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South Dakota State University, Cooperative Extension, "Warm-Season Grasses for July and August" (1977). *SDSU Extension Fact Sheets*. 587.
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warm-season grasses for july and august



Switchgrass • Indiangrass • Big
bluestem • Little bluestem • Sideoats
grama • Blue grama • Buffalograss

Cooperative Extension Service
South Dakota State University
U. S. Department of Agriculture

Warm-Season Grasses for July and August

The low production of pasture grasses, long a problem in South Dakota, is most critical during the mid-summer months of July and August. These are the months when Kentucky bluegrass, smooth brome grass, and cool-season native grasses become somewhat dormant and production is greatly reduced.

The problem has at least two solutions: (1) use a lighter stocking rate all season long, or (2) put part of the herd on mid-summer or supplementary pasture.

Perennial grasses that provide maximum forage production for mid-summer pasture in July and August will be discussed in this Fact Sheet. Cool-season grasses are discussed in three other publications: "Cool-season Grasses for Early Spring and Fall," "Cool-season Grasses for May and June," and "Grasses for Special Purposes."

With a relatively light stocking rate on cool-season pasture, livestock do not use the forage as fast as it is produced during cool weather (May, June, and September), but may use it faster than it is produced during warm weather (July and August). This type of management allows the use of one pasture for an entire season, but is not always the most efficient type of management. A second type of management includes a heavier stocking rate that uses forage from cool-season grasses as fast as it is produced during cool weather and includes the use of a mid-summer pasture during warm weather.

Smooth brome grass-alfalfa pastures and intermediate wheatgrass-alfalfa pastures at Brookings were capable of supporting 1 animal unit per acre (AU/A) for 4.5 months and provided 4.5 animal unit months per acre (AUM/A) of grazing. Some forage produced in May and June was not used until later. With management that used the forage as fast as it was produced, these pastures were capable of supporting 2 AU/A from mid-May to mid-July and again in September, but only $\frac{1}{2}$ AU/A during late July

and August. They provided about 5.5 AUM/A of grazing. By grazing grass as it grew, it was possible to increase stocking rate by 1 AUM/A.

Over an 8-year period at the Pasture Research Center, Norbeck, cow-calf pairs were grazed for an average of 130 days on pastures composed of smooth brome grass, intermediate wheatgrass, and pasture-type alfalfa. Similar pastures were grazed more intensively from mid-May to early July and again in August and September. These cow-calf pairs were pastured on Summer switchgrass for 36 days in July and August. The comparisons in

Table 1. Comparison of two pasture systems for about 4 months of grazing at Norbeck, 8-year average.

	Days grazing	A/AU	AUM/A
BIA*	130	3.31	1.33
BIA*	73	1.3	1.99
Switchgrass	36	0.7	1.92
Total	109	2.0	1.82

* Mixture of Lincoln smooth brome grass, Oahe intermediate wheatgrass, and Teton alfalfa.

Table 1 show that the carrying capacity of the cool-season pasture was increased 50% and that the first systems

Switchgrass.
Plant X 1/2;
seeds X 10.



required 65% more land for only 3 weeks of additional grazing.

At Lincoln, Neb., 189 days of grazing on cool-season grasses produced 193 pounds of gain per steer while 104 days (56 days in the spring and 48 in the fall) on cool-season grasses and 85 on warm-season produced 267 pounds. The 74-pound greater gain was obtained by using warm-season grasses in mid-summer.

COMPARISON OF WARM-SEASON GRASSES

Five warm-season grasses were established in replicated 4-acre pastures at the Pasture Research Center in 1965. Best stands were with Nebraska 28 and Summer switchgrass and Pierre sideoats grama. Only fair stands were established with Pawnee big bluestem

and Holt Indiangrass. Dry matter yields in early July 1973 and 1974 (Table 2) indicate that switchgrass produced more forage per acre.

Several species of switchgrass were seeded at Brookings in 1972. Dry matter yields in 1974 (Table 2) indicate that Nebraska 28, Pathfinder, and Summer were the highest yielding varieties.

