



Marshfront Management Plan

City of Folly Beach, SC



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Adopted by City Council
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July 2025

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Executive Summary

Folly Beach is a unique ecological area encompassing approximately 8,600 acres of saltwater marsh, tidal creeks, and marsh islands. These habitats play a critical role in floodwater absorption, pollutant filtration, and supporting diverse recreational and commercial activities.

The Marshfront Management Plan (MMP) aims to provide strategic recommendations for protecting, restoring, and managing Folly Beach's marshfront areas. This update to the original 2019 MMP reflects the need for ongoing research and adaptation in marsh management, having drawn upon lessons learned from similar initiatives across South Carolina's coastal towns.

Key components of the updated MMP include an emphasis on collaboration among stakeholders, clearly defined responsibilities, refined regulatory frameworks, and robust educational initiatives. The management plan acknowledges the dynamic nature of the marshfront and the importance of maintaining its ecological integrity, particularly in the face of challenges such as sea-level rise and erosion.

Specific recommendations of note include changes to allowable uses within 15-ft marshfront setback and to septic regulations and planning.

- Monitor: Identify and prioritize sewer transition zones for the medium-term.
- Protect:
 - Update septic regulations on rental applications/properties and refine requirements of septic inspection program.
 - Modify allowable uses within the 15-ft setback:
 - Allow nature-based erosion control to provide marshfront owners with property protection options, and
 - Prohibit new construction of sidewalks and bulkheads.

This MMP is designed to be flexible, with annual reviews and updates every five years to ensure the management strategies remain relevant and effective. By thoughtfully balancing ecological preservation with economic needs, this plan seeks to secure the long-term health and stability of Folly Beach's marshfront ecosystem for future generations.

Introduction

Folly Beach encompasses about 8,600 acres of saltwater marsh, tidal creeks, and marsh islands. These marshes help absorb floodwaters and filter pollutants but face threats from rising sea levels, development, and erosion. They support public and commercial fishing, as well as recreational activities like boating and birdwatching. Recreational fishing is vital for South Carolina's economy, contributing approximately \$2.74 billion and supporting nearly 32,000 jobs in 2023. In 2022, commercial fishermen landed 14 million pounds of finfish and shellfish, generating around \$25 million in revenue. Sustainable management is crucial for preserving economic stability and natural resources (Figure 1).

This MMP updates the 2019 MMP, which was the first of its kind in South Carolina. At that time, few marshfront management plans had been published globally (e.g., NYC Parks 2017ⁱ; EA 2007ⁱⁱ). Since then, Elko Coastal Consulting has co-developed comprehensive marshfront resilience plans for the Towns of Kiawah, Seabrook, and Sullivan's Islands, South Carolina.



Figure 1. The City of Folly Beach municipal limits encompass about 8,600 acres of marsh. Map created by the Kiawah Conservancy.

This MMP update emphasizes the importance of collaboration, clear responsibilities, refined regulations, and educational initiatives for effective management of Folly's marshfront. While some actions can be implemented quickly, many will require coordinated efforts across multiple sectors, with ongoing collaboration to refine strategies. This MMP is a dynamic document - reviewed annually and updated every five years to track progress and adjust strategies for better marsh management.

Overview of Folly Beach Marshfront

Folly Beach's marshfront is a dynamic and ecologically rich landscape that forms a critical interface between the city's upland areas and surrounding tidal waterways. This salt marsh and tidal creek system is part of an intertidal zone—submerged during high tide and revealed at low tide—that supports a wide range of ecological functions and species.

A network of tidal creeks runs through the marsh, facilitating nutrient circulation and sediment flushing, crucial for the estuarine system's health. Dominated by *Spartina alterniflora* (smooth cordgrass), the marsh also hosts salt-tolerant species like *Juncus roemerianus*, *Salicornia virginica*, *Batis maritima*, *Spartina patens*, and *Borrchia frutescens*, enhancing ecosystem resilience (Appendix A). The marsh's extent at Folly Beach is influenced by elevation, which affects tidal flooding frequency and soil salinity, ultimately determining vegetation types. This interplay of elevation, vegetation, and tidal flow underscores the importance of careful management for the marsh's long-term stability.

The South Carolina Department of Environmental Services (DES) Bureau of Coastal Management (BCM) is tasked with delineating the boundaries of critical areas, which include tidally-influenced wetlands, under the State's Coastal Zone Management Act. The jurisdictional boundary between uplands and coastal marsh is called the critical line (Figure 2). SC DES-BCM jurisdiction extends to all tidally influenced wetlands below the critical line. The City of Folly Beach may impose additional regulations landward of the critical line through local ordinances, zoning, and setback requirements to further protect marshfront ecosystems and manage development.

