CHARACTERISTICS OF ADULT FEMALE BLACK BEAR DAYBEDS IN NORTHERN ARIZONA

CHERYL M. MOLLOHAN, Arizona Game and Fish Department, 2222 Greenway Road, Phoenix, AZ 85023

Abstract: Ninety-four black bear (*Ursus americanus*) bedding sites were located between May 1982 and August 1984. Locations were identified by radio-tracking 14 adult females. Sampling from sites of females with and without cubs showed both bedding and feeding activity at 39% of the sites. Multiple daybeds were found at 28% of the sites and all sites were within 0.8 km of water. Bedding sites occurred on canyon walls 81% of the time, the slopes of which averaged 39%. Daybeds were on the uphill side of a tree 74% of the time. Bed trees averaged 73 cm dbh. Chewing and scratching of daybed trees was recorded at 38% of the sites, and scats were found at 69% of the sites. Removal of vegetative cover and large trees in black bear bedding habitat could reduce overall habitat quality.

Int. Conf. Bear Res. and Manage. 7:145–149

Black bear activity patterns and habitat use have been documented in the western United States (Amstrup and Beecham 1976, Lindzey and Meslow 1977, LeCount et al. 1984, Unsworth 1984, Young 1984, Mollohan 1985). Young (1984) and Unsworth (1984) briefly discussed black bear bedding sites but gave little detail or description. Mysterud (1983) described summer daybeds of European brown bears (*Ursus arctos arctos*) in Norway. Little or no specific information exists detailing black bear daybed sites. This paper describes adult female black bear bedding sites in Arizona.

Data for this study were collected in conjunction with a black bear habitat use study in northern Arizona. More detailed information on adult female black bear habitat use on the study area is available in Mollohan (1985).

This study would not have been possible without the help and enthusiasm of the many volunteers and students that helped in data collection and summary. Technical assistance was provided by J. Wegge, W. Carrell, and R. Benda Dodd. Statistical advice was provided by W. Brady and R. Ockenfels. A. LeCount provided support, overall supervision, and a continual commitment of patience and enthusiasm. This study was conducted under Fed. Aid in Wildl. Restor. Proj. W-78-R, Ariz. Game and Fish Dep.

STUDY AREA

The 465 km^2 Leonard Canyon study area straddles the Mogollon Plateau in northern Arizona and includes parts of the Apache-Sitgreaves, Coconino, and Tonto national forests. The Mogollon Plateau is a geologic uplift running from east to west across north central Arizona. Elevations range from 1,500 to 2,400 m.

Plant communities on the study area are the Rocky Mountain Montane Conifer Forest and the Great Basin Conifer Woodland (Brown et al. 1979). Ridgetops below 2,100 m are predominately pinyon pine (*Pinus edulis*) and alligator juniper (*Juniperus deppeana*); ponderosa pine (*Pinus ponderosa*) is on the west-facing slopes of major canyons and mixed conifer on the east-facing slopes. Ridgetops ranging in elevation from 2,100 to 2,300 m are dominated by ponderosa pine with Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) occurring in small patches. Ridgetops greater than 2,300 m are dominated by the Douglas-fir-mixed conifer association, which includes Douglas-fir, white fir, limber pine (*Pinus flexilis*), Rocky Mountain maple (*Acer glabrum*), and aspen (*Populus tremuloides*). Canyon walls are predominately mixed conifer with ponderosa pine occurring on warmer sites and in association with Gambel oak (*Quercus gambelli*) along canyon bottoms. Vegetation on the face of the Mogollon Rim is typified by a ponderosa pine and mixed conifer overstory with a manzanita (*Arctostaphylos pungens*), Emory oak (*Quercus emoryi*), and turbinella oak (*Quercus turbinella*) understory not found above the Rim.

Major land uses on the study area include timber production, cattle grazing, and recreation.

METHODS

Fourteen adult female black bears were captured between July 1980 and August 1983 with Aldrich foot snares and were fitted with radiocollars. Presence or absence of cubs was determined by visiting the winter dens of collared bears.

