Marshfront Management Plan

CITY OF FOLLY BEACH, JULY 2019
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Executive Summary

With over 10,000 acres of the state’s roughly 350,000 acres of saltmarsh within its jurisdictional boundaries, the City of Folly Beach aims to preserve its marsh and protect the life and property of its citizens by encouraging responsible development along the marshfront. The city’s 2017 Sea Level Rise Adaptation Report recognized that despite the vulnerability of the marshfront, little investment has been made in planning, management, or protection along the vital marsh shorelines of the community. This Marshfront Management Plan (MMP) is the first of its kind in the state. It is an adaptive management effort that occurred in conjunction with a 2018 waterfront building moratorium and aimed to develop recommendations to guide planning efforts along the city’s marshfront.

Beach- and marshfront construction came to a halt while City officials developed both this MMP and a Dune Management Plan, which guided the implementation of a number of new ordinances to better manage coastal development in Folly Beach, SC. This was an unprecedented, progressive, and efficient process of implementing adaptation plans into action in real time.

Community engagement was the foundation of the MMP. Stakeholder concerns were communicated to the city planners, prioritized by stakeholders, and voted on by the public to finalize the plan’s recommendations. Marshfront management concerns were grouped into four categories: upland, regulatory, marsh-related, and education. The top concerns for each category were decreased flood protection value with increasing water levels (upland), the lack of a map of the critical line (regulatory), the marsh response to sea level rise (marsh-related), and the education of marshfront property owners and residents.

To address these concerns, the MMP and the concurrent planning process served to help implement management actions that included fifteen (15) new ordinances that provided regulatory updates and zoning changes, a marshfront structural inventory, a historic marsh shoreline change analysis, marsh restoration projects, and engagement and education. These short-term management actions directly address the stakeholders’ upland marsh management concerns. The regulatory and zoning ordinances also have a positive effect on the marsh and indirectly address some of the stakeholders’ marsh-related management concerns, such as marsh response to sea level rise (by establishing setbacks and marsh buffers). Partnerships with local community groups, as well as state and federal agencies, facilitated implementation of the short-term actions.

The MMP also describes future marshfront management opportunities such as mapping of the marshfront critical line, a more detailed inventory of habitable marshfront structures and bulkheads including their distance from the critical line, a marsh mitigation bank fund, a detailed outline of how other communities handle marshfront management, continued public education and engagement, and a septic vulnerability assessment.

To ensure that the next generation of Folly Beach residents experiences the same quality of life that today’s residents enjoy, a long-term commitment to marshfront management and protection and restoration of the saltmarsh ecosystem is needed.
1. Introduction

1.1 Purpose

The City of Folly Beach is home to about 10,000 acres of saltwater marsh, tidal creeks, and marsh islands. These beautiful, important, and productive environments provide habitat for shrimp, crabs, fish, oysters and birds. The marsh provides recreational opportunities, absorbs wave energy, and filters pollutants. The City seeks to gain a better understanding of the uses, benefits, potential impacts, and management options along their marshfront shoreline. The purpose of this plan is to develop recommendations to guide planning for the protection, restoration, and management of the marsh and marsh islands within the jurisdiction of the City of Folly Beach. The spatial extent of the planning area is shown in Figure 1.

The South Carolina Department of Health and Environmental Control (DHEC) Office of Ocean and Coastal Resource Management (OCRM) is responsible for delineating exact boundaries of tidally influenced wetlands, which are known as critical areas per the State’s Coastal Zone Management Act. The state-delineated boundary between the upland and the coastal marsh is called the critical line.

![Figure 1. Spatial extent of the marsh and marsh islands in the jurisdiction of the City of Folly Beach, SC.](image)
This document is the first of its kind in the state of South Carolina. Few other marshfront management plans have been published globally (e.g., NYC Parks 2017; EA 2007). While individual efforts to protect and restore the marsh have occurred over the years on Folly Beach, this is the first comprehensive planning effort. The intent of this plan is to facilitate the planning process for the City of Folly Beach to better manage their marshfront and to have the most positive influence on the marshes within their jurisdiction over the next several decades. This plan anticipates the landward movement of the critical line and develops new regulations and plans to address such movement.

Due to physical and regulatory limitations on direct marsh restoration, this plan discusses mostly the indirect benefits to the marsh through the modification of upland behaviors and actions along the marshfront. Numerous marshfront management actions have been defined and prioritized through extensive community input. This plan develops a new regulatory and zoning approach to the marshfront area along Folly Island and the marsh islands within Folly’s jurisdiction in the vicinity of and upland of the critical line.

1.2 Motivation for the Marshfront Management Plan (MMP)
The City of Folly Beach desires to preserve its marsh and protect the life and property of its citizens by encouraging responsible development along the marshfront. Some sources estimate that 50% of the original salt marsh habitat in the U.S. has been lost due to human influence over the last century (Kennish 2001). Globally, it is estimated that 85% of oyster reefs have been lost, with those remaining in poor condition (Beck et al. 2001).

City’s long-term planning documents including but not limited to the 2015 Beachfront Management Plan, the 2015 Comprehensive Plan, the 2017 Sea Level Rise Adaptation Plan, and the 2018 Strategic Plan, include recommendations that the City pursue the review and development of various regulations applicable to properties located adjacent to the marsh. The City has experienced chronic flooding due to high tides and storms leading to loss of property, and increased local, state, and federal disaster spending.

In particular, the 2017 Sea Level Rise Adaptation Report laid out the following implementation plan for an MMP, one of the top three recommendations of the Report. In an unprecedented effort, the City of Folly Beach implemented the near- and medium-term action items of the following outline in approximately one year.

Recommended Adaptation Action: Marshfront Management Plan

Near-term (1 year)

1. Initiate partnership with SCDHEC-OCRM to develop a pilot Marshfront Management Plan for a South Carolina beach community.
   a. Understand critical line permitting and building requirements
2. Participate in SCDHEC-OCRM’s Living Shorelines Working Group
3. Begin Plan development
4. Develop strategic education campaign of property owners and elected officials

Medium-term (3 years)
1. Complete and Adopt Plan, which will include a detailed inventory of all structures, property lines, habitat, erosion control devices, a vulnerability (historic and present) assessment of the marshside, as well as the consideration of management and adaptation options such as setbacks, ordinance/code modifications, and living shoreline incentives.

2. Continue strategic education campaign of property owners and elected officials

Long-term (5 years+)

1. Implement Plan
2. Assess modifications to setbacks, codes, and regs to determine effectiveness of plan implementation.
3. Adapt strategic education campaign of property owners and elected officials

1.2.1 2018 Waterfront Building Moratorium
On May 30th, 2018 the Folly Beach City Council approved a building moratorium on the development of lots on either the beach- or the marshfront. During the moratorium, the Planning Commission examined and recommended changes to the City’s requirements for setbacks, buffers, septic drain fields, marsh island development, dune protection, seawalls, construction elevations, and other regulations related to building in the affected areas. Final recommendations were presented to City Council in December 2018 with review and adoption of new ordinances through March 2019. This was an unprecedented, progressive, and efficient process of implementing adaptation plans into action in real time.

During this time, the Folly Beach Planning Commission met twice monthly. Public involvement was encouraged through social media, newsletter articles, and information provided on the city website. The website included the meeting schedules and agendas, as well as resources such as city planning documents, and other links from the City of Folly Beach, SCDHEC OCRM, the Nature Conservancy, the S.C. Sea Grant Consortium, and other agencies and nonprofits. The information was provided as both education and a touchstone for conversations regarding current best practices.

1.2.2 Saltmarsh Overview
The salt marsh-tidal creek ecosystem within the City of Folly Beach is a highly productive coastal wetland between upland areas, such as the barrier or marsh islands, and the tidal rivers. The marsh is an intertidal habitat, meaning the surface of the salt marsh is under water at high tide and dry at low tide. A finger-like network of tidal creeks winds through the marsh and allows tidal water onto the marsh surface and back into the rivers.

Folly Beach contains about 10,000 of South Carolina’s 350,000 acres of salt marshes and tidal creeks. The marshes are dominated by smooth cordgrass (Spartina alterniflora) (see Appendix 6.2.1). The extent of the marsh ecosystem is determined primarily by the elevation, which determines frequency, depth, and duration of salt water inundation and soil salinity (Figure 2).
1.2.3 Marsh and Marshfront Uses and Values
Salt marshes provide essential habitat, wave attenuation, and water filtration. They provide vital refuge, breeding grounds and food for fish, birds and wildlife, as well as a unique open space in a dense urban environment. Within the City of Folly Beach, the marsh provides public and commercial fishing/oystering opportunities, as well as other recreational opportunities like boating and bird watching. In South Carolina, recreational fishing is a $686 million annual industry (USFWS 2014). In 2012, commercial fishermen in South Carolina landed 12.3 million pounds of finfish (2.4 million pounds) and shellfish (9.9 million pounds), earning $24 million in landing revenue (NMFS 2014).

Salt marshes also provide services for the City of Folly Beach by reducing wave energy, absorbing flooding, and filtering debris and pollutants from the water. Yet despite decades of regulatory protection, salt marshes continue to be threatened by poor water quality, rising sea levels, encroaching development, illicit dumping, and erosion. Folly’s marshes need to be managed in a sustainable manner to protect both long-term economic stability and the recreational amenities and natural resource benefits the marsh provides.

1.2.4 Summary of Marshfront Vulnerability to Future Sea Level Rise
The 2017 City of Folly Beach Sea Level Rise Adaptation Report included a vulnerability assessment to elevated water levels. It detailed historic and future sea level rise and the occurrence of King Tides or nuisance flooding as they relate to potential community flooding. Here, we discuss predicted timing of marsh impacts under different marsh accretion rate scenarios.

Long-term tide gauge data from nearby NOAA station 86655300 at Charleston, SC, located at the Cooper River Entrance, provides the data necessary for identifying sea level trends. Since the station’s establishment in 1921, relative mean sea level has risen an average of 0.126 inches (3.21 mm) per year (Figure 3). This translates to 1.05 feet/century.
The NOAA Sea Level Rise Viewer (NOAA, 2018) was useful in the Sea Level Rise Adaptation planning process. It allows a user to toggle water level scenarios to visualize potential impacts. Interestingly, little effect is obvious even at 3 feet of sea level rise on the beachfront, while the back side of the island and the causeways are significantly affected. This confirms the need to develop a MMP to protect critical habitat, private property and City infrastructure that are housed in, or service, these low-lying areas. The NOAA Sea Level Rise Viewer also includes an option to visualize marsh impacts, which is discussed later in this section.

Due to increased storminess and frequent nuisance flooding, the Folly Beach Sea Level Rise Adaptation Report recommended the City prepare for 3 feet of sea level rise over the next 50 years, or by 2066. This corresponds with the high sea level rise scenario of the U.S. National Climate Assessment (NCA, 2014). Marsh impacts under this scenario, as depicted by NOAA (2018), are compared in Figure 4. The timing for the marsh reaching this condition will depend on the rate of sediment accumulation on the marsh (i.e., accretion, restoration), among other factors. Unfortunately, little is known about sedimentation rates in the Folly Beach marsh system and future marsh restoration efforts are not included. Table 1 shows different accretion rates and the resulting change in the year that the NOAA Sea Level Rise Viewer predicts this scenario. The marsh will reach the condition depicted in Figure 4 in 2060 provided the accumulation rate is 4mm/yr. Marsh restoration projects can help increase elevations (i.e., increase the accretion rate) if deemed necessary.
Figure 4. NOAA’s Sea Level Rise Viewer Marsh Migration visualization depicting (top) present day sea level and (bottom) 3 feet of sea level rise for Folly Beach, SC.
To ensure future marsh habitats through conservation, the likely pathways of marsh migration need to be identified. Salt marsh will migrate onto former upland areas where not blocked by development. It is difficult to accurately predict future habitat change, but this tool, particularly at lower sea level rise scenarios, can help plan for marsh restoration.

Table 1. NOAA Sea Level Rise Viewer prediction of year Folly marsh will reach the scenario depicted in Figure 4 under the National Climate Assessment’s High SLR Scenario as selected by the City’s Sea Level Rise Adaptation Report.

