Black Bear Use of Forest Roads in Western Washington

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ABSTRACT: Radiolocations (108) of 20 black bears were used to assess use or avoidance of 3 forest road types in western Washington. Distances of bears to each type of road were compared to distances of 108 random points using t-tests. Females and males avoided 2-lane roads, while only males avoided 1-lane roads, the most common road type in the area. Females, but not males, were located closer to overgrown, spur roads than expected. This road type has substantial cover of grasses, forbs, and berry-producing shrubs along with protective tree cover. This situation may provide easy travel for females along with security cover and a relatively abundant source of high-energy foods that could favor high reproductive success. It also suggests that 1-lane roads and overgrown roads are the best places to locate supplemental feeding stations aimed at providing nutrition to female bears in the spring.

KEY WORDS: black bear, forest management, roads, *Ursus americanus*, wildlife management

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INTRODUCTION

Black bears (*Ursus americanus*) commonly occur on western forestlands. The increased use of these lands by humans for forestry, recreation, and other activities can potentially lead to increased conflicts, especially as forest road densities and vehicular use increase. Additionally, on intensively managed public and private forest lands of the Pacific Northwest and Intermountain West, black bear damage to conifer trees caused by feeding on the cambium is a long-standing problem, and probably one of increasing scale (Stewart et al. 1999). The damage is primarily by female bears leaving dens in the spring when these bears are undernourished and need to find supplemental nutrients to support them and their cubs (Stewart et al. 2002). The interaction of wildlife and roads is an important aspect in the management of bear populations, their habitats, and the damage they can cause. Roads provide humans with access to bear habitats that otherwise would not be easily accessible. The roads also provide access for the use of supplemental feeding stations which are being commonly used to reduce bear damage to trees (Ziegltrum 2006). The use of roads by humans can have various negative effects on bears. In contrast, if the roads receive little or no vehicular use, bears may not be adversely affected and may even benefit. We summarized these potential effects from a review of the published literature (Table 1).

We used aerial locations of radio-transmittered bears in western Washington, obtained from the Washington Department of Fish and Wildlife, to assess the use of habitats in relation to three forest road types. We

hypothesized that bears would use--or at least not avoid--forest roads with little vehicular use.

Table 1: Potential Effects of Roads on Black Bears

Potential Adverse Effects[1]	Potential Beneficial Effects[2]
Direct loss of habitat	Easy travel routes
Indirect loss of habitat	Increased foraging opportunities:
Habitat fragmentation	--early successional plants
Loss of security	--carrion availability
Decreased dispersal and genetic isolation	--human refuse, baits
--supplemental feeding sites	
Increased mortality:	
--legal	
--illegal	
--accidental	

[1]Brody and Pelton 1989, Brody and Stone 1987, Fies et al. 1987, Gibeau and Heuer 1996, Gilbert and Wooding 1996, Kasworm and Manley 1990, Kasworm and Thier 1994, Lindzey and Meslow 1977, Manville 1983, Mattson et al. 1987, Rossell and Litvaitus 1994, Ruediger 1996, Seibert 1989, Woods and Munro 1996, Young and Beecham 1986.

[2]Brody and Stone 1987, Kasworm and Manley 1990, Lindzey and Meslow 1977, Manville 1983, Seibert 1989.

STUDY AREA AND METHODS

The 81.6 km^2 study area is in the forested foothills of the western Cascade Mountains, King County, Washington. The area has a maritime climate with more than 131 cm of annual precipitation. Elevations range from 366 to 1160 m. The low to mid-elevations are in the western hemlock (*Tsuga heterophylla*) forest zone and dominate tree species are Douglas fir (*Pseudotsuga menziesii*) and western hemlock. Higher elevations are in the pacific silver fir (*Abies amabilis*) forest zone with silver fir and subalpine fir (*Abies lasiocarpa*) the dominant tree species. Salmonberry (*Rubus spectabilis*), devil's club (*Oplopanax horridum*), and huckleberry (*Vaccinium* spp.) are the most common understory species.

