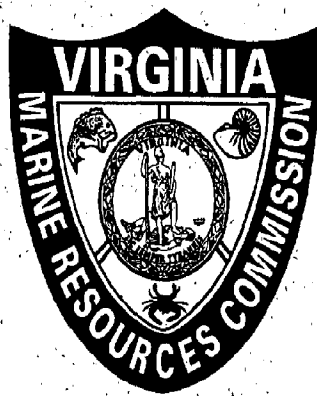


Coastal Primary Sand Dunes/ Beaches Guidelines

Guidelines for the Permitting of Activities Which Encroach into Coastal Primary Sand Dunes/Beaches



Issued by the
Virginia Marine Resources Commission
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Coastal Primary Sand Dunes / Beaches Guidelines

Section I

Introduction

During its 1980 session, the Virginia General Assembly took an important step in reducing the potential for the loss of lives and property as well as the expenditure of public assistance funds in coastal hazard areas by adopting the first State-supervised program in Virginia for controlling development in coastal primary sand dunes. In adopting the legislation, the Commonwealth recognized the importance of coastal primary sand dunes as features which, in their natural state, serve as protective buffers to the effects of flooding and erosion caused by coastal storms; thereby, protecting life and property, and further recognized the value of these features to the replenishment of sand on beaches, their importance as habitat for coastal fauna and their role in the overall scenic and recreational attractiveness of Virginia's coastal environment.

At the same time, the General Assembly expressed its concern over the fact that activities which do not take into account the essentially dynamic nature of coastal dunes and which compromise their special values may lead to increased shoreline erosion, coastal flooding damage to fixed structures and increased expenditure of public funds for disaster assistance and beach replenishment. Therefore, the General Assembly established the policy of preserving and protecting, whenever necessary and practical, coastal primary sand dunes in a manner which accommodates necessary economic development. Building upon the successful structure of the Virginia Wetlands Act, the General Assembly has chosen to offer selected localities having coastal primary sand dunes the opportunity to adopt a specified ordinance to control development in these dunes through local wetlands boards already in existence or created in order to carry out this Act. In order to simplify the task of these boards as well as the Marine Resources Commission, the legislators have wisely chosen to standardize procedures for the Wetlands and Dunes Statutes. Therefore, as with the Wetlands Statute, the Marine Resources Commission will review, on appeal, local permit deci-

sions on dunes, and where the locality has not adopted the specified ordinance, administer the permit system itself.

In order to provide guidance to the public, and to local wetlands boards as well as to insure uniformity of decision making criteria, the General Assembly directed the Marine Resources Commission, with the assistance of the Virginia Institute of Marine Science, to develop and publish guidelines. These guidelines were approved by the Commission August 26, 1980 following four public hearings which were held in conformance with the Administrative Processes Act. They are promulgated to supplement the policy and standards of the Coastal Primary Sand Dune Protection Act with the hope that they will assist project proponents and decision-makers alike in shaping shorefront development in a manner that preserves and protects the values of coastal primary sand dunes articulated in the Act.

In 1989, the General Assembly modified the Coastal Primary Sand Dune Protection Act to bring "beaches" in certain counties, cities and towns fronting on Chesapeake Bay under the same regulatory process as that required of dunes. The intent is to regulate the use or development of sandy beaches and to prevent their alteration even if no coastal primary sand dune can be identified or where contiguity with a dune system or former dune system has been interrupted by a manmade structure such as a road, bulkhead or building.

Section II

Description of Coastal Primary Sand Dunes and Their Values

A. Dune Characterization. The Coastal Primary Sand Dune Protection Act defines a dune as a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent and upon any part of which is growing as of July one, nineteen hundred eighty, or grows thereon subsequent thereto, any one or more of ten plant species associated with dunes. Under this definition, chosen to recognize the dynamic nature of the system, coastal primary sand dunes include both the mound of sand comprising the dune zone as well as the foreshore comprising the beach zone. Together, these two zones form the coastal primary sand dune system which commences at mean high water and proceeds landward to the backside of the dunes where the slope drops below ten percent. (See Figure 1).

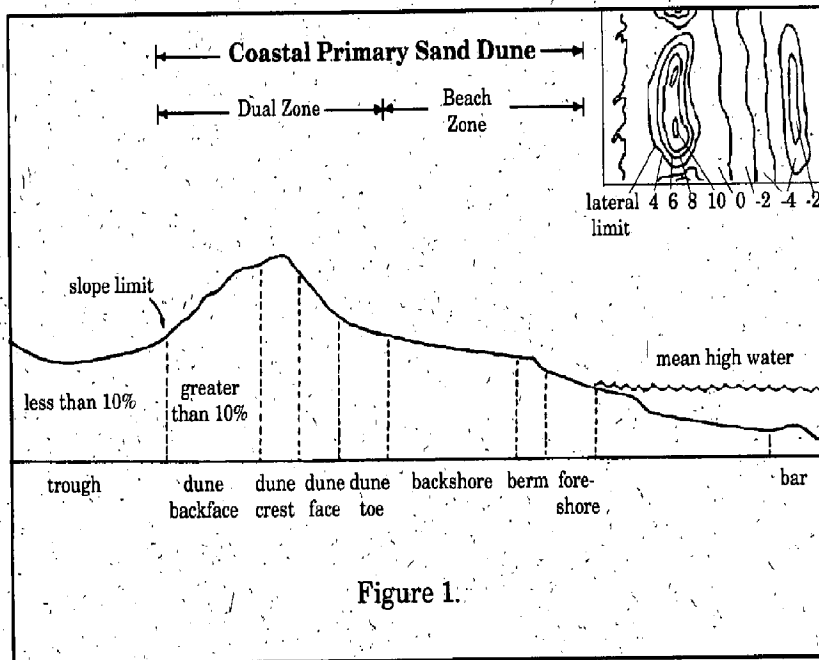


Figure 1.

The primary dune system is a component of the active shore system as well as a transition zone between the intertidal area and secondary rows of dunes or fastland property.

Coastal primary sand dunes represent an accumulation of sand, often supporting rooted vegetation, formed by the interaction of wind and wave action on the sandy material along the shore. Sand moved on the beach during periods of relatively low wave energy is moved landward by the action of on-shore winds. Vegetation along the dune line acts as a baffle, slowing wind speed and causing wind-borne sand to settle and be trapped in the vegetation resulting in the growth or accretion of the dune. The size and location of a primary dune are therefore determined by the amount of sand available and the ability of wind and waves to move the sand as well as the degree to which any existing vegetation can act to trap it. Thus, just as the intensity, direction and duration of winds and waves constantly change through the seasons, so, too, do coastal dunes remain in a state of flux. During high energy conditions, such as the northeast storms which frequent the Eastern Seaboard, primary dunes may be subject to attack by wind driven waves aided by storm surges, and the dune is eroded away, with the sand settling in an off-shore bar. Thus, during normal weather conditions, dunes act as a reservoir of sand which can, through erosion, buffer inland areas from the effects of storm waves and in the process act as natural levees against the effects of coastal flooding.

B. Dune Values. In adopting legislation governing coastal primary sand dunes, the General Assembly recognized that these features, "...in their natural state serve as protective barriers from the effects of coastal flooding and erosion caused by coastal storms...provide an essential source of natural sand replenishment for beaches and an important natural habitat for coastal fauna; and are important to the overall scenic and recreational attractiveness of Virginia's coastal area." Every primary sand dune provides some measure of each of these four recognized benefits, depending upon the size, location and setting of the dune as well as the quality and vigor of the vegetation.

1. Flood and Erosion Protection. Primary sand dunes provide a buffer against coastal flooding and erosion by virtue of both their location and composition. Primary dunes develop at an elevation above the normal reach of tidal waters. During storm surges, however, the dune, as noted above, serves as a levee protecting the land behind from the force of waves and flood waters. The sand itself absorbs much of the wave energy as it is moved about by storm waves. Thus, the energy each wave expends eroding the dune is subsequently unavailable to act on fastland and structures behind the dune. The ability of the dune to provide this protection is obviously dependent on its height and breadth. The continuity of the dune line is also a major factor in the ability of the dune to provide protection. Solitary dunes or dune lines which are subject to being breached or flanked cannot afford the protection provided by a continuous line of uniformly high dunes.

