Promoting Living Shorelines for Erosion Control

February 19, 2019

Coastal Studies Institute

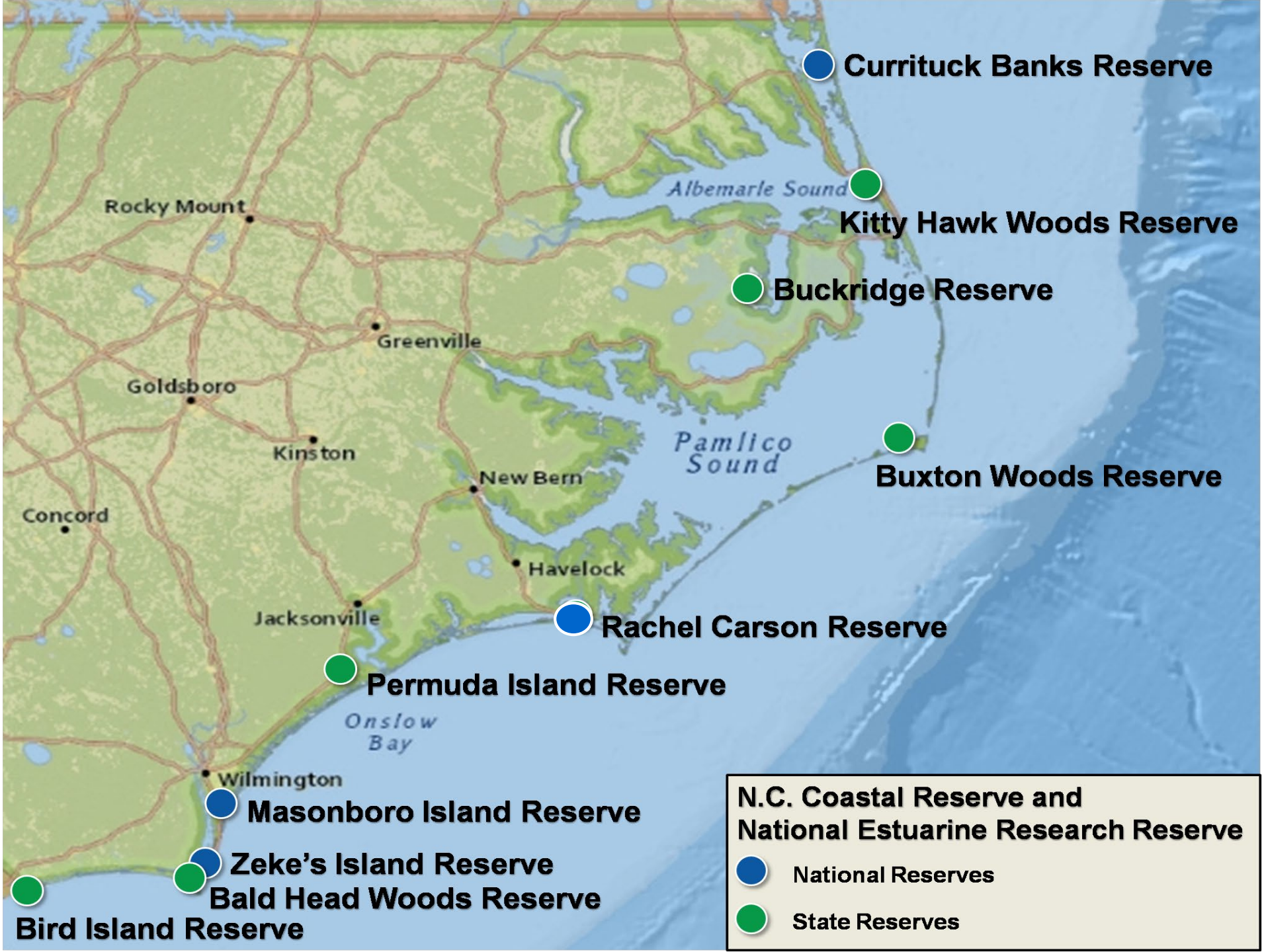
29 National Estuarine Research Reserves

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

NC
Coastal Management
ENVIRONMENTAL QUALITY

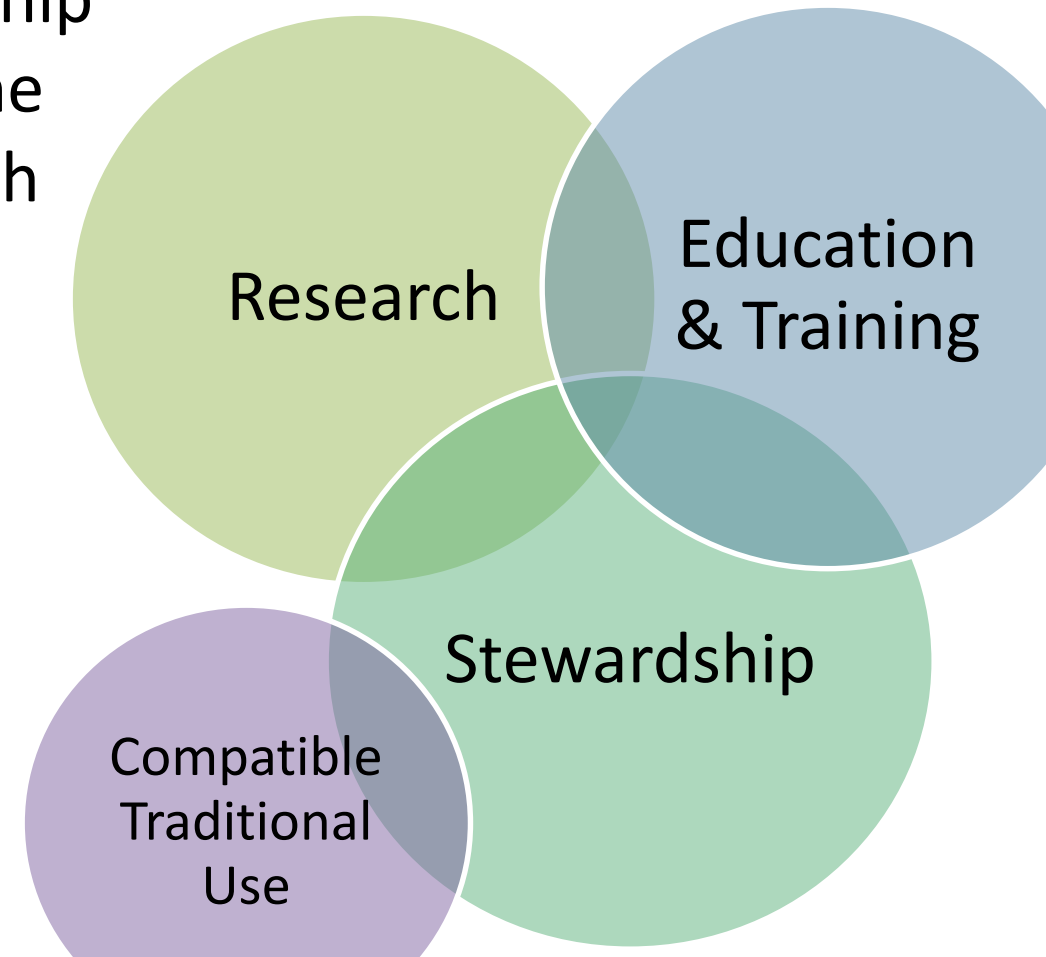
North Carolina Coastal Reserve

North Carolina
National Estuarine Research Reserve


Currituck Banks Reserve
Albemarle Sound
Kitty Hawk Woods Reserve
Rocky Mount
Buckridge Reserve
Greenville
Goldsboro
Kinston
Pamlico Sound
Buxton Woods Reserve
New Bern
Concord
Havelock
Jacksonville
Rachel Carson Reserve
Permuda Island Reserve
Onslow Bay
Wilmington
Masonboro Island Reserve
Zeke's Island Reserve
Bald Head Woods Reserve
Bird Island Reserve
N.C. Coastal Reserve and National Estuarine Research Reserve
National Reserves
State Reserves

Mission

To promote informed management and stewardship of North Carolina's estuarine and coastal habitats through research, education, and example.



Connect with us!

North Carolina Coastal Reserve

@NCReserve

www.nccoastalreserve.net

WiFi

Select: “ECU Guest”

User Name: cm@csi.edu

Password: Cw3Ph

Past Workshop Resources

deq.nc.gov/past-workshops

To obtain additional course documents from past workshops, please contact Coastal Training Program Coordinator Whitney Jenkins at 252-838-0882.

- Living Shorelines for Erosion Control on Estuarine Shorelines - February 20, 2019 - Wanchese

Resources For Homeowners and Professionals

Below is a list of available resources for homeowners and technical professionals (*e.g.*, marine contractors, landscape architects, engineers, etc.) who are interested in learning more about implementing a living shoreline.

