

Deer - Livestock Forage Studies on the Interstate Winter Deer Range in California

WILLIAM P. DASMANN

Division of Fish and Game, San Francisco, Calif.

INTRODUCTION

THE Interstate deer herd is made up of Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) that summer principally on the Fremont national forest in Oregon and winter on the Modoc national forest in California (Fig. 1). The summer range covers approximately 400,000 acres and the winter range about 375,000 acres (2). Much of the area that is called the winter range, however, is made up of territory through which the deer merely pass during migration. The acreage on which Interstate deer actually winter is much smaller. Deer from summer ranges in California also come to winter on this smaller area.

The winter range in California is used by livestock during the regular spring-fall grazing period. In 1946, a total of 18,072 animal unit months, of which 9053 a.u.m.'s were cattle and 9019 a.u.m.'s were sheep, were permitted on the area during grazing seasons of various lengths between April 1 and September 30. The estimated use by deer on the area from October 25, 1946 to April 15, 1947 is reported as 17,670 animal unit months, (12,400 deer for 5.7 months converted to animal units at a ratio of 4 to 1) (3). Thus the animal unit months of grazing by livestock during the summer and by deer during the winter were nearly equal.

As early as 1938, it was reported that a forage problem existed on the Interstate winter deer range (4).

In May, 1945, a committee made up of representatives of the Oregon Game Commission, Regions V and VI of the U. S.

Forest Service, and the California Division of Fish and Game, was organized to study the Interstate deer herd and its range. Later a plan was drawn up for management of livestock and deer on the winter range (2). The management plan aims at balancing range use by livestock and deer, in keeping with proper utilization and with average forage production. It provides for the allotment of forage crops from key plant species to livestock and deer on a 50/50 basis. The plan states that forage utilization plots will be established on the range, and that data obtained from these plots will be accepted by the agencies as a true index of forage use by livestock and deer on the area involved. Adjustments in stocking are to be made on the basis of 3-year averages of forage utilization data (3).

METHODS

A line intercept plot method of sampling vegetation designed to offer data on composition of ground cover and the percentage utilization of important forage species was used. In October, 1947, a series of 200 plots were set out, fifty in each of the four principal vegetation types that occur on the winter range, viz. pine-bitterbrush, sagebrush, juniper, and grassland. The plots were spotted at pre-determined intervals along roads and trails. They were run at right angles from the roads and trails, starting 30 feet from the edge of the travelled portion so as to eliminate at least part of the passage-way influence. On each plot measurements of plants were confined to twenty 25-inch segments

