Structure and recent dynamics in coastal Everglades tree islands

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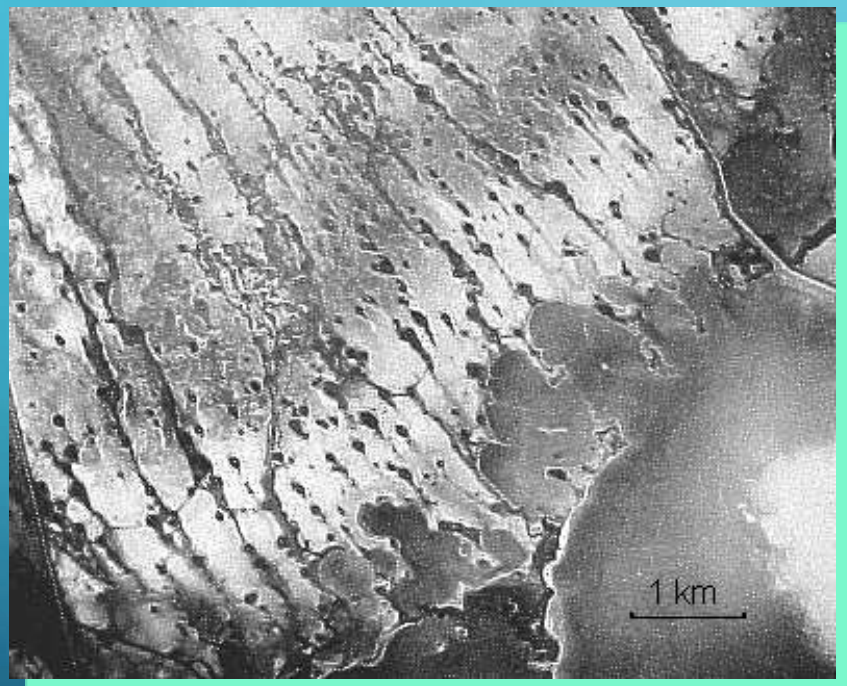
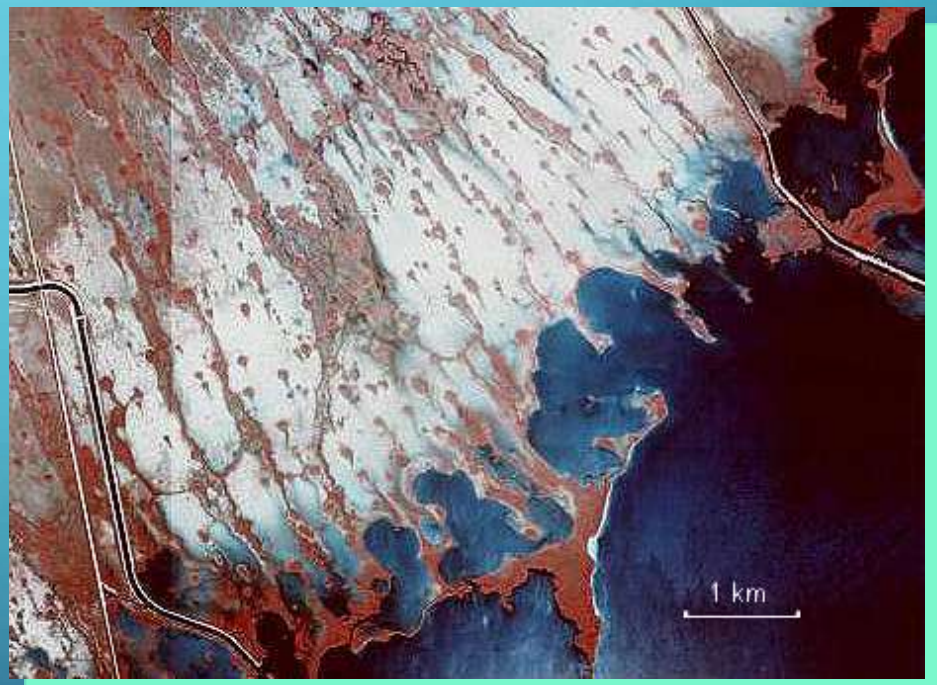
The “White Zone”: a zone of low productivity, and a marker of coastal Change

