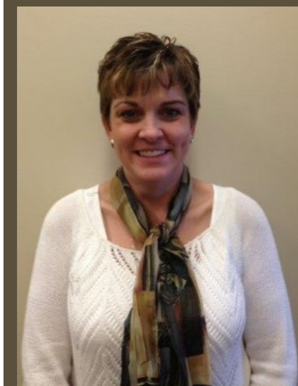


# Planned grazing demonstration

2018 INT1

Measuring the impact of planned grazing on forage, soil and cattle health and productivity

Project Lead: **Pam Iwanchysko,** Livestock Farm Production Extension, Manitoba Agriculture

MBFI Location(s): Brookdale Farm

Collaborating Partners: Blain Hjertaas, Holistic Management Canada, Certified Educator and beef producer from Redvers, Saskatchewan

Start Date: June 2015 Status: Final, (Renewed 2018)

## Introduction

Ranchers have a vested interest in managing for the best results in terms of production, profitibality and sustaining natural resources on pasture[1]. Cattle managed in a continuous grazing situation may damage the land, whereas cattle managed in a planned grazing situation can have profound opposite effects. Impacts of livestock on soil fall into two broad categories: first, the physical impact of the animal on soil as it moves around, and, second - the chemical and biological impact of the feces and urine that the animal deposits to soil[2].

This project will demonstrate how producers can make positive changes with minimal expenses by focusing on the management of the cattle. It has been noted, that the absence of distubances in grassland ecosystems results in a decline in species diversity and deterioration of physical structure[3]. Therefore there is a defined need to have some animal impact on the land to maintain a healthy ecosystem. The end result is one of the biggest opportunities to increase profit on the farm, while adding environmental resiliency to the farm through improved soil, animal and forage species, productivity and health.

The core of planned grazing is simply grazing livestock in super dense herds that mimic the grazing patterns of big game, which have since disappeared. Those livestock tilled the soil with their hooves and fertilized it with their dung – thus preparing the land for new vegetation in a cycle that evolved over millions of years[4].

This project will target short graze periods, high stock density and full recovery of the plants before being grazed a second, and even a third time. The project will also monitor growing conditions with adjustments being made in recovery periods based on the monitoring of forage growth, environmental conditions and animal performance.

The graze period is defined as the amount of time cattle are allowed to stay in a pasture at one time. Overgrazing is a function of time. To exemplify the positive impacts that cattle can have on the land, overgrazing must not occur. This in turn requires a short graze period and, as a general rule, the shorter the better. For practical purposes, a graze period of two to three days will be used in this project, the same amount of days as used in the previous year.

The stock density is the number of head per hectare at a given time and the higher the stock density the better the results. The stock density is affected by the graze period. As the graze period is shortened, the stock density will be increased. This will be pre-determined along with the graze period according to the planned grazing technique, whereby animal requirements on a dry matter basis are calculated first and then estimated yields will be taken prior to grazing to determine the length of stay on a particular measured paddock.

The recovery period is the number of days that the plants have to re-grow before they are grazed a second time. Full recovery of the plants is essential. In most areas a recovery period of 60 to 90 days is likely required. Experience has been that the results tend to improve as you move closer to the 90-day range. In dry, slow-growing areas grazing only once in the growing season may be the best choice. The project will also aim for a 90-day recovery period at the start of the project on which to base the rest of the grazing days. First and foremost, the project will essentially work backwords in terms of grazing days to account for a 90-day rest period on the grazing paddocks.

Monitoring plant re-growth is essential to planned grazing. In fact, this is one of the major differences between planned grazing versus many other types of grazing. A plan as described above will be made and adjusted to current growing conditions by increasing the recovery period if required. The result will be a full recovery of the pastures under all growing conditions. Planned grazing is a powerful tool to improve the land's resilience to environmental extremes, its carrying capacity and ultimately the bottom line.

