



# Shoreline Erosion Control Plan



## Washington Park, NC

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# INTRODUCTION

The Town of Washington Park is located in Beaufort County, North Carolina, on the northern shore of the Pamlico River. Developed initially as a “residential subdivision” by Dr. John Small, the town received approval from the North Carolina State Legislature in 1923 to incorporate itself as a town.

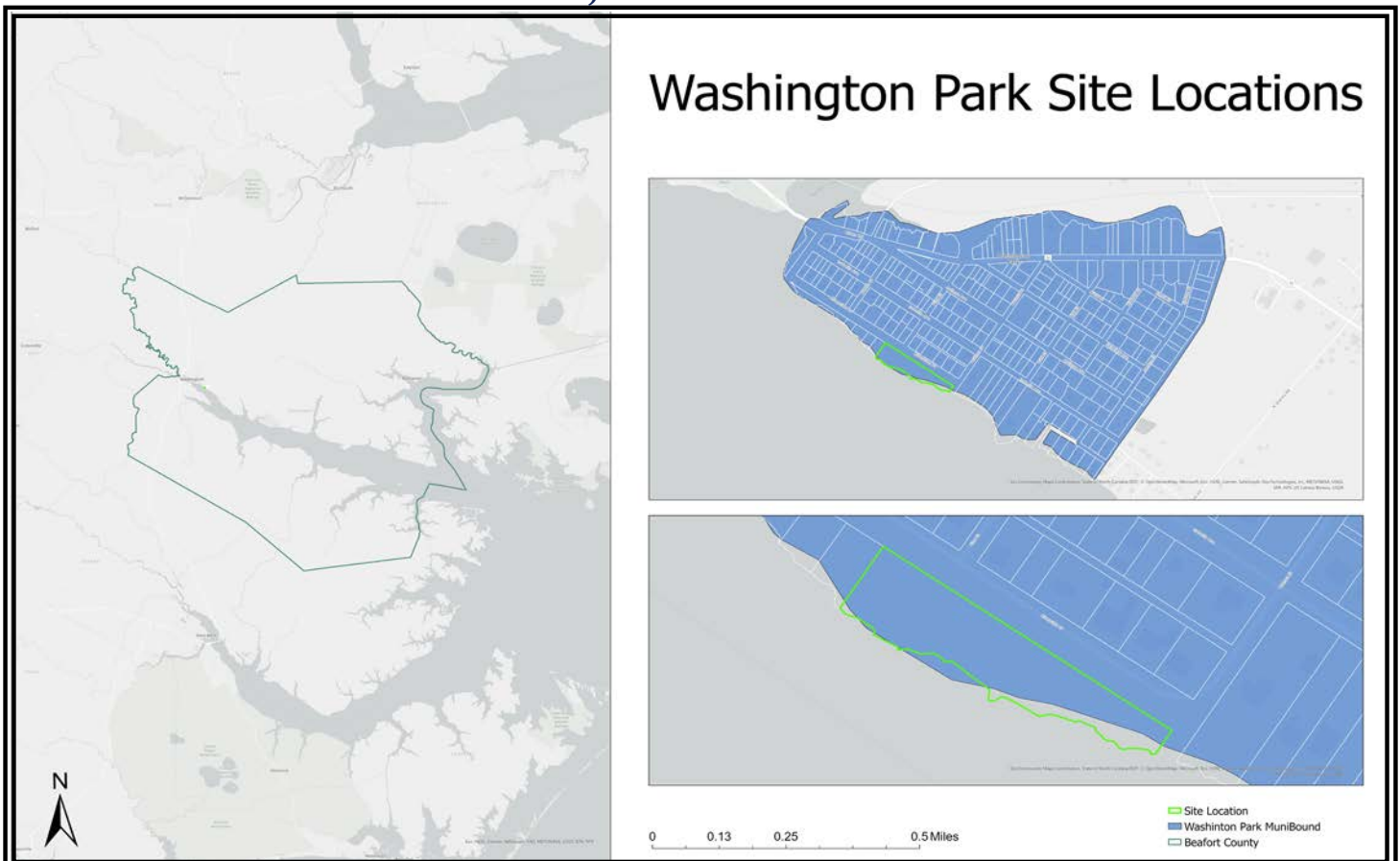
The town, which began as Cedar Grove, is a mix of old houses, new houses, established families, and new families. Early in the town’s history, women would cook huge pots of Brunswick stew on New Year’s Day.

After eating, the town’s men would plant dog-wood trees around the Park. Education and community were part of the town’s foundation when it was first established. The Washington Collegiate Institute called Washington Park home from 1913 until it closed in 1931.

One of the town’s key features is its beautiful waterfront park, where residents hold a pot-luck picnic annually. Residents use the waterfront park throughout the year for active and passive recreational activities.



FIGURE 1  
PROJECT VICINITY







Source: Team picture taken on 10/26/2023

## PROJECT OVERVIEW

The study area consists of 3.2 acres of land owned by Washington Park, NC. The property is located on the southern line of River Drive and along the northern shoreline of the Pamlico River.

