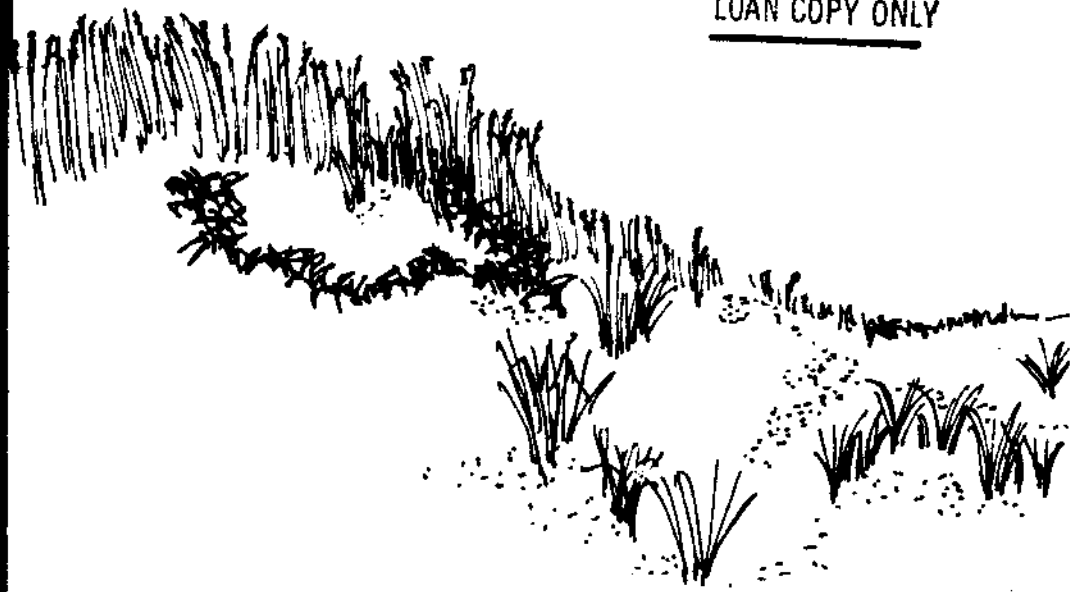


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THE
DUNE BOOK
how to plant grasses
for dune stabilization

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with many thanks for their cooperation.
December, 1976*