It is hypothesized that planned grazing (commonly referred to as intensive grazing or mob grazing) will increase soil, forage and ultimately animal health and production. However, this management style can require some time and resources to set up and manage, which is likely why it is not widely adopted yet. According to the Western Canadian Cow-Calf Survey[5] collected in 2014, "Intensive grazing was practiced by only 11 per cent of respondents on tame pasture and 2.7 per cent of respondents on native pasture." Planned grazing is designed to have short grazing periods, high stocking density and a full rest and recovery of the plants before being grazed a second time. Recovery periods are adjusted (60 to 90 d is targeted) based on monitoring forage growth, environmental conditions and animal performance.

## Objectives

This project will compare two types of grazing: planned grazing and conventional continuous grazing. It is hypothesized that in the initial years, the performance of the cattle will stay relatively similar between the two grazing types but a significant improvement in soil health and forage production will result.

The overall project objective is to determine if planned grazing is a more beneficial grazing method than the conventional continuous grazing. Another project objective is to determine the soil nutrient status and its change over time after the different grazing methods have been utilized. Baseline soil tests were taken in 2015 to compare to consecutive years. Grazing cages will stay in place for many years to be used as a baseline with no grazing in the grazed paddocks and fields (results to be reported in projects *INT 10* and *EXT 11*). Additionally, the project will measure the change in forage production and quality and its potential impact on livestock production (weight gain and BCS). The final objective is to identify fixed point plant succession and to determine if there will be any long-term changes in plant communities and biodiversity.

## Project Design and Methods

A grazing plan was developed to implement grazing of two herds of 25 cow-calf pairs each, to compare planned grazing to a conventional continuous grazing plan. Each herd are assigned paddocks which are lettered with the same letter (A-G) which corresponds to the same forage quality, and within those lettered paddocks, smaller paddocks of the same size for the planned herd. The continuous herd has the same amount of acres but there is no paddock division within that paddock letter.

Pastures consist of native forage (paddocks 12, 13, 14, 15, 16, 21, 22, 23) and a tame pasture mix (paddocks 1 to 11, 17 to 19 and 24 to 30) for the herds. Each herd had access to a combination of both tame and native species. The herds were assigned grazing according to a randomized complete block design to accomomdate soil microbiolgical analysis research by Brandon University.

The tame pasture mix consisted of 45 per cent meadow bromegrass, 30 per cent orchardgrass, 10 per cent timothy, 10 per cent creeping red fescue and some additional cicer milkvetch was also added. The native pastures included western wheatgrass, northern wheatgrass, slender wheatgrass, green needlegrass, big bluestem, little bluestem, side-oat grama grass, switch grass and indian grass. Twenty-three paddocks, approximately four acres each, were set-up with temporary electric fencing on the perennial summer pastures, with a permanent two-strand electric wire around the perimeter for the planned herd and continuous grazing occured on the rest of pastures (Table 1). There was the same amount of pasture area for each of the herds.

| Paddocks for McGonigle project INT 11 | Planned herd paddock number(s) | Number of ac | Continuous herd paddock number(s) | Number of ac |
|---|---|---|---|---|
| A | 1 – 4 | 16.8 | 5 | 16.8 |
| B | 7 – 11 | 18 | 14 | 18 |
| C | 12 – 13 | 8.1 | 7 – 8 | 9.9 |
| D | 15 | 5.7 | 16 | 5.1 |
| E | 17 – 19 | 10.8 | 20 | 10.4 |
| F | 21 – 23 | 10.4 | 24 | 9.7 |
| G | 25 – 28 | 21.1 | 30 | 20 |
| Sum of acres | | 90.9 | | 89.9 |

**Table 1. Paddock treatment assignment and number of acres in each**

Grazing patterns were inconistent over the past three year period due to the fluctuation in knowledge of how manipulate the animals and due to the different environmental conditions each year. In year one, on the planned grazing herd, the cattle were placed on the first paddock and followed a consequetive grazing sequence in order of the lettered paddocks and basically followed a twice over grazing regime. In the second year the cattle were monitored a little more closely, however the cattle were allowed to do a quick graze in the spring which was then followed by a second graze monitoring forage growth and days rest more closely. In year 3, cattle were place on the first grazing paddock quite late in the season due to cool conditions and poor forage growth and paddocks were monitored for grazing based on days rest, targeting a 75 day rest period in the active growing season. Each of the paddocks were approximatley 1 acre in size on the planned system with the exception of the last few paddocks which were altered to become larger due to poor forage re-growth due to dry conditions, taking into account a 75 day rest period for the next growing season.

