EFFECT OF GRAZING INTENSITY ON THE DEGREE OF USE OF RANGE GRASSES IN FLINT HILLS BLUESTEM PASTURES

by

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INTRODUCTION

The determination of the grazing capacity of a range is an important aspect in its management. The significance of fixing the proper rate of stocking cannot be emphasized sufficiently; the margin between overgrazing and failure to make full use of the available forage is small, bounded by range deterioration and economic necessity. The condition of many ranges today is evidence of the fact that understocking is readily distinguishable while the incipient effect of overstocking is easily overlooked. Although the commercial value of a range is determined by the number of livestock it is capable of supporting, an objective view must logically be in accord with the definitives of range management; sustained yields of livestock products. Correct rate of stocking is the major factor in the conservation of range resources.

Determining the percentage utilization is a check on the current stocking rate. It is an immediate comparison between the actual amount of forage removed and the amount that could be safely removed, as determined by a use factor. By assigning a use factor, the percent of the current season's forage production that may be removed without incurring a change in botanical composition, it is possible to set a theoretical limit of grazing use.

Utilization can be defined as the degree to which animals have removed the current growth of forage and is expressed in

percentage of growth within reach of livestock (18). The use factor and utilization might be thought to be synonymous on a range fully used but not overgrazed. Of the many methods of determining utilization in common use today, none is entirely satisfactory for use in bluestem pastures. These methods have been developed for short grass ranges and are not applicable to the tall grass pastures. It was the purpose of this study to develop and test a method of measuring utilization of range grasses in Flint Hills bluestem pastures.

REVIEW OF LITERATURE

Investigators have long recognized the difficulty of fixing a value for carrying capacity. Because many variable factors affect grazing capacity it is impossible to determine from surveys a fixed numerical value representing the absolute grazing capacity of a range. Costello and Turner (5), in discussing short grass ranges, stated that annual variation in forage production caused primarily by weather, especially amount and distribution of rainfall, make necessary an adjustment of the herd to the year. This adjustment is not practical in the Flint Hills area due to the custom of leasing pasturage for a definite number of cattle long before seasonal rainfall can be anticipated. Pechanec and Pickford (13) discussed the variations that occur in grazing capacity as calculated from ground cover or plant density surveys and

actual grazing trials. In discussing the application of agronomic methods to range research, Sarvis (16) stated that gain or loss of livestock should be a measure of grazing capacity; good appearance of the animals does not always indicate gain.

In comparing several methods of determining percentage utilization, Pechanec and Pickford (12) concluded that these characteristics were essential in a desirable method: rapidity, accuracy, and adaptability. Rapidity is desired so that the vegetation, soil types, and topography may be thoroughly sampled. To avoid endless complexity the method must be adaptable for use in vegetation of varying species composition. Any method must be considered, not only as a research technique, but for practical application by the stockman.

Methods of measuring utilization can be placed in two groups, estimates and measurements.

The earliest method of estimating utilization was by general reconnaissance. This involved inspection of the entire range more or less in detail as the basis for an estimate of the percentage utilization. Stoddart (19) pointed to the present condition of many ranges as evidence of the inaccuracy of this method due to the poor judgment and optimism of the investigators.

Deming (7) devised a qualitative method in which observations of primary forage plants were employed to place the utilization in one of nine comparative classes. These classes

ranged from unused to destructive. The use of descriptive terms has been criticized in that they fail to meet the need for recognition of proper intensity of use by Pechanec and Pickford (12).

The ocular-estimate-by-plot method is a modification of the general reconnaissance method. Each estimate is made on a plot of limited size entirely visible from one point. Pechanec and Pickford (12) stated that the method requires training in estimating forage yields and that two observers should work together the entire season. Burton (2) found training improved individual estimates of forage yields considerably in dallisgrass (Paspalum dilatatum) and bahiagrass (Paspalum notatum) pastures. Frischknecht and Plummer (8) regulated the size of the plot so that the forage weight in grams could be converted directly to pounds per acre. In comparison with the stubble-height method, Reid and Pickford (14) concluded the ocular-estimate-by-plot method was more suitable for field use, because of its simplicity and adaptability.

In the ocular-estimate-by-average-of-plant method, the average of the estimates of utilization of each plant in the plot, in randomly located plots, is taken as the utilization of the plot. Pechanec and Pickford (12) considered this method well suited for use with bunchgrasses or species that occur in clumps.