How to Protect your Property from Shoreline Erosion: A Handbook for Estuarine Property Owners in North Carolina - Weighing Your Options

- This guide serves as a tool for those interested in learning about the options available in for shoreline stabilization in North Carolina. In addition to providing information about stabilization methods, permitting, and costs, the guide also has a worksheet that asks site-specific questions designed to help users learn more about their estuarine shoreline property before making a decision about which control option to implement.

Living Shoreline Workshops

- The N.C. Coastal Reserve & National Estuarine Research Reserve's Coastal Training Program held a living shorelines workshop - *Living Shorelines for Erosion Control on Estuarine Shorelines* - for realtors and technical professionals. Click on the link to access presentations by speakers from partnering organizations, like DCM, the N.C. Coastal Federation, and N.C. Sea Grant.

Shoreline Erosion Control Using Marsh Vegetation and Low-Cost Structures

- North Carolina Sea Grant developed this helpful publication that not only explains the role of marsh vegetation in reducing shoreline erosion but also highlights the types of plants that work best based on site-specific characteristics and provides advice for planting various types of vegetation.

Estuarine Shoreline Stabilization

How to Stabilize Your Estuarine Shoreline

NC CCAP

Estuarine Shoreline Mapping Project

Living Shoreline Research

Stabilization Options

Resources For Homeowners and Professionals

Marsh Grass Suppliers

- North Carolina Sea Grant developed this list of marsh grass suppliers. The Division of Coastal Management does not endorse these entities.

