Habitat use by mule deer of the Armstrong Winter Range, Bridger Mountains, Montana
by Heidi Behrens Bailey Youmans

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

Abstract:
A study of winter habitat usage by mule deer was conducted on the Armstrong Winter Range in the Bridger Mountains of southwestern Montana during the winters of 1976-77 and 1977-78. Objectives were to ascertain the extent of individual variability in habitat use and to evaluate the reliability of conventional estimates of winter range use. A total of 19 deer wearing radio transmitter collars were monitored from the. ground, and from the air during weekly surveys in a Supercub aircraft. Conventional ground observations were obtained of neckbanded and unmarked deer. The number of marked deer on the winter range totaled 58 and 76 for the 1976-77 and 1977-78 winters, respectively. Relocations of instrumented and neckbanded individuals indicated the existence of three major winter range units. Instrumented animals exhibited larger home ranges during the first, mild winter than during the second, more severe winter, and north unit deer were characterized by more extensive movements than middle unit deer both winters. A substantial bias toward open habitats in observations of neckbanded and unmarked deer favored the use of instrumented deer for habitat use assessment. During the 1976-77 winter, deer use was concentrated on the forested upper portion of the winter range with only 19% of the total use by instrumented deer occurring in shrub/grass types. Percent total use of shrub/grass and forest types by instrumented deer during the 1977-78 winter was 39% and 54%, respectively. Core home range preference ratios for individual habitat types and for shrub/ grass and forest habitat categories varied widely among individuals.

But preference ratios less than 1 for total shrub/grass types and greater than 1 for total forested types were common to all instrumented individuals of the north and middle range units, indicating a common preference for forested types. Habitat types most selected were the JUSC-PUTR/FEID and PSME/FEID types of the north unit and the PSME/SYAL and PSME/PRVI types of the middle unit. Temporal variation in habitat usage and home range size during the 1977-78 winter reflected snow depth and crust conditions. Snow depths of 36-48 cm with a non-supportive surface crust prompted deer congregation in forested habitats offering less severe snow conditions. Habitat use patterns observed on the winter range suggested a strategy of energy conservation rather than forage gathering. Daytime deer activity reached a peak the first half of March, at the start of accelerated snowmelt. Largest group size and greatest number of individuals sighted per observation period were recorded at that time.

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Chairperson, Graduate Committee

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Bozeman, Montana

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ABSTRACT

A study of winter habitat usage by mule deer was conducted on the Armstrong Winter Range in the Bridger Mountains of southwestern Montana during the winters of 1976-77 and 1977-78. Objectives were to ascertain the extent of individual variability in habitat use and to evaluate the reliability of conventional estimates of winter range use. A total of 19 deer wearing radio/transmitter collars were monitored from the ground, and from the air during weekly surveys in a Supercub aircraft. Conventional ground observations were obtained of neckbanded and unmarked deer. The number of marked deer on the winter range totaled 58 and 76 for the 1976-77 and 1977-78 winters, respectively. Relocations of instrumented and neckbanded individuals indicated the existence of three major winter range units. Instrumented animals exhibited larger home ranges during the first, mild winter than during the second, more severe winter, and north unit deer were characterized by more extensive movements than middle unit deer both winters. A substantial bias toward open habitats in observations of neckbanded and unmarked deer favored the use of instrumented deer for habitat use assessment. During the 1976-77 winter, deer use was concentrated on the forested upper portion of the winter range with only 19% of the total use by instrumented deer occurring in shrub/grass types. Percent total use of shrub/grass and forest types by instrumented deer during the 1977-78 winter was 39% and 54%, respectively. Core home range preference ratios for individual habitat types and for shrub/grass and forest habitat categories varied widely among individuals. But preference ratios less than 1 for total shrub/grass types and greater than 1 for total forested types were common to all instrumented individuals of the north and middle range units, indicating a common preference for forested types. Habitat types most selected were the JUSC-PUTR/FEID and PSME/FEID types of the north unit and the PSME/SYAL and PSME/PRVI types of the middle unit. Temporal variation in habitat usage and home range size during the 1977-78 winter reflected snow depth and crust conditions. Snow depths of 36-48 cm with a non-supportive surface crust prompted deer congregation in forested habitats offering less severe snow conditions. Habitat use patterns observed on the winter range suggested a strategy of energy conservation rather than forage gathering. Daytime deer activity reached a peak the first half of March, at the start of accelerated snowmelt. Largest group size and greatest number of individuals sighted per observation period were recorded at that time.