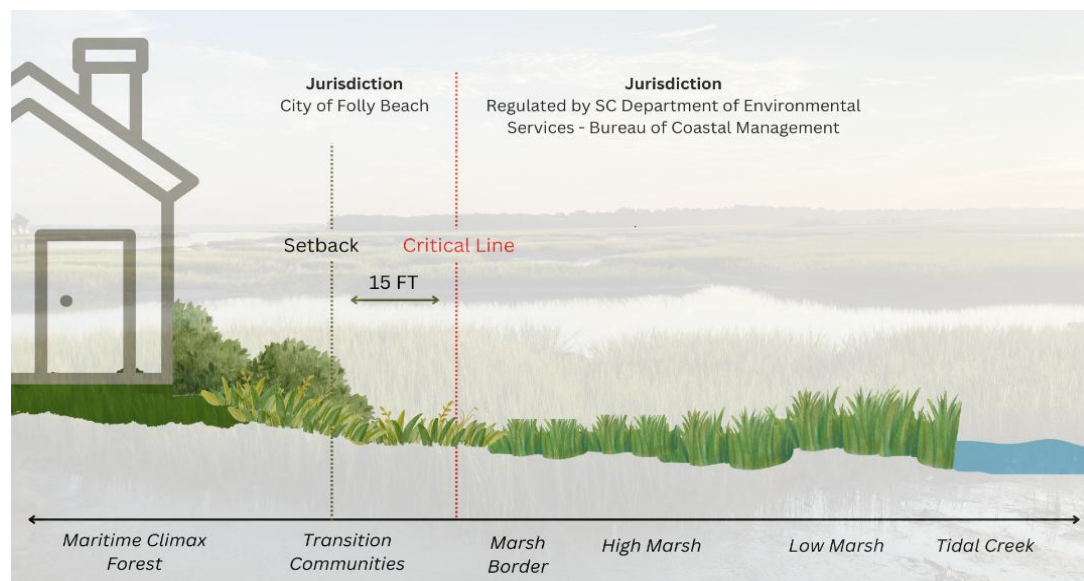


Figure 2. The critical line defines jurisdictional boundaries but is also a biophysical jurisdictional feature that shifts as the edge of the marsh migrates.

Creating This Plan

The MMP development process began in January 2025 with a kick-off meeting among City staff and the consultant team. This meeting established a shared understanding of marshfront habitat characteristics, the needs of recreational users and property owners, City infrastructure and development plans, and the potential impacts of marshfront erosion and sea-level rise.

The update process for the 2025 Plan builds on the 2019 Marsh Management Plan. An internal implementation assessment, conducted with City staff, evaluated the relevance and effectiveness of the original goals and strategies. This assessment identified accomplishments, ongoing goals, and gaps needing new or revised approaches (see call out box below).

Accomplishments since 2019 MMP

- Protect: A revised critical line setback increased the setback from 5 to 15 feet and expanded it to a setback and vegetative buffer.
- Protect: Acquisition of marshfront properties on 5th St. E. and Shadow Race Ln.
- Restore & Engage: Public demonstration projects: Rain barrels, rain gardens, and a Living Shoreline project at City Hall, the Community Center, and Folly River Park.
- Monitor: Surveyed the marshfront critical line to establish a baseline for monitoring and protection.
- Engage: Addition of the Folly Beach critical line layer in the public Charleston County GIS - https://gisccweb.charlestoncounty.org/public_search/
- Adapt: Developed long-term adaptation strategies to address the evolving environmental conditions of the marshfront ecosystem.

Consultants reviewed prior studies, conducted original spatial analyses, and held several interviews and “virtual planning charrettes” with stakeholders, including property owners, business owners, and external partners. The sessions provided a focus-group style format. Before the charrettes, stakeholders completed a survey to gauge their concerns regarding the state of the marsh. With the survey as an icebreaker, the focus group discussion could dive right into understanding marsh management concerns, assessing progress on the recommendations from the 2019 plan, and identifying remaining or emerging needs and gaps in management efforts. A marshfront tour followed to visit specific areas of concern with property owners (Figure 3).

A partnership with the Kiawah Conservancy provided invaluable data and mapping, supporting a regional perspective on marsh conditions. Throughout the plan, best practices and pilot projects from adjacent communities—such as Kiawah Island—were leveraged for education, awareness, and to inform locally relevant strategies.



Figure 3. View of Folly Beach marsh from Tabby Drive on the east side in April 2025.

The consultant team and City staff visited Kiawah Island in May 2025 to assess several installations of the [Envirolok](#) erosion control system—a vegetated, mechanically stabilized nature-based solution using geotextile bags filled with a soil/sand mix (Figure 4). Appendix B lists take-aways from the site visits including pros and cons of Envirolok and similar installations.



