Seasonal Weight Changes of Cattle on Semidesert Grass-Shrub Ranges

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Highlight: *Average cow weights, on semidesert grass-shrub ranges of the Santa Rita Experimental Range in southern Arizona, increased slightly following spring greenup, but major weight gains began with summer forage and continued into November. Major weight losses were at calving time in December and January.*

Cattle on semidesert range gain weight most rapidly when forage is green and actively growing, and gain less rapidly or may even lose weight as forage matures and dries. One reason for this pattern is that green forage is always higher in protein than is mature or dry forage. For example, Cable and Shumway (1966) found that the protein content of green plant parts on the Santa Rita Experimental Range was as much as 1.82 times that of whole plants. Rumen samples were also found to be higher in crude protein than were whole plant samples.

Rumen protein levels determined by Cable and Shumway (1966) would meet current minimum requirements (Nat. Acad. Sci., 1970) for dry pregnant cows yearlong, but would be deficient for wet cows in December and January and in May and June. Protein levels for bulls would be adequate during periods of active plant growth (Table 1). A comparison of protein levels between rumen and forage samples indicates that cattle meet their protein requirements over most of the year by selectively grazing the most nutritious plant parts, individual plants, or species. Cattle were therefore weighed throughout the year to determine whether nutritional adequacy was reflected in seasonal changes in animal weights.

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The Study

The objectives of the study were to: (1) determine seasonal weight changes in breeding cows on a mesquite-infested range in southern Arizona, (2) relate seasonal changes in cow weights to seasonal changes in vegetation, calving, or other events, and (3) determine whether cow weights were higher for cattle that remained on the same pasture yearlong or for cows that spent the summer in one pasture and the winter in another.

The study was conducted during 1970 and 1971 on the Santa Rita Experimental Range 35 miles south of Tucson, Arizona. The vegetation is typical of the desert grass-shrub type in southern Arizona. Topography slopes slightly to the west and is cut by several shallow dry washes. The elevation ranges between 3000 and 4000 feet. Average annual rainfall is 12.8 inches, with 60% falling in summer and 30 to 40% from December through April.

The study involved two herds of breeding cows on three pastures. One herd of 45 cows grazed yearlong on the same pasture. The second herd of 75-80 cows spent the winter (November-April) in one pasture and summer (May-October) in another. Bulls were run with both herds approximately March to October.

The 4450-acre, yearlong pasture lies at a slightly higher elevation and receives slightly more precipitation than the seasonally grazed pastures. The 4044-acre, winter pasture has only one permanent water and one temperary water, with distances from water ranging to 3 miles. The summer pasture (4891 acres) supports a dense invasion stand of velvet mesquite and is the least productive. It has two

Table 1. Periods of adequate (+) and deficient (–) protein levels (%) based on analysis of forage samples taken from rumens of fistulated steers.

Month	Crude protein in rumen samples[1]	Periods of adequate and deficient protein[2]		
		Dry pregnant cow	Wet cow	Bull
Jan.	6.80	+	–	–
Feb.	10.10	+	+	–
Mar.	16.06	+	+	+
Apr.	11.80	+	+	–
May	7.94	+	–	–
June	7.78	+	–	–
July	10.90	+	+	–
Aug.	21.60	+	+	+
Sept.	13.24	+	+	+
Oct.	–	+	–	–
Nov.	8.76	+	–	–
Dec.	–	+	–	–

[1] Rumen samples by Cable & Shumway (1966).
[2] Protein requirements are: Dry pregnant cow 5.90%; Wet cow 9.20%; Bull 12.20% (from Nat. Acad. Sci., 1970).

permanent and two temporary waters, with maximum distances to permanent water of only 1½ miles. Travel between water and forage apparently posed no hardship on livestock in any of the pastures.

Vegetation measurements included phenological observations, and estimates of herbage production and utilization. Plant phenology was observed monthly on selected perennial grasses, annual grasses and forbs, and shrubs. Herbage yields of annual and perennial grasses were measured in the fall by a double-sampling method similar to that described by Wilm et al. (1944). Utilization was estimated in June by the ungrazed plant count method (Roach, 1950).

Animals in the two herds were weighed at monthly intervals from January 1970 through December 1971. Bull weights were available only during the breeding season from March through October. Cattle were weighed with an automatic weighing system with platforms placed so animals had to cross them to get to water (Martin et al., 1967).