The composition of the dune, in terms of its sediments and vegetation, also affects its ability to provide protection for coastal areas. As noted above, dune vegetation acts as a baffle to trap sand where the root system of the vegetation as well as dead vegetation bind the sediments together. Thus, the type and vigor of vegetation present on dunes help to determine the degree to which the dune will absorb wave energy.

2. Sand Replenishment. Coastal primary sand dunes are basically onshore sand bars, or as noted above, reservoirs of sand. Sand is constantly being moved by wind and waves between offshore sand bars, beaches, dunes and during storm events, even inland. Sand eroded from dunes during high energy conditions often finds its final resting place on beaches or offshore bars. These offshore bars then act as sources of sand for the beach during periods of lower energy when wave action tends to deposit material in the beach zone. Thus after each storm, the sand origi-

nally eroded from the dune returns to the beach zone during the rebuilding process.

- 3. Habitat.** Coastal primary sand dunes, in their natural state, serve as a habitat for a wide variety of plants. Dune vegetation is characterized by its ability to withstand extremes in the natural environment and by its inability to withstand man-made disturbances. The dune is a very rigorous environment for a plant. Each plant must be able to survive with very limited amounts of fresh water, tolerate constant salt spray and endure extreme variations in temperature. That such vegetation hardy enough to survive all of these stresses should be so intolerant to any additional disturbance such as trampling by people and/or vehicles is explained by the fact that these plants are living close to their limit of tolerance and even minor disturbances to root systems can cause such plants to die.

Vigorous vegetation both on the dune crest and the leeward side of the dune can provide attractive habitats for some shore-dwelling animals. The most visible inhabitants of dunes other than plants are various shore birds which utilize the area for roosts and nesting. Dunes also support a variety of insects and occasionally some small mammals and reptiles.

- 4. Aesthetics.** Perhaps the most widely accepted but least quantifiable value of the coastal primary sand dune is the contribution it makes to the attractiveness of the coastal area. Aesthetic evaluations are a personal prerogative and therefore difficult to utilize as the basis for management decisions. Nevertheless, the General Assembly has taken note of the contribution dunes make to the enhancement of the shore experience. It is therefore, appropriate for development adjacent to dune areas to be considerate of that contribution.

Section III

Consequences of Altering Coastal Primary Sand Dunes

Simply stated, the consequences of altering coastal primary sand dunes are a loss of or diminution of the values discussed above. Unfortunately, there is very little information enabling quantitative assessments of the loss or degradation of these values from any proposed development in the dunes area. In the absence of such information decisions regarding such development must be based on experience and reasoned judgements with each decision being made on a case-by-case basis. It is, however, possible to rank the consequences of alteration in terms of the scale of alteration:

- A. Leveling dunes.** The leveling of a dune is certainly the most extreme alteration of that feature which can be undertaken. In such instances, the buffering capability provided by the natural levee of the dune and its source of sand are obliterated. This exposes adjacent and neighboring properties to substantially greater risk of flooding and causes a reduction in available sand for the adjacent beach zone as well as destabilization of the flanks of adjacent dunes.

- B. Displacement of the dune.** The natural position of a dune is the result of a balance of natural forces at any given time. Generally dunes are found in areas where they are attacked by waves only during storm events and then only after the backshore has been eroded by wave action. Displacement of a dune to a more seaward location exposes it to wave energy more often thereby accelerating erosion of the dune. Structures built on or behind the dune may then be exposed to wave action or inundated with sand as the dune migrates to a position in which it is again in equilibrium with wind and wave forces. Equally important, however, is the breach that such relocation causes in the dune line and the hazard such a breach poses for both the property located behind the relocated dune and adjacent properties as well. Displacement of a dune to a more landward location for whatever reasons

would create the same type of breaching problem as well as affording no buffering capability for any property located seaward of it. Such displacement also causes a loss of sand for natural beach replenishment.

C. Building on the beach backshore. Building on the beach backshore, seaward of the dune can lead to adverse consequences in three ways:

1. During construction, the dune may be reduced in elevation for access to the building site. Should a storm occur during this period, the dune may be breached with the impacts discussed above.
2. After construction, the structure itself may interfere with wind patterns over the dune crest causing deflation or wind scouring.
3. Pedestrian traffic over the dune can cause the loss of vegetation anchoring the dune unless a dune overwalk, following the natural contour of the dune, is provided.

D. Pedestrian and vehicular traffic across the dune. The principal consequence of cross dune traffic is that, after the vegetation has been killed, wind transport of sand can very quickly excavate a crossdune blowout resulting in a localized weakness.

E. Building on the crest or foreface of the dune. Building on the foreface of the dune is very likely to result in alteration of the dune contours during construction, sand removal from channelization of wind around the structure and an increase of pedestrian traffic over the dune. During construction, wind blown sand may become a nuisance to other nearby properties.

F. Building on the dune backface. Since the dune backface is the natural zone of deposition in the dune system, construction in this zone is less deleterious to the functions of the dunes so long as significant amounts of material are not excavated. The presence of the structure will modify the

wind flow but to the extent the structure is in the lee of the dune this may be minimized.

The preceding comments are directed principally toward destructive alterations of coastal primary sand dunes. It is possible to enhance dunes. Basically, these alterations are efforts to create more extensive, better stabilized dunes. Encouraging the natural development of a dune is not an exact science, but there is information available about the efficacy of a variety of methods. Just as with the construction of any other structure, seeking advice from a professional is advisable. The benefits accrue in terms of lessening costs associated with coastal storms.

The consequences of altering existing natural dunes are, in some respects, dependent on where the dune is located. This is particularly true of the dune's role as a protection and beach replenishment device. Within Virginia, coastal dunes are found in three broad geographic areas: the oceanside of the Eastern Shore, the Atlantic beaches south of the Bay entrance, and the shoreline of the Bay proper.

Eastern Shore - Oceanside

The oceanside of the Eastern Shore contains by far the largest complement of dunes in Virginia. Accomack and Northampton Counties have a total of about 85.3 miles of coastal dunes associated almost exclusively with the barrier islands. Barrier islands are among the most dynamic of coastal features.

As the Barrier Islands absorb the storm induced wave energy, they are frequently breached or overtopped and the sand is spread over the lee-side marshes. With the onset of normal weather, the dunes rebuild. As the Barrier Islands erode, the entire ensemble, beach-dune-washover, also retreats. Thus, the complete beach morphology is preserved. For the most part, the dunes are of low elevation and susceptible to even moderate storm activity. Given the many inlets in the system, the dunes do not have a primary function of flood control. They do, however, help control the washover processes. Given the low-lying elevations, any development on the Barrier Islands may result in inordinately high private or public costs. (See Section VII).

Virginia Beach

The second general area includes the Atlantic coast beaches south of the entrance to Chesapeake Bay. These beaches lie almost entirely within the City of Virginia Beach. The city contains about 38.5 miles of dunes. In contrast to the Barrier Island dunes, the Virginia Beach sand dunes include some under the most intense developmental pressure anywhere in Virginia.

Because of the tremendous development along the coastline, it is in this area that primary sand dunes have their greatest potential for protecting life and property. In order for the dunes to offer the maximum flood and erosion protection, they must be maintained as a relatively uniform, uninterrupted dune line. Each time a dune elevation is lowered or a portion of the dune line is completely removed, the protective capabilities of the dune are compromised not only at that site, but for adjacent areas as well.

The challenge is to accommodate the property owner's desire for access to the beach while retaining the integrity of the dune system. Repeated experience has established that construction on the dune is undesirable. Even open-pile structures lead to changes in wind and sand deposition patterns in the area. Frequently, this results in a local deflation of the dune. In the Virginia Beach area, loss of the primary dune line integrity could have its most significant consequences in terms of loss of life and property.

A second consequence of modifying dunes in the Virginia Beach area is the loss of the natural sand replenishment dunes provide to beaches. In an area whose principal resources include an attractive beach, the value of a viable dune system can easily be appreciated. The costly and continuous efforts of artificial beach nourishment are a partial result of sand dunes having been previously destroyed.

