2018

Antelope Creek Habitat Development Area

2016 GPS Collar Analysis

Antelope Creek Technical Committee

Introduction

Crested wheatgrass (*Agropyron cristatum*) invasion in the Dry Mixegrass Natural Subregion is a legacy effect of historic seeding practices. The implications of seeding this invasive species and its encroachment potential on native grasslands were not fully understood at the time.

Crested wheatgrass management is site specific, and the key to preventing spread is persistent management to continually stress plants. Crested wheatgrass begins growth early in the growing season and can outcompete slower establishing native species for moisture and nutrient resources.

Antelope Creek Habitat Development Area is a 5,500 acre property managed under a partnership of Alberta Fish and Game, Ducks Unlimited Canada, Alberta Environment and Parks, and Wildlife Habitat Canada. The Ranch was purchased in 1986 and is managed to preserve and integrate wildlife habitat and values on a multiple use landscape, showcasing effective resource integration of grazing, industrial activity (oil and gas development primarily), research, education, and maintenance of wildlife habitat and biodiversity values.

Crested wheatgrass is a management concern on the Antelope Creek Habitat Development Area (ACHDA). Although palatable while young and vegetative, it becomes less palatable as it matures, and can build up growth to the point where it is avoided by grazing animals. Cattle are typically turned out on native grasslands after spring and early growth, which compounds this issue by allowing crested wheatgrass to fully develop and set seed. Early season grazing can be used as a management tool to stress crested wheatgrass, prevent seed production, and reduce re-growth. The ACHDA Ranch Manager has implemented earlier season grazing in fields with crested wheatgrass communities to reduce vigour and spread of crested wheatgrass. This management tool is not without concerns; however, as native grasses are generally more sensitive to grazing pressure, specifically during the early growing season.

Objectives

In 2016 a GPS collar project was conducted on the Antelope Creek Habitat Development Area in Field 3 to document cattle behavior for these factors:

1. Cattle use of rangeland plant communities
2. The influence of plant community types on cattle distribution
3. Establish cattle preference of crested wheatgrass (*Agropyron cristatum*) community types within these native communities

Site Description

Field 3 is approximately 498 hectares (1,231 acres) in size, composed of a mixture of intact native plant communities and disturbed areas where non-native species, mainly Kentucky bluegrass (*Poa pratensis*) and crested wheatgrass, have encroached and created modified communities. Disturbances included linear pipelines, lease and well sites, old roads, and areas where groundwork was done to facilitate wetland/dugout/slough features.

Two large waterbodies are located in the northern portion of the field and provide water for livestock.

Methods

Plant communities in Field 3 were identified during field inventory of summer 2016 and mapped using Rangeland Plant Communities for the Dry Mixedgrass (Adams et. al 2013) as the source for plant community names and information (Figure 1).

