Westport, Massachusetts

The crossroads of coastal and cultural resiliency

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5/22/23

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Recognitions

This booklet and the work contained was made possible thanks to the time spent by my committee members Cheri Ruane, RLA, FASLA, and Amber Christoffersen, providing their professional guidance. It is also made possible thanks to the guidance of our Capstone instructors Anna Wik and Lorene Athey.

Introduction

Mission

This project aims to introduce innovative solutions to sea level rise (SLR) and storm surge in coastal Massachusetts. This will involve analysis, evaluation, and solutions to problems faced on the coast, offshore, and within the marsh systems. Beyond the physical and ecological aspects being addressed, this project aims to preserve town history and a sense of place in the process of providing solutions to the community.

Goals

- Assess the current conditions of a coastal town
- Address physical needs relating to SLR and storm surge
- Produce a site for community members to interact and learn about their town and nature
- Restore marsh, wetland, and river systems to their original function
- Enhance biodiversity

Objectives

- Create visually compelling graphics to display thoughtful design solutions
- Ensure that sense of place is not lost and that the community's wants and needs are being addressed equitably.

Figure 1. Aerial of Westport, MA

Town History/Culture

1652

Achushnea, Apponegansett, and Acoaxet territory was purchased by the Jenney, Hathaway, Cooke, Shaw, Palmer, Culber, and Delano Families

Noquochoke—"the land at the fork"—

Acoaxet—"the land on the other side of the little land."

Quansett—originally spelled Nutuquansett and means "at the burnt woods" or possibly "the place of fishing by fire" and is part of Horseneck.

Paquachuck—the name once given to Westport Point and means "at the learor open hill."

Hassanegk—has been corrupted to Horseneck and means "cellar dwelling."

Watuppa—great ponds between Westport ant! Fall River and means "they draw water."

Anniversary of the Town of Westport 1787-1937

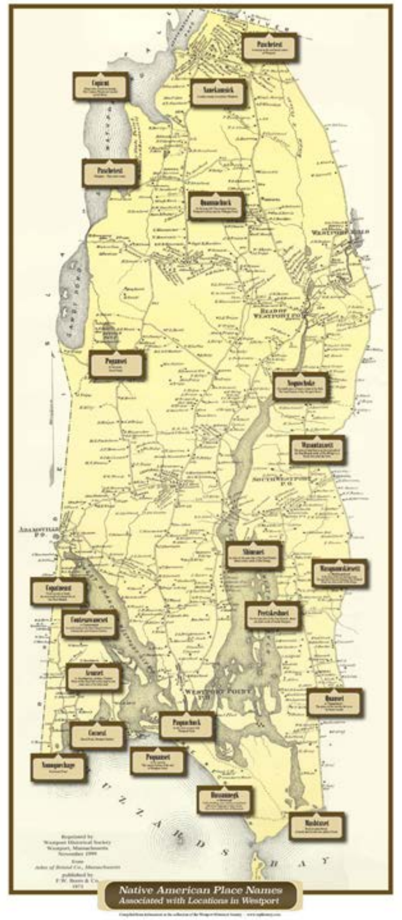


Figure 2. Map of Westport, MA

Bell House School

Built in 1841, the school served the west side of the river. In 1858 the second floor of the school became Westport Academy, a private school. The school has since had multiple different ownerships and functions but is now owned and operated by the Westport Historical Society.

Figure 3. Bell House School

Handy House

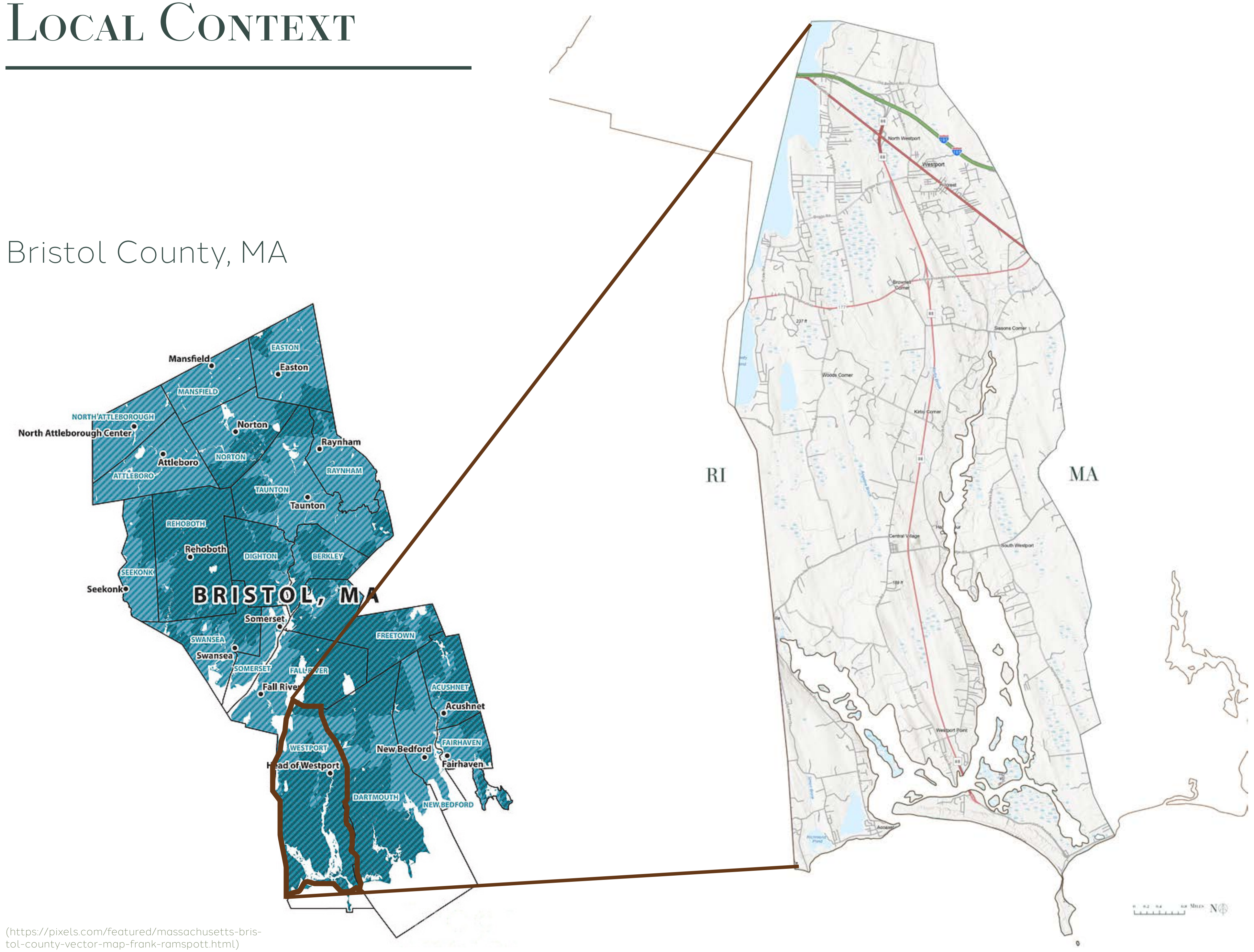
The handy house was built in 1713 for Elizabeth Cadman White and William White. the house was expanded upon in 1800 and again in 1830

Figure 4. Handy House

Site Analysis

Local Context

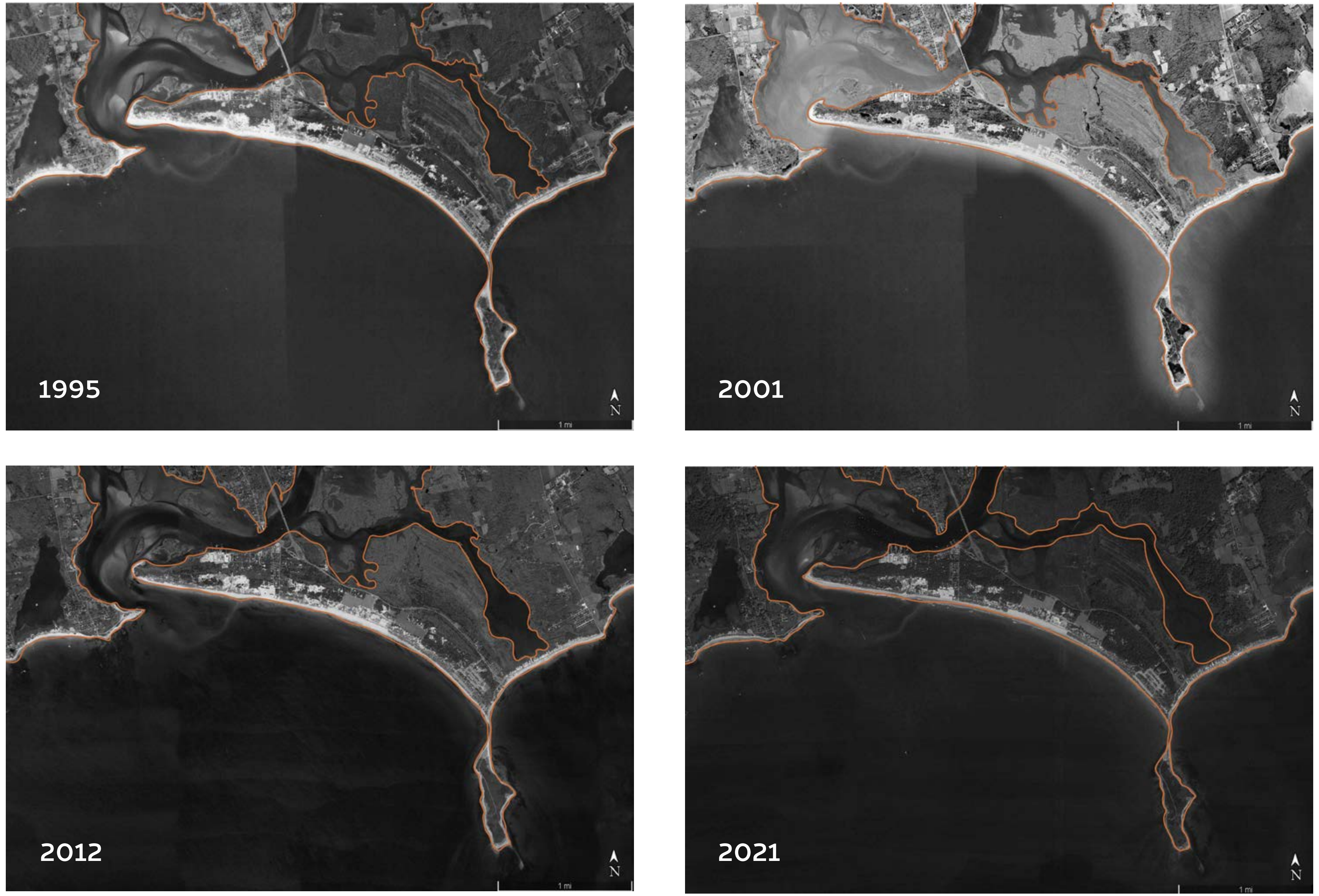
Bristol County, MA



(https://pixels.com/featured/massachusetts-bristol-county-vector-map-frank-ramspott.html)

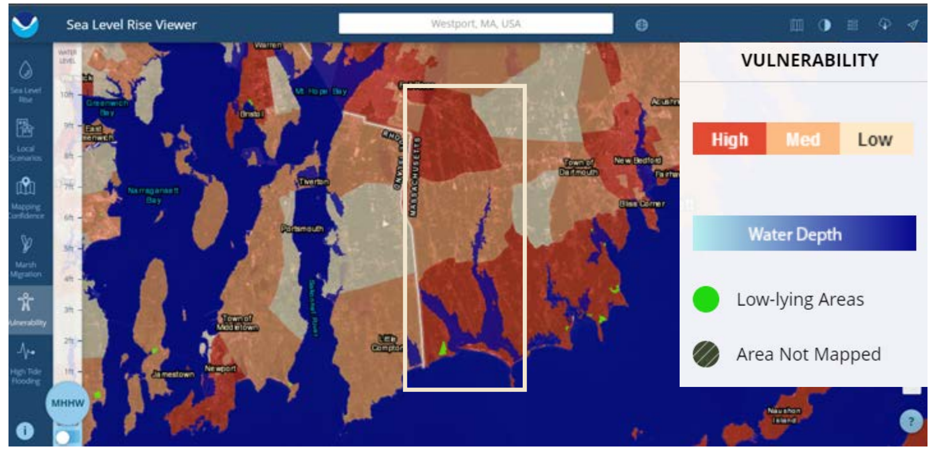
Historic Shoreline Change

Using GoogleEarth, the progression of the Westport, MA coastline can be seen. Areas especially around the marsh have begun deteriorating and receding.



