

# Evaluating Living Shorelines To Inform Regulatory Decision- Making in South Carolina

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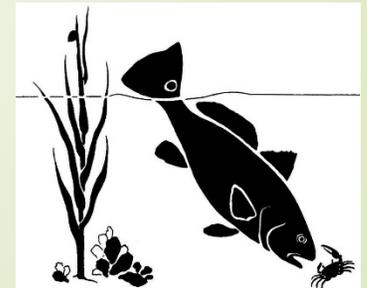
<sup>3</sup> South Carolina Dept. of Health & Environmental Control (SCDHEC)



DNR



NATIONAL ESTUARINE  
RESEARCH RESERVE SYSTEM  
SCIENCE COLLABORATIVE



North Inlet - Winyah Bay  
National Estuarine  
Research Reserve

# NERRS Science Collaborative Project:

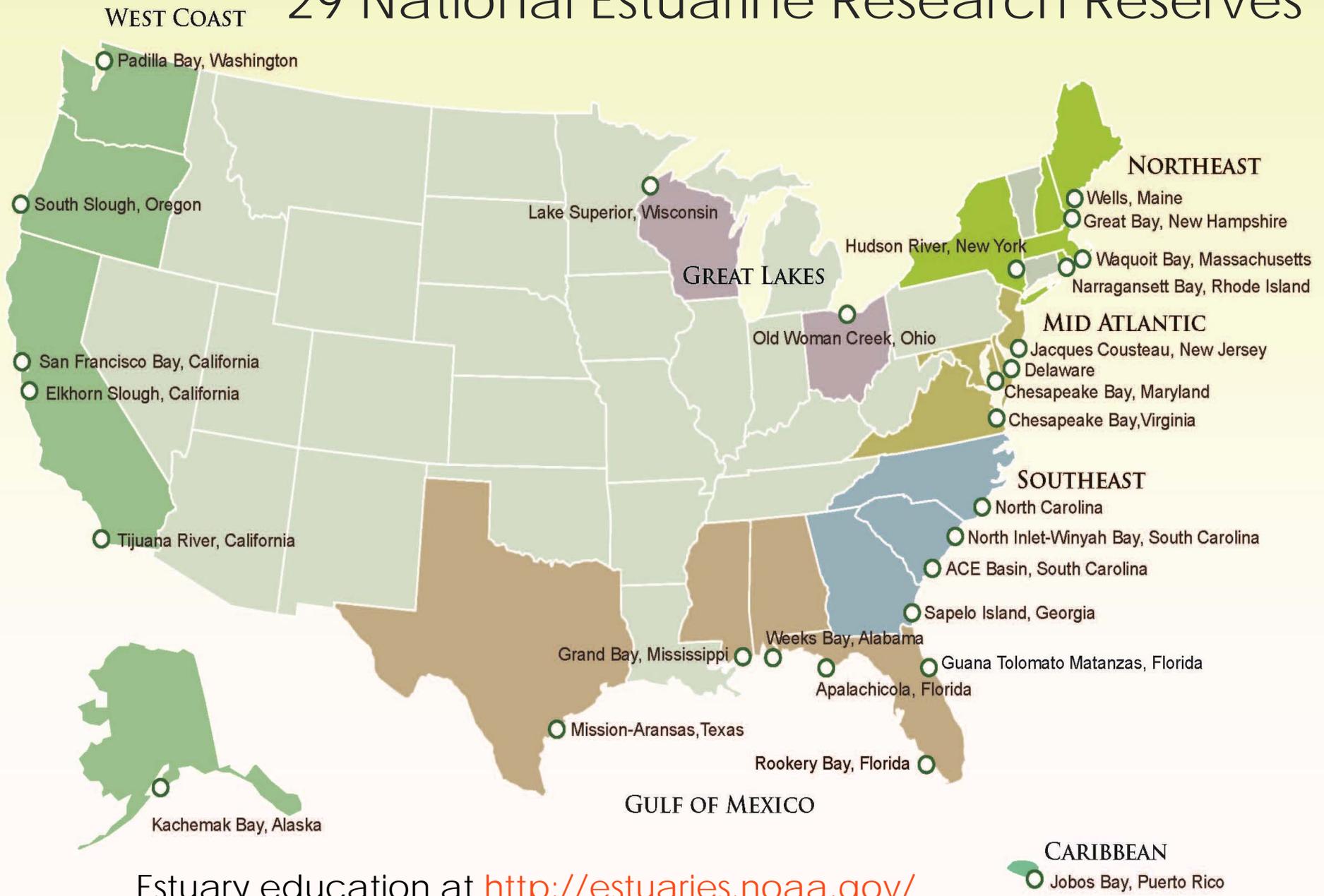
- This work is sponsored by the National Estuarine Research Reserve System (NERRS) Science Collaborative, which supports collaborative research that addresses **coastal management problems** important to the Reserves.
- Funded by the National Oceanic and Atmospheric Administration (NOAA) and managed by the University of Michigan Water Center.



