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Grizzly bears and forestry
I: Road vegetation and placement as an attractant to grizzly bears

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ABSTRACT

Today's growing demand for timber is increasing road development in once roadless forest ecosystems. Roads create both local changes in plant communities and landscape-level changes in forest connectivity. Roads also increase human access, which can be detrimental to species such as grizzly bears. Because most grizzly bear mortalities occur near roads, we examined grizzly bear attractants near roads, which could increase bear use of roadsides and consequently increase human/grizzly bear interactions. We measured the prevalence of 16 grizzly bear foods near roads and examined patterns in road placement to better understand use of roaded habitats by grizzly bears in west-central Alberta. We found that roadsides had a higher frequency of ants, *Equisetum* spp., *Taraxicum officinale*, *Trifolium* spp., graminoids, and sedges; whereas, interior forest stands had a higher frequency of *Shepherdia canadensis*, *Vaccinium myrtilloides*, *V. vitis-idaea*, and ungulate pellets, an indicator of ungulate presence. In addition, roads near water had a greater occurrence of *Arctostaphylos uva-ursi* and *Equisetum* spp. than roads not near water, indicating that road placement influenced bear food diversity. Patterns in road placement varied between the upper and lower foothills, although models for the lower foothills predicted road placement in both regions. In the lower foothills, roads were constructed at low elevation, low soil moisture, high sun exposure, and intermediate terrain ruggedness, possibly similar to sites selected by bears. Reducing grizzly bear foods near roads should involve decreasing the width of roadside ditches, banning the planting of clover (*Trifolium* spp.), and reevaluating road placement in areas with high grizzly bear density.

1. Introduction

Throughout the world, a growing human population and a high standard of living increase the pressure to expand into undeveloped forests for the extraction of timber, oil, and natural gas. Resource extraction also requires the development of a transportation network. These roads affect forest communities both chemically and physically by increasing chemical pollutants (Forman et al., 2003), aiding in the transport of non-native and disturbance species (Schowalter, 1988; Watkins et al., 2003), creating edges, increasing fragmentation (Forman et al., 2003; Riitters et al., 2004), and increasing human access (Forman and Alexander, 1998). The most noticeable road effects are within 10–15 m of the roadside (Forman et al., 2003; Watkins et al., 2003; Hansen and Clevenger, 2005), but impacts on some bird and mammal species have been observed greater than 1 km away (Forman and Deblinger, 2000). In the foothills of Alberta, road densities are increasing due to industrial development (Schneider, 2002), fragmenting grizzly bear (*Ursus arctos*) habitat and increasing the potential for human/grizzly bear interactions.

Grizzly bear mortalities increase near roads due to increased encounters with humans in North America (McLellan and Shackleton, 1988; Mattson et al., 1992; Mace et al., 1996; Johnson et al., 2004) and Europe (Boscagli, 1987; Clevenger et al., 1997; Kaczensky et al., 2003). Nielsen et al. (2004a) found that grizzly bear mortalities in west-central Alberta were concentrated around roads, water features, and forest edges. Human-caused mortalities in Alberta between 2000 and 2005 fell into several categories: legal harvest (85 individuals), illegal harvest (24), self-defense (20), mistaken for a black bear by a hunter (11), native or métis harvest (8), research (5), problem bear removal (4), and accident (3) (Alberta Sustainable Resources Development, 2007). Even within Banff National Park, where bears are protected, human-caused mortalities accounted for 90% of all grizzly bear deaths between

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