

# Development of Historical Topographic Models of the Beach/Dune System in Northeast Coastal and Barrier Network Parks

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# INTRODUCTION

## The USGS Patuxent Wildlife Research Center Coastal Field Station *and the* Northeast Coastal and Barrier Network (NCBN) of the NPS

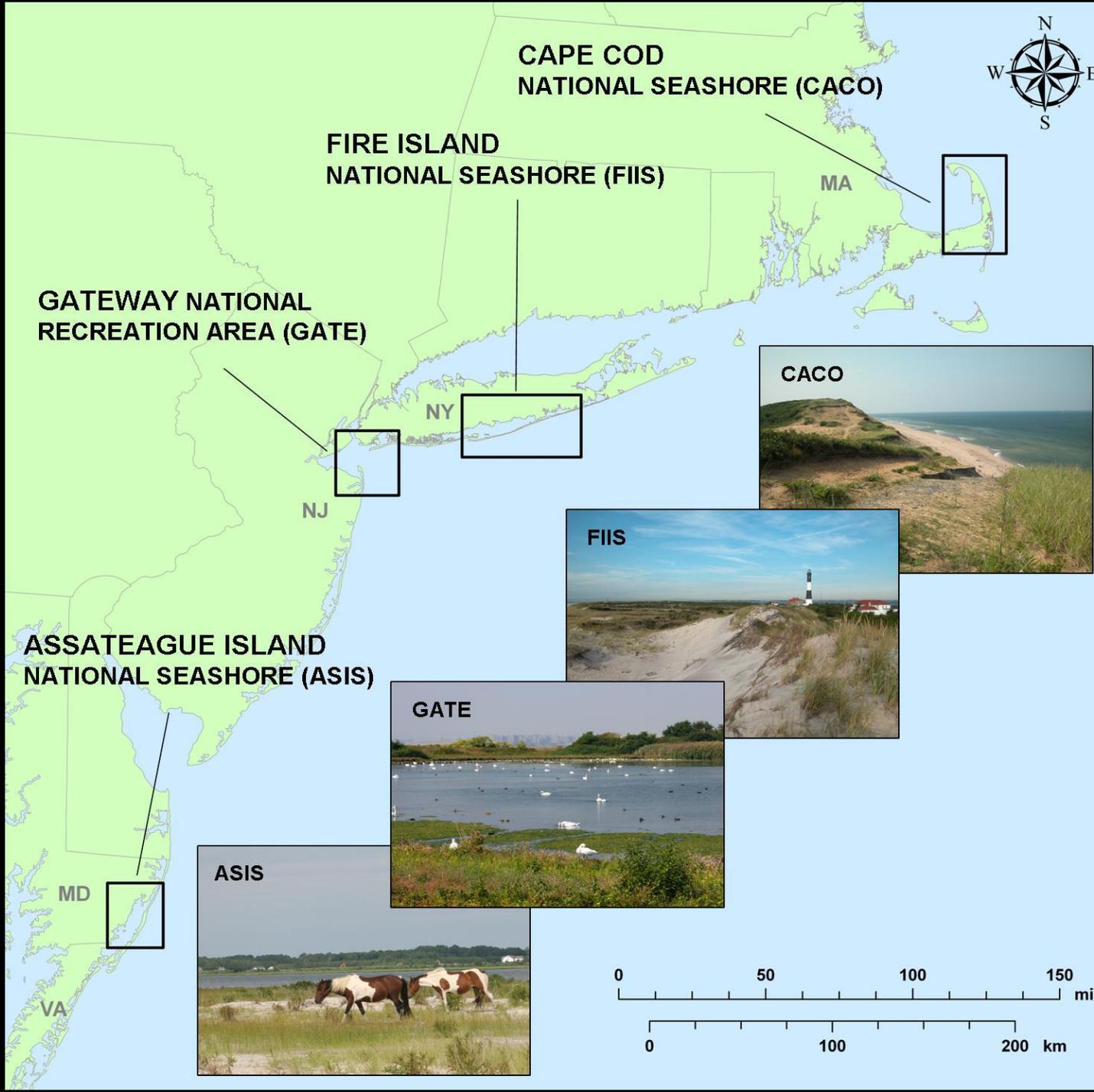
1. Develop baseline of Historical Topography
  2. Generate orthophotography
- Existing Historical Shoreline Data
    - Widely spaced 2-dimensional profiles
    - Irregular survey points
    - Change measured through shoreline comparison
  - *NEW* Historical Terrain Data
    - Large swath of 3-dimensional data
    - Dense network of survey points
    - Interpolated surface can be compared with lidar data

# INTRODUCTION

- Coastal barriers are high energy systems
- Maintained by physical forces – wind, waves, tides



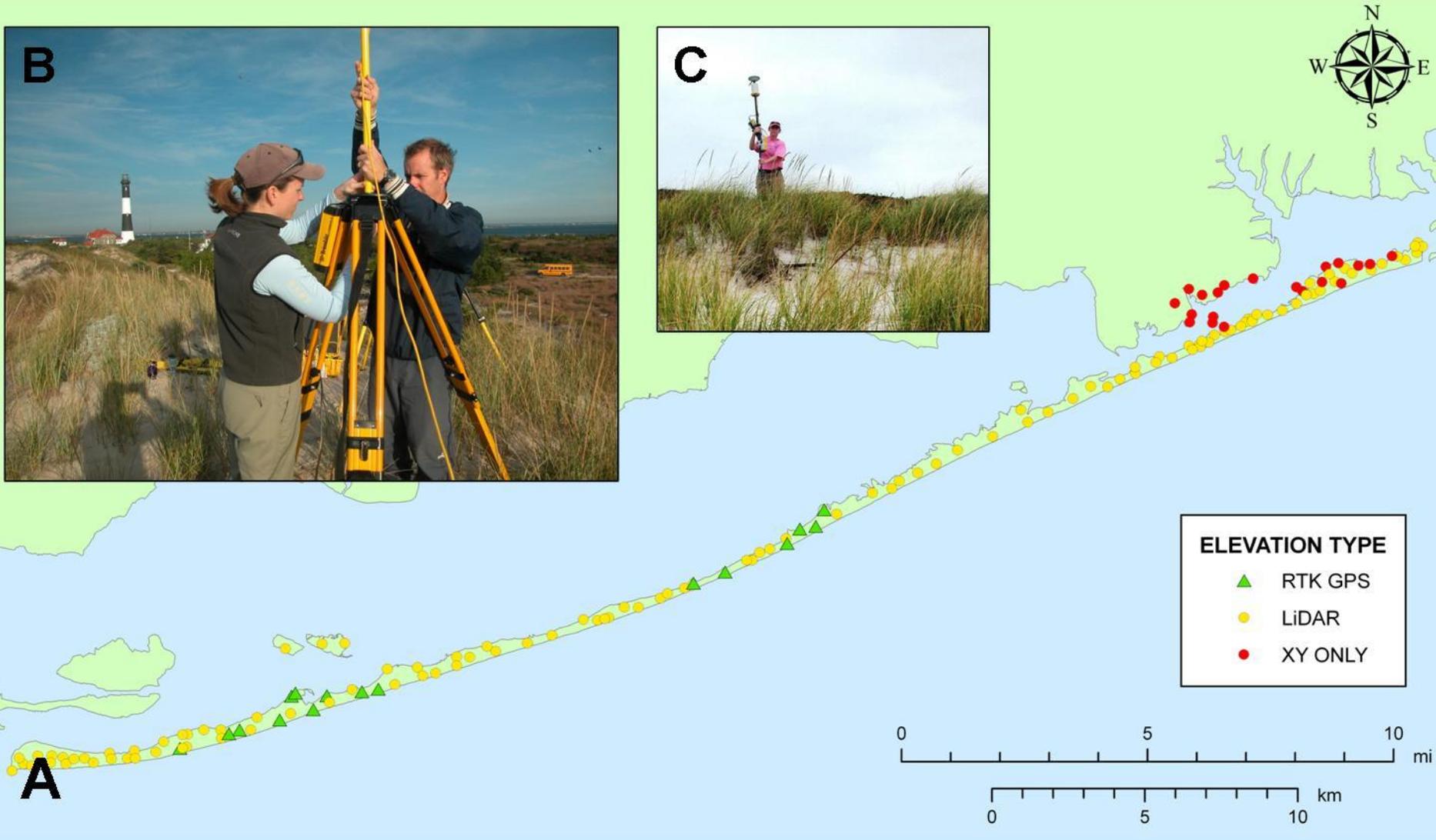
- Change in response to these forces can be rapid or occur over time
- Long-term monitoring is crucial towards understanding natural barrier island conditions and how they differ from anthropogenic influences.



