DEPARTMENT OF AGRICULTURAL, FOOD AND NUTRITIONAL SCIENCE

MSc Thesis Seminar

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Date:	**Thursday, April 26, 2018**
Time:	**9:00 a.m.**
Location:	**318J Agriculture/Forestry Centre**
Title:	**Long-term grazing effects on soil greenhouse gases emission and soil microbial communities of Alberta grasslands**

ABSTRACT

Grasslands cover a large area of the terrestrial surface and their soils store vast amounts of carbon (C) and nitrogen (N). Small changes in the processes driving C and N cycling can lead to either sequestration of these elements or their release as greenhouse gases (GHG) into the atmosphere. While livestock grazing is the primary use of grasslands worldwide, its effect on soil GHG fluxes and soil microbial communities remains unclear, especially in northern temperate grasslands. This thesis reports on the effect of long-term cattle grazing, at light to moderate stocking rates, on soil GHG fluxes and soil microbial communities across the grasslands of Alberta, Canada (Central Parkland, CP; Dry Mixedgrass, MG; Foothills Fescue, FF subregions), over two growing seasons (2015 and 2016).

Using static chambers and gas chromatography, the CO_2, CH_4 and N_2O fluxes from soils were measured and their global warming potential (GWP) was assessed. Livestock grazing itself did not affect cumulative GHG fluxes or GWP in either year. However, GWP was altered by a grazing and year interaction, being relatively lower from grazed than non-grazed areas in the dry year, while the opposite was true during the wet year. Among subregions the lowest GWP was observed within MG. Overall, GWP was reflective of CO_2 emissions rather than CH_4 or N_2O fluxes. The soil microbial communities (bacterial, archaeal and fungal) was quantitatively and qualitatively assessed using quantitative polymerase chain reaction and high-throughput sequencing. Livestock grazing did not affect the abundance of bacterial and archaeal communities, or richness and beta diversity in either year. However, fungal alpha diversity was lower in grazed areas during the dry year, but greater in the same areas during the wet year. Also, richness of bacterial and archaeal communities was greater within MG, while their abundance was greater within FF.

Overall this study showed that light to moderate long-term grazing had limited impact on soil GHG fluxes and soil microbial communities, compared to non-grazed areas of the grasslands, while regional characteristics (climatic conditions) and soil properties had a greater impact.