# Rotational Grazing

2019 D 14

Improving Marginal Pasture through Rotational Grazing compared to Mob Grazing

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MBFI Location(s): First Street Pasture

Collaborating Partners: Mae Elsinger, Range Biologist, Agriculture and Agri-Food Canada

Start Date: 2019 Status: In Progress

**Introduction**

First Street Pasture is Class 4 and 5 lands with rapidly draining, coarse, and infertile soils. This project will implement a simple low-cost rotational grazing system to improve production and compare it to a portion of the site in a mob grazed system. GPS collars will be placed on some of the livestock on both systems and be use to track cattle movement and the influence of the different distribution strategies. The use of salt/mineral placement will be used to try to improve livestock distribution on the rotational system and salt/mineral and strip grazing on the mob grazing system. The intent is to use the GPS information to show how animal behavior can be modified by salt/mineral and fence placement. Passive seeding of legumes will take place at opportune times of the season to improve pasture quality and productivity. A legume mix will be spread on approximately ¼ acre with salt/mineral placed at the center of the seeding. Legumes will be monitored for germination and survival.

**Objectives**

1. To determine if some infrastructure and management changes to this poor quality marginal pastureland will pay off economically for the producer with increased production.

2. Information from this project will be communicated through a field day, final report, extension at livestock meetings and community pastures, articles and COP placed on MBFI, MBP, MFGA and MB Ag websites.
3. Rotational grazing is known to improve the carrying capacity of pastureland and improve health and resilience of the plant community. However, 1st Street Pasture is poor quality land whose value has gone up considerably in the last 20 years. Much of this land has a carrying capacity below the land value. Will rotational grazing and other low cost changes make this land economically viable as compared to the more intensive mob grazing system?

## Project Design and Methods

The pasture at First Street will be rotationally grazed with quicker moves early in the season and longer grazing periods on the second pass. Where cattle start and go to next will be determined by pasture readiness and previous years use. Pasture improvement is judged by changes is pasture yields and quality as well as carrying capacity for cattle. Costs of passive seeding of legumes will be recorded by counting seedling germination and stems counted for long-term persistence. Yield and quality will be compared against non-treated pasture. Costs for fencing, water development and labor will be used to compare rotational and mob grazing to the Costs of Production for Manitoba pastures.

Long-term biomass production is being monitored in most fields at First Street Pasture. There are 3 subsamples per site, and 4 fields (D, E, F, I) have a moist depressional site ("Moist Site"), and a dry site. Data appear to indicate that productivity of the dry sites is very similar to that of the modal sites in fields A, B, G, and H, so these 2 types are combined and considered "Modal Site". Biomass under grazing cages is harvested in late September, according to the MBFI Standard Operating Procedure for biomass assessment. Grazing cages are shifted to a new but close-by location before each new grazing season.

Biomass data are tracked against total precipitation for September-April and May-August at the Environment Canada monitoring station at the Brandon Airport, approximately 3 miles away.

Forage supply, or livestock carrying capacity expressed as Animal Unit Days (AUD), can be converted directly from biomass (lb/ac) by multiplying by the area of the field assuming half of the forage is available for use (the rest is trampled or set aside for conserving the resource), and then dividing by ~26 lb of feed needed per animal unit (1000-lb cow) per day. Forage demand by the herd at First Street Pasture is calculated based on number of days used per field, number of each type of animal, and the average mass per type of animal (Day X number X $(\text{mass(lb)})^{0.75} \div 1000\text{lb}^{0.75}$)

Mob grazing in Paddock B at 1st street location was chosen due to abundance of leafy spurge and ease of fence/water set up. Temporary fence and water systems were used to allow for quick and efficient movement of animals. Water trough placement is adaptive throughout and between grazing periods. The spring grazing had the water placed in the north east corner and a temporary alleyway on the east side of the paddock was created for cattle access. All other grazing events the water trough was moved periodically with the cattle. The summer and fall grazing events had the water bowl on the east side of the fence line. Whereas the spring re-graze had the water trough placed along the west side. It is important to move the position of the water trough for each grazing event to avoid having bare ground in an alleyway. On the south, east and north sides of paddock B there is a single strand high tensile wire the west side has a 5-strand barbwire fence. To allocate moves throughout the grazing period temporary fence materials including, batt latches were used. The gate placement was always on the same side as the water trough as it is more efficient to move cattle.

The spring grazing paddock was sampled for available forage biomass on June 10$^{th}$ before the cattle entered. Four random samples were taken with a ¼ meter squared frame. Each sample was weighed and then dried using a microwave at 10-25 second intervals and weighed periodically until no change of weight was found. The biomass was then used to calculate time allocation per paddock. Average forage production was 929 lb/ac (1043 kg/a). Forage allocations were based on 3% of body weight dry matter intake per day. Goal of the grazing was to leave 50% total biomass. We calculated that half an acre would last the cattle approximately 2 hours.

