

# BOY SCOUT ISLAND LIVING SHORELINE RESTORATION PROJECT

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# PROJECT LOCATION

- Boy Scout Island is a spoil island in the Indian River Lagoon
- Situated adjacent to Intercoastal Waterway (ICWW) within the St. Lucie Inlet flood shoals
- The island holds ecological, educational, and recreational value
- The island has been shrinking in size since the late 1960s
- Erosion has accelerated significantly over the past 20 years

# STUDY OBJECTIVES

1

Develop a comprehensive understanding of the coastal processes affecting Boy Scout Island and adjacent areas through analysis of aerial imagery, meteoceanographic data, and numerical modeling



2

Apply the Delft3D numerical model to simulate coastal processes and assess the performance of conceptual alternatives of island stabilization

# FIRST STEP, VISIT THE SITE

- Site visit conducted with Martin County staff
- Direct observation of erosion patterns, shallow flats, and tidal channels
- Field understanding supports meaningful modeling and future design work



# HISTORY OF BOY SCOUT ISLAND (1958)



*No landmass visible; area consisted of tidal flats within the flood shoal of St. Lucie Inlet.*

*This is a human-created, evolving system*

# HISTORY OF BOY SCOUT ISLAND (1966)



*Island created with material from ICWW; poorly defined shoreline; little to no vegetation.*

*This is a human-created, evolving system*

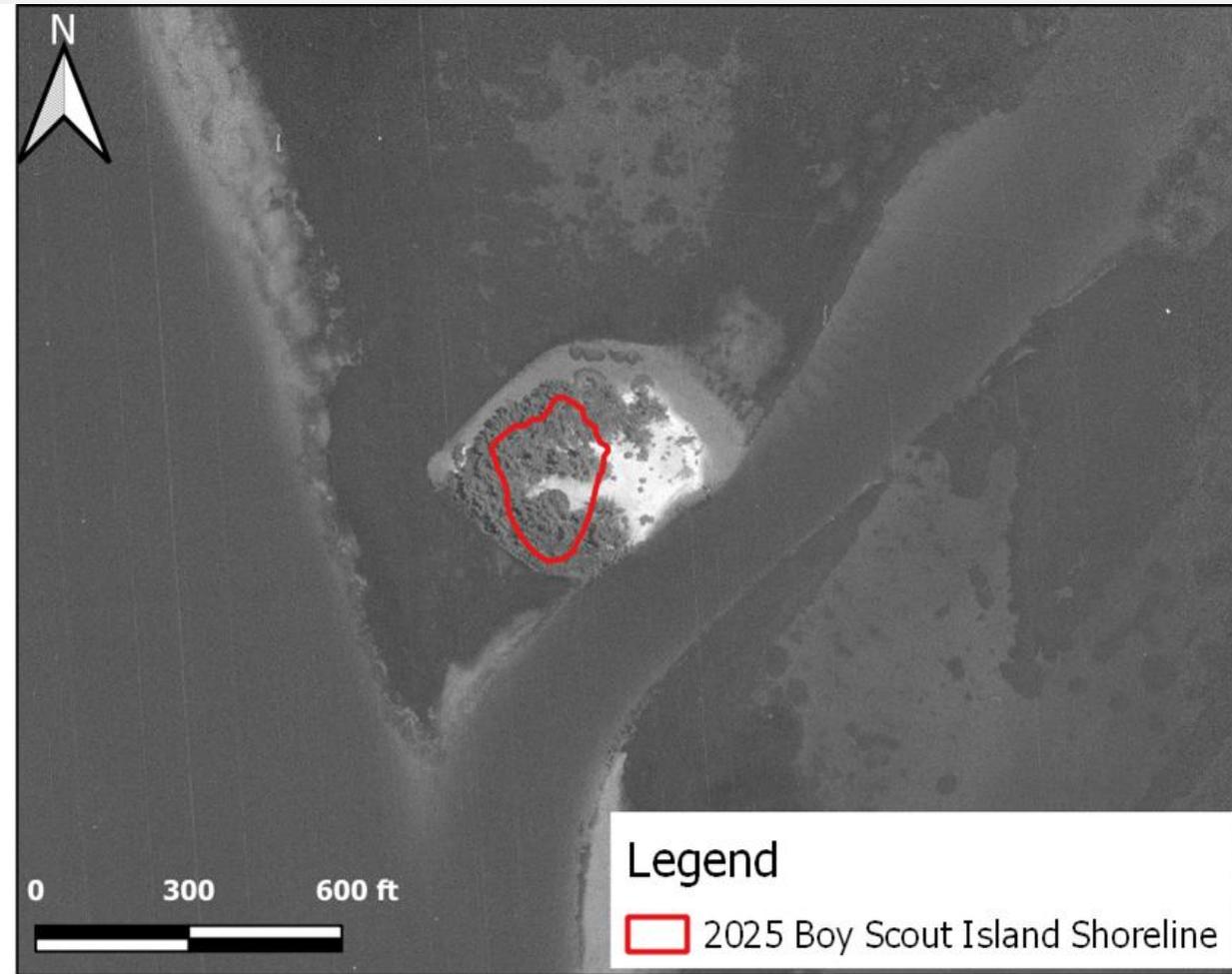
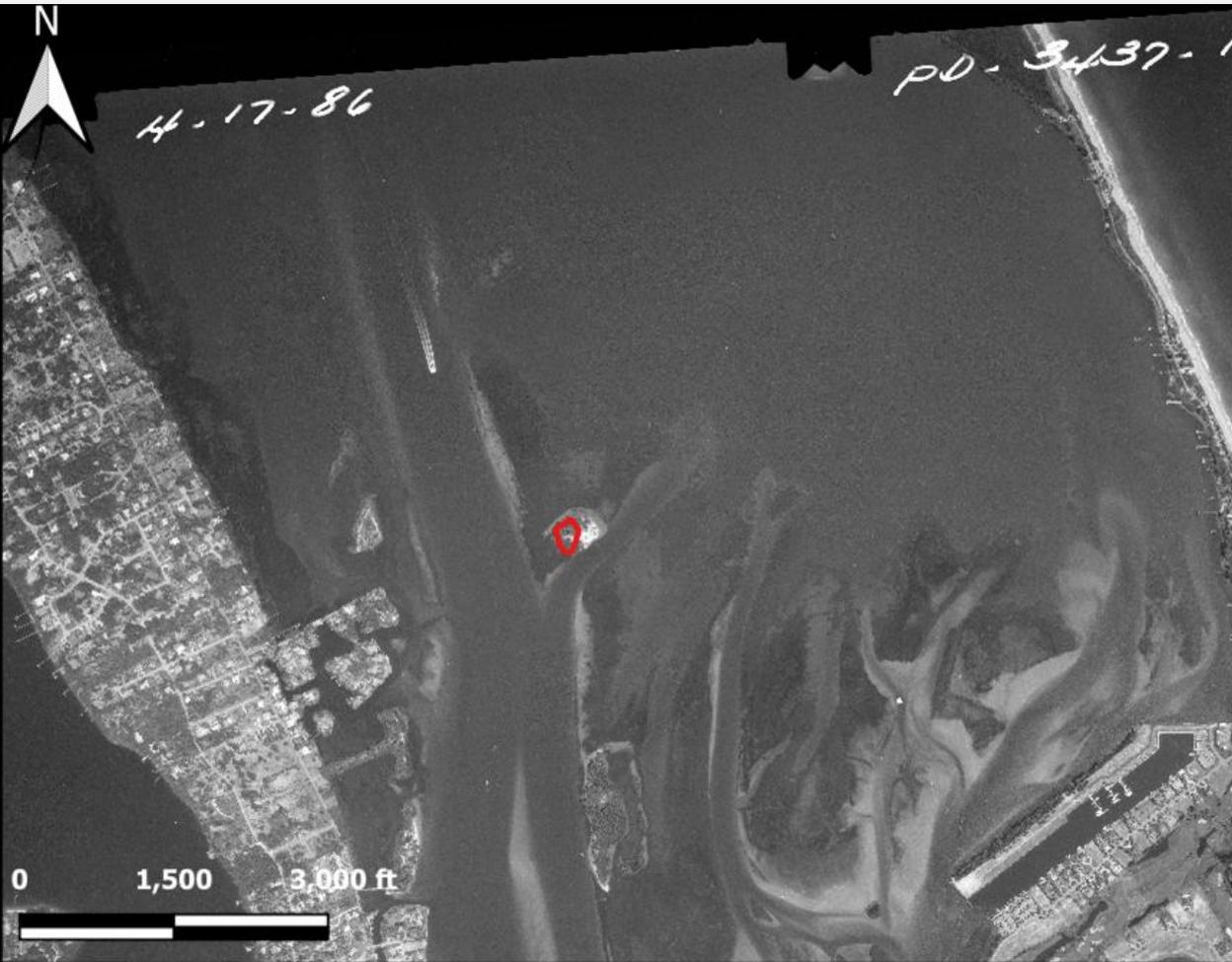
# HISTORY OF BOY SCOUT ISLAND (1974)



