

# Town of Brewster



## Coastal Resource Management Plan Phase 1 Report

---

Brewster Coastal Committee  
Ridley & Associates, Inc.  
2019

## Table of Contents

<b>Executive Summary</b>	<b>3</b>
<b>Part I: Overview of the Coastal Resource Management Plan</b>	<b>5</b>
Introduction .....	5
Adaptive Management.....	7
Overview of Resources, Facilities and Land Uses in the Planning Area .....	7
Plan Goals.....	8
Planning Process.....	9
Organization of the Phase 1 CRMP.....	9
<b>Part II. Coastal Resource Management Issues and Recommendations</b>	<b>10</b>
<b>1. Increase the Resilience of Public Beaches and Landings</b>	<b>10</b>
Overview .....	10
Management strategies to increase the resilience of public beaches and landings .....	14
1. Provide ongoing monitoring of the coastal system on a regional basis .....	14
2. Manage and maintain public access points to increase resilience .....	15
3. Proactively address flooding of Brewster’s beaches and landings.....	17
Recommendations to increase the resilience of public beaches and landings:.....	17
<b>2. Preserve Ecosystem Services Provided by Healthy Coastal Wetlands</b>	<b>22</b>
Overview .....	22
Management Issues to preserve ecosystem services provided by healthy coastal wetlands .....	24
1. Preserve natural sediment transport processes in balance with erosion management... ..	24
2. Maintain the elevation of salt marshes and tidal flats .....	25
Recommendations to preserve ecosystem services provided by healthy coastal wetlands... ..	27
<b>3. Provide Access for Water Dependent Activities</b>	<b>30</b>
Overview .....	30
Management Issues to provide access for water dependent activities.....	31
1. Provide opportunities for commercial aquaculture .....	31
2. Provide opportunities for commercial shellfish harvesting.....	32
3. Enhance propagation and other activities to support recreational shellfishing .....	34
4. Manage competing uses at Town landings and mooring Areas .....	35
Recommendations to provide access for water dependent activities .....	37
<b>4. Preserve Peak-Season Access to Public Beaches and Landings</b>	<b>39</b>
Overview .....	39
Management Issues to preserve peak season access to public beaches and landings .....	40
1. Augment peak seasonal parking demand/capacity at beaches and landings .....	40
Bike and Pedestrian Access Improvements.....	42
Beach Shuttle Pilot Project.....	43
2. Enhance access for populations with limited mobility .....	44
Recommendations to preserve peak season access to public beaches and landings .....	45

<b>5. Protect Infrastructure, Visual Access and Sense of Place Threatened by Changing Conditions</b>	<b>47</b>
Overview .....	47
Management issues to protect infrastructure, visual access and sense of place threatened by hanging conditions.....	48
1. Minimize and mitigate development impacts in coastal areas .....	48
2. Identify opportunities to preserve visual access .....	49
3. Protect vulnerable low roads, groundwater, and underground infrastructure .....	49
Recommendations to protect infrastructure, visual access and sense of place.....	51
 <b>Part III. Implementation Issues</b>	 <b>53</b>
<b>Operational Management Structure</b>	<b>53</b>
 <b>Part IV. Maps</b>	 <b>54</b>
 <b>Sources</b>	 <b>55</b>
 <b>Acknowledgements</b>	 <b>56</b>
 <b>Terms and Abbreviations</b>	 <b>57</b>
Appendix A. Compiled CRMP Recommendations.....	58
Appendix B. Complementary Planning Efforts.....	69
Appendix C. Workshop Information .....	71
Appendix D. Town Actions to Manage Coastal Resources and Minimize Erosion Impacts	72
Appendix E. Public Comments on Draft CRMP .....	74
 <b>Figures and Tables</b>	
Figure 1. Erosion, deposition of sediment within Dennis-Brewster-Orleans littoral cell	11
Table 1. Guiding Principles for Coastal Resource Management	6
Table 2. Summary of Sea Level Rise Impacts on Town Access Points	13
Table 3. Brewster’s Coastal Wetland Resources	22

## **Executive Summary**

### **Purpose of the Coastal Resource Management Plan**

Brewster's bayside coastal resources are an integral part of the Town's history, economy and quality of life. Erosion and flooding caused by increased storm intensity, storm surge and rising sea level threaten the long-term sustainability of Brewster's beaches and landings, and associated public access ways and parking areas. Proactive strategies and measures are needed to ensure the sustainability, resilience and enjoyment of Brewster's coastal resources for generations to come.

The Brewster Coastal Resource Management Plan Phase 1 Report (CRMP) is intended to provide vision and policy direction for the future management of Brewster's coastal resources. The plan will assist the Town in meeting diverse community access needs and adapting to coastal change.

The CRMP builds on prior planning efforts, including the Brewster Vision Plan and Coastal Adaptation Strategy, and provides a framework for coordinating ongoing and future planning efforts and capital projects involving Brewster's coastal resources. The plan is designed to: (1) enhance public access to the Bay shore, (2) protect and maintain the natural beauty of the Bay shore, (3) make use of best available science and management practices, (4) protect the whole coastal system, (5) be adaptable to change, and (6) reflect community consensus.

The CRMP has been developed by the Brewster Coastal Committee. In developing the plan the Committee gathered information from expert sources and conducted five public workshops to listen to community views on coastal issues and potential strategies and actions.

### **Priority Coastal Resource Management Issues and Recommendations**

The plan identifies five key coastal resource management issues, and provides core strategies for addressing those challenges.

#### **1. Increase the resilience of public landings and beaches using the following strategies:**

- Provide ongoing monitoring of the dynamic coastal system on a regional basis
- Proactively address flooding at public beaches and landings
- Manage and maintain public access points, where possible, in ways that increase resilience to storm damage

Priority recommendations include: participate in the Storm Tide Pathways Project directed by Barnstable County and Center for Coastal Studies; undertake studies to monitor coastal dynamics; develop an Inner Cape Cod Bay ACEC Management Plan with adjacent towns; evaluate resilient shoreline management practices; evaluate regulatory changes to address the impacts of coastal change on private properties; and create a storm resiliency tool kit for maintenance of town landings and beaches.

#### **2. Preserve the ecosystem services provided by healthy coastal wetland resources using the following strategies:**

- Preserve natural sediment transport processes in balance with erosion management
- Maintain the elevation of salt marshes and tidal flats

Priority recommendations include: evaluate changes to local regulations to enhance wetlands protections; update the Wetlands Conservancy and Flood Plain Overlay District bylaws; promote public education about the beneficial eco-system services provided by healthy wetlands; and identify strategies to allow migration and/or elevation of salt marshes and tidal flats threatened by sea level rise.

**3. Provide access for water dependent activities using the following strategies**

- Provide opportunities for commercial aquaculture
- Provide opportunities for commercial and recreational shellfishing
- Manage competing uses and activities at Town landings

Priority recommendations include: update the Town’s regulations for commercial shellfishing and commercial aquaculture; continue the Razor Clam pilot project; enhance propagation activities to support recreational shellfishing.

**4. Preserve peak-season access to public beaches and landings using the following strategies**

- Augment peak seasonal parking demand/capacity at beaches and landings
- Enhance access for populations with limited mobility

Priority recommendations include: implement a beach shuttle demonstration project during the summer of 2020; implement measures to improve safe bike and pedestrian access; and identify ways to enhance beach/landing access and coastal views for individuals with limited mobility.

**5. Protect vulnerable infrastructure, visual access, and sense of place threatened by changing conditions using the following strategies**

- Minimize and mitigate impacts of development in coastal areas
- Protect low lying and vulnerable infrastructure
- Identify opportunities to preserving visual access

Priority recommendations include: Develop a multi-hazard mitigation plan; evaluate potential bylaws to limit the size, height and lot coverage of newly constructed or reconstructed residential dwellings in the coastal resource planning area; evaluate the potential benefit of revisions to the Flood Plain Overlay District and Wetlands Conservancy District bylaws to further limit development in velocity zones; develop a stormwater management bylaw; and evaluate Board of Health regulations concerning depth of groundwater.

**Implementation**

The Coastal Committee will be responsible for coordinating implementation activities under the CRMP, in close coordination with citizens, Town Administration, Town staff, and applicable boards and committees

## Part I: Overview of the Coastal Resource Management Plan



Fish weirs once dotted Cape Cod Bay; they were emptied at low tide by horse drawn cart. Photo and caption courtesy of the Brewster Historical Society

### Introduction

Brewster's Cape Cod Bay shoreline and tidal flats are among the Town's most cherished and well-used resources. These coastal resources are an integral part of Brewster's history and the Town's attractiveness as a place to live and visit. Yet erosion and inundation caused by increased storm intensity, storm surge and rising sea level threaten the long-term sustainability of Brewster's beaches and landings, and associated public access ways and parking areas. Proactive strategies and measures are needed to ensure the resilience and enjoyment of Brewster's coastal resources for generations to come. The significance of these resources to the community is reflected in the *Town of Brewster Vision Plan (2018)*, which establishes as a key goal the preservation, protection and expansion of public access to Brewster's coastal resources in the face of dynamic conditions.

The Vision Plan builds on other actions undertaken by the community to protect its coastal resources. The Select Board charged the Brewster Coastal Committee with developing a management plan that considers these complementary efforts and provides a unifying vision and direction for the future management of Brewster's coastal resources.

According to the Committee's charge, the management plan is intended to:

- (1) Assess the coastal processes, natural resources, existing uses and management practices on Brewster's Cape Cod Bay shore, including critical areas of the bay shore,

those that support important human uses or habitat, and those that are vulnerable to the effects of erosion or upland development;

(2) Identify a range of alternatives to address future management of the coastal resources of Brewster’s bay shore; including public access to the bay, alternatives to onsite parking lots; and measures to address rising sea levels and increases in storm intensity, such as retreat and re-location; and

(3) Recommend on-going, immediate (1-3 year), short-term (4-6 year) and long-term (6+ years) actions; and ways of securing funding, including changes to current means of generating revenue or new sources of revenue for coastal management and protection.

Planning for the resilience of Brewster’s coastal resources and addressing the community’s demand for access to the shoreline is proceeding step-by-step.

As a first step, in 2016 the Coastal Committee met as part of the Brewster Coastal Advisory Group, “to develop and publicly present a set of strategies and mechanisms to address key community vulnerabilities, issues and priorities and to identify the community’s preferred adaptation strategies.” The resulting *Coastal Adaptation Strategy (CAS)* developed by the Brewster Coastal Advisory Group and written by the Horsley Witten Group assessed impacts to town landings and beaches resulting from sea level rise and storm surge, and provided guiding principles for assessing future management actions. The CAS<sup>1</sup> also includes three planning scenarios for sea level rise and storm surge. In addition to an assessment of impacts, the CAS also articulates a series of guiding principles to be used in the assessing future decisions regarding the management of Brewster’s shoreline (Table 1).

**Table 1. Guiding Principles for Coastal Resource Management**

<p><b>Access:</b> Maintain and expand the opportunities for all to access Brewster's public beaches year-round. Meet peak season access needs by exploring opportunities at all public access points and through alternative means, including off-site parking, improved biking and pedestrian access, and investigation of shuttle options. Also consider those with limited mobility and users of wheelchairs, families, commercial and recreational shellfishers, and emergency access, and the safety needs of providing and balancing this access for all.</p>
<p><b>Natural Beauty:</b> Protect and maintain the natural beauty, non-commercial, peaceful, quiet, spacious, and "small feel" of Brewster's coast, beaches, and coastal neighborhoods, and safeguard their long-term significance for town residents and visitors.</p>
<p><b>Science-based, Innovative and Realistic:</b> Seek long-term solutions based on the best available science that are innovative, realistic, and achievable, that work along with nature and build climate resiliency today and into the future, and that are both environmentally and fiscally sustainable.</p>
<p><b>Holistic:</b> Protect the whole coastal system, including beaches, dunes, wildlife habitat, salt marshes, and other ecosystem services. Seek actions appropriate to coastal projections and community needs that build on and enhance the coast as well as the ecosystem as a whole.</p>
<p><b>Adaptive:</b> Recognize that the changing nature of coastal resources requires flexibility and adaptive planning, with ongoing monitoring of changing conditions and community needs, to best respond to new technologies, opportunities, and scientific uncertainties.</p>
<p><b>Consensus-based:</b> Provide for public input and build community consensus through all phases of the planning and implementation of the Coastal Adaptation Strategy.</p>

Source: Coastal Adaptation Strategy

<sup>1</sup> The Full Coastal Adaptation Strategy is available at <http://records.brewster-ma.gov/weblink/0/doc/75572/Page1.aspx>

The Coastal Adaptation Strategy (CAS) provides the foundation for development of the *Brewster Coastal Resource Management Plan (CRMP)*. The CRMP is intended to provide policy direction and serve as a guide for future management and decision-making concerning Brewster’s coastal resources. *The CRMP* provides a framework for expanding and implementing the preferred coastal resiliency strategies identified in the CAS. In so doing, the CRMP will assist the Town in meeting the diverse access needs of the community and adapting to coastal change, sea level rise, storm surge and shoreline erosion. In meeting this charge, the CRMP will be coordinated with other related town planning efforts that involve the protection of coastal resources. These planning efforts are briefly described in Appendix B.

## **Adaptive Management**

Due to the dynamic nature of the coastal system and the forces shaping it, management actions must be flexible and adaptable to the dynamic nature of the system, changes in community needs, and innovations in science and technology. The CAS included “adaptive management” as a guiding principle in the assessment of future coastal management options. Adaptive management of natural systems is a rigorously structured decision-making process. In the context of Brewster’s CRMP, a more conceptual approach to adaptive management is proposed, encompassing the following tenets:

1. Thorough assessment of current (baseline conditions) using the best available science;
2. Modeled predictions of probable outcomes due to changing conditions, based on best available science;
3. Evaluation of management actions in terms of effectiveness in achieving the community’s social and ecological goals in light of modeled anticipated system changes;
4. Data collection before, during and following the implementation of management actions, to compare actual outcomes to predicted changes;
5. Adjustment of management actions as necessary to improve effectiveness in achieving the community’s goals.

In recognition of the adaptive management approach, the CRMP is envisioned to be a multi-phase effort. This Phase 1 report of the CRMP is intended to identify and describe the priority management challenges to be addressed, recommend management actions to address those management challenges, and suggest implementation steps necessary to pursue recommended management actions. It is anticipated that further research and analysis of coastal resources trends and conditions would be undertaken in subsequent phases to implement and update the CRMP.

## **Overview of Resources, Facilities and Land Uses in the Planning Area**

The coastal resources addressed in the CRMP include Brewster’s Cape Cod Bay shore, extending from the bay-facing edge of the uplands to the lowest low tide of the intertidal flats. To fully assess management challenges associated with beach access and potential flooding impacts to vulnerable infrastructure, the plan also considers impacts to upland properties and roadways.

Part of the Select Board's charge to the Committee is to "[a]ssess the coastal processes, natural resources, existing uses and management practices on Brewster's Cape Cod Bay shore, including critical areas of the bay shore, those that support important human uses or habitat, and those that are vulnerable to the effects of erosion or upland development." Accordingly, the Committee worked with the Cape Cod Commission to develop a series of figures to help characterize and visualize the location and extent of critical natural resources, water dependent activities and infrastructure, and the built environment in the planning area. These figures are found in Section IV and are referenced throughout the Phase 1 report.

#### Natural Resources

- Map 1 Wetland resources
- Map 2 Anadromous fish and shellfish resources
- Map 3 Habitat

#### Water Dependent Uses and Activities

- Map 4 Public beaches and landings and mooring areas
- Map 5 Recreational and commercial shellfishing and aquaculture
- Map 6 Shoreline structures

#### Built Environment

- Map 7 Land uses
- Map 8 Zoning
- Map 9 Flood hazards and vulnerable infrastructure

### **Plan Goals**

The Brewster Vision Plan establishes the importance of sustaining public access to the Town's coastal resources in light of increased erosion due to sea level rise and storm surge. The CAS provides a thorough assessment of potential impacts to public and private coastal resources resulting from sea level rise and storm surge based on three planning scenarios, and identifies management challenges that need to be addressed.

The CRMP presents an opportunity to fulfill the community's vision by setting forth an action plan that effectively responds to the management challenges identified in the CAS and refined by the Coastal Committee. The management challenges helped to define the goals for the CRMP:

1. Increase the resilience of public landings and beaches
2. Preserve the ecosystem services provided by healthy coastal wetland resources
3. Provide access for water dependent activities
4. Preserve peak-season access to public beaches and landings
5. Protect vulnerable infrastructure, visual access, and sense of place threatened by changing conditions

## **Planning Process**

The Phase 1 report was developed by the Coastal Committee and Ridley & Associates, Inc., with technical support from the Director of Natural Resources and input from other Town officials and Town committees.

The process of developing the plan began with a series of five issue-focused community workshops to garner community input. The workshops focused on coastal processes shaping the shoreline, wetland protection, access for water dependent activities, seasonal beach access, and surrounding land uses and infrastructure. Topical discussion papers were prepared and made available to the public in advance of each session. Each paper discussed current conditions and future trends, and explored a range of potential management strategies and actions. Proposed strategies and actions could encompass physical improvements, policies and regulations, management practices, technical studies/analyses, or communications measures. Each paper was presented in a community workshop to engage stakeholders in discussing management issues and trends, and evaluating potential strategies and action items. More information about the workshops is provided in Appendix C.

Following the workshops, a draft Phase 1 CRMP was developed and presented to the Select Board and made available for public comment. The Planning Board, Open Space Committee, Conservation Committee and Board of Health received a copy of the draft with a request for comment. The Coastal Committee reviewed all comments received and prepared a final Phase 1 report.

## **Organization of the Phase 1 CRMP**

Part I provides an introduction to the background, purpose and scope of the plan.

Part II examines the five coastal resources management issues addressed in the plan:

1. Increasing the resilience of landings and beaches
2. Preserving ecosystem services provided by healthy coastal wetlands
3. Providing access for water dependent activities
4. Preserving peak-season access to public beaches
5. Protecting infrastructure, visual access and sense of place threatened by changing conditions

Each section in Part II provides an overview of the resource management issues, identifies planning objectives, and presents recommended actions to meet objectives. Recommended actions are presented at the end of each section in a matrix, prioritized by time frame into near-term (year 1-3), intermediate term (year 4-6) and long-term (year 6+) actions. Parties involved and an initial estimate of resource needs are also indicated. It should be noted that as recommendations are implemented, they may be refined based on additional environmental, engineering, regulatory and policy review.

Part III of this report addresses the implementation structure needed to undertake the actions recommended by the plan and track progress. Maps, sources and other supporting materials are included at the end of the report.

## Part II. Coastal Resource Management Issues and Recommendations

### 1. Increase the Resilience of Public Beaches and Landings



*Accretion (gain) of sand on the flats adjacent to Crosby Landing*

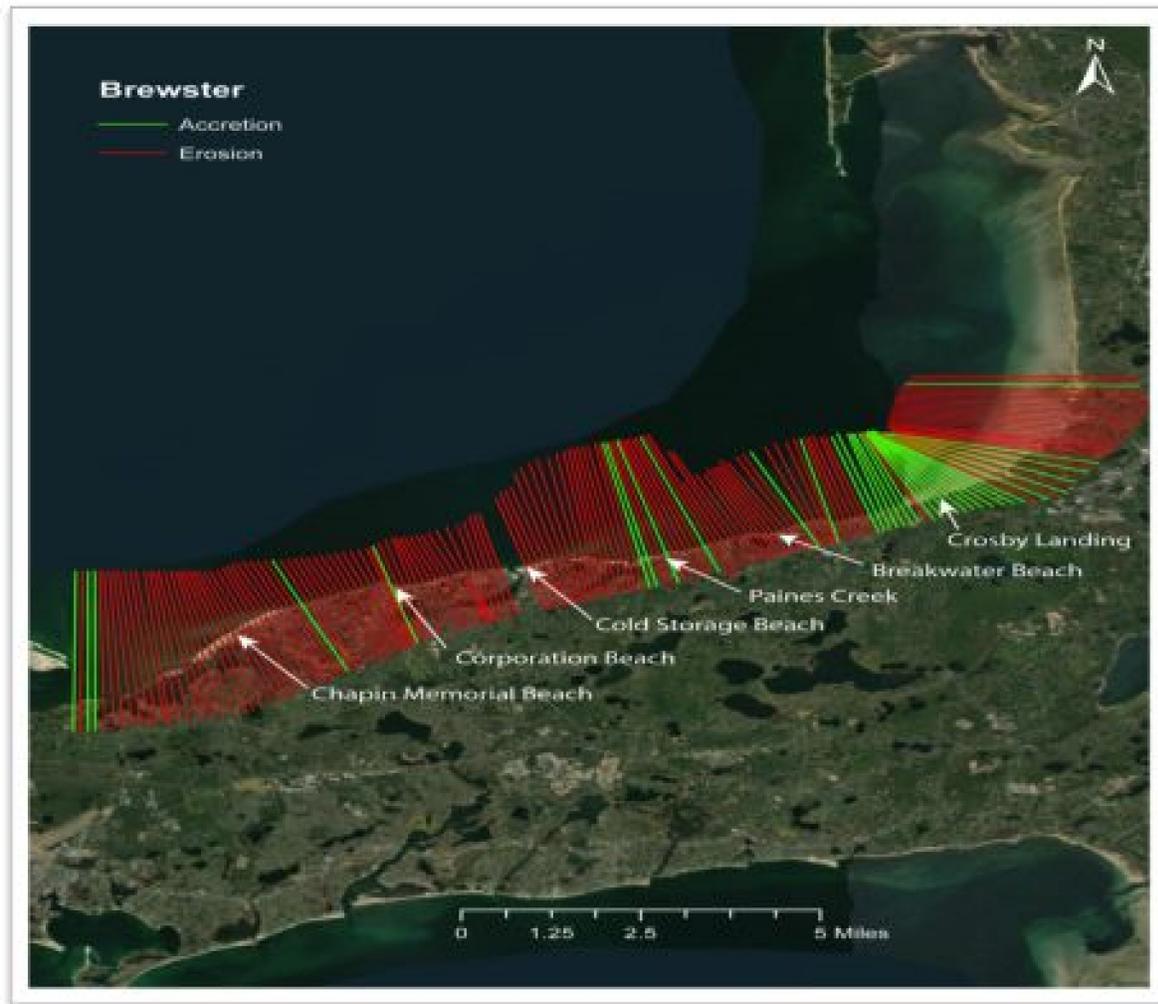
#### Overview

The Massachusetts Coastal Erosion Commission Final Report (2015) summarizes the challenges facing coastal communities seeking to preserve crucial resources in the midst of natural and human-induced pressures:

*The coast is a very dynamic environment, and coastal shorelines—especially beaches, dunes, and banks—change constantly in response to wind, waves, tides, and other factors such as seasonal variation, sea level rise, and human alterations to the shoreline system. The movement of sediment along the coast and the loss and gain of shoreline through erosion and accretion are continuous and interrelated processes. In Massachusetts, eroding coastal landforms and marine deposits are the primary sources of sand that created and continue to feed our beaches and dunes. While erosion is necessary and natural, it also causes damage to coastal property and related infrastructure and can have adverse effects on beaches and other habitat.*

Brewster’s seven miles of north-facing shoreline on Cape Cod Bay includes ten public landings and access points with limited onsite public parking, including Wing Island, which is accessed over a public right of way on property owned by the Cape Cod Museum of Natural History, with informal parking at Drummer Boy Park (Map 4). The entire shoreline is within FEMA VE flood

zone (Map 9), subject to inundation by the one percent annual chance flood event (i.e., 100-year storm<sup>2</sup>). Brewster’s famous tidal flats extend seaward approximately two miles at low tide, encompassing some 12,000 acres, of which approximately 4,000 acres exposed at low tide constitute the flats that most residents and visitors enjoy.



