

Proximity of Adult Female Black Bears to Limited Access Roads

Patrick C. Carr,¹ *Department of Forestry, Wildlife, and Fisheries, The University of Tennessee, Knoxville, TN 37901*

Michael R. Pelton, *Department of Forestry, Wildlife, and Fisheries, The University of Tennessee, Knoxville, TN 37901*

Abstract: Seven adult female black bears (*Ursus americanus*) were radio monitored from 1980 to 1982 in Great Smoky Mountains National Park. Bears showed no avoidance of limited access roads and trails, frequently crossed roads and trails during any given 24-hour period, and used areas around them. Response to seasonally abundant food supplies, rather than avoidance or other behavioral adjustments by individual bears, seemed to determine whether bears crossed roads and trails and used areas around them in this protected population.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 38:70-77

Earlier reports differ regarding the relationship between roads and bears. Some authors have stated that bears avoid roads (Rieffenberger 1974, Hamilton 1978, Brown 1980, Quigley 1982, Villarrubia 1982), even to the point of never crossing them (Rieffenberger 1974). However, other authors have noted no avoidance (Hardy 1974, Lentz 1980, Hugie 1982, G. Alt, pers. commun.). These conflicting reports are likely associated with different research methodologies, types of roads, and relative use or abuse of the roads by people. For harvested populations, roads into bear habitat create access which increases hunter success (Jonkel and Cowan 1971, Villarrubia 1982). Sixty-six percent of 246 hunter-harvested bears in western North Carolina from 1969 to 1977 were harvested within 1.6 km of a road (J. Collins, North Carolina Wildlife Resources Commission, pers. commun.); in fact, 22 bears (8.9%) were killed on a road during this period. Unrestricted use of these roads by hunters may prove detrimental to bear populations in national forests of the Southern Appalachians (Pelton 1979).

In contrast, for unharvested or protected populations, some roads may actually attract bears if the roads bisect habitats where humans leave food or

¹ Present address: Lacawac Sanctuary, Rt. 1, Box 518, Lake Ariel, PA 18436.

garbage. This paper focuses on providing quantitative data for adult female bears around limited access roads and trails in an unharvested population. Adult females were studied because this sex and age class is more sedentary than males (Carr 1983) and represents the breeding nucleus in bear populations.

D. Dell, S. Garris, and G. Wathen provided assistance with field work. D. Stark, Tennessee Wildlife Resources Agency pilot, B. Schoen, and B. Kindy supplied aerial support. The cooperation of the National Park Service is greatly appreciated. This study was financed by McIntire-Stennis Project No. 27 of the Agricultural Experiment Station, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, Knoxville, and the Tennessee Wildlife Resources Agency.

Study Area

Research was conducted on a 108-km² study area in the westernmost portion of Great Smoky Mountains National Park (GSMNP or park). Topography of the area is characterized by steep ridges, separated by narrow valleys and fast-flowing streams (King and Stupka 1950). Elevation ranges from 271 m to 1,509 m with the majority above 760 m.

There are 2 road types on the study area. A limited public access road (Parsons Branch) is gravelled, open only during daylight hours, and open only from 1 May through 31 October; less than 100 cars per day travel this road. Bunker Hill Road is a dirt, no-public access road that is gated and accessible only to researchers and park rangers. The study area contains 8.5 km of the no-public access road, 12.9 km of the limited public access road, and approximately 50 km of trails (Fig. 1).

Ninety-six percent of the study area is comprised of 3 forest types: closed oak (*Quercus* spp.) (55%), open oak and pine (*Pinus* spp.) (23%), and cove hardwood (18%). The varied aspects and topography create an interspersed mosaic of these forest types. Blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.), mountain laurel (*Kalmia latifolia*), and rhododendron (*Rhododendron* spp.) are common understory plants. The study area is typical of habitat open to bear hunting in the Southern Appalachians.

