



## COASTAL PANICGRASS

### *Panicum amarum* Elliott var. *amarulum* (Hitc. & Chase) P.G. Palmer

Plant Symbol = PAAMA2

**Common Names:** coastal panicgrass; dune panic grass; dune switchgrass; seabeach grass; seaside panic grass; seaside panicum; shoredune panicum; slightly bitter panic grass; southern seabeach grass; tall sand-dune panic grass

**Scientific Names:** *Panicum amarulum* Hitc. & Chase; *Panicum amarum* Elliott ssp. *amarulum* (Hitc. & Chase) Freckmann & Lelong; *Panicum amarum* var. *amarulum* (Hitc. & Chase) P. Palmer

#### Description

**General:** Coastal panicgrass is a native, warm-season, clump forming, rhizomatous, perennial grass that grows 3-7 feet tall (Fernald, 1950; Surrency and Owsley, 2006). Its blueish green leaves grow from 8-20 inches long and up to 0.5 inches wide (Tiner, 2009; USDA-NRCS, 2012). Robust stems with a diameter of up to 0.5 inches form a hard, knotty base (Gleason and Conquist, 1963; USDA-NRCS, 2012). Narrow, densely flowered panicles up to 2 feet long form from July to August (Hough, 1983; Tiner, 2009). Flowers produce bright orange anthers. Elliptically shaped gray to tan seed 0.06-0.09 inches long and 0.04-0.05 inches wide (Palmer, 1975) is produced October through November (Hough, 1983; Lorenze et al., 1991; Tiner, 2009).

Coastal panicgrass is often mistaken for bitter panicgrass (*Panicum amarum* Elliott var. *amarum*), a closely related species. Coastal panicgrass tends to have a more erect, bunch forming habit while bitter panicgrass tends to be more prostrate. Panicle width and flower density have also been used to distinguish the two varieties. Bitter panicgrass has narrower and more sparsely flowered panicles compared to the wider and heavily flowered panicles of coastal panicgrass. These characteristics are at least somewhat impacted by ecological conditions with differences becoming more pronounced at the northern end of the species range and less distinct at the southern end of the range (Palmer, 1975).

**Distribution:** Coastal panicgrass commonly occurs on the dunes of sandy coastal beaches from the Northeast United States to Mexico. The widely accepted native range is along the east coast from New Jersey to as far south as the Yucatán Peninsula of Mexico (Lonard and Judd, 2011). Coastal panicgrass is rare in Rhode Island but it is reported to occur as far north as Barnstable County, Massachusetts (Tiner, 2009; USDA-NRCS, 2019). It can be grown in USDA hardiness zones 7a-12b but may winterkill during especially harsh winters at the northern extent of the zone and inland (USDA-NRCS, 2012). For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

**Habitat:** Coastal panicgrass most frequently grows in tufts in the coastal dune environment from the leeward side of the primary dune in the pioneer zone to the scrub zone in association with American beachgrass (*Ammophila breviligulata*), saltmeadow cordgrass (*Spartina patens*), seaoats (*Uniola paniculata*), seacoast marsh elder (*Iva imbricata*), devil's-tongue (*Opuntia humifusa*), amberique-bean (*Strophostyles helvola*), southeastern wildrye (*Elymus glabriflorus*), partridge pea



Coastal panicgrass (*Panicum amarum* Elliott var. *amarulum*). Photo by Scott Snell, USDA-NRCS, Plant Materials Program.

