Nova Scotia Community Pasture Assessment

PREPARED FOR THE NOVA SCOTIA FARM LOAN BOARD

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NOVA SCOTIA COMMUNITY PASTURES

HISTORY

The Nova Scotia Department of Agriculture began acquiring the lands during the 1950s and 1960s for the purpose of establishing community pastures in Nova Scotia. These community pastures were developed to allow farmers to increase livestock numbers, and at the same time develop land at home for increased production (MacKenzie, 2006). Originally three pastures were purchased, Cape John, Minudie, and Cape Mabou. In the mid to late 1960s more lands were acquired but these lands were managed by local pasture cooperatives. Each Cooperative had the authority to manage its pasture under the terms of the lease agreement with the province. The Cooperatives were to set fees, determine stocking rates, determine the grazing season, etc.

In the late 1960s the Cape Mabou lands were transferred to the Department of Natural Resources (DNR) due to the high portion of wooded land to cleared land but it continued to be operated by The Nova Scotia Department of Agriculture, through its Nova Scotia Community Pasture Board. In the early ‘70s, operations at Minudie were assigned to a local farmer reducing the government managed pastures to Cape John and Cape Mabou. In turn in 2000, these pastures were turned over to local cooperatives to manage. All pastures except Manchester were in operation in 2005 (Neary, 2006).

To date there are 8 pastures owned by the province, with the exception of Cape Mabou where ownership is still retained by the Nova Scotia Department of Lands and Forests (formally DNR), the remaining 7 pastures are owned by the NS Farm Loan Board. The Nova Scotia Department of Lands and Forests has licensed the use of the Cape Mabou lands to the NS Farm Loan Board (Neary, 2016). Except for Cape Mabou, all pastures have signed leases expiring in April 2020. There is currently no formal lease arrangement between the NS Farm Loan board and Cape Mabou.

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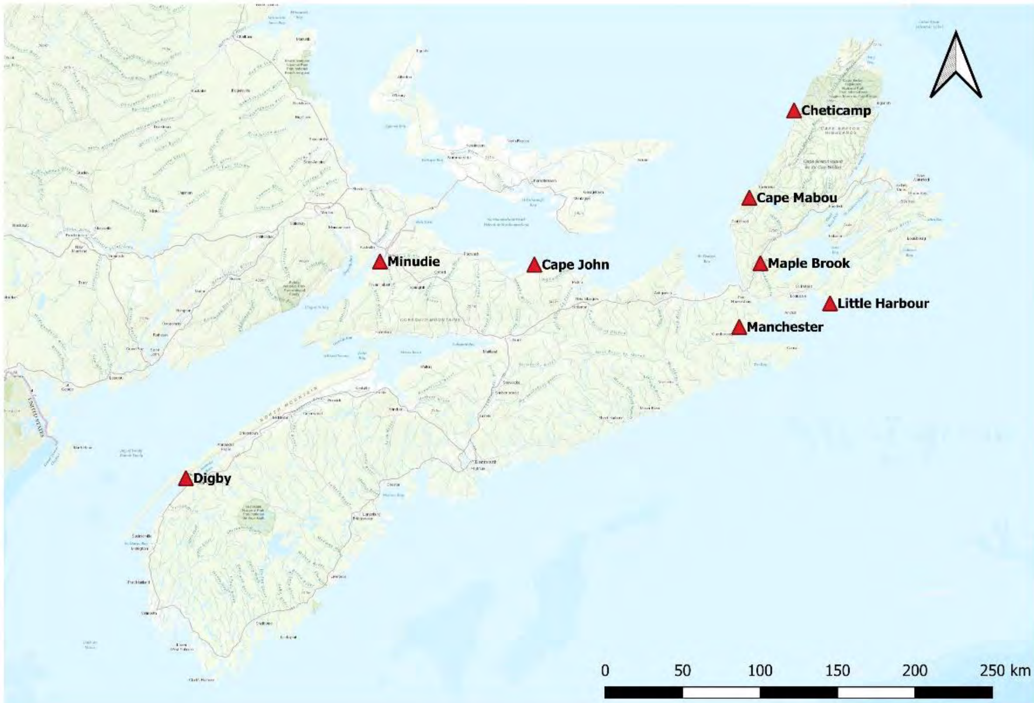


Figure 1.1 Location of Community Pastures in Nova Scotia

PURPOSE OF PROJECT

This project is intended to provide support to the current project of the Nova Scotia Farm Loan Board that is investigating the Nova Scotia Community Pastures and their operation and potential for future development. The information generated from these activities will provide the Board with a very complete picture of the current situation with the community pasture including site assessments, fertility assessments, recommendations, fertility improvement cost estimates, infrastructure assessments and recommendations, (including estimate of improvement costs), and estimates of potential stocking rates for the respective pastures.

ASSESSMENT METHODS

Four members of the Perennia Team provided input and support for this project. Soil Specialist Amy Sangster lead the soil sampling and site assessment process with support from Thomas Harrington, mapping and drone imagery; and Shane Wood, soil sampling. Jonathan Wort assessed the pasture infrastructure and carrying capacity of the pastures. Site visits were conducted between September 17th and October 26th, 2020; with participation of the team listed previously. Soil and water analysis were conducted by the Nova Scotia Department of Agriculture Laboratory in Bible Hill Nova Scotia. Evaluation and interpretation of the results were conducted by Perennia team members. The report was written primarily by Amy Sangster with contribution from Jonathan Wort and mapping and imagery analysis by Thomas Harrington.

Mapping

A combination of satellite and drone imagery and lidar elevation data were used to create various maps for each site. Drone imagery was collected using a DJI Phantom 4 Pro model with the stock camera. Satellite imagery was provided by Google Earth (https://earth.google.com/web/). Lidar elevation DEM data was provided by the Province of Nova Scotia and accessed through the GeoNOVA Portal (https://geonova.novascotia.ca/geo-data).

Manual image captures were completed at the following pastures: Minudie, Cape John, Cape Mabou, Cheticamp and Little Harbour. The drone was controlled using the DJI GO app and images were captured of water sources, infrastructure and oblique landscape photos.

Additional full drone field surveys were completed at the following pastures: Manchester, Digby, and Maple Brook. Flights were completed using the DroneDeploy app to guide the drone on an automatic switchback flight path covering the entire site. Flights were at 120 m altitude above ground level with image captures overlapping 75% fore/aft and side to side. Image processing was completed using the DroneDeploy online dashboard where single images captured by the drone were processed into a stitched composite orthomosaic (2 cm resolution) and elevation digital elevation model (DEM) (20 cm resolution). The DEM data was post-calibrated using the provincial lidar data. Mapping was completed using QGIS (Version 3.14.15) and features were manually digitized using satellite imagery or drone captured orthophotos.

Screenshot showing the DroneDeploy software tool used to collect the drone imagery for the full field surveys.

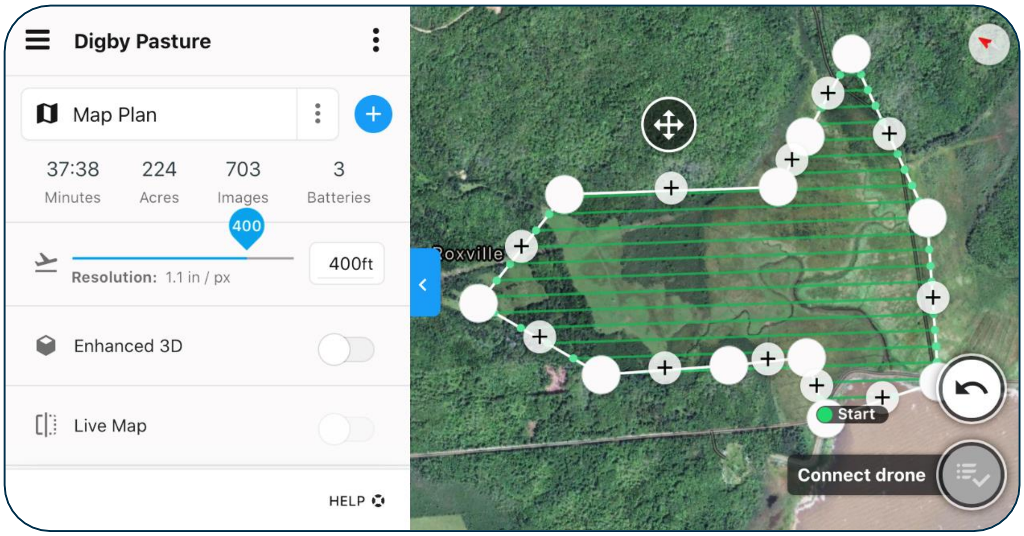


Figure 1.2 Screenshot of the DroneDeploy software used for a full field drone survey.

Soil Sampling

A composite soil sample was collected from predetermined areas of each pasture. Samples were collected at a depth of approximately 10-13 cm with a minimum of 15 subsamples per composite sample. In each area a randomized sample pattern was followed. Atypical areas within the field were avoided. Soil samples were submitted for analysis to the Nova Scotia Department of Agriculture analytical laboratory (NSDA lab) in October 2020. The NSDA lab uses Mehlich 3 extractant to determine plant available nutrients. Organic carbon is determined by combustion and a factor of 0.53 is used to calculate organic matter. The required calcium carbonate is determined following the Adams-Evans method. Copies of the analysis are included in the Appendix A of this report.

Fertility Recommendations

Fertility recommendations are based on soil test results and the recommendations established by the NSDA lab for native pasture.

Nitrogen is often the most limiting nutrient in pastures and is the nutrient most associated with vegetative growth or yield. Nitrogen is not meaningfully measured in the soil as a one-time measurement and therefore not reported as part of the standard analytic package through the NSDA lab.

The NSDA lab recommendations for nitrogen are universally 100 kg/ha for native pasture. The assumption is that the grass will be grazed twice with 50 kg/ha N applied two weeks before grazing. Split applications of nitrogen will reduce the occurrence of excess nitrogen in the soil which may be lost to the environment and will improve nitrogen use efficiency. The recommendations over all for native pasture are less than for grass or mixed pasture as it is assumed the forage species in the native pasture are not as productive as the improved cultivars and therefore do not have the genetic potential to yield as much as their improved counterparts. A study conducted in western Quebec evaluated yield response of forage stands dominated by timothy and orchardgrass to four rates of N fertilizer. On average, 125 kg/ha (112 lb/ac) of actual N was necessary to reach the optimum economic yield under the site conditions which included relatively cool soil conditions that likely restricted soil N mineralization in early spring. This shortage of soil N had to be compensated for by additional fertilizer to reach the optimal economic yield of these forage grasses.

If fertility budgets are limited, it's common industry practice to just apply N. We know however that there is an interactive effect of these nutrients and ideally pasture fertility levels are sufficient to ensure efficient use of applied nitrogen.

Fertilizer recommendations for the other macro nutrients (phosphorous, potassium, magnesium, and calcium) are adopted from the NSDA soil test report. Phosphorous fixation happens rapidly and therefore mobility through the soil is limited after application. For this reason, applications of phosphorous have been neglected on established pastures. We have recommended phosphorous in this report despite that thinking but, in many cases, recommendations may have not met the full phosphorous requirements. Better incorporation over time into the rooting zone can occur via bioturbation and other natural processes.

Secondary nutrients (sulfur) and micronutrients are rated according to the PEI analytical lab standards as Nova Scotia does not report these levels. The Maritime Pasture Manual offers some general recommendations for pasture fertility which are summarized below.

Table 1.1: Nutrient recommendations for pasture (adopted from the Maritime Pasture Manual)

Timing	Nutrient Requirements (kg/ha)			Example Analysis	Application Rate (kg/ha)
	N	P2O5	K2O		
>85% Grass					
Early Spring	50	0	0	34-0-0	150
Mid-June	50	15	45	21-6-18	250
Early September	32	9	21	21-6-18	150
70-85% Grass					
Early Spring	35	35	35	19-19-19	200
Mid-June	32	9	27	21-6-18	150
>30% Legume					
Early Spring	20	20	60	10-10-30-+0.2 Boron	200

The soil nutrient ratings in this report have been simplified into three color coded categories. Green represents high levels of nutrients and likely no economic response to fertilization (H-, H, H+ and E), yellow represents moderate soil concentration and a likely economic response to fertilization (M-, M, M+) and red indicates a definite need for fertilization and soil fertility is limiting crop growth (L-, L, L+).

