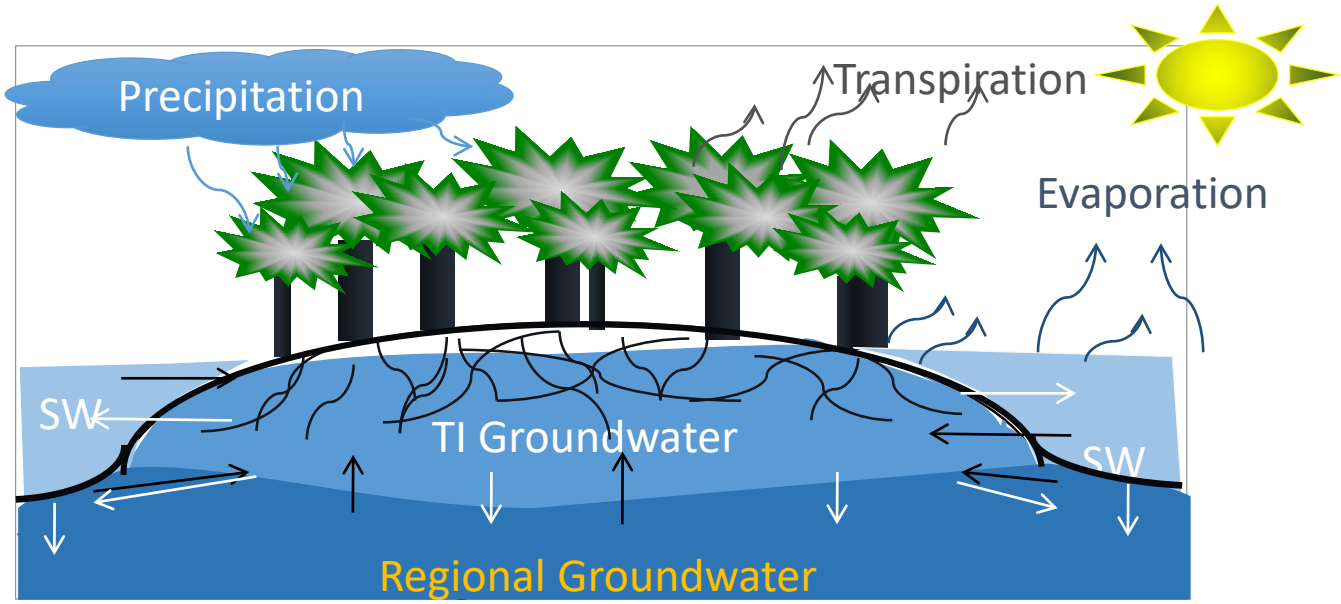
Hydrodynamics of Constructed Tree Islands



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Leonard Scinto, Mike Ross, Pamela Sullivan, Andres Prieto

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Eric Cline, Fred Sklar, Tom Dreschel

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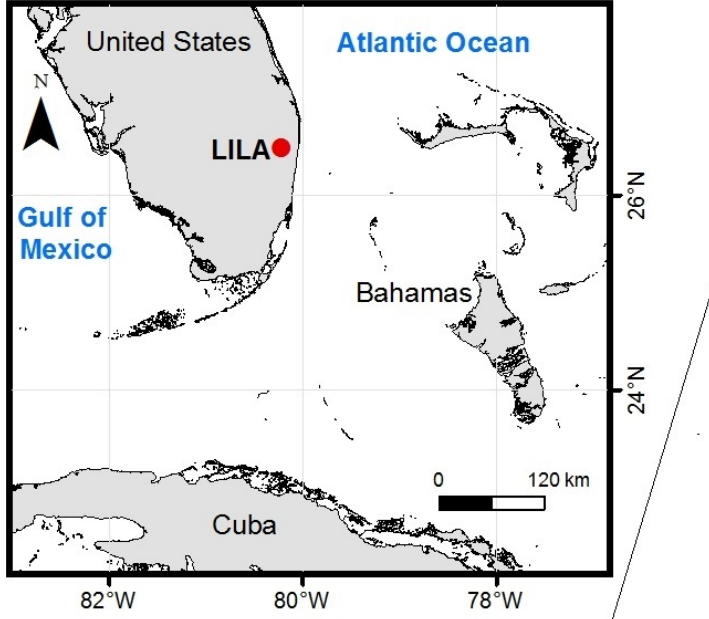
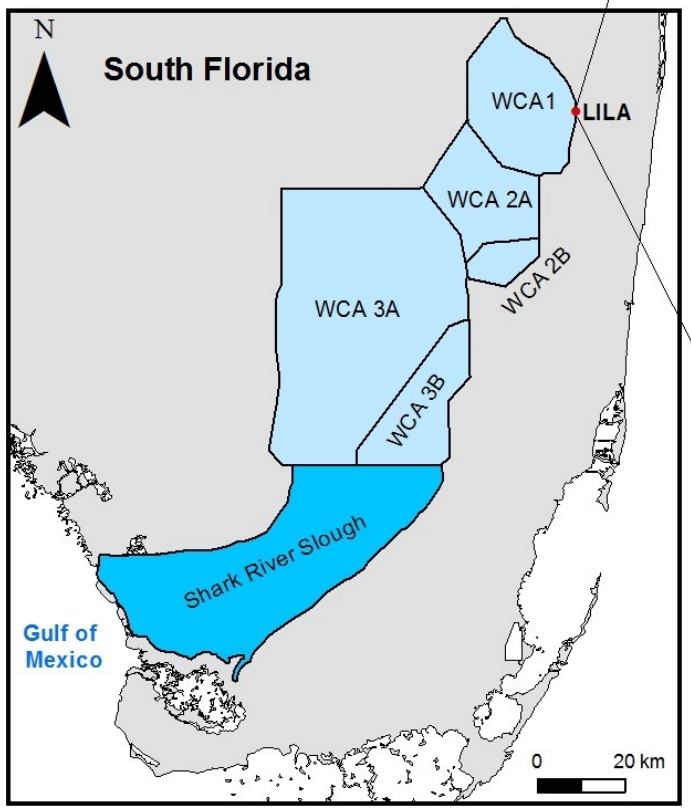
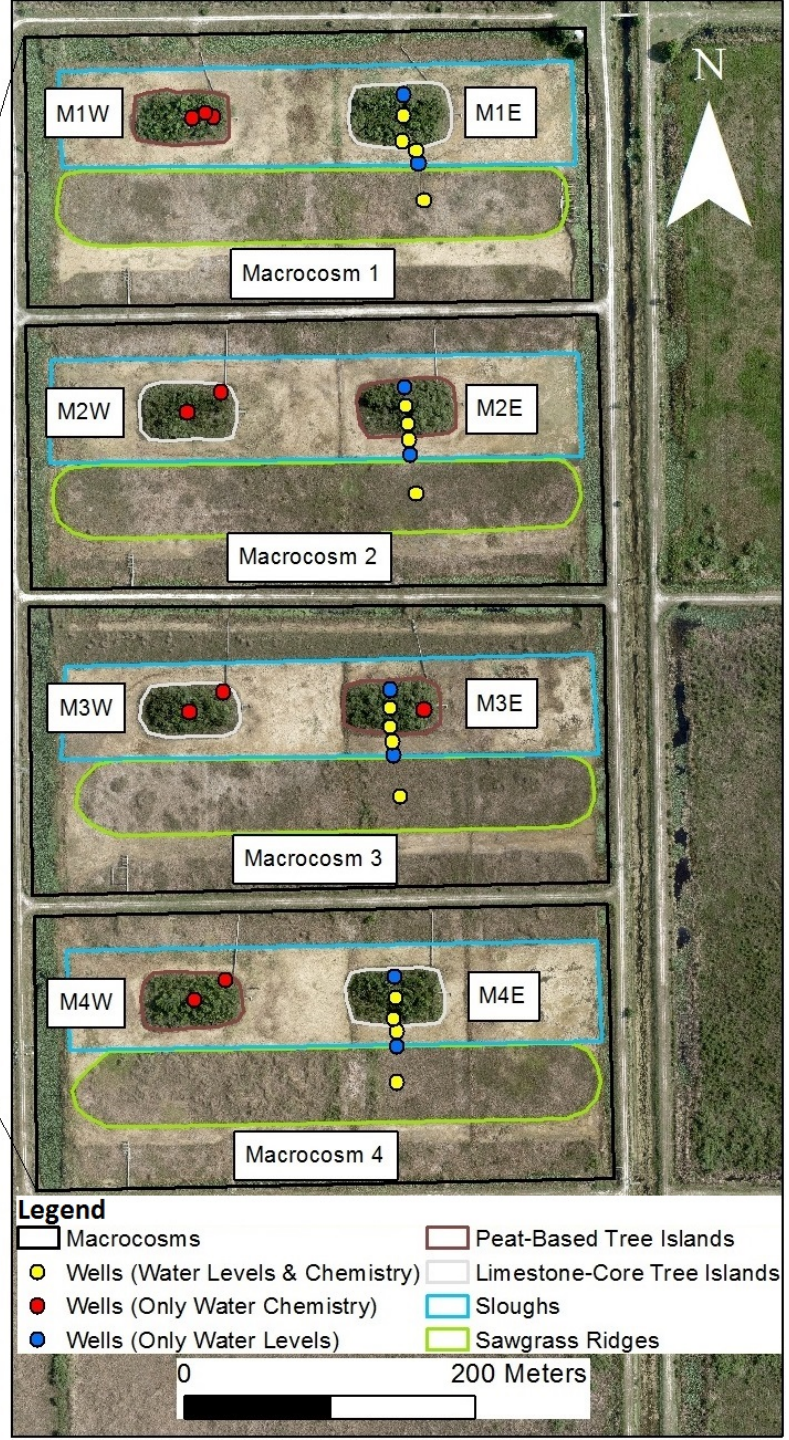