Chesapeake Bay Shores

There are scattered dune areas throughout much of the Virginia Bay shoreline. They can be found in: Norfolk, Hampton, Virginia

Beach, Mathews County, Lancaster County, Northumberland County, and Northampton and Accomack Counties on the Eastern Shore. The Chesapeake Bay shoreline in Virginia Beach, Norfolk's Ocean View section and some of Hampton's shoreline possess the same development pressures as the Atlantic shoreline of Virginia Beach. The consequences of dune alteration are therefore identical in those areas. The other localities differ in the type and location of dunes generally found there. Typically, the dunes are part of a less extensive beach system and frequently occur in areas with much less developmental pressure than the more urban settings. In these areas, loss of a dune's protective capabilities can have consequences for both life and property similar to that in Virginia Beach, and can impact other natural resources as in the Barrier Islands.

Section IV

Recommended Guidelines When Altering Coastal Primary Sand Dunes

In adopting the Coastal Primary Sand Dune Act, the General Assembly established the following standards for construction on sand dunes:

"No permanent alteration or construction upon any coastal primary sand dune shall take place which would:

- A. impair the natural functions of the dune as described by the Act
- B. physically alter the contour of the dune
- C. destroy vegetation growing on the dune

Activities contrary to these standards will be permitted only if the wetlands board or Commission finds that there will be no significant adverse ecological impact from the proposal, or that granting a permit for the proposal is clearly necessary and consistent with the public interest."

It is apparent from a reading of the policy and standards of the Act that the General Assembly did not intend a prohibition on all activity in the dunes area. Instead, the legislators sought a careful balancing of the public and private benefits and detriments of each proposal. Some proposed development in the dunes area can be accommodated by utilizing proper location and design methods. Each proposal will likely be unique with respect to the necessity for the project and its probable effects on the beneficial value of dunes; therefore, criteria must be applied on a case-by-case basis. The objective of these criteria is to provide guidance which will direct development into an accommodation with the ecology of the coastal primary sand dune.

Guidelines

- A. Provided the beneficial attributes of coastal primary sand dunes as discussed above are not significantly disturbed, alteration of dunes may be justified in order to:
 - 1. Construct water access dependent facilities which must pass over the coastal primary sand dune for such access.

Such construction as might be allowed in item 1 above must be constructed in a manner which will minimize alteration of the dune slope during and after construction. Encroachment on the backside of a primary dune should be limited to the minimum necessary. In addition to other requirements that may apply for construction, only structures with open pile foundations should be constructed.

Rationale: The requirement that any construction on the dune backside must utilize an open pile foundation design is based upon consideration of the dynamics of dune movement, the compatibility of housing within the dune system, and the need to protect life and property within the fastland fringing the beach zone.

During times of severe storms, the entire primary dune system may yield to excavation by elevated water levels accompanied by high waves. Structures on slab foundations

or designs other than open piling may be expected to exhibit structural failure. Such slab foundations also generally require the excavation of the dune backface for placement and do not allow for the natural migration of the dune. During periods of normal weather and sea state, and during poststorm periods of natural dune rebuilding, the backside of the dune is a zone of sand deposition. Structures elevated on open piling foundations will be less susceptible to burial by encroachment and deposition.

Bridging the dunes to gain access for certain water dependent activities may be permitted when those activities are deemed necessary. In such cases, elevated open piling foundations will minimize disturbance of natural dune building processes.

It should be noted that a requirement for open pile foundations is consistent with existing requirements of the National Flood Insurance Act.

B. Alteration of coastal primary sand dunes is ordinarily not justified:

1. For purposes of activities which can be accommodated without encroachment into the dune area.

Rationale: It is clearly the intent of the legislature to protect the primary sand dunes from unnecessary despoliation. Therefore, activities which have no inherent need to be immediately adjacent to the shore or for which there is sufficient room landward of the coastal primary sand dune may not require modification of the dune.

2. Where the construction is proposed on the dune crest or seaward of the dune crest.

Rationale: The beach backshore is the primary sand supply for the primary dune and the foreface and crest of the deposit are the most active transport zones in the dune system. Construction on the backshore, frontal face and

crest is thus likely to disrupt the transport system. In particular, construction on the crest and/or frontal face will cause local deflation of the sand elevations causing local weaknesses in the integrity of the dune system.

3. Where the dune location must be modified in order to accommodate the proposed construction activity.

Rationale: The natural location of the primary dune is the result of all beach processes. The natural dune position is just beyond the reach of normal beach modulations. Relocation of the dune by artificial means to a more seaward or landward location is likely to result in a loss of the sand stored in the dune. This will reduce the integrity of the dune line and compromise the ability of the dune to protect against storm flooding and erosion.

4. Where alteration of the dune would likely result in damage to neighboring property owners.

Rationale: Construction within a primary coastal dune may lead to weaknesses in the protective attributes of the system. Under severe storm attack, the weakness may lead to failure causing that site to become the focus of wave overwash activity. The breach in the system can reasonably be expected to widen to neighboring properties and cause otherwise avoidable damage.

In addition, during the periods of dune regrowth, the new sand deposits may encroach upon the developed zone of the neighboring lots.

Section V

Considerations for Construction and Mitigation Activities in the Area of Coastal Primary Sand Dunes

Due to the constantly changing nature of dunes and the possible wind, wave and scour action they may be subjected to, the design, location selection, and construction of structures in dune areas should be done by qualified professionals. As a recommended minimum, all elements of beach front structures, including the foundation and non-structural fastenings and components, should be designed to withstand the wind and wave forces of a 100 year storm. The first habitable floor of a building should be elevated on a piling foundation to a height above the crest of the 100 year design wave. Any construction in the space below the first floor should incorporate breakaway walls intended to collapse under stress without jeopardizing the structural support of the building. The piling foundation should safely transmit to the ground the full vertical and horizontal loads imposed on the superstructure by 100 year design storms. It should present as slender a profile as possible while being durable enough to resist storm loads, which may include the impact of floating debris. Piling should be spaced such that no one row of piles is subject to significant wave forces at any one time and the spacing should provide for unhindered movement of water and debris between piles. Piling should be of a circumference which minimizes induced concentration of wave force and consequent erosion and scour at the base, yet they should penetrate deeply enough (5 to 20 feet below mean sea level) and have sufficient strength to safely support the superstructure when the surrounding material is eroded down to the lowest predictable level. The foundation should be of a material which will resist deterioration in a corrosive marine environment. Structures with large areas in contact with the ground, such as swimming pools, decks, and slab foundations, should be discouraged. The ground below the first habitable floor should not be paved or altered, however, shell or marl are suitable when used to stabilize driveways. Telephone and electric lines should be located under-

ground in water proof conduits laid in protected areas not subject to erosion. Water and sewage facilities should also be located in protected areas not subject to erosion.

Vegetation is the most effective protection for the land against the sea in establishing and maintaining a coastal position, and for that reason, during permitted construction, all precautions should be taken to retain as much natural vegetation as possible on the dunes and upper beaches. When walkways and platforms are located over a dune system, they should be elevated sufficiently to provide for the continued healthy growth of the vegetation below (3 feet minimum). Restoration of destroyed dunes can be accomplished by creating fills using slat or brush fencing or by moving upper beach sand by machine. Both procedures should be followed by long-term plantings of vegetation to replace that which was destroyed and to stabilize the dune. For the restoration of a long foredune, the fence should be aligned parallel to primary dunes in the vicinity and somewhat parallel to the drift line berm of the upper beach. The fence should be far enough back to allow the wind to move an adequate supply of sand against it, and placed so as not to bury existing vegetation. To build fills and help reform dune topography in smaller areas, fences should be built across the direction of prevailing winds. The newly created fill material should then be stabilized with plantings.

Section VI

Beaches

A. Definition. In the 1989 change to the Coastal Sand Dune Protection Act, the term beach is defined and added in place of reach. All references to reaches were dropped. Beach is defined as:

1. The shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that extends from the low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff or marsh, or
2. where no such change can be identified, to the line of woody vegetation (usually the effective limit of storm waves), or the nearest impermeable man-made structure, such as a bulkhead, revetment or paved road.

Beaches have therefore been added to the legislative declaration of policy as an area to preserve and protect in the same fashion as Coastal Primary Sand Dunes.

B. Applicability. Under the foregoing definition, all coastal and bay beaches in Virginia would be included since they all are composed of unconsolidated sandy soil and experience the "... mutual interaction of erosion, sediment transport and deposition..."