Microsites used by bears were identified by locating radio-collared females from the ground. Females were approached as closely as possible without disturbing them. Several radio location points were obtained for each site and, whenever possible, the radio tracker completed a circle around the bear. Bears were usu-

ally located between 0900 and 1500 hrs to ascertain as many daybed microsites as possible. Choice of this time period was based on activity information from central Arizona and other states (Garshelis and Pelton 1978, LeCount et al. 1984).

After the bear left the site (usually within 3 days), the area was gridded for "sign" to verify the radiolocation. If fresh bedding or feeding sign was not found, the site was not sampled. Based on sign, sites were classified as feeding or bedding. Some sites contained both types of sign and were classified as feeding-bedding sites. All bear sign on the site was noted and inventoried. Phenology of food plants was noted and food availability was assessed based on the number of food species available to the bear while she was at the site. Distance to water was ocularly estimated. Site location in relation to topography (ridgetop, canyon wall, slope, bench, or canyon bottom) was recorded, and percent slope was measured at each site.

The daybed or feeding sign was used as the center of a plot to inventory vegetation. A 30.5 m line-intercept transect, with the 15.2 m mark located at the center of the daybed, was established at each site at 3 height intervals (0–3 dm, 3–18 dm, and 18+ dm) to determine vertical cover. Bed trees were identified to species and their diameter measured at breast height (dbh).

Horizontal cover was measured at each plot. This measurement was defined as the distance in meters at which 90% of an average-sized Arizona black bear would be hidden from view. To determine this, a cloth silhouette of an average-sized bear was placed in the center of the plot. An observer walked in each cardinal direction until 90% of the bear silhouette was obscured from view. Distances were measured and averaged for each site. Horizontal cover is similar in definition to "sight distance" used by Thomas (1979) to measure deer (*Odocoileus* spp.) and elk (*Cervus elaphus*) cover. Horizontal cover, however, includes all types of cover afforded an animal, including topography and non-vegetative cover, whereas sight distance refers only to vegetative cover.

Sites were classified by vegetation type or association based on Brown et al. (1979). The chi-square (X^2) goodness of fit test (Zar 1974) was used to detect significant differences between the availability and observed use of vegetation types, site characteristics, and slopes. Preference or avoidance of the individual habitat components by collared bears was determined by applying a modified *z* statistic (Marcum and Loftsgaarden 1980). U.S. Dep. of Agric., For. Serv. vegetation maps were used to determine acres of various vegetation types available on the study area.

Percent occurrence of topographical site characteristics and percent slopes available were determined using a nonmapping, random dot grid technique (Marcum and Loftsgaarden 1980). A habitat component "selected for" was one used significantly more than expected ($P = 0.05$) based on availability; a habitat component "selected against" was used significantly less than expected ($P = 0.05$).

RESULTS AND DISCUSSION

Site Selection

A total of 118 daybeds at 94 sites was located and sampled between April 1982 and August 1984. Bears selected for mixed conifer and maple-mixed conifer areas and selected against ponderosa pine for bedding sites (Table 1). All other habitat types were used in proportion to their availability. Cover at the 3–18 dm and 18+ dm height levels differed significantly among ponderosa pine, mixed conifer, and maple-mixed conifer sites, with ponderosa pine sites providing less cover than either mixed conifer or maple-mixed conifer (Table 2). Females also selected canyon walls and steep slopes for bedding sites; 81% of the sites sampled occurred in such areas. Slopes averaged 39% for bedding sites, with females selecting against slopes of 0–19% and for slopes of 40–59%. Unsworth (1984) reported that black bear beds in north-central Idaho generally occurred on steep slopes in dense timber. Mysterud (1983) found a significant preference for slopes greater than 44% for summer beds of European brown bears. I believe that beds were selected primarily for security and that topography and slope were as important in providing this security as vegetative cover. There were no significant differences in site selection or bed site characteristics between females with or without cubs.