All individual animals were weighed at the beginning of the trial and then monthly to get a measurement of the rate of gain and they were body condition scored (BCS). Animals and pastures were monitored for health and growth and were managed according to the forage growth in the paddocks. A grazing plan was compiled and used for the detailed management of the grazing treatments. Cows were watered daily through a solar-powered watering system that was developed on the entire section.

The number of animal days per acre (ADA) plus residual forage was assesed on all the paddocks at the end of the growing season. Yield clippings were taken each day the cattle were moved to a new paddock. Species composition was completed at the beginning of August. These assessments are to record any plant succession that may take place due to the impact of grazing in the future.

## Results and Discussion

In year 1, the planned herd remained on trial for 124 days while the continuous herd grazing period had to be shortned by 17 days prior to Sept. 30$^{th}$ (only 107 days).

In year 2, the planned herd remained on trial for 135 days from 15-May-17 through to 27-September-17, while the continuous herd was placed on pasture on 01-June-17 and taken off on 05-September-17 for a total of 97 days. There were 38 more days grazing for the planned herd in the 2017 grazing season. There appeared to be no difference between weight gains on any of the animals while they were on the pasture trial. The continuous cows however did lose some body condition, which was pretty well identical to the results of the previous grazing year.

In year 3, both herds went on pasture at the same time due to the late and cold spring on May 28, 2018. The continuous cows came off on August 10, 2018 and the planned herd came off 10 days later on August 20, 2018. There was an additional 10 days grazing for the planned herd.

Yield measurements including residual forage DM after the cattle were taken off the grazing systems, resulted in more forage yield on the planned grazing system for the three consecutive years (Table 2).

| Total Yield (lbs/acre) including residual Planned vs. Continuous Grazing Project | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Paddocks** | **2016** | | **2017** | | **2018** | | **Description** |
| | **Planned** | **Continuous** | **Planned** | **Continuous** | **Planned** | **Continuous** | |
| **A** | 4759.13 | 2849.49 | 3818.67 | 2052.87 | 2636.72 | 2149.72 | **Tame Pasture** |
| **B** | 4002.53 | 2893.65 | 2627.87 | 1410.85 | 3108.17 | 1204.10 | **Tame Pasture** |
| **C** | 2290.65 | 1706.22 | 2621.63 | 2739.23 | 2268.98 | 1204.01 | **Native Pasture** |
| **D** | 3466.64 | 3724.18 | 2826.76 | 1398.96 | 4174.13 | 7811.26 | **Native Pasture *** |
| **E** | 4328.8 | 1680.58 | 3497.58 | 1214.3 | 3392.13 | 785.41 | **Tame Pasture** |
| **F** | 3963.42 | 5813.3 | 3185.89 | 2765.75 | 3346.65 | 1650.30 | **Tame/Native Mix** |
| **G** | 5105.58 | 5262.96 | 3178.04 | 1439.91 | 2505.38 | 849.95 | **Cicer Milk Vetch** |

**Table 2. Total Yield (lbs/acre) including residual measurements after grazing in both planned and continuous grazing systems**
***Native pasture residue was extremely high due to little or no grazing because of old dead material which was unpalatable**

Table 2 also showcases the impact of the grazing strategies on the forage yield between the two grazing pastures and the individual three consecutive years of the project. In 2016, 2017 and 2018 yields were higher on the planned grazing system. Forage growth slowed dramatically in August and September for the continuous pasture. Dry conditions in 2017 and 2018 showed a decrease in overall yield on both grazing systems as compared to the previous year, with a dramatic drop in September before rainfall had any effect in October to replenish soil mositure and resume forage growth after grazing prior to freezing.

