Planned Grazing

RD 1

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

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MBFI Location(s):	Brookdale Farm
Collaborating Partners:	Dr. Terence McGonigle – Brandon University Mae Elsinger – Range Biologist, Agriculture and Agri-Food Canada
Start Date:	May 2019 Status: In Progress (year 1 of 3)

Introduction

Planned grazing refers to the process of moving livestock from pasture to pasture at the right time—allowing the animals to fertilize the land, disturb and aerate the soil slightly, and trigger plants to come back with stronger growth. Managers subdivide their pastures into paddocks which enables them the power of controlling the livestock movements. When done correctly, grazing in this way can actually increase biodiversity and slowly improve levels of soil organic matter through increasing soil microbial activity and allowing for more litter accumulation on top of the soil. Ranchers have a vested interest in managing for the best results in terms of production, profitibality and sustaining natural resources on pasture[3]. 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[5].

Planned grazing allows managers to decide how long the animals will stay on a paddock, when they will move next and more importantly when they will return. It has been noted, that the absence of distubances in grassland ecosystems results in a decline in species diversity and deterioration of physical structure[2]. 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, productivity and health.
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[4] 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 demonstration project will provide a means of showcasing proper grazing management in order to promote the reduction and elimination of the practice of continuous grazing and the negative impact that continuous grazing of pastures, has on the landscape. It will demonstrate the positive impact of the continuous movement of animals, with the proper timing and duration, allowing for proper amounts of rest for the plants and how that can actually rehabilitate the landscape.

This demonstration project will measure the estimated forage yield differences between the two grazing regimes, it will calculate the animal grazing days and measure plant diversity between the two as well.

Finally the project will also try to calculate an economic analysis of the two grazing systems and determine the financial impact proper planning and management can have on the potential profit for the forage and livestock operation.

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 was assigned paddocks which were 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 had the same amount of acres but there was no paddock division within that paddock letter.

Pastures consisted 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 with some additional 4 barbed wire fencing along a major highway, and continuous grazing occured on the rest of pastures (Table 1.1). 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 1.1. Paddock treatment assignment and number of acres in each

Each of the paddocks on the planned grazing regime were approximatley 1 acre in size 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 offered water through a solar-powered watering system that was developed on the entire section with an above ground pipeline that reached all of the paddocks through a trough that moved with the animals.

56 Grazing cages were randomly placed throughout the grazing pastures for estimated yield and residual measurments throughout the growing seasons and samples were collected prior to grazing at the end of May and beginning of June, mid-season grazing on July 10, 2019 and residual samples were collected at the end of grazing on October 3, 2019.

Results and Discussion

Grazing was scheduled to commence when the majority of the grasses had reached the three leaf stage. Monitoring started at the beginning of May and occurred weekly throughout all the paddocks. Mature leaves were counted from each stem on different species within each paddock and an average was determined. Each leaf was determined to be mature when each leaf had developed a collar. After the third-leaf stage it is noted that the plant has captured enough energy reserves to regrow after the plant has been defoliated. Planned paddocks were ready at this stage on May 29, 2019. The continuous pastures were not identified to have reached the three leaf stage until June 12, 2019. An additional 14 days of grazing occurred on the planned paddocks in the spring of 2019.

Estimated yields were taken prior to the animals' commencement of grazing and mid-season. Four grazing cages were placed within each treatment (specific paddock letter) on each grazing regime. A ¼ meter square sample was taken within each grazing cage, weighed, and then dried in an air drier. The sample

was then re-weighed to determine the dry matter content of the sample. Estimated yields were then averaged amongst the 4 samples within each lettered paddock. Residual samples, after the grazing was completed, were collected in the same manner and added to the total yield for those paddocks. All residual samples were taken after the planned cows were taken off pasture on September 30, 2019. The continuous cows were taken off trial on September 3, 2019, thus the planned herd had an additional 27 days of grazing in the fall, thus having a total of 41 additional days of grazing in the 2019 season.