- This video is a compilation of presentation by various experts about living shorelines.

N.C. Coastal Federation - Living Shorelines

- The N.C. Coastal Federation has been involved in numerous living shoreline projects in North Carolina. Details and photos from projects in the northeast, central, and southeast regions of our coast are available on this site.

Virginia Institute of Marine Science's Center for Coastal Resources Management (CCRM) website .

- CCRM exists to develop and support integrative and adaptive management of Virginia's

Search: NC DCM Resources for Homeowners & Professionals

Or

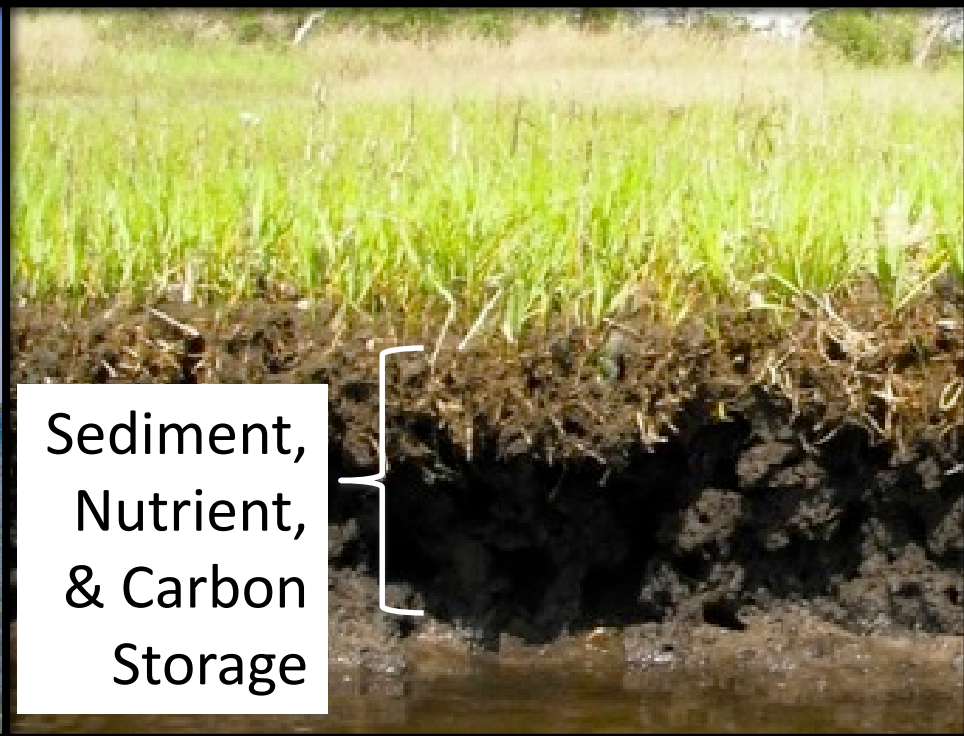
https://deq.nc.gov/about/divisions/coastal-management/coastal-management-estuarine-shorelines/stabilization/resources-homeowners-professionals

Living Shorelines: Benefits & Limitations

Adapted from Carolyn Currin & Rachel Gittman

North Carolina Coastal Habitats

Coastal Habitat Benefits



North Carolina Coastal Habitats

Shoreline Erosion

Causes:

- Natural wave energy
- Storm events
- Disruption in sediment supply
- Changes in shoreline topography
- Removal of vegetation
- Boat wakes

