

Beach Management Community Forum

Blue Ocean Event Center

Thursday, June 4th

5:00-6:30 PM



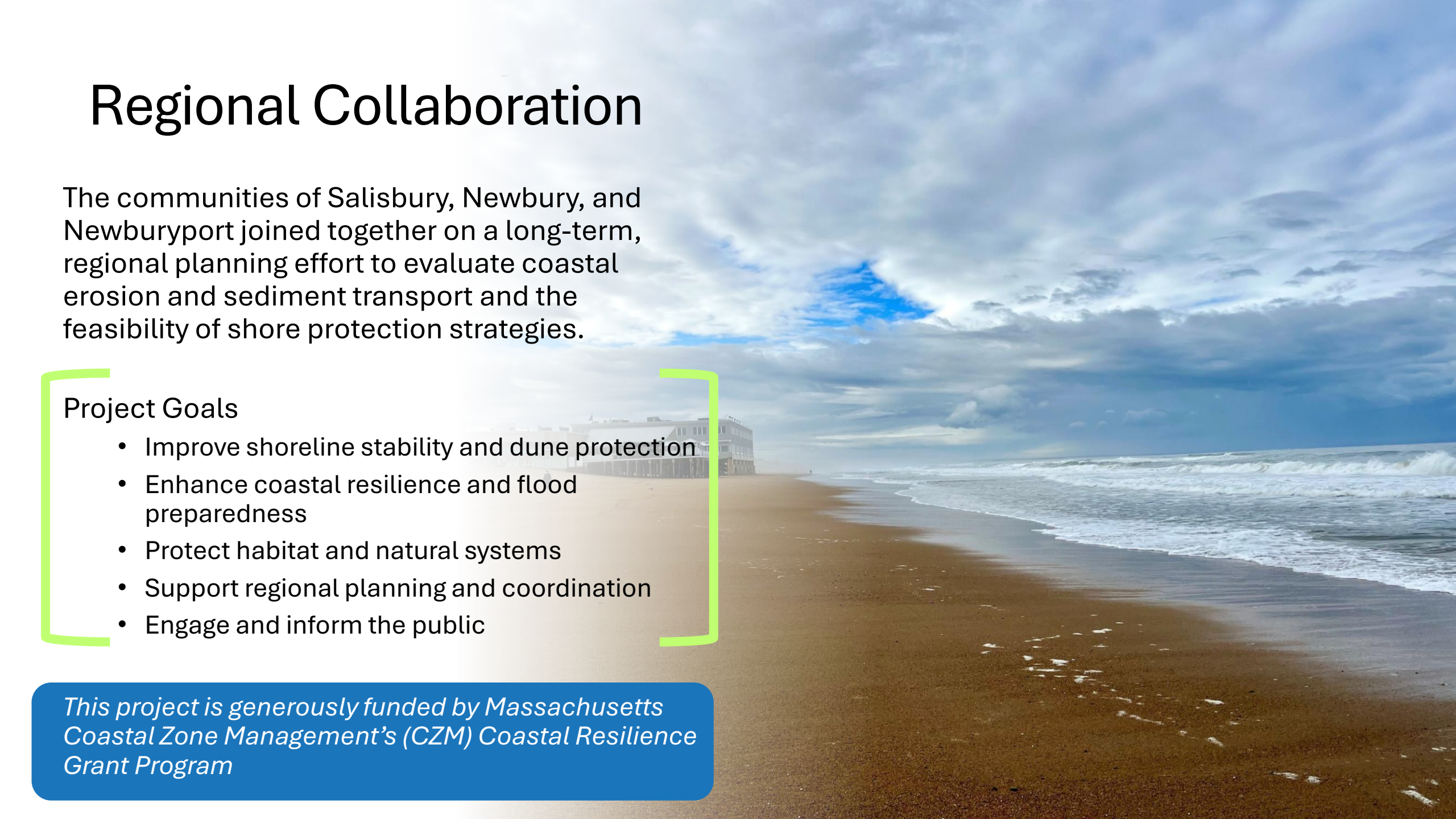
Regional Collaboration

The communities of Salisbury, Newbury, and Newburyport joined together on a long-term, regional planning effort to evaluate coastal erosion and sediment transport and the feasibility of shore protection strategies.

Project Goals

- Improve shoreline stability and dune protection
- Enhance coastal resilience and flood preparedness
- Protect habitat and natural systems
- Support regional planning and coordination
- Engage and inform the public

This project is generously funded by Massachusetts Coastal Zone Management's (CZM) Coastal Resilience Grant Program



Community Forum Agenda

5:00-5:15 PM

Gallery Walk

Please walk around to view the boards and share feedback

5:15-5:20 PM

Welcome

Representatives from Salisbury, Newbury, and Newburyport

5:20-6:00 PM

Regional Beach Sediment Management Study

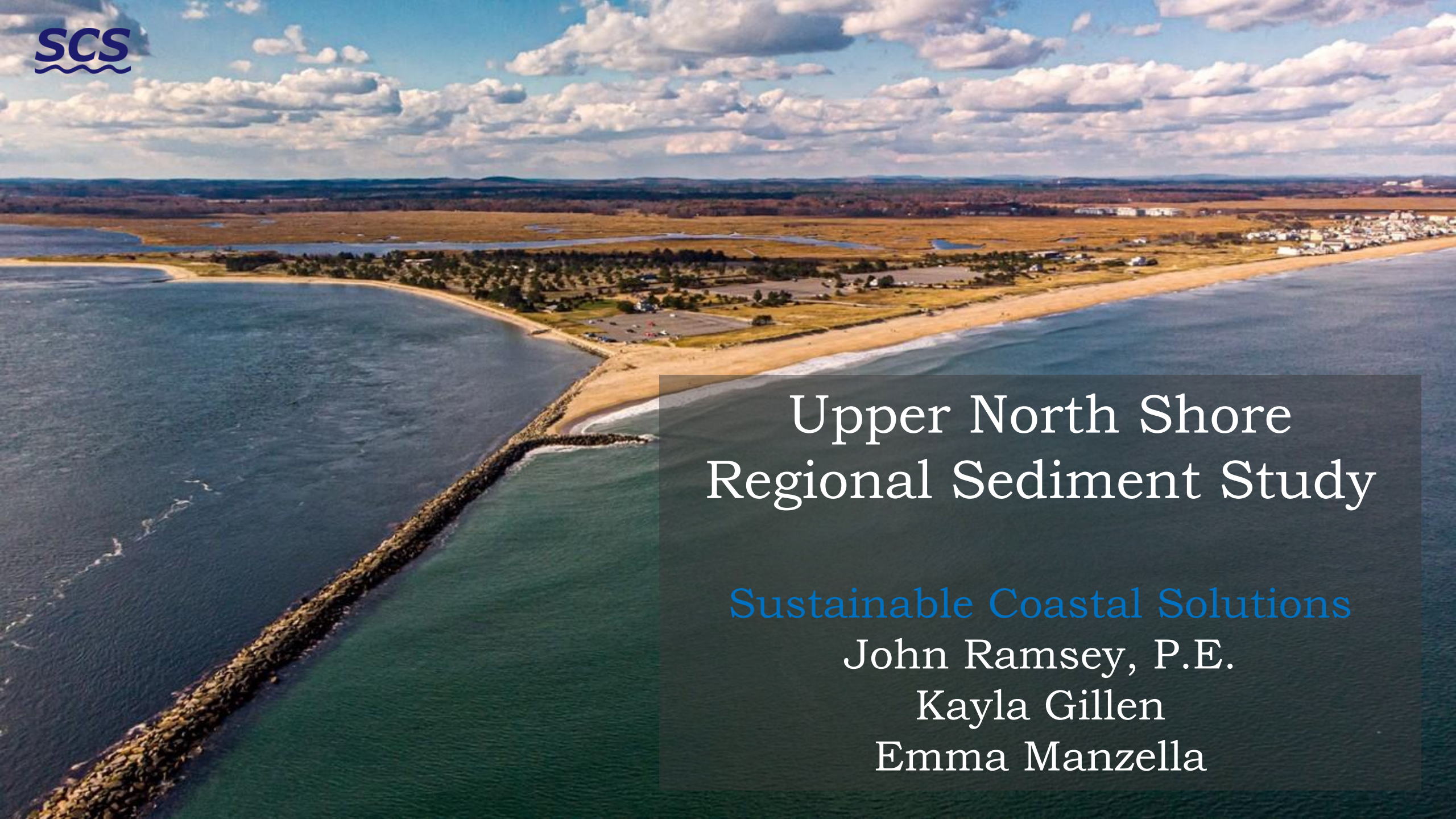
Overview of study findings from Sustainable Coastal Solutions

6:00-6:15 PM

Q&A

6:15-6:30 PM

Community Feedback & Wrap Up

An aerial photograph of a coastal region. In the foreground, a long, narrow breakwater made of rocks extends from the shore into the ocean. To the left of the breakwater is a calm, blue-green inlet. To the right is a sandy beach and a small town. Beyond the beach is a large area of marshland with patches of water and dry grass. In the background, there are rolling hills under a blue sky with scattered white clouds.

Upper North Shore Regional Sediment Study

Sustainable Coastal Solutions

John Ramsey, P.E.

Kayla Gillen

Emma Manzella

Meeting Overview

Background:

- Barrier beach and inlet processes
- Beach nourishment
- General analysis approaches

Project Areas:

- Analysis and mitigation strategies for
 - Salisbury
 - Plum Island
 - Reservation Terrace

Barrier Beaches

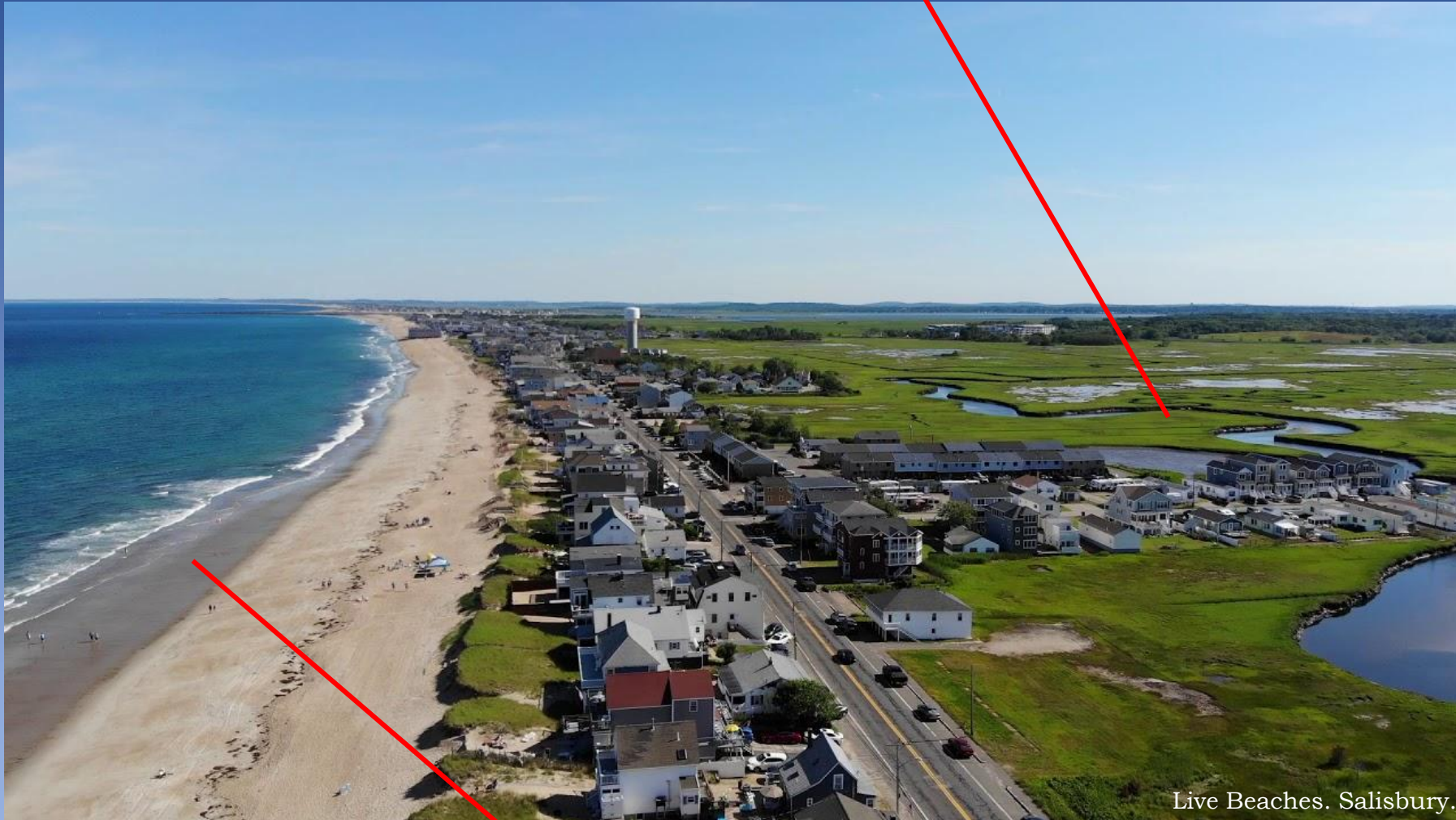
Typically backed by saltmarsh,
lagoon, estuary



Parallel to coastline

Barrier Beaches

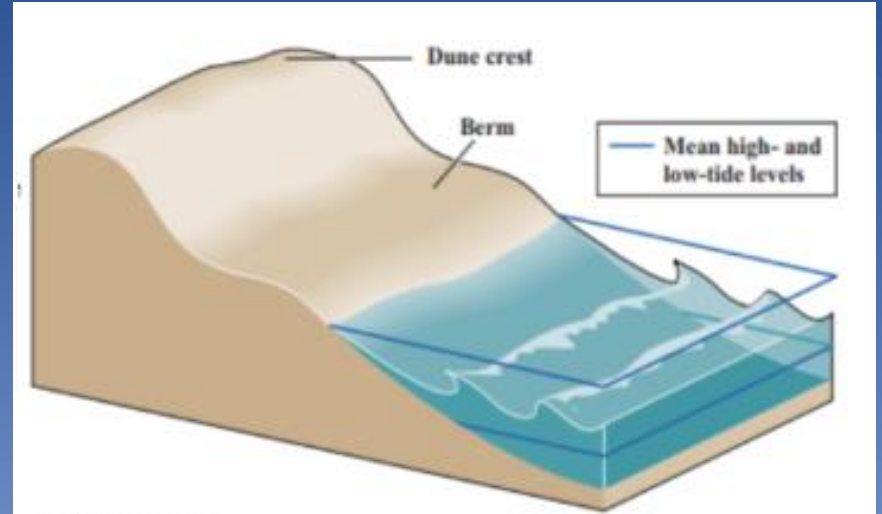
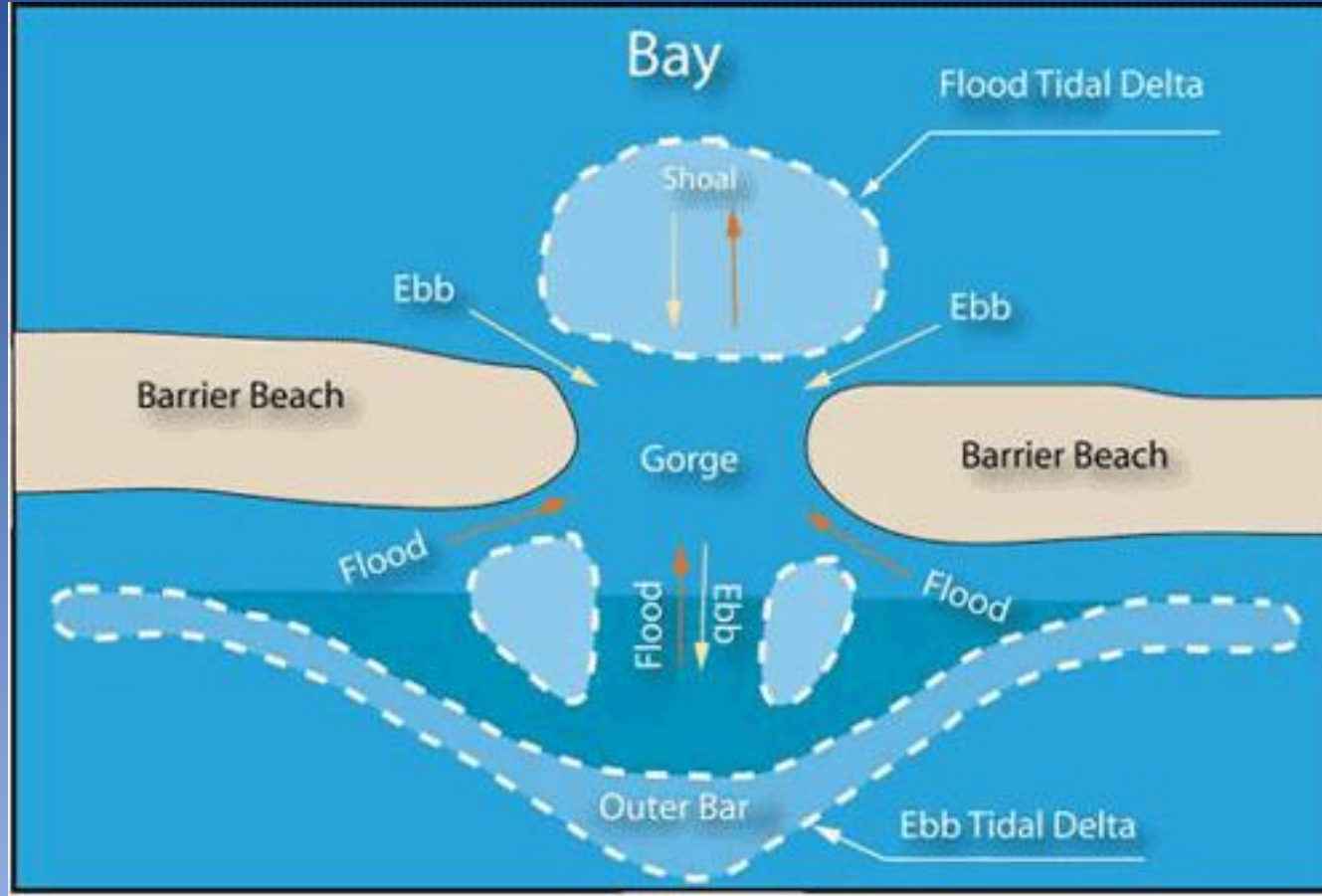
Typically backed by saltmarsh,
lagoon, estuary



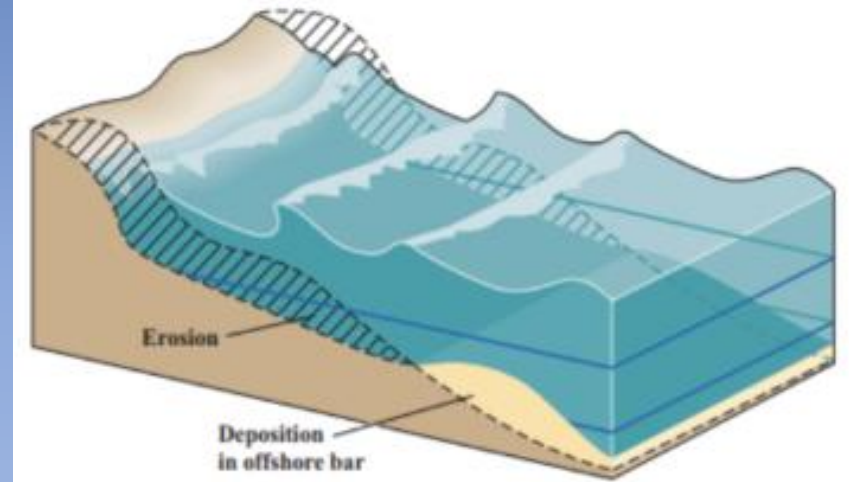
Live Beaches. Salisbury.