*Figure 1* above shows the pattern of erosion and deposition of sediment within the Dennis-Brewster-Orleans littoral cell. The net direction of sediment movement in the littoral cell is from Dennis (a sediment source) to Brewster (a sediment sink). Source: Borrelli

<sup>2</sup> Scientists use statistics and observe how frequently different sizes of floods occurred, and the average number of years between them, to determine the probability that a flood of any given size will be equaled or exceeded. The "100-year flood" is an estimate of the long-term average recurrence interval, which does not mean that we really have 100 years between each flood of greater or equal magnitude" Source: <https://pubs.usgs.gov/fs/FS-229-96/>

Brewster's shoreline is part of the larger Cape Cod Bay coastal system that extends from Provincetown to Sandwich and the Cape Cod Canal. Like Brewster, several areas along the larger Cape Cod Bay system are experiencing erosion from daily tidal action and periodic coastal storm surge. Paine's Creek and Mant's Landing are among the areas hardest hit by erosion in Brewster, while Herring Cove in Provincetown, Chapin Beach in Dennis, and Town Neck Beach in Sandwich are among the other areas along Cape Cod Bay experiencing dramatic erosion in recent years.

Within this larger system, Brewster is part of a littoral cell that extends from Dennis to the west, to Orleans to the east. A littoral cell consists of a *sediment source* from which sand is eroded, and a *sediment sink*, where sand is deposited. Sediment moves or is transported by wind, tides, waves and currents within the littoral cell. While the movement of sediment is dynamic and often multi-directional, there is often a prevailing direction of sediment movement in a littoral cell. In Brewster's littoral cell, sediment moves predominantly west to east (Dennis to Orleans) due to prevailing northwesterly wind and waves (Figure 1).

*A Century Scale Sediment Budget of the Brewster Coast* (Borrelli, 2015) was developed to estimate the direction, volume and net effect of this "river of sediment" (i.e., sand) moving along Brewster's shoreline. The assessment found that "Brewster, at its westerly boundary, receives sediment eroded from the coast of the adjoining Town of Dennis. Eastward moving sediment maintains a fairly constant rate of between 25,000 and 30,000 cubic meters per year throughout the western half of the Town's coastline, and then decreases to some 10,000 cubic meters per year at the Town's eastern boundary. This reduction in transport rate indicates that some 15,000 to 20,000 cubic meters of sediment per year are added to eastern section of the active Brewster coast. However, all available data indicate that the deposition occurs offshore of the Brewster shoreline." (Borrelli, 2015) Through the process of longshore sediment transport, a large amount of sediment is being deposited annually offshore at the eastern end of the Town near Crosby Landing.



Despite the accumulation of sediment offshore in the vicinity of Crosby Landing, the study also concludes that, overall, erosion is outpacing accumulation of sediment (accretion) along Brewster's shoreline. This conclusion corresponds with historical data documented in the CAS (Horsley Witten, 2016). Based on historical data, the average long-term rate of erosion along Brewster's shoreline is 0.6 ft/year, while accumulation (accretion) is occurring at a rate of 0.2 ft/year. As shown on Figure 1, erosion and accretion are highly variable at different points along the shore:

- Highest rates of erosion at Mant's Landing and Paine's Creek;
- High to medium rate of erosion at Breakwater Beach and Ellis Landing and the shoreline west of Spruce Hill;
- Little or no net change at Saint's Landing, Linnell Landing, Point of Rocks, Breakwater Landing;
- Medium accretion (building up of sand) at Linnell and Crosby Landing.

The CAS evaluated how increases in sea level rise and storm surge could alter historic patterns of erosion, accretion and inundation along Brewster's shoreline. Based on an assessment of best available projections of sea level rise, and the associated storm surge potential, the CAS selected three scenarios of combined sea level rise and storm surge. The scenarios were used to model potential future impacts to public access points along Brewster's shoreline:

- Low scenario - MHW + 2 feet which can represent either a particularly high tide in 2016, or a more average tide with a storm surge or some sea level rise,
- Mid scenario - MHW + 4 feet which can represent an average tide with four feet of sea level rise, or two feet of sea level rise with a two-foot storm surge,
- High scenario - MHW + 8 feet which can represent an average tide with a combination of four feet of sea level rise, and four feet of storm surge,

Current mean high water (MHW) provided a benchmark or baseline measurement of coastal flooding against which scenarios could be compared. In addition to the baseline and low, mid and high scenarios described above, MHW + 10 feet was modeled to reflect potential hurricane conditions.

To assess potential impacts under each scenario, current and elevated MHW levels (from the three scenarios) were superimposed on high-resolution (LiDAR) aerial imagery. The maps were then used to evaluate the nature of changes to each respective public access point. The National Weather Service developed a computerized Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for estimating storm surge heights resulting from historical, hypothetical, or predicted hurricanes. The model takes into account atmospheric pressure, size, forward speed, and track data, but not wave action. Therefore, the SLOSH model may underestimate the inland extent of storm surge. The analysis of impacts is described in Table 2 below.

**Table 2. Summary of Sea Level Rise Impacts on Town Access Points\***

	<b>Low Scenario MHW+2ft (surge or SLR)</b>	<b>Mid Scenario MHW+4ft (surge or SLR)</b>	<b>High Scenario MHW+8ft (4 ft surge + 4 ft SLR)</b>
Paine’s Creek	<ul style="list-style-type: none"> <li>• <b>Beach/marsh partially floods</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach/marsh floods</b></li> <li>• <b>Access to beach floods</b></li> <li>• <b>50% impact to parking</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Resource fully floods</b></li> <li>• <b>Access floods</b></li> <li>• <b>100% impact to parking</b></li> </ul>
Mant’s Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach, flooded marsh</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach, flooded marsh</b></li> <li>• <b>Flood impacts parking access</b></li> <li>• <b>50% impact to parking</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>No beach or marsh</b></li> <li>• <b>Flood prevents parking access</b></li> <li>• <b>100% impact to parking</b></li> </ul>
Saint’s Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>
Breakwater Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• <b>Flood impedes access to pkg</b></li> <li>• No impact to pkg; but no access</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• <b>Flood impedes access to pkg</b></li> <li>• No impact to pkg; but no access</li> </ul>
Breakwater Beach	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• No impact to access</li> <li>• <b>100% impact to parking</b></li> </ul>
Point of Rocks	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• <b>Access to beach floods</b></li> <li>• No impact to parking</li> </ul>
Ellis Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• <b>Access to beach floods</b></li> <li>• <b>15% impact to parking</b></li> </ul>
Linnell Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach area</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods almost entirely</b></li> <li>• No impact to access</li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beach floods entirely</b></li> <li>• <b>Access to beach floods</b></li> <li>• <b>60% impact to parking</b></li> </ul>
Crosby Landing	<ul style="list-style-type: none"> <li>• <b>Reduced beach, wetland flood</b></li> <li>• No impact to access<sup>7</sup></li> <li>• No impact to parking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Reduced beach, wetland floods</b></li> <li>• <b>Access to parking floods</b></li> <li>• <b>50% impact to parking</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Entire resource underwater</b></li> <li>• <b>Access to parking floods</b></li> <li>• <b>100% impact to parking</b></li> </ul>

Source: Coastal Adaptation Strategy

\*Access to Wing Island and Spruce Hill was not evaluated

The historically dynamic nature of sediment movement along Brewster’s shoreline has resulted in areas of intense erosion and other areas of modest accretion. The potential for these trends to intensify due to increasing storm surge and sea level rise, has contributed to the following management issues.

## **Management strategies to increase the resilience of public beaches and landings**

### **1. Provide ongoing monitoring of the coastal system on a regional basis**

As noted above, Brewster’s coastal resources are part of a larger and constantly changing Cape Cod Bay shoreline system. Ongoing study of Brewster’s coastal resources in the context of this broader system is necessary to build understanding of the coastal processes and potential impacts

of sea level rise shaping these resources. As noted above, an adaptive management approach is proposed to assess management alternatives and their effectiveness. This will require on-going data collection and assessment of physical conditions—including tidal dynamics, sediment movement, and extent of erosion and accretion—using best available science. Data collection and assessment should be undertaken in the context of a monitoring plan that provides scientifically sound protocols, clear objectives and baseline reference points. Due to the regional nature of the system, data collection and analysis can be conducted in coordination with neighboring communities that manage adjacent resources to ensure a more holistic understanding of resource trends and help to offset costs of monitoring and assessments.

## **2. Manage and maintain public access points to increase resilience**

The Town has been proactive in undertaking measures to mitigate the erosion impacts on the Town’s coastal resources. However, as the climate change effects intensify as predicted, the frequency and severity of coastal erosion is likely to increase. New approaches to assess, plan for, implement, fund and monitor erosion management and mitigation measures will be needed.



Brewster Bayside tidal flats

In estimating storm surge levels into the future, the Town looked at the historic record of five significant storms measured at Boston Harbor, the closest NOAA gauge with a sufficient historic record. The storm surge levels varied from a “low” of 3.69 feet in the Valentine’s Day nor’easter in 1940 to 4.88 feet during the “Perfect Storm” of October 1991. The storm surge estimate for the January 2, 2018 storm was 4.82 feet. The 1991 and 2018 storm surges are the equivalent of two feet of sea level rise and at least 2 feet of storm surge; slightly less than the mid-impact scenario modeled by the CAS.

Appendix D presents some of the measures Brewster has undertaken to increase the resilience of town-owned coastal resources. While these measures have helped to mitigate the effects of erosion, the severity of coastal storms in the past five years has nevertheless resulted in dune wash-over, flooding and significant beach erosion. In some areas up to 20 feet of dune or coastal bank has been lost in one event. Erosion and coastal flooding from storms and surges may intensify in frequency and magnitude as sea level rises, placing shoreline access points at greater risk of erosion.



*Flooding at Paine's Creek during a January 2018 storm.*

Shoreline structures and certain land use conditions can alter the natural flow of sediment transport and potentially exacerbate the effects of coastal erosion. Structures such as groins and sea walls are effective at trapping updrift sediment, but tend to starve downdrift beaches and force the downdrift beach to retreat landward. As stated in the *Massachusetts Coastal Erosion Commission's Final Report* (2015), “[u]nder conditions of reduced sediment supply, the ability of coastal landforms to provide protection from storm damage and flooding is diminished, increasing the vulnerability of infrastructure and development.” The natural ecosystem – beaches, dunes, barrier beaches, salt marshes and estuaries – are also threatened and will slowly disappear as the sand sources that supply and sustain them are eliminated.”

Similarly, stormwater run-off and loss of wetlands vegetation can lead to overland run-off, which is a significant contributor to erosion.

When contemplating management actions, it is important to consider the broader forces behind sediment movement, erosion and accretion – both on and offshore – within the system.

**3. Proactively address flooding of Brewster’s beaches and landings**

Under the potential scenarios of sea level rise and storm surge outlined above, beach and marsh resources, parking areas and access ways may be partially or fully flooded at some Brewster beaches and landings.

The CAS assesses the impact that alternate potential scenarios of sea level rise and storm surge would have on Brewster’s eleven shoreline public access points. The likely effects on public landings and beaches under these scenarios are summarized in Table 2 and depicted on figures found in the CAS. Under the low scenario, beaches and marshes are flooded and reduced in size. These impacts are added to under the mid and high scenarios, where in addition to flooding and loss of resource areas, some access roads and parking are also flooded.

**Recommendations to increase the resilience of public beaches and landings:**

The following recommendations are proposed to address the management issues identified above. The parties primarily responsible for implementing the action, the targeted timeframe, and likely funding source (if applicable) are identified.

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Provide Ongoing Monitoring of the Coastal System on a Regional Basis</b>			
<p><b>1. Periodically assess coastal resources conditions for comparison with baseline conditions.</b></p> <ul style="list-style-type: none"> <li>• Review the efficacy of previous and ongoing measures employed at coastal landings relative to the principles and goals of the CRMP.</li> </ul> <p>1.A Monitor and assess physical processes to support short-term management decisions and long-term planning. These measures could include:</p> <ul style="list-style-type: none"> <li>• Every five years (next in 2021) update projections of sea level rise and storm surge and the modeled impacts of these forces on public beaches and landings, infrastructure, and coastal resources;</li> <li>• Update tidal benchmarks; track and record highest annual high tide as proxy for effects of sea level rise;</li> <li>• Evaluate the potential benefit, cost and candidate locations for installing one or more tide gauge(s) and a wave buoy to provide localized data on trends in tidal dynamics;</li> </ul>	<p>Coastal Committee, Dept. Natural Resources</p>	<p>Plan Yr 1-3</p> <p>Implement Yr 4-6</p>	<p>Staff time</p> <p>\$30,000 (est.)</p>

Recommendations	Responsible Parties	Priority	Funding
<ul style="list-style-type: none"> <li>Evaluate the potential benefit, cost and candidate location for installing a wave height buoy;</li> <li>Evaluate the potential usefulness of establishing a volunteer-based program to monitor changes in beach profiles.</li> </ul>			
<p>1.B Use best available tools to understand the potential impact of storm surge on public and private property, sensitive infrastructure and natural resources, and to develop strategies and plans to avoid, minimize or mitigate adverse impacts, including tools made available through the Cape Cod Commission’s Resilient Cape Cod project, Municipal Vulnerability Preparedness program, and the storm tide pathways assessment project being undertaken by the Barnstable County Extension Service and Center for Coastal Studies (see 2B below).</p>	<p>Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator</p>	<p>Implement Yr 1-3</p>	<p>Seek MVP Action Grant; Staff time</p>
<p><b>2. Assess coastal resources on a regional scale</b>                  2.A The 2015 Century Scale Sediment Budget should be updated in tandem with the sea level rise (next in 2021) to assess trends in sediment movement within the littoral cell that encompasses Brewster’s shoreline. This effort should be evaluated and potentially undertaken in cooperation with Dennis, Orleans and Eastham. The assessment should include recommendations for monitoring protocols and potential management actions necessary to increase resiliency of Brewster’s shoreline and ensure that tidal flats keep pace with sea level rise.</p>	<p>Coastal Committee, Dept. Natural Resources</p>	<p>Plan Yr 1-3  Implement Yr 4-6</p>	<p>\$40,000 (est.)</p>
<p>2.B Participate with the Barnstable County Extension and Center for Coastal Studies in developing a Storm Tide Pathway for Brewster. The Storm Tide Pathways project will encompass the entire Cape Cod Bay shoreline, and may provide a basis for additional coordinated efforts among towns sharing the same littoral cell.</p>	<p>Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator</p>	<p>Yr 1-3</p>	<p>Staff time</p>
<p>2.C Consider development of a regional framework for coastal resilience:</p> <ul style="list-style-type: none"> <li>Develop a management plan for the Inner Cape Cod Bay Area of Critical Environmental Concern (ACEC), in concert with the other towns sharing the ACEC. Such a plan could encompass studies of sea level rise and sediment budget, regional sediment management, and other ACEC resource issues.</li> <li>Consider establishing a regional coastal resilience</li> </ul>	<p>Dept. Natural Resources, Coastal Committee, Town Administrator</p>	<p>Evaluate Yr 1-3  Implement Yr 4-6</p>	<p>\$15,000 (est.) consultant cost to assess feasibility of frameworks  \$50,000 (est.) for</p>

Recommendations	Responsible Parties	Priority	Funding
<p>planning group among towns in the same littoral cell (Dennis, Orleans, Eastham) to identify/study issues of shared concern cost effectively. Regional coordination could increase funding opportunities. This could be done in concert with the existing Barnstable County Coastal Resources Committee, or the Cape Cod Commission’s Resilient Cape Cod, Cape Cod Bay Work Group</p>			<p>studies, plan development; Staff time</p>
<b>Management Issue: Proactively Address Flooding of Brewster’s Beaches and Landings</b>			
<p><b>3. Adopt long-term coastal management resiliency strategies</b>            3.A Evaluate resilient shoreline management practices (those that mimic natural coastal processes) and identify where on Brewster’s shoreline they might be applied:</p> <ul style="list-style-type: none"> <li>• Preserve coastal landforms and vegetation that provide buffers to erosion caused by storm surge. Salt marsh and fronting coastal dunes have been shown to be effective in mitigation erosion along Brewster’s Cape Cod Bay shoreline (APCC, 2016).</li> <li>• Beach and dune nourishment practices for public and private beaches: Mant’s, Paine’s, Breakwater Beach;</li> <li>• Dune protection (vegetation, fencing) and reconstruction: Mant’s, Breakwater Beach, Point of Rocks;</li> <li>• Create a living shoreline<sup>3</sup> demonstration project: oyster reef at Mant’s Landing;</li> <li>• Managed retreat similar to the relocation of the Paine’s Creek parking lot: locations to be determined.</li> </ul>	<p>Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator</p>	<p>Plan Yr 1-3  Implement Yr 4-6</p>	<p>\$45,000 (est.) for engineering  Investments to be included in 5 year capital plan  Staff time</p>
<p>3.B Evaluate changes to the existing groin field, including potential removal/attrition of groins or other structures on the shoreline that impede coastal processes or hasten erosion. Evaluate whether existing groins could impede sediment transport necessary to sustain the tidal flats under different sea level rise scenarios.</p>	<p>Dept. Natural Resources, Coastal Committee, Conservation Agent</p>	<p>Yr 6+</p>	<p>\$25,000 (est.) for consultant evaluation</p>
<p>3.C Enhance stormwater management to minimize or eliminate erosion caused by overland run-off:</p> <ul style="list-style-type: none"> <li>• Implement the stormwater management improvements identified in Brewster’s Integrated Water Resource Management Plan and the work</li> </ul>	<p>Dept. Natural Resources, Dept. Public Works</p>	<p>Yr 1-3</p>	<p>Cost to be included in five-year capital plan or road bond</p>

<sup>3</sup> A living shoreline is a protected, stabilized coastal edge made of natural materials such as plants, sand, or rock. Unlike a concrete seawall or other hard structure, which impede the growth of plants and animals, [living shorelines](#) grow over time. Natural infrastructure solutions like living shorelines provide wildlife habitat, as well as natural resilience to communities near the waterfront. Living shorelines are sometimes referred to as nature-based, green, or soft shorelines. They are an innovative and cost-effective technique for coastal management. (Source: <https://www.fisheries.noaa.gov/insight/understanding-living-shorelines>)

Recommendations	Responsible Parties	Priority	Funding
<p>being undertaken on MS4 General Permit compliance;</p> <ul style="list-style-type: none"> <li>• Prioritize stormwater improvements in any locations where infrastructure could reduce or eliminate erosion caused by run-off;</li> <li>• Provide funding for ongoing maintenance of existing or proposed improvements, possibly through the creation of a stormwater utility;</li> <li>• Design and adopt a stormwater management bylaw to enhance stormwater management on public and private property; and ensure that issues related to coastal erosion, use of green infrastructure and use of stormwater best management practices (BMPs) are incorporated.</li> </ul>	<p>Dept. Natural Resources, Dept. Public Works</p> <p>Dept. Natural Resources, Dept. Public Works</p> <p>Town Planner, Planning Board, Coastal Committee, D Dept. of Natural Resources</p>	<p>Yr 1-3</p> <p>Yr 4-6</p> <p>Yr 1-3</p>	
<p>3.D Evaluate policy and regulatory changes to promote coastal resiliency:</p> <ul style="list-style-type: none"> <li>• Evaluate the potential for implementing a flood plain bylaw to, among other things, “restrict or prohibit development and uses on Land Subject to Coastal Storm Flowage (i.e., 100-year coastal floodplain) and its buffer zones in order to minimize potential loss of life, destruction of property, and environmental damage inevitably resulting from inappropriate development on land known to be subject to storms, flooding, erosion, relative sea level rise and other coastal zone hazards,”(Cape Cod Commission model bylaw). The Cape Cod Commission model bylaw and efforts implemented in other towns should be evaluated to determine policies applicable to Brewster.</li> <li>• Develop permitting guidance for erosion control activities on private properties, and work with the Conservation Commission to apply the guidance in the review of Notices of Intent and issuance of Orders of Condition.</li> </ul>	<p>Conservation Agent, Dept. Natural Resources, Conservation Commission, Coastal Committee</p>	<p>Yr 1-3</p>	<p>\$20,000 (est.) consultant support for bylaw development and permitting guidance; Staff time</p>
<p>3.E Ensure consistency with other planning efforts:</p> <ul style="list-style-type: none"> <li>• Incorporate the potential for coastal resource impacts in the MVP plan;</li> <li>• Complete a FEMA eligible multi-hazard mitigation plan;</li> <li>• Ensure that MVP and multi-hazard planning is informed by the CRMP, and that measures promoted in these plans are considered in future phases of the CRMP.</li> </ul>	<p>Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator</p>	<p>Yr 1-3</p>	<p>Staff time</p>
<b>Management Issue: Maintain and Manage Public Access Points to Increase Resilience</b>			
<b>4. Promote Resilient Management and Maintenance</b>	Dept. Natural	Develop	

Recommendations	Responsible Parties	Priority	Funding
<p><b>of Town-owned Access Points</b></p> <p>4.A Create a coastal resiliency tool kit consisting of best practices for sustainable design, management and maintenance of town-owned landings and beaches. The tool kit should make use of the work being undertaken through the Cape Commission’s Resilient Cape Cod project, and other proven techniques, including:</p> <ul style="list-style-type: none"> <li>• Managed retreat of parking areas and structures</li> <li>• Use of articulated mats to provide stability under ramps and parking areas; and</li> <li>• Use of beach grass planting, beach nourishment, and dune nourishment/rebuilding/stabilization, among other initiatives.</li> </ul>	Resources, Coastal Committee	Yr 1-3  Implement as needed	Staff time
<p>4.B Develop a sustainable funding source, possibly through an environmental bond bill offset by short term rental tax revenues, potential increase in deeds tax revenues, town beach sticker revenues or other sources for resilient maintenance and management actions that balance needs for beach access, public safety, natural resource sustainability, and coastal resiliency; and that meet local and state permitting requirements. These measures include: Repair stairs, ramps, walkways (including measures needed for improved handicapped accessibility). A proactive, resilient maintenance program may lower long-term costs by reducing the potential need for emergency repairs.</p>	Coastal Committee, Town Administrator, Dept. Natural Resources, Select Board, Finance Committee	Yr 4-6	Staff time
<p>4.C Conduct technical alternatives assessments for resilient capital projects needed to address erosion pressure and preserve access at highly threatened town-owned access points. Mant’s Landing and Paine’s Creek are currently experiencing significant erosion and should be prioritized for evaluation and possible resilient capital projects.</p>	Dept. Natural Resources, Dept. Public Works, Conservation Agent, Coastal Committee	Plan Yr 1-3  Implement Yr 4-6	\$15,000 for engineering (est.); Staff time  TBD

## 2. Preserve Ecosystem Services Provided by Healthy Coastal Wetlands



Stony Brook Marsh, south

### Overview

While walking on the flats or enjoying a day at the beach, we don't often think about the natural processes constantly shaping and sustaining these special places. Tidal flats, beaches, dunes and other shoreline features each play a role in sustaining a healthy coastal system. The ongoing health and functioning of a variety of coastal wetland resources along Brewster's shoreline is essential to sustaining our enjoyment of beaches and flats, and the extensive wildlife and other benefits these resources provide to the community.

The primary types of coastal landforms along Brewster's shoreline include land under the ocean, salt marshes, dunes, tidal flats, coastal banks, and coastal beaches. Even though these areas are not "wet" all the time, they are considered wetland resources and are protected under local and state wetland protection regulations. The variety and extent of coastal and inland wetlands is shown on Map 1. The descriptions and significance of coastal wetland resources are summarized in Table 3.

