Intermittent Defoliation Impacts on Mixedgrass Prairie

Prepared by E.W. Bork, University of Alberta

Controversy exists over whether rotational grazing systems can favorably alter forage growth and native grassland composition. Rotational systems entail dividing large areas of grassland into smaller pastures to better control the timing and frequency of livestock grazing during summer. This, in turn, may alter the pattern and amount of forage grown throughout the growing season, as well as maintain desirable plants by equalizing stress on all vegetation during grazing events. These benefits may be limited within the Mixedgrass Prairie, however, where plant communities are relatively homogenous, the growing season is short, and annual moisture deficits commonly restrict vegetation growth by late July.


Mattheis Ranch calving pasture. Photo by Hanna Schoenberg.

A PhD study conducted on the Mattheis Research Ranch by Dr. Tanner Broadbent examined season-long forage yield and plant composition responses of two mixed grasslands to different defoliation regimes under ambient and elevated moisture conditions over a 5-year period (2010-2015). Results showed that defoliation and moisture divergently altered plant growth and composition, with responses further dependent on the initial composition of the grassland and its local moisture status. In moister areas where western wheatgrass (an important forage species found across SE Alberta) was normally dominant, high intensity recurrent defoliation during summer reduced biomass due to low regrowth. This finding suggests that both high density cattle grazing (to achieve uniform use) and recurrent 'patch' defoliation under continuous (i.e. free-choice) grazing, may both negatively impact this valuable grass. In contrast, needle-and-thread grass, which dominates drier areas of the mixedgrass landscape, was surprisingly found to be more tolerant of repeated summer defoliation than previously thought. High intensity defoliation was generally more likely to maintain productivity where shorter-statured and more grazing tolerant native grasses were prevalent, such as June grass and blue grama. While moisture addition generally increased productivity, it did not ameliorate the negative impacts of frequent, intense defoliation on plant growth during the growing season. Overall, defoliation increased total plant diversity in mesic mixed grassland by reducing dominance of tall-statured and highly competitive species such as western wheatgrass. In contrast, defoliation had less impact on the floral diversity of arid mixedgrass prairie.

This study has refined our understanding of how defoliation and moisture interact to alter mixedgrass composition, diversity and production, including the tradeoff between maintaining forage availability and grassland composition. By addressing mechanisms regulating vegetation dynamics, this study helps explain where, when and how benefits of rotational grazing are likely to occur in mixedgrass prairie. Additional investigations underway are working with ranchers employing specialized rotational grazing systems across western Canada to further understand the impacts of this practice on a suite of ecosystem goods and services, including forage production, biodiversity, carbon storage and greenhouse gasses. For more information on the results of this project, please contact Dr. Edward Bork (edward.bork@ualberta.ca).

This research is published:

Broadbent, T.S., Bork, E.W., Cooke, J.E., Willms, W.D. 2019. Grass Yields Under Clipping and Watering Explain Varied Efficacy of Management Intensive Grazing on Rangelands. Rangeland Ecology & Management 72(3): 446-453.

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