STANDARD AND SPECIFICATIONS FOR VEGETATING SAND DUNES AND TIDAL BANKS

Definition

Establishing and maintaining vegetative cover for coastal shoreline protection.

Purpose

1. To stabilize frontal sand dunes and provide for sand entrapment for dune building where possible and necessary.

2. To provide for protection of dune vegetation from foot traffic and vehicles.

3. To stabilize tidal banks and provide for long term protection.

Condition Where Practice Applies

On any coastal shoreline, including the Great Lakes, where vegetation can be expected to effectively stabilize a site.

Specifications

1. Sand dunes

   A. Where stabilization of existing sand dunes and/or re-establishment of beachgrass is needed.

      1) Long Island and NYC area, use Certified 'Cape' American Beachgrass. Planting of frontal dunes should be accomplished by April 30. Refer to American Beachgrass Information Sheet for specific instructions.

      2) Lake Champlain and Great Lakes, use the Lake Champlain strain or species if adequate planting material is available. Use American beachgrass guidelines for planting. 'Cape' will do well but is very aggressive compared with the Lake Champlain strain. Some people consider 'Cape' an invasive plant in these locations.

      3) 'Atlantic' coastal panicgrass is excellent for back dune areas. Seed at 10 pounds pure live seed per acre. Refer to Vegetative Stabilization of Sand and Gravel Pits for determining the proper amount of pure live seed.

      4) Immediately after planting, a sand fence (snow fence) will be built to protect the beachgrass from vehicle and foot traffic. The fence shall surround the planted area at a distance of 15 feet from the planted area. Passageways should be provided to allow pedestrians to cross the planted area at 300 foot intervals. Elevated boardwalks, or dune cross-overs, are desirable. Move the opening and boardwalk when beachgrass becomes weak.

   B. Where sand dunes must be reconstructed through sand entrapment, and shore conditions allow for sand deposition, a specialist from Sea Grant or the USDA Natural Resource Conservation Service shall make the determinations of feasibility. Appropriate permits for altering shorelines must be obtained prior to beginning work.

2. Building, Planting, and Maintaining Coastal Sand Dunes

Dune stabilization work must start at least one hundred (100) feet (horizontal distance) from the mean high tide (MHT) water line as a minimum. Whenever feasible, leave room for two or more dune lines for a double layer of protection. Dunes grow toward the sand supply, which is the ocean or the lake.

   A. Building the dune:

      1) Vegetatively.

         Where blowing sand is available, a simple, relatively inexpensive and successful method exists for building dunes. It consists of planting American beachgrass strips parallel to the coastline. As the windblown sand moves off the beach landward, it drops its load of sand, beginning the natural cycle of dune growth. The row closest to the ocean should be at least 100 feet (horizontal distance) from the MHT line. The plantings will trap most of the windblown

sand, particularly during the growing season when the grass will continue to grow up through the newly trapped sand.

2) Sand Fences (Snow Fence Material).

The use of sand fence is effective and the material is readily available. It may be more expensive than building dunes vegetatively, but is less expensive than doing it with machinery. Normally it is also much faster than with vegetation alone.

To form a barrier dune, erect the sand fences, a minimum of 100 feet (horizontal distance) from the MHT line in two (three or four rows may be used where sufficient land area and sand is available.) parallel lines 30 or 40 feet apart. The fences should be roughly parallel to the water line and yet be as nearly as possible at a right angle to the prevailing winds. See Figure 3.3 on page 3.41. Where this is not possible, erect a single line of fence parallel with the water at least 140 feet from the MHT line and space 30 foot long perpendicular spurs 40 feet apart along the seaward side to trap lateral drift.

As the fences fill with sand, additional sets of fence can be placed over those filled until the barrier dune has reached a protective height.

To widen an old dune, the fencing should be set seaward at a distance of 15 feet from the old dune base.

Materials -

Use standard 4-foot sand (snow) fence. The fence should be sound and free of decay, broken wire, and missing or broken slats.

Wood posts, for fence support should be black locust, red cedar, white cedar, or other wood of equal life and strength. They do not need to be treated. They should be a minimum of 6 ft. 6 in. long and a minimum diameter of 3 inches. Standard fence post length is usually 7 ft.—8 ft. and should be used where possible.

Four (4) wire ties should be used to fasten the fence to the wood posts. Weave fence between posts so that every other post will have fence on ocean side of posts. Tie wires should be no smaller than 12 gauge galvanized wire.

