Blue Carbon Sequestration Within a Northeastern Florida Intertidal Wetland – Response to Climate Change and Holocene Climate Variability

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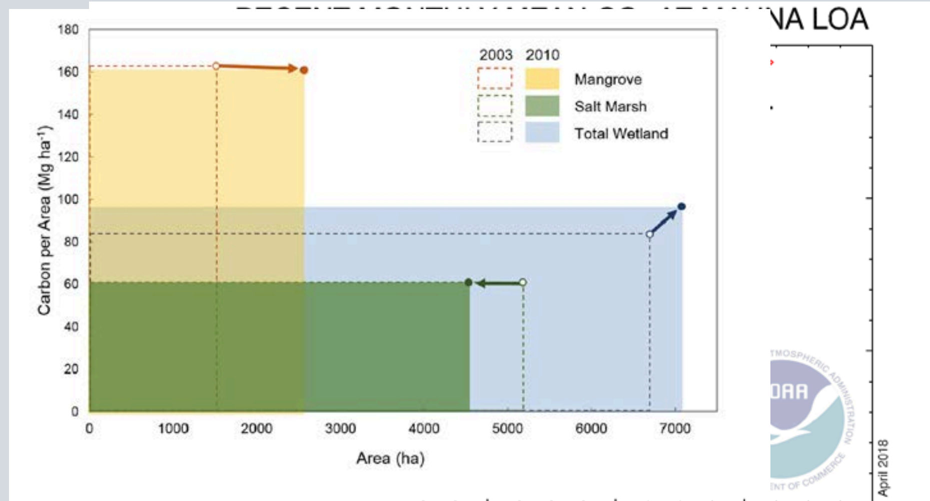
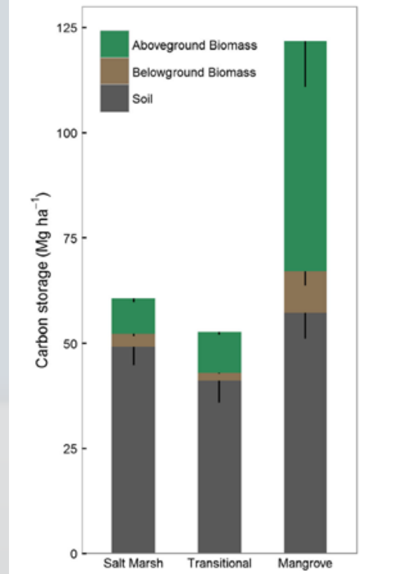
Agenda

Introduction	Carbon sequestration in northern Florida wetlands
Methods	Study site and proxies
Results and Discussion	Discussions of the top portion of cores and entire cores
Future Work	Comparing cores between coasts
Conclusions	What are the cores telling us so far?

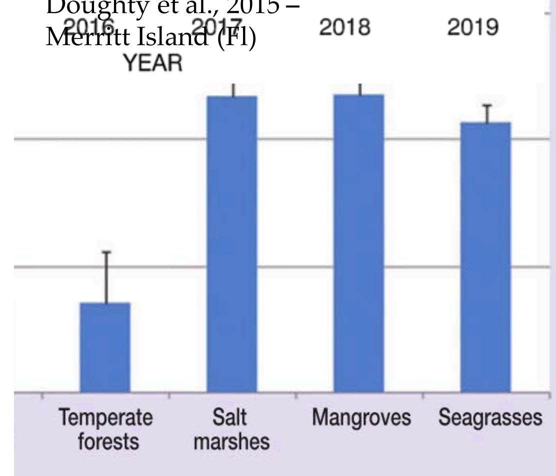
Carbon Sequestration in Northern Florida Wetlands

- Terrestrial sequestration is a natural way to reduce CO_2 emissions.
- Blue carbon habitats bury more carbon per unit area compared to any other terrestrial system.
- The destruction and conversion of these habitats via anthropogenic activity and sea-level rise results in the conversion of previously stored carbon into CO_2 (Pendleton et al., 2012).
- Increase in mangrove extent with climate change may alter carbon storage.





Doughty et al., 2015 – Merritt Island (Fl)



Goals of This Study

- Do we see differences in carbon being stored in the top 20 cm between marsh, mangrove, and transition sites in northern Florida wetlands?
- Have there been any significant changes to carbon storage over a longer interval (down to 300 cm)?
- If there have been changes, are those driven by changes in Florida’s climate and can that be linked to changes in vegetation?
- Could there be any anthropogenic influences on carbon storage?

Study Site – Anastasia Island (St. Augustine, Fl)

Methods:

- Split vibracores in 2 cm intervals
- 100 year record
    - Presented with Pb^{210}/Cs^{137} dating
    - Used CRS model
- Long-term Holocene record
    - Will be dated using ^{14}C

