WINTER DISTRIBUTIONS AND HABITAT PREFERENCES OF DEER, ELK, AND BIGHORN SHEEP IN THE BIG CREEK DRAINAGE

Report prepared for the
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University of Idaho

by

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March, 1983

Introduction

This study analyzes populations of Rocky Mountain mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus elaphus*), and Rocky Mountain bighorn sheep (*Ovis canadensis*) utilizing the lower Big Creek winter range, Valley County, Idaho. For the purpose of the study, lower Big Creek is defined as the thirteen mile portion of the drainage from Cabin Creek, T. 21N., R. 12E., Boise Meridian, eastward to the confluence with the Middle Fork of the Salmon River, T. 21N., R. 14E., B. M., and the slopes on the east side of the Middle Fork Salmon River to Waterfall Creek (Figure 7).

The study was conducted from Taylor Ranch, a research field station owned by the University of Idaho. Taylor Ranch is situated at the mouth of Pioneer Creek on the south side of Big Creek in the center of the study area.

In winter, deer, elk, and bighorn sheep are abundant in the lower Big Creek drainage. These three species all utilize this area during winter for meeting the basic needs of food, water, and shelter. The study area contains a variety of vegetative and physiographic units. The potential exists for habitat partitioning or differential habitat preference among deer, elk, and sheep. By assessing use of vegetation types and distribution patterns throughout the winter months, differences among species use can be determined. Hobbs (1983) observed significant differences among deer, elk, and bighorn sheep in forage class composition (grass, forb, browse) of

winter diets.

Habitat preference information can be used for managing winter ranges or manipulating habitat to favor a particular species. Information is also needed on population size, density, and the relative abundance of wintering deer, elk, and sheep in the Middle Fork Salmon River drainage (Nielson 1975).

Methods

Density estimates were made from an indefinite width line transect (Caughley 1977). Eberhardt (as cited in Caughley 1977) indicated that the precision of a density estimate is increased as the number of animals increases, therefore, all animals seen should be counted. An indefinite width transect was chosen for this reason.

Observations of herds, rather that individuals were used in data analysis. Distributions of groups of gregarious ungulates are closer to random than the distribution of individuals (Matzke 1975). To calculate animal density the following information was recorded for each sighting:

1. species
2. number of animals in the herd
3. perpendicular distance of the center of the herd from the transect

Distances were estimated to the nearest 50 yards. Habitat type and animal activity were also recorded. Herd locations were mapped on 7.5 minute USGS quadrangle maps. Due to the difficulty of travel across rugged terrain, the Big Creek Trail was systematically designated as the transect line. Observations were made on foot. The transect was divided

into two similar length segments. One section was from Taylor Ranch to Cabin Creek, the other was from Taylor Ranch to the Middle Fork. Sightings were collected once per week for each section. Twelve transects were conducted between November 15, 1982 and February 15, 1983. Total transect length was 13.0 miles. The selection of a 13 mile transect was based upon the distance which a person could walk in a day under winter weather conditions.

The 6.52 square mile study area size and shape reflects the sighting distances from the transect line. Visibility restrictions due to topography also affect area size and shape. The sighting distance was defined as the distance at which deer, elk, and sheep were discerned with binoculars. The most distant animal sightings were used to formulate the sighting distance boundary (Figure 7). In areas where insufficient sightings exist, the boundary line was placed at the furthest point at which any of the three species could be distinguished if present. Where visibility is unobstructed, such as at Cabin Creek, Taylor Ranch, and on the Middle Fork the study area is wide compared with narrower portions of the canyon, like the Big Creek Gorge, where visibility is restricted.

The study area is located in a steep canyon. Cliffs, rock outcrops, and talus slopes are common throughout the area. The dominant geologic formation is the granitic Idaho batholith with quartzite and latite intrusions (Bordonave 1980).

A variety of plant communities occur along this segment of Big Creek. The study area was divided into four generalized habitat types. Daubenmire defines habitat type as "the aggregate of all areas that support, or can support, the same primary vegetation complex; a classification of environmental settings characterized by a single plant association; the expression through the plants present of the sum of the environmental factors that influence the nature of the climax." (Thomas 1979). Habitat types were delineated according to potential natural vegetation (Thornburg 1976). The four habitat types are: mahogany bluff (Cercocarpus ledifolius, Artemesia tridentata, Agropyron spicatum), grass shrub (Artemesia tridentata, Prunus sp., Agropyron spicatum), grass (Agropyron spicatum, Festuca idahoensis, Balsamorhiza sagitata), and forest (Psuedotsuga menziesii, Physocarpus malvaceus, Populus trichocarpa, Symphoricarpos albus). These four habitat types are variable in size and distribution, as displayed in Figure 7. Table 1 indicates that the grass type is most common in the study area. The mahogany bluff type also shows a strong representation. The forest type is less common. The grass shrub type is not well represented.