Figure 4. Multi-phase installation of Envirolok on Kiawah Island. Note difference in vegetative cover at different phases.

Community engagement played a key role throughout the development of the Folly Beach MMP. Educational events helped inform residents about the challenges facing the marsh, while public meetings provided forums for feedback and discussion (Figure 5). On June 10, 2025, the community participated in an open-house style planning workshop with the consultant team (Figure 6). This event brought together a wide range of local voices and expertise. Attendees

reviewed and discussed the plan's five core goals (see next page) and contributed directly by identifying priority areas on a collaborative map. Public input during this session helped refine the plan's objectives and shape its final recommendations.



Figure 5. City Planning Commission meeting in April 2025 provided an opportunity for public input and education.



Figure 6. On June 10, 2025, the community participated in an open-house style planning workshop with the consultant team.

Community Concerns

During the engagement sessions described in the Creating This Plan section, the majority of key stakeholders noted moderate concern over the state of Folly's marsh, describing it as healthy but showing some stress. Flooding, policy issues, the need for stronger protection, marsh die-off, and encroachment were cited as pressing challenges in Folly marsh management. When questioned about strategies to address marshfront concerns, stakeholders voiced unanimous support for marshfront protection measures like living shorelines and strong support for public education and awareness programs and large-scale, public marsh restoration projects.

Residents identified various areas of concern during the engagement sessions (Figure 7). These areas were generalized to show broader trends of marsh concerns while maintaining resident privacy.

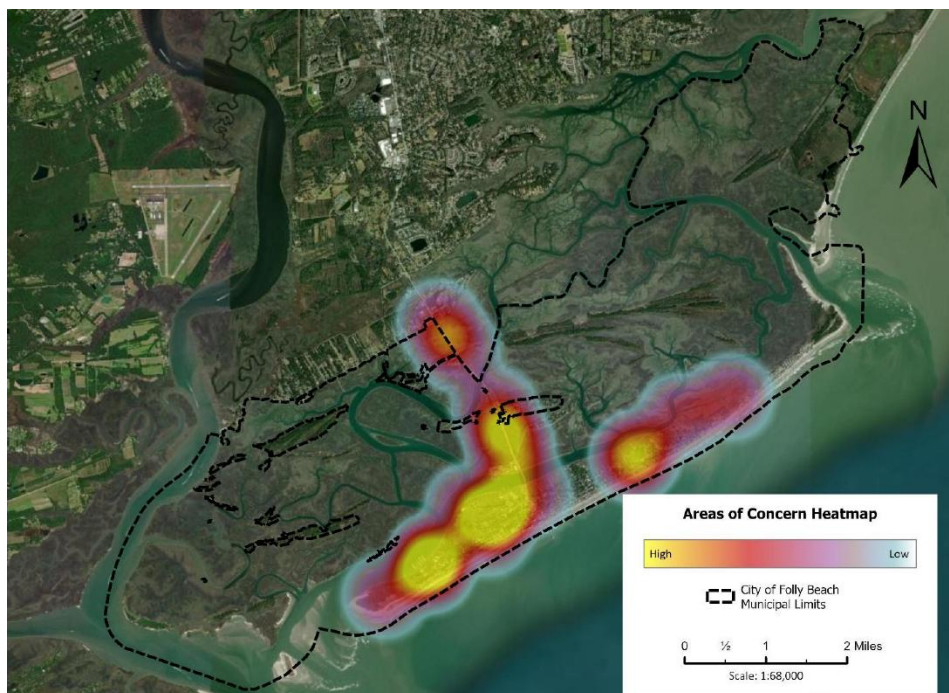


Figure 7. Areas of concern identified through focus groups, surveys, and public input during the open house.

Geospatial Analysis

The **Kiawah Conservancy** generously engaged in this planning process at no cost to the City. They analyzed geospatial information related to marsh conditions and developed the [Folly Marsh Management Viewer](#) (2025)ⁱⁱⁱ, an interactive web mapping application for the City to visualize the data. It contains three sections that depict current and future conditions of Folly's tidal salt marshes, providing a baseline for management efforts. The first section was developed by the Kiawah Conservancy and is described below.

The second section links to a Tidal Inundation and Asset Vulnerability viewer developed by the College of Charleston's Lowcountry Hazards Center and the South Carolina Sea Grant Consortium. This tool was developed during the City's update to the Sea Level Rise Adaptation Plan, called Folly 2050: Planning for Water. It could be used to identify potential marsh migration pathways. The third section links to Charleston County's GIS viewer which has several Folly specific features.

Vegetation Analysis

Unvegetated-vegetated ratio (UVVR) is the simple ratio of the total unvegetated and vegetated areas and is used as an indicator of the health of marsh habitat (Figure 8). To calculate UVVR, the Kiawah Conservancy analyzed aerial imagery from 2021-2023 to create 1-meter resolution maps defining vegetation presence in the marsh^{iv}. The higher the vegetation coverage, the more resilient a marsh area is. Oyster reef coverage is also included in the viewer, which increases resilience of unvegetated marsh areas.