<b>Table 3. Brewster’s Coastal Wetland Resources</b>		
<b>Resource / Amount</b>	<b>Definition</b>	<b>Benefits</b>
<b>Land under the Ocean</b>	Land extending from the mean low water line seaward to the boundary of Town jurisdiction (three miles).	<ul style="list-style-type: none"> <li>• Provides important habitat for fish and shellfish</li> <li>• Helps prevent storm damage and provides flood control.</li> </ul>
<b>Coastal Dune Approx. 70 acres</b>	A natural hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash; also sediment deposited by artificial means and serving the purpose of storm damage prevention or flood control.	<ul style="list-style-type: none"> <li>• Prevents storm damage and provides control flooding by supplying sand to coastal beaches.</li> <li>• Protects inland coastal areas from storm damage and flooding by storm waves and storm-elevated seas because the dunes are higher than the coastal beaches which they border.</li> <li>• Sediment source as wind, waves and currents move sediment from coastal dunes to coastal beaches.</li> </ul>
<b>Coastal Bank Approx. 5 acres</b>	Seaward face or side of any elevated landform, other than a coastal dune, that lies at the landward edge of coastal beach, land subject to tidal action, or other wetland.	<ul style="list-style-type: none"> <li>• Serves as a major continuous source of sediment for beaches, dunes, and barrier beaches.</li> <li>• Assumed to be significant to storm damage prevention and flood control.</li> <li>• Due to height and stability, coastal banks may act as a buffer or natural wall protecting upland areas from storm damage and flooding.</li> </ul>
<b>Coastal Beach Approx. 44 acres</b>	Unconsolidated (loose) sediment subject to wave, tidal and coastal storm action that forms the gently sloping shore of a saltwater body. Extends from mean low water line landward to the dune line, coastal bankline or the seaward edge of existing human-made structures, when these structures replace one of the above lines, whichever is closest to the ocean.	<ul style="list-style-type: none"> <li>• Prevents storm damage, controls flooding and protects wildlife habitat.</li> <li>• Dissipates wave energy because of gentle slope, and granular, permeable sandy sediment.</li> <li>• Sediment source for dunes and offshore subtidal areas.</li> <li>• Vegetative debris found in the drift line of coastal beaches is consumed by invertebrates, which in turn are a food source for resident and migratory shorebirds.</li> </ul>
<b>Tidal Flat Approx. 4,000 acres at low tide</b>	Nearly level part of a coastal beach which usually extends from the mean low water line landward to the more steeply sloping face of the coastal beach or which may be separated from the beach by land under the ocean.	<ul style="list-style-type: none"> <li>• Provide habitats for marine organisms such as worms and mollusks (shellfish), which in turn are food sources for fishes and migratory and wintering birds.</li> <li>• Sites where organic and inorganic materials may become entrapped and then returned to the photosynthetic zone of the water column to support algae and other primary producers of</li> </ul>

<b>Resource / Amount</b>	<b>Definition</b>	<b>Benefits</b>
		the marine food web. • Dissipates wave energy thereby buffering beach from storm damage.
<b>Salt Marsh Approx. 363 acres</b>	Extends landward up to the highest high tide line (ie, highest spring tide of the year), and is characterized by plants that are well adapted to or prefer living in saline soils, such as salt meadow cord grass ( <i>Spartina patens</i> ) and/or salt marsh cord grass ( <i>Spartina alterniflora</i> ), spike grass ( <i>Distichlis spicata</i> ), high-tide bush ( <i>Iva frutescens</i> ), and black grass ( <i>Juncus gerardii</i> ). A salt marsh may contain tidal creeks, ditches and pools.	• Salt marshes are significant to protection of marine fisheries, wildlife habitat, and shellfish. • Salt marshes absorb wave energy and floodwaters, which helps to prevent storm damage and flooding during coastal storms.

Source: Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) Source of wetland acreages: Cape Cod Commission

## **Management Issues to preserve ecosystem services provided by healthy coastal wetlands**

### **1. Preserve natural sediment transport processes in balance with erosion management**

Coastal shorelines like Brewster’s are dynamic systems subject to the constant influences of tides, waves, storm and tidal surges, currents and wind. Erosion occurs when these natural forces move coastal sediments (predominantly sand), particularly from eroding coastal banks and dunes. Eroded sediments are then transported by wind, waves and currents and are deposited on beaches, dunes, marshes or offshore tidal flats. The receiving resource areas rely on a supply of sediment to maintain elevation. Without the processes of sediment erosion, transport and deposition to counteract sea level rise and subsidence, beaches, dunes, marshes, and tidal flats would eventually drown in place.

Allowing sand to move freely through the natural coastal processes of sediment erosion, transport and deposition is essential to the long-term sustainability of beaches, tidal flats, dunes and salt marshes. In addition to the natural beauty and commercial and recreational opportunities, these resources provide protection from erosion and storm damage, filter pollutants that otherwise would reach coastal waters, support wildlife habitat, and store large volumes of carbon that otherwise would contribute to climate change. These natural benefits, called ecosystem services, are difficult and expensive to replicate if the resource areas providing them are lost or degraded.

Erosion management measures on public and private property can interfere with natural coastal processes and the beneficial movement of sediment. Hard shoreline structures such as revetments, bulkheads, groins and gabions are designed to prevent the process of sediment erosion, transport and deposition. These structures can starve adjacent and downdrift beaches, dunes and salt marshes of sediment they need to maintain elevation. Even with regular beach nourishment, beaches and marshes that are adjacent to or downdrift of hard structures can

experience a net loss of sediment supply. As a result, beaches and marshes are reduced in size or, in the extreme, can drown in place and disappear altogether.

Any effort to manage erosion on public and private property needs to be conducted in balance with the need for a steady supply of sediments to maintain the elevation of salt marshes, beaches, dunes and tidal flats.

## **2. Maintain the elevation of salt marshes and tidal flats**

Salt marshes are among the most productive ecosystems on the planet, rivaling rain forests in their productivity. A salt marsh produces large amounts of organic matter. A significant portion of this material enters coastal waters where it provides the basis for a large food web that supports many marine organisms, including finfish and shellfish and many bird species. Salt marshes also provide a spawning and nursery habitat for several important estuarine forage fish as well as important food, shelter, breeding areas, and migratory and overwintering areas for many wildlife species. Salt marshes are protected by Brewster's beach and dune system, separating them from the bay. Wind-driven sand helps to maintain the marsh system elevation.

Salt marsh plants and substrate remove pollutants from surrounding waters. The sediments absorb chlorinated hydrocarbons and heavy metals such as lead, copper, and iron. The marsh also retains nitrogen and phosphorous compounds, which in large amounts can lead to algal blooms in coastal waters. The underlying peat also serves as a barrier between fresh ground water landward of the salt marsh and the ocean, thus helping to maintain the level of such ground water.

A more recently acknowledged benefit of salt marshes is their ability to store carbon. Salt marsh plants remove carbon dioxide from the atmosphere. Some of the carbon is stored for centuries as soil carbon. Why do marshes store so much carbon? They grow upward every year at about the same rate as sea level rise, roughly ¼ inch. The soil is composed of plant roots and trapped sediment, and so as they grow upward, they build large carbon stores over many centuries, keeping CO<sub>2</sub> out of the atmosphere. This "ecosystem service" is referred to as "Blue Carbon."<sup>4</sup>

Salt marshes are naturally extremely adaptable. As noted in the Coastal Adaptation Strategy, salt marshes can contract or expand depending on the frequency and depth of flooding. The pattern of inundation in turn dictates vegetation coverage and the overall marsh ecosystem.<sup>5</sup> When rising sea level or increased erosive forces outpace the ability of a salt marsh to increase in elevation, the marsh would naturally seek to migrate landward. However, the presence of hardscape (e.g., buildings, roads, hard shoreline structures) can reduce or eliminate opportunities for landward migration of salt marsh. A marsh that experiences loss of elevation without the ability to migrate landward eventually will become permanently inundated, resulting in a loss of salt marsh resource area and the related ecosystem services.

Salt marshes maintain their elevation in two ways. First, layers of peat build as underground roots die-off and re-generate, creating new layers of biomass. Second, sediments carried by the

<sup>4</sup> Kroeger, Kevin D., USGS Woods Hole Coastal and Marine Science Center. Blue Carbon in the Herring River: Can We Reduce Greenhouse Gas Emissions through Wetland Restoration? Paragraph excerpted from presentation to Friends of Herring River. March 29, 2018.

<sup>5</sup> CAS, p 26

tidal cycle are trapped by grasses and add to the marsh substrate. These natural processes enable marshes to maintain their elevation in the face of inundation due to rising sea level. At a certain point, inundation exceeds the ability of a marsh to increase in elevation and the marsh seeks migrate landward. Inland migration of marshes can be prohibited if inland areas are developed and are unavailable for marshes to migrate.



Marsh at Paine's Creek

Strategies to maintain the elevation of marshes through measures such as thin layer deposition of sediment, or by creating and preserving opportunities for the landward migration of marshes, are essential to the preservation of this critical coastal resource.

Brewster's shoreline resources are anchored by two large marsh systems: the Quivett Creek-Paine's Creek marsh system shared with Dennis, and the Namskaket Creek marsh system shared with Orleans. If all or portions of these systems are lost, the ecological and other public benefits they provide also would be lost. Man-made replication of these naturally occurring ecosystem services, if even possible, can be extremely costly and difficult to achieve.

The elevation of Brewster's marshes has kept pace with sea level rise. However it is not clear whether the marshes will be able to keep pace if sea level rise accelerates, as is anticipated. There may be opportunities for active management of these resource areas in coordination with adjoining towns of Dennis and Orleans, respectively.

Like the salt marshes, Brewster's extensive tidal flats have largely kept pace with sea level rise from the 1930s to the present, and in some areas have been increasing in size. (Borrelli, 2016) The tidal flats dissipate storm surge, providing a buffer for the beach and shore. However, a significant acceleration of sea level rise is expected during the present century, and it is not clear if the tidal flats will remain exposed at low tide under future sea level rise scenarios.



### **Recommendations to preserve ecosystem services provided by healthy coastal wetlands**

The following recommendations are proposed to address the management issues identified above. The parties primarily responsible for implementing the action, the targeted timeframe, and likely funding source (if applicable) are identified.

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Preserve Natural Sediment Transport Processes in Balance with Erosion Management</b>			
<p>1. Evaluate policy and regulatory changes to protect wetland resources</p> <p>1.A Work with the Conservation Commission to evaluate the Town’s wetlands protection bylaw and regulations to determine if any changes would provide enhanced protection of coastal wetlands and natural coastal processes. Areas of exploration could include, but not be limited to:</p> <ul style="list-style-type: none"> <li>• Potential to incorporate the sediment budget into the local wetlands by-law and regulations to regulate protection of upland development differently in eroding areas;</li> <li>• For all new or renewed Orders of Condition for erosion management, require analysis of cumulative system-wide impacts, and require adherence to best practices for shoreline erosion management structures:</li> <li>• Adopt permitting guidelines based on Woods Hole Oceanographic Institution Sea Grant publication <i>Spectrum of Erosion Control Methods</i>.<sup>6</sup> The recent publication of <i>Guidelines for Erosion Management in Pleasant Bay</i><sup>7</sup> provides a guide;</li> <li>• Require maintenance and nourishment of erosion management structures (in specific locations of need);</li> <li>• Incorporate monitoring requirements for erosion control measures to provide information to evaluate their functions and impacts.</li> </ul>	<p>Conservation Commission; Coastal Committee</p>	<p>Yr 1-3</p>	<p>\$25,000 (est.) for bylaw preparation; staff time</p>
<p>1.B Review the Town’s policy for allowing access through town landings to perform shoreline stabilization work on private property. Ensure that applicants carry adequate insurance coverage in case of damage to resources caused by heavy equipment or fuel spills.</p>	<p>Select Board; Town Administrator; Dept. Natural Resources</p>	<p>Yr 1-3</p>	<p>Staff time</p>
<p>1.C Work with the Planning Board to revise, update or extend the Flood Plain Overlay District and Wetlands Conservancy bylaws, based on an evaluation of the bylaw’s effectiveness in meeting its original purpose, and based on a survey of similar measures employed in other communities ore recommended by the Cape Cod Commission.</p>	<p>Town Planner; Planning Board; Dept. Natural Resources; Coastal Committee</p>	<p>Yr 1-3</p>	<p>Staff time</p>

<sup>6</sup> <https://web.whoi.edu/seagrant/wp-content/uploads/sites/24/2015/07/Spectrum-of-erosion-control-FINAL.pdf>

<sup>7</sup> [http://pleasantbay.org/wp-content/uploads/Ridley\\_EditedErosionReport\\_10.30.18\\_PRINT.pdf](http://pleasantbay.org/wp-content/uploads/Ridley_EditedErosionReport_10.30.18_PRINT.pdf)

Recommendations	Responsible Parties	Priority	Funding
<p><b>2. Increase public awareness of the importance of healthy coastal wetlands and natural coastal processes, and the need to protect these resource areas.</b></p> <p>2.A Education materials should be aimed at shoreline property owners, among others, to discuss the importance of natural sediment transport processes, and best practices for vegetation management, erosion management, and buffer protection, etc. This effort should be coordinated with the development of permitting guidance.</p>	<p>Coastal Committee; Dept. Natural Resources; Conservation Agent, Conservation Commission</p>	<p>Yr 1-3</p>	<p>MVP Action Grant; educ. resources may be available from MCZM, and Barnstable County Cooperative Extension</p>
<p><b>Management Issue: Maintain the Elevation of Salt Marshes and Tidal Flats</b></p>			
<p><b>3. Promote opportunities for salt marsh migration</b></p> <p>3.A Use the state of the art wetland modeling to assess patterns of salt marsh retreat in Brewster. Model results could then be used to develop salt marsh management plans to counteract loss of marsh due to subsidence or inundation. Management actions could include:</p> <ul style="list-style-type: none"> <li>• Channel improvements to restore or enhance hydrology;</li> <li>• Evaluate the potential for a pilot project for thin layer deposition of material on any subsided areas of salt marsh plane, in coordination with MassDEP permitting guidance;</li> <li>• Work with the Town’s Open Space Committee, Community Preservation Committee and the Brewster Conservation Trust to identify key parcels for acquisition/conservation restriction and to develop a funding strategy for acquisition/protection of these properties; and develop a framework for tracking and pursuing parcel opportunities;</li> <li>• Identify and remove any remaining undersized culverts that may restrict tidal flow and causing degradation of coastal wetlands. An example is the Crosby salt marsh restoration project.</li> </ul>	<p>Dept. Natural Resources, Conservation Agent, Conservation Commission, Coastal Committee</p> <p>Open Space Committee, Dept. Natural Resources, Brewster Conservation Trust, Community Preservation Committee, Coastal Committee, Town Administrator</p>	<p>Plan yr 1-3</p> <p>Modeling Yr 6+</p> <p>Yr 1-3</p>	<p>\$40,000 for modeling</p> <p>Additional funds for channel work or thin layer deposition</p> <p>Staff time</p>
<p>3.B Develop/update and implement resource management plans to protect large areas of salt marsh. Land Use and Management Plans for Quivett Creek/Paine’s Creek Marsh and Namskaket Marsh should be developed in coordination with Brewster Conservation Trust, MA Division of Conservation and Recreation, and adjacent towns.</p>	<p>Open Space Committee, Dept. Natural Resources, Brewster Conservation Trust, Community Preservation Committee, Coastal Committee, Town Administrator</p>	<p>Yr 4-6</p>	<p>\$20,000 (est.) to update management plans; State TA may be available</p>

### 3. Provide Access for Water Dependent Activities



Brewster Oysters

#### Overview

Brewster has a rich history as a community in which many residents earned their livelihood from the sea by weir fishing, shellfishing, salt works, running a packet ship, or other maritime trade. Today, beyond a small number of aquaculture grants licensed by the Town, there are far fewer opportunities for commercial water dependent activities. On the other hand, recreational water dependent activities, including beach going, shellfishing and boating, have grown.

Brewster has abundant shellfish resources (Map 2). Recreational and commercial shellfishing, commercial aquaculture, and recreational boating are important to Brewster's quality of life and local economy. Areas where these activities primarily take place are shown on Map 5. As described below, these activities also present management challenges and opportunities to be addressed in the CRMP.

## Management Issues to provide access for water dependent activities

### 1. Provide opportunities for commercial aquaculture

Commercial aquaculture is a growing industry in the region. As of 2016 there were 249 licensed shellfish growers operating on Cape Cod cultivating 628.8 acres, primarily for oysters and quahogs.

Interest in commercial aquaculture in Brewster is expanding as well, and this has implications for management of Brewster's coastal resources. The Town's regulations governing commercial aquaculture grants were last updated more than a decade ago. Current regulations are not consistent with neighboring towns, nor are they consistent with recent changes in state regulations. Current regulations are vague in some areas and do not address emerging issues such as the need for regulations to control diseases such as vibrio. The MA Division of Marine Fisheries (DMF) works with the state Department of Public Health to develop a Vibrio Control Plan. DMF regulates shellfish harvesters, while Public Health regulates the dealers that buy from harvesters.

The Town is in the process of updating regulations governing commercial shellfish aquaculture to ensure that aquaculture is allowed in a manner that protects fragile resources and avoid conflicts with other coastal activities. Key management issues are:

- **Grant Size/Number.** There are currently 11 licensed shellfish grants in Brewster. Under current town regulations, each grant is allowed to be a maximum of two acres. There is a waiting list of people interested in obtaining a new grant license, and others have informally indicated interest.
- **Location.** To prevent stress on public access points during the summer, current regulations do not allow grants to be permitted off of town-owned beaches and landings. However, some grants predate that rule and six of the grants are located off of public access points. The current regulations allow grants to be located in front of private property with the owner's permission. While in the past this permission to locate a grant in front of private property has not been difficult to obtain, growers are now encountering more resistance.
- **Access.** As noted, six grants are currently accessed on foot via Town landings or beach areas, while private access is contingent on obtaining owner's permission. Mant's, Linnell, Point of Rocks and Ellis Landings currently provide access to grants. However, there is no oversight or regulation for this use of public landings or protocols in the event of accidents, spilled fuel or other liability concerns.

To provide alternate access, the Town may begin discussion with the Town of Dennis regarding the possibility of allowing access to grants via Crowes Pasture. The Town of Dennis allows grant holders in that town to access grants by driving over the flats under the town's Off Road Vehicle (ORV) Management Plan. The Town of Brewster is interested in exploring whether the Crowes Pasture access could be used by Brewster grant holders as well as at the west end of town.

---

<sup>8</sup> MassDMF 2016 Annual Report

- Economic impact.** According to a 2015 report on the economic impact of the shellfish industry, “[t]he output of the shellfish aquaculture industry in Massachusetts was valued at approximately \$25.4 million in 2013, which in turn generated approximately \$45.5 million in the Massachusetts economy, or 1.79 times the activity. Shellfish farmers were responsible for approximately 769 direct jobs in 2013. They also generated an additional 140 jobs through indirect and induced activity, resulting in a total of 909 jobs in Massachusetts. Shellfish farmers paid approximately \$11.9 million in wages in 2013. Their economic activity generated additional labor income of \$8.2 million, for a total of approximately \$20.1 million in labor income in Massachusetts.” (Augusto and Holmes, 2015) It was also noted that income generated from this industry remains local, as the majority of product is sold locally. According to the 2017 Annual Report issued by the MA Division of Marine Fisheries, aquaculture sales in Brewster totaled \$258,472 in 2017. If the same multiplier is applied, this generated roughly \$463,000 in the local economy.



Oyster aquaculture, Brewster

**2. Provide opportunities for commercial shellfish harvesting**

There are currently 20 commercial shellfish licenses issued annually. Commercial harvesting is allowed only in the east end of town. Commercially harvestable species under current regulations include quahogs, and oysters grown in grants. As described below, the Town is undertaking a razor clam harvest pilot project to test the viability of ongoing commercial harvesting of that

species. The Town can open up harvests for other species such as scallops, but they are not addressed in the current regulations.

As with aquaculture, the Town is in the process of updating regulations governing its commercial shellfish regulations. MA Division of Marine Fisheries also regulates shellfish harvesters, while the MA Department of Public Health regulates the dealers that buy from harvesters.

#### Razor Clams

Razor clams have not been a commercially harvested species in Brewster. At the request of local commercial fishermen, the Town launched a Commercial Razor Clam Harvest Pilot Project in 2018 to determine whether a regular commercial harvest can be sustained without undue stress on the resource and, if so, how such the fishery should be managed. The initial pilot involved 11 licenses to Brewster commercial harvesters. Harvesting began in April and concluded in September, and provided only a few months of data. The Department of Natural Resources is proposing to extend the pilot for another season, from April through December, to generate a full year of harvest data. Based on the data, decisions about future licensing of this fishery will be determined. The following bullets describe the terms of the pilot project and some issues to be evaluated during the pilot.

- **Landing Location.** The fishery will be based out of Linnell, Ellis and Crosby landings. This means that all harvest will be landed at these locations, unless fishing via boat. If by boat, landings will be at either Rock Harbor in Orleans, or at Sesuit Harbor in Dennis. Prior to landing, notice must be given to the Shellfish Department to allow inspection at the point of landing.
- **Competing Uses.** The increased shellfishing activity is expected to result in additional parking demand at the three landings. It is expected that up to 15 vehicles will be parking at the landings to harvest for a period of 5 hours at a time, plus one town vehicle for staff to monitor landings. By comparison, Linnell Landing has 24 parking spaces, plus two handicap spaces. However, it is important to note that razor clam harvest will take place at extreme low tides. Therefore, the potential for harvesters competing with other parking demand might not be significant if the tides do not coincide with periods of higher demand for beach parking. Parking issues and competing uses will be monitored during the pilot project.
- **Habitat Considerations.** Some concerns have been raised regarding the potential resource impacts associated with salting and/or hydraulic methods of razor clam harvesting. Additional study is needed to fully understand the potential effects of different harvesting methods. Similarly, commercial harvesting of razor clams would reduce the population available to horseshoe crabs and other species that utilize razor clams for food.
- **Number of Days Fishing.** The pilot project will operate seven days a week through December, with ongoing monitoring by the Shellfish Department. The ongoing costs of monitoring will need to be factored into annual budgets for the Shellfish Department.



Brewster volunteers working with oyster cages

### 3. Enhance propagation and other activities to support recreational shellfishing

Recreational shellfishing is a quintessential summer activity on Cape Cod. Recreational licenses permit the taking of regulated quantities of the following species: sea clams, soft-shell clams, mussels, quahogs, razor clams, oysters, scallops, sea worms, sand eels, and American eels. Last year Brewster issued 539 resident recreational shellfishing permits, 174 weekly non-resident permits and seven seasonal non-resident permits. Oyster harvest in the fall draws a number of permit holders. The oyster harvest was particularly robust in 2018.

Recreational harvesting is allowed:

- During the months of July and August, all shellfish harvested in the Saints Landing stocked area must be landed and checked out by the Shellfish Constable at Saints Landing.
- In July and August the Town only allows shellfishing on Thursdays and Sundays, and stock an area off Saints Landing with quahogs. In the fall (Sundays in October/November) the Town stocks an area for oyster harvest off Ellis Landing. These seasonal programs are extremely popular with permit holding town residents and visitors. From June 1 through September 30, recreational fishing area is closed east of Ellis Landing in the summer, and is being opened for limited commercial harvesting of razor clams under the pilot program.

- The taking of shellfish from the rock piles seedbeds directly off of Ellis Landing and Ocean Edge is prohibited throughout the year.
- The immediate areas of Paine's Creek, Quivett Creek, Namskaket Creek are closed to the taking of shellfish due to contamination.

The Town runs several shellfish propagation efforts to support recreational harvesting. These include a floating upweller to raise shellfish seed (quahogs, oysters) to maturity in Sesuit Harbor in Dennis, which is shared with the Town of Dennis. The Town raises oysters in cages and bags off of Mant's Landing, Breakwater Landing and Ellis Landing. Quahog seed is distributed in the rock beds to supplement the natural set. Recently, the Town acquired 600,000 juvenile oysters from the Town of Orleans' Lonnie's Pond Demonstration project, and this seed will be distributed over time to augment the recreational fishery.

Spring propagation events include an eight-day littleneck season off Ellis Landing. This is repeated in late September.



Oyster Sundays in October/November

#### **4. Manage competing uses at town landings and mooring areas**

Town landings are the core of the Town's water dependent infrastructure and provide public access for a variety of recreational and commercial activities along Brewster's shoreline.

