Increasing Pasture Production

2017 INT 18

Low cost management techniques to improve pasture production

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Speciality:	Range management and forage selection
Location(s):	MBFI First Street Pasture, Brandon, Manitoba
Collaborating Partners:	Mae Elsinger, AAFC, Rangeland Biologist, Agriculture and Agri-Food Canada
Start Date:	June 2015 Status: Complete

Introduction

The First Street Pasture is 403 acres of pastureland that has inherently poor productivity due to sandy and coarse soils (Canada Land Inventory classes 4 and 5). Historically this pasture was cropped and experienced soil erosion and later seeded to tame forages and grazed as a single unit with one water source located in the southwest corner. The distance to water has caused overgrazing near the water source and underutilization at the farthest reaches of the pasture. This land is also infested with leafy spurge which is densest near the original water source. Prior to MBFI taking over the pasture it did not receive any grazing for approximately three years. Dead standing biomass (grass) was poor quality and hampered new growth on the pasture.

Due to the coarse soils and very low soil fertility the site is prone to reacting to drought very quickly. Another complicating factor is the forage stand is primarily dominated by smooth brome and Kentucky blue grass. Smooth brome produces most of its growth by midsummer and does not have good regrowth later in the season. Kentucky blue grass will go dormant in midsummer if it is hot and dry and is of poor quality when dormant. This makes management difficult as stocking for early season growth may result in overstocking later in the season.

Leafy spurge has an inverse relationship with carrying capacity for cattle: as the area covered by leafy spurge increases the carrying capacity goes down[1]. An 80 percent cover of leafy

spurge reduces carrying capacity for cattle to near zero[1]. The First Street Pasture represents much of the poorer quality pastureland remaining in Manitoba. This project will look at low cost infrastructure and management changes to see if they will improve the production enough to be economically meaningful to a producer with similar land.

Objectives

To increase production through implementing low cost changes to management and infrastructure. The first change to the pasture was to switch the pasture from one paddock with one water source and continuous grazing to 10 paddocks using single strand electric fence, only a few gates and shallow buried water lines to facilitate rotational grazing. At the end of the project, determine if production increases are enough to offset the extra costs of the added infrastructure and labor costs through an economic analysis.

Project Design and Methods

The pasture was divided into ten paddocks using single strand electric wire. Shallow buried water lines were installed to service the paddocks with five spigots, quick couplers and movable troughs. A limited number of gates were installed to reduce the cost of the fencing. The cattle were trained to go under a raised wire of the fence by coaxing them with feed and herding them toward the uplifted portion of the fence.

Baseline soil tests were taken in the spring of 2015 across different land types: upland, lowland, bale feeding sites and non-bale feeding sites. Thirty grazing cages were set up near the soil test locations and used to collect forage yield data. Yield data was collected each fall by clipping a ¼ m^2 inside each grazing cage, dried and weighed.

In 2015 a leased herd of fifty cow-calf pairs were rotationally grazed starting June 13 and ending on September 6. The herd passed through most pastures twice during the grazing season. The cattle were weighed on entry, 40 days on pasture and at the end of the grazing season, 81 days on pasture.

In 2016 a new herd of fifty heifers and five cow-calf pairs were rotationally grazed starting on May 26 and ending on September 29. None of the cattle were from the previous year's herd. The cattle were moved quickly on the first pass and slowed down on the second pass depending on forage availability. Cattle were weighed and body condition scored (BCS) on entry, exit and every 30 days in 2016 and 2017.

In 2017, 32 of the 2016 heifers returned as first time calvers and an additional 26 replacement heifers added to the herd. Grazing began May 18 and ended October 11th when the cattle started to loose BCS on the all grass pasture.

Each year the cattle weights and BCS were used to track individual animal performance and pounds of gain per acre.

Results and Discussion

In 2015, 52 cow/calf pairs entered the pasture on June 13 after all the fencing and waterlines were in place. The cattle stayed until September 9 and were removed due to poor forage quality.

In early spring of 2016, fifty 700 to 800 weight heifers were purchased for projects on the First Street Pasture. Five mature bred cows were placed on the pasture to help the heifers adjust. The cows were calved on pasture.

From June 4 to 20 the herd was used to facilitate two supportive projects to improve the pasture productivity: to establish alfalfa by sod and mob seeding alfalfa into the existing grass pasture and secondly to train the herd to eat leafy spurge. These two projects, though run separately, aim at making the pasture more productive through better soil fertility, forage quality and a reduction in leafy spurge.

