Sand, Prairie and Rough dropseed

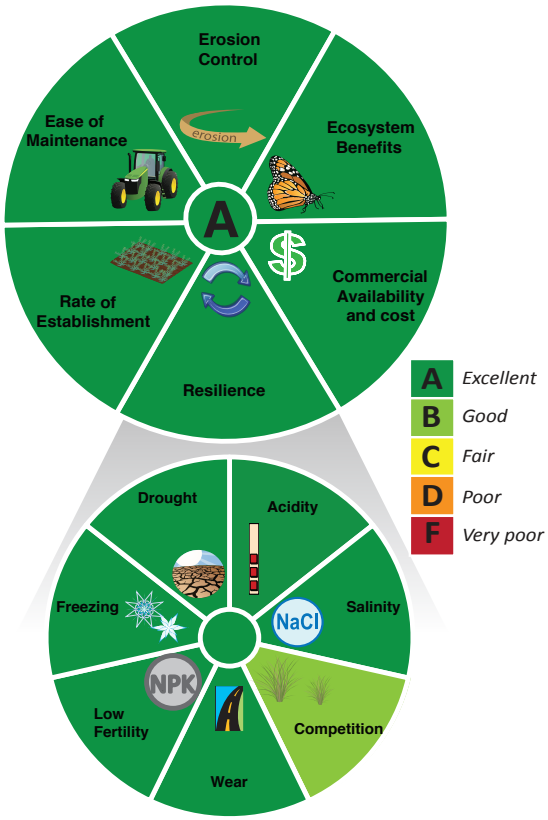
Sporobolus cryptandrus, S. heterolepis, and S. asper = S. compositus

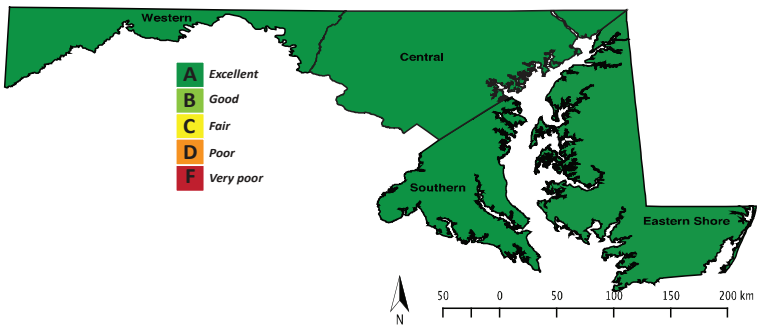
Dropseeds are native grass species that provide excellent services for roadside management including high erosion control benefits, excellent resilience to roadside conditions, and superior ecosystem benefits. Dropseeds are best used in combination with other species to enhance biodiversity. As the top recommended group of species, dropseeds are rated as Excellent (grade = A) with a few minor management concerns:

Although the seed cost per pound for dropseeds is high, the seeding rate is low such that the cost per acre is excellent.

Dropseeds attain moderate plant height such that mowing may be required to maintain sight distance.

Germination and establishment rates are good but variable, requiring extra attention to seed pre-treatment.





Dropseeds are adapted to environmental conditions throughout Maryland.

If seed costs can be improved, dropseeds could be more widely used in roadside management. Commercial growers should also consider growing two additional dropseed species that are common along roadsides but are currently not available commercially – poverty grass (*S. vaginiflorus*) and small dropseed (*S. neglectus*).

Biology: One hundred and eighty-nine species within the genus Sporobolus are recognized worldwide. Most Sporobolus species that occur within the United States are adapted to southern climates (Leithead 1973) but ten species are present in the mid-Atlantic region (Rhoads and Klein 1993, USDA Plants Database). Of these, three species (*S. compositus*, *S. cryptandrus*, and *S. heterolepis*) are commercially available. Some species within the genus are desiccation tolerant ('resurrection species'; Wood and Gaff 1989). Others are drought resistant due to drought avoidance mechanisms such as deep roots (Hameed et al. 2008). Some have salt glands and are therefore salinity tolerant (Wood and Gaff 1989).