Management issues associated with town landings include:

- **Emergency Vehicle Access.** Maintaining access at town landings to allow emergency response is a top priority. The Brewster Fire Department has an all terrain vehicle and an inflatable vessel that can be launched from a beach or landing; and Fire Department vehicles can be used off of several landings.

- **On-going Nourishment and Maintenance.** Town landings and beaches will continue to require regular maintenance and nourishment to manage the effects of sea level rise and storm surge, address wear and tear generated by heavy public use, and provide improved access and amenities for diverse user groups. Appendix D provides a summary of recent maintenance and management actions at Brewster’s public beaches and landings.
- **Access for Beach Nourishment.** Certain Town landings are used by private contractors to bring equipment and sand for beach nourishment projects and/or installation and repair of erosion control structures or other building projects on private property. Mant’s and Breakwater landings have been used for most of the private property projects, with Point of Rocks, Ellis and Linnell landings used less frequently. This access is allowed by permit from the Select Board. To obtain a permit, applicants must post a bond and meet other requirements. Recently, private projects using Town landings for staging equipment have increased in frequency, size of equipment, and duration of staging. The Town may need to revisit the policy of allowing use of Town landings for this purpose if this level of intense use continues.
- **Peak Season Parking.** A limited amount of parking at Town landings and access points serves multiple user groups during the busy summer peak season. If aquaculture activities are expanded and/or other opportunities for commercial and recreational fishing arise, parking demand will need to be addressed.
- **Mooring Access.** Vessel activity on Brewster’s north facing shoreline is naturally constrained by the large tidal range that leaves many boats grounded for much of the tidal cycle. However, there is steady demand for moorings in Cape Cod Bay. Brewster requires moorings for any vessel greater than nine feet that is kept on the water, flats or shore for more than 14 days. Brewster issues permits for 150 moorings each year along the coast, and each permit is assigned to a designated mooring field. Moorings are not allowed directly in front of town landings or in Paine’s Creek. Currently there is no wait list for mooring permits on the bayside (there are waiting lists for Long Pond). It is not necessary to be a tax-payer to be eligible to obtain a mooring permit.



Kayaks at Paine’s Creek

- Commercial Activity.** Limited non-commercial activity is currently allowed on Town landings and beaches. These non-commercial activities include yoga classes, and religious services. The only licensed commercial use of the landings, other than for fisheries landings, is for a single ice cream vendor to service all beaches during the summer. The Town should consider the positive and negative impacts of allowing new or expanding commercial activities, such as paddle board rental and lessons, kayak clubs and flyfishing lessons that may seek to use the landings and beaches in the future.
- Storage of Kayaks and Dinghies.** The Town operates a lottery program for the storage of kayaks on town racks. Currently, roughly 100 kayak rack permits are issued each year at Paine’s and Mant’s landings. Kayak racks may be added at Crosby and Linnell landings, but not without encroaching on resource areas or parking. Dinghy racks are provided for mooring permit holders at Crosby and Linnell Landings. No dinghy or kayak storage is allowed on public beaches.

**Recommendations to provide access for water dependent activities**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Provide Opportunities for Commercial Aquaculture</b>			
1. Update the Town’s commercial aquaculture regulations.	Dept. Natural Resources, Town	Yr 1-3	Staff time

Recommendations	Responsible Parties	Priority	Funding
	Administrator, Select Board		
2. Evaluate the possibility of designating an Aquaculture Development Area. The designation would identify a number of acres of tidal flats made available for private aquaculture grants. Most likely locations would be the west end of town near Crowe’s Pasture, or off Linnell Landing. Issues of access to grants and conflicts with other fisheries and user groups would need to be considered. Work with Town of Dennis to explore alternative access via Crowe’s Pasture.	Dept. Natural Resources, Town Administrator, Select Board, Conservation Commission, MassDEP, Mass Division of Marine Fisheries, Army Corps of Engineers, Bureau of Indian Affairs	Yr 1-3	Staff time
3. Undertake an assessment of economic costs and benefits to the community from expanded shellfishing and aquaculture opportunities, with consideration to other competing uses of resource areas	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time
<b>Management Issue: Provide Opportunities for Commercial Shellfish Harvesting</b>			
5. Update the Town’s commercial shellfishing regulations.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time
6. Review the performance of the razor clam pilot project and evaluate the potential for a permanent razor clam fishery.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Permanent program could require additional resources
<b>Management Issue: Enhance Propagation and Other Activities in Support of Recreational Shellfishing</b>			
7. Continue/expand public shellfish propagation programs. Evaluate future needs for an upweller, and whether these can be met by the existing upweller, and/or by developing a shared upweller with the Town of Dennis.	Dept. Natural Resources, Town Administrator, Select Board	Ongoing	Staff time
<b>Management Issue: Manage Competing Uses of Town Landings and Mooring Areas</b>			
8. Develop a capital plan to plan for and prioritize expenditures for maintenance and improvements at town landings.	Dept. Natural Resources, Town Administrator, Select Board	Yr 4-6	Staff time
9. Monitor demand for moorings and whether changes to mooring regulations are needed.	Dept. Natural Resources, Town Administrator, Select Board	Ongoing	Staff time
10. Evaluate the need for regulations or guidelines for commercial activity at town landings.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time

## 4. Preserve Peak-Season Access to Public Beaches and Landings



Summer beachgoers enjoy the Brewster shoreline

### Overview

Brewster's shoreline resource areas are its crown jewel. Consequently, the Town's eleven access points are heavily used by residents and visitors. Accessing the Town's coastal resources are a key component of quality of life and a significant contributor to the local economy. Repeated storm damage has eliminated parking spaces at a number of Town landings. For example, the Paine's Creek parking lot was abandoned and replaced with parking spaces located further inland. However, parking spaces lost at Mant's and Ellis Landings cannot be replaced, as there is no upland area to accommodate retreat.

Providing access opportunities without necessarily increasing parking at the shoreline is a priority for the Town and is reflected in the vision statement of the Brewster Coastal Adaptation Strategy (CAS):

*The Town of Brewster will preserve and protect the community's coastal resources and expand access to its public beaches through public consensus, and in ways that preserve the natural habitat and peaceful character of the coastal environment and coastal*

*neighborhoods, respect the overall coastal and land-based ecosystem, and adapt to long-term projections for coastal change.*

Maintaining and expanding public access is also identified as a Town of Brewster Vision Plan priority.

In 2016, as part of the development of the CAS, the Town conducted a coastal beach access survey to gain a better understanding of how resident and non-resident taxpayers and visitors use the Town's beaches and landings. Nearly three-quarters of the 2,048 survey respondents indicated that they go to the beach at least once per week during the summer. The most popular beaches among those surveyed are Crosby, Paine's and Breakwater. The most popular activities among those responding include walking, swimming, sunset watching, and sunbathing, with activities such as shellfishing, paddling, and picnicking less frequently noted.

Most times of the year, it is not difficult to find a parking space at any of Brewster's coastal access points. However, during the peak summer season demand for parking increases. Beach parking permits are required for access to town beaches from 9 am to 4 pm from June 15 through Labor Day. The permits are issued in accordance with the Town's *Rules and Regulations for Resident Beach Parking Permits (Residents and Real Estate Property Owners.)*

As discussed below, high demand for beach parking at peak times could be exacerbated if more of the current parking supply is compromised by erosion and storm damage. Erosion and coastal flooding from storms and surges may intensify in frequency and magnitude as sea level rises, placing shoreline access points at greater risk of erosion. The CAS notes that, "public parking areas do not provide the level of access desired by Brewster residents and visitors. The Town will need to adapt and strategize to meet the current and future needs and desires as continuing sea level rise, storm damage and erosion affect the Town's ability to maintain access."

The CAS recommends further exploration of adaptation strategies to augment public access to Town beaches:

- Provide access without increasing parking at the shoreline by:
  - Expanding pedestrian and bike access;
  - Considering shuttle service options, and
  - Satellite parking within walking, biking and/or shuttling distance of a town landing
- Evaluate possible new access points and/or parking spaces; and
- Continue to provide access in parking areas and walkways for people with limited mobility.

## **Management Issues to preserve peak season access to public beaches and landings**

### **1. Augment peak seasonal parking demand/capacity at beaches and landings**

Brewster has eleven heavily used public beach access points (Map 4). With the exception of Spruce Hill and Wing Island, each access point experiences some degree of congestion during

the summer. The most heavily used and congested among the access points are Paine’s Creek Beach, Crosby Landing, Mant’s Landing and Breakwater Beach. According to the beach access survey, nearly three-quarters of those surveyed drive to the beach, while 13% walk and 3% ride a bike.



Parking lot at Crosby Landing in the summer of 2015 (source Google Earth)

During the busy summer months, there is a significant mismatch between the heavy demand for access and the limited supply of parking spaces. There are approximately 400 parking spaces at the eleven access points. By comparison, in 2017 the Town issued 6,412 seasonal passes to residents and 4,850 day, week or seasonal passes to visitors. While not all stickers covered a full season or are used every day, the difference between the number of parking spaces and the

number of permits issued demonstrates the potential for parking demand to greatly exceed supply on any summer day.

The demand for parking during the summer has a number of implications including:

- Residents or non-resident taxpayers may be unable to get a beach parking space when desired;
- Overcrowding may cause congestion on beach access roads, lead to illegal parking on town roads, or create safety issues for pedestrians or cyclists;
- Commercial and recreational shellfishermen and shellfish grant holders may not find parking when needed to access the flats;
- Congestion and potential for illegal parking may impede emergency response or interfere with emergency access;
- Lack of parking may deter seasonal visitors, with a negative impact on local businesses.

The Town has evaluated different strategies to address peak parking demand. The Town has looked at reconfiguring parking areas to create more parking spaces. Because this approach must factor in required room for emergency access and handicap spaces, it did not yield a significant number of additional spaces. The Town also has evaluated opportunities to acquire parcels near beaches and landings when they come on to the market, for additional parking. This latter approach must be pursued in balance with any potential impacts to natural resources or to neighborhood safety or rural character. A successful example of expanded parking is the addition of approximately 120+ spaces on land located within walking distance to Crosby Landing, owned by the Massachusetts Division of Conservation and Recreation (MassDCR). Working in cooperation with MassDCR, the additional parking was developed outside the flood hazard area and without adding congestion to the surrounding neighborhood.

Other means of improving beach access—such as bikeway enhancements, and a beach shuttle—are discussed below.

### **Bike and Pedestrian Access Improvements**

Enhancing bike and pedestrian access to beaches and landings is another significant way to reduce demand for beach parking. A key recommendation of the CAS is to “[e]valuate and expand safe bike routes to town landings, and develop additional walking trails and safe pedestrian access.” This recommendation is consistent with goals set forth in *Biking Brewster – A strategy to enhance biking in Brewster* (Brewster Bikeways Committee, 2015). Goals of *Biking Brewster* include expanding recreational biking opportunities and access to key destinations, such as Town beaches. The report notes that Lower Road provides cyclists and pedestrians with scenic access to Town beaches but that wetlands bordering the road make the construction of bike lanes infeasible. Enhanced vegetation pruning could help make these roads safer for bikes and pedestrians.

The proposed Cape Cod Rail Trail Extension across Route 6A through state property to Linnell Landing will be a significant improvement in safe bike access to Brewster beaches. The project will create a multi-use, bicycle and pedestrian, off-road, pathway connection between the Cape Cod Rail Trail / Nickerson State Park and Cape Cod Bay and thereby help relieve parking pressures at Linnell Landing and Crosby Landing. The project had been discussed conceptually

for many years, was designed and permitted in 2016-18 and could be ready for use in 2019. The BCC and the Bikeways Committee sent a joint letter to the Brewster Select Board, expressing support for this proposal, along with concern about the Route 6A crossing. The joint letter also urged the Select Board to pursue funding for a bikeways tunnel under Route 6A.



The proposed Cape Cod Rail Trail Extension will improve safe bike access to Brewster beaches

Other strategies for enhancing safe bike and pedestrian access to the shoreline include:

- Creating a Lower Road Beach/Landing Bike Route;
- Creating safe walking routes to beaches that avoid dangerous areas;
- Using informational materials, signage, pedestrian/biking beacons, and/or striping to mark bike lanes and to direct pedestrians and cyclists (bike right, walk left), and let cyclists know they can ride on sidewalks;
- Considering improvements to road surfaces to enhance safety;
- Pruning vegetation to make roads safer for bikes and pedestrians;
- Marking Route 6A sidewalks indicating bikers can share these with pedestrians;
- Identifying and marking safe parking areas for bikes and pedestrians.

### **Beach Shuttle Pilot Project**

A key recommendation of the CAS is to “[e]valuate public and public/private opportunities for satellite parking and shuttle access, including potential parking areas and proposed shuttle

routes.” The CAS strategy refers to satellite parking as “parking opportunities that may be in walking, biking or shuttling distance of a town landing,…”

The Coastal Committee worked with the Cape Cod Commission to develop a beach shuttle pilot project. The Commission developed a beach shuttle conceptual model that looked at alternate routes, satellite parking locations, service type and schedule, shuttle type, service providers. Based on this assessment, the Committee recommended an initial pilot route. The route encompasses a four-mile loop traveling on Route 6A, Paine’s Creek Road, and Lower Road, and could include the following steps:

- Satellite parking lot(s)
- Paine’s Creek
- Saint’s Landing
- Mant’s Landing

The route would be served in 30-minute intervals by a single shuttle vehicle. The Coastal Committee is working with Town Administration to explore potential funding sources to implement the pilot project.

## **2. Enhance access for populations with limited mobility**

The Town’s beach access points serve a wide variety of user groups with differing access needs and/or limitations. This is particularly true for residents, non-residents and visitors who have limited mobility or other handicap that affects their ability to enjoy beach access.

A key recommendation of the CAS is “to [b]roaden and improve access (including visual access) for individuals with limited mobility.”

The Town has made progress in improving accessibility at several locations. These improvements to handicap accessibility include a platform and path at Linnell Landing; an accessible platform at Mant’s Landing; a roll out walkway at Breakwater Beach; a viewing area at top of stairs at Breakwater Landing; an accessible roll out pathway installed at Paine’s Creek spring 2018; and a shed to store a beach wheelchair at Paine’s Creek.

Currently there are 16 dedicated handicap parking spaces at town landings and beaches out of a total of approximately 400 spaces. A shortage of peak season parking limits the potential for expanding the number of dedicated handicap parking spaces.

The Coastal Committee proposes to work with the All Access Committee to explore new strategies for improved access to beaches and beach views for all populations.

**Recommendations to preserve peak season access to public beaches and landings**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Augment peak seasonal parking demand/capacity at beaches and landings</b>			
<p><b>1. Continue to assess and monitor peak season beach access demand.</b>                      1.A Consider the use of surveys administered with seasonal parking permits to gather information on seasonal parking demand at town landings and beaches.</p>	Coastal Committee, Recreation Dept., Police Dept., Select Board, Town Administrator	Yr 1-3	Staff time
<p><b>2. Maintain or enhance peak season access to public beaches and landings.</b>                      2.A Where existing parking facilities face erosion danger, assess opportunities for managed relocation or retreat (e.g., Paine’s Creek, Breakwater Beach) or other measures such as use of articulated mats to protect existing parking spaces</p>	Dept. Natural Resources; Coastal Committee	Ongoing	Staff time
<p>2.B Develop strategies to promote the use of under utilized public access locations, including Spruce Hill and Wing Island.</p>	Dept. Natural Resources; Coastal Committee	Evaluate yr 1-3 Implement Yr 4-6+	Staff time
<p>2.C Assess opportunities for new or expanded public access locations and/or parking, including through state- and town-owned land, and future acquisitions in collaboration with Town Open Space Committee. Special consideration should be given to balancing access with impacts to natural resources and surrounding neighborhoods.</p>	Dept. Natural Resources, Open Space Committee, Brewster Conservation Trust	Ongoing	Staff time
<p><b>3. Implement a Beach Shuttle.</b> Develop and implement a beach shuttle service pilot project. Based on performance, the initial route/service should be continued, and evaluated, expanded or altered.</p>	Select Board, Town Administrator, Coastal Committee, Dept. Natural Resources, Dept. Public Works, Police Dept.	Pilot project Yr 1-3; Pending results, Implement Yr 4-6	TBD

Recommendations	Responsible Party	Priority	Funding
<p><b>4. Implement measures to improve safe bike and pedestrian access.</b></p> <p>4.A Bike and pedestrian access improvements consistent with Comprehensive Brewster Bike Strategy should be evaluated and implemented where feasible. These measures include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Addition of sidewalks where they can be accommodated</li> <li>• Employ signage to mark bike and pedestrian lanes,</li> <li>• Continue parking restrictions on shore access roads during summer</li> <li>• Create a Lower Road bike trail to beaches</li> <li>• Create safe walking routes to beaches</li> </ul> <p>Create and maintain walking trails and connections to beaches and landings.</p>	<p>Coastal Committee, Bike Committee, Police Dept.</p>	<p>Ongoing</p>	<p>DPW budget, grants for signage and education materials; Staff time</p>
<p><b>5. Complete the CCRT Extension through DCR property to Linnell Landing.</b></p>	<p>State</p>	<p>Complete yr 1-3</p>	<p>State; Staff time</p>
<p><b>Management Issue: Enhance Access For Populations With Limited Mobility</b></p>			
<p><b>6. Enhance access for populations with limited mobility.</b></p> <p>6.A Explore opportunities to enhance physical and visual access for populations with special needs, working in coordination with Brewster All Access Committee and Council on Aging:</p> <ol style="list-style-type: none"> <li>1. Continue improvements to enhance physical access</li> <li>2. Preserve or expand the number of dedicated handicapped parking spaces</li> </ol> <p>Identify measure to improve visual access in concert with vegetation management.</p>	<p>Dept. Natural Resources, Dept. Public Works, All Access Committee, Coastal Committee</p>	<p>Ongoing</p>	<p>Staff time</p>

## 5. Protect Infrastructure, Visual Access and Sense of Place Threatened by Changing Conditions



### Overview

The high value Brewster residents place on the health of the Town's coastal resources and on the community's rural character is reflected in this excerpt from the Town of Brewster Vision Plan:

*We preserve our historical setting and seek to protect its contribution to our town's character. We work to preserve the rural, small town feel of Brewster created by low density development and open space, which contributes to protecting water resources and providing scenic areas for recreation and contemplation. In the context of coastal change, we protect our bayside coastline, which defines our sense of place and provides special recreational and economic opportunities.*

The built environment near the coastline, including residences, businesses and infrastructure, will potentially be affected by increased flooding and erosion caused by sea level rise and storm surge. Brewster's entire coast is currently in the FEMA VE flood zone and most or all of its tidal marsh and creek system are mapped as AE (Map 9). There are 1,138 land parcels within these zones. In the past five years, extensive parts of coastal Brewster have been exposed to storm surge impacts, including dune washover, flooding and significant erosion. In some areas, up to twenty feet of dune/coastal bank have been lost in a single storm event.

Conversely, the built environment and the activities it supports also can have impacts on the health of coastal resources, by encroaching on resources, causing erosion, and contributing nitrogen pollution.

The Town regulates land use and seeks to protect natural resources from impacts caused by develop through local bylaws and regulations, including regulations administered by the Planning Board, Zoning Board of Appeals, Conservation Commission and Board of Health.

Brewster's zoning bylaw includes a Floodplain Overlay District (§179-7) that governs development in designated flood zones. The overlay is intended to, among other things, prevent damage to public and private property, protect public safety and prevent health emergencies resulting from contamination caused by storm damage to structures. The zoning bylaw also contains a Wetlands Conservancy District (§179-6) to prevent development in areas with poor draining soils. However, in practice the bylaw is often overlooked.

In addition to the flood plain overlay, the Town is undertaking forward looking plans to guard against flood damage to public and private property and natural resources. Earlier this year, Brewster received a \$20,000 grant from the state Municipal Vulnerability Preparedness (MVP) Program for coastal resiliency planning. The grant will fund the development of a FEMA MVP plan, and will provide the basis for a full-scale multi-hazard mitigation plan.

The Board of Health administers regulations (local and state Title 5) governing wastewater discharge, primarily through onsite septic systems, to prevent excessive nitrogen or pathogens from reaching groundwater or surface waters. In addition, the Brewster Integrated Water Resources Plan is looking at the impacts of nutrient loading on the quality of groundwater and fresh and marine surface water, and developing a program of management actions to be implemented over 40 years to protect groundwater, ponds, Cape Cod Bay and Pleasant Bay from the effects of excess nutrients.

These regulatory and planning tools are currently available to help protect Brewster's coastal resources and the built environment that surrounds them. Modified or new regulatory tools could bolster efforts to promote the Town's vision of healthy coastal resources, rural character and quality of life.

## **Management issues to protect infrastructure, visual access and sense of place threatened by hanging conditions**

### **1. Minimize and mitigate development impacts in coastal areas**

Like many communities on Cape Cod, Brewster's near shore neighborhoods are relatively densely developed.

Most of the land area surrounding Brewster's coastline is zoned medium density residential (Maps 7 and 8). Under current zoning, permitted uses include single-family dwellings and accessory dwellings, and historical, cultural, museum or municipal activities, among other uses. Minimum lot size for new development is 1.5 acres, height is limited to 30 feet and lot coverage is limited to 25%. Much of the residential development is pre-existing non-conforming, which means that lots and buildings existed before these zoning rules were put in place and may involve smaller lots or buildings that cover more than 25% of the lot area, for example.

Expansion or redevelopment of existing dwellings is occurring in neighborhoods across Cape Cod, and particularly in coastal neighborhoods. If homes are allowed to expand to a point where they are out of scale with the surrounding neighborhood, this can significantly change community character, or result in loss of public views. Expanded development can have other impacts on coastal resources. For example, greater lot coverage and impervious surface area may increase runoff that causes erosion of coastal banks or conveys pollutants into nearby wetlands or water bodies. Increased development may also lead to increased nutrient load from septic systems and fertilizer use.

Increased hardening of the shoreline to protect homes built close to shore can impede the movement of sand needed to feed dunes, beaches and marshes that are important buffers to storm surges. Many of the original structures built along our beaches have been renovated, expanded, or torn down and rebuilt by new owners (Map 6). The Brewster Conservation Commission is under pressure to allow hardening, beach fencing and other erosion control measures to protect redeveloped coastal properties. These measures protect the structures behind them for some period of time; however the beach and other natural resources may be adversely impacted in the process.

## **2. Identify opportunities to preserve visual access**

Views of coastal resource areas from roads and other public access points add significantly to the community's scenic beauty. Views of Paine's Creek and Quivet Marsh from Route 6A are prime examples. For people with limited mobility, views afford an important opportunity to enjoy the Town's coastal resources. The CAS points out the importance of maintaining views of the water from beach and landing parking areas, to benefit people who are unable to walk down to shore. Natural and restored dunes may impede visual access to the Bay; however these dunes function as a buffer to storm damage. In such cases, any loss of visual access from the dune is mitigated by an increase in coastal resiliency without the need for hardened structures. The coastal resiliency measures employed at Breakwater Beach are one example. Paine's Creek, Mant's, Saints, and Ellis Landings, and Breakwater Beach provide visual access to the bay.

The protection of viewscapes also should include consideration of landward views from Cape Cod Bay and the flats.