NATIONAL ESTUARINE  
RESEARCH RESERVE SYSTEM  
SCIENCE COLLABORATIVE



# 29 National Estuarine Research Reserves



Estuary education at <http://estuaries.noaa.gov/>

Data available online at <http://cdmo.baruch.sc.edu/>

2010 - Spring (prior to installation of shell bags)



2010 - Fall



S.C. Oyster Restoration and Enhancement (SCORE) Program reef, on Hunting Island

Homeowner interest!!

2013



# Additional Approaches

- **Creating reefs from salvaged crab traps**



**Bears Bluff National Fish Hatchery  
Collaboration between SCDNR & USFWS  
Reef installed on May 2<sup>nd</sup>, 2011  
Photo taken on July 3<sup>rd</sup>, 2012 (Ben Stone, SCDNR)**

# Project Goals

- **Provide SCDHEC-OCRM with science-based information** on the relative effectiveness of different LS approaches under a range of regional site conditions.
- Support the **creation of new LS-friendly regulations** appropriate for coastal SC's physical conditions, **removing a critical barrier to living shoreline implementation.**
- Thereby: **Foster an increase in the footprint of living shorelines**, protecting SC's marshes from erosion and habitat loss, while increasing biodiversity and coastal resiliency.

Existing  
data  
analysis

+

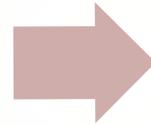
Intense  
old site  
monitoring

+

New sites

+

Case  
studies



Guidance for  
regulators, and  
property owners  
on suitable living  
shoreline  
approaches for  
a variety of  
conditions

# Project Type A sites

- Selected from successful SCORE Program oyster reef sites.
- High salinity (> 20ppt).
- Wave energy = medium to high.
- Erosion = medium to high.
- Sinkability = low.
- Assumed crab traps will work here.
- Focus on natural fiber approaches.

# Project Type B sites

- Biologically suitable for oysters.
- Less familiarity than with A sites.
- High salinity (> 20ppt).
- Wave energy = low.
- Erosion = medium.
- Sinkability = medium to high.
- Typical of recent crab trap sites.

# Project Type C sites

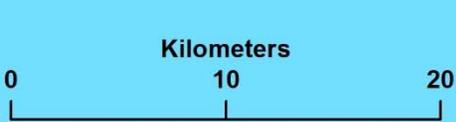
- Type of site with least familiarity.
- Biologically unsuitable for oysters.
- Marginal salinity (low, fluctuating).
- Lower salinity (< 20ppt).
- Wave energy = medium.
- Erosion = medium.
- Sinkability = variable.