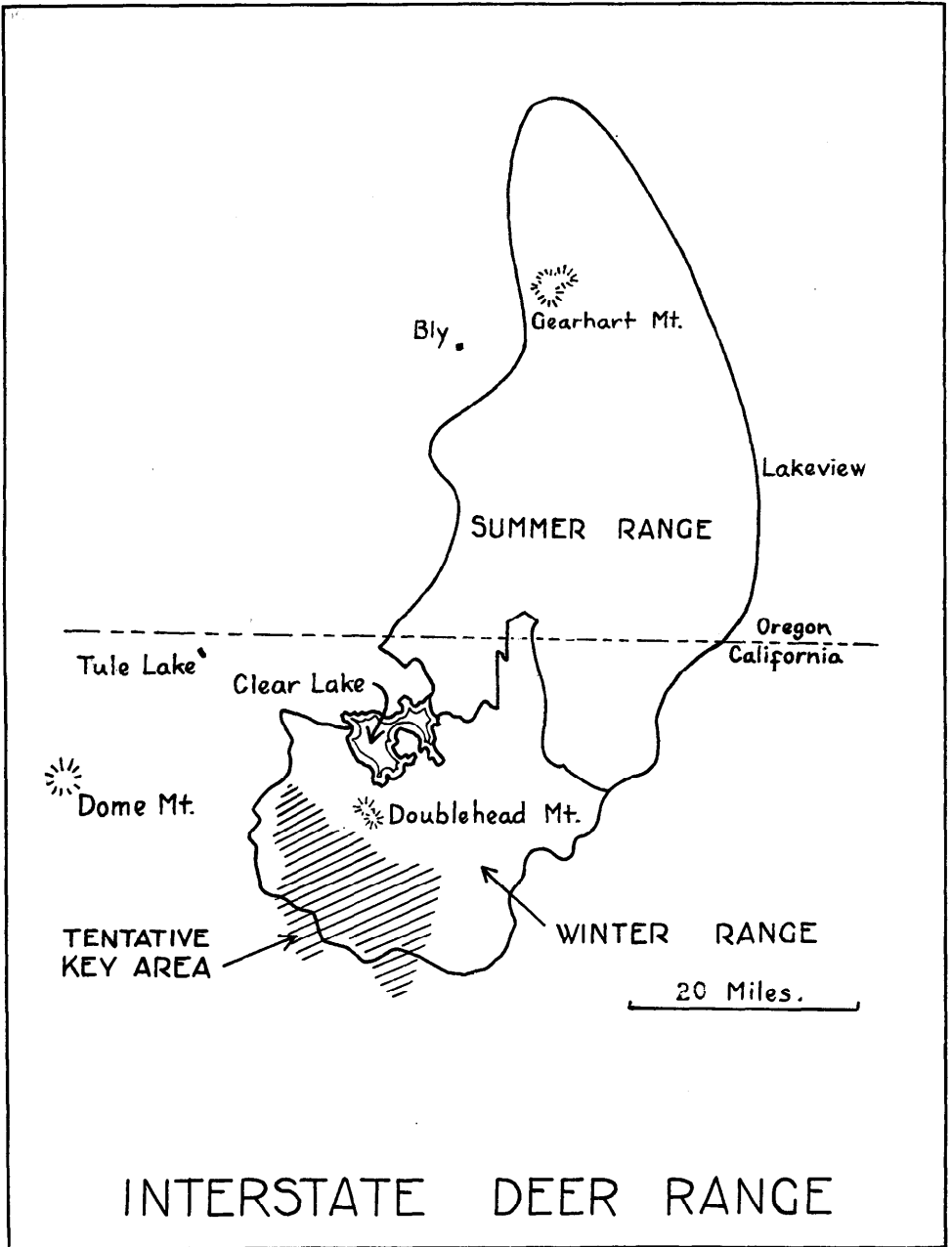


FIGURE 1. The summer and winter range of the Interstate deer herd made up of Rocky Mountain mule deer.

spaced at 10-foot intervals along a 200-foot transect line. The limits of each of the 25-inch segments were marked with painted iron spikes driven into the ground.

On each of the plots, measurements to the nearest inch were made of bare soil, litter, dead shrubs, and living individual plants by species. Measurements of the

living plants were of the number of inches of line covered by foliage in normal, undisturbed densities as viewed from directly above.

Estimates of percentage utilization were made for each of the plants intercepted by the line segments. Estimates of cropping on grasses were made by a height-weight method similar to that described by Lomasson and Jensen (5). Percentage utilization of forbs was estimated as indicated by the volume removed. The percentage utilization of total inches of current growth on shrubs was determined by the visual estimate method described by Hormay (6). The percentage utilization of total inches of juniper twigs was determined by placing metal tags on four available twigs on each tree and measuring the twig length outside the tag before and after the season of use (7). Three crews of two men each established the 200 plots, measured the intercepts, and estimated utilization in about 13 days. Because the plot segments are marked with spikes and can be located without a tape, one man can make semi-annual utilization checks nearly as quickly as two. However, it has been the practice on the winter range to use 2-man crews. Three such crews rechecked the plots for utilization in 5 days.

COMPOSITION OF THE GROUND COVER

Data on composition were determined not only as an indication of present range condition but also for use as a base from which to measure future trends. It was realized that a measurement to the closest inch of ground covered by grasses does not offer so reliable a base from which to measure trend as would a basal area measurement to the closest 100th of a foot as described by Canfield (8). But, a desire to obtain data on cover composition indicative of relative mass of forage offered by different forage species, together with the belief that the method used would prove quite satisfactory for

measuring trend of shrubs on which deer-livestock competition is apt to be greatest, led to the adoption of this rather than a basal area measurement. The need for keeping the job within reasonable time limits was also a factor in the selection of methods used.

Composition of the ground cover is shown in Table 1. The figures do not include coverage by the over-story of trees that occurs principally in the pine-bitterbrush and juniper types. Only low bushy saplings and poles that offered forage within five feet of the ground are included in the measurements.

MEASUREMENTS OF FORAGE UTILIZATION

On the Interstate winter deer range it is possible to separate livestock use of forage from deer use because each kind of animal uses the range during a different part of the year. Measurements in the Fall give data on livestock use; those in the spring give data on deer use. Figures on degree of use are shown in Table 2.

