ALTERNATIVE SHORELINE MANAGEMENT IN COASTAL MISSISSIPPI

Project supported via financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of the Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration and the Mississippi Department of Marine Resources.
Team Members

• MS Department of Marine Resources
  – Bureau of Wetland Permitting
    • Willa Brantley, Director
    • Jennifer Wittmann, Deputy Director

• Allen Engineering and Science
  – Science, Engineering, and Planning Divisions
    • Melissa Pringle, Ph.D.
    • Tammy Wisco, P.E. and AICP
    • Kimberly Miller, AICP
    • Paul Lanning, RLA
GOALS OF ALTERNATIVE SHORELINE MANAGEMENT

Protect and Preserve Mississippi’s Natural Shorelines in Conjunction with Shoreline Stabilization Practices
• Assessment
• Research
• Report of Findings
• Manual Development
• Stakeholder Engagement
HARD SHORELINE MANAGEMENT PRACTICES

- Bulkheads
- Revetment
- Groins
- Rock Sills
- Breakwaters

Hard Shoreline Management Practices Often Used in Areas with High Wave Action, High Erosion Rates, and Steep Slopes
HARD SHORELINE MANAGEMENT PRACTICES

- **Bulkhead** - Vertical structure of timber, steel, vinyl or concrete placed parallel to eroding shoreline in high wave energy locations

- **Revetment** - Sloped seawall made of concrete or riprap

- **Groin** - Series of timber, rock, vinyl or concrete structures built perpendicular to shoreline
DISADVANTAGES ASSOCIATED WITH HARDENED SHORELINES

- Interrupt natural processes
- Block long-shore sand transport
- Increase erosion along adjacent shorelines
- Habitat loss
- Beach loss
- Prevent natural migration of wetlands and sediment
- Drown vegetation
- Costly
ALTERNATIVE MANAGEMENT PRACTICES

- **Extreme High Tide & Storms**
- **Mean High Tide**
- **Mean Low Tide**

**LIVING BREAKWATER**
- Regularly Flooded
- Irregularly Flooded

**TIDAL MARSH**

**UPLAND**
- Native Trees/Shrubs

**BANKFACE**
- Deep rooted native grasses & shrubs on banks
- Natural Fiber Matting

**COASTAL WETLANDS & BEACH STRAND**
- Wetland plants matched to tidal hydrology & salinity
- Sills, stone surface groins, marsh toe revetments, marshy islands, etc...
  matched to wave, climate & shoreline environment

**SAV**

**SUBTIDAL WATERS**
- Submerged aquatic vegetation (SAV)
- Artificial oyster reefs
- Living Breakwaters
LIVING OR SOFT SHORELINE MANAGEMENT STRATEGIES

- Clean or Dredge Fill
- Re-grading & Re-vegetating
- Planting Upland Vegetation
- Planting Wetland Vegetation
- Anchoring Natural Fiber Logs with Vegetation
- Natural Fiber Matting with Vegetation
- Geotextile Tubes filled with Clean Dredge Fill
- Living Breakwaters
- Oyster Reefs or Use of Oyster Balls
LIVING OR SOFT SHORELINES

- Marsh Grass Plantings- Native plants introduced at the shoreline to minimize erosion.

- Coir Log- Anchored natural fiber log with marsh grass planting

- Natural Fiber Matting & Logs- Stabilize slope and allow for regrowth of vegetation
LIVING OR SOFT SHORELINES

* Living Breakwaters - Rock, oyster shell timber etc. seeded with oyster spat and planted with vegetation

* Geotextile Tubes - Tubes filled with sediment, placed underwater or on beach to stabilize shore and wetlands

* Oyster Reef - Natural reefs and oyster balls introduced to dissipate wave energy
HYBRID SHORELINE MANAGEMENT

- Sill with Planted Marsh
- Marsh Toe Revetment
- Breakwater with Transitional Wetland

Note: Overtopping Wave Energy Dissipated by Native Plants
HYBRID SHORELINES

- **Sill with Planted Marsh**
  - Low elevation stone structure near shore traps sediment and promotes plant growth