Loxahatchee Impoundment Landscape Assessment (LILA):

a large physical model of the Everglades

Arthur R. Marshall Loxahatchee National Wildlife Refuge in Boyton Beach, FL.

Constructed in 2003

- 4 islands of peat/sand
- 4 islands of limestone/peat/sand

Trees Planted in 2006/2007
>700 trees per island
8 native Everglades tree species

Planted Saplings: 2006, 2007

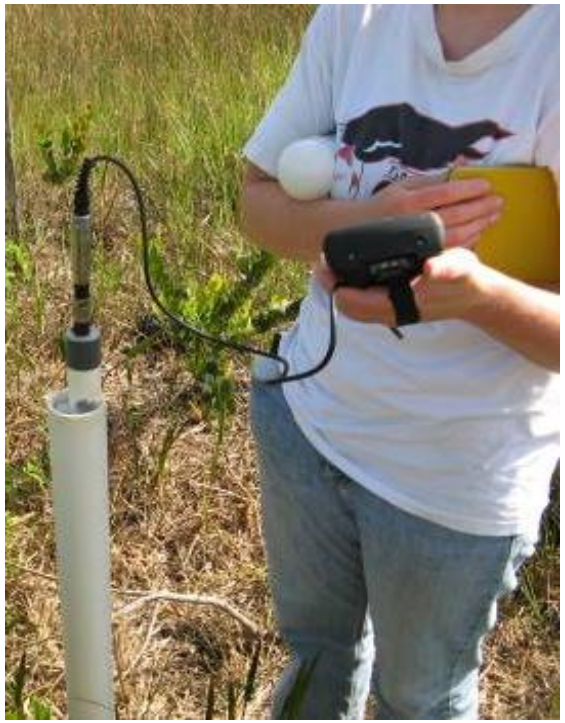
Objectives:

- Observe changing hydrologic conditions in the tree islands in response to the growing trees.
- Compare the hydrologic conditions of constructed tree islands to native Everglades tree islands.

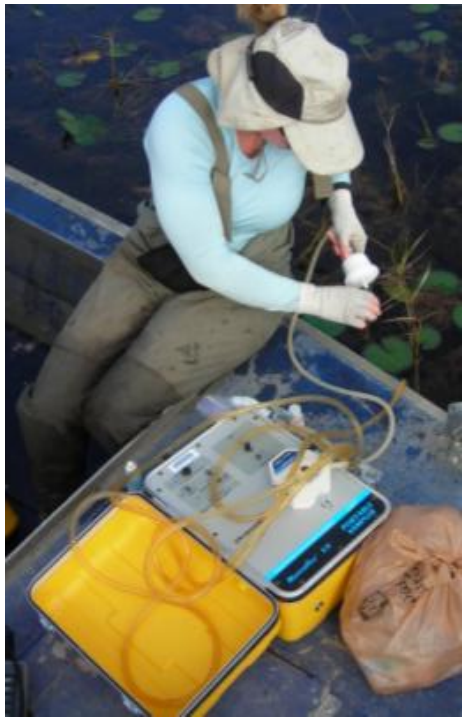
METHODS

Installed groundwater monitoring wells at an average depth of 1.34 m on the islands and ridge and slough

