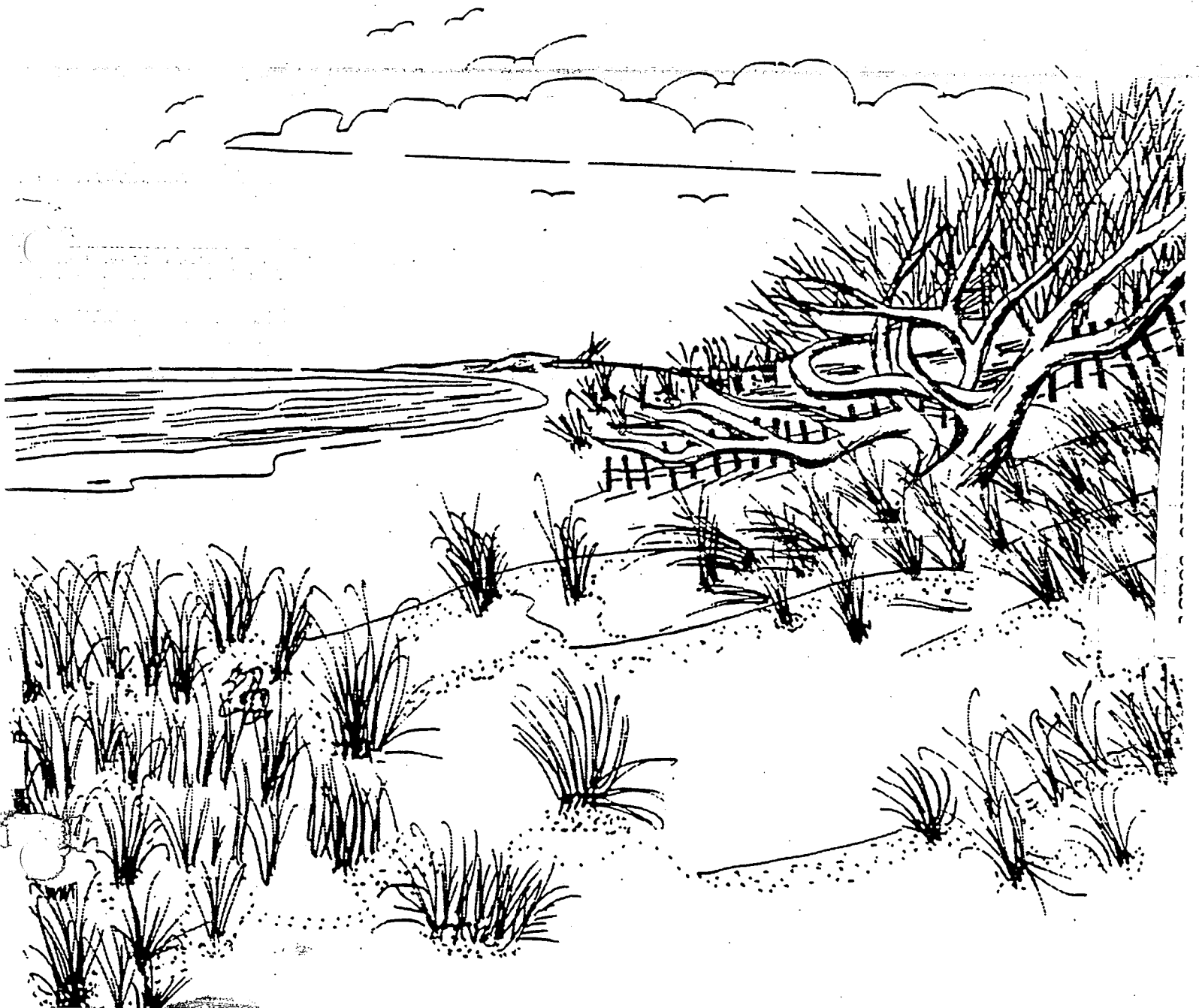


United States
Department of
Agriculture

Soil
Conservation
Service

Somerset,
New Jersey

Restoration of Sand Dunes Along the Mid-Atlantic Coast



RESTORATION
of
SAND DUNES
along the
D-ATLANTIC COAST

December 1992

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Introduction

Sand dunes are the first line of defense against ocean waves during coastal storms. They act as flexible barriers to high tides and normal wave action. When dunes give way to storm winds and water, the shifting mounds of sand will soon reappear. The dunes are reservoirs of sand that keep the shore intact. Well-vegetated dunes are dynamic parts of the landscape.

Dunes are formed by waves and wind and, when unvegetated, are extremely vulnerable to these same forces. Several grass and woody plant species are well-adapted to this harsh environment. These hardy plants help hold the dunes in place. They are tolerant to salt, intense heat, coarse sands lacking humus, and limited moisture. As the sand accumulates around beachgrass plants, new roots develop along the buried stems from which new plants arise. Under ideal conditions, a dense mat of vegetation develops to anchor the dune below the surface and stabilize windblown sand on the surface.

The dunes, stabilized with vegetation, provide a unique natural barrier. These mounds of sand buffer incoming waves, reducing their velocity and absorbing the oceanic forces.

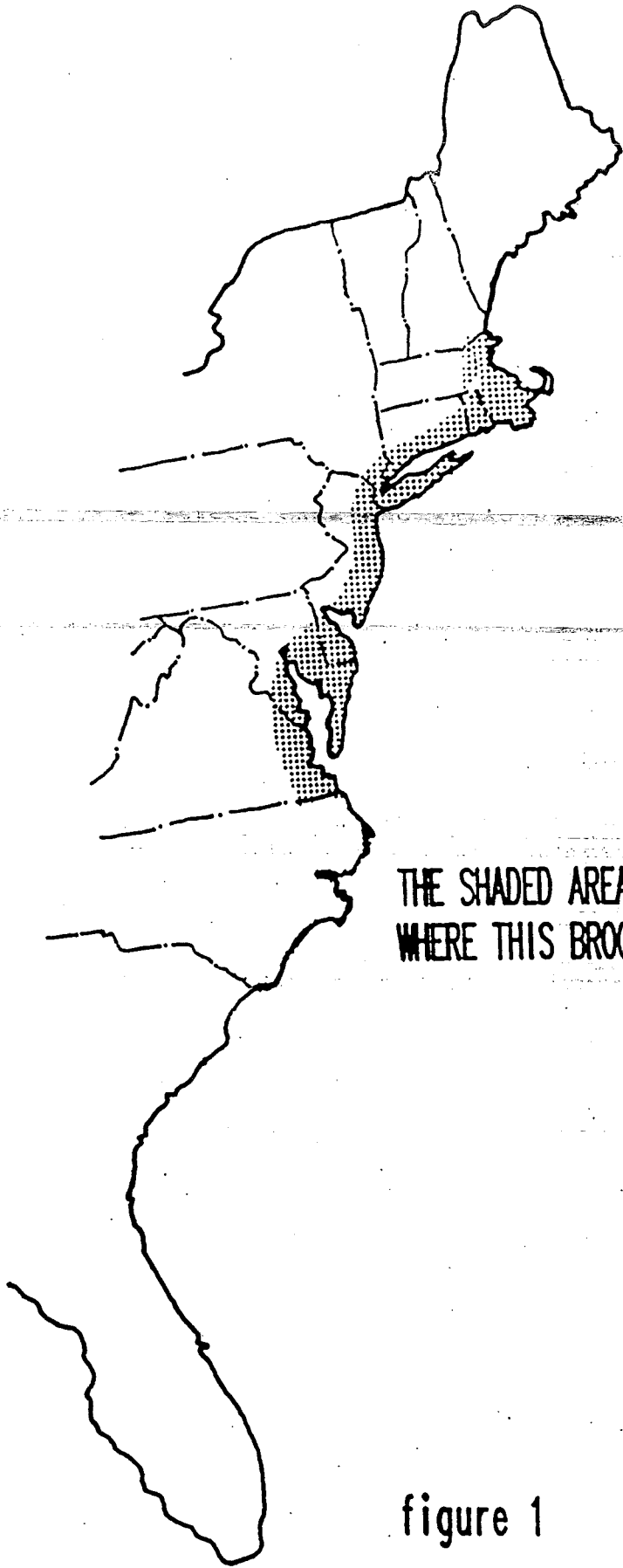
The information in this document provides guidance to the Soil Conservation Service, Soil Conservation districts, civic groups, units of governments, and individuals to minimize erosion of sand dunes along the mid-Atlantic coast (Figure 1).

Natural Sand Dunes

It is important to understand the process of dune building as it occurs in nature. It begins when storm waves break in relatively deep water offshore. These waves dig a trough in the sand and deposit it as a submarine bar near to and parallel to the shore.