<table>
<thead>
<tr>
<th>Accretion Rate</th>
<th>Year will reach 3ft scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>2053</td>
</tr>
<tr>
<td>Low (2mm/yr)</td>
<td>2056</td>
</tr>
<tr>
<td>Mid (4mm/yr)</td>
<td>2060</td>
</tr>
<tr>
<td>High (6mm/yr)</td>
<td>2064</td>
</tr>
</tbody>
</table>

1.3 Overview of Municipality & History of Marsh Management Approaches

1.3.1 Overview of Municipality

The City of Folly Beach, SC, is located 4 miles south of the entrance to Charleston Harbor. The barrier island portion of the municipality is approximately 6 miles in length and runs in a general northeast/southwest direction. The municipal limits of the City extend up to 2 miles inland and encompass about 10,000 acres of marsh, tidal creeks, and developed and undeveloped marsh islands. Folly Road, with its span bridges and causeways, intersects the marsh to provide vehicular access to the City. The Folly River runs along the landward side of the barrier island and the Stono River runs along the western municipal limit as shown in Figure 1. The City is bordered on the northeast by Lighthouse Inlet. Known to Charleston locals as "the Edge of America," the City’s vulnerable position to coastal hazards is clear.

1.3.2 History of Marsh Management Approaches

There is a stark contrast between historical beach and marsh management approaches on Folly Beach. The federal government and the city have invested significantly in the beachfront through a 50-year Local Cooperation Agreement (LCA) between the U.S. Army Corps of Engineers (USACE) and the city which remain in effect from 1992 until 2042. The city has also planned for beach management alternatives in addition to the Federal project in its State-Approved Folly Beach Local Comprehensive Beachfront Management Plan (LCBMP1). The goal of this plan is to “develop a long-term beach preservation strategy such that the restored beach and dune system is not lost between periodic renourishments.”

Like the beachfront, most of the marshfront on the backside of Folly Island, as well as the marsh islands, is privately controlled. However, long-term management plans or strategies to manage development or restore habitat along the marsh side of the island have not yet been created. As mentioned previously, the Folly Beach Sea Level Rise Adaptation Plan recommended that the City develop this MMP.

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1 City of Folly Beach Local Comprehensive Beach Management Plan, 2015
Marshfront policies and regulations in effect at the beginning of the coastal building moratorium included DHEC rules for septic systems, which require a 75-foot buffer from the critical line. In 2010, the City’s marsh setback was increased to 10 feet from the critical line for any impervious surface. The intent of this setback is to begin to reduce and control stormwater runoff into the marsh.

The majority of marsh parcels are zoned conservation. Seawalls upland of the critical line require building permits from the City; whereas, seawalls or any modifications beyond the critical line require permission from SCDHEC OCRM. DHEC is also responsible for permitting docks. The City prohibits signs in the marsh. River-based vendors pay sales tax and business license fees. DOT handles post-storm debris removal along the causeway.

In June 2018, the S.C. Department of Natural Resources (SCDNR) South Carolina Oyster Restoration and Enhancement (SCORE) Program partnered with Folly Beach to restore an oyster reef at the County operated Folly Beach boat ramp (Figure 5). This is a common living shoreline approach in the Lowcountry. Oyster reefs can protect marsh habitats and the upland behind them from erosion if the conditions are right. Oysters do best when placed in environments with low wave energy. SCDNR\(^2\) and The Nature Conservancy\(^3\) each manage ongoing oyster restoration projects in South Carolina.

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\(^2\) [http://score.dnr.sc.gov/](http://score.dnr.sc.gov/)

recommendations to alleviate and mitigate flood impacts to this State, with emphasis on the coastal and river-based communities. A subcommittee of the commission is focused on Living Shorelines.

SCDNR is conducting research to investigate the effectiveness of different types of living shoreline materials along South Carolina marsh edges which include oyster reefs, modified crab traps, and natural fiber logs. Best management practices and industry standards do not yet exist for living shorelines projects. Most S.C. living shoreline projects to-date have been small-scale and mostly privately funded or installed for research purposes. Aside from the oyster restoration project depicted in Figure 5, no other living shoreline projects have been installed along the Folly Beach marshfront.

1.3.3 Land Use & Recent Actions to Limit Development

The primary land use classification in the City of Folly Beach is low density residential. The largest zoning district is Residential Single Family (RSF) which covers approximately 85 percent of the island. Although there are scattered properties containing more than one residential unit that have been grandfathered, there are no commercial or high-density residential uses located in the RSF district. The standard lot size in this district is 10,500 square feet and the average density is 4 units per acre.

Folly Beach has taken several actions to limit the scale and impact of residential development in recent years. In 2013, the City codified regulations that require homes in the RSF district that are nonconforming to adhere to the 50% rule. This limits improvements to nonconforming structures over a 10-year period to 50% of the appraised value of the home. Any homeowner who wishes to exceed this limit must bring the property into conformity with current zoning. Since many of the parcels currently zoned RSF were developed as multiple unit properties, this would mean abandoning all but one of the units.

The City also changed the dimensional standards governing single family development. In 2010, the maximum size of a home allowed on a standard Folly Beach lot was reduced from 4,500 heated square feet to 3,600 heated square feet. Maximum lot coverage was reduced from 50% to 35% of the lot’s high ground. Also, the setback from the OCRM Baseline was increased from 0’ to a minimum of 5’ (maximum 10’) and the critical line setback was increased from 5’ to 10’. In 2014, the City increased side setbacks from 5’ to 10’ and required all new driveways to be constructed with pervious surfaces. Finally, the City passed an ordinance which requires that all new construction be built to V-Zone flood standards even if located in A-Zones.

Higher density residential uses are clustered in the center of the island and along the causeway leading from the mainland. Historically, each wave of multifamily housing led to greater restrictions on the allowable density of future projects. The first condominium project in the City was constructed in 1996 with an allowable density of 32 units per acre. The current maximum density is 12 units per acre. The area available for future multifamily construction has also been gradually reduced over time. Currently no future multifamily construction is allowed on Folly Island and is limited to properties on the causeway.

Residential Multi Family (RMF) is the highest intensity residential zone in Folly Beach. Growth in this zoning district in recent years has occurred primarily in the Preserve, a previously approved project at the intersection of Folly Road and Bowens Island Road. This project was approved for
approximately 60 units in 2006. Properties zoned RMF are located along the causeway to the island with two exceptions. Little Oak Villas is located on Little Oak Island and is surrounded by an RSF district. Palmetto Pointe, which takes up the entirety of Peas Island, is also zoned RMF. Since the 2005 Comprehensive Plan, there have been no new developments approved in the RMF District and there are currently no vacant parcels in the City that have this designation.

The commercial core of the island is roughly 2 blocks wide and 6 blocks long. Commercial uses include retail, lodging, bars, and restaurants. The largest physical and most intense commercial use is the Tides Hotel which is located on the beach at the end of Center Street. Growth of the commercial district is extremely restricted. Steady reductions in lot coverage allowances combined with increased parking requirements and a commitment to prevent the expansion of commercial zoning districts have all served to limit actual and potential expansion of the business district.

1.3.4 Marshfront Land Use and Zoning
Like the majority of Folly Island, the dominant zoning along the marsh is also RSF. The RSF properties account for approximately 70% of the marshfront. The current maximum allowable square footage is 3,600 heated square feet. A handful of homes are built to the prior maximum allowable size of 4,500 square feet, but the majority of the houses on the marsh are 3,600 square feet or less. Setbacks are as low as zero 0’ and lot coverage as high as 50% (mostly in Sunset Point and beyond the Washout). At the time of the building moratorium, regulations on lot coverage were 35% and the marsh setback was 10 feet.

Commercially zoned marshfront properties cluster in the middle of the island near the commercial district and cover about 10% of the marshfront shoreline of Folly Island. These include multifamily properties (Turtle Bay, Water’s Edge, the Sandbar Apartments, Back Bay), two Inns (Water’s Edge In, the Folly Lodge), the Folly Beach Boat Landing, the Folly Beach Baptist Church, and a commercial development at 81-83 Center Street. Sunset Cay Marina extends into the river at 9th Street West Extension. As built setbacks in this area are as low as 0’.

20% of the marshfront shoreline of Folly Island is zoned Conservation (CN) which allows very limited development intended to maintain property in a mostly undeveloped state. Lands at either end of the island as well as the Folly Beach Boat Landing at the causeway, are owned and operated by Charleston County Parks and Recreation. The Folly River Park, operated by the City, is also zoned CN.

On the causeway, the dominant use is Residential Multiple Family (Turn of River, Marshwinds, Marshview Villas/Mariners Cay, Little Oak Villas, The Palmettos at Folly, Waterfront Point Villas, The Clam Farm, Peas Island). Single family homes are located at Kings Flats, Little Oak Island, McDonough Road, and Oak Island, and Bowens Island. Commercial development is limited (Lolo’s, Bowen’s Island Restaurant, and Crosby’s Seafood.

The Marsh Islands to the East/North of Folly Beach including Long Island are currently undeveloped. They are zoned RSF.
1.3.5 Threatened and Endangered Species
Endangered species that utilize the salt marshes within the jurisdiction of Folly Beach may include the Bald eagle, the West Indian manatee, and the Shortnose and Atlantic sturgeon. Any future marsh restoration project would require consultation with NOAA National Marine Fisheries Service as required by the National Environmental Policy Act (NEPA).

2. Community Input Process
The MMP was informed through significant stakeholder input at the beginning, middle, and end of the planning process. This iterative format allowed stakeholders to voice their concerns about marshfront management and to share ideas and opportunities for improved management. Stakeholders were informed of the MMP process, educated about marsh management challenges, consulted with during public meetings, and involved through surveying, direct polling, and expert presentations. This ensured that public concerns were understood and considered throughout the planning process.

During the early stakeholder meetings, the MMP process was also determined to be an adaptive management effort. Adaptive management is a structured, iterative process of decision making in the face of uncertainty with an aim at reducing uncertainty over time through monitoring. The MMP is envisioned to be a living document that should be revisited once every five years to assess the effectiveness of implemented recommendations, and adapt as needed for improved management.

The MMP process began, concurrent with the coastal building moratorium, on May 30, 2018 with a kick-off meeting with city staff, DHEC OCRM, South Carolina Sea Grant, The Nature Conservancy, and Elko Coastal Consulting to discuss the planning process. A public City Planning Commission Meeting was held on July 9, 2018 to introduce MMP concept, which was followed by a public listening session on August 15, 2018 and another Planning Commission meeting on September 10, 2018. S.C. Sea Grant staff presented at the August meeting and staff met with SCDNR prior to the September meeting. These initial meetings served to educate stakeholders and formulate a list of concerns about marshfront management in the City of Folly Beach.

Once the list of concerns was developed, an online survey of city staff, planning commissioners, and elected officials was conducted during October 2018 to prioritize the concerns, propose regulatory changes, develop action items, and identify future opportunities. Eighteen (18) City staff and officials participated in the survey. These action items were incorporated into a draft MMP which was posted on the City’s website.

A final public meeting was advertised online, in the City’s newsletter, and on social media. This meeting, held on November 20, 2018 provided an opportunity for stakeholders to further prioritize the concerns and action items. The final prioritized list of marshfront management concerns below includes a discussion of each concern and the existing regulations and any relevant ongoing actions follows the prioritized lists.

# Stakeholders’ Prioritized Marshfront Management Concerns

### Upland

1. Septic systems (Outdated/leaky/too close to marsh)
2. Bulkheads on private marshfront land and the impacts on existing marsh and adjacent shorelines
3. Stormwater (polluting marsh)
4. Decreased flood/storm protection due to nuisance flooding/sea level rise
5. Scenic views
6. Causeway impacts on marsh health
7. Public access

### Regulatory

1. No map of critical line along the marshfront
2. General lack regulations to manage marsh appropriately
3. Mixed jurisdiction on marsh islands

### Marsh/River-based

1. Marsh response to sea level rise (Coastal squeeze, can it keep up?)
2. Planning marsh restoration
3. River-based vendors
4. Marsh bank erosion from boat wakes
5. Regular debris removal program needed
6. Private and commercial docks

### Education

1. Educating City property owners and residents
2. Visualizing parcel scale impacts
3. Educating public officials/staff
2.1 Prioritized Marshfront Management Concerns: Upland

The following items are related to the upland portion of the marshfront, defined as the area landward of the critical line - the high ground of marshfront properties. Each concern is followed by a brief description of the relevant existing conditions and regulations, as well as any ongoing City actions.

