Town of Westport

Coastal Processes 101

Atlantic Ave, The Knubble, East Beach

Community Meeting #2 – May 21st, 2025

Project Team

Town of Westport – Project Lead

- Michael Burris
- Chris Capone
- Diya Wheeler

Coastal Zone Management – Funder of Technical Work

- Sam Haines
- Rebecca Haney

EEA Municipal Vulnerability Preparedness Program – Funder of Outreach

- Courtney Rocha

Woods Hole Group

- Conor Ofsthun – Project Manager
- Brittany Hoffnagle – Outreach and Alternatives Analysis
- Justine Rooney – Beach Management Plans
- Adam Finkle, Mitch Buck – Site Survey Leads

Southeast Regional Planning & Economic Development District (SRPEDD)

- Kevin Ham
- Maria Jones

March 2025 – The Knubble

Source: WHG

Agenda

1. The Project
2. Coastal Processes
   - What is a Barrier Beach?
   - Geological Origins
   - Seasonal Changes
   - Storm Impacts
   - Sea Level Rise
   - Impact of Grain Size
   - What You Can Do To Help?
3. Project Timeline and Outreach Events
4. Discussion

Barrier Beach Management Plan

5

Project Goals

1. Understand existing conditions and natural resources
2. Examine vulnerabilities to erosion, flooding, and storms
3. Assess past and present management of Atlantic Ave, the Knubble, and East Beach barrier beaches
4. Evaluate a range of management and adaptation strategies to enhance resilience
5. Incorporate community feedback into planning mechanisms within Town

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What are the outcomes of the project?

1. **Establishment of Existing Conditions**
   - Wetland resources
   - Sediment analysis
   - Topographic survey
2. ***Draft* Near-Term Management Plan for current conditions**
   - Balancing conservation & human use
   - Reduce storm damage
   - Increase resiliency
3. **Data to support mid- to long-term options**
   - How will changing weather impact the beach in coming decades
   - How can the Town work together to create adaptive plans

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Coastal Processes in Westport

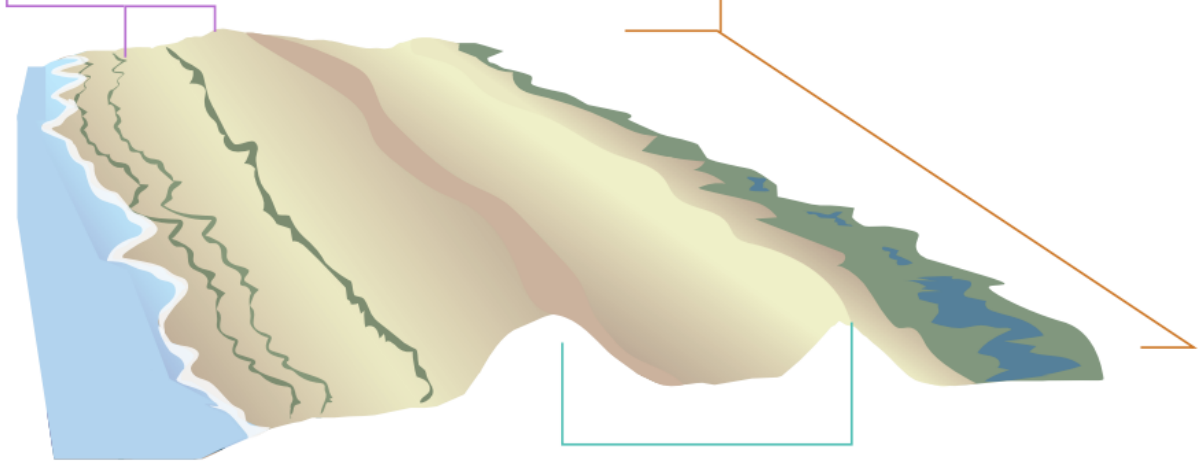
What is a Barrier Beach?

Beach Face

"The side of the barrier beach facing the ocean where waves crash is called the **beach face**. Here, sand is constantly being deposited, shifted, and reshaped by the tides and wave energy.

