

Spatial and Temporal Variability in Urban Water Quality on a Tropical Island

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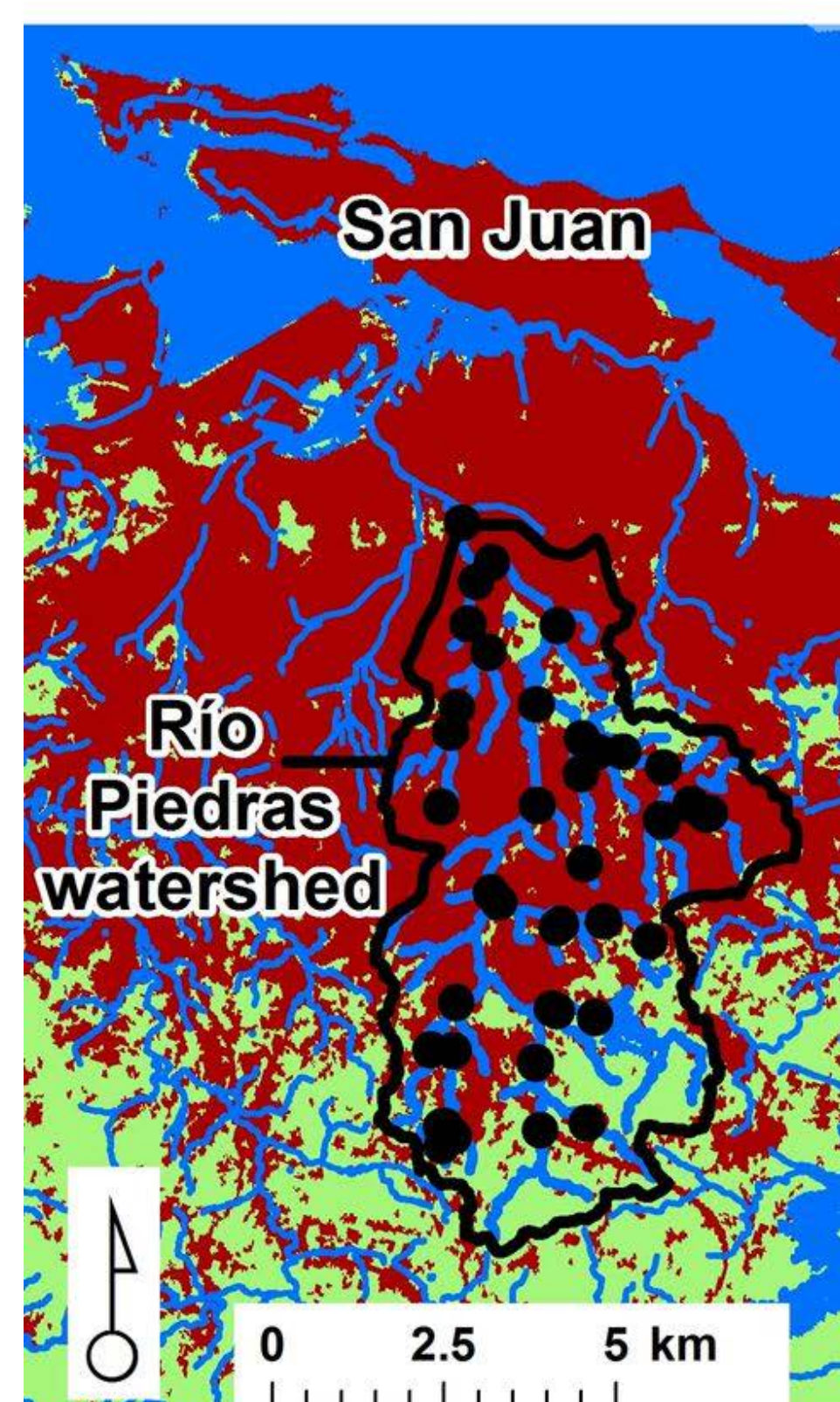
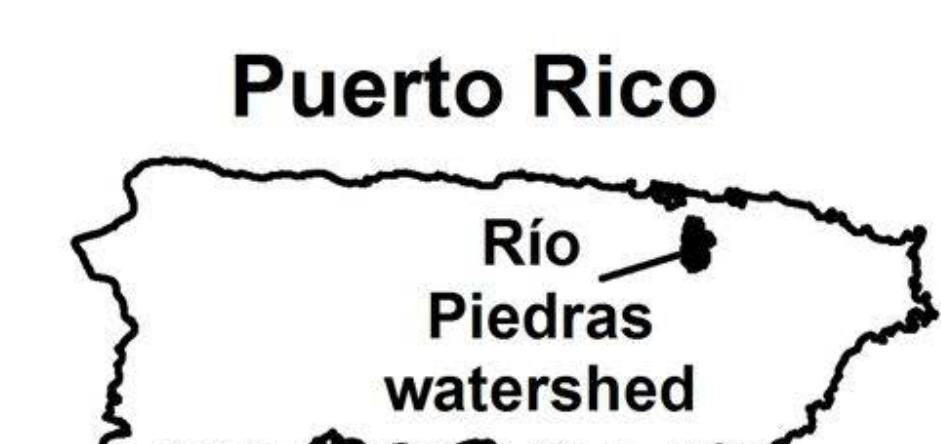
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Introduction

