

Estuarine Shoreline Stabilization Design & Techniques



Dr. Mariko Polk *Coastal Processes Specialist*



@ncseagrants

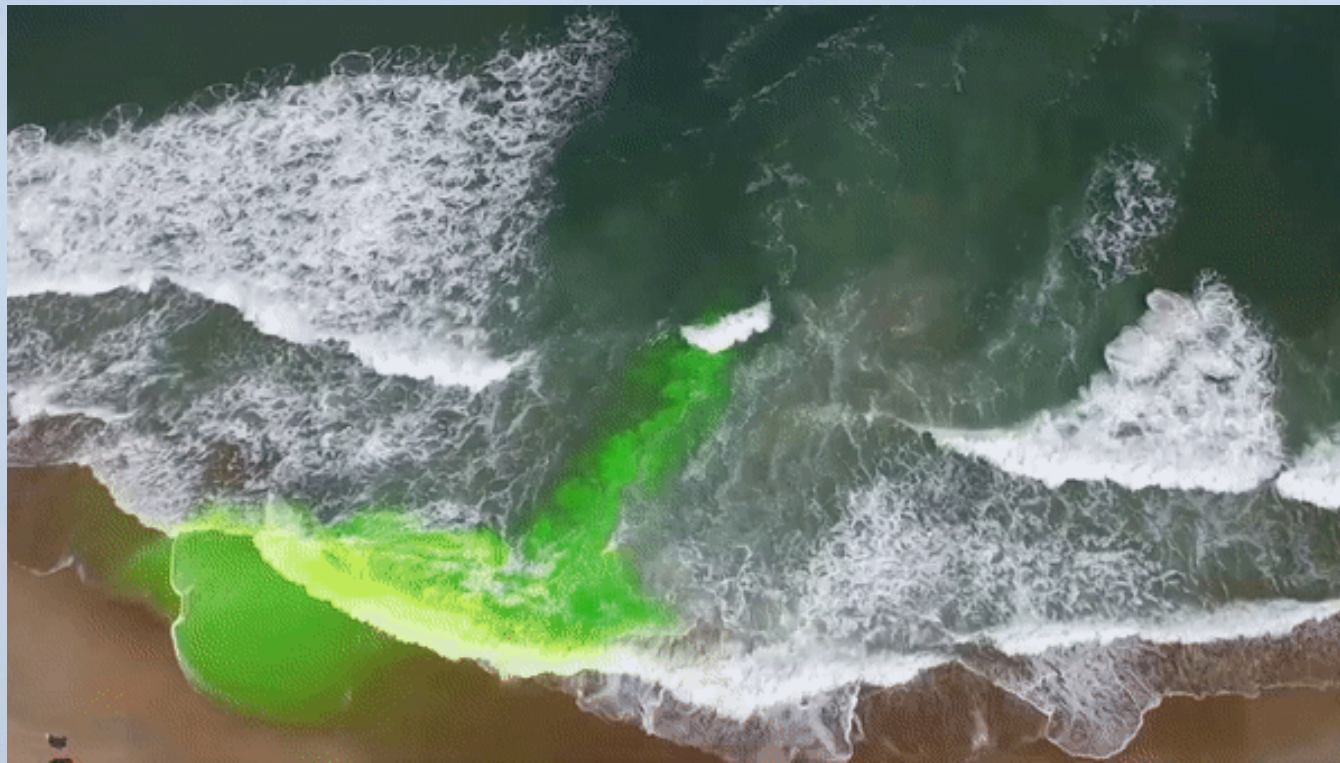


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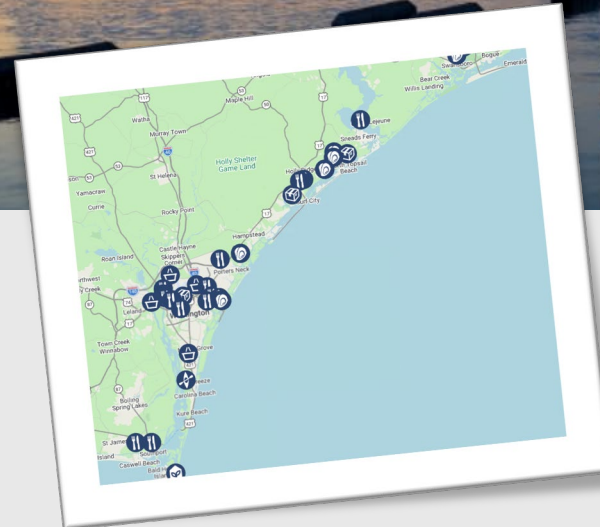
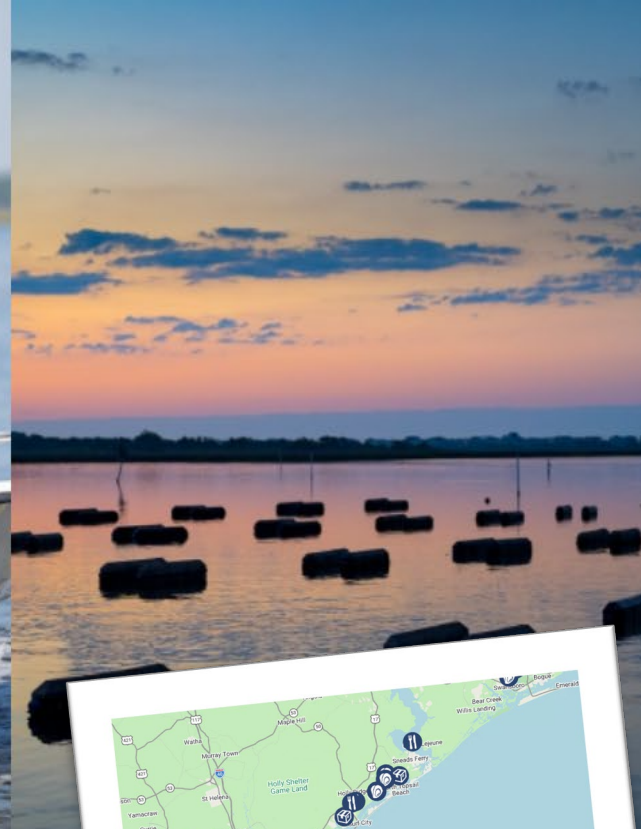
THE CAPE SHARK PROJECT





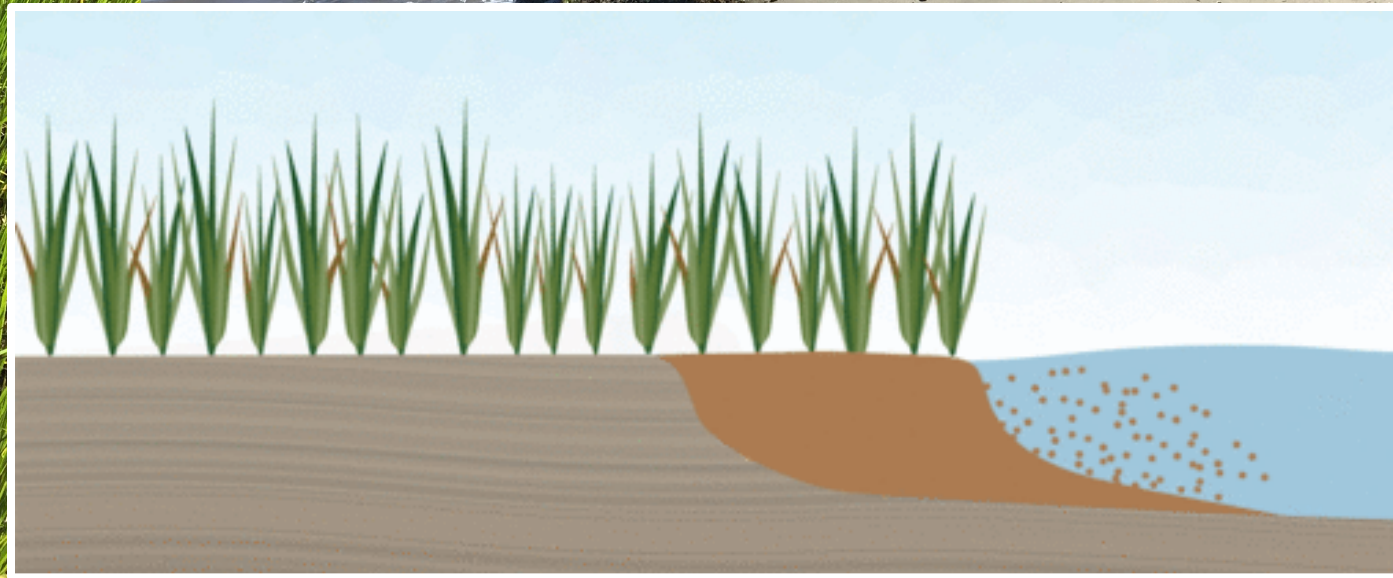
To order:
rejone25@ncsu.edu

Why Do Wetlands Matter?



