

## **RANGE COW CULLING: HERD PERFORMANCE**

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This article is the first in a series of three articles on range cow culling. The focus of this article is biological performance related to fertility, calf weight, and cull cow weight. The second article will focus on price relationships, while the last article will incorporate both biological and market considerations to present a framework for increasing profits through better culling decisions.

Biological factors determine a cow's ability to produce marketable products, specifically calves and salvage value as slaughter cows. Performance measures for one ranch's herd in Arizona are presented below. Estimates of fertility, calf weights and slaughter cow weights were made from the herd's individual cow records for the years, 1982 to 1989. The results presented below represent an average expected performance for this herd and should be compared to the performance of your herd.

### **FERTILITY**

Fertility encompasses three basic stages before a marketable product is obtained from cow-calf operations. These stages are: 1) conception, 2) calving, and 3) survival of calves until weaning. Fertility percentages for each

of these three stages can be calculated for different classes and ages of cows if records are kept on individual cows. These three percentages multiplied by each other give the "marketable fertility." For example, if 85% of the cows in a particular class conceived, 96% of those that conceived had live calves, and 98% of these cows had a live calf at weaning, your marketable fertility for this class of cows would be 80% (i.e.,  $.85 \times .96 \times .98 = .80$ ). Simply stated, 80% of all the cows in this class produced a marketable calf.

What determines fertility? Some of the major factors are: each cow's individual genetic make-up, body condition, and age. The genetic make-up of your herd can be changed by the selection of replacement cows but is fixed for the year once you have selected the replacements. Cow body condition on the range is influenced by weather fluctuations and forage availability. Because the weather cannot be controlled, supplementing range forage with minerals and/or nutrients may be a wise investment during periods of poor forage availability resulting in improved cow condition and subsequent improved fertility.

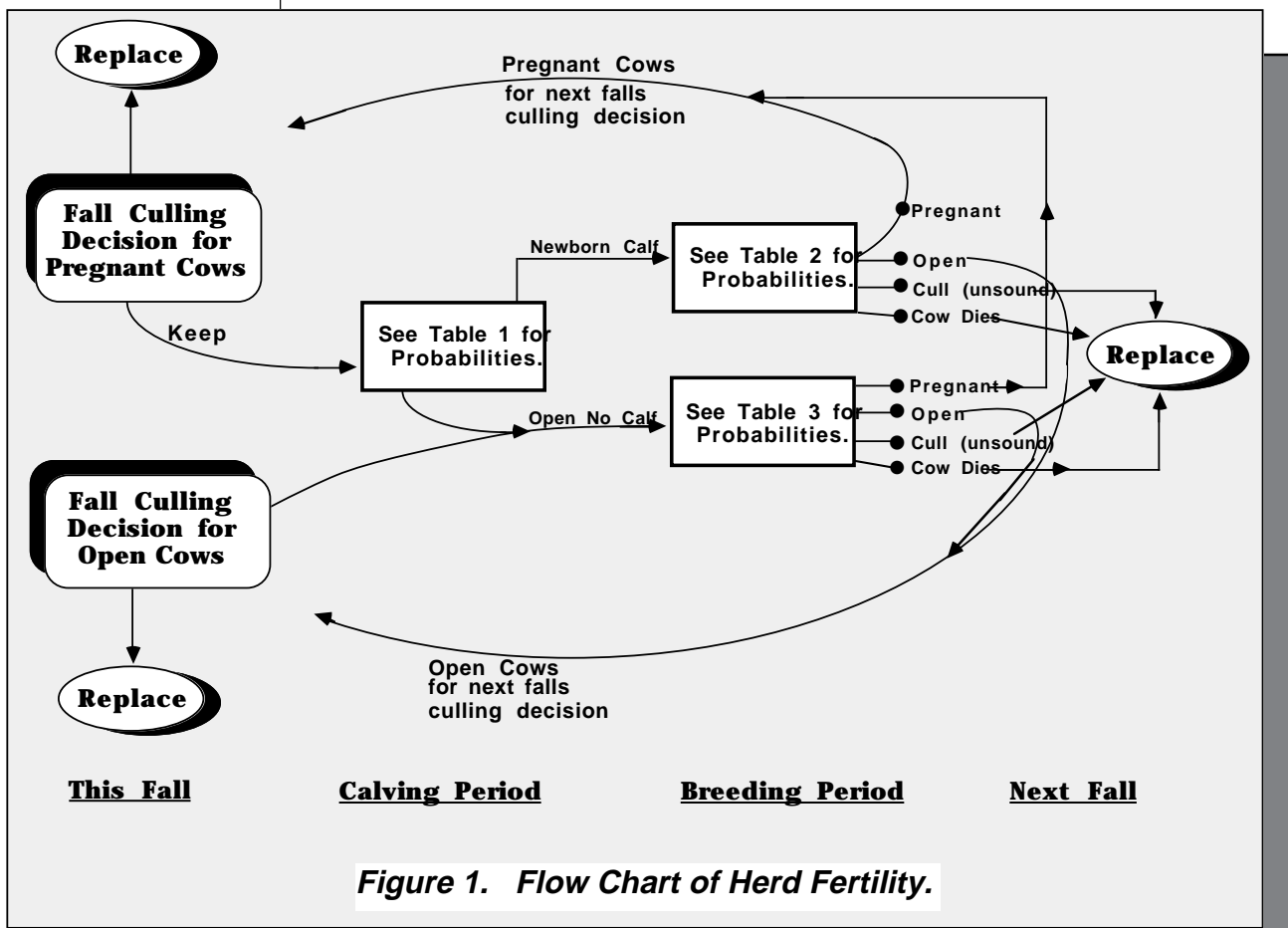
As a cow gets older, condition and associated fertility are likely to deteriorate from age factors rather than forage factors. The chance that a cow will die within the next year or become physically unable to produce another calf is related to the cow's age. These probabilities are very influential in the decision of whether to keep or cull a range cow since a cow that dies on the range will bring nothing for "salvage" whereas an older cow that makes it to slaughter will generally bring \$400 or better. Also, older cows that become