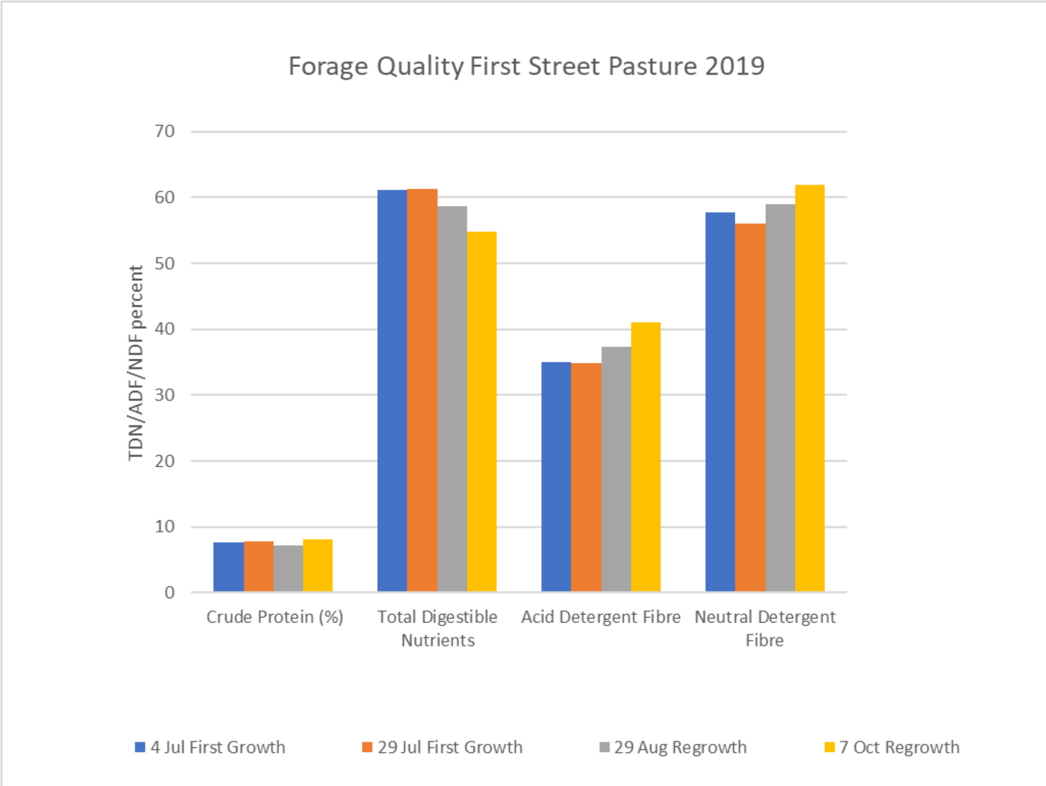
The animals were given approximately 0.5-acre cell at a time the cell was approximately 54 ft by 400 ft. When cattle first entered a seasonal paddock treatment, they were given 2 hours in the 0.5-acre allotment. At two hours staff would determine if approximately 50% of the forage was utilized. If they reached 50% utilization staff moved the animals and would move the animals after another 2 hours. If animals utilized more than 50% staff would move the animals into a new cell and decrease the amount of time in the new cell to achieve 50% forage utilization. If animals didn't utilize 50% of available forage they were left in the cell until approximately 50% of forage was utilized by the animals. Approximately 2 hours before nightfall the animals were moved into a new paddock, at nightfall they were given access to all paddocks they grazed that day. At sunrise they were moved into a new paddock. During the day the animals were moved on average every 2.15 hours, minimum time was 1 hour, and maximum was 4 hours

The spring grazed paddock was re-grazed due to the plant stage leaving the vegetative and entering dormancy. Also, that the paddock had 74 recovery days from the previous grazing event. We are aiming for a minimum of 60 days recovery dependent on growing season conditions and plant growth and stage.

## Results and Discussion

Forage quality is tested four times per grazing season on First Street pasture. Two samples are first growth and the second two are forage regrowth. Forage quality on First Street pasture has shown to be poor quality and below the needs of a lactating cow. A lactating cow will do best with crude protein (CP) in the 10 to 13 percent range and total digestive nutrients (TDN) in the 60 to 65 percent range. At no time during the grazing season was CP above 10 percent and only in June and July did the energy, TDN, meet the needs of the lactating cows. Fibre indices, acid detergent fibre (ADF) and neutral detergent fibre (NDF), also increase as the season progresses. For best production, ADF should be below 40 percent and NDF below 60 percent. The higher the ADF the lower the forage digestibility and the higher the NDF the lower the animal intake.

Figure 1. Forage quality at First Street Pasture. Tested four times per growing season.




Poor forage quality is reflected in calf gains. All cattle are weighed monthly to document calf gains and to establish how well the cows are performing. Insufficient nutrients for the cows means lower milk production and results in lower calf gains. In 2019 due to the second year of summer drought, cow condition was beginning to drop by August. Calves were given supplemental hay starting on August 22 to help their performance and to decrease the feed requirements of the cows. Figure 2 shows calf gains before and after supplementation began.