Height was first used as a method of measuring utilization. This use was based on the premise that percentage utili-

zation was equal to the reduction in average leaf height as a result of grazing. Early attempts to use this principle were discussed by Stoddart and Smith (20). This concept later evolved into the theory that a certain percent of flower stalks must be left to maintain the species. Later studies have shown this often was currect usage.

Beruldsen and Morgan (1), in Australia, proposed weighing the forage from randomized plots before and after grazing. The difference in weight was assumed to be the amount removed by grazing. This method necessitates the use of check areas protected from grazing or making the measurement before grazing begins.

A modification of this method, adapted to measuring utilization by sheep, was introduced by Cassaday (4). Weight was taken of a predetermined number plant units before and after grazing. The plant units consisted of the whole plant, stems, leaves, or twigs. The place of sampling was selected by an unbiased method, on the general route of grazing. The difference of the weight of the plant units was taken as the utilization for the area. Temporary exclosures for ungrazed areas are required when utilization of cattle ranges is being determined.

Lommasson and Jensen (9) first demonstrated the correlation between weight and height of range grasses. They constructed tables to convert inches of stubble remaining into percentage of height removed. This concept was used by later

investigators in modifications and improvements of the method.

Crafts (6) used key indicator species to calculate height-volume charts. Tufts of each species were clipped at one or two inch intervals and the relation between the dry weight of each section and the total dry weight was calculated in percentage. Weight was used to represent volume. From those charts it was possible to convert percentage height of grazed plots directly into percentage volume. Reid and Pickford (14) reported this method to require more work than the ocular-estimate-by-plot method and pointed out the need for conversion tables for different years and localities. Morris (10) stated that weight of forage is not uniformly distributed in a plant and that total productivity of a species must be calculated for the more important height and basal area classes on the various soil types.

Canfield (3) introduced a modification of the height-volume method in which the percentages of grass partly grazed, grazed to two inches or less, and not grazed are compared. The basis of this comparison is a correlation of these three values. Canfield stated that this method is accurate to within ten percent and is easy to teach to observers.

Roach (15) simplified Canfield's method by making use of the habit of cattle of grazing a clump only once and the relationship between the percentage of accessible perennial grass clumps grazed and the amount, by weight, of forage removed. From heights of ungrazed and grazed clumps the percent utili-

zation was calculated from height-weight charts. Using these data, the percent ungrazed plants and percentage utilization were plotted and regression computed.

Western wheatgrass (Agropyron smithii) was used as an indicator species by Stoddart (19). The average of several counts of number of stalks grazed, and stalks ungrazed was taken for several quadrats and the percentage of grazed stalks used as percentage utilization. Pechanec (11) commented that this method presupposes reasonably complete removal of the forage from each stem grazed. As this is not consistently true, this method is not sufficiently accurate to merit its unqualified use.

METHODS AND MATERIALS

Pastures

The six pastures used in this study were typical Flint Hills bluestem pastures, each 60 acres in area, grazed at different intensities and under different systems of grazing. The vegetation of these pastures was predominantly tall and midgrasses with short grasses occurring in drouthy preclimax or closely grazed locations. Two sites were recognized in each pasture. Site 1 was on lands having moderately deep to deep soil with medium or loamy texture on moderate to steep slopes. This site had suitable soil-plant moisture relationships to support climax vegetation. Site 2 was moderately

heavy, cherty ridgetops and clay soils on gentle slopes. This site was too drouthy to support climax vegetation. The total vegetation of site 1 was composed of 59.4 percent major decreasing species and 24.2 percent major increasing species. The total vegetation of site 2 was composed of 38.0 percent decreasing species and 43.5 percent increasing species.

Stocking Rates

Pastures I, II, and III were grazed season long and at different intensities. Pastures IV, V, and VI were grazed under a deferred system with pasture V deferred in 1951. Table 1 shows the number of cattle in each pasture, acres per head, days of grazing, and animal units per pasture. Animal units were calculated according to the method proposed by Vinall and Semple (21).

Weather

Precipitation for the period May to November, 1951, was far above normal (Table 2). Monthly departure from normal ranged from 5.86 inches to 11.59 inches in May, June, and July. This is the period when moisture would have had the most influence on forage production. The mean temperature for each month was only slightly lower than normal and presumably would not have had any important effect on forage production.

Table 1. Rate of stocking data.

