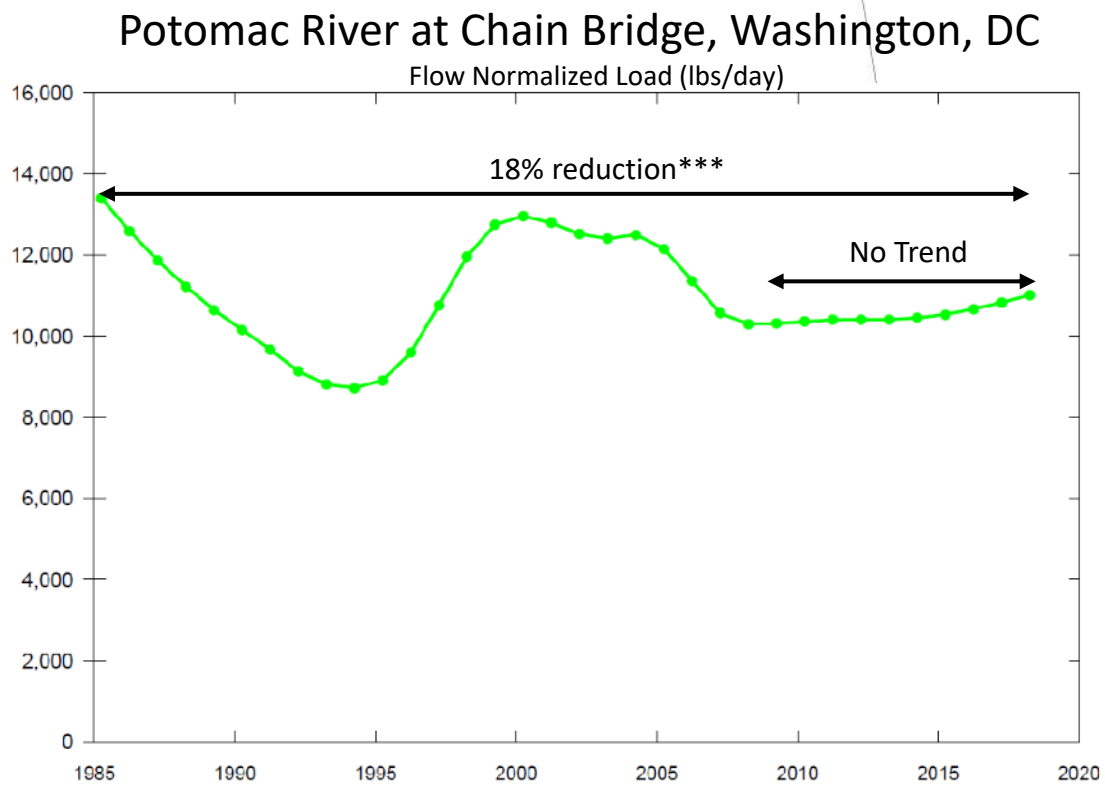
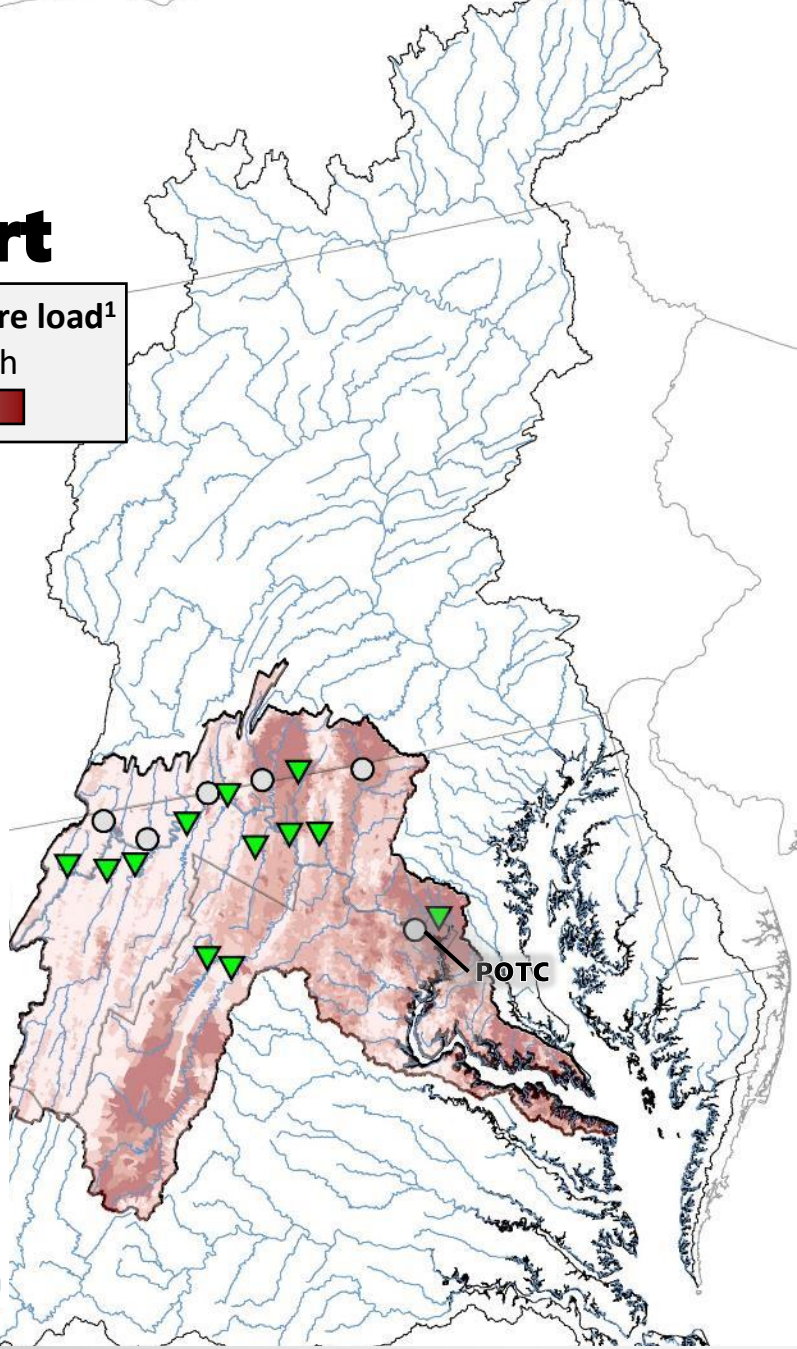
Trends in phosphorus loads result from changing phosphorus inputs or transport