Sand dropseed (*Sporobolus cryptandrus*) is a native perennial warm-season bunch type grass that is widespread throughout the United States and southern Canada and occurs in many different habitats, including roadsides, rocky to sandy shores, slopes, scrub, and woodlands (Jepson Manual 1993), and at elevations from 0 to 2900m (Peterson et al 2002; http://herbarium.usu.edu/webmanual). Despite its widespread habit, it is most common on the North American Great Plains and intermountain region (Leithead 1973, Johnson 2008). It is listed as rare in Pennsylvania (Rhoads and Klein 1993) and has not been documented by the Maryland Biodiversity Project. The species produces abundant seeds and can therefore be of value commercially as well as for wildlife. It is tolerant of heavy grazing and mowing (Johnson 2008) and is drought hardy (USDA plant guide). It is used for rehabilitating disturbed sites (USDA Forest Service).

Prairie dropseed (*Sporobolus heterolepis*) is a perennial grass species that occurs on serpentine barrens of the mid-Atlantic region. Prairie dropseed is state rare in both Pennsylvania (Rhoads and Klein 1993) and Maryland (S1; Maryland Biodiversity Project) where it occurs only on serpentine barrens. Prairie dropseed is used widely for roadside revegetation, grassland rehabilitation, and residential landscapes (USDA Forest Service).

Rough dropseed or tall dropseed (*Sporobolus compositus = S. asper*) is a long-lived perennial species that is most widespread in the Great Plains and the Midwest but occurs almost throughout the United States except California, Nevada, Florida, South Carolina, New Hampshire, Alaska, and Hawaii. It occurs patchily in Pennsylvania (Rhoads and Klein 193) and is considered state rare (S1 rank) in Maryland where it has been documented to occur in Montgomery, Anne Arundel, Queen Anne's and Talbot counties (Maryland Biodiversity Project). Tall dropseed occurs on dry sites in the eastern United States and is often associated with disturbed lands such as roadsides and railroad banks. It does not produce rhizomes but has a persistent seed bank (USDA Forest Service).

Seeds per pound:

Sand dropseed:	5,600,000 (Ernst Conservation Seed); 5,300,000 (Stock Seed Farms); 3,200,000 (Prairie Moon Nursery); 1,760,000 (Agrecol)
Prairie dropseed:	240,000 (Stock Seed Farms); 256,000 (Prairie Moon Nursery and Agrecol)
Composite dropseed:	760,000 (Ernst Conservation Seed); 750,000 (Roundstone Native Seed); 450,000 (Prairie Moon Nursery), 480,000 (Agrecol)

Cost per pound:

Sand dropseed:	$10 from Ernst Conservation Seed and Chesapeake Valley Seed

Prairie dropseed: $120 from Ernst Conservation Seed
Composite dropseed: $ 24 from Ernst Conservation Seed

Suggested sowing rate:
Sand dropseed: 1 pound per acre (Chesapeake Valley Seed and Ernst Conservation Seed)
Prairie dropseed: Drilled 6 lbs/acre (Stock Seed Farms); does not establish well when direct seeded
Composite dropseed: Unknown

Cost per acre:
Sand dropseed: $10.00 per acre
Prairie dropseed: $720.00 per acre
Composite dropseed: unknown

Sowing depth: 1/8 inch (USDA Plant Guide)
Germination time: 7-10 days
Seeding timing: Fall or early spring; cold stratification is necessary for good germination.
Seed viability: Low
Length of growing season: Late winter or early spring (USDA Plant Fact Sheet)
Leaf length:
Sand dropseed: 3-10 inches (USDA Forest Service)
Prairie dropseed: 6-18 inches (USDA Forest Service)
Composite dropseed: 20 inches (USDA Plant Fact Sheet), 2-28 inches USDA Forest Service)

Height at seed head stage:
Sand dropseed: 12-40 inches (USDA Forest Service)
Prairie dropseed: 1-3 ft (USDA Forest Service)
Composite dropseed: 2-4 feet (USDA Plant Fact Sheet), 8-51 inches (USDA Forest Service)