INTRODUCTION

Winter is a critical season for year-round resident wildlife of northern latitudes. Big game animals are often found in high densities during this period on traditional wintering areas which are very limited in size and extent. The relative importance of environmental requirements of wintering animals must be better understood to facilitate accurate assessment and wise management of these vital winter ranges.

Deer exhibit morphological, physiological and behavioral adaptations which allow them to modify their energy requirements with respect to limited winter resources. Hoffman and Robinson (1966) found thyroid activity of white-tailed deer (*Odocoileus virginianus*) to be lowest during the winter. Silver *et al.* (1969) reported lowered basal and fasting metabolic rates, and Seal *et al.* (1972) documented lowered metabolic rates as well as depressed thyroid activity during winter by white-tailed deer. Voluntary reduction in winter forage intake and in general activity were recorded by Ozoga and Verme (1970) and Wood *et al.* (1962). Range use strategies and behavior exhibited by deer are undoubtedly conducive to survival on a particular winter range and reflect existing environmental conditions.

The objectives of the present study were to examine habitat use by mule deer of the Armstrong Winter Range, ascertain the extent of individual variability in habitat usage and to evaluate

the reliability of conventional estimates of winter range use. Field research was conducted during the periods December 15, 1976 to April 1, 1977 and December 1, 1977 to April 1, 1978.

Several previous studies of the ecological characteristics of the Armstrong Winter Range and its associated mule deer population have been conducted. Investigations of mule deer food habits and range use initiated by Wilkins (1957) were followed by Schwarzkoph (1973) and Hamlin (1974), who provided additional information on seasonal distribution and population characteristics. Ecological attributes of the winter range and production and utilization of key browse species were examined by Bucsis (1974). Morton (1976) further evaluated nutritional attributes of several important winter forage species. Summer and fall distribution and habitat use by mule deer associated with the Armstrong Winter Range were described by Pac (1976). Late winter-spring distribution and population trends have been monitored since 1975 and were reported by Mackie *et al.* (1976), Mackie and Stewart (1976), Mackie and Knowles (1977) and Mackie *et al.* (1978).

DESCRIPTION OF THE STUDY AREA

The Bridger Mountain Range, the geological features of which have been described by McMannis (1955), is located in southwestern Montana. Seven major mule deer winter ranges have been identified in the Bridger Mountain complex, and distribution and population studies have indicated the existance of rather distinct herd units associated with each of these major winter range areas (Mackie *et al.* 1978). Migratory deer associated with the Armstrong Winter Range spend the remainder of the year in the main portion of he Bridger Range bounded by Flathead Pass on the north and Ross Pass on the south (Mackie *et al.* 1978). They generally arrive on the winter range in November and December and depart during May and June.

The Armstrong Winter Range is located on a southwestern exposure of the Bridger Range, approximately 32 km north of Bozeman (Fig. 1). Bucsis (1974) described this area as encompassing 510 ha of lower mountain and footslopes, bounded by North Cottonwood Creek on the north and Bill Smith Creek on the south. Elevations range from 1600 to 2378 m. The northern half of the study area is characterized by a west-facing aspect, cut by east-west drainages while the southern portion changes from a south to a southwest aspect with north-south and northeast-southwest drainages. The terrain is typified by steep inclines with slope gradients occasionally exceeding 50 percent.

Vegetational characteristics of the Armstrong Winter Range were summarized by Bucsis (1974), who described 14 habitat types on the