Biomarkers

Shown today: Lignin

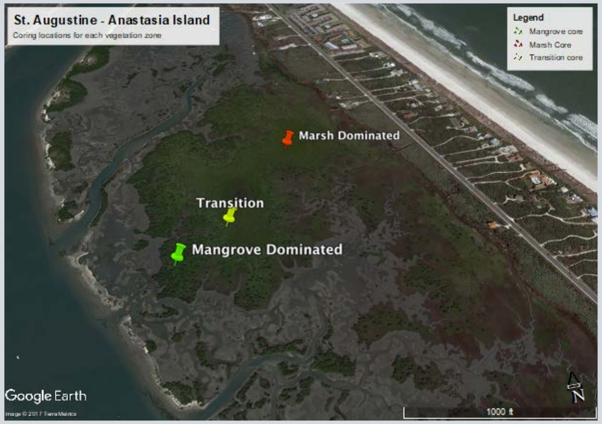
Will also include alkanes and sterols

Carbon Isotopes

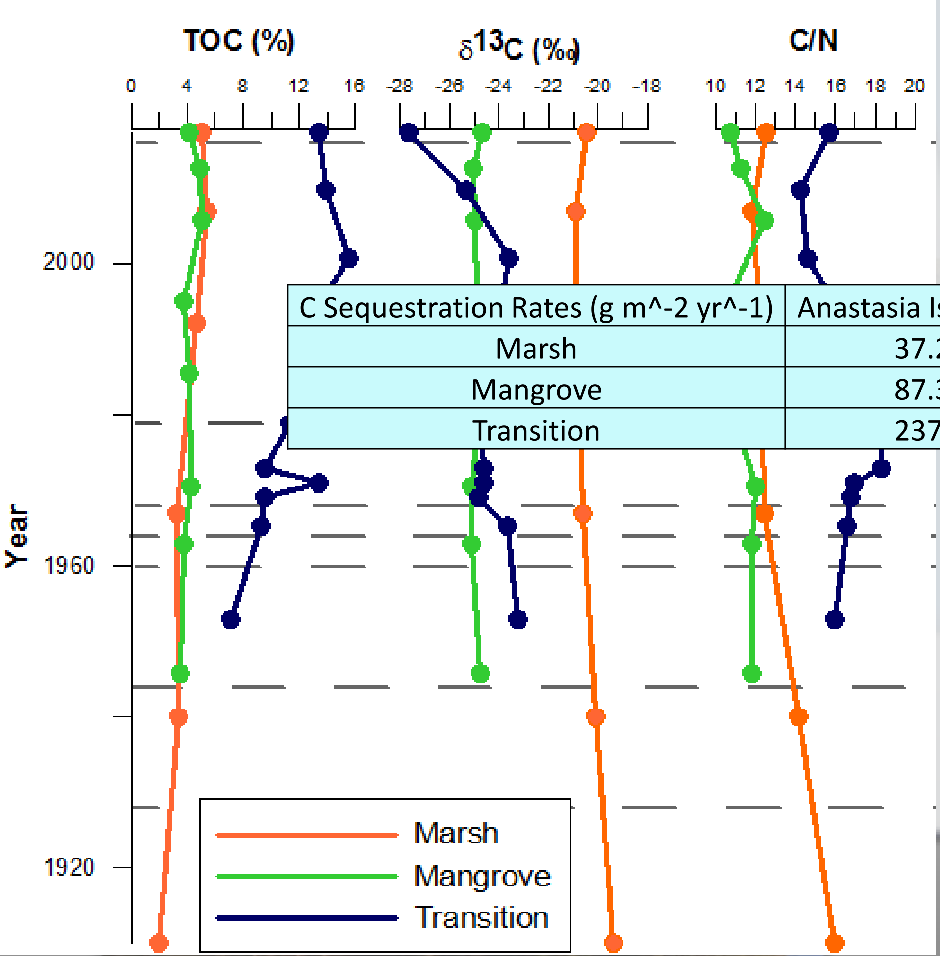
% TOC

$\delta^{13}C$: Indicator of organic carbon sources (C3 vs. C4 vs. algal)

