Black bear habitat use in west-central Idaho
by James W Unsworth

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:
Black bear (Ursus americanus) habitat use patterns were studied in west-central Idaho from 1982-1983. Ten adult female bears were instrumented with radio transmitters. Bears' were relocated 64 0 times during the study. Uncut' timbered sites were important bedding areas and timber components along drainages served as travel corridors. Open timber components were used in spring as foraging areas. Open timber/shrubfield components were used as foraging areas and bedding sites. Riparian areas were preferred as feeding sites and used as travel corridors. Aspen components were preferred by bears with cubs. They provided dense horizontal cover and were often adjacent to shrubfields. The meadow component was used in the spring as a foraging area for grasses and forbs. Rock/talus and sagebrush/grass components were avoided. Selection cut/shrubfield components were preferred as feeding sites for berry species. Other selection cut components were used in proportion to availability. Clearcuts were avoided. Abies grandis/Vaccinium globulare, Abies grandis/Acer glabrum, and Pseudotsuga menziesii/Physocarpus malvaceus habitat types received over 90% of the use. The Abies grandis habitat types were important food producers and the Pseudotsuga menziesii/Physocarpus malvaceus habitat type was most often used for bedding. Topographic features that enhance the growth of mesic vegetation were preferred. Female bears preferred areas in cover, but would venture from cover to seek food. Timber and hunting management recommendations are presented.

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A thesis submitted in partial fulfillment
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of

Master of Science

in

Fish and Wildlife Management

MONTANA STATE UNIVERSITY
Bozeman, Montana

DECEMBER 1984

APPROVAL

of a thesis submitted by

James W. Unsworth

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ACKNOWLEDGMENT

I wish to thank Dr. Lynn R. Irby, Montana State University, for his supervision of this project and reviewing the early drafts of this manuscript. Dr. Irby has gone beyond what is normally expected of a Major Professor and his help has been truly appreciated. Dr. John J. Beecham, Research Supervisor of the Idaho Department Of Fish and Game, deserves special thanks for his support during this study, his help in the field, and providing me with the opportunity to work on an animal such as the black bear. Drs. Harold D. Picton and William R. Gould, Montana State University, critically reviewed the manuscript and offered valuable comments. Jeffery Rohlman and Greg Servheen provided excellent field assistance. Linda Redinius and family provided uncountable home cooked meals and a link with the comforts of civilization. I would also like to thank my parents, James F. and Madge Unsworth, for their encouragement and for instilling in me a love for the outdoors. Project funding was provided by the Idaho Federal Aid in Wildlife Restoration, Project W-160-R, the Idaho Department of Fish and Game, and Montana State University.

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ABSTRACT

Black bear (*Ursus americanus*) habitat use patterns were studied in west-central Idaho from 1982-1983. Ten adult female bears were instrumented with radio transmitters. Bears were relocated 640 times during the study. Uncut timbered sites were important bedding areas and timber components along drainages served as travel corridors. Open timber components were used in spring as foraging areas. Open timber/shrubfield components were used as foraging areas and bedding sites. Riparian areas were preferred as feeding sites and used as travel corridors. Aspen components were preferred by bears with cubs. They provided dense horizontal cover and were often adjacent to shrubfields. The meadow component was used in the spring as a foraging area for grasses and forbs. Rock/talus and sagebrush/grass components were avoided. Selection cut/shrubfield components were preferred as feeding sites for berry species. Other selection cut components were used in proportion to availability. Clearcuts were avoided. *Abies grandis/Vaccinium globulare*, *Abies grandis/Acer glabrum*, and *Pseudotsuga menziesii/Physocarpus malvaceus* habitat types received over 90% of the use. The *Abies grandis* habitat types were important food producers and the *Pseudotsuga menziesii/Physocarpus malvaceus* habitat type was most often used for bedding. Topographic features that enhance the growth of mesic vegetation were preferred. Female bears preferred areas in cover, but would venture from cover to seek food. Timber and hunting management recommendations are presented.