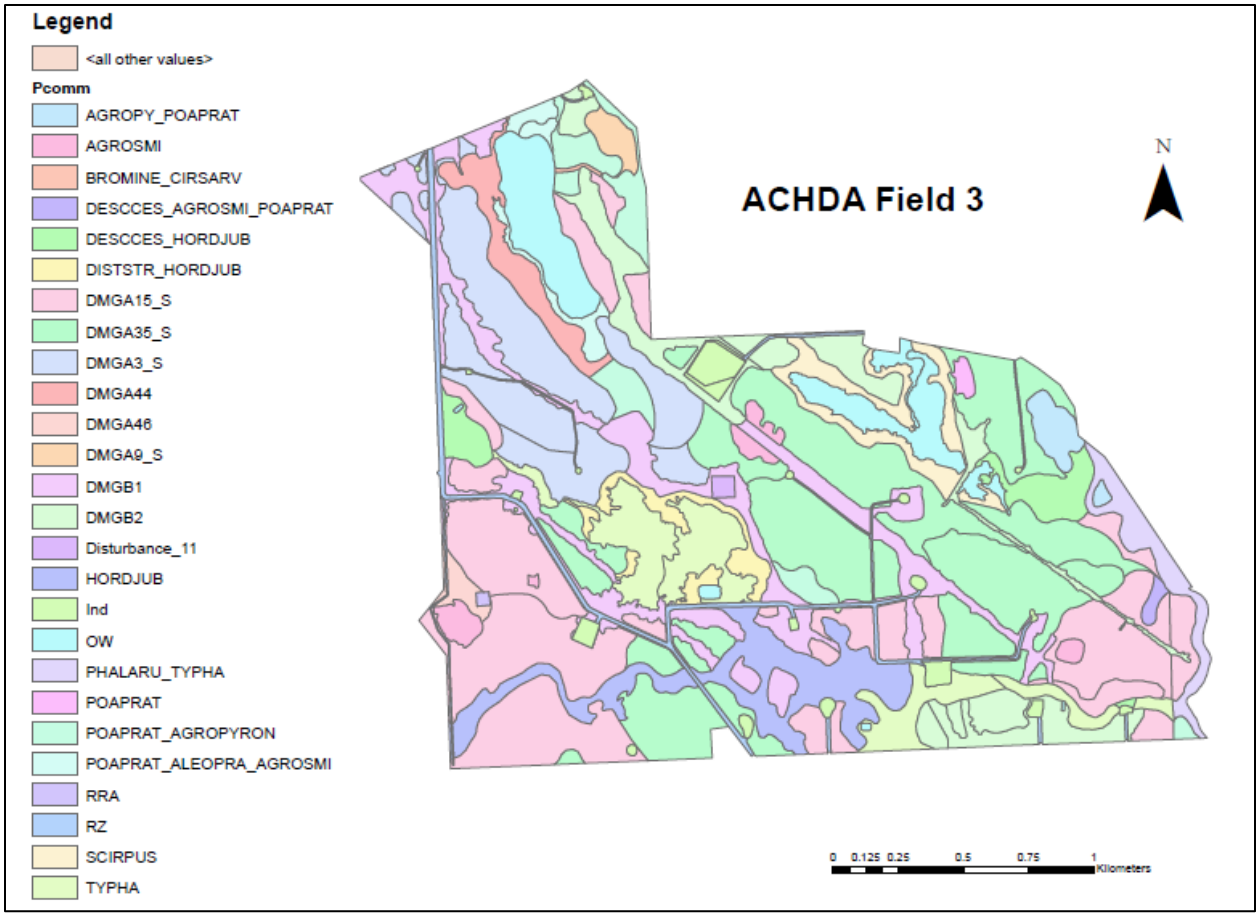

Figure 1. Plant communities found in Field 3.

Crested wheatgrass communities were noted primarily along linear disturbances and disturbed areas (Figure 2).

