Vegetation Dynamics on Tree Islands within the Ridge and Slough Landscape in the Southern Everglades

Jay P. Sah

Susana Stoffella, Michael S. Ross,

Bianca Constant

Florida international University, Miami, FL

Pablo Ruiz

SFCN-National Park Service, Miami, FL

GEER

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Everglades tree islands

- **A patch of broadleaf forest embedded within non-woody vegetation types, typically a freshwater or brackish marsh**

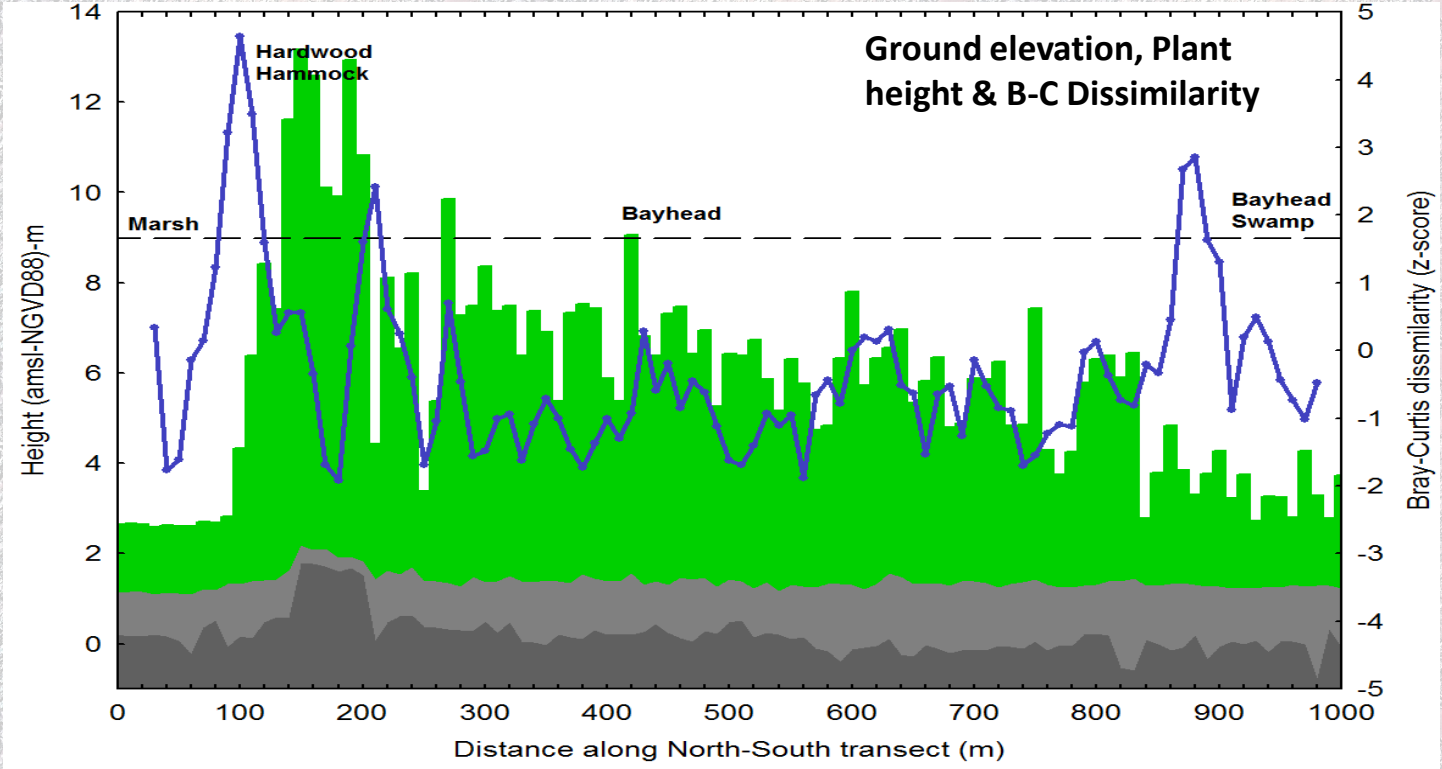
Tree islands

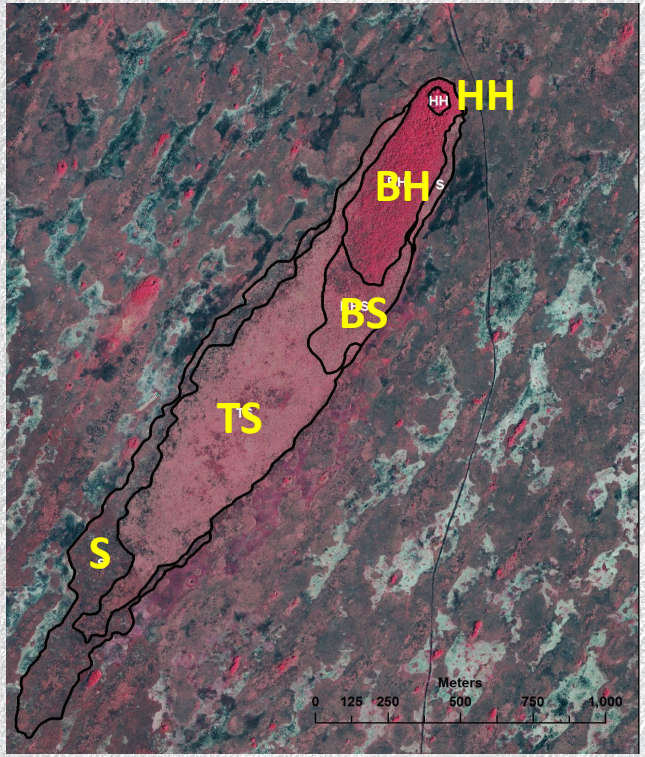
Ridge & Slough landscape

Marl prairie landscape

Tree islands are focal communities in the restoration efforts currently underway in the Comprehensive Everglades Restoration Plan (CERP).

Plant communities on a Shark Slough Tree Island

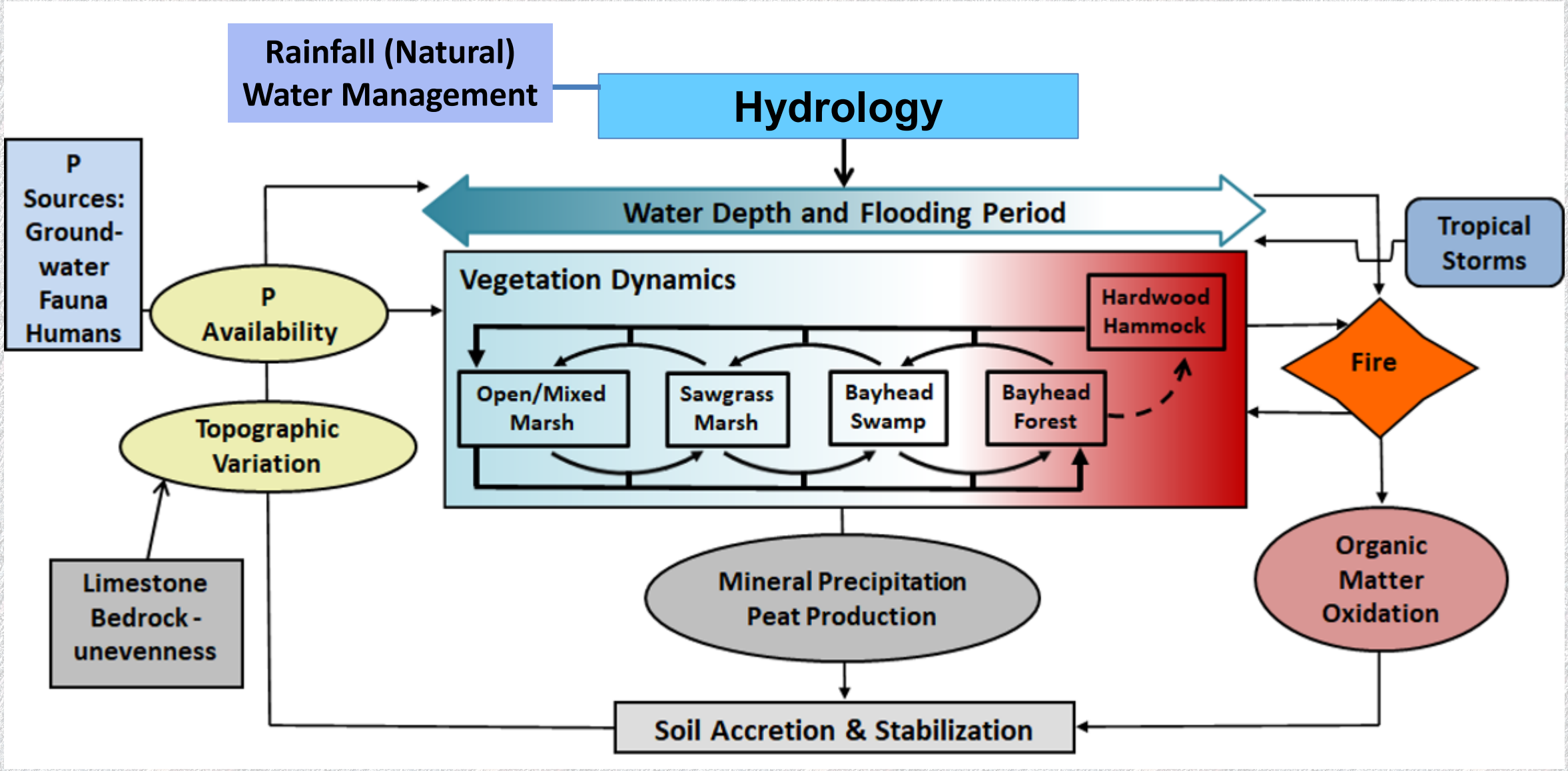




HH = Hardwood Hammock
BH = Bayhead Forest
BS = Bayhead Swamp
TS = Tall Sawgrass
S = Sawgrass marsh

