

**RELATIONSHIP BETWEEN ELK AND MULE DEER IN THE  
BLUE MOUNTAINS OF OREGON\*****Edward P. Cliff***U. S. Forest Service, Portland, Oregon*

The early history of the big game in the Blue Mountains of eastern Oregon is an old and much repeated story that can be applied to many localities in the west—a story of primeval abundance followed by profligate waste and then a surge of conservation consciousness that didn't know how to apply the brakes. By the beginning of the present century the elk (*Cervus canadensis nelsoni*) and Idaho whitetail deer (*Odocoileus virginianus ochrourus*) had been practically exterminated by settlers and market hunters and the Rocky Mountain mule deer (*O. hemionus macrotis*) had been so greatly reduced that it was an event to sight one in the woods. Finally there was an awakening and man hastened to repair the damage that had been wrought. Laws were passed protecting the elk against hunting and restricting the killing of deer to prescribed seasons and bag limits. With this reprieve nature started the task of rebuilding what had been so ruthlessly destroyed by man.

A small band of elk remained in the vicinity of Trout Meadows in the headwaters of the North Fork of the John Day River on what is now part of the Whitman National Forest. Under protection this remnant increased gradually and spread out onto adjacent ranges. In an attempt to speed up the processes of nature, elk secured from Jackson Hole, Wyoming, and the northern Yellowstone herd were planted on ranges where they had been eliminated or greatly reduced. Plantings were made at Billy Meadows on the Wallowa National Forest in 1912 and '13 and in three places on the Umatilla National Forest north of the Oregon-Washington line in 1911, 1918, and 1930. These transplanted animals increased and populated ranges on the Wallowa Forest and in the northern part of the Blue Mountains but, contrary to popular opinion, it was the Trout Meadows band of elk and not the transplanted animals that formed the nucleus of the elk herds which now occur on the Whitman and south end of the Umatilla National Forests and are gradually invading the Malheur and Ochoco National Forests.

The mule deer, which had not been reduced to such low numbers as

\*This paper is based upon unpublished Forest Service reports and records, data secured from organized game and game range studies conducted on the national forests in the Blue Mountains since 1934, and the personal observations of the writer. Special credit is due District Ranger George O. Langdon, whose observations and studies on the North Fork of the John Day River during the past two decades provide a basis for many of the statements.

the elk, made a remarkable recovery under the protection of the buck law and adequate law enforcement and were again common in the Blue Mountains by 1920.

In the Blue Mountains, as in most other parts of the West, the quality and quantity of food available on the winter ranges are the factors which eventually limit the maximum size of big game herds. The most favorable parts of the hereditary winter range were taken by settlers and converted into farms, livestock ranches, and villages, and deer and elk were forced to winter on a much reduced area around the edges of the national forests. It is on these restricted winter ranges that the pangs of hunger first strike when game herds get out of bounds.

The deer and elk of the Blue Mountains share the same winter ranges and since they subsist largely upon the same species during the critical winter months they often become competitors for food. Although deer and elk are known to consume over a hundred different plants in the Blue Mountains, the bulk of the winter feed is made up of not more than a dozen species. The most important winter food plants and the average amount that each contributes to the diet of deer and elk under normal conditions are shown in Table 1.

Browse plants provide the bulk of the winter food for both deer and elk. Herbaceous vegetation and low shrubs are usually covered with snow and available only by pawing. Young green grass is eaten by both species in early spring but Table 1 applies only to the critical winter period when snow covers the ground, usually December 15 to March 15. Bitterbrush, snowbrush, mountain mahogany, and western juniper are the key forage species upon which management of deer and elk in the Blue Mountains must be based. As long as these plants are moderately browsed, maintained in a thrifty condition, and allowed to reproduce, both deer and elk can occupy the same ranges without conflict. But if one or both of these animals are allowed to increase beyond the sustained carrying capacity of their habitat, it immediately becomes a matter of "the survival of the fittest."