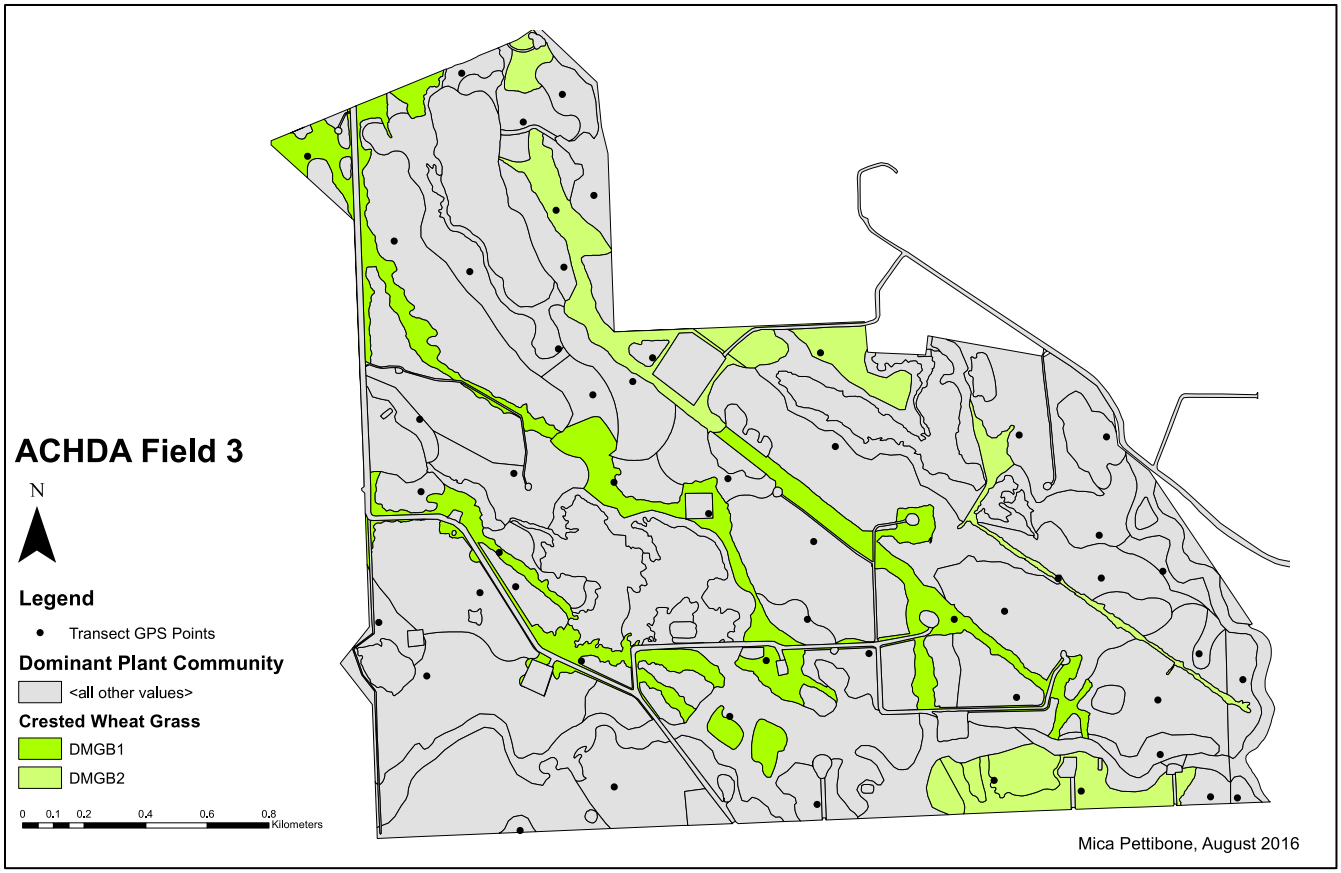

Figure 2. Crested wheatgrass Occurrence and Community Type for Field 3

Eight cows were chosen at random and collared with Loteck 3300 GPS collars (Figure 3) programmed to provide a location fix every 10 minutes. Animal movement of these eight cows in Field 3 was tracked from late May to early August 2016, but necessary data correction and clean up provided robust GPS measures only for the month of June 2016. Animals were moved through the field according to the regular ranching practices of the ranch manager. Collar data was analyzed from 5:00am-10:00pm (17 hours) to best reflect foraging time. Data were downloaded from the collars, corrected and analyzed with the plant community inventory map to provide an assessment of cattle use of plant community types relative to availability. Analysis is based on the assumption that behaviour of collared cows is representative of the entire herd.

Figure 3. Cattle outfitted with Loteck 3300 GPS collars at Antelope Creek Ranch.

Preference or avoidance of each plant community was calculated using Ivelev's electivity index. Electivity values were generated using Ivlev's Electivity Index (Ivlev 1961) where:

$$Electivity = \frac{(\%\ of\ GPS\ points\ in\ PC) - (\%\ of\ field\ that\ is\ Plant\ Community)}{(\%\ of\ GPS\ points\ in\ PC) + (\%\ of\ field\ that\ is\ Plant\ Community)}$$

Electivity values between -1 and 0 indicate avoidance of the plant community because use is less than what would occur randomly. Electivity values of zero indicate neutral (or random) selection. Electivity values between 0 and 1 indicate selection of a plant community with use exceeding what would occur at random.

