Local environmental extension programs

Eric Sparks
eric.sparks@msstate.edu
Living Shorelines
Alternative to hardened shorelines
Which do you prefer?
LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.

**One square mile** of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually.

Marshes trap sediments from tidal waters, allowing them to **grow in elevation** as sea level rises.

Living shorelines improve **water quality**, provide fisheries **habitat**, increase **biodiversity**, and promote **recreation**.

Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy.

Living shorelines are **more resilient** against storms than bulkheads.

**33%** of shorelines in the U.S. will be **hardened by 2100**, decreasing fisheries habitat and biodiversity.

Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.

---

The National Centers for Coastal Ocean Science | coastsacience.noaa.gov

Some graphics courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)
Project Partners: MS DEQ-NOAA
Total Project Cost: $50,000,000
5.9 miles of Living Shorelines
46 acres of marsh creation
46 acres of subtidal Oyster reef
AL.com

NOAA Gulf Spill Restoration
Federal and State Controlled Land

U.S. Mainland, Alaska and Hawaii are not on the same scale.

- Native American Reservations
- Designated Wilderness Areas
- Wilderness Study Areas
- U.S. Forest Service & Grasslands
- Bureau of Land Management
- National Parks, Landmarks, Monuments, etc.
- National Wildlife Refuge
- Military Bases and Installations
- Tennessee Valley Authority
- State and County Lands
Small-scale living shorelines
Hardened structures: response to erosion

- Shoreline begins to recede
- Vertical erosion occurs
- Bulkhead installed
- Loss of intertidal habitat
Loss of intertidal
Resiliency

Hardened Structure

Living Shoreline

Before

Before

After

After
Adaptability
Downstream impacts
Living Shoreline  v.s.  Bulkhead

- Erosion control:  ✔  ✔
- Resiliency:  ✔  ✗
- Lifetime:  ✔  ✗
- Natural benefits:  ✔  ✗
Why do landowners choose bulkheads over living shorelines?
Why do landowners choose bulkheads over living shorelines?

- Never heard of them
- No demonstration projects
- Don’t think living shorelines can protect their property from erosion
- Don’t connect natural environments with coastal benefits (subconsciously they do)
- Like clean cut look and/or don’t like wildlife
- Permitting
- Perceived cost
Protecting Your Property and the Environment: A Homeowner's Guide to Living Shorelines in Mississippi

Why Living Shorelines?
- Natural bank stabilization
- Alternative to hardened structures (i.e., bulkheads)
- Provide habitat for aquatic and terrestrial species
- Improve water quality
- Cost-effective compared to hardened structures
- More resilient than hardened structures

To learn more about living shorelines, visit the following sites:
- livingshorelinesacademy.org/
- Mississippi-Alabama Sea Grant (masgc.org/living-shorelines)
- Mississippi Department of Marine Resources (dmr.ms.gov/index.php/coastal-resources-management/wetland-permitting)

Top 5 Reasons for Permit Rejection
1. Application does not contain a full, narrative description of proposed work.
2. Drawings do not show mean high tide (MHT).
3. Drawings are not on 8½-by-11-inch paper, in grayscale.
4. Application does not list latitude/longitude and section/township/range of project site.
5. Drawings are not drawn to scale and do not show accurate dimensions of proposed work.

Permitting Agencies
- Mississippi Department of Marine Resources
- U.S. Army Corps of Engineers
- Department of Environmental Quality

Permit Application Checklist
- DMR/USACE joint application
- Drawings
- Environmental assessment
- Adjacent homeowner approval
- Agent authorization

Helpful Hints
- Start early. Submit your living shoreline application at least 90 days before construction is planned to begin.
- Be prepared. Have a pre-application meeting with the Mississippi Department of Marine Resources.
- Be patient. Permit approval takes time.