Parallel to coastline

Barrier beach and inlet processes

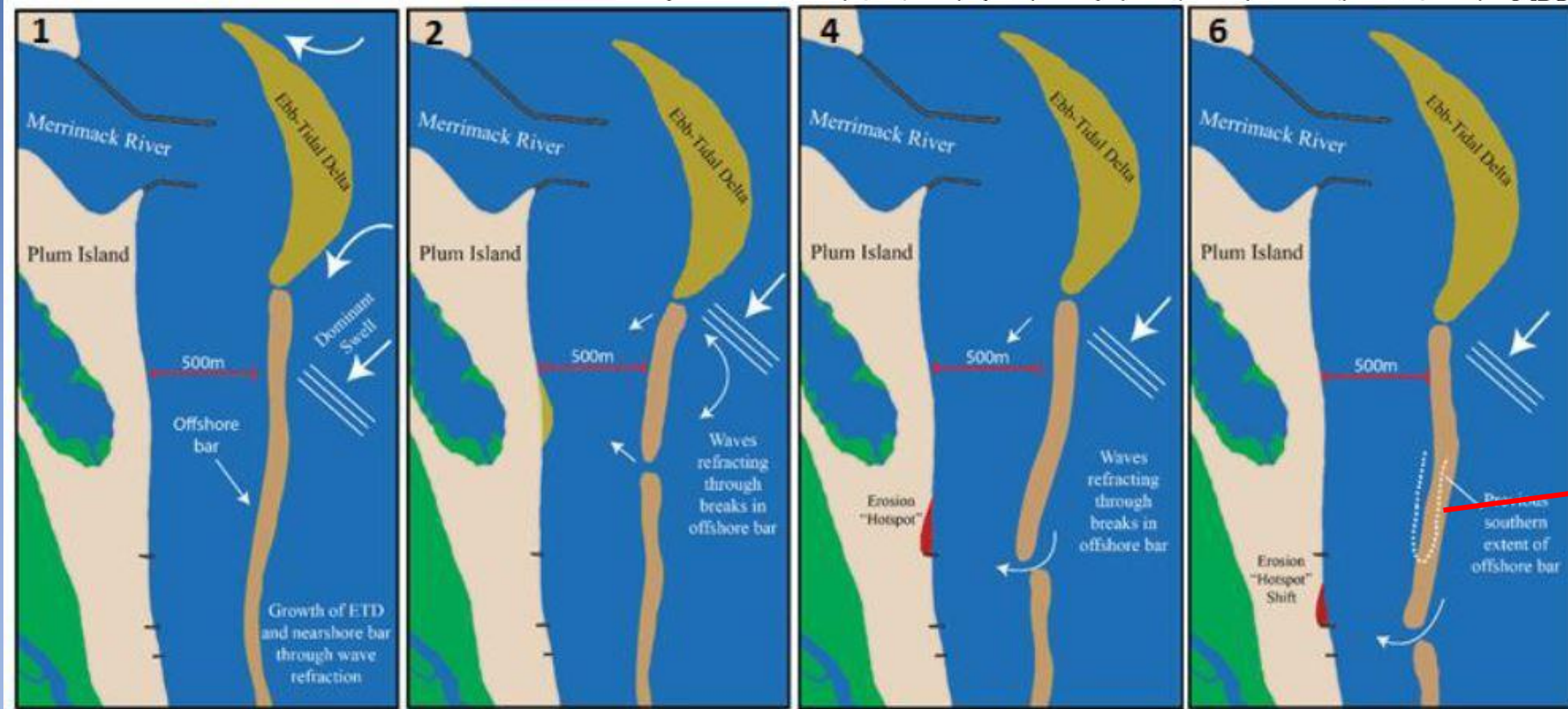
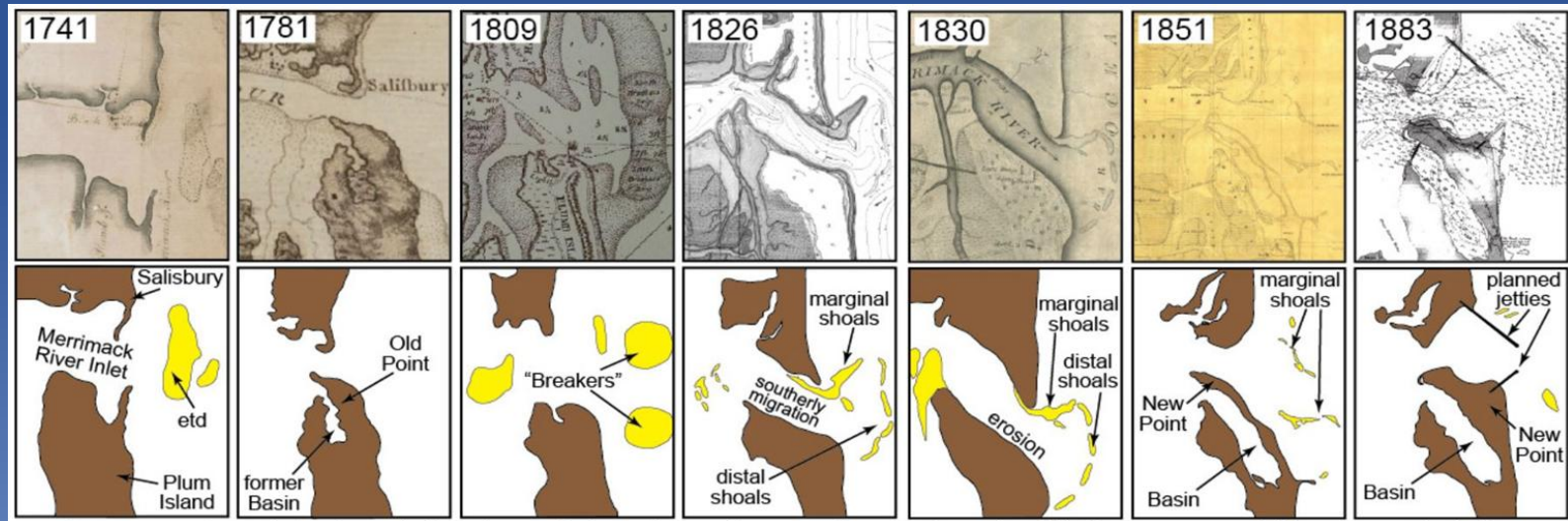


(a) Summer profile



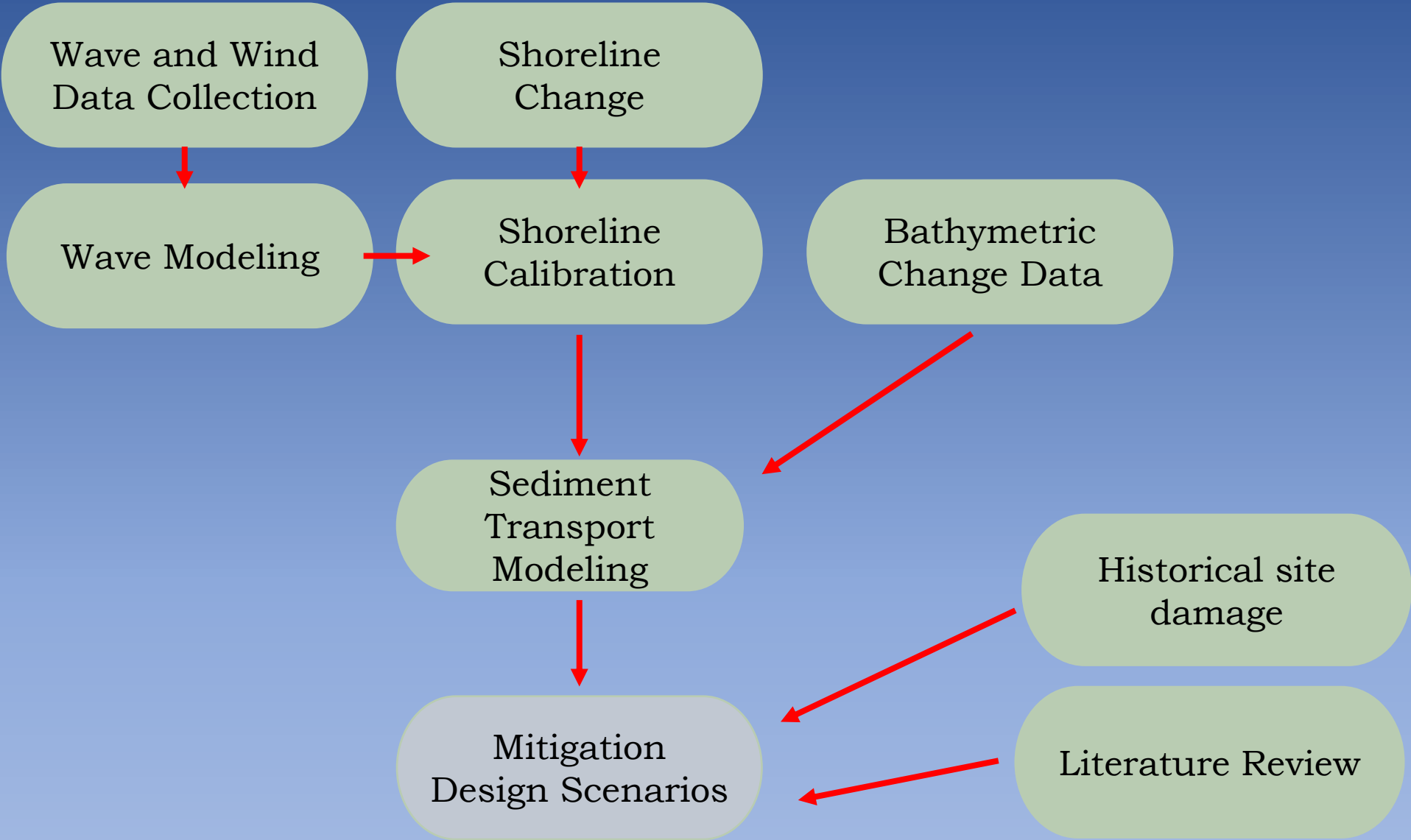
(b) Winter profile

Barrier beach and inlet processes

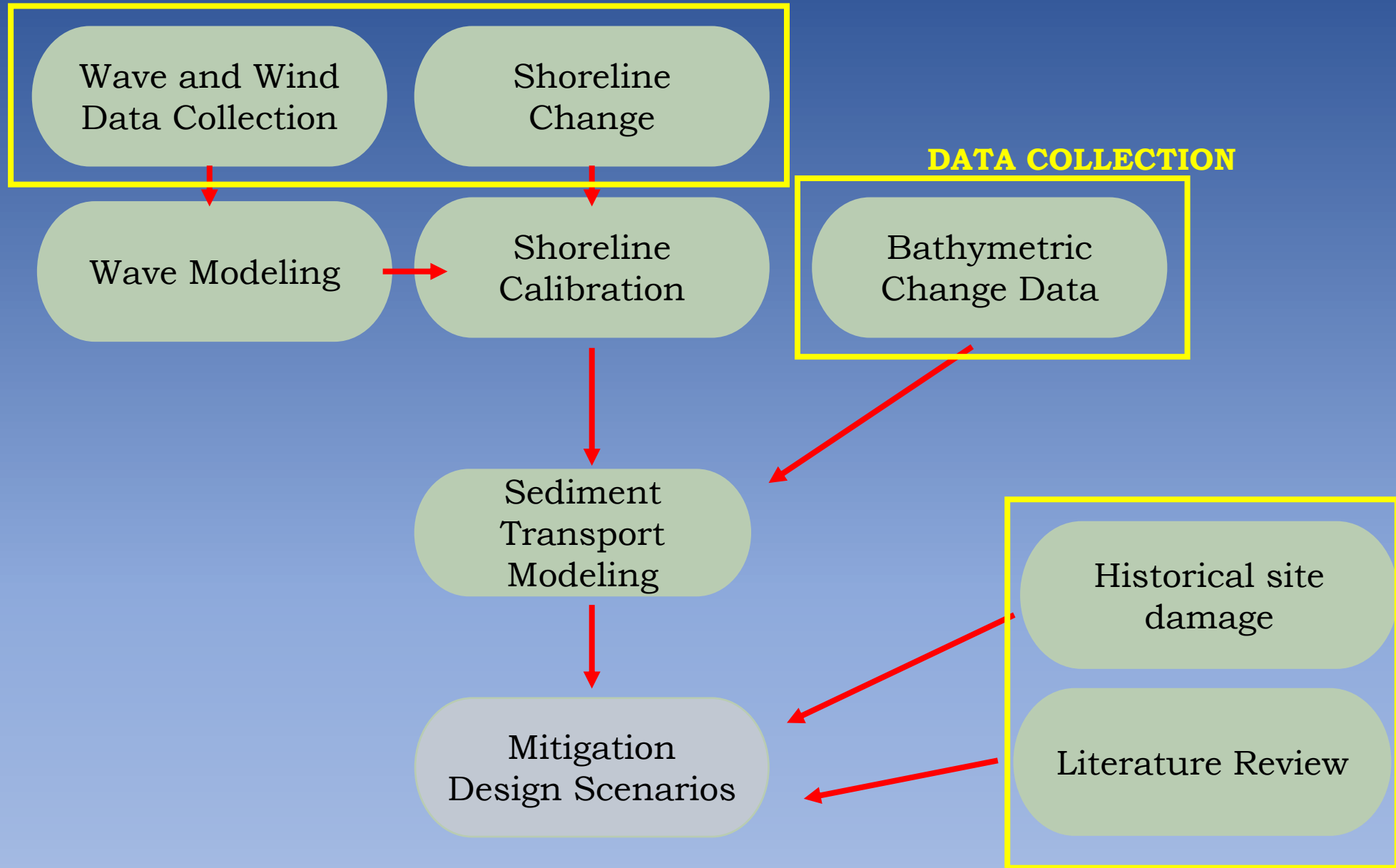


Bypass bar

Analysis approach

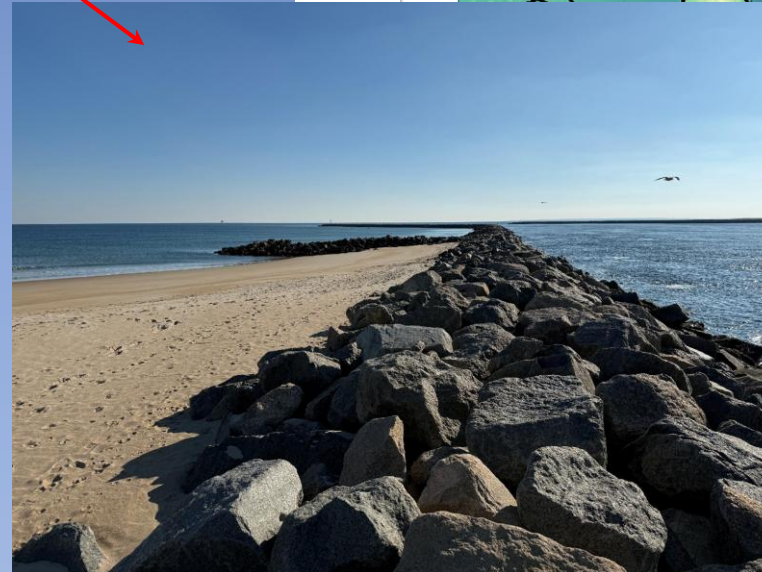
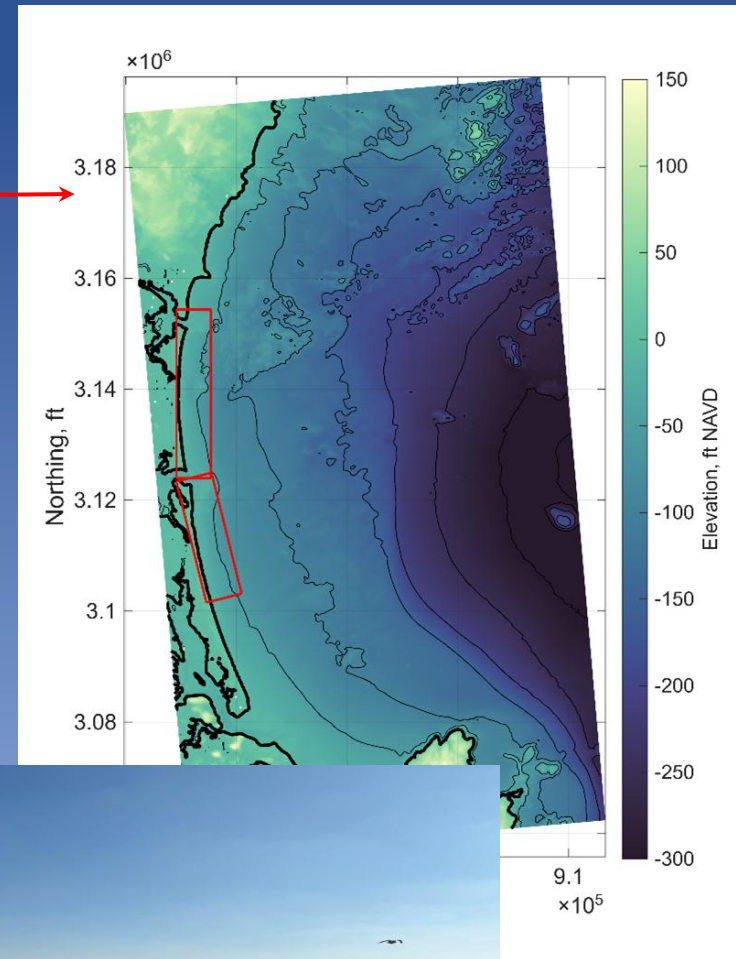


Analysis approach

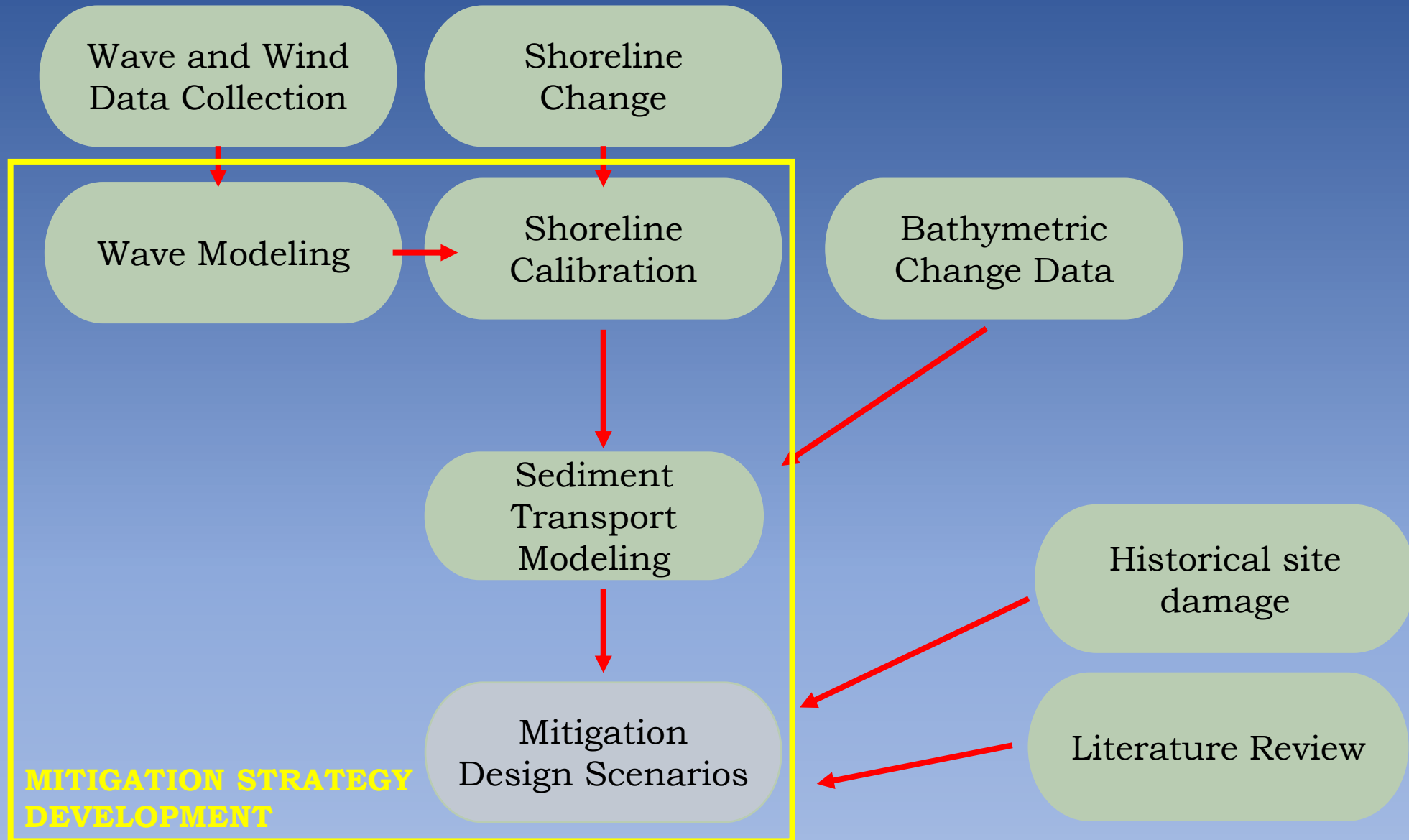


Data collection

- LiDAR and Bathymetry
- Historic shorelines
- Wave information
- Priority habitat and estimated habitat inventory
- Storms and storm surge information
- Existing coastal infrastructure
- Current shoreline
- Sediment samples

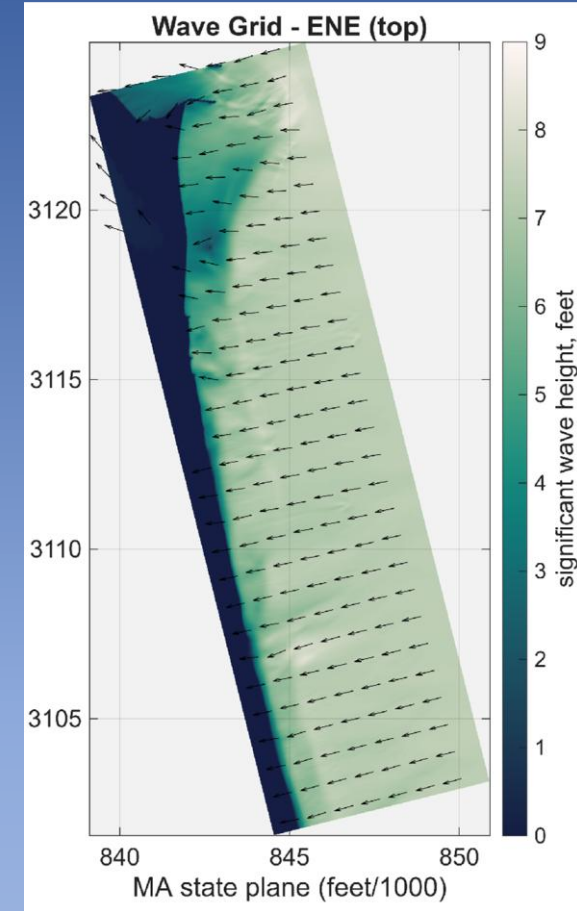
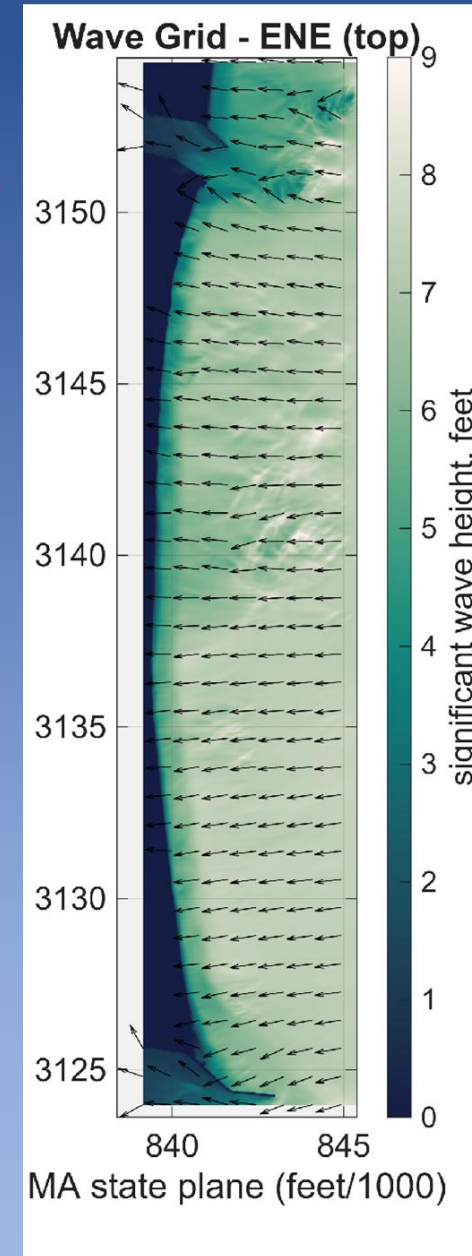
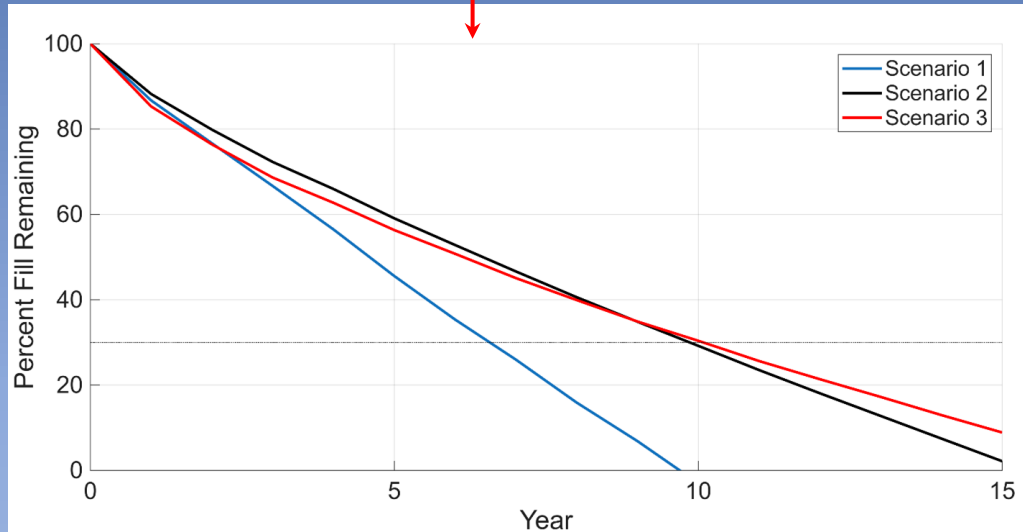


