Chronic Nutrient Enrichment Alters the Soil Micobiome in a Coastal Plain Wetland

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Background

- Human activities (e.g., industrial agriculture, fossil fuel combustion) have caused an imbalance to global nutrient cycles.
- Beneficial plant-microbe relationships aid in plant health by suppressing diseases, improving nutrient uptake, and increasing plant richness.
- Increased nutrient enrichment of low nutrient ecosystems could disrupt beneficial plant-microbe interactions.
- Changes in plant-microbe interactions could alter functional traits in soil microbes and modify plant communities.

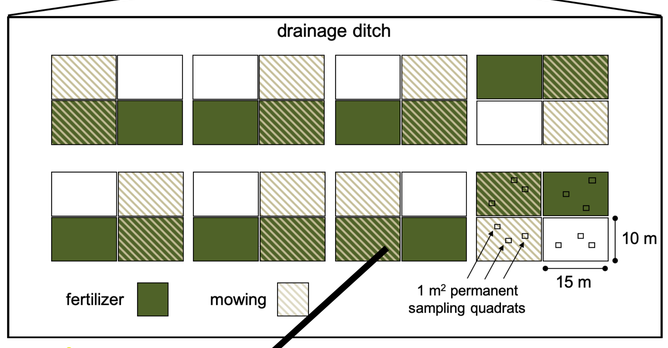
***QUESTION**: How has chronic nutrient enrichment of a low nutrient wetland altered plant-microbe relationships and antibiotic resistance of culturable soil microbiome?*

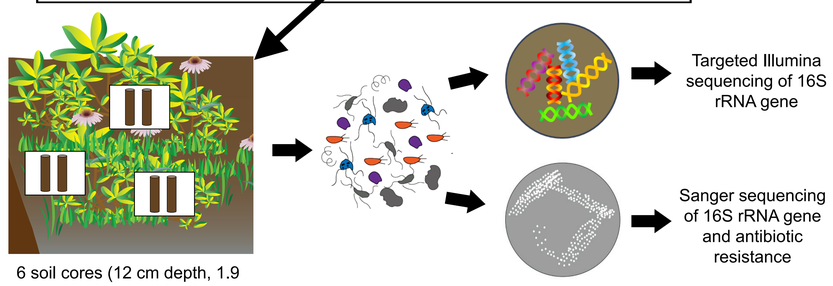
***HYPOTHESIS**: Long term nutrient enrichment will cause plant-microbe interactions to become more competitive than mutualistic.*

Field Experimental Design

ECU's West Research Campus: Long-term fertilization experiment (est. 2003)

Sample Collected 2018 and 2019:
Treatment (4 replicate blocks)
Mowed-Unfertilized, mowed-fertilized
1x yearly, mowing & raking
3x yearly NPK (10-10-10)



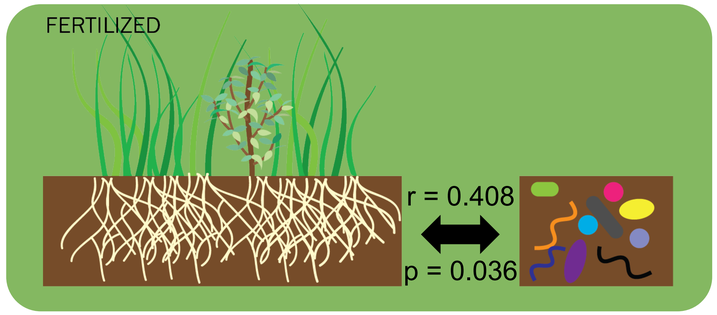


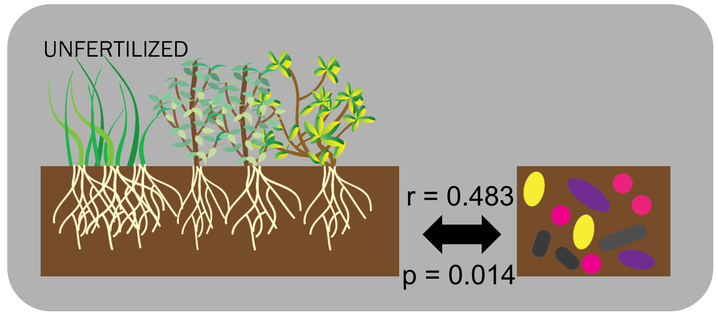
6 soil cores (12 cm depth, 1.9 cm dia.) combined

