BIGHORN SHEEP SEASONAL MOVEMENTS AND HABITAT SELECTION IN A COAL MINING AREA

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Abstract: Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) inhabit the east side of the Elk Valley in southeastern British Columbia where 4 large, open pit coal mines were in operation. Sheep in this area generally wintered at high elevation on windswept, south facing native grasslands, with some sheep also wintering on mine properties. Expansion of coal mining was proposed in portions of the valley which may result in direct loss of high-elevation winter habitat. The primary objectives of this study were to describe winter range habitat selection, seasonal movements, and use of mine property by this population. A concurrent companion study examined winter range plant communities and production, range condition, and winter diet. We obtained ~54,000 GPS locations from 41 sheep (19 ewes, 22 rams) between March 2009 and May 2011. Winter severity differed markedly between winter 2009–10 (very low snow) and winter 2010–11 (deep snow). Survival of collared sheep dropped from 0.93 (annual rate) during the first year to 0.78 during the second, more severe winter. Winter range size did not differ between sexes, but were roughly one-third the size during winter 2010–11 (3.2 km^2) compared with winter 2009–10 (9.5 km^2). Most (79%) of the sheep monitored for a summer to winter session were migratory (non-overlapping seasonal ranges), and all non-migratory sheep – mostly ewes – were associated with the northern 2 adjacent coal operations. Fidelity to winter ranges among years was high (88%). Although differences among individuals and mine areas were apparent, use of mine property by the population varied seasonally, and showed low use (~10–15%) between November–December and April, followed by increased use which peaked at about 60–70% in September–early October. Habitat selection (resource selection function analysis) at both the winter use to home range and within-winter range scales was dominated by topographic-security variables, and less so by land cover class variables. At the winter range scale, sheep selected strongly for moderate to high elevations close to escape terrain, and weakly for higher solar incidence; females showed greater selection for higher solar incidence than males. Females exhibited higher selection for grasslands and exposed lands than males. Both sexes avoided coniferous cover in general, but made higher use of conifers during the severe winter. Use of mine property by this population was high during the growing season, which might have contributed to population increases over the past 2 decades, likely aided in large part through reclamation. High fidelity to winter ranges and the apparent influence of winter severity on survival suggested that disturbance to winter range resulting from resource extraction should be minimized where possible, with careful consideration towards management and mitigation to reduce impacts.

Key words: Ovis canadensis canadensis, Rocky Mountain Bighorn Sheep, resource selection function, mining.

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