Climate Change, Freshwater Salinization Syndrome, and the Search for a Cure

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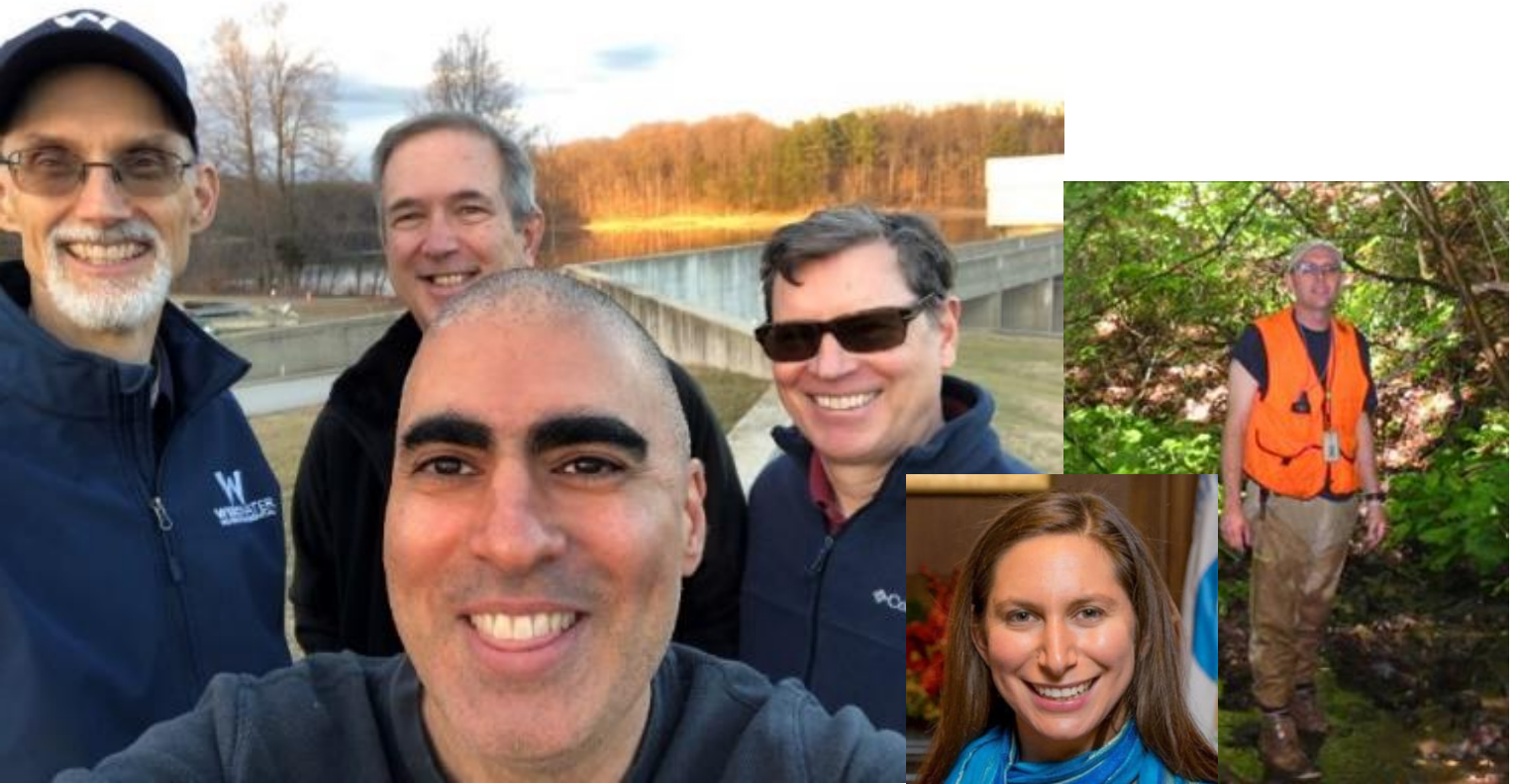
[1]University of Maryland, [2]Virginia Tech, [3]U.S. Geological Survey



Acknowledgements:
Washington Metropolitan Council of Governments
EPA Region 3 ROAR Team
National Science Foundation
U.S. Environmental Protection Agency
U.S. Geological Survey

Thanks WSSC for the Salt Summit!

Establishing A Science Partnership to Understand Salinization



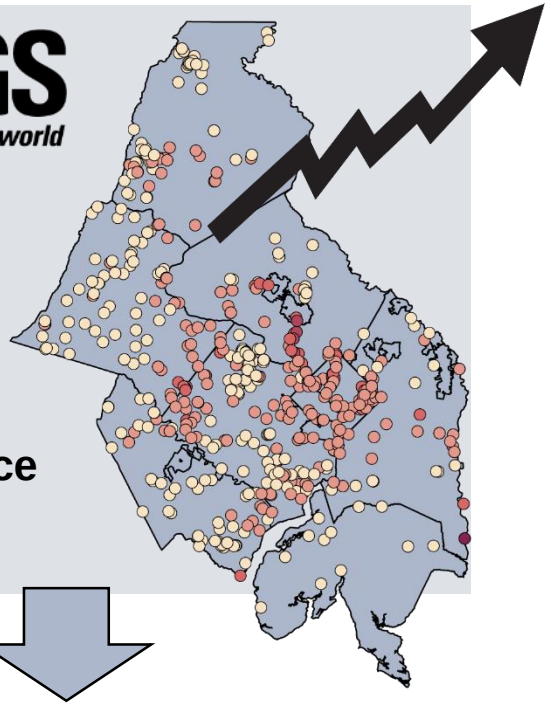




Vision: A collaborative scientific partnership is needed to address a complex, regional issue…

USGS science for a changing world

Monitoring networks can characterize patterns over time and space



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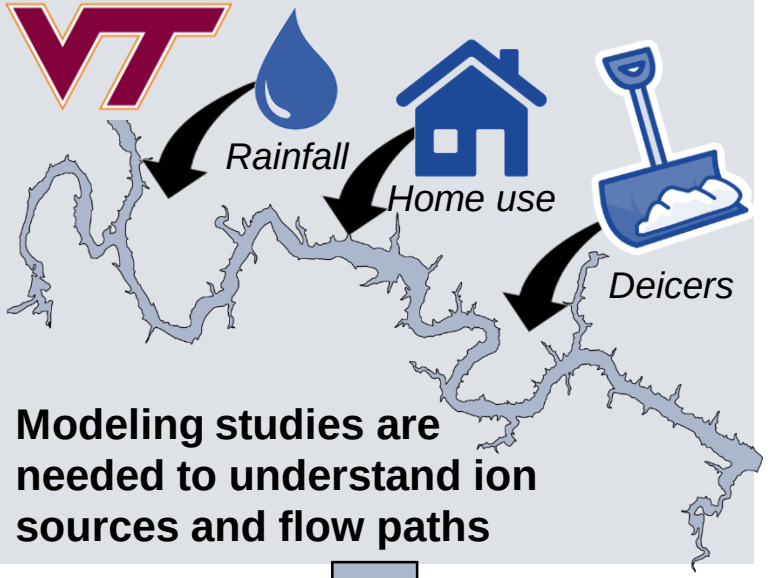
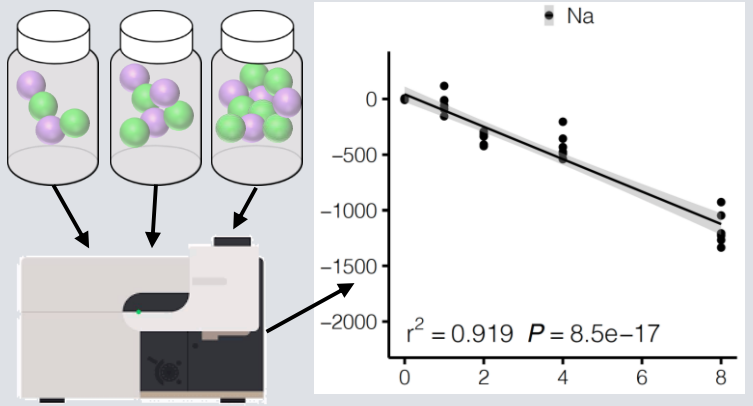


Modeling studies are needed to understand ion sources and flow paths

Field and lab experiments are needed to evaluate impacts and mechanisms



Synthesizing this knowledge is needed to understand and manage FSS in the MWCOG region

Thanks also to Jimmy Webber, USGS!