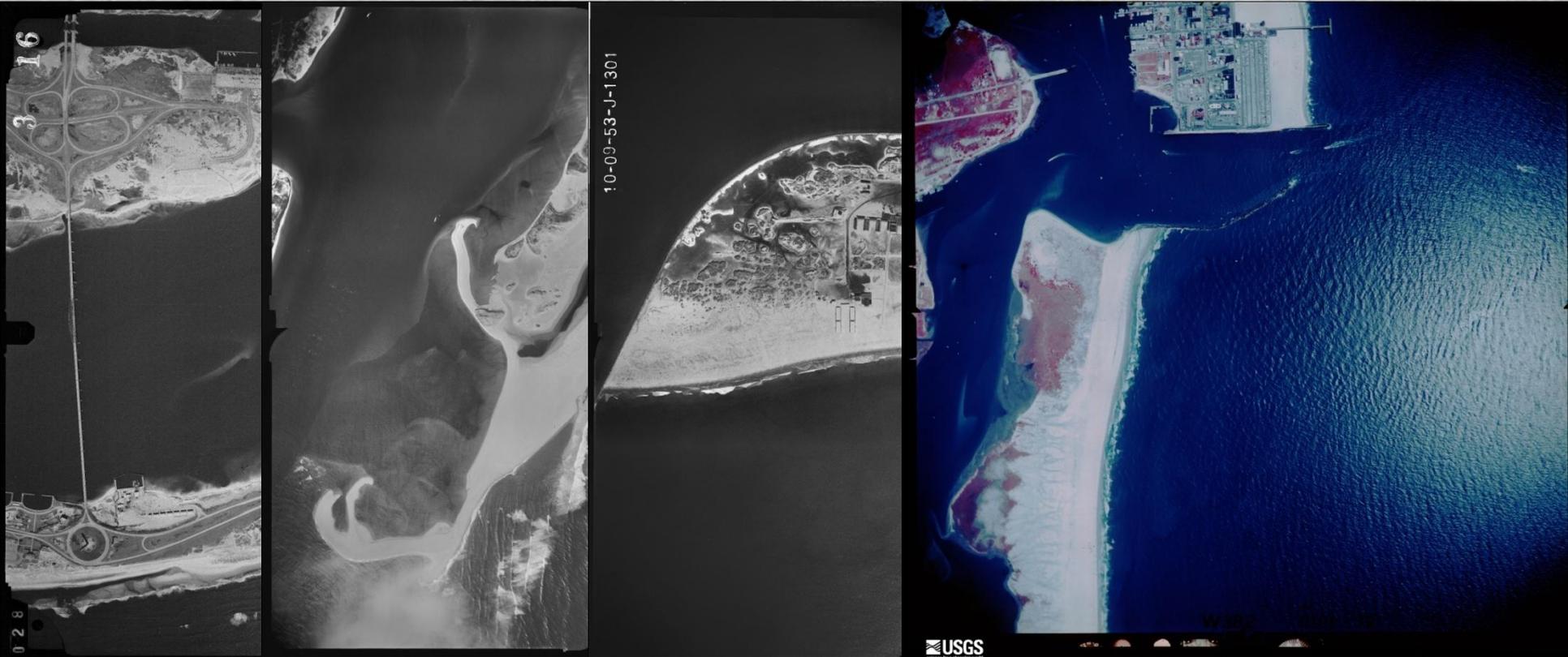
# APPROACH

- Acquire and scan high resolution historical imagery
- Survey and collect ground control points
- Generate historical topography, by means of photogrammetric processing, utilizing the high resolution imagery and ground control data

