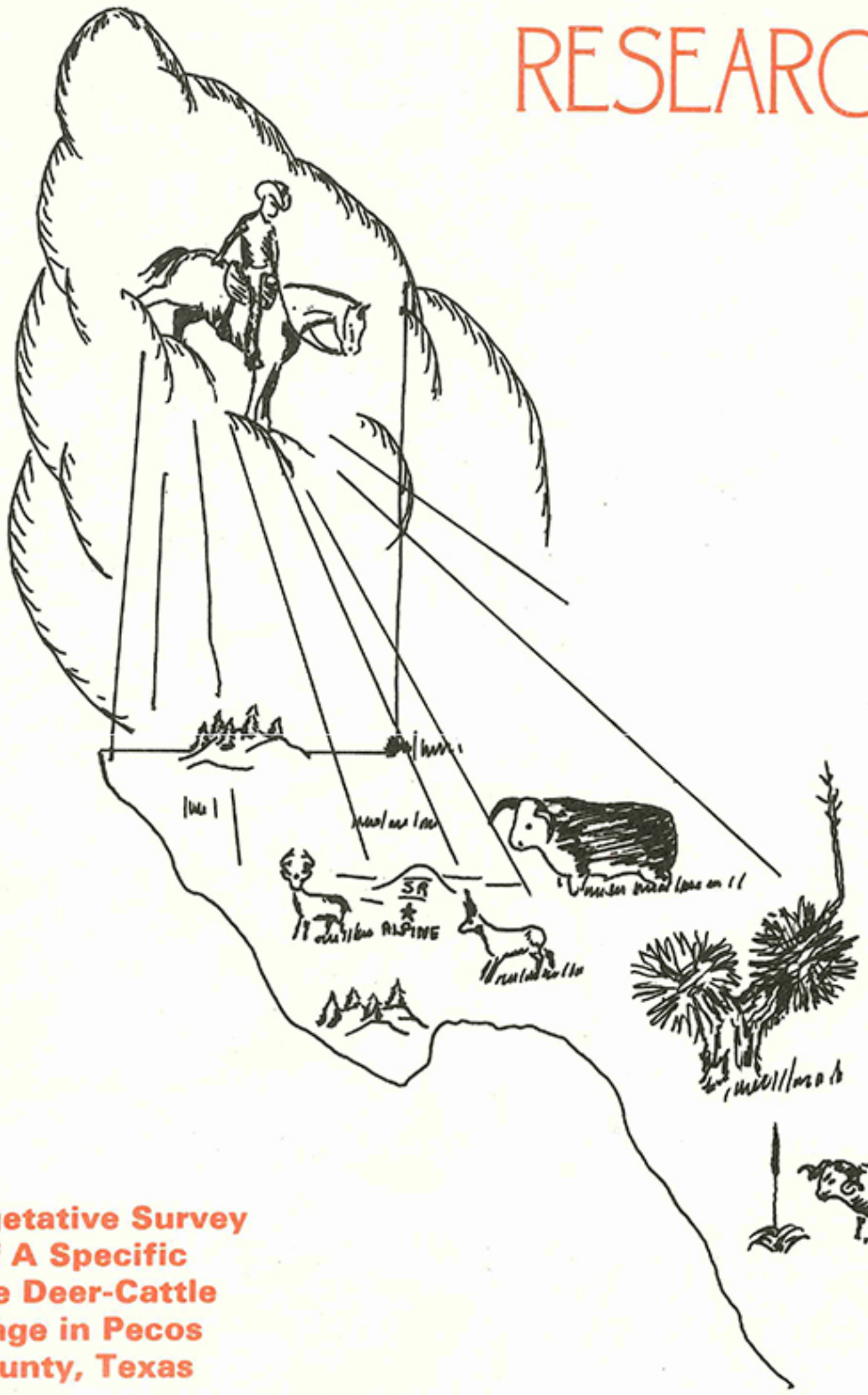
Fall 1974
Vol. 1 No. 2

RANGE ANIMAL SCIENCE RESEARCH SERIES



A Vegetative Survey Of A Specific Mule Deer-Cattle Range in Pecos County, Texas

by

Samuel O. Nance, Jr.

and

C. Wayne Hanselka

Published By

Range Animal Science Department

Sul Ross State University

Alpine, Texas 79830

Published 1974 by
Range Animal Science Department
Sul Ross State University
Alpine, Texas, USA

Printed by
Sul Ross State University Press

Range Animal Science Research Series

Vol. 1 Fall 1974 No. 2

A Vegetative Survey of a Specific Mule Deer-Cattle Range in Pecos County, Texas

by

Samuel O. Nance

and

C. Wayne Hanselka

Range Animal Science Department

SUL ROSS STATE UNIVERSITY

Alpine, Texas 79830

A Vegetative Survey of a Specific Mule Deer-Cattle Range in Pecos County, Texas

by

Samuel O. Nance
Graduate Assistant, RAS Department
Sul Ross State University

C. Wayne Hanselka
Associate Professor, RAS Department
Sul Ross State University
Alpine, Texas

ABSTRACT

A vegetative survey was conducted during the fall and winter months on a mule deer *(Odocoileus hemionus crooki)*-cattle range in Pecos County, Texas. A pasture near the headquarters was selected for the study and a plant collection was compiled for reference. A study area within the pasture was designated for the vegetative analysis.

A type map was constructed of the study pasture and six major plant associations were distinguished according to overstory species.

The results of the range survey indicated that blue grama *(Bouteloua gracilis)* was the dominant grass throughout the pasture. Buffalograss *(Buchloe dactyloides)* was abundant on all sites with the exception of the hillsides and the desert shrub areas. Wright threeawn *(Aristida wrightii)* was also in evidence in all areas.

Forb species that were most evident were gray coldenia *(Coldenia canescens)*, grassland croton *(Croton dioicus)*, and sticky selloa *(Gymnosperma glutinosum)*. Annual broomweed *(Xanthocephalum sarothrae)* was found in abundance on the mesa top.

Redberry juniper *(Juniperus pinchotii)* appeared to be the dominant shrub throughout the pasture. Skeletonleaf goldeneye *(Viguiera stenoloba)* and catclaw *(Mimosa biuncifera)* dominated the top and sides of the hills while mesquite *(Prosopis glandulosa)*, tarbush *(Flourensia cernua)*, and creosote bush *(Larrea divaricata)* dominated the lower elevations. The lateral "headers" of the hills contained small communities of oak *(Quercus emoryi)*, hackberry *(Celtis reticulata)*, and Spanish walnut *(Juglans microcarpa)*.