Pasture	Number of cattle	Acres per head	Length of grazing period[1]	Animal units per pasture
I	18	3.3	186	12
II	24	2.5		16
III	12	5.0		8
IV	27	2.2		18
V				36
VI	27	2.2		18

[1] This period represents the number of days of grazing during the time observations were made.

Table 2. Precipitation data for the 1951 grazing season.

	May	June	July	August	September	October	November
Monthly precipitation, 1951	10.29	11.12	15.32	6.32	6.13	2.70	.61
Normal monthly precipitation	4.43	4.61	3.73	4.24	3.93	2.25	1.77
Departure from normal	5.86	6.51	11.59	2.08	2.20	.45	-1.16

Method of Making Observations

Observations were made on modified point-observation transects in which samples were spaced five paces apart. Each observation was made on a single grass plant nearest the observer's toe at the end of each five paces. This method of random sampling was used to ensure adequate sampling of the vegetation and to satisfy the prerequisites of subsequent statistical analyses. Approximately 100 observations were made on grass species only. Each observation was recorded in one of three categories: A, not grazed; B, slightly grazed, the tops only partially removed; C, heavily grazed, the tops cropped completely or grazed to short stubble height (Table 3). Placing each plant observed into its appropriate category was influenced, to some extent, by the size of the individual plant and its habit of growth (Figs. 1 through 6). The original observations were made individually for each species encountered; later they were grouped into decreasers, and increasers and invaders, according to the concepts of Weaver and Hansen (22) and Smith (17). This was done to facilitate statistical analysis and to study the utilization of the two groups of grasses under different grazing intensities.

This method was designed to serve as a basis for developing a quantitative method of measuring utilization in Flint Hills bluestem pastures. Acceptance and further refinement of the method was contingent upon satisfactory results of the preliminary experiment.

Table 3. Summary of utilization of increasers (i) and decreasers (d) in different sites and under different grazing intensities by number of plants observed in each degree of use.

Pasture	Site[1]	Degree of use[2]	Time of sampling: June d	June i	July d	July i	August d	August i	Sept. d	Sept. i	November d	November i
I	1	A	70	12	91	9	82	8	72	7	56	9
		B	28	0	13	0	12	0	23	0	23	0
		C	7	0	10	0	11	0	19	0	24	0
	2	A	20	17	56	31	70	11	55	9	34	17
		B	7	6	9	5	14	1	23	2	31	6
		C	4	0	22	0	14	2	27	1	16	1
II	1	A	52	7	62	7	37	7	32	13	41	10
		B	32	0	31	1	20	1	29	3	36	3
		C	36	0	25	0	49	0	27	0	22	0
	2	A	39	53	44	28	43	45	25	35	29	44
		B	20	2	20	2	21	0	23	1	20	8
		C	7	0	11	0	22	0	20	0	7	1
III	1	A	63	27	78	21	70	13	66	4	71	6
		B	12	1	15	0	14	0	17	0	24	3
		C	10	0	5	0	25	0	18	0	9	0
	2	A	28	54	38	58	31	16	33	16	38	30
		B	15	6	13	3	14	1	24	6	15	4
		C	16	0	21	0	41	3	28	1	20	0
IV	1	A	53	22			35	6	42	16	51	18
		B	27	6			25	3	18	4	26	0
		C	19	0			46	1	40	0	9	5
	2	A	36	44			47	11	43	25	39	24
		B	11	6			11	0	20	3	21	2
		C	12	1			35	0	16	0	27	1
V	1	A			93	6	49	5	66	9	27	4
		B			23	1	19	1	19	2	32	6
		C			3	0	37	0	10	0	34	0
	2	A			60	1	38	5	39	11	31	20
		B			23	4	31	0	18	4	23	6
		C			14	1	37	0	31	1	35	1

Table 3. (concl.)

Pasture	Site[1]	Degree of use[2]	Time of sampling: June d	June i	July d	July i	August d	August i	Sept. d	Sept. i	November d	November i
VI	1	A	48	18			67	2	70	10	56	22
		B	35	2			13	0	13	0	12	1
		C	21	0			27	0	8	0	11	1
	2	A	42	53			66	20	44	19	62	2
		B	25	5			13	2	18	4	15	0
		C	16	0			12	1	25	1	27	0

[1] Site 1 was lands with moderate to steep slopes; site 2 was ordinary uplands.

[2] A, not grazed; B, lightly grazed; C, heavily grazed.

Fig. 1. Andropogon scoparius, not grazed. This plant is representative of category A.

