

Breeding Bull Management

It's a Year-Round Commitment

Karla H. Wilke, UNL Extension Cow-Calf Stocker Management Specialist

Kacie L. McCarthy, UNL Extension Beef Cow-Calf Specialist

Hannah Greenwell, UNL Extension Beef Systems Educator

In the United States, approximately 90% of beef cows are impregnated by natural service. Additionally, 90% of the genetics in a typical cowherd can be attributed to the bull. As a valuable asset in a cow-calf operation, bulls deserve the utmost care and attention. All too often, however, bulls are not a priority until it is time to breed cows. Managing for healthy, productive bulls is a year-round process. Keep in mind spermatogenesis (sperm production and development) is a 61-day process, making the two months prior to the breeding season critical. Management practices during the “off-season” for bulls, however, can also impact sperm production and quality, and the bull’s physical ability to breed cows.

Body Condition in Bulls

Body condition is just as important in bulls as it is in cows. Much like cows, bull body condition needs to be



evaluated as fat cover over the front ribs, brisket, and tail head (University of Nebraska–Lincoln [UNL] Extension Circular EC281 *Body Condition Scoring Beef Cows: A Tool for Managing the Nutrition Program for Beef Herds* making sure that gut fill does not impact the score given. Research has shown that bulls with a body condition score (BCS) of 5 or 6 (scale 1–9) have better semen quality than those of 4 or 7.

When to Evaluate Bull Body Condition

During the breeding season, bulls may lose 100 to 200 pounds, which translates to 1 to 2 BCS; therefore, a 5.5–6.5 BCS before the breeding season starts is ideal. Evaluate bull BCS 90 days before the breeding season to allow time to add weight, if needed. This means understanding the quality and quantity of feed available to the bulls prior to the breeding season, regardless of time of year, is critical for having healthy bulls ready to breed at turnout.

Nutrient Availability Prior to the Breeding Season

Depending on when the breeding season occurs, providing bulls with high-quality grazing 60 to 90 days before breeding begins may not be possible. Typically, calving seasons are late winter/early spring (February–early April), late spring/early summer (late April–June), or late summer/fall (August–October). Table 1 provides a chart for determining when bull BCS should be evaluated based on preferred calving date.

Table 1. Body condition score evaluation schedule for breeding bulls.

Initial calving date	Initial breeding date	90-day bull evaluation
February 1	April 25	January 25
May 1	July 23	April 23
August 15	November 6	August 6

Table 2 provides example diets for maintenance and growth for bulls prior to the breeding season when grazing is not available. Keep in mind the young bull has nutrient requirements for growth as well as maintenance.

Trace minerals also influence bull reproduction and health. For example, zinc (Zn) has been shown to affect sperm production and motility, and iodine (I) has been shown to help alleviate foot rot, a common ailment impacting bull performance. Selenium (Se) also plays a critical role in sperm morphology and motility. Furthermore, copper (Cu) impacts sexual maturity and reproductive development. Therefore, providing supplemental trace minerals and vitamins year-round should improve bull performance during the breeding season.

Nutrient Content of the Forage Before and During Summer and Fall Breeding

Depending on the type of forage and environmental conditions, mid-summer/early fall (July–September) forage quality decreases, and quantity can be inadequate. This can be an issue when wet, cool springs result in rapid grass growth and early maturity, or in hot, dry years when grass growth is reduced. As a result, bulls could be losing body condition prior to or during the breeding season while grazing. Since they would likely be grazing with lactating cows that have a high nutrient requirement (UNL–Lincoln Extension NebGuide G2268 [*Supplementation Needs for Gestating and Lactating Beef Cows and Comparing the Prices of Supplement Sources*, supplementation may be necessary to maintain an appropriate BCS prior to winter. Therefore, evaluating BCS for signs of loss throughout the summer and fall is critical.

Unless cattle are grazing cool-season annual forages during the fall breeding season, it is likely a complete diet, or total mixed ration, will need to be formulated to maintain both bull and cow BCS for the best reproductive success. UNL Extension personnel can assist producers with ration development.