The study pasture was judged to be in fair condition at the time of the analysis. The carrying capacity coincided with the present stocking rate (21 ha/animal unit). Appraisal indicated that the pasture was not overgrazed.

The grazing habits and behavioral patterns of both mule deer and cattle should be determined to produce data for a more exact stocking rate.

This study is part of a thesis submitted as partial fulfillment of the requirements for a Master of Science in Range Animal Science, Sul Ross State University, by the senior author. The authors acknowledge the assistance of Barton Warnock and A. Michael Powell in plant identification and preparation of the manuscript. Jerry Phillips and Harry Schaaf assisted in the field work. Special mention is made of Mr. William Blakemore II, Mr. Eddie Dwyer, and Mr. Lewis Hill for their cooperation in allowing this study to be conducted on the Longfellow Ranch. The study was supported, in part, by a grant from the Houston Livestock Show Association.

INTRODUCTION

Approximately 40% of the land on the earth's surface falls in the category of rangeland. This area, with its characteristic grassland vegetation, is only suitable for management by ecological principles rather than by agronomic principles. In the past, rangelands have been utilized primarily by grazing animals. With increasing population pressures and increased leisure time more demands are being placed upon the rangelands of the world. They must continue to produce increased supplies of animal products demanded by society and, at the same time, produce recreational outlets for an urban oriented society.

Many wild species of animals, in addition to domestic livestock, depend on the grasslands for sustenance. Competition between the native herbivores and domestic livestock may be of serious concern to the land manager. The best use of the range, as determined by cultural and economic interests and molded by management practices, may fit only peripherial interest in the others. Knowledge of the dynamics of the species interactions involved is a prerequisite in making management decisions.

In the Trans-Pecos region of Texas the desert mule deer *(Odocoileus hemonius crooki)* is the largest ungulate living in close association with domestic livestock. It would be of value to ranchers and to wildlife biologists to know the extent that mule deer and cattle compete for the same forage on the same range.

The logical starting point for determining possible competition is a survey of the vegetation on the range designated for the study. Determination of the locations and composition of the plant communities within the area is the basis for locating key grazing and browsing areas of both mule deer and cattle. This paper describes the range survey that was conducted to gain the information necessary for locating and analyzing these key areas.

Surveys usually attempt to delineate vegetative types. These types, or communities, are then analyzed for several botanical characteristics. Species composition, density, cover (basal and/or canopy), and productivity are the characteristics that are usually examined.

Surveys examining these characteristics have been conducted in short grass and semiarid regions of the United States. In Nevada, a series of studies were conducted to aid management of 12 range watershed areas. A description of the climax and seral units of vegetation and associated soils were recorded (Blackburn, Tueller and Eckert, 1968a; 1968b; 1968c, 1969). Seventeen plant communities were delineated and examined for tree density and crown cover, basal area and cover, frequency, nonliving ground cover, constancy, topographic and physiographic features, soils, and climate.

Haase and Schreiber (1972), in Arizona, produced valid information concerning plant cover on an area similar to that of Southwest Texas. They investigated variation in plant cover with aspect, slope position, and soil attributes. These factors influenced the development of two plant communities—*Bouteloua eriopoda* (Black grama) and *Hilaria belangeri* (Curley mesquite). Also in Arizona, McClearey and Wagner (1972) analyzed three arid plant communities to obtain the important values of the perennial plant species. *Calliandra eriophylla* (Calliandra), *Acacia greggii* (catclaw) and *Larrea divaricata* (creosote bush) proved to be the most important species in each of the respective communities.

Studies in the Trans-Pecos region of Texas have ranged from annotated floras (Havard, 1885; Hinckley, 1949; Billings, 1970) to detailed work plans of agency personnel. Weyerts (1961) conducted an ecological survey on a two section tract of rangeland in Brewster County to determine possible improvements for increasing forage production. Hanselka (1973) and Porter (1962) analyzed portions of desert shrub communities in the southern areas of Presidio and Brewster counties. Creosote bush *(Larrea divaricata)* densities ranged from 1375 plants/ha to 1357 plants/ha. Wallmo (1957) conducted an extensive ecological survey of the Big Bend area of Texas. His studies included an analysis of the vegetation.

Brownlee (1971) has continued Wallmo's studies of the Black Gap Wildlife Management Area located northwest of the Big Bend National Park. Forbs and grasses on three geologic units (basalt, limestone, and alluvial) were analyzed for percent composition and basal cover. Shrub density was calculated.

The vegetation of Southwest Texas has been analyzed on the basis on vegetative types. York (1949) worked on the vegetation of the Sierra Vieja mountain range in Presidio County. He described 14 vegetative types in three vegetation belts and one biotic district. Blair (1940) conducted a similar study in the Davis Mountains in Jeff Davis County.

Tharp (1944) and Webster (1950) investigated vegetative types in Pecos and Terrell counties on the Stockton Plateau where the present study was conducted. Webster (1950) limited his investigation to a study area in the northeastern portion of Terrell County. Tharp (1944) generalized about the whole of the "mesa country" of the plateau. Tharp delineated nine vegetational types whereas Webster described thirteen communities.

EXPERIMENTAL PROCEDURE

Description of the Experimental Area

The present study was conducted on the Longfellow Ranch located 26.6 km west of Sanderson in Pecos County, Texas. The study area is in a 4,259 ha pasture (Fig. 1), located south of the headquarters and approximately 46.6 km north of U.S. highway 290. This pasture is located between 30°26′15″ and 30°22′32″ N latitude and 102°37′29″ west longitude.