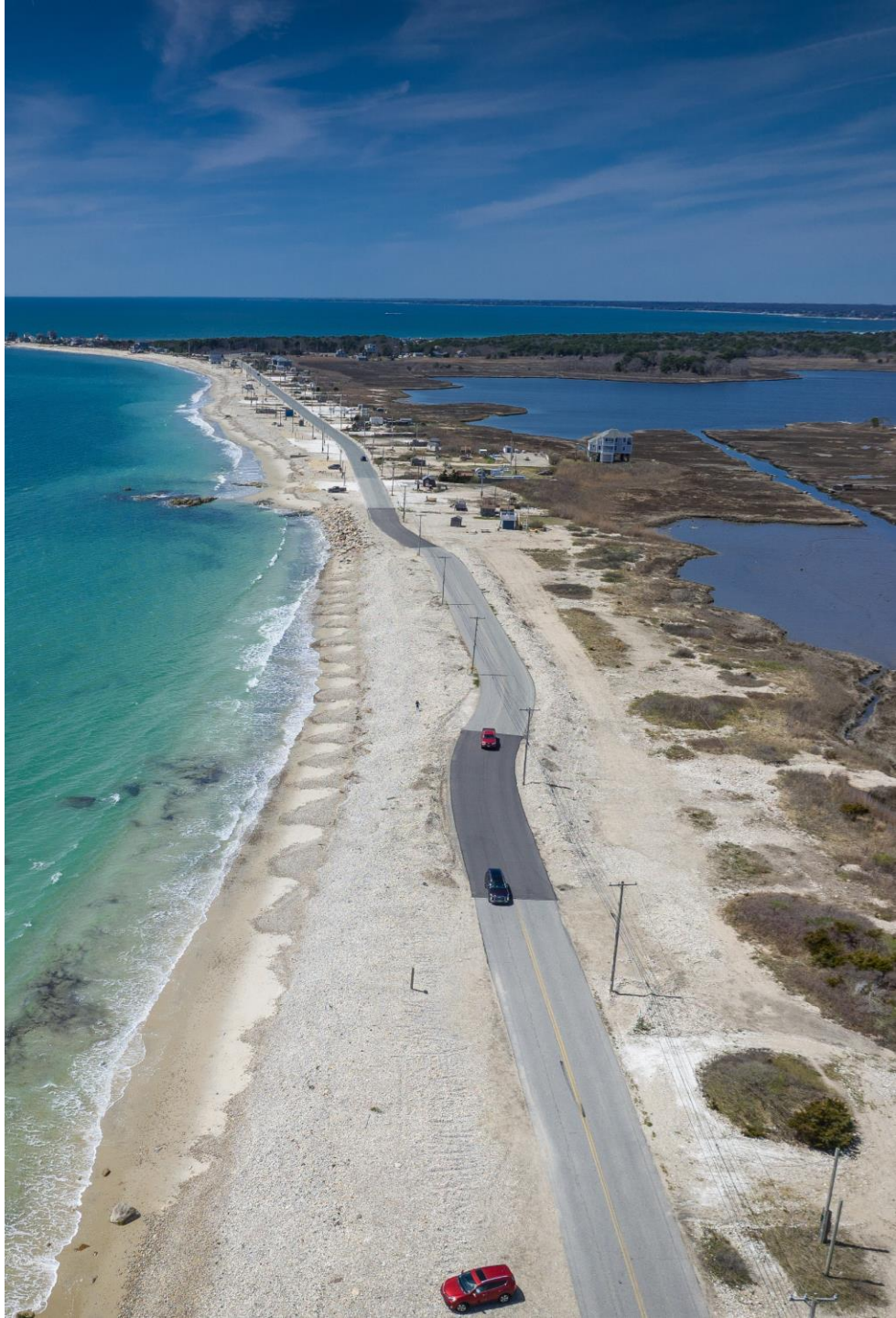
Back Barrier

The landward side of the barrier beach consisting of bodies of water such as bays and lagoons, as well as marshes, tidal creeks, and tidal flats is defined as the **back barrier.** These systems are protected from direct wave action, and their low energy environment provides essential nursery and feeding habitat for many coastal organisms. Back barriers are also vital for water filtration and flood protection.



Dunes

Behind the beach face, sand **dunes** form. Dunes are small hills or ridges of sand, gravel, and cobble formed by wind and waves that are often stabilized by beach grass and other vegetation, which helps trap the sand.



Why are barrier beaches important?

Barrier beaches are essential for coastal resilience and ecosystem health in Westport. Their natural features provide several key benefits:

Storm Damage Prevention & Flood Control:

Barrier beaches act as natural shields, protecting inland areas from storm surge and powerful waves.

During storms, they absorb wave energy reducing flooding impacts on nearby communities.

Erosion Control:

Dunes provide a natural source of sand, which is gradually released during storms. This mitigates beach erosion and protects inland areas from being flooded or washed away.

Wildlife Habitat:

Barrier beaches provide critical nesting and feeding grounds for protected shorebirds (Piping Plovers and Terns).

The tidal flats and marshes of the back barrier support organisms like clams, crabs, and small fish.

Photo Sources: American Bird Conservancy

Recreation and Economy:

Beaches are unique and attractive sites for residents, beach clubs, visitors, and tourists; Westport's beaches are a vital asset for the local tourist economy.

How do barrier beaches form?

Barrier beach development depends on sand availability.

Barrier beach development depends on sediment sources, or tiny pieces of land that can break down to form sand. Primary sources of sand for coastal Massachusetts include:

Eroding cliffs, headlands, and glacial deposits:

The Massachusetts shoreline gradually wears away, releasing sand into the water. The erosion of glacial landforms from thousands of years ago is a primary source of the sand, gravel, and cobble that now supply coastal areas.