Table 1. Area of Each Habitat Type

Habitat type	Area (square miles)	Percent
grass	2.6	39.4
mahogany bluff	2.1	32.0
forest	1.3	20.1
grass shrub	0.5	8.4

Results

Animal counts were analyzed for average densities, differences in habitat use, and changes in habitat use throughout the winter. To assess differences in animal visibility a sighting frequency curve was drawn to express the relationship between the percent of animal sightings and distance from transect line. Three types of curves can be expected (Figure 1): linear, half-normal, and negative exponential. In analyzing the curves of deer, elk, and sheep, the only representative curve was that for sheep (Figure 2). The curves for deer and elk indicate that some factors caused nonrandom animal locations. The transect location along the streamcourse caused observations to be biased. Habitat types were not spatially random; conversely, plant associations were affected by topography. Observations were weighted toward lower slope habitat types and animal use and against upper slope types and use. Elk seem to prefer upper slopes in all seasons (Thomas and Toweill 1982). This was demonstrated in the study area. Few animals of any species were found in the stream riparian during midmorning, when transects were conducted. For these reasons average sighting distance and visibility adjustments could not be used in density analyses.

Animal densities were calculated from the following: average observed density = average number of herds observed per transect ÷ square miles of area (study area or habitat type). Data for density calculations were sorted by animal species, habitat type, and transect week. Due to small

sample size, variances of density figures were not calculated. Average densities of deer, elk, and sheep in the study area are displayed in Table 2. These density figures were based

Table 2. Average Densities of Deer, Elk, and Sheep on the Study Area During Winter

animal	herds per mile^2	individuals per mile^2
Deer	1.07	6.51
Elk	0.52	4.99
Sheep	0.69	6.04

on actual observations. Since herd numbers were not adjusted for visibility, these density figures represent minimum actual densities.

Density estimators commonly used with indefinite width transect data, such as King, Gates, and Rodgers (as cited in Matzke 1975) are based on the assumption that the represented area used for calculating density is proportional to average sighting distance, and therefore varies for each species. For the purposes of this study there was a defined area, influenced by visibility restrictions associated with topography. Density calculations for all species were based on the same area.

Animal densities were determined for all habitats. The occurence of animal herds in each habitat type reflects habitat utilization for each species. Table 3 indicates that deer were most frequently observed in grassland, elk were rarely seen anywhere besides grassland, and sheep were found primarily in mahogany bluff.

Table 3. Percent Occurrence of Animal Herds by Habitat Type

animal	grass	grass shrub	mahogany bluff	forest
Deer	49	20	I9	12
Elk	74	7	12	7
Sheep	18	23	59	0

Data was further analyzed to determine the percent of animal occurrence in each vegetation type with respect to the proportion of area in each habitat type (Figure 3). If all habitat types were used equally, then the percent of herds in any type would approximate the percent of area within that type, yielding a proportion of 1.00. Relative animal use greater than relative area indicates habitat preference or selective usage. This is expressed numerically as "greater than 1.00". Proportional animal use of a habitat which is less than the proportional habitat area indicates habitat "avoidance" or negative preference, expressed numerically as "less than 1.00". Figure 4 shows that sheep display marked preference for grass shrub, a moderate preference for mahogany bluff, a slight avoidance for grass and extreme avoidance of the forest type. Deer highly prefer grass shrub, favor grass, and avoid forest and mahogany bluff types. Elk show positive habitat preference for the grass type, while showing varying degrees of negative preference for grass shrub, forest, and mahogany bluff types.

Importance of various habitats changed during winter. Figure 5 indicates that deer densities increased greatly

in grass shrub and grass types as the winter progressed. Use of forest and mahogany bluff types by deer changed little, despite the increase in herds within the study area. Elk were not observed in the study area in early winter. Elk use was primarily concentrated in the grass type throughout winter, although elk were also found in the grass shrub type in early January. There were low densities of elk in forest and mahogany bluff types all winter. Sheep were observed more often in grass shrub and mahogany bluff types as the winter progressed, while use of the grass type was constant. Sheep were never observed using forest.