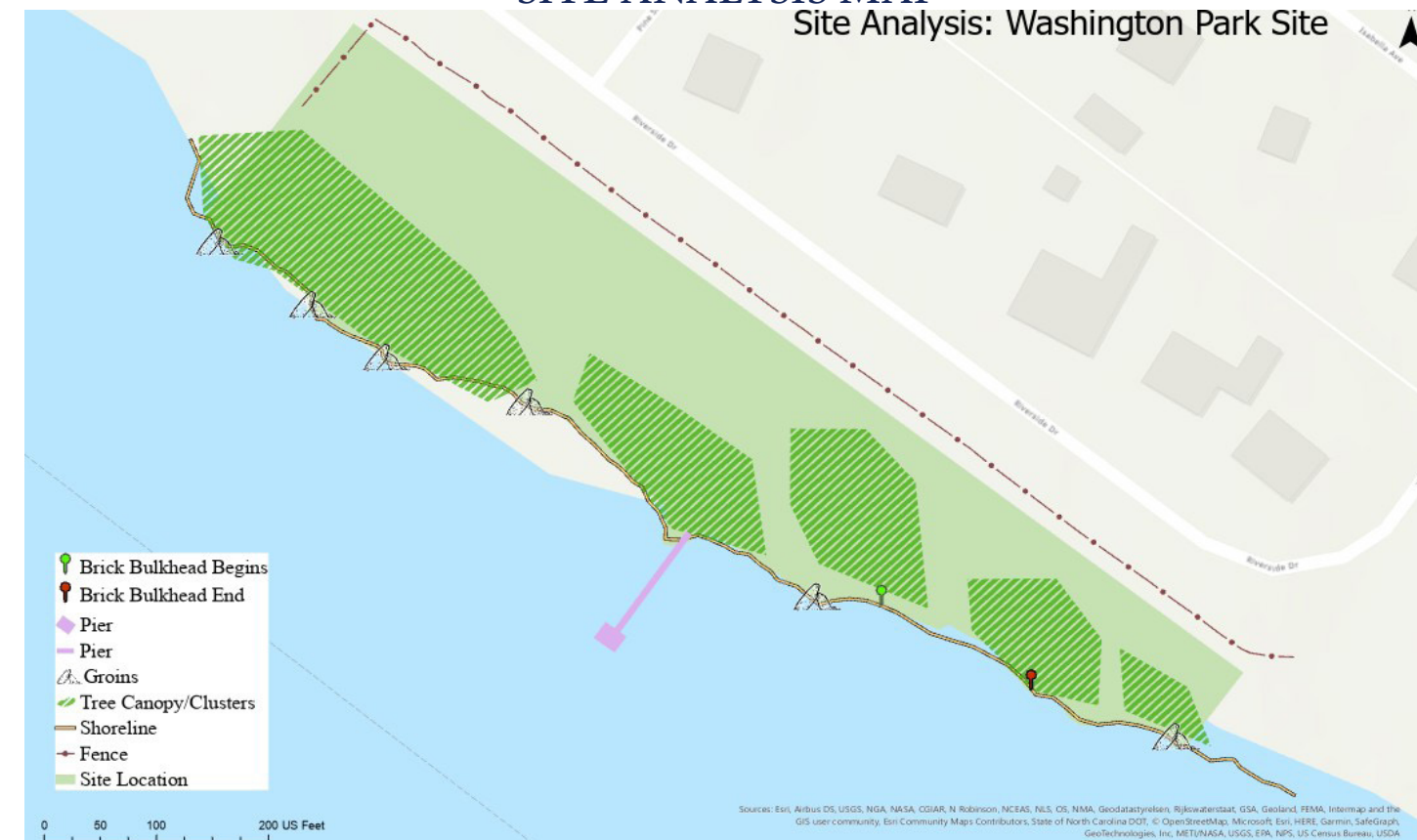
The purpose of this report was to propose a landscape plan to enhance the park's beauty while also increasing its shoreline's stability. Through on-site inspections, it was made clear that the town's first step is to stabilize the erosion areas along the park's shoreline. Historical erosion has been noted for the park, and current and past measures have proved inadequate in preventing further erosion. Based on this, the report will propose recommendations to enhance and stabilize the shoreline and provide minor recommendations to plant life to enhance the park's beauty.

A site analysis was conducted on September 12 and October 26, 2023, to verify the areas of concern, inventory the already established vegetation, and attempt shoreline erosion prevention measures. The shoreline is vegetated with a mixture of low-growth vegetation, mature pine trees, hardwoods, and underbrush directly growing on the shoreline. Various wetlands and marsh grasses were growing along the shoreline as well. Also noted for the park was a handful of juvenile oak trees approximately sixty feet from the shoreline that the town planted to protect the park's shoreline in the future.

Artificial structures were also noted. At least two older, battered docks/piers, six stone groins at least 60 feet apart, and an old deteriorated brick bulkhead were noted along the length of the shoreline.

A site analysis map was created to document all the noted vegetation and structures found during the site analysis and is illustrated in Figure 2.

FIGURE 2  
SITE ANALYSIS MAP  
Site Analysis: Washington Park Site



Example of installed groin. Source: Team picture on 10/26/2023

Example of installed brick bulkhead. Source: Team picture on 09/12/2023



# HISTORICAL EROSION

There is evidence of continuing erosion for the subject shoreline and evidence of erosion near the top of the bank resulting from major storm and wind events. The entire shoreline is exposed to constant wind-driven waves across the Pamlico River.

Aerial imagery taken in October 2015 depicts a healthy-tree-populated shoreline. Imagery taken in February 2017 shows a loss of tree population for the same area.

Further evidence of erosion was observed using NC OneMap imagery taken in 2010 and 2023. A comparison between the two imagery dates illustrates erosion along the shoreline. A comparison between the 2010 and the 2020 shoreline imagery can be seen in Figure 3.



Aerial Image of project site on October 2015. Source: Google Earth



Aerial Image of project site on February 2017. Source: Google Earth

Visual inspections of the shoreline during the two site analyses conducted on September 12, 2023, and October 26, 2023, confirmed the existence of erosion along the shoreline in multiple areas. Some areas were more pronounced than others, as seen within the red circle in Figure 3.



Area as noted within red circle in Figure 3  
Source: Team picture on 10/26/2023



Minor Shoreline erosion. Shoreline receding closer to pine tree.  
Source: Team picture on 09/12/2023

**FIGURE 3**  
**SHORELINE EROSION HISTORY**  
Washington Park Site Erosion Within a 10 Year Span







Picture of submerged aquatic vegetation  
Source: Adobe Stock Images

## SUBMERGED AQUATIC VEGETATION (SAV) SURVEY

The North Carolina Department of Environmental Quality requires a Submerged Aquatic Vegetation (SAV) survey before any development occurs along a coastal shoreline. The study location falls under these regulations, and the team recommends requesting proposals from any land management firm to conduct an SAV survey.

