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Coastal Shoreline and Dune Restoration

Plant Materials Technical Note

Photo by Shelly Maher, E. Kika de la Garza PMC

Background

Coastal shorelines and dunes are dynamic ecological systems with capacity for complex reactions to seemingly minor actions. These landforms are a resilient, natural barrier to the destructive forces of wind and waves and absorb the impact of storm surge and high waves, preventing or delaying intrusion of saline waters into inland areas. Coastal shoreline and dune protection is important along the Texas Gulf coast, particularly in areas experiencing shoreline erosion and concentrated urban development. Inland areas become more vulnerable to hurricanes and tropical storms when coastal shorelines and dunes are weakened. Protecting these landforms helps prevent loss of life and property during storms and tidal events.

Purpose

The purpose of this technical note is to provide information about coastal shoreline and dune restoration techniques.

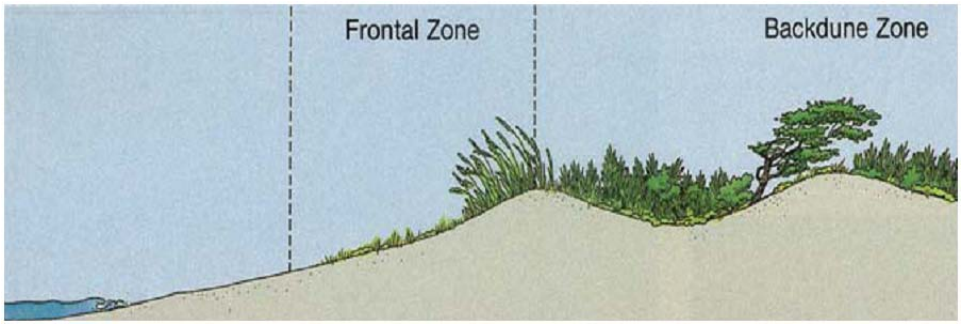
Coastal Shoreline and Dune Construction and Repair

Several methods may be used to conserve and/or improve existing dunes and shorelines. Beach access is critical when planning shoreline and dune construction and repair. Careful consideration must be given in planning access routes to the beach because they may open existing dunes for significant erosion from wind and storm wave penetrations. More information pertaining to construction standards, walkover designs, access roads and drainage may be found in the *Dune Protection and Improvement Manual for the Texas Gulf Coast* as well as in the E. "Kika" de la Garza Plant Materials Center March 2008 Final Report Evaluation of Construction Techniques in the Establishment of Coastal Sand Dunes. Before performing any coastal shoreline or dune construction or repair, check with the local building official or the Texas General Land Office to secure any necessary permits and avoid violation of state laws.

Structures such as slatted wood or plastic sand fencing can help to trap sand and stabilize dunes, but should only be used in conjunction with native vegetation. In areas where the local sand supply is insufficient for sand-trapping methods to be effective, dunes can be artificially constructed with imported sand. Imported sand should be similar in texture and structure to sand that exists on the beach. However, **never remove sand from the beach** for use as imported sand. All dune improvement projects must be vegetated as quickly as possible to maintain stability.

Dune construction using metal concertainers
Photo by Shelly Maher, E. Kika de la Garza PMC

The use of native vegetation in dune construction and repair is critical to the success of any coastal shoreline and dune restoration project. Vegetation stabilizes the dune by trapping wind blown sand and spreading roots through the dune to bind the sand. Vegetation should be planted on natural grade in the frontal zone (dry beach or backshore) of the shoreline.



Coastal Shoreline and Dune Vegetation

There are only a few plant species that tolerate the stresses of a beach environment. Beach plants must be able to survive burial by blowing sand, sand blasting, salt spray, salt water flooding, drought, heat and low nutrient supply. Many plant species that occur in these areas have developed specific attributes to help them survive this harsh environment. Most dune plants produce little to no viable seed. Rather, these plants invest their energy into vegetatively spreading by rhizomes, stolons and other unique rooting systems. Table 1 lists species and recommended selections for re-vegetation use on Texas coastlines. Many of these species are not commercially available, thus, requiring transplanting from native stands. A permit may be required if the harvesting or planting site is seaward of a dune protection line.

Vegetation Planting Techniques

Photo by Shelly Maher, E. Kika de la Garza PMC

Native stand transplant survival rates can be expected between 50 to 80 percent. In general, the best time of year to transplant is January or February for coastal areas south of Corpus Christi and anytime from February to April for coastal areas north of Corpus Christi.

Care should be taken when selecting areas for harvesting of transplants. Never take transplants from coppice mounds or foredunes that are sparsely vegetated. Once a transplant site is selected remove transplants in a scattered pattern not harvesting closer than two feet apart. Plants should be taken from the site using a shovel to ensure that the plants root structure is damaged as little as possible.

Best results are obtained using hand planting techniques, particularly on small areas and steep slopes. Larger and flatter areas may be planted using slightly modified tractor-drawn transplanters. But it is not necessary to plant more than 50 feet wide to establish an adequate dune. Single plants should be placed into individual holes made with a shovel or dibble bar and packed firmly with moist soil. Irrigation (Immediate watering) is not imperative but increases the success of plant establishment. What is critical is that one plants into 6 inches of moist soil and can depend on either through rainfall or irrigation 1 to 2 inches of water per month. Within one to two years, vegetation should be well established. Bare areas remaining after two years can be replanted with local transplants from the well-established sites.

