



Coastal Landscaping in Delaware with Common Marsh and Dune Plants

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If you are fortunate enough to have a home bordering Delaware's lush wetlands or lying near the state's famous beaches, you have the opportunity to landscape your property with native coastal plants rather than commonly used traditional nursery stock. Such plantings are attractive, require little maintenance, and can help control the erosion and flooding often associated with coastal environments. This bulletin is designed to describe the plants that are naturally adapted to Delaware's dunes and saltwater wetlands and to familiarize you with their use as landscape alternatives.

Using native plants to landscape your coastal property has several important benefits. First, it can prevent frustrating and costly replanting. For example, in a wetland border setting, the flooding that often occurs during storms or extremely high tides will kill most traditional landscape plants, but landscape plants originally selected from the wetland environment are flood- and salt-tolerant and thus are not susceptible to flooding or salinity damage.

Second, landscaping with native plants can help the environment by conserving our limited freshwater resources, protecting the shore, and decreasing the need for fertilizers. For example, in a dune setting, plants originally selected from that environment are relatively drought-tolerant and do not require the irrigation needed by traditional landscape plants. Dune plants also stabilize the dunes and hold sand in place during storms, decreasing erosion. And since natural dune and wetland plants do not require the periodic fertilization needed by traditional landscape ornamentals, their use would aid Delaware's efforts to decrease contamination of groundwater and bays from fertilizers.

Finally, the use of native species has aesthetic value, making our presence in the coastal zone seem more a compatible extension of the natural ecosystem rather than an intrusion into it.

Adaptations to the Tidal Marsh Environment

Coastal plants possess unique adaptations to their environment. Understanding these adaptations will help you choose the best species for your site.

Plants adapted to the marsh environment are salt- and flood-tolerant. Salt-tolerant plants are called *halophytes* (*halo* meaning salt in Greek, and *phytos* meaning plant). These plants have specialized mechanisms that enable them to grow and reproduce in saline soil or to be irrigated with seawater. Salt-sensitive plants lack these mechanisms. Although halophytes can grow in fresh water, here they are usually "out-competed" by freshwater plants.

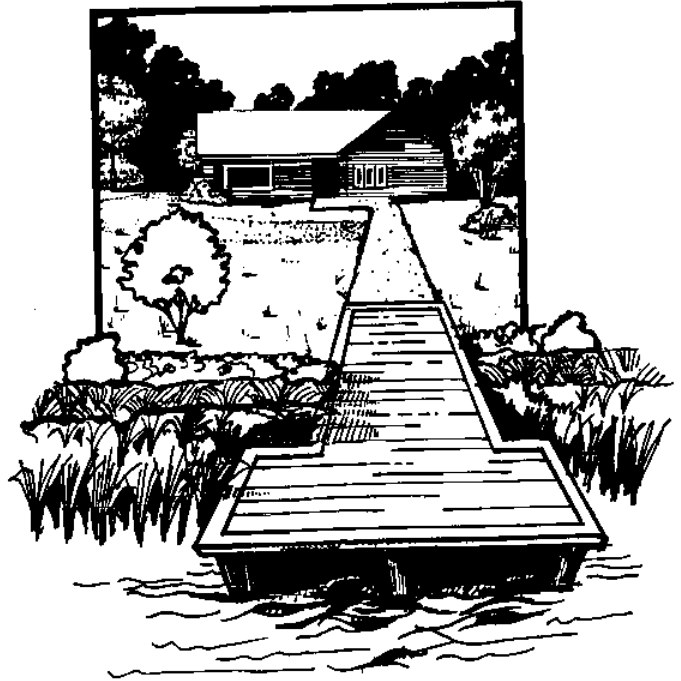


Figure 1. This sketch depicts the use of native plants for landscaping a coastal property. As you proceed from the dock to the house, you first see smooth cordgrass, fringed at its upper edge by fine, soft, salt-meadow hay. Next are flower beds of purple sea lavender, pink seashore mallow, and yellow seaside goldenrod, bordered by salt-tolerant shrubs such as groundsel tree, which has showy, white fruits in the fall. Farther up the walk are wax myrtle trees. Illustration by David Barczak.

