

# Techniques in Studying Competition Between Big Game and Livestock

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Most of the big game grazing lands in the West are grazed in common with livestock. Much of this range is heavily stocked with game, livestock, or both, resulting in overuse of the important forage plants on the more intensively used areas. On such areas conflict exists between game and livestock for the limited supply of forage. This we refer to as forage competition, and this paper is concerned with

methods of determining this type of competition between big game and livestock.

The degree of competition between big game and livestock on a range is determined by two factors: (1) the extent to which game and livestock graze the same areas, and (2) the extent to which they prefer the same species. Thus two phases of study are necessary in determining competition.

## Areas Grazed

Several methods may be used to delimit areas of intensive use by game and livestock. In our game-livestock studies in Utah, surveys were made of two areas: one a natural deer herd unit and sheep allotment, and the other a deer herd unit and cattle allotment. Parallel line-plot transects were run covering the entire width or depth of the unit, which included both summer and winter range for deer and spring-fall and summer range for livestock. Transects were located by dividing the area into  $\frac{1}{2}$ - or  $\frac{3}{4}$ -mile strips and selecting a random line in each. Circular 96-sq. ft. plots were located mechanically every 4 chains along the transect. In later work, for statistical reasons, two plots were located at random in every 8-chain segment. Aerial photos were used to locate transects and to aid in interpreting the data collected.

On the plots, weight and utilization of forage were estimated by species. Using the same hub as center, plots of 1/100-acre were used to determine number of deer pellet groups and cow or sheep droppings per acre. Other indications of use, such as highlining and hedging of shrubs, and animal tracks, were recorded. Vegetal type, steepness of slope, exposure, and accessibility were also recorded for each plot. Animal signs were noted between plots to aid in delimiting areas. Observations were made over the entire study units at different seasons of the year to supplement the survey data.

From this information the areas grazed intensively by deer and by livestock were mapped out on aerial photos or mosaics. Areas were classed as intensively used by deer if they had 200 or more deer pellet groups per acre, or if they showed conspicuous deer signs such as highlining, hedging, or 50 percent or greater use of current growth of shrubs palatable only to deer [e.g., curl-leaf mountain-mahogany (*Cercocarpus ledifolius*), cliffrose (*Cowania stansburiana*), or Utah juniper (*Juniperus osteosperma*)]. Areas of intensive use by cattle were delimited chiefly on the basis of heavy utilization—arbitrarily set up at 50 percent or more—of grasses, supplemented by cow-chip counts and cattle tracks. Areas used intensively by sheep were determined by heavy use of plants palatable to sheep but little used by deer, such as grasses and certain forbs. This was supplemented by other sheep signs.

Deer defecate chiefly where they feed and seldom where they bed. Cattle and sheep droppings, however, are found concentrated at bed grounds and shading places. Hence the pellet-group count is a reliable index to the intensity of deer use, but is much less reliable for sheep or cattle with present practical intensities of sampling.

Where deer alone, or livestock alone, graze an area, utilization of the more palatable species is a reliable indicator of intensity of stocking. However, where game and livestock graze in common, a combination of methods, as described above, is necessary.

Sight records of deer, including tracks, may have value, particularly in locating winter concentration areas of big game, but they may be very deceptive at other seasons. Useful information on livestock distribution and use can, of course, be obtained from stockmen and range managers.

A survey, such as described above, yields much information in addition to intensity of use. Factors such as forage preferences and vegetal types preferred by game and livestock, and the effects of exposure, steepness of slope, and distance from water, on distribution of animals can be ascertained. If the survey data are coded for IBM machines, they may be summarized very readily in any way desired.

### Forage-Preference Studies

The chief method we have used of determining forage use is by estimation of herbage production and percent utilization by species on each plot as described by Pechanec and Pickford (1937 and 1937a). From these data can be computed the amount in pounds per acre of each species eaten and the proportion which each species makes of the animals' diet.

On summer range where deer and sheep grazed the same area, forage used by deer was determined by estimating weight present and percentage utilized by deer just before sheep grazed the area. Sheep were then permitted to graze the area once over, as commonly practiced on this allotment, and utilization estimates were again made on the same plots. The difference between first and second readings equalled sheep use. On range used by sheep in fall and deer in winter, estimates were made immediately after sheep use to obtain weight present and amount used by sheep. In spring,