Overview

1. **Climate Change:** Increasing Salinity Risks
2. **Trading Places:** the Rise and Fall of Pollutants
3. **Restoration:** Conserving our Freshwater
4. **Updates:** Breaking News on the Salt Front

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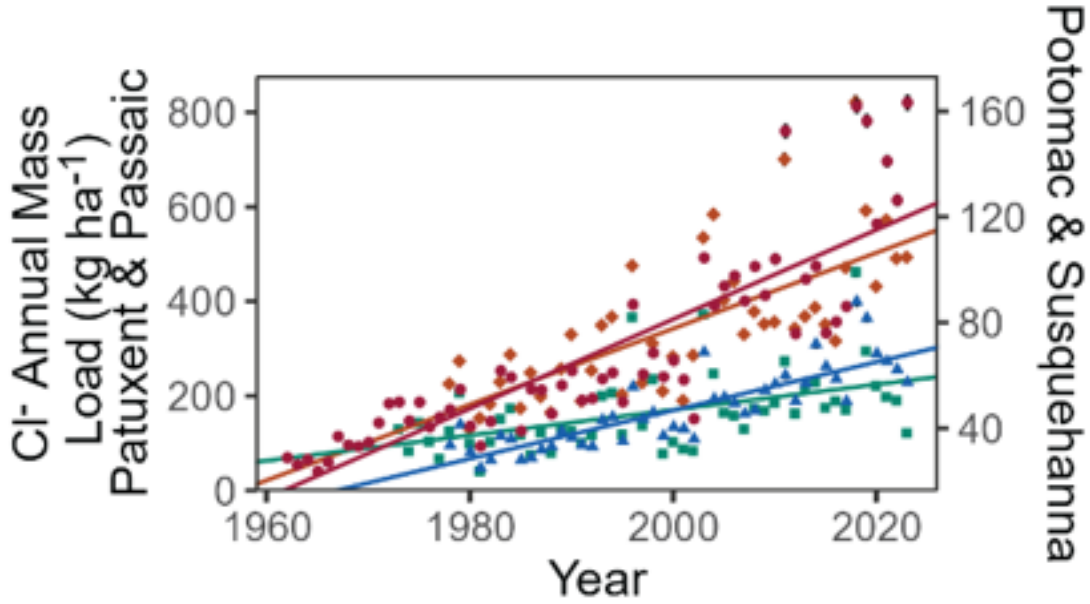
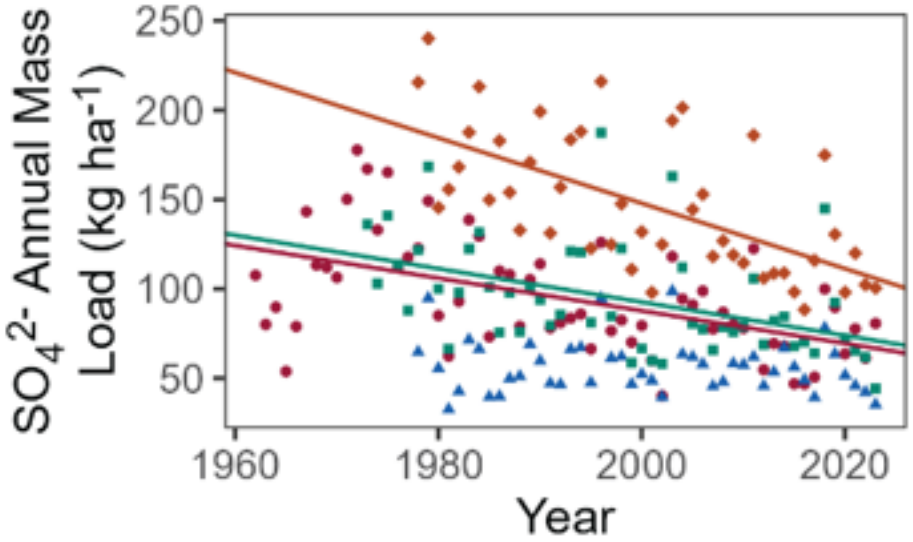
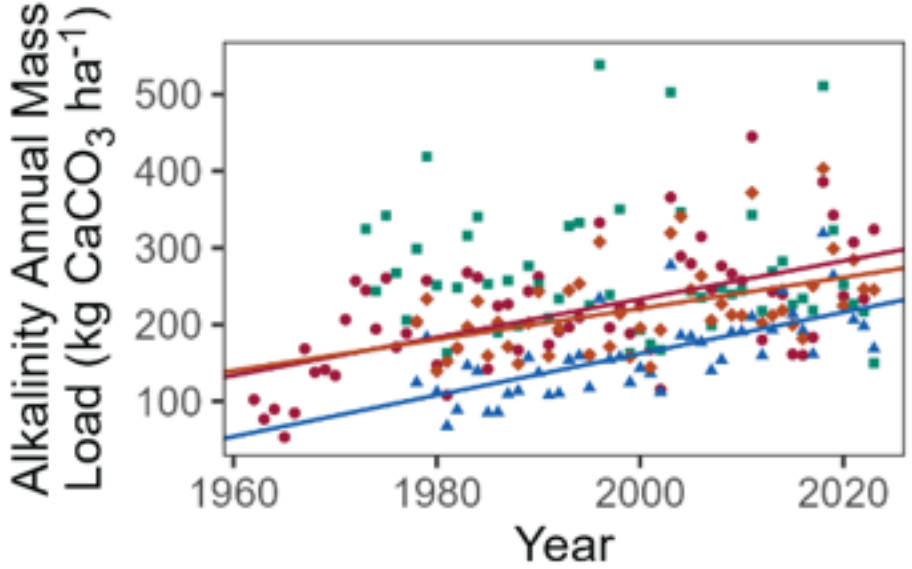
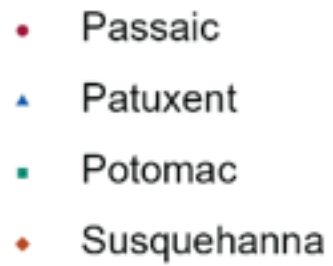