Analysis approach



Mitigation Strategy Development

- Use wave information to build wave model
- Use wave model results to understand sediment transport patterns
- Use sediment transport patterns to design erosion mitigation scenarios

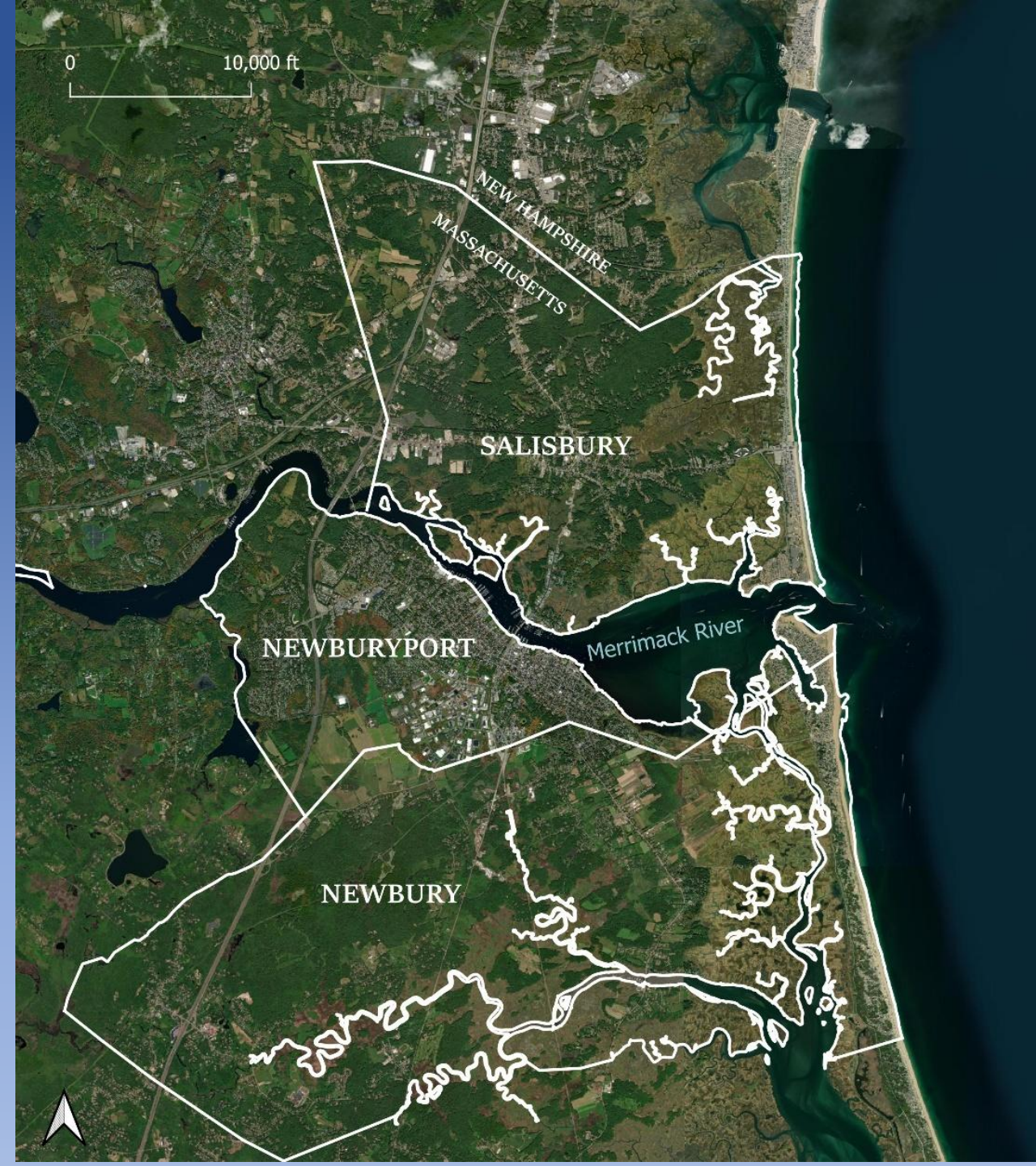


Project Areas

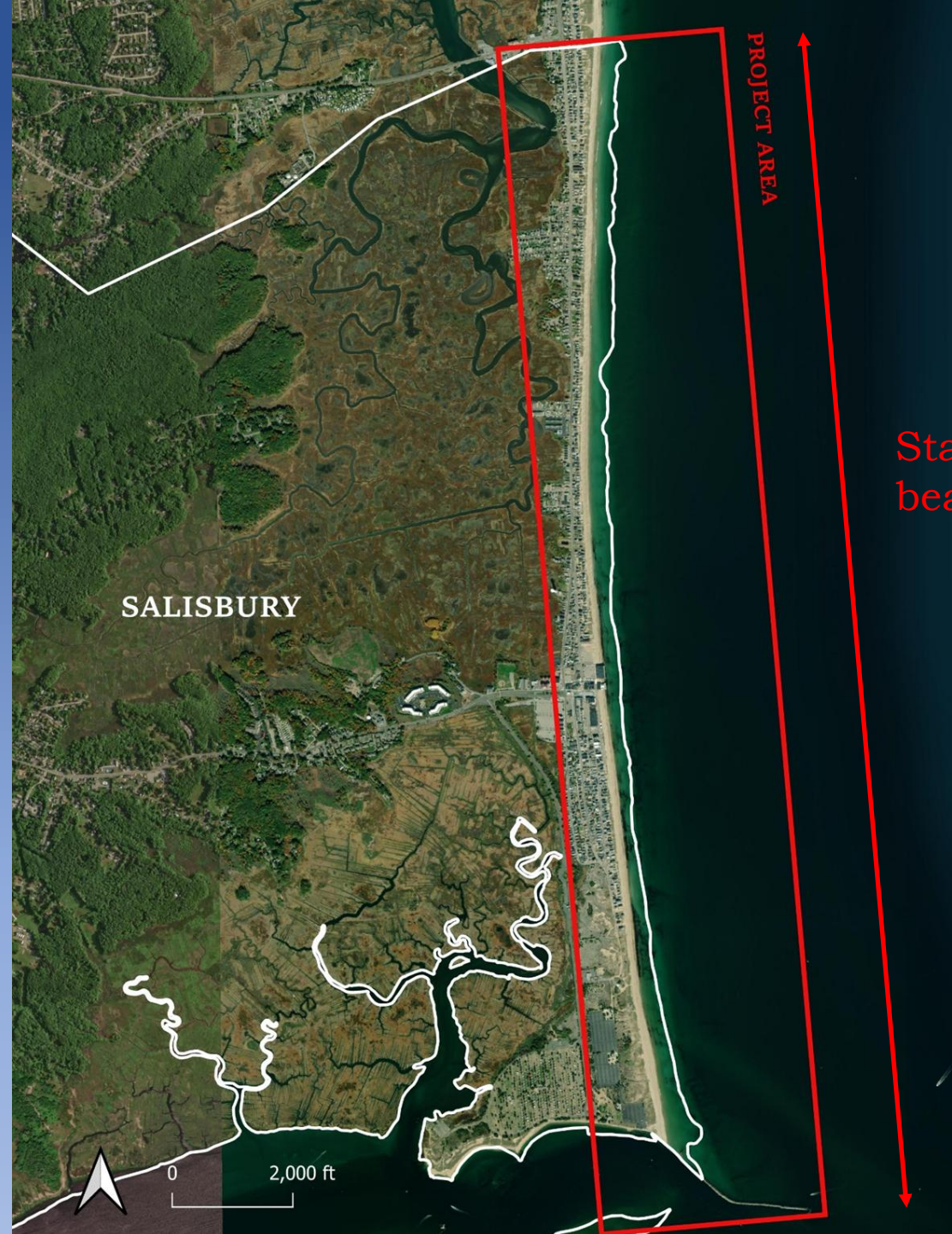
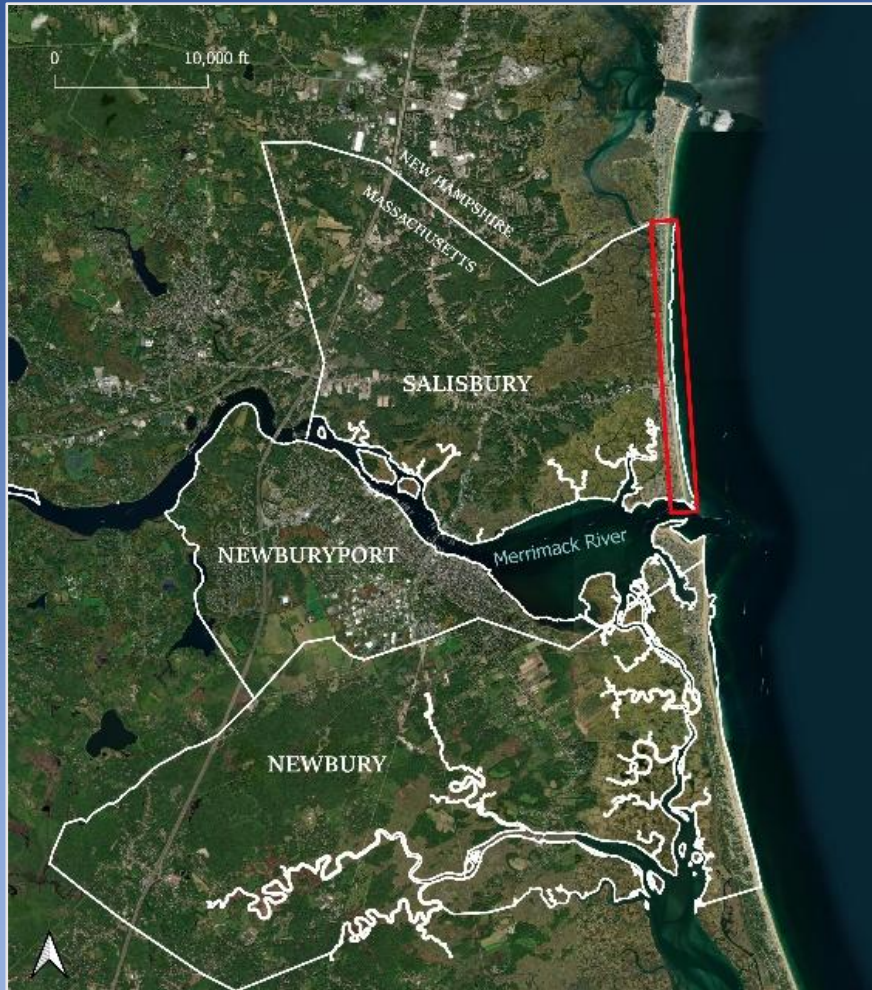
- Salisbury
- Plum Island (Newburyport and Newbury)
- Reservation Terrace (Newburyport)

For each project area, discuss:

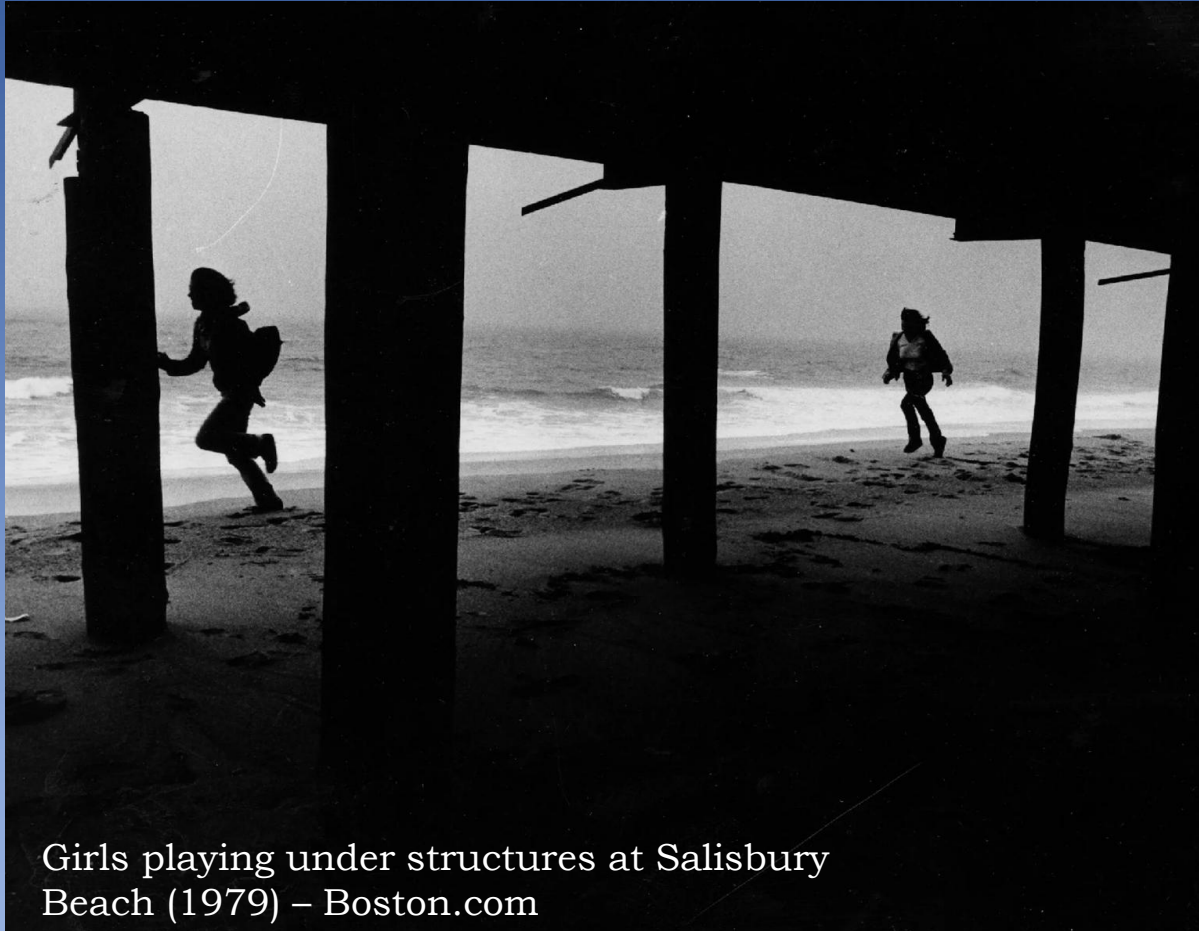
- Analysis
- Potential mitigation for coastal resilience



Project Area: Salisbury



Project Area: Salisbury, historic conditions



Girls playing under structures at Salisbury Beach (1979) – Boston.com



From North American Forts, 1958

Project Area: Salisbury, storm damage

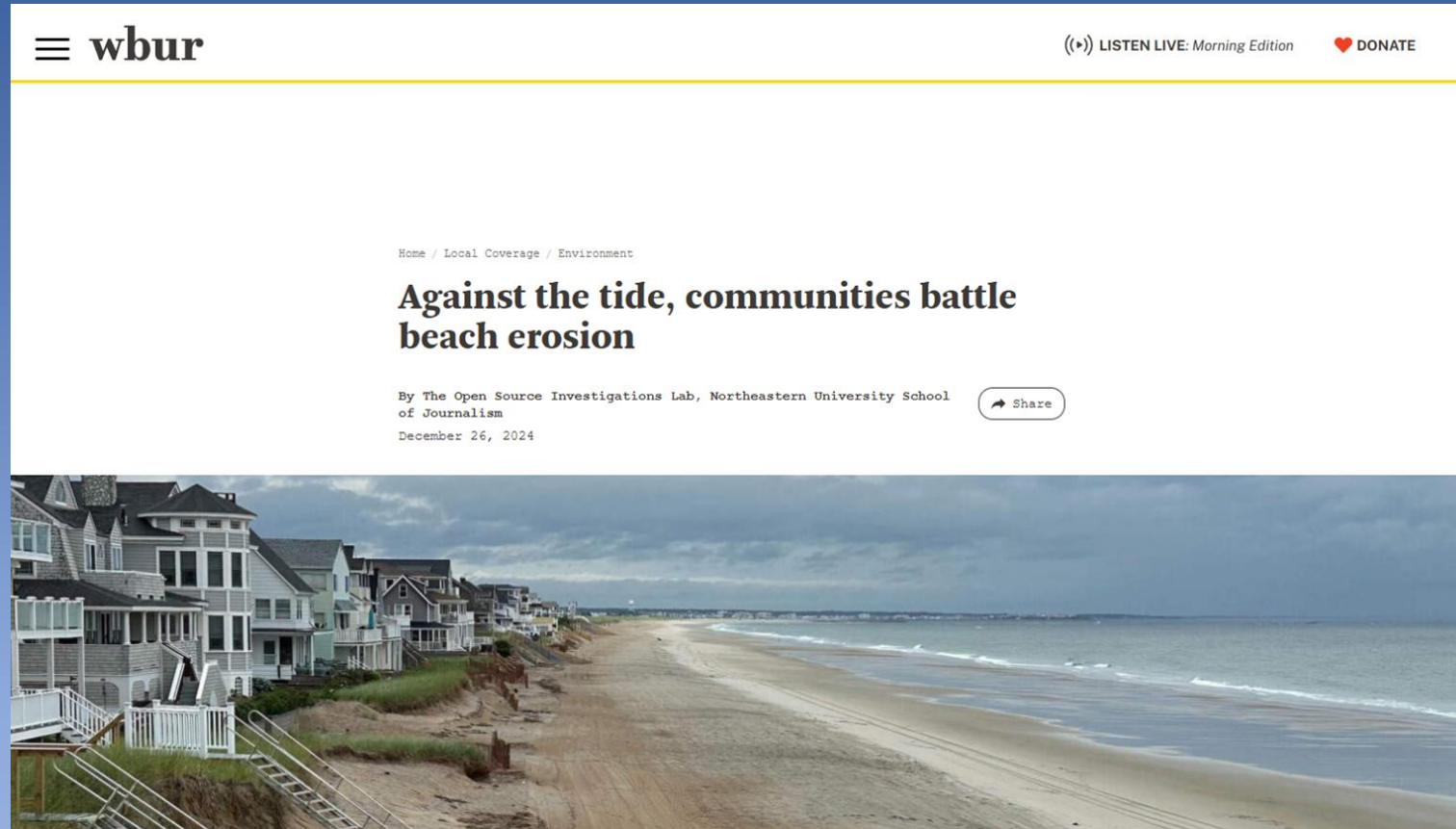
January 28, 2016



January 28, 2016



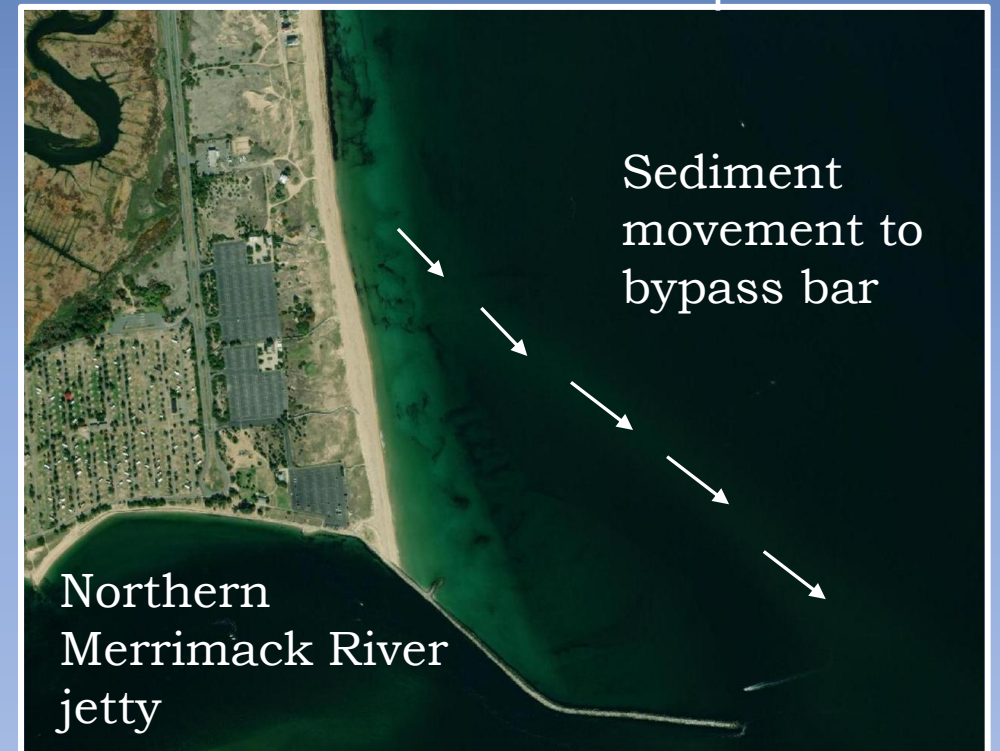
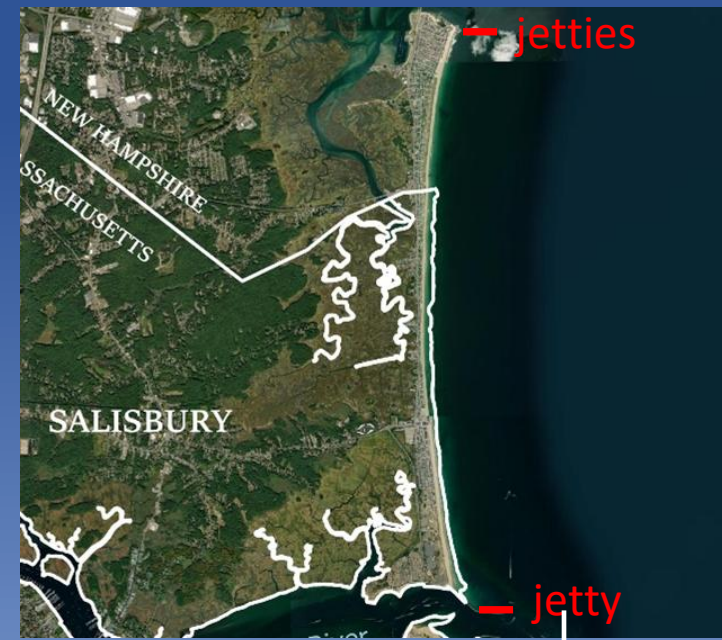
Project Area: Salisbury, storm damage