Shoreline Hardening

Bulkhead

Groin/Jetty

Riprap Revetment

Seawall

Breakwater

Photo credit: VIMS

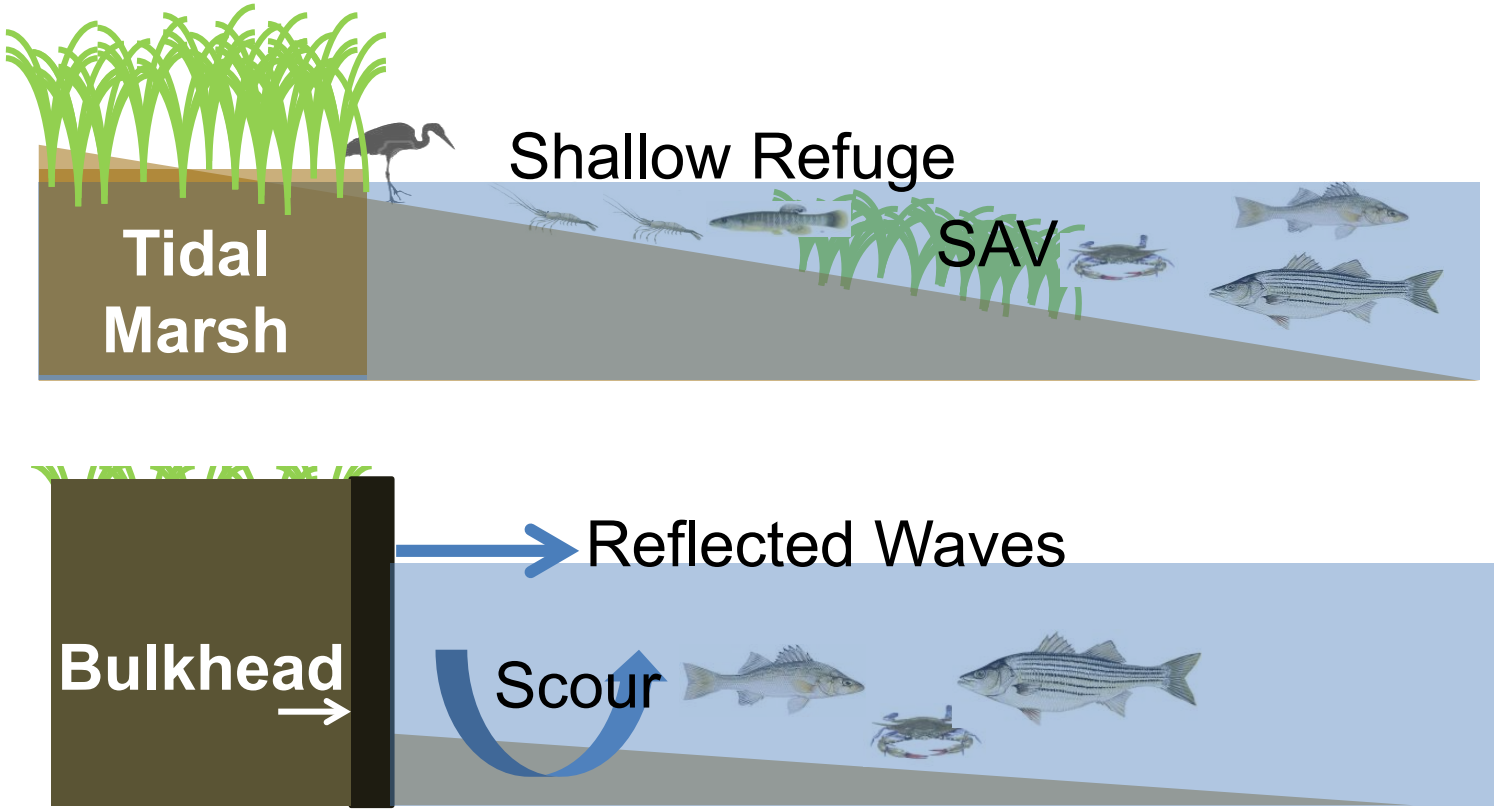


Fig. courtesy T. Jordan

Changes occur **<u>BELOW</u>** the MHW line:

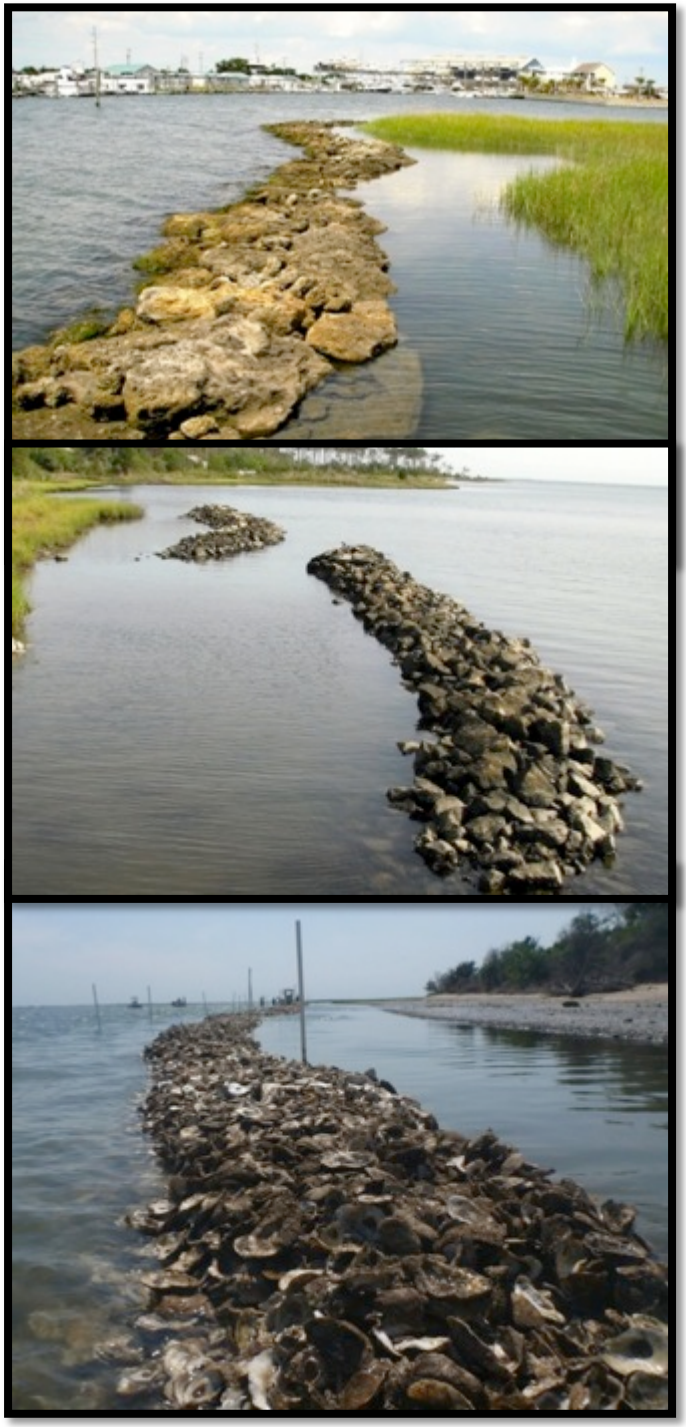
- Sediment transport & particle-size change
- Vegetation loss
- Animal abundance reduced
- Ability to remove nitrogen is reduced