Survey respondents were asked to select their #1 and #2 marshfront management concerns. Additionally, stakeholders were polled about their #1 upland concern during the November 2018 public meeting. Top priority responses received two points and #2 priority responses received one point. The total points each concern received is depicted in Figure 6.

![Prioritized Upland Marshfront Management Concerns](image)

**Figure 6. Stakeholder feedback: Prioritized Upland Marshfront Management Concerns**

2.1.1 Septic

The #1 stakeholder priority was septic systems along the marshfront, whether they might be leaky, outdated, or too close to the marsh. The existing sewage system on Folly Island extends from commercial district to Berts along Ashley and Sunset Point. Marsh islands are also on public sewage. Most of Folly Beach Island’s residential properties rely on septic systems; however, the water table is only 3.5 feet deep on average. DHEC regulates septic systems by requiring a 75-foot buffer from the critical line.

When a septic tank is compromised (e.g., eroded off beachfront) and the City is made aware of it, the home is ruled unfit for occupancy until septic tank is fixed or relocated. City Ordinance 55.09 requires that when a residential property is sold, a septic inspection is required and enforced. City
Ordinance 55.07 requires a baseline septic inspection when the property becomes a short-term rental, then every 5 years thereafter.

Septic systems contribute to marsh pollution when septic tanks and drainfields are over-topped as a result of King tides, heavy precipitation events, storm surge inundation, erosion, and higher water tables due to sea level rise. Contaminants of concern include pathogenic organisms like fecal bacteria that cause illness in humans from ingestion or contact with contaminated water (EPA 2012).

2.1.2 Bulkheads
The #2 priority of stakeholders was the use of bulkheads on private marshfront land and the impacts on the existing marsh and adjacent shorelines. To obtain City permission to install a bulkhead on private marshfront property, a permit application is submitted that includes a site plan showing property lines, setback lines, and the OCRM critical line, as well as a scope of work that includes a description of the bulkhead construction materials. The permit application goes through both a building and zoning review to ensure compliance with the City’s seawall ordinance 151.23. At the beginning of the building moratorium, there was no setback for bulkheads from the critical line.

During the passage of Hurricane Irene in the outer banks of North Carolina, marshes with and without sills protected estuarine shorelines from erosion better than bulkheads (Gittman et al. 2014). No damage was observed at marsh or marsh sill shorelines as a result of Irene; whereas, 76% of bulkheads were damaged. The study suggests that marsh vegetation and sills may provide better erosion protection than bulkheads. Another study suggests that property owners with bulkheads reported quadruple the annual maintenance costs as compared to those with natural shorelines and that despite increased use, hardened shorelines are not living up to homeowner expectations (Smith et al. 2017).

Additionally, bulkheads have the potential to exacerbate flooding by trapping water that emerges from the subsurface on the landward side of the shoreline. These subsurface waters may be contaminated or overloaded with nutrients from human sewage in septic drain fields.

2.1.3 Stormwater runoff (Drainage)
The #3 priority of stakeholders was the potential for stormwater runoff to pollute the marsh. Roughly half of the roads and marshfront on Folly Beach have drainage infrastructure to collect stormwater runoff. About 10 underground drainage systems take runoff to the marsh through 24 or 30” diameter pipes with tide check valves that discourage saltwater from entering the drainage system at high tide. Other drainage mechanisms include wetland-type ditches that aim to direct stormwater to the marsh.

Inevitably, some pollutants are draining to lower elevations including the marsh and upland soils. Stormwater runoff is rain mixed with pollutants on impervious surfaces (rooftops, driveways) like oil, grease, and coolants from vehicles; fertilizers and pesticides from gardens and homes; bacteria from pet wastes and leaky septic systems; sediment from construction sites, etc. Stormwater runoff entering the marsh can have negative impacts like over sedimentation which may increase elevations out of the narrow marsh elevation window, destroying existing marsh; algae blooms that remove
oxygen from the water; human health hazards from bacteria and pathogens; death or injury to marine organisms from for example debris and plastics, etc⁴.

Controlling stormwater with vegetative buffers is one of the most effective ways to protect salt marsh habitat (see Appendix 6.2). According to Morganello and Rose (2013), vegetative buffers provide the following benefits:
1. Reduce pollution in stormwater runoff,
2. Reduce shoreline erosion and property damage caused by flooding,
3. Provide increased privacy to the homeowner while still maintaining a view corridor,
4. Serve as wildlife habitat, and
5. Save the homeowner money, especially when native plant species are dominant, as little to no water, fertilizers or pesticides are needed to maintain this area of the yard.

There are many types of vegetative buffers depending on the intent, location, and desired appearance and function. For example, the level of manicuring by property owners determines the differences between undisturbed, natural, and landscaped buffers. The middle option in this example is a natural buffer which involves the removal of invasive species and planting of native vegetation.

Other South Carolina communities with critical line buffers or setbacks (and the average distance from the critical line where known) include but are not limited to Beaufort County (50’ buffer), Charleston County (35’ setback), James Island (35’ setback), City of Charleston (35’ setback), and the Town of Mount Pleasant (35’ buffer). A detailed listing of other S.C. local governments’ marshfront regulations on bulkheads, setbacks, and buffers was compiled by a member of the City’s Planning Commission during this planning process (Appendix 6.1.3).

Through Charleston County, the City of Folly Beach has been contracting with Clemson Extension in the Ashley Cooper Stormwater Education Consortium⁵ for several years. The Consortium provides stormwater related outreach and education directly to Folly Beach. Recent efforts have included metal disks marking storm drains along Center Street indicating that the water drains to the river. The consortium also hosts an annual rain barrel sale in early summer which offers rain barrels to Folly property owners at 50% off. The consortium’s 2018 strategic plan focuses on three types of pollutants: bacteria (e.g., from septic systems and pet waste), nutrients, and microplastics.

The City also contracted with a consultant to conduct a City-wide drainage study as a result of the recommendations of the Sea Level Rise Adaptation report. The study held its kick-off meeting in August 2018. The drainage study will assess the city’s drainage infrastructure which includes drainage outfalls that cross the critical line and flow into the marsh. Stakeholder input from this and the Sea Level Rise adaptation reports will be incorporated.


⁵ https://www.clemson.edu/extension/carolinacler/regional-consortiums/acsec/index.html
According to the project manager, the objectives of the study are to 1) collect supporting data including potential field survey information and inspection of all components of the drainage system; 2) organize the data (catalog) including creating a comprehensive inventory and map; 3) create a drainage study (2 Dimensional) of existing and future conditions; and 4) provide drainage recommendations that can be incorporated into a Capital Improvement Plan and where grant applications can be developed. At the time of publication, an existing conditions model was being finalized. The next step is a future conditions model to propose potential drainage solutions.

Other coastal municipalities are investing in major drainage and infrastructure improvements to improve flood protection. For example, the City of Charleston has made a $235 million capital investment in drainage improvements (tunnels, pumps) and transportation improvements (roads, seawalls) between 1990 and 2020.

2.1.4 Decreased flood/storm protection value due to increased nuisance flooding/sea level rise
The #4 priority of surveyed participants was the loss of protection as flooding increases. Here, the concerns are about flooding of upland public and private infrastructure along and adjacent to the marshfront. The City of Folly Beach Sea Level Rise Adaptation report addressed this concern through the recommendation of an MMP. A summary of marshfront vulnerability has been provided in Section 1.2.4.

Concerns 2.1.1 through 2.1.4 were very important to surveyed participants (Figure 6), whereas the following concerns ranked lower in terms of prioritized concerns.

2.1.5 Scenic views
Scenic views across the marsh can be impeded by signs or lights. City Ordinance 166.10 prohibits exterior lights from shining directly on the Folly River, but it is vague and difficult to enforce. New park sites for marsh viewing are primarily envisioned as pocket parks located in unopened right-of-ways with visual access to the marsh. For example, benches have been installed along the Erie Canal and a pocket park with a bench constructed in the right-of-way at 1585 East Ashley. The City has applied for state funding to aid in the development of this site.

2.1.6 Causeway impacts
Stakeholders are also concerned about how the causeways might be affecting marsh health, perhaps by limiting circulation and perhaps exacerbating marsh dieback along the edges of the causeway. Large areas of adjacent marsh have been converted to mud flats over time. It is thought that the causeway may be trapping sediment and causing excessive marsh accretion (i.e., elevation increase) which has resulted in this marsh dieback. On the other hand, these mud flats appear to be quite popular with grazing shorebirds and the elevation increase may help the marsh keep up with sea level rise in the future.

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2.1.7 Public access
Public access was the lowest priority marshfront management concern of surveyed participants. For some people, marshes are considered dangerous and inhospitable places which are typically appreciated for their open space and aesthetic value from afar. Recreational values attached to marshes are often for commercial and recreational fishing, or for ecosystem and wildlife viewing. Thus, access by small watercraft is in demand.

There is limited physical access over or across the marsh beyond the County operated boat ramp on the west side of the Folly River Bridge on Folly Island and the public dock at the City of Folly Beach River Park on the northeast side of the bridge on the island. The 2014 Five Year Plan completed by the Folly Beach Parks and Recreation Committee calls for increasing both physical and visual access to the rear of the island. The first step includes the small pocket parks located in City owned rights of way. Future plans also include two canoe/kayak launches in the footprint of the old bridges. One would be located northeast of the County boat ramp near the new bridge and the other across from Crosby’s on the north side of Folly Creek near the Clam Farm docks.

2.2 Prioritized Marshfront Management Concerns: Regulatory
The following prioritized concerns relate to the City’s ability to regulate marshfront activities in order to preserve and manage the marsh (Figure 7). Each concern includes a description of existing regulations.

![Prioritized Regulatory Marshfront Management Concerns](image)

*Figure 7. Survey Results: Prioritized Regulatory Marshfront Management Concerns*

2.2.1 No critical line map
The primary regulatory concern of stakeholders was the lack of a map of the critical line along the marshfront. SCDHEC OCRM does not maintain a map of critical lines for wetland areas. Each line is delineated on a lot-by-lot basis, but is not retained by the agency following permit processing. Due to this limitation, a significant survey effort would be required to determine how far existing development is located from the critical line. OCRM commissioned a statewide mapping study to
inventory structures that cross the critical line (Jackson 2017) which was used in the marshfront inventory and shoreline analysis for this report.

2.2.2 Lack of regulations
Upland of the critical line, coastal development regulation is the responsibility of the City; however, as mentioned previously, little marshfront management planning had occurred prior to the moratorium and this plan. Aside from a 10’ setback from the critical line for impervious surfaces, few other regulations existed. Stakeholders were concerned that the city did not have adequate regulatory tools available to properly manage the marsh.

2.2.3 Mixed jurisdiction
The numerous marsh islands located between Folly Beach and James Island present a unique challenge for management. Only Long Island, the largest of the islands, is technically within the Folly Beach jurisdictional limits. The other islands scattered in the marsh are within the jurisdiction of Charleston County. This mixed jurisdiction is the result of the annexation of the area which was written to only annex the areas below the critical line into Folly Beach. All the high ground of the islands (and also parcels along Sol Legare Road) were excluded – remains within the County. This means that these parcels are all currently split between the jurisdictions. Folly Beach has no authority over the use and dimensional standards on the high ground.

2.3 Prioritized Marshfront Management Concerns: Marsh
The following items are related to the submerged portion of the marshfront, defined as areas below the critical line, in the marsh itself, not on the upland private property. The main threats to salt marsh longevity include limited area for migration, failure to build up in elevation at the same pace as sea level rise, and marsh bank erosion (NYC Parks 2017). These items were prioritized within the top four concerns below (Figure 8).

Survey respondents were asked to select their #1 and #2 marsh-related management concerns. Top priority responses received two points and #2 priority responses received one point. The total points each concern received is depicted in Figure 8. Marsh response to sea level rise and planning marsh restoration are clearly of highest priority to stakeholders.
Here, it is important to keep in mind that although 10,000 acres of saltmarsh lie within the jurisdictional boundaries of the City of Folly Beach, the marsh (coastal tidelands) is owned and regulated by the state in most cases.