If other crops were to be considered, in comparison to native pasture, their fertility requirements are significantly higher. In many cases, the crop most suited for these locations is indeed grass or mixed grass and legume pastures.

When soil testing to determine forage fertility requirements, evaluation of soil pH is important as it influences the availability of plant nutrients. When soils are very acidic (pH less than 5.5 to 5.8), soil bacteria and nitrogen-fixing bacteria in legume stands are adversely affected and soil biological activity is reduced. Optimum nutrient uptake by most crops occurs at soil pH between 6.0 and 7.0. The limestone recommendations are based on raising soil pH to a pH of 6.5.

Fertilizer costs vary according to market pricing and the blend being used and typically range from $550-$800 per tonne. In this report, a generalized costing is provided to give an indication of the investment required to improve fertility levels. It is likely uneconomical to think every hectare of pasture will be fertilized, therefore a "cost per hectare" value is provided. Priority fields should be identified and fertilized to allow an increase in stocking density as demanded.

Soil Classification

Where possible, 2-3 soil pits dug along a catena were marked via GPS and soil profiles are described according to the Canadian System of Soil Classification, 3rd edition and as outlined in "Soils Illustrated: Field Descriptions, 1st edition" (Watson, 2014). Horizon designation (A, B or C horizon) is based on differing properties within each horizon such as color, structure, texture, consistence, chemical, biological or mineral composition. Lower case horizon letters are used to further describe properties within the master horizons (A, B or C). The summarized definition of commonly used suffixes in Nova Scotia as used in this report are described below.

b	**A buried horizon**
c	An irreversible cemented horizon
ca	Carbonate enrichment, horizon > 10 cm thick
cc	Cemented pedogenic concretions
e	Eluvial horizon
f	Al and Fe enrichment
g	Gleyed horizon mottles
h	Organic matter enrichment
j	Indicates failure to meet limits of suffix it modifies
k	Presence of calcium carbonate
m	Modified, slightly altered horizon
p	Ploughed horizon
s	Horizon with salts including gypsum, crystals or veins can been seen
sa	Secondary salt enrichment horizon thickness >10 cm thick
ss	Slickenslides
t	Illuvial silicate clay present
u	Horizon disrupted by physical or faunal processes
x	Fragipan horizon

In some cases where soil excavation was not practical, soil type confirmation was determined by using a Dutch auger and soils are visually described in field to confirm the description in the Soil Survey Maps. GPS points of the augured sites are recorded in fields and are indicated on the soil map.

Report Structure

This report is organized according to Community Pasture. Where data was available each pasture contains information on:

- Location and field size
- Elevation
- Soil Survey
- Soil Survey Descriptions
- In-Field Soil Pit Analysis
- Soil Test Results and Fertility Recommendations
- Location of Wells and Water courses and Water Test Results
- Description of Infrastructure
- Summary Recommendations

CAPE JOHN COMMUNITY PASTURE

Location and field sizes

Figure 2.1 Cape John Community Pasture paddock size and locations.

ELEVATION

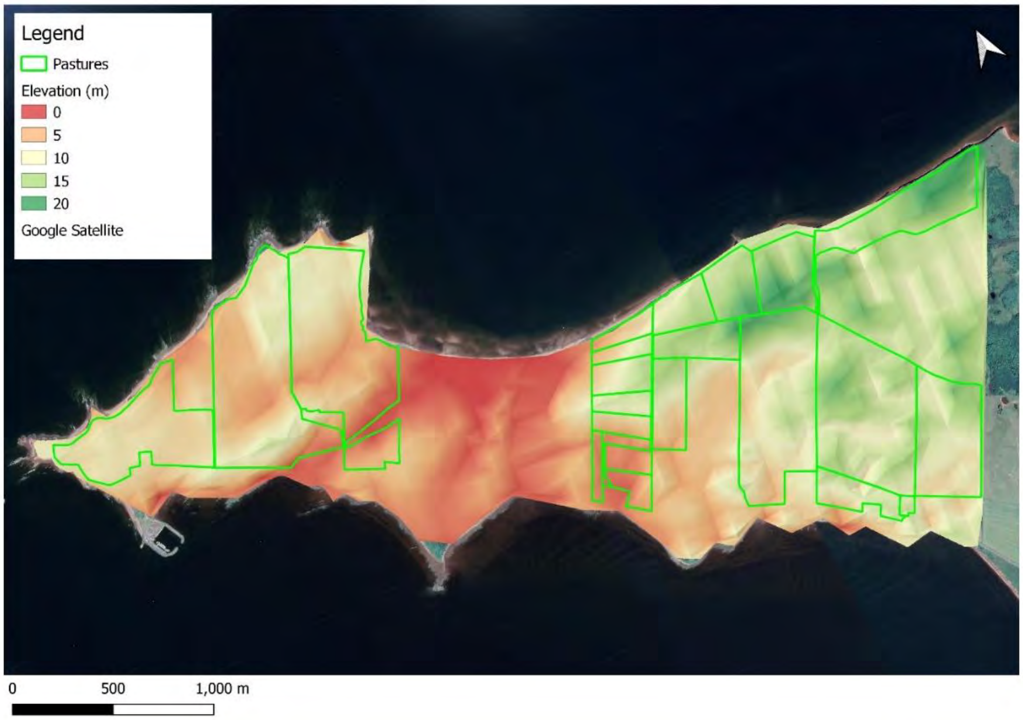


Figure 2.2 Cape John Community Pasture elevation 0 – 20 m.

SOIL SURVEY MAP

Figure 2.3 Cape John Community Pasture Soil survey map and soil pit location.

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 2.3.

QUEENS (QUE) SOIL DESCRIPTION

According to the soil survey, most of the soil of the Cape John community pasture are Queens soils. The following information is summarized from the soil descriptions found in the soil survey reports and Canadian Soil Information Service (CanSIS) website. A quick summary of the CanSIS data is provided in the adjacent text box.

Queens soils have developed in 10-30 cm of silt loam to clay loam (A horizon) over 30-50 cm of firm silt loam to clay loam (B horizon) over compact, strongly acidic to slightly acidic, dark reddish brown, loam to clay loam till (C Horizon). Queens soils are non to slightly stony and nonrocky and are found on undulating to rolling till plains on nearly level to moderate slopes (0.5-30%). Below the A horizon, the B horizon is a firm, coarse, blocky structured Bt horizon, which is characterized by thin clay films on the surface of the soil aggregates. This slowly permeable Bt horizon is 30-50 cm thick, ranges in texture from loam to clay loam, is mottled and gleyed to varying degrees, and grades into a compact, slowly permeable subsoil. The texture of this material ranges from loam and silt loam to sandy clay loam and clay loam and contains more than 18% clay. The coarse fragment content throughout the profile is less than 20% by volume. Soil limitations affecting

QUEENS SOILS

Queens soils are farmed throughout Nova Scotia but do have some limitations. The Bt horizon, along with the compact loam to clay loam till parent material (C horizon or subsoil), creates drainage issues and can cause perched water tables during seasonally high rainfall. This makes these soils hard to get out on in the spring and slow to warm up. Because these soils are often shallow improvement with tile drain is possible but may only marginally improve drainage. These soils are most suitable for pasture and forage production.

the use of Queens soils are excess soil water; shallow, compact, very slowly permeable subsoil; and, in some locations, adverse topography. Queens soils are used extensively for pasture and forage production and are highly productive when properly managed. To eliminate excess soil water from these soils some form of drainage is required.

These soil series are further divided by modifiers to the QUE soil code. Cape John includes both QUE5 and QUE6 soils. The explanation for the difference between the QUE5 and QUE6 soil have been taken from the CanSIS soil name description tables and are as follows:

QUE5

QUE5 map units are imperfectly drained Gleyed Brunisolic Gray Luvisol. The growth of plant roots is restricted by the third layer which is a compact basal till. The water table is always present in the soil. Water is removed from the soil sufficiently slowly in relation to supply, keeping the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major supply. If subsurface water or groundwater, or both, is the main source, the flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils

Gleying and Mottling

Gleying, gray soil colors, results from prolonged soil saturation and chemically reducing environments. Subsequent drainage restores aerobic conditions leaving the grayish surface of the mineral soil grains exposed to oxygen. Areas around soil pores, cracks and root channels then develop a reddish-brown color due to the oxidization of iron which is called mottling and is related to chemically oxidizing environments. Periods of alternating wetting and drying cycles are characterized by blotches of gray and reddish-brown soil colors occurring at the same depth. The longer the saturation period, the more pronounced the reduction process, and the grayer the soil becomes.

have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups.

Table 2.1: Generalized description of QUE5 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Loam
15-35	Bm	10	Loam
35-60	Btgj	10	Loam
60-100	C	10	Clay Loam

QUE6

The Queens 6 soils are classified as an "Orthic Luvic Gleysol" where the water table is always present in the soil. The growth of plant roots is restricted by the third layer which is a compact basil till. QUE6 map units are nonrocky. The soil water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and organic soils.

Table 2.2: Generalized description of QUE6 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Loam
15-35	Aeg	10	Loam
35-80	Btg	10	Loam
80-100	Cg	10	Clay Loam

CASTLEY (CSY) SOIL DESCRIPTION

The Castley (CSY7) association is also present at Cape John but to a much lesser extent. Castley (CSY7) soils are classified as Fibric Mesisols which means they are organic soils that have developed in 40-60 cm of poorly decomposed peat over 50-180 cm of moderately decomposed peat of mixed origin over mineral material. These organic materials are extremely to strongly acidic and are found on level to nearly level basin bogs, domed bogs, stream fens, and stream swamps. The use of Castley soils for agriculture is limited by their very poor drainage and high water tables, which persist at or near the surface for most of the year. These soils have very poor soil strength and poor trafficability. The large, deep bogs have some potential for vegetable production but require expensive drainage work and fertility improvements. Large peat bogs are potential sources of horticultural peat

Other Map notation which is self-explanatory includes:

Swamp (ZSW)

Water (ZZZ)

In-Field Soil Pit Analysis

Overall the in-field analysis was in agreeance with the soil survey reports. In some of the depressional areas in the field organic matter accumulation due to saturated conditions was evident (Auger 1) and these small nuances were not captured in the soil survey report. These areas developed over a mineral soil that consisted on sand. This finding is not terribly significant as these areas occupied very small portions of the pasture and in some cases had been fenced out if they followed any water course. Despite the soils inherit characteristics, the soil was well aggregated and of good quality which reflects the effect of forage as a permeant cover and the management at this site. Below are the results from the infield assessment. Soil pit and auger locations are indicated in Figure 2.4.

Table 2.3: In Field Soil Analysis Pit 1

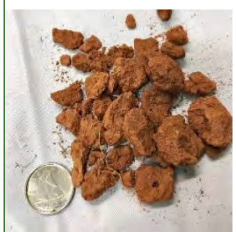
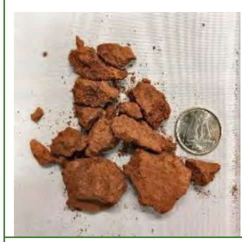
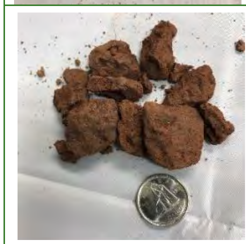
PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 CM	Apg	Pale Brown (10 YR 6/3d); loam; moderate, massive to fine granular structure, slightly plastic, abundant fine roots; many fine to medium prominent yellowish red (5YR 5/6d) mottles; clear, wavy horizon boundary.
	15-40 cm	Bf	Reddish Brown (2.5 YR 5/6d); loam; strong, medium subangular blocky structure; hard, plastic; few fine roots; gradual horizon boundary.
	40-60cm	Bt	Reddish Brown (2.5 YR 5/6d); loam; strong, medium subangular blocky structure; hard, plastic; gradual horizon boundary.
	60 CM+	C	Reddish Brown (2.5 YR 5/6d); clay loam; strong, medium subangular blocky structure; very hard, plastic; gradual horizon boundary.

