Sources of dissolved organic nitrogen (DON) in tributaries of the Chowan River and Albemarle Sound

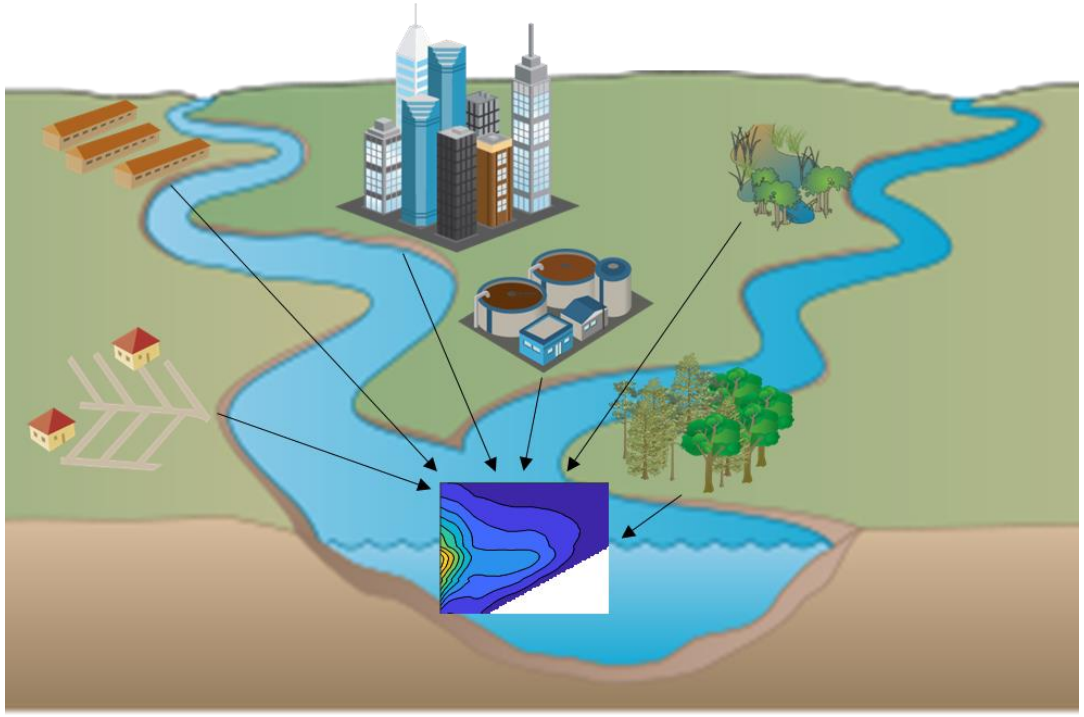
Chris Osburn

Department of Marine, Earth, and Atmospheric Sciences

NC State University

Albemarle Algal Bloom Summit

College of the Albemarle | November 03, 2023



Variation within categories allows for better estimation of dissolved organic matter sources

