University of Nebraska–Lincoln EXTENSION

EC127

Grazing Systems for Nebraska Sandhills Rangeland

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A grazing system is a specialization of grazing management that manipulates livestock to achieve the desired outcome for grazing lands. In a grazing management plan, grazing systems provide a sequential movement of animals among pastures with properly timed grazing and recovery periods within a season or year. A grazing system is a tool to achieve enterprise goals and objectives within a set of environmental, economic, resource, and management factors. There are an endless number of potential grazing systems because each should be custom-made for a situation. Conceptually, there are four categories of grazing systems used in the Nebraska Sandhills: season-long continuous, rest rotation, deferred rotation, and short duration, also commonly referred to as intensively managed grazing.

Review of Grazing Systems

Continuous Grazing

Season-long continuous grazing is a method of grazing livestock on a single pasture for the entire growing season or year without a recovery period (*Figure 1*). Generally, this method has relatively low input costs for infrastructure or management compared to other grazing systems. Good to excellent range condition can be maintained with continuous grazing when using proper stocking rates and management strategies (i.e., smaller, homogeneous pastures with appropriate distances to water) that ensure good livestock grazing distribution. Research and on-ranch observations have shown that herbage and livestock production on properly managed, continuously grazed Sandhills range can be comparable to that of rotationally grazed pastures. However, because continuously grazed pastures usually are large with relatively few livestock watering points, livestock grazing distribution is heterogeneous and harvest efficiency is relatively low. Harvest efficiency is the amount of forage that livestock consume in relation to the amount of forage in the pasture.

Recommendations suggest that continuously grazed pastures have a harvest efficiency of 25 percent *(Figure 2)*. Very simply, the pasture vegetation is grazed to the recommended intensity of leaving 50 percent of the plant tissue to maintain the amount of leaf area needed for adequate photosynthesis and plant vigor, and assumes about 25 percent of the total plant tissue is lost to waste, trampling, and other herbivores. Properly managed, rotationally grazed pastures are reported to have a harvest efficiency of 30 to 35 percent. Higher grazing efficiencies on the rotational pastures are possible because of shorter grazing periods, longer recovery periods, and better distribution as a result of increased fencing and livestock watering points.

With continuous grazing, individual livestock performance during the early half of the growing season is usually high. This system allows livestock access to all available forage in a pasture. Grazing pressure is relatively low early in the season, allowing for selection of the most palatable and nutritious forage.

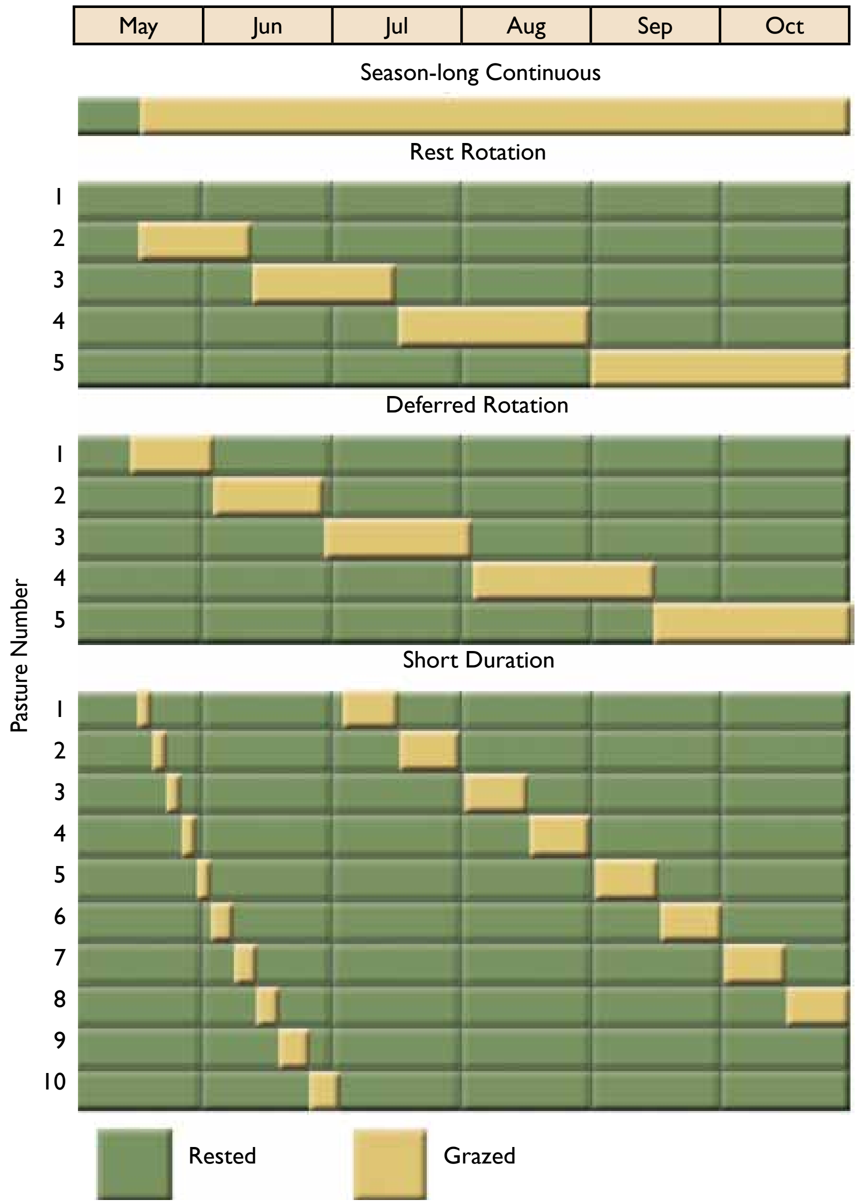


Figure 1. *Season distribution of grazing for the four types of grazing systems.*