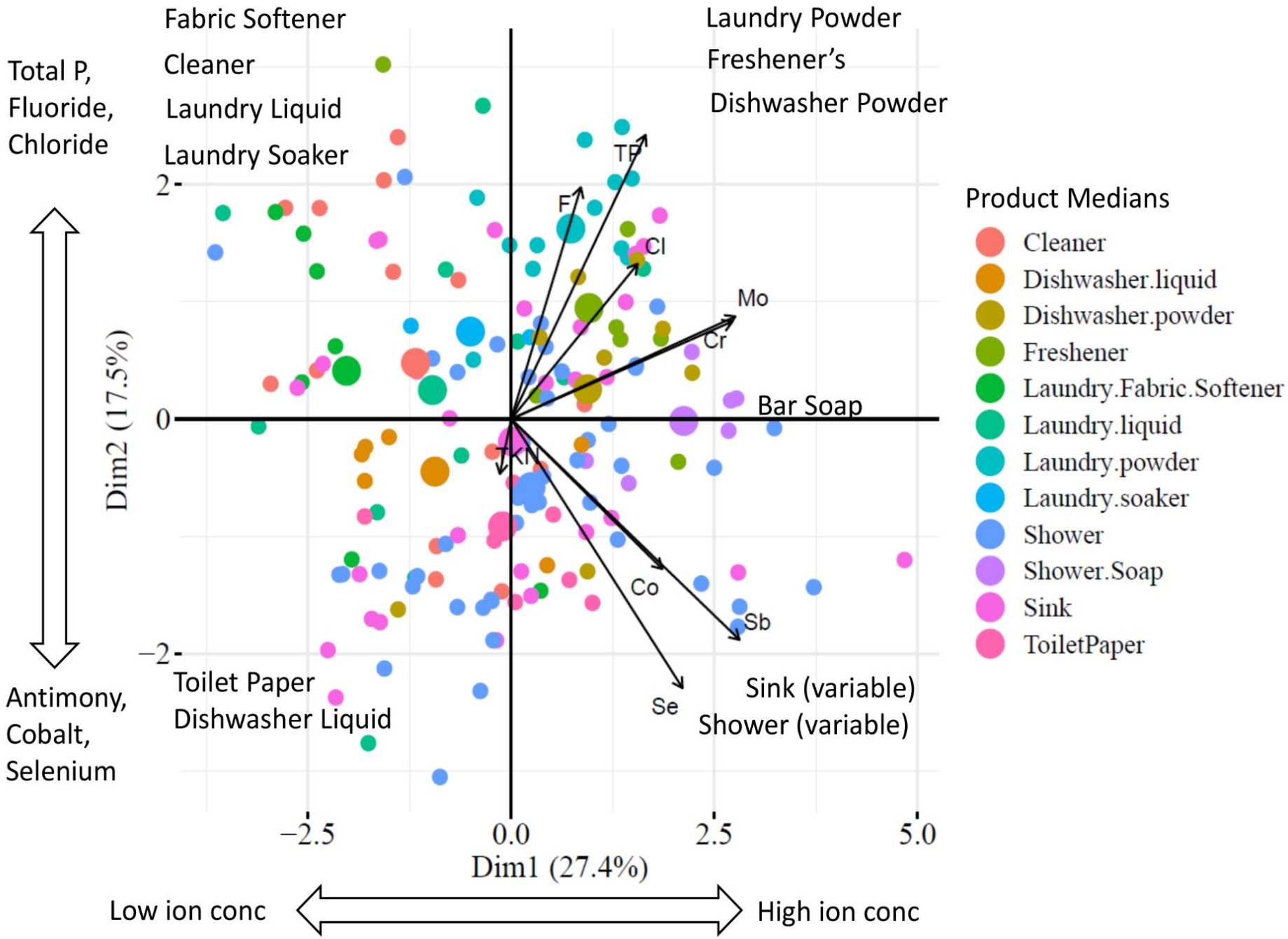


Kaushal et al. (In Review)

Thank you, Shantanu Bhide and Sydney Shelton!

2. Trading Places: the Rise and Fall of Pollutants

Stories from the Occoquan…



Importance of Wastewater and Household Products….?

Stay tuned for work from Stanley Grant, Megan Rippy, Peter Vikesland and others…

Kaushal et al. 2024

Thank you, Megan Rippy!

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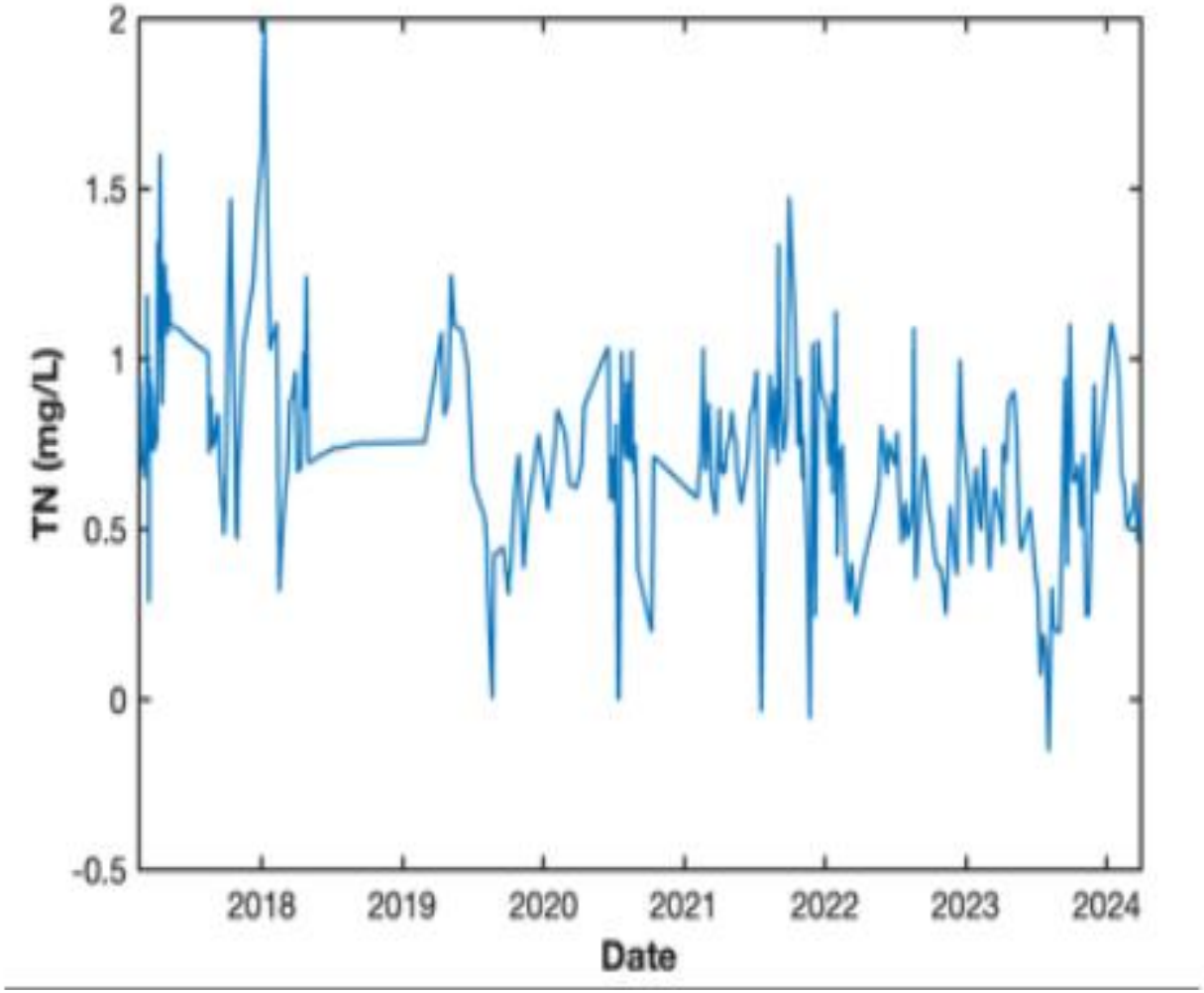
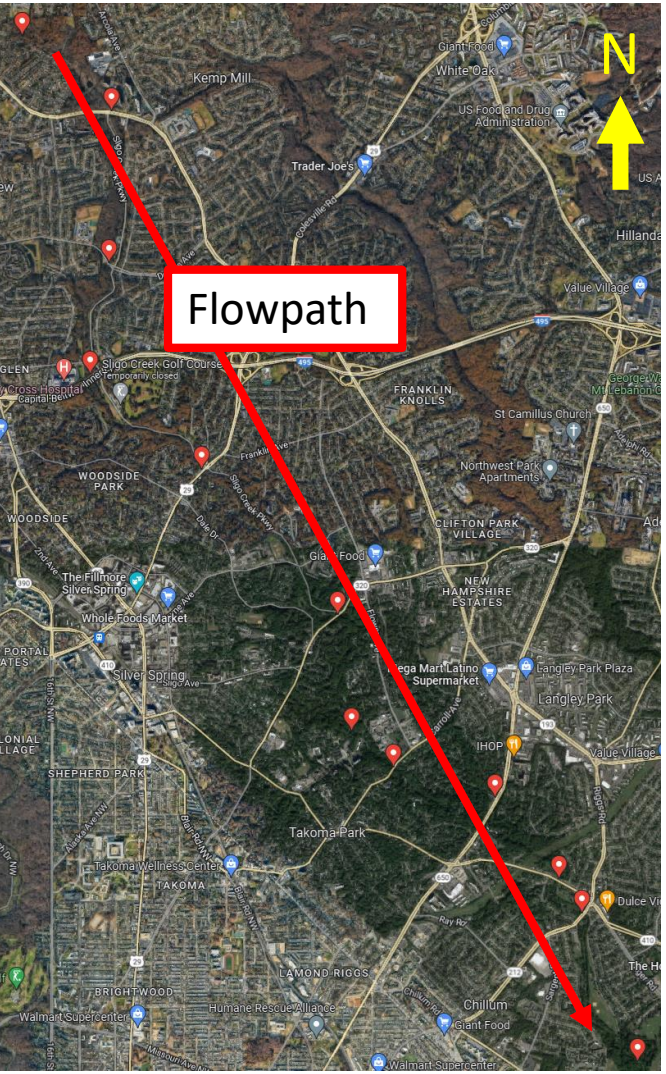
Restoration May Reduce Nitrogen, What about Salt?

