Food Preferences of Antelope and Domestic Sheep in Wyoming's Red Desert[1]

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Highlight

A food habits study, in a big sagebrush-grass type in Wyoming's Red Desert, revealed very little overlap in use of native range forage by pronghorn antelope and domestic sheep. Generally, sheep preferred grasses whereas antelope utilized shrubs.

The Red Desert region is the most important winter sheep range in Wyoming. It is also a major pronghorn antelope range. Although these two animal species have apparently been compatible in this area for several decades, new livestock management practices have tended to focus additional attention on this multiple-use region. Future management plans include using this area as a year-long, sheep and cattle range. This study, designed to yield data on competition for forage between pronghorn antelope and sheep, will assist land managers in making more precise evaluations of management practices such as sagebrush spraying and game-or-stock-only programs.

The information used in this discussion was obtained in a cooperative study initiated by the Bureau of Land Management, the Wyoming Game and Fish Department, and the Plant Science Division of the University of Wyoming. The primary objectives of the study were to determine the degree of overlap in use of native vegetation and to determine grazing capacities of pronghorn antelope and domestic range sheep.

The degree of forage competition between these two herbivores varies greatly and appears to depend on the geographic area, season, and the vegetative types being used.

Einarsen (1948) did not put too much emphasis on forage competition between antelope and sheep. He stated that antelope preference is for a wide variety of foods including most range weeds and browse plants, while sheep are more restricted in their diet. Hoover et al. (1959), however, stated that ". . . . because their annual diet consists of a high proportion of browse and forbs, antelope are in direct competition with sheep, whose diet comprises the same type of forage." Buechner (1950) maintained that competition is severe on overgrazed sheep ranges because the forbs and weedy species preferred by antelope were eliminated, but that it may be almost absent on properly grazed ranges. During World War II, Wyoming went as far as to hold special hunting seasons to reduce the antelope herds in an attempt to ". . . . reduce competition between domestic stock and antelope . . . to cope with the feed shortage for domestic stock" (Allred, 1943).

Study Area and Procedures

The study area was located in the Red Desert region in the south central part of Wyoming north of Wamsutter. The greater portion of the observations were taken from a pasture system designed and constructed by the Bureau of Land Management which consisted of six pastures; 2 of 120 acres, stocked with antelope; 2 of 120 acres, stocked with sheep; and 2 of 240 acres, stocked with both antelope and sheep. The pastures were located in a uniform big sagebrush community. The major species in the study area were: big sagebrush, *Artemisia tridentata;* Douglas rabbitbrush, *Chrysothamnus viscidiflorus* var. *pumilis;* western wheatgrass, *Agropyron smithii;* needleandthread, *Stipa comata;* Indian ricegrass, *Oryzopsis hymenoides;* bottlebrush squirreltail, *Sitanion*

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hystrix; winterfat, *Eurotia lanata;* Sandberg bluegrass, *Poa secunda* and obtuse sedge, *Carex obtusata.*

The methods and procedures used were all based on standard range analysis methods. Percent compressed crown cover and precent utilization by weight of the plant species were estimated from plots 1 x 10 ft in size. Ninety of the plots were analyzed during each sample period. Production was determined for all species except sagebrush by clipping 96 caged plots, 2 x 4 ft in size. Sagebrush production was obtained by clipping 15 plots, 4 in wide x 50 ft long, in an exclosure adjacent to the pastures. Sagebrush utilization was estimated by examining 150 plants in each pasture. All sample numbers were obtained by statistical analysis and all weights given are oven dried weights.

Under the direction of the Wyoming Game and Fish Commission, two antelope and two sheep were collected for rumen samples each month. Other data obtained from the collected animals included body, viscera and organ weights, jaws for age determinations and information on internal parasites.

Forage Production

Forage production varied significantly between 1964 and 1965 (Table 1). The most significant increase was noted in the annual production of big sagebrush, from 147 lb/acre to 266.7 lb/acre. All species except Douglas rabbitbrush and winterfat demonstrated some increase. The difference in annual production between 1964 and 1965 can be explained by variations in climate. Annual precipitation increased every year since 1962 when 4.5 in were recorded. Five inches fell in 1963, 5.5 inches in 1964 and in 1965, 6.5 in were recorded. The long-term average for the Wamsutter station is 5.47 in. Particular attention should also be given to the forb production for this area. The forb category as shown in Table 1 includes one species each of *Arabis, Penstemon, Astragalus, Allium, Cryptantha* and *Gayophytum.* Of these only *Arabis* was utilized. The minor contribution by forbs to the vegetation is fairly characteristic of the entire desert, except in disturbed areas where russian-thistle *(Salsola kali)* and halogeton *(Halogeton glomeratus)* are found. This is the reason that the information obtained in Wyoming doesn't even remotely resemble that collected in Texas by Buechner (1950) or Russell's (1964) studies in New Mexico. In both of these areas forbs were predominant in the antelope diet and in Texas, the floral composition.