Find part of the Trail near you!
ncoystertrail.org

WHAT CAUSES SHORELINE LOSS?



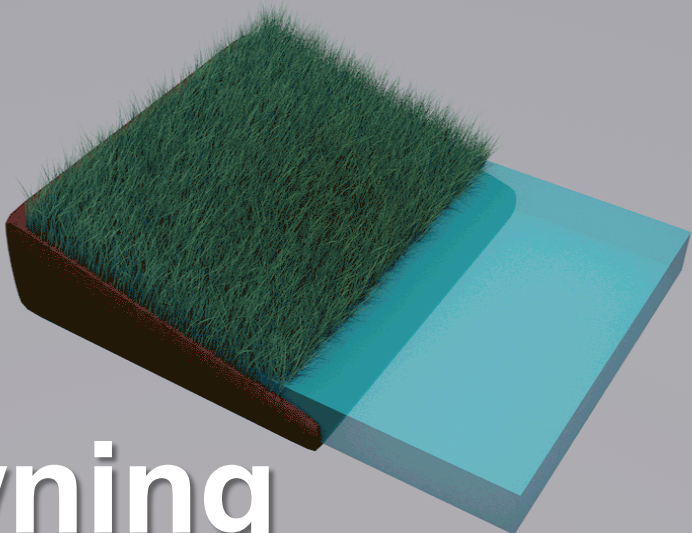
WHAT CAUSES SHORELINE LOSS?



Boat Wakes



Storm Damage



Drowning



Wave Attacks

Stormwater Pollution



Debris

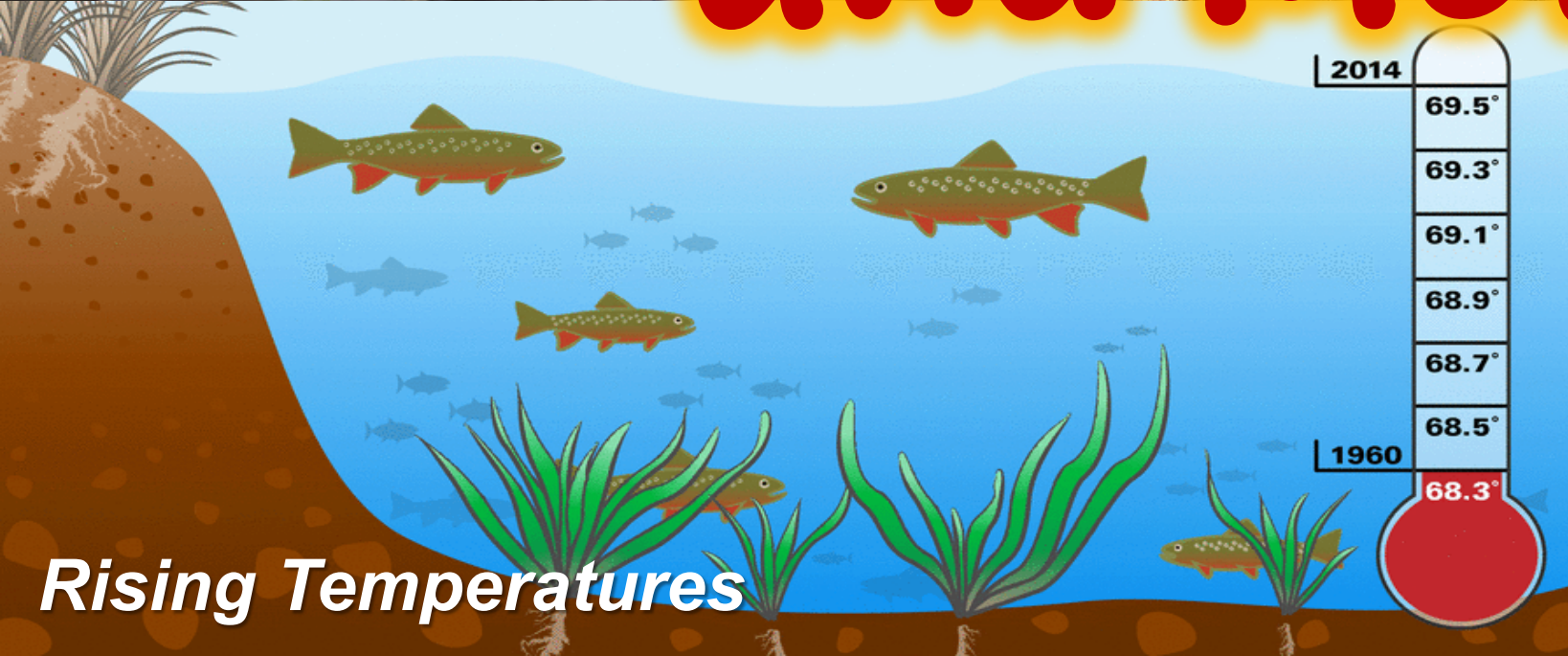


Algal Bloom



and More

Rising Temperatures



Vegetation Loss



WHY DO WE MANAGE THE SHORELINE?

- Protect infrastructure
- Preserve wetlands
- Reduce pollution
- Maintain property value
- Increase resilience



SHORELINE MANAGEMENT

Smithsonian article on
ancient seawalls



Seawall 1902



Revetment

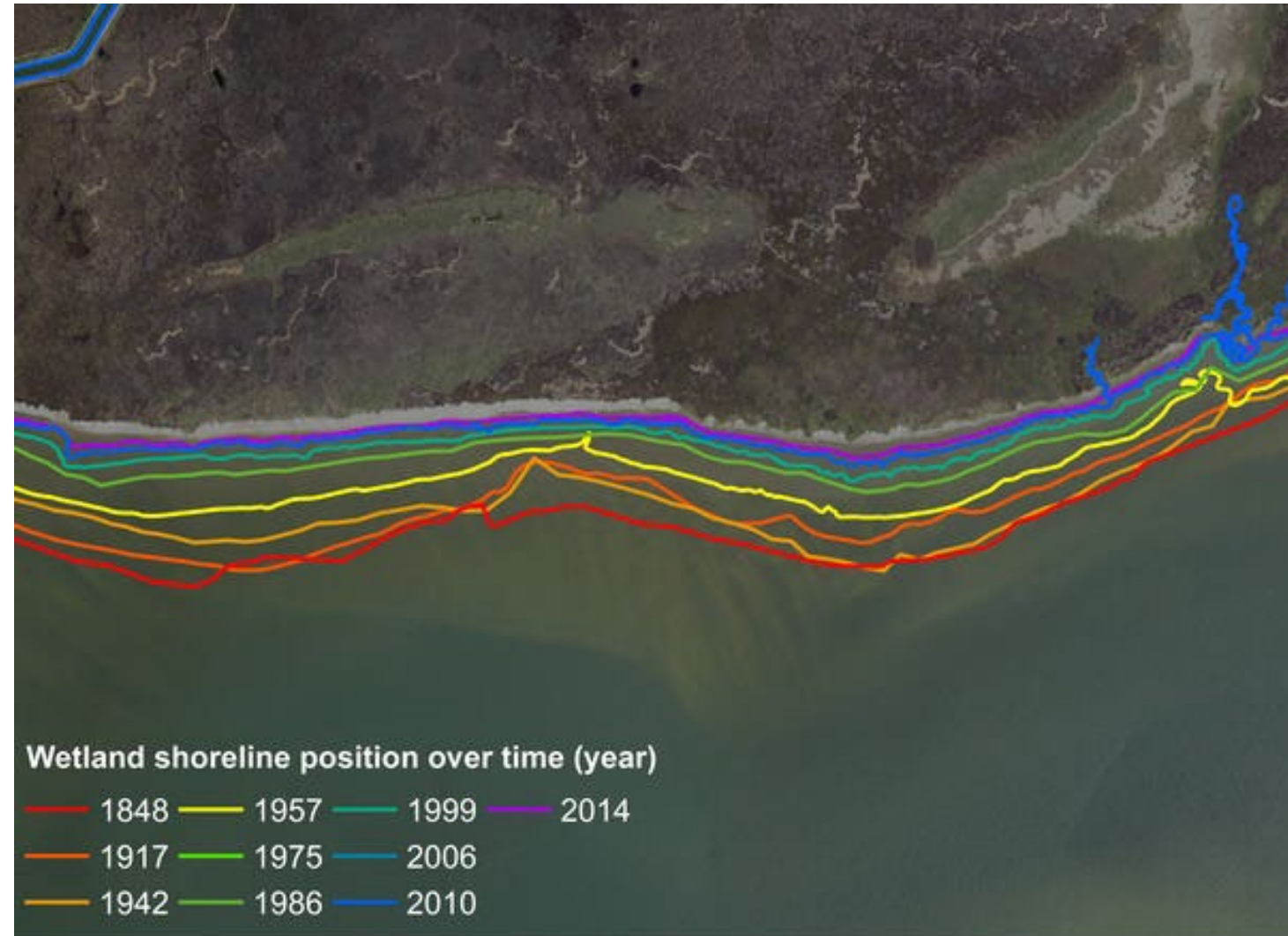


Bulkhead

DESIGN CONSIDERATIONS

- **Goals of Project**
- **Future Conditions**
- **Site Conditions**
 - Wave height
 - Fetch
 - Tidal regime
 - Habitat condition
 - Slope