The bottom of the fence should be set about 3 inches into the sand, or a mechanical grader could be used to push some sand against the bottom of fence.

3) Sand fence plus vegetation -

The combination of these two approaches is more effective than either one alone. The sand fence should be placed as discussed above. Bands of vegetation should then be planted parallel to the fence on the landward and seaward side. Each bank of vegetation should be about 20 feet wide and placed 10 to 15 feet from the sand fence. As the sand fills between the two fences, additional fence can be erected or the area between the fences can be planted. Such a combination can trap most of the wind blown sand crossing the dune area and produce a much broader based dune than either approach alone. See Figure 3.4.

3. Tidal Streams and Estuaries

The procedures to determine the effectiveness potential of stabilization of tidal streams and estuaries are found in Table 3.9.

Plants to be used are as follows:

A. Certified ‘Cape’ American beachgrass

B. Certified ‘Bayshore’ smooth cordgrass

C. Certified ‘Avalon’ saltmeadow cordgrass

D. Certified ‘Atlantic’ coastal panicgrass

4. Coastal panicgrass is primarily used in freshwater tidal areas above high tide line. Frequently, it is seeded over top of saltmeadow cordgrass plantings.

5. Additional Reference

“Best of Beach Vegetation” by W. Curtis Sharp. Reprints from Parks and Recreation Resources. Volume 1, Nos. 1, 2, 4 & 5, 7 & 8. Published in January, February, May/June, July/August 1982.

Figure 3.3
Combination of Sand Fence and Vegetation for Dune Building

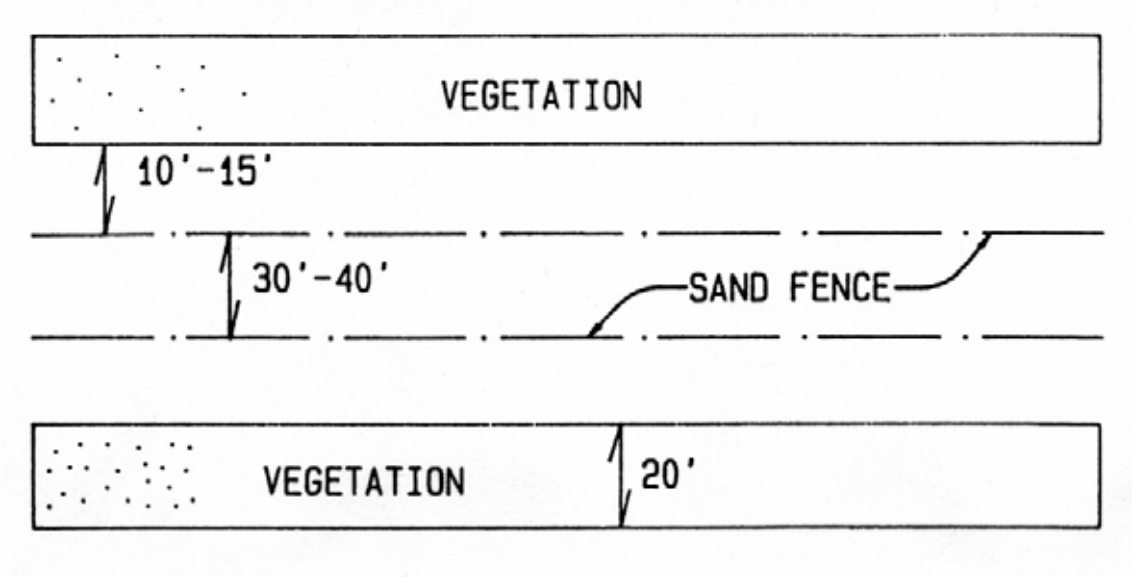


Figure 3.4
Typical Cross-Section Created by a Combination of Sand Fence and Vegetation