Methods

Bears were live-trapped using barrel traps and Aldrich foot snares, immobilized with etorphine hydrochloride (M-99), and instrumented with motion-sensitive radio collars (Telonics, Inc., Mesa, Ariz.). Daily radio locations were obtained by either ground triangulation or aerial homing and assigned X and Y coordinates of the UTM grid system. Consecutive hourly locations also were made during 8 24-hour radio tracking sessions. Use of roads by bears was expressed as the percentage of bear locations within 200 m of a road

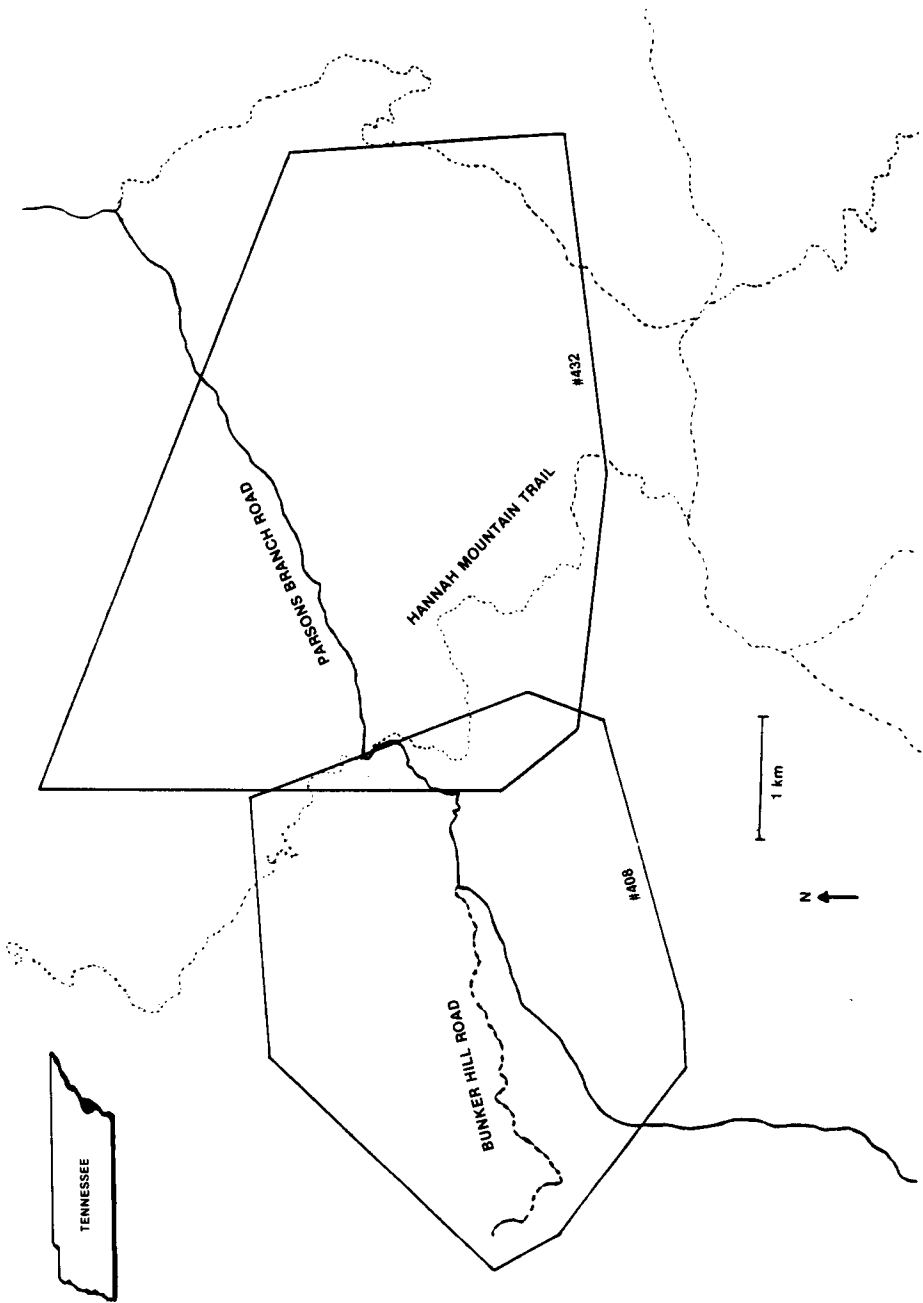


Figure 1. Home ranges of 2 adult female black bears on the GSMNP study area.

