

Nantucket Coastal Research

Updated October 2019,
Compiled by:

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Loring Nature Foundation

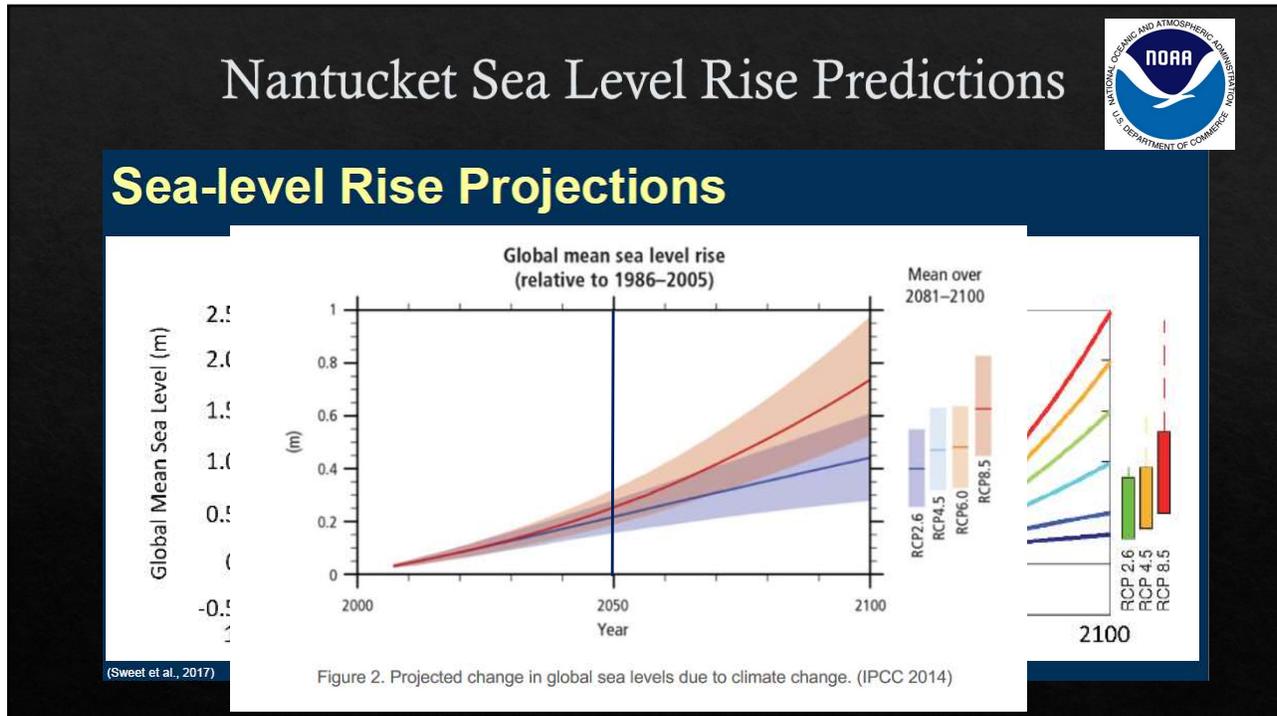
Dr. Jennifer Karberg,
Nantucket Conservation
Foundation

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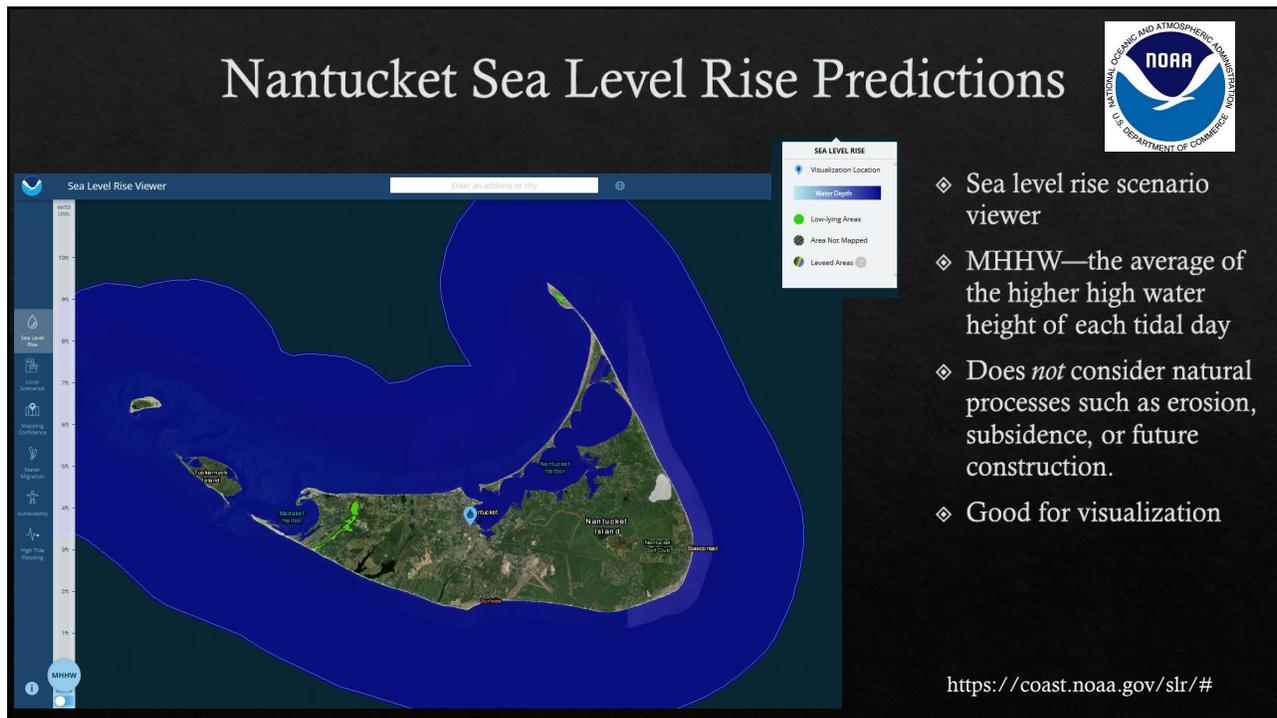
Completed and On Going Resources

- ◆ Nantucket specific Sea Level Rise Predictions
<https://coast.noaa.gov/slr/#>
- ◆ Nantucket Storm Surge and Inundation Pathways
<https://www.nantucket-ma.gov/DocumentCenter/View/19053/Storm-Surge-and-Inundation-Pathways---2016>
- ◆ TTOR Climate Vulnerability Assessment
- ◆ MA Shoreline Change Project
http://maps.massgis.state.ma.us/map_ol/czm_shorelines.php
- ◆ Nantucket Sea Level Rise Visualization – Preservation Institute of Nantucket
- ◆ MA CZM Sea Level Affecting Marsh Migration Model
<https://www.mass.gov/files/documents/2018/12/07/czm-slammm-report-nov2016.pdf>
- ◆ Changing Climate: Island-Wide Vulnerability and Natural Resiliency
On-going – jkarberg@nantucketconservation.org and stbois@lnf.org

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Nantucket Sea Level Rise Predictions



- ◆ Sea level rise scenario viewer
- ◆ MHHW—the average of the higher high water height of each tidal day
- ◆ Does *not* consider natural processes such as erosion, subsidence, or future construction.
- ◆ Good for visualization