INTRODUCTION

Black bear (Ursus americanus) populations occur throughout much of Idaho, but are largely confined to coniferous forests in the northern two-thirds of the state and isolated areas of eastern Idaho (Beecham 1977). There are many competing uses for these forested areas including mining, mineral and oil exploration, recreation, water development, livestock grazing, and timber production. Many of these uses have dramatic effects on wildlife habitats, but timber production and the associated increase in access probably has the greatest effect on black bears. In the Pacific Northwest, thousands of hectares of timber are clearcut each year (Lindzey and Meslow 1977), and forest management plans that take black bear habitat needs into consideration are rare.

The effects of logging on wildlife have been described by many researchers. Wallmo et al. (1972) found that mule deer (Odocoileus hemionus) were attracted to logged areas which produced increased amounts and varieties of forage. Logging activities at low elevations have generally benefited white-tailed deer (Odocoileus virginianus) in the northern Rockies by providing seral shrubs which are important as winter forage (Pengelly 1963). In some areas

with heavy snow accumulation, overstory removal has had negative effects on white-tail populations that depend on dense stands to intercept snow on winter ranges (Mundinger 1979). Elk (Cervus elaphus) were found to use clearcuts less than 10 years old in proportion to availability, but avoided older cuts (Hershey and Leege 1976).

Gashwiler (1970) found varying responses of small mammal populations to clearcuts. Deer mice (Peromyscus maniculatus), Townsend's chipmunk (Eutamias townsendii), Oregon vole (Microtus oregoni), and snowshoe hare (Lepus americanus) populations increased in clearcut areas. Red-back voles (Clethrionomys occidentalis), Douglas' squirrels (Tamiasciurus douglasii), and northern flying squirrels (Glaucomys sabrinus) were eliminated from clearcut areas. Removal of old growth forests reduces habitat for pileated woodpeckers (Dryocopus pileatus) and the northern spotted owl (Strix occidentialis) (Luman and Neitro 1980), but habitat for early seral stage species such as mountain bluebird (Sialia mexicana) and Brewer's sparrow (Spizella breweri) is enhanced.

Black bear populations have been the focus of many kinds of studies in many areas of the United States and Canada (Barnes and Bray 1967, Beecham 1980, Erickson et al. 1964, Jonkel and Cowan 1971, Kemp 1972, Lindzey 1976, Stickley 1957). Activity and food habits studies have

provided important information on bear activity patterns and their relationship to the foods eaten by bears (Amstrup and Beecham 1976, Landers et al. 1979, Rogers 1976, Tisch 1961). Habitat use studies have been conducted in Montana (Jonkel and Cowan 1971), Alberta (Fuller and Keith 1980), California (Kelleyhouse 1980, Novick and Stewert 1982), and Virginia (Vaughan et al. 1983). Other studies related directly to timber management and bears have been conducted in Montana (Zager 1983), Idaho (Young 1984), and Washington (Lindzey and Meslow 1977). Because black bear populations are unique products of specific habitat parameters which influence population dynamics, social organization, reproductive potential, and availability of suitable den sites (Beecham 1980), data from differing geographic areas may not be applicable to west-central Idaho. With the increased popularity of black bears as game animals and increasing demands on forest lands as resource producers, management plans are needed that consider the welfare of black bears and their habitat.

The major goal of this research was to document female black bear habitat use patterns in the Middle Fork of the Weiser River drainage of west-central Idaho and to use this information in formulating timber management guidelines which can be used by land managers for the benefit of the black bear population in west-central Idaho. Specific objectives were to: 1) quantify seasonal habitat use by

female black bears and determine physical and environmental factors which affected utilization; 2) identify relationships that existed between black bear food plants (variety, abundance, and phenology) and habitat use; 3) identify the effect of different silvicultural practices on black bear habitat use; and 4) prepare timber management guidelines.

STUDY AREA

The study area is located on the Middle Fork of the Weiser River in west-central Idaho about 13 kilometers (km) southeast of Council, Idaho. Major geographic features include Council Mountain to the north and West Mountain Ridge to the east. Elevations range from 1070 meters (m) to 2470 m on Council Mountain (Figure 1).