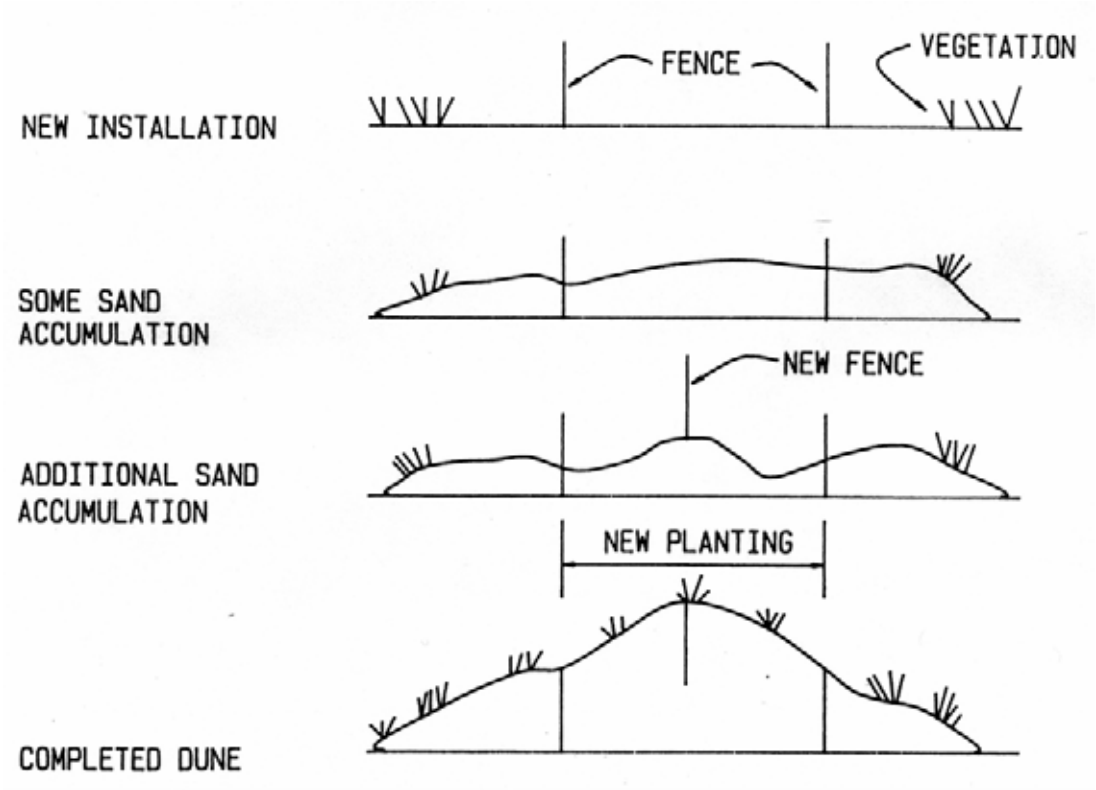


Table 3.9
Vegetative Treatment Potential for Eroding Tidal Shorelines

DIRECTIONS FOR USE

1. Evaluate each of the first four shoreline variables and match the site characteristics of the variable to the appropriate descriptive category.
2. Place the Vegetative Treatment Potential (VTP) assigned for each of the four variables in the right hand column.
3. Obtain the Cumulative Vegetative Treatment Potential for variables 1, 2, 3 & 4 by adding the VTP for each.
4. If it is 23 or more, the potential for the site to be stabilized with vegetative is very good and the rest of the table need not be used. If it is below 23, go to step 5.
5. Determine the VTP for shoreline variable 5 through 9 and obtain the cumulative VTP for variables 1-9.
6. Compare the cumulative VTP score with the Vegetative Treatment Potential Scale at the bottom of this page.

SHORELINE VARIABLES	DIRECTION FOR USE The Vegetative Treatment Potential (VTP) is located in bold type.					VTP
1. Fetch: Average distance in miles of open watermeasured perpendicular to the shore and 45 degrees either side of perpendicular to shore.	Less than 0.5 miles **8**	0.5 thru 1.4 miles **7**	1.5 thru 3.4 miles **4**	3.5 thru 4.9 miles **2**	over 5 miles[1] **0**	
2.General shape of shoreline for distance of 200 yards on each side of planting site.	Coves **8**	Irregular shoreline **3**		Headland or straight shoreline **0**		
3. Shoreline orientation: General geographic direction the shoreline faces.	Any less than 1/2 mile fetch **5**	West to North **3**	South to West **2**	South to East **1**	North to East **0**	
4. Boat traffic: Proximity of site torecreational & commercial boat traffic.	None **5**	1-10 per week within 1/2 mi. of shore. **3**	More than 10 per week within 1/2 mi. of shore. **2**	1-10 per week within 100 yds. of shore. **1**	More than 10 per week within 100 yds. of shore. **0**	

Cumulative Vegetative Treatment Potential for Variables 1, 2, 3 & 4 _____

If this score is 23 or above, the potential for the site is very good and the rest of the table need not be used. If it is below 23, go to step 5 below.

