

# Comparative Management Attributes Associated with Adaptive Multi-Paddock (AMP) Grazed Ranches and Neighbouring Cattle Operations

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## Introduction

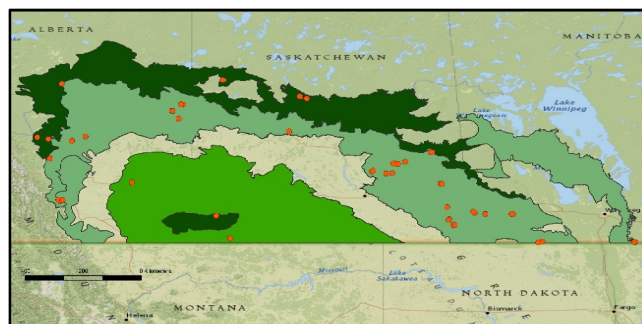
Significant interest exists in understanding how specialized grazing systems, including Adaptive Multi-Paddock (AMP) grazing (Fig. 1), alters the provision of various Ecosystem Goods and Services (EG&S), including carbon storage and greenhouse gas (GHG) mitigation. AMP systems, where livestock are grazed for short periods at high densities using flexible management practices, have been touted as capable of maximizing vegetation recovery and therefore forage production [1, 2], potentially increasing carbon storage and combating climate change. As the merits of rotational grazing have generally been questioned in recent times [3], this has created division and uncertainty into how rotational systems can be optimally applied to achieve both economic and environmental benefits. A critical first step in evaluating grazing systems is to understand how management practices differ between AMP ranches and other ranches in western Canada. Here we summarize differences in pasture and cattle management attributes between a sample of AMP cattle ranches and their neighbouring operations (hereafter Non-AMP).



**Figure 1.** Example of a typical AMP grazed pasture in central Alberta.

## Materials and Methods

We interviewed ranch operators responsible for managing 64 individual land areas, which were further grouped into 32 pairs of AMP and Non-AMP ranches. Study locations represented a broad agroclimatic gradient in the Canadian prairie provinces (Fig. 2) as part of a larger study examining AMP grazing impacts on grassland function. Ranchers were asked to respond to a series of questions that characterized the land use history of their ranch, and quantify different pasture and cattle management metrics, including stocking rates and cattle rotation patterns during the growing season.



**Figure 2.** Location of the 32 study site ranch pairs in the Canadian prairie provinces. Each point is a pair of ranches practicing AMP and Non-AMP grazing.

## Results

Most management attributes differed between AMP and Non-AMP ranches (Table 1). AMP ranches were more likely to have been cultivated and seeded to tame forage in the past, and were markedly larger in area. AMP ranches were also comprised of a more than 10-fold increase in the number of pastures, which were typically less than 20% the individual size of those in Non-AMP ranches.

**Table 1.** Comparative attributes between 32 AMP and Non-AMP beef cattle operations. \* indicates differences.

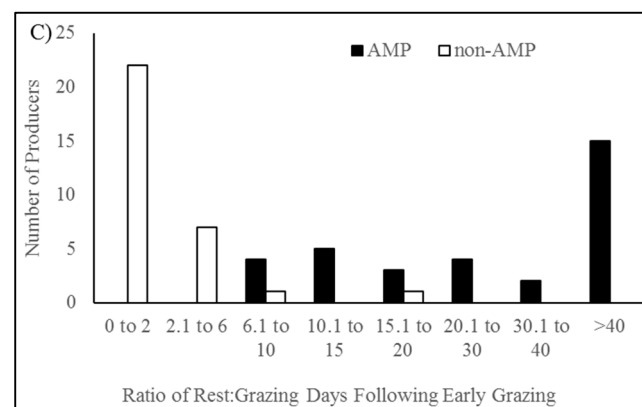
Ranch Attribute	AMP	Non-AMP
<u>Ranch land properties</u>		
Cultivation history (% of ranches)	81.3%	74.2%
Time since cultivation (years)	19.5	19.6
Total area grazed (ha)	1374 *	283 *
Number of pastures	61.0 *	5.2 *
Mean pasture size (ha)	22.3 *	120.4 *
<u>Cattle management</u>		
Animal units# (animal units)	405.1 *	111.8 *
Stocking rate (animal-unit-months / ha)	3.63	2.85
Computed stock density (animal units / ha)	70.6 *	2.9 *
<u>Grazing practices</u>		
Initial grazing date (Julian day)	April 25 *	May 17 *
Total grazing season (days)	217.3 *	141.2 *
Early-season (<July 31) grazing period (days)	2.8 *	75.7 *
Minimum rest after early-season grazing (days)	68.9 *	26.8 *
Rest:Grazing ratio	39.0 *	1.8 *

Although AMP ranches tended to support more cattle on average, comparative stocking rates remained similar to those in Non-AMP ranches (within 25% of one another). AMP ranches tended to run 24-fold greater stock densities within pastures, and initiated grazing earlier in the year (late April vs mid May), with a total grazing season that was 76 days longer. Finally, ranches using AMP grazing employed very short grazing periods, particularly early in the year (prior to July 31), and ensured a much longer rest period prior to re-grazing. This pattern led to marked divergence in the number of days of rest per day of active grazing during the early growing season (referred to as the Rest:Grazing day ratio) between AMP and Non-AMP ranches (Fig. 3).

## Conclusions

Our management data indicate that AMP ranches differed from Non-AMP operations in several key ways, including land use history, cattle management, and grazing practices. Specifically, AMP ranches were larger, more likely to be seeded, and had more pastures ranches, cattle were grazed over an extended grazing season and used higher stock densities, though stocking rates remained similar. Perhaps most important, grazing

during the early growing season comprised of smaller land areas. Also, AMP was associated with a short grazing period and lengthy recovery interval, leading to longer Rest:Grazing day ratios.



**Figure 3.** Comparative frequency distribution of cattle ranches employing different ratios of Rest:Grazing days following early growing season grazing (< July 31), as reported by ranches utilizing AMP and Non-AMP systems.

## Future Work

Information on management attributes, particularly those differentiating AMP from Non-AMP ranches, such as the Rest:Grazing ratio, will be used to further interpret the biophysical data obtained in this study. The latter includes soil carbon, GHG flux and water infiltration, plant diversity and forage production metrics, as well as soil microbial community attributes and indicators of carbon and nutrient cycling.

## References

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