Fig. 2. Sorgastrum nutans, not grazed. This plant is representative of category A.

Fig. 3. Andropogon scoparius, lightly grazed. This plant is representative of category B.

Fig. 4. Sorghastrum nutans, lightly grazed. This plant is representative of category B.

Fig. 5. Andropogon scoparius, heavily grazed. This plant is representative of category C.

Fig. 6. Sorghastrum nutans, heavily grazed. This plant is representative of category C.

Statistical Analysis

Weighting Data. The figure representing utilization for each group of grasses in a site was composed of three values in categories representing the different degrees of use. To place the values for the groups on a comparable basis it was necessary to combine the three values for degree of utilization into a single value. To accomplish this, and to retain the degree of utilization recognized in each category, a method of weighting was used. The weighting values one, two, and four were used for the categories A, B, and C, respectively. The selection of a logarithmic function, and these values in particular, was arbitrary. A summary of the weighted data is shown in Table 4.

Analysis of Variance. As pastures I, II, and III and pastures IV, V, and VI were grazed under different systems of management, it was necessary to compute separate analyses of variance for the two groups of pastures. Because there were many variable factors affecting utilization and forage production, an analysis of variance for each of the pastures grazed season long was computed. This was not done for the pastures grazed under the deferred system as the cattle were free to graze on any of the three pastures after July. The analysis of variance for pastures I, II, and III is shown in Table 5, for each of the pastures grazed season long in Table 6, and for pastures IV, V, and VI in Table 7.

Table 4. Summary of weighted data.

Pasture	Site	Utilization		
		Decreasing species	Increasing species	Total
I	1	7.80	5.00	12.80
	2	9.00	6.68	15.68
	Sum	16.80	11.68	28.48
II	1	10.94	5.65	16.59
	2	9.29	5.32	14.61
	Sum	20.23	10.97	31.20
III	1	7.79	5.36	13.15
	2	11.03	6.15	17.18
	Sum	18.82	11.51	30.33
IV	1	8.17	5.66	13.83
	2	8.08	4.92	13.00
	Sum	16.25	10.58	26.83
V	1	7.47	5.08	12.55
	2	8.71	5.04	13.75
	Sum	16.18	10.12	26.30
VI	1	6.80	4.27	11.07
	2	7.41	4.60	12.01
	Sum	14.21	8.87	23.08

Table 5. Analysis of variance for pastures I, II, and III.

Source of variation	D.F.	M.S.
Pasture (grazing intensity)	2	.0964
Sites	1	.4050
Months	4	.1152*
Groups of grasses	1	7.8409**
Interactions		
Pasture X site	2	.5089**
Pasture X month	8	.0297
Pasture X groups	2	.2145**
Site X month	4	.0219
Site X groups	1	.0071
Month X groups	4	.0236
Error	30	.0377

Table 6. Analyses of variance for each of the pastures I, II, and III.

Source of variation	D.F.	M.S.
Pasture I		
Months	4	.037
Sites	1	.420**
Groups of grasses	1	1.320**
Interactions		
Months X sites	4	.007
Months X groups	4	.036
Site X groups	1	
Error	4	.020
Pasture II		
Months	4	.050
Sites	1	.200*
Groups of grasses	1	4.290**
Interactions		
Months X sites	4	.012
Months X groups	4	.067
Site X groups	1	.080
Error	4	.017
Pasture III		
Months	4	.087
Sites	1	.820**
Groups of grasses	1	2.680**
Interactions		
Months X site	4	.030
Months X groups	4	.022
Site X groups	1	.290*
Error	4	.020

Table 7. Analysis of variance for pastures IV, V, and VI.

Source of variation	D.F.	M.S.
Pasture (grazing intensity)	2	.2578
Sites	1	.0358
Months	3	.0750
Groups of grasses	1	6.0705**
Interactions		
Pasture X site	2	.0758
Pasture X month	6	.1206
Pasture X groups	2	.0077
Site X month	3	.0897
Site X groups	1	.1017
Month X groups	3	.1143
Error	23	.0781

EXPERIMENTAL RESULTS

The analysis of variance for pastures I, II, and III indicated that significant variation resulted from months, groups of grasses, the interaction between pastures and sites, and the interaction between pastures and groups of grasses. It was anticipated that the degree of utilization would vary between any two months due to changes in abundance in forage and general palatability. It was also anticipated that there would be a difference in degree of utilization between groups of grasses, principally due to differences in the palatability of species making up each group.