All cattle were body condition scored (BCS) in 2016 and 2017 at the beginning of the grazing season and throughout the season at each weighing. In 2015 the cattle were weighed but BCS were not documented.

In general, the cows lose BCS as the year progresses due to feeding their calves. Though looking at individuals some gain BCS at the expense of poor milk production for their calf. The heifers tended to be able to grow and move up in BCS through the summer.

Table 1. The percent of cows in each body condition score at the start of grazing and at the end of the grazing season in 2016 and 2017.

Body Condition Score of Cows with Calf				
Body Condition Score	**% of herd in each BCS class May 26, 2016**	**% of herd in each BCS class Sept 29, 2016**	**% of herd in each BCS class May 18, 2017**	**% of herd in each BCS class Oct 11, 2017**
2.0	0	0	0	9
2.5	0	20	29	53
3.0	80	40	71	38
3.5	20	20	0	0
4.0	0	0	0	0

Table 2. Heifers generally move up in BCS due to not feeding a calf. They are able to grow and move up in BCS.

Body Condition Score of Heifers				
Body Condition Score	**% of herd in each BCS class May 26, 2016**	**% of herd in each BCS class Sept 29, 2016**	**% of herd in each BCS class May 18, 2017**	**% of herd in each BCS class Oct 11, 2017**
2.5	13	5	7	0
2.75	0	0	19	8
3.0	42	44	70	92
3.25	0	0	4	0
3.5	40	40	0	0
4.0	4	11	0	0

The soil tests from June 17, 2015 indicated that nitrogen, phosphorus and sulphur are generally very deficient and the potassium was in the medium to high range. Six of the eleven soil samples taken are displayed in Table 3 and represent the range of soil fertility on the pasture. These limiting nutrient levels plus the coarse soil texture (attached map) likely account for the poor forage growth on the site. The lower areas in the fields collected more moisture and therefore yielded more forage growth, however the majority of the acres on First Street pasture are upland.

Table 3. Soil fertility, organic matter and pH representative of First Street pasture. Tests taken on June 17, 2015**.**

Paddock	**A**	**E**	**G**	**I**	**H**	**I**
Description	**Upland**	**Lowland**	**Bale fed**	**Lowland**	**Exclosure**	**Upland**
Nitrogen (lb/ac)[1]	9	11	12	5	10	9
Phosphorus (ppm)[2]	6	3	9	7	4	3
Potassium (ppm)[2]	191	209	251	198	198	121
Sulphur (lb/ac)[1]						
Organic matter (%)[2]	3.4	5.6	3.4	3.1	3.2	4.8
pH[2]	7.6	6.6	7.2	7.4	7.1	7.6
[1] Depth of testing was 0-12”						

[2] Depth of testing was 0-6”

[3]An exclosure is an area in which cattle are fenced out. They are used as a control for the collection of data against data collected on areas with grazing.

Forage yields gathered from 30 grazing cages, 3 or 6 cages per paddock or site, in 2015, 2016 and 2017 are compared in Table 4. Increased precipitation throughout the summer in 2016 allowed for good growth. Precipitation from May 1 to October 15 was 277 mm in 2015, 411 mm in 2016, and 217 mm in 2017. In some areas the forages did not have an increase in production in 2016 and this may be due to soil properties andfertility. No data was collected in 2016 from the sites that had no bale feeding as the cattle knocked the grazing cages down in mid summer and grazed the plots.

Table 4. 2015, 2016 and 2017 Forage yields (lb/acre) on the First Street Pasture paddocks

Paddock	**2015**	**2016**	**2017**
A – drier upland	1294	1249	2113
H – drier upland	1349	2002	1523
G – bale (drier upland)	1427	1427	2741
G – no bale (drier upland)	1277	No data	1903
I – drier upland	1619	2660	1940
I – moister depression	3691	6478	6377
E – drier upland	1073	3338	1190
E – moister depression	4413	4703	4223
D – drier upland	1229	3142	1241
D – moister depression	3681	4023	3422

Table 5. Average cattle gains through 2015 to 2017 grazing season and a comparison of total gains per acre. No heifers were grazed in 2015. Note that three different herds, class and number of head grazed on First Street Pasture in 2015, 2016 and 2017.