and the number of times bears crossed roads. Activity was expressed as a probability of activity (0 = inactivity, 1 = most activity) based on a given set of conditions rather than as a percentage of bears active (Garshelis and Pelton 1980). Visitor use of Parsons Branch Road was expressed as the number of cars/day.

Results and Discussion

Seven adult female black bears were captured and radio collared. Three females were monitored for 1 year and 4 females for 2 years. No differences in road use between solitary adult females, females with cubs of the year, or females with yearlings were observed, except for early spring when newborn cubs restricted the movements of females (Carr 1983). All 7 females had home ranges that included Parsons Branch Road (limited public access road); 3 had home ranges encompassing Bunker Hill Road (no public access); 2 had home ranges encompassing foot trails (primarily Hannah Mountain Trail). These features and representative home ranges for 2 bears are shown in Fig. 1. No roads or trails formed home range boundaries or were otherwise avoided by the bears.

Adult female bears regularly crossed roads and trails in the study area during daily movements. Females located near a road or trail crossed it multiple times during a single day (Table 1). Crossings were related to bear activity (Fig. 2) and not to visitor use of the road (Fig. 3). As bear activity increased, more crossings were observed. During summer, bears repeatedly crossed Bunker Hill Road (gated) and Parsons Branch Road; these roads bisect an area of abundant blueberry and huckleberry. Road crossings decreased in the fall as bear activity decreased and the bears switched from a summer diet of soft mast to a fall diet of acorns. Acorns were more abundant in the closed oak forests located north and southeast of Bunker Hill and Parsons Branch, areas which did not have roads.

Adult female bears consistently were found within 200 m of roads (Fig. 4). Roads closed to the public comprised only 3.1% of the study area, but bears were found near them 5% to 20% of the time. All female home ranges included portions of Parsons Branch Road; collectively, adult female bears were

Table 1. Average number of crosses/day by adult female black bears initially located near a road or trail during 24-hour radio-telemetry sessions, GSMNP.

	Summer	Fall
Trail	3.5	2.8
No public access road	2.9	1.8
Limited public access road	4.8	2.6