- **Breakwater with Transitional Wetland** - Similar to Sill, but used in the event of greater water depth, slope of shoreline, higher wave action

- **Marsh Toe Revetment** - Stone structure placed at marsh edge to stabilize eroding marsh
Tools for Choosing the Right Management Strategy

#1 Identify Your Shoreline Type
- Natural or Hardened Shoreline
- Slope
- Erosion Rates
- Wave Energy
- Water Depth
- Offshore Ground Surface
- Salinity
- Fetch
- Longshore Sediment Transport

#2 Prioritize Management Goals
- Erosion Prevention
- Water Quality Improvement
- Fish Production
- Habitat Diversity
- Recreational Benefits
#3 Match your shoreline to best management practices

<table>
<thead>
<tr>
<th>General Practices</th>
<th>Shoreline Type</th>
<th>Practice and Site Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marsh</td>
<td>Cove</td>
</tr>
<tr>
<td>Marsh Plantings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coir Logs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beach Nourishment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oyster Reefs/Balls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sills with Plantings/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwaters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulkhead</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Best management strategy
- Good management strategy
- Least Effective management strategy
#4 Determine which best management practices meet your goals

<table>
<thead>
<tr>
<th>Practice and Ecosystem Benefits</th>
<th>General Practices</th>
<th>Erosion Prevention</th>
<th>Water Quality Improvement</th>
<th>Fish Production</th>
<th>Habitat Diversity</th>
<th>Recreational Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh Plantings</td>
<td>Reduces wave energy, holds soil and traps sediments in grasses.</td>
<td>Filters runoff, improving quality of water.</td>
<td>Protection and habitat for juvenile fish and feeding areas for adult fish.</td>
<td>Provides food and protection for finfish, shellfish, mammals, and shorebirds.</td>
<td>Not for public use; piers must be elevated.</td>
<td></td>
</tr>
<tr>
<td>Coir Logs</td>
<td>Reduces wave energy, holds soil and traps sediments more effectively than plantings alone.</td>
<td>When used in conjunction with marsh grass and other plantings, coir logs filter runoff, improving quality of water.</td>
<td>Allows marsh to establish in higher erosion areas, creating protection and habitat for fish.</td>
<td>When used in conjunction with marsh grass and other plantings, provides food and protection for finfish, shellfish, mammals, and shorebirds.</td>
<td>Not for public use.</td>
<td></td>
</tr>
<tr>
<td>Beach Renourishment</td>
<td>Replenishes eroded shorelines and minimizes loss of private property. Reduces wave energy and inland damage from coastal storms.</td>
<td>Beaches provide minimal filtration and are often the site of high bacteria concentrations from stormwater system discharge. Sand filters to the existing stormwater outfalls have been used in other areas, and could improve beach water quality.</td>
<td>Fish eggs and microorganisms are often smothered by highly turbid water in beach environments.</td>