Livestock Gains				
Average Daily Gain/Year	**Heifers (lbs/day)**	**Cows (lbs/day)**	**Calves (lbs/day)**	**Total lbs gained/ac**
2015	-	1.7	2.3	36.7
2016	1.5	0.3	2.7	27.2
2017	1.8	0.3	2.1	44.1

In 2015 paddocks were grazed a second time with the goal of providing each paddock with 60

to 90 days of rest before regrazing, Table 6. Two paddocks, G and I, did not receive the proposed rest period. In 2017 due to having both cow/calf pairs and heifers the herds were separated for the breeding period and no pastures receive the 60 to 90 days of rest goal of the project.

Table 6. Paddock acres, number of days grazed and rest period before 1st and 2nd grazing.

Paddocks – Days Grazing and Rest			
Paddock	**# of Acres**	**# of Days Grazed**	**# of Days Rested**
A	21	11	115
B	25	11	87
C	23	13	105
D	33	12	115
E	33	11	78
F	31	12	114
G	48	10	32
H	40	15	111
I	53	14	54
East J	48	4	122
West J	48	11	116

Using Manitoba Agriculture's *2017 Pasture Cost of Production* tool the costs for the following grazing senarios were calculated, Table 7. The baseline assumption is from when Brandon Research Station used the area as pasture for off project cattle. At that time it was run as one paddock with only the southwest watering trough. Calculations were made for each year's circumstances and includes the extra costs of cross fencing, shallow buried waterline, and increased labour for rotational grazing.

Table 7.

Pasture Cost of Production		
Grazing Situation	**$/head**	**Total cost/ AUM**
Baseline Assumption: 100 cow/calf for 100 days – continuous grazing	$1.16	$25.91
2015 – 52 cow/calf for 90 days – rotational grazing	$2.61	$60.97
2016 – 50 heifers & 5 cow/calf for 120 days – rotational grazing	$2.02	$64.86
2017 – 32 cow/calf & 26 heifers for 141 days – rotational grazing	$1.73	$58.63
Breakeven with Baseline: 75 cow/calf for 140 days	$1.16	$28.20

– rotational grazing		
Objective of project: 90 cow/calf for 140 days – rotational grazing	$1.00	$23.65

Summary

The rotational grazing system is distributing cattle better than the one paddock system used previously. So far, it is too early to tell if the rotational grazing system is impacting forage production or livestock gains. The project was unable to acquire sufficient cattle numbers to compare against the baseline information. However, the pasture did distribute cattle more evenly on the pasture and provided extra days of grazing. The standing dead grass has taken some time to remove or knock down due to the low stocking rate on the pasture. Good moisture through the growing season of 2016 provided for abundant forage. The herd was changed in 2016 from cow/calf pairs to unbred heifers and in 2017 changed again to first time calvers and unbred heifers. With the different class of livestock no comparison or conclusion can be made about individual animal or pounds per acre gains on the livestock between years.

Lack of gates did not hamper livestock movement from one paddock to another as the cattle quickly learn to pass under the wire; fresh pasture being the incentive. However, vehicle travel is more cumbersome and two people are required when using a truck. The quad can moved between paddocks without the assistance of a second person. Guides to slip the wire beneath the truck or quad would facilitate easier movement when using motorize vehicles. The extra cost of more gates may be worth the cost for producers working alone or using a truck.

References

[1]Leistritz, FL, Thompson, F and Leitch, JA. Economic impact of leafy spurge (*Euphorbia ecula*) in North Dakota. Weed Science. 1992; 40:275-280.

