

## Switchgrass, Big Bluestem, and Indiangrass for Grazing and Hay

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The grazing management and cultural practices discussed in this NebGuide can make the tall warm-season grasses switchgrass, big bluestem, and indiangrass high quality summer forage.

Switchgrass, big bluestem, and indiangrass are native warm-season grasses that can provide abundant, high-quality forage during summer. Warm-season grasses produce 70 to 80 percent of their growth after June 1 in Nebraska, while more than 75 percent of cool-season grass growth, such as brome grass and bluegrass, often occurs before June 1. Therefore, warm-season grasses can provide forage to graze after cool-season pastures have been used.

Warm-season grasses must be managed differently than cool-season grasses. Poor management will cause productivity and stand persistence to decline, and forage quality will be poor. Proper grazing management and cultural practices will optimize production, maintain a healthy stand, and provide adequate forage quality.

### Adaptation and Yield

Switchgrass, big bluestem, and indiangrass are adapted to most soils throughout the eastern half of Nebraska. Yields vary considerably among sites due to soil and precipitation differences. They can be grown in mixtures or monocultures, but switchgrass is grazed more efficiently in a monoculture than in a mixture. For more specific information on areas of adaptation and available cultivars consult Extension Circular 120, *Certified Perennial Grass Varieties Recommended for Nebraska*.

### Grazing

Proper grazing management is crucial to maintain dense stands of warm-season grasses. Before grazing, consider type of grazing system, season of use, duration of use, level of defoliation, and type of grazing livestock.

Warm-season grass pastures can be stocked continuously or rotationally. Continuous stocking, with its lower stocking

density, requires the least management because livestock remain on the same pasture of warm-season grass throughout their grazing season. This may result in poor utilization, with some plants overgrazed while other plants are underused. Rotational stocking is a method of grazing that uses recurring periods of grazing and rest to improve forage utilization and provide recovery periods for the pasture. With rotational stocking, livestock graze a pasture until some predetermined criteria is reached, such as recommended stubble height or grazing readiness of other pastures. Livestock then are moved to the next pasture. Livestock sometimes re-graze a previously grazed pasture, but only after the plants have had adequate time to recover and regrow (usually 30 to 45 days, depending on environmental conditions). Grasses grazed short during the time stems are elongating will need longer recovery periods to maintain dense, vigorously growing stands.

Rotational stocking requires at least two pastures or one pasture with feeding elsewhere while the pasture is not grazed. The number of pastures may vary, but three or four are typical in rotational stocking systems of warm-season grasses. Increasing the number of pastures has several benefits including more uniform grazing, higher quality regrowth, fewer weed problems, more uniform nutrient recycling, more stable production during drought, and higher, sustainable stocking rates. When rotational stocking is used, alternate the pasture grazing sequence from year to year. If a pasture is grazed first one summer, graze a different pasture first the next summer.

Average daily gains of yearling steers typically range from 1.4 to 2.8 pounds per day when warm-season grass pastures are stocked continuously with the proper number of animals grazing during the summer. Well-managed grazing research on class 1 and 2 land near Mead in eastern Nebraska produced as much gain as 2.2 lb/head/day average daily gain and 500 pounds of beef gain per acre from ‘Trailblazer’ switchgrass. In a three-year grazing trial near Mead, ‘Bonanza’ big bluestem had an average daily gain of 2.8 lb/head/day, and produced an average of 405 pounds of beef gain per acre. In a two-year grazing trial near Mead, ‘Scout’ indiangrass had an average daily gain of 2.0 lb/head/day, produced 383 pounds of beef gain per acre, and provided as many as 85 grazing days when stocked continuously with three steers per acre.

Average daily gains with rotational stocking may be slightly lower than with continuous stocking unless grazing is well managed. Rotationally stocked pastures usually provide 10 to 60 percent more animal days of grazing than continuous-use pastures, depending on the number of pastures available for rotation and the effectiveness of grazing management.

Summer grazing systems are more efficient when separate pastures of warm-season grasses and separate pastures of cool-season grasses are both available and used for grazing during the summer. For example, as warm-season grass pastures become fully used in midsummer, remove livestock from these pastures and return them to previously grazed cool-season pastures. After sufficient regrowth has occurred, warm-season grasses can be grazed again. Do not over-utilize warm-season grasses late in the summer, and do not graze them short between September 1 and the first killing frost. Leave at least 6 to 8 inches of growth when plants go dormant for the winter. Severe defoliation of warm-season grasses in late summer will result in poor regrowth, reduced plant vigor, and potential stand thinning and weed encroachment the following spring.

