



Implementing Living Shorelines through Community Engagement, Partnerships, Science, Policies and Funding

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*Coastal Resilience in the Southeast:
Science, Policies, and Programs
Furthering Local Resilience Goals*

March 13, 2020



North Carolina
Coastal Federation
Working Together for a Healthy Coast

North Carolina Coastal Federation

Working Together for a Healthy Coast

- Collaborate and engage people from all walks of life to protect and restore coastal water quality and habitat throughout the North Carolina coast
- Member supported organization founded in 1982
- 30 staff and 30 board members
- Cover North Carolina's 20 coastal counties
- Offices in Wanchese, Ocean and Wrightsville Beach, NC



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What We Work For – Our Goals

- **Clean coastal waters** that support fishing and swimming
- **Living shorelines** that reduce soundside erosion and provide habitat
- **Thriving oysters** that support the coastal environment and economy
- **Effective coastal management** that protects our coast
- A coast that is **free of marine debris**



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Living Shorelines



Shoreline Erosion

- Storms
- Sea level rise
- Higher water levels and tides
- Boat wakes
- Shoreline hardening
- Development



How Living Shorelines and Salt Marsh Stabilize Shorelines and Protect Habitat



Living Shoreline Types



Salt Marsh Planting



Offshore Sill with Landward
Salt Marsh Grass Plantings



Marsh-toe Revetment

Effectiveness of Living Shorelines

Bogue Sound, Pine Knoll Shores, NC



Before (2007)



After 9 Years (2016)

Benefits of Living Shorelines

- Natural alternative to the traditionally used hard shoreline stabilization methods
- Attenuate waves and reduce shoreline erosion
- Restore and protect valuable salt marsh and oyster habitat
- Improve water quality
- Resilient and outperform bulkheads through storms
- Increase property value
- Less expensive than bulkheads

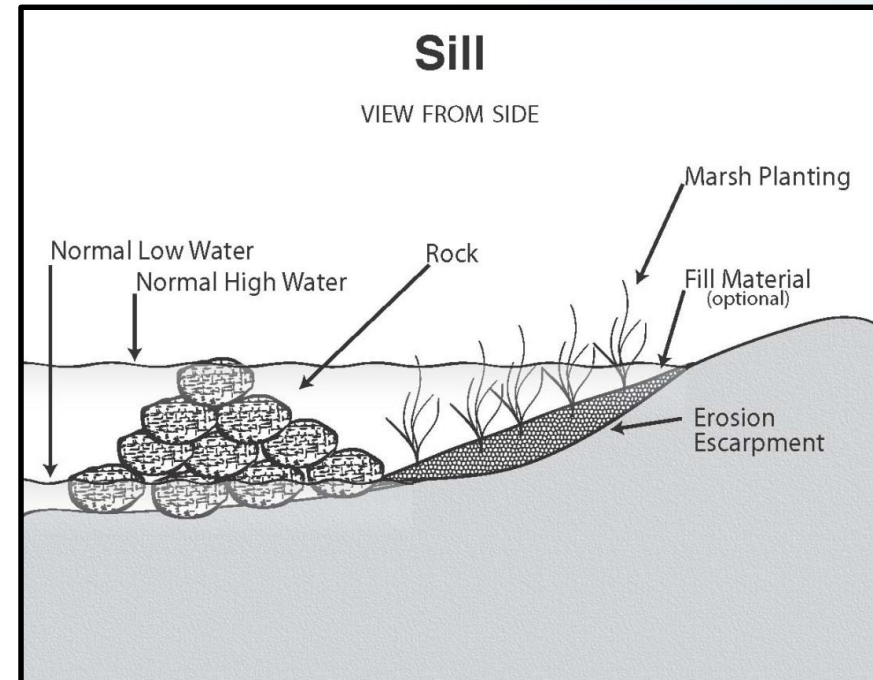


Co-benefits of Living Shorelines



Living Shoreline Design Considerations

- Wave energy
- Fetch
- Predominant wind direction
- Water depths
- Proximity to navigation channels
- Shoreline orientation
- Extent of erosion
- Slope
- Natural abundance of oysters
- Cost
- Property owner preference