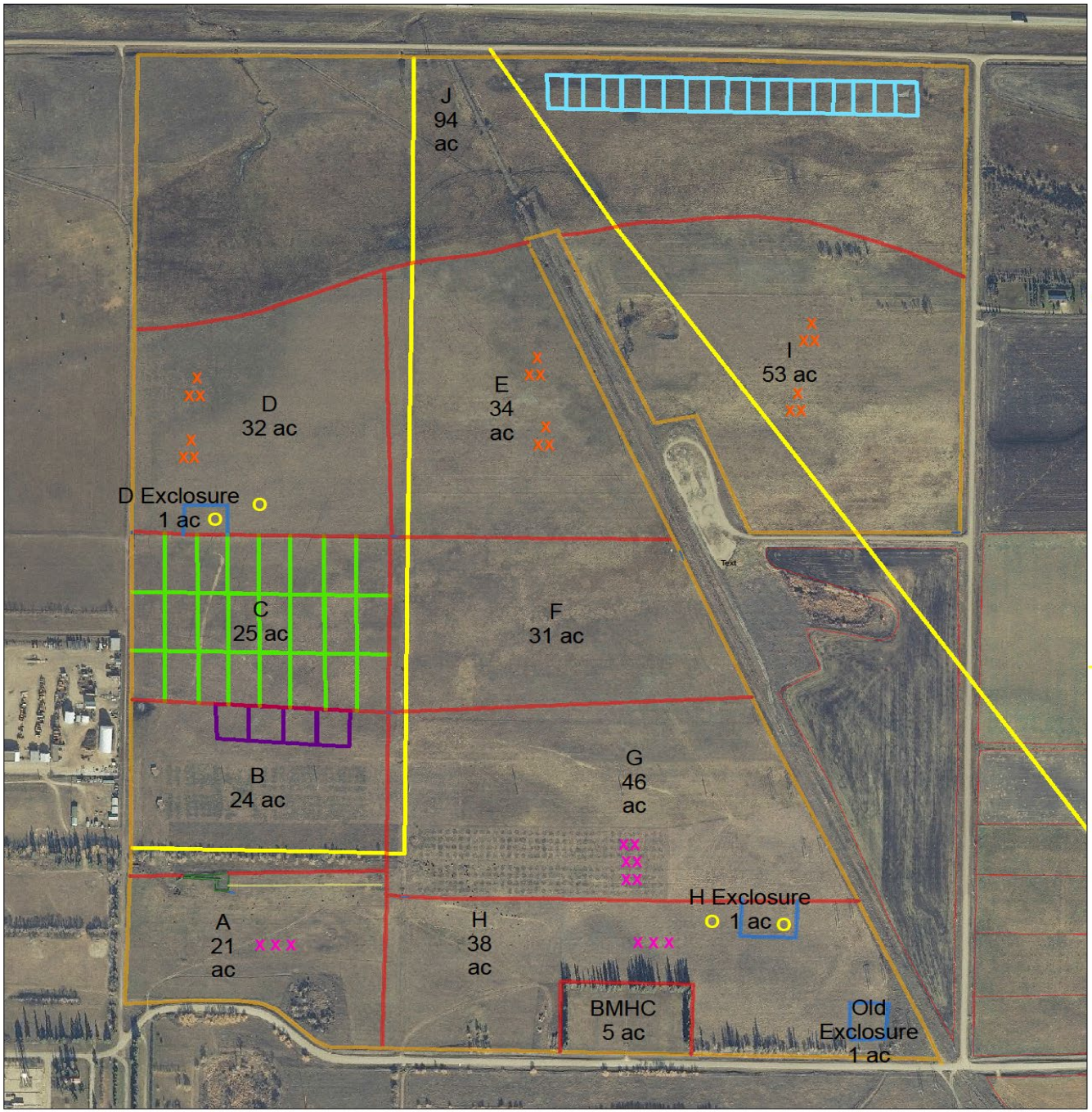
Manitoba Agriculture, 2017 Pasture Costs of Production

Acknowledgements

Thank you to Mae Elsinger, Rangeland Biologist, Agriculture and Agri-Food Canada, Brandon for the assistance in clipping, drying and weighing of forages from the 1st Street Pasture and sharing her project yields to flush out the yields collected for Project INT18.

To move cattle between pastures a 1X 6 board was used to hold up the wire. This negates the need for gates between many of the paddocks. 1st Street Pasture, June 22, 2015; photo by Jane

After training cattle to eat leafy spurge in 2016 the cattle seemed to have lost some of their aversion to eating within patches of spurge. This behaviour continued throughout the grazing season. June 20, 2016; photo by Jane Thornton.