Numbers of herds observed increased as the winter progressed, reaching a peak in late January. Herd numbers along the upstream Cabin Creek transect segment increased more abruptly than did the downstream Middle Fork section (Figure 6). Elk herd sightings reached two peaks, one at the end of December and the other in late January. In analyzing the two transect section seperately, it can be observed that the majority of elk herd sightings occurred along the Cabin Creek segment (Figure 8). Deer herd sightings reached a peak in early February. Early in the winter more deer herds were observed along the Middle Fork segment than the Cabin Creek segment. As the winter progressed this tendency reversed and by the end of January there were substantially more deer herd sightings in the Cabin Creek section. Sheep herd sightings were highly variable throughout the winter. The greatest number of sheep herds occurred in late January. There were consistently more sheep sightings

along the Middle Fork segment where the rugged mahogany bluff habitat type predominates (Figure 7).

Herd size differed for the three species. Deer were observed in herd sizes averaging 5.9 animals. Elk herds were largest, averaging 9.5 animals per herd. Sheep herds were slightly smaller, averaging 8.7 animals per herd.

Transects containing the highest number of herds also contained the maximum number of individuals. When transects of 18 and 12 herds of deer were counted, each transect tallied 111 individual animals. When 6 and 8 elk herds were seen, there were 55 and 129 individuals observed. Transects with the greatest number of sheep herds (11, 7, and 7) had 63, 75, and 65 individuals respectively. These observations support the assumption that a direct relationship exists between the number of herds observed and the number of individuals observed for each species.

There was a total of 179 herds seen on the twelve transects. Of the total, 84 herds were deer, 41 were elk, and 54 were sheep. An average of 14.9 herds per transect was observed. For each transect there was an average of 7 deer herd sightings, 3.4 elk herd sightings and 4.5 sheep herd sightings.

Discussion

The line censusing technique provided a workable method for obtaining spatial information on deer, elk, and bighorn sheep. This technique also enabled the assessment of herd size and individual species habitat preference.

It was found that elk formed the largest herds. However, elk herds were observed the least often and had the lowest density per square mile. Sheep were intermediate in both herd size and density. Deer formed the smallest herds, but occurred in the greatest density over the study area. Sightings of deer and elk most frequently occurred in the grassland, while sheep were most commonly observed in the mahogany bluff habitat type. Winter habitat preferences were apparent for the three species studied. Elk demonstrated a preference for grass slopes. Both deer and sheep preferred the grass shrub sites to the other three habitat types within the study area.