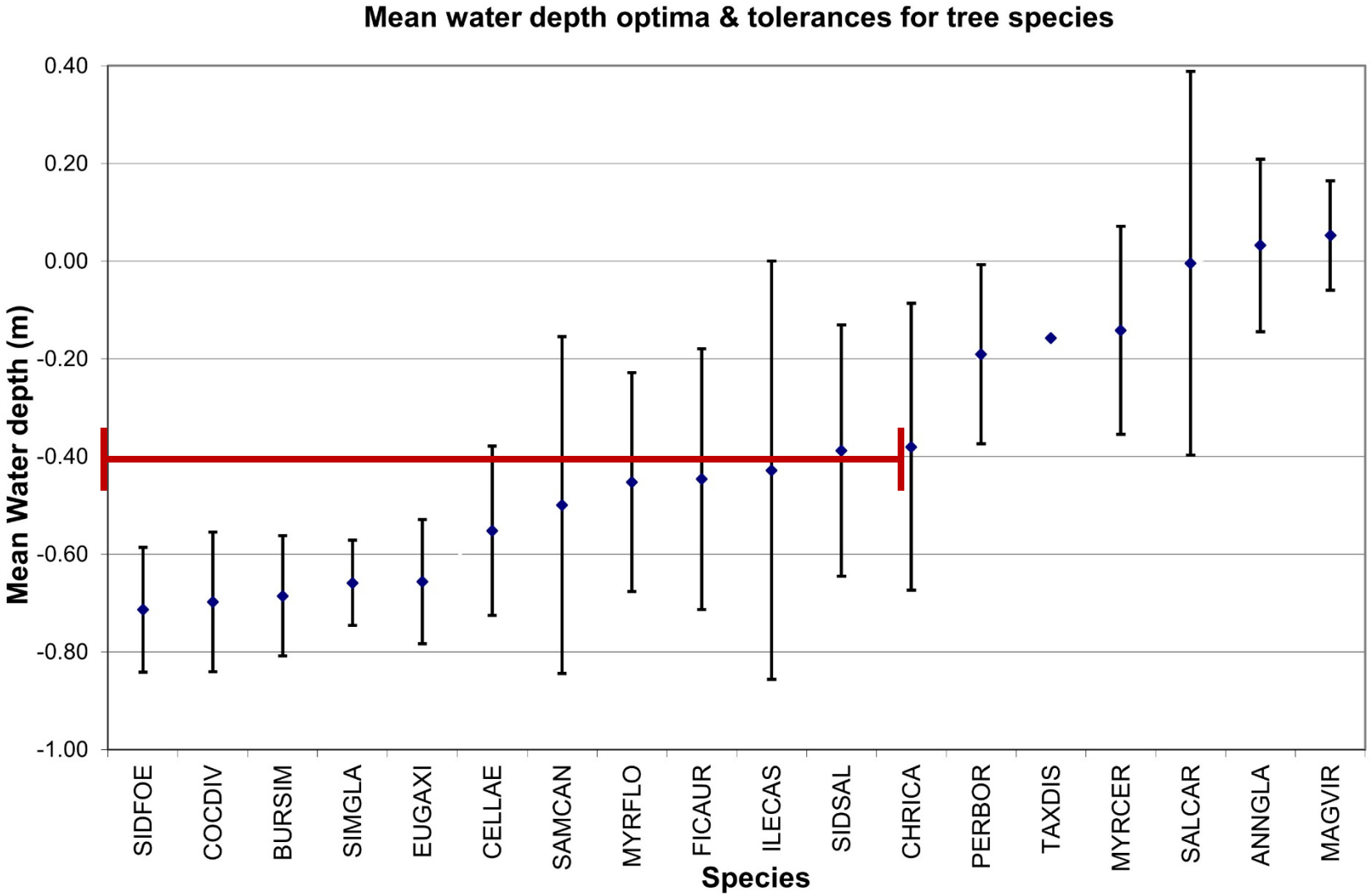
Plant communities along topographic gradient in R&S tree islands

Tree Island vegetation dynamics



Sah et al. 2018 (Modified)