- Rapid transit time from mountain to sea in small islands makes them particularly susceptible to coastal degradation from land use and urbanization
- Fringing mangrove lagoons and coastal reefs are at high risk from impact in tropical islands with high rainfall and runoff
- Tourist-based economies are especially vulnerable to economic losses from degraded water quality
- Focus here: How well does urban infrastructure protect water quality in San Juan, Puerto Rico?



Site Description



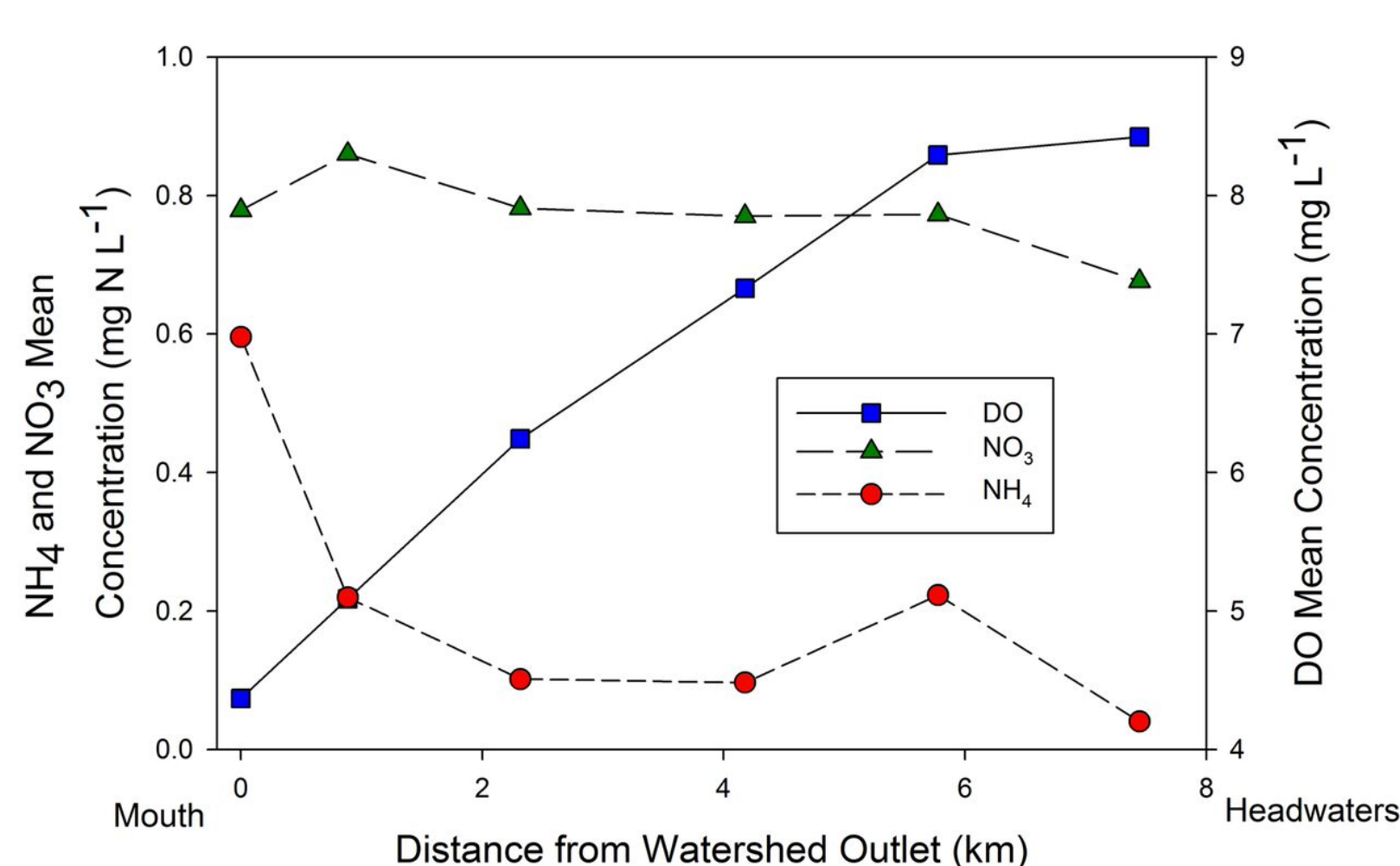
Legend

- Study Sites
