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Effect of Forest Roads on Habitat Use by Roosevelt Elk

Abstract

Radio locations of 6 female Roosevelt elk (*Cervus elaphus roosevelti*) were monitored for one year in the central Coast Range of Oregon. Frequency distributions of elk from paved and spur roads were compared with distributions of 200 randomly located points about paved and spur roads. Elk were located at half the expected frequency within a 500 m wide band surrounding paved roads. Significantly fewer ($P<0.05$) elk observations also were noted for a narrower band (125 m) about spur roads open to vehicular traffic, but no differences existed for elk locations about spur roads closed to vehicles. Effect of roads on elk use of habitat may be mitigated by a system of road closures.

Introduction

Forest roads are necessary for the protection, administration, and utilization of managed forests. In the Pacific Northwest, the intensively managed forest commonly has 2 or more km of roads per km^2 of land. These intensities of roading are a source of concern because of the potential for harassment of wildlife caused by human use of the roads. The biological effect of such harassment can be elevated metabolism, which depletes energy available for production or storage. This may lead to death, reduced vigor, or reduced reproduction (Ward 1977, MacArthur *et al.* 1982). Animals may also avoid or abandon harassment-prone areas with subsequent reduced range of the population (Geist 1978).

Other studies have documented the effects of forest roads on Rocky Mountain elk (*Cervus elaphus nelsoni*) populations (Pedersen *et al.* 1979, Lyon 1979, Rost and Bailey 1979). This paper reports the effect of forest roads on habitat use by Roosevelt elk (*Cervus elaphus roosevelti*).

Study Area and Methods

A 12-month radio-telemetry study of 2 bands of Roosevelt elk was conducted in 1978-79 in the 14 km^2 Alder Creek Basin of the Bureau of Land Management Coos Bay District, Oregon Coast Range (Witmer 1981). The area is rugged with vegetation of the Western Hemlock Zone (Franklin and Dyrness 1973). Forest cover of the area is dominated by 190-year-old stands of mixed conifer species interspersed with clear-cuts, regenerating conifer stands and hardwood stands aged 0-30 years. The areas

occupied by the north and south bands contained 4.5 and 2.9 km of paved through roads and 10.3 and 7.6 km of dirt or gravel-surfaced spur roads, respectively. Although we did not monitor traffic volume, there was heavy log and gravel truck traffic on the paved roads on weekdays. Outdoor recreationists utilized basin roads primarily on weekends.

Data collected during 3,635 daylight remote triangulations from roads of 6 radio-collared cow elk included distance to the nearest paved road and to the nearest spur road. A receiver and hand-held, two element yagi antenna were used. Triangulation on randomly-placed radio-collars was practiced until collar locations were consistently mapped within 115 m of their actual location. Signal bearings that intersected at nearly right angles were used to minimize error polygons. Ninety-five percent of elk locations were within 1.6 km (1 mile) of the investigator. Because elk were easily frightened at night, we discontinued collecting night location data early in the study. Frequency distributions of the distance of elk locations from roads (observed values) were compared with frequency distributions of expected values derived from 200 points located at random in each of the north and south band areas. These distributions were compared with the chi-square analysis and, if significantly different, the Bonferroni z-test was used to determine in which distance interval(s) there were significantly fewer elk locations than expected (Neu *et al.* 1974). Average distances of elk to roads by season were compared by analysis of variance.

All roads in the study area were open to the public with the exception of the spur road system in the south band's area which was closed to public vehicular traffic by a locked gate except during the 10-day elk hunting season in November.

Results and Discussion

Spur roads pervaded the study area; none of the 200 randomly located points within either area was more than 375 m from a spur road. Less than half of the 200 randomly located points were within 375 m of paved roads and the greatest distance from a random point to a paved road was over 1125 m. Thus elk could hardly escape proximity to spur roads but could position themselves at somewhat greater distances from paved roads.

