Hampton-Seabrook Estuary Tributary Monitoring Program - *Preliminary Water Quality Data*

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Hampton-Seabrook Estuary Collaborative Meeting

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NEW HAMPSHIRE WATER RESOURCES RESEARCH CENTER

University of New Hampshire

NEW HAMPSHIRE Water Quality Analysis Lab

PREP™ Piscataqua Region Estuaries Partnership

Hampton-Seabrook Estuary Monitoring Program

- PREP supported a pilot Tidal Tributary Monitoring Program (TTMP) for Hampton-Seabrook Estuary (HSE) starting in 2024
- **Goal:** Determine water quality of freshwater tributaries to HSE (e.g. PREP State of Our Estuaries)
- Quality Assurance Project Plan (QAPP)

  https://scholars.unh.edu/prep/474
- Funding 2023-2027: Infrastructure Investment Jobs Act (IIJA; formally BIL)
- Funding for ≥2028 not guaranteed

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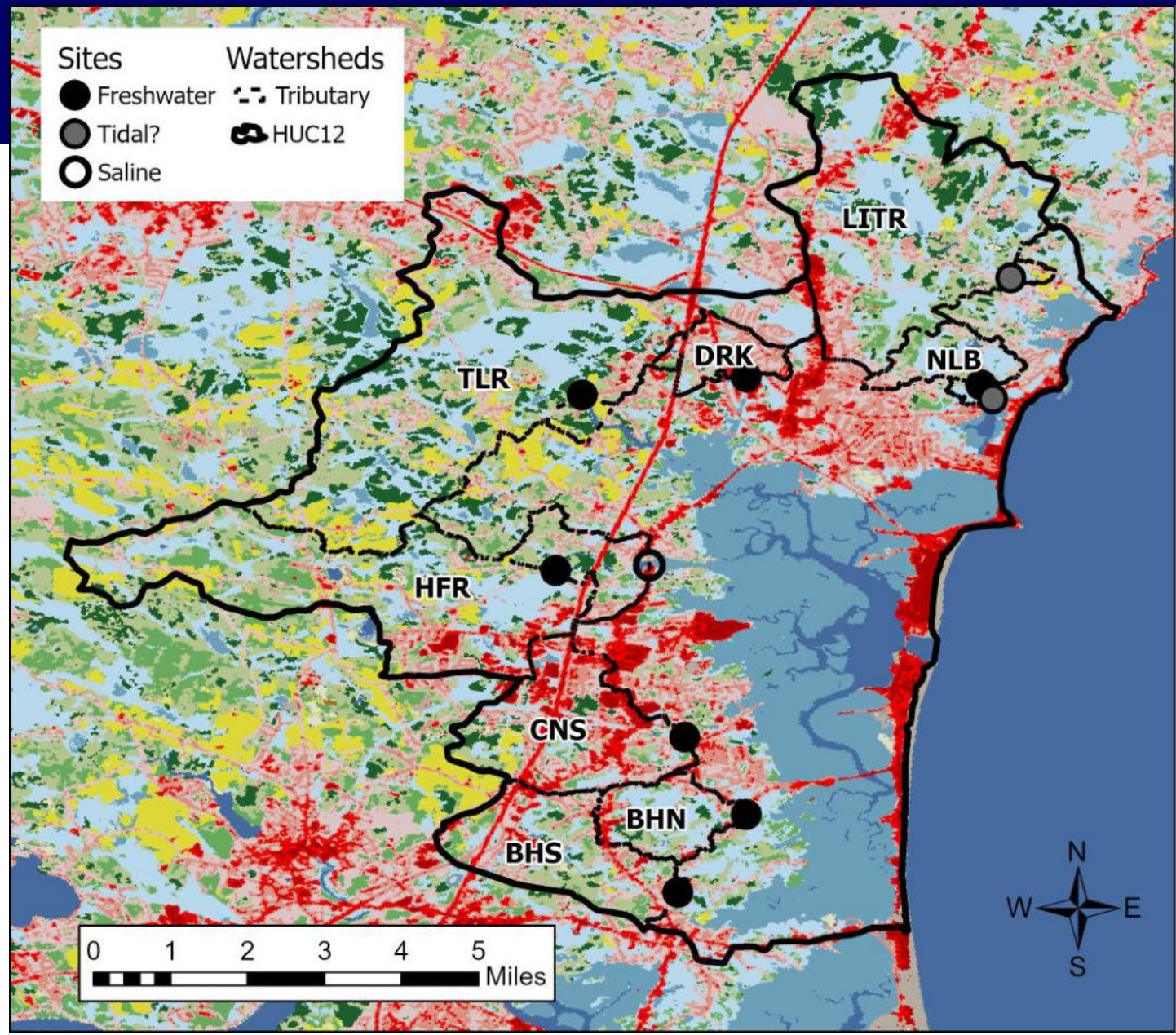


Tributary Watersheds

8 Tributaries (north to south)

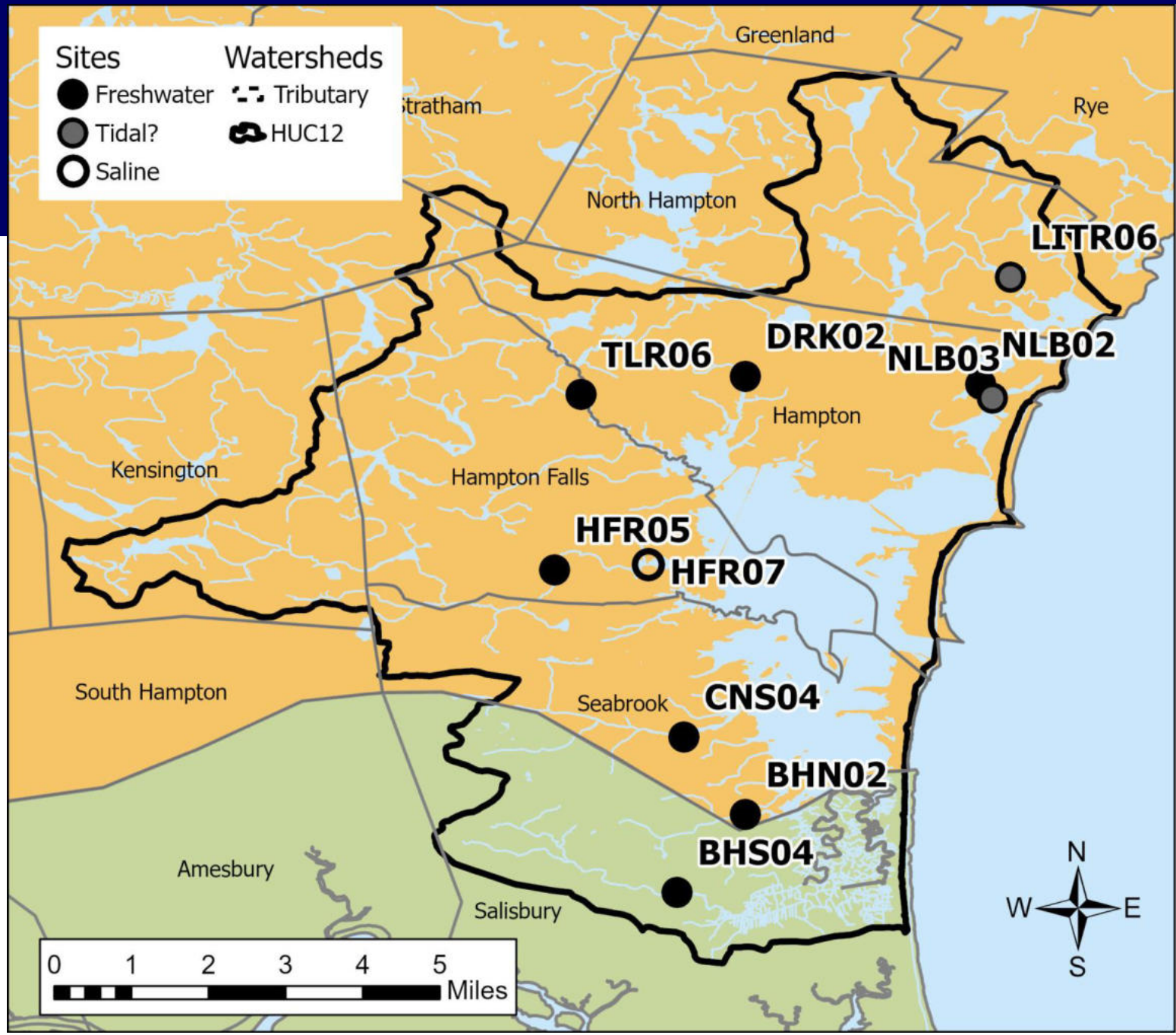
- LITR – Little River (drains directly to coast)
- NLB - Nilus Brook
- DRK - Drakes River
- TLR - Taylor River
- HFR - Hampton Falls River
- CNS - Cains Brook
- BHN – Blackwater Headwaters North
- BHS – Blackwater Headwaters South

