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USE OF DIFFERENT CLASSES OF RANGE LAND BY CATTLE

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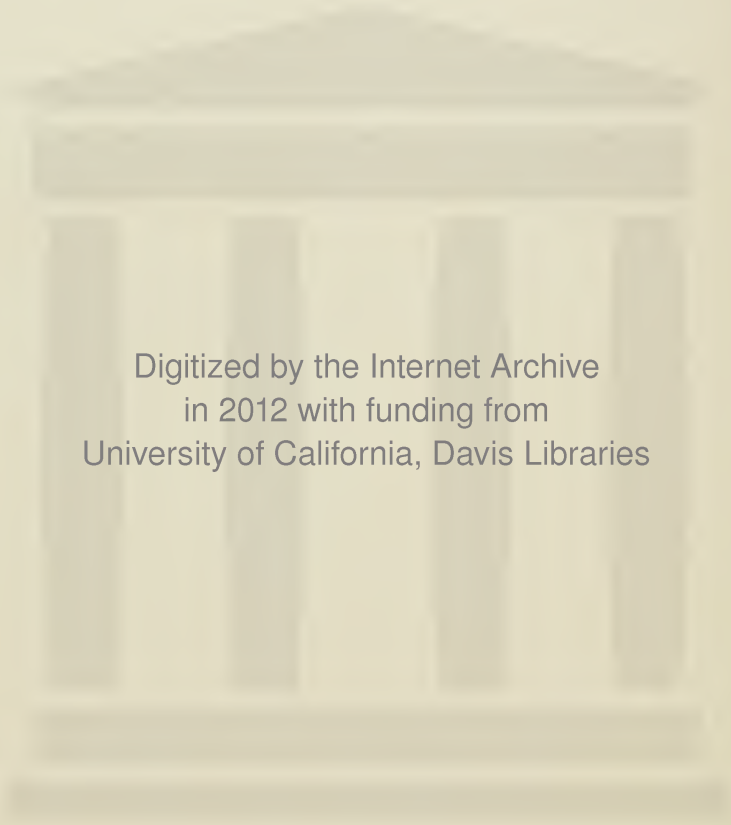

USE OF DIFFERENT CLASSES OF RANGE LAND BY CATTLE

This bulletin reports a study of the utilization by cattle of ten different classes of rangeland in the Sierra Nevada foothills, adjacent to the San Joaquin Valley. It also discusses the effects on cattle utilization from seasonal variations in the forage crop through the year, differences in rates of utilization, variations in annual rainfall, and convenience of salt licks.

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USE OF DIFFERENT CLASSES OF RANGE LAND BY CATTLE[1]

Studies of the annual-type range in the Sierra Nevada foothills and its utilization by cattle revealed several different land types that varied in extent from place to place. It was noted that the forage on these land types varied somewhat in the amount produced per acre, time of growth, and species composition (Hutchison and Kotok, 1942; Bentley and Talbot, 1951; and Wagnon *et al.*, 1959).

Bentley and Talbot (1951), in evaluating the grazing capacity of their experimental pastures, found that the range could be separated into six readily identifiable land classes, four of which could be further divided into north and south exposures. The relative average annual herbage yields per grazable acre of these land classes were determined. By measuring the extent of each land class within a pasture it was possible to calculate its average forage productivity.

Wagnon (1963), studying the grazing behavior of cows in these pastures, noted variability in their use of the different land classes apparently affected by differences in forage productivity due to season of year, growth stage of certain forage species, and composition of the annual forage crop. In addition, other factors such as range fertilization (Green *et al.*, 1959), range fires, and heel fly activity have been observed to influence cattle to use certain areas more than others at times.

Moorefield and Hopkins (1951) in a Kansas study of the grazing habits of cattle in a mixed-prairie pasture composed of 9.3 per cent lowlands, 64.5 per cent hillsides and 26.2 per cent uplands (each land class supporting a different type forage) found that the cattle favored the lowlands 49.2 per cent, the hillsides 22.0 per cent and the uplands 28.8 per cent of the time. Furthermore, there was a monthly variation in the percentagewise distribution of the cattle among these three areas.

This study investigates the frequency with which feeding cows use the various land classes of the California annual-type foothill range as affected by such factors as annual variability in herbage production, seasonal variability in plant growth, variation in degrees of utilization of the forage crop, and location of the salt lick.

EXPERIMENTAL PROCEDURE

This study was conducted on seven pastures (I to VI, and XIV, figures 1A and 1B, see pocket in the back of the bulletin) at the San Joaquin Experimental Range[2] which has been previously described (Hutchison and Kotok, 1942; Bentley and Talbot, 1951). Basic maps of the experimental area showing the extent of 10 different classes of range land within each pasture were prepared by the Pacific Southwest Forest and Range Experiment Station, USDA (fig. 1). The percentage of each land class within each experimental pasture was calculated from these maps. Data used on the relative average yield of herbage per surface acre for each land class, on estimated total annual production of air-dry herbage per grazable acre, on the degree of utilization in pastures I through VI and the description of the different land classes are from Bentley and Talbot (1951). Land classes 2, 4, 6 and 8 are on northern exposures and classes 3, 5, 7 and 9 are on southern exposures. Description of the land classes are as follows:

Class 1. *Swale.* The swale soil (drainage bottom) is typically a dark gray, sandy loam with a fairly good water-holding capacity, as contrasted to the shallow, brownish, sandy loams of low

[1] Submitted for publication September 14, 1967.
[2] Maintained by the Forest Service, USDA.

water-holding capacity that are found on the slopes. The swales receive a considerable amount of seepage water; in wet winters some portions remain saturated for several months. Swales consist of a heavy, poorly drained phase, or wet swale, and a lighter, better-drained phase, or dry swale, that usually borders the wet swale.