Erosion in Nantucket

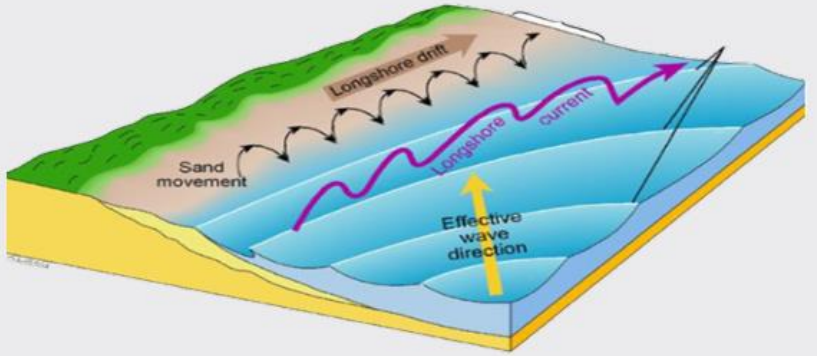
Rivers and estuaries:

Waterways carry sediment from inland areas to the coast, adding material to beaches.

Longshore currents transport sediment to build up barrier beaches.

Wind direction and shoreline orientation drive waves to the coast at an angle, creating **longshore currents**, currents that run parallel to the shore and carries water and sediment in a zigzag along the coast. As waves wash ashore, some sediment is deposited, and some remains suspended in the wave.

As this process repeats, large amounts of water and suspended sand shift along the coast in a predominant direction.



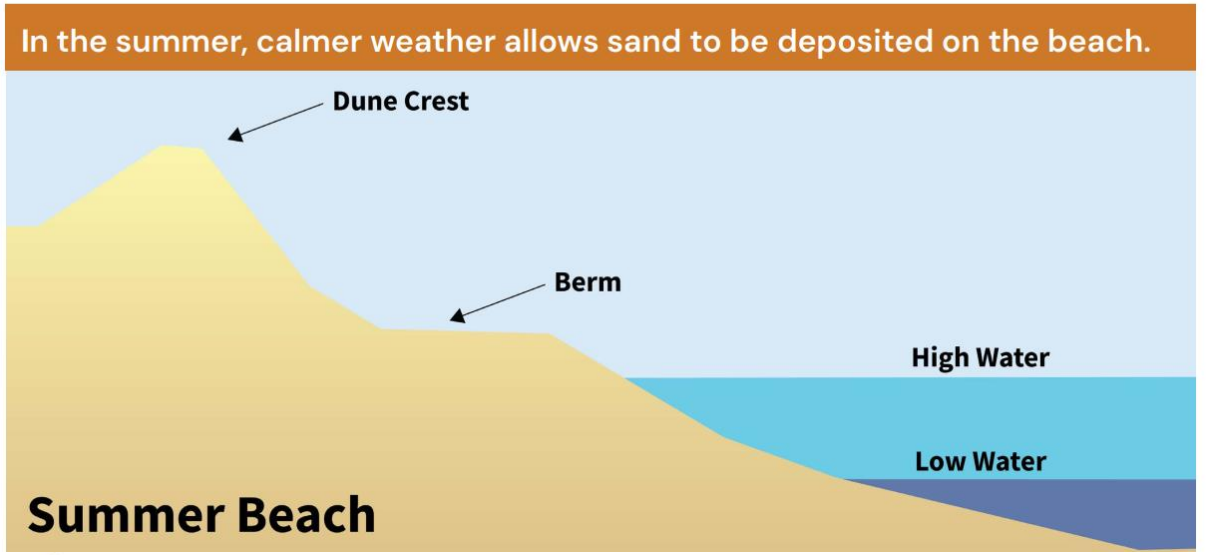
Over time, longshore currents can form sand spits and barrier beaches by depositing these transported sediments in the same location.

How do seasonal changes affect Westport's coast?

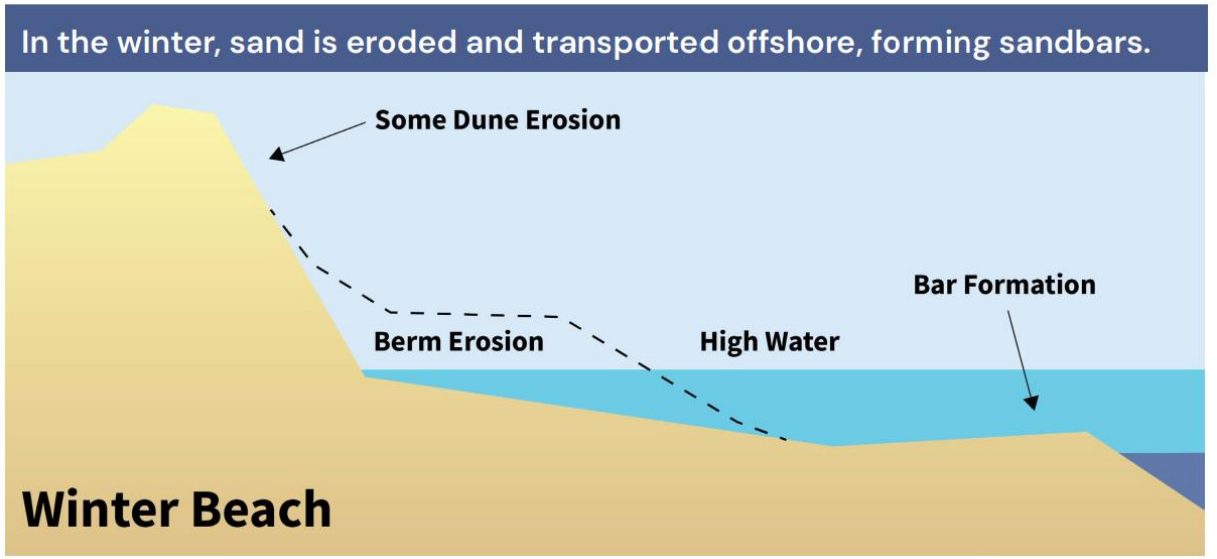
Summer in New England is characterized by prevailing winds from the southwest and an overall lower wind speed, which creates gentler and smaller waves that are depositional in nature. During this time, sand builds up, creating a higher, wider, and more gently sloped beach.