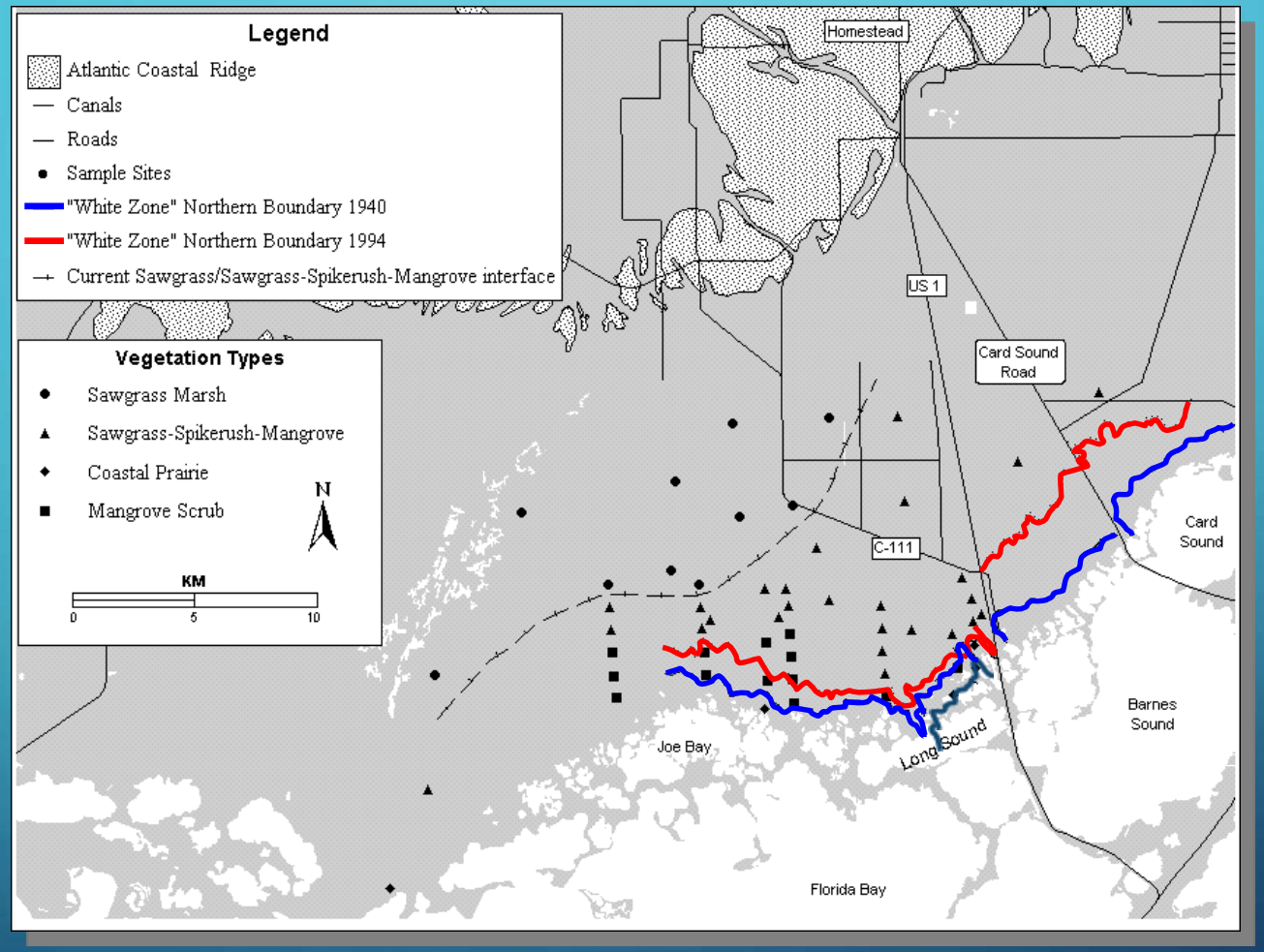


1940



1994

White Zone I: Changes in the "Southeast Saline Everglades (SESE)", 1940-1994

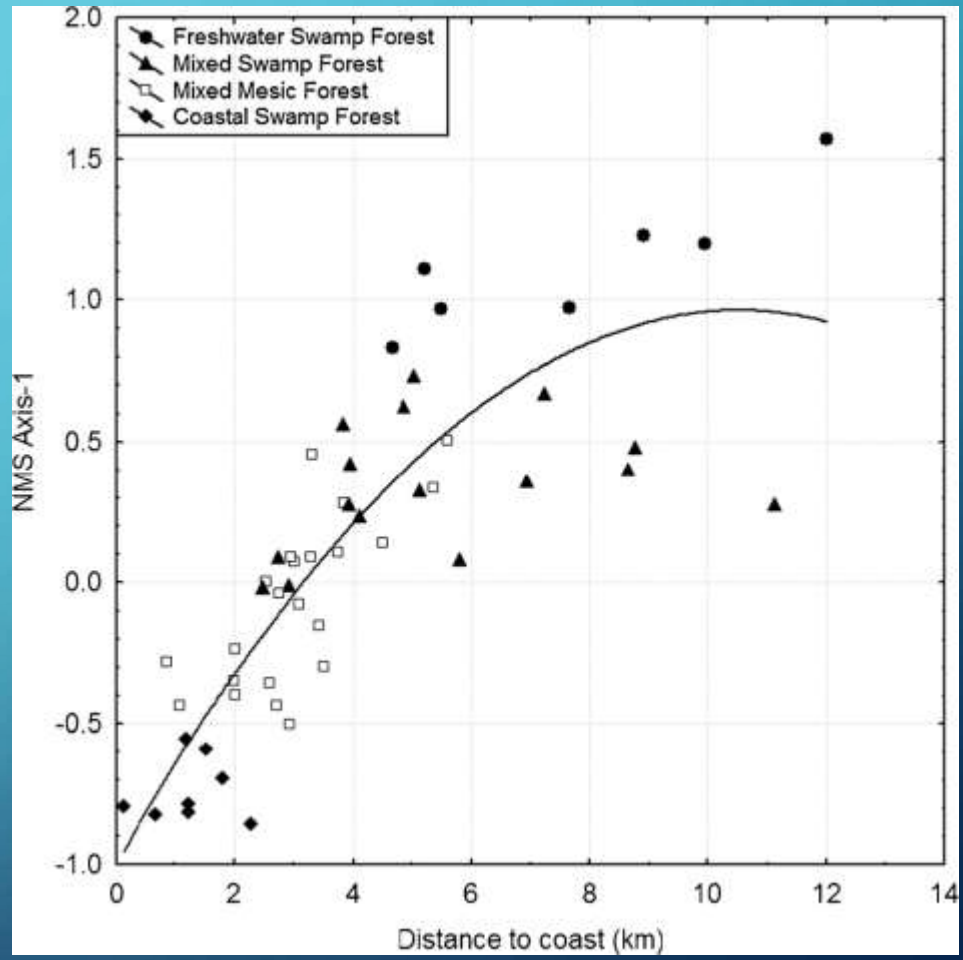


Funding (1995-97): SFWMD

- Average inland movement of the white zone = 1.5 km.
- Movement farther in areas cut off from surface water sheetflow.
- Compositional boundary between marsh and mangrove swamp moved further inland.

SESE tree islands distinguished in four zones parallel to Florida Bay coast

	FW Swamp	Mixed Swamp	Mixed Mesic	Coastal Swamp
Bald-cypress	X			
Wax myrtle	X	X	X	
Coco plum	X	X		
Swamp bay	X	X		
Dahoon holly	X	X		
Willow	X			
Pond apple	X			
Poisonwood		X	X	
Buttonwood		X	X	X
Red mangrove		X	X	X
White mangrove				X
Randia				X
Mahogany			X	
Christmas berry				X
Spicewood			X	
Sea grape			X	
Saffron plum				X
Spanish stopper			X	
Pigeon plum			X	