Classes 2 and 3. *Gentle slope.* Located just above the swale, the fine sandy loams of gentle slopes represent the transition from transported soil in the drainages to soil developed in place on the slopes. Gradient is below 10 per cent.

Classes 4 and 5. *Open, rolling slope.* These sites, with a gradient of 10 to 25 per cent, have an open cover of trees and shrubs and only scattered rock outcrops. Most of the sandy loams are about 24 inches deep.

Classes 6 and 7. *Rocky, brushy, rolling slope.* The average gradient of these sites is greater than for the open, rolling slope but the range in gradient, 10 to 25 per cent, is about the same. In general, the soils are shallower and coarser and more of the surface is covered by rocks, shrubs, and trees. Such lands comprise more acreage than any other site class within the area of granitic soils.

Classes 8 and 9. *Rocky, brushy, steep slope.* These sites have a gradient of 25 per cent or greater and numerous outcrops or many shrubs and trees. The steep areas are not common in the lower foothills; they differ considerably from place to place, including some productive soils as well as thin, sandy soils.

Class 10. *Steep, rocky bluffs.* These localized areas are small in size and practically unused by cattle.

To obtain data on the frequency of use of the various land classes, the experimental pastures (figure 1) were checked by horseback and the location of each cow found was plotted on a tracing-paper overlay on a topographical map. For a short period at the start, the bull in each pasture was also included. Symbols were used to indicate whether the cow was feeding or engaged in other activities. Later the tracing-paper overlay was placed over a map showing the extent of the various land classes within each pasture and the data on all feeding cows summarized according to the land class on which they had been plotted. In order that the cows in pastures I through VI would be checked during the different daylight hours we alternated the rotation in which the pastures were checked, and also varied the starting time. Pasture XIV was not checked during the earlier morning or later afternoon hours. Cows were not plotted after dark or during rain.

Data were collected over six annual periods (1941–1946) in pastures I–VI and for three annual periods (1943–44 to 1945–46) in pasture XIV. In pastures I–VI grazing was initiated each year between January 9 and March 7, and terminated between July 12 and August 13. Each pasture contained 15 cows, their calves until weaned about July 1, and a bull until May 1. In pasture XIV grazing was initiated between July 20 and August 8, and terminated between January 9 and March 7. Stocking rate varied from 43 to 47 cows annually, calving commenced about October 1, and a bull was added about December 28. Supplements were not fed in any of the pastures.

Each pasture was provided with a salt lick that contained block salt during the rainy months and coarse-ground salt during the dry months. During the first year in pastures I–VI, the licks were located in what were considered convenient locations. Thereafter, and alternating each year with half the pastures, the lick was placed in convenient or inconvenient lo-

cations. In pasture XIV the lick was each year in a different place, one of which was conveniently located. Convenient location implies that the lick was located in an area or near a trail frequently used, whereas inconvenient location implies an area less frequently visited. Locating a lick near a water source does not necessarily mean that it is conveniently located unless that is the only source of water within the pasture.

The extent of land class 10 in the pastures, and data on its use by cattle were not used in the analysis of results, but are included in table 1.

RESULTS AND DISCUSSION

Annual average pounds of herbage produced per acre differed markedly among most years of the six-year study period. The first two years were near a 13-year average for the station, the third and fifth years was above average, and the fourth and sixth years below average (figure 2).

From figure 1 it is evident that the extent of each of the 10 different land classes within each pasture is quite variable. Data in table 1 show the percentage of each land class, in relation to pasture size, as well as the average percentage of estimated total forage produced by that land class in each pasture. The estimated average total production of air-dry herbage per pasture (figure 3) show marked differences in total forage production between paired pastures (pastures I and III, II and V, and IV and VI).

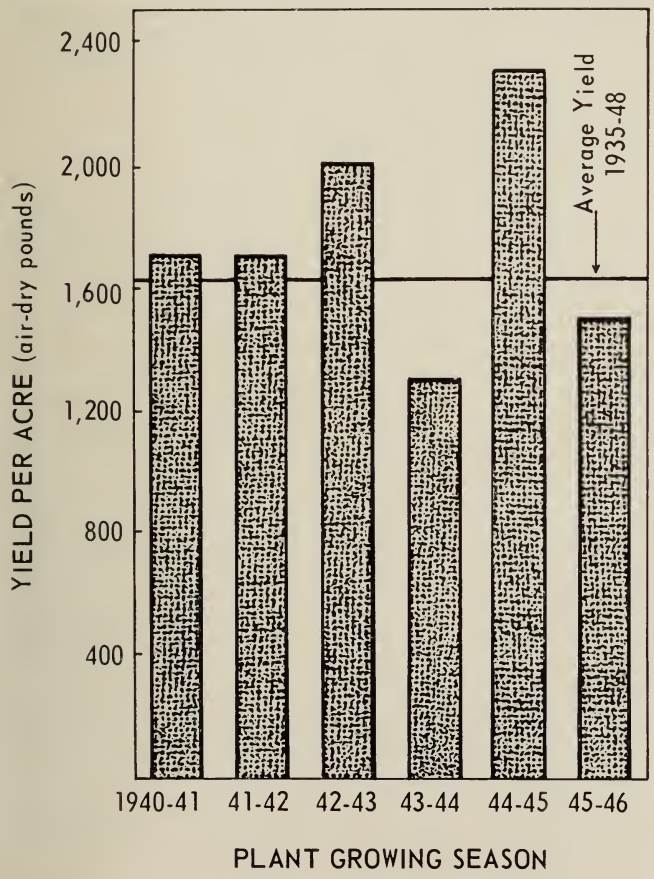
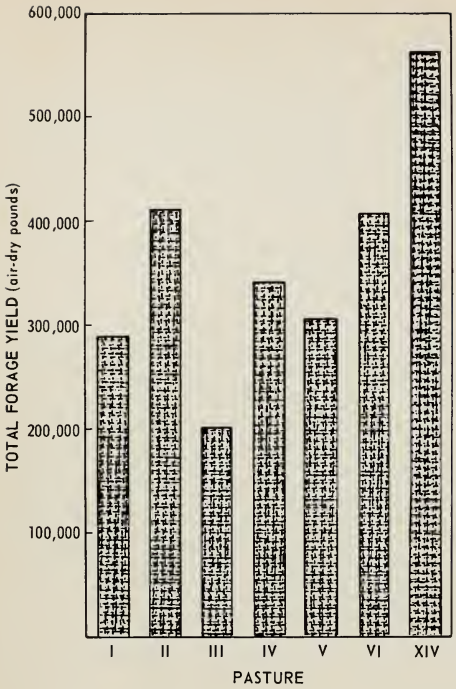


