Coastal Salt Marsh Change in Grand Bay National Estuarine Research Reserve (GBNERR) from 1955 to 2014

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Introduction

Image Credit: Gretchen Grammer – From Marine Debris NOAA

Image Texture Analysis

Texture analysis - horizontal variability in brightness values

Image Credit: Aero-Data Corporation LLC

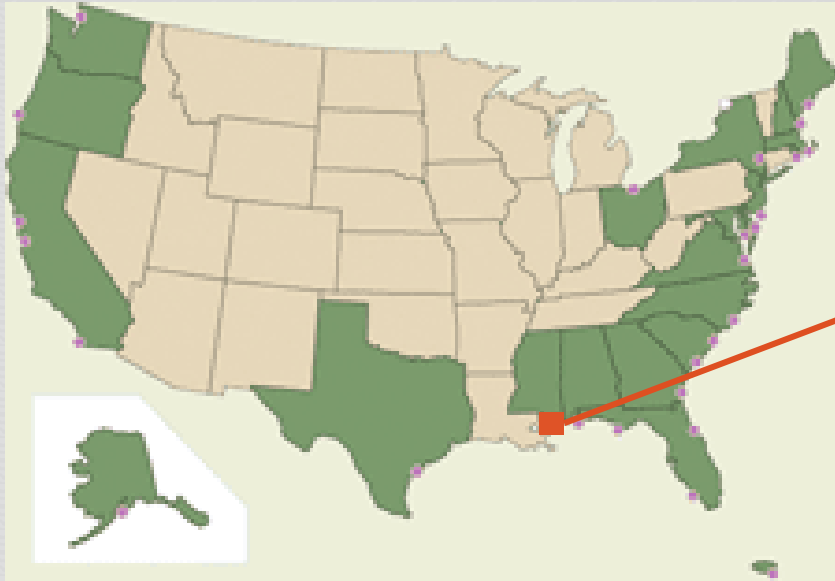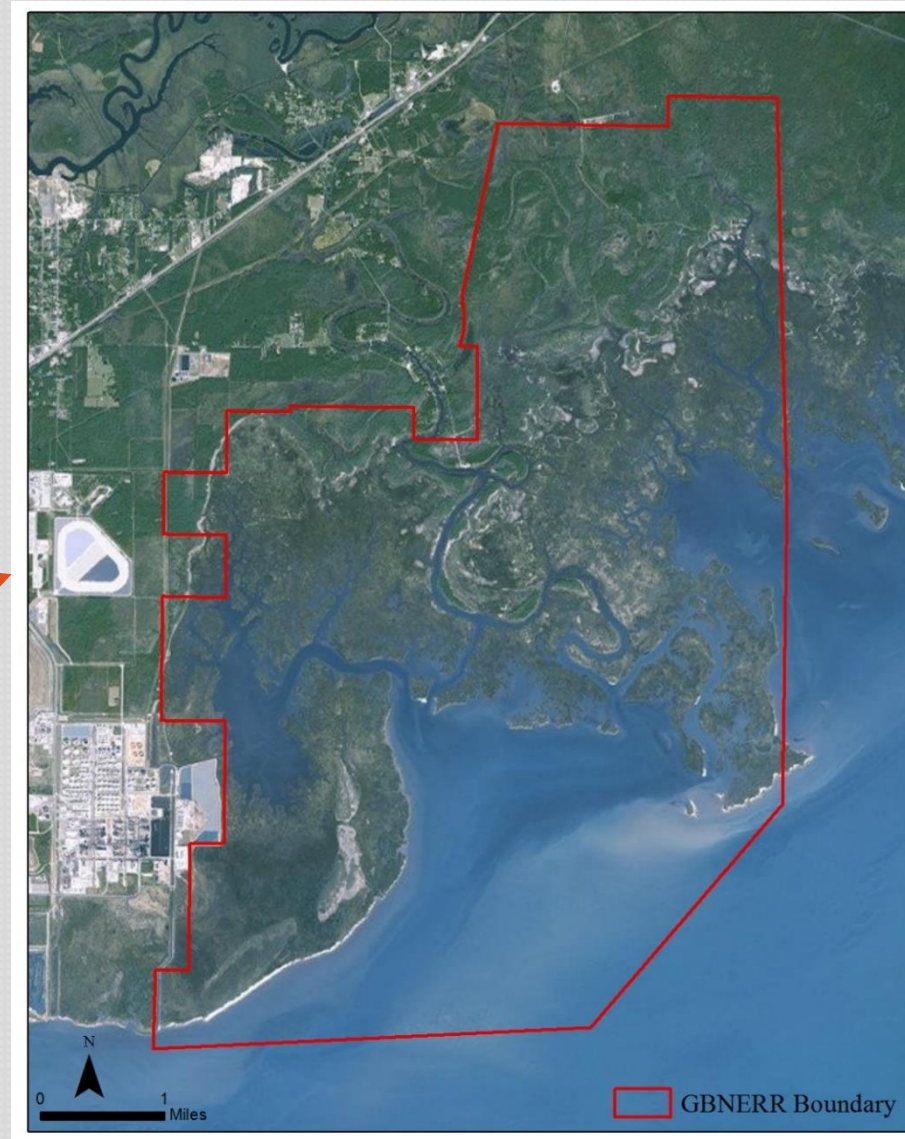# Grand Bay National Estuarine Research Reserve

