9.14 Increasing pasture production

2016 INT 18

Low cost management techniques to improve pasture production

Project Lead:	**Jane Thornton**, Farm Production Extension – Forage and Pasture, Manitoba Agriculture
MBFI Location(s):	First Street Pasture
Collaborating Partners:	Mae Elsinger, AAFC, Rangeland Biologist, Agriculture and Agri-Food Canada
Start Date:	June 2015 Status: In progress

9.14.1 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 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. This left a lot of dead standing material on the pasture.

Due to the coarse soils, the fertility is very low and 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% cover of leafy spurge reduces carrying capacity for cattle to 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.

9.14.2 Objectives

The objectives of this project are to implement low cost changes to management and infrastructure. The pasture, which currently is one large 403-acre pasture with one water source, will be divided into 10 paddocks using single strand electric fence, only a few gates and shallow buried waterlines to facilitate a rotational grazing system. To improve production alfalfa will be introduced using sod and mob seeding (Project *INT 13*) and reducing leafy spurge by teaching cattle to eat leafy spurge (Project *INT 14*). At the end of the project, an economic analysis will be conducted to determine if the extra costs of infrastructure and management can be offset by increased pasture production.

9.14.3 Project Design and Methods

The pasture was divided into 10 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. Cattle were trained to go under the 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 are used to collect forage yield data. Yield data is collected each fall by clipping a 0.25-m^2 inside each grazing cage, dried and weighed.

In 2015, a leased herd of 50 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 50 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.

Each year the cattle weights are used to track individual animal performance and pounds of gain per acre. Note: these same cattle were used for projects *INT 13 Sod and mob seeding of legumes; INT 14 Teaching cattle to eat leafy spurge*; and *EXT 7 Impacts of cattle grazing on the proliferation of foxtail barley in wet meadow rangeland communities*.

9.14.3 Results and Discussion

In early spring of 2016, fifty 700 to 800 lb 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 calved on pasture and the whole herd was given one week to acclimatize to their new location.

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

All cattle were body condition scored (BCS) at the beginning of the grazing season and throughout the

season at each weighing. Comparing starting and ending BCS the cattle as a whole moved up in body condition with 86% ranging from 3.0 to 4.0 on May 26 and 95% in that range at the end of the grazing season on September 29 (Table 1). At the end of the grazing season 37% had gained 0.5 BCS, 27% lost 0.5 BCS and 36% stayed the same.

Table 9.14.1 The per cent of cattle in each body condition score at the start of grazing and at the end of the grazing season; includes the heifers and cows

BCS	Start: 26-May-16 % of herd in each BCS class	End: 29-Sep-16 % of herd in each BCS class
2.5	13	5
3.0	42	44
3.5	40	40
4.0	4	11

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 11 soil samples are displayed in Table 2 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 the First Street Pasture are upland.

Table 9.14.2 Soil fertility, organic matter and pH representative of the First Street Pasture (samples taken on June 17, 2015)

Paddock	A	E	G	I	H	I
Description	Upland	Lowland	Bale fed	Lowland	Exclosure[x]	Upland
Nitrogen, lb/ac[z]	9	11	12	5	10	9
Phosphorus, ppm[y]	6	3	9	7	4	3
Potassium, ppm[z]	191	209	251	198	198	121
Sulphur, lb/ac[z]	16	12	14	24	6	16
Organic matter, %[y]	3.4	5.6	3.4	3.1	3.2	4.8
pH[y]	7.6	6.6	7.2	7.4	7.1	7.6

[z]Depth of testing was 0 to 12”

[y]Depth of testing was 0 to 6”

[x]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 in 2016 seem to be higher yielding than in 2015 (Table 3). Increased precipitation throughout the summer allowed for good growth. In 2016, the precipitation from May 1 to October 15 was 16.2” compared to 10.9” in 2015 for the same period. In some cases the forages did not have an increase in production and this may be due to limited soil fertility or coarser texted soil. No data was collected from the sites that had no bale feeding as the cattle knocked the grazing cages down in mid summer and grazed the plots.