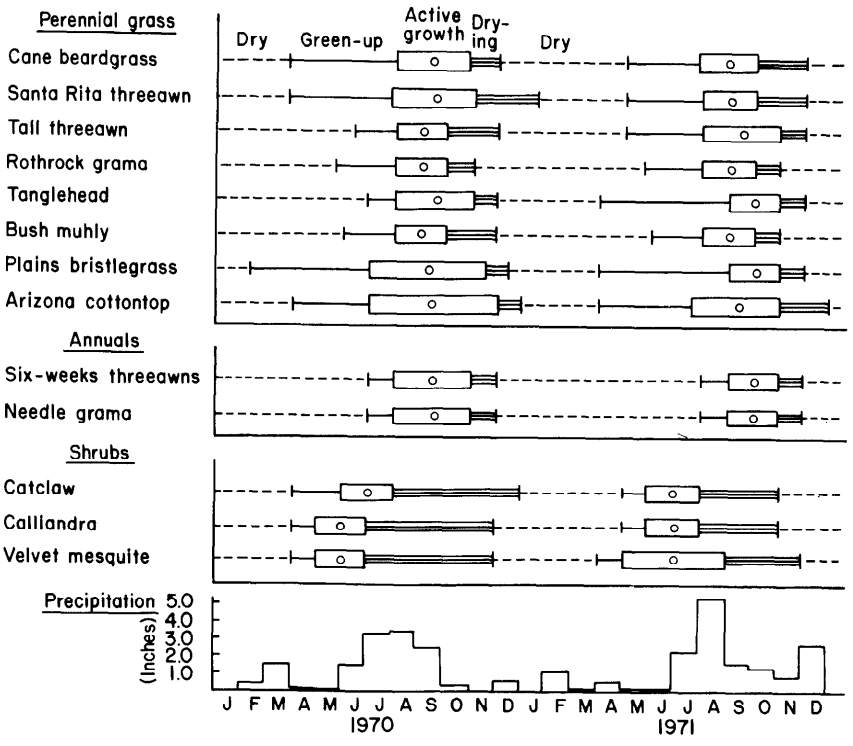

Fig. 1. *Growth stages of grasses and shrubs from January 1970 to December 1971 in the study pastures.*

Table 2. Herbage production of annual and perennial grasses (lb/acre).

Grass group and season of grazing	1957-66	1969	1970
Perennial grasses			
Yearlong	86	54	146
Winter	58	49	112
Summer	16	36	48
Annual grasses			
Yearlong	72	90	136
Winter	87	103	48
Summer	108	66	53

Results

Forage Production and Utilization

Forage production varied annually in response to summer rainfall. Perennial grass production was below the 1957-66 average in 1969-70 and above average in 1970-71 in the yearlong and winter-grazed pastures, but was greater than the 1957-66 average in both years in the summer-grazed pasture (Table 2). Eight species accounted for almost all perennial grass forage (Table 3). Arizona cottontop, the greatest forage producer in all three pastures, was most abundant in the winter pasture. Utilization in the study pastures ranged from 32 to 48%, but differences between pastures and between years were not significant. Apparent differences in utilization between pastures and years are attributed to relative differences in forage abundance and season of use.

Seasonal Growth

Shrubs such as velvet mesquite and catclaw acacia leaf out in April or May, even in drought years (Fig. 1). False mesquite, however, will not leaf out in the spring if winter-spring moisture is markedly deficient. During mild winters leaves may be retained until spring, but cold winters may result both in total early defoliation and late spring budding. Summer rainfall produces a second cycle of vegetative growth as well as flowering and fruiting.

The major productive period for most native perennial grasses is during the summer rainy season. A few semidesert grasses (Lehmann lovegrass and plains bristlegrass, for example) begin growth if moisture is available and provide green feed in early spring.

Table 3. Species composition (%) of perennial grass forage on the study pastures (average for 1969 and 1970).

Species	Season grazed		
	Yearlong	Winter	Summer
Arizona cottontop	29	47	32
Black grama	13	0	0
Rothrock grama	9	T	3
Bush muhly	13	25	21
Plains bristlegrass	6	2	11
Tanglehead	5	0	0
Santa Rita threeawn	16	11	8
Tall threeawns	9	15	25

Seasonal Changes in Animal Weights

Animal weight changes were related to several factors. However, relative seasonal weight changes were similar for the two herds and for both years. Average cow weights increased slightly following spring greenup, but major weight gains began with summer forage and continued into November. Major weight losses were at calving time, December-January. Cows generally regained their pre-calving weight from one calving to the next.

Average cow weights indicate that the major portion of calving had occurred by January, with average cow weights at 849 lb (Fig. 2). Seasonal spring greenup in late February and March resulted in cow weight increases to 874 lb. These spring gains were lost as green forage became increasingly scarce in April, May, and June. Summer forage growth and advanced pregnancy increased cow weight from July to November when cow weights were highest. The December drop in cow weights indicates that calving had started.