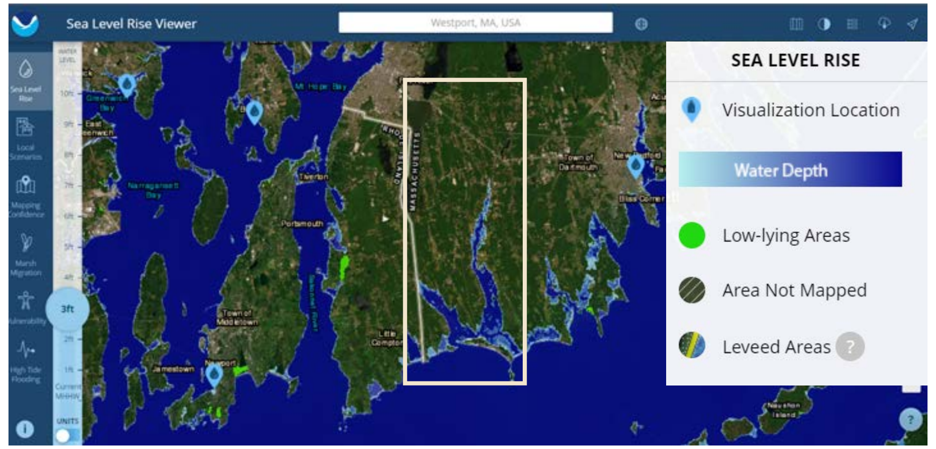
National Oceanic & Atmospheric Administration (NOAA) Assessments

Vulnerability

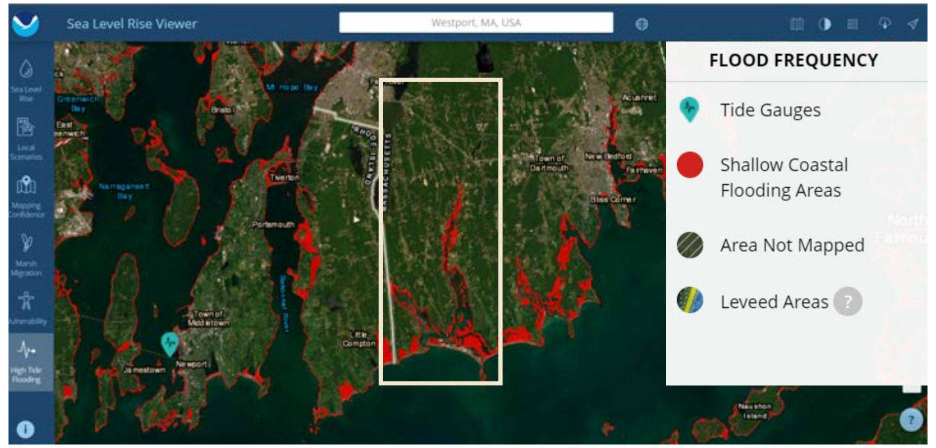


According to NOAA sea level rise (SLR) predictions, large amounts of the town's marsh systems will be lost with just a few feet of SLR. Additionally, a large portion of the town has been designated a High vulnerability status with the rest of the town in the Medium vulnerability designation.

Sea Level Rise - 3ft

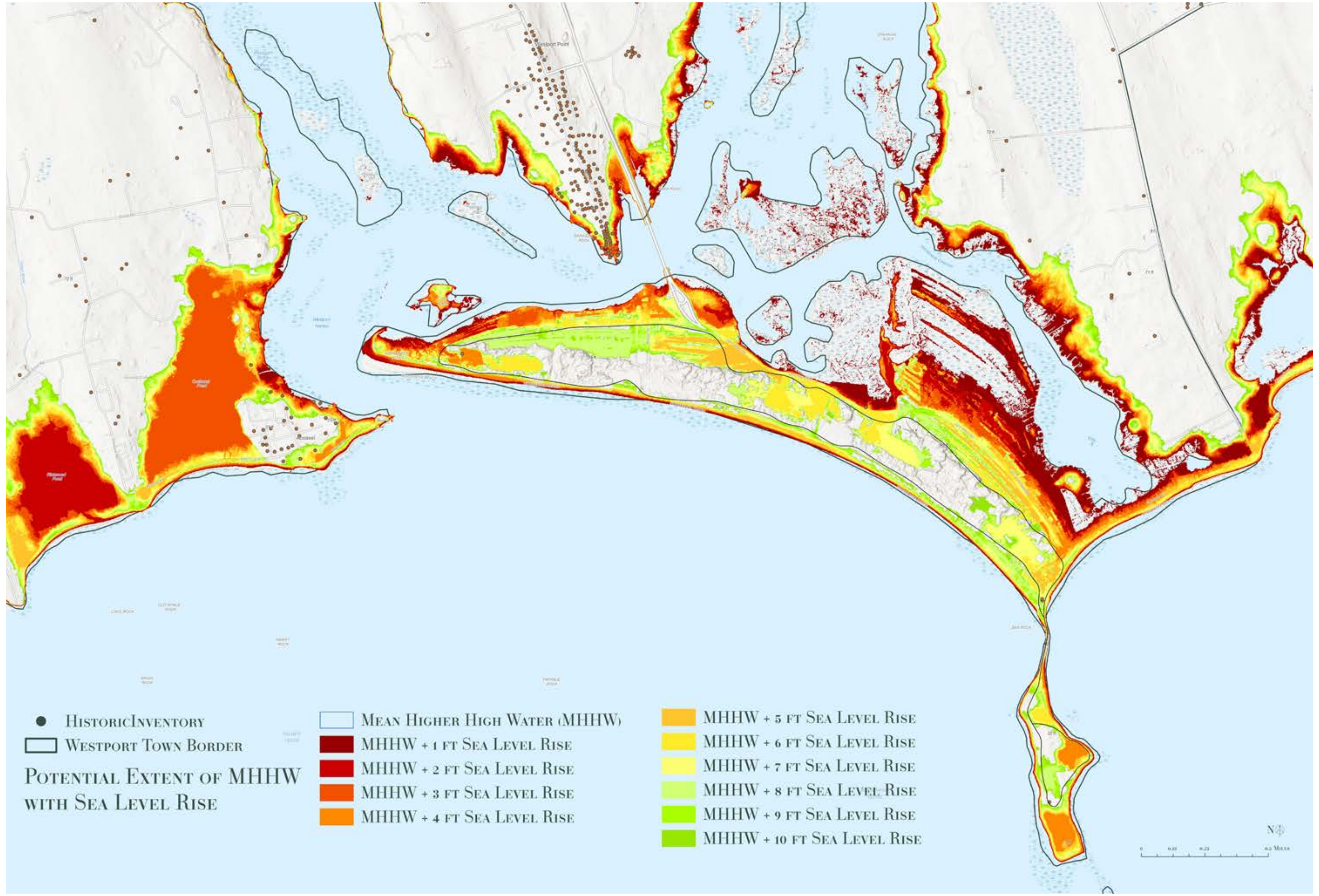


High Tide Flooding



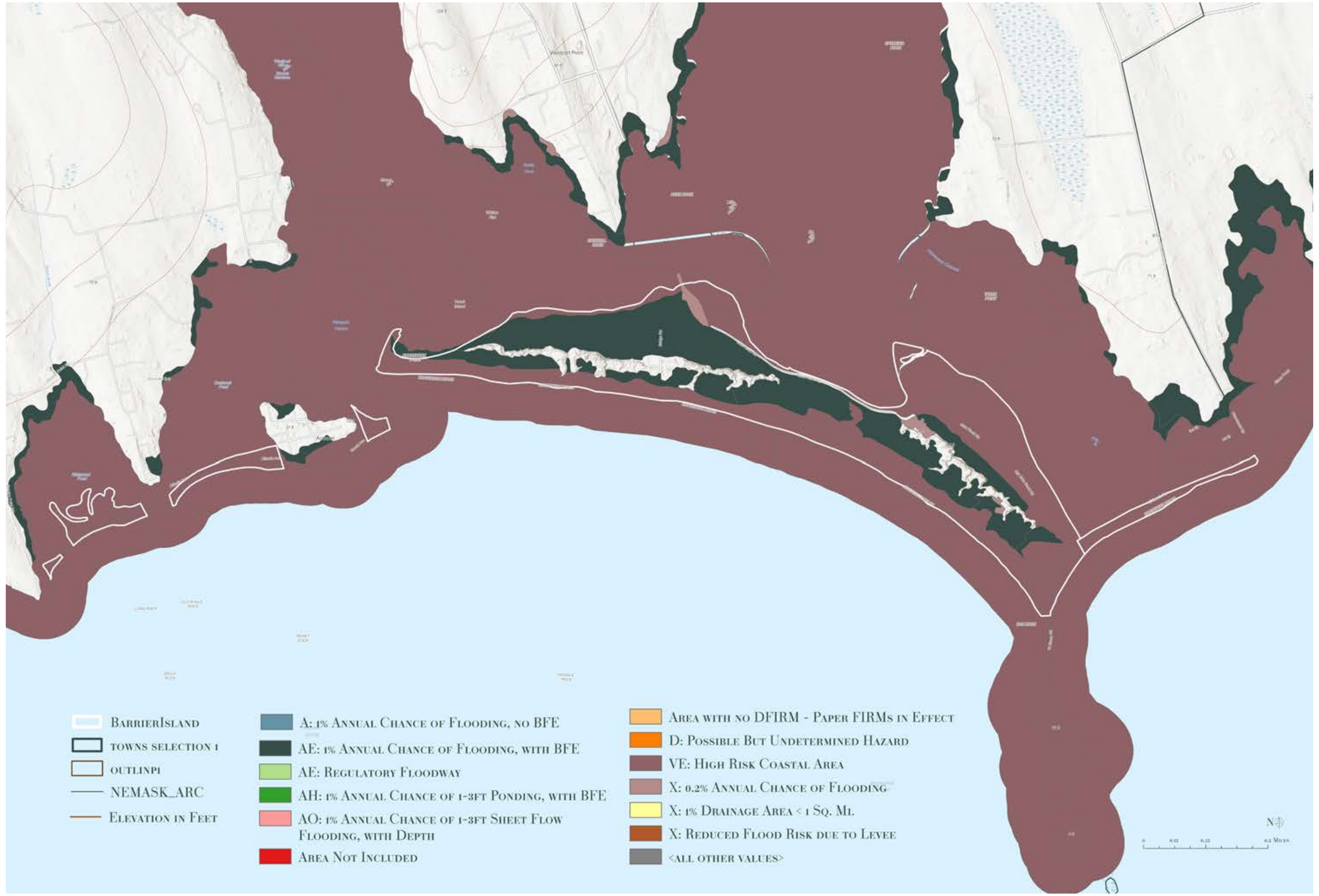
At-Risk Historic Sites

658 total structures are at risk due to the potential extent of mean high high water (MHHW) with Sea Level Rise, including 56 Historical sites. This analysis includes inundations from 1' to 10' in 1 ft intervals.



FEMA Flood Designations

Flood designations help us to understand not only physical conditions, but socioeconomic implications as well to give an index of the most vulnerable lands.

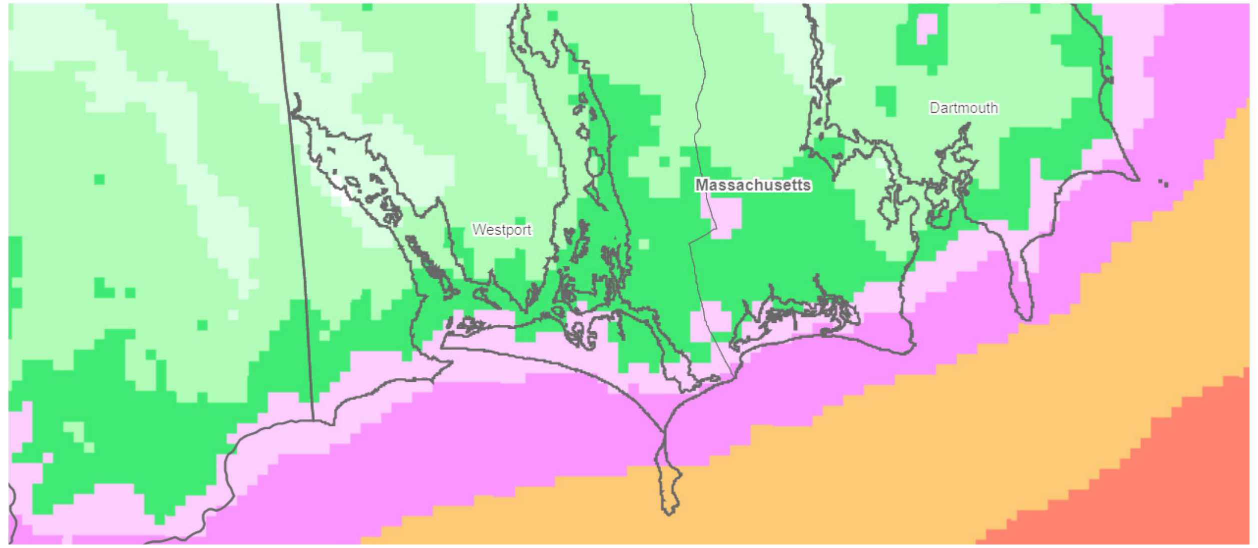


Land Use Interaction w/ Water

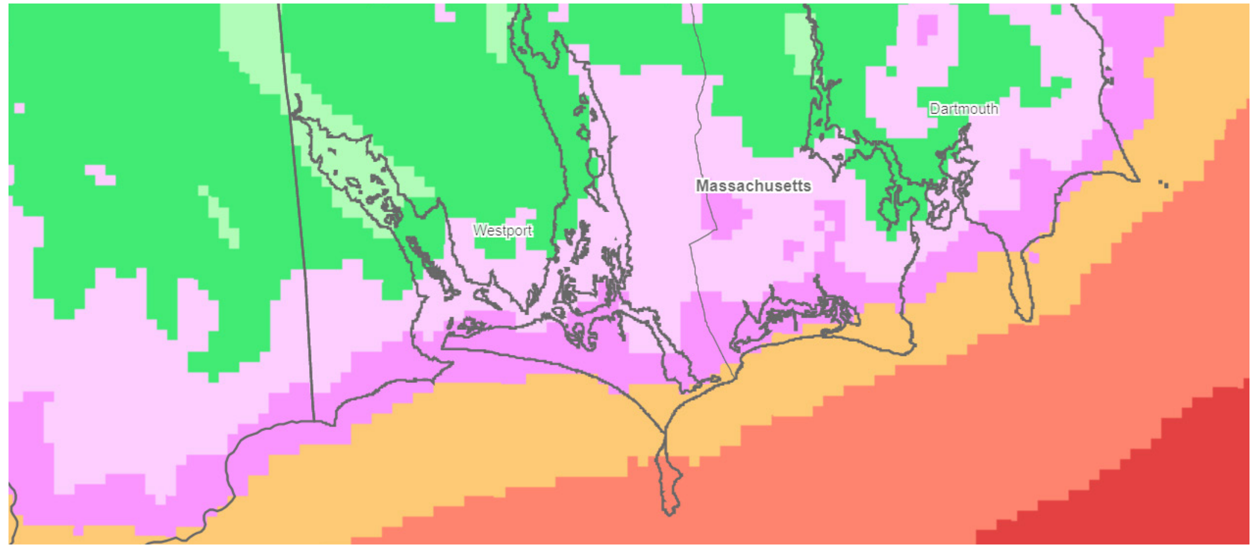
Understanding what land types interact with waterways, can help to understand how the community engages with the water as well as highlight opportunities for intervention.