River Input Monitoring Station:







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[1]Ator and others, 2011

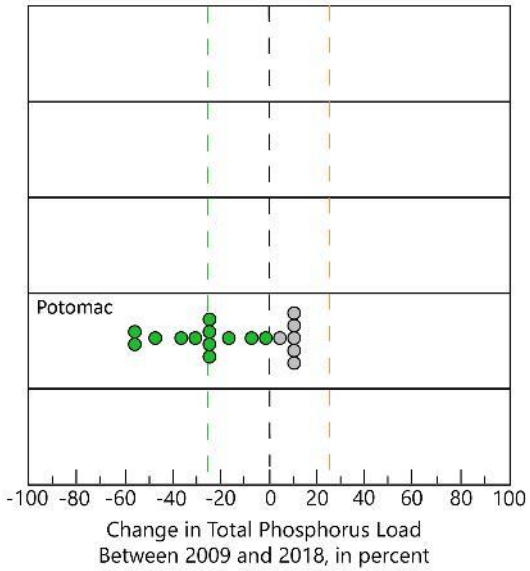
[2]Moyer and Langland, 2020

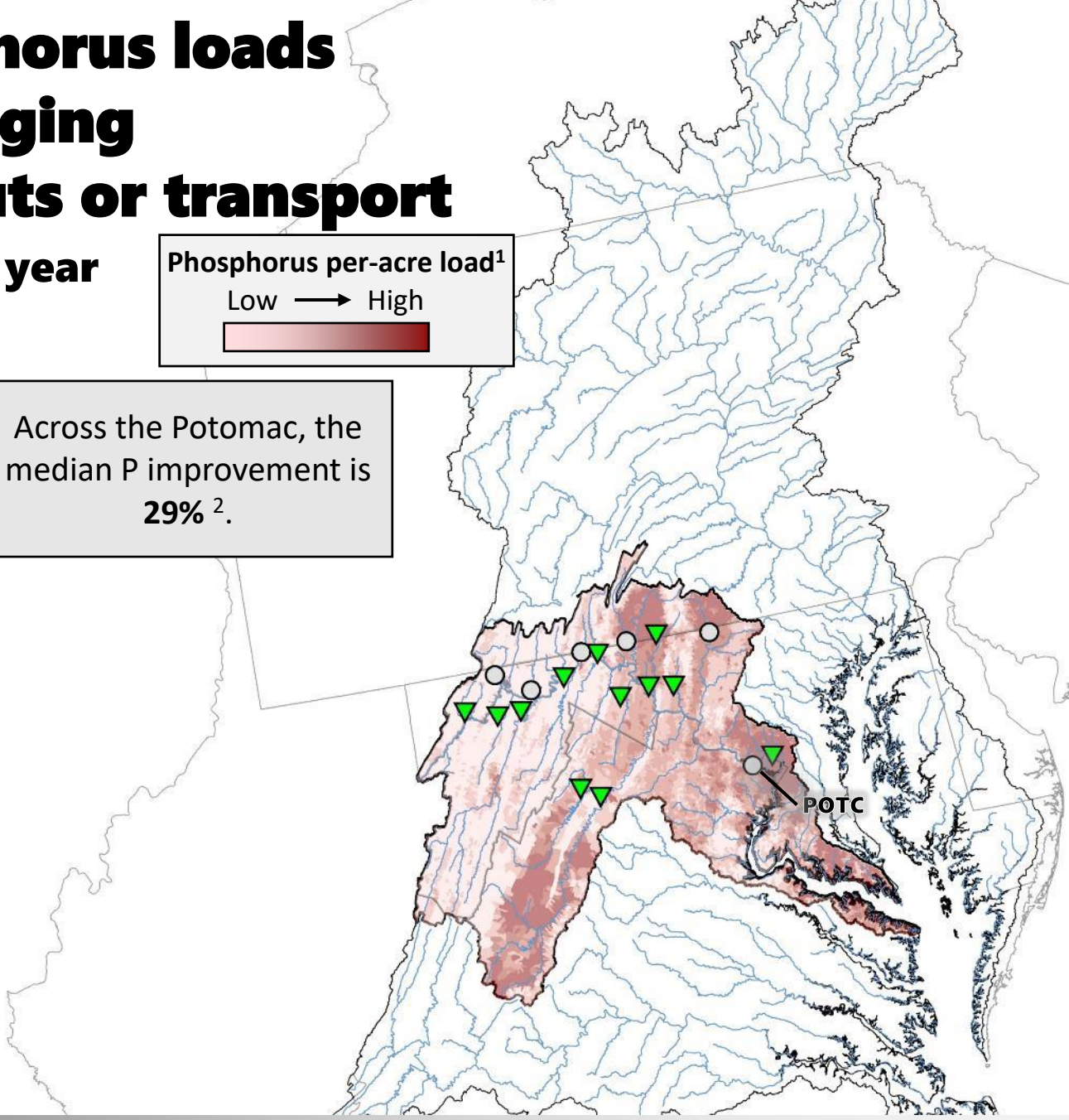
Trends in phosphorus loads result from changing phosphorus inputs or transport

In the most recent ten year period (2009 – 2018)[2]:

Phosphorus loads **(n=18)** have improved at **12** and have no trend at **6** stations[2].

Across the Potomac, the median P improvement is **29%** [2].





