



CCCL Dune Planting Recommendations

These recommendations offer best management practices for planting sea oats and other beach-dune plants in Florida's pioneer beach and frontal dune zones (see Figure 1). The recommended planting practices do not cover regulated dune restoration activities such as placement of [sand fill](#), [sand fence](#) installation, installation of temporary or permanent irrigation systems or the construction of protective rope and post barriers or other structures. A permit for work seaward of a Coastal Construction Control Line (CCCL) established by the state of Florida may be required. Call 850-245-2094, email cccl@FloridaDEP.gov, or contact Department of Environmental Protection (DEP) CCCL program staff listed at www.FloridaDEP.gov/CCCL for information on CCCL permit regulations under section 161.053, Florida Statutes, and Rule Chapters 62B-33 and 62B-34, Florida Administrative Code. For information on working on the beach during sea turtle nesting season, visit the Florida Fish and Wildlife Conservation Commission (FWC) [website](#), call 850/922-4330 or email marineturtle@MyFWC.com.

Beach-Dune Plants

"Beach-dune plant" refers to sea oats, *Uniola paniculata*, bitter panic grass, *Panicum amarum*, railroad vine, *Ipomoea pes-caprae*, beach morning glory, *Ipomoea imperati*, beach elder, *Iva imbricata*, seapurslane, *Sesuvium portulacastrum*, and other native grasses and groundcovers growing in the pioneer and frontal dune zones of the beach and dune system. These native beach-dune plants stabilize dunes by anchoring the sand with root systems that resist erosion. They are adapted to the beach's inhospitable growing conditions, salt spray and periodic saltwater flooding, sand blasting and burial, nutrient poor and droughty sands, and recovery after storms.

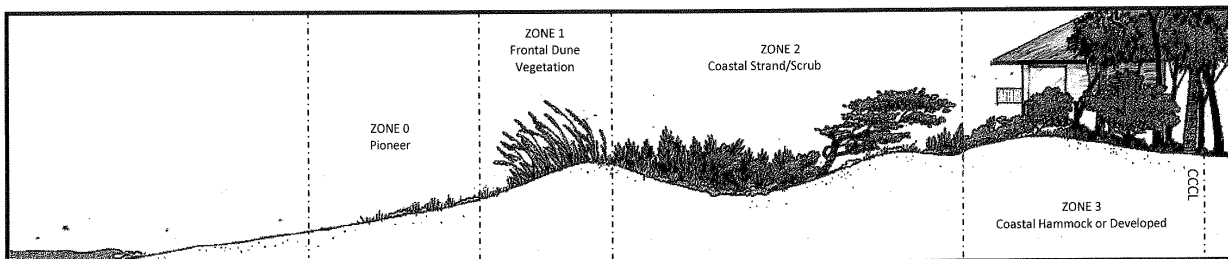


Figure 1: Diagram of pioneer, frontal dune, coastal strand/scrub, maritime hammock zones of natural communities within a typical beach and dune system seaward of the state of Florida's coastal construction control line.

The Florida Natural Areas Inventory describes the beach-dune natural community in its [Guide to the Natural Communities of Florida](#). Beach-dune plants include those species documented as native or endemic in the [Atlas of Florida Vascular Plants](#) maintained by the University of South Florida's Institute for Systematic Botany. The term invasive exotic plants refers to non-native species listed in the Florida Exotic Pest Plant Council's [List of Category I and II Invasive Species](#).

General Dune Planting Best Management Practices

- Consult experts with local knowledge such as in [IFAS/Sea Grant Extension Offices](#) and read the helpful dune planting handbooks and fact sheets listed in the [References](#).
- Work on the beach or frontal dune within beach mouse or gopher tortoise habitat or during sea turtle or shorebird/seabird nesting seasons must avoid burrows and nesting sites and be consistent with state and federally protected species conservation measures. Helpful FWC wildlife conservation information is available for [sea turtles](#), [shorebird/seabirds](#), [beach mice](#) and [gopher tortoise permitting](#).
- No operation, transportation, or storage of equipment or materials is allowed on or seaward of the frontal dune or armoring structure in sea turtle nesting habitat during the sea turtle nesting season without a CCCL permit or coordination with FWC. Sea turtle nesting season is March 1 – October 31 in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, April 15 – October 31 in Monroe County and May 1 – October 31 in all other coastal counties. To coordinate with FWC approved sea turtle nesting survey activities prior to working on the beach within sea turtle nesting season, email mtp@myfwc.com.
- Vehicular traffic (i.e., beach driving with ATVs, light trucks, etc.) in support of planting activities may be conducted if consistent with local beach driving regulations and existing beach access points are used.
- Do not trespass! Planting and site access require the approval of the property owner or if on public property, the approval of the responsible government resource management agency.
- Use low impact methods that do not alter dune topography, remove native beach-dune vegetation, require new beach access, disturb coastal wildlife, obstruct public access, cause excavation of the ground or damage adjacent properties.
- Make sure there is enough space on the beach for the plants. Plantings need to be as far away from the water line as possible to give the new plants a chance to survive. Placing the plantings/seedlings well above the wrack and vegetation lines will keep them from being flooded by saltwater or easily dislodged by waves during a high tide.
- Prior to planting, remove invasive exotic plants, litter and rubble from the project area. Dispose of debris properly landward of the dune system. Leave seaweed and organic wrack in place as a potential seedbank of other beneficial native pioneer dune species such as sea rocket, *Cakile* species, or beach orach, *Atriplex cristata*.
- Any native dune plants damaged during construction, transportation or maintenance activities must be replaced to the approval of the DEP [Beach Field Services Inspector](#).
- Smooth out any ruts, holes or other disturbance of the beach sand or ground surface to a stable, pre-planting project condition. Remove all excess materials and debris and properly dispose of debris.