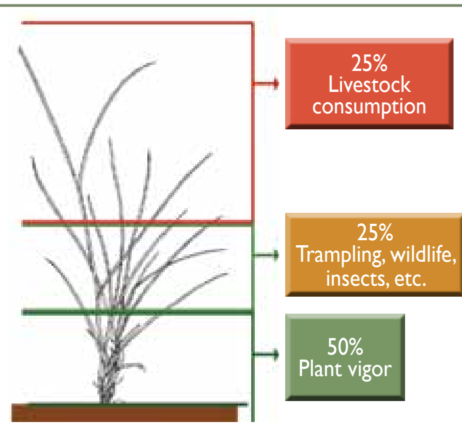


Figure 2. *Proportion of total standing crop commonly allocated to different functions to maintain healthy rangeland under continuous, season-long grazing.*

Consequently, plants that are highly palatable are more detrimentally affected by continuous grazing than less desired plants. Repeated grazing on individual plant species during the growing season and in consecutive years tends to decrease the plant's vigor and subsequent growth and reproductive potential. In contrast, those plants less favored by livestock may increase in abundance and out-compete plants that are grazed excessively.

Rest-Rotation Grazing

Rest rotation is a "simple" rotation grazing system for the grazing season (May-October) in that there are three to six pastures, a single pasture occupation per year, and relatively long grazing periods (more than 30 days; *Figure 1*). The goal of this system is to improve range condition by resting one or more pastures for an entire calendar year. However, improvement can be difficult to achieve if stocking rate for the entire set of pastures is not adjusted. For instance, in a four-pasture rest rotation, livestock are concentrated into three of the pastures for the grazing season. If the recommended stocking rate for the four-pasture area is used, the actual stocking rate on the three grazed pastures will be greater than recommended and the benefits of periodically resting a pasture can be offset by three years of overstocking.

With this system there is concern that forage quality is relatively low by mid to late summer because livestock are moving into pastures where plants have not been grazed *(Figure 1)* and are mostly stemmy and of lower forage quality; whereas, in continuously stocked or short-duration grazing systems, livestock can continue to graze on the new growth of previously grazed plants. There have been reports of relatively low animal performance during the last half of the grazing season because of the low quality of available forage.

Rest-rotation grazing frequently is recommended when wildlife habitat is a primary objective. Each spring the rested pasture and the pasture grazed first during the preceding year will provide habitat for wildlife species requiring relatively high levels of cover. A relatively dense canopy of herbaceous plants and shrubs in the spring and early summer is particularly important as nesting cover for upland game birds. Furthermore, deferring grazing in these pastures until mid-June or early July ensures optimum cover for nesting and brood-rearing.

Deferred-Rotation Grazing

Deferred rotation is a three- to six-pasture rotational grazing system commonly recommended for the five- to six-month grazing season (May through October) in the Sandhills *(Figure 1)*. Each pasture is grazed once each year for 30 to 45 days with at least one of the pastures not grazed until the end of the growing season (early to mid-September). Deferred rotation provides a deferment period (no grazing until the end of the growing season) for each pasture once every few years. The deferment provides the dominant, warm-season tallgrasses the entire growing season to gain vigor and reproduce without being grazed. Pastures grazed early in the season have shorter grazing periods because forage availability is limited at this time. The sequence of grazing pastures changes each year to avoid grazing a pasture at the same time in consecutive years.

Both deferred-rotation and rest-rotation grazing are more likely to improve range condition when used for relatively long grazing seasons that extend into fall. This increases the length of grazing season when plants are dormant. However, with deferred rotation and rest rotation, forage quality will be lower in late summer and fall than earlier in the season. Therefore, animal performance tends to be lower during the last half of the grazing season because livestock are grazing pastures that haven't been previously grazed and are characterized by mature, lower quality forage.

Short-Duration Grazing

Short-duration grazing (SDG), also known as intensively managed grazing, was developed as a multiple-pasture, rotational system with a single herd, relatively short grazing periods (3 to 10 days), and two or more grazing cycles per year *(Figure 1)*. The multiple pastures are key to managing for high stocking density and controlling length and timing of grazing and recovery periods. High stocking density and associated high grazing pressure commonly are tied to improved grazing distribution and harvest efficiency. Grazing and recovery periods are used to control timing, intensity, and frequency of grazing/defoliation of key management forage species. It's important to avoid multiple grazing events (re-grazing) on an individual plant during a grazing period. The multiple grazing cycles are key to the success of SDG.

The first grazing period should be timed and have adequately high grazing pressure so that all of the pasture plants' tillers are grazed at a vegetative stage. The second grazing period should be timed so that the forage plants have adequate time to recover from the first grazing period before they reach an elongation or reproductive stage of development. If the length of the growing season allows, other grazing periods are realized with similar timing considerations. Ultimately, the multiple grazing periods are to maintain the forage plants in a vegetative stage characterized by high palatability and forage quality, uniform distribution of grazing (high harvest efficiency), and a prolonged green season (vegetative tillers remain green and growing later in the growing season than reproductive tillers). The expectations are that grazing animals should produce more (e.g., greater average daily gain) per acre because a consistently leafy stand (over time and space) provides high forage quality over the entire growing season. Additionally, carrying capacity should be greater because of greater forage production and higher harvest efficiency.

A basic assumption associated with short-duration grazing is that plants defoliated multiple times during the growing season will produce more aboveground biomass than plants not defoliated until the end of the growing season. (This is also called compensatory growth.) Implementing short-duration grazing results in greater carrying capacity because of increased total forage availability in response to the multiple grazing periods. Livestock carrying capacity also is reportedly increased over years because grazing is timed to favor the high-producing, palatable forage species.