2.3.1 Marsh Response to Sea Level Rise

The Folly Beach salt marsh will be subjected to continued sea level rise over the next century. The rate of sea level rise will likely be faster than it was over the last century, when salt marshes were able to “keep up” with sea level rise. Preliminary findings from an ongoing study by the National Centers for Coastal Ocean Science in North Carolina (NCCOS, 2018) has measured salt marsh accretion rates between 2.3 and 9 mm/yr since 2004. This suggests that marshes will keep up with present rates of sea level rise (3.2 mm/yr, see Figure 3); however, if the rate of sea level rise accelerates, salt marshes will likely begin to decline.

Even if salt marshes are able to keep up with rising sea level, the accommodation space available for their migration is limited by coastal development. Natural salt marshes keep up with sea level rise by slowly migrating landward as sea level rises (Figure 9). Folly Beach stakeholders are concerned that coastal development has rendered the salt marsh unable to migrate and keep up with sea level rise. This restriction on natural habitat migration is known as coastal squeeze (ESCP, 2018). Marsh habitats become squeezed up against coastal development, such as bulkheads and buildings along the marshfront, as sea levels rise. This means the extent and function of the marsh will decrease over time, as well as the habitats and species that it supports.
A recommended action of NYC Parks (2017) is to protect and create pathways for marsh migration. This type of recommendation is more difficult to implement when the pathways for migration are privately owned, as opposed to publicly owned park property; however, the concept of regulating to allow the maximum amount of space for marsh migration is sound.

2.3.2 Planning marsh restoration
Folly Beach stakeholders are interested in learning more about options for marsh restoration, such as living shorelines. They are concerned about marsh degradation in general and specifically, a perceived over-oystering along the banks of tidal creeks within Folly Beach. Over oystering can

Figure 9. Graphic depicting the difference between natural marsh migration and coastal squeeze from ESCP (2018).
reduce marsh bank stability. Oysters are efficient filter feeders that help maintain water quality. Oyster beds along the marsh provide shelter for other species and help keep marsh edges from eroding. Additional SCORE projects could be installed along the Folly Beach marsh edge, but determining the ideal location is a challenge.

SCDNR mapped boundaries of intertidal oyster reefs using aerial photography in 2003-2006, and updated in 2016, to create the SC Intertidal Oyster Reefs Map Application (http://www.dnr.sc.gov/GIS/descoysterbed.html). Figure 10 illustrates most of the oyster reef coverage within the City of Folly Beach jurisdictional limits. The map scale is an artifact of the online tool’s zoom function.

Figure 10. SCDNR 2015 Intertidal Oyster Reefs Map, vicinity Folly Beach (from http://www.dnr.sc.gov/GIS/descoysterbed.html)

The National Estuarine Research Reserve System (NOAA NERRS 2018) has established two marsh monitoring sites in South Carolina in the Ace Basin and at North Inlet-Winyah Bay. A variety of ecological and geological measurements are collected, which include sediment accretion or elevation change. No similar monitoring site exists in the marshes of Folly Beach. It is unclear whether results from these sites would be applicable to Folly marshes. Folly Beach stakeholders hope to better understand the health of the marsh to inform the location for future restoration efforts.

Stakeholders have asked the following questions about future marsh restoration efforts:

- How to identify areas with poor marsh health for future restoration opportunities
  - What are the appropriate metrics? Marsh bank erosion, over oystering, vegetative cover, elevation?
- How to fund?
- What is a good community-scale marsh restoration project?
2.3.3 River-based vendors

Numerous vendors operate in the Folly River and therefore provide access to the marshes. River-based vendors include boating and fishing charters, kayak and standup paddle board tours and rentals, ecotours such as dolphin watching and salt marsh adventures, etc. Vendors that operate in the Folly River must obtain a Folly Beach business license, but are not required to pay a franchise fee. This is different from beach vendors, which are required to do both.

2.3.4 Bank erosion from boat wakes

Ongoing erosion along the water’s edge due to boat wakes is a threat to salt marsh longevity. Recreational boat traffic appears to be on the rise in the Folly River. Stakeholders have shown some concern that slow speed zones are limited, poorly marked, and not enforced along the Folly River.

2.3.5 Regular debris removal program needed

One survey respondent recommended that the city implement a regular marine debris removal effort along the marshfront and Folly River. Marine debris is any man-made, solid material that enters waterways through littering or indirectly via rivers, streams, and storm drains. Beach cleanups have become popular and can perhaps serve as a proxy for a similar program for the marsh and river.

2.3.6 Private and commercial docks

The construction of private recreational docks is one of the most popular ways for citizens to gain access to the creeks and waterways. SCDHEC OCRM is responsible for the permitting of docks within the critical area. State requirements include:

- Docks should not be located on or near sensitive natural resources, such as oyster beds.
- Docks typically must end at the first navigable creek.
- Dock length is limited to no more than 1000 feet.
- Docks typically cannot cross side extended property lines or dock corridor lines.
- Docks cannot restrict public access to and in state waterways.

A dock permit application can be obtained at local DHEC OCRM offices or online at: https://www.scdhec.gov/ocrm.

2.4 Prioritized Marshfront Management Concerns: Education

The following prioritized concerns relate to the need for educational programs related to marshfront management (Figure 11).
Figure 11. Survey results - Prioritized educational marshfront management concerns

2.4.1 Education of property owners and residents
Section 3.7 includes suggestions on individual actions that property owners can adopt to better manage the marshfront. This information could be incorporated into educational materials and included on the city website.

In addition, the South Carolina Sea Grant Consortium, on behalf of the Charleston Resilience Network, has received a Regional Coastal Resilience Grant from the National Oceanic and Atmospheric Administration (NOAA) to understand the capacity of the Charleston, SC, region’s infrastructure to handle nuisance and severe flooding. This information will allow the region to respond now to immediate needs and enhance adaptive capacity for future issues. Partners on the project include the S.C. Sea Grant Consortium, College of Charleston, The Citadel, and University of South Carolina.

The project includes several objectives, one which is engagement and educational awareness. Outreach events are conducted in representative communities and sectors in the Charleston region on vulnerability and actions to address these issues. The first engagement event occurred on July 10, 2018 in North Charleston. While this effort is not focused specifically on marshfront management, a similar outreach event on Folly Beach may be useful in educating the community about several of the priorities listed in this Section 2 that are related to flooding and sea level rise.

2.4.2 Visualizing parcel scale impacts
Most publicly available mapping tools (e.g., NOAA 2018) do not have the resolution to predict parcel scale flooding impacts from the combined effects of degrading salt marshes and future sea level rise. Site specific studies are typically required to provide property owners with detailed information.

Another element of the S.C. Sea Grant project described in Section 2.4.1 above is this type of localized modeling effort. Parcel level analysis is being conducted of flood impacts that incorporates tides, meteorological components, wind, surge, and infrastructure such as drains (Figure 12).
2.4.3 Educating public officials and staff

The survey of public officials and staff indicated that education of public officials and staff was not a high priority. The City of Folly Beach has done an excellent job providing information to elected officials during the ongoing moratorium, and their efforts have been applauded in the local press (Spees 2018).
3. Short-Term Marshfront Management Actions

This section translates the stakeholder concerns, prioritized by the survey and public workshops and discussed in detail in Section 2, into short-term actions. Each recommended action section describes the action and which prioritized marshfront management concern it addresses. Short-term marshfront management actions recommended by this plan were actually implemented in real-time alongside the planning process and building moratorium, and include new local regulations, modifications to marshfront zoning, a marshfront structural inventory, a historical shoreline change analysis, and an engagement and education component. The short-term actions lay the foundation for future opportunities for marshfront management, which are discussed in the next section.

3.1 Regulatory Proposals

A number of regulatory changes that relate to marsh management were proposed and adopted during the waterfront building moratorium. The survey of city staff and elected officials, as well as the stakeholder public meeting, served to prioritize vegetative buffers as the highest priority (Figure 13) regulatory proposal. As described in this section, each of the proposed regulatory modifications addresses a specific concern (Section 2) that was voiced by stakeholders during the MMP process. The city is directly addressing all of the upland marsh management concerns. As discussed previously, the city has direct authority to manage the upland. Management of the marsh areas below the critical line is out of the city’s jurisdiction. Some of the proposed regulatory updates will have a positive indirect effect on the marsh and indirectly address some of the prioritized marsh-related management concerns, such as marsh response to sea level rise (by creating a setback and marsh buffers).

<table>
<thead>
<tr>
<th>Highest Priority Regulatory Proposals</th>
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</thead>
<tbody>
<tr>
<td>Vegetative buffers</td>
</tr>
<tr>
<td>Septic regulations</td>
</tr>
<tr>
<td>Update marsh island zoning (in coord. With County)</td>
</tr>
<tr>
<td>Setback from critical line for new bulkheads</td>
</tr>
<tr>
<td>Prohibit signs in the marsh, require removal of existing over time</td>
</tr>
<tr>
<td>Marsh lighting standards</td>
</tr>
</tbody>
</table>

Figure 13. Survey results: Highest priority regulatory proposals of stakeholders, city staff and elected officials.

The regulatory proposals address the upland marshfront management concerns, as discussed in Section 2.1 and the mixed jurisdiction of marsh islands, as discussed in Section 2.2.3. These new
proposals also at least begin to address the concern discussed in Section 2.2.2, that the city had limited ability to manage the marshfront due to a lack of regulations.

3.1.1 Septic
Septic systems along the marshfront, whether they might be leaky, outdated, or too close to the marsh was the #1 marshfront management concern and regulating septic was the #2 ranked regulatory proposal. To address the concern of overtopping of functional septic systems, and leaky, outdated and improperly located septic systems, as described in Section 2.1.1, the city adopted Ordinance 11-19 which enacted new septic regulations. They include requirements that all new or substantially improved septic systems be located as far upland as possible on the site and permit drawings must include the certified SCDHEC OCRM critical line and/or baseline, as well as all DHEC setbacks. All short-term rental properties must have annual septic system inspections. In addition, any DHEC septic permit older than 2007 submitted as basis for new construction must also include a current survey establishing that original conditions of approval are met.

3.1.2 Bulkheads
While bulkheads were the #2 marshfront management concern, bulkhead regulations came in 4th (Figure 13). This may be due to the upland property owner concerns related to regulating bulkheads on private property. To address the concern of the use of bulkheads on private property, as described in Section 2.1.2, the city adopted Ordinance 09-19 which enacted new seawall and bulkhead regulations. They include requirements that all new bulkheads must be constructed flush with adjacent grade/elevation, and any disturbed land must be backfilled and planted with appropriate vegetation. All bulkhead construction requires a City permit with proof of location behind the critical line with a depiction of the certified critical line.

3.1.3 Stormwater runoff (Drainage)
Stormwater runoff into the marsh was the #3 marshfront management concern and the top regulatory recommendation was to require upland vegetative buffers. Perhaps regulating soft approaches, such as buffers is more palatable to elected officials, staff and stakeholders. To address the concern of stormwater runoff and drainage of pollutants into the marsh, as described in Section 2.1.3, the city adopted Ordinance 05-19 which enacted new marsh setback and buffer requirements. The marsh setback was increased from 10 to 15 ft for all new construction and/or substantial improvement. This setback also serves as a natural buffer, to be maintained only with native vegetation. Appendix 6.2 provides educational materials about the types of native vegetation that are recommended, as well as best management practices. Property owners can also learn more about creating healthy, watershed-friendly landscapes through the Carolina Yards program. The new ordinance exempts existing structures, which can be renovated at the previous 10-foot setback. The new regulations prohibit pervious surfaces (to reduce the disturbance of the area) as well as impervious surfaces. The only construction allowed in the setback are a boardwalks, piers, bulkheads and associated riprap

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7 Clemson Extension, Carolina Yards: [https://www.clemson.edu/extension/carolinayards/](https://www.clemson.edu/extension/carolinayards/)
3.1.4 Flood Protection
To address the concern of a loss of protection as flooding increases, as described in Section 2.1.4, the city adopted Ordinance 08-19 to increase its freeboard requirement by one foot to two feet above base flood elevation. FEMA’s National Flood Insurance Rate Maps dictate the required minimum or base flood elevation (BFE) of new construction in a flood zone. Freeboard is any additional elevation above BFE that is added to the structure’s height as a safety factor against extreme flooding. This new regulation also provides a benefit to the city’s FEMA Community Rating System (CRS) credits which result in a discount on residents’ flood insurance policies.