In the winter, prevailing winds from the northwest combined with storms and Nor'easters create a much more erosional and high energy environment on the beach. This increased windspeed causes winter waves to cut into the beach, transporting the sand offshore and narrowing the beach.

SUMMER BEACH PROFILE



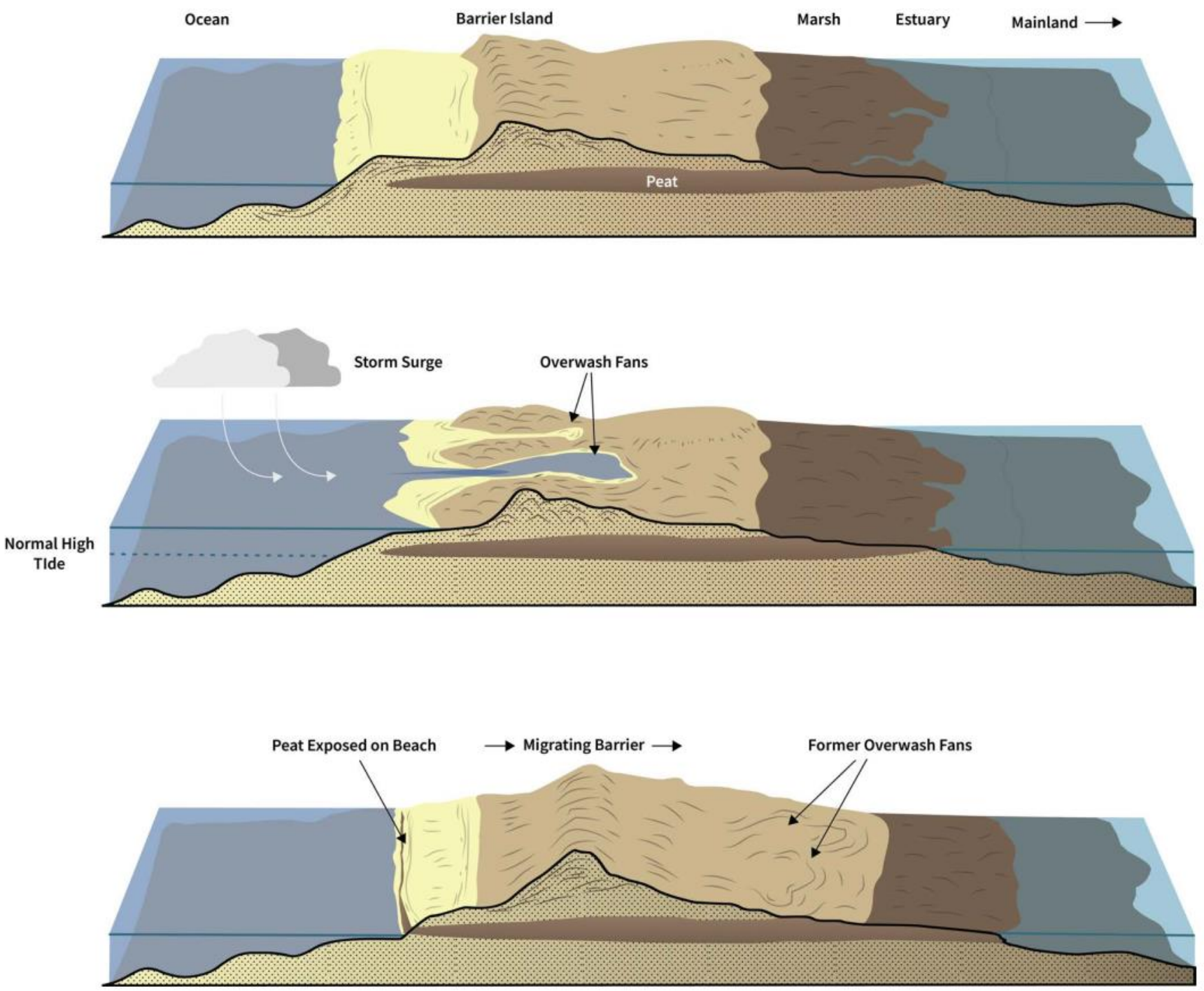
WINTER BEACH PROFILE



Storms rapidly change beaches

Overwash events occur during storms when waves surge overtop the dunes to the landward side or move through tidal inlets into the bay or river behind the barrier beach, pushing sand and water inland.