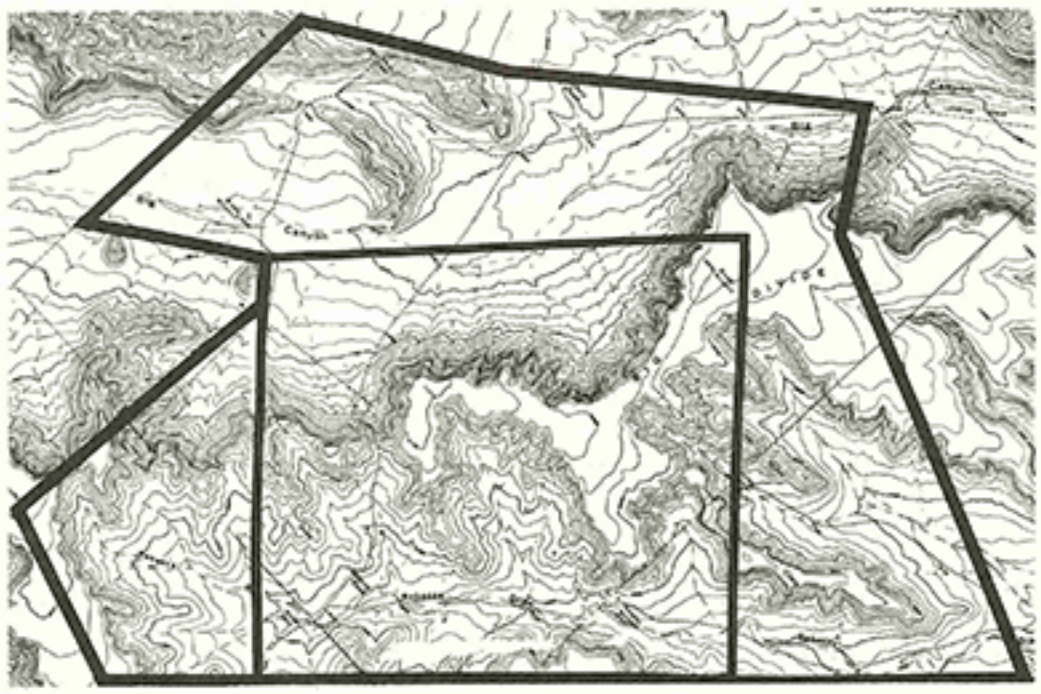


Figure 1. Topographic features of the Study Area.

The ranch is stocked moderately (21 ha/animal unit) with Santa Gertrudis cattle and a large mule deer herd (4.4 ha/deer). Hereford cattle utilized this range prior to 1949, with no record of use by sheep.[1]

The area is located in a semi-arid region, characterized by mild winters and hot summers. There are approximately 226 days in the growing season.[2] Precipitation totaled 35.25 cm during 1972 (Table 1). Rainfall during this period was highest in July and August with 8.50 cm and 9.50 respectively and lowest during the months of March, April, November, and December with no precipitaion recorded. The recordings for January and February are approximate figures as a result of snowfall.

The study area is on the Stockton Plateau, a southward extension of the Edwards Plateau. This area was formerly a continous limestone tableland which is being eroded away (Hawley, 1971). It is characterized by flat topped mesas alternating with broad valleys. Lateral to the broad valleys are many "header" canyons of varying widths which lead up between the mesa slopes to near the limestone rimrock (Webster, 1950). The altitude varies from ap-

[1]Mr. Louis Hill, personal communication
[2]United States Soil Conservation Service, unpublished data

proximately 1090 m in the valleys to approximately 1236 m on top of the mesas.

Table 1. Precipitation in the study area for 1972*.
(CM)

Month	Total Rainfall
January	0.50
February	0.50
March	0.00
April	0.00
May	4.75
June	2.75
July	8.50
August	9.50
September	5.50
October	3.25
November	0.00
December	0.00
Total	35.25

***As recorded by Lewis Hill at Longfellow Ranch (unpublished data)**

There are six range sites within the study area. A range site is an area of land having a combination of edaphic, climatic, topographic, and natural biotic factors that are different from adjacent areas (Huss, 1964).

The following site descriptions are taken from a United States Soil Conservation Service worksheet (unpublished data).

The Low Stony Hills Site is found primarily in northwest portion of the study pasture. This site contains limestone hills with slopes ranging from rolling to steep. The soils are classified as Ector Stony Loams. These soils are very shallow resulting in a low water holding capacity. Approximately 50 percent of the surface is covered with limestone fragments up to 0.6 m in diameter.

The Deep Soil Site is located on the broad plains between the mesas. The soil within this area is Regan Silty Loam and is 35 cm to 75 cm deep. It is capable of holding 5 cm to 6.25 cm per 30 cm of depth. This area, at present, is poorly protected by a desert shrub type cover resulting in crusting of the soil. This crusting inhibits infiltration of water and contributes to high runoff with considerable sheet and gully erosion.

The Gravelly Site occurs as a narrow band at the foot of large limestone hills. The soils are Upton Gravelly Clay Loam and Sanderson Gravelly Loam. These soils vary from 25 cm to 75 cm deep and consist of approximately 30 percent by volume of gravel up to 2.5 cm in diameter. Some areas have a caliche layer at 25 cm to 60 cm. Infiltration is moderate but the water holding capacity is low with runoff moderate to high.

The Steep Rocky Site is found on the nortwestern slope of the divide. This site contains very steep and stony slopes composed of large fragments of boulders and outcrops of hard limestone. The soil in this area is Ector Stony Hills. Soil cover is less than 20 percent but has a good plant - air - soil - moisture relationship, making rainfall highly effective. Due to the steep slope and large amount of rock cover, water runoff is high if unprotected by vegetation.

The Shallow Divide Site is located on the flat tops of the mesas. The slopes range from flat to gently sloping. Ector Stony Clay Loam is the soil found in this site. These are clay loams, 15 cm to 25 cm in depth and consist of approximately 50 percent by volume of limestone fragments and stones. The soils are moderately permeable and have a good plant - soil - air - moisture relationship, but due to the shallow depth there is a limited moisture storing capacity. These soils tend to crust badly if unprotected by plant cover.

The Overflow Sites occur as narrow draws which receive runoff water from adjoining sites. The soils found on this site are Dev Very Gravelly Loam, Gila Loam and Frio Clay Loam. These soils are moderately permeable and have a good plant - atmosphere - moisture relationship. This site receives additional water from runoff.

Materials and Methods

The vegetative survey was conducted within a designated portion of the study pasture (Fig. 1). This sampling area is indicated by the area enclosed within the outside boundaries of the study pasture. This sampling area consists of approximately 2,500 ha or approximately 58 percent of the study pasture.

A plant collection was made in the study pasture. These plants were pressed, mounted on herbarium sheets, and identified for reference. Nomenclature followed Correll and Johnston (1970).