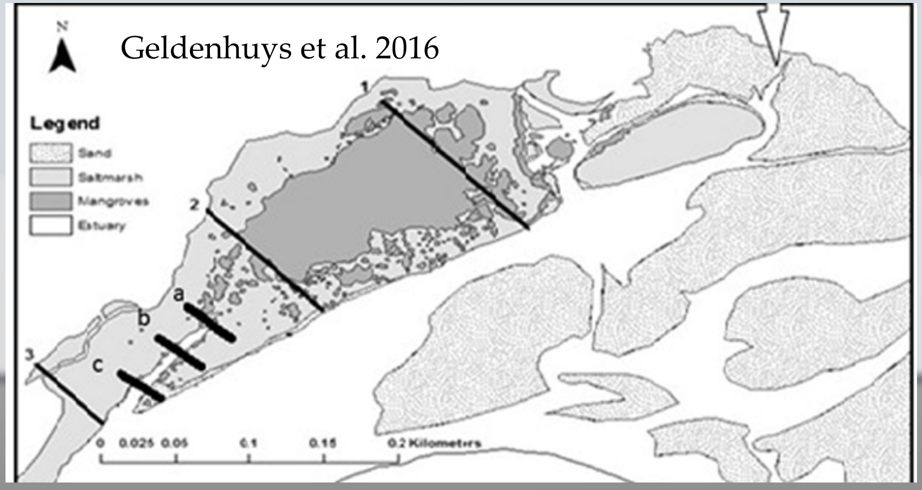
Top Core



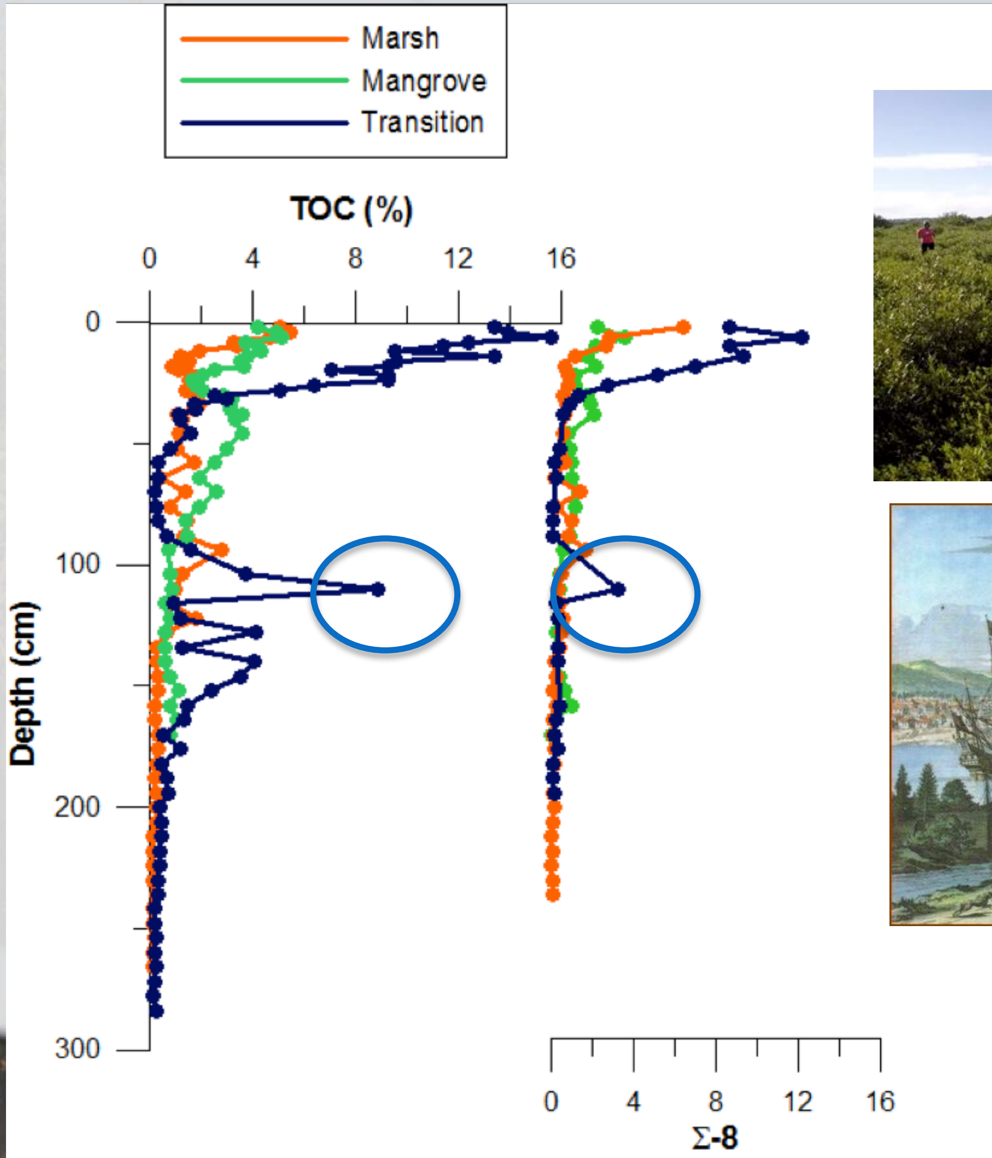
Organic Carbon Stock	100 years (g/cm^2)	100-year depth (cm)
Marsh	0.372	10
Mangrove	0.874	16
Transition	2.370	20

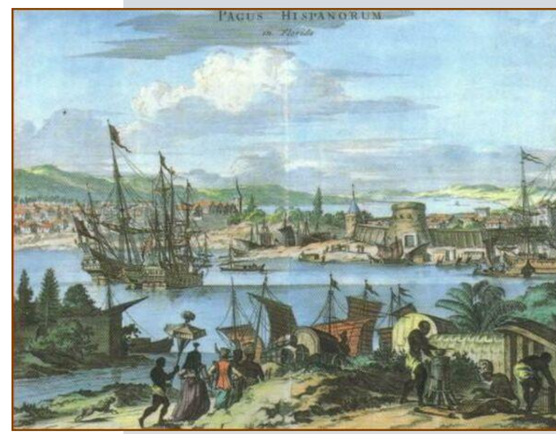


C Sequestration Rates (g m^-2 yr^-1)	Anastasia Island (This study)	Mean global carbon burial rates (McLeod et al. 2011)
Marsh	37.24076805	218.000
Mangrove	87.39927998	226.000
Transition	237.0190943	