Identifying the landward limit of a beach should present minimal problems. In most cases a dune, bulkhead or other solid man-made structure will mark the upper limit of the beach. Where none of these are found, the landward limit will be marked by woody vegetation such as wild black cherry (*Prunus serotina*) Ehrhart, live oak (*Quercus virginiana*) Miller, red cedar (*Juniperus virginiana*) L., wax myrtle (*Myrica cerifera*) L., loblolly pine (*Pinus taeda*) L., bayberry (*Myrica pensylvanicum*)

Loisel, poison ivy (*Rhus radicans*) L., and highbush blueberry (*Vaccinium corymbosum*) L.

In evaluating an application to use or develop property which meets the "beach" definition, Sections IV and V of these Guidelines contain information which can be utilized in arriving at the appropriate decision.

C. Decision Process. The wetlands and dunes protection programs have been successful largely because of the conscientious adherence of local boards and VMRC to established policy standards and guidelines. Similar careful adherence to a rule of reasonableness in administering "beaches" will assure the development of a decision record which can successfully sustain an appeal should one result.

Section VII

Virginia Marine Resources Commission Barrier Island Policy

(Rev. October 25, 1990)

A. Introduction

- 1. Definitions.** For the purpose of this regulation, the definitions contained within Section 28.2-1400 of the code of Virginia apply. In addition, the following words and terms when used in these regulations, shall have the following meaning unless the context clearly indicates otherwise:

Barrier Islands - means elongated-narrow landforms consisting largely of unconsolidated and shifting sand, fronted on one side by the ocean and on the other by a bay or marshland which separates them from the mainland.

Dune Crest - means the highest elevation of the coastal primary sand dune on the lot as determined in consultation with the Virginia Institute of Marine Science.

Local 100-year long-term recession rate - means calculating the average shoreline recession over fixed one-mile intervals averaged over the period between surveys of 100 years or more.

- 2. Background.** Barrier islands are transient landforms. Their dynamic and unstable nature poses significant risk to life and property located there. Scientific evidence placed before the Marine Resources Commission supports a finding that some of Virginia's barrier islands, including Cedar Island, are more fragile, more unstable, and pose even greater risk to life and property than many other coastal barriers due to their sand-deficient character. In

addition, barrier islands are themselves significant natural resources that contain a number of specific features (coastal primary sand dunes, wetlands, and vast stretches of state-owned sandy beaches) including natural heritage resources and threatened or endangered species that are recognized by the General Assembly for their natural value and are protected by law. This policy applies to the barrier island systems on the seaside of the Virginia portion of the southern Delmarva peninsula, and is not intended to cover military activities essential to national security, or the construction, operation, maintenance or rehabilitation of Coast Guard facilities or access thereto. This exclusion does not obviate compliance with other applicable provisions of the Coastal Primary Sand Dune Protection Act.

Survival of these barrier islands often depends on the ability of sand to wash across the island naturally in concert with the local wind and wave climate. The sand is then protected from loss offshore and provides a means of perpetuating the island, albeit in a more landward location. Activities which adversely affect this interaction can have an extremely detrimental impact on the island as well as the structure, form and function of its dune system. The artificial accumulation of sand along the oceanside of an island can make it more susceptible to loss offshore during a storm. Once such a loss occurs, the sand then becomes unavailable for washover and for the continued landward migration of the island. Houses, sand fences and similar structures can also alter wind patterns; this alteration impedes the wind transport of sand across the island. Accumulations adjacent to these impediments can be lost offshore as the shoreline continues to recede, leading to an increased rate of recession and a narrowing of the island. In addition, many of the Commonwealth's rarest species depend on the continuation of natural processes that currently exist on barrier islands. Consequently, they are threatened by any interference with those processes. The

implementation of the policies and guidelines set forth in this document will support a fuller achievement of the purposes of the Virginia Natural Area Preserves Act (Section 101.1-209 et. seq. of the Code of Virginia), the Virginia Endangered Species Act (Section 29.1-563 et. seq. of the Code of Virginia) and the Virginia Endangered Plant and Insect Species Act (Section 3.1-1020 et. seq. of the Code of Virginia).

Two of the main natural features of barrier islands are natural dunes and washover areas, both of which are included in the statutory definition of a coastal primary sand dune as a "mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon any part of which is growing" certain designated plants as listed in Section 28.2-1400 of the Code of Virginia. Given the particular combination of risks to both natural values and life and property posed by development on barrier islands, the Commission finds it necessary and appropriate to establish a policy and supplemental guidelines to assist landowners and decision makers alike in shaping barrier island uses in a manner that preserves and protects the values of Coastal Primary Sand Dunes as set forth by the General Assembly.

B. Permits Required

1. Applications for New Development

- a. No construction or any other activity which has the potential for encroaching on or otherwise damaging coastal primary sand dunes or state-owned beaches shall occur without review and approval by the Marine Resources Commission (Commission) or a local wetland board, or both. Consequently, a permit appli-

cation must be submitted for any such construction or other activity. Each application shall include:

(1) A certified survey of the site which is representative of current conditions showing:

(i) One-foot contours relative to local mean high water, commencing at that line and proceeding through the site to the first wetlands vegetation,

(ii) Specific location for all proposed structures including septic system and drainfields,

(iii) Size, configuration and design of access points,

(iv) Location of any other activity which may affect coastal primary sand dunes or State-owned shore, and

(v) A dune crest, determined in consultation with the Virginia Institute of Marine Science, which identifies the highest elevation of the coastal primary sand dune on the lot.

(2) A copy of both a valid building permit and septic or other wastewater handling or disposal system permit.

b. All lot pins and proposed construction locations, drainfield sites and access points shall be staked and tied to suitable reference points.

c. In its review of the application, the Commission (or a local wetlands board) will determine the correctness of the dune crest and will establish a minimum setback necessary to prevent encroachment in or dam-

age to the dune or interference with the natural processes of dune growth.

- 2. Loss of Structures and Applications for Redevelopment.** When a structure is destroyed or damaged by natural events such that the structure is condemned by health officials or local building officials, reconstruction in that location may not be authorized. Submission of a new application and evaluation as if no structure were present will be required. In the event a structure is damaged beyond repair and is no longer habitable, or damaged and not restored to a usable state within one year, the owner of record shall be responsible for the complete removal of all vestiges of the structure and materials resulting therefrom, including the septic tank, distribution box and drainfields in their entirety, or as directed by the State or local Department of Health. The owner of the lot shall restore the area to as natural a state as possible.

C. Supplemental Guidelines

1. Structures

- a. No permanent structure, other than those already specifically allowed by law or provided for in Section C.2.b below for purposes of permanent access, will be permitted seaward of the crest of the coastal primary sand dune. No permanent alteration of the coastal primary sand dune will be permitted, except in accordance with the standards set forth in the Coastal Primary Sand Dunes Act.
- b. Since it is well established that the coastal primary sand dunes and the islands themselves recede continually westward at a reasonably predictable rate, and that excessive vehicular and pedestrian use will increase the fragility of coastal primary sand dunes or impact upon significant natural resources, development must be limited to no more than low density

single family use on each platted parcel. Uses other than single family dwellings can clearly be characterized as “unnecessary and inconsistent with the public interest considering all material factors.”

- c. The density of structures and the percent of the shoreline frontage occupied by those structures are critical to minimizing the impact they have on sand migration across the island. Data concerning the development on barrier islands indicates that adverse impacts may be minimized when no more than 25% of the islands' linear shoreline is occupied by structures. This factor shall be considered in evaluating the individual and cumulative impacts of each permit application. In considering permit applications, the following guidelines shall be followed:
- (1) There shall be adequate area within the lot that is neither sand dune (including beach and overwash areas) nor wetlands to accommodate the proposed dwelling and any appurtenant structures, including attendant sanitary facilities.
 - (2) Minimum frontage for a lot on the ocean capable of supporting a single-family vacation cottage shall be 100 feet.
 - (3) Minimum side yard requirements shall be 30 feet.
 - (4) The setback from the dune crest for all structures including septic systems shall be 20 times the local 100 year long-term annual shoreline recession rate. The dune crest shall be defined as the location of the highest elevation of the coastal primary sand dune, beach or washover located on the lot.