### Switchgrass

*Switchgrass must be grazed before seedheads develop.* Before seedheads develop, forage quality is high and palatability good. After seedheads emerge, nutrient levels become low and switchgrass becomes less acceptable as pasture. Animals are reluctant to eat mature switchgrass and may refuse it entirely if other feed is available.

Begin grazing switchgrass when it becomes ready to graze, regardless of how much grazing potential remains on cool-season pastures. Switchgrass matures earlier than most warm-season grasses, so grazing often needs to begin while cool-season grasses still provide good forage. It is better to graze switchgrass when it is ready and then graze the remaining cool-season grass later in the summer, than to finish grazing the cool-season grass first and let the switchgrass become stemmy. If switchgrass becomes stemmy before grazing begins, cut it for hay and graze the regrowth about 45 days later.

Several options are available for managing switchgrass. One option is to begin grazing when switchgrass is 8 to 10 inches tall (late May to early June). Stock the pasture so livestock will consume switchgrass at the same rate that it grows. Livestock will graze off the tops of switchgrass plants rather uniformly (*Figure 1*) if coarse stems have not started to form. Keep plant height between 8 and 16 inches for six to eight weeks, and then remove livestock for 30 to 45 days. Any regrowth then can be grazed to a stubble height no shorter than 8 inches. Usually it is better to stock switchgrass too heavily and move animals to other pastures sooner than planned than to stock lightly and have abundant seed-head development.

It is difficult to predict switchgrass growth rate and to stock it to maintain 8 to 16 inches of stubble. Thus, an easier method of managing switchgrass is to begin grazing when the grass is 10 to 12 inches tall (early to mid-June) and stock heavily for two to three weeks until there is about 4 to 6 inches of stubble remaining. Remove the livestock and allow 30 to 45 days to recover. Graze again in August if at least 12 inches of regrowth has occurred, but graze to no less than an



**Figure 1.** Livestock remove switchgrass uniformly.

8-inch stubble height. Grazing that removes young stems in early summer will reduce and delay switchgrass heading and provide higher quality regrowth forage later in the growing season.

Switchgrass is not good as the only forage source for all of June, July, and August. It is better to use switchgrass during just two of the three summer months. Either graze switchgrass uniformly in June and July or graze completely in June and graze regrowth in August. Avoid stemmy, mature growth.

### Big Bluestem and Indiangrass

Big bluestem and indiangrass each can be grown as monocultures but for grazing they often are used best in mixtures. Big bluestem and indiangrass mature later in the growing season than switchgrass (*Figure 2*). Thus, they may become ready to graze at a more convenient time than switchgrass, relative to growth of cool-season pastures. Big bluestem and indiangrass provide excellent warm-season grass pasture that can be continuously stocked for the entire summer if cattle are turned in when the grass is 10 to 12 inches tall (mid- to late June). Adequate stubble and leaf area must be maintained through adjustments in animal numbers. Forage removal should equal the plant growth rate so adjust animal numbers as necessary depending on summer growing conditions. Late summer management is critical, and at least 6 to 8 inches of stubble must remain after September 1.

Since indiangrass flowers and matures later in the summer than switchgrass and big bluestem, it typically has higher quality when harvested on the same date.

Big bluestem and indiangrass are well suited to rotational stocking during June, July, and August. Begin grazing the first pasture when the grasses are about 8 to 12 inches tall (early to mid-June). Graze each pasture no longer than two to three weeks to a stubble height about equal to one-half the original plant height. The grazing period on each pasture should be shorter as the number of pastures increases. Alternatively, graze big bluestem and indiangrass to a stubble height of 4 to 6 inches, like switchgrass. This will require a longer rest period than when removing only one-half the growth since taller stubble will regrow faster than short stubble (weather permitting). Delay further grazing of pastures until regrowth is at least 12 inches tall. Remove livestock during subsequent grazing periods so that the average stubble height is at least