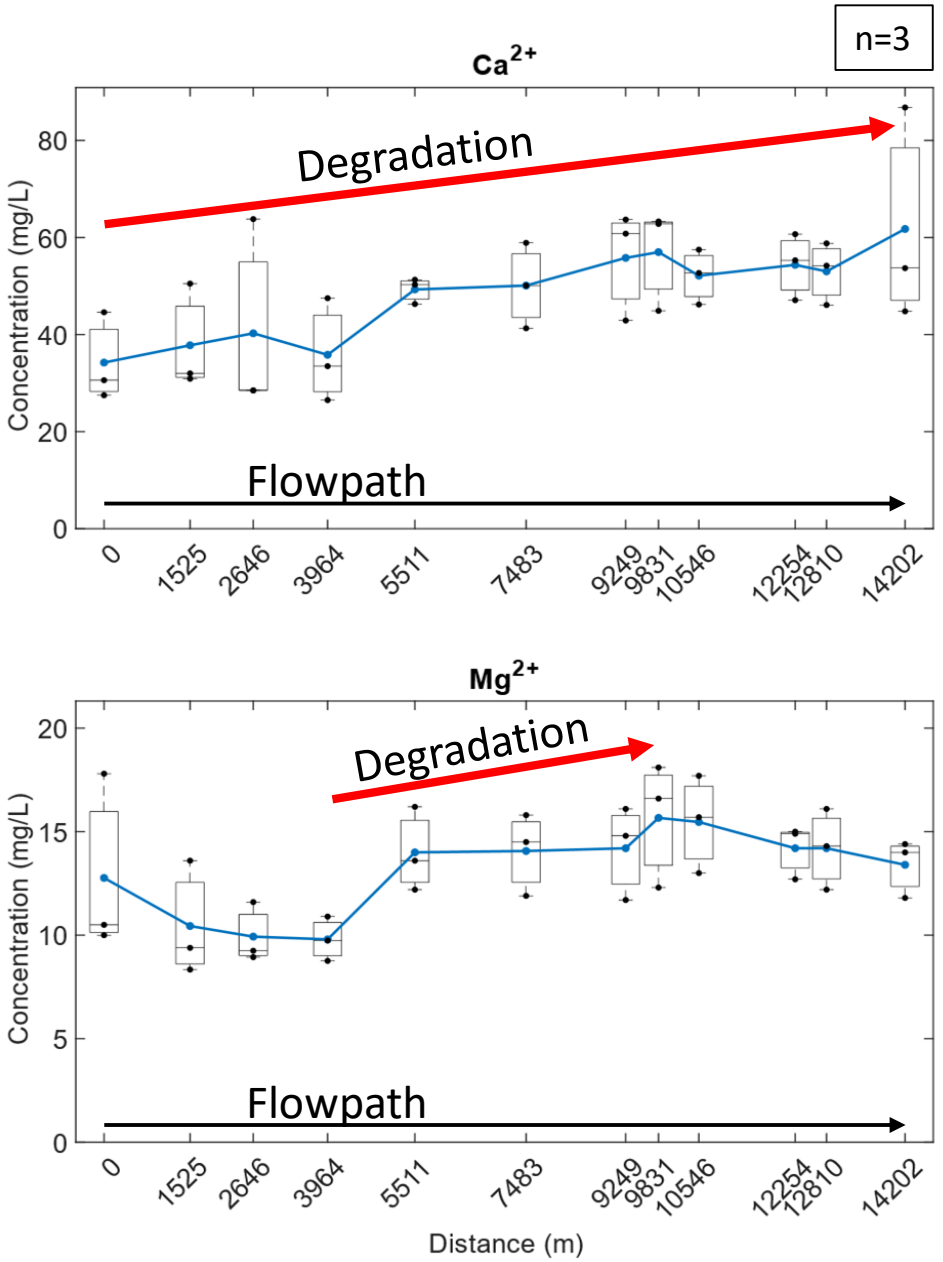


Kaushal et al. (Unpublished)

Alexis Yaculak, former UMD student

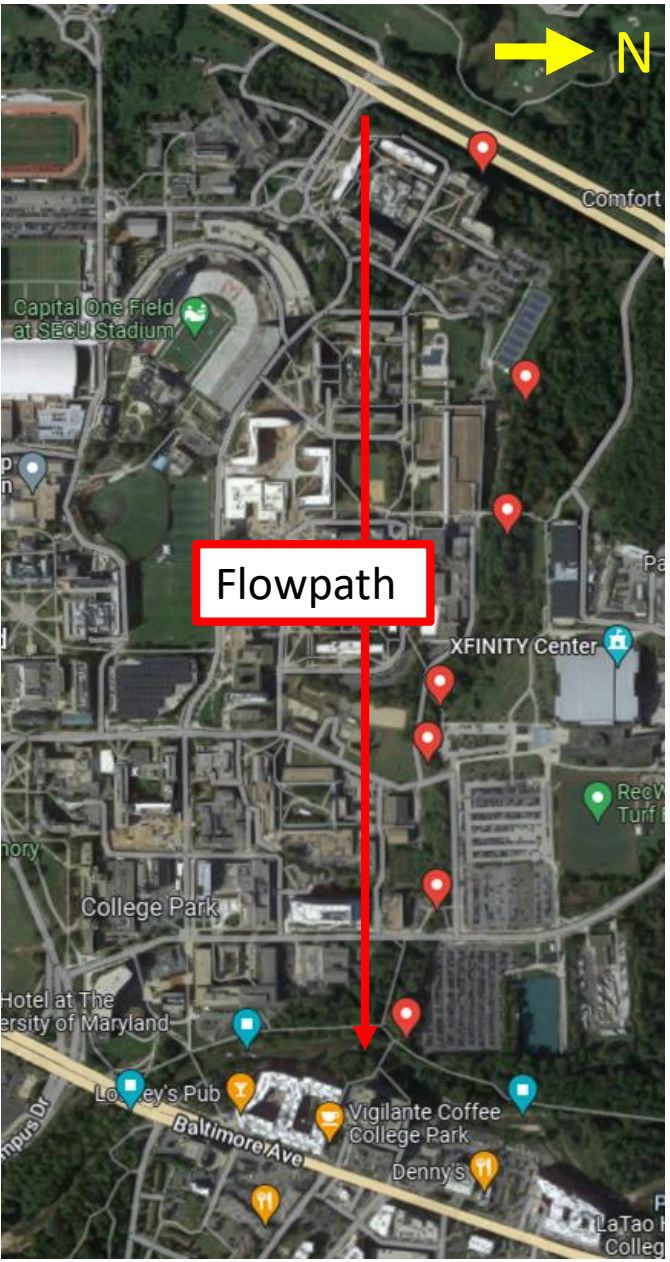
Sligo Creek (Accumulation of Salt along Watershed)

