

# **Planting Your Living Shoreline Project**

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# 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

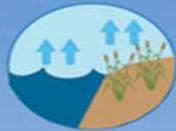


## LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

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.

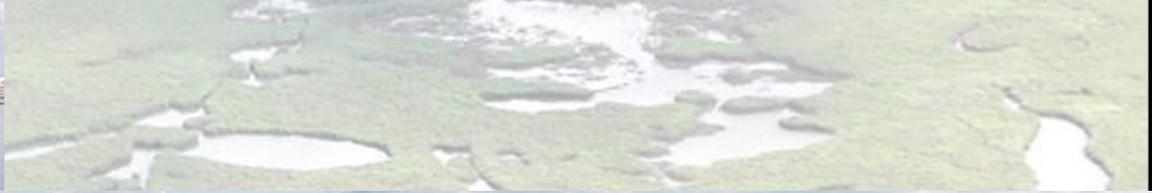


Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.



# 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.

**TEXAS PARKS & WILDLIFE**

**Application for Permit to Introduce Fish, Shellfish or Aquatic Plants into Public Waters (No Fee Required)**

For assistance completing this form, please call 512-389-4742 or email [IFpermits@tpwd.texas.gov](mailto:IFpermits@tpwd.texas.gov).

**NOTE:** This application will not be considered unless fully completed and must be received by the Department at least 30 days before the proposed introduction. Consultation with local or regional fisheries biologists before application submission is required for aquatic resource relocations and recommended for all applicants. If you have not yet consulted the local biologist, please call or email the permits office for their contact information.

**1. APPLICANT INFORMATION:**  
 Effective September 1, 2015, Texas Parks & Wildlife is required to collect Social Security numbers for the purpose of child support enforcement under the Texas Family Code, Section 231.302 and Federal Statute 42 U.S.C. §666. Missing or incomplete information may delay application processing time.

Name: \_\_\_\_\_ Social Security #: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Street City State Zip  
 Email: \_\_\_\_\_ Primary Phone: (\_\_\_\_) \_\_\_\_-\_\_\_\_

Would you like to help us reduce paper by choosing to receive your permit by email?  Yes  No

**2. PUBLIC WATER WHERE ORGANISMS WILL BE INTRODUCED (address or GPS coordinates):**  
 \_\_\_\_\_

**3. EXPECTED DATE OF INTRODUCTION:** \_\_\_\_/\_\_\_\_/\_\_\_\_ (MM / DD / YYYY)  
 For relocations or plantings—what is the expected end date of the activity? \_\_\_\_/\_\_\_\_/\_\_\_\_

**4. WHAT IS THE PURPOSE OF THIS INTRODUCTION?**  
 Fish Stocking  Planting  Aquatic Resource Relocation  Research  
 Other – Please Describe: \_\_\_\_\_

**5. SPECIES TO BE INTRODUCED (for aquatic resource relocations, please skip this question):**

Common Name	Scientific Name	Number	Size
1)			
2)			
3)			
4)			

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**5. SPECIES TO BE INTRODUCED (continued):**

Common Name	Scientific Name	Number	Size
5)			
6)			
7)			
8)			

**6. SOURCE OF ORGANISMS:** \_\_\_\_\_  
 \_\_\_\_\_

**7. COMMENTS:** \_\_\_\_\_  
 \_\_\_\_\_

**8. AFFIDAVIT:**  
 I certify that  
 (1) all the information provided above is accurate and complete and  
 (2) that I have received and read the rules pertaining to Introduction of Fish, Shellfish, or Aquatic Plants (31 TAC Ch. 57C:  
[http://texreg.sos.state.tx.us/public/readact\\$ext.ViewTAC?ac\\_view=5&#31&pt=2&ch=57&sch=C&r=Y](http://texreg.sos.state.tx.us/public/readact$ext.ViewTAC?ac_view=5&#31&pt=2&ch=57&sch=C&r=Y)).

I understand that under Texas Penal Code §37.10, it is a felony to make a false statement on this form.

