

# Forage Preference and Grazing Habits of Cattle at the Eastern Colorado Range Station<sup>1</sup>

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The purpose of this study was to determine what native forage species and parts of these species were selected and consumed by cattle grazing upon sandhill ranges. In addition, grazing habits of the animals were studied.

It is an established fact that the chemical composition of range forage undergoes seasonal changes which may affect the nutrition of grazing animals (Hart, 1932; Stanley, 1938a and 1938b). Cook and Harris (1950) pointed out that preference for certain forage species was an important factor affecting the nutritive value of ingested forage. The need has been stressed for determination of botanical and nutritive composition of a grazing animal's diet so that grazing and range supplementation plans can be made (Cook and Harris, 1950; Harris *et al.*, 1952).

The many studies initiated by researchers to determine the botanical and nutritive content of the diet of grazing animals follow three general lines of methodology similar to those recognized by Lucas (1950): (1) nutritional methods, (2) observational methods, and (3) sampling before and after grazing. The work reported herein was ac-

complished by observational methods.

Observational methods, which involve following the animal as it freely grazes, have been employed by several workers. Many researchers in game management have used a method similar to that used by Dixon (1934) in California who followed deer and recorded the time they spent grazing each plant species. Stoddard (1952) however, noted that the time spent may not have any relationship to the amount of forage consumed.

Culley (1937) in Arizona found by observation that cattle generally showed indiscriminate use of most grasses, weeds, and shrubs. However, definite preference was shown for some species at certain times of the year. Preference was primarily influenced by summer temperature and stage of growth of plants.

Doran (1943) observed sheep in Colorado with the aid of field glasses. It was found that the time spent grazing grasses and forbs was closely correlated with their relative abundance. In a grazing habit study conducted in Kansas with range cattle, it was observed that preference changed through the seasons. The stage of growth of the plant and temperature influenced preference. It was noted that pastures must not be heavily grazed in order to obtain an expression of preference by the cattle (Moorefield and Hopkins, 1951).

The method of following grazing cattle and making an ocular estimate of the forage species consumed was utilized by Hub-

bard (1952) in Alberta, Canada. It was reported that availability and not palatability was a primary factor governing species intake.

Halls (1954) conducted a study in Georgia in which an approximation of cattle diet was made by observing tame cattle and recording the forage species and portion as it was eaten. The relative amount that each species contributed to the total intake was estimated. Forage samples were collected and chemically analyzed. Evidence was found of preference for certain species and certain parts of those species. However, the estimate of a species ratio was found to vary considerably without an appreciable change in the chemical composition. It was further concluded that the actual plant part being selected was of more importance than the species being consumed.

Grazing habit studies have been conducted for many classes of livestock in many areas of the United States. Several of these habits are of interest as they may influence or have direct bearing upon preference. They are also of interest in learning of the methods of observation used.

The activities observed have been many and include time spent traveling, feeding, licking salt, drinking water, resting while lying down, standing, ruminating while standing and lying, idling while standing, grazing, browsing, miscellaneous feeding, and supplemental feeding (Cory, 1927; Grelen and Thomas, 1957).

The time spent for observation of cattle varied from one 24-hour period a month (Cory, 1927) and four hours, two consecutive days a month (Halls, 1954) to 12 hours once a week (Moorefield and Hopkins, 1951).

Many devices were suggested for facilitating observation of cattle so that their grazing patterns are most normal. Halls

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(1954) found that with tame cattle it was best to observe the animals on foot. Peterson and Woolfolk (1955) utilized both a horse and a truck from which they observed cows and calves; a pickup truck was recommended by Grelen and Thomas (1957). Both Cory (1927) and Moorefield and Hopkins (1951) found it advisable to use field glasses.

The results of grazing habit studies are varied. Definite patterns of early morning and late afternoon grazing were reported by several workers (Culley, 1937; Moorefield and Hopkins, 1951; Grelen and Thomas, 1957).

Time spent grazing each day varied from 5 hours 36 minutes (Atkeson, *et al.*, 1942) to over 11 hours (Peterson and Woolfolk, 1955) and often depended upon the abundance of forage. Some researchers, such as Moorefield and Hopkins (1951), found grazing to occur primarily during daylight hours, while others, such as Peterson and Woolfolk (1955), reported some night grazing.