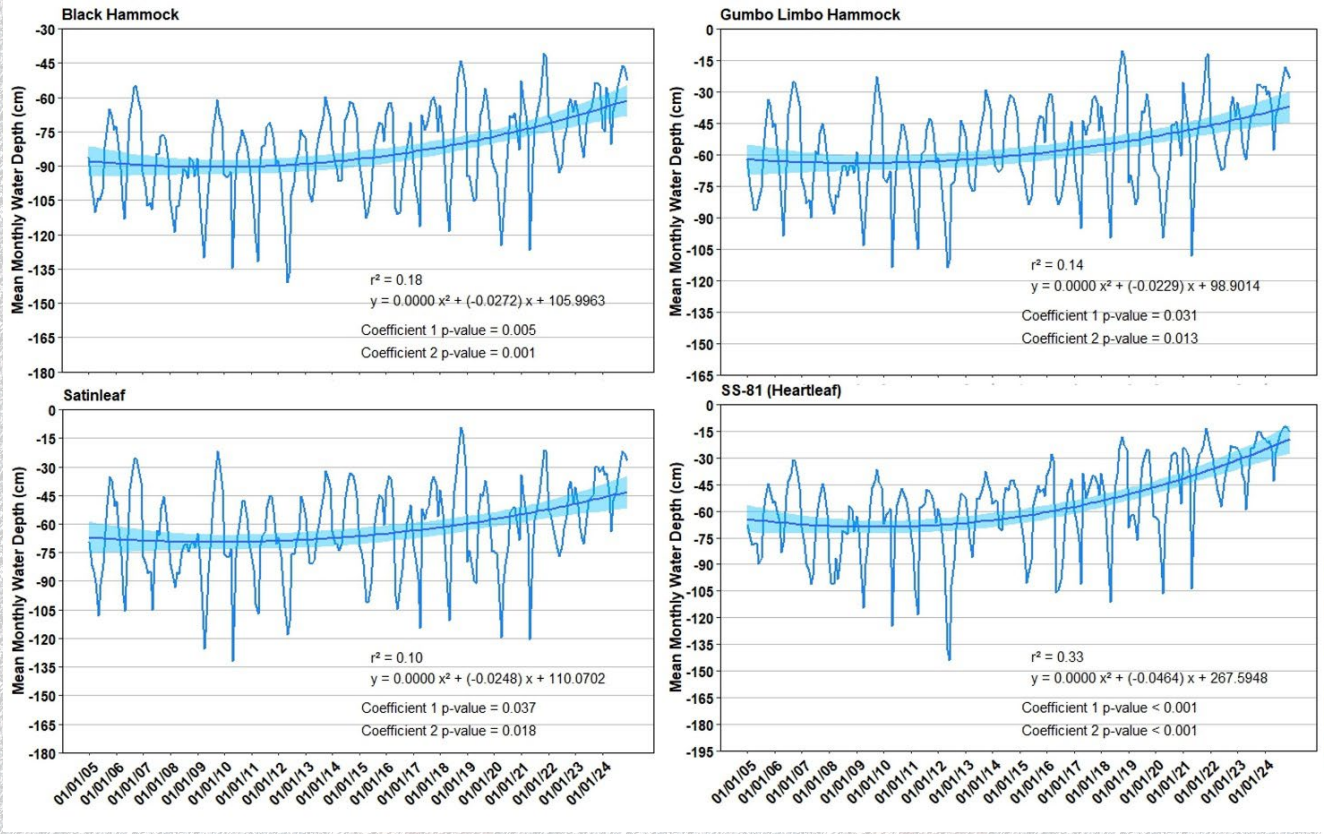
Results: Hydrology and Vegetation

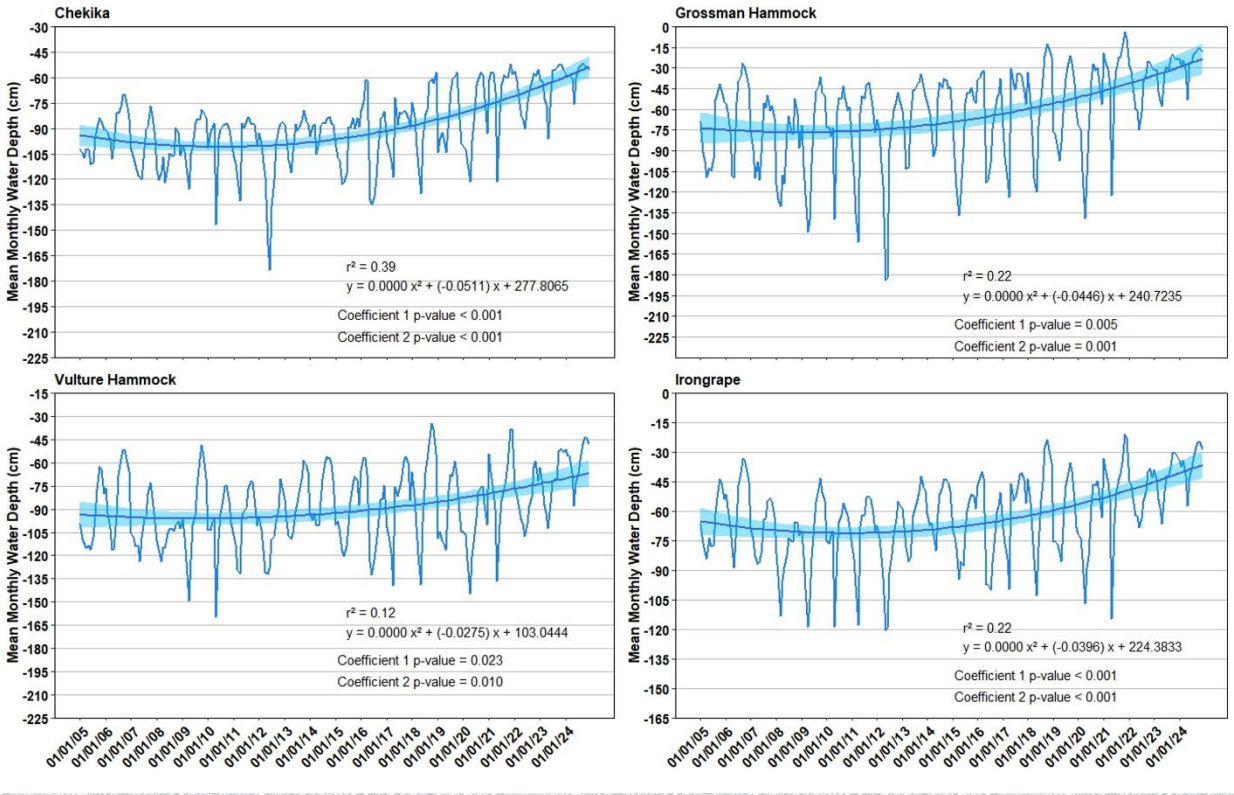


- Most of Hardwood Hammock trees species have optimum Water Depth <= -40 cm RWL

Hardwood Hammock

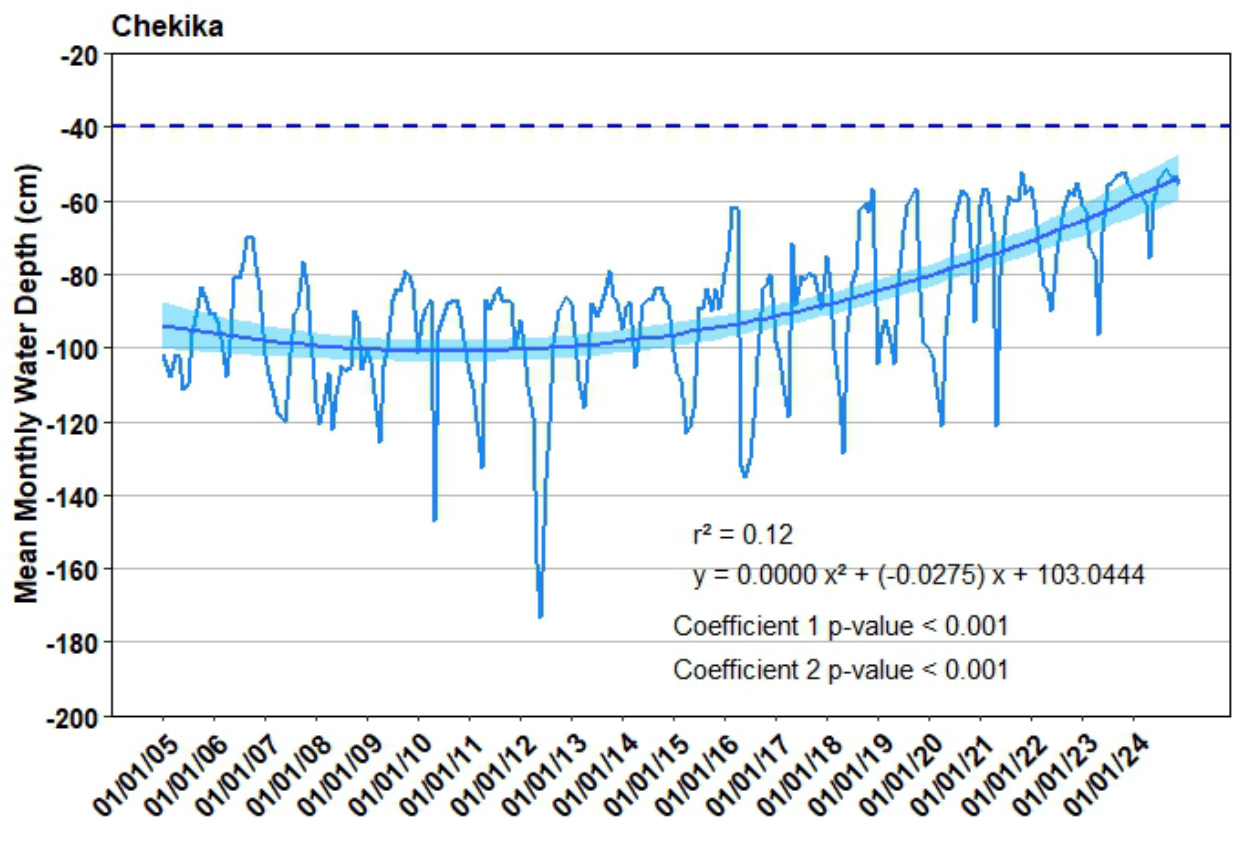
Tree Islands: Hydrologic conditions

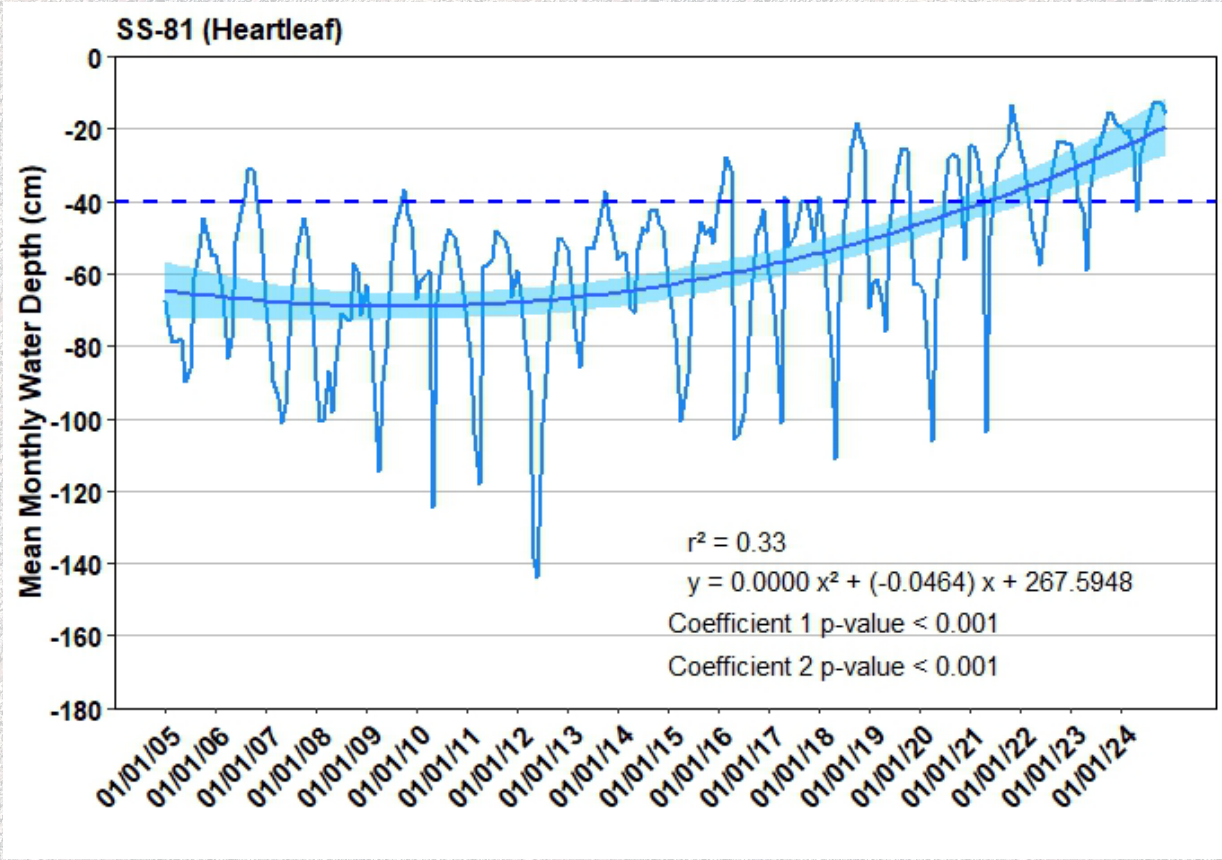




- **Relative water lever (RWL) has noticeably increased since mid-2010s**
- **Annual mean RWL has remained <0 cm (Hydroperiod = 0)**

Tree Islands: Hydrologic conditions





- In recent years, some tree islands, relative water level has been > -40 cm (above optimum WD of most of flood intolerant species) in the hardwood hammock portion of some tree islands