Image Source: DNR

Mississippi Gulf Coast Examples

Image Credit: USM- GCRL

- Hilbert 2006
  - Used NDVI and three bands from the Principle Component Analysis to detect habitat change in GBNERR
- Wells 2010
  - Used panchromatic imagery to detect salt marsh change in GBNEER (non-texture methods)
- English 2011
  - Used Landsat data to conduct a full coastal land use classification to detect habitat change
- Jeter and Carter 2016
  - Observe and Describe the change on Horn Island habitats using texture methods

Research Goal

Image Credit: From Mister Tristan

- Estimate change in marsh coverage in the present-day Grand Bay NERR over ca. 60 years using panchromatic aerial image data.
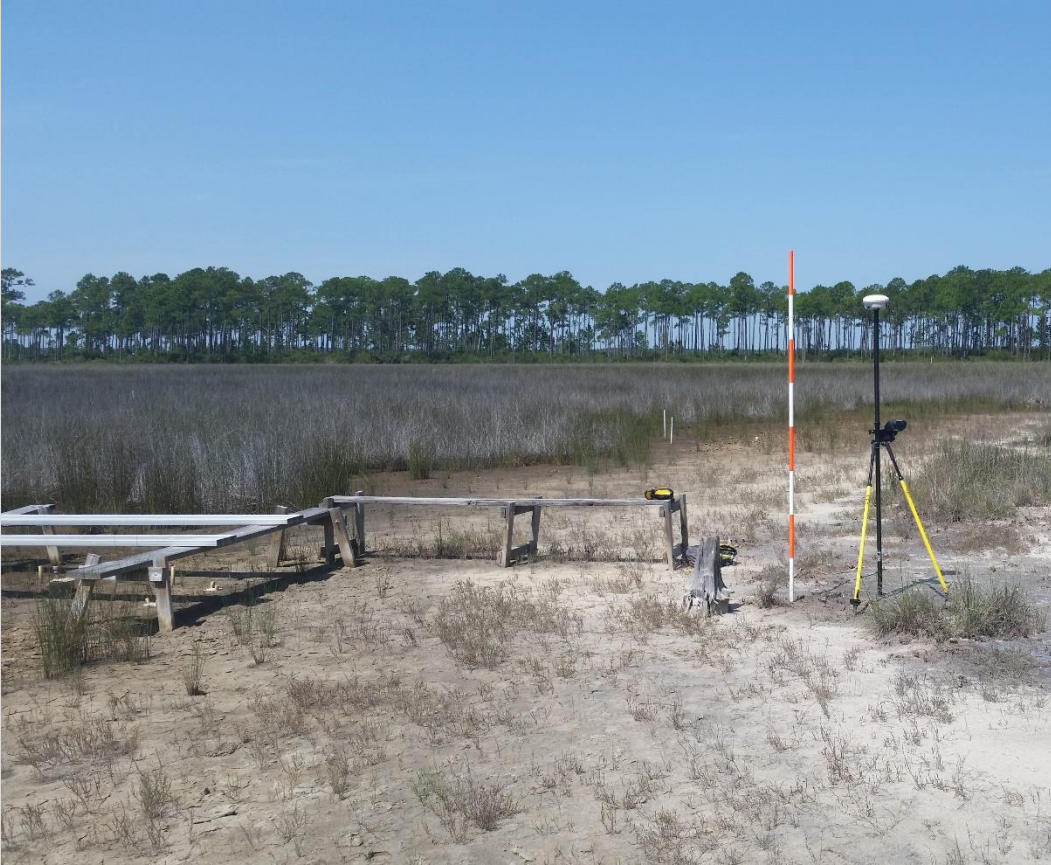
Methods