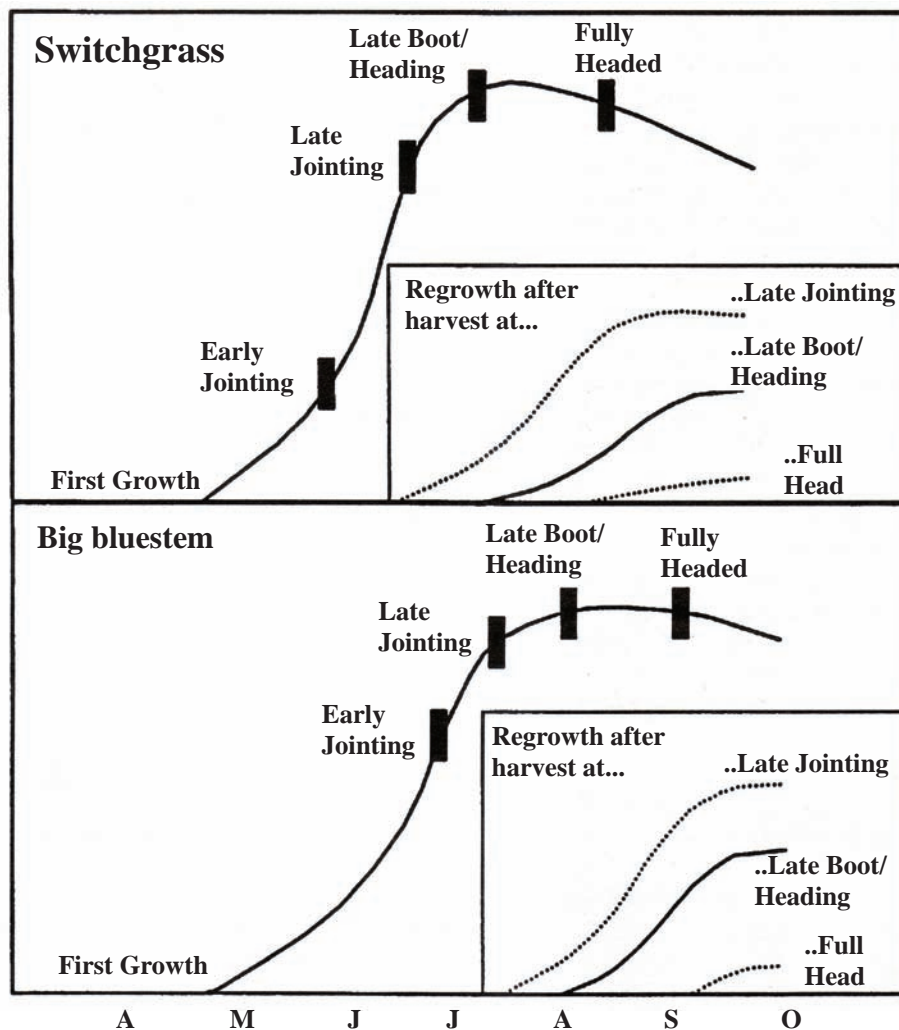


Figure 2. Forage accumulation of first growth and regrowth of switchgrass and big bluestem.

6 inches. Conclude grazing around September 1. If grazed after September 1 be sure to leave at least 6 inches of plant material on each pasture.

### Winter Grazing and Calving Pastures

Top growth of warm-season grasses killed by below freezing temperatures can be grazed with little effect on survival, plant vigor, and subsequent year growth. Allow 4 to 6 inches of stubble to remain until spring to help catch snow, insulate plant roots, and provide wildlife cover. Forage quality is usually very low. Therefore, feed appropriate supplements when needed since nutrient content of winter pasture usually is below animal requirements for crude protein, energy, phosphorus, and vitamin A.

Warm-season grasses can provide excellent spring calving pastures, especially when large amounts of unused residue remain for natural bedding and protection. Unused residue can be obtained several ways: harvest hay early and stockpile all regrowth, stockpile regrowth following early grazing, or avoid any grazing or haying during the growing season.

If trampling is severe on calving pastures, do not use the same warm-season grass pasture more than two springs in a row if they also are used for some grazing or haying during

summer. Pastures used only as calving pastures can be used every year. Remove animals prior to significant spring growth (late April) to minimize trampling damage.

### Haying

Harvest warm-season grass hay according to the stage of plant growth and intended use of the hay. Proper hay management balances hay quality and quantity with livestock nutrient requirements, while maintaining vigorous stands.