Most of the perennial grasses, especially the blue grasses (*Poa secunda* and *P. nevadensis*), start growth while the deer are still on the winter range. An analysis of the stomach contents of 53 deer taken on the winter range during the 1946-47 winter season, indicates that grass (both dry and green) made up from 19 percent in November to 64 percent in March of the volume of material present in the deer stomachs (2). Measurements of percentage utilization of grasses made in the fall include the amount of use by deer during the previous spring. On the other hand, shrubs usually have hardly started growth at the time deer leave the winter range. Therefore, livestock are the first to feed from the seasonal growth of shrubs. Deer feed during the winter months from the shrubby forage that has been left by livestock. Hence total percentage utilization of shrubs as shown by measurements

in the spring includes the amount taken by livestock during the previous summer. shrub on the winter range. Overall cropping on this shrub by livestock was 18

TABLE 1
Composition of ground cover on the winter range

KIND OF COVER	PERCENTAGE OF GROUND SURFACE COVERED BY TYPES				
	Grassland	Pine-bitterbrush	Juniper	Sagebrush	Average
Bare soil.....	24.6	19.0	35.2	40.2	29.7
Rock.....	8.7	3.6	11.1	8.2	7.9
Moss.....	0.1	0.2	0.5	0.2	0.2
Litter (All kinds).....	29.9	51.6	20.3	14.7	29.1
Dead shrubs.....	0.5	2.8	3.5	3.9	2.7
Total non-producing.....	63.8	77.1	70.5	67.0	69.6
Annual grass.....	10.0	0.7	3.3	0.8	3.7
Annual forbs.....	15.6	0.7	3.5	1.7	5.4
Total annuals.....	25.6	1.4	6.8	2.5	9.1
Perennial shrubs.....	3.0	9.4	15.0	23.2	12.7
Perennial forbs.....	0.6	1.7	0.5	1.0	0.9
Perennial grasses.....	6.8	9.8	6.8	6.0	7.3
Total perennials.....	10.4	20.9	22.3	30.2	20.9
Unclassified.....	0.2	0.6	0.4	0.3	0.4
Grand Total.....	100.0	100.0	100.0	100.0	100.0

TABLE 2

Average percentage utilization of forage plants, figures are from 200 plots on the four range forage types

PLANT SPECIES	NO. OF PLOTS ON WHICH IT OCCURRED	AVERAGE % GROUND COVERED	GRASSLAND TYPE		SAGEBRUSH TYPE		JUNIPER TYPE		PINE-BITTERBRUSH		ALL TYPES COMBINED		
			Live-stock	Deer	Live-stock	Deer	Live-stock	Deer	Live-stock	Deer	Live-stock	Deer	Total
Bitterbrush.....	59	1.3	40.0	0.0	9.8	23.5	17.9	34.4	21.1	14.1	18.4	19.8	38.2
Rabbit brush.....	53	1.1	0.8	6.6	0.0	0.9	0.3	1.5	1.1	7.0	0.6	4.2	4.8
Sagebrush.....	117	7.8	0.1	0.7	0.2	0.7	0.4	1.3	0.0	3.3	0.3	0.9	1.2
Juniper.....	28	—	—	—	0.0	0.0	0.0	13.2	0.0	7.8	0.0	11.3	11.3
Blue grasses.....	159	2.9	0.9	5.2	4.8	2.9	6.8	5.5	21.5	4.3	5.6	4.5	10.1
Squirrel-tail.....	125	1.2	19.1	1.7	5.1	2.0	11.4	1.1	7.2	1.5	8.7	1.4	10.1
Needle grasses.....	112	1.0	11.9	0.2	20.4	0.3	14.0	1.3	9.2	0.2	9.1	2.9	12.0
Idaho fescue.....	56	0.5	17.6	1.5	24.5	0.1	22.6	0.6	4.0	0.5	17.4	0.5	17.9
Dryland sedge.....	55	0.9	0.0	0.7	2.3	0.0	13.9	1.1	1.1	1.0	3.2	0.8	4.0
Wheat grass.....	48	0.5	3.8	0.1	9.8	0.1	8.1	1.1	2.4	1.5	5.8	0.6	6.4
Other species.....		3.7											

An analysis of the data on utilization indicates that bitterbrush (*Purshia tridentata*) was the most heavily cropped percent and by deer 20 percent. In the pine-bitterbrush type where the plant is most abundant, and occurred on 34 out

of 50 plots, livestock took 21 percent and deer 14 percent.