Among the mechanisms plants have for tolerating salt are salt glands, salt-exclusion mechanisms at the root surface, salt compartmentation, and succulence. Located on the leaf surface, salt glands consist of two or more specialized cells that excrete much of the salt taken up by the plant. As Figure 2 shows, you can see these excreted salt crystals sparkling on leaf surfaces in the marsh; the crystals will be washed away with the next rain.

Some halophytes, such as seashore mallow, exclude salt at the root surface. The root cell membrane, in this case, has a specialized composition that regulates



Figure 2. Salt glands help some marsh plants excrete excess sodium. Excreted salt crystals can be seen on this leaf of smooth cordgrass.

salt entry into the plant. Seashore mallow also compartmentalizes salt away from the young, growing shoots and leaves and translocates it to the oldest leaves, which eventually drop off, ridding the plant of excess sodium.

Another salt-tolerant mechanism is succulence. Here, the plants store water in their fleshy tissue much like cacti do. As succulent plants such as glasswort take up water containing large quantities of salt, the water stored in their tissue dilutes the salt, enabling the plants to survive.

In addition to being able to tolerate salt, marsh plants also must be able to live in flooded soil for long periods. Upon flooding, the soil rapidly becomes depleted of sufficient oxygen for the plants' respiratory activities. How do these plants "breathe" when their roots and much of their shoots are under water? The major adaptation for this stress is the formation of *aerenchyma*, specialized tissue in the stem and roots that contains large air spaces. Many plants produce ethylene gas, and when the plants are flooded, this gas stimulates *aerenchyma* to form, which results in a pathway through which air can travel from the portion of the shoot that is above water down through the stem to the submerged roots. Thus, the *aerenchyma* functions like a snorkel, supplying oxygen to the oxygen-depleted tissues under water.

Planting in the Marsh or Near Its Border

What marsh plants will grow best on your coastal property? To find the answer, you should first observe where marsh plants grow in the natural environment. Figure 3 is a schematic diagram of a tidal marsh profile which depicts where the plants discussed in this bulletin are located in the natural ecosystem. The diagram shows two distinct zones: the low marsh and the high marsh. To distinguish the low marsh from the high marsh, follow this simple rule of thumb. If you have to wear boots at low tide, you are in the low marsh. In Delaware, the low marsh is characterized by an almost uniform stand of smooth cordgrass. If boots are necessary at high tide but not at low tide, you are probably in the high marsh. This zone is characterized by a more diverse plant community, as illustrated in Figure 3. (Note that plants other than those featured in this bulletin also will inhabit the high marsh.) The upper margin of the high marsh often is occupied by salt-tolerant shrubs.

The salinity of the water that floods your site may also guide you in selecting the best plants for that site. Delaware's coastal ocean water is approximately 3.1% salt, compared to 3.4% salt for the open ocean. You can determine the salinity of the seawater on your site by taking a quart of it and boiling it down. One quart of 3.1% seawater will yield approximately six teaspoons of salt. Likewise, one quart of 1.5% seawater will yield about three teaspoons of salt (water of this salinity and below, down to 0.5% salt, is *brackish*). As you travel up an estuarine river away from the ocean, the proportion of salt in the water becomes lower.

Now let's look at several common marsh plants and discuss how to plant them in or around a marshy habitat. While common names will be used in the main text, each plant's scientific name will be included under its photograph.

Smooth cordgrass (Figure 4) is the most extensive and productive salt-marsh plant along the East and Gulf coasts. The habitat it forms provides vital nursery and feeding grounds for juvenile fish and crabs. When the plants are dead, they form detritus (decayed marsh grass) which, along with floating single-celled algae, forms the base of the estuarine food chain.

This lush green grass occurs in both a short form and a tall form in the marsh. In Delaware, the short form grows from less than a foot to 2 feet; the tall form grows from 2 to 6 feet tall. If there are unvegetated, regularly flooded, saline areas on your

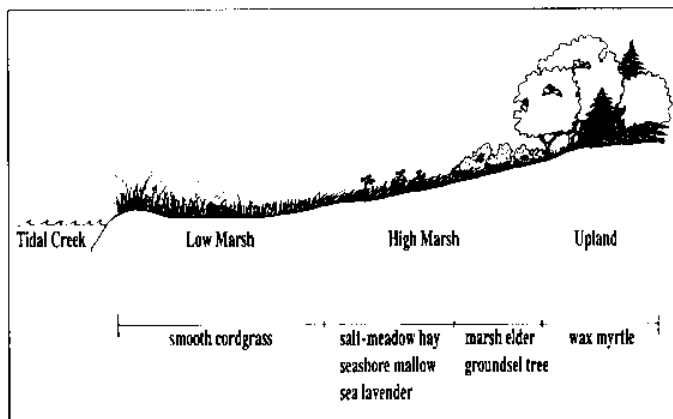


Figure 3. Plants occur in "zones" like these in the tidal marsh.