The DON problem

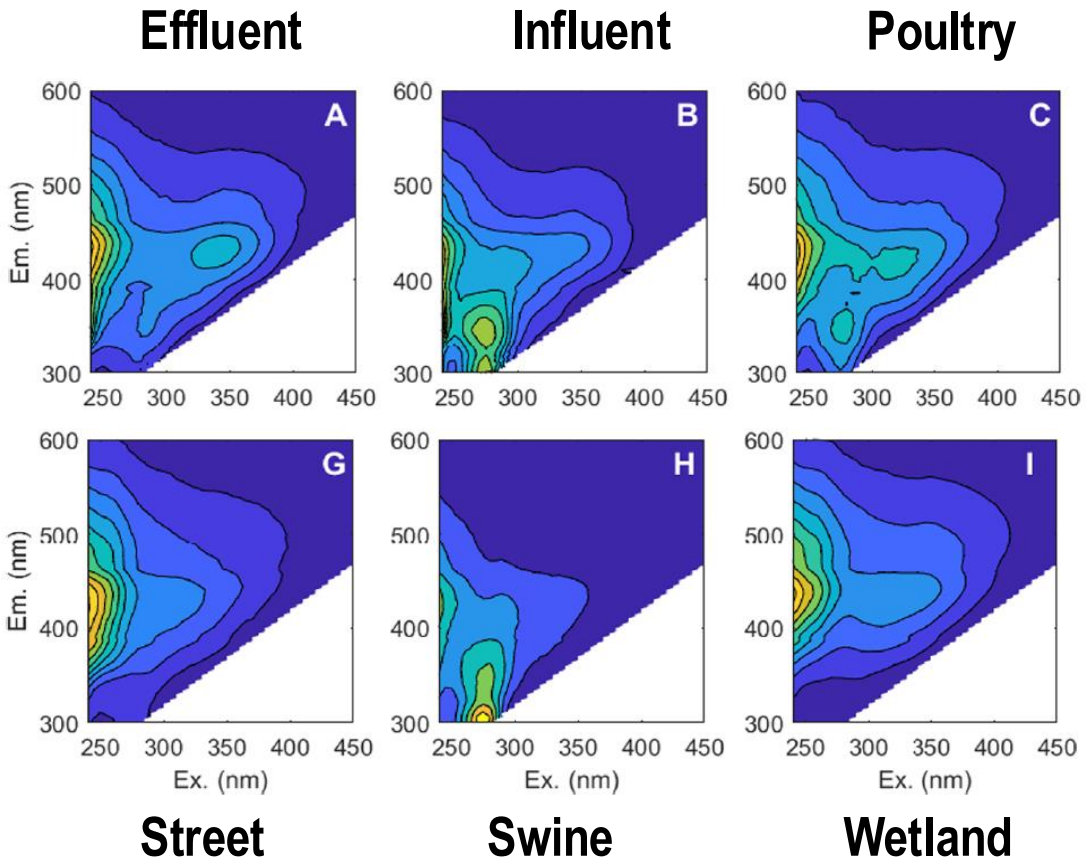
- The N-containing part of **natural organic matter** from algae, plants, soils found in streams, lakes, swamps, rivers, and estuaries
- Prevalent in **anthropogenic organic matter** – sewage, animal waste, septic, street runoff
- Made up of urea, amino acids, proteins, amino sugars – **good food** for algae and bacteria!
- Blue-green algae (*Anabaena flos-aquae*, *Microcystis aeruginosa*) grew about 50% faster on DON than did green algae or diatoms (Fielder et al. 2015)
  - ***DON could promote growth of HAB-forming species***.

Sources of DON are as important as their concentrations

We use **fluorescence** to

fingerprint the different sources, then determine their ***percentages*** in a water sample

Different fingerprints are hard to visualize



Hence, we use a regression approach to ***weight the sources*** in a water sample…