Table 1. Average annual forage production on the study area for 1964 and 1965, determined by clipping of 2 x 4 ft plots. (Lb/acre, oven dried).

Species	1964	1965
Big sagebrush	147.0	266.7
Douglas rabbitbrush	89.4	88.7
Western wheatgrass	51.6	57.2
Needleandthread	19.3	21.1
Indian ricegrass	14.5	19.2
Bottlebrush squirrel tail	13.0	14.9
Winterfat	10.0	6.7
Sandberg bluegrass	3.6	7.7
Obtuse sedge	3.1	8.1
Forbs	T	2.6
Total	351.5	492.9

Utilization

Utilization figures are given in pounds consumed per acre over a particular season and related to animal days of use. Table 2 compares data gathered in the summer of 1964 with that collected over the same period in 1965. The excellent replication demonstrated by western wheatgrass is, at best, unusual. It does, however, demonstrate the trend that will become obvious after examining the entire table—and that is the preference for grasses by sheep as compared to antelope. The trend in shrub utilization is indicated by Douglas rabbitbrush which was preferred more by antelope than by sheep. Indian ricegrass and needleandthread were taken infrequently by antelope, but were the two most important species in the sheep diet. Needleandthread appeared to be more preferable than Indian ricegrass. There was some difference in sheep use of these two species from 1964 to 1965, notably a decrease in the use of needleandthread and increased use of Indian ricegrass. The possible reasons for these differences will be discussed later. Sandberg bluegrass followed the same trend—that is, use to a greater extent by sheep. However, both animal species used this plant heavily in the spring because it was the first species to exhibit green growth, but sheep utilized it later into the summer. Winterfat, in the summer, was used infrequently by sheep and not at all by antelope.

Big sagebrush, another important species in the antelope diet,

Table 2. Summer forage consumption by antelope and sheep detected by agronomic methods.

	Summer, 1964		Summer, 1965	
	Antelope	Sheep	Antelope	Sheep
Western wheatgrass	.1	1.8	.1	1.8
Douglas rabbitbrush	9.5	.2	10.1	.3
Indian ricegrass	.1	1.0	.1	2.7
Needleandthread	T	6.6	—	3.7
Sandberg bluegrass	T	.3	T	.9
Winterfat	—	T	—	.1
Big sagebrush	1.2	2.4	1.5	—
Bottlebrush squirreltail	.1	1.3	—	.4
Obtuse sedge	T	T	T	—
Lb used/acre	11.1	13.6	11.8	9.9
Animal days use/pasture	833	750	1041	864
Lb used/animal/day	1.6	2.1	1.4	1.4

was utilized to a rather small extent in the summer, but was still the second most important species. Sagebrush use by sheep was quite variable. This difference, as well as all other major variations between 1964 and 1965 may be explained through dissimilarities in the growing seasons. Big sagebrush also presented a problem when it came to determining use. The growth form of this plant was very low, scrubby, and had tight, knotty leader groups. Quantitative measurement, tagging twigs and weighing browsed and unbrowsed leader groups were tried but the time involved and the sample numbers required made these methods infeasible, so ocular estimates were used. However, big sagebrush utilization was well replicated between years. Also, the number of sagebrush plants examined in each pasture was increased for the second year, which would increase the precision for the determination of use in the pastures. Another reason for variations in utilization could be the length of growing seasons. Green growth was available from the end of April to mid-July in 1964 and from the end of April to mid-August in 1965, or about one month longer. Sagebrush use was detected on the pastures in the November transects in 1965 so it appears that it was not used by sheep until the grasses had cured. Bottlebrush squirreltail was also more important to sheep than to antelope and again there was a substantial difference from 1964 to 1965 in the sheep diet. Obtuse sedge was fairly common in all pastures but utilization of this species was minimal by both animals.