# GROUND CONTROL COLLECTION

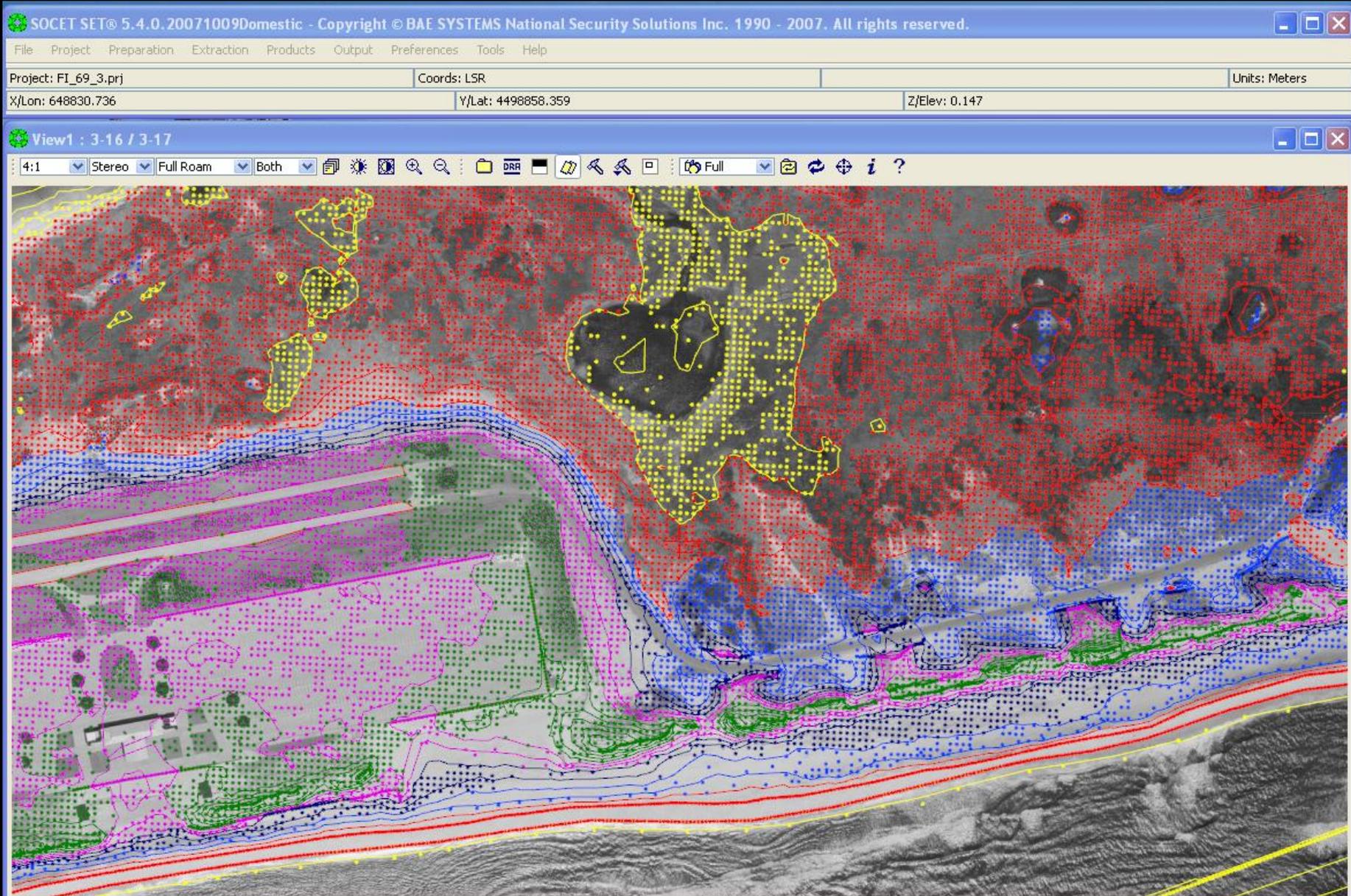


# HIGH RESOLUTION AERIAL IMAGERY



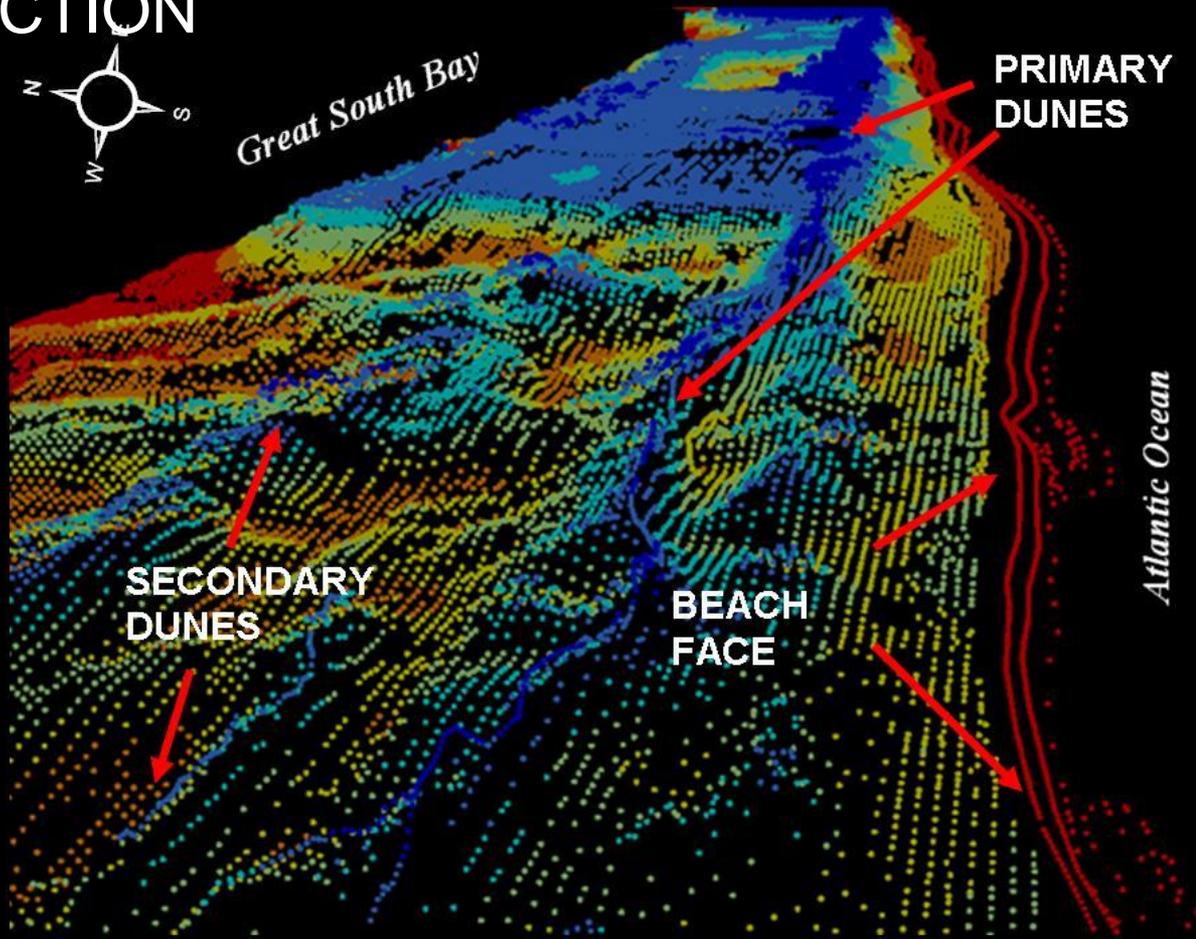
PARK	SOURCE	YEAR	SCALE
FIIS	Michael Baker Jr. Inc.	1969	1:12,000
CACO	NOAA/NOS	1951	1:10,000
GATE – Rockaway, NY	NOAA/NOS	1953	1:10,000
GATE – Sandy Hook, NY	NOAA/NOS, GATE	1951, 1940s	1:20,000
ASIS	EROS/USGS	1976	1:10,000