ACS ES&T Water

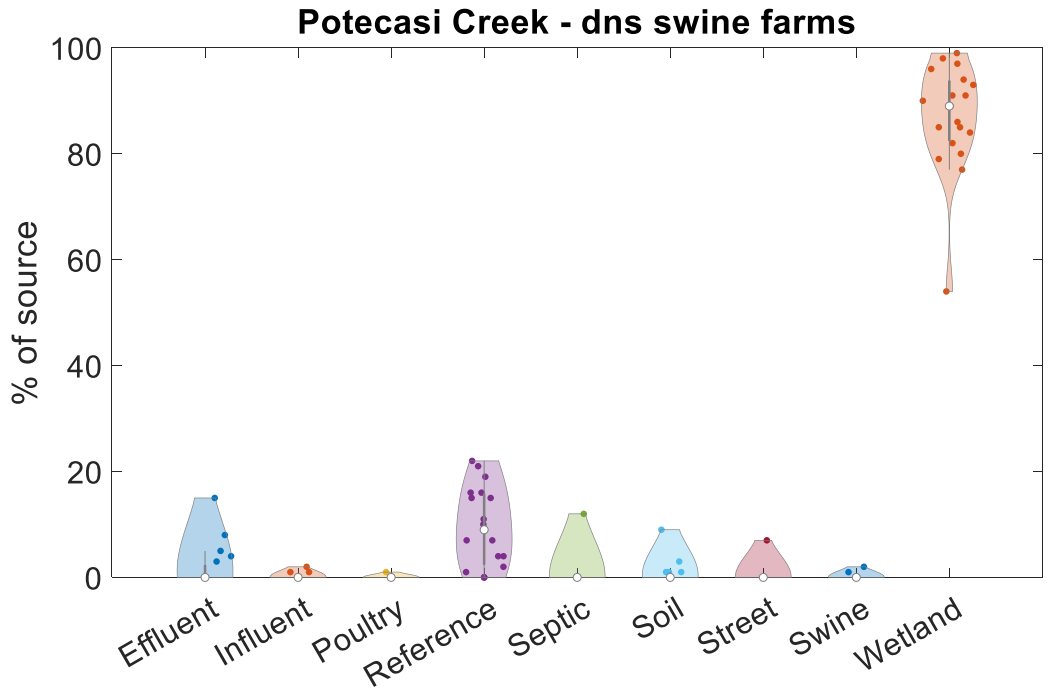
pubs.acs.org/estwater Article

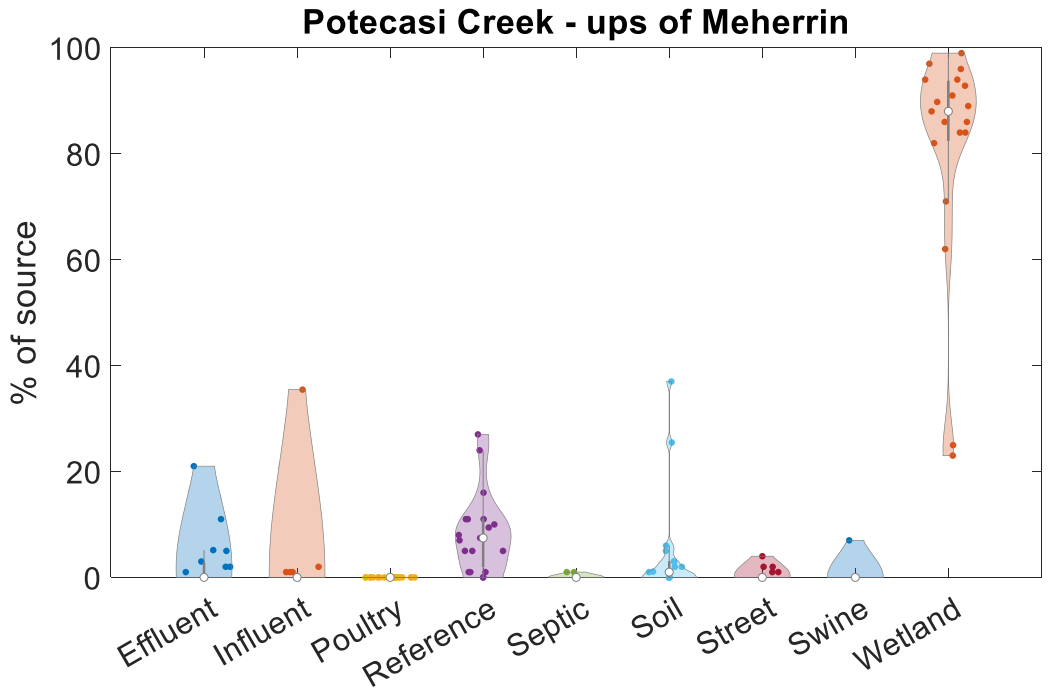
Routine Estimation of Dissolved Organic Matter Sources Using Fluorescence Data and Linear Least Squares