(*Chamaecrista fasciculata*), Adam's needle (*Yucca filamentosa*), hairawn muhly (*Muhlenbergia capillaris*), shore little bluestem (*Schizachyrium littorale*), common evening primrose (*Oenothera biennis*), Carolina rose (*Rosa carolina*), gulf croton (*Croton punctatus*), seaside goldenrod (*Solidago sempervirens*), largeleaf pennywort (*Hydrocotyle bonariensis*), yaupon (*Illex vomitoria*), wax myrtle (*Morella cerifera*), northern bayberry (*Morella pensylvanica*), eastern baccharis (*Baccharis halimifolia*), winged sumac (*Rhus copallinum*), peppervine (*Nekemias arborea*), Virginia creeper (*Parthenocissus quinquefolia*), muscadine (*Vitis rotundifolia*), devilwood (*Osmanthus americanus*), beach plum (*Prunus maritima*), eastern red cedar (*Juniperus virginiana*), and live oak (*Quercus virginiana*) (Graetz, 1973; Slattery et al., 2003; Wootton et al., 2016). Coastal panicgrass also occurs along the borders of intertidal marshes and has been reported to colonize disturbed sandy sites (Anderson and Alexander, 1985; Hill, 1986).

### **Adaptation**

Coastal panicgrass is extremely drought resistant and salt spray tolerant making it well adapted to its indigenous habitat on the coastal dunes (Graetz, 1973; Lorenze et al., 1991). It is a barrier plant in the dune pioneer zone, protecting more salt susceptible species beyond the primary dune. In a study examining the salinity tolerance of American beachgrass, saltmeadow cordgrass, sea oats, and coastal panicgrass seedlings, Seneca (1972) found coastal panicgrass to be the second most salt tolerant of the four species tested based on growth response. Miller (2013) also found coastal panicgrass can withstand occasional saltwater treatments. Coastal panicgrass is most adapted to the well-drained, sandy soils of the Atlantic Coastal Plains but will tolerate poorly drained soils (Lorenze et al., 1991; USDA-NRCS, 2006 a). It can withstand a soil pH range of 4.5-7.5 (Salon and Miller, 2012). It is intolerant of shade and does not do well as an understory plant (Lorenze et al., 1991).

### **Uses**

*Conservation Practices:* Coastal panicgrass has an upright growth habit, is resistant to lodging, is easily established, long-lived, and manageable. These characteristics make it an ideal candidate in Hedgerow (422), Vegetative Barrier (601), and Herbaceous Wind Barrier (603) plantings (USDA-NRCS, 2012). Belt (2015) reported coastal panicgrass as a top performer in a trial evaluating the ability of 40 species to reduce or limit the spread of dust, odor, and ammonia emitted by poultry farm exhaust fans. Additionally, coastal panicgrass has proven applications for the NRCS Critical Area (342) standard for dune stabilization plantings, mined land reclamation sites, and dredged material revegetation (Knight et al., 1980; USDA-NRCS, 2012). It is one of the few dune stabilization species to be successfully established by direct seeding (Wootton et al., 2016). Coastal panicgrass may also be used to stabilize other Critical Area sites e.g. gravel pits, dikes, and road banks (USDA-NRCS, 2006 a). Coastal panicgrass could also be applied to long term management plans using the NRCS Herbaceous Weed Treatment (315) standard. Planting coastal panicgrass in coastal dune environments is recommended as a means of discouraging the recolonization of the invasive Asiatic sand sedge (*Carex kobomugi*) following successful treatment control measures (TLC, 2017).

*Wildlife:* Coastal panicgrass provides food and shelter for a variety of species including songbirds, waterfowl, and small mammals (Slattery et al., 2003). The calorie dense seed provides doves and quail with a concentrated energy source in the late fall/early winter when other food sources may be scarce (Surrency and Owsley, 2006). In a study of grassland bird habitat frequented for breeding purposes by the regionally rare grasshopper sparrow, Rudnicki et al. (1997) reported coastal panicgrass as a dominant species at one of the sites tested. Pernell and Soots (1975) reported a highly successful herring gull colony with nests next to bunches of coastal panicgrass. In an additional study of the nesting habits of sea birds, McNair and Gore (2000) reported coastal panicgrass as the dominant vegetation on a Florida island for two breeding seasons. Coastal panicgrass habitat is the preferred habitat of eight subspecies of beach mice: Alabama beach mouse, Perdido Key beach mouse, Santa Rosa beach mouse, Choctawatchee beach mouse, St. Andrew beach mouse, Anastasia Island beach mouse, Southeastern beach mouse, and pallid beach mouse. With the exception of the Santa Rosa beach mouse, all have been listed as threatened or endangered by either the United States Fish and Wildlife Service or the Florida Fish and Wildlife Conservation Commission (Bird et al., 2002). The beach mouse subspecies (the pallid beach mouse has been declared extinct) depend on coastal panicgrass for shelter and its seed as a constituent of their diet (Dziergowski, 2009; Lonard and Judd, 2011).