The grasses seeded at the Pasture Research Center in 1965 were grazed with yearling steers for 3 years, 1973-75. The results (Table 3) indicate that big bluestem provided more days of grazing per acre, but that higher daily gains came from Indiangrass and more pounds of beef per acre were obtained from switchgrass and big bluestem.

At Lincoln steers were grazed between June 22 and September 14 over

Table 2. Average yields (T/A) of warm-season grasses at Norbeck and Brookings.*

Established:	Norbeck		Brookings
Harvested:	1973	1974	1974
Switchgrass			
Nebraska 28	1.23	1.20	4.14
Summer	1.28	1.33	3.82
Pathfinder	—	—	3.92
Forestburg	—	—	3.18
SD 30	—	—	3.50
Cave-in-rock	—	—	2.60
Big bluestem			
Champ	—	—	0
Pawnee	1.08	1.14	—
SD 42	—	—	0
Indiangrass			
Holt	0.89	0.89	—
SD 45	—	—	0
Sideoats grama			
Pierre	0.44	0.52	—

* One harvest per year.

a 5-year period. Average production was 160 to 180 pounds of beef per acre on late-maturing switchgrass, Indiangrass, and big bluestem. Average daily gains were 1.35 pounds on switchgrass, 1.74 on Indiangrass, and 1.97 on big bluestem.

In another Nebraska test three warm-season grasses were compared with three cool-season tame grasses. The pounds of beef per acre for the six grasses were: 175 on intermediate wheatgrass, 170 on smooth brome-grass, 155 on tall wheatgrass, 160 on big bluestem, 140 on switchgrass, and 130 on sideoats grama.

All of the warm-season grasses in South Dakota are native grasses. They all start growth in late May, are ready for grazing around July 1 and mature during late August. Plant breeders have collected individual plants of several species and used these to develop varieties.

Stand establishment is more difficult to achieve with warm-season

Table 3. Comparison of five warm-season grasses for mid-summer pasture at Norbeck, 3-year average.

	Days per A	Lbs gain per day	Lb gain per A
Summer Switchgrass	64	1.95	125
Neb 28 Switchgrass	66	2.05	131
Holt Indiangrass	45	2.38	106
Pawnee big bluestem	81	1.53	123
Pierre sideoats grama	56	1.96	100



grasses than with such cool-season grasses as brome grass or the tame wheatgrasses. Of the warm-season grasses, switchgrass appears to be the least difficult to establish.

The grasses listed in Table 2 were planted at Brookings on June 26, 1972. A dense growth of weeds occurred after seeding, and the next year only switchgrass was successfully established. In the spring of 1974, atrazine was applied at the rate of 1 lb/A in early May. Dry matter yields (Table 2) were obtained on October 17, 1974. Practically no plants of either big bluestem or Indiangrass could be found. Cave-in-rock switchgrass had less of a stand than the other varieties of switchgrass, but generally this species was well established.

Switchgrass

Switchgrass, *Panicum virgatum* L., is a tall, sod-forming, warm-season, perennial grass with short rhizomes. It has coarse stems, broad leaves, and grows from 3 to 5 feet in height. The flowering head is a widely branching open panicle. The leaves are usually from $\frac{1}{4}$ to $\frac{1}{2}$ inch wide and 6 to 18 inches long. Leaves are green to bluish-green. Switchgrass is native to flood plains throughout the state and occurs on nearly all soil types, but is most abundant and thrives best on moist low areas of relatively high fertility. It spreads slowly by short rhizomes. The stand looks like a colony rather than a sod.

Switchgrass is recommended for use as a mid-season (supplemental) pasture from mid-July to September when cool-season grasses are less productive. Start grazing 5 to 6 weeks after growth begins (first plants are starting to head) and graze continuously. Recovery after grazing or mowing is minimal. Early grazing of switchgrass removes the growing point and lowers production.