Jordan Bryan, Peter Hoff, and Christopher L. Osburn*

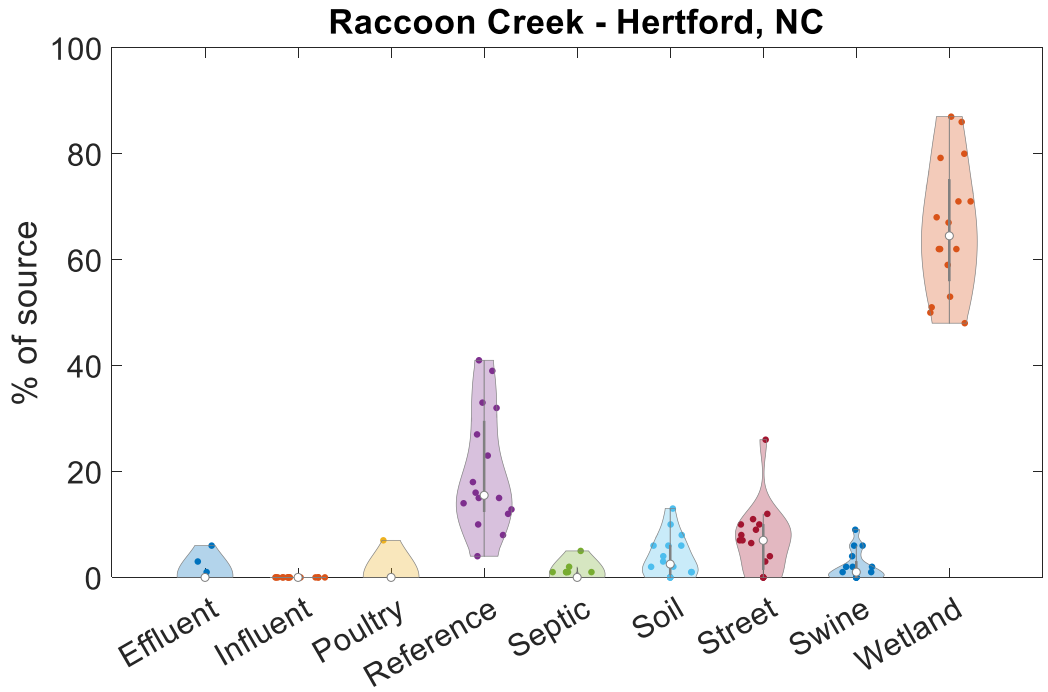
Cite This: https://doi.org/10.1021/acsestwater.2c00605 Read Online