Bed Location

Seventy-four percent of daybeds were located on the uphill side of what was usually the largest tree on the site. Bed trees averaged 73 cm dbh (Fig. 1). All species of conifers occurring on the study area were used for bed trees. Mysterud (1983) found that European brown bears bedded in association with a tree or trees at 78% of the sites sampled. Blanchard (1983) found that 87% of grizzly bear (*U. arctos*)

Table 1. Percent use versus availability for habitat types, slope, and site characteristics for adult female black bear daybed sites in northern Arizona.

Habitat types (N = 93 daybed sites)

Mixed conifer		Ponderosa pine		Maple mixed-conifer		Pinyon juniper		Other	
Use	Avail	Use	Avail	Use	Avail	Use	Avail	Use	Avail
66.7	22.6	7.5	62.1	12.9	1.1	8.6	8.8	4.3	2.0

Percent slope (N = 91 daybed sites)

0–19		20–39		40–50		>60	
Use	Avail	Use	Avail	Use	Avail	Use	Avail
14.3	54.4	31.8	30.0	40.7	10.2	13.2	5.3

Site characteristics (N = 89 daybed sites)

Ridgetop		Canyonwall or slope		Bench		Canyon bottom	
Use	Avail	Use	Avail	Use	Avail	Use	Avail
2.2	45.0	88.8	46.3	3.4	5.4	5.6	3.3

daybeds in Yellowstone National Park were constructed less than 1 m from a tree.

Herrero (1972) discussed the importance of trees to black bears for resting, sleeping, and hiding. On 2 occasions I documented an adult female bedding at the base of a large tree and putting her cubs in the tree. Sixty-four percent of the daybeds I located had less than 5 m of horizontal visibility in 1 direction from the daybed (Fig. 2). Females could bed on the uphill side of a tree, be completely hidden downslope, and have the security of having their cubs up in the tree.

Twelve percent of the bed sites were found in dense thickets of conifer or deciduous tree regeneration. These sites were typically in areas of less steep slopes with thick vegetation that provided excellent cover and cool temperatures. The remaining bed sites were associated with logs or large rocks. Eighty-one percent of the sites were located within 0.4 km of water and all were within 0.8 km of water.

Table 2. Cover variables by habitat type for female black bear daybed sites in northern Arizona.

Vegetation type	Vegetative cover (%)			Horizontal cover (m)
	0–3 dm	3–18 dm	18+ dm	
Mixed conifer	29	34	75	16.0
Ponderosa pine	21	8	58	28.6
Maple-mixed conifer	36	62	100	12.5

Bed Site Characteristics

Mysterud (1983) said that quality and quantity of cover constituted an important factor in the European brown bear's selection of bedding sites, and that, in general, the beds were judged to be almost as well hidden as cover permitted. I also found cover to be extremely important in black bear bed selection in northern Arizona. Bedding sites were found to be high in vegetative cover at the 3–18 dm and 18+ dm height levels (Fig. 3). Horizontal cover averaged 13.7 m for bedding sites; most sites ranged from 5 to 20 m (Fig. 4). Sixty-four percent of these sites had a single-direction visibility of less than 5 m (Fig. 2). I believe that the horizontal cover measurement was the most accurate in assessing bear cover because it

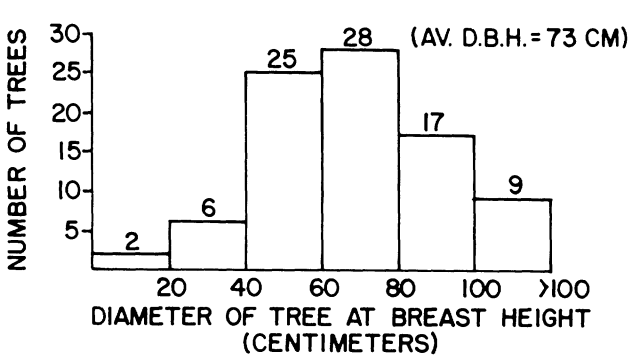

Fig. 1. Size distribution of adult female black bear daybed trees in northern Arizona.