*More stable and clearly defined shoreline; beginning of ecological development.*

*This is a human-created, evolving system*

# HISTORY OF BOY SCOUT ISLAND (1986)



*Island appears to be more established; increased vegetation coverage and ecological development.*

*This is a human-created, evolving system*

# HISTORY OF BOY SCOUT ISLAND (1996)

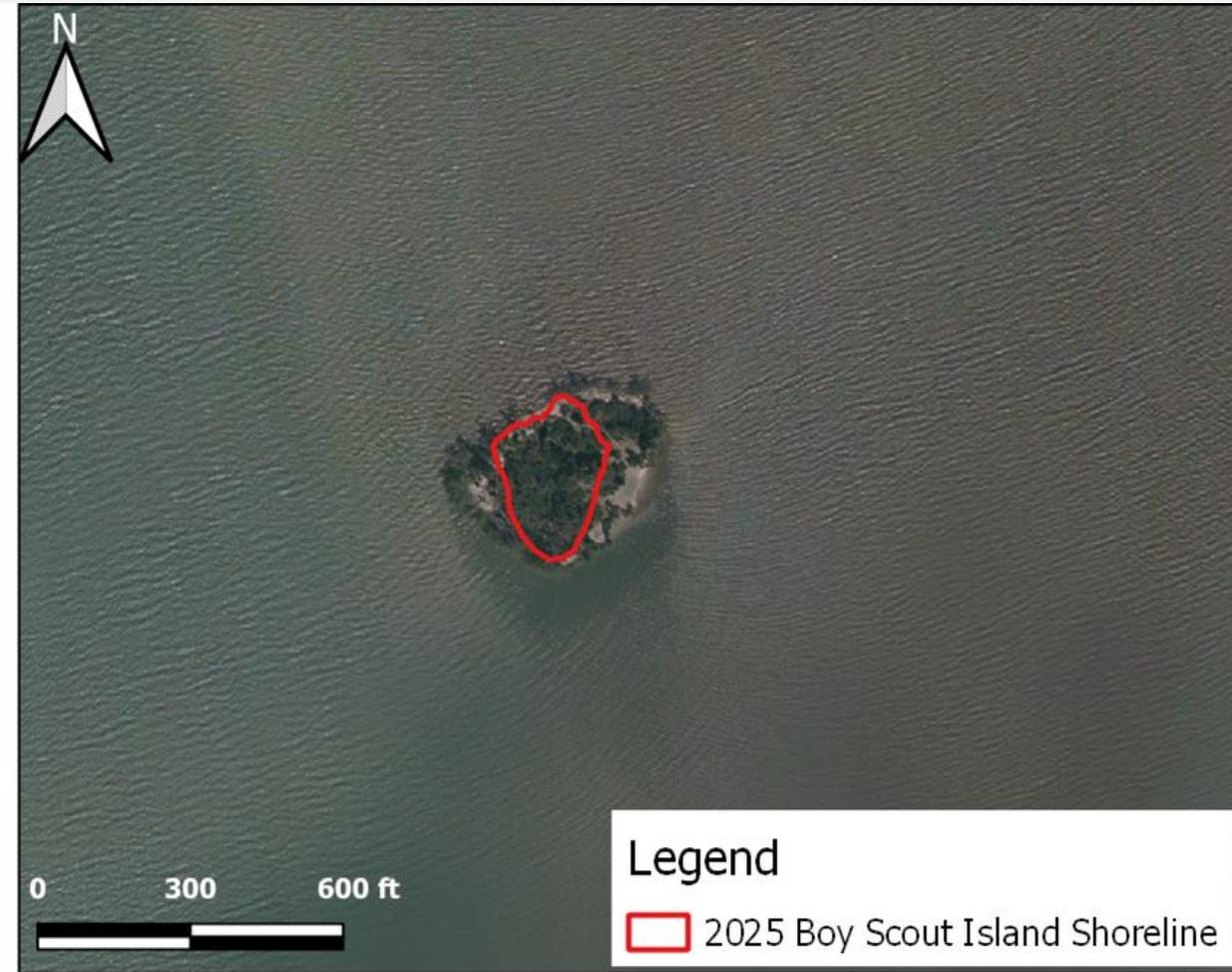
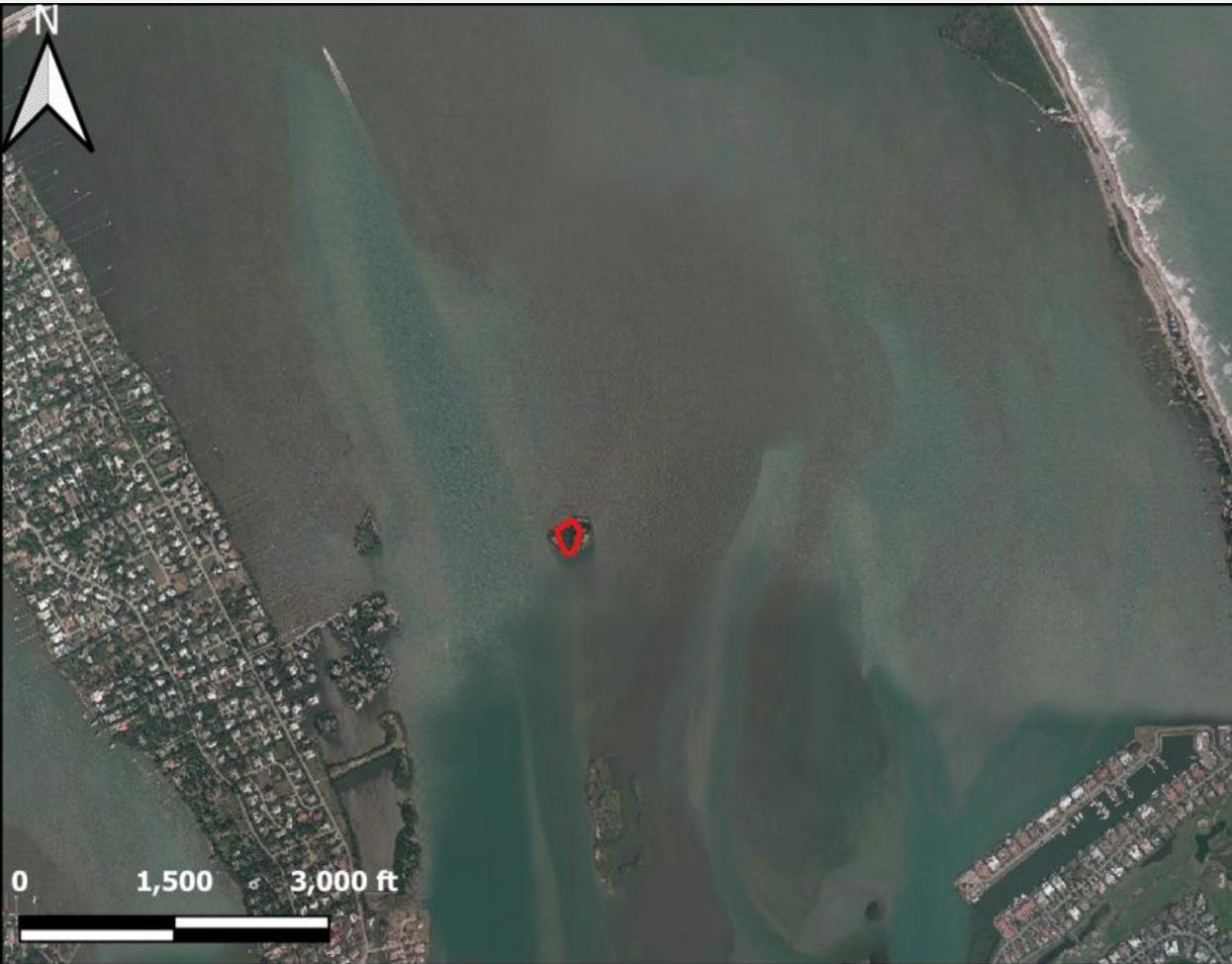


*Well-defined and mature shoreline; relative stability characterizes this period.*

