

Co-Variation of Macrophyte and Microbial Mat Standing Stocks along Benthic Ecosystem Resource and Stress Gradients

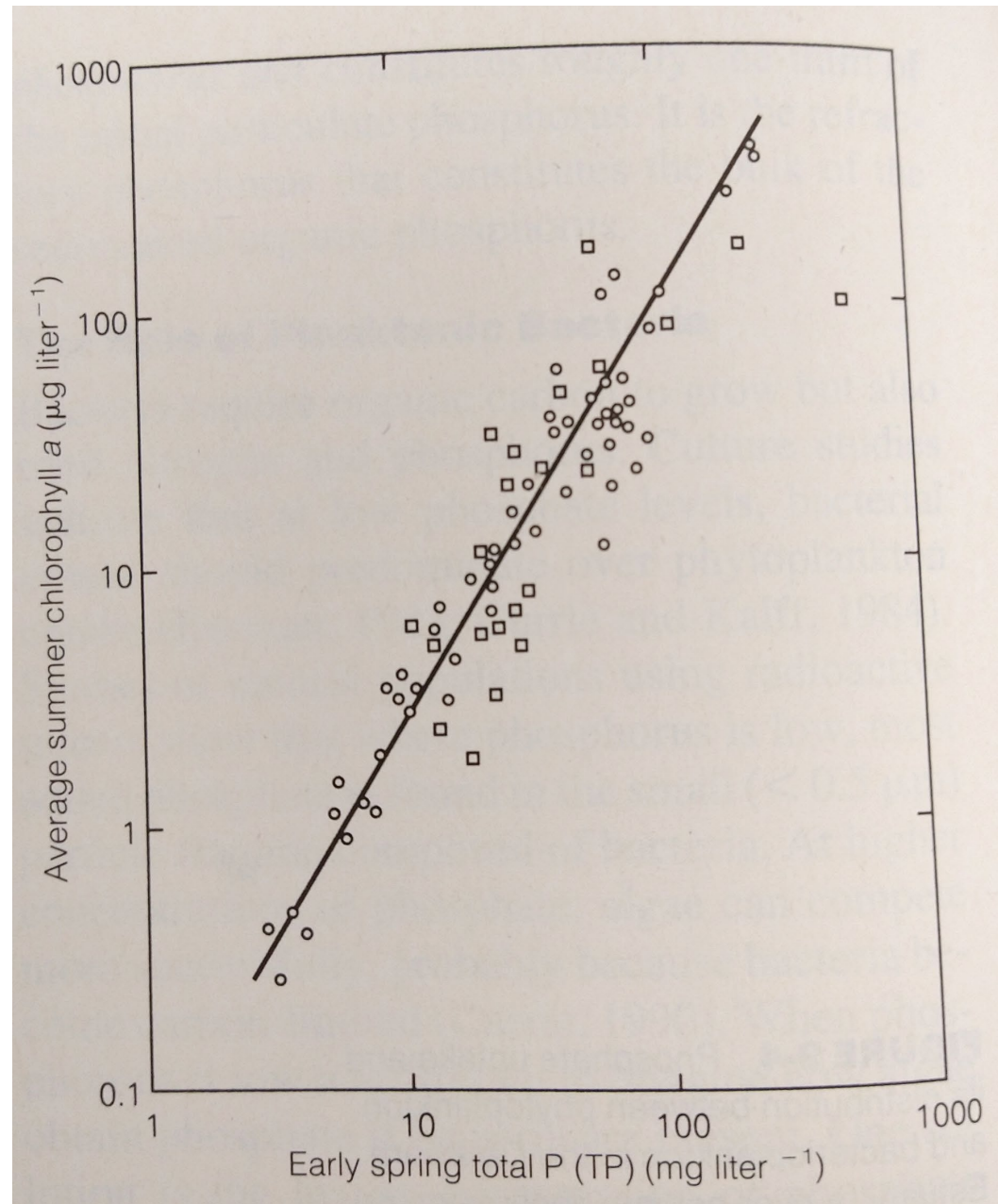
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Oligotrophic?