Shade tolerance: intolerant of shade (USDA Forest Service)
Suggested mowing height: Unknown; do not mow in July and August
Tolerance of wet conditions: Sand dropseed is an upland species and will not tolerate wet conditions for prolonged periods of time.
Humidity tolerance: Adequate for those Sporobolus species adapted to the mid-Atlantic region.
Disease resistance: Unknown

Services:


Commercial availability and cost: Sand dropseed, prairie dropseed, and composite dropseed are available commercially from several native plant nurseries. Prairie dropseed is significantly more expensive and yet contains the least amount of seeds per pound than the other two species. Sand dropseed is the least expensive, has the most seeds per pound and the lowest sowing rate.


Rate of establishment: Establishment of dropseed is variable and depends on whether seed has been pre-treated. Sand and composite dropseed require overwintering and scarification for germination because new seed is very hard and impermeable (USDA Plant Guide, USDA Forest Service). Germination was only 6% after 6 weeks of cold and moist conditions, 44% after 9 weeks of stratification, and 96% after 15 weeks (USDA Forest Service). Seeds stay viable in the soil for a long time with germination increasing as seeds age. Ten to twenty-five percent of sand dropseed germinated in lab and field experiments (Biesboer 1994, 1998) but pretreatment with potassium

nitrate resulted in 39% germination of composite dropseed. Fedawa and Stewart (2009) found very high viability of seeds for prairie dropseed but low germination percentage. Only ~1-5% of prairie dropseed germinated in Minnesota (Biesboer 1994). Germination of prairie dropseed in petri dishes was 5-13% after cold stratification and only 2% in NE Illinois field plots (Gibson and Carrington 2008). Ninety-one percent of composite dropseed seeds germinated when planted in April, but the previous year none of the seeds germinated when planted in April (USDA Forest Service). In a drought experiment of 15 grass species, composite dropseed showed excellent establishment (Mueller and Weaver 1942). Composite dropseed was used to seed reclaimed Appalachian surface mines (Thorne et al. 2011) where it established a good population density after 30 days (33% viable seeds sown) that was maintained at 24-29% across two years. At the end of the 2-year study, composite dropseed began to spread into adjacent plots.

Seedlings may have low vigor and will therefore be susceptible to drought and grazing before becoming fully established (USDA Plant Guide). The USDA Forest Service suggests that composite dropseed establishes and spreads quickly on open sites owing to high seed production and good viability.


Ease of maintenance: Sand dropseed, prairie dropseed, and composite dropseed are all tall perennial plants that will grow ca. 1 m tall (Brown et al. 2010, USDA Plant Guide). Some mowing will therefore be required to be acceptable for roadsides.

Erosion control: Sand dropseed is considered an excellent species for erosion control because it produces dense mat-forming rhizomes (USDA Forest Service). In a roadside experiment along Rhode Island right-of-ways, Brown et al. (2010) showed that sand dropseed had an even root distribution that reached the bottom of rooting columns at 76 cm depth. Similarly, prairie dropseed produces an extensive root system that spreads horizontally in the upper soil by 1-2 ft and extends down vertically by 4-5 ft (Weaver 1958). Composite dropseed roots may extend to 18 inches (45 cm) soil depth (USDA Forest Service) but the species does not produce rhizomes.


Ecosystem benefits: Sand dropseed, prairie dropseed, and composite dropseed are native species. Their seeds provide food for birds and small mammals and their foliage provide forage for wildlife and cover for small animals (USDA Plant Fact Sheet). Sand dropseed has been used by Native American tribes to make bread and porridge and was used to create a cold infusion to aid in the healing of horse legs (USDA Plant Guide). Sand dropseed may become weedy and invasive in grazed environments because herbivores prefer more palatable grasses than sand dropseed (USDA Plant Guide).