*This is a human-created, evolving system*

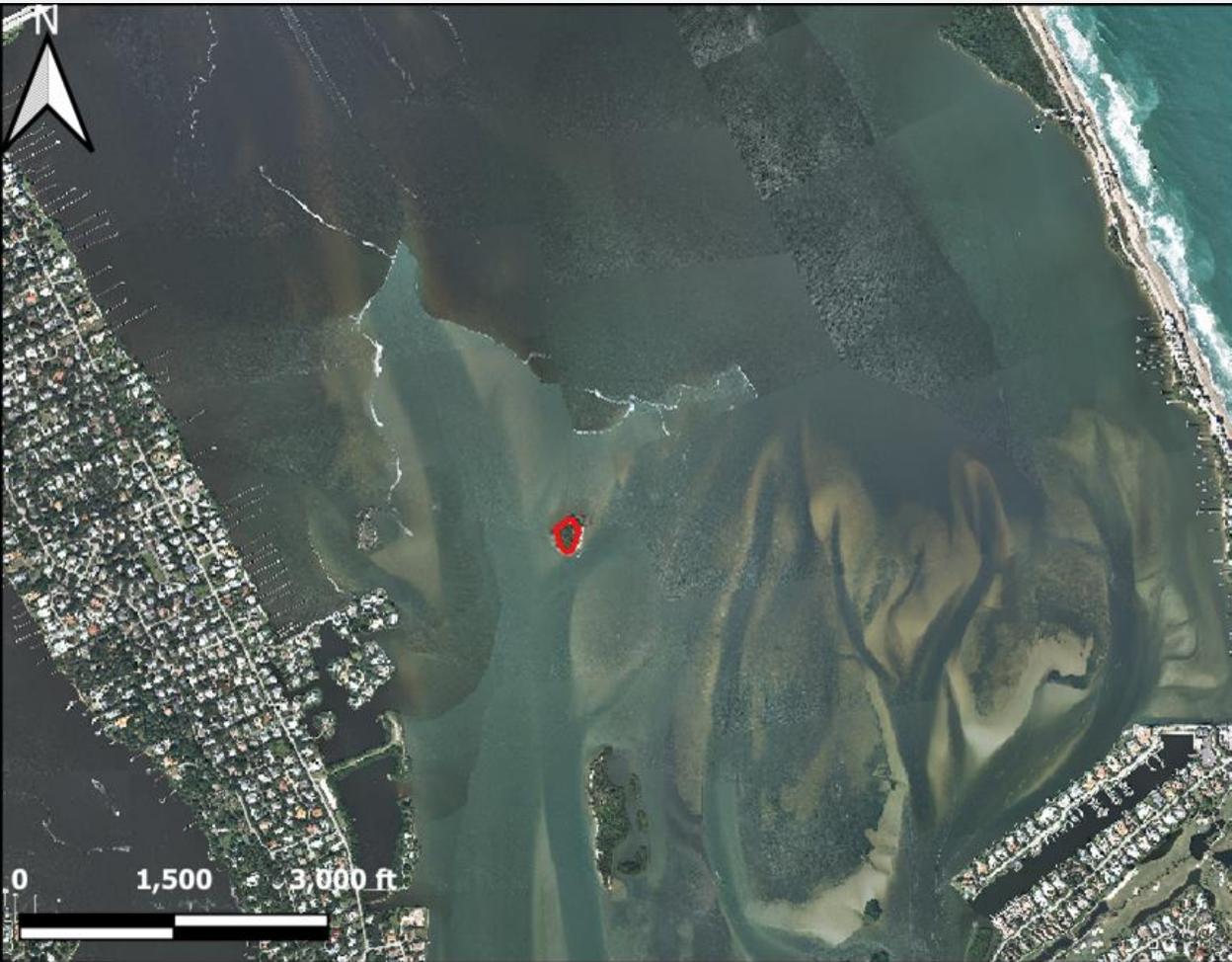


# HISTORY OF BOY SCOUT ISLAND (2006)



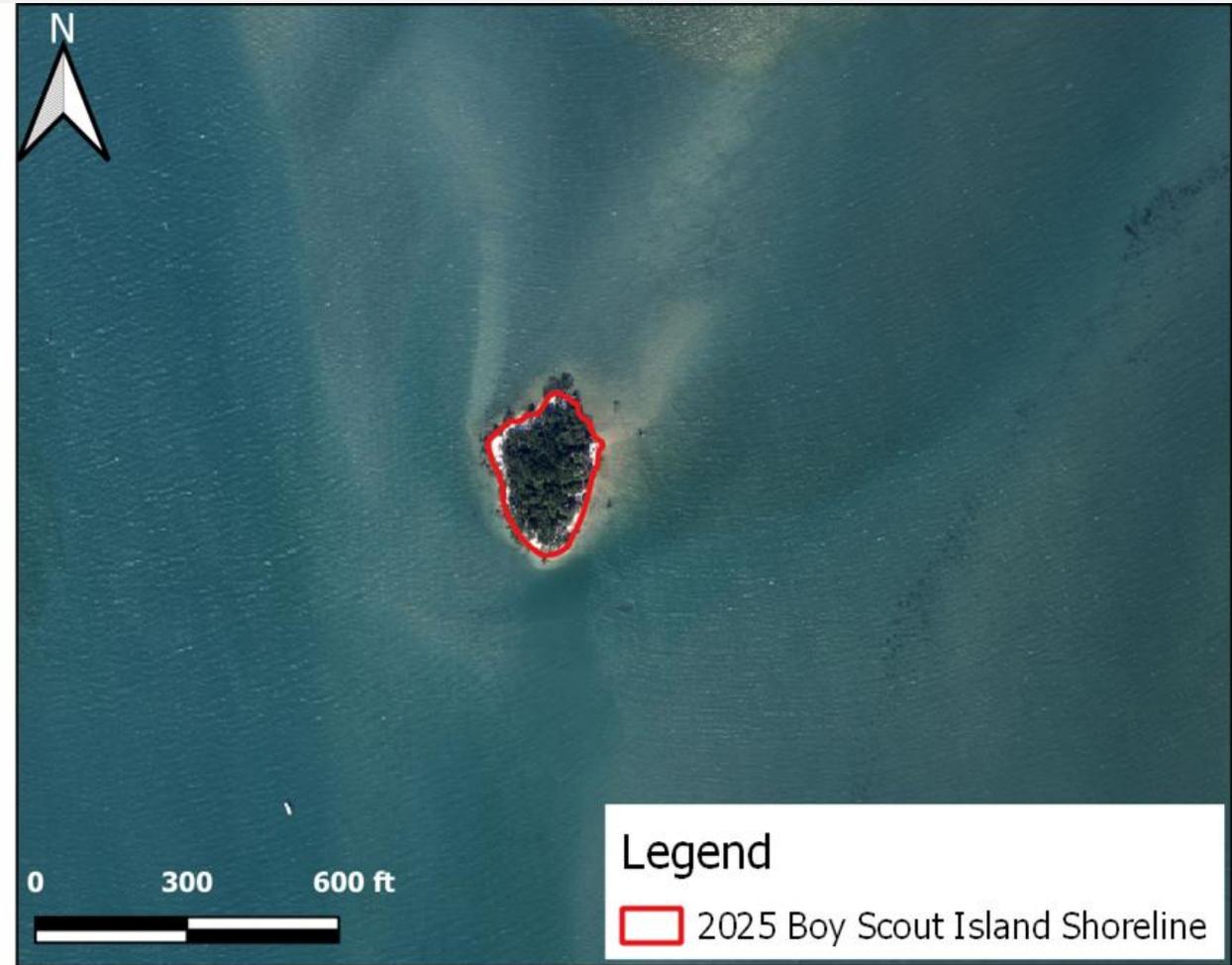
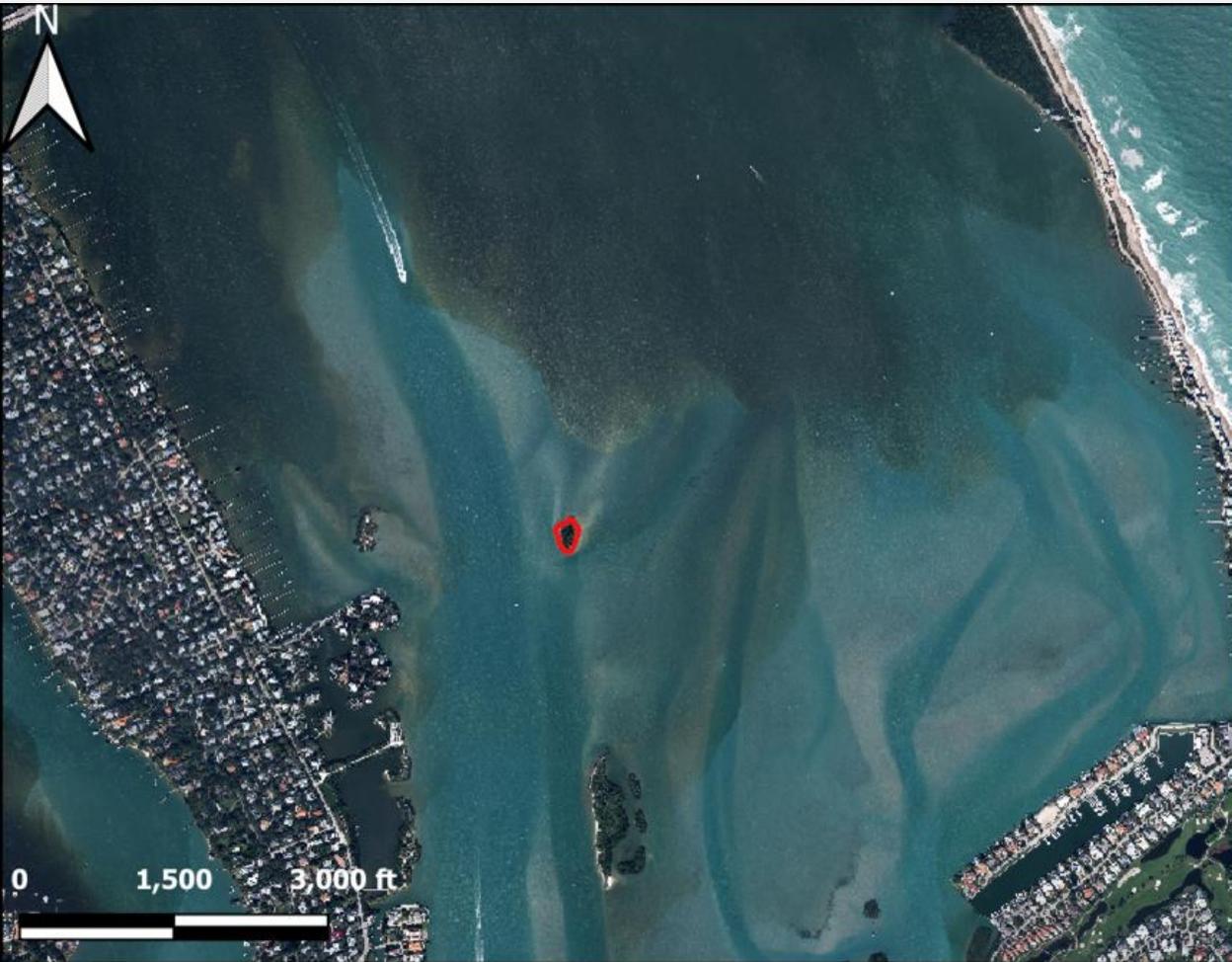
*Significant erosion, with noticeable loss of landmass from previous year.*