<https://coast.noaa.gov/slr/#>

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Nantucket Sea Level Rise Predictions



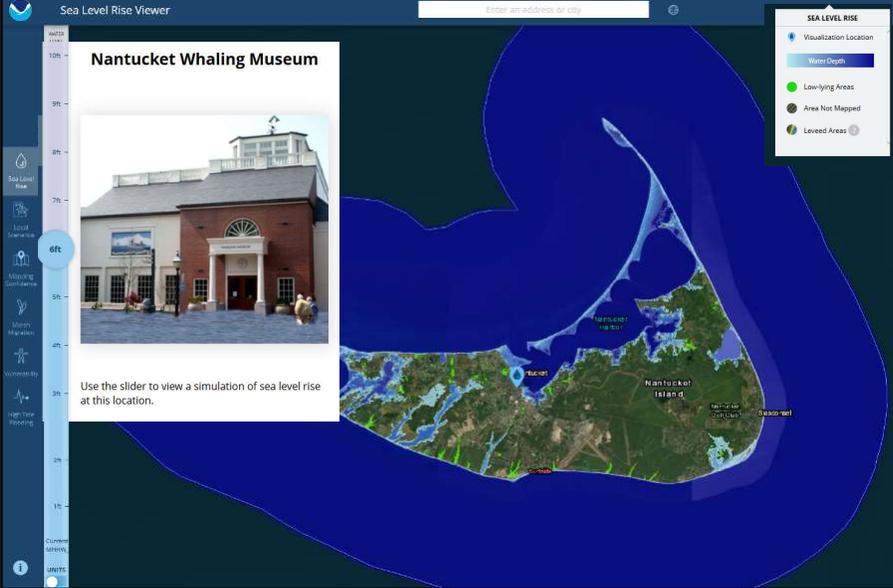
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<https://coast.noaa.gov/slr/#>

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Nantucket Sea Level Rise Predictions





Nantucket Whaling Museum

Use the slider to view a simulation of sea level rise at this location.

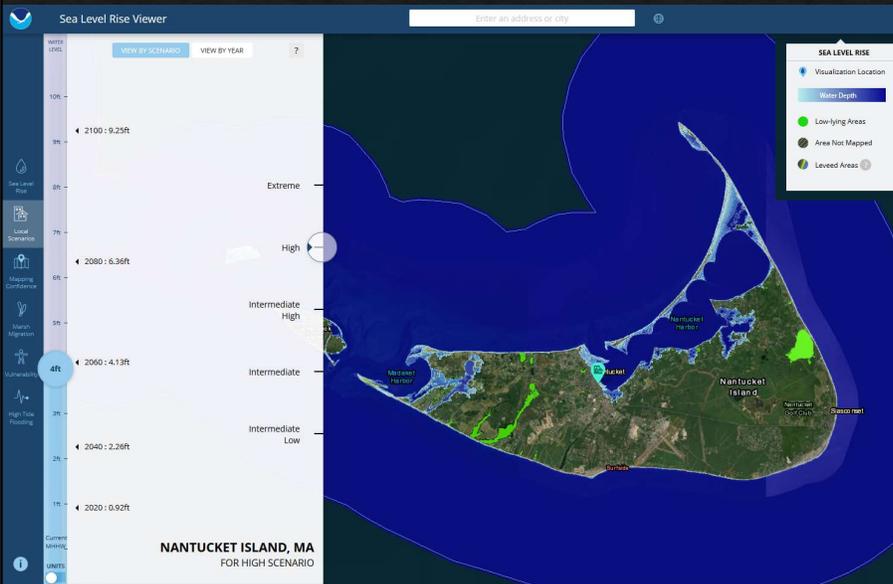
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<https://coast.noaa.gov/slr/#>

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Nantucket Sea Level Rise Predictions



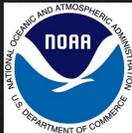


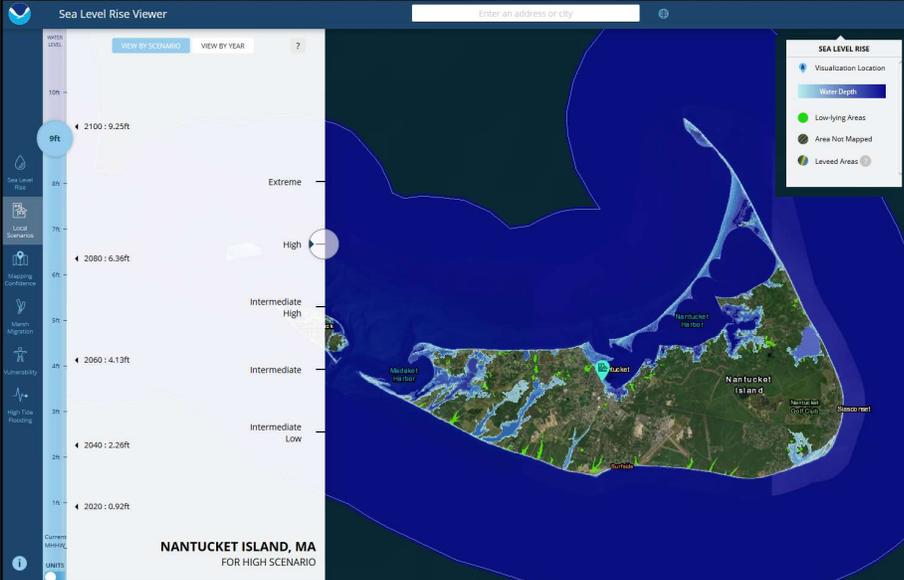
NANTUCKET ISLAND, MA FOR HIGH SCENARIO

- ❖ Sea level rise scenario viewer
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- ❖ Does *not* consider natural processes such as erosion, subsidence, or future construction.
- ❖ Good for visualization

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Nantucket Sea Level Rise Predictions





NANTUCKET ISLAND, MA
FOR HIGH SCENARIO

- ❖ Sea level rise scenario viewer
- ❖ MHHW—the average of the higher high water height of each tidal day
- ❖ Does *not* consider natural processes such as erosion, subsidence, or future construction.
- ❖ Good for visualization
- ❖ What scenario are we planning for?

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Storm Surge and Inundation Pathways

by. Dr Mark Borelli, 2015

- ❖ Contracted by the Town of Nantucket – report available online.
- ❖ Plan for Low-frequency, storm related inundation separate from SLR.