Living Shoreline Materials

Mesh Bags Filled with Recycled Oyster Shells

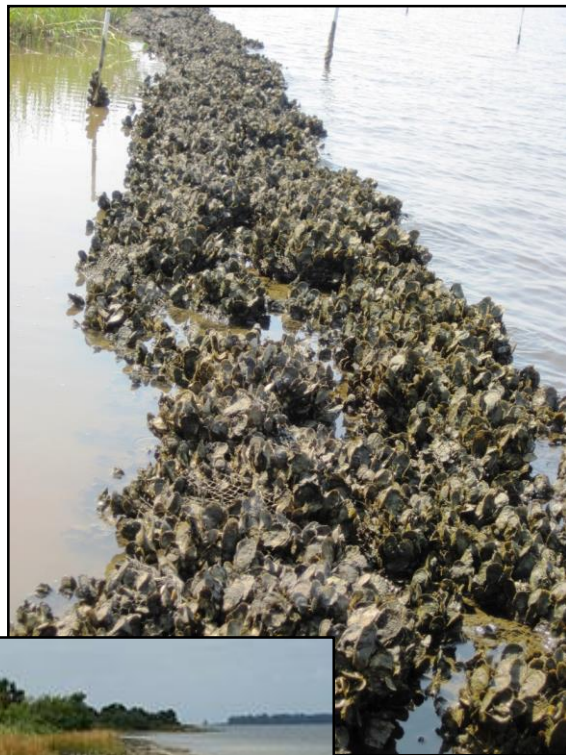


Photo Credit: Tampa Bay Watch



Photo Credit: Vance Miller

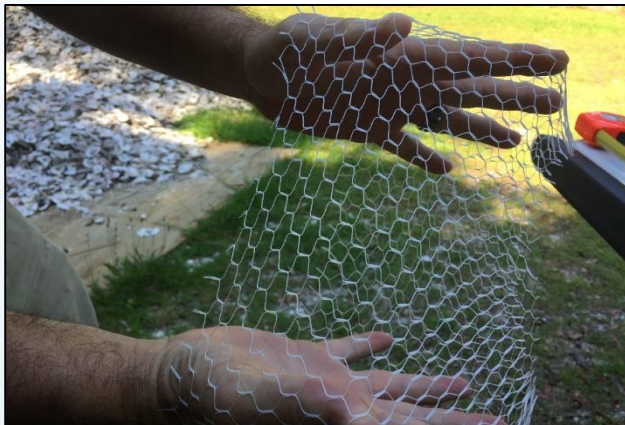


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Living Shoreline Materials

Testing Alternatives to Traditional Mesh Bags

filtrex[®]
SUSTAINABLE TECHNOLOGIES



Tensar.



GREEN
Recycling Solutions, LLC



Living Shoreline Materials

Oyster Catcher™



Oyster Domes/Reef Balls



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Living Shoreline Materials

Oyster Castles

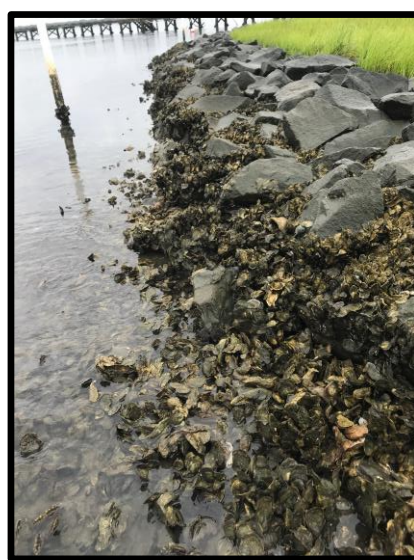


Atlantic ReefMaker EcoSystems



Living Shoreline Materials

Granite, Concrete and Marl



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Living Shoreline Maintenance

- Bulkheads often require costly repairs and replacement
- Living shorelines require minimal to no maintenance
 - Salt marsh is restored in 1-3 years
- Fared extremely well after Hurricane Florence
 - Salt marsh plants and rock sills were not affected by the storm
 - Oyster shell bags also remained in place



Post-Hurricane Florence



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Partnerships

- Students
- Community
- Waterfront Property Owners
- Businesses
- Marine Contractors
- Engineers
- Developers
- Universities and Colleges
- Local, State and Federal Agencies
- Other Non-Profit Organizations



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Living Shoreline Permitting

- Salt marsh planting alone: no permit required
- Marsh sill and marsh-toe revetment: Coastal Area Management Act (CAMA) General Permit
 - \$200 fee
 - Project location map and designs
 - Adjacent property owner signatures
 - Valid for 120 days
- CAMA Major Development Permit
 - \$400 fee
 - Additional application materials
 - Reviewed by 13 state and federal agencies
 - Valid for 3 years



