

An aerial photograph of a vast wetland landscape, likely a salt marsh or mangrove area. The terrain is a mosaic of shallow water channels, some appearing dark blue or grey, and patches of green and brownish vegetation. The water channels are irregular and interconnected, creating a complex network across the flat land. The sky is overcast with grey clouds, and the horizon is visible in the distance. The overall scene conveys a sense of a dynamic, water-saturated environment.

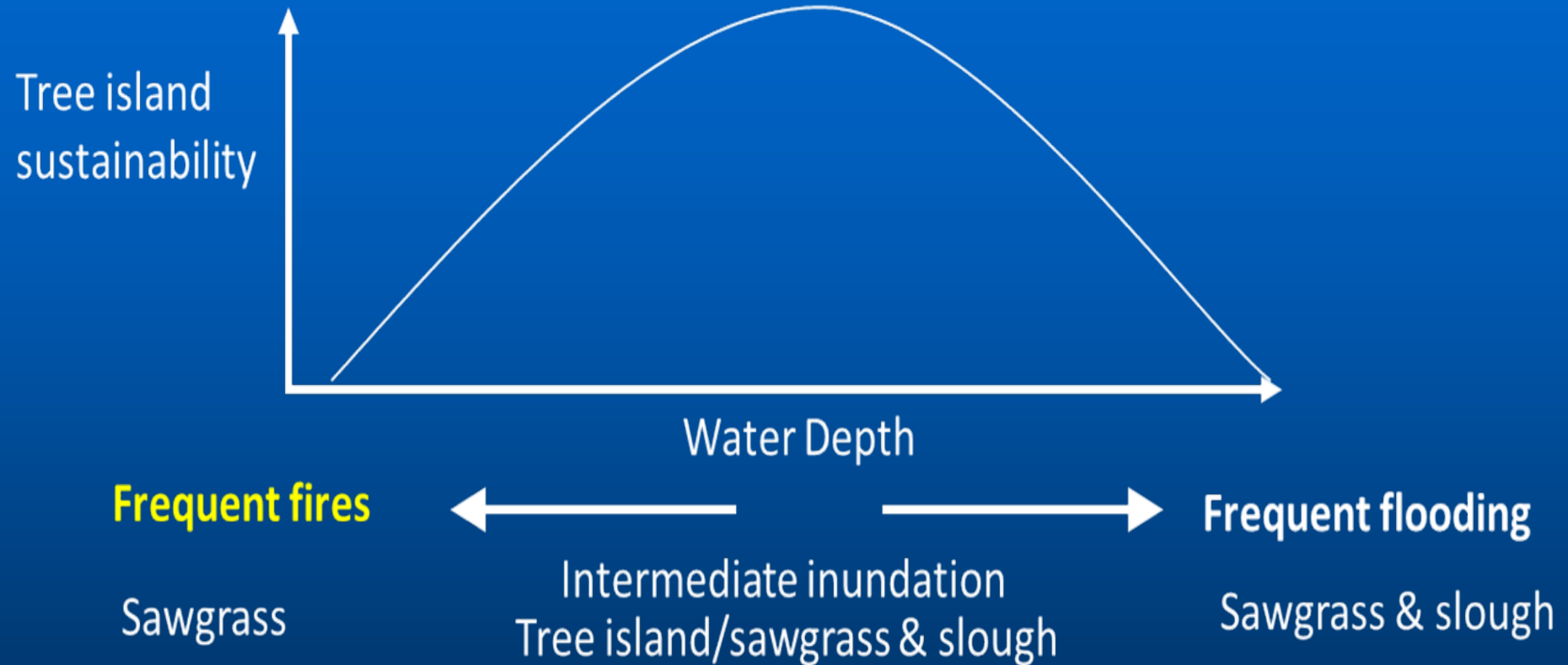
Soil Elevation-dependent soil accretion: Implications for tree island persistence in the Water Conservation Area 3

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MARK COOK

Subsidy – Stress Hypothesis (E.P. Odum)



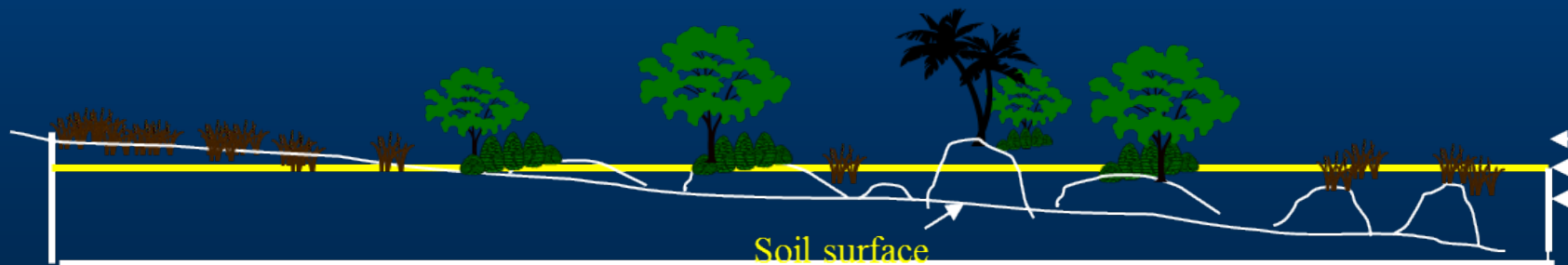
We are testing the hypothesis that periodically flooded environments generally have higher soil accretion and positive elevation change than either dry or permanent flooded environments.

Research Goals

This presentation highlights the effects of changes in hydroperiod on soil accretion and elevation on tree islands experiencing contrasting hydropatterns.