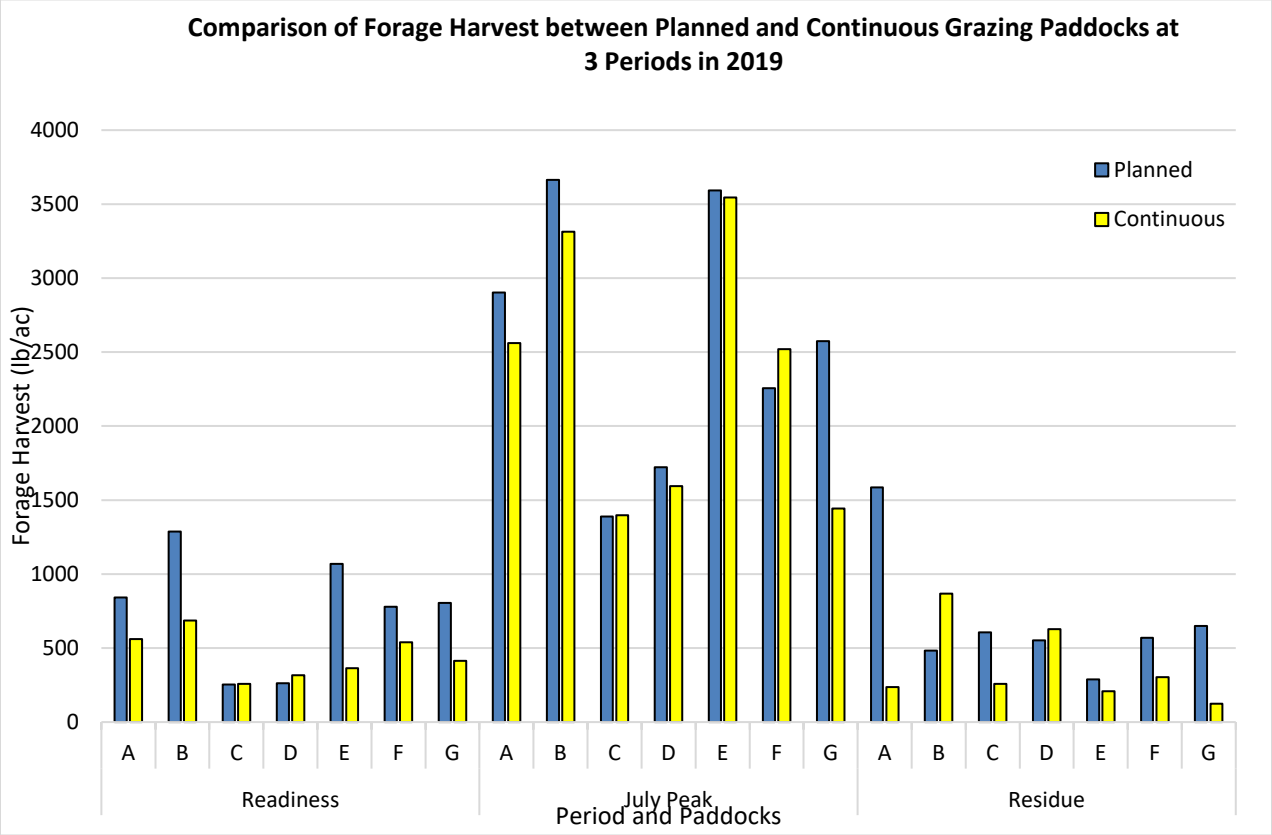

Figure 1.1. Estimated Yield for paddocks within the planned and continuous grazing systems for 3 different periods throughout the growing season.

Figure 1.1 showcases the differences that were defined through sampling at three different time periods throughout the growing season. In the spring of 2019 the spring was dry and cool. Conditions were not favorable for rapid forage development. Assessments were completed on a weekly basis starting at the beginning of May to determine when the grasses within the species mixtures would be ready for grazing at the targeted 3 leave stage. Following that determination, samples were taken from within the middle of the randomized grazing cages, prior to grazing and it was determined that the paddocks that had the 75 day rest period in the previous year were the quickest to reach the 3 leaf stage. Grazing began on the E paddocks in 1 acre sub-divided paddocks and were moved daily throughout the other paddocks based on readiness. The native planned paddocks were not at that stage at the beginning of the grazing season, but the estimated yield was also not favorable for grazing either and were grazed near the end of the first over grazing regime. Average yield for the planned paddocks was 738 lbs. per acre relative to 449 lbs. per acre on the continuous on the readiness sampling date.

Figure 1.1 also exhibits the targeted increased production over all the planned paddocks relative to the continuous paddocks. The response seems less desirable on the named native paddocks. It should be noted that these paddocks are in relatively low areas of the entire pasture and historically have been under water. The species composition is relatively unpalatable and the cattle spend a small amount of time in these paddocks based on yield estimates. The intent would be that the species composition may change over time relative to the grazing management but we have not seen significant results to date. The C and D paddocks are only grazed once during the entire growing period. Average yield for the planned paddocks was 2590 lbs. per acre relative to 2339 lbs. per acre on the continuous on the peak yield sampling date.

