fact sheet 6

stormsmart coasts

Landscaping to Protect Your Coastal Property from Storm Damage and Flooding

The Massachusetts coastline is a dynamic system—beaches and dunes constantly move in response to wind and wave action, coastal banks erode, and storms and hurricanes shift large amounts of sediment. Rainwater and snowmelt carry away the soils left exposed by the wind and waves, compounding erosion problems. The right landscaping approach can help counter the forces of wind, waves, and runoff and protect property against erosion caused by storms and flooding.

Wind and waves; salt spray; and shifting, parched, sandy, and nutrient-deficient soils make the coastline an inhospitable place for most plant species. However, there are plants that are well adapted to this niche—with characteristics that make them fit to survive the elements. And these plants that are resilient to harsh coastal conditions are one of the best remedies against the forces that cause erosion and destabilization of dunes, banks, and bluffs along the coast. For example, trees, shrubs, and smaller plants have root systems that structurally reinforce and support slopes (similar to rebar reinforcing concrete in building construction), bind soils, and reduce their susceptibility to erosion from wind or rain. In addition, by taking up the water directly from the ground, absorbing it through their leaves, and breaking the impact of raindrops or wave-splash, plants slow down the rate and quantity of water runoff that can lead to erosion.

Landowners can mimic nature by planting native coastal plants to protect property from storm damage and flooding. Using native coastal plants also enhances the visual appeal of coastal property, protects property values, preserves the natural character of the coastal environment, provides habitat for wildlife, and helps to filter pollution.

Photo: Michael J. DeRosa

Carefully planned coastal landscaping helps reduce erosion and storm damage, while improving the property's visual appeal.

Before performing any landscape activities along the coast, contact the local Conservation Commission to determine if a permit is necessary. Where landscaping work is directly in a bank, dune, or other coastal resource area,[1] an approved Order of Conditions (or local permit) may be required. Within the 100-foot buffer zone to the resource area, a Determination of Applicability may be all that is necessary if the work is minimal and won't cause excessive land disturbance. If undertaking planting or restoration activities in threatened or endangered species habitat, you will need to follow specific guidelines (see *Guidelines for Barrier Beach Management* at www.mass.gov/czm/hazards/beach/barrierbeach.htm).

[1]A resource area is defined under the Massachusetts Wetlands Protection Act Regulations as a bank, freshwater wetland, coastal wetland, beach, dune, flat, marsh, or swamp bordering on the ocean, an estuary, a creek, a river, a stream, a pond, or a lake. Resource areas also include land under any of the waterbodies listed above; land subject to tidal action, flooding, or coastal storm flowage; and riverfront areas.

PLANTING TO HELP STABILIZE COASTAL BANKS

The stability of coastal banks that are made of loose materials—such as sand, rocks, or soils—can be greatly improved by plants. A thickly planted area can prevent the surface runoff of rainwater or snowmelt from creating gullies or ruts in the bank. Plants also absorb rainfall and groundwater, reducing the seepages within a bank that could cause landslides, slumps, or a bank collapse. A strip of dense shrubs, perennials, and/or deep grasses along the top of a coastal bank can also limit access and foot traffic that may otherwise aggravate erosion or be a safety concern.

Selecting Plants for Coastal Banks

Native grasses that are extremely tolerant of salt spray and exposure to wind and waves, such as American beachgrass (*Ammophila breviligulata*), can help build up windblown sediments on the face of banks or bluffs and effectively bind the soil with their thick, fibrous root systems. The roots of beachgrass can establish themselves quickly, while allowing other plants to take hold. Other native grasses, such as little bluestem (*Schizachyrium scoparium*), and smaller, low-growing shrubs, such as bearberry (*Arctostaphylos uva-ursi*), creeping juniper (*Juniperus horizontalis*), and shore juniper (*Juniperus conferta*), can be grown on the slopes of the banks and bluffs—their root structure and surface area provide stability. In fact, rows of thick drought-tolerant grasses planted across the face of the slope will not only prevent erosion, but will slow water runoff and allow sediment to be deposited—creating a buildup of the bank. (Be sure to avoid planting rows of plants in such a way that they channel the water downhill and increase erosion.) Larger shrubs, such as bayberry (*Myrica pensylvanica*) and beach plum (*Prunus maritima*), are also good choices for exposed areas of a coastal bank since they are hardy and tolerant of salt spray and drought. Native trees, such as black cherry (*Prunus serotina*), pitch pine (*Pinus rigida*), and Eastern red cedar (*Juniperus virginiana*), may be beneficial for stability since their root structures are either deep or spreading, but locating trees on banks should be done carefully to ensure that their weights do not contribute to bank instability. In general, trees should be placed on lower slopes or set back from steep slopes. For stabilizing slopes that are steep, rocky, or difficult for planting, live cuttings or stakes (branch cuttings from dormant woody plants) can be inserted by hand or driven into the soils to take root, grow shoots, and become established.

