Cool-Season Grasses of South Dakota

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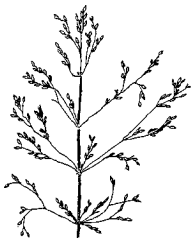
Introduction

There are several types of grasses found in pastures and rangelands throughout South Dakota and the Northern Great Plains. Knowing which grasses are in your pastures and rangelands can influence grazing management decisions, and ultimately impact animal performance.

This guide focuses on common South Dakota cool-season grasses – grasses that utilize the C3 photosynthetic pathway. Cool-season grasses have an optimum temperature range of 65-75°F for the most active growth. Growth typically starts when the soil temperature reaches 40-45°F. Plants become less efficient as temperature increases; however, cool-season plants generally provide a higher percentage of crude protein compared to warm season plants.

Cooler temperatures during the day and night, along with shorter photoperiods, and higher soil moisture in the spring and fall help cool-season grasses with production. Growth slows down in the summer and plant dormancy is induced due to high temperatures and low precipitation. As we see in South Dakota, growth generally resumes in the fall when fall temperatures drop and if moisture is readily available. South Dakota rangelands are largely composed of cool-season grass plants.

For each grass, the common and most current scientific name are provided, as well as an identification description – Figure 1 provides images of Poaceae (grass) inflorescence types and vegetative features that are helpful for identification. In addition, a discussion of the habitat and grazing considerations are given for each grass.

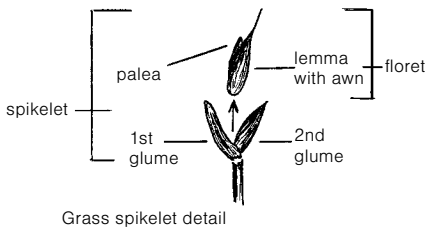


Panicle

Wheatgrass spike

One-sided spikes of blue grama (6 cm long)

Inflorescence of big bluestem, spicate raceme (10 cm long), plus closeups of paired spikelets; 1 sessile, 1 stalked (20 mm long)