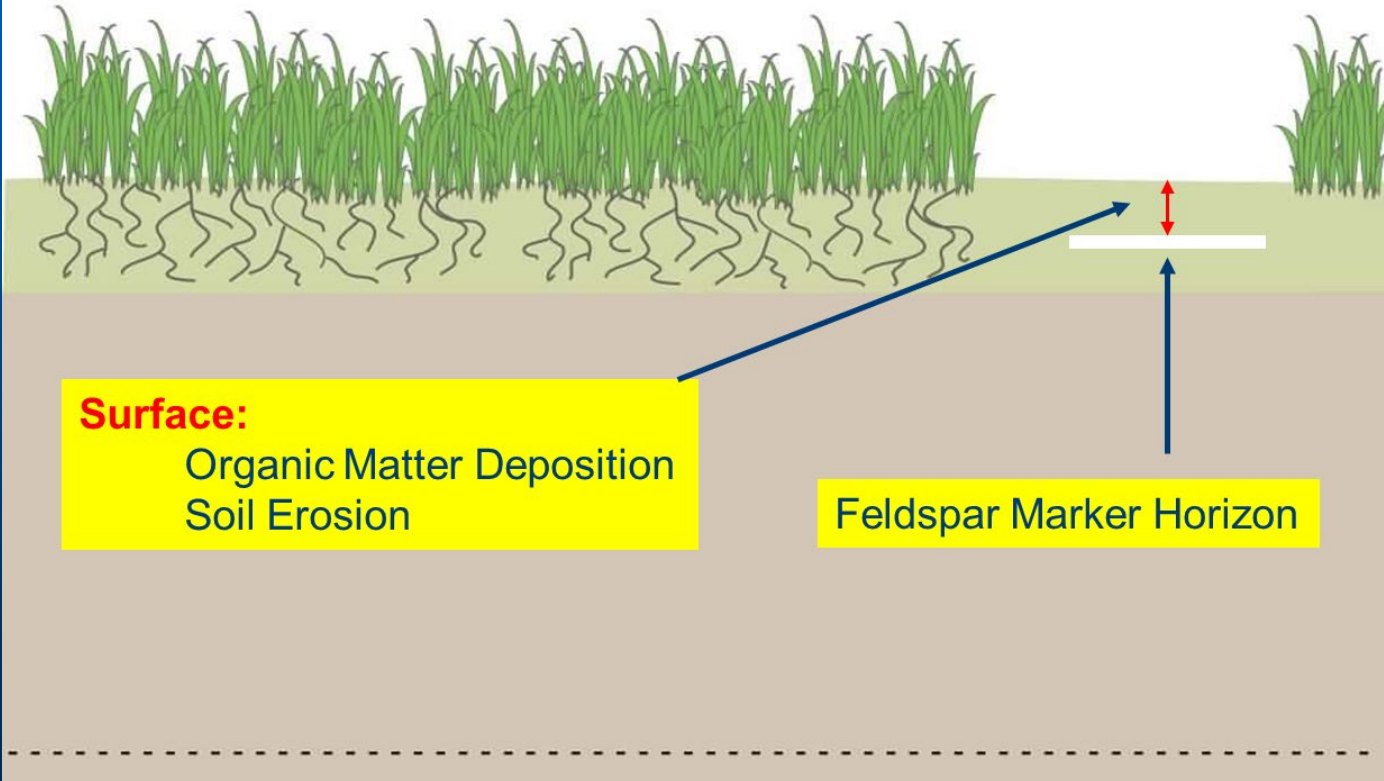
The main questions are:

- a) Are tree islands in equilibrium with increasing water levels?
- b) Do they accrete material and gain elevation at rates that allow tree islands to experience less frequent inundation?



Methodological Approach

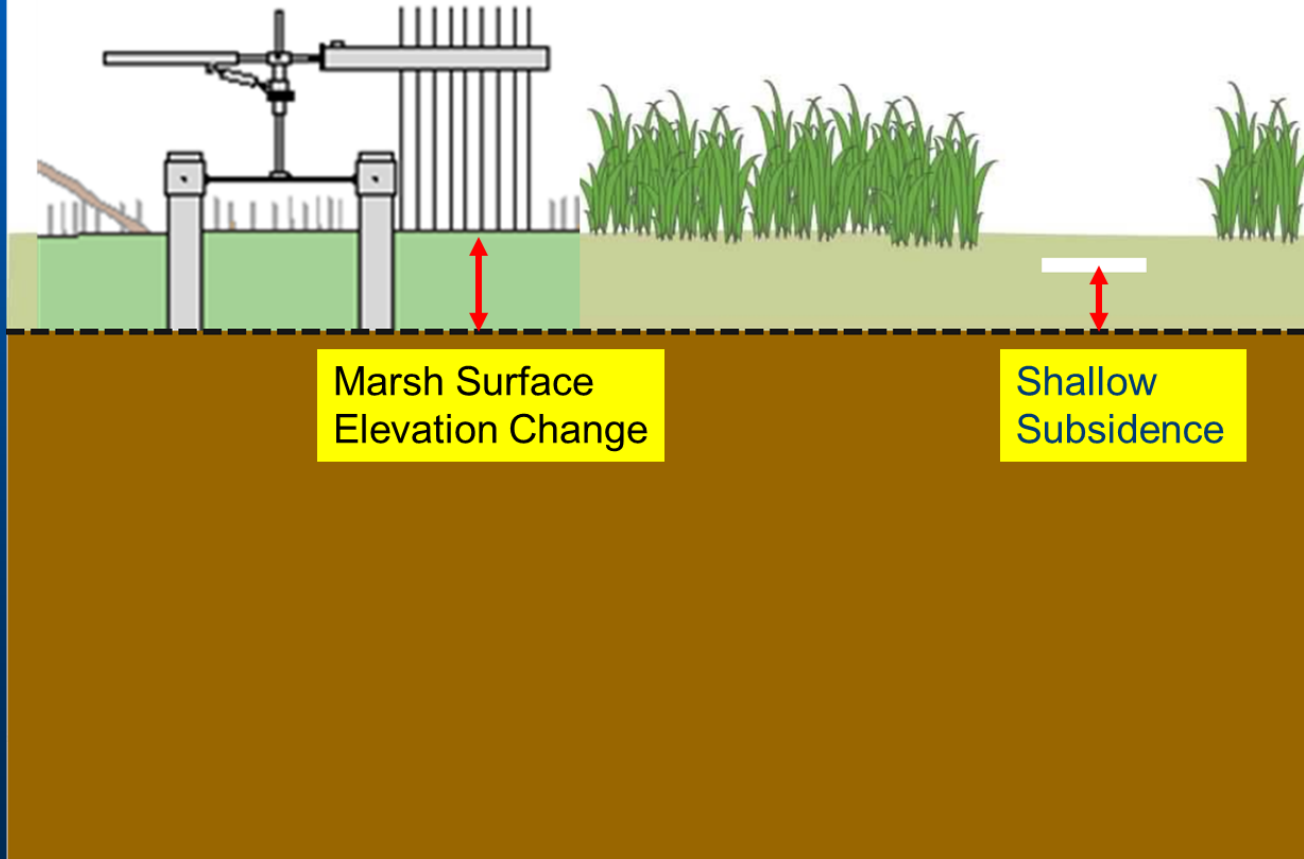
Marker Horizons measure VERTICAL ACCRETION, which incorporates predominantly Surface Processes.