As these overwash events repeat over time, the entire barrier beach system shifts landward because large amounts of sand is washed over to the landward side of the barrier beach.



Storms rapidly change beaches

East Beach

Photo Sources: Westport Historical Society

The Knubble

Photo Sources: Westport Historical Society

A Timeline of Major Storms

The Trafford cottages before (above) and after (below).
Source: Westport Historical Society

September 21, 1939
The Great New England Hurricane

August 31, 1954
Hurricane Carol

Source: Westport Historical Society

The remnants of Elephant Rock Beach Club the day after.
Source: SouthCoastToday.com

August 19, 1991
Hurricane Bob

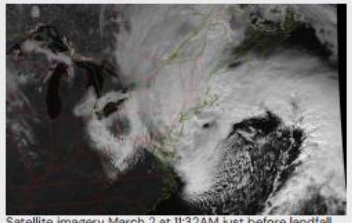
October 29, 2012
Superstorm Sandy

Image taken during the storm at Horseneck Beach.
Source: MassDOT

Horseneck Beach access path is covered by 24 in of snow.
Source: benji2505 /Flickr

January 27, 2015
Blizzard Juno (Nor'easter)

March 2-3, 2018
Nor'easter Riley

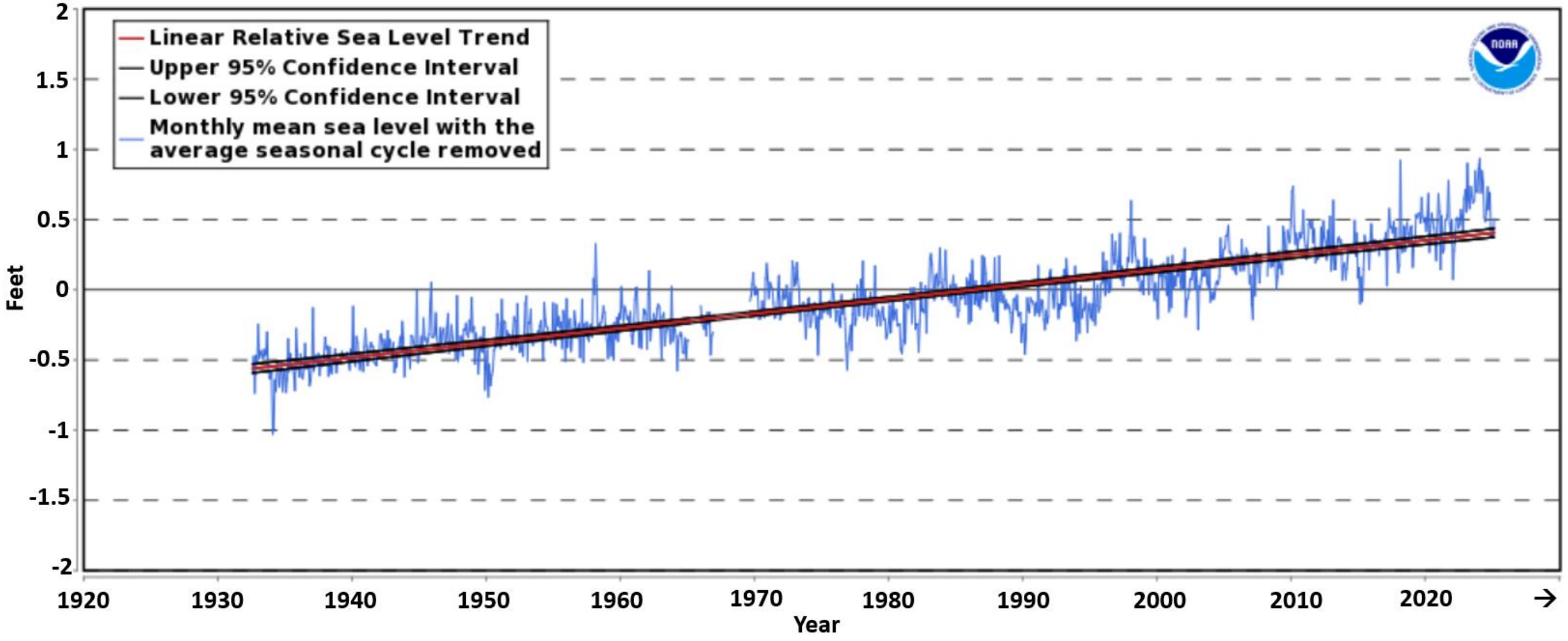


Satellite imagery March 2 at 11:32AM just before landfall.
Source: GOES-16 Satellite / NOAA

