DEPARTMENT OF AGRICULTURAL, FOOD AND NUTRITIONAL SCIENCE

PhD Thesis Seminar

Name:	**Lysandra Pyle**
Supervisor:	**Dr. Edward Bork**
Date:	**April 27, 2018**
Time:	**8:30 a.m.**
Location:	**318J Agriculture/Forestry Centre**
Title:	**Influence of management and disturbance history on germinable seed bank composition and legume recruitment in Alberta's Central Parkland and Dry Mixedgrass prairie**

ABSTRACT

The seed bank (SB) is a cryptic component of plant community (PC) diversity, as it is a legacy of historical disturbance events, ongoing succession, and seasonal shifts in PC composition. Alberta's Central Parkland (CP) fescue grasslands have been subject to significant anthropogenic disturbance through cultivation and changes in fire and grazing regime, with many grasslands now dominated by introduced forages, either intentionally seeded or those encroached under contemporary patterns of grazing. Dry Mixedgrass (DMG) prairie has experienced similar disturbances and is recognized as a region wherein industrial activity (e.g. oil and gas infrastructure) can cause a decline in native grassland and increased introduced vegetation invasion. In this study, germinable SBs in the topsoil of grasslands were characterized, including managed Parkland-Boreal pastures of central Alberta and native DMG prairie disturbed by natural gas pipelines. SBs were examined for their similarity to above-ground PC, and their composition linked to ongoing disturbances and/or specific management attributes. This research was conducted with a focus on potential legume recovery in the CP and examined legumes as invasive species along industrial disturbance. In the CP 102 pastures were sampled, and a previous history of cultivation was found to have a significant influence on both PCs and SBs, including a reduction in native plants, particularly perennial grasses. Unexpectedly, grazing systems (continuous vs. rotational) led to few differences in PCs, SBs, and soils, likely due to similar stocking rates. PCs and SBs each responded to unique historical management factors, with SB composition more responsive to livestock husbandry (i.e., manure spreading, bale grazing, etc.), while both communities were altered by aspects of cultivation and fire history. Similarity in species richness between the SB and PC was related to a few key aspects of management: 1) low RH scores were associated with high similarity and greater SB densities of forbs, 2) previously cultivated and well-established pastures had a higher similarity comprised of mostly introduced forage grasses. Legumes like clovers (*Trifolum* spp.) formed persistent SBs and were resistant to recent herbicide use. In DMG prairie both aboveground PCs and SBs exhibited legacy effects of natural gas pipeline installation, which were further influenced by pipeline diameter and age. Distinct legacy effects were also evident along spatial gradients with increasing distance (to 55 m) from the pipelines. SBs directly on pipeline trenches were associated with higher densities of introduced *Melilotus* spp. and two native grasses typically used to revegetate prairie disturbances; however, these were not representative of native grassland. Wide diameter pipelines were more likely to have greater seed densities of introduced grasses like *Agropyron cristatum* and *Poa pratensis*, which can be invasive in native grasslands. Legacy effects of pipeline disturbance were most pronounced for the cryptic biological soil crust (BSC) community, where the recovery of macro-lichens was nearly absent. BSCs were also linked to shifts in SB composition, where BSC elimination resulted in greater bare soil and higher densities of introduced species in the SB. Overall, this research greatly expanded our understanding of the influence of disturbance regimes on grassland range health, as well as aboveground vegetation, seed bank and cryptic BSC composition, within both introduced and native grasslands.