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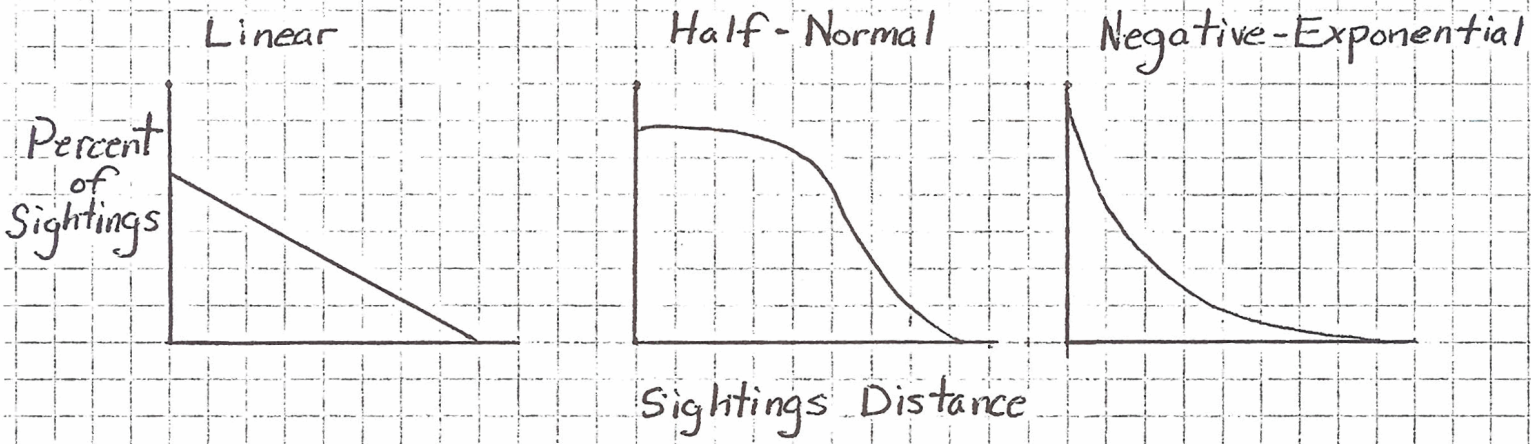
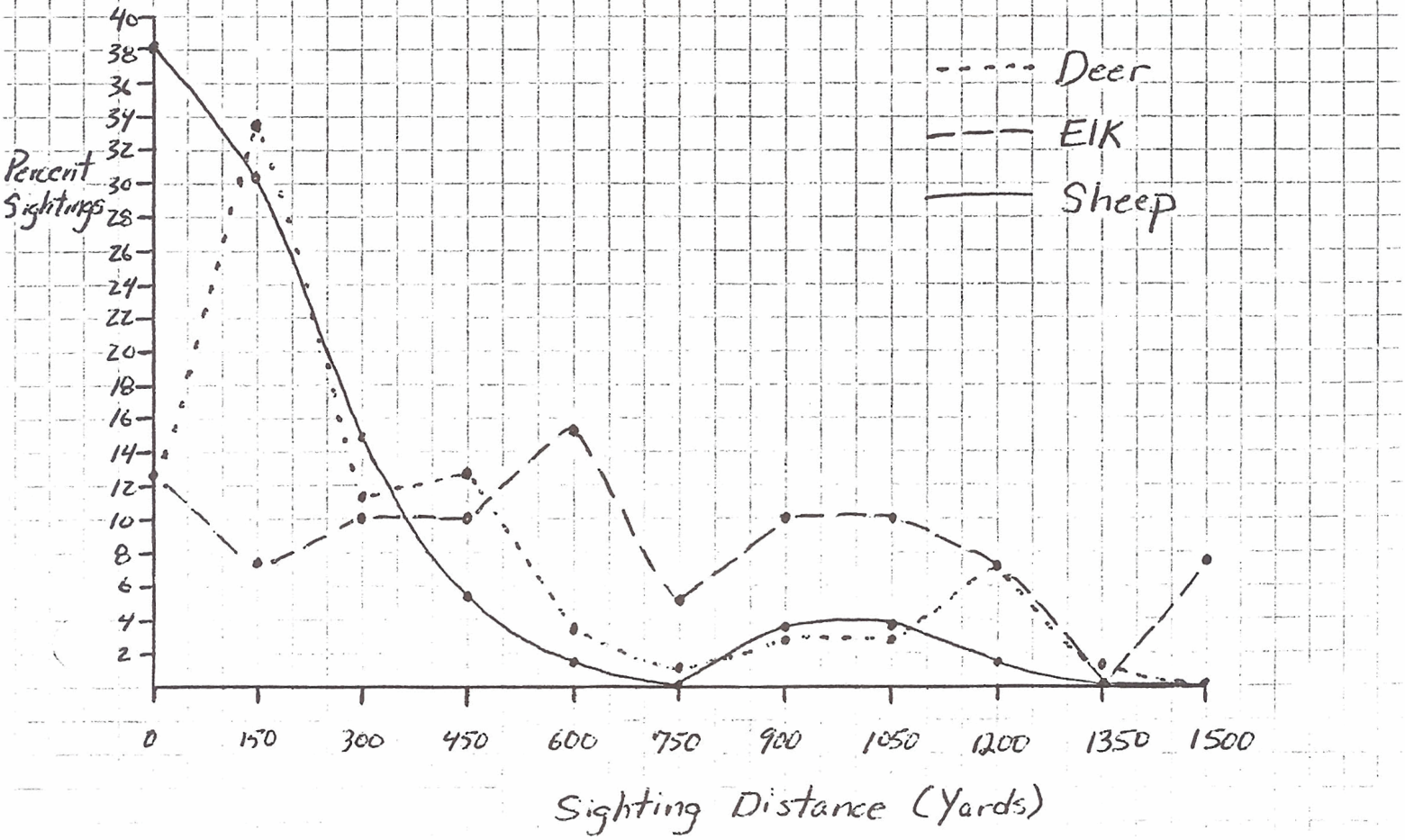
Types of Sighting Frequency Curves