Fig. 2 Estimated total production of air-dry herbage per grazable acre during the plant-growing season—September to time of plant maturity. (Adapted from Bentley and Talbot, 1951.)



The total number of daily observations made in each pasture with the total number of feeding cows recorded in each is given in table 2. As expected, a greater percentage of the cows were accounted for in those pastures containing greater areas of gentle and open slopes, (Pastures I, II, III). Of the total number of cows found in each pasture the number of feeding cows varied from 47.6 to 61.0 per cent. The large numbers of nonfeeding cows are explained by the fact that observations were made through the morning and afternoon resting periods as well as at times the cows were moving about their pastures. Some of the early-morning observations began when cows were still at their night beds and the last observations in the day were made when the cows were moving towards their night feeding and bedding areas (Wagnon, 1963).

Fig. 3. Estimated average total production of air-dry herbage per pasture. (Calculated from data in Bentley and Talbot, 1951.)

LAND CLASS USE

Variability in the use of the different land classes by the cows is evident in table 1. A summation by percentages of cow distribution for each land class, of each land class in the entire study area, and the estimated forage production per acre of each land class is given in table 3. From these data we find a definite relationship between forage productivity per acre and frequency of cow distribution, in descending order, from the highest producing land class 1 to the lowest producing land class 8. The only exception was land class 9 which had the same ratio as land classes 6 and 7.

Bentley and Talbot (1951) calculated the relative herbage production of each land class from yield measurements made in pastures I, II and III during the period 1943–45. Steep slopes were not well represented within the sampling areas, but the estimated yields for these land classes (8 and 9) were considered indicative of the average production of such areas. The 1944 and 1945 forage years were the lowest and highest, respectively, in forage production during this six-year period of study, while 1943 was a better than average forage year (figure 2).

Evidence that the percentage of cow distribution is highly correlated with the forage production of the different land classes, and not with the percentage of area in each land class, is shown by the data given in table 4. The correlation coefficients between forage production and cow distribtuion were high for all pastures while those between area and cow distribution were variable and extremely low in some pastures. For the entire study area the correlation coefficient was 0.92 between percentage of forage produced and percentage of cow distribution for each land class, as compared with a correlation coefficient of 0.61 between percentage of area and percentage of cow distribution for each land class.

Even though the percentage of the different land classes varied markedly between pastures, as well as in degree of

TABLE 1

ANALYSIS OF SEVEN PASTURES BY LAND CLASS AREA, FORAGE PRODUCED, AND COW DISTRIBUTION

Land class	Pastures																				
	I			II			III			IV			V			VI			XIV		
	154 acres			230 acres			155 acres			309 acres			250 acres			316 acres			545 acres		
	Moderate-close use			Light use			Close use			Light-moderate use			Moderate use			Light use			Moderate use		
	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution	Area	Forage produced	Cow distribution
	Per cent																				
1	14.0	32.9	35.0	11.1	27.1	37.9	7.0	24.1	30.3	1.6	6.4	17.5	2.6	9.4	13.1	6.1	20.7	38.7	2.0	8.4	8.5
2	0	0	0	6.5	10.9	9.2	1.2	2.7	2.5	0.3	0.7	1.0	0.5	1.2	1.3	0.8	1.8	1.3	0.5	1.3	1.2
3	7.3	10.4	7.8	4.3	6.4	5.5	0.4	0.8	1.2	0.1	0.2	0.0	0.4	1.0	0.8	3.8	7.8	5.4	0.1	0.3	1.8
4	10.0	10.6	10.9	11.6	12.8	10.0	1.8	2.8	0.7	1.5	2.7	5.7	0.3	0.5	1.1	1.1	1.8	2.7	2.6	5.0	5.5
5	23.2	22.3	20.9	12.5	12.5	10.4	1.2	1.7	0.6	1.4	2.3	1.2	9.2	13.6	11.4	5.8	8.1	7.0	2.4	4.2	2.1
6	22.4	11.7	12.6	25.3	13.8	12.2	23.4	17.9	19.3	19.4	17.3	14.0	8.3	6.7	8.5	27.3	20.7	16.7	42.4	40.1	37.6
7	23.1	12.1	12.8	18.0	9.8	9.7	39.5	30.2	29.3	31.2	27.9	27.0	30.2	24.4	29.8	34.9	26.5	21.2	35.0	33.2	39.1
8	0	0	0	2.0	0.6	0.9	8.7	3.4	4.9	3.9	1.7	4.1	1.9	0.7	1.2	9.6	3.7	4.1	14.5	7.0	3.7
9	0	0	0	8.7	6.1	4.2	16.8	16.4	11.2	35.6	40.8	29.0	41.0	42.5	31.3	9.1	8.9	2.6	0.4	0.5	0.5
10*	0	0	0	0	0	0	0	0	0	5.0	0	0.5	5.6	0	1.5	1.5	0	0.3	0.1	0	0

* Because this land class was mostly inaccessible or little used by cattle its forage production was not included in pasture totals.