## **3. Protect vulnerable low roads, groundwater, and underground infrastructure**

As noted above, all of Brewster's bay shoreline is in the VE zone (Map 9) defined by FEMA as high hazard area "...subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater." The study area also includes inland property and roads within the AE zone. According to FEMA, "AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet."<sup>9</sup>

---

<sup>9</sup> Flood Hazard Zones, FEMA Coastal Flood Hazard Analysis and Mapping Guidelines, Focused Study Report, February 2005

According to the CAS, “[a] combination of a storm surge with a rising sea level and/or a particularly high tide may impact low-lying roads that provide access to the landings.” As noted above, these impacts could be more severe when wave height is factored in. Areas particularly susceptible to flood impacts include:

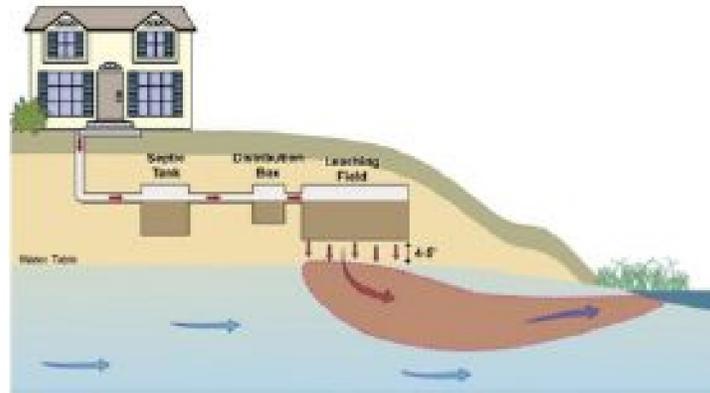
- Route 6A at the Dennis town line and east of the Cape Cod Museum of Natural History near Paine’s Creek would experience flooding under a Mean High Water (MHW) + 4 ft scenario, with additional flooding at the intersections of Paine’s Creek Road, Lower Road and Route 6A under a MHW + 8 ft scenario. This would impact access to Wing Island, Paine’s Creek and Mant’s Landing;
- Lower Road around the intersection with Bloomer Path under a MHW + 8 ft scenario would block access to Wing Island, Paine’s Creek and Mant’s Landing;
- Breakwater Road would flood at MHW + 4ft, and at MHW + 8 ft would impede access to Breakwater Beach and Landing.



A winter storm resulted in severe flooding of Route 6A at the Dennis town line (2018)

In addition to preventing access to landings, flooding poses an access constraint for public safety and utility repair vehicles. Stormwater infrastructure servicing these roads also is at risk of flooding.

As reported in the CAS, a recent study by the US Geological Survey (USGS) reports that six feet of sea level rise could result in the groundwater table rising 0.3 to 5 feet in Brewster. Rising sea level also and an elevated groundwater table could disrupt septic systems and underground water mains and utilities. Many septic systems serving homes along Lower Road are already mounded (elevated) and could be negatively impacted by a rising water table.



This image shows a depth of 4-5” between a leachfield and the groundwater table  
(Image source: Horsley Witten Group)

Elevation of infrastructure is one alternate response to increased risk of flooding. As with any management alternative there may be related issues. In the case of elevating roadways, related issues include displacement or interruption of stormwater flow, coordination with driveway aprons, and loss of shoulder, which can pose a danger for cars or bikes.

**Recommendations to protect infrastructure, visual access and sense of place**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Minimize and Mitigate Impacts of Development in Coastal Areas; Protect vulnerable low roads, groundwater, and underground infrastructure</b>			
<p>1. Protect vulnerable low-lying infrastructure</p> <p>1.A Elevate low-lying road segments and/or retrofit stormwater management systems to mitigate flooding during storm surge conditions. The following segments were identified in the CAS and being of special concern:</p> <ul style="list-style-type: none"> <li>• Route 6A at Dennis town line and east of the Cape Cod Museum of Natural History near Paine’s Creek</li> <li>• Lower Road at Bloomer Path intersection</li> <li>• Breakwater Road various locations</li> <li>• Crosby Lane</li> </ul>	<p>Dept. Public Works, Coastal Committee, Water Quality Review Committee, Dept. Natural Resources, Town Planner</p>	<p>Yr 4-6 following storm pathways project</p>	<p>Capital budget</p>
<p>1.B Work with the Board of Health to evaluate whether the required separation to groundwater is sufficient, and whether changes in regulation are needed to prevent groundwater intrusion into wells and onsite wastewater treatment systems.</p>	<p>Coastal Committee, Health Dept, Water Quality Review Committee, Dept. Natural Resources, Town Planner</p>	<p>Yr 1-3</p>	<p>Staff time</p>
<p>2. Complete the proposed Municipal Vulnerability Preparedness Plan and develop a full-scale multi-hazard mitigation plan.</p>	<p>Town Planner, Dept. Natural Resources, Police Dept , Fire Dept., All town</p>	<p>Yr 1-3 Yr 4-6 implement</p>	<p>MVP Action Grant; staff time</p>

Recommendations	Responsible Parties	Priority	Funding
2.A FEMA-approved hazard mitigation plan is needed to access some forms of emergency assistance from FEMA.	boards	Yr 1-3	
2.B. As part of the hazard mitigation plan, develop an inventory of underground infrastructure (water mains, underground utilities) that may be threatened by increasing groundwater elevation due to sea level rise. Develop a plan to prioritize improvements to protect infrastructure identified as subject to threat.	Dept. Public Works	Yr 1-3	MVP Action Grant; staff time
3. Work with the Planning Board and other stakeholders to evaluate changes to local zoning and regulations to preserve scale, character and resource protection.  3.A Consider establishing a Coastal Resource District of Critical Planning Concern (DCPC) as a planning process for considering multiple overlapping planning objectives and tools.	Town Planner, Planning Board	Yr 1-3	\$30,000 (est.) for bylaw development; staff time
3.B Develop and implement a stormwater management bylaw/low impact development zoning bylaw as part of compliance with the MS4 General Permit.	Dept. Public Works, Town Planner, Planning Board	Yr 1-3	Part of MS4 compliance
3.C Evaluate the potential benefits of establishing a Coastal Conservancy zoning district with enhanced protections for coastal resources and building scale	Town Planner, Planning Board	Yr 4-6	Staff time
3.D Evaluate zoning restrictions governing the size, height and lot coverage of newly constructed or reconstructed residential dwellings in the coastal resource planning area	Town Planner, Planning Board	Yr 1-3	Staff time
3.E Evaluate the potential benefit of revisions to the Flood Plain Overlay District and Wetlands Conservancy District bylaws to further limit development in velocity zones. Any proposed changes should be based on a thorough assessment of the effectiveness of the current bylaws, and the approaches and experience of other communities with similar circumstances.	Town Planner, Planning Board	Yr 1-3	Staff time
<b>Management Issue: Identify Opportunities to Preserve Visual Access</b>			
4. Include viewing enhancements in the long-term maintenance plans at landings and beaches.	Dept. Natural Resources, Dept. Public Works, All Access Committee, Coastal Committee	Ongoing	Staff time

## **Part III. Implementation Issues**

### **Operational Management Structure**

Implementation of the CRMP will require involvement from many areas of Town government and the broader community, including coordination with adjoining towns, Barnstable County, and state and federal agencies.

The Coastal Committee's charge includes responsibilities that are integral to successful implementation of the CRMP:

- Recommend ways of securing funding, including new strategies or changes to current means of generating revenue for coastal management and protection;
- Integrate robust public participation in all phases of its work;
- Coordinate planning and implementation across institutional boundaries, including incorporation of climate change adaptation strategies into policies, plans and regulations;
- Monitor changing coastal conditions and evolving community needs;
- Monitor and evaluate implemented adaptation strategies.

The Coastal Committee consists of a chair and three other members. The Director of Natural Resources and Select Board Liaison also participate regularly in Coastal Committee meetings. In order to successfully coordinate the implementation of the CRMP, the Committee would benefit from robust participation from other Town boards and committees, staff support from Town departments, a close working relationship with the Town Administrator, and clear direction from the Select Board. Suggested strategies include:

1. Consider expanding Coastal Committee membership to seven members, including representatives of diverse user groups: property owners, recreational interests, shellfishing interests, conservation interests, among others;
2. In addition to the Select Board liaison, identify liaisons from the Planning Board, Conservation Commission, Board of Health, Vision Committee, Bike Safety Committee, and Open Space Committee. Meet at least quarterly with the liaisons to review progress on recommended actions.
3. Work with the Town Administrator to identify dedicated resources to support the Committee's work.
4. Provide an annual report to the Select Board on: 1) coastal resource management annual goals; 2) progress on previously stated annual goals; 3) summaries of new issues or analyses.

## **Part IV. Maps**

Map 1. Wetland Resources

Map 2. Anadromous and Shellfish Resources

Map 3. Habitat

Map 4. Public Access and Mooring Locations

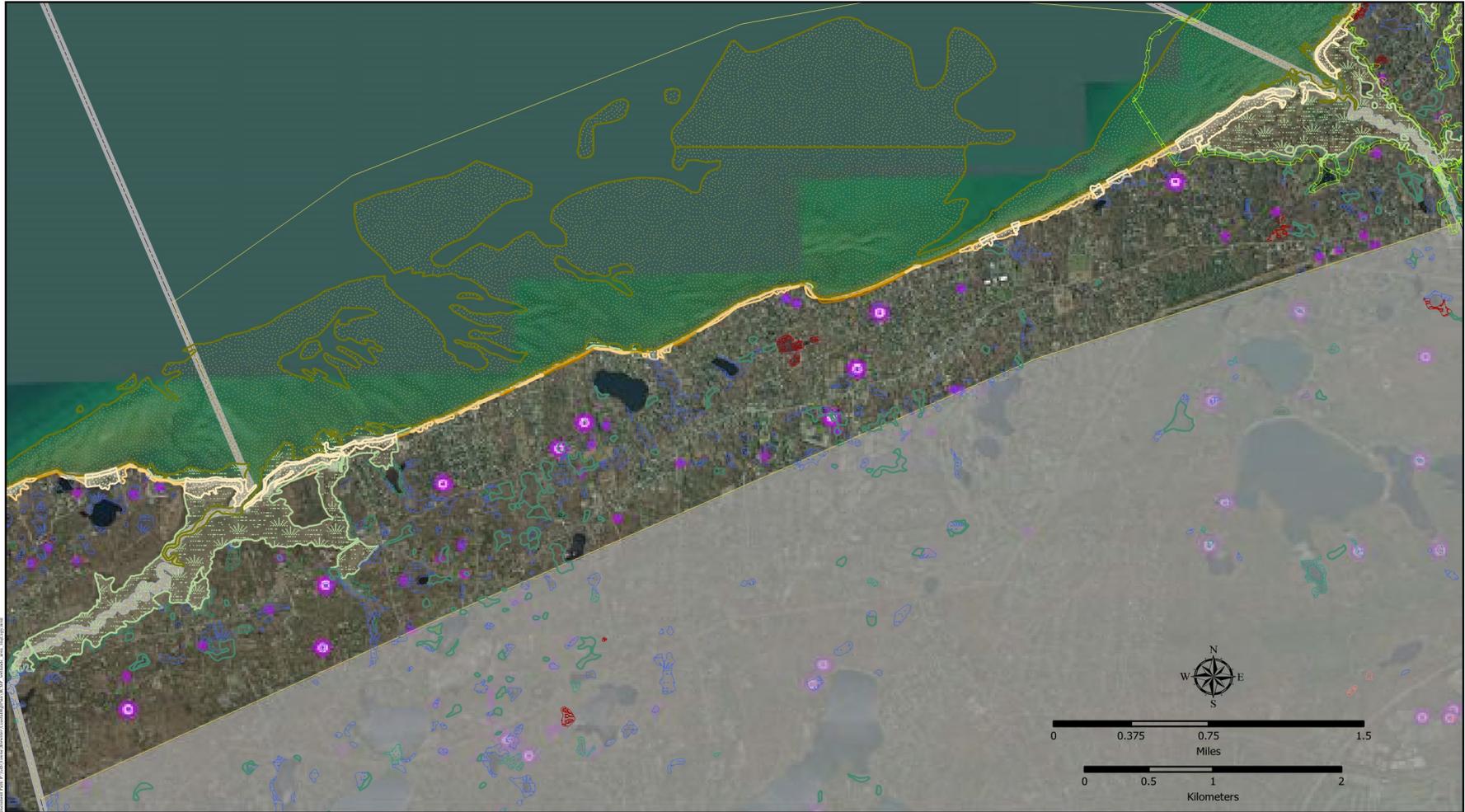
Map 5. Water Dependent Activities

Map 6. Shoreline Structures

Map 7. Land Use

Map 8. Zoning

Map 9. Flood hazard and Vulnerable Infrastructure



**Brewster Coastal Resource Management Plan**

**Wetland Resources**



**DEP Wetlands 2005**

**Coastal Wetlands**

- Barrier Beach System
- Coastal Bank
- Coastal Beach
- Coastal Dune
- Salt Marsh
- Tidal Flat

**Inland Wetlands**

- Cranberry Bog
- Deep Marsh
- Fen
- Shrub Swamp
- Wooded Swamp

**NHESP Vernal Pools**

- Certified
- Potential

**Area of Critical Environmental Concern**

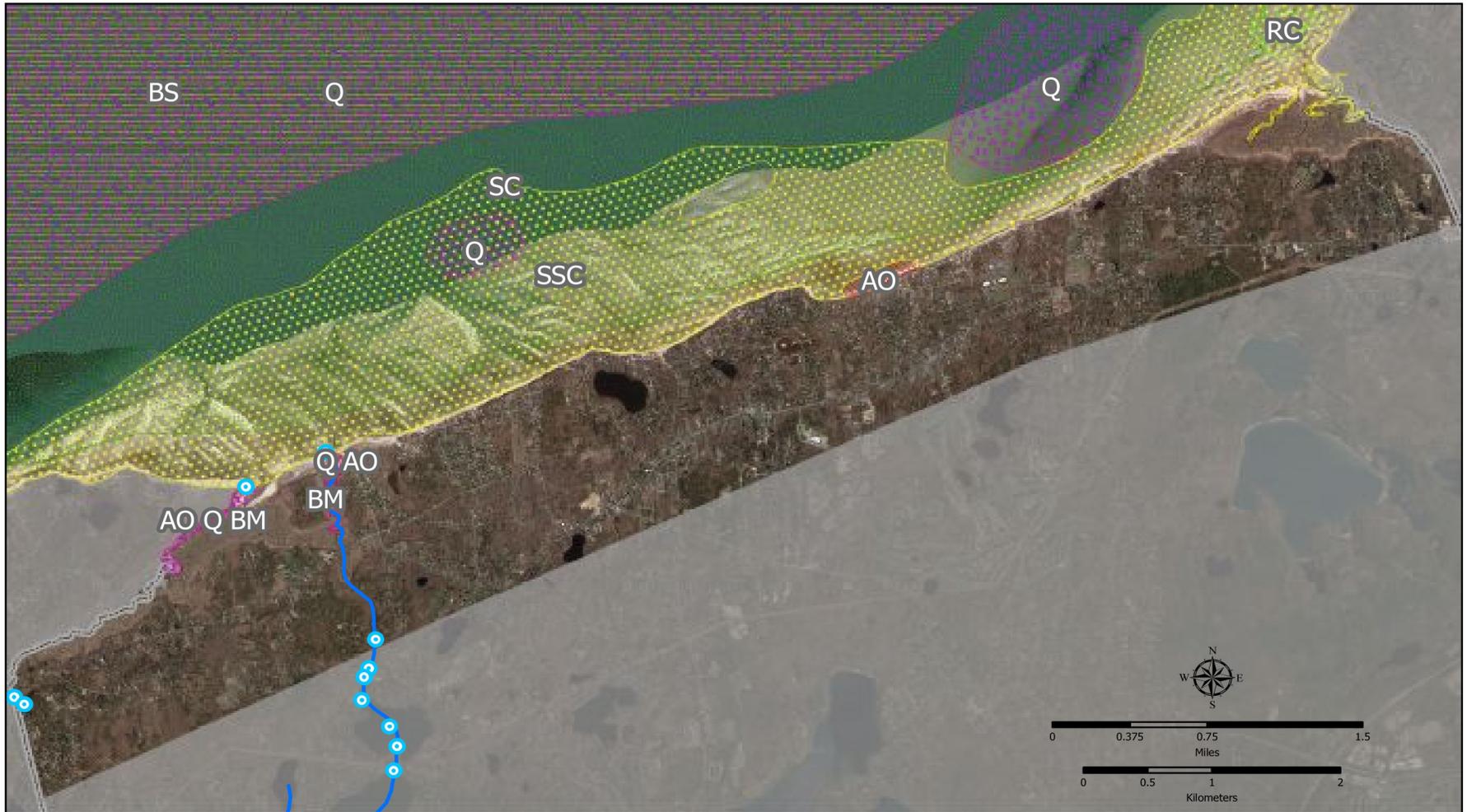
- ACEC

Areas outside study area



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research. Date: 2/21/2019

Map 1



Brewster Coastal Resource Management Plan

Anadromous and Shellfish Resources



**Shellfish Habitat**

- American Oyster (AO)
- Bay Scallop (BS)
- Blue Mussel (BM)

- Quahog (Q)
- Razor Clam (RC)
- Soft-shelled Clam (SSC)
- Surf Clam (SC)

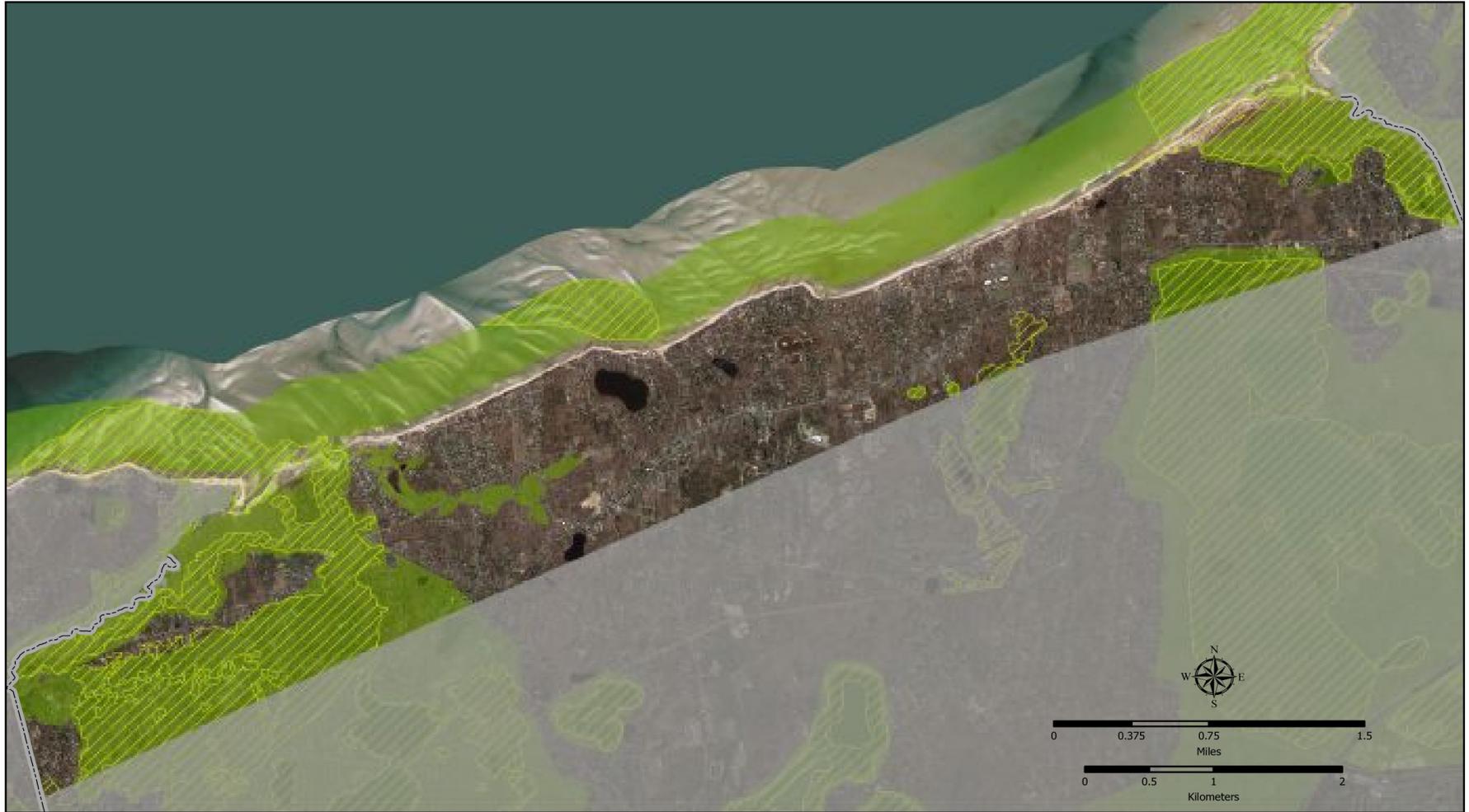
**Anadromous Fish Habitat**

- Anadromous fish presence
- Anadromous fish run

Areas outside study area



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.



Brewster Coastal Resource Management Plan

Habitat



**BioMap2**

- Core Habitat
- Critical Natural Habitat
- Areas outside study area



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.

Map 3



Brewster Coastal Resource Management Plan

Public Access & Mooring



**DEP Wetlands 2005**

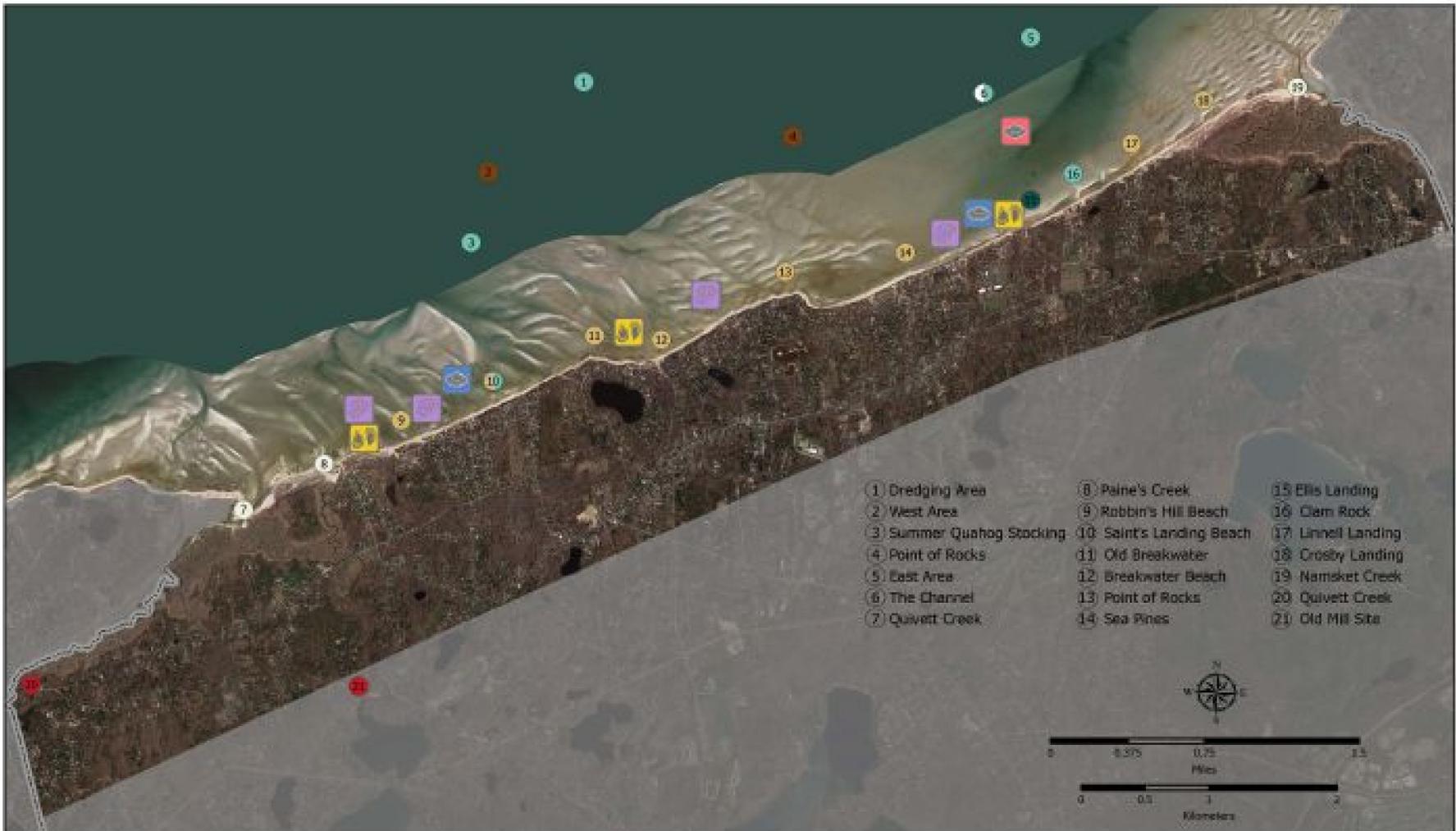
Coastal Wetlands	Inland Wetlands
Barrier Beach	Deep Marsh
Coastal Beach	Shrub Swamp
Coastal Dune	Wooded Swamp
Salt Marsh	Cranberry Bog
Tidal Flat	

- Public Access
- Mooring Field
- Areas outside study area



Map 4

The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.