1. Limited evidence suggested that compositional change in tree islands (at least 1960-1994) was far less than in marsh

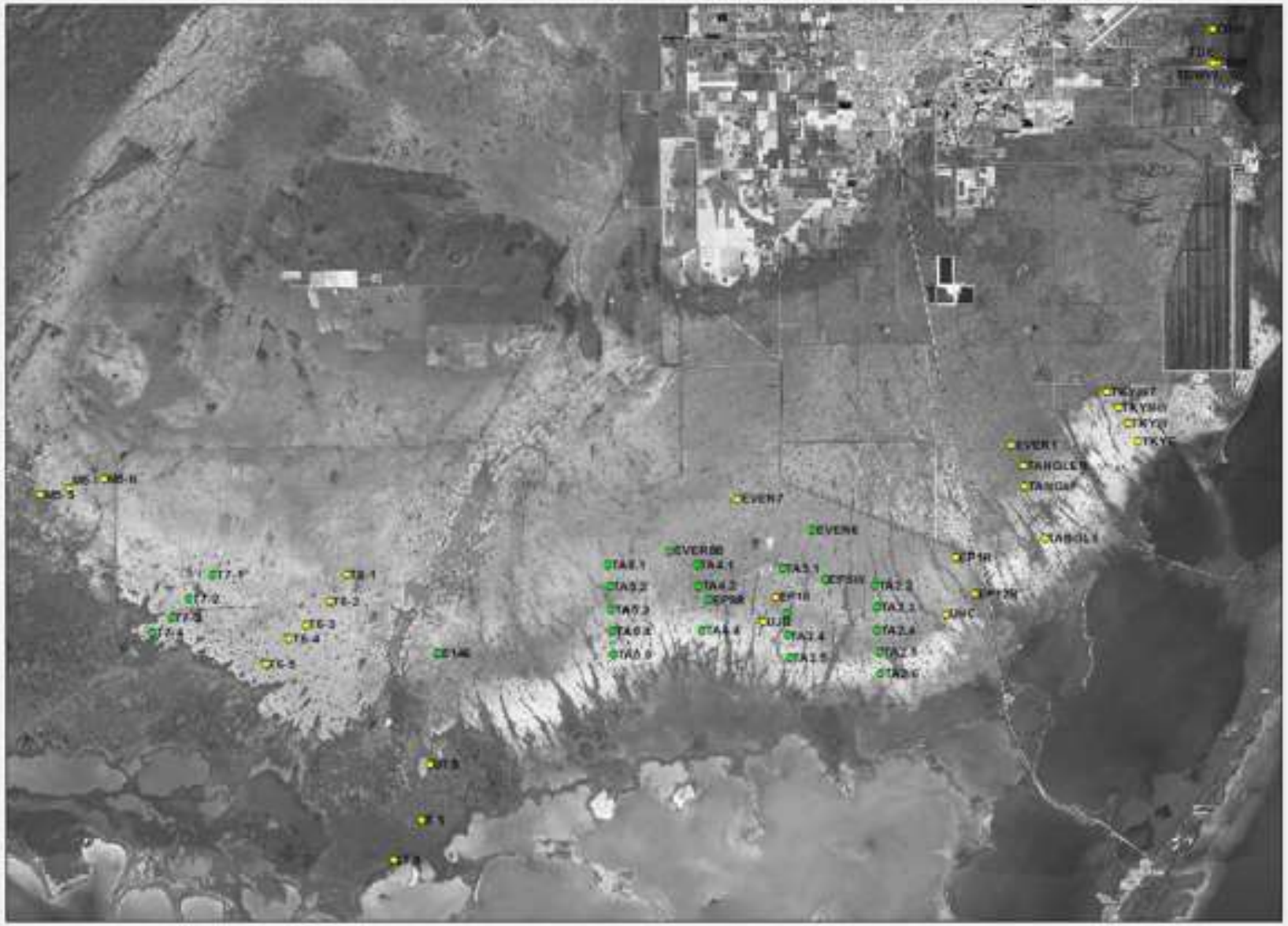
White Zone II (2016-2018)

1. How has the WZ shifted in last 23 years? How has local plant composition changed inside and outside of it?

2. Why is the productivity of the WZ so low, and why does WZ expand when freshwater delivery is interrupted?

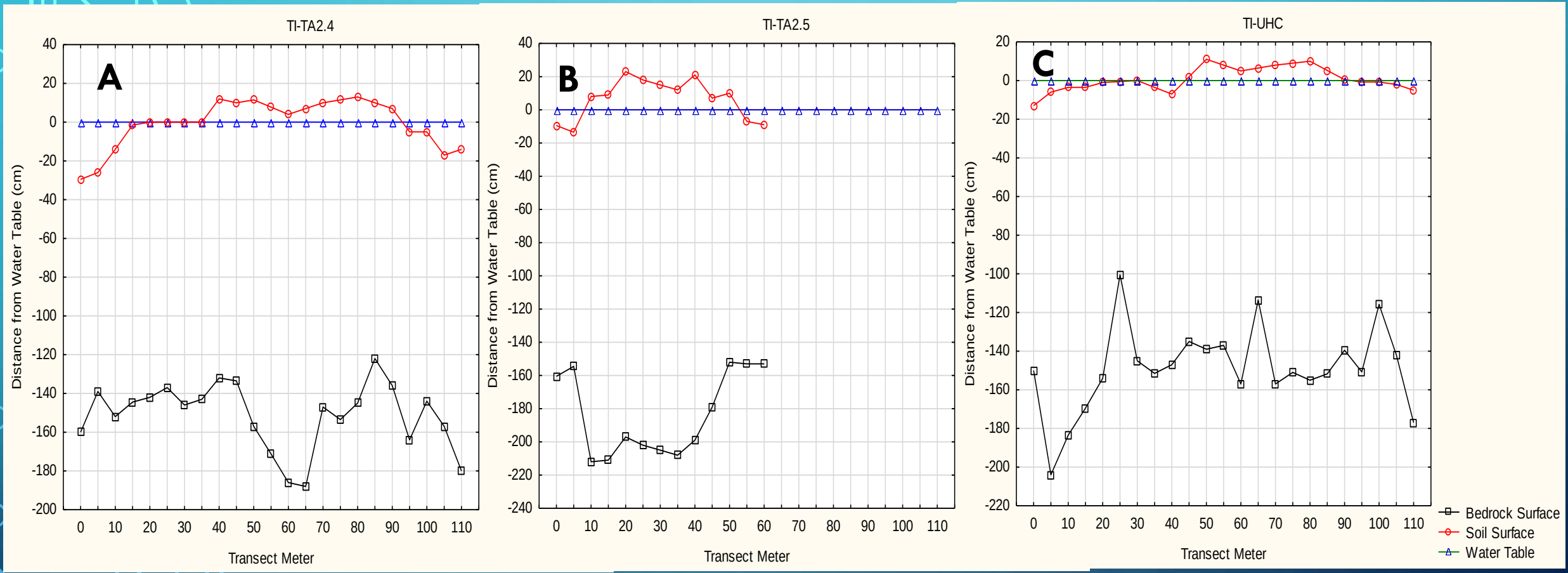
3. As salt water intrusion proceeds, how do rates of soil accretion vary across the coastal zone? With what vegetation feedbacks?