Table 2

NUMBER OBSERVATIONS OF FEEDING COWS IN EACH PASTURE

Pasture	Total daily observations	Total possible observations individual cows	Total number cows feeding
I.....	304	4,583	2,601
II.....	305	4,599	2,681
III.....	305	4,604	2,705
IV.....	303	4,573	2,271
V.....	302	4,551	2,050
VI.....	301	4,533	2,395
XIV.....	109	4,975	2,236

grazing use (table 1), the correlations between forage production and cow distribution on the different land classes within pastures were high and uniform for all the pastures (table 4). The correlations between forage production and cow distribution for each land class for all pastures were high for all land classes except lowest producing class 8 (table 3).

Differences in exposure did not appear to affect frequency of cattle use. In the entire study area, except for pasture I which does not contain all the land classes, the combined north exposures (land classes 2, 4, 6 and 8) comprised 39.5 per cent of the area, produced 32.8 per cent of the forage, and had 29.7 per cent of the cows, whereas the combined south exposures (land classes 3, 5, 7 and 9) comprised 54.2 per cent of the area, produced 51.8 per cent of the forage and contained 45.1 per cent of the cows.

Table 3

ANALYSIS OF STUDY AREA BY LAND CLASS, COW DISTRIBUTION, AND FORAGE YIELD†

Land class	Land class area	Cow distribution	Ratio: Area/cow distribution	Forage yield per surface acre ‡	Correlation coefficient: forage produced/cow distribution
	as percentage of total study area				
				Pounds	
1.....	5.2	26.5	1 : 5.1	4,400	0.87*
2.....	1.2	2.7	1 : 2.3	3,040	0.99**
3.....	1.9	3.4	1 : 1.8	2,660	0.97**
4.....	3.5	5.7	1 : 1.6	1,980	0.91**
5.....	6.5	7.9	1 : 1.2	1,800	0.99**
6.....	27.4	18.0	1 : 0.7	980	0.97**
7.....	31.8	22.7	1 : 0.7	980	0.92**
8.....	7.5	2.5	1 : 0.3	495	0.57
9.....	15.0	10.6	1 : 0.7	1,260	0.99**

* $P < 0.05$.
** $P < 0.01$.
† Land class 10 not included.
‡ From Bentley and Talbot, 1951.

Table 4

CORRELATIONS BETWEEN COW DISTRIBUTION AND LAND CLASSES, AND FORAGE PRODUCTION

Pasture	Correlation coefficient: Land class areas/cow distribution	Correlation coefficient: Forage production/cow distribution
I.....	0.01	0.98**
II.....	0.26	0.96**
III.....	0.72*	0.96**
IV.....	0.88**	0.92**
V.....	0.94**	0.94**
VI.....	0.39	0.81**
XIV.....	0.94**	0.98**

* $P < 0.05$.
** $P < 0.01$.

Seasonal variation

Previous studies at this station by Bentley and Talbot (1951) and Wagnon *et al.* (1959) showed that, despite the great similarity in forage developmental periods from year to year, these forage periods may also vary markedly in duration and productivity among years. Figure 4 shows

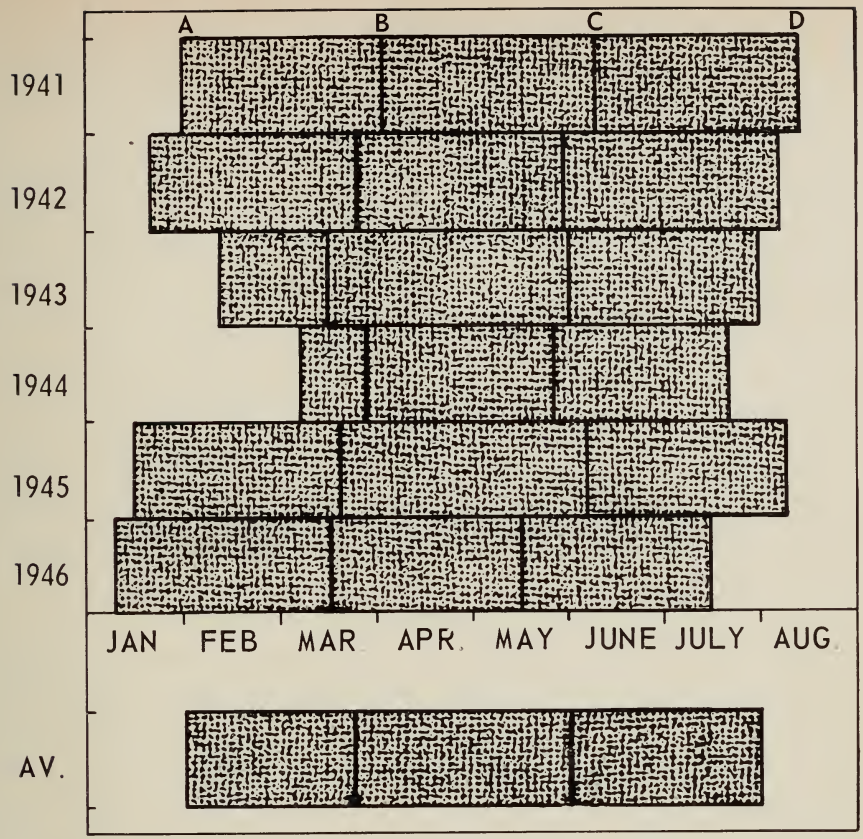


Fig. 4. Periods during which pastures I through VI were stocked each year of the study. A is date of entry, B is average date of start of rapid forage growth, C is average date when bulk of the forage has dried, and D is date of removal of cattle. Average dates are for the base period 1936 through 1947.

the duration of each of the grazing periods on pastures I–VI, and cows were in pasture XIV when not in these pastures.