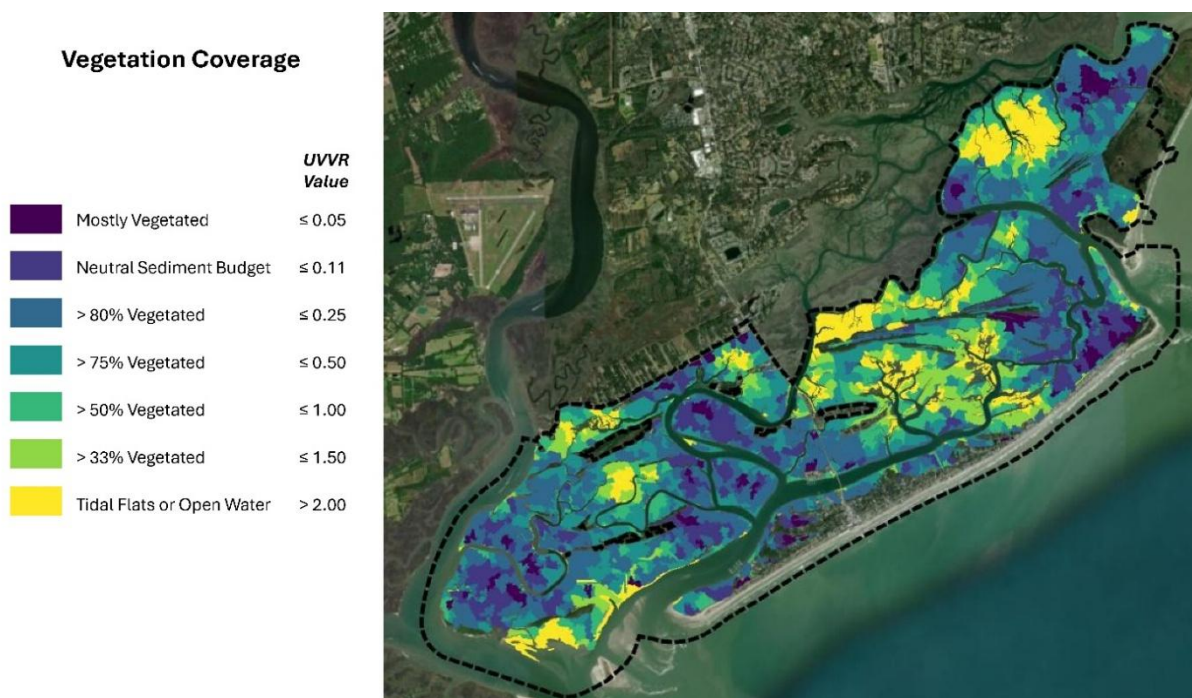


Figure 8. Unvegetated-Vegetated Ratio (UVVR) map of Folly's marshes created by the Kiawah Conservancy.

A combination of UVVR and marsh elevation was then used to create the custom *Restoration Decision Matrix* to prioritize plan recommendations and future restoration projects (Figure 9). The analysis is based on similar marsh planning efforts conducted by USGS in the Chesapeake Bay^v. Active management is recommended in areas with less vegetative cover (high UVVR = evaluate or restore); whereas, passive management is appropriate in vegetated areas (UVVR = monitor and protect).

A final analysis estimated the lifespan of marsh vegetation based on local sedimentation characteristics and sea level rise rate scenarios from 2000-2100. For example, the lifespan of the marsh at the Folly River boat ramp is 37 years under the moderate sea level rise scenario of 3 feet of rise by 2100.

Restoration Decision Matrix

Framework for guiding decisions for marsh management based on vegetation and elevation conditions

	PROTECT Protect or conserve Facilitate upland migration	RESTORE Sediment augmentation Facilitate revegetation
High Elevation ($> 1.33'$)		
	MONITOR Establish monitoring protocol Investigate potential causes	EVALUATE Evaluate co-benefits Determine cost/feasibility
Low Elevation ($\leq 1.33'$)		
	Low UVVR (≤ 0.15)	High UVVR (> 0.15)