# Living Shorelines Year 1 Installations



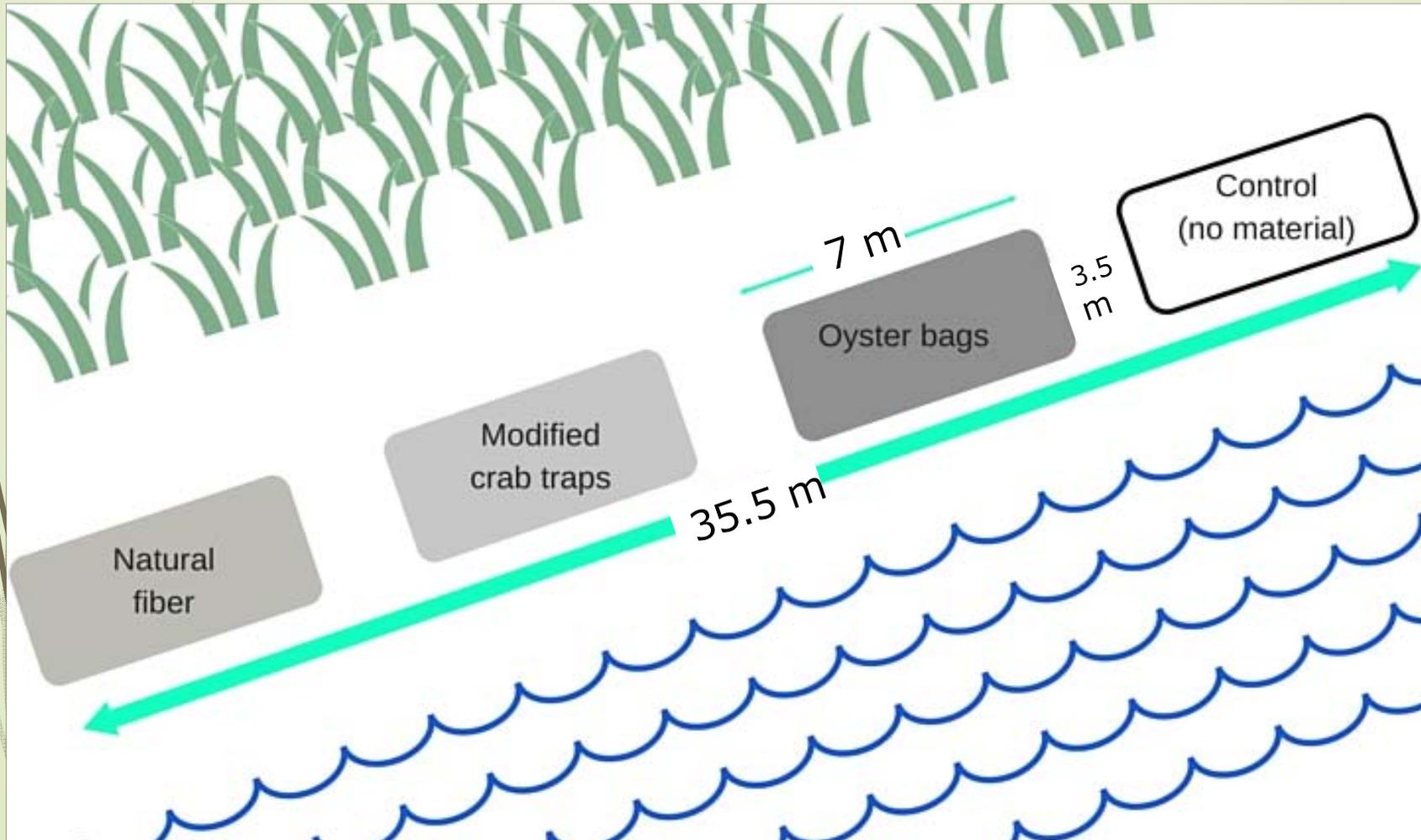
**Site Type**

- A
- B
- C



# Construct and monitor experimental sites

4 different materials with additional variations (treatments)  
3 different types of sites