Many times at weaning, when cows are pregnancy checked and producers are disappointed with the results, they may assume the cows were thin and not cycling at

Table 2. Example diets for maintenance and growth for bulls when green grass is not available.

1,300 lb yearling bull			
lb as-fed basis	Maintenance	90 days to gain 100 lb	60 days to gain 100 lb
Example 1 ^a			
Meadow hay, lb	35	35	31
DDGS cubes, lb	0	1	3.5
Example 2 ^b			
Millet hay, lb	32	29.5	23
Corn silage, lb	0	14	27
WDGS, lb	6	0	4
1,800–2,000 lb mature bull			
	Maintenance	90 days to gain 100 lb	60 days to gain 100 lb
Example 1 ^a			
Meadow hay, lb	42	36	38.5
DDGS cubes, lb	0	3	8
Example 2 ^b			
Millet hay, lb	35	31	25.5
Corn silage, lb		15	25
WDGS, lb	3	4.5	14

^aMeadow hay at 56% TDN (total digestible nutrients), 10% CP (crude protein); DDGS cubes (dried distillers grains with solubles) at 90% TDN, 28% CP

^bMillet hay at 54% TDN, 8% CP; corn silage at 68% TDN, 8% CP; WDGS (wet distillers grains with solubles) at 108% TDN, 30% CP

breeding time. While this may be part of the issue, bull condition prior to breeding is seldom considered as a potential issue of poor pregnancy rates.

Breeding Soundness Exam

In addition to monitoring body condition, bulls should undergo a breeding soundness examination (BSE) approximately 4 to 6 weeks prior to the breeding season by the producer's veterinarian. The Society for Theriogenology has developed minimum guidelines for a bull to pass a BSE.

The BSE consists of the following:

1. Physical examination
2. Reproductive examination (including scrotal circumference measurement)
3. Semen collection and examination

To successfully pass a BSE and be classified as a *satisfactory potential breeder*, a bull needs to have good eyesight

and musculoskeletal conformation, a minimum scrotal circumference based on age (Table 3), and at least 30% sperm motility and 70% normal sperm morphology. If a bull does not pass one of these requirements, he is either categorized as a classification *deferred* (recommend the bull be tested again, generally in 3 to 4 weeks, depending on veterinarian recommendation) or as an *unsatisfactory potential breeder*.

Physical Examination

The physical component of the BSE determines if the bull can physically breed a cow. A bull must be able to see, smell, eat, and move normally to successfully breed cows. Sound feet and legs are crucial, because if the bull is unsound, he may be unable to travel and/or mount a cow and successfully mate. Evaluating bull soundness during the winter and prior to the breeding season is just as important as evaluating cows. Furthermore, pelvic size (height, width, area) can be recorded as pelvic size in bulls is related to pelvic size in their daughters. Using pelvic measurements can help manage dystocia.

Reproductive Examination

The sheath should be inspected and palpated to ensure problems such as trauma (ex. broken penis), fibrosis, abscesses, and scarring are not present. The penis, which can be palpated within the sheath, should freely move and have no abnormal masses (e.g., adhesions, fibropapillomas, and hematomas). Additionally, scrotal conformation should be evaluated and the testes palpated for hardness and resiliency; a normal testicle should be firm and resilient. Scrotal circumference indicates testicular mass, and as it increases, so does the daily production of high-quality sperm. Scrotal circumference is also important, because it is directly related to the onset of puberty in the bull and his female offspring. Monitor and identify if a bull has experienced an injury to scrotum/testes, including frostbite, because it will take 60 days or more to produce normal sperm again following an injury.

Semen Collection and Examination

A semen sample can be collected by rectal massage, the use of an artificial vagina, or by the most commercially used method, electroejaculation. Semen quality evaluation includes ejaculate volume, sperm cell motility, and sperm cell morphology. Sperm motility measures the percentage of spermatozoa in an ejaculate that has progressive (head-first) movement. The minimum recommended threshold

Table 3. Minimum recommended scrotal circumference (SC).

