FEMALE BLACK BEAR HABITAT USE IN WEST-CENTRAL IDAHO

JAMES W. UNSWORTH,[1] Department of Biology, Montana State University, Bozeman, MT 59717
JOHN J. BEECHAM, Idaho Department of Fish and Game, P.O. Box 25, Boise, ID 83707
LYNN R. IRBY, Department of Biology, Montana State University, Bozeman, MT 59717

Abstract: We studied black bear (*Ursus americanus*) habitat use patterns in west-central Idaho during 1982–83. We radiomarked 10 adult female bears and located them 640 times during the study. Selection cut-shrubfield and shrubfield habitats were used for feeding. Uncut timbered sites were important bedding areas. Open timber and meadows were used in spring as foraging areas. Riparian and aspen (*Populus tremuloides*) habitats were used as feeding and bedding sites during summer and fall. Rock-talus and sagebrush (*Artemisia tridentata*)-grass habitats were avoided. Selection cut-shrubfields were used as feeding areas. Female bears preferred to feed in areas where topographic features enhanced the growth of mesic vegetation.

J. WILDL. MANAGE. 53(3):668–673

Black bears occur throughout Idaho; however, most populations are associated with the coniferous forests of the northern two thirds of the state and along the Wyoming border. These forested areas are used for mining, mineral and oil exploration, recreation, water development, livestock grazing, and timber production; however, timber production and the associated increase in access probably have the greatest effect on black bears. In the Pacific Northwest, thousands of ha of timber are clearcut each year (Lindzey and Meslow 1977), and forest management plans that take black bear habitat needs into consideration are rare.

Black bear habitat use has been studied in Montana (Jonkel and Cowan 1971), Alberta (Fuller and Keith 1980, Pelchat and Ruff 1986), and California (Kelleyhouse 1980, Novick and Stewart 1982, Grenfell and Brody 1986). Other studies related directly to timber management and bears have been conducted in Washington (Lindzey and Meslow 1977), Montana (Zager et al. 1983), and Idaho (Young and Beecham 1986). With the expanding popularity of black bear as a game animal and increasing resource demands on forest lands, land managers need to consider the habitat needs of black bear throughout their range. Our goal was to document patterns of habitat use by female black bears in west-central Idaho and to use the information to formulate guidelines for timber management.

We thank J. A. Rohlman and G. L. Servheen for field assistance. H. D. Picton and W. R. Gould reviewed early drafts of the manuscript. 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.

STUDY AREA

The 104-km^2 study area was located on the Middle Fork of the Weiser River in west-central Idaho 13 km southeast of Council, Idaho. Elevations in this area ranged from 1,070 to 2,470 m. Mean annual precipitation ranged from 64 cm at lower elevations to 114 cm at upper elevations with 80% occurring from October through April as snow. The mean January minimum and mean maximum July temperatures for 1976–83 were −8.0 and 32.0 C, respectively.

Plant communities at lower elevations were dominated by big sagebrush, grasses, and forbs. Forest habitat types of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*) were most common (Steele et al. 1981). Ponderosa pine grew in scattered stands at lower elevations and was the dominant species from 1,200 to 1,525 m. Douglas fir and grand fir replaced ponderosa pine as the dominant species from about 1,525 to 1,900 m. Lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and western larch (*Larix occidentalis*) occurred on the grand fir sites and were common in the upper and wetter portions of this zone. Subalpine fir and lodgepole pine were dominant at >1,900 m and whitebark pine (*Pinus albicaulis*) was present at >2,100 m. Quaking aspen was scattered throughout the area. Common shrub and undergrowth species included hawthorn (*Crataegus douglasii*), chokecherry (*Prunus virginiana*), bittercherry

[1] Present address: Idaho Department of Fish and Game, Kamiah, ID 83536.