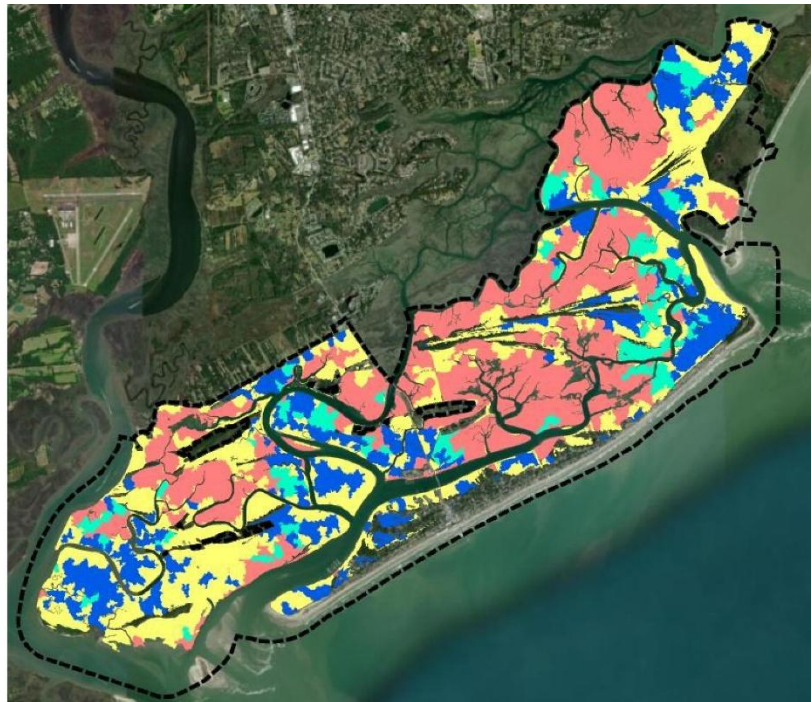
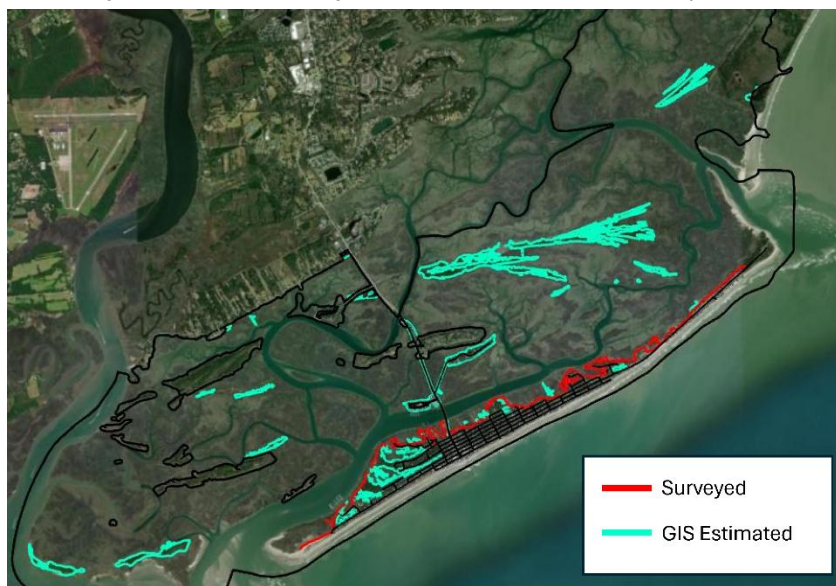


Figure 9. Decision matrix map for Folly's marshes created by the Kiawah Conservancy.

Community & Structures

This section of the interactive mapping tool visualizes the built environment on Folly Beach and includes the marsh critical line boundary. Both the surveyed marshfront critical line (ECC 2022)^{vi} and an estimated critical line for unsurveyed areas mapped along the 7.8 ft MLLW (4.6 ft NAVD88) contour (Figure 10). The same elevation roughly coincides with a King Tide water level.

Figure 10. Upland-marsh boundary mapped by ECC in 2022 and estimated by the Kiawah Conservancy at the 7.8 ft MLLW elevation contour. This line represents an approximation of the critical line.



The City's 15-foot marsh setback is also mapped with building footprints to illustrate structures within and adjacent to the setback (Figure 11). There are 1,918 buildings along Folly's marshfront with 296 within the setback. This section also maps the location of other man-made structures, including docks, causeways, and hardened erosion control devices. Based on this remote sensing analysis, there are 232 docks, 9 bridges/causeways, 34 erosion control structures, and 3 boat ramps.



Figure 11. Building footprints within and adjacent to the City's 15-foot setback mapped by the Kiawah Conservancy.

Recommendations

The remainder of this document focuses on solutions for monitoring marsh trajectory, regulating marshfront structures, engaging stakeholders, and restoring degraded systems. Effective implementation of these recommendations requires coordination, ensuring the plan reflects community interests and garners support for successful implementation and long-term stewardship.