Important Contacts
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36602-0001
(251) 448-2488
www.usace.army.mil/

Mississippi Department of Marine Resources
1141 Bayview Avenue
Biloxi, MS 39532
(228) 532-4144
www.dmr.state.ms.us/

Mississippi State University Coastal Research and Extension Center
1815 Popp Ferry Road
Biloxi, MS 36022
(228) 388-4710
www.coastal.msstate.edu

To determine if you may have wetlands on your property, visit https://www.fws.gov/wetlands/data/mapper.HTML

Examples of Living Shoreline Projects

Photo by Eric Sparks

Photo by North Carolina Coastal Federation

Photo by NOAA

Sea Grant
NOAA
National Estuarine Research Reserve System Science Collaborative
Fleischmann Bay Science Collaborative

Publication 3062-06.17
MASGC-17-011

By Sara Martin, Extension Program Associate, Eric Sparks, Assistant Extension Professor, Nigel Temple, PhD student, and Daniel Firth, master's student, Coastal Research and Extension Center.

Copyright 2017 by Mississippi State University. All rights reserved. This publication may be copied and distributed without alteration for nonprofit educational purposes provided that credit is given to the Mississippi State University Extension Service.

Produced by Agricultural Communications.

We are an equal opportunity employer, and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability status, protected veteran status, or any other characteristic protected by law.

Living Shoreline Success

- Poor candidate
- Good candidate
Top 4 factors affecting Design and Costs

Wave Energy

Salinity

Elevation

State of shoreline
Levels of wave energy

- LOW
- MODERATE
- HIGH

Wave energy reducers
Materials
(per linear foot)

Living Elements
- Plants $10
- Coir log $16-20
- Oyster shell $5-20

Hybrid Elements
- Rip rap $18-35
- Reef balls $40

Bulkhead
- Wood $115-265
- Vinyl $125-285
- Concrete $500-1000
# Bottom Line cost estimates

(materials + labor)

<table>
<thead>
<tr>
<th></th>
<th>Living shorelines</th>
<th>Bulkhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price range (per linear ft)</td>
<td>$200-1300</td>
<td>$400-1300</td>
</tr>
<tr>
<td>Lifetime</td>
<td>indefinite</td>
<td>20-50 yrs</td>
</tr>
</tbody>
</table>
The Wise Project
On Palmetto Creek
Perdido Beach, AL
225 linear ft. shoreline
Temporary wave mitigation: $2,240

600 6” sods local grown marsh grass: $1,800
No labor costs!
Instructable:

1. Assess site & design
2. Prep site
3. Plant sods
Finished product

Before

After
Project costs

Living Shoreline
(estimated cost)
$30k - $49k
(self installation)
$4,200

Wooden Bulkhead
(estimated cost)
$30k - $56k
(self installation)
$26,000
Perdido Key, FL

- Failed bulkhead
- 150 ft of shoreline
- $3,000
- Stop mowing!!!!!
- Install temporary wave break
- Plant marsh
Why do landowners choose bulkheads over living shorelines?

- Never heard of them
- No demonstration projects
- Don’t think living shorelines can protect their property from erosion
- Don’t connect natural environments with coastal benefits (subconsciously they do)
- Like clean cut look and/or don’t like wildlife
Questions?
Education, awareness, and research program

Cleanups (July 5 and October 21)

To register or get more info, visit mscoastalcleanup.org
What is Marine Debris?
Top 10 Items Collected

1. Cigarette Butts: 2,043,470
2. Food Wrappers (Candy, chips, etc.): 1,685,422
4. Bottle Caps (Plastic): 847,972
5. Straws, Stirrers: 555,007
6. Grocery Bags (Plastic): 441,493
7. Beverage Bottles (Glass): 394,796
8. Other Plastic Bags: 389,088
9. Paper Bags: 368,746
10. Beverage Cans: 339,170

Ocean Conservancy
Table 1. Marine debris collected during the 2016 Mississippi Coastal Cleanup.