3.1.5 Scenic Views
To address the concern of preserving scenic views of the marsh, as described in Section 2.1.5, the city adopted Ordinance 06-19 which clarifies requirements for exterior lighting on structures facing the Folly River. The new regulations require lights facing the river to shine downward and not out to the river. In addition, a plan was developed to address existing signs in the marsh.

3.2 Zoning Proposals
To address the mixed jurisdiction of marsh islands, as discussed in Section 2.2.3, the city adopted Ordinance 02-19. It created a new Marsh Island Residential zoning district (a lower density version of R1) with stricter lot size and setbacks to to match County’s zoning (in red bold) of Cole Island. By matching County zoning on marsh islands, the critical line setback increases to 35 feet on Long Island, Palm Island, and any other marsh islands that are developed in the future.

1. Max Density: 4/3 units per acre.
2. Minimum Lot Area: 10,500/14,500 square feet.
3. Minimum Lot Width: 70/70 feet.
5. Max Lot Coverage: 35/30 percent of high ground.
6. Max Height: 35 feet above BFE.
7. Allowable Uses: Single Family and associated Accessory Uses

The city is also authorized to engage owners of Bowens Island and initiate rezoning to residential areas if warranted.

Ordinance 12-19 requires letters of coordination with Charleston County for coordination of any highland development on marsh islands in their jurisdiction. It also requires letters or coordination with OCRM that the proposed marsh island development meets state marsh island development regulations.

The city also adopted Ordinance 04-19 which modified the intent of the city’s zoning codes to prevent encroachments on adjacent environmentally sensitive areas. This helps to address the marsh management concern, as described in Section 2.2.2, regarding the lack of regulations available for the city to protect the marsh.

Finally, Ordinance 01-19 modifies the city’s Conservation District zoning to allow private, non-commercial docks, relying on the OCRM definition of commercial docks. This addresses the marsh management concern, as described in Section 2.3.6, regarding private and commercial docks.
3.3 Marshfront Structural Inventory

Without a map of the marshfront critical line, it is difficult to inventory the habitable structures and bulkheads and their distance from the line. Based on a cursory analysis of the parcels that intersected a 2016 mean high water contour extracted from lidar data, this draft plan estimates that there are approximately 600 habitable properties on the marshfront within the jurisdiction of the City of Folly Beach. An inventory of the parcels and developed lots along the marshfront is beyond the scope of this MMP but it is recommended as a future opportunity.

Jackson (2017) conducted a mapping study of the South Carolina coast that digitized all anthropogenic shoreline features (e.g. docks, seawalls, bulkheads) in the vicinity of the state critical line. Data from this study were used to create a map book depicting all marshfront structures located in the vicinity of the SC DHEC-OCRM critical line (Appendix 6.3). Figure 14 provides an example map for the area in the vicinity of the Folly River bridge. Twenty-seven maps depict the 393 marshfront structures that cross the critical line. These structures are dominated by private docks and bulkheads (Figure 15).
3.4 Marsh Shoreline Change Analysis: 1933-2014

SCDHEC, in partnership with the Governors’ South Atlantic Alliance, is promoting the use of a spatial analysis tool that can be used by state and local coastal managers and scientists to improve comprehensive and hazard mitigation planning, post-disaster redevelopment, as well as determine areas best suited for restoration and mitigation efforts. Hazard Vulnerability Assessment (HVA) tool\(^8\). The HVA is an analysis tool that evaluates coastal hazard vulnerability from four hazards: storm surge, shoreline change rate (erosion or accretion), flooding, and social/economic vulnerability (SoVI\(^*_\)). The final product is a vulnerability index on a scale of 1 to 5 (1 being the least risk, 5 being the most risk).

In addition to the shoreline structural inventory, Jackson (2017) also examined shoreline change rates along S.C. marsh shorelines. Data from Jackson (2017) were utilized in this study to produce Figure 16. After a detailed examination of the data, outliers that indicated very large shoreline change rates, for example near the mouth of Folly River, were removed. If one were to compare the HVA tool, which also utilizes data from Jackson (2017), and Figure 16, these data modifications would become obvious. In this example, the data were removed because a comparison of historic maps did not reveal that the shoreline change rates suggested by Jackson (2017) were realistic.

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\(^{8}\)http://www.scdhec.gov/HomeAndEnvironment/Water/CoastalManagement/CoastalZoneManagement/CoastalHazards/
Changes affecting saltmarshes take place on variety of temporal and spatial scales, partly as a result of the dynamic nature of saltmarsh processes and partly due to changes in external forcing factors such as sea level, tidal range, wave climate, sediment supply and human activities. It is important to identify the scale of natural fluctuation, as distinct from any net change, before intervention measures are considered and implemented. In the case of the dynamic shoreline changes near the Folly River mouth, it is important to recognize that these are natural shoreline dynamics that should be allowed to continue and do not require mitigation.

Figure 16. Shoreline change rates along the marshfront within the City of Folly Beach between 1933 and 2014, modified from Jackson (2017).

3.5 Planning Restoration Projects
The city can approach restoration efforts from both the upland and the marsh area below the critical line. Restoration efforts on upland city owned property are the most straightforward; whereas, marsh restoration projects require consultation with, and permits from, numerous state and federal agencies.
An example of a short-term upland restoration project could be a vegetative buffer and/or a rain garden at one of the public marshfront properties, such as the City’s River Park. Marsh restoration efforts were proposed through existing state programs such as additional oyster reef builds with SCORE (Figure 5) or a youth wetland restoration project, Seeds to Shorelines (S2S). S2S involves students in harvesting, cultivating, and transplanting young seedlings of salt marsh grass to restore an area of salt marsh. By collaborating with local groups, S.C. Sea Grant Consortium, Clemson Extension, and SCDNR, these types of restoration projects could be initiated in the next year.

In fact, a pilot S2S community salt marsh restoration event was planned for June 12, 2019 (Appendix 6.2.3) but postponed due to weather until August 16, 2019. This educational marsh restoration event was a direct result of the MMP effort. The first-time community level pilot program includes about 30 community volunteers transplanting Spartina alterniflora upland of the SCORE oyster restoration project at the County boat ramp. It also includes salt marsh exploration and stewardship activities to assist with the City’s goal of continued education and outreach.

The city should also partner with SCDNR and NERRS to gain a better long-term understanding of marsh health in order to most effectively plan, permit, and construct future marsh restoration projects. An analysis of marsh health could be determined by combining new monitoring data with various products that have been developed and compiled through this MMP, such as shoreline change (Figure 16) and oyster reef coverage (Figure 10).

An example of particular concern to stakeholders is the health of the marsh along the causeway where dieback and mud flats appear to be most prevalent. Further research is required to determine whether this observation is factual and if so, whether or not human intervention is needed. In many cases of marsh dieback, restoration is not immediately recommended because the root system often lies dormant and regrowth may occur naturally. Meanwhile, the City Public Works Department has limited mowing of the marsh edge along the causeway.

3.6 Engagement and Education
This MMP initiated a community engagement plan to better manage the marshfront within the jurisdictional limits of the City of Folly Beach. This planned two-way process engages stakeholders and gives them the opportunity to provide input that enhances the decision-making process on issues that may impact the stakeholders’ well-being and interests. The MMP process has informed and educated stakeholders about marshfront management challenges. This has happened through public information sessions and the city website. The city has also consulted with stakeholders during the MMP process by obtaining feedback on the regulatory proposals and other decisions during public meetings. In fact, a third level of community engagement has been achieved by the involvement of stakeholders, meaning the planners worked directly with the public throughout the process to ensure that public concerns are understood and considered. This has been done through workshops, deliberative polling, expert panels, and marsh-related community events.

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9 S.C. Sea Grant, Seeds to Shoreline Program: [http://www.scseagrant.org/Content/?cid=921](http://www.scseagrant.org/Content/?cid=921)
10 International Association for Public Participation: [https://www.iap2.org/](https://www.iap2.org/)
Figure 17. Stakeholder prioritized list of educational opportunities.

Stakeholders polled during the November 2018 public meeting prioritized a number of ways the city should continue these community education and engagement efforts (Figure 17). All of the recommended education opportunities can be achieved through partnerships with agencies such as SCDNR, South Carolina Sea Grant Consortium, and Clemson Extension. These agencies can continue to provide expert panels and help with the development of additional educational materials tailored to city residents and property owners. As mentioned above, S.C. Sea Grant and Clemson Extension are working with the City to restore the marsh near the county boat ramp in the summer of 2019 (Appendix 6.2.3).

Steps to improve vegetative buffers to protect the saltmarsh are outlined in Appendix 6.2, and include how to maintain existing vegetation and a list of native plants to improve an upland buffer. Marshfront property owners should be encouraged to manage as much of their upland as possible and/or desired, and not be limited to the regulatory setback. Morganello and Rose (2013) suggest a buffer maintenance zone up to 50 feet inland from the critical area. Property owners can also learn more about creating healthy, watershed-friendly landscapes through the Carolina Yards program11.

The following information related to stormwater management could be included in educational materials for property owners and residents. This information was obtained from the City of Charleston12, S.C. Sea Grant Consortium, Clemson Extension13, and Penn State Extension14.

11 Clemson Extension, Carolina Yards: https://www.clemson.edu/extension/carolinayards/
12 https://www.charleston-sc.gov/DocumentCenter/View/12347
13 https://www.clemson.edu/extension/carolinaclcr/  
14https://agsci.psu.edu/aec/research-extension/research-centers/center-for-green-infrastructure-and-stormwater
• Plant trees. Trees can reduce a city’s stormwater runoff by 2-7%. During a rainfall event of 1 inch, 1 acre of forest will release 750 gallons of runoff, while a parking lot will release 27,000 gallons.
• Capture Water via Rain Barrels. During a rainfall event of 1 inch, a 1,000 square foot roof can capture over 600 gallons of water.
• Install a Rain Garden. A planted depression that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots and compacted lawn areas, the opportunity to be absorbed.
• Consider downspout planter boxes. A cross between a rain barrel and a rain garden.

Downspout planter boxes intercept water from a downspout, allow it to slowly soak through the planted media, and then slowly re-enter the downspout after the initial flush of rainwater has passed. Diverting water away from the storm drain during a rainfall event reduces demand on the sewer system, and also cleans and filters water as it is absorbed by plants, or as it soaks through the layers of the downspout planter box.
• Green Roofs. Will intercept between 50 and 60% of rooftop runoff first ½ + inch rainfall

Educational materials could also encourage marshfront property owners and residents to minimize fertilizer use and impervious surfaces. They should also be made aware of the option to donate land to the Folly Beach Nature Conservancy, a land-holding 501c(3) created in 2001 to acquire vulnerable coastal properties. Many of the properties that have been donated to the conservancy are partially submerged.

River or marsh sweeps or clean ups could also be organized by local groups, such as Folly Green Team, Surfrider Foundation, and Adopt-a-Highway. Litter is not only an eyesore; it can also harm marine life. Deteriorating plastics create harmful and nearly invisible microplastics within 8 weeks of entering the marine environment\(^\text{15}\).

4. Marshfront Management Opportunities

The completion and implementation of the short-term marshfront management action items, discussed in Section 3, have laid the ground work for future marshfront management opportunities for the city. These opportunities include mapping of the marshfront critical line, a more detailed inventory of habitable marshfront structures and bulkheads including their distance from the critical line, a marsh mitigation bank fund for future large-scale public marsh restoration, continued public education and engagement, and a septic vulnerability assessment (Figure 18).

\(^{15}\) http://www.saltmarshguide.org/
As mentioned previously, SCDHEC OCRM is responsible for delineating exact boundaries of tidally influenced wetlands, which are known as critical areas per the State’s Coastal Zone Management Act. However, the state does not maintain a map of the critical line for South Carolina marsh shorelines. A map (i.e., GIS layer) of the critical line along the marshfront would be useful for future management and regulation of marshfront development. Presently, it is not possible to determine, without extensive field checking, the relation of the mapped bulkheads and other erosion control structures to the critical line. The city will require a continuous digitized critical line along the marsh for regulatory and planning purposes.

Once the marshfront critical line is mapped, a more complete inventory of development along the critical line can occur. The inventory will map and discuss all marshfront structures located in the vicinity of the critical line. The discussion should provide summary statistics on type and number of habitable structures along the marshfront. A table (appendix) of structures which includes distances to critical line from any existing building, dock, or erosion control structure(s) should be included.