**Brewster Coastal Resource Management Plan**

**Water Dependent Activities**



**Shellfish Activities**

- Recreational Shellfishing
- Commercial Shellfishing
- Public Propagation
- Aquaculture Grant

**Shellfish Beds and Fish Runs**

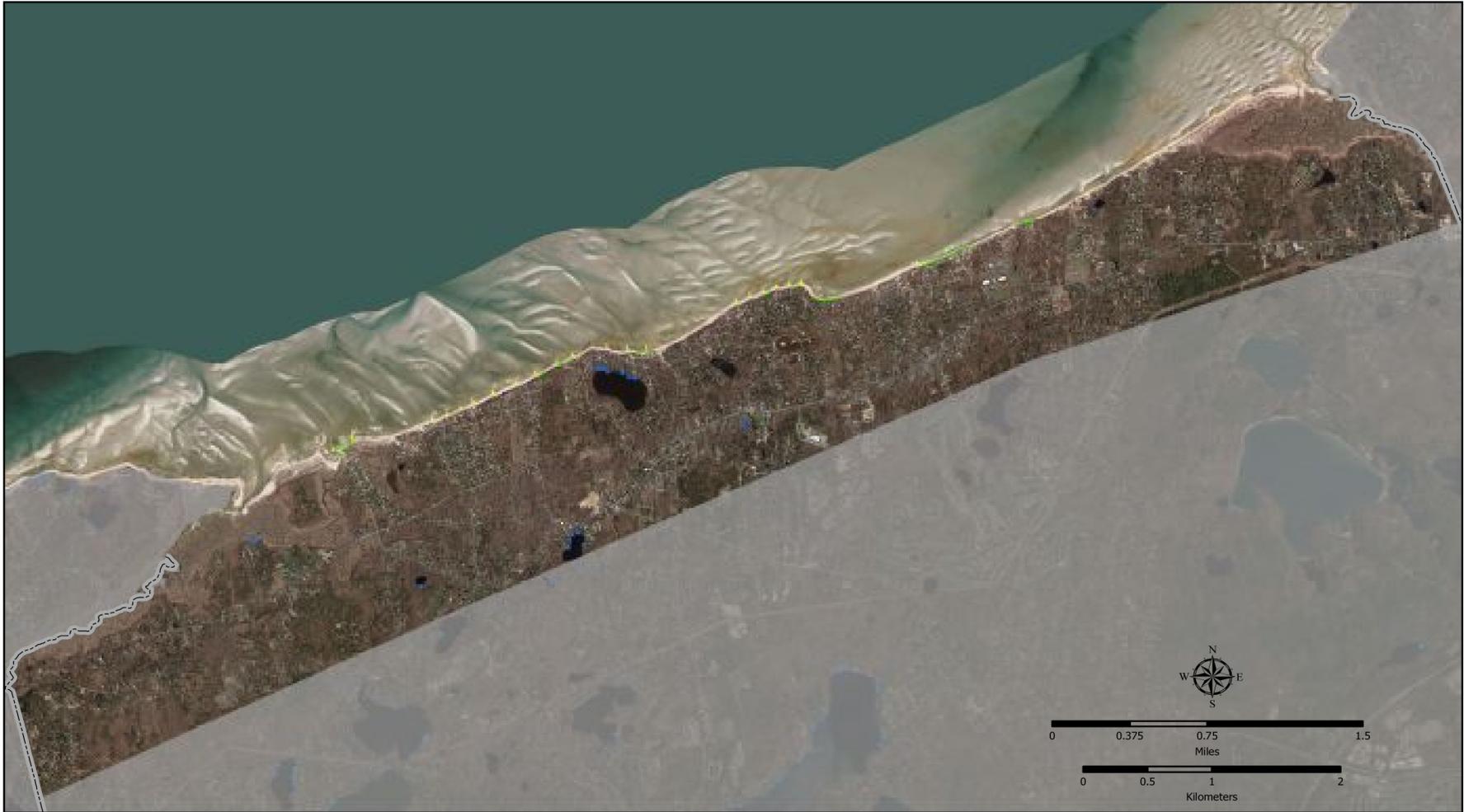
- Herring Run
- Little Necky/Cherry Stones
- Quahogs
- Scallops/Quahogs
- Sea Clams
- Steamers
- Winter Steamers/Summer Quahogs
- Other

Area outside study area



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.

Map 5



Brewster Coastal Resource Management Plan

Shoreline Structures

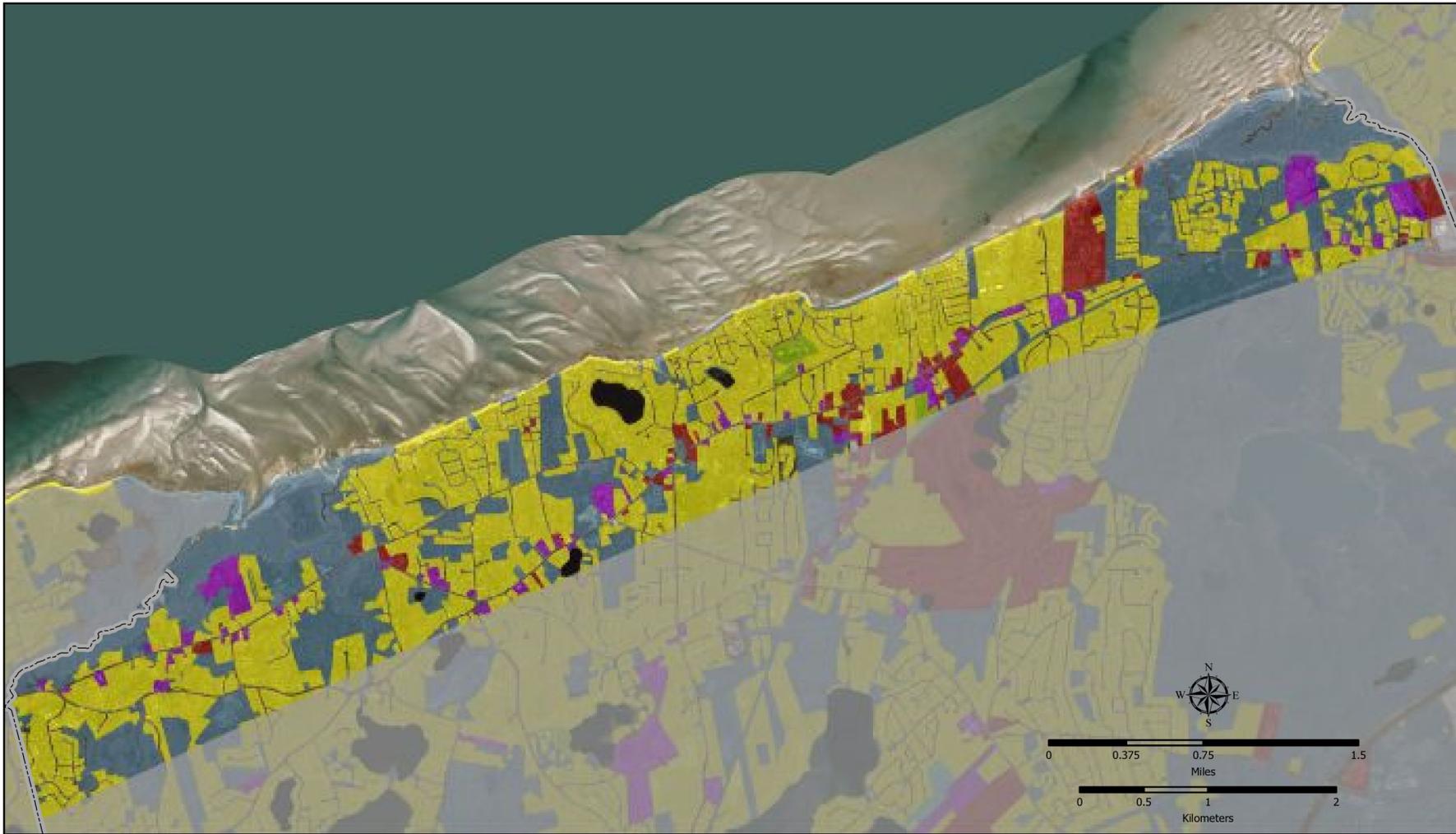


- Docks and Piers**
- Docks and Piers
- Coastal Defense Structure**
- Groins and Jetties
- Revetments
- Areas outside study area



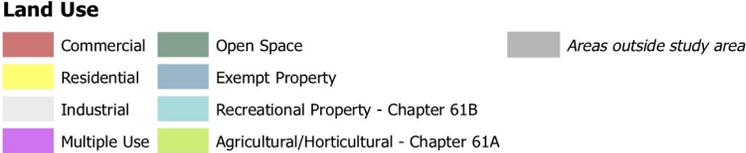
The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.

Map 6

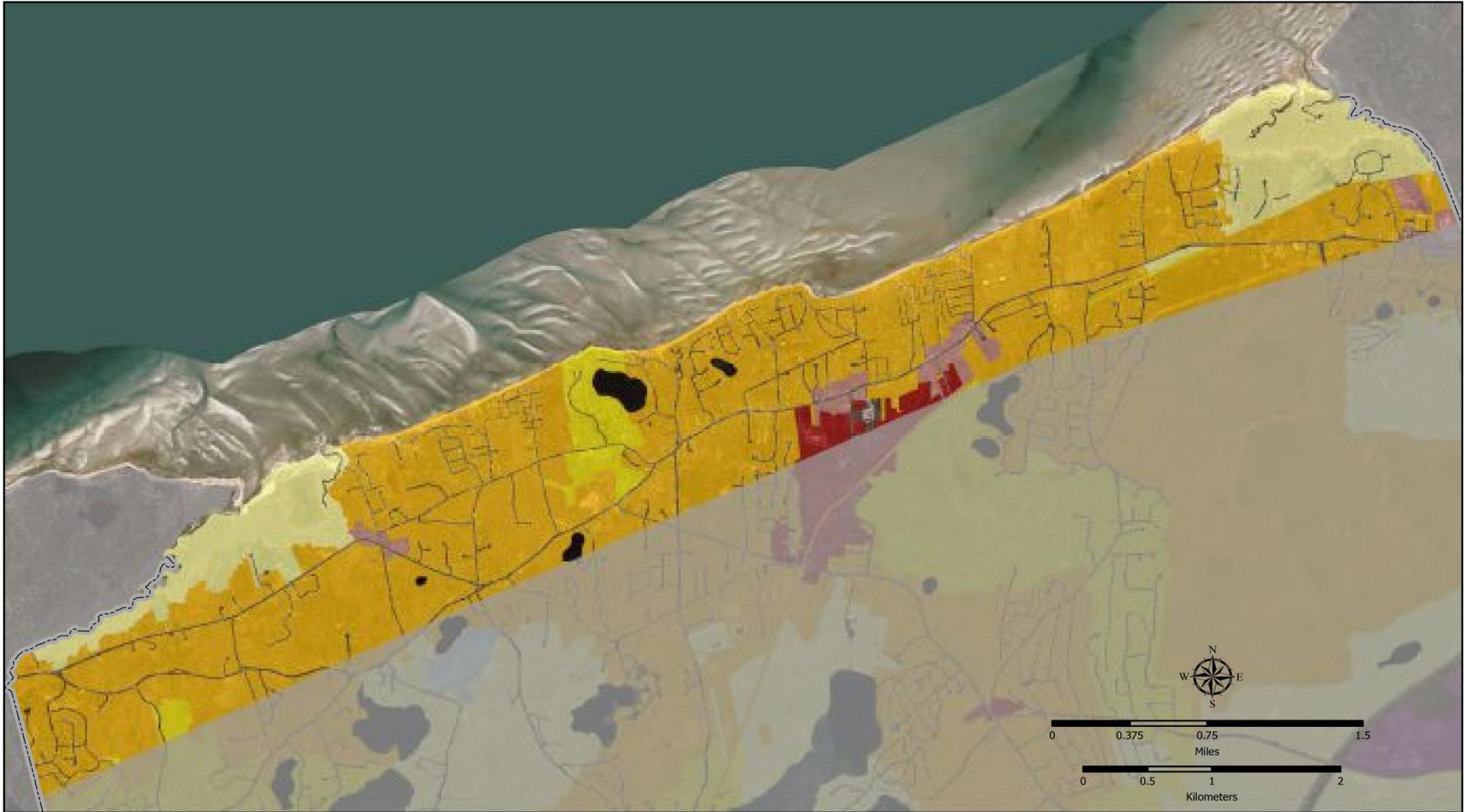


Brewster Coastal Resource Management Plan

Land Use



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.



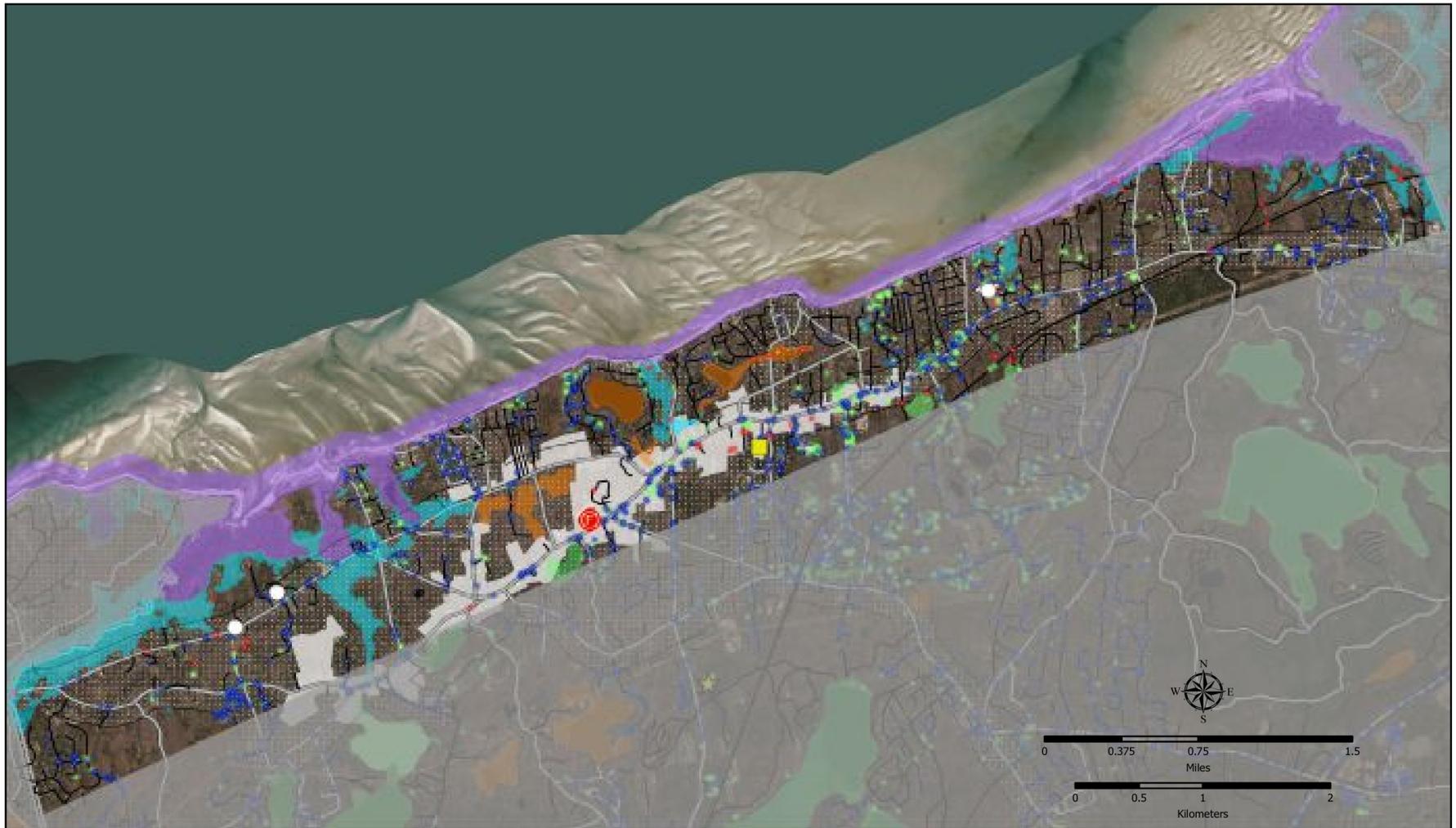
Brewster Coastal Resource Management Plan

Zoning



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.

Map 8



Brewster Coastal Resource Management Plan

Flood Hazards and Vulnerable Infrastructure



**FEMA National Flood Hazard Designation**

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- VE: High Risk Coastal Area
- X: 0.2% Annual Chance of Flooding
- Areas outside study area
- Ⓢ Fire Station
- ★ Local Police

**Historic District Type**

- Local
- National Register
- State Registered Historic Place
- Old King's Highway District
- Town Hall

**Road Jurisdiction**

- Public
- Unaccepted by City or Town

**Stormwater Infrastructure**

- Culvert
- Catch Basin
- Manhole



The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel level analysis. It should not substitute for actual on-site survey, or supersede deed research.

## Sources

Augusto, K. & Holmes, G. (2015). Massachusetts shellfish aquaculture economic impact study. Woods Hole, MA.

Berman, Greg. (2015) Spectrum of Erosion Control Methods. Poster published by Woods Hole Oceanographic Sea Grant.

Borrelli, Mark; Giese, Graham, et al. (2015) Assessment of the Century Scale Sediment Budget of the Brewster Coast. A report submitted to the Town of Brewster. Center for Coastal Studies of Provincetown, MA.

Brewster Bikeways Committee. (2015) *Biking Brewster – A strategy to enhance biking in Brewster.*

Brewster Coastal Advisory Group and Horsley Witten Group. (2016) Coastal Adaptation Strategy for the Town of Brewster, MA.

Federal Emergency Management Administration (2005). Flood Hazard Zones, Coastal Flood Hazard Analysis and Mapping Guidelines, Focused Study Report.

Report of the Massachusetts Coastal Erosion Commission Volume 1: Findings and Recommendations (2015)

Massachusetts Division of Marine Fisheries. (2017) Annual Report.

Town of Brewster Vision Advisory Committee (2018) Town of Brewster Vision Plan.

Tupper, Steven, Cape Cod Commission. (2018) Beach Shuttle Conceptual Model, Presentation to Brewster Coastal Committee, December 6, 2018.

## Acknowledgements

The Brewster Coastal Resource Management Plan Phase 1 Report was prepared by the Brewster Coastal Committee and Ridley & Associates, Inc. :

### Brewster Coastal Committee

Pat Hughes, Chair  
Abigail Franklin Archer, member  
Rachel Hutchinson, member  
Mary O'Neil, member  
Mary Chaffee, Select Board Liaison  
Chris Miller, Director, Natural Resources Department

Maps 1-9 were prepared by:  
Anne Reynolds, GIS Director, Cape Cod Commission  
Gary Prahm, Cape Cod Commission

The Committee wishes to thank the following contributors:

Mark Forest, Acting Town Administrator  
Ryan Birch, Natural Resources Department  
Ryan Bennett, Town Planner  
Noelle Aguiar, Conservation Administrator  
Nancy Ellis Ice, Health Director

Kristin Andres, APCC  
Greg Berman, WHOI Sea Grant and Barnstable County Extension Service  
Alex Carlson, Aquaculture Grant Holder  
Shannon Jarbeau, Barnstable County Cooperative Extension Service  
Diane Murphy, Barnstable County Cooperative Extension Service  
Steven Tupper, Cape Cod Commission

Many thanks to Cape Cod Museum of Natural History for providing a meeting location and logistical support for the community workshops.

Carole Ridley, Ridley & Associates, Inc.

## **Terms and Abbreviations**

ACEC – Area of Critical Environmental Concern

BCAG – Brewster Coastal Advisory Group

BCC – Brewster Coastal Committee

BFE – Base Flood Elevation

CAS – Coastal Adaptation Strategy

CRMP – Coastal Resource Management Plan

DCPC – District of Critical Planning Concern

FEMA – Federal Emergency Management Agency

MHW – Mean High Water

MLW – Mean Low Water

MS4 - Municipal Separate Storm Sewer System

MVP – Municipal Vulnerability Preparedness Program

VE zone – FEMA flood zone meaning coastal high hazard areas

AE zone – FEMA flood zone meaning areas that have a 1% probability of flooding each year

## Appendix A. Compiled CRMP Recommendations

### Recommendations to increase the resilience of public beaches and landings:

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Provide Ongoing Monitoring of the Coastal System on a Regional Basis</b>			
<p><b>1. Periodically assess coastal resources conditions for comparison with baseline conditions.</b></p> <ul style="list-style-type: none"> <li>Review the efficacy of previous and ongoing measures employed at coastal landings relative to the principles and goals of the CRMP.</li> </ul> <p>1.A Monitor and assess physical processes to support short-term management decisions and long-term planning. These measures could include:</p> <ul style="list-style-type: none"> <li>Every five years (next in 2021) update projections of sea level rise and storm surge and the modeled impacts of these forces on public beaches and landings, infrastructure, and coastal resources;</li> <li>Update tidal benchmarks; track and record highest annual high tide as proxy for effects of sea level rise;</li> <li>Evaluate the potential benefit, cost and candidate locations for installing one or more tide gauge(s) and a wave buoy to provide localized data on trends in tidal dynamics;</li> <li>Evaluate the potential benefit, cost and candidate location for installing a wave height buoy;</li> <li>Evaluate the potential usefulness of establishing a volunteer-based program to monitor changes in beach profiles.</li> </ul>	Coastal Committee, Dept. Natural Resources	Plan Yr 1-3  Implement Yr 4-6	Staff time  \$30,000 (est.)
<p>1.B Use best available tools to understand the potential impact of storm surge on public and private property, sensitive infrastructure and natural resources, and to develop strategies and plans to avoid, minimize or mitigate adverse impacts, including tools made available through the Cape Cod Commission's Resilient Cape Cod project, Municipal Vulnerability Preparedness program, and the storm tide pathways assessment project being undertaken by the Barnstable County Extension Service and Center for Coastal Studies (see 2B below).</p>	Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator	Implement Yr 1-3	Seek MVP Action Grant; Staff time
<p><b>2. Assess coastal resources on a regional scale</b></p> <p>2.A The 2015 Century Scale Sediment Budget should be updated in tandem with the sea level rise (next in 2021) to assess trends in sediment movement within the littoral cell that encompasses Brewster's shoreline. This effort should be evaluated and potentially undertaken in cooperation with Dennis, Orleans and</p>	Coastal Committee, Dept. Natural Resources	Plan Yr 1-3  Implement Yr 4-6	\$40,000 (est.)