Table 2.4: In Field Soil Analysis Pit 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 CM	Ap	Reddish Brown (5YR 4/4d); loam; moderate, massive to fine granular structure, slightly plastic, abundant fine roots; clear, wavy horizon boundary.
	15-50 cm	Bfgj	Yellowish Brown (10YR 5/4d); loam; massive and granular structure; friable; plastic; gradual horizon boundary.
	50-70cm	Bt	Reddish Brown (2.5 YR 5/6d); loam; strong, medium subangular blocky structure; hard, plastic; gradual horizon boundary.
	70 CM+	C	Reddish Brown (2.5 YR 5/6d); clay loam; strong, medium subangular blocky structure; very hard, plastic; gradual horizon boundary.

Table 2.5: In Field Soil Analysis Pit 3

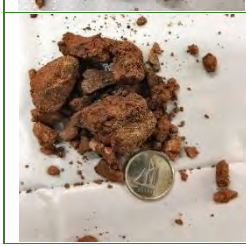
PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 CM	Ap	Dark yellowish brown (10YR 4/4d); loam; moderate, fine to medium granular structure; friable, plastic; abundant fine roots; wavy clear horizon boundary.
	15-20 cm	Ae	Very pale brown (10 YR 7/3d); loam, fine to medium subangular blocky structure; very friable; slightly plastic; plentiful fine roots, wavy clear horizon boundary.
	20-70cm	Bf	Brown (7.5 YR 5/4d); loam; moderate fine to very course granular structure; friable; plastic; plentiful fine roots; smooth gradual horizon boundary.
	70 CM+	C	Dark Reddish Brown (2.5 YR 5/4d); clay loam; firm medium subangular blocky structure.

Table 2.6: In Field Soil Analysis Auger 1 (Pit 4 on map)

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 CM	Ap	Very dark greyish brown (10 YR 3/2d); loam, weak, massive structure, friable, slightly plastic; plentiful fine roots, smooth, clear horizon boundary.
	15-50 cm	Bg	Light brownish grey (10 YR 6/2); loam; weak, massive structure, friable, slightly plastic; many fine, prominent yellowish brown (% YR 3/3) mottles; smooth, clear horizon boundary.
	50 +	C	Dark Reddish brown (5YR 3/3); sand; weak, single grained structure, friable, non-plastic.

Soil Test Results and Fertility Recommendations

Soil results for the Cape John Community Pasture have been grouped according to required nutrient. Overall, the differences in required nutrient was small among the fields and pastures. In some cases, to simplify fertilizer purchase and application the balance between required nutrient and recommended application did not equate. Slight over application of fertilizer here is not a concern as “a build and maintain” approach to fertility has been taken and these pastures are in the building phase.

Figure 2.4 Cape John Community Pasture soil sample areas.

Table 2.7: Fertility table for Project Pasture 1B FLD (CJ-001), Project Pasture 3A/B (CJ-004), Project Pasture 7A/B (CJ-008)

		N	P2O5	K2O	Ca	Mg	S	B	Zn	OM	pH
		---------------------------- kg/ha					-------------------------	-----ppm----		%	
CJ-001	Nutrient Analysis	N/A	89	115	2087	377	22	0.52	0.84	5.9	5.73
CJ-004	Nutrient Analysis	N/A	87	112	2435	584	18	0.55	1.05	6.2	6.2
CJ-008	Nutrient Analysis	N/A	56	113	2325	551	18	0.59	0.81	5.2	5.2
	Required Nutrient	100	75	50							
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring						
	Fertilizer 2	46	0	0	@100 kg/ha after grazing						
	Balance	-6.5	-27.5	-2.5							
	~ cost per Ha	$255 fertilizer and $76 lime plus shipping									

Lime required (t/ha)
2

Table 2.8: Fertility table for Project Pasture 4A (CJ-002), Project Pasture 5A (CJ-005), Project Pasture 5B2 (CJ-006)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
		---------------------------- kg/ha					------------------------	-----ppm----	
CJ-002	Nutrient Analysis	N/A	111	132	2854	397	21	0.64	1.79
CJ-005	Nutrient Analysis	N/A	105	153	2522	582	21	0.56	1.53
CJ-006	Nutrient Analysis	N/A	109	123	2893	437	20	0.62	1.02
	Required Nutrient	100	60	40					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-.6.5	-12.5	7.5					
	~ cost per Ha	$255 fertilizer and $76 lime plus shipping							

OM	pH
%	
7.6	5.73
7.1	6.00
5.5	6.05

Lime required (t/ha)
2

Table 2.9: Fertility table for Project Pasture 4B (CJ-003)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
CJ-003	Nutrient Analysis	N/A	131	131	2435	584	18	0.55	1.05
	Required Nutrient	100	50	40					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	-2.5	7.5					
	~ cost per Ha	$255 fertilizer							

OM %	pH
6.8	6.44

Lime required (t/ha)
0

Table 2.10: Fertility table for Project Pasture 5B1 (CJ-007)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
CJ-007	Nutrient Analysis	N/A	83	210	2875	451	23	0.64	1.07
	Required Nutrient	100	75	25					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	-27.5	27.5					
	~ cost per Ha	$255 fertilizer and $38 lime plus shipping							

OM %	pH
5.1	6.14

Lime required (t/ha)
1

Table 2.11: Fertility table for Project Pasture 6A (CJ-009)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
CJ-009	Nutrient Analysis	N/A	86	239	2524	642	22	0.51	0.91
	Required Nutrient	100	60	40					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	-12.5	7.5					
	~ cost per Ha	$255 fertilizer							

OM %	pH
5.1	6.39

Lime required (t/ha)
0

Table 2.12: Fertility table for Breeding Pasture FLD (CJ-011)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
CJ-011	Nutrient Analysis	N/A	104	165	2733	562	23	0.97	1.92
	Required Nutrient	100	60	30					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	-17.5	17.5					
	~ cost per Ha	$255 fertilizer and $38 lime plus shipping							

OM %	pH
5.7	6.0

Lime required (t/ha)
1

Table 2.13: Fertility table for Breeding Pasture FLD 7 (CJ-010), Open Pasture FLD 5 (CJ-014)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
		---------------------------- kg/ha					-------------------------	-----ppm----	
CJ-010	Nutrient Analysis	N/A	81	192	2207	507	26	0.62	1.47
CJ-014	Nutrient Analysis	N/A	75	168	2483	428	19	0.61	1.31
	Required Nutrient	100	75	30					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	-27.5	17.5					
	~ cost per Ha	$255 fertilizer and $76 to $114 plus shipping							

OM %	pH
5.1	5.69
5.4	5.94

Lime required (t/ha)
3 and 2

Table 2.14: Fertility table for Breeding Pasture FLD 9 (CJ-012), Open Pasture FLD13 (CJ-013)

		N	P2O5	K2O	Ca	Mg	S	B	Zn
		---------------------------- kg/ha				------------------------		-----ppm----	
CJ-012	Nutrient Analysis	N/A	59	124	2454	638	25	0.86	1.09
CJ-013	Nutrient Analysis	N/A	99	144	2520	554	19	0.59	0.89
	Required Nutrient	100	75	40					
	Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
	Fertilizer 2	46	0	0	@100 kg/ha after grazing				
	Balance	-6.5	27.5	7.5					
	~ cost per Ha	$255 fertilizer and $76 plus shipping							

OM %	pH
5	5.9
4.8	5.93

Lime required (t/ha)
2

Location of Wells and Water courses and Water Test Results

Each pasture has its own well and water distribution system that allows pumping water to various areas of the pasture (fig. 2.5). Well water is available in all areas of the pasture with the exception of Field 5 (aka water pour pasture) where the cattle are currently drinking from a ditch or walking back to the open pasture (this pasture was brought back into production in 2020).

The water pipe delivery system on both the breeding pasture and open pasture are both original to the Community Pasture development in the 60's. There are multiple repairs and leaks in the system. The system in the yearling pasture was installed in 2011 and is in good condition.

The water tests for all three wells fell in the acceptable level for livestock drinking water (Appendix B), except for the pH in the wells on the open and breeding pasture. These wells have pH levels over 8 which is slightly above the recommended levels, but not excessive. This does not appear to be affecting livestock performance. The well on the yearling pasture that fell within the guidelines is a replacement well that was installed in the last 4 years. This well replaced an old well that was delivering water that was muddy.

Figure 2.5 Cape John Community Pasture well and watering sites.

Description of Infrastructure

The Cape John Community Pasture Co-op is operated by a member board that employs two herdsmen for the pasture season. It has been continually active since it took over the operation from the NSDA.

The pasture has been divided into three distinct management pastures: 1) open pasture, 2) yearling or project pasture, and 3) breeding pasture. There are barns and handling systems at both the open and breeding pastures. With the handling system at the open pasture being used to process cattle from the yearling pasture.

Figure 2.6 Cape John Community Pasture eastward (left) and westward (right) barns and handling systems.

Between 2011 and 2016 Perennia conducted an intensive pasture management demonstration on the yearling pasture. This project involved subdividing this pasture into 13 paddocks and implementing rotational grazing management. Included in this project was the installation of a new squeeze shoot, head gate and handling system with scales and ID reader. This allowed better handling of the cattle and accurate collection of data.

The pasture fences are functional; however, there are 18.7 km of wire fencing that has been in place since the pasture was established and it requires significant annual maintenance. The Co-op has started the process of fence upgrades by replacing 8 km with new electric fencing.

The handling system and corral at the open pasture are in good condition. The handling equipment is 10 years old with the corrals having been replace in the last 4 years. The open pasture handling system squeeze and head gate and scales need to be upgraded. The handling corrals are in the process of being replaced in 2020.

At the time that the site visit was conducted many of the cattle had left the pasture for their winter home. The remaining cattle were in good body condition and the pasture appeared well utilized indicating that the current stocking rate was appropriate for the existing conditions.

Table 2.15: Cost of Infrastructure Improvement

Infrastructure Improvement	Cost per unit	Total Cost	Operation Impact
Replacement of existing fence with 3 or 4 strand electric	4 strand electric $274/100m 18.7 km	$52,238.00	Reduced annual maintenance cost. Fewer herdsmen hours to repair and maintain fence.
Installation of electric divider fences in open and breeding pasture	2 strand electric fence: $231/100m 4.64 km Fencer unit $1,600.00 (breeding pasture)	Fence: $2,310.00 Fencer unit $1,600.00 Total $3,910.00	Increased carrying capacity of pasture: More cattle equals more income. Better pasture utilization.
Water system upgrade in open and breeding pasture	Pipe 1' /$0.67/$2.2/m 1.97km Tubs 5/$350 each	Pipe $4,300.00 Tubs $1,750.00 Total: $6,050.00	Improved water distribution and cattle grazing. Eliminate water leakage in existing system will save water and reduce electrical power use.
New Squeeze and weigh bars	Squeeze $4,500.00 Weigh bars $2,000.00	$6,500.00	Improved safety and handling for cattle and workers.
Total cost of infrastructure improvement:		**$69,698.00**	

Figure 2.7 Cape John Community Pasture suggested infrastructure changes.

Summary Recommendations

Fencing: The replacement for the old fence with high tensile electric fence should be finished as soon as possible. This will significantly reduce both the maintenance cost and time for the pasture. Conversion to 100% electric fence will save maintenance costs, provide the most cost-effective upgrading cost, and ensure effective control of the cattle. In addition, consideration should be given to installation of divider fences to allow for more intensive rotational grazing on both the open and breeding pasture.

The water pipe system in both the breeding and open pastures should be replaced. At the time of replacement, it should be redesigned and relocated in both pastures to optimize rotational grazing.

Figure 2.8 View of pasture series 1-7.

The squeeze and head gate at the breeding pasture should be replaced (the existing equipment is worn out and no longer safe). The scale load bars should be replaced so that they are compatible with the scale head and ID reader that is used at the open pasture barn. The implementation of more intensive rotational grazing will allow the increase of the stocking rate on the open and breeding pastures, through improved grazing management. While it is hard to quantify the increased productivity from grazing management and improved fertility; in the case of Cape John, it is possible that this could amount to an increase by as much as 30% in the carrying capacity.