Beach-Dune Planting Guidelines

These recommendations are primarily for sea oats (see Figure 2) and are also generally applicable to other beach-dune plants. The recommendations assume that the plants are to be installed in the native beach sand or sand from a beach or dune restoration project that very closely matches the native beach sand. In Florida, beach sands are loose, well drained and composed mostly of silicate or quartz sands with more shell farther south. In contrast, sandy soils in upland and back dune areas, or fill materials hauled in for dune projects may have much finer sediment (fine sand, silt or clay sized grains), slower water infiltration and chemical compositions that can reduce plant growth and planting success.



Figure 2: Sea oats, *Uniola paniculata*, building a dune by trapping and stabilizing windblown beach sand.

Plant Selection and Layout

- Use the [References](#) to help select the right plant for the right place! Sea oats are an ideal choice for about any beach or dune site. They establish easily and start trapping windblown sand and building up elevation relatively quickly. Sea oats tend to grow vertically with the dune, while bitter panicum is better at spreading out and railroad vine and beach morning glory grow long runners and quickly cover large areas of bare sand.
- Purchase native dune plants from local nurseries using plant stock native to the region within which the project occurs (see www.fann.org). Research shows that sea oats sourced from local stock perform the best. Other species, such as dune sunflower, have important regional genetic diversity.
- Plant bare root or boxed and shipped sea oats within 3-days of harvesting and hold over protected container stock no more than 8-days. Plants still in their pots or flats can be held over longer periods under irrigation and shade.
- The minimum size of a sea oat plug (also called “liner”) or other perennial grass or herbaceous plant seedlings or cuttings is about 1 in² within a 2.5-in diameter pot. Sea oat plugs need to have at least 5 healthy, green leaves, 9-in to >12-in high, and dense, bright white roots that hold the potting soil together. Multiple seedlings in a pot or container cell is also a good predictor of rapid establishment.
- Where sea oats and other pioneer dune plants are slated for removal by permitted coastal construction, they are capable of being dug, salvaged and transplanted (with permission!) as the species are adapted to growing from fragments torn off “mother” plants during storms. Sea oat plants salvaged for transplants can be divided into single or multiple culms (stems with leaves) attached to approximately 6-inch (in) long rhizomes and trimmed into planting units, kept in partial shade under a water mister or “heeled-in” (which means laid in 6-in to 12-in deep troughs and covered back over with sand with leaves sticking out 6-in to 12-in), and watered for several weeks before replanting.
- Plant as far landward on the beach and dune system as possible, no farther out on the beach than the existing line of dune vegetation in the area. Research plantings on Santa Rosa Island performed best when located 300 feet landward of the waterline. If no dune vegetation exists, investigate adjacent beaches for the appropriate elevation on the beach and distance back from the waterline that has sustained dune vegetation over time. Aerial photography from the Department’s [MapDirect](#) map browser or apps such as Google Earth may also be helpful.
- Avoid placing plants within or across established or potential beach paths. Young plantings are trampled easily.

- On beaches that are routinely cleaned or raked, make sure that the beach rakers, beach cleaning equipment operators and other beach vendors are aware that the planting area will be restored and is to be protected.
- Layout sea oat plugs in staggered rows on an average of 18-in spacing of the plant centers. Other layouts and spacing can work depending on plant size and the size of the planting area, including spacing of plugs as tight as 9-in on center and one-gallon or 6-in pots with 3-feet or greater centers. Tighter spacing and larger plants start trapping sand more quickly.
- For ecological restoration and the creation of a more natural looking planting, experts recommend not to “put all your eggs in one basket” and plant a diversity of species, such as including bitter panicum, *Panicum amarum*, in 25% of the grasses planted, and adding herbaceous groundcovers such as beach elder, *Iva imbricata*. Planting in clusters of 10-15 plants both mimics the “patchy” arrangement of foredune vegetation and provides the plants the protection of being in a crowd.