2025 NLCD Land Cover



Tributary Sites and Political Boundaries

- Site selection:
  - Major tributary
  - Road crossing or public access
  - Safe sampling location
  - Upstream of saline influence
- Sites named with tributary acronym followed by km from headwaters
- Two sites established upstream to avoid saline conditions



Monthly samples analyzed by the Water Quality Analysis Laboratory at UNH for:

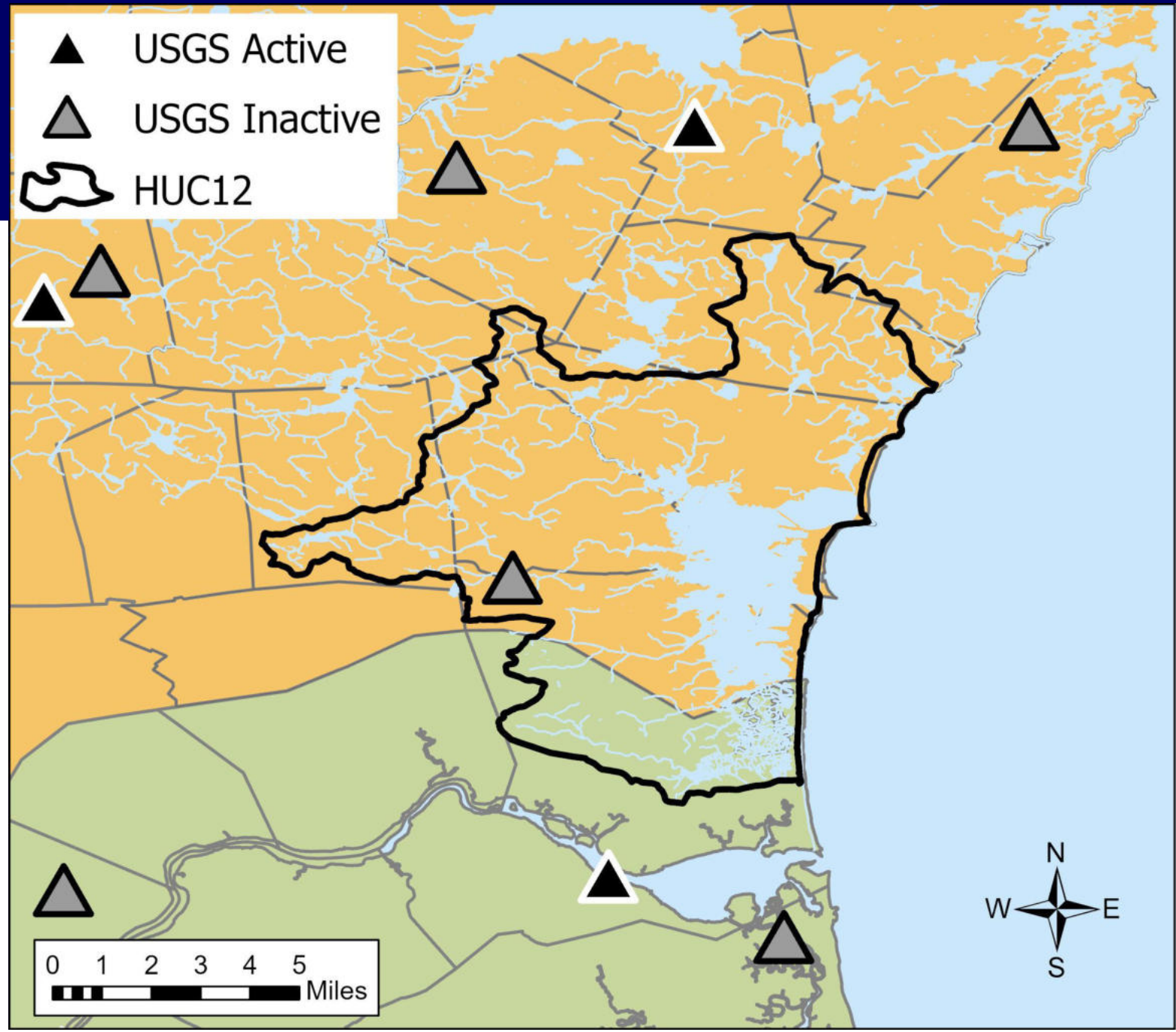
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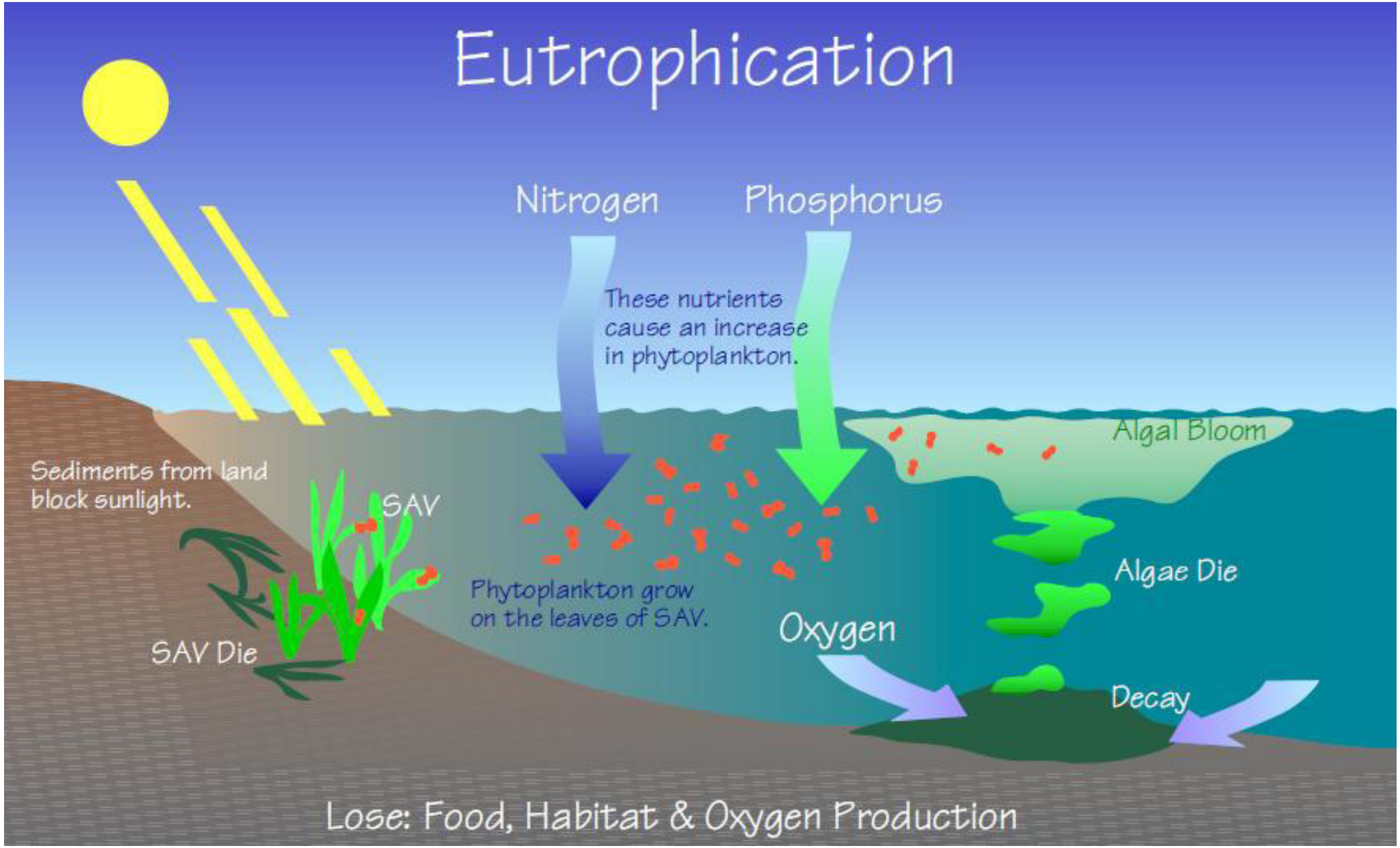
- Nitrogen (TN, TDN, NO_3^-, NH_4^+)
- Phosphorus (TP, PO_4^{3-})
- Dissolved organic matter (DOC, DON)
- Suspended solids (TSS)
- Field parameters (pH, DO, temperature, conductivity, turbidity)
- Additional analyses in 2025
  - TDP and Silica (SiO_2)
  - Cl^-, SO_4^{2-}, Na^+, K^+, Mg^{2+}, Ca^{2+}