(*Prunus emarginata*), elderberry (*Sambucus cerulea*), buffaloberry (*Shepherdia canadensis*), huckleberry (*Vaccinium globulare*), and red-osier dogwood (*Cornus stolonifera*). Common forbs and grasses included balsamroot (*Balsamorhiza* spp.), lomatium (*Lomatium* spp.), wild onion (*Allium* spp.), bluebunch wheatgrass (*Agropyron spicatum*), and Idaho fescue (*Festuca idahoensis*). Nomenclature follows Hitchcock and Cronquist (1973). The major land uses affecting the area were commercial timber cutting and livestock grazing. Other uses included fishing, hunting, camping, and berry picking.

METHODS

We radiocollared 10 female bears and located them at 2–3-day intervals from May to November in 1982 and April to November 1983. Black bear monitoring was concentrated during daylight hours because the activity of bears around Council was known to be diurnal and crepuscular (Amstrup and Beecham 1976, Reynolds and Beecham 1980).

We monitored bears from the ground, and locations were classified as: visual (bear was seen), close (≤100 m), close triangulation (≤300 m), and triangulation. Close triangulation and triangulation were used infrequently (n = 64) and were included in the habitat analysis only if the error polygon was sufficiently small (≤0.25 ha) that the observer could be confident that the location was within a single habitat. Locations were plotted on U.S. Geological Survey orthophotographs (scale = 1:24,000).

Activity was recorded as bedding, feeding, travelling, denning, or unknown. Radio collars were equipped with motion sensitive devices.

The following site characteristics were recorded at each location: habitat, elevation, slope, aspect, topography, and distance to water and roads. Topography was classified as ridge top, upper slope, mid-slope, lower slope, bench or flat, or stream bottom.

When a bear location was precisely determined (visual or close and fresh bear sign present), then the vegetation was sampled using an 11-m radius circular plot (Steele et al. 1981). A physiognomic habitat classification system (Zager et al. 1983, Unsworth 1984) was used to classify non-forested, seral stages, and sites where timber had been harvested.

We measured random plots throughout the study area to determine habitat characteristics. Habitat characteristics at each plot were sampled with the same methods described for bear locations.

Significant differences between use and availability of specific habitat characteristics were determined with the Chi-square goodness-of-fit test (Zar 1974, Nie et al. 1975) and the Bonferroni Z-test (Marcum and Loftsgaarden 1980). For analysis, locations were grouped by activity and season. Season was determined by diet and classified as spring (Apr–Jun) when bears fed mainly on grasses and forbs, and summer (Jul–Nov) when the diet consisted primarily of berries. Use and availability analysis was not conducted on travelling and denning relocations because of small sample size. Analysis of variance was used to test for differences in the use of elevation by month and slope by activity.

RESULTS

Activity and Habitat Use

Ten female bears were located 640 times during the study: 197 visuals (31%), 379 close (59%), 53 close triangulations (8%), and 11 triangulations (2%). Bear activity was classified as feeding (20%), bedding (44%), travelling (8%), denning (3%), and unknown activity (26%). Observed feeding habitats differed significantly from expected (χ^2 = 70.3, 13 df, $P < 0.01$). Selection cut-shrubfield and shrubfield habitats were used and rock-talus and sagebrush-grass habitats were avoided when feeding (Table 1).

Bear use of bedding habitat varied significantly from availability (χ^2 = 228.4, 13 df, $P < 0.01$). Timber was used and other habitats were avoided or used in proportion to availability (Table 1).

Seasonal Habitat Use

Habitat use differed significantly between seasons (χ^2 = 52.7, 13 df, $P < 0.01$). Spring and summer–fall habitat use differed significantly from availability (χ^2 = 88.2, 13 df, $P < 0.01$ and χ^2 = 237.8, 13 df, $P < 0.01$, respectively). Timber was used, and rock-talus and sagebrush-grass habitats were avoided during both seasons (Table 1). Shrubfields were avoided in spring. During summer and fall open timber, meadows, clearcuts, and roads were avoided and open timber–shrubfield, riparian, and aspen habitats were used.

