



Forage preference of range sheep
by Mons L Teigen

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the degree of Master of Science in Range Management
Montana State University
© Copyright by Mons L Teigen (1949)

Abstract:

This study was conducted on two adjoining sheep allotments in the Bridget Range of the Gallatin Rational Forest. A comparison of forage preference was made between a ewe and lamb band and a yearling or "dry" band.

By use of a modification of the line interception method various grazed areas were sampled to determine what the animals had been eating. All species of plants encountered on the transects were recorded and a notation was made as to whether grazed or not. If grazed, the portions removed by grazing were noted. Vegetational composition was also indicated by recording all species encountered.

The study has shown that a certain amount of preference is exercised by sheep in grazing. It has been shown also that this preference is not necessarily in favor of the most abundant plants. Species composition, as determined from the transects, ranked the types of forage according to abundance as follows: grasses and grass-like plants, forbs, and then browse*. Preference according to the type of forage, however, was led by forbs followed by grass and then browse. This held true for both bands.

The most abundant plant encountered was California brome followed by elk sedge, sheep fescue, slender wheatgrass, and pinegrass, respectively. Of these, slender wheatgrass was the first preference of the ewe and lamb band, California brome and sheep fescue following. For the yearling band, sheep fescue led with slender wheatgrass second and California brome thirds. The four most abundant palatable forbs for the yearling band were common dandelion, pale agoseris, northwest cinquefoil, and lupine. Their order of preference for the ewe and lamb band was common dandelion, pale agoseris, northwest cinquefoil, and heartleaf arnica. Although encountered less frequently the preference for thickstem aster was high for both bands.

Browse preference was difficult to determine as the area had few shrubs on it. Snowberry appeared to be one of the more preferred plants, especially for the ewe and lamb band. Douglas fir was preferred to some extent by the ewe and lamb band also.

The average use by lines together with its standard deviation has been computed for some of the more preferred or abundant plants. The standard deviations were so large as to render the average use figure of little value as an exact measurement of preference. This was the extent of the statistical analysis made of the study. However, it was sufficient to show the extreme variability of utilization of the same plant on different transects.

FORAGE PREFERENCE OF RANGE SHEEP

by

MONS L. TRIGEN

A THESIS

Submitted to the Graduate Committee

in

partial fulfillment of the requirements

for the degree of

Master of Science in Range Management

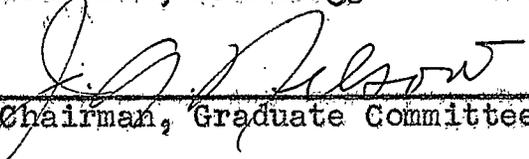
at

Montana State College

Approved:


In Charge of Major Work


Chairman, Examining Committee


Chairman, Graduate Committee

Bozeman, Montana
March, 1949

RECEIVED
MONTANA STATE COLLEGE
LIBRARY

N378
T23f
Cop. 2.

TABLE OF CONTENTS

	Page
Abstract	3
Introduction	5
Previous Work	7
Description of Area	11
Experimental Procedure	15
Results	21
Summary and Conclusions	37
Literature Cited	40
Appendix	42

Y of the Graduate Committee

Leslie's Script

A LESLIE PAPER

ABSTRACT

This study was conducted on two adjoining sheep allotments in the Bridger Range of the Gallatin National Forest. A comparison of forage preference was made between a ewe and lamb band and a yearling or "dry" band.

By use of a modification of the line interception method various grazed areas were sampled to determine what the animals had been eating. All species of plants encountered on the transects were recorded and a notation was made as to whether grazed or not. If grazed, the portions removed by grazing were noted. Vegetational composition was also indicated by recording all species encountered.

The study has shown that a certain amount of preference is exercised by sheep in grazing. It has been shown also that this preference is not necessarily in favor of the most abundant plants. Species composition, as determined from the transects, ranked the types of forage according to abundance as follows: grasses and grass-like plants, forbs, and then browse. Preference according to the type of forage, however, was led by forbs followed by grass and then browse. This held true for both bands.

The most abundant plant encountered was California brome followed by elk sedge, sheep fescue, slender wheatgrass, and pinegrass, respectively. Of these, slender wheatgrass was the first preference of the ewe and lamb band, California brome

and sheep fescue following. For the yearling band, sheep fescue led with slender wheatgrass second and California brome third.

The four most abundant palatable forbs for the yearling band were common dandelion, pale agoseris, northwest cinquefoil, and lupine. Their order of preference for the ewe and lamb band was common dandelion, pale agoseris, northwest cinquefoil, and heartleaf arnica. Although encountered less frequently the preference for thickstem aster was high for both bands.

Browse preference was difficult to determine as the area had few shrubs on it. Snowberry appeared to be one of the more preferred plants, especially for the ewe and lamb band. Douglas fir was preferred to some extent by the ewe and lamb band also.