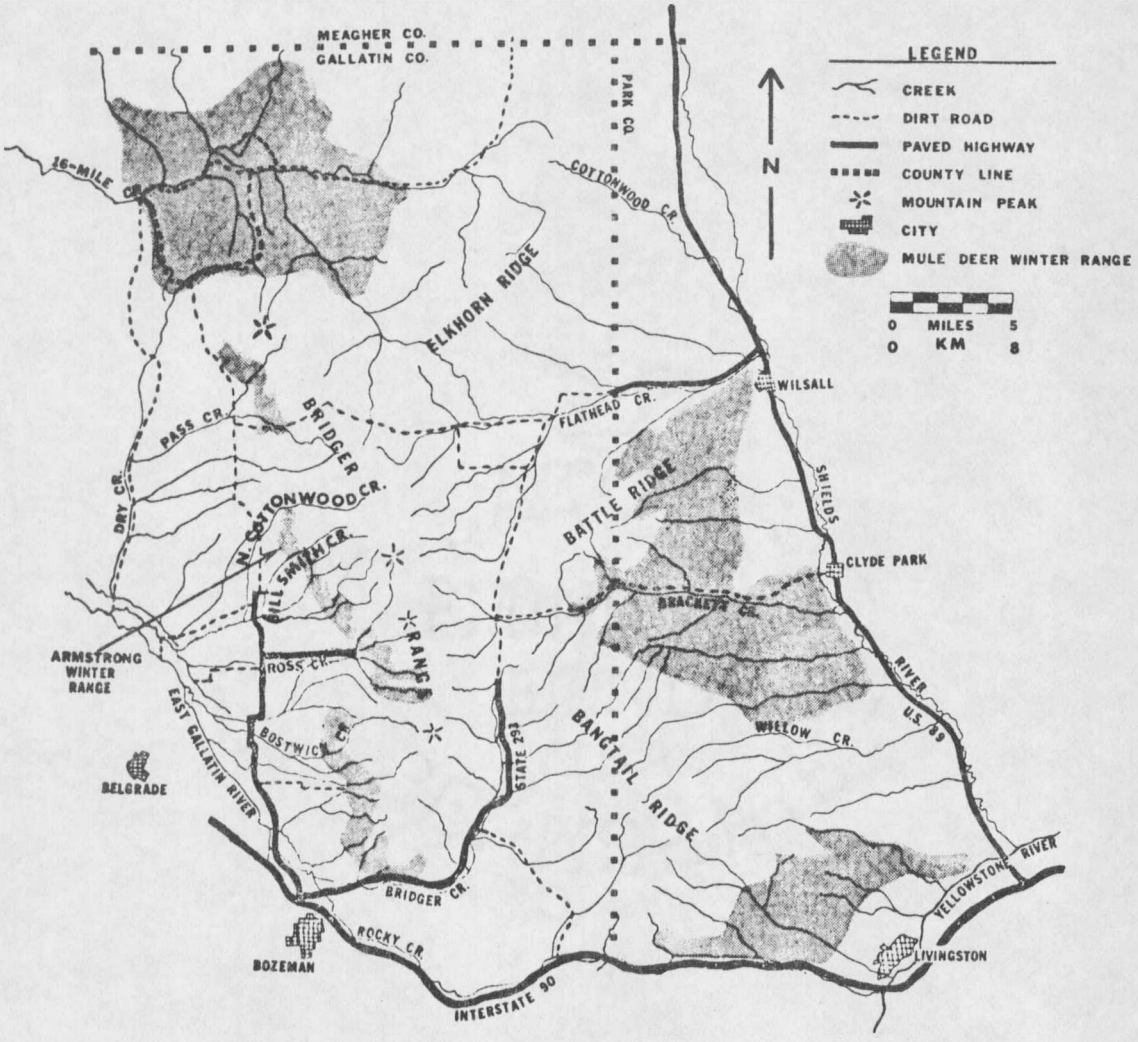

Figure 1. Map of the Bridger Range showing major features and location of the Armstrong Winter Range.

area, to a resolution of 1.2 ha. His classification scheme followed Mueggler and Handl (1973) and Pfister *et al.* (1973). Habitat type classification of the forested portion of the study area above 2015 m has since been modified by Pac (1976), after Pfister *et al.* (1974). The heterogeneity of the study area with respect to elevation, topography and edaphic characteristics is reflected in the mosaic distribution of the 16 designated habitat types (Fig. 2).

Records from the Montana State University weather station show a mean annual temperature of 6.3°C and mean annual precipitation of 47.5 cm for the period 1947 through 1977 (U.S. Weather Bureau). Mean total precipitation and mean monthly temperature for November through April are 17.2 cm and -1.3°C, respectively. This station is considered to be subject to weather conditions similar to those of the west slope of the Bridgers.

Although historically primarily a mule deer wintering area, the Armstrong Winter Range and immediate vicinity is also utilized by approximately 50 elk (*Cervus elaphus canadensis*) during the winter and spring. They range more widely than the deer and are generally observed in forested habitats, singly or in small groups.