Surveyed the groundwater wells to compare groundwater and surface Water levels



In-situ troll 500 Pressure Transducers were used to monitor water levels



Collected groundwater and surface water samples for analysis

Tree Island Lithology

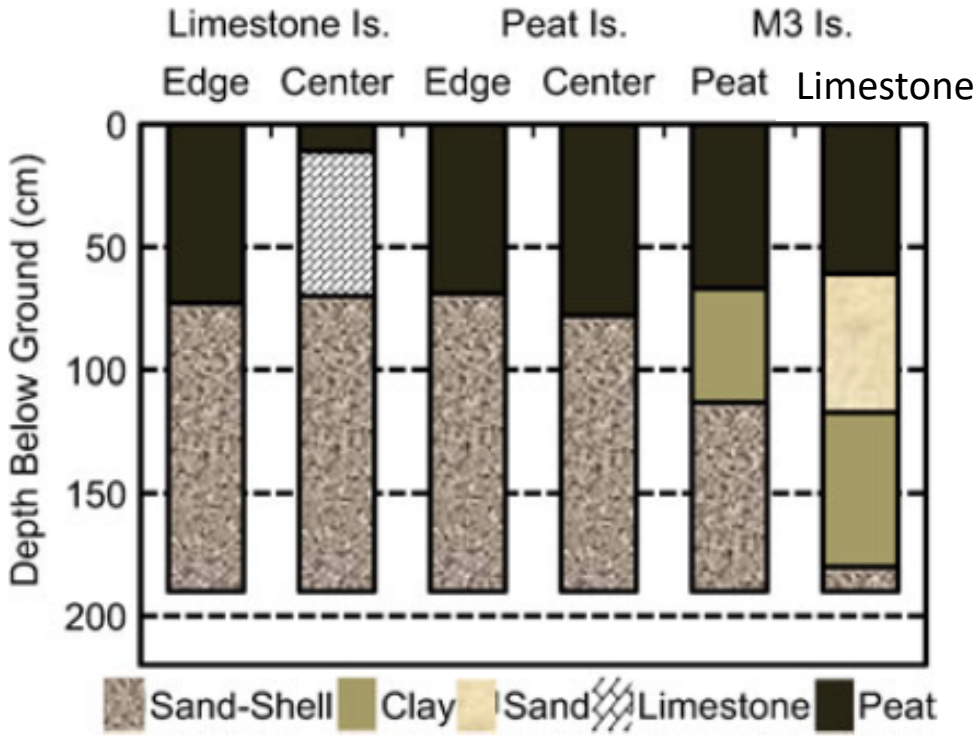
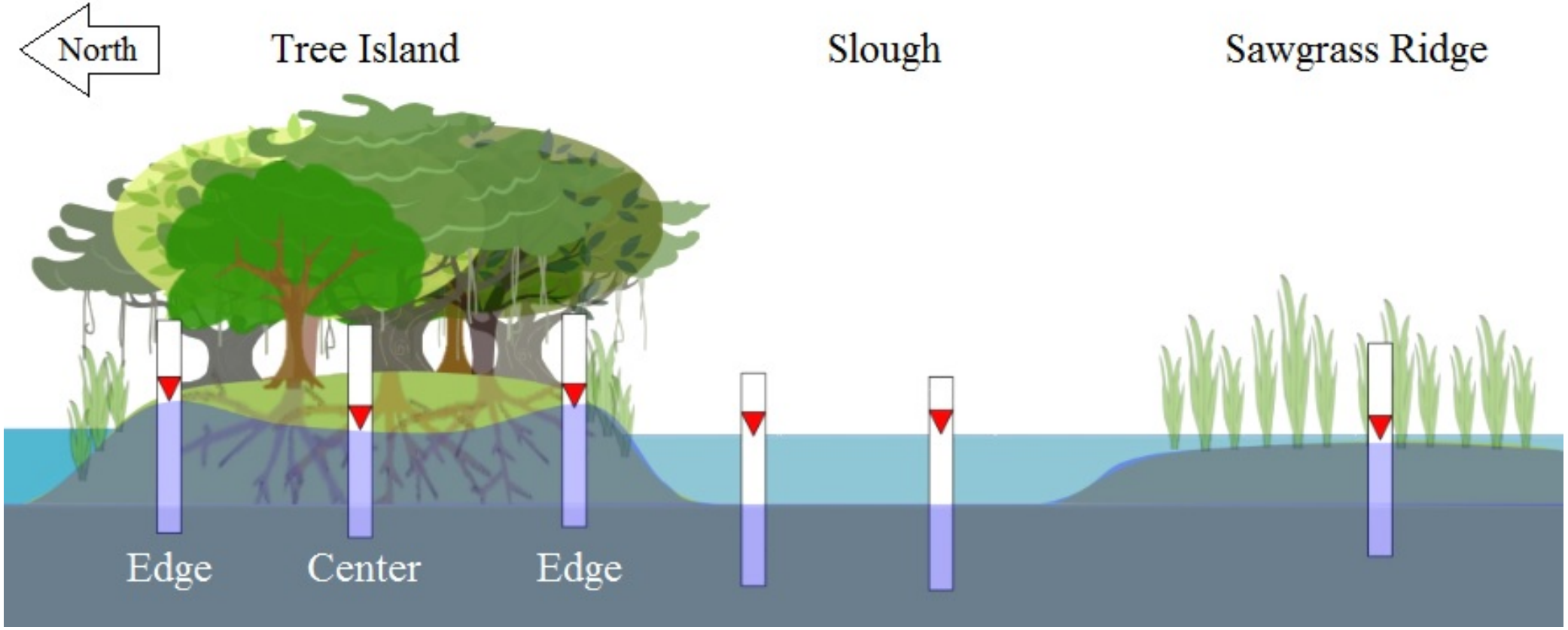


Fig. 4 The average sediment profile at the center and edges of the peat and limestone islands. In macrocosm 3 (*M3*) a thick layer of clay was observed across the peat island and at the edges of the limestone island

