

COMPETITIVE USE OF NEVADA'S RANGE FORAGE BY LIVESTOCK AND BIG GAME

Paul T. Tueller
and A. L. Lesperance
University of Nevada
Reno, Nevada

Abstract: Studies have been conducted in Nevada to better understand and quantify the actual areas of competition between big game and livestock. The total consumption of dry matter by both livestock and big game on Nevada's range forage resource amounts to 1.5 million tons annually. Livestock consume 83% of this, while big game account for 17%. The data indicate two general areas of competition between mule deer and cattle: namely, the early spring competition for grass and fall competition for browse. Competition for forbs was not found to be important. The continuation of present or higher big game numbers (primarily mule deer) on the Nevada ranges appears to be dependent upon directly managing range forage with cattle.

The multiple use concept considers a wide variety of land uses including grazing of livestock, wildlife production, recreation, watershed and timber production. Some uses are compatible, while others are more competitive and often result in subjectively determined measures influencing the ultimate uses of the land. In the utilization of range resources, the greatest area of direct competition occurs between livestock and wildlife grazing forages in common.

The multiple use concept can theoretically be practiced on all lands. However, it is obviously more easily legislated on the publically owned lands which come under the management policies of one of the several regulatory agencies. Therefore, the multiple use concept has had far more influence in the western states. Nevada is unique in that 86% of the state is federally administered, and comes under the management of the Bureau of Land Management (BLM) primarily, and to a lesser extent, the United States Forest Service.

Competitive use of the range forage resource between livestock and big game species will become more important on the public domain with increased public demand for recreation associated with big game species. In Nevada, this appears to be primarily a problem existing between cattle and mule deer (Odocoileus hemionus).

An investigation of range forage uses by livestock and big game should include an understanding of the two groups that are, or appear to be, most closely associated with the two uses: namely, the livestock man and the hunter.

The livestock man: Thompson and West (1881), in their History of Nevada, wrote, "The cattle become only half as wild as did their constant companions, the herders, who are a unique race with a code of morals and language all their own." The great American saga of cattle and cowboys was written in trail dust, which began in the late 1850's, and clouded the western skies until after the turn of the century. For many years the livestock industry was perhaps best characterized by the old buckaroo statement of, "The pay in this business is bean and money, plenty of beans and damned little money."

The individuals who put together a spread asked little help, and gave even less, are today a rare breed. Instead, today the livestock industry and its individual ranchers see and accept change. Today's rancher is not only a successful husbandman, but he is a nutritionist, physiologist, breeder, and perhaps most of all, a keen businessman, or he is any one of these as a specialist, in the corporate venture.

Most of all, today's livestock man is well educated and beyond all else, knows that at least on the public domain the future of the livestock industry in the West may largely be determined by the action of the industry itself.

The hunter: C. S. Coon (1954), in his Story of Man, concludes: "We would do well if some of us recaptured certain aspects of the hunting life. All anthropologists who have lived with primitive hunters report that they are sportsmen, gentlemen, and conservationists. Good manners, cooperation, and a respect for the plants and animals among which they live and from which they derive their food are basic hunting patterns of behavior."

T. J. Peterle (1966), in a study to characterize some Ohio hunters concluded: "Hunters are a discrete group, a minority that is diminishing as population grows, but a group that is of increasing importance if man is to retain a collective social, moral, and ethical responsibility to the wildlife resource. The hunter is ready for species management, compulsory firearms training and greater restrictions on methods of taking game."

Sportsmen will have the opportunity to contribute to the development and management of western rangelands. They will continue to provide constructive criticism. Their opinions must be considered. However, groups or individuals with little real understanding of biological concepts of wildlife and range management should not be allowed to over-rule professionally trained biologists.

In studying competitive utilization of public rangelands, a knowledge of grazing patterns of both species is necessary. Livestock grazing patterns vary in the intermountain area but generally cattle graze foothill ranges in the spring, and as the season progresses, move higher into the mountains. With the onset of fall, cattle gradually return to the foothill areas. During the winter,

cattle are either maintained on dry desert valleys or fed harvested forages. In Nevada the grazing pattern varies somewhat with the area. The southern part of the range area is generally utilized year-round. In the north, livestock usually are fed harvested forages from three to five months during the winter period.

In some respects mule deer follow similar patterns in their natural grazing habits. However, their foraging migrations are more dependent upon weather phenomena and particularly upon their habitual nature. In northeastern Nevada they are less prone to move in herd units (Gruell and Papez, 1963) but rather tend to move in small groups from mountains to foothills to valleys or from range to range in an almost random fashion.