# A-Site Detail: Boy Scout



## Marsh

Control

Coir + shell

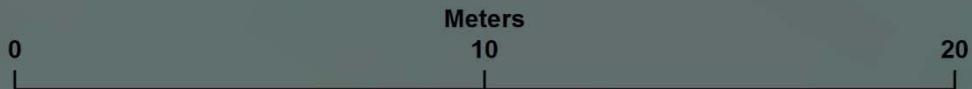
Curlex + shell

Bagged Shell

### Point Type

- Marsh edge
- Treatment corner
- Treatment elevation
- High edge
- Low edge

*Bohicket Creek*



# Treatment: Bagged oyster shell ("bags")

Boy Scout Camp, July 21<sup>st</sup> 2016



# Treatment: Modified crab traps

Big Bay Creek, July 26<sup>th</sup> 2016



# Treatment: Coir log (coconut fiber)

Coosaw Cut, June 22<sup>nd</sup> 2016



**Treatment: Curlex® (aspen)**



Combahee #2, September 21<sup>st</sup> 2016

Site information		Living shoreline treatments					Installation Date
Type	Location	Bags	Bags + pallets	Crab traps	Coir Logs	Curlex Blocs	
A	Coosaw Cut	✓			✓	✓	June 2016
	Dataw Island	✓			✓✓	✓✓	July 2016
	Boy Scout Camp	✓			✓	✓	July 2016
B	Hobcaw Creek		✓	✓		✓	June 2016
	Dawho		✓	✓	✓		June 2016
	Abbapoola Creek		✓	✓	✓		June 2016
	Morgan Island		✓	✓		✓	July 2016
	Bohicket Creek		✓	✓		✓	July 2016
	Big Bay		✓	✓		✓✓	July 2016
C	Combahee 1				✓✓	✓✓	Sept 2016
	Combahee 2				✓✓	✓✓	Sept 2016
	Whitehouse				✓✓	✓✓	Winter 2017
	Little Dock				✓	✓	Winter 2017

# Monitoring

- All treatments will be monitored immediately prior to and at installation to generate baseline data, and then 1-yr and 2-yrs later.
- All treatments will be compared to an adjacent, unaltered control area.
- Monitoring will quantify the ability of treatments to accumulate sediment, support marsh development and reduce erosion.
- Incorporating monitoring of 'historic' reef sites will generate data on living shoreline performance over longer term periods.

# Monitoring

- Data will be collected on changes in parameters including:
  - Escarpment height
  - Sediment composition and elevation\*
  - Living shoreline treatment elevation
  - Location of marsh edge
  - Development of marsh behind living shoreline
- Data collection will involve on-the-ground measurements using a variety of techniques.
- Other data sources (watersheds, aerial imagery, tidal data, etc.) will be incorporated.

# Hurricane Matthew: Landfall Oct. 8<sup>th</sup> in SC



NOAA/NASA

Image courtesy of NOAA

Immediately after installation...



Big Bay Creek, July 26<sup>th</sup> 2016

# Post-Matthew



Big Bay Creek, October 14<sup>th</sup> 2016

Immediately after installation...



Boy Scout Camp, July 26<sup>th</sup> 2016

... and less than 3 months later.



Boy Scout Camp, Oct 26<sup>th</sup> 2016

# Post-Matthew Status

Sites		Living shoreline treatments					Installation Date	
Type	Location	Bags	Bags + pallets	Crab traps	Coir Logs	Curlex Blocs		
A	Coosaw Cut	✓				X	X	June 2016
	Dataw Island	✓			✓✓	✓ X		July 2016
	Boy Scout Camp	✓			✓	✓		July 2016
B	Hobcaw Creek		✓	✓			✓	June 2016
	Dawho		✓	✓		X		June 2016
	Abbapoola Creek		✓	✓		✓		June 2016
	Morgan Island		✓		X		X	July 2016
	Bohicket Creek		✓	✓	✓		✓	July 2016
	Big Bay		✓	✓	✓	✓✓		July 2016
C	Combahee 1				✓✓	✓✓		Sept 2016
	Combahee 2				✓✓	✓✓		Sept 2016
	Whitehouse							<i>Spring 2017</i>

# Post-Matthew:



Curlex treatment:  
"Sock" is gone

Bohicket, Oct 26<sup>th</sup> 2016

## Accomplishments to date...

### ➤ Installed:

- 3 A sites
- 6 B sites
- 4 C sites

### ➤ Monitored:

- 30 historic reefs
- Pre and Post installation
- Post Hurricane Matthew

### ➤ Stakeholder Engagement:

- Workshops and discussion.