Age (months)	≤ 15	≥15–≤ 18	≥18–≤ 21	≥2–≤ 24	>24
SC (cm)	30	31	32	33	34

for individual motility is 30%. Sperm morphology is calculated by evaluating the percentages of normal spermatozoa and sperm with abnormalities. Sperm morphology can impact pregnancy success more than motility. The minimum recommended threshold for sperm morphology is 70% normal spermatozoa. Research has indicated bulls with 80% or more normal sperm had greater pregnancy rates compared to bulls with less than 80%. Therefore, selecting bulls with more normal sperm can increase the chances of greater overall pregnancy rates in a herd. It is important to remember that substandard nutrition, extreme environmental temperatures (both heat and cold), and disease can reduce semen quality. Additionally, semen quality from a single bull may change over time.

Additional Health Considerations

Generally, bulls receive the same pre-breeding vaccinations as the cow herd. For other health considerations (including deworming, fly control, or additional vaccination strategies), producers should develop a relationship with their local veterinarian to determine the best management practices for their region.

Libido

Libido refers to the desire to mate. High libido can positively impact pregnancy rates and conversely, low libido can negatively impact pregnancy rates. Libido can be evaluated by closely watching a bull after introducing him to a cow herd—is he more interested in detecting cows in estrus, or in finding food in the bunk or pasture? Yearling bulls will have more false mounts early in the breeding season, but all bulls should be evaluated frequently (preferably weekly) to monitor ongoing mating activities and capabilities. Bulls with diminished (due to heavy activity load) or inherently low libido may require rest and recuperation during a competitive breeding season.

Bull-to-Female Ratio

Knowing how many bulls to turn out in each pasture can be a moving target with multiple considerations.

The bull-to-female ratio depends on bull age, length of the breeding season, distance needed to travel within a breeding pasture, terrain, and use of breeding technologies. Therefore, it is important to match bull demand to the breeding program to ensure effective and economical bull power. For example, when using an additional breeding technology, such as estrus synchronization and/or artificial insemination (AI), bull power will need either to be increased or decreased. This ranges from a 1:10 bull-to-female ratio for yearling bulls in synchronized natural service breeding systems to a 1:60 bull-to-female ratio when mature bulls are used for natural service clean-up following AI. If a tighter calving season is desired, supplying more bull power may be necessary. Using synchronization, increasing the nutrition, or shortening a breeding season to less than 60 days are arguments why bull stocking density should be increased. On the other hand, if the bulls can settle two-thirds of the cows in the first cycle of a 60-day breeding season, fewer bulls are needed later in the breeding season, assuming no major incidents occur in the first cycle of breeding. Producers should also consider the age of the bulls in the bull battery, and, specifically, match each bull's mating capabilities with the operation's breeding demands. As bulls mature, they should be able to breed, or "cover," more cows in a breeding season. One mature bull for 25 cows is typically recommended in a 60-day breeding season. Table 4 shows recommended mating capabilities depending on bull age.

Lastly, when determining bull-to-female ratio, producers should consider a back-up bull. Having an additional bull to use if something happens to another bull can be an insurance policy for bred cows. If this seems expensive, take the bull purchase price and divide it by the dollar difference between a bred cow and an open cow, to determine the number of additional cows that would have to get bred to recoup that bull's purchase price.

Social Dominance

Another factor to consider is bull social behavior. Under natural service conditions, the social ranking of bulls within the herd hierarchy can influence reproductive performance. Dominance is more related to seniority than any other factor, and is expressed more strongly in older bulls (i.e., 3 to 4 years of age and older). Dominance can have a greater impact when the bull-to-female ratio is low, and there is limited estrus activity within a herd. Dominant bulls can impregnate more cows, limiting subordinate bulls in terms of reproductive performance and calves sired. Conversely, if the dominant bull has low semen quality or

Table 4. Mating ranges of different ages of bulls for a 60-day breeding season

Bull Age	Mating Capacity Range
12–16 months	10–15 females
17–23 months	15–20 females
24–29 months	20–25 females
30 months or older	25–30 females



low sex drive, this can compromise herd fertility. Correctly calibrating bull-to-female ratio can help avoid compromised herd fertility, help prevent bulls from fighting, prevent bull fatigue, and allow bulls time off to recover from injury, etc.