It is difficult to completely ascertain the degree of range utilization on a complex area such as Nevada. Of the some 70 million acres in Nevada, approximately 92%, or 64.4 million acres is classified as range land. Of the range land resource, 78%, or 50.2 million acres, is managed by the BLM. Ten percent is privately owned, 8% is managed by the Forest Service, while 4% is controlled by other interests.

Meat animals in Nevada require annually 7.9 million AUM of forage. The complete breakdown of the source of these AUM appears in Table 1. The greatest contribution to the forage requirements of meat animals actually comes from crop lands. However, approximately 53% of the total feed requirements of meat animals in Nevada comes from all range sources. Twenty-two percent, or 1.7 million AUM, is provided by privately owned lands and such things as purchased range supplements. The Forest Service provides only 6% of the range requirements, or approximately 250,000 AUM. We can assume that an AUM is equivalent to 600 pounds of harvested dry matter. Thus, the 4.14 million AUM harvested off the range resource in Nevada amounts to 1.25 million tons of range forage utilized annually by grazing domestic animals.

Table 1. Total forage requirements of livestock in Nevada.

Source	AUM	% of total forage requirements	% of total range forage
BLM Land	2,200,000	28%	53%
Forest Service	260,000	3%	6%
Private Range, etc.	1,690,000	22%	41%
Crop Land	<u>3,720,000</u>	<u>47%</u>	
Total	7,870,000	100%	100%

Big game use of range forage in Nevada is obviously more difficult to document than livestock use. Most big game use occurs on ranges utilized by cattle in either spring, summer or fall. Although estimates of big game numbers are

available, it should be remembered that game numbers only are as good as available techniques for estimating. The best figures at hand for Nevada ranges indicate that approximately 195,000 big game inhabit Nevada ranges (Table 2). Approximately 95% of this number are deer. Using an average daily consumption of 4% of the live body weight it can be estimated that big game animals in Nevada consume 250,000 tons of forage annually (Table 2). Thus, the total consumption of dry matter by both livestock and game on Nevada's range forage resource amounts to 1.5 million tons annually. Livestock consume 83% of this, while big game species account for 17%. The necessity of determining the major sources of this forage is obvious.

Table 2. Estimated game numbers and forage requirements of game species in Nevada.

Species	Number	Estimated Daily Forage Consumption Pounds	Total Yearly Forage Requirements Tons
Deer	190,000	7	242,000
Antelope	3,000	5	3,000
Sheep	2,500	5	3,000
Elk	<u>260</u>	<u>40</u>	<u>2,000</u>
Total			250,000

Early investigators in the area of livestock-game competition chiefly studied relationships between elk and livestock. Pickford and Reid (1943), Mackie (1965), and Stevens (1966) have all contributed to the understanding of elk-livestock range relationships. Morris (1956) concluded that the problem of elk and livestock competition could only be solved by an intelligent, fair and informed public, representing all interests of the land involved, developing a plan for the best management of all resources, including game and livestock. Direct competition studies between deer and cattle are scarce. But most general studies (Davis, 1952; Julander, 1955) have indicated that deer feed primarily on stems of woody plants, while cattle generally use grass when grazing ranges which offer a wide degree of selectivity.

With increased public demand for recreation associated with big game species, every effort should be made by management to maintain or improve their numbers. Therefore, if the range livestock is to hold its current position of importance in the multiple use concept on the public domain, an understanding of the extent of competition between livestock and big game species is urgently needed.

Studies were initiated in Nevada to better delineate the actual areas of competition between deer and livestock. Rumen-fistulated cattle were used to obtain a total of 493 samples of forage on these study areas. Rumen contents were obtained from 171 deer on five study areas. Cattle investigation sites included Delamar Valley and the Nevada Test Site, both located in southern Nevada, and

Knoll Creek, located in northeastern Nevada. The five deer study areas included Fox Mountain, White Rock, and Bates Mountain used as summer or year-round study areas, and Morey Bench and the Pequop Mountain, used as winter areas. Samples were collected over several years and during specific grazing periods. Samples were analyzed for grass, browse and forbs. Individual browse and forb species were identified. Data are presented in Tables 3 through 6. Detailed descriptions of these data are available in several theses. Cattle data are available in Connor (1962) and Smith (1968), while deer data appears in Doughty (1966) and Deibert (1968).