Use of Aspect and Topography

Aspect use differed between feeding and bedding locations (χ^2 = 22.92, 3 df, $P < 0.01$). Bears

Table 1. Availability and use (%) of cover types by season and activity categories for 10 female black bears near Council, Idaho, 1982–83.

Cover type	Random availability (n = 489)	Spring use (n = 151)	Summer–fall use (n = 483)	Feeding use (n = 123)	Bedding use (n = 281)
Timber	13.9	43.6+[a]	37.9+	12.3	56.9+
Open timber	10.6	12.8	5.0−	5.7	5.0−
Open timber–shrubfield	7.4	8.3	13.9+	15.6	11.4
Riparian	0.4	1.3	2.5+	1.6	0.4
Aspen	0.8	1.3	3.3+	3.3	3.2
Shrubfield	4.7	0.6−	7.9	14.8+	5.0
Meadow	6.7	3.2	0.0−	3.3	0.0−
Rock–talus	1.6	0.0−	0.0−	0.0−	0.0−
Sagebrush–grass	17.8	3.2−	0.6−	2.5−	0.0−
Roads	3.5	1.3	0.4−	0.8	0.0−
Clearcut	2.7	0.6	0.2−	0.8	0.4−
Selection cut–shrubfield	5.7	7.1	8.9	16.4+	3.6
Selection cut–open timber	20.2	15.4	16.6	21.3	10.3−
Selection cut–timber	3.9	1.3	2.9	1.6	3.9

[a] A + indicates use > availability and − indicates use < availability ($P < 0.10$).

used all aspects when feeding ($\chi^2 = 5.29$, 3 df, $P = 0.15$) and used north aspects when bedding ($\chi^2 = 86.48$, 3 df, $P < 0.01$) (Table 2). Use of aspects did not differ significantly between seasons ($\chi^2 = 1.56$, 3 df, $P = 0.67$).

Bears used benches or flats and stream bottoms when feeding ($\chi^2 = 50.80$, 5 df, $P < 0.01$) and usually bedded on lower slopes ($\chi^2 = 35.19$, 5 df, $P < 0.01$) (Table 2). In spring, bears used all topography classes in proportion to availability except lower slopes, which were preferred ($\chi^2 = 14.72$, 5 df, $P = 0.01$). During summer–fall, bears used lower slopes and stream bottoms and avoided ridge tops, upper, and midslopes ($\chi^2 = 61.35$, 5 df, $P < 0.01$) (Table 2).

Distance to Roads and Water

Bears were found >50 m from roads (Table 2) during spring ($\chi^2 = 13.98$, 1 df, $P < 0.01$), summer–fall ($\chi^2 = 14.82$, 1 df, $P < 0.01$), and when bedded ($\chi^2 = 31.61$, 1 df, $P < 0.01$); however, bears did not avoid roads when feeding ($\chi^2 = 1.59$, 1 df, $P = 0.21$).

Bears used areas <100 m from water during spring ($\chi^2 = 29.03$, 1 df, $P < 0.01$), summer–fall ($\chi^2 = 66.87$, 1 df, $P < 0.01$), when feeding ($\chi^2 = 36.49$, 1 df, $P < 0.01$), and when bedded ($\chi^2 = 40.78$, 1 df, $P < 0.01$) (Table 2).

Elevation and Slope

Elevation of bear locations varied significantly by month ($F = 11.56$, 5 df, $P < 0.01$). Mean elevation of locations increased from April–May (1,413 m) until August (1,539 m). During September–November bears returned to low elevations ($\bar{x} = 1{,}393$ m) until denning.

Slope of terrain at bear locations varied significantly by activity ($F = 3.843$, 4 df, $P < 0.01$). Bedded bears used the steepest slopes ($\bar{x} = 32.2\%$) and gentler slopes ($\bar{x} = 25.5\%$) were used when feeding.