Grass spikelet detail

Laterally compressed floret and stylized cross-section

Dorsally compressed floret, its spikelet, and stylized cross-section of floret

Figure 1a. Poaceae (Grass) Inflorescence Types

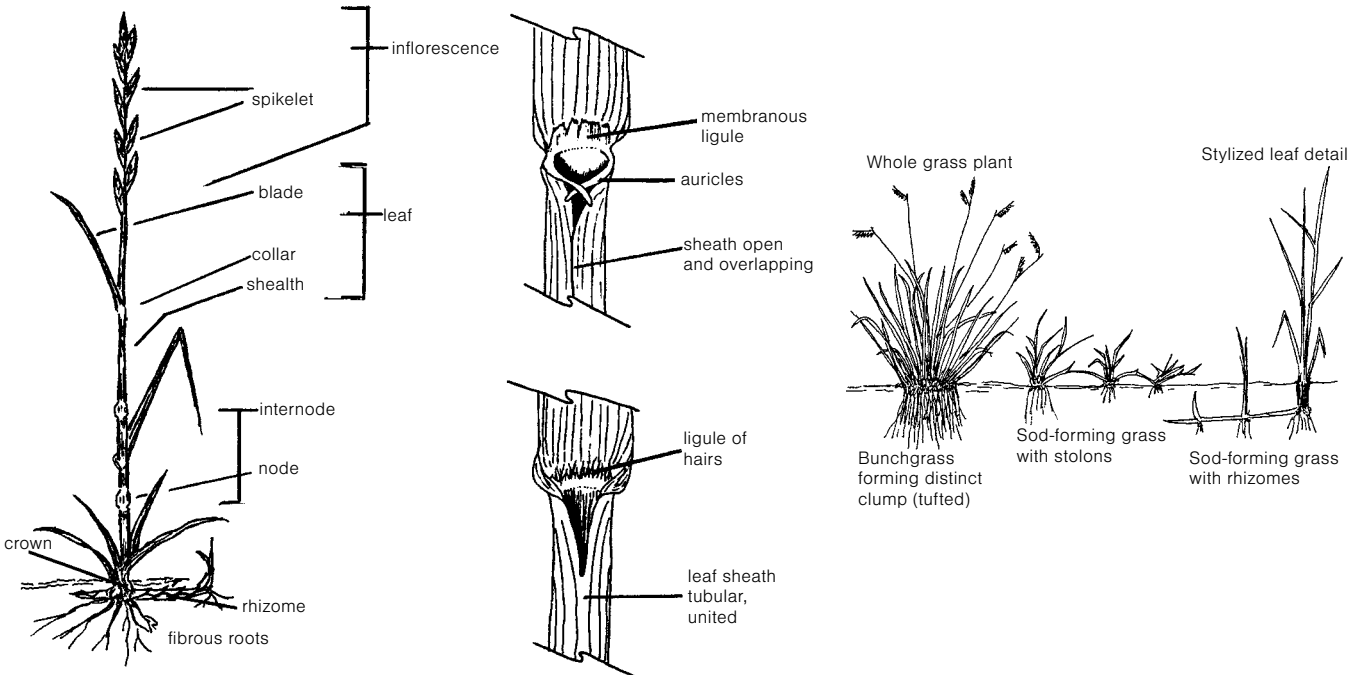


Figure 1b. Poaceae (Grass) Vegetative Features

Terms Used

Alkali soil: soil that has a very high degree of alkalinity (pH > 8.5 or higher), or it has a higher percentage of exchangeable sodium (15% or more), or both characteristics. Growth of most plants is reduced or prevented.

Auricle: "ear lobes" at the base of leaf blades, often clasping the stem; the lateral appendages at the collar of a grass leaf.

Bunchgrass: grass with a characteristic growth habit that forms a bunch or tuft. Example: crested wheatgrass.

Decreaser: plant species that decreases in relative abundance with grazing pressure, fire, drought, or other continued disturbance.

Increaser: plant species that increases in relative abundance, at least for a time period, under continued disturbances like grazing, fire, or drought.

Introduced: a plant species that is not part of the original plant community of the area in question. Generally, from a different continent. Some introduced species have been cultivated for pasture and hayland.

Invader: a plant species that was *not found* in undisturbed portions of the original vegetation of a specific range site; however, it will invade and increase following disturbance or continued heavy grazing. Some invader species can enter a site that has not been disturbed.

Ligule: within the grass family, the ligule is the appendage, membrane, or ring of hairs on the inner side of a leaf at the junction of the sheath and blade.

Membranous: thin, soft, flexible – more or less translucent, like a membrane.

Native: a plant species that is part of the original plant community of the area in question. Generally, from the same continent.

Perennial: a plant that lives for 3 years or more.

Rhizome or Rhizomatous: a rhizome is a creeping underground stem, that often has scale leaves. Can produce shoots and roots at the nodes, which gives rise to new plants. Rhizomatous = a plant that has rhizomes.

Saline soil: soil that contains soluble salts, usually chlorides or sulfates. Concentrations are high enough to reduce plant growth; pH is < 8.5. Often has a white or gray crust on the soil surface.

Sod-forming: grasses that form a sod by rhizomes or stolons. Examples: Kentucky bluegrass, buffalograss.

Stolon: a horizontal stem above the ground surface that roots at the nodes and produces new plants. Examples: strawberry, buffalograss.

Native Cool-season Grasses

Slender wheatgrass, *Elymus trachycaulus*

Slender wheatgrass

Beardless slender wheatgrass, left; bearded slender wheatgrass, right

Identification

Bunchgrass, perennial. Typically 2-4 feet tall with a slender spike seed head 4-10 inches long that matures in July. Flat leaf blade, 1/16 to 1/8 inch wide and without hair. Short ligule; very small or absent auricle. Leaves and stem are often purplish tinted. Two forms are recognized, beardless, (subsp. trachycaulus) which has awns less than ¼ inch long and bearded, (subsp. subsecundus) with awns 0.25-1 inch long.

Habitat

Native to the mountain and intermountain areas of the western U.S. and Northern Great Plains. Common throughout South Dakota grasslands, including the Black Hills. Most common on overflow sites in western South Dakota. Prefers loamy and sandy loams in areas that receive at least 14 inches annual precipitation. Grows on moist to dry sites and has moderate to good tolerance of alkaline conditions. Less drought tolerant compared to crested or western wheatgrass.

Grazing considerations

Palatable and nutritious to livestock. Makes good quality hay. Decreases with excessive grazing.