Image Credit: Gulf Coast Geospatial Center

- Download Data
  - USGS Single Frame Imagery
- Pre-Processing
  - Mosaic images
  - Geo-rectify
  - Convert 2014 image to panchromatic
  - Mask as needed

Methods Continued

- Supervised Classification
  - Compute image textural features
  - Run maximum likelihood classifier
  - Conduct accuracy assessment
- Compute loss in marsh surface area

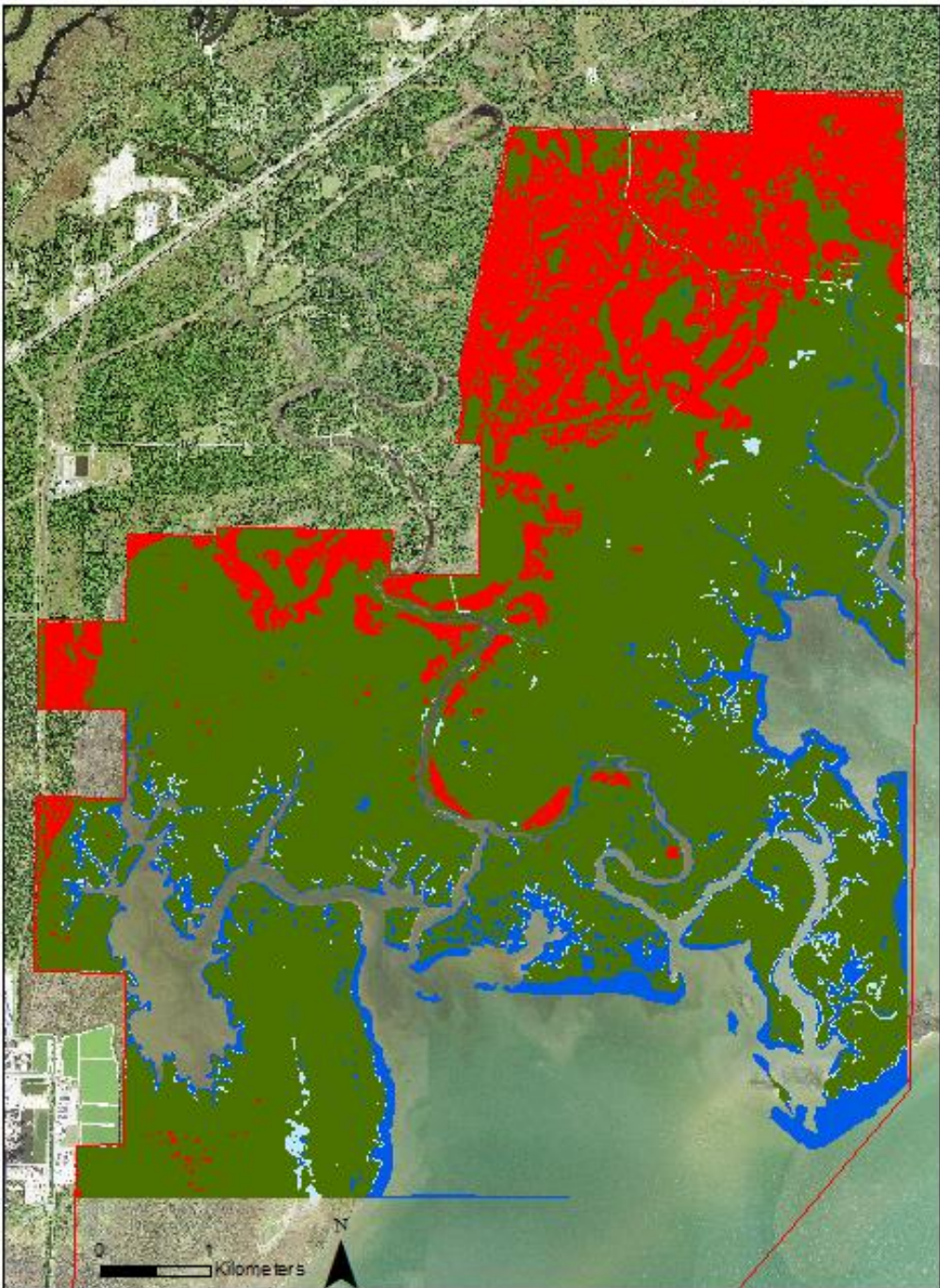Image Credit: Aero-Data Corporation LLC
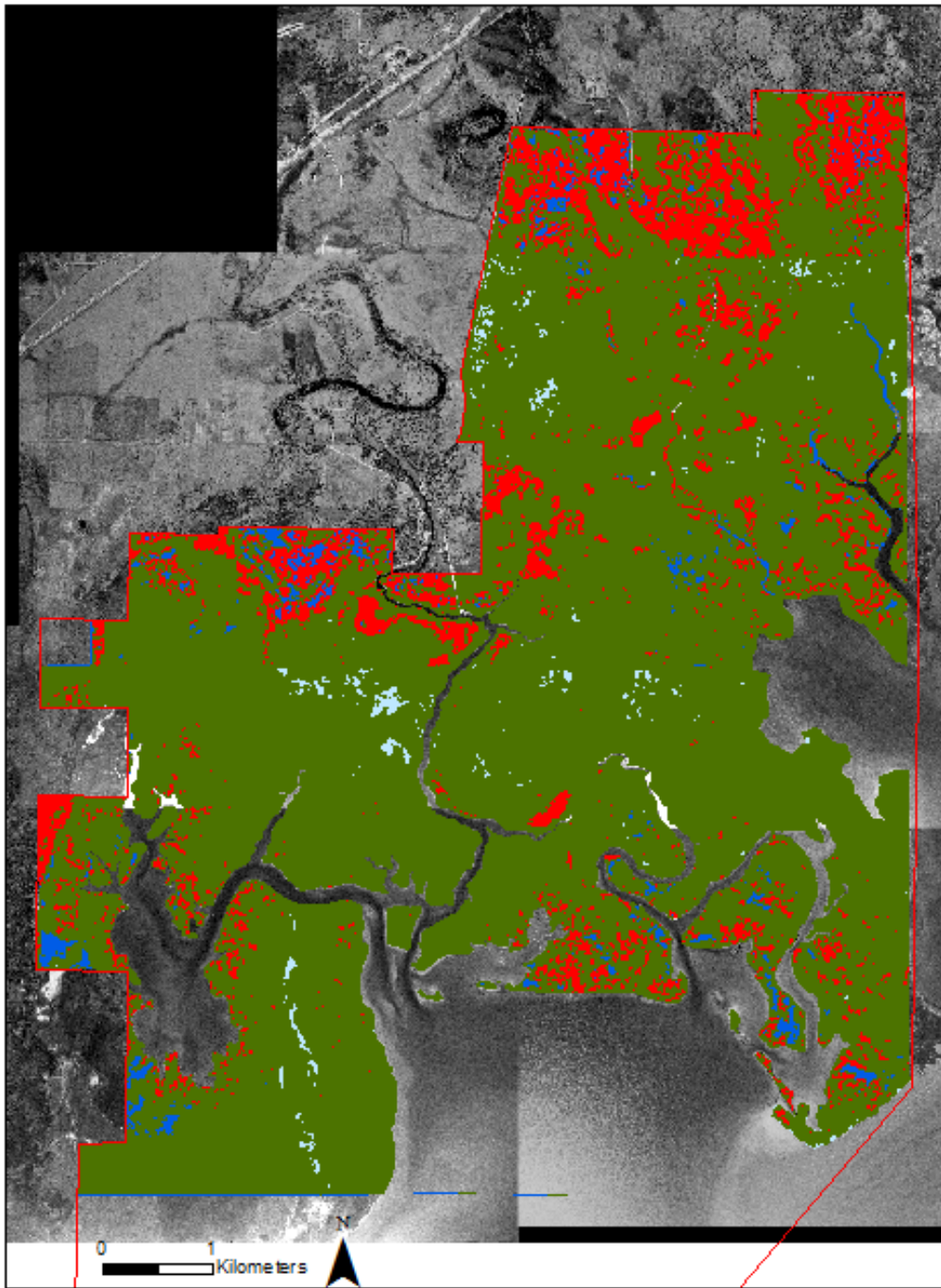
1955 Classification

