Cattle Weight Gain Comparisons Under Seasonlong and Rotation Grazing Systems

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Highlight

A carefully designed 6-year study showed cows and calves gained the same amount of weight, whether they grazed pastures seasonlong or under a rotation management system. A complex cross-over statistical design minimized variation from changes in vegetation or differences in range improvements. These results, along with results from earlier studies on effects of livestock management on rates of range recovery, indicate that complex rotation-grazing systems are of questionable value on ponderosa pine-bunchgrass ranges in Colorado.

Some form of rotation grazing, rest-rotation, or deferred rotation grazing has been widely advocated for managing rangelands in the western United States. Rotation grazing has been described in the literature as early as 1797 (Johnstone-Wallace and Kennedy 1944) and served as impetus for research in the United States since the late 19th century (Smith 1895). More recently, Hormay (1970) and Hormay and Talbot (1961) advocated rest-rotation grazing on many western United States rangelands. These rotational systems were recommended primarily as a means of promoting range improvement or maintenance. The grazing schemes are designed to favor select forage species or range condition as a whole.

Accrued benefits of rotational systems versus continuous seasonlong use have often been quite variable, particularly in relation to livestock weight gains. Herbel (1971) concluded that most comparisons show livestock performance per animal to be the same or lower for rotation systems compared with continuous grazing. In a review of grazing systems from 1895-1966. Hickey (n.d.) concluded two- and three-pasture rotations showed no advantage or a slight disadvantage for livestock weight gain performance. Deferred rotation, however, showed an advantage in livestock gains. Thus, there are inconsistencies in benefits within rotational systems.

These inconsistencies have led livestock operators to question the validity of using rotation or complex grazing systems. Ranchers maintain the intensive management will cost them more and not bring about better results (High Country News 1977). They believe that frequent livestock movement or changes in forage supply associated with a rotation system result in lower cattle weights than those for animals grazed on a seasonlong basis. Because of these objections at the same time that rotation grazing in some form is becoming prevalent on many federal lands, the study reported here was undertaken to determine whether cows and calves grazing under a rotation system, gain equally as well as animals under seasonlong management.

The present study differs from earlier studies cited in that it was designed to answer only the question on weight gain performance. A direct effort was made to minimize or remove consideration of effects of any vegetative changes associated with the grazing system comparisons. This was done to avoid confounding weight gain responses with changes in vegetation resulting from the grazing system. Range improvements such as fencing, water developments and other management activities have also been suggested as primary factors influencing the systems. The present study was also designed to minimize these effects in terms of weight gain performance, so that only the total grazing effect was being evaluated.

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Study Area and Methods

The study was done on ponderosa pine-bunchgrass rangeland at the Manitou Experimental Forest, 45 km northwest of Colorado Springs, Colo. Native vegetation of the Forest is characteristic of the ponderosa pine-bunchgrass type of the Rocky Mountains. It is composed of a complex of plant communities of ~~open~~ grassland parks interspersed among ponderosa pine *(Pinus ponderosa)*. The understory contains a large number of grass and forb species but few shrubs. Arizona fescue *(Festuca arizonica)*, mountain muhly *(Muhlenbergia montana)*, and western wheatgrass *(Agropyron smithii)* are the principal grass forages. Sun sedge *(Carex heliophila)* is abundant and an important grasslike forage. Only two forbs readily identifiable in cattle diets, fringed sagebrush *(Artemisia frigida)* and Pennsylvania cinquefoil *(Potentilla pensylvanica)* are consistently important forages at definite times throughout the year (Malechek 1966).

In this area, native plant growth becomes evident in late March or early April and ceases in late September or early October. Growing seasons daytime temperatures rarely go above 32 C, and frost is common in all months except July and August. Precipitation averages approximately 40 cm annually, with about three-fourths of this amount falling during the April through August growing season. July is normally the wettest month, with rainfall averaging almost 9 cm.

The range was fenced into 12 pastures. Each pasture was approximately 40.5 ha. Fences between pastures were constructed to lay down or be put up as required to form the rotation or seasonlong treatment areas. Treatments were applied to two replicate blocks of six pastures each. The study was based on a cross-over design to reduce bias from past treatment and hold any vegetative change constant during the 6-year study period. The grazing plan for a 6-year cycle is outlined in Table 1. In year 1 and block 1, for example, animals were rotated from pasture 1 to pasture 3 to pasture 5 at 40-day intervals during the June 15 to October 15 grazing season. Fences between pastures 2, 4 and 6 were let down to form the seasonlong treatment. The following year (year 2), fences were put up between 2, 4 and 6, and these three pastures were

Table 1. Grazing management plan for seasonlong and rotational movement of livestock for a 6-year period.