# HISTORY OF BOY SCOUT ISLAND (2016)



*Continued erosion with further reduction of island size.*

# HISTORY OF BOY SCOUT ISLAND (2025)

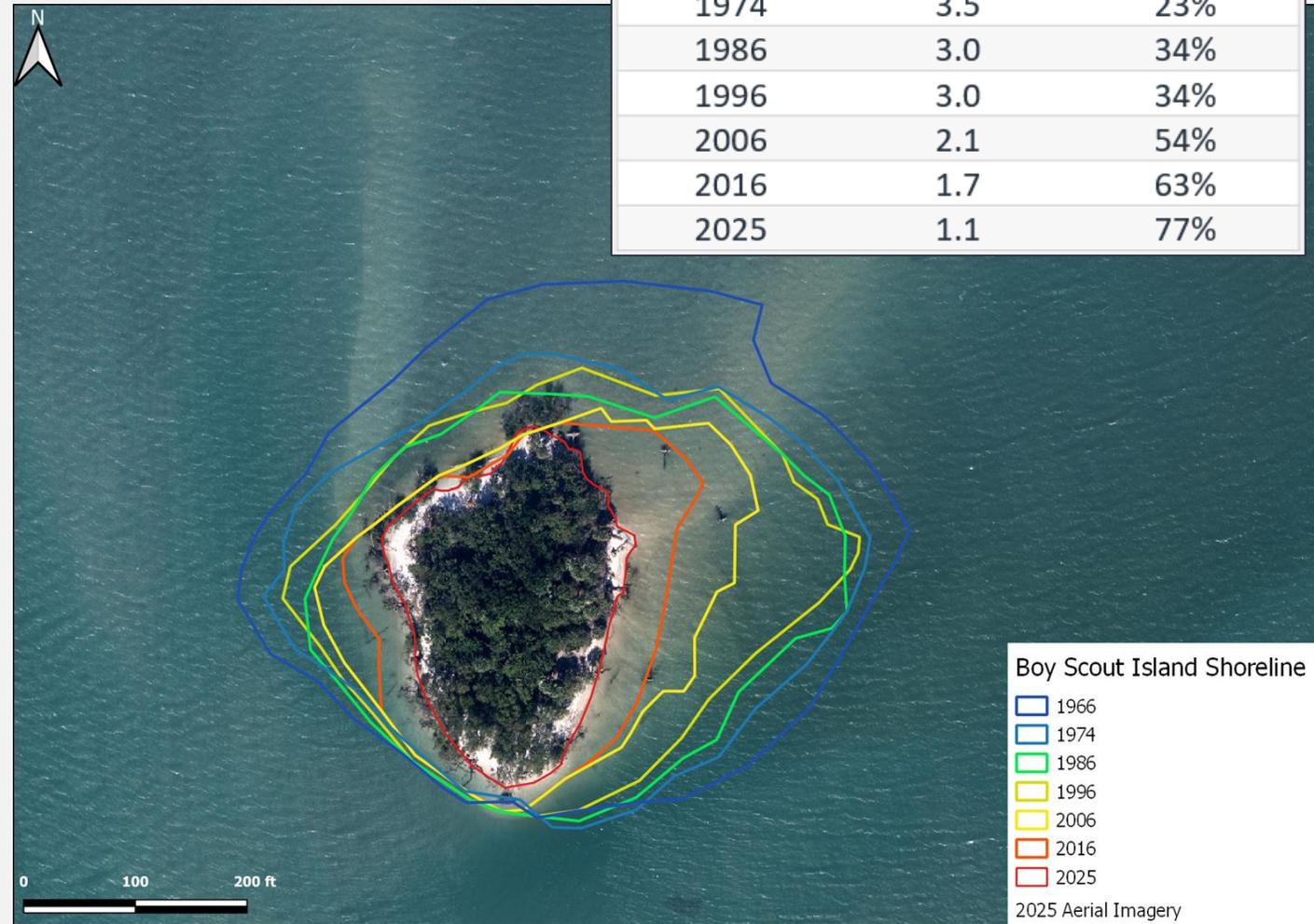


*Ongoing shoreline retreat and additional land loss.*

# HISTORY OF BOY SCOUT ISLAND

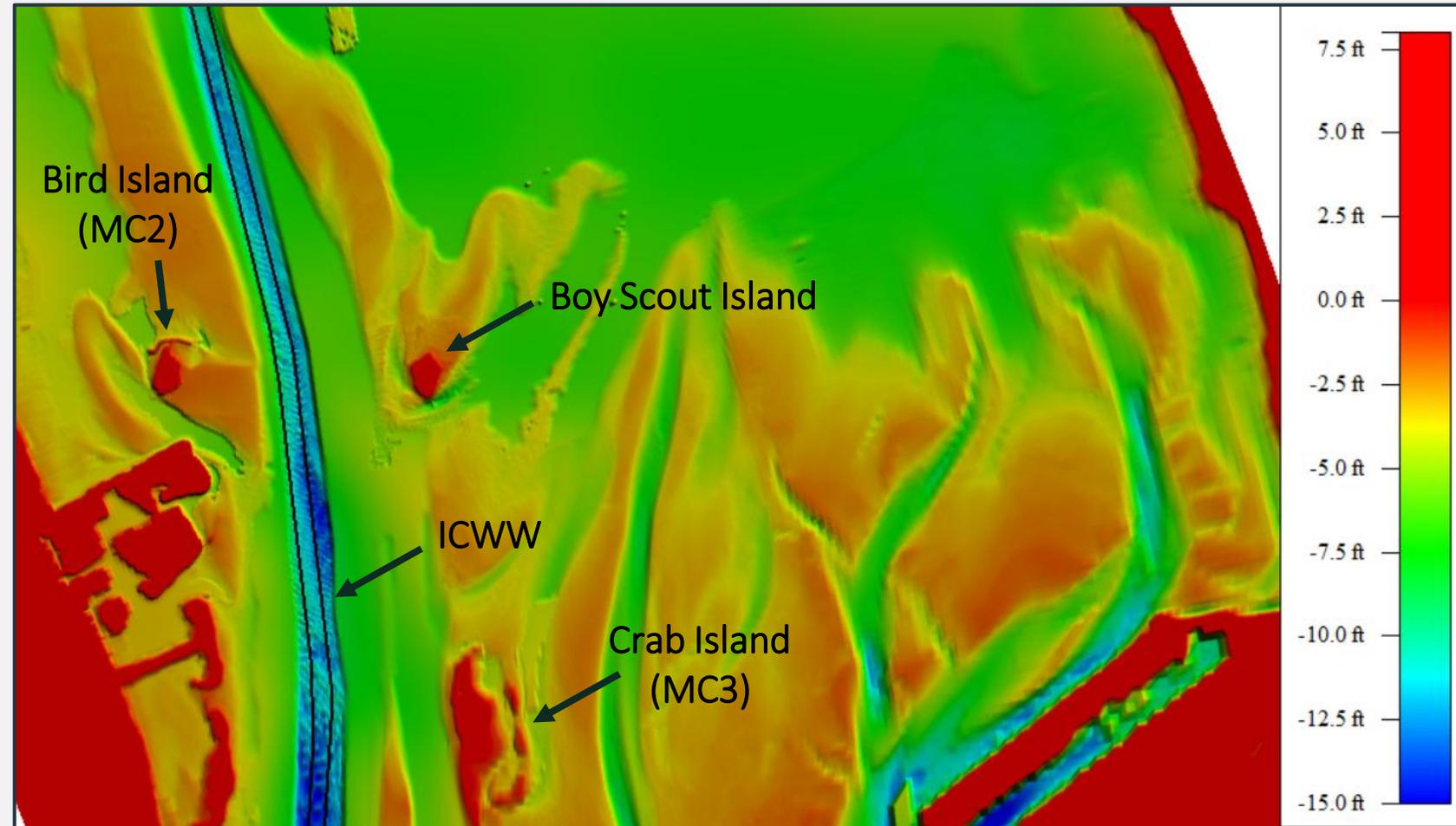
- 77% land loss since 1966, approximately 3.5 acres over 59 years
- Eastern shoreline experienced the most severe erosion
- Northern shoreline consistent erosion since 1966
- Western shorelines remained relatively stable until followed by accelerated retreat
- Southern shoreline remains comparatively stable