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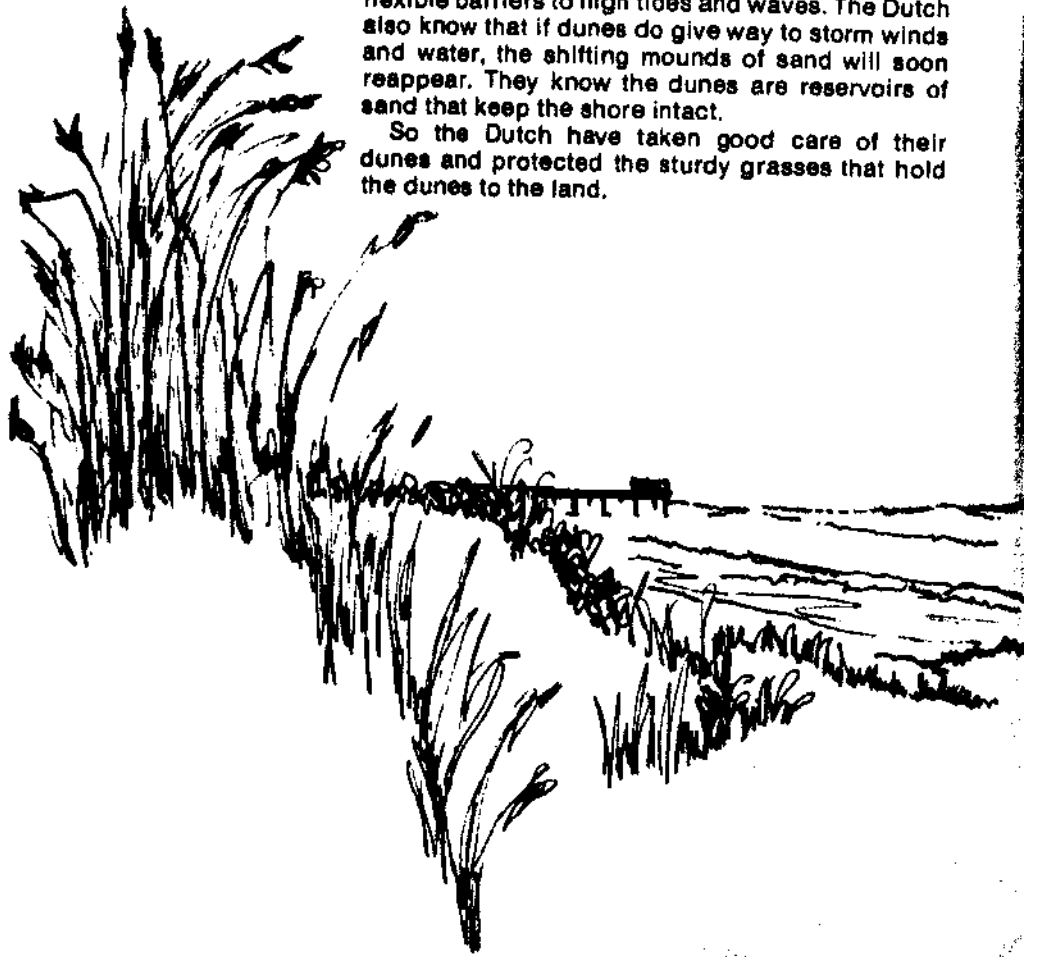


American beachgrass planting.

Dunes, a resource worth protecting

The Dutch have known for years that dunes deserve more than dune-buggy path status. They know that dunes are the first line of defense against the sea and that when storms hit, dunes will act as flexible barriers to high tides and waves. The Dutch also know that if dunes do give way to storm winds and water, the shifting mounds of sand will soon reappear. They know the dunes are reservoirs of sand that keep the shore intact.

So the Dutch have taken good care of their dunes and protected the sturdy grasses that hold the dunes to the land.





We have not been as smart on the North Carolina coast. Early settlers led their cattle to the dunes and let them grow plump on the tall dune grasses. As the cattle grazed, their hoofs and teeth tore at the land and the grasses grew more sparsely. Later, settlers built homes, paved large areas and made roads through the dunes, adding to the destruction of the grass. With the disappearance of the grasses, the dunes lost the cement that held them in place, and they too gradually disappeared . . . leaving the coast defenseless against the sea. And leaving the homes and the people defenseless.



Restoring dunes...

While we can ruin dunes, we can also help them grow.

Dunes begin life in the ocean when waves and currents sweep sand to the shore. There wind picks up the particles of sand and carries them over the land. If anything—a shoot of grass, a boulder, a piece of tidal litter abandoned on the beach—is in the way, the wind will be slowed. If the wind is slowed enough it will drop a portion of its sand load. The sand falls at the foot of the shoot of grass, and the plant, which thrives in the sandy environment, continues to grow and spread. More sand is captured from the wind until a hump of sand sits on the beach above the high tide line. The process continues—the sand is trapped, the grass grows—until a sand dune and its community of grasses rests on the shore.



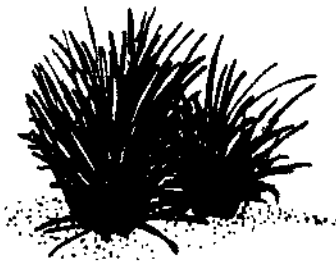
Engineers have tried to copy nature by building dunes with bulldozers and dredges or by stringing long fences across the sand. A simpler, usually less expensive and often more successful method exists where blowing sand is available: by planting salt and sand-resistant grasses, homeowners and developers, restaurant owners and motel keepers, anyone, can encourage the wind to slow and drop its load of sand, beginning the natural cycle of dune growth. A grass planting 40 to 50 feet wide can trap several cubic yards of blowing sand per foot of beach in a year.