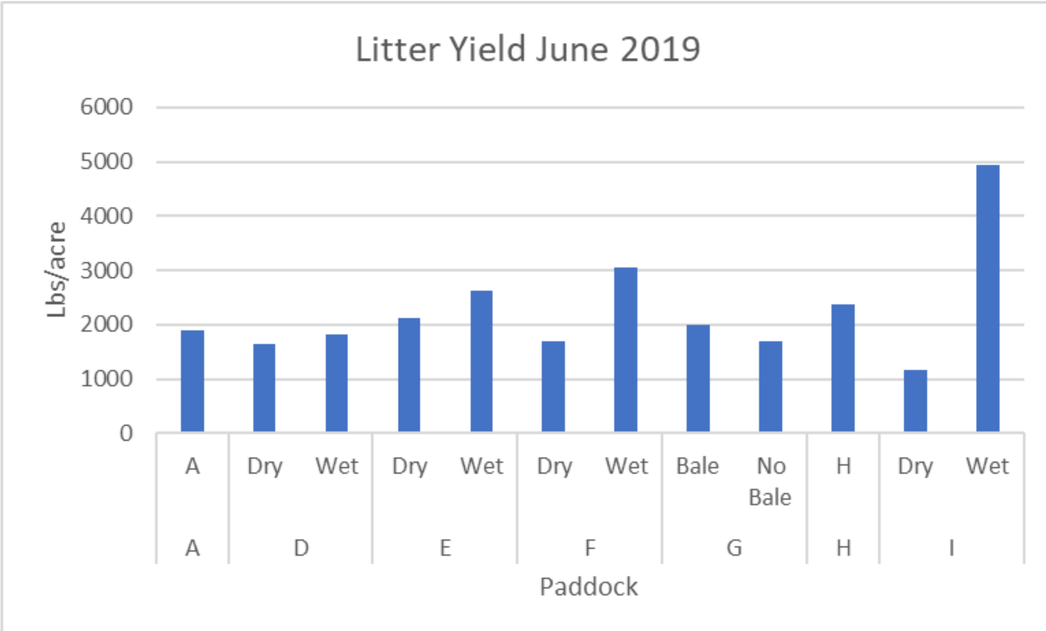
Figure 2. Monthly weight gains by calves in 2019. Supplementation of the calves with hay started August 20th and daily weight gains by the calves increases in September and October.

| Weighing Date | Average Daily Gain (lbs/day) | Supplemental Feed (Hay) for Calves (lb/day) |
|---|---|---|
| June 25 | 2.11 | 0 |
| July 29 | 2.36 | 0 |
| Aug 22 | 2.20 | 0 |
| Sept 27 | 2.36 | 3.84 |
| Oct 10 | 2.56 | 5.56 |
| **Average Gain Season (lbs/day)** | **2.32** | |

Documenting litter is a way of determining if stocking rates are suitable for a pasture. Litter is necessary to maintain nutrient cycling and improves water infiltration and retention. Work done in Alberta established litter requirements for maintaining healthy grasslands[1]. For Manitoba, on sandy soils, Paddocks A, H and G bale and no bale and dry sites in D, E, F and I, stand health will be maintained with 800 lb/ac. On loamy soils represented by Paddocks D, E, F and I wet sites the requirement is 1500 lb/ac.

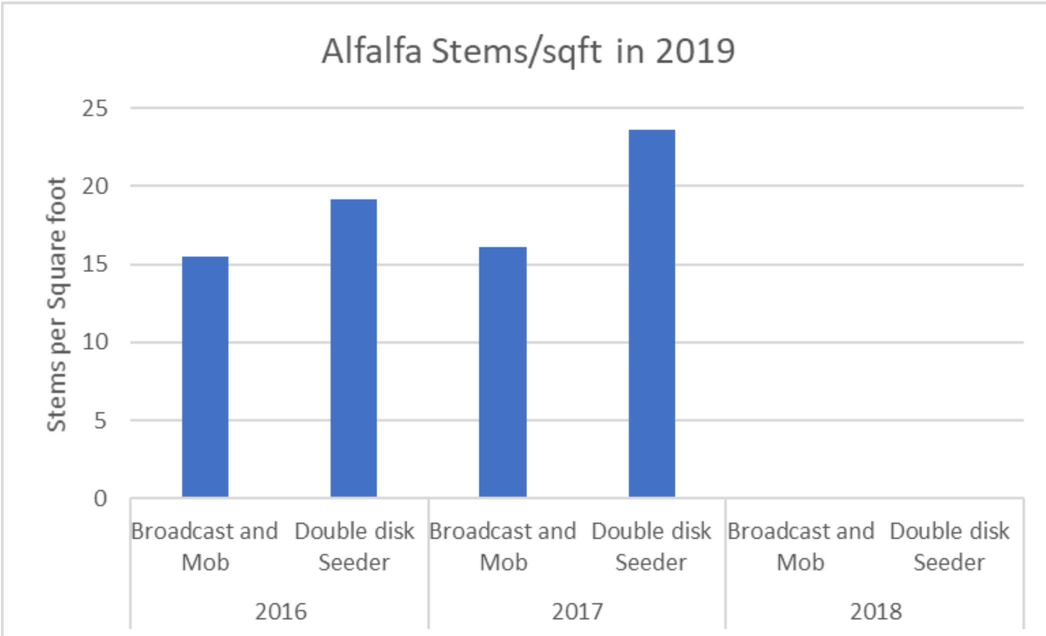
Litter yields collected in June, 2019 show that First Street pasture has more than adequate litter in all paddocks at this time.

Figure 3. Litter yield is collected in June every few years. It is used to determine if the stocking rate is leaving sufficient litter behind to maintain pasture health.




Due to the poor forage quality and low soil fertility, the establishment of legumes is important for improving the forage quality at First Street pasture. Project INT 13 ran from 2016 to 2018 to establish alfalfa into existing grass stand. Seeding at 12.5 lb/ac establishment was successful in two of the 3 years. Both methods of establishment were successful. Observation of the plots shows that at higher stem densities grass production is reduced and alfalfa plants remain smaller than their individual potential. It may be that a lesser number of stems per square foot would be sufficient to improve forage quality and improve nutrient soil status while maintaining a better balance of grass to alfalfa for cattle grazing.