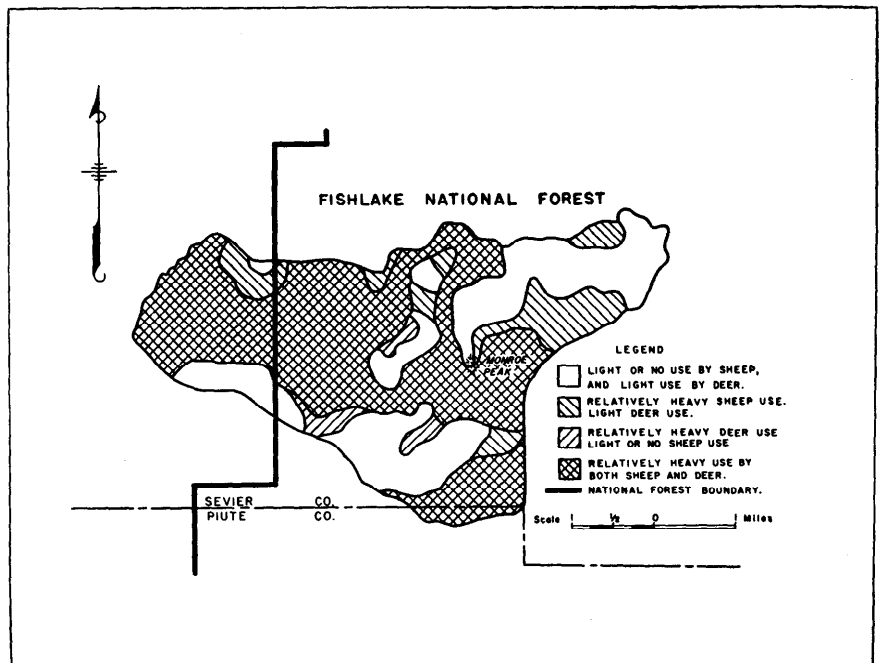


FIGURE 1. Distribution of deer and sheep grazing on Monroe Mountain sheep allotment, Fishlake National Forest, central Utah.

after deer moved to higher country and before new growth of shrubs started, estimates were repeated to get total sheep plus deer use. The difference in the two estimates equalled deer use.

The same procedure was used in determining deer and cattle use on foothill range used by deer in winter and cattle in spring and fall. It was possible to estimate cattle use, both spring and fall, before deer came on the area, and to estimate deer winter use in the spring before cattle were permitted to graze.

A modification of this approach is being used to study effect of early spring deer use of seeded grasses on subsequent production of forage for cattle. Replicates of three matched plots are used: one of the three is totally protected to measure total production, one is left open to permit deer use and then closed, and the third is grazed by both deer and cattle. At the close of the grazing season, at which time grass has completed growth, grass on all plots is clipped and weighed. Portable wire cages enclosing 9.6-sq. ft. plots are used.

Determining deer and cattle use on summer range where the two graze in common during the same period is difficult. Several approaches have been used.

On open range, forage utilization on areas inaccessible or closed to livestock and grazed by deer only were compared to similar areas grazed by both deer and cattle. Where seeded areas were fenced to exclude livestock, forage use was estimated on either side of the fence to get deer use compared to common use. Temporary barbed-wire cattle enclosures, roughly 100 x 100 feet square, were used in the same way. Advantage was taken of 3-way enclosures constructed by the Forest Service and State Fish and Game Department with one plot totally protected, one excluding cattle but allowing deer to enter, and the third an open plot.

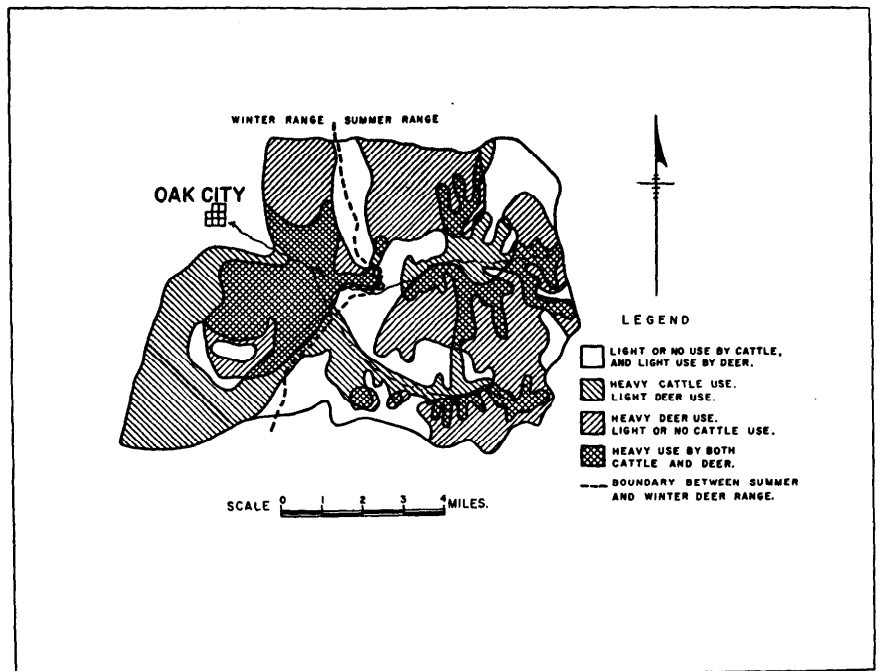


FIGURE 2. Distribution of deer and cattle on Oak Creek Range, west-central Utah.