4. Are tree islands more resistant to salt water intrusion than the matrix around them?



1. Network extended both east and west.
2. Expanded work on soils, nutrient availability, paleoecology, and landscape ecology.
3. Report here Year 1 results from marsh and tree islands at 14 sites sampled in both 1995 and 2016.

SESE tree islands vary in physiography



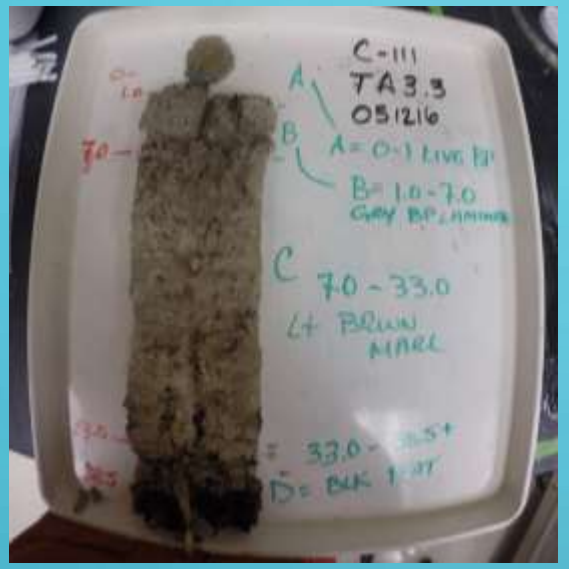
1. Sometimes occur over bedrock depressions (A, B), sometimes over bedrock outcrops (C)
2. Surface ranges from 30-50 cm above adjacent marsh