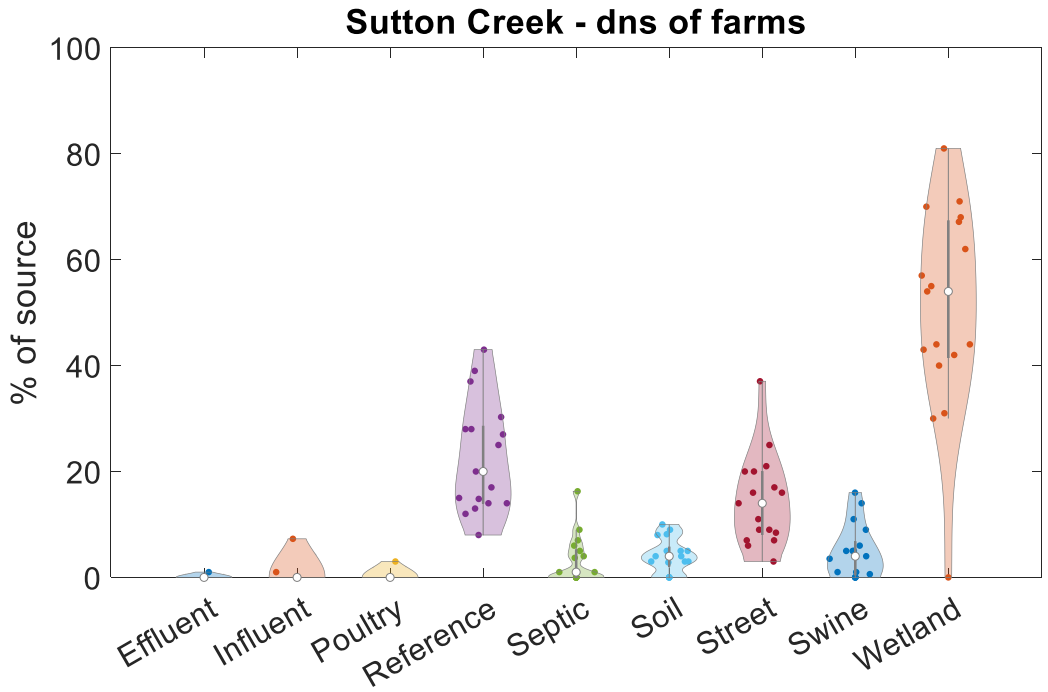
Sources from Potecasi Creek



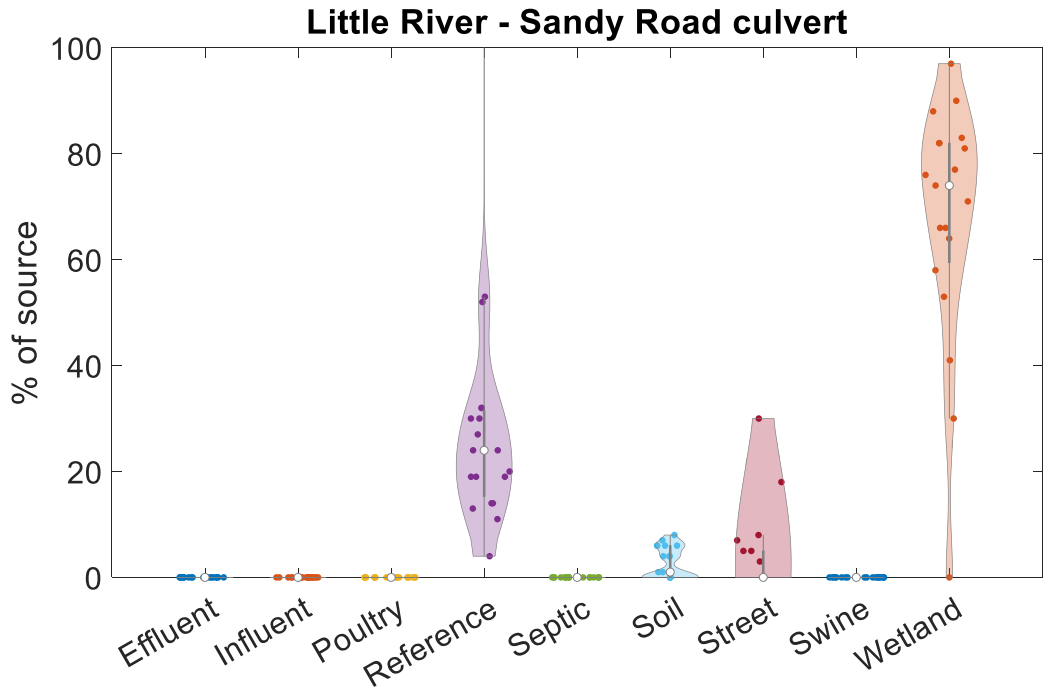


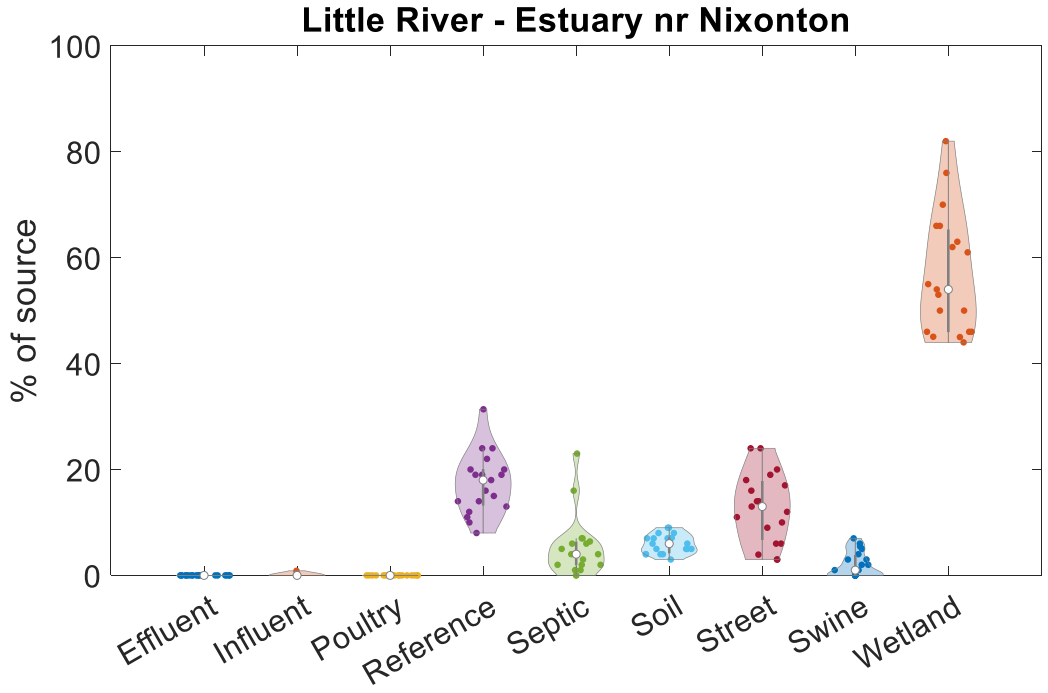
Sources to Perquimans River



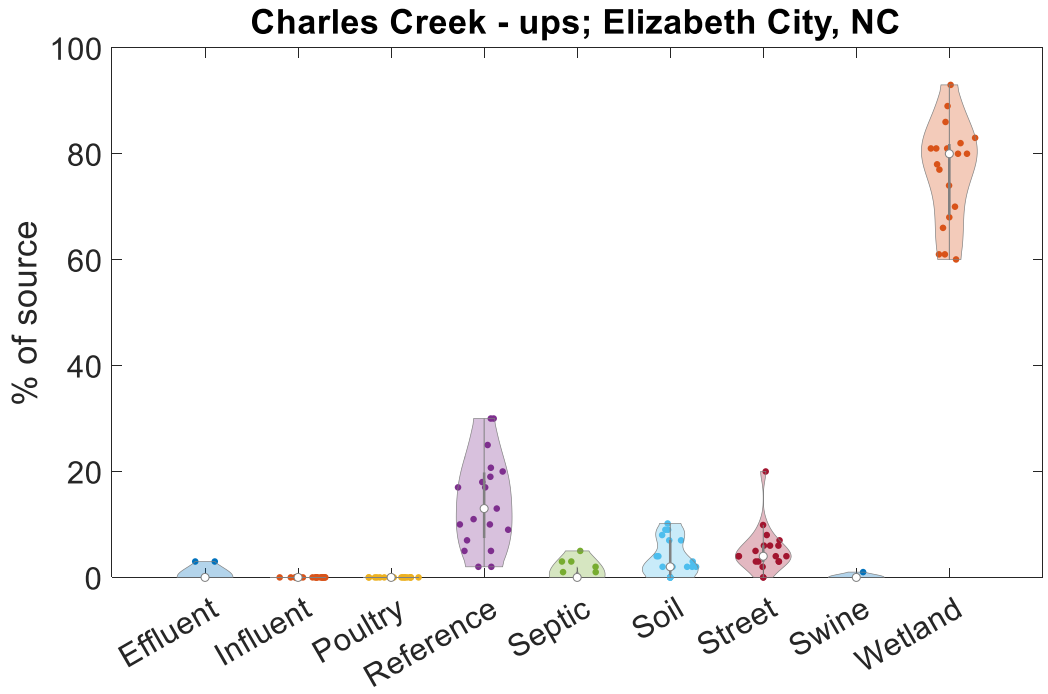


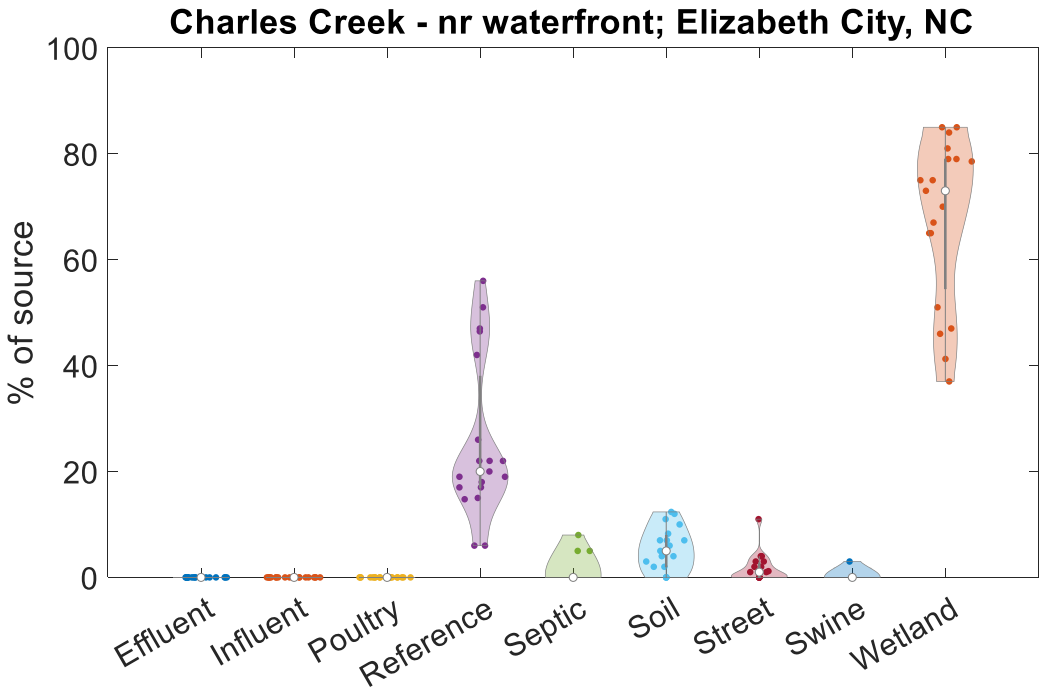
Sources to Little River





Sources to Pasquotank River





Takeaways

- Fluorescence is a **valuable screening tool** for sources of DON in watersheds
- Wetland sources dominate all locations in the 1.5 yr of sample collection
  - *Thinning of forest cover (clear cutting) and lack of buffers likely **accelerate the loss of wetland DON***
  - *[cf. Grace et al. 2005, Transactions of the ASABE, Vol. 49(3): 645−654]*
- Monthly sampling provides **only a snapshot** of trends
  - *Higher resolution of observations can detect **episodic pulses***
  - ***In situ sensors** deployments are desirable*