Oligotrophic



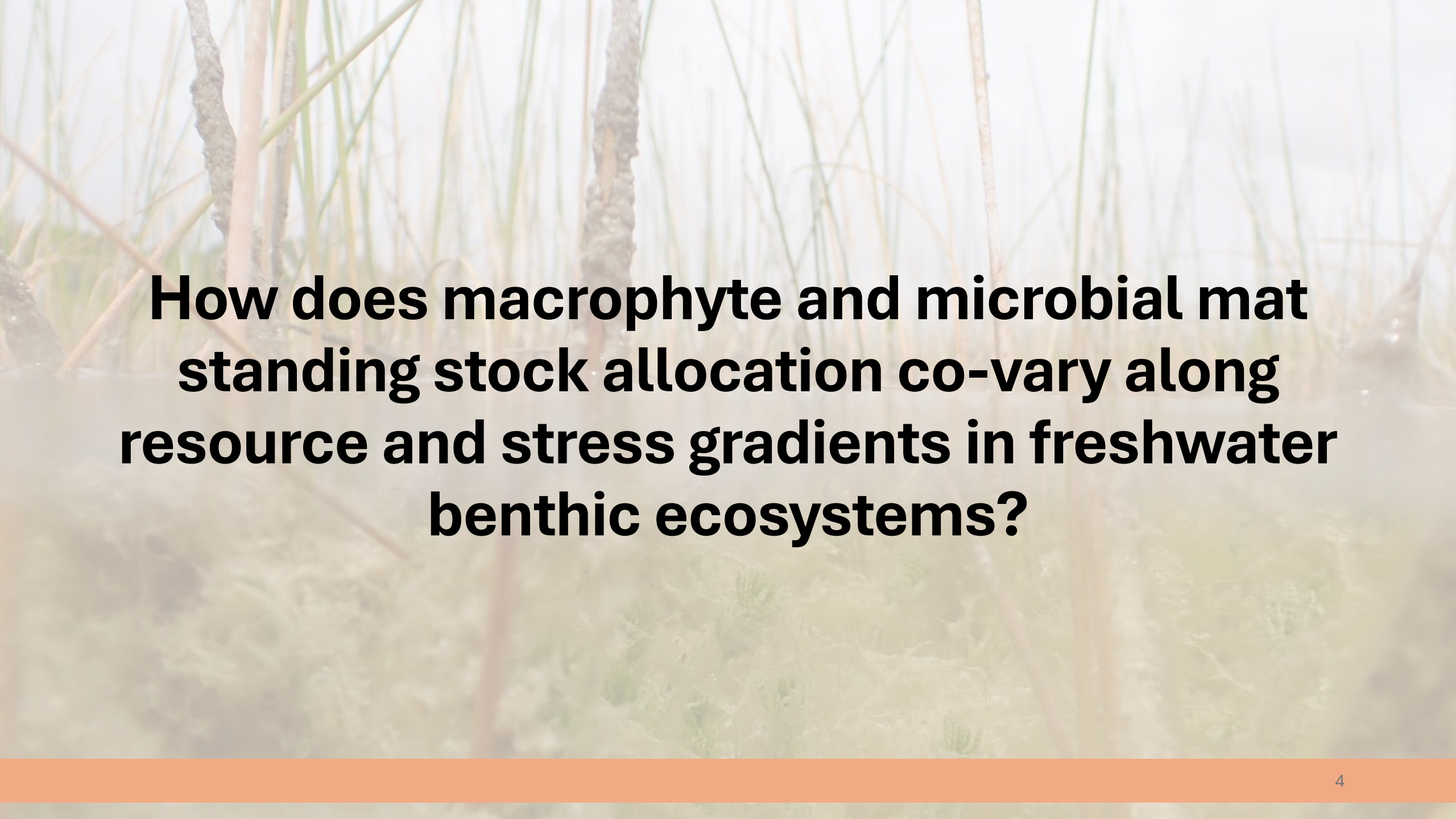
Eutrophic

Production
Paradox

Standing Stock Allocation



Gaiser et al., 2010
Photo Credit: Franco Tobias



**How does macrophyte and microbial mat
standing stock allocation co-vary along
resource and stress gradients in freshwater
benthic ecosystems?**