Estimated Runoff for HSE Sites

- Runoff = area normalized discharge; *not just stormwater runoff*
- No active USGS station in HSE watershed
- Used USGS station on Winnicut River in Greenland, NH (similar size and land cover)



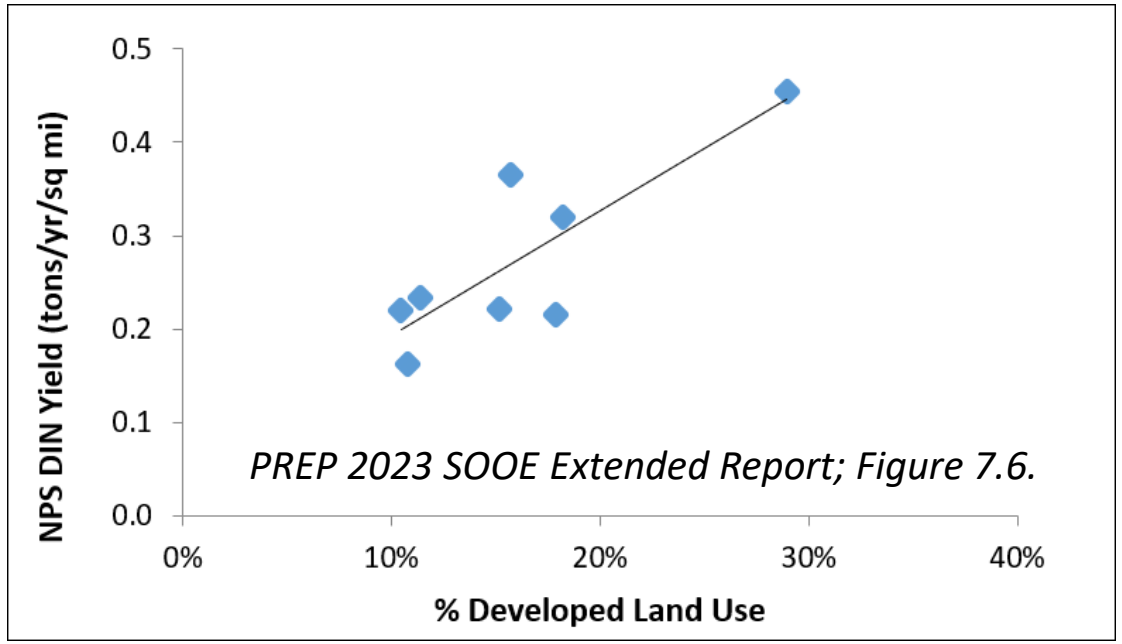


Nutrient enrichment can be a driver of salt marsh loss (Deegan et al. 2012)

SAV – Submerged Aquatic Vegetation e.g. Eelgrass
http://www.fiu.edu/~envstud/labs/imageJ1B.JPG

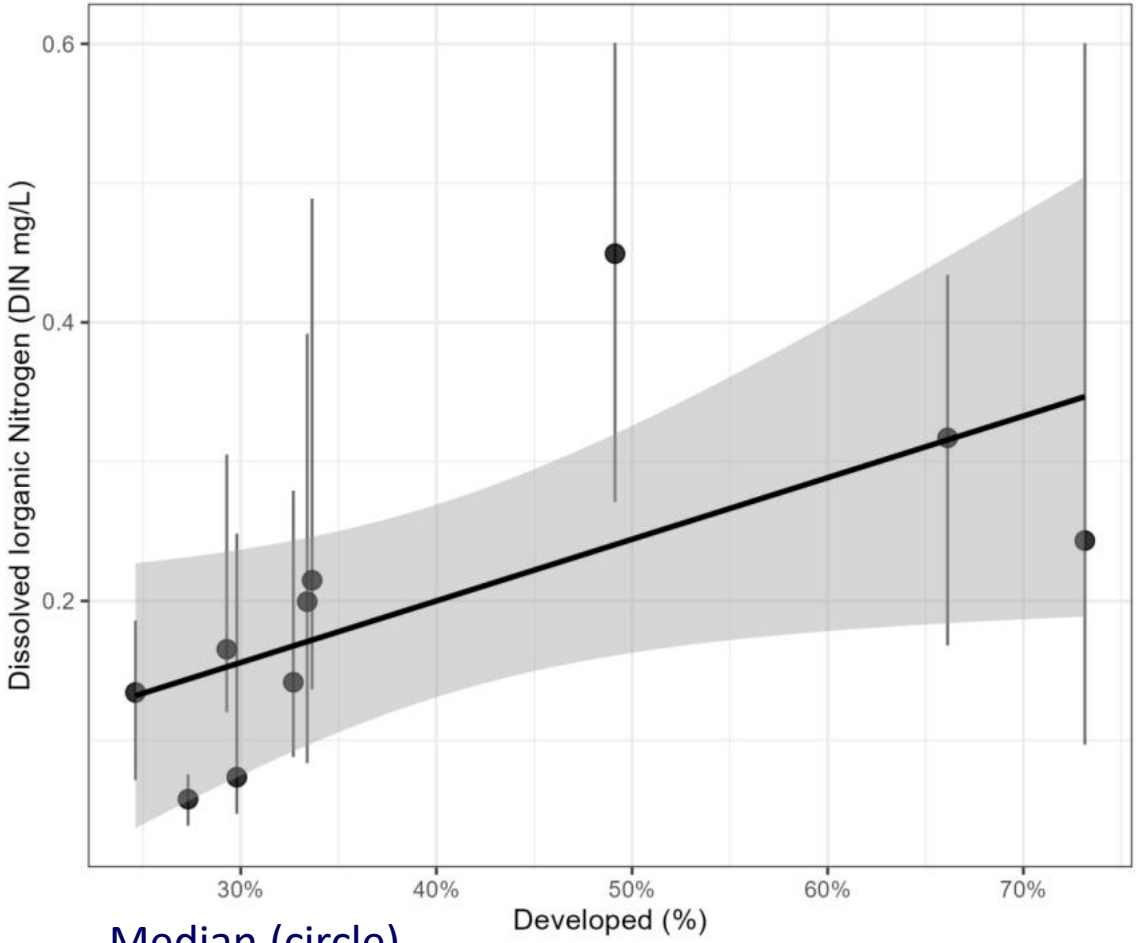
Dissolved Inorganic Nitrogen (DIN; NO_3^- + NH_4^+) increases with watershed development