GPS collars were attached to 2 cows in each of the grazing systems to monitor animal movement (total of 4 collars). Visual observations showed that the continuous cows stayed in favorite or preferred areas throughout the grazing season, thus overgazing certain areas on the continuous pastures occured while under utilizing others. This is evident in grazing year 3, where there appears to be a huge increase in forage production on the D paddock under the continuous grazing regime, however what was recorded is that the forage that is present is untouched due to unpalibilty and little to no disturbance by the cattle.

Visual observations (Figure 1) were also noted with regards to the viusal appearance of the continuous pastures. There appeared to be some population growth of rodents into the pastures, particularly gophers and more invasive plant species. However this was not measured statistically but rather just an observation.

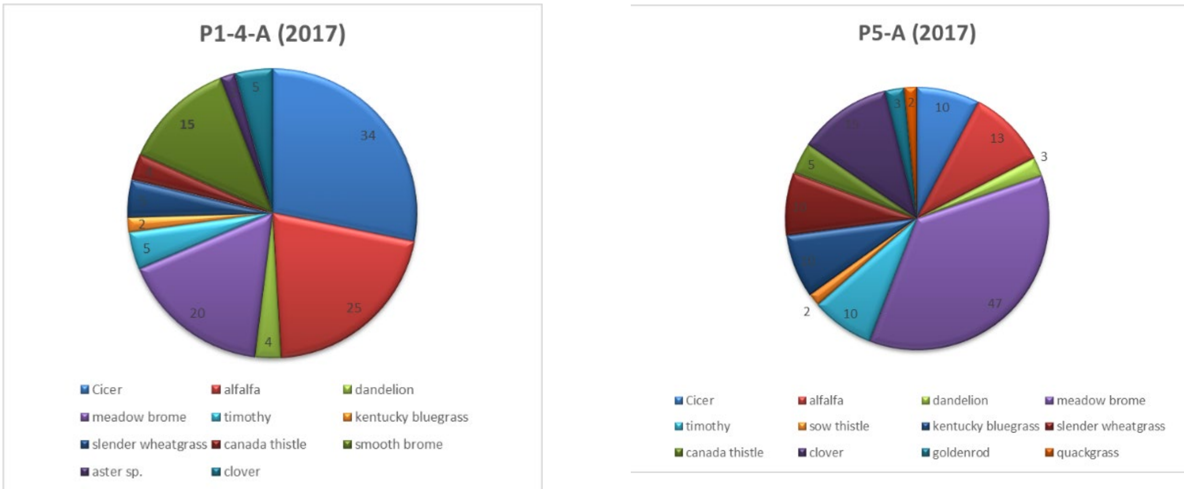



**Figure 1 – Example of visual observation measurements of compared planned (paddocks 1-4) and continuous (paddock 5) paddocks for species composition in 2017.**