Year	Area (Acres)	Percentage Loss
1966	4.6	--
1974	3.5	23%
1986	3.0	34%
1996	3.0	34%
2006	2.1	54%
2016	1.7	63%
2025	1.1	77%



# COASTAL SETTING

- Shallow estuarine-lagoon setting with ocean-driven tides through St. Lucie Inlet
- Boy Scout Island is surrounded by tidal flats with depths up to -3 ft NAVD88
- Tidal exchange concentrated in channels, with broad shallow flats controlling wave transformation



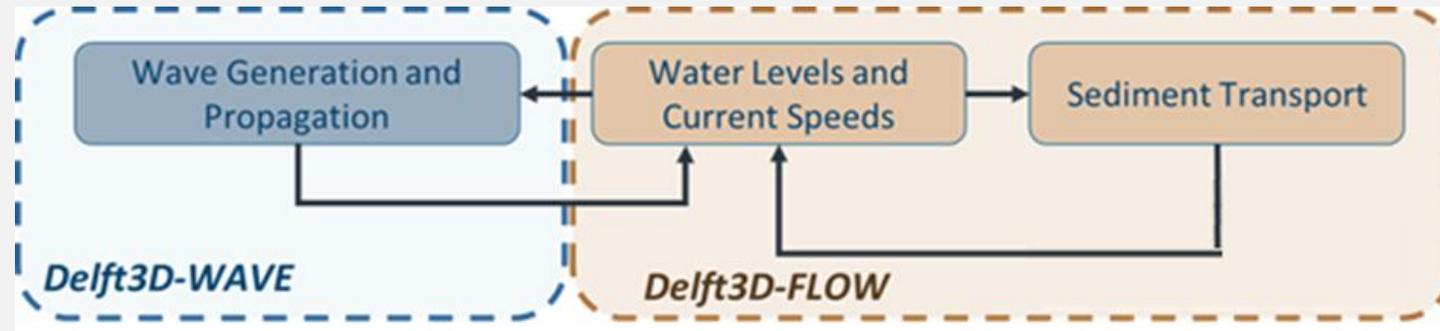
# WHERE MODELING FITS IN

- Modeling helps us ask better questions, not just expect solutions
- What we needed the model to tell us:
  - Where do waves and currents actually matter?
  - How far do effects extend from the island?
  - What happens during neap vs spring tides?
  - How do wave patterns shift around the island under different wind directions?



# MODELING APPROACH

- Modeling approach: **Delft3D**

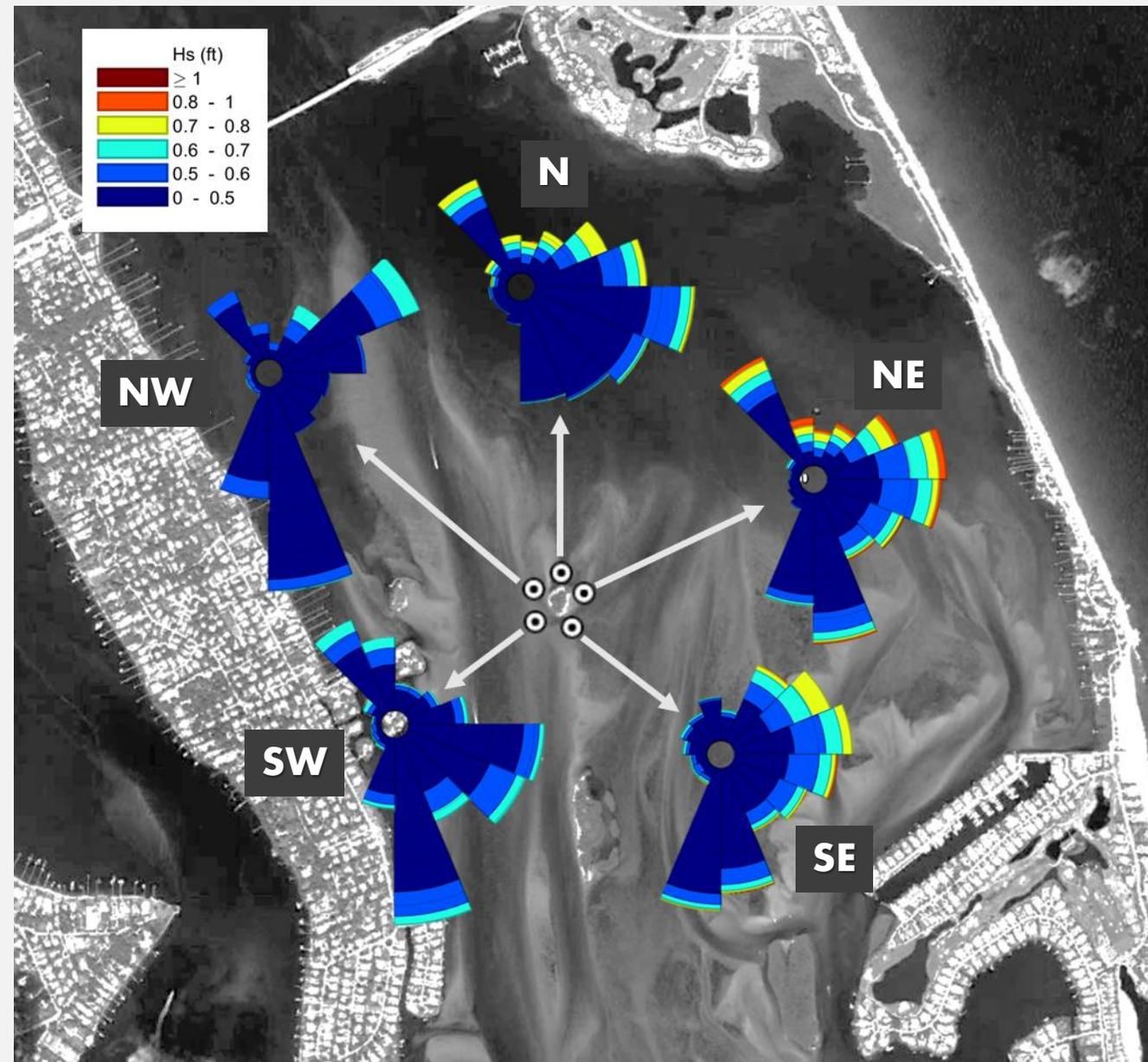


- **Water level and discharge calibration** performed using data provided by Martin County in multiple locations