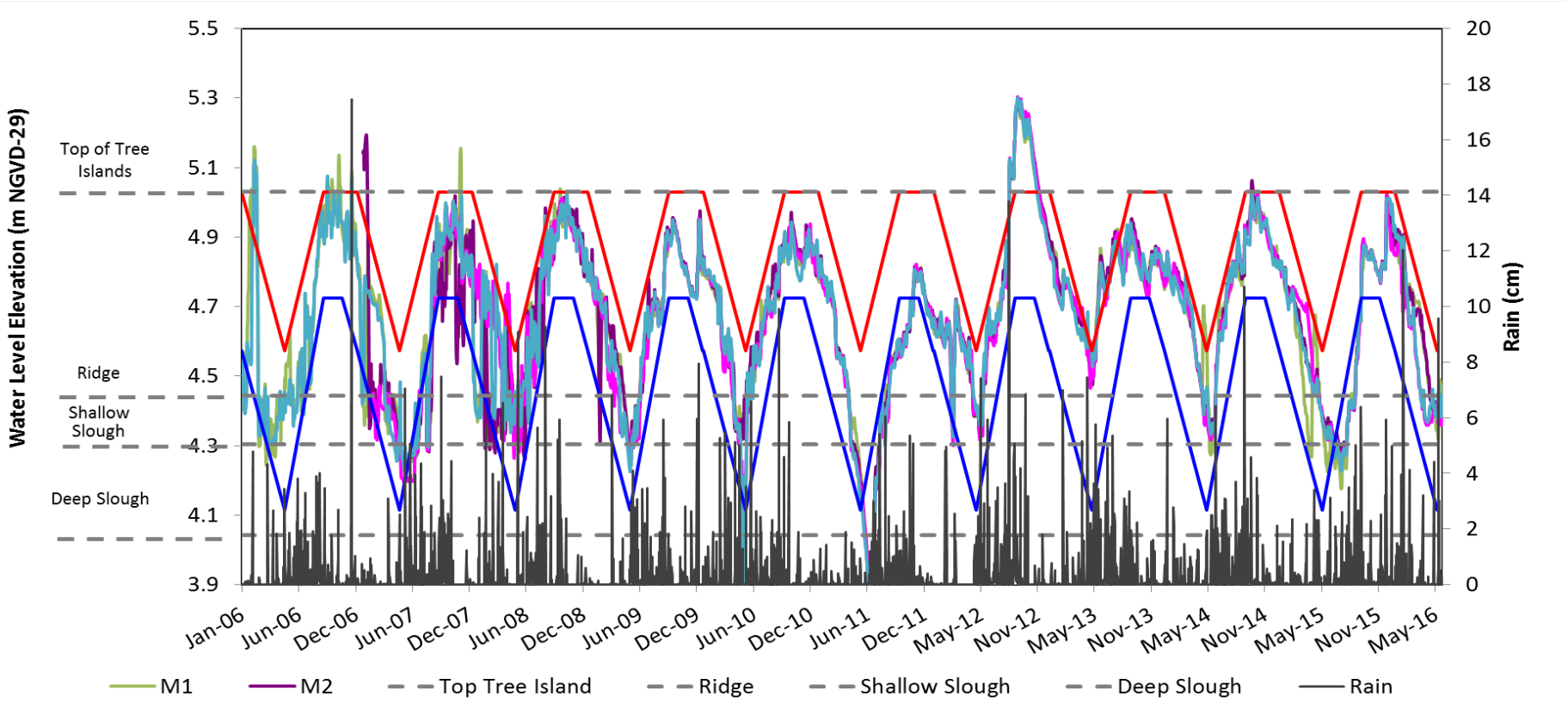
DOI 10.1007/s10040-010-0691-0



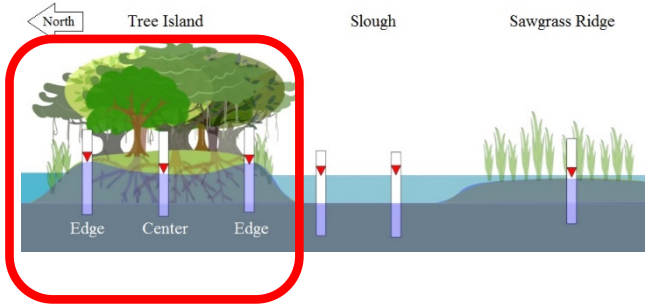
Hydrologic conditions monitored: 2006-2018

