

# Building and Planting Coastal Sand Dunes: Dune Vegetation

## Introduction

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Vegetation plays a vital role in dune formation and stabilization. On windy days, sand grains get picked up by the wind and blow around. When those airborne sand grains hit an object, they stop blowing and fall to the ground. The leaves of beach grass and other plants on a dune act as collectors for blowing sand. Once on the ground, the grass blades help protect the sand from the breeze, so the sand grains tend to stay where they land and start to pile up, forming a dune. As the plants grow, they send out lots of roots and rhizomes that further trap and stabilize the sand, helping to make the dune stronger and more resistant to erosion. As a result, dune plants are a key component of an effective dune restoration plan.

Many native coastal plant species play a major role in the formation of sand dunes and also protect shoreline areas from erosion. These plants often produce foliage and deep root systems that assist in the formation of a sand dune over time. The foliage of these species reduces wind velocity and filters sand from the wind, and their deep root systems help to anchor dunes to their foundation. For example, as filtered sand piles up around dune plant species, new roots develop on the buried stems and new shoots emerge from the sand's surface. The end result is a dense mat of vegetation that anchors the dune below its surface and traps more windblown sand.

There are generally three zones of vegetation that form on coastal dunes. Each of these zones is exposed to different levels of soil salinity, which determine the types of plant species that occur within each zone. The frontal dune zone, which occurs closest to the ocean, contains several grasses and other herbaceous plants that are able to tolerate high exposures to salt

spray. The backdune zone is located behind the frontal zone and supports trees, shrubs, and vines as well as grasses and other herbaceous plants. These species generally have lower salt tolerance. Farthest from the ocean is the maritime forest zone, which supports pines and hardwoods.

Along much of our highly developed coastline, we generally don't see all three dune zones. We generally see one or maybe two zones, such as in constructed dunes (berms) that have a trapezoidal shape which has a front, a wide crest (top,) and a sloping backdune.

### A Word about American Beachgrass

American beachgrass (*Ammophila breviligulata*) is currently the species that is most often utilized in dune plantings in New Jersey and elsewhere in the Northeast. Unfortunately, this species has very specific growth requirements and tends to thrive best in actively accreting sands in the frontal dune. After a few years, when the sand has become stabilized, the *Ammophila breviligulata* usually dies, yielding to other species that provide long-term dune coverage, if present, or leaving bare sand if no alternative "volunteer" species have colonized the area or been planted there in the interim. Coastal communities with fixed sand dune maintenance and replenishment budgets often choose the short-term convenience of working with one species over long-term ecologically correct approaches. However, it is shortsighted to plant only American beachgrass. Unfortunately, the ease by which this species' planting units establish and its low cost and short-term effectiveness have made it difficult to persuade landowners and municipalities to consider the use of other plant species for sand dune

restoration. However, over the past 25-30 years or so, it has been observed that throughout its native range beachgrass is susceptible to decline after three to six years, especially when established on dredged sand in Army Corps of Engineers beach replenishment projects. In response to this problem, the Cape May Plant Materials Center of the USDA-Natural Resources Conservation Service (NRCS) has been focusing on testing and releasing additional plant species for diversifying sand dune plantings to the commercial nursery industry rather than relying on traditional beachgrass monocultures. In addition, work is being done to make local New Jersey ecotypes of beachgrass available commercially to broaden genetics beyond the single clone of 'Cape'.