The Army Corps of Engineers has primary responsibilities for beach and shore protection. All applicable state and federal laws and policies must be followed when providing technical assistance for stabilization or manipulation of sand dunes.

As the bar of sand rises above water level, a dune is formed. Isolated bars continue to emerge and then grow together to form a continuous dune or barrier island. The area of water between this dune and shore becomes a shallow lagoon or bay.



THE SHADED AREA OUTLINES THE LIMITS
WHERE THIS BROCHURE IS APPLICABLE

figure 1

Further dune formation then occurs on the oceanside, where another offshore bar or dune is formed. The intervening area between the two dunes fills with sand to form the typical coastal dune. It begins at the ocean with an intertidal zone, followed by a beach, the primary dune, a trough, the secondary dune and the flat back dune, which terminates at the bayshore. See Figure 2 for a typical cross section of a barrier island. Of course, this is the ideal, but most stable dunes have varying forms of this configuration.

Several factors determine the configuration and stability of the beach and dune. Waves usually approach the beach from an acute angle, the water runs over the sand and recedes at right angles to the shore. As a result, the sand carried by the receding wave is transported downdrift of its origin. This is described as littoral drift, because the sand is transported in one direction. The direction of littoral drift is determined by the geographic location of the beach.

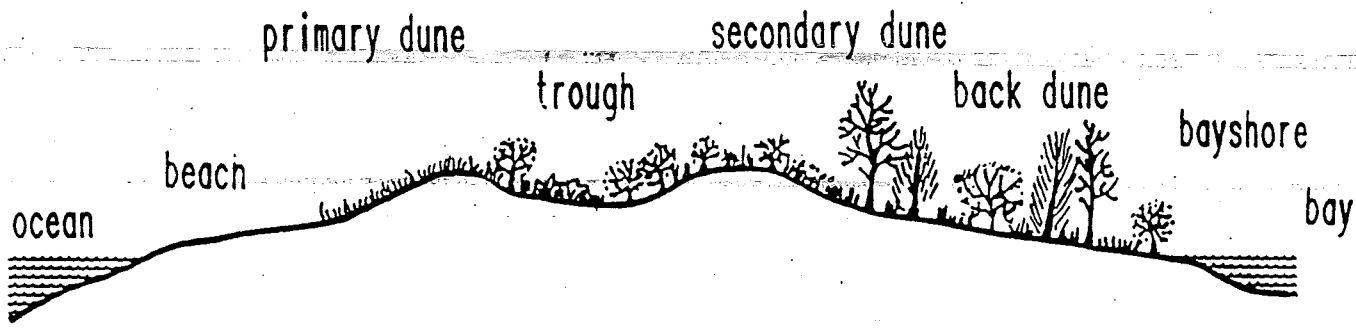
The configuration of barrier islands and their sand dunes are continually altered by autumn and winter storms. During storms the bays are likely to fill with sea water and flood the bayshore. During severe winter storms the ocean may cross over the entire island. A dune's stability is dependent on its height, vegetative cover, width, and storm intensity and duration.

Development along much of the mid-Atlantic coast does not allow natural dune-building factors to work. In some cases, encroaching development along the beach has prevented the formation of new sand dunes. This activity eliminates the possibility of newly deposited sand, either naturally or by man, being used to form a new sand dune or enhance existing dunes.

Several factors affect the success of vegetation: (1) Large groins frequently alter the littoral drift pattern, which is the source of sand that supplements the dune-building process. (2) There are points along the coast where the littoral drift is south, and adjacent to it the drift will be north. Beaches at that point are starved for sand. (3) Vegetation is vulnerable to foot and vehicle traffic and the plants may die if trampled. (4) A constant maintenance program is required to maintain successful vegetative cover.

BEACHNESTING BIRD HABITAT

Many species of wildlife use the sand dunes for habitat. Some shore birds require specific nesting conditions, generally referred to as beachnester habitat. These conditions must exist to attract the birds during the nesting period and provide habitat for successful chick production. Development of areas adjacent to the dunes and human activity have discouraged certain beachnesting birds and even destroyed some habitat.



TYPICAL BARRIER ISLAND CROSS SECTION.

figure 2

Several states have designated special areas for the preservation of beachnesting birds.

Beaches lacking a mature dune system fronting developed areas.

Developed barrier islands lacking a dune system typically have little or no beachnester habitat. Any efforts to build dunes in these areas will enhance their value to beachnesters. Techniques that produce the most natural dunes, i.e., irregular dune lines attract beach nesters.

Beaches fronting undeveloped areas.

On beaches where no structures are located behind the dune line (e.g. state parks and natural areas), artificial dune building may not be necessary and could be potentially detrimental to beachnester habitat. Small natural blowouts and overwash areas in the dune system can be tolerated and allowed to persist. In some areas efforts to extend the dune line towards the surf should be discouraged. Increasing vegetative cover on the primary dune may reduce beachnester habitat. Dune fertilization and management should be balanced between storm protection and beachnester habitat. Management to repair blowouts and stabilize areas within the mature dune system does little harm to beachnester habitat.

Beaches with a mature dune system fronting developed areas.

Some sand dunes fall between the two extremes given above. There are many developed portions of barrier islands requiring storm protection that are fronted by a wide, well developed dune system. In these areas the existing dune system provides adequate storm protection. Extending the dune lines towards the surf should be discouraged since additional protection is unnecessary and may reduce available habitat. Where the mature dune system is particularly wide and well developed, some small blowouts and overwash areas in the primary dune should be allowed to persist. Efforts to increase vegetative cover on the primary dune through planting and excessive fertilization may reduce beachnester habitat and should be discouraged in selected areas.

Municipal officials and dune managers should be aware of the habitat requirements for endangered beachnesting birds and the potential harm to their habitat from excessive or poorly planned dune management. Dune planting, fencing and fertilization activities should be scheduled to avoid disturbance to nesting birds. Beachnesters require privacy for successful nesting, therefore, human and mechanical activity should be prohibited in designated areas during the nesting season. A listing of endangered beachnesting bird areas in New Jersey is appended in this document.

BUILDING AND PLANTING COASTAL SAND DUNES

Dunes grow toward the sand supply, which is the ocean. Experience with dune stabilization work indicates that the primary dune must be at least 100 feet of horizontal distance from the Mean High Tide (MHT) line. Therefore, new dune construction should begin at least 100 feet landward of MHT. Whenever feasible, leave room for two or more dunes, which will provide a double layer of protection.

I. Building the Dune

A. Vegetatively

Where blowing sand is available, a simple, relatively inexpensive and successful method for building dunes is to plant American beachgrass. It consists of planting strips of beachgrass parallel to the coastline. As the airborne sand moves landward, the velocity decreases. The sand falls to the surface to begin the natural cycle of dune formation. The row closest to the ocean should be at least 100 feet from the MHT line. If space permits, plant a 40-to-50-foot wide strip, but no less than 20 feet. Such plantings will trap windblown sand, particularly during the growing season. The American beachgrass will continue to grow up through the newly trapped sand. Large quantities of sand deposited on the beach by winter storms may quickly exceed the capability of the grass to trap and hold it. Some of this unstabilized sand may be blown to the back dune areas or returned to the beach and then the ocean.

See Section III, Vegetating the Dune, for planting specifications.

B. Sand Fences (Snow Fence Material)

A sand fence is effective for trapping and holding sand. The material is readily available in the form of snow fence. It may be more expensive than building dunes with vegetation alone, but is less expensive than using machinery. Where a sand source is available and the wind is from the desired direction, a sand fence will build a dune much faster than vegetation alone.

To build a barrier dune, erect two parallel sand fences 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.

Where this is not possible, erect a single line of fence parallel with the ocean at least 140 feet from the MHT line. Attach 30-foot-long perpendicular spurs at 40 foot intervals along the water side of the fence to trap lateral drift. These spurs form pockets to trap sand as it drifts laterally along the fence.

As the pockets fill with sand, additional sets of fence can be placed over those filled units until the barrier dune has reached the desired height. As a general rule, sand will only fill to a level about three-fourths of the depth of the sand fence height.

To widen an old dune, the fence line should be erected oceanward at a distance of 15 feet from the base of the old dune.

Sand Fence Specifications

Use standard 4-foot wood slatted (snow) fence. The wood should be sound and free of decay. The fence should have no broken wire, missing or broken slats. An alternate fence material is the poly vinyl type that has at least a 50-percent porosity.

Wood posts, for fence support, should be black locust, red cedar, white cedar, or other wood of equal life or strength. They do not need to be chemically treated. The posts should have a minimum length of 6-1/2 feet and a minimum diameter of 3 inches. Standard fence posts are usually 7-to 8 feet-long and can be used when available and when they meet the minimum standards.