physically unsound tend to have relatively light weights and no sale calf at their side when culled.

The conception rate for the Arizona herd analyzed was calculated for cows that were open with a calf at side and open without a suckling calf at their side. Since the reproductive history and nutrition requirements are different for these two groups of open cows, their conception rates are likely to differ too. To determine fertility rates, calving and weaning records were used, after the fact, to determine which cows had become pregnant. Cow and calf records were linked and sorted by cow tattoo and year. Cows recorded as having a newborn calf (live or dead) in the spring or sale calf in the fall, obviously had to have been pregnant in the

previous fall. Cows that were kept in the herd and had no calf show up the following year were obviously open in the fall. Cows that were sold because they were simply open or lost their calf were treated as open cows fit to breed again. Cows that were sold because of bad udder, structural unsoundness, and/or cancer eye were classed in the category of physically unfit to breed. The "dead category" included cows that were recorded as dying or cows that disappeared from the herd.

Figure 1 is a flow chart illustration of how the estimated calving rates (Table 1) and fertility estimates for open cows (Tables 2 and 3) fit into the fall-spring cycle. The Arizona ranch operation analyzed only considered spring calving so that cows which were open



**Figure 1. Flow Chart of Herd Fertility.**

**Table 1. Calving Rates for Pregnant Cows by Age.**

Cow Age (year)	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5
	%											
Pregnant to No Calf	2.17	2.78	3.23	3.53	3.68	3.68	3.52	3.22	2.76	2.15	1.39	0.48
Pregnant to live Newborn Calf	97.83	97.22	96.77	96.47	96.32	96.32	96.48	96.78	97.24	97.85	98.61	99.52

**Table 2. Estimate Fertility of Open Cows with Calf by Age.**

Cow Age (year)	3	4	5	6	7	8	9	10	11	12	13
	%										
Newborn calf at side to Pregnant	81.95	80.80	79.33	77.52	75.39	72.94	70.15	67.04	63.59	59.83	55.73
Newborn calf at side to Open	14.59	14.59	14.59	14.59	14.59	14.59	14.59	14.59	14.59	14.59	14.59
Newborn calf at side to Cull (unsound)	1.40	1.86	2.65	3.77	5.21	6.98	9.08	11.51	14.26	17.35	20.76
Newborn calf at side to Cow Died	2.06	2.75	3.43	4.12	4.81	5.49	6.18	6.87	7.55	8.24	8.93