- (5) The maximum allowable square footage for the first floor of a single family dwelling on a 100 foot lot shall be 900 square feet and for a 200 foot lot, 1800 square feet, including porches, decks, and other appurtenances. Houses with first floors larger than these will not be considered necessary economic development.
 - (6) The maximum height of a dwelling shall be 25 feet measured from the base of the first floor to the peak of the roof.
 - (7) All dwellings shall be constructed on elevated open pilings a minimum of ten feet above grade. No enclosures will be permitted below the first floor.
 - (8) An appropriate identification number shall be affixed to all septic tanks made of nonbiodegradable plastic materials to aid in their identification.
 - (9) Exceptions to these requirements may be authorized in individual cases. No such exception shall be authorized unless the Commission finds:
 - (i) That the strict application of the requirement would produce undue hardship, and
 - (ii) That the authorization of such exception will not result in significant detriment to barrier islands, their natural resources, or adjacent property.
- d. Evidence of cumulative environmental impacts of existing and proposed structures, as well as the secondary impacts resulting from their use, shall be

considered in passing upon any application for a permit.

2. Access

- a. No cuts through the dune will be permitted. Temporary vehicular access for purposes of construction will be permitted only by open-pile or "corduroy" ramps. Permits for temporary vehicular access will be limited as necessary to protect significant natural resources. At expiration of the authorized term all structures, except as noted in subdivision b below, must be removed and the dune restored to its pre-construction contours and revegetated. All plans for temporary construction access must be specified in the application for any construction permit.
- b. Permanent vehicular access across the dune will be permitted only by "corduroy" or open-pile vehicular ramps which allow the natural process of dune growth and migration to occur. An open-pile or "corduroy" ramp developed for purposes of construction access may remain in place for permanent access if it meets the above criteria and is specifically approved. All plans for permanent access must be specified in the application for any construction permit.
- c. Each dwelling will be limited to a maximum of one vehicle for access to and from the island's landings. All vehicles shall be subject to the following conditions:
 - (1) Each vehicle shall have a no-cost annually renewable permit to travel on the beach. The owner shall attest at the time of renewal the vehicle's status and condition.

- (2) The permit number for each vehicle shall be displayed in two foot high letters on the roof and sides of the vehicle.
- (3) When a vehicle for a particular dwelling is no longer functional, it must be removed from the island. Evidence of its removal must be provided prior to the issuance of a permit for a new vehicle.
- (4) All driving will be limited to the intertidal zone and between there and approved dune cross-overs. Vehicular use of the beach at periods greater than four hours either side of low water shall be considered a violation of this section.
- (5) All bird nesting areas posted by the Virginia Department of Game and Inland Fisheries, U.S. Fish and Wildlife Service, or Department of Conservation and Recreation shall be off limits to all vehicles.
- (6) No all terrain vehicles (ATVs) will be permitted on barrier islands.
- (7) Evidence of vehicular use in areas other than those authorized shall be cause for revocation of the permit and a requirement that the vehicle be removed from the island.

Any person having his or her permit revoked shall be precluded from reapplication for a one-year period.

3. Roads. No roads or trails will be permitted on or across any coastal primary sand dune or in any wetland.

4. Sand Movement. No artificial relocation of sand will be permitted.

- 5. Shore Hardening.** Structures normally associated with or used for shoreline protection or erosion control, including but not limited to bulkheads, riprap, revetments, gabion baskets, sand bags, groins and jetties, or any other hardening of the shoreline will not be permitted under any circumstances.
- 6. Point Source Discharges.** No point source discharge pipe, structures or other devices will be permitted.
- 7. Bond Requirement.** A reasonable bond or letter of credit will be required prior to granting any permit to assure restoration of any temporary alteration of the coastal primary sand dune including, but not limited to, regrading to the original elevation, resprigging with appropriate vegetation and removal of any and all construction debris.
- 8. Sand Fence.** The use of sand fencing or other artificial barriers is discouraged because of its interference with the natural sand transport and migration on barrier islands.
- 9. Solid Waste.** All solid waste generated on barrier islands must be removed and disposed of appropriately on the mainland.
- 10. Pets.** In order to prevent unrestricted roaming which may result in the disturbance of, or depredation to wildlife, domestic pets must (a) be restrained or under the control of their owner at all times; (b) shall not be allowed off of the owner's property except under leash; and (c) shall not be abandoned on a barrier island.
- 11. Endangered Species.** Encroachment upon the nesting sites of threatened and endangered species identified by the Virginia Department of Game and Inland Fisheries or Department of Conservation and Recreation is prohibited. Evidence of impact or potential impact on threatened and endangered species shall be considered in passing upon any application for a permit.

12. Landscaping. The planting of exotic species or introduction of non-native fauna are impermissible. Broadcast spraying of pesticides or herbicides are impermissible except when necessary to protect the public health or safety as decreed by the appropriate public health official.

D. Public Hearings

The public hearing required by § 6 of the model ordinance may be held in Newport News, Virginia. Such hearing will not be scheduled until the Commission staff has determined that it is in receipt of a complete application.

E. Comments/Advisory Notes

1. Risks. While future events and their impacts on human activity cannot be forecast with any degree of precision, experience in other coastal areas suggest a proclivity to seek public assistance when catastrophic events occur or when services are needed beyond the ability of private resources to provide. The Commission believes that any development on barrier islands should be undertaken only with the full acceptance by the owners of the risks involved.

a. No Public Protection of Private Property.

Authorization of structures should in no way serve as justification for the future expenditure of public resources to protect such structures.

b. Services. Any services which may be provided by local government to promote public health, safety and general welfare must be installed, maintained and operated in a manner consistent with the policy, standards and guidelines of both the Wetlands and Dunes Protection Acts.

c. Relocation of Structures. Once local mean high water approaches a structure to within 10 times the average recession rate, a plan for its movement/relo-

cation must be submitted for review. No movement or relocation will be permitted without the written permission of the Commission.

- 2. Interference With Natural Processes.** The serious sand deficiency which currently exists on Virginia's barrier islands is exacerbated by any artificial manipulation, including sand fences, which might render the supply more vulnerable to export offshore or interfere with the natural movement onshore in washover areas during storm events. Private property owners have even more at stake than the public-at-large in assuring that natural processes are not interfered with to any discernible degree.
- 3. Value of Dune Preservation.** Special emphasis is placed on the legislative declaration of public policy that coastal primary sand dunes "in their natural state serve as protective barriers from the effects of flooding and erosion caused by coastal storms, thereby protecting life and property."

 - a. Accordingly, every reasonable precaution to avoid permanent alteration is expected to be exercised by all users in gaining temporary access to private property for construction or for continued access to authorized structures.
 - b. All construction, including septic systems, shall be set back from mean high water a distance at the site to assure reasonable survival duration. Setbacks from the dune crest were specified in Section C.1.c(4) of this policy.
- 4. Water Quality.** While the Commission believes that properly functioning septic systems in the limited density anticipated will have no measurable effect, failing systems or greater numbers than now forecast could impact important public shellfish growing areas. Therefore, staff will request at least biannually from the State Health

Department an assessment of the cumulative impact and/or catastrophic failure of septic systems they have authorized.

F. Policy with Regard to Private Restrictive Agreements

In addition to the above guidelines and advisory comments and as an additional means to reasonably "preserve and protect coastal primary sand dunes and beaches and to prevent their despoliation and destruction," and to help achieve the other purposes set forth by the General Assembly in the Coastal Primary Sand Dune Protection Act, the Commission endorses and looks favorably upon restrictive private covenants which "accommodate necessary economic development in a manner consistent with the protection of (coastal primary sand dunes)." For example, the Commission encourages restrictive private covenants which:

1. Protect the "natural habitat for coastal fauna," "wildlife habitat," and "vegetation which stabilizes (Coastal Primary Sand Dunes)."
2. Prohibit special exemptions or attempts to obtain such exemptions from the application of controlling statutes.
3. Enhance the "scenic and recreational attractiveness of Virginia's coastal area," protect the "important natural habitat for coastal fauna," and protect the "vegetation which stabilizes such features."
4. Require cooperation with the state and federal conservation agencies to protect the ecologically significant natural resources including granting permission to post critical bird nesting sites.