<td>Reduces habitat diversity by covering existing plants and other organisms with sand. Also increases sediment in breeding grounds which can smother plants and fish eggs.</td>
<td>Provides opportunity for public access to swimmers and boaters.</td>
<td></td>
</tr>
<tr>
<td>Oyster Reefs/Balls</td>
<td>Reduces wave energy, traps sediment and adds shell material to living reef.</td>
<td>Filters runoff and surrounding water, improving quality of water.</td>
<td>Fosters development of oysters, thus creating feeding areas, habitat for fish, and crab.</td>
<td>Provides habitat for shrimp, crabs, clams, snails, worms, and finfish.</td>
<td>In open season, oysters, fish, and crab can be harvested from the reefs located in approved waters. Over-harvesting could eliminate the benefits of this strategy.</td>
<td></td>
</tr>
<tr>
<td>Sills with Plantings/Hybrids</td>
<td>Absorbs and spreads out wave energy; traps sediments to counter changing sea levels. May reflect wave energy; however, leading to erosion in adjacent areas.</td>
<td>Filters runoff, improving quality of water.</td>
<td>Nursery and habitat for fish.</td>
<td>New marsh may attract a greater diversity of aquatic species, plants and migrant birds. Rocks or recycled material are good habitat for aquatic species, especially oysters. Shells can encourage growth of subaquatic vegetation.</td>
<td>Dry beach habitat is replaced by a marsh sill system. Docks may need to extend longer to reach open water. Recreation marshes attract migrating birds, increasing bird-watching opportunities.</td>
<td></td>
</tr>
<tr>
<td>Breakwaters</td>
<td>Spreads out wave energy, but reflects waves that may cause scour or erosion of adjacent shorelines. Also accumulates blocks sediment that should nourish downstream properties.</td>
<td>No effect.</td>
<td>Barnacles and oysters often settle on breakwaters, providing foraging areas for fish, however the “beach” that is formed from accumulating sediment reduces fish habitat.</td>
<td>Depending on wave energy, concrete shellfish and finfish habitat. Can also create conditions for subaquatic vegetation if water depth (amount of light) and sediment content is appropriate. Placement of extra sand on some beaches can impact habitat of protected turtle species.</td>
<td>Construction of breakwater leads to the creation of a new beach, where sediment accumulates.</td>
<td></td>
</tr>
<tr>
<td>Bulkhead</td>
<td>Properly built bulkheads provide protection from waves in extreme conditions, but because wave energy is reflected rather than absorbed, reflected waves may cause bottom scour and loss of shoreline vegetation.</td>
<td>If bulkhead base is in the intertidal zone, property owners may plant vegetation to filter and improve water quality, but if vegetation is removed to construct bulkhead on the shoreline, it will lead to a decrease in water quality.</td>
<td>Minimizes or eliminates the marsh/wetlands, reducing habitat and food for fish.</td>
<td>Stops the creation of wetlands. Loss of habitat and connection between terrestrial and aquatic habitats.</td>
<td>Easy access to deeper water.</td>
<td></td>
</tr>
</tbody>
</table>
#5 Identify Pros & Cons to Potential Management Strategies