Living Shoreline Construction and Implementation: Community Engagement



Hands on Education and Restoration



Living Shoreline Open Houses

Living Shoreline Construction and Implementation: Contractors



Funding

- N.C. Division of Soil and Water Conservation's Community Conservation Assistance Program
- N.C. Clean Water Management Trust Fund
- N.C. Division of Water Resources
- National Oceanic and Atmospheric Administration
- National Fish and Wildlife Foundation
- USDA Natural Resources Conservation Service
- Southeast Aquatic Resources Partnership
- Atlantic Coastal Fish Habitat Partnership
- Grady White Boats
- TogetherGreen



GRADY-WHITE BOATS



Homeowner Scale Living Shoreline

Steepy Property and Neighbors, Newport River, NC



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Construction



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Cost-Share Funding

- N.C. Division of Soil and Water Conservation's Community Conservation Assistance Program (CCAP)
- National Oceanic and Atmospheric Administration (NOAA)



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Community Scale Living Shoreline: Sanders Point at Trinity Center



Erosion at Sanders Point



Winter 2012-2013



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Planning and Permitting January-December 2013



Seagrass and Shellfish Survey
Sanders Point Oyster and Salt Marsh Habitat Restoration
Applicant: Trinity Center/Episcopal Diocese of East Carolina
Date: September 6, 2013

Methods
A seagrass and shellfish survey was performed in April 2013 by staff from the North Carolina Coastal Federation and Trinity Center along the center's shoreline at Sanders Point. The surveys were conducted in the vicinity of the proposed oyster shell bag sills. Six vegetation transects (30 ft apart) were sampled for vegetation type and percent coverage every 15 ft using a 0.5 m PVC oyster shell bag sills. The transects extended from NW to SE past the footprint of the proposed oyster shell bag sills. The footprint of the proposed oyster shell bag sills was also noted along the footprint of the proposed oyster shell bag sills. In addition to the April survey, photos were taken to demonstrate that seagrass is not present in this area during the time of peak biomass.

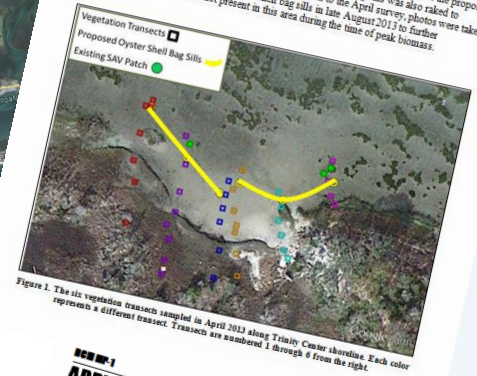


Figure 1. The six vegetation transects sampled in April 2013 along Trinity Center shoreline. Each color represents a different transect. Transects are numbered 1 through 6 from the right.

Form DCM MP-2 EXCAVATION and FILL (Except for bridges and culverts)

Attach this form to your application for CMAA Major Permit. For Application that relate to this proposed project. Please include all activities described below the purpose of proposed excavation and/or fill activity.

Length	Access Channel (NLW or RWL)	Canal	Boat Basin	Boat
Any Existing				
Final Project				
Depth				

- 1. EXCAVATION**
a. Amount of material to be excavated from below NLW or RWL in cubic yards:
b. Type of material to be excavated:
c. Does the area to be excavated include coastal wetlands/marsh or other sensitive (NLW) and/or bottom (SB) resources? If yes, where?
d. High-ground excavation in cubic yards:
e. Describe the purpose of the excavation in these areas:

- 2. DISPOSAL OF EXCAVATED MATERIAL**
a. Location of disposal area:
b. Dimensions of disposal area. *This section not applicable.*
c. Do you own the disposal area?
d. Will a disposal area be available for future maintenance?
e. Does the disposal area include any coastal wetlands/marsh or other sensitive (NLW) and/or bottom (SB) resources? If yes, where?
f. Does the disposal include any area in the water?
g. If yes, how much water area is affected?

Project Narrative
Sanders Point Oyster and Salt Marsh Habitat Restoration
Applicant: Trinity Center/Episcopal Diocese of East Carolina
Date: September 12, 2013

Background
Trinity Center, located in Pine Knoll Shores on Bogue Banks in Carteret County, is a retreat and worship center of the Episcopal Church's Diocese of East Carolina (see Trinity Center Project Location Map). Through the years, numerous storms, particularly Hurricane Irene in 2011 and Hurricane Sandy in 2012, have eroded the center's shoreline along Bogue Sound at Sanders Point, named in honor of the Rt. Rev. B. Sidney Sanders, VI Bishop of the Diocese of East Carolina (Figure 1). Sanders Point is Trinity Center's cherished landmark and worship area.