Switchgrass starts growth about June 1 and makes its maximum growth during the warm part of the summer when cool-season grasses are dormant. At Brookings, switchgrass produced over 3 tons per acre of forage by July 8 (40 days after growth started). Its palatability is not as high as that of smooth brome grass or intermediate wheatgrass, but is acceptable to livestock especially when grazed in pure stands.

It is widely used for summer pasture and erosion control. Hay can be made, however, it is generally too coarse for good quality. Its value for standing winter feed is poor. Switchgrass occurs naturally on fertile soils well supplied with moisture, but will produce better growth and cover on droughty, infertile, eroded soils than most introduced grasses. Seed matures in September.

Summer was selected at the South Dakota Agricultural Experiment Station and released in 1964. It came from a native collection made south of Nebraska City, NE.

This variety is tall, upright and leafy, and somewhat late in maturity. In a variety trial at Brookings in 1962, only Summer and Nebraska 28 showed no winter injury. Forage yield of Summer at Brookings in 1963 was 2.40 tons per

acre compared with 1.68 tons per acre for Nebraska 28. At Centerville 500 pounds of seed per acre were obtained from Summer grown in rows and cultivated.

In more recent tests, forage yields have been less than Nebraska 28. The small seed of this variety may lead to difficulty in establishment, as indicated at Norbeck (Table 4). Good stands have been obtained in eastern South Dakota.

Nebraska 28 was selected at the Nebraska Agricultural Experiment Station in cooperation with ARS and SCS from a native collection from Holt County, NE, and released in 1949. This variety is an early maturing strain, representative of sand hill types. Plants are fine stemmed, moderate in height, and leafy. The variety is well

Big bluestem.
Plant X 1/2;
seed X 5.



Table 4. The 1972 yields (lb/A) of three switchgrass varieties planted at 14-day intervals at Norbeck in 1971.

Date of Seeding	Neb 28	Pathfinder	Summer
May 17	255	204	79
May 31	339	232	17
June 14	1634	1140	676
June 28	1335	1046	510
July 12	511	415	252
July 26	77	16	75
August 9	0	0	0
August 23	0	0	0

adapted to different soil conditions and is suitable for warm-season pasture. In South Dakota tests, it has shown excellent seedling vigor and was more easily established than other varieties tested. It has a large seed which may contribute to this characteristic.

Pathfinder was selected at the Nebraska Agricultural Experiment Station, Lincoln, for winterhardiness, vigor, leafiness, late maturity, and rust resistance. From the standpoint of ease of establishment, it has not been as good as Nebraska 28 at Norbeck (Table 4).

Forestburg was selected at the Plant Materials Center, SCS, Bismarck, ND, for leafy upland type of growth. This variety has not been exceptional for yield or ease of establishment in eastern South Dakota tests.

Stand Establishment. Obtaining a good stand is one of the problems with warm-season grasses. Since they do not germinate or grow in cool weather, they should be planted later in the spring than cool-season grasses. The best seeding date appears to be in mid- to late June. Cool-season annual weeds compete with new seedlings if the grass is planted too early. In July there is seldom enough rainfall for germination or to provide moisture for the seedlings.

Nebraska 28, Pathfinder, and Summer were planted at the same rate of pure-live-seed per acre at Norbeck in 1971. Plantings were made at 14-day intervals. Yields in 1972 indicated that on all dates, Nebraska 28 produced a better stand than the other two varieties (Table 4). This may be related to the larger seed size of this variety and the fact that Summer may be outside

its region of adaptability in northern South Dakota.

A high degree of dormancy occurs in seeds of these native warm-season grasses and may in some instances, cause poor stand establishment. The use of 2- or 3-year-old seed will often give better stands than new seed.

The application of 1 lb/A of atrazine the fall after seeding is very helpful in controlling annual weeds that compete with your seedlings.

Grazing Management. Grazing management is regulated by the carbohydrate supply in the plants. The best time to start grazing is at the late jointing stage of growth (about July 9). Grazing should stop when plants are grazed down to a height of about 10 inches.

Total carbohydrate reserves in the crowns of Summer switchgrass were measured at Brookings in 1972. During the rapid growth period (mid-May to mid-June) plants used carbohydrate reserves to produce top growth, and crown reserves dropped rapidly.