To identify funding for implementation of the opportunities listed above, and for future marsh restoration efforts, the city could establish a Marsh Mitigation Bank fund which could be funded through dedicated annual revenues from the City’s General Fund, similar to the beach preservation fund, and required mitigation contributions when new marshfront proposals are violated. The fund could cover the City’s share of future restoration efforts, which may be cost shared with SCDNR, FEMA, or other state and/or federal agencies.

Continued public education and engagement is recommended to ensure the two-way feedback loop described in Section 3.7 is closed. Stakeholders will be advised of key findings and outcomes of the planning process, as well as adaptive actions in the future.
4.1.1 Septic Vulnerability Assessment

Opportunities to address the effect of septic systems on the marsh, as described in Section 2.1.2, include the regulatory proposals discussed in Section 3.1.1 as well as the initiation of a septic vulnerability assessment. The 2017 Sea Level Rise Adaptation Report recommended the following implementation plan for a Septic Vulnerability Assessment, one of the top three recommendations of that report. Some of the near-term recommendations, such as education from SCDHEC occurred during the moratorium and MMP process.

**Recommended Adaptation Action: Septic Vulnerability Assessment**

**Near-term (1 year)**

1. Enforce septic limitations on rental applications
2. Learn from other beach communities with septic challenges (Edisto, Sullivan’s, Isle of Palms, Nags Head NC, etc.)
3. Approach SCDHEC about possibly hosting a workshop to educate stakeholders and for communities to share lessons learned
4. Initiate a strategic education campaign of property owners and elected officials
5. Map and inventory septic tanks

**Medium-term (3 years)**

1. Hire an engineering firm to conduct a vulnerability assessment of septic at elevated water level scenarios, ID priority areas (Marshfront Management Plan may help), and provide estimates of cost per linear foot.
2. Consider a [septic inspection incentive program](http://www.nagsheadnc.gov/index.asp?SEC=F43EBE1E-2B2D-4F36-8182-0544F0BEEAD1&Type=NONE)
3. Continue strategic education campaign of property owners and elected officials

**Long-term (5 years+)**

1. Expand sewer to prioritized areas (high risk + enough customers)
2. Adapt strategic education campaign of property owners and elected officials

In addition to the new regulations on septic system testing, SCDHEC staff presented to the Planning Commission during the MMP process. It has become clear that Folly Beach is not alone in their aversion to the wide-spread use of central sewer systems. Other communities appear to share the same concerns about the cost to design, construct and maintain the systems. They are also undesirable for communities who wish to limit development pressures. A majority, 85 percent, of properties in Nags Head, NC rely on private septic systems to collect, treat, and dispose of sewage.

The next step in implementation of the septic vulnerability assessment is a joint grant application with the North and South Carolina Sea Grant Consortiums to investigate septic tipping points for Folly Beach, SC and Nags Head, NC. This proposed study will study the benefits of alternative wastewater technologies and relocation of septic systems. The study will show how to maximize

pollution reduction under various climate scenarios. Results of the study may modify the city's long-term approach to wastewater management.

An outline of how other local communities handle marshfront management was initiated by a member of the Folly Beach Planning Commission during this planning effort (Appendix 6.1.3). Adding details to this list, to address additional elements of concern to stakeholders (septic, drainage, etc.), would provide a useful comparison for future planning and regulatory efforts. Comparing innovative marsh management concepts from coastal counties and municipalities along the U.S. East Coast can provide ideas for future adaptive management of this plan.

As mentioned previously, the MMP process is an adaptive management effort. Adaptive management is a structured, iterative process of decision making in the face of uncertainty with an aim at reducing uncertainty over time through monitoring. For purposes of this adaptive plan, the city should revisit this document following the implementation of the action items and opportunities to determine how effective the new policies and regulations have been. Based on knowledge gained from this review, future management can be improved. The MMP and its associated policies and regulations can be agile and adapt as the city moves into an era of increasing coastal challenges due to rising seas.
5. Summary and Recommendations

Development of this MMP occurred in conjunction with a Citywide moratorium on marsh and beachfront development between May 30, 2018 and February 2019. All waterfront construction came to a halt while City officials developed both this MMP and a Dune Management Plan, which guided the implementation of fifteen (15) new ordinances to better manage coastal development in Folly Beach, SC. This was an unprecedented, progressive, and efficient process of implementing adaptation plans into action in real time. Thus, many items that would have been “Recommendations” of this plan were implemented during the planning process.

A summary of the top upland and regulatory priorities of this MMP (recommendations) compared to the new ordinances are detailed in Table 2. As discussed previously, the City has jurisdiction over the marshfront upland areas adjacent to the marsh, and as such, the upland concerns are the most straightforward for the City to address.

Table 2. MMP prioritized management concerns and the City ordinance that addressed each in 2019

<table>
<thead>
<tr>
<th>Concern Topic</th>
<th>Ordinance No.</th>
<th>Ordinance Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic: Leaky, outdated, too close to marsh</td>
<td>11-19</td>
<td>New septic systems must be as far upland as possible; annual septic inspections for short-term rentals</td>
</tr>
<tr>
<td>Use of bulkheads on private marshfront/impacts on existing marsh &amp; adjacent shorelines</td>
<td>09-19</td>
<td>New bulkheads in marsh setback must not exceed upland elevation &amp; must be upland of critical line*</td>
</tr>
<tr>
<td>Stormwater runoff/drainage into the marsh</td>
<td>05-19</td>
<td>Setback increased from 10 to 15 ft &amp; includes native buffer</td>
</tr>
<tr>
<td>Loss of protection as flooding increases</td>
<td>08-19</td>
<td>Freeboard increased to 2 ft above base flood elevation</td>
</tr>
<tr>
<td>Preserving scenic views of the marsh</td>
<td>06-19</td>
<td>Marsh lighting must shine downward; sign removal plan</td>
</tr>
<tr>
<td>Mixed jurisdiction of marsh islands</td>
<td>02-19</td>
<td>New marsh island residential zoning district with stricter lot size and setbacks (35') to match county zoning</td>
</tr>
<tr>
<td></td>
<td>12-19</td>
<td>Letters of coordination from county and DHEC required for new marsh island development</td>
</tr>
<tr>
<td>Lack of regulations to protect marsh</td>
<td>04-19</td>
<td>Intent of zoning codes includes the prevention of encroachments adjacent on environmentally sensitive areas</td>
</tr>
</tbody>
</table>

*No change was made to the marshfront bulkhead setback. It remains at 0 feet from the critical line.

Additional recommendations of the MMP include:

- mapping of the marshfront critical line,
- a more detailed inventory of habitable marshfront structures and bulkheads including their distance from the critical line,
• a marsh mitigation bank fund for future large-scale public marsh restoration,
• natural buffer education station on a public marsh edge property,
• continued public education and engagement, and
• a septic vulnerability assessment.

These additional recommendations are described in detail in Section 4, Marshfront Management Opportunities.

6. Prior Studies/References


NCA, 2014. U.S. National Climate Assessment, U.S. Global Change Research Program, www.nca2014.globalchange.gov (included more than 300 experts guided by a 60-member Federal Advisory Committee, and the assessment was reviewed by the public, federal agencies, and a panel of the National Academy of Sciences)


6. Appendices

6.1 Federal, State, City, and other Local Marsh Management and Authorities

The 10,000 acres of marsh within the jurisdictional limits of the City of Folly Beach are not owned by the city. Instead, much of the marsh has been divided up into private parcels and is owned by land trusts, homeowner’s associations, or LLCs. Regardless of ownership, the marsh is undevelopable and SCDHEC OCRM and the U.S. Army Corps of Engineers (USACE) have jurisdiction over them and any activities on them.

According to the Charleston District, the USACE has been involved in regulating activities by others in navigable waterways through the granting of permits since passage of the Rivers & Harbors Act (Section 10) of 1899. At first, this program was meant to prevent obstructions to navigation, although an early 20th century law gave USACE regulatory authority over the dumping of trash and sewage. Passage of the Clean Water Act (Section 404) in 1972 greatly broadened this role by giving the USACE authority over dredging and filling in the "waters of the United States," including many wetlands.

6.1.1 State Authorities

The State’s Office of Ocean and Coastal Resource Management (OCRM) is responsible for delineating exact boundaries of tidally influenced wetlands, which are known as critical areas per the State’s Coastal Zone Management Act.

A dock application can be obtained from a local OCRM office or downloaded at http://www.scdhec.gov/ocrm. A non-refundable permit application fee is required with an application. The fees are outlined in the application packet.

SCDHEC-OCRM established a Living Shorelines Working Group in 2017 to assess data from a Science Collaborative project from SCDNR and NOAA’s National Estuarine Research Reserves. From this assessment, OCRM will aim to develop a regulatory definition for "Living Shoreline", along with success criteria and installation guidance. Once regulations are promulgated, individual permits for living shoreline projects will be more easily obtained by individual property owners, ideally making such projects a more, or at least equally, attractive alternative to armorining.

In South Carolina, oysters may be harvested recreationally from State Shellfish grounds (labeled with an S and green polygon in Figure 19) and Public Shellfish grounds (labeled with an R and red polygon in Figure 19) with a Saltwater Recreational Fishing License. License must be in possession while harvesting. Most Public (recreational-only) and State shellfish grounds are marked with signs.
6.1.2 Local Government and Authorities

6.1.2.1 Municipality’s Comprehensive Plan

The following excerpts from the City of Folly Beach 2015 Comprehensive Plan relate to the marsh.

In general, the Folly Beach Comprehensive Plan seeks to eliminate existing encroachments on sensitive water fronts, marshes, wetlands, and riparian areas while encouraging environmentally sensitive development; “Engage more fully with....other sensitive areas to balance access with protection; Create buffer zones on top of setbacks to require planting vegetation during development and redevelopment.”

1) **Protecting Natural Resources.** In the next decade Folly Beach must be prepared to adapt to the effects of sea level rise, decreasing federal and state funding, and increased tourism. The Plan recognizes the need for proactively managing the beach, the river and marsh areas, and wildlife habitat within the City.

**Needs**

1) Property in Folly Beach includes beach front, marsh and wetland environments, and historically important lands and structures which must be protected through sensitive development. (Land Use)
Goal: Eliminate existing encroachments on sensitive water fronts, marshes, wetlands, and riparian areas while encouraging environmentally sensitive development to protect the environments that define the beauty of Folly Beach.

Implementation: Vigorous enforcement of ordinances such as setbacks, sand dune disturbance, and impervious surfaces. Incorporate recognized Green Building Practices into the Folly Beach Building Code.

10) Undeveloped, environmentally sensitive lands in the marsh behind Folly Island are not protected from intense development. (Natural Resources)

Goal: Protect marsh islands from inappropriately intense development.

Implementation: Create a new lower density zoning classification for Long Island. Work with Charleston County to ensure that marsh islands out of Folly’s jurisdiction are regulated.

6.1.2.2 Municipality’s Sea Level Rise Adaptation Plan

The City of Folly Beach 2017 Sea Level Rise Adaptation report utilized a participatory approach to explore adaptation actions for making the City more resilient over time. Long-term data from the National Oceanographic and Atmospheric Administration (NOAA) tide gauge at Charleston, SC document 12 inches (1 foot) of sea level rise since its installation in 1921. Folly Beach is already being impacted by rising seas, particularly during “King” tide events when stormwater drainage systems backup and flood low-lying roads and yards.

This report highlights several adaptation options and recommends that the City plan for 3 feet of sea level rise over the next 50 years, or by 2066, and that City Council should consider the top Sea Level Rise Adaptation Actions, prioritized by stakeholders and the public as follows: a) Drainage Management Plan, b) Septic Vulnerability Assessment, and c) Marshfront Management Plan.

The Marshfront Management plan is envisioned to be similar to the Local Comprehensive Beach Management Plan (LCBMP) most recently updated by the City in 2015 but with a focus on the marshfront shore of Folly Beach. The marshfront management plan would include a detailed inventory of all structures, property lines, habitat, erosion control devices, etc. as in the LCBMP.

Management and adaptation options such as living shorelines would be considered.