Section VIII

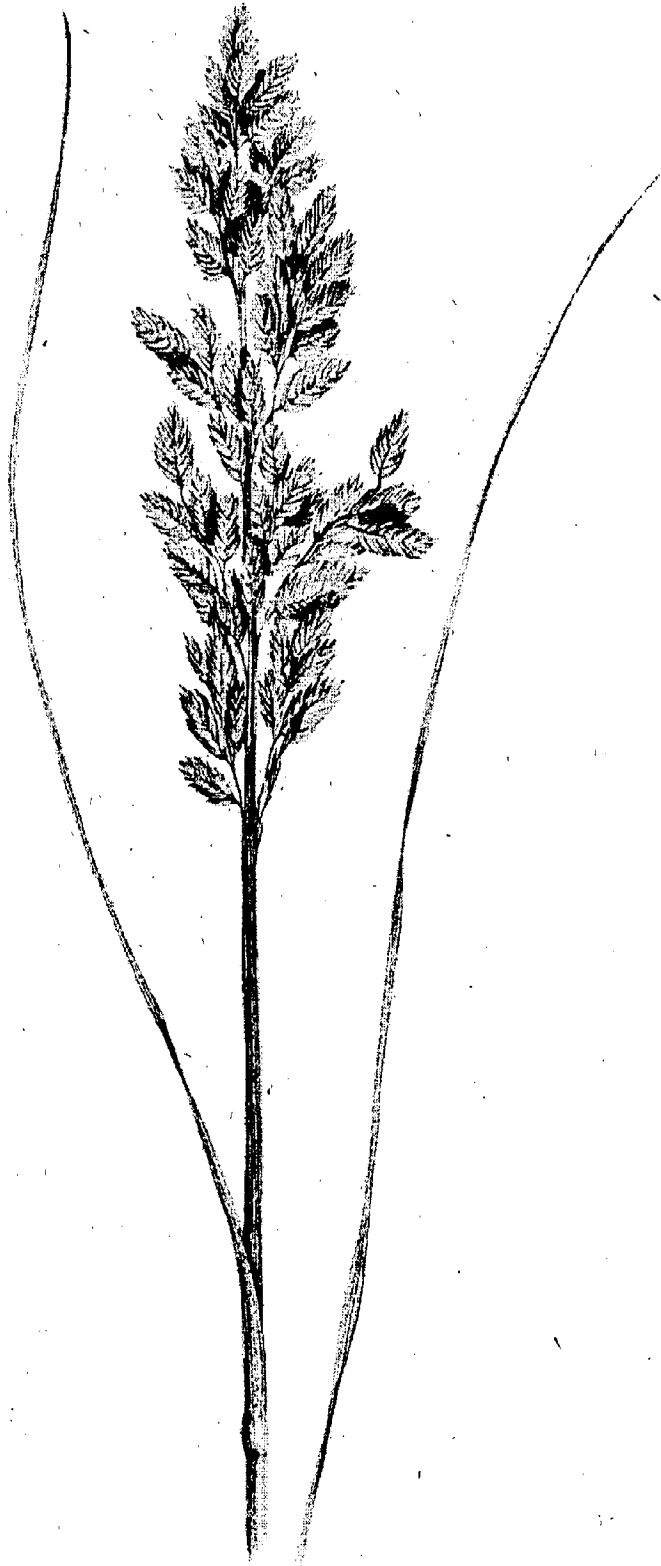
Coastal Dune Vegetation

The following dune plants commonly occupy coastal primary dunes and related habitats in Virginia and adjacent states. These plants are important to the dune environment in that they reduce the effects of the wind erosion and in some cases actually aid in dune development. They are an integral part of coastal dune habitat and play an important role in the ecological integrity of this system. Several dune species, such as American Beach Grass and Sea Oats are often planted for dune stabilization or dune creation projects. These two grasses have the capacity of not only surviving but stabilizing accreting sand. When buried by sand, these grasses produce fast growing vertical rhizomes (underground stems) that eventually produce a shock of leaves at the top of the dune. Therefore, if a sand supply is available, a dune can grow and become stabilized through the help of these grasses.

Most dune plants are necessarily very hardy. They must be able to withstand intense heat, reflected light, saltspray, nearly sterile substrate, and strong winds. Many of these species have developed specialized morphological features that have helped them adapt to these adverse conditions. Despite these outstanding features, these plants are highly susceptible to trampling, off-road vehicles and the like.

The dune plants illustrated* and described* in this section are protected by the Coastal Primary Sand Dune Protection Act, Virginia Code Chapter 14 of Title 28.2.

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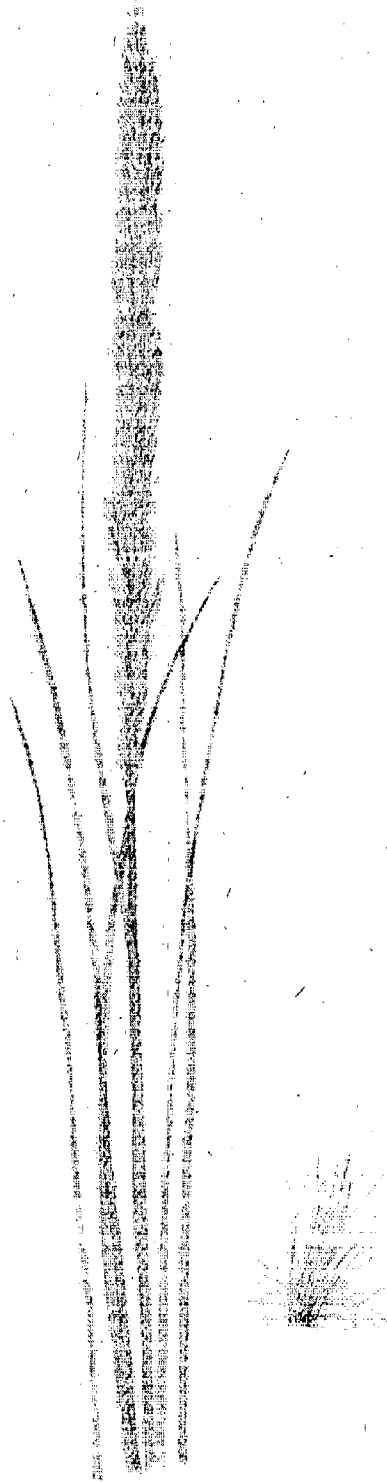


Sea Oats

Uniola paniculata L.

This tall, stately grass is one of the most important primary dune plants on the Southeast Coast. Sea Oats ranges from Virginia to the Gulf Coast. It's robust seed head (a panicle of numerous wafer-like spikelets) is easily distinguished from Beach Grass which has a rather narrow, dense spike of flowers.

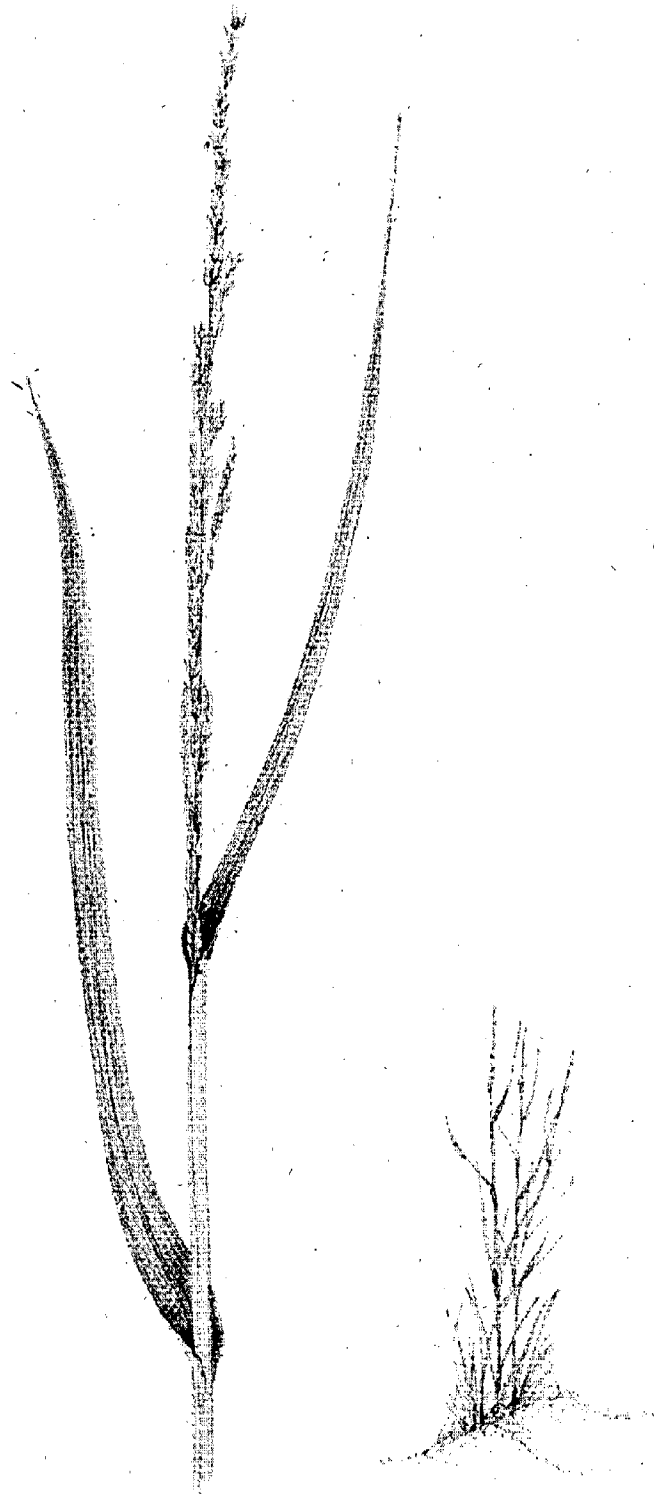
In late summer or early fall the seed head turns a bronze-yellow color whereas the spike of Beach Grass matures to a dull gray. Both grasses are highly adaptive to accreting sand, salt spray, wind and dry conditions. They are very important natural resources in a dune field and should not be disturbed.