The lowest level of reserves occurred during the jointing stage of growth in late June and early July. After sufficient top growth accumulated, more carbohydrates were produced than were used, and crown reserves were replenished. In late September, crown carbohydrate reserves were replenished and were at a maximum level. Some reserves are used during the dormant winter period to maintain the living plant processes, resulting in a decrease of energy levels in the crowns during winter. If adequate reserves are not maintained, the plants will die.

Early observations at Centerville indicated that close clipping of switchgrass resulted in severe loss of stands. This prompted a study of the effect of various management practices of an established switchgrass stand. In 1971, an experiment was started at Brookings that consisted of harvesting Summer switchgrass initially at three stages of maturity: vegetative growth of 16 inches (June 17), late-jointing (July 9), and 100% headed (August 12).

Plants were cut to leave 2.5 and 10.0 inches in height. Regrowth was harvested at 14- and 28-day intervals within each stubble height. The following year, switchgrass crowns were dug and analyzed for total nonstructural carbohydrates, and a residual forage harvest was made to measure the carry-over effects of the previous treatments. The different management regimes were evaluated by comparing yield, crude production, and carbohydrate reserves.

Results show that early harvesting or grazing of switchgrass (16 inches of growth) had two detrimental effects. First, it encouraged weed invasion, especially when the stubble height was 2.5 inches. Second, it produced less total forage because of minimal regrowth ability of switchgrass after its growing point is removed. However, delaying the initial cutting or grazing until the 100% headed stage resulted in poor quality forage and low yields of crude protein per acre. The best time for harvesting or starting to graze was at the late-jointing stage of growth. Allowing dry matter production to accumulate before grazing is a compromise between obtaining maximum forage quality and maximum forage yield.

Maintaining a 10-inch stubble resulted in higher yields the following year, regardless of the stage of growth at initial harvest. Crown carbohydrate reserves were also highest when a 10-inch stubble remained, compared with a 2.5-inch stubble. Proper stubble height is probably the single most important factor in maintaining maximum switchgrass production over a period of years.

While carbohydrate reserves are generally low at the recommended start of grazing, animals graze switchgrass systematically from top to bottom over the grazing period. This allows leaf tissue to remain on plants sufficiently long to synthesize carbohydrates for the next year. Since little regrowth occurs, reserves are accumulated if sufficient stubble is allowed to remain.

Yellow Indiangrass

Indiangrass, *Sorghastrum nutans* (L.) Nash, is a tall, sod-forming,

warm-season perennial. Plants grow to a height of 2 to 5 feet, leaves are rough, long, 3/16 to 1/8 inch wide, and covered with a bloom. The sheath is smooth and the seedhead is a panicle 4 to 12 inches long that contracts and darkens with age from yellowish- to reddish-brown.

Indiangrass is a high-yielding grass having good nutritional and palatable qualities. Its growth habits and uses are similar to those of switchgrass.

It is a good crop for hay, mid-summer pasture and is effective for preventing soil erosion.

Holt is a strain developed from selections obtained in Holt County, northern Nebraska. It should be adapted to eastern South Dakota and favorable moisture sites in western areas, but has not been fully evaluated. Seed from native stands less than 200 miles north or 300 miles south of the area to be seeded is recommended.

THE BLUESTEMS

Stems of *Andropogon* species are solid or pithy, differing in this respect from those of most other grasses, which are hollow. Two spikelets are produced at each node of the rachis. One spikelet is sessile and produces seed; the other is stalked and sterile.

Several species are regarded as good forage grasses because of their wide natural occurrence and dependability. Big and little bluestem are perhaps the most prevalent constituents of the wild hay of the Prairie States. They are valued highly for grazing, although they become less palatable as they mature.

