Characterizing biogeochemical shifts in two shrub encroached marshes under different historical disturbance regimes in the St. Johns River, FL

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Wetlands act as valuable carbon (C) sinks.

Atmospheric CO$_2$ levels are rising.

Wetlands store 1/3 of global soil C$^1$.

Wetland management may alter soil C storage.

$^1$ The Economics of Ecosystem and Biodiversity for Wetland Loss
Shrub Encroachment in the St. Johns River Watershed

• Coastal plain willow (*Salix caroliniana* Michx.)
• Willow management
  • Greater evapotranspiration rates
  • Altered habitats
  • Abiotic processes
• Knowledge gap on C storage
Do willow-encroached marshes store as much C as non-encroached marshes?
Study Design

- Stratified random design
  - 3 plot types
  - 5 of each plot type (n=5)

Willow plot

Adj. marsh plot

Control plot
Concurrently willow-shrub encroached since 1970s.

<table>
<thead>
<tr>
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<th>Moccasin Island</th>
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<tbody>
<tr>
<td>Disturbance</td>
<td>Hydrological alterations</td>
</tr>
<tr>
<td>Current Vegetation</td>
<td>Sawgrass &amp; willow shrub</td>
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<tr>
<td>Hydroperiod</td>
<td>Seasonal (Aug – Dec)</td>
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</tbody>
</table>

* No direct statistical comparisons were made between regions
Methodology

Litter C storage
- Litter bag experiment (4-month)
  - Δ mass, total C, and lignin

Soil C storage
- Total C content
- CO₂ & CH₄ production
- Enzyme activity

Statistical Analyses
- Independently for each region
- One-way ANOVA (plot type)
Litter C Storage

4-month mass decay

Leaf lignin ($R^2 = 0.8$)

↑ short-term litter C storage for both regions
Soil C Results

Hydrological differences between regions may alter soil C storage potential
Soil C Cycling

Moccasin Island

- ↑ soil C cycling in willow and/or adj. marsh plots

Lake Apopka

- ↓ soil C cycling in adj. marsh plots
Summary

- C storage differences in willow-encroached marshes
  - ↑ litter C storage in willow plots
  - Soil C storage dependent upon region
- Foundation for future studies
  - Litter transport
  - Long-term decomposition/mixed litter
Management Implications

- Better informed management decisions
- Currently investing resources into willow removal
- Management plans specific to desired functions
Acknowledgements