…all of which are negative impacts to our public trust resources.

What's the alternative?

Living shorelines are erosion control methods that include a suite of options

- Marsh grasses
- Sills made of stone, oyster shell, or wood
- Maintain connections between upland, intertidal, and aquatic areas
- Proven effective erosion control during hurricanes



Pivers Island Living Shoreline

March 2001

Pivers Island Living Shoreline

March 2001

Pivers Island Living Shoreline

March 2001

Pivers Island Living Shoreline

Oyster shells applied in 2000 and 2006

Pivers Island Living Shoreline

Oyster shells applied in 2000 and 2006

Pivers Island Living Shoreline

June 2003

Pivers Island Living Shoreline

July 2006

Pivers Island Living Shoreline

May 2014

Pivers Island Living Shoreline

September 2014

Pivers Island Living Shoreline

After Hurricane Irene – 2011

Shoreline Accreted Sediment

Edenhouse Boat Ramp, Edenton

September 2002

Edenhouse Boat Ramp, Edenton

2004

Edenhouse Boat Ramp, Edenton

2004

Edenhouse Boat Ramp, Edenton

2004

Edenhouse Boat Ramp, Edenton

2005

Edenhouse Boat Ramp, Edenton

2006

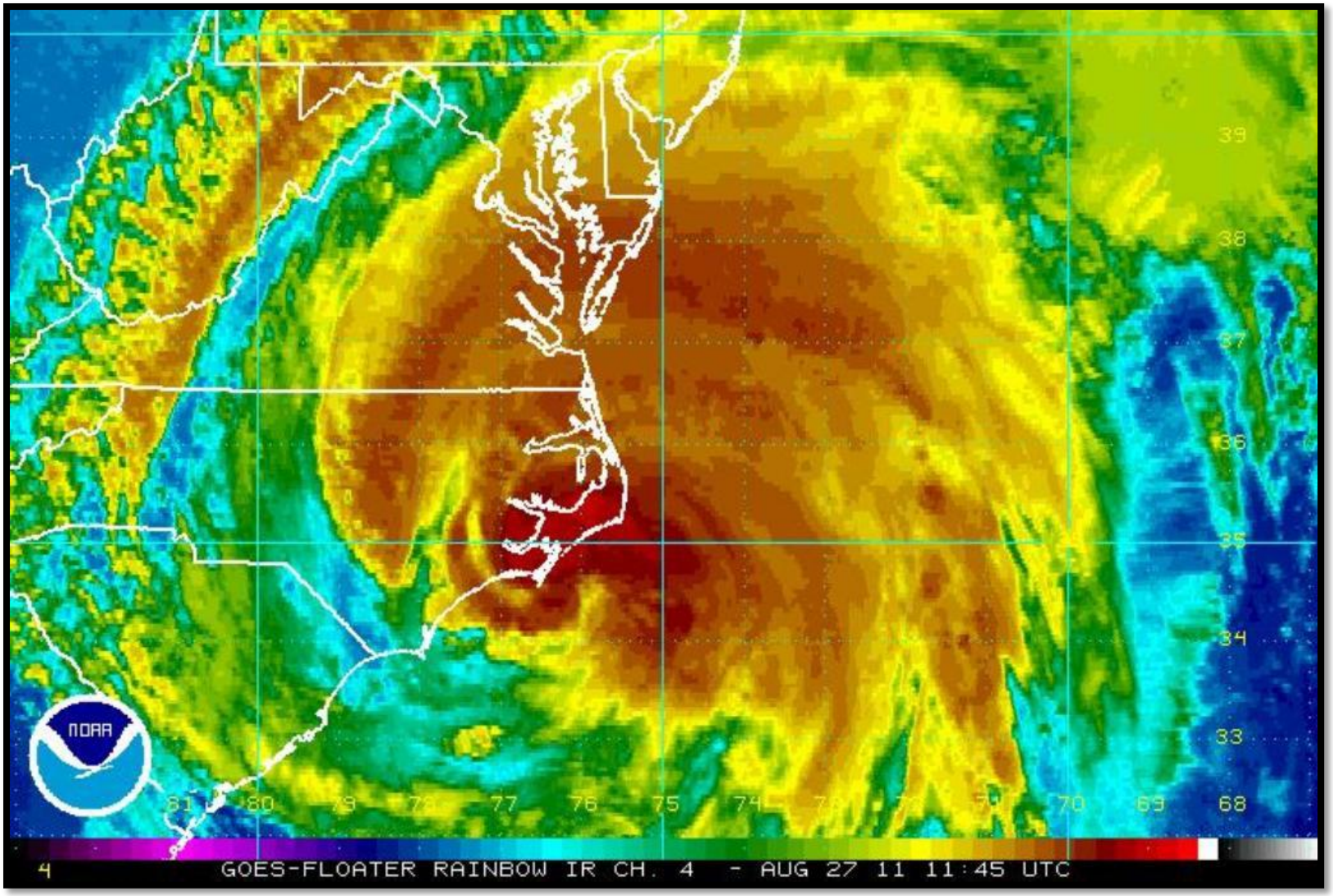
Edenhouse Boat Ramp, Edenton

2007

Edenhouse Boat Ramp, Edenton

What about hurricanes?

Hurricane Irene 2011



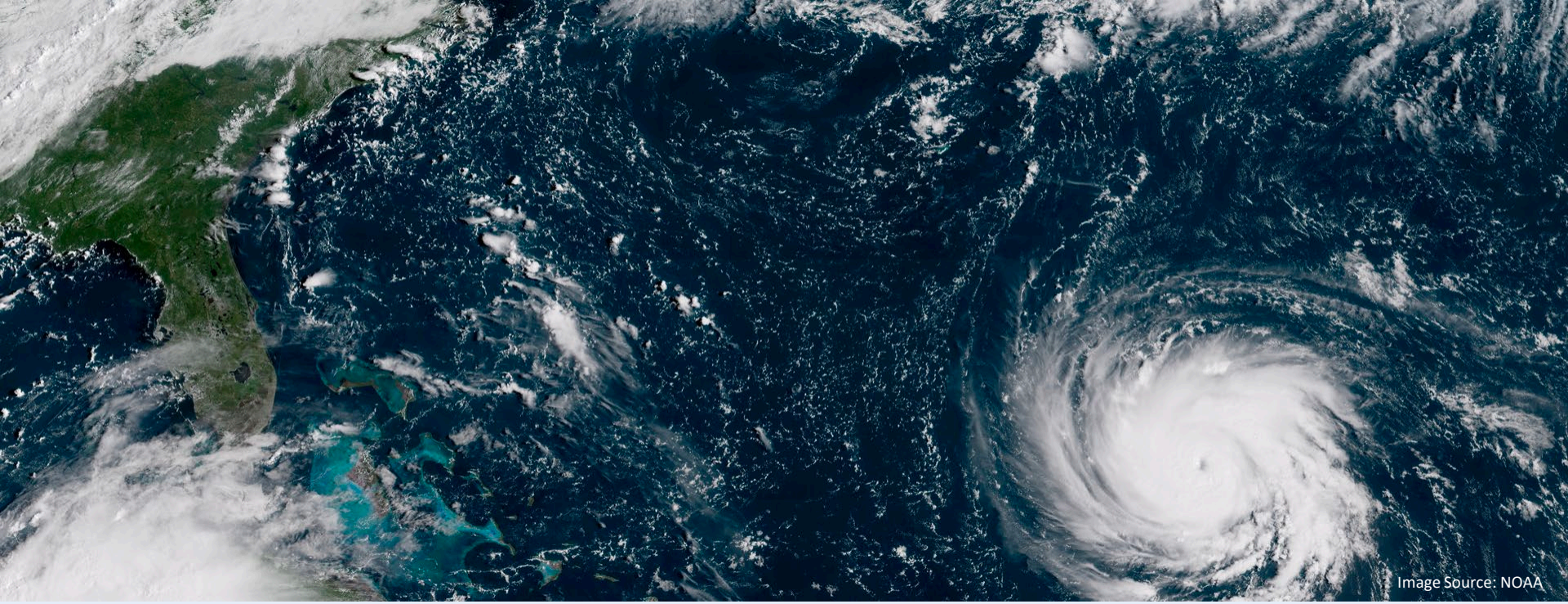
NOAA 2011

Bulkhead vs. Living Shoreline

Before

Hurricane Matthew (2016)