Modeled Wind Speed

30m (meters/second) Above Surface



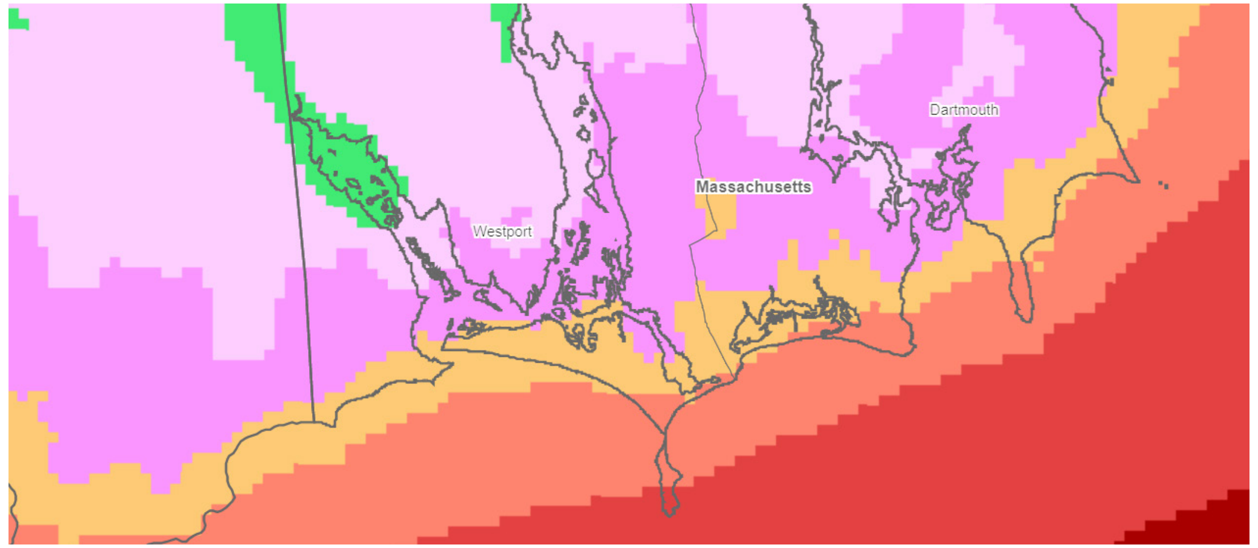
50m (meters/second) Above Surface

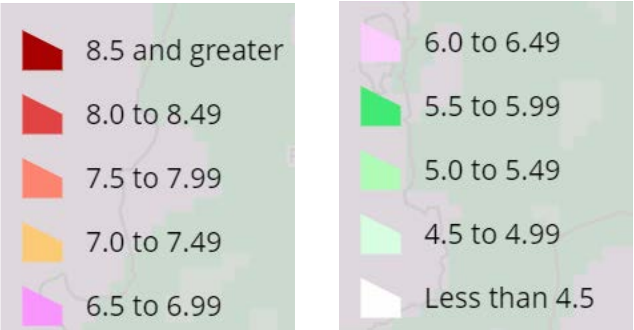


Provided by the State of Massachusetts, the maps shown represent modeled win speed. This informs the placement of both above-ground and under-water structures and is crucial to the analysis of the site.

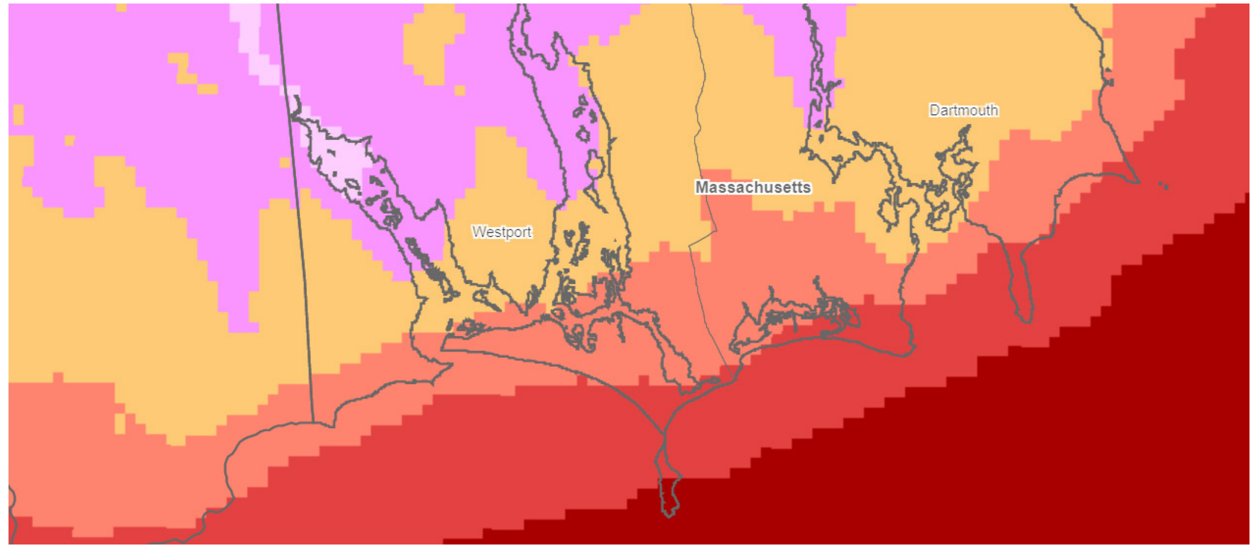
Modeled Wind Speed

70m (meters/second) Above Surface





100m (meters/second) Above Surface

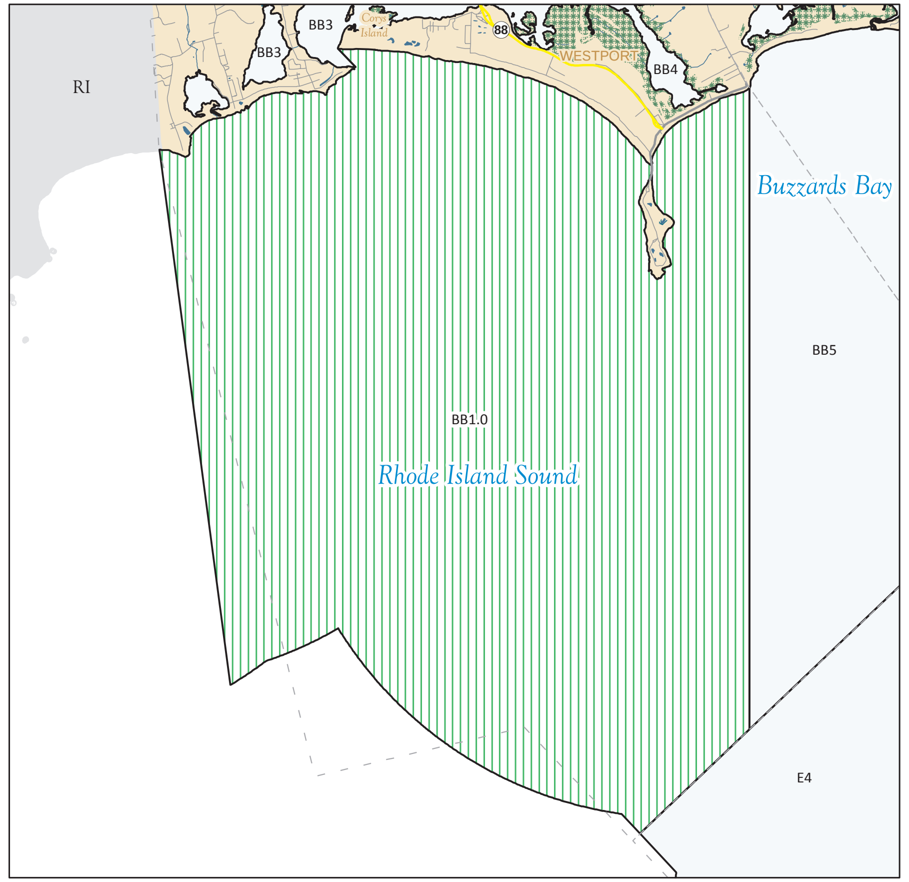


Westport South Coastal

MarineFisheries Massachusetts Division of Marine Fisheries
SHELLFISH SANITATION AND MANAGEMENT

Growing Area Code: BB1
Area Name: WESTPORT SOUTH COASTAL
Area Town(s): Westport

Shellfish Area Classification
Approved | Conditionally Restricted | Conditionally Approved | Prohibited | Restricted
Produced: 01/02/2018



Area of detail

This map depicts the MarineFisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or MarineFisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland | Saltmarsh | Pond/Lake/Reservoir | Town Boundaries | Stream/Ditch/Canal

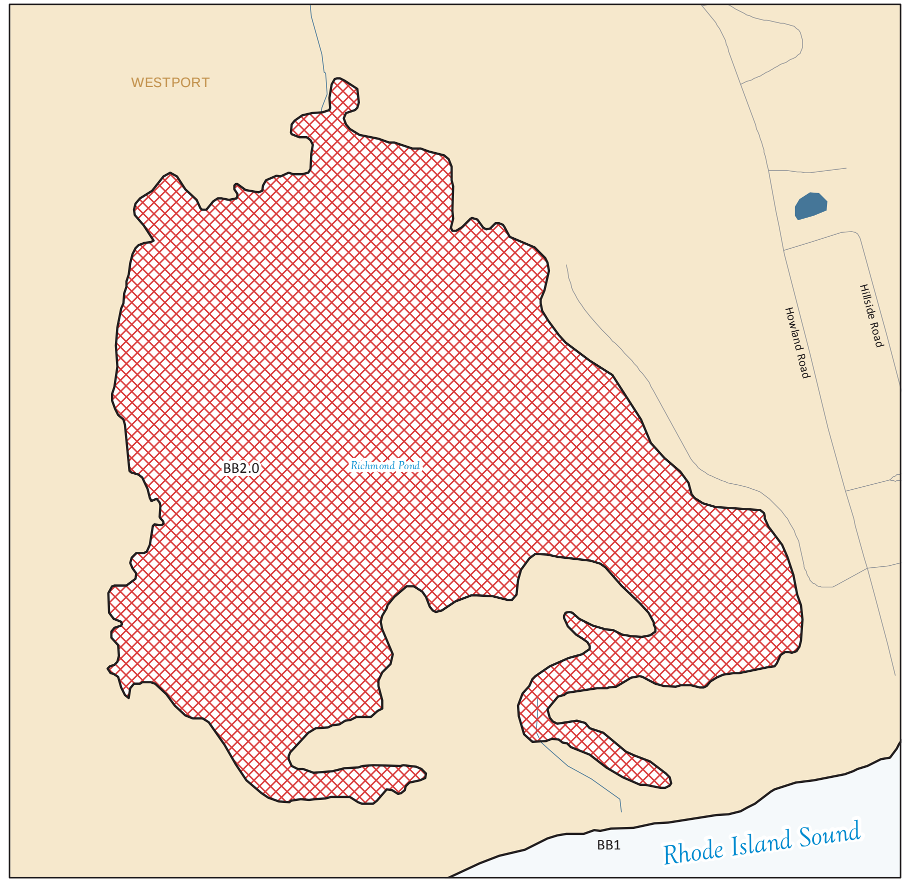
NORTH 0 0.5 1 miles

Richmond Pond

MarineFisheries Massachusetts Division of Marine Fisheries
SHELLFISH SANITATION AND MANAGEMENT

Growing Area Code: BB2
Area Name: RICHMOND POND
Area Town(s): Westport

Shellfish Area Classification
Approved | Conditionally Restricted | Conditionally Approved | Prohibited | Restricted
Produced: 7/1/2013



Area of detail

This map depicts the MarineFisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or MarineFisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland | Saltmarsh | Pond/Lake/Reservoir | Town Boundaries | Stream/Ditch/Canal

NORTH 0 250 500 Feet

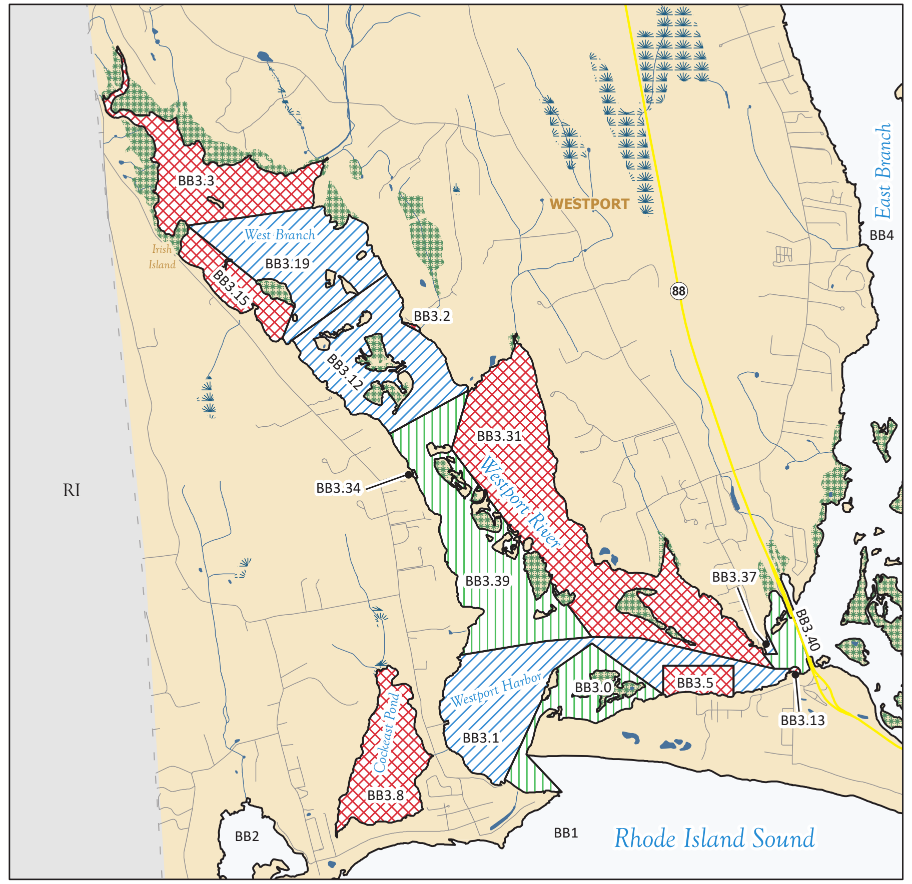
Shellfish Area Classification - MA Division of Fisheries