Two major rock types are present: basalt rocks of the Columbia River Formation and granite rocks of the Idaho Batholith. Soils derived from basalt are fine to medium in texture with depths varying from 76 centimeters (cm) to 125 cm. Soils derived from granitic rocks are generally coarse textured and depths range from 60 cm to 100 cm. Erodibility of basaltic soil is low. Granitic soils are moderately to highly erodable. The area includes strongly glaciated, periglaciated, fluvial, and depositional lands (Larsen et al. 1973).

Climate is influenced by the Aleutian low in the winter months and the Pacific high during the summer. Mean annual precipitation ranges from 635 millimeters (mm) at lower elevations to 1143 mm at upper elevations. Eighty percent of the annual precipitation occurs from October through April as snow. Temperatures recorded at Council range from -32 degrees Clesius (C) to 43 degrees C, with a mean annual temperature of 3.7 degrees C (Larsen et al. 1973)

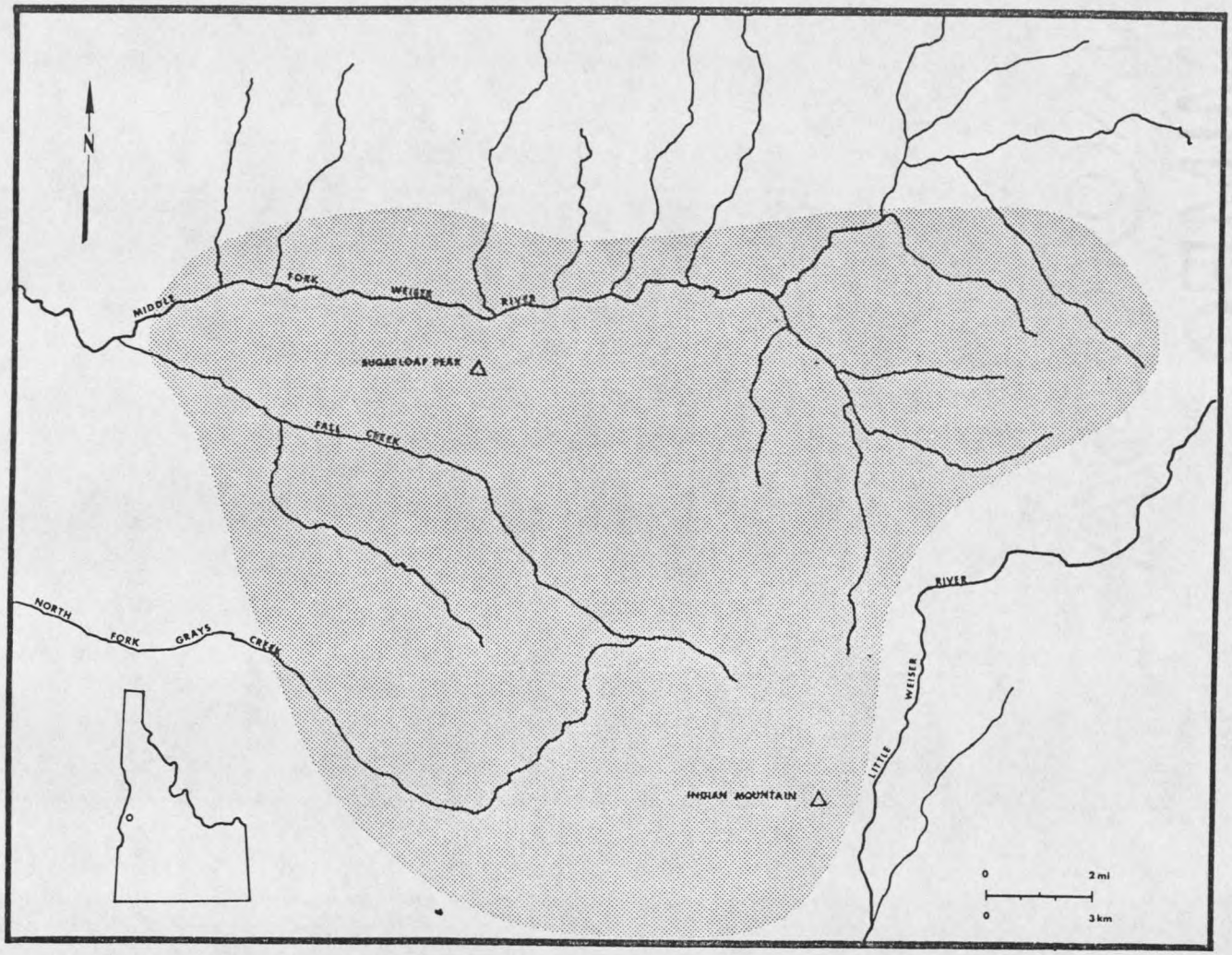

Figure 1. Study area on the Middle Fork of the Weiser River.