In addition, there are two blocks of land adjacent to or part of the open pasture amounting to approximately 14 ha that could have the timber removed and be converted to pasture. This could increase the number of cow calf pairs by 20.

The breeding pasture is separated from the open and yearling pasture by private lands and a salt marsh. With only one well in the breeding pasture area there is a risk that if that well failed there would be no way to water the cattle. This report recommends consideration be given to installing an additional well on that property to ensure a constant supply of water. The best location of this well would be to the east “Seas Edge Road” where it would be central to the pasture and power would be accessible.

Wood land: the wood land on this property is over mature and the Co-op has consulted a forest technician who recommended harvesting the timber two years ago. In the fall of 2019, a hurricane damaged most of the standing timber. If anything is going to be recovered there should be a salvage harvest this winter before everything is a total loss.

Based on the site visit Cape John Community Pasture seems to be operating at capacity within the current limitations of the available funding. The Co-op is making annual investments to improve the pasture but financially they are limited by their current budget which is dictated by the number of cattle they graze. With a capital investment they could increase the number of cattle they graze, and this would create a more sustainable pasture operation. It would also allow more cattle to be grazed creating opportunities to increase the Co-op membership which would also improve the long-term sustainability of the pasture.

CAPE MABOU COMMUNITY PASTURE

Location and field size

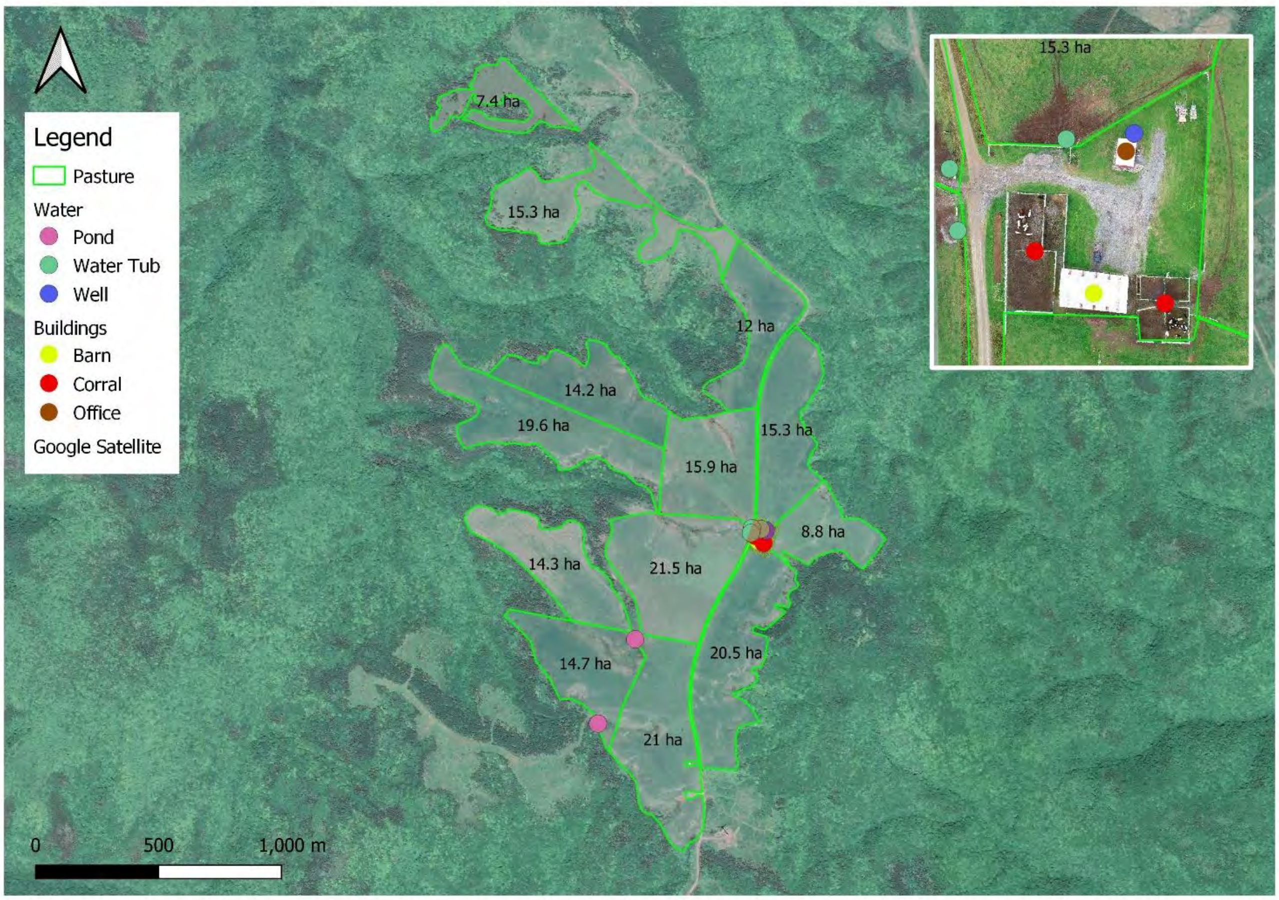


Figure 3.1 Cape Mabou Pasture paddock size and location with water sources.

Elevation

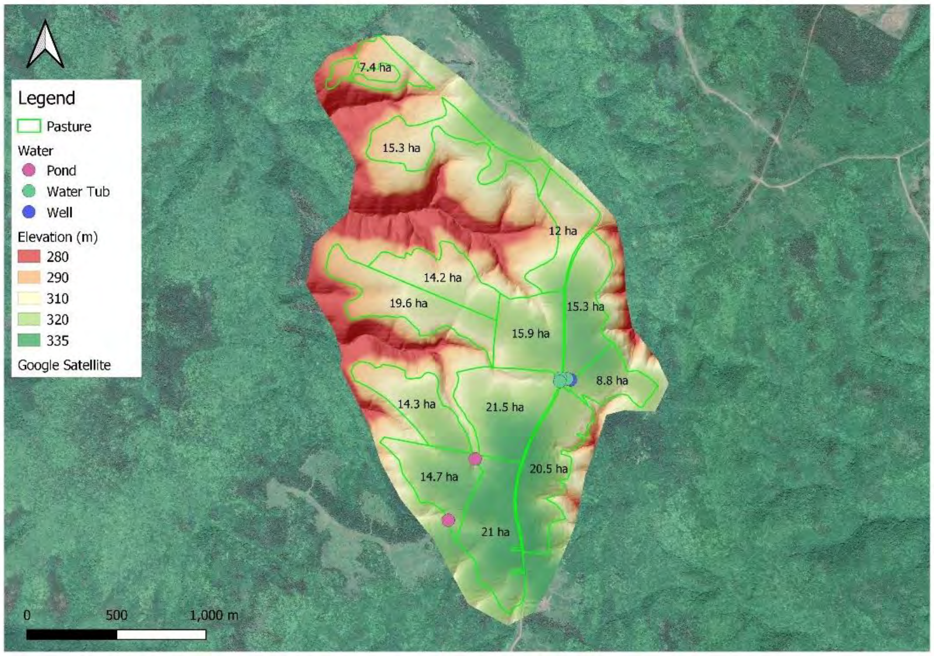


Figure 3.2 Cape Mabou Pasture elevation 280 - 335 m showing locations of water.

Soil Survey

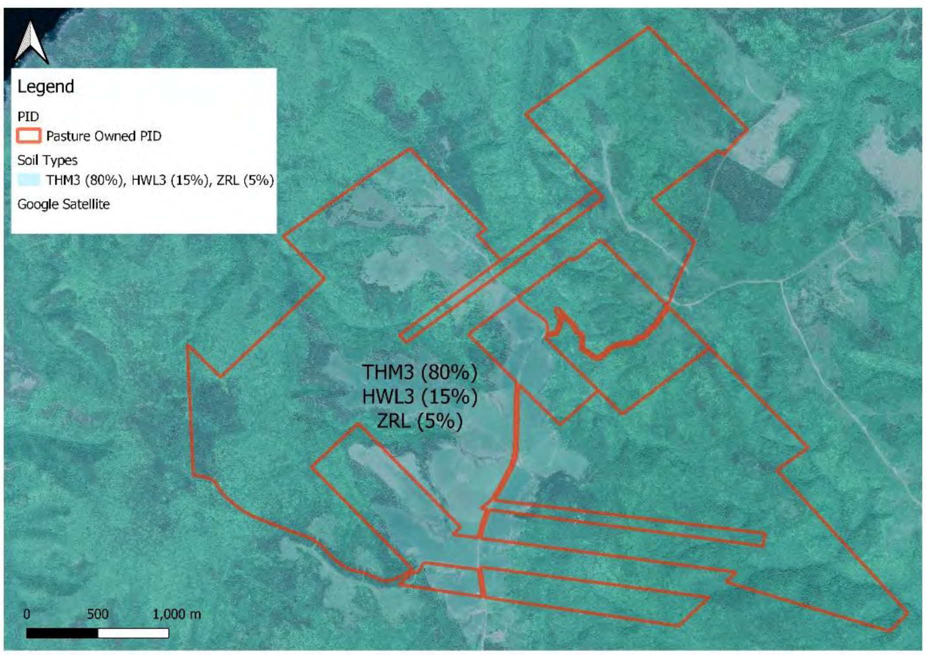


Figure 3.3 Cape Mabou Pasture soil survey data showing the area designated as primarily Thom soil.

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 3.3. According to the soil survey, the majority of the soil of the Cape Mabou community pasture is Thom soil with 15% of Hopewell (HWL) soil and 5% Rockland (ZRL). The following information is summarized from the soil descriptions found in the soil survey reports and CanSIS website. A quick summary and interpretation of the CanSIS data is provided in the adjacent text box.

THOM SOIL

Agriculture production on Thom soils is challenging due to steep slopes which are at risk to erosion, shallow depth to layers that would restrict root growth and stoniness that would impede cultivation. Pasture and timber would be suitable for Thom soils. Like many soils in Nova Scotia, natural fertility is low on these soils and amending fertility to agronomic recommendations would be costly.

THOM (THM3) SOIL DESCRIPTION

Thom soils (THM3) are classified as Orthic-Humo-Ferric Podzol. Plant root growth is restricted by the C horizon, which is a sandy loam compact basal till layer. This till layer is porous and occasionally very stony. The till varies in depth from a few inches to several feet with bedrock outcrops in some places. The water table is present during the non-growing season. Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity and are generally intermediate in texture and depth. The water source is from precipitation. On slopes subsurface flow may occur for short durations, but additions are equaled by losses.

In general, the topography is hilly or even mountainous. Smoother areas occur on the tops of the hills and in a few other locations, but about 90 per cent of the land has slopes greater than 8 per cent. Large areas of the Thom soils are very stony and only about 3 per cent of them are sufficiently free from stone to permit cultivation. The cleared slopes have fairly rapid runoff, but there are places where seepage spots occur on the hillsides due to this dip of the underlying rock.

Most areas of Thom soil have topography and stoniness that make cultivation impractical. Traditionally areas of Thom soil that have been cleared are abandoned and revert to forest. Some areas with suitable topography have been used for pasture. The largest area to be used in this manner is Cape Mabou pasture on the top of Mabou Mountain in Inverness County. There are a few other areas, now under forest, that have similar topography and stoniness but are too small to be used in this way. The Thom soils are low in natural fertility and evidently deteriorate rapidly under cultivation, largely due to loss of organic matter. These soils erode easily and precautions should be taken to slow rapid runoff on slopes that are suitable for cropping. Most of the land is best suited to forest, as tree roots penetrate the soil readily. Excellent stands of timber have been observed on these soils.

Table 3.1: Generalized description of THM3 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH	0	-
0-10	Ae	25	Loam
10-55	Bf	25	Loam
55-100	C	30	Sandy Loam

Hopewell (HWP3) SOIL DESCRIPTION

Hopewell soil (HWP3) like the Thom soils are Orthic Humo-Ferric Podzols. Plant roots are restricted by a layer of bedrock under the C horizon. The water table is present in the soil during the non-growing season. These soils are well drained. Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations, but additions are equaled by losses.