figure 1



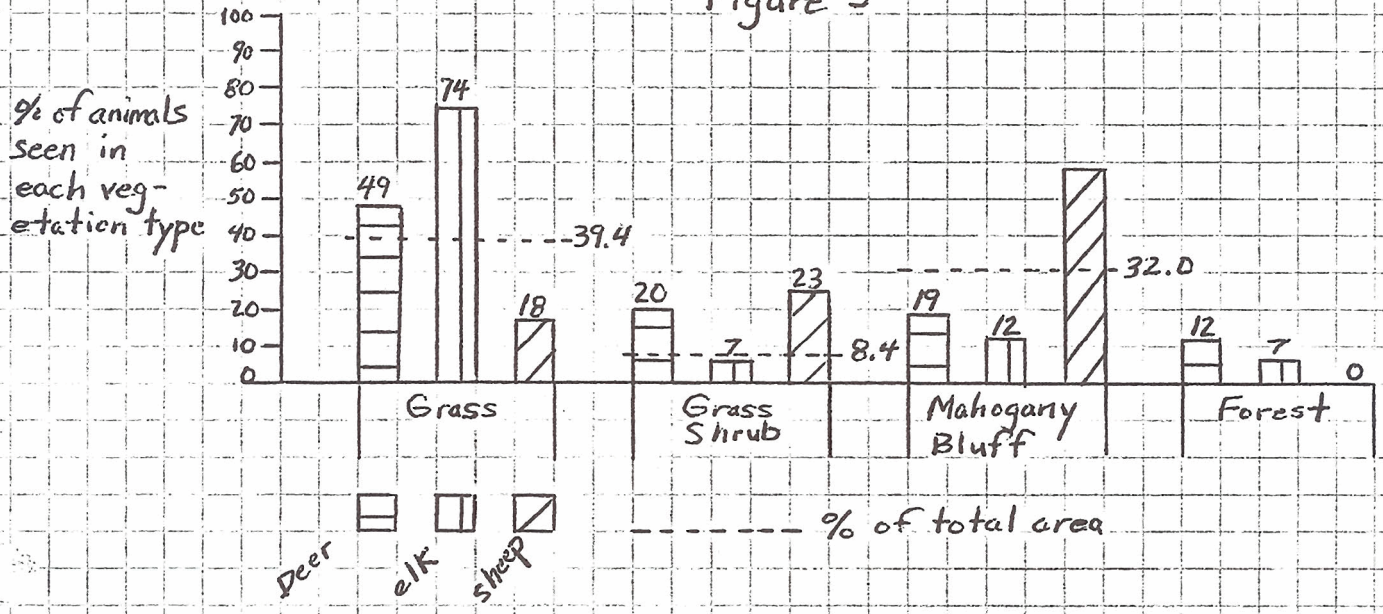
Sighting Frequency Curves for Deer, Elk, and Sheep

