



Non-Native Plant Invasions in Prairie Grasslands of Alberta

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Prairie grassland provide important ecosystem goods and services, such as forage for livestock, habitat for plants and wildlife, and recreational space. However, following a wide-scale conversion to cropland, only 26% of the former grasslands in Alberta remain. One of the most urgent challenges that remaining grasslands face is the invasion by non-native plants. In Alberta, a total of 350 non-native vascular species (16% of the flora) have been reported as naturalized outside of cultivation. Although not all introduced species are invasive, some can displace native plants and change how grasslands function. Owing to their ecological and economic impacts, invasive non-native plants are a major obstacle for grassland management and conservation. A high abundance of non-native plants that are unpalatable for cattle can also increase operating expenses for weed control and decrease the value of rangeland properties.

Efficient policy and control options of invasive non-native plants require an understanding of the factors that facilitate invasions. In theory, a good water or nutrient supply in more mesic prairie could benefit highly competitive invasive plants more than native ones. Human disturbance may also facilitate invasion if it facilitates an influx of non-native seeds. Transportation corridors, oil and gas activity, and intentional seeding of agronomic forage plants have all been linked to elevated levels of invasion in native plant communities. Heavy or prolonged grazing, as well as prolonged protection from grazing, are known to promote non-native plant invasion. Although the impacts of invasive plants in Alberta grasslands have been relatively well researched, only few studies have examined the factors enhancing invasions, and none have surveyed non-native plant invasions across a large regional gradient.

To quantify the state of non-native plant invasions in Alberta prairie grasslands and disentangle possible factors facilitating invasions, we surveyed 139 native grassland plots in Alberta, along a 938km southeast-northwest gradient, from the border with Montana to the Peace River region (Figure 1). Our objective was to 1) identify the most common non-native plant species and 2) determine which predictors influence non-native plant abundance and richness, and to 3) test whether non-native plant invasions differ between mesic and semiarid grasslands and are facilitated by similar factors. We hypothesized that moisture and anthropogenic factors, like agricultural activity and grazing, play a large role in the patterns of non-native plants given their previously documented effects on plant biodiversity patterns.

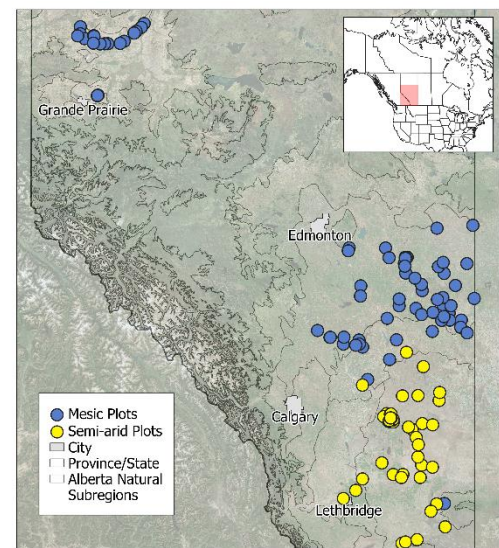


Figure 1. Research locations across Alberta.

A striking result was that Kentucky bluegrass (*Poa pratensis* subsp. *angustifolia*), commonly used for agronomic purposes, was by far the most frequent and abundant non-native plant in the surveyed grasslands. Looking at species cover, smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*) occupied the next ranks. Meanwhile, dandelion (*Taraxacum officinale*) and goat's beard (*Tragopogon dubius*) occurred frequently throughout the province but occupied only small covers. Across the surveyed regions, the abundance and richness of non-native plants was higher in mesic than in semi-arid grasslands, more pronounced in lower topographic positions and increased with agricultural activity. Meanwhile, levels of invasion decreased in grasslands with sandy soils and did not significantly change across different grazing intensities.

In summary, non-native plant invasions vary foremost due to climatic conditions, and to some extent agricultural activity, soil texture, and topography. Given that agronomic grasses were the most frequent and dominant invaders, legislation must consider a development of tools to strengthen the screening of intentionally introduced agronomic species, some of which have larger footprints throughout grasslands compared to provincially tracked and regulated invasive plants. The spread and influx of invasive non-native plants into prairie grasslands could be decreased by prioritizing the usage of native seed material in forage and turf development and utilization, as well as in land management. In addition, control of invasive species is warranted at the local scale, especially in native prairie remnants of the Central Parkland, which are not only highly fragmented but also have the highest levels of invasion. Established invasions could be managed using rangeland management principles. Since the grasses are technically palatable, invaded areas could be grazed or hayed early in the season when grasses are high in nutrients. In late summer/fall, after their active growing, grazing could be shifted to native pastures. Finally, our study provided a glimpse into the general state of non-native plant invasions in Alberta's prairie grasslands, but did not capture locally restricted or emergent invasions, such as cheatgrass (*Bromus tectorum*). A proactive approach of monitoring and early detection will help mitigate future invasions in prairie grasslands.



Assessing plant cover at one of the arid research locations, Mattheis Research Ranch.

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