Recommendations	Responsible Parties	Priority	Funding
Eastham. The assessment should include recommendations for monitoring protocols and potential management actions necessary to increase resiliency of Brewster’s shoreline and ensure that tidal flats keep pace with sea level rise.			
2.B Participate with the Barnstable County Extension and Center for Coastal Studies in developing a Storm Tide Pathway for Brewster. The Storm Tide Pathways project will encompass the entire Cape Cod Bay shoreline, and may provide a basis for additional coordinated efforts among towns sharing the same littoral cell.	Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent Agent, Conservation Commission, Coastal Committee, Town Administrator	Yr 1-3	Staff time
<p>2.C Consider development of a regional framework for coastal resilience:</p> <ul style="list-style-type: none"> <li>• Develop a management plan for the Inner Cape Cod Bay Area of Critical Environmental Concern (ACEC), in concert with the other towns sharing the ACEC. Such a plan could encompass studies of sea level rise and sediment budget, regional sediment management, and other ACEC resource issues.</li> <li>• Consider establishing a regional coastal resilience planning group among towns in the same littoral cell (Dennis, Orleans, Eastham) to identify/study issues of shared concern cost effectively. Regional coordination could increase funding opportunities. This could be done in concert with the existing Barnstable County Coastal Resources Committee, or the Cape Cod Commission’s Resilient Cape Cod, Cape Cod Bay Work Group</li> </ul>	Dept. Natural Resources, Coastal Committee, Town Administrator	<p>Evaluate Yr 1-3</p> <p>Implement Yr 4-6</p>	<p>\$15,000 (est.) consultant cost to assess feasibility of frameworks</p> <p>\$50,000 (est.) for studies, plan development; Staff time</p>
<b>Management Issue: Proactively Address Flooding of Brewster’s Beaches and Landings</b>			
<p><b>3. Adopt long-term coastal management resiliency strategies</b></p> <p>3.A Evaluate resilient shoreline management practices (those that mimic natural coastal processes) and identify where on Brewster’s shoreline they might be applied:</p> <ul style="list-style-type: none"> <li>• Preserve coastal landforms and vegetation that provide buffers to erosion caused by storm surge. Salt marsh and fronting coastal dunes have been shown to be effective in mitigation erosion along Brewster’s Cape Cod Bay shoreline (APCC, 2016).</li> <li>• Beach and dune nourishment practices for public and private beaches: Mant’s, Paine’s, Breakwater Beach;</li> </ul>	Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator	<p>Plan Yr 1-3</p> <p>Implement Yr 4-6</p>	<p>\$45,000 (est.) for engineering</p> <p>Investments to be included in 5 year capital plan</p> <p>Staff time</p>

Recommendations	Responsible Parties	Priority	Funding
<ul style="list-style-type: none"> <li>• Dune protection (vegetation, fencing) and reconstruction: Mant’s, Breakwater Beach, Point of Rocks;</li> <li>• Create a living shoreline<sup>10</sup> demonstration project: oyster reef at Mant’s Landing;</li> <li>• Managed retreat similar to the relocation of the Paine’s Creek parking lot: locations to be determined.</li> </ul>			
<p>3.B Evaluate changes to the existing groin field, including potential removal/attrition of groins or other structures on the shoreline that impede coastal processes or hasten erosion. Evaluate whether existing groins could impede sediment transport necessary to sustain the tidal flats under different sea level rise scenarios.</p>	<p>Dept. Natural Resources, Coastal Committee, Conservation Agent</p>	<p>Yr 6+</p>	<p>\$25,000 (est.) for consultant evaluation</p>
<p>3.C Enhance stormwater management to minimize or eliminate erosion caused by overland run-off:</p> <ul style="list-style-type: none"> <li>• Implement the stormwater management improvements identified in Brewster’s Integrated Water Resource Management Plan and the work being undertaken on MS4 General Permit compliance;</li> <li>• Prioritize stormwater improvements in any locations where infrastructure could reduce or eliminate erosion caused by run-off;</li> <li>• Provide funding for ongoing maintenance of existing or proposed improvements, possibly through the creation of a stormwater utility;</li> <li>• Design and adopt a stormwater management bylaw to enhance stormwater management on public and private property; and ensure that issues related to coastal erosion, use of green infrastructure and use of stormwater best management practices (BMPs) are incorporated.</li> </ul>	<p>Dept. Natural Resources, Dept. Public Works</p> <p>Dept. Natural Resources, Dept. Public Works</p> <p>Dept. Natural Resources, Dept. Public Works</p> <p>Town Planner, Planning Board, Coastal Committee, D Dept. of Natural Resources</p>	<p>Yr 1-3</p> <p>Yr 1-3</p> <p>Yr 4-6</p> <p>Yr 1-3</p>	<p>Cost to be included in five-year capital plan or road bond</p>
<p>3.D Evaluate policy and regulatory changes to promote coastal resiliency:</p> <ul style="list-style-type: none"> <li>• Evaluate the potential for implementing a flood plain bylaw to, among other things, “restrict or prohibit development and uses on Land Subject to Coastal Storm Flowage (i.e., 100-year coastal floodplain) and its buffer zones in order to minimize potential loss of life, destruction of property, and environmental damage inevitably resulting from inappropriate development on land</li> </ul>	<p>Conservation Agent, Dept. Natural Resources, Conservation Commission, Coastal Committee</p>	<p>Yr 1-3</p>	<p>\$20,000 (est.) consultant support for bylaw development and permitting guidance;</p>

<sup>10</sup> A living shoreline is a protected, stabilized coastal edge made of natural materials such as plants, sand, or rock. Unlike a concrete seawall or other hard structure, which impede the growth of plants and animals, [living shorelines](#) grow over time. Natural infrastructure solutions like living shorelines provide wildlife habitat, as well as natural resilience to communities near the waterfront. Living shorelines are sometimes referred to as nature-based, green, or soft shorelines. They are an innovative and cost-effective technique for coastal management. (Source: <https://www.fisheries.noaa.gov/insight/understanding-living-shorelines>)

Recommendations	Responsible Parties	Priority	Funding
<p>known to be subject to storms, flooding, erosion, relative sea level rise and other coastal zone hazards,”(Cape Cod Commission model bylaw). The Cape Cod Commission model bylaw and efforts implemented in other towns should be evaluated to determine policies applicable to Brewster.</p> <ul style="list-style-type: none"> <li>Develop permitting guidance for erosion control activities on private properties, and work with the Conservation Commission to apply the guidance in the review of Notices of Intent and issuance of Orders of Condition.</li> </ul>			Staff time
<p>3.E Ensure consistency with other planning efforts: Incorporate the potential for coastal resource impacts in the MVP plan; Complete a FEMA eligible multi-hazard mitigation plan; Ensure that MVP and multi-hazard planning is informed by the CRMP, and that measures promoted in these plans are considered in future phases of the CRMP.</p>	Dept. Natural Resources, Town Planner, Planning Board, Conservation Agent, Conservation Commission, Coastal Committee, Town Administrator	Yr 1-3	Staff Time
<b>Management Issue: Maintain and Manage Public Access Points to Increase Resilience</b>			
<p><b>4. Promote Resilient Management and Maintenance of Town-owned Access Points</b></p> <p>4.A Create a coastal resiliency tool kit consisting of best practices for sustainable design, management and maintenance of town-owned landings and beaches. The tool kit should make use of the work being undertaken through the Cape Commission’s Resilient Cape Cod project, and other proven techniques, including:</p> <ul style="list-style-type: none"> <li>Managed retreat of parking areas and structures</li> <li>Use of articulated mats to provide stability under ramps and parking areas; and</li> </ul> <p>Use of beach grass planting, beach nourishment, and dune nourishment/rebuilding/stabilization, among other initiatives.</p>	Dept. Natural Resources, Coastal Committee	Develop Yr 1-3  Implement as needed	Staff time
<p>4.B Develop a sustainable funding source, possibly through an environmental bond bill offset by short term rental tax revenues, potential increase in deeds tax revenues, town beach sticker revenues or other sources for resilient maintenance and management actions that balance needs for beach access, public safety, natural resource sustainability, and coastal resiliency; and that meet local and state permitting requirements. These measures include: Repair stairs, ramps, walkways</p>	Coastal Committee, Town Administrator, Dept. Natural Resources, Select Board, Finance Committee	Yr 4-6	Staff time

Recommendations	Responsible Parties	Priority	Funding
(including measures needed for improved handicapped accessibility). A proactive, resilient maintenance program may lower long-term costs by reducing the potential need for emergency repairs.			
4.C Conduct technical alternatives assessments for resilient capital projects needed to address erosion pressure and preserve access at highly threatened town-owned access points. Mant’s Landing and Paine’s Creek are currently experiencing significant erosion and should be prioritized for evaluation and possible resilient capital projects.	Dept. Natural Resources, Dept. Public Works, Conservation Agent, Coastal Committee	Plan Yr 1-3  Implement Yr 4-6	\$15,000 for engineering (est.); Staff time  TBD

**Recommendations to preserve ecosystem services provided by healthy coastal wetlands**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Preserve Natural Sediment Transport Processes in Balance with Erosion Management</b>			
<p>1. Evaluate policy and regulatory changes to protect wetland resources</p> <p>1.A Work with the Conservation Commission to evaluate the Town’s wetlands protection bylaw and regulations to determine if any changes would provide enhanced protection of coastal wetlands and natural coastal processes. Areas of exploration could include, but not be limited to:</p> <ul style="list-style-type: none"> <li>• Potential to incorporate the sediment budget into the local wetlands by-law and regulations to regulate protection of upland development differently in eroding areas;</li> <li>• For all new or renewed Orders of Condition for erosion management, require analysis of cumulative system-wide impacts, and require adherence to best practices for shoreline erosion management structures:</li> <li>• Adopt permitting guidelines based on Woods Hole Oceanographic Institution Sea Grant publication <i>Spectrum of Erosion Control Methods</i>.<sup>11</sup> The recent publication of <i>Guidelines for Erosion Management in Pleasant Bay</i><sup>12</sup> provides a guide;</li> <li>• Require maintenance and nourishment of erosion management structures (in specific locations of need);</li> <li>• Incorporate monitoring requirements for erosion</li> </ul>	Conservation Commission; Coastal Committee	Yr 1-3	\$25,000 (est.) for bylaw preparation; staff time

<sup>11</sup> <https://web.who.edu/seagrant/wp-content/uploads/sites/24/2015/07/Spectrum-of-erosion-control-FINAL.pdf>

<sup>12</sup> [http://pleasantbay.org/wp-content/uploads/Ridley\\_EditedErosionReport\\_10.30.18\\_PRINT.pdf](http://pleasantbay.org/wp-content/uploads/Ridley_EditedErosionReport_10.30.18_PRINT.pdf)

control measures to provide information to evaluate their functions and impacts.			
1.B Review the Town’s policy for allowing access through town landings to perform shoreline stabilization work on private property. Ensure that applicants carry adequate insurance coverage in case of damage to resources caused by heavy equipment or fuel spills.	Select Board; Town Administrator; Dept. Natural Resources	Yr 1-3	Staff time
1.C Work with the Planning Board to revise, update or extend the Flood Plain Overlay District and Wetlands Conservancy bylaws, based on an evaluation of the bylaw’s effectiveness in meeting its original purpose, and based on a survey of similar measures employed in other communities ore recommended by the Cape Cod Commission.	Town Planner; Planning Board; Dept. Natural Resources; Coastal Committee	Yr 1-3	Staff time
<b>2. Increase public awareness of the importance of healthy coastal wetlands and natural coastal processes, and the need to protect these resource areas.</b>  2.A Education materials should be aimed at shoreline property owners, among others, to discuss the importance of natural sediment transport processes, and best practices for vegetation management, erosion management, and buffer protection, etc. This effort should be coordinated with the development of permitting guidance.	Coastal Committee; Dept. Natural Resources; Conservation Agent, Conservation Commission	Yr 1-3	MVP Action Grant; educ resources may be available from MCZM, and Barstable County Cooperative Extension
<b>Management Issue: Maintain the Elevation of Salt Marshes and Tidal Flats</b>			
<b>3. Promote opportunities for salt marsh migration</b> 3.A Use the state of the art wetland modeling to assess patterns of salt marsh retreat in Brewster. Model results could then be used to develop salt marsh management plans to counteract loss of marsh due to subsidence or inundation. Management actions could include: <ul style="list-style-type: none"> <li>Channel improvements to restore or enhance hydrology;</li> <li>Evaluate the potential for a pilot project for thin layer deposition of material on any subsided areas of salt marsh plane, in coordination with MassDEP permitting guidance;</li> <li>Work with the Town’s Open Space Committee, Community Preservation Committee and the Brewster Conservation Trust to identify key parcels for acquisition/conservation restriction and to develop a funding strategy for acquisition/protection of these properties; and</li> </ul>	Dept. Natural Resources, Conservation Agent, Conservation Commission, Coastal Committee  Open Space Committee, Dept. Natural Resources, Brewster Conservation Trust, Community Preservation Committee, Coastal	Plan yr 1-3  Modeling Yr 6+  Yr 1-3	\$40,000 for modeling  Additional funds for channel work or thin layer deposition  Staff time

<p>develop a framework for tracking and pursuing parcel opportunities;</p> <ul style="list-style-type: none"> <li>Identify and remove any remaining undersized culverts that may be restricting tidal flow and causing degradation of coastal wetlands. An example is the Crosby salt marsh restoration project.</li> </ul>	Committee, Town Administrator		
<p>3.B Develop/update and implement resource management plans to protect large areas of salt marsh. Land Use and Management Plans for Quivett Creek/Paine’s Creek Marsh and Namskaket Marsh should be developed in coordination with Brewster Conservation Trust, MA Division of Conservation and Recreation, and adjacent towns.</p>	Open Space Committee, Dept. Natural Resources, Brewster Conservation Trust, Community Preservation Committee, Coastal Committee, Town Administrator	Yr 4-6	\$20,000 (est.) to update management plans; State TA may be available

**Recommendations to provide access for water dependent activities**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Provide Opportunities for Commercial Aquaculture</b>			
1. Update the Town’s commercial aquaculture regulations.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time
2. Evaluate the possibility of designating an Aquaculture Development Area. The designation would identify a number of acres of tidal flats made available for private aquaculture grants. Most likely locations would be the west end of town near Crowe’s Pasture, or off Linnell Landing. Issues of access to grants and conflicts with other fisheries and user groups would need to be considered. Work with Town of Dennis to explore alternative access via Crowe’s Pasture.	Dept. Natural Resources, Town Administrator, Select Board, Conservation Commission, MassDEP, Mass Division of Marine Fisheries, Army Corps of Engineers, Bureau of Indian Affairs	Yr 1-3	Staff time
3. Undertake an assessment of economic costs and benefits to the community from expanded shellfishing and aquaculture opportunities, with consideration to other competing uses of resource areas.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time
<b>Management Issue: Provide Opportunities for Commercial Shellfish Harvesting</b>			
5. Update the Town’s commercial shellfishing regulations.	Dept. Natural Resources, Town Administrator,	Yr 1-3	Staff time

Recommendations	Responsible Parties	Priority	Funding
	Select Board		
6. Review the performance of the razor clam pilot project and evaluate the potential for a permanent razor clam fishery.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Permanent program could require additional resources
<b>Management Issue: Enhance Propagation and Other Activities in Support of Recreational Shellfishing</b>			
7. Continue/expand public shellfish propagation programs. Evaluate future needs for an upweller, and whether these can be met by the existing upweller, and/or by developing a shared upweller with the Town of Dennis.	Dept. Natural Resources, Town Administrator, Select Board	Ongoing	Staff time
<b>Management Issue: Manage Competing Uses of Town Landings and Mooring Areas</b>			
8. Develop a capital plan to plan for and prioritize expenditures for maintenance and improvements at town landings.	Dept. Natural Resources, Town Administrator, Select Board	Yr 4-6	Staff time
9. Monitor demand for moorings and whether changes to mooring regulations are needed.	Dept. Natural Resources, Town Administrator, Select Board	Ongoing	Staff time
10. Evaluate the need for regulations or guidelines for commercial activity at town landings.	Dept. Natural Resources, Town Administrator, Select Board	Yr 1-3	Staff time

**Recommendations to preserve peak season access to public beaches and landings**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Augment peak seasonal parking demand/capacity at beaches and landings</b>			
<b>1. Continue to assess and monitor peak season beach access demand.</b> 1.A Consider the use of surveys administered with seasonal parking permits to gather information on seasonal parking demand at town landings and beaches.	Coastal Committee, Recreation Dept., Police Dept., Select Board, Town Administrator	Yr 1-3	Staff time
<b>2. Maintain or enhance peak season access to public beaches and landings.</b> 2.A Where existing parking facilities face erosion danger, assess opportunities for managed relocation or retreat (e.g., Paine’s Creek, Breakwater Beach) or other measures such as use of articulated mats to protect existing parking spaces	Dept. Natural Resources; Coastal Committee	Ongoing	Staff time
2.B Develop strategies to promote the use of under	Dept. Natural	Evaluate	Staff time

utilized public access locations, including Spruce Hill and Wing Island.	Resources; Coastal Committee	yr 1-3 Implement Yr 4-6+	
2.C Assess opportunities for new or expanded public access locations and/or parking, including through state- and town-owned land, and future acquisitions in collaboration with Town Open Space Committee. Special consideration should be given to balancing access with impacts to natural resources and surrounding neighborhoods.	Dept. Natural Resources, Open Space Committee, Brewster Conservation Trust	Ongoing	Staff time
<b>3. Implement a Beach Shuttle.</b> Develop and implement a beach shuttle service pilot project. Based on performance, the initial route/service should be continued, and evaluated, expanded or altered.	Select Board, Town Administrator, Coastal Committee, Dept. Natural Resources, Dept. Public Works, Police Dept.	Pilot project Yr 1-3; Pending results, Implement Yr 4-6	TBD
<b>4. Implement measures to improve safe bike and pedestrian access.</b>  4.A Bike and pedestrian access improvements consistent with Comprehensive Brewster Bike Strategy should be evaluated and implemented where feasible. These measures include but are not limited to: <ul style="list-style-type: none"> <li>• Addition of sidewalks where they can be accommodated</li> <li>• Employ signage to mark bike and pedestrian lanes,</li> <li>• Continue parking restrictions on shore access roads during summer</li> <li>• Create a Lower Road bike trail to beaches</li> <li>• Create safe walking routes to beaches</li> <li>• Create and maintain walking trails and connections to beaches and landings.</li> </ul>	Coastal Committee, Bike Committee, Police Dept.	Ongoing	DPW budget, grants for signage and education materials; Staff time
<b>5. Complete the CCRT Extension through DCR property to Linnell Landing.</b>	State	Complete yr 1-3	State; Staff time
<b>Management Issue: Enhance Access For Populations With Limited Mobility</b>			
<b>6. Enhance access for populations with limited mobility.</b>  6.A Explore opportunities to enhance physical and visual access for populations with special needs, working in coordination with Brewster All Access Committee and Council on Aging: <ol style="list-style-type: none"> <li>3. Continue improvements to enhance physical access</li> <li>4. Preserve or expand the number of dedicated handicapped parking spaces</li> <li>5. Identify measure to improve visual access in concert with vegetation management.</li> </ol>	Dept. Natural Resources, Dept. Public Works, All Access Committee, Coastal Committee	Ongoing	Staff time

**Recommendations to protect infrastructure, visual access and sense of place**

Recommendations	Responsible Parties	Priority	Funding
<b>Management Issue: Minimize and Mitigate Impacts of Development in Coastal Areas; Protect vulnerable low roads, groundwater, and underground infrastructure</b>			
<p>1. Protect vulnerable low-lying infrastructure</p> <p>1.A Elevate low-lying road segments and/or retrofit stormwater management systems to mitigate flooding during storm surge conditions. The following segments were identified in the CAS and being of special concern:</p> <ul style="list-style-type: none"> <li>• Route 6A at Dennis town line and east of the Cape Cod Museum of Natural History near Paine’s Creek</li> <li>• Lower Road at Bloomer Path intersection</li> <li>• Breakwater Road various locations</li> <li>• Crosby Lane</li> </ul>	<p>Dept. Public Works, Coastal Committee, Water Quality Review Committee, Dept. Natural Resources, Town Planner</p>	<p>Yr 4-6 following storm pathways project</p>	<p>Capital budget</p>
<p>1.B Work with the Board of Health to evaluate whether the required separation to groundwater is sufficient, and whether changes in regulation are needed to prevent groundwater intrusion into wells and onsite wastewater treatment systems.</p>	<p>Coastal Committee, Health Dept., Water Quality Review Committee, Dept. Natural Resources, Town Planner</p>	<p>Yr 1-3</p>	<p>Staff time</p>
<p>2. Complete the proposed Municipal Vulnerability Preparedness Plan and develop a full-scale multi-hazard mitigation plan.</p> <p>2.A FEMA-approved hazard mitigation plan is needed to access some forms of emergency assistance from FEMA.</p>	<p>Town Planner, Dept. Natural Resources, Police Dept., Fire Dept., All town boards</p>	<p>Yr 1-3 Yr 4-6 implement Yr 1-3</p>	<p>MVP Action Grant; staff time</p>
<p>2.B. As part of the hazard mitigation plan, develop an inventory of underground infrastructure (water mains, underground utilities) that may be threatened by increasing groundwater elevation due to sea level rise. Develop a plan to prioritize improvements to protect infrastructure identified as subject to threat.</p>	<p>Dept. Public Works</p>	<p>Yr 1-3</p>	<p>MVP Action Grant; staff time</p>
<p>3. Work with the Planning Board and other stakeholders to evaluate changes to local zoning and regulations to preserve scale, character and resource protection.</p> <p>3.A Consider establishing a Coastal Resource District of Critical Planning Concern (DCPC) as a planning process for considering multiple overlapping planning objectives and tools.</p>	<p>Town Planner, Planning Board</p>	<p>Yr 1-3</p>	<p>\$30,000 (est.) for bylaw development; staff time</p>

<b>Recommendations</b>	<b>Responsible Parties</b>	<b>Priority</b>	<b>Funding</b>
3.B Develop and implement a stormwater management bylaw/low impact development zoning bylaw as part of compliance with the MS4 General Permit.	Dept. Public Works, Town Planner, Planning Board	Yr 1-3	Part of MS4 compliance
3.C Evaluate the potential benefits of establishing a Coastal Conservancy zoning district with enhanced protections for coastal resources and building scale	Town Planner, Planning Board	Yr 4-6	Staff time
3.D Evaluate zoning restrictions governing the size, height and lot coverage of newly constructed or reconstructed residential dwellings in the coastal resource planning area	Town Planner, Planning Board	Yr 1-3	Staff time
3.E Evaluate the potential benefit of revisions to the Flood Plain Overlay District and Wetlands Conservancy District bylaws to further limit development in velocity zones. Any proposed changes should be based on a thorough assessment of the effectiveness of the current bylaws, and the approaches and experience of other communities with similar circumstances.	Town Planner, Planning Board	Yr 1-3	Staff time
<b>Management Issue: Identify Opportunities to Preserve Visual Access</b>			
4. Include viewing enhancements in the long-term maintenance plans at landings and beaches.	Dept. Natural Resources, Dept. Public Works, All Access Committee, Coastal Committee	Ongoing	Staff time

## Appendix B. Complementary Planning Efforts

### Summary of Complementary Planning Initiatives

Study or Initiative	Objective	Status	Lead Department or Board	Comments
<b>Coastal Resource Plans</b>				
Coastal Adaptation Strategy	Provide an initial assessment of coastal resource threats due to climate change, and identify the adaptation strategies the community prefers	Completed in 2017	Brewster Coastal Advisory Group	
Coastal Resource Management Plan	Provide overarching policy direction for the resiliency of Brewster's Cape Cod Bay shoreline	Launched November 2017; ongoing.	Brewster Coastal Committee	identify and describe the priority management challenges to be addressed in a coastal resource management plan, recommend management actions to address those management challenges, and suggest implementation steps necessary to pursue recommended management actions.
Municipal Vulnerability Preparedness (MVP) Plan	Assists towns in planning for climate changes and resiliency; a requirement for certain state funding sources	Town received MVP designation in 2018; received \$20,000 planning grant	Planning Department	
FEMA Multi-Hazard Mitigation Plan	Required for obtaining certain types of FEMA assistance; assists in preparations for first responders and planning for large capital projects	Grant funds to support preparation of the plan are being sought	Planning Department	
<b>Complementary Planning Efforts</b>				
Brewster Vision Plan	Express community preferences for	Completed	Brewster Vision Committee	Request for implementation funds anticipated

	how Brewster evolves socially, environmentally and economically			Spring TM
Integrated Water Resources Management Plan		Ongoing	Natural Resources Department	
Small Municipal Separate Storm Sewer Systems (MS4) General Permit Compliance	Develop new regulations to demonstrate compliance with the MS4 General Permit		Department of Public Works	May result in a new stormwater management bylaw
Open Space Plan Update				May identify conservation strategies to protect coastal resource areas

## Appendix C. Workshop Information

During 2018, the Brewster Coastal Committee sponsored a series of issue focused community discussions to inform the development of the Brewster Coastal Resource Management Plan. Coastal Committee members and Select Board members hosted the meetings and provided background information about coastal management planning.