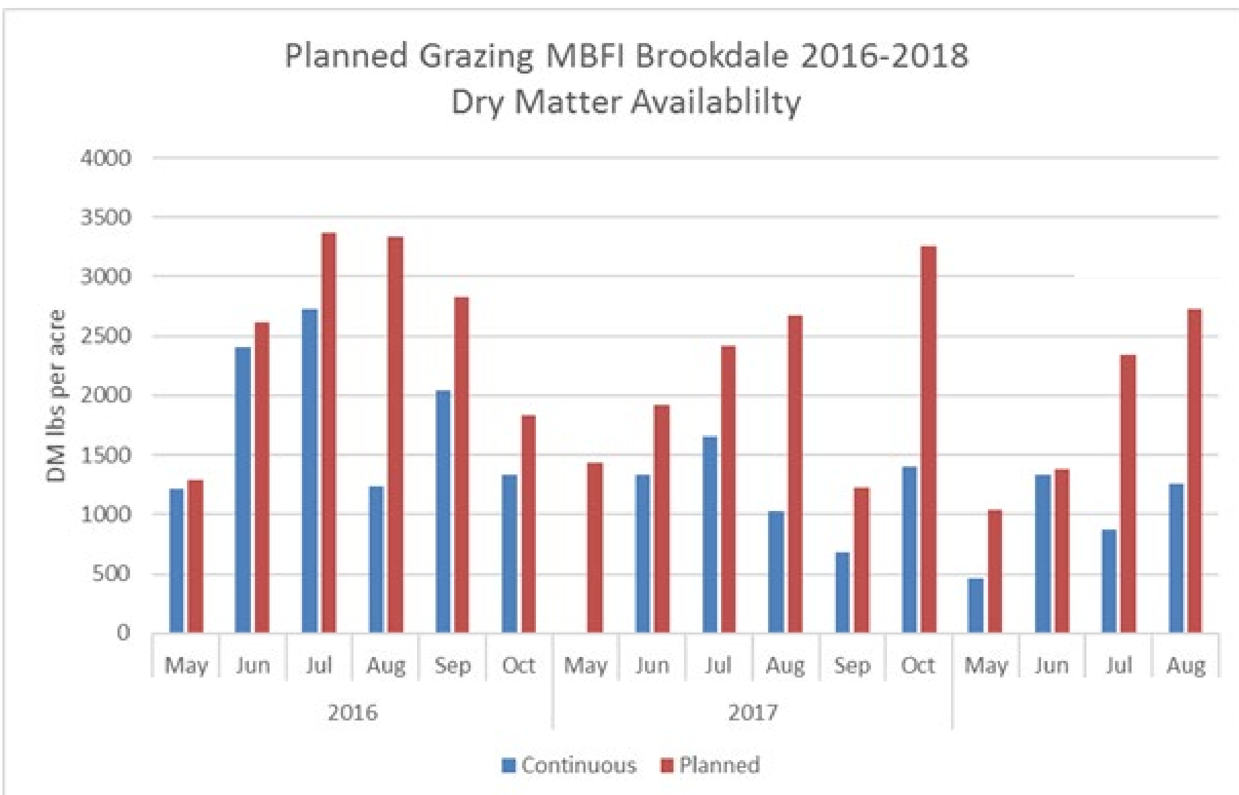



**Figure 2. Total yield of all paddocks (lb/acre) in DM for both the 2016, 2017 and 2018 grazing seasons.**

Additionally, to the yield measurement in the paddocks, a species composition was conducted across all of the paddocks. One significant difference that was found was with regards to a higher population of Meadow Bromegrass on the continuous grazed pastures. It is suggested that this may be due to the earlier grazing that happens on the planned grazing system. With Meadow Bromegrass being more palatable in the early spring, the cattle tend to eat it more readily and since the continuous herd was postponed in terms of grazing, the meadow bromegrass had more time to re-grow and regenerate itself. The planned herd grazing strategy may have actually decreased the population of Meadow Bromegrass in the paddocks due to the early grazing. However, there may be more of a need to reassess the population of the many different grass species in future grazing years to see if this effect continues.

### 9.1.5 Economics

For this project, the assumption will be made that the average summer grazing period is 135 days based on the Manitoba Agriculture cost of production. Over the 3-year trial, 65 days less feed for winter was required for the planned herd due to the extra grazing that occurred due to better management. At \$1.734/hd/d plus yardage at \$1.345/d; this is equivalent to \$3.08/hd/d x 65 d = \$200.20 x 25 cows = \$5005.00 in winter-feed costs that was saved by the additional grazing days on pasture.

Project costs included additional fencing, labor and the solar powered watering system, which were used in both grazing systems. Many of the capital expenses were already on the farm and were not allocated as expenses to the project. Overall, this project had double the amount of labor involved for the planned grazing regime over the continuous regime as shown in Figure 3 below. However, with regard to safety and animal welfare concerns, two staff are required to be where animals are, at all times on this research farm and that is included in the labor commitments.