Data on forage production for each land class each year of this study or for the different forage seasons each year are not available. Thus, frequency of cow distribution to the various land classes at different seasons of the year, or for high and low forage productive years, will have to be considered without their relationship to actual forage production data.

To see if seasonal differences in forage development, within the forage year, had influence on cow distribution to the different land classes, the data for the entire study period were summarized for monthly periods for combined pastures I–VI and for the dry forage and winter periods (which start with the onset of fall rains) for pasture XIV (table 5). From these data it is evident that seasonal changes of cow distribution to the different land classes did occur. The most marked changes occurred on land class 1 in pastures I–VI. From the time the cows were placed in the pasture until the start of rapid forage growth in late March (average) cow distribution to class 1 remained constant and about equal to that in class 7. Then marked increases in cow distribution occurred during April and May when the forage was growing rapidly to maturity. During this time, compensating decreases in cow distribution

TABLE 5

COW DISTRIBUTION ON NINE LAND CLASSES BY MONTHS (PASTURES I-VI) AND DURING DRY FORAGE AND WINTER PERIODS (PASTURE XIV)

Land class	Cow distribution							
	Combined pastures I-VI						Pasture XIV	
	Jan. + Feb.	Mar.	Apr.	May	June	July + Aug.	Dry forage period	Winter period
	Per cent							
1	22.9	22.8	34.9	40.2	28.3	28.1	4.5	5.2
2	2.7	2.8	2.8	2.9	2.2	2.9	3.0	1.5
3	3.4	4.6	3.8	3.7	3.0	2.0	0.8	3.7
4	4.8	6.0	7.1	5.1	4.2	3.2	8.4	6.3
5	9.3	9.6	9.4	7.8	7.5	6.1	2.3	5.1
6	13.8	13.5	13.8	11.9	16.6	18.9	47.4	40.4
7	22.9	24.0	18.1	17.5	24.3	21.8	31.1	37.5
8	3.2	2.6	1.4	2.3	2.6	4.0	2.5	0.3
9	17.0	14.4	8.7	8.6	11.3	13.0	0.0	0.0

occurred on other land classes, but particularly so in classes 6, 7 and 9. With maturity and drying of the forage in June, cow distribution in class 1 decreased sharply, to a level above that at the start of the grazing season while cow distribution markedly increased in classes 6, 7 and 9. Even though the forage on land class 1 had been closely grazed, the cows continued to spend considerable time regrazing these areas. Through this grazing period there were small changes in cow distribution between the land classes with north and south exposures. The average distributions of cows on land classes with northern exposures increased from 24.5 per cent at the period start to 29.0 per cent at the close, while land classes with southern exposures showed a decrease from 52.6 per cent to 42.9 per cent, respectively, for the same period.

In pasture XIV changes in percentage of cow distribution to the different land classes between the dry forage and winter periods were less marked. There was practically no difference in the use of land class 1; the average distribution to the combined land classes with northern exposure decreased from 61.3 to 48.5 per cent; and that on the southern exposures increased from 34.2 to 46.3 per cent.

The effects of variations in annual forage production on percentage of distribution of cows to the different land classes is shown by the data in table 6. These data, collected in pastures I–VI, have been summarized for the years with above-average (1943 and 1945), average (1941 and 1942) and below-average forage production (1944 and 1946) (see figure 2). Among these three different periods of total annual forage production there is little difference in average percentage of cow distribution to the different land classes other than small progressive decreases, correlated with decreasing forage production, to land class 1 with compensating increases to the other land classes. However, within each of these annual periods we find monthly variations in the percentage of cow distribution to the different land classes that are similar to those averages for all years combined, discussed above, except for some differences in use of land class 1. In this class, use was almost 10 per cent greater during the peak month May, for the above average forage production period, as compared to that of the average period, and during the below-average period the peak month of use occurred in April.

TABLE 6

AVERAGE MONTHLY VARIATION IN COW DISTRIBUTION ON NINE LAND CLASSES AT THREE AVERAGE FORAGE-PRODUCTION LEVELS

Land class	Cow distribution																			
	Above average (1943 and 1945)							Average (1941 and 1942)							Below average (1944 and 1946)						
	Seasonal average	January + February	March	April	May	June	July + August	Seasonal average	January + February	March	April	May	June	July + August	Seasonal average	January + February	March	April	May	June	July + August
	Per cent																				
1	30.9	21.6	24.5	34.4	49.7	30.6	26.1	29.3	22.5	22.1	33.1	39.9	27.6	28.7	27.9	25.1	21.2	39.0	27.8	25.4	34.9
2	2.3	2.3	3.2	2.0	2.0	2.4	0.7	2.8	2.1	2.6	4.1	2.1	1.9	4.5	3.2	3.7	2.1	1.6	5.1	2.6	7.0
3	4.0	4.5	6.1	3.9	2.9	2.4	2.3	3.2	2.5	3.5	3.9	3.7	2.6	1.5	3.7	2.9	3.4	3.6	4 5	4.8	2.3
4	5.3	3.8	7.1	9.2	3.2	5.0	1.2	5.6	5.6	6.7	6.8	5.2	3.0	5.0	5.1	5.4	2.6	4.5	7.4	4.8	4.6
5	7.9	9.6	9.5	8.5	6.0	7.0	3.5	9.2	8.5	10.5	11.2	7.8	7.3	9.2	8.9	9.5	8.1	7.5	10.3	9.1	4.6
6	13.3	13.8	10.7	15.3	8.0	17.1	18.6	14.9	13.4	14.5	15.1	13.4	16.2	20.5	14.2	14.3	17.3	9.0	15.1	16.6	12.8
7	21.7	24.1	22.9	18.8	18.8	23.1	21.7	21.4	24.3	25.5	16.8	17.4	24.5	21.2	20.5	19.9	23.4	19.1	16.1	25.9	25.6
8	2.3	3.4	1.3	0.6	1.6	2.4	7.7	2.2	3.3	2.4	1.1	1.9	2.9	0.7	3.5	2.9	5.2	3.3	4.1	2.4	1.2
9	12.3	16.9	14.7	7.3	7.8	10.0	18.2	11.4	17.8	12.2	7.9	8.6	14.0	8.7	13.0	16.3	16.7	12 4	9.6	8.4	7.0