Western wheatgrass, *Pascopyrum smithii*

Western wheatgrass

Identification

Rhizomatous, sod former. Perennial. Plant is 1-2 feet tall with a 3-6 inch long seed head that matures in July. Has a characteristic blue-green color to it. Stiff and flat leaf blades that are angled at 45 degrees from the stem and taper to a sharp point; deeply ridged on the upper surface – feels like sandpaper if you run your thumb down it. Long and clasping auricles – often purple; short, membranous ligules. Strong, spreading rhizomes.

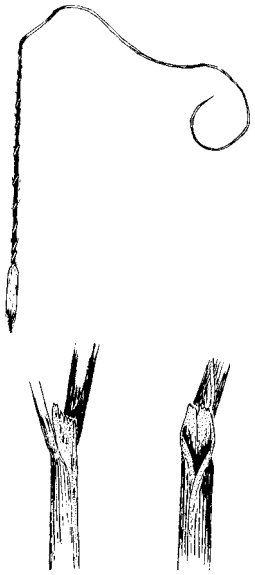
Habitat

Native to North America and found in the Northern and Central Great Plains. Most abundant grass in most of the South Dakota mixed prairie. State grass of South Dakota. Abundant on upland sites with high range condition and overflow sites in western and central South Dakota; tolerates a variety of soils from clay to sand and is found on heavy soils in the eastern part of the state. Can tolerate slightly acidic soils. Requires moderate to high soil moisture content – most common in the 10-14 inch precipitation zones. Often co-occurs with blue grama, buffalograss, needlegrass, and prairie junegrass, among others.

Grazing considerations

High forage quality. Below 20 inches of precipitation per year, it behaves as a decreaser – grazing abuse early in the season (spring) will decrease abundance. Will withstand drought and recolonize after a disturbance. Can be used a hay crop during high precipitation years or if supplemental water is used.

Needleandthread, *Heterostipa comata*



Awn and uniformly wide floret. Actual floret length is 5/16 inch. Ligule is split or frayed.

Needleandthread

Identification

Bunchgrass, perennial. Reaches 1-3 feet tall and has narrow panicles of which the lower portions are typically retained in the uppermost sheath. The sharp pointed seed has an awn that can be up to 6 inches long and curls when cured, resembling thread. Foliage is dull green in color. Leaf blades are 8-12 inches long, rough on the upper surface, flat or rolled, with tips commonly dying back. Conspicuous ligule has an unevenly split membrane – it looks like where you would “thread the needle.” No auricles.

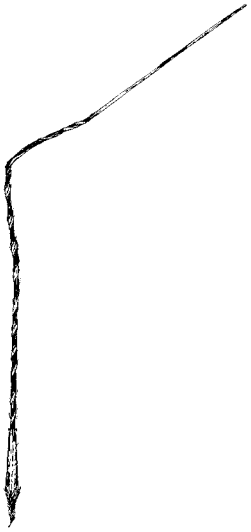
Habitat

Native throughout from the Yukon to southern Manitoba and Indiana, west to Texas, Arizona, and California. Within the Northern Great Plains, it is found in the mixed grass prairie and associates with western wheatgrass, blue grama, and threadleaf sedge. Common on sandy and silty sites in central and western South Dakota.

Grazing considerations

Readily grazed by all livestock, with emphasis on early spring and late fall grazing. It produces an abundance of basal leaves, which stay green during most seasons. It cures well on the stem and can provide good forage in the fall and winter. Awns can cause mechanical injury to eyes, mouth, and flesh of livestock, along with contamination of wool in sheep – suggestion is to remove livestock for 2-3 weeks until seeds ripen and fall to the ground. Can increase with increased grazing pressure or disturbance.

Porcupinegrass, *Hesperostipa spartea*



Floret tapers toward awn. Actual floret length (excluding awn) is 11/16 inch.

Porcupine grass

Identification

Bunchgrass, perennial. Plant is 1.5-3.5 feet tall with a narrow panicle seed head that is 6-8 inches long. Heavy spikelets cause the panicle to lean. Awns on the sharp pointed seeds can be up to 8 inches long. Rigid upper surface leaf blades, that are 1/16 to ¼ inch wide and up to 16 inches long, tapering to a point. Absent auricles; prominent and membranous ligules that are ⅛ to ¼ inch long and evenly cut (in contrast to needleandthread, which has an unevenly split ligule).