### The Study Area

The Eastern Colorado Range Station, which is located about midway between Akron and Sterling, is typical of a considerable area of sandhills in north-eastern Colorado. The predominant relief is that of dune type topography made up of many small depressions with no apparent drainage pattern. Such areas predominate and are termed "sandhill" range sites. Where the topography tends to be more nearly level, the range site designation is "sandy plains."

The vegetation on the study area is made up primarily of a tallgrass, sandreed (*Calamovilfa longifolia*) and a shortgrass, blue grama (*Bouteloua gracilis*).<sup>2</sup> These two warm season grasses

grow in a close mixture in certain areas and in separate patches in other areas.

An important bunch grass which commonly occurs on the better condition ranges is needle-and-thread (*Stipa comata*). This mid-grass is a cool season plant which contributes greatly to the quality of forage early and late in the growing season, provided there is adequate moisture.

Sand bluestem (*Andropogon hallii*), western wheatgrass (*Agropyron smithii*), and sand dropseed (*Sporobolus cryptanrus*) are occasionally abundant. Little bluestem (*Andropogon scoparius*), sideoats grama (*Bouteloua curtipendula*), and switchgrass (*Panicum virgatum*) are desirable grasses which occur only sparsely on the study area. Sun sedge (*Carex heliophila*) is the most abundant grasslike plant.

Three undesirable grasses commonly found are sandhill muhly (*Muhlenbergia pungens*), six-weeks fescue (*Festuca octoflora*), and red threeawn (*Aristida longisetata*).

The sandhill site usually has some sand sagebrush (*Artemisia filifolia*) which is considered desirable in small amounts. Yucca (*Yucca glauca*) occurs to a lesser extent than sand sagebrush.

The following forbs are some of the many which occur widely over the range; cudweed sage (*Artemisia ludoviciana*), bush morning-glory (*Ipomoea leptophylla*), puccoon (*Lithospermum incisum*), sand lilly (*Leucocrinum montanum*), and rush pea (*Hoffmanseggia jamesii*). Under certain conditions the following forbs are common in localized areas: western ragweed (*Ambrosia coronopifolia*), Russian thistle (*Salsola kali*), common sunflower (*Helianthus annuus*), scarlet globemallow (*Sphaeralcea coccinea*), ironplant goldenweed (*Haplopappus spinulosus*), pepperweed (*Lepidium densi-*

*florum*), and chimaya (*Cymopterus* sp.). Many other species of forbs occur, but they usually do not make up much of the total composition.

The estimated species composition as determined by ocular reconnaissance for all pastures in the study averaged approximately 40 percent sandreed, 40 percent blue grama, 4 percent needle-and-thread, 2 percent sand bluestem, 4 percent other grasses, 4 percent forbs, and 6 percent shrubs.

The climate of the study area is semi-arid with much of the precipitation falling as rain during the summer growing season. The 1956 growing season was 177 days from May 1 to October 14. The average growing season is probably nearly 146 days based on records from Akron. The average annual precipitation for the Station was 13.8 inches for a three-year period from 1955 through 1957.

### Procedure

This study was conducted from February, 1956, to January, 1957, to determine preference for native forage by yearling heifers. A pasture observation method was used monthly for a 48-hour period and consisted of following 20 heifers as they freely grazed in 100-to 400-acre pastures. Observations were limited to daylight hours. A pickup truck was found to be least disturbing to the heifers, and when supplemented by sixpower field glasses, a very good view of forage being selected could be maintained. Valid observations were made from as close as 6 feet to as much as 20 and 30 feet (Figures 1 and 2). A particular animal was observed at one time but the observation switched to other individuals as they came into range. This method can best be defined as resulting in a herd observation which tended to average out differences between animals.

<sup>2</sup>Scientific names follow nomenclature of Harrington, H. D. 1954. *Manual of the plants of Colorado*. Sage Books, Denver. 666 pp.

A unit was devised upon which an estimate could be based. This unit was called the mouthful. It was recognized that as the heifers grazed they gathered quantities of forage that ranged from nearly nothing to relatively large amounts. The mouthful unit allowed this difference in relative size of forage quantity consumed to be taken into account by recording in a relative manner  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , or 1 mouthful. A portion of a mouthful unit was considered to commence when the animal, having taken a stance over some forage, lowered her head and began to graze. The same unit was considered to end when the animal either stopped grazing to walk forward or simply took a step forward. In this manner the mouthful unit consisted of one to several actual bites of forage.