<table>
<thead>
<tr>
<th>Practice</th>
<th>Pros</th>
<th>Cons</th>
<th>Best Used in Areas with:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bulkheads</strong></td>
<td>• Protection from waves in extreme conditions</td>
<td>• Poorer than usual due to upland water pressure and increased erosion on the waterfront</td>
<td>High wave energy, limited land availability, narrow and shallow banks, wetland or shoreline erosion</td>
</tr>
<tr>
<td></td>
<td>• Increased erosion in extreme conditions</td>
<td>• Wave reflection causes increased erosion at base</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Increased erosion on adjacent shoreline</td>
<td>• Erosion on downstream side</td>
<td></td>
</tr>
<tr>
<td><strong>Revetments</strong></td>
<td>• Wave reflection less than bulkhead</td>
<td>• Increased erosion on adjacent shoreline</td>
<td>High wave energy and no existing marsh</td>
</tr>
<tr>
<td></td>
<td>• Low maintenance</td>
<td>• Increased erosion on adjacent shoreline</td>
<td></td>
</tr>
<tr>
<td><strong>Groins/Jetties</strong></td>
<td>• Increased need on splitfill side rumpus beach</td>
<td>• Erosion on downstream side</td>
<td>Where beach development necessary and downstream beach not necessary</td>
</tr>
<tr>
<td></td>
<td>• Increased maintenance</td>
<td>• Natural sand transport</td>
<td></td>
</tr>
<tr>
<td><strong>Sills</strong></td>
<td>• Wave attenuation</td>
<td>• Non-functional</td>
<td>Moderate water energy without conditions for vegetation</td>
</tr>
<tr>
<td></td>
<td>• Habitat Construction</td>
<td>• May not be effective</td>
<td></td>
</tr>
<tr>
<td><strong>Breakwaters</strong></td>
<td>• Can withstand high wave activity</td>
<td>• Inefficient</td>
<td>Moderate to high wave energy</td>
</tr>
<tr>
<td></td>
<td>• Can maintain effective with minor damage</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Does not impact natural shoreline</td>
<td>• Subject to settling and erosion</td>
<td></td>
</tr>
<tr>
<td><strong>Clean Fill/Dredge Material</strong></td>
<td>• Encourages vegetation</td>
<td>• Not effective alone in high wave energy areas</td>
<td>Low wave energy</td>
</tr>
<tr>
<td><strong>Upland Vegetation - Trees, Shrubs, Grasses and Grass Roots</strong></td>
<td>• Soil stabilization in upland zone</td>
<td>• Does not improve stabilization in wetland or coastal areas</td>
<td>Low wave energy</td>
</tr>
<tr>
<td></td>
<td>• Stormwater runoff filtration</td>
<td>• Appropriate soil type for native species</td>
<td></td>
</tr>
<tr>
<td><strong>Wetland Vegetation - Marsh Grasses</strong></td>
<td>• Improve fish and shellfish habitat</td>
<td>• Not feasible alone in high wave energy areas</td>
<td>Low energy sediment with minimal boat wake action</td>
</tr>
<tr>
<td></td>
<td>• Stabilize soil</td>
<td>• Not for use in high wave energy areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trap and retain sediment</td>
<td>• Not for use in high wave energy areas</td>
<td></td>
</tr>
<tr>
<td><strong>Natural Fiber Logs with Vegetation</strong></td>
<td>• Low impervious</td>
<td>• Biodegradable</td>
<td>Low energy, as they are intended to biodegrade over time once vegetation is established</td>
</tr>
<tr>
<td></td>
<td>• Biodegradable</td>
<td>• Trap and retain sediment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trap and retain sediment</td>
<td>• Trap and retain sediment</td>
<td></td>
</tr>
<tr>
<td><strong>Natural Fiber Matting with Vegetation</strong></td>
<td>• Can be used for moderate slopes</td>
<td>• Not for use in high wave energy areas</td>
<td>Moderate slopes</td>
</tr>
<tr>
<td></td>
<td>• Biodegradable</td>
<td>• Not for use in high wave energy areas</td>
<td></td>
</tr>
<tr>
<td><strong>Living Breakwaters</strong></td>
<td>• Wave attenuation</td>
<td>• Moderate to high wave energy, where sill not substantial enough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Improved wave quality</td>
<td>• Absence of submerged aquatic vegetation?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decrease in wave energy</td>
<td>• Fines and bottom to native settlement</td>
<td></td>
</tr>
<tr>
<td><strong>Sediment-Filled Geotextile Tubes</strong></td>
<td>• Effective erosion control</td>
<td>• Navigation hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Beneficial use of placed material</td>
<td>• Expensive</td>
<td></td>
</tr>
<tr>
<td><strong>Native Oyster Beds</strong></td>
<td>• Wave attenuation</td>
<td>• Trapped and &quot;trapped&quot; from other areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Improver wave quality</td>
<td>• Absence of submerged aquatic vegetation?</td>
<td></td>
</tr>
<tr>
<td><strong>Small Concrete Oyster Balls</strong></td>
<td>• Wave attenuation</td>
<td>• Navigation hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trap and sediment</td>
<td>• Expensive</td>
<td></td>
</tr>
<tr>
<td><strong>Silt with Planted Marsh</strong></td>
<td>• Absorb wave and create a calm area behind the sill to promote habitat and vegetation growth</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Filters runoff to improve water quality</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provides nursery habitat for juvenile fish</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td><strong>Marsh Toe Revetment (Existing Marsh)</strong></td>
<td>• Stabilize eroding marsh</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td><strong>Breakwaters with Transitional Wetlands</strong></td>
<td>• Absorb wave and create a calm area behind the sill to promote habitat and vegetation growth</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trap and sediment</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Maintain water interface</td>
<td>• Shall not be effective</td>
<td></td>
</tr>
</tbody>
</table>
Steps to Implementing your Shoreline Management Strategy
GETTING YOUR PROJECT UNDERWAY