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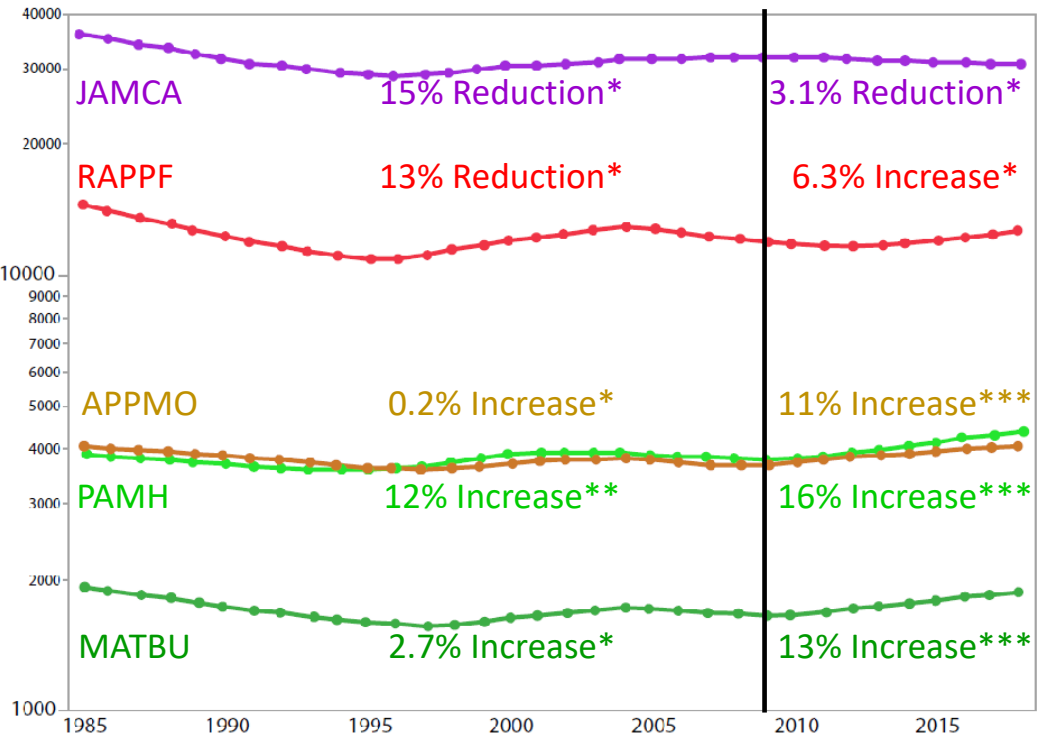
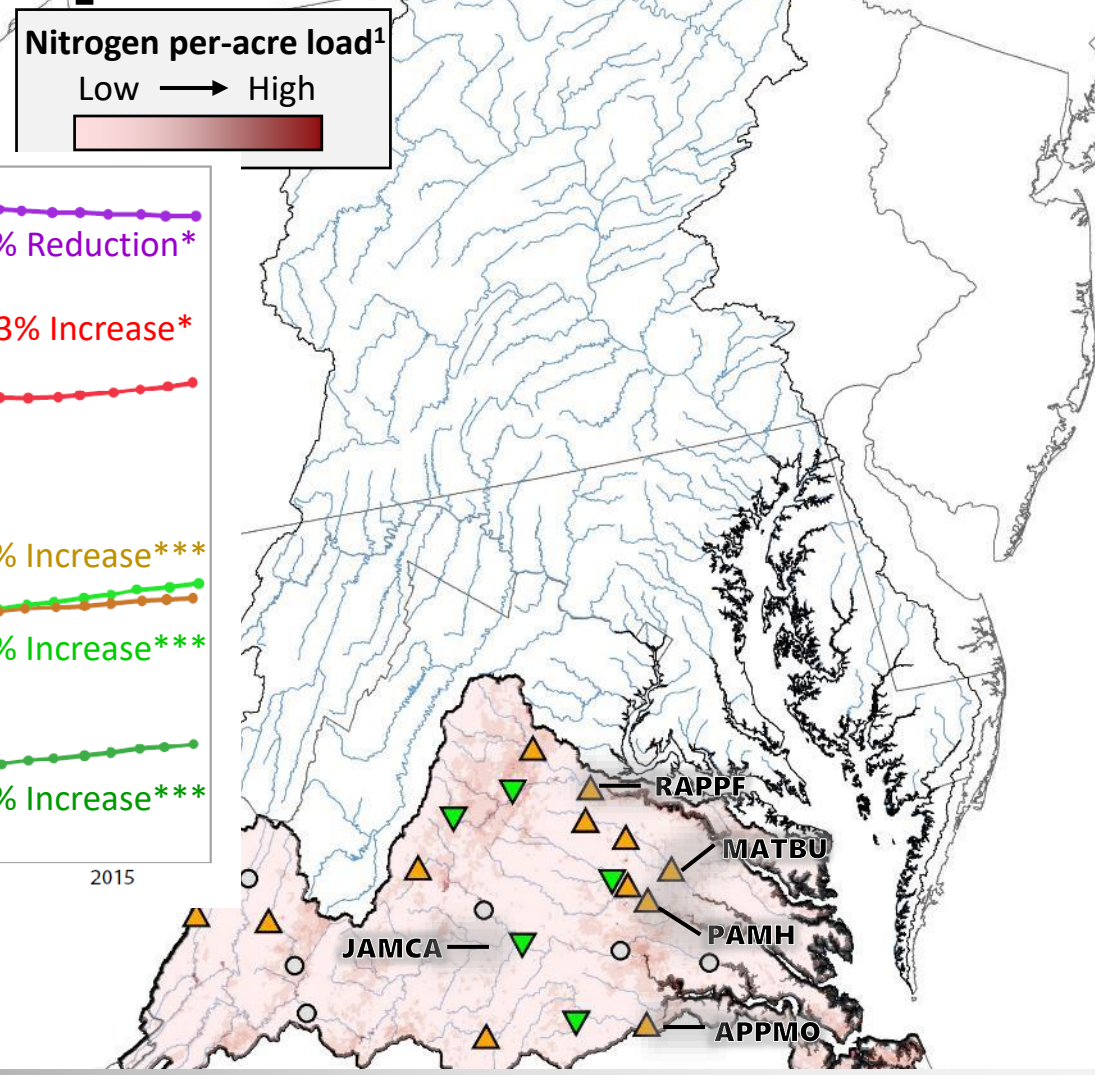
Trends in nitrogen loads result from changing nitrogen inputs or transport

River Input Monitoring Stations:





[1]Ator and others, 2011

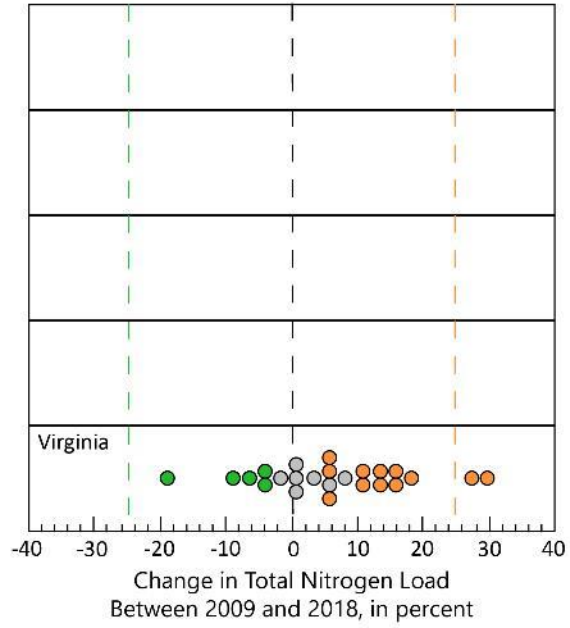
[2]Moyer and Langland, 2020

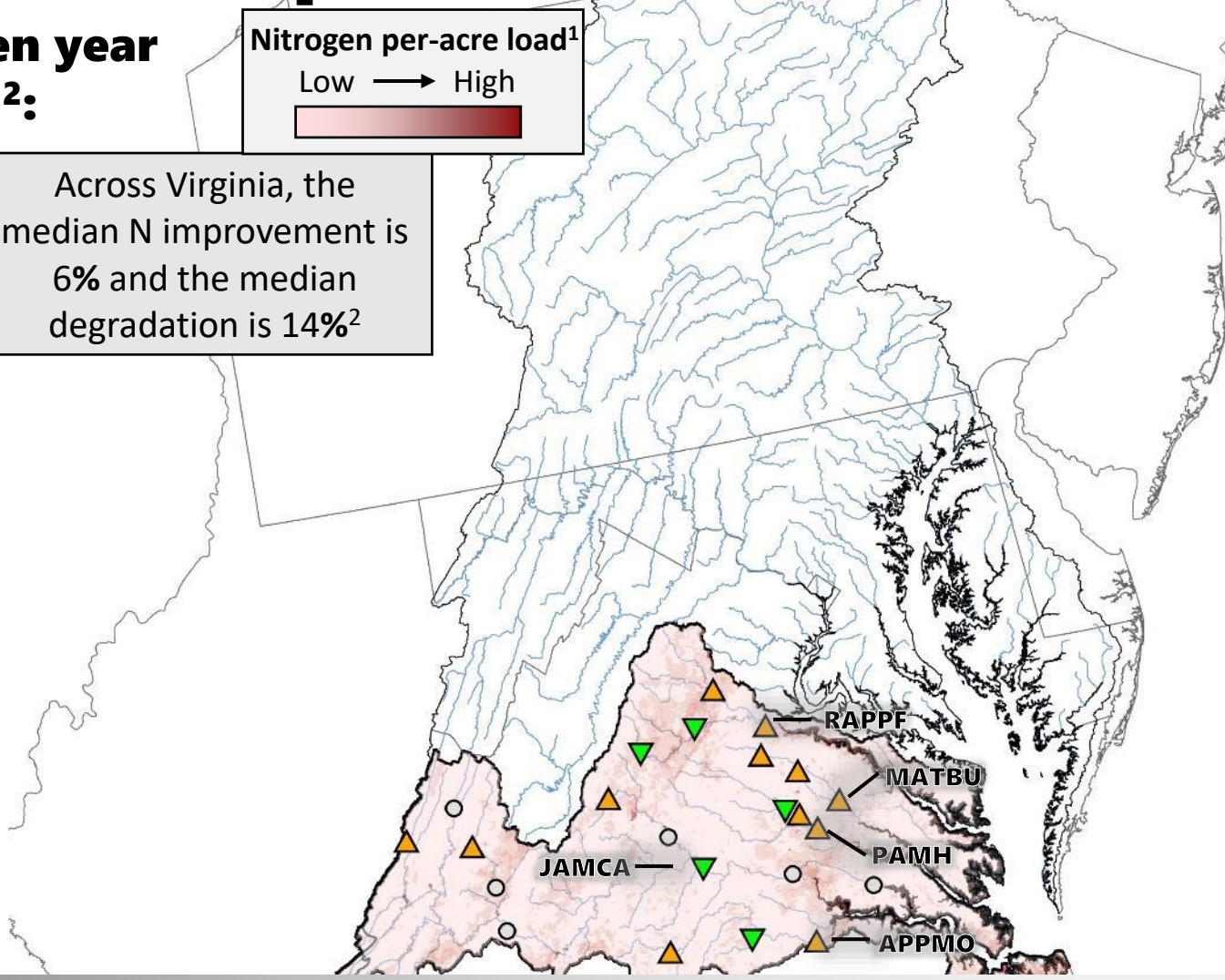
Trends in nitrogen loads result from changing nitrogen inputs or transport

In the most recent ten year period (2009 – 2018)[2]:

Nitrogen loads **(n=24)** have improved at **5**, degraded at **12**, and have no trend at **7** stations[2].

Across Virginia, the median N improvement is 6**%** and the median degradation is 14**%**[2]