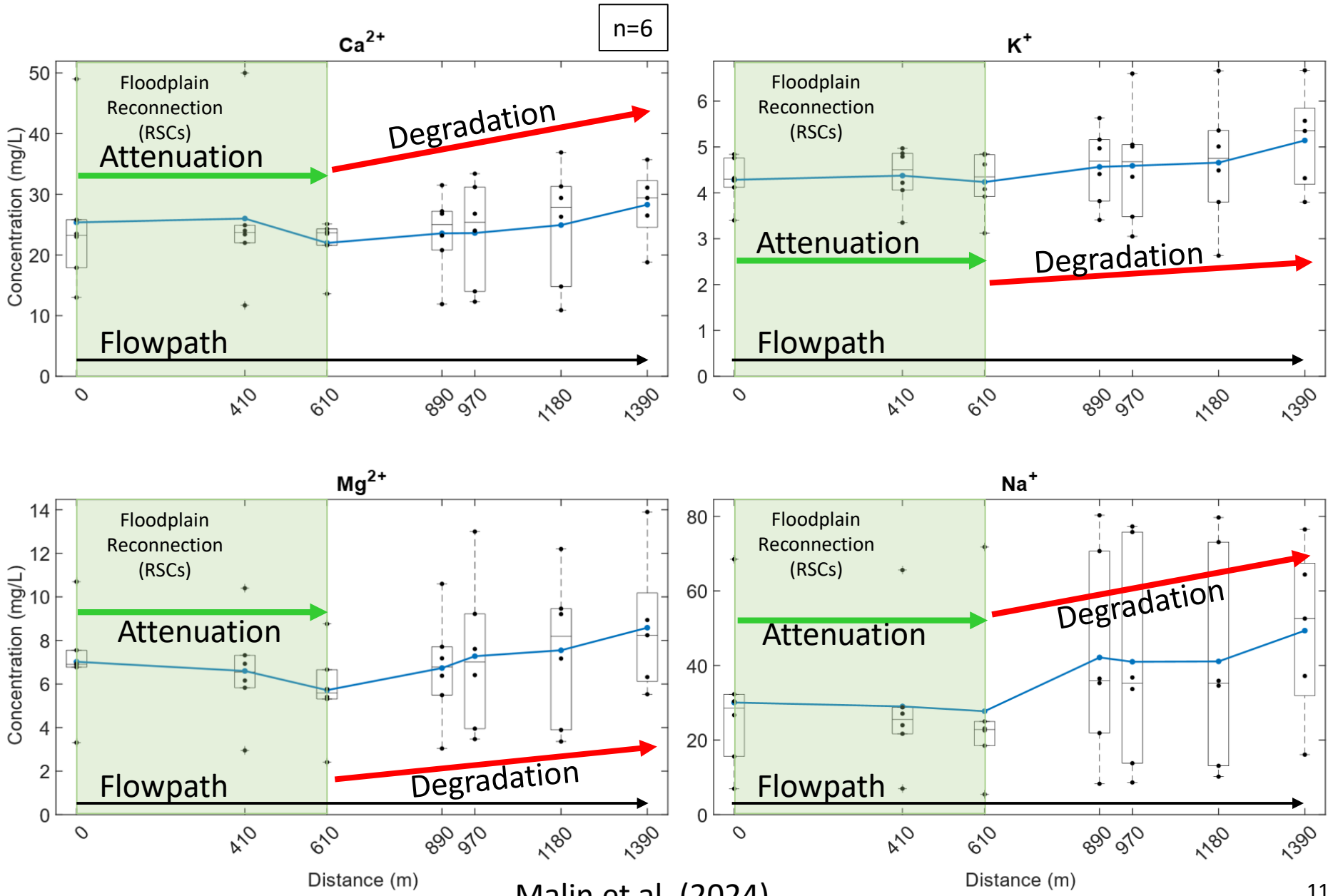




Malin et al. (2024)

Campus Creek (Highest Connection with Floodplain)

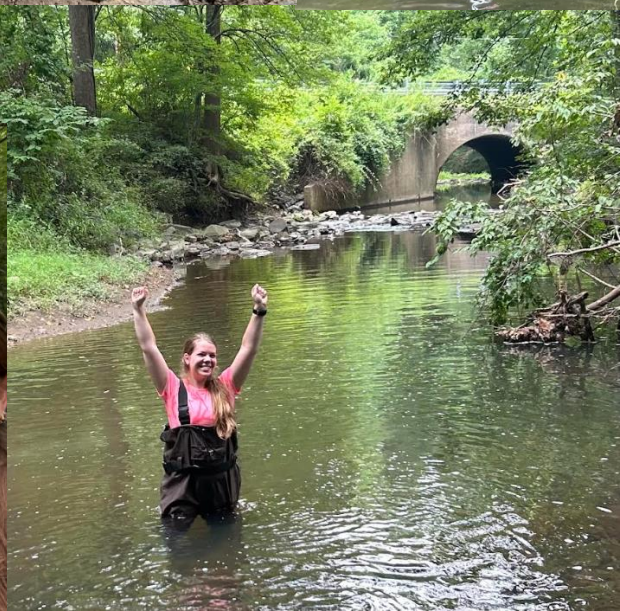




Malin et al. (2024)

Watts Branch

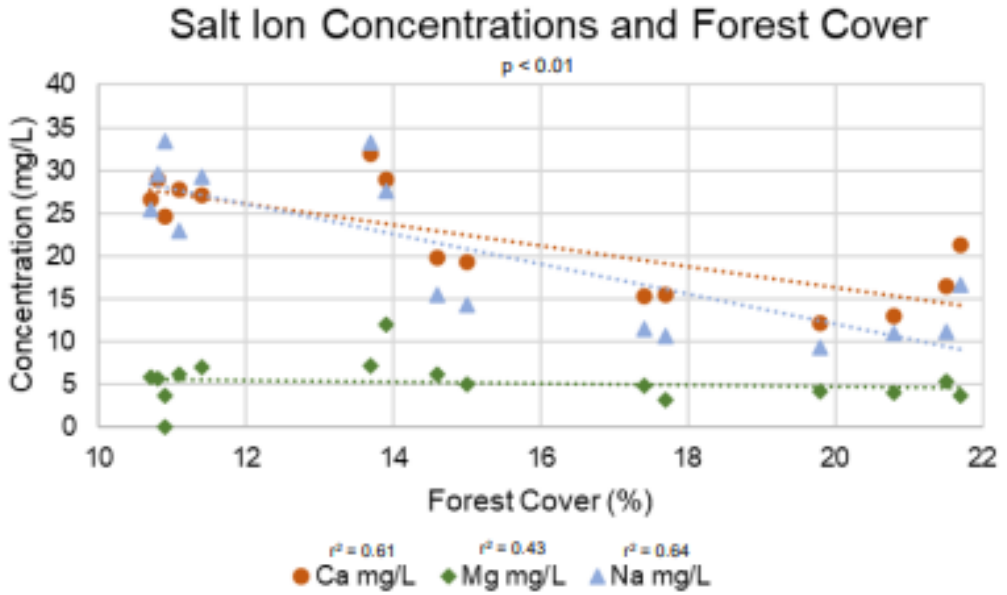
The importance of conservation and low salt zones….stay tuned for Steve Nelson, Mark Symborski, and Ken Mack!