Before harvest, determine the type of livestock that will be fed the hay and their nutrient requirements, as well as other feed alternatives for the livestock. Harvest before seedheads emerge for high quality hay and maximum regrowth potential. This hay will provide most of the nutrients needed by growing stock as well as first-calf heifers. For mature nonlactating cows, hay harvest can be delayed until shortly after plants develop seedheads. Hay harvested after heading will provide higher yields but lower quality hay. Analyze each cutting of hay for quality, especially for protein and energy (see NebGuides G331, *Sampling Feeds for Analyses* and G1892, *Understanding and Using a Feed Analysis Report*).

Switchgrass hay is very palatable if it is harvested before or just as the first seedheads appear, but as plants become



more mature and stemmy, switchgrass hay can become unacceptable unless it is ground. Big bluestem and indiangrass hay also is more palatable when it is harvested early, but livestock acceptance still remains satisfactory when plants develop seedheads.

Regrowth is influenced by initial harvest date and weather conditions. Harvest prior to the boot stage for excellent regrowth (Figure 2). Very little regrowth will occur following a harvest after heading. Do not harvest warm-season grasses for hay after early August unless stubble height is 8 inches or more. At that time forage quality is low, regrowth is poor, and stand reductions may occur. Grazing regrowth in August after prior haying and leaving an 8-inch stubble causes less stand damage than a second hay harvest.

Cut warm-season grass pastures for hay if forage production exceeds livestock consumption to avoid overly mature forage. Avoid giving livestock access to an area recently cut for hay. Livestock will graze young, palatable regrowth before plants have recovered fully from cutting, resulting in overgrazing. If uncut areas are in the same pasture they will be used poorly. Instead, move livestock to another pasture, move livestock to a drylot for feeding, or fence out the hayed pasture to prevent livestock access. Delay grazing the regrowth at least six weeks or until the grass is 10 to 12 inches tall. Remember to leave at least 6 to 8 inches of stubble when grazing regrowth.

### Fertilization

Warm-season grasses produce higher yields when fertilized with nitrogen and/or phosphorus (soil tests are needed to determine rate) where sufficient moisture is available for growth (see Extension Circular 155, *Nutrient Management for Agronomic Crops in Nebraska*). But, fertilizing is economical only when extra growth is needed and can be harvested efficiently. Typically, good growing conditions will produce about 20 to 30 pounds of additional warm-season grass hay or 1 pound of additional animal gain for every 1 pound of nitrogen applied. Consequently, if a pound of nitrogen is cheaper than a pound of animal gain, it is generally profitable to fertilize warm-season grass pastures.

Fertilizing often is profitable on haylands since extra growth is harvested easily. Fertilize pastures, especially with nitrogen, only when livestock numbers exceed the growth potential of unfertilized warm-season grasses and when grazing can be managed properly. Otherwise, growth might become stemmy, less palatable, and lower quality. Animal performance will be poorer than expected and much of the extra growth stimulated by the nitrogen will be wasted.

Apply nitrogen in mid- to late May after warm-season grasses have 6 to 8 inches of growth. Do not apply nitrogen in early spring; it will stimulate growth of cool-season grasses and weeds rather than the warm-season grasses. Also, only apply as much nitrogen as the warm-season grasses will use during one growing season, typically no more than 120 pounds of nitrogen per acre. Nitrogen carryover into fall promotes

growth of weeds and cool-season grasses, and may also contaminate water sources.

### Prescribed Burning

Prescribed burning often is the most economical method to improve or maintain warm-season grass pastures. It can reduce competition from undesirable cool-season grasses and remove litter that inhibits warm-season grass growth. Burning also will remove many woody plants (especially red cedar) that invade pasture. Proper grazing or haying management can prevent or correct most of these problems so prescribed burning may be beneficial only infrequently.

Do not burn unless it will be done safely and properly (see Extension Circular 148, *Grassland Management with Prescribed Fire*). Burn warm-season grasses when shoots are one-half to 2 inches tall (typically late April or early May). Burning usually is not recommended during extensive dry periods, in the Sandhills, or in drier pasture areas of the state.

### Potential Problems

Indiangrass accumulates prussic acid early in the growing season and should not be grazed in spring before first growth is 6-inches tall. The prussic acid concentration declines as plant height increases and is not a concern as plants reach the recommended grazing height. Switchgrass contains diosgenin, a chemical that is toxic to horses and other nonruminants. Consequently, we do not recommend feeding switchgrass hay to horses, or grazing switchgrass monocultures with horses. Current research is underway to determine if the concentrations of diosgenin decline with increased plant height, or if concentrations differ among cultivars.

**This publication has been peer reviewed.**

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