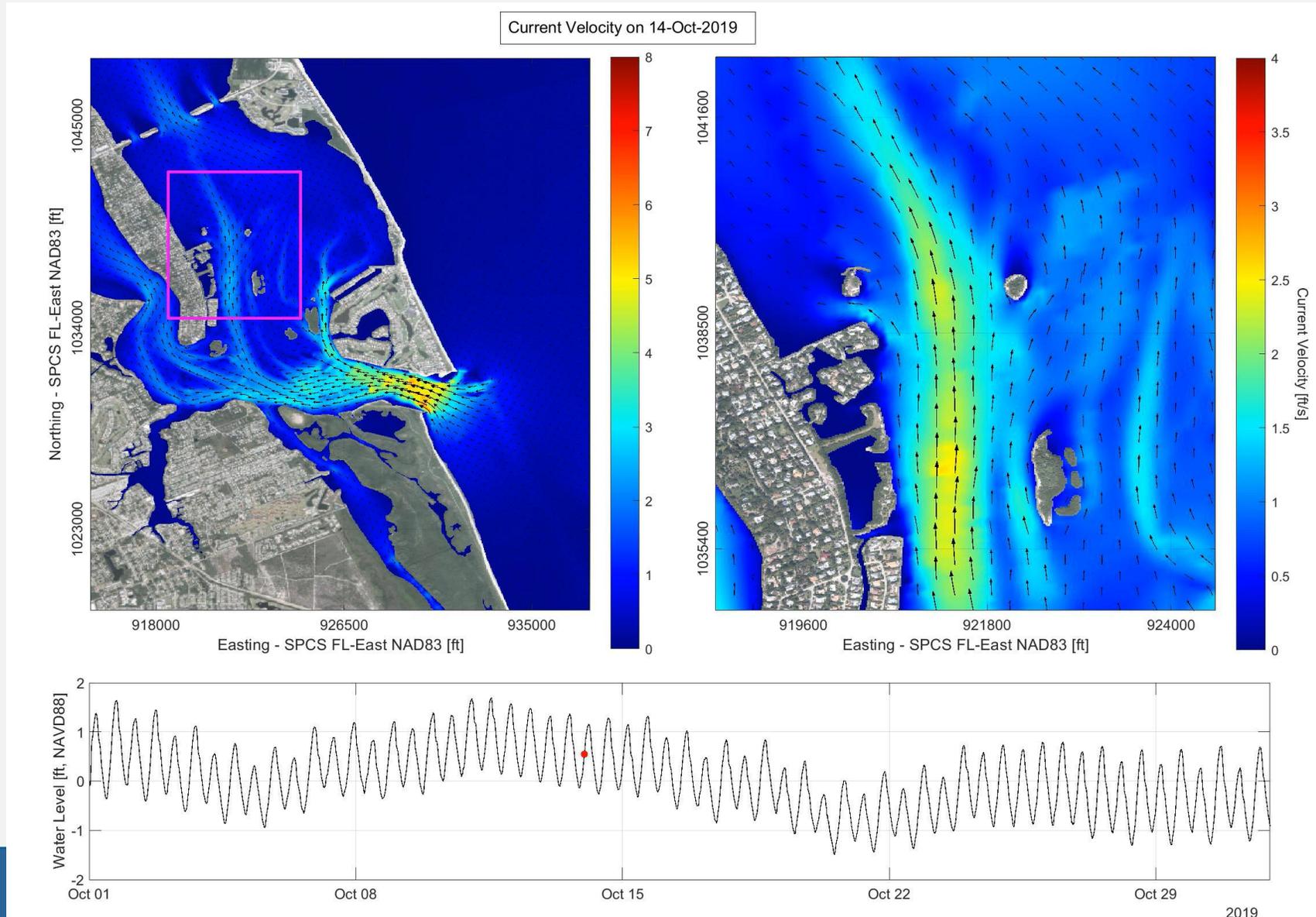


# WAVES

- Wave climate analysis through modeling to understand site-specific wave behavior and where structures would be most effective
- Wave climate is low-energy, short-period, and locally generated
  - Average wave height  $\sim 0.5$  ft
  - 90% of the waves are below  $\sim 0.7$  ft
  - Maximum wave height 2.29 ft (SE)
- Wave exposure varies spatially around the island
  - SE to NE  $\rightarrow$  highest wave exposure, highest energy and most frequent waves
  - N and S  $\rightarrow$  moderate exposure, lower wave energy
  - SW to NW  $\rightarrow$  most sheltered due to limited fetch

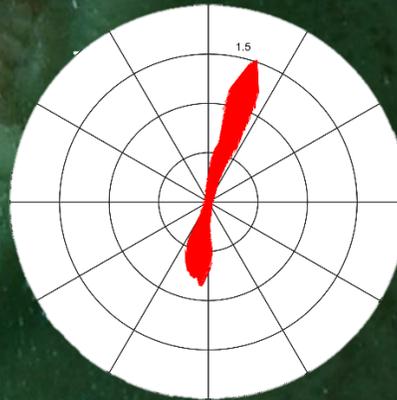


# CURRENT VELOCITIES



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- Flood currents are consistently stronger than ebb currents
- This asymmetry creates a residual northward flow



Average Current Velocity (ft/s)  
October 1-31, 2019

	West	East
Flood	1.0	0.8
Ebb	0.7	0.5

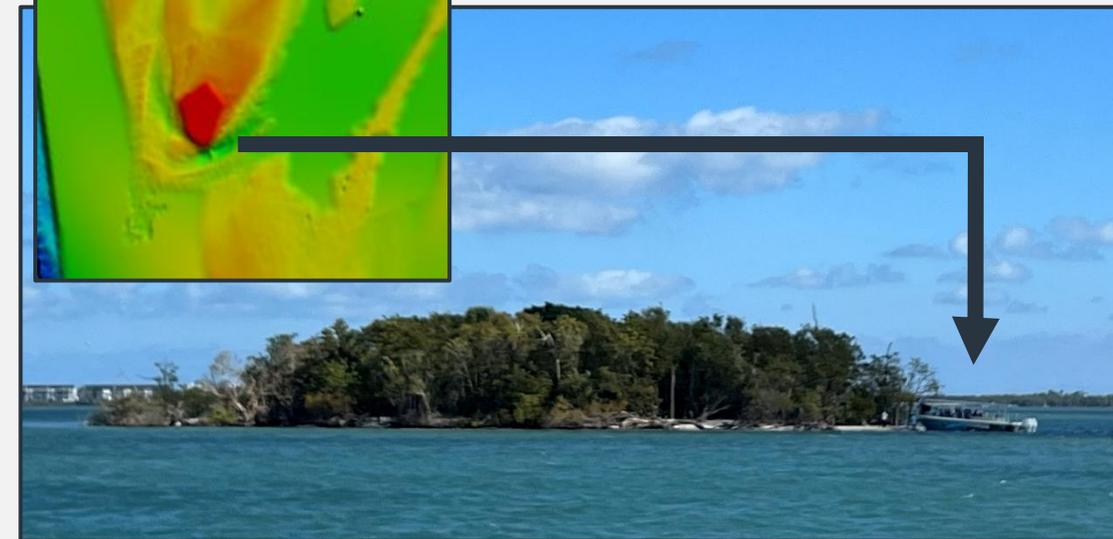
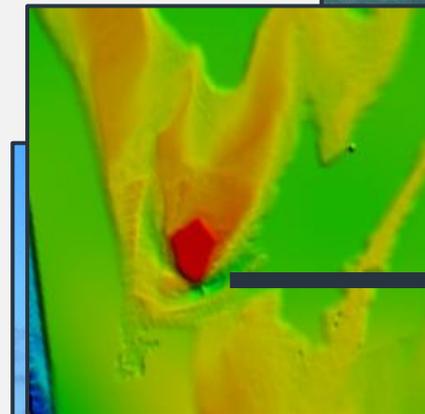
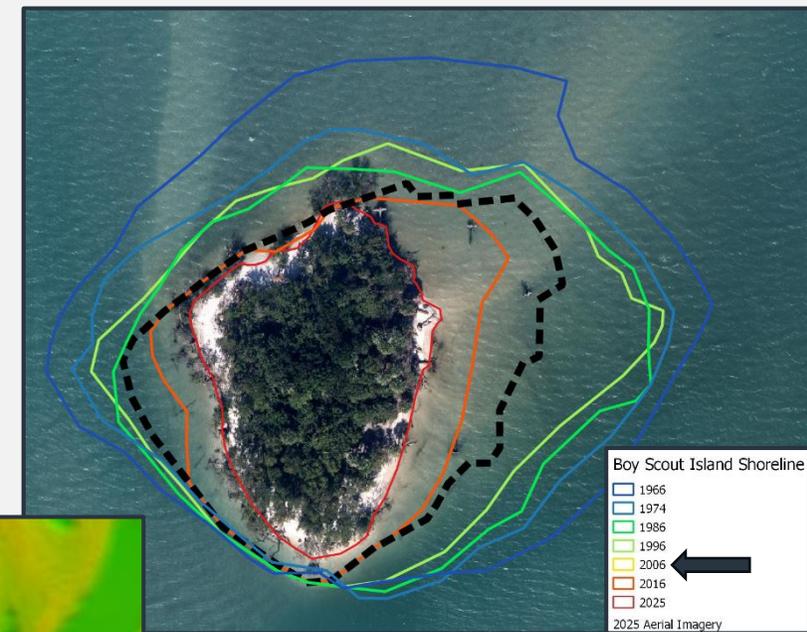
# SETTING THE STAGE FOR THE ALTERNATIVES EVALUATION

- Site visit, site history, coastal setting, wave climate and current analyses were critical to framing the problem correctly
- Modeling builds on that understanding, it does not replace it
- With the key processes driving change identified, modeling was used intentionally as a tool to test ideas grounded in site-specific understanding
- Conceptual alternatives were tested, refined, and compared through an iterative process