Great Bay Estuary (GBE) Tributaries



- Five HSE tributary watersheds more developed than GBE tributary watersheds
- Median DIN at HSE sites similar to GBE sites, BHS slightly higher than Cocheco River (GBE)

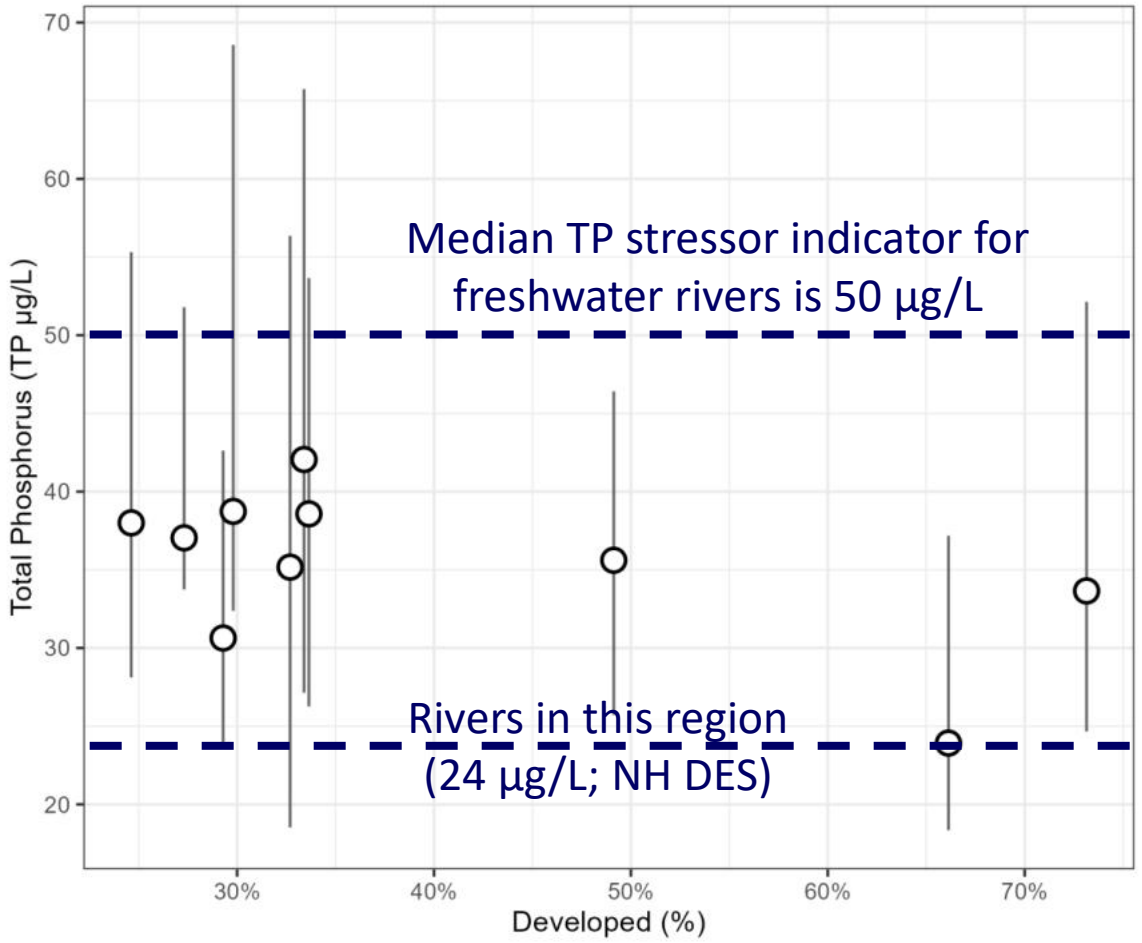
Hampton-Seabrook Estuary Tributaries



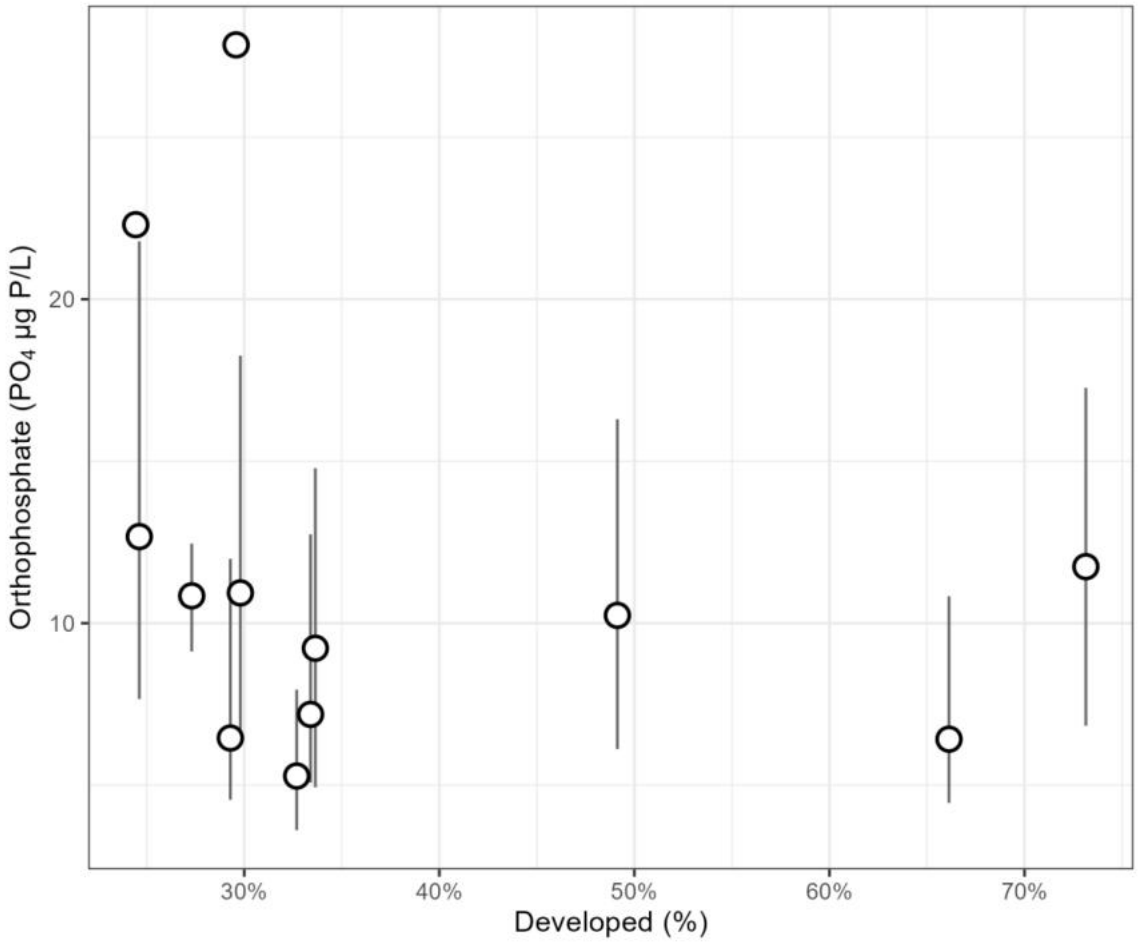
Median (circle)
Confidence intervals: Inner quartile range of 25-75%

Phosphorous not correlated with watershed development (or agriculture)