figure 2



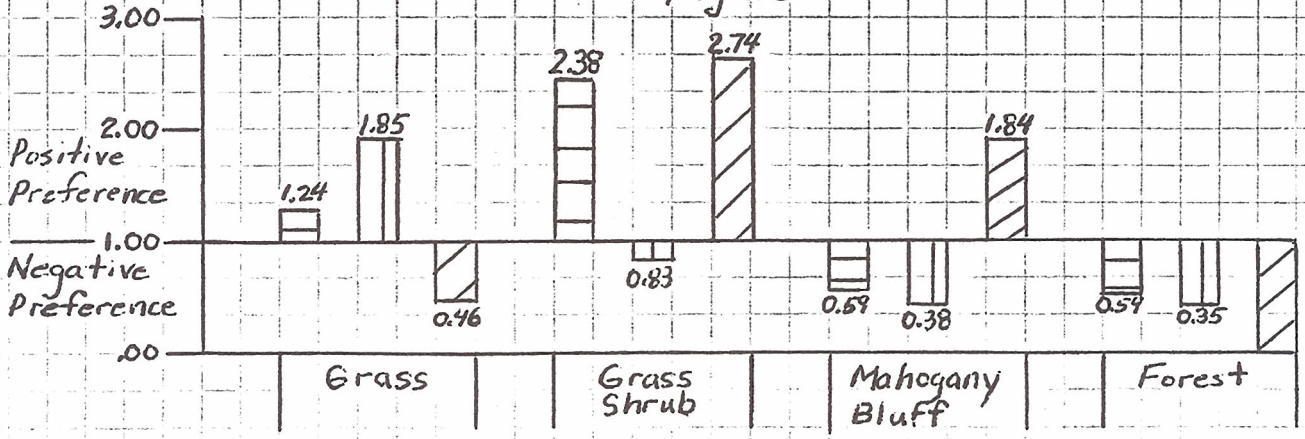
Habitat Use

Figure 3



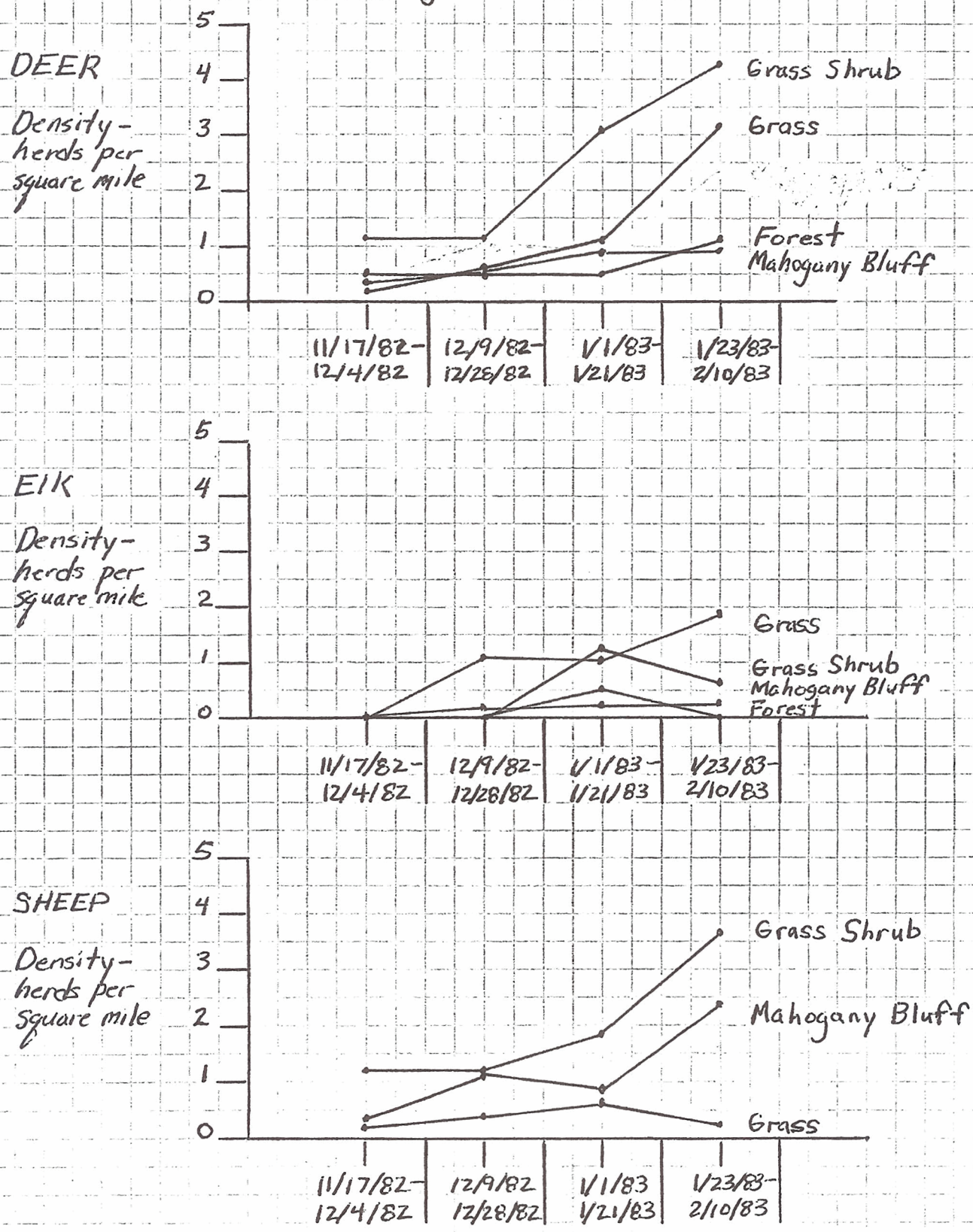
Habitat Preference of Deer, Elk, and Bighorn Sheep

