Clearer or Greener: How does saltwater intrusion impact coastal river color in the Southeast?

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Intro

Sea level rise, drought, storm surge, water management, and connectivity can lead saltwater to intrude inland.

When saltwater mixes with dissolved organic matter (DOM) rich water, calcium and magnesium bind with DOM, removing it from the water column.

Adapted from Meyer et al. 2024, Scientific Data:
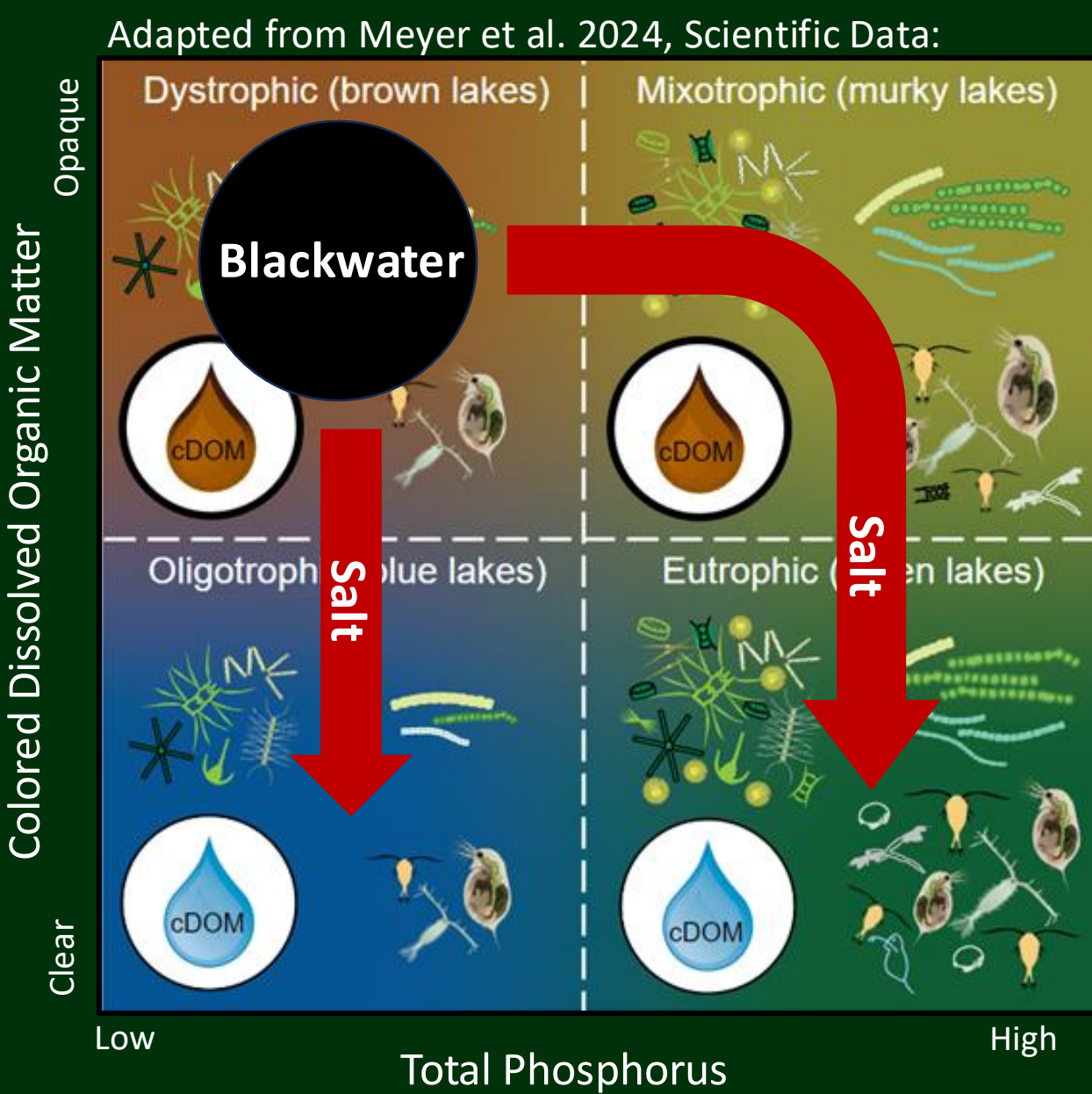
When *saltwater* intrudes into *blackwater rivers*, will water *clear* or *green*?