## An Idealized Dune Planting

American beachgrass (*Ammophila breveligulata*) is best adapted in the foredune where sands are constantly shifting and occasional overwash occurs. Interplanting other adapted species on the backside of the foredune provides a seed source of additional plants to assist in the successional process. These species may include grasses such as bitter panicgrass (*Panicum amarum*), coastal panicgrass (*Panicum amarum* var. *amarulum*), switchgrass (*Panicum virgatum*), saltmeadow cordgrass (*Spartina patens*), coastal little bluestem (*Schizachyrium scoparium* var. *littorale*), and dune wildrye (*Elymus glaberrimus*). Species of forbs (herbaceous flowering plants) include seaside goldenrod (*Solidago sempervirens*), partridge pea (*Chamaecrista fasciculata*), beach pea (*Lathyrus japonicus*), and trailing wild bean (*Strophostyles helvola*). Many of these plant species are available from specialized nurseries as potted and/or bareroot plants (see Plant Selection sections of this document). Seeding techniques are also being developed for many of these species. For instance, coastal panicgrass has been successfully seeded between rows of beachgrass on beach replenishment projects in the Mid-Atlantic. Within three to five years, coastal panicgrass dominates much of the backdunes and provides the primary stabilization where beachgrass has lost vigor. Once the primary vegetation is established, natural

recruitment will take place and increase plant diversity over time.

For dunes where adequate width is achieved (greater than 100 feet) and some salt spray protection is afforded, shrubs such as bayberry (*Myrica pensylvanica*), beach plum (*Prunus maritima*), winged sumac (*Rhus copallina*), and groundsel (*Baccharis halimifolia*) can be added for long-term stabilization. These species are generally planted as containerized material. Shrubs need not be planted on as tight a spacing as the herbaceous plants but rather scattered throughout the planting area in more natural groupings to provide a seed source. Again, it is noted that woody species should not be planted in or near rare, threatened, and endangered species areas (not even in backdune areas), as they provide perches for avian predators.

Sand dune restoration is not as simple as establishing a native community of plants, but involves managing the sand budget (the ocean gives sand and takes it away). True coastal dune restoration must consider the natural dynamics of this ecosystem. The plant species inhabiting certain niches have evolved and adapted to these locations and require specific environmental conditions to survive establishment and persist.

As mentioned earlier in this manual, in all developed portions of the New Jersey coast designated as piping plover nesting areas, including all "protected zones" and "precautionary zones" (Figure 17), it is important that only native herbaceous vegetation be planted and that the areal extent and density of plantings be minimized to avoid conflict between plantings and the habitat needs of beach-nesting species. In such areas, periodic thinning of planted beach grass may be needed to maintain plant densities compatible with the use of those areas by rare, threatened, and endangered species (see targets in Table 1).

# Recommended Plant Species

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## Choosing and Acquiring Plant Materials

When choosing plant materials, consider using plant releases developed by the USDA-NRCS Plant Materials Program. These plant releases have been tested and found to establish successfully along the Mid-Atlantic coast. If NRCS plant releases are not available through specialty conservation plant suppliers, many commercial growers produce the desired species needed for dune plantings. For a list of commercial producers growing coastal vegetation, please see Appendix. This list will be posted/updated on the website of the USDA-NRCS Plant Materials Program at the following link:

<http://www.nrcs.usda.gov/wps/portal/nrcs/publication/s/plantmaterials/pmc/northeast/njpmc/pub/>.

Although a fair number of plant species occur in natural dune systems, a smaller subset of those species is commercially available for projects. These are the species that are focused on in this document. Once the primary vegetation is established, natural recruitment will take place and will increase plant diversity over time. However, it is most important to first establish those keystone plant species to provide stabilization and vegetative cover to catch sand and jump-start the successional process. These commercially available species are listed below:

### Frontal Dune Species (\* limited commercial availability)

- American beachgrass (*Ammophila breveligulata*)
- bitter panicgrass (*Panicum amarum*)\*
- Potential future species for New Jersey: Sea oats (*Uniola paniculata*)\* is a native, indigenous plant south of New Jersey in Maryland and Virginia. A cold-tolerant selection is being developed by the Cape May Plant Materials Center and will be available to growers.

### Secondary (Backdune) Species (\* limited commercial availability)

- coastal panicgrass (*Panicum amarum* var. *amarulum*)
- saltmeadow cordgrass (*Spartina patens*)
- coastal little bluestem (*Schizachyrium littorale*)\*
- seaside goldenrod (*Solidago sempervirens*)\*
- beach pea (*Lathyrus maritima*)\*
- trailing wild bean (*Strophostyles helvola*)