LOCATION OF SALT LICKS

A previous study (Wagnon *et al.*, 1942) found that salt consumption decreased if the salt licks were placed in inconvenient locations (in relation to cattle use of a pasture) within pastures, as compared with situations where salt was placed in convenient locations. Data were not available to show if placing the lick in inconvenient locations resulted in an increase in the percentage of cattle utilizing the range in those areas.

Selection of an inconvenient lick site within a pasture was based on observations of cattle movements within the pastures through several annual grazing periods prior to this study. During this time an investigation of range rodents was based in the eastern half of pasture I (figure 1). Observations indicated that the frequent movement of personnel checking trap lines hindered the movement of cows utilizing this area. For this reason a salt lick was established during some years near the eastern end of the pasture, to see if it would induce the cattle to use the area more frequently. Shortly after the initiation of the present study the rodent investigations in the pasture were discontinued. As shown in table 7, the average salt consumption at the inconvenient site was comparable to those at the convenient location. Since both locations were in the eastern half of the pasture and within the areas of greater forage production this is not surprising. A more inconvenient location for the lick could have been found in the western end of the pasture as in pastures II and III (see figures 5 and 6).

The degree of convenience or of inconvenience of the lick locations in one pasture were not considered comparable to those in the other pastures. This situation would be difficult to establish between pastures with gentle topography (pastures I, II and III) as compared to pastures with extensive steep slopes or canyons (pastures IV, V, VI, and XIV). Even so, the results of this study verify those of the previous study. Surprisingly, an inconvenient lick location causing a marked reduction in salt consumption was found in pasture III which is small in size, mostly of gentle terrain, and was very closely grazed. During those years in which the salt licks were at inconvenient locations in pastures II–VI the cows became notably salt hungry before the close of the grazing periods.

To determine if placing the licks in inconvenient locations would induce greater numbers of cows to graze in those vicinities, an analysis was made of the dispersal of feeding cows on those areas when the licks were conveniently and inconveniently located (figures 5, 6, and 7). No significant differences were found.

TABLE 7

VARIATION IN AVERAGE DAILY SALT CONSUMPTION PER ANIMAL UNIT FOR GRAZING PERIODS WHEN THE SALT LICK WAS AT CONVENIENT OR INCONVENIENT LOCATIONS WITHIN THE PASTURES

Pasture	Grazing periods					
	1941	1942	1943	1944	1945	1946
	Average daily salt consumption per animal unit *Ounces*					
I	0.72	0.62*	0.84	0.85*	0.93	0.84*
II	0.78	0.65*	0.71	0.49*	0.82	0.69*
III	0.92	1.02	0.41*	0.95	0.35*	1.11
IV	0.54	0.34*	0.85	0.46*	0.80	0.46*
V	0.59	0.60	0.38*	0 61	0.25*	0.50
VI	0.76	0.91	0.36*	0.90	0.34*	0.75
XIV				0.85	0.51*	0.71

* Salt lick placed at inconvenient location.

SUMMARY

The dispersal of feeding cows on the various classes of land, comprising the experimental pastures, was highly correlated with the average annual forage production per acre of each land class.

There were seasonal changes in cow distribution to some of the land classes. These were most marked during the period of forage growth and maturity. The greatest change occurred on land class 1 which received heaviest use in May when the bulk of the range forage on the other land classes had matured. As the forage matured and dried the percentage of cows on the south slopes decreased, while the percentage of cows on the north slopes increased correspondingly. In the winter months, when rains started new forage growth, the percentage of cows on north slopes decreased, with a corresponding increase in percentage of cows on south slopes. In years of above-average forage production, class-1 land received heavier use in May than in years of average or below-average forage production. In below-average forage years, class 1 land had its heaviest use in April.

Placing salt licks in inconvenient locations within a pasture resulted in decreased daily salt consumption per animal unit as compared with placing the lick in a convenient location. Locating a lick in a less frequently used area of a pasture did not cause a significant increase in grazing cows in that area.

LITERATURE CITED

Bentley, J. R., and M. W. Talbot
1951. Efficient use of annual plants on cattle ranges in the California foothills. U. S. Dept. Agr. Cir. **870**:1–51.

Green, L. R., K. A. Wagnon, and J. R. Bentley
1958. Diet and grazing habits of steers on foothill range fertilized with sulfur. Jour. Range Mgmt. **11**(5):221–27.

Hutchison, C. B., and E. I. Kotok
1942. The San Joaquin Experimental Range. Calif. Agr. Exp. Sta. Bul. **663**:1–145.

Moorfield, James G., and Harold H. Hopkins
1951. Grazing habits of cattle in a mixed-prairie pasture. Jour. Range Mgmt. **4**(3): 151–57.

Wagnon, Kenneth A.
1963. Behavior of beef cows on a California range. Calif. Agr. Exp. Sta. Bul. **799**: 1–58.