Table 3.2: Generalized description of HWP3 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH	-	-
0-5	Ap	25	Loam
5-55	Bf	25	Loam
55-70	C	30	Sandy Loam
70-100	R	-	-

In-Field Soil Pit Analysis

Overall, the in-field analysis was in agreement with the soil survey reports with the exception of the soil texture in the C horizon. Our analysis determined it was a loam. As well, the soils survey reports are based on a forest soil classification. The LFH layer is an organic forest floor mat and the Ae horizon is an elevated horizon that developed under this organic horizon. In agriculture, these horizons are tilled and often become indistinguishable. Despite the soils inherit characteristics, the soil was well aggregated and of good quality which reflects the effect of forage as a permeant cover and the management at this site. This site was considerably remote. Topography (Fig 3.4) and climate would make it challenging to grow some crops. Furthermore, the percent course fragment is high in these soils making cultivation difficult. Below are the results from the infield assessment. Soil pit and auger locations are indicated in Figure 3.6.

Course Fragment Percentages

Thom soils have significant course fragment that would impede cultivation. The figure below illustrated visually course fragment percentages of 1% in comparison to 30%.

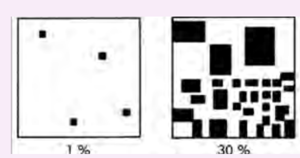


Figure 3.4 An aerial view of a pasture with a gully running through the center of the paddock.

Figure 3.5 An aerial view of a pasture with a well-maintained road network. The road veering to the right in the distance leads to the furthest pastures and would need significant improvements to provide access for truck and cattle trailers.

Table 3.3: In Field Soil Analysis Pit 1

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	A	Dark Brown (7.5 YR 4/4d); loam; moderate, fine to medium granular structure; loose, slightly plastic; abundant fine and very fine roots; 15 % stones, cobbles and gravel; gradual smooth horizon boundary.
	15-60 cm	Bf	Dark Brown (7.5 YR 4/4d); loam; moderate, fine to medium granular structure; loose, slightly plastic; plentiful fine roots; 20 % stones, cobbles and gravel; gradual smooth horizon boundary.
	60 +	c	Strong Brown (7.5 YR 4/6d); loam; moderate, fine to medium granular structure; loose, slightly plastic; 30 % stones, cobbles and gravel.

Table 3.4: In Field Soil Analysis Pit 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Dark Brown (7.5 YR 4/4d); loam; moderate, fine to medium granular structure; loose, slightly plastic; abundant fine and very fine roots; 15 % stones, cobbles and gravel; gradual smooth horizon boundary.
	15-60 cm	Bf	Dark Brown (7.5 YR 4/4d) loam; moderate, fine to medium granular structure; loose, slightly plastic; plentiful fine roots; 20 % stones, cobbles and gravel; gradual smooth horizon boundary.
	60 +	C	Dark Brown (7.5 YR 3/4d); loam; moderate, fine to medium granular structure; loose, slightly plastic; 30 % stones, cobbles and gravel.

SOIL TEST RESULTS AND FERTILITY RECOMMENDATIONS

Soil results for the Cape Mabou Community Pasture have been sampled according to Figure 3.6. Overall many fields are showing adequate fertility which is a reflection of good management. Some fields are lower in fertility and could benefit from an application of fertilizer and lime. Lime prices are estimated based on last year's pricing from Mosher's Limestone. Antigonish Limestone is a closer source and the price per tonne at Antigonish tends to be a little lower. In some cases, the fertility balance shows a positive or negative balance. This is not too much of a concern at these sites because fertility over all is quite low. In most cases the larger negative balances are related to P_2O_5 application. Again, since the P_2O_5 is being surface applied and will take time to move into the rooting zone, this negative balance is not too much of a concern.

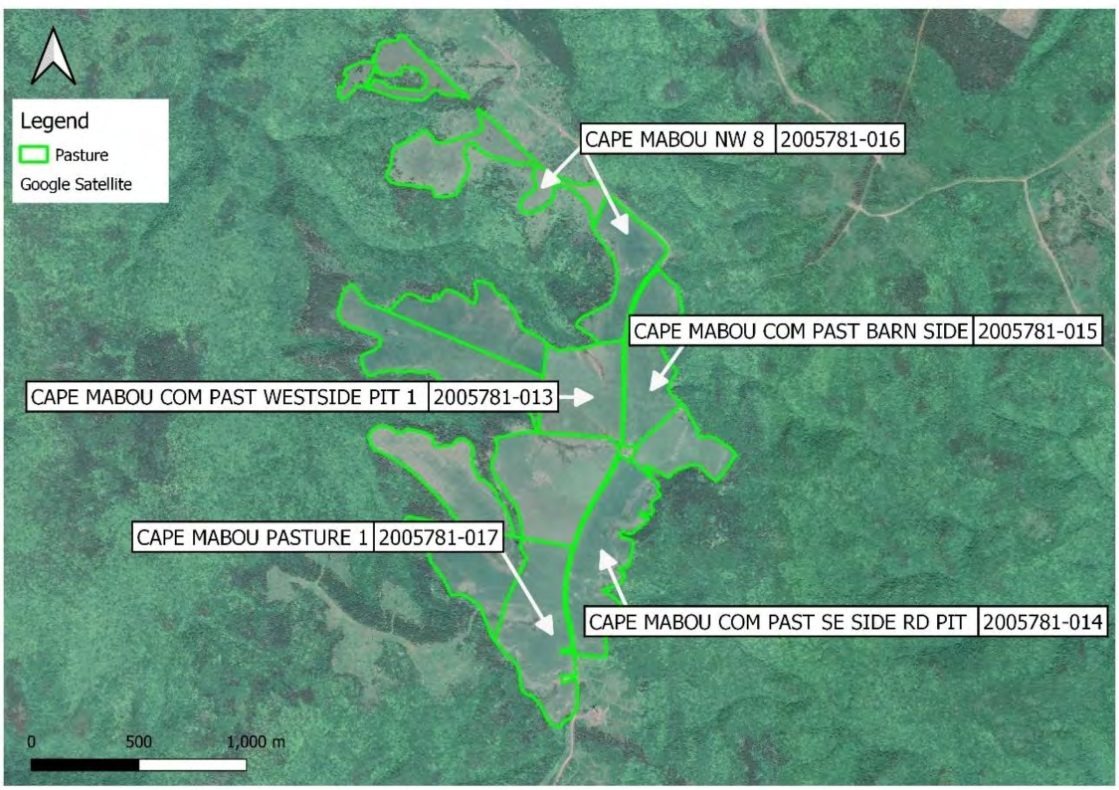


Figure 3.6 Cape Mabou Pasture Soil Sampling areas

Table 3.5: Fertility table for Cape Mabou Com Past Westside Pit One (013)

Past Westside Pit One	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------------------------- kg/ha -------------------------						-----ppm----	
Nutrient Analysis	N/A	126	127	2543	505	32	<0.50	1.79
Required Nutrient	100	50	40					
Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
Fertilizer 2	46	0	0	@100 kg/ha after grazing				
Balance	-6.5	-2.5	7.5					
~ cost per Ha	$255 fertilizer and $152 lime plus shipping							

OM %	pH
10.8	5.91

Lime required (t/ha)
4

Table 3.6: Fertility table for Cape Mabou Com Past SE Side Pit 1 (014)

Past SE Side Rd Pit 1	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------------------------- kg/ha -------------------------						-----ppm----	
Nutrient Analysis	N/A	354	147	4108	854	26	<0.5	1.49
Required Nutrient	100	0	40					
Fertilizer 1	21	6	18	@ 250 kg/ha broadcast spring				
Fertilizer 2	46	0	0	@100 kg/ha after grazing				
Balance	-1.5	15	5					
~ cost per Ha	$255 fertilizer and $76 plus shipping							

OM %	pH
9.2	6.8

Lime required (t/ha)
0

Table 3.7: Fertility table for Cape Mabou Com Past Barn Side (015)

Past Barn Side	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha -------------------------						-----ppm----	
Nutrient Analysis	N/A	243	250	4133	1122	32	<0.5	1.52
Required Nutrient	100	20	20					
Fertilizer 1	32.5	9.5	9.5	@ 200 kg/ha broadcast spring				
Fertilizer 2	46	0	0	@100 kg/ha after grazing				
Balance	11	-1	-1					
~ cost per Ha	$215 fertilizer							

OM %	pH
12.9	7.08

Lime re-quired (t/ha)
0

Table 3.8: Fertility table for Cape Mabou NW8

NW 8	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha -------------------------						-----ppm----	
Nutrient Analysis	N/A	61	98	3329	798	24	<0.5	1.17
Required Nutrient	100	75	50					
Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
Fertilizer 2	46	0	0	@100 kg/ha after grazing				
Balance	-6.5	-27.5	-2.5					
~ cost per Ha	$255 fertilizer							

OM %	pH
10.8	6.68

Lime re-quired (t/ha)
0

Table 3.9: Fertility table for Cape Mabou Pasture

Pasture 1	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------------------------- kg/ha------------------------						-----ppm----	
Nutrient Analysis	N/A	145	153	2580	527	28	<0.5	0.87
Required Nutrient	100	40	40					
Fertilizer 1	19	19	19	@ 250 kg/ha broadcast spring				
Fertilizer 2	46	0	0	@100 kg/ha after grazing				
Balance	-6.5	7.5	7.5					
~ cost per Ha	$255 fertilizer and $152 lime plus shipping							

OM %	pH
11.4	6.01

Lime required (t/ha)
4

Location of Wells and Water courses and Water Test Results

The location of the well and water source for cattle are outlined in Figure 3.1: Cape Mabou Pasture paddock size and location with water sources.

Figure 3.7 Cape Mabou cattle water troughs

Water is supplied from a well near the barn and from surface ponds. The water test from the well showed that the water is within the acceptable levels for livestock consumption, except for the pH which falls within the range that is considered poor for livestock. The surface ponds are accessible to the cattle.

At the time of the site visit there were still a couple of groups of cattle on the pasture. These cattle were in good body condition and the pasture was well grazed with no indication that there was grass that was not utilized. Based on what we observed the stocking rate on the pasture was appropriate for the current pasture conditions.

Description of Infrastructure

Mabou Community Pasture is operated by a board similar to Cape John. Unlike Cape John the pasture has not operated continually since NSDA relinquished operation. They functioned until approximately 10 years ago until the old herdsman retired. Over the next few years, they had a couple of people work for the pasture and more recently relied primarily on volunteer workers. The pasture has been able to acquire very significant capital investment that has allowed them to replace the aging infrastructure and the investment shows. The fences, buildings, and handling system are all in very good condition. They have even been able to clean up an old derelict building and replace it with a very nice office/lunch building.

Figure 3.8 Cape Mabou Community Pasture handling system and outbuildings.

Table 3.10: Cost of Infrastructure improvement

Infrastructure Improvement	Cost per unit	Total Cost	Operational Impact
Fencing surface ponds to limit cattle access	Fence: $250.00 Per pond	2 ponds $500.00	Improved water quality and reduced environmental impact.
Installation of remote solar surface water pumps and watering tubs	$1,500.00 per pond *	$3,500.00	Improved water quality for cattle.
Total		$4,000.00	

*Cost based on purchasing water system components separately and building system their self.