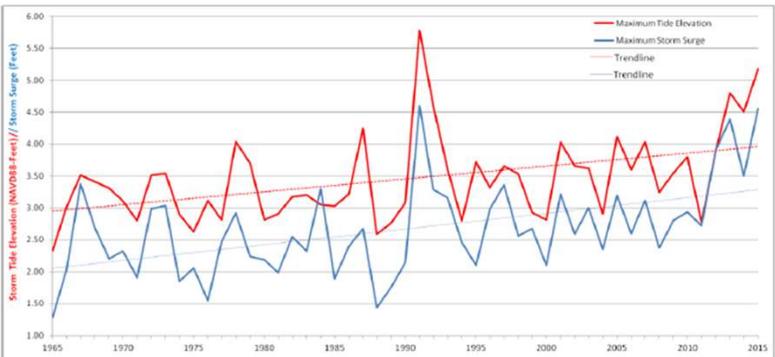
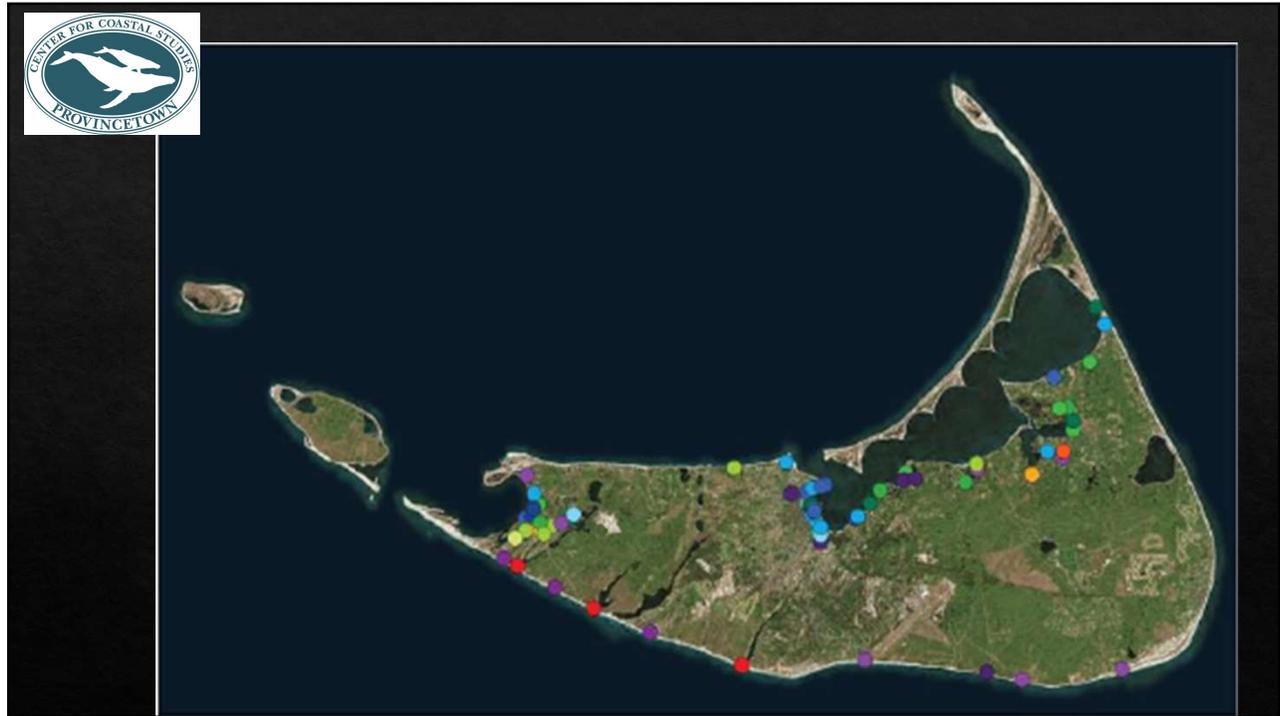
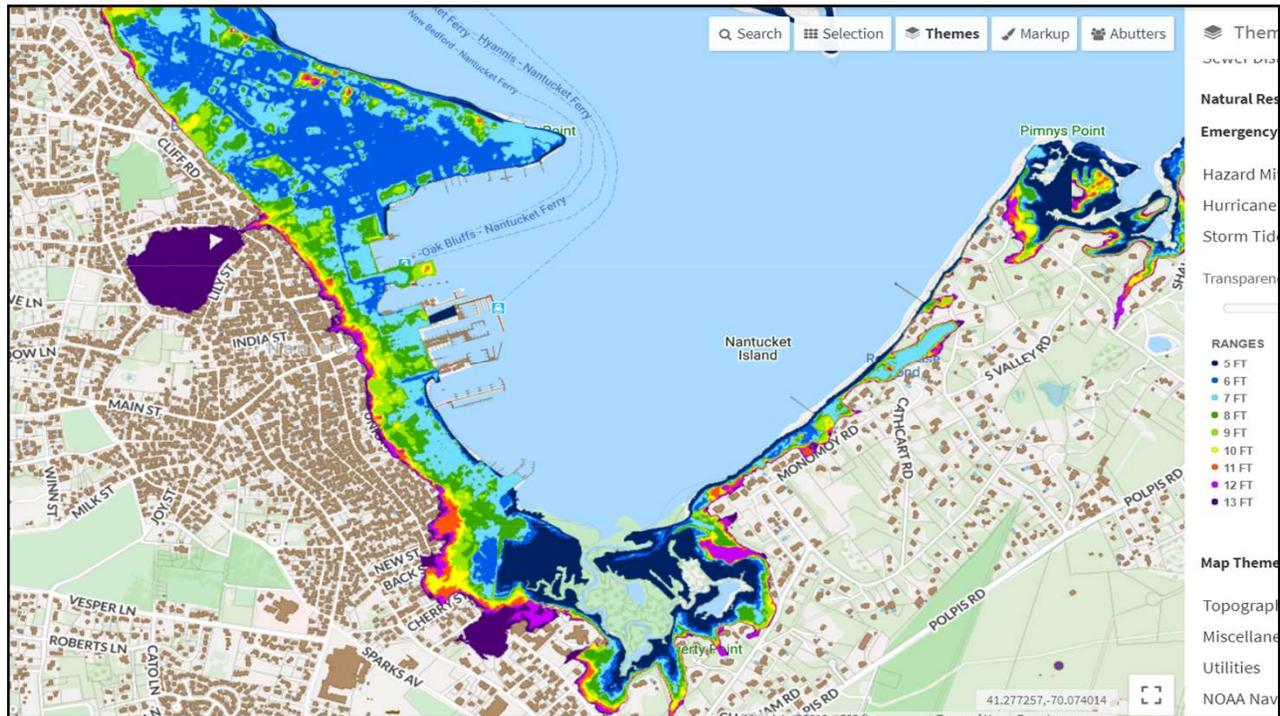


Figure 3 Plot of Maximum Annual Storm Tides and Storm Surges recorded at the Nantucket Harbor Tide Station. (#8449130) since 1965. Note upward trendlines.