It was estimated what species and in what relative size each unit of observation consisted. A record was also made of the parts of plants being grazed and whether or not these parts consisted of green or old forage. The parts were considered to be stems and leaves, leaves, stems and heads, or all parts. Old forage included a previous season's herbage and most of the herbage after the first heavy frost.

The grazing habits of the herd of 20 heifers were also noted and

recorded. The observed habits consisted of the time spent grazing, lying, traveling, idling (standing at rest), watering, salting, and supplemental feeding. Also of importance were observations of the phenology of important forage species. Forage samples were collected by species for chemical analyses, but this study does not deal with these analyses.

The yearling heifers were fed daily 4 pounds of alfalfa hay at feedbunks during the period of early November to early May each year.

### Results

The yearling heifers observed at monthly intervals for one year exhibited a preference for certain species and plant parts. Preference was a phenomenon which changed to favor certain species at various seasons. This is indicated by the following presentation of observational data.

*February 10-12 and March 9-11, 1956:* Sandreed was the largest single component of the diet ranging from 41.1 to 45.9 percent (Table 1). Considerable use was made of blue grama, needle-and-thread, sand bluestem, and western wheatgrass. Forbs were rarely grazed. Shrubs comprised 14.6 percent of the diet during the February

period and only 3.4 percent in March.

The diet was made up predominantly of old forage, although some green forage was obtained from yucca and very few green leaves of sun sedge and needle-and-thread. Leaves, or a mixture of stems and leaves, were the most abundantly selected plant parts making up from 78 percent (February) to 84 percent (March) of the total diet. Light snowfall during both periods resulted in tall stubble heights for most species.

*April 5-7 and April 26-28, 1956:* The new growth of needle-and-thread attracted the cattle to this species, which made up from 55.2 percent to 56.8 percent of the total diet (Table 1). Sandreed and blue grama made up important amounts of the diet. Sun sedge and western wheatgrass furnished some early green forage in important amounts. Forbs were grazed very little and sand sagebrush was less important than earlier.

In early April, 54 percent of the diet was estimated to be green forage, while in late April green forage was estimated to be 67 percent of the diet. Plant parts preferred were leaves, which made up over 80 percent of the diet during both periods.

*June 1-3, 1956:* Green sandreed was very important during this

**Table 1. Percent composition by species of total forage consumed by yearling heifers at the Eastern Colorado Range Station, February 10, 1956-January 20, 1957.**

Species	Starting Dates of Observation Periods												
	Feb 10	Mar 9	Apr 5	Apr 26	Jun 1	Jun 27	Jul 24	Aug 21	Sep 15	Oct 18	Nov 16	Dec 17	Jan 18
	Percent												
Sandreed	41.1	45.9	19.9	27.2	53.9	62.1	55.1	25.9	46.6	1.8	1.4	7.8	2.5
Blue Grama	10.7	17.5	6.9	7.5	9.0	23.3	29.9	62.8	43.2	85.0	56.8	20.2	84.8
Needle-and-Thread	13.5	14.1	56.8	55.2	31.4	5.1	4.0	2.5	2.3	10.1	32.8	63.4	9.6
Sand Bluestem	12.4	13.9	4.5	*	2.0	3.1	3.3	1.5	.7	.5	.8	.0	*
Sand Dropseed	6.3	.7	.0	*	.0	1.8	3.0	2.5	.1	2.3	2.8	2.2	2.4
Western Wheatgrass	1.0	3.0	4.6	3.5	.2	.4	.3	.0	.0	.3	*	.3	*
Sun Sedge	.0	.7	5.6	6.6	*	.0	.2	.0	.0	*	.3	*	.0
Forbs	.5	.8	*	*	.4	3.5	4.2	4.8	6.8	*	.0	.0	.0
Sand Sagebrush	6.2	1.7	1.7	*	3.1	.0	.0	.0	.0	.0	5.1	6.1	.7
Yucca	8.4	1.7	.0	.0	*	.7	.0	.0	.3	.0	.0	.0	.0

\* Less than 0.05 percent.

period making up 53.9 percent of the diet while needle-and-thread still was important at 31.4 percent (Table 1). Blue grama, sand bluestem, and western wheatgrass were also selected in small amounts. Slight use was made of forbs. Possibly due to the extremely dry conditions for this time of year, new green sand sagebrush leaves and twigs made up 3.1 percent of the diet. Ninety-five percent of the forage selected was green. In addition, 99 percent of the plant parts taken was equally divided between a mixture of stems and leaves and leaves alone.