The history of the Blue Mountain deer and elk herds demonstrates conclusively that mule deer cannot compete successfully with their larger adversaries when food becomes a limiting factor. The elk can browse about 2½ feet higher than deer. When foliage and twigs are consumed as high as elk can reach they often break large shrubs and small trees down and it is common for the bulls to rake limbs down with their antlers to a height of nearly 10 feet. Elk are more robust than deer and are able to paw more effectively for snow-covered forage. Their longer legs enable them to buck deeper drifts and range farther for feed. By preference they will eat much more dry grass than deer

TABLE 1.—LIST OF WINTER FOOD PLANTS OF DEER AND ELK IN THE BLUE MOUNTAINS OF OREGON

Scientific name	Common Name	Average per cent of winter diet	
		Mule deer	Elk
<b>Trees and Shrubs</b>			
<i>Acer glabrum</i>	Dwarf maple	x*	x*
<i>Alnus</i> sp.	Alder	x	1
<i>Amelanchier</i> sp.	Serviceberry	x	1
<i>Artemisia tridentata</i>	Big sagebrush	4	1
<i>Artemisia</i> sp.	Sage—other species	1	
<i>Ceanothus velutinus</i>	Snowbrush	8	10
<i>Cercocarpus ledifolius</i>	Mountain mahogany	20	12
<i>Chrysothamnus nauseosus</i>	Rabbitbrush	4	1
<i>Cornus stolonifera</i>	Red-osier dogwood	x	x
<i>Juniperus occidentalis</i>	Western juniper	12	8
<i>Lepargyrea canadensis</i>	Buffalo-berry	x	1
<i>Odostemon</i> sp.	Oregon grape	x	1
<i>Pachystima myrsinites</i>	Myrtle boxleaf	x	2
<i>Philadelphus lewisii</i>	Mockorange	x	x
<i>Pinus ponderosa</i>	Ponderosa pine	3	1
<i>Populus tremuloides</i>	Aspen	x	x
<i>Prunus demissa</i>	Chokecherry	x	x
<i>Prunus emarginata</i>	Bitter cherry	x	x
<i>Pseudotsuga taxifolia</i>	Douglas fir	4	3
<i>Purshia tridentata</i>	Bitterbrush	30	30
<i>Ribes</i> sp.	Wild currant	x	x
<i>Rosa</i> sp.	Wild rose	x	x
<i>Salix</i> sp.	Willow	x	1
<i>Sambucus glauca</i>	Elderberry	x	x
<i>Sarcobatus vermiculatus</i>	Greasewood	x	
<i>Spiraea</i> sp.	Spiraea	x	x
<i>Symphoricarpos</i> sp.	Snowberry	x	1
<i>Vaccinium</i> sp.	Huckleberry	x	2
<b>Weeds and Lichens</b>			
<i>Achillea lanulosa</i>	Yarrow	x	x
<i>Alectoria fremontii</i>	Black moss	2	3
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick	x	x
<i>Balsamorhiza sagittata</i>	Balsam root	x	x
<i>Eriogonum</i> sp.	Eriogonum	x	x
<i>Evernia vulpina</i>	Staghorn lichen or yellow moss	x	x
<i>Lupinus</i> sp.	Lupine	x	x
<i>Pentstemon</i> sp.	Foxglove	x	x
<b>Grasses and Grasslike Plants</b>			
<i>Agropyron</i> sp.	Wheatgrass or bunchgrass	x	5
<i>Bromus tectorum</i>	Cheatgrass	x	2
<i>Carex geyeri</i>	Elk sedge	x	2
<i>Poa</i> sp.	Bluegrass	x	1

\*The species marked x usually make up less than 1 per cent of the diet. In the aggregate they compose about 10 per cent of the winter food taken.

when browse feed becomes sparse. By reason of these differences elk are able to gradually increase at the expense of the deer and eventually dominate the range.

It is known that the mule deer has a pronounced homing instinct. It adheres tenaciously to its customary feeding grounds and has been known to die from starvation rather than seek out new ranges. Because of this trait the natural spread of mule deer is ordinarily rather slow. Although the Rocky Mountain elk exhibits similar characteristics it is more inclined to wander and as a result of population pressure and hunting disturbance is progressively invading new ranges in the Blue Mountain area. As this trend continues conflicts are arising on important mule deer ranges to the detriment of the deer.