5. Width of beach above mean high tide in feet	Greater than 10 ft. **3**	10 ft. thru 7 ft. **2**	6 ft. thru. 3 ft. **1**	Less than 3 ft. **0**	
6. Potential width[2] of Planting area in feet	More than 20 ft. **3**	20 ft. thru 15 ft. **2**	14 ft. thru 10 ft. **1**	Less than 10 ft. **Do not plant**	
7. On shore gradient slope from MLW to toe of bank.	below 8% **6**	8% thru 14% **3**	15% thru 20% **1**	Over 20% **0**	
8. Beach Vegetation	Vegetation below toe of slope **3**		No vegetation below toe of slope **0**		
9. Depth of sand[3] at mean high tide in inches.	more than 10 in. **3**	10 in. thru 3 in. **2**	less than 3 in. **0**		

Cumulative Vegetative Treatment Potential for Variables 1-9 _____

1. Do not plant.
2. If tidal fluctuation is 2.5 feet or less, measure from MLW to toe of bank. If tidal fluctuation is over 2.5 feet, measure from MW to toe of bank.
3. Refers to depth of sand deposited by littoral drift over the substrata.

Vegetative Treatment Potential Scale

If the VTP is, Between	And	Potential of site to be Stabilized with Vegetation
40	33	Good
32	24	Fair
23	16	Poor

Figure 3.5
American Beachgrass Information Sheet
(*Ammophila breviligulata* Fern)

Adapted from USDA—NRCS Plant Guide[2]

Use: Major use is to stabilize moving sand along the Atlantic Sea coast and Great Lakes region. It is the best species for the initial stabilization of frontal dunes.

Useful as an erosion control plant on non-dune areas where soils are very sandy and the site conditions make establishment of seeded species very difficult. Also used on soils high in salinity such as industrial waste needing vegetative cover.

Description: American beachgrass is a leafy, spreading grass with many stems per clump. It may reach a height of two to three feet. The seed head is a spike-like panicle, about ten inches long, and appears in late July or August. Leaves are long and narrow, and may become rolled or folded as it matures.

One outstanding growth characteristic is the strong underground stems (rhizomes) that spread beneath the sand and give rise to many new plants. Its vigorous growth enables the plant to withstand heavy deposits of sand and the ability to grow up through deposits.

Adaptation: American beachgrass is native to the mid-Atlantic coastal region from Maine to North Carolina, and the Great Lakes region. It will grow on island sites, high in sand and/or saline content, provided adequate amounts of nitrogen and other nutrients are present.

Varieties: 'Cape' is the most recent variety and was developed by the Soil Conservation Service at the Cape May Plant Materials Center, Cape May Court House, N.J. 'Hatteras' developed by the Agricultural Experiment Station in North Carolina is a variety better adapted to southern climates.

Source: Both are commercially available vegetatively. Seed not available.

Establishment: The best time to plant beachgrass is from October 1 to April 30. If properly planted, good survival can be expected at any time during this period, except when soil is frozen. Summer plantings are not satisfactory. American beachgrass can be planted either by hand or by mechanical equipment designed for this work. The stems of plants called 'culms' are used for planting stock. Two or three culms are planted per hole. Space plants 18" by 18", unless wind erosion is severe, then reduce spacing to 12" by 12". Stagger the plantings in alternate rows to provide maximum erosion control. On very stable areas where wind is not a factor, a spacing of 24" x 24" is suitable. An 18" x 18" spacing requires 58,500 culms (3 culms/planting unit) per acre, or 1,350 culms per 1,000 square feet.

Beachgrass culms must be planted at least 8" deep. This prevents plants from drying out, as well as being blown out by the wind. A tiling or ditching spade is an excellent tool for opening the planting hole. A two person crew works best in planting on frontal dunes and loose sandy areas. The culms and roots must be kept cool and moist before and during planting. Success of planting will increase if the stock is dormant or has made very little growth.

AMERICAN BEACHGRASS

Fertilizer properly applied is the key to good vigorous growth, as coastal sands are rather infertile. Fertilize in March or April with 30 to 40 pounds of inorganic nitrogen per acre until desired density is obtained.