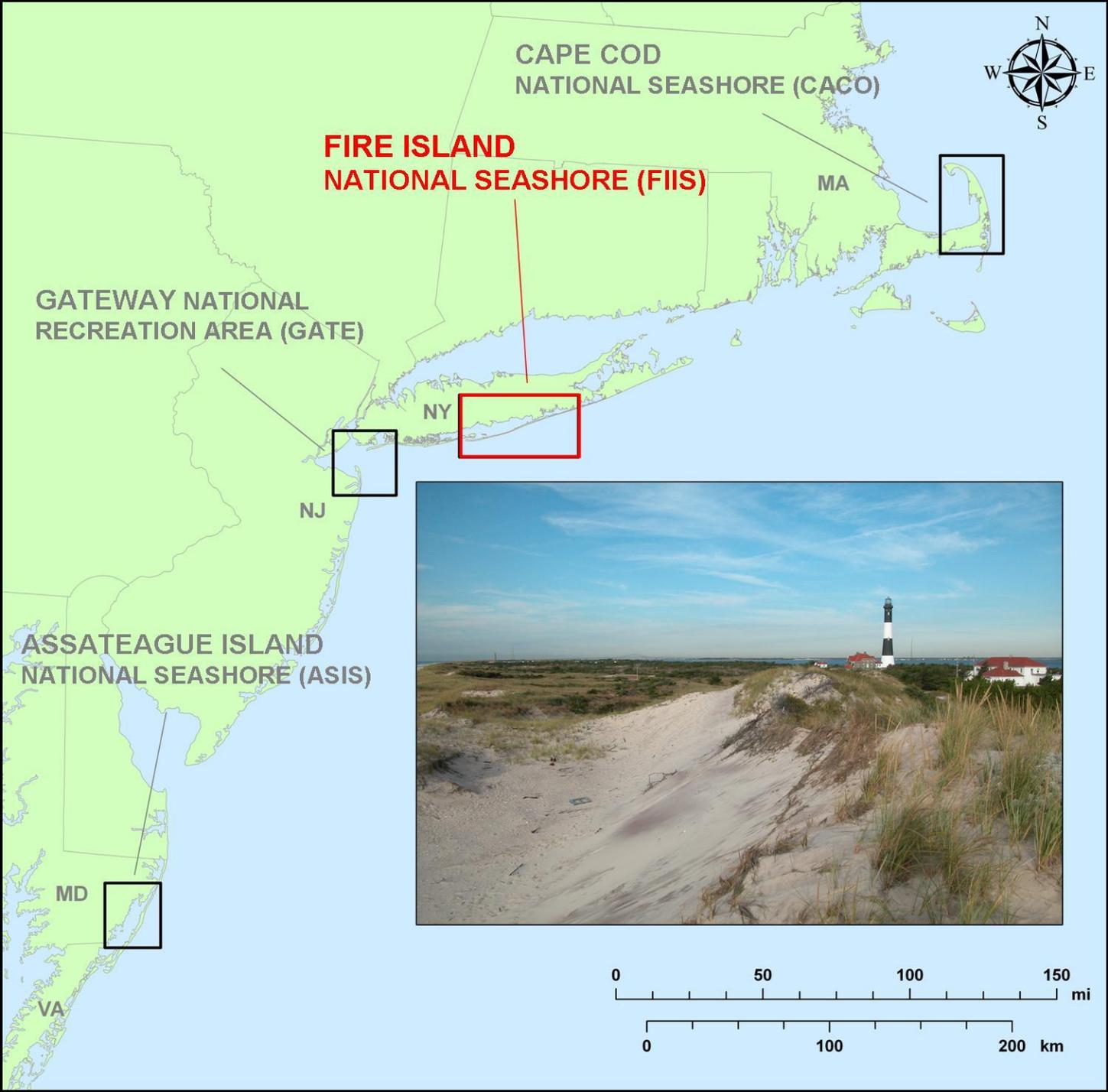
# HISTORICAL TOPOGRAPHY DATA



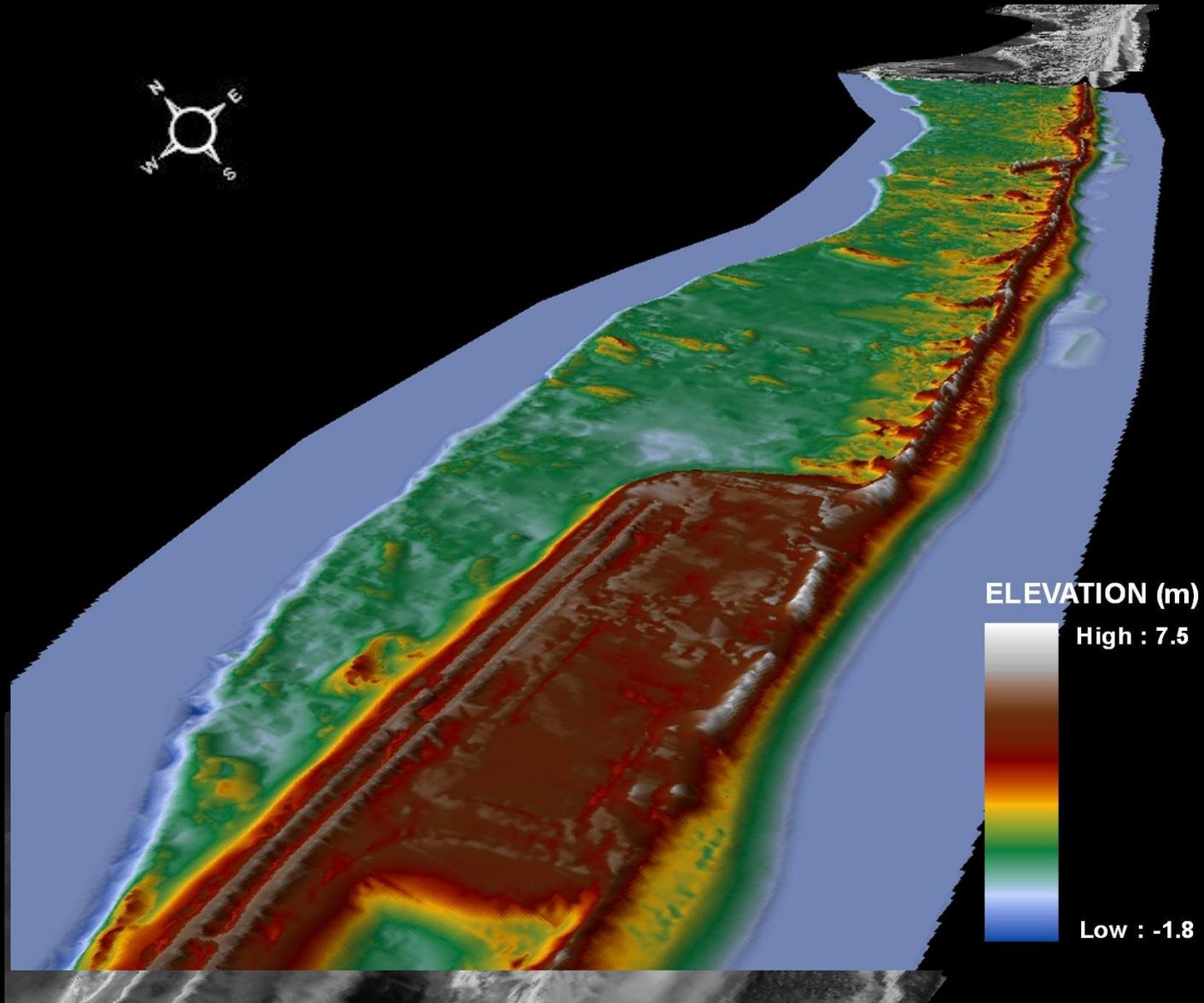
# DATA PRODUCTS

- ORTHOPHOTOGRAPHY
- DIGITAL TERRAIN MODELS
- ELEVATION DATA
- RASTER SUBTRACTION

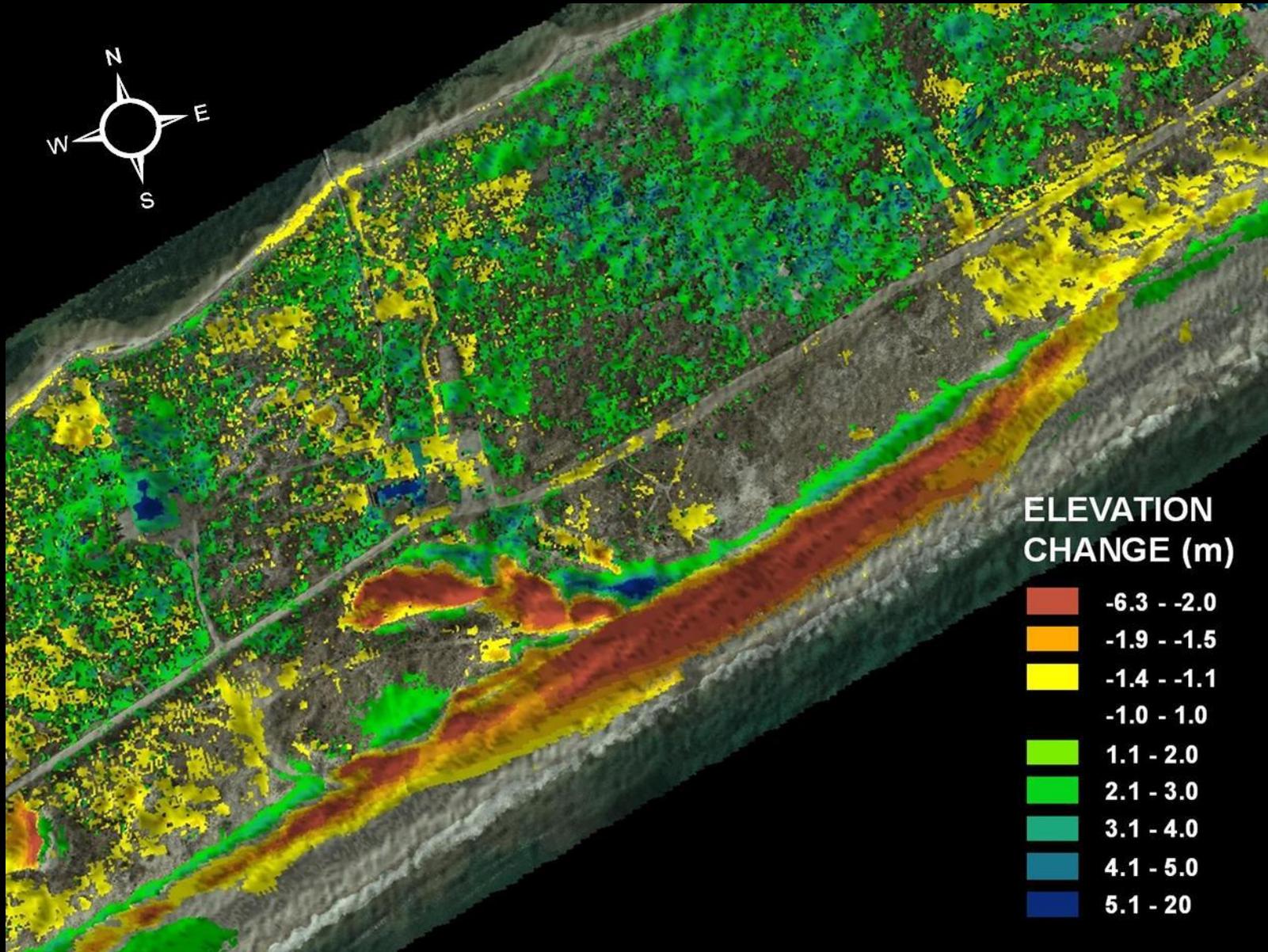




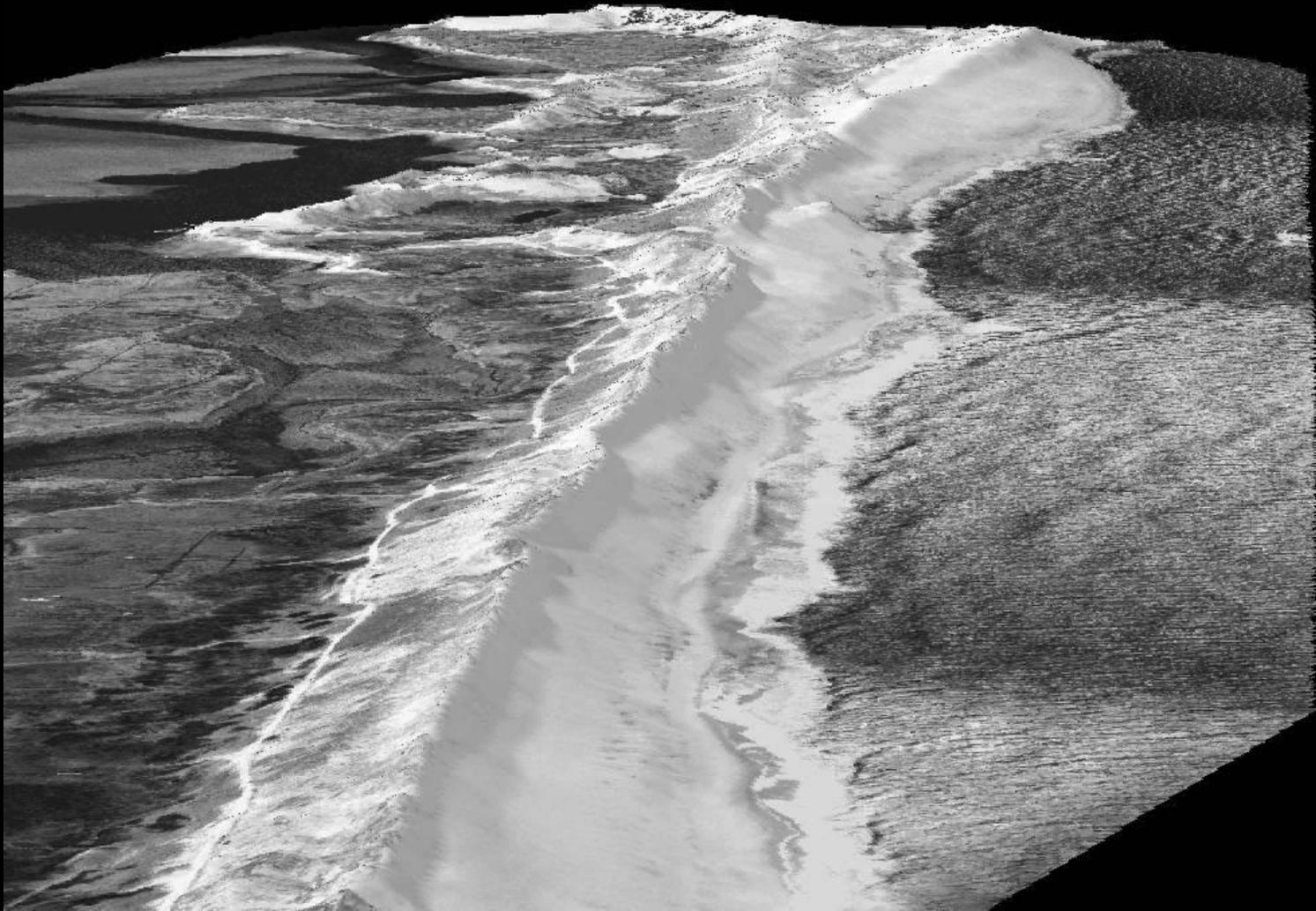