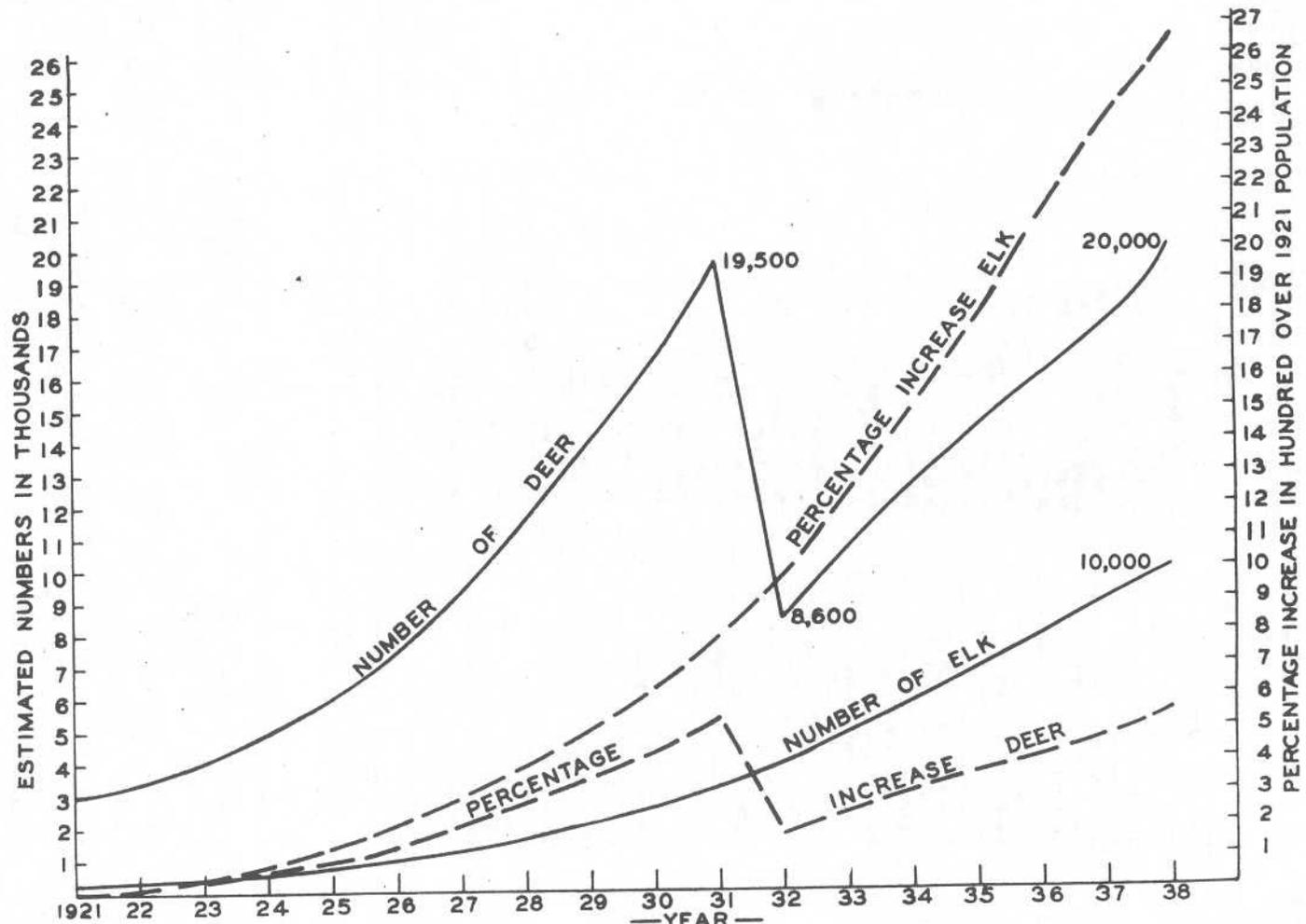


FIGURE 1. INCREASE OF MULE DEER AND ELK ON WHITMAN NATIONAL FOREST, OREGON, 1921 TO 1938.

ESTIMATED NUMBER OF MULE DEER AND ELK IN WHITMAN NATIONAL FOREST, OREGON, 1921 TO 1938. In elk ally mule deer use been mule deer and mule deer for-

The effect of elk on a mule deer population is vividly illustrated by the recent history of these two species on the Whitman National Forest which supports a larger combined deer and elk population than any other national forest in Oregon, and particularly by the events in the Desolation Ranger District which embraces the headwaters of the North Fork of the John Day River where the conflict has been most acute. It is estimated that there were about 360 elk and 3,100 mule deer on the Whitman forest in 1921. The deer were distributed over the entire forest while the elk were centered mainly in the North Fork of the John Day River. Hunting demand was low, particularly in the North Fork country. Cougars had been greatly reduced and war was waged against the coyote to protect range livestock. With these natural checks restrained the inevitable result was the rapid expansion of the big game population.

The increase in numbers of deer and elk from 1921 to 1938 as determined from the forest's annual game estimates and the percentage of increase over the 1921 population are graphically illustrated in Figure 1.