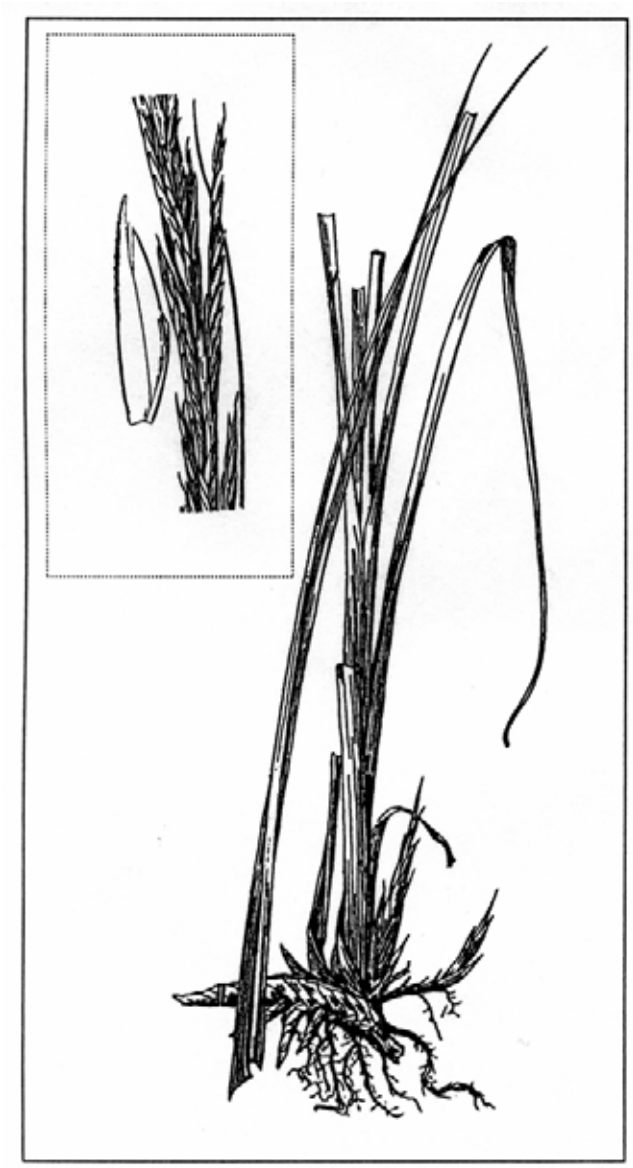
Management: Once the stand is well established, the rate of fertilizer applied can be reduced by half, or applied only when the stand appears to be weakening.

Exclude vehicular traffic if possible and provide elevated boardwalks for pedestrians. Pedestrian and vehicular traffic that bends or breaks the culms will seriously damage the plants and may kill them. Move boardwalks, or dune cross-overs, when beachgrass underneath begins to weaken and become open, exposing the sand for potential blowing. On frontal dunes, any area devoid of protective cover is subject to blowing and eventual ruin. Replanting of beachgrass stands that become open should be an annual operating procedure.

Figure 3.6
Cordgrass Information Sheet
Smooth Cordgrass (*Spartina alterniflora*)
and
Saltmeadow Cordgrass (*Spartina patens*)

Adapted from USDA—NRCS Plant Fact Sheets[2]

Description: Smooth cordgrass, a long life perennial, is the dominant, most productive marsh plant in the regularly flooded inter-tidal zone along the Atlantic and Gulf coast from Newfoundland to Florida and Texas. Smooth cordgrass grows three to seven feet tall with stems up to 1/2 inch in diameter. The leaves are twelve to twenty inches long, tapering to a point. The seed heads, produced in September and October, are ten to twelve inches long and hold twelve to fifteen spikelets, each two to three inches long. Its primary method of spreading is by vigorous, hollow rhizomes.