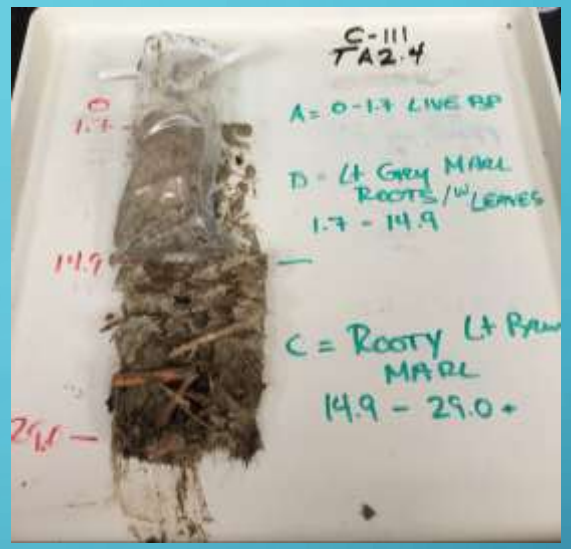
EP12R

TA3.3

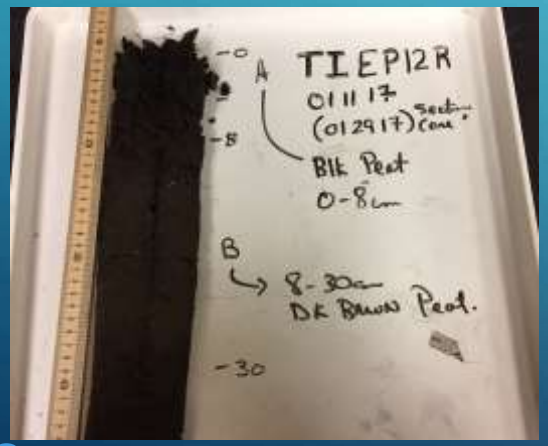
TA2.4

Marsh



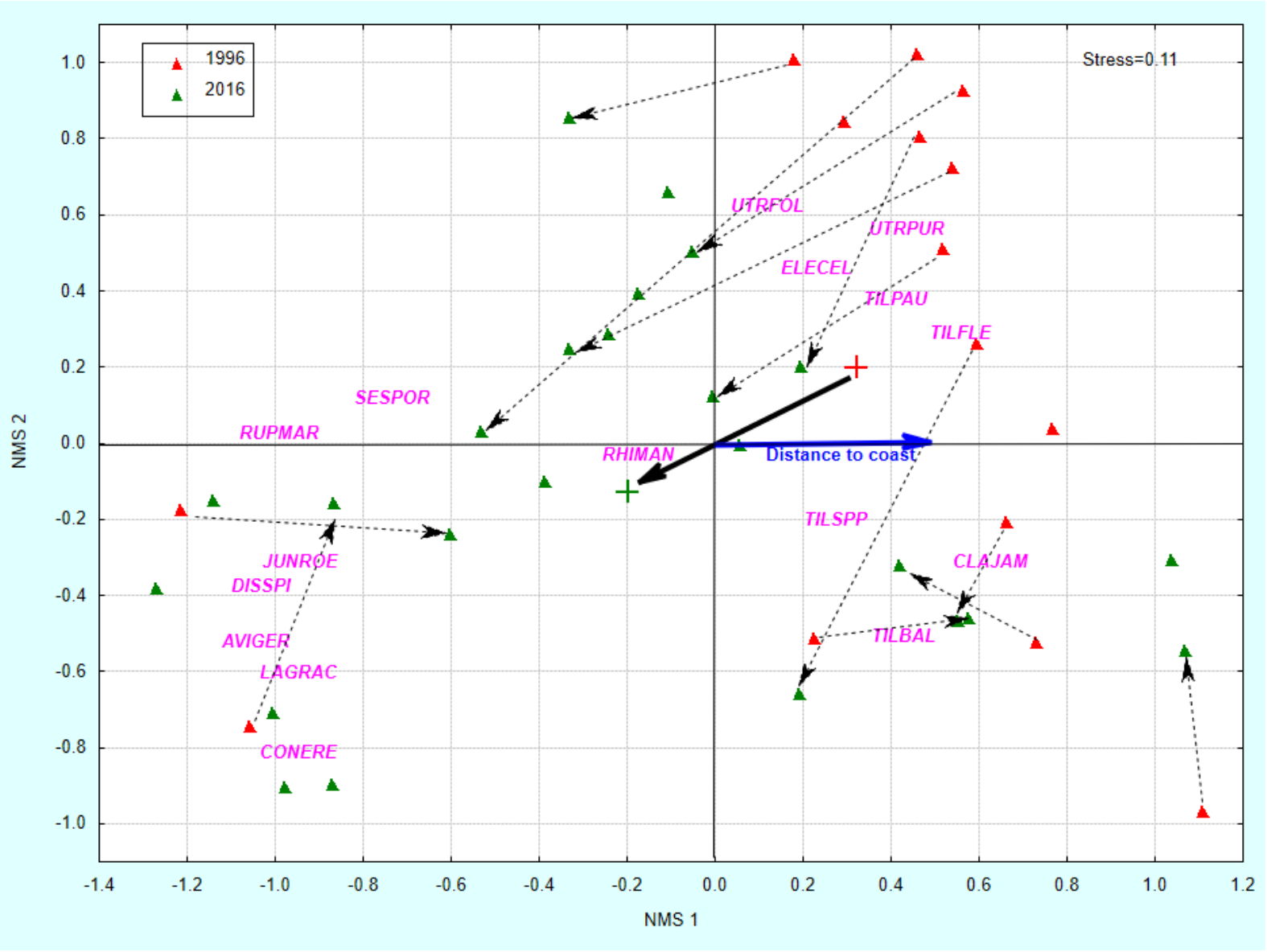


Tree island



As a rule, SESE tree island sediments are peats, or high in organic matter, while marsh sediments are marls