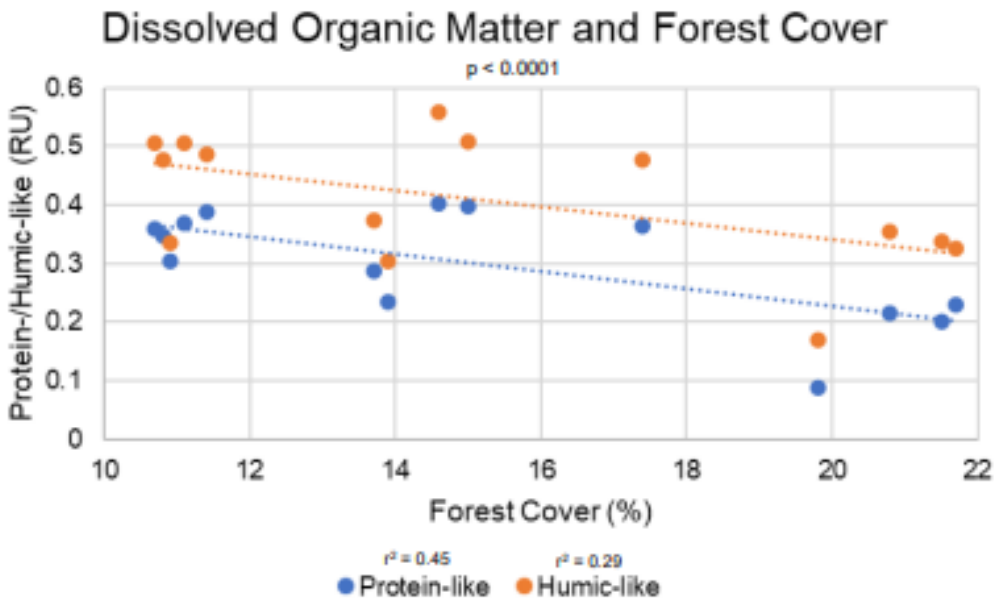


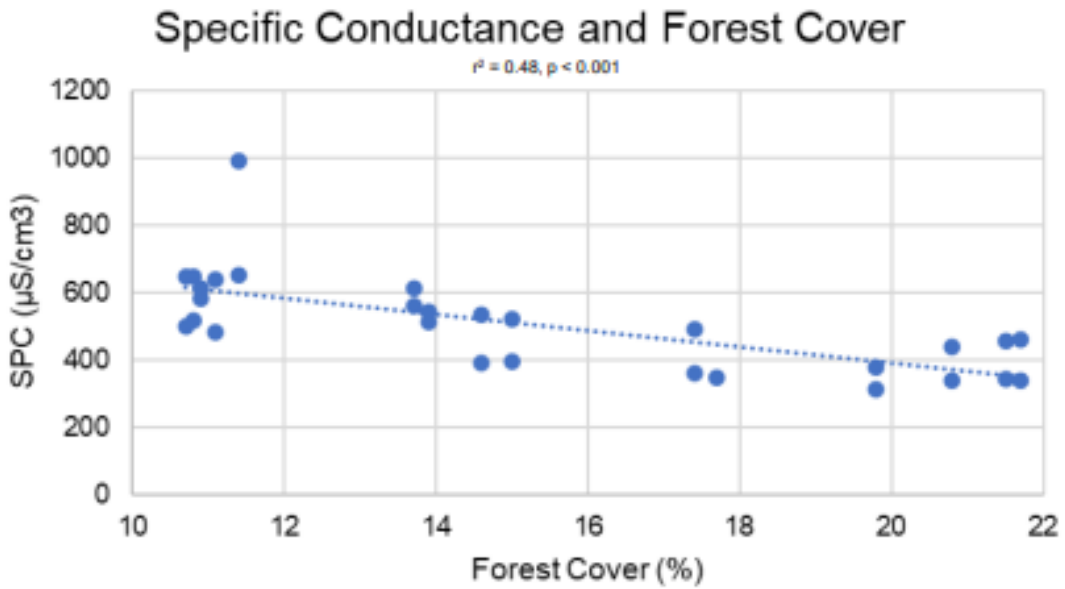
An Ounce of Prevention Is Worth a Pound of Salt

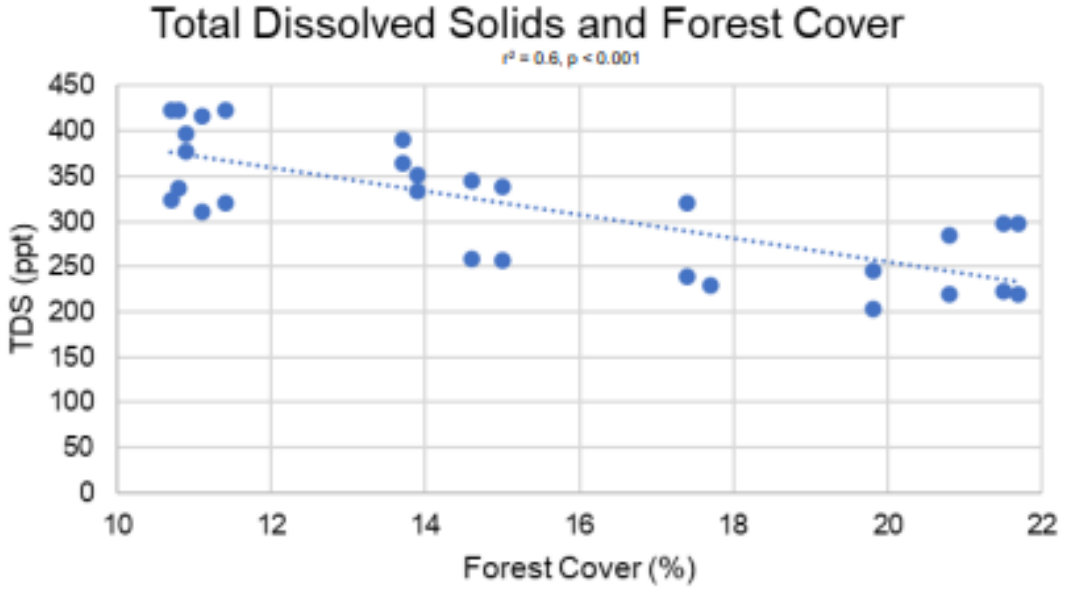
Thank you, Madeleine Seppi!