*June 27-28 and July 24-25, 1956:* During these periods sandreed made up from 55.1 to 62.1 percent of the total diet (Table 1). Blue grama responded to summer rains and gradually became more important in the diet, making up 23.3 to 29.9 percent of the forage selected. Needle-and-thread was preferred much less as it matured. Several other grasses were taken in small amounts. Selection of forbs became more common, although they were only 4.2 percent of the diet in July. Grazing of shrubs was uncommon.

Sandreed was observed to reach bloom stage by the July date while blue grama was in the dough stage by July. Needle-and-thread had matured by the July period. Over 98 percent of the forage grazed was green. The plant parts selected became more stemmy with a combination of stems and leaves making up over 50 percent of the diet. Leaves alone still made up from 36 to 41 percent of the diet.

*August 21-23 and September 15-17, 1956:* Blue grama was very important during these periods. It made up 62.8 percent of the diet in August and 43.2 percent in September (Table 1). Sandreed was taken in large quantities accounting for 25.9 and 46.6 percent of the diet in August and September respectively. Some

use was made of needle-and-thread, sand bluestem, and sand dropseed. Forbs made up from 4.8 to 6.8 percent of the total diet. Shrubs were only slightly used.

The grasses were in various stages of seed production in August, while many had shattered seed by September. In September needle-and-thread exhibited some basal leafage regrowth. The amount of green forage selected was in excess of 97 percent for both months although the quality of greenness was considerably less than found early in the summer. The forage was more stemmy than in early summer. About 55 percent of the diet was made up of all parts (stems, leaves, and seed heads) while over 30 percent was classified as stems and leaves.

*October 18-20 and November 16-17, 1956:* Blue grama continued to be a very important forage plant during these months making up from 56.8 to 85.0 percent of the total diet (Table 1). Sandreed was avoided by the heifers and in its place some of the cool season grasses exhibiting significant amounts of regrowth mixed with old forage were selected. Needle-and-thread was notable in this re-

spect, accounting for 10.1 and 32.8 percent of forage selected. Other grasses accounted for smaller amounts. Dried forbs were only slightly used. Sand sagebrush comprised 5.1 percent of the forage consumption in November.

The growing season ended October 14 and much of the past season's green forage was in an "old forage" classification. In October green forage was estimated to account for 21 percent of the diet, while in November it was only 3 percent as a result of colder temperatures. In October the plant parts grazed were 63 percent all parts, while in November the parts were 56 percent leaves and only 42 percent all parts.

*December 17-18, 1956:* The preference for needle-and-thread during this period was the greatest of any period during the study. It was estimated that the diet of the heifers consisted of 63.4 percent needle-and-thread, 20.2 percent blue grama, 7.8 percent sandreed, and 6.1 percent sand sagebrush (Table 1). A snow blanket, 2 to 3 inches deep, covered most of the range except where it had melted around sand sagebrush clumps. This



FIGURE 1. A heifer at the optimum observation distance, December 17, 1956. Grazing of sand sagebrush and associated needle-and-thread is a result of snow conditions.



FIGURE 2. Heifers grazing abundant sandreed and blue grama at the maximum observation distance, July 19, 1956.

fact, associated with the fact that needle-and-thread often grows in close association with sand sagebrush, made these two species most available for grazing heifers (Figure 1).

Needle-and-thread and sun sedge, both cool season plants, were able to withstand the cold night temperatures and utilize the moisture from the melting snow to maintain regrowth. All other species were dormant and dry. Only 6 percent of the forage consumed was green. Leaves made-up 61 percent of the total diet.

*January 18-20, 1957:* This period was characterized by very little snow cover and a change in the preference for forage by the grazing heifers. Blue grama made up 84.8 percent of the diet and needle-and-thread composed 9.6 percent (Table 1). Little use was made of sandreed and other grasses. Forbs were not selected. Sand sagebrush was grazed very slightly.