Finally, residual measurements were taken on October 3, 2019 when all grazing ceased. It should also be noted that the residual measurements were taken for all paddocks on the same day but grazing was complete on the continuous paddocks 27 days prior to the planned herd. This may in fact have skewed the residual results due to the additional moisture that was received in the later part of the summer and early fall – see Figure 1.2. Grazing was ceased somewhat earlier than anticipated due to another research project where the continuous cows were required from the continuous cow herd and residual measurements appear to be higher on the continuous paddocks. Additional recovery took place after precipitation and warmer temperatures prevailed after they were taken off of those paddocks. However residual measurements were much higher on the planned paddocks overall. Average yield for the planned paddocks was 684 lbs. per acre relative to 375 lbs. per acre on the continuous on the residual sampling date.

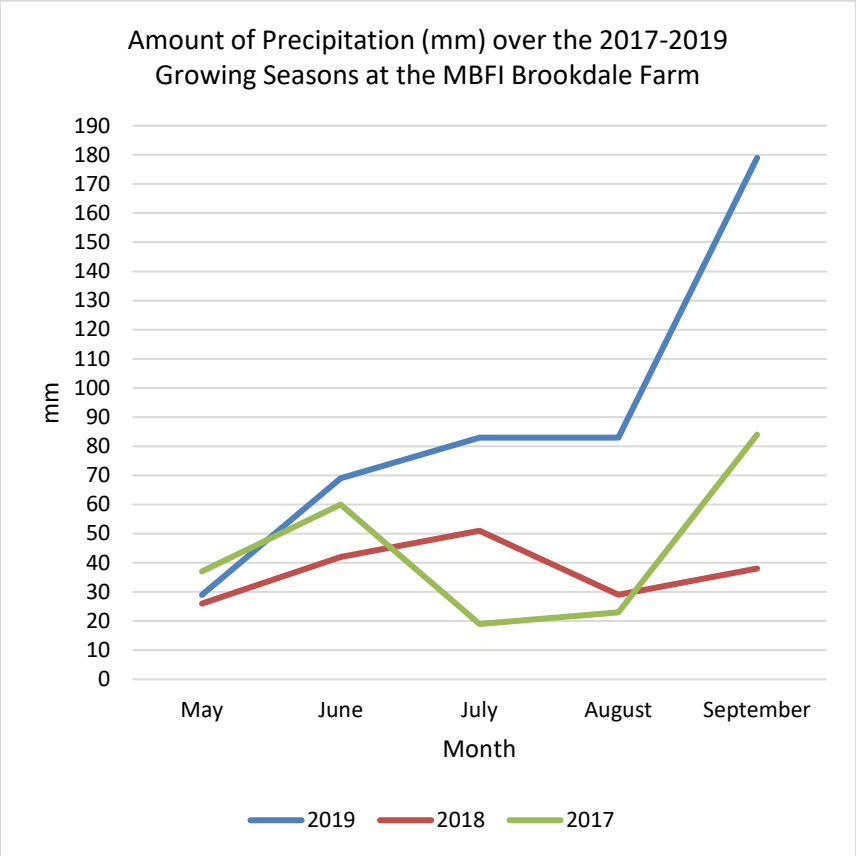

Figure 1.2 Total precipitation received at the MBFI Brookdale Farm during the 2017-2019 growing seasons.

Animal performance was not surprisingly different from what was anticipated. There was relatively no difference in terms of average daily gain on either of the herds within the trial. Planned cows and calves were not able to selectively graze because of being moved every day so therefore it was expected that it would reduce gains. However due to the fact that the planned herd was on trial for an additional 41 days the planned calves did gain additional pounds for the additional days on trial. Particularly of interest is that the planned calves went on trial at an average of 138 pounds and came off at 458 pounds, an average gain of 2.5 pounds per day. Continuous calves went on later in the grazing season at 182 pounds and came off at only 421 pounds an average of 2.9 pounds per day. The planned calves gained 3.55 pounds per acre and the continuous calves gained 2.65 pounds per acre. All cows maintained body condition throughout the trial.