These data indicate two general areas of competition between deer and cattle; namely, the early spring competition for grass and fall competition for browse. Both species generally select some forbs when available; however, with the exception of the Bates Mountain data, forbs play an unimportant role in the diet of either species. Consequently, the competition for forbs is not considered important on Nevada ranges.

The competition for grass during the early spring months would appear to have some serious consequences; however, a close examination of these data leaves some question. Deer consumed approximately 14% grass during the months of March through May, and essentially no grass after that. Conversely, cattle consumed in excess of 90% grass during this same period. Direct competition on the same area does not normally occur. Range cattle are grazing lower foothill areas during this period, while deer tend to graze in more mountainous terrain. Additionally, the seeding of approximately one million acres in the foothill areas of Nevada has greatly alleviated the problem. Range seedings are normally used during the spring period (March to May) and are not used appreciably by deer in Nevada (Cole, 1968). By the time cattle are moved to native ranges, deer are no longer consuming grass, but have changed to a browse diet.

Throughout the summer, cattle consume grass as long as it is available, while deer remain on browse. Obviously, if overgrazing eliminates available grass and if the range is primarily browse type, cattle will be forced to consume browse species, as the data from Delamar Valley indicate. Apparently, cattle will naturally switch to some browse in the late fall, but by this time cattle usually have been returned to lower areas which are not often utilized by deer until later as wintering areas. Cattle appeared to actually select browse extensively during the fall in only one area, the Nevada Test Site. Browse consumption in Delamar Valley was not a function of selection, but rather of necessity because of over-grazing. At Knoll Creek, browse only accounted for 9% of the diet in the September to November period.

The period of competition for browse in the fall is generally considered the most important by game managers. Deer and cattle were not always concentrating on the same browse species during this period. Cattle at both Knoll Creek and the Nevada Test Site extensively selected bitterbrush (Purshia sp.), which accounted for 65% of the total browse selected. Other species only accounted for small amounts of the diet and are not characteristic of normal deer winter use areas.

Table 3. Average botanical composition of diets selected by fistulated cattle on three Nevada ranges.

Area	Grass	Browse	Forbs
Knoll Creek (247) ^a	83 (1.4) ^b	9	8
Delamar Valley	26 (2.5)	74	0
Nevada Test Site	80 (2.5)	9	11

^a Number of samples

^b Standard error of the mean

Table 4. Percentage grass diets selected by fistulated cattle by months at three Nevada locations.

Month	Knoll Creek	Delamar Valley	NTS
January	-- ^a	26 (8.6)	98 (0.7)
February	-- ^a	18 (5.3)	100 (0.0)
March	--	22 (6.2)	88 (3.0)
April	--	39 (3.9)	93 (1.2)
May	96 (1.7) ^b	81 (3.6)	92 (6.5)
June	85 (3.0)	--	99 (0.4)
July	80 (2.5)	60 (6.7)	67 (9.4)
August	78 (2.4)	27 (5.2)	80 (6.5)
September	81 (1.6)	5 (1.9)	63 (9.0)
October	87 (1.7)	1 (0.5)	74 (7.3)
November	87 (1.6)	7 (2.4)	69 (12.6)
December	--	5 (1.4)	35 (6.2)

^a Data not collected during blank months

^b Standard error of the mean

Deer tend to select three to five browse species in any one area. Consequently, they do not concentrate on a single species like cattle. Furthermore, certain browse species selected by deer in these studies based on weighed averages, consisted of species, e. g., sagebrush (Artemisia sp.), juniper (Juniperus osteosperma), and pinon (Pinus monophylla) that were not found in the diet of cattle except for an occasional trace. Sagebrush was the only browse species

selected extensively by deer at all five sites and accounted for an average of 17% of the total diet consumed by deer. Pinon and juniper accounted for an additional 15% of the total diet. Approximately 21% of the diet consisted of browse species normally not extensively selected by cattle, including serviceberry (*Amelanchier pallida*), aspen (*Populus tremuloides*), chokecherry (*Prunus virginiana*), and snowberry (*Symphoricarpos* sp.) Although these browse species are consumed by cattle, they did not account for more than 1% of the diet in these studies. Thirty-three percent of the diet selected by deer consisted of bitterbrush and mahogany. Although only bitterbrush was extensively selected by cattle in these studies, mountain mahogany is also considered desirable by cattle. It is apparent that these or similar browse species will constitute the most important area of fall competition for browse. To our knowledge no one has shown where heavy grazing by cattle has seriously depleted a stand of bitterbrush in Nevada.