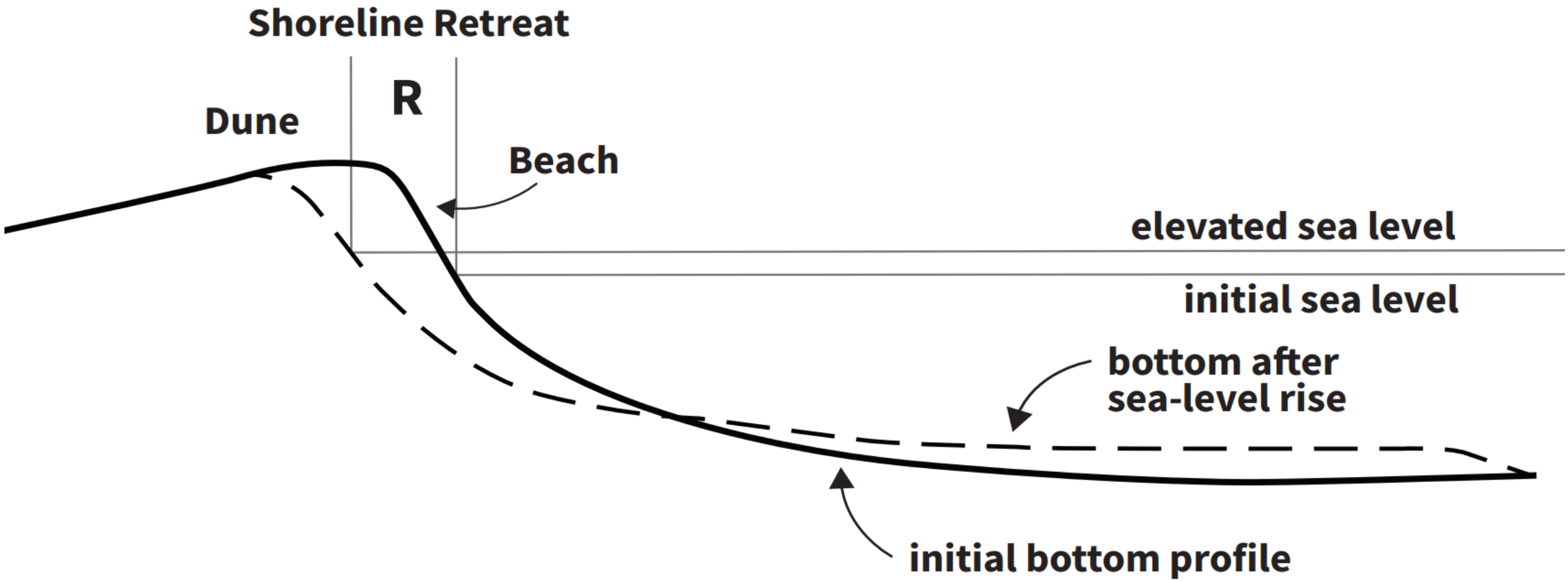
Henri caused strong surf and dangerous ocean conditions.
Source: WCVB