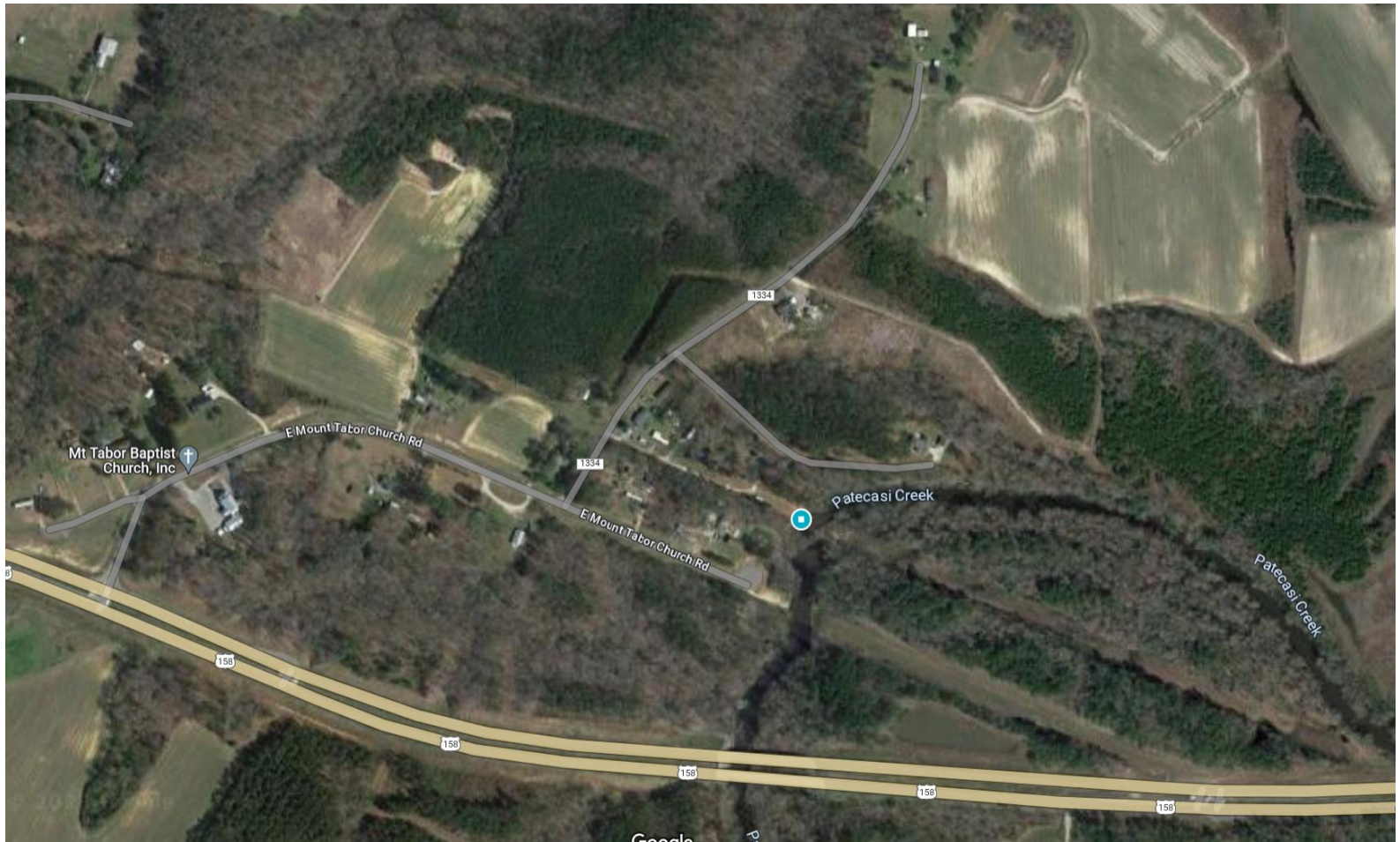
Ongoing Work: Jamie Huerta (Ph.D. candidate)

- Exploring **antecedent conditions** (rain before sampling, soil moisture) as important physical – weather and climate – driver
- Examining **current land use and historic land use changes** to find patterns that can explain coherent wetland dominance and secondary sources

- Google Earth images

Potecasi Site 5

Potecasi near Meherrin/Chowan



Pembroke & Filberts Creeks