**Introduction**

Blackwater rivers are naturally low in dissolved oxygen (DO) levels in the summer months when water temperatures are high and flows are low (Georgia EPD). Blackwater rivers are influenced by wetlands, which retain water and provide organic detritus that is responsible for the humic acid stain of the water. DO may be impacted by natural factors like temperature, salinity, and the breakdown of organic plant matter. DO may also be affected by human influences through point- and non-point source pollutants. Determining baseline water quality characteristics of a particular location, especially in blackwater systems, can begin to help us understand what factors are contributing to unhealthy DO levels.

Planktonic communities are the basis of aquatic food webs and essential in primary production. The metabolic activity of planktonic and microbial organisms can also affect the DO levels in the water column. As sediment bacteria break down organic detritus, oxygen is used. An influx of nutrients can promote algal growth in the water column. As phytoplankton begin to decompose, oxygen is used. Phytoplankton biomass and production can be regulated by bottom-up controls like light availability and nutrients. They can also be regulated by top-down controls like predation from zooplankton and filter feeders.

**The Satilla River**

The Satilla River drains Georgia’s Coastal Plain and a watershed area of 9,140 km² (~3529 mi²). The major land use in the Satilla Watershed is the timber industry. Two sites on the lower reaches of the Satilla River were chosen to study water physiochemical parameters and plankton diversity. Woodbine (WB) is in the middle of a DO-impaired segment. Burnt Fort (BF) is not DO-impaired (Georgia EPD).

**Research question** – How do WB and BF differ in water quality and plankton community composition?

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**Results: Water Quality**

- **DO was higher at BF**
  - ![Graph showing DO levels with BF consistently higher than WB](image)
  - *(X = 3.3 mg/L > 2.5 mg/L; p < 0.001)*

- **Water temperature was higher at WB**
  - ![Graph showing water temperature with WB consistently higher than BF](image)
  - *(X = 28.86°C > 28.47°C; p < 0.001)*

- **Secchi disk depth was greater (turbidity was lower) at BF**
  - ![Graph showing Secchi disk depth with BF consistently deeper than WB](image)
  - *(X = 53.2 cm > 25.27 cm; p < 0.001)*

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**Results: Plankton Communities**

- **WB had a greater abundance of phytoplankton but not zooplankton**
  - ![Graph showing phytoplankton and zooplankton abundance](image)
  - *(phyto x = 130 cells > 11 cells; zoo x = 4 cells vs. 3 cells; * indicates p < 0.001)*

- **Plankton taxa were more evenly distributed at BF**
  - ![Graph showing plankton taxa distribution](image)
  - **Euglenoids and water fleas were more abundant at BF.**

- **BF had a greater overall diversity of plankton**
  - ![Graph showing plankton diversity](image)

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**Discussion**

- Both sites fell below the minimum dissolved oxygen state standard of 4.0 mg/L. What should the state standard be for DO in blackwater rivers?
- WB and BF differed in DO, temperature, and turbidity. What is the impact of natural versus human factors on water quality?
- These measures are watershed-specific depending on land uses. Long-term monitoring is needed to better understand baseline characteristics.
- Total phytoplankton abundance differed between sites but zooplankton did not. Variation may be explained by current speed, productivity, and/or heterotrophy.
- Specific plankton taxa may be indicators that respond differently to water quality.

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**Methods**

- 22 morning sampling events at WB and BF in June–July 2014
- 20 minute plankton tows
- Collected water quality and other physiochemical parameters
- Photographed, counted and identified (to higher taxa) plankton cells with microscope (0.1 mL random aliquot)
- Used paired t-tests to test for differences between WB and BF in physiochemical variables and abundance of plankton groups
- Compared plankton community composition using Shannon diversity index, richness, and evenness of higher taxa

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