*Site Conditions change overtime,
Risk also changes*



ESTUARY SHORELINE MANAGEMENT IN NORTH CAROLINA



Living Shorelines



Bulkhead



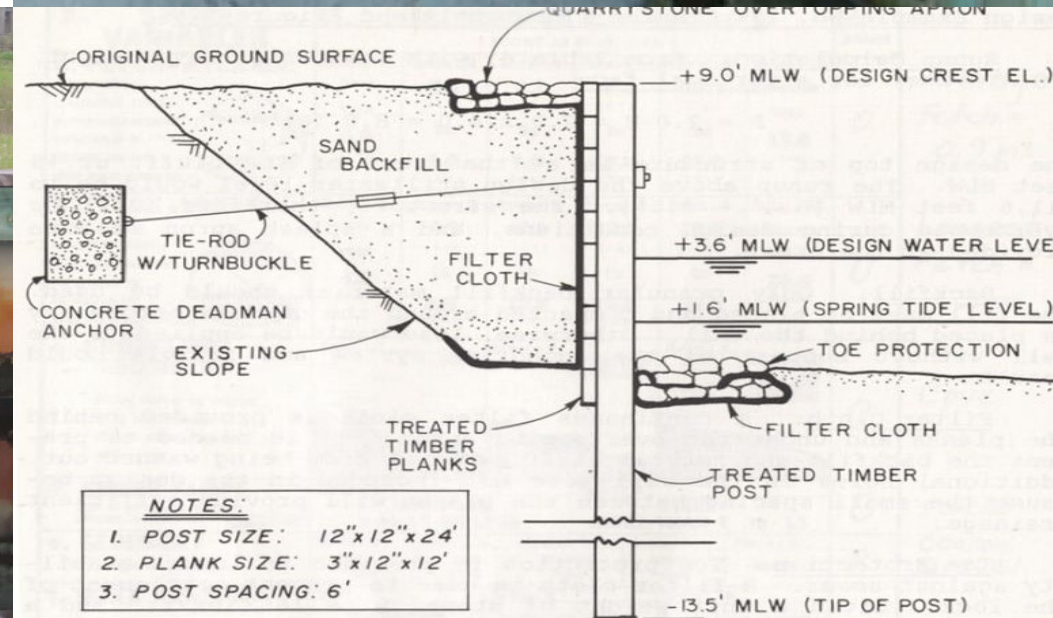
Revetment



Use the Space

BULKHEADS

- Wood, Vinyl, Concrete, Metal
- Has a small exposed footprint



BULKHEADS

May be only solution for narrow canals and marinas/harbors



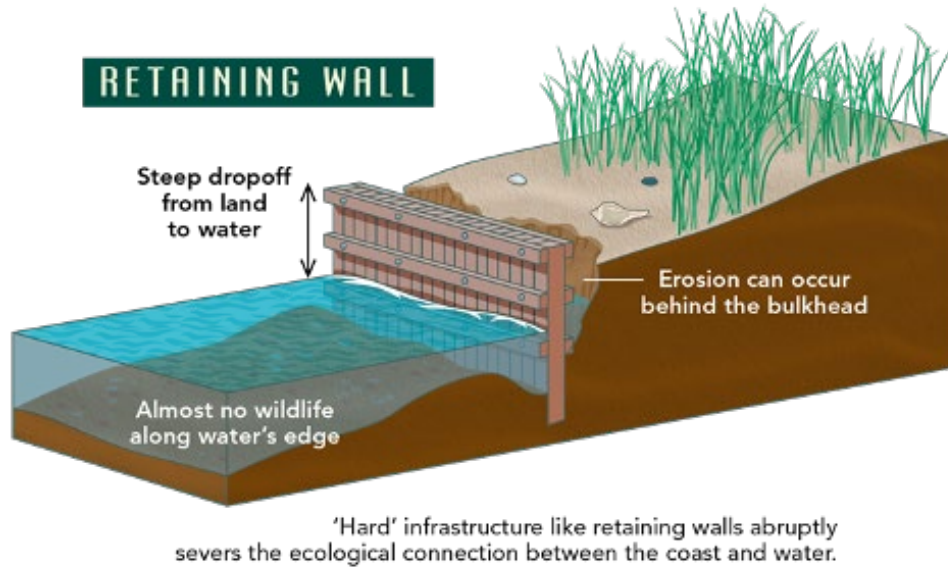
BULKHEADS

Benefits

- Static Shoreline
- Durable In low energy conditions
- Initial installation can *sometimes* cost less

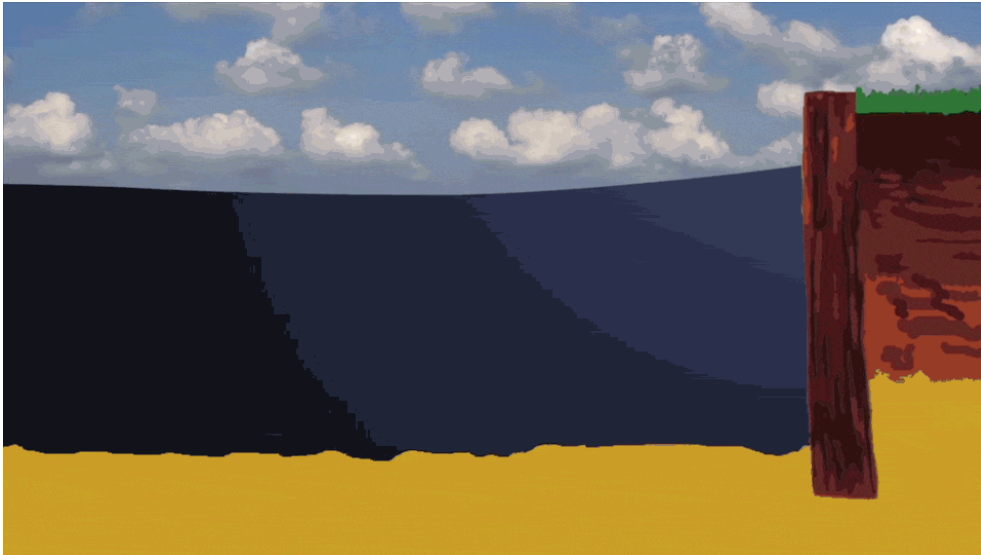


BULKHEADS



Drawbacks

- Expensive to Maintain
- Short service life
- Disconnect land & water
- Erosion & habitat loss

