# Rotation-Deferred Grazing as Compared to Season-Long Grazing on Sagebrush-Bunchgrass Ranges in Oregon

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## Purpose of Study

IN 1938 A study was initiated to determine the practicability of rotation-deferred grazing on semi-desert sagebrush-bunchgrass range in Oregon. It is a summer range utilized by cattle, and this report summarizes 11 years of records (1938–48, inclusive) and compares the results with those obtained on range grazed season-long.

## Description of Study Areas

In this study four ranges were used, located some 40 miles west of Burns in southeastern Oregon on generally rolling lands. Big sagebrush (*Artemisia tridentata*) was the dominant shrub and juniper (*Juniperus* spp.) occurred in varying abundance. Bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*) were the best forage grasses. Sandberg bluegrass (*Poa sandbergii*), though producing the greatest forage density was of secondary value. The pastures were approximately 2100 acres each. Distribution of grazing in each pasture was partially controlled by salting and watering.

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## Methods and Procedure

Three of the experimental ranges were grazed under a rotation system. The 6 year rotation period included two years of consecutive spring use, followed by one year of partial deferment, two years of full deferment, and one year of partial deferment. The three grazing periods were of approximately equal length in number of days. Since the growing season usually begins April 1 and ends June 30, the partial deferment period of grazing was essentially full deferment.

The fourth range was grazed continuously throughout the grazing season—from approximately May 1 to October 1.

The stocking rate of 10 to 12 surface acres per animal unit month was approximately the same under both systems of grazing and from year to year. It resulted in heavier use under season-long grazing because the season-long range was in slightly poorer condition in 1938 than the rotation ranges.

The breeding cow herds were balanced as to age, size, grade, condition, calving date, and weight performance on summer range. Each year the cows were given a 10- to 14-day fill on surplus ranges prior to turn-in date. Cows and calves were weighed on the ranges after spending about 12 hours off feed but on water and following the same procedure, again at the close of each grazing period.

Livestock data was kept on an indivi-

dual animal basis, and birth dates of calves permitted the adjustment of each cow weight, eliminating weight attributed to pregnancy (unpublished procedure used on Squaw Butte-Harney Exp. Sta.). Calves were dropped during March through August, inclusive.

Bulls were grazed with the cows beginning about the first of June.

Permanent plots located on a 10 by 20 chain grid throughout the ranges were used for square-foot density estimates during 1938, 1944, and 1948.

Utilization data were taken yearly on each range after grazing was concluded.

## Results and Discussion

Broadly considered, season-long grazing was more favorable to both cattle and vegetation, mainly because the rotation system resulted in serious over-grazing during the first foraging period. In practice, rotation did not provide all advantages expected. This study may serve as a guide in devising a system of rotation-deferred grazing which will provide more of the benefits consistent with the theories.

The experiments did not incorporate randomization or replication, so statistical analysis could not be applied to the data. Figures in the report indicating the differences between the two grazing systems can be accounted for by a composite of differences between the ranges, herds, and grazing systems. However, since the herds were balanced the writers believe that little difference existed between them; neither was there much difference between the ranges in potential forage production; therefore the greatest difference was attributed to the systems of grazing.

### *Weight Gains and Losses of the Cows*

Since a desirable system of grazing should indicate consistent results from year to year, the adjusted cow weights (1944 to 1948, inclusive) were analyzed by variation in weight gains between years as well as net gain per animal. (Table 1).

**TABLE 1**

*Average gain or loss in weight of cows under rotation and season-long grazing*[1]

| YEAR | GRAZING PERIOD | AVERAGE GAIN OR LOSS PER COW (LBS.) | | DIFFERENCE (LBS.) SEASON-LONG MINUS ROTATION |
|---|---|---|---|---|
| | | Season-long | Rotation | |
| 1944 | 1 | 116 | 91 | 25 |
| | 2 | 68 | 76 | −8 |
| | 3 | −65 | −60 | −5 |
| | Total | 119 | 107 | 12 |
| 1945 | 1 | 136 | 137 | −1 |
| | 2 | 42 | 45 | −3 |
| | 3 | −15 | −28 | 13 |
| | Total | 163 | 154 | 9 |
| 1946 | 1 | 125 | 114 | 11 |
| | 2 | 45 | 33 | 12 |
| | 3 | −57 | −26 | −31 |
| | Total | 113 | 121 | −8 |
| 1947 | 1 | 133 | 91 | 42 |
| | 2 | 25 | 34 | −9 |
| | 3 | −62 | −57 | −5 |
| | Total | 96 | 68 | 28 |
| 1948 | 1 | 121 | 85 | 36 |
| | 2 | 77 | 98 | −21 |
| | 3 | −63 | −50 | −13 |
| | Total | 135 | 133 | 2 |
| Average | 1 | 126 | 103 | 23 |
| | 2 | 51 | 57 | −6 |
| | 3 | −52 | −44 | −8 |
| | Total | 125 | 116 | 9 |

[1] Cow weights were adjusted to compensate for the increase in weight directly attributed to pregnancy.

Cattle weights on the season-long range showed less than half the variation be-

tween years during the first grazing period, about the same variation during the second period, and nearly twice the variation during the third grazing period as on the rotation ranges. Also, cows on the season-long range gained 23 pounds more per animal during the first grazing period, 6 pounds less during the second grazing period, and lost 8 pounds more during the third grazing period. There was an average annual advantage in weight gain of 9 pounds per cow for the season-long range.

