

# Evaluating the Breeding Soundness of Beef Bulls

## Guide B-216

Ron Parker, Head, Extension Animal Resources  
Clay Mathis, Extension Livestock Specialist  
Dean Hawkins, Associate Professor,  
Dept. of Animal and Range Sciences

Cooperative Extension Service  
College of Agriculture and  
Home Economics



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Evaluating breeding soundness of bulls is an often neglected management practice. Producers may incorrectly believe that bulls that have previously proven fertile are of sound breeding value for the rest of their lives. They may also assume that new bulls are reproductively sound simply because of some vague or implied guarantee by the seller. Unfortunately, neither assumption is correct. Bulls that do not settle their share of cows early in the breeding season contribute to reproductive inefficiency. This can be as costly as dead calves, although much less dramatic.

Bulls are selected for their genetic potential to improve the cow herd. It is economically important that all bulls are fertile. An annual breeding soundness examination of each bull is the only way to predict that the producers will get their money's worth from the bull battery.

There are three periods during the year that are most logical for routine breeding soundness evaluation of the bull battery. Individual ranch situations may make one period more desirable than another. These three periods are (1) just before the breeding season, (2) immediately after the breeding season, and (3) at weaning time.

The most popular time to test bulls is just before the breeding season. An evaluation at this time gives the producer the greatest assurance that the bull will be reproductively sound during the breeding season. The more time between the evaluation and the beginning of the breeding season, the less reliable the results will be as a predictor of the bull's fertility and his ability to breed. One disadvantage of testing at this time is that it may be difficult to replace unsatisfactory animals.

Evaluating bulls immediately after the breeding season allows the producer the most time to replace unsatisfactory animals. However, it is important to consider that bulls tested immediately following the breeding season may have lower semen quality due to heavy usage.

Testing at weaning allows sufficient time to identify and purchase replacement sires before the next

breeding season begins, but testing at this time is a less reliable indicator of the bull's breeding soundness than testing closer to the beginning of the breeding season.

A basic breeding soundness evaluation consists of:

- Physical examination of the animal.
- Examination of reproductive organs.
- Measurement of scrotal size.
- Evaluation of semen.

In addition, the following tests or procedures may be included in a breeding soundness evaluation:

- Mating ability: some assessment of the bull's desire (libido) and ability to breed a female in heat (termed serving capacity).
- Pelvic measurement.
- Trichomoniasis testing.

### PHYSICAL EXAMINATION

The bull needs to be able to see, eat, smell, and move around to successfully breed his share of cows. Any factor that lowers the efficiency of these activities will have a negative effect on the bull's breeding ability. A history of recent illness is also important because semen quantity and/or quality may be reduced as a result of a prior illness.

*Eyes.* A bull with poor vision is not only dangerous to handle but is usually dominated by other bulls to the point that his breeding effectiveness is reduced. Vision is an important factor in detecting potential riding activity, because bulls use it to find females in heat. Both eyes should be free from injuries or disease. Special care should be taken to examine eyes for early eye cancer growths. Old pink eye scars that result in loss of vision may be reason to cull some bulls, especially in multiple sire groups.

*Teeth and Mouth.* Older bulls need to be examined for lost and severely worn teeth. Lump jaw (Actinomycosis) is a chronic bone and soft tissue infection that is not responsive to treatment. Bulls with Actinomycosis should be culled as soon as the condition is diagnosed.

**Body Condition.** Ranchers often disagree about the correct body condition for a breeding bull. Bulls should have enough condition to be strong with some reserves of energy in the form of fat. The required amount of condition will vary with time of year, age, size and kind of rangeland, length of breeding season, and the number of cows per bull. A body condition score of 5 to 6 is generally recommended for range bulls entering the breeding season.