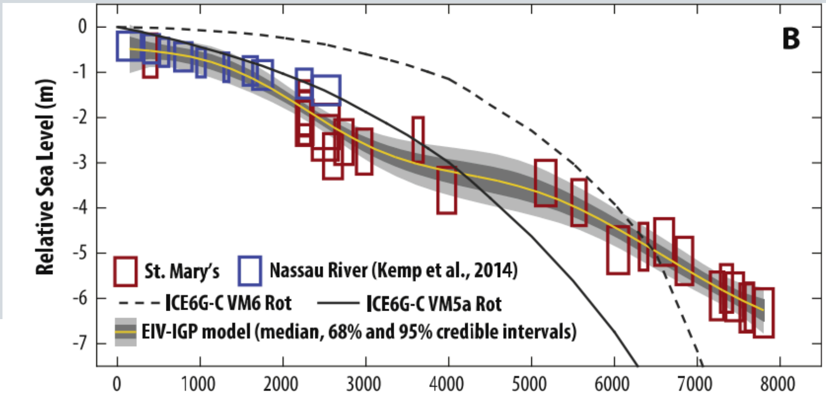
TOC Profile –
Does the OC get stored?



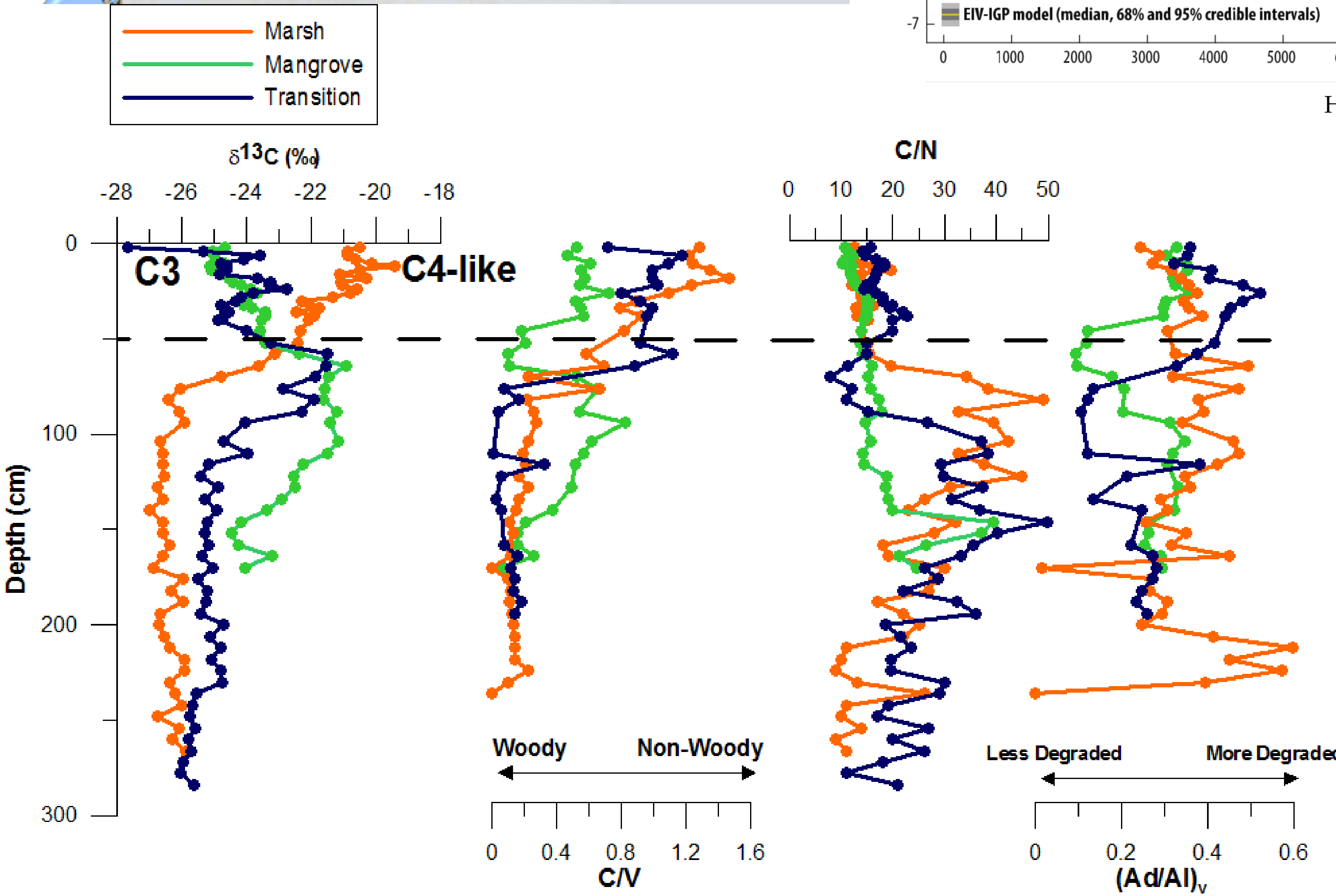


