Effects of Rodents and Rabbits on Estimates of Forage Disappearance[1]

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Estimates of forage production and disappearance have been made regularly in the sandsage grasslands of the Southern Plains Experimental Range, near Woodward, Oklahoma. For the years 1950-1957, the estimates suggested that, on a yearlong basis, an average of 45 per cent of the forage which disappeared was not eaten by cattle. The annual figure varied from nine to 59 per cent. Rodents, rabbits, abrasion and other factors have, therefore, been suspected of depriving cattle of nearly half the potential available food.

Basic to the forage inventory technique are a pair of 1.92-square-foot plots, and a heavy wire cage of either six-by-six- or two-by-six-inch mesh. The cage covers an area four by four feet. To obtain the "forage production" figure, weight of forage in grams is estimated on the 1.92-square-foot plot on a given date. A wire cage is then placed over the plot to prevent grazing by cattle. Weight of forage on the covered plot is again estimated one month later. The difference between the first and second estimates represents the quantity of forage produced on the plot during the month.

On the date of the second estimate on the caged plot, weight of forage is also estimated on another plot, which was available to cattle during the month. The difference between the estimated weights on the protected and unprotected plots, on the same date, equals the amount of "forage disappearance." Reliability of the estimated weights is checked by clipping and weighing the forage on at least every fifth caged plot.

The average of estimates on replicated plots, at monthly intervals during the growing season, provides pounds-per-acre figures for forage yield and disappearance.

The amount of forage which the cattle should have eaten during a given period is estimated from tables of normal intake, published by the National Research Council, and from feeding studies done on the Experimental Range. This estimated weight of forage eaten by cattle is subtracted from the estimated weight of disappeared forage in the pasture. The difference represents that part of the forage disappearance which is not due to cattle.

Some puzzling results were noted for three seeded pastures during the summer of 1957. There, the estimated weight of forage on plots outside the cages averaged one-third less than on those inside. There were no cattle in these pastures during the summer, and both caged and uncaged plots, therefore, seemed subject to the same factors of forage removal. All cages in these pastures were of six-by-six-inch mesh, and were no apparent physical barrier to animals the size of jackrabbits *(Lepus californicus melanotis)*, or smaller.

The discrepancy in forage estimates in the pastures with no cattle

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suggested that cages might discourage smaller animals from entering the protected plots. This prompted a check on possible deterrent effects of cages on rodents and rabbits.

During January, 1958, forage inventory plots were examined in the three seeded pastures where forage weight estimates were greater on caged then on uncaged plots, even though cattle had been absent. At that times, the cages had not been moved for three months, and small mammal signs were common under them. Rodent runways extended through many, and there were recently-used burrow entrances under some of the cages.

In the three seeded pastures mentioned, and in two other seeded pastures, Victor rat traps were set at 160 wire cages, on the afternoon on March 19, 1958. The cages were mechanically spaced in four parallel lines across each 25-acre pasture, with eight cages per line. A trap was placed inside the cage at alternate plots in each line, and outside at the other 80 plots. The total catch the next morning was 34 rodents (Table 1). All of the more common rodent species of the Experimental Range were taken under, as well as outside of the cages. The numbers of each species caught were too small to show any significance as to preference for either the inside or outside traps.

Table I. Rodents dead-trapped at 160 forage inventory cages. Seeded pastures 2W, 2E, 3W, 4W and 4E, Southern Plains Experimental Range, Harper County, Oklahoma. March 19, 1958.

Species	Number Taken	
	Trap outside of cage	Trap inside of cage
Kangaroo Rat *(Dipodomys ordi richardsoni)*	9	5
Grasshopper Mouse *(Onychomys leucogaster breviauritus)*	5	8
Deer Mouse *(Peromyscus* spp.)	2	1
Cotton Rat *(Sigmodon hispidus texianus)*	2	1
Spotted Ground Squirrel *(Citellus spilosoma marginatus)*	1	0

The possibility that rabbits were excluded from the caged plots was checked in one pasture. The 141 cages, therein, were of two- by six-inch mesh, which might have barred jackrabbits, if not cottontails *(Sylvilagus floridanus llanesis)*. Actually, many of the cages did not rest flush with the ground, and rabbits could enter. During the three months from May 15 to August 15, 1958, forage inventory crews recorded numbers of rabbit pellets on each plot when the cage was first placed over it, and again a month later. During two of the three monthly periods, the number and frequency of occurrence of pellets greatly increased on the caged plots (Table 2). Range technicians reported that heavy rains seemed to have washed many pellets out of the plots during the month for which the frequency decrease was recorded.

Table II. Accumulation of rabbit pellets under protective cages on forage inventory plots. Moderately grazed pasture 19, Southern Plains Experimental Range, Harper County, Oklahoma.

Month, 1958	No. Pellets per Hundred Plots		Frequency of Occurrence (percent of plots)	
	Start of period	End of period	Start of period	End of period
May 15 — June 10	32	80	13	27
June 10 — July 10	64	68	23	20
July 10 — August 15	32	60	12	18

The wire cages were not effective barriers to the more common rodent, and at least one of the rabbit, species of the Southern Plains Experimental Range. It is, therefore, suggested that little of the difference in weights of estimated forage was due to deterring effects of large-mesh wire cages on rodents and rabbits. Other factors which might affect the difference, such as effects of cages on rate of plant growth, are not considered here, nor are complications, such as the fact that denser plant cover on the caged plots might tend to attract rather than repel some rodent species.

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Summary

Forage production and disappearance estimates suggested that annually much forage is removed by factors other than cattle. The estimates are made on paired plots, one grazed by cattle and one protected by a large-mesh wire cage. In 1957 a 33 per cent difference occurred between estimates on the paired plots in the same pastures, where neither set was grazed by cattle. It was proposed that cages might deter small mammals. Trapping results and other observations showed that forage inventory cages were not effective barriers to the common rodent species, nor to many of the rabbits. It is suggested that little of the noted discrepancy of 1957 was due to barring of rodents and rabbits by large-mesh wire cages.