American Beach Grass

***Ammophila breviligulata* Fern.**

This grass is the most common plant that grows on primary dunes from New England to North Carolina. It has a very dense narrow flowering spike which distinguishes it from other dune grasses. The spike is surrounded by a dense tuft of long, narrow and pointed leaves. Beach Grass has excellent sand binding capabilities and can tolerate, and even thrives to some degree, on being buried by shifting sand. Seedlings of Beach Grass are often planted in dune restoration projects. Only one other beach plant can withstand such conditions, and that is Sea Oats *Uniola paniculata* which has a more southern range.



Short Dune Grass

Running Beach Grass

***Panicum ararum* Ell.**

The grass is often found on dunes from the New England area to the Gulf Coast. Compared to *Ammophila* and *Uniola*, the leaves of Short Dune Grass have blue green color that is quite distinguishing. The seed head is a rather sparse, narrow panicle of small ellipsoid seeds. Unlike the other two species, this grass is not as highly adapted to accreting sand. Whereas the specialized growth system of *Ammophila* and *Uniola* can keep up with sand build up, *Panicum* will eventually become buried by large amounts of shifting sands. Where there are optimal growing conditions (reduced sand accretion and salt spray), this grass often forms relatively dense mats of vegetation originating from underground rhizomes.



Seaside Goldenrod

***Solidago sempervirens* L.**

Seaside Goldenrod is one of the most striking plants in the coastal zone during late summer or early fall. This tall, leafy perennial produces a spray of bright yellow blooms that is typical of interior goldenrods. The leaves are dark green and fleshy and are produced in profusion along the entire length of the stem which may be as much as 6 feet long. It is typically found on the more stable part of the dune, on low secondary dunes or along the edges of salt marshes.



Dusty Miller

***Artemisia stelleriana* Besser.**

Dusty Miller is an introduced plant that over the years has invaded and adapted well to coastal dunes from Quebec to Virginia. It is commonly used as a border plant because of its unusual and attractive foliage. The lobed leaves have dense whitish hairs on both sides that gives the foliage a velvety appearance. As are many dune species, this plant is a perennial and spreads by creeping underground stems called rhizomes. Although the foliage is mostly low or creeping in posture, the plant produces a flowering stem at the peak of the growing season that may be over two feet tall. This reproductive stem may have a large number of flower heads. Each head bears many tiny, nearly inconspicuous flowers. This characteristic is typical of the composite or Aster family to which this plant belongs.

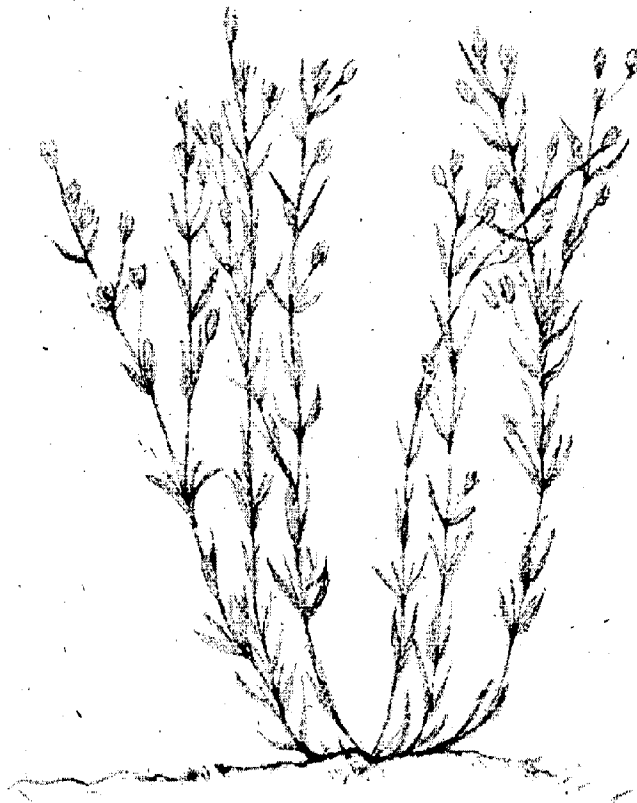


Dune Bean

Beach Bean

***Strophostyles helvola* (L.) Ell.**

Dune Bean is an annual, trailing and twining vine which occupies various habitats in the dune/beach system. It has a characteristic bean or legume flower which is usually rose or purplish when mature. It also produces a typical "bean pod." The leaves are divided into three separate leaflets. The combination of these three features (flower, pod and leaf) will distinguish this vine from many other plants that live in the beach/dune habitat. This plant is not strictly a dune species but can also be found in maritime forests, and other interior, open woodland habitats.



Seabeach Sandwort

***Arenaria lanuginosa* (Michaux) Rohrback**

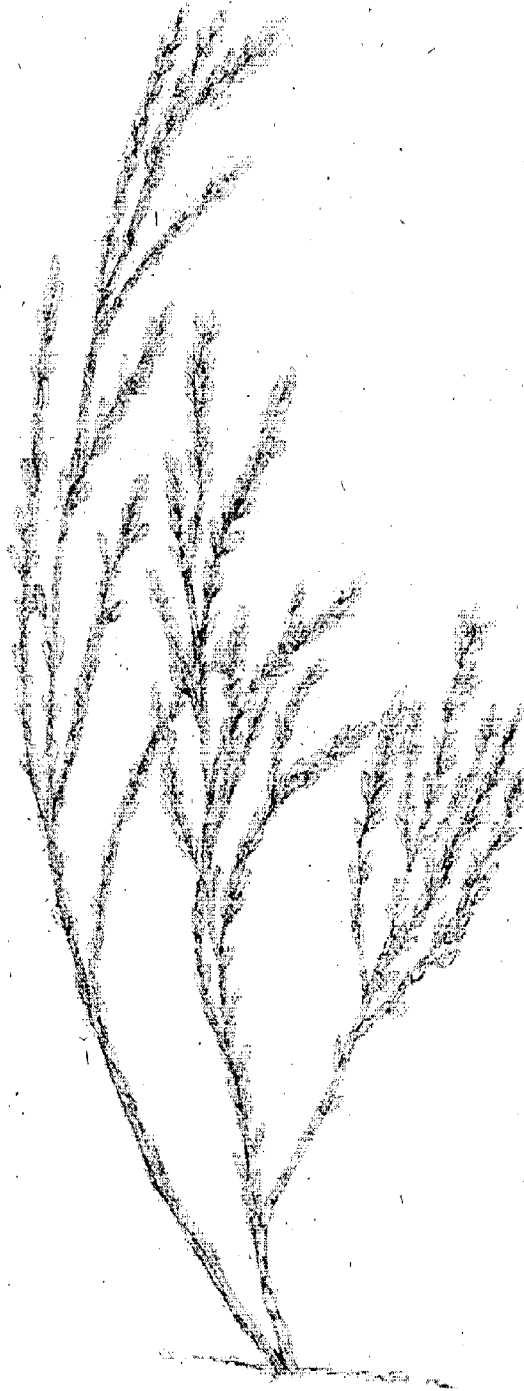
This small plant is usually found on the margin of swales between or behind the primary dunes. Sandwort appears to be too delicate for the rigorous coastal environment and in fact, the plants appear to be more vigorous where they are somewhat protected from salt spray, excessive sand accretion and wind. The leaves are small and narrow and the flowers not very conspicuous. It is found only sparingly in Virginia as this area is the northern extent of its range which continues as far south as South America.