The second most heavily cropped browse species on the winter range was Western juniper (*Juniperus occidentalis*). It was utilized only by deer. Because trees tend to compensate above for the loss of foliage taken by browsing animals below, the volume of available forage produced by mature trees is apt to decline with use. For sustained yield, this loss must be made up by forage produced by seedlings, saplings and poles. These young trees are the source of the future forage supply. Overall cropping on the young trees in the juniper understory was 11 percent of the available twig growth. In the juniper type, where understory juniper occurred on 16 plots, deer took 13 percent of the twig growth.

Overall utilization of species of rabbitbrush (*Chrysothamnus spp.*) was 0.6 percent by livestock and 4 percent by deer. Heaviest cropping of this shrub occurred in the pine-bitterbrush type where deer took an average of 7 percent of the current growth. Sagebrush (*Artemisia tridentata*) was very lightly cropped, livestock taking only 0.3 percent and deer 0.9 percent. It was heaviest used in the pine-bitterbrush type where cropping by deer averaged 3 percent. The stomach analyses indicate that sagebrush makes up an average of 19 percent of the deer diet during winter, and, therefore, one might expect a higher degree of browsing to show on this shrub. However, sagebrush is the most abundant shrub (Table 2) over most of the winter range, which accounts for the low percentage use showing on individual plants.

For the purpose of making a comparison of use of grasses by livestock and deer, it was assumed that 1) cropping of young grass plants by deer in the early spring directly reduces the final volume, and 2) that cropping of grasses by deer during the 1946-47 season, which antedated the

present study, was at the same rate as that found in the spring of 1948.

Data from the plots indicate that the blue grasses are the perennial grass species most heavily used by deer. These plants are of common occurrence over the entire winter range, appearing on 159 out of the 200 plots. Bluegrasses made up 40 percent of the perennial cover on the grassland type, 11 percent on the juniper type, 10 percent on the sagebrush type, and 5 percent on the pine-bitterbrush type. Overall utilization of bluegrasses was 6 percent by livestock and 5 percent by deer. In the pine-bitterbrush type where it occurred on 35 out of 50 plots, cropping was 22 percent by livestock and 4 percent by deer.

KEY FORAGE SPECIES

The term "key forage species" may be defined as a forage plant or plants for which deer and/or livestock show a preference and which occurs in sufficient abundance to be used as a practical base for carrying capacity. Because such species are subject to somewhat heavier cropping than other plants on the range, it can be assumed that where these preferred plants are not over-utilized, no other plant species of significant occurrence will be generally over-cropped (9).

From a study of the data on distribution, abundance, and utilization of plants it was judged that bitterbrush is a key browse species for both deer and livestock in the pine-bitterbrush type. In the other types, however, its occurrence is possibly not of sufficient frequency to warrant its use as a key species. Bluegrasses appear suitable for use as key species for deer in all types, and for livestock in the pine-bitterbrush type. Accepting bitterbrush and bluegrasses as the primary key species on which most direct competition between deer and livestock occurs, then the division of forage between the two kinds of

animals during the 1947-48 grazing year was as follows:

FORAGE TYPE	KEY SPECIES	AVERAGE PERCENTAGE LIVESTOCK	UTILIZATION DEER
Pine-bitterbrush	Bitterbrush	21.1	14.1
All types combined	Bluegrasses	5.6	4.5

It may be seen that utilization by livestock in the pine-bitterbrush type was greater by about 7 percent than that by

A loss of 60 percent of the current leader growth of bitterbrush is reported as being the maximum this shrub can withstand and still maintain vigor and produce seed (10). An analysis of the cropping of individual bitterbrush shrubs in the pine-bitterbrush type was made to determine the number of shrubs browsed in excess of 60 percent. It was found that 9 percent of the shrubs on the plots had been browsed in excess of 60 percent at the time livestock left the range in the fall. By the following spring, deer browsing resulted in an additional 15 percent of

TABLE 3

Average percentage utilization inside and outside of the key area

RANGE TYPE	FORAGE SPECIES	AVERAGE PERCENTAGE CROPPING			
		Inside key area		Outside key area	
		Livestock	Deer	Livestock	Deer
All types combined	Bluegrasses	—	10.6	—	3.2
Pine-bitterbrush	Bitterbrush	20.5	17.4	21.5	11.1
All types combined	Bitterbrush	13.8	26.7	23.2	12.1
Juniper	Juniper	—	19.4	—	6.2
Grassland	Rabbitbrush	1.0	7.7	0.0	2.3

deer. Use of the bluegrasses by livestock was also somewhat greater than that by deer.