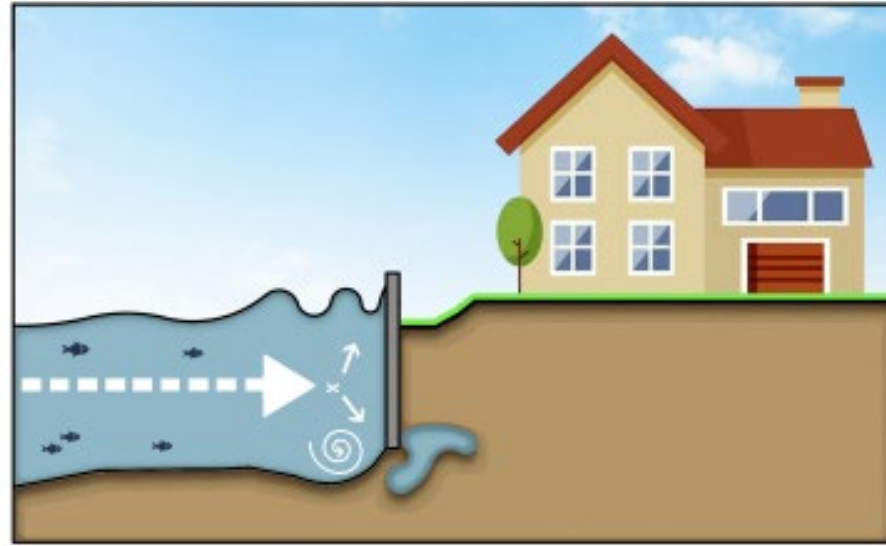
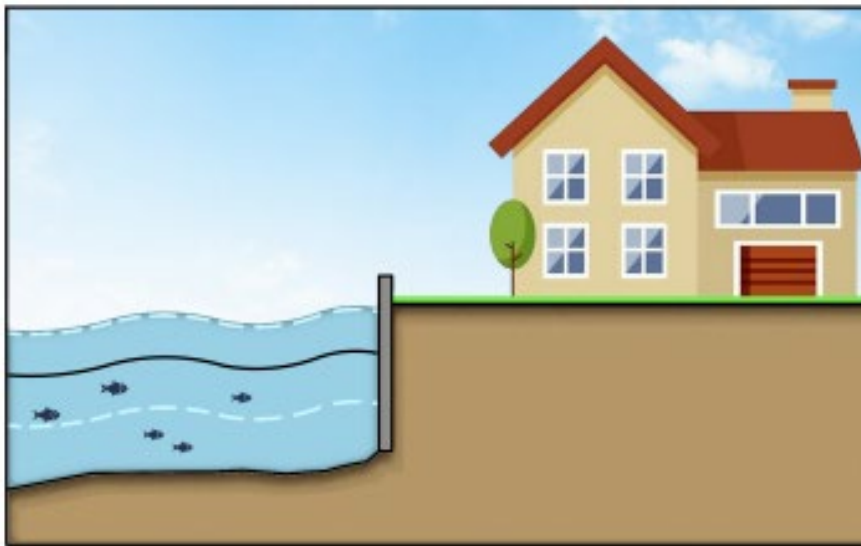




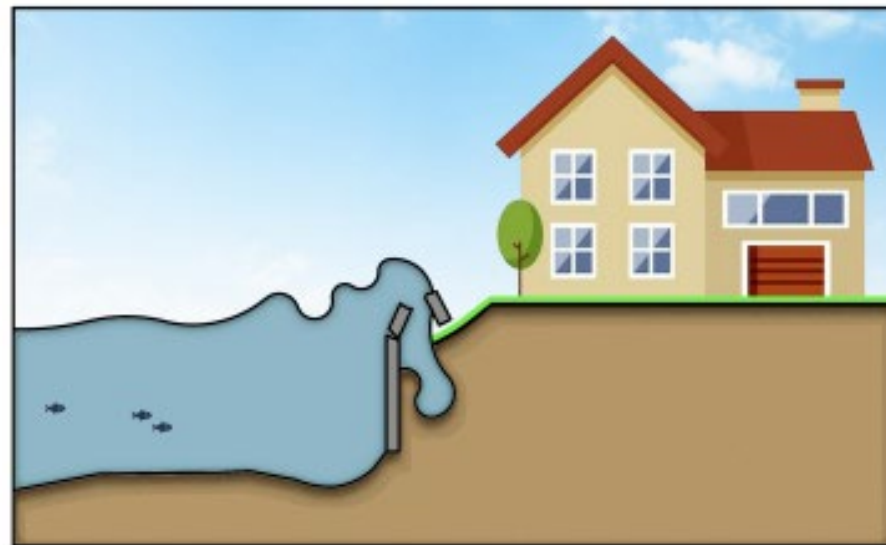
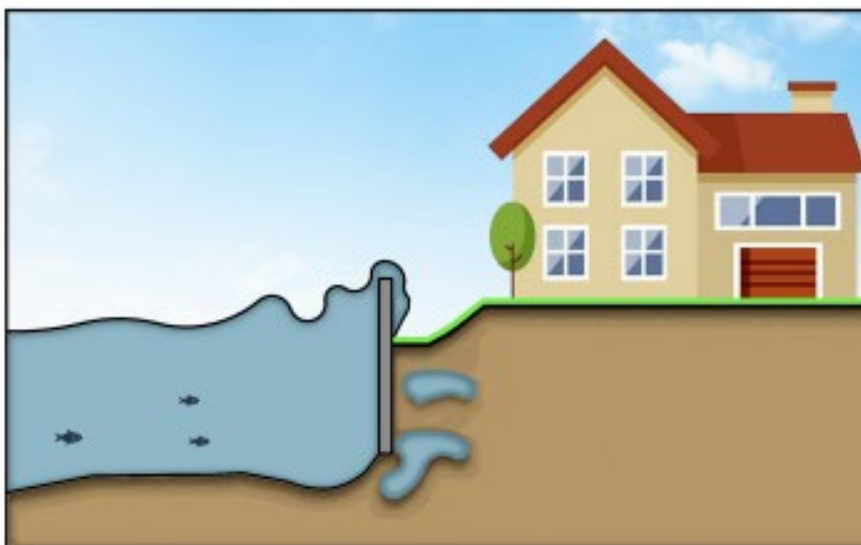
- Maintenance and replacement are the **homeowner's responsibility**
- Degrade and **become weaker overtime**
- Average **service life depends on conditions** but can potentially be 20-30 years