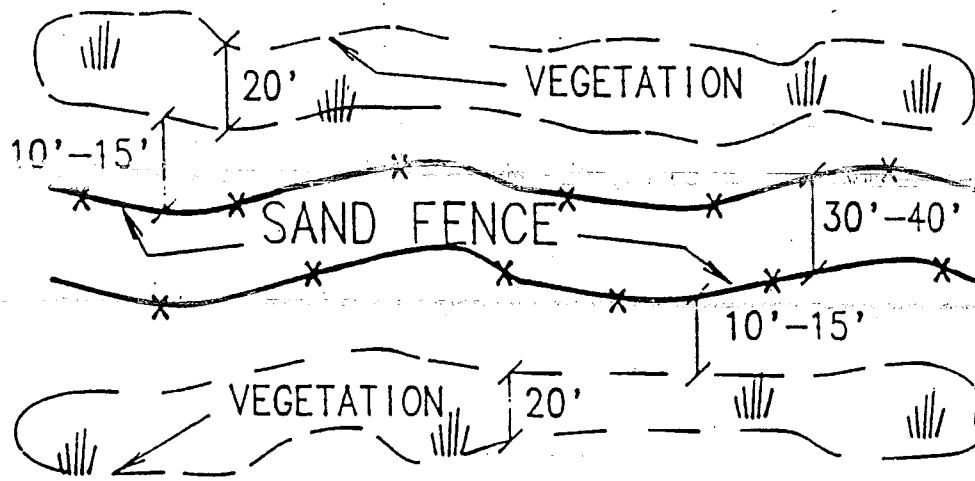
Four wire ties should be used to secure the fence to the wood posts. Install the fence so alternate posts will have fence on

) the oceanside of them. Tie wires should be no smaller than 12-gauge galvanized wire.

Posts will be set no more than 10 feet apart and at least 3 feet deep. This method makes the fence more resistant to changes in wind direction.

C. Sand Fence Plus Vegetation

ward fence as
The combination of these two approaches may be more effective than either of the two alone. The sand fence should be placed as outlined above. Strips of vegetation should then be planted parallel to the fence on the landward side of the landward fence and oceanward side of the oceanward fence as shown in Figure 3. Each strip of vegetation should be about 20 feet wide and located 10 to 15 feet from the sand fence. As the sand fills between the two fences, additional fence can be erected in the area between the fences. The area can be planted as shown in Figure 4. Such a combination can trap more wind blown sand crossing the dune area than either fence or beachgrass alone. This method can produce a broader-based dune than either approach alone.

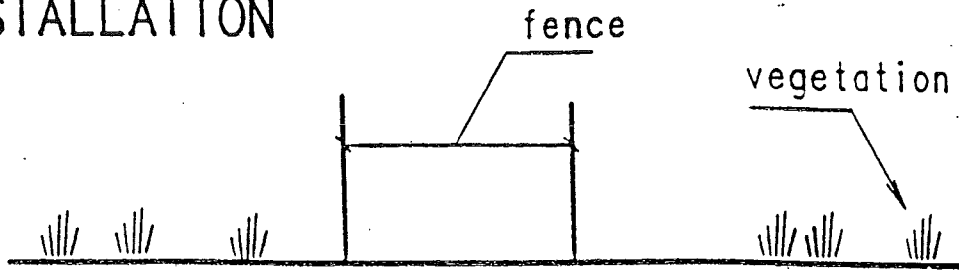


COMBINATION OF SAND FENCE AND VEGETATION FOR DUNE BUILDING

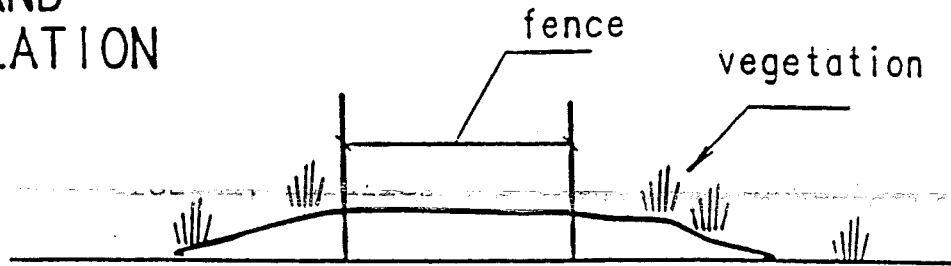
not to scale

figure 3

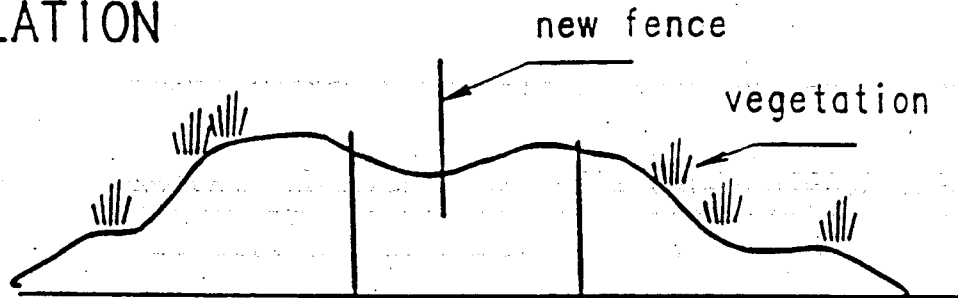
NEW INSTALLATION



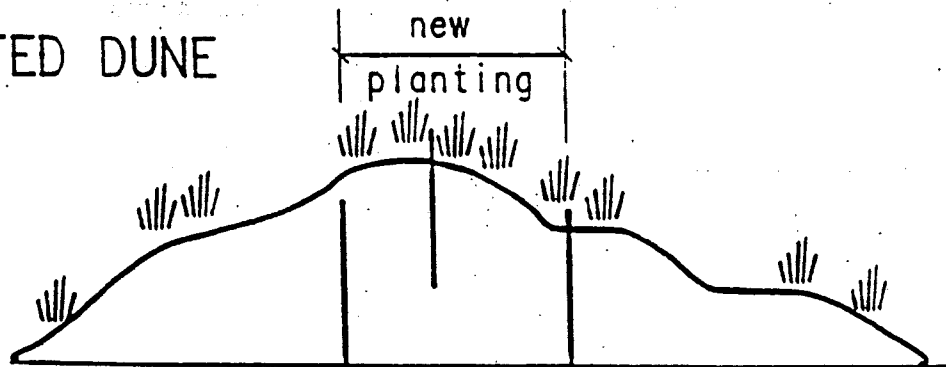
SOME SAND ACCUMULATION



ADDITIONAL SAND ACCUMULATION



COMPLETED DUNE



TYPICAL CROSS SECTION PRODUCED BY A COMBINATION OF SAND FENCE AND VEGETATION

not to scale

figure 4

II. Height of Dune

The length of time required to build a dune varies with weather conditions, available sand, and the method used to build the dune. If the sand fence-vegetation combination is used and ample quantities of sand are brought onto the beach by storms, 4 feet of dune elevation can be built in a season. If vegetation alone is used the dune will be no higher than the vegetation is capable of growing in a season.

The dunes eventual maximum height, which will be influenced by the installation of additional sand fence or vegetation and available sand, is about 12 feet to 15 feet. At this height range, the wind's energy is either unable to lift the sand above this elevation or the sand is carried over the top of the dune and deposited on the back side. To maintain this height requires a vigorous maintenance program. Maintenance includes replanting, protection from traffic, fertilization, and diversity of plant species.

Care should be taken to ensure that local residents are aware of any interference the dune height will have on their scenic vistas. This may influence the maximum height that the dune is built.

III. Vegetating the Dune

A. Species to Use

'Cape' American beachgrass is the best plant material for initial stabilization of the frontal or primary dunes of the area. Once established, Cape spreads by underground stems to form an erosion-resistant cover. The foliage reduces the wind velocity near the dune surface, causing sand to be deposited in the vegetation. As the sand deposits accumulate, the grass grows up through it, maintaining a protective cover.

B. Planting the Dunes

'Cape' American beachgrass can be planted from October 15th to March 31st in the Mid-Atlantic area, anytime the sand is not frozen. Further north in New England, planting can be extended to April 15th.