Planting

- Plant bare root or boxed seedling sea oats removed from their containers as soon as possible (within 3 days). “Heeled-in” bare-root stock and container stock can be held longer in protected areas landward of the dune under irrigation and in partial shade.
- Planting deeply and making sure that the roots are in moist soil is key to survival of plants installed into beach sand as the top layer of sand heats up and oven dries under direct sunlight and wind. In addition, wind erosion can lower the sand surface, particularly toward the dune crest, exposing rootballs to drying sun and air.
- Dry sand is difficult to plant into as the sand slides quickly back into the hole. Make a test hole to know how deep the sand is that is more cohesive and feels damp and cooler to the touch. Plants are most easily installed in damp sand, either after rains or by purposely wetting the area prior to planting.
- Choose planting tools and methods based on the plant size of the and soil moisture levels. Dune restoration specialists have perfected their planting methods with customized dibble sticks, shovels and soil augers to place the top of the root-ball 6-in or deeper. Tree spades with straight, long and narrow blades are effective in getting the bottom of a 6-in long sea oat root-ball 12-in deep into the sand. Post-hole diggers are only useful in damp sand; otherwise, dry sand just flows back down out the gap between the blades.
- Soil amendments are not as critical as planting location, depth and soil moisture. Because sea oats have symbiotic relationships with vesicular arbuscular mycorrhizal fungi naturally present in beach sand, fertilizer amendments may not be necessary and overfertilization has its drawbacks. Moisture absorbing gel crystals have not demonstrated conclusive benefits and are difficult to apply properly, requiring a pre-hydration process and adequate mixing with soil deep down around the rootball.
- Fertilizers can speed leaf growth and root establishment but check on local fertilizer ordinances before using them. Counties and cities have restricted the time of year and how close to a shoreline that fertilizers can be applied. When able, apply slow release fertilizer appropriate for the plant species, size and planting season. One recommendation is to mix ½ teaspoon of 18-6-12 (nitrogen, phosphorus, potassium) slow release pelletized fertilizer in the open planting hole of each small or “liner” size planting unit at the root ball depth and adjust fertilizer amount for other plant sizes accordingly. Some planters recommend adding manganese, magnesium and boron micronutrients to the fertilizer formulation. Followup maintenance fertilizers are not necessary.

- Green side up! Plant, backfill and tamp the soil around the plug. Bury the top of the planting unit root-ball deep enough to be in damp sand, 6-in or more below the soil surface. Install smaller plants so that at least 3-in of leaves and stem remain above the sand.
- Mulches have not proven to be necessary and along with erosion mats and other soil stabilization materials are not recommended to be placed in sea turtle nesting habitat.
- Seaweed and organic debris in the high tide wrackline benefit dune vegetation and are best left in place to naturally decompose. Seaweed and wrack offer a natural source of essential micronutrients such as manganese, magnesium and boron. Pick out plastics and litter from any wrack left in place.

Watering

- With well-timed rain, dune plantings can establish with no additional watering. Research has shown that dune plants have a high survival rate (70%) over a year provided good quality plants are properly and deeply planted and receive 1-2 inches of rain per month on average. Plantings in North Florida may not receive enough rainfall in extremely dry fall or spring months (October and May). Central and South Florida's winter – spring dry season (January – May) is also a time when watering, especially at planting, can help improve survival and growth.
- Hand watering and irrigation systems helps thirsty plants get through dry spells. Hand watering is preferred over sprinkler systems as hand watering uses less water, is less likely to cause direct dune impacts, and is more easily controlled to prevent disturbing wildlife.
- Irrigation systems in the dune or on the beach require a CCCL permit from DEP. Contact [CCCL staff](#) for permit information.
- Monitor and maintain watering systems so that line or hose failure does not scour or erode the beach sand or disturb nesting habitat. Dune plants can rot out from overwatering.

Protecting the Plantings

- Beach-dune planting sites are hostile environments not just for harsh growing conditions but also for the risk of getting trampled by beach goers.
- Signs, post and rope barriers, and sand fences can help direct foot traffic along beach access routes and keep people from crossing dunes.
- Signs on existing structures, such as dune walkovers or sand fence posts, and new signs on single posts not set in concrete, do not require CCCL permits. Construction in nesting habitat during sea turtle nesting season benefits from coordination with FWC wildlife conservation programs.
- DEP does not endorse specific wording of educational or informational signs advising beachgoers to “keep off the dunes – dune restoration in progress.” Do not cite Florida Statutes 161.053 or 161.242, or Rule Chapter 62B-33 of the Florida Administrative Code as these coastal construction regulations do not prohibit foot traffic on dunes.
- Post and rope barriers require CCCL permits from DEP. To allow sea turtles to pass under the ropes and around the barriers, the ropes should not hang closer than 36-in to the beach sand and posts need to be at least 7-ft apart. Rope barriers cannot be used to block existing beach access points.
- Sand fences require CCCL permits and construction practices that do not interfere with sea turtle nesting. They require maintenance, have a limited design life (3-5 years) and become safety hazards

due to storm damage and deterioration of the wood pickets and metal wire used in their construction. DEP's Sand Fencing Guidelines are posted on the CCCL [website](#).