Plants versus Engineered Structures

For property experiencing serious erosion, consider planting a protective cover of native plants, such as beachgrass and creeping and shore junipers, on the bank rather than installing hard engineered structures (such as seawalls, riprap, and bulkheads). In most cases, engineered structures are prohibited in Massachusetts because they stop the movement of sediment in the overall system and reflect waves, both of which can damage other properties. Plantings, however, can buffer wave energy while maintaining natural sediment transport. Plantings are also substantially less expensive and more aesthetically appealing than structural measures. And while any form of bank stabilization affects the natural processes of erosion, plants are a more natural stabilizer. But, effective protection requires live plants—brush, vegetative debris, discarded Christmas trees, and other materials act to limit the natural growth and establishment of plants and do not help bind soils.

PLANTING TO HELP BUILD AND STABILIZE DUNES

Coastal beaches and dunes are highly dynamic and migratory systems—sand, gravel, and cobble are eroded, deposited, and reworked by wind and waves. Homeowners who attempt to maintain lawns and ornamental gardens in or adjacent to dunes and beaches will find that they are covered with sand after storms, or routinely damaged by the salt spray. Rather than working against nature, the better strategy is to plant natural communities of beach and dune plants that thrive in this environment, and that offer substantial benefits in return. Plants help to build up the dunes and maintain their form, so that in major storms, the dunes will act as a buffer against waves and flooding.

Selecting Plants for Fronting Dunes

In beach and dune systems, the pioneer plants that grow at the wrack line (the line of seaweed and debris deposited by waves and tides) trap windblown sand and allow the dune to build. Meanwhile, the roots of plants such as American beachgrass, dusty miller (*Artemisia stelleriana*), beachpea (*Lathyrus japonicus*), and seaside goldenrod (*Solidago sempervirens*) act like "glue" that holds the dune together. The dune will continue to build up as long as the plants are there to catch and hold the sand. For property that is experiencing erosion from wave and wind activity, planting beachgrass can help build and stabilize the dune and provide protection to landward areas. American beachgrass is the optimal choice for the fronting sand dunes (the dune closest to the beach), because of its fast growing subsurface rhizomes (stems) and roots, which spread beneath the sand and give rise to many new plants, helping to colonize the species in dune environments. Although woody vines and trees may look more stable, beachgrass can more quickly and effectively stabilizes large areas of coastal dunes

and banks. Beachgrass is also tolerant of salt spray, exposure to wind and waves, and frequent over-topping by sand. In fact, the wind-blown sand promotes a healthier and more rigorous stand of beachgrass by providing nutrients, forcing new rhizomes to sprout, and avoiding the buildup of unhealthy thatch. For more healthy plant stands, a mix of beach and dune grasses and other plants can be used to create a varied resistance to disease, pests, and local climatic conditions.

Selecting Plants for Secondary Dunes

Secondary dune systems (those landward of the fronting dunes) that are beyond the reach of regular wave action but are still exposed to salt spray, wind, or storm waves are habitat for hardy plants such as beach heather (*Hudsonia tomentosa*), lowbush blueberry (*Vaccinium angustifolium*), bayberry, beach plum, Japanese black pine (*Pinus thunbergii*), pitch pine, and Eastern red cedar. Due to their adaptation to dry, sandy, loamy, sometimes acidic and nutrient-poor soils, and their tolerance to salt spray, these plants are particularly useful for re-vegetating or stabilizing coastal dunes. They are also a good choice for gardens and yards that are exposed to wind and waves where little else will grow successfully. Saltmeadow cordgrass (*Spartina patens*) can also effectively colonize dune areas, particularly in troughs between dunes. Saltmeadow cordgrass, typically a salt-marsh plant, is dominant in these areas because most other sand dune species cannot tolerate wet- to saturated-soil conditions.