1. To build dunes, planting are made in the form of a continuous strip and should consist of at least 10 rows paralleling the shoreline. Where space permits, the strip width should be 50 feet wide.
2. Fresh planting stock should be used and the plants cut back to 16-18 inches long.
3. On most sites, the recommended plant spacing within the row is 18 inches. Where erosion is severe or expected to be, decrease the plant spacing to 12 inches apart.
4. Plant 2 stems in a hole approximately 7 to 9 inches deep.
5. Compact the sand firmly around the transplant to eliminate any air pockets.
6. Broadcast fertilizer at a rate equivalent to 600 pounds of 10-10-10 per acre. The fertilizer should be applied 30 days after the planting date, but not before April 1. This rate would be about 14 pounds per 1,000 square feet of fertilizer material.
7. For dunes built with the aid of sand fence only, planting should begin when the sand elevation approaches the top of the fence. Sand placed by earth moving equipment should be allowed to become compacted by rains before planting.

Maintaining the Dunes

Woody Plants for Secondary Dune Stabilization

Many woody plants are adapted to secondary coastal dunes. Where humans or storms have not destroyed the vegetation, trees, shrubs, and vines flourish and collectively provide excellent erosion protection. The permanent vegetation on other than the frontal dune will most certainly contain woody species.

The most abundant native woody plants along the mid-Atlantic coast are bayberry, wax myrtle, beach plum, highbush blueberry, inkberry, native roses, and choke cherry. The woody species recommended for planting are bayberry, wax myrtle, beach plum, Japanese black pine, and 'Emerald Sea' shore juniper.

The survival rate for woody seedlings transplanted in dune sand is often lower than when planted in the general landscape. Growth may also be poor, unless efforts are made to enhance the

environment into which the seedlings are transplanted and must live.

Desiccation of the plants during the establishment period undoubtedly accounts for some of the loss. The following steps are recommended to reduce desiccation and improve survival when transplanting adapted woody species onto sand dunes.

- A. Provide protection from the wind. This is best accomplished by planting into established stands of Cape American beachgrass or other herbaceous plants. Protection provided by buildings is also useful. Erection of a low barrier around each plant, such as, wood shingles, is also effective.
- B. Alter the composition of the sand into which the seedling will be planted. This is accomplished by mixing 1/2 gallon of organic material such as peat moss, with about twice as much sand. To do this, dig a hole about 8 by 8 by 8 inches, place the organic material in the hole, and mix it with the sand as the hole is filled. This can be done at planting time or well in advance of the planting date. Place the plant in the center of this amended hole slightly deeper than the plant grew in the nursery. Late fall or early spring is the best time to plant.

The use of container-grown plants is highly recommended and may eliminate the need for organic amendments.

Fertilizer at planting time is not recommended since it may reduce the survival rate.

Supplemental herbaceous species

Other herbaceous species, besides American beachgrass, are important to the sand dune vegetation community. Some species, i.e., Japanese sedge, are more pest-resistant than beachgrass.

Perennial and annual grasses, forbs, and certain legumes add diversity and longevity to the dune environment. Diversity of species make any planting more desirable for wildlife habitat by providing a variety of food and cover.

A. 'Atlantic' coastal panicgrass

Coastal panicgrass is a succession species. This species adds diversity and longevity to dune vegetation. It can be interplanted into existing stands of native dune vegetation. In Delaware and southward, coastal panicgrass

produces moderate seed yields. These seeds can provide food for wildlife, especially song birds.

'Atlantic' is adapted from Long Island to North Carolina. It can be planted from the crest of the foredune to the bayshore. Coastal panicgrass can be established from seed or with vegetative material.

I. Seedings

1. The seed should be drilled 1.5 to 2.5 inches deep at a rate of 10 pure-live-seed per linear foot.
2. The optimum planting dates are April 1 in the south to May 1 in the northern sector.
3. The row spacing can vary from 3 to 10 feet. Planting is easier if the rows meander to follow open sand rather than through existing dune plants.
4. Two or more years may be required for plants to reach mature size. The clump diameter will continue to increase with age.

II. Vegetative Material (Plants)

1. Interplant dormant seedlings into sparse cover.
2. Planting should be done in the early spring.
3. Plant the seedlings 2 inches deeper than they grew in the nursery.
- 4a. A recommended spacing for diversity is 4 by 4 feet. However, this can vary with differences in existing plant density.
- 4b. For erosion control, the recommended plant density is one per 2 square feet of dune area. This density can be either 'Atlantic' or other adapted dune species.

B. 'Sea Isle' Japanese Sedge

Japanese sedge is an introduced species, but has grown in isolated locations since the 1920s. It is adapted from North Carolina to Connecticut.

'Sea Isle' is more tolerant to abuse, such as foot traffic, than Cape. It also tends to be less subject to pests than beachgrass. Sea Isle will not tolerate as much sand deposition as Cape.

Sea Isle is recommended for high traffic areas, dunes subject to pests, and for landscaping around beach houses. The plants have sensitive rhizomes and require special care during planting. Unless specific planting procedures are followed, mortality may be high.

1. Fall plantings result in the best survival, and is highly recommended. Planting window is from September 15 to November 15.

2. Plant only in stable sand.

3a. For diversity, plant on a grid of approximately 5 by 5 feet into existing dune plants.

3b. For a pure stand, plant on a grid of 1 by 2 feet. Expect complete cover within 2 years.

4. Plant slightly deeper than the plant grew in the nursery. DO NOT compact the sand with the foot. Use the hands to do this. Rough planting methods may break the rhizomes and kill the plants.

5. Use potted plants whenever available.

Restoring the Dunes

Even the best vegetated dune will not remain that way unless a reasonable maintenance program is followed. Some considerations include:

A. Control of Foot and Vehicle Traffic

Primary dune vegetation cannot tolerate trampling. Traffic must be prohibited! However, dunes must be crossed to reach the beach. At selected sites mechanical crossovers must be installed. Elevated walks, paved paths, and sandy surfaces are satisfactory. Walkways, except elevated ones, should be curved to reduce wind erosion. The secondary dune must also be protected from pedestrian and vehicular traffic. All walkways should be fenced to channel the traffic across the dune. The front and back faces of the dune should

be fenced to prevent ingress, particularly from the beach.

B. Vegetation Maintenance

Vegetation is maintained with applications of fertilizer applied as needed to keep desired density. A maximum annual application of 50 pounds of N per acre should be applied. Replanting of areas where the vegetation has been destroyed is an essential annual maintenance requirement. This should be accomplished at the first window of opportunity. Woody plants need a maintenance fertilizer program beginning in the second year after planting.

C. Maintenance of Dune Line

A dune system, like a chain, is no stronger than its weakest link. Consequently, to receive maximum protection from dunes, a strong and uniform dune line must be maintained. Blow-outs, wash-outs, or other natural or human-produced damage must be repaired quickly or it will weaken the entire protective dune system.

However, sand dunes are dynamic formations. They tend to move oceanward during periods of relatively calm weather and landward after severe storms. Our task is to assist nature to maintain and restore the dunes.

Blow-outs in a dune system can be repaired by placing a sand fence between the existing dune parts. One or more fences may be required. It is essential to tie the ends of the fence into the existing dune to keep the wind from whipping around the ends.

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Appendices

APPENDIX A

New Jersey Endangered Beachnesting Bird Areas

SITE

OWNERSHIP

Sandy Hook	U.S.D.I. National Park Service
Mantoloking Brick Twp. Island Beach State Park	municipality & private municipality & private N.J. Div. Parks & Forestry
Barnegat Light Loveladies (Long Beach Is. Twp.) Holgate	municipality Municipality & private U.S.D.I. Fish & Wildlife Service
Little Beach	U.S.D.I. Fish & Wildlife Service
North Brigantine Natural Area	N.J. Div. Parks & Forestry
Brigantine - south beach Brigantine - south inlet Longport Sodbanks (Egg Harbor Twp.) Waverly Beach (Ocean City) Corson's Inlet State Park	municipality municipality municipality & private municipality & private N.J. Div. Parks & Forestry
Strathmere Natural Area	N.J. Div. Parks & Forestry
Whale Beach (Upper Twp.) Sea Isle City Townsend's Inlet (Sea Isle City) Avalon - north Avalon Dunes Champagne Island (North Wildwood) North Wildwood Coast Guard Electronics Base	municipality & private municipality municipality municipality municipality & private municipality municipality U.S.D.C. Coast Guard Service
Coast Guard Training Center	U.S.D.C. Coast Guard Service
Poverty Beach (Cape May) South Cape May Meadows Cape May Ferry (Lower Twp.) Higbee Beach WMA/Magnesite	municipality & private The Nature Conservancy municipality & private N.J. Div. Fish, Game & Wildlife

