Saskatchewan
Prairie Conservation Action Plan

Prairie's Got the Goods Week!

Presentation: Understanding Carbon Storage and Greenhouse Gas Uptake in Grasslands

Monday March 13th, 2017 at 12:00pm CST
Presenter: Dr. Edward Bork, University of Alberta

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Presentation: Understanding Carbon Storage and Greenhouse Gas Uptake in Grasslands

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Abstract

Alberta contains about 9 M ha of grazing lands, most of which (6.5 M+ ha) consists of native grasslands. While these areas are important for forage and livestock production, they also provide many other environmental goods and services (EG&S), including carbon (C) storage, pollinator habitat, and biodiversity. We are undertaking research to quantify these benefits in northern temperate grasslands, and here report on the role of these areas for storing carbon, maintaining soil health, and reducing greenhouse gases. Recently completed studies at up to 114 sites across Alberta indicate that native grasslands hold large amounts of C, including in soil, but also in aboveground dead and decaying vegetation. In pairwise comparisons, native grasslands had approximately 1.5x more total C than introduced forages, and 1.62x more C than cropland cover types. By linking these values to spatial data on land cover changes for the province and market values for C, we estimate that the value of C retained in native grasslands by avoiding conversion exceeds $3B within each of the Prairie and Parkland regions. Even larger values of C have been lost due to conversion of native grasslands into tame forage and cropland. Parallel investigations within agroforestry systems across central Alberta further support these studies, as silvo-pastures (natural aspen forest combined with perennial grassland) were effective at storing C and reducing GHG footprint relative to systems comprised of annual cropland paired with shelterbelts or natural hedgerows. Native grassland also had improved soil health metrics relative to other agricultural land uses based on soil aggregation and the ability to provide water under increasing moisture stress.

Our research also revealed that long-term exposure to grazing was consistent with maintaining, and in select situations increasing, the size of C pools within native grasslands. While grazing predictably reduced C in total aboveground vegetation, this change was offset by increases in other C pools, including root mass, soil organic matter, and in some cases shoot mass, particularly under high moisture availability in SW Alberta. The latter coincided with increased abundance of grazing tolerant introduced plant species, which may help maintain or increase soil C. Moderate grazing was also compatible with maintaining range health, and reduced woody species encroachment into grasslands of the Rocky Mountain Forest Reserve. Finally, current studies underway are quantifying the role of grazing in altering various greenhouse gases (GHG), including CO_2, as well as more potent GHGs such as CH_4 and N_2O. Collective results from these projects aim to highlight the compatibility of native grasslands in maintaining, and sometimes increasing, a variety of environmental goods and services, including forage production, biodiversity and C storage. Our long-term goal is to encourage the development of novel policies and market mechanisms that reward grassland managers for maintaining and improving these EG&Ss.