The SAV survey will identify any specific vegetative constraints to developing options, such as hardened shoreline options. The SAV survey will also determine the cause of vegetative loss or lack of vegetation growth along the park's shoreline.

## ENVIRONMENTAL SCOPING

It is also recommended that an inter-agency "scoping" meeting be completed. This type of meeting allows representatives from federal and state agencies to come together to discuss the project and determine necessary practices to be followed when improving the shoreline.

Agencies such as NC Coastal Management, USA Corps of Engineers, NC Wildlife Resources Commission, NC Division of Water Resources, and NC Division of Energy, Mineral and Land Resources are recommended to attend. The team would also recommend that members of the Mid-East Commission be present as they oversee the Beaufort County Land Use plan. Said plan includes Washington Park.

Examples of topics to discuss during the meeting:

1. Location of existing erosion concerns and their possible causes.
2. A discussion of possible erosion control measures.
3. A conversation on the regulatory process.

Feedback from the meeting could develop the need to alter the proposed recommendations or make entirely new recommendations.

A review of the submerged aquatic survey would need to take place. The survey results would recommend the best option for enhancing the park's shoreline. For example, the survey could recommend the implementation of a "living shoreline" in some regions of the park's shoreline. The team recommends this type of enhancement; however, any erosion control measure recommended by the SAV survey should prioritize long-term strength and stability over any environmental improvements.

The scoping meeting would also determine which mandated NC Department of Environmental Quality shoreline development permit should be applied for: Major, Minor, or General.

## PROPOSED SHORELINE ENHANCEMENT OPTIONS

As previously stated, the SAV report and scoping meeting will determine the best course of action for shoreline enhancement. However, our team is recommending the option of a living shoreline for the area within the red circle and natural planting along the other areas of the shoreline.

A living shoreline is a protected, stabilized coastal edge made of natural materials such as plants, sand, or rock. Unlike a concrete seawall or other hard structure, which impedes the growth of plants and animals, living shorelines grow over time.

Natural infrastructure solutions like living shorelines provide wildlife habitat and natural resilience to communities near the waterfront. Living shorelines are considered an innovative and cost-effective technique for coastal management.

Living shorelines can be successfully used on sheltered coasts to dampen wave energy and reduce erosion. Even narrow marshes—a frequent component of living shoreline designs—have been shown to slow waves and reduce shoreline erosion—specifically, *Spartina* spp. Salt marshes have been shown to dissipate wave energy by 50 percent within the first 2.5 meters.



## LIVING SHORELINE

Living shoreline is a broad term encompassing a range of stabilization techniques along estuaries, bays, tributaries, and other sheltered shorelines. Living shorelines are not typically used on beaches on the open ocean.

A living shoreline has a footprint made mostly of native material. It incorporates natural vegetation or other living, natural 'soft elements alone or in combination with some type of harder shoreline structure, like oyster reefs, rock sills, or anchored large wood for added stability. Living shorelines connect the land and water to stabilize the shoreline, reduce erosion, and provide ecosystem services, like valuable habitat, that enhance coastal resilience.

The National Oceanic and Atmospheric Administration (NOAA) provides a diagram of project techniques along a green (natural materials only) to green/gray (hybrid) to gray (all built materials) scale. The diagram can be found below.