Total Phosphorous



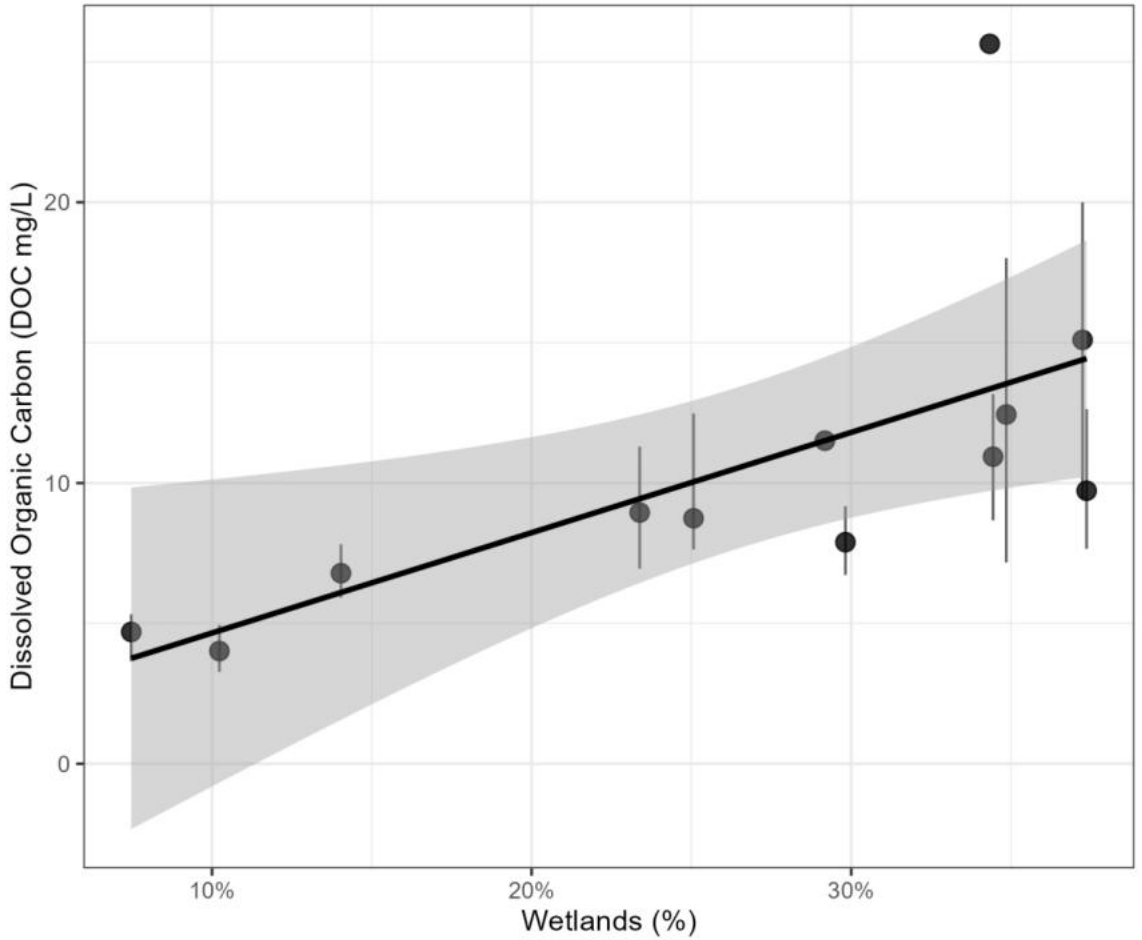
Soluble Reactive Phosphorous (SRP)



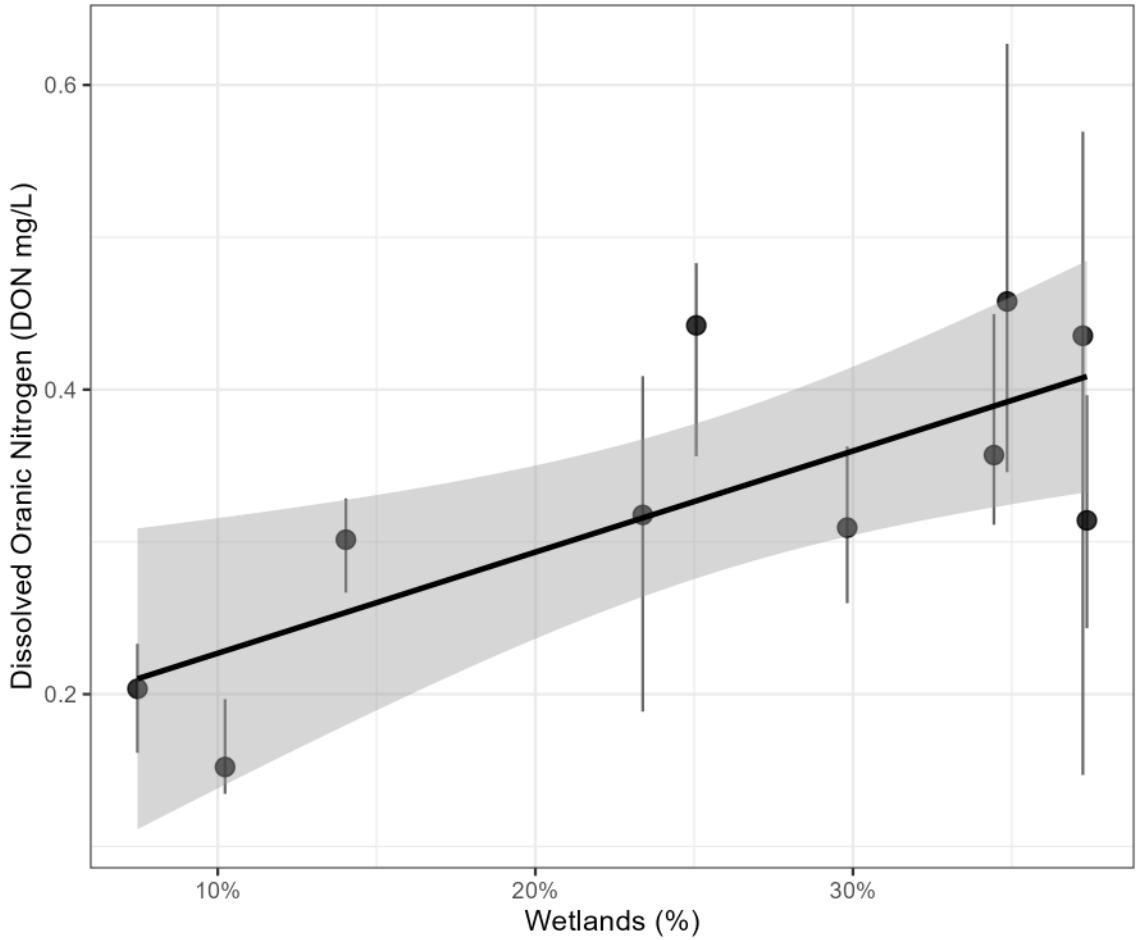
Dissolved Organic Matter (DOC and DON) associated with wetlands and can decrease clarity



