



Woody plant encroachment in prairie grassland ecosystems

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Grasslands provide vital global ecosystem services, are sensitive to disturbance and invasion, and prone to rapid functional collapse. Grasslands worldwide have been degraded in recent decades due to intense human activity and climate change, and this degradation not only threatens ecosystems but negatively affects ecosystem services. Degradation pressures emphasize the need to understand, evaluate, and monitor grassland ecosystems. A comprehensive grassland assessment is hindered by uncertainties in understanding the expansion of unwanted species and the methods to detect and effectively assess their impacts using remote sensing and geospatial methods. One key issue is woody plant encroachment (WPE) and its integration with grassland ecosystem health assessments. WPE is a natural ecosystem process but has become a threat to grassland ecosystem health because of the effects of climate change and the lack of a clear understanding of the WPE mechanisms especially in Canadian prairies, a location where WPE was not an issue in the past. There are two major challenges to understanding WPE in grasslands using remote sensing and spatial techniques. First, woody plant cover is highly heterogeneous leading to mixed pixels that include various types of cover. This is because grasslands appear in various WPE stages. Second, a woody plant has typical healthy vegetation spectral features that are hard to separate from healthy productive grass species. Therefore, monitoring the WPE in a grassland ecosystem involves 1) developing effective approaches to assess WPE in grasslands using remote sensing; 2) understanding the drivers of WPE in grasslands using remote sensing, geographic information science, and spatial analytical techniques; and 3) integrating WPE into grassland ecosystem health assessment and facilitating WPE modelling.