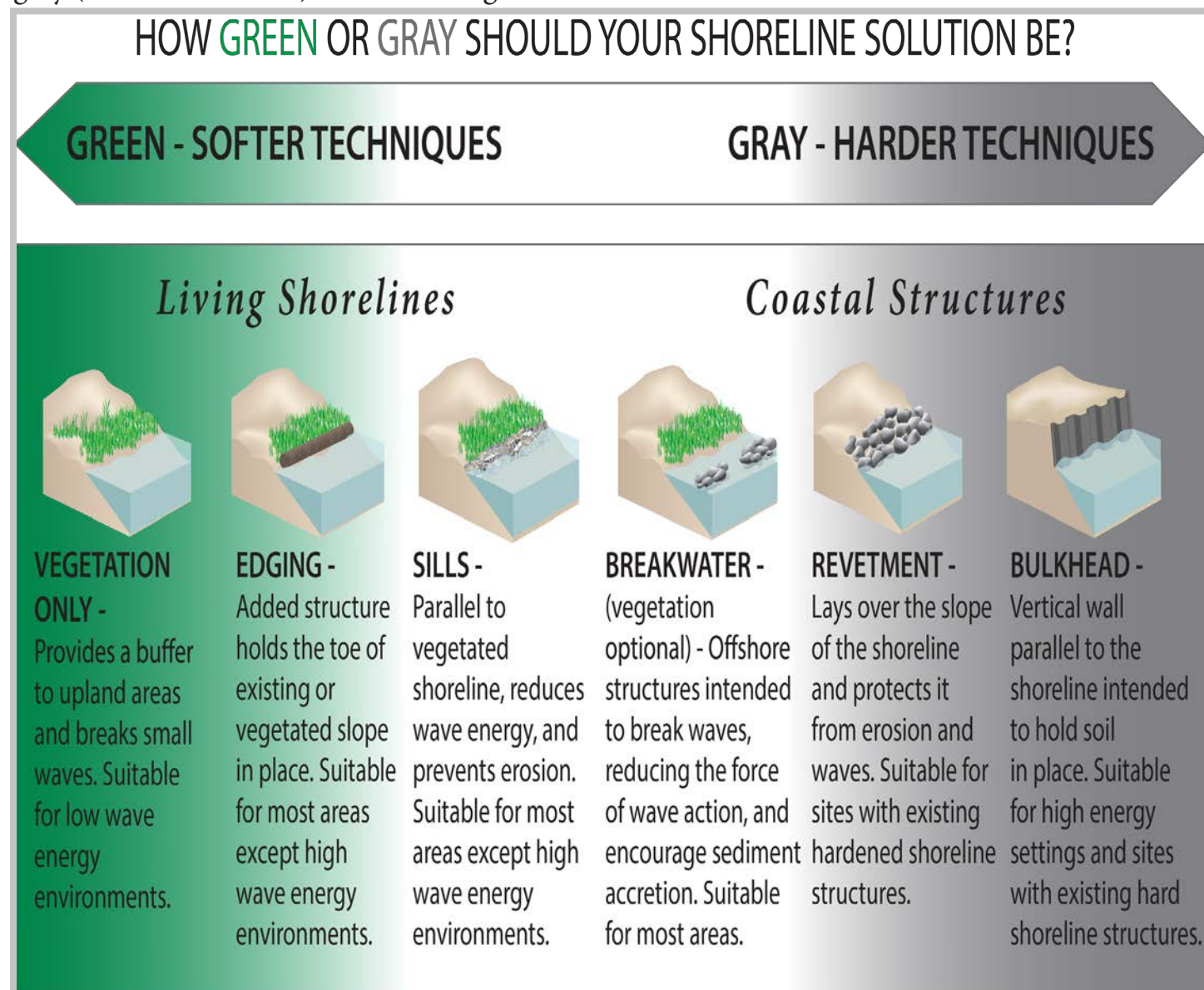


Diagram of living shoreline project types. Source: NOAA

Our team recommends the installation of a marsh sill in the key priority area noted during the site analysis (within the red circle). We also recommend installing natural planting along the shoreline in areas that have not yet experienced heavy erosion but are showing signs.

Below is an example of natural planting to enhance a shoreline. We want to note that the SAV survey and the Environmental scoping meeting will affect whether the living shoreline will be installed. We recommend following the guidance of the two as to whether the survey and the subject matter experts recommended a living shoreline in the proposed areas.

## PROPOSAL #1 NATURAL PLANTING



Example of natural planting for erosion control. Source: NCDEQ

Natural planting includes using new plantings or preserving existing vegetation and may be planted or allowed to colonize naturally. A final established minimum width of 10-20 feet is preferable to dissipate wave energy and thus control erosion. An additional width of 10 feet of upland or riparian vegetation is also preferred.

Marsh grasses dissipate wave energy and wave height through friction and drag and thus help to reduce erosion further inland (usually on the high ground). The vegetation also increases the marsh habitat and provides food for the lower organisms such as algae and seaweeds, finfish and shellfish, mammals, and shorebirds.

Planting vegetation is the cheapest and most environmentally sound stabilization method available. No CAMA permits are necessary for this stabilization method unless there is to be filling or grading.



## EXAMPLES OF VEGETATION

The most effective marsh species are smooth cordgrass and saltmeadow cordgrass. Both are perennial grasses, but they differ in appearance and habitat. Smooth cordgrass grows from 1 foot to 6 feet tall, and saltmeadow cordgrass grows from 1 foot to 3 feet tall. One other plant that can be used by itself or in combination with the cordgrasses is black needlerush. Below are some examples of each species.

### SMOOTH CORDGRASS



Source: Gardenia

### SALTMEADOW CORDGRASS



Source: Gardenia

### BLACK NEEDLERUSH



Source: iNaturalist

## PROPOSAL #2 MARSH SILL

A sill (a.k.a. Marsh Sills or Sheetpile Sills, previously known as Marsh Enhancement Breakwaters) is a shore-parallel, wood, or rock structure designed to protect existing or newly planted wetland vegetation.

A sill is placed offshore of the existing marsh to help reduce the erosion of the waterward edge. If there is no marsh already on the property, a sill is placed just offshore where the marsh would or could grow and is planted. The sill helps to protect the marsh by dissipating enough wave energy so that the marsh can establish itself. Once established, the marsh grasses dissipate wave energy and wave height through friction and drag and thus help to reduce erosion further inland (usually on the high ground).

Marsh vegetation also increases the marsh habitat and provides food for the lower organisms such as algae and seaweeds, finfish and shellfish, mammals, and shorebirds. This stabilization method can be permitted through a CAMA Major or General Permit.