Six lines for sampling were established in a stratified manner approximately .85 km apart. These lines lie in a northwest, southeast direction and are 3048.8 m in length. The base for these lines is established on the south fence of the study pasture, which is oriented in a northeast, southwest direction. Each line consists of four 304.6 m transects with a 609 m interval between each transect. Transect number 1 of line 1 begins at the base; transect number 1 of line 3 begins back at the base, etc. to produce a staggered effect.

The first three m of each 30 m of the transects were analyzed for basal area ground cover of plant species, utilizing the line-intercept method.

Shrubs were measured along the transects at three predetermined points; at the beginning, at 152 m, and at 304 m. The point-centered quarter method (Cottam and Curtis, 1956) was used to estimate the relative dominance and relative density of the shrubs.

Square meter clips were taken at 76 m and 228 m along the transects to determine forage production. These clips represent total herbaceous forage production. The samples were air dried and weighed.

The transects were separated into vegetational types for calculating the data. These vegetational types were determined by constructing a vegetative type map of the study area.

Range condition for the study pasture was calculated by use of the "toe" method (Brown 1954). This method requires only to record plant "hits" at the toe of the boot at predetermined number of steps. Square meter clips were made by species to supplement the information.

RESULTS AND DISCUSSION

A total of 207 plant species in 56 families were collected from the study area. These plants can be separated into 50 brush and shrub species, 110 forb species, and 47 grasses species. *Yucca, Dasylirion,* and *Fouquieria* species were included within the brush and shrub category. The family *Polypodiaceae,* which is made up of fern species, was included within the forb count. New Mexico feathergrass (*Stipa neomexicana*) was not collected. This grass appeared in abundance on the Low Stony Hill Sites during the early spring but was not found during the collecting and analysis period.

The vegetation complex on the study area includes six major plant associations. These were named after the dominant shrub species (Fig. 2). The associations include: redberry juniper (*Juniperus pinchotii*)/mesquite (*Prosopis glandulosa*), Mesquite/lotebush (*Ziziphus obtusifolia*), skeletonleaf goldeneye *(Viguiera stenoloba)*/catclaw (*Mimosa biuncifera),* tarbush (*Flourensia cernua*)/creosote bush (*Larrea divaricata*), redberry juniper/javalina bush (*Microrhamnus ericoides*)/catclaw, and sotol *(Dasylirion texanum*)/redberry juniper.

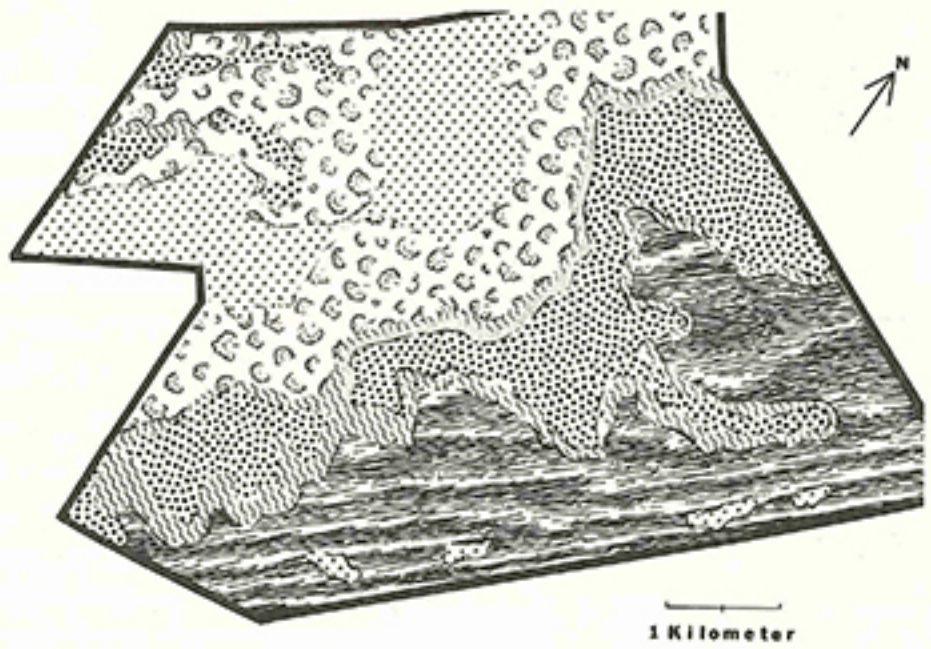


Figure 2. Vegetative Types in the Study Pasture

LEGEND

Juniper/Mesquite Association

Mesquite/Lotebush Association

Skeletonleaf goldeneye/Catclaw Association

Tarbush/Creosotebush Association

Juniper/Javelinabush/Catclaw Association

Sotol/Juniper Association

In the following discussion the vegetative types are discussed in order of approximate percentage of the study pasture that they occur.

Juniper/Mesquite Association

The Juniper/Mesquite Association is located primarily in the southern portion of the study pasture (Fig. 2). It is the largest in area, occupying approximately 30% of the pasture. This area is a shallow valley between mesas. Low Stony Hills and Overflow Sites comprise the majority of the juniper/mesquite association (Fig. 3).