Figure 4. This smooth cordgrass (*Spartina alterniflora*) was planted one year ago in a newly created marsh.



Figure 5. Years ago, salt-meadow hay (*Spartina patens*) was harvested for animal forage, hence the name.

property, consider planting smooth cordgrass. This plant grows very vigorously at full-strength seawater salinities and higher. The salinity of the soil is often higher than that of the flooding water, depending on the frequency of flooding.

Often fringing the upper edge of the marsh is a relative of smooth cordgrass called *salt-meadow hay* (Figure 5). You can plant this more narrowly leaved grass just above the high-tide zone at the upper border of the smooth cordgrass plantings in the

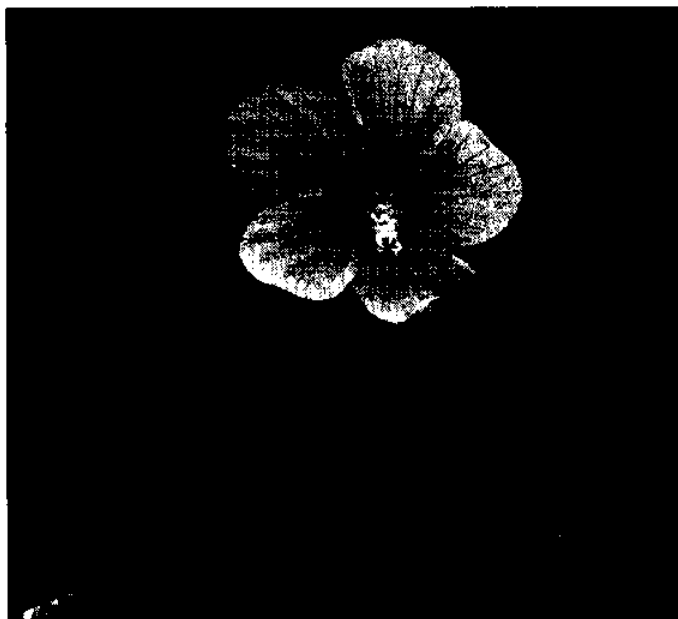


Figure 6. Seashore mallow (*Kosteletzkya virginica*) has large, bright pink flowers.

marsh you create. Salt-meadow hay and smooth cordgrass will help stabilize the shoreline, forming marshes that buffer coastal storms. These plants will also attract birds such as egrets, great blue herons, and marsh wrens.

Smooth cordgrass and salt-meadow hay can be obtained from commercial nurseries on the Delmarva Peninsula. Usually, the plants are provided in peat pots. The best time to plant is in the spring, but fall and summer plantings are often successful. Simply dig a hole and place the plant so that the soil level of the peat pot is at ground level, cover the peat pot with soil, and tamp it down. Slow-release fertilizer may be placed in the hole under the plant. Although not necessary for starting the plants, it will promote rapid growth. Subsequent fertilization is not necessary.

Seashore mallow (Figure 6) is a brackish-marsh plant that often grows scattered among salt-meadow hay and marsh hibiscus (a plant that has large white or pink flowers and centers). In fresh water, it can reach a height of 5 feet, while in quite salty water (3% salt) it may be only 2 feet tall. The plant will go through its reproductive cycle in seawater salinities; however, it grows better in brackish water (0.5–1.5% salt). Its large pink flowers (up to 3 inches in diameter) bloom from mid-July through August, filling the marsh with color.