go.ncsu.edu/bulkhead



Things to Look Out For



Things to Look Out For



**Learn how to maintain your bulkhead and
improve it with a living shoreline**
go.ncsu.edu/bulkhead



ESTUARY SHORELINE MANAGEMENT IN NORTH CAROLINA



Living Shorelines



Bulkhead



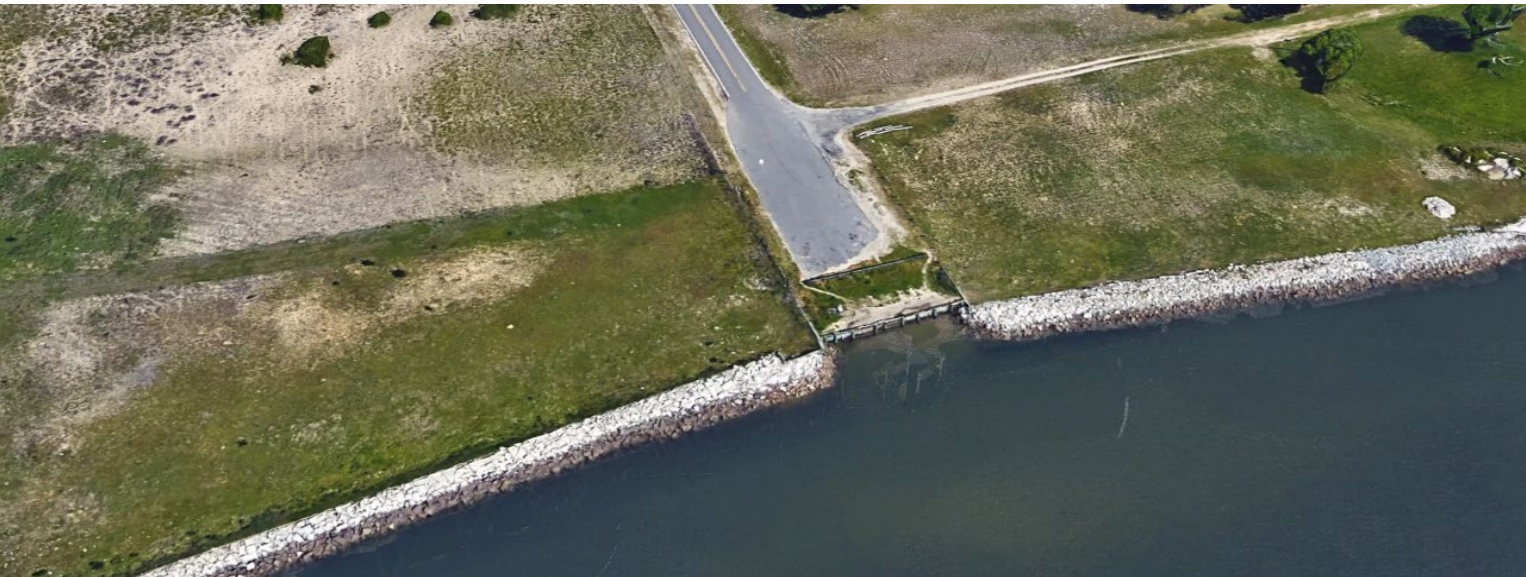
Revetment



Use the Space

RIPRAP REVETMENT

- Granite, marl, concrete
- Used on sediment banks

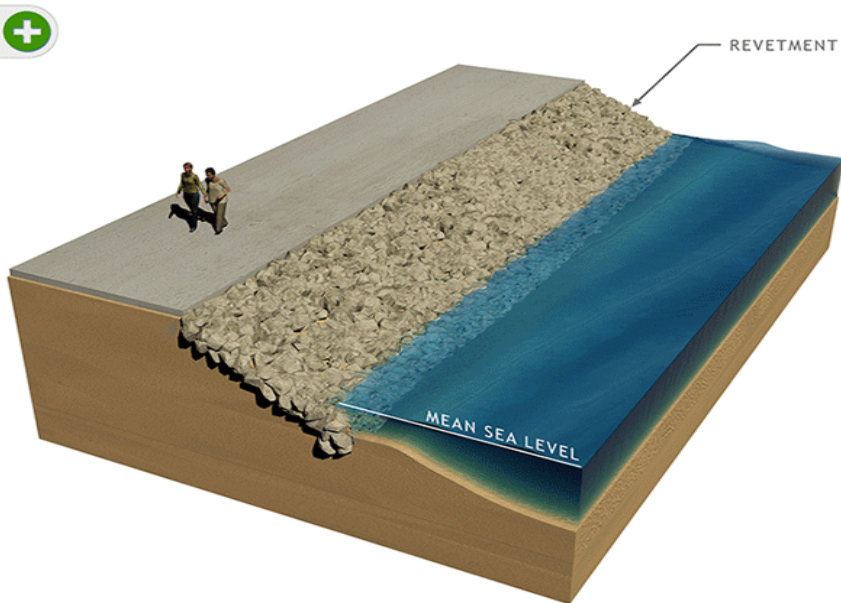
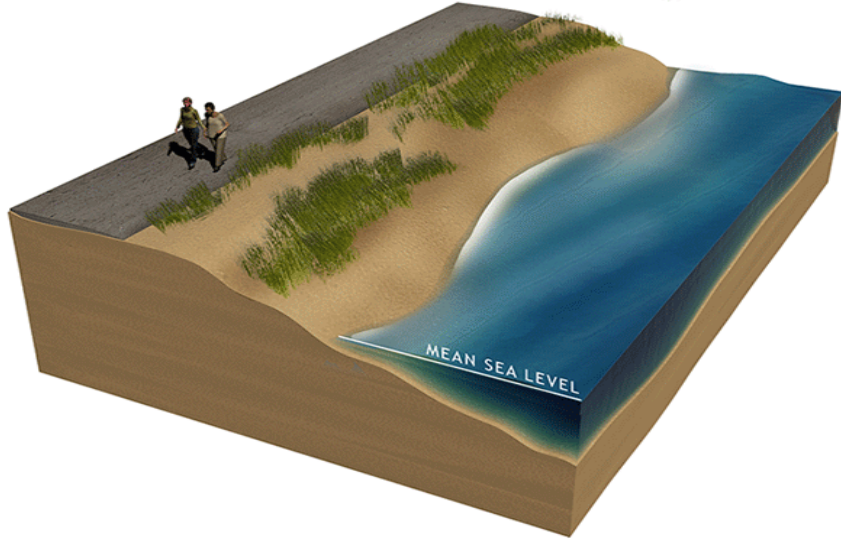


Images (Google Earth: LANDSAT, NC DCM)

RIPRAP REVETMENT

Benefits

- Longer service life
- Suited for high energy
- Less scour issues
- Can sometimes provide habitat for a few species