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[1]Ator and others, 2011

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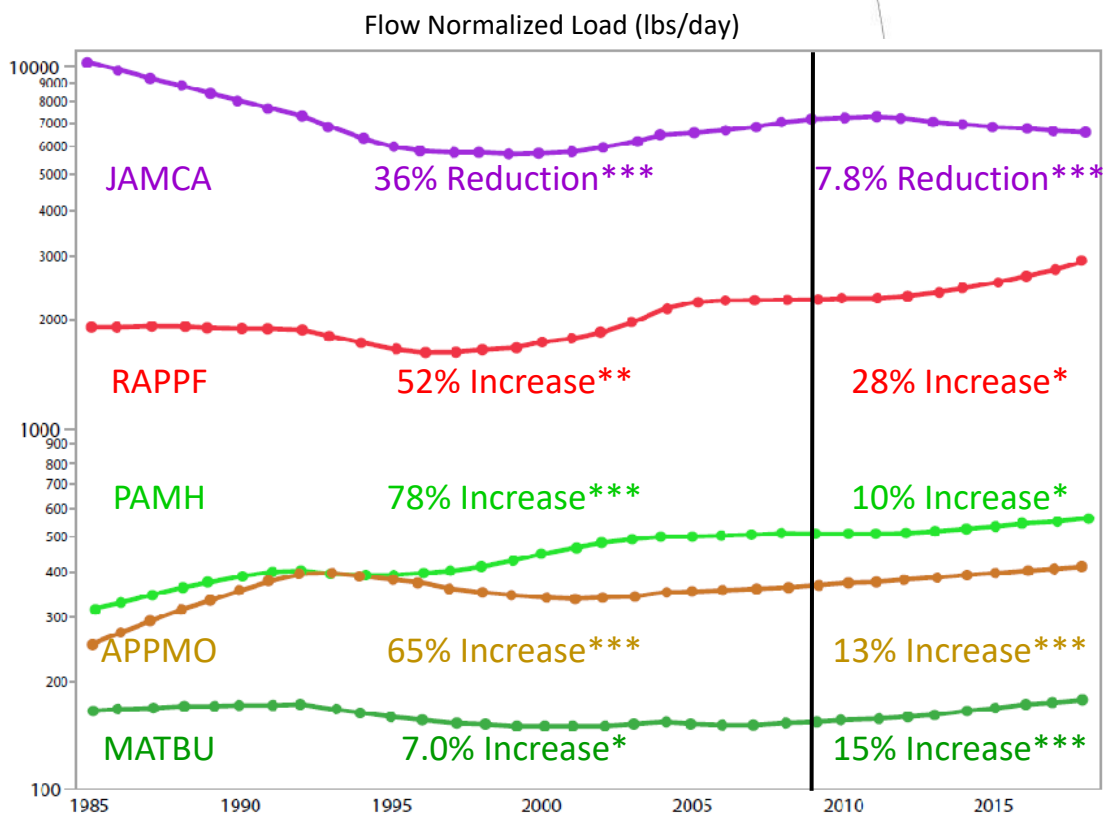
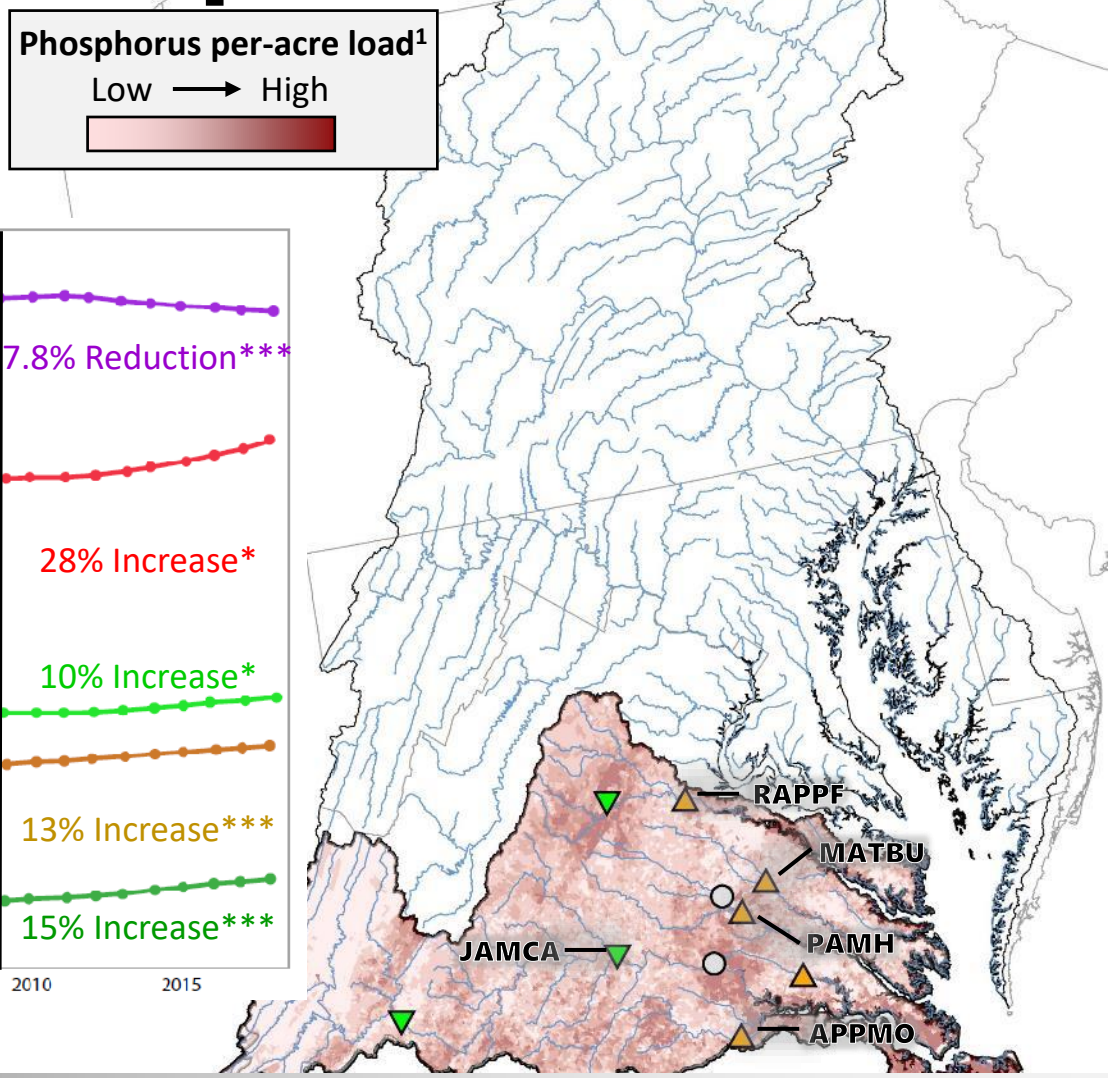
Trends in phosphorus loads result from changing phosphorus inputs or transport

River Input Monitoring Stations:





[1]Ator and others, 2011

[2]Moyer and Langland, 2020

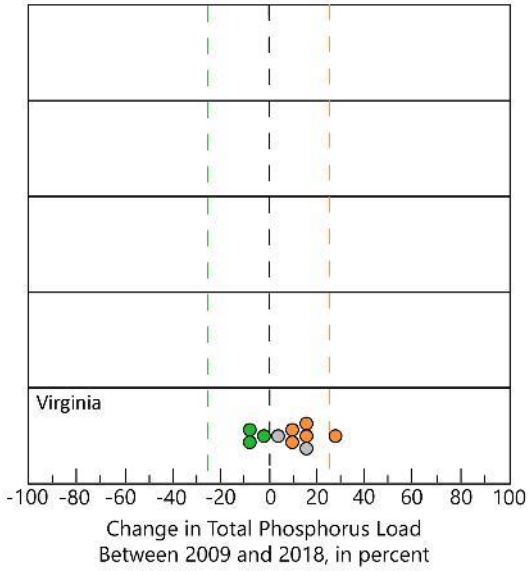
Trends in phosphorus loads result from changing phosphorus inputs or transport