To be successful, plantings should be located where a dune would most likely occur in nature—in the path of blowing sand parallel to the high tide line. It is wise to start dune plantings as far as possible from the water since dunes grow toward the sand supply, which is usually the surf zone. Three hundred feet from the high tide line is the recommended minimum, although in low-lying areas locating a dune too far back can cause problems. Whenever feasible, leave room for two or more dune lines, a double layer of protection.

Most important, though, is the choice of plants.

To grow well at the ocean shore, a plant must be able to tolerate up to several feet of sand accumulation a year, sand blast strong enough to take the paint off a car, salt spray, salt water flooding, drought, heat and low nutrient supply. The plants must be able to trap and hold sand against wind and water erosion.

Four grasses meet the requirements in North Carolina:



American beachgrass.



Sea oats.



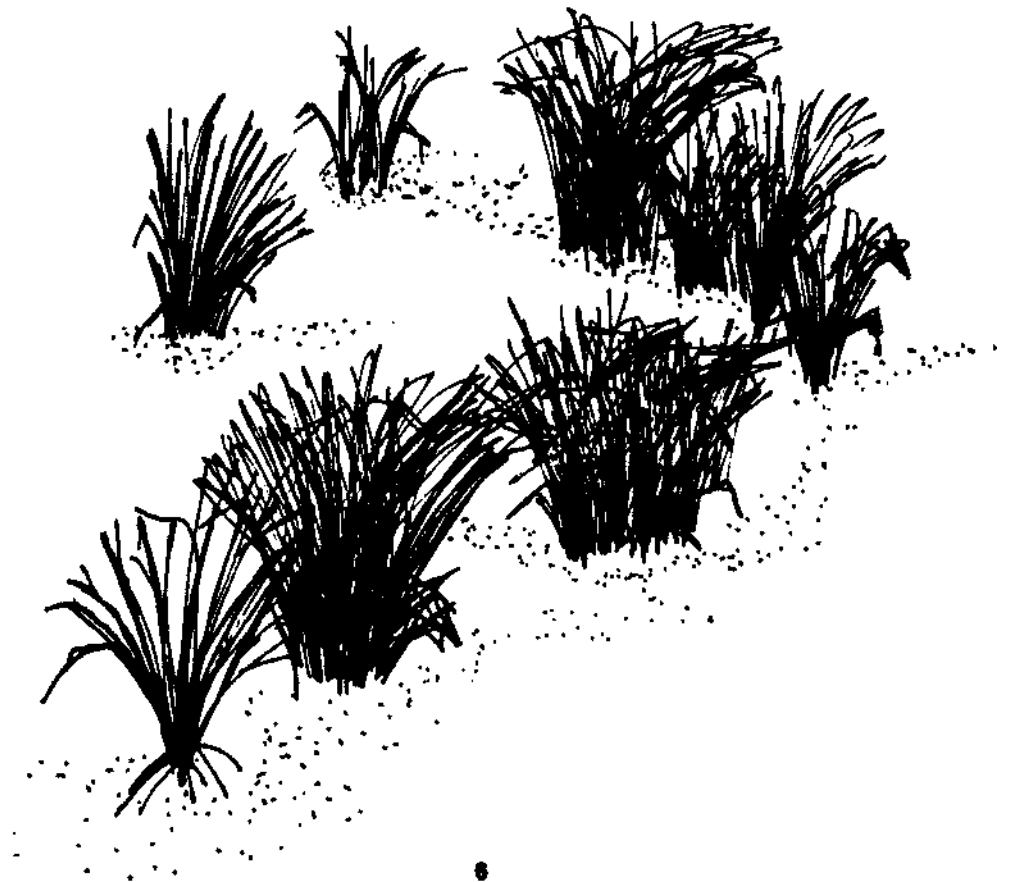
Bitter panicum.