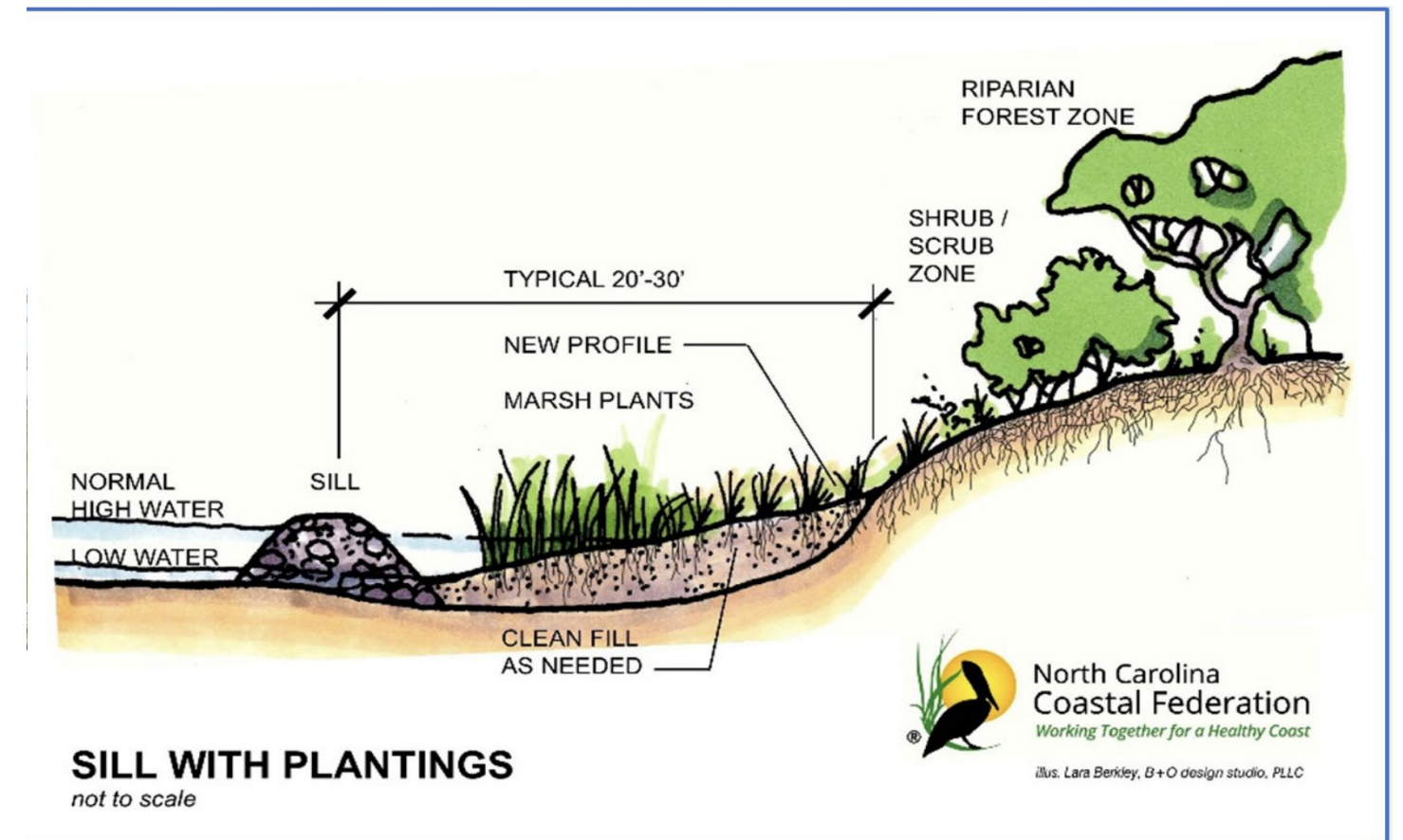


Diagram of sill with plantings (Marsh Sill). Source: NCCF



## MARSH SILL EXAMPLES



Pine Knoll Shores Aquarium Marsh Sill. Source: NCCF



Established Marsh Sill in Maryland Source: Maryland Department of Natural Resources

## PRELIMINARY COST OPINION

The cost of installing either erosion control measure will depend on many factors: cost of material, labor of workers, and future upkeep. The cost also should include any permit that is required for the installations. Our recommendation of natural planting will not require any CAMA permit except if the town wishes to fill in the heavily eroded areas and commence planting natural vegetation. This method will result in a permit and subsequent permit fee. Installing a marsh sill will require either a major or general permit (depending on the project size).

Natural vegetation planting can cost up to \$1,000 per linear foot, depending on the species of vegetation used. Additional operation and maintenance costs of up to \$100 per linear foot for an approximate 50-year project life are to be included.

A marsh sill can cost between \$1,001 to \$2,000 per linear foot, depending on the species of vegetation and material used. Also included are operational and maintenance costs of \$101 to \$500 per linear foot for an approximate 50-year project life.

If the town wishes to enhance the existing groins on the property, they should account for an approximate cost of \$101 to \$500 for their maintenance.

We want to note that the cost of both installations will vary depending on whether the town wishes to install the improvements themselves or if they wish to hire outside contractors to complete the project.

Below is a rough outline created by the NC Coastal Federation for the installation of a marsh sill.

### Out-of-pocket costs & considerations

#### At-a-glance:

##### Stone work & site work

- Price range: \$75–\$150 per linear foot

- Average: \$130

##### Planting (labor & plants)

- \$7.50–\$100 per linear foot / 20 ft wide

- Average: \$22

#### Factors in determining cost:

- equipment access

- stone work
- site work (bottom preparation, land fill)
- access to water
- material (wood, stone, concrete riprap, marl)
- labor for planting
- cost of transporting materials to site
- cost and type of plants

Example of marsh sill construction cost. Source: NCCF



## LIVING SHORELINE



Photo Credit: Maryland Department of Natural Resources - Shoreline Conservation Service

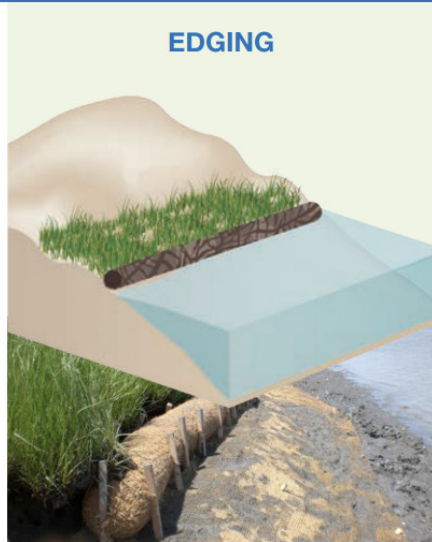


Photo Credit: Partnership for Delaware Estuary

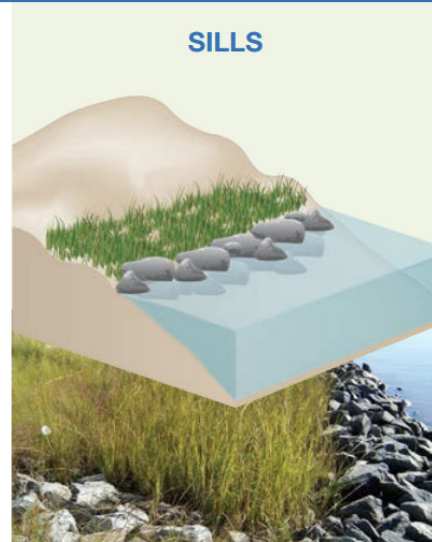


Photo Credit: Maryland Department of Natural Resources - Shoreline Conservation Service

Roots hold soil in place to reduce erosion. Provides a buffer to upland areas and breaks small waves.

**Suitable For**

Low wave energy environments.