Figure 3. *Cow/calf pairs on upland range at the UNL Barta Brothers Ranch.*

Recent Grazing Research in the Nebraska Sandhills

Study Site

This evaluation of grazing systems is based largely on a 10-year research project at the University of Nebraska–Lincoln's Barta Brothers Ranch (BBR) about 20 miles south of Long Pine. The project was initiated in 1999 on upland range at the ranch to compare deferred-rotation (DR) grazing and short-duration grazing in terms of botanical composition and production of vegetation cover and diet quality and weight gains of grazing cattle *(Figure 3)*. Twenty-four pastures (120 to 200 acres each) on upland ecological sites (sands, sandy, and choppy sands) were allocated to two, four-pasture deferred-rotation grazing systems and to two, eight-pasture short-duration systems. Rangeland vegetation was dominated by a mixture of warm-season tallgrasses (for example, prairie sandreed and switchgrass), but also included significant proportions of cool-season grasses (for example, porcupinegrass and prairie junegrass), forbs (for example, western ragweed and stiff sunflower), and shrubs (for example, leadplant and rose).

The pastures were grazed each year (1999-2008) from about May 15 to October 15 by cow/calf pairs at 0.75 AUM/acre. Each pasture in the two deferred-rotation systems were occupied once during the grazing season for 30 to

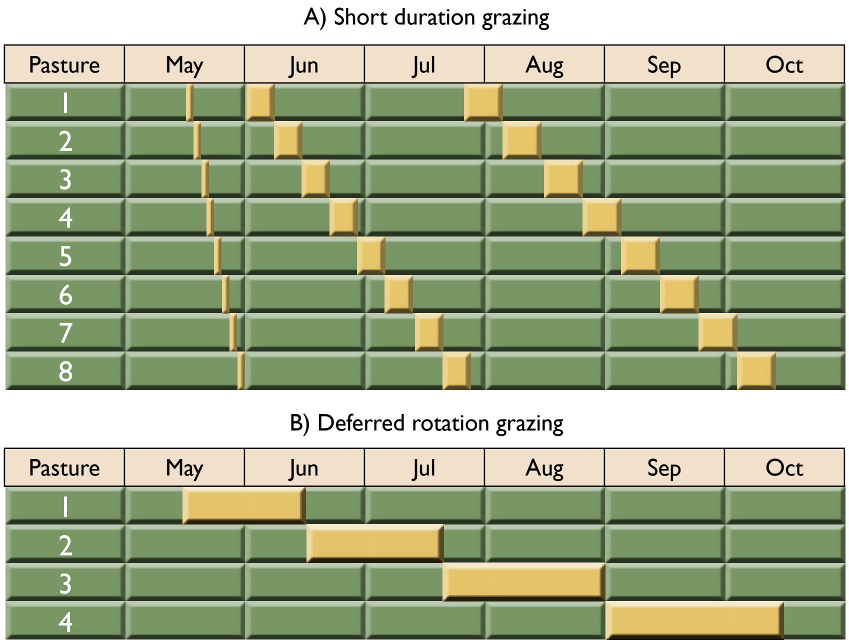


Figure 4. *Grazing periods for (A) an eight-pasture short-duration grazing system and (B) a four-pasture deferred-rotation grazing system at the Barta Brothers Ranch in the Nebraska Sandhills.*

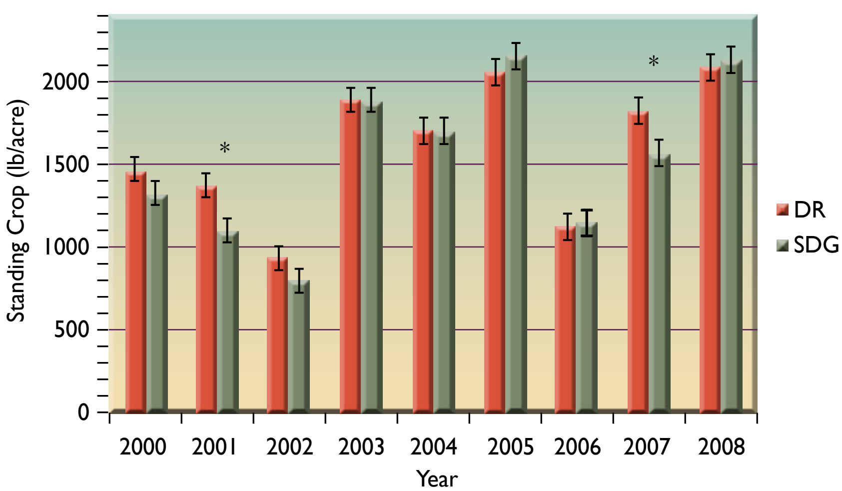


Figure 5. *Mid-August standing crop (lb/acre) from 2000 through 2008 for deferred-rotation grazing and short-duration grazing at the Barta Brothers Ranch.*

45 days; whereas, each pasture in the two short-duration grazing systems were occupied three times during the growing season for two days (early season), six or seven days (mid season), and 10 to 12 days (late season) *(Figure 4)*. The order and timing for grazing individual pastures changed from year to year. Measurements were taken during the course of the study to quantify plant and animal responses to the grazing systems. These included standing crop in grazing exclosures clipped in mid-June and mid-August each year; botanical composition based on frequency of occurrence in 1998 (pre-treatment), 2003, and 2008; quality of diet samples collected by esophageally fistulated cows in 2005 and 2006; and average daily gains of spayed heifers grazing with the cow/calf pairs in 2006, 2007, and 2008.