Plant community electivity was used to discuss cattle selection of different plant communities, with inferences made on the impacts of this behaviour on pasture management.

Results & Discussion

GPS collar locations recorded in Field 3 during the month of June 2016 shown below in Figure 4.

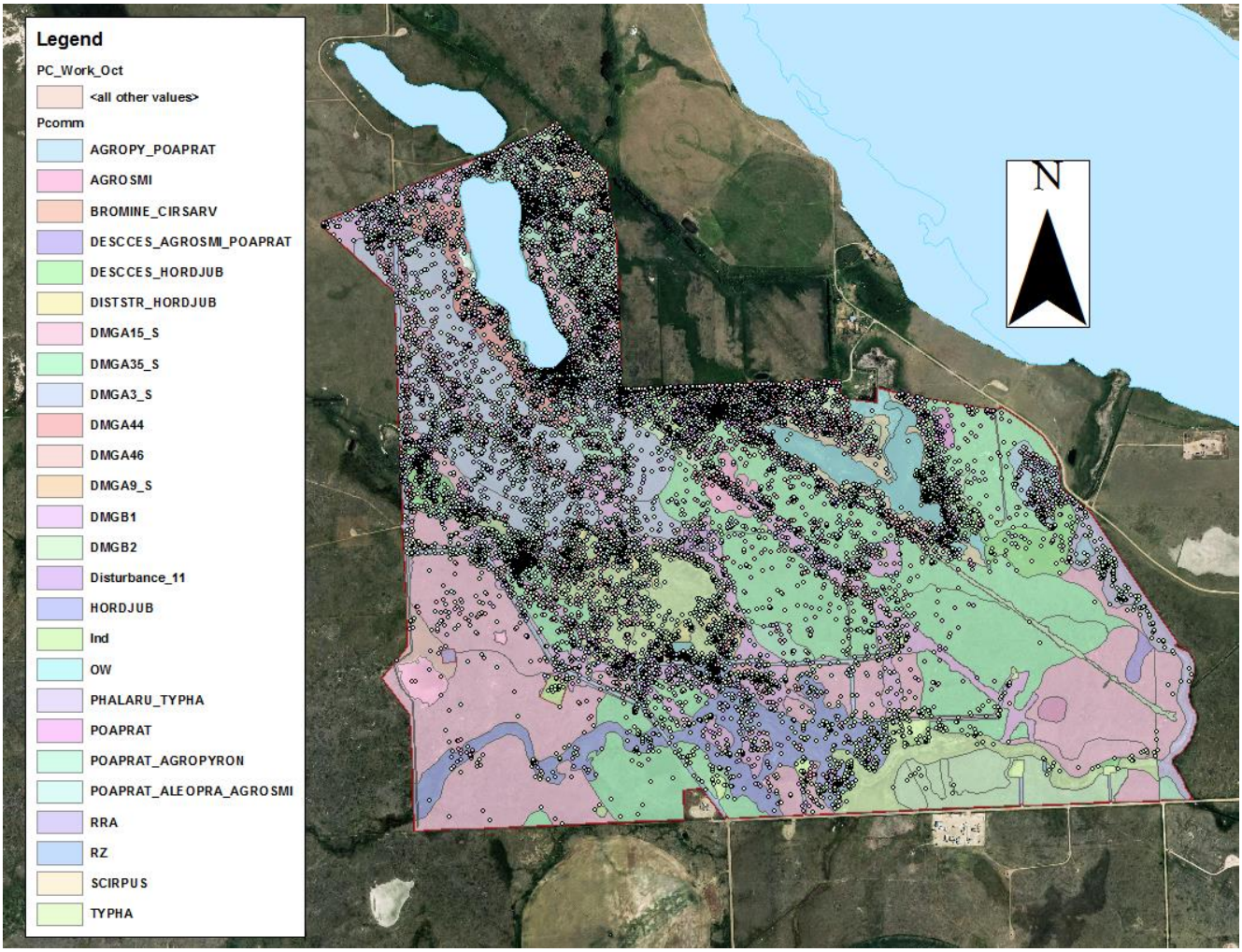

Figure 4. GPS collar locations in Field 3.