**Feet and Legs.** Structural soundness of the feet and legs is of paramount importance if the bull is to travel and mount females in heat. A bull that is sore or crippled may not be able to perform under range conditions. Structural defects of the feet and legs should be discriminated against during the breeding soundness evaluation. Conformational faults, stifling, foot rot, and other injuries can result in the bull becoming lame soon after the breeding season begins.

Most structural faults such as sickle-hock and post-legs are heritable and may cause lameness with hard use. All four legs and all joints should be clean and free from any swelling or evidence of old injuries. A bull traveling on rough, hard ground will have relatively even levels of wear on each hoof and seldom will have foot problems if he is structurally correct.

Diseases of the foot including foot rot (foul foot), interdigital corns, and puncture wounds should be identified and treated to render the bull “sound” before the breeding season.

## EXAMINING THE REPRODUCTIVE ORGANS

A thorough examination of the bull’s reproductive system should follow the general health examination. The internal organs can be examined by rectal palpation while the bull is restrained. The vesicular glands, ampullae, and prostate should also be examined for evidence of inflammation, adhesions, or fibrosis. Furthermore, the spermatic cord, scrotum, testicles, and epididymides need to be examined for evidence of abscesses, injury, frost bite damage, or tumors. The testicles are the factories where sperm cells are produced, and they should be firm, equal in size, and adequate to large for the bull’s age. Degeneration in any of these anatomical sites may reduce fertility.

Testicular hypoplasia (underdevelopment) should also be evaluated and discriminated against at this time. Testicular hypoplasia has the potential to reduce fertility and it is a highly heritable trait. With this condition, one or both testicles are about one-third of normal size.

The penis and sheath should be examined for any sores, lacerations, abscesses, scar tissue, hair rings, warts, or adhesions. When erect, the penis should ex-

tend from the sheath in a straight line with the body of the bull. Persistent penile frenulum (tied back penis) is occasionally found in young bulls during this part of the examination, but it typically is easily corrected.

Injuries to the penis or prepuce may occur during the active breeding season. However, injuries of this nature may not be noticed until the breeding soundness exam. Old lacerations and adhesions may prevent the penis from being fully extended or cause pain during breeding. Bulls with any type of painful lesion typically lose their desire to breed cows and become ineffective. Warts on the tip of the penis are a relatively common finding in young bulls and should be surgically removed. In severe cases of penile warts, the bull should be culled from the herd.

## SEMEN EVALUATION

A bull considered normal based on the general physical and reproductive organ examinations may still have low fertility due to poor semen quality and quantity.

Under normal field conditions, a semen sample is usually collected from beef bulls by electro-ejaculation. The quality of semen obtained with the electro-ejaculator is equal to that of other collection methods. However, a semen sample adequate for evaluation cannot always be collected from every bull on every attempt using an electro-ejaculator. Failure to obtain sperm cells from a single attempt does not automatically place the bull in the unsatisfactory category.

### Scrotal Circumference

There is no accurate, repeatable method of measuring actual semen concentration with samples collected with the electro-ejaculator. Because scrotal size correlates well with daily sperm production and is a highly repeatable measure, scrotal circumference is a valuable indicator of semen production. Bulls with bigger testicles usually produce more semen and sire sons with bigger testicles. Bulls with larger testicles generally reach puberty at an earlier age and sire earlier maturing heifers.

Breed type can influence testicular size. In particular, Zebu cattle (*Bos indicus*) or breeds containing a percentage of Zebu blood tend to have smaller testicles compared to *Bos taurus* breeds. However, this does not diminish the value of testicular size, and large allowances should not be made for bulls of these breed types.

Scrotal circumference is given a score based on the age of the bull. Scrotal circumference score represents 40 percent of the total score of the bull (table 1).

## Semen Quantity and Quality

Sperm cell concentration (number per cc), motility (movement), and morphology (normal vs. abnormal cells) evaluations are the basis for the scoring system developed by the Society of Theriogenology. This scoring system has become the standard across the country and is used by almost all veterinarians. If the bull is satisfactory on general physical exam and the complete exam of internal and external reproductive organs, a semen sample is collected and evaluated under the microscope for the following traits:

Concentration (the number of normal sperm cells present in each cc of the ejaculate) and volume (the number of cc's of ejaculate) are important factors in semen quality. Together, these values represent total sperm output, providing an indicator of the bull's serving capacity.