DISCUSSION

Bears in North America generally forage in spring on forbs and grasses and use hard and soft mast in summer and fall (Bennett et al. 1943, Landers et al. 1979, Beeman and Pelton 1980, Graber and White 1983, Grenfell and Brody 1983). The same general pattern occurs in the Council, Idaho area (J. Beecham, Black Bear Ecol., Job Prog. Rep., Id. Dep. Fish Game, Boise, 35pp., 1976). Habitat use was closely related to the temporal availability and phenological development of food plants (Amstrup and Beecham 1976, Reynolds and Beecham 1980). Bears responded by making elevational movements and using habitats that provided the densest stands of bear foods (Unsworth 1984).

Grasses and forbs were present in all habitats during spring. With the exception of timber, which was predominantly used for bedding, bears did not prefer any cover type. Meadows were used as feeding areas during spring and may have been more important than our data suggest. Meadows were rich in bear foods and many incidental sightings of bears using meadows were noted. Meadows were very important spring feeding sights for black bears in California (Kelleyhouse 1980, Grenfell and Brody 1986).

During summer–fall, bears fed on a variety of berry species and used habitat supporting the densest stands of berries (Unsworth 1984). Open

Table 2. Use of aspect, topography, roads, and water (%) by season and activity categories for 10 female black bears near Council, Idaho, 1982–83.

Variable	Random availability	Spring use	Summer–fall use	Feeding use	Bedding use
Aspect					
North	27.6	53.5+[a]	51.4+	37.0	59.0+
East	15.1	12.9	15.4	16.5	14.5
South	20.9	5.8−	7.9−	16.5	5.7−
West	36.4	27.7	25.3−	29.9	20.8−
Topography					
Ridge top	9.6	5.9	3.1−	4.1−	3.2−
Upper slope	21.9	15.8	15.5−	16.3	16.5
Mid-slope	47.5	43.4	39.6−	29.3−	44.4
Lower slope	13.5	25.0+	27.0+	24.4	28.3+
Bench–flat	5.1	6.6	7.3	17.1+	3.9
Stream bottom	2.3	3.3	7.3+	8.9+	3.6
Distance to road					
0–50 m	18.8	6.1−	10.0−	13.7	4.3−
>50 m	81.2	94.0+	89.8+	85.4	95.7+
Distance to water					
0–100 m	34.0	59.2+	60.5+	64.2+	57.9+
>100 m	65.8	40.7−	39.5−	35.8−	42.0−

[a] A + indicates use > availability and − indicates use < availability ($P < 0.10$).

timber–shrubfield and shrubfield habitats were important sources of berries in summer and fall. Huckleberry, hawthorn, bittercherry, and chokecherry were the preferred species. Riparian areas and mesic aspen stands also produced abundant summer–fall foods. Riparian areas were used as feeding sites by black bears in northern Idaho (Young and Beecham 1986) and as feeding areas and travelling corridors in California (Kelleyhouse 1980).

Bears consistently preferred the lower portion of hillsides. These were more mesic than other areas and provided cover and food. Benches or flats and stream bottoms were preferred for feeding. These sites typically were more mesic than other areas, and included riparian and most shrubfield habitat. Upper slopes and ridge tops were used as feeding areas in the spring but were the first areas to desiccate; they only provided foods during spring. Mid-slopes were the next to dry, and although shrub species that provided bear foods were present, small benches or flats on mid-slopes supported the densest stands of bear foods.

Timber was the most frequently used habitat in the study area and 65% of locations here were classified as bedding. Bedding areas in all habitats were typically on steep slopes with north or east aspects. Beds were usually oval shaped and scraped out in the duff on the uphill side of a tree in areas with dense tree or shrub overstory and little ground level vegetation. In northern Idaho, bears preferred timbered areas with sparse understory as bedding sites, even when bears were in shrub-dominated selection cuts (Young and Beecham 1986). Mollohan (1987) found bears in northern Arizona used mixed conifer and maple (*Acer* spp.)-mixed conifer habitats on steep sloped canyon walls for bedding sites and determined bedding habitat use was related to security.

