Protecting the Dunes:
A Beach Planting Guide for Southwest Florida

Naples Botanical Garden™

Center for Nature-Based Solutions
at Naples Botanical Garden

Restoring Beaches, Fortifying Communities

Beach dunes are Southwest Florida's natural defense system. These low-profile sand mounds—and the plants that grow upon them—have an outsized ability to dissipate wind and wave energy and lessen the impact of storms.

But dunes frequently need human help to recover after severe weather. This first-of-its-kind guide offers planting recommendations specific to Southwest Florida. Using nature as a blueprint, it addresses species selection, planting zones, and the importance of using local genetics. It offers a science-backed alternative to common beach restoration practices, which rely on sand alone or sand with a limited selection of plants, usually all of the same species.

The guidance draws from years' worth of observational studies and trial plantings by Naples Botanical Garden conservationists and ongoing research by faculty and students of The Water School at Florida Gulf Coast University.

What is a beach?

Far from simply a place to sunbathe, beaches are our region's most **dynamic ecosystems**, continuously adapting in response to ever-changing conditions.

They are among the state's largest **wildlife corridors**, spanning over 800 sandy miles and supporting the movement of birds, reptiles, mammals, and other species.

And they are the **economic engines** of our community, with nearly 110 miles of coastline from Collier to Charlotte counties luring visitors from around the world. Beaches lie at the heart of Collier County's $4-billion-a-year tourism economy.

What is beach renourishment?

Beach renourishment is the practice of adding large quantities of sand to widen, stabilize, and replenish a beach. Although often necessary, the practice is expensive, requiring truckloads by the thousands and costing several million dollars per beach.

Without vegetation to hold that sand in place, it will likely wash or blow away during the next significant storm. Plants protect taxpayer investments. The following pages will offer step-by-step instructions how.

Our planting philosophy

To create more resilient beaches, we adhere to two key planting principles:

1. **Species diversity.** A natural beach in Southwest Florida supports dozens of plant species. Each serves a distinct purpose, from stabilizing soil to amassing sand to rebounding quickly after storms and kickstarting nature's recovery. We think of beach dunes like a mosaic of many plant types, rather than a straight-rowed monoculture.
2. **Local genetics.** Some common dune plants have an expansive natural range. Sea oats (*Uniola paniculata*), for example, span from Mexico to Virginia. Although technically the same plant, a sea oat originating on Myrtle Beach will behave much differently than one born on Naples Bay. Plants and their progeny are shaped by their surroundings, from placid Gulf waters to turbulent Atlantic surf. Local wildlife depend on homegrown plants to produce fruits and seeds in harmony with their life cycles. We recommend plants propagated from Manatee to Monroe counties for use in Southwest Florida beach restoration projects.

Before you begin

1. **Remove invasive species** from the area before planting. The most common coastal invasive species are beach naupaka (*Scaevola taccada*) and beach vitex (*Vitex rotundifolia*).
2. **Define your planting areas.** For restoration in urban areas, we consider the dunes to have two zones:
   - **Planting Zone 1**, the foredune, is the part of the dune sloping toward the water. It receives the most wave and wind energy.
   - **Planting Zone 2** sits behind Zone 1 on the landward side. It includes the crest of the dune and the back slope when such an incline is present.

Our recommended species

ZONE 1

- Sea oats (*Uniola paniculata*): 70%
- Bitter panicum (*Panicum amarum*): 20%
- Sea purslane (*Sesuvium portulacastrum*): 10%

Plants in this area should be spaced 24 inches on center. Plant in an offset diamond pattern to help trap sand and prevent it from blowing inland through the dune.

ZONE 2

- Sea oats (*Uniola paniculata*): 50%
- Bitter panicum (*Panicum amarum*): 15%
- Diversity species: 35%

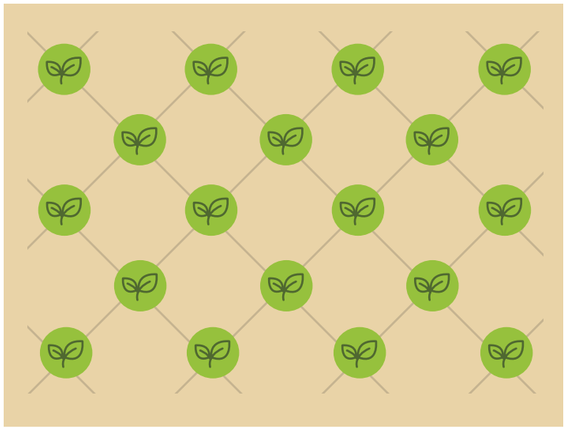
Plants in this area should be planted closer to each other, 18 inches on center, to trap windblown sand. As in Zone 1, plant in an offset diamond pattern.

Planting depth

Planting depth should be a minimum of 6 inches, as measured from the top of the root ball to the sand surface. Placing roots in deeper, moister sand will allow them to reach the water more easily.

Planting timing

Shoreline planting can take place at any time of the year, even in winter when rainfall is sparse. In Collier County, a 13-mile coastal revegetation project began in November 2024. The plants put their energy into root production; by rainy season, they were flourishing above ground.



This offfset diamond planting pattern helps prevent erosion.