Appendix B

Plant Material Sources

'Cape' American beachgrass

1. Banks of Eden Farm
489 Cooper Road
Eden, Maryland 21822
(410) 749-8994
2. ~~Beaver Dam Acres~~
RD#1, Box 3
Lewes, Delaware 19958
(302) 945-1840
3. Benedict Nurseries
Box 347-A
Pemberton Drive
Salisbury, Maryland 21801
(410) 228-2540
4. Church's Greenhouse & Nursery
522 Seashore Road
Cape May, New Jersey 08204
(609) 884-3927
5. Phil Clarkson
Marshville Road
Tuckahoe, New Jersey 08250
(609) 390-2058
6. Steve Dubreville
86 U.S. Highway 50
Ocean View, New Jersey 08230
(609) 390-2058
7. Fine Tree Farm
24 Smith Street
Rehoboth, Massachusetts 02769
(508) 222-3477
8. Harper Farms
Rt.1, Box 244
Rhodesdale, Maryland 21659
(410) 943-4173
9. Hatchville Farm
P.O. Box 241
Falmouth, Massachusetts 02541
(508) 457-9695

10. Jack Partyka
Hope Valley, Rhode Island 02832
(401) 789-8187
11. Peat & Sons Nursery
32 Old Country Road
Westhampton, New York 11977
(516) 288-3458
12. Seabury Farm
2560 Main Street
West Barnstable, Massachusetts 02668
(508) 362-4595
13. Springer Environmental Services
32 Keene Road
E. Freetown, Massachusetts 02717
(508) 763-2152
14. Suncatcher Farms
150 Fulling Road
Rio Grande, New Jersey 08242
(609) 886-1962
15. Gary Timberman
RD#1, Box 380
Bridgeton, New Jersey 08302
(609) 451-2422

'Atlantic' Coastal panicgrass

1. Banks of Eden Farm
489 Cooper Road
Eden, Maryland 21822
(410) 749-8994
(Only Plants available)
2. Norwood Farms
P.O. Box 438
McBee, South Carolina 29101
(803) 335-6636
3. Sylva Native Nursery & Seed Co.
1927 York Road
Timonium, Maryland 21093
(301) 560-2288
(Seed only)

4. William Wolters
RD#1, Box 197
Greenwood, Delaware 19950
(302) 349-4478
(Seed and Plants available)

'Sea Isle' Japanese sedge

1. Louis Cullipher
1449 Princess Anne Road
Virginia Beach, Virginia 22456
~~(804) 426-2212~~
2. Seabury Farm
2560 Main Street
West Barnstable, Massachusetts 02668
(508) 362-4595

'Emerald Sea' Shore juniper

1. Centerton Nursery
RD#5, Route 553
Bridgeton, New Jersey 08302
(609) 455-0926
2. Ferruci Nurseries
Piney Hollow Road & Victoria Avenue
Newfield, New Jersey 08344
(609) 697-1950
3. Fine Tree Farm
24 Smith Street
Rehoboth, Massachusetts 02769
(508) 222-3477
4. Phyto-Ecology
Box 303
Rt. 480 & Junction 312
Ridgely, Maryland 21660
(410) 634-2526
5. Rhodo-Lake Nursery
Rolland DeWilde
RD#1
Bridgeton, New Jersey 08302
(609) 451-5877

Secondary Dune Species

<u>Nursery</u>	<u>Species Available</u>
1. Arrowwood Nursery, Inc. P.O. Box 418C Malaga Road Williamstown, New Jersey 08094 (609) 753-1160	Bayberry
2. Adams Nursery Box 606 Springfield Road Westfield, Massachusetts 01086 (413) 562-3644	Bayberry Beachplum
3. Bigelow Nurseries 455 West Main Street Northboro, Massachusetts 01532 (617) 845-2143	Bayberry Beachplum
4. Crowshaw Nursery Mill Lane, P.O. Box 339 Columbus, New Jersey 08022 (609) 298-0477	Bayberry
5. Environmental Concern, Inc. 210 West Chew Avenue P.O. Box P St. Michaels, Maryland 21663 (410) 745-9620	Bayberry Beachplum Rugosa Rose
6. Hess Nurseries, Inc. P.O. Box 326 Cedarville, New Jersey 08311 (216) 259-5571	Bayberry Beachplum
7. Pinelands Nursery RR1, Box 12, Island Road Columbus, New Jersey 08022 (609) 291-9486	Bayberry Beachplum
8. Peat & Sons, Inc. 32 Old Country Road Westhampton, New York 11977 (516) 288-3458	Bayberry Beachplum Rugosa Rose Japanese Black Pine
9. Quansett Nurseries, Inc. 794 Horseneck Road South Dartmouth, Massachusetts 02748 (617) 636-6931	Bayberry Beachplum

- | | |
|--|--|
| <p>10. Seabury Farm
 2560 Main Street
 West Barnstable, Massachusetts 02668
 (508) 362-4595</p> | <p>Bayberry
 Beachplum
 Rugosa Rose</p> |
| <p>11. Sepers Nursery
 1003 Columbia Avenue
 Newfield, New Jersey 08344
 (609) 691-0597</p> | <p>Bayberry
 Beachplum
 Rugosa Rose</p> |
| <p>12. Springfield Nursery, Inc.
 490 Mountain Avenue
 Springfield, New Jersey 07081
 (908) 479-5841</p> | <p>Bayberry
 Rugosa Rose
 Japanese Black
 Pine</p> |
| <p>13. Sylva Native Nursery
 1927 York Road
 Timonium, Maryland 21093
 (301) 560-2288</p> | <p>Bayberry
 Beachplum</p> |

Disclaimer:

This is a complete list of growers in the Mid-Atlantic region which we are aware of at this time. There may, however be other growers in the region who may be able to supply these plant materials.

Appendix C

PLANTS FOR CONSERVATION IN THE NORTHEAST
USDA - SOIL CONSERVATION SERVICE
NTC - CHESTER, PA

CONSERVATION PLANT SHEET

No. 28

AMERICAN BEACHGRASS
(Ammophila breviligulata Fern.)

USE: Major use is to help 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, bunch-type grass with many stems per clump. It may reach a height of two to three feet. The seedhead 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 grow up through it.

ADAPTATION: It is native to the mid-Atlantic coastal region from Maine to North Carolina, and the Great Lakes region. It will grow on inland sites, high in sand and/or saline content, provided applications of fertilizer containing nitrogen are made.

VARIETIES: 'Cape' is the variety that was developed by the Soil Conservation Service at the Cape May Plant Materials Center, Cape May Court House, New Jersey. 'Hatteras' developed by the Agricultural Experiment Station in North Carolina is a variety possibly better adapted to southern climates.

SOURCE: Both are commercially available vegetatively.

ESTABLISHMENT: The best time to plant beachgrass is from October 15 to April 1. If properly planted, good survival can be expected at any time during this period except when soil is frozen. Summer plantings are not recommended.

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 culms are planted per hole. Space plants 18" by 18" unless wind erosion is severe, then spacing is reduced 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" by 24" is suitable. An 18" by 18" spacing requires 38,720 culms per acre, or 889 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 team of two works best in planting on frontal dunes and loose sandy areas. The culms and roots must be kept moist before and during planting. Success of planting will increase if the stock is dormant or has made very little growth.

Fertilizer properly applied is the key to good vigorous growth, as coastal sands are rather infertile.

Broadcast fertilizer at a rate equivalent to 600 pounds of 10-20-10 per acre. The fertilizer should be applied 30 days after the planting date, but not before April 1. This rate would be about 14 pounds per 1,000 square feet.

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.

Pedestrian and vehicular traffic that bend or break the culms will seriously damage the plants and may kill them if traffic is intensive. On frontal dunes, any area devoid of protective cover is subject to blowing and eventual ruin. Replanting of beachgrass stands that become thin should be an annual operating procedure.

Revised March 5, 1993

Donald W. Hamer
Cape May PMC Manager

All SCS programs and services are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLANTING GUIDE

Coastal Panicgrass

Coastal panicgrass, Panicum amarum v. amarulum, is native to the sandy shores and coastal dunes of the east coast. Its cultivated use has been for coastal dune stabilization on the mid-Atlantic coast and the stabilization of sandy inland sites. It is a deep-rooted, long-lived, warm-season grass that thrives on a variety of droughty, infertile sites. Its rate of growth during the seedling year is slow, when compared to many cool-season grasses, but is more rapid than some warm-season species. On dune sands it will produce about one foot of top growth the first year, consisting of 3 to 7 culms. First year growth on more fertile sites will be about two-fold. The mature plant, reaching a height of 3 to 5 feet, will remain standing all winter and provide excellent protection against erosion and cover for wildlife. While producing short rhizomes, it has the appearance of a bunchgrass. It is tolerant to moderate saline conditions.