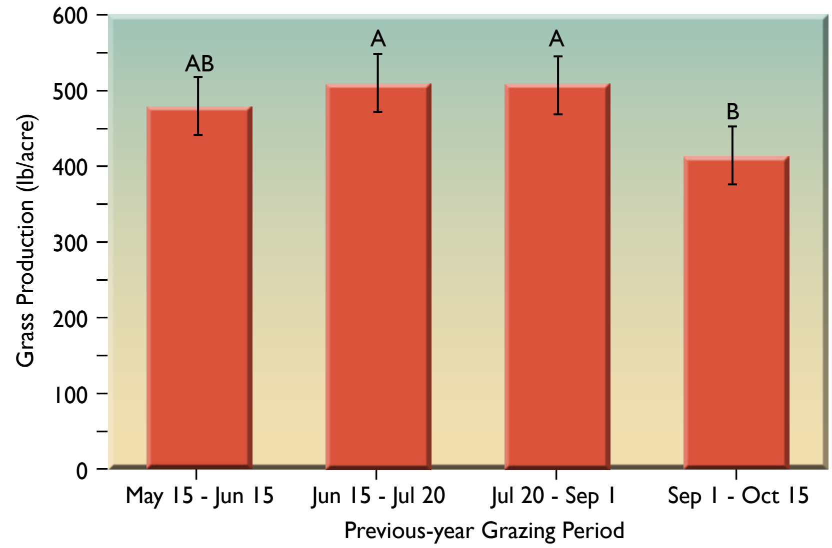
Plant Response

Grazing system had little effect on botanical composition changes over the 10 years of the study, although the warm-season grasses sand bluestem and little bluestem increased more on deferred-rotation pastures than on short-duration pastures. Overall, botanical composition changes were much more responsive to rainfall patterns and topography (for example, dune tops vs. interdune areas) than to grazing system. Herbage production generally did not differ between the two grazing systems over the study period *(Figure 5)*. The only differences occurred in mid-August 2001 and 2007 when standing crop was 33 percent and 17 percent greater, respectively, on deferred rotation pastures than on short-duration pastures. Overall, vegetation responses to grazing system were negligible.

Time of grazing (i.e., grazing period) had little effect on herbage production in the year after grazing. Subsequent year production of warm-season grasses and total herbage were not affected by time of grazing – production was not greater in a deferred pasture than in the other pastures. Subsequent year production of cool-season grasses was relatively low on pastures grazed in the deferment period *(Figure 6)*. In most years, soil moisture in August and September was adequate to support new growth of cool-season grasses. These cool-season grasses are nearly the only green plant material available at this time of the year, and they are palatable and utilization can be very high. This study indicated that heavy use of cool-season grasses at this time is detrimental, causing reduced herbage production of these grasses in the subsequent year. Effects of time of grazing in the short-duration pastures were difficult to interpret. Because each pasture was grazed three times during the five-month grazing season, it was not possible to separate out the effects of an individual grazing period on herbage production. Overall, total herbage production of the SDG pastures was not affected by the different combinations of time of grazing.

Cattle Response

Crude protein content and digestibility of diets of grazing cattle did not differ between the two grazing systems in 2005 and 2006. Crude protein content of diets declined from as much as 15 percent in May to 7 or 8 percent in October in the two years. In vitro dry matter digestibility of the diets decreased from 65 to 70 percent in May to less than 45 percent in October of the two years. These patterns of quality change were consistent with increasing maturity of the available forage. Heifer daily gain averaged 1.8 lb/head/day and was not different between grazing systems or years *(Figure 7)*. With similar diet quality and stocking rates between the two grazing systems, weight gains of heifers would not be expected to differ.



[AB]Unlike letters indicate difference between grazing periods (P<0.01).

Figure 6. *Timing of grazing effect on cool-season grass production in mid-June of the subsequent year.*

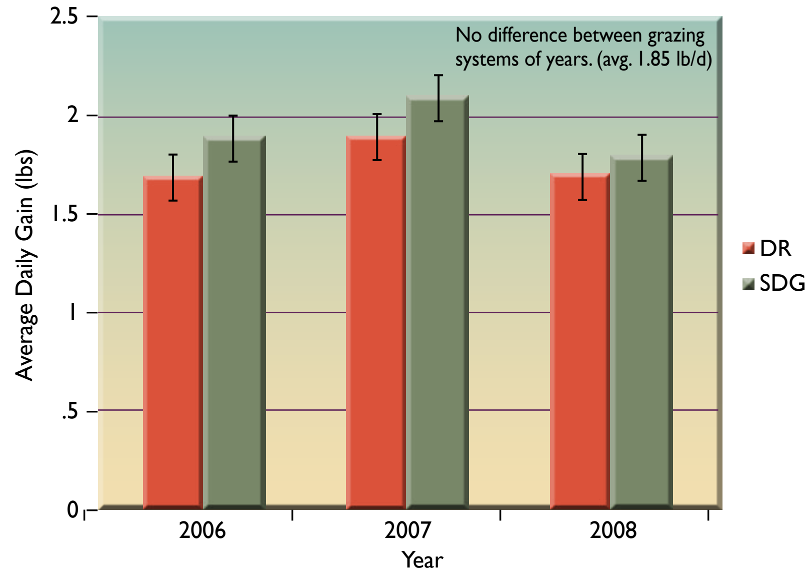


Figure 7. *Daily gain of spayed heifers in four-pasture deferred-rotation and eight-pasture short-duration grazing systems.*

Management Implications

Objectives

Enterprise goals and objectives must be identified before deciding about grazing systems and associated infrastructural and management changes. Numerous goals and uses are appropriate for Sandhills rangeland and include wildlife habitat, aquifer recharge, recreation, and aesthetics; however, the principal goal for privately owned Sandhills rangeland is livestock-production oriented. Many other potential uses are complementary to livestock grazing, but livestock production is the principal means of generating income and supporting management/conservation of rangeland.