Methods

Downloaded Landsat[1] 5, 7, 8, 9 and Harmonized Landsat Sentinel surface reflectance[2] for 33 North Carolina Rivers from the National Hydrography Dataset (NHD).
Removed clouds with Fmask[3] (Landsat + HLS) and land with the Dynamic Surface Water Extent Algorithm[4] (Landsat) and Fmask (HLS)
Compared seasonal green reflectance to mean seasonal Palmer Drought Severity Index[5]

References

1) Landsat-7 image courtesy of the U.S. Geological Survey, 2) Claverie M. et al. Remote Sensing of Environment (2018) 3) Qui S. et al. Remote Sensing of Environment (2019), 4) Jones J. Remote Sensing (2019), 5) National Center for Atmospheric Research, 6) Ross M. et al. Water Resources Research (2019), 7) Gardner J. et al. Geophysical Research Letters (2020), 8) National Water Quality Monitoring Council

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In times of **drought**,
River reaches **nearest the ocean become greener**
But **upstream reaches do not.**
Suggesting drought induced saltwater intrusion
Increases productivity/algae abundance

Harmonized Landsat-Sentinel Green Reflectance
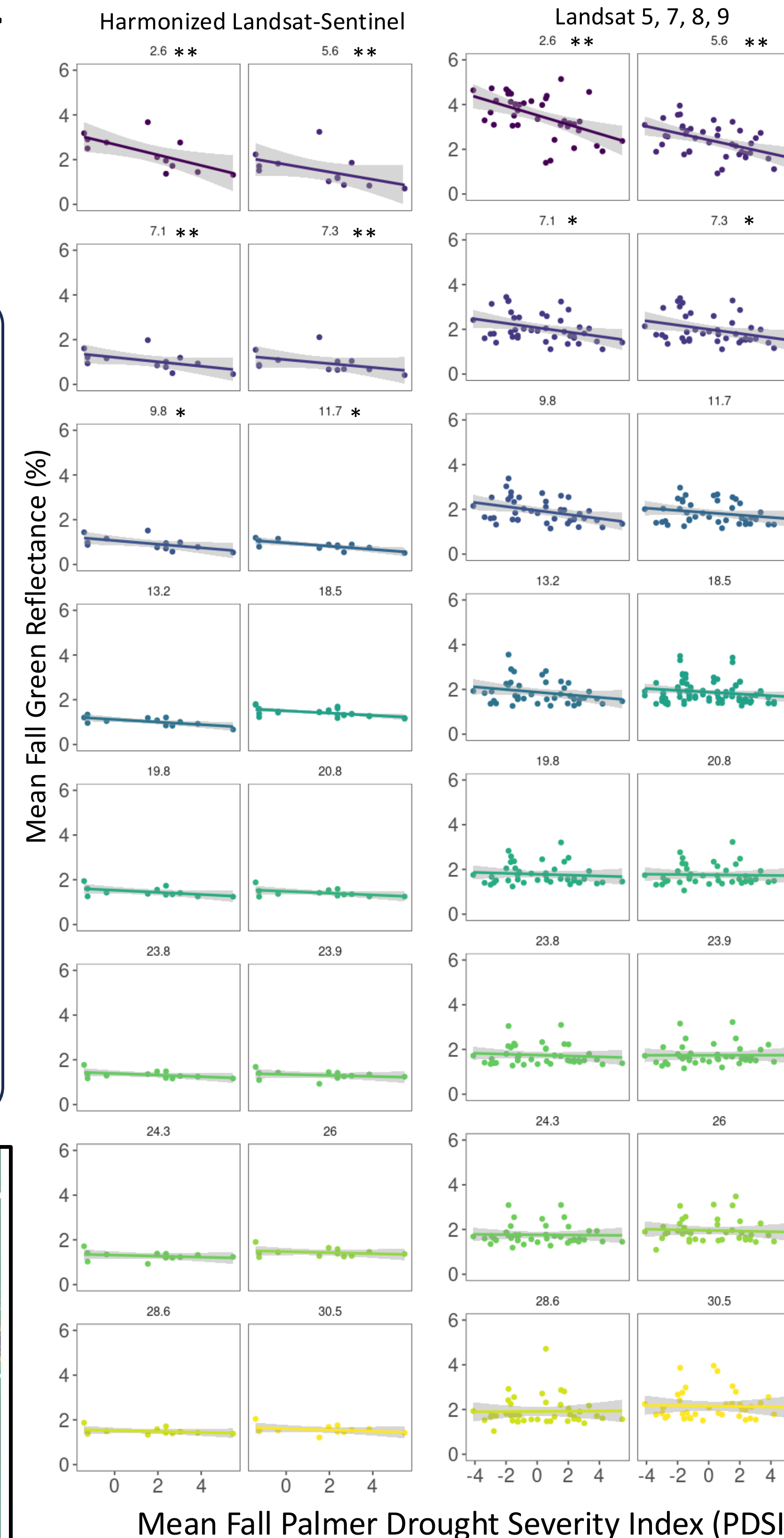White Oak River, North Carolina
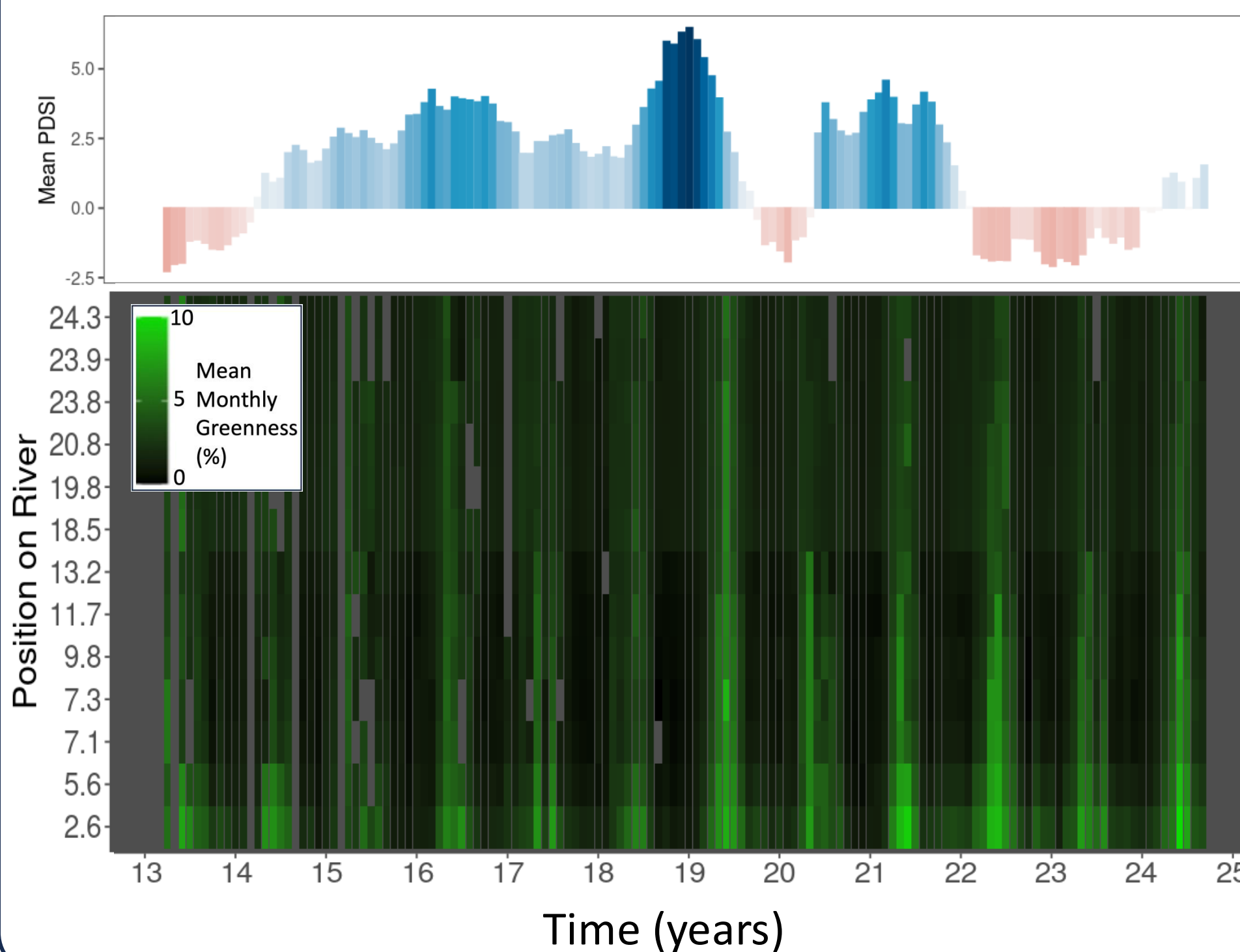
Landsat 8, high green reflectance day
2022-06-17
(White Oak and New River, NC)

