The ecology of Rocky Mountain bighorn sheep in the Sun River area of Montana with special reference to summer food habits and range movements
by Glenn Lee Erickson

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Fish and Wildlife Management
Montana State University

Abstract:
A study was conducted in the Sun River area of westcentral Montana during summer and winter to obtain quantitative data on the daily and seasonal movements and range use habits of bighorn sheep. Vegetation was classified as to seven major habitat types: bunchgrass, old burn, rocky reef, Douglas-fir, lodgepole pine, quaking aspen and lodgepole/aspen. Percent canopy coverages and frequencies of occurrence of low-growing taxa were determined for five types. Sex and age composition of the herd was determined from 5,165 observations of the same individuals. Numbers per 100 ewes for rams, lambs and yearlings were 45, 55 and 37 in summer and 27, 40 and 23 in winter, respectively. Mean group sizes were similar for winter and summer. Group constancy was determined from the analyses of 326 associations of bighorn sheep. Over 50 percent of the coefficients' of association were .50 or less, indicating there was no great attraction between any two individuals. Range use was determined by recording the locations of 3,112 and 1,030 bighorn sheep during winter and summer, respectively. Use during winter of bunchgrass, rocky reef and old burn habitat types appeared to be related to availability. Percentage distribution of the observations for these types in summer was 24, 55 and 17, respectively. South exposures received 84 percent of the use during winter and 73 percent in summer. The interspersion of rocky terrain with the various habitat types influenced significantly the use of types and various portions of the range. The percent of bighorn sheep observations that were within 150 yards of rocky terrain was 66 and 70 for winter and summer, respectively. The mean" elevation for all observations in winter was 5,045 feet while that in summer was 6,508 feet.

The winter home range for each of 41 marked bighorn sheep was determined by using the center of activity and standard diameter.

Pooled standard diameters in each of three wintering areas were 1.48, 1.56 and 1.37 miles. The summer distribution of bighorn sheep from the three wintering areas was described from relocations of 31 marked animals. Bighorn sheep moved longer distances within home ranges in summer than in winter. Distances between consecutive relocations averaged .67 and 1.78 miles in winter and summer, respectively. Summer food habits were determined by examination of 14 feeding sites. Grass and grass-like plants and forbs together respectively constituted 79, 67 and 94 percent of the summer diet in old burn, bunchgrass and rocky reef habitat types. The forage class receiving the greatest usage in each type was also the most abundant. It was recommended that the present hunting district be sub-divided into four hunting units.

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Signature Glenn Lee Erickson

Date May 24, 1972

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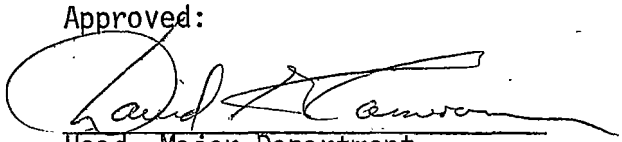

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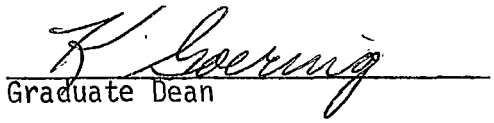

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ABSTRACT

A study was conducted in the Sun River area of westcentral Montana during summer and winter to obtain quantitative data on the daily and seasonal movements and range use habits of bighorn sheep. Vegetation was classified as to seven major habitat types: bunchgrass, old burn, rocky reef, Douglas-fir, lodgepole pine, quaking aspen and lodgepole/aspen. Percent canopy coverages and frequencies of occurrence of low-growing taxa were determined for five types. Sex and age composition of the herd was determined from 5,165 observations of the same individuals. Numbers per 100 ewes for rams, lambs and yearlings were 45, 55 and 37 in summer and 27, 40 and 23 in winter, respectively. Mean group sizes were similar for winter and summer. Group constancy was determined from the analyses of 326 associations of bighorn sheep. Over 50 percent of the coefficients of association were .50 or less, indicating there was no great attraction between any two individuals. Range use was determined by recording the locations of 3,112 and 1,030 bighorn sheep during winter and summer, respectively. Use during winter of bunchgrass, rocky reef and old burn habitat types appeared to be related to availability. Percentage distribution of the observations for these types in summer was 24, 55 and 17, respectively. South exposures received 84 percent of the use during winter and 73 percent in summer. The interspersion of rocky terrain with the various habitat types influenced significantly the use of types and various portions of the range. The percent of bighorn sheep observations that were within 150 yards of rocky terrain was 66 and 70 for winter and summer, respectively. The mean elevation for all observations in winter was 5,045 feet while that in summer was 6,508 feet. The winter home range for each of 41 marked bighorn sheep was determined by using the center of activity and standard diameter. Pooled standard diameters in each of three wintering areas were 1.48, 1.56 and 1.37 miles. The summer distribution of bighorn sheep from the three wintering areas was described from relocations of 31 marked animals. Bighorn sheep moved longer distances within home ranges in summer than in winter. Distances between consecutive relocations averaged .67 and 1.78 miles in winter and summer, respectively. Summer food habits were determined by examination of 14 feeding sites. Grass and grass-like plants and forbs together respectively constituted 79, 67 and 94 percent of the summer diet in old burn, bunchgrass and rocky reef habitat types. The forage class receiving the greatest usage in each type was also the most abundant. It was recommended that the present hunting district be sub-divided into four hunting units.