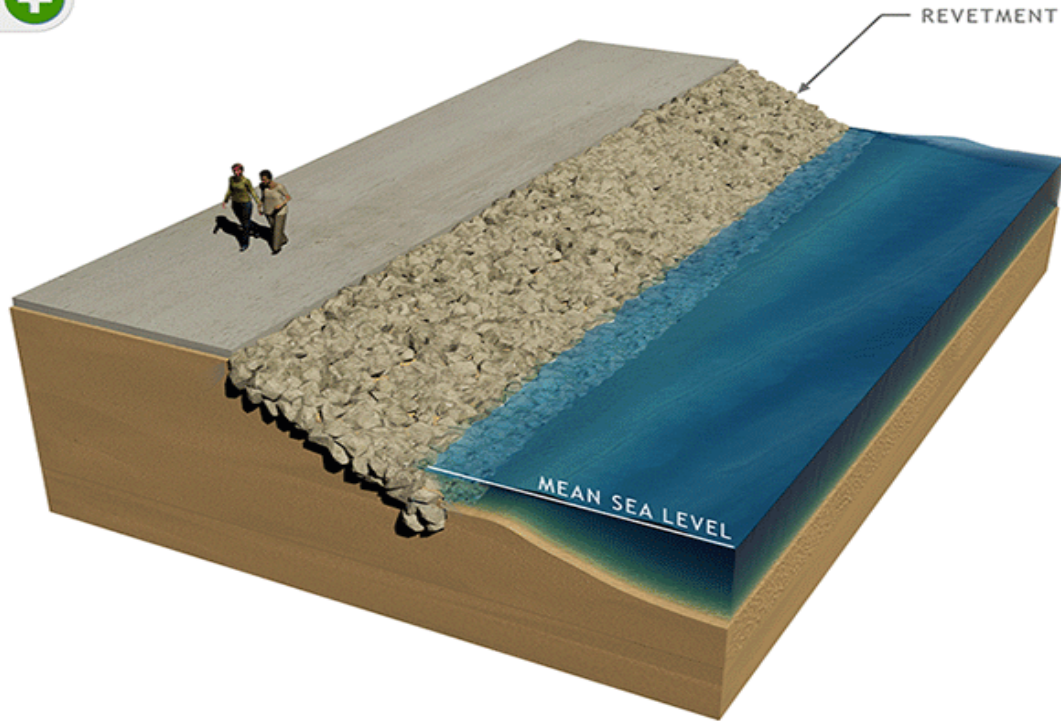
RIPRAP REVETMENT



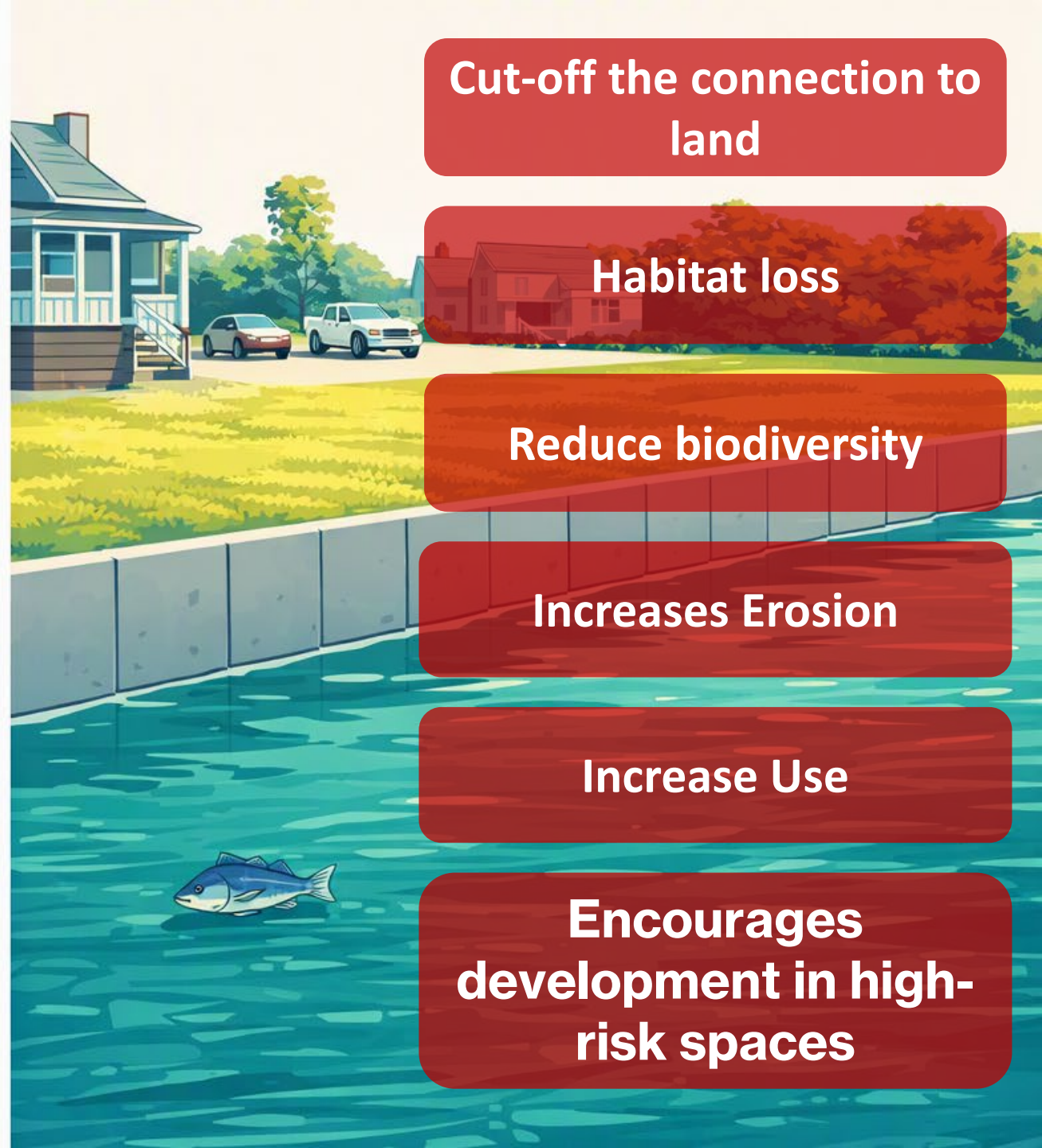
Drawbacks

- Large footprint
- Maintenance costs
- Habitat loss

Things to Look Out For



- Dislodged material that does not look intentionally placed
- Filter cloth exposed
- Large sections of material that is lower in elevation or displaced



**Cut-off the connection to
land**

Habitat loss

Reduce biodiversity

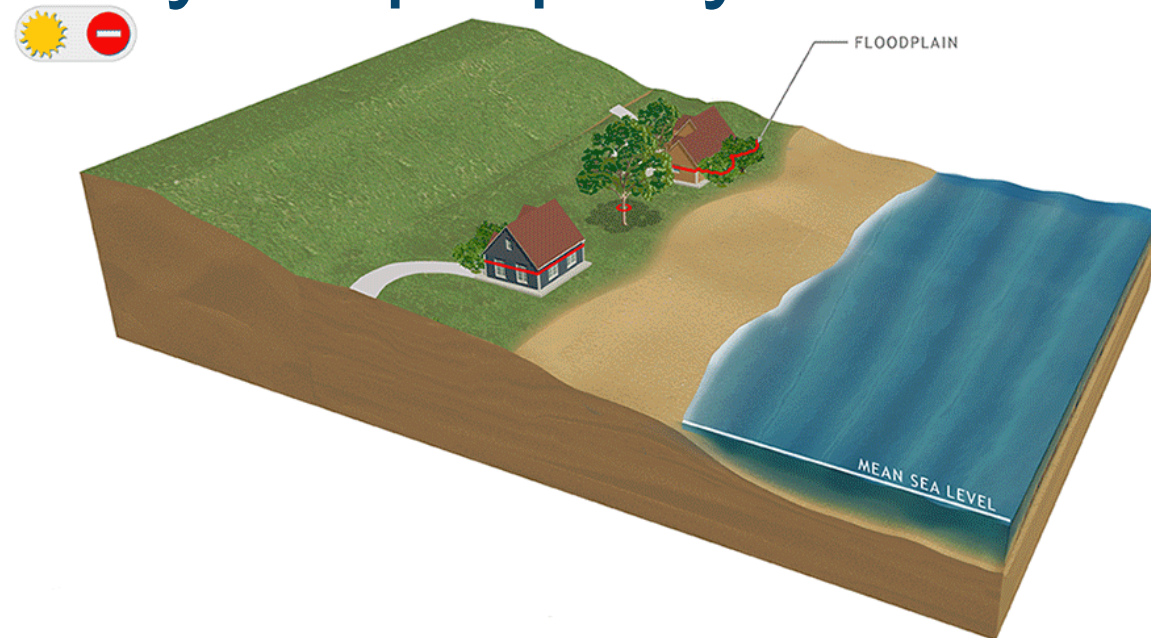
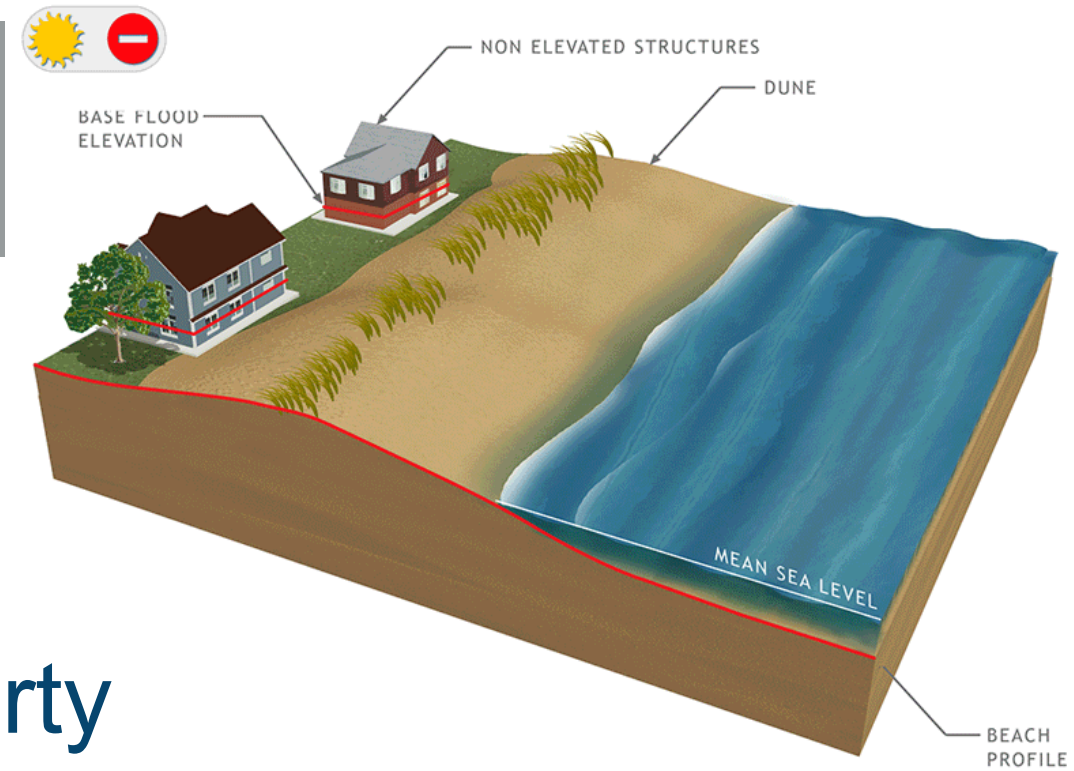
Increases Erosion

Increase Use

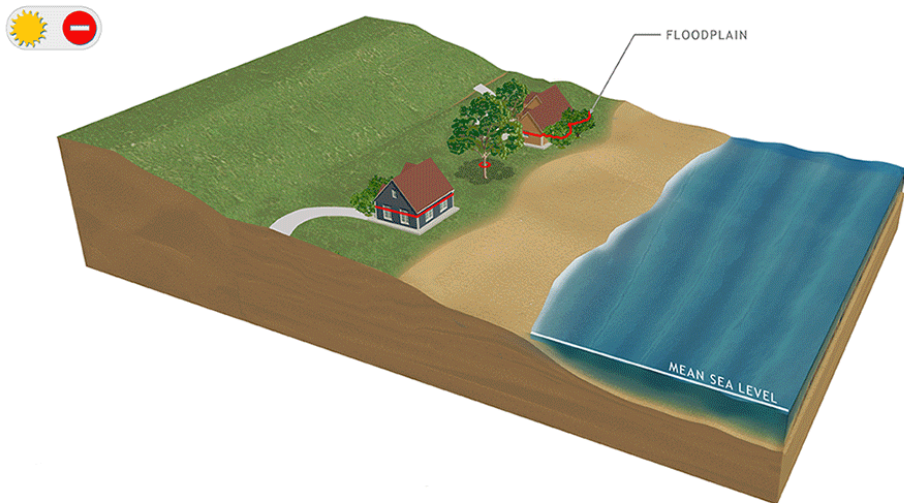
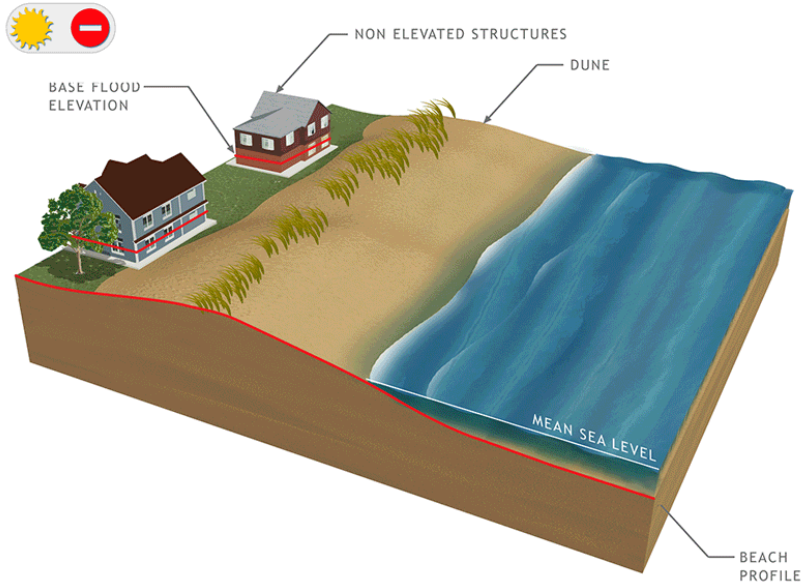
**Encourages
development in high-
risk spaces**