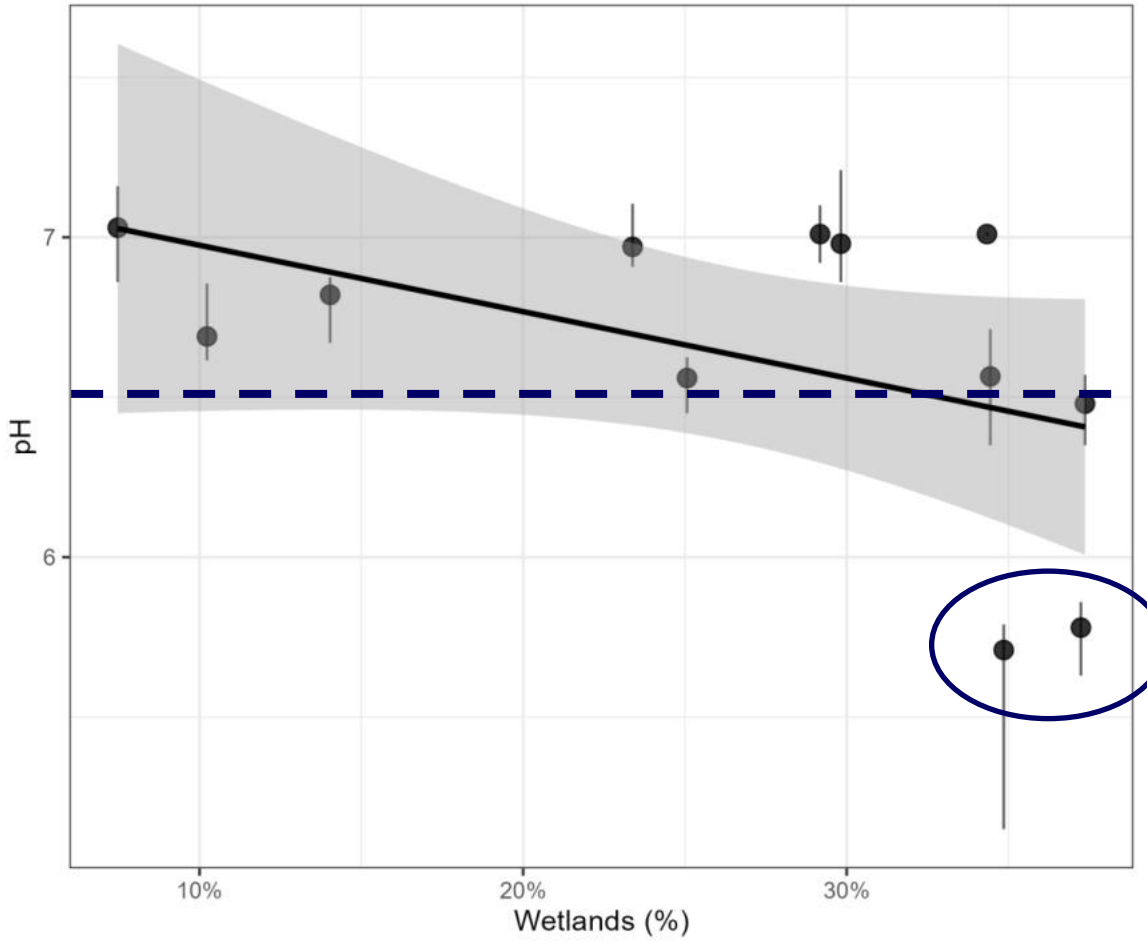
Dissolved Organic Carbon (DOC)



Dissolved Organic Nitrogen (DON)