	Area (%)	Area (ha)
Water	1.8	97.5
Woodland	5.9	489.3
Salt Panne	0.4	34.9
Marsh	48.9	4041.6

Overall Classification Accuracy: 93.53
Kappa Coefficient: .8578

Habitat Classifications

- Woodlands
- Salt Panne
- Water
- Marsh

2014 Classification

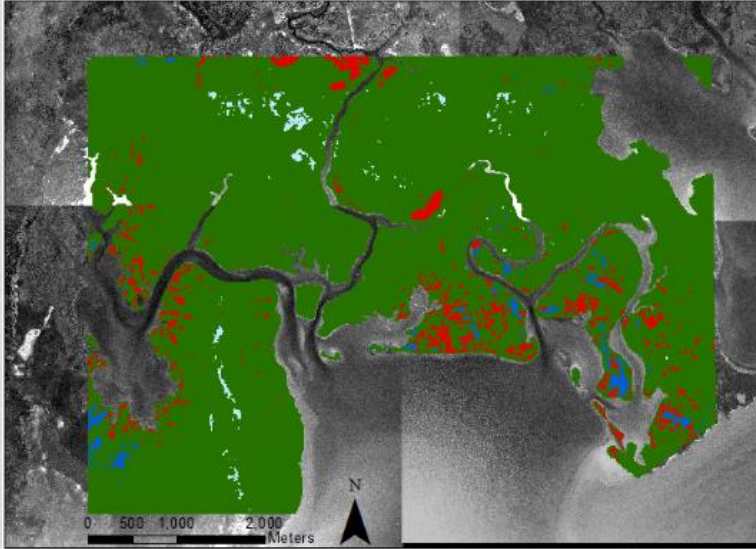|	Area (%)	Area (ha)
Water	4.5	367.6
Woodland	10.6	876.4
Salt Panne	1.0	78.7
Marsh	40.7	3358.0

Overall Classification Accuracy: 97.6452
Kappa Coefficient: .9577

Habitat Classifications
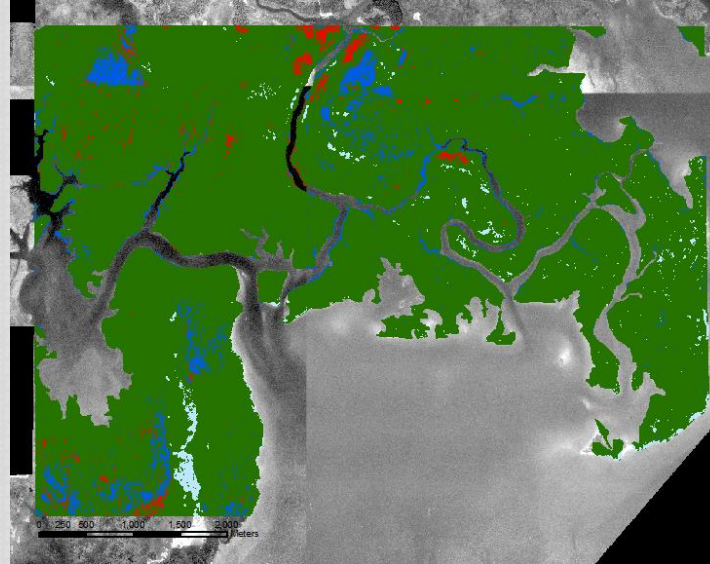
- Woodlands
- Salt Panne
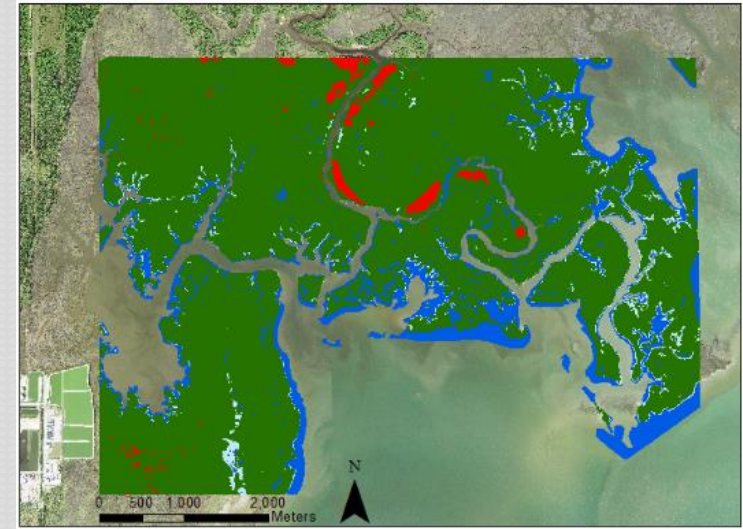- Water
- Marsh