West Branch Westport River

MarineFisheries Massachusetts Division of Marine Fisheries
SHELLFISH SANITATION AND MANAGEMENT

Growing Area Code: BB3
Area Name: WEST BRANCH WESTPORT RIVER
Area Town(s): Westport

Shellfish Area Classification
Approved | Conditionally Restricted | Conditionally Approved | Prohibited | Restricted
Produced: 2/18/2021



Area of detail

This map depicts the MarineFisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or MarineFisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland | Saltmarsh | Pond/Lake/Reservoir | Town Boundaries | Stream/Ditch/Canal

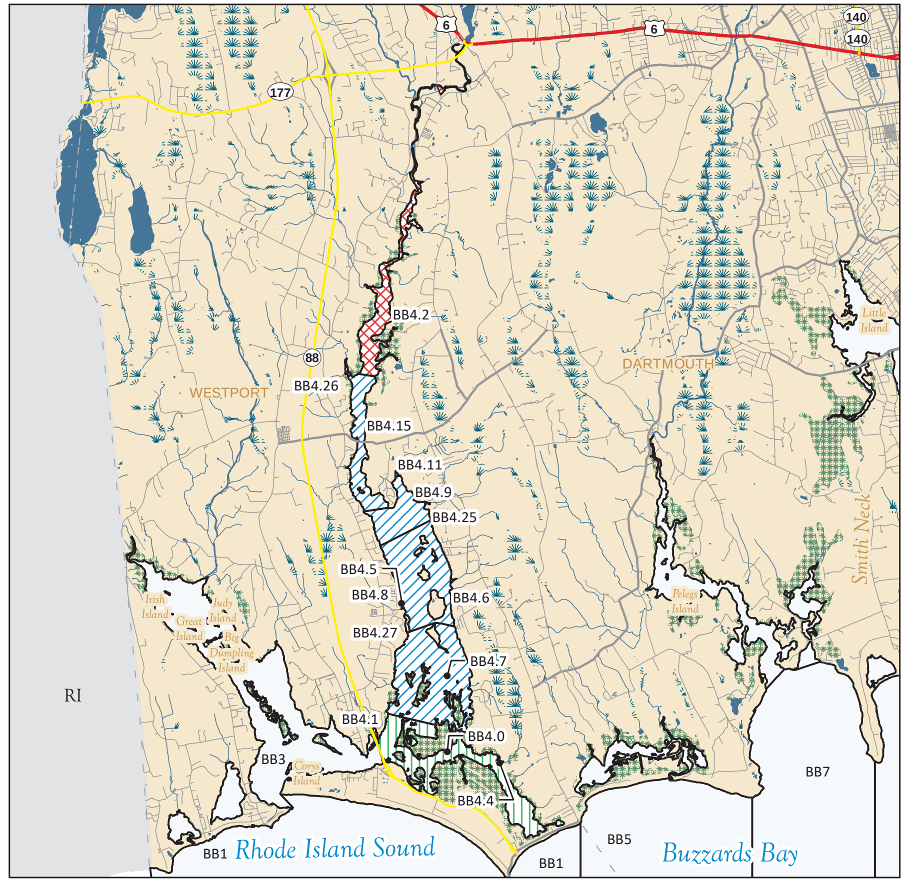
NORTH 0 0.5 1 miles

East Branch Westport River

MarineFisheries Massachusetts Division of Marine Fisheries
SHELLFISH SANITATION AND MANAGEMENT

Growing Area Code: BB4
Area Name: EAST BRANCH WESTPORT RIVER
Area Town(s): Westport

Shellfish Area Classification
Approved | Conditionally Restricted | Conditionally Approved | Prohibited | Restricted
Produced: 3/15/2021



Area of detail

This map depicts the MarineFisheries' sanitary classification of shellfish growing waters in accordance with the National Shellfish Sanitation Program. It does not indicate the current status, either "open" or "closed" to harvesting due to shellfish management or public health reasons. Always confirm the status with local authorities and/or MarineFisheries. Information on this map may be out-dated or otherwise incorrect, and should not be relied upon for legal purposes.

Marsh/Wetland | Saltmarsh | Pond/Lake/Reservoir | Town Boundaries | Stream/Ditch/Canal

NORTH 0 0.5 1 miles

Historic Preservation

Keeping 74 Bridge Street Above Water

Summary

The Christopher Townsend House in Newport, located in a historic waterfront neighborhood prone to flooding, was used as a case study project by the Newport Restoration Foundation (NRF) to experiment with mitigation and resiliency strategies. A team of experts, including architects, engineers, planners, and community members, collaborated on the project in 2016. The development of the case study was a joint effort between NRF, BCA New England, Union Studio, and Mohamad Farzan, RIBA, AIA.

Major Points or Topics

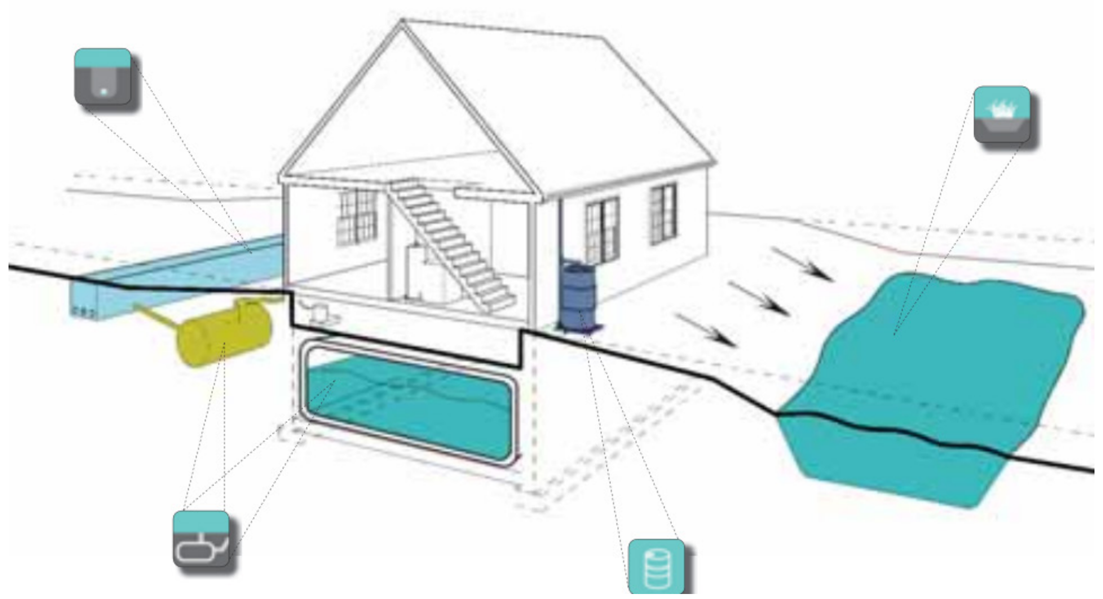
- The cultural and historical significance of the building as well as its economic value are currently at risk due to SLR and flooding
- Its time to starting planning to preserve history, sense of place, and the economics related to cultural assets

Source:

74 Bridge St. Case Study. History Above Water. (n.d.). https://historyabovewater.org/74-bridgest/

Design Implications:

- Problems have been broken up into stormwater, sea level rise, and design & policy regulations
    - Breaking the problem down into different types helps to create managed approaches tailored to a problem
- Design factors such as style and materiality don't have to be compromised with a preservation project
- Moving structures is a viable solution when applicable



(https://historyabovewater.org/74-bridgest/)

Canopy Tower - Panama City, Panama | Case Study

Overview

The structure was originally constructed by the United States Military in 1963 as a radar tower in wake of the Cuban missile crisis. In 1988, the radar tower began detecting airplanes suspected of transporting illegal drugs from South America. This continued until 1995 when the tower was left vacant."In August of 1997, the government of Panama signed a long-term contract with Raul Arias de Para to transform the tower into a center for rain forest observation and ecotourism in Panama"

Site Specifics

- 35 miles north of Panama City
- The land is home to over 970+ species of birds, making it an attractive spot for bird watchers
- Includes an observation deck, library, and rooms for visitors

(https://canopytower.com/canopy-tower/tower-history/)

Before & After

Nature-Based Solutions

Runnels Reverse Mega-pool Expansion and Improve Marsh Resiliency in the Great Marsh, Massachusetts (USA) | Case Study

Overview

Sampling was taken pre-restoration to get an accurate idea of current vegetation and elevation conditions. Sampling and data collection was followed-up with 5 times over the course of 6 years. Once the restoration was complete, hydrology was monitored to record effectiveness of the runnel paths.

Site Specifics

- Pine Island Marsh, located within the Great Marsh system and Parker River National Wildlife Refuge (Newbury, MA)
- 191 ha salt marsh platform with three major tidal creeks, numerous small order creeks, and artificial drainage ditches
- Access to the marsh is limited but people can explore into the land with a few local trails and local boating opportunities within the surrounding river system
- Two pools were selected for restoration

Fall, North Pool (2017) - Philip Jessup

Springtime, North Pool (2017) - Philip Jessup

Runnels Reverse Mega-pool Expansion and Improve Marsh Resiliency in the Great Marsh, Massachusetts (USA) | Case Study

Site	Season	High Tide (NAVD88 m)	Higher High Tide (NAVD88 m)	Max Tide (NAVD88 m)	Pool High Tide Flooding Frequency (%)	Pool Flooding Duration (%)	Platform High Tide Flooding Frequency (%)	Platform Flooding Duration (%)
North	2015 (Spring)	1.39 +/- 0.02	1.44 +/- 0.02	1.66	100	92.6	31.5	10.3
	2016	1.44 +/- 0.01	1.48 +/- 0.02	1.75	100	97.1	55.2	26.1
	2018	1.41 +/- 0.02	1.47 +/- 0.04	2.12	76.3	74.8	33.9	11.3
	2021	1.40 +/- 0.02	1.45 +/- 0.03	1.78	100	100	34.5	5.1
South	2015 (Spring)	1.32 +/- 0.02	1.35 +/- 0.03	1.89	33.3	26.0	15.8	3.0
	2016	1.45 +/- 0.02	1.50 +/- 0.03	1.80	75.4	63.6	49.1	25.5
	2018	1.44 +/- 0.03	1.51 +/- 0.04	2.06	62.7	23.5	37.3	8.5
	2021	1.37 +/- 0.02	1.42 +/- 0.03	1.77	56.9	13.2	31.0	4.3

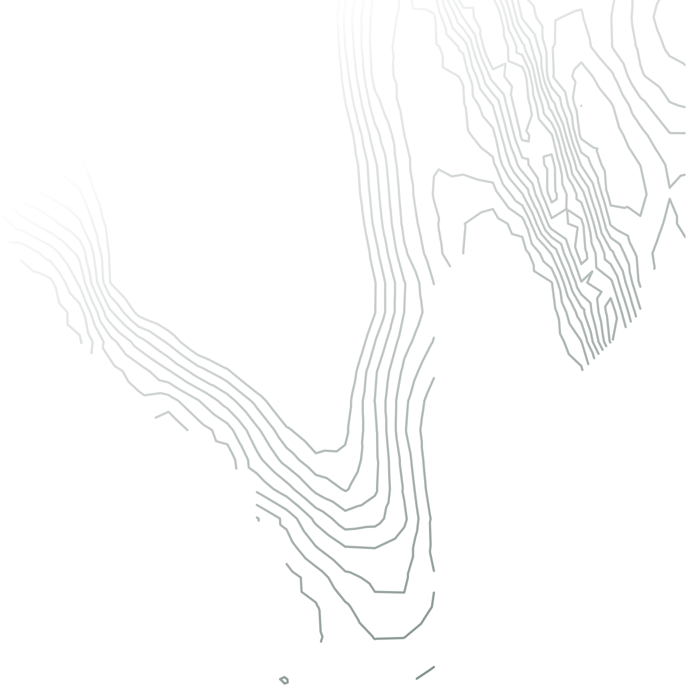
https://doi.org/10.21203/rs.3.rs-1610002/v1