Additional Observations and Concerns:

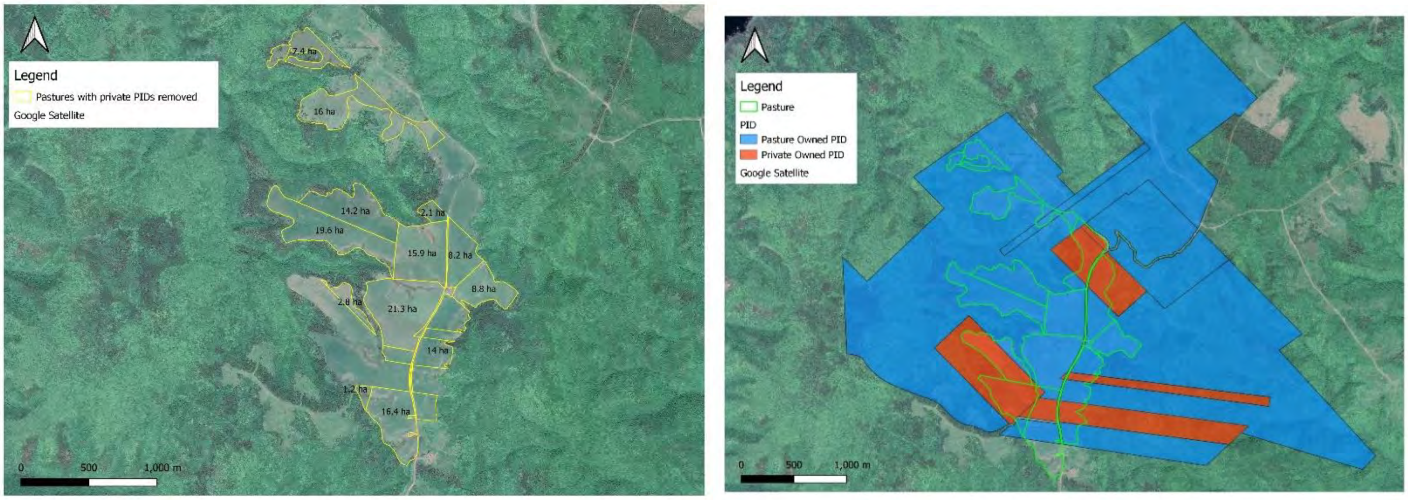


Figure 3.9 Cape Mabou PIDS showing recently sold parcels that are now under private ownership.

Summary Recommendations

The funding that has been available to the Mabou Pasture has allowed them (with volunteer commitment) to bring their infrastructure up to a very high level. There is very little that appeared to need to be addressed to improve the infrastructure. It would be nice to see the surface water ponds fenced so the cattle do not have direct access to the water and remote watering systems installed. This will ensure that the water quality from these ponds was maintained and contamination by the cattle was prevented.

It appears that the carrying capacity of the pasture could only be improved by addressing the fertility issues identified in the soil testing. Improvements to fertility on this pasture would be the most significant investment that could be made at this time to increase the number of cattle that could be pastured.

The Mabou Pasture infrastructure is in exceptionally good condition as the result of a significant investment of both time and volunteer labour over the last number of years. The concerns over potential loss of access to some of the land is very significant and would have devastating impact on the pasture operations. It would reduce the useable land base to the point where it would probably not make sense to continue operations.

There is additional land, however, it is not accessible at this time by truck and it would be impossible to get a cattle truck to the site without very significant road upgrades to ensure safe access to the site. If access to the site were possible it would require a large investment in new infrastructure since it has not been used for years. The two blocks of land are separated and consist of approximately 25 ha. There is no power on site. (At the time of the site visit we attempted to reach the site with our truck and the trailer carrying the excavator. We turned back after damaging the trailer and because of concerns about getting stuck in the remote location). Use of this other area of land would require very significant improvement to the access road, and investment in infrastructure that would far exceed its value for pasture.

CHETICAMP ISLAND COMMUNITY PASTURE

Location and field size

Figure 4.1 Cheticamp Pasture paddock size and location, with water sources.

ELEVATION

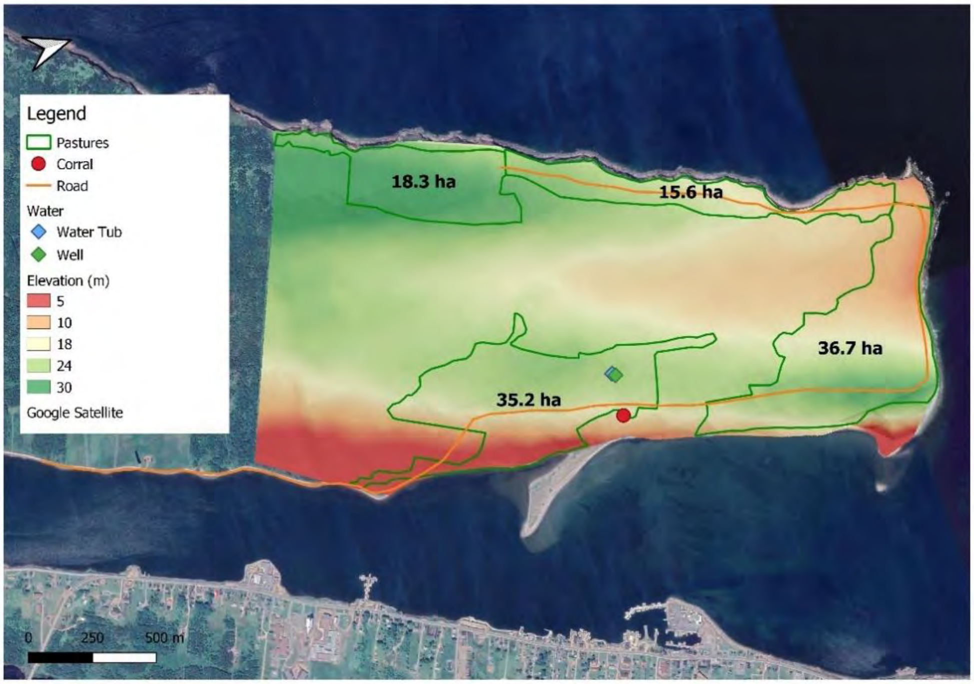


Figure 4.2 Cheticamp Pasture elevation 5 - 30 m, showing locations of water, corral and pastures.

SOIL SURVEY

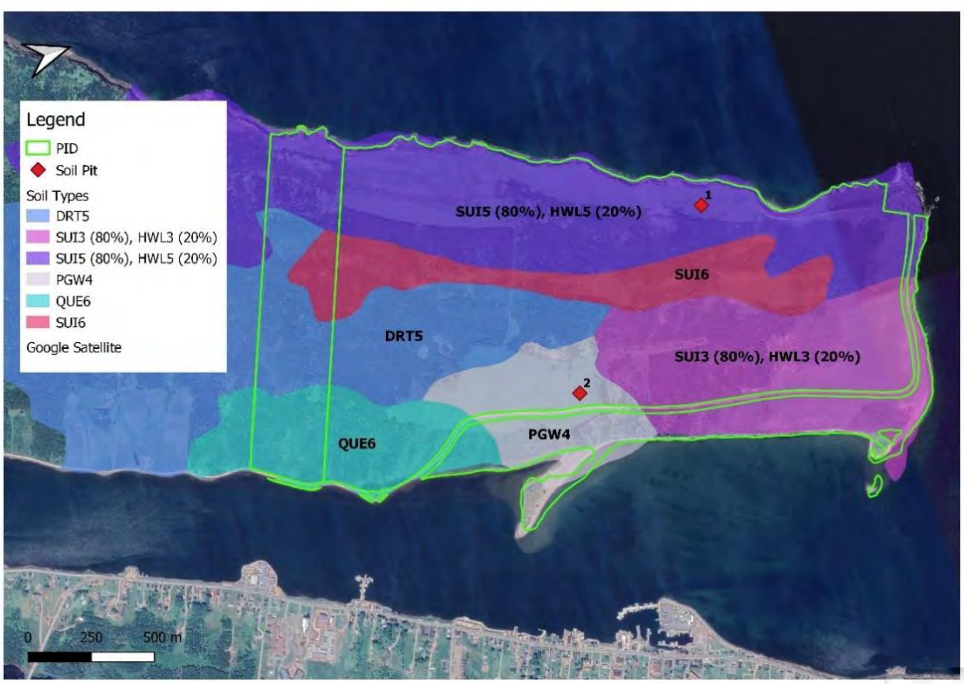


Figure 4.3 Cheticamp Pasture soil survey data showing the area comprised of a number of soil types but namely Shulie (SUI).

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 4.3 above. According to the soil survey, the majority of the soil of the Cheticamp community pasture is Shulie (SUI) with inclusions of Hopewell (HWL) soils. Pugwash soils make up the majority of pasture 1. Areas not in pasture contain Debert and Queens soils. A full description of the Queens 6 soil (QUE6) is found in the Cape John pasture section and will not be included here. The following information is summarized from the soil descriptions found in the soil survey reports and CanSIS websites from both the archived soil survey reports as well as the soil name and layer data. A quick summary and interpretation of the CanSIS data is provided in the adjacent text box.

Shulie (SUI) Soils

The topography ranges from gently undulating to hilly. Stoniness varies with depth of the till over bedrock. In general, the more steeply sloping land is the stoniest. The soils have good surface drainage and moderately rapid internal drainage. The parent material of these soils is a grayish-brown sandy loam till of variable thickness. There are some areas that are very shallow over the sand- stone bedrock. The cultivated soil is a light-brown sandy loam. About 31% of the Shulie soils have topography and are free from stones that make them favorable for cultivation. Some of this land could be used for vegetable growing, but most is suitable for hay or pasture. Some precautions are necessary to prevent erosion when row crops are grown on this land. Shulie soils are very acid. They are also very porous and the maintenance of organic matter is a problem.

Shulie SUI3 SOIL DESCRIPTION

The SUI3 soils are orthic humio- ferric Podzol. The growth of plant roots is restricted by the C horizon which is a compact (basal) till layer. The water table is present in the soil during the non-growing season. These soils are well drained as water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations, but additions are equaled by losses.

Table 4.1: Generalized description of SUI3 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-15	Ap	25	Sandy Loam
15-60	Bf	25	Loam
60-100	C	25	Loam

Shulie SUI5 SOIL DESCRIPTION

The SUI5 soils are gleyed humo- ferric Podzol. The water table is always present in the soil during the non-growing season. The growth of plant roots is restricted by the C horizon which is a compact (basil) till. Water is removed from the soil sufficiently slowly in relation to supply, to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major supply. If subsurface water or groundwater, or both, is the main source, the flow rate may vary but the soil remains wet for a significant

SHULIE SOIL

The soil texture at Cheticamp is favorable for crop production however, in depressional areas these soils have the potential to be quite wet. The main difference between the SHI3, SHI5 and SHI6 soils is the degree of water saturation. The course fragment percentages would make cultivation difficult. Location is good in that it is close to Cheticamp town. The topography is not excessive. The pH at this site is adequate and is a reflection of good management. Fertility here is quite low and these pastures would benefit from fertilizer applications.

part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups.

Table 4.2: Generalized description of SUI5 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-15	Aegj	25	Sandy Loam
15-60	Bfgj	25	Loam
60-100	Cg	25	Loam

Shulie SUI6 SOIL DESCRIPTION

The SUI6 soil is an orthic gleysol and the water table is always present in the soil. The growth of the plant roots is restricted by the C horizon which is a compact (basal) till. These soils are poorly drained. Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Table 4.3: Generalized description of SUI6 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-15	Aegj	25	Sandy Loam
15-60	Bfgj	25	Loam
60-100	Cg	25	Loam

Hopewell HWL3

HWL3 soils are described in the Cape Mabou Community Pasture.

Hopewell HWL 5 SOIL DESCRIPTION

HWL5 soils are classified as Gleyed Humo-Ferric Podzol**.** The growth of plant roots is restricted by a consolidated bedrock layer under the C horizon. The water table is always present in the soil. Water is removed from the soil sufficiently slowly in relation to supply, to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major supply. If subsurface water or groundwater, or both, is the main source, the flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups.

Table 4.4: Generalized description of HWL5 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-5	Aegj	2o	Loam/Silt Loam
5-55	Bfgj	30	Loam
55-70	Cg	40	Loam
70-100	R		Sandy Loam

DRT5

The DRT5 soils are classified as a Gleyed Sombric Brunisol. Root growth is restricted by a fragipan layer in the b horizon. The water table is always present in the soil and these soils are imperfectly drained. Water is removed from the soil sufficiently slowly in relation to supply, to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major supply. If subsurface water or groundwater, or both, is the main source, the flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high;

contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups.