### *Forage Utilization*

Utilization records permitted the division of each range into lightly, properly, and heavily grazed areas. The proportion of each of these use divisions indicated the distribution of grazing in that range. Fifty six percent of the rotation ranges was properly utilized as compared with 39 percent of the season-long range. The heavily utilized areas included 26 percent of the rotation and 37 percent of the season-long ranges. There was also a smaller percentage of the rotation ranges lightly grazed—18 percent as against 23 percent on season-long ranges. Also grazing was more evenly distributed in each range under rotation than under season-long grazing. During the study period the season-long range was overutilized by an average of 20 percent whereas the rotation ranges were overutilized by 10, 12, and 14 percent.

### *Vegetal Trends*

In general, even though the season-long range was utilized more heavily than those grazed in rotation, vegetation made a net increase in density of 22 percent as compared with an average increase of 20 percent on the rotation ranges (Table 2). Since an increase in vegetation density may indicate either an increase or decrease in forage production, an analysis by groups of vegetation is important.

Of the 22 percent increase in vegetal density on the season-long range, almost 19 percent were grasses, 1 percent shrubs (mostly big sagebrush), and 2.5 percent forbs. Of the 20 percent increase on the rotation ranges, 11 percent were grasses, 1 percent shrubs, and 8 percent forbs.

To fully apprcciatc these changes a similar analysis of the three primary grasses will be helpful (Table 3).

Season-long grazing permitted the greatest increase in forage production. The increase in density of the two primary forage species (expressed in terms of total vegetation density at the beginning of the study period) was 2.4 percent under season-long grazing. This was more than twice the increase, 1.1 percent under rotation grazing. The increase in Sandberg bluegrass of 13 percent under season-long grazing as compared with 7.9 percent under rotation grazing, may also indicate greater increase in forage production on the season-long range, but primarily indicates retrogression.

Under rotation grazing the three primary grasses increased throughout the ranges; whereas under season-long grazing, bluebunch wheatgrass and Idaho fescue increased mostly on the area grazed lightly, and Sandberg bluegrass on the heavily grazed area. Because it is important to maintain as much forage as possible on the most accessible areas, rotation grazing may have much to offer range managers in distribution of grazing over a long period of time. There was an apparent change in dominance from bluebunch wheatgrass to Idaho fescue under rotation grazing that also occurred on the heavy-use area of the season-long range.

### *Objections to Rotation System*

There was considerable difference in the vegetation trends on the rotation

ranges due to the respective position in the rotation order when range surveys were made. Trends in forage production were depressed following two years of consecutive spring use. Apparently the combination of two years of consecutive spring grazing, and close use during the growing season, offset the advantages gained through deferment as shown by livestock gains and losses (Table 1). The data may also indicate an unreliable nature of range surveys due to the difference between density estimates on grazed and ungrazed forage. Apparently the difference between the rotation ranges was primarily one of changes in plant vigor and size rather than in number of plants. Concentration of grazing on a single range for most of the growing season, seriously restricted regrowth of the forage, and storage of carbohydrates for the maintenance of plant vigor (McCarty and Price, 1942; Blaisdell and Pechanec, 1949).

In the use of a rotation grazing system the authors believe that attention should

TABLE 2

*Net 10-year change in vegetation density (1938–1948) per 100-square-foot plot*

| VEGETATION GROUP | SYSTEM OF GRAZING | 1938 SQ. FT. DENSITY | NET CHANGE | |
|---|---|---|---|---|
| | | | Sq. Ft. Density | % of Total Vegetation Density |
| Grasses | Season-long | 2.289 | 1.358 | 18.8 |
| | Rotation | 3.495 | 0.889 | 11.2 |
| Shrubs | Season-long | 4.270 | 0.071 | 1.0 |
| | Rotation | 3.759 | 0.082 | 1.0 |
| Forbs | Season-long | 0.671 | 0.183 | 2.5 |
| | Rotation | 0.756 | 0.638 | 8.0 |
| Total | Season-long | 7.230 | 1.612 | 22 |
| | Rotation | 8.010 | 1.609 | 20 |

TABLE 3

*Net 10-year change in density of the primary grass species per 100-square-foot plot*

| SPECIES | SYSTEM OF GRAZING | 1938 SQ. FT. DENSITY | NET CHANGE | |
|---|---|---|---|---|
| | | | Sq. Ft. Density | % of Total Vegetation Density[1] |
| *Agropyron spicatum* | Season-long | 0.403 | 0.019 | 0.3 |
| | Rotation | 0.456 | −0.098 | −1.2 |
| *Festuca idahoensis* | Season-long | 0.264 | 0.155 | 2.1 |
| | Rotation | 0.498 | 0.183 | 2.3 |
| Total[2] | Season-long | | | 2.4 |
| | Rotation | | | 1.1 |
| *Poa secunda* | Season-long | 1.354 | 0.942 | 13.0 |
| | Rotation | 2.063 | 0.630 | 7.9 |

[1] The average 1938 square-foot density of all vegetation on the season-long range was 7.23 square feet and on the rotation ranges was 8.01 square feet (see Table 2).

[2] Totals represent the combination change of *Agropyron spicatum* and *Festuca idahoensis*.

be directed to plant vigor rather than seed production. Such management will also result in larger seed crops.

## Summary

1. The first grazing period under the rotation system included most of the normal growing season.

2. Season-long grazing resulted in: 1) less variation in animal gains between years during the first grazing period; 2) an average of 23 pounds more gain per cow during the first grazing period; 3) an average of 9 pounds more gain per cow per year; 4) a greater increase in both total vegetation density and density of the forage species.

3. Rotation grazing resulted in: 1) less variation in animal gains between years during the third grazing period; 2) 6 pounds more gain per animal during the second grazing period; 3) eight pounds less loss per animal during the third grazing period; 4) better distribution of grazing; 5) serious overgrazing during the first foraging period.

4. In the use of a rotation grazing system attention should be directed to plant vigor rather than seed production.

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