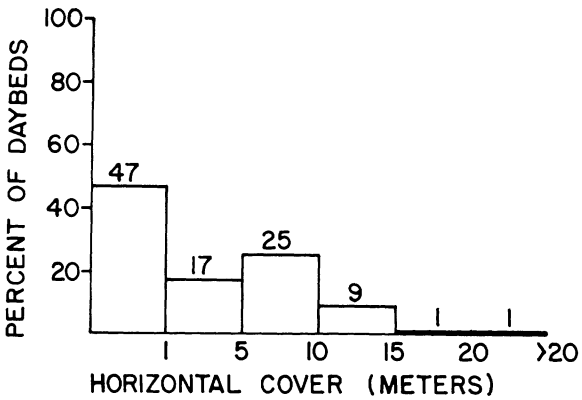

Fig. 2. Frequency distribution of the lowest single-direction horizontal cover measurement for adult female black bear daybed sites in northern Arizona.

considered security cover afforded by topography as well as vegetative cover.

Bed construction varied from almost none to deep, well-excavated bowl-shaped structures. Mysterud (1983) reported that 18% of the European brown bear beds he sampled were lined with duff or plant material from the immediate vicinity. I found 2 early summer beds built by a female with cubs-of-the-year that were nestlike and had been lined with plant material similar to nests built in dens. The remainder of beds sampled throughout the year were not lined with plant material.

Use of Bedding Sites

Forty percent of sites sampled were classified as feeding-bedding sites. Seventy-six percent of these showed that logs and rocks had been rolled over, presumably to search for insects. There were few differences among sites used for feeding and bedding vs. those used for bedding alone. It appeared that bears 1st select a bedding site and that feeding is incidental. Significant differences in cover and site selection were found between these sites and those identified as feeding sites (Mollohan 1985), however, no significant differences were found in food availability among sites used only for feeding vs. those used for bedding.

Scats were found at 69% of the sites, with an average of 4.1 scats per site. Scratches and chew marks were found at 38% of the sites. These usually occurred on the daybed tree and typically were found at the base of the tree as if the bear had chewed on the tree while bedded. Established rub trees were only found at 4% of the sites, but several more sites were found where females had rubbed on trees immediately adjacent to the bedding site.

I documented cubs building crude daybeds and leaving scats by mid-July, when the cubs were about 5.5 months old. Beds of yearlings were typically 1–3 m from the female's daybed.

Mysterud (1983) documented use of traditional daybed areas that contained multiple beds and were used repeatedly. Twenty-eight percent of the sites I sampled had more that 1 daybed, however, in most cases this occurred because yearlings or cubs also built beds. I found 2 sites that had obviously been used over a number of years as daybed areas. Both of these sites contained multiple beds and showed extensive scratching and chewing of bed trees, as well as established rub trees and bear trails. One bed tree had many different claw marks on the bark and chew marks at the base of the tree more than 1 inch deep.

CONCLUSIONS

Adult female black bears in Arizona selected bedding sites that provided security through vegetative

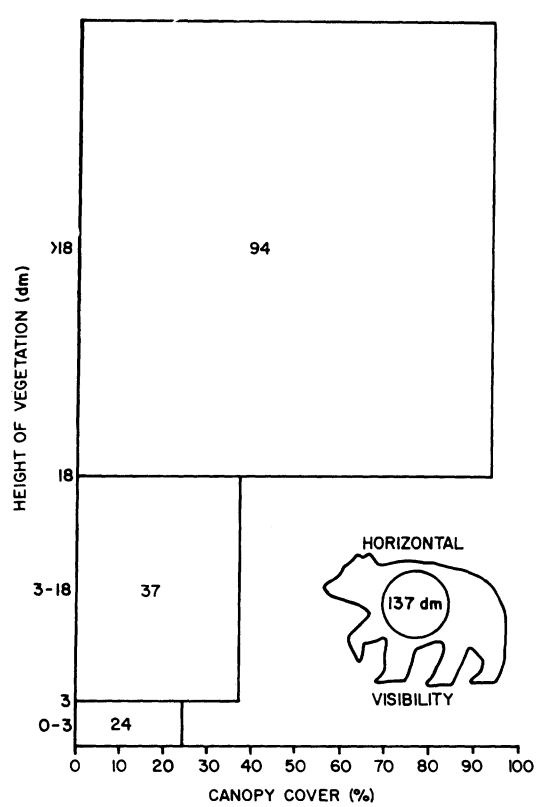

Fig. 3. Vegetation profile and horizontal visibility for adult female black bear daybed sites in northern Arizona.