Project Area: Salisbury, current conditions

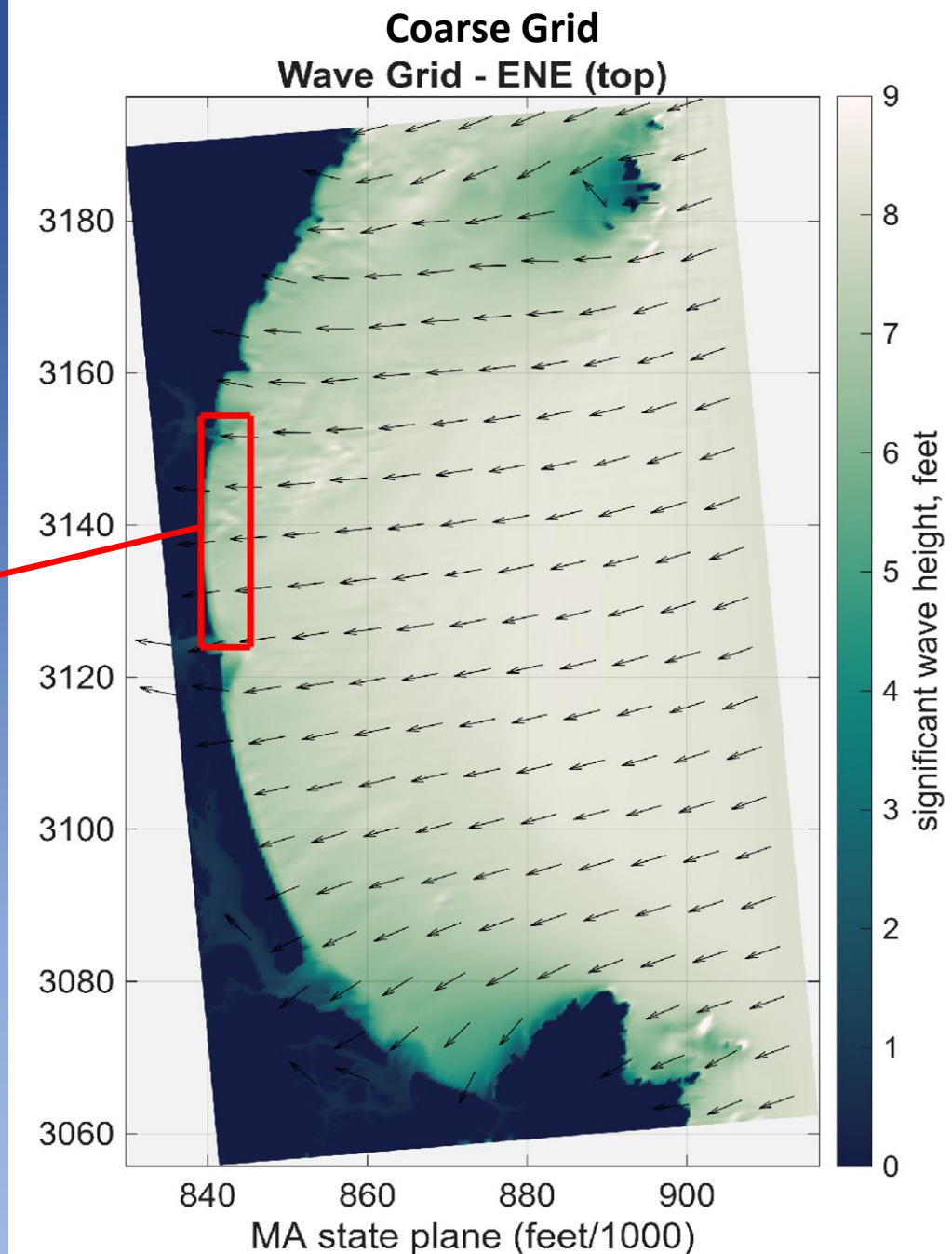
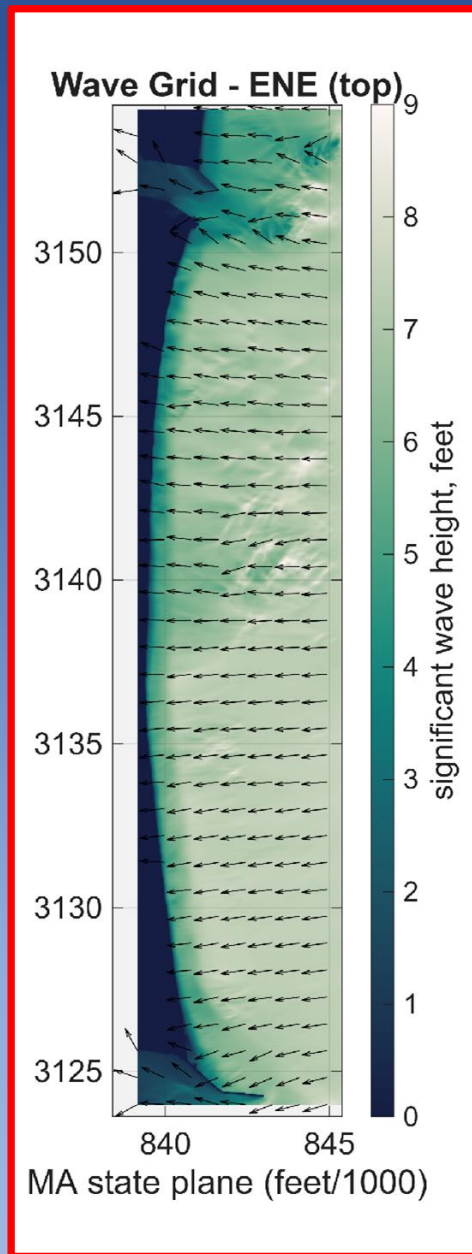


- Generally low beach and dune system
- Natural sediment movement constricted due to jetties to the north and south
- Sediment migrates offshore to bypass bar north of jetty



Project Area: Salisbury Wave modeling

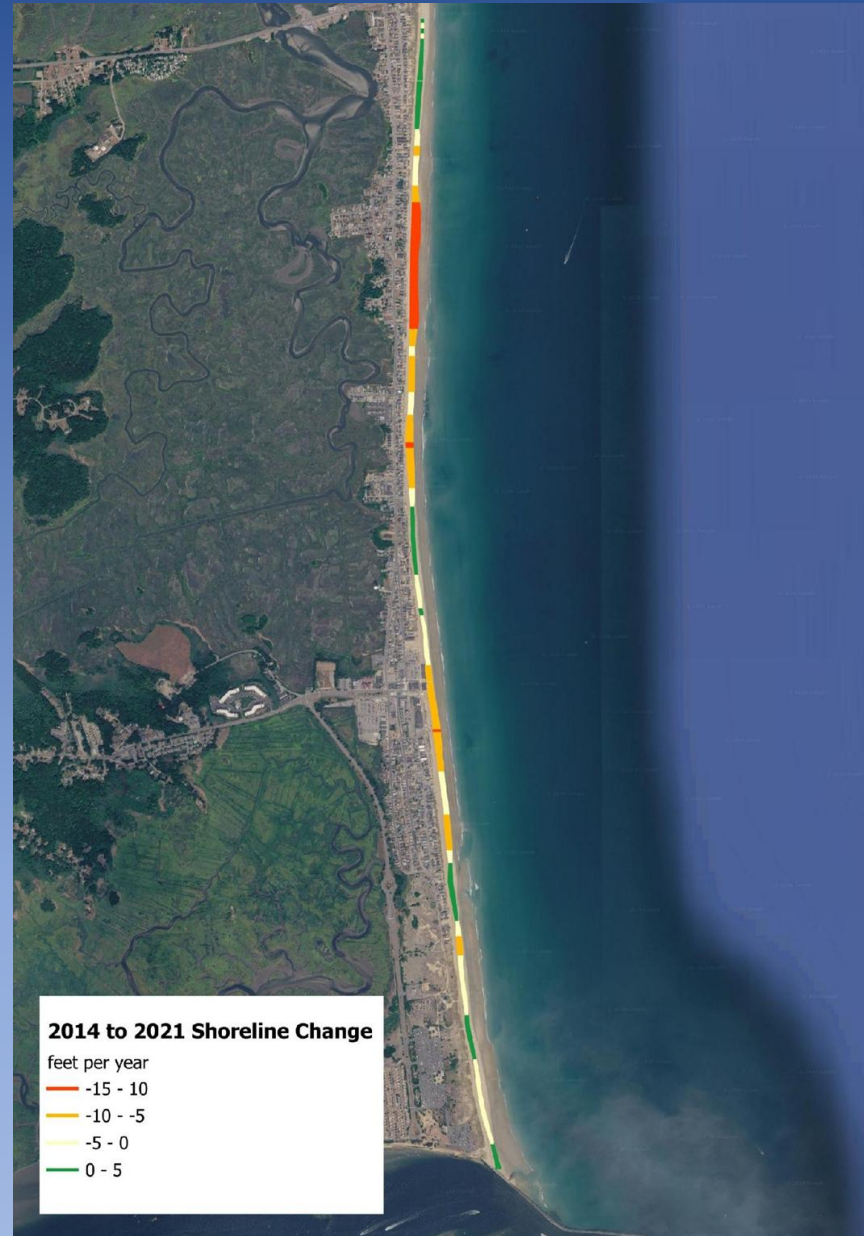
Wave
direction
←



Project Area: Salisbury Data Collection

Shoreline change

- 2014 to 2021: multiple significant storms, erosion
- 2021 to 2026: fewer significant storms, stable (minor erosion and accretion in some areas)

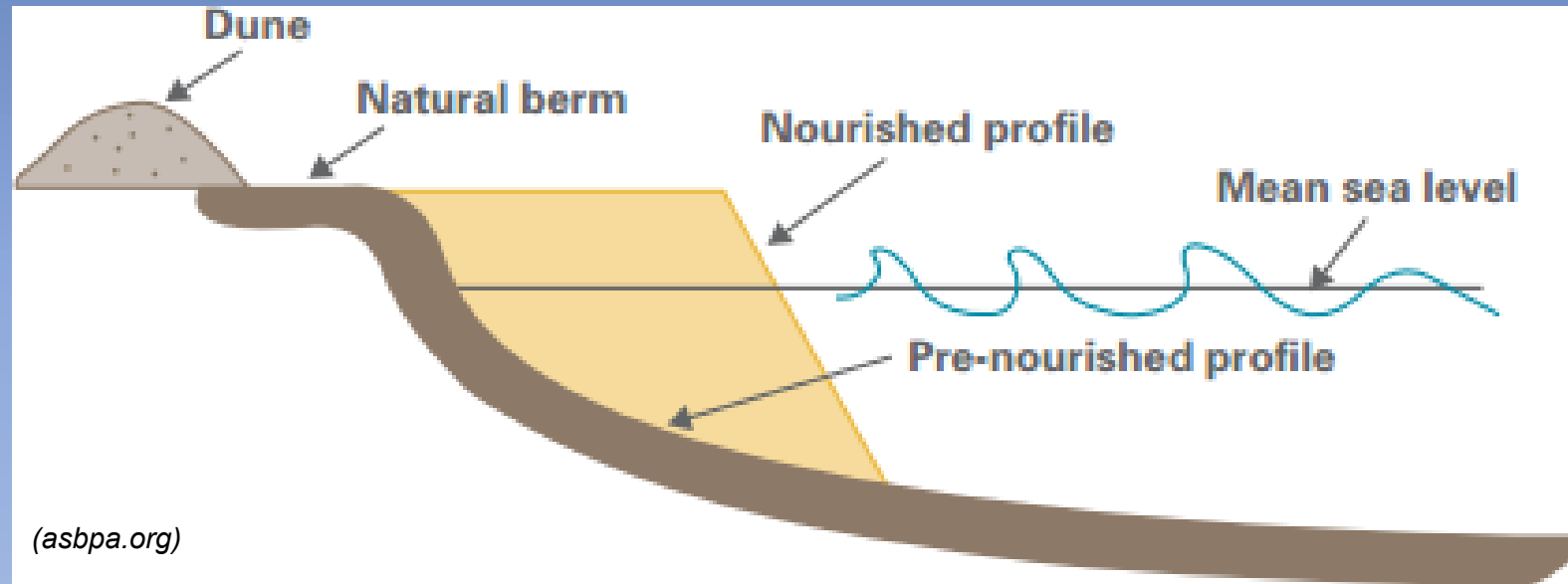


Engineered beach nourishment

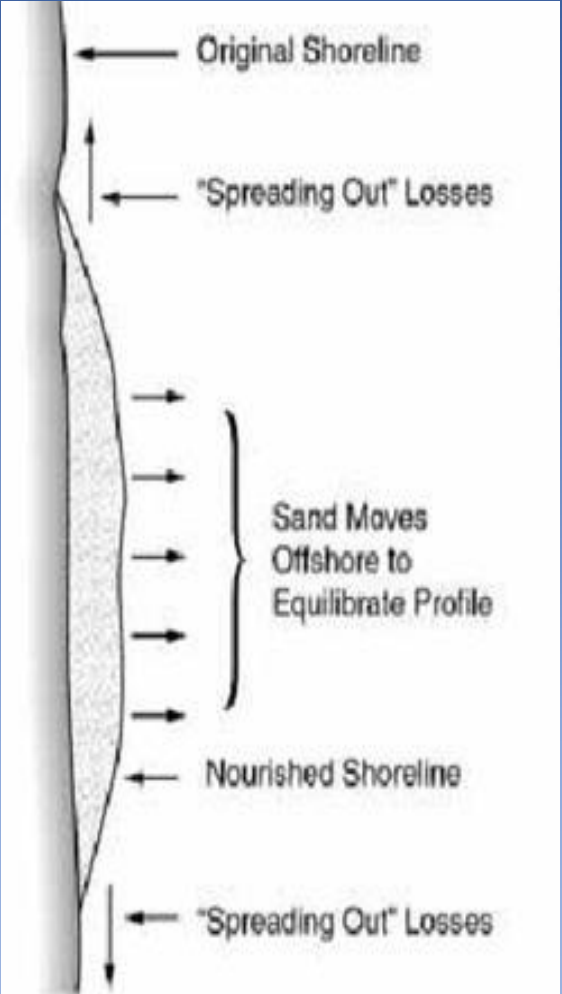
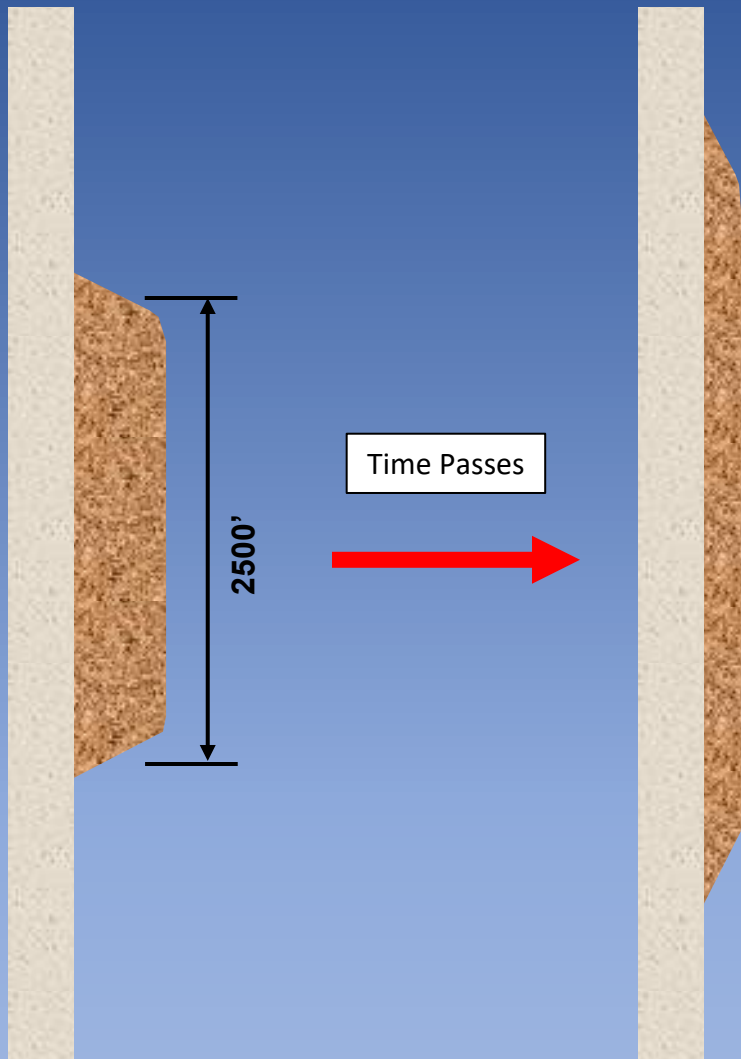
- “Soft” shore protection
- Environmentally friendly and mimics natural system
- Increases beach width
- Protects infrastructure by dissipating wave energy

Nourishment performance (design life):

- the length of time until additional nourishment projects are necessary, typically when less than 30% of sediment remains where it was placed



Engineered beach nourishment



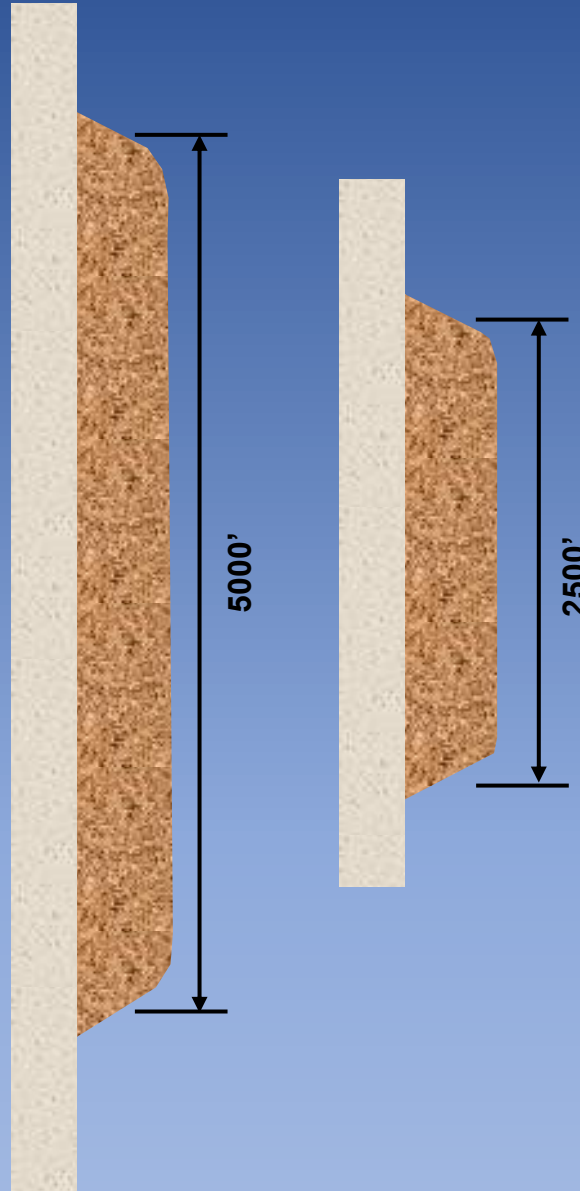
Nourishment remains within system

National Research Council. 1995. *Beach Nourishment and Protection*.

