



The seasonal distribution and range use of bighorn sheep in the Beartooth Mountains, with special reference to the West Rosebud and Stillwater herds  
by Gregory L Pallister

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  
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Abstract:

A study was conducted in the Beartooth Mountains in south central Montana from July through December 1973, to obtain quantitative data on daily and seasonal movements, range use habits and the population composition of bighorns in the West Rosebud and Stillwater drainages. Vegetation within the study area was classified into 17 vegetation types. Percent canopy coverages and frequencies of occurrence were determined for low growing taxa on 9 types. Range use was determined by recording the locations of 951 observations of bighorns in summer, fall and winter. Observations of bighorns made in the West Rosebud indicated that 43 percent of the summer use occurred on the Douglas Fir-Snowberry type. Thirty-four percent of the fall and 100 percent of the winter use occurred on the Alpine Tundra type. In the Stillwater, 46 percent of the fall observations occurred on the seeded Roadbed type and 85 percent of the winter observations occurred on the Bunchgrass-Forb type. Bighorn affinity to escape terrain lessened as they moved onto winter ranges with 98, 84, and 44 percent of the observations occurring within 150 yards of escape cover in summer, fall and winter, respectively. South and southeast slopes received the greatest overall use. Numbers per 100 ewes for rams and lambs of the West Rosebud were 25 and 64 during summer, 8 and 50 during fall and 14 and 40 during winter, respectively. In the Stillwater, the respective numbers were 35 and 62 during fall and 24 and 36 during winter. The maximum movement of a marked bighorn from the point of capture was 26.5 miles. The average standard diameter of the summer, fall and winter area was 0.36, 4.96, and 0.94 miles, respectively. Winter standard diameters were smaller than fall for each of three bighorns of the Stillwater herd. Summer, fall and winter food habits were determined from the examination of 17 feeding sites involving 5,934 instances of plant use and from the contents of two rumens. Grasses and grasslike plants, forbs and shrubs, respectively, made up 12, 55, and 32 percent of the diet during summer, 99, 1 and 0 during fall, and 98, 2, and 0 during winter for bighorns in the West Rosebud. In the Stillwater, the respective percentages were 85, 11, and 3 during fall and 35, 28, and 38 during winter. Range use and feeding site data obtained for mountain goats, mule deer and livestock indicated that competition with bighorns was minimal at present population levels. Recommendations were made to establish a separate hunting unit and limited hunting permits for the Stillwater herd and to discourage future livestock use of the Stillwater winter area.

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THE SEASONAL DISTRIBUTION AND RANGE USE OF BIGHORN SHEEP  
IN THE BEAR TOOTH MOUNTAINS, WITH SPECIAL REFERENCE  
TO THE WEST ROSEBUD AND STILLWATER HERDS

by

GREGORY L. PALLISTER

A thesis submitted to the Graduate Faculty in partial  
fulfillment of the requirements for the degree

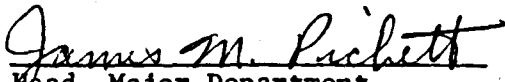
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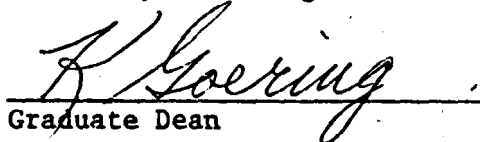
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## ABSTRACT