\_\_\_\_\_  
 Signature of Applicant Date

**Please return completed application to:**  
 Permit Coordinator, Inland Fisheries  
 Texas Parks and Wildlife Department  
 4200 Smith School Road  
 Austin, Texas 78744

To help our office process your request more efficiently, you may email completed applications to [IFpermits@tpwd.texas.gov](mailto:IFpermits@tpwd.texas.gov) or fax to: 512-389-4405

Texas Parks and Wildlife Department maintains the information collected through this form. With few exceptions, you are entitled to be informed about the information we collect. Under Sections 552.021 and 552.023 of the Texas Government Code, you are also entitled to receive and review the information. Under Section 559.004, you are also entitled to have this information corrected.

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# TPWD Permits

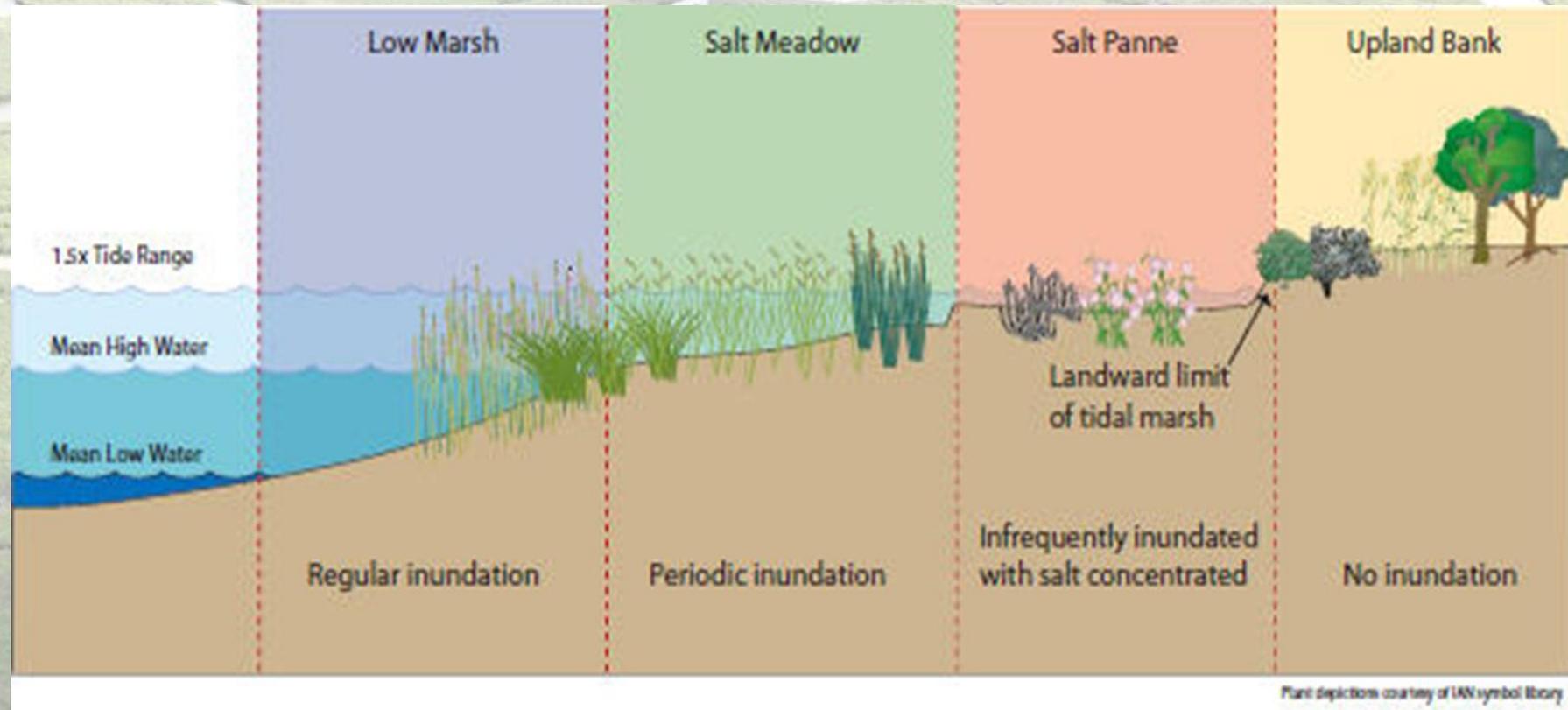
- **Aquatic Resources Relocation Permit:** permit required to relocate organisms (fish, mussels, shellfish) due to impacts from construction or maintenance project that require temporary diversion of water from streams, ponds, lakes, stilling basins, flood control structures or bays.
- **Sand, Gravel,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