Longitudinal Patterns in Water Quality along Watts Branch



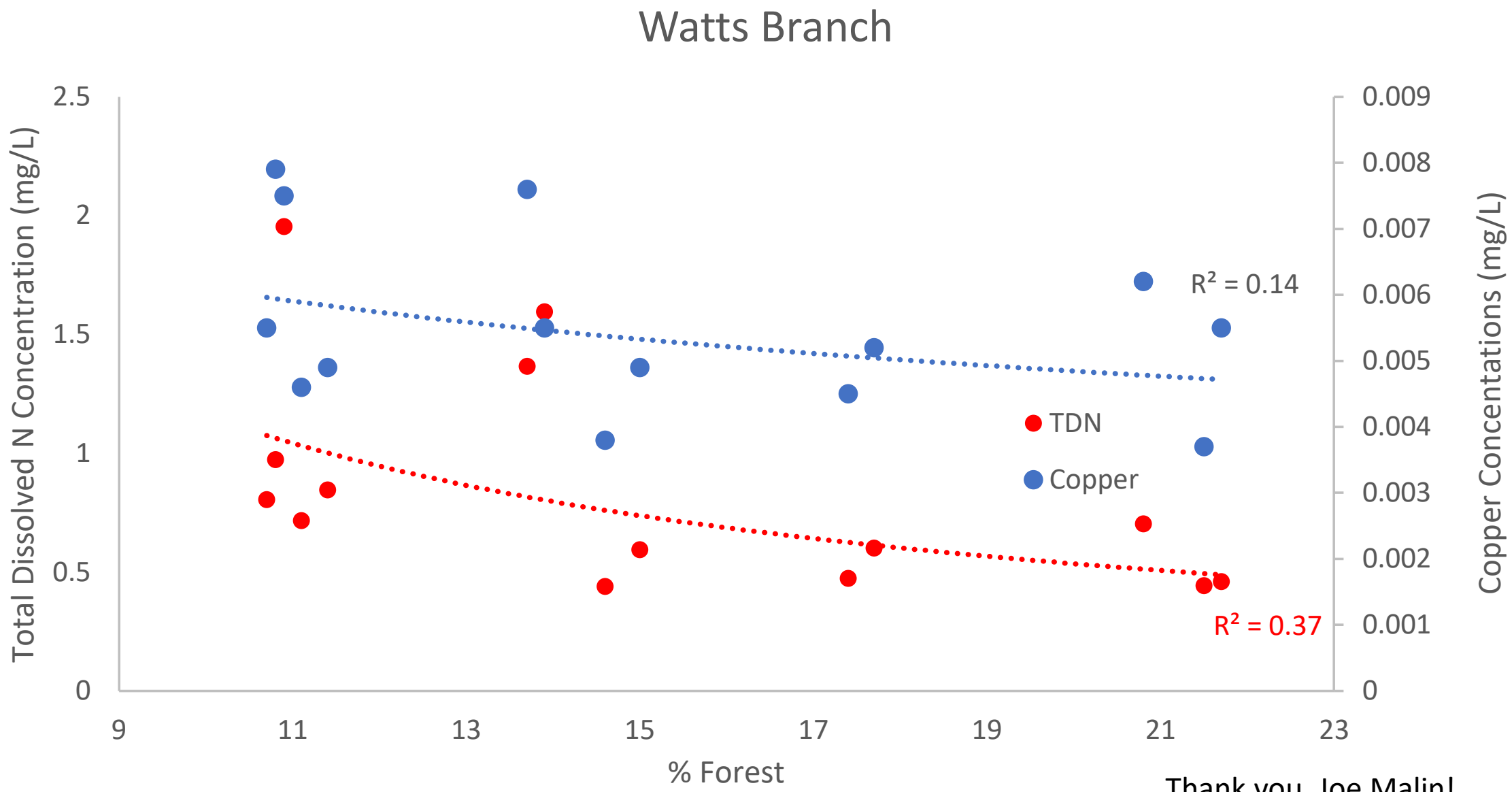






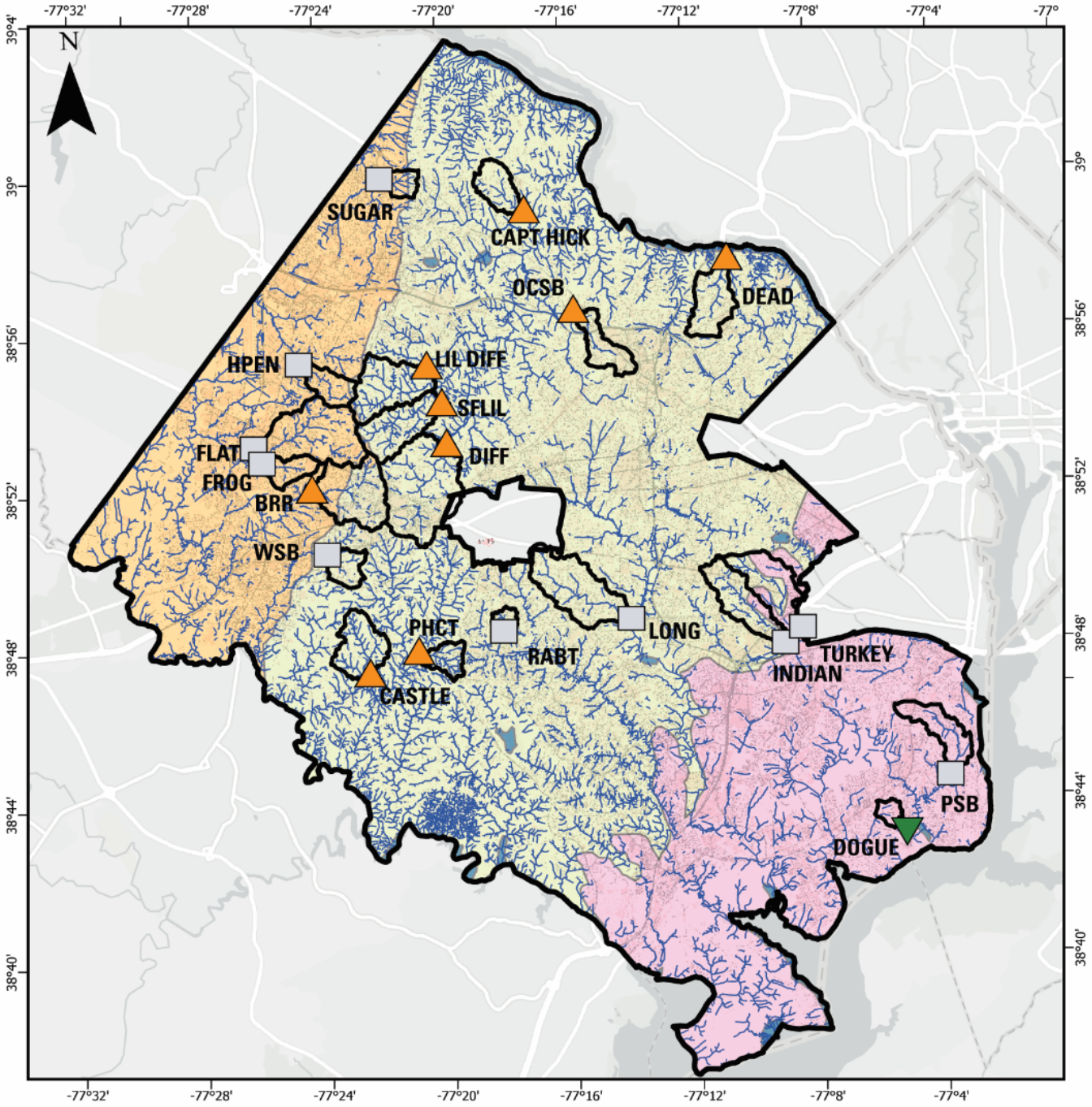
Thank you, Madeleine Seppi and Joe Malin!

Reduced Nitrogen and Metals along Watts Branch



Thank you, Joe Malin!

A

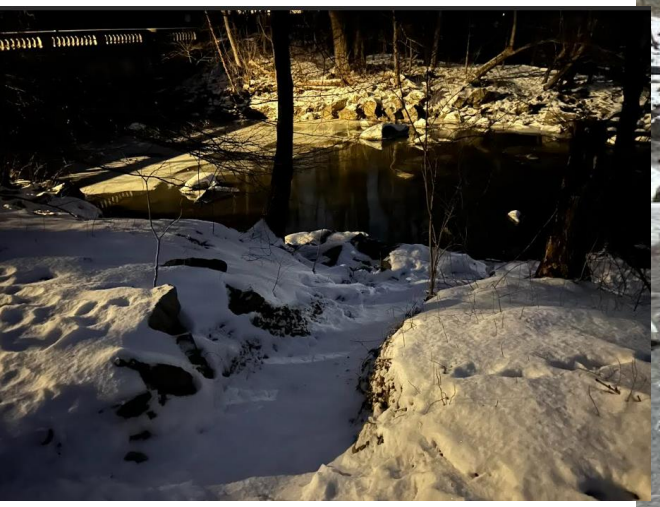


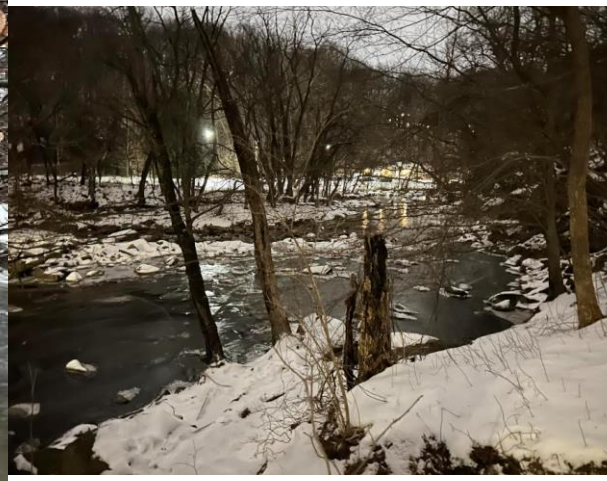
Lessons from Long Branch

Thank you, Aaron Porter!