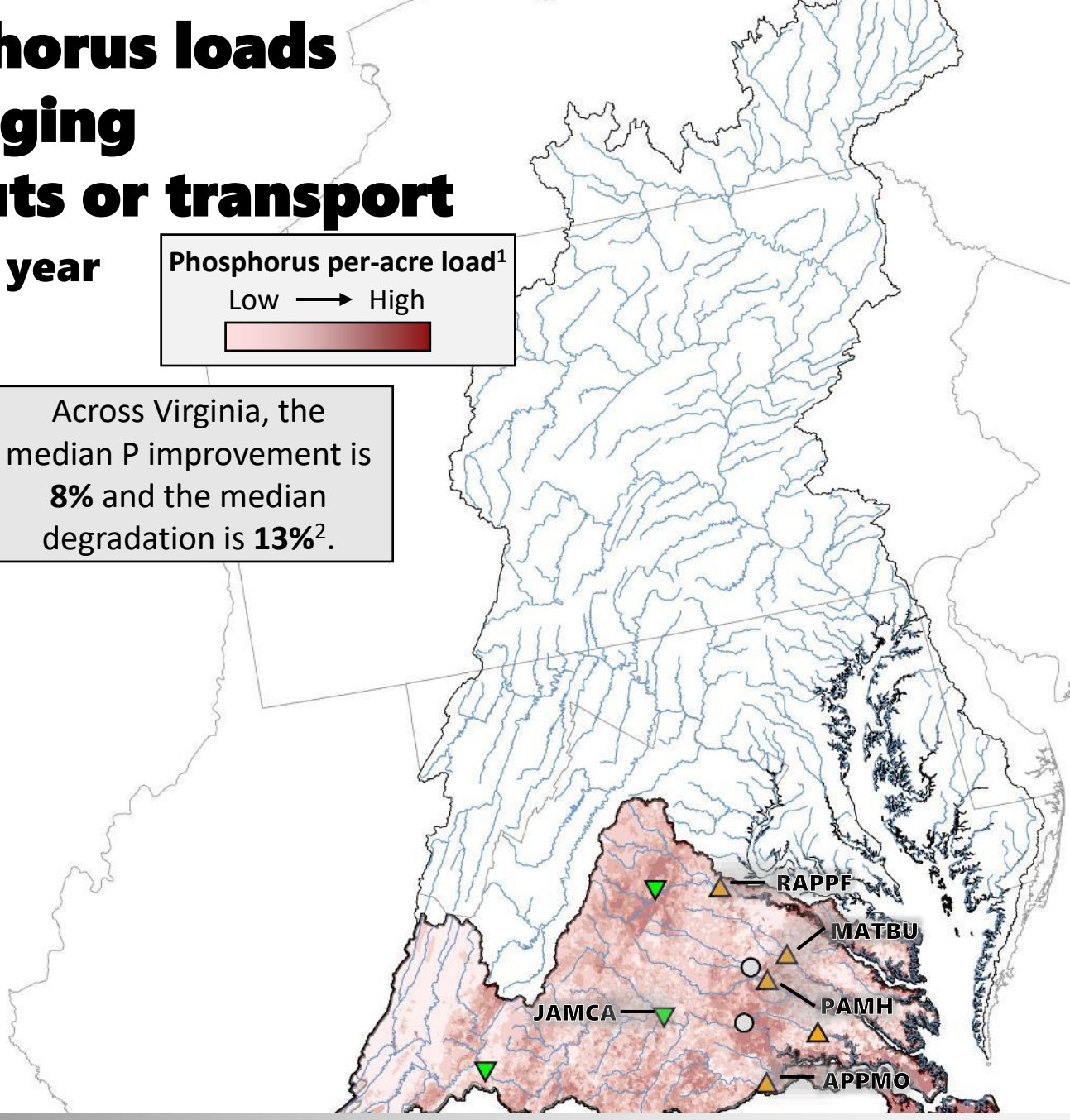
In the most recent ten year period (2009 – 2018)[2]:

Phosphorus per-acre load[1]
Low → High

Phosphorus loads **(n=10)** have improved at **3**, degraded at **5**, and have no trend at **2** stations[2].

Across Virginia, the median P improvement is **8%** and the median degradation is **13%**[2].