Sampling Locations

Plot Types



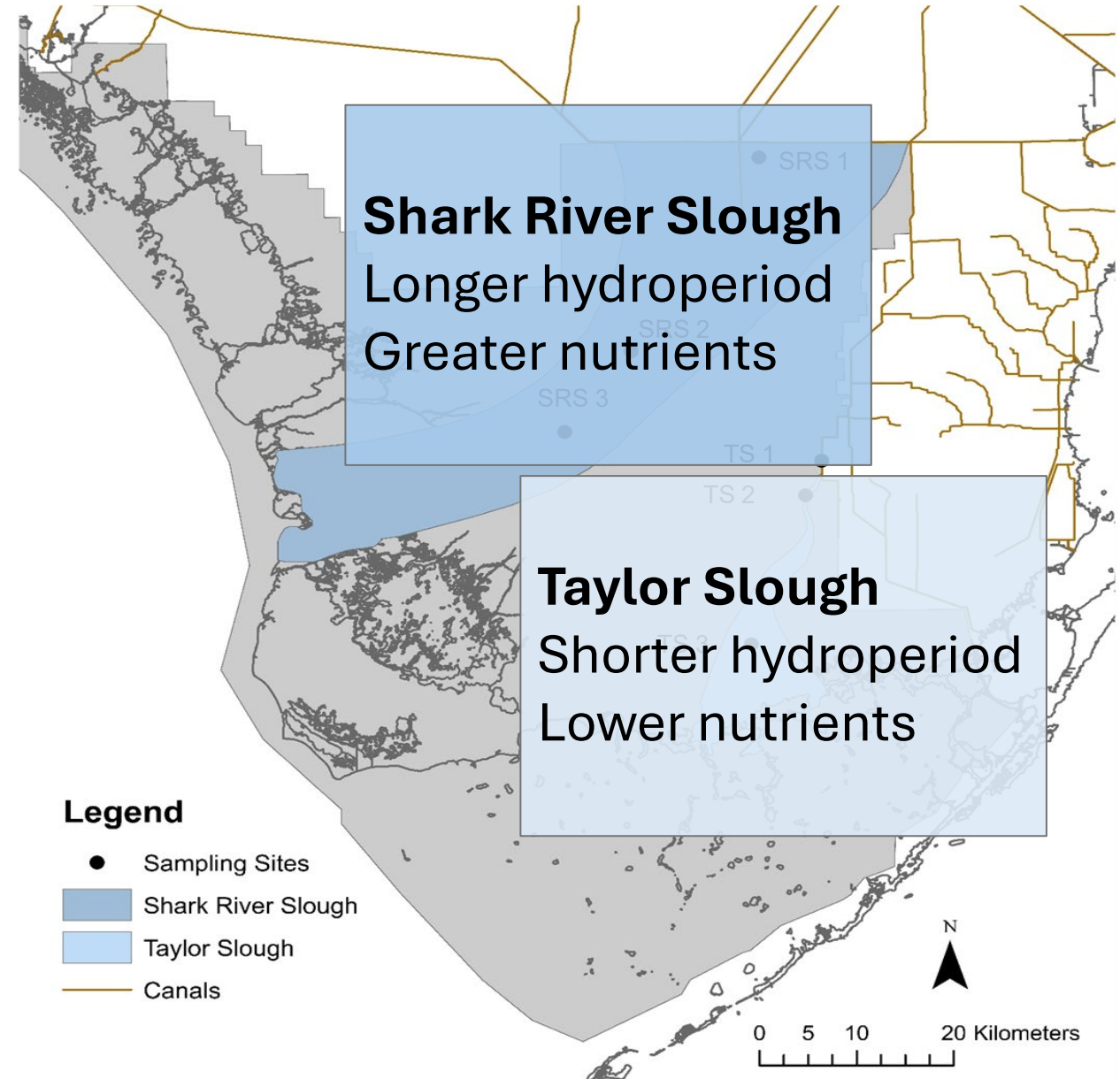
Cladium jamaicense

- Ridge habitat
- Shallow
- Shorter hydroperiod



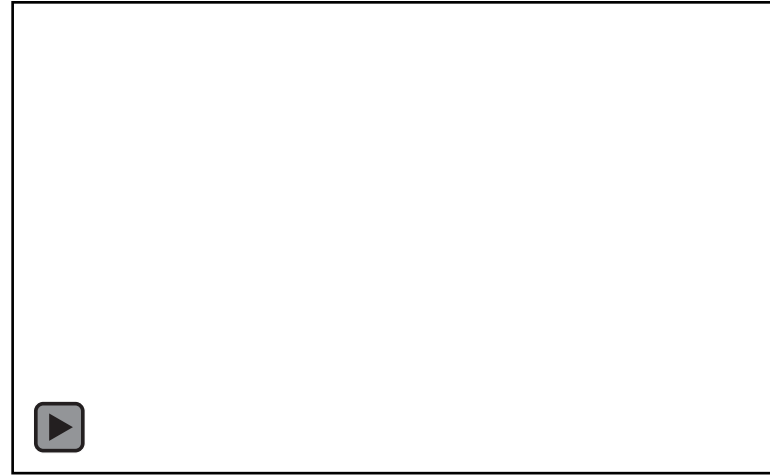
Eleocharis cellulosa

- Slough habitat
- Deeper
- Longer hydroperiod



Methods

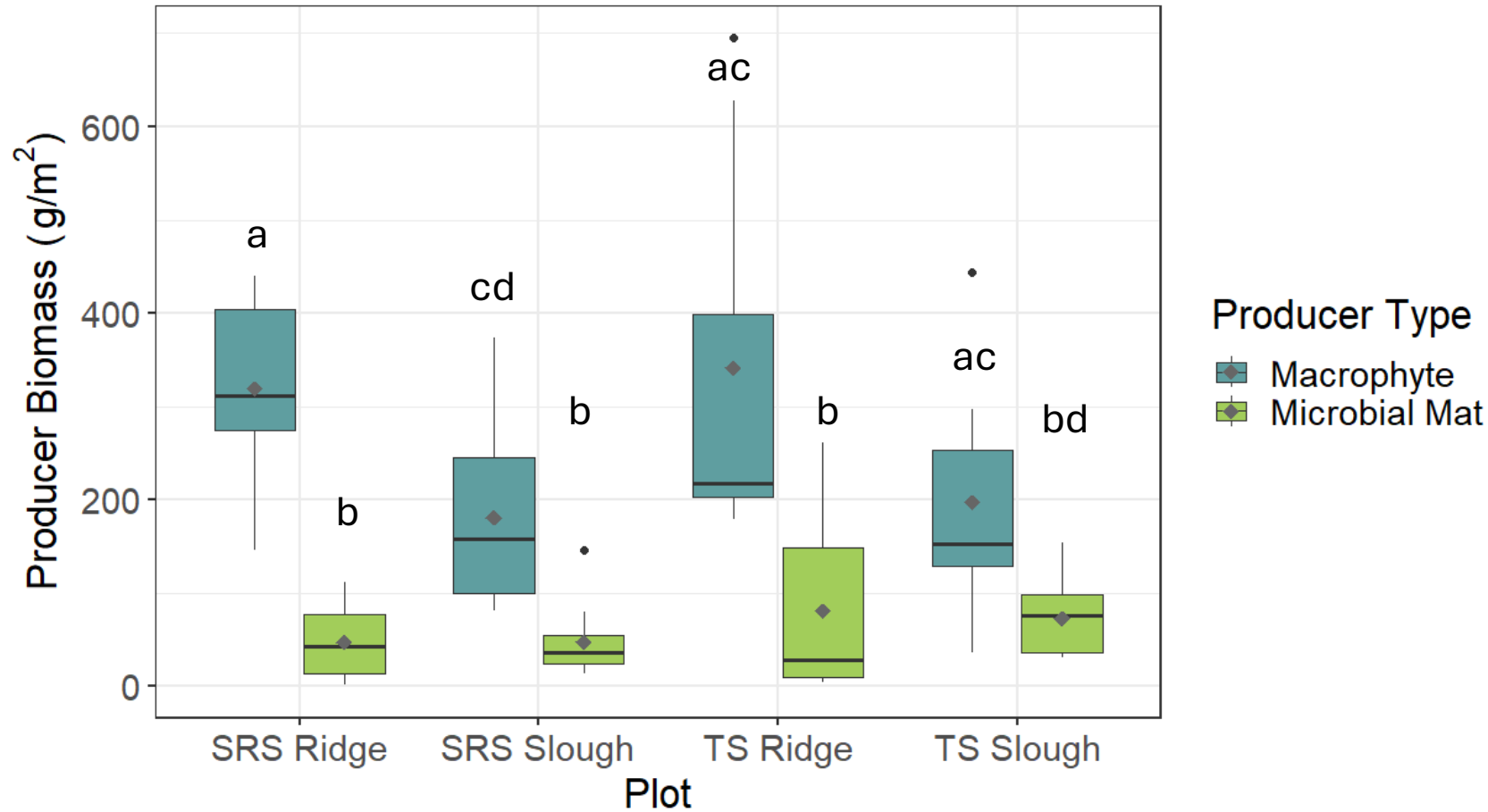
- Standing Stock Allocation
 - Biomass
 - Macrophyte (DM g/m²)
 - Microbial mat (AFDM g/m²)
 - C, N, and P concentrations (μg/g)
- Resource Gradient
 - Macrophyte or microbial mat C, N, and P concentrations (μg/g)
- Stress Gradient
 - Water depth (cm) and hydroperiod (days)