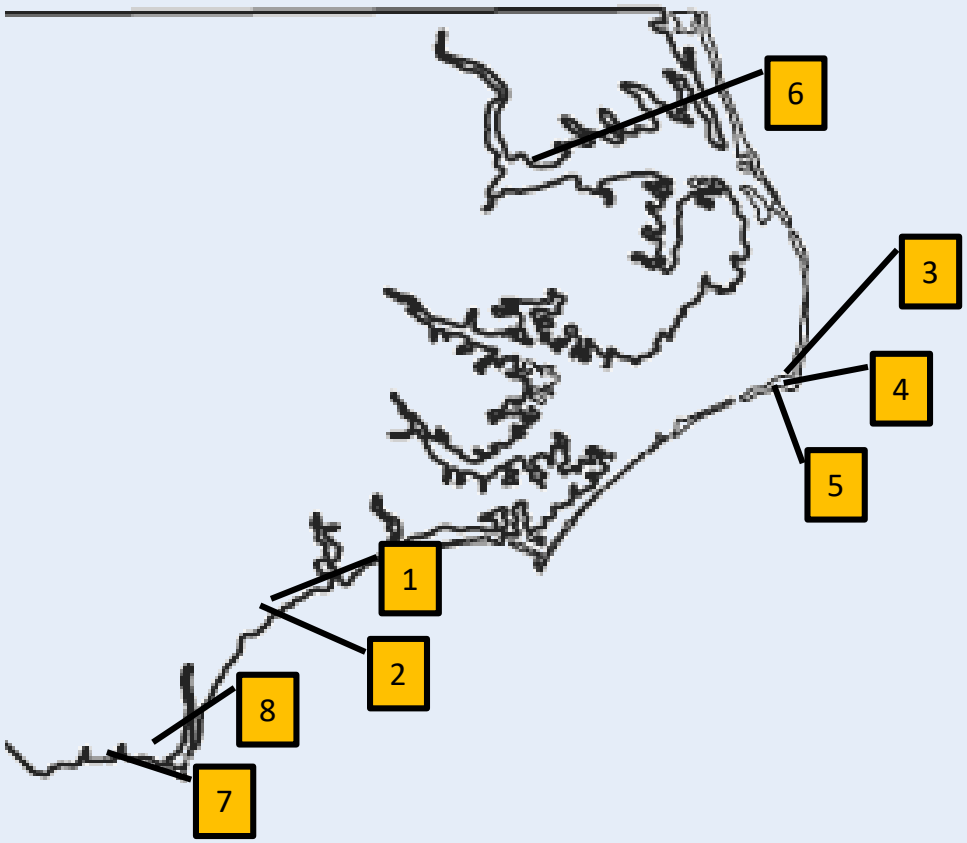
[Photo credit: Rachel Gittman]



Monitored living shorelines before and after Hurricane Florence

8 living shorelines monitored along the coast

List of Monitored Living Shorelines



1. Morris Landing Rock Sill- Wilmington
2. Morris Landing Oyster Sill- Wilmington
3. Springers Point Rock Sill- Ocracoke
4. Woodall Rock Sill- Ocracoke
5. Cahoon-Davis Oyster Sill- Ocracoke
6. Chowan River Boat Ramp Rock Sill- Edenton
7. St. James Oyster Sill- Wilmington
8. Southport Rock Sill- Wilmington