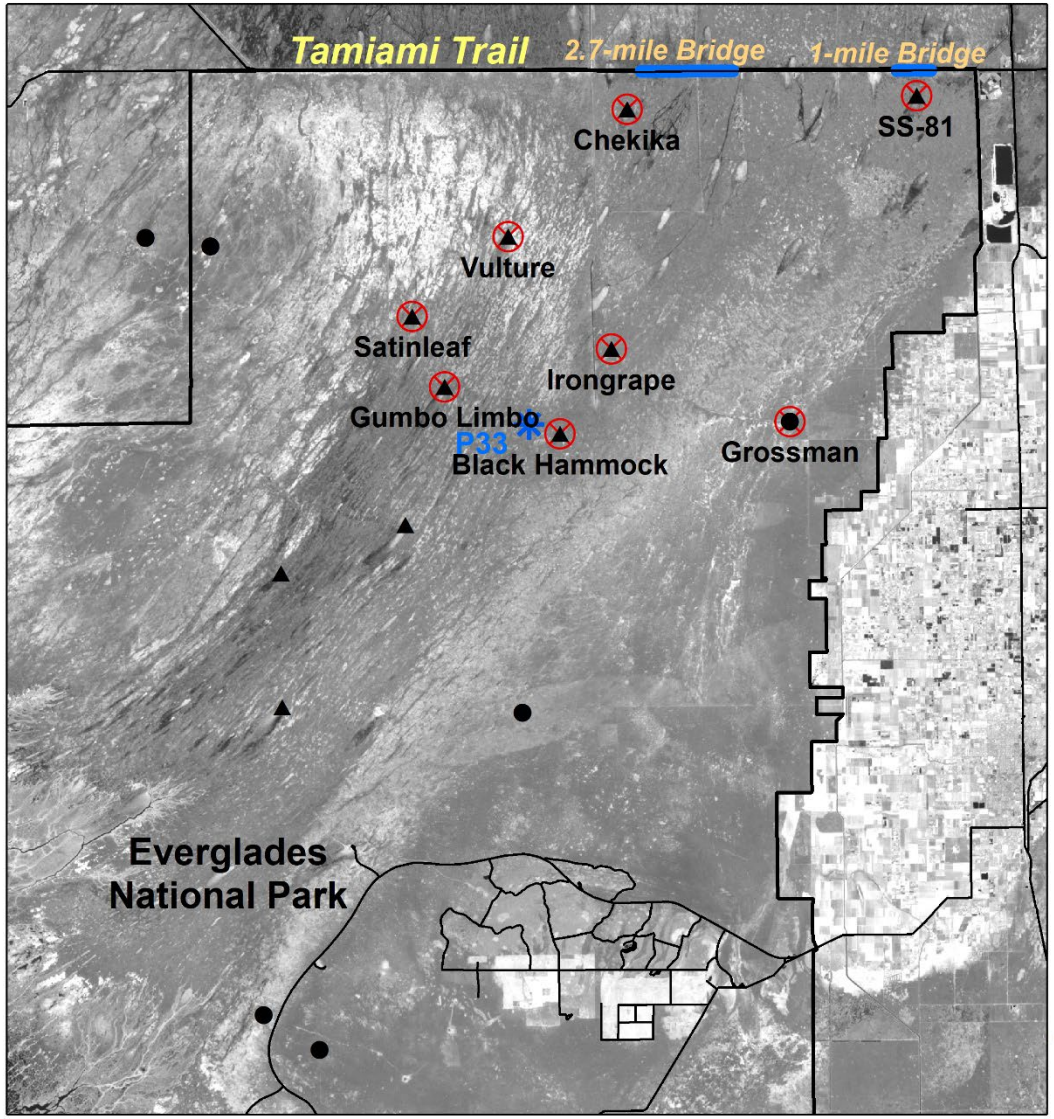
Tree Island vegetation dynamics

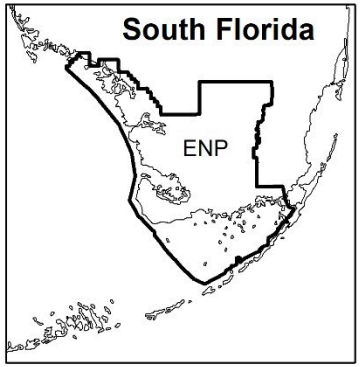
Questions:

- How resistant are hardwood hammock tree species to the rising water level in the ridge and slough landscape?

- How resilient are the bayhead and bayhead swamp plant communities in response to short-term changes in hydrologic regimes?

Study area





Legend

16 Tree islands (Region)

- SS
- WP
- TI sampled after Hurricane Irma
- P33 (Hydrostation)
- Tamiami Bridge
- Highways
- Everglades National Park

N

0 1.5 3 6 9 12 Kilometers

In four tree islands:

- Hardwood Hammock plots sampled annually since WY 2006/07,
- Bayhead & Bayhead swamp plots: 3-4 times (2001_03, 2011_12, 2018_19 & 2023_24)

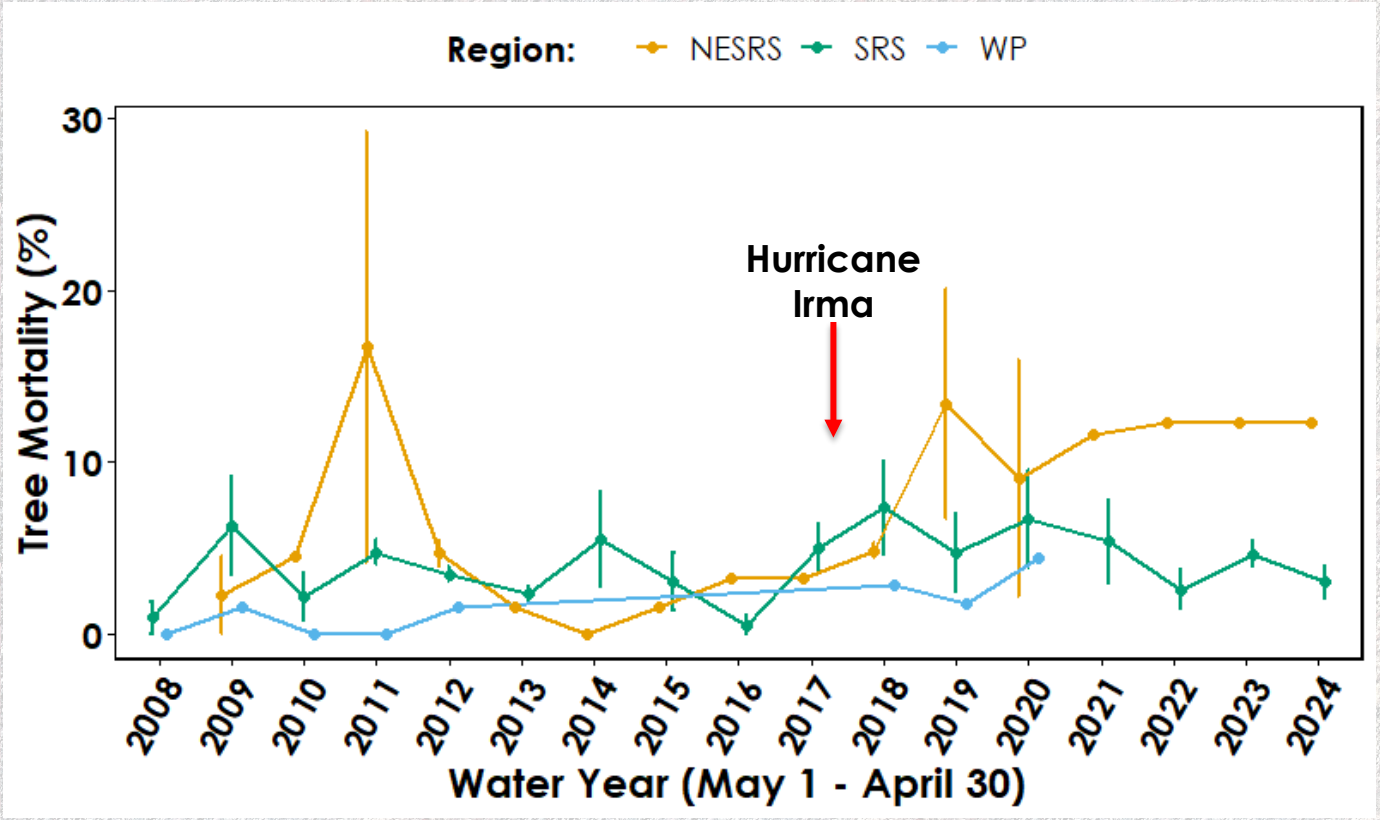
Other four tree islands:

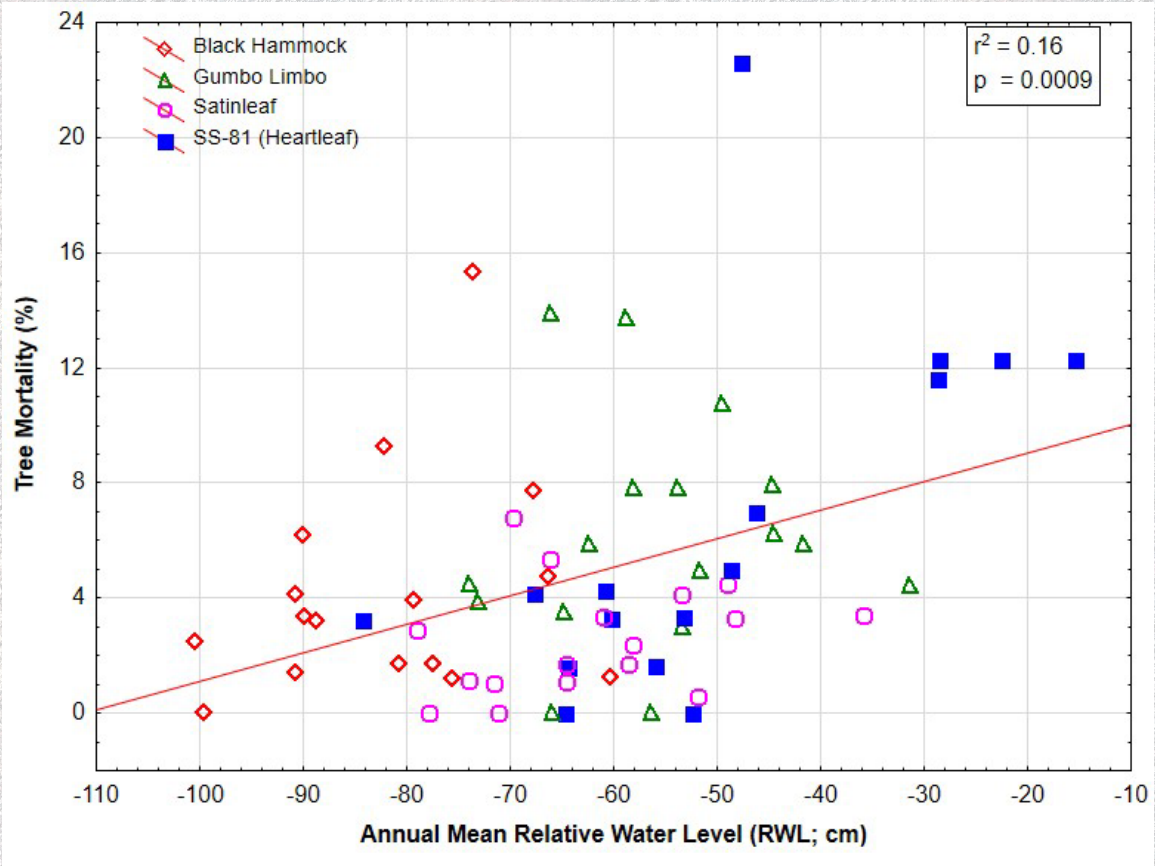
- Hardwood Hammock plots – annually between 2006/07 & 2011/2012, and 2017/18 & 2019/20

Within permanent plots (with 5 x5 m subplots)

Trees and saplings within 5 x 5 m sub-plot, shrubs and herbs in 1 m and seedling in 0.57 radius sub plots, respectively

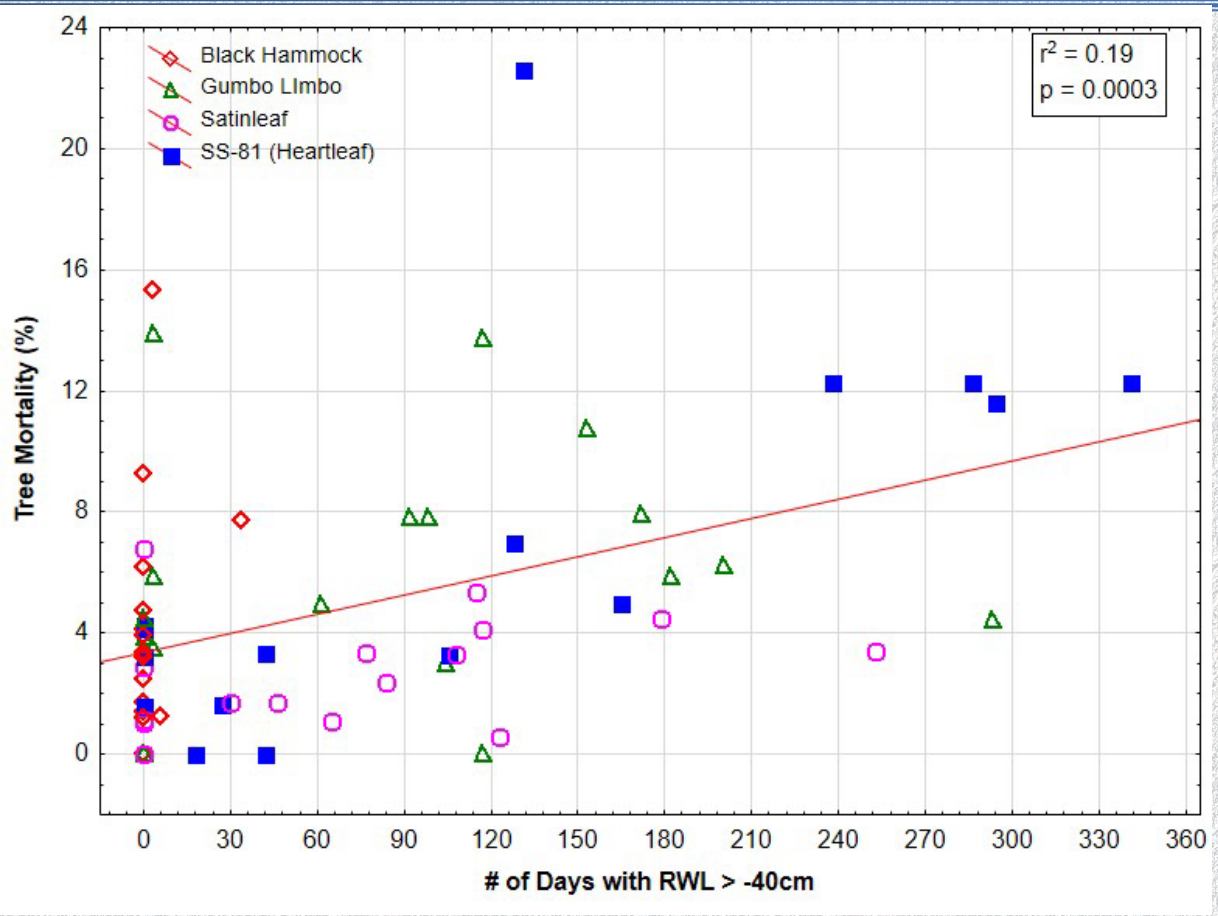
Results: Tree Mortality

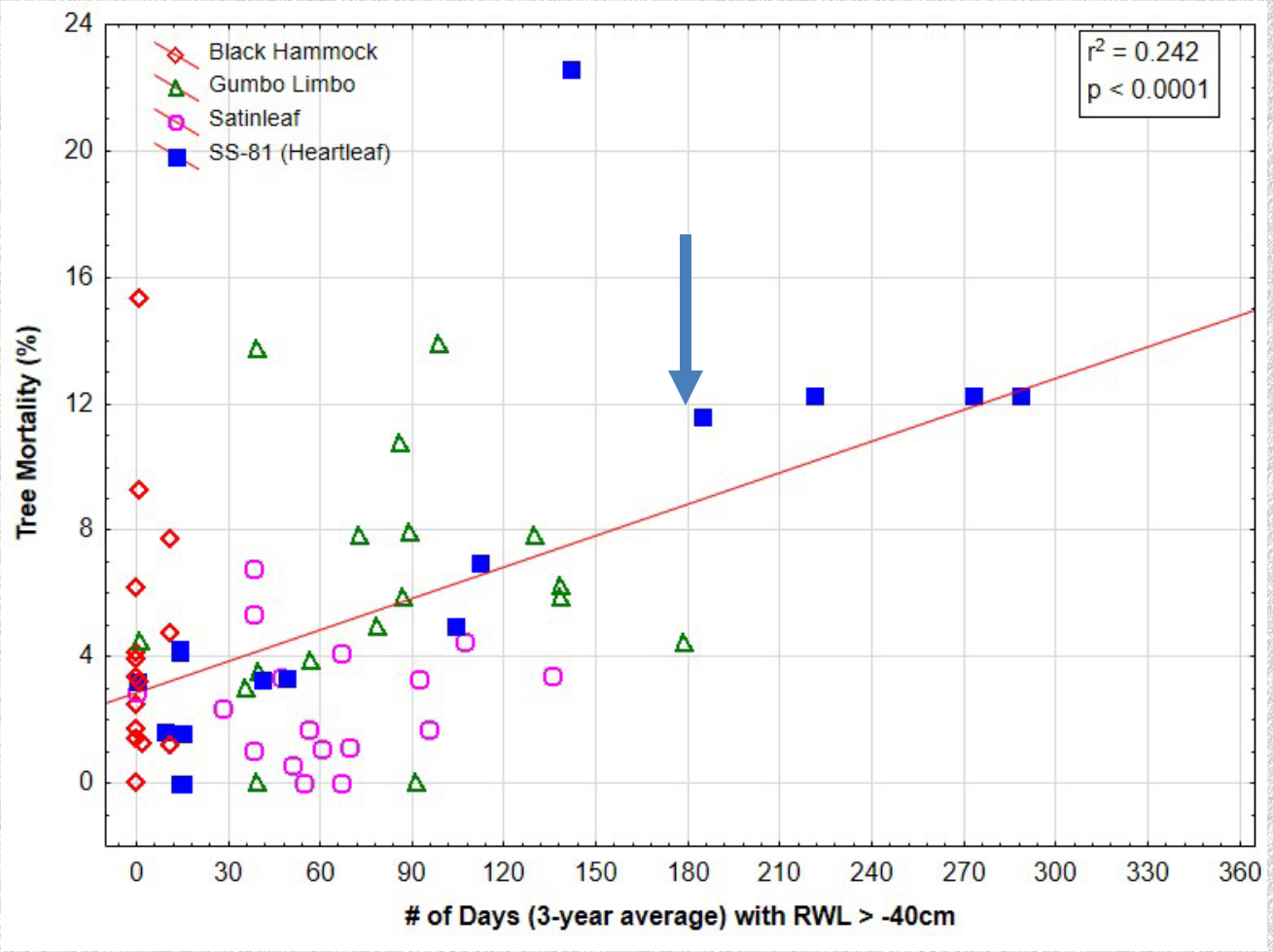




- Tree mortality varied annually
- In NESRS tree islands, mortality consistently high in recent years
- Overall, HH tree mortality increased with increase in RWL