Logging units made >30% of the available habitat on the study area and included 28% of bear locations. Selection cuts (10–35-yr-old areas where overstory had been partially removed) provided a wide variety of bear foods as a result of reduced canopy cover and little or no scarification following logging. Young and Beecham (1986) found that bears in northern Idaho preferred 20–40-year-old selection cuts during all seasons. They believed this use was due to abundant food species and available trees for escape cover.

Clearcut components made up a small portion of the study area (3%), and bears were located in them only twice during the study. Clearcuts were <8 years old, and although some bear foods were present on these sites, foods most commonly found in scats did not appear to be as abundant in clearcuts as in more mature stands. Black bears in northern Idaho avoided clearcuts in all seasons (Young and Beecham

1986). Bears in western Washington used clearcuts 18–25 years old and avoided areas cut 9–14 years previously (Lindzey and Meslow 1977). In northern Montana, Jonkel and Cowan (1971) found that black bears seldom used recently logged areas but used a 10-year-old clearcut as much as surrounding areas.

All roads in the study area were 1- and 2-lane gravel or unimproved forest roads and were used in spring and by feeding bears. Only feeding bears used areas <50 m to roads in proportion to availability. Feeding bears were less likely than bedding bears to avoid areas where human contact was possible. Roads were not used as travel routes. Forested habitats generally lacked thick undergrowth that would inhibit travel by bears.

In northern Idaho, Young and Beecham (1986) reported that female black bears avoided roads, but males used roads in proportion to availability. They speculated that female avoidance of roads was a function of innate avoidance of open areas and that use by males was related to their high mobility and the convenience of roads as travel routes. Manville (1983) reported that Michigan black bears used oil pipeline right-of-ways, oil well service lanes, and lumber roads as travel routes. Human access along these roads increased bear vulnerability to hunters.

MANAGEMENT IMPLICATIONS

A large portion (34 km²) of important bear habitat in the Council study area is a result of past logging activities. Huckleberry, buffaloberry, bittercherry, chokecherry, and hawthorn are all important bear foods abundant on timbered lands. Timber harvest methods and post-logging treatments have changed radically in the last 10 years with shifts from selection cutting to clearcutting. Current timber management plans call for a series of thinnings over a 10-year period that ultimately will result in clearcuts. Intensive post-logging site treatments follow each stage. Forest managers have shifted from little or no post-treatment to bulldozer piling of slash and burning in conjunction with extensive soil scarification. Because of the root damage done to berry producing shrubs by soil scarification this shift in treatment could have a detrimental effect on black bear habitat (Martin 1983, Zager and Jonkel 1983).

Many of the detrimental impacts could be avoided by modifying clearcutting procedures. Because clearcutting shifts vegetation to early, and eventually, mid-seral stages that produce high quantities of mast, slash remaining after logging should be broadcast burned or left untreated (Lindzey and Meslow 1977, Martin 1983, Zager and Jonkel 1983) rather than bulldozer piled and burned with soil scarification.

The negative impact of individual clearcuts can be minimized by harvesting small and irregularly shaped areas in a rotation that precludes adjacent placement of cuts within a 20 year period (Zager 1980, Young and Beecham 1986). Specific sites within each cutting unit, including dense timber stands on north aspects and strips along streams and roads, should be maintained for bedding and hiding cover.

A cooperative private and public road management plan can mitigate many of the impacts of timber harvest. Road placement (min. no. to accomplish cutting objectives), standards (min. quality to withstand necessary traffic, maintenance of screening cover), and access (min. traffic consistent with resource management needs and public access requirements) are important considerations for the management of black bears.

LITERATURE CITED

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

BEEMAN, L. E., AND M. R. PELTON. 1980. Seasonal foods and feeding ecology of black bears in the Smoky Mountains. Int. Conf. Bear Res. Manage. 4:141–147.

BENNETT, L. J., P. F. ENGLISH, AND R. L. WATTS. 1943. The food habits of the black bear in Pennsylvania. J. Mammal. 24:25–31.

