Impact of prescribed burning on Kentucky bluegrass invaded rangelands

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INTRODUCTION

The influence of disturbances such as fire and grazing play an important role in the development of Great Plains grassland communities. Grazing animals are attracted to recently burned areas with new plant growth, a process referred to as pyric herbivory. Patch-burn grazing is a management practice that uses pyric herbivory to promote biological heterogeneity. Over time, the rotational application of prescribed burns to sections of pasture, while allowing grazing animals access to the entire pasture, will create a pattern of vegetative patches varying in time since disturbance, which enhances biodiversity.

When either fire or grazing regimes are altered, plant communities shift in response to this change. Non-native plants, such as Kentucky bluegrass (Poa pratensis L.; hereafter referred to as bluegrass), can become established and drive change in native plant communities as a result of fire suppression or shifts in grazing patterns. Bluegrass is now widespread across the Great Plains, impacting native plant communities as well as forage production.

Bluegrass becomes a problem by creating a thick thatch layer on the soil surface, which makes it difficult for other plants to grow. The litter layer can also alter the physical, chemical, and biological conditions at the soil surface. Patch-burn grazing could be a useful management strategy to control bluegrass by removing the thatch layer, while favoring native plant species and promoting biodiversity.

LOCATION

This study was conducted in the northern mixed-grass prairie of south-central North Dakota. Key plant species include green needlegrass (Nassella viridula), little bluestem (Schizachyrium scoparium), and western wheatgrass (Pascopyrum smithii). However, without fire and grazing the plant community shifts towards bluegrass, smooth brome (Bromus inermis), western snowberry (Symphoricarpos occidentalis), and rose

Figure 1. Crew conducting a prescribed burn near Streeter, North Dakota.

TREATMENTS

The experiment was conducted over a period of 2 years. Experimental plots were established in pastures managed under a patch-burn grazing regime. The control treatment excluded both burning and grazing, which resulted in the abundance of bluegrass and thatch.

Patch-burn grazed plots were burned annually in the spring, with ¼ of the entire pasture being burned each year. Grazing was season-long at a moderate stocking rate. Soil properties measured in this study included water infiltration, moisture, temperature, soil carbon and nitrogen, microbial abundance/community structure, and decomposition.

RESULTS

Soil moisture remained higher and temperature remained cooler under bluegrass conditions compared to patch-burn grazed plots. Water infiltration did not change across treatments, but it was lower when measured the same year as a burn compared to 1 year after a burn. Less litter decomposition occurred in plots the same year as a burn than in the control (bluegrass) treatment, but again this property rebounded when measured 1 year after a burn. There were no differences in soil carbon and nitrogen, or microbial abundance and community structure between control and patch-burn grazed plots one year after burning.

MANAGEMENT IMPLICATIONS

Burning and grazing had limited impact on soil properties in this study, with measured properties recovering within a year post-burn. Patch-burn grazing may be a practical land management technique for controlling bluegrass invasions without negative impacts on soil, and for promoting biological heterogeneity. Longer-term studies are needed to assess the impact of patch-burn grazing on soil conditions.

Figure 2. Kentucky bluegrass thatch layer can be several inches thick.

Adapted from:
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