Motility of individual sperm cells is an important factor in determining the breeding soundness of bulls. Ideally, the sample should contain more than 90 percent vigorous, progressively motile sperm cells. Motility is easily decreased by exposing the semen sample to cold temperature shock during collection. Special heated equipment must be used during cold weather if the test is to be meaningful. Motility score represents 20 percent of the total breeding soundness score (table 1). Motility may be described either by gross activity (descriptive terms) or by an estimate of individual sperm activity (percent).

Morphology, or the shape of the sperm cells, is also an important semen characteristic. A small sample of semen is stained on a microscope slide, and at least 100 cells are graded for normal shape. Sperm cells with droplets, bent or coiled tails, malformed heads, or other defects are less apt to fertilize an egg. Abnormal cells should usually be less than 25 percent of the total sperm cells to receive the full points in this category. Morphology score represents 40 percent of the total breeding soundness score (table 1).

## CLASSIFICATION OF BREEDING BULLS

In 1976, the Society of Theriogenology developed a standardized system to evaluate breeding ability of bulls. This system has become the standard by which bulls are measured for breeding soundness. In 1992 the system was modified slightly to reflect the most current concepts in bull fertility examination (table 1).

To be classified a *Satisfactory Potential Breeder* requires a satisfactory physical examination and minimum values for scrotal circumference, motility, and morphology. Any bull not meeting the minimum is either classified as *Unsatisfactory Potential Breeder* or classification may be *Deferred* at the evaluator's

discretion. It is common for yearling bulls, due to immaturity, to require a second fertility examination to achieve *Satisfactory Potential Breeder* status.

**Table 1. Bull breeding soundness evaluation.**

SCROTAL CIRCUMFERENCE (40 percent)		
Age of bull	Minimum scrotal circumference	
< 15 months	30 cm	
15–18 months	31 cm	
19–21 months	32 cm	
22–24 months	33 cm	
> 24 months	34 cm	

  

MOTILITY (20 percent)		
Gross activity	Individual activity*	Rating
Rapid swirling	~ 70%	Very good
Slower swirling	50–69%	Good
Generalized oscillation	30–49%	Fair
Sporadic oscillation	< 30%	Poor

  

MORPHOLOGY (40 percent)
Minimum is 70 percent normal sperm cells.

\* Motility may be described either by gross activity (descriptive) or by individual activity (percent).

## MATING ABILITY

No practical way is known to estimate a bull's potential mating ability except to observe the bull servicing cows. Semen production, scrotal size, or hormone levels do not relate well to the bull's mating performance. There is no good visual indicator of bull fertility.

Libido, or sex drive, is important in the bull's ability to "settle" a large number of cows. Assessment of libido and mating ability is important to help detect physical abnormalities that would prevent a bull with good semen from settling cows. Information is lacking on breed difference in mating behavior of bulls in natural breeding service. Libido and semen production do not appear to have any relationship, so it is possible to get good semen from low-libido bulls and vice versa. Standardized libido testing procedures using heifers in standing heat are described and are quite accurate, but the cost of such tests may preclude their routine use in the breeding soundness examination.

## PELVIC MEASUREMENT

Another evolving technology is pelvic evaluation. Research studies have reported the heritability of pelvic area in a wide range from 0.36 to 0.68. If these research reports are summarized, they place heritability value of the pelvic area at 0.55, which suggests this trait is highly heritable and probably higher than the 0.45 heritability of calf birthweight.

This means that both traits will respond to selection, but greater selection pressure could be put on pelvic size. Genetic correlation between pelvic size and growth is also positive. This would suggest that by selecting both bulls and heifers for pelvic size, a herd of cows could be developed with larger pelvic area. This could also increase growth rate and weaning weight, which leads to larger mature size (a potential disadvantage with some breed types).