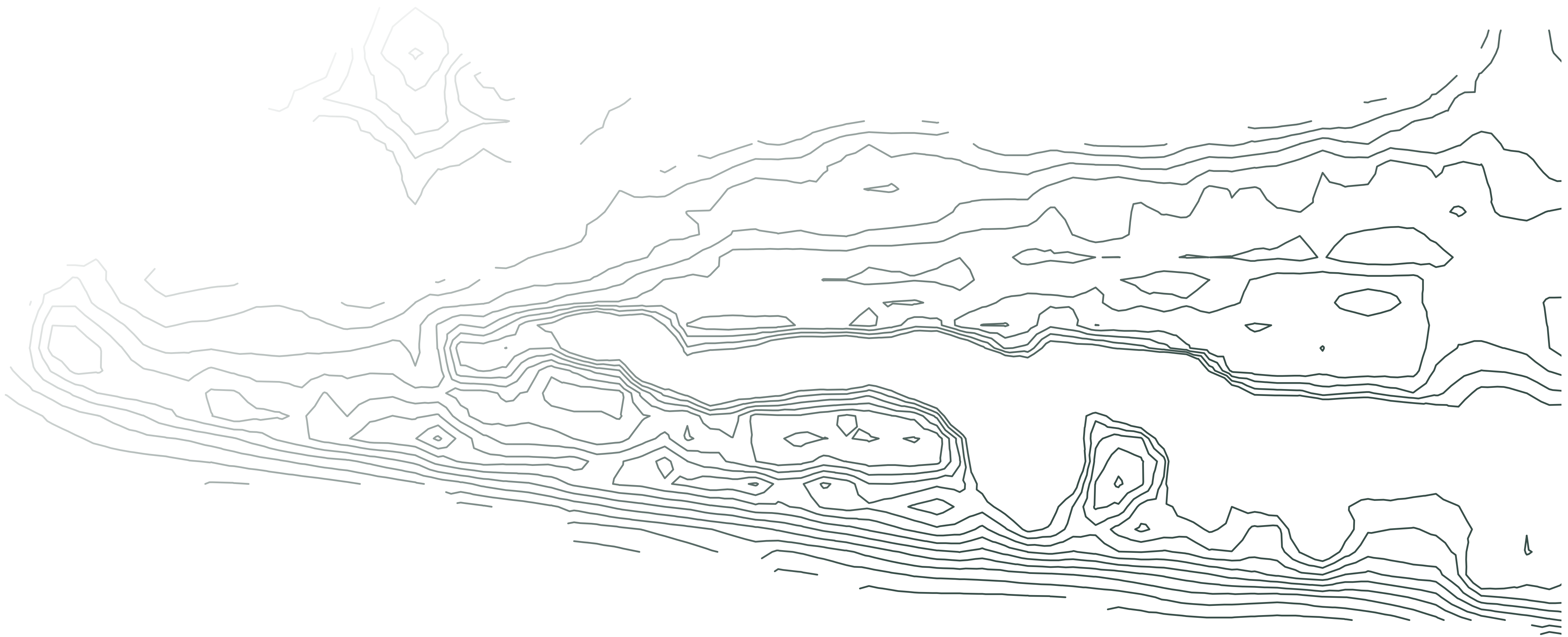
"Pool hydrology matched natural creek hydrology in both timing and tidal elevations in 2018 when it was draining every tidal cycle"

"The salt marsh platform surrounding the north pool experienced greater drainage of flood waters with flooding duration decreasing from 10% in 2015 to 5% in 2021 with similar high tide flooding frequencies."

"Remote sensing analysis showed a trend of pool expansion and high marsh soil saturation before runnel construction and then vegetation recovery and expansion into the pools after restoration activities"

Barrier Islands





Coastal Impacts, Recovery, and Resilience Post-Hurricane Sandy in the Northeastern US | Case Study

Overview

One of the three Fire Island Breaches remained opened during hurricane Sandy due to a wilderness designation. Monitoring the area pre- and post-breach resulted in data supporting it remaining open.

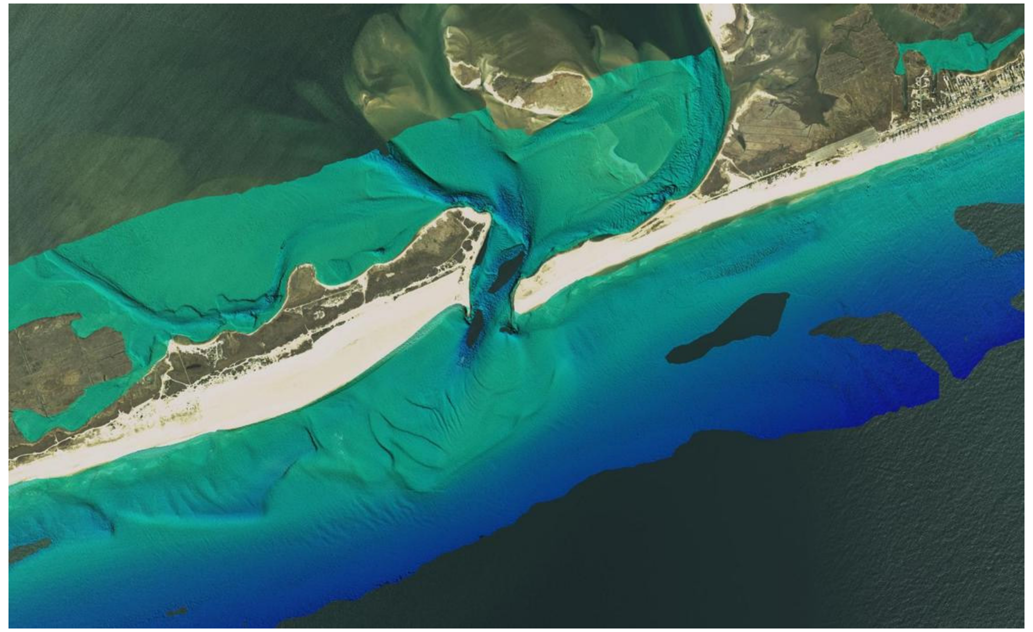
Identified and mapped specific vegetation on the island to track changes in plant communities after a disturbance.

"Overall, the vegetation found in the residential communities of Fire Island is similar to those found in uninhabited areas."

Site Specifics

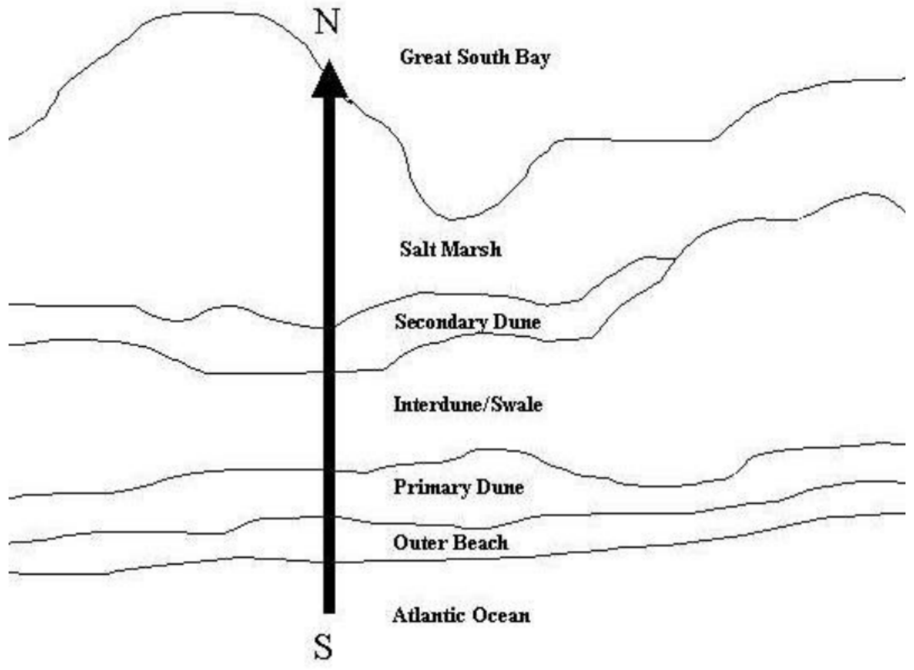
- 50-km (~31 mi.) long barrier island
- The island is home to residents and federal, state, and county parks.
- The vegetation of Fire Island is divided into over 4,000 different vegetation delineations

Fire Island Local Context

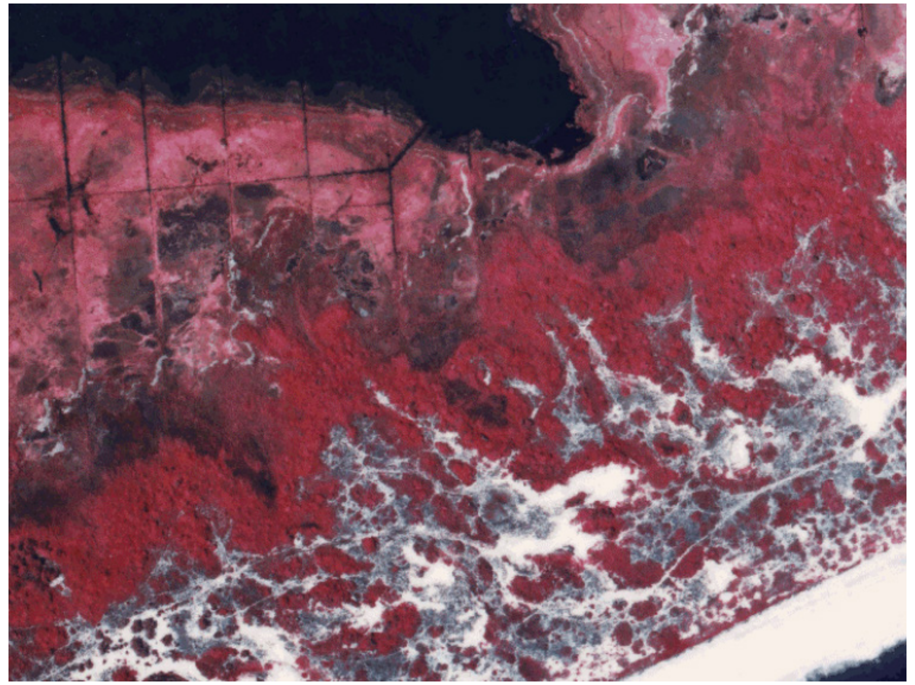


East end of Fire Island

Coastal Impacts, Recovery, and Resilience Post-Hurricane Sandy in the Northeastern US | Case Study



The vegetation zones observed on Fire Island



TColor-infrared aerial photo used as ancillary data for FIIS vegetation mapping

The overarching goals were to:

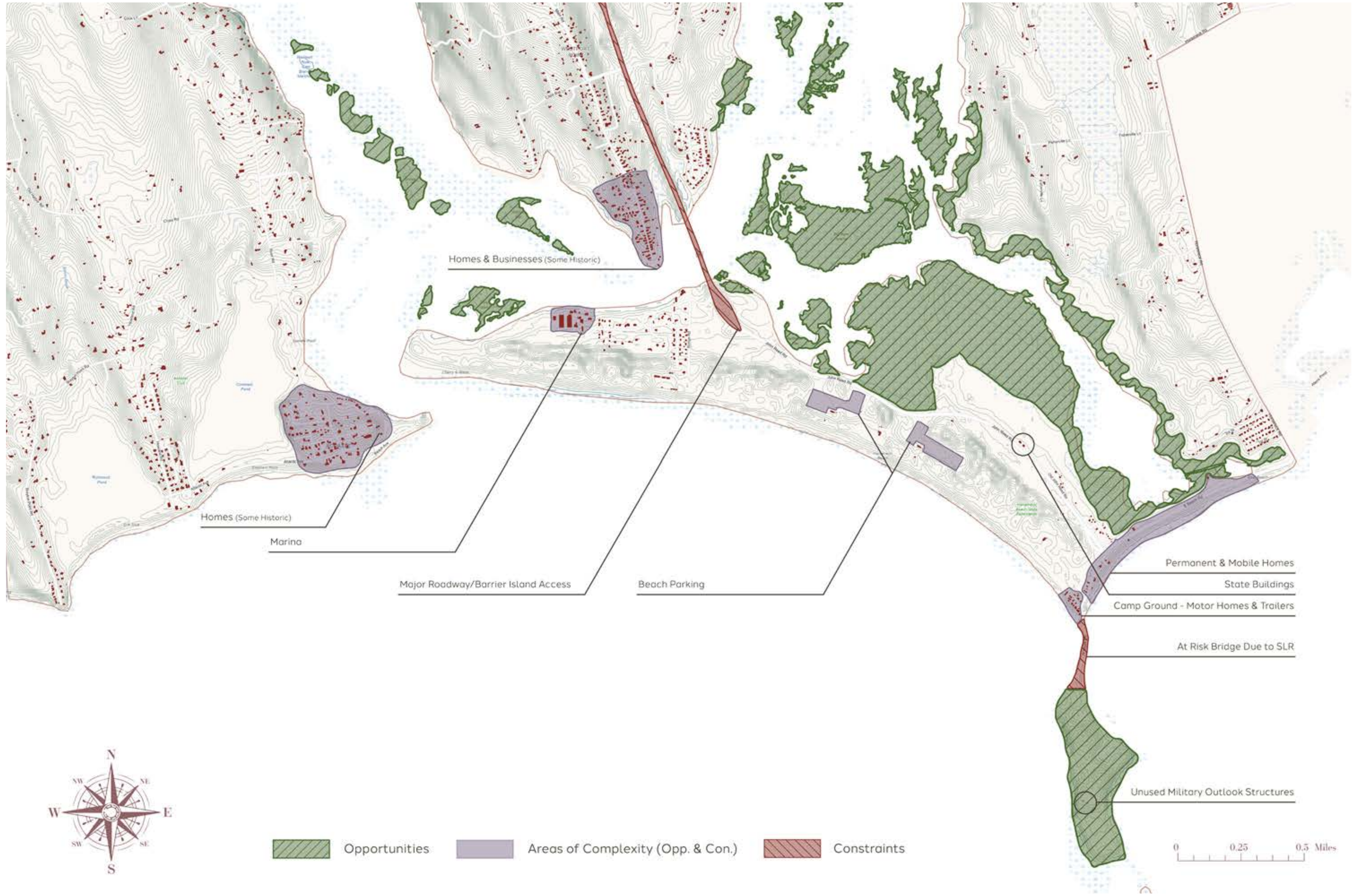
(1) reduce the impacts of coastal storm surge, wave velocity, sea level rise, and associated natural threats on coastal and inland communities;

(2) strengthen the ecological integrity and functionality of coastal/inland ecosystems to protect communities and to enhance fish and wildlife and their associated habitats, and

(3) enhance our understanding of the impacts of storm events and identify cost-effective resilience tools that help mitigate the effects of future storms, sea level rise, and other phenomena related to climate change.