*Forage:* Coastal panicgrass is readily grazed by cattle and provides a sufficient level (140 g kg<sup>-1</sup>) of crude protein to support beef production (Mehaffey et al., 2005). In a study examining the performance of tall fescue (*Schedonorus arundinaceus*) bermudagrass (*Cynodon dactylon*), yellow bluestem (*Bothriochloa ischemum*), and coastal panicgrass pasture systems, the coastal panicgrass pasture system produced the greatest steer gains during the warm-season grass growth period (Burns et al., 2012). However, Burns et al. (2012) reported that coastal panicgrass pastures could not support the same level of steer stocking as tall fescue/bermudagrass pasture systems without signs of severe stand weakening following a second year of grazing. The researchers concluded that coastal panicgrass pastures could be advantageous for grazing if incorporated into a rotational stocking system.

*Ornamental/landscaping:* The blueish green leaves and bright, vibrant orange anthers of coastal panicgrass make it a desirable plant for ornamental and landscaping purposes (Craig, 1976). This is especially true for landowners in coastal communities whose properties are adjacent to or within the vicinity of the dune environment. Many traditional ornamental plants cannot tolerate the salt spray and/or the native sandy soils of the barrier islands and littoral areas where most coastal communities occur.

*Biofuel Production:* In studies examining the biofuel potential of warm season grasses, coastal panicgrass has displayed greater biomass production than some big bluestem (*Andropogon gerardii*), eastern gamagrass (*Tripsacum dactyloides*), switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*) varieties (Viands, et al., 2010). The average annual yield of ‘Atlantic’ coastal panicgrass was slightly over 6 dry tons/acre after 4 years of data collection (USDA-NRCS, 2012). Coastal panicgrass’ tolerance for saline conditions may make it the ideal choice as a biofuel crop on marginal agricultural land that has been impacted by saltwater inundation (Miller, 2016).



*Flowering spikelet of coastal panicgrass displaying orange anthers and purple stigmas. Photo by Scott Snell, USDA-NRCS, Plant Materials Program.*

### **Ethnobotany**

Various species of panicgrass were used for medicinal purposes by Native Americans. The Seminole Tribe used panicgrass medicinally as an antirheumatic (external), cough medicine, pulmonary aid, and throat aid (Hutton, 2010). The Natchez and Creek Tribes used panicgrass to treat malaria fevers (Hutton, 2010). The Miccosukee Tribe used panicgrass as a treatment for ‘gopher-tortoise sickness’ (Lamphere, 2006). The Cherokee Tribe padded their moccasins with stems from panicgrass (Lamphere, 2006).

### **Status**

*Threatened or Endangered:* Coastal panicgrass is listed as endangered in Pennsylvania, threatened in Connecticut, and as a species of special concern in Rhode Island (USDA-NRCS, 2019). Coastal panicgrass is ranked as “S3” in New Jersey meaning “Not yet imperiled in state but may soon be if current trends continue” (Snyder, 2016).

*Wetland Indicator:* FAC for Atlantic and Gulf Coastal Plain region; FACU for all other regions in which it occurs (USACE, 2018).

*Weedy or Invasive:* Coastal panicgrass is listed as introduced in Massachusetts (CZM, 2019).

