Common Use of Summer Range by Sheep and Cattle

C. WAYNE COOK

Associate Research Professor, Department of Range Management, Utah State Agricultural College, Logan, Utah

MOUNTAIN ranges are sometimes better adapted to one kind of livestock than another, but most areas can be more efficiently utilized when stocked with both sheep and cattle. In the intermountain area, common use of summer range by sheep and cattle amost always results in more uniform utilization than can be obtained by one kind of animal alone (Jardine *et al.*, 1919; Sampson, 1952; and Stoddart and Smith, 1943). The combined number of both kinds of stock must be commensurate with the forage production. Likewise, due consideration must be given the character of the forage, topographic features and distribution of water in deciding the correct proportion of the various kinds of livestock and the suitability of the range for each. In addition, administrative problems in land management may make common use impractical in some cases.

Many people believe that browse ranges are better adapted to sheep, and grass ranges are better adapted to cattle. However, there are extensive grass ranges in the shortgrass plains that are utilized effectively by either sheep or cattle. Sheep, however, cannot make effective use of stemmy bunchgrasses or the tall grasses of the prairies.

Sheep make better use of rough topography and, likewise, tolerate infrequent watering better than cattle. Mountain range, then, should be better adapted to sheep than cattle, but this is not always the case. Many grasses on summer ranges are used only sparingly by sheep, especially late in the grazing season after they become stemmy, whereas, cattle eat most grasses rather readily during most of the grazing season. In addition, cattle consume many forbs and shrubs with avidity but generally more complete use of these plants is made by sheep. Therefore, more effective use of summer range might be made by sheep and cattle grazing in combination. The more kinds of animals grazing, the more likely that every species will contribute its share to the total forage consumption. Likewise, many kinds of animals will more thoroughly cover the range and make full use of steep and less accessible areas. This fact is recognized in the Edwards Plateau country of Texas where deer, cattle, sheep and goats are commonly grazed together. Stockmen there found this system made efficient use of rough topography and of all forage species.

It must be emphasized that common use, or dual use, of a range does not mean double use. If livestock are removed when the range is properly grazed, no species will be misused unless this is purposeful. Rare and very palatable species might be "sacrificed" or overused to get full use of more abundant and less palatable species. The range manager, not the stock, determines the point at which grazing should cease. Under common-use grazing there is no more reason to permit overuse than under single-use grazing. Common use is based on the assumption that, animal behavior will be normal irrespective of what kind of stock grazes the forage on the range. That is, if cattle normally utilize a given species to 60 percent by the end of the grazing season, an individual cow will not utilize it closer than this regardless of whether she follows a foraging sheep or another cow over a given range area.

Discussion

This study was conducted on typical summer range in the Wasatch mountains in northern Utah at an average elevation of about 7300 feet. The region is characterized by relatively steep slopes with aspen on the less exposed north and east slopes and sagebrush on the more exposed south and west slopes. The area receives about 30 inches of precipitation annually and the soils are derived from limestone and dolomite formations.

One area of approximately 400 acres was grazed by 80 head of cattle from July 1 until Oct. 1 and an adjacent and comparable area of about 2400 acres was grazed by 1050 ewes and lambs from July 3 until Sept. 26. The lambs were sold during the last week in September and averaged about 87 pounds per head. Thus, the lambs were rather large during the actual grazing period and for this reason the customary 5 to 1 ratio of sheep to cattle was considered somewhat wide. If a ratio of 4 to 1 is used the volume of forage consumed is about equal. Actually, based upon this ratio, 9.14 acres were allowed for each animal unit in the case of sheep and 5.0 acres in the case of cattle. This variability between the two kinds of animals is borne out by the forage factor for sheep and for cattle shown in Table 1.

The two ranges have very similar topographic features and forage cover. The flora in both areas is definitely better adapted to cattle than to sheep (Table 1). This is due primarily to the large percentage of grass which is more completely utilized by cattle than by sheep

after the July 1 opening date. These grasses were stemmy and in full head by the middle of July and the sheep avoided the coarse stems and ate sparingly of the foliage. The avoidance of grass by sheep became more pronounced as the season advanced. Cattle ate appreciable amounts of grass stems throughout the summer but they, too, showed increased selectivity for grass leaves as the season advanced. In addition, both sheep and cattle showed increasing preference for forbs and browse as the season progressed. Cattle, however, seemed to favor forbs and sheep had a tendency to favor browse.

The floral composition of the pastures and actual utilization of species by sheep and cattle at the end of the grazing season are shown in Table 1. The composition percentages for the two areas were averaged in order to calculate the theoretical grazing capacity for common use if both cattle and sheep were to graze the entire area simultaneously. Utilization percentages were obtained by averaging weight estimates from 14 individual estimators who had previously received 4 weeks training in the determination of utilization. The forage factor for sheep and cattle individually was obtained by multiplying the actual degree of utilization from each by the composition percentage.

The forage factor was .2034 for sheep and .3728 for cattle, thus the area was theoretically 1.83 times more suited for cattle than for sheep (Table 1). However, if the higher forage factor for either cattle or sheep is used for each plant species the total becomes .4339. This figure represents the forage factor for common use and is materially higher than either the forage factor for cattle or for sheep. Thus, by common use, the area can be 2.13 times more effectively used than by sheep alone and 1.16 times more effectively used than by cattle alone.