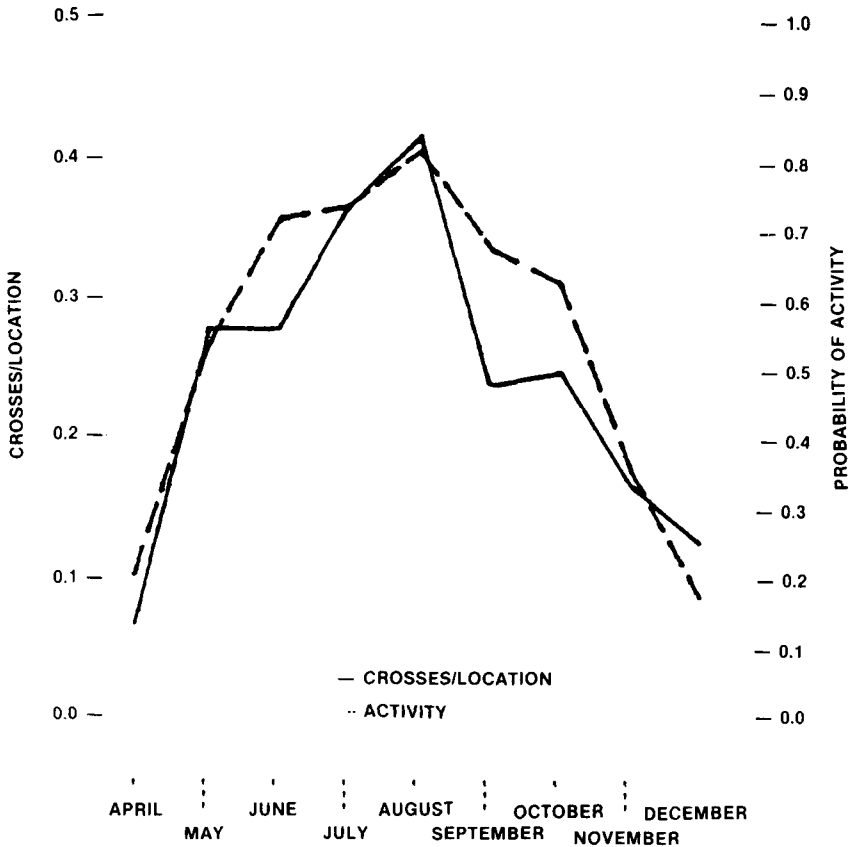


Figure 2. Crossing of Parsons Branch Road by adult female black bears in relation to bear activity.

found to be near this road 21% to 34% of the time depending on season, although it comprised only 4.8% of the study area. Individually, only 1 female bear (No. 432) used the area around Parsons Branch Road less than the proportion in which it was found in her home range, but this lower use was not significant ($P > 0.05$, Bonferroni z-test) (Table 2). All other females used the areas within 200 m of Parsons Branch Road either in proportion to the area found in their home range or in much greater proportion, up to 20% greater for some females (Table 2).

The roads and trails of the park were, most likely, constructed on or very near traditional game trails. As evidence, black bear mark trees are 3 times more common on established trails than off-trail (Burst and Pelton 1983) and mark trees in the area of a previously established road outnumber the mark

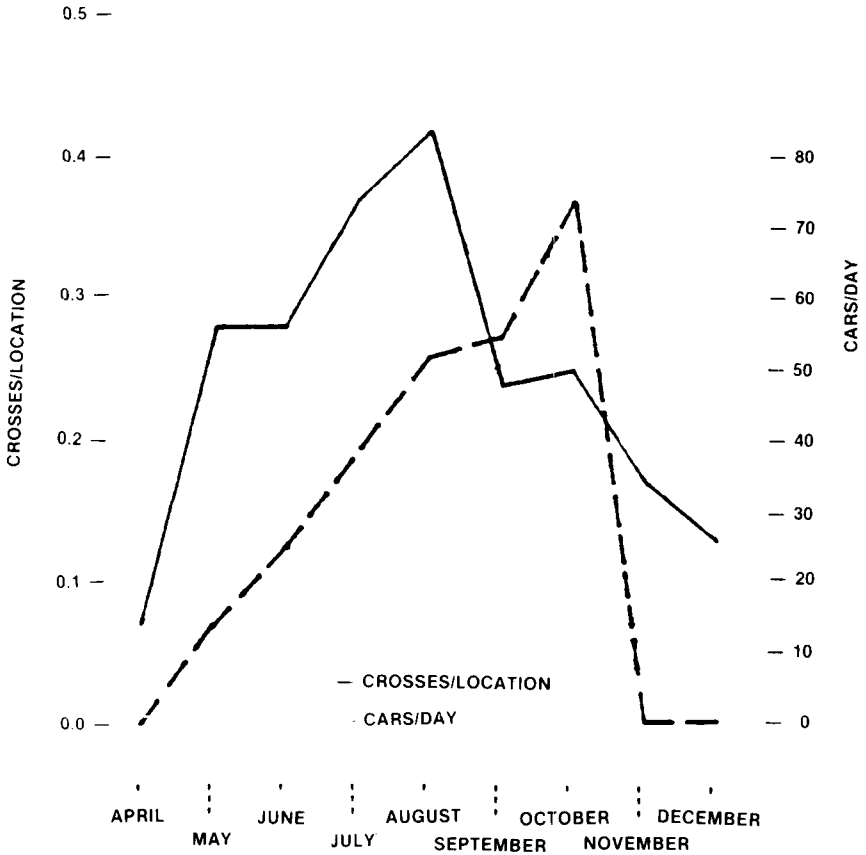


Figure 3. Crossing of Parsons Branch Road by adult female black bears in relation to road traffic.

