



Target Age and Weight When Breeding Beef Heifers

To maintain its size, a beef herd's annual replacement rate typically equals the number of cows that exit annually due to death, marketing, or culling. A typical replacement rate of 15% has been suggested (Thomas). So, for the average Wisconsin cow-calf herd with 25 cows, four replacements per year are needed. Producers need to decide if purchasing replacements or breeding their heifers is best for their operation.

When purchasing bred heifers, select those that will calve 20-30 days before the rest of your herd. Research tells us that heifers benefit from calving before the mature cows as they are growing themselves and their fetus during their first gestation, and they will continue to grow until they are about four years of age. Heifers are more likely to bear a smaller calf that will benefit from more nursing days. Growing heifers will need more post-calving days to recover body condition and reproductively cycle in time for breeding during the herd's breeding season.

Many management decisions are involved with raising herd replacements that are not included in this factsheet. This factsheet focuses on the timing for breeding heifers to successfully join your herd.

Targeting timed events involves recordkeeping; at the very least, writing down calves' ID and birthdates are essential. Additional data to improve reproductive management includes calf birth and weaning weights and the dam's age and weight.

Multiple researchers confirm the economic advantage of heifers delivering their first calving as two-year-olds rather than as three-year-olds (Day and Nogueira; Short et.al., Troxel and Gadberry). The goals for breeding to calve at 22-26 months of age include having heifers reach puberty at 12 months of age (yearling) and have at least two estrus cycles before their first breeding at 14-15 months of age and calve one month prior to the

herd's calving. Let's break down these two points in the following sections.

Puberty at 12 months of age

Heifers may only become pregnant after puberty is reached. Puberty is dependent on three things: age, weight, and breed composition. As stated by Troxel and Gadberry, "The most critical point is that heifers be at the desired weight for breeding, which is approximately 65% of their mature weight." British breeds (Angus, Hereford, Shorthorn, etc.) attain puberty sooner than Continental breeds (Charolais, Limousin, Gelbvieh, for example) and both breed groups reach puberty sooner than do Brahman cattle (Short, et.al.). Larger framed cattle generally take longer to achieve puberty. Medium and small-framed heifers (frame scores 4-6) will more likely reach sexual maturity as yearlings at an age-weight correlated puberty.

Pre-weaning, weaning, and post-weaning nutritional management is key to reaching puberty at 12 months of age. The heifer must continue to gain weight every day, not stall out, nor get sick, during the weaning process, and continue to grow with a consistent average daily gain. She must be fed to reach 55-65% of the cow's herd's mature weight, without getting fat, when she is 12 months old (Dickinson). Brandt recently reported, "Heifers can be developed to lower bodyweight thresholds, ranging from 50-57% of their expected mature weight, without sacrificing reproductive performance." Mature body weight of the yearling heifer may be estimated by using the weight of the heifer's dam or by averaging weights taken from mature cows in the herd or by averaging cull cow sale weights.

Along with the importance of weight at breeding, research conducted by Dickinson et. al demonstrated an association of age to the breeding outcome. Their research found an 88% pregnancy rate for heifers that were at least 368 days old when bred; and a 12.5% chance of becoming pregnant when bred younger than 368 days. As a note of caution, Day and Nogueira explain, "Heifers reaching puberty at very young ages are often exposed to fertile bulls or bull calves. Heifers that experience

precocious puberty (puberty before 300 days of age) and become pregnant at this time usually calve late or after the normal calving season for their herd, are of smaller size than heifers calving for the first time at 2 years of age, and have a greater propensity for dystocia, calf death loss and calving and an extended postpartum recovery period.”

Knowing her first birthday and her weaning weight, you can calculate the daily gain needed to reach the desired weight by the targeted breeding date. Research by Dickinson et. al. demonstrates a “window of opportunity for the development of heifers of varying weaning weights to reach a target mature body weight greater than 53% that is likely influential on [their] reproductive performance.” Weaning weights are affected by the age of the animal, and to take age into account when comparing weaning weights as individuals that are managed as a group, an adjustment is made for animals all weighed and weaned on the same day but differing in age. The standard age for adjustment is 205 days; this calculation is known as the standardized 205-day adjusted weight, or 205-Day Weaning Weight. To calculate this adjusted weight, the ADG from birth to weaning is multiplied by 205, and then birth weight is added:

$$205\text{-Day Weaning Weight} = (\text{lbs. weaning wt.} - \text{lbs. birth wt.}) / \text{age of weaning in days} \times 205 + \text{lb. birth wt.}$$

The Beef Improvement Federation recommends that weaning weights be standardized to 205 days of age and a mature age-of-dam basis. An online 205-day calculator is available on the Iowa Beef Center website, www.iowabeefcenter.org/calculators.html

Use heifers’ 205-day of age-adjusted weaning weight to identify those with above-average standardized weaning weights that are not too fat to narrow down the pool of breeding candidates; then, select the older ones in the pool as they will have the greatest likelihood of cycling by the target breeding date. The average daily gain from weaning to 12 months of age often approximates 1.25 lbs. to meet their target breeding weight and body condition score (BCS) of 6 (Troxel and Gadberry). Feed a balanced ration to meet the heifer’s nutritional needs. As Short points out, “...make sure the genetic composition of the herd will have a young enough age at puberty to allow breeding at that age. **When the genetic composition of the herd is set, then determine the target weight necessary before breeding to give a high proportion cycling and then manage grazing and feeding to obtain the necessary gains to reach that target weight.**”



When should this heifer be bred? Photo by Sandy Stuttgarten.