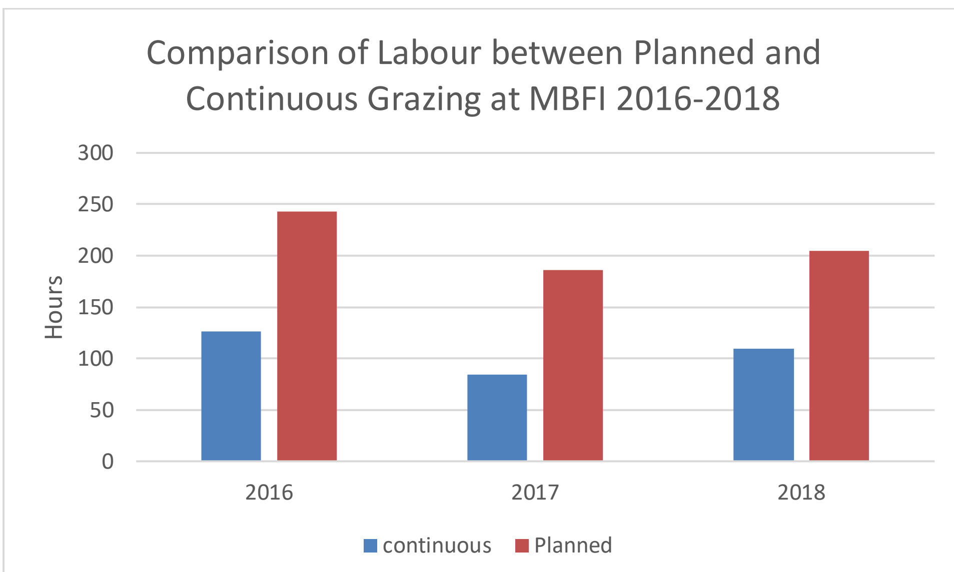



**Figure 3. Total in-field labor for the grazing regimes in the 2016 - 2018 grazing seasons.**

Additional fencing costs for the planned grazing project included step-in posts, additional geared reels and additional polywire. This includes 50 step-in posts at \$8.00 per post, a geared reel and additional polywire for 3 additional half-mile fences for a total cost of \$1620.00. However, this cost would be amortized over 8 years for an additional total cost to the planned grazing of \$202.50 per year for a total over the three years of \$607.50. An additional cost to the continuous pasture was an additional watering trough, which was a total cost of \$600.00.

On a traditional Manitoba farm, the average value that is used for labor is $15 per hour. Over the three years of this project with additional fencing, fixing and repairing fence lines, moving cattle daily the total hours for the 2 summer students was an additional 306.90 hours/2 = 153.45 X $15 per hour for total additional labor expenses of $2301.75.

Total income captured through this project was $5005.00 – $607.50 – $2301.75 = $2096.00/25 cows/3 years = $27.95 per cow. Additional value that can not be applied at this time include, additional nutrients accumulating in the soil through better plant and root development, water infiltration and management, microbial population increases and more.

## Summary

To date the results of this project, are very promising in terms of yield response, grazing days (animal days per acre) and the effect that the grazing rest and recovery planned system is having on the planned grazing paddocks. Even with the dry years in 2017 and 2018, yields were higher than the continuous system and more grazing days occurred.

The expected outcome of the continuous system experiencing detrimental effects seems to be holding true in terms of more invasive plant species entering the pastures and overall yield to be lower and declining. Economic returns also appear to be promising in terms of return on investment for the input costs as well as there are good financial returns in the three years of this project.

Planned grazing can be a powerful tool to improve the land's resilience to environmental extremes, carrying capacity, and ultimately the producer's bottom line.

## Acknowledgements

Acknowledgement to Blain Hjertaas for his ongoing support and input towards the project planning. The author is extremely grateful to MBFI Staff Leah Rodvang, Kristelle Harper and Warren Bowles and MBFI summer students for assistance in the field and data management during this study.

## References

[1]Teague R, Provenza F, Norton B, Steffens T, Barnes M, Kothman M and Roath R. Benefits of multi-paddock grazing management on rangelands: limitations of experimental grazing research and knowledge gaps. Grasslands: Ecology, Management and Restoration. 2009; pp 41-80.

[2]Whitmore AP. Impact of livestock on soil [Internet]. 2000. Available from http://www.agriculture.de/acms1/conf6/ws4lives.htm

[3]Rice EL and Parenti RL. Causes of decreases in productivity in undisturbed tallgrass prairie. Am. J. Bot. 1978; 65:1091-1097.