On all of these study areas deer pellet-group counts were made on the area grazed by deer only and the paired area grazed by both deer and cattle. If there was no significant difference in pellet groups on the paired areas, the difference in utilization between the two was credited to livestock use. Occasionally cattle enclosures were found where deer made heavier use inside than out, and with some there was materially less use inside. In such cases the above inference could not be drawn. Observations indicate that a log fence, or one with a solid bar or pole along the top and one or two strands of No. 9 wire beneath, are the most desirable fences for allowing deer to enter and to exclude cattle. This type of fence permits deer to either crawl through or jump over. Net wire with no rail on top appears to be the least desirable.

Wherever possible 8 x 8 ft. portable temporary enclosures, made of poultry netting with angle aluminum posts, were used to exclude grazing animals and provide a sample of ungrazed forage plants. These samples

were very valuable in training for both weight and utilization estimates in the various range types. The enclosures were light enough to be carried by hand or on horseback and could be readily moved.

Deer stomach-content analyses were made to supplement utilization studies. While not reliable quantitatively, they supplied useful qualitative information. This was especially true during periods when utilization estimates were difficult and with certain species which were difficult to estimate. For example, in the autumn, stomach contents revealed heavy use of fallen aspen leaves, Oregon grape, and new regrowth of grass. In early spring, when observations indicated that deer had discontinued use of browse in favor of new herbaceous growth, stomach contents showed that considerable juniper had been eaten by deer.

#### Results with Methods

The following examples show the results obtained on two study areas using the methods described above:

Figure 1 shows the overlap in deer and sheep use on Monroe

Mountain, Fishlake National Forest (Smith and Julander 1953). With few exceptions the areas used most intensively by sheep showed the greatest deer concentration. The exceptions include: (1) a few areas having palatable forage and well utilized by deer but inaccessible to sheep, and (2) small areas of the more open, dry, grassy slopes and flats which sheep used but which were only lightly used by deer. About 20 percent of the unit was not used by sheep because of inaccessibility or lack of forage, and most of this was used very little by deer. About 55 percent of the unit was used relatively heavily by both sheep and deer, and it is on this area that deer and sheep compete for forage.

Diets of deer and sheep were very similar. On summer range the chief difference in diets was the greater use of grass by sheep. An average for the various range types showed the following percentage of diets:

	Deer	Sheep
Forbs	71	37
Browse	22	28
Grasses and sedges	7	35

Nearly all preferred deer forage species were also preferred sheep forage. Spring diets of deer and sheep were even closer, since at that time grass was important to deer as well as sheep. On range grazed in fall by sheep, and in winter by deer, both showed

preference for the same browse species.

Figure 2 illustrates the overlap in areas used on the Oak Creek deer-cattle unit of the Fishlake National Forest (Julander 1955). Deer grazed over large areas that were inaccessible to cattle or were too far from water. About a fifth of the summer range and a third of the winter range were used heavily by both deer and cattle, and it is on these areas that competition between deer and cattle is most severe.

Deer on this unit fed chiefly on forbs and browse. Cattle fed chiefly on grass where, or as long as, it was available. However, much of the grass had been depleted on the areas of intensive use, and cattle fed heavily on browse and forbs—the same ones preferred by deer.

On deer winter range grazed by cattle in spring and fall, cattle preferred grass but utilized bitterbrush considerably, and bitterbrush was the most highly preferred winter deer forage. Deer fed chiefly on browse, but ate considerable grass in early spring.

On this unit, as on several other areas studied, maximum sustained grazing use is limited by (1) proper use of perennial grasses for exclusive cattle grazing, (2) proper use of palatable shrubs and forbs for exclusive deer grazing, and (3) proper use

of shrubs and forbs palatable to both kinds of animals for maximum combined deer-cattle grazing.

Most of our ranges are grazed in common by game and livestock, and any overuse of plants palatable to both results in forage competition. Management of these ranges calls for balancing the total number of grazing animals with the usable forage supply on the areas of dual intensive use.

Competition varies with each unit, and it is difficult to determine competition accurately in terms of the exchange ratio of game to livestock on the open range. However, such studies as presented provide information on key areas, important forage species, and other range relations which may be used as a basis for management of game-livestock ranges.

#### LITERATURE CITED

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#### New Phillips Booklet Issued

Phillips Petroleum Company has issued Section 4 of a series on pasture and range plants. The new booklet is entitled "Poisonous Grassland Plants." Thirty-one poisonous range plants are illustrated in full color in the booklet. The symptoms of poisoning are given for each species, and the most important methods of control are outlined briefly. Section 3, "Undesirable Grasses and Forbs", was distributed at the 10th Annual Meeting of the Society at Great Falls, Montana, last January.