**Table 3. Estimated Fertility of Open Cows with No Calf by Age.**

Cow Age (year)	3	4	5	6	7	8	9	10	11	12	13
	%										
Open to Pregnant	70.99	69.26	67.03	64.41	61.52	58.49	55.44	52.49	49.75	47.36	45.43
Open to Open	25.09	24.09	23.08	22.08	21.08	20.08	19.07	18.07	17.07	16.07	15.07
Open to Cull (unsound)	3.32	5.58	8.21	11.09	14.10	17.13	20.04	22.72	25.05	26.90	28.15
Open to Cow Dies	0.60	1.07	1.68	2.42	3.29	4.30	5.44	6.71	8.12	9.67	11.35

in the fall would still be open the following spring. Cows that were pregnant in the fall could have either a live or dead newborn calf in the spring. For example, if a cow is 5.5 years old and pregnant, results indicate that this cow has a 3.53% chance of losing her calf and a 96.47% chance of having a live calf (see Table 1). Because future calving records were used to determine which cows were pregnant, no cows were classed in a pregnant to "dead cow category." All the cow deaths are accounted for in an open to dead cow category.

Table 2 gives the fertility estimates for open cows with a calf at their side. These cows could: 1) remain open, 2) become pregnant (determined by future calving records), 3) become physically unfit to breed, or 4) die. Results show that death and cull rates increase quite sharply for cows greater than eight years of age while the rate of pregnancy drops. The rate for open cows with a calf at side to stay open (structurally sound) was found to remain constant with age and estimated at 14.59%.

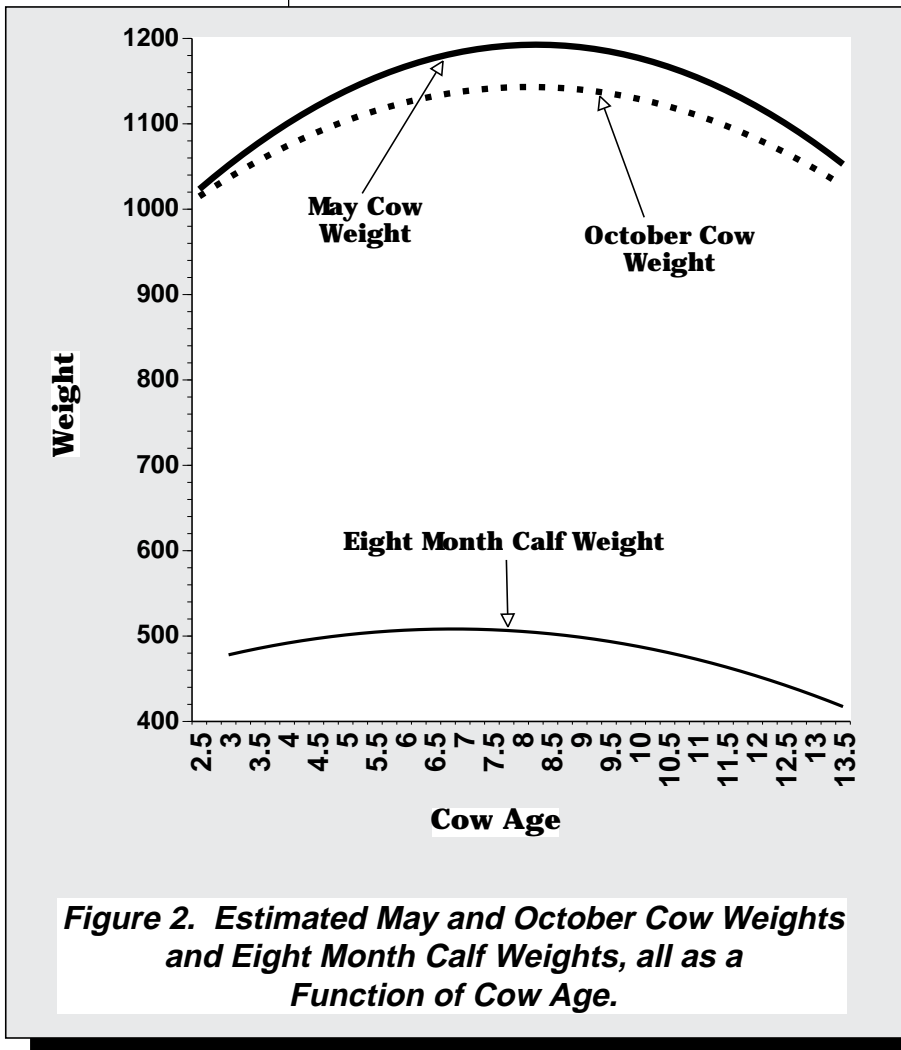
Fertility estimates for open cows with no calf at their side are given in Table 3. As shown in Figure 1, these cows could have either lost their calf in the spring or have been open in the previous fall. Similar to the open cows with a calf at their side, these cows could go into the four categories of 1) open, 2) pregnant, 3) physically unfit to breed, or 4) or dead cow. Fertility estimates in Tables 2 and 3 indicate that cows with no calf at their side have a higher chance of failing to conceive than cows that have a suckling calf at their side. Our results are based on data from years with good forage production on the ranch used for the analysis. Other studies have shown that in periods of nutritional stress cows