1st Street Pasture

N

X MbAg - Improving Pasture Production

MBAg - Introduction of Legumes to Existing Pasture

MbAg - Teaching Cattle to Eat Leafy Spurge

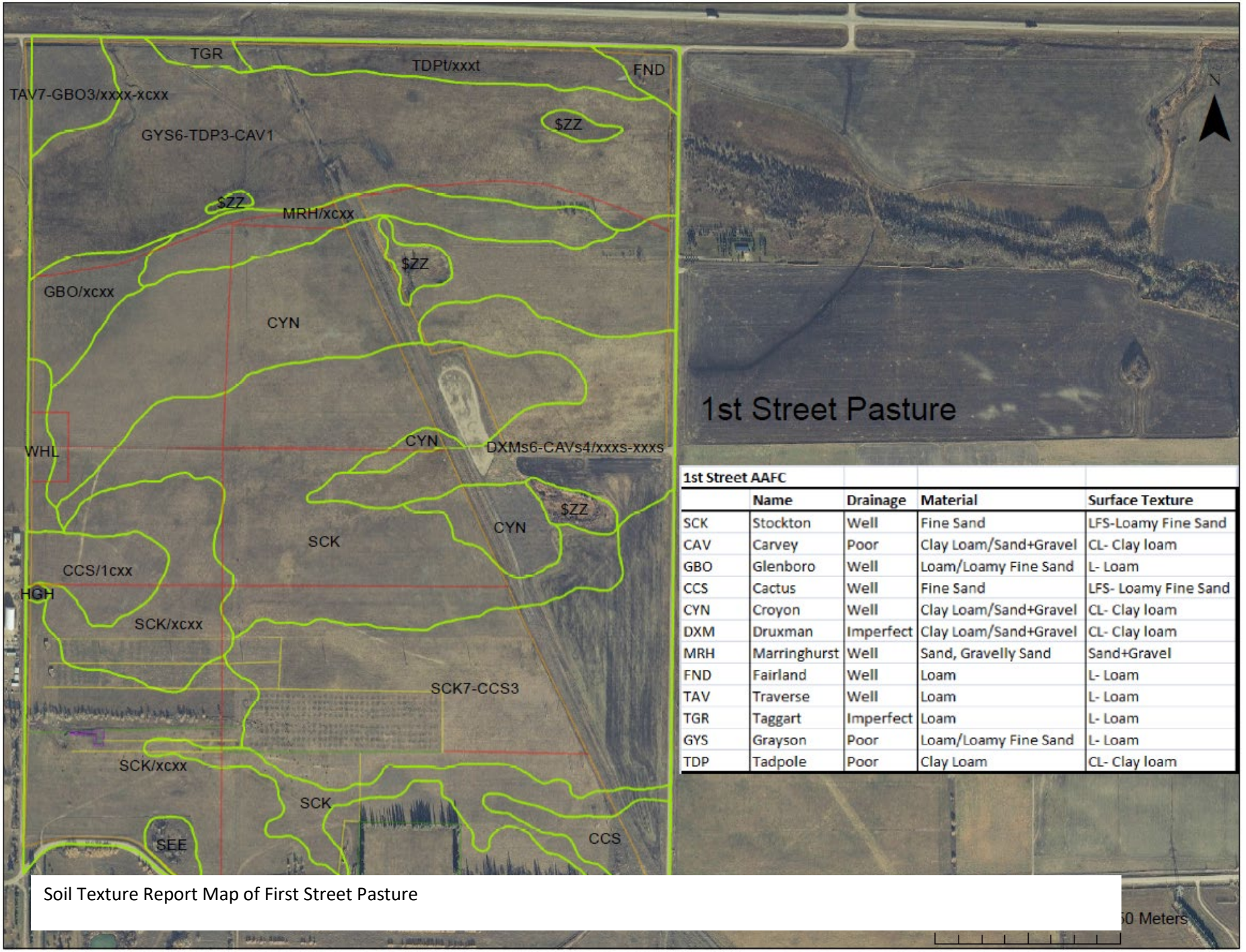
U of M - Grazing Impacts on Foxtail Barley and Wet Meadow Communities

X AAFC Pasture Rotation Study

O AAFC Leafy Spurge Beetle Drop

Hydro - Gas Line

0 70 140 280 Meters



1st Street AAFC				
	Name	Drainage	Material	Surface Texture
SCK	Stockton	Well	Fine Sand	LFS-Loamy Fine Sand
CAV	Carvey	Poor	Clay Loam/Sand+Gravel	CL- Clay loam
GBO	Glenboro	Well	Loam/Loamy Fine Sand	L- Loam
CCS	Cactus	Well	Fine Sand	LFS- Loamy Fine Sand
CYN	Croyon	Well	Clay Loam/Sand+Gravel	CL- Clay loam
DXM	Druxman	Imperfect	Clay Loam/Sand+Gravel	CL- Clay loam
MRH	Marringhurst	Well	Sand, Gravelly Sand	Sand+Gravel
FND	Fairland	Well	Loam	L- Loam
TAV	Traverse	Well	Loam	L- Loam
TGR	Taggart	Imperfect	Loam	L- Loam
GYS	Grayson	Poor	Loam/Loamy Fine Sand	L- Loam
TDP	Tadpole	Poor	Clay Loam	CL- Clay loam

Soil Texture Report Map of First Street Pasture