Sheep data in Table 3 are absent from the fall and winter column and also from the summary of all-seasons column because of the severity of the 1964-65 winter. Enough sheep were lost from these pastures to render the data invalid and weather conditions made restocking completely infeasible. As for antelope, western wheatgrass use was absent in winter and contributed very little to the yearly total. Douglas rabbitbrush use decreased from summer to winter but was still very important. Most of the utilization shown in the fall-winter column was from September to mid-November, after which it was pretty well covered by snow. In the yearly total this was the most important species. Indian ricegrass and needleandthread use was not found in winter and both were unimportant as to their contribution to the animal's diet. Sandberg bluegrass followed this same grass trend in the antelope foods and was only important early in the spring. Winterfat use demonstrated a notable increase in late summer and fall, but like rabbitbrush, its use was limited to fall, as it was covered by snow by November. Big sagebrush was the most important species in the antelope diet in the winter and often the only species available. The snow depths ran from 6 inches to 4 ft in drifts during the winter of 1964-65, and sagebrush was the only visible species on some areas. Most of the use indicated in the winter column of this table was after mid-November. Squirreltail grass was relatively little used. No use was found on needleleaf sedge during the winter and this plant also contributed little to the final total. In 1965, the fall data were separated from the winter data and although not presented in the utilization chart, the 1965 data were used to interpret when the listed species were utilized. The data from the combination pastures were not included here but utilization on these pastures does show intermediate results when compared to the single use pastures.

Table 3. Winter and year-long forage consumption by antelope[1] in 1964, detected by agronomic methods.

Species	F & W[2]	YL[3]
Western wheatgrass	—	.2
Douglas rabbitbrush	10.4	20.1
Indian ricegrass	—	.1
Needleandthread	—	T
Sandberg bluegrass	—	T
Winterfat	.8	.9
Big sagebrush	11.6	13.2
Bottlebrush squirreltail	—	.1
Obtuse sedge	—	.1
Lb used/acre	22.8	34.7
Animal days use	1544	2377
Lb used/animal/day	1.7	1.8

[1] No information available for sheep because of missing data from the winter of 1964-65.
[2] F & W Fall and winter.
[3] YL Summary, 1964.

Table 4. Forage consumed on feeding trials and in pastures (oven-dried lb/day/animal).

Animal and item	Feeding Trials	Pastures
Antelope		
No. observ.	18	10
Range, lb/day	0.5-2.6	1.3-1.8
Average lb/day	1.5	1.7
Sheep		
No. observ.	12	10
Range, lb/day	1.7-4.4	1.0-2.5
Average lb/day	2.9	1.6

Closely controlled feeding trials were also conducted with penned animals (Table 4). Several animals were given various combinations of different forage types in excess of what they would need and the following day that remaining forage was weighed, subtracted from that given, and converted to pounds consumed/animal/day. Again, all weights were based on oven dried samples. Eighteen days of data were collected in this manner for antelope and compared to data collected from the pastures. Each of the 10 observations from the pastures was an average derived from one season's use on one pasture. For example, antelope averaged 1.7 lb/day during the fall and winter in one pasture. This explains the smaller

range noted in the pasture data. When the two means were compared, using a simple t-test, no significant difference was noted. There was, however, a significant difference in daily consumption by sheep. Sheep consumption in feeding trials averaged almost twice as much as was found by the range analysis methods. This can be partially explained by observing the feeding habits of sheep. They appeared to use as much forage as possible when it was offered to them in such a manner that they didn't have to work to obtain it. The time spent in seeking preferred plants on pastures was used in eating when feeding from a trough. Palatability may also have been an influence. Some alfalfa was used in the feeding trials along with native forage—however, the largest daily consumption found (4.4 lb/day) was on native hay. Because the sheep in the pastures were feeding primarily on grasses, some utilization may have been obscured by regrowth, which could help account for the lower figure reached through range analysis methods.

Observations and measurements taken throughout the grazing season provided information that enabled utilization of plant species to be broken down even further (Fig. 1). Sandberg bluegrass, as mentioned before, was taken readily in early spring by both antelope and sheep because it was the first species to initiate spring growth and for a period of 10-14 days it was the only green plant in the pastures. As soon as Douglas rabbitbrush started to grow, antelope began to use it, and it remained the species most used by antelope from late spring to mid-summer. As late summer-early fall approached, rabbitbrush, although still available, either decreased in palatability or sagebrush increased. There was a notable trend in increased sagebrush use that reached a peak in winter. One of the reasons for this was availability governed by snow depth. The slight use of rabbitbrush in winter represents limited availability rather than a decrease in palatability. Winterfat was not used by either antelope or sheep until late fall and its use again, as with rabbitbrush, was terminated by decreased availability. Grass use by antelope, with the exception of bluegrass, was very minor for the entire year.