without calves have higher fertility levels than cows with suckling calves.

### WEIGHT PERFORMANCE

Since cattle are sold by weight, it is fertility, calf weight and cow weight when culled that determine total production. Weight performance from the cow comes from its annual calf weaning weight and its own weight when sold for slaughter. Although the cow herd is not sold on an annual basis like the calf crop, cow weight is an important consideration for the culling decision since a cow losing weight is equivalent to losing production and a cow gaining weight is equivalent to increasing production.

Figure 2 gives the estimated May and October cow weights as well as the eight month calf weight, all estimated as a function of cow age. As expected, calves from the youngest and oldest cows are lighter than calves from cows in their prime age. Estimated calf weights start out at 470 lbs. for heifers that calve when they are three, reach a maximum of 508 lbs. for seven year old cows, and drop off to 431 lbs. for 13 year old cows. Although the expected differential between the "largest" and "smallest" calf may seem small at only 77 lbs., this is about a 15% reduction in gross sale receipts that translates to a much higher percentage reduction in profit. Calf weight is obviously influenced by other factors that are hereditary and related to cow-calf nutrition and range



**Figure 2. Estimated May and October Cow Weights and Eight Month Calf Weights, all as a Function of Cow Age.**

conditions. However, the linkage of calf weight to cow age is especially important to the culling decision since a cow retained in the herd becomes one year older while her genetic make-up remains the same.

Figure 2 shows that May cow weights are greater than October cow weights with the greatest weight differential occurring for cows that are between 6 and 10 years of age. These weights reflect that for the ranch used as the basis for this analysis, good winter forage was available. After cows attain their maximum weight at around 8 years of age (1192 and 1143 pounds for May and October, respectively), weights drop off about 10 lbs. a year until they are 10 and then drop off nearly 30 lbs. a year after that. One needs to consider both the lower slaughter weight for culls and a lower weaning weight when keeping an older cow one more year. Conversely, a young cow will generally increase its own weight and calf weaning weight if kept for another year. However, more

nutrients are generally required for cows carrying their first calf to obtain this growth. All these considerations influence the economic decision of whether one should keep or cull a range cow.

Because range, breeding stock, and environment are different for most Arizona ranches, herd fertility and weight performance will vary from ranch to ranch. This variation indicates that your ranch needs to keep good fertility and weight records so that you can make accurate culling decisions on every cow in your herd. If you don't know the performance characteristics of cows in your herd by age class perhaps its time to consider improvements in your record keeping system. The next article in this series will focus more on the economics of the culling decision by looking at market prices. Specifically, current market prices for replacement stock, cull cows, and calves plus the likelihood of increases or decreases in these price relationships are explored in the next article.

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