The only green forage during this period was a very few green leaves remaining in protected clumps of needle-and-thread. It was estimated that 99 percent of

the forage selected was cured. Over 50 percent of the diet was made up of all parts (stems, leaves, and seed heads) and 40 percent leaves.

#### Species Preference

Sandreed comprised most of the diet for six of the thirteen periods of observation (Figure 3). It was used primarily in the late winter periods and the sum-

mer periods, namely, February 10, March 9, June 1, June 27, July 24, and September 15. It was the second largest species component of the diet April 5, April 26, and August 21. During the December 17 and January 18 observations, sandreed was the third ranked component of the diet. It was less during the October 18 period when it was fourth ranked behind sand dropseed and the November 16 period when it was fifth behind sand sagebrush and sand dropseed.

Blue grama was the largest species component of the diet of heifers for 3 of the 13 observation periods (Figure 3). This preference was primarily expressed in late summer, fall, and early winter months. The August 21, October 18, November 16, and January 18 periods were dominated by preference for blue grama while during the September period blue grama composed nearly as much of the diet as sandreed. Blue grama made up over 80 percent of the diet during the October 18 and January 18 observation periods. Blue grama ranked second for the five periods of March 9, June 27, July 24, September 15, and

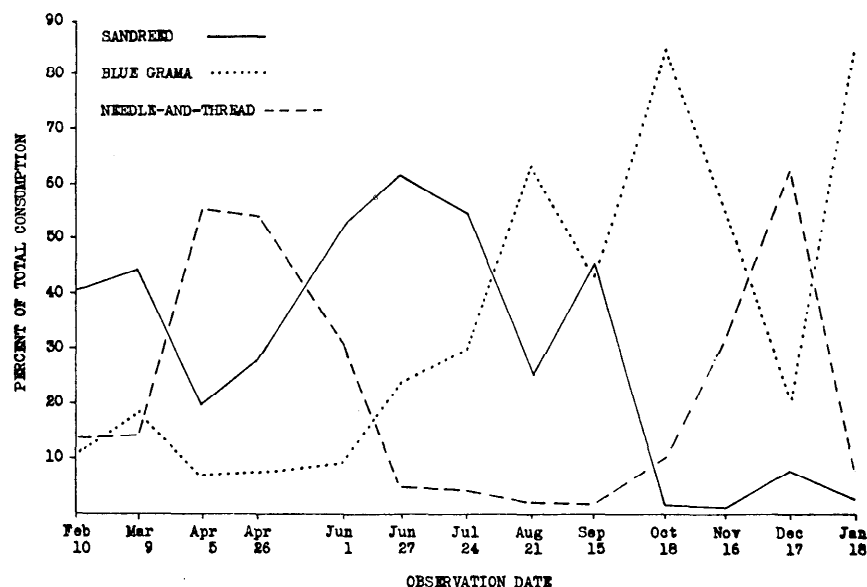


FIGURE 3. Seasonal consumption of three grasses at the Eastern Colorado Range Station, February, 1956—January, 1957.

December 17. This species ranked third during the three periods of April 5, April 26, and June 1. Blue grama was fourth behind sand bluestem during the February 10 period.

Needle-and-thread was the most preferred grass for 3 of the 13 observation periods (Figure 3). Two of these periods occurred in the spring and one in the late fall. They were April 5, April 26, and December 17. This species ranked second during the five periods of February 10, June 1, October 18, November 16, and January 18. During the periods of March 9, June 27, and July 24 it was third. The August 21 period results showed needle-and-thread fourth-ranked, with sand dropseed behind summer-cypress, while during the September 15 period of observation it was fourth-ranked behind ragweed.

The pattern of grazing use formed by sand sagebrush is of special interest, although it never comprised over 7 percent of the diet of the heifers. Use was made of this species during the spring, late fall, and winter months. During the June 1 period, use was made of green, leafy sand sagebrush and it made up 3.1 percent of the diet. In November it ranked third, making up 5.1 percent of the

diet. In December, in making up 6.1 percent of the diet it ranked fourth. Grazing use made of yucca, the other shrub, formed a pattern similar to that of sand sagebrush. During the period of February 10 it made up a significant 8.4 percent of the diet (Table 1). Grazing use was made primarily of green yucca leaves and secondarily of old leaves with no observed use of flower stalks or roots.