Saltmeadow cordgrass.

American Beachgrass

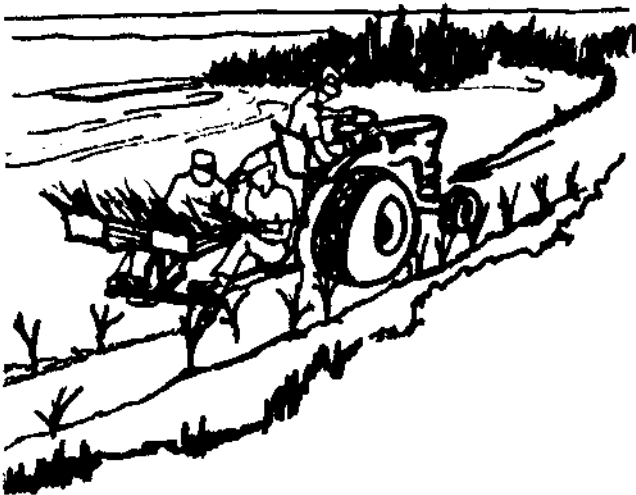
American beachgrass (*Ammophila breviflora*) is a tough dune grass which transplants easily and rapidly captures sand from the wind. It is an excellent dune starter and is available commercially. Hatteras beachgrass, a strain developed by the North Carolina Agricultural Experiment Station, is particularly vigorous. American beachgrass is not native to most of North Carolina, however, and tends to fall prey to fungus disease and insects. The grass should be combined with sea oats or bitter panicum in plantings. Dead beachgrass patches can also be replaced with sea oats.



Date of planting: November through April, with earlier dates preferred.

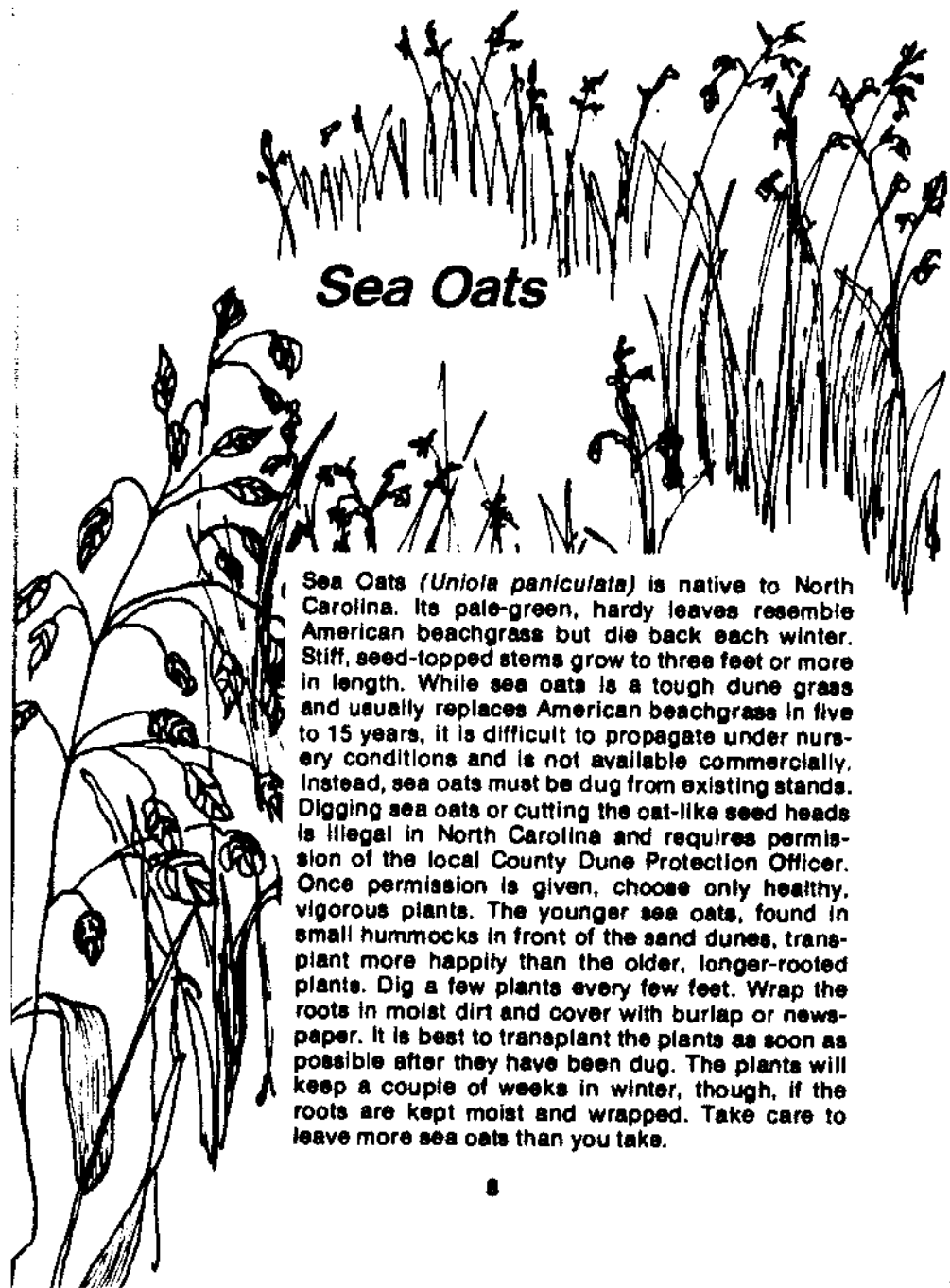
Depth of plantings: 8"-10"