Sea Rocket

***Cakile edentulata* (Bigelow) Hooker**

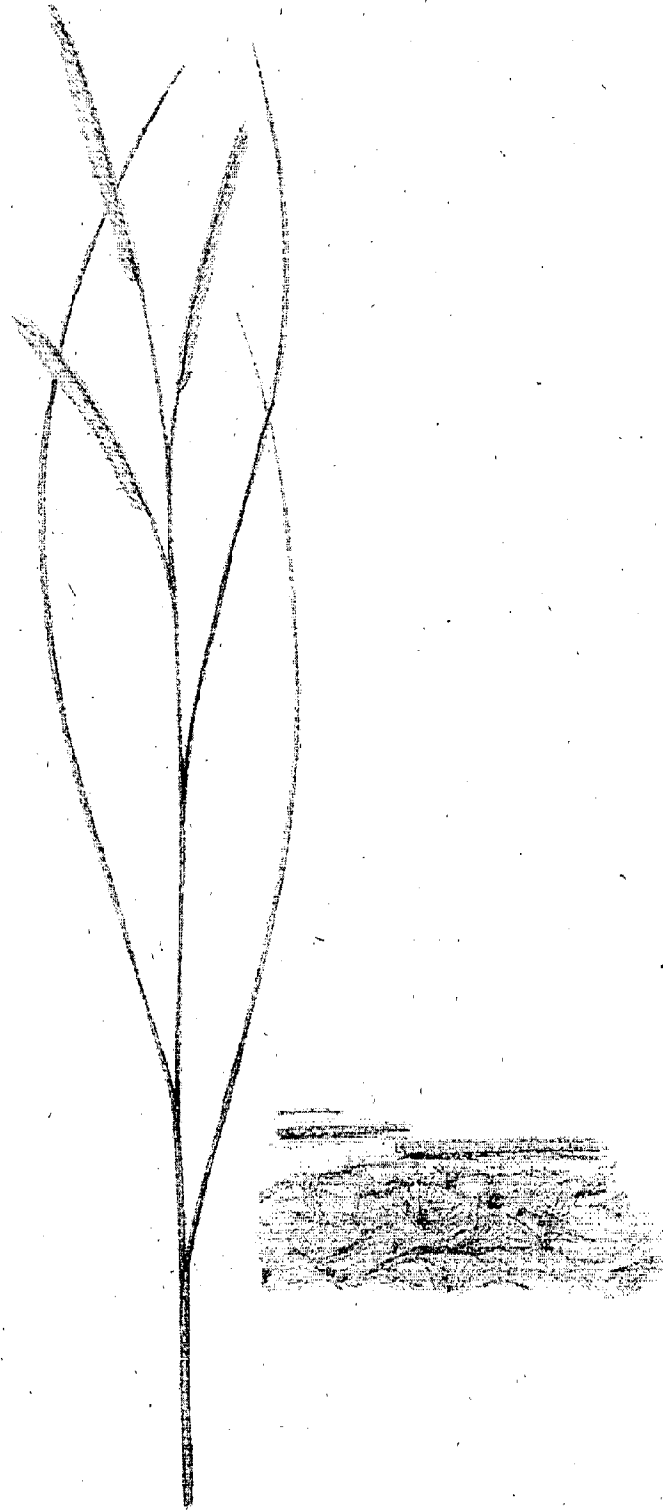
Sea Rocket usually occupies the zone between the toe of the primary dune and wrack line on the beach. *Cakile* is a succulent plant with fleshy stems and leaves. The small flowers are usually lavender or light blue or occasionally white. Thick, fleshy fruits develop late in the growing season. Although Sea Rocket does not have the sand binding qualities of the beach grasses, it is indicative of this dynamic zone between dune and mean high water.



Beach Heather

***Hudsonia tometosa* Nuttall**

Beach Heather is a low, spreading shrubby plant that rarely grows over a foot tall. The leaves are scale-like, somewhat resembling those of a cedar tree and are covered with very short, dense hairs. The whitish hairs give these little shrubs a "mildewy" appearance. At the peak of the growing season, tiny yellow flowers are evident. Beach Heather generally grows on somewhat moist, compacted sand which is typical around the edge of swales between dunes. *Hudsonia tometosa* is more common in the New England area but ranges as far south as North Carolina where it is found infrequently.



Saltmeadow Hay

***Spartina patens* (Aiton) Muhl.**

Saltmeadow Hay is short (seldom over knee high) wirey grass that grows in dense clumps on the backside (landward) of primary dunes. It is also found, sometimes profusely, on lower secondary dunes, swales and higher portions of a saltmarsh where it often forms dense meadows. Compared to Beach Grass and Sea Oats, it has a relatively sparse, branching seed head. Its leaves are long, very narrow and are often rolled inward (somewhat trough-like) so that they appear to be round. This mechanism helps reduce water loss (excessive transpiration) in the plant. Most dune plants have adaptive characteristics that help them withstand the rigorous environment of the coastal ecosystem.

Glossary

ACCRETION - growth by accumulation of new material.

BARRIER ISLAND - a low island which, usually in conjunction with other islands, shelters an open area of water or marsh between itself and the mainland.

BACKSHORE - an area in the beach zone between mean high water and the toe of the dune system.

BERM - that part of the beach at the upper limit of the wave wash formed by the deposit of material by wave action.

COASTAL PRIMARY SAND DUNE - mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten per centum or greater to less than ten per centum, and upon any part of which is growing as of July one, nineteen hundred eighty, or grows thereon subsequent thereto, any one or more of the following: American beach grass (*Ammophilla breviligulata*); beach heather (*Hudsonia tometosa*); dune bean (*Strophostylis umbellata* var. *paludigena*); dusty miller (*Artemisia stelleriana*); salt-meadow hay (*Spartina patens*); seabeach sandwort (*Arenaria peploides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass (*Panicum ararum*). For purposes of this chapter, "Coastal Primary Sand Dune" shall not include any mound of sand, sandy soil or dredge spoil which has been deposited by man for the purpose of the temporary storage of such material for later use.

CONTIGUOUS - bordering or adjoining, next to.

DEFLATION - the removal of loose material from a beach or dune by wind action.

DUNE BACKFACE - the zone from the crest of the dune to the point at which the dune grade drops below ten percent.

DUNE CREST - a line connecting the highest points of a dune along its long axis.

DUNE LINE - the line established by several dunes positioned next to one another.

DUNE TOE - a zone on the seaward face of the dune marked by a significant change in grade.

FASTLAND - the comparatively stable upland area adjacent to the shoreline.

FORESHORE - that part of the shore lying between the upper limit of wave wash at high tide and the ordinary low water mark.

GRADE - as used in the Sand Dune Act, the term refers to the rate of change in elevation progressing across a dune; grade is determined by dividing the absolute increase or decrease in the vertical distance occurring over any measured horizontal distance as long as both measures are in the same units.

LANDWARD LIMIT - in the Act, the onshore boundary of the dune.

LATERAL LIMIT - in the Act, the ends of the dune usually found lying perpendicular to the shoreline or the dune boundaries normal to the long axis of the dune.

MEAN HIGH WATER - the average height of high waters over the previous nineteen year period.

MORPHOLOGY - the form and structure of a dune or dune vegetation.

OFFSHORE BAR - one (or more) sand bar(s) running roughly parallel to the shoreline.

ONE HUNDRED YEAR STORM - that storm event which, on the average, may be expected to occur once in one hundred years.

OPEN PILE FOUNDATION - a foundation composed entirely of large poles driven into the ground which support a structure above ground level.

STORM SURGE - the additional depth of water above mean high water which accompanies coastal storms.

TRANSITION ZONE - that area in which physical and/or biological features characteristic of two adjacent areas (e.g., beach and uplands) can both be found.

UNCONSOLIDATED - in the Sand Dune Act, sediments which do not bind together.

WASHOVER DEPOSIT - the material deposited by the passing of water over the beach onto the fastland.

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