Transitions from Freshwater Forested Wetland to Salt Marsh
Impacts of Sea Level Rise

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INTRODUCTION

Tidal freshwater swamps of the southeastern US occur along large rivers that empty into the Atlantic Ocean and the Gulf of Mexico. The mixing of saline ocean water and fresh river water results in varying salinities in the most downstream portions of the river. Though a variety of marsh grasses have adapted to the diluted seawater, tidal freshwater trees are not suited to live in areas where the average salinity is above 2 parts per thousand (ppt). Global warming and the associated rise in sea level are causing salinity to encroach further upstream causing decreased growth and, in many cases, the eventual death of many trees including baldcypress.

A stressed tidal freshwater forest along the Sampit River, which drains into Winyah Bay near Georgetown, SC.

GOALS

- **1:** to study the sensitivity of tidal freshwater swamps undergoing dieback;
- **2:** to understand the processes by which tidal swamps physically convert from a forested state to a marsh state;
- **3:** to provide essential information on biogeochemical processes;
- **4:** to determine how trees and stands respond ecophysiologically to habitat transitions;
- **5:** to quantify carbon budgets and flux relations in healthy and degraded tidal swamps.

Measuring DBH in a healthy freshwater wetlands

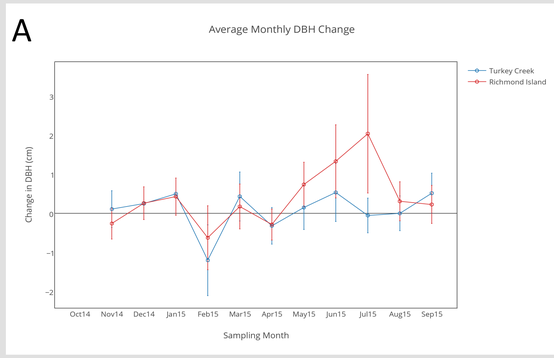
METHODS

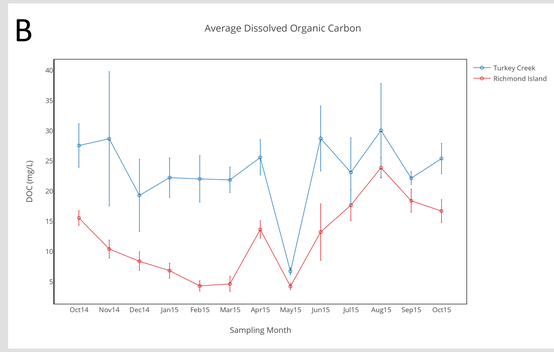
Two long term sampling sites, two plots each - Turkey Creek: feeds into the Sampit River, near Georgetown, SC, degraded forest, brackish, dominated with marsh grass. Richmond Island: on the Waccamaw River, near Pawley's Island, SC, healthy forested freshwater wetlands (Fig D).

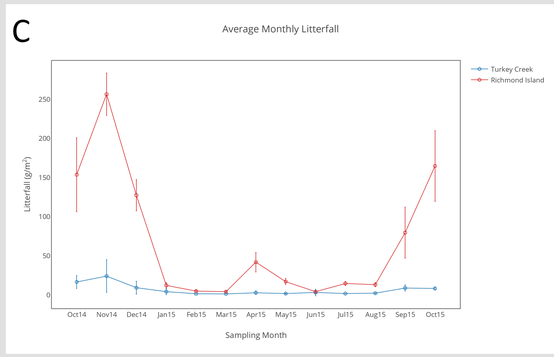
Water quality measurements - Monthly pore water samples taken from October 2014, scheduled to continue until 2019. We tested for dissolved organic carbon (DOC) (Fig. B), optical qualities, pH, electical conductivity, NH_3-N, PO_4-P, and NO_3-N, and salinity (Fig D).

Above ground productivity - Monthly diameter at breast height (DBH) measurements taken for baldcypress within study plots (Fig A) and 0.25 m^2 litterfall traps collected, dried at 70C, sorted and weighed (Fig C).

RESULTS







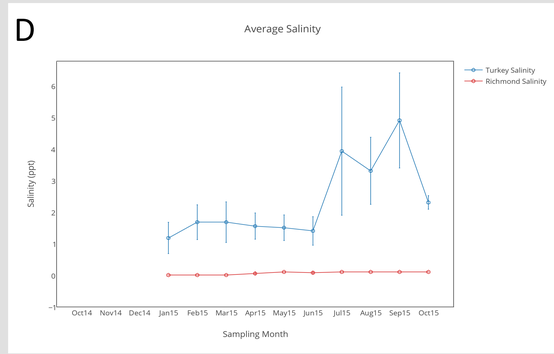


Fig A: Average monthly DBH change at Richmond Island and Turkey Creek. Fig B: Average DOC load. Fig C: Average monthly litterfall. Fig D: Average salinity.

RESULTS

DOC – Turkey Creek (degraded forest) had the highest DOC concentration (28 – 42 mg/L) in monthly water samples compared to Richmond Island (forested freshwater wetlands) (19 – 38 mg/L).
Above ground productivity – Forested freshwater wetlands had significantly higher annual stem growth with 230 g/m^2/yr and litterfall of 612 g/m^2/yr compared to degraded forest with 102 and 392 g/m^2/yr of annual stem growth and litterfall, respectively.

CONCLUSIONS

Salt-impacted degraded wetland has unique biogeochemical cycles that differ from unaltered freshwater forested wetlands.

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