A study was conducted in the Beartooth Mountains in south central Montana from July through December 1973, to obtain quantitative data on daily and seasonal movements, range use habits and the population composition of bighorns in the West Rosebud and Stillwater drainages. Vegetation within the study area was classified into 17 vegetation types. Percent canopy coverages and frequencies of occurrence were determined for low growing taxa on 9 types. Range use was determined by recording the locations of 951 observations of bighorns in summer, fall and winter. Observations of bighorns made in the West Rosebud indicated that 43 percent of the summer use occurred on the Douglas Fir-Snowberry type. Thirty-four percent of the fall and 100 percent of the winter use occurred on the Alpine Tundra type. In the Stillwater, 46 percent of the fall observations occurred on the seeded Roadbed type and 85 percent of the winter observations occurred on the Bunchgrass-Forb type. Bighorn affinity to escape terrain lessened as they moved onto winter ranges with 98, 84, and 44 percent of the observations occurring within 150 yards of escape cover in summer, fall and winter, respectively. South and southeast slopes received the greatest overall use. Numbers per 100 ewes for rams and lambs of the West Rosebud were 25 and 64 during summer, 8 and 50 during fall and 14 and 40 during winter, respectively. In the Stillwater, the respective numbers were 35 and 62 during fall and 24 and 36 during winter. The maximum movement of a marked bighorn from the point of capture was 26.5 miles. The average standard diameter of the summer, fall and winter area was 0.36, 4.96, and 0.94 miles, respectively. Winter standard diameters were smaller than fall for each of three bighorns of the Stillwater herd. Summer, fall and winter food habits were determined from the examination of 17 feeding sites involving 5,934 instances of plant use and from the contents of two rumens. Grasses and grass-like plants, forbs and shrubs, respectively, made up 12, 55, and 32 percent of the diet during summer, 99, 1 and 0 during fall, and 98, 2, and 0 during winter for bighorns in the West Rosebud. In the Stillwater, the respective percentages were 85, 11, and 3 during fall and 35, 28, and 38 during winter. Range use and feeding site data obtained for mountain goats, mule deer and livestock indicated that competition with bighorns was minimal at present population levels. Recommendations were made to establish a separate hunting unit and limited hunting permits for the Stillwater herd and to discourage future livestock use of the Stillwater winter area.

## INTRODUCTION

The Rocky Mountain bighorn sheep (*Ovis canadensis canadensis* Shaw), indigenous to the Beartooth Mountains in south central Montana, inhabits several well known wintering areas throughout this mountain range. Principal among these are the Main Rock Creek, the West Rosebud Creek and the Main Stillwater River wintering areas. Little is known of areas frequented by bighorns in the Beartooth range in other seasons of the year.

Prior to 1971 work on bighorns in this area had been limited to the determination of sex and age of animals on winter-spring ranges and the examination of a few scattered feeding sites. Stoneberg (1973) observed bighorns during the winters of 1971-1972 and 1972-1973 and reported on production, utilization of grasses, and the incidence of lungworm. Unsuccessful attempts to trap bighorns with the aid of bait on the Stillwater and West Rosebud winter areas for the purposes of marking them for future study were made during the winters of 1971-1972 and 1972-1973. During the spring of 1973, area biologists of the Montana Fish and Game Department using a "cap-chur" gun were successful in capturing, marking and releasing 7 and 8 bighorns on the Stillwater and West Rosebud areas, respectively. Each sheep was tagged in the right ear with a metal tag and fitted with a neck band which was color coded as to area of capture. Ewes received 6-inch wide neck

bands whereas rams and lambs were equipped with 3-inch wide bands. Ewes were additionally marked with ear tags embossed with black numerals in the left ear. Each of two ewes from each area was equipped with a radio transmitter (Stoneberg 1973).

To determine daily and seasonal movements, range use and food habits, and the population composition of bighorns in the Stillwater and West Rosebud drainages, I conducted a full time field study from July through December of 1973.

## HISTORY

Prior to 1800 the Beartooth Mountains were inhabited by several Indian nations, principal among them were the "Sheep Eaters" or Shoshone, who maintained year around occupancy of this area (Haines 1958). In 1835, Osborne Russell, while leading trappers through the Cooke City area reported killing two bighorns and seeing several scattered bands (Haines 1955). Bighorns in the Beartooths apparently reached their lowest levels around 1928 at which time a U. S. Forest Service bighorn survey of the "Beartooth Forest" revealed only 75 animals (U.S.D.A. Forest Service 1928). From 1928 to 1970, bighorn numbers for the West Rosebud wintering area have remained stable at an estimated 40 animals. The Stillwater herd apparently reached highest densities during the late 1940's and early 1950's when reports of over 100 sheep were common. Since that time bighorn numbers have declined (Koch 1940; Couey 1953 and 1955; Holman 1974).