Pasture Productivity was measured by yield as well as animal unit months per acre (AUM/acre). Knowing how much forage an animal needs is the first step in determining how many animals can be supported on the land available. The amount of forage required by one animal unit (AU) for one month is called an Animal Unit Month (AUM). One animal unit is defined as a 1,000 lb. (450 kg) beef cow with or without a nursing calf with a daily requirement of 26 lb. (11.8 kg) of dry matter forage. Therefore, one AUM is equal to 780 lbs (355 kg) of dry matter forage (30 days X daily forage requirement). The following chart summarizes the AUM's per acre for the paddocks within the trial. Not surprisingly the AUM's per acre on the planned paddocks were more than double that of the continuous pasture supplying more forage throughout the grazing season and allowing the animals to remain on pasture longer.

Average Animal Unit Months per acre on the Planned and Continuous Grazing Paddocks at the Brookdale MBFI farm.	
Paddock	**AUM/Acre**
A Paddocks	1.31
B Paddocks	1.27
C Paddocks	1.04
D Paddocks	1.07
E Paddocks	1.50
F Paddocks	1.01
G Paddocks	1.27
Continuous Pasture	0.32

Plant species composition was also analyzed across the paddocks. For each of the 14 experimental units, seven random points were taken. At each random point, 20 pins were dropped. Therefore 140 pins per unit, giving 140 * 14 = 1960 pins per year to determine percentage cover of plant species for each paddock. A pin-frame scoring system[1] is not constrained to a maximum of 100%, because multiple plant contacts can be scored for any given pin. The pin frame was lowered into the vegetation and enumerated data every time a plant part touched a pin. Percent cover was determined from these counts by recording the total number of counts in a plot for a particular plant species and dividing by the total number of pins. The pins were small (1 mm) in diameter.

The planned paddocks showed better composition of desirable species such as alfalfa, smooth brome and milkvetch as noted in Figure 1.3. Kentucky bluegrass and meadow brome grass as well as white aster (less productive and desirable species) appeared to be the dominant species in the continuous pastures. Multiple paddocks in the continuous pastures were showing signs of degradation with regards to soil exposure and lack of ground cover. Other notable species encroaching on specific paddocks

included absinthe wormwood and dandelions on the continuous paddocks. These visually striking plants or a locally more abundant plants may actually be found to not contribute very much to cover over the broader landscape and were only recorded with a small score using the pin scoring system.