We pooled elk locations for the 12-month period for the north and south bands, respectively, and found the cumulative frequency distribution of observed elk locations from paved roads to be significantly different from the expected frequency distribution ($P<0.05$). Fewer elk locations occurred in the 0-125 and 126-250 m distance intervals than expected ($P<0.05$) for each band (Figure 1). Elk use was reduced to approximately 50 percent of the expected use on a 500 m wide band of habitat associated with a paved road.

Distribution of elk was less affected by spur roads (Figure 1). Significantly fewer ($P<0.05$) north band elk locations occurred in the 0-62 m interval from spur roads. The cumulative frequency distribution of south band elk distances from spur roads was not significantly different ($P>0.05$) from the expected distribution (Figure 1), perhaps because this spur road system was closed to most vehicular traffic.

Elk distributions were affected by roads more in some seasons than others. The average distances of elk locations of each band to the nearest paved road and to the nearest spur road varied significantly between seasons ($P<0.05$). The greatest degree

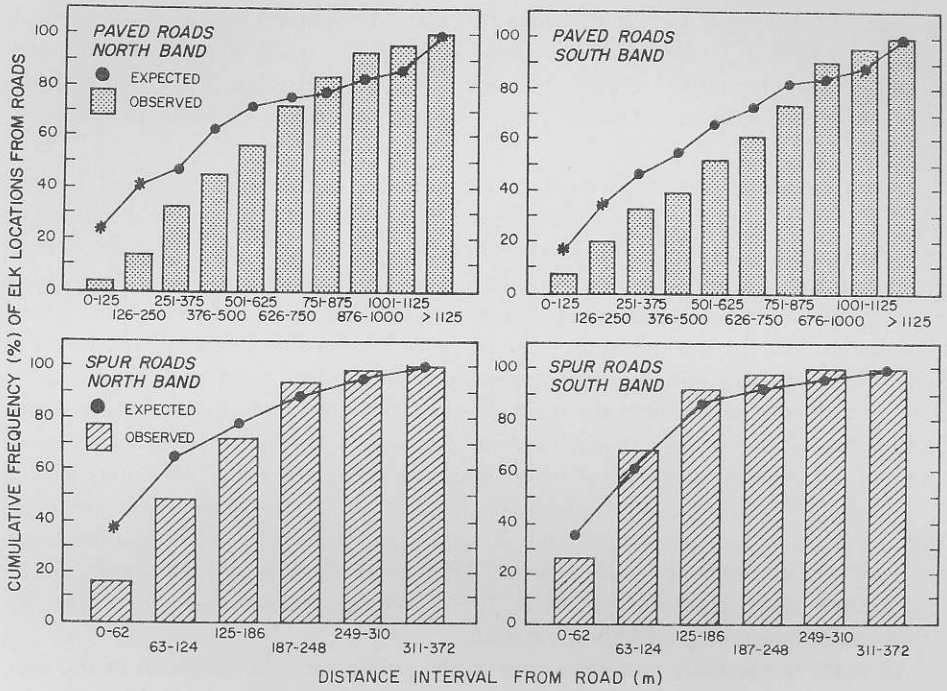

Figure 1. Cumulative frequency (%) disturbances for observed (bars) and expected (points) distances of elk from paved and spur roads. Values of expected distances that differ ($P < 0.05$) from observed distances are starred (*).

of observed avoidance of roads was exhibited by the 2 north band radio-collared cows during the season they bore their calves. However, 4 south band radio-collared cows, none of which were known to have calved that year, were farthest from roads during the rut. This suggests that if managers wish to reduce harassment of elk, their efforts might be most effective during calving (May-June) and rut (September-October). Elk avoided roads during the fall season which contained the hunting season, but not more than the yearly average. They did spend significantly more ($P<0.05$) time in cover during the hunting season (Witmer 1981).

The results of this study indicated that human activity on forest roads alters distributions of Roosevelt elk habitat use. The effect is comparable to that reported by Thomas (1979:122) for Rocky Mountain elk. This impact may be mitigated by road closures, especially during rut and calving seasons.

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