DEPARTMENT OF AGRICULTURAL, FOOD AND NUTRITIONAL SCIENCE

MSc Thesis Seminar

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Date:	**Wednesday, December 11, 2019**
Time:	**9:00 a.m.**
Location:	**410C Agriculture/Forestry Centre**
Title:	**Simulated Livestock Soil Compaction, Plant Defoliation and Litter Removal on Extracellular Enzyme Activity and Vegetation Across a Moisture Gradient in Southern Alberta, Canada**

ABSTRACT

Preservation of grasslands is vital for the continuation of the numerous ecosystem goods and services (EG&S) provided by these ecosystems, including forage for livestock, nutrient cycling, carbon sequestration and habitat for flora and fauna. All EG&S in grasslands are supported by microbial biological functions and the vegetation community. Recent attention on adaptive multi-paddock (AMP) grazing, which focuses on effects to the soil and plant community through trampling and compaction of litter into the soil surface, have raised questions about the relative roles of the different mechanisms through which cattle affect grasslands, namely, compaction, defoliation and subsequent depletion of litter. Few studies have been conducted that isolate the mechanisms through which grazing may alter grasslands, particularly in western Canada. This study investigated relationships of soil biological activity, vegetation production and diversity with individual grazing mechanisms across a moisture gradient. We conducted a plot-level factorial study that simulated cattle trampling and defoliation as well as litter depletion at three locations with different climates and vegetation types in Alberta rangelands. In the first year of study, litter was removed or retained to examine the importance of litter presence, which generally decreases with heavy grazing. To simulate seasonal defoliation and trampling, plots were clipped and compacted, or not, in the spring or the fall of the first and second year of study. Data was collected in the second and third year of study. Extracellular enzyme activity (EEA) is a measure of enzyme availability and used in this study as a metric of microbial community function at each site. Enzymes are used to degrade specific substances by plant and soil microbes, and were measured in this study in both soil and litter. Our study determined that litter manipulation had a strong influence on EEA in both soil and litter, as litter presence affects moisture, though patterns fluctuated between sites. Response of both soil and litter EEA to defoliation and compaction treatments did not present consistent patterns. Production and structure of the vegetation community are known to be key influences on biodiversity; our study determined that litter presence was important for vegetation production, likely due to the influence of litter on moisture regulation and soil exposure. Defoliation, particularly in the fall, had a greater influence on vegetation production and diversity than trampling in either season. The results of this study demonstrate the key role that litter presence plays in biological function and the vegetation community in grasslands. From this study, the implications for grassland preservation and management are on the importance of litter management for decomposition, nutrient cycling, and vegetation production. Additionally, this study highlights the importance of monitoring effects of seasonal grazing in grasslands, as production and structure of the vegetation community are affected variably at different locations.