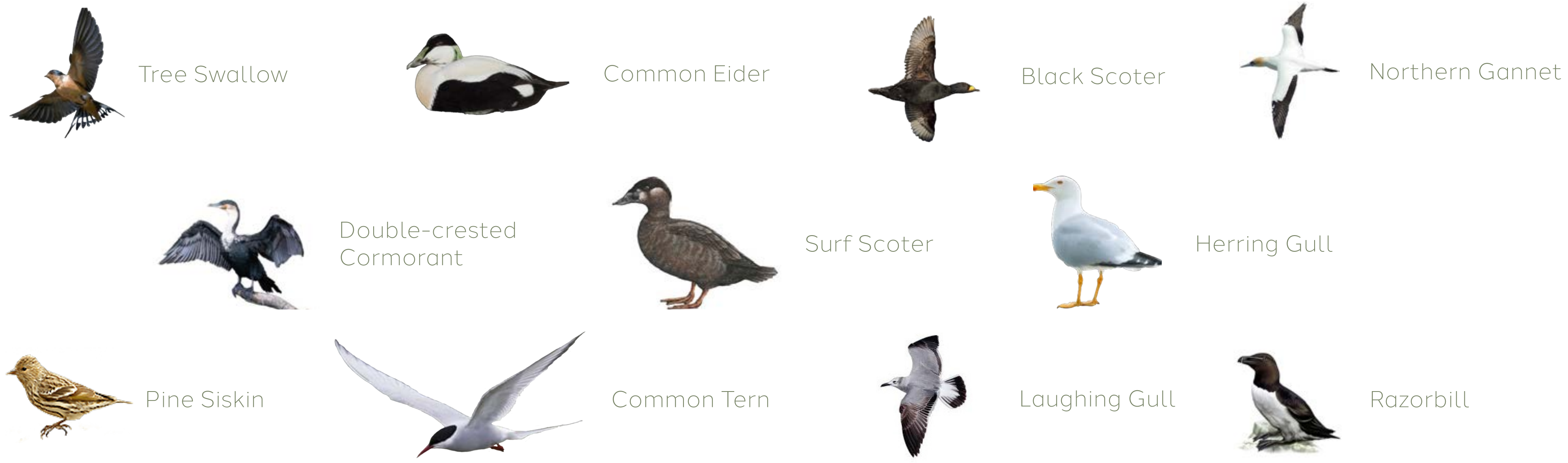
Design Process

Opportunities and Constraints

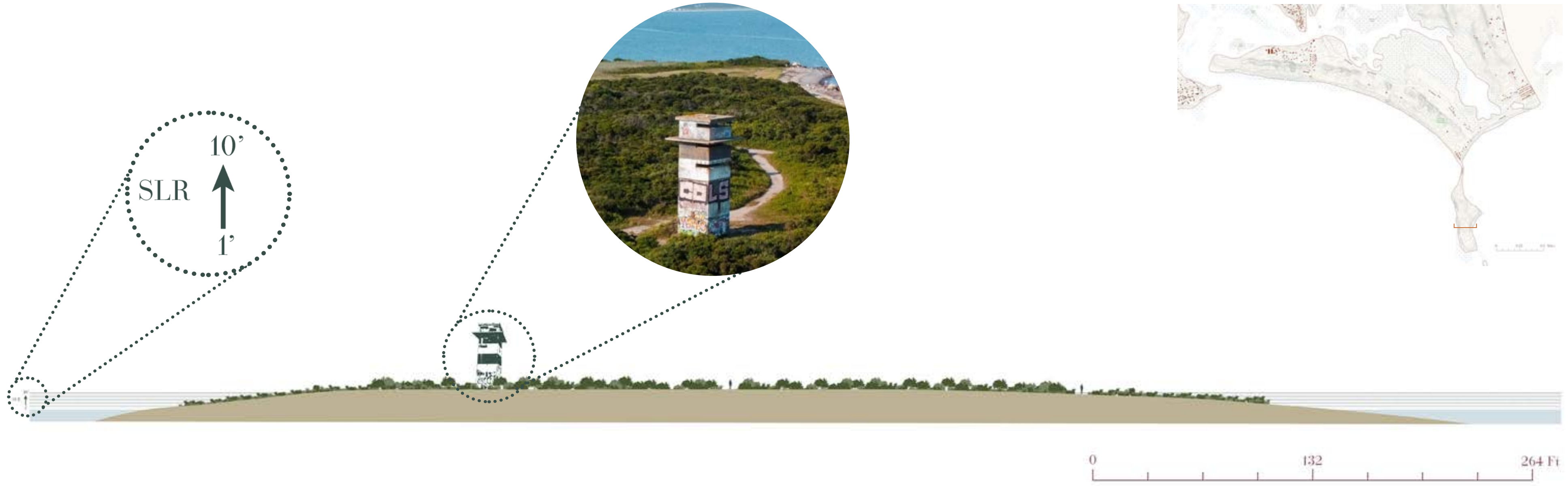


GooseBerry Island Current Conditions

Popular Bird Sitings - Species of Interest



Current Topography w/ Predicted SLR

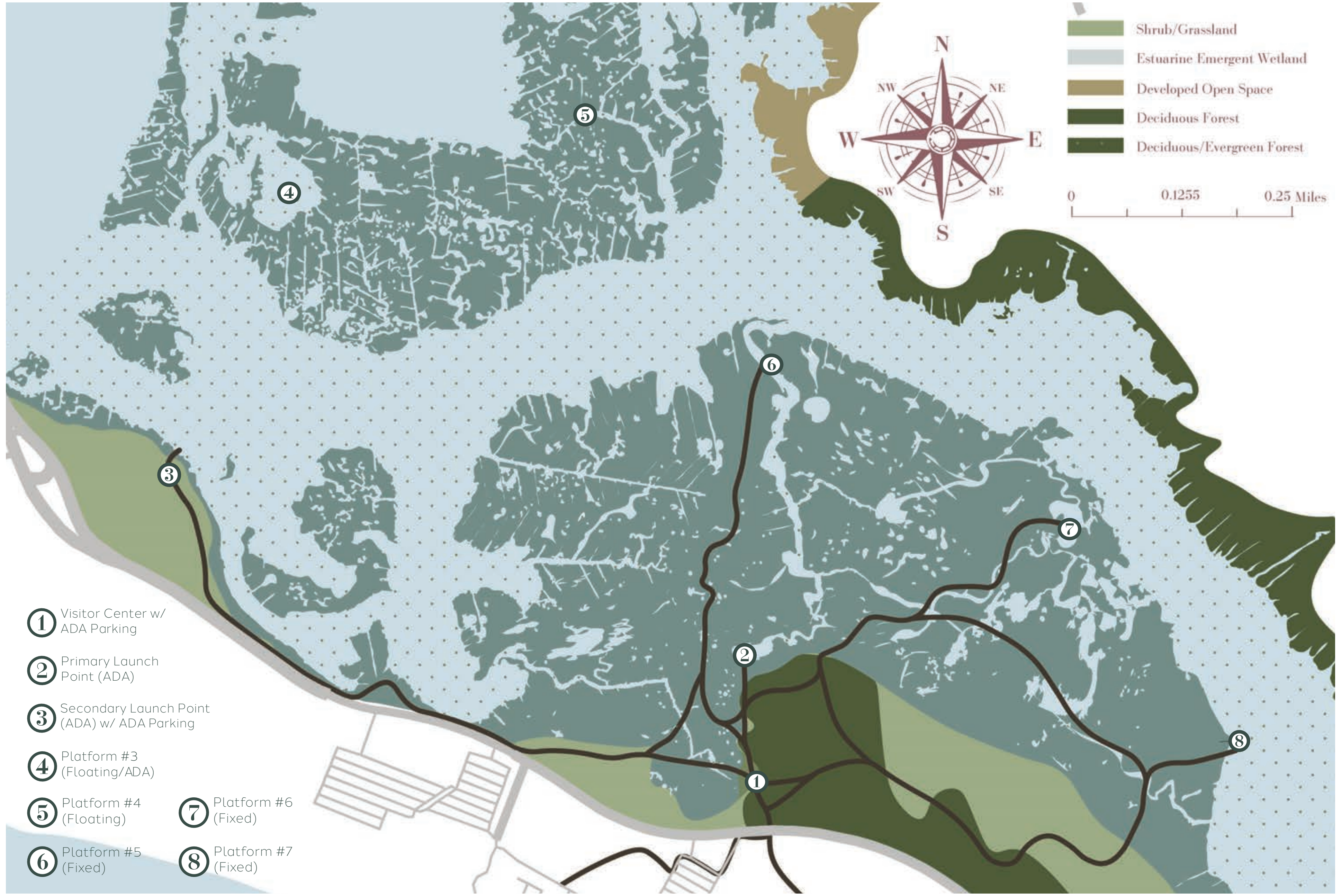


Initial Masterplan

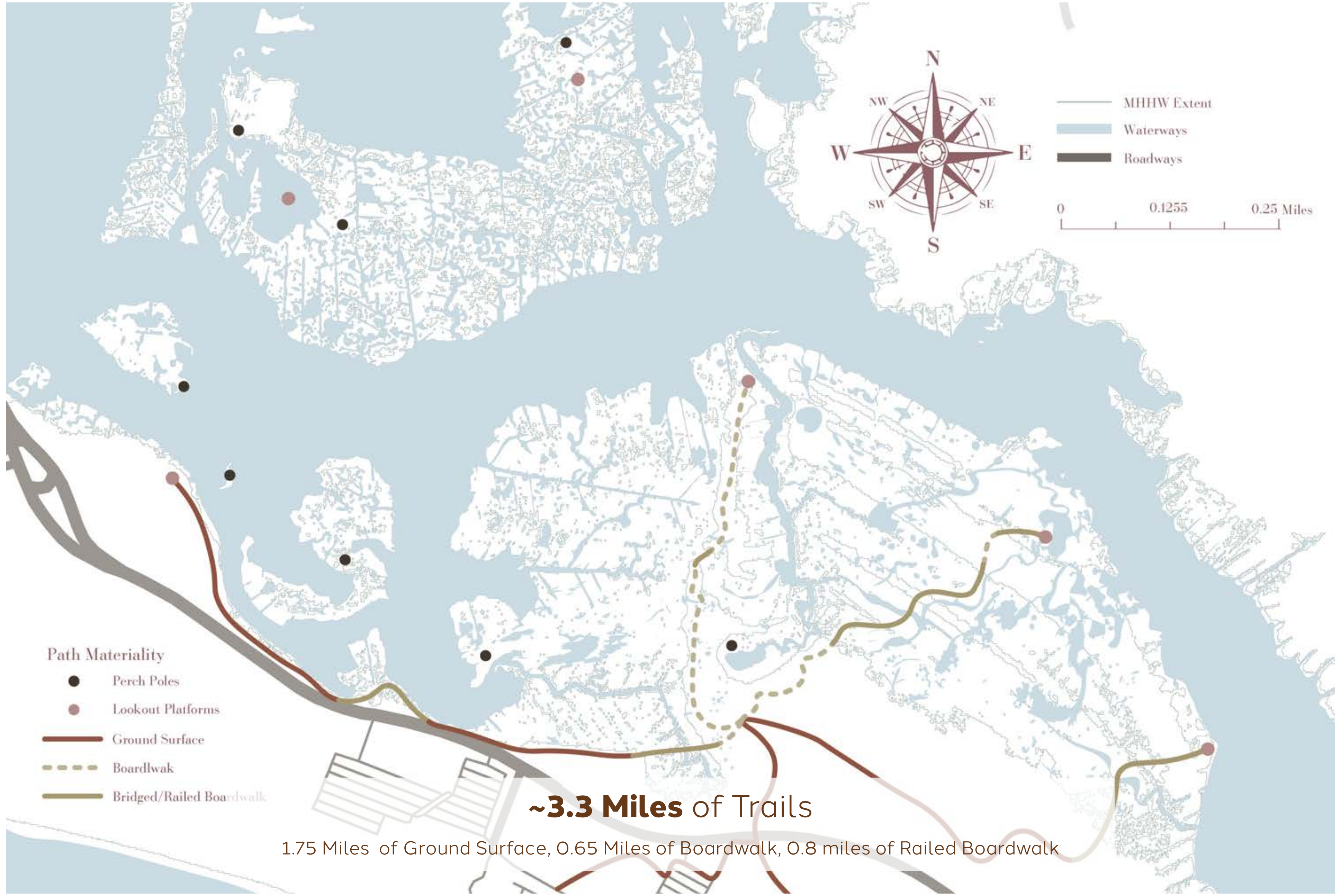
Marsh Restoration

Marsh - Current Conditions

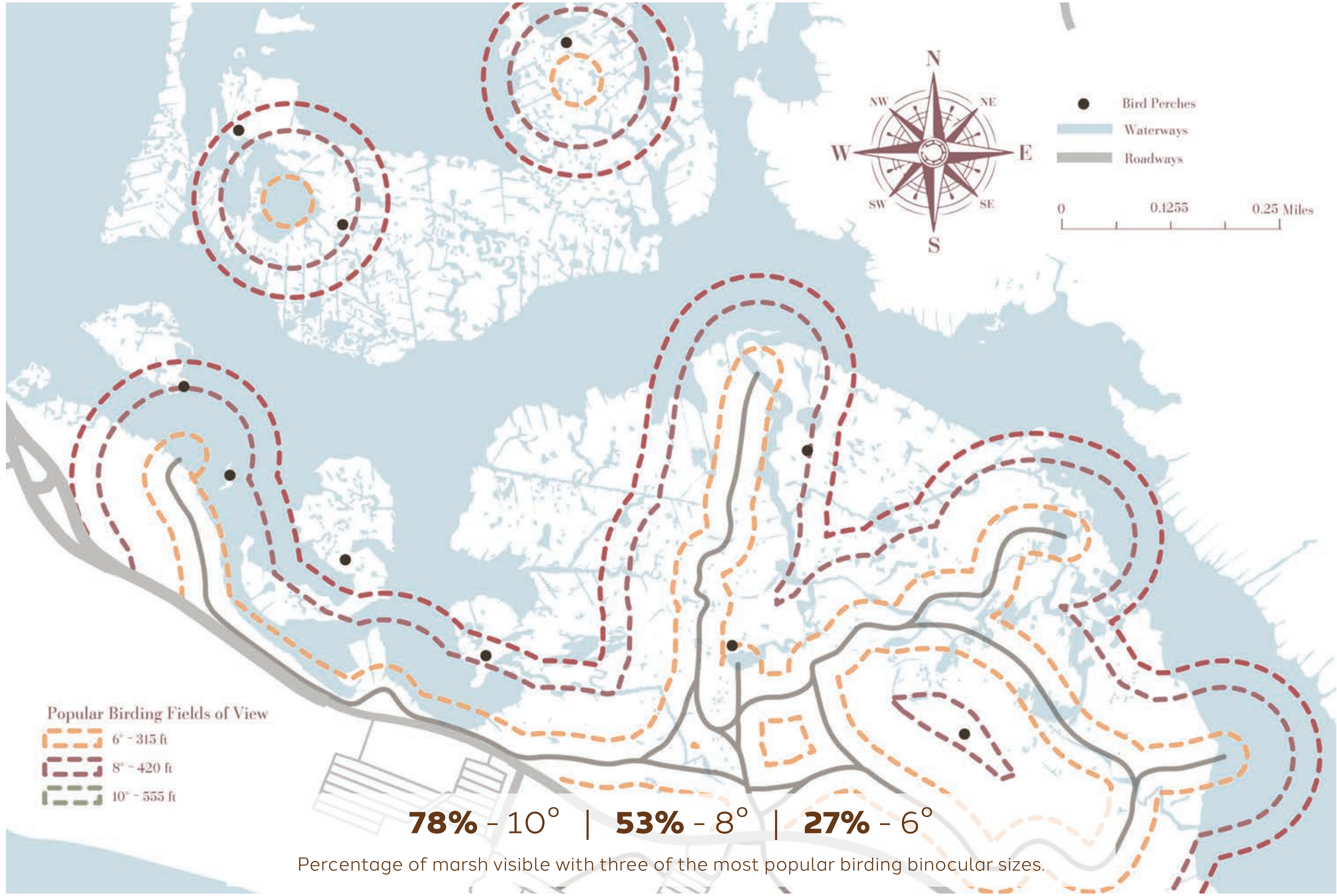