Big Bluestem

Big bluestem, *Andropogon gerardi* Vitman, is a tall, sod-forming, warm-season perennial grass that has short underground stems. Plants usually grow 6 feet tall under favorable conditions of soil and moisture. Although short rhizomes are present, it usually makes a bunch type of growth. Leaf blades are about 12 inches long and 1/4 to about 1/2 inch wide. The leaves may be hairy near the base, and the sheaths are usually hairy. The flowering stalks

are stout, coarse, and solid. The extensive root system penetrates deeply. It is native to eastern South Dakota and grows well on most soil types, but is most abundant on moist, well-drained loams of relatively high fertility.

It is recommended for use in mid-summer (supplemental) pastures much the same as switchgrass. Palatability is seldom a problem with big bluestem. It also may be grazed in late fall after plants mature.

Growth begins with warm weather in early June and continues until fall.

It is the dominant species in eastern South Dakota in well-managed native pastures and provides abundant, palatable, nutritious forage for all classes of livestock during summer months. It is vigorous and will recover from close grazing if allowed to make adequate

growth before being grazed. Good pasture management is required to prevent stands from being depleted.

It makes good quality hay if mowed before it becomes stemmy and seed heads form. Much of the native hay marketed in South Dakota consists of big bluestem and associated species.

Pawnee is a variety developed from selections obtained in Pawnee County, southern Nebraska. Champ is a composite developed from four strains obtained on sandy soils in Cherry and Holt counties of northern Nebraska, Ames, Iowa, and Pawnee County, Nebraska. Pawnee should be adapted to the southeastern quarter of South Dakota; whereas Champ may be more widely adapted. Seed from native stands less than 200 miles north or 300 miles south of the area to be seeded is recommended.



Little bluestem.
Plant X 1/2;
seed X 5.

Little Bluestem

Little bluestem, *Andropogon scoparius* Michx., is an erect, mid-tall warm-season perennial bunchgrass. Plants usually grow 1 to 3 feet tall. The leaf blades are less than $\frac{1}{4}$ inch wide and 4 to 8 inches long. The leaves, flattened at the base, are light green until the plants reach maturity, when they develop a distinctive reddish-brown color. Seed matures in September and October.

Little bluestem is less productive than switchgrass, Indiangrass, or big bluestem. Therefore, it is recommended only for use in a mixture of warm-season grasses for erosion control on low fertility sites, and possibly for mid-summer pasture.

It produces a fair yield of nutritious, palatable forage when grazed at early stages of growth. However, it becomes unpalatable as it nears maturity. If

kept too closely grazed it will be replaced by less productive grasses. After frost the reddish-brown color of little bluestem makes it conspicuous on the steep slopes where it still occurs.

Little bluestem is native to silty and coarser textured upland soils throughout South Dakota. Its habit of growth and adaptability to a wide range of soils make it valuable for erosion control.

Little bluestem is smaller than big bluestem. The two usually are found in close association, but little bluestem is more drought-resistant and therefore is better adapted to sites that receive limited moisture.

THE GRAMA GRASSES

All species of *Bouteloua* are native to the Western Hemisphere.

The gramas are summer growers, and the amount of forage they pro-

duce depends upon the moisture available during the growing season. In years of extreme drought they make little or no new top growth. Most species cure naturally, however, and standing growth from previous seasons makes very satisfactory and palatable forage for most classes of livestock.

Sideoats Grama

Sideoats grama, *Bouteloua curtipendula* (Michx.) Torr., is a native warm-season bunchgrass with short rhizomes that sometimes spread to form a sod. The flowering stalks are 2 to 3 feet tall. The leaves are about 6 inches long and nearly $\frac{1}{4}$ inch wide. The seed head consists of a large number of spikes set on a slender, zigzag rachis about 6 to 8 inches long. The stalks of the spikes are twisted, so that the spikes all extend, like a banner, on one side of the central axis. The root system is fairly deep and well branched; thus plants can effectively use all available moisture.

Sideoats grama is recommended for use in the same way as little bluestem.