Groundwater/Surface water chemistry: 2009-2018

LILA Surface Water Hydrograph

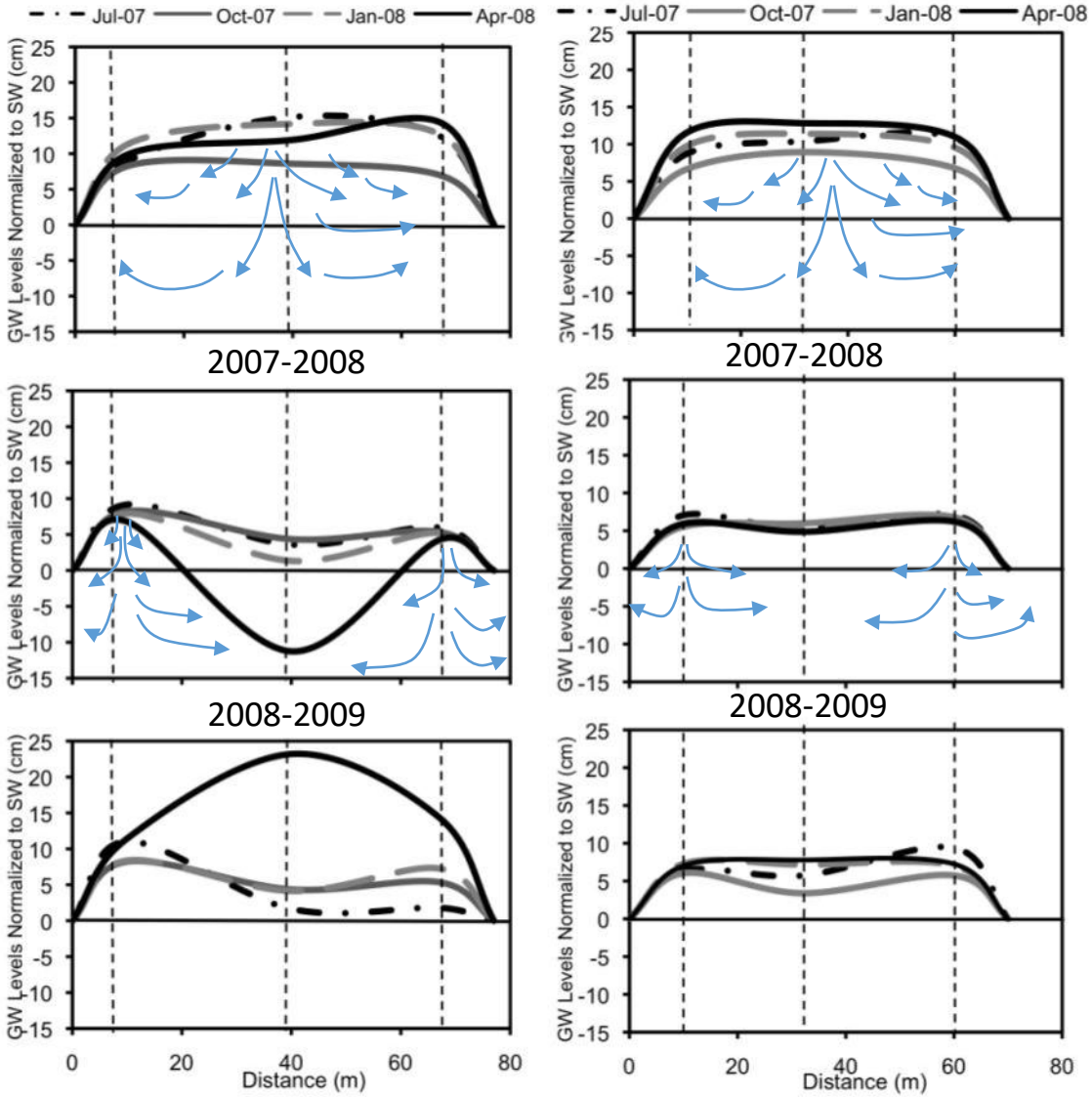


Early Tree Island Hydrologic Conditions

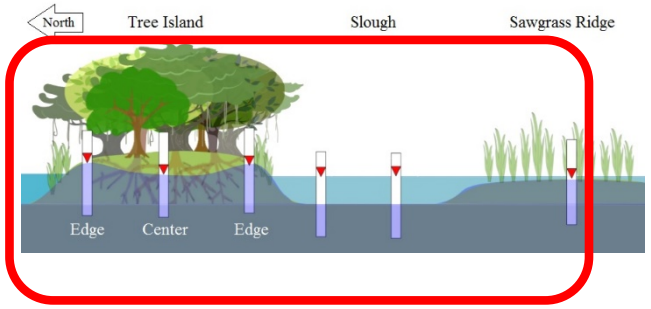


Limestone/Clay

Peat/Sand

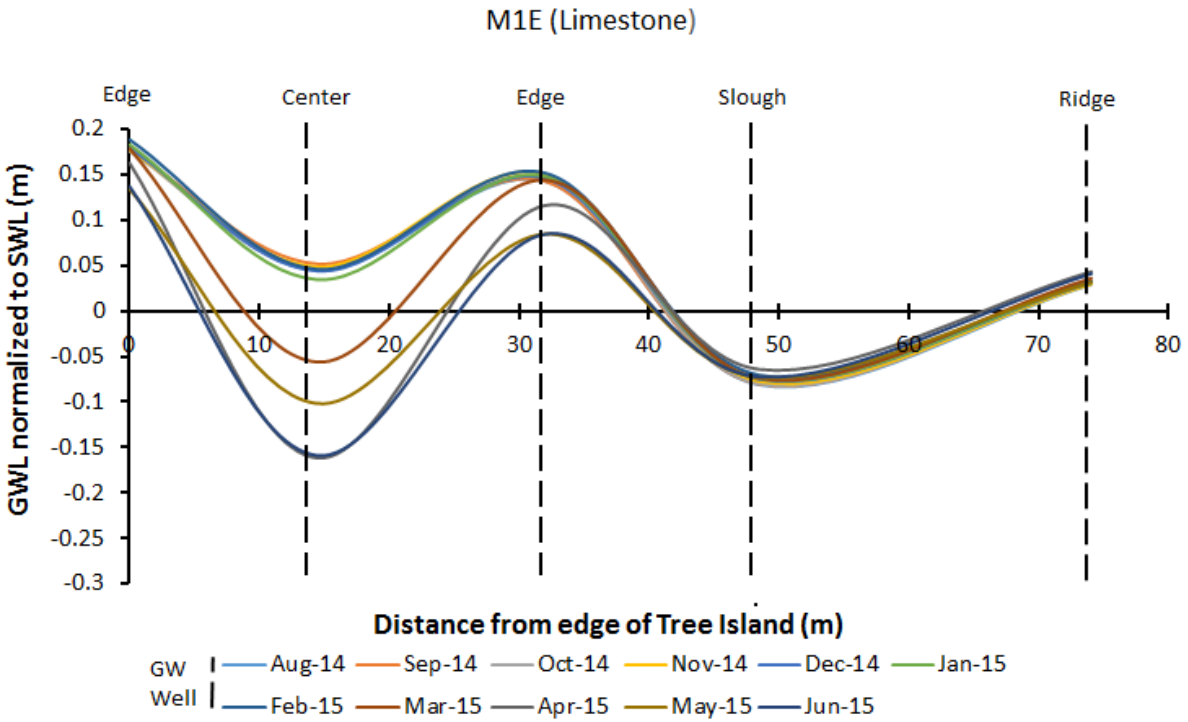


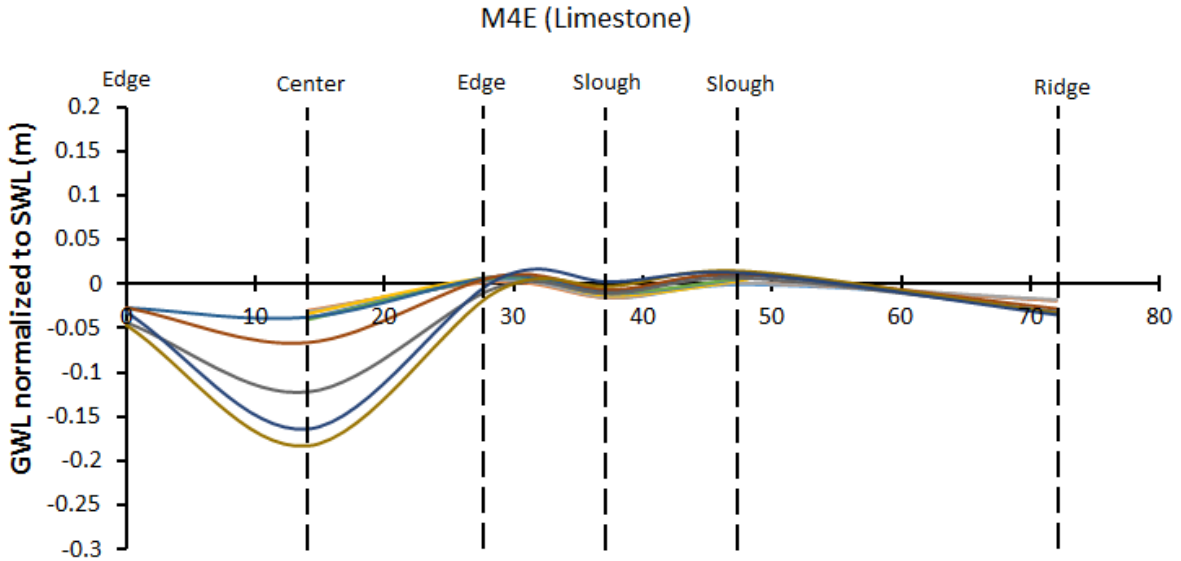
Landscape Hydrologic Conditions



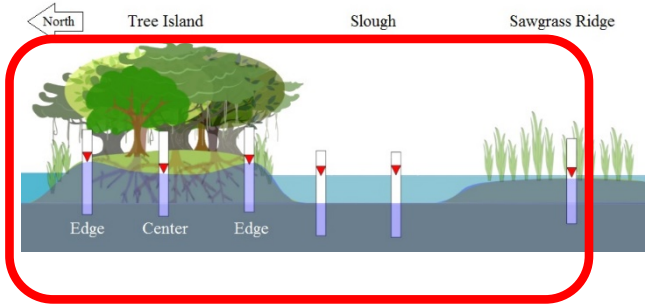
In later Years:
Differences in lithology influenced hydrologic conditions