In 1941 the U. S. Forest Service granted a 30 day grazing allotment for 1,040 domestic sheep on the Fishtail Plateau and West Rosebud Creek. This allotment was continued until 1945 at which time it was sold and converted to a cattle allotment. From 1945 to the present a 30 day grazing season from September 10 to October 10 for 200 cattle has been in effect (Knox 1974). The Stillwater River winter range had a long history of overuse by domestic livestock, chiefly horses,

until 1967 at which time the U. S. Forest Service built a fence below the road and closed the above road portion to livestock grazing. Throughout the study period a few head of cattle and horses and a donkey were present on the area.

## METHODS

Emphasis was placed on locating marked and unmarked bighorn sheep in the field. Except for the limited use of horses and a snowmobile, back country travel was limited to hiking on foot. Back country camps were established from which daily observations were made, mainly in the Stillwater and West Rosebud drainages. When sheep were at lower elevations, observations from a vehicle were possible. Sixteen aerial flights in a Super Cub and one in a helicopter aided in locating bighorns. A radio receiver was used on the ground and in the air in attempting to locate sheep with radio-transmitters. This proved unsuccessful due to malfunctioning transmitters and/or receivers. Observation sites of marked bighorns were plotted on a map to establish basic data for evaluating movements between winter and summer ranges, and seasonal home ranges. Bighorns observed were classified by sex, age, and activity. Rams were assigned to one of four categories based on extent of curl of horns as follows: 0-1/4; 1/4-1/2; 1/2-3/4; or 3/4+. Ewes were classified as adults or yearlings. The area occupied by bighorns at each observation site was described as to vegetation type, approximate slope, exposure, elevation, location to the nearest section, and the distance to escape cover and water. Pertinent weather data were also recorded. Observations of mule deer and mountain goats were treated in a similar manner.



Vegetation of representative areas of types used by bighorns was quantitatively sampled using the method described by Daubenmire (1959). Canopy coverages and frequencies of occurrence of plant species less than 1 meter in height were determined within twenty or forty 2x5 decimeter plots spaced at 5 foot intervals along a 100 or 200 foot line transect at representative sites.

Feeding sites were examined to gather information on plant preferences and forage competition among mule deer, mountain goats, domestic livestock and bighorns. An estimation of one bite of a grass species, the use of a single leaf or stem of a forb species and the use of a leaf, fruit or leader of a browse species was considered to be one instance of use (Knowlton 1960). Availability of and preference for plant species on several feeding sites were determined by examination of twenty or forty 2x5 decimeter plots as described above. Botanical nomenclature of plant species collected in the field follows Booth (1950) and Booth and Wright (1959).

A one quart rumen sample was collected from each of two illegally killed ewes during November 1973. Rumen contents were analyzed as described by Wilkins (1957). Analysis of both feeding site examinations and rumen analyses followed the aggregate percentage method of Martin *et al.* (1946).

Data from the files of the Montana Fish and Game Department dating from 1950 were analyzed to establish past range use and population

characteristics. Present population dynamics were determined from ram::ewe, lamb::ewe, and lamb::adult ratios. Ovaries of the two illegally killed ewes mentioned above were collected and examined for structures relevant to reproductive history.

## DESCRIPTION OF AREA

The study area of approximately 300 square miles, of which about one-half is in the Beartooth primitive area, is located 75 miles southwest of the city of Billings. Boundaries were the Boulder River, Shepherd Peak and Cutoff Mountain on the west, the Red Lodge-Cooke City highway on the east, the Montana-Wyoming border and Yellowstone Park boundary on the south, and the West Fork of the Stillwater River and the border of Custer National Forest on the north (Figure 1).

Major stream drainages originating within the study area include the Boulder River, West Fork of Rock Creek, Rock Creek, Clarks Fork of the Yellowstone River, Buffalo Creek, Hellroaring Creek, West Fork of the Stillwater River, Rosebud Creek and the Stillwater River. Two prominent features of the area are the Mystic Lake Power Plant on the West Rosebud Creek and the Mouat Mine on the Stillwater River, both of which occur on bighorn winter and/or spring areas.