Pbc history online

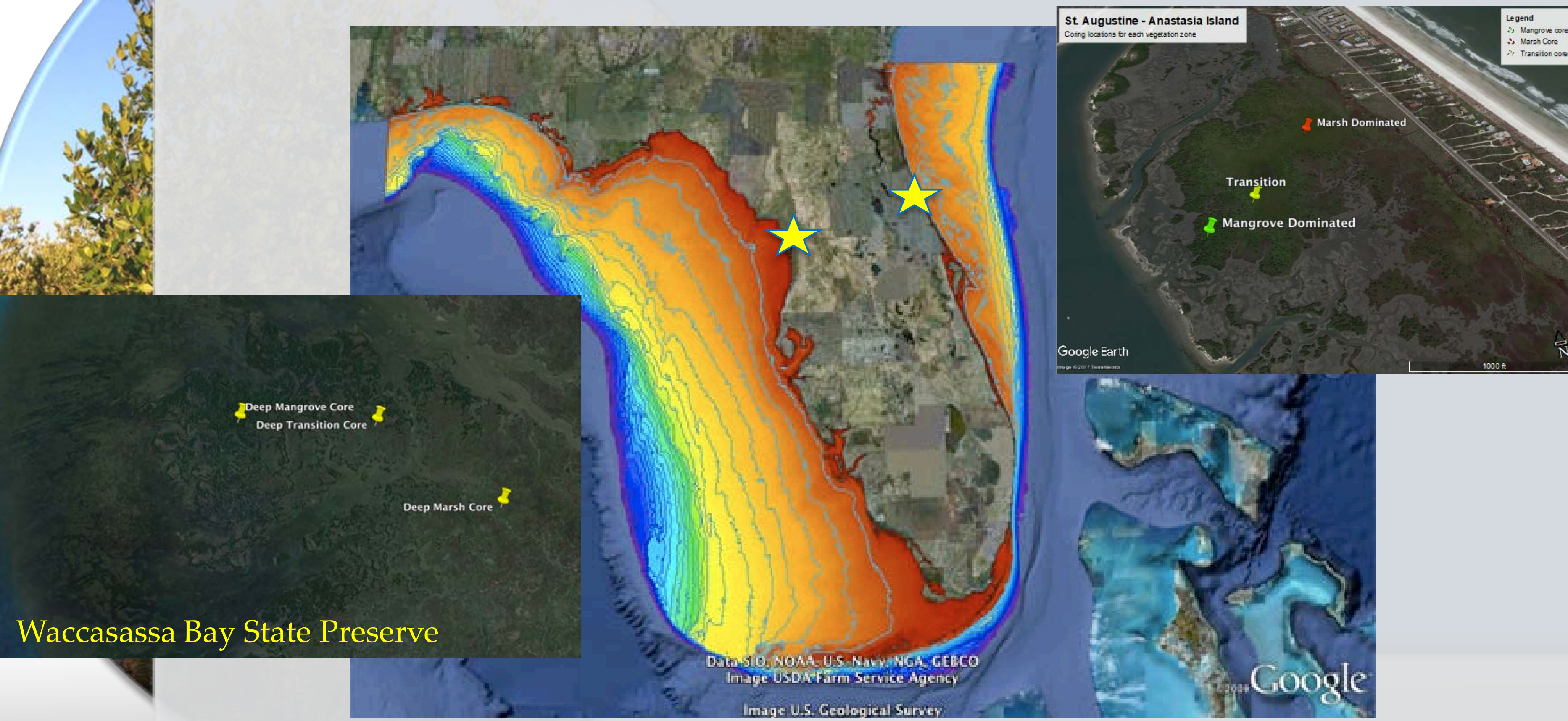
Recording Shifts in Plant Communities?