OTHER BENEFITS OF COASTAL LANDSCAPING

Landscaping property with native plants adapted to the coastal environment will not only help stabilize soils and prevent erosion (thereby protecting property and property values), but the plants will offer many other benefits, such as providing a buffer for pollution, creating wildlife habitat, establishing a natural character and aesthetic, and minimizing maintenance requirements.

Pollution Buffer

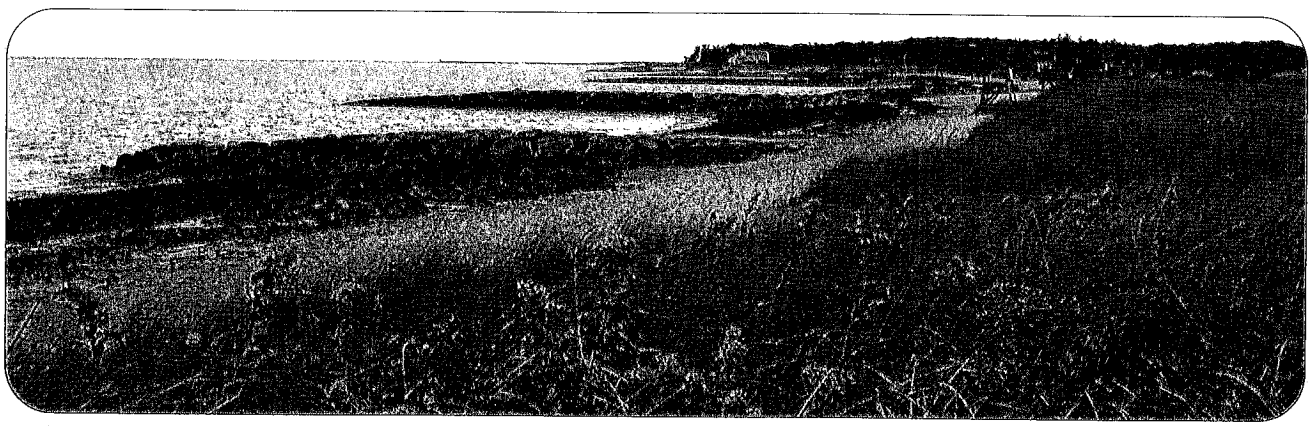
Coastal landscaping can help keep your local bay or harbor clean. Excess sediments washed to coastal waters can smother eelgrass beds and other habitats, and can also reduce water quality. Nutrients from pet wastes, septic systems, or fertilizers (that are not absorbed by plants) can lead to nuisance plant or algae growth, and bacteria from pet wastes and septic systems can lead to closed shellfish beds and swimming areas. Oils and greases washed from roadways and driveways can also pollute water bodies. Plants offer a natural defense—capturing and filtering many of these pollutants before they reach coastal waters.

Wildlife Habitat and Natural Beauty

Trees, shrubs, groundcovers, and grasses growing along the coast—particularly native species—provide shelter, nesting areas, and food for wildlife. These plants also beautify the land, preserve the natural character of the shoreline, and provide privacy. In contrast, extensive lawns do not provide stability against erosion (their roots are relatively shallow) or value for wildlife. In addition, fertilizers and pesticides used on lawns (especially with the quantities needed in sandy soils) can degrade water quality and may be hazardous to human health and wildlife.

Minimized Maintenance Requirements

Native plants are adapted to local conditions, and as a result require less maintenance, watering, fertilizer, and pest control than introduced species. Because certain natives thrive in coastal conditions, they may also out compete and control unwanted invasive species, such as multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), and Japanese knotweed (*Polygonum cuspidatum*)—all of which tend to take over and require a lot of pulling and weeding to keep a tidy appearance. When selecting plants, always be sure to avoid invasive species by checking the Invasive Plant Atlas of New England (nbii-nin.ciesin.columbia.edu/ipane).



Beachgrass and goldenrod growing on the dunes help build and stabilize the sand and sediments and protect landward areas.