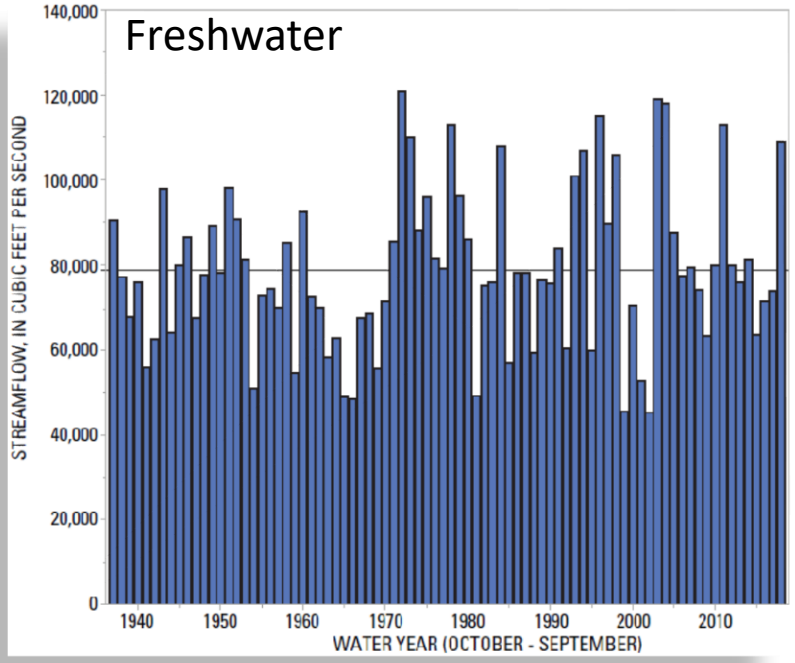


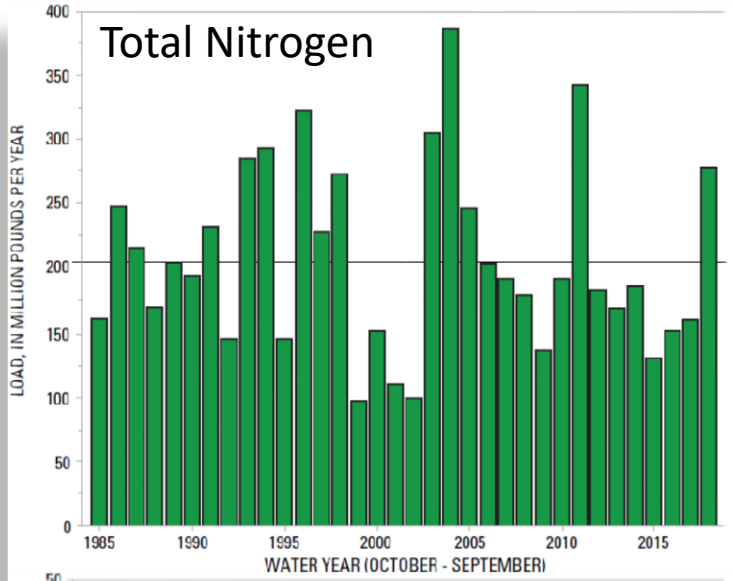


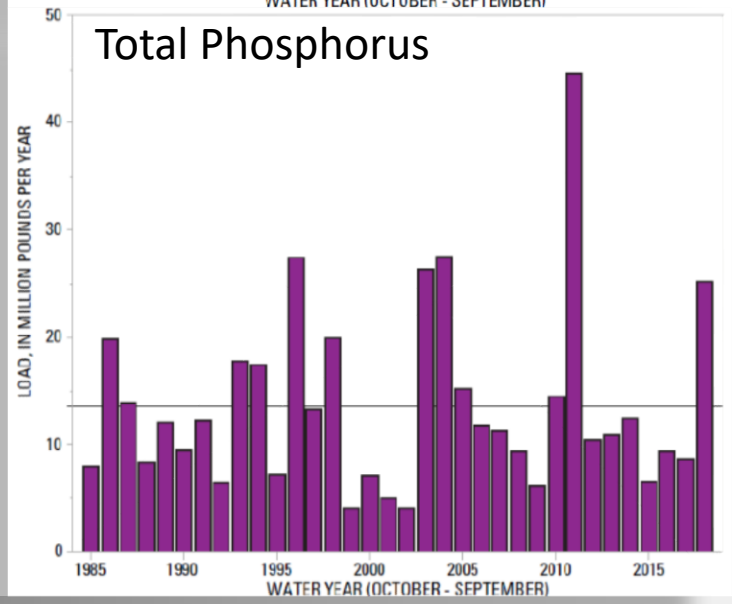
[1]Ator and others, 2011

[2]Moyer and Langland, 2020

2018 delivery of freshwater flow and total nitrogen and phosphorus loads







2018 Stats

- 5th largest freshwater flow to the bay since 1985 (8th since 1937).
- TN load for 2018 was the 7th largest since 1985.
- TP load for 2018 was the 5th largest since 1985.

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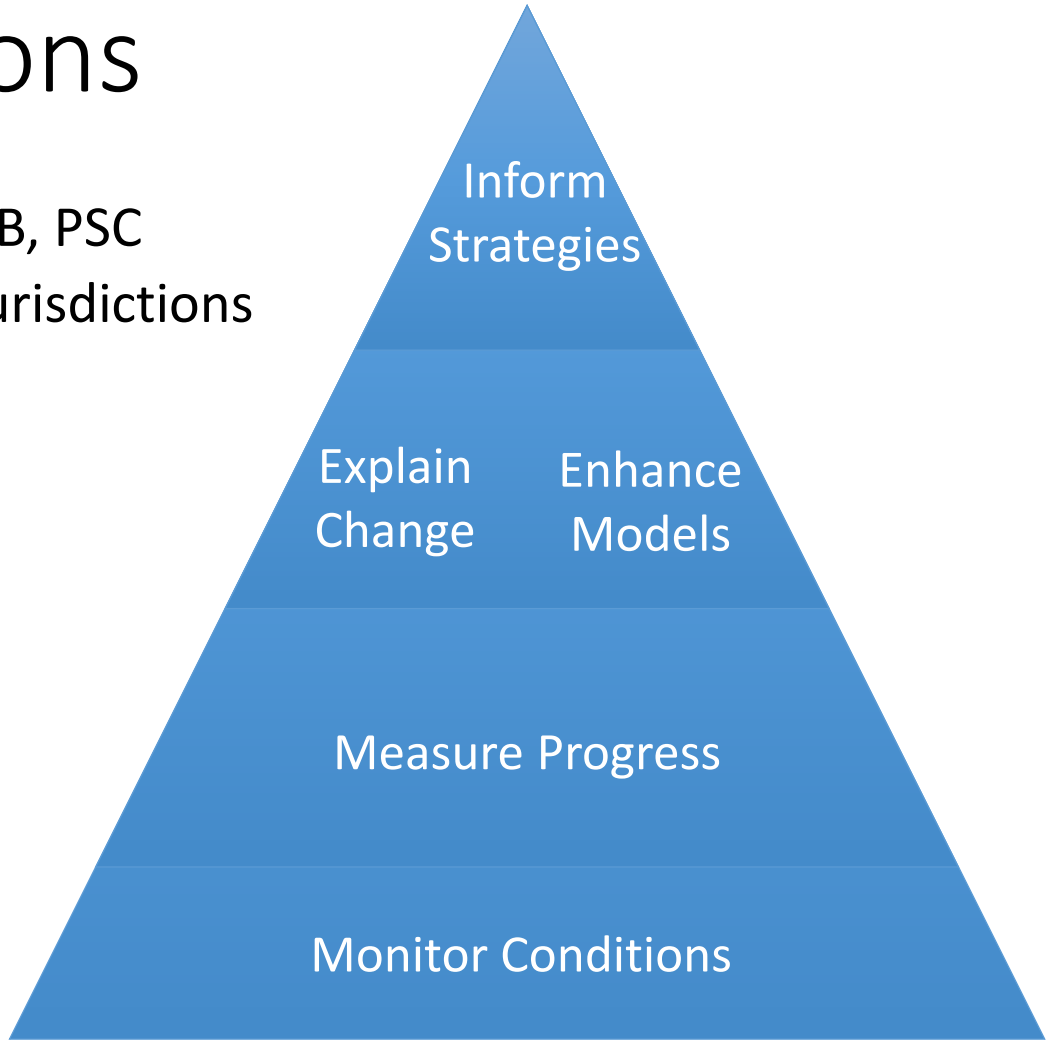
[2]Moyer and Langland, 2020