# DIGITAL TERRAIN DATA



# RASTER SUBTRACTION: 1969 - 2004



# FIIS TERRAIN ANIMATION



Please contact the author for animations

**Name:** Rachel E. Hehre

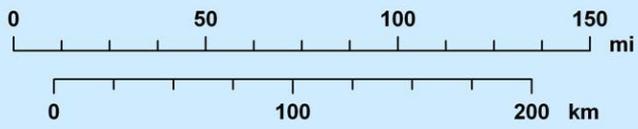
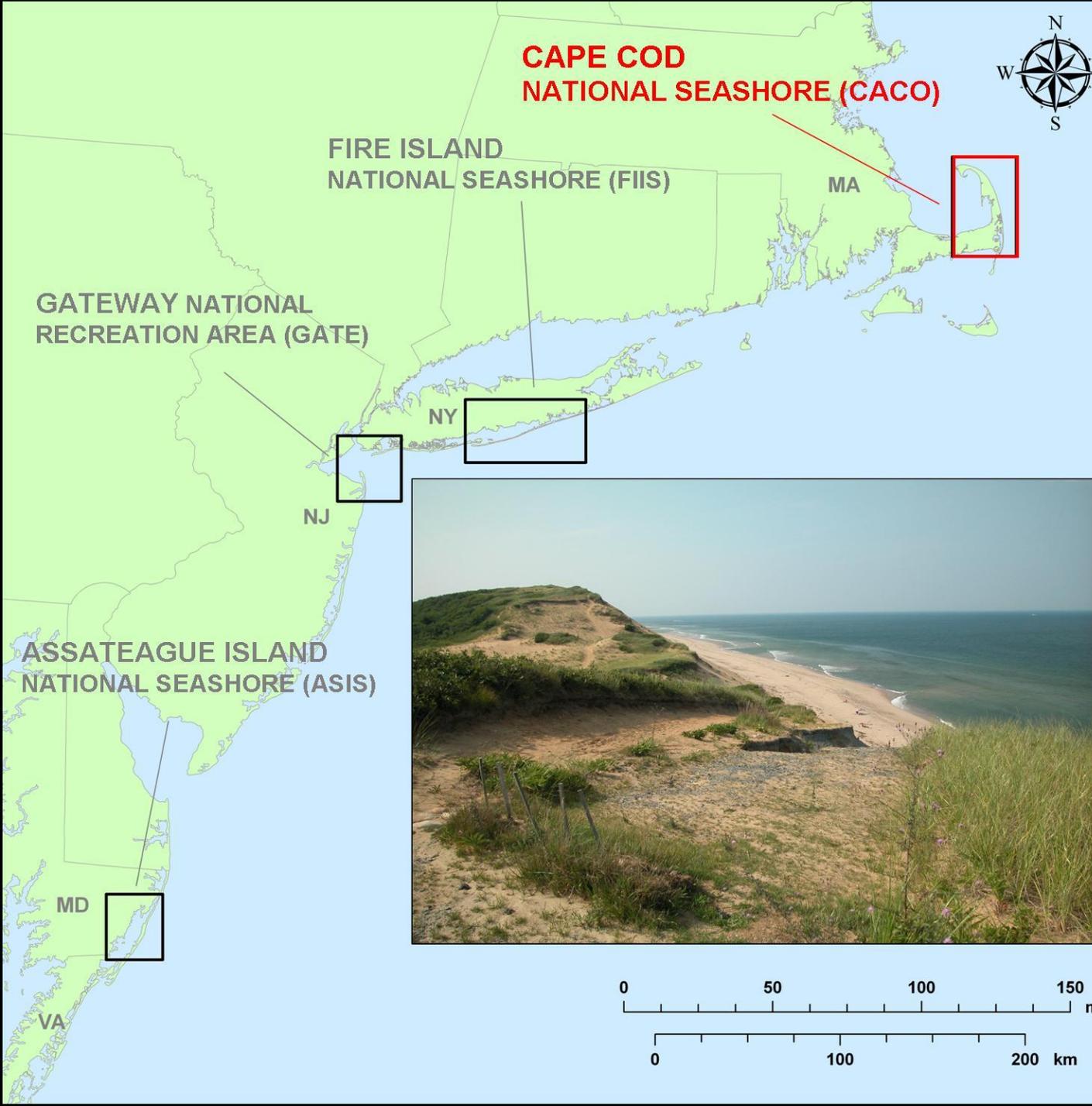
**Title:** Coastal Geologist