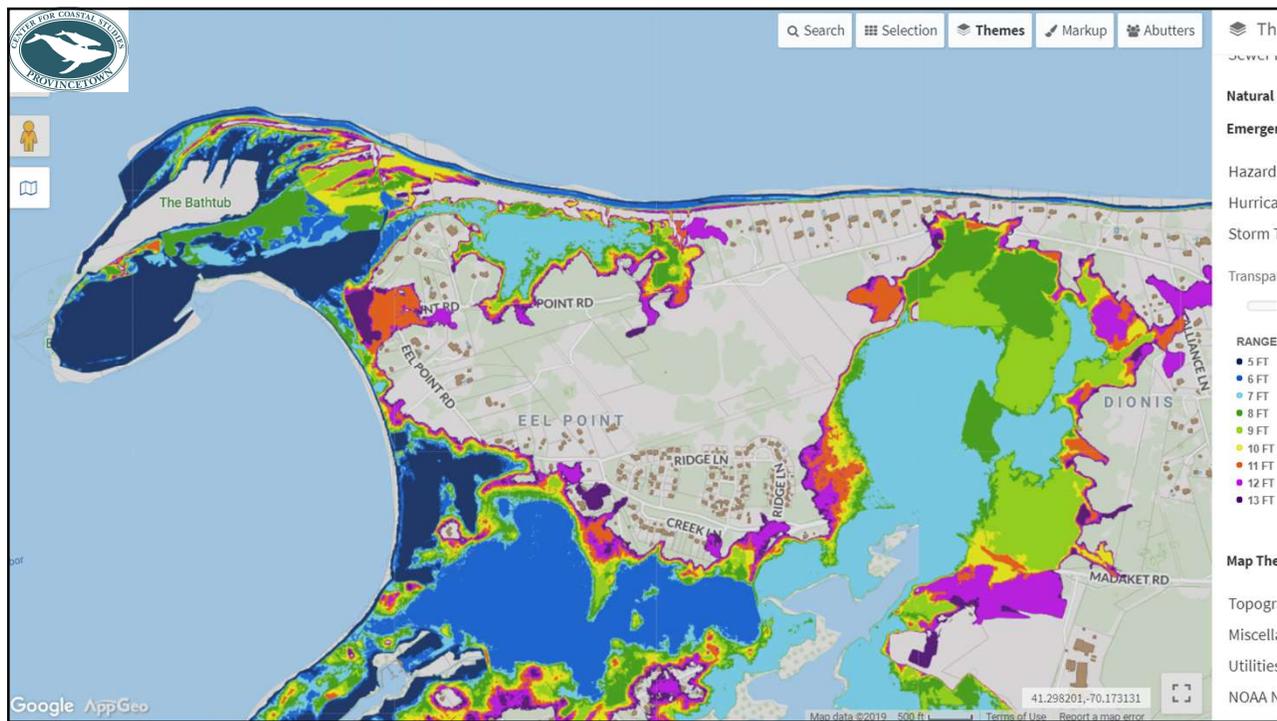
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Today (based on data 10+ years old):

- Madaket wetlands can buffer a 7ft storm tide.
- Brant Point cannot – no place natural to put the water in Town.

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TTOR Climate vulnerability assessment

- ◆ Climate vulnerability assessment (CVA) conducted by Woods Hole Research Group on all TTOR coastal properties
- ◆ Step-wise process
 - ◆ Inundation (probability of flooding)
 - ◆ ID assets, properties, regions that are vulnerable and need protecting
 - ◆ What adaptations are best suited to moderate vulnerabilities
 - ◆ Prioritize those vulnerabilities

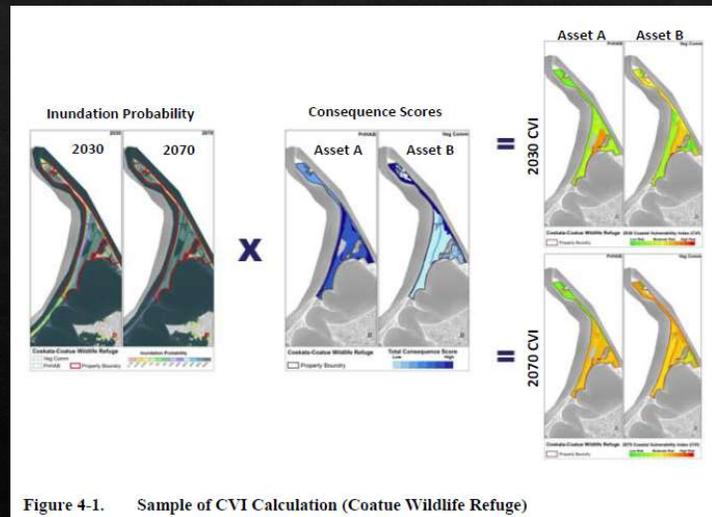


Figure 4-1. Sample of CVI Calculation (Coatue Wildlife Refuge)



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Property	Overview of CVI Results	% of Total Property with Inundation Probability = 100%		Strategic Planning Consideration ³
		2030	2070	
Coskata-Coatue Wildlife Refuge	<ul style="list-style-type: none"> • The CVIs are elevated given the exposure of the property and the value placed on its assets. The average CVI in 2070 is 2244. • Nearly all the assets are vulnerable to some extent in 2030 and 2070 • The CVIs are highest near the tip of the property and around Coskata Pond 	49%	83%	<ul style="list-style-type: none"> • Given the exposure and dynamic nature of this location, actions to protect valuable assets should be balanced with long term options for access and use. Retreat should be considered for some areas. • Green infrastructure buffers along the trails would help stabilize these areas, re-routing may be necessary • Coskata Woods Track – monitor because it is highly valued.

- ◆ Trustees leadership identified their high-profile properties, in terms of use, revenue generation, as well as ecological and historical significance.
- ◆ Coskata-Coatue Wildlife Refuge identified as high priority for more detailed adaptation evaluation
 - ◆ Beach vegetation communities have the highest CVIs, wildlife found in the at risk habitats include piping plover, northern harrier, and least, roseate and common terns. Also the highest at-risk trails
 - ◆ Additional adaptation plans have yet been made for Coskata-Coatue Wildlife Refuge, but are being considered



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Nantucket Shoreline Change and Erosion

◆ MA Coastal Zone Management, updated in 2013 with 2009 data

◆ Analysis of entire coastline by various methods to estimate erosion vs accretion zones

Shoreline Sources & Uncertainties

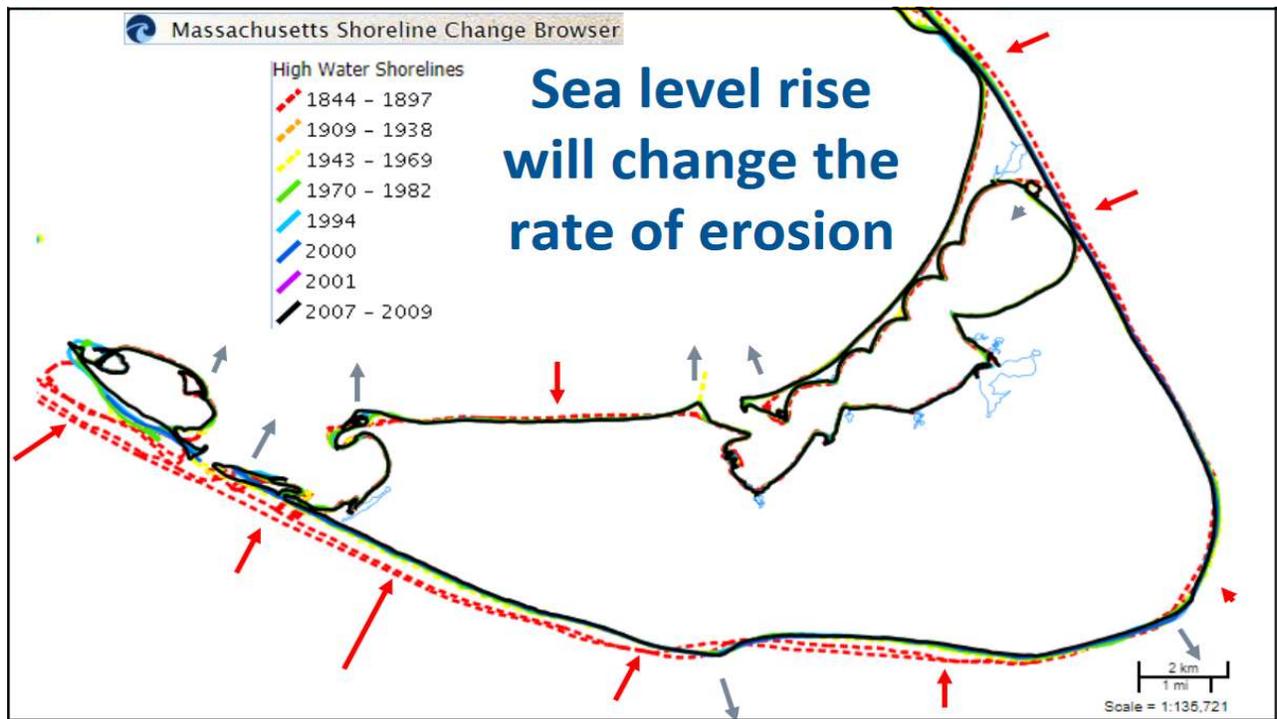
- 1844-1897: topographic sheets (~ 38')
- 1909-1938: topographic sheets (~ 38')
- 1943-1969: topographic sheets (~ 22-38')
- 1970-1982: topographic sheets & aerial photos (~ 22')
- 1994: aerial photos (~ 22')
- 2000: LIDAR (~ 4')
- 2001: orthophotos (~ 17')
- 2007-2009: LIDAR & orthophotos (~ 4-20')