FULLER, T. K., AND L. B. KEITH. 1980. Summer ranges, cover-type use, and denning of black bears near Fort McMurray, Alberta. Can. Field-Nat. 94:80–83.

GRABER, D. M., AND M. WHITE. 1983. Black bear food habits in Yosemite National Park. Int. Conf. Bear Res. Manage. 5:1–10.

GRENFELL, W. E., JR., AND A. J. BRODY. 1983. Seasonal foods of the black bears in Tahoe National Forest, California. Calif. Fish Game. 69:132–150.

———, AND ———. 1986. Black bear habitat use in Tahoe National Forest, California. Int. Conf. Bear Res. Manage. 6:65–72.

HITCHCOCK, C. L., AND A. CRONQUIST. 1973. Flora of the Pacific Northwest. Univ. Washington Press, Seattle. 730pp.

JONKEL, C. J., AND I. MCT. COWAN. 1971. The black bear in the spruce-fir forest. Wildl. Monogr. 27. 57pp.

KELLEYHOUSE, D. G. 1980. Habitat utilization by black bears in northern California. Int. Conf. Bear Res. Manage. 4:221–227.

LANDERS, J. L., R. J. HAMILTON, A. S. JOHNSON, AND

R. L. MARCHINTON. 1979. Foods and habitat of black bears in southeastern North Carolina. J. Wildl. Manage. 43:143–153.

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

MANVILLE, A. M., II. 1983. Human impact on the black bear in Michigan's Lower Peninsula. Int. Conf. Bear Res. Manage. 5:20–33.

MARCUM, C. L., AND D. O. LOFTSGAARDEN. 1980. A nonmapping technique for studying habitat preferences. J. Wildl. Manage. 44:963–968.

MARTIN, P. 1983. Factors influencing globe huckleberry fruit production in northwestern Montana. Int. Conf. Bear Res. Manage. 5:159–165.

MOLLOHAN, C. M. 1987. Characteristics of adult female black bear daybeds in northern Arizona. Int. Conf. Bear Res. Manage. 7:145–149.

NIE, N. H., C. G. HULL, J. G. JENKINS, K. STEINBRENNER, AND D. H. BRENT. 1975. Statistical package for the social sciences. Second ed. McGraw-Hill, New York, N.Y. 675pp.

NOVICK, H. J., AND G. R. STEWART. 1982. Home range and habitat preferences of black bears in the San Bernardino Mountains of southern California. Calif. Fish Game 68:21–35.

PELCHAT, B. O., AND R. L. RUFF. 1986. Habitat and spatial relationships of black bears in boreal mixedwood forest of Alberta. Int. Conf. Bear Res. Manage. 6:81–92.

REYNOLDS, D. G., AND J. J. BEECHAM. 1980. Home range activities and reproduction of black bears in west-central Idaho. Int. Conf. Bear Res. Manage. 4:181–190.

STEELE, R. S., R. D. PFISTER, R. A. RYKER, AND J. A. KITTAMS. 1981. Forest habitat types of central Idaho. U.S. For. Serv. Gen. Tech. Rep. INT-114 Intermt. For. Range Exp. Stn., Ogden, Ut. 138pp.

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

YOUNG, D. D., AND J. J. BEECHAM. 1986. Black bear habitat use at Priest Lake, Idaho. Int. Conf. Bear Res. Manage. 6:73–80.

ZAGER, P. 1980. The influence of logging and wildfire on grizzly bear habitat in northwestern Montana. Ph.D. Thesis, Univ. Montana, Missoula. 131pp.

———, AND C. JONKEL. 1983. Managing grizzly bear habitat in the northern Rocky Mountains. J. For. 81:524–526.

———, ———, AND J. HABECK. 1983. Logging and wildfire influence on grizzly bear habitat in northwestern Montana. Int. Conf. Bear Res. Manage. 5:124–132.

ZAR, J. H. 1974. Biostatistical analysis. Prentice-Hall, Inc., Englewood Cliffs, N.J. 620pp.

Received 24 April 1987.
Accepted 25 January 1989.