Figure 4. Alfalfa stem counts in Paddock C. Alfalfa established into existing forage stand using two different methods and seeded on three different years. In 2016 and 2017 forage establishment was successful. In 2018 continued hot dry conditions severely limited alfalfa establishment.

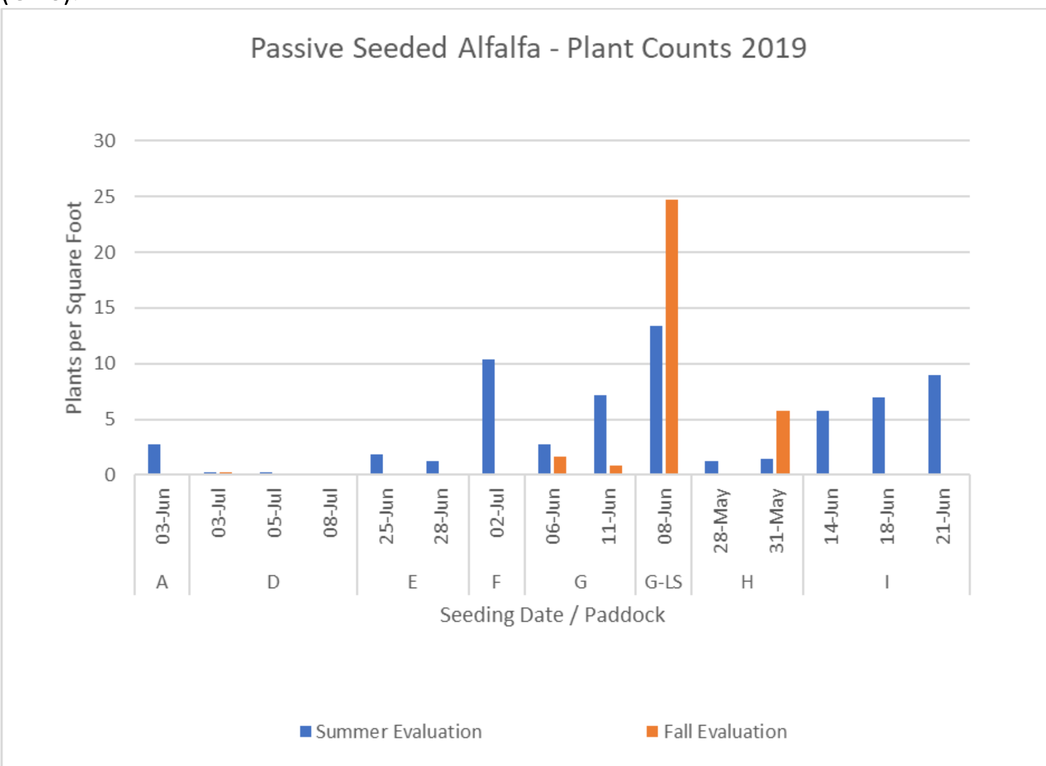




**Alfalfa seeded in June 2016 via broadcast and mob grazed. Picture taken June 2019**

Broadcast seeding and hoof action proved adequate to establish some legumes into the pasture as seen in Project INT 13, Figure 4. In 2019, a legume mix of alfalfa, sainfoin and cicer milkvetch was broadcast at 8 lbs/ac on the area used for placing the livestock mineral and salt. It takes very little time and despite a very hot and dry summer there was some successful legume establishment. Earlier seeding preformed the best and where there was more concentrated hoof action as at the site used for training the cattle to eat leafy spurge, greater germination. Seedlings were counted one month after seeding and again in the fall. Due to the hot, dry summer, it appears that not all seedlings survived as indicated by the differences between summer and fall seedling counts.

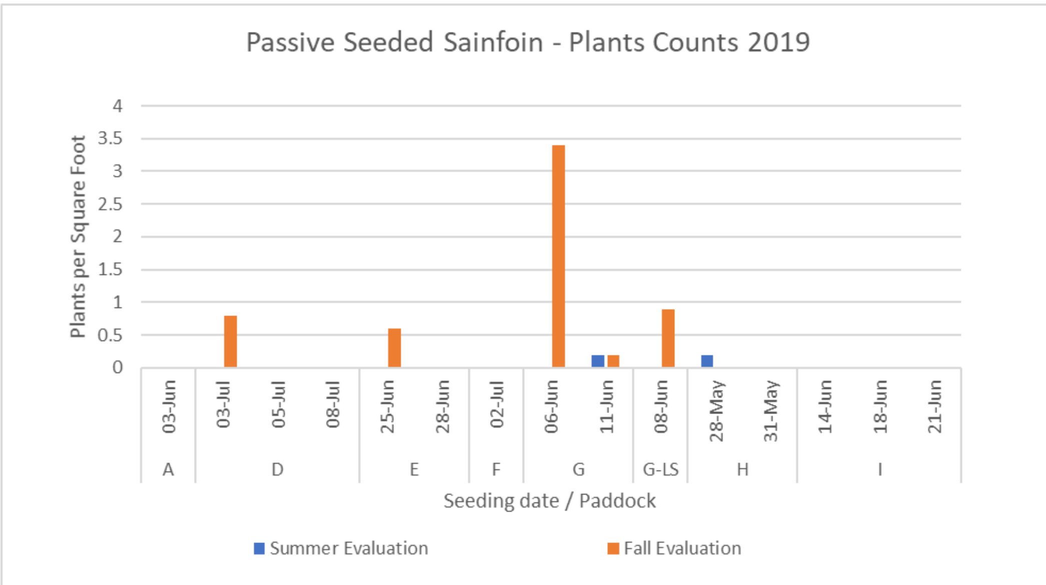
Figure 5. Alfalfa establishment of seed broadcast on 0.25 acres. Hoof action at mineral stations as the only method for incorporation of seed into the soil.  Mixture of alfalfa, sainfoin, cicer milkvetch seeded at 8 lb/ac. On June 8 seed was broadcast on the site to be used for training the cattle to eat leafy spurge (G-LS).