[4]Savory A and Parsons, S. The Savory grazing method. Rangelands. 1980; 2:234-237.

[5]Western Beef Development Centre, 2014 Western Canadian cow-calf survey, aggregate results [Internet]. July 2015. Available from

http://www.wbdc.sk.ca/pdfs/economics/WCCCS_Summary_Overall_Jun2015.pdf

**Pictures**

**Legumes in Paddock 12C (Planned Grazing Regime) – June 20, 2017**

**Riparian Area Crossing in the Continuous Pasture between Paddocks 24F and 20E.**

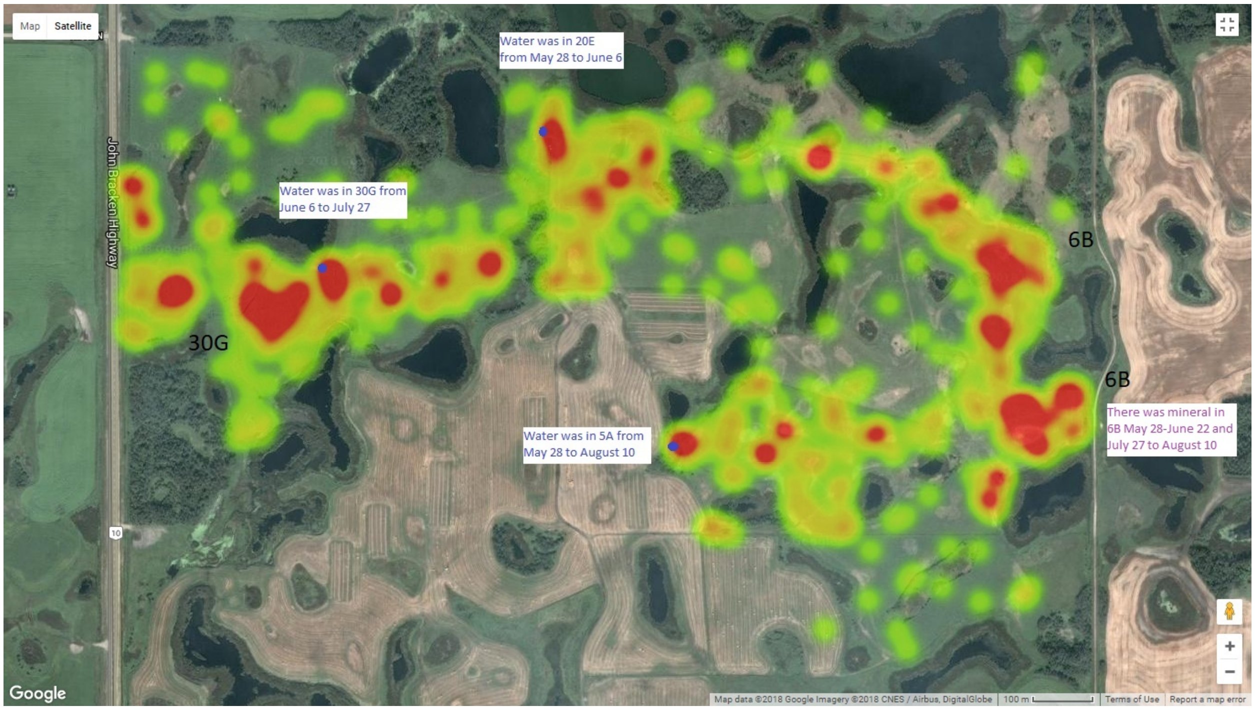

**Contrast pictures of Paddock 5A - Continuous (right) and 2A - Planned (left) on June 20, 2017 prior to second grazing on Paddock 2A.**

**Contrast pictures of Paddock 20E Continuous (right) and 18E Planned (left) – May 24, 2018**

**Contrast pictures of residual taken on August 27, 2018 of continuous paddock 30G (right) and planned paddock 25G (left).**




**Distribution of cattle grazing (red areas indicate areas of higher frequency) throughout the 2018 grazing period.**