Installation of grazing systems for livestock production purposes generally requires an investment because of increased fencing and livestock water development. The return on investment and the increased annual maintenance costs associated with the improvements must be more than enough to cover these costs. The return can come only as increased animal performance (for example, increased calving percentage or increased weight gain per yearling) or as increased carrying capacity (for example, number of animals per acre that can be produced without causing degradation to the site). Grazing systems on upland rangeland usually do not affect animal performance unless there is a major change in the forage resource (for example, considerable increase in forage quality) or in the effectiveness of management. Most change in response to grazing system is

Figure 8. *Livestock water location and distribution of grazing over the landscape.*

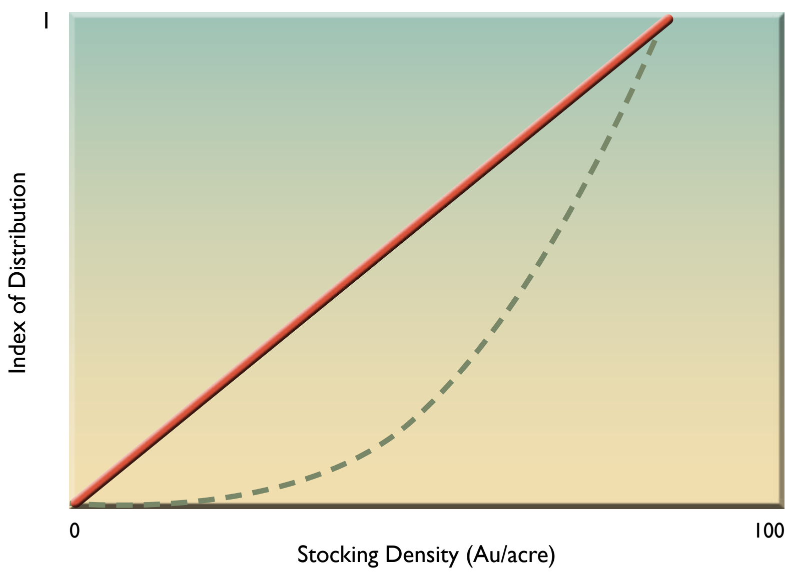


Figure 9. *Commonly presented one-to-one relationship between stocking density and distribution of grazing (——) versus the threshold model between stocking density and distribution of grazing (- - -).*

related to carrying capacity. In other words, if the management unit does not produce more forage, resulting in more head of livestock, there is no reason to install a grazing system.

Short-Term Responses

An increase in carrying capacity of rangeland can occur in both the short and long term through the more efficient management of the plant resource. Immediate increases in carrying capacity can occur when the installation of a grazing system immediately improves the evenness of use of the forage resource — where there is better distribution of grazing and improved harvest efficiency. The rule of thumb for continuously stocked pastures is 25 percent harvest efficiency (*Figure 2*). The low harvest efficiency in continuously stocked pastures commonly is caused by poor grazing distribution. Most of the improvement in grazing distribution with a new grazing system results from reducing the distance to livestock water and improving fence location.

Water and Ecological Sites. The placement of water developments is the single, most important factor affecting grazing distribution (*Figure 8*). Cattle are central-place foragers so grazing frequency and forage utilization decreases rapidly as distance to water increases beyond ¼ to ½ mile. Otherwise, pastures are often unevenly used due to variability in topography, plant communities, distribution of shelter or shade, and time of plant growth. In a heterogeneous pasture, livestock are poorly distributed as they tend to overutilize favored topographical sites and plant communities and underutilize less attractive areas.

Much of this spatial variability in use can be minimized by basing fence placement on such land attributes as range/ecological site. Maximizing the homogeneity of a pasture improves livestock distribution and harvest efficiency within the pasture and facilitates management of the vegetation cover. Management strategies (for example, timing and length of grazing periods) are much more effective in a pasture dominated by a single range/ecological site than on a pasture comprised of several sites.

Stocking Density. Rotational grazing concentrates cattle in relatively small pastures, thus increasing stocking density. Increasing stocking density increases grazing pressure and has the potential to improve livestock grazing distribution and harvest efficiency. As with most variables in cause-effect relationships, stocking