Alfalfa seedling left, sainfoin seedling middle one month after seeding. Alfalfa seedling, right, in October of year of seeding.

Sainfoin has a very large and light seed and remained on the soil surface even after hoof action. Surprisingly some managed to germinate and establish before winter. Cicer milkvetch, which tends to have a hard seed coat, generally takes three years to establish. A few seedling were found in the fall counts.

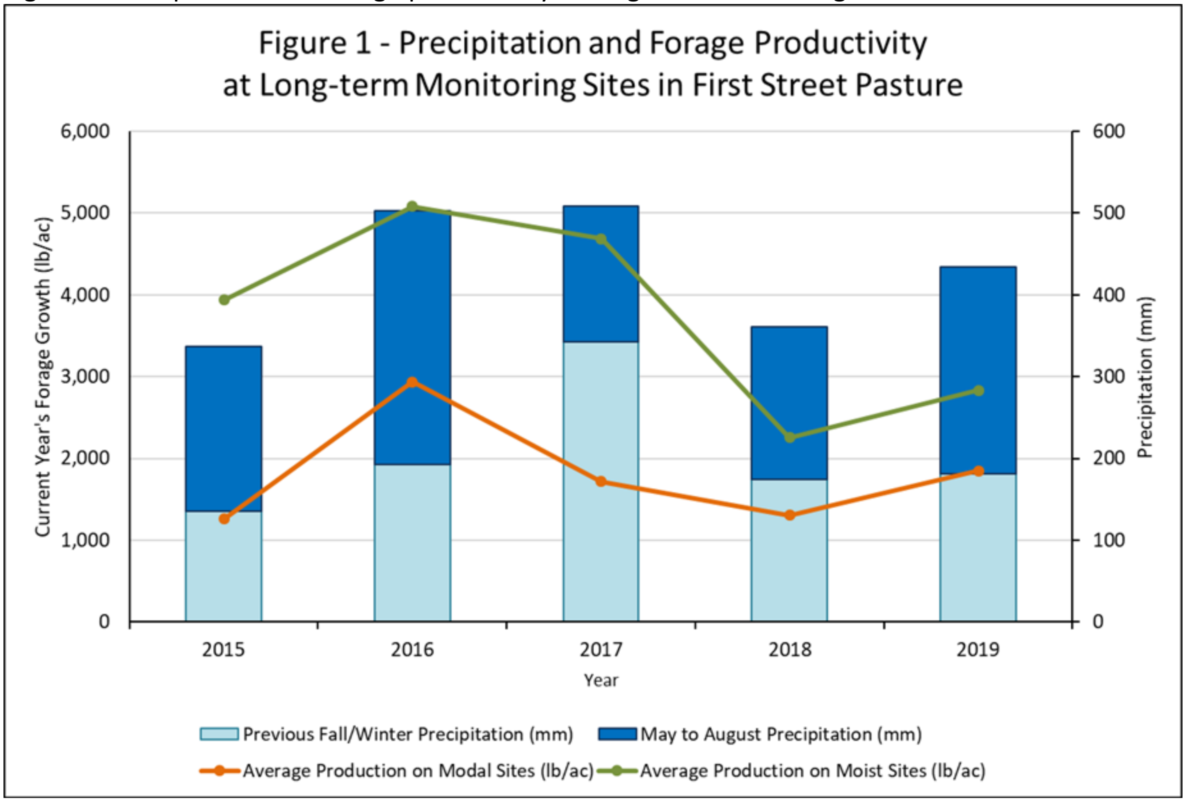
Figure 6. Sainfoin establishment of seed broadcast on 0.25 acres and mineral station placed on top. Hoof action the method of seed incorporation into soil.  Mixture of alfalfa, sainfoin, cicer milkvetch seeded at 8 lb/ac.




This project and its previously related projects (EXT 17 and INT 18) have allowed us to collect 5 contiguous years of forage yield data for most fields at First Street Pasture, and 5 years of stocking rate data. Four of these years have had less than normal precipitation, and one year had close to average precipitation.