August 22, 2021 - Hurricane Henri

Sea level rise impacts shorelines



Sea level rise impacts shorelines

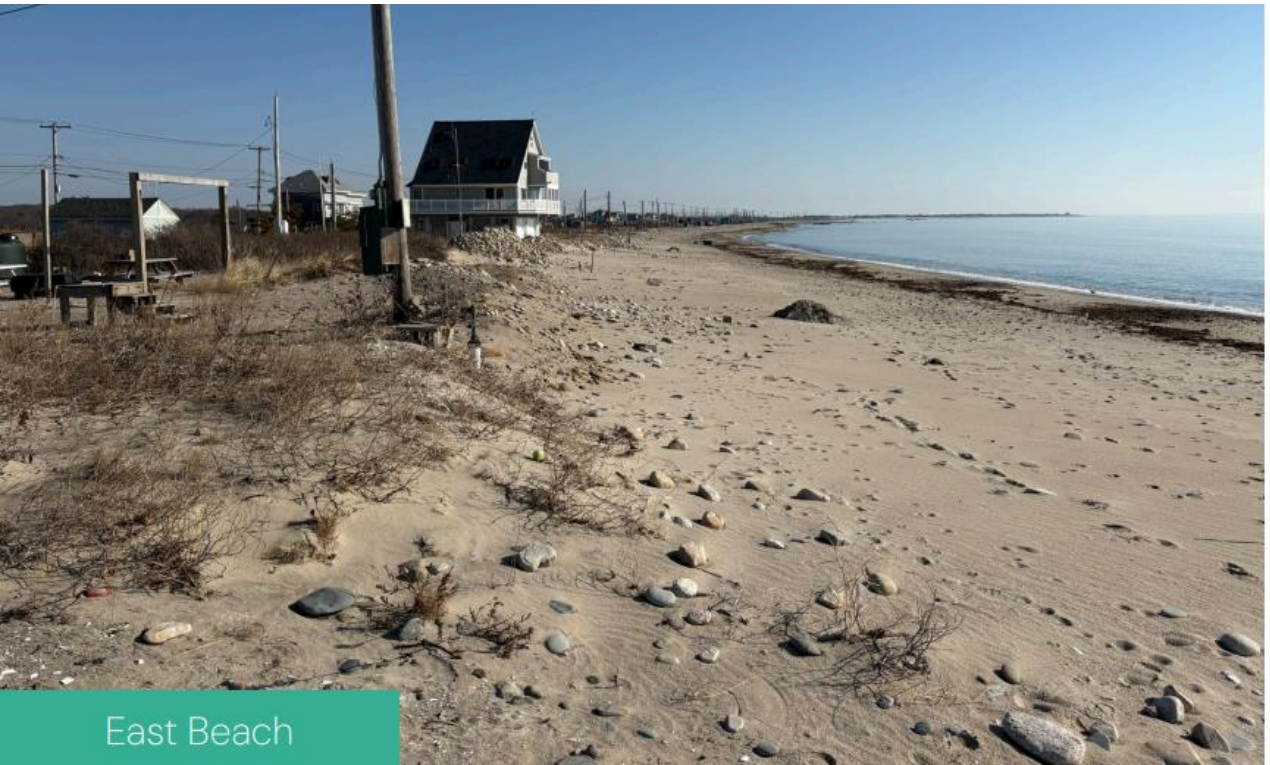


Understanding sand and sediment dynamics

Fine Sand

Fine sand is lightweight and easily displaced by wind, waves, and currents.

During storm events it is rapidly washed offshore, reducing the width and stability of the beach.

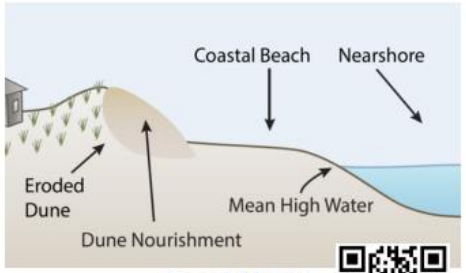


Cobble and Gravel

Cobble and coarse gravel can naturally reduce erosion by absorbing wave energy.

Large waves push cobble inland and upland steepening the beach and increasing elevation.

What you can do to help?



Read More!

Dune Nourishment.

Proper slope stabilization reduces the risk of dune collapse and limits sand loss over time. More gentle, gradual slopes help trap windblown sand, allowing the dune to grow over time. If the bottom of a dune has eroded and the slope is steeper than the upper portion of the dune, it is likely unstable. Efforts to restore the dune slope should be considered.

Read More!

Plant dune vegetation.

Native vegetation such as beach grass helps hold sand in place due to its deep root system. Vegetation also absorbs water from raindrops or waves, which reduces runoff erosion during a storm. It can also slow wind speeds and trap windblown sand, which is important for building dune volume.

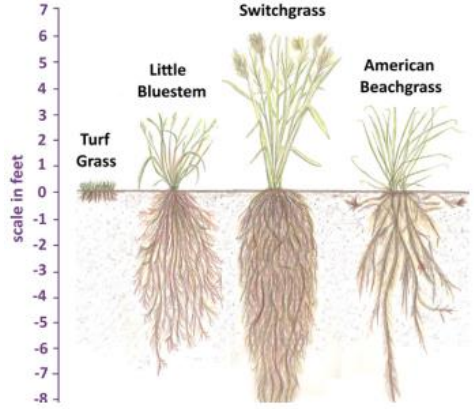


Image citation: Dede Christopher, Tennessee Valley Authority

Plant dune grass.

Salt-tolerant plants with extensive root systems can help address both kinds of coastal erosion problems. Plant roots hold sediment in place, helping to stabilize the areas where they are planted. Dune plants can root up to 9-feet deep, providing significant stabilization over turf grass which roots on the scale of inches. Unlike seawalls or rock revetments, vegetated coastlines absorb and dissipate wave energy, rather than reflecting waves and causing scour and beach loss.

Close Dune Openings or Weak Points.

Gaps or weak spots in dunes create pathways for water and wind, which makes the dune more vulnerable to erosion. Reinforcing weak points and minimizing the number of inlets through the dune strengthens the overall dune system, which will offer better protection to inland areas.

Read More!

Stay off the Dunes.

Walking or driving on dunes damages vegetation and weakens their structure, which will make the dune more prone to erosion and provide less protection during storms. It is important to establish designated walkways and beach access points to minimize damage.

Read More!

Install Sand Fencing.

Sand fencing is often used to capture sand and build up dunes. As wind blows through sand fencing, it creates a drag that reduces the wind speed and sad is deposited at the base of or behind the fence. Sand fencing is a low-cost and easy way to build dunes and protect inland areas from storm damage. Unlike seawalls or rock revetments, sand fencing doesn't push waves onto nearby beaches or properties.