Figure 1. Erosion along Trinity Center's Bogue Sound shoreline at Sanders Point.

Form MP-1 APPLICATION for Major Development Permit (last revised 12/27/00)

North Carolina DIVISION OF COASTAL MANAGEMENT

1. Primary Applicant/Landowner Information

Business Name: Trinity Center/Episcopal Diocese of East Carolina

Project Name (if applicable): Sanders Point Oyster and Salt Marsh Habitat Restoration

Applicant 1: First Name: Maghan Last Name: Maghan Title: Director

Address: 815 Satter Path Road City: Pine Knoll Shores State: NC Zip: 28512

Phone No. 1: 850-874-8282 ext: 200 Phone No. 2: 850-874-8282 ext: 200

Email: mdmaghan@trinitycenter.com

2. Agent/Contractor Information

Business Name: Trinity Center/Episcopal Diocese of East Carolina

Agent/Contractor 1: First Name: Maghan Last Name: Maghan Title: Director

Address: 815 Satter Path Road City: Pine Knoll Shores State: NC Zip: 28512

Phone No. 1: 850-874-8282 ext: 200 Phone No. 2: 850-874-8282 ext: 200

Email: mdmaghan@trinitycenter.com

<Form continues on back>

September 6, 2013
TO: Trinity Center/Episcopal Diocese of East Carolina
FROM: Trinity Center/Episcopal Diocese of East Carolina
SUBJECT: Major Development Permit
CMAA Major Permit No. 2013-12
City, State, Zip Code: NC 28512

Dear Adjacent Property:
This letter is to inform you that Trinity Center/Episcopal Diocese of East Carolina have applied for a CMAA Major Permit on property at 815 Satter Path Road, Pine Knoll Shores, NC 28512 in Carteret County.
Permit on my property at 815 Satter Path Road, Pine Knoll Shores, NC 28512 in Carteret County.
As required by CMAA regulations, I have enclosed a copy of my permit application and project drawing(s) as notification of my proposed project. No action is required from you or you may sign and return the enclosed objection form. If you have any questions or comments about my proposed project, please contact me at (850) 874-8282 or mdmaghan@trinitycenter.com at the address listed below. If you wish to file written comments or objections with the N.C. Division of Coastal Management, you may submit them to:
N.C. Division of Coastal Management
400 Commerce Ave.
Morehead City, NC 28557

Sincerely,
Maghan Dismen, Trinity Center
P.O. Drawer 380
Trinity Center
Satter Path, NC 28512
City, State, Zip Code

Acquiring and Bagging the Oyster Shells



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Trinity Center needs your help!

Trinity Center's Sound to Sea Environmental Education program is partnering up with the North Carolina Coastal Federation to restore the salt marsh.

When: January 20, 2014 1:00pm

Where: Trinity Center
618 Salter Path Rd
Pine Knoll Shores

What to Bring: Clothes and closed-toed shoes that can get dirty, a water bottle, and work gloves, galoshes, or rain boots if you have them.

Please call if you have questions:

Call 252-247-5600 ext 16

On [Sound to Sea's Facebook page](#)

Email mdinneen@trinityctr.com

Trinity Center plans to restore the salt marsh at Sanders Point, a part of the conference center near and dear to the hearts of many who come here. Human and natural activities have eroded away the marsh that acts as a natural barrier in front of Sanders Point. Sound to Sea staff and volunteers have been bagging oyster shells in preparation for an oyster sill that will be installed at Sanders Point. The sill will slow down waves that have been pulling soil away from the marsh. As those waves slow, they will drop sediment suspended in the water, building the marsh back up. The oyster sill will also be habitat for new oysters to grow on and hopefully provide shelter for many other small sound inhabitants.





We built 150 feet of the oyster sill with the help of about 30 volunteers and 14 staff.



Sound to Sea staff built the last 50 feet one week later.