USE THE SPACE

- If you've got space move up, move side to side.
- Investing to stay on your property



USE THE SPACE



Benefits

- Stay in place
- Time for other solutions to work
- Can result in insurance benefits
- Can increase property value

USE THE SPACE



Drawbacks

- Space may not exist
- Cost
- Continued risk to hazards

What is a living shoreline?

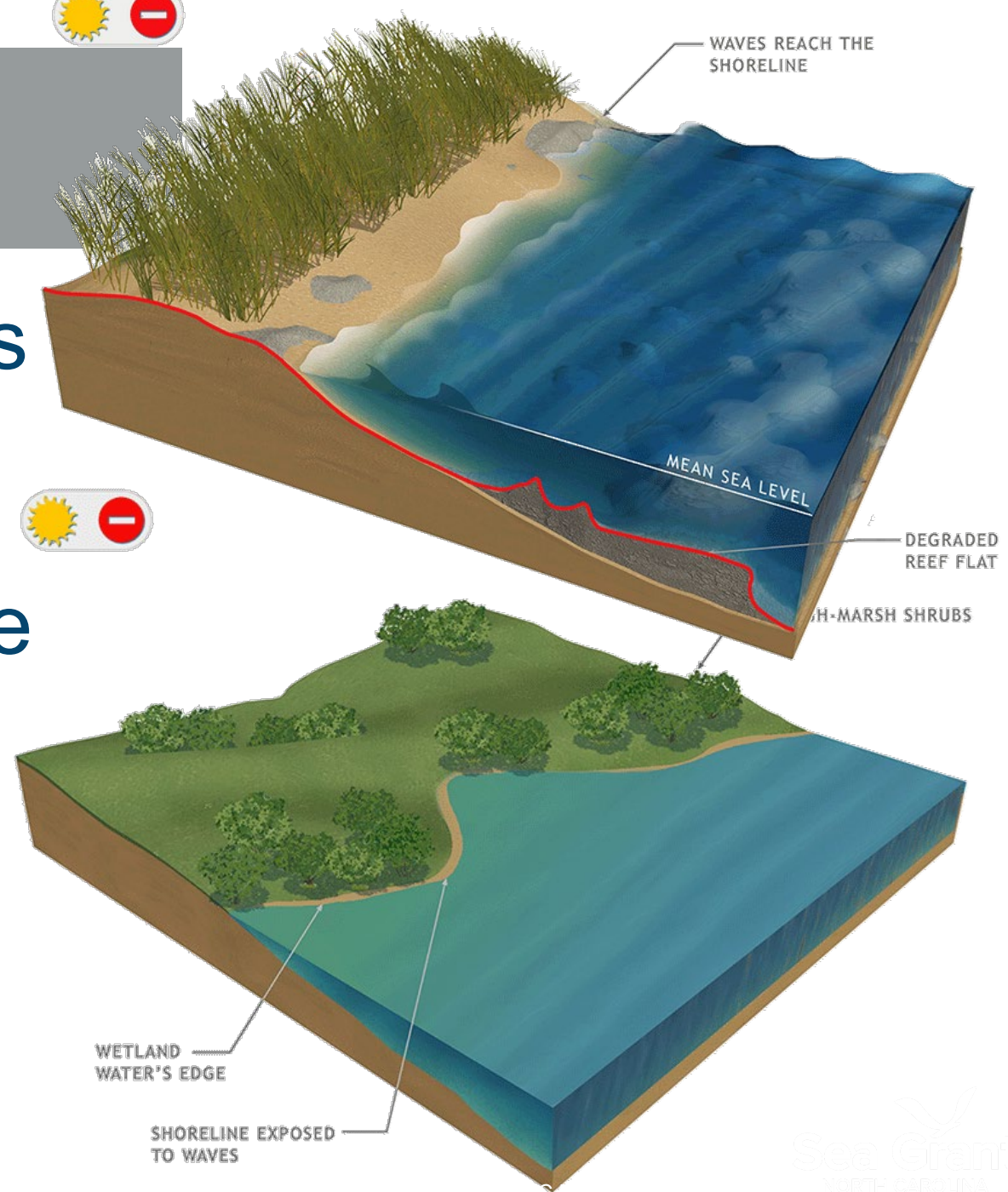


PBS 
NEWS
HOUR



LIVING SHORELINES

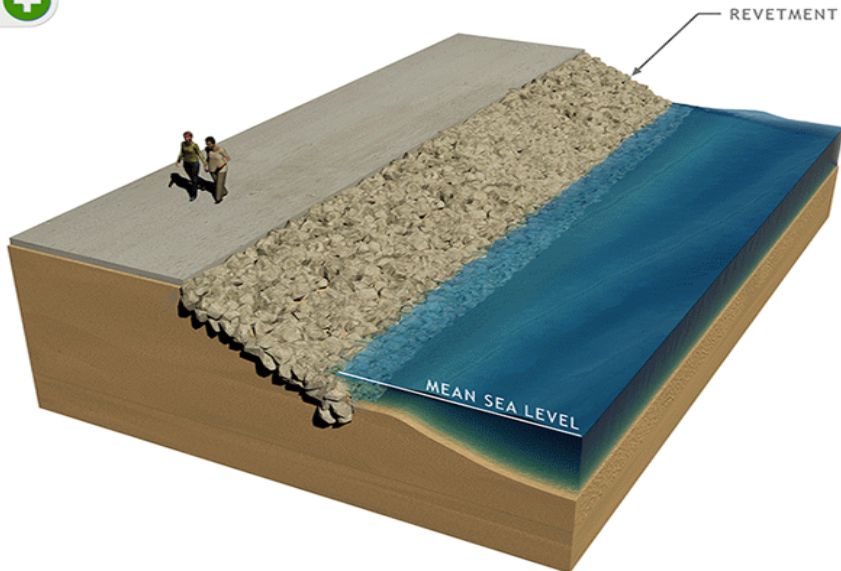
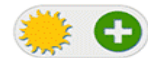
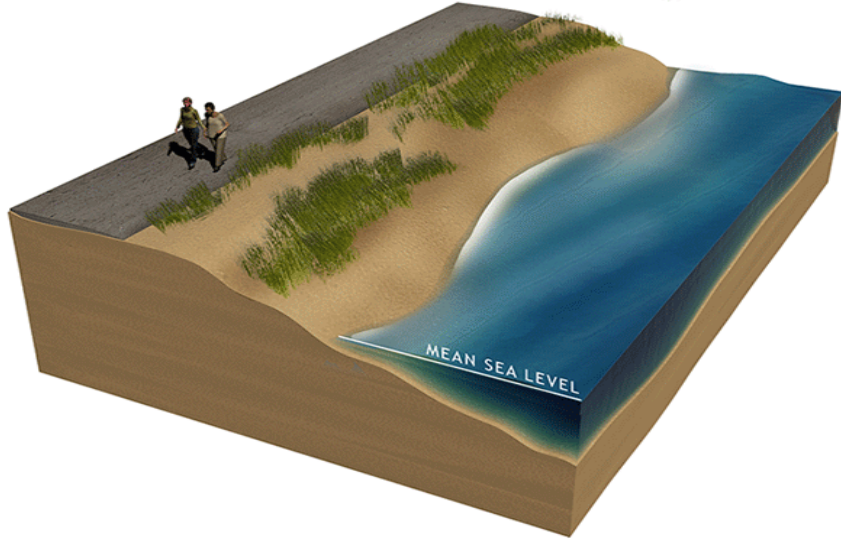
- Many designs and strategies
- In the right conditions can be used in front of existing bulkheads and revetments.