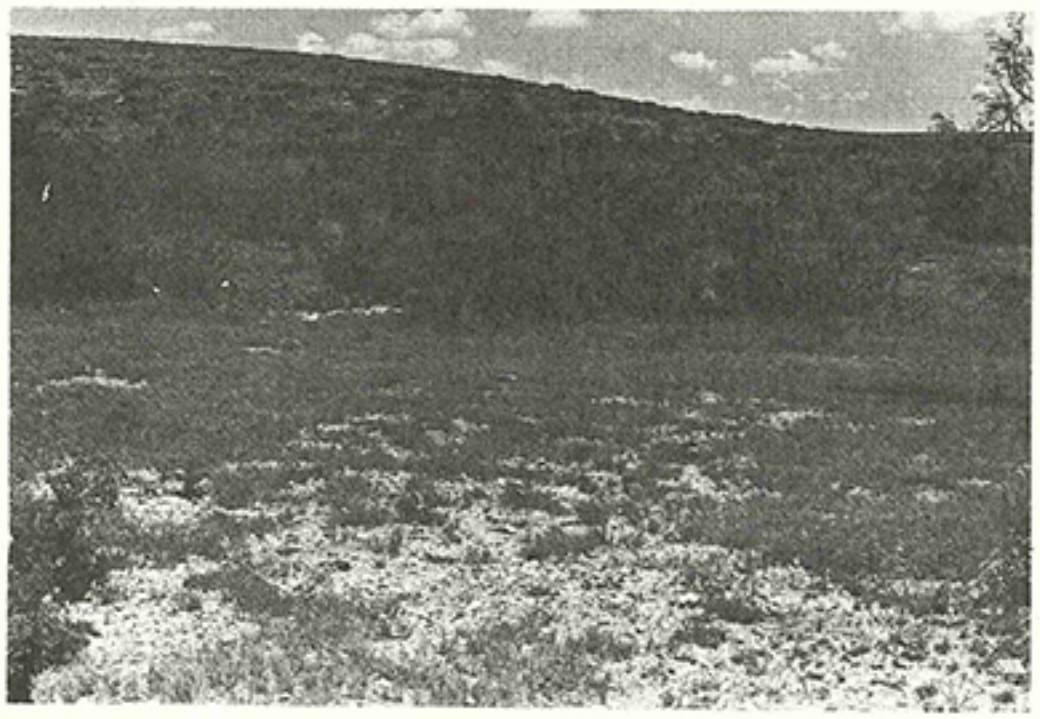


Figure 3. The Juniper/Mesquite Association

The total basal ground cover in the juniper/mesquite area is 25.5% (Table 2). Buffalograss (*Buchloe dactyloides*) is the dominant grass representing 11.1% of the ground cover and 43.8% of the total plant composition. It is found in almost solid mats in the overflow areas. Blue grama (*Bouteloua gracilis*) is found throughout the juniper/mesquite association representing 7.4% of the ground cover and 29.0% of the plant composition. Gray coldenia (*Coldenia canescens*) was the only significant forb present at the time of the analysis. It represents 0.4% of the ground cover and 1.6% of the total composition.

Table 2. Ground cover and composition of the Juniper/Mesquite Association.

Species	Ground Cover (%)	Composition (%)
Buchloe dactyloides	11.1	43.8
Bouteloua gracilis	7.4	29.0
Tridens pilosus	1.5	5.6
Aristida longesita	1.2	4.4
Muhlenbergia porteri	.8	3.2
Panicum hallii	.7	2.8
Juniperus pinchotii	.6	2.4
Bouteloua curtipendula	.4	1.6
Coldenia canescens	.4	1.6
Setaria leucopila	.4	1.6
Bouteloua trifida	.3	1.2
Aristida adscensionis	.1	.4
Bouteloua eriopoda	.1	.4
Croton dioicus	.1	.4
Dyssodia pentachaeta	.1	.4
Scleropogon brevifolius	.1	.4
Tridens albescens	.1	.4
Tridens pulchellus	.1	.4
Total	25.5	100.0

Redberry juniper (*Juniperus pinchotii*) is the dominant shrub indicating a relative dominance of 55.1% calculated from the basal diameter (Table 3). The relative density of the redberry juniper is 54.2%. Mesquite is abundant throughout this area showing a relative dominance of 30.8% and relative density of 33.3%. Little leaf sumac (*Rhus microphylla*) was found scattered over the juniper/mesquite association with a relative dominance of 10.3% and a relative density of 8.3%.

Total forage production for the juniper/mesquite association was approximately 408 kg/ha. This low production is partially explained by the abundance of buffalograss, which does not produce heavy yields. A factor which may also be considered is that this area is utilized to a great extent by livestock.

Table 3. Relative dominance and density of shrubs on the Juniper/Mesquite Association.

Species	Relative Dominance (%)	Relative Density (%)
Juniperus pinchotii	55.1	54.2
Prosopis glandulosa	30.8	33.3
Rhus microphylla	10.3	8.3
Yucca elata	3.8	4.2
Total	100.0	100.0

Mesquite/Lotebush Association

The mesquite/lotebush association occupies approximately 25% of the study pasture and is found in two major areas in the pasture. The largest area is located at the base of the northwestern slope of the divide and extends the length of the pasture. The smaller area is located in the west corner of the study pasture encircling the lower slopes of low hills (Fig. 2). This association is found on a Gravelly Site (Fig. 4).

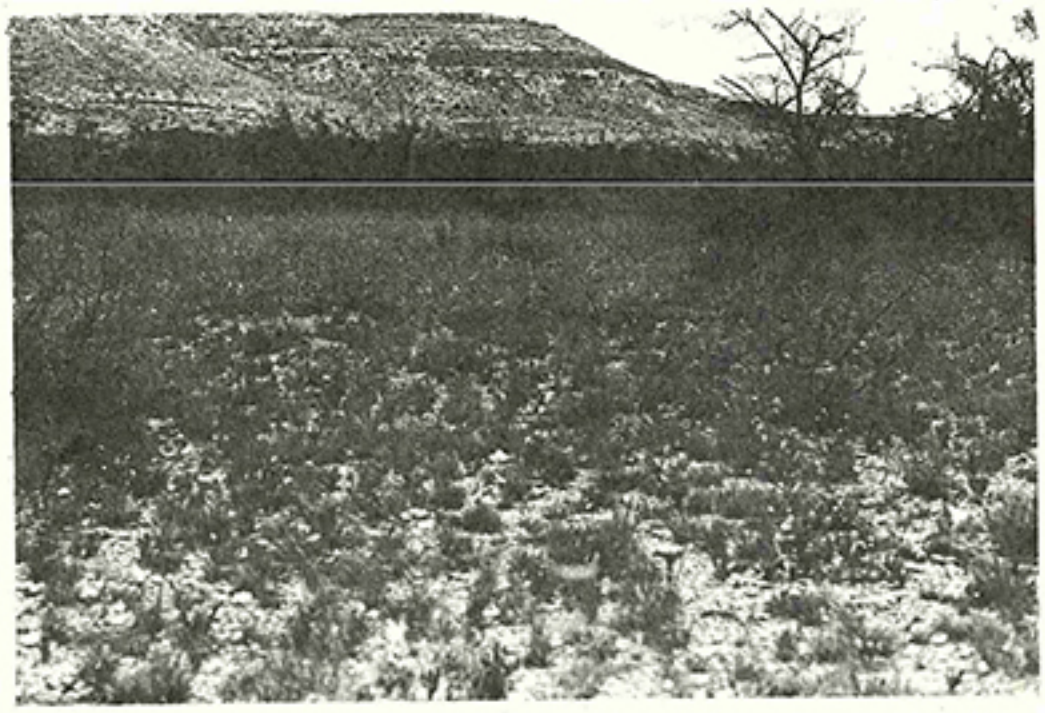


Figure 4. The Mesquite/Lotebush Association

The total basal ground cover of the mesquite/lotebush association is approximately 14.83% (Table 4). The plant community within this area includes an abundance of species. Blue grama is the dominant grass, representing 4.37% of the basal area and 28.9% of the plant composition. This grass is found throughout the mesquite/lotebush association. Buffalograss comprises 1.86% of the ground cover and 22.0% of the total plant composition. It is found in low areas and draws. Wright threeawn (*Aristida wrightii*) is in evidence throughout the association. The ground cover for wright threeawn is 1.40% and it represents 9.6% of the total plant composition.