INTRODUCTION

One of the largest herds of Rocky Mountain bighorn sheep (*Ovis canadensis canadensis* Shaw) ranges in the Sun River, Ford Creek and Deep Creek drainages of the Sun River area of westcentral Montana. Early history of the herd which now numbers about 700 is given by Couey (1950).

Hunting of three-quarter curl rams by permit holders was initated in 1953 following a long period of closure dating to 1912. From 1955 to 1970 the number of permit holders and rams killed per year ranged from 20 to 60 and 12 to 52, respectively. Locations of kills in recent years indicate a high percent were in easily accessible areas; eg., 42 percent in Hannan Gulch in 1970 (Figure 1). This suggested an unbalanced harvest, but adequate data on the relations of various herd segments were unavailable for improving present hunting unit boundaries. A full time field study was conducted from June to September in 1970 and 1971 and from January to March, 1972 to determine daily and seasonal movements and range use habits of bighorn sheep from the three major drainages. Some observations were made in December of both years. Emphasis was placed on determining whether wintering herds remained separate entities throughout the year. Other studies, including Morgan (1970), Oldemeyer *et al.* (1971) and Woolf *et al.* (1970) have considered the movements and distribution of bighorn sheep in other localities and were of aid in analyzing the data.

Winter food habits have been reported for this area by Couey

(1950) and Schallenberger (1966), but summer food habits have not been as adequately examined and were thus investigated concurrently with the movement study.