**Material Options**

- Native plants\*

**Benefits**

- Dissipates wave energy
- Slows inland water transfer
- Increases natural storm water infiltration
- Provides habitat and ecosystem services
- Minimal impact to natural community and ecosystem processes
- Maintains aquatic/terrestrial interface and connectivity
- Flood water storage

**Disadvantages**

- No storm surge reduction ability
- No high water protection
- Appropriate in limited situations
- Uncertainty of successful vegetation growth and competition with invasive

Structure to hold the toe of existing or vegetated slope in place. Protects against shoreline erosion.

**Suitable For**

Most areas except high wave energy environments.

**Vegetation\* Base with Material Options**

(low wave only, temporary)

- "Snow" fencing
- Erosion control blankets
- Geotextile tubes
- Living reef (oyster/mussel)
- Rock gabion baskets

**Benefits**

- Dissipates wave energy
- Slows inland water transfer
- Provides habitat and ecosystem services
- Increases natural storm water infiltration
- Toe protection helps prevent wetland edge loss

**Disadvantages**

- No high water protection
- Uncertainty of successful vegetation growth and competition with invasive

Parallel to existing or vegetated shoreline, reduces wave energy and prevents erosion. A gapped approach would allow habitat connectivity, greater tidal exchange, and better waterfront access.

**Suitable For**

Most areas except high wave energy environments.

**Vegetation\* Base with Material Options**

- Stone
- Sand breakwaters
- Living reef (oyster/mussel)
- Rock gabion baskets

**Benefits**

- Provides habitat and ecosystem services
- Dissipates wave energy
- Slows inland water transfer
- Provides habitat and ecosystem services
- Increases natural storm water infiltration
- Toe protection helps prevent wetland edge loss

**Disadvantages**

- Require more land area
- No high water protection
- Uncertainty of successful vegetation growth and competition with invasive

\* Native plants and materials must be appropriate for current salinity and site conditions.

Initial Construction: ●  
Operations & Maintenance: ●

Initial Construction: ●●  
Operations & Maintenance: ●

Initial Construction: ●●●  
Operations & Maintenance: ●

Initial Construction: ● = up to \$1000 per linear foot, ●● = \$1001 - \$2000 per linear foot, ●●● = \$2001 - \$5000 per linear foot, ●●●● = \$5001 - \$10,000 per linear foot  
Operations and Maintenance (yearly for a 50 year project life): ● = up to \$100 per linear foot, ●● = \$101 - \$500 per linear foot, ●●● = over \$500 per linear foot

Diagram noting cost of initial construction and maintenance. Source: NOAA

## PERMITTING REQUIREMENTS

The location of the project area requires permitting from the North Carolina Department of Environmental Quality (DEQ) under the Coastal Area Management Act (CAMA). Under CAMA requirements, three types of development permits are available: major, minor, and general. The major versus minor permit threshold is at 500 linear feet of proposed shoreline improvements.

Of the two proposals the team recommends, the marsh sill installation requires a general permit with DEQ. However, this permit places a maximum sill length of 500 feet. The general permit has specific requirements for the applicant to complete before it is considered for approval. Figure 4 provides a step-by-step process for the application procedures.

The priority area designated within the red circle is less than 100 linear feet. Thus, it does not qualify for the major permit threshold. The town could extend the marsh sill further down the shoreline with this short length in either direction as they see fit. However, they must be mindful of the requirements outlined in the general permit. Two key specifications are below.

FIGURE 4  
GENERAL PERMIT STEPS

- Contact the CAMA office in Washington, North Carolina to schedule a site visit with a representative to discuss the project.
- Notify adjacent riparian property owners.
- Contact the CAMA office in Washington, NC to set up a site visit once notifications are returned for permit issuance.
- Pay a \$200 application fee for the general permit.

Please note, the CAMA representative will provide the final decision on the proposed project and will make recommendations on whether additional permitting is needed.

DEQ also requires specific conditions for sill installation. Examples of these specific conditions are below:

1. Sills shall have at least one five-foot opening every 100 feet and may be staggered, overlapped, or left open as long as the five-foot separation between sections is maintained.
2. Sills shall be marked at 50-foot intervals with yellow reflectors extending at least three feet above normal high water and normal water level and shall be maintained for the structure's life.



## POTENTIAL FUNDING OPPORTUNITIES

Several avenues can be pursued to apply for funding assistance for installing a living shoreline to promote environmental health and prevent further erosion. Several Federal, State, and non-local grants can be applied for on the Department of Environmental Quality's website.

The North Carolina Land and Water Fund is an example of potential financial assistance. The North Carolina Land and Water Fund (NCLWF), previously the Clean Water Management Trust Fund, is administered by the North Carolina Department of Natural and Cultural Resources (NCDNR). Stream Restoration is one of several categories, including land acquisition and innovative stormwater measures for highly competitive grant funds.

Appendix A lists additional potential funding opportunities through other government and non-local agencies.