Landsat 8, post Hurricane Florance
2018-09-19
(White Oak and New River, NC)

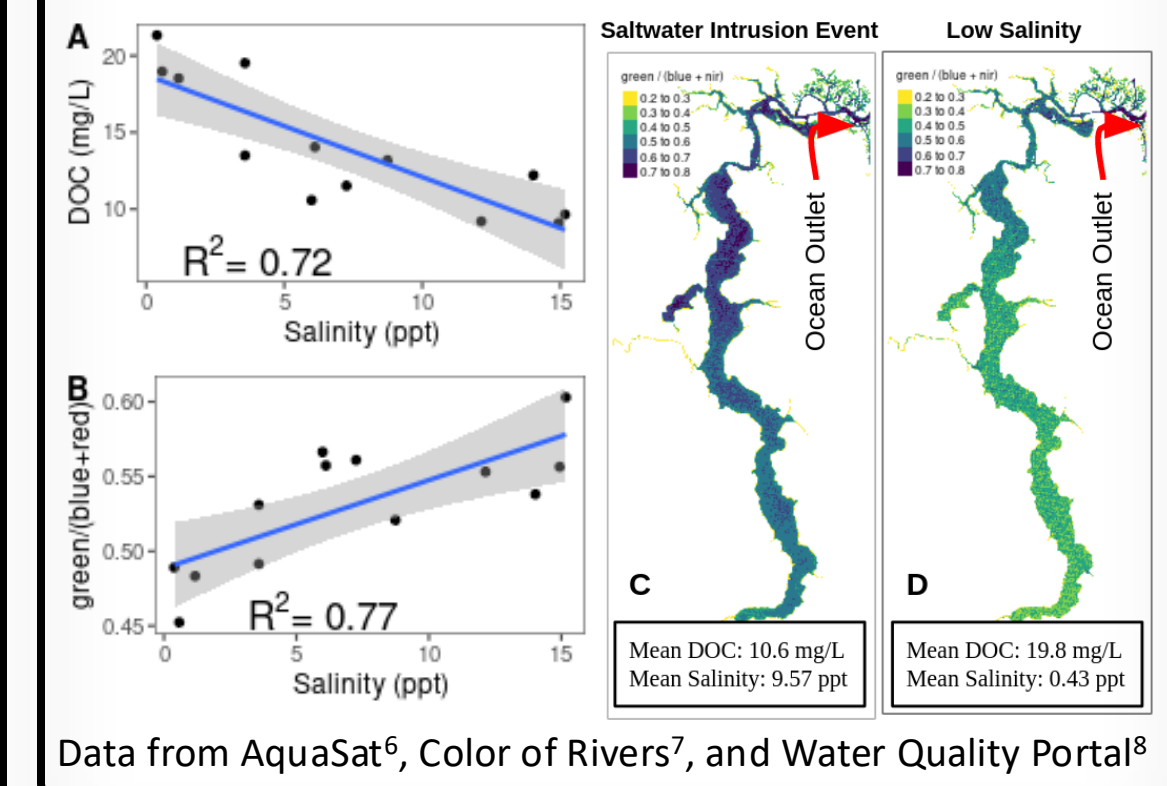## Drought vs. Greenness
White Oak River, NC

Mean Fall Green Reflectance (%)