ENGAGE: Educate the public, property owners, and decision-makers about undesirable marsh changes, seek input on Plan and Plan updates



MONITOR: Detect changes in wetland vegetation species composition and structure within the salt marsh over time



PROTECT: Prevent or correct trajectories leading to impairments to the marsh by adopting marsh management regulations



RESTORE: Manage vulnerable areas and mitigate against future issues and undesirable changes



ADAPT: Increase marsh ability to adjust to changing environmental conditions

Additionally, the 2023 Supreme Court case *Sackett v. EPA* narrowed federal wetlands protection under the Clean Water Act, exempting isolated wetlands from regulation. To protect Folly's wetlands, recommendations address marshfront areas connected to the Folly River as well as wetlands and interior marshes lacking a "continuous surface connection" to traditional navigable waters.

Engage

Relentless engagement with the Folly Beach community is essential for the success of the Marshfront Management Plan (MMP). The following objectives and actions are recommended:

Create Marsh Management Awareness through Education and Guidance Strategies

- Partner with state programs* to offer **volunteer opportunities**** that complement the **Restore** goal:
 - Educate about the Sol Legare Oyster Recycling Drop-off Bin and request one for the Folly Boat Ramp through the [SC DNR SCORE Program](#)
 - Initiate a regular marsh debris removal program with Toby the Turtle, Sunset Cay Marina, Charleston Water Keeper, and the S.C. Aquarium's digital litter journal.
 - Schedule community vegetation plantings with S.C. Sea Grant Consortium's [From Seeds to Shoreline](#) program.
 - Leverage [Marsh and Living Shoreline Trainings by Clemson Extension](#)
 - Consider an "Adopt-A-Marsh" program like [SCDES Adopt-A-Beach Program](#)
- Give **educational resources*** to the public, property owners, and decision-makers**
 - Include information about marsh dynamics, health, and the impacts of management actions such as bulkheads on neighboring properties.
 - Highlight the importance of **balancing property protection** with impact minimization on neighboring properties while protecting the marsh in harmony.
 - Offer training opportunities for City staff, council, and appointed officials.
 - Involve the Planning Commission and City Council in plan development.
- Showcase **demonstration sites on public property** to show best management practices*
 - Oyster restoration, rain barrels, living shorelines, and native vegetation buffers.
 - Monitor and engage the public on the River Park pilot living shoreline project to protect marshfronts while enhancing habitat and improving water quality.
- Complement the **Monitor** goal by developing citizen science programs*

Implement a Communications Plan*

- Launch a professional awareness campaign
- Highlight enhancing coastal resilience to prepare for climate change and rising seas.
- Utilize established and new communication channels:
 - Emails, meetings, newsletters, social media, Post Office flyers, water bill mailers.
 - Develop a tourist education campaign with flyers in short-term rentals.
- Make coastal resilience plans more accessible on the City website.

Seek Stakeholder and Community Input**

- Announce public comment opportunities, like Open Houses, at the Post Office
- Solicit input on plan updates to ensure co-development and stakeholder engagement.
- Provide regular public updates on MMP implementation progress.

Monitor

In collaboration with the Kiawah Conservancy, the City began implementing recommendations to monitor the condition of Folly's marsh, marshfront, and interior marsh/wetland areas during the planning process. The following actions should be updated every five years:

Define the Extent and Characteristics of Marsh Areas

- Identify properties along interior marshes without a "continuous surface connection" to traditional navigable waters that will require local permitting
- Update key indicators for marsh health, such as the Unvegetated-Vegetated Ratio (UVVR), to monitor vegetative cover and marsh die-off (Figure 8).
- Use the [Folly Beach Marsh Management Viewer 2025](#) to:
 - Identify areas prone to marsh bank erosion, particularly creek bends, and
 - Monitor flagged marsh areas in the *Restoration Decision Matrix*.
 - Visualize future marsh migration pathways with the tidal inundation tool.
- Update the **critical line** surrounding Folly Island every five years. It was partially mapped in 2022 and fully estimated in this MMP at the 7.8 ft MLLW contour (Figure 10).
- Ground truth planning maps and inventories with field surveys and assessments.
 - Island-wide impermeable surfaces and maintenance of permeable surfaces.
 - Native vegetative buffer management vs. lawns or other non-native maintenance.

Septic/Drainage Assessments*

- Map and inventory septic tanks in a sea level rise vulnerability assessment to provide sewer estimates at cost per linear foot and prioritize areas for upgrades.
- Use S.C. Sea Grant Consortium's Water Quality portal to monitor water quality*
- Identify and prioritize sewer transition zones for the medium-term.
- Update the City's Drainage Study every five years.

Inventory and Map Marshfront Structures:

- Inventory public property, vacant/undeveloped lots, and conserved lands along the marshfront for potential demonstration sites.
- Digitize pervious coverage within the jurisdictional limits of the City*
- Update the inventory of habitable marshfront structures and bulkheads within and adjacent to the 15-foot critical line setback.
- Include future lidar data collected by the state in 2025 into next MMP update.

