Cumulative Impacts of Spring Elk Use on Steppe Vegetation

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Introduction

In an effort to better understand herbivory by wild and domestic ungulates, range and wildlife scientists are interested in the impact of Rocky Mountain elk on vegetation structure, composition, and abundance. Elk and other ungulates, such as mule deer, may impact their environment by suppressing selected food plants. Although foraging is an active, immediate action, the effects of that action may be long term and chronic in nature, and thus are resistant to short-term investigations. In addition, elk may impact their environment by their physical presence and associated activities such as trampling. The cumulative nature of elk impacts may arise in part from their seasonal site fidelity, influenced by forces such as hunting, human encroachment, roads, timber harvest, fire, weather, or food.

The history of use by domestic ungulates in Hells Canyon, Oregon, began with the introduction of sheep in the 19^{th} century. Cattle use in the canyon increased in the 20^{th} century on a major portion of the Hells Canyon rangelands. In 1979, a group of cattle allotments became vacant. Concurrently, elk began a sustained population growth throughout this area, peaking in 1987 at about 5,200 elk.

Rocky Mountain bull elk.

Experimental Protocol

The objectives of this study were to 1) determine whether there were differences in vegetative and soil characteristics` between sites deemed nonimpacted and impacted from springtime use by elk, and 2) determine whether there were differences in vegetative and soil factors over time at these sites.

The portion of Hells Canyon selected for the study included the 126,000-mile^2 Canyon Allotment, encompassing an elevational range from 1,000 ft along the river to 5,000 ft at the brow of the canyon rim. The allotment is contained within the Oregon Department of Fish and Wildlife Snake River Wildlife Management Unit.

The use of pre-existing, permanent monitoring points provided a credible comparison between earlier sample results and current sampled data. The areas were covered by Parker 3-Step Condition and Trend (C&T) transect clusters established in the mid- to late 1970s (early visit) and subsequently by ecological community classification plots (ecoplots) in the early 1990s (recent visit).

We investigated differences in canopy cover of perennial and annual grasses; introduced, native, and all bunchgrasses; key species (Kentucky bluegrass, Sandberg's bluegrass, bluebunch wheatgrass, Idaho fescue, ventenata [*Ventenata dubia*], prairie junegrass, cheatgrass, small bedstraw); increasers and decreasers; and other plant/soil-associated variables (moss, lichens, bare ground, bedrock, rock, gravel, pavement, and litter).

Results and Discussion

Of the 43 monitoring plots, 22 plots (51 percent) were subjectively categorized as being negatively impacted by elk by physical evidence (tracks, droppings, etc.). We included cover values for perennial grass, annual grass, cheatgrass, ventenata, moss, lichens, and bare ground as independent variables.

Perennial grass cover was slightly higher on elk-impacted sites (34 percent) than on non-impacted sites (30 percent) during the recent visit. Analysis of covariance showed a slight trend attributable to elk impact. Kentucky bluegrass was the only perennial grass to show any notable change in cover, increasing from 2.2 percent in the 1970s to 3.8 percent in the 1990s visit. The magnitude of increase was greater at impacted sites than nonimpacted sites over time.

Annual grass cover was higher on the impacted sites consistently over time. The relative influence of the two most important annual grass species, cheatgrass and ventenata, however, shifted dramatically over time. Cheatgrass was effectively replaced by ventenata over the course of the study. Cheatgrass cover decreased on elk-impacted sites between visits (averaging 5.7 percent and 1.2 percent early and recently, respectively), but was similar between time periods on nonimpacted sites, averaging 2.6 percent and 1.9 percent early and recently, respectively. Ventenata cover increased from 0 percent (a trace occurring at one location) on elk-impacted sites in the early visit to 7.3 percent in the recent visit.

Moss cover declined over time in both elk-impacted and nonimpacted categories, but more at impacted sites. Lichen cover increased over time, but when adjusted for initial differences did not show an impact effect. Litter cover increased from 44 to 66 percent over time overall. Bare ground cover was steady (11.5–11.0 percent) over time, but was higher on elk-impacted sites (13.6 percent) than on nonimpacted sites (9.0 percent).

It is unknown whether the differences we detected were the result of elk impacts over the time span of our study, the result of longer-term responses to grazing pressure by livestock and wild herbivores, an unknown factor, or a combination of factors. Our data on elk population size on the area indicate stable populations from the 1960s through 1977. We do not know what elk abundance was prior to that time.

Overall, perennial grass cover was not impaired by elk impacts, but instead was around 6 percent higher at the impacted sites than at nonimpacted sites. It is quite possible that the higher cover values were attributable to something beyond the time range of the study or the impacts of elk. If elk impacts on perennial grasses were significant in a practical sense during the time frame of our study, it would make sense that the comparisons of old versus recent visits would have reflected differences in perennial grass cover. Amount of bare ground cover, higher at the impacted sites, was indicative of trampling effects by elk. It is noteworthy that bare ground cover was substantially higher at elk-impacted sites than at nonimpacted sites when the study commenced (13.9 vs. 9.2 percent).

Management Implications

Elk may have played a role in the composition shift from cheatgrass to ventenata and the resultant increase in annual grass cover over time. If so, this is likely the most negative elk impact. Based on our findings, it appears that the years of high elk abundance in Hells Canyon resulted in impacts in spring attributable to concentrations of animals through increased bare ground and a sharp decline in mosses, but it has not altered the perennial grasses.