By 1931 forest officers estimated that there were approximately 19,500 deer and 3,200 elk on the forest, total increases of about 500 and 800 per cent respectively over 1921 estimates. Approximately 12,000 of these deer and 2,000 of the elk ranged in the North Fork of the John Day River. In the summer months these animals spread out over as much as 425,000 acres of range in the North Fork drainage but in winter they were concentrated on an area of about 125,000 acres lying partly inside the national forest and partly on privately owned range land outside. The relative size and location of this concentration area with respect to the summer range and national forest boundary are shown in Figure 2.

The big game animals had passed the carrying capacity of the range by 1929. The juniper and mahogany trees were "high skirted" and the bitterbrush had been so severely grazed that many of the shrubs were beginning to die back, and other palatable shrubs showed evidence of severe overbrowsing. Ninety deer carcasses were counted on the North Fork winter range that year. Death was primarily due to lack of sufficient winter food. As indicated by the graph, however, the deer and elk continued to increase until the winter of 1931 and '32. That winter was marked by heavier than average snowfall and prolonged cold weather. This combination of circumstances wrote a chapter of stark tragedy in the North Fork. The deer began dying during the latter part of February. An effort was made to haul hay on sleighs and pack horses to the starving herds but to no avail. When the small supply of palatable browse was exhausted the deer consumed large

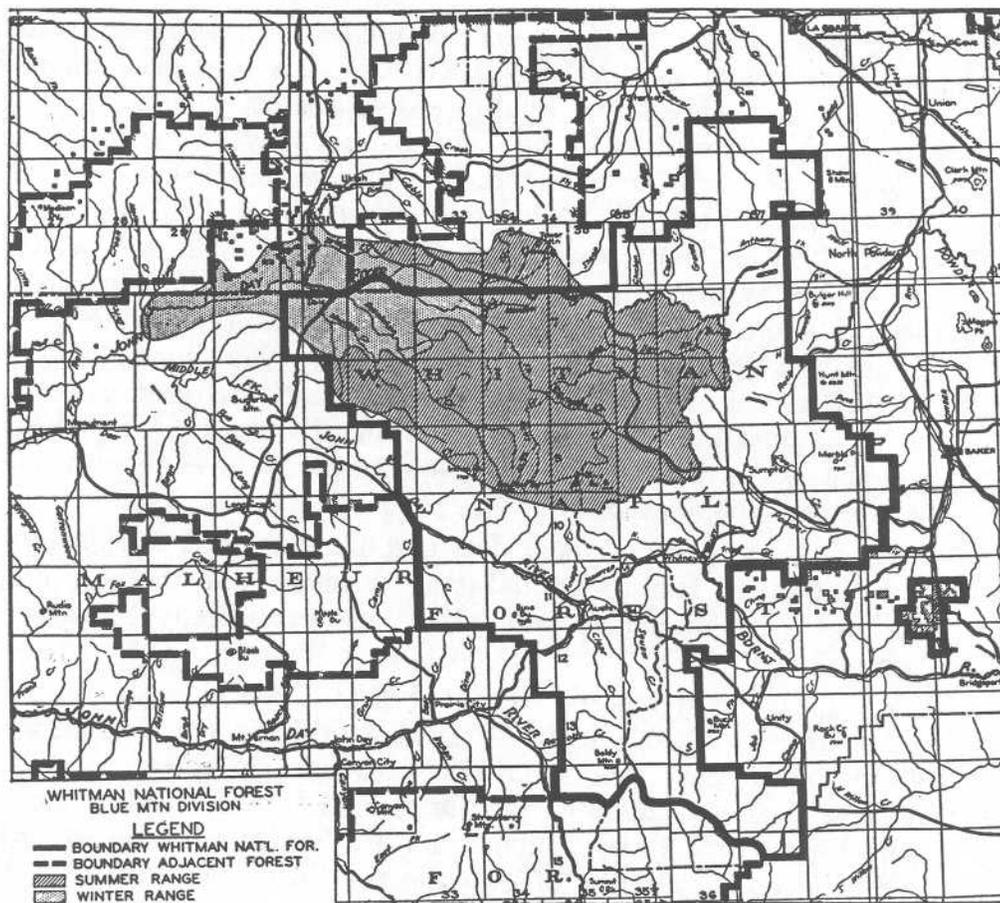


FIGURE 2 SUMMER AND WINTER RANGE FOR DEER AND ELK, NORTH FORK OF JOHN DAY RIVER.

quantities of ponderosa pine and Douglas fir needles and twigs. The contents of stomachs of dead deer were examined at various times during the winter and spring. All stomachs examined contained a high percentage of fir and pine needles but no dead grass, although wheatgrass could have been obtained by pawing.