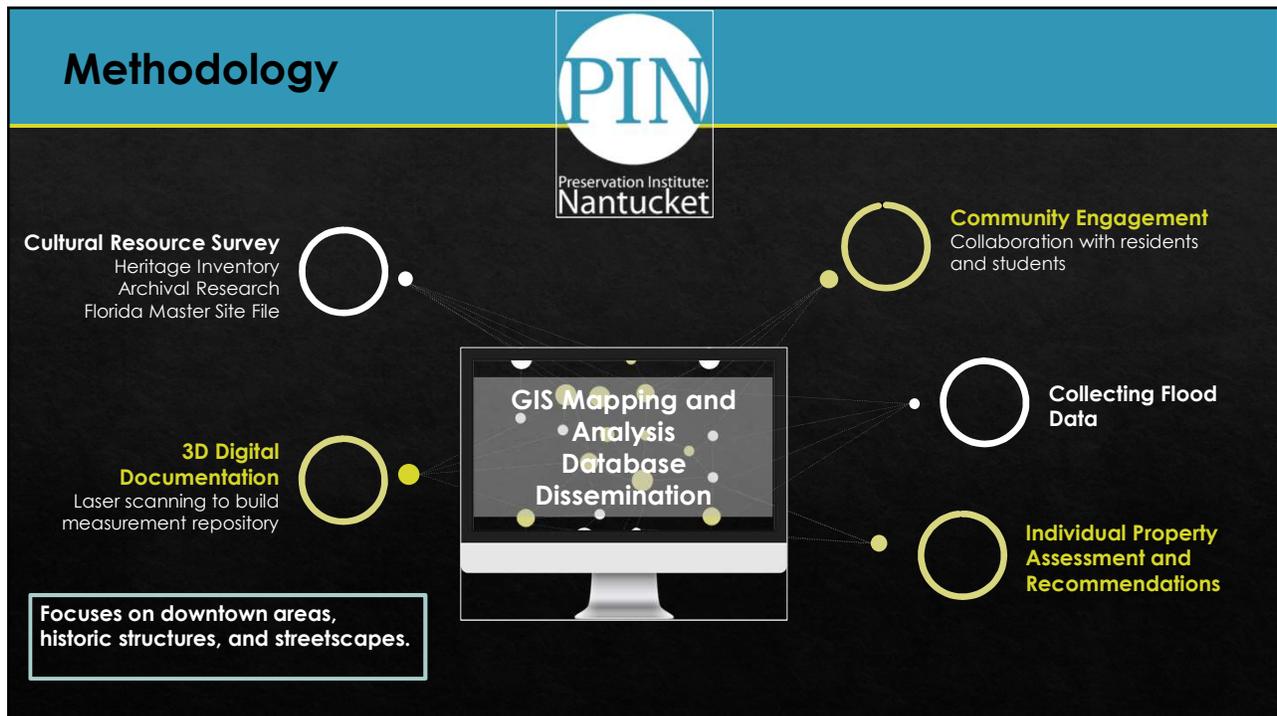
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Easy & Broad Streets

8.04 FEET in 2100



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Wave Shuttle Terminal

8.04 FEET in 2100



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Brant Point at Easton Street

8.04 FEET in 2100



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Considerations for Nantucket

In addition to having hazard mitigation plan, public outreach programs and adaptation strategies in place, its also necessary to look into:



Leadership and Governance



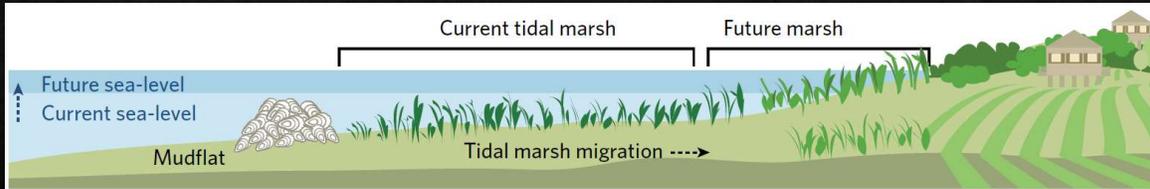
Ecosystem Based Risk Reduction Strategies



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Sea Level Affecting Marsh Migration Model SLAMM

- 1) Where do Wetlands want to move as Sea Level Rises?
- 2) How can we identify barriers to natural movement?



- ◆ The objective of the SLAMM model is to predict wetland response to SLR.
- ◆ Uses: LiDAR elevations, wetland classifications, sea-level rise, tide range, and accretion and erosion rates.