The average use by lines together with its standard deviation has been computed for some of the more preferred or abundant plants. The standard deviations were so large as to render the average use figure of little value as an exact measurement of preference. This was the extent of the statistical analysis made of the study. However, it was sufficient to show the extreme variability of utilization of the same plant on different transects.

INTRODUCTION

Many thousands of acres of range land in the West are grazed by sheep. This practice contributes greatly to the income of the region. The importance of these animals to the economy of the West has caused much investigational work to be done in an effort to determine which feeds, feeding practices, and systems of management can produce the most successful long-term range operation. Most of these studies have had one fundamental problem to cope with, the problem of what the animals obtain from the native range forage. A factor of primary importance in this determination, therefore, is a knowledge of the forage preference of the animal. The aim of this project was, consequently, to determine what this preference might be on summer forest range.

Previous research (5, 12, 16) has indicated that as sheep graze over the range they do not forage indiscriminantly, but display a rather definite choice as to both species and portions consumed? This characteristic of consciously selecting certain plants over others indirectly creates one of the livestock industry's greatest problems--the proper degree of forage utilization? It can readily be seen that as the more palatable plants are grazed, modifying in some respects their physiological functions, the less palatable ones are thereby benefited by having the degree of competition decreased. If the grazing use does not become too intense on the preferred plants, no

harm is done, and the plants will continue to reproduce and thrive. If on the other hand, the plants become too intensely grazed, they will fail to reproduce in sufficient numbers to maintain their position in the plant community and will eventually be replaced by less palatable plants. This generally constitutes a decrease in the carrying capacity of the range, which is a situation that stockmen can ill afford.

Forage preference has been determined largely from observations by persons closely connected with grazing management. There is relatively little information on forage preference based upon detailed and accurate measurements, due primarily to the lack of an adequate sampling method which can take into account all of the various interrelationships that exist between the environment, the vegetation, and the animals themselves. Another factor of importance is that information obtained in one locality will not necessarily hold true for another locality.

PREVIOUS WORK

Jardine and Anderson (12) have mentioned that sheep prefer forbs while horses and cattle prefer grasses. This has been borne out by Stoddart and Smith (16) in a more recent publication. Doran (10), while studying the grazing habits of ewes and lambs on summer forest range found that the ewes spent more time grazing grasses and forbs than did their lambs, however, the lambs spent more than an hour more time each day grazing browse plants than did their mothers.

Several methods have been devised that readily make themselves useful in preference determination. Stapledon and Jones (15) used a "before and after" method to check utilization wherein plots were clipped and weighed both before and after grazing, and the difference attributed to grazing. Beruldsen and Morgan (2) using a similar method found it possible to estimate the amount removed by a single determination if a good growth of herbage was present. This procedure was modified by Cassady (4) when he clipped a number of plant portions of the principal forage species and obtained an average weight both before and after grazing. The difference in the weight was attributed to utilization by the sheep. Cook, Harris, and Stoddart (6) have elaborated upon Cassady's work by devising a method whereby randomly encountered plants have portions clipped and chemically analyzed before and after grazing to determine the nutritive content of the range forage. With this

method it could be assumed that on a properly grazed range the degree of utilization of the various plants indicated preference.

Cory (7) suggested a method of determining forage preference by establishing permanent quadrats over the range and noting any changes in the vegetation over a period of years. While apparently giving reliable results, the length of time involved usually precludes its use.

Yound, et al (18) made determinations of utilization by counting leaves and measuring current livestem before and after grazing on sheep range in the cut-over western white pine areas of Idaho. The utilization values obtained were fairly consistent from year to year, showing that certain species were definitely preferred by the sheep. Although various browse plants appeared to make up most of their diet, mountain brome and elk sedge were also quite heavily utilized by the animals.

A botanical analysis of stomach contents was attempted by Norris (13) to determine its feasibility in preference studies. Differences in the digestibility of the forage and in the digestive abilities of the various sheep created wide variability between the ration consumed and the material found upon examining the contents of the stomachs. To calculate the mean grass consumption per day for sheep on pasture, Woodman, Evans, and Eden (17) used a system whereby the weight of feces voided each day was determined by independent digestion trials on

other similar sheep the digestibility of the herbage was obtained. This made it possible for the weight of dry matter consumed each day to be computed. In most instances this method would be too expensive and time consuming for use with range sheep. Esplin, Greaves, and Stoddart (11) working with winter range plants developed a system wherein they multiplied species composition by the percentages of each species consumed at the end of the season. This method is obviously too general for most scientific study, although it does give an indication of the amount of forage consumed.

Certain portions of plants are more highly preferred by sheep than others according to Cook, Cook, and Harris (5). Throughout their study, leaves averaged a greater percentage utilization by weight than stems. Although grass made up a larger percentage of forage produced, it ranked second in the diet of sheep, forbs making up the largest percentage of diet. Davies (9) found that the stage of growth has an effect upon palatability of pasture plants for sheep. The younger more succulent plants were preferred over mature plants and in young plants leaves were preferred to stems. Beaumont, et al (1) working with dairy cattle found that there is little discrimination shown between various kinds of pasture grasses when two to four inches in height, however, stage of growth became a factor when grass becomes taller. In a study of grazing habits of cattle, Culley (8), found that some southwestern

range plants were grazed rather uniformly throughout the year, while others were subject to seasonal differences.