Methodological Approach

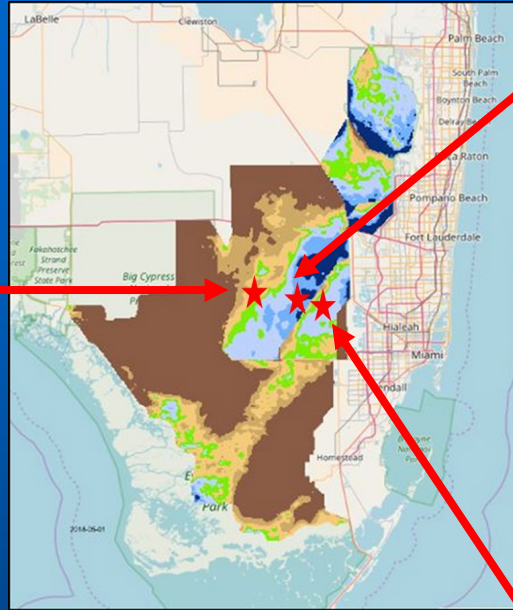
We installed shallow rod SET (0.40 m), which accounts for processes that occur within the root zone

When used simultaneously, these techniques can provide information on below ground processes that influence elevation change.



Study Tree Islands

Tree Island 3AS2



Tree Island 3AS5

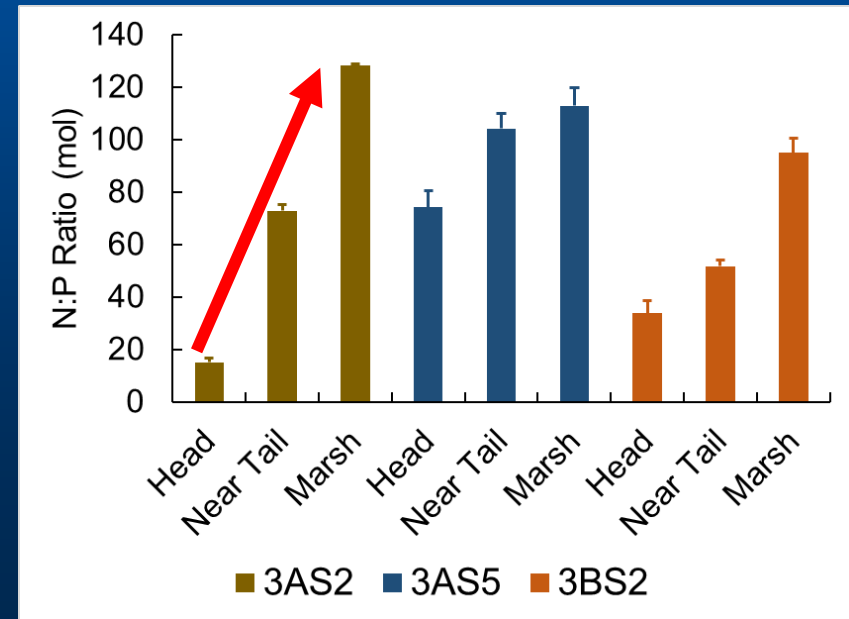
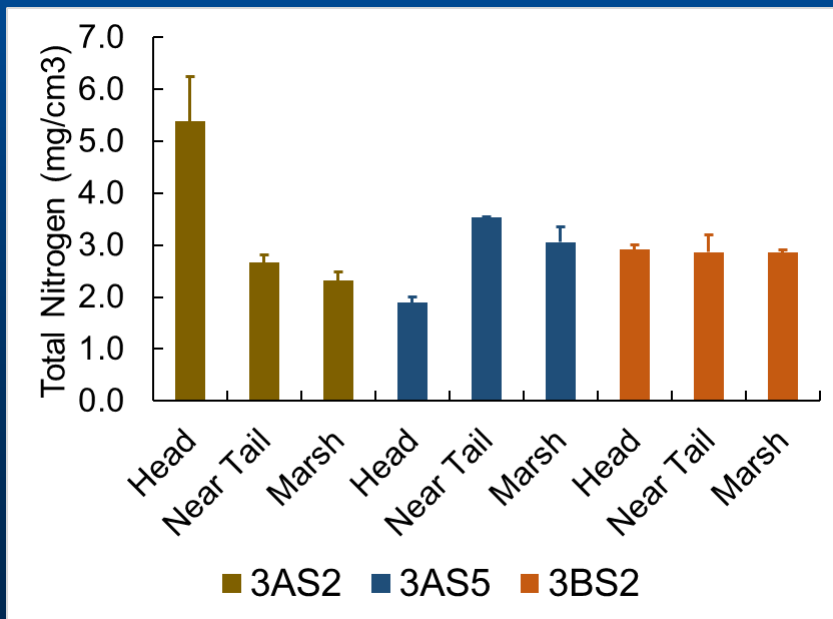
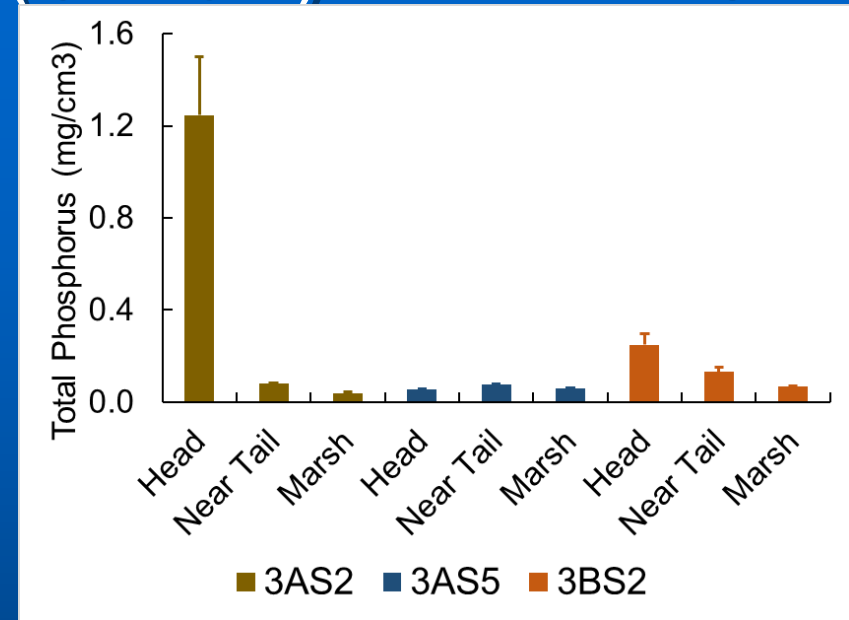
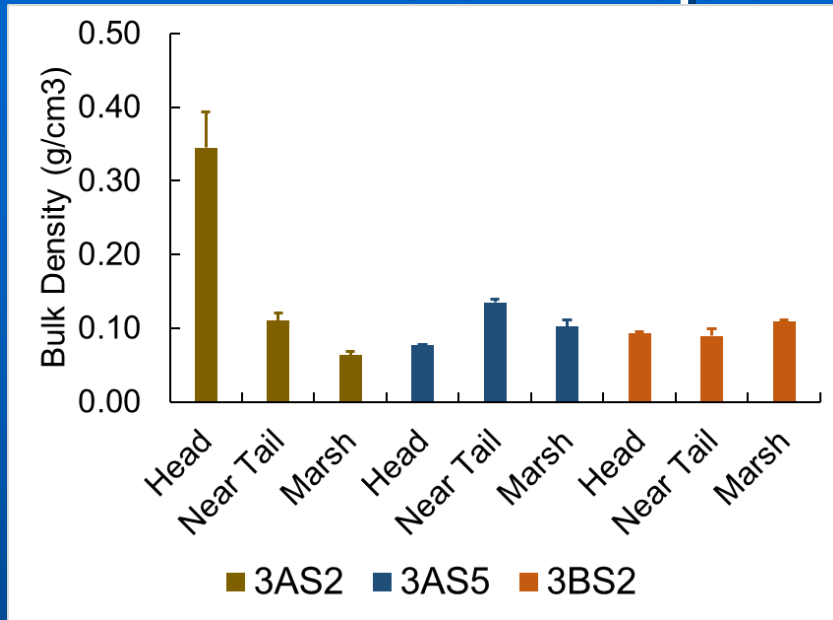


Tree Island 3BS2



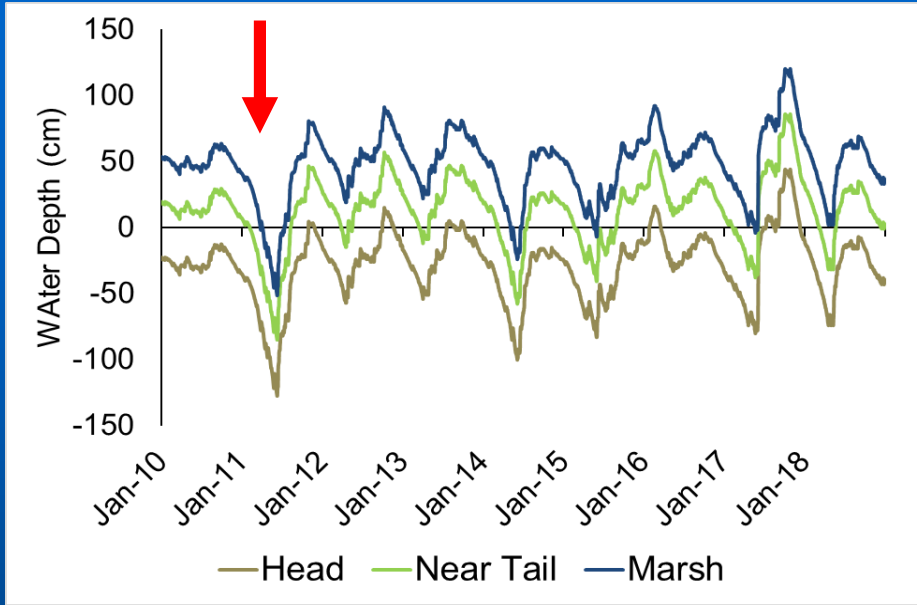
Soil Properties (0-4 cm)