	Grazing Treatment			
	Block 1		Block 2	
Year	Rotation	Seasonlong	Rotation	Seasonlong
1	1,3,5	2-4-6[1]	8,10,12	7-9-11[1]
2	2,4,6	1-3-5	7,9,11	8-10-12
3	3,5,1	2-4-6	10,12,8	7-9-11
4	4,6,2	1-3-5	9,11,7	8-10-12
5	5,1,3	2-4-6	12,8,10	7-9-11
6	6,2,4	1-3-5	11,7,9	8-10-12

[1]Under seasonlong grazing, pasture fences were let down each year to form one unit from the 3 pastures shown.

grazed rotationally while fences were let down between 1, 3 and 5 for seasonlong grazing. During the next 4 years, a similar switching was done, so that over the 6-year study period, all pastures were under rotation grazing with each pasture grazed as an early, midseason and late season pasture in the rotation plan.

Grade Hereford cows and calves were used in the study. Ten cows plus calves were used in each treatment in each block. Cow-calf pairs were randomly assigned to the treatments every year. These cows and calves were individually ear tagged and weighed at the beginning and end of the grazing season. Forced herding or livestock movement between pastures was avoided as much as possible. Gates were opened and the cows and calves enticed to change pastures. If herding by horseback became necessary, every effort was made to move animals gently.

Results and Discussion

Weight gain differences between treatments were small and not statistically significant. Calves gained slightly more weight in four out of six years under seasonlong grazing while cows gained better in four out of six years under the rotation system (Table 2). The average seasonal difference amounted to only 1 kg for the cows and 4 kg for the calves. Skovlin *et al.* (1976) reported similar results for grazing systems on ponderosa pine-bunchgrass range in Oregon. They found cow and calf weights averaged slightly more with seasonlong management than with deferred rotation management and differences between treatments were not significant for the 10 year study.

Table 2. Weight gains of hereford cows and calves from seasonlong and rotation systems of grazing[1]

	Cows		Calves	
Year	Seasonlong	Rotated	Seasonlong	Rotated
A. Average Gain/Animal/Season (kg)				
1971	113	121	116	120
1972	83	68	118	112
1973	59	69	111	101
1974	37	53	102	102
1975	49	39	105	99
1976	61	62	112	111
Average	67	68	111	107
B. Average Gain/Day (kg)				
1971	.94	1.00	.96	1.00
1972	.68	.55	.97	.93
1973	.50	.57	.92	.84
1974	.30	.44	.84	.84
1975	.39	.32	.85	.80
1976	.50	.51	.92	.91
Average	.55	.56	.91	.88

[1]Average grazing season is 122 days from mid-June to mid-October. Rotation is three-pasture rotation of approximately 40 days in each unit.

In the present study, cows with calves were randomly assigned each year. During the course of the study, the same cow, for example, was assigned to the seasonlong treatment in one year but might be in the rotation treatment in subsequent years. Also, sex of the calves was accounted for during several years. The sex ratio averaged very near the expected 50:50 ratio, and, apparently, was not a factor in the small but consistently greater weight gains of calves on the seasonlong treatment.

Average percent utilization was estimated in some years to evaluate stocking rate. The heaviest rate of use of the two major bunchgrass Arizona fescue and mountain muhly was 43 percent, which is within the range of utilization recommended by Smith (1967) for the long-term moderate rate of stocking for ponderosa pine-bunchgrass ranges. Thus, rate of grazing was not considered a factor for the small weight gain differences of either the cows or calves. Likewise, herd management in terms of livestock water, salt placement, and cattle movement was kept consistent throughout the study and was not a factor for differences in weight gain.

In view of the small weight gain differences and small advantage accruing to calf production, which is the saleable meat commodity, an independent but concurrent study was used to evaluate vegetative change (Currie 1976). This study showed that complete protection from grazing or alternate rest did not promote recovery of ponderosa pine-bunchgrass range that had been heavily grazed for a number of years. Presumably, recovery of a given range is a primary purpose of any rotation system, and some significant change should be expected. Because there were no significant changes in plant density, basal area, or herbage yields, these treatments could not be recommended over seasonlong grazing to promote range recovery.

Conclusions

Cow and calf weight gains did not differ significantly between seasonlong and a rotation system of management on ponderosa pine-bunchgrass rangelands in central Colorado. Weight gain data suggest that rotation grazing may be of questionable value for grazing management in areas receiving substantial growing-season rainfall. Such systems should also receive careful evaluation for other areas. Most complex systems require a substantial investment in range improvements. Water development, changes in salt placement, or other good management factors may be equally effective without involving complex grazing systems.

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