Mean Fall Palmer Drought Severity Index (PDSI)
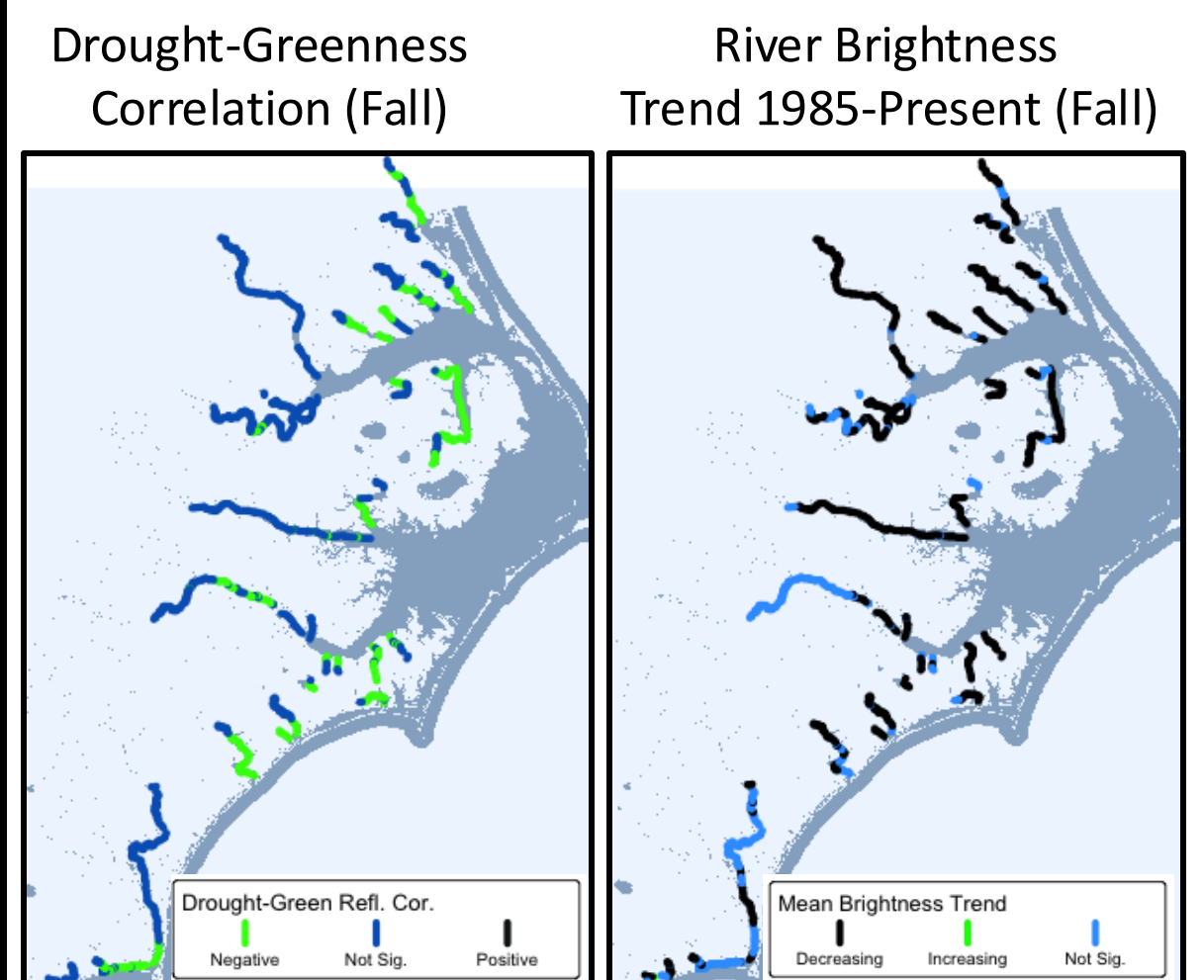
Predicting Salinity with Landsat

Given the change in color of blackwater rivers caused by saltwater intrusion, can we use optical imagery to predict salinity?

Case Study: St. Johns River (Jacksonville, Florida)

Data from AquaSat[6], Color of Rivers[7], and Water Quality Portal[8]

Future Work: Expand Analysis to Southeast

Drought-Greenness Correlation (Fall)

River Brightness Trend 1985-Present (Fall)