Colorado research reported a 0.60 genetic correlation between male and female pelvic area. This indicates selection for pelvic size in bulls should result in increased pelvic size of daughter offspring. Hip height, frame score, and scrotal circumference were positively correlated with pelvic size.

At this time, limited research has been reported on pelvic size of bulls. However, some research suggests that bull pelvic area relative to body weight is smaller than that of heifers and that pelvic area measurements in yearling bulls should be adjusted for age or weight if measurements are to be used in intensive selection programs. Table 2 lists suggested minimum pelvic areas for yearling and two-year-old bulls.

**Table 2. Suggested minimum pelvic area for bulls of various weights and ages.**

Age	Weight	Pelvic area
Yearling	900–1,000 lb	150 cm <sup>2</sup>
	1,000–1,200 lb	170 cm <sup>2</sup>
2 year old	1,300–1,500 lb	190–200 cm <sup>2</sup>

## TRICHOMONIASIS TESTING

Trichomoniasis, a venereal disease, can negatively affect reproductive performance of cows. This disease usually causes abortion within the first 4 months of pregnancy. If the bulls are removed after only a short breeding season, infected cows are typically open at pregnancy test time. However, cows will usually clear up and breed back during a prolonged breeding season, producing a prolonged calving season.

In many range cattle communities, trichomoniasis outbreaks are a major concern. Awareness of and vigilance against trichomoniasis are certainly encouraged on the part of all beef producers.

Trichomoniasis is caused by a one-celled protozoan that is found in the prepuce and sheath of bulls and reproductive tracts of cows. The protozoan resides in the little "pockets" (crypts) that line the sheath. Because older bulls generally have more crypts, they are more likely to carry the organism for a longer period

of time. The organism kills the embryo or fetus, which is then expelled by the cow. The cow generally cycles two or three times and then regains fertility. This immunity will last about 1 year. However, most bulls over 3 years carry trichomoniasis indefinitely. In a few cases, a cow can remain a carrier, but the overwhelming majority of carriers are bulls.

Producers should have all breeding bulls tested annually for trichomoniasis. The veterinarian will collect some mucus from the deepest portion of the sheath and culture this material to allow the trichomoniasis organisms to grow. The culture is observed for 3 to 7 days for any live trichomonads. Bulls testing positive should be culled from the herd. Bulls testing negative should be retested at a later date, particularly if the veterinarian suspects trichomoniasis as being related to breeding problems in the herd.

The accuracy rate for a single sample properly collected and examined is 85 percent. This means that of 100 positive bulls tested, 85 will show up on the first test as positive. For this reason, retesting is required to eliminate the disease from a bull battery. Bulls should be tested for trichomoniasis well ahead of the breeding season to allow time to replace infected animals. Remember that without proper management of the cow herd, testing and removal of infected bulls will not completely eliminate the problem.

Controlling trichomoniasis on communal grazing allotments can be difficult and must be a cooperative effort among producers because of the likelihood of herds commingling. Consequently, even though a producer may eliminate the problem in his or her herd, animals are likely to become infected by another producer's infected bulls.

## SUMMARY

Breeding soundness evaluation is a practical method to eliminate bulls with less than satisfactory breeding potential. This evaluation should be conducted on every bull 30 to 60 days before each breeding season to allow time to replace questionable or unsatisfactory bulls. Producers should also observe bulls with cows in heat to determine if bulls have the desire and ability to mate successfully. Pelvic measurement allows selection of bulls with a large pelvic area for their size or age. Bulls should be free of venereal diseases, the most important being trichomoniasis.

—Adapted from *Identifying the Functional Bull: Bull Soundness and Management*, by Ed Duren and Jack Walker. Cattle Producer's Library, CL425, University of Idaho. 2nd ed. Fall 1996.