Normalized Groundwater Levels

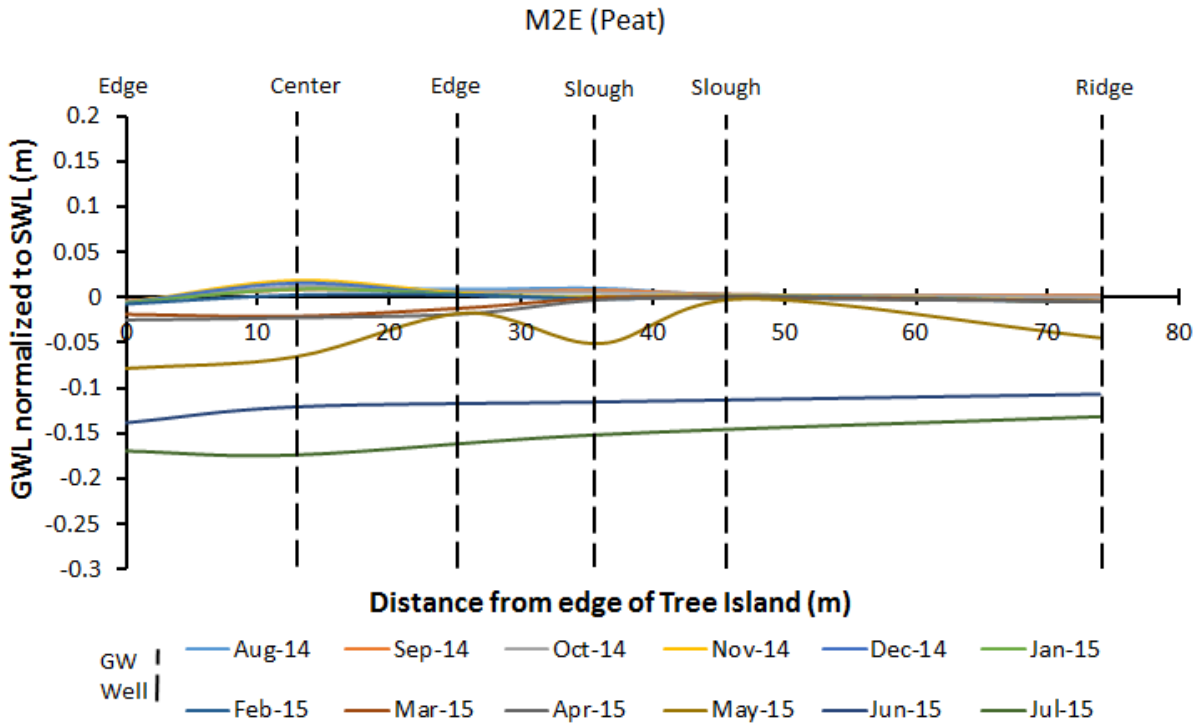




Landscape Hydrologic Conditions

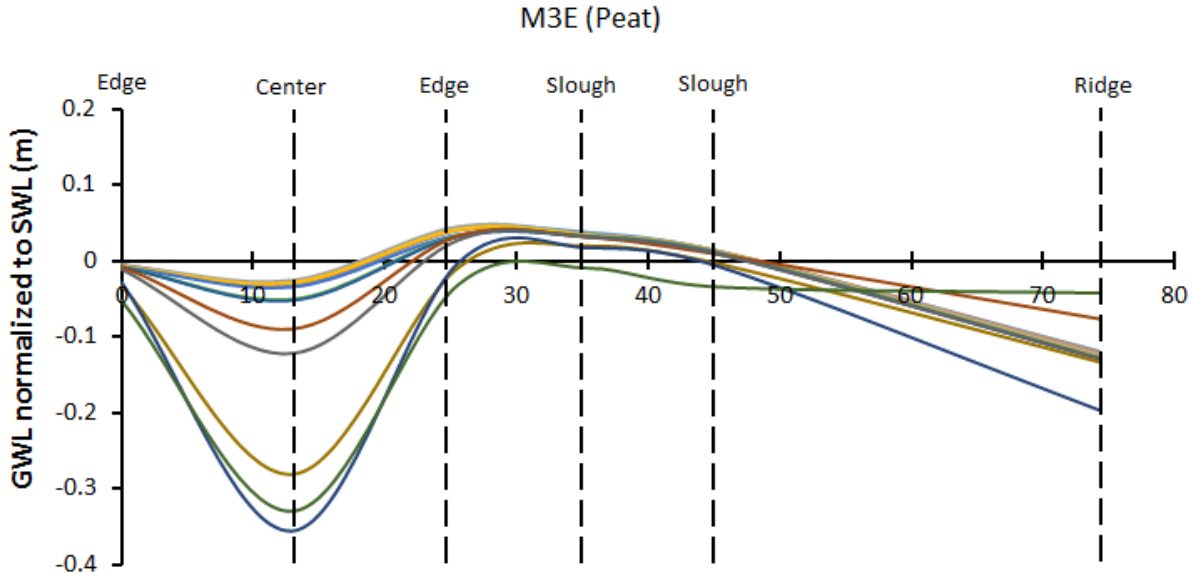


Normalized Groundwater Levels



Peat + Sand

Relatively flat water table

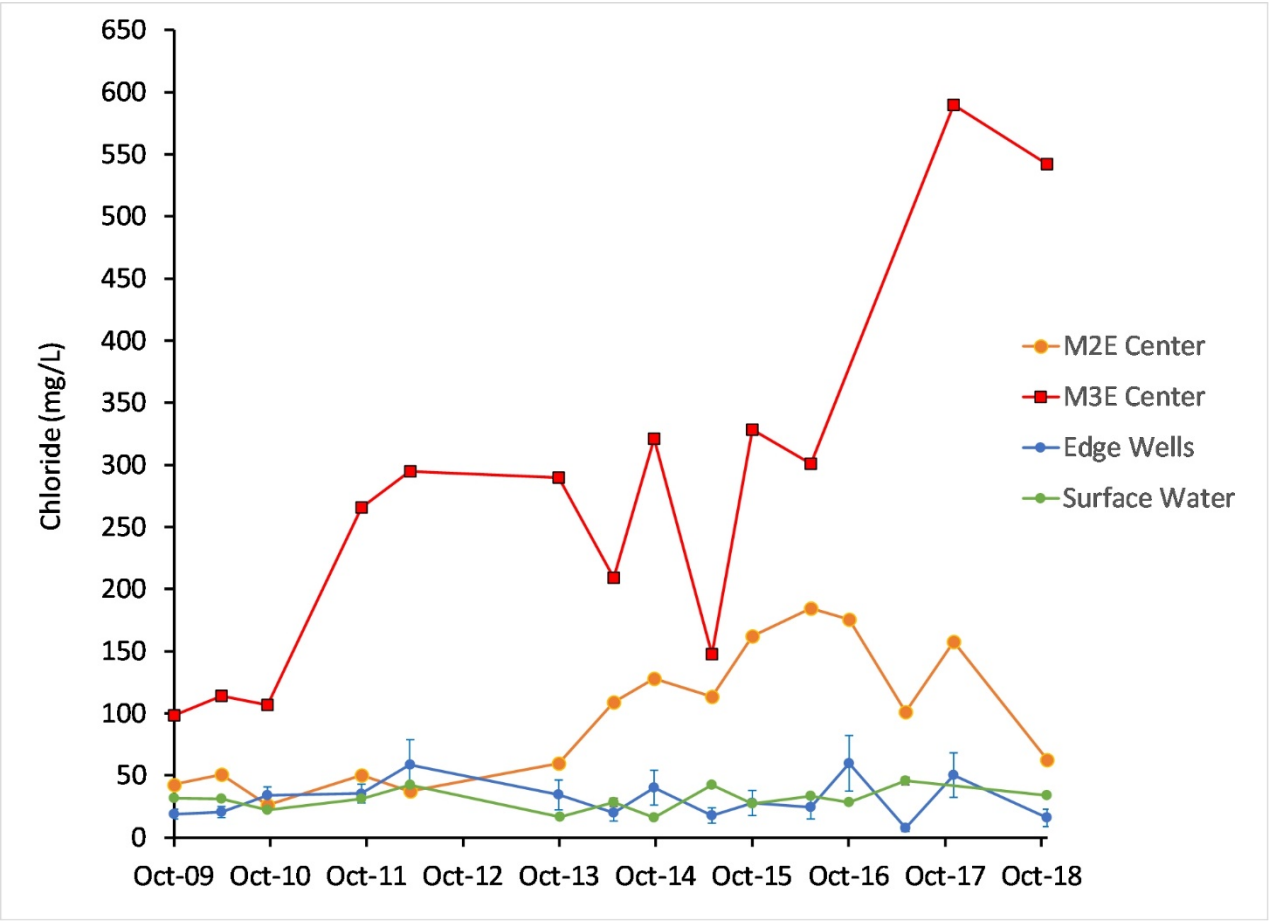


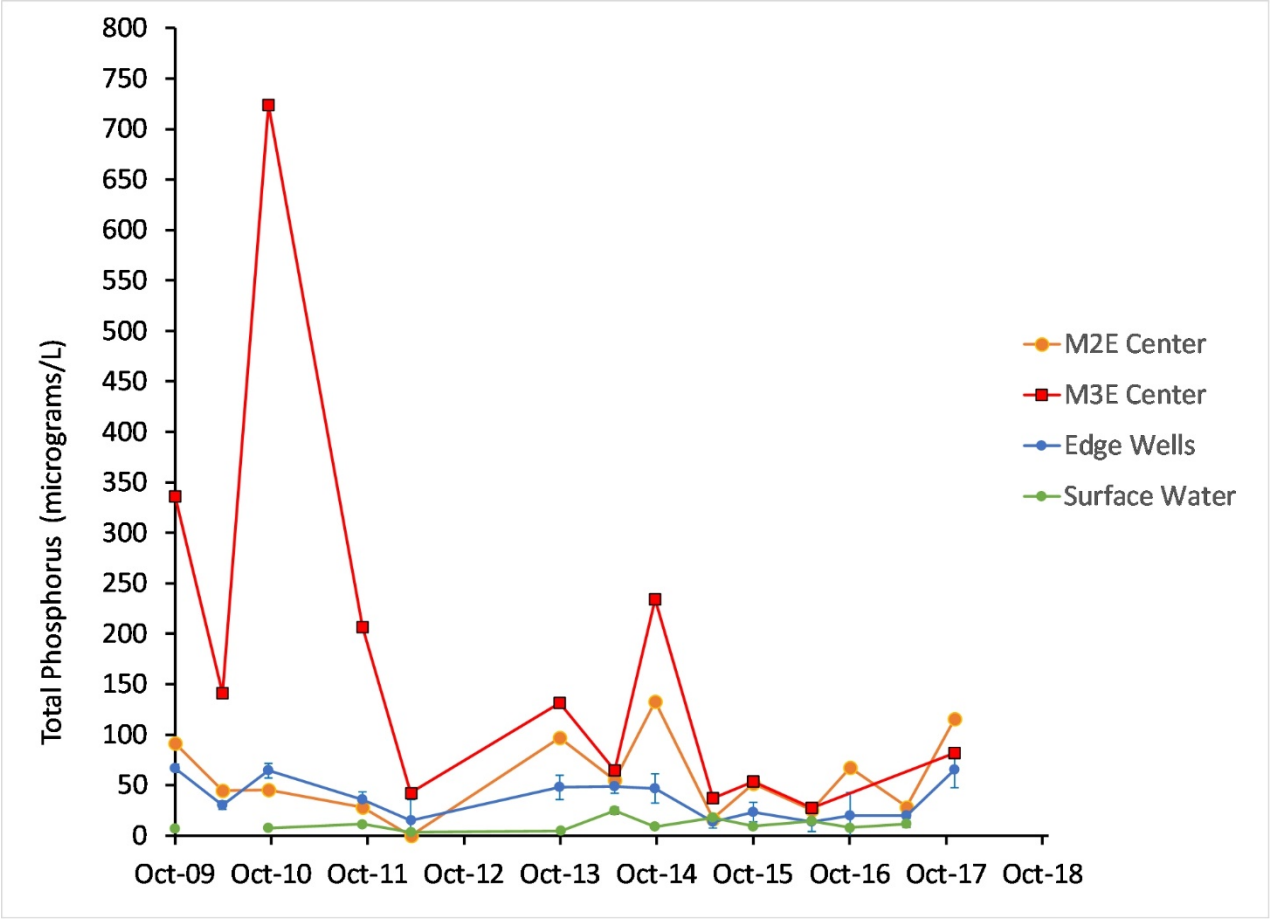
Peat + Clay

Steep drawdown in the water table beneath tree island

In later Years:
Differences in lithology influenced hydrologic conditions

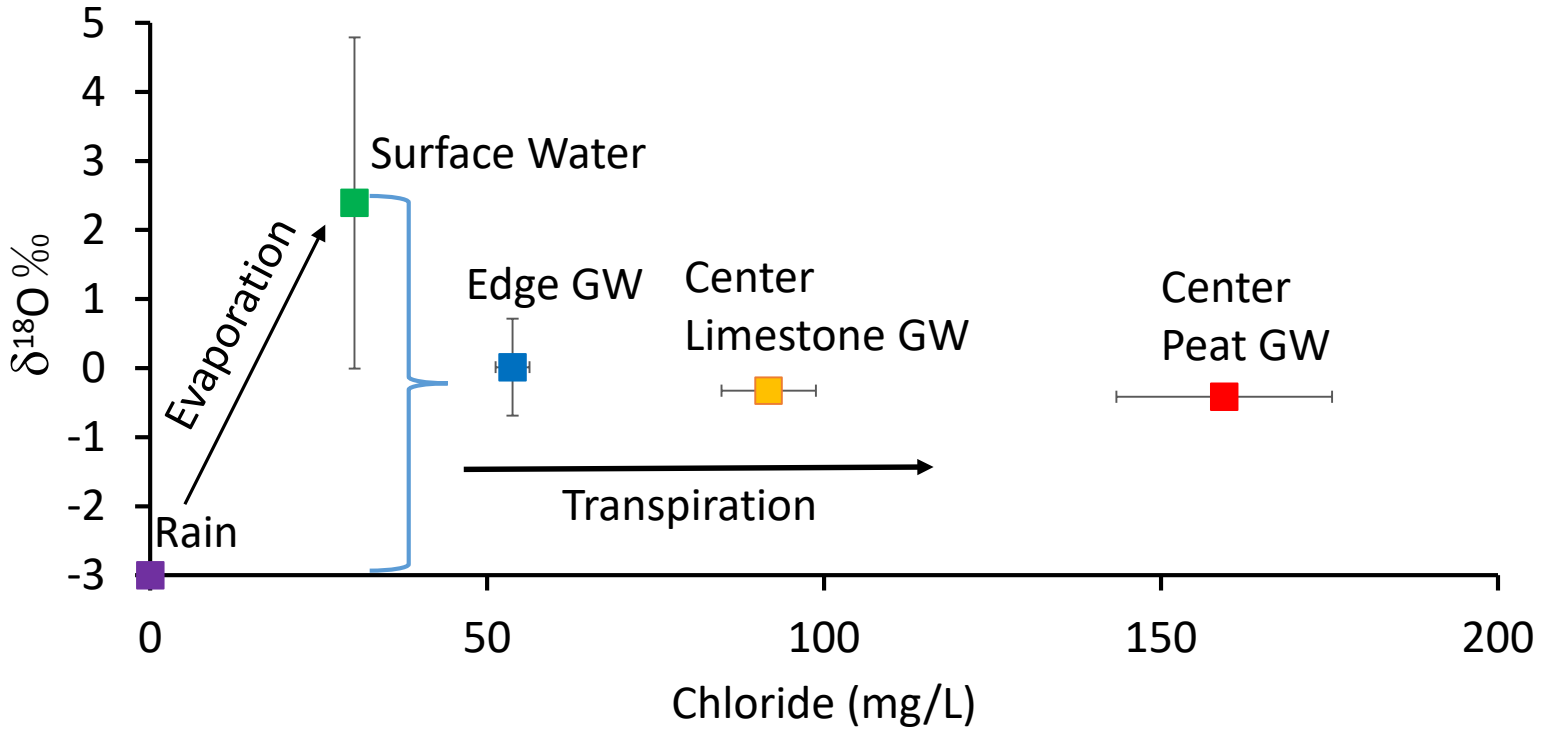
Water Chemistry



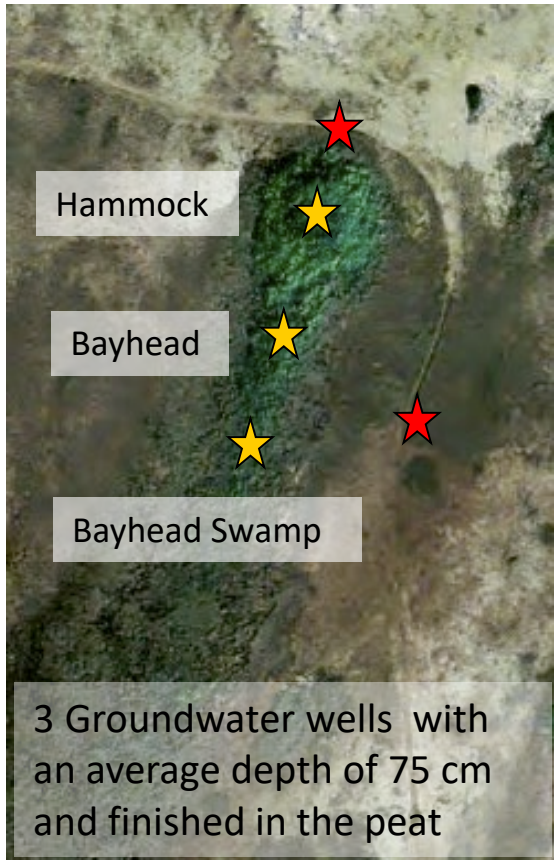