Table 5. Average botanical composition of diets selected by mule deer on three summer ranges and two winter ranges.

<u>Area</u>	<u>% of diet</u>		
	<u>Grass</u>	<u>Browse</u>	<u>Forbs</u>
<u>Year-round</u>			
Fox Mountain (68) ^a	11	83 (2.1) ^b	6
White Rock (45)	5	85 (2.8)	10
<u>Summer</u>			
Bates Mountain (29)	5	49 (4.9)	46
<u>Winter</u>			
Morey Bench (14)	2	97 (1.5)	1
Pequop (15)	5	91 (2.2)	4

^a Number of samples

^b Standard error of the mean

Table 6. Browse composition in diets of mule deer by months at five Nevada locations.

Month	Year-round		Summer	Winter	
	Fox Mtn.	White Rock	Bates Mtn.	Morey Bench	Peguop Mtn.
January	-- ^a	--	--	99 (0.9)	94 (2.3)
March	62 (2.0) ^b	76 (13.0)	--	92 (3.3)	86 (4.9)
May	75 (5.4)	70 (7.3)	52 (9.7)	--	--
July	93 (1.4)	89 (6.4)	31 (4.7)	--	--
September	97 (1.2)	90 (1.0)	64 (7.7)	--	--
December	90 (2.3)	100 (0.2)	--	100 (0.3)	94 (3.7)

^a Data not collected during blank months

^b Standard error of the mean

Obviously, cattle can be managed to avoid direct competition with deer simply by removing them from bitterbrush areas before the fall months; however, Hormay (1969) has emphasized the need for cattle use on bitterbrush. He indicates that bitterbrush plants are left in open-branched form under deer use, while cattle graze bitterbrush and shape the plants into compact, solid, hedged forms. Such use stimulates adventitious growth in the interior of the crown; thus a sufficient proportion of the annual growth is protected, maintaining the plant in a more healthy state. Continued heavy use by cattle will be detrimental to bitterbrush. Hormay advocates a rest-rotation grazing pattern where cattle do not graze bitterbrush every year. The possibility of utilizing reseeded areas in the fall should not be discounted either.

It is apparent that where ample forage is available there is little competition between deer and cattle. Deer are not animals of the grass land, whereas cattle are. However, mismanagement of either species will upset the balance that now exists between both. Smith (1949), in studying adjacent winter deer ranges used extensively by livestock in one case and by deer in the other, found heavy use by deer killed much of the sagebrush and resulted in tremendous increases in forbs generally not utilized on the deer ranges. The area grazed by livestock produced a dense stand of healthy sagebrush. Thus, over-utilization by either animal species resulted in an increasingly less desirable plant population for that species but tended to produce an ecological shift more favorable for the utilization by the opposite animal species.

Changes which have occurred in Nevada from the onset of livestock grazing support Smith's (1949) observations. It is generally concluded that grasses were more abundant before the arrival of livestock. Livestock over-grazing, starting in the 1880's, extensively shifted Nevada ranges by increasing browse dominance (Robertson and Kennedy, 1954). Although this change would be considered detrimental in relationship to the climax succession of species, it has

apparently produced a more favorable habitat for the mule deer. Deer populations were extremely low prior to 1920 when first surveys were available. In fact, deer were considered scarce at that time (Anonymous, 1964), but numbers have increased since then. The Ruby Mountain herd in Elko County increased from an estimated 25 in 1917 to 3,000 in 1939. The peak population of deer in Nevada was obtained about 1950 and remained fairly constant until 1960. Since then, a general decline has occurred (Papez, 1969). The situation in Nevada is not unique. Swank (1958) reported in Arizona that large deer populations spring from land misuse and further concluded that elimination of livestock from western ranges would eventually reduce deer population.

Ecological shifts back to climax habitat seem long and almost impossible to accomplish even under complete protection from grazing, particularly in xeric environments. However, the continuation of present big game numbers (deer) on the public domain would appear to be assured by directly managing range forage with such species as cattle. Drastic changes in the use of the range forage resource on the public domain must not be enacted until the relationship of all factors are well understood. Elimination of such manageable species as cattle would eventually decrease deer numbers. The information available at this time leads to the conclusion that the maximum production of all animals will only be obtained by the dual utilization of the range forage resource by such diverse species as cattle and deer.

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