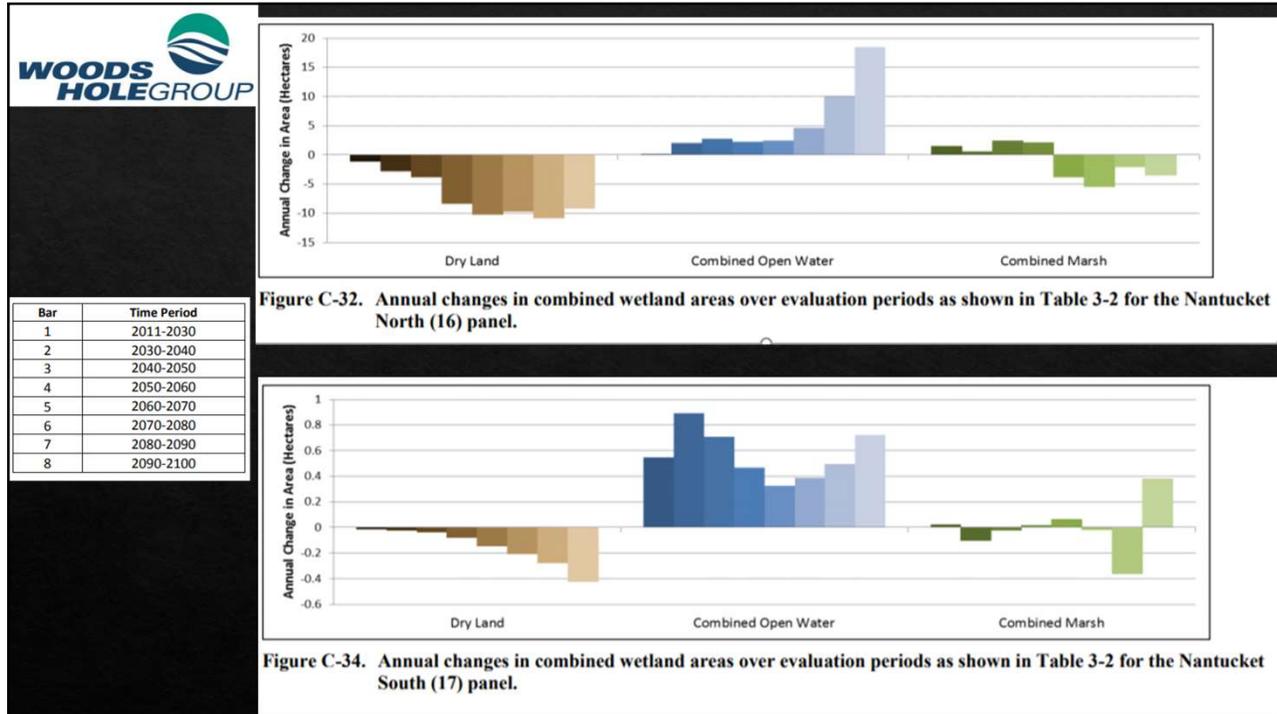
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SLAMM

- ◆ MA CZM with Woods Hole Group has complete MA-level Shoreline SLAMM modelling.
- ◆ Completed in 2016, based on older data;
 - LiDAR from 2013
 - 2011 Wetland Classification Map
- ◆ Waiting on Nantucket specific data need

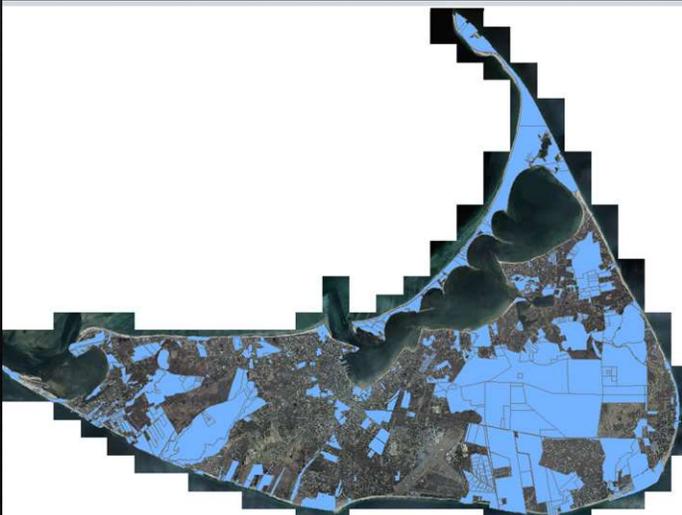
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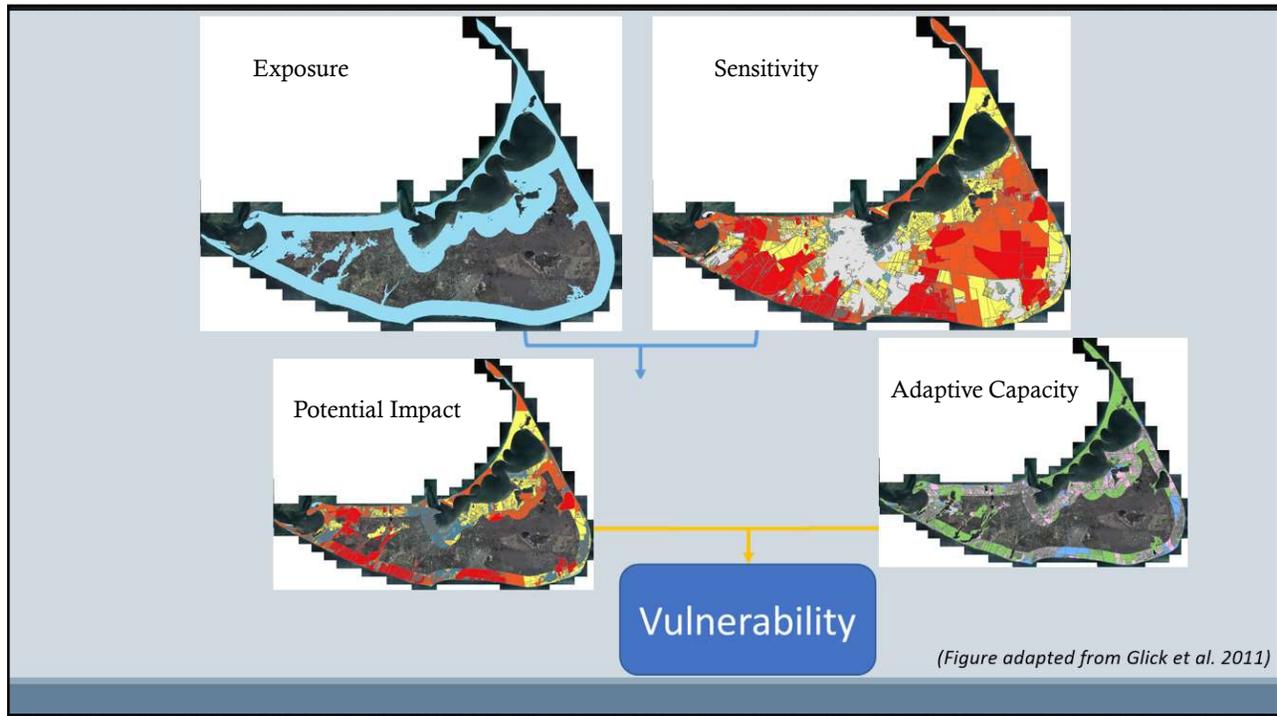
Changing Climate: Island-Wide Vulnerability and Natural Resiliency

- ◆ Island-wide vulnerability analysis
- ◆ Conservation and open space missing from many other discussions of resiliency
- ◆ How do we combine what we know about our island systems, conservation lands, and future scenarios to assess vulnerability?
- ◆ How do we focus action?
- ◆ In-progress