Table 1. Vegetation composition, utilization when fully grazed, and forage factor for sheep and cattle on summer range in northern Utah

Plant Species	(1) Vegetation Composition	(2) Utilization	(3) Utilization	(1 x 2) Forage Factor	(1 x 3) Forage Factor	Higher Forage Factor
		Sheep	Cattle	Sheep	Cattle	
	Percent	*Percent*	*Percent*			
Agropyron subsecundum	11.2	24	55	.0269	.0616	.0616
Bromus carinatus	22.5	15	35	.0337	.0787	.0787
Elymus glaucus	39.4	9	46	.0355	.1812	.1812
Achillea lanulosa	1.0	8	0	.0008	.0000	.0008
Agastache urticifolia	.3	26	16	.0008	.0005	.0008
Aster adscendens	.1	14	10	.0001	.0001	.0001
Aster engelmanni	.1	53	20	.0005	.0002	.0005
Aster fremontii	.2	25	50	.0005	.0010	.0010
Balsamorhiza sagittata	.4	76	20	.0030	.0008	.0030
Descurainia californica	.3	14	0	.0004	.0000	.0004
Helianthella uniflora	.5	34	60	.0017	.0030	.0030
Lathyrus leucanthus	5.9	45	20	.0265	.0118	.0265
Lithospermum ruderale	.4	60	60	.0024	.0024	.0024
Lupinus caudatus	.7	39	9	.0027	.0006	.0027
Orthocarpus luteus	.1	30	0	.0003	.0000	.0003
Osmorhiza occidentalis	.3	34	15	.0010	.0004	.0010
Phacelia heterophylla	.1	20	0	.0002	.0000	.0002
Polemonium albiflorum	.1	33	15	.0003	.0001	.0003
Senecio serra	.9	31	18	.0028	.0016	.0028
Thalictrum fendleri	11.6	45	5	.0072	.0008	.0072
Vicia americana	.3	61	25	.0018	.0007	.0018
Amelanchier alnifolia	2.9	46	10	.0133	.0029	.0133
Prunus demissa	2.4	54	9	.0129	.0022	.0129
Purshia tridentata	4.4	42	50	.0185	.0220	.0220
Symphoricarpus vaccinioides	3.9	24	0	.0094	.0000	.0094
	100.0			.2034	.3728	.4339

Assuming that past stocking of 5.0 acres per cow and 9.14 acres per animal unit of sheep is correct stocking, the entire area consisting of 2800 acres would support 306 animal units of sheep, whereas, if it were stocked with cattle, the grazing capacity would be 560 animal units. However, as shown in Table 2 more effective use is theoretically possible under common use when stocked with 422 animal units of cattle and 230 animal units of sheep which is about 65 percent cattle and about 35 percent sheep or 1.83 times more cattle than sheep because of the suitability ratio. In this manner a total of 652 animal units grazing for three months is obtained.

The total capacity of the area under common use was calculated by adding the total capacity when grazed by cattle alone (560 animal units) and the total capacity when grazed by sheep alone (306 animal units) and in like manner adding the forage factor for cattle (.3728) and sheep (.2034) giving a total of 866 animal units with a total forage factor of .5763. Thus, if the theoretical forage factor .5763 would have a total capacity of 866 animal units then the forage factor .4339 (Table 1) for common use would have a total grazing capacity amounting to 652 animal units.

It is assumed by these calculations that common use is not excessive use but instead the grazing of each kind of stock is complementary to the other. This may not always be true under range conditions but observations indicate that it is not an unreasonable assumption.

For many years range technicians

have calculated conversion ratios by determining the suitability of ranges for one class of livestock or big game compared to another. If the range is equally suited to both kinds of animals being considered, the conversion is usually based upon the nutritional requirement of the animal which is in turn based upon average weight or upon surface area of the body.

Conversion ratios or equivalents are used by range managers to calculate the number of sheep that can be added when a certain number of cattle are removed or vice versa. These, as previously stated, generally are calculated from the suitability of the range for the kind of animal being considered. These ratios are obtained from the forage-acre factors or forage factors calculated for each kind of animal when the conventional range survey or range inventory is made. Forage factor is derived from a summation of the products of the percent composition of each species on the range times the palatability or preference index for the type of animal being considered. Palatability indexes or preference index figures for each kind of animal must be determined separately for all forage species present and forage-acre factors calculated independently by using separate palatability lists. The ratio of the forage-acre factor obtained for cattle and the forage-acre factor obtained for sheep is considered the suitability rating to be used when converting from one animal to the other. Thus, if the factor is twice as high for sheep as for cattle, the range is considered capable of furnishing twice as much sheep forage as cattle forage. Actual conversion ratios can, therefore, be calculated from this suitability rating plus some measure of normal forage requirement. For example, one cow may require 5 times as much forage as one sheep. This 5:1 ratio, however, becomes 10:1 in the above case where the range is twice as suitable to sheep.

