Apalachicola River Delta Soil Nutrients

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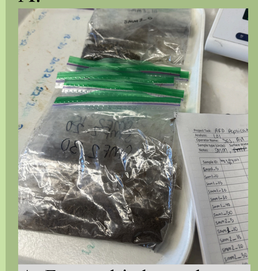
Introduction

- Coastal wetlands are complex ecosystems located in coastal watersheds. These wetlands protect against floods, filter pollutants, and provide vital habitats.
- Wetlands have complex sinks and sources of nitrogen (primarily organic nitrogen) and phosphate; Nutrients enter through surface water, sediment, groundwater, runoff, etc.
- Total nitrogen (TN) is a key nutrient for all plant species. Plant production and soil biogeochemistry may convert wetlands into "nutrient sink" by sequestering more nutrients than they export. This may contribute to a regional decrease in algal blooms.
- Carbon dioxide has increased drastically impacting the world through climate change. Blue carbon is the carbon captured by the world's ocean and coastal ecosystems. Plants sequester CO^2 from the atmosphere and accumulate it as organic carbon (OC) in their tissues and soil.
- It is important to understand how the type of vegetation impacts the nutrients in the soil.
- The Apalachicola River carries nutrients through the delta (ARD) before reaching the Bay.
- The project compares stocks of OC and TN in marsh and forest soils of the ARD.
- More OC is predicted to be found in the forest topsoil.
- More TN is predicted to be found in the marsh topsoil.
- Nutrients are predicted to be found in the topsoil due to vegetation and surface water.
- Soil nutrient stocks of OC and TN have not previously been quantified for the ARD.

Methods

- Field collection occured on October 10th, 2025.
- Three sampling locations on three rivers each consisting of a marsh plot and a forest plot creating a total of six plots.
- Russian half cores were taken from each plot; the cores were cut into predetermined samples (7 sample depths per 50cm cores) (Figure A and D).
- Samples were frozen, freeze-dried, and homogenized.
- Dry-bulk density was calculated as sample dry mass divided by initial wet volume (g cm^{-3}).
- Organic matter (OM) was estimated using Loss-on-Ignition (LOI) of samples at 550 ºC for three hours (Figure B).
- 36 samples were measured for C and N content in the Stable Isotope Mass Spec Lab (SIMSL) at the University of Florida. A linear relationship with OM% was used to estimate C and N content of the remaining samples. (Figure C).

A.

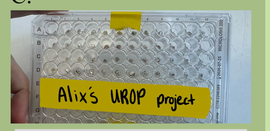


A. Freeze dried samples

B.

B. Sample after LOI

C.

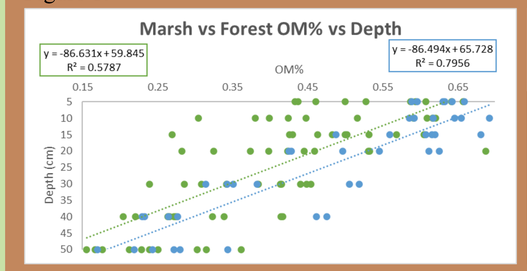


C. 36 samples for OM%

C. Tin boat with sample

Results

Figure 1:



Marsh
Forest

- All figures represent marsh vs forest using all samples
- Figure 1 represents OM% vs depth calculated from LOI
- Figure 2 and 3 represent OC% and TN% vs depth calculated from the SIMSL.

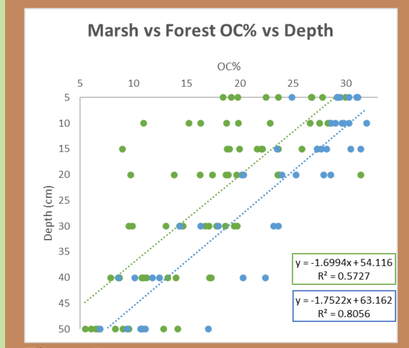


Figure 2:

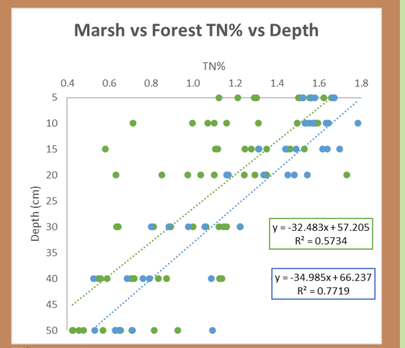
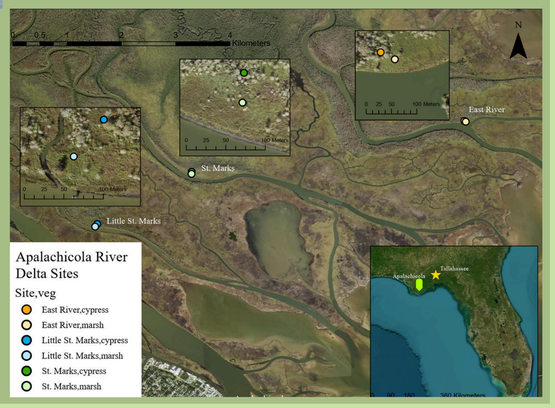


Figure 3:

D. 5cm of each core were sampled at the respective locations to demonstrate depth.

Methods

Name	Vegetation	Cores	Samples
Little St. Marks	Marsh	4	28
Little St. Marks	Forest	3	21
St. Marks	Marsh	3	21
St. Marks	Forest	2	14
East River	Marsh	3	21
East River	Forest	1	7



Results

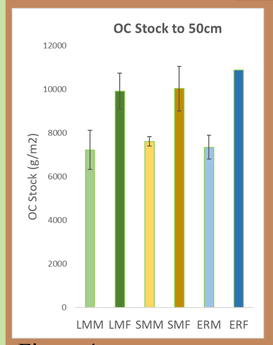


Figure 4:

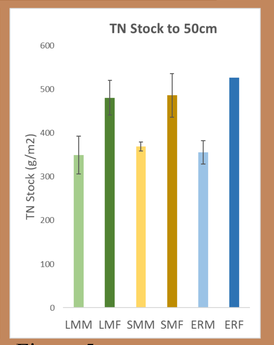


Figure 5:

Marsh = Light
Forest = Dark

- Figure 4 & 5 represent the average stock (at 50 cm depth) of OC and TN in forest and marsh vegetation types.
- The forest cores have the greater stock.

Conclusions

Conclusions:

With the data provided:

- There is more OM%, OC%, TN% in the topsoil forest samples.
- There is more OC stock and TN stock in forest samples.

Discussion:

- Due to high nutrient concentrations in forest plots, most of the OM likely originates from the vegetation.
- The forest had more coherent results (R^2 Value).

Limitations:

- Lack of samples leads to incomplete and possibly inaccurate results.
- OM% and DBD are both estimates.

Future:

- More samples will be collected to increase reliability and accuracy.
  - Samples will be collected from 0-100cm.
  - Samples will be more consistent.
- After several more studies, researchers and engineers could possibly design and implement techniques to work with soil in order to combat the environmental issues like eutrophication and the increasing concentration of greenhouse gases in the atmosphere.

Acknowledgments

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References