Some considerations for managing social dominance include:

Separating bulls by age when possible. Some producers may run mature and young bulls (less than 4 years of age) together in the same breeding season. Mature bulls are generally more dominant, and younger bulls may have little to no chance to cover females. Therefore, separating bulls by age groups in different breeding pastures may reduce the chance of injury from fighting, and allow younger bulls with different genetic potential to cover females.

Altering bull-to-female ratio as the breeding season progresses. If a high bull-to-female ratio is required early in the breeding season to accommodate synchronization, consider removing some bulls after the first 21-day cycle to lower stocking density. Ideally, they should settle two-thirds of the cows in the first 30 days.

Rotating bulls during the breeding season. Utilizing older herd bulls with higher coverage ability early in the

breeding season, and swapping them out with younger bulls during the second 30 days of the breeding season can not only eliminate dominance issues, but also prevent younger bulls from losing body condition during the entire breeding season.

Implementing breeding groups. Instead of putting 10 bulls into a pasture of 250 cows and letting them sort it out, consider reducing the number of cows in those breeding groups so that only three to four bulls or fewer are needed per pasture. This can also present an opportunity to be more selective in placing certain females with certain bulls to improve genetic outcomes in the calves.

Establishing social order early. Introducing new bulls into an already established bull battery needs to be done prior to the breeding season. While it does not take long for social order among bulls to be established (30 days), waiting until the breeding season to introduce new bulls is not ideal, because once bulls are placed with cycling cows, they should focus on the cows, not establishing dominance once they are placed with the cows.

Culling Considerations

Bulls should be evaluated and culled if they have poor vision, low semen quality, undesirable conformation, injuries to reproductive organs, structural injuries, or aged out of the bull battery. Semen quality can decline with age, and bulls can also lose their rank in social hierarchy to younger, more aggressive bulls. Stifling is another structural injury that could preclude a bull from breeding again.

Seasonal Management

Summer

During the summer, access to shade has the potential to improve fertility in bulls. The scrotum is the protective sac surrounding the testes, and is heavily populated with sweat glands that cool the testes through evaporative heat transfer. The scrotum helps protect the testicles against extreme temperatures (both heat and cold). The cremaster muscle helps support the testis, and is responsible for facilitating blood flow to the testes. This muscle relaxes when hot, and contracts when cold. Increased testicular temperature due to sickness (and resulting fever) or exposure to high environmental temperatures reduces semen quality. The testes need to be 3.6 to 10.8° F cooler than the bull's



natural body temperature of 101.9° F. Although spermatogenesis is a long-term process (60 days), short-term heat stress can also alter that process. Therefore, bulls experiencing short-term increases in body temperature from infection, handling, moving, or transporting during hot weather, or being exposed to elevated ambient temperature for several days without shade can have reduced semen quality. One way to help reduce the exposure to excessive heat is to provide shade. Providing ample drinking water can also reduce heat stress.

Winter

Consider providing windbreaks and bedding to help protect bulls from frozen ground and wind chill. Lack of protection from frozen ground or continual snow presence could lead testes to blister or scab from frostbite, which could permanently lower sperm-production capabilities. Generally sustained temperatures below 20° F, especially with wind are considered conditions where bedding and windbreaks are necessary for comfort and well-being in herd bulls. Providing protection from cold temperatures and wind can help bulls maintain body condition rather than using provided nutrition to maintain body temperature.

Summary

With 90% of beef cows in the United States bred by natural service, managing bulls to optimize breeding performance is important. Herd bulls influence not only the calf crop and genetic improvement, but ultimately the profitability and sustainability of an operation. Bull body condition should be critically evaluated approximately 90 days before the breeding season to prepare the bulls for a rigorous breeding season, and to help ensure bulls pro-

duce adequate quality sperm ahead of the breeding season. Because injuries, weather insults, aging, and other factors can impact the bull's ability to breed cows, bulls should undergo a breeding soundness exam before each breeding season. The ratio of bulls to females depends on a variety

of factors, so producers should evaluate their situations carefully and adjust this ratio accordingly. By proactively monitoring and maintaining bulls year-round, producers can get the most efficient use of dollars spent on the bull battery.

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