Planting Your Living Shoreline Project

Paul Silva
Natural Resource Specialist
Coastal Fisheries
Texas Parks & Wildlife Department
What is a Living Shoreline?

Living shoreline is a broad term that encompasses a range of shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g. oyster reefs or rock sills) for added stability. Living shorelines connect the land and water to stabilize the shoreline, reduce erosion, and provide ecosystem services, like valuable habitat, that enhances coastal resilience.
What are Ecosystem Services

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 | coastalscience.noaa.gov
Some graphics courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (lan.umces.edu/symbols/
Living Shoreline Options

Dagger Island – Redfish Bay
Permitting

Permit approval and legal compliance: Compliance with all federal, state, and local laws, regulations, and permits for proposed restoration activities must be ensured prior to implementation.

Depends on the size and location of living shoreline

- US Army Corps of Engineers
  - Nationwide 13, 27 and 54
  - Individual
- Texas General Land Office-Lease of state land
- Texas Parks and Wildlife Department
  - Introduction of Fish, Shellfish and Aquatic Plants
  - Aquatic Resources Relocation Permit
  - Sand, gravel and Marl permit

TPWD highly recommends coordinating with adjacent landowners.
TPWD Permits

- Permit to Introduce Fish, Shellfish or Aquatic Plants into Public Waters (Introduction Permit): a permit is required to place or stock any fish, shellfish or aquatic plant into state waters.
TPWD Permits

- **Aquatic Resources Relocation Permit**: permit required to relocate organisms (fish, mussels, shellfish) due to impacts from construction or maintenance project that require temporary diversion of water from streams, ponds, lakes, stilling basins, flood control structures or bays.

- **Sand, Gravel, Shell or Marl Permit**:
  Required if project would disturb or take the bed materials of a perennial stream, or if the stream bed is more than 30 feet wide between the banks.
Plant Considerations

Using your site analysis, determine what type of environment/environments you want to create:

Submerged and Intertidal

- Coastal marsh
- Seagrass
- Tidal flat
- Oyster
Submerged Aquatic Vegetation (SAV)

Submerged marine flowering plant which means that it can produce a new plant from a seedling. Pollen and fruit created by different flowers are released into the water where they will unite with pollen and fruit from other seagrass pants. They can also expand through the growth of their rhizomes.
Plant Considerations

Submerged Aquatic Vegetation (SAV)

- **Turtle Grass** *(Thalassia testudinum)*
- **Shoal Grass** *(Halodule wrightii)*
- **Manatee Grass** *(Syringodium filiforme)*
- **Widgeon Grass** *(Ruppia maritima)*
- **Star Grass** *(Halophila engelmannii)*
Plant Considerations

**Low Marsh Plants**
The low marsh area is flooded daily during high tides. This marsh zone traps sediment and provides important aquatic habitat for small fishes and crabs while it is flooded. During low tides, the low marsh zone is exposed which provides access to food and cover for wetland and terrestrial animals.

- *Spartina alterniflora*
  Smooth Cordgrass
- *Juncus roemerianus*
  Black needlerush
- *Bolboschoenus robustus*
  Saltmarsh bulrush
- *Avicennia germinans*
  Black Mangrove
**Plant Considerations**

**High Marsh Plants**
The high marsh area is only flooded during extreme high tides and storm events. This marsh zone provides valuable storm protection and provides a buffer to intercept and filter stormwater runoff and groundwater flowing from the adjacent upland. There is greater plant diversity in this zone compared to the low marsh due to less flooding.

- *Distichlis littoralis* 
  Shoregrass

- *Batis maritima* 
  Saltwort

- *Salicornia spp.* 
  Glasswort

- *Borrichia frutescens* 
  Sea Oxeye Daisy

- *Iva frutescens* 
  Marsh elder

- *Disticulis spicata* 
  Seashore saltgrass
Planting Methodology

Harvesting

1. Notify TPWD of harvest activity
2. Stake out harvest site with pvc or wood stakes
3. Remove one 15 cm (6 inch) diameter plug per one square meter within the borrow area. (post-hole digger, coring tool, sharpshooter shovel)
4. Place plug in container to transport, keep plug moist and out of direct sunlight
5. Transport to planting site
Planting Methodology

Planting

1. Notify TPWD of planting activities
2. Mark planting area with pvc or wood stakes
3. Confirm elevations are acceptable for survival success
4. Excavate hole to same depth as harvest site (plugging or coring tool)
5. Insert sprig into hole and pack soil around stem.
6. Planting on 3-foot centers is most common interval
7. Optimum planting period is between March and May
8. Monitor after 60-days, 6 months, 1 year then annually
Where Do I Acquire Plants

- Commercial Nurseries
  - Private Land
  - Navigation Districts
  - State Owned Land
- Ask the local contractors
Costs

- Varies on several aspects of the “living shoreline”
  - Type of shoreline created
  - Size of project
  - Location and ease of access
  - Sediment
  - Types and diversity of plants
  - “no-cost” or purchased plants
  - Monitoring requirements
  - “self built” or contractors
Costs

- Construction can cost up to $5,000 per linear foot
- Annual maintenance is typically less than $100 per linear foot

In general, the more natural the shoreline the cheaper it is*:
- Smooth Cordgrass $1-2/ft
- Recycled oyster bags $75/ft
- Granite rock $125-350/ft
- Bulkheads $125-500/ft
- Rip Rap revetment $18-35/cu yd

*Does not include engineering or installation costs
## Funding Sources

<table>
<thead>
<tr>
<th>National Fish &amp; Wildlife Foundation</th>
<th>Texas Parks &amp; Wildlife Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Agency</td>
<td>Texas Parks &amp; Wildlife Foundation</td>
</tr>
<tr>
<td>NOAA/NMFS</td>
<td>Texas General Land Office</td>
</tr>
<tr>
<td>• CZMA</td>
<td>• CMP</td>
</tr>
<tr>
<td>• CZMERR</td>
<td>• CEPRA</td>
</tr>
<tr>
<td>• OCM</td>
<td>• CIAP</td>
</tr>
<tr>
<td>N. American Wetland Conservation Act</td>
<td>Conservation Groups</td>
</tr>
<tr>
<td>• CBBEP/GBF/SAB</td>
<td>• CCA/BCT</td>
</tr>
<tr>
<td></td>
<td>• DU</td>
</tr>
<tr>
<td></td>
<td>Sea Grant</td>
</tr>
</tbody>
</table>
Information Sources

- Federal and Stage Agencies
  - NOAA, NMFS, USFWS
  - TPWD, TGLO, TCEQ, Sea Grant
- Non-governmental Entities
  - Coastal Bend Bays Foundation, Galveston Bay Foundation
  - Universities
- Environmental Groups
  - CCA, SEA, Sierra Club, International Whooping Crane Foundation
- Environmental Contractors
Questions???

Paul Silva
Natural Resource Specialist
Coastal Fisheries
Texas Parks & Wildlife Department
361-825-3204
paul.silva@tpwd.Texas.gov