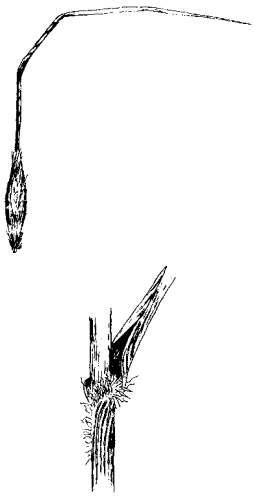
Habitat

Native and found throughout much of the Great Plains, over to Pennsylvania, and southwest to New Mexico. Commonly found in the tallgrass prairie of South Dakota, but also found in mixed grass prairie communities – especially across the northern tier counties. Likes sandy and silty upland soils in eastern South Dakota, as well as medium textured soils. Medium drought tolerance and no tolerance to salinity.

Grazing considerations

Nutritious and relished by livestock before awns develop. Awns can cause mechanical injury to livestock while grazing or from hay. Decreases under grazing pressure.

Green needlegrass, *Nassella viridula*



A twice-bent awn is common. Actual floret length (excluding awn) is ¼ inch. Ligule is a ring of hairs. Actual length of portion shown is ¾ inch.

Green needlegrass

Identification

Bunchgrass, perennial. Plant grows 18-36 inches tall. Seed head is a compacted panicle, 4-10 inches long. Flowering occurs early June with mature seeds by late June or early July. Curved, twice-bent awns are 1 inch long. Leaves are 4-12 inches long, often rolled, smooth, prominent veins above. Absent auricles; ligule is ring of hairs. Sheath is hairy at margins. Deep, fibrous roots can extend to 10 feet or more.

Habitat

Native to the Northern Great Plains and found down to Arizona and over to eastern Washington. Favors medium to fine-textured soils; found with western wheatgrass, needleandthread, and blue grama on medium-textured soils; needleandthread tends to drop out of the plant community on fine-textured soils. On very fine soils, blue grama decreases allowing green needlegrass and western wheatgrass to dominate.

Grazing considerations

Nutritious and palatable. Growth begins in early spring and cattle will seek it out, generally the most palatable needlegrass. If moisture conditions are favorable, growth will continue in the fall. Decreases under heavy grazing use. Stands up well for winter grazing. Unlike other needlegrasses, the awns are not as troublesome to livestock and can be grazed throughout the season.

Prairie junegrass

Junegrass

Identification

Bunchgrass, perennial. Reaches 8-24 inches tall. Very narrow panicles that are 1-5 inches long, resembling a pipe cleaner and matures in June. Leaves are up to 12 inches long, stiff, dark, green. Absent auricles. Short, membranous ligules. By mid-June, growth is complete, and plant becomes dormant until fall or the following spring.

Habitat

Native and found throughout Canada and in the U.S. except for the southeastern states. In the Central and Northern Great Plains, it serves as an important range plant, despite being scattered and seldom abundant. Grows well on upland sandy soils. In South Dakota it is found throughout the state, commonly in the mixed grass and short grass prairie ecosystems.

Grazing considerations

Cures early and acts as good and palatable forage to all domestic livestock and wildlife species. Easily overgrazed because it greens up earlier than most other native grasses. Can tolerate moderate grazing to 3 or 4 inches, even during fall months – if there is enough moisture available to stimulate re-growth. Decreases with increased grazing pressure.

Introduced Cool-season Grasses

Smooth brome, *Bromus inermis*

Smooth bromegrass

Identification

Sod former from creeping rhizomes. Perennial. Plant is 2-4 feet tall; seed head is a panicle 4-8 inches long that matures in July. Leaves are many, flat, and mostly basal, smooth, and shiny and vary in length from 4-10 inches. An “M” or “W” constriction occurs approximately two thirds up on the leaf blade – this is a key identifying characteristic. Auricles are absent and ligule is membranous and 1/16 inch long.

Habitat

Introduced from Europe in 1884 and is now considered naturalized in the northern two thirds of the United States and adjacent areas of Canada. Widely cultivated as hay, silage, and pasture. Found throughout South Dakota in planted fields, road ditches, and waste or wetland areas. Frequent invader of native grasslands and will successfully outcompete native plants, making it a nuisance on rangelands. Grows best on slightly acidic to slightly alkaline well drained clay loam soils that have high fertility.

Grazing considerations

Palatable to grazing livestock and of good quality – high in protein content and low in crude-fiber content. As an introduced cool-season grass, ranchers can utilize it early in the grazing season, while native grasses are not yet ready to be grazed. Grazing readiness occurs at the 3-leaf stage. Often utilized as hay in tame grass pastures.