Seashore mallow is an herb that comes up year after year from a perennial taproot system, which consists of a primary root that grows vertically downward with many smaller lateral roots. The plant propagates by seed, having a five-part capsule with each part containing a single seed. The seeds can be collected in the marsh in the fall and germinated in small pots of potting soil. No pretreatment of the seeds is necessary; however, rubbing one of the smooth sides of the seed with a nail file or piece of sandpaper will speed germination by enhancing water penetration through the seed coat. The seedlings can then be planted outside in the late spring. Planting the seeds directly in your garden also gives good results. The seeds should be planted in a high-marsh setting, just above the high-tide line.

Sea lavender produces a spray of delicate lavender flowers during the late summer or early fall (Figure 7). It makes a beautiful fresh or dried bouquet by itself or as a complement to another arrangement. It is a salt- or brackish-marsh plant that grows in the upper zone of the marsh or on hummocks where drainage is adequate and salinity is not full-strength. Seeds of this perennial can



Figure 7. Sea lavender (*Limonium carolinianum* or *L. nashii*) is equally attractive in a dried bouquet as in the marsh.

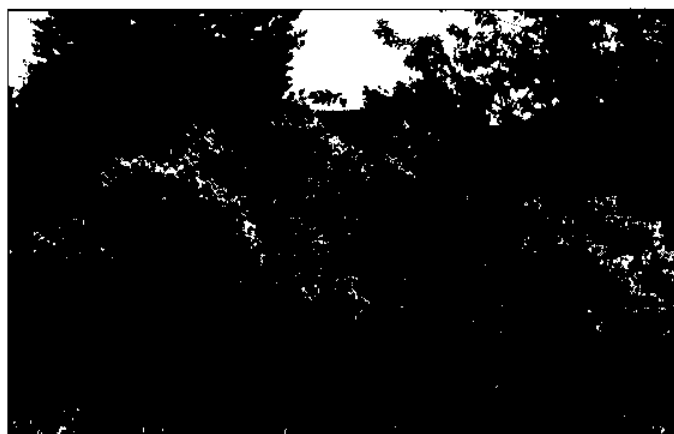


Figure 8. Groundsel tree (*Baccharis halimifolia*) displays its showy white, bristled fruits in the fall.



Figure 9. This marsh elder (*Iva frutescens*) cutting is about four months old and is ready for planting outside.

be collected during late fall and stored in the refrigerator. They can be started in small pots of moist potting soil or planted directly in your garden in the spring.



Figure 10. The leaves and waxy, bluish gray fruits of wax myrtle (*Myrica cerifera*) have a spicy aroma.

Marsh elder and groundsel tree are brackish- or salt-marsh shrubs that grow together at the marsh-upland border or on hummocks in the marsh above the high-tide line where there is better drainage. For identification purposes, the major difference between the two is leaf arrangement. Marsh elder has oppositely arranged leaves; groundsel tree has alternately arranged leaves.

Both shrubs are good for marsh borders or saline soils and can be propagated by cuttings, which should be started in late winter or early spring while the plants are still dormant. In the case of groundsel tree, which has male and female flowers on separate plants, the plant you will take cuttings from should be identified in the fall while its white, dandelion-like fruits are obvious. Thus, you can be sure you will have the showy female shrub (Figure 8).

To propagate the shrubs, cut off a small branch or twig, 4 to 6 inches long. Pull off the lower two or three leaves if leaves are present and gently scrape this area, or that of former leaf positions, with a knife. Dip this part into a rooting hormone, a powder mixture (obtainable at most garden supply stores) that promotes root growth and inhibits fungal growth, and then plant the cutting in a small pot of potting soil. Keep the soil moist with fresh water. After the cutting has rooted, it can be planted outside (Figure 9). Seedlings found growing around adult plants in the spring also can be successfully transplanted.

Wax myrtle is a shrub common to both marsh borders and dunes. Along marshes, it occurs above the high-tide line, above marsh elder and groundsel tree, but it can tolerate occasional high storm tides. It is evergreen and may grow up to 35 feet tall, but in the more stressful environments of the beach or marsh edge, it is typically 8 to 10 feet tall. It bears small, waxy, bluish gray fruits (Figure 10). Wax myrtle makes a good landscape plant either as a shrub or a small tree. When planted 3 to 4 feet apart, it can be used as a screen or border plant. Propagate it as described previously for marsh elder and groundsel tree.