## RECOMMENDATIONS

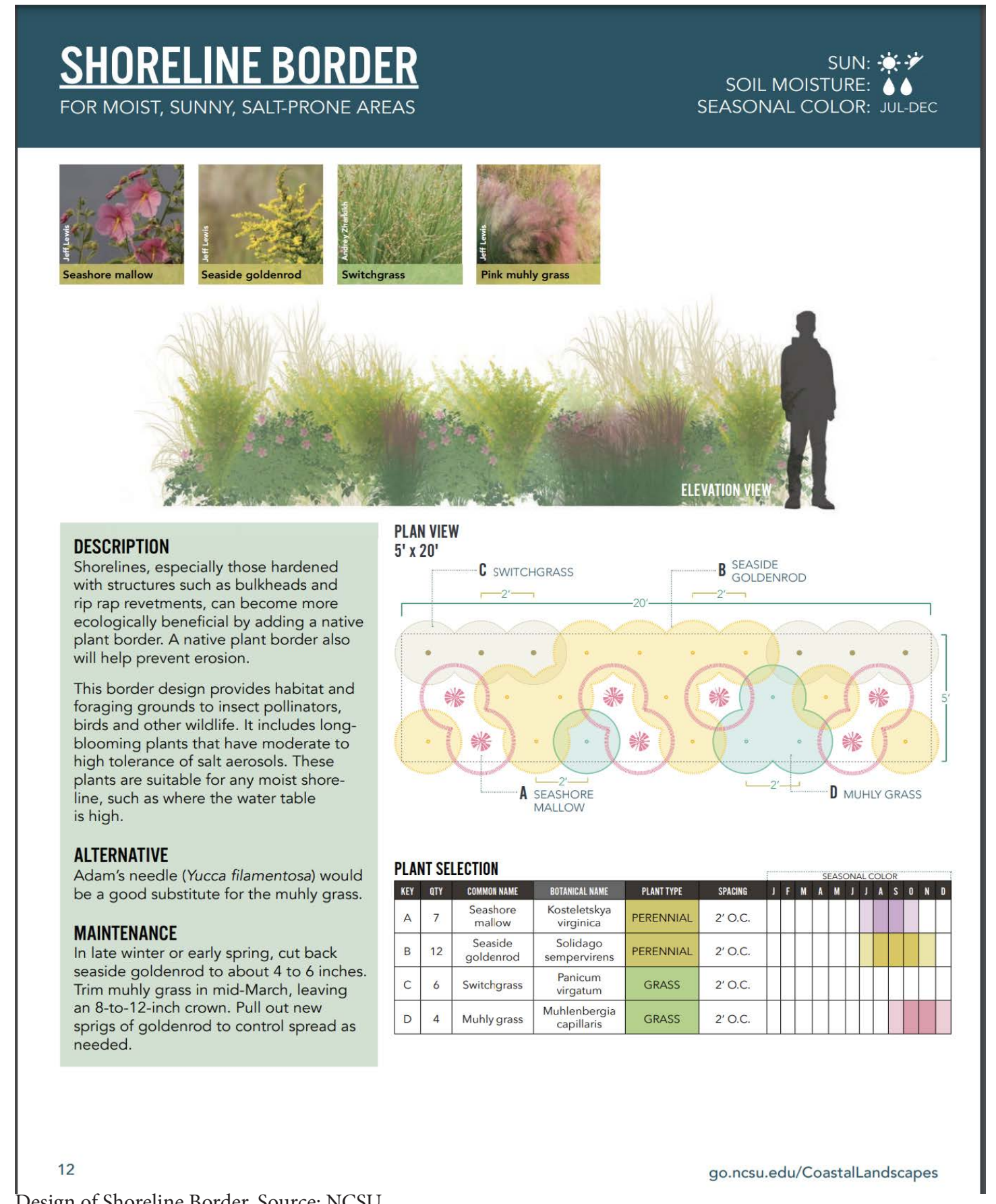
Shoreline erosion control mitigation is recommended to be pursued utilizing a living shoreline. A marsh sill development is proposed in the high-priority area noted in Figure 2. Natural planting is recommended in all other areas showing signs of minor erosion but is not at the critical stage of failure.

Prior to initiating survey, design, and permitting tasks, Washington Park may wish to pursue grants to assist with funding for shoreline erosion mitigation improvement.

As stated in the project overview, we were initially tasked with developing a landscape plan for the town's community park to enhance the beauty and stabilize the eroding shoreline. We recommend the following design created by North Carolina State University, showing an example of how flowering plant life can border a shoreline. Figure 5 expresses the design, and we recommend following its recommendations to enhance the beauty of the shoreline's border, ultimately enhancing the beauty of the community park.



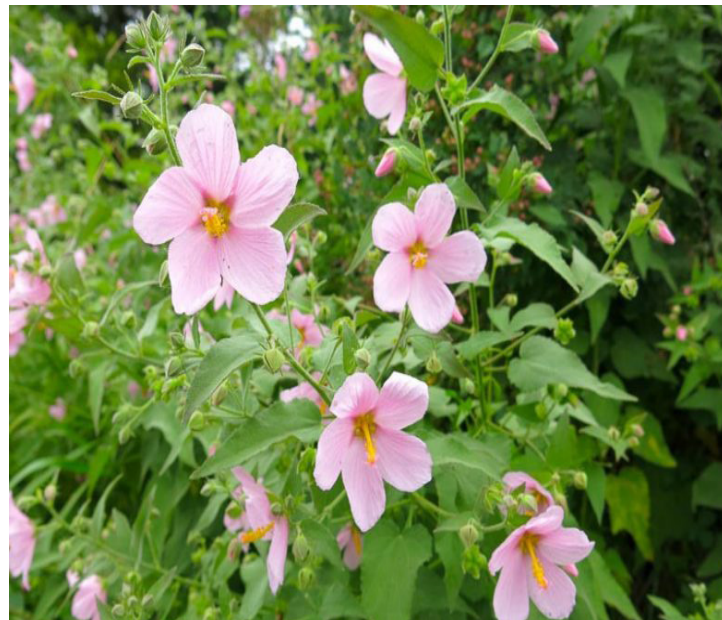
**FIGURE 5  
FLOWERING SHORELINE BORDER**





## FIGURE 5 IMAGES INLARGED

SEASHORE MALLOW



Source: Gardenia

SEASIDE GOLDENROD



Source: Gardenia

SWITCH GRASS



Source: Gardenia

PINK MUHLY GRASS



Source: Gardenia

## APPENDIX A: POTENTIAL FUNDING OPPORTUNITIES

### DCM/CAMA:

- Planning and Management Grants

### STATE/NON-FEDERAL:

- Water Resources Development Grant Program
- Community Conservation Assistance Program (CCAP)

### FEDERAL:

- National Coastal Resilience Fund and Grants

### OTHER SOURCES, PARTNERS AND ASSISTANCE:

- North Carolina Sea Grant
- American Institute of Architects  
Sustainable Design Assessment Team (SDAT) Program
- North Carolina Coastal Federation
- The Nature Conservancy - North Carolina Chapter
- Coastal Land Trust
- Albemarle-Pamlico National Estuary Partnership (APNEP)
- North Carolina Land of Water (NC LOW)