Density analysis better illustrates cattle distribution and highlights areas of localized pressure below in Figure 5.

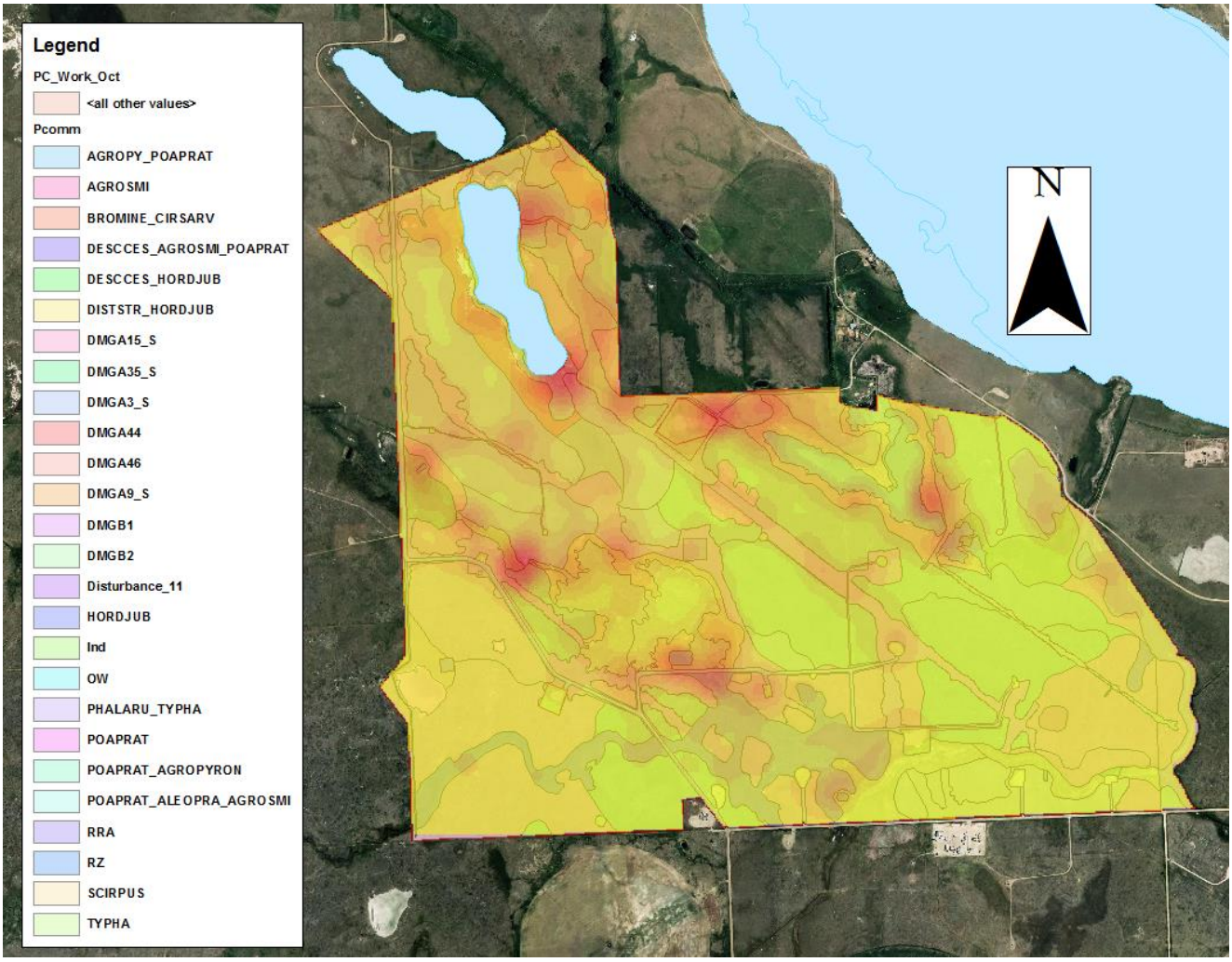

Figure 5. Density distribution of cattle in Field 3.