- Water/Wetlands
- Forest/Grassland
- Developed



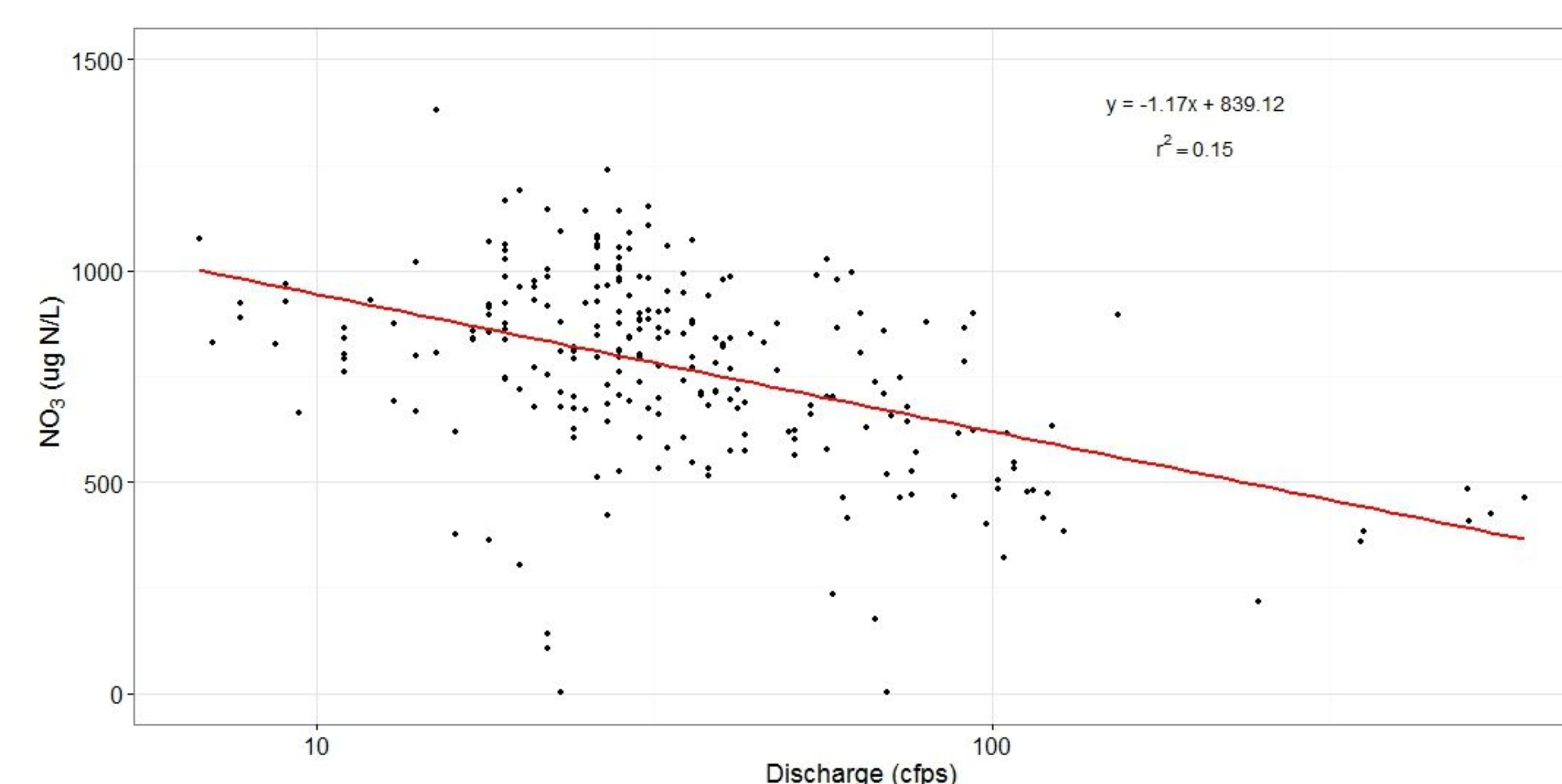
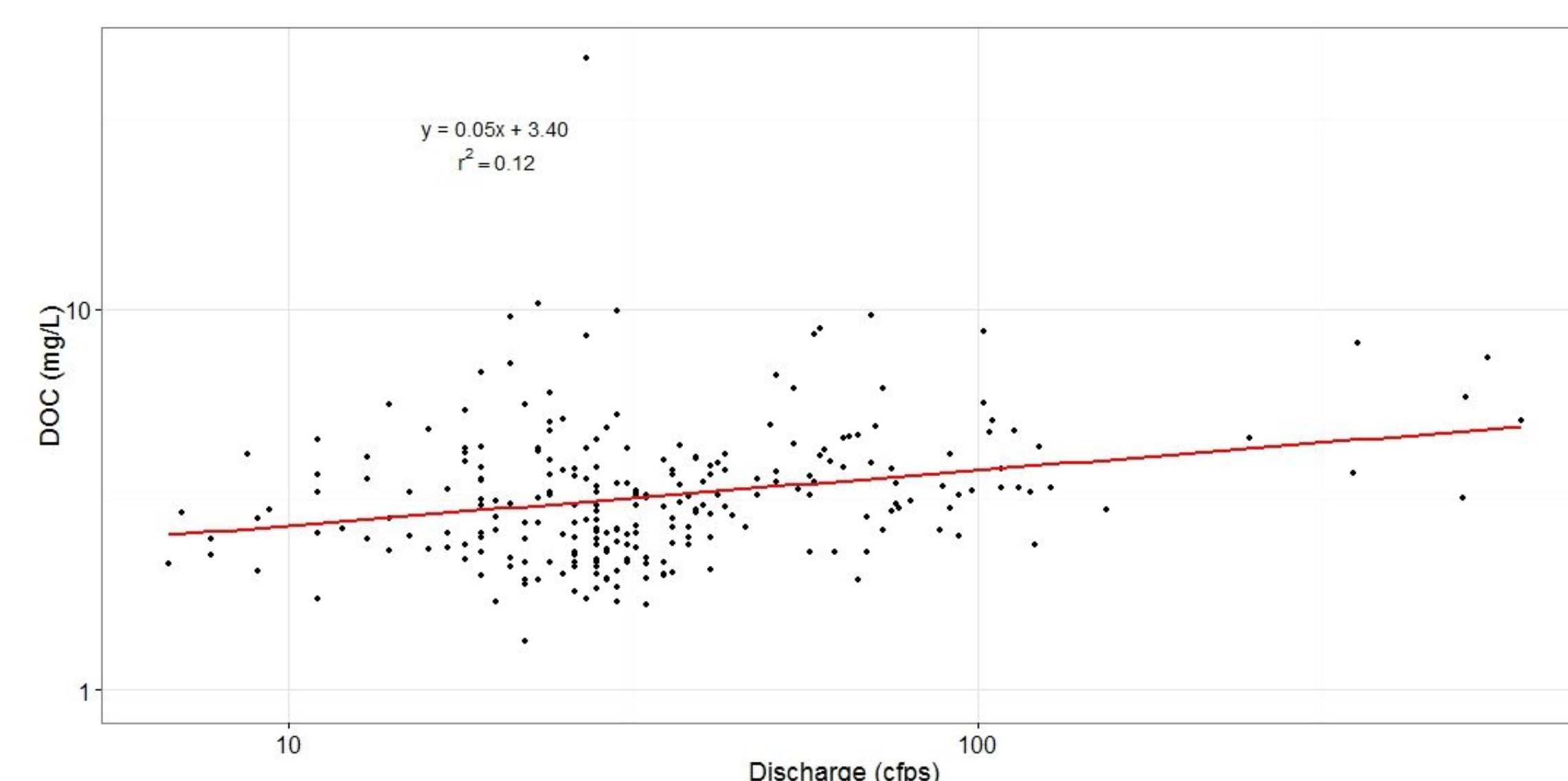
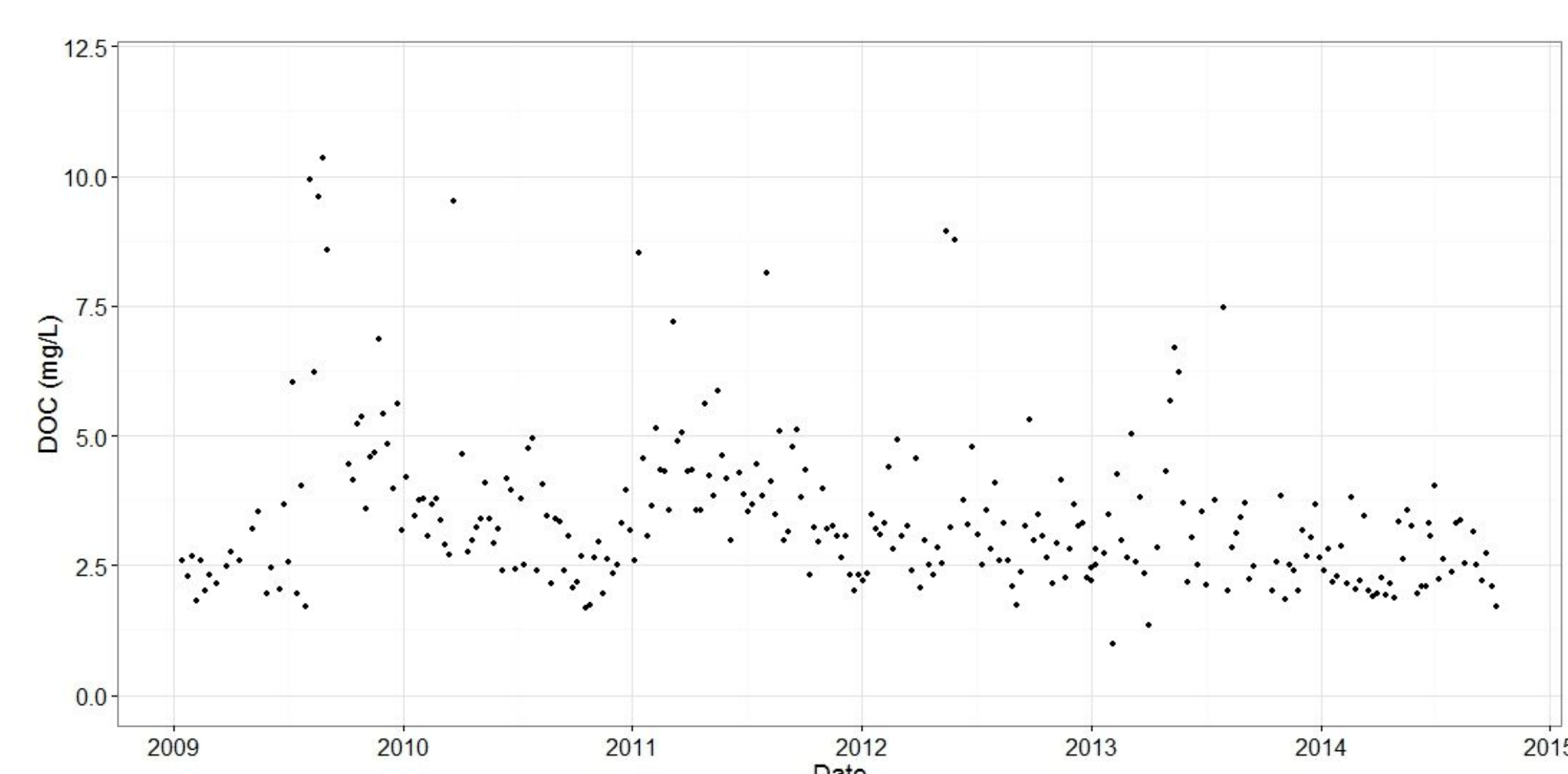
Spatial

