Coastal Engineering Technical Note

DUNE GRASS FERTILIZATION AND MAINTENANCE

PROBLEM: Hurricane and coastal flood protection projects often involve the building of sand dune stabilized with grasses. Although properly planted, fertilized and maintained during the first and perhaps second growing season, dune plants often suffer, thereafter, from neglect.

PURPOSE: To recommend a fertilization and maintenance program to sustain healthy dune grasses in coastal regions.

APPROACH: Healthy dune grasses can be perpetuated through an annual assessment of the need for fertilization and application of fertilizer as needed.

DUNE GRASSES: Five dune grasses are commonly planted for sand dune stabilization in the continental United States. One or more will be common to a region. They are: American beachgrass (Ammophila breviligulata), bitter panicum (Panicum amarum), European beachgrass (A. arenaria), saltmeadow cordgrass (Spartina patens), and sea oats (Uniola paniculata).

DETERMINING IF FERTILIZATION IS NEEDED: Dune grasses should be inspected in midsummer to assess the need for fertilization the following spring. After establishment, the color of the grass itself can be used as a general indicator of need for fertilization. Dark green leaves indicate an adequate supply while lighter shades of green and yellowing lower leaves during active growth may indicate nutrient deficiencies.

WHEN TO APPLY FERTILIZER: Fertilizer should be applied in a single application in the late winter or early spring while the plants are still dormant. These dune grasses begin active growth when the maximum daytime temperature regularly exceeds 60° F (16° C). In general, fertilization should be conducted in: (1) late February and March in the Southeast Atlantic and Gulf states and in Southern California; (2) March and April in the mid-Atlantic and in central California; and (3) April and early May in the Northeast Atlantic, Great Lakes, and Pacific Northwest. Fertilizer should be applied when winds are calm (less than four miles per hour) and foliage is dry (no dew, rain or spray on leaves).

TYPE OF FERTILIZER TO APPLY: Apply a granular or pelletized agricultural type fertilizer. It need not be a costly, slow-release material.

AMOUNT OF FERTILIZER TO APPLY: Nitrogen (N) is the nutrient of greatest importance in dune areas and should be the rate-controlling factor. Use the maximum rate only if the area is seriously nutrient deficient and has not been fertilized in more than three years. Exceeding the maximum rate may damage (burn) plants. Application is often the costliest part of the program, so using less than the minimum rate is not cost-effective and may not produce the desired results. Table 1 gives the rate schedule for the key nutrients.

Table 1

ANNUAL NUTRIENT RATES FOR DUNE GRASSES 1/

(in pounds per acre)

Rate	Nitrogen (N)	Phosphate (P_2O_5) 2/	Potash (K_2O) 3/
Maximum	100	50 to 100	0 to 100
Normal	50	30 to 50	0 to 50
Minimum	25	15 to 25	0 to 25

1/ To convert to pounds per 1000 square feet, divide by 43.56; to convert to kilograms per hectare, multiply by 1.121.

2/ Should not exceed nitrogen rate.

3/ Not limiting in coastal areas; however, should not exceed nitrogen rate.

In conventional mixed fertilizers, the number designations on the bag such as 10-10-10 represent the percentages (by weight) of nitrogen (N), phosphate (P_2O_5), and potash (K_2O), respectively, in the mixture. To determine the weight of a commercial mixed fertilizer that is needed for a project, use the following formula:

$$\text{Weight of Mixed Fertilizer Needed} = \left(\text{Area to be Fertilized}\right) \times \frac{\left(\text{Annual Nutrient Application Rate-Table 1}\right)}{\left(\text{Percent Nutrient in Mixture}\right)} \times 100$$

As noted earlier, nitrogen is of greatest importance and is the rate-controlling nutrient in dune fertilization. Therefore, use nitrogen to determine the annual nutrient application rate in the above formula. In most instances, using mixed fertilizers, you will meet or exceed your phosphate needs by using

the nitrogen application rate. For example, the amount of 10-10-10 mixed fertilizer needed for one acre to provide 100 pounds of nitrogen and 50 pounds of phosphate (maximum rate - Table 1) would be 1000 pounds. The higher unit weight costs of using a more concentrated (more nitrogen) fertilizer at a lesser application rate must be balanced against the reduced cost of a less concentrated fertilizer at an increased application rate. Use a "Turf-builder" type lawn fertilizer (e.g., 27-4-4) only if a more balanced fertilizer is not economically available.

METHODS OF APPLYING FERTILIZERS:

1. Aerial
   a. 50-100 acres of dune grass per day can be fertilized.
   b. Best for large areas with uneven topography.
   c. Costs may vary greatly with location and proximity to an airfield.
   d. Eveness of distribution (stripping) varies with skill of pilot; using a helicopter reduces this but increases cost.

2. Mechanical
   a. Number of acres treated per day varies with size of equipment and topography. About 10-40 acres of dune grass per day can be fertilized.
   b. Most cost-effective if feasible.
   c. Produces most uniform results.
   d. Cyclone spreader most suitable; hopper spreader seldom suitable.
   e. Suitable only on flat topography.
   f. Tractors or other vehicles may seriously damage dunes.
   g. Best done when sand is moist but foilage is dry.

3. Hand
   a. An individual can usually fertilize 2-5 acres in a day depending on difficulty of walking.
   b. Best for small areas, particularly uneven foredunes.
   c. Requires some skill for even distribution.
   d. Lay out bags in pattern according to application rate.
   e. Use gloves to protect hands from drying effects of fertilizer or use hand-type cyclone spreader.

THINGS TO AVOID:

1. Do not fertilize in fall or early winter as with cool-season lawn grasses.

Dune grasses are dormant in the winter and the winter rains will carry the nutrients through the sand out of reach of the root system.

2. Do not fertilize in late spring or summer. This encourages the growth of less desirable, highly competitive annual plants.

3. Do not over-fertilize. This will produce dense stands of grass which will mat and be highly susceptable to disease particularly in hot humid weather.

4. Do not use lawn fertilizers with weed killers or disease control additives. They are not effective and can damage or kill desirable dune plants.

5. Do not use liquid fertilizer as this could result in fertilizer burn.

6. Never irrigate dune grasses with salt water. Dune grasses are salt-tolerant, not salt-loving.

TRAFFIC CONTROL: Dune grasses are particularly susceptable to pedestrian trampling and off-road vehicle traffic. All traffic should be channeled to controlled access points. Beach dune walkover structures are discussed in CERC Technical Note III-5. Off-road vehicle traffic should be restricted to a few well-managed "heavy-use" trails and ramps should be built and maintained over the dune lines. On the beach, vehicular traffic should be restricted to the outer beach, seaward of the drift-line. New unplanned trails should be closed immediately with brush or sand-fence. Sand-fence is four feet tall and should be staked at least every eight feet. Six foot posts should be driven (if metal) or dug (if wood) at least two feet into the ground. Sand fence has a life-expectancy of three years and is subject to vandalizm and destruction for campfires. A more extensive discussion of recreational impacts on dune grasses is contained in the "Barrier Island Handbook" by S.P. Leatherman.

ADDITIONAL INFORMATION: Contact Art Hurme of the CERC Coastal Ecology Branch at (202) 325-7392.

REFERENCES:

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