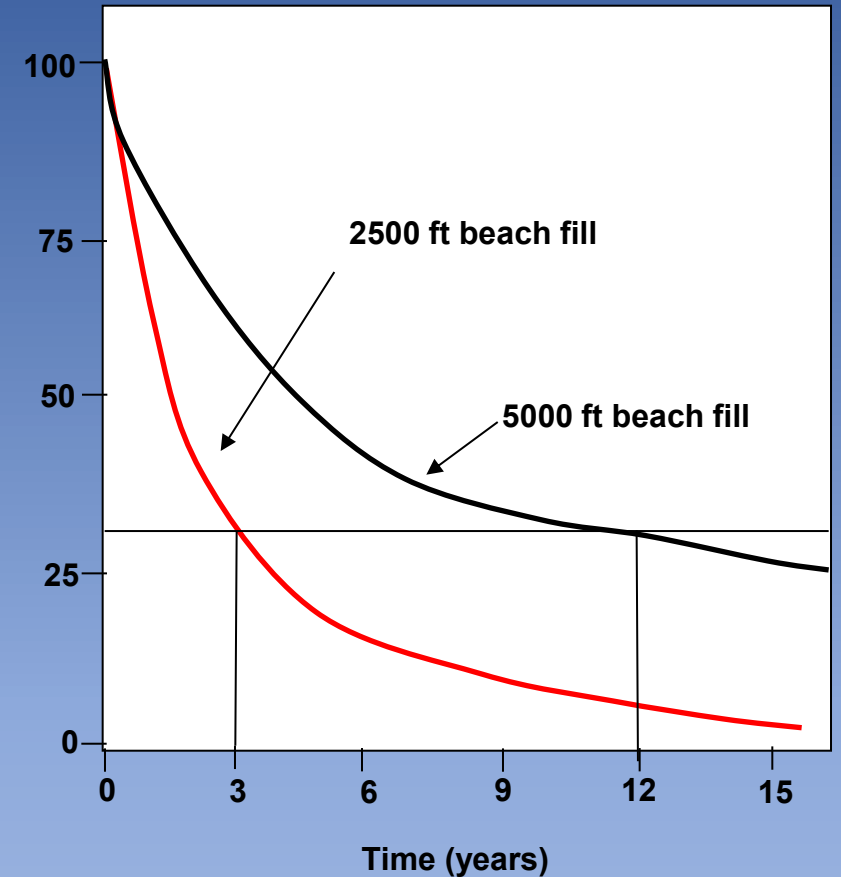
Engineered beach nourishment

Nourishment performance factors:

- Fill length (pictured right)
 - 2x fill length = 4x design life
- Berm width
- Grain size

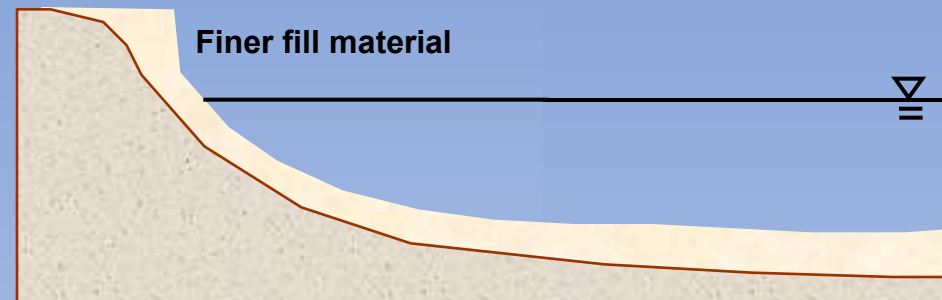
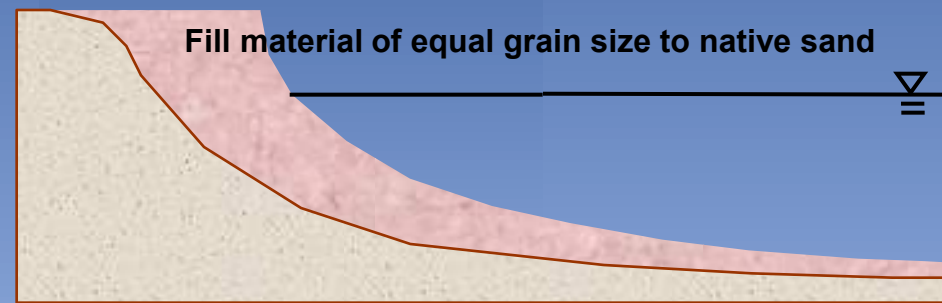
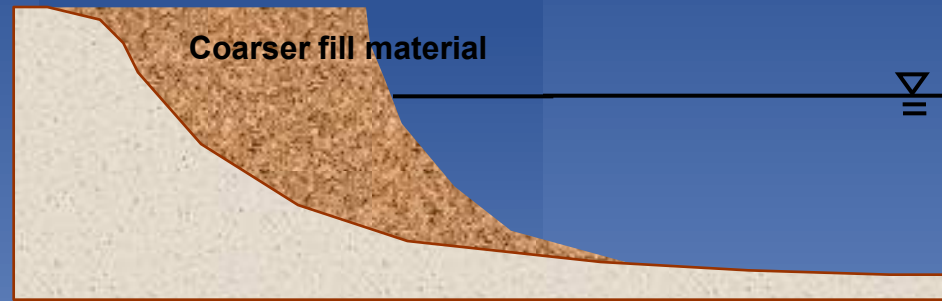


Example Nourishment timeline

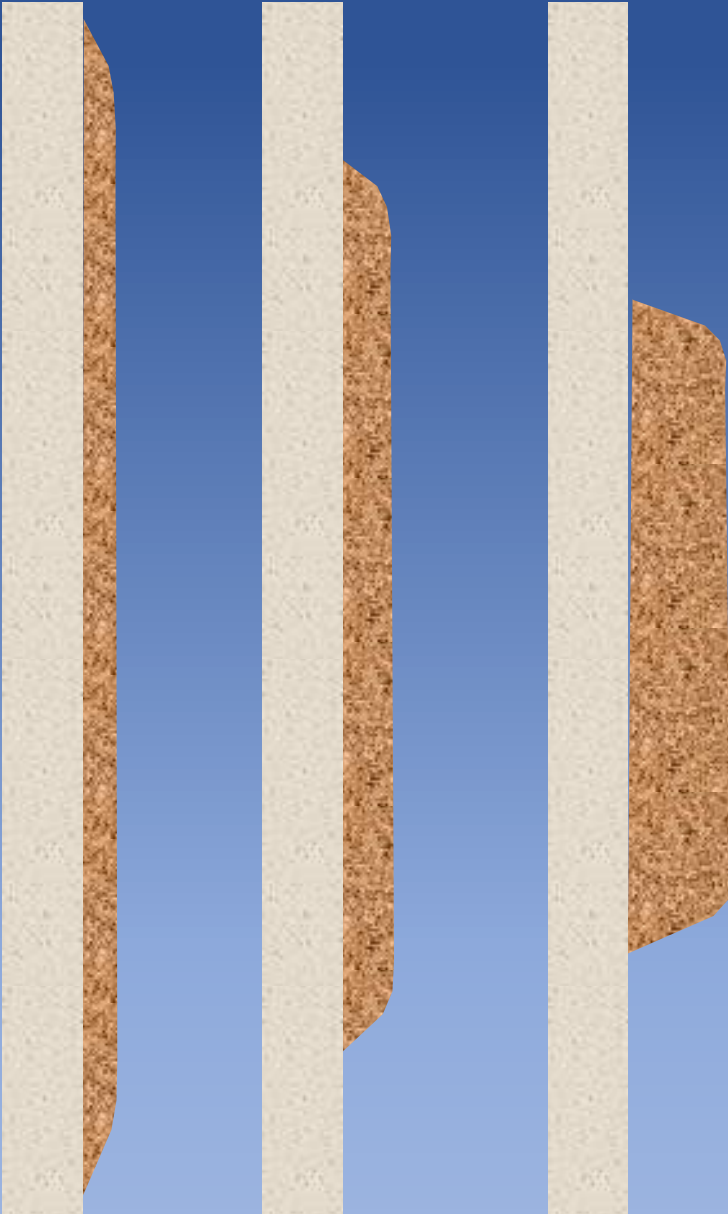
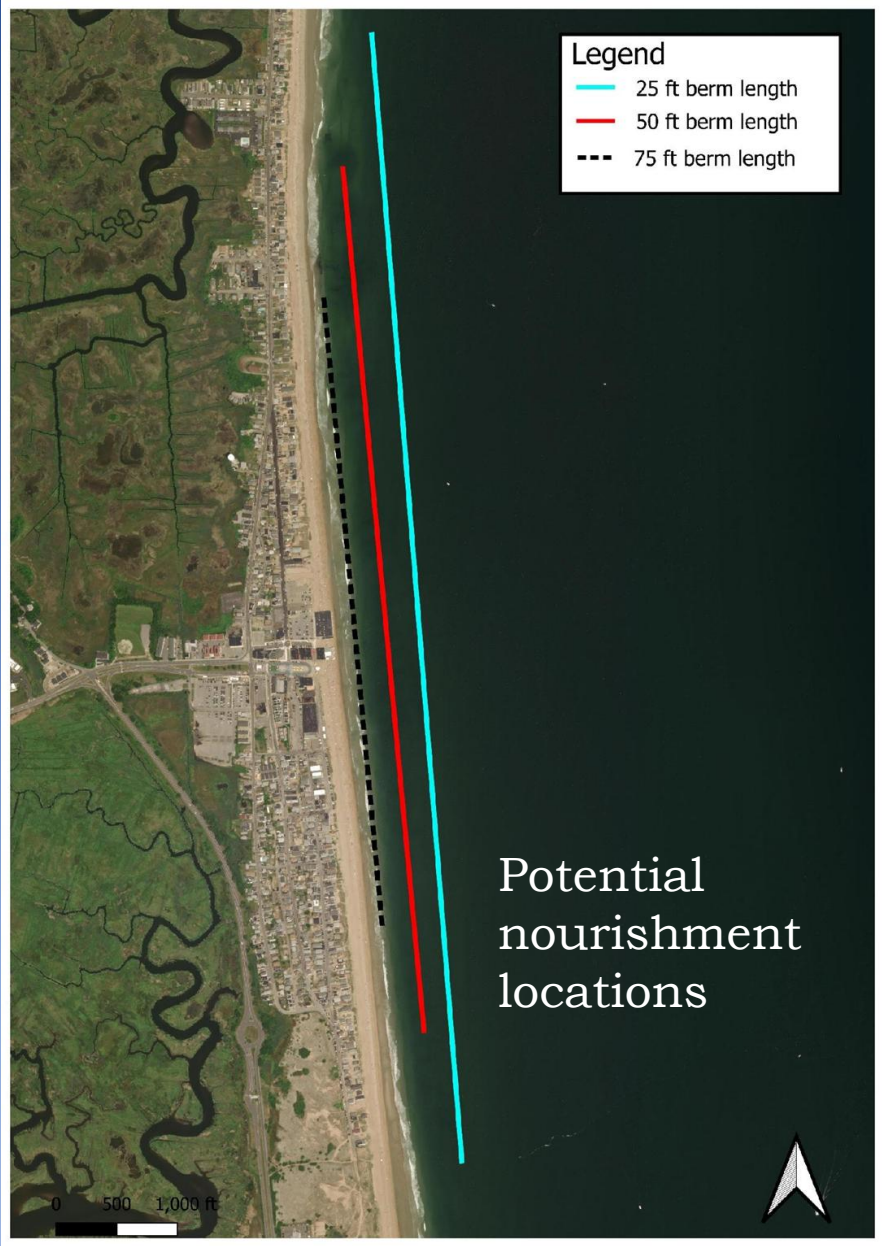


Engineered beach nourishment

Compatible
sediment key to
successful
nourishment
project



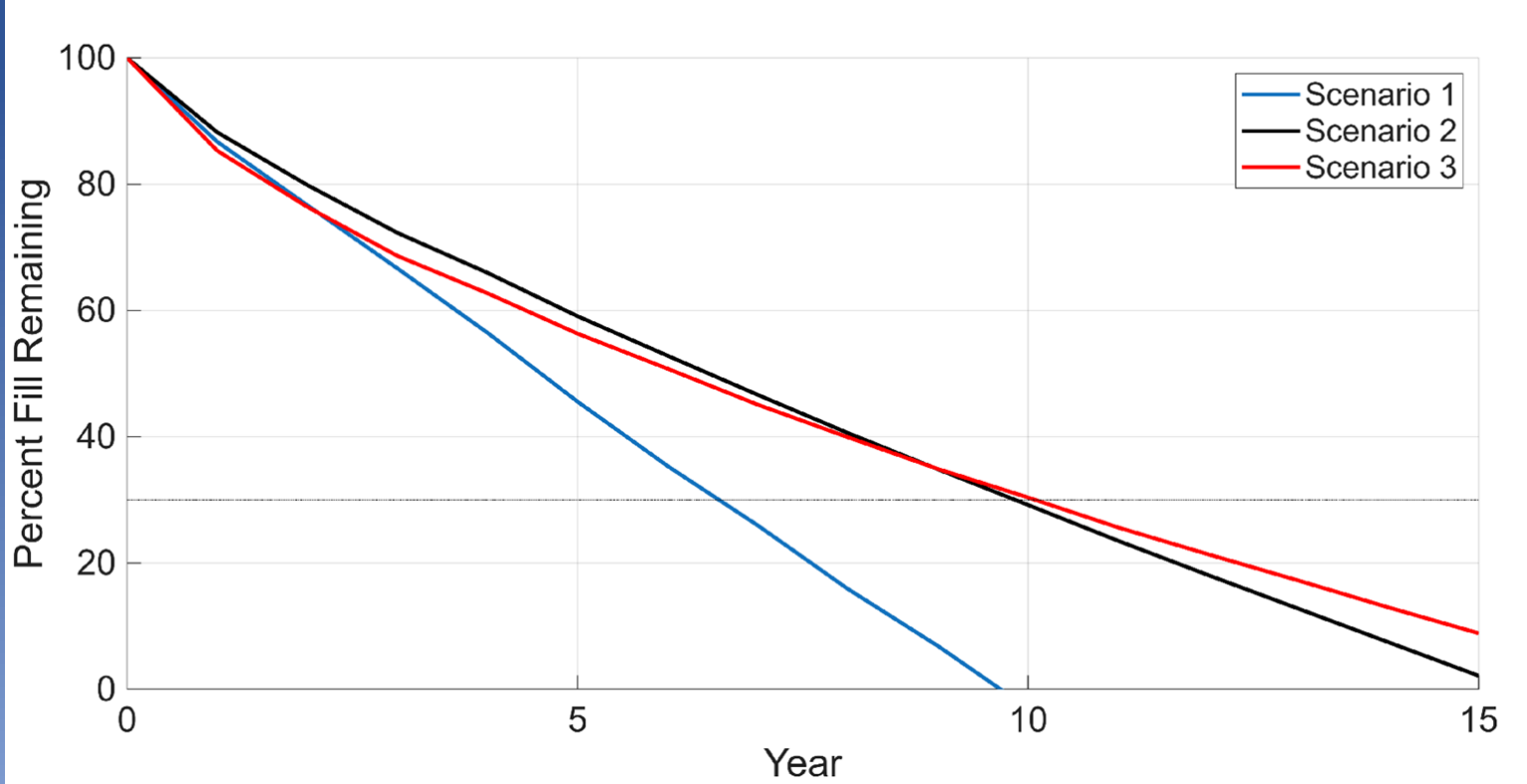
Project Area: Salisbury
Mitigation Options:
Nourishment Scenarios



25 ft berm 50 ft berm 75 ft berm

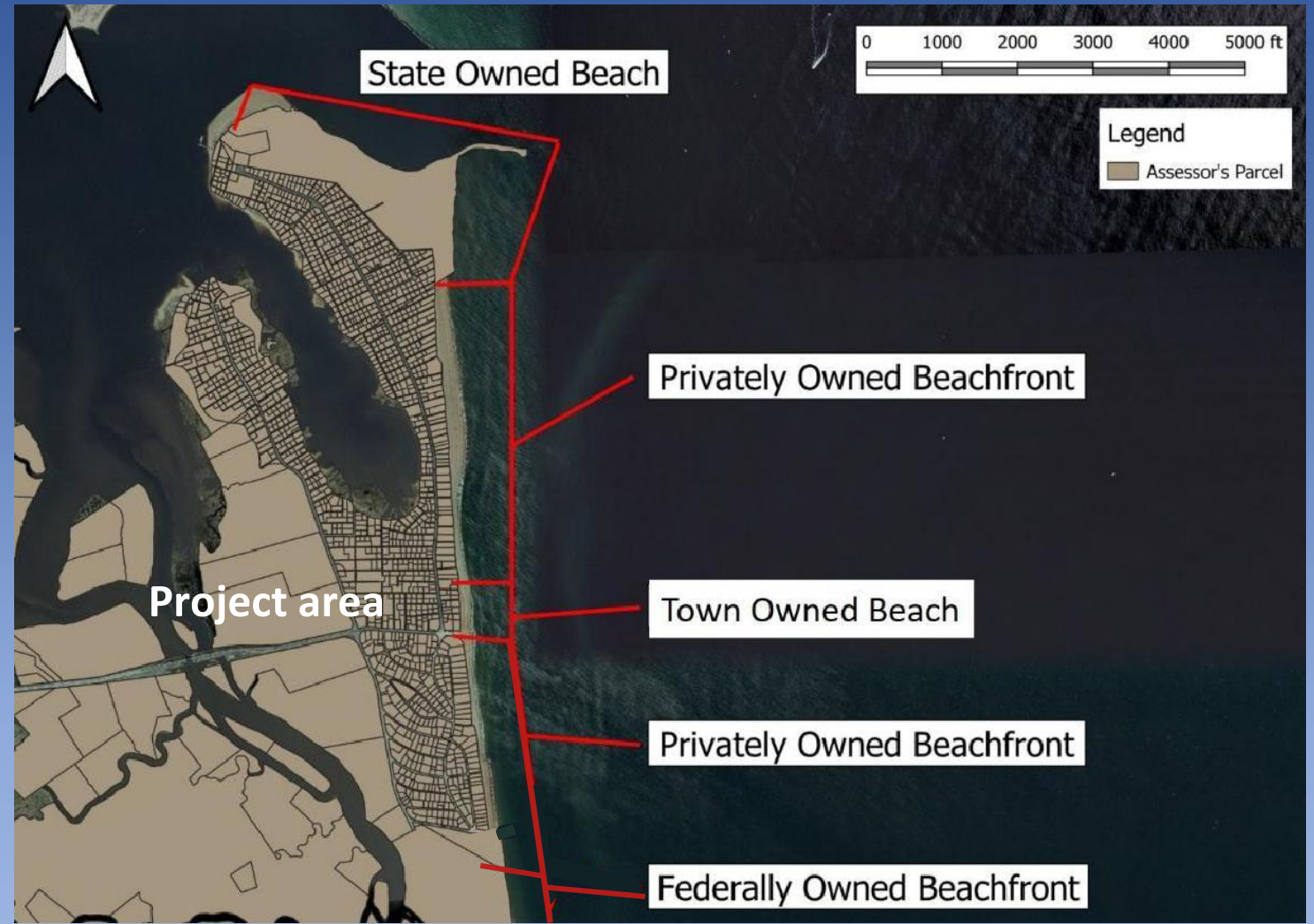
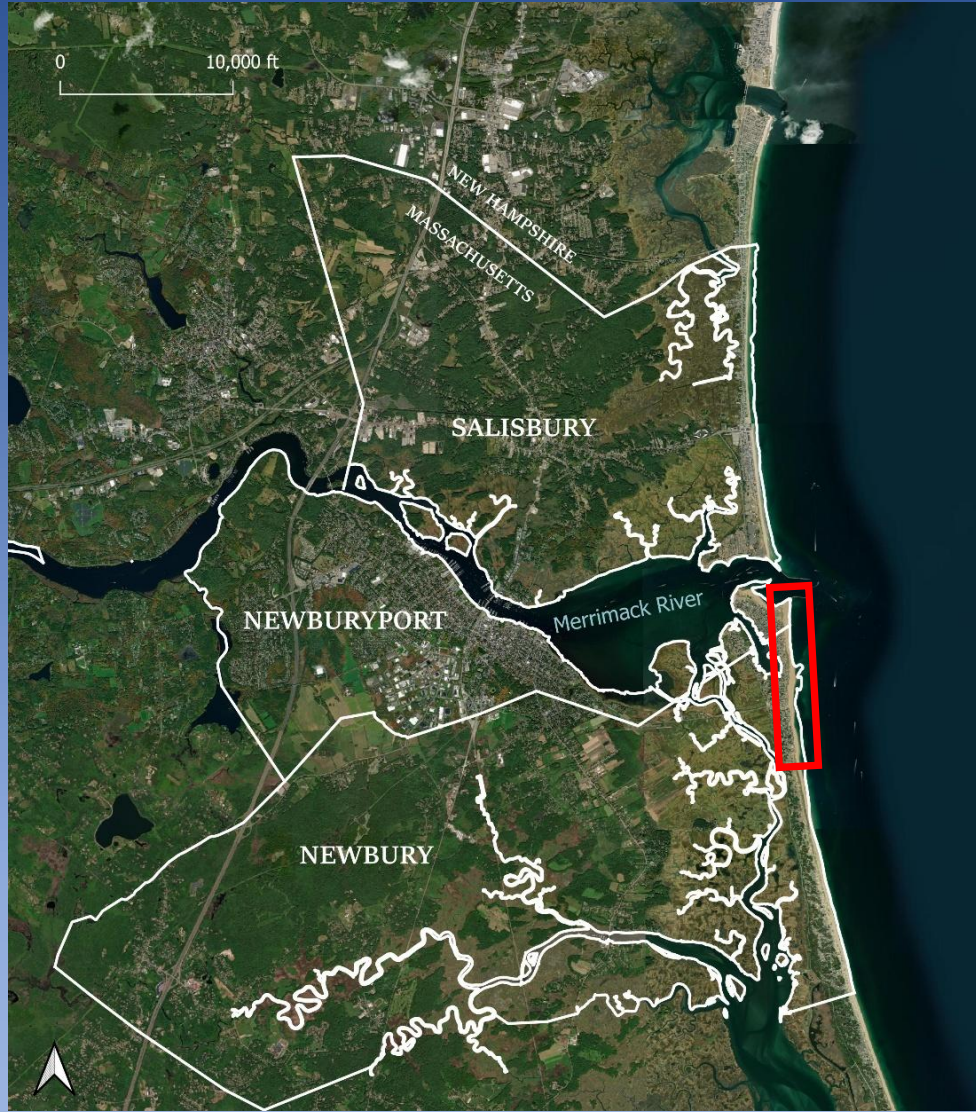
*Beach width not to scale