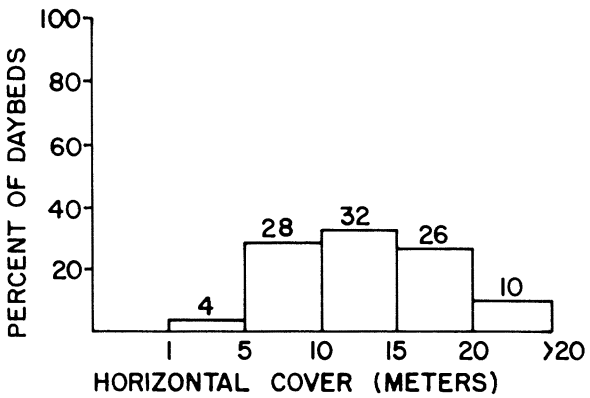

Fig. 4. Average horizontal cover for adult female black bear daybed sites in northern Arizona.

cover, topography, and slope. Large trees were preferred as bed trees and provided cover to the female bedded on the uphill side of them as well as to cubs that could climb the tree. Management practices that remove vegetative cover and large trees in black bear bedding habitat could reduce the quality of habitat available to a bear population. Therefore, horizontal cover on areas of greater than 30% slope should not be reduced below 20 m.

LITERATURE CITED

AMSTRUP, S. C., AND J. J. BEECHAM. 1976. Activity patterns of radio-collared black bears in Idaho. J. Wildl. Manage. 40:340–348.

BLANCHARD, B. M. 1983. Grizzly bear habitat relationships in the Yellowstone area. Int. Conf. Bear Res. and Manage. 5:118–123.

BROWN, D. E., C. H. LOWE, AND C. P. PACE. 1979. A digitized classification system for the southwest. J. Ariz.-Nev. Acad. Sci. 14. 16pp.

GARSHELIS, D. L., AND M. R. PELTON. 1978. Use of telemetric motion sensors for monitoring of black bears. East. Black Bear Workshop 4:155–166.

HERRERO, S. 1972. Aspects of evolution and adaptation in American black bears (*Ursus americanus* Pallas) and brown and grizzly bears (*Ursus arctos* Linne) of North America. Int. Conf. Bear Res. and Manage. 2:221–231.

LECOUNT, A. L., R. H. SMITH, AND J. R. WEGGE. 1984. Black bear habitat requirements in central Arizona. Ariz. Game and Fish Dep. Spec. Rep. 14. 49pp.

LINDZEY, F. G., AND E. C. MESLOW. 1977. Home range and habitat use by black bears in southeastern Washington. J. Wildl. Manage. 41:413–425.

MARCUM, C. L., AND D. O. LOFTSGAARDEN. 1980. A nonmapping technique for studying habitat preferences. J. Wildl. Manage. 44:964–968.

MOLLOHAN, C. M. 1985. Adult female black bear habitat use in northern Arizona. M.S. Thesis, Ariz. State Univ., Tempe. 52pp.

MYSTERUD, I. 1983. Characteristics of summer beds of European brown bears in Norway. Int. Conf. Bear Res. and Manage. 5:208–222.

THOMAS, J. W. 1979. Wildlife habitats in managed forests - the Blue Mountains of Oregon and Washington. U.S. Dep. Agric. Handbook 553. 512pp.

UNSWORTH, J. W. 1984. Black bear habitat use in west-central Idaho. M.S. Thesis, Mont. State Univ., Bozeman. 96pp.

YOUNG, D. D. 1984. Black bear habitat use at Priest Lake, Idaho. M.S. Thesis, Univ. Mont., Missoula. 66pp.

ZAR, J. H. 1974. Biostatistical analysis. Prentice-Hall, Inc., Engelwood Cliffs, New Jersey. 620pp.