Marsh vegetation change in SESE over last two decades

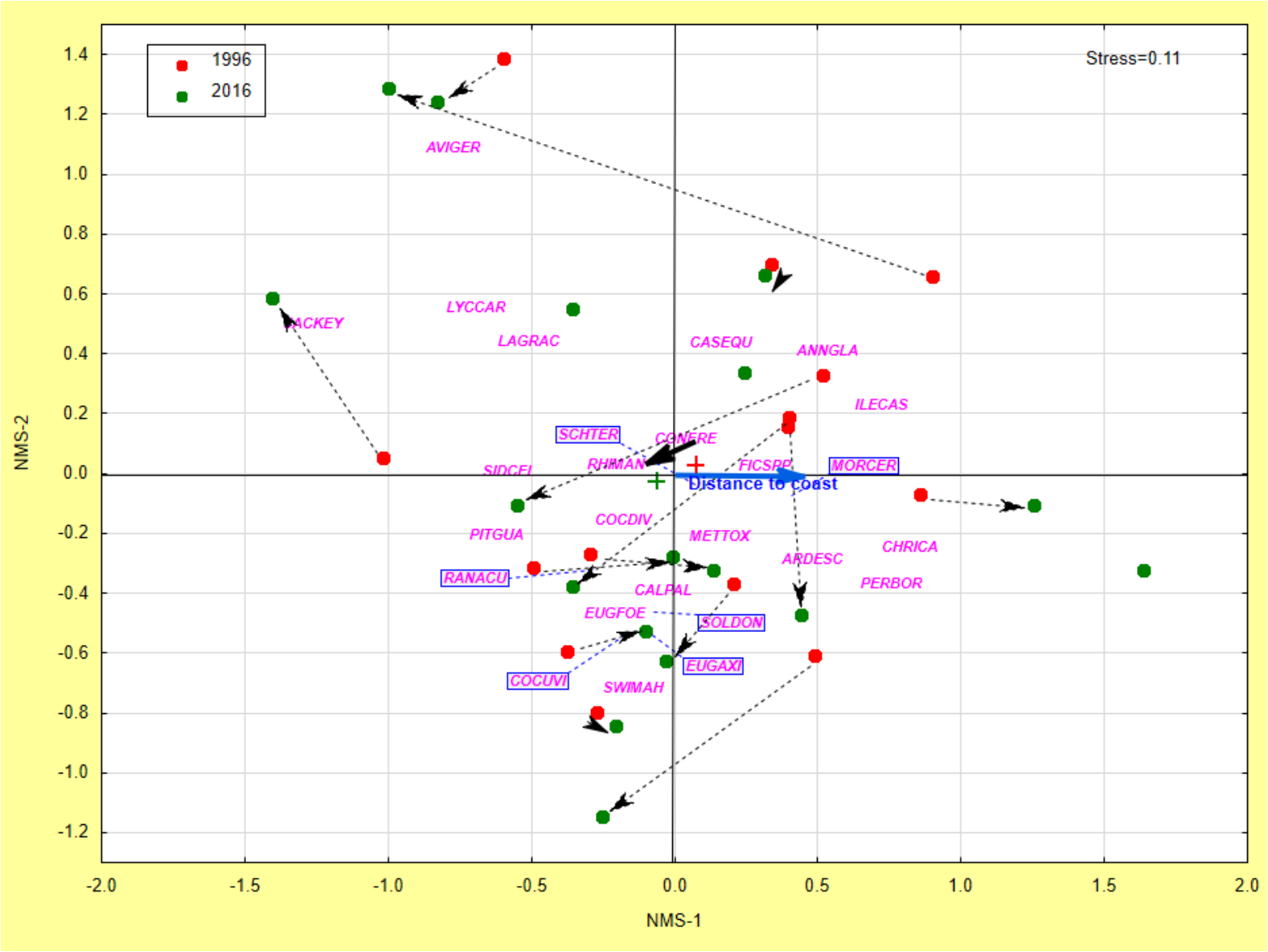


Distance to coast was significantly correlated to species composition (Mantel test 999 permutations, r==0.25, p<0.05).

Differences in marsh species composition between 1996 and 2016: t-test comparing scores at common sites in 1996-2016.