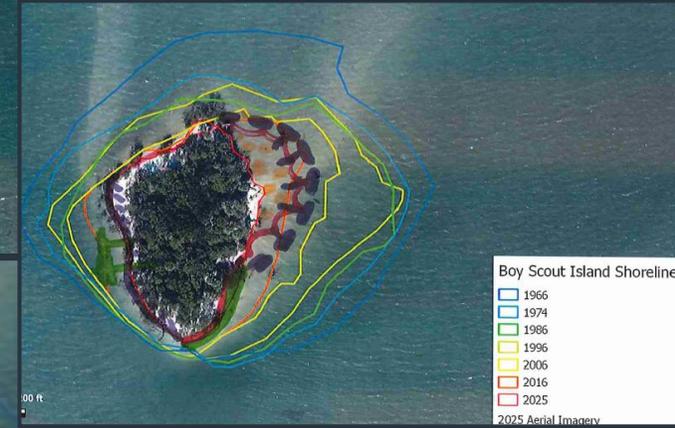
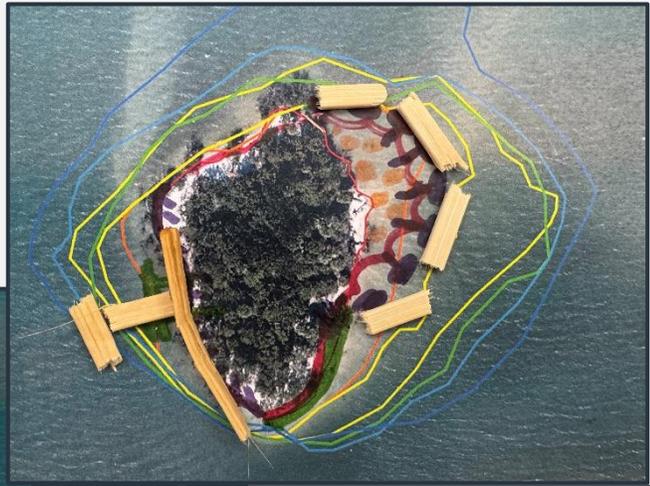
# FROM EARLY COORDINATION TO MEANINGFUL ALTERNATIVES

- Martin County input shaped the project from the start
- County's priorities guided the framework
  - 2006 shoreline as our "goal"
  - Boat docking access needed to remain functional
  - Minimize impacts to SAV
- Milestone meetings with the County guided alternative development



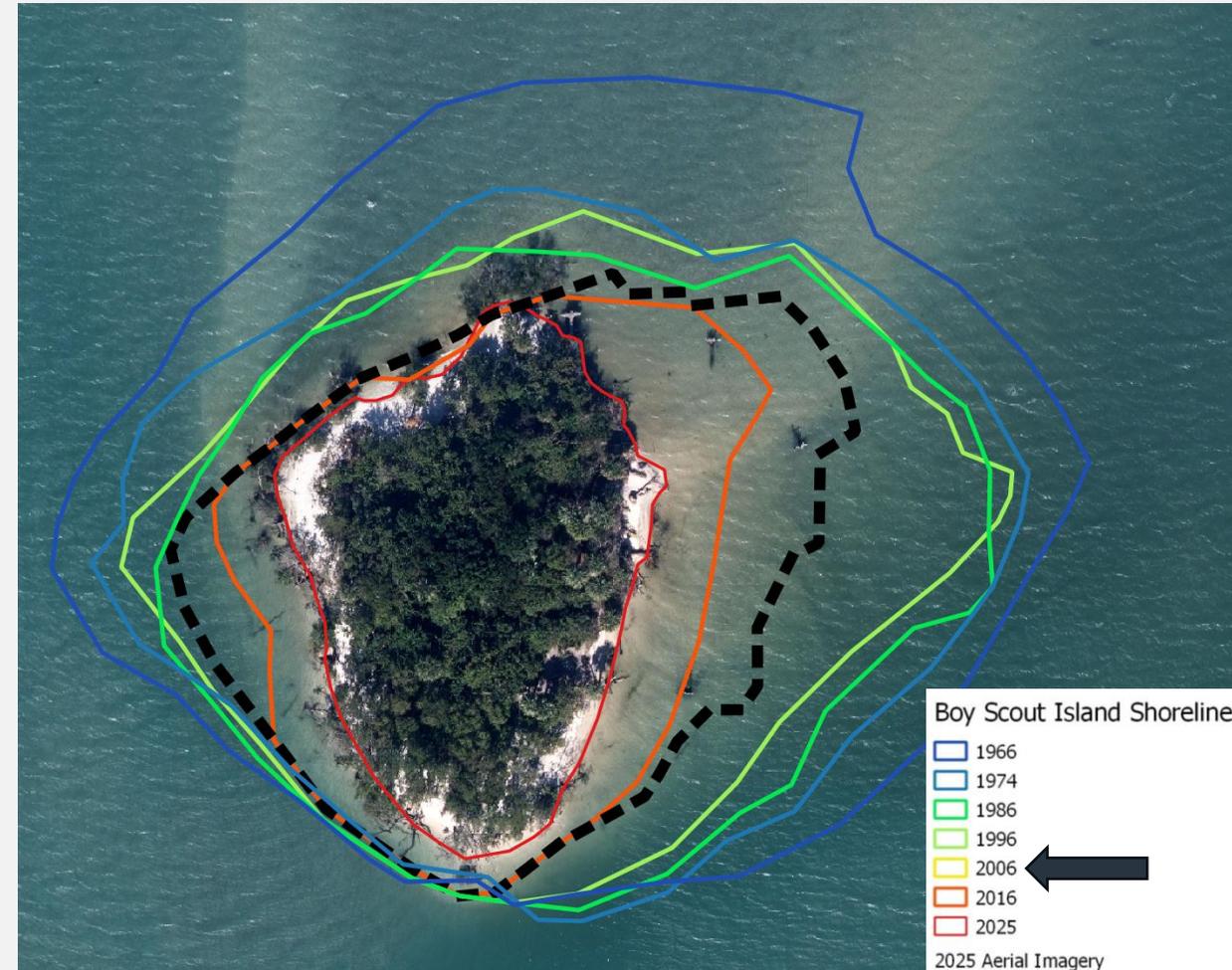
# FROM CONVERSATIONS TO CONCEPTS

- Early conversations, hand sketches, and simple concepts
- Multiple ideas explored before narrowing options
- No single “right answer” at the outset
- Open dialogue across disciplines and project teams

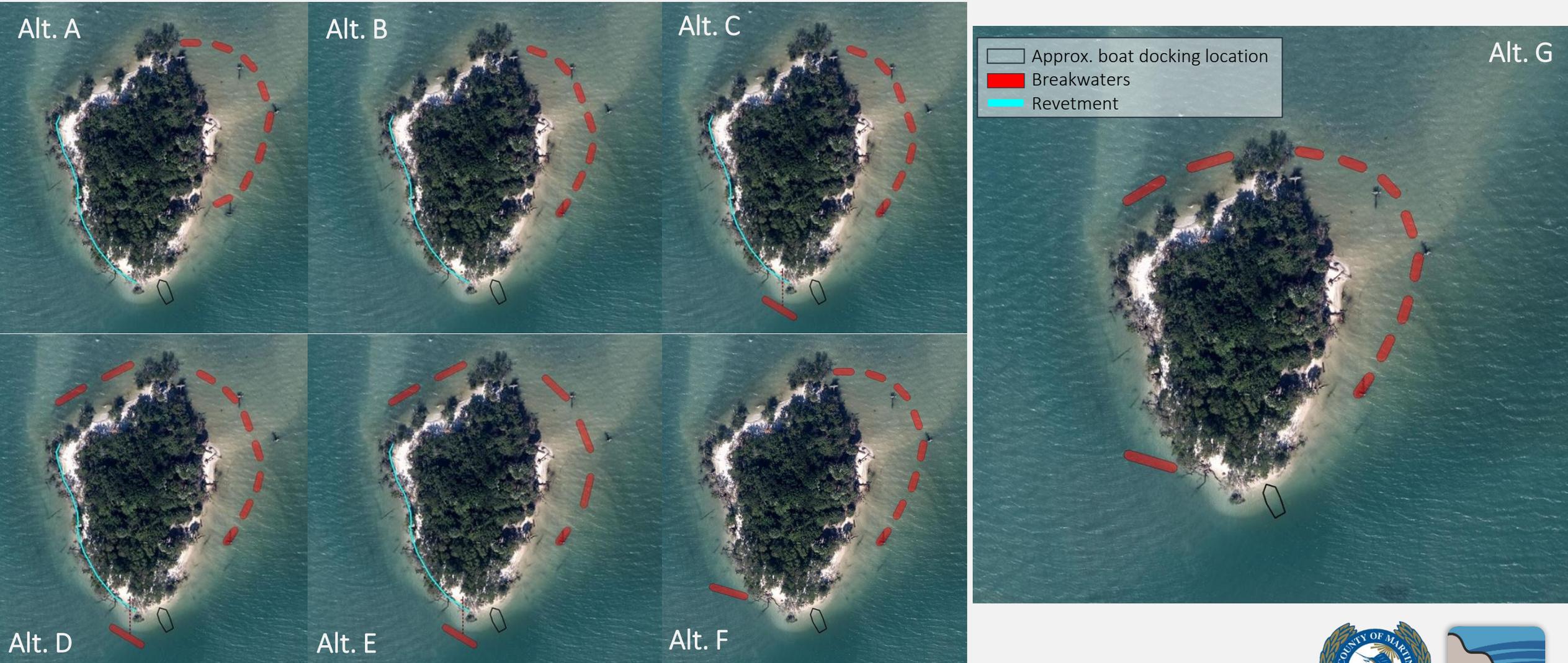


# ALTERNATIVES EVALUATION APPROACH

- Developed 7 alternatives targeting restoration toward the 2006 shoreline footprint
- Simulated 2 average and 2 high-energy wind scenarios across spring and neap tidal cycles
- Evaluated alternatives relative to Existing (No Action) conditions
- Assessed changes in waves, currents, and sediment transport
- *Note: evaluating structural stabilization at this stage, but living shoreline options will be considered in future phases of the project, as well as vegetation planting for enhanced stabilization and beneficial use of dredging material from FIND to also enhance stabilization*