trees on a recently built road 26 to 1 (Burst and Pelton 1983). Bears continue to use these traditional, established routes, thus contributing to high use of areas around roads and trails in the park.

Bears in this study did not panhandle along the roads nor were there any picnic areas or campgrounds in the vicinity. Thus, human foods were not available to them. However, blueberry and huckleberry patches were numerous along some sections of these roads. High use of these sites by bears during summer is attributed to the availability of ripening berries.

During the period of this study, bears were hunted from roads and chased by dogs almost year round in the Cherokee National Forest (CNF) adjacent to and south of the study area (S. Garris, pers. commun.). Four radio collared bears in a CNF study area were killed in 1978 and 1979 by hunters within

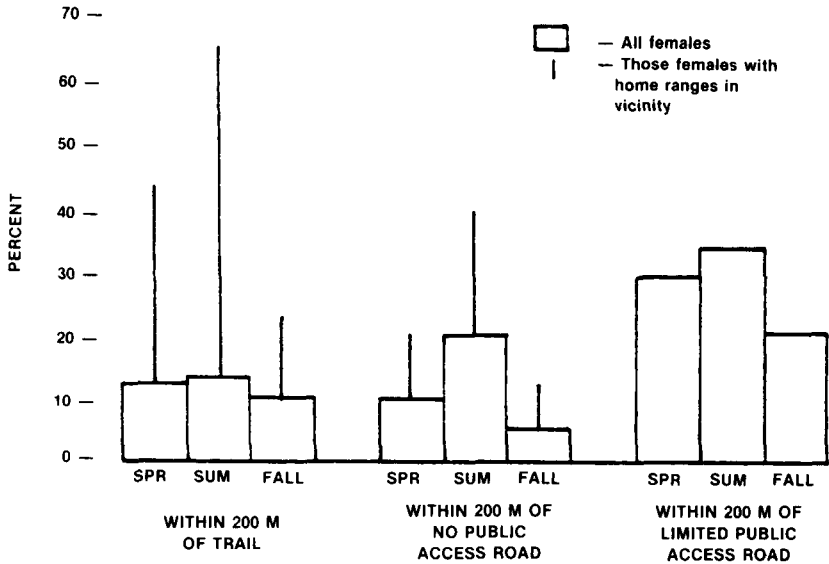


Figure 4. Percentage of radio locations of adult female black bears within 200 m of roads and trails in GSMNP, 1980-1982.

0.5 km of roads (Villarrubia 1982). Bears in the GSMNP study area were not subjected to this type of harassment.

Response to seasonally available food supplies, rather than avoidance or other behavioral adjustments by the bears, likely determined whether individuals crossed roads and used the areas around roads in GSMNP. In this protected population, roads and trails of the type described offered no barrier to bear movement and habitat use.

Table 2. Frequency of use of Parsons Branch Road by adult female black bears in GSMNP.

Bear N	% of home range within 200 m of Parsons Branch Road	% of radio locations within 200 m of Parsons Branch Road	N locations
408	14.4	17.5	166
421	17.6	37.7 ^a	175
424	22.0	41.8 ^a	79
429	14.2	31.5 ^a	168
432	9.1	6.3	63
440	6.0	26.8 ^a	97
442	10.0	23.7 ^a	38

^a Significantly higher than expected at 0.05 level (Bonferroni z = test).

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