For the purpose of the electivity analysis plant communities were grouped into functional units and common names were used as descriptors. The areas of each of these functional groups noted in Table 1 below.

Table 1. Plant communities and associated coverage in Field 3.

Plant Community	Area (Ha)
Wheat Grass - Needle and Thread - June Grass (DMGA15)	91
Reed Canary Grass-Cattail	8
Needle and Thread - June Grass - Blue Grama Grass (DMGA35)	102
Foxtail Barley	36
Cattail	28
Needle and Thread - June Grass - Blue Grama Grass (DMGA3)	47
Crested wheatgrass (DMGB1)	46
Road	10

Tufted Hairgrass -Foxtail Barley	10
Salt Grass - Western wheatgrass (DMGA44)	10
Crested wheatgrass - Needle and Thread / Silver Sage (DMGB2)	34
Industrial	7
Bullrush (Scirpus)	11
Saltgrass-Foxtail Barley	7
Kentucky Bluegrass	24
Water	26

Collar data illustrated in Figure 6 below suggests that cattle grazing during the month of June showed a positive electivity (use exceeding what would occur at random) for mainly modified and riparian communities. This electivity may not be directly tied to cattle preference of these plant communities cattle use may not be explicitly due to vegetative composition, but rather use may be influenced by their location on the landscape, eg. close proximity to water sources. The exception to this is the two upland native communities, Salt Grass - Western wheatgrass (DMGA44) and Needle and Thread - June Grass - Blue Grama Grass (DMGA3), which both also had positive electivity.

The majority of community types with a negative electivity were native upland communities, foxtail barley, and very wet riparian communities with a cattail component.