Coastal dunes sites may be vegetated with culms of bitter panicum (*Panicum amarum*) rather than whole plant transplants. Vegetative culms can be harvested and stored in water for short periods of time. Roots are not necessary for bitter panicum as long as the internode is not damaged. Some success has been attained with sea oats (*Uniola paniculata)* using its culms but it is not as reliable as with bitter panicum. Utilizing 2-3 tillers with a few roots has been the most effective method for transplanting sea oats.

Photo by Shelly Maher, E. Kika de la Garza PMC

Two foot culm lengths of bitter panicum should be planted a minimum of 9 – 12 inches deep from November through February. Culms must be planted into sand that is moist at the top four to six inches. If the top four to six inches is not moist irrigation prior to planting is required.

Initial fertilization may enhance transplant establishment but is usually unnecessary thereafter. Plant establishment may be enhanced by adding a controlled release fertilizer to a polymer water gel at planting time. Ensure that the polymer water gel is fully hydrated before adding fertilizer. Thoroughly mix the controlled release fertilizer in the polymer water gel. Place the fertilizer/polymer water gel mix into the planting hole with the plant and cover with sand. An approved soils testing laboratory can provide site specific fertilization recommendations. In general, add one teaspoon of 18-6-12 slow-release fertilizer per planting hole.

Photo by Shelly Maher, E. Kika de la Garza PMC

Site Management

As with most aspects of natural resource management, follow-up management is

critical to ensure the success of a restoration or enhancement project. The project area must be protected from vehicles, pedestrians and grazing animals. The area should not be mowed as this destroys the ability of dune grasses to trap sand and may kill the plant.

Table 1.

Recommended Vegetative Species for Coastal Dune and Shoreline Restoration

Species	Recommended Site	Comments
Spartina alterniflora (smooth cordgrass)	Intertidal areas of low energy shores to salt marshes (dominant plant in regularly flooded intertidal zone or tidal flat)	Recommended plant spacing: 2 – 4 foot centers Variety recommended: 'Vermilion'
Spartina patens (marshhay cordgrass, saltmeadow cordgrass)	Back dunes to saline meadows or salt marsh and coastal bay shorelines	Recommended plant spacing: 2 – 3 foot center Variety recommended: 'Gulf Coast', 'Sharp'
Spartina spartinae (gulf cordgrass)	Salty Prairie, bay shorelines with clay soils. 2 feet above tidal zone.	Recommended plant spacing: 2 – 3 foot centers
Sporobolus virginicus (seashore dropseed)	Mid to upper areas of frontal and back dune, as well as coastal bay shorelines	Recommended plant spacing: 1 – 3 foot centers
Paspalum vaginatum (seashore paspalum)	Back dunes to saline meadows or salt marsh and coastal bay shorelines	Recommended plant spacing: 1 – 3 foot centers; generally Port Lavaca northward Variety recommended: Brazoria Germplasm
Uniola paniculata (seaoats)	Mid to upper areas of frontal and back dune	Recommended plant spacing: 2 – 3 foot center Plant in high percentage with bitter panicum due to soil binding abilities and forming stable dune matrix. Recommended planting percentage of 20% sea oats, 80% bitter panicum. Variety recommended: Caminada Germplasm
Panicum amarum (bitter panicum)	Mid to upper areas of frontal and back dune	Recommended plant spacing: 2 – 3 foot center Plant in high percentage with sea oats due to soil binding abilities and forming stable dune matrix. Recommended planting percentage of 20% sea oats, 80% bitter panicum. Variety recommended: Fourchon Germplasm, 'Northpa', 'Southpa'

Species	Recommended Site	Comments
Avicennia germinans (black mangrove)	Intertidal to lower supratidal areas of low energy shoreline	Recommended plant spacing: 2 – 4 foot centers Variety Recommended: Pelican Germplasm
Iva frutescens (marsh elder, Jesuit's bark)	Bay shorelines with clay soil	Recommended plant spacing: 2 – 3 foot centers approximately 2 foot above tidal zone.
Juncus roemerianus (black rush, needlegrass rush)	Intertidal areas of low energy shores to salt marshes with salinities less than 25ppt.	Recommended plant spacing: 2 – 3 foot center; generally Port Lavaca northward.
Scirpus robustus (saltmarsh bulrush, sturdy bulrush)	Salt marsh areas and zones above the high tide mark.	Recommended plant spacing: 2 – 3 foot center
Scirpus californicus (California bulrush)	Brackish areas with salinity levels less than 10 parts per thousand to fresh area wetlands	Recommended plant spacing: 2 – 4 foot center Variety recommended: Bayou Lafourche Germplasm

For additional information on planting techniques and sources of seed and planting stock contact the following:

E. "Kika" de la Garza Plant Materials Center
3409 N FM 1355
Kingsville, TX 78363-2704
361-595-1313

Brooksville Plant Materials Center
14119 Broad Street
Brooksville, FL 34601
352-7969600

Golden Meadow Plant Materials Center
438 Airport Road
Galliano, LA 70354
985-475-5280

References:

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