The five sessions were as follows:

- Sustaining public beaches and landings in the face changing shoreline conditions - May 17 – Presenters included Greg Berman, Coastal Resources Specialist for the Cape Cod Cooperative Extension Service and WHOI Sea Grant; and Chris Miller, Director of Natural Resources
- Preserving healthy coastal wetlands - June 14 – Presenters included Kristen Andres, Outreach and Education Coordinator for APCC; and Chris Miller, Director of Natural Resources
- Providing access for water-dependent activities - July 19 – Presenters included Ryan Birch, Assistant Director of Natural Resources; Alex Carlson, commercial shellfisherman; Dianne Murphy, *Deputy Director, Fisheries & Aquaculture Specialist Cape Cod Cooperative Extension & Woods Hole Sea Grant*
- Preserving public access to beach & landings - August 16 – presenters included Steven Tupper, Transportation Program Manager, Cape Cod Commission
- Protecting infrastructure, visual access, cultural & historical resources - September 13 - Shannon Hulst Jarbeau, CFM, CRS & Floodplain Coordinator Barnstable County/Cape Cod Cooperative Extension & Woods Hole Sea Grant.

The meetings were publicized through local newspaper articles, announcements at Select Board meetings, and by posting of notices in high visibility locations throughout town. An electronic message board deployed on Route 6A also was used. All meetings will be held from 6pm to 8pm at the Cape Cod Museum of Natural History. In advance of each meeting, a discussion paper specific to the meeting was posted on the town website: <http://brewster-ma.gov/committees-mainmenu-29/coastal-committee>. The sessions were also video taped and available for viewing through the town's website.

## **Appendix D. Town Actions to Manage Coastal Resources and Minimize Erosion Impacts**

The Town of Brewster has a record of proactive management of its bayside coastal resources through land purchases, policies, management actions and physical improvements.

### Planning Efforts

The Town has implemented plans and studies to enhance understanding of resources and the natural and anthropogenic threats to them, and to develop forward looking strategies (see Appendix C):

- Integrated Water Resources Management Plan
- District of Critical Planning Concern for Water Resources,
- Municipal Vulnerability Preparedness Plan
- Multi Hazard Mitigation Plan and Update
- Inner Cape Cod Bay Area of Critical Environmental Concern designation
- Century Scale Sediment budget
- Coastal Adaptation Strategy

### Capital Project and Maintenance

Repair/prevent erosion caused by storm surge or sea level rise:

- Relocated parking lot at Paine's Creek; parking lot replaced with sacrificial sand and beach;
- Ellis Landing stormwater and beach restoration: Removed non-functional stormwater structures from beach, installed a resilient mat, nourishment, installed stormwater controls in roadway and parking area, eliminating a direct stormwater discharge to the beach;
- Replaced stairs at Spruce Hill with a raised structure that allows dune migration. Stairs damaged in storm, to be replaced Spring 2018;
- Maintenance at all locations: Regular nourishment at Breakwater Landing, Ellis Landing, and Paine's Creek;
- Sand nourishment at Mant's Landing, sacrificial dune and sturdy sand fence;
- Notice of Intent/Order of Conditions developed for all landings except Mant's, allowing regular maintenance and nourishment as required; For Mant's Landing, a conceptual study was completed to evaluate removal of pavement with replacement by a resilient pervious surface, with grade changes to address stormwater concerns from flooding beach side and from the marsh at the back;

### Improve stormwater management or hydrology:

- Improved drainage at Saint's landing, eliminating direct discharge onto the beach and erosion down the path;
- Replaced the undersized culvert at Paine's Creek leading to Freemans Pond;
- Replaced the undersized culvert under Route 6a at Stony Brook with a much larger box culvert;
- Stormwater controls throughout the Stony Brook valley, including Paine's Creek Road, Stony Brook Road, and replacement of the dam at the Stony Brook Mill;

- Linnell Landing stormwater project: Installed stormwater control structures throughout parking lot and roadway, pitched parking lot back from beach, repaved; Eliminated a direct stormwater discharge onto the beach;
- Relocated parking spaces, restored and protected dune at Breakwater, including a sturdy sand fence at the beach side of the dune. Implemented green infrastructure (vegetated swale) to absorb stormwater and pollutants to eliminate a direct discharge onto the beach;
- Culvert to be replaced under Crosby Lane Fall 2018.

Enhance Accessibility:

- Improvements to handicap access (platform and path at Linnell Landing, accessible platform at Mant's Landing, roll out walkway at Breakwater Beach, viewing area at top of stairs at Breakwater Landing);
- Accessible roll out pathway to be installed at Paine's Creek spring 2018, including a shed to store a beach wheelchair;
- Footbridge at Paine's Creek to be replaced spring 2018, including a raised walk across the marsh;
- Stairs and sand nourishment at Little Breakwater to replace a degraded path/gulley down the coastal bank.

## Appendix E. Public Comments on Draft CRMP

# Comments on Draft Phase I Brewster Coastal Resource Management Plan

Your Name: Catherine Ricks

## 1. What is your general feedback on the CRMP?

## 4. What sections, if any, should be expanded and in what ways?

I feel it was well thought out and put together in a legible format.

### 1. I believe that an engineers point of view should be included.

I understand protecting the resources, but a balance is necessary with all the existing development along the shoreline. A Civil/Coastal or Environmental Engineering opinion on different aspects of the plan would add to the balance. Someone who understands protecting the resources, while protecting the existing infrastructure. It is important to find the balance, though understanding expansion needs to be restricted.

### 2. I believe the monitoring and collection of data section could be expanded. The monitoring and data is great, but having a plan to move forward with the data collected would be an asset to the plan. Having trigger points in the monitoring where a project should then be proposed.

### 3. What the data collection will include and when this data will become more specific to develop a project. This would be greatly benefited by input from an engineer.

## 5. Do you agree with the CRMP priorities? If not, what do think are the key priorities that need to be addressed?

## 6. Other Comments?

I believe the priorities included for each section of the plan are appropriate, though of those

### 4. I believe the public access points should be priority, including the on-site versus off-site parking and accessibility.

### 5. Monitoring of the shoreline system should be a priority.

### 6. Prioritize those items that can be reasonably implemented that will produce an outcome.

## Additional Comments on the CRMP\*: Catherine Ricks CRMP (4-22-19) Additional Comments

Monitoring and oversight should be conducted by professionals with a means and methods to be followed. Different eyes can see different visual markers.

### 7. Reconsider the use of buffer zones for the Land Subject to Coastal Storm Flowage as that buffer could extend quite a way landward with little impact to Coastal Resources.

### 8. Please provide a resource for the Coastal Wetland Resource area quantities (Page 22 and 23).

### 9. Display the MLW and the location of the Land under the Ocean resource area.

### 10. The Look into whether additional Tidal Flats may be detrimental to the shoreline and other Coastal Resources. As the Tidal Flats expand and water levels increase the water would push further landward if it is shallower offshore. The concept of the benefit of the Tidal Flats should be reviewed and the change in the Tidal Flats over an historical period of time versus the amount of nourishment placed on the shoreline from upland resources, instead of the ocean floor where it erodes to should be studied.

### 11. Public awareness needs to be a major topic. I encounter many homeowners that truly do not understand the dynamic shoreline and the benefits of protecting the coastal resources. Presenting

the benefits of the resource areas could have a positive effect on projects proposed by homeowners within or near these resource areas.

Public awareness and education could yield more support for town projects.

Engineers and Environmental Scientists should be involved within the committee for the insight of the balance between the community and understanding of the homeowners to protect their property.

\*The \*pdf form for comments was not formatted correctly under #2 and #6. The above information covers both of those questions.

---

## **Comments on Draft Phase I Brewster Coastal Resource Management Plan**

**Your Name: John Lamb, Crosby Lane, Brewster**

### **1. What is your general feedback on the CRMP?**

Thank you! This is an excellent look at the science and our management options. The adaptive management section is right on target.

12. Some of the vision, scope, analysis and prioritisation that the BCAG completed has not been embraced here, although it is highly relevant. It should be incorporated to improve the completeness and management value of this plan. I have added references to these below.

I also strongly recommend we change the basis of the scientific analysis, based on my travel round the country since our BCAG met. There are many parts of the country that have experienced 500 year storm events, often more than once in the last five years. We stayed in eastern Oklahoma, and saw the impact of two 500 year floods in the last three years. Houston has experienced something similar.

We know climate changes are impacting the ocean around our region more than the global average. We have not seen it yet, but

13. I would suggest it is not an abundance of caution, but rather a preponderance of probability, that should lead us to use "500 year storm" levels in all our projections. I believe we have a very realistic probability of seeing one or more of those in the next 30 years, and we would be very naive not to at least take the precaution of preparing with that level of storm in mind.

### **2. What are your specific comments on the CRMP, or suggested edits to the plan?**

On p6 it would be helpful to restate the vision which is supposed to be guiding this and reflects many, many hours of work on the BCAG:

#### **Vision**

The Town of Brewster will preserve and protect the community's coastal resources and expand access to its public beaches through public consensus, and in ways that preserve the natural habitat and peaceful character of the coastal environment and coastal neighborhoods, respect the overall coastal and land-based ecosystem, and adapt to long-term projections for coastal change.

14. On p13 the statement about "Buildup of sand at Crosby Landing" needs to be qualified, as it has led some people to erroneously assume that the beach area is growing. The qualification should be: "This does not mean any growth in high tide beach area at Crosby Landing. The high tide beach area has eroded over the last ten years in some areas north and east of Crosby Landing."

The study shows a net migration of sand to the east, but that it is being deposited out in the bay on the flats, where the trans-sections all tend to overlap. Mark Borelli has confirmed that this does not indicate any growth of beach area at higher tides, and that there is still some loss of available beach area.

### 3. What did we miss or leave out of the plan that may need to be included?

This management plan is primarily based on excellent scientific input and analysis and the input from five focused sessions last year. This has inclined it to become a very broad wish list with many indicated directions but no informed prioritization.

15. We should not lose the fact that BCAG was deliberately created to represent all interests, and was able to incorporate all these same inputs and work to recommend prioritizations. They were not all fully agreed by the wider group due to distractions in the final two sessions, but particularly the level 1 recommendations were taken close to that level. They were created by cross-sectional subgroups assigned by the CBA facilitator. They held multiple meetings during and outside full BCAG sessions and consulted with others, and reviewed their findings with the whole group without any major issues raised.

I was reminded of to when I saw: “Access to Wing Island and Spruce Hill was not evaluated” on p14. The notion our head of DPW has emphasized that beaches have a carrying capacity and we should look at the size of beach and how many people we bring to it seems to have been lost. The table of proximal parking and ratio to lateral beach feet should be revised and included to show which beaches have the most capacity to benefit from enhanced access. This will help regain some sensible guidance to prioritize the many opportunities tabulated, and identify which deserve the most attention first.

It is important to add this, as a refresh of the 2016 analysis may well indicate that the ones that were omitted completely – Spruce Hill and Wing Island – remain our best opportunities. Currently they are not specifically identified anywhere in the management actions for detailed study, although they had by far the lowest ratio of access to space, so may be the first place to look to expand beach access where there is the most available capacity.

- 15.A. This was what led the BCAG sub-group to recommend we prioritize study of the opportunities for improving access to these two substantial beach areas – Spruce Hill and Wing Island – that are only very lightly used even at peak times. They were accepted as Level 1 recommendations – reviewed without issues, not voted.

A number recommended the former: increase the available parking at Spruce Hill. Some also suggested better grading on the 0.4 mile carpath (which DPW confirmed would be simple) to make it buggy-friendly, and perhaps even add an electric shuttle vehicle. The latter was supported by the Director of the CCMNH, who needs a more reliable boardwalk for museum programs, and by others in town. Multiple people recommended a study to add parking in the NE area of Drummer Boy, with a boardwalk to Wing Island.

### 4. What sections, if any, should be expanded and in what ways?

#### 2. Preserve Ecosystem Services Provided by Healthy Coastal Wetlands

This seems to be the most important section. There’s lots of good information, and everything we can do here will reduce the negative impacts we know are coming. Perhaps we should head it: 16.

16. “Preserve/Enhance Services ...” to capture how critical it is for us to understand these processes so well we can find natural ways to nudge them to be even stronger and more sustainable.

Good recommendations to increase resilience on p17

- 17.p32 subheading ‘Habitat Considerations’ should be worded ‘habitat and threatened species considerations’. The horseshoe crabs are not habitat! They are a higher lifeform that is a leading

indicator of the status of our habitat. They may be our beach “canaries”, so should be a focus of our study and measurement.

**p36 and 37** the management actions all seem designed to increase access for shellfishing and aquaculture, which is a laudable goal. However there are no management actions to understand the capacity of our resource areas to support these additional demands. With ten different ways to open up farming access, we will be in danger of overusing a resource – eg a nutrient source or over concentrating the density leading to contamination or disease sharing and consequent damage to other recreation or population crash.

18. Before we open up anything significantly, we need a comprehensive study of the shellfish capacity and issues of our coastal resources, and the potential impact (positive and negative) of allowing all the ten or so expansions proposed, both individually and together.

It may be that the result of doing it all is positive – clearer water and more storm resiliency from oyster reefs, for example. But it may also be that two of these clash in a dangerous way, or one threatens the success of another. Either way it is immensely valuable to know this ahead of time, rather than just start taking more and more clams and count them as they go and hope for the best. If we know what is sustainable and helpful in advance, and what undermines sustainability and resiliency, we can manage all these activities for the benefit of everyone. This is actually a huge potential opportunity, as it brings thousands of hours of free manual labor, people who are motivated by the pleasure and economic value and family food benefits of what they do!

#### **P41 Bike Trail extension**

It was good to make the point about our Town only supporting this with a tunnel under 6A. The Linnell Landing Road/6A intersection is probably the most accident prone and dangerous point in Brewster in the summer. The marijuana business to be added 1.3 miles to the east will substantially *increase* summer traffic on an already overloaded road. A grade-level crossing between Linnell and Crosby will significantly add to the danger and delays. To even consider a grade level crossing, we would need a traffic study in July/August to measure the summer volume and flow.

19. Also the latest extension plan creates a path for bikers to come out in front of one of the two rental cottages managed by, and used to fund, Crosby Mansion. This is a serious conflict with an existing valued cultural use that we should want to avoid. Brian Locke, the Manager of the Mansion believes it will be seriously detrimental to his program.

It also creates a major wide matted passage in a place that now just has a narrow informal path across an active dune, used by a small number of people. That will significantly coastal dune reduce resiliency in that area.

**p50** It will be good to gain more control over development in coastal areas. We held a community forum on the issue of home size, and all but one realtor attendee argued for much greater limitation on floor area than we have now.

20. There should also be one more small initiative to recommend that the planning board evaluate (with public engagement) the summary change made about ten years ago to add parking lots to the list of permitted uses in residential areas. We should reevaluate this to explore zoning regulation opportunities which regain some balance between giving ever increasing numbers easy access to the same beaches, and maintaining our vision for peaceful and rural character of our neighborhoods.

It was slipped through Town Meeting late on the warrant agenda, grouped with many other changes, without any prior public discussions.

This has since supported strategies of adding more parking adjacent to and opposite residences on access roads such as Paines Creek, Breakwater Road and Crosby Lane. These have led to significant degradation of living environment for nearby residents, who already endure much disturbance in the peak season. There could be ongoing pressure to add parking on and adjacent to house lots as they become available.

---

From: Jonathan Rice <[jonathan.rice17@gmail.com](mailto:jonathan.rice17@gmail.com)>

Date: May 15, 2019 3:50 PM

Subject: Comments on BCM To: Chris Miller <[cmiller@brewster-ma.gov](mailto:cmiller@brewster-ma.gov)>

I can't say I've read every word of the BCMR. I do know the I am unable to navigate the official comment form. Please accept my thoughts informally.

The Report seems to be a helpful expansion of the BCAG Report of 2016. Nevertheless, It leaves me with concerns similar to the ones I had back then.

21. A. You talk of affirmative action, yet I see the phrase "climate change" only once and the words "global warming" not at all.

Therefore, your affirmative action is still limited to "repair" and "retreat". I realize that the EPA is in denial that global warming even exists let alone that it is primarily responsible for rising sea levels and the increasing intensity and destructiveness of coastal storms. Consequently, no real affirmative action is going to happen until the EPA puts its foot down on carbon emissions.

22. What the Town of Brewster needs to do is to lobby aggressively Cape-wide, State-wide and federally to convince our politicians to acknowledge global warming and resolve do something about it, especially at the federal level.

B. You point correctly to the fact that the 7 miles of Brewster beaches is a single ecosystem where what happens in one area (a jetty, perhaps) has a direct effect on the ecosystem to the East thereof. Nevertheless, all of you affirmative action proposals seem to be limited just to the points of public access at town beaches.

23. Any interventions should be in cooperation with individuals with property on the shore. The town should not be able to back away from projects that also benefit individuals. The town should not make it more difficult for individuals to protect their property with acceptable interventions as they should from time to time be established.

C. Waste water run-off is a major concern, especially as heavier rainfalls are one of the consequences of global warming.

---

24. We need a town-wide sewer system to protect the ponds from pollution and the beaches from erosion.

---

**From:** Chris Powicki <[chrisp@weeinfo.com](mailto:chrisp@weeinfo.com)> **Sent:** Wednesday, May 22, 2019 11:52 PM

**To:** Mary Oneil **Subject:** FW: CRMP Comments

Chris Powicki 2042 Main Street Brewster, MA 02631 774-487-4614

Hi Mary, FYI below. I am not optimistic that comments will be addressed, as some are repeats of things communicated in your workshops. You may pass this sentiment along to your colleagues!

Greetings, generally, I would like to commend Coastal Committee members, consultant Carole Ridley, and other contributors for preparing an impressive plan that will well serve a broad range of community interests in the years ahead ... especially if the specific comments detailed below are addressed. I am

glad to answer any questions you might have. I will appreciate an itemized response as to how these comments are addressed. Best,

### Specific Comments on Draft CRMP

p. 14 discussion:

25. Need to mention that the HW static inundation scenarios do not account for wave action, which according to Mark Borelli can double the surge height (and greatly expand the area of inundation), nor do they account for timing relative to the diurnal and lunar tidal cycles.

These are critical caveats providing important context to the bullets, in that impacts on landings will be far worse than projected for a given level of surge if the storm hits at the wrong time, and with the wrong wind direction.

26. p. 17 table entry 1A: Consider a nearby wave height buoy, in addition to a tidal gauges.

27. p. 17 table entry 1: Add a new bullet or row to add a critical missing element for successful adaptive management: "Review the efficacy of previous and ongoing interventions at individual coastal landings relative to the principles/goals of the CRMP."

28. p. 19 table entry cell 3A: The suggestion to "create a living shoreline demonstration project" - an oyster reef off Mant's Landing - seems extremely preliminary. How about "Assess potential locations and approaches for a living shoreline demonstration project based on experiences elsewhere in areas with similar coastal conditions."

29. p. 19 table entry 4B: The idea of a sustainable funding source is great - but why suggest only new revenue sources? Should include the possibility of beach sticker / kayak sticker revenues - at least a portion - being reserved for this use rather than being tossed into the general fund.

p. 23: Under #1, thank you for providing this detailed discussion - erosion happens, hard structures destroy habitat and beaches.

30. p. 25: The first paragraph makes a declarative statement that thin-layer deposition is essential, a statement not supportable by current science.

Later, there's a statement that there are opportunities for active management with neighboring towns. That puts cart before horse - need to first establish scientific basis for such action.

31. p. 26-27 table entry 1A: Add a new bullet or row to add a critical missing element for successful adaptive management -

ConsCom permits coastal projects individually but big picture has allowed a massive re-engineering of dune/bank over the past decade and needs to take a step back and conduct a comprehensive review of cumulative environmental impacts associated with erosion "control" measures both along the entire stretch of Brewster's coastline and from removal of water filtration capacity in Zone II watershed protection area.

32. p. 28 table entry 3: The Crosby salt marsh restoration project is not a good example - the existing culvert is a joke, but it does not cause a tidal restriction, it is a storm flood restriction. By contrast, Paine's Creek is a good example at the entrance to Freemans Pond and at 6A. The Considine Ditch, undergrounded from the culvert at Breakwater Beach to the south side of Breakwater Road, is another, were it to be on the town's radar screen.

33. p. 30, under the "Access" bullet: The text says "The Town of Brewster is interested in exploring whether the Crowes Pasture access could be used..." This reads like a policy statement; no such determination has been made.

The Dennis access by ORV is opposed by state agencies. Further, according to Brewster DNR, Dennis is permitting grants on Brewster's side of the border. Clarifying what's going on, assessing legal/environmental impacts of same should be what the Town of Brewster focuses on first, as a resource management issue.

34. p. 37 table entry 3: Expand economic impact assessment to include all costs borne by the town associated with commercial and recreational shellfishing, the revenues garnered by commercial enterprises, and the revenues to the town from selling permits.

35. p. 43-44 table entries 2A and 2B: Coastal Committee should be involved in these assessments; citizens must be engaged.

36. p. 48 under #2: This text, "any loss of visual access from the dune is mitigated by an increase in coastal resiliency without the need for hardened structures," is inappropriate in a section focused on preserving visual access. Appropriate phrasing in this context would go something like this: "While restored or sacrificial dunes may increase coastal resiliency, they can impede visual access." Also, there is no landing called "Little Breakwater."

37. P. 48 under #3: Per comment above, it is essential to acknowledge the possible effect of wind-driven waves (which may double effective surge height) in exacerbating impacts described in the bullets.

38. p. 50 in table entry 1A: Add reference to Crosby Lane - adding the box culvert won't address a tidal restriction, but it will remediate a vulnerability by elevating the road, and the planned parking lot reconstruction will protect parking spaces.

39. Somewhere in the report, the need for robust and regular water quality monitoring should be described - this should be a component of adaptive planning to protect public and environmental health. Beach monitoring occurs and should be managed through the Health Department. There should also be sampling of outflows from Freeman's Pond, Paine's Creek, Considine Ditch to give an idea of stormwater impacts.

---

**Name:** (not provided)

### **General Comments on CRMP: DRAFT PHASE 1**

#### **1. What is your general feedback on the CRMP?**

40. I do not think razor clam fishing should be a part of this Plan. I think the issue of Razor Clam fishing has been promoted by a small group of financially motivated fisherman who are a small number of residents. Razor clam fishing does not benefit the Town as a whole.

#### **Specific Comments on, or Edits to the CRMP:**

Neither the Brewster Coastal Adaptation Strategy of the Brewster Vision Document mention fishing or Razor Clam fishing. So, why does this plan devote 20% (One of the 5 sections) to fishing, particularly mentioning the 'Razor Clam' pilot program?

#### **What is Missing from the CRMP:**

41. The report was too general. Specific suggestions made in past reports were missing, such as a pilot beach shuttle bus, opening beaches between Linnell and Crosby, open Spruce Hill beach parking at old Historic Society Building and provide more parking at Wing Island.

**What sections, if any, should be expanded and in what ways?**

All items mentioned in #3

**Do you agree with the CRMP priorities? If not, what priorities do you think should be in the CRMP?**

42. I don't think the needs of Brewster's small number of fishermen should be anywhere near a priority. Brewster is not a fishing town. The flats should be used to provide clamming experiences for tourists and locals, not for profit.