Video Credit: Gus Dominguez



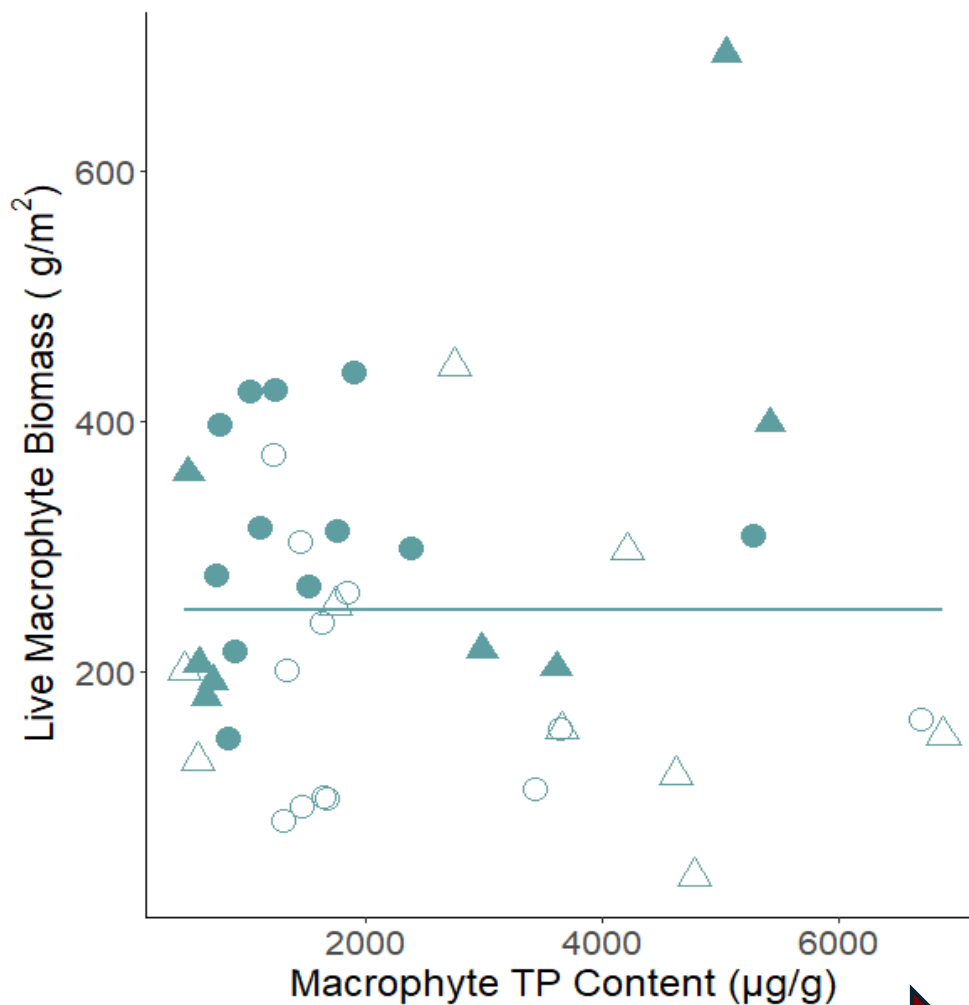
Photo Credit: Gabe Kamener



Greater
macrophyte
stock than
microbial stock

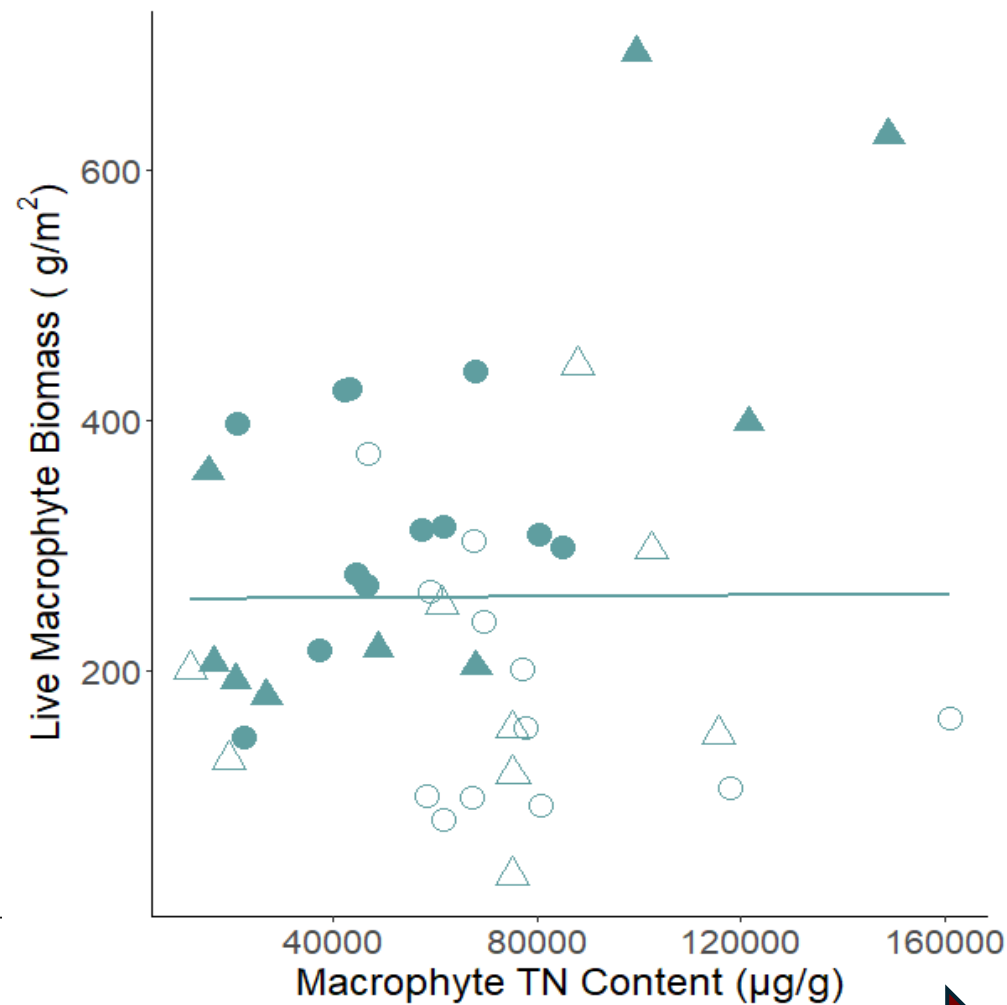
Similar
macrophyte and
microbial stock
across plots