Satin Leaf Tree Island in Everglades National Park:
groundwater Cl^-= 175 mg/L; TP= 388 µg/L
(Sullivan et al., Ecohydrology, 2013)

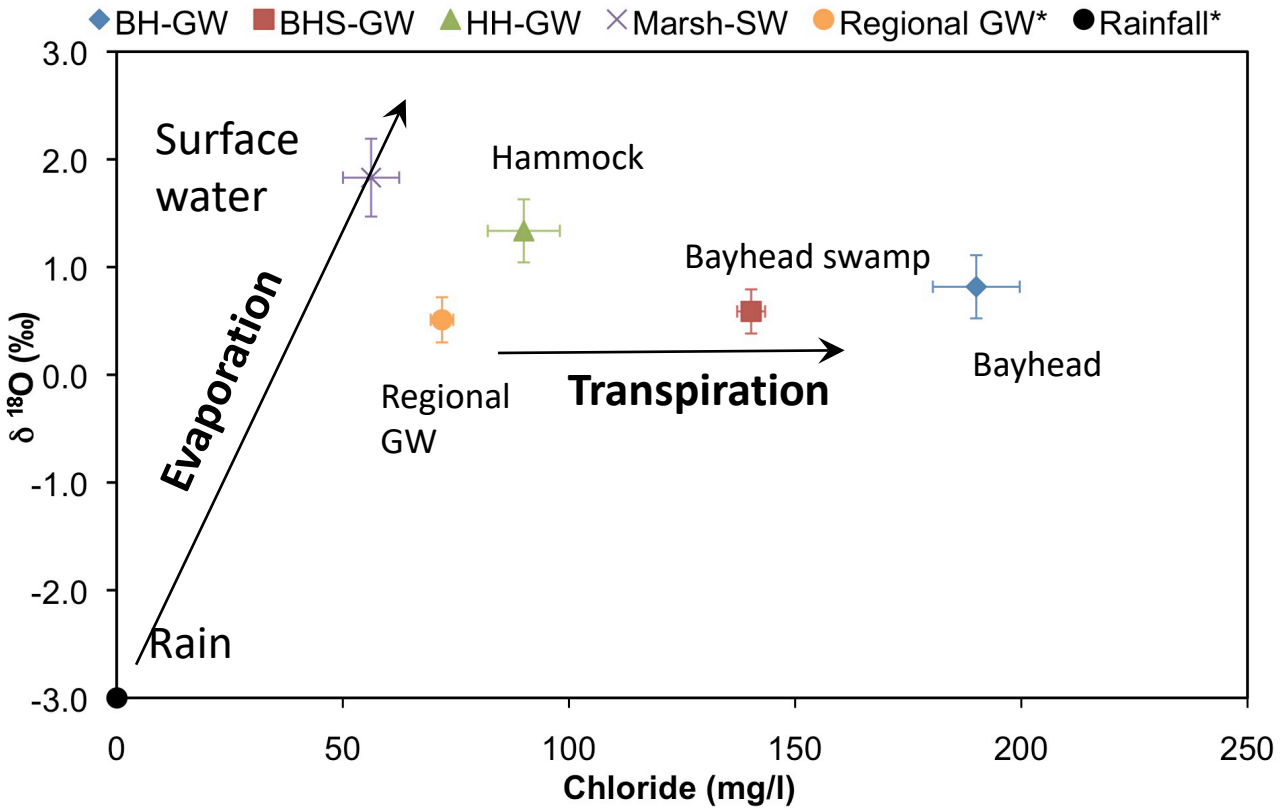
LILA Water Chemistry



Satinleaf Tree Island



2 SW Sites



Transpiration in the tree island results in increased ion concentrations in the groundwater in the center of the Tree island.

(Sullivan et al., Ecohydrology, 2013)

Summary

- Hydrodynamics of the constructed tree islands at LILA were influenced by tree transpiration and soil composition.
- Groundwater chemistry (chloride and oxygen isotopes) of LILA was similar to Satin Leaf Tree Island in ENP.
- TP of groundwater at LILA was lower than observed at Satin Leaf Tree Island.

Publications:

Prieto AE, Price RM, Scinto LJ, Maurrasse FJ-MR, Dreschel TW, Sklar FH, and Cline EA . *2018*. **Lithologic controls on hydrologic and geochemical processes in constructed Everglades tree islands.** *Chemical Geology.* https://doi.org/10.1016/j.chemgeo.2018.04.001.

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Thank You