Conversion equivalents are not constant as sometimes believed but change with each shift in livestock numbers from one kind of animal to another unless a complete change is made. The calculated grazing capacities presented in Table 2 show that the conversion equivalents vary greatly when various combinations of sheep and cattle are grazed but remain constant after the point of most effective use is reached when changing from cattle to sheep or from sheep to cattle.

The conversion equivalents for each change in livestock combination shown in Table 2 apply only when a complete change is made from one kind of livestock to the other. For instance when changing from common use to cattle alone, when 468 animal units of grazing are now being obtained by cattle and 153 animal units of grazing obtained by sheep, the calculated conversion equivalent is 0.60. Thus, removing the 153 animal units of sheep will permit increasing cattle from 468 to 560 animal units entailing a loss of 153 animal units of sheep grazing to gain only 92 units of cattle grazing. The conversion ratio between these figures is 1:0.60; therefore, for each animal unit of sheep grazing removed only 0.60 animal units of cattle grazing can be added. However, when the area is grazed by 281 animal units of sheep and 141 animal units of cattle the conversion equivalent is 1.49. If 281 animal units of sheep are removed and replaced by cattle, 419 animal units are gained in total grazing capacity. This increase is brought about by a shift toward greater efficiency because cattle numbers are considerably lower than desirable, whereas, the loss in grazing capacity in the first case was a result of shifting toward cattle numbers which were already above desired numbers for most efficient common use.

If the shift is being made from common use to sheep alone, total grazing capacity is reduced in every case. For example, by removing 141 animal units of cattle only 25 animal units of sheep can be added or by removing 514 animal units of cattle only 229 animal units of sheep can be added. However, in both cases greatest grazing capacity is still obtained by common use.

Table 2. Calculated grazing capacity in animal units when grazed by both sheep and cattle with various numbers of each or by each class alone. The right hand columns show conversion ratios when changing from common use to a single use

Combined Grazing Capacity	Ratio of Cattle and Sheep under Common Use				Conversion Ratio Changing to Cattle	Conversion Ratio Changing to Sheep
	Cattle		Sheep			
Animal units	*Percent*	*Animal units*	*Percent*	*Animal units*	*Animal units*	*Animal units*
306	0	0	100	306	1.83	—
422	33.4	141	66.6	281	1.49	0.18
536	52.4	281	47.6	255	1.09	0.18
652	64.7	422	35.3	230	0.60	0.18
621	75.4	468	24.6	153	0.60	0.33
591	87.0	514	13.0	77	0.60	0.45
560	100	560	0	0	—	0.55

Summary and Conclusions

Common use of summer range in the intermountain area results in more uniform utilization than is obtained by single use provided the combined numbers of each kind of animal are commensurate with forage production.

A summer range area grazed by sheep and a comparable range grazed by cattle were studied in order to compare the foraging

habits of the two kinds of livestock and to evaluate the desirabilities of common use compared to single use.

Cattle ate considerable quantities of the grasses, moderate amounts of the forbs and only limited quantities of the browse, whereas, sheep ate sparingly of the grasses and consumed large quantities of the forbs and browse.

Assuming that present stocking capacity was correct and that the heaviest utilization on any particular species by either kind of animal was obtained under common use, the area would furnish 652 animal units of grazing when stocked with the proper proportions of sheep and cattle. However, if the entire area were grazed by cattle alone it would furnish grazing for 560 animal units and when grazed only by sheep, it would furnish 306 animal units of grazing. Thus, the area would furnish more grazing from common use than from single use and was judged 1.83 times more suitable for cattle than for sheep.

Calculated grazing capacities under various combinations of sheep and cattle showed that conversion ratios for replacing one kind of animal with another are not constant until after the point of most effective use is reached when changing from one kind of animal to another.

LITERATURE CITED

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REORGANIZATION OF THE U. S. DEPARTMENT OF AGRICULTURE

The reorganization of the U. S. Department of Agriculture, as announced by Secretary Benson, November 1, 1953, established four main groups of service agencies:

(1) *Federal-States Relations:* Agricultural Research Service, Forest Service, Federal Extension Service, Soil Conservation Service, Agricultural Conservation Program Service and Farmer Cooperative Service

(2) *Marketing and Foreign Agriculture:* Agricultural Marketing Service, Foreign Agricultural Service and Commodity Exchange Authority

(3) *Agricultural Stabilization:* Commodity Stabilization Service, Federal Crop Insurance Corporation and Community, County, and State Committees

(4) *Agricultural Credit:* Farmers Home Administration, Farm Credit Administration and Rural Electrification Administration

Changes affecting the research and regulatory activities in range management were largely centered in the *Federal-States Relations* group. Reassignments to the Agricultural Research Service from other agencies include: research on farm management, land economics and agricultural finance from the former Bureau of Agricultural Economics; all soil conservation research except that required for the national soil survey from the Soil Conservation Service; research on range management (except that on forest ranges and adjacent integrated non-forest lands) and on grass and control of undesirable plants from the Forest Service.

Management of the land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act by the Soil Conservation Service has been transferred to the Forest Service. State offices of the Soil Conservation Service have been given greater responsibility for program formulation and execution with the elimination of the regional offices.