<table>
<thead>
<tr>
<th>CLEANUP SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trash bags filled</td>
</tr>
<tr>
<td>Weight of trash collected (pounds)</td>
</tr>
<tr>
<td>Distance cleaned (miles)</td>
</tr>
<tr>
<td>Number of volunteers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMMONLY FOUND ITEMS</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette butts</td>
<td>27,916</td>
</tr>
<tr>
<td>Food wrappers</td>
<td>8,590</td>
</tr>
<tr>
<td>Take-out containers (plastic)</td>
<td>2,008</td>
</tr>
<tr>
<td>Take-out containers (foam)</td>
<td>1,999</td>
</tr>
<tr>
<td>Bottle caps (plastic)</td>
<td>6,923</td>
</tr>
<tr>
<td>Bottle caps (metal)</td>
<td>3,263</td>
</tr>
<tr>
<td>Lids (plastic)</td>
<td>4,013</td>
</tr>
<tr>
<td>Straws/stirrers</td>
<td>5,396</td>
</tr>
<tr>
<td>Forks, knives, spoons</td>
<td>1,030</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMMONLY FOUND ITEMS</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverage bottles (plastic)</td>
<td>8,468</td>
</tr>
<tr>
<td>Beverage bottles (glass)</td>
<td>4,313</td>
</tr>
<tr>
<td>Beverage cans</td>
<td>5,874</td>
</tr>
<tr>
<td>Grocery bags (plastic)</td>
<td>4,380</td>
</tr>
<tr>
<td>Other plastic bags</td>
<td>4,691</td>
</tr>
<tr>
<td>Paper bags</td>
<td>2,001</td>
</tr>
<tr>
<td>Cups and plates (paper)</td>
<td>2,389</td>
</tr>
<tr>
<td>Cups and plates (plastic)</td>
<td>2,926</td>
</tr>
<tr>
<td>Cups and plates (foam)</td>
<td>1,595</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PACKAGING MATERIALS</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-pack holders</td>
<td>80</td>
</tr>
<tr>
<td>Strapping bands</td>
<td>316</td>
</tr>
<tr>
<td>Tobacco packaging/wrap</td>
<td>1,490</td>
</tr>
<tr>
<td>Other plastic/foam packaging</td>
<td>2,972</td>
</tr>
<tr>
<td>Other plastic bottles (oil, bleach, etc.)</td>
<td>829</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERSONAL HYGIENE</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condoms</td>
<td>106</td>
</tr>
<tr>
<td>Diapers</td>
<td>85</td>
</tr>
<tr>
<td>Syringes</td>
<td>67</td>
</tr>
<tr>
<td>Tampons/tampon applicators</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FISHING GEAR</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing buoys, pots, and traps</td>
<td>181</td>
</tr>
<tr>
<td>Fishing net and pieces</td>
<td>291</td>
</tr>
<tr>
<td>Fishing line (1 yard = 1 piece)</td>
<td>976</td>
</tr>
<tr>
<td>Rope (1 yard = 1 piece)</td>
<td>403</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER TRASH</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appliances (refrigerators, washers, etc.)</td>
<td>116</td>
</tr>
<tr>
<td>Balloons</td>
<td>412</td>
</tr>
<tr>
<td>Cigar tips</td>
<td>1,868</td>
</tr>
<tr>
<td>Cigarette lighters</td>
<td>386</td>
</tr>
<tr>
<td>Construction materials</td>
<td>1,729</td>
</tr>
<tr>
<td>Fireworks</td>
<td>2,027</td>
</tr>
<tr>
<td>Tires</td>
<td>462</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TINY TRASH</th>
<th>TOTAL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam pieces</td>
<td>5,104</td>
</tr>
<tr>
<td>Glass pieces</td>
<td>5,559</td>
</tr>
<tr>
<td>Plastic pieces</td>
<td>13,018</td>
</tr>
</tbody>
</table>
Plastic Worlds

Plastic Production (millions of tonnes)
- 2014: 311 MT
- 2050: 1,124 MT

Ratio of plastics to fish in the ocean (by weight)
- 2014: 1:5
- 2050: >1:1

Plastics' share of global oil consumption
- 2014: 6%
- 2050: 20%

SOURCE: WORLD ECONOMIC FORUM
What are microplastics?
Where do they come from?

Primary microplastics

Secondary microplastics
Most common microplastic

• Fibers
• Synthetic fabrics - polyester, nylon, acrylic
• Shed from clothes with each washing
• BIG source of microplastics
IMPACTS OF MARINE DEBRIS

INGESTION
Animals mistakenly eat plastic and other debris.