Highly variable macrophyte stock along resource gradients



Low Nutrient Availability High

Macrophyte; $p = 0.27$, $edf = 1.00$, $R^2 = 0.004$, $f = 1.17$



Low Nutrient Availability High

Macrophyte; $p = 0.55$, $edf = 1.84$, $R^2 = 0.02$, $f = 0.64$

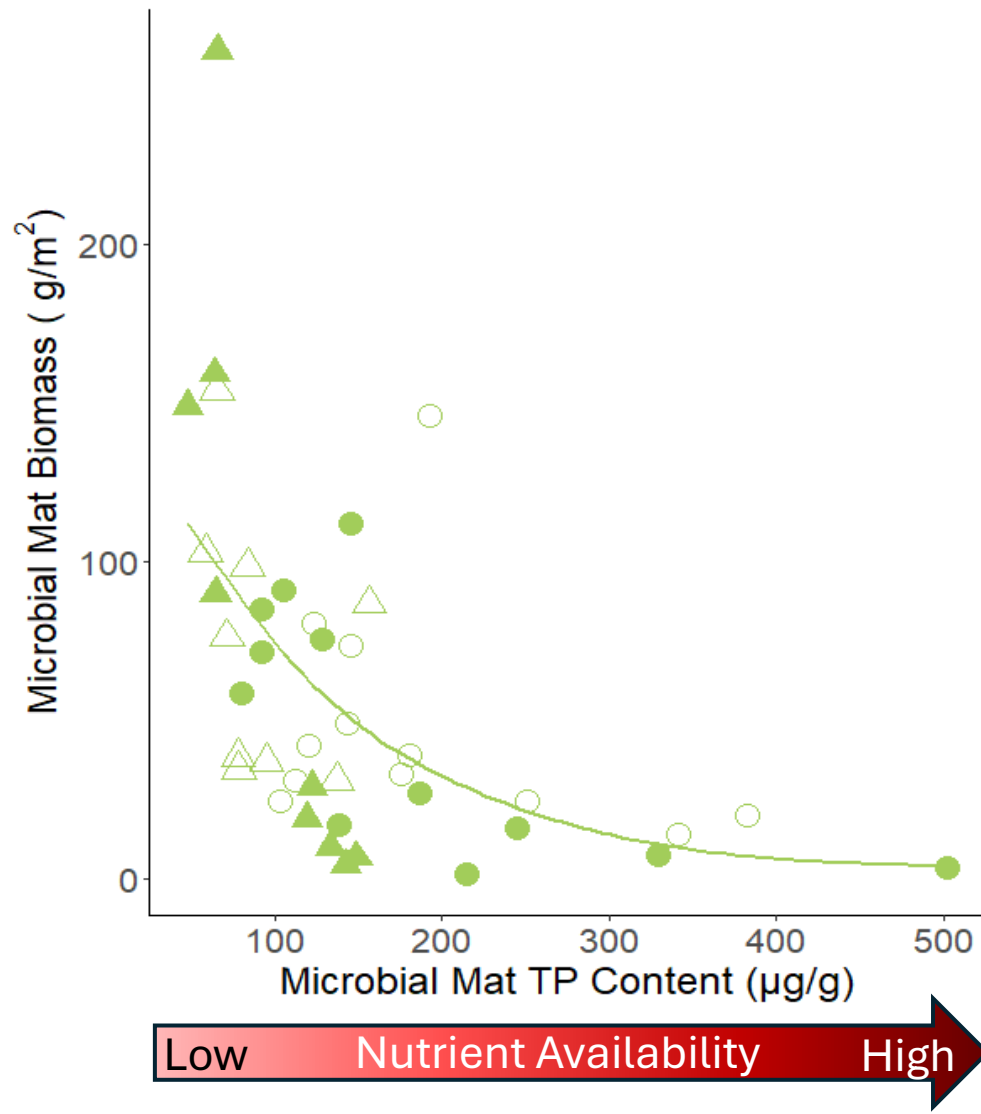
Wetland Plot

- SRS-CJ
- SRS-EC
- ▲ TS-CJ
- △ TS-EC

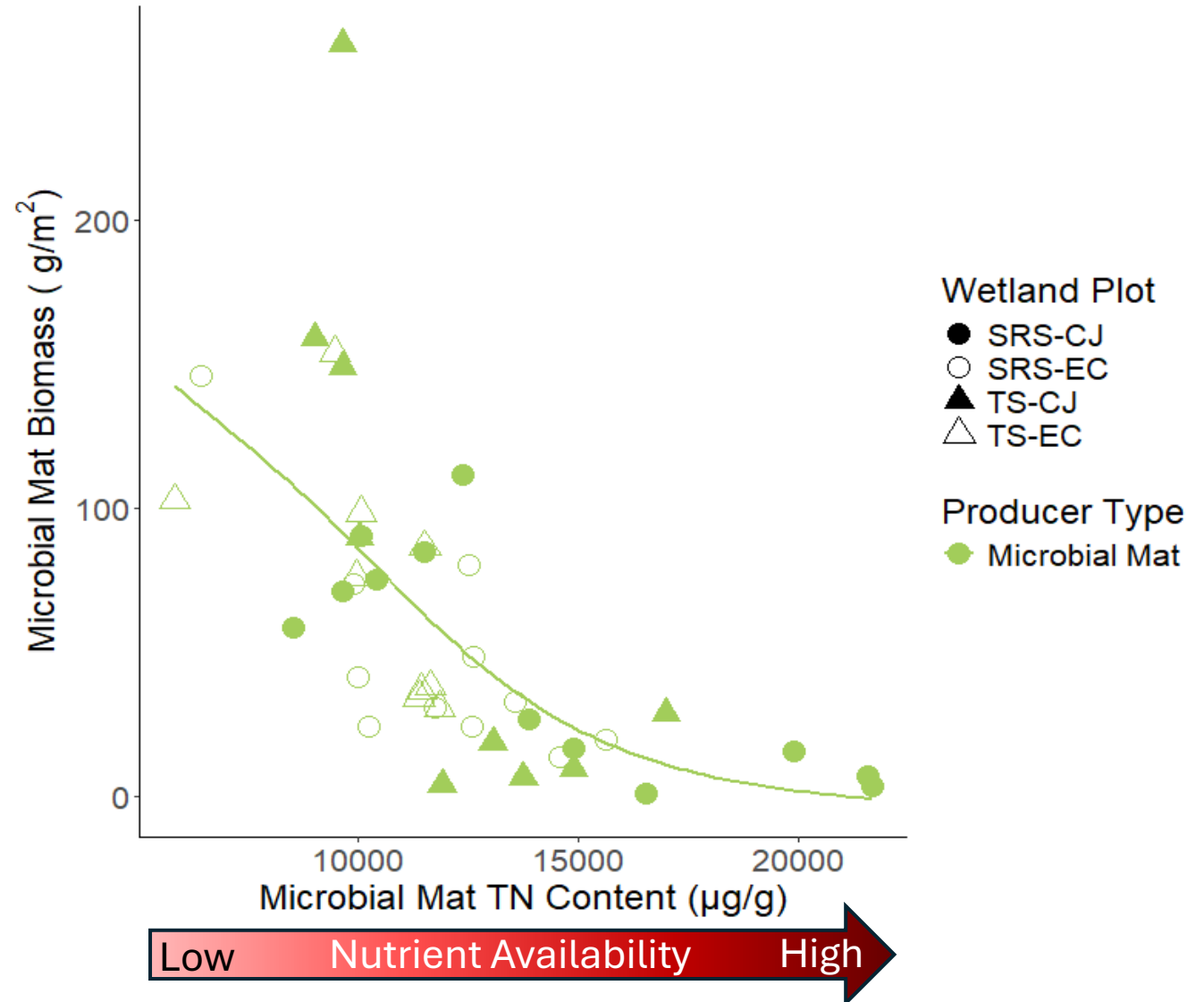
Producer Type

- Macrophyte

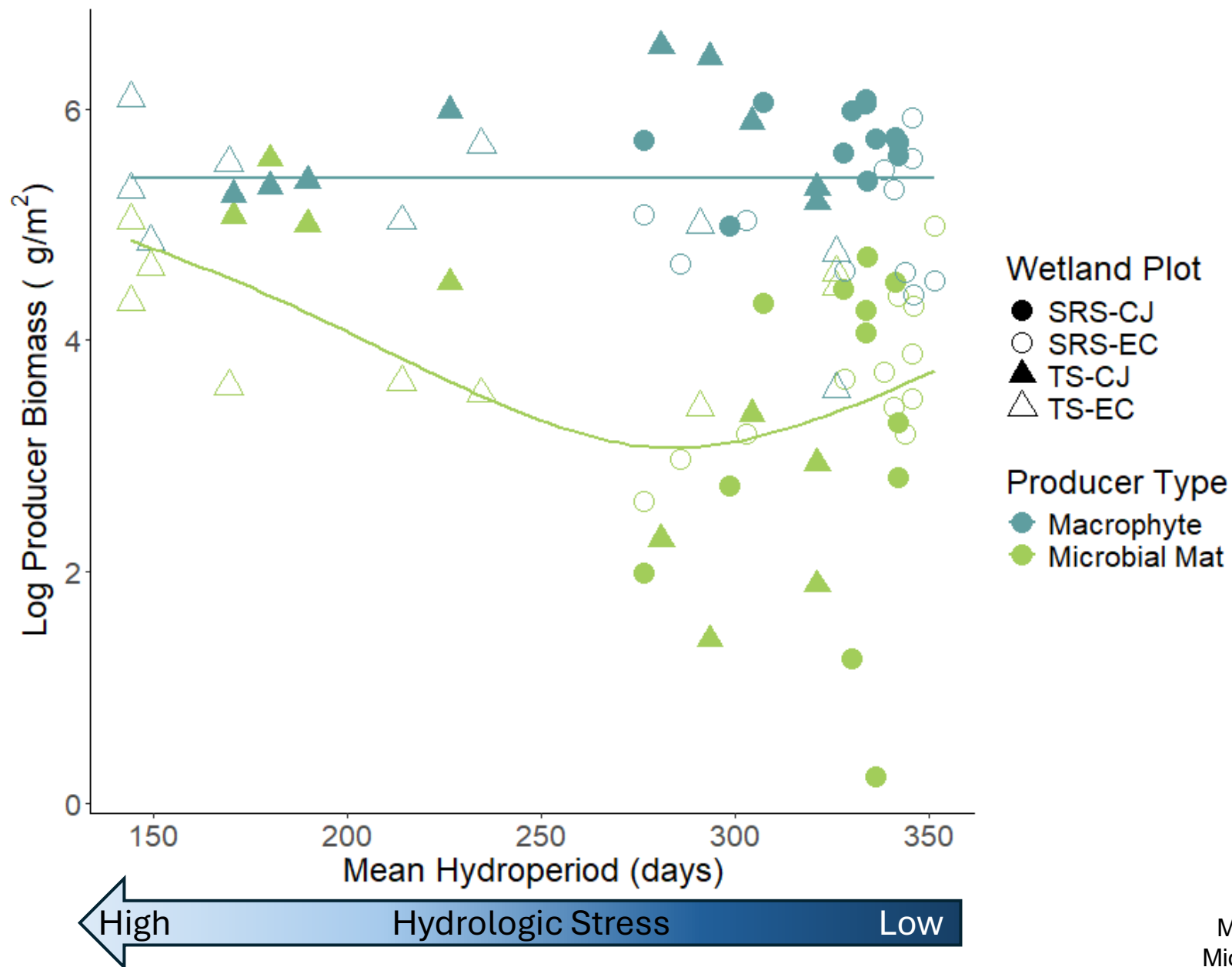
Microbial mat stock **declined** along resource gradients