1. Examine your neighbors’ shorelines
2. Assess your shoreline to determine size, feasibility and type of shoreline management
3. Request a pre-application meeting with the Mississippi Department of Marine Resources
4. Hire contractor
5. Develop design & cost estimate
6. Apply for necessary permits
7. Obtain permits
Mississippi Gulf Coast
Living Shoreline Project
Examples

Gulf Hills
Keegan Inlet
Grand Bay NERR
LIVING SHORELINE: GULF HILLS ON OLD FORT BAYOU

- **Shoreline Type:** Bayou Cove
- **Project Length:** 200 feet
- **Problem Addressed:** Erosion from road culvert channeling high velocity waters, nearby bulkheads
- **Strategy Chosen:** Hybrid Natural Fiber Coir Logs with rip rap
LIVING SHORELINE: KEEGAN BAYOU INLET

- Shoreline Type: Mouth of Bayou
- Project Length: approx. 125 feet
- Boat Wake Exposure: Moderate
- Problem Addressed: Degraded habitat, erosion, aesthetics of abandoned bridge
- Strategy Chosen: Marsh Planting
The Grand Bay National Estuarine Research Reserve installed a living shoreline restoration project at the Bayou Heron boat ramp to demonstrate an environmentally friendly and low cost alternative to shoreline hardening practices. The project used natural coconut husk fibers (coir) in compacted logs. The logs, when utilized with backfilled sand and planted vegetation (Juncus roemerianus) are stabilizing the shoreline. Local elementary school children helped install the living shoreline.
PLANT SPECIES FOR MISSISSIPPI LIVING SHORELINES

- Grasses, Sedges & Rushes
- Wildflowers
- Trees & Shrubs
GRASSES, SEDGES AND RUSHES
EXAMPLES

* Black needlerush
  (Juncus roemerianus)

* Seaoats (Uniola paniculata)
* American searocket 
(Cakile edentula)

* Seaside goldenrod 
(Solidago sempervirens)
TREES AND SHRUBS EXAMPLES

* Buttonwood
  (Conocarpus erectus)

* Seashore elder
  (Iva imbricata)
Educational Materials

WHAT IS A LIVING SHORELINE?
A “living shoreline” describes a natural approach to shoreline stabilization that reduces erosion while restoring, preserving, or creating valuable habitat along the shore. Instead of drowning the shoreline habitats and hardening shoreline landscapes as seen with the use of hardened structures, living shorelines encourage preservation and growth while improving water quality. By installing living shorelines where appropriate, property owners can make a significant cumulative impact on the restoration and preservation of Mississippi’s shorelines and habitats.

BENEFITS OF LIVING SHORELINES
- Increased fish/wildlife habitat
- Increased property value
- Erosion reduction
- Pollution reduction
- Aesthetically pleasing
- Improved water quality
- Cost savings for installation and maintenance

STEPs TO SUCCESSFUL SHORELINE MANAGEMENT
- Understand your neighbors’ shoreline plans.
- Request pre-application meeting with MDMR.
- Conduct a site assessment to determine the amount of shoreline to be protected, feasibility of the project, and type of shoreline stabilization practice to be implemented.
- Hire contractor/consultant to consult on the project.
- Obtain a project design and cost estimate.
- Apply for and receive permit(s) if necessary.

For more details on the permitting process see: http://www.dmr.ms.gov/index.php/coastal-zone-management/wetland-permitting

WHO TO CONTACT
Bureau of Wetlands Permitting
Mississippi Department of Marine Resources
1141 Bayview Avenue
Biloxi, MS 39530
Phone: (228) 374-5000
Website: http://www.dmr.ms.gov

U.S. Army Corps of Engineers
Mobile District
Regulatory Division
Mobile, AL 36602
Phone: (251) 690-2658
Website: http://www.sam.usace.army.mil/
Biloxi Field Office
Phone: (228) 523-4116

SHORELINE MANAGEMENT OVERVIEW DMR
MISSISSIPPI DEPARTMENT OF MARINE RESOURCES

Project supported via financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of the Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration and the Mississippi Department of Marine Resources.
OVERVIEW

The *Alternative Shoreline Management Guidebook (Guidebook)* is a Mississippi Department of Marine Resources (MDMR) project. Mississippi’s shorelines are key to the ecological and economic health of the coast; therefore, the Guidebook was developed to offer property owners a range of alternative shoreline management strategies to better balance shoreline protection and ecological restoration. The alternative management strategies promoted in this guidebook focus on vegetation restoration and erosion prevention with minimal use of hard structures.

TYPES OF SHORELINE MANAGEMENT PRACTICES

- **Hard Structures** - Armoring practices including bulkheads, seawalls, riprap, jetties, groins, and breakwaters.