The deer continued to die until April, when plant growth was resumed. On April 7 two forest officers piled up and photographed eleven carcasses on one spot in the center of the concentration area. This took them about 40 minutes. About one-quarter mile above the first pile they assembled another of eight carcasses in 30 minutes. This condition existed for about 30 miles along the North Fork. Later in the month of April a count was made of all carcasses on a sample strip 15 miles long and averaging 300 feet in width. This strip traversed ridges, slopes, and bottoms on a typical part of the winter range. The count revealed a loss of eighty-six dead deer per thousand acres. Applied to the entire winter range area this ratio would indicate a total loss of approximately 10,000 deer.

During the summer of 1932 numerous deer carcasses were found over the entire winter range area. Forest Service guards and other employees who are required to keep a tally of game animals seen, reported less than one-twentieth the number of deer tallied in 1931. Deer crossings on roads and trails, alkali banks, and dust beds used by deer for years were checked and a ratio of about one track was found in 1932 where there were ten in 1931.

Although approximately 2,000 elk occupied the winter range where this terrific loss of deer occurred, there was no evidence of abnormal loss among the elk herds. In his 1932 game report, Ranger George O. Langdon stated, "The elk herd increased very noticeably during the past year as was indicated by the amount of sign over the entire district. The loss during the past winter was but little above normal."

Examination of the range following the fateful winter of 1931-'32 revealed that most of the bitterbrush which is the principal browse plant along the breaks of the North Fork was in a dying condition. The mountain mahogany and juniper were so severely overbrowsed that they contributed little food for deer. A distinct deer line was in evidence on the Douglas fir and pine reproduction, many clumps being killed completely. Willow and serviceberry were dying. In 1933 Ranger Langdon reported, "I am thoroughly convinced that something will have to be done to balance the elk and the elk feed. . . . The willows are 70 per cent killed, alder 60 per cent killed, snowbrush 90 per cent dead, mahogany browsed as high as a bull elk can reach by standing on his hind feet and breaking limbs off with his horns, moss is browsed higher than a man can reach. . . . If elk are allowed to increase and nothing but bulls killed, in a few years there will be no feed for the elk, deer, or domestic stock except the season's growth of weeds and grasses."

After the die-off the tension was released temporarily and, favored by a series of mild winters, the deer were able to make a partial recovery and elk continued to increase at a steady rate. The graph in Figure 1 indicates that by 1938 the deer population on the entire Whitman Forest equals the numbers present in 1931 before the die-off, but most of this increase has taken place on areas outside the North Fork drainage. By 1936 the estimated populations in the North Fork were 6,000 elk and 6,500 deer as compared with about 2,000 elk and 2,000 deer in 1932.

It has been impossible for the forage to improve in the face of these increases. Deterioration of browse species has spread to the summer ranges. The writer has viewed vast areas of summer deer and elk range where the snowbrush is being gradually killed out, the huckleberry, myrtle boxleaf, and spiraea have been so closely cropped by big

game that their productive capacity is greatly impaired, and the black lichen which was formerly so abundant on the trunks and limbs of trees has been utilized as high as elk can reach. A bad condition of this kind on the summer range emphasizes the acute situation on the much smaller winter range.

In the winter of 1936-'37 another deer loss estimated at nearly a thousand head occurred on the North Fork. Again there was no apparent loss of elk. Because of the shortage of feed the deer herd is still in a precarious position and faces almost total elimination the first severe winter. Naturally as the winter feed situation becomes more out of balance, the elk herds will suffer losses but this will probably not happen until the deer herd is reduced to negligible proportions.

Looking at the problem on the Whitman National Forest as a whole, the elk are increasing at a more rapid rate than the deer. As illustrated in Figure 1, the elk have increased a total of about 2,650 per cent since 1921 compared to a net increase of about 550 per cent in deer over the same period. The average net annual increase for elk during the 17-year period is 23 per cent whereas it has been 14.4 per cent for deer despite the fact that deer have a higher potential rate of increase. Deer increased at the rate of 21 per cent per year prior to the big die-off in the North Fork since 1932. Since that time the rate has dropped to 15.4 per cent. The sex ratio of the deer as shown by tallies over a 4-year period averages 1 buck to 2.25 does, indicating that the hunting of bucks is not limiting the rate of increase.