Spacing: Hills with one to five stems of grass are set 18" apart in the central portion of the dune, spreading out to three to four feet apart at the edges. This graduated planting allows sand to penetrate to the center of the grass in the first two seasons, making a wider, flatter dune.



Method of planting: Small areas and steep slopes should be planted by hand by setting single plants into individual holes made with a shovel or dibble. Each plant must be firmly packed. Larger and smoother sites can be planted more economically with tractor-drawn transplanters—such as one-and-two-row tobacco transplanters with their shoes extended to make holes 8 or 10 inches deep. The transplants do not need to be watered when planted. Most commercial dealers sell American beachgrass in bundles of 1,000, ranging in cost from about \$15 to \$50 per 1,000. One thousand plants should stabilize a 50 x 100 foot strip in a year.

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Sea Oats

Sea Oats (*Uniola paniculata*) is native to North Carolina. Its pale-green, hardy leaves resemble American beachgrass but die back each winter. Stiff, seed-topped stems grow to three feet or more in length. While sea oats is a tough dune grass and usually replaces American beachgrass in five to 15 years, it is difficult to propagate under nursery conditions and is not available commercially. Instead, sea oats must be dug from existing stands. Digging sea oats or cutting the oat-like seed heads is illegal in North Carolina and requires permission of the local County Dune Protection Officer. Once permission is given, choose only healthy, vigorous plants. The younger sea oats, found in small hummocks in front of the sand dunes, transplant more happily than the older, longer-rooted plants. Dig a few plants every few feet. Wrap the roots in moist dirt and cover with burlap or newspaper. It is best to transplant the plants as soon as possible after they have been dug. The plants will keep a couple of weeks in winter, though, if the roots are kept moist and wrapped. Take care to leave more sea oats than you take.



Sea oats may also be propagated by seed. Collect the spikelets when they are ripe, usually in late September, and store them in a cold, dry place over the winter. Plant the whole spikelet in the desired location or germinate the spikelets in peat pots and transfer them to the dunes after several months of growth.

Sea oats grow best in areas where sand is drifting and accumulating, but, unlike American beachgrass, will also thrive where the sand is still.