- **Living Shorelines** - Habitat restoration through plantings and erosion control measures to provide nourishment for coastal wetlands, marshes, and beaches.

- **Hybrid Methods** - Combined structural and natural approaches for medium wave energy environments requiring some structural protection.

FACTORS TO CONSIDER WHEN SELECTING SHORELINE PRACTICES

- Type of Shoreline
- Rate of Erosion
- Slope
- Erosional Forces
- Wave Energy
- Water Depth
- Offshore Ground Surface
- Salinity
- Fetch
- Longshore Sediment Transport

SHORELINE HABITAT AND RECOMMENDED PRACTICES

- **Tidal Marsh**
  - Irregularly Flooded
  - Native marsh plants
- **Savanna (SAV)**
  - Irregularly Flooded
  - Tidal hydrology
  - Salt marsh plants
- **Upland**
  - Native trees/shrubs
  - Deep-rooted native grasses/shrubs on banks
- **Coastal Wetlands & Beach Strand**
  - Natural fiber matting
- **Subtidal Waters**
  - Submerged aquatic vegetation (SAV)
  - Artificial oyster reefs
  - Living breakwaters

SOFT OR LIVING SHORELINE PRACTICES AND HYBRIDS

- Clean Fill/Dredge Materials
- Upland Planting Vegetation
- Wetland Planting Vegetation
- Natural Fiber Logs and Matting with Vegetation
- Sediment-Filled Geotextile Tubes
- Living Breakwaters
- Native Oyster Reefs and Oyster Balls
- Sill with Planted Marsh
- Marsh Toe Revetment with Vegetation
Educational Materials

<table>
<thead>
<tr>
<th>Practice</th>
<th>Pros</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Fill/Dredge Material</td>
<td>* Encourages vegetation</td>
</tr>
<tr>
<td>Upland Vegetation - Trees, Shrubs, Grasses and Grass Roots</td>
<td>* Soil stabilization in upland zone</td>
</tr>
<tr>
<td></td>
<td>* Stormwater runoff filtration</td>
</tr>
<tr>
<td>Wetland Vegetation - Marsh Grasses</td>
<td>* Improves fish and shellfish habitat</td>
</tr>
<tr>
<td></td>
<td>* Traps sediment</td>
</tr>
<tr>
<td></td>
<td>* Improves water quality by filtering runoff</td>
</tr>
<tr>
<td>Natural Fiber Logs with Vegetation</td>
<td>* Low impact</td>
</tr>
<tr>
<td></td>
<td>* Biodegradable</td>
</tr>
<tr>
<td></td>
<td>* Traps and retains sediment</td>
</tr>
<tr>
<td></td>
<td>* Promotes plant growth</td>
</tr>
<tr>
<td></td>
<td>* Inexpensive and easy to install</td>
</tr>
<tr>
<td>Natural Fiber Matting with Vegetation</td>
<td>* Can be used for moderate slopes</td>
</tr>
<tr>
<td></td>
<td>* Low cost</td>
</tr>
<tr>
<td>Living Breakwaters</td>
<td>* Wave attenuation</td>
</tr>
<tr>
<td></td>
<td>* Improved water quality</td>
</tr>
<tr>
<td></td>
<td>* Increased oyster habitat</td>
</tr>
<tr>
<td></td>
<td>* Creates a calm reef near shoreline that can be planted with vegetation for improved marsh habitat</td>
</tr>
<tr>
<td>Sediment-Filled Geotextile Tubes</td>
<td>* Effective erosion control</td>
</tr>
<tr>
<td></td>
<td>* Beneficial use of dredged material</td>
</tr>
<tr>
<td>Native Oyster Reefs</td>
<td>* Wave attenuation</td>
</tr>
<tr>
<td></td>
<td>* Improves water quality</td>
</tr>
<tr>
<td></td>
<td>* Traps sediment</td>
</tr>
<tr>
<td></td>
<td>* Habitat development</td>
</tr>
<tr>
<td>Small Concrete Oyster Balls</td>
<td>* Wave attenuation</td>
</tr>
<tr>
<td></td>
<td>* Improves water quality</td>
</tr>
<tr>
<td></td>
<td>* Shelter for vegetation</td>
</tr>
<tr>
<td></td>
<td>* Habitat development</td>
</tr>
<tr>
<td>Sill with Planted Marsh</td>
<td>* Absorbs waves and creates a calm area behind the sill to promote habitat and vegetation growth</td>
</tr>
<tr>
<td></td>
<td>* Traps sediment; maintains natural shoreline</td>
</tr>
<tr>
<td></td>
<td>* Provides nursery habitat for juvenile fish</td>
</tr>
<tr>
<td></td>
<td>* Maintains land-water interface</td>
</tr>
<tr>
<td></td>
<td>* Can promote oyster growth</td>
</tr>
<tr>
<td></td>
<td>* Long lifespan</td>
</tr>
<tr>
<td>Marsh Toe Revetment (Existing March)</td>
<td>* Stabilization of eroding marsh</td>
</tr>
<tr>
<td></td>
<td>* Can promote oyster growth</td>
</tr>
<tr>
<td></td>
<td>* Long lifespan</td>
</tr>
<tr>
<td>Breakwaters with Transitional Wetlands</td>
<td>* Traps sediment; maintains natural shoreline</td>
</tr>
<tr>
<td></td>
<td>* Maintains land-water interface</td>
</tr>
<tr>
<td></td>
<td>* Filters runoff to improve water quality</td>
</tr>
<tr>
<td></td>
<td>* Provides nursery habitat for juvenile fish</td>
</tr>
</tbody>
</table>