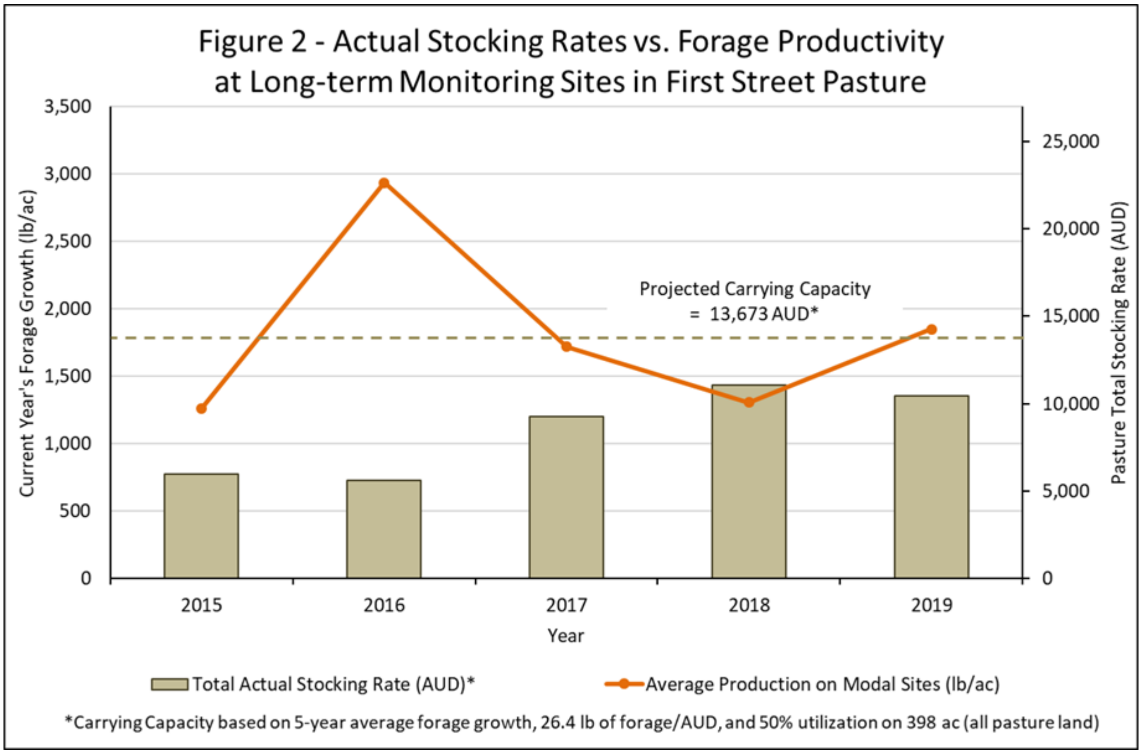
Productivity (lb/ac) of representative (modal) sites appears to respond to the 4-month summer precipitation trends, while productivity of moist sites appears to respond to the 12-month September to August precipitation trends (Figure 7). With only five years of data, and forage yields highly dependent on soil moisture which has been variable, we cannot conclude that there is a positive effect on forage yield from the rotational grazing system that was implemented in 2015. The 2019 implementation of a more intensive rotational grazing system in field B is expected to provide productivity and stocking rate data for better comparison to the simple rotational grazing system currently in place in other fields.

Figure 7. Precipitation and forage productivity at long-term monitoring site in First Street Pasture




Stocking rates in animal unit days (AUD) have increased over the 5 years, but this has been more in response to management pressures than available forage (carrying capacity) (Figure 8). Based on the conventional calculation of carrying capacity (AUD) from 5-year average yield of representative (modal) sites, the stocking rates (also conventionally standardized to AUD) have never reached the long-term average carrying capacity. A year-end utilization survey of each field may be able to tell us if this carrying capacity value is too conservative or generous (a target utilization would be 50%, to reflect the conventional calculation method).

Figure 8. Actual stocking rates versus forage productivity at long-term monitoring sites in First Street Pasture