Spartina alterniflora

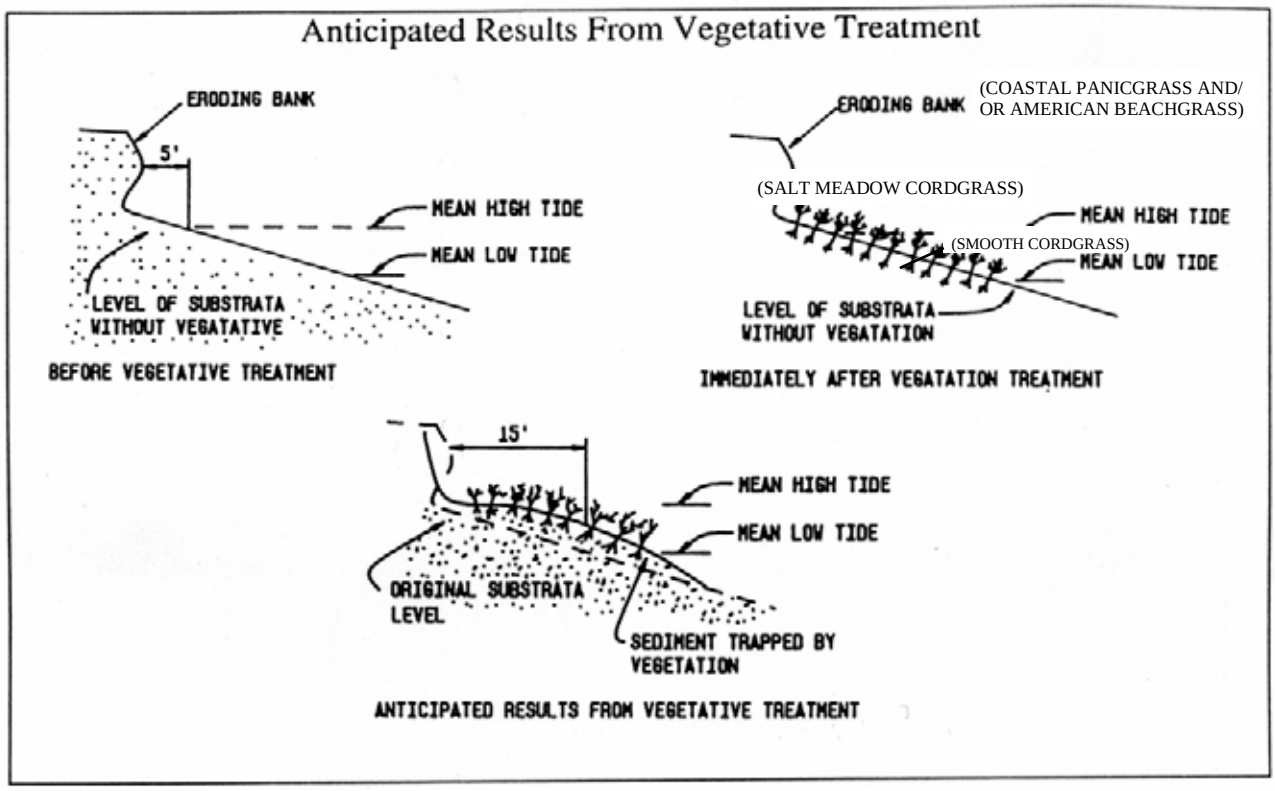
Saltmeadow cordgrass grows in salt marshes and sandy meadows along the Atlantic and Gulf coasts from Quebec to Florida and Texas. It occupies the area immediately above the inter-tidal zone. Mature plants are grayish green, usually one to three feet tall. The leaf sheath is round; the leaf blade is long and narrow, usually rolled inward giving a wiry appearance; the upper side of the leaf is rough. The seed heads produced in October have spikelets that grow almost at right angles to the rachis or main stem. Saltmeadow cordgrass reproduces rapidly by long, scaly, slender rhizomes.

Spartina patens

Both smooth and saltmeadow cordgrasses are used by waterfowl as a source of food. Saltmeadow cordgrass is also used by muskrats for housing materials.

Uses: Because of their adaptation to brackish water, smooth and saltmeadow cordgrasses occur naturally or can be planted to stabilize eroding shorelines. Planted along the shoreline, the cordgrasses absorb the wave energy and collect the sediment brought in by water. As the sediment is dropped, the band of vegetation expands, pushing the mean high tide away form the tow of the bank, thus reducing the potential for continuous erosion.

Establishment of Shoreline Plantings: Smooth cordgrass is planted between the mean low water level and the mean high water level. Saltmeadow cordgrass is planted above



the smooth cordgrass from mean high water to the toe of the slope. If the distance from the mean high water to the toe of the slope exceeds 10 feet, American beachgrass should also be planted in the upper part of the slope.

Establishment of Plants: There are three types of plant materials that can be used for planting along the shoreline. One type is seedlings grown in peat pots. Such plants should be about 12 inches tall with 3-5 stems per container before they are large enough for transplanting. The container is planted with the root mass.

A second method is to grow the plants in containers which allow the plants with the root mass to slip out at the time of planting. Their size, etc., are the same as above. The advantage of this method is that it eliminates the barrier occasionally created by the peat pots that may produce a slight turbulence around the plant and wash it out.