Adaptations to the Dune Environment

Moving and accreting sand is probably the biggest physical factor to which plants growing on the sand dunes must adapt. Because dune grasses such as American beach grass and beach panic grass can keep themselves above a rising sand surface, they are the primary dune stabilizing plants along the North and Mid-Atlantic coasts. With their system of vertical and horizontal *rhizomes*, or underground stems, these plants are responsible for building and protecting our highest dunes (Figure 11). American beach grass grows even more vigorously in an area of accreting sand than it does in a less dynamic site.

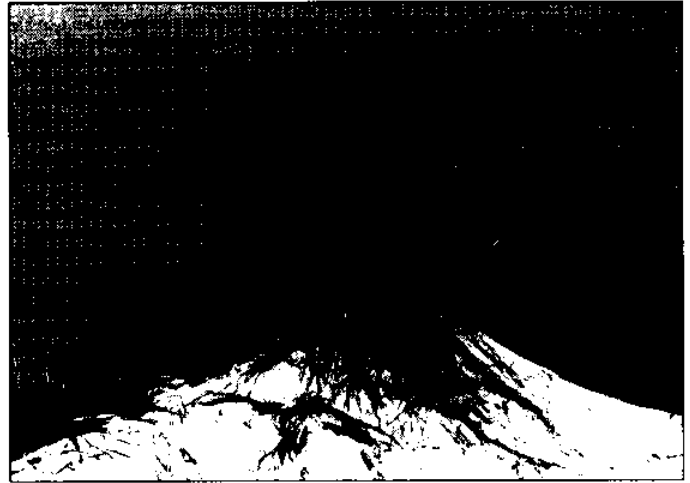


Figure 11. A single clump of beach panic grass protects a small dune.

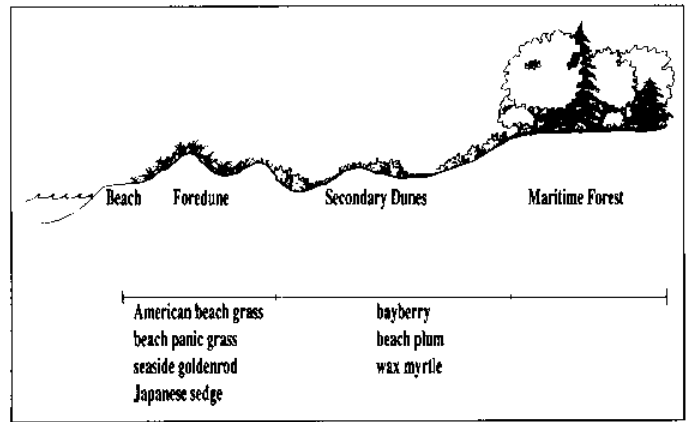


Figure 12. Sand dune profile and typical plant zonation pattern.

What helps American beach grass thrive in the nutrient-poor dune environment is the association of this plant's roots with specialized bacteria named *Azotobacter*. These bacteria convert gaseous nitrogen from the atmosphere into a form the beach grass can use, thereby providing nitrogen for the plants in what is otherwise a nitrogen-poor environment. The plants and the bacteria have a mutually beneficial relationship, for the young roots of American beach grass exude carbohydrates, which may provide food for the bacteria.

At the upper limit of the beach, plants growing on the debris line must tolerate salinity, wind, and burial by sand. Seeds caught in decaying plant material and other debris washed in on the high tides germinate here and trap wind-blown sand, initiating dune formation. One such plant is sea rocket, which has adapted to the salty environment by means of succulence. It stores water in its fleshy stems and leaves, which helps dilute the salt taken up by its roots. Its tough *cuticle* (waxy covering) helps it withstand sand abrasion.

Planting the Sand Dunes

Landscaping in the dune environment is not difficult if you use plants adapted to dune conditions. These plants can form attractive landscapes while holding sand in place. As with the tidal marsh, knowing the natural distribution of the various dune plants will help you select the best plant for a particular location.