Salt Marsh Plantings





Before



April 2014



May 2015



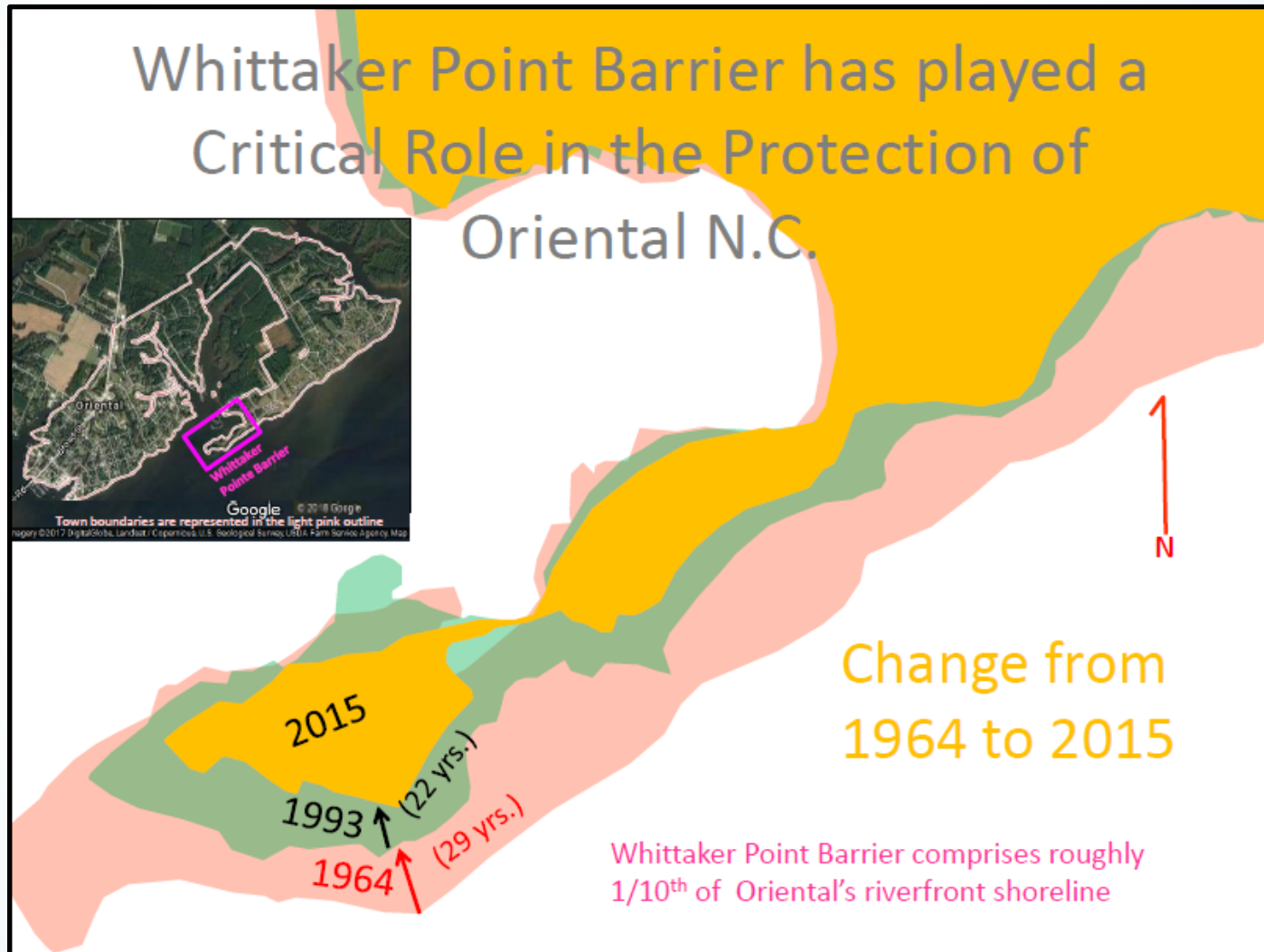
September 2018

Meghan Dinneen (Program Coordinator) & Mindy Furrer (Education Director), Sound To Sea Pelican Award Winners 2014



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Local Government Scale Living Shoreline Town of Oriental, NC



Whittaker Point, Oriental, NC

Funding

- National Fish and Wildlife Foundation (NFWF)
- Golden LEAF Foundation
- N.C. Division of Water Resources (DWR)
- USDA Natural Resources Conservation Service (NRCS)