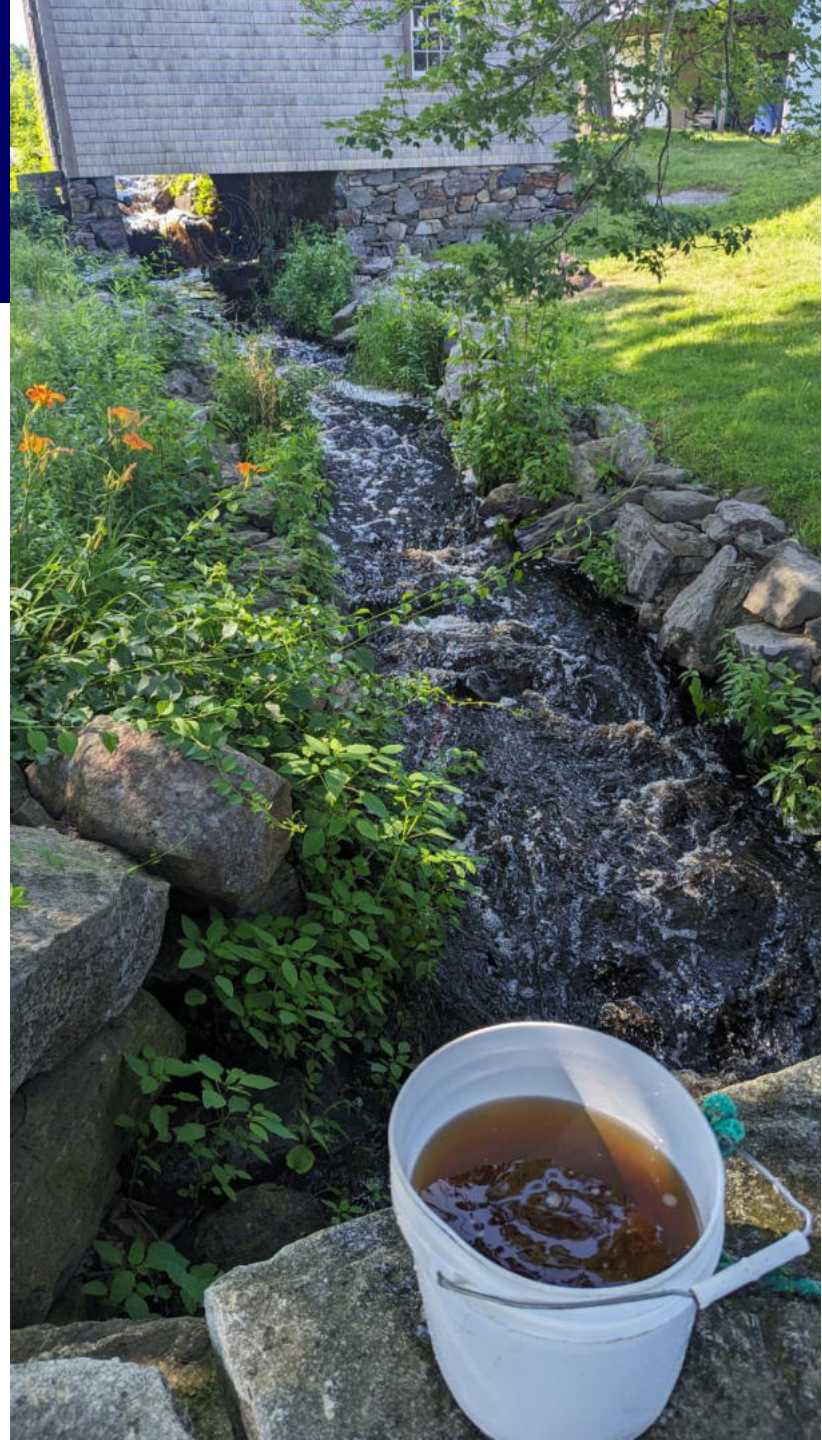


Wetlands contain organic acids and have low pH

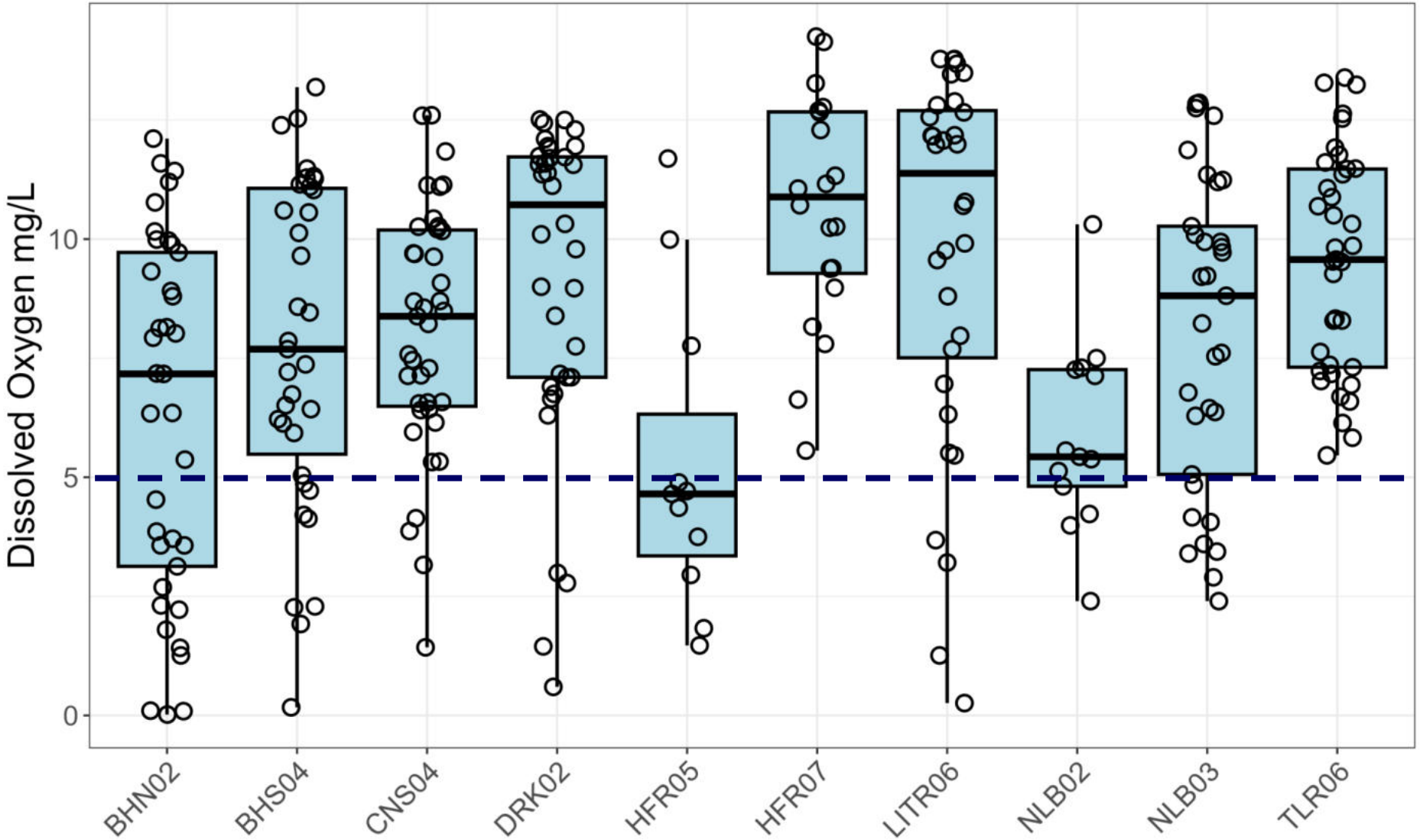


Criteria to support aquatic life:
6.5 > pH < 8.0
unless naturally occurring

Nilus Brook



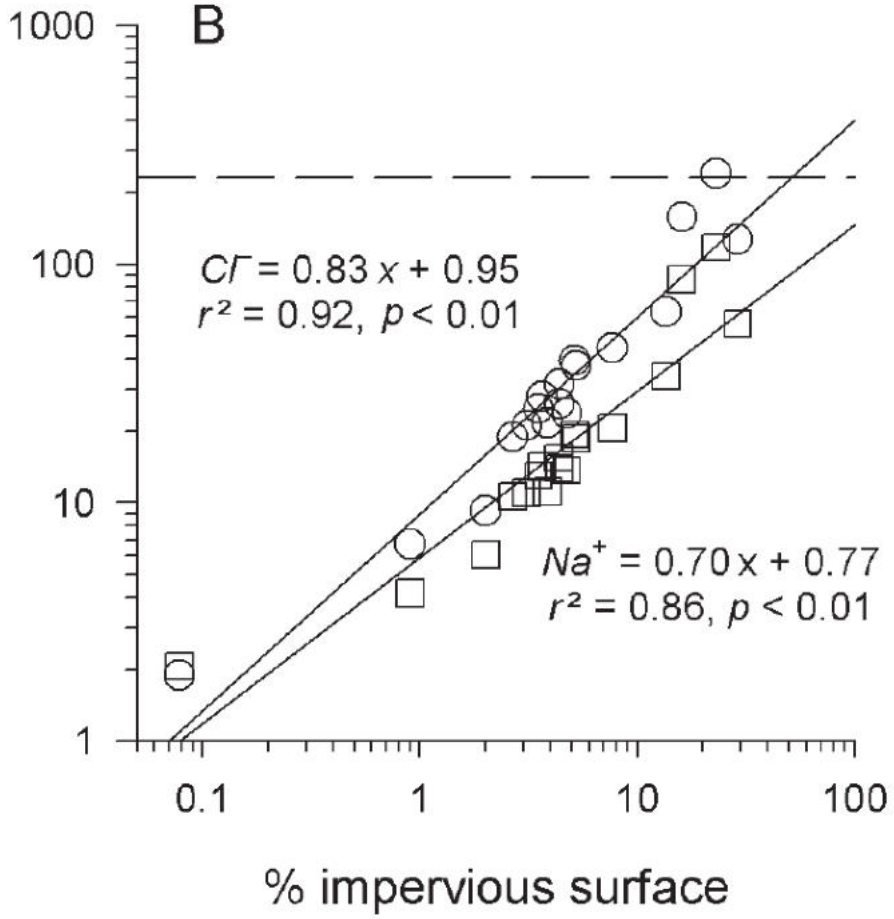
Dissolved Oxygen (DO) often low at HSE sites



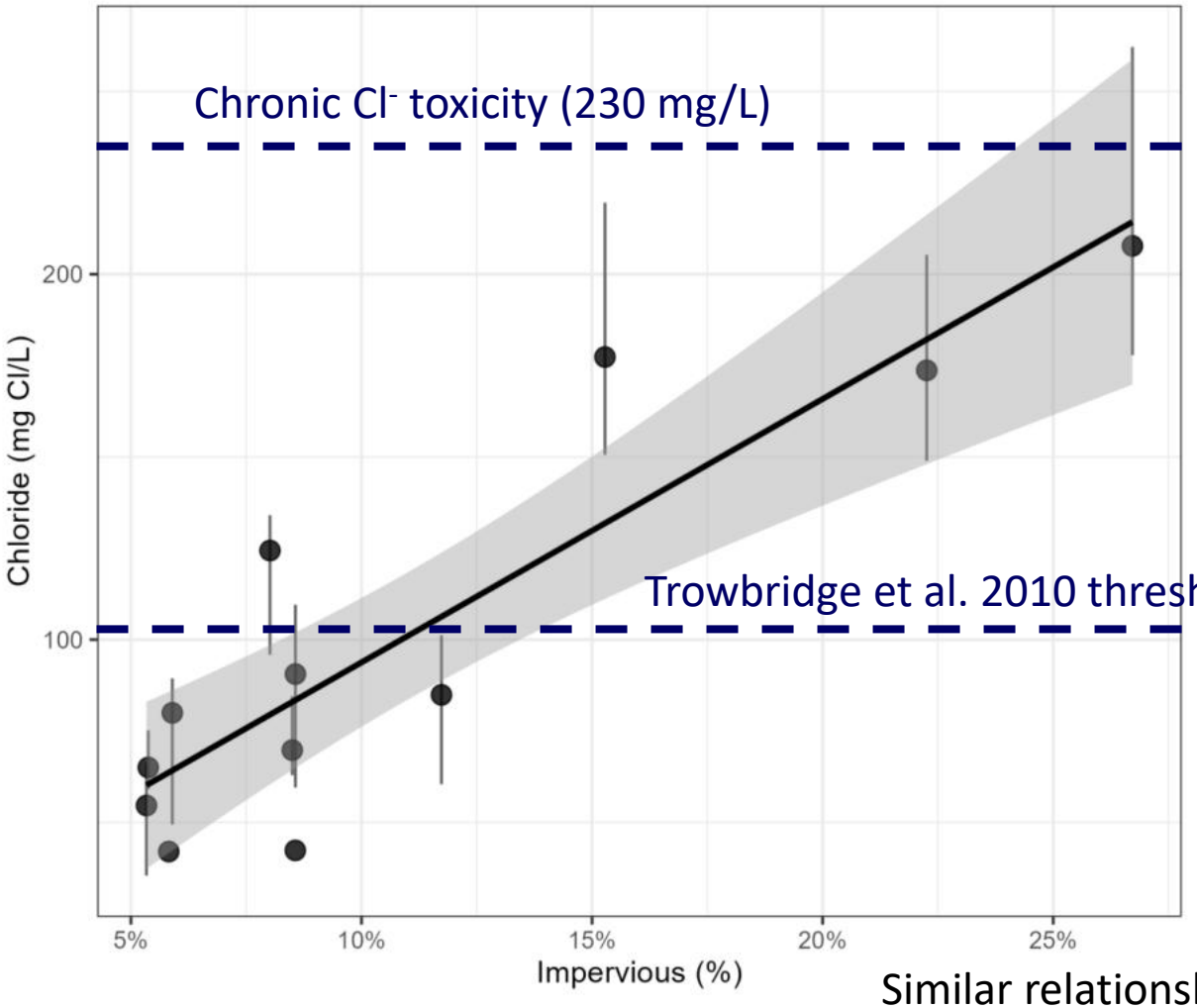
Class B instantaneous threshold, unless naturally occurring