## Submerged and Intertidal

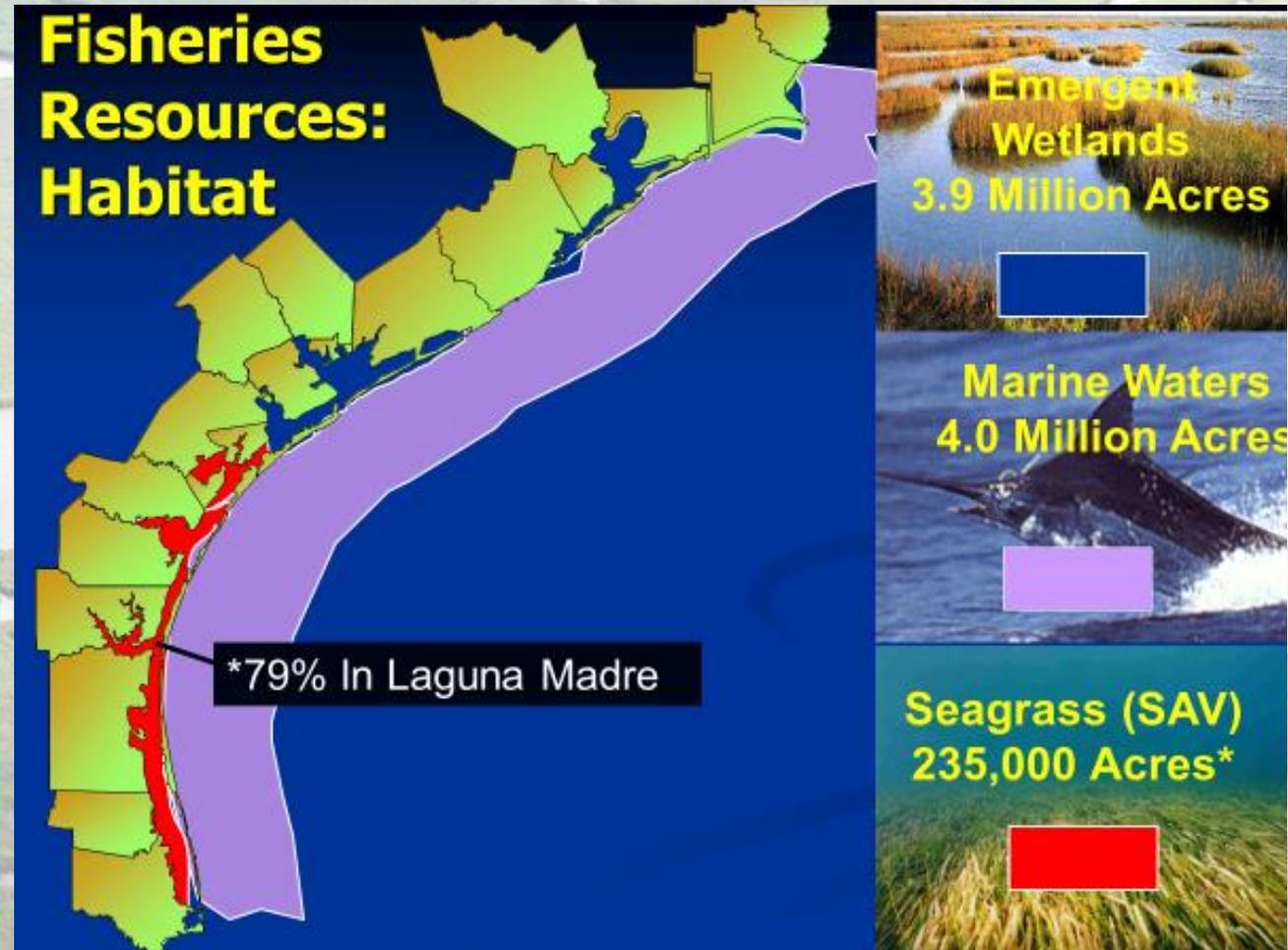
- Coastal marsh
- Seagrass
- Tidal flat
- Oyster