Marsh Restoration



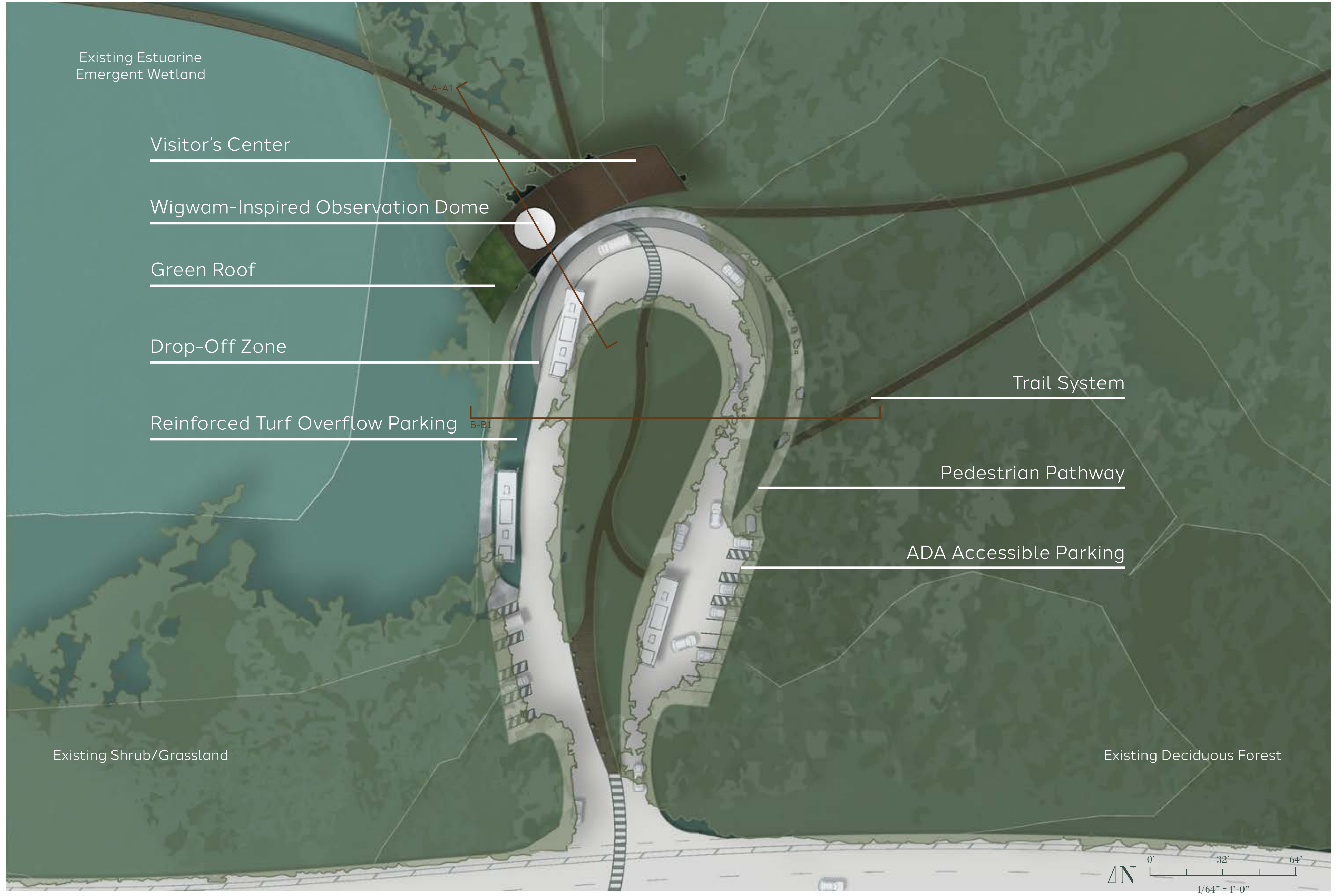
Marsh - Materiality



Marsh - Visibility



Marsh Engagement - Visitor's Center



Boardwalk Specifications

A-A1

B-B1

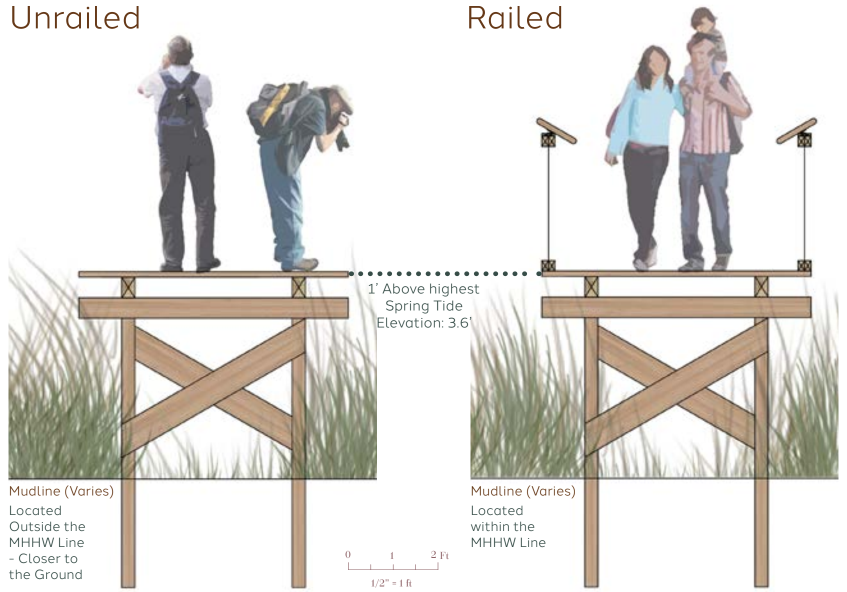
A-A1 Focus

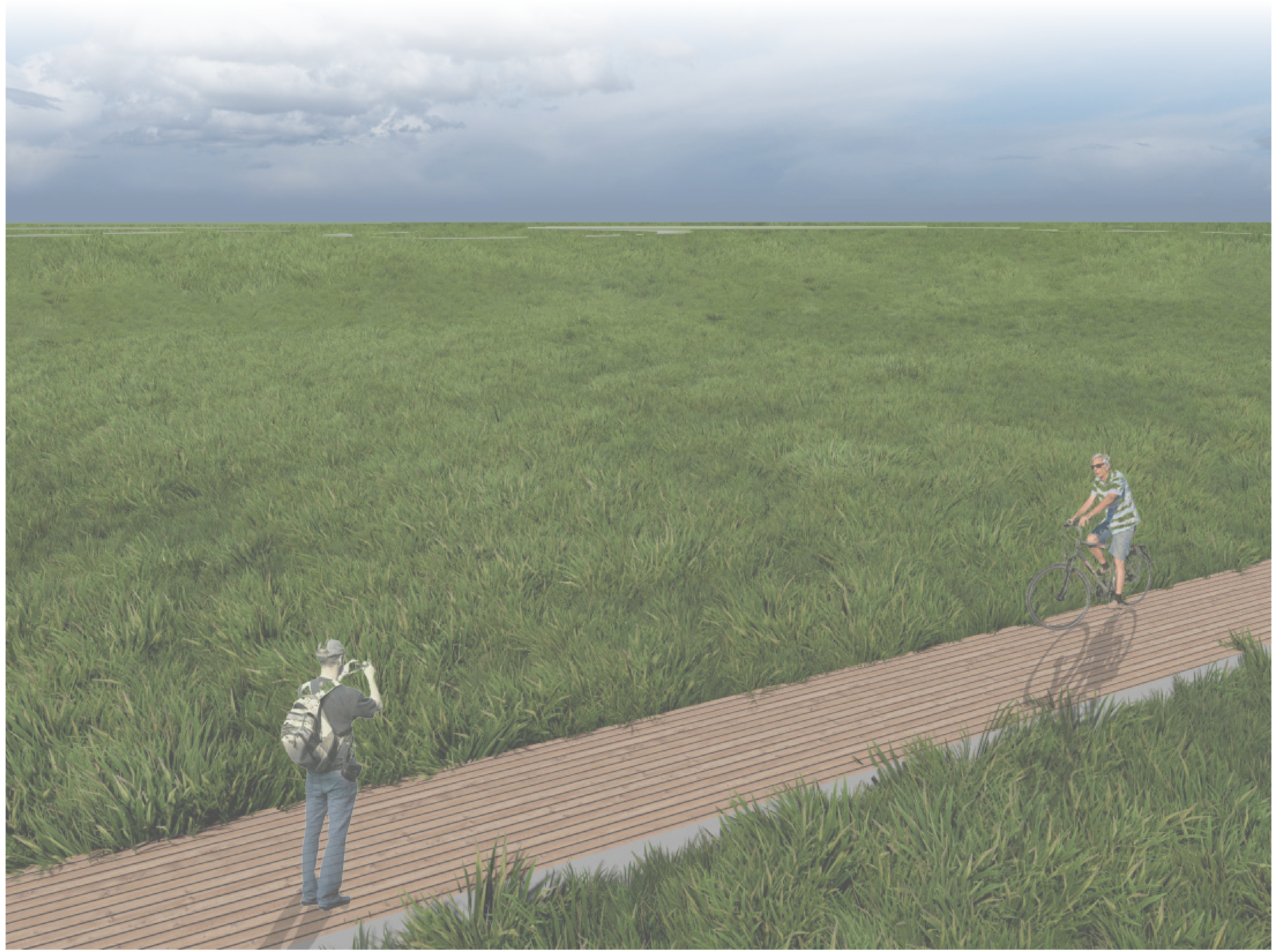
B-B1 Focus

Specifications created using Massachusetts State Code and Referenced The Town of Sandwich, MA Marsh Boardwalk Restoration plans.