Plant communities at lower elevations are dominated by big sagebrush (Artemisia tridentata), grasses, and forbs. Ponderosa pine (Pinus ponderosa) grows in scattered stands at lower elevations and is the dominant species from 1200 m to 1525 m. Douglas fir (Pseudotsuga menziesii) and Grand fir (Abies grandis) replace pondersoa pine as the dominant species at about the 1525 m to 1850 m level. Lodgepole pine (Pinus contorta), subalpine fir (Abies lasiocarpa), Englemann spruce (Picea engelmannii), and western larch (Larix occidentalis) occur on the grand fir sites which are common in the upper and wetter portions of this zone. Quaking aspen (Populus tremuloides) is scattered throughout the area. Whitebark pine (Pinus albicaulis) is present on the highest sites. Important shrub and undergrowth species include hawthorne (Crataegus douglasii), chokecherry (Prunus virginiana), bittercherry (Prunus emarginata), elderberry (Sambucus cerulea), buffaloberry (Shepherdia canadensis), huckleberry (Vaccinium globulare) and red-osier dogwood (Cornus stolonifera). Important forbs and grasses include balsamroot (Balsamorhiza spp.), lomatium (Lomatium spp.), wild onion (Allium spp.), bluebunch wheatgrass (Agropyrom spicatum), and Idaho fescue (Festuca idahoensis). Nomenclature is from Hitchcock and Cronquist (1976).

The major land uses affecting the area are commercial timber cutting and livestock grazing. Logging on public lands began in the 1950s and has continued since. Over 225

million board feet of timber were removed from the Council Ranger District from 1960 to 1970. Approximatly 1000 cows and calves graze the study area. The grazing season on United States Forest Service lands runs from July until mid-October. Other uses of the study area include fishing, hunting, camping, and berrypicking.

METHODS

Trapping and Handling

Black bears were captured with Aldrich spring-activated foot snares set in or adjacent to cubby sets or on trails leading to sets. Sets were baited with spawned out salmon (Oncorhynchus tshawytscha). Snares were attached to "green" drag logs or living trees adjacent to cubbies and trails.

On the Council study area, bears were immoblized with intramuscular injections of Ketaset (ketamine hydrochloride, 2 milligrams (mg)/.45 kilogram (kg) of body weight) and Rompun (xylazine hydrochloride, 1 mg/.45 kg of body weight). Drugs were administered with a syringe mounted on the end of a 2 m "jab stick".

Bears were marked with individually numbered plastic ear tags and tattooed with the same number in the upper lip. Weight and other physical measurements were recorded, along with physiological parameters from all captured bears. Vaginal smears were taken, and appearance of mammary glands and vulvas were used to determine reproductive status (Reynolds and Beecham 1980). Bears were aged using the cementum-annuli technique (Stoneberg and Jonkel 1966) and by observer estimates of tooth wear and canine length.

Instrumenting and Monitoring

Ten adult female bears were instrumented with radio-transmitters. Females were radio-collared because of their reproductive importance, and their smaller home ranges (Lindzey and Meslow 1977, Poelker and Hartwell 1973, Reynolds 1977, Stickley 1957) helped to expedite relocations.

The Council bear population was known to be diurnal and crepuscular (Amstrup and Beecham 1976, Reynolds and Beecham 1980) therefore, monitoring of black bears was concentrated during daylight hours. Bears were monitored for two field seasons, May to November in 1982 and April to November 1983. Five bears were removed from their dens in March 1984 to replace radio collars and determine cub production. Two other radioed bears were captured in June 1984 with dogs and reinstrumented for future study.