Frame score indicates an animal's growth curve, which can be used to project expected finishing weight for slaughter cattle, or mature weight for breeding cattle. Age and hip height are used to calculate frame scores as the hip height measurement can be converted to a frame score if the animal's age is known. Frame scores can also be approximated from "height for age" frame score tables or calculated by mathematical formulas (Dhuyvetter). Separate charts and formulas exist for bulls and heifers due to differing rates of skeletal growth between sexes. Sex also affects maturity. If frame size is equal, heifers will mature quicker than steers (Rhinehart). Along with age-adjusted weight, select replacements whose frame score matches the mature size target for your herd.

It is recommended to select replacement heifers for breeding who themselves have early birthdates within the herd’s calving season as this indicates they were conceived early in the breeding season. Born early in the season means they will be older and heavier when weaned (more days nursing and grazing or eating at the bunk) which will support puberty as they reach their 12th month of age.

Yearlings’ reproductive tract scores (RTS) determined by a veterinarian provide evidence of puberty. RTS takes into consideration the size and turgidity of uterine horns, the size of ovaries and indications of estrus activity, presence of follicles or corpus luteum (CL). Veterinary RTS of 4-5 indicate puberty: 30 mm or greater uterine horn diameter, ovary size over 30 mm long and 16 mm high, and 10 mm follicles or CLs present. (Cardoso et.al.). As research by Dickinson et.al. indicates weight, body condition (BCS) greater than 6, and RTS greater than 4 indicate the greatest potential for becoming pregnant in their first breeding season.

Monitor heifers for estrus activity (physically watch, use tailhead paint or patches). Make sure heifers have adequate space and good footing to allow them to safely express estrus. Estrus synchronization for AI or timed AI

works well with heifers, especially with those who have shown one or two heat cycles before the start of the synchronization protocol.

Deliver before the herd's calving season

Optimally she should calve 3-6 weeks before the herd calves. For example, if the herd's calving season is June 1 to July 15, then heifers should begin calving May 1. With an approximate 283-day gestation length, targeting a heifer calving date of May 1 means a prior breeding date of July 23. So, to fit the June cow calving season, begin breeding the heifers in mid-July, and the cows in mid-August. Use veterinary diagnostics to confirm pregnancy beginning 32-42 days after the start of the cow's breeding season to select your bred heifer replacements from those who conceived early; sell late conceiving heifers as a better fit for someone else's herd.

Do you have the facility/ability to breed during different time frames? To fit your management, it may be better to sell open heifers or breed heifers with the cows during one breeding season to produce heifers for another's calving season. For example, if your management may only handle one breeding season in late August, then advertise bred heifers (confirmed pregnant) for summer or fall-calving herds; your bred heifer should calve in June, ahead of the herd whose calving season begins in July.

When breeding heifers during the cow's breeding season, you will need to manage and nutritionally support that first calf heifer after she calves (potentially separate from the herd) so that she is ready to breed during your herd's one-time breeding season. Without managing her growth, she will likely conceive late in the breeding season; over time your herd's calving season will continue to be pushed back to later in the year.

Calve as a two-year-old weighing at 85% of the mature equivalency and BCS 5-6

Pregnant heifers should be weighed, body conditioned scored, and their ration adjusted to support growth. After calving, they may need to be fed separately from the cow herd to allow ration adjustments for continued growth.

Records and measurements (scale) are 'must haves' for raising herd replacements. Multi-generational breeding, calving, and weaning dates are needed for selecting heifers to breed and for determining the target breeding date and weight. Birth, weaning, and mature cow weights are needed for making herd-specific reproductive management decisions. Without accurate data, you are left using industry standards and estimates, both of which often lead to sub-optimal herd-specific results.

Author and Reviewers

Sandy Stuttgen, DVM, Agriculture Educator UW-Madison Division of Extension Taylor County
sandra.stuttgen@wisc.edu

Reviewed by UW-Madison Division of Extension
Agriculture Educators

Amanda Cauffman, William Halfman, and Ryan Sterry

Citations

- Brandt, Kiernan. How to Reduce Development Costs for Replacement Heifers. 2021. WI State Farmer newspaper, September 17.
- Cardoso, Rodolfo, et.al. Puberty in Beef Heifers. Proceedings, Applied Reproductive Strategies in Beef Cattle. August 2019.
- Day, Michael and Guilherme Nogueira. Management of Age at Puberty in Beef Heifers to Optimize Efficiency of Beef Production. Animal Frontiers. 2013. Available <https://doi:10.2527/af.2013-0027>
- Dickinson, Sarah, et.al. Evaluation of Age, Weaning Weight, Body Condition Score and Reproductive Tract Score in Pre-selected Beef Heifers Relative to Reproductive Potential. Journal of Animal Science and Biotechnology. (2019) 10:18. Available <https://doi.org/10.1186/s40104-019-0329-6>
- Dhuyvetter, John. Beef Cattle Frame Scores. North Dakota State University AS-1091, May 1995. Available https://library.ndsu.edu/ir/bitstream/handle/10365/9229/AS1091_1995.pdf?sequence=1&isAllowed=y
- Rhinehart, Justin. Feeder Cattle Grading. July 2021. Available <https://beef2live.com/story-feeder-cattle-grading-143-105331>
- R.E. Short, et.al. Breeding Heifers at One Year of Age: Biological and Economic Considerations. Montana State University Western Regional Research Project W-112, Reproductive Performance in Domestic Ruminants. Available https://animal.ifas.ufl.edu/beef_extension/bcsc/1990/docs/short.pdf
- Troxel, Tom and Shane Gadberry. Selection and Management of Beef Replacement Heifers. University of Arkansas Research and Extension. 2021. Available <https://www.uaex.uada.edu/publications/PDF/FSA-3076.pdf>
- Schwab, Denise, and Garland Dahlke. Determine Cow Herd Productivity by Using Weaning Weight Adjustment Tool. 2019. Available http://guidelines.beefimprovement.org/index.php/Weaning_Weight