A third type is to harvest culms from natural or cultivated stands which are then planted directly to the shoreline. If the plants are to be taken from natural stands, they should be growing in sandy substrata. The stands should be open and developing rather than dense and mature. The culms will be ready for digging and transplanting when the top growth is six to ten inches tall. Each culm should have a well developed root.

Methods one, two and three are equally recommended for smooth cordgrass. Methods one and two are recommended for saltmeadow cordgrass. Although method three can be used, performance expectations will be less than with the other two methods. Coastal panicgrass can be planted using method one or be seeded.

Typical plantings consist of one row parallel to the shoreline. Transplants should be midway between the high and low tide elevations. Plant spacing within the row will vary according to the size of the transplant materials being used and the rate at which full coverage is desired. One gallon container stock are generally planted at 5' to 8' centers and plugs generally on 2'-3' centers. Smooth cordgrass typically produces 8'-10' rhizomes for lateral spread in one growing season. If two rows are planted, allow 5' between rows. The spacing to be used is influenced by the severity of the site. On sites that have a potential of being washed away, the spacing should be closer. In protected areas where there is little danger of the planting being initially destroyed, the spacing can be wider. The hole made in the substrata should fully accommodate the plant roots. Be sure to seal the hole by pressing the soil around the roots with your heal.

Planting Method/Fertilization:

Planting Methods: When planting trade-gallons, transplants should be planted in a hole. Post-hole diggers, gas drills with modified bits, or any other methods of digging are satisfactory. The planting hole should be the same size or only slightly larger than the root-ball and deep enough so that the top of the root-ball is flush or slightly below ground. The top of the root-ball should not protrude above

nor be more than 2" below normal ground. The planting hole should be tightly closed around the plant to prevent the plant from wobbling and plants should remain erect after planting.

Planting sites where high wave energy is a problem may require the addition of a plant anchor. A plant anchor consists of ¼" steel re-bar bent into a hook (candy-cane shape) and pushed down into the soil so that the hook lays across the root-ball, pinning it to the ground. Anchors are generally about 30" in overall length and will add to the cost of the planting. However, anchors are generally necessary at unusually problematic sites to prevent plants from washing out.

When planting bare-root plugs, holes need only be approximately 3" in diameter and deep enough to cover the roots. Any style of tool that will punch a hole this size such as a dibble bar will work. Cupping the roots of the plug in hand and pushing down into the mud carefully will also work in more fluid soils. There are no plant anchors for plugs, and in practice, plugs should not be used at any site where wave energy is a factor.

Fertilization: There is no clear consensus on the effectiveness of fertilizer when used in saturated and/or anaerobic soils. However, the additional cost of fertilizer is a small investment given the overall cost involved in vegetative restoration.

Slow-release fertilizer tablets are commercially available in a range of weights and analyses. Recommended tablet weight should be between 15 and 25 grams and have a nitrogen content of not less than 15% and not more than 30%. When using tablets with trade-gallon plants, push the tablet into the top 3" of the root-ball immediately prior to or immediately after planting the transplant. The resulting hole should be pinched closed. When using tablets with bare-root plugs, drop the tablet in the planting hole prior to inserting the plug.

Planting should be made between mid Spring and July 1. The early Spring plantings are more hazardous because of storms and less favorable soil temperatures. Actual dates are influenced by location. Late Spring plantings are preferred.

Site Suitability: A high percentage of plantings made on tidal shorelines fail due to shoreline conditions, storms, etc. Most shoreline conditions can be identified and their likelihood of contributing to success or failure estimated. They are shown in Table 3.9.

While the procedure outline in Table 3.9 has been tested against actual plantings, there is no guarantee the outcome of the planting will be as the guideline suggests. For instance, unexpected storms could completely eliminate the value of these guidelines and destroy the planting.

Management of Established Plantings: Plantings should be monitored frequently each year. Plants destroyed or washed out should be replanted as quickly as possible. All debris washed onto the plantings should be immediately removed to prevent smothering the plants.

Sources: Smooth and saltmeadow cordgrasses are available commercially. Because commercial sources are subject to change, contact your local USDA Natural Resources Conservation Service office for sources closest to you. 'Bayshore' smooth cordgrass, 'Avalon' saltmeadow cordgrass, and 'Atlantic' coastal panicgrass are recommended varieties for Long Island.