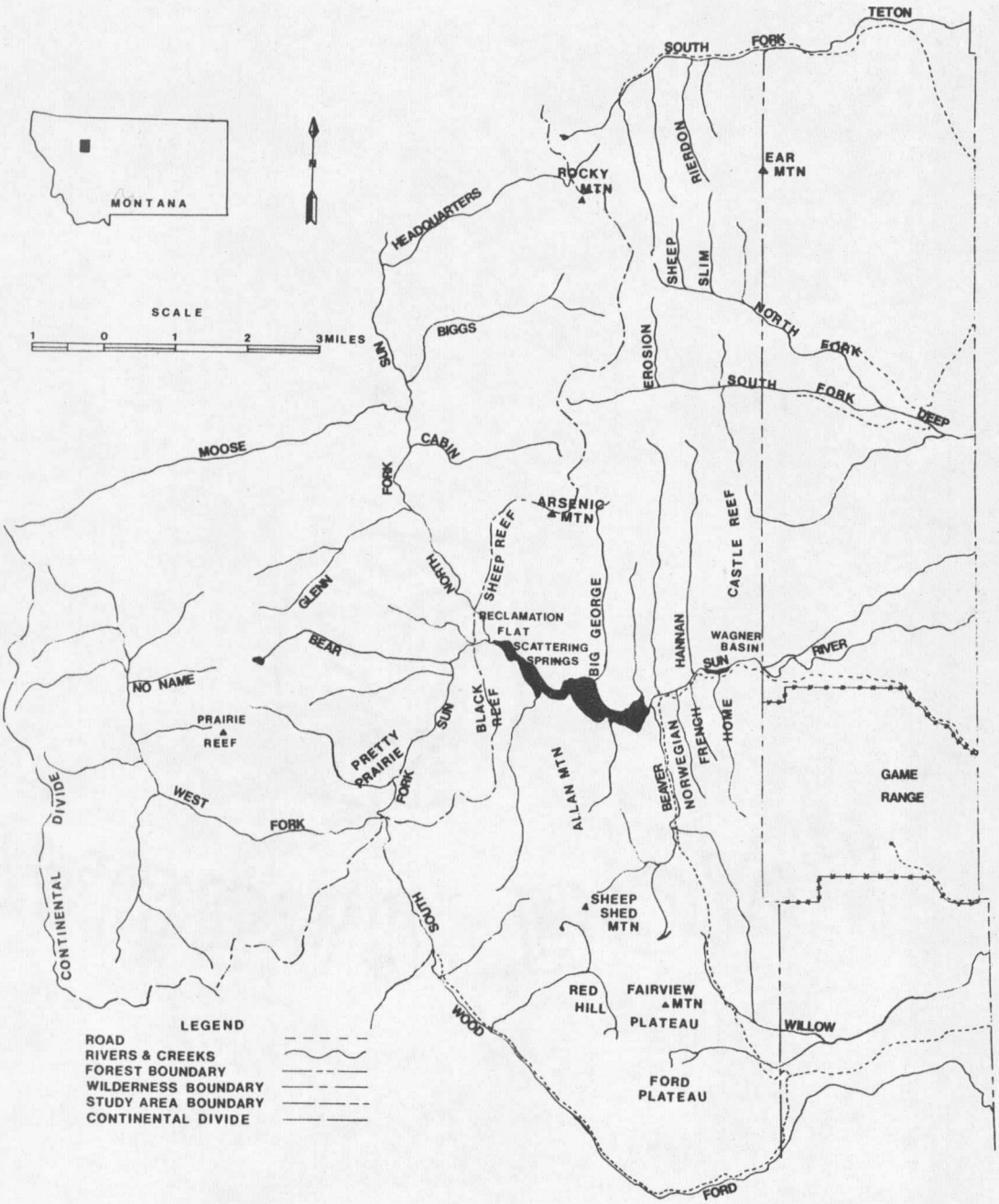

Figure 1. Map of study area showing major drainages.

METHODS

Ninety-eight bighorn sheep have been live-trapped, marked and released during winter and spring in the area since 1967. Ewes were marked for individual identification with 3-inch wide neckbands. Rams were marked in each ear with orange cattle tags embossed with black numerals. Neckbands and ear tags can be observed for distances to 1 mile and a few yards, respectively.

Approximately two-thirds of the study area was designated wilderness under the Wilderness Act of 1964. This restricted the use of motor driven and wheeled vehicles. Foot and horseback were the primary means of travel. Monthly aerial flights during the summer were of aid in locating groups of bighorns. A pack train was used to establish base camps from which daily trips could be made into areas occupied by bighorn sheep. In winter, effort was made to cover respective drainages as often as practicable as dictated by weather. Observations were aided by the use of a variable 60X spotting scope and 7 x 35 mm binoculars. Information recorded at the time of each observation of bighorn sheep included time of day, temperature, wind velocity, activity of the animals, whether marked, and classification by sex and age. Males were classified as to one of five categories based on extent of curl of horns. Females were classified as yearlings or adults in the summer. The areas occupied were described as to exposure, vegetation type, elevation, locations to the nearest one-sixteenth square mile, distance to escape cover, and percent slope as determined by use of an

Abney Level.

Vegetation was classified as to types and subtypes to correlate plant communities with observed animal use. Plants collected in the field during the summer of 1970 and identified in the laboratory aided recognition of plants by species. Botanical nomenclature follows Booth (1950) and Booth and Wright (1959). Quantitative data on coverage and frequency of occurrence for plants less than 1 meter in height were gathered by examination of 40 randomly spaced, 2 x 5 decimeter plots located along a line transect in an area considered to be representative of the type being sampled (Daubenmire 1959). Characteristics of trees at transects in forest types were examined by taking three readings with a spherical densiometer at each location to measure percent canopy coverage, and dbh (diameter at breast height) was recorded for at least 40 trees.

Information on plant preferences for feeding bighorns was gathered during both summers by examination of feeding sites (Cole 1956). An estimation of one bite was considered to represent one instance of use for a plant species. Rumen samples collected by hunters during the fall of 1970 were examined. Analysis of data for both feeding site examinations and rumen analyses followed the aggregate percentage method of Martin *et al.* (1946).

DESCRIPTION OF AREA

The 800 square mile study area lies within the Sawtooth Mountain Range approximately 65 miles west of Great Falls, Montana. Boundaries of the study area were Moose Creek, Headquarters Creek and Teton River on the north, West Fork of the South Fork of Sun River, Wood Creek, Ford Creek and Willow Creek on the south, 112°35" longitude on the east, and the Continental Divide on the west (Figure 1). The Sun River, which flows eastward along the boundary between Teton County to the north and Lewis and Clark County to the south, constitutes the major drainage in the area. Minor drainages include Deep Creek and Ford Creek to the north and south of Sun River, respectively. A prominent feature of the area is Gibson Lake which extends 7 miles in length and was formed by a large dam completed in 1929 for irrigation.

The topography of the area consists of parallel reefs running north and south connecting peaks ranging from 7,000-9,000 feet in elevation. Reefs are characterized by abrupt cliffs on the east and 45-80 percent slopes on the west. Canyons between the reefs ascend to the north and south from each drainage forming high east-west passes which connect the parallel reefs (Figure 2). These passes and reefs provide migration routes for bighorn sheep between widely separated summer and winter ranges. According to Deiss (1943) this topography was formed by the Lewis overthrust which placed Proterozoic and Paleozoic shales and limestones on top of younger Mesozoic sediments. Subsequent glacial action and erosion have formed the present conformation.