Wagnon, K. A., H. R. Guilbert, and G. H. Hart
1942. Experimental herd management, pp. 50–82 *in:* Hutchison and Kotok, 1942.
1959. Beef cattle investigations on the San Joaquin Experimental Range. Calif. Agr. Exp. Sta. Bul. **765**:1–70.

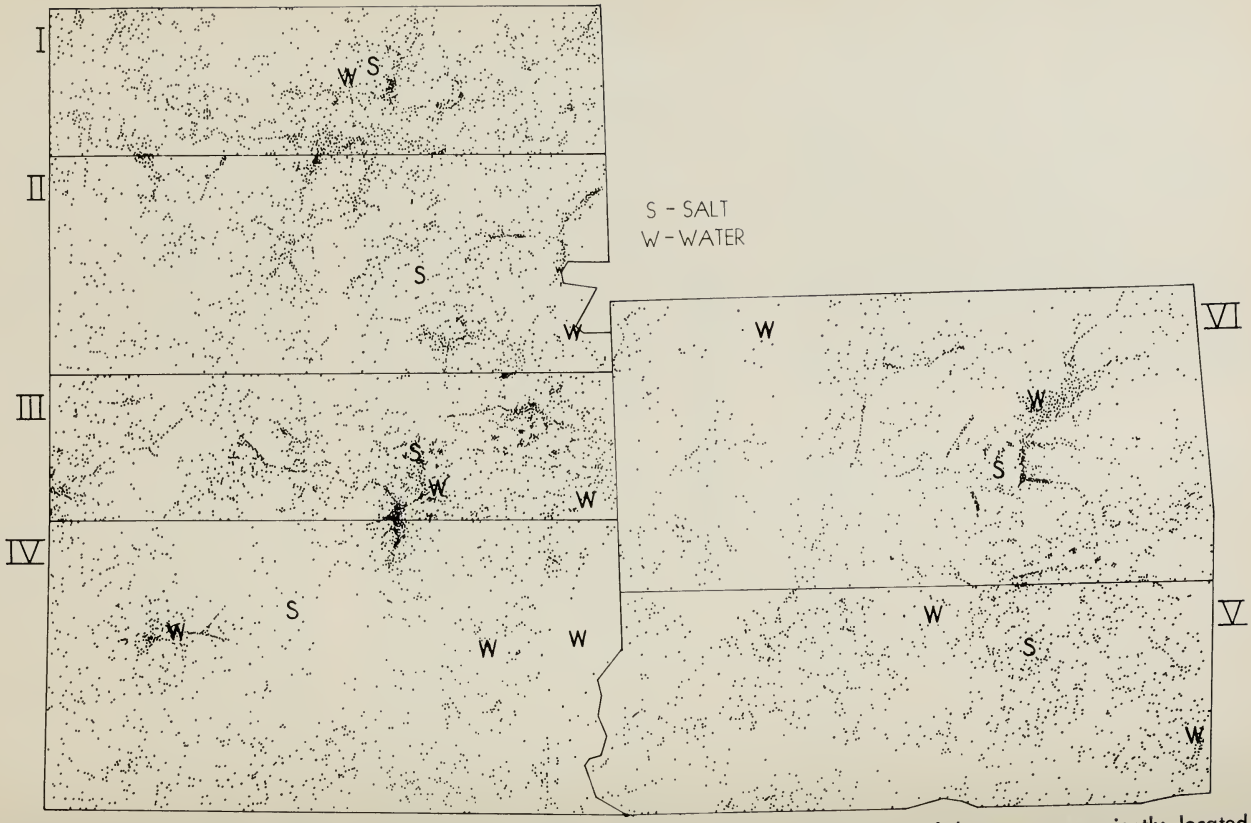


Fig. 5. Distribution of feeding cows in pastures I through VI for the years when the salt licks were conveniently located.