Table 9.14.3 2015 and 2016 Forage dry matter yields, lb/ac on the First Street Pasture paddocks			
Paddock	# of grazing cages	2015	2016
A – drier upland	6	1294	1249
H – drier upland	3	1349	2002
G – bale (drier upland)	3	1427	1427
G – no bale (drier upland)	3	1277	No data
I – drier upland	6	1623	2498
I – moister depression	6	3700	6600
E – drier upland	6	1075	3122
E – moister depression	6	4424	4460
D – drier upland	6	1232	2676
D – moister depression	6	3690	4014

The livestock gains for 2015 and 2016 are presented in Table 4. In 2015, 50 cow-calf pairs were grazed on the project. In 2016, that herd was replaced with fifty 700 to 800 lb heifers and five cows with calves. Weather conditions and cattle changes between the years makes it difficult to make any comparisons on weight gains but does document the variability that can be experienced between years and cattle. The cattle were also used in three other projects during the grazing season and may have influenced livestock gains.

Table 9.14.4 Cattle average daily gain, lb/d throughout the 2016 grazing season and a comparison of 2016 and 2015 average season gain per animal and total gain per acre				
Time period	Heifers, lb/d	Cows, lb/d	Calves, lb/d	Total gain, lb/ac
26-May to 4-Jul	1.9	-0.9	2.9	
8-Jul to 4-Aug	0.8	-2.2	2.4	
4-Aug to 29-Aug	2.2	2.9	2.4	
1-Sep to 29-Sep	2.4	1.5	3.3	
2016 Season average weight gain	1.5	0.26	2.7	
2016 Total gain				27.2
2015 Season average weight gain	-	1.7	2.3	
2015 Total gain				36.7

The pasture rotation on the First Street Pasture aims to move the cattle through nine paddocks (A to I) before the middle of July. Paddock J is an ephemeral wetland and is left till the soils dry out to reduce pugging and hummocking . An ephemeral waterbody is a wetland, spring, stream, river, pond or lake that only exists for a short period following precipitation or snowmelt. In 2016, paddock J remained wet through most of the summer and was used for a limited number of days later in the season. The paddock was split in half using temporary fence due to the east side having a moderate population of

the toxic plant western water hemlock.

Paddocks are grazed a second time with the goal of providing each paddock with 60 to 90 days of rest before regrazing (Table 5). Each year the order of grazing is changed.

Table 9.14.5 Paddock area, number of days grazed and rest period before first and second grazing

Paddock	# of ac	# 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

As with every grazing system, adjustments must be made due to any number of factors. In 2016, the grazing season was shortened due to a couple of factors. The first was the loss of grazing time in Paddock J because of an increase in the toxic plant western water hemlock. Though not as poisonous later in the season, it still poses a threat to the livestock. As the cattle started to consume the water hemlock they were pulled from the pasture. The second factor was Manitoba Hydro needed access to Paddock I to do some maintenance work on a pipeline. It is estimated that the grazing season was shortened by approximately four weeks.

9.14.4 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 pasture itself was rested for about three years prior to MBFI taking over. The standing dead grass is taking some time to remove or knock down due to the low stocking rate on the pasture. Lack of gates does not seem to hamper livestock movement from one paddock to another as the cattle learned quickly to pass under the wire, withfresh pasture being the incentive. However, vehicle travel is more cumbersome and two people are required when using the truck. Guides to slip the wire beneath the truck or quad would facilitate easier movement when using motorized vehicles.

The project is scheduled to run through the 2017 grazing season with further consideration for continuing longer term.

9.14.5 Acknowledgements

Thank you to Mae Elsinger for sharing forage yield data from her projects, drying and weighing forage samples and many discussions on the project as a whole.

9.14.6 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.

Fig. 9.14.1 Cow calving on pasture, note the abundance of leafy spurge. First Street Pasture Paddock A, June 2017; photo by MBFI.

Fig. 9.14.2 To move cattle between pastures a 1 x 6 board was used to hold up the wire. This negates the need for gates between many of the paddocks. First Street Pasture, June 22, 2015; photo by MB Ag.

Fig. 9.14.3 Cattle avoided areas with leafy spurge and ate the grass outside of the spurge patches. First Street Pasture, June 22, 2015; photo by MB Ag.