Bears were monitored from the ground and relocations were classified as 1) visual--bear was seen; 2) close--within 100 m, determined from signal strength or hearing bear without triangulation; 3) close triangulation--within 300 m, triangulation and signal strength; and 4) triangulation. Close triangulation and triangulation were used infrequently and were included in the habitat analysis only if all compass bearings intersected, roughly, at a single location and if the location were within a large homogeneous habitat component (Young 1984). Locations were

plotted on U.S. Geological Survey orthophotographs (scale 1:24,000) and topographic maps (scale 1:62,500). Locations were assigned X,Y coordinates utilizing Universal Transverse Mercator (U.T.M.) meridians.

Activity was recorded as 1) bedding, 2) feeding, 3) traveling, 4) denning, or 5) unknown. Radio collars were equiped with motion sensitive devices that changed the pulse to a slow mode if the collars were motionless for 2 minutes. The pulse remained fast if the animal was moving. Activity was determined from pulse rates and observing bears or looking for sign in the area the bear had been using. Also bears were considered traveling if there was a significant change in the direction of a signal during the location process.

Habitat Sampling at Bear Locations

Habitat sampling was conducted in two ways. At locations where the bear was not observed or sign detected, the following site characteristics were recorded when possible: elevation, slope, aspect, topography, horizontal configuration and distance to the nearest cover, water, and road (Steele et al. 1981). Topography was recorded as ridge top, upper slope, mid-slope, lower slope, bench or flat, or stream bottom. Horizontal configuration was classified as convex (dry), straight, concave (wet), or undulating. A bear was considered in cover if it could not

be seen by the observer from a distance of 100 m. Habitat types, as classified by Steele et al. (1981), were recorded for each bear location. Ponderosa pine and subalpine fir habitat types were each grouped as a series for analysis. Areas without an identifable overstory were not assigned habitat types. If the bear was observed or if the location could be determined exactly from feeding or bedding sign, then the vegetation was sampled using a 375 square meters (m^2) circular plot (Pfister and Arno 1980). With this method the observer estimates the percentage canopy cover of each plant species within the plot and assigns it to a coverage class (1=0-1%, 2=>1-5%, 3=>5-25%, 4=>25-50%, 5=>50-75%, 6=>75-95%, or 6=>95-100%).

Habitat component classification (Zager et al. 1980) was also utilized but modified for the Council study area. Habitat components were used to supplement habitat types because of the need for classifying non-forested, seral stages and sites where timber had been harvested (Table 1). The distance from the center to the edge (size) of the component and the distance to the nearest different component were recorded. If timber had been harvested from the site, post-logging treatment was also noted. Overstory canopy closure was estimated and assigned a coverage class value. Stands were classified as even or uneven aged. Vertical diversity was measured by estimating the coverage

Table 1. Habitat component classification system used at the Council study area, 1982-1983.

1. Timber (T)	Unlogged stand of timber with canopy closure > 60%.
2. Open Timber (OT)	Unlogged stand of timber with canopy closure > 30 but < 60%. Undergrowth dominated by grasses and forbs.
3. Open Timber /Shrubfield (OTS)	Unlogged stand of timber with canopy closure > 30 but < 60%. Undergrowth dominated by shrubs.
4. Riparian (R)	Streamside or moist areas with well developed mesic vegetation.
5. Aspen (A)	Stands with dense overstory dominated by quaking aspen.
6. Shrubfield (S)	Unlogged areas with timber canopy closure < 30%. Undergrowth dominated by shrubs.
7. Meadow (M)	Open sites dominated by grasses and forbs.
8. Rock/Talus (RS)	Extensive areas of exposed bedrock or rock slides.
9. Sagebrush /Grass (SG)	Open areas dominated by big sagebrush, grasses, and forbs.
10. Roads (RD)	Cleared or graded areas that are not blocked to vehicular travel.
11. Clearcut (C)	Logged areas with overstory completely removed. Dominated by shrubs.
12. Selection cut /Shrubfield (SCS)	Logged areas with overstory < 30% and undergrowth dominated by shrubs.
13. Selection cut /Open Timber (SCOT)	Logged areas with overstory > 30%, but <60%. Undergrowth dominated by shrubs.
14. Selection cut /Timbered (SCT)	Logged areas with overstory > 60% and sparse undergrowth dominated by shrubs and forbs.

class of all vegetation in each of four strata: 0-1m, >1-2m, >2-8m, and >8m (Young 1984).