Figure 4



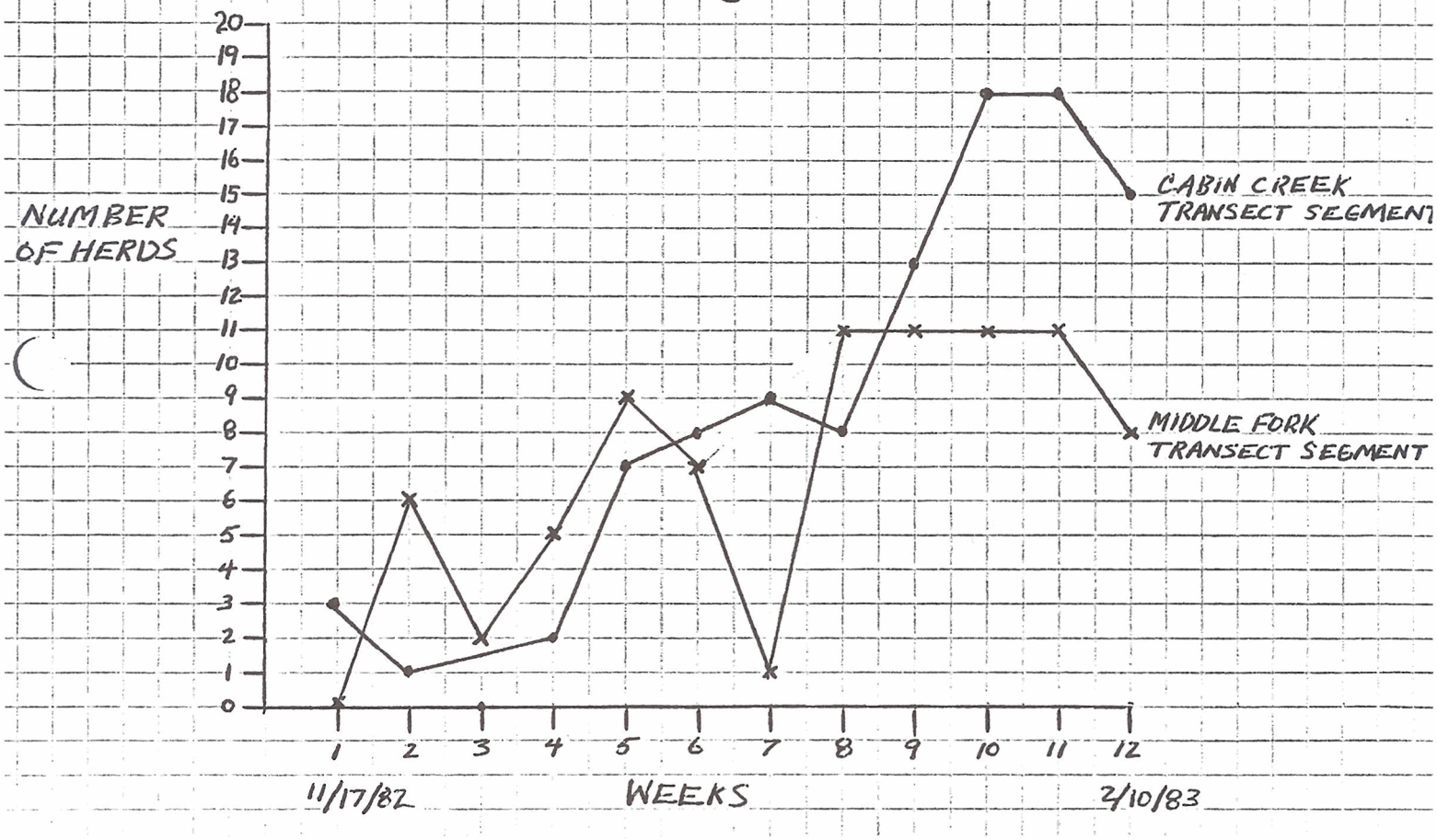
Changes in Habitat Use Through the Winter for Deer, Elk, and Bighorn Sheep

figure 5



Number of Herds Seen Along the Two Transect Segments Over the Twelve Week Study Period.

figure 6



Number of Deer, Elk and Sheep Sightings Through the Twelve Week Study Period.

figure 8