### NATIONAL AND INTERNATIONAL

- National Fish and Wildlife Foundation - Conservation Programs



## APPENDIX B: LIST OF TRAINED & CERTIFIED LIVING SHORELINE CONTRACTORS

— Northeast Coast Contractors — — Central Coast Contractors — — Southeast Coast Contractors —

### ▶ Outer Banks Excavating

mperry@perrymarine.com  
Mark Perry  
(252) 202-8733

### ▶ Total Marine Services Inc

Winkie Silver  
(252) 473-3338

### ▶ Backwater Environmental

www.backwater.biz  
(919) 523-4375  
newell@backwater.biz

— Northeast Coast Engineers —

### ▶ Bissell Professionals

www.bissellprofessionalgroup.com  
Dave Blebitz  
(252) 261-3266

### ▶ Quible & Associates

www.quible.com  
Brian Rubino, Warren Eadus  
(252) 291-8147

### ▶ Albemarle & Associates, Ltd.

www.albemarleassociates.com/  
John M. Delucia  
(252) 441-2113

### ▶ Restoration Systems

www.restorationsystems.com  
(252) 333-9852  
mary-margaret@  
restorationsystems.com

### ▶ Sandbar Oyster Company

www.sandbaroystercompany.com  
(252) 732-4516  
Niels@SandbarOysterCompany.com  
Clammerhead@SandbarOysterCompany.com

### ▶ Bobby Cahoon Marine

**Construction**  
www.bobbycahoonconstruction.com  
(252)249-1617  
bobbycahoonconstruction@yahoo.com

### ▶ Mud Bucket Dredging

www.mudbucketdredgingnc.com  
(252) 241-1504  
mudbucketnc@gmail.com

### ▶ Brooks Dredging and Marine Construction, Inc.

www.brooksdredging.com  
(252) 728-6886  
dbrooks62@ec.rr.com

### ▶ TD Eure Marine Construction, LLC

www.tdeuremarine.com  
252-728-4191  
andrew@tdeure.com  
shay@tdeure.com

### ▶ Connaway Marine

**Construction**  
frontyardshrimp@gmail.com  
Chris Connaway  
(910) 264-9599

### ▶ Maritech, LLC

adamknierim@gmail.com  
Adam Knierim  
(910) 270-4058

## APPENDIX C: POTENTIAL VEGETATION SUPPLIERS

### Marsh Grass Suppliers

**Smooth Cordgrass (*Spartina alterniflora*), Saltmeadow Cordgrass (*Spartina patens*) and Black Needlerush (*Juncus roemarianus*)**

\*Carry only Smooth Cordgrass (*Spartina alterniflora*)

Carolina Home & Garden  
4778 Highway 24 East  
Newport, NC 28570  
252-393-9004  
[carolinahomegarden.com](http://carolinahomegarden.com)

\*Coastal Transplants  
1509 George II Hwy SE  
Bolivia, NC 28422  
910-512-2204  
[coastaltransplants.com](http://coastaltransplants.com)

Garner's Landscaping & Plant Stand  
173 Sam Garner Rd  
Newport, NC 28570  
252-241-1184  
[garnerslandscaping.com](http://garnerslandscaping.com)

Lumber River Native Plants  
7000 Livingston Rd.  
P.O. Box 42  
Gibson, NC 28343  
336-601-8787  
[ncnativeplants.com](http://ncnativeplants.com)

Mellow Marsh Farm  
1312 Woody Store Road  
Siler City, NC 27344  
919-742-1200  
Fax: 919-742-1280  
[mellowmarshfarm.com](http://mellowmarshfarm.com)

Sunshine Garden Market  
1700 Live Oak St.  
Beaufort, NC 28516  
252-342-6335  
[sunshinegardenmarket.com](http://sunshinegardenmarket.com)

Wetland Plants Inc.  
812 Drummonds Point Road  
Edenton, NC 27932  
252-482-5707  
[wetlandplantsinc.com](http://wetlandplantsinc.com)

Note: The Division of Coastal Management does not endorse the vendors listed above and is only providing resources for marsh grass.

Williams Farm and Garden Center  
1309 Old Cherry Point Rd.  
New Bern, NC 28560  
252-638-1983  
[williamsfarmandgardencenter.com](http://williamsfarmandgardencenter.com)

### Out of State:

Aquatic Plants of Florida  
8305 Wauchula Road  
Myakka City, FL 34251  
800-266-1272  
941-378-2700  
[apofl.com](http://apofl.com)

Environmental Concern Inc.  
P.O. Box P  
201 Boundary Lane  
St. Michaels, MD 21663  
410-745-9620  
[wetland.org](http://wetland.org)

Pinelands Nursery & Supply  
323 Island Road  
Columbus, NJ 08022  
609-291-9486  
[pinelandsnursery.com](http://pinelandsnursery.com)

Created by: NC Sea Grant Revised March 2017



## RESOURCES

Albermarle-Pamlico National Estuary Partnership. (2023). APNEP Soundings blog - partners work together to protect North Carolina's Underwater Meadows. APNEP. <https://apnep.nc.gov/our-work/monitoring/submerged-aquatic-vegetation-monitoring>

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Broome, S. W., Rogers, S. M., & Seneca, E. D. (n.d.-b). Shoreline Erosion Control Using Marsh Vegetation and Low-Cost Structures. [http://ccrm.vims.edu/livingshorelines/documents/Promotional/shore\\_erosion\\_marsh\\_NC.pdf](http://ccrm.vims.edu/livingshorelines/documents/Promotional/shore_erosion_marsh_NC.pdf)

Currin, C. A., J. Davis, L.C. Baron, A. Malhotra, and M. Fonseca (2015) Shoreline change in the New River Estuary, NC: rates and consequences. *Journal of Coastal Research* 31(5) 1069-1077.

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