n=3

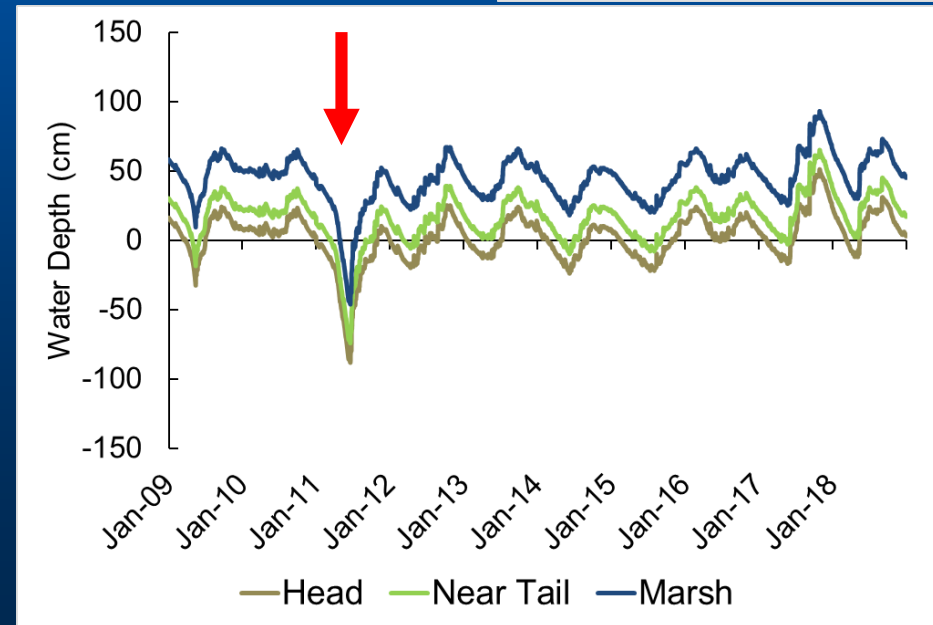
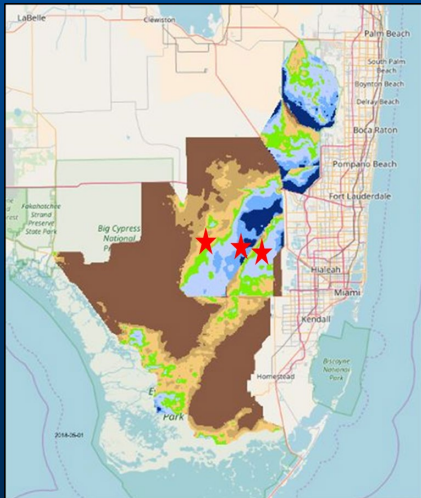
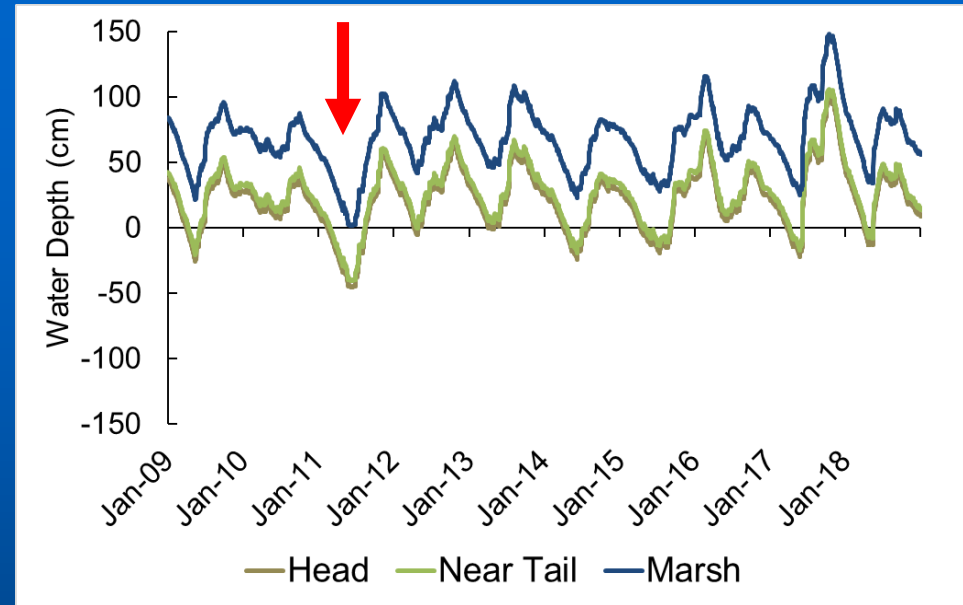


Water Depths & Hydroperiods (2009-2018)