**Unit or Office:** Contractor to the U.S.  
Geological Survey, Woods Hole Science  
Center, Woods Hole, MA

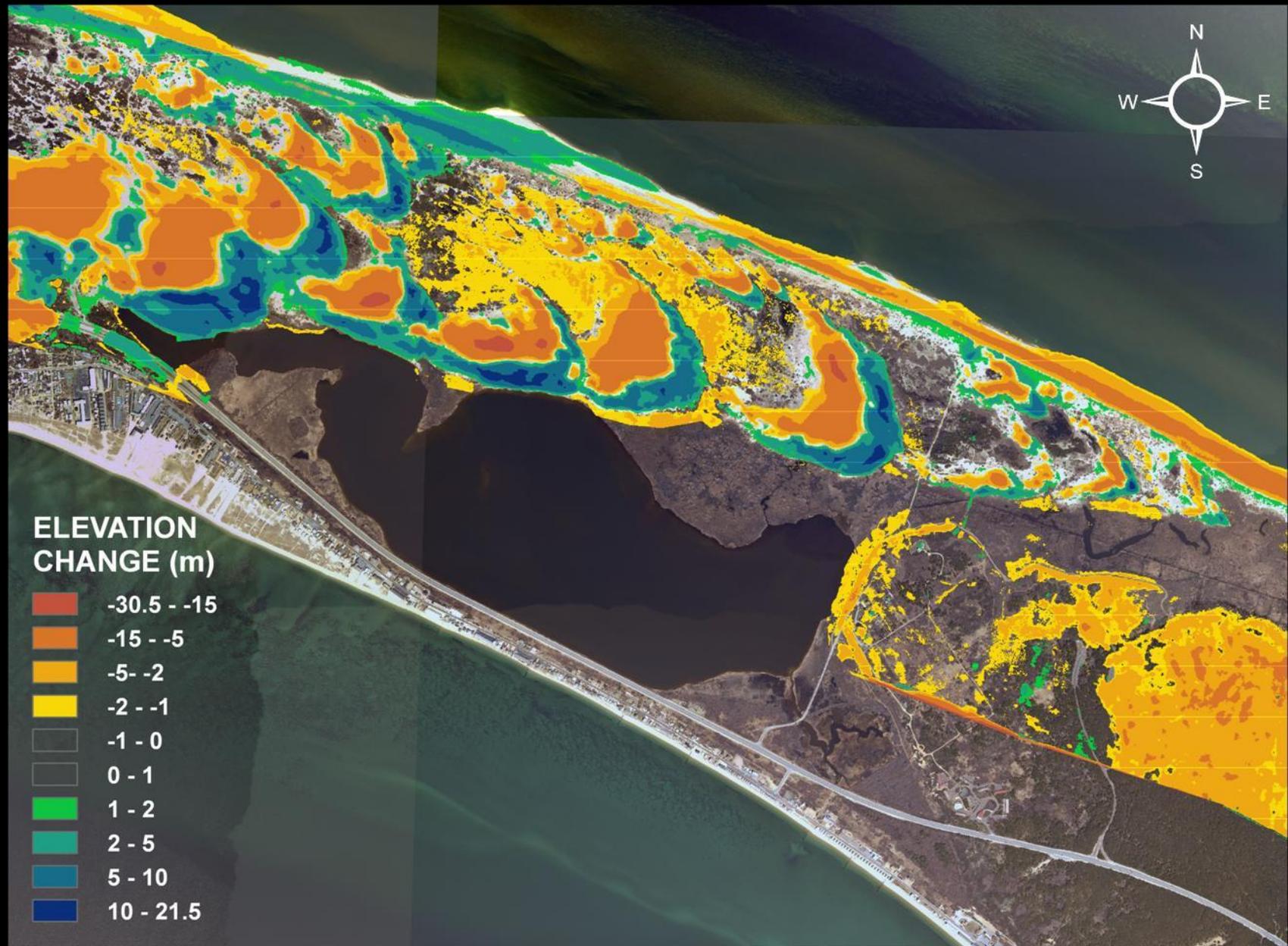
**E-mail:** [rhehre@usgs.gov](mailto:rhehre@usgs.gov)

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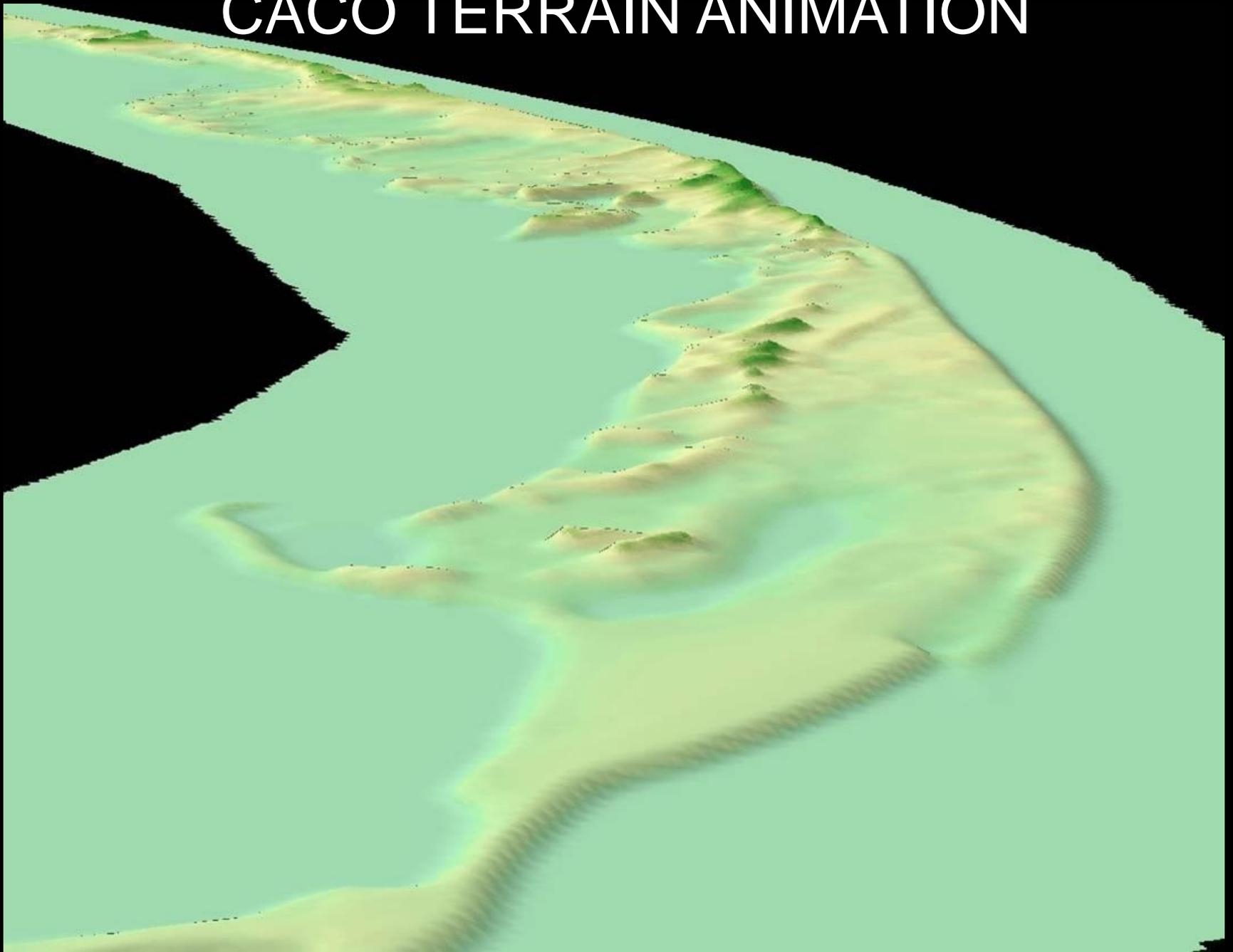
**CAPE COD  
NATIONAL SEASHORE (CACO)**