Date of planting: November through March.

Depth of planting: Take care to plant deep enough to keep the base of the plant moist, at least 8" to 10".

Spacing: Plant hills 18" apart in the main area of the dune with graduated planting extending to four feet apart at the edges. Only one stem per hill is necessary.

Method of planting: Same as for American beachgrass except that more care must be taken to get deep planting. Sea oats usually take two growing seasons to fully stabilize a dune. This, and the unavailability of commercial plants, is why interplanting with American beachgrass and/or bitter panicum which start more rapidly is recommended for most sites. Interplanting also cuts the risk of disease and pest infestation. Sea oats are good replacements for patches of dead American beachgrass, too.

Bitter Panicum

Bitter panicum (*Panicum amarum*) is a good grass for relatively high and dry sites. It is quicker starting than sea oats and a tenacious grower. Bitter panicum is not as efficient a dune-builder as sea oats or American beachgrass when planted alone. But including bitter panicum in five to 10 per cent of a dune planting can help assure the long-term stability of an area. Bitter panicum is tasty to grazing animals, and was practically eaten off most of North Carolina's coast. The plant was relatively rare on the coast until the Ash Wednesday storm of 1962 spread patches of the grass.

Bitter panicum has bluish smooth leaves $\frac{1}{4}$ " to $\frac{1}{2}$ " wide and four to 12" long. The seed heads do not produce viable seed. Bitter panicum is available commercially but can also be dug from existing stands, with permission of the local Dune Protection Officer. Remember to leave more grass than you take.

Date of planting: March through June.

Depth: 6"

Spacing: 18"

Method of planting: Bitter panicum will root at every node on its stem. Place the runners in a trench and cover, leaving six or eight inches sticking out of the sand. With small plants, use the same method as American beachgrass, planting one or two stems in each hill.





Saltmeadow Cordgrass

Saltmeadow cordgrass (*Spartina patens*) should be used only on moist sites, such as sand flats. The grass has small stems two to two-and-a-half feet tall and rolled leaves less than an eighth of an inch wide. Saltmeadow cordgrass spreads by slim rhizomes which are often banded in purple. Though work is underway to produce transplants commercially, the plants must now be dug from the wild. Get a permit from the local Dune Protection Officer. And make sure you leave more plants than you take.

Date of planting: March through May. On low flats where drying isn't a problem, you can plant through June.

Depth: Take care to plant deep enough to keep the plant moist—usually 4"

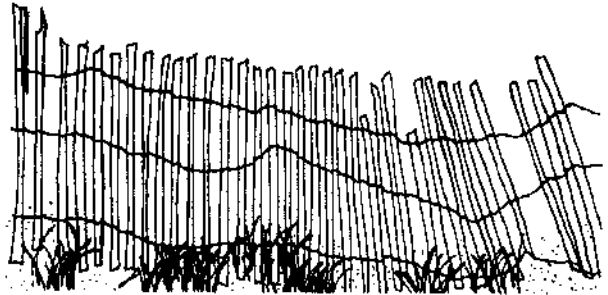
Spacing: Same as American beachgrass

Method of planting: Same as American beachgrass with one plant of six to 10 stems per hill.

Some tips:

— avoid planting pure stands of any one dune grass. This encourages pest and disease invasion. Also, no one grass alone is good for both immediate and long-term stabilization.

— a sand fence parallel to the shore and in the middle of the planting area will help collect sand for the first six months while the plants get started.