Figure 12 is an illustration of a typical sand dune profile in Delaware. The beach grasses are located on the most dynamic dunes, that is, where sand movement is greatest—the foredune and the first of the secondary dunes. Shrubs are most typical of the less dynamic, more stabilized dunes. Dune plants tolerate

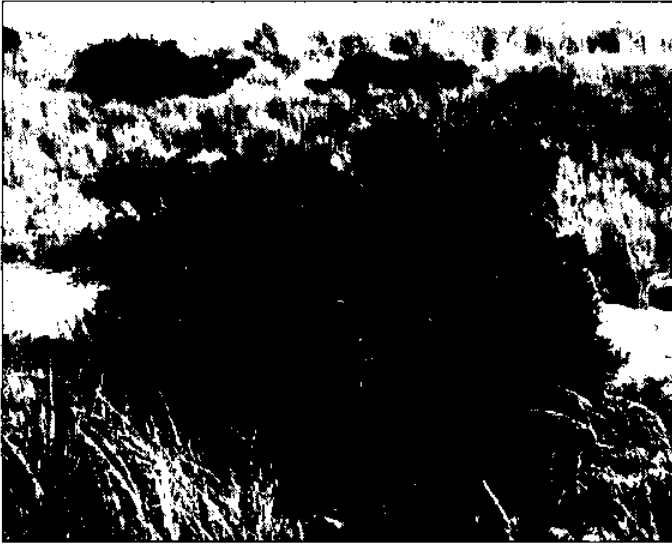


Figure 13. Bayberry (*Myrica pensylvanica*) is a common dune shrub.



Figure 14. In the fall, many coastal residents collect the plums of the beach plum (*Prunus maritima*) and make them into preserves.

sea spray but not soil salinity. The water table underlying the dunes is fresh or nearly so.

Shrubby plants can be planted as yard borders and can be trimmed appropriately. In addition to wax myrtle (a common shrub described in the preceding section), bayberry is the dominant shrub in the dune thickets (Figure 13). Unlike the evergreen wax myrtle, bayberry is a deciduous shrub that loses its leaves in the fall. It also has bluish gray, waxy fruits on its younger stems, but they are somewhat larger than those of wax myrtle. The leaves of bayberry are somewhat broader than those of wax myrtle, but both have a spicy aroma. This plant can be propagated via cuttings, as described for the other shrubs.

Flowering in early May, beach plum is a very showy shrub, with its covering of white flowers. Its fruit—small plums about one-half inch in diameter that ripen in September—is a favorite of Delawareans who enjoy making preserves (Figure 14). Beach plum also can be propagated via cuttings.

American beach grass is the dominant grass of the Mid-Atlantic coastal dunes (Figure 15). By trapping blowing sand, this plant is a pioneer in dune formation and, more importantly, it stabilizes the dune by holding the sand in place with an extensive and deep root and rhizome system. The plant can be readily obtained from local nurseries for planting from November

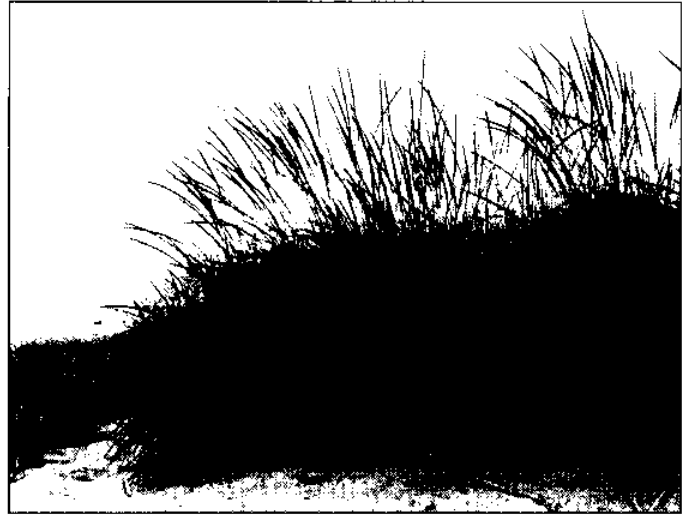


Figure 15. American beach grass (*Ammophila breviligulata*) is the dominant dune-stabilizing plant along the Mid-Atlantic coast.



Figure 16. Planting American beach grass is easy and fun.

through March. Scientists at the Delaware Department of Natural Resources and Environmental Control have determined that planting after April 15 is usually unsuccessful due to higher temperatures and less available moisture.