Diversity species

- Coastal sea rocket (*Cakile lanceolata*)
- Baybean (*Canavalia rosea*)
- Beach tea (*Croton punctatus*)
- Beach creeper (*Ernodea littoralis*)
- Railroad vine (*Ipomoea pes-caprae*)
- Seacoast marsh elder (*Iva imbricata*)
- Seashore paspalum (*Paspalum vaginatum*)
- Coastal groundcherry (*Physalis angustifolia*)
- Sea purslane (*Sesuvium portulucastrum*)
- Marshhay cordgrass (*Spartina patens*, also called *Sporobolus pumilus*)
- Seashore dropseed (*Sporobolus virginicus*)

PLANTING ZONE 1

Sea oats (*Uniola paniculata*)
Though slow-growing, sea oats are the premier dune stabilizers, accounting for their prevalence in dune restoration projects. Underground, they produce horizontal stems, or rhizomes, and grow root systems reaching up to 40 feet deep. Above ground, they grow about 5 feet high and produce the oat-like seed heads for which they are named.

Bitter panicum (*Panicum amarum*)
Bitter panicum has a wide, almost blue-colored leaf and a stem that collapses to the ground instead of staying upright. When sections of the stem fall, they take root, enabling plants to spread by vegetative growth. The light pink-to-purple flowers are subtle, like many other grass flowers, and are reminiscent of small grain stalks on wheat.

Sea purslane (*Sesuvium portulacastrum*)
Sea purslane is a pioneer plant, meaning it is one of the first species to sprout and begin building a new dune in an area lacking vegetation. Where it takes hold, it stabilizes the beach and traps windblown sand and seeds of other dune species, becoming a nursery for an entire ecosystem.

PLANTING ZONE 2

Coastal sea rocket (*Cakile lanceolata*)
Fast-growing coastal sea rocket embellishes beaches with white or lavender blooms, which attract bees and butterflies. Despite its flowers' delicacy, this species is a hardy plant that's drought tolerant and wind resistant. It is a good dune stabilizer immediately after storm damage.

Baybean (*Canavalia rosea*)
Baybean is a sprawling vine that forms a dense groundcover. It helps control erosion by stabilizing sand. Baybean flowers are pinkish-purple and hang inverted off its thick, fleshy stems. Its seeds are buoyant and disperse through ocean currents.

Beach tea (*Croton punctatus*)
Beach tea, sometimes referred to as gulf croton, is a small, dense shrub in the spurge family with silvery green leaves. It typically grows up to 3 feet tall. The plant forms compact mounds of sand, making it an important choice for its dune-building capacity. This species produces small flowers that lack petals and yields clusters of small fruits.

Beach creeper (*Ernodea littoralis*)
Also known as golden creeper, beach creeper is an evergreen shrub that helps control erosion. It produces pinkish-white to pink flowers, and it fruits year-round, providing wildlife habitat—and a burst of color—on beaches throughout Central and South Florida.

Railroad vine (*Ipomoea pes-caprae*)
A familiar sight on Southwest Florida beaches, railroad vine earned its common name for its long "tracks" of stem. With purple, cup-shaped flowers, it adds an aesthetic element to beaches, but its value goes well beyond beauty. Railroad vine is a pioneer species, one of the first to rebound after a storm.

Seacoast marsh elder (*Iva imbricata*)
This succulent-like shrub plays a critical role in beach stabilization and formation. Research by Florida Gulf Coast University ecology students found that it trapped more sand than any other species they studied. It grows on foredunes, providing the first line of defense in storms.

Seashore paspalum (*Paspalum vaginatum*)
This low-growing, blue-green grass may look familiar because it's a popular turfgrass in coastal areas due to its ability to tolerate saline conditions. Seashore paspalum helps control erosion with its dense root system. Considered a dune initiator, it grows quickly, driving a beach's recovery.

Coastal groundcherry (*Physalis angustifolia*)
A wild-growing relative of tomatillo, the native coastal groundcherry is important both as an early dune stabilizer and as a food source for wildlife. Its fruits are yellow to orange and surrounded by a papery husk.

Marshhay cordgrass (*Sporobolus pumilus*)
Marshay cordgrass, another native ornamental grass, grows 2 to 3 feet tall and reaches up to 4 feet when in flower. It begins as a clumping grass but spreads by rhizomes, creating expansive tracts. Marshay cordgrass has special cells that prevent salt from entering the roots, allowing it to thrive in coastal ecosystems.

Seashore dropseed (*Sporobolus virginicus*)
This shoreline grass serves as a dune stabilizer and is also useful along stream banks, roadsides and other places prone to erosion. Colonies of seashore dropseed often house shorebirds; other wildlife, including small mammals and deer, graze on it for its high protein and mineral content.

Our research journey

Garden conservationists first started studying local dune ecosystems in 2019, as the region recovered from Hurricane Irma's historic damage two years earlier. They sought to understand which plant species grow naturally on our shorelines and the roles each play in stabilizing beaches, amassing sand, building dunes, and starting the process all over again following a storm.

In 2021, in collaboration with the City of Naples, the Garden planted three trial sites along Naples Beach to see if its recommended mix of species and locally sourced genetics made a difference in dune health. It did. Following Hurricane Ian in 2022, the Garden monitored the plots and found that they rebounded more quickly than the rest of the beach.

We invited professors from The Water School at Florida Gulf Coast University to join us in investigating dune ecosystems. Their students conduct ongoing, important trials that consider everything from the ideal size for new plants to the effectiveness of light-penetrating boardwalk planks in supporting plant growth.

Since Hurricane Ian, the Garden has been advising city and county governments on replanting beach dunes for resiliency. In 2024, the Collier County Board of Commissioners included the Garden's core restoration principles—biodiversity and local genetics—in its 13-mile beach revegetation project. Garden conservationists began amassing seeds and cuttings and growing plants to address the immediate need for dune species. Many of these were hard to find in the commercial market at the quantities needed for restoration.

Meanwhile, Garden educators, with support from the Collier Community Foundation, offer ongoing walks on area beaches to help the community understand these dynamic ecosystems and the need to protect them.

For more information, scan the QR code or contact us at education@naplesgarden.org

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