Project Timeline

Project Timeline:

January 31st 2025

Project Kick-Off

February 2025

Topographic and Site Survey

Wetland Delineation

Sediment Sampling

March – April 2025

Literature Review

Alternatives Analysis

Community Workshop #1

We are here

May 2025

Performance Modeling

Barrier Beach Management Plan Draft

Community Workshop # 2

Beach Walks – Saturday May 31st

June 2025

Reporting

Stakeholder and Public Engagement

July 2025

Stakeholder and Public Engagement

2025

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Public Engagement and Input

Beach Walk – May 31st 2025

1. **Atlantic Ave @ 930-11am**
   Meet at Elephant Rock parking lot

2. **The Knubble @ 1130am-1pm**
   Meet on Town beach

3. **East Beach @ 2-330pm**
   Town Parking Lot *(east end)*

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Public Survey

Survey Link

https://arcg.is/qW41L

Sign-up for updates

Project Webpage

www.srpedd.org/wbbmp

Outreach Events

Contact Maria Jones: mjones@srpedd.org

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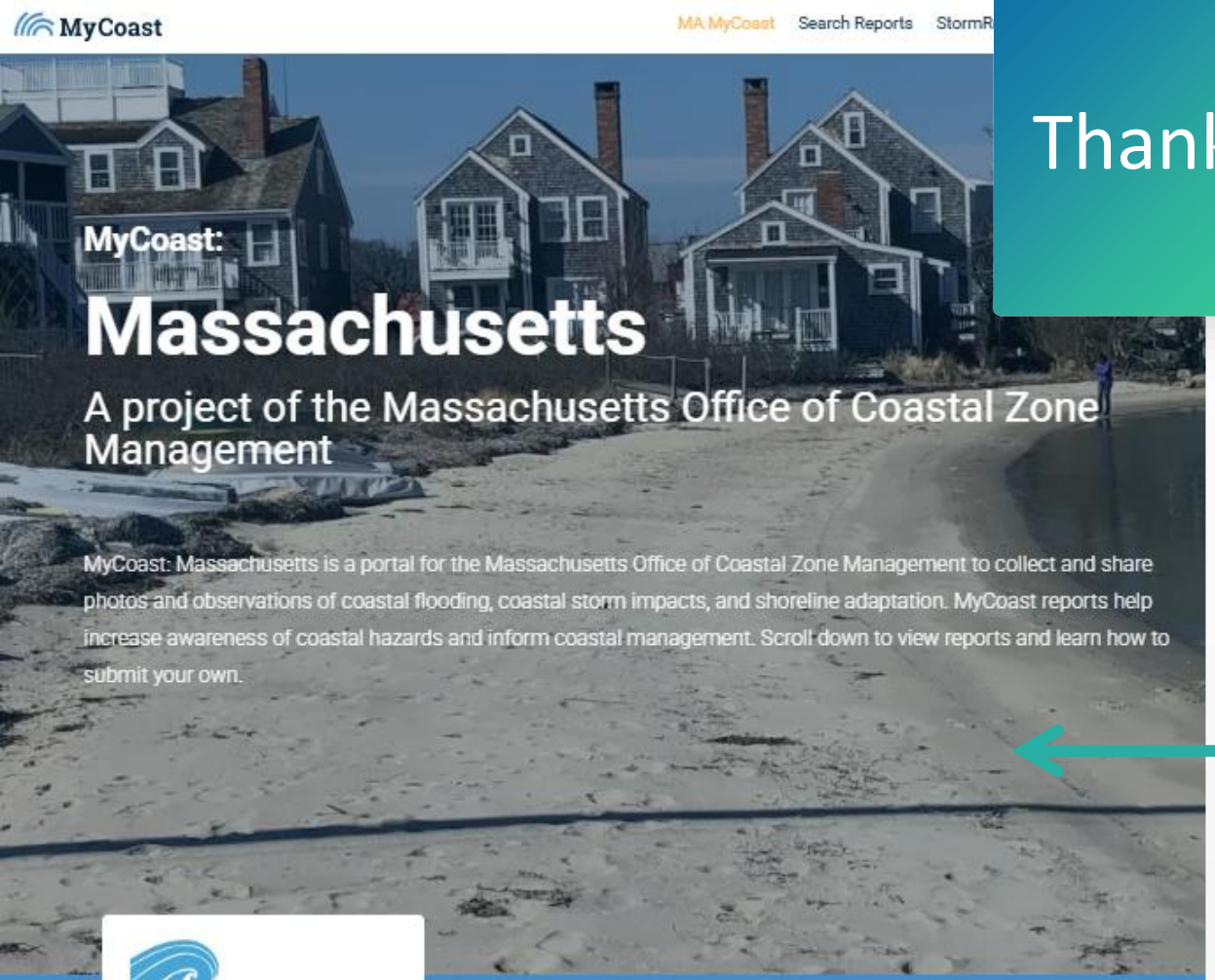
Thank You



Contact Information:

Michael Burris -
burrism@westport-ma.gov

Upload your photos of flooding and storm impacts to: *https://mycoast.org/ma*

Feel free to send historic photos to:

Conor Ofsthun -
cofsthun@woodsholegroup.com

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