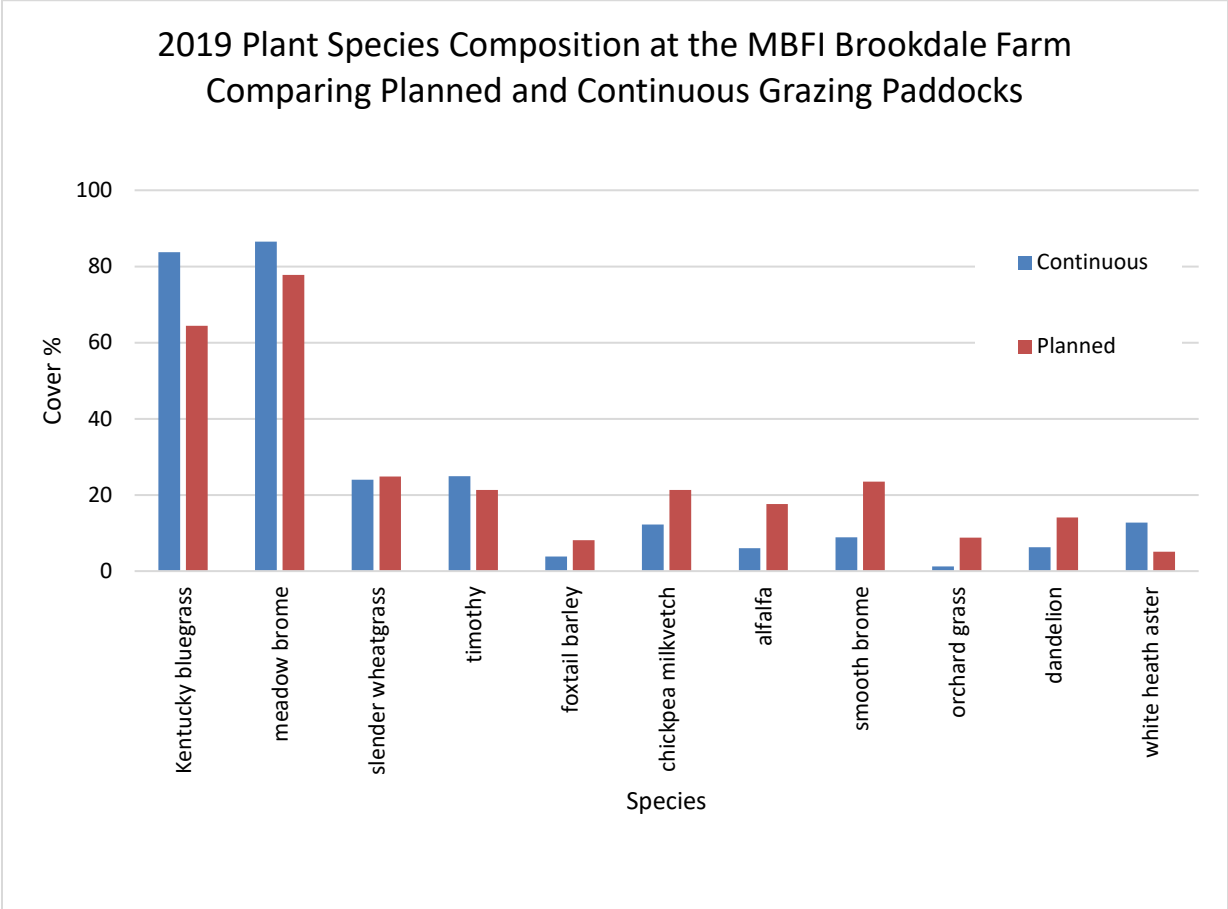

Figure 1.3 2019 Plant Species Composition at the MBFI Brookdale Farm Comparing Planned and Continuous Grazing Paddocks

Economic Analysis

From a winter feed cost perspective this trial showcases the economic benefit very clearly. Since winter feed costs are the highest costs for a producer to keep cattle on their operation, keeping the cows and calves out grazing for a longer period of time, without being a detriment to the pasture longevity and productivity is beneficial for the overall net profit. Average feed costs for producers in Manitoba this winter are estimated to be $2.78 per cow per day (due to the increase in hay prices – hay is valued at $0.75 per pound) plus yardage at $1.61 per day = $4.39 per hd/day. This would equate to $4.39 per day X 41 days on pasture and not having to secure feed and yardage costs for those calves = $179.99 X 25 cows = $4499.75 in savings.

From a calf production perspective, the planned calves actually gained 315 pounds and the continuous calves gained 239. A difference of 76 pounds. If we calculate the 76 pounds at a market price of $2.00 per pound that also equates to a net profit of $152 more in profit X 25 calves = $3800.00. Even though the planned calves only gained 2.5 lbs per day and the continuous calves gained 2.8 lbs per day, the planned calves started off lighter and came off heavier for the total time they spent on pasture.

Summary

This trial has been conducted to showcase how improving management will benefit overall net profit for livestock producers as well as contributing to a healthier and more productive forage stand. Many unknown benefits and ecological goods and services are yet to be determined by additional studies including soil health and carbon sequestration and capture that is well known with regards to forages on the landscape. Economically planned grazing pays in many ways over and above the financial aspects, but realistically economics are the basis of the decision making on the livestock operation. This planned grazing demonstration has showcased value in the additional management and will continue to support a positive change in the modified landscape by human activity. It is imperative that rangelands are treated and valued properly and that regulated grazing is well understood to maintain and improve these landscapes.

Acknowledgements

Acknowledgement to Mae Elsinger, Rangeland Biologist from Agriculture and Agri-Food Canada for all of her resources and time contributing to this project. Acknowledgment to Dr. Terence McGonigle of Brandon University for his testing of plant species composition on all the paddocks. To Blain Hjertaas for his ongoing support and input towards the project planning. Additional thanks to Greg Fedak, Farm Business Management Specialist with Manitoba Agriculture and Resource Development for the economic analysis. The author is extremely grateful to Leah Rodvang, Jordan Dahmer, Kristelle Harper and MBFI summer students for assistance in the field and data management during this study.

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Figure 1.4 Grass Plant at readiness (3 leaf stage)

Figure 1.5 Fence line contrast on paddock 7B left (planned) and 6B right (continuous) June 26, 2019

Figure 1.6 Planned cows on Paddock 18E June 19, 2019

Figure 1.7 Native Species on Planned Grazing paddock 29G Side Oats Grama and Big Bluestem
Photo Credit – MBFI

Figure 1.7 Water troughs that were moved with the planned herd as they moved through the paddocks.