LIVING SHORELINES

Benefits

- Can be customized for almost every shoreline
- Grows stronger over time
- Preserves critical resources coastal communities depend on
- Less maintenance cost



LIVING SHORELINES



Drawbacks

- Larger footprint
- Some designs can be costly to install
- Not a cure-all





Bagged Oyster Shells



Coir Logs



Revetment



Synthetex
Hydrotex Enviromats



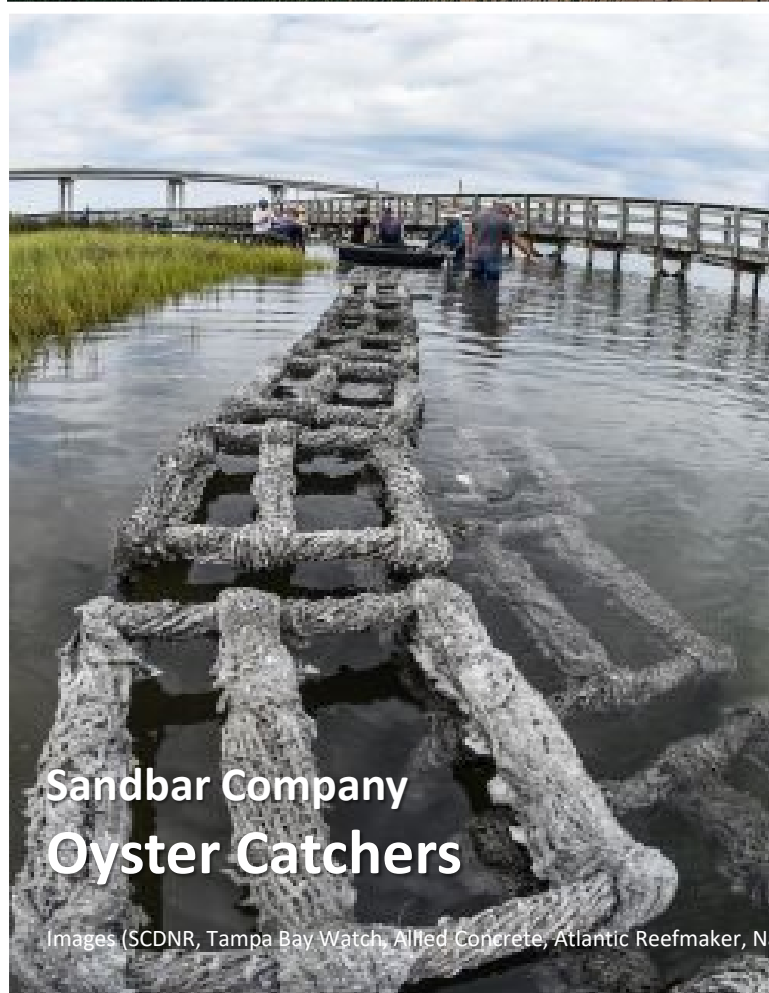
Atlantic Reefmaker



Allied Concrete
Oyster Castles



Coastal Technologies Corp
Marsh Oyster Units



Sandbar Company
Oyster Catchers



Tampa Bay Watch
Oyster Balls/Domes



Native Shorelines
QuickReef



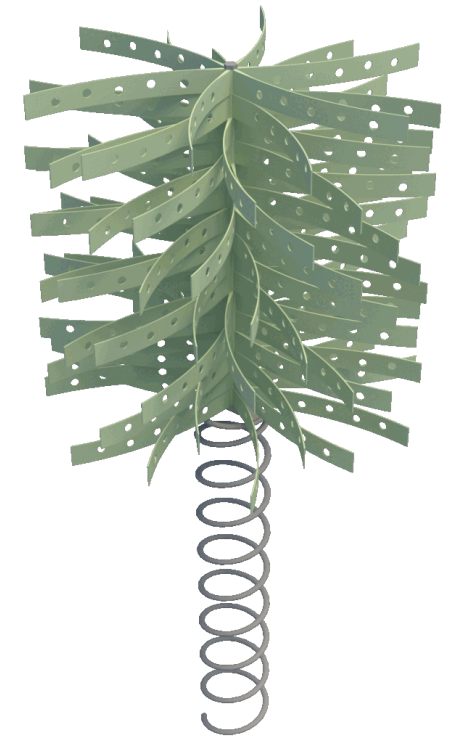
Empty or Filled
Gabion Baskets

Images (SCDNR, Tampa Bay Watch, Allied Concrete, Atlantic Reefmaker, Native Shoreline, Topsail News, Synthetex, Coastal Technologies Corp)

Kind Designs
3D Printed



Coastal Technologies
MarshGuard System



Natrx
Exoforms

CHOOSE A SHORELINE SOLUTION THAT WORKS FOR YOU

LIVING SHORELINE

PROTECT YOUR PROPERTY. SUPPORT THE ECONOMY. BUILD COASTAL RESILIENCE.



Sea Grant
NORTH CAROLINA

10 FACTS ABOUT LIVING SHORELINES

Proven by science conducted in North Carolina
by Faculty and Students at our universities

1 Slows Erosion and Can Grow Land

Native plants stabilize soils and reduce wave impacts, slowing erosion and collects sediment

2 Provides Storm Protection

Can reduce wave energy by up to 60% and protect homes and infrastructure

3 Reduces Flooding

Salt marsh wetlands are natural sponges that absorb and store floodwaters

4 Important Fisheries Habitat

Estuaries provide essential feeding, spawning, and nursery habitat for over 70% of NC commercially and recreationally important species

5 Improves Water Quality

Salt marsh plants and oysters filter sediments and pollutants to make water cleaner

6 Supports Wildlife

Provides habitat for birds, shrimp, crabs, oysters, fish, and other species that our economy relies on

7 Increases Property Value

Natural shorelines enhance waterfront aesthetics that can increase property appeal and value

8 Cost Less

Maintenance costs for living shorelines is on average lower than bulkheads and revetments

9 Adapts to Changing Conditions

Living shorelines grow on their own by supporting the marsh and accumulating sediment, becoming stronger over time

10 Strengthens Coastal Economy

By protecting fisheries, recreation, tourism, and natural resources they contribute to stronger economies and more resilient communities



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GETTING STARTED

Step 1 – Contact NC Division of Coastal Management
DCM Field Representatives can help determine what stabilization options are possible for your property and explain permitting requirements

Step 2 – Consult with a Living Shoreline Expert
Experienced contractors and coastal restoration experts can evaluate site conditions for solutions

Step 3 – Design and Permit
Contractors will help develop a design and help obtain necessary permits

Step 4 – Install and Enjoy
Once installed, vegetation and natural materials begin working to stabilize and protect your shoreline

COST PROGRAMS

Are there any programs to assist homeowners with the costs?

There are a couple of options for property owners

NC Coastal Federation Cost-Share Program
go.ncsu.edu/nccf-share

NC Soil and Water CCAP Program
go.ncsu.edu/ccap-share

FIND OUT MORE

Learn more about
living shorelines
go.ncsu.edu/shoreline

Learn how to
maintain a bulkhead
and improve it with a
living shoreline
go.ncsu.edu/bulkhead



Dr. Mariko Polk Coastal Processes Specialist mapolk2@ncsu.edu

ncseagrant.ncsu.edu



Why aren't living shorelines as popular?



- **Perception that bulkheads are more effective**

Bulkheads are everywhere, they must work



- **Neighboring property influence**

But they have one and I want it to match



- **Knowledge: Landowners, Marine Contractors**

I've never used a living shoreline before, I'm scared



- **Permitting hurdles**

My contractor said that's a headache



- **Perception that living shorelines aren't appropriate for high energy environments**

It looks so small and weak compared to a big hard wall

Where Can I see a Living Shoreline?

Carolina Beach State Park

1010 State Park Rd, Carolina Beach, NC 28428

Bradley Oaks

Bradley Drive, Wilmington, NC 28409

Airlie Gardens

300 Airlie Rd, Wilmington, NC 28403

Morris Landing Preserve

State Rd 1538, Holly Ridge, NC 28445



Homeowner Cost Sharing

There are a couple of options for property owners:

NC Coastal Federation cost-share program

go.ncsu.edu/nccf-share

NC Soil and Water CCAP Program

go.ncsu.edu/ccap-share





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