Hawkes et al. 2016



Comparing Coasts



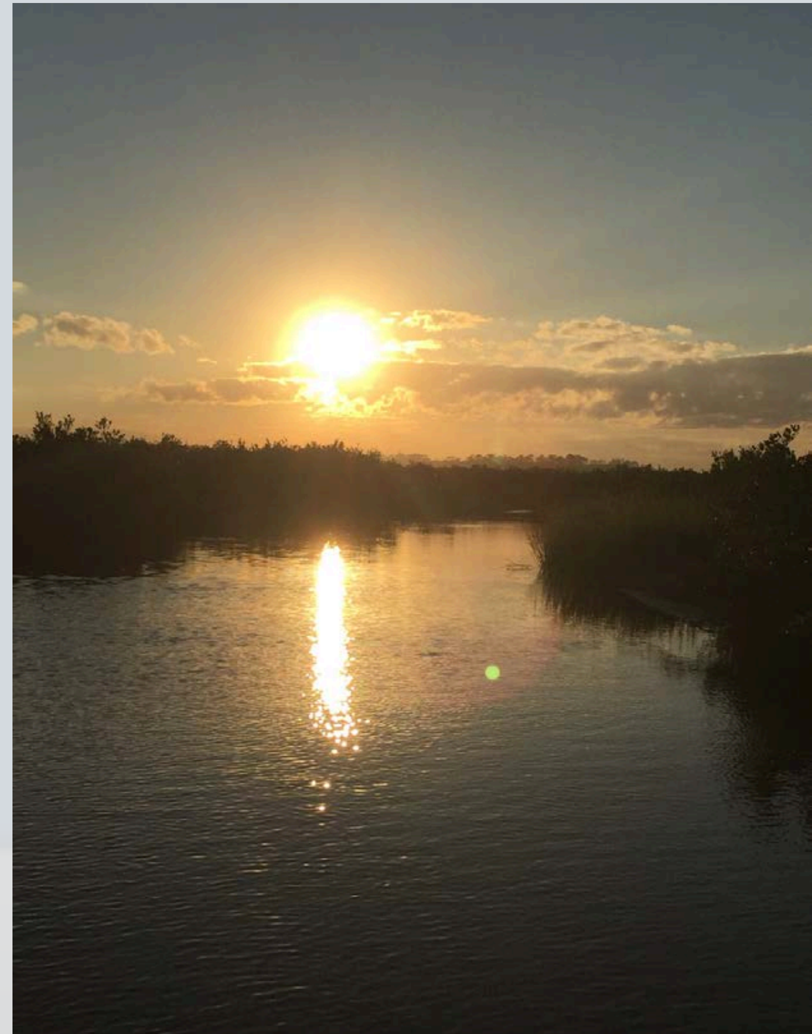
USGS

Conclusions

- The transition zone between mangrove and marsh currently sequesters the most carbon. Carbon sequestration rates are likely influenced by tides and vegetation structure.
- There were no recognizable changes in carbon amount or signatures with recent (100 years) vegetation community shifts.
- The large increase in TOC near 1 meter demonstrates that this carbon can be stored over long periods of time and may represent a former mangrove expansion.
- Shifts in vegetation communities over time are likely due to combination of gradual sea-level rise, increasing temperatures, and anthropogenic influences.

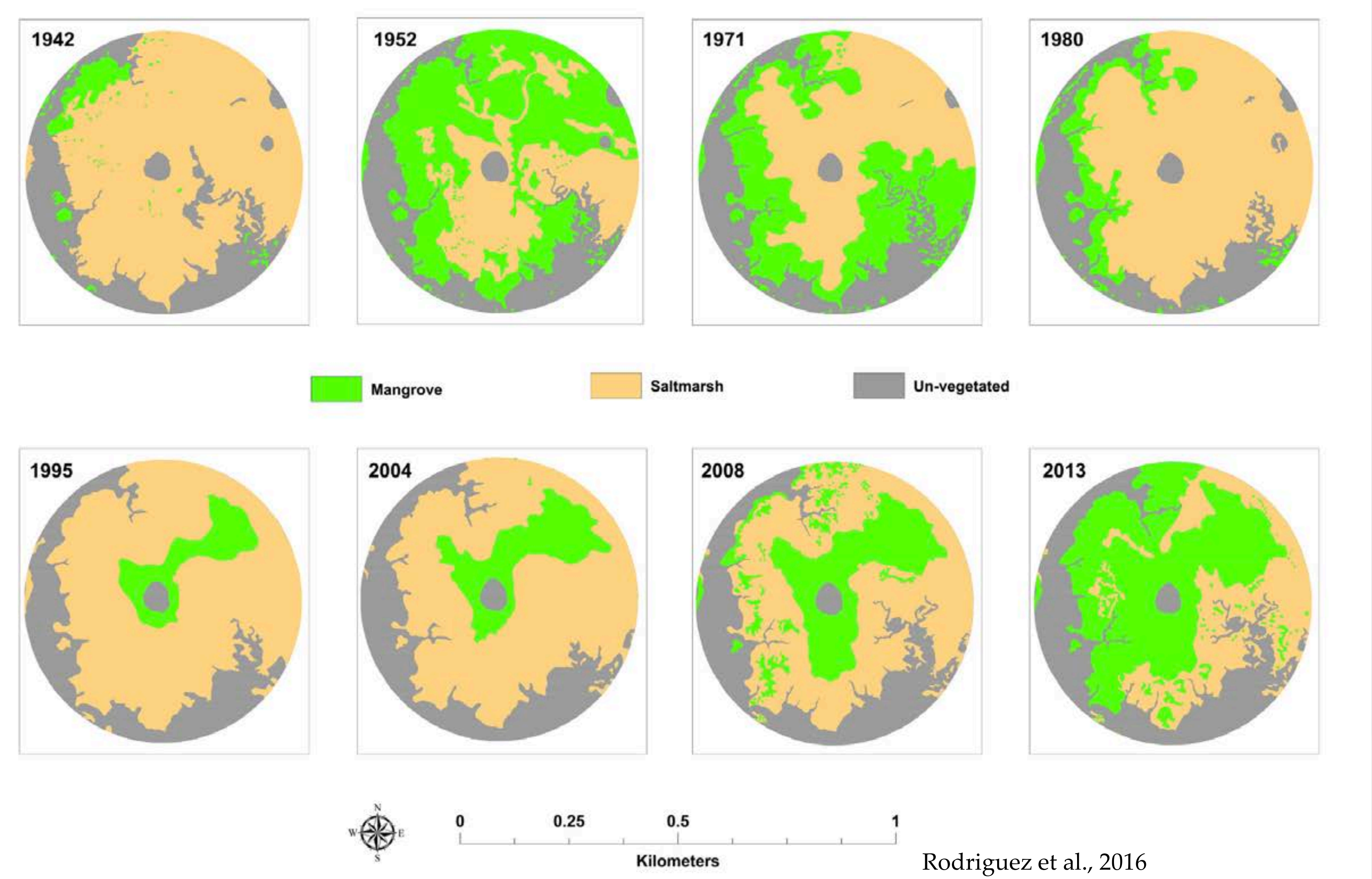
Thanks!

Questions?