Adaptation - Like most plants, coastal panicgrass flourishes on fertile, well drained sandy loam soils, but it will also perform satisfactorily on very sandy, droughty sites. Its usefulness is primarily as a stabilizing plant on exposed sandy, gravelly sub-soil material, such as graded gravel pits, dikes, road bank cuts and fills or semi-stable sand dunes. It will not tolerate large quantities of sand accretion. The exact tolerance of coastal panicgrass to acidity is not well known, but it tolerates a pH of about 5.0 on very sandy soils. Climatically, it is adapted to the entire mid-Atlantic coastal area.

Establishment - Coastal panicgrass can be planted as early in the spring as weather will permit, but this may have some disadvantage on certain sites. Previously, the only successful establishment techniques was to drill the seed into a firm seedbed. The dormant seeding of other warm season grasses has been successful in the midwest. The term dormant seeding refers to a seeding date at which the seed are not expected to germinate immediately. Two methods of establishment are recommended for this trial.

Atlantic coastal panicgrass can either be overseeded or no-till planted during the dormant season. Both methods involve interseeding 'Atlantic' into a established cover crop. In many instances, it would be desirable to establish a stand of permanent cover without destroying that afforded by the temporary vegetation. In both methods, a satisfactory stand of the temporary winter cover must be established using small grain as the temporary species. In New Jersey, Atlantic should be dormant seeded after November 1 but prior to April 15.

The seeding depth for no-till planting method may vary from 1/2 to 1 1/2 inch, depending upon soil texture and planting date. The planting depth should be deeper for dates after March 15 and on coarser textured soils. Row spacing should not exceed 15 inches. The pure-live-seed seeding rate range is 8-10 lbs. per acre.

The second method is overseeding or broadcasting the seed on the soil surface without additional seedbed preparation. This method calls for broadcasting the seed on a somewhat loose soil surface prior to the end of the daily freezing and thawing soil temperatures. In order to obtain a uniform stand one-half of the seed should be broadcast in one direction. The remaining seed should be broadcast perpendicular to the initial direction. A tractor powered seeder/spreader or a hand operated cyclone type seeder should give satisfactory distribution of the seed. Use 10-12 lbs. of pure-live-seed per acre.

Management - A soil analysis should be used to determine lime and fertilizer needs. As a minimum, approximately 50 lbs. of N, P₂O₅, and K₂O per acre should be broadcast on the surface in lieu of following the recommendation of a soil test result. An equal amount of fertilizer should be broadcast after growth begins in the second year.

Weedy growth may be competitive during the first year. This competition can be reduced by clipping the top growth at nearly the height of the coastal panicgrass in early summer. Broadleaf weeds may be controlled with selected herbicides applied according to label. It may, also, be necessary to mow the small grain after the jointing stage to reduce competition for water and sunlight.

Switchgrass has similar growth and cultural characteristics to Atlantic. 'Blackwell' switchgrass or the PI-421136 strain can be substituted for Atlantic.

Cluster R. Belcher
Somerset, New Jersey
February 1986

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Planting Guide (Sand Dune Restoration)
'Sea Isle' - Japanese sedge

Introduction - Japanese sedge, Carex kobomugi, was first discovered in this country growing along the central New Jersey coast. It is believed a colony of plants became established on the sand dune from material discarded by a passing ship. Japanese sedge is native to northeastern Asia, but is naturalized to the New Jersey coast. Since its discovery in 1929, the original colony broken up by storms can now be found in several locations from New Jersey to Virginia. Adaptation plantings have been made by the Soil Conservation Service from Massachusetts to North Carolina.

Description - Japanese sedge grows to a height of 8-10 inches, but the arching leaves are much longer. It spreads by short rhizomes, which root at the nodes. These closely spaced nodes can form a dense stand of Japanese sedge which usually covers most of the ground surface. The emerging rhizomes are very sharp and fragile.

'Sea Isle' is a low growing cool season perennial sedge that stays green into late fall. The grass-like leaves have a leathery texture and are about 1/4 inch wide. Although the plants produce seed, propagation and spreading is almost entirely by vegetative means. The plants are extremely salt tolerant.

Adaptation - Sea Isle is naturally adapted to dry sandy areas. It has grown vigorously on Atlantic coast dunes for 50 years. Its range of adaptation is not fully known, but performs well along all of the mid-Atlantic coast from New York to North Carolina.

Japanese sedge is presently growing on frontal dunes, which are subjected to moving sand. It will trap sand which stimulates new growth. Plants have emerged from stands that were completely covered with sand. Because of its short growth form, it does not trap sand as rapidly as beachgrass. However, the foliage is not damaged by moderate amounts of foot traffic.



Uses - Sea Isle has the potential for stabilizing sand closes to beach houses, private homes and similar areas. American beachgrass, which will not tolerate much foot traffic, is normally used in such areas. The plants of Sea Isle are attractive, relatively short, and will tolerate moderate foot traffic.

Establishment - Establishment can be done by transplanting either bare-root or potted plants. Plant bare-root material in the late fall, after the plants are dormant. Potted plants can be established anytime but the best results are from fall planting dates. The same fertilizer practices used with beachgrass are satisfactory. Space the plants on 18 inch centers slightly deeper than they grew in the nursery. The roots should be completely covered with the planting medium to prevent 'wicking'. The fragile rhizomes or growing points should be handled carefully, with the sand firmed around the plants by hand to lessen the chance of damage to the growing points.

Maintenance - Sea Isle is a low maintenance sand dune species. As the plants can tolerate some foot traffic, protection is less important than with beachgrass. However, fencing or other barriers should be located to provide protection against excessive foot and vehicular traffic.

A broadcast application of fertilizer every other year will maintain ground cover and plant vigor. Approximately 9 pounds of 10-5-5 or the equivalent per 1,000 square feet should be broadcast after growth commences in the spring.

Cluster R. Belcher, CPAg
Plant Materials Specialist
August 1990

PLANTS FOR CONSERVATION IN THE NORTHEAST

USDA - SOIL CONSERVATION SERVICE

CONSERVATION PLANT SHEET-41

BAYBERRY

(Myrica pennsylvanica Loisel.)

Uses: Bayberry is an excellent shrub for improving food and cover conditions for farm wildlife. Because some leaves remain on the plant most of the winter months, it provides year-round shelter for game and small birds. Its berry crop, which is available above the snow most of the winter, provides a staple food for bobwhite, quail and ruffed grouse, and is readily eaten by ring-necked pheasants, wild turkeys, and numerous songbirds, as well. Bayberry is used effectively in hedges, wildlife borders, and on roadbanks. Because of its ability to live on very sandy soils, it's a particularly valuable shrub for use on the mid-Atlantic coastal dunes for a variety of purposes. Its thicket forming character makes it useful for erosion control plantings. The thick enduring mulch of leaves built up on the ground beneath the plant greatly increases its effectiveness for this purpose.

The highly scented bayberry fruit was a source of wax for early settlers in America, and is still used in making bayberry candles. The fruited branches, bare of leaves, make attractive decorative materials for indoor use in fall and winter.

Description: Bayberry is an upright shrub, 5-7 feet in height except in shore and poor soil areas, where it seldom exceeds 4 feet. The aromatic dark-green leaves tend to hang on the twigs through most of the winter, although this characteristic varies greatly with individual plants from one place to another. The leaves are simple, serrated and about 1½" long. Bayberry plants flower inconspicuously in early spring. The clusters of waxy-greyish white fruit ripen in October and remain on the plant into winter. Male and female flower occur on separate plants.

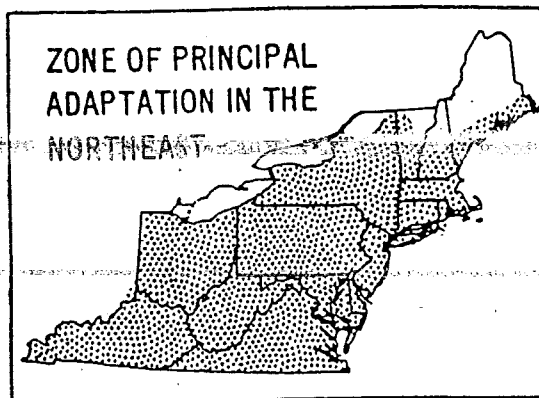
Varieties: There are no cultivated varieties of bayberry.

Adaptation: Bayberry is a native to the coastal zones of the eastern U.S. Although adapted to a variety of soil conditions its best performance is on light textured soils.



It is climatically adapted to the area shown on the map. The plant does not spread into sod or farmed areas. It does spread naturally onto denuded areas along the sandy Atlantic Coast, such as gravel pits. South of Delaware along the Atlantic Coast another species, Myrica cerifera, wax myrtle, replaces bayberry. It is similar in appearance although it has smaller fruit and a slightly more elongated leaf.