## Next steps...

### ➤ Spring-Summer 2017:

- Continue with data analysis
- Identify 4 new sites and consider Spartina planting
- Install 4 new sites

### ➤ Fall 2017 - Summer 2018:

- Monitor reefs: 16 new sites + 30 more 'historic' reefs

### ➤ Summer-Fall 2018:

- Complete data analyses

### ➤ Fall 2018:

- Prepare living shorelines guidance document for state coastal regulatory agency (SCDHEC-OCRM)

# Acknowledgements

Funding & funds management:



Project team:



SCDNR Field team members:

Trent Austin  
Abigail Del Giorno  
Austin Sturkie  
Grace Smythe  
Tyler Edwards

Joseph Burnette  
Alex Miller  
Nicole Carey  
Nick Wallover  
Al Segars

Additional stakeholders:



Fiber treatment advice: Josh Moody



Thank you for listening.

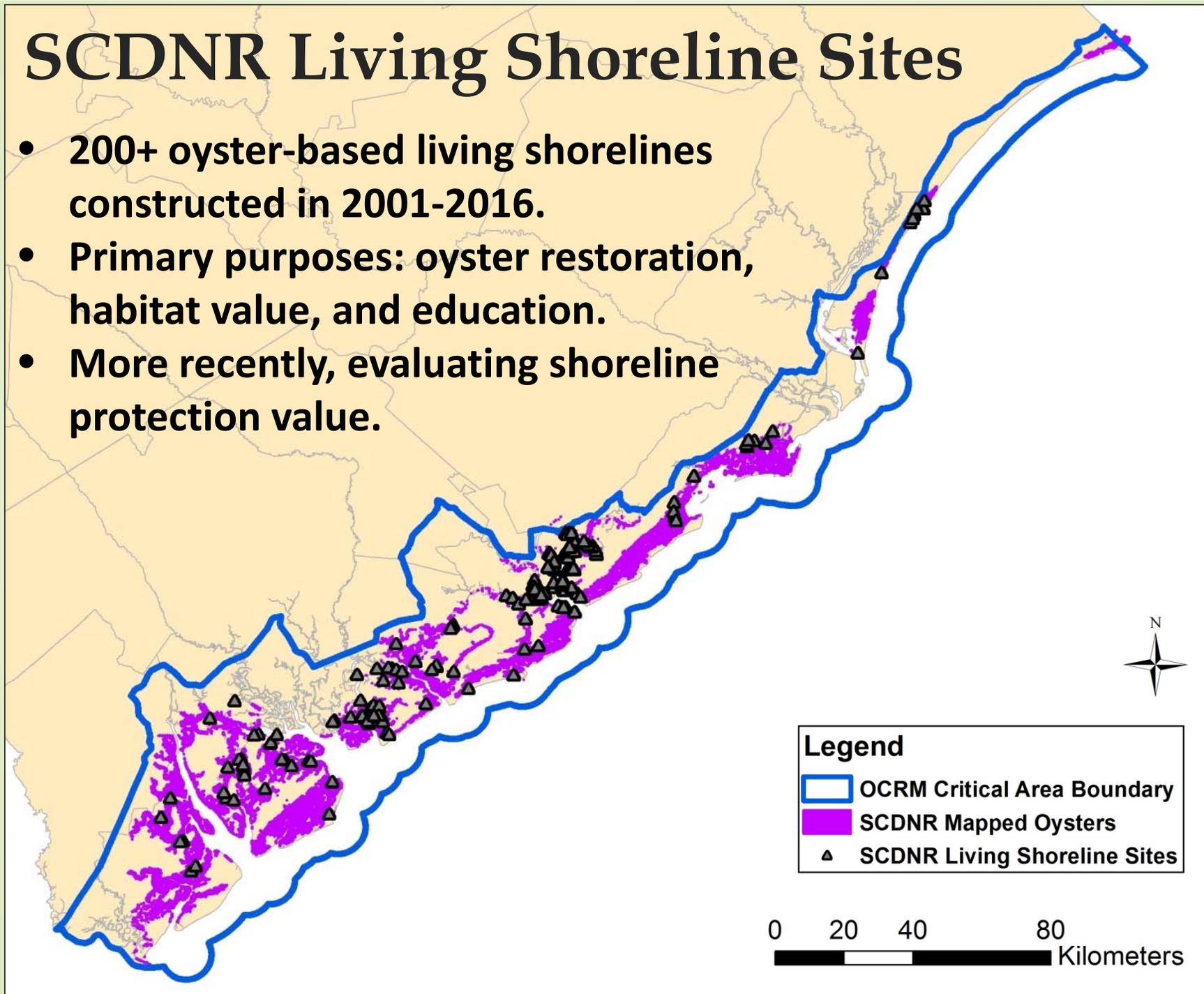
Dataw site, August 5<sup>th</sup> 2016





# SCDNR Living Shoreline Sites

- 200+ oyster-based living shorelines constructed in 2001-2016.
- Primary purposes: oyster restoration, habitat value, and education.
- More recently, evaluating shoreline protection value.





**Bulkhead installed to protect high ground of private property**



**Lack of saltmarsh seaward of bulkhead**



# Site Type characteristics:

- **Type A**: Successful SCORE program sites (happy oysters); gentle slope; low sinkability.
- **Type B**: Oyster-friendly areas where SCORE reefs have not been successful; steep slope or high sinkability.
- **Type C**: Non-oyster-friendly areas; salinity is too low or too variable.

# Project Components

- **Construct several reef types at each of 16 experimental sites, representing a range of habitat conditions.**
- **Monitor: Our project reefs & previously constructed ('historic') reefs.**