6.1.3 Other Local Government Marshfront Regulations
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Buffer</th>
<th>Setback</th>
<th>Bulkhead</th>
<th>Notes</th>
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<tbody>
<tr>
<td>HILTON HEAD</td>
<td>Comprehensive Buffer Ordinance that includes both tidal and freshwater wetland buffers; marsh mitigation and revegetation requirements; wetland restoration, preservation and creation; wetland banking or fees. (Ch. 16-6-102).</td>
<td>SF Res. Tidal: Min. 20 feet buffer</td>
<td>Yes, impervious allowed within buffer.</td>
<td>Pervious (ie. Fill related) allowed under certain conditions</td>
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<td>Multi-fam or non residential:</td>
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<td>Pervious paved: 35 ft av/15 ft min</td>
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<td>Structures: 40 ft av/ 20 feet min</td>
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<td></td>
<td></td>
<td>Impervious:  50 ft av/ 25 feet min</td>
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<td></td>
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<td>*Buffers subject to reduction for site specific features</td>
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<tr>
<td>BEAUFORT COUNTY</td>
<td>50 ft buffer of native vegetation (planted or existing) from the OCRM Critical Line. Purpose: 1. provide a natural filtration system for runoff from adjoining development that may enter the waters; 2. minimize erosion and help stabilize the streambank; 3. provide a natural habitat for the flora and fauna that exist in this important transition area between wetland and upland areas... The entire buffer must be maintained as an undeveloped landscaped area. “ Buffer varies by zoning classification.</td>
<td>Ch. 5-11-60 – complicated table of setbacks from critical line vary depending of zoning category**</td>
<td>Bulkhead, Rip-Rap, or Other Erosion Control Device More Than 48 Inches High. A proposal to install a bulkhead, rip-rap, or other erosion control device more than 48 inches in total vertical height from the existing ground elevation shall be accompanied by design plans and certification from a South Carolina registered professional engineer stating the design is adequate to prevent collapse or other failure.</td>
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<tr>
<td>Jurisdiction</td>
<td>Buffer</td>
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<td>be granted though an administrative waiver unless the <strong>setback</strong> is to preserve a specimen tree, historic resource, or to prevent a lot from becoming unbuildable with comparable houses as described in Subsection D.1 above. Where the <strong>setback</strong> is to preserve a specimen tree or historic resource, the building envelope allowed shall optimize the protection of the resources.</td>
<td></td>
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<tr>
<td>FRIPP ISLAND</td>
<td></td>
<td>Setback consistent with Beaufort County 50 ft buffer (above)</td>
<td></td>
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<tr>
<td>CITY OF BEAUFORT</td>
<td>Critical Area Buffer Required:</td>
<td>Transect-based zones: 30 ft min Conventional zones: 50 ft min To remain undeveloped; indigenous vegetation removal limited. exceptions: paths, steps, gazebos up to 80 ft, yard sculpture, furniture, docks, playground equipment, erosion control devices permitted by OCRM (not stormwater ponds) - Existing bulkheads in transect zoning excepted Beaufort Dev. Code Sec. 8.1.2</td>
<td>Some – lots in Transect-based zoning with bulkheads existing at the time of adoption of ordinance (2016) exempted from critical line buffer provision</td>
<td></td>
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<tr>
<td>SEABROOK</td>
<td></td>
<td><strong>25 ft set back</strong> from OCRM critical line for everything except open decks; 15 ft for decks (7-60-50)</td>
<td>Restrictive covenants prevent building of bulkhead without prior governmental approval and Arch Design Review Board (Section 15)</td>
<td>* Planning Commission to approve the replacement of damaged non conforming structures on existing footprint or at a lower density 3-30-20</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Buffer</td>
<td>Setback</td>
<td>Bulkhead</td>
<td>Notes</td>
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<tr>
<td><strong>KIAWAH</strong></td>
<td>Residential: 10 feet</td>
<td>Residential: <strong>30 feet</strong> from lot line or OCRM critical line (whichever is more restrictive)</td>
<td>17-201 – must apply to town of Kiawah and DHEC for approval and input</td>
<td>* variances may be granted by BZA</td>
</tr>
<tr>
<td></td>
<td>Nonresidential: 35 feet</td>
<td>Nonresidential: <strong>50 ft from OCRM critical line</strong></td>
<td>- structures permitted by DHEC/OCRM shall be exempted from buffer requirements</td>
<td>* variances may be granted by BZA</td>
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<td></td>
<td>Prohibited:</td>
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<td>- soil excavation (except minimal for landscape with indigenous species)</td>
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<td>- planting of grasses shrubs and trees requiring maintenance/herbicides or pesticides</td>
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<td>- gardens, fences or structures</td>
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<td>- paved or impervious surface</td>
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<td>- destruction or addition plant life alter existing</td>
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<td>- structures permitted by DHEC/OCRM shall be exempted from buffer requirements</td>
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<td></td>
<td>* variances may be granted by BZA</td>
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<tr>
<td><strong>JAMES ISLAND</strong></td>
<td>15 feet from OCRM Critical line (RSL (low density residential))</td>
<td><strong>35 ft from OCRM critical line:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CITY OF CHARLESTON</strong></td>
<td>25 ft buffer</td>
<td></td>
<td></td>
<td>Exemptions for prior platted properties; historic properties and certain exempted properties</td>
</tr>
<tr>
<td></td>
<td>54-347.1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>CHARLESTON COUNTY</strong></td>
<td>OCRM Buffer: 15 feet</td>
<td><strong>35 ft Setback</strong> from OCRM critical line</td>
<td></td>
<td>*Reduction of OCRM Critical Line Buffer: Planning Direction may reduce buffer when deemed necessary to</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Buffer</td>
<td>Setback</td>
<td>Bulkhead</td>
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</tr>
<tr>
<td>SULLIVANS ISLAND</td>
<td>RC2 District is the marsh zone – no building within this zone</td>
<td><strong>Setback of 30 ft</strong> from the RC-2 District Boundary or the critical line, whichever is more landward</td>
<td>NONE permitted</td>
<td>** conservation easements allow for certain structures and recreational uses in the easement if conditions are met</td>
</tr>
<tr>
<td>ISLE OF PALMS</td>
<td></td>
<td>Minimum of 10 feet from OCRM line; 20 feet from OCRM line if subdivided; existing homes within the 20’ setback can be rebuilt to their current footprint as long as they don’t extend further into the 20 ft setback; Location of critical line by State-registered land surveyor and drawn on a site plan of the lot and approved by OCRM within 18 mos. Zoning administrator may require new survey if reason to believe critical line changed</td>
<td>Beachfront plats must say: “The City of Isle of Palms, at the time of the approval of this plat, prohibits the issuance of any permits for any kind of hard beach erosion control structures or devices (i.e., sea walls, revetments, rip-rap, bulkheads, groins, large sandbags, etc.) within the area landward of the OCRM critical area and within a 250-foot radius of the mean high water mark of the Atlantic Ocean, Breach Inlet, or Dewees Inlet, and strongly opposes the</td>
<td>*no driveways or other impervious surfaces within 20 feet of critical line</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Setback varies by zone – Residential (R-4) set forth above. Others are greater</strong></td>
<td></td>
<td>* fences shall not be constructed which impede the free flow of water in V and A zones</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Buffer</td>
<td>Setback</td>
<td>Bulkhead</td>
<td>Notes</td>
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</tr>
<tr>
<td>MT PLEASANT</td>
<td>Critical line buffer – undeveloped vegetative area; no uses other than pedestrian path; swales rather than drainage pipes; Width varies by location: <strong>15 feet</strong> (between Cooper and Ben Sawyer bridges) <strong>35 ft</strong> (and min width of 20 ft)(between Cooper and up the Wando and from Ben Sawyer Northward) Exception: lots of record and final plats approved prior to 9/12/00 (Ch. 156.047)</td>
<td>“<strong>30-foot setback</strong> for all impervious surfaces on property located in any zoning district shall apply to the DHEC-OCRM critical line” (measured at right angles from all points of critical line) Ch. 156.106 (Lots of record as of June 1992 are exempted from this provision)</td>
<td>Yes with prior OCRM approval and provided that the required buffer width is maintained or re-established landward of the installed erosion control structure</td>
<td></td>
</tr>
<tr>
<td>GEORGETOWN COUNTY</td>
<td></td>
<td>15 ft minimum set back from OCRM/DHEC line ART. VIII, SEC. 809</td>
<td></td>
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</tr>
<tr>
<td>PAWLEYS ISLAND</td>
<td></td>
<td>10 ft from critical line Part II, Art. 3-2</td>
<td></td>
<td>15 feet from OCRM line for in ground pools</td>
</tr>
<tr>
<td>EDISTO</td>
<td></td>
<td>5 ft from critical line</td>
<td></td>
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</tr>
</tbody>
</table>
6.2. Educational Materials
6.2.1 Spartina Alternflora Poster
The most common salt marsh plant species in the Southeast provides us with a wealth of benefits!

**Habitat**
- Salt marsh is the second-most productive ecosystem on the planet. Its productivity is fueled by the recycling of nutrients, largely from Spartina alterniflora. The plant dies in the fall, forms wrack, and breaks down (decomposes) to release its nutrients back into the system.
- Over 75% of the commercially important species in the Southeast use the salt marsh during their life cycle.
- A number of animals such as shrimp, oysters, fish, and birds use the marsh as nursery habitat, feeding grounds, and nesting areas.

**Erosion control**
- Spartina rhizomes (underground stems) and root mats stabilize the marsh mud, protecting against erosion.
- Spartina stalks break up wave energy before it reaches the land, lessening the impacts of storms.
- Spartina stalks also trap sediment which helps protect against sea level rise.

**Clean water**
- Salt marshes filter pollutants from the water column that enter our estuaries from non-point sources such as houses and roads.
- Spartina helps remove pollutants from the water, such as pesticides, heavy metals, and nutrients.
- Marsh sediment can act as a sponge, burying and absorbing pollutants, thus minimizing the toxic effects.

**Smooth Cordgrass**

A salt marsh is a coastal wetland that serves as the transition zone between land and salt water. The dominant salt marsh plant in southeastern estuaries is Spartina alterniflora. This amazing plant can tolerate being covered by salt water twice a day.

**Salt marsh distribution**
Spartina alterniflora is found throughout the Atlantic and Gulf of Mexico coasts. It is a dominant coastal habitat with about 1,000,000 acres in North Carolina, South Carolina, and Georgia.

**Leaf surface**
Spartina can excrete salt from plants on its leaves which allows it to survive in salt water. Algae on the leaf’s surface provides food for grazers, such as the periwinkle snail.

**Seasons in the salt marsh**
- **Spring**: Being a perennial plant, Spartina in the salt marsh is an excellent indicator of the changing seasons. In the spring, new Spartina plants grow from seeds and rhizomes. In the summer, the marsh takes on its distinct bright green color.
- **Summer**: By fall, small white flowers will have developed along the upper stalk, becoming a seed head. Leaves then turn a golden brown color and the seeds disperse. By mid-winter, dead Spartina breaks off and accumulates as mats of detritus ("wreck") on the surface of the mud.
6.2.2 Life Along the Salt Marsh: Protecting Tidal Creeks with Vegetative Buffers
South Carolina is home to some 350,000 acres of salt marsh, comprising 30% of all tidal salt marsh on the United States’ eastern seaboard (Seabrook, 2012; Weigert and Freeman, 1990). This image shows a classic salt marsh in the South Carolina Lowcountry. Photo by Chris Ramaglia.

The salt marsh is the transitional area where the rivers meet the sea, comprised of intertidal water bodies in which salinity can range from near ocean strength (30 parts per thousand) to brackish water (greater than .5 and less than 30 parts per thousand). The salt marsh is ranked as one of the most biologically productive ecosystems on earth, providing nursery grounds for many species of birds and fish, as well as vital wildlife habitat (SCDNR, 2010). Additionally, the salt marsh provides many services to humans, including flood control during major storm events, nursery grounds for many commercially and recreationally important fish and shellfish species, and serves as a filter for removal of sediments and pollution from the water.