This plant may become weedy or invasive in some regions or habitats and may displace desirable vegetation if not properly managed. Please consult with your local NRCS Field Office, Cooperative Extension Service office, state natural resource, or state agriculture department regarding its status and use. Please consult the PLANTS Web site (<http://plants.usda.gov/>) and your state’s Department of Natural Resources for this plant’s current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

### **Planting Guidelines**

Although establishment in the coastal dune environment via vegetative plugs is the recommended method, establishment via direct seeding is possible under appropriate conditions (Lorenze et al., 1991). Soil moisture is critical with best results achieved in moist sand (Darovec et al., 1975; Slattery et al., 2003). Direct seeding into saline environments is also a feasible option. Coastal panicgrass seed will germinate at salinity levels almost equal to the levels that seedlings can tolerate (Seneca, 1972). Plant seed 1-3 inches deep; shallower for finer textured soils with higher silt content and deeper for coarse textured soils. Mulching the seeding area will improve establishment results (Craig, 1991; USDA-NRCS, 2012). In replicated seeding

depth trials on sand dunes conducted by the New Jersey Plant Materials Center, coastal panicgrass seeded 1 inch deep consistently showed greater seedling emergence than seed planted at 0.5 inch. Plant seed by broadcasting and incorporating to ensure good seed to soil contact or using a drop seeder, drill, or other seeding equipment. A single row garden push seeder is the simplest, small scale option (USDA-NRCS, 2007). Recommended seeding rates range from 6-15 lb/acre if drilled and up to 20 lb/acre if broadcast (USDA-NRCS, 2007; Wootton et al., 2016). Use containerized plugs or bare root divisions that are at least 12 inches tall for vegetative establishment. Plant spacing of 6-8 feet between rows and 18 inches within the row is recommended to obtain about 5,000 plants/acre for satisfactory coverage on dunes (Wootton et al., 2016). Recommended planting dates for seed and vegetative establishment are from November first to March first or June first to September first for the Gulf Coast region and March to May for the Mid-Atlantic region (USDA-NRCS, 2007; Wootton et al., 2016). Fertilizer application recommendations are always site dependent. While most native species do not require fertilizer amendments during the establishment year, some recommendations have been made for coastal panicgrass, see management section (Dickerson et al., 1997; USDA-NRCS, 2006 a; USDA-NRCS, 2007).

Establish seed production fields following the same guidelines and methods for coastal dune environment conservation plantings. The site should receive full sun and have soils that are well-drained and course to medium textured. Preferred annual precipitation is at least 30 inches. The soil pH should be amended if necessary, until slightly acidic to neutral (Dickerson et al., 1997).

### **Management**

For wildlife habitat applications, mowing is a treatment option to control undesired vegetation. Coastal panicgrass withstands mowing well. Rudnicki et al. (1997) reported it to be a dominant species following mowing treatments of grassland bird habitat. Prescribed burning suppresses weeds, controls the spread of unwanted perennial species, and kills some weed seeds (USDA/EPA, n.d.). In addition to weed control, controlled burning assists in nutrient recycling and stimulates seed production (USDA-NRCS, 2006 a). Selective herbicide applications are a reliable means of weed control (USDA/EPA, n.d.). Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA-NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

Fertilizer recommendations for coastal panicgrass are inconsistent. Top or side dressed single application and split applications (June and August) of 10-10-10 fertilizer applied at rates ranging from 400-600 lb/acre annually have been recommended for both seed production fields and coastal dune plantings (USDA-NRCS, 2007; USDA-NRCS, 2006 a). More recent fertilization recommendations for the coastal dune environment address water quality concerns due to excess nutrients from overfertilization. In response, lower fertilization rates (20-30 lb/acre nitrogen) and alternative nutrient sources (slow release fertilizers and organic options) are recommended for coastal dune sites (Wootton et al., 2016). In all cases, base fertilizer applications on soil test results of the planting site. Contact your local agricultural extension for soil test analysis and fertilizer application recommendations prior to implementing a fertilization plan.