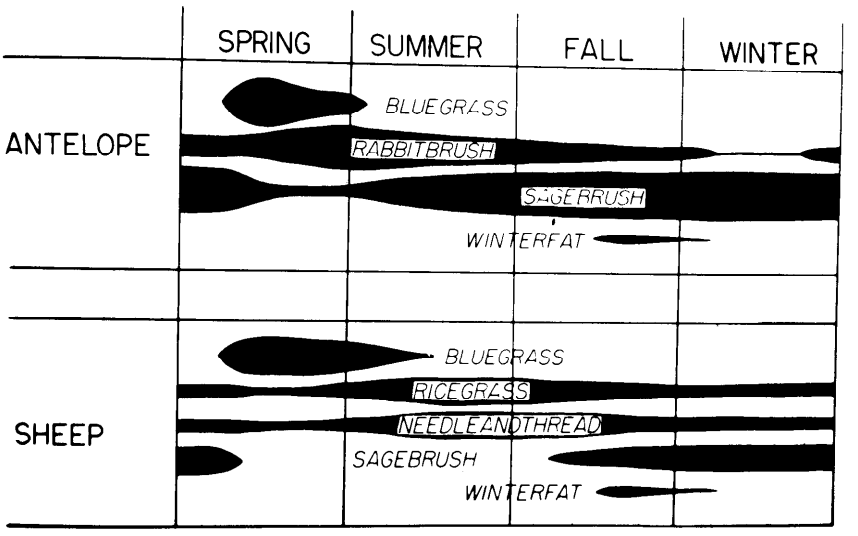

FIG. 1. Summary of seasonal preferences by sheep and antelope.

Sheep went to Indian ricegrass and needleandthread as soon as these species started to grow and they were utilized quite heavily until availability was limited by snow depth. Use was less on these species in the early spring when they were seeking the green bluegrass. Some sagebrush use was noted when the grasses dried up and this use increased through the winter as the availability of grasses decreased due to increasing snow depth. Douglas rabbitbrush, western wheatgrass and bottlebrush squirreltail utilization by sheep was minimal over the entire year.

Feeding Habits

The results on feeding habits from this study paralleled those noted by other investigators (Cory, 1927; Einarsen, 1948; Buechner, 1950; Gregg, 1955). Antelope move about much more than sheep while feeding, covering about 1.5 times the linear distance in an equal period of time. Antelope were much less gregarious than sheep. From early spring to late August they remained well distributed over the pastures as singles or in groups of two to three. As individuals they had no apparent pattern to their daily movements. Antelope acted independently even when in groups. The pronghorn was also a very delicate feeder, they took less of each plant grazed than a sheep. This is so common, especially on sagebrush, that it became very difficult to determine utilization. Sheep on the other hand, tend to be much more gregarious. Generally speaking, when one was feeding all were feeding. Sheep also fed, primarily, early and late in the day, especially in the summer. Antelope, apparently less affected by heat, fed on and off all day.

Conclusions

It can be concluded from the preceding information that there is little competition between pronghorn antelope and domestic sheep for range forage on the northern desert sagebrush-grass type in Wyoming. The two major

species in the antelope diet were big sagebrush and Douglas rabbitbrush as compared to needleandthread and Indian ricegrass in the sheep diet. There was some overlap in use of Sandberg bluegrass and winterfat. However, these two species contributed so little to the annual production of the area that they could be designated as sacrifice species if need be. Past records give no evidence that winterfat is ever abundant in this vegetative type. Furthermore, Sandberg bluegrass and big sagebrush have wide ecological tolerances, both are common increasers in this area and would not be eliminated from the composition unless extreme intensity of use occurred.

The only notable overlap was with big sagebrush, but again, this probably isn't critical because the basic definition of competition states that the resource for which two organisms are competing must be in limited supply. It is difficult to visualize big sagebrush as being in short or limited supply in Wyoming's Red Desert. This species is the dominant plant on from 50 to 60% of the area and the subdominant on another 10% (Vass and Lang, 1938). Under severe winter conditions, with deep snows, it would be conceivable that big sagebrush could become limiting, especially on key antelope winter ranges. These areas are, however, limited in extent and winters this severe occur infrequently.

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