Photo: Massachusetts Office of Coastal Zone Management

TIPS FOR LANDSCAPING A COASTAL PROPERTY

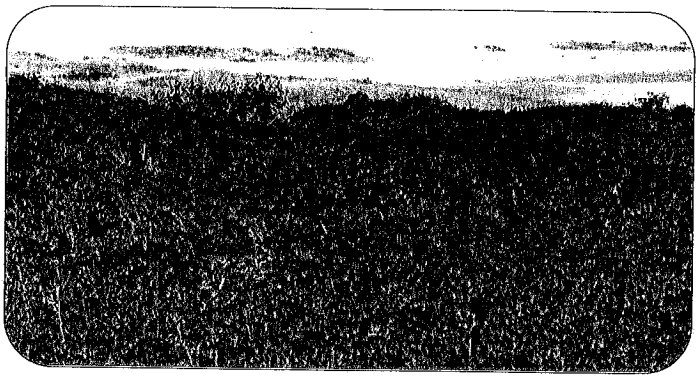


Photo: Massachusetts Office of Coastal Zone Management

• **Plant a buffer area** of native trees, shrubs, and deep-rooted grasses between maintained areas of the property and the shore to help stop or slow shoreline erosion, to filter sediments and pollutants, and to beautify the area. Do not mow right up to the edge of the dune, bank, beach, or marsh. **Keep the lawn area as small as possible.**

• **Grade property to direct stormwater away from the shoreline and toward planted areas** to reduce erosion of banks, dunes, and beaches and to prevent contaminants from entering the bays, harbors, and ocean. Note: In areas that are frequently inundated with standing stormwater, plant species that are tolerant of both wet and dry conditions in a "rain garden." Appropriate herbaceous plants include swamp milkweed (*Asclepias incarnata*), Joe Pye weed (*Eupatorium purpureum*), cardinal flower (*Lobelia cardinalis*), yarrow (*Achillea* spp.), and Stella de Oro daylily (*Hemerocallis 'Stella de Oro'*). Shrubs or small trees include arrowwood viburnum (*Viburnum dentatum*), winterberry (*Ilex verticillata*), highbush blueberry (*Vaccinium corymbosum*), Virginia sweetspire (*Itea virginica*), and serviceberry (*Amelanchier* spp.). For more plant species suitable for raingardens, see the UMass Extension's fact sheet on rain gardens: www.umassgreeninfo.org/fact_sheets/plant_culture/rain_gardens_07.pdf.

• **Plant an area around driveways to slow stormwater and trap sediments and pollutants**, and replace impervious driveways or install new driveways with pervious material (crushed stone, shells, gravel) to allow water to infiltrate slowly into the ground.

INSTALLATION AND MAINTENANCE

• Do not use heavy equipment and machinery on a dune, bank, or other resource area (or even next to them) without the proper permits and professional installation advice from a certified landscaper. Generally, plantings can be accomplished by a landowner with a shovel, rake, trowel, and wheelbarrow, but be sure to check with your Conservation Commission to see if a permit is necessary.

• Prepare the soils with a layer of organic material (e.g., compost, peat moss) to make nutrients available to the plants and to increase the soil's water retention capacity. A topping of mulch (e.g., bark, composted leaves and grass, nut shells, seaweed) will also provide nutrients and help retain water in the soils while keeping weeds at bay. If fertilizers are necessary for plant growth, use only an organic, slow-release, water-insoluble fertilizer at the recommended dose.

• For good plant establishment, newly planted vegetation will need approximately 1 inch of water per week during the growing season from April through October. If nature does not provide the 1 inch, temporary irrigation (such as drip tubing on a timer) may be used for initial plant establishment. Permanent irrigation systems adjacent to a dune or bank generally worsen erosion problems and should not be used.

• On steep slopes where erosion is threatening property, biodegradable erosion fabric, such as coconut fiber or coir mesh, may be used to provide temporary erosion control while plants take root.

FOR MORE INFORMATION

The Massachusetts Office of Coastal Zone Management (CZM) Coastal Landscaping website (www.mass.gov/czm/coastal_landscaping) provides homeowners and local officials with more information on plant selection and the benefits and "how tos" of coastal landscaping to help slow erosion and protect landward areas from storm damage and flooding, provide wildlife habitat, and prevent pollution. **See also the StormSmart Coasts website (www.mass.gov/czm/stormsmart) for additional information.**

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