4. Updates…Breaking News on the Salt Front

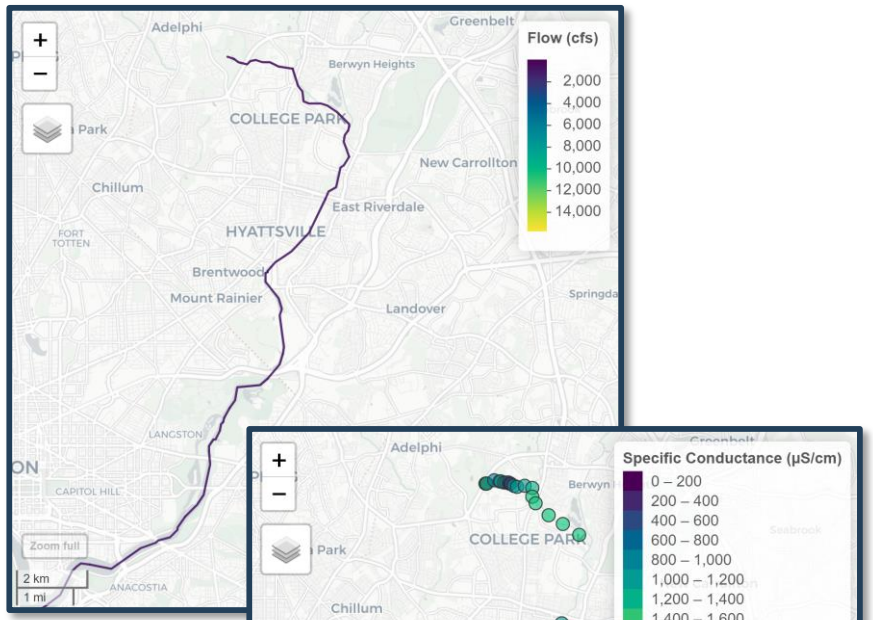
Sampling over an hour per day, every day for the last 14 days….
Picking up samples from Montgomery County (Ken Mack's shop)

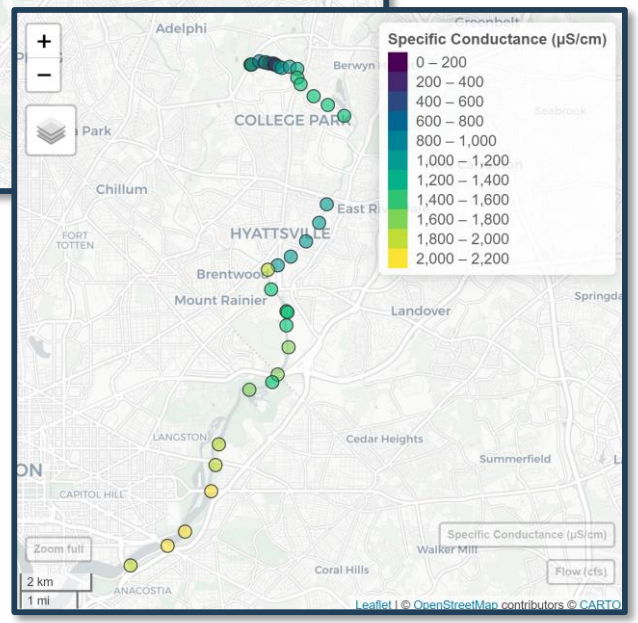




Tools and Approaches

- **Modeling:**
  - Bridges gaps in monitoring data
  - Reveals regional patterns in large watersheds
- **Synoptic field data collection:**
  - Capture stream response to specific events
  - Identify complex hydrology in localized areas with local insights





Spatially Referenced Models of Streamflow and Nitrogen, Phosphorus, and Suspended-Sediment Loads in Streams of the Northeastern United States

Scientific Investigations Report 2019-5118

National Water Quality Program

By: Scott W. Ator

https://doi.org/10.3133/sir20195118

Predictive Modeling Reveals Elevated Conductivity Relative to Background Levels in Freshwater Tributaries within the Chesapeake Bay Watershed, USA

Rosemary M. Fanelli*, Joel Moore, Charles C. Stillwell, Andrew J. Sekellick, and Richard H. Walker

https://pubs.acs.org/doi/10.1021/acsestwater.4c00589

Thank you, Andrew Sekellick and Jason Chase!

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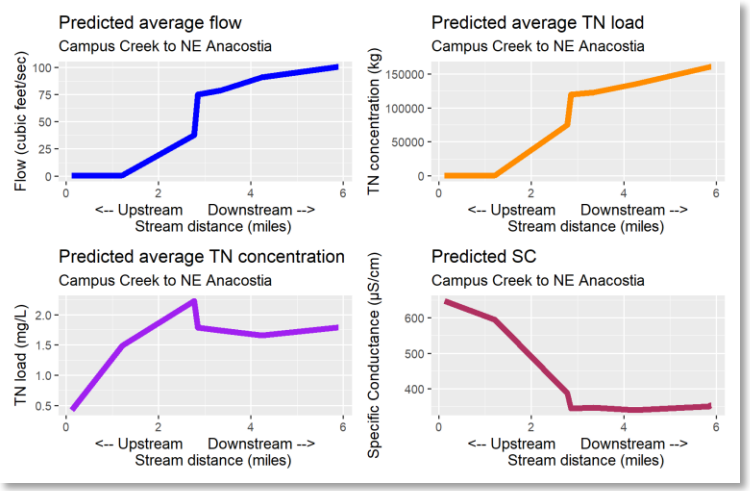
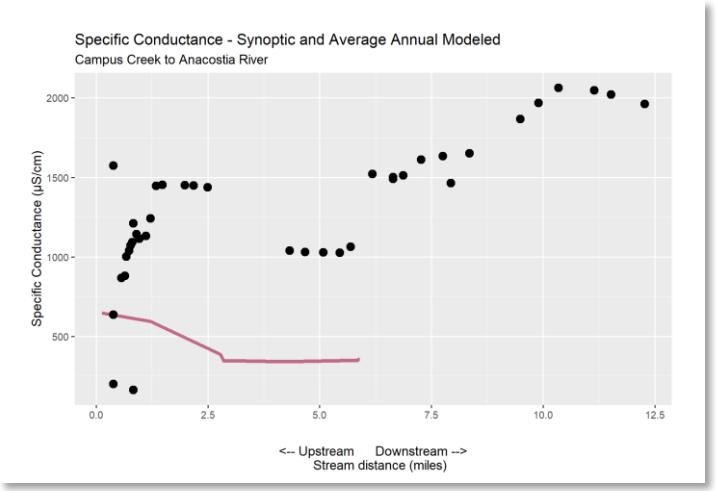
USGS modeled data (annual average)



Understand chronic conditions and improve targeting of BMPS (including possible co-benefits)

Campus Creek – Anacostia synoptic - January 2022



Identify illicit discharges, storm response, and increase spatial resolution along stream corridor

Thank you, Andrew Sekellick and Jason Chase!

Science & Outreach Efforts: EPA ROAR Project

Collaboration among EPA Region 3, EPA Office of Research and Development, and UMD

- How does salinization relate to pollutant mobilization and what are management approaches?

Sujay Kaushal, Steve Hohman, Virginia Vassalotti, Sydney Shelton, Paul Mayer, Patrick McGettigan (not pictured), Regina Poeske (not pictured)

Shelton, S.A., Kaushal, S.S., Mayer, P.M., Shatkay, R.R., Rippy, M.A., Grant, S.B. and Newcomer-Johnson, T.A., 2024. Salty chemical cocktails as water quality signatures: Longitudinal trends and breakpoints along different US streams. *Science of The Total Environment*, *930*, p.172777.

Urban Freshwater Salinization

Introduction | Chemical Cocktails | Site Details | Discoveries

You can talk to **Patrick McGettigan** at EPA for further details

https://www.epa.gov/aboutepa/urban-freshwater-salinization

Conclusions

- Interaction between climate and land use change amplifies salt pulses
- Salt is replacing nitrogen and phosphorus as pollutant of emerging concern
- Restoration and conservation can reduce downstream transport of salt pollution