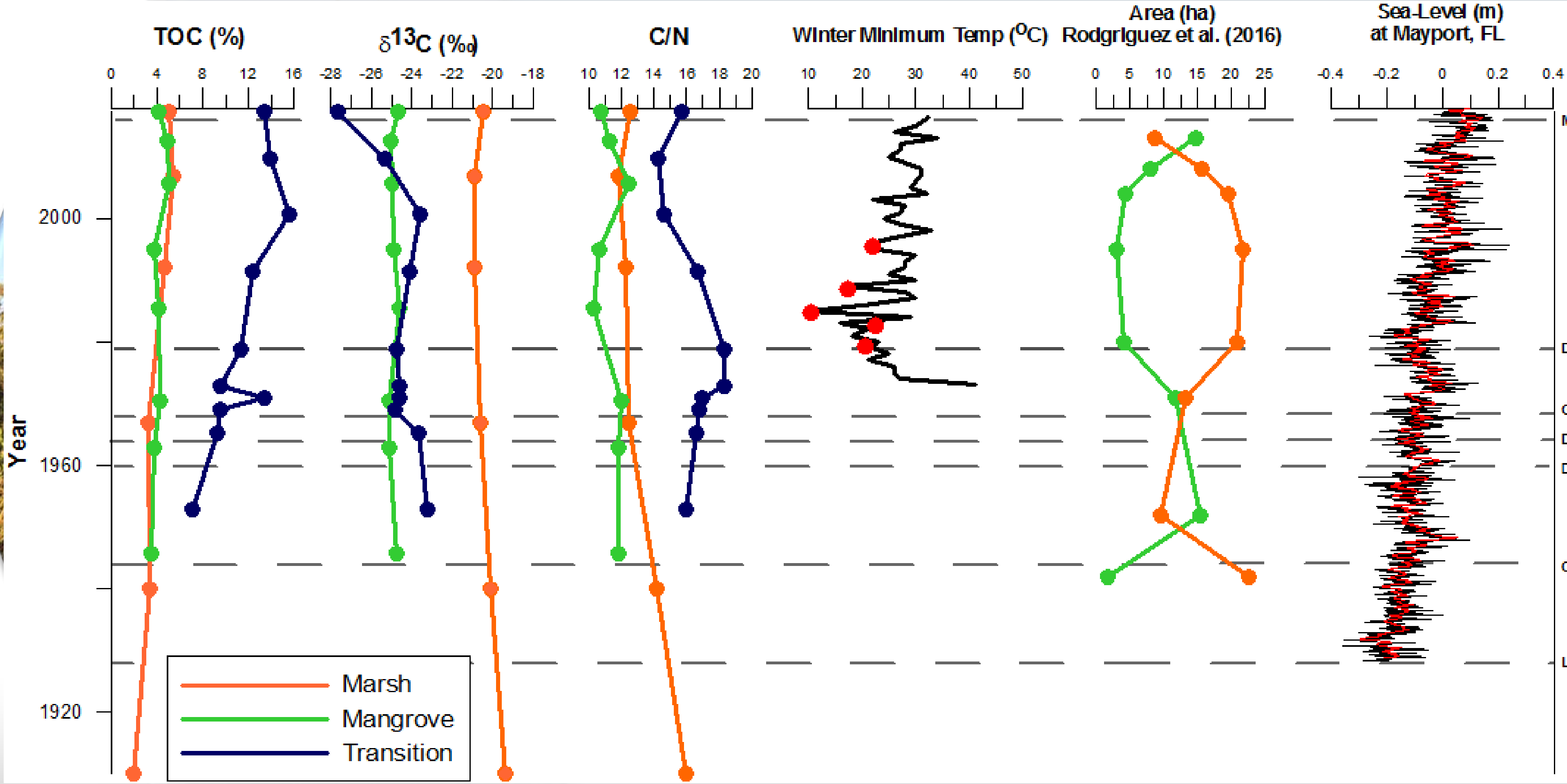


Extra Slides

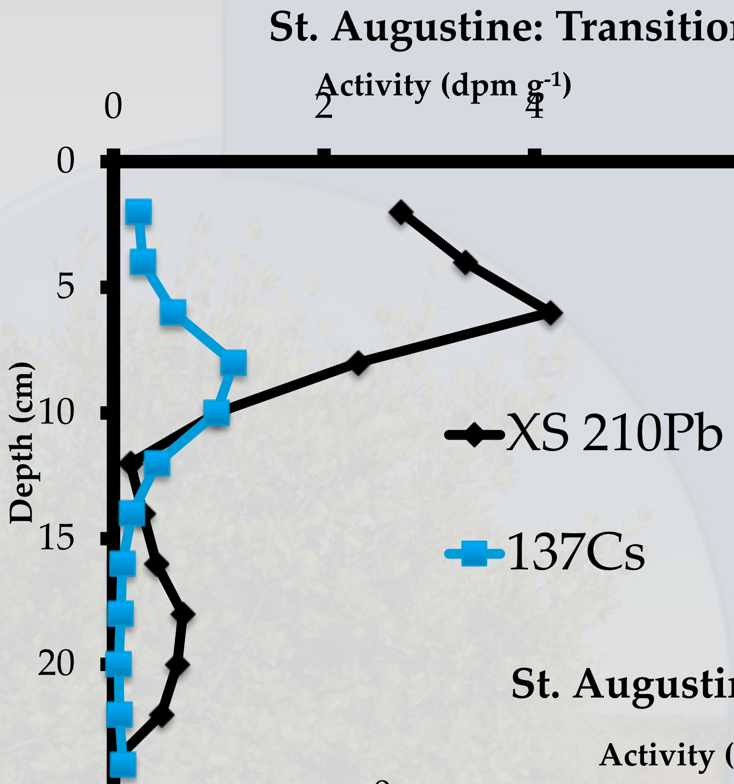
North Florida Wetlands – Edge of Mangroves Northernmost Extent