Table 4.5: Generalized description of DRT5 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Sandy Loam
15-40	Bmgj	10	Sandy Loam
40-70	Bxgj	10	Sandy Loam
70-100	Cg	10	Sandy Loam

PGW4

The PGW4 soils are classified as an Orthic Sombric Brunisol. The water table is always present in the soil and the growth of plant roots is restricted by the third layer. These soils contain a fragipan layer as denoted by the subscript x in the B horizon. The growth of plant roots is restricted by this layer. These soils are moderately well drained. Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6 cm) within the control section and are usually medium to fine textured. Precipitation is the dominant water source in medium to fine textured soils; precipitation and significant additions by subsurface flow are necessary in coarse textured soils.

Table 4.6: Generalized description of PGW4 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Sandy Loam
15-45	Bm	10	Sandy Loam
45-55	Bx	10	Sandy Loam
55-100	C	10	Sandy Loam

In-Field Soil Pit Analysis

Table 4.7: In Field Soil Analysis Pit 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Very dark greyish brown (10 YR 3/2d); sandy loam; weak, fine granular structure; loose, slightly plastic; abundant very fine and medium roots; clear smooth horizon boundary.
	15-20 cm	Ae	Light brownish grey (10 YR 6/2d); sandy loam; moderate, massive and platy structure; friable; non plastic, few fine roots, wavy clear horizon boundary.
	20-40cm	AB	Brown (10 YR 5/3d); loam; moderate; platy and medium subangular blocky structure; friable, non-plastic; very few fine roots; gradual smooth horizon boundary.
	40-60 cm	Bf	Strong to dark brown (10 YR 4/3); loam; strong massive structure; firm; non-plastic; very few fine roots; gradual smooth horizon boundary.
	60+	C	Dark yellowish brown (10YR 4/4); strong; fine to course subangular block structure; very few fine roots.

Table 4.8: In Field Soil Analysis Pit 1

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Dark Reddish Brown (5 YR 3/2d); clay loam; weak to moderate, very fine to medium granular structure; loose, slightly plastic; abundant fine and medium roots; clear smooth horizon boundary.
	15-20 cm	Aej	Brown (7.5 YR 5/4); clay loam; weak, single grained and medium subangular blocky structure; friable; plastic, few fine roots, wavy clear horizon boundary.
	20-45 cm	AB	Brown/Dark Brown (7.5 YR 4/4d); clay loam; weak to moderate; platy and granular fine structure; fria-ble, plastic; gradual smooth horizon boundary.
	45-60 cm	Bf	Strong Brown (7.5 YR 5/8d); sandy clay loam; weak single grained and fine granular structure; friable; slightly plastic; very few fine roots; gradual smooth horizon boundary.
	60+	C	Reddish Brown (5 YR 4/4d); silty clay; moderate to subangular blocky structure; firm; slightly plastic.

Figure 4.4 Cheticamp Pasture soil sampling areas.

Table 4.9: Fertility Table for Cheticamp Pasture 1

1	N	P2O5	K2O	Ca	Mg	S	B	Zn
	------------------------------ kg/ha ------------------------------						-----ppm----	
Nutrient Analysis	N/A	341	210	2317	297	22	<0.5	2.71
Required Nutrient	100	0	25					
Fertilizer 1	21	6	18	@ 200 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-12	6	11					
~ cost per Ha	$215 fertilizer and $152 lime plus shipping							

OM %	pH
4.4	5.65

Lime required (t/ha)
3

Table 4.10: Fertility Table for Cheticamp Pasture 2

2	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------------------------- kg/ha						-----ppm----	
Nutrient Analysis	N/A	63	98	3081	617	16	0.57	1.89
Required Nutrient	100	75	50					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	-2.5					
~ cost per Ha	$255 fertilizer plus $38 lime plus shipping							

OM %	pH
5.1	6.19

Lime required (t/ha)
1

Table 4.11: Fertility Table for Cheticamp Pasture 3

3	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------------------------- kg/ha						-----ppm----	
Nutrient Analysis	N/A	134	133	3327	638	20	0.80	1.95
Required Nutrient	100	50	40					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-2.5	7.5					
~ cost per Ha	$255 fertilizer plus $38 lime plus shipping							

OM %	pH
5.4	6.26

Lime required (t/ha)
1

Table 4.12: Fertility Table for Cheticamp Pasture 4

4	N	P2O5	K2O	Ca	Mg	S	B	Zn
	kg/ha						ppm	
Nutrient Analysis	N/A	102	150	2196	502	16	0.54	2.49
Required Nutrient	100	75	40					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	7.5					
~ cost per Ha	$255 fertilizer plus $38 lime plus shipping							

OM %	pH
5.0	5.94

Lime required (t/ha)
1

Location of Wells and Water courses and Water Test Results

Location of wells and water access is outlined in Figure 4.1 and 4.2. Water is primarily supplied from a well on the inland side of the island near the handling corral. The water test reports did not indicate any levels that were not within acceptable levels.

Figure 4.5 Cheticamp well and watering system.

Description of Infrastructure

The Cheticamp Island Pasture Society has operated the Cheticamp Island Community Pasture for 4 years. They have been making on-going pasture fertility improvements and upgrades to the infrastructure such as the corral.

Figure 4.6 Cheticamp landscape views.

At the time of the site visit the cattle on the pasture were in good body condition. The pasture looked well grazed with no sign of excess accumulated grass. The good condition of the cattle and pasture indicate that with the current management and pasture conditions the stocking rate was well balanced.

There are limited fences on the island with one fence across the island with a Texas gate keeping the cattle in the pasture. There are single wire fences keeping the cattle away from the cliffs. The boundary fence is in good condition. The grazing land is around the outside of the island following the shoreline.

Figure 4.7 Cheticamp handling system.

Table 4.13: Cost of Infrastructure Improvement

Infrastructure Improvement	Cost per unit	Cost	Operational Impact
Additional watering site	Pipe $2.10/m 700m Waterer $550	$1,470.00 $550.00	Improved cattle performance; better grazing management.
Scale	$5,000.00	$5,000.00	Better cattle management.
Total		**$7,020.00**	

Summary Recommendations

Consideration should be given to making water available on the west side of the island. This could be accomplished by running a pipe on the surface of the ground across the island. Another option may be to see if there is a functional well at the light house that could be accessed. The only reliable water source in dry weather is the well and waterer on the east side. The cattle would perform better if they did not have to walk so far to access water. This would also make it possible to implement a rotational grazing program.

At the time of the site visit it was not possible to ascertain if a weigh scale was available on site. If one is not available this would be a recommended addition.

The land base that is being utilized currently is the best of the land available. Increases in the number of cattle grazed on the pasture will come from improved fertility. Intensification of the grazing management would only be possible with additional watering sites. If they were installed, it would be possible to subdivide the pasture and implement a basic rotational grazing program.

DIGBY COUNTY COMMUNITY PASTURE

LOCATION AND FIELD SIZE

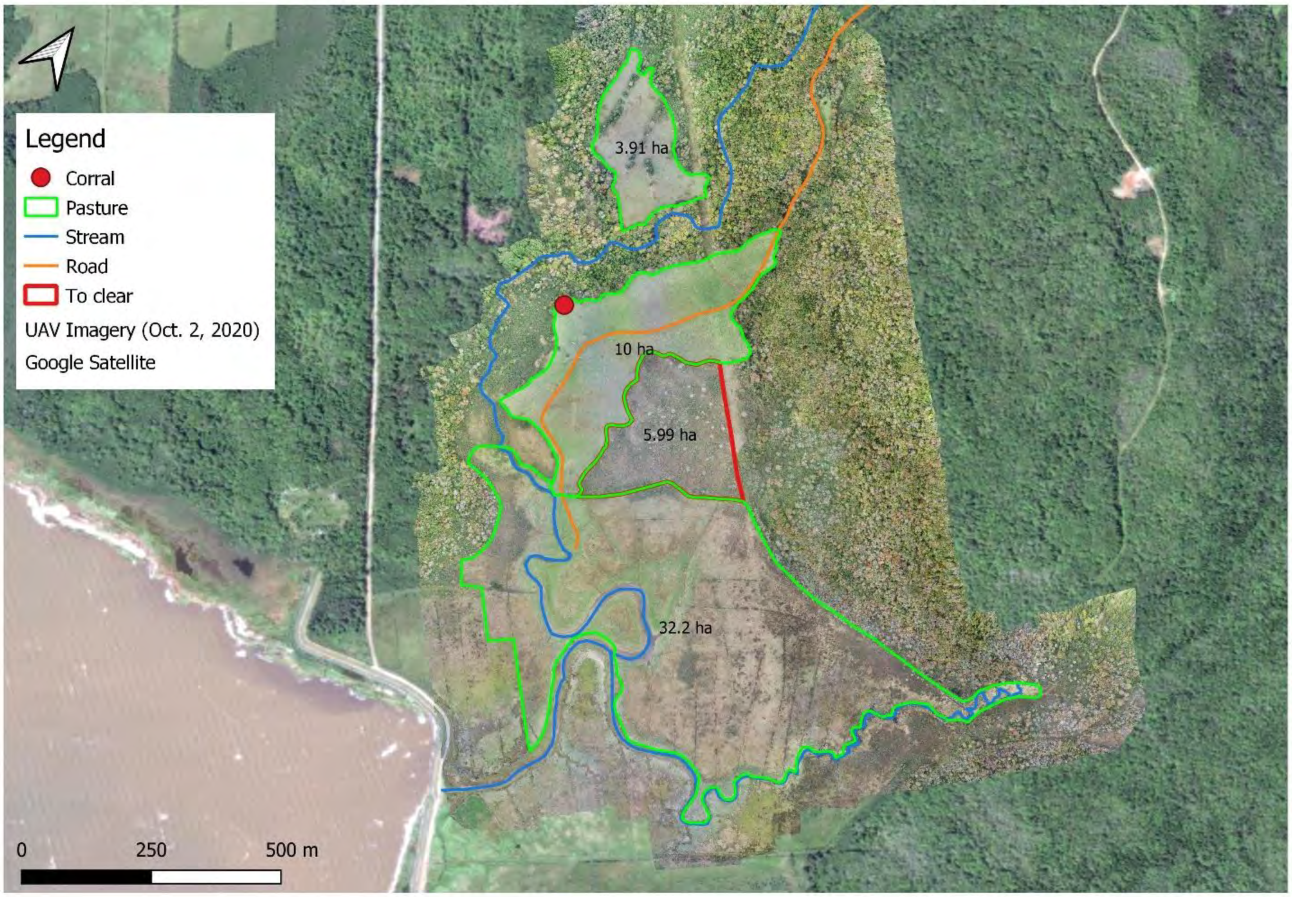


Figure 5.1 Digby County Community Pasture paddock size and location, with water sources.

Figure 5.2 Photo of a pasture currently being grazed (left) and the stream network (right).

ELEVATION

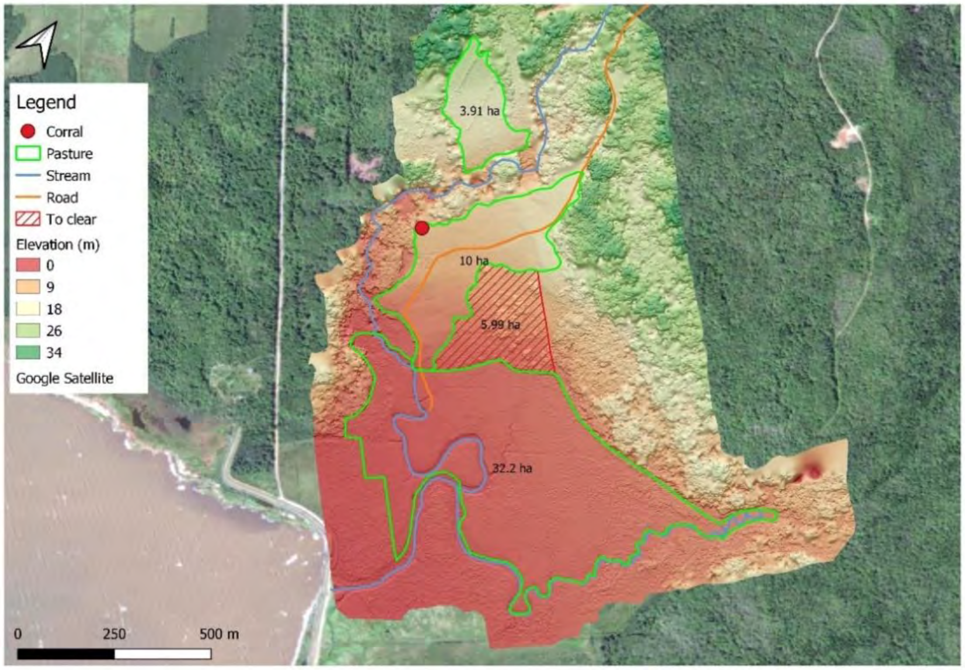


Figure 5.3 Digby County Pasture elevation 0 - 34 m, showing locations of water, corral and pastures.