# Plant Considerations

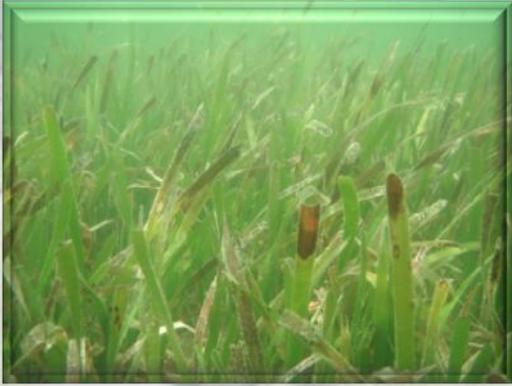
## Submerged Aquatic Vegetation (SAV)

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 plants. They can also expand through the growth of their rhizomes



# Plant Considerations

## Submerged Aquatic Vegetation (SAV)



Turtle Grass  
(*Thalassia testudinum*)



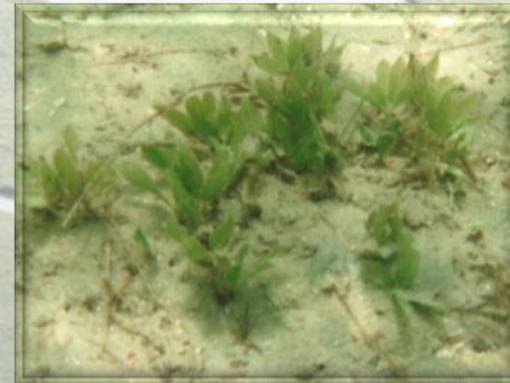
Shoal Grass  
(*Halodule wrightii*)



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.



*Salicornia spp.*  
Glasswort



*Distichlis littoralis*  
Shoregrass



*Batis maritima*  
Saltwort



*Iva frutescens*  
Marsh elder



*Distichlis spicata*  
Seashore saltgrass



*Borrichia frutescens*  
Sea Oxeye Daisy

# 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

<b>National Fish &amp; Wildlife Foundation</b>	<b>Texas Parks &amp; Wildlife Dept</b>
<b>Environmental Protection Agency</b>	<b>Texas Parks &amp; Wildlife Foundation</b>
<b>NOAA/NMFS</b> <ul style="list-style-type: none"><li>• <b>CZMA</b></li><li>• <b>CZMERR</b></li><li>• <b>OCM</b></li></ul>	<b>Texas General Land Office</b> <ul style="list-style-type: none"><li>• <b>CMP</b></li><li>• <b>CEPRA</b></li><li>• <b>CIAP</b></li></ul>
<b>N. American Wetland Conservation Act</b>	<b>Conservation Groups</b> <ul style="list-style-type: none"><li>• <b>CCA/BCT</b></li><li>• <b>DU</b></li></ul>
<ul style="list-style-type: none"><li>• <b>CBBEP/GBF/SAB</b></li></ul>	<b>Sea Grant</b>

# Information Sources

- **Federal and State 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**  
<https://www.swg.usace.army.mil/Portals/26/docs/regulatory/Env%20Consultant%20List%20August%202020.pdf?ver=2020-08-20-102405-447>

# Questions???

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