Table 4. Ground cover and composition of the Mesquite/Lotebush Association.

Species	Ground Cover (%)	Composition (%)
Bouteloua gracilis	4.37	28.9
Buchloe dactyloides	1.86	22.0
Aristida wrightii	1.40	9.6
Coldenia canescens	1.18	8.1
Erioneuron pulchellum	.75	5.2
Tridens pilosus	.63	4.3
Setaria leucopila	.52	3.6
Bouteloua curtipendula	.50	3.4
Berberis trifoliolata	.50	3.4
Croton dioicus	.35	2.4
Eragrostis cilianensis	.33	2.3
Aristida longiseta	.28	1.9
Tridens muticus	.27	1.8
Zinnia acerosa	.27	1.8
Andropogon barbinodis	.23	1.6
Flourensia cernua	.23	1.6
Buddleja scordioides	.20	1.4
Juniperus pinchotii	.17	1.2
Biguiera stenoloba	.17	1.2
Muhlenbergia arenicola	.13	.9
Bouteloua eriopoda	.10	.7
Leptoloma cognatum	.10	.7
Solanum elaeagnifolium	.10	.7
Panicum hallii	.07	.5
Prosopis glandulosa	.06	.4
Thelesperma longipes	.06	.4
Total	14.83	100.0

Gray coldenia is again the most abundant forb occupying 1.18% of the ground cover and 8.1% of the plant composition. Grassland croton (*Croton dioicus*), spinyleaf zinnia (*Zinnia acerosa*), silverleaf nightshade (*Solanum elaeagnifolium*), and longstalk greenthread (*Thelesperma longipes*) has a ground cover of 0.35%, 0.27%, 0.10% and 0.06% respectively. These are only forbs found along the transect.

Mesquite is the most dominant shrub with a relative dominance of 39.8% and a relative density of 39.0% (Table 5). Lotebush has a relative dominance of 15.0% but a relative density of 2.7% which indicates that the shrub is not abundant. Tarbush has a relative dominance of 14.0% and a relative density of 22.3% as result of analysis along a transitional zone between the mesquite/lotebush and a desert shrub type community. Agarita *(Berberis trifoliolata)* can be seen in abundance in the area but has a relative dominance of 2.2% and relative density of 2.7%.

Square meter clips indicate a forage production of 381.5 kg/ha. The area contains a wide variety of species as mentioned above; however, ground cover is relatively sparse. The many shrub species found invading the Mesquite/Lotebush Association are indicators of overuse.

Table 5. Relative dominance and density of shrubs on the Mesquite/Lotebush Association.

Species	Relative Dominance (%)	Relative Density (%)
Prosopis glandulosa	39.8	39.0
Ziziphus obtusifolia	15.0	2.7
Flourensia cernua	14.0	22.3
Juniperus pinchotii	9.7	5.6
Mimosa biuncifera	7.5	13.8
Rhus microphylla	4.3	5.6
Viguiera stenoloba	4.3	5.6
Microrhamnus ericoides	3.2	2.7
Berberis trifoliolata	2.2	2.7
Total	100.0	100.0

Skeletonleaf Goldeneye/Catclaw Association

The flat topped mesas and hills contain a Skeletonleaf goldeneye/Catclaw Association. This area occupies approximately 20% of the study pasture (Fig. 2). The terrain varies from almost level on top of the mesa to steep slopes of the hills. The range sites would include both Shallow Divide and Steep Rocky Sites (Fig. 5).

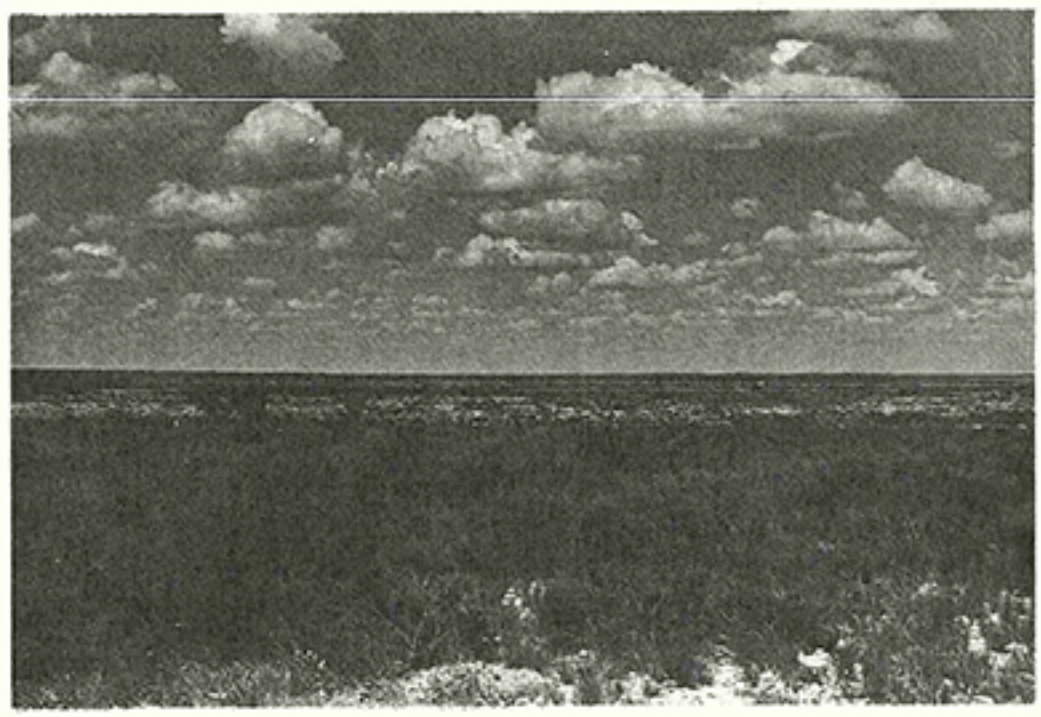


Figure 5. The Skeletonleaf goldeneye/Catclaw Association

Blue grama is the dominant grass with approximately 4.8% ground cover and 23.3% of the total plant composition (Table 6). Curleyleaf muhly *(Muhlenbergia setifolia)* and slim tridens (*Tridens muticus*) have a ground cover of 2.5% and 2.0% respectively. Curlyleaf muhly is found primarily on the slopes while slim tridens is more abundant on the mesa.