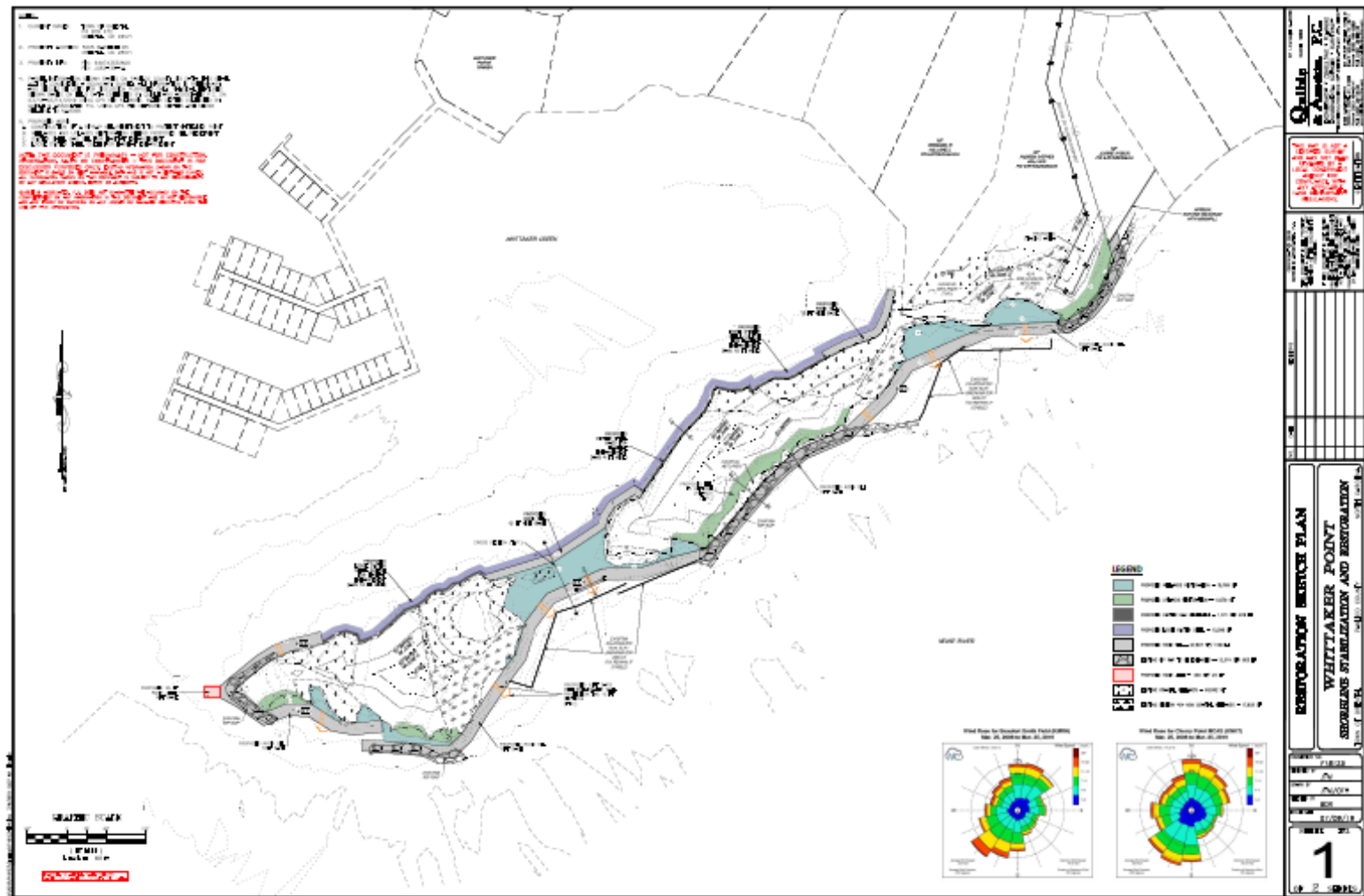
Erosion at Whittaker Point



Slide provided by Jim Blackerby

Whittaker Point Living Shoreline Design

Quible & Associates, P.C.



National and International Case Study:

US-Netherlands Infrastructure Resilience Collaboration



Needs for Increasing the Use of Living Shorelines in the Future

- Strong promotion of living shorelines by regulatory and resource agencies
- Projects should be expected to conduct an alternative's analysis to identify most effective shoreline stabilization method
- Financial incentive programs
- Grant opportunities for communities
- Short-term construction insurance
- Business programs for marine contractors





North Carolina Coastal Federation

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Northeast Regional Office

637 Harbor Road, P.O. Box 276
Wanchese, NC 27981
252-473-1607

Headquarters & Central Regional Office

3609 N.C. 24
Newport, NC 28570
252-393-8185

Southeast Regional Office

309 W. Salisbury Street
Wrightsville Beach, NC 28480
910-509-2838

www.nccoast.org