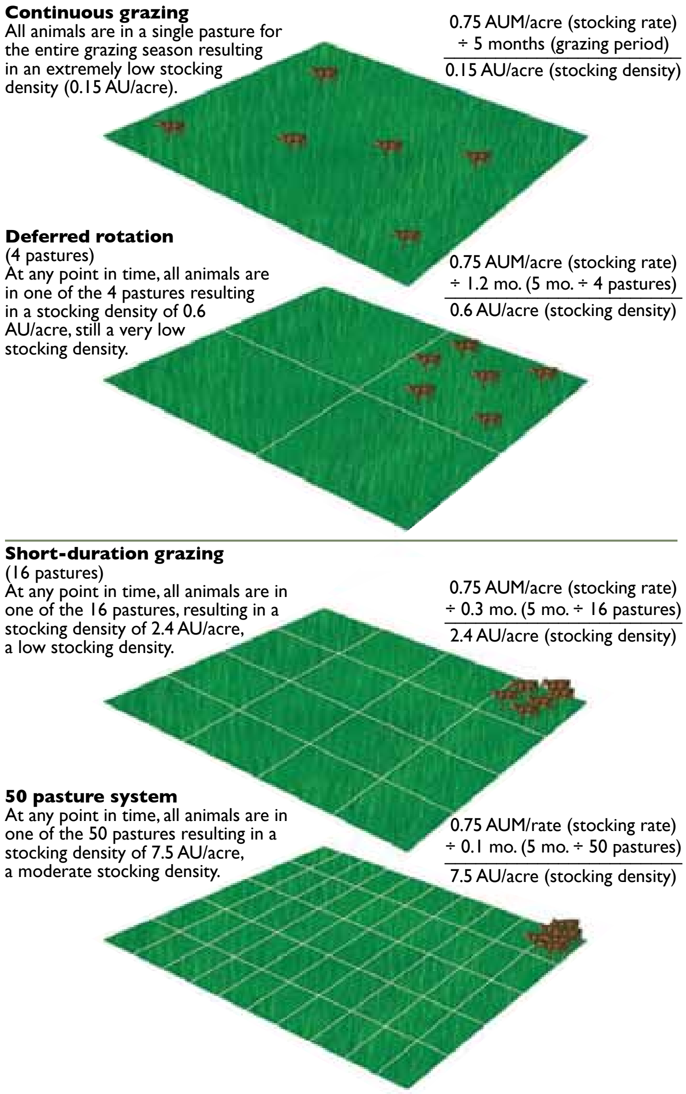


Figure 10. *Effect of grazing system on stocking density.*

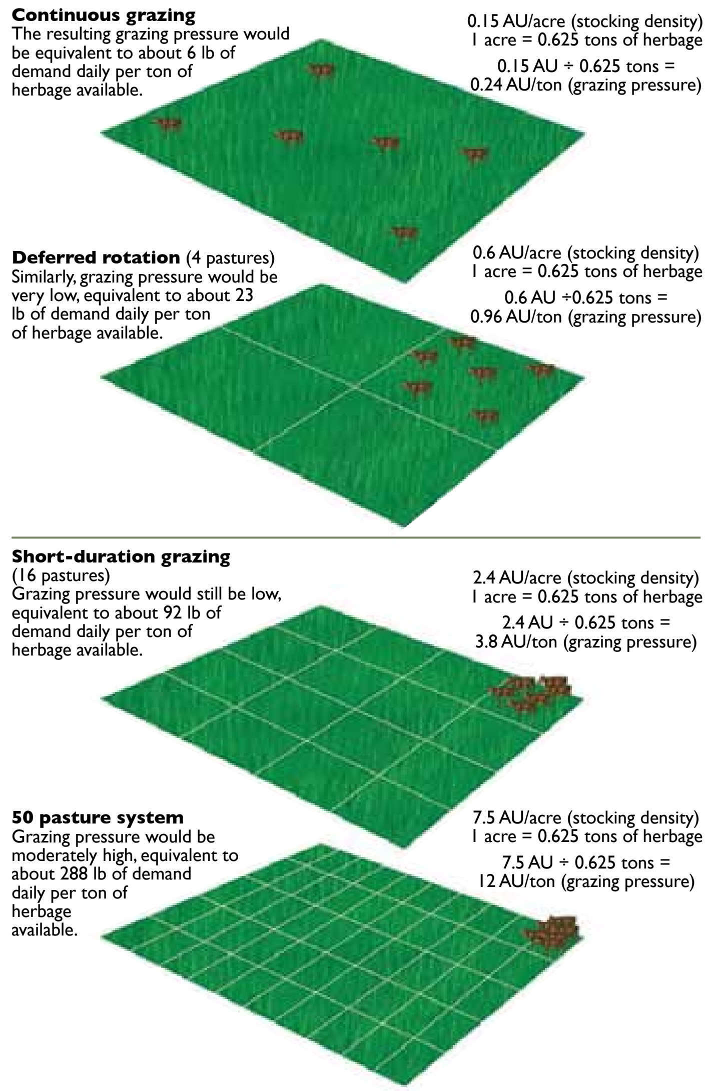


Figure 11. *Effect of grazing system on grazing pressure.*

density needs to reach a threshold before it affects grazing distribution (*Figure 9*). Research has shown that stocking densities for grazing systems on upland sites in semi-arid regions are less than those needed to affect grazing distribution. Our research and observations indicate that a stocking density of about 10 AU/acre on Sandhills upland sites grazed by yearling cattle during the growing season can minimize selective grazing and improve grazing distribution. At common stocking rates used in the Sandhills (0.75 AUM/acre), stocking densities achieved with a four-pasture deferred-rotation or a 16-pasture short-duration grazing system are less than 3 AU/acre (*Figure 10*), far less than that needed to affect grazing distribution (more than 10 AU/acre). On an upland site in the Sandhills, the stocking density in a 16-pasture short-duration grazing system might be 16 times greater than the stocking density on a season-long, continuously stocked pasture, but it is still much lower than what is required to affect the ability of livestock to selectively graze and therefore, affect grazing distribution. The stocking density of a 50-pasture system with a single, 3-day grazing period is still less than 10 AU/acre (*Figure 10*). Correspondingly, grazing pressure also is low on Sandhills uplands even when using a 16-pasture short-duration grazing system (*Figure 11*).

Long-Term Responses

With rotational grazing, the manager can improve long-term productivity of the vegetation cover, especially with desired forage species. With multiple pastures and multiple grazing periods possible through the growing season, botanical composition and productivity of individual pastures can be manipulated by timing of grazing. Timing of grazing is a land manager's principal tool in affecting grassland productivity. Non-grazing or deferment periods can be timed to favor species sensitive to grazing at particular times of the year. With a multiple-pasture rotation system, the sequence and timing of grazing can be controlled so that only a single (and different) pasture is grazed during a sensitive period. For instance, long-term grazing research at the Gudmundsen Sandhills Laboratory (GSL) and Barta Brothers Ranch indicates that the long-term productivity of the dominant, warm-season tallgrass of the Sandhills are compromised by grazing in July and August in consecutive years. The research also shows that cool-season grass production declines with consecutive years of grazing in mid-September through October.

Timing of grazing not only affects aboveground production of forage plants, but it also has a significant influence on root and rhizome production. The roots of perennial grasses are the source of most soil organic matter on range and pastureland. Vigorous plants will produce greater organic matter, resulting in better soil moisture conditions and grassland productivity.

Short-Duration Grazing versus Deferred-Rotation Grazing

Multiple grazing periods (two or more) and relatively large numbers of pastures (seven or more) are key components of short duration grazing and are reported to optimize overall grazing efficiency of these systems. A common assumption when expecting high grazing efficiency with this system is that grazed forage plants will regrow after defoliation. There are three primary reasons why growth after grazing is essential for short-duration grazing to be successful, including increased grazing efficiency.