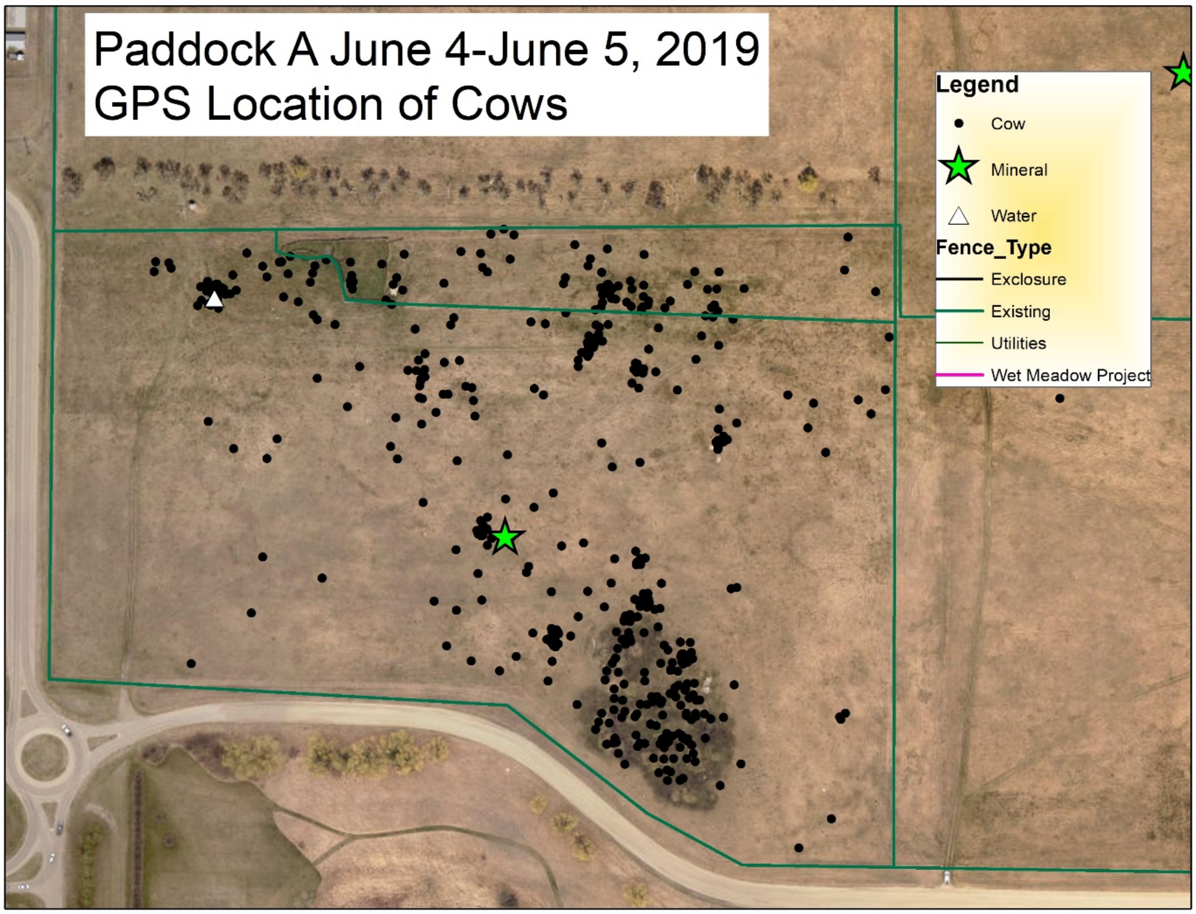

Impact from mob grazing is too early to compare to the rotational grazing system. Cows were very vocal for the duration of the grazing, especially before and for five minutes after moving to a new strip.

Figure 9. Cattle mob grazing Paddock B in spring 2019

The GPS collars gave some trouble over the summer. Of the four collars, two recorded every 30 minutes but ran out of battery power by the end of July, one recorded every hour and one did not work at all.

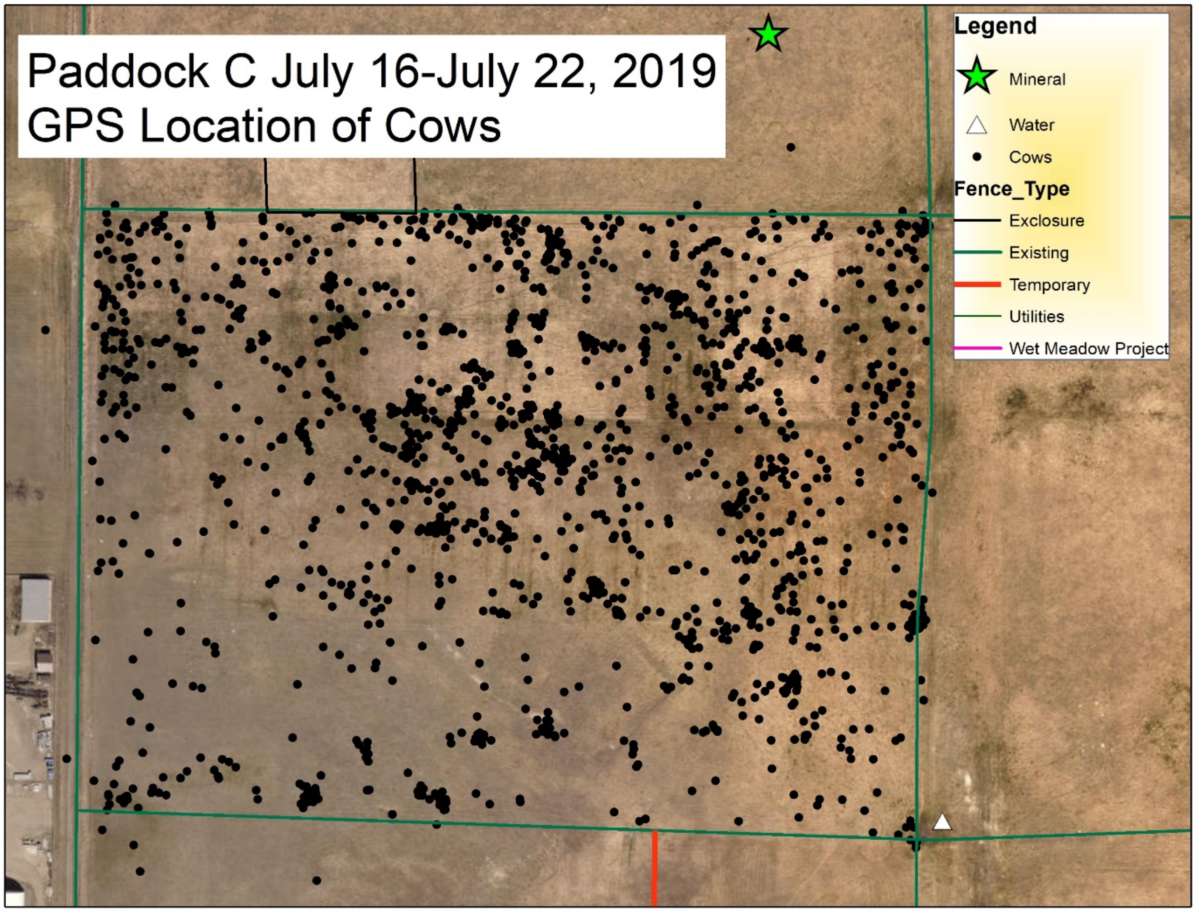
In Figure 10 shows the cattle movement over 2 days in early June. Cattle spent the majority of their time in the bush, by the water, mineral site and a few favorite spots. Most of the pasture received very little use.