Forbs were used for the most part during the summer when in a green condition. As a group they were the third ranked component of forage consumed during the periods of July 24, August 21, and September 15. In August summer-cypress made up 3.7 percent for third ranking, and in September ragweed made up 3.1 percent of the diet for third ranking.

#### Daily Grazing Habits

The 13 observation periods allowed good opportunity to collect information about the habits of grazing heifers. These results are presented in Table 2. The active day was primarily a function of day length and varied from 9 hours, 30 minutes, on December 17, 1956, to 16 hours, 45 minutes, on both June 27 and July 24, 1956.

The time spent grazing is not

so closely correlated with day length as is the active day. Usually grazing started in the early morning before dawn and continued for 30 minutes to over an hour. Grazing occurred for periods during the mid-day, and in mid or late afternoon grazing intensified for a 3- to 5-hour period that often continued until after sundown. Little grazing was done in complete darkness, although a full moon at dusk seemed to prolong the evening grazing period significantly. During the summer months grazing frequently occurred in the mid or late morning hours, while in the winter this time was spent at supplemental feeding. During the growing season on June 2, 1956, 12 hours, 11 minutes were spent grazing. During supplemental feeding periods such as February, 1956, the grazing time was much less (Table 2).

Idling and lying were two activities indulged in nearly every day. When considered together they showed a tendency to increase in time with the increase was spent, varying from 35 minutes to one hour, consuming supplemental feed for six of the 13 observation periods (Table 2). This practice greatly controlled the patterns of travel in the pasture. The heifers were usually

**Table 2. Time spent by yearling heifers at various activities during observation periods at the Eastern Colorado Range Station, February 11, 1956-January 19, 1957.**

Observation Date	Active Day	Grazing	Idling	Lying	Supplemental Feeding	Salting	Drinking	Traveling
	Hours	Hours	Hours	Hours	Hours	Min.	Min.	Min.
Feb. 11, 1956	11.4	5.6	2.3	1.7	1.0	1	6	43
Mar. 10, 1956	13.2	6.1	1.6	4.3	1.0	5	5	....
Apr. 6, 1956	13.2	6.9	3.0	2.0	0.8	0	12	17
Apr. 27, 1956	15.0	9.8	2.7	2.1	0.0	8	11	6
June 2, 1956	15.9	12.2	2.5	1.0	0.0	3	6	6
June 27, 1956	16.7	8.1	5.7	2.4	0.0	0	13	15
July 24, 1956	16.7	8.4	3.6	4.5	0.0	0	12	5
Aug. 22, 1956	14.6	8.4	3.3	2.4	0.0	5	19	12
Sep. 17, 1956	13.8	9.9	2.5	1.0	0.0	5	10	10
Oct. 19, 1956	13.7	8.5	2.4	2.5	0.0	0	10	5
Nov. 16, 1956	11.6	7.6	1.7	1.2	0.6	0	6	23
Dec. 17, 1956	9.5	6.0	1.8	0.0	0.9	3	20	22
Jan. 19, 1957	12.0	7.7	1.3	1.6	0.9	1	10	19

at or near the feed areas as much as an hour before arrival of the feed. In addition, a rather direct course was often taken from the feeding area to water.

Water consumption occurred three times during the active day April 27, June 27, July 24, and August 22. On April 6, June 2, September 17, October 19, and December 17, the heifers were observed to drink twice; for the remaining four observation periods the heifers journeyed to the windmill only once for water. There appeared to be little relationship between the taking of salt and the drinking of water. The December period was the only one in which the heifers drank immediately after taking salt. The salt was more than  $\frac{1}{4}$ -mile from the water tank. Frequently they drank water before salting, but there was considerable time lapse before the salt was eaten. In November it was observed that after drinking all heifers changed their preference from grasses to sand sagebrush. In November the heifers were observed licking snow into their mouths. Very little travel was noticed unless it was for the purpose of obtaining water, moving to the supplemental feed area, or obtaining salt.

### Discussion and Conclusions

Based on the analysis of the data collected at 13 times during the year, it can be stated that preference for certain species was very definite and varied considerably at different times of the year.