The annual rate of increase for elk prior to 1932 was 26.5 per cent; since that time it has been 18.4 per cent. The drop in the net annual increase for elk is due in part to natural drift from the Whitman to neighboring forests and partly to the removal of bulls during the legal hunting season which has been in effect since 1933. The kill of bulls has been light in comparison to the total population and it is believed the productive capacity of the herd is unimpaired. A complete check has been kept on the number and condition of animals killed since the opening of the elk hunting season. In 1938, 70.7 per cent of elk killed on the Whitman Forest had antlers with 4 points or more, indicating that during the five preceding hunting seasons sufficient bulls escaped to provide ample mature breeding stock. It is evident that hunting of bulls alone is having little effect toward holding the elk in check.

There is evidence that the deer on the Whitman Forest are averaging smaller in size than before 1930. No accurate records of deer weights were obtained prior to that time so direct comparisons are impossible. However, the weights of carcasses taken from the Whitman and other forests during the past 2 years provide a basis for gauging trends.

As shown in Table 2, the hog-dressed weights of mule deer killed in the two, three, four, and five antler point classes on the Colville Forest in northeastern Washington in 1937 and '38 averaged 24 to 34 pounds heavier than the bucks of the same species and classes taken from the

**TABLE 2.—AVERAGE HOG-DRESSED WEIGHTS OF MULE DEER KILLED ON THE WHITMAN, OCHOCO, AND COLVILLE NATIONAL FORESTS IN 1937 AND 1938**

Antler Class	Whitman		Ochoco Snow Mt. Unit		Colville	
	No.	Aver. wt.	No.	Aver. wt.	No.	Aver. wt.
2 point	44	105	39	112	375	129
3 point	26	132	28	148	180	157
4 point	61	170	49	173	209	202
5 point	4	194	14	194	53	228
All classes	135	142	130	152	817	160

Whitman Forest. The weights of deer carcasses taken on the Snow Mountain District of the Ochoco Forest are heavier than those on the Whitman in all groups except the five point class although the differences are much less than between the Whitman and Colville. There are no elk on the Colville Forest; the ranges are in good condition and are conservatively stocked with deer. The Snow Mountain unit consists of dry transition zone and desert fringe type forests and has less natural advantages as a yearlong habitat for deer than the Whitman. This unit supports only 30 head of elk but the deer herd is approaching carrying capacity of the range. It is believed that the principal reason for the lighter average weights of the Whitman deer is the depleted condition of some of the important winter ranges. It is realized that classification by antler points does not give reliable age group comparisons but it is believed that the differences indicated in Table 2 are significant.

#### SUMMARY AND CONCLUSIONS

Studies and observations made by the Forest Service in the Blue Mountains of Oregon show that the winter feeding habits of mule deer and elk are quite similar in this region. When deer and elk occupy the same ranges and one or both of them exceed the carrying capacity they become competitors for food. The mule deer are unable to compete successfully with elk because of the physical advantages of the latter which means gradual replacement of the deer by elk.

The effect of elk on mule deer is strikingly exemplified by the recent history of these two species on the Whitman National Forest, particularly in the North Fork of the John Day River, where large populations of deer and elk developed prior to 1930 and the carrying capacity

of the range was greatly reduced. A disastrous loss of deer occurred in the winter of 1931-'32 but no elk losses were recorded. Serious range depletion is continuing on summer as well as winter ranges. Elk have continued to increase at a more rapid rate than deer and are now dominating the situation. The deer made a partial recovery but face further serious losses in event of severe winters.

There is evidence that the unfavorable range conditions and competition with elk are reducing the size of deer on the problem areas on the Whitman Forest.

The elk are spreading out and increasing on adjacent forests in the Blue Mountains and the mule deer herds and ranges are threatened with the same processes that operated in the North Fork of the John Day River.

The killing of bull elk alone has not resulted and will not result in keeping the herds within bounds.

The mule deer is generally regarded as superior to elk as a game animal. Although the elk of the Blue Mountains is a worthy adversary in the chase, as witnessed by the average success ratio of about 1 elk to 4 hunters during six hunting seasons, it is large and difficult to handle when killed. About three times as many deer as elk can be produced on the same amount of forage. Where the objective is to produce the largest number of game animals for sport, the mule deer should be favored over the elk.

Whichever species is to be favored, the total population of big game animals must be kept at all times below the sustained carrying capacity of the range.