LIVING SHORELINE EROSION POST HURRICANE FLORENCE

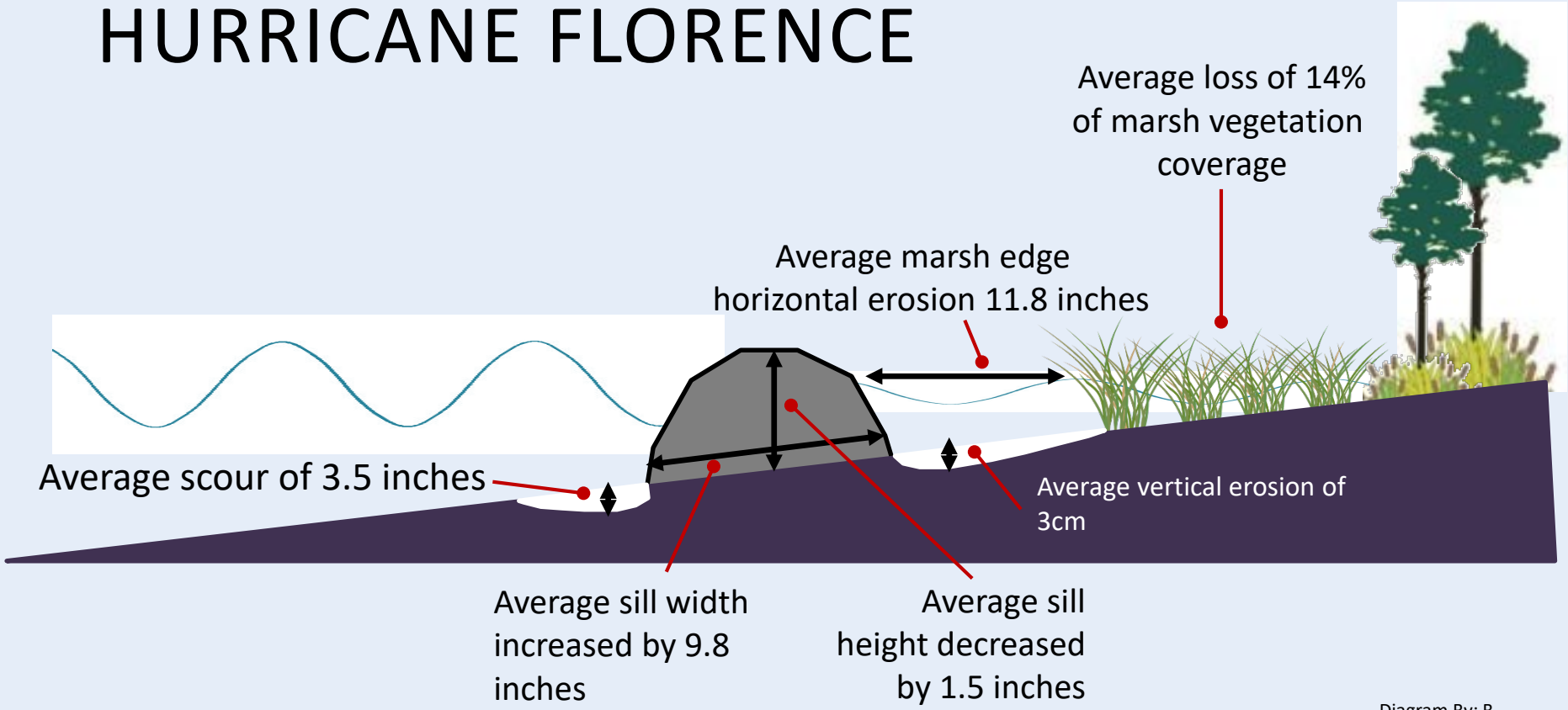


Diagram By: B. Puckett

Morris Landing Rock Sill - Wilmington

AUGUST
{1 MONTH PRE STORM}

OCTOBER
{1 MONTH POST STORM}

Springers Point Rock Sill - Ocracoke

AUGUST
{1 MONTH PRE STORM}

DECEMBER
{3 MONTHS POST STORM}

Woodall Rock Sill - Ocracoke

AUGUST
{1 MONTH PRE STORM}

DECEMBER
{3 MONTHS POST STORM}

Chowan River Boat Ramp Rock Sill - Edenton

AUGUST
{1 MONTH PRE STORM}

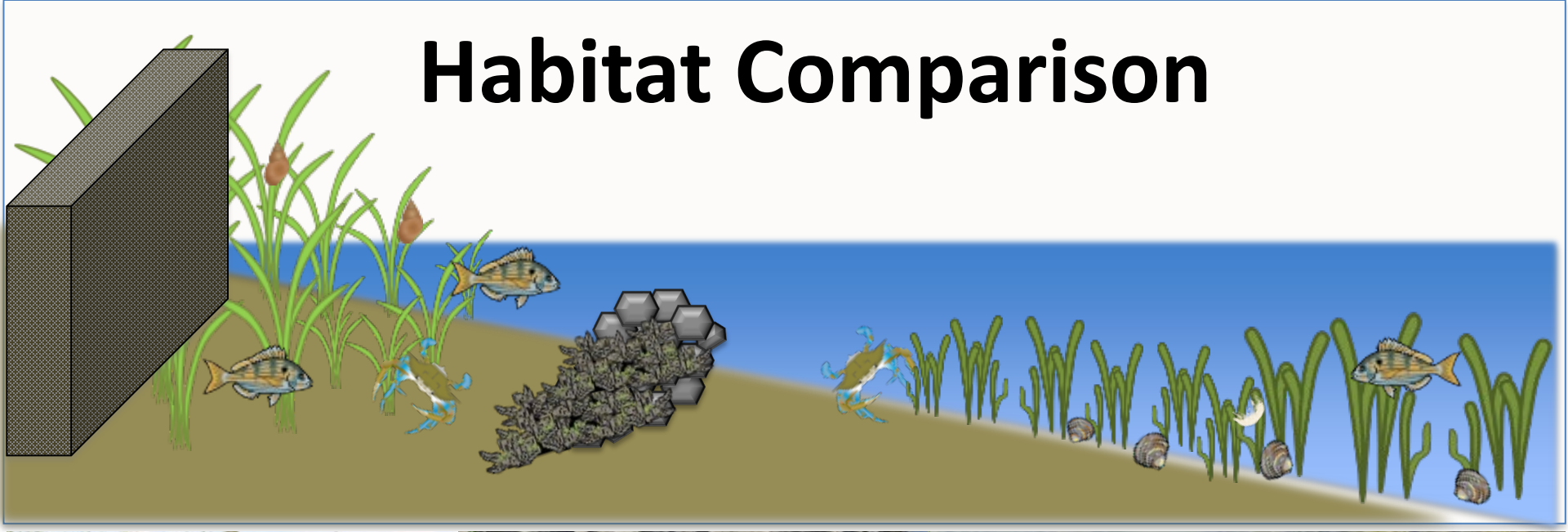
OCTOBER
{1 MONTH POST STORM}

St. James Oyster Sill - Wilmington

AUGUST
{1 MONTH PRE STORM}

NOVEMBER
{2 MONTHS POST STORM}

Habitat Comparison



Fish Habitat

- Living shorelines provide better habitat for fishes and crustaceans than bulkheads
- Sills may function similar to oyster reefs in terms of providing habitat for fish
- Marsh planting is important

Marshes Dampen Wave Energy

How long before you see the benefits of a living shoreline?

Year 1

Year 3

Year 5

Summary

- Hardened structures (bulkheads/riprap) do not provide the ecosystem services that natural shorelines do, and may not perform as well during storm events
- Lack of design standards may contribute to overuse of hard structures
- In N.C., intertidal oysters are a viable alternative to stone sills in many settings
- Marshes and oyster reefs can increase their elevation, unlike hardened structures
- Incorporating marsh and oyster reefs into a ‘living shorelines’ approach to shoreline stabilization can result in cost-effective and sustainable shoreline protection

Pivers Island Living Shoreline