Microbial Mat; $p < 0.001$, edf = 3.75, $R^2 = 0.42$, $f = 6.94$



Microbial Mat; $p < 0.001$, edf = 3.36, $R^2 = 0.38$, $f = 6.22$

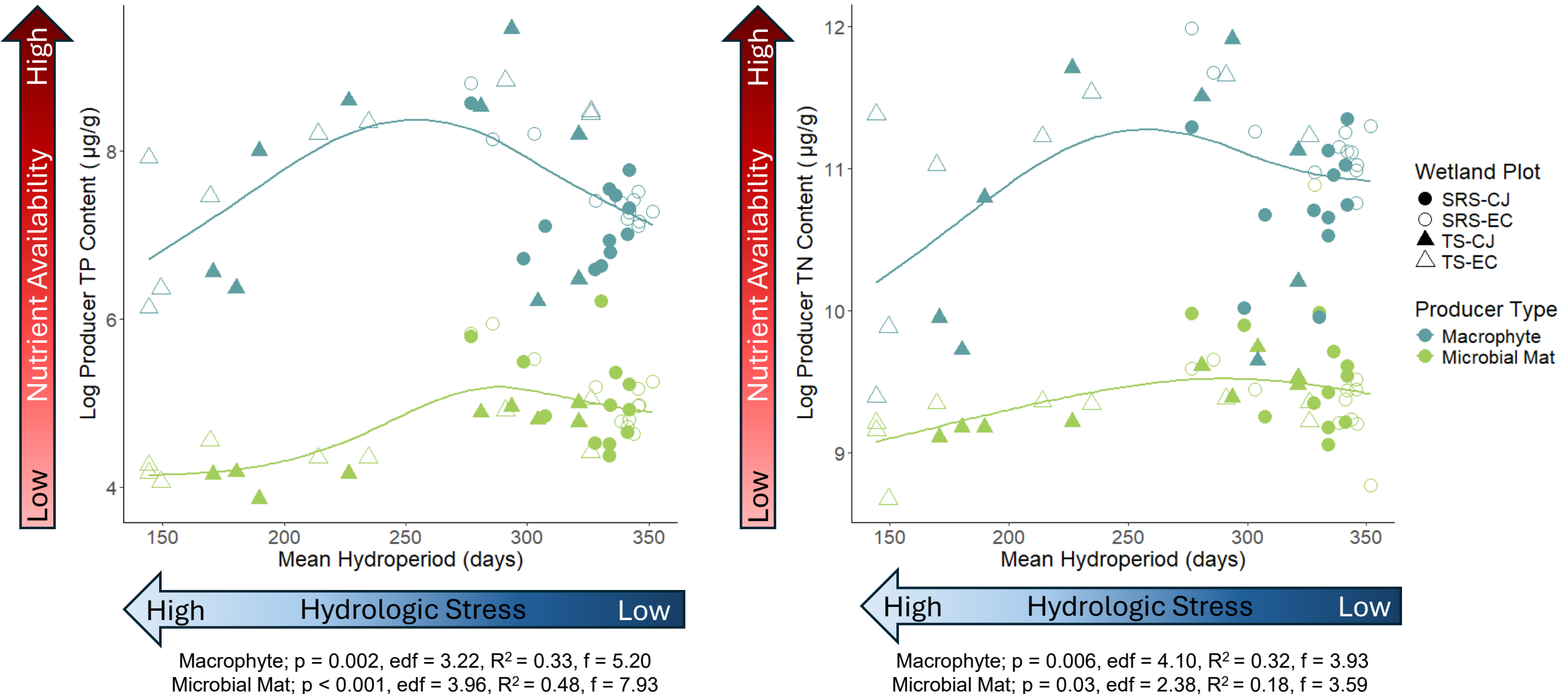


Similar
macrophyte
stock along
stress gradient

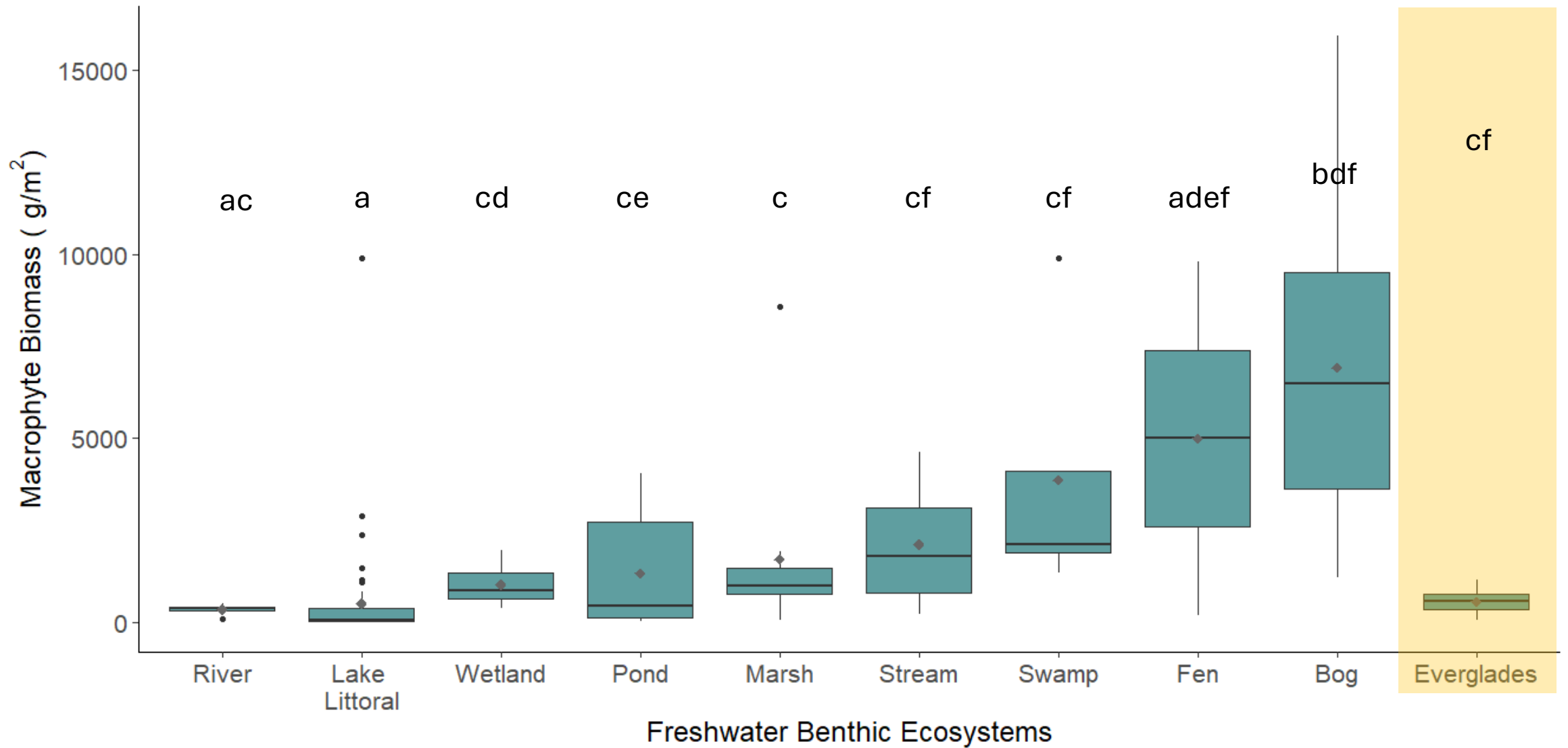
Microbial stock
declined along
stress gradient