Communicating results and informing decisions

- Results to WQ GIT & WGs, MB, PSC
- Meetings/interactions with jurisdictions
- Inform 2-year milestones

- Fact Sheets
- Press Releases
- Web summaries
- Story Maps
- Tributary summaries
- Data Dashboard
- Technical reports and articles



Chesapeake Bay Program
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University of Maryland
Center for Environmental Science

More information

- USGS Chesapeake Bay Website: https://www.usgs.gov/centers/cba
  - Science summaries
    - Nutrient and sediment trends
    - Explaining water-quality changes
  - Nontidal Trends Webpage **https://cbrim.er.usgs.gov/index.html**

- Chesapeake Progress: Clean Water https://www.chesapeakeprogress.com/

- CBP Watershed Data Dashboard

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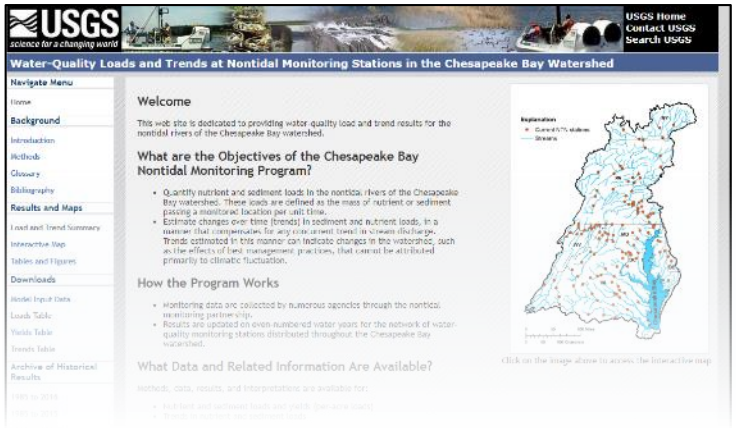
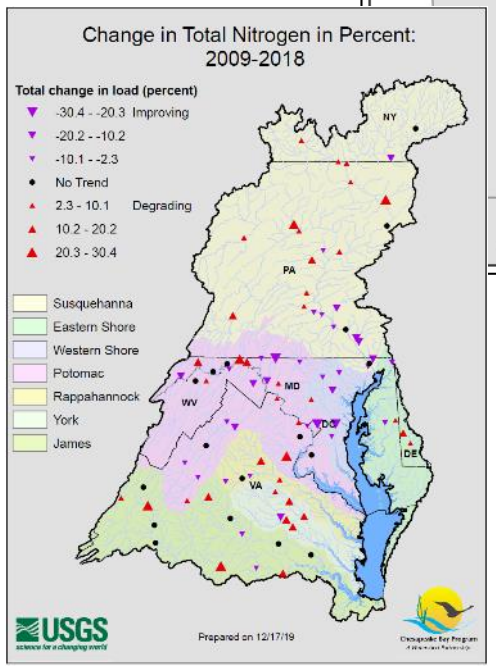
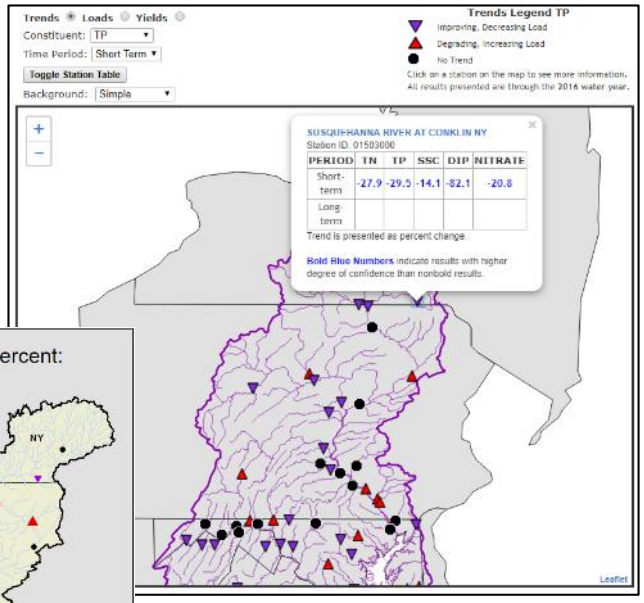
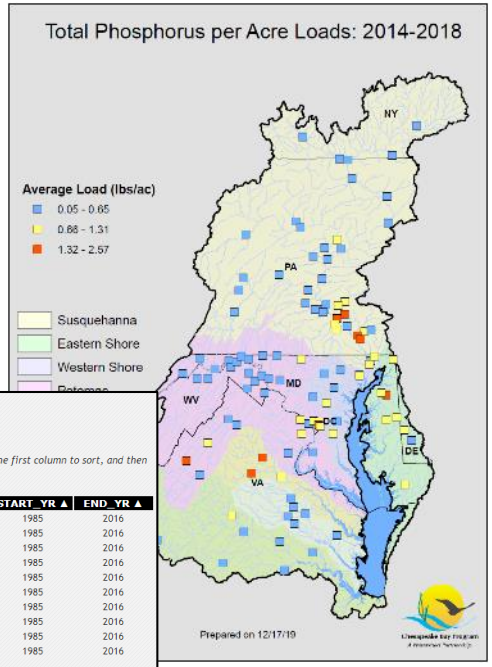
The nontidal monitoring webpage has been updated with 2018 results

https://cbrim.er.usgs.gov/index.html

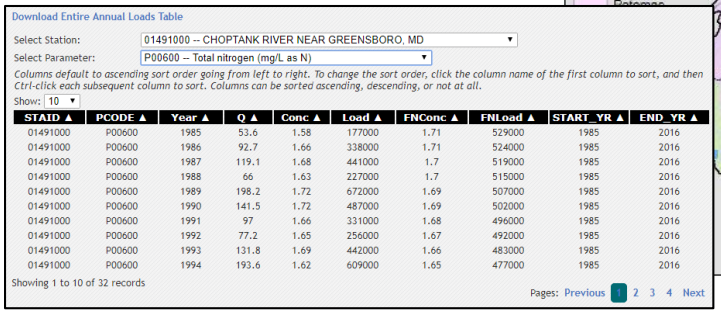








The website contains load and trend results for Total Nitrogen, Nitrate, Total Phosphorus, Orthophosphorus, and Suspended Sediment at individual monitoring stations in graphical or tabular formats.



The Chesapeake Bay Watershed Data Dashboard (Rivers & Streams) page is being updated.