ENTANGLEMENT & GHOSTFISHING
Marine life gets caught and killed in ghost nets, trapped in derelict gear, and entangled in plastic bands and other marine debris.

HABITAT DAMAGE
Heavy marine debris crushes sensitive habitat, such as coral reefs and sea grass.

NON-NATIVE SPECIES
Marine debris transports alien and invasive species from one region to another.
The October Cleanup
Part of ICC

- Over 50 local sites
- ≈4,000 volunteers
- 10-14 tons of trash
How to get involved:

› Register at www.mscoastalcleanup.org

› Assemble a group of friends or family

› Mark your calendar!
Coastal Cleanup Agenda:

- Morning clean up
- Collect data
- Free lunch
- Educational booths
- Prizes
Citizen Science
Microplastic sampling
We provide sampling gear, guides, and training.

Partners provide citizen scientists and data.
Sampling & Processing Guide Book
CITIZEN SCIENCE MARINE DEBRIS MONITORING & OUTREACH

Amanda Sartain, Caitlin Wessel, & Eric Sparks
MISSISSIPPI STATE UNIVERSITY COASTAL RESEARCH & EXTENSION CENTER | DAUPHIN ISLAND SEA LAB | NOAA MARINE DEBRIS PROGRAM | MISSISSIPPI-ALABAMA SEA GRANT CONSORTIUM
How-to Videos

• How to sample in the field
• How to build necessary equipment
• Processing water samples
• Processing beach samples
INTERNATIONAL COASTAL CLEANUP
Data

• Location of sample

• Number of microplastics per volume/area

• Type of microplastics
  • Fibers
  • Fragments
  • Film
  • Beads
Microplastic distribution maps
Want to participate?
Contact me at eric.sparks@msstate.edu
Chapters

➢ Central - Jackson

➢ Coastal - Biloxi
Mission

To develop an organization of knowledgeable volunteers to help promote conservation and management of Mississippi’s natural resources through education, outreach, and service within their communities.
Who are Master Naturalists?

- Adults interested in nature
- Adults who want to educate and volunteer to their community
Program reach

➢ Tracking began in 2008

➢ Approximately 230 participants

➢ Participants have reached over 200,000 people!

➢ Growing exponentially
Certification Requirements

1. Basic training course
2. *8 advanced training hours
3. *40 hours volunteer hours

*Annual requirements that must be approved
THE TITLE OF
CERTIFIED MISSISSIPPI
MASTER NATURALIST
IS HEREBY CONFERRED UPON

FOR SUCCESSFULLY COMPLETING THE MISSISSIPPI MASTER NATURALIST TRAINING AND VOLUNTEERING REQUIREMENTS.

DATE
Certification expires December 31st annually, unless annual volunteer and training requirements are fulfilled.

CHAPTER COORDINATOR

STATE COORDINATOR

We are an equal opportunity employer, and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability status, protected veteran status, or any other characteristic protected by law.

F1125 (03-16)
Coastal Course Agenda

1 – Intro, pre-test, Ecology
- September 7th
- Coastal Research and Extension Center (CREC)

2 – Forest Ecology
- September 15th
- De Soto National Forest

3 – Coastal and Estuarine Ecology
- September 23rd
- Dauphin Island Sea Lab

4 – Entomology, Human Impacts
- September 28th
- CREC
Coastal Course Agenda

5 – Fish
- October 3rd
- Gulf Coast Research Lab

6 – Wildlife and Forest Management
- October 7th
- Longleaf pine plantation

7 – Coastal habitats, birds
- October 14th
- Grand Bay NERR

8 – Volunteering, post-test, project presentations
- October 17th
- CREC
Last year’s coastal course
How to find out about Master Naturalist opportunities

- Website
  - [http://masternaturalist.extension.msstate.edu/](http://masternaturalist.extension.msstate.edu/)

- Check and “like” facebook page
  - [www.facebook.com/MSMasterNaturalists](http://www.facebook.com/MSMasterNaturalists)

- Email
  - eric.sparks@msstate.edu
Want to be added to waiting list?
Contact me at eric.sparks@msstate.edu