Results: Tree Mortality

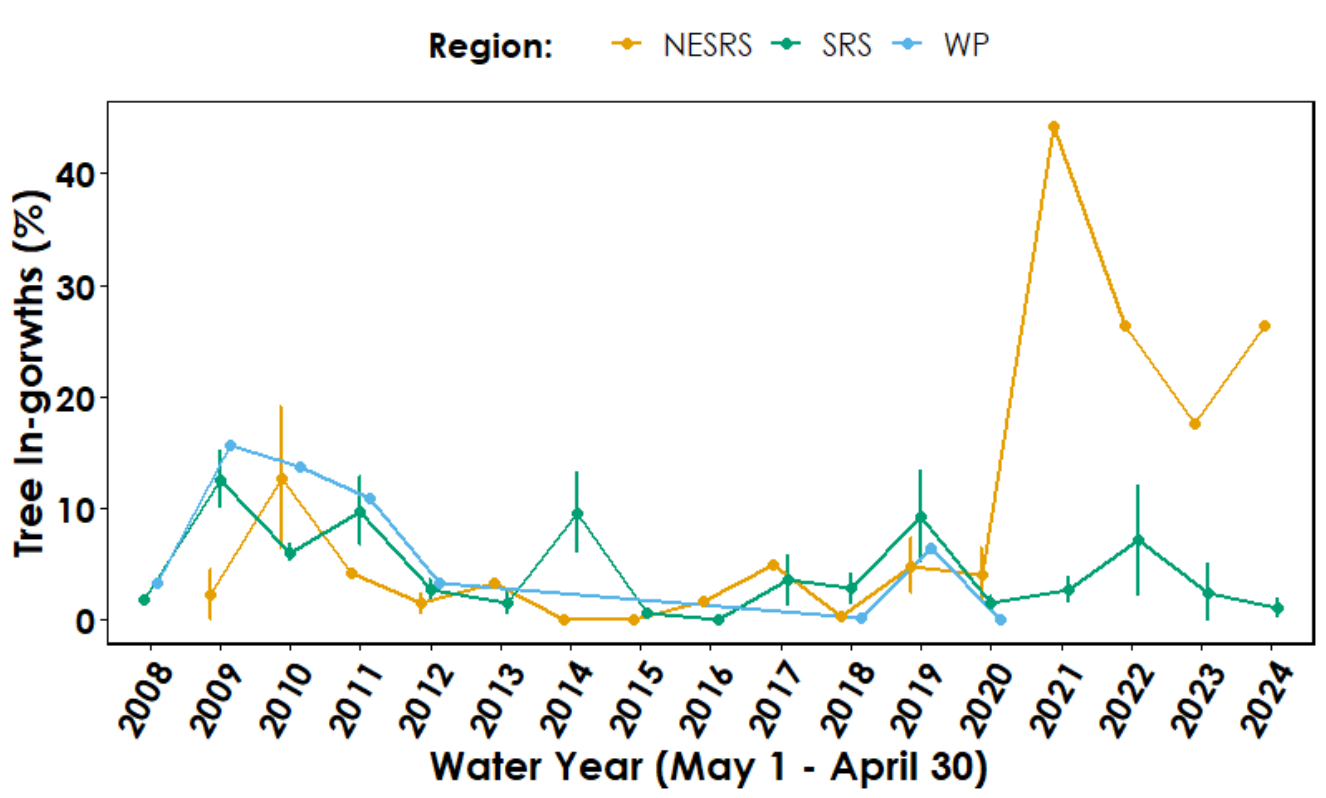


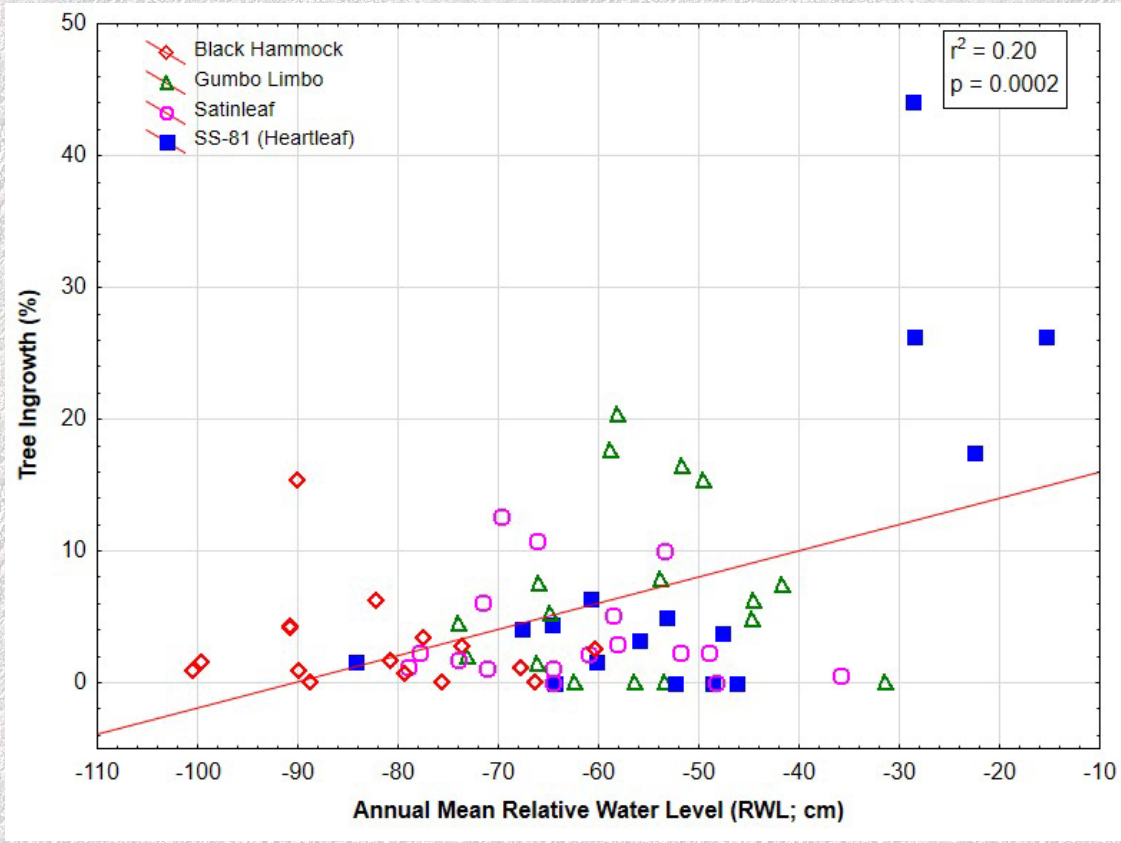


# of Days with RWL > -40 cm

➡ Relatively high mortality

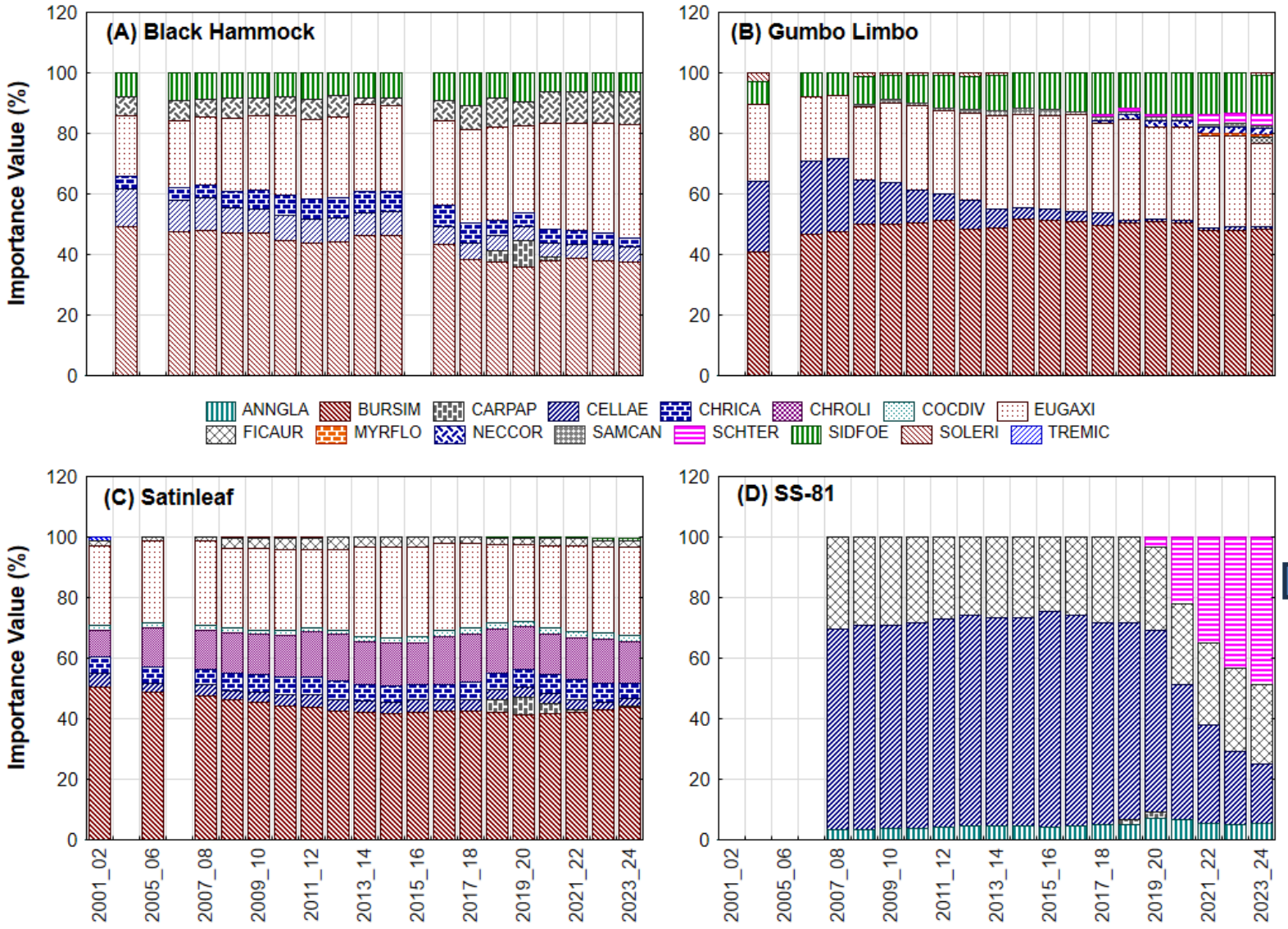
Results: Tree ingrowths





- Harwood hammock tree ingrowths increased with increase in RWL
- In a NESRS tree island, high ingrowth in recent years was due to exponential increase in Brazilian pepper (*Schinus terebinthifolius*)