NMS-1			NMS-2		
t	df	p-value	t	df	p-value
2.35	13	<0.05	1.44	13	0.17

Tree island vegetation change in SESE over last two decades

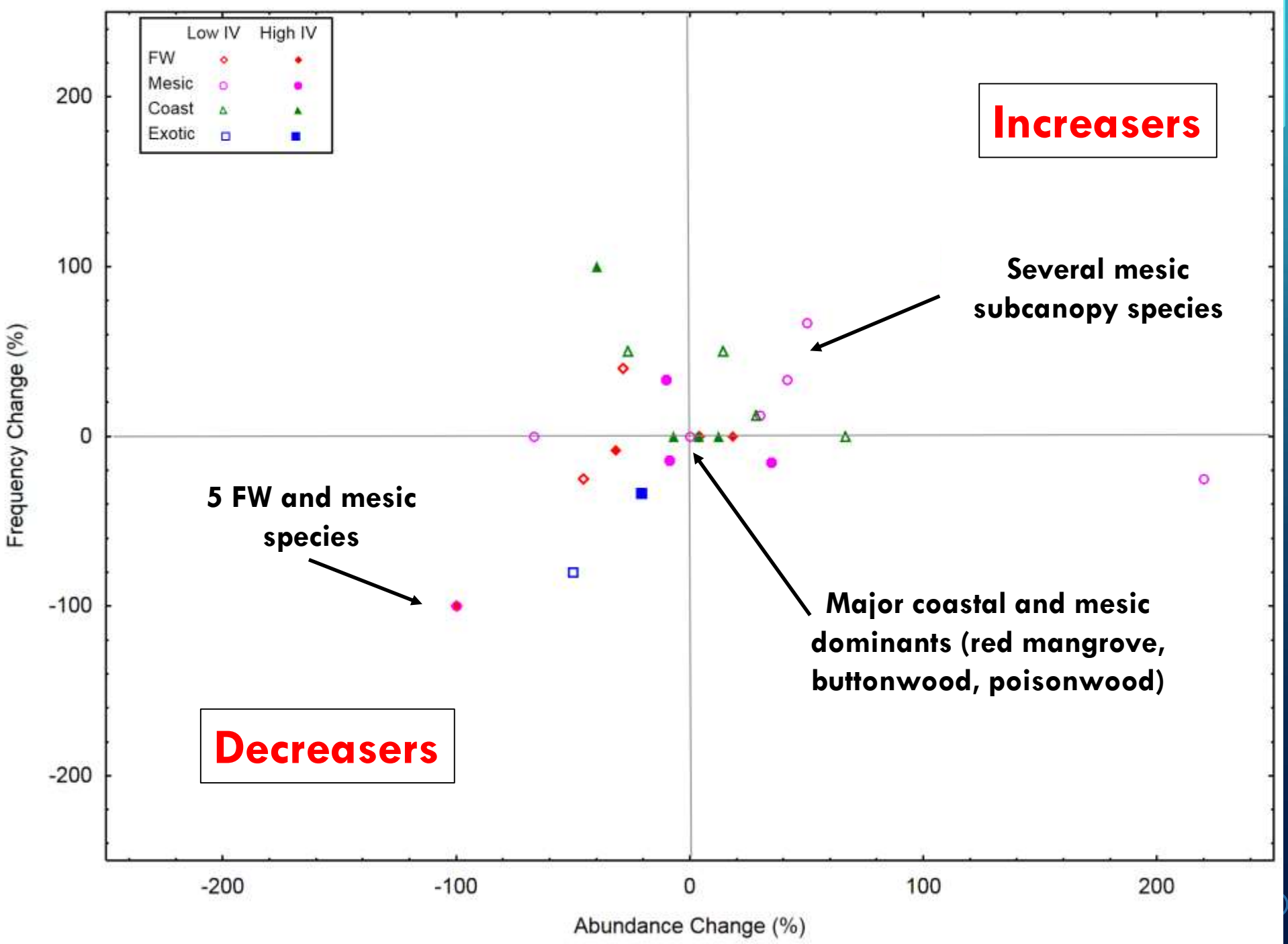


Mantel test results (999 permutations, r==0.03, p=0.21) shows a weak relationship between salinity and distance to coast with floristic composition.

Differences in marsh sites' species composition between 1996 and 2016: t-test comparing scores at common sites in 1996-2016.

NMS-1			NMS-2		
t	df	p-value	t	df	p-value
1.44	13	0.07	<0.1	13	1

Responses of individual tree species, 1995-2016



SESE is a landscape of 2 phases, whose dynamics are independent but linked, built around small differences in elevation (hydrology), and sharp differences in soils (marl and peat).

Tree islands contain a diverse & dynamic mixture of species, that occupy biologically elevated sites forming along bedrock eccentricities, often associated with drainage pathways.

Thank you!!