### **Pests and Potential Problems**

In the Mid-Atlantic coastal dune environment, coastal panicgrass has been reported to be negatively impacted by plant parasitic nematodes. Seliskar and Huettel (1993) reported a correlation between the presence of plant parasitic nematodes and reduction of plant health. Coastal panicgrass did not show any signs of plant stress the initial year that nematodes were found, but signs of stress were reported in following years. Coastal panicgrass is a reported host of multiple fungal rust species (Farr and Rossman, 2019).

### **Environmental Concerns**

Coastal panicgrass is listed as introduced in Massachusetts (CZM, 2019; Lonard and Judd, 2011). Coastal panicgrass seed can remain viable for up to 5 years in its natural habitat without any specialized storage (USDA-NRCS, 2012). Although initial seed dispersal is limited to no more than 20 feet, consumption by wildlife and floatation on moving waters are two possible means by which seed could become distributed greater distances to non-native habitats (Lonard and Judd, 2011; USDA-NRCS, 2012). Coastal panicgrass rhizomes are a viable means of regeneration in favorable conditions and may spread 3 feet in a single growing season (USDA-NRCS, 2012). Coastal panicgrass has been reported to invade the frontal dune system but will not become well established due to the inevitable burial of the shifting sands (Palmer, 1975). Coastal panicgrass has not been reported to cause any allelopathic effects (USDA-NRCS, 2012).

### **Seeds and Plant Production**

Coastal panicgrass is propagated vegetatively or by seed (USDA-NRCS, 2006 a). Seed production fields reach maturity and become productive in two growing seasons. Up to 300 lb/acre of cleaned seed is produced by properly managed seed production fields (USDA-NRCS, 2012). Seed production is stimulated by annual prescribed burns in late winter or early spring (USDA-NRCS, 2006 a). Coastal panicgrass seed ranges from 325,000-350,000 seeds/lb (Dickerson et al., 1997;

USDA-NRCS, 2012). Laboratory viability tests of seed produced at the New Jersey Plant Materials Center from 2001 to 2020 ranged from 70 to 94 percent with an average rate of 84 percent. Coastal panicgrass maintains excellent longevity under ideal storage conditions. Seed stored in a seed cooler (4°C and 40 percent relative humidity) at the New Jersey Plant Materials Center maintained 75 percent or greater viability rates after 9 years of storage with germination rates increasing after storage in some instances.

Harvest seed with hand tools (hand sickles) or on a greater scale with mechanical agricultural equipment. Seed has been successfully harvested at the New Jersey Plant Materials Center using a plot harvester with a standard grain head. Harvester settings depend on a multitude of variables (equipment, environmental conditions, management methods, etc.), but the following ranges have proven satisfactory: cylinder spacing of 0.26-0.28 inch, cylinder speed of 1000 rpm, and a low air flow setting. Seed is typically harvested in early October in the Mid-Atlantic region of the U.S.

Seed cleaning methods depend upon the harvest method. If harvested with hand tools, thresh seed before attempting to separate the chafe from the seed. Thresh seed with mechanized seed cleaning equipment or use a manual rubbing board. Small harvest amounts can be mechanically threshed using a slightly modified kitchen blender (Scianna, 2004). Air and screen seed cleaning equipment readily separates chafe from seed using 0.31-0.14 inch round holes for the top screen and 1/22 inch round holes for the bottom screen.

#### **Cultivars, Improved, and Selected Materials (and area of origin)**

These plant materials are readily available from commercial sources. ‘Atlantic’ coastal panicgrass is a cultivar developed and released in 1981 by the Cape May, NJ Plant Materials Center, USDA-NRCS. The source material for Atlantic was collected from Back Bay Wildlife Refuge, Princess Anne County, Virginia. It was selected for seedling vigor, uniform characteristics, and rust resistance (USDA-NRCS, 2006 b). It is recommended for critical area, forage, hedge row, salt affected sites, and wildlife applications (USDA-NRCS, 2012)

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