On the mesa top, annual broomweed (*Xanthocephalum sarothrae*) appears to be the dominant plant; however, it represents only 2.4% of the ground cover and 11.6% of the plant composition. Other forbs

Table 10. Ground cover and composition of the Juniper/Javalinabush/Catclaw Association

Species	Ground Cover (%)	Composition (%)
Aristida wrightii	2.1	14.5
Muhlenbergia rigens	1.7	11.7
Bouteloua gracilis	1.6	11.0
Bouteloua curtipendula	1.5	10.3
Tridens muticus	1.4	9.7
Muhlenbergia setifolia	1.3	9.0
Gymnosperma glutinosum	.9	6.2
Tridens pilosus	.8	5.5
Viguiera stenoloba	.7	4.8
Panicum hallii	.5	3.4
Zinnia acerosa	.5	3.4
Leptoloma cognatum	.4	2.8
Buchloe dactyloides	.2	1.4
Dasylirion texanum	.2	1.4
Notholaena sinuata var. *cochisensis*	.2	1.4
Quercus emoryi	.2	1.4
Aristida longiseta	.1	.7
Berberis trifoliolata	.1	.7
Mimosa biuncifera	.1	.7
Total	14.5	100.0

Table 11. Relative dominance and density of shrubs on the Juniper/Javalinabush/Catclaw Association

Species	Relative Dominance (%)	Relative Density (%)
Juniperus pinchotii	60.0	54.1
Microrhamnus ericoides	13.3	16.7
Mimosa biuncifera	13.3	12.5
Viguiera stenoloba	6.8	8.3
Dasylirion texanum	3.3	4.2
Prosopis glandulosa	3.3	4.2
Total	100.0	100.0

Sotol/Juniper Association

The steep portion of the northwestern slope of the mesa is characterized by a sotol/juniper association. This community occupies approximately 5% of the study pasture (Fig. 2). Steep Rocky Sites are the range sites on which this association is found (Fig. 8).

Figure 8. The Sotol/Juniper Association

The basal ground cover for this association is 16.65% (Table 12). Wright threeawn is the most abundant grass found here, representing a basal ground cover of approximately 3.30% and 19.8% of the plant composition. Sideoats grama, hairy grama (*Bouteloua hirsuta*) and slim tridens are in evidence in this area with ground covers of 2.30%, 1.20% and 1.10% respectively.

Table 12. Ground cover and composition of the Sotol/Juniper Association

Species	Ground Cover (%)	Composition (%)
Aristida wrightii	3.30	19.8
Bouteloua curtipendula	2.30	13.8
Juniperus pinchotii	1.95	11.8
Bouteloua hirsuta	1.20	8.2
Tridens muticus	1.10	6.6
Xanthocephalum sarothrae	1.10	6.6
Dyssodia pentachaeta	.90	5.4
Leptochloa dubia	.75	4.5
Muhlenbergia setifolia	.55	3.3
Viguiera stenoloba	.50	3.0
Choisya dumosa	.40	2.4
Tridens pilosus	.40	2.4
Andropogon scoparius	.30	1.8
Bouteloua gracilis	.30	1.8
Ephedra trifurca	.30	1.8
Thelesperma longipes	.30	1.8
Yucca elata	.25	1.5
Yucca torreyi	.25	1.5
Coldenia canescens	.15	.9
Gymnosperma glutinosum	.15	.9
Notholaena sinuata var. *cochisensis*	.10	.6
Quercus emoryi	.10	.6
Total	16.65	100.0

Sotol is the dominant shrub with a relative dominance of 38.6% and a relative density of 20.8% (Table 13). Redberry juniper was found in abundance on the lower edge of the area and represents approximately 25.7% relative dominance and 16.6% relative density. Prickly pear (*Opuntia* sp.) and skeletonleaf goldeneye are found scattered throughout the area.

Table 13. Relative dominance and density of shrubs on the Sotol/Juniper Association

Species	Relative Dominance (%)	Relative Density (%)
Dasylirion texanum	38.6	20.8
Juniperus pinchotii	25.7	16.6
Opuntia sp.	10.0	12.5
Viguiera stenoloba	10.0	25.0
Ephedra trifurca	4.3	4.2
Yucca elata	4.3	4.2
Quercus emoryi	4.3	8.3
Dalea formosa	1.4	4.2
Mimosa biuncifera	1.4	4.2
Total	100.0	100.0

Forage production on the sotol/redberry juniper association was 1681.5 kg/ha. This was the most forage production found on any of the associations. The extremely steep slopes are utilized primarily by deer and are practically inaccessible to cattle. The high forage production can be partially explained by this light use.

Range Condition

The study pasture, at the present, should be placed in fair condition. The carrying capacity is approximately 200 animal units.

The range condition by plant association is classified as the following: Juniper / Mesquite, good: Mesquite/Lotebush, fair; Skeletonleaf goldeneye/Catclaw, fair; Tarbush/Creosote Bush, poor; Juniper/Javelinabush/ Catclaw, excellent; Sotol/Juniper, good.

The overall appearance of the pasture gives the impression of good range management. There is very little evidence of recent range deterioration. Primary species for cattle such as blue grama, black grama, and on some sites, buffalograss are found in almost all areas of the pasture. There is also an abundance of primary species for deer such as skeletonleaf goldeneye, sticky selloa, and oak (United States Soil Conservation Service, unpublished data). Both mule deer and cattle appear to be in good condition.

From observations of the total ranch (ca 50,000 ha), the six vegetative types outlined above are characteristic. We feel generalizations from this data to include the entire Longfellow Ranch would be valid.