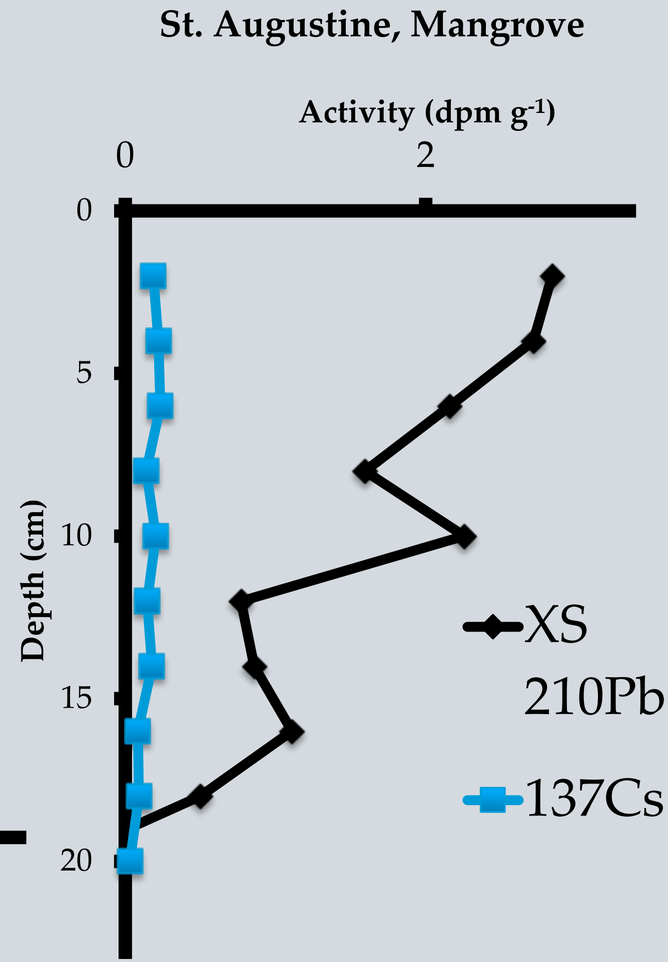


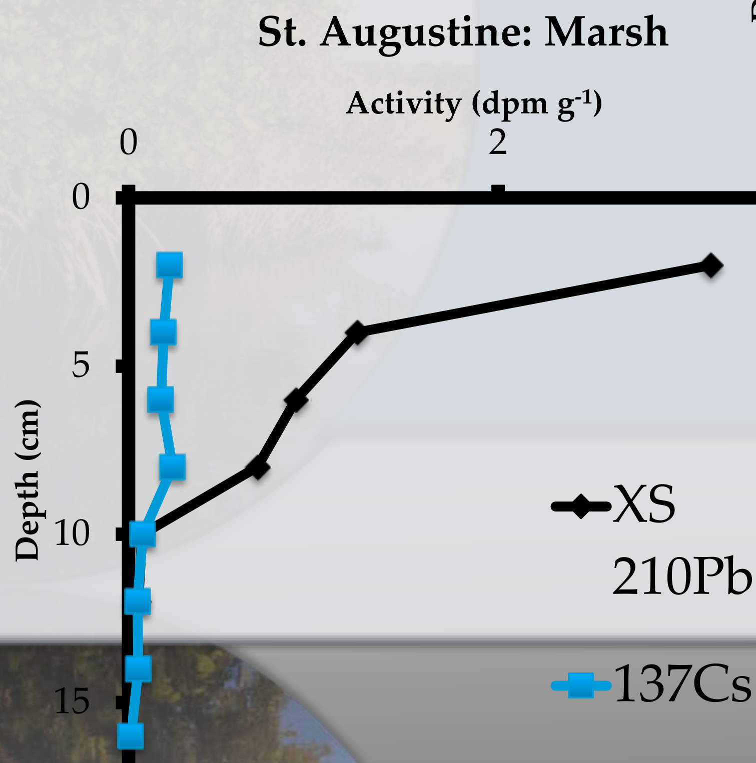
Rodriguez et al., 2016



TOC (%)
δ13C (‰)
C/N
Winter Minimum Temp (OC)
Area (ha)
Rodgriguez et al. (2016)
Sea-Level (m)
at Mayport, FL
Year
2000
1960
1920
Marsh
Mangrove
Transition


St. Augustine: Transition
Activity (dpm g-1)
0
2
4
Depth (cm)
0
5
10
15
20
XS 210Pb
137Cs


St. Augustine, Mangrove
Activity (dpm g-1)
0
2
Depth (cm)
0
5
10
15
20
XS 210Pb
137Cs


St. Augustine: Marsh
Activity (dpm g-1)
0
2
Depth (cm)
0
5
10
15
XS 210Pb
137Cs