**STEPS TO SUCCESSFUL SHORELINE MANAGEMENT**

- Understand your neighbors’ shoreline plans.
- Request pre-application meeting with MDMR.
- Conduct a site assessment to determine the amount of shoreline to be protected, feasibility of the project, and type of shoreline stabilization practice to be implemented.
- Hire contractor/consultant to consult on the project.
- Obtain a project design and cost estimate.
- Apply for and receive permit(s) if necessary.


**WHO TO CONTACT**

Bureau of Wetlands Permitting
Mississippi Department of Marine Resources
1141 Bayview Avenue
Biloxi, MS 39530
Phone: (228) 374-5000
Website: [http://www.dmr.ms.gov](http://www.dmr.ms.gov)

U.S. Army Corps of Engineers
Mobile District
Regulatory Division
Mobile, AL 36602
Phone: (251) 690-2658
Website: [http://www.sambase.army.mil/](http://www.sambase.army.mil/)
Biloxi Field Office
Phone: (228) 523-4116
**Educational Materials**

**WHAT IS A LIVING SHORELINE?**
A “living shoreline” describes a natural approach to shoreline stabilization that reduces erosion while restoring, preserving, or creating valuable habitat along the shore. Instead of drowning shoreline habitats and changing shoreline landscapes as seen with the use of hardened structures, living shorelines encourage the preservation and growth of shoreline habitats and improved water quality. By installing living shorelines where appropriate, property owners can make a significant cumulative impact on the restoration and preservation of Mississippi’s shorelines and habitat.

**FACTORS TO CONSIDER WHEN SELECTING SHORELINE PRACTICES**
- Type of Shoreline
- Rate of Erosion
- Slope
- Erosional Forces
- Wave Energy
- Water Depth
- Offshore Ground Surface
- Salinity
- Fetch
- Longshore Sediment Transport

**SOFT OR LIVING SHORELINE PRACTICES AND HYBRIDS**
- Clean Fill/Dredge Material, Regrade, and Revegetate can dissipate wave energy and provide surface to plant vegetation in the upland buffer and bankface zones.
- Upland Vegetation: Trees, Shrubs, and Grass Roots stabilize riparian zone (upland buffer) above high tide, stabilize soil, filter runoff, and provide habitat.
- Wetland Vegetation: Marsh Grasses dissipate wave energy, filter upland runoff, and improve habitat for fish and wildlife.
- Natural Fiber Logs with Vegetation are coconut fibers bound together with biodegradable netting and are used to stabilize the toe of a slope and minimize bank erosion.