In a trial of cool and warm season pasture grasses, Rogler (14) found that cattle displayed a definite taste preference for certain grasses rather than a preference due to the mechanical condition of the plants.

DESCRIPTION OF AREA

The experiment was performed in an area which is located for the most part on two adjoining sheep allotments on the Bridger Range of the Gallatin National Forest. Approximately fifteen sections of land make up these two allotments which are referred to by name as the Jackson Creek and the Spring Creek allotments.

The range is rather rough and has a general southern exposure with fairly steep slopes. The elevation ranges from approximately 5,200 feet at the south edge where Jackson Creek leaves the forest to approximately 7,400 feet south of the Bangtail Ranger Station on the northern edge of the allotments. The area makes up the headwaters of several streams. Fleshman Creek is a small stream that heads on the eastern watershed and flows southeast into the Yellowstone River at Livingston. Jackson Creek heads on the area and flows southwest and then west until it forms the East Gallatin River. Spring Creek and Stone Creek make up the western watershed and eventually flow into Bridger Creek which in turn flows into the East Gallatin River. A portion of the allotments, largely unavailable for grazing, lies on the upper headwaters of Willow Creek which flows eastward into the Shields River a short distance north of where that river flows into the Yellowstone. From this description, one can see that the area forms a divide from which part of the water flows westerly into the East Gallatin

River and the remainder flows eastward to the Yellowstone River.

The soil of the area is, for the most part, of a sandy texture with sandstone outcrops forming rather rugged escarpments at the extreme head of Jackson Creek. Above these one finds gravel-capped ridges. There are many slide-rock slopes in the area. The stream bottoms are composed of a well drained, fairly deep silt loam.

The area is predominantly a timber type, but produces very little merchantable saw timber. The predominant species being Douglas fir, Pseudotsuga taxifolia* and lodgepole pine, Pinus contorta. The open parks and meadows at the medium elevations are composed of a grass-weed type with grasses dominating. This type is mainly a brome-grass-bluegrass-cinquefoil community. On the higher untimbered portions of the range, the type is predominantly grass, principally a sheep fescue-brome-grass community. The valley bottoms are mainly a timothy-brome community. There is very little shrubby vegetation on either allotment. Big sagebrush, Artemisia tridentata, is present in scattered stands and is probably the most abundant shrub. A few scattered clumps of mountain balm, Ceanothus velutinus are occasionally encountered, but compose only a

* Both technical and common names will be given the first time encountered, thereafter only the common name will be used. See Appendix A.

very small percentage of the total vegetation.



Figure 1
Open park, typical of the area, before grazing.

Several transects were studied soon after leaving the forest allotments. These transects have been included with the others in the study because of the close similarity between these areas and the adjacent forest lands.

Climatological data is not available for the specific area. Data from Bozeman, approximately sixteen air miles southwest gives the mean annual precipitation as 17.39 inches with 36.5 percent of the total falling in the winter months of October, November, December, January, February, and March. The mean frost-free period is 115 days for the Bozeman station. The weather for 1948 as recorded at Bozeman does not appear to differ greatly from previous years. It was generally believed by people well acquainted with the study area, that the first thirty days on the allotments were considerably cooler than

the average, and also that there was a greater frequency of rainfall during that period. The weather records at Bozeman do not bear this out, but variations such as this are common in the mountain areas due to elevational and topographical influences.

Approximately eleven air miles southeast of the allotments is Livingston, the only other station in the vicinity where weather records are taken. Livingston has a mean frost-free period of 127 days. The mean annual precipitation is 14.67 inches with 31.3 percent of it falling in the winter months of October, November, December, January, February, and March. Although somewhat nearer the experimental area, the Livingston station, because of its location on the plains east of the mountains, does not give as accurate a picture of the climate of the study area as does Bozeman.

EXPERIMENTAL PROCEDURE

The forage preferences of two different bands of sheep were studied. One band was composed of 1,030 ewes with lambs at side, and the other was made up of 745 yearling ewes plus 165 older "dry"* ewes, making a total of 910 head for the band. Each band was under the control of a herder and the "one-night bed-ground" system of management as described by Stoddart and Smith (16) was used during the time spent on the forest. Since it was not possible for the investigator to exert any form of control over either band, sampling was done wherever the animals had previously grazed. The sheep were never directed to any special location for the purpose of this study.

Before sampling, it was necessary for the investigator to confer with the herder to determine what areas had been grazed previously. In most instances areas to be sampled were selected from those which had been exposed to grazing animals twice. It was difficult to determine the length of time the sheep spent grazing an area, however, it was generally less than half a day, due to the fact that during the middle of the day they would "shade-up" and generally move onto another area in late afternoon. If this was not done and the sheep grazed

* "Dry" ewes are ewes that are not raising lambs this year.