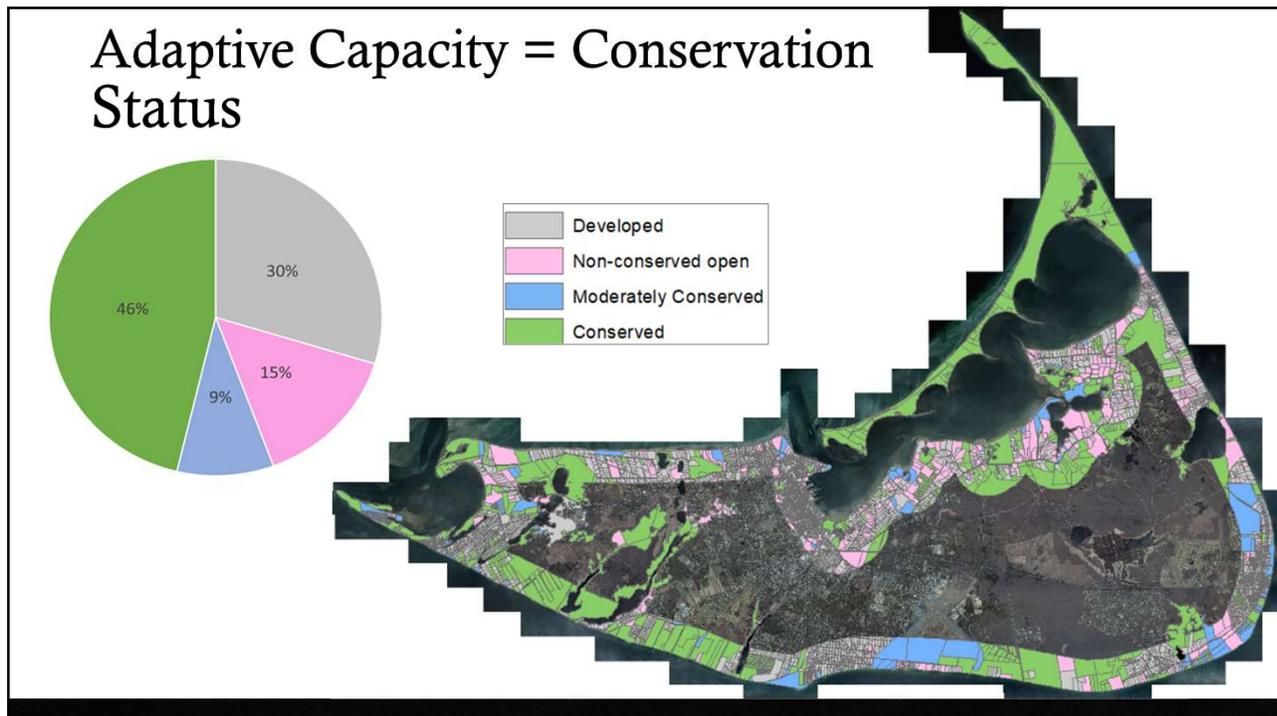




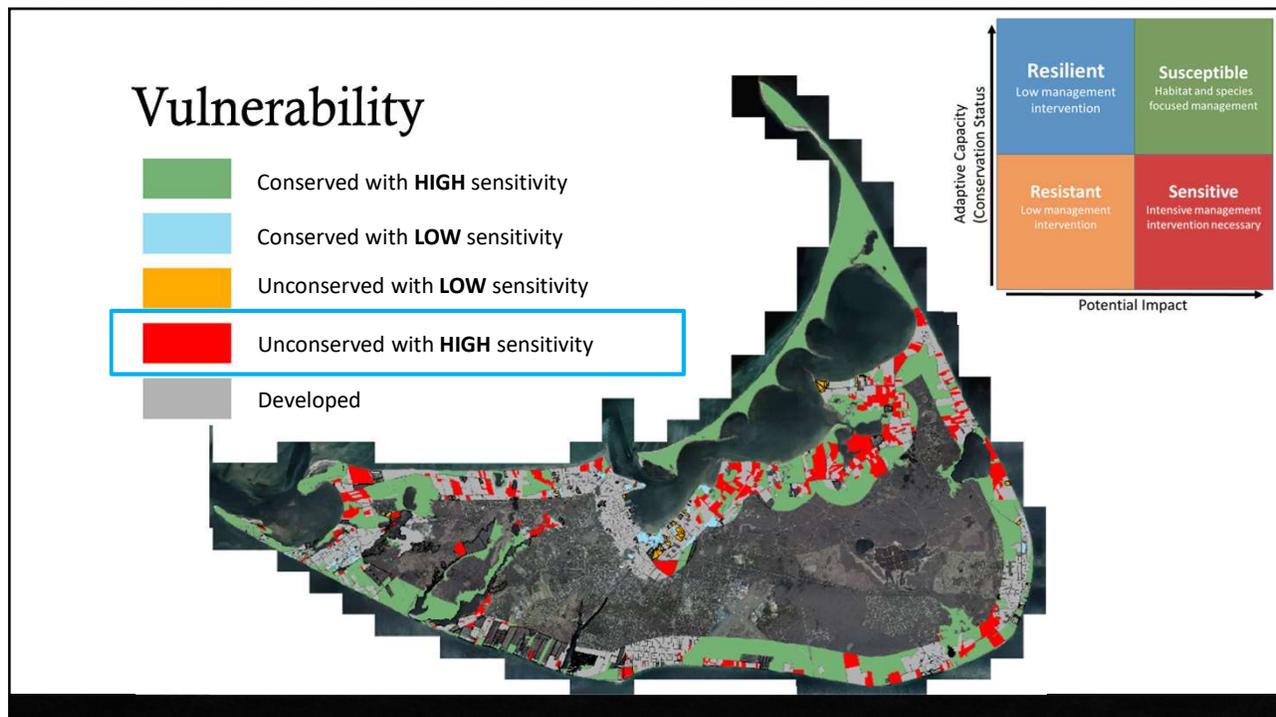

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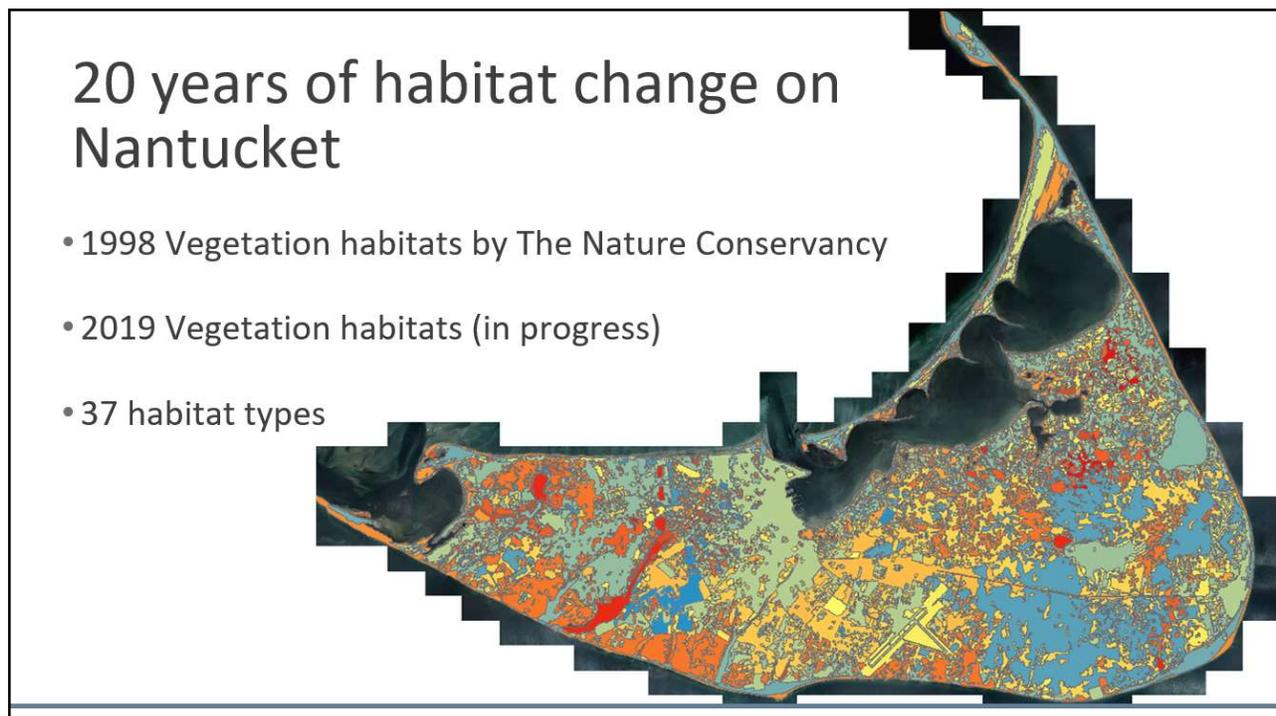
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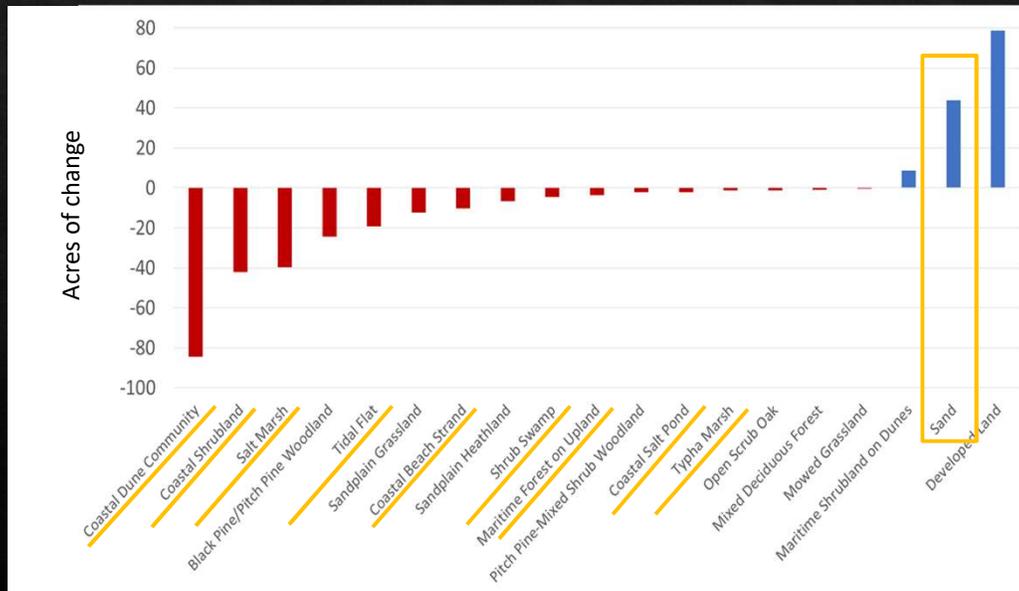


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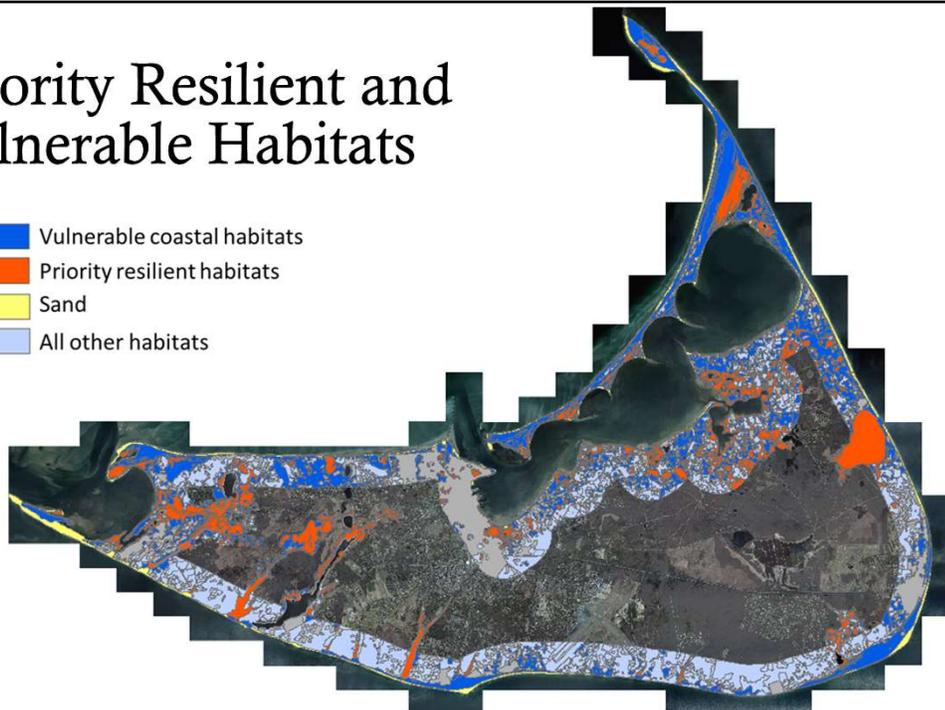
Habitat Change on Nantucket since 1998



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Priority Resilient and Vulnerable Habitats

- Vulnerable coastal habitats
- Priority resilient habitats
- Sand
- All other habitats



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The screenshot shows a website page with a header containing navigation links: 'Who WE ARE', 'What WE DO', 'Follow EVENTS & STORIES', and 'Explore DATA & RESOURCES'. On the right, there are links for 'Events' and 'Contact', and a logo for 'CAW New Hampshire Coastal Adaptation Workgroup' with the tagline 'RESILIENT - READY - THRIVING'. The main content area is titled 'BUILDING A FLOOD SMART SEACOAST: SUMMER WORKSHOPS' and includes a sub-header 'May 29, 2018 | Events, Featured Event, Workshop Series'. The page lists three workshops:

- WORKSHOP #1: INTRO TO COASTAL FLOODING & PROPERTY-LEVEL RESILIENCE STRATEGIES**
 Tuesday, June 19 | 6-8 pm | Saint James Masonic Lodge. 102, 77 Tide Mill Rd, Hampton, NH 03842
 Why does it flood? How do salt marshes and dunes help reduce flooding? Is your property at risk? What can you do to enhance your property's flood resilience?
- WORKSHOP #2: OPTIONS FOR PROTECTING EXISTING HOMES FROM COASTAL FLOODING**
 Tuesday, July 17 | 5:45-8 pm | Saint James Masonic Lodge. 102, 77 Tide Mill Rd, Hampton, NH 03842
 Elevation? Floodproofing? Which retrofitting method(s) might be right for your home? Do you need flood insurance? How can you lower the cost of your flood insurance premium?
- WORKSHOP #3: SMART SHORELINE STABILIZATION APPROACHES**
 Tuesday, August 21 | 6-8 pm | Saint James Masonic Lodge. 102, 77 Tide Mill Rd, Hampton, NH 03842
 What natural and structural shoreline stabilization techniques exist? What factors should you keep in mind? What should you do next to figure out if shoreline stabilization is right for you?

On the right side of the page, there are sections for 'EVENTS & STORIES' (with links for 'Events' and 'Stories') and 'SEARCH POSTS'. A vertical image on the right shows a coastal landscape with a building and a body of water.