Unrailed

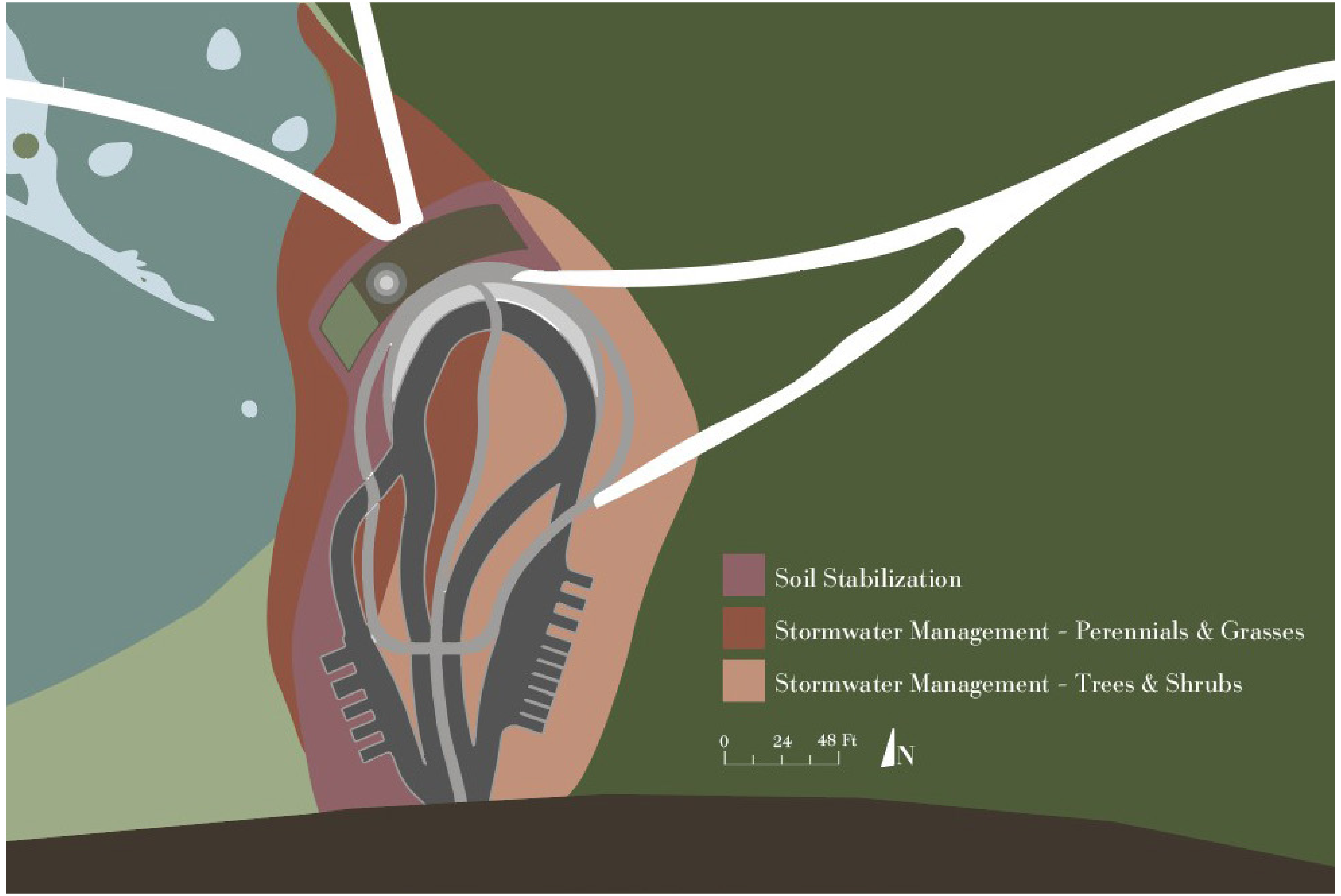
Railed





Planting Zones

Redoing Graphic



Planting Palette

Soil Stabilization


Cornus sericea


Rhus aromatica


Ilex verticillata

Stormwater Management
Shrubs & Trees


Aronia arbutifolia


Clethra alnifolia


Viburnum dentatum

Stormwater Management
Perennials & Grasses


Aquilegia canadensis


Panicum virgatum


Schizachyrium scoparium


Solidago sempervirens


Sorghastrum nutans


Symphyotrichum novae-angliae

Appendix A

Historic Preservation

Optimizing historic preservation under climate change: Decision support for cultural resource adaptation planning in national parks

Summary Paragraph/Abstract

Climate change poses a threat to physical and cultural resources, including historic buildings. Coastal zones are susceptible to inundation, deterioration, and destruction from sea-level rise and storm-related flooding and erosion. This study focused on developing a decision support model to manage historic buildings at Cape Lookout National Seashore transparently to make cost-effective decisions in the face of climate change.

Author(s):

Xiao, X., Seekamp, E., Post van der Burg, M., Eaton M., Fatorić, S., McCreary, A.

Source:

Xiao, X., Seekamp, E., Post van der Burg, M., Eaton M., Fatorić, S., McCreary, A., Optimizing historic preservation under climate change: Decision support for cultural resource adaptation planning in national parks. Land Use Policy, Volume 83, 2019, Pages 379-389. https://doi.org/10.1016/j.landusepol.2019.02.011.

Major Points or Topics

- Studied Cape Lookout National Seashore - a 56-mile chain of Barrier Islands
- Addresses the gap of planning for climate change adaptation and the inclusion of cultural resources
- Designed a model to evaluate the accumulated resource value for historic buildings
    - Results showed that when "no action" was applied, the cultural resource buildings would decrease in value by 45%

Design Implications:

- When no action is taken (no budget given) to historic building site, their value decreases by almost 50%
    - Solidifies the need for investment in cultural buildings
- If planning and budgeting are used, cultural resources can be included
    - Climate adaptation planning decisions can be all-inclusive of cultural resources and trade-offs can be evaluated
- Investment in climate adaption methods raises their value
    - Justifies the need to invest in cultural sites

CULTURAL BENEFITS OF FORMER MILITARY BUILDINGS' REUSE: PUBLIC ROOM, SKOPJE, REPUBLIC OF NORTH MACEDONIA

Summary Paragraph/Abstract

The reuse of former military buildings is a recent trend in Skopje, where they are being repurposed for cultural uses. This has helped promote the smart city concept and create new cultural networks. The conversion of neglected military buildings into cultural hubs has offered many benefits, and this paper aims to explore the decision-making process behind the adaptive reuse project of the former Railway Station. The project, led by "Public Room," promotes multicultural activities and events without any bias towards politics, ethnicity, or religion.

Author(s):

Grcheva, O.

Source:

Grcheva, O. (2019). CULTURAL BENEFITS OF FORMER MILITARY BUILDINGS'REUSE: PUBLIC ROOM, SKOPJE, REPUBLIC OF NORTH MACEDONIA. Journal of Tourism Leisure and Hospitality, 1(2), 76-84.

Major Points or Topics

- Historic buildings are crucial in terms of aesthetic, culture, and economy
- Case studies were gathered to track the success of historic reuse of buildings

Design Implications:

- Historic building types should be selected wisely, physical characteristics and organizations can be a constraint
- To sustain their new function, these buildings should be open to both locals and tourists for maximum success
- Accessibility can be a problem with historic buildings, so making sure not to ignore accommodations is crucial to the process.

Appendix B

Nature-Based Solutions

Nature Based Solutions for Climate Adaptation - Paying Farmers for Flood Control

Summary Paragraph/Abstract

The study explores farmers' willingness to accept a contract to flood their farmland to reduce urban flood risks in Denmark. Results show that farmers are hesitant about entering into such contracts, but prefer separate compensation for lost crops, collective negotiation, and higher annual payments. The study highlights the potential and limitations of Nature Based Solutions for climate adaptation at the landscape scale.

Author(s):

Zanderson, M., Oddershede, J., Pederson, A., Nielson, H., Termansen, M.

Source:

Zandersen, M., Oddershede, J., Pedersen, A., Nielsen, H., Termansen, M., Nature Based Solutions for Climate Adaptation - Paying Farmers for Flood Control. Ecological Economics. Volume 179, 2021. https://doi.org/10.1016/j.ecolecon.2020.106705.

Major Points or Topics

- Main goals:
    - Enhancing sustainable urbanization
    - Restoring degraded ecosystems
    - Developing climate change adaptation and mitigation
    - Improving risk management and resilience
- Analysis is based on survey data of a sample of farmers in the catchment area

Design Implications:

- There needs to be a collaboration between stakeholders and municipalities to successfully protect urban structures
- The value of an ecosystem directly correlates to the capacity to mitigate external disturbances to reduce risks to human society
- PES contracts are voluntary and help avoid negative relations and resistance from the landowner community compared to expropriation
- There must be enough spacial coverage of land committed to periodic flooding or no benefit will be seen

Success of coastal wetlands restoration is driven by sediment availability

Summary Paragraph/Abstract

This article discusses the effectiveness of nature-based solutions in mitigating the impact of sea-level rise on coastal wetlands. The study found that restored coastal wetlands are more effective in trapping sediment, and the success of the restoration project depends on sediment availability, not wetland elevation, tidal range, local rates of sea-level rise, and significant wave height. The results suggest that nature-based solutions can be effective in mitigating coastal wetland vulnerability to sea-level rise, but only in areas with abundant sediment supply.

Author(s):

Liu, Z., Fagherazzi, S., & Cui, B.

Source:

Liu, Z., Fagherazzi, S., & Cui, B. (2021). Success of coastal wetlands restoration is driven by sediment availability. Communications Earth & Environment, 2(1), 44.

Major Points or Topics

- The success of restoration projects is primarily driven by sediment availability, which explains the correlation between the concentration of total suspended matter (TSM) and accretion and elevation change rates in salt marshes and mangroves.
- 'Restored wetlands may be lower in the tidal frame than natural ones, because of erosion or soil compaction after land reclamation in pre-restoration site"

Design Implications:

- Nature-based solutions significantly increase resilience to sea level rise
- Other variables such as elevation relative to mean sea level, significant wave height, tidal range, regional rate of SLR, and elevation difference between restored and natural sites also affect the variation in accretion and elevation change rates.
- "Biomass controls sediment accretion by trapping sediment on stems and leaves, increasing below ground production of organic matter, and slowing tidal currents, thus promoting deposition"

Integrated assessment of storm surge barrier systems under present and future climates and comparison to alternatives: a case study of Boston

Summary Paragraph/Abstract

Large-scale barriers can be used as a management option to address coastal storm flooding, but their cost-effectiveness is low and their operational lives are limited due to increasing annual gate closures as sea levels rise. An assessment of two barrier options for the coastal city of Boston showed that shore-based adaptation options using nature-based solutions located on the waterfront have higher cost-effectiveness and several advantages.

Author(s):

Kirshen, P., Borrelli, M., Byrnes, J., Chen, R., Lockwood, L., Watson, C., & Herst, R.

Source:

Kirshen, P., Borrelli, M., Byrnes, J., Chen, R., Lockwood, L., Watson, C., & Herst, R. (2020). Integrated assessment of storm surge barrier systems under present and future climates and comparison to alternatives: a case study of Boston, USA. Climatic Change, 162, 445-464.

Major Points or Topics

- "The alternative of a wide spectrum of shore-based, district-level solutions located around the inner harbor waterfront, however, has the potential for high cost-effectiveness, and have several key advantages."
- Cities and other harbor municipalities should focus on multi-layered, shore-based approaches

Design Implications

- Smaller nature-based solutions can be layered to have a more impactful presence than a large-scale barrier
- Nature-based solutions provide flexibility and adaptability that hard structured barriers cannot
- With Barriers:
  - Water quality would degrade slightly
  - Habitat quality impacts would be mixed
  - Ecosystem service impacts would be mixed

Appendix C

Barrier Islands

Leveraging the Interdependencies Between Barrier Islands and Backbarrier Saltmarshes to Enhance Resilience to Sea-Level Rise

Summary Paragraph/Abstract

The article presents a framework for enhancing the resilience of barrier islands by applying the reciprocal relationship between barrier islands and their backbarrier saltmarshes. It describes a case study of designing a marsh creation project for Cedar Island in Virginia, US, which would provide habitat, slow barrier island migration, and hinder island breaching. The project aims to enhance storm and sea-level rise resilience and can serve as an example for other global barrier settings.

Author(s):

Hein, C. J., Fenster, M. S., Gedan, K. B., Tabar, J. R., Hein, E. A., & DeMunda, T. .

Source:

Hein, C. J., Fenster, M. S., Gedan, K. B., Tabar, J. R., Hein, E. A., & DeMunda, T. (2021). Leveraging the Interdependencies Between Barrier Islands and Backbarrier Saltmarshes to Enhance Resilience to Sea-Level Rise. Frontiers in Marine Science, 8, 721904.

Major Points or Topics

- The marsh was mapped using a combination of morphologic, stratigraphic, sedimentologic, and ecologic field data collection
- Developed design plans are for a marsh construction project within a 160-ha area

Design Implications:

- Marsh/barrier-island bio-geomorphodynamics to attenuate accelerating barriersystem changes
    - Use the natural systems to your advantage by making them support each other
- “early partnership in the conceptualization, design, and funding of a project of this nature is critical to identifying the priorities of the local community and achieving mutually desired outcomes with community support”
    - Get community input and approval!

Post-storm beach and dune recovery: Implications for barrier island resilience

Summary Paragraph/Abstract

The study examines the rate of dune recovery following extreme storms on Galveston Island, Texas and Santa Rosa Island, Florida using new remotely sensed data. Results show that dune recovery is largely complete within six years on Galveston Island, but takes approximately 10 years on Santa Rosa Island. Areas with the smallest dunes before the storm exhibit rapid recovery, but those with the largest dunes are particularly vulnerable to significant changes in island morphology if there is a change in the frequency and magnitude of storm events.

Author(s):

Hein, C. J., Fenster, M. S., Gedan, K. B., Tabar, J. R., Hein, E. A., & DeMunda, T. .

Source:

Houser, C., Wernette, P., Rentschlar, E., Jones, H., Hammond, B., & Trimble, S. (2015). Post-storm beach and dune recovery: Implications for barrier island resilience. Geomorphology, 234, 54-63.

Major Points or Topics

- Recovery rates are different for different sites post-storm
- Slow dune recovery is a threat to island resilience with a change in storm activity.

Design Implications:

- Dune and vegetation height reach a peak rate of recovery roughly 5 years after a disturbance
    - The dune recovery itself only takes about 3 years
- Larger dunes have the inability to fully recover due to anthropogenic interference
- “Results suggest that the recovery of the beach and dune to their pre-storm morphology can take up to a decade, and that the rate and amount of recovery is dependent on the pre-storm dune height.”

Piping Plover (Charadrius melodus) habitat selection, survival, and migration on New York barrier islands following natural and engineered habitat changes

Summary Paragraph/Abstract

This study analyzed the impact of Hurricane Sandy and engineered response on the habitat selection, abundance, and survival of the piping plover, a migratory shorebird. After the storm, the plovers selected new nesting sites closer to the ocean and newly-created bayside habitats, resulting in a 93% increase in abundance by 2018. Post-fledging survival did not vary in the six years following the storm, and fledgling migration occurred between July and September. Protecting newly-created habitats would likely help safeguard fledglings.

Author(s):

Walker, K. M.

Source:

Walker, K. M. (2020). Piping plover (Charadrius melodus) habitat selection, survival, and migration on New York barrier islands following natural and engineered habitat changes (Doctoral dissertation, Virginia Tech).

Major Points or Topics

- The federally threatened piping plover is a migratory shorebird that has been listed under the Endangered Species Act due to factors such as coastal development, recreational use, and habitat loss.

Design Implications

- After constructing new habitats, Piping plover abundance increased 93% by 2018 from pre-Hurricane Sandy abundances, with most pairs nesting in new habitats.
- Only 58% of suitable piping plover habitat was protected from recreational use, and few piping plovers used unprotected habitats for nesting.

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Extending the Reference pages

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