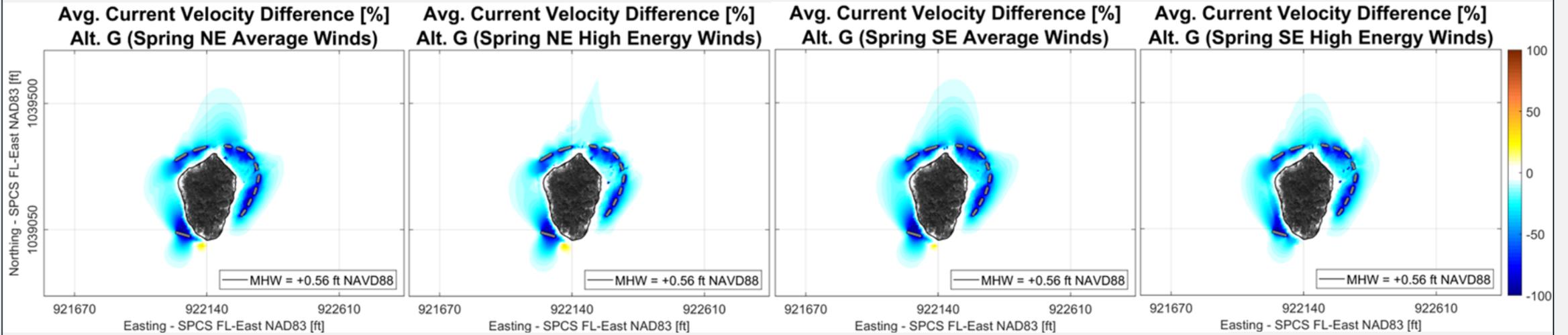


# ALTERNATIVES EVALUATION

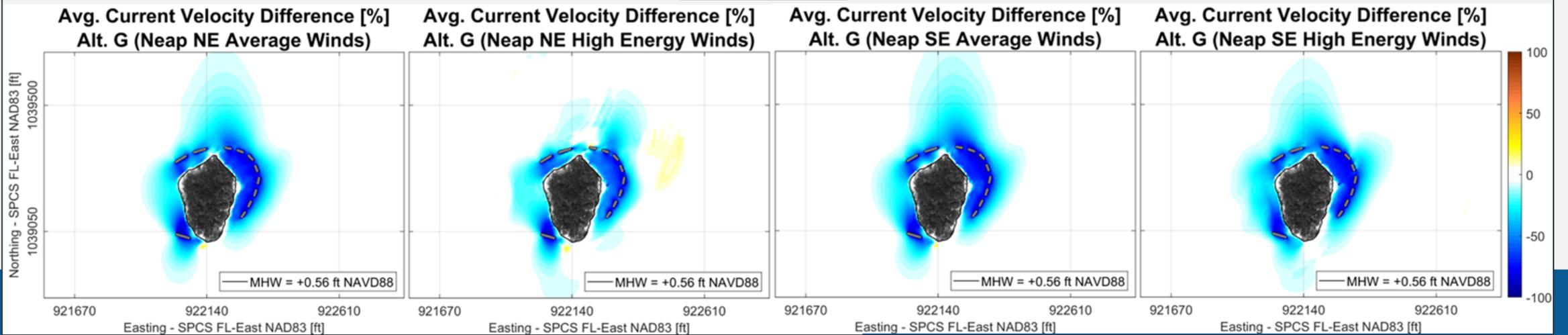


# PREFERRED ALTERNATIVE RESULTS

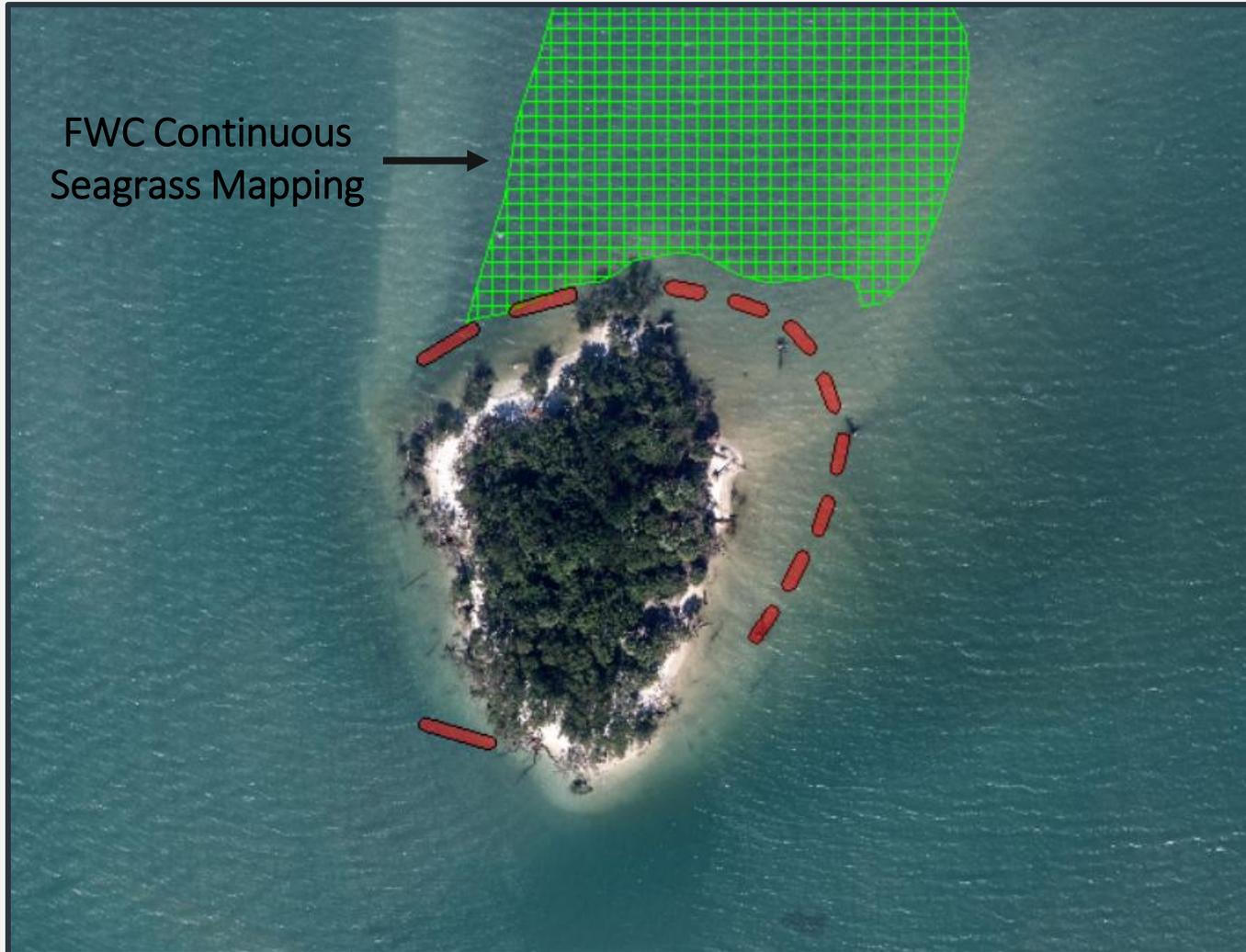
## Spring Tide



## Neap Tide



# EARLY AGENCY COORDINATION



- Early coordination meeting with state regulatory agencies
- Discussed project goals, constraints, and restoration intent
- Confirmed feasibility of proposed stabilization concepts
- Identified considerations for permitting and future design phases
- Helped frame a clearer, more efficient path forward

# STUDY FINDINGS

## Coastal System Behavior

Boy Scout Island is a dynamic, human-created system, where flood-dominated currents and spatially variable wave exposure drive long-term change, even under low-energy conditions.

## Living Shoreline Implications

Daily, low-energy processes can produce meaningful shoreline change, reinforcing that stabilization strategies must respond to processes, not just erosion symptoms.

## Structural Influence and Tradeoffs

Strategic placement of structures can significantly alter local hydrodynamics, but benefits vary spatially, requiring careful balance among stabilization, sediment pathways, and access constraints.

## Role of Modeling in Decision-Making

Numerical modeling was used intentionally as a comparative tool to test conceptual alternatives consistently across tides and wind conditions, not to predict a single outcome.

## Value of Coordination and Iteration

Early coordination with Martin County and iterative, cross-disciplinary discussion shaped realistic alternatives aligned with navigational, environmental, and constructability constraints.



# LOOKING AHEAD

- Structural stabilization evaluated as a first step to address active erosion drivers
- Living shoreline elements to be incorporated in future phases, including vegetation planning
- Opportunities to beneficially use dredged material from FIND to enhance stabilization and habitat
- Design and permitting will build on the process understanding developed in this study
- Continued coordination with Martin County and agencies will guide next steps



# THANK YOU!

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