3AS2



3AS5



3BS2

Head

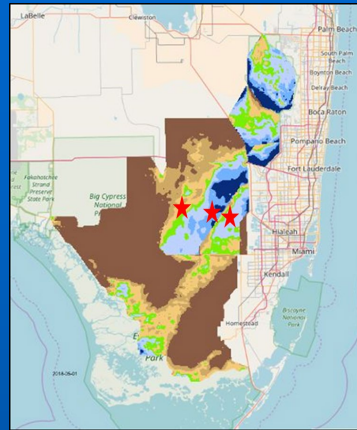
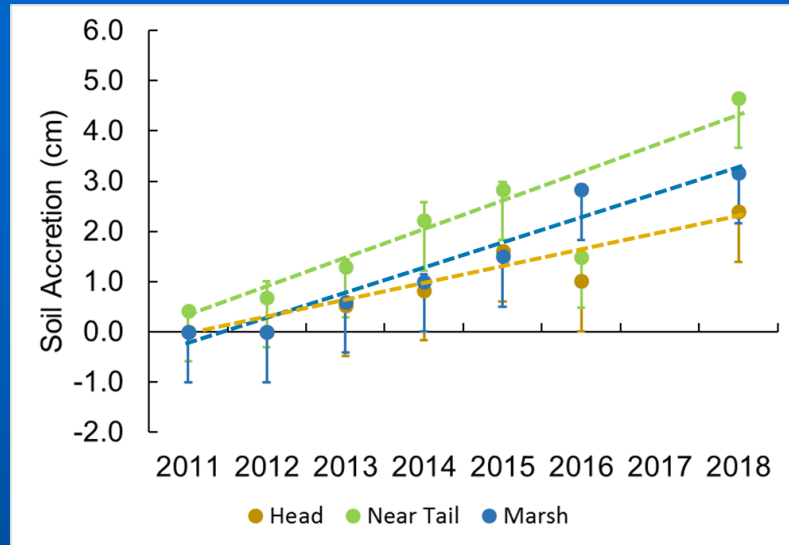
Near Tail

Marsh

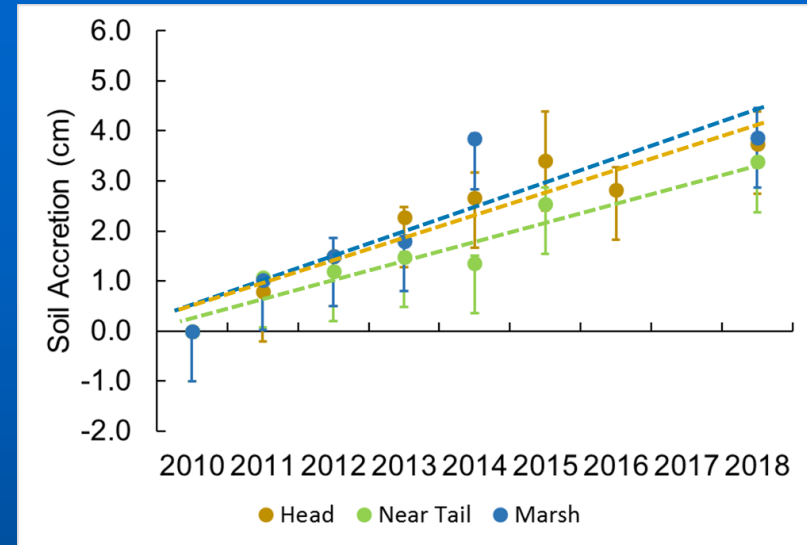


Annual Soil Accretion (feldspar) (2009-2018) n=3

3AS2



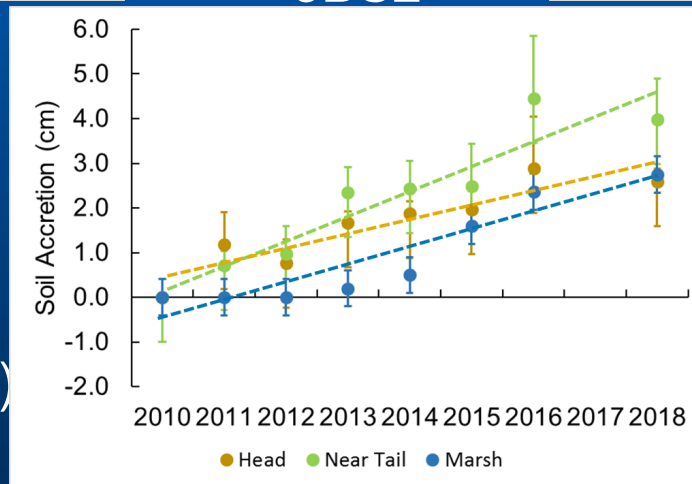
3BS2



3AS5

Accretion Rates (cm/yr.)

Head 0.30
Near Tail 0.51
Marsh 0.45



Accretion Rates (cm/yr.)

Head 0.49
Near Tail 0.38
Marsh 0.49

Accretion Rates (cm/yr.)