Cow weights at all seasons were somewhat higher in the herd that grazed yearlong in the same pasture

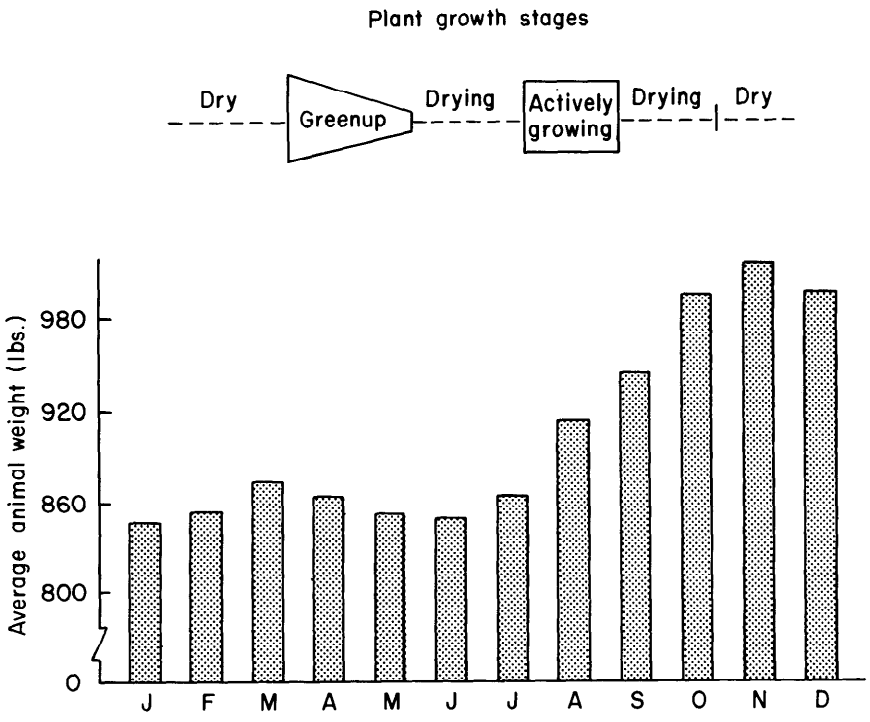

Fig. 2. *Average monthly weights of cows in relation to forage growth and calving cycles.*

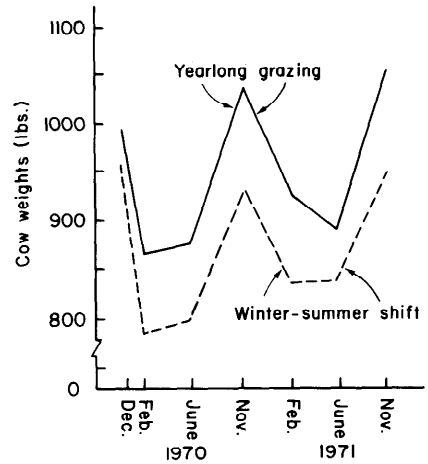

Fig. 3. *Seasonal weight changes in breeding cows grazed yearlong in the same pasture and cows that grazed one pasture in winter and another in summer.*

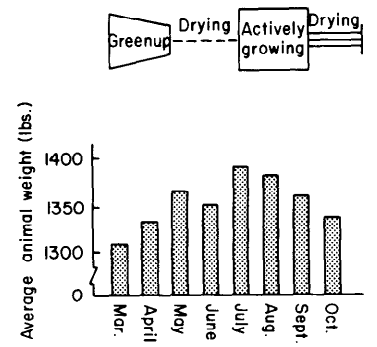

Fig. 4. *Changes in bull weights (March-October) in relation to forage growth; average for all pastures.*

(Fig. 3). However, it would be risky to attribute cow weight differences to the grazing treatment, because part or all of the difference may be due to the fact that the yearlong pasture is more productive than either of the seasonally grazed units.

Bull weights varied only slightly through the breeding season (March-October); they ranged from 1311 lb in March to 1387 lb in July, and declined to 1333 lb in October (Fig. 4). Bull weights from April to May seem to indicate that forage nutrient levels for maintenance were met and the excess resulted in weight gains. The slight losses in June probably indicate a deficiency in the nutrient intake. July weight gains reflect nutrient levels above maintenance requirements followed by a deficiency thereafter until October. These data suggest that forage quality is highest in July and declines as herbage begins to mature in Aguust.

Summary

1. Major changes in cow weights were associated with (1) the calving cycle, and (2) seasonal changes in quantity and quality of forage. In general, cow weights were maintained from one calving to the next.

2. Cow weights were greatest in November and December just prior to calving and lowest in January and February immediately after calving.

3. Spring forage greenup produced slight cow weight gains, but these gains were usually lost in May and June.

4. Rapid weight gains began in July with the onset of summer forage growth and continued into November. This weight gain is associated with response to forage growth, weaning of calves around November 1, and advancing pregnancy. Average weight gain from July through November was 164 lb in the yearlong pasture and 144 lb in the seasonally grazed pastures.

5. Sudden winter weight losses were due to the combined effect of calving and low forage quality. Average weight loss was 119 lb in the yearlong pasture and 131 lb in the seasonally grazed pastures.

6. Bull weights during the breeding season ranged from a low of 1311 lb in March to a high of 1387 lb in July, then dropped to 1333 lb in October.

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