- **Prepare living shorelines guidance document for state coastal regulatory agency (SCDHEC OCRM).**

# Project Components

- Review and analyze existing data.
- Create new type A, B, and C experimental sites.
- Monitor 'historic' reef sites.
- Monitor new living shoreline sites.
- Complete comprehensive data synthesis and analysis.

# Monitoring

- **Monitoring of ‘historic’ reefs will provide data on living shoreline performance over longer-term periods, and on site characteristics that are associated with reef successes/failures.**
- **Monitoring of project-installed reefs occurs at installation (baseline), and 1- & 2-yrs later.**
- **All ‘historic’ and ‘project’ reef areas will be compared to adjacent, unaltered control areas.**

# Monitoring, cont.

- Parameters include:
  - **Pre-install: Bank slope & sediment “sinkability”**
  - **Repeated fixed-point photos**
  - **Elevation of sediment surface (& sed. comp.)**
  - **Elevation of mid-reef surface**
  - **Escarpment position**
  - **Marsh edge position**
  - **Stem density transects (perpendicular to shore)**
  - **% cover of live oysters (for a subset of reef types)**
- Additional data (GIS, salinity, boat traffic, etc.) will also be incorporated.

## Next steps...

- Fall 2016 – Monitoring ‘historic’ reef sites and collect post-hurricane baseline data.
- Winter 2016 – Analyze ‘historic’ reef data.
- Spring / Summer 2017 – Install year 2 living shoreline treatments (4 new sites).
- Fall 2017 – Monitor year 1 living shorelines.
- Spring / Summer 2018 – Monitor all sites created during the project.
- Summer / Fall 2018 – Complete data analyses.
- Fall 2018 – Transfer information to end users (SCDHEC) to prepare guidance document for living shorelines in South Carolina.