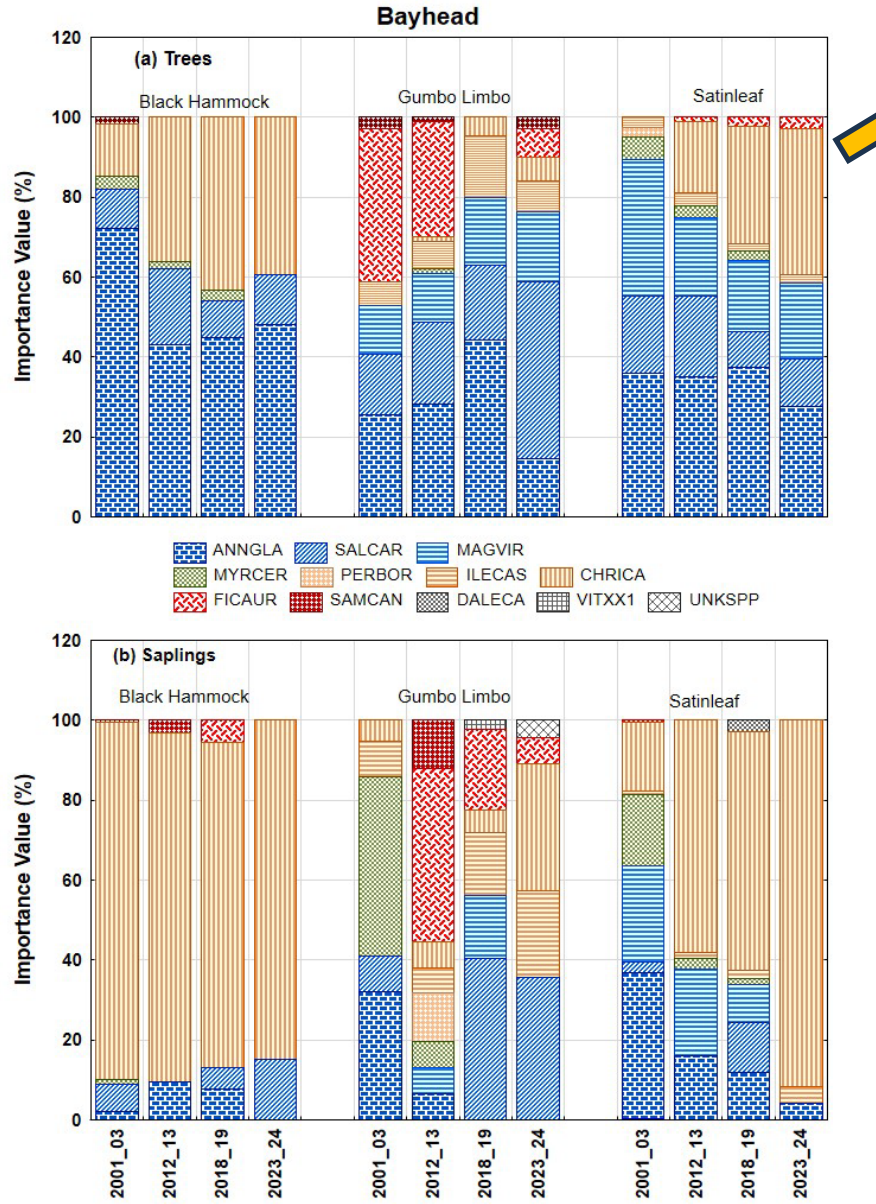
Results: Vegetation Change

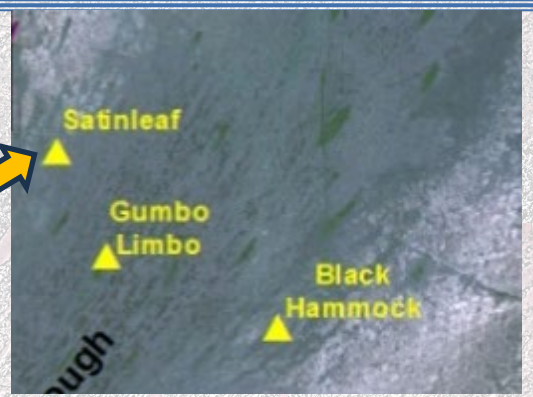


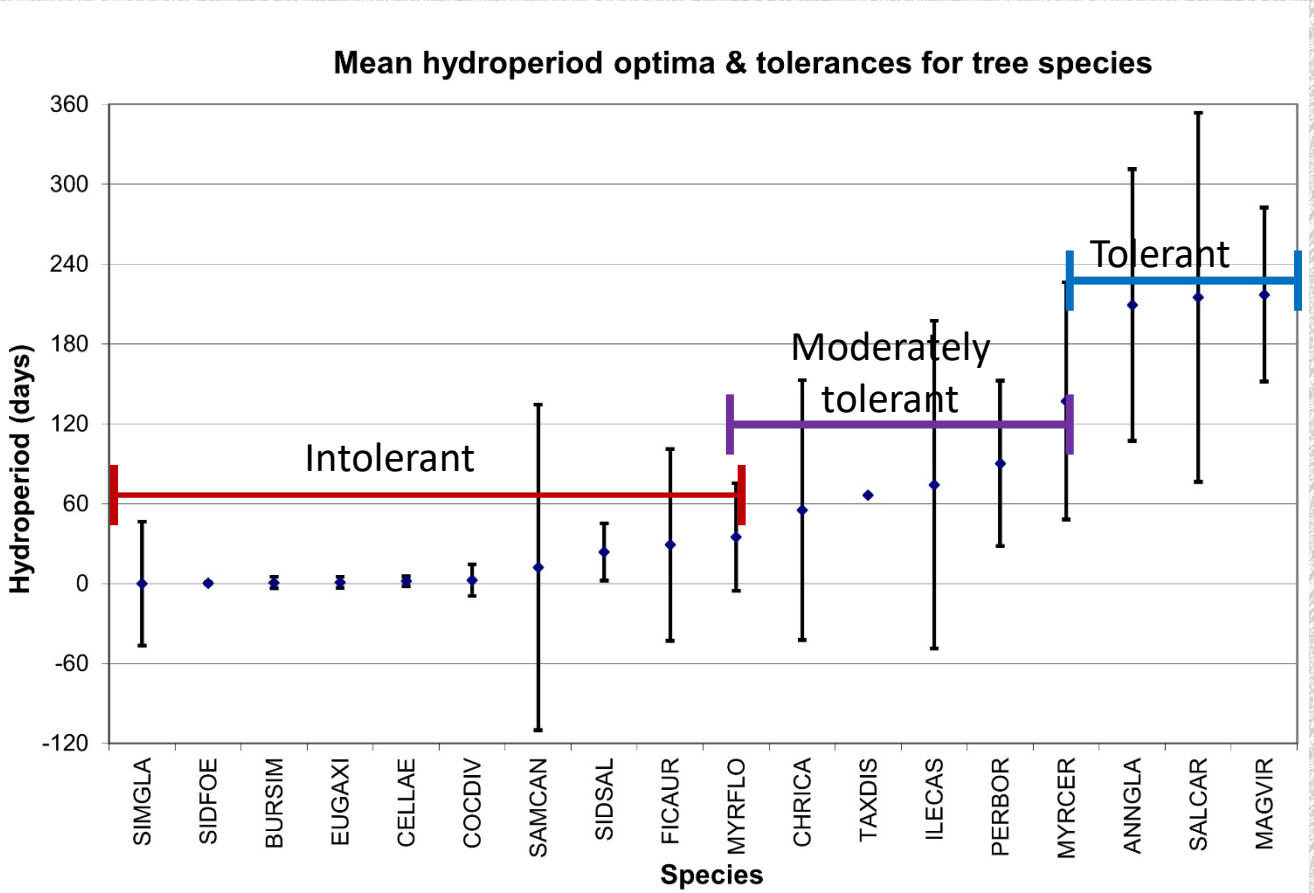
- Change in hardwood hammock vegetation composition was noticeable in two tree islands

- The vegetation on tree island with low diversity was much more affected than other islands.