The data were analyzed to determine if there exists on the winter range key areas on which use of forage by deer is heavier than elsewhere on the range. It was found that the cross-hatched area in Figure 1 contained 92 percent of the plots on which cropping fell into the heaviest use class and only 9 percent of the plots on which cropping fell into the lightest use class. A comparison of average percentage utilization by deer and livestock inside and outside this tentative key area is given in Table 3. The data indicate that use of key species by deer was 2 to 3 times heavier on this area where deer usually concentrate during mid-winter than on the outside.

the shrubs falling into the over-browsed class. Thus 22 percent of all bitterbrush shrubs on the plots in the pine-bitterbrush type were over-browsed at the end of the grazing year. Average percentage cropping of these over-browsed shrubs ranged from 65 to 90 percent, with 7 out of every 10 falling into the 65-75 percent class.

ADJUSTING STOCKING

The management plan for the winter range bases adjustments in stocking by deer and/or livestock on 3-year averages of forage utilization data. No reductions have been recommended as a result of the 1-year study described above. Where utilization data indicate that a primary key species has been subjected to more than allowable use, adjustments will be made to reduce use to within allowable

limits. With livestock this may be accomplished by changing the season of use, shifting the animals to other areas, or by reducing the number of permitted animals. Where deer exceed their quota of forage, it is planned to make reductions by taking antlerless animals from the winter range during the period of use.

SUMMARY

The range management plan for the Interstate winter deer range allots forage offered by key plant species to deer and livestock on a 50/50 basis. Adjustments in stocking are to be made on the basis of 3-year averages of utilization data. A system of 200 forage utilization check plots were established on the winter range in October, 1947. Data from these plots are accepted by the Agencies concerned with management of the deer herd and its range as a true index of forage use on the area involved.

A line interception method of sampling was used. The 200 sample plots yielded data indicative of composition of the ground cover and average percentage utilization of important forage species. The data indicate that on the average 9 percent of the ground surface on the winter range is covered with annual type forage plants and 21 percent is covered with perennial type forage plants.

The forage utilization study indicates that bitterbrush and bluegrasses are the primary key forage species on the winter range on which most direct competition between livestock and deer occurs. It was indicated that livestock took 21 percent of the annual crop of bitterbrush forage in the pine-bitterbrush type while deer took 16 percent. On the tentative key area in the pine-bitterbrush type where

deer use appears to be heaviest, livestock took 21 percent and deer took 17 percent.

An analysis of percentage cropping of individual bitterbrush shrubs indicated that 9 percent of the shrubs had been over-cropped when livestock left the range in the fall. At the end of the grazing year when deer left the range in the spring, an additional 15 percent of the shrubs fell into the over-browsed class making a total of 22 percent of the plants over-browsed.

LITERATURE CITED

- (1) Interstate deer herd committee, 1949. Third progress report. California Fish and Game, 34-2. 115-134.
- (2) 1947. Second progress report. California Fish and Game, 33-4. 287-314.
- (3) 1949. Interstate winter deer range management plan. California Fish and Game, 34-2. 103-114.
- (4) RANDLE, ALLAN C., 1938. Deer winter range studies, 1937-38, Modoc National forest. USFS, Region V, #73-W4, 17 pp. mimeo.
- (5) LOMMASSON, T., AND JENSEN, CHANDLER, 1942. Determining the utilization of range grasses from Height-Weight tables. Northern Region, USFS, 9 pp.
- (6) HORMAY, AUGUST L., 1943. A method for estimating grazing use of Bitterbrush. Calif. For. and Range Exper. Sta., Research Note No. 35, 4 pp. (Multilithed).
- (7) ALDOUS, C. M., 1945. A winter study of mule deer in Nevada. Jour. Wildlife Mgmt., 9-2, 145-151.
- (8) CANFIELD, R. H., 1941. Application of the line interception method in sampling range vegetation. Jour. Forestry 39, 388-394.
- (9) DASMANN, WILLIAM P., 1948. A critical review of range survey methods and their application to deer range management. California Fish and Game. 34-4, 189-207.
- (10) HORMAY, AUGUST L., 1943. Bitterbrush in California. Calif. For. and Range Exper. Sta. Research note 34, 13 pp. (Multilithed).