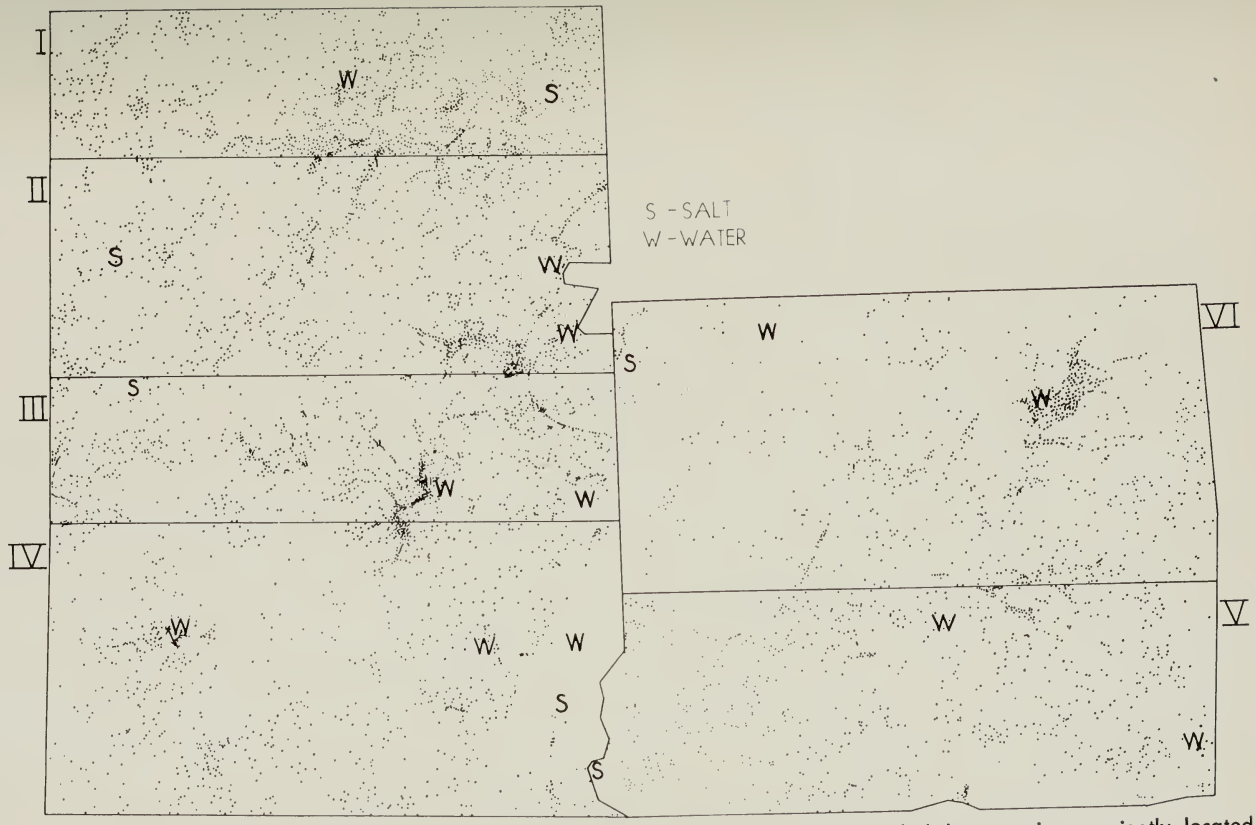


Fig. 6. Distribution of feeding cows in pasture I through VI for the years when the salt licks were inconveniently located.

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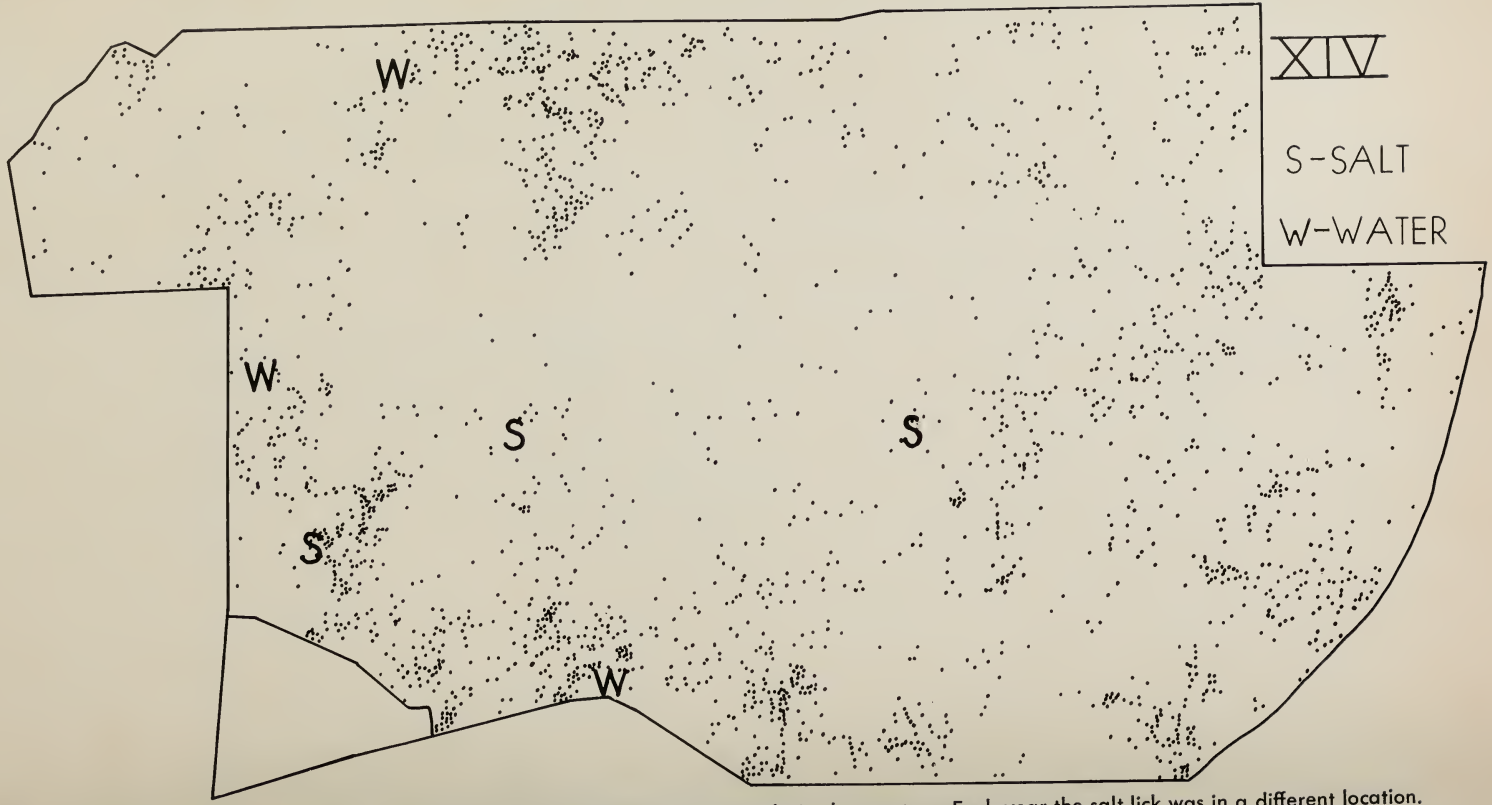

Fig. 7. Distribution of cows in pasture XIV for the three years of study in that pasture. Each year the salt lick was in a different location.