Class B waters: Of the second highest quality, acceptable for fishing, swimming and other recreational purposes, and for use as water supplies after adequate treatment

Sodium and chloride increase with impervious surfaces due to road salt application



Lamprey and Oyster River watershed sites

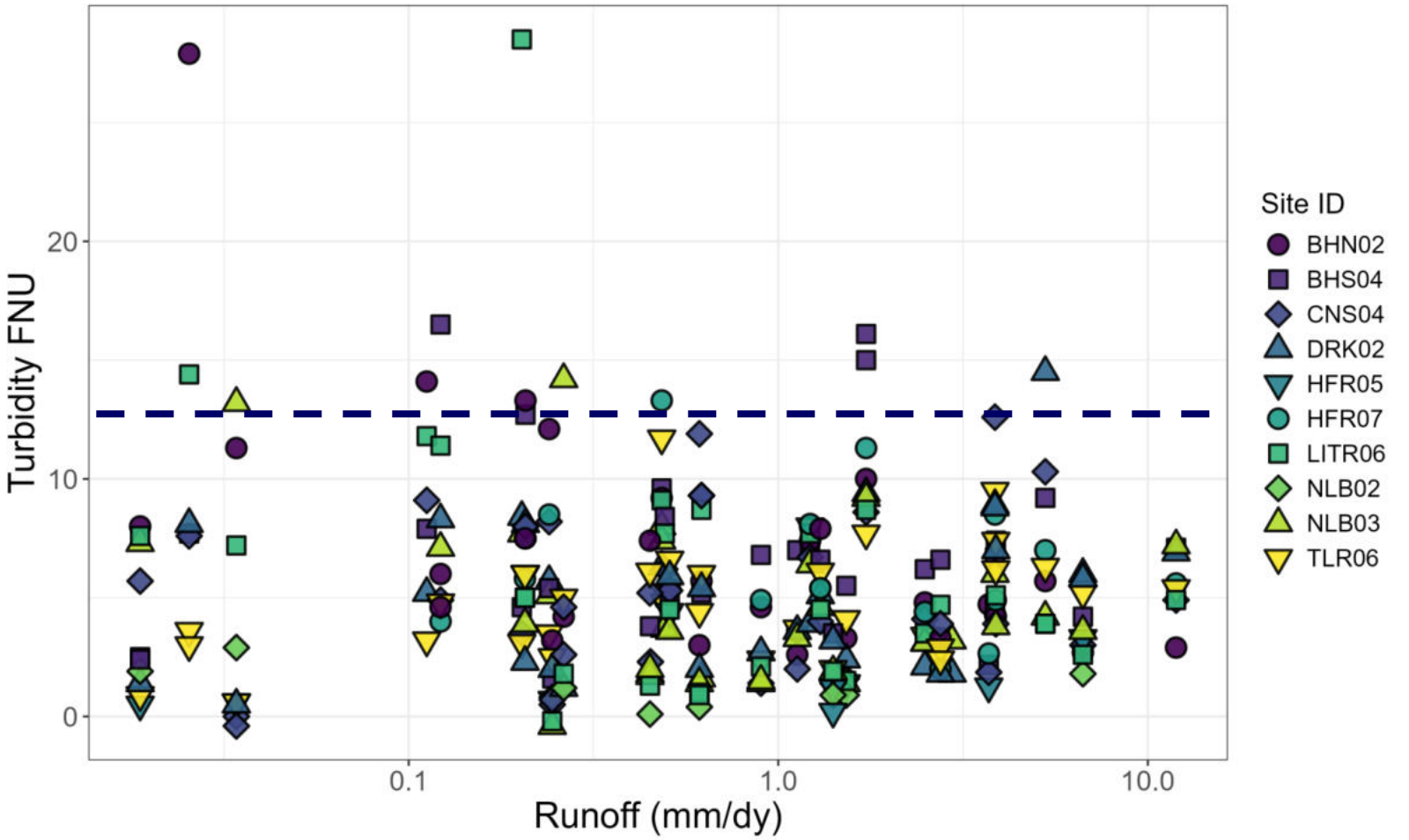


HSE sites

Similar relationship with sodium (Na^+)

Turbidity does not seem to respond to flow at these HSE sites

Median Turbidity in 90% of NH Rivers <3 NTU (NH DES)



Class B waters shall only have turbidity not more than 10 NTU over naturally occurring conditions.

Some HSE sites potentially not attaining standards

Summary

- Human footprint is strong predictor of inorganic nitrogen and salt, but not phosphorus
- Abundance of wetlands on the landscape affects concentrations of organic nitrogen, organic carbon and pH
- Establishing a baseline for water quality parameters
- Compared to NH CHAPTER Env-Ws 1700 SURFACE WATER QUALITY REGULATIONS
  - Four sites likely impaired by elevated chloride
  - Potential pH, dissolved oxygen and turbidity impairments

Next steps

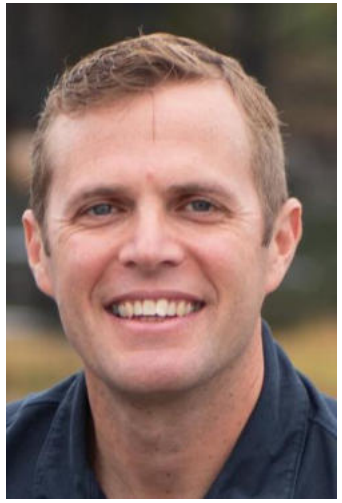
- Finalize laboratory data through 2025 (mostly done except for some PN reruns)
- Finalize data report for quality assurance
- Submit data to NH DES Environmental Monitoring Database
- Assess strategies for future monitoring

➢ Survey of HSE collaborative members and other stakeholders: https://forms.gle/hrxePxvTmYAQScUt9

Questions for group discussion

1. What aspects of this monitoring program are most valuable to you, and how do they support your work or interests?
2. If resources are limited, which parts of the program would you prioritize continuing, and why?
3. What changes or additions would make the program more useful to you?
4. What funding sources, partnerships, or other resources could help sustain future monitoring?
5. Who else should we be involving in this discussion?

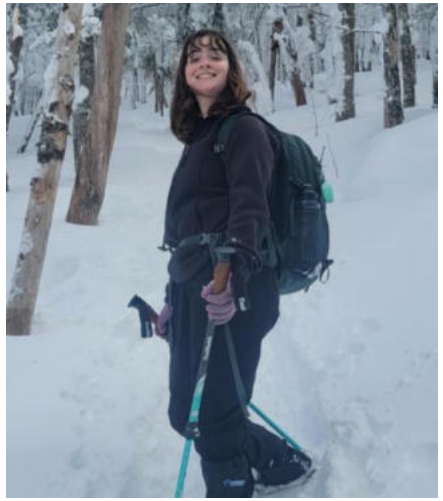
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