Project Area: Salisbury
Nourishment Scenarios



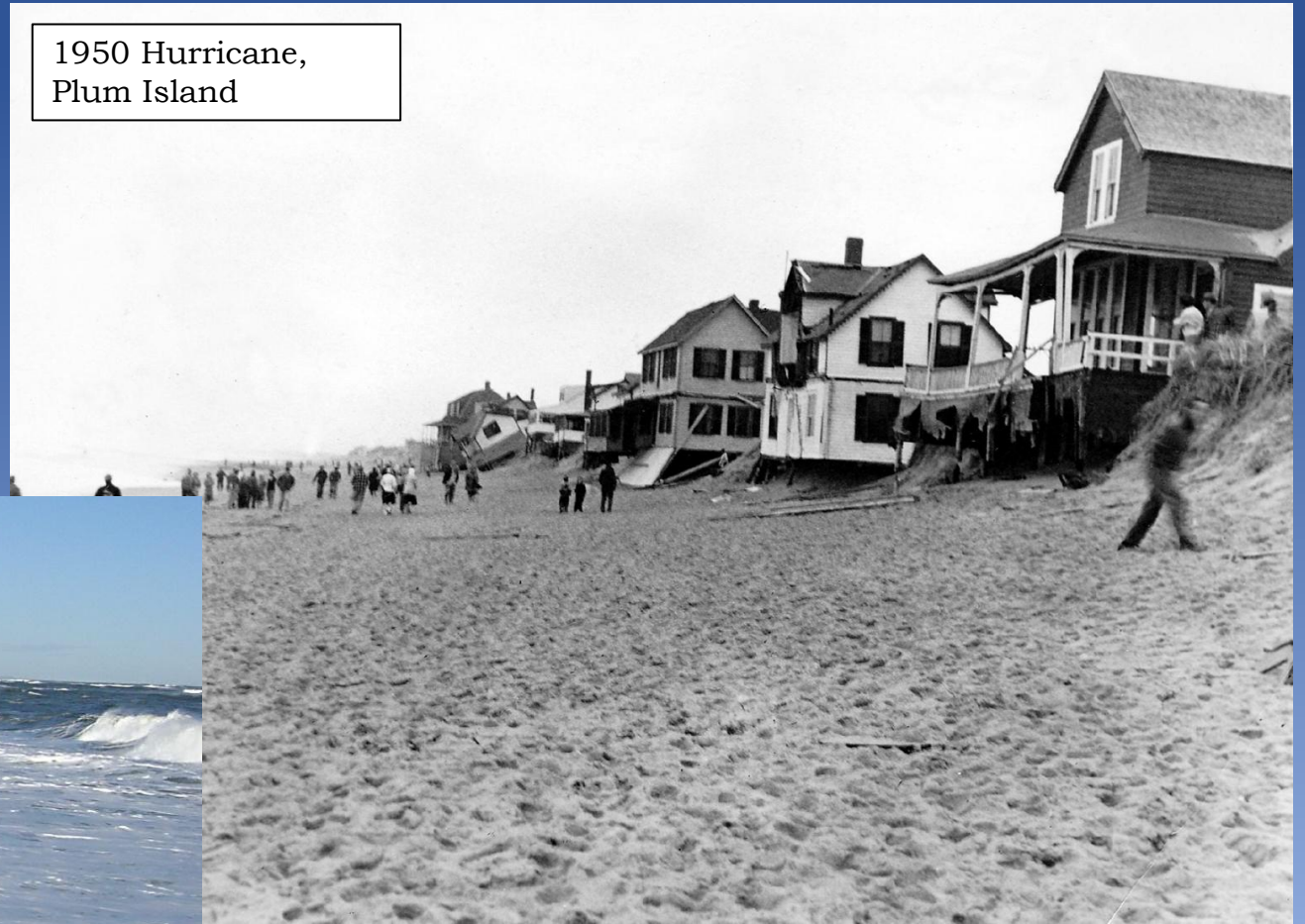
Scenario	Volume (cu-yd)	Berm width (ft)	Fill length (ft)	Year of 30% fill remaining
1	110,000	25	9,000	6.6
2	180,000	50	7,000	9.9
3	200,000	75	5,000	10.1

Project Area: Plum Island



Project Area: Plum Island, Historic conditions

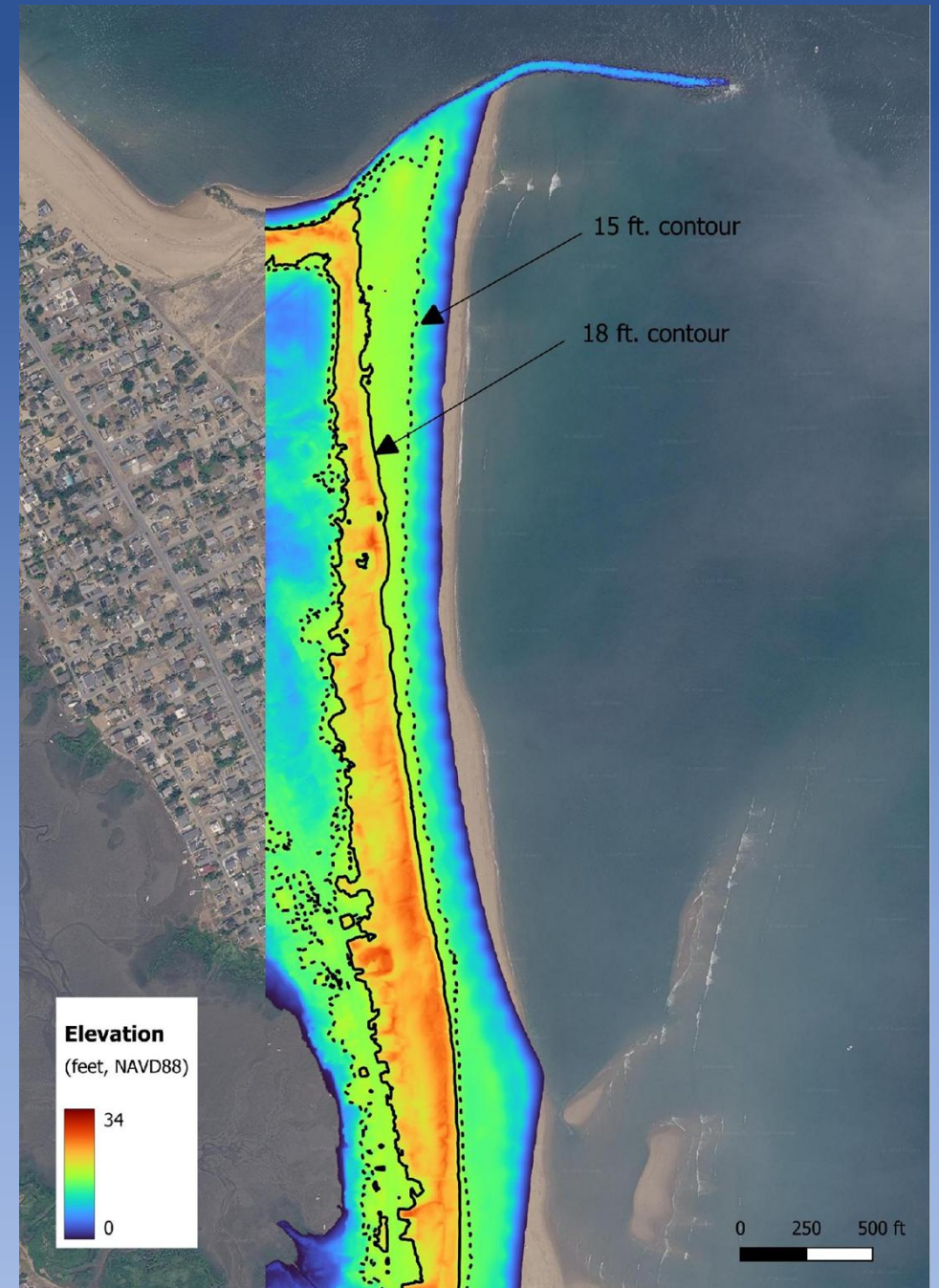
1950 Hurricane,
Plum Island



January 28, 2008 2:09 pm edt

Project Area: Plum Island, Existing conditions

- More dune protection than other sites



Project Area: Plum Island, Erosion hot spots

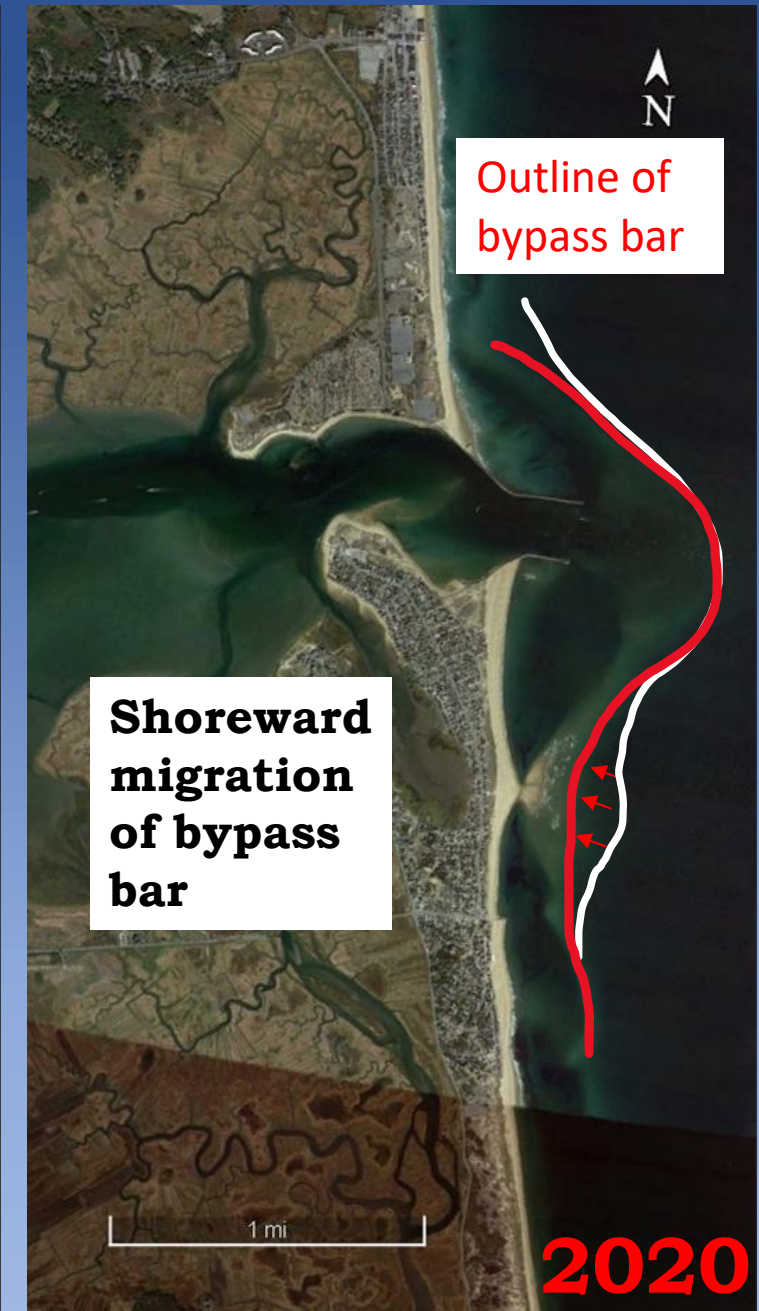


Rocks placed by residents along dune line in storm aftermath

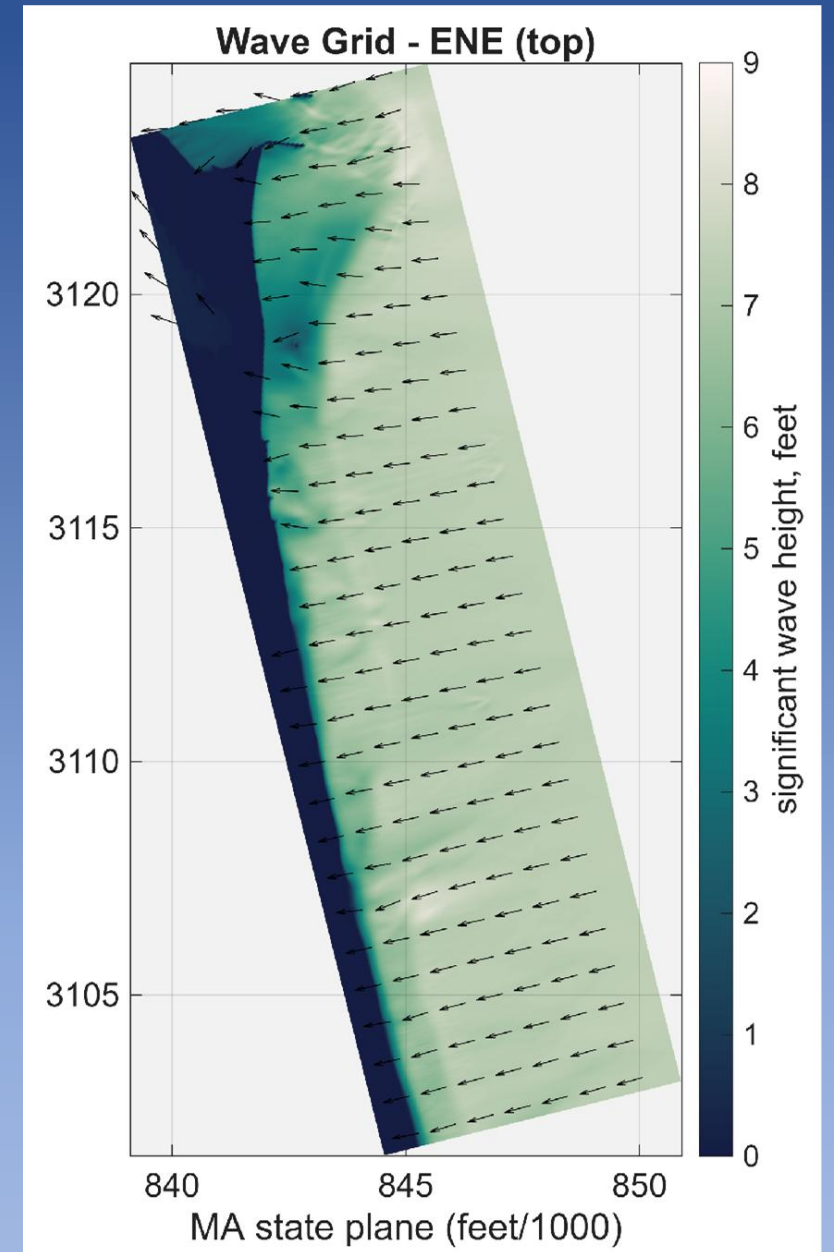
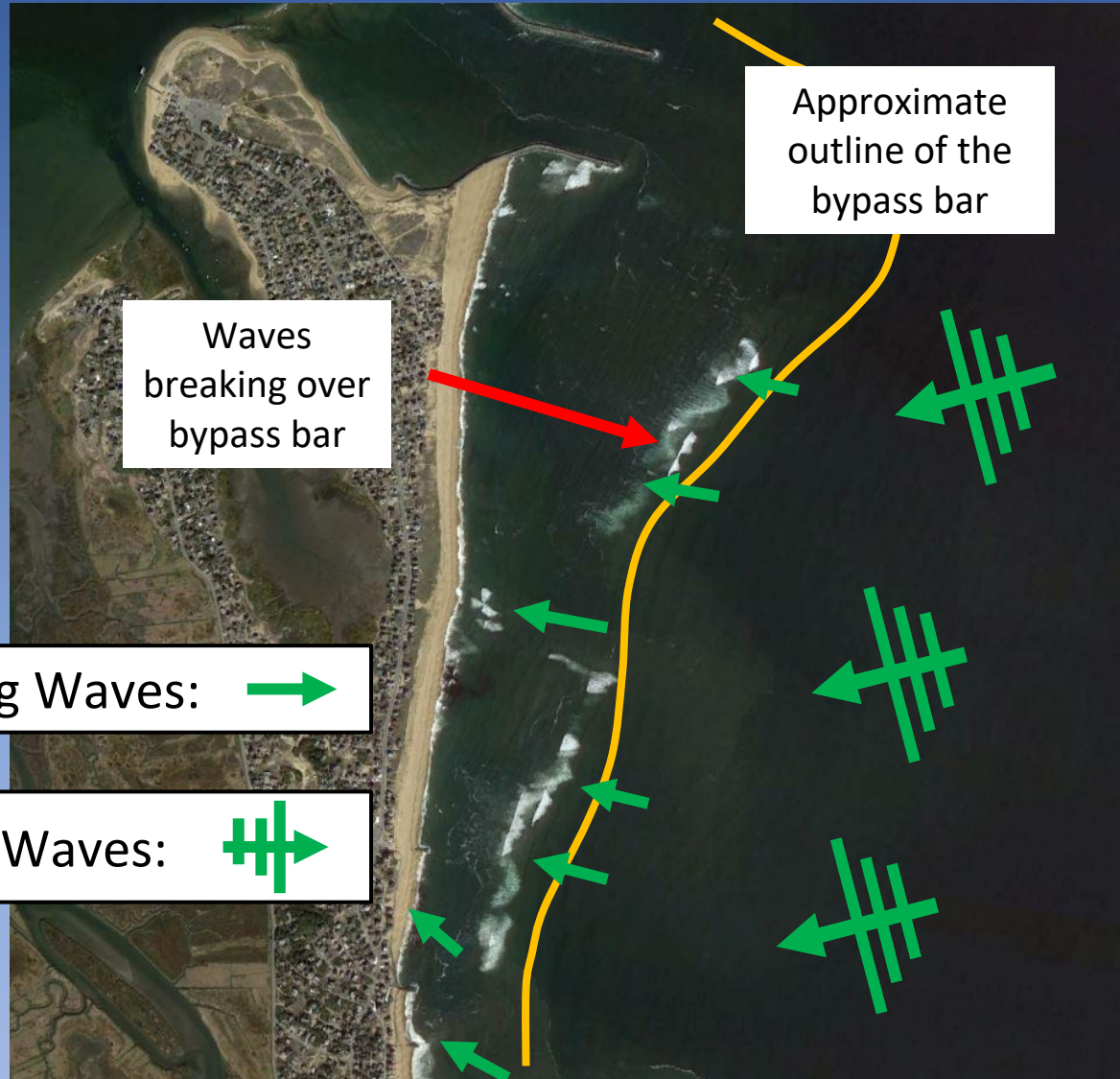


Project Area: Plum Island, Bypass Bar Effects

- Shelters Plum Island from waves
- Provides sediment source to Plum Island
- Refracts waves to drive northern transport
- Erosion hotspot changes based on bypass bar location