Monitoring

- Keep an eye on the planting. The beach and dune system changes constantly and quick action can prevent loss of plants from drying out, becoming exposed or buried, or being trampled.
- Expect initial "burning" of tender leaves and growing tips from the nursery grown young plants' exposure to salt spray, wind and intense heat and light of the beach. With rain or water, new shoots will emerge from the sand within a week or two.
- Establish photo stations using the same location and direction of the photograph to document the planting's progress. Collect baseline, first month, third month, half year and then annual photos.
- Dune grasses and herbaceous plants will become rooted and established in several months to a year. Plant survival rates are expected to range from 70% to 90%, with researchers measuring a 70% survival rate over a year for sea oats planted and left on their own. Professional dune planters offer a 90% or greater survival guarantee for nursery grown plants installed on dune restoration projects.
- Survival rates can be determined by troweling up plants and looking at the shoots and roots. Plants are considered healthy and surviving if they show clearly vigorous rhizomes and white, turgid roots. When dug up, sand tends to stick to live roots compared to falling from dry, tan or grey dead roots. An 80% survival rate is met by confirming that there is a minimum of 24 healthy plants out of 30 randomly selected planting units.



Florida Dune Planting References

- FANN. [*Florida Association of Native Nurseries Plant and Service Directory*](#).
- FDEP. 2021. [*Recommended Florida Native Beach and Dune Plants for Beachfront Properties and Dune Restoration*](#). Florida Department of Environmental Protection, Coastal Construction Control Line Publication.
- FNAI. 2010. [*Guide to the Natural Communities of Florida – 2010 Edition*](#). Florida Natural Areas Inventory.
- FLEPPC. 2021. [*List of Florida's Invasive Species*](#). Florida Exotic Pest Plant Council.
- Gilman, Ed. 2014. [*Sea Oats, Uniola paniculata*](#). University of Florida, Institute of Food and Agricultural Sciences. EDIS Publication FP594.
- IRB. [*Natives for Your Neighborhood*](#), Institute for Regional Conservation.
- ISB. [*Atlas of Florida Vascular Plants*](#). University of South Florida, Institute of Systematic Botany.
- Miller, D.L., M. Thetford, C. Verlinde, G. Campbell and A. Smith. June 2018. *Dune Restoration and Enhancement for the Florida Panhandle*, Florida Sea Grant College Program, UF/IFAS Extension. Document SGEB-76, available on the [EDIS](#) website.
- On-Line Sunshine. 2021. *Florida Beach and Shore Preservation Act*, Chapter 161, [Florida Statutes](#).
- Williams, M.J. 2007. [*Native Plants for Coastal Restoration: What, When, and How for Florida*](#). USDA, NRCS, Brooksville Plant Materials Center, Brooksville, FL. 51p.



Coastal Construction Control Line Dune Planting Checklist

- ☐ Property owner, property manager or public land manager approval
- ☐ Contact with DEP [Beach Field Services Inspector](#)
- ☐ Coastal Construction Control Line [Permit](#), if required
- ☐ Sea turtle nesting survey contact information for work on beach or dune during nesting season (FWC Tequesta Field Office at (561) 882-5975)
- ☐ Planting plan with schedule, location and layout of the the planting area, species, numbers, sizes of plants and planting methods.
- ☐ Access to site from upland or using existing, open beach access route
- ☐ Open planting site landward of the vegetation line
- ☐ Planting tools and materials suitable for the project and site conditions
- ☐ Local beach dune plants ready to plant or hold in temporary nursery
- ☐ Planting site clear of invasive exotic species and debris
- ☐ Method for supplemental watering, if required because rain not expected
- ☐ Signs or permitted post and rope, sand fence or other structures for protecting the planting area, if required
- ☐ Notification of beach rakers and other beach vendors of protected dune restoration project, if required
- ☐ Camera and maps, drawings or notes documenting the planting area, dates, species, numbers and sizes of plants installed
- ☐ Site cleanup and restoration, including smoothing out ruts and holes
- ☐ Post-project debriefing
- ☐ Monitoring schedule and replanting, if required

Coastal Construction Control Line Program

Florida Department of Environmental Protection
Office of Resilience and Coastal Protection
Bob Martinez Center, Suite 505
2600 Blair Stone Road, MS 3522
Tallahassee, Florida 32399-2400
Email: cccl@dep.state.fl.us
Website: www.FloridaDEP.gov/CCCL
Phone: 850-245-2094