Macrophyte; $p = 0.70$, $\text{edf} = 1.00$, $R^2 = -0.02$, $f = 0.16$
Microbial Mat; $p = 0.009$, $\text{edf} = 2.74$, $R^2 = 0.25$, $f = 4.39$

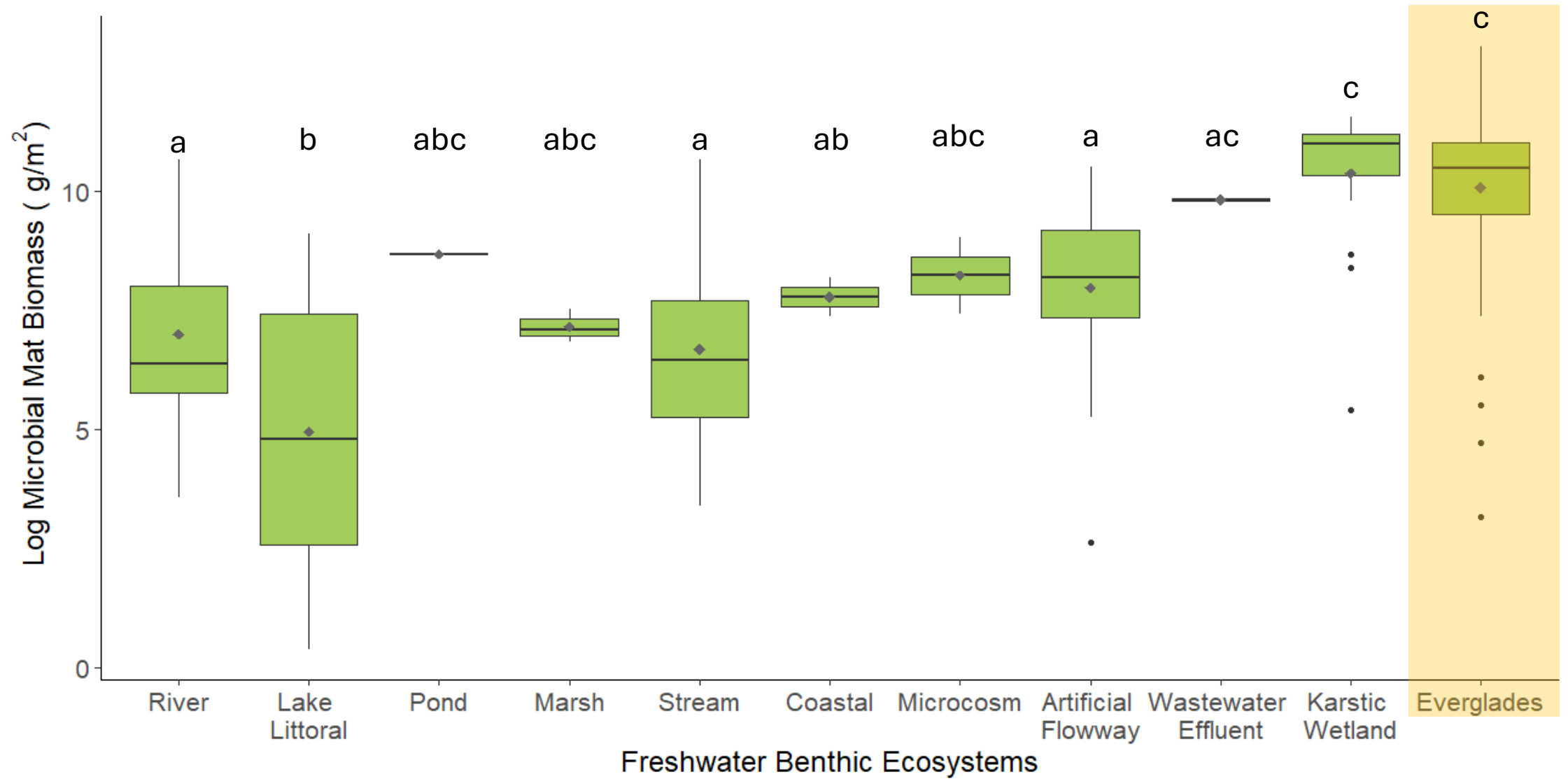
Nutrient content **peak** along the stress gradient



Low macrophyte biomass in Everglades



High microbial biomass in Everglades



Conclusions

- Community-level responses
- Loss of microbial mat functions may make macrophyte roles more important
- Investigating new framework for benthic systems