The analysis of variance for each of these pastures showed significant variation for sites and for groups of grasses. Examination of the weighted data (Table 4) showed a reversal in the utilization values for sites in the heavily stocked pastures as compared to those stocked moderately and lightly. This reversal concealed the variation due to sites in a combined analysis of variance for the three pastures (Table 5). Additional evidence of this reversal was the change in the value of the site mean square in the analysis of variance for each of the pastures. Although the error mean square (Table 6) was approximately the same in each analysis, the site mean square decreased by approximately one-half for each increase in stocking rate.

Examination of the weighted data showed that the degree of utilization of the increasing and invading species was approximately the same in all six pastures (Table 4). The difference in degree of utilization of all the decreasing species provided the variation shown in the analyses of variance (Tables 5 and 7).

DISCUSSION

In this study, the forage was utilized most closely in site 2 under light and moderate stocking while under heavy stocking the closest use of the forage occurred in site 1. This reversal in degree of utilization was the most striking feature of the results of this study. It had been thought that the forage in site 1 would be more palatable than that in site 2 due to its better moisture relationships and to the relatively greater abundance of such major forage species as Andropogon scoparius, Andropogon gerardi, and Sorghastrum nutans. The preference for the forage in site 2 exhibited under light stocking, where the cattle had complete freedom in selecting areas to graze, cannot be fully explained. There is, however, a tendency for cattle to graze on uplands and on the flat or gently sloping areas. In this pasture understocking and high forage production made abundant forage available in both sites. The animals, therefore, were not forced to use the steeper areas.

The reversal in degree of utilization of sites from light to heavy stocking concealed the differences among the three pastures grazed season long in the analysis of variance. The effect of abundant rainfall is to stimulate forage production, but its effect on palatability is not known. The failure of the method as used in this study to measure the expected differences in the degree of utilization among the pastures might have been due in part to this unknown effect. Unusually high rainfall may also have affected the relative amounts of decreasing, increasing, and invading species grazed. Ordinarily, the decreasing species are preferred by livestock to the increasing and invading species. The large amount of moisture might have stimulated production by the decreasers to such a degree that the animals were never short of forage of these preferred species even in the pastures stocked heavily. Evidence to this point is the relatively limited use of the increasers in all rates of stocking. In a season with less precipitation, there probably would be differences in degree of use of the increasing species.

As a guide to future experiments on measuring utilization there are several suggestions to be made. In a more comprehensive study it would be desirable to use randomly located paired, clipped plots, with one plot protected from grazing, to measure accurately the utilization in each site. With this as a means of comparison, it would be possible to make any required modifications in sampling and weighting data.

SUMMARY

1. Proper rate of stocking is important in making full and efficient use of the range but more important is the maintenance of the resource, the native vegetation. Measuring utilization is a comparison between the amount of forage removed during the current season and the amount that could be safely removed. The purpose of this study was to develop and test a method of measuring utilization of range grasses in Flint Hills bluestem pastures.

2. The pastures used in this study were typical bluestem pastures. Three pastures were grazed season long and at different rates of stocking, the other three were grazed under a deferred system.

2. Precipitation during the 1951 grazing season was far above normal. The effect of this unusual amount of moisture on forage production and utilization is not known.

4. The method of measuring utilization of range grasses used in this study was one in which the utilization of the individual plant was recorded in one of three categories; A, not grazed; B, slightly grazed; and C, heavily grazed. The observations were made on randomly located, modified point-observation transects. The data were weighted to combine the value in each category into one value for statistical analysis.

5. In this study it was shown that the degree of utilization was highest in site 2 under light and moderate stocking, while under heavy stocking the highest degree of use was in site 1. There was a significant difference in the degree of utilization of the two groups of grasses, the decreasers on the one hand as compared to the increasers and invaders on the other. The variation in groups of grasses shown in the analysis of variance was due to the varying rates at which the decreasers were taken under the different rates of stocking. The degree of utilization of the increasing and invading species was approximately the same in all six pastures. Statistical analysis showed no difference in utilization among the pastures grazed season long at different intensities. This difference may have been concealed by the interaction between sites and pastures. Differences in utilization among the three pastures grazed under the deferred system was not anticipated.

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Range management is the science and art of planning and directing range use so as to obtain the maximum livestock production consistent with conservation of the range resources. Through failure to recognize the proper degree of use the stockman often overgrazes the range severely. The detrimental effects of overgrazing may be reflected in the vegetation, and in the yield of livestock products. Correct rate of stocking is the keynote of range management.