Monitor Ownership of Marsh Islands within City's jurisdictional boundary:

- Contact marsh island property owners to gauge interest in annexation of these islands to be more proactive in zoning/management and increase FEMA Community Rating Score
- Work with Charleston County to monitor marsh island real estate transactions
- Collaborate with the County on marsh island zoning, future land use, and plans to modify zoning or drainage.

Protect

The Protect goal focuses on how the City's regulatory framework can better preserve the marshfront. Policy issues and the need for stronger protection measures were top concerns among stakeholders during plan development. Updates to ordinances and zoning are recommended:

Adjust Local Regulatory Framework

- Consider a Wetland Protection Ordinance to incorporate wetland area protections into land use, planning, and development approval procedures.
- Refine allowable uses within the 15 ft critical line setback to:
 - Include nature-based erosion control to provide marshfront owners with property protection options (e.g., Appendix B)
 - Prohibit new construction of sidewalks and bulkheads in the setback*
- Update septic regulations on rental applications/properties and refine requirements of septic inspection program*
- Continue to enforce a native vegetation buffer in the critical line setback
 - See Appendix A for examples of native marshfront vegetation.
- Reduce impermeable surfaces* on marsh-adjacent parcels to minimize runoff into the marsh.



Reduce Threats to Marshfront Uplands

- Plan for infrastructure maintenance and improvements based on land cover, marsh migration, and elevation change analysis determined in the Monitor section.
- Provide guidance for existing seawalls to mitigate future impacts to adjacent properties
- Formulate cost-benefit statistics on hard vs. soft marshfront management options.
- Protect marsh areas flagged by the *Restoration Decision Matrix* (Figure 9).
- Provide a list of contractors that specialize in Nature-Based erosion control and that can delineate interior marshes^{vii}.

Conserve Marshfront Property

- Identify, acquire, or conserve vulnerable low-lying properties and wetlands, such as the right-of-way between E. Cooper and E. Erie, that experience chronic inundation.
- Identify repetitive flood and undevelopable lots for prioritized acquisition

Restore

By promoting and embracing innovative restoration techniques, such as living shorelines and thin-layer placement, the City can enhance long-term ecological resilience. Marsh die off and vegetation loss were top concerns among stakeholders during plan development. The following actions are recommended:

Plan for Long-term Marsh Restoration:

- Explore potential for adjacent marshfront property owners to **collaborate** on restoring privately held marshfront sections, for example, with a continuous Living Shoreline.
- Consider innovative restoration approaches, such as demonstrated by the SC DNR SCORE program.
- Explore the potential for **Thin Layer Placement** to rebuild marsh elevation and resilience.
- Evaluate flagged marsh areas in the *Restoration Decision Matrix* to prioritize areas of low-marsh health like mud flats for future restoration (Figure 9).

Incorporate Best Practices:

- Offer **incentives** to marshfront property owners to:
 - Improve on-site stormwater management to reduce runoff from marshfront properties, i.e., converting driveways to permeable surfaces*
 - Convert existing non-compliant vegetation in the setback/buffer via vegetative buffer workshops and mini-grants for native plants.
- Utilize the Kiawah Conservancy's Nature-Based Solutions manual to integrate sustainability into marshfront management.
- Consider two undeveloped marshfront parks as pilot areas.
- Enforce the neighbor notification clause in the marshfront berm ordinance.
- Assess the feasibility of pilot projects on public lands to provide hands-on, in-person demonstrations of best marshfront management practices.
- Collaborate with DES BCM's dock working group

Explore Creative Funding Opportunities:

- Utilize the marsh acquisition reserve for mitigation and acquisition
- Offer **mini-grants** to marshfront property owners to support the installation of green infrastructure, native vegetation, and living shorelines. For example, native plant giveaways.
- Track federal grant opportunities such as NOAA's National Coastal Resilience Fund and The Nature Conservancy's Living Shorelines grant.

Adapt

Implementing adaptive management practices will ensure that marshfront areas remain resilient in the face of ongoing climate impacts. The following actions are recommended:

Adapt to Changing Climate Conditions and Rising Sea Levels:

- Understand and plan for adaptation strategies to address the impacts of sea level rise on marshlands.
- Utilize data collected and products developed in the Monitor goal to determine the cost/benefit of restoration and private property protection decisions regarding marsh migration

Align Adaptation Efforts

- Ensure consistency across city planning documents by, for example, adopting the five goals of Engage, Monitor, Protect, Restore, and Adapt in all resilience plans.
- Develop a Resilience Matrix to cross-check city plan strategies and identify complementary recommendations between plans.
- Align marsh adaptation plans with other local strategies, i.e. Folly 2050: Planning for Water, Resilience Element of Comp Plan.
- Develop an online mapping tool that combines resilience planning products and Smart City GPS concepts for decision makers, residents, and visitors.