# RASTER SUBTRACTION: 1951 - 2005



# CACO TERRAIN ANIMATION



Please contact the author for animations

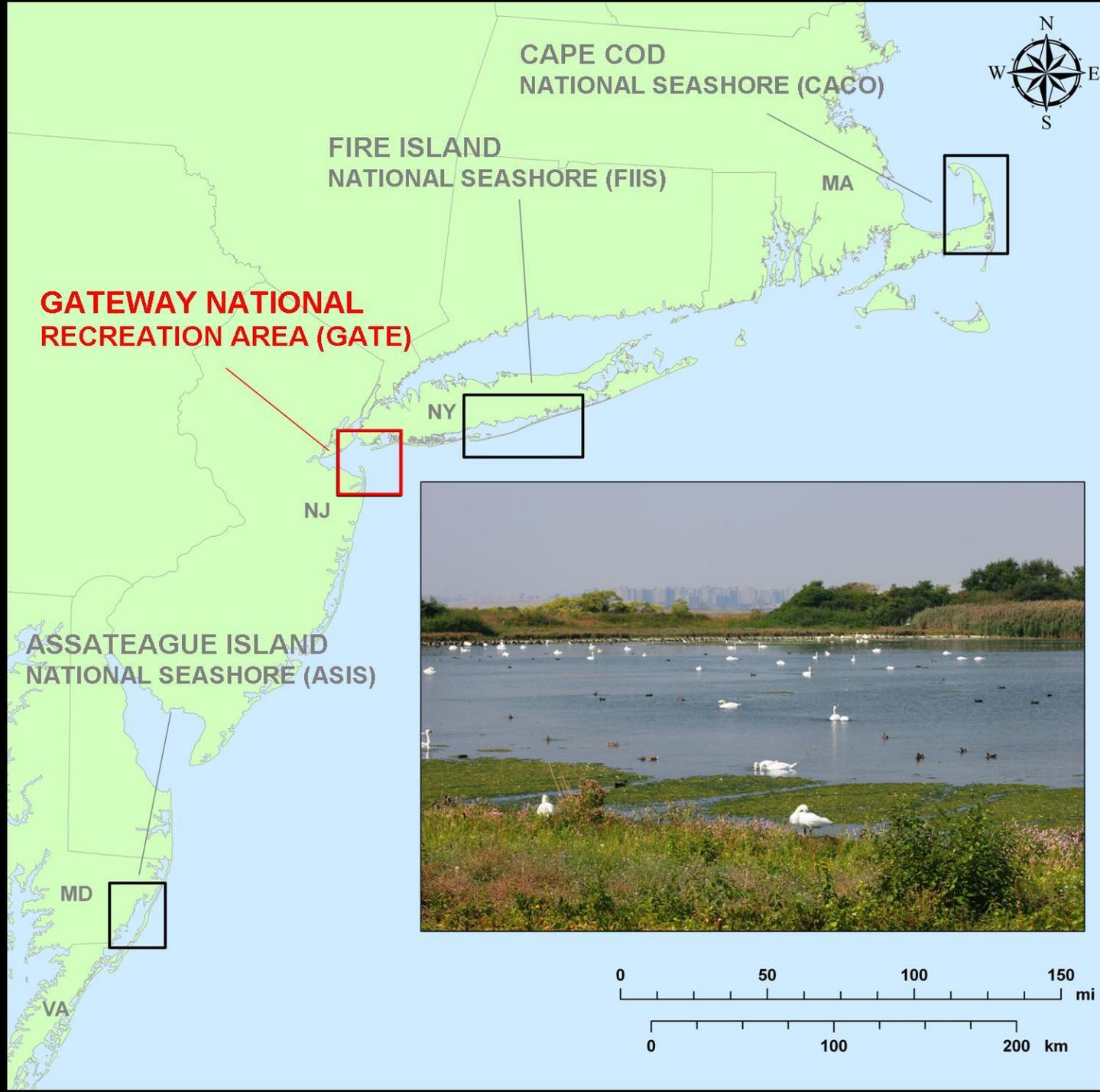
**Name:** Rachel E. Hehre

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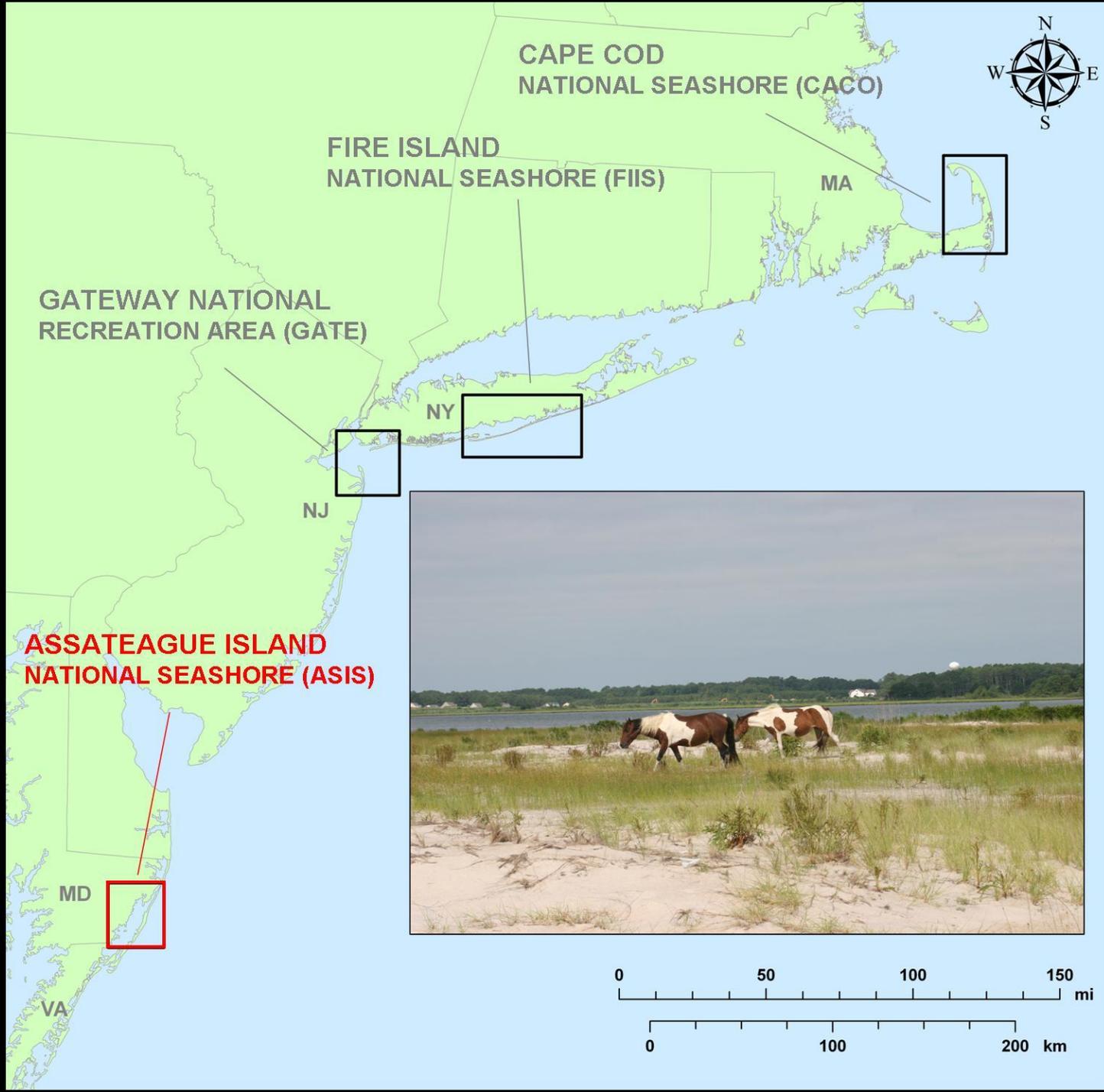
# RASTER SUBTRACTION: 1953 - 2006