Figure 10. GPS collar data from two cows with location recorded every 30 minutes.



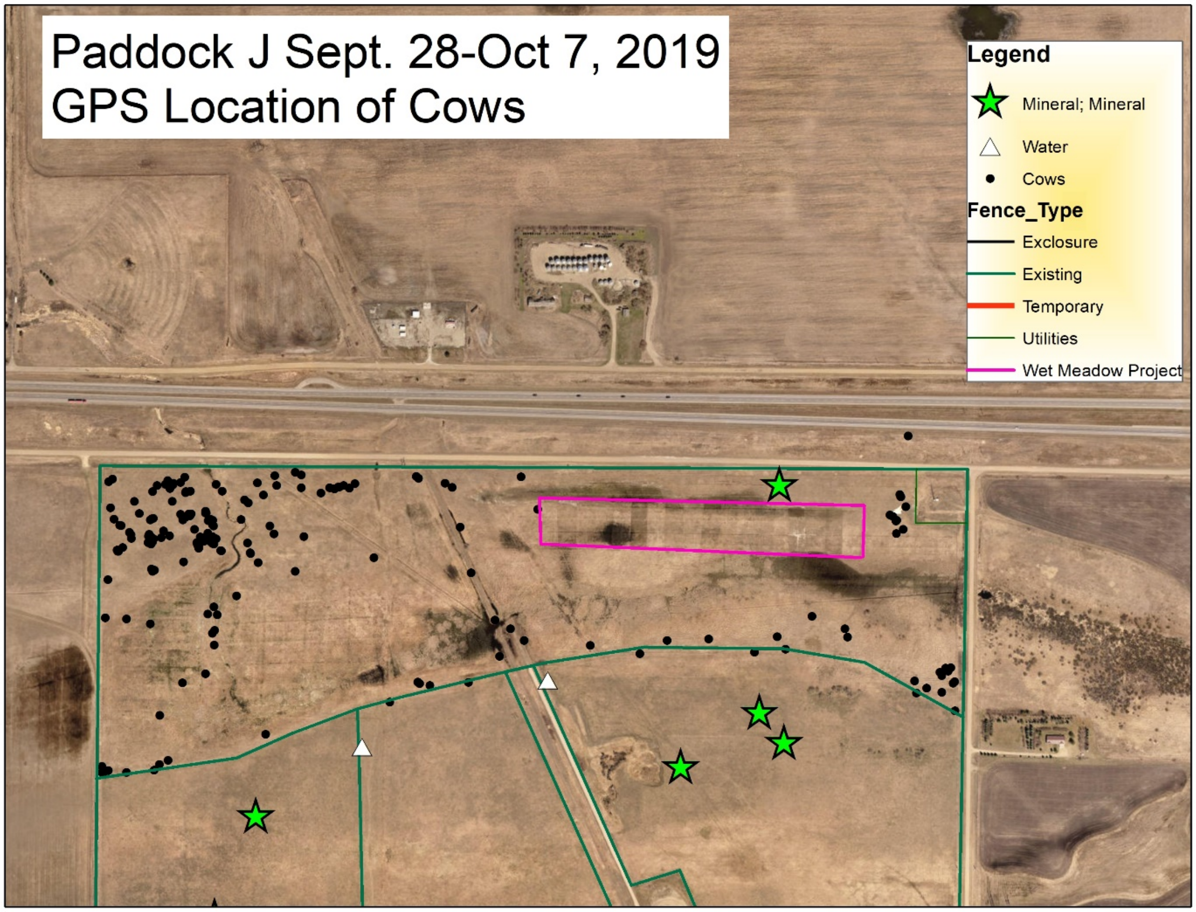

In July, the cattle spent 6 days in Paddock C which was previously seeded with alfalfa. Establishment of the alfalfa was best in the northern 2/3 of the pasture and the GPS tracking shows that the cattle preferred to spend most of their time in the northern 2/3 of the pasture, Figure 11.

Figure 11. Cattle distribution in Paddock C over 6 days of grazing. Most use in the northern 2/3 of the paddock where alfalfa was established in 2016 and 2017.




Paddock J most years provides good grazing and the cattle use most of the pasture. In 2019 the pasture flooded prior to use so cattle congregated in the NW corner, further enticed by supplemental hay for the calves and lick-tubs for the cows, Figure 12.

Figure 12. Cattle distribution influenced by flooding running east/west through the centre of the paddock and supplemental feed in the NW corner.




## Summary

It is too early to determine if rotational grazing and mob grazing are improving pasture productivity and forage quality. Forage quality is poor on the site and efforts to introduce legumes without fully rejuvenating the stand has had some success. Calf gains are moderate and could be better if the cows had better quality forage. Litter yields, forage productivity and stocking rates remain positive for the site despite low precipitation 4 out of the last 5 years. GPS collars may help with management decisions in the future as they do a good job of tracking areas favored by the livestock.

## Acknowledgements

## References

1. Rangeland Health Assessment for Grasslands, Forests and Tame Pasture. Alberta Sustainable Resource Development, Public Lands Division, Rangeland Management Branch. May 2003