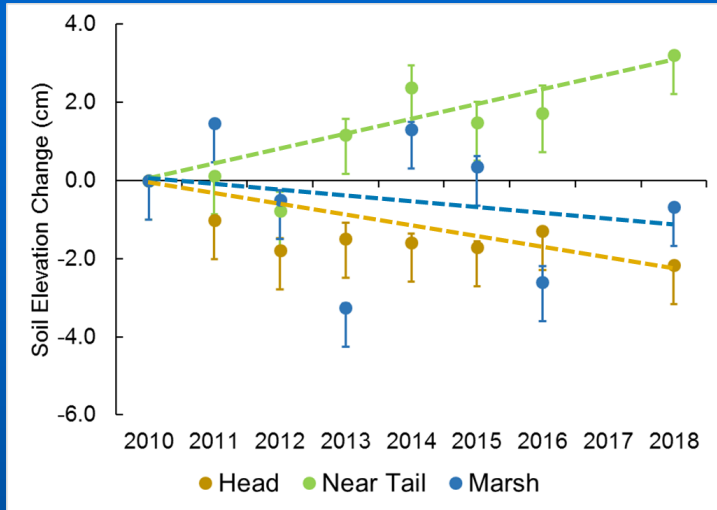
Head 0.33
Near Tail 0.52
Marsh 0.34

Head Near Tail Marsh

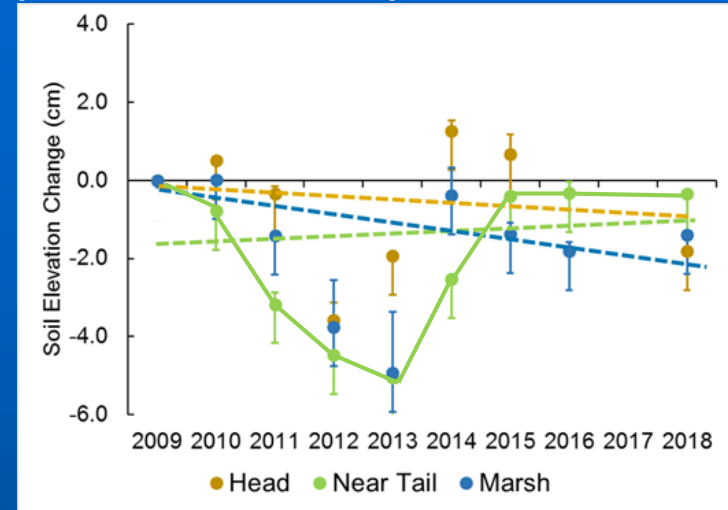


Annual Soil Elevation Change (2009-2018) n=2

3AS2



3BS2



3AS5

Soil Elevation Rates (cm/yr.)

Head -0.18

Near Tail 0.42

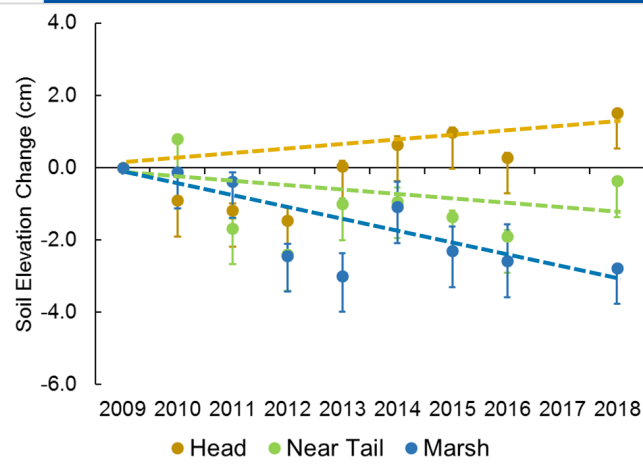
Marsh -0.18

Soil Elevation Rates (cm/yr.)

Head 0.25

Near Tail -0.10

Marsh -0.32



Soil Elevation Rates (cm/yr.)

Head -0.08

Near Tail 0.13

Marsh -0.11

Head

Near Tail

Marsh



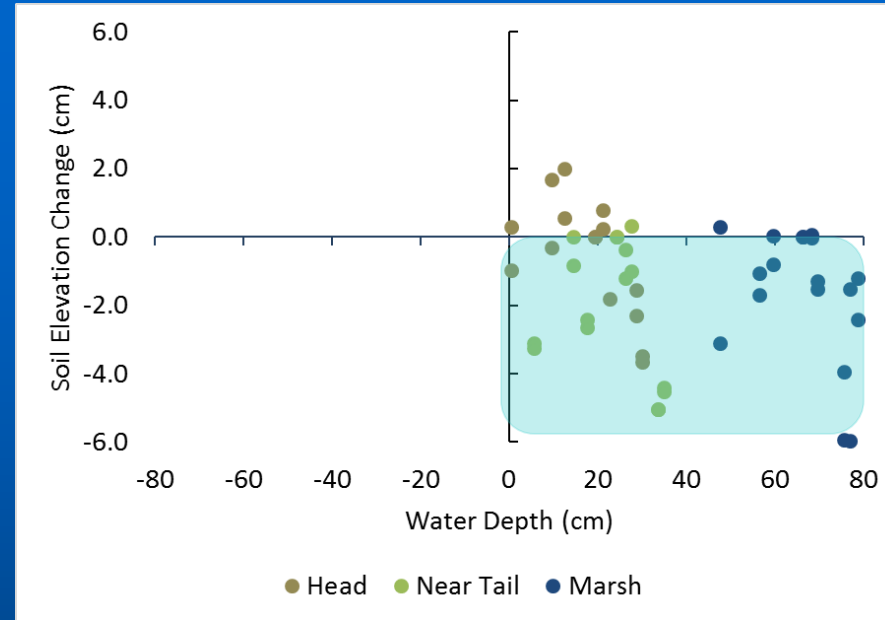
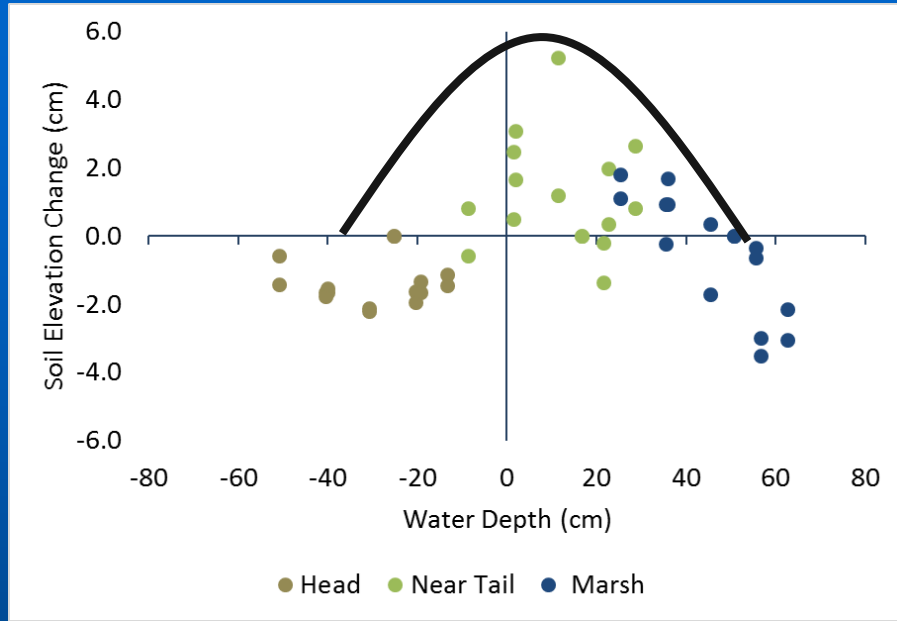
Subsidence Rates in the Root Zone cm year⁻¹