Project Area: Plum Island, Wave results



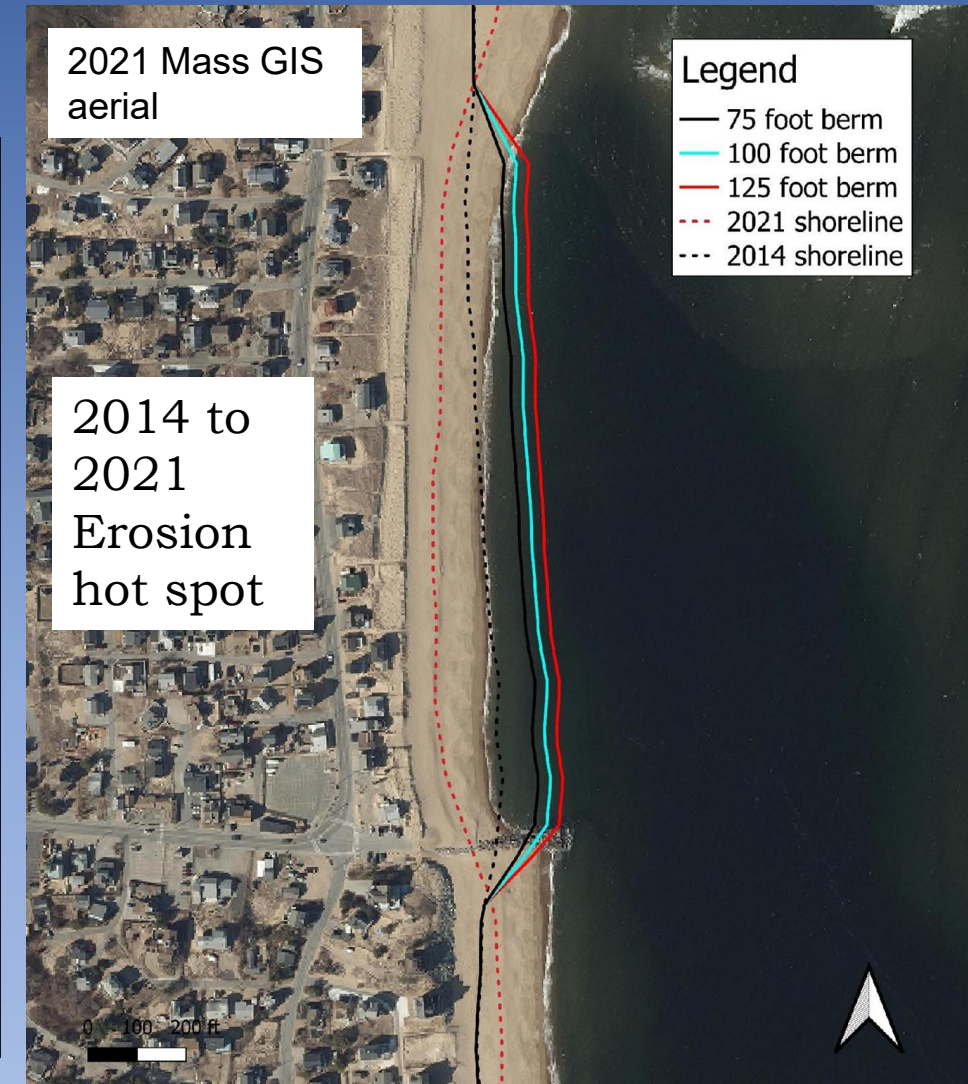
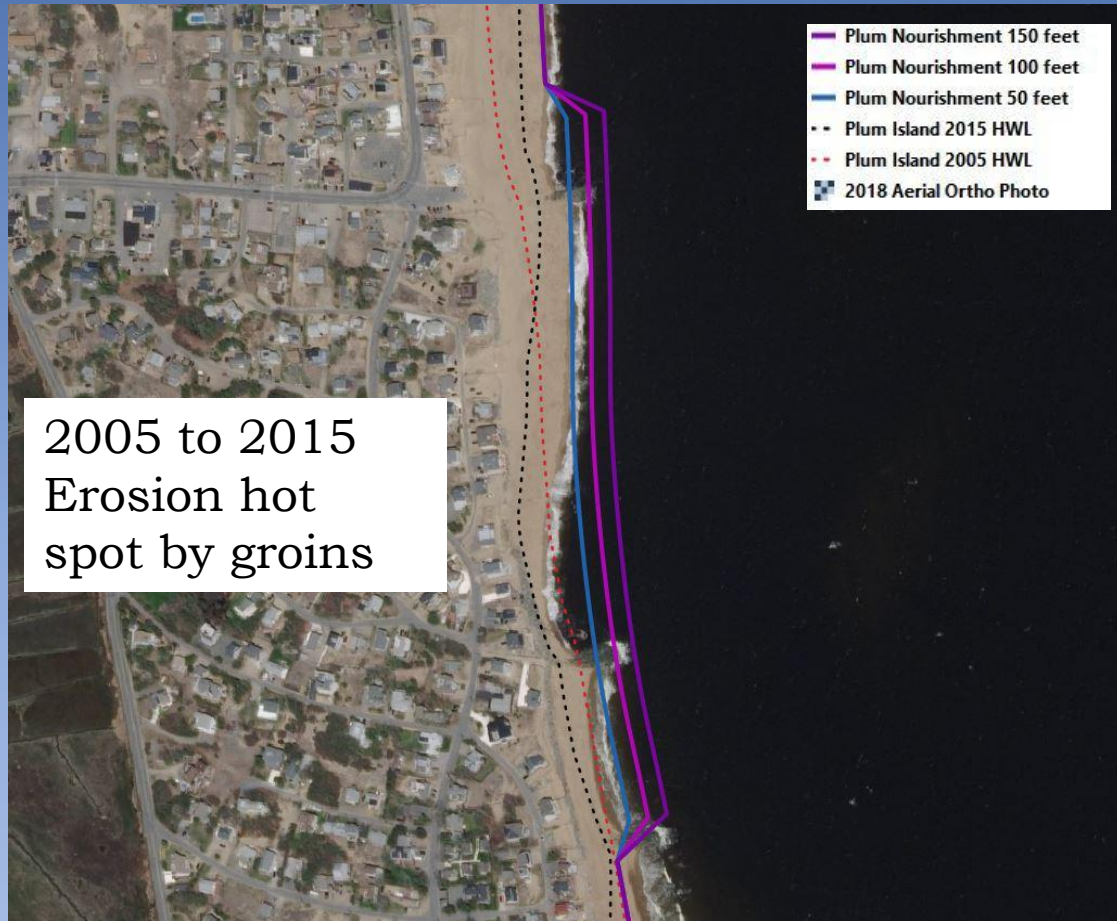
Project Area: Plum Island, Shoreline Change

- Overall significant accretion since jetty reconstruction
- Erosion hotspot resolved between 2021 to 2026

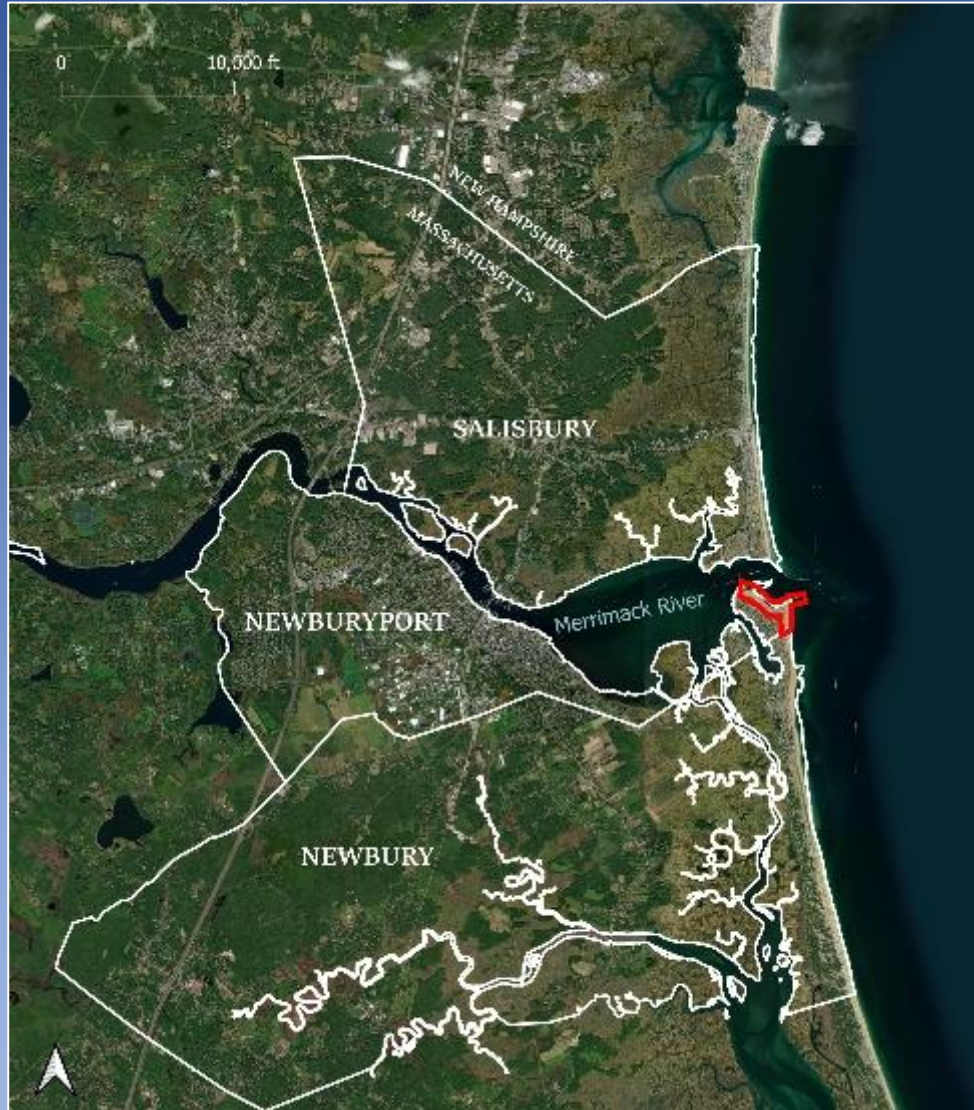


Project Area: Plum Island, Nourishment Scenarios

- Present conditions: accretion along entire shoreline
- Monitoring of bypass bar location and development of erosion hot spots
- Future nourishment location determined based on development of erosion hot spot



Project Area: Reservation Terrace



Project Area: Reservation Terrace, Historic Conditions

Storm of Feb. 1969,
Reservation Terrace



Project Area: Reservation Terrace, Storm Conditions

2022, Pre-nourishment

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MASSACHUSETTS

Damage to This Plum Island House Shows the Power of Friday's Winter Storm

The second floor was left hanging over empty space because of the damage, firefighters said

By Asher Klein • Published December 24, 2022 • Updated on December 24, 2022 at 10:22 pm

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A damaged vacant home on Massachusetts' Plum Island after a storm blew through on Friday, Dec. 23, 2022.

The powerful storm that hit New England Friday washed away a wall on the first floor of a beachfront house on Massachusetts' Plum Island, firefighters said Saturday.

The already-vacant house on 73rd Street at Reservation Terrace was being monitored by the Newburyport fire and building departments Saturday, according to fire officials. It "has long been a victim of ongoing erosion on Plum Island," they said in a statement.

PITA NEWSLETTER

SUMMER 2023 ISSUE 1

During project

RESERVATION TERRACE AND RIVER DREDGING PROJECT UPDATE

Written by Lela Lischke Wright and Susan Grillo

Life along Reservation Terrace has been anything but dull. For the 1st time in 3 years, this neighborhood can stop watching the rising tide and breathe a bit easier! Over the past 5 years we have become accustomed to our ever-changing landscape: once dunes covered in seagrass (2018), then giant mounds of sacrificial sand (2019), rows of concrete blocks (2020), heaps of tattered supersacks (2021), boulders along the water's edge (2022), and today it has become a HUGE Beach! Thanks in part to the Norfolk Dredging Company and the super-sized (365') dredger built in 2022, the Delaware!



While everyone agrees that it is a relief to see the river so far away, we are keenly aware that this sand will be swept away over time. The dredging was necessary to keep the channel open, and after 12 years it was well overdue. The sand could have been placed somewhere offshore, but fortunately for Plum Island, it was available to be used here instead.

There is currently a study being done to best determine a permanent solution to the problematic gyre created by the jetty repair almost 10 years ago. Unfortunately, this is not an imminent project for the USACE. It will take some time for necessary approvals and funding. We can only hope it is not too far off.

The Merrimack River Beach Alliance (MRBA) meetings at PITA Hall have been instrumental in providing a table for these discussions and a forum to allow residents voices to be heard. Many thanks to Senator Bruce Tarr for chairing these meetings and making all of this possible!

As of the April 21st MRBA meeting, the next action steps include:

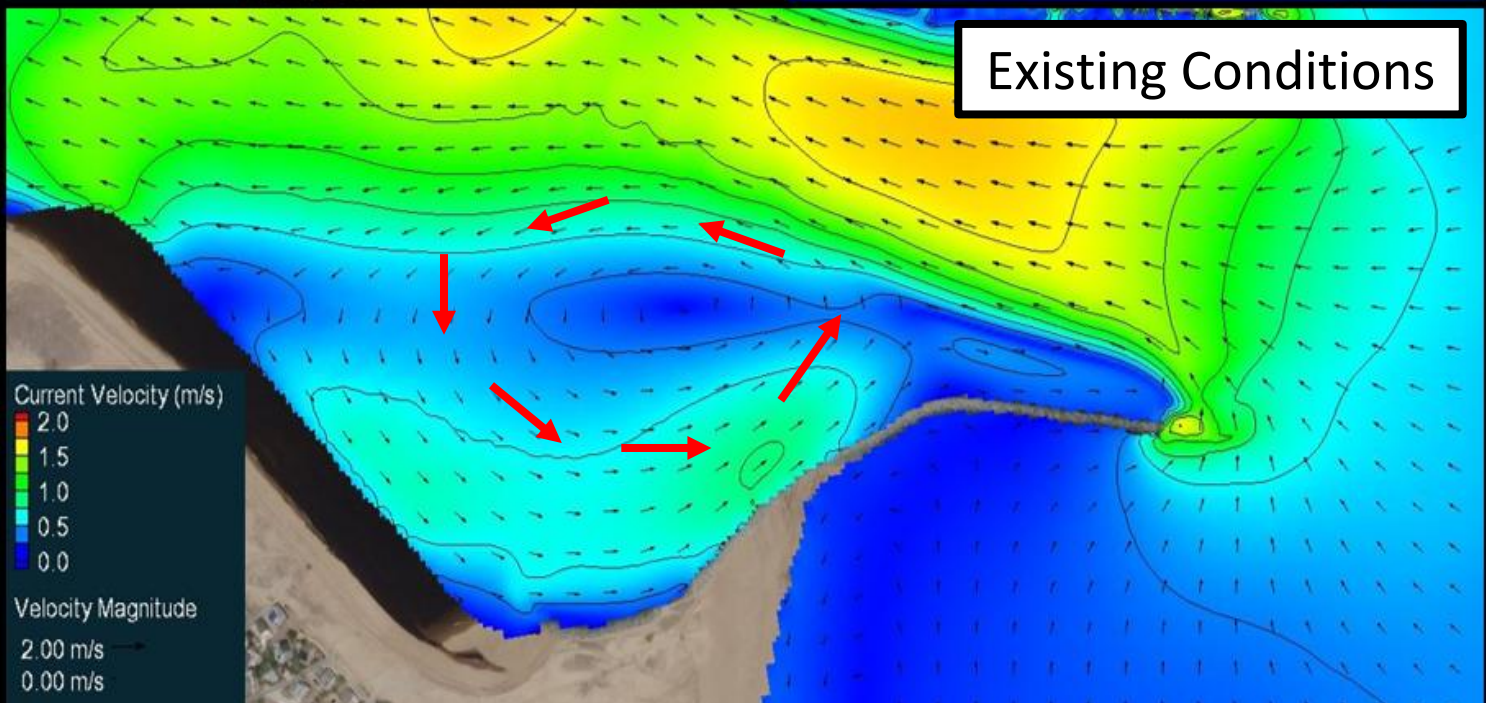
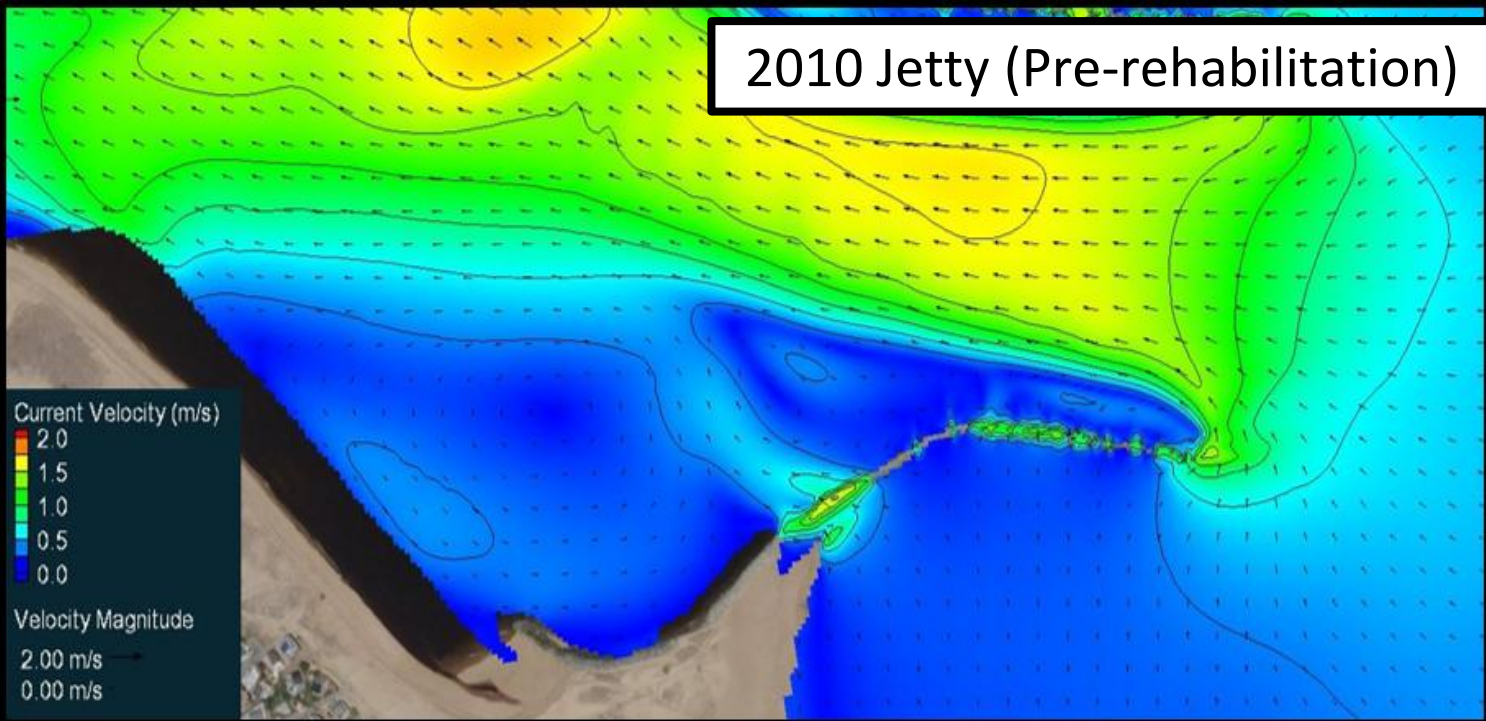
- planting beach grass to secure the sand (this has now been completed by Gregg Moore from University of New Hampshire and his Team of students along with several local volunteers)

Project Area: Reservation Terrace, Current Conditions

- Rapidly eroding shoreline
- Sediment starvation
- Inlet tidal circulation (see next slide)



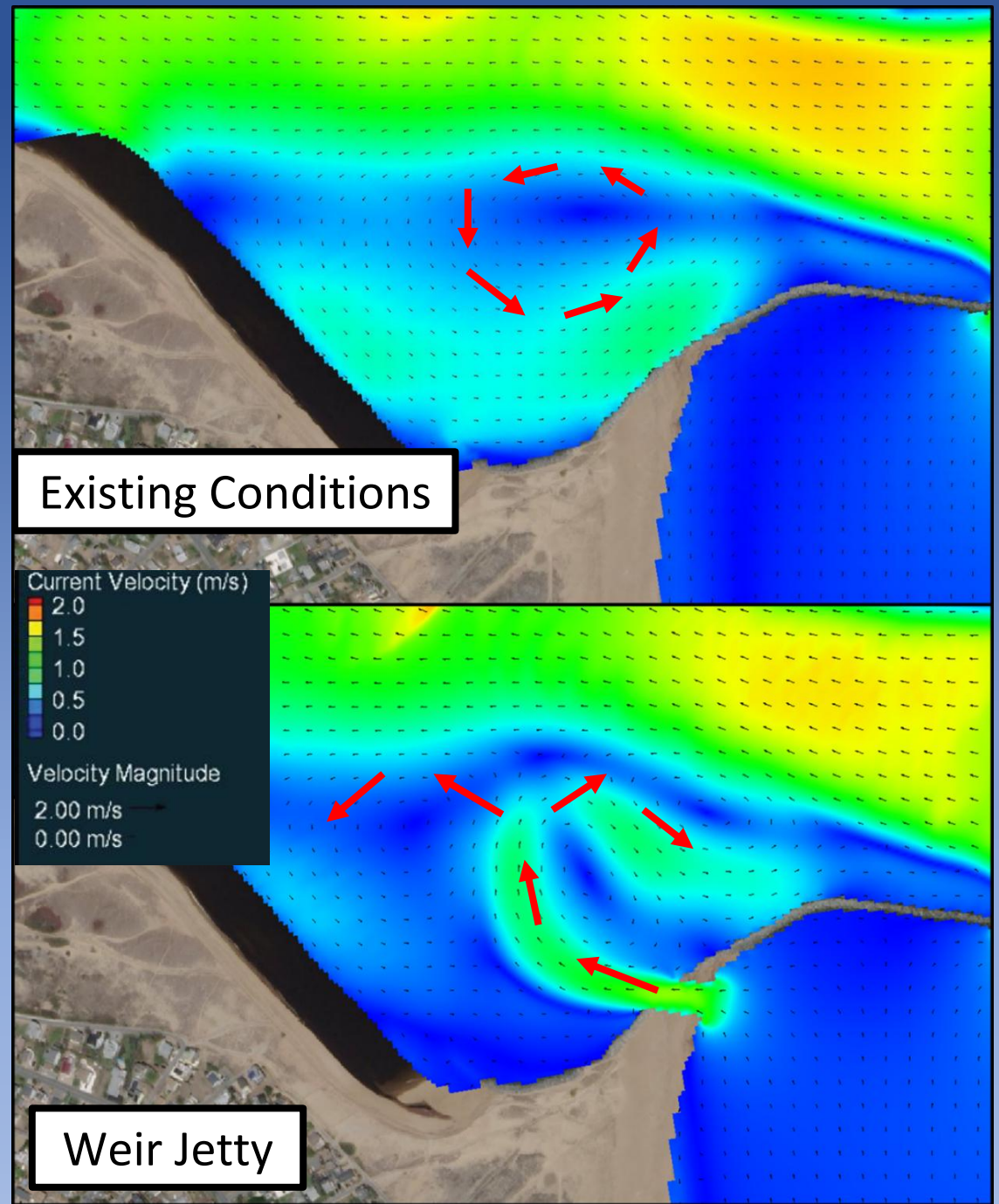
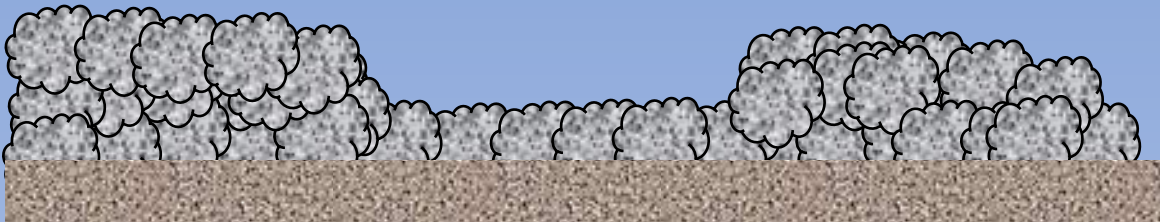
Project Area: Reservation Terrace,
Gyre Formation



