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Grazing disturbance a benefit to species diversity in re-established native grass stands

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Key words : seeding mixture, native plants, grazing, species richness, biodiversity

Introduction In western Canada, increasingly land is being taken out of annual crop production and returned to perennial cover, in part due to an aging producer population but also the recognition of improved sustainability of perennial systems. A portion of the reseeded perennial cover has been native plant material. Seeding mixtures of species have included only a single species to over 100 species. Recommendations for utilization of seeded native grassland species have ranged from a year to establish prior to grazing to no grazing to be allowed. This series of studies set out to determine the possible benefits of seeding a simple seven species mixture versus a more complex fourteen species mixture and the impact that grazing might have on the resulting plant communities.

Materials and methods A 2×2 factorial experiment with 4 replicates was initiated in 2001. Sixteen paddocks (2 ha each) were seeded to either a simple six species mixture of cool season grasses plus a native legume or fourteen species including the seven from the simple mixture plus warm season grasses and 2 shrubs species. The grazing factor had two utilization levels; either 40-50% utilization or 60%-70%. The seeding rates were 75 pure live seeds (PLS) m^{-2} for the simple while the complex had 99 PLS m^{-2} . Within each paddock an area (3.6 m \times 3.6 m) was excluded from grazing. Cattle grazing commenced in 2002 in the month of June until September. Grazing followed the same pattern for 2003 and 2004. Plant compositions, bare ground and litter cover were determined for each of the grazed portions of the paddock using 10 randomly selected sampling points (a^{1/4} m^2) on a diagonal transect. A single random sampling point was used for the enclosures. From the plant compositions a Simpson's Index was calculated. Data was analyzed using Proc GLM and Tukey's test for mean separation from SAS Institute, Inc. (2000). Data presented is from the final year of the study, 2004.

Results and discussion The complex species mix had 12% less ($P < 0.05$) litter. Within the enclosures there was no bareground and 38.9% litter cover. This was significantly ($P < 0.05$) different than the grazed areas which had 44.9% bareground and 17.2% litter cover. The complex species mixture was composed of 66% wheat grasses while the simple mixture was composed of 97% wheat grasses for the final year 2004. The enclosures were dominated by one or two species while the grazed areas had greater representation of the seeded species. Within the grazed areas the species that dominated were different then enclosures. Simpson's index increased from 0.86 to 0.94 within the enclosure while the grazed increased from 0.93 in 2002 to 0.96 in 2004. The enclosure Simpson's Index value 0.94 differed ($P < 0.05$) from the grazed area value 0.96. These trends agree with reported trends within the literature for grasslands which are grazed versus those which are not. The increase in species richness is due to opening of the canopy to allow access less dominant species access to resource such as light. This is indicated by decreased bareground and increased litter within the enclosures. One would expect limits to the benefits of grazing for species richness. Overgrazing, after all, is well known to dramatically decrease species number. One would have expected to see some reduction in the more intensively utilized pastures but no impact on plant composition was noted ($P > 0.05$). This would suggest a 4 year study is inadequate to observe deleterious grazing impacts from the higher utilization. This would be in agreement with earlier work done on pre-existing mixed grass prairie (Schellenberg et al., 1999) in which no negative impacts to production were noted after high utilization over a 7 year period under the similar climatic conditions.

Conclusions Disturbance, in the form of cattle grazing, would be beneficial for maintaining plant diversity in new seedings. This benefit being the result of a more open canopy resulting from grazing and preventing complete dominance of a few seeded species over the complement of seeded species.

Reference

Schellenberg, M.P., Holt, N.W., Waddington, J., (1999). Effects of grazing dates on forage and beef production of mixed prairie rangeland. *Canadian Journal of Animal Science* 79, 335-341.