Determining the degree of utilization of a range is a means of checking the current rate of stocking against a limit set by a use factor, which is usually determined by past experience. As the first effects of overgrazing may not be easily observable, measuring the utilization of forage is an important guide in the determination of the carrying capacity of a range.

Research workers have devised many methods of determining the utilization of range forage. In general, these methods have been developed for use in short grass ranges or in some particular type of range vegetation. Due to inherent inaccuracies or to general lack of adaptability they cannot be used satisfactorily in Flint Hills bluestem pastures. This study was designed to serve as a preliminary experiment in the development of a method of measuring the utilization of range grasses in bluestem pastures.

Six typical, bluestem pastures, each approximately 60 acres in area, stocked at different rates, and grazed under different

systems of management were used in this study. The first three pastures were grazed season long and at different intensities of stocking. The other three pastures were grazed under a deferred system. Observations were taken in two sites in each pasture. Basically, topography and soil conditions, as they influence vegetative composition, provided the differentiation of the sites. Site 1 was ordinary uplands with medium textured soils on moderate to steep slopes; site 2 was moderately heavy "ridgetops" soils and deep clay soils on gentle slopes. Site 1 had suitable soil-plant relationships to support a climax vegetation, in this case composed of such major forage species as Andropogon gerardi, Andropogon scoparius, and Sorghastrum nutans. The vegetation in site 2 was composed of a higher proportion of increasing and invading species, due to the somewhat drouthy conditions.

Precipitation during the 1951 grazing season was above normal. Although the effect of excessive moisture would be to stimulate forage production, its effect upon palatability is not known. As the average monthly temperature was only slightly below normal its effect upon forage production and palatability probably was negligible. The combined influence of these factors upon the degree of utilization cannot be predicted.

Randomized point observation transects were used to obtain samples in this study. The individual observations were made at five pace intervals, on the plant nearest the observer's

toe. The observations were recorded in three categories according to the degree of utilization: A, not grazed; B, lightly grazed; C, heavily grazed. Approximately 100 observations were made in each site monthly. Originally the individual species were recorded separately as they were encountered, later they were combined into two groups, decreasers, and increasers and invaders according to the concepts of Weaver and Hansen of Nebraska and Smith of Oklahoma. The grouping was done to facilitate statistical analysis and to study the utilization of the two groups of grasses under increasing grazing pressure. To combine the figures for the categories into one figure, while at the same time, maintaining the degree of utilization recognized in the B and C categories, a method of weighting was used. The values, two and four, were used to weight categories B and C, respectively. The selection of these values was arbitrary.

Separate analyses of variance were calculated for the three pastures grazed season long and for the pastures grazed under the deferred system. To examine further the utilization of the first three pastures; analyses of variance for each of them were calculated. It was shown that there was a significant variation among the first three pastures in the sources of variation: months, groups of grasses, the interactions pastures by sites, and pastures by groups of grasses. The analyses of variance for each of these pastures showed significant variation in sites and groups of grasses. The analysis

of variance for the pastures grazed under the deferred system showed significant variation in groups of grasses only.

Examination of the weighted data and the analysis of variance for the first three pastures indicated that the degree of utilization was highest in site 2 under light and moderate stocking and highest in site 1 under heavy stocking. The interaction between grazing intensity and site concealed the differences in overall degree of utilization among the pastures. Differences in the degree of utilization of the two groups of grasses, decreasers, and increasers and invaders, were anticipated due to the preference cattle generally exhibit for the decreasing species. The rate at which the increasers and invaders were taken was fairly constant from pasture to pasture and from site to site. Any significant variation between the groups of grasses was the result of varying degree of utilization of the decreasers among the various grazing intensities.

The most striking feature of the results of this study was the shifting of the higher degree of utilization from site 2 to site 1 as the grazing intensity was increased from moderate to heavy. This indicates the preference of cattle for the forage in site 2 when the grazing pressure does not force them to graze other sites. This preference cannot be explained on the basis of vegetational differences as the vegetation in site 1 was composed of more palatable species than that of site 2. Ordinarily it is expected that the cattle will show a

preference for the decreasin species until they are forced, by grazing pressure, to graze the increasing and invading species. The relatively constant rate of utilization of the increasers and invaders, in all grazing intensities, may have been caused by abnormal precipitation or the failure to stock the pastures at rates that would result in overgrazing.