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Plant Responses to Different Grazing Intensities in the Missouri Coteau of North Dakota

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Abstract

In a rangeland system, after weather, grazing has the greatest influence on the structure and function of plant communities. We evaluated the effects of 18 years of long-term grazing in five plant species: western wheatgrass (*Agropyron smithii*), smooth brome (*Bromus inermis*), stiff sunflower (*Helianthus rigida*), stiff goldenrod (*Solidago rigida*), and green needlegrass (*Stipa viridula*). We looked at the population response (the frequency of occurrence), morphological response (specific leaf area) and physiological response (photosynthetic rate, V_{cmax} , J_{max} [both rates of reactions within the photosynthetic process], and leaf nitrogen content) of these five dominant perennial plant species at the Central Grasslands Research Extension Center (CGREC). The study showed the following results:

1. Green needlegrass appears to be resistant to grazing, showing little change in frequency of occurrence, specific leaf area, photosynthetic rate, and leaf nitrogen content under various grazing intensities.
2. The photosynthetic rate of western wheatgrass on the heavy grazing intensity treatment was 48% higher than on the no-grazing treatment.

3. Eighteen years of grazing caused significant changes in specific leaf area, frequency of occurrence, and leaf nitrogen content of smooth brome.
4. Under moderate grazing intensity, stiff sunflower increased photosynthetic capability and also increased V_{cmax} and J_{max} more than any of the other species under any treatment.

The population and morphological traits of some of the five species in this study have changed significantly, but the absence of large changes in physiological traits of the dominant grasses indicates that long-term grazing did not substantially alter plant gas-exchange characteristics.

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