Resilience:


Drought: Sand dropseed is considered to be a very drought tolerant warm season bunchgrass that produces a deep root system (Brown et al. 2010) and therefore has access to water resources within the soil column. Composite dropseed is considered drought tolerant but less so than sand dropseed (USDA Plant Guide). In a drought experiment of 15 grass species, composite dropseed showed excellent establishment and drought tolerance compared to most species (Mueller and Weaver 1942). Only buffalograss and blue grama were more drought tolerant but composite dropseed was more tolerant than side-oats grama and prairie junegrass. Sand dropseed planted along a Rhode Island roadside was one of 8 species (out of 14) that did not survive a drought. New transplants

failed to survive as well (Brown et al. 2010). This poor survival is likely due to low adaptation to the New England environment (R. Brown *pers. communication*) rather than poor tolerance to drought.

Low fertility: Sand dropseed increases on poor condition sites (USDA Plant Guide). Composite dropseed can occur on sites with little organic matter (USDA Forest Service).


Freezing*:* Sand dropseed grows at elevations up to 8,000 feet (USDA Plant Fact Sheet) and composite dropseed up to 6,500 feet (USDA Forest Service).

Salinity: The genus *Sporobolus* is generally well adapted to soils that are saline. In a study of seven grasses evaluated for salinity tolerance (Marcum 1999), salt grass > alkali sacaton (*Sporobolus airoides*) > bermudagrass = Zoysia > sand dropseed > buffalograss > side-oats grama. Prairie dropseed was more tolerant of salinity than sand dropseed (Biesboer 1994), and germination percent increased from 5% to 13% when salinity was increased in petri dishes (Gibson and Carrington 2008). Sand dropseed, however, did not survive salinity treatments in Biesboer (1998). The biomass yield and foliage injury in the predominantly western species *S. airoides* was not affected by salinity treatments (Greub et al. 1985), but seedling survival of the species was completely inhibited by salinity treatments (Hughes et al. 1975).


Acidity: Dropseeds have a wide pH range that varies by species. Composite dropseed can occur on soils ranging from 5.5 to 7 (Thorne and Cardina 2011).


Wear tolerance: Sand dropseed can withstand heavy use owing to a protected root crown; however plants will be killed by overgrazing (USDA Plant Guide). *Sporobolus elongates*, a species in Australia, showed high flexibility and resistance to trampling suggesting that it is wear tolerant (Sun and Liddle 1993). Prairie dropseed will decrease in response to heavy grazing (USDA Forest Service). Composite dropseed may increase following mowing (USDA Forest Service) but mowing in July and August may result in declines.


Competition: Composite dropseed was able to withstand the reinvasion of Kentucky bluegrass better than many other species seeded on reclaimed surface mines (Thorne et al. 2011).

Mixes: Prairie dropseed co-occurs with little bluestem (Weaver 1958), big bluestem, indiangrass, side-oats grama, and switchgrass (USDA Forest Service). It can also occur with buffalograss and blue grama in shortgrass prairie (USDA Forest Service).

Other Species: Two dropseed species are annual (*S. vaginiflorus* and *S. neglectus*) and are common on dry thin soils such as roadsides (Fernald 1933) but are not available commercially. Poverty grass (*Sporobolus vaginiflorus*) is a native annual grass species that occurs in the Eastern United States and eastern Ontario (Catling 2013). The species occurs as an early successional species on disturbed sites (Simmons et al. 2011). Thus, it is observed frequently along roadsides (Catling 2013). The species is low growing and inconspicuous. In Central Europe, poverty grass is considered an invading grass species along roadsides although conservation threats have not been reported (Kiraly and Hohla 2015).

Seashore dropseed *(Sporobolus virginicus*) is a halophyte that occurs in tropical and subtropical coastal zones world-wide and is considered a low-maintenance turfgrass. In the United States, it occurs in southern states (Leithead 1973) and along the eastern coast up to Maryland. Seashore dropseed will continue to thrive under full strength sea water (Marcum 2008a,b). Seeds have low viability. Thus, seashore dropseed needs to be planted by sodding.