Sandreed, blue grama, and needle-and-thread as a group made up from 65.3 percent to 96.9 percent of all the forage consumed. The species which contributed the most to the diet was always found to be one of these three species. Both blue grama and sandreed were present in the vegetation complex to such an extent that they were

readily available to grazing heifers. This fact indicates that relative availability of the species is one important factor influencing preference.

The cool season grass, needle-and-thread, consisted of green parts during the spring and fall, which caused this species to be much preferred at these times. Needle-and-thread was the most important source of forage during these periods. This occurred even though available needle-and-thread was estimated to be less than 5 percent of the species composition. At times when this species was preferred it had more green growth than sandreed or blue grama. This indicates that the stage of development of the plant is a primary factor determining the preference exhibited by grazing animals. The stage of development of a plant species may be important in the way it affects relative palatability of the species and, in some cases, the manner in which it affects the availability.

Many climatic conditions were observed to have little effect upon the preferential selection of native forage. One exception to this trend was the effect of snowfall. This caused grazing heifers to seek forage that was not covered by snow, which led to increased use of taller grasses and shrubs. The onset of cold winter temperatures, and the consequent ending of the growing season, resulted in a preference for the only "green" forage available, sand sagebrush and yucca.

The data indicate that certain parts of plant species are preferred to other parts at different times of the year. A tendency was noted for the grazing heifers to select green forage in preference to old. In addition, a preference was exhibited for leaves rather than stems and coarser forage. This should have resulted in a more nutritious diet

for the animals, considering the higher nutritive value of green leafy forage compared to old or stemmy forage (Maynard and Loosli, 1956).

It was observed that from mid-summer to the end of the growing season the parts of forage consumed became increasingly more stemmy. This occurred even though the forage was in what was considered a "green" stage. The quality of greenness was less than the bright green color of early summer. These facts were considered to indicate that the nutritive value of the forage grazed was lessening considerably with the passage of the growing season.

The 13 observations from February, 1956, to January, 1957, indicated that certain daily grazing habits were related to preference of native forage. The time spent grazing varied according to the presence of supplemental feeding and conditions of the native forage. The longer periods of grazing, April 27 and June 2, may be associated with preference for needle-and-thread at this time. This period was lacking in precipitation, and green forage was at a premium. The difficulty in finding and selecting green forage from the vegetation complex may have resulted in increased time spent grazing.

Idling and lying apparently increased as day length increased. This increased demand for rest during the growing season may also be in response to higher temperatures. Supplemental feeding was noticed to effect the routes of travel considerably. The heifers were observed before feeding to graze toward the feeding area in the morning and after feeding to graze and travel rather directly to water. This suggests that periodic changes in the feeding area might direct grazing and trampling to other areas of a pasture.



It was observed that the location of water determines many of the travel patterns in a pasture. On at least one occasion the consumption of water was followed by a change in forage preference from grass to shrubs. This indicates that proper location of water or movement of its location may result in more efficient use of a pasture. In addition, after consumption of water, preference may change from certain plants to others. The use of salt was observed to have less effect upon the movement than either supplemental feeding or water location.

### Summary

A study was conducted at the Eastern Colorado Range Station to determine what species of native forage are selected and consumed by cattle. Related grazing habits were also studied. The method used consisted of observation of heifers which were grazing unrestricted in native sandhill pastures.

This study revealed that the heifers showed a variable preference for different species at different times of the year. Sandreed was observed to be the main constituent of the diet during the late winter and summer period of observation. Blue grama was important during the winter periods. Sandreed and blue grama were very abundant and available compared to the other major species, needle-and-thread. Needle-and-thread was important during spring and fall months. Other grass species made significant contributions during certain periods. Considerable use was made of other cool season species, such as sun sedge and western wheatgrass during the early spring. Forbs

were of some importance during the growing season. Shrub use, both sand sagebrush and yucca, was of importance primarily in winter.

Grazing heifers showed a tendency to select green forage in preference to old forage. Favor was also shown for leaves in preference to stems. With the passage of the growing season, the ingested forage was judged to become increasingly more stemmy.

It was concluded that forage species selected by grazing heifers were not necessarily in proportions coinciding with the abundance of those species in the pasture. Therefore, the nutritive value of ingested forage may be of higher quality than the average nutritive value for the pasture based on relative plant abundance alone.

The time spent at certain daily grazing habits was largely a function of day length with variations caused by supplemental feeding and availability and growth stage of native forage.

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