**BENEFITS OF LIVING SHORELINES**
- Increased fish/wildlife habitat
- Increased property value
- Erosion reduction
- Pollution reduction
- Aesthetically pleasing
- Improved water quality
- Cost savings for installation and maintenance

**EQUIPMENT AND MATERIALS**
- Natural Fiber Matting with Vegetation used in over-eroding coastal areas or on entire slopes to trap sediment and encourage growth of vegetation.
- Sediment-Filled Geotextile Tubes can be placed underwater to stabilize the shoreline or along a beach to stabilize the upland area behind the beach.
- Living Breakwaters are constructed of rock, oyster shell, recycled concrete, or timber fencing and placed parallel to the shore in medium- to high-energy open-water environments.
- Native Oyster Reefs can be enhanced or created at living shoreline sites to serve as natural shoreline protective structures.
- Small Concrete Oyster Balls are hollow concrete structures strategically placed to dissipate wave energy and provide habitat by creating a hard surface for oysters to construct an oyster reef.
- Sills with Planted Marsh are low elevation stone structures used to trap sediment to promote marsh growth and habitat development behind the structure.
- Marsh Toe Revetments with Vegetation are revetments composed of riprap installed parallel to the shoreline along an existing marsh.
- Breakwaters with Transitional Wetlands calm wave energy, creating a protective area for wetland habitat development and growth.
Next Steps

• Living Shoreline Education Campaign and Demonstration
  – Educational Materials – brochure on costs
  – “Go To” List of Resources
  – Vendor Fair and Contractor Training Workshop - November 19th
  – Small-Scale Demonstration Models
  – Conceptual Plan and Design of Living Shoreline Demonstration Project
Cost Comparisons

<table>
<thead>
<tr>
<th>Cost of Alternative Shoreline Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best Used in Areas with:</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>Marsh Plantings</strong></td>
</tr>
<tr>
<td><strong>Coir Logs &amp; Natural Fiber Stabilization with Vegetation</strong></td>
</tr>
<tr>
<td><strong>Oyster Reef Structures</strong></td>
</tr>
<tr>
<td><strong>Sills with Plantings/ Hybrid Structures</strong></td>
</tr>
<tr>
<td><strong>Bulkheads</strong></td>
</tr>
</tbody>
</table>

* Engineered Geotextiles are also available at a variety of price points
** Installation costs will vary depending on distance of transport and site conditions

Sources: “Living Shorelines: A Natural Approach to Erosion Control”. Galveston Bay Foundation; “Cost and Maintenance of Living Shorelines”. Debbie DaVore, NFWS for Gulf
Example “Go To” Experts

Available upon request: Name of professional, Institution, Contact Information, and Area of Expertise

• Sea Grant                Ex: AL/MS Sea Grant
• Universities             Ex: University of South Alabama
• State Agencies           Ex: MS DMR
• Federal Agencies         Ex: NOAA
• Non-profits:             Ex: TNC and Mobile National Estuary Program
SAVE THE DATE!

VENDOR FAIR - ALTERNATIVE SHORELINE MANAGEMENT

November 19, 2014 11:30–1:30

Mississippi State University Coastal Research and Extension Center
1815 Popps Ferry Road, Biloxi

Want to create more attractive, effective shoreline environments?

Join the MDMR’s Vendor Fair to:

- Compare traditional and alternative shoreline management strategies;
- Learn shoreline management techniques that benefit the natural environment;
- Meet local vendors of materials used in alternative shoreline construction.
Alternative Shoreline Management Model

Model will demonstrate how water dynamics may affect different habitats and how utilizing living shorelines will reduce erosion and sediment transport.

- Subtidal
- Coastal Wetland and Beach
- Bankface

Viewers will see the difference in soil loss between bare sand and soil conditions and a variety of alternative shoreline management materials and strategies.
Demonstration Project

• Location: Biloxi on Bayview Avenue
• Proposed Management Options:
  – Slight Regrading
  – Coir log
  – Plantings
View north from 5th floor window
Looking west from Bayview Ramp
Bureau of Wetland Permitting
MS Department of Marine Resources
Biloxi, MS

www.dmr.ms.gov
228-374-5000