1. New growth of a previously grazed plant should not be grazed within the same grazing period. To avoid this, grazing periods should be relatively short.
2. Forage grasses can be "maintained" in a vegetative stage of growth because grazed vegetative tillers will continue to grow and stimulate growth of new vegetative tillers, minimizing the number of low-quality and non-palatable reproductive tillers.
3. Defoliated grass plants will produce more aboveground biomass than a non-defoliated plant because of compensatory growth. Conceptually, the multiple grazing periods of short-duration grazing are designed to take advantage or manage the rapid growth of forage plants after defoliation. Properly planned grazing and recovery periods are used to manage for intensity and frequency of grazing. Multiple grazing periods are designed to keep the forage plants largely in a vegetative stage of growth and to manage for compensatory growth.

In semi-arid regions such as the uplands of the Nebraska Sandhills, soil moisture is relatively low by mid to late growing season in most years (*Figure 12*). The relatively high grazing pressure required of the short-duration grazing system in the early growing season (to attain spatial uniformity of defoliation) is risky when adequate soil moisture for new growth after defoliation is uncertain. And with low soil moisture, compensatory growth cannot occur. Consequently, the multiple grazing periods used in short-duration grazing do not appear to provide the reported benefits on upland Sandhills range.

It also should be noted that native perennial grasses in the Sandhills reproduce vegetatively and most grass tillers remain vegetative throughout the growing season. Even in a pasture that is not grazed until late in the growing season, most grass tillers are vegetative. Moreover, deferred-rotation grazing does not depend on new growth from defoliated plants as a forage source. In fact, with two pastures of a four-pasture deferred-rotation grazing system held back for grazing until the last half of the grazing season (August, September, and October), forage produced early in the season can be stockpiled for grazing later in the growing season, which is a good match for the Sandhills. Our research has shown that 60 to 75 percent of annual forage production on Sandhills rangeland occurs by June 15, which is only one-fifth of the way into the grazing season. Therefore, much of the forage biomass for a given management unit is produced early in the season but grazed in the last half of the season.

Finally, much of the reported improvement in vegetation cover and grazing distribution seen in moving from large pastures and extensively managed grazing to short duration systems likely results from decreasing pasture size, distance to water, and improved pasture design (for example, fencing along ecological/range site boundaries). Based on the results of our study, there are no vegetation productivity and animal performance improvements with SDG when compared to properly designed deferred-rotation grazing on upland Sandhills rangeland; therefore, the added infrastructure and management expenses associated with short-duration grazing cannot be justified. When planning for deferred-rotation grazing on upland Sandhills sites, properly designed systems should include the following:

- The areas within each pasture should be of similar ecological/range site.
- Distance to water in each pasture should be no more than ¼ to ½ mile.
- Timing of grazing is critical.
  - For rangeland dominated by warm-season grasses, avoid grazing in July-August in consecutive years.
  - Generally, graze the most vigorous pasture in July-August.
  - Grazing in the deferment period (September-October) generally is detrimental to cool-season grasses, especially in years with good precipitation in late summer and/or early fall.
  - Delaying grazing until the dormant season generally is beneficial to warm-season grasses.

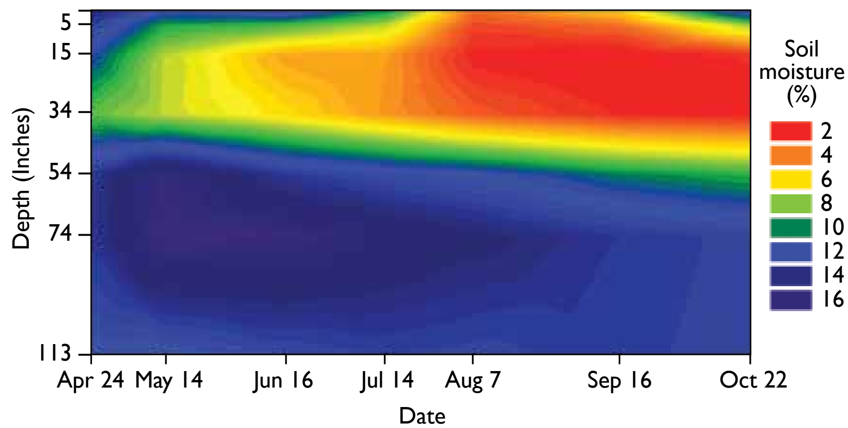


Figure 12. *Soil moisture (percentage) on upland sites during a growing season with near average monthly precipitation (UNL Barta Brothers Ranch, 2003).*

Periods of grazing for an alternative short-duration grazing system.

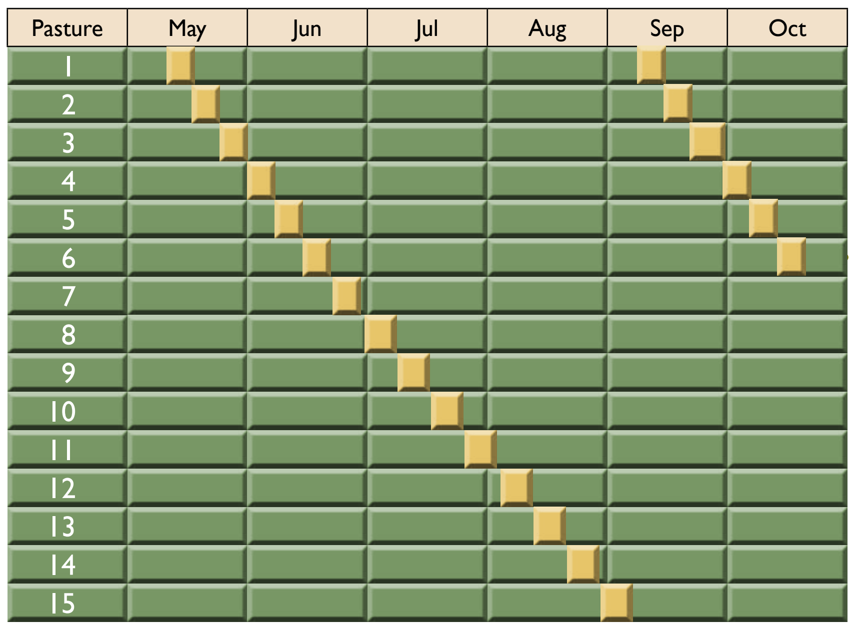


Figure 13. *Distribution of timing of grazing for an alternative short-duration grazing system.*

  - Consider stocking the first pasture in the grazing sequence again in the dormant season in years with good soil moisture and herbage production.
- And of course, consider other grazing management practices, such as appropriate stocking rates and grazing dates for the site.