Bayhead – Vegetation Change







Bayhead Swamp – Vegetation Change

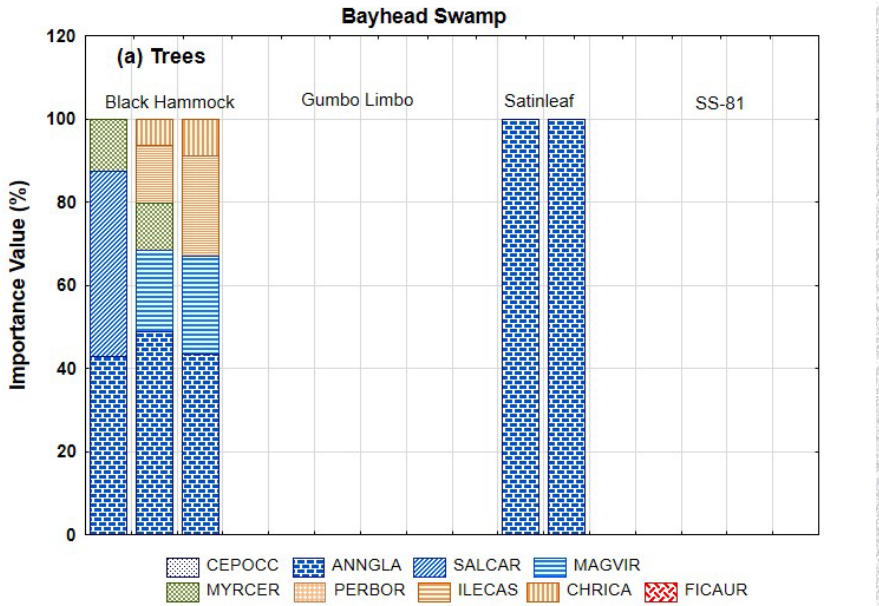
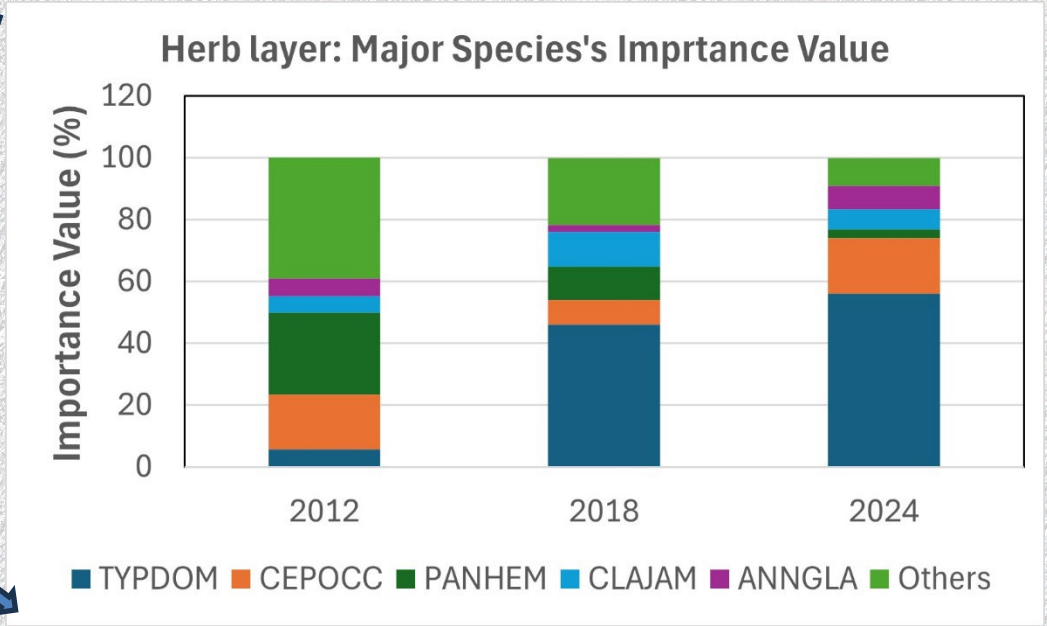
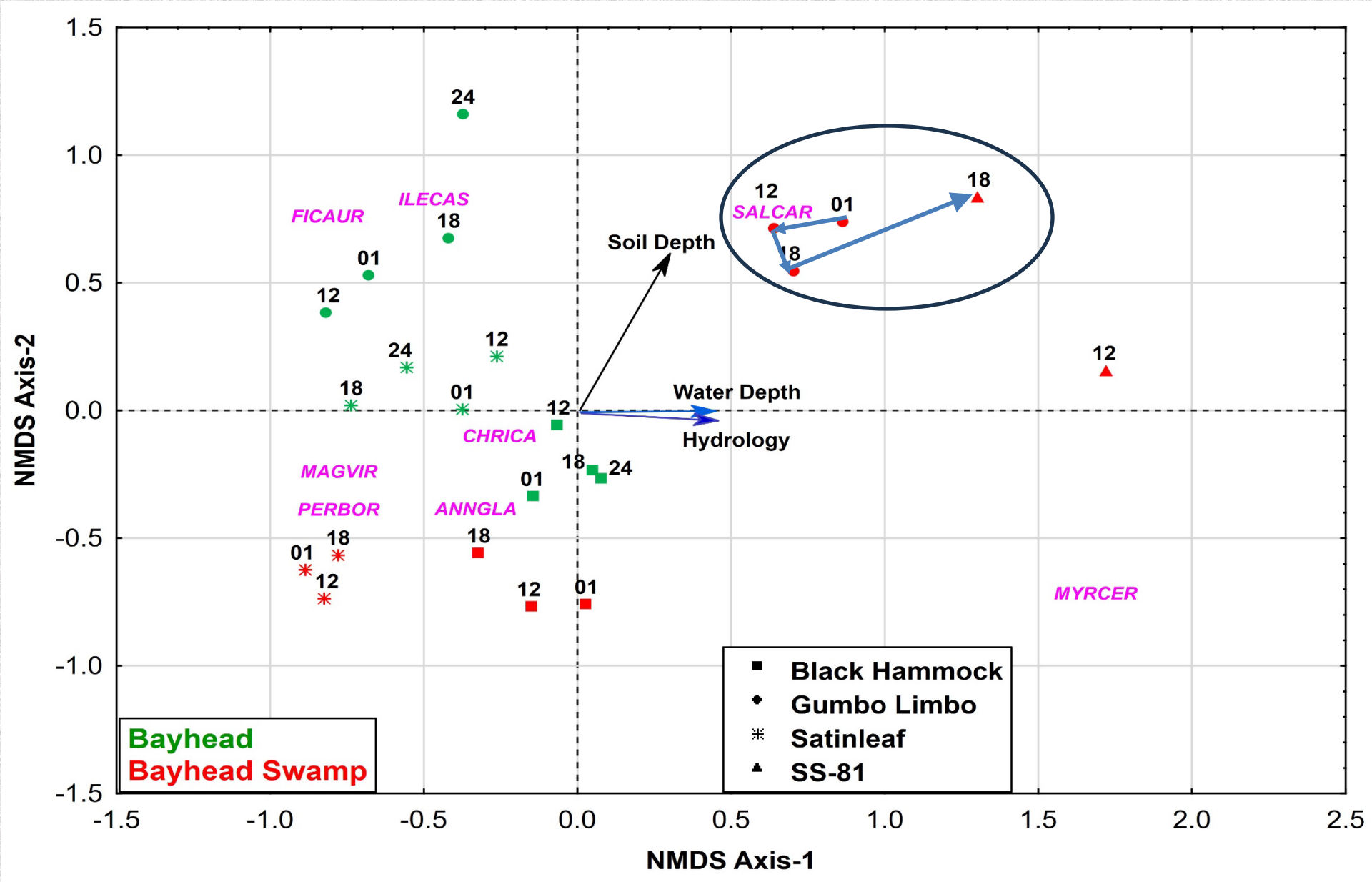


Photo: Juliana Alvarez



Bayhead/Bayhead Swamp – Vegetation Change



Conclusions

a) Increase in relative water level even close to the ground can have detrimental effects on flood-intolerant species in the hardwood hammock of tree islands.

b) The hardwood hammock plant community with low species diversity is highly vulnerable to the hydrologic disturbance.

c) Woody communities in hydric portion of islands (i.e., bayhead and bayhead swamps) have low resistant to hydrologic disturbance but they seem to be resilient.