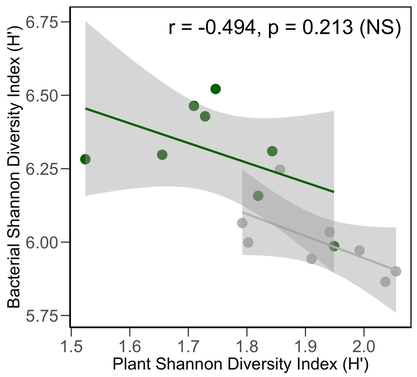
Nutrient enrichment decreases plant-microbe associations and alters community composition of soil microbiomes

Results

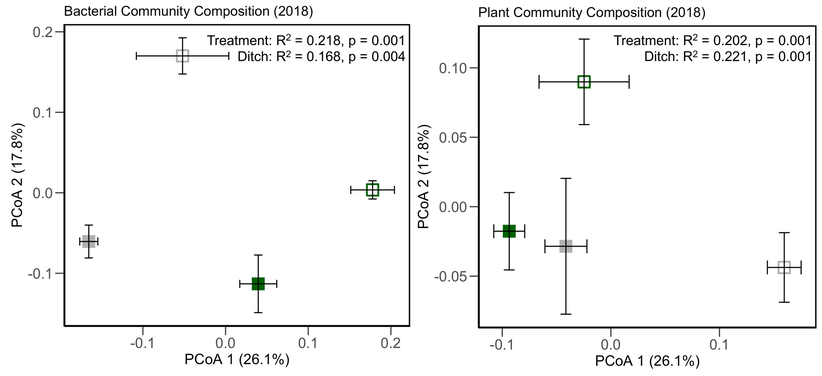
Excessive nutrient enrichment modifies the soil microbiome weakens plant-microbe interactions.



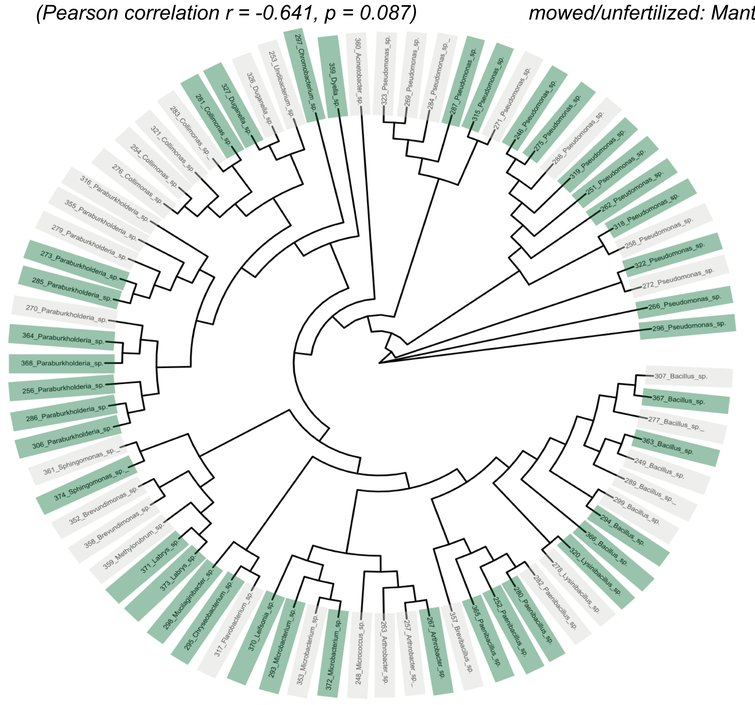




Plant and bacterial diversity (Pearson correlation r = -0.641, p = 0.087)



Plant and bacterial community matrix comparison (Mantel r): mowed/unfertilized: Mantel r = 0.483, p = 0.014; mowed/fertilized: Mantel r = 0.408, p = 0.036



There is overlap in the identity of cultured bacterial representatives, but community composition of fertilized plots is different than unfertilized plots. This could support a difference in microbial function.

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