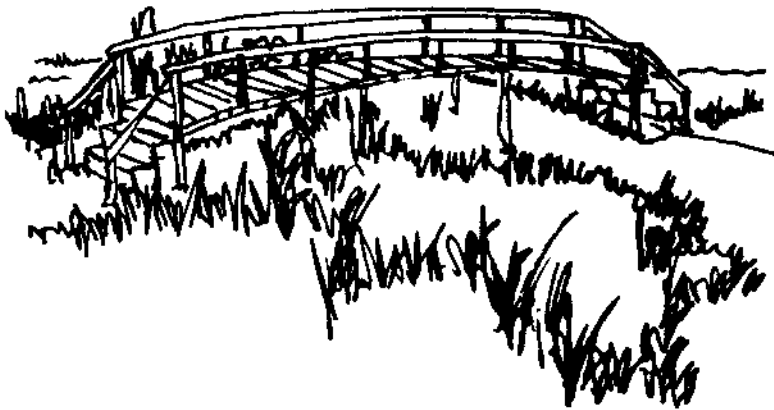
— avoid getting too close to the shore. Leave room for more than one line of dune protection.

— graduated planting allows sand to get to the middle of the dune planting and build a wide dune area.

— dune grasses appreciate fertilization, especially when they are just getting started or sand has stopped blowing heavily. Nitrogen and phosphorus, are particularly helpful. To each acre, apply 150-200 pounds of nitrogen and 50-60 pounds of phosphorus, divided into three to four equal amounts around April 1-15, May 15, July 1 and August 15 of the first year. One or two applications of 30-40 pounds per acre of nitrogen and 15-20 pounds per acre of phosphorus are recommended for the second year starting in April. The third year and after, drop to one application or no application every other year, depending on growth.

Take care not to overstimulate: the plants will grow too tall to support themselves and fall, increasing the risk of disease. Helicopter or hand-spreading of fertilizer is recommended. Ground spreading equipment is liable to damage the grasses. Avoid heavy initial treatment followed by sudden halting of fertilization.

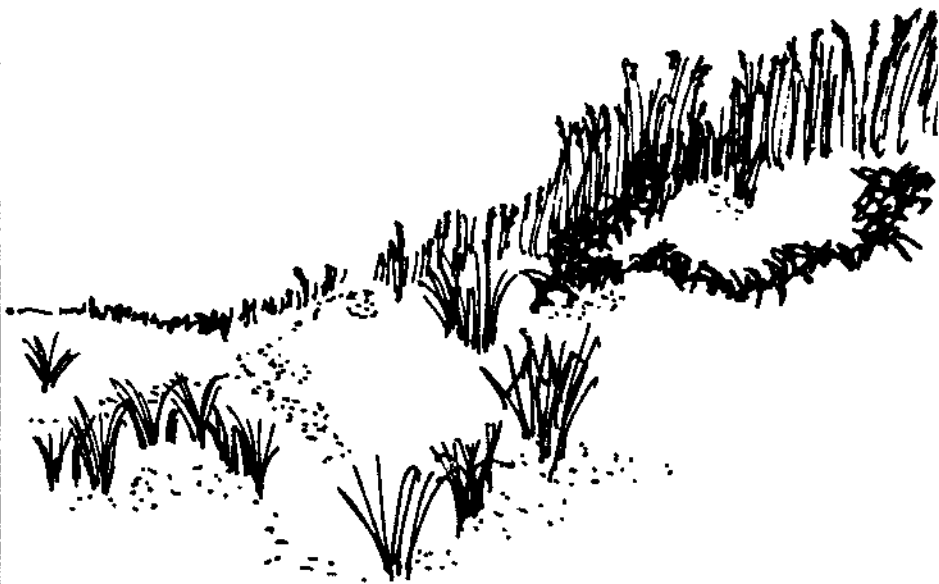
— dune grass is tough and thrives on sand, salt and heat, but it doesn't appreciate trampling. Avoid excessive traffic over the dune and, if possible, erect a walk-over to keep your dune healthy. Dune buggies are death on dune grass.



A precaution:

Dunes are a fine addition to a shorefront. But remember, large stabilized dunes can create a false sense of security. If a large enough storm occurs, any dune can break.

For more information: Contact UNC Sea Grant, 1235 Burlington Labs, NCSU, Raleigh, N.C. 27607 or the NCSU Agricultural Extension Service, NCSU, Raleigh, N.C. 27607.



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