Establishment: Use two year old nursery grown, bare root or container grown seedlings. Plant in an area where all competing vegetation has been removed. This can be in holes with at least two square feet of sod removed. Do not plant directly in sod. It is desirable to mulch around the newly planted seedling. This controls weeds and holds moisture. To assure production, staminate and pistillate plants must be put close together. Since the plants sex cannot be identified before planting, several seedlings should be put in one place. For use in hedges, plant either 1 row at two feet spacing, or two rows, four feet apart at 2 feet staggered spacing. On road banks plant at three feet intervals. For wildlife borders use bayberry in outer two rows, next to open fields, spacing three feet apart.



For establishment, cultivation or mulching is desirable for the first two years. Remove competing plants. Fertilization is usually not required.

REFERENCES:

Edminster, Frank C., and May, Richard M. 1951. Shrub plantings for Soil conservation and wildlife cover in the northeast. USDA Circular No. 887, Washington, D.C. pp.21-24.

Wyman, Donald. 1956. Ground cover plants. The Macmillan Co., N.Y. p.137

Northeast Technical Service Center
Broomall, Pennsylvania
April 1976

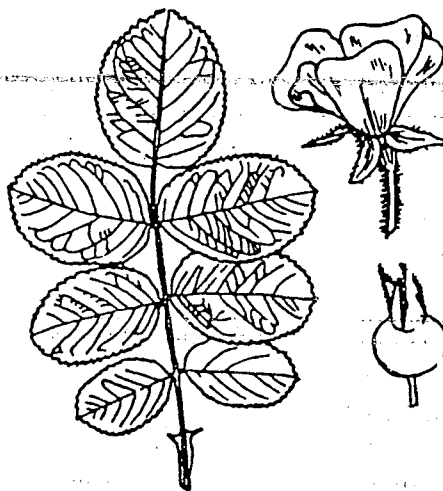
PLANTS FOR CONSERVATION IN THE NORTHEAST

USDA - SOIL CONSERVATION SERVICE

CONSERVATION PLANT SHEET-42

RUGOSA ROSE
(*Rosa rugosa*, Thunb.)

Uses: Rugosa rose is used for beautification, revegetation and erosion control on roadbanks and urban developments and is occasionally used around private homes for beautification purposes. This very hardy shrub is one of the few species of rose that can withstand salt water spray and is therefore extensively used in beach gardens, and for controlling erosion on storm lashed sand dunes. Rugosa rose can also be used for borders and wildlife areas where a fairly high degree of maintenance will be practiced. The ripe fruit or hips have a high vitamin C content and can be used to make a pleasantly flavored tea, as well as jam or jelly.



Leaf, flower, fruit

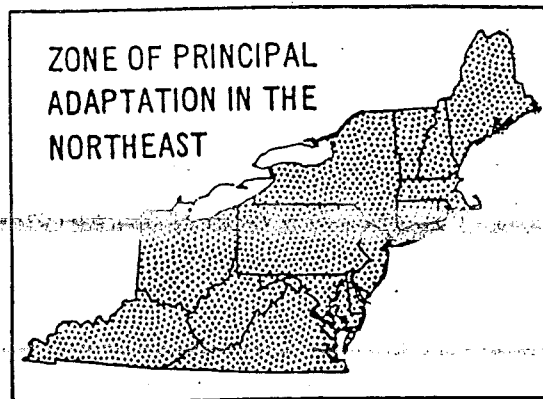
Description: Rugosa rose is a native of northern China. It is a sturdy, erect, much branched, leafy shrub which grows to a height of four to five feet. Its stout stems are covered with numerous thorns. The flowers are single, two to three inches across and though usually red, range from white to purple. The plants flower throughout the summer. The leaves are deciduous and compound with fine leaflets. They are dark green and lustrous, adding to the plants beauty. The fruit, which resembles small red tomatoes, vary in size from $\frac{1}{2}$ " to $1\frac{1}{2}$ " in diameter. Fruiting begins about the second year and is generally heavy. Rugosa rose spreads slowly by way of stout underground stems, producing a colony effect after a few years.

Varieties: A number of horticultural varieties are commonly grown: 'Ruskin', 'Sarah Van Fleet' and 'Grootendorst'. The most commonly available plants from nurseries are not a named variety.

Adaptation: Rugosa rose has a fairly wide range of adaptability. It is handy in the areas shown on the map. Its best growth is in sandy, light textured soils but does well in medium textured soils as well.

Low survival rate can be expected on heavy, poorly drained soils. It is well adapted to coastal areas.

Establishment: For a large roadbank and seashore plantings bare root one year old seedlings or rooted cuttings, spaced about two feet apart, can be used where the site is critical or a high degree of survival is necessary. ~~Container grown one-year-old plants are recommended.~~ This is particularly true on coastal sand dunes. If bare root plants are used on sand dunes, add at least one gallon of peat moss to the planting hole. Competing vegetation should be kept away from the plants until they become well established. Experience has shown that rugosa rose tends to dominate the planting site through reproduction by the underground stems. Once this has happened, little or no maintenance is required.



References:

Edminster, Frank C., and May, Richard M.
1951. Shrub Plantings for Soil Conservation and Wildlife Cover in the Northeast. U.S.D.A. Circular No. 887. Washington, D.C. pp. 41.

Northeast Technical Service Center
Broomall, Pennsylvania
April 1976

PLANTS FOR CONSERVATION IN THE NORTHEAST
USDA - SOIL CONSERVATION SERVICE

CONSERVATION PLANT SHEET - NE-75

BEACH PLUM
(Prunus maritima marsh.)

USES: Beach plum is most useful in the revegetation and landscaping use on sand dunes. Although it is not cultivated for its fruit production, it is edible and used for jelly making. It is also used for landscaping or for screens in non-sand dune environments.

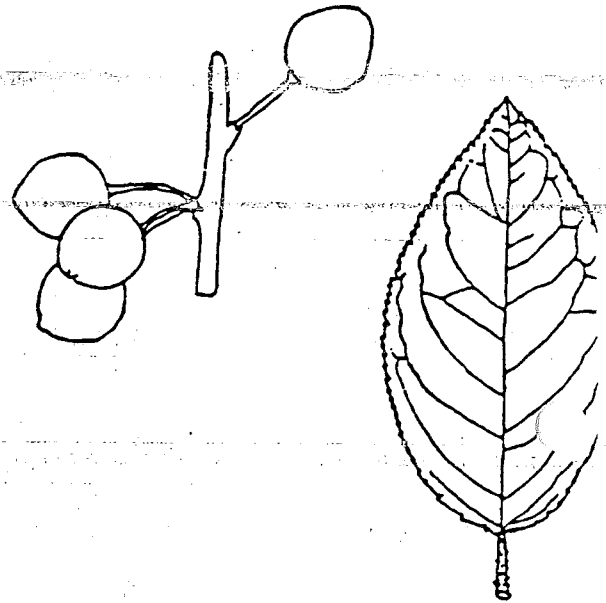
DESCRIPTION: Beach plum is a straggling shrub, 4-7 feet high; away from the beach it becomes tree-like, reaching 16-18 feet. Young branchlets are hairy, becoming smooth with age.

The firm, simple, alternate leaves are dull green, rough and ridged above, paler and finely hairy beneath. Measuring 1 1/2 to 2 1/2 inches long and half as wide, the outline varies from elliptical to egg-shaped. The base is wedge shaped, sometimes rounded; the stalk is stout, hairy and often granular. The leaves are finely serrated with broadly triangular to semi-circular shape with abruptly pointed teeth.

In the spring, flowers expand before the leaves. The stalks and sepals are very hairy, with several stalks originating nearly from one place to form an axillary cluster. Measuring 1/4 to 1/2 inch across, the flowers are snowy white becoming pinkish with age, and are born in clusters of two or three.

The fruit is available from August to October. Round, 1/2 to 3/4 inch across, and edible, the fruit varies in color from purplish-black to sometimes red or yellow. The surface is covered with a heavy, white waxy bloom. The stone, truncate at the base, is egg-shaped and swollen.

The decumbent branches often layer, particularly in sand, and overtime, produces colonies up to 20 feet wide.