The area is a mixture of private and public lands and is intensively managed for wood fiber production. Consequently, the area (excluding the Tolt Reservoir) has a high density (about 2.7 km/km^2) of forest roads. This includes 42.8 km of major, 2-lane through roads (0.55 km/km^2); 141.3 km of 1-lane secondary roads (1.8 km/km^2); and 125.4 km of overgrown, spur roads (0.32 km/km^2). In part because the watershed provides water for the city of Seattle, public vehicular access to the area has been largely restricted since 1995. As part of an ongoing research program, bears had been trapped with foot snares at trail or bait sets and surgically implanted with abdominal radio-transmitters. Personnel of the Washington Department of Fish and Wildlife aerially relocate the bears twice per week. We used 108 radiolocations of 20 bears (10 female and 10 male) from April 30 to July 15, 1996, and measured the nearest distances of those locations to each of the 3 road types, using a USGS 7.5 minute quadrangle map that had been updated with all roads in the study area. The same measurements were made using 108 randomly-generated points in the study area and this provided the availability data set. T-tests were used to determine if the distances from roads of bear locations and random locations were significantly different from each other by road type and by sex of bear. An alpha significance level of 0.05 was used in all analyses.

RESULTS AND DISCUSSION

Comparison of the 108 bear locations and the 108 random locations revealed that black bears exhibited preferences and avoidances of certain road types (Table 2). There was no significant avoidance ($p=0.2304$) of 2-lane, through roads, although these roads were relatively uncommon in the area, occurring around the periphery of the study area and the shoreline of the reservoir. The sizeable mean distances of bears (1106 m overall, 1126 m for females, 1034 m for males) and random points (1031 m) from 2-lane roads suggests that bears could easily remain far from these roads throughout most of their home ranges.

There was no significant avoidance ($p=0.1139$) of 1-lane, secondary roads by all bears combined. The mean distance (173 m) for bears was similar to the mean distance (147 m) for random points. In this case, however, there were significant differences between sexes. The mean distance (222 m) of males from these roads was significantly ($p=0.0338$) farther than the mean distance of random points (147 m), but this was not the case for female bears (160 m; $p=0.2635$). Because male bears in the area have larger home ranges (about 61 km^2 versus 11 km^2, unpubl. data) and do considerable travelling during this time of year (the breeding season), one might expect to find them closer to roads than females, unless they were actively avoiding this type of road. Special damage

hunts, to reduce bear density and hence damage to commercial trees, have been held in this area during this time of year for many years now. It is possible that these hunts have instilled a wariness in male bears of being near 1-lane, secondary roads, the most common road type. On the other hand, the greater use of these 1-lane roads by female bears suggests that these roads should be used for the placement and maintenance of supplemental feeding stations used primarily by female bears in the spring.

Table 2: A Comparison of Average Distances of all Bears (20), Female Bears (10), Male Bears (10), and Random Points from 3 Types of Forest Roads in Western Washington, 1995.[1]

	Average Distance (m)			
Road type	All bears	Female bears	Male bears	Random points
2-lane, through roads	1106	1126	1034	1031
1-lane secondary roads	173	160	222[2]	147
Overgrown, spur roads	390[2]	360[2]	501	638

[1]See text for details, number of locations, and p-values.

[2]Distance is significantly ($p<0.05$) different from the random points distance.

Bears were significantly ($p=0.0011$) closer (390 m) to overgrown, spur roads than the random points (638 m). This difference was accounted for by female bears which were significantly ($p=0.0002$) closer (360 m) to this road type than the random points (638 m), whereas male bears (501 m) were not ($p=0.1106$). The overgrown, spur roads receive little, if any, vehicular use, mainly because of the rapid reinvasion of alder (*Alnus* spp.) trees. These roads commonly have a substantial cover of grasses, forbs, and berry-producing shrubs. Consequently, overgrown, spur roads may provide easy travel with adequate security cover along with a relatively abundant source of high-energy foods that

would favor high reproductive success.

We conclude, from our literature search and our data, that roads can have adverse effects on bears and are often avoided. Male bears may be more sensitive to roads than female bears, but bears will use roads, especially if vehicular use has been restricted for a long enough period. Finally, female bears with cubs may gain a nutritional advantage by foraging along or near overgrown roads with early successional vegetation and 1-lane roads with supplemental feeding stations.

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