Habitat and Plant Phenology Sampling at Random Sites

In order to determine the availability of habitat components and types, and other measured habitat characteristics, 489 random plots were measured throughout the study area. Habitat characteristics at each plot were sampled with the same methods described for visual and sign documented bear locations.

Phenological stages of plants that have been identified as important bear foods on the Council study area (Amstrup and Beecham 1976, Beecham 1976, 1977, Reynolds and Beecham 1980) were recorded throughout the field seasons on permanent plots located at varying elevations and aspects and at bear and random locations. Phenological stages were recorded using a modification of the method described by West and Wein (1971) (Table 2).

Table 2. Phenological stages and codes used at Council study area, 1982-1983.

Phenology code	Phenologic stage	
	Shrubs	Grasses & forbs
0	Flower	Vegetative growth
1	Fruit set	Flower buds
2	Fruit swelling	Flower
3	Fruit turning color	Fruit set
4	Fruit ripe	Fruit swelling
5	Fruit dry or dropping	Plant curing

Data Analyses

Significant differences between the use and availability of specific habitat charateristics were determined with the chi-square, goodness of fit test (Nie et al. 1975, Zar 1974). Preference, avoidance, or use in proportion to availability was determined with the Bonferroni Z test (Marcum and Loftsgaarden 1980). Habitat characteristics were considered preferred, if they were used more than in proportion to availability and avoided, if used less than in proportion to availability. Differences between median coverage classes of bear food plants at bear use locations and on random plots were determined using the Mann-Whitney U test (Zar 1974). Differences in use of habitat components and types, when classified according to activity, season, and presence or absence of cubs, were tested with chi-square goodness of fit tests. Significance level for all tests was $P < 0.10$.

RESULTS

Sample Characteristics

Data on the ten adult female bears were captured and instrumented with radio transmitters in 1982 are presented in Table 3. Bears were relocated 640 times during the study:

Table 3. Age, reproductive status, color phase, and number of relocations of female black bears on the Council study area,1982-1983.

Bear	Age-1983	No. Cubs 1982	1983	1984	Color phase	No. of Relocations
01	10.5	0	*1	0	Brown	63
04	7.5	0	0	2	Black	74
39	5.5	2	0	2	Black	71
41	8.5	0	*1	0	Brown	78
45	11.5	0	2	0	Brown	14
49	14.5	0	2	0	Brown	71
55	15.5	0	2	0	Brown	63
56	8.5	0	2	0	Black	66
59	6.5	0	*1	0	Black	76
63	9.5	1	0	3	Brown	73

* Bears 01, 59, and 41 left the den with 2 cubs, but each lost 1 during the summer of 1982.

197 visuals (30.8%), 379 close (59.2%), 53 close triangulations (8.3%), and 11 triangulations (1.7%). Bear number 45 was not monitored during 1983, except to determine cub production, because her home range was on the extreme southern edge of the study area and attempts to obtain relocations were overly time consuming.

Overall Habitat Component Use

Female black bears on the Council study area did not use all habitat components in proportion to their availability (X^2=244.7, d.f.=13, P<0.001). With all seasons and activities combined, bears selected for timber, open timber/shrubfield and riparian components and selected against meadow, road, rock/scree, sagebrush/grass, and clearcut components. All other components were used in proportion to availability (Figure 2).

The radio tagged bears did not select for or against different sized habitat components (X^2=5.401, d.f.=3, P=0.1438) or certain distances from the edge of components (X^2=5.435, d.f.=3, P=0.1437).

Seasonal Habitat Component Use

Habitat component use differed significantly between seasons (X^2=52.7, d.f.=12, P<0.001). Spring(April-June) and summer/fall(July-November) habitat component use differed significantly from availability (X^2=88.2, d.f.=13, P<0.001 and X^2=237.8, d.f.=13, P<0.001, respectively). Timber was preferred in both spring and summer/fall. All selection cut components were used in proportion to availability, and rock/talus and clearcut components were avoided during both seasons. The shrubfield component was avoided and all other components were used in proportion to availability in the