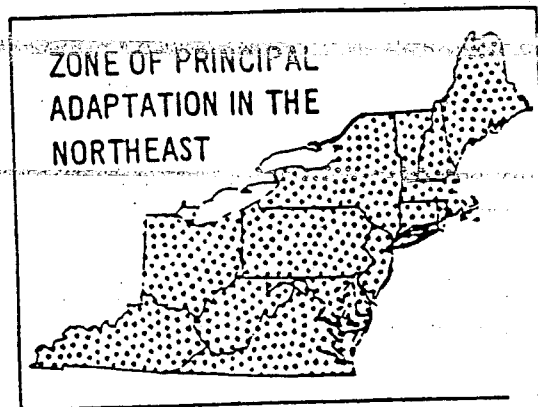


Prunus maritima

ADAPTATION: Although beach plum is native to only coastal areas, it grows well in other than coastal areas. It is well adapted to medium-fertility, slightly acidic, loamy and sandy soils, and has an excellent drought tolerance. It also tolerates moderately well drained soil, but performs poorly in heavy clays.

Its climatic adaptation is shown by the map.

ESTABLISHMENT AND MANAGEMENT: For a large mass planting use bare root, 1-year old seedlings spaced about 2 feet apart. Where the site is critical or a high degree of survival is essential, container grown 1-year old plants are recommended. This is particularly true on coastal sand dunes where the planting is for landscaping purposes. If bare root plants are used on sand dunes, add at least 1 gallon of peat moss to the planting hole. Mix this thoroughly with the sand in the hole before planting. Place the bare root seedling in prepared area to the depth it normally grows in the nursery. Competing vegetation should be kept away from the plants until they become well established. Mulching around the plants with wood chips is highly recommended. After the plants become well established, little or no maintenance is required.



CULTIVARS: There are no cultivars recommended for use at this time. However, the Cape May Plant Materials Center is now making selections of plants with superior fruiting, growth form, flower abundance, etc. They expect to release one or more within the next few years.

DISEASES AND INSECTS: Beach plum can be expected to have mild to moderate infestations of mildew in mid to late summer. Aphids occasionally feed on it in abundance. Standard chemical controls are recommended for both, if they become excessive.

W. Curtis Sharp
NENTC, Chester, PA
June 1984

PLANTS FOR CONSERVATION IN THE NORTHEAST

USDA - SOIL CONSERVATION SERVICE

CONSERVATION PLANT SHEET-59

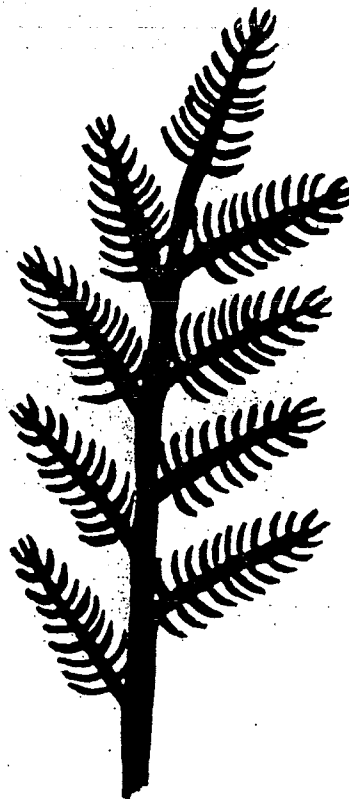
SHORE JUNIPER
(*Juniperus conferta*)

Uses: Shore juniper is especially adapted for planting on sand dunes in the vicinity of the seashore, where other junipers cannot be grown successfully. It has good salt tolerance and is well adapted to sandy areas.

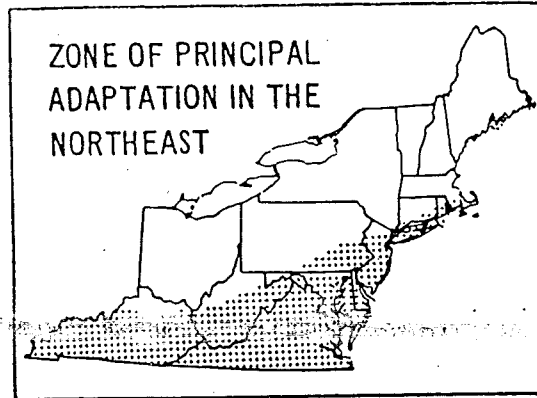
Around buildings, it is used for mass, bank, or border plantings and often as a foreground in front of taller plant groups. Draping over walls and planters, shore juniper creates a pleasing effect.

Description: Shore juniper is a low-growing or trailing shrub, up to one foot tall, and mat forming. Its pale greenish-blue leaves are evergreen; the needles, $\frac{1}{2}$ to 1 inch in length, are softer than red cedar. It maintains good winter color.

Varieties: The only variety recommended for use in the Northeast is 'Emerald Sea'. Most plants on the market are not identified by variety name. Reliability of quality plants is increased by buying 'Emerald Sea'.



Adaptation: Shore juniper grows well on a variety of soils from loams to very sandy soil. It is well adapted to seashore plantings. It performs best in a full sun. For poor sandy soils in exposed situations, shore juniper may be the best juniper to consider. Plantings benefit from partial wind protection and at least some topsoil around their roots.



Establishment: Shore juniper is propagated by cuttings taken in the fall or winter and treated with a root-inducing substance. Even though shore juniper is well adapted to harsh sites such as seashore plantings, care must be taken when it is established. Only container-grown plants should be used. Each planting hole should have about one gallon of peat moss mixed into it before planting. Water well the first year. Fertilize with a small handful of 10-10-10 fertilizer or the equivalent, a month or so after transplanting. Mulching with bark or woodchips will help conserve moisture and restrict weed invasion.

Plant spacing should be about 18-24 inches. If planted correctly, well fertilized, and mulched, it will make a full ground cover in two years.

Northeast Technical Service Center
Broomall, Pennsylvania
January 1978

pine, Japanese black

PLANTS FOR CONSERVATION IN THE NORTHEAST

USDA - SOIL CONSERVATION SERVICE

CONSERVATION PLANT SHEET - 65

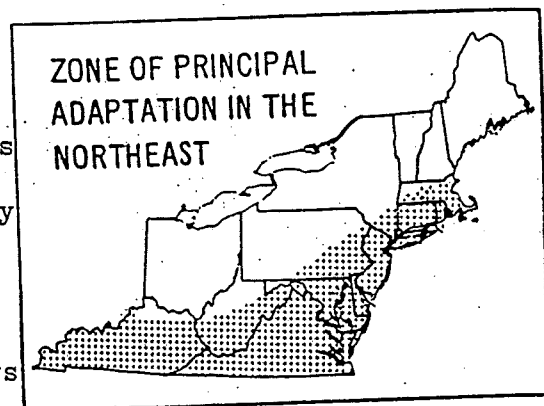
JAPANESE BLACK PINE
(*Pinus thunbergii* Parl.)

Uses: The best pine, and possibly the best evergreen for planting along the seashore in the Northeast is the Japanese black pine. It is a favorite for beach beautification and screening. Japanese black pine is used as an ornamental tree for borders, screens, and windbreaks on sandy areas inland and along the coast. It is useful as a single specimen or in groups. Japanese black pine is better adapted for beach use than several native tree species.

Description: In its most favorable habitat, Japanese black pine can reach a height of 100 feet, but in beach plantings, it is usually less than 20 feet tall. Its spreading, loosely swaying branches are orange-yellow in color, and form an irregular head. The blackish-gray bark is furrowed into irregular plates. Its evergreen foliage consists of bright green bundles of 2 stiff, sharp-pointed needles, 3-5 inches long. The large, grayish-white terminal buds are oblong, with fringed scales at the tips. After 4 or 5 years of age, nut-brown colored, short-stalked cones, 2-3 inches long, are produced. Fruiting and seed production are usually prolific.

Adaptation: This is a very adaptable and hardy pine, and will grow on a wide variety of soils under adverse conditions. Japanese black pine exhibits excellent drought tolerance but poor shade tolerance; it tolerates moderately well-drained soils. This pine is more salt-spray resistant than any of the native pines.

Establishment: Japanese black pine grows in medium fertility, slightly acid, loamy and sandy soils. Establishment is by planting bare-root or container-grown plants 2-3 years old. On sand dunes, the use of container-grown plants is recommended. It may be established using bare-root two-year-old seedlings where soil and moisture conditions are good for



plant establishment. It is desirable to dig a hole 2-3 times larger than the container, backfill with peat moss and mix thoroughly with the sand. Place the roots in the hole and backfill around them. Water immediately. Some protection from strong winds the first and second years may improve survival. Growth is 12-18 inches per year. It is propagated by seed, using conventional nursery practices. European pine shoot moth (*Rhyacionia buolinana*) frequently kills terminal growth of young trees, resulting in misshapen trees. Japanese black pine is also susceptible to red-pine scale (*Matsucoccus resinosae*).

Northeast Technical Service Center
Broomall, Pennsylvania
January 1978