Elk Foraging Site Selection on Foothill and Mountain Rangeland in Spring

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IMPACT STATEMENT

Resource managers can use moderate and light intensity cattle grazing in summer-early fall to purposely modify elk forage conditions to: 1) increase elk foraging efficiency in spring, 2) lure elk away from places needing rest or deferment from spring elk grazing, or 3) lure elk away from places where elk in spring are experiencing conflicts with humans, predators, or other wildlife.

SUMMARY

Previous research suggests that cattle grazing during the preceding summer-fall can enhance spring foraging habitat of Rocky Mountain elk. However, previous studies were limited to one-year or conducted within relatively small experimental pastures. We evaluated elk foraging site selection during spring across 4 years and 145,900 acres of foothill and mountain rangeland in northwestern Wyoming and west-central Montana. Elk in spring avoided foraging in areas not grazed by cattle during the previous summer-early fall. In contrast, elk preferred to forage where cattle had grazed lightly (11-30% forage use) or moderately (31-60% forage use), and preference by elk was stronger for moderately-grazed sites. Both moderate and light cattle grazing intensity had more influence on elk foraging site selection than distance to security cover, distance to roads, aspect, or slope. We developed and validated a resource selection model that correctly classified 80 to 89% of elk foraging observations across 5 large landscapes and 4 years. Resource managers can use our model to map predicted changes in elk grazing distribution when considering potential habitat adjustments in security cover, roads, or cattle grazing intensities and distribution.

INTRODUCTION

Habitat management for Rocky Mountain elk presents varied challenges on foothill and mountain rangeland. In many areas, elk herd recruitment rates are declining due, at least in part, to nutritional limitations of their foraging habitat during spring (Cook et al. 2013). In contrast, elk populations in other areas are thriving, but excessive elk grazing is degrading vegetation and soil resources (Gass and Binkley 2011; Thrift et al. 2013). In these areas, elk grazing often occurs too frequently in the same locations, and habitat management is needed to provide periodic rest or deferment from spring elk grazing (Brewer et al. 2007; Thrift et al. 2013).

Previous cattle grazing can enhance elk foraging habitat by increasing elk forage digestibility and nutritive value, and by reducing excessive plant litter and standing dead plant material that impede plant growth and inhibit forage accessibility (Short and Knight 2003; Ganskopp et al. 2004). Consequently, elk during spring may favor foraging in areas that were grazed previously by cattle (Grover and Thompson 1986; Jourdonnais and Bedunah 1990; Frisina 1992). Previous research results, however, are from one-year studies or from within relatively small experimental pastures, or

the studies did not adequately consider other habitat attributes that might have influenced elk foraging site selection (Vavra and Riggs 2010).

PROCEDURES

We studied elk foraging site selection during spring on non-forested foothill and mountain rangeland of the Absaroka Mountains near Cody, WY and the Big Belt Mountains near White Sulphur Springs, MT. Elk foraging sites were identified with systematic aerial surveys from fixed-wing aircraft during 4 consecutive years. We generated 600 random points and, for each random point and for each elk foraging site, we obtained slope, distance to nearest improved road, nearest distance to primitive road, nearest distance to hiding cover, nearest distance to security cover, elevation, and aspect. We also recorded the cattle grazing intensity that each random point and each elk foraging site received during the previous summer-early fall (approximately June1-October 1). Cattle grazing intensity was inventoried in October after the cattle grazing season ended each year. Cattle grazing intensity was inventoried and mapped via horseback and all-terrain vehicles, and polygon boundaries of cattle grazing intensity were later digitized.

We used the first 2 years of elk observations from Wyoming to: 1) compare habitat attributes of used and random (i.e., available) foraging sites; 2) determine whether elk avoided foraging where cattle had not grazed during the previous summer-early fall; and 3) develop a resource selection model. Elk observations recorded during years 3 and 4 in Wyoming and Montana were reserved for use later when we evaluated our resource selection model for robustness across years and study sites.

RESULTS AND DISCUSSION

We recorded 20,738 foraging elk during our 4-year study. Elk foraging sites were closer to security cover, further from improved roads, and on gentler slopes than available sites.

Elk in spring avoided foraging in areas not grazed by cattle during the previous summer-early fall. Rather, elk preferred to forage where cattle had grazed lightly (11-30% forage use) or moderately (31-60% forage use), and preference by elk was stronger for moderately-grazed sites. Both moderate and light cattle grazing intensity had more influence on elk foraging site selection than distance to security cover, distance to roads, aspect, or slope.

At least 3 other smaller-scale studies reported results similar to ours and concluded that elk in spring were attracted to cattle-grazed areas because cattle grazing during the previous summer-fall had reduced the standing dead plant biomass within and around elk forage plants (Grover and Thompson 1986; Jourdonnais and Bedunah 1990; Frisina 1992). All 3 of these previous studies also concluded that targeted cattle grazing during summer-fall could be applied to purposely improve forage conditions for elk during spring. Frisina (1992) further advocated that cattle grazing during the previous summer-fall could be used purposely to create improved forage conditions and lure elk away from places where elk grazing pressure might be excessive. These previous studies were limited to one-year duration or were conducted within relatively small experimental pastures. Our study results support these relationships across 5 large landscapes and 4 years.

Our foraging site selection model correctly classified 80 to 89% of elk foraging observations. Resource managers can use our foraging site selection model to map predicted changes in elk grazing distribution when considering potential habitat adjustments in security cover, roads, or cattle grazing intensities and distribution.

Our results also suggest that resource managers can use targeted cattle grazing in summer-early fall to purposely modify elk forage conditions to: 1) increase elk foraging efficiency in spring, 2) lure elk away from places needing rest or deferment from spring elk grazing, or 3) lure elk away from places where elk in spring are experiencing conflicts with humans, predators, or other wildlife. Finally, research scientists studying cattle-grazed habitats should strongly consider including previous cattle grazing intensity as a predictor variable in future models of elk foraging site selection. Complete details

about our study are published in Crane et al. (2016).

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