Crested wheatgrass, *Agropyron cristatum*

Crested wheatgrass

Identification

Bunchgrass. Perennial. Plant is 1.5-3 feet tall. Seed head is a flattened, easily identifiable spike 1.5-3 inches long that matures in July. Flat leaf blade, moderately coarse above and smooth below, mostly basal and flat when growing. Short auricles and short and membranous ligule.

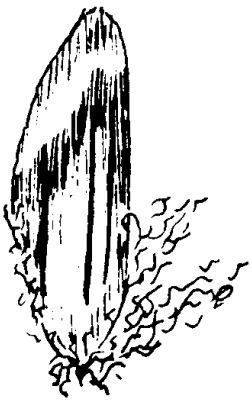
Habitat

Introduced in the late 1800s from eastern Russia. Was widely planted in the Great Plains and farther west when it gained favor as a soil holder during the 1930s drought and is highly drought tolerant. Considered invasive on native rangelands and is now found throughout South Dakota pastures from seedings in the 1930s. Grows well on shallow to deep, moderately coarse to fine textured, moderately well to well drained soils. Doesn't do well in saline soils where vigor and production are reduced.

Grazing considerations

Palatable to all classes of livestock and wildlife. Can withstand very heavy grazing pressure (65% use and greater) once stands are established. Three inches of stubble should be left at the end of the grazing season to maintain long term plant health. Again, as an introduced cool-season grass, it can be grazed early in the season at the 3-leaf stage. As the season progresses, it quickly goes dormant and loses most all grazing value.

Kentucky bluegrass, *Poa pratensis*



Floret removed from spikelet to show silky tuft or web of fine hairs at base. Actual floret length is ⅛ inch.

Kentucky bluegrass

Identification

Rhizomatous and sod forming. Perennial. Can be identified by an open, pyramidal shaped seed head with whorled branches and mostly basal, slender leaves that are 6-12 inches long and ⅛ to ¼ inch wide. Leaves have a distinct, double midvein (often described as "railroad tracks" or "skis") that come to a pointed keel. Absent auricles; very short ligule. Seedhead stems vary from 18-24 inches tall. If you separate the florets from the glumes, there's a tuft of cobweb type hairs.

Habitat

Introduced from Europe. Occurs extensively in cooler parts of North America. Widely used for lawns and golf courses. Is invasive throughout pastures in all areas of South Dakota. Best adapted to well-drained, fertile, medium-textured soils of limestone origin. Becomes essentially dormant during dry or excessively hot weather; it can survive severe droughts.

Grazing considerations

Highly palatable to horses, cattle, and sheep when green. One of the first grasses to green-up in the spring; can withstand heavy grazing pressure. Loses grazing value quickly with dormancy; livestock will deselect if excessive litter has built up from the plant. Production is typically less than other adapted grasses due to short stature and thin leaves. Can easily invade native rangelands if not managed and will take over pastures.

Plant Identification

If you are unsure of identifying a plant, collect the plant, and take it to your local SDSU Extension or NRCS office for help with identification.

The easiest and best way to get a collection is to pick the plant at ground level and cut it with a scissors or garden shears, and then place it in a Ziploc bag and place it in the refrigerator before you bring it in – this prevents mold. If you can dig the plant up for a sample, the roots can sometimes aid in identification. If it will be more than 2 days before you can bring it in to the office, it needs to be dried – place it between sheets of newspaper and place a heavy weight on top (like a stack of books). You will need to change the newspaper about every 2 days until it completely dries out to again reduce the risk of mold. It is also often helpful to share pictures of the habitat where the plant is growing and what it is growing next to, in addition to bringing the plant itself in for identification.

Summary

Although this list of cool-season grasses is not exhaustive, it provides details of common cool-season grasses that occur in South Dakota. It is important to note the grazing considerations for each plant, as they can be useful when developing a grazing plan for your operation. For more information, see the references below.

References

Oregon State University. Cool-season or warm-season grasses. https://forages.oregonstate.edu/regrowth/how-does-grass-grow/grass-types/cool-season-or-warm-season-grasses

Johnson J and G Larson. 2007. Grassland plants of South Dakota and the Northern Great Plains. South Dakota State University.

USDA Plants Database. https://plants.usda.gov

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