Fig. 9.14.4 After training cattle to eat leafy spurge they 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 MB Ag.

Fig. 9.14.5 Cattle on second pass of paddock I, with lots of grass left due to above average rainfall for this area in 2016. First Street Pasture, Sept. 10, 2016; photo by MB Ag.

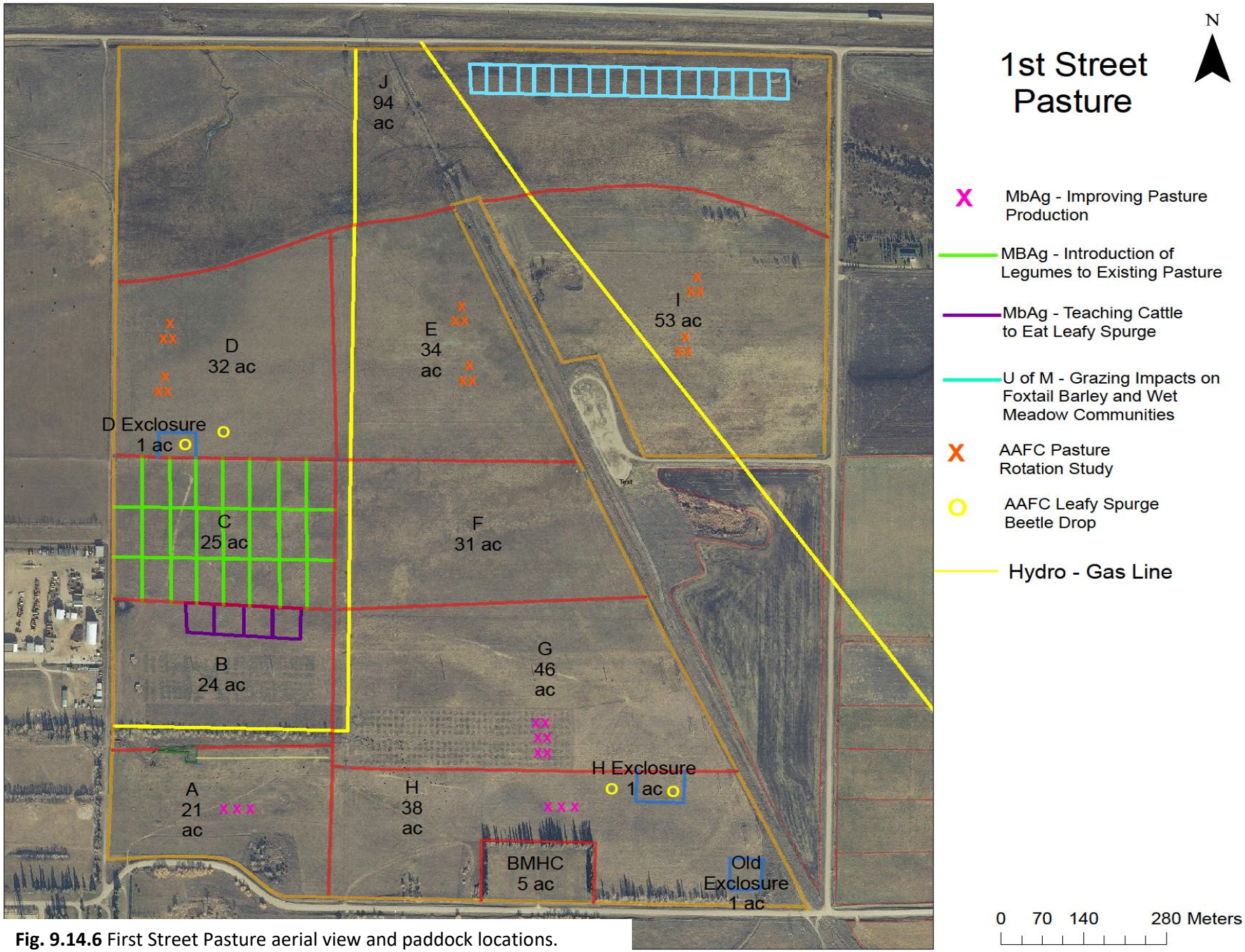
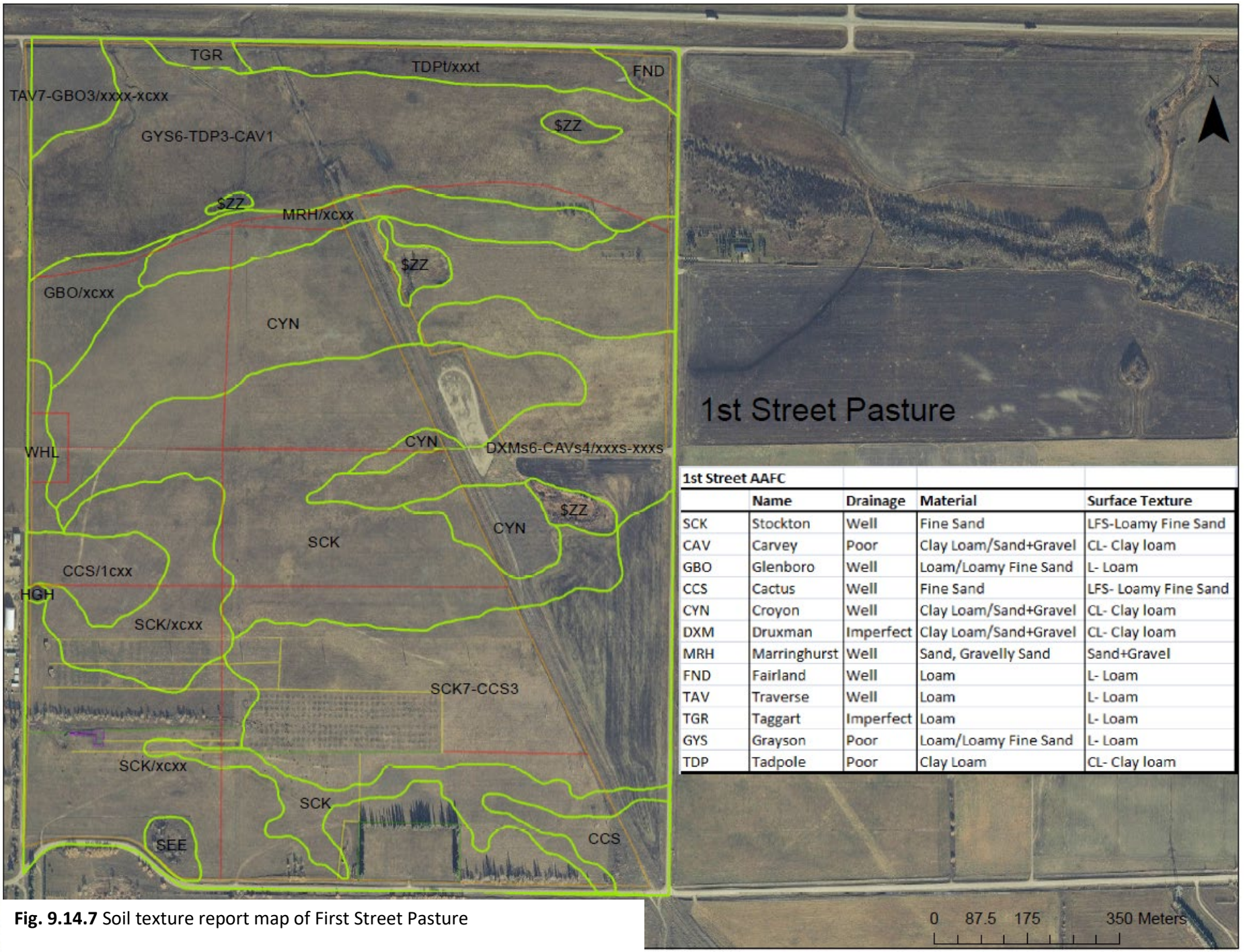


Fig. 9.14.6 First Street Pasture aerial view and paddock locations.



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

Fig. 9.14.7 Soil texture report map of First Street Pasture