Project Area: Reservation Terrace, Weir Jetty

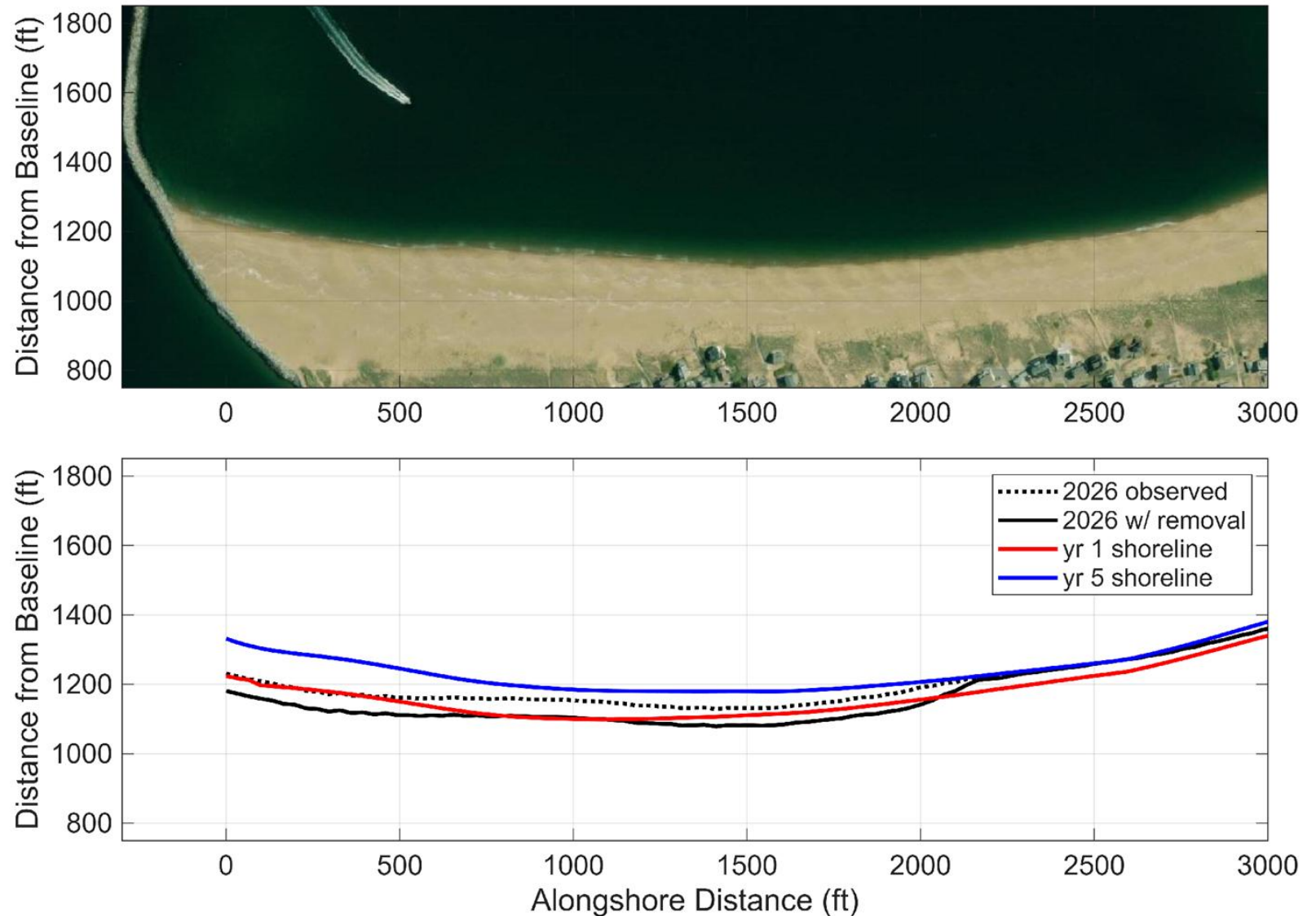
- Weir Jetty solution is being considered by USACE
- Plum Island bypass scenario could provide sediment in meantime

Weir Jetty



Project Area: Plum Island/ Reservation Terrace Augmentation Source

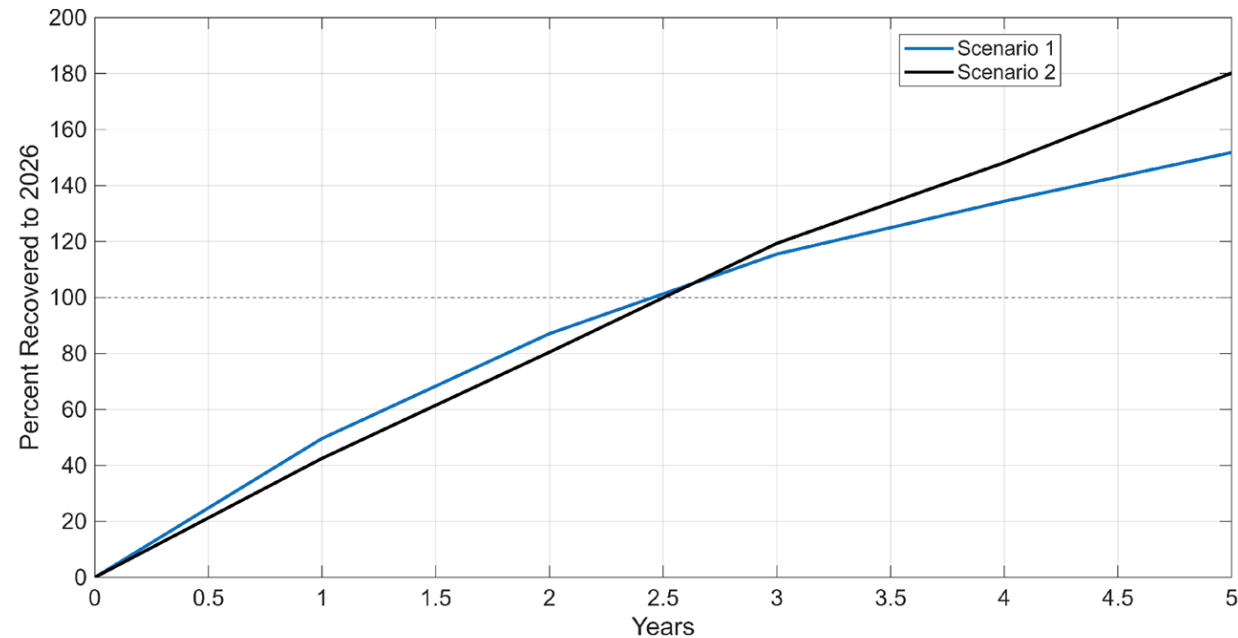
- By year 5, shoreline has accreted past 2026 shoreline



Project Area: Plum Island/ Reservation Terrace, Augmentation Scenario

Scenario	Volume (cu-yd)	Berm width (ft)	Removal length (ft)	Year to 100% recovery
1	100,000	-100	1,000	2.45
2	145,000	-50	2,000	2.5

- Excavate region of beach near jetty as source for Reservation Terrace or for erosion hot spot along Plum Island (bypass or back-pass alternatives)



Project Area: Plum Island/ Reservation Terrace, Augmentation Scenario

Scenario	Volume (cu-yd)
1	100,000
2	145,000

Inlet Dredging History

- 40,000 cu-yd/yr since 1961
- 1.3M cu-yd loss to system
 - (placed offshore- 1930 to 1977)
- 1.1M cu-yd loss to subject beaches
 - (placed on bypass bar-1981 to 2010)

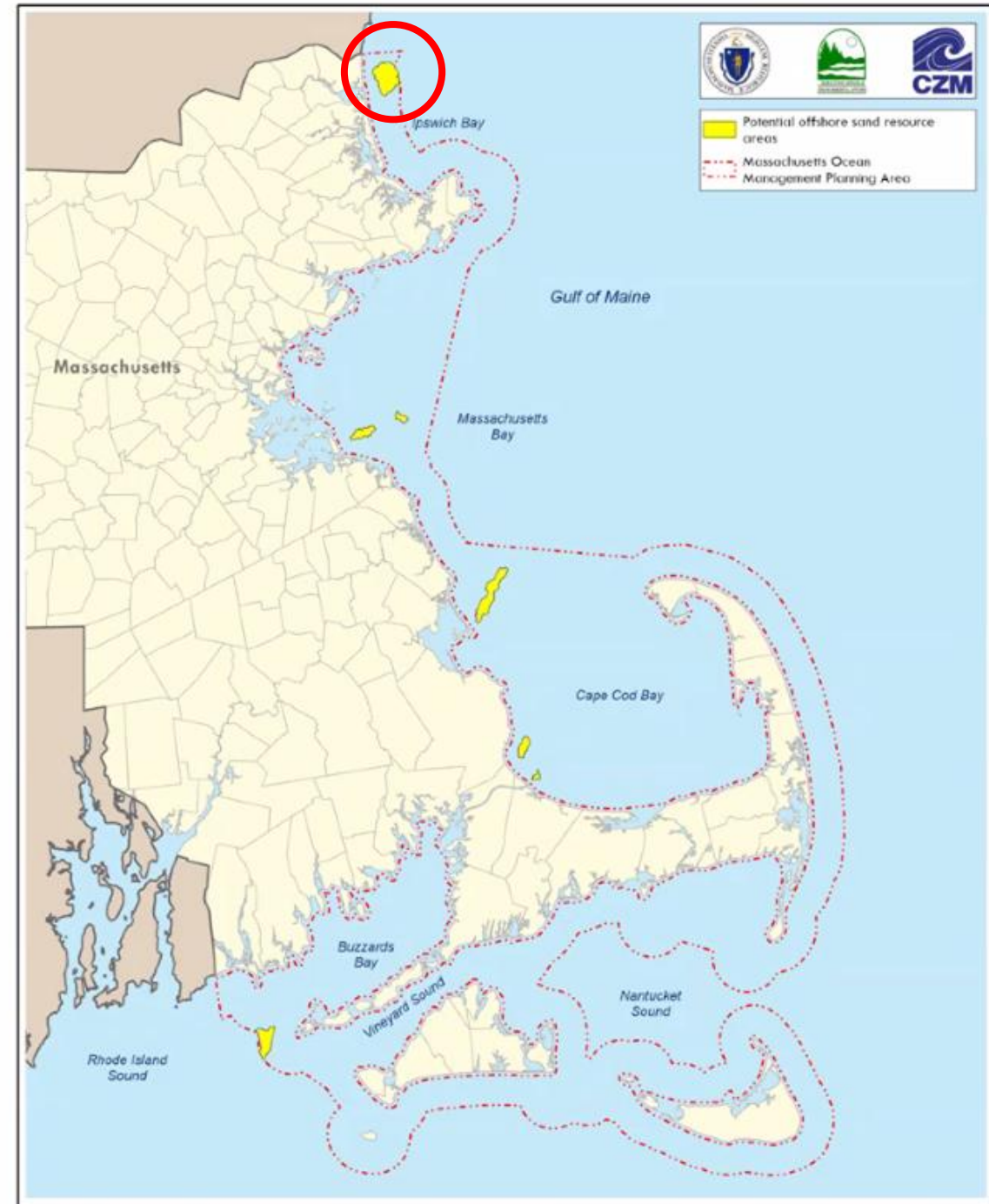
Inlet Dredging History

Date of Works	Amount (CY)	Disposal Location
1937-1938	335,000	Offshore Placement
August, 1961	250,000	Offshore Placement
May, 1964	131,000	Offshore Placement
May, 1966	50,000	Offshore Placement
July, 1968	86,000	Offshore Placement
July, 1970	106,190	Offshore Placement
October, 1970	183,230	Offshore Placement
September, 1973	93,650	Offshore Placement
July, 1977	54,000	Offshore Placement
July, 1981	102,600	Bypass Bar
August, 1983	123,500	Bypass Bar
September, 1983	154,000	Bypass Bar
September, 1987	156,265	Bypass Bar
July, 1990	62,460	Bypass Bar
September, 1991	135,290	Bypass Bar
May, 1993	125,040	Bypass Bar
September, 1996	125,386	Bypass Bar
August, 1999	145,017	Bypass Bar
October, 2010	165,500	Salisbury Beach and Plum Island
March, 2023	226,000	Reservation Terrace

**This does not include the dredging done from the Piscataqua River in 2022.

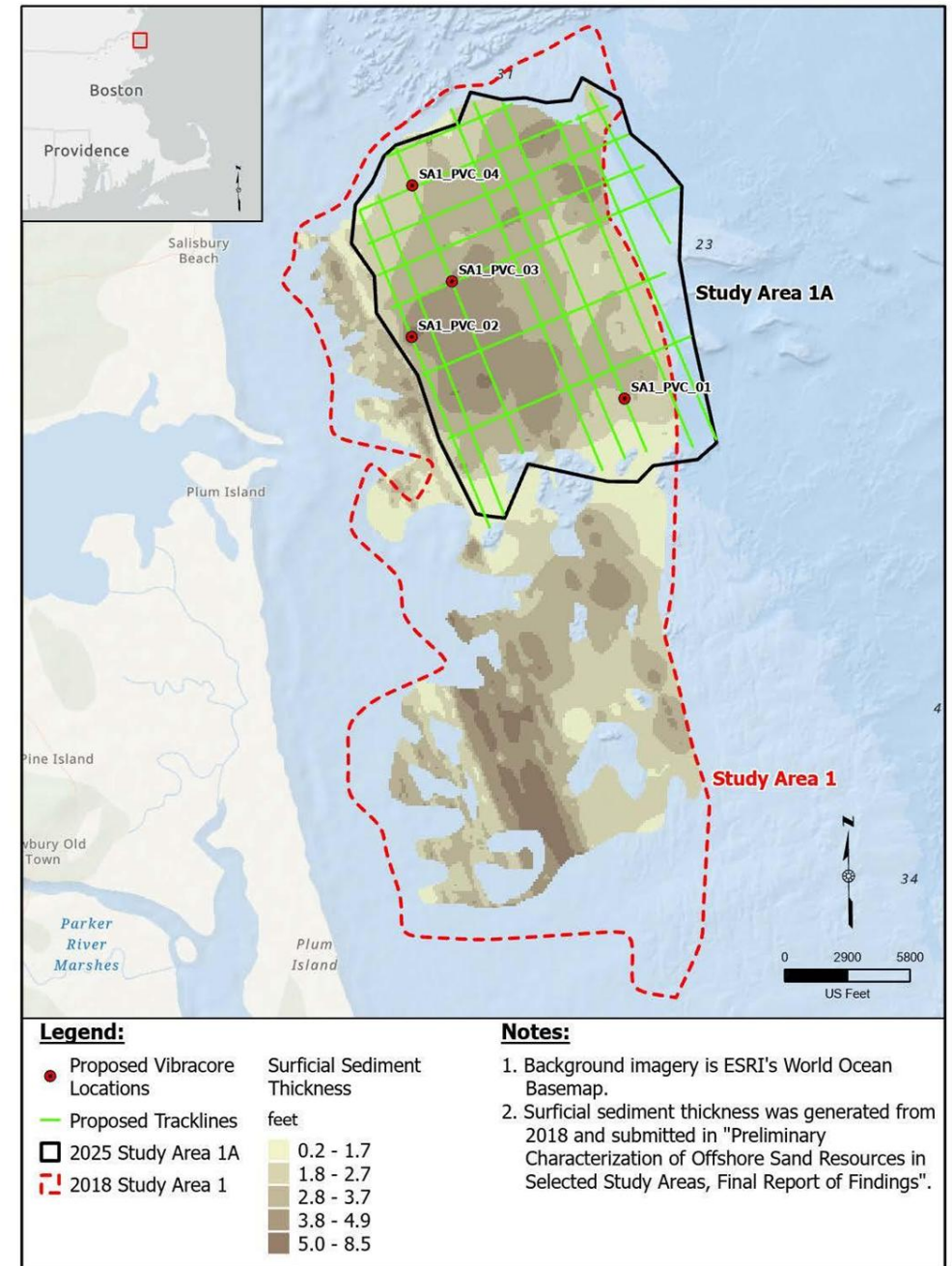
Potential Nourishment Sediment Sources

- Inlet maintenance dredging (40,000 cubic yards per year since 1960s)
 - 1,300,000 cu-yd loss from system (1930s to 1980) - material deposited offshore and permanently lost
 - 1,100,000 cu-yd loss from major beaches (1980 to 2010) – material deposited ‘nearshore’ - adjacent to bypass bar – lost to subject beaches
- Upland borrow sources
- Potential offshore borrow sources (shown right)



Potential Nourishment Sediment Sources

- Inlet maintenance dredging
- Upland borrow sources
- Potential offshore borrow sources
 - Deposit seaward of inlet includes a significant sand deposit
 - More analysis is required to characterize the site for both potential quality of material, as well as environmental considerations
 - Initial findings support more detailed exploration of this resource



Beach nourishment

Trucking example



Beach nourishment

Example of successful large-scale beach nourishment project Winthrop, MA





April 2008



August 2013



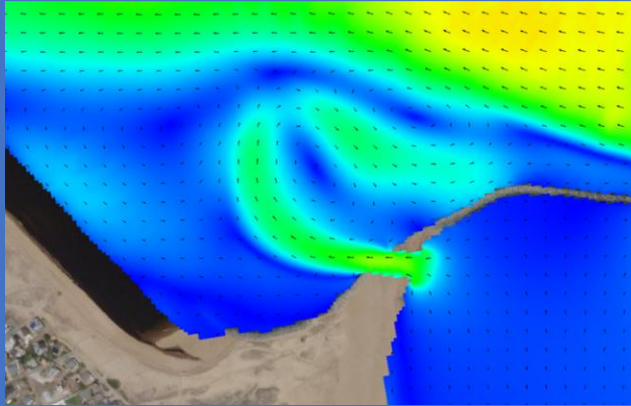
March 2015

Summary

Beach nourishment

- Most feasible option for long-term shore protection and resiliency
- Sediment bypassing or back-passing could be an option for Plum Island before South Jetty issue is addressed
- Large-scale Salisbury Beach nourishment shows promise

Jetty reconfiguration



- Stabilize Reservation Terrace
- Maintain Plum Island fronting beach

Nourishment sediment sources

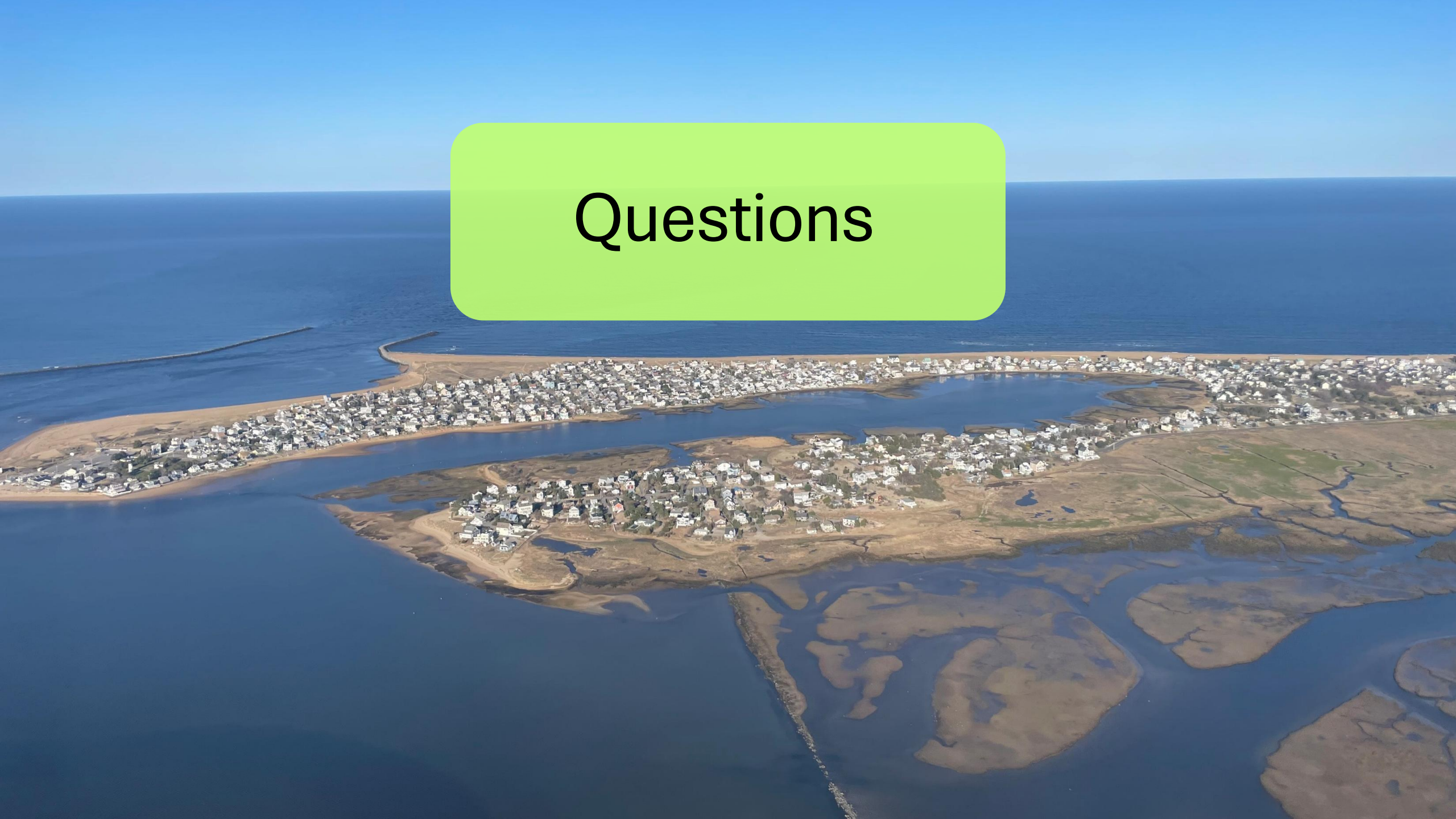


- Inlet maintenance dredging
- Upland borrow sources
- Potential offshore borrow sources

Thank you to our collaborators



Questions



Thank you for Joining us!

Please feel free to check out more information about the project and read the final report in July which will be posted to:

MAMRBA.gov