Vegetative buffers are one of the most effective ways to protect salt marsh habitat (SC DHEC OCRM, 2002). Vegetative buffers provide the following benefits:

1. Reduce pollution in stormwater runoff
2. Reduce shoreline erosion and property damage caused by flooding
3. Provide increased privacy to the homeowner while still maintaining a view corridor (Figure 1)
4. Serve as wildlife habitat (Figure 2)
5. Save the homeowner money, especially when native plant species are dominant, as little to no water, fertilizers or pesticides are needed to maintain this area of the yard (SC DHEC OCRM, 2002).
Minimizing Impacts to the Salt Marsh, ...Naturally!

After European arrival in the “New World,” salt marshes and other wetland areas were diked, drained, and filled for human use; by 1954, these activities contributed to the destruction of nearly 50% of the nation’s wetlands (Kusler and Opheim, 1996). Though salt marsh is now protected under federal and state and some local laws, human threats still exist largely in the form of stormwater runoff and shoreline hardening. As coastal counties become increasingly popular and more people move to and visit these areas, additional infrastructure such as roads, rooftops and parking lots are needed. This increase in impervious area can significantly impact pre-existing hydrology and result in a larger volume of stormwater runoff to nearby waterways. Additionally, more people also means more contributors of nonpoint source pollution caused by seemingly harmless daily activities such as bacteria and pathogens from pet waste, sediment from construction activities, excess nutrients from improper fertilizer application and gasoline and oil from vehicles. See HGIC 1850 Illicit Discharge Detection.

Steps to Successfully Improving your Vegetative Buffer to Protect the Salt Marsh

1. Before Planting

Due to regulations in place to protect the salt marsh, understanding local, state or federal authority is a first and necessary step. The South Carolina Department of Health and Environmental Control-Office of Ocean and Coastal Resource Management (SC DHEC-OCRM) has direct permitting authority over “critical areas,” defined as coastal waters, tidelands, beaches and dune systems. Any land disturbance planned within the critical area may require a permit from SC DHEC-OCRM, in addition to any necessary authorizations from the local and federal governments. In most cases, establishing a vegetative buffer occurs on the adjacent upland and does not require disturbance in the salt marsh defined as a critical area; therefore, a special permit may not be necessary. For the purpose of this factsheet, the recommended buffer establishment and maintenance actions take place in the upland area above the high water mark, thus inland from the critical area.
Trees and shrubs may be shaped and “limbed up” to frame a view rather than blocking it. Silhouettes of branches and moss can make the salt marsh viewscape even more dramatic and aesthetically pleasing.

Before planting, consider the existing topography, vegetation, and soil present at the site. Whenever possible, use the natural contours and keep existing vegetation in place. The underground structure of existing plants helps to prevent erosion by holding soil in place with their fibrous roots system. Avoid unnecessary erosion by minimizing disturbance to the soil when planting or grading the shoreline bank. As with any new planting, having your soil tested will take the guesswork out of the pH and fertility of the site. See HGIC-1652 Soil Testing.

2. Right Plant, Right Place

Using the “right plant” will increase the effectiveness and chances that the vegetative buffer will survive. Plant selection is narrowed by the dynamic conditions that exist adjacent to a salt marsh, including the ever-present elements of wind, salt, and exposure. There are few appropriate plants for such sites, and most of these will be the native plants that have adapted to the pressures of living near the salt marsh. Once established, native plants typically require less maintenance time and cost, while also supporting local wildlife such as birds and beneficial insects including butterflies and other pollinators.

3. Maintaining Your Vegetative Buffer Adjacent to the Salt Marsh

Maintaining your vegetative buffer is important in ensuring the continued success, function and aesthetic appeal of the buffer zone. For the purpose of this factsheet, the following recommended actions occur in the “buffer maintenance zone,” described as the area up to 50 feet inland from the critical area. Additional local buffer requirements may apply.

- Turf grass in the buffer zone: If turf grass exists within your buffer maintenance zone, the lawn should be kept at the maximum recommended height for the specific turf, which will allow for a more extensive root system, help stabilize soil, and afford a larger leaf area, which can work to slow runoff, and capture sediment. See HGIC-1205 Mowing Lawns.

- Irrigation considerations: Irrigating within the buffer maintenance zone should be minimized to ensure that excess fresh water does not run off into salt marsh or tidal creeks. Stormwater occurs through irrigation efforts as well as rainfall events and can transport harmful pollutants to area waterways.

- Chemical controls: Consistent with management recommendations for areas adjacent to freshwater shorelines, pesticides and fertilizers should be avoided in the buffer maintenance zone. Weed control is best done by hand pulling. Mulch can help to unify the landscaped area and will also protect plants by conserving soil moisture and moderating temperature; however, mulch should only be spread in the upper portions of the buffer area to avoid being carried away during high tides. To reduce the potential for weed growth in the buffer area, consider spacing plants closely together.

- Maintenance: Any cut or mowed plant material within the buffer maintenance zone should be removed so that excess plant material does not wash away, potentially leading to water quality issues and water navigation challenges.

Zones of a Vegetated Salt Marsh Shoreline
The salt marsh is designated as a critical area; any activity-taking place in the salt marsh will require a special permit from a regulatory authority. The salt marsh should be left untouched by maintenance or home gardening efforts.

Salt marsh vegetation is constantly inundated with varying water levels dependent on the twice-daily influence of the high and low tides. Soil in the salt marsh remains permanently saturated, forming a substrate affectionately known in the Lowcountry as “pluff mud.” Each year, the salt marsh vegetation, predominantly *Spartina alterniflora*, (commonly referred to as Smooth cordgrass) goes dormant in the winter months and grows back in the spring. This is obvious to the naked eye as the salt marsh appears brown and drab in the winter, vibrant green in the summer months, and near golden in the fall. As the Smooth cordgrass dies, it decays to form the base of a complex food web supporting not only next year’s salt marsh growth, but also a diverse array of animal life. In areas located upriver thus further away from the ocean, the water is less salty; the dominant plant in the salt marsh is *Juncus rosmarieanus* (commonly referred to as Black needlerush).

The intertidal zone is part of the designated critical area; any activity-taking place in the intertidal zone will require a special permit from a regulatory authority. A vegetative buffer is created in the intertidal zone best by leaving the area untouched; for example, avoid the use of a lawn mower, weed eater or planting in areas reached by the high tide.

The intertidal zone is highly variable, parts of this zone may be inundated with water twice daily during high tide where as some portions of the zone may typically be above the high tide mark, thus rarely inundated by the tides. Regardless, this transitional area of land lies above water at low tide. Plants that occur naturally in this area and can potentially volunteer include the following:
Sweetgrass – *Muhlenbergia filipes* is a plant of cultural significance in the Lowcountry as the Gullah community utilizes this plant to make sweetgrass baskets. Sweetgrass has gained increasing popularity over the years as a landscape plant, and becomes the “queen of the garden” in the fall with a showy purple inflorescence. Sweetgrass grows naturally along the edge of the salt marsh and can tolerate full sun to part shade with some saltwater inundation.
**Groundsel tree** – *Baccharis halimifolia* is a member of the Aster family and is extremely salt tolerant. This shrub is very attractive in the fall when the female plants bloom and make white snowy clusters of airborne achenes. The flowers are also a very important nectar source to pollinators, especially honeybees and migrating Monarch Butterflies.

**Sand Cordgrass** – *Spartina bakeri* is related to the dominant plant in the salt marsh, *Spartina alterniflora*, yet *S. bakeri* thrives naturally in isolated freshwater wetlands. Sand cordgrass also does well in dryer conditions, but certainly does not thrive in consistent saltwater intrusion as Smooth cordgrass. For this reason, Sand cordgrass should be planted well above the high tide line. Sand cordgrass can take full sun and makes for an excellent buffer as it grows low and thick, thus allowing a view while also slowing stormwater runoff. Like Sweetgrass, Sand cordgrass is becoming increasingly popular in the landscape industry.

**Beautyberry** – *Callicarpa americana* is a deciduous shrub with opposite leaves and small light lavender sessile flowers which are fragrant and attractive to beneficial insects. In the fall, clusters of bright purple berries appear and are eaten by birds. Beautyberry can grow up to 8’ but it may be pruned in winter without sacrificing its glamour.

**Live oak** – *Quercus virginiana* is one of several important oak species found in the upland zone. The Live Oak is the most notable and grand with its low spreading branches and it produces acorns and habitat for many species of small mammals, reptiles, birds, and insects. Live oaks are frequently adorned with two epiphytic species Spanish moss (*Tillandsia usneoides*) and Resurrection fern (*Pleopeltis ploypodioides*). Laurel oak (*Quercus laurifolia*) and
water oak (*Quercus nigra*) are also common and can tolerate some salt spray.

**Saw palmetto** – *Serenoa repens* is a low growing evergreen shrub that is both salt and drought tolerant. The Saw palmetto is one of four native palms found in South Carolina and its habitat includes maritime forests and coastal dunes. Saw palmetto can be planted in cluster form to create a ground cover or used as a stand-alone planting.

**Yaupon holly** – *Ilex vomitoria* is a coastal plain plant that has naturalized to more northern and western locations as it was thought to have been traded by early Americans for its use in ritual ceremonies. The leaves contain caffeine. Male and female flower on separate hollies; berries are produced on the female plants and utilized by songbirds for food. Yaupon holly is found in nature as an understory tree in the maritime forest. These attractive evergreen plants can be used as mass plantings and also single or multi-trunk small trees, limbed up as “see through” landscaping.

**Red buckeye** – *Aesculus pavia* is one of the first nectar sources for early migrating hummingbirds attracted to its clusters of red tubular flowers. It is found in maritime forests. Buckeye is a small deciduous shrub or tree and grows about 12 feet high. Deer do not eat them, and they grow well in wet or dry soils.
Wax myrtle – *Morella cerifera* is a favorite of birds who use them for nesting and cover as well as for food by foraging on the waxy berries found on the female plants. The leaves are mostly evergreen and are aromatic when crushed. Wax myrtle can grow to a 25 foot tree, but can also be maintained as a hedge, windbreak, or limbed up as a standard.

If this document didn’t answer your questions, please contact HGIC at [hgic@clemson.edu](mailto:hgic@clemson.edu) or 1-888-656-9988.

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6.2.3 From Seeds to Shoreline Folly Beach Community Salt Marsh Restoration Event flyer
Come join the City of Folly Beach for the first From Seeds to Shoreline® community restoration day! You will enjoy a morning dedicated to learning about and helping your local environment as you transplant *Spartina alterniflora* (smooth cord grass) seedlings to eroded areas of salt marsh and engage in stewardship activities. This event is free to attend, but registration is required (and space is limited)!

- **When:** June 12, 2019 from 9:00 AM – 12:30 PM  
  *(lunch sponsored by Ashley Cooper Stormwater Education Consortium)*
- **Where:** Folly Boat Landing and Folly River Park
- **Deadline to Register:** June 7, 2019
- **Registration:** [https://www.surveymonkey.com/r/LHXC6F6](https://www.surveymonkey.com/r/LHXC6F6)

As part of this event, you will engage in the following activities:

- 9:00 – 9:15 AM: Welcome & Introductions
- 9:30-10:30 AM: *Spartina alterniflora* Planting and Restoration
- 10:45-11:45 AM: Salt Marsh Exploration and Stewardship Activities
- 12:00 – 12:30 PM: Lunch (provided)

**History:** The From Seeds to Shoreline® program was established in 2011 by the South Carolina Sea Grant Consortium in partnership with Clemson University Extension and the South Carolina Department of Natural Resources. The program is designed to teach K-12 students and teachers about the importance of the salt marsh ecosystem through engagement in the restoration process: seed collecting, germinating, cultivating, and planting *Spartina* on coastal shorelines.

This first-time community level pilot program is a result of efforts associated with the 2018 City of Folly Beach Marshfront Management Plan.

**Questions?**

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Clemson University Cooperative Extension Service offers its programs to people of all ages, regardless of race, color, gender, religion, national origin, disability, political beliefs, sexual orientation, gender identity, marital or family status and is an equal opportunity employer.
6.3 Structural Inventory Map Book
Shoreline Structures database provided by DHEC-OCRM. Some adjustments have been made.
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Shoreline Structures

- Private Dock/Walkway
- Public Access
- Boat Ramp
- Vehicular Bridge/Causeway
- Commercial Dock
- Abandoned/Historic
- Bulkhead
- Bulkhead with Revetment
- Revetment (Sloped)

Shoreline Structure database provided by DHEC-OCRM. Some adjustments have been made.
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