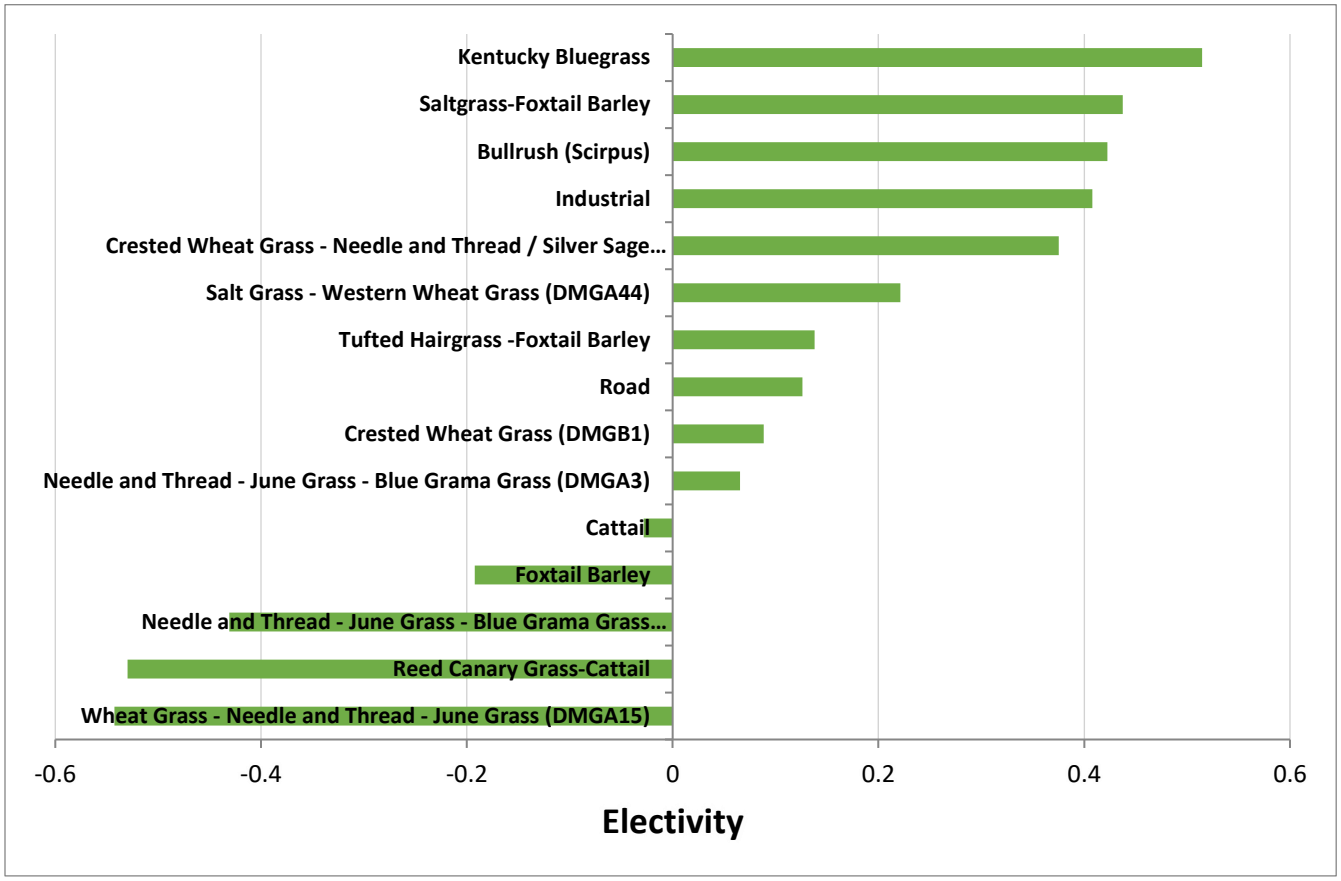

Figure 6. Plant community electivity index for Field 3.

The two crested wheatgrass communities found in Field 3, DMGB1 (Crested Wheatgrass) and DMGB2 (Crested Wheatgrass – Needle and Thread/Silver Sagebrush) as defined in Rangeland Plant Communities for the Dry Mixedgrass (Adams et. al 2013), had a positive electivity as illustrated in Figure 6. This suggests that there is increased grazing pressure on these communities, which may prevent crested wheatgrass setting seed, reducing wind-borne spread, as well as plant re-growth and vigour.

Figure 7. Crested wheatgrass communities highlighted with cattle density overlaid. Note reduced use of crested wheatgrass communities in the south eastern portion of Field 3.

Some crested wheatgrass communities received less grazing pressure as a function of location (Figure 7). Use of distribution tools (eg. salt, riding, etc.) could improve early season use of these communities and assist in the management of crested wheatgrass.

Other communities that showed a positive electivity were primarily modified communities (Figure 8), where Kentucky bluegrass dominated communities showed the highest electivity. This is likely due to the early green up of introduced grass species relative to native grass species, which is supported by the negative electivity of the late seral stage native communities [DMGA35 (Wheat Grass – Needle and Thread – June Grass) and DMGA 35 (Needle and Thread – June Grass – Blue Grama Grass)].