Implement Adaptive Management:

- Conduct annual implementation assessments of plan recommendations.
- Update this plan every five years.

Appendix A

Native Marshfront Vegetation Examples. Visit [Clemson Extension^{viii}](#) for more.

Common & Scientific Name

Smooth cordgrass (*Spartina alterniflora*)



Black needle rush (*Juncus roemerianus*)



Goldenrod (*Solidago*)



Marsh hay cordgrass (*Spartina patens*)



Saltwort (*Batis maritima*)



Sea oxeye (*Borrichia frutescens*)



Appendix B

Site Visit Summary: Envirolok Natural Stabilization Systems on Kiawah Island

Date: 5/7/2025

Host: Ryan Ellmers, Kiawah Island Community Association (KICA) Public Works Director

Observed Technical Specifications

- **Bag Fill:** Approximately **70% topsoil, 30% sand**.
- **Anchoring Depth:** **6–15 feet** depending on site engineering.
- **Slope Design:** Determined on a site-specific basis by a local licensed engineer.
- **Installation and Maintenance Materials:** Biodegradable bags (composition unknown), plastic mesh, plastic zip ties, plastic anchor spikes, and plastic irrigation.

Benefits:

- **Cost-Effective:** Generally less expensive than bulkheads.
- **Vegetation Potential:** Supports natural vegetation recruitment; can be planted for ecological and aesthetic value.
- **Biodegradability:** Bags break down over time, leaving a naturally vegetated slope.
- **Hydrologic Performance:** Semi-permeable bags drain faster than traditional armoring.
- **Reduced Construction Impact:** Less invasive installation process than bulkheads.
- **Aesthetic Appeal:** Offers a softer, natural appearance suited to residential and conservation-minded communities.



Disadvantages:

- **Sunlight Requirement:** Systems require adequate sunlight to support vegetation; tree trimming or removal is necessary.
- **Ongoing Maintenance:** Requires more maintenance than bulkheads (e.g., trimming, irrigation, invasive species control).
- **Lack of Back-of-Wall Drainage Guidance:** No standard specification for managing stormwater behind the wall, which could be critical in urban or high-precipitation areas.
- **Inappropriate Tree Planting Can Be Detrimental:** Overplanting or planting the wrong species at the marsh edge can impede natural marsh expansion.
- **Plastic Use and Microplastic Risk:** The outer bags are made from biodegradable fabric, but plastic components like mesh, zip ties, and anchor spikes are used during installation. These materials can degrade over time and contribute to microplastic

pollution, especially in tidal environments where degradation is accelerated. This poses long-term ecological risks, particularly for sensitive estuarine and marsh systems.

- **Permitting requirement:** If system extends beyond the critical line, state and federal permitting process is triggered. State is now permitting Envirolok to same standards as bulkheads.

Contractors Referenced by KICA: S&S Coastal Enterprises, Three Oaks Contractors, Truluck Marine



Endnotes

All links were accessed July 11, 2025.

ⁱ New York City Department of Parks & Recreation (NYC Parks). 2017. Toward a Salt Marsh Management Plan for NYC: Recommendations for Restoration and Protection.

<https://naturalareasnyc.org/wp-content/uploads/2024/02/Salt-Marsh-Strategy-Report-2017.pdf>

ⁱⁱ EA, 2007. Saltmarsh management manual, R&D Technical Report SC030220, Defra, Environment Agency Flood and Coastal Erosion Risk Management R&D Programme, UK, ISBN: 978-1-84432-714-0.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290974/scho0307bmkh-e-e.pdf

ⁱⁱⁱ Folly Marsh Management Viewer (2025):

<https://scgis.maps.arcgis.com/apps/instant/portfolio/index.html?appid=70b3420026024d18b627a5a43fc336fc>

^{iv} Methods from Ganju, N.K., Z. Defne, and S. Fagherazzi. 2020. Are elevation and open-water conversion of salt marshes connected? *Geophysical Research Letters* 47 (3): e2019GL086703.

<https://doi.org/10.1029/2019GL086703>

^v Ganju, N.K., Ackerman, K.V., Defne, Z., 2024. Using Geospatial Analysis to Guide Marsh Restoration in Chesapeake Bay and Beyond, *Estuaries and Coasts* (2024) 47:1–17.

<https://link.springer.com/content/pdf/10.1007/s12237-023-01275-x.pdf>

^{vi} Elko Coastal Consulting, 2022. Marshfront Critical Line Mapping & Retaining Structures Inventory, December 2022, 16p.

^{vii} For example, <https://newkirkenv.com/services/wetland-delineation/>

^{viii} <https://www.clemson.edu/extension/living-shorelines/index.html>