From the nursery, you will get dormant stems of American beach grass about 12 inches or so in length with very few roots. These should be planted fairly deep so that only 4 to 5 inches remain above the sand. Push a spade or shovel into the sand. Before pulling the shovel out, push the stem down into the space on the back side of the shovel formed by pushing the shovel forward. As you pull the shovel out of the sand, give the stem a little extra push (Figure 16). Tamp the soil down around the stem with your foot. If desired, a teaspoon of slow-release fertilizer can be put in the hole before placing the plant in it. Planting density can vary; planting American beach grass on 1- to 3-foot centers is recommended.

Beach panic grass is another important dune-stabilizing plant along the Mid-Atlantic coast. Standing 2 to 4 feet tall, it is an attractive plant with its graceful, somewhat drooping seed heads (see Figure 11 for another look at this plant). It can be obtained from nurseries and planted in the same way as described for American beach grass.

Japanese sedge is another sand stabilizer that some nurseries may soon carry. It is a shorter, more creeping plant and a slower spreader than either American beach grass or beach panic grass

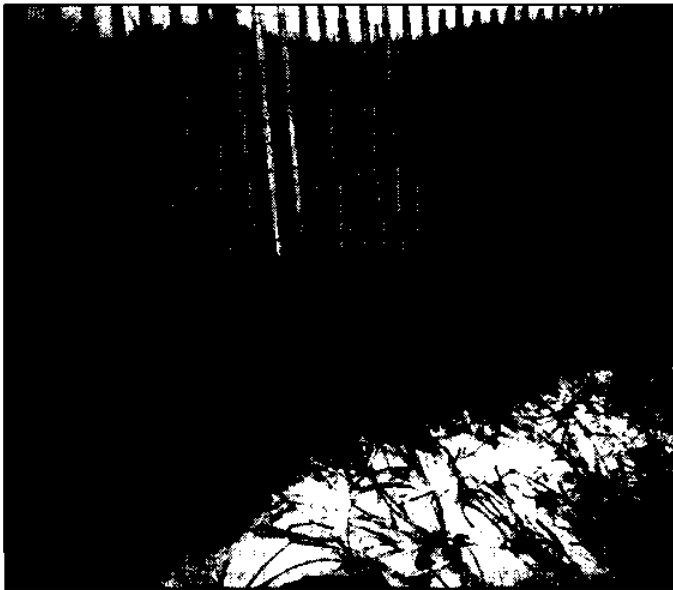


Figure 17. Japanese sedge (*Carex kobomugi*), naturalized from Asia, is a short, creeping plant that forms a dense cover.

and may not be as well adapted to locations of heavy sand accumulation. However, this plant does form a dense cover on the dunes and may be desirable in more stable areas (Figure 17).

With its bright yellow flowers in the fall, *seaside goldenrod* is a showy plant in the dunes and along the marsh borders (Figure 18). Collecting the seeds of this plant after it flowers in the fall is probably the best way to propagate it. Let the seeds dry and then store them in your refrigerator for the winter. In the late winter or early spring, germinate them in small pots of potting mix. When the seedlings are a few inches tall, plant them in your yard—April is probably the best time. A slow-release fertilizer may be applied.

Having read this bulletin, you are now ready to embark on a plan for landscaping your property with plants that are not only natural to the coastal environment in which you live, but that are also functional and attractive. Using these plants alone or as part of a landscape plan will provide a link between your home and the natural coastal ecosystem. Happy planting!

Editor's Note:

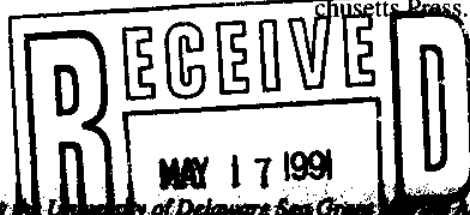
If you would like some seashore mallow seeds for planting on your coastal property, please send a stamped, self-addressed envelope to Dr. Denise Seliskar, University of Delaware, Graduate College of Marine Studies, 700 Pilottown Road, Lewes, DE 19958-1298. Dr. Seliskar will send out seeds for as long as her supply lasts.



Figure 18. Seaside goldenrod (*Solidago sempervirens*) has bright yellow flowers in the fall.

For Further Reading

- Barnett, M. R., and D. W. Crewz (eds.). *An Introduction to Planting and Maintaining Selected Common Coastal Plants in Florida*. Florida Sea Grant College Program. Report No. 97.
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