The area is extremely diverse in topography and landform. Elevations vary from approximately 5,000 feet in the lower Stillwater to 12,799 feet at Granite Peak. Tundra plateaus, unique to the area, are alpine areas, very gentle in topography which rise from approximately 9,800 feet to near 12,000 feet. These plateaus are slashed by numerous glacially carved canyons which commonly drop in excess of 2,000 feet to glacially fed cirques and lakes. To the north and east the canyons

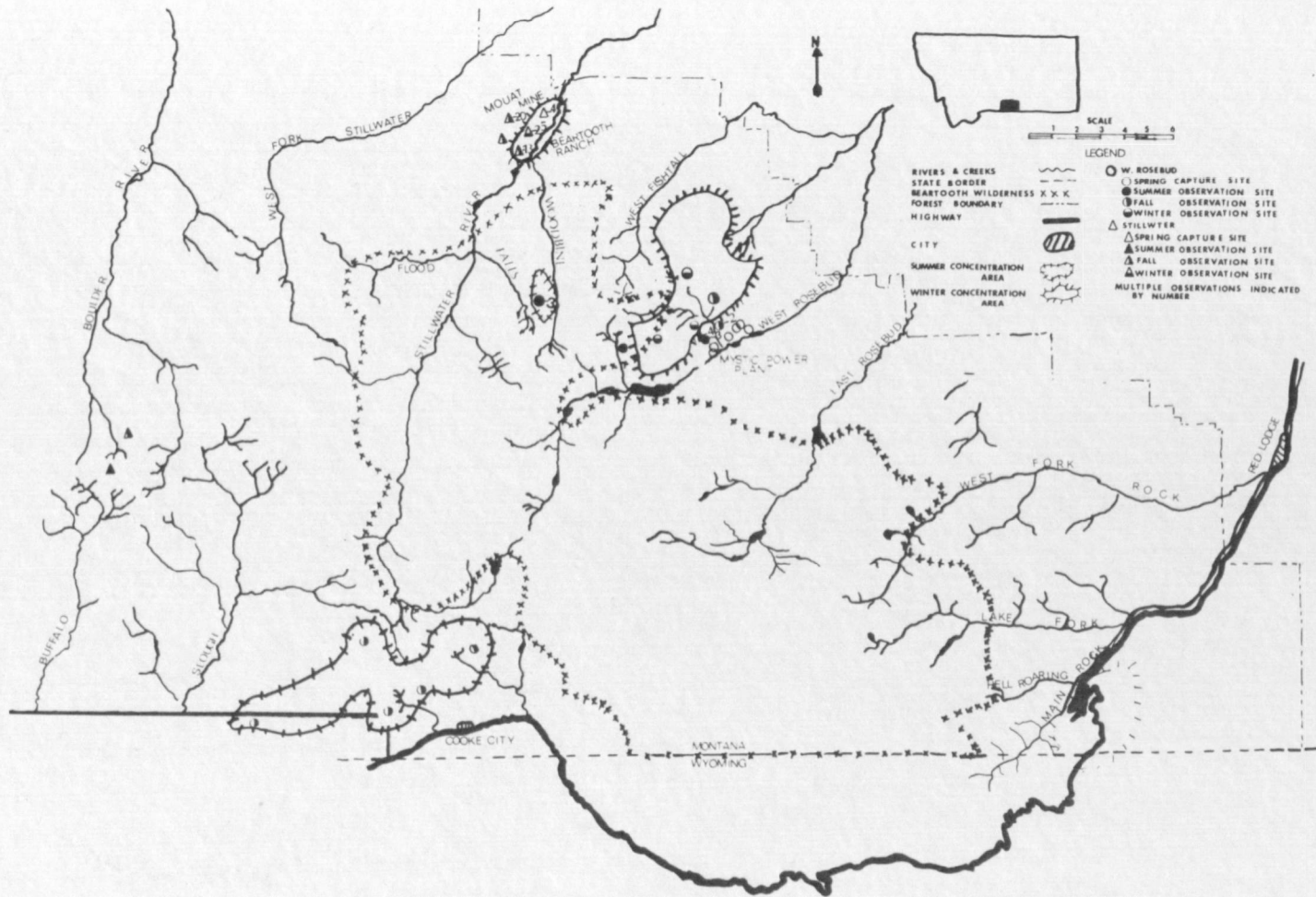


Figure 1. Map of the study area showing the distribution by season of observations of marked bighorn sheep from the Stillwater and West Rosebud drainages.



































































































