Mid-Reserve Changes

1955 GBNERR

1992 GBNERR

2014 GBNERR

Salt Marsh Area (ha): 2280.54

Salt Marsh Area (ha): 2152.51

Salt Marsh Area (ha): 2025.99

Habitat Classifications

- Woodlands
- Salt Panne
- Water
- Marsh

Shoreline Loss (Enlargement)

90 m

122 m

227 m

290 m
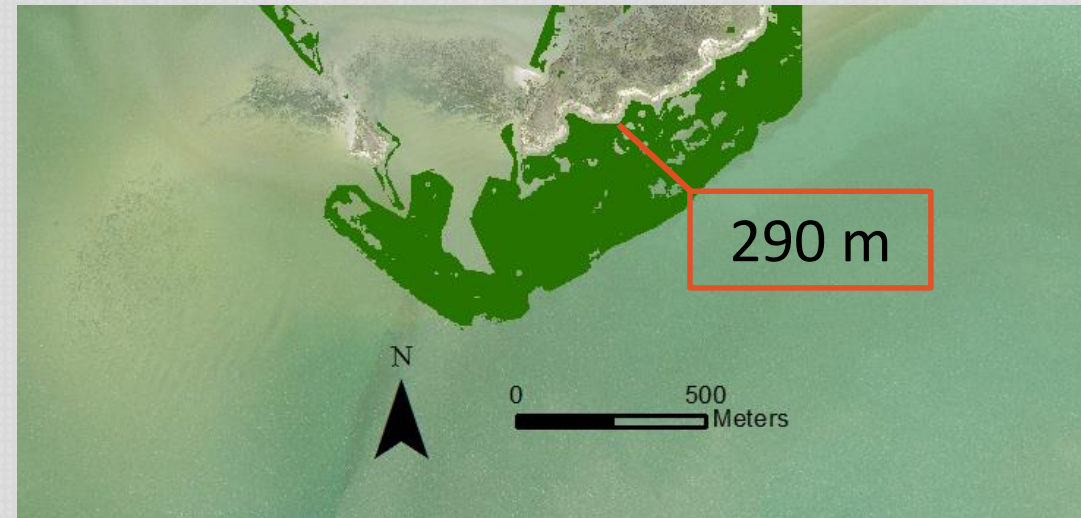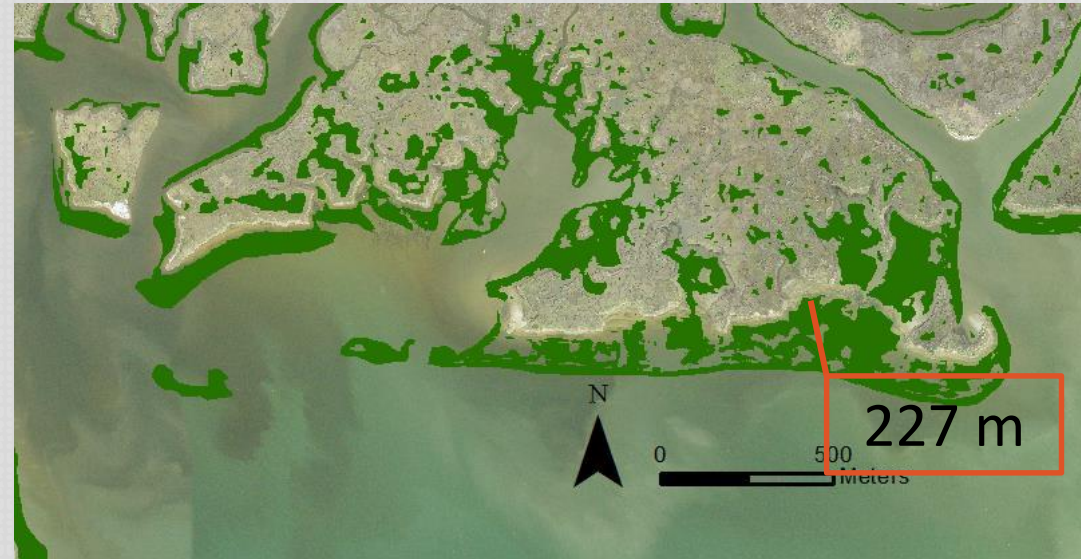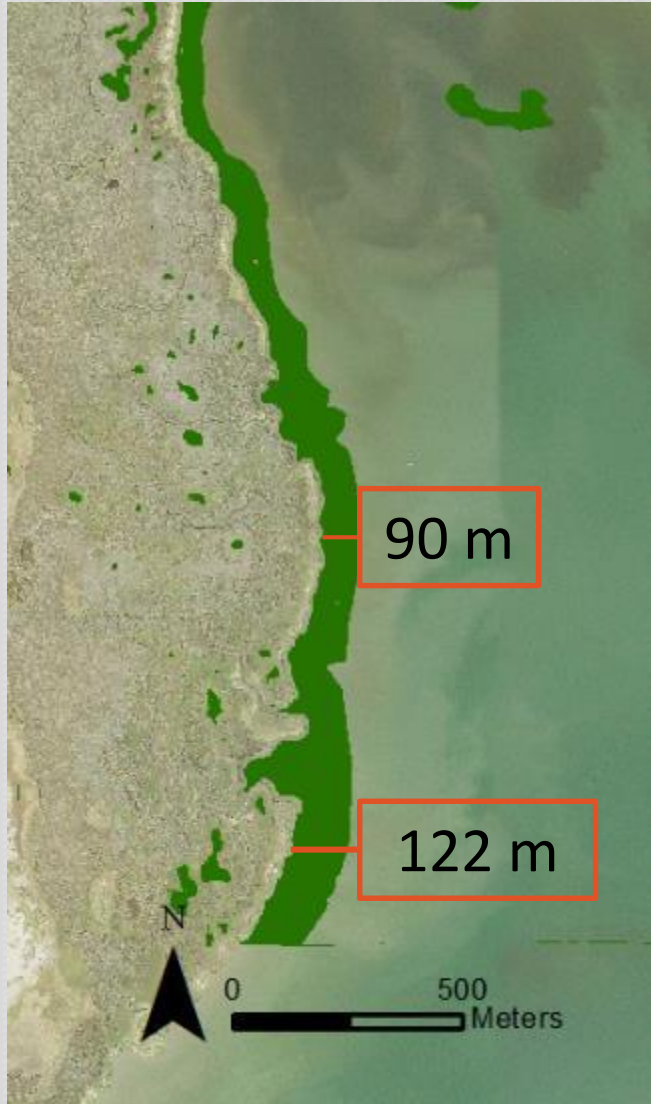
Methodological Limitations

- Data availability (Spectral, Spatial, Temporal, Ground Truth)
- Geo-rectification due to a lack of well-defined ground control points

Image Credit: NOAA NERR

In Progress

- Classification of 1970s data
- Change detection among dates

Image Credit: BHI Conservancy

Conclusions

- Marsh surface area has declined
- Results will help model future change
- Results may influence protection and restoration efforts

Image Credit: National Park Planner

Image Credit: WCAI – Dan K/ FLICKR

QUESTIONS?