It is found in favorable sites in central and western South Dakota. In drier areas it is replaced by blue grama. It rarely forms pure stands. It usually grows in association with bluestems or with needlegrass or western wheatgrass in a mixed prairie. It is palatable to all classes of livestock, having about the same forage value as the bluestems. Forage yields are greater than for blue grama, slightly less than little bluestem, and much less than big bluestem or switchgrass. Its main use is in a mixture of warm-season grasses for grazing in July and August in the western two-thirds of the state.

Butte and Pierre are the varieties recommended for use in South Dakota. Butte was developed in Nebraska, and Pierre was developed in North Dakota from seeds collected from vigorous native plants growing 5 miles west of Pierre, S. D. Seed from native stands less than 200 miles north or less than

Sideoats grama.
Plant X $\frac{1}{2}$;
seed X 5.



Blue grama. Plant X $\frac{1}{2}$; seed X 5.

300 miles south of the site to be seeded may be used.

Blue Grama

Blue grama, *Bouteloua gracilis* (H. B.K.) Lag. ex Steud., is a short, sod-forming, native warm-season, perennial grass that spreads by means of short rhizomes. The leaves are 3 to 6 inches long and less than 1/8 inch wide. The flowering stems are 12 to 18 inches tall. Each stem usually has two purplish spikes that extend at a sharp angle from the main stem.

Blue grama is found on all soil types, including alkaline soils, but is most abundant on the heavier rolling upland soils. Its capacity to resist drought permits it to occupy the drier sites throughout its range of adaptation.

Growth begins fairly late in the spring depending on how much moisture is available. The seed matures in August. The forage is relished by all classes of livestock. Growth ceases during long droughts, but begins again upon the return of favorable moisture and temperature. Because of its high quality, hardness, and growth habits it is one of the most important range species in the western two-thirds of the state.

Under heavy grazing, blue grama often persists in nearly pure stands after the associated grasses disappear. It is palatable and nutritious, but does not produce enough forage to make it useful to plant in a pasture or hay mixture.

Buffalograss

Buffalograss, *Buchloe dactyloides* (Nutt.) Engelm., is a fine-leaved native, sod-forming perennial. It is the dominant species on large areas of upland in the short-grass region of western South Dakota. Generally it grows 4 to 6 inches high and produces leaves less than 1/8 inch wide and 3 to 6 inches long. It spreads rapidly by surface runners and forms a dense, matted turf. During the growing season the foliage is grayish-green, which turns to a light straw color when the plants cease growth.

Buffalograss grows in association with blue grama. Growth begins in late spring and continues through the summer. Livestock like its forage. Its palatability, prevalence, and adaptation to a wide range of soil and climatic conditions make it an important for-

age species of western South Dakota.

It withstands long, heavy grazing better than other grasses native to that region. On ranges consistently subjected to severe use, it often survives as a nearly pure stand.

Though it is palatable and highly nutritious, it does not produce enough forage or TDN per acre to make it worthwhile to plant in a pasture or hay mixture.

ACKNOWLEDGMENT

The authors have drawn freely from the USDA Yearbook "Grasses" and the SCS Agriculture Handbook No. 339 "Grasses and Legumes for Soil Conservation in the Pacific Northwest and Great Basin States." The line drawings were taken from SCS Agriculture Handbook 339 and SCS-TP-151, "Key to Perennial Grasses." All production data, however, were obtained in South Dakota, except where otherwise specified.

Buffalograss.
Plant X 1/2.
plant parts X 5.



Additional information on grasses, their utilization and management can be obtained from the following publications:

Cool-Season Grasses for Early Spring and Fall, FS 546

Cool-Season Grasses for May and June, FS 547

Grasses for Special Purposes, FS 549

Alternative Pasture and Forage Systems, EC 709

Planting Tame Pastures and Hayland, FS 503

Fertilizing Pasture and Hayland, FS 425

Chemical Weed Control in Pasture, Range and Hayland, FS 426

Interseeding and Modified Ren-

ovation for Pastures and Range, FS 422

Identification of 22 Grasses Common to South Dakota, FS 600

Prairie Hay at its Best, FS 581

Grazing Management Based on How Grasses Grow, FS 302

Grass Species and Variety Performance in South Dakota, Bul 692

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