SUMMARY

This study was conducted to determine the plant composition and forage production of a mule deer-cattle range in Pecos County, Texas. The survey was conducted on the Longfellow ranch near Sanderson, Texas. A pasture near the headquarters was selected for the study pasture and a plant collection was compiled. A study area was designated within the pasture for the vegetative analysis. Six vegetative lines containing four transects each were established. The transects were analysed using the line-intercept method to determine basal ground cover of plant species, the point-centered quarter method to determine relative dominance and density of shrub species and a square meter clip quadrat to determine forage production. A type map of the study pasture was constructed to place individual transects in a plant association for calculation purposes. The type map distinguishes six major plant associations according to dominant brush species. To complete the analyses, separate transects and forage clips were analyzed within each plant association to determine range condition.

The range survey results indicate blue grama as being the dominant grass. It is found on all associations and is the dominant grass on three sites. Buffalograss is abundant in all areas except the tarbush/creosote bush and sotol/juniper associations. Wright threeawn is considered of secondary grazing value, but because of its abundance, can be considered important within the study pasture.

The late fall and winter analysis of the vegetation indicated an almost total lack of forb species. Gray coldenia, grassland croton and sticky selloa apparently were the dominant forbs available at this time. Annual broomweed was found in abundance on the mesa top.

Redberry juniper is the dominant shrub and is found throughout the study pasture. Skeletonleaf goldeneye and catclaw dominate the top and sides of the hills while mesquite, tarbush, and creosote bush dominate the lower elevations. The lateral "headers" of the hills contain small communities of oak, hackberry, and Spanish walnut *(Juglans microcarpa).*

The range condition of the study pasture is fair. The carrying capacity, calculated from the range condition transects, coincides with the present stocking rate of the pasture. The condition of the vegetation of the study pasture appears to be capable of supporting the present animal units.

The stocking rate of the study pasture may be adjusted as more research is completed. The behavioral patterns and feeding habits of both cattle and mule deer should be determined so that a more exact stocking rate can be established.

LITERATURE CITED

Billings, Floyd C. 1970. Vegetational Study of Vascular Plants on Iron Mountain. Unpubl. MS thesis, Sul Ross State University, Alpine, Texas. 151p.

Blackburn, W. H., Paul T. Tueller, and Richard E. Eckert, Jr. 1968. Vegetation and Soils of the Mills Creek Watershed. U.S. Dept. of Interior - Bureau of Land Management. R4:71.

_____ 1968. Vegetation and Soils of the Duckwater Watershed. U.S. Dept. of Interior - Bureau of Land Management. R40:81

_____ 1968. Vegetation and Soils of the Crowley Creek Watershed. U.S. Dept. of Interior - Bureau of Land Management. R42:58.

_____ 1969. Vegetation and Soils of the Cow Creek Watershed. U.S. Dept. of Interior - Bureau of Land Management. R49:77.

Blair, W. F. 1949. A contribution to the ecology and faunal relationships of the mammals of the Davis Mountains region, Southwestern Texas. Misc. Publ., Mus. Zool. Univ. Mich. 46:1-38.

Brown, Dorothy. 1954. Methods of Surveying and Measuring Vegetation. Commonwealth Agricultural Bureau, Farnham Royal, England. 223p.

Brownlee, Sam. 1971. Composition and usage of plants by desert mule deer through rumen samples. Final Report, Federal Aid Project No. W-48-D-21, Texas Parks and Wildlife Dept., Austin, Texas. 45p.(Mimeo).

Correll, D.S., and M.C. Johnston. 1970. Manual of Vascular Plants of Texas. Texas Research Foundation, Renner, Texas. 1881p.

Cottam, Grant, and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology 37:451 - 460.

Haase, E. F. and H. A. Schreiber. 1972. Topographic relations of vegetation and soil in a southwestern Arizona grassland. S. W. Naturalist 16:387 - 401.

Hanselka, C. Wayne. 1973. The ecological success of the desert pocket mouse *(Perognathus penicillatus* Woodhouse) as influenced by methyl parathion. Unpubl. Ph.D. Dissert. Texas A&M Univ., College Station, Texas.128p.

Havard, V. 1885. Report on the flora of western and southern Texas. Proc. U.S. Natl. Mus. 8 (29): 449 - 533.

Hawley, J. L. 1971. A study of the mineral content of certain range sites and key species of grasses in the Stockton Plateau area. Unpubl. MS thesis, Sul Ross State University, Alpine, Texas. 89p.

Hinckley, L. C. 1947.Contrasts in the vegetation of Sierra Tierra Vieja in Trans-Pecos Texas. Amer. Midl. Nat. 37:162 - 178.

Huss, Donald L. (Ed.). 1964. A Glossary of Terms Used in Range Management. Amer. Soc. of Range Management. Portland, Oregon. 32p.

McCleary, J. A. and K. A. Wagner, 1972. A study of three xeric plant communities. The S. W. Naturalist 17:169 - 180.

Porter, R. D. 1962. Movements, populations and habitat preferences of three species of pocket mice (*Perognathus*) in the Big Bend Region of Texas. Unpubl. Ph.D. Dissert, Texas A&M Univ., College Station, Texas. 255p.

Tharp, B. C. 1944. The mesa region of Texas: an ecological study. Proc. Tex. Acad. Sci. 27:81 - 91.

Wallmo, O. C. 1957. Ecological survey of the Big Bend area. Department of Wildlife Management, Texas A &M Univ., College Station, Texas. (Mimeo).

Webster, Grady L. 1950. Observations of the vegetation and summer flora of the Stockton Plateau in northeastern Terrell County, Texas. Tex. J. Sci. 2:234.

Weyerts, Paul R. 1961. A study of the factors affecting the vegetation on the H. H. Weyerts ranch in northeastern Brewster County, Texas. Unpubl. MS, thesis, Sul Ross State University, Alpine, Texas. 46p.

York, C.L. 1949. The physical and vegetational basis for animal distribution in the Sierra Vieja range of southwestern Texas. Tex. J. Sci. 1:46 - 62.

RANGE ANIMAL SCIENCE
RESEARCH SERIES

Vol. 1

No.

1. Webb, Ben W. and Everett E. Turner. Cross-Breeding for More $ Yield: A comparison of weaning weights of crossbred calves from eight breeds of bulls.