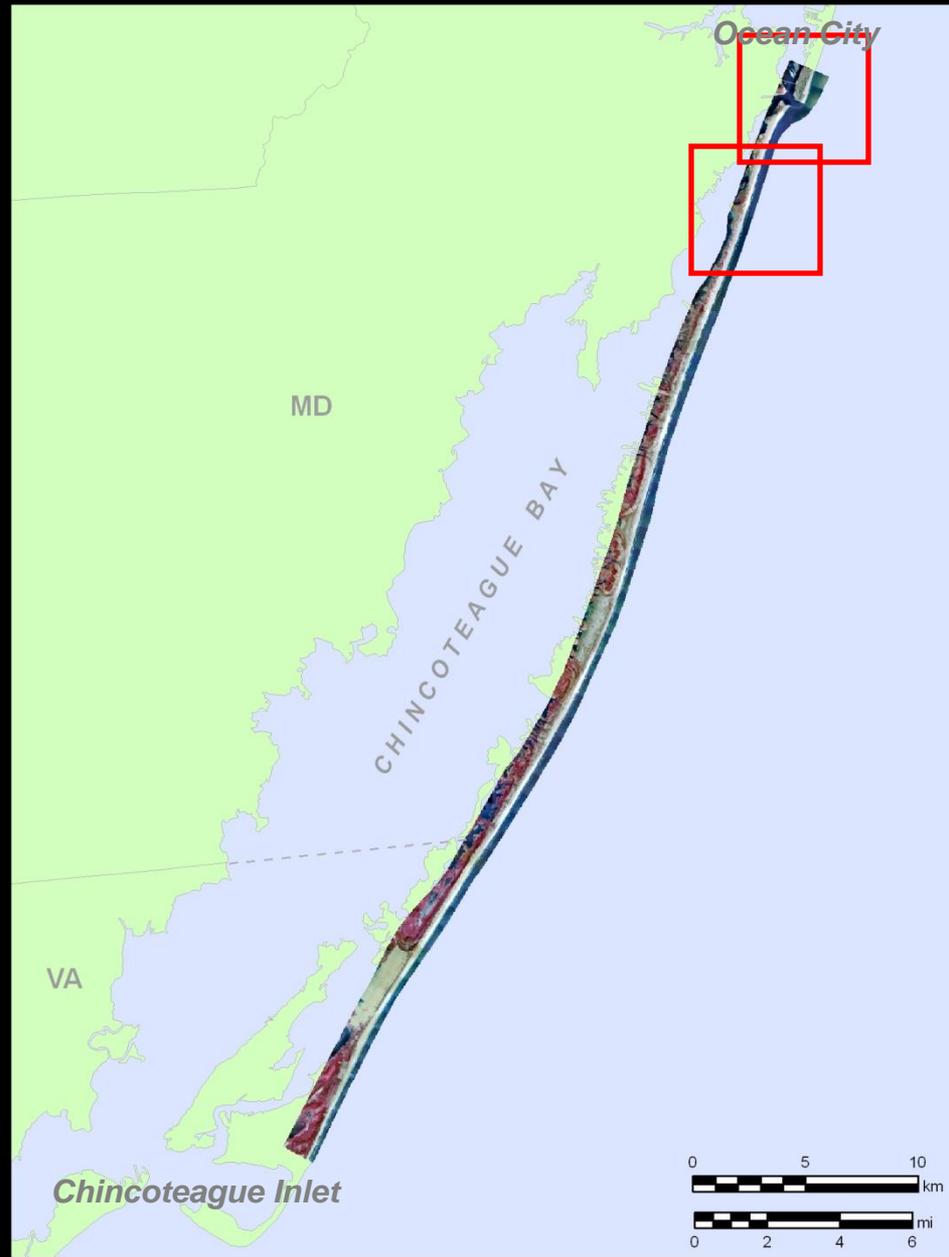
# SHORELINE CHANGE: 1953 – 2006



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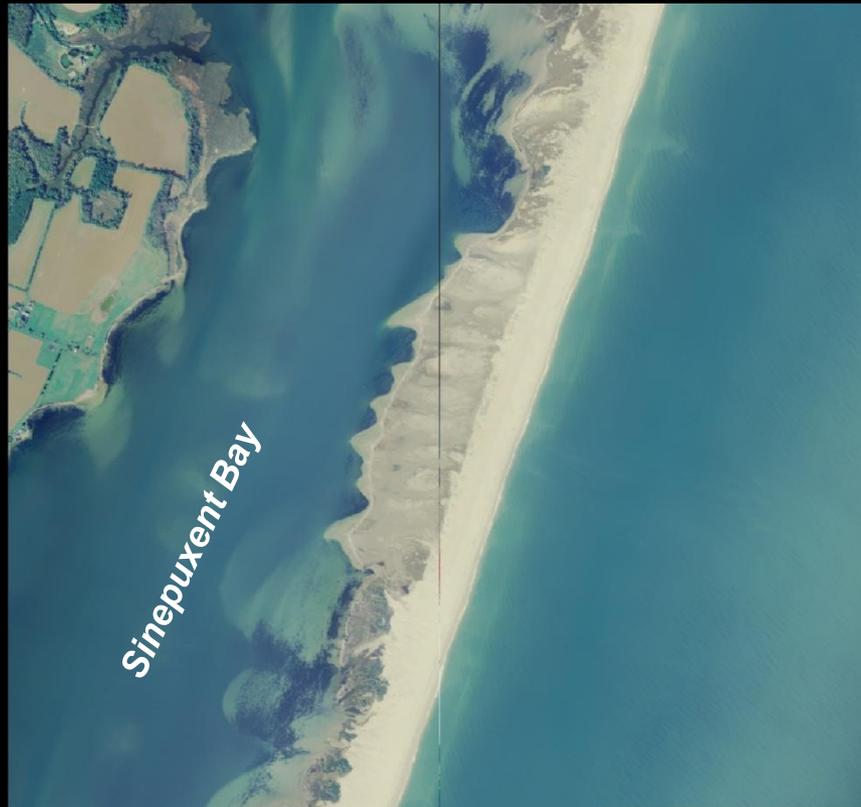
# ORTHOPHOTOGRAPHY – 1976



# SHORELINE CHANGE – 1976-2003



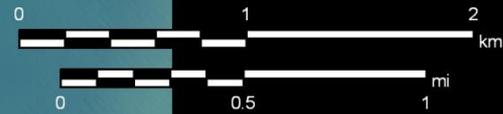
# SHORELINE CHANGE – 1976-2003



Sinepuxent Bay



**ASIS Visitors Center**



# SUMMARY

Fire Island National Seashore – **1969**

Cape Cod National Seashore – **1951**

GATE, Breezy Point – **1953**

- ✓ *Aerial Imagery*
- ✓ *Orthophotography*
- ✓ *Historical topography*

Assateague Island National Seashore – **1976**

- ✓ *Aerial Imagery*
- ✓ *Orthophotography*

# SUMMARY

- Historical topographic data
  - Volume change analysis
  - Comparison of dune and beach systems with modern lidar data.
  - Beach width and dune elevation change studies.
- Orthophotography
  - Shoreline change studies
  - Vegetation change studies

# DATA DISTRIBUTION

All data products are housed at the North East Coastal and Barrier Network (URI)

For distribution information:

**Dennis Skidds – Data manager NCBN**

Dennis\_Skidds@nps.gov

***QUESTIONS??***





# SUMMARY CONT.

This data should NOT be used for:

- Topographic change analyses landward of the primary dune. The topographic models underwent detailed manual editing in the beach and dune areas as part of the processing; equivalent editing was not performed for the interior portions of the island due to: project time constraints/goals and issues with editing in highly vegetated or developed areas.
- Marsh surface elevation change. Ground control data used for establishing the historical model was modern LiDAR data, therefore, marsh surface elevations would reflect the control data elevations, rather than the precise elevation of historical marsh surface.
- Extraction of a MWH elevation from the elevation dataset. Where applicable, the high water line (HWL) was used as a proxy for mean high water, and an elevation of 0.46 (NAVD88) was applied for this feature. Due to difficulty resolving stereo models in/near the swash zone where wave interference occurs on the beach face, elevation values for the lower beach face are estimates.