Acknowledgements



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Scholarship**



Gaiser Periphyton Lab

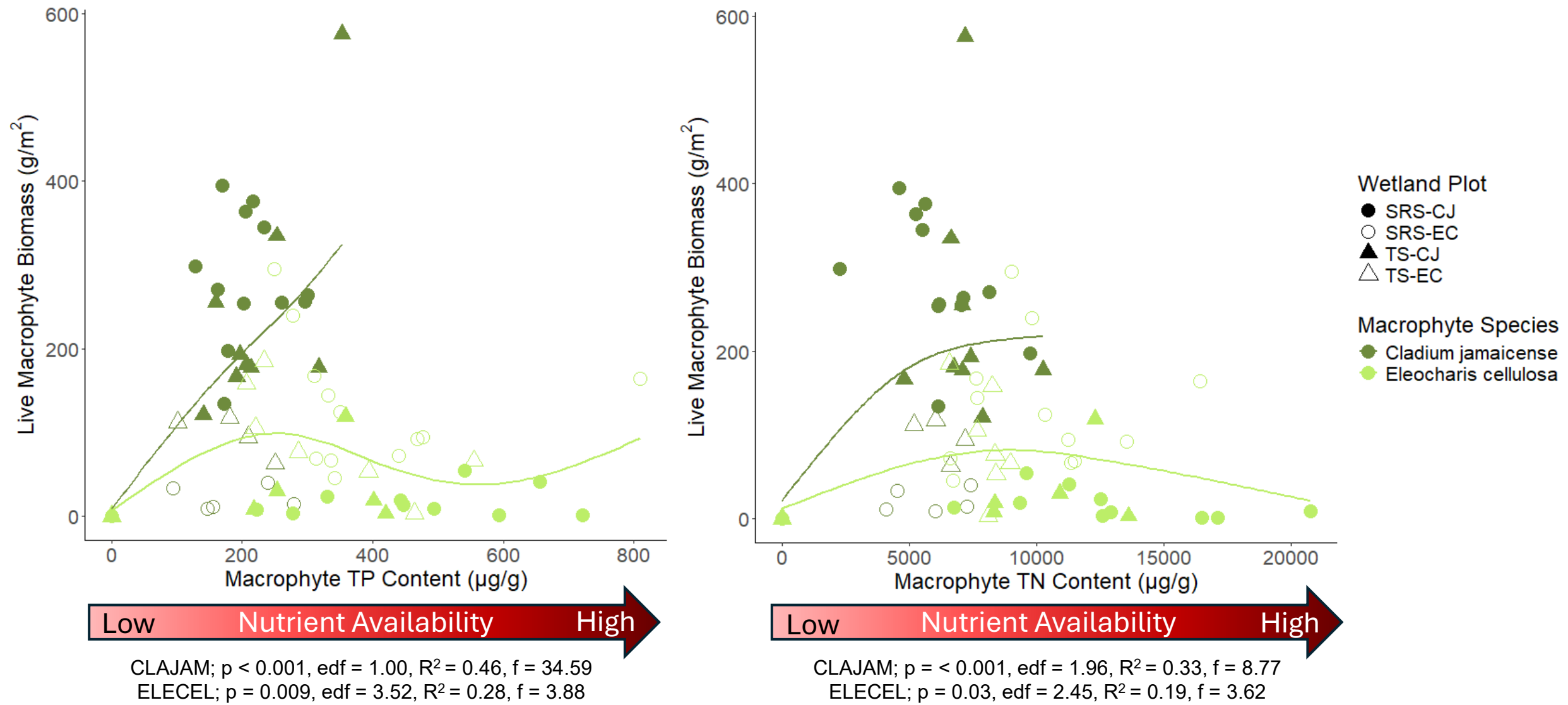


**Carol Candelario, Rafa Travieso,
Gus Dominguez**

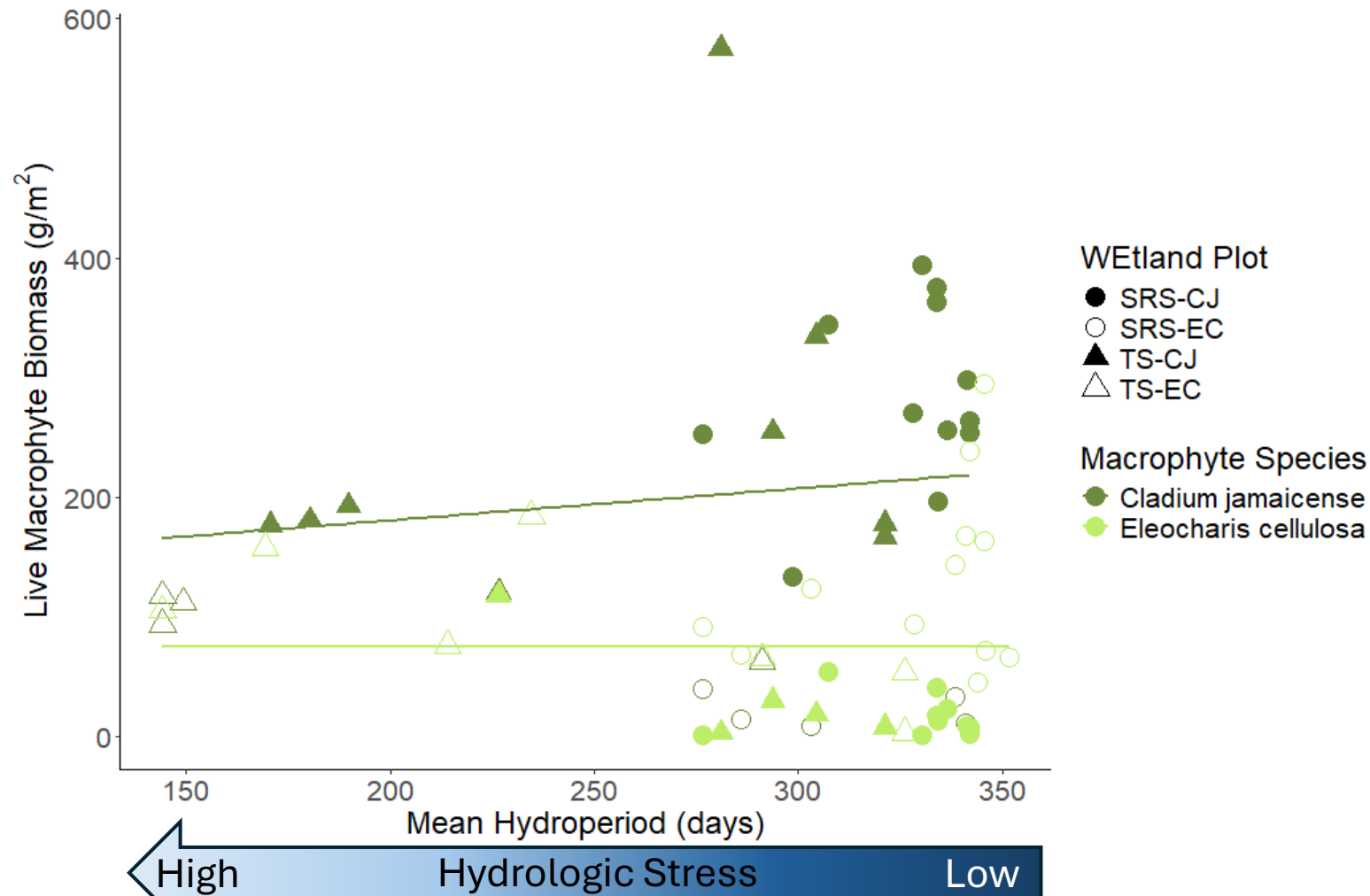
Questions



Macrophyte species responded **differently** to resource gradients



Macrophyte species **did not respond** to stress gradient



CLAJAM; $p = 0.14$, $\text{edf} = 1.00$, $R^2 = 0.04$, $f = 2.27$

ELECEL; $p = 0.39$, $\text{edf} = 2.11$, $R^2 = 0.06$, $f = 1.37$