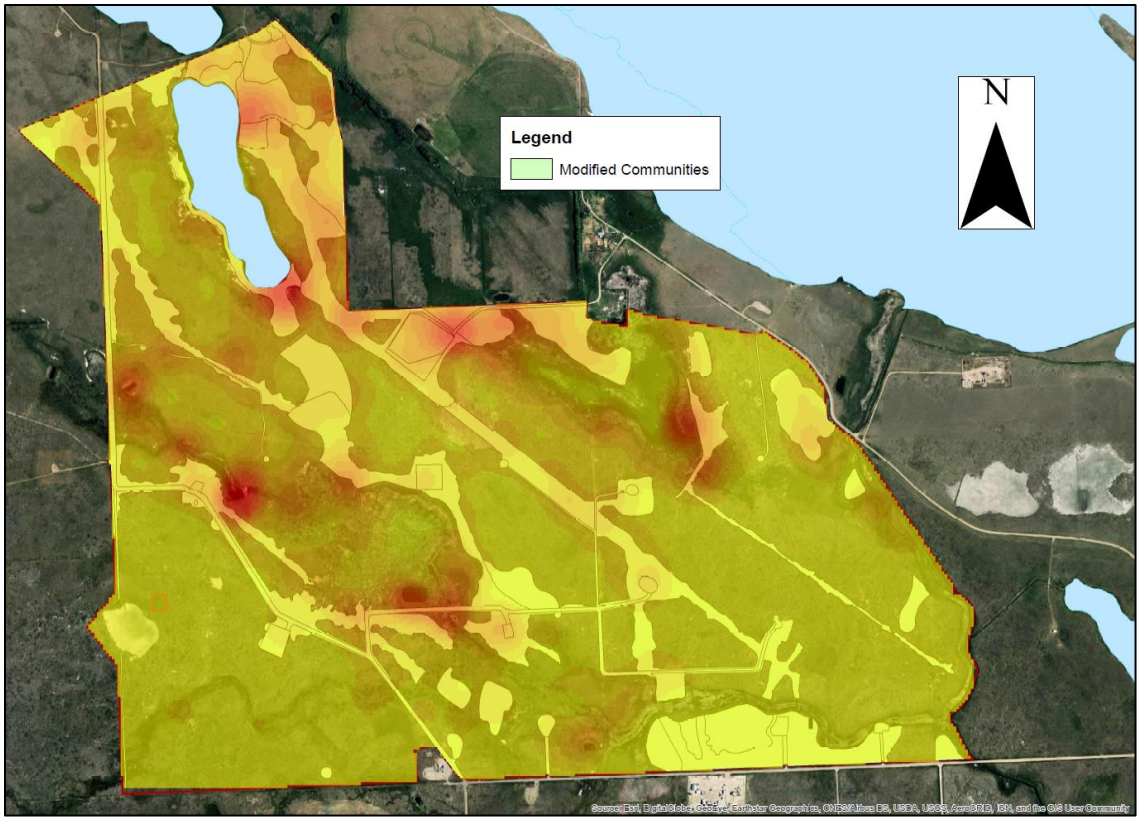

Figure 8. Modified plant communities with cattle density overlaid. Note increased cattle density in red associated with modified communities.

Conclusion

The electivity analysis indicates that cattle select crested wheatgrass communities, as well as other modified communities, and select riparian communities early in the growing season grazing. This suggests that skim grazing targets crested wheatgrass communities, which may prevent crested wheatgrass setting seed, reducing wind-borne spread, as well as plant re-growth and vigour.

Use of attractants such as salt and mineral blocks, and other distribution tools to encourage the use of crested wheatgrass communities in the south eastern portion of Field 3 may promote selection of target communities and assist in reaching management objectives. Other activities that may increase selection of target crested wheatgrass communities may include restricting cattle to these communities by use of temporary electric fencing, and burning or mowing target communities to promote selectivity of palatable regrowth.

References

Adams, B.W., J. Richman, L. Poulin-Klein, K. France, D. Moisey and R.L. McNeil. 2013. Rangeland Plant Communities for the Dry Mixedgrass Natural Subregion of Alberta. Second Approximation. Rangeland Management Branch, Policy Division, Alberta Environment and Sustainable Resource Development, Lethbridge, Pub. No. T.040 135 pp.

Ivlev, S.V. 1961. Experimental ecology of the feeding of fishes. Yale University Press. 302p.