High variability with striking decline in water quality downstream

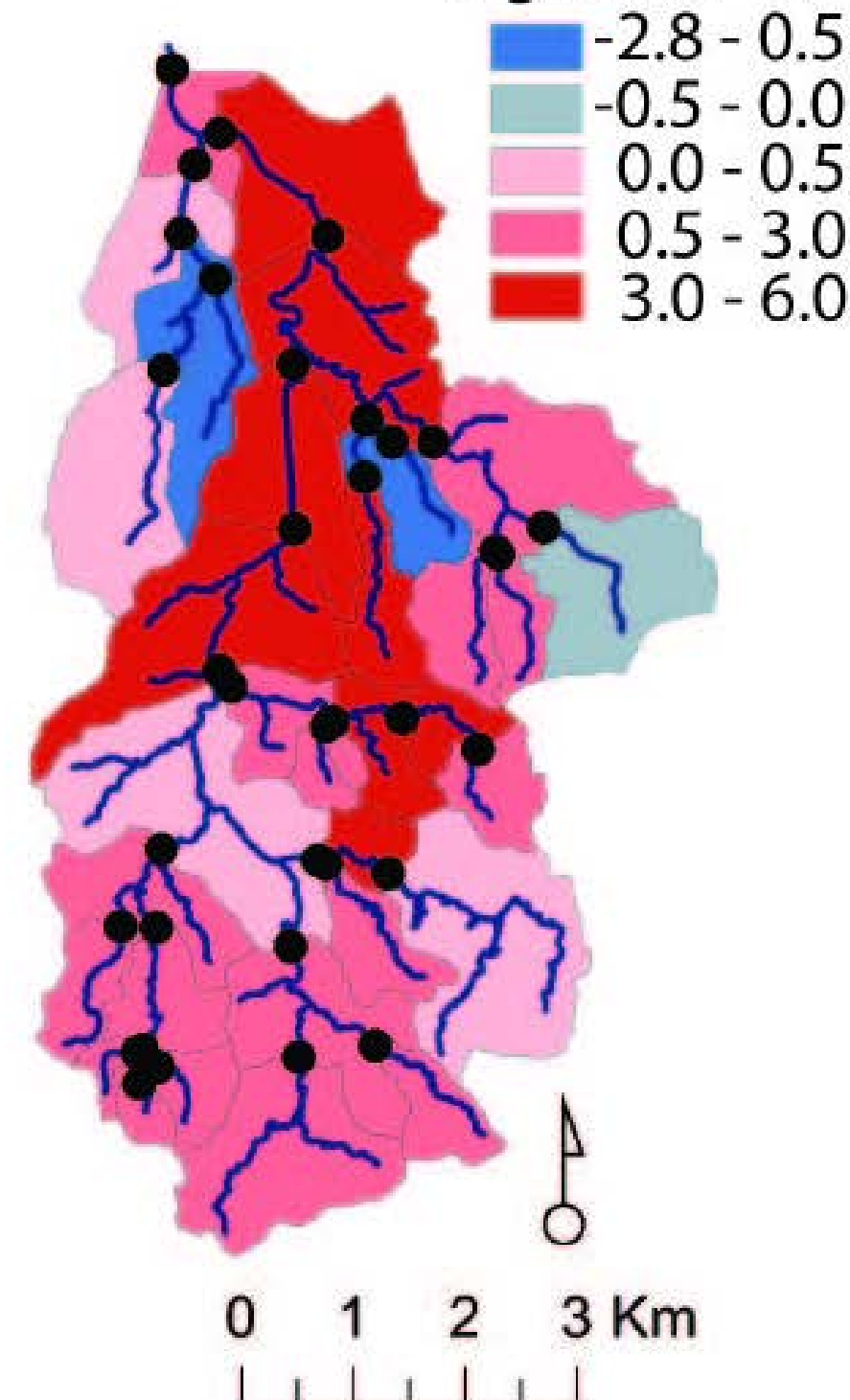


Temporal

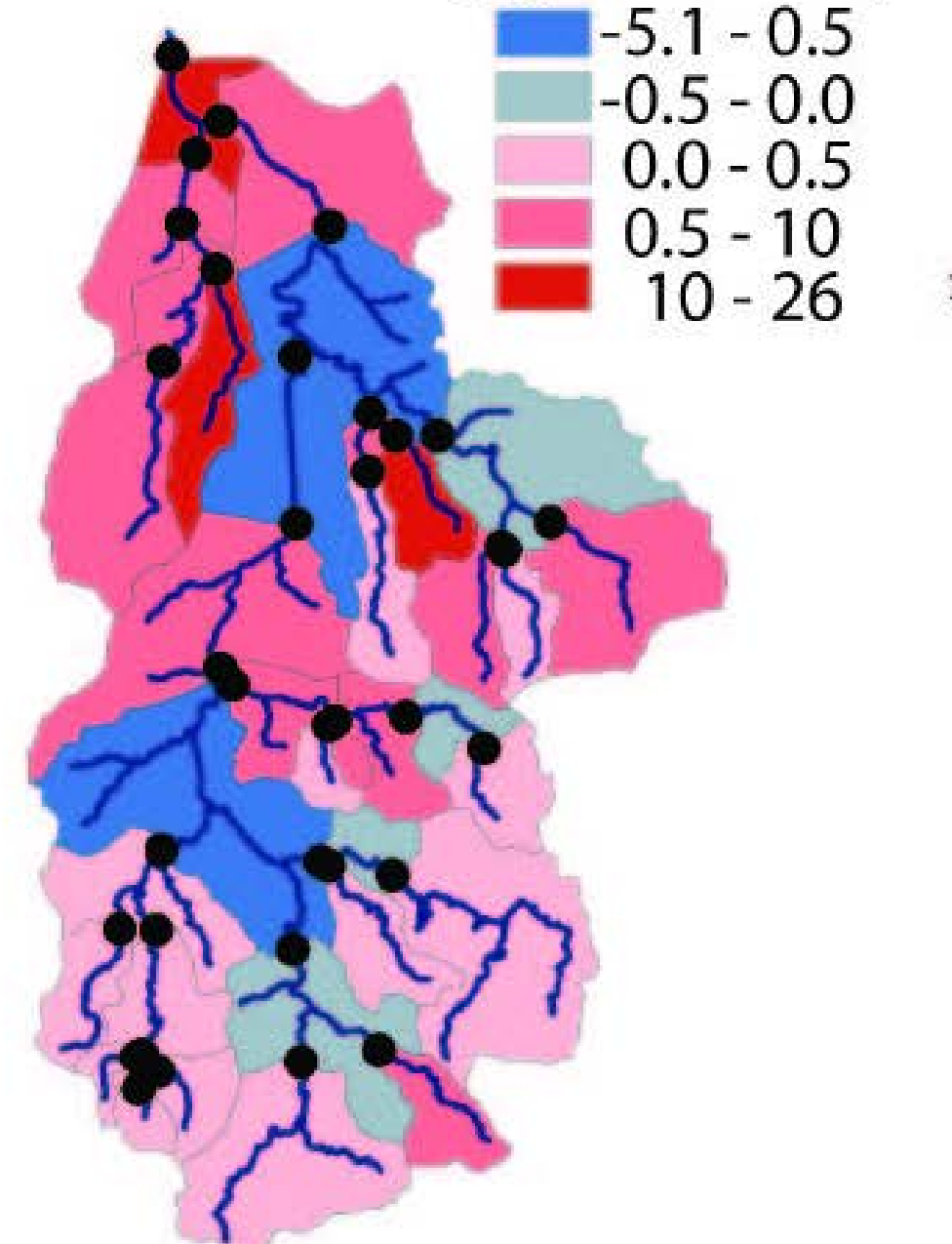
Variability driven by flow and perhaps seasonality; big storms matter!



NO₃ Loading Rate
(kg N km⁻² d⁻¹)



NH₄ Loading Rate
(kg N km⁻² d⁻¹)



Methods

Spatial Assessment:

- 30 sub-watersheds with a range of land use/land cover
- Variation in stream chemistry with sampling once a year for 7 years
- Model hydrologic network, and nitrogen loading or uptake down the drainage network
- Assess whether nitrogen loading varies with urban infrastructure

Temporal Assessment:

- Weekly samples taken over 6 years
- Nutrients, organic matter, major anions and cations
- Relationship with discharge as primary driver of concentration variation

Acknowledgements

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Literature cited

Potter JD, McDowell WH, Helton AM, Daley ML (2014) Incorporating urban infrastructure into biogeochemical assessment of urban tropical streams in Puerto Rico. *Biogeochemistry* 121: 271-286
 McDowell, WH, JD Potter, and A Ramirez (in prep.) Export of nutrients, organic matter, and weathering products from a tropical urban watershed.