Tree Island	Environment	Rates	Hydrology
3AS2	Head	0.48	Very Short
3AS2	Near Tail	0.08	Dry-Wet Cycle
3AS2	Marsh	0.63	-
3AS5	Head	0.54	Very Long
3AS5	Near Tail	0.25	Very Long
3AS5	Marsh	0.60	-
3BS2	Head	0.08	Dry-Wet Cycle
3BS2	Near Tail	0.62	Long
3BS2	Marsh	0.66	-

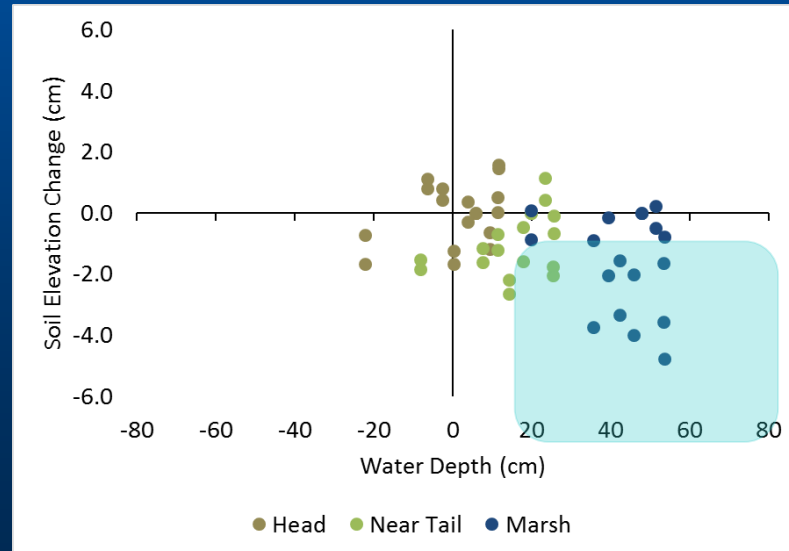
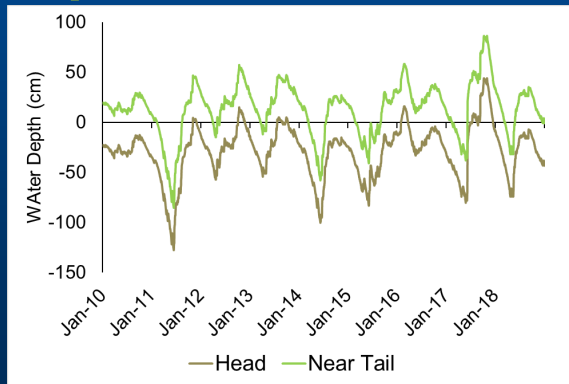
Subsidence = vertical accretion – surface elevation

Management implications: Soil Elevation-Water Depth

3AS2

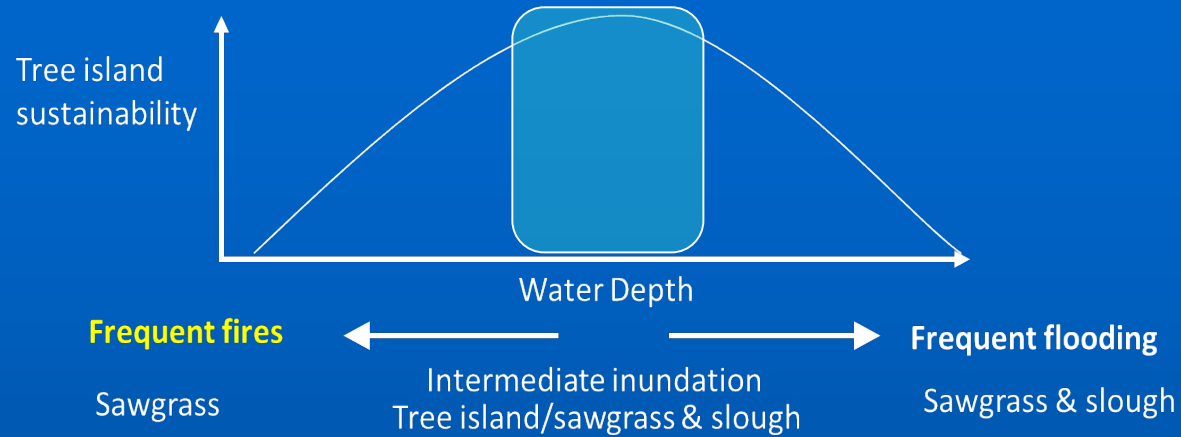


3AS5



3BS2

Summary



- Tree islands with decreasing soil elevation and subsidence are experiencing compaction/shrinking of the soil matrix, which is driven mainly by long periods of inundation.
- Tree islands that experience short hydroperiods are also losing soil elevation; however the main process associated with elevation loss is soil oxidation.
- Increasing soil elevation can be achieved on Tree Islands when a distinct wet-dry cycle is maintained.

Thank You

Questions?