Furthermore, deferment does not appear to be the critical element of four-pasture deferred rotation on Sandhills rangeland in good to excellent condition. Although not tested, the key to rotational grazing systems likely is changing the grazing date of pastures from year to year. Other Sandhills research has shown that grazing in the same grazing period in consecutive years has a negative impact on production of palatable, perennial grasses.

There are no strict rules in determining how the order of pasture grazing should change from year to year. In deciding grazing order, the manager of Sandhills rangeland wanting a mixture of warm-season and cool-season grasses should avoid the following:

1. grazing a pasture at the same time in consecutive years,
2. grazing a pasture in July and August if the vigor and production of warm-season grasses are low, and
3. grazing a pasture in the deferment period if the vigor and production of the cool-season grasses are low.

Other Grazing Options for Sandhills Uplands

Although there are no significant or consistent production responses to the multiple grazing periods characteristic of short-duration grazing, there is still interest in intensively managed grazing on upland rangeland in the Sandhills. Many practitioners believe there are advantages to the high stocking densities and short grazing periods associated with multiple-pasture grazing systems *(Figure 13)*. Modifying short-duration grazing to a single pasture occupation during the growing season, with 12 pastures or more and relatively short grazing periods (less than 14 days) can:

1. result in high stocking densities and potential improvement in harvest efficiency,
2. provide for short grazing periods that minimize the number of days forage plants are exposed to grazing, and
3. eliminate the concern about providing adequate recovery time between grazing periods within a growing season in a semiarid environment.

Glossary

Animal-unit (AU) – one mature, non-lactating bovine weighing about 1,000 lb or equivalent in other classes or kinds of ungulate herbivores based on animal demand or quantitative forage dry matter intake; assumes a standard daily forage intake of 26 lb on an oven-dry basis.

Animal-unit day (AUD) – an AUD of grazing is equivalent to about 26 lb of air-dry forage.

Animal-unit equivalents (AUE) – estimated by dividing the average weight of pairs or an individual by 1,000 lb.

Animal-unit month (AUM) – an AUM of grazing is equivalent to about 780 lb of air-dry forage.

Carrying capacity – number of animals that can be sustained on a management unit compatible with management objectives for the unit.

Compensatory growth – phenomenon of a defoliated plant producing more aboveground biomass than a non-defoliated plant over a period of time, usually the growing season.

Deferment – nongrazing from the breaking of plant dormancy until after seed set or equivalent stage of vegetative reproduction.

Deferred-rotation grazing – a multiple pasture, one-herd grazing system in which one pasture is deferred each year and the other pastures are grazed rotationally through the growing season.

Ecological site (range site) – a type of land with specific physical characteristics that differs from other types of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Grazing cycle – the time between the beginning of one grazing period and the beginning of the next grazing period in the same pasture; one grazing cycle includes one grazing period plus one recovery period.

Grazing distribution – dispersion of animals during grazing over a management unit or area.

Grazing efficiency (harvest efficiency) – the percentage of the total standing crop by weight that is ingested.

Grazing management – manipulation of grazing animals to accomplish desired results.

Grazing pressure – animal unit demand per unit weight of forage for a specified time period, expressed as AUM/ton of forage or AUD/ton of forage.

Grazing system – specialization of grazing management that provides movement of grazing animals between pastures with a specified objective and defined periods of grazing and nongrazing.

Range site (ecological site) – a kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Recovery period – nongrazing period in the growing season when grazed plants gain vigor prior to the subsequent grazing period.

Rest – nonuse of grazing land for a full year.

Rest-rotation grazing – a multiple pasture, one-herd grazing system in which one pasture is rested each year and the other pastures are grazed rotationally through the growing season.

Rhizome – a horizontal, usually underground stem that often sends out roots and shoots from its nodes; common in most perennial, warm-season grasses of the Sandhills.

Season-long continuous grazing – allowing animals unrestricted and uninterrupted access to a pasture for most or all of the grazing season.

Short-duration grazing – a rotational grazing system employing high stocking density, one herd, commonly 5 to 12 paddocks, grazing periods of 3 to 10 days, and two to several grazing cycles per year.

Stocking density – number of animal units (AU) per unit area at a point in time, often expressed as AU/acre.

Stocking rate – number of animal units (AU) per unit area for a specified period of time, often expressed as AUM/acre or AUD/acre.

Resources

Integrating Management Objectives and Grazing Strategies on Semi-arid Rangeland. Patrick E. Reece, Jerry D. Volesky, and Walter H. Schacht. University of Nebraska–Lincoln Extension Circular EC 158. 2008.

Skillful Grazing Management on Semi-arid Rangeland. Patrick E. Reece, Walter H. Schacht, and Jerry D. Volesky. University of Nebraska Extension Circular EC 162. 2007.

Plant and Animal Responses to Grazing Systems in the Nebraska Sandhills. Walter H. Schacht, Jerry D. Volesky, Mitchell.B. Stephenson, Terry K. Klopfenstein, and Don C. Adams. University of Nebraska 2010 Beef Report MP93, pages 36-37. 2010.

Grazing System Effects on Grazing Cattle Diet Composition in the Nebraska Sandhills. P.R. Schroeder, M.S. Thesis, University of Nebraska–Lincoln. 2007.

Effect of Deferred-Rotation and Short Duration Grazing Systems on Livestock Performance, Botanical Composition, and Standing Crop in the Nebraska Sandhills. Mitchell B. Stephenson, M.S. Thesis, University of Nebraska–Lincoln. 2010.