SOIL SURVEY

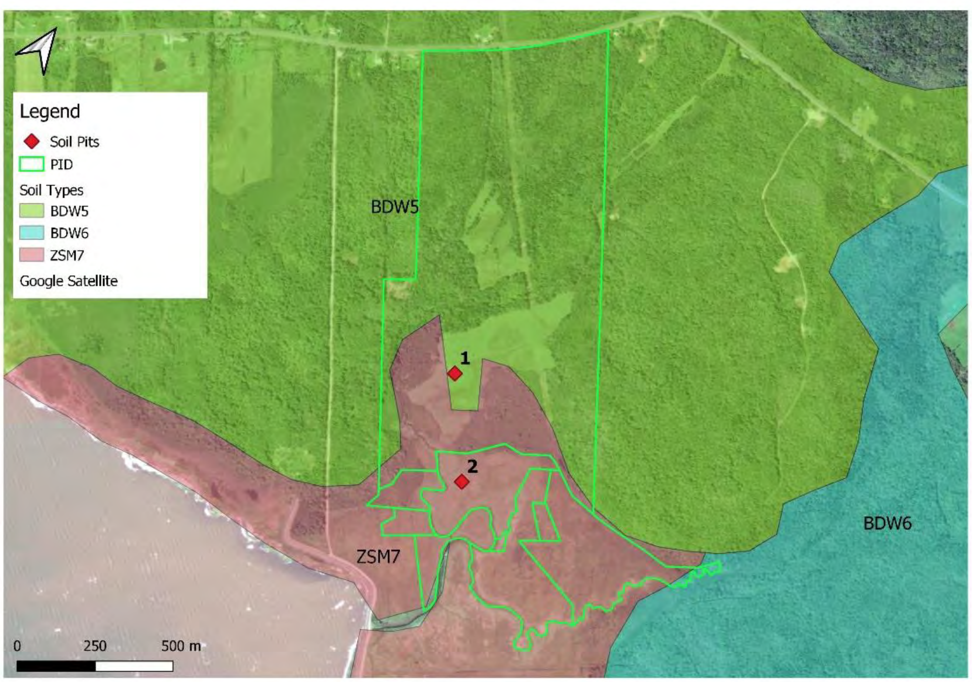


Figure 5.4 Digby Pasture soil survey data showing the area comprised mainly of Bridgewater (BDW).

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 5.4. According to the soil survey, the Digby community pasture is comprised of Bridgewater (BDW) soils and Salt Marsh (ZSM7). The following information is summarized from the soil descriptions found in the soil survey reports and CanSIS websites from both the archived soil survey reports as well as the soil name and layer data that corresponds. A quick summary and interpretation of the CanSIS data is provided in the adjacent text box.

Bridgewater (BDW) Soils

Topography ranges from gently undulating to rolling, the latter being the most common. Drainage, both external and internal, is fairly rapid, but occasional seepage spots occur where bedrock is near the surface.

Bridgewater soils in the coastal areas of Digby County have a relatively high organic matter content in the cultivated layer. In the cultivated soils, granular structure is well developed, particularly under sod. The subsoil is a fairly uniform yellowish brown and has a well-developed fine to medium crumb structure in the upper B horizon. The lower B horizon is usually yellowish brown in color and loam to sandy loam in texture. In areas where the slate-derived parent materials are nearly pure, the lower B horizon may have an olive or olive-gray color. This horizon grades into a light olive gray to yellowish-brown parent material. Fragments of soft, weathered slate occur in the parent material and are usually present to a lesser degree throughout the solum.

BRIDGEWATER SOIL

Although Bridgewater soils can be quite productive, according to the soil survey data, the modifier 5 and 6 indicate gleyed features. Our analysis of pit one did not reveal any gleyed features in Pit 1 in comparison to what the soils survey report suggests. The salt marsh was of course very gleyed at depth and had an increase electrical conductivity (salt) content. The surface of the marsh was an accumulation of organic matter. In some areas organic soils or “muck” soils are used for vegetable production. However, the cost to remediate the salinity and drain these soils would be prohibitive.

Agriculture utilization on the Bridgewater series is largely confined to the smooth rolling ridges south and southwest of the Town of Digby. Some areas are relatively stone-free but other, larger areas have a considerable amount of stone, both on the surface and throughout the solum. Hay and grain are the principal crops grown on the Bridgewater soils, but some acreage south of the town can produce vegetable crops when well managed.

Bridgewater BDW5

BDW5 soils are classified as Gleyed Humo-Ferric Podzols. The growth of plant roots is restricted by the third layer which is the C horizon and is a compact basal till. The water table is always present in the soil. These soils are imperfectly drained. Water is removed from the soil sufficiently slowly in relation to supply, to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is the major supply. If subsurface water or groundwater, or both, is the main source, the flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups.

Table 5.1: Generalized description of BDW5 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		Sandy Loam
0-5	Aegj	5	Sandy Loam
5-50	Bfgj	10	Sandy Loam
50-100	C	10	Sandy Loam

Bridgewater BDW6

The BDW6 soils are classified as an Orthic Gleysol. The growth of plant roots is restricted by the third layer which is the C horizon and is a compact basal till. The water table is always present in the soil. These soils are poorly drained. Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Table 5.2: Generalized description of BDW6 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		Sandy Loam
0-5	Aeg	5	Sandy Loam
5-50	Bg	10	Sandy Loam
50-100	Cg	10	Sandy Loam

ZSM7

The salt marsh at Digby comprised a significant proportion of the Digby pasture. Salt marshes consist of gray silty clay loam marine sediments distributed in spots along the coastline of Nova Scotia. These marine sediments are deposited, reworked, and flooded by tidal waters. Salt marshes are stone free and are partially stabilized by salt-tolerant plants such as sand spurry, glasswort, sea-blite, sea-rocket, and salt grass. The deposits are saline and mostly alkaline in reaction, but compacted peat and dense old sediments rich in organic matter are extremely acid where sea water has been unable to penetrate. The peat bodies and acid sediments were laid down during periods of low sea level. Salt marshes are very poorly drained and are nonstony and nonrocky.

In-Field Soil Pit Analysis

Table 5.4: In Field Soil Analysis Pit 1

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	A	Dark Reddish brown (5 YR 3/3d); loamy sand; single grained, fine and medium structure; loose; non-plastic; fine and medium, abundant roots; clear smooth horizon.
	15-70 cm	Bf	Dark Red (2.5YR) 3/6; weak, single grain to fine granular structure, loose, non-plastic, plentiful very fine and medium roots, gradual smooth horizon.
	70+	C	Red (5 YR 4/6) sand; weak single grained structure, loose, non-plastic

Table 5.5: In Field Soil Analysis Pit 2

PHOTO	DEPTH	DESCRIPTION
	0-100 cm	The upper layers of the salt marsh are layers of organic matter at various stages of decomposition. Lower in the profile is a gray material of loamy clay texture and is generally dense, massive, and virtually impermeable and contains more organic matter. The smell of hydrogen sulfide was strong indicating some layers with a high organic matter content that have pH values so low that sulfates are reduced to sulfides.

Soil Test Results and Fertility Recommendations

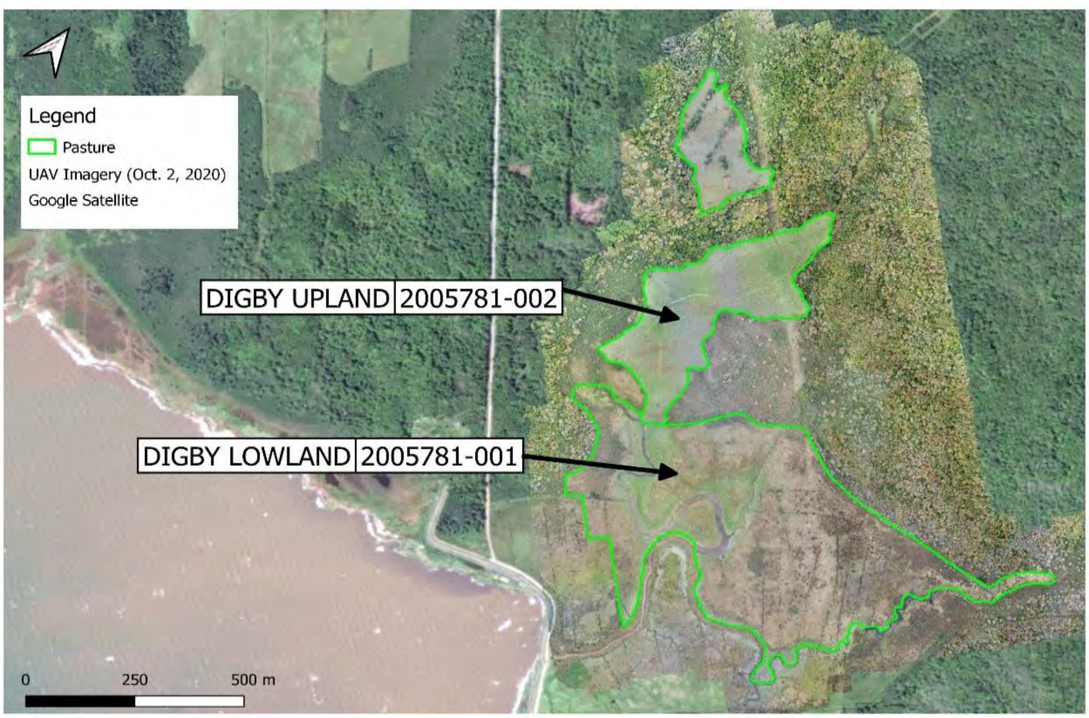


Figure 5.5 Digby Pasture soil sampling areas

Table 5.6: Fertility for the Digby low-land (salt marsh) area

Digby Low-land	N	P2O5	K2O	Ca	Mg	S	B	Zn
	------- kg/ha						-----ppm----	
Nutrient Analysis	N/A	87	298	1564	850	277	2.14	3.21
Required Nutrient	100	75	20					
Fertilizer 1								
Fertilizer 2								
Balance								
~ cost per Ha	No fertilizer recommended							

OM %	pH
11.4	5.08

Lime required (t/ha)
6

Table 5.7: Fertility for the Digby Upland

Digby Upland	N	P2O5	K2O	Ca	Mg	S	B	Zn
	------- kg/ha						-----ppm----	
Nutrient Analysis	N/A	68	237	2372	419	31	<0.5	1.16
Required Nutrient	100	75	20					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	27.5					
~ cost per Ha	$255 fertilizer plus $152 lime plus shipping							

OM %	pH
8.7	5.83

Lime required (t/ha)
4

Location of Wells and Water courses and Water Test Results

The location of water sources is indicated in Figures 5.1 and 5.2.

Figure 5.6 Stream access in the pasture showing areas of bank erosion caused by cattle.

Description of Infrastructure

The Digby County Community Pasture is operated by Digby Cooperative Pastures Limited. The work is done primarily by volunteers with limited paid labour.

At the time of the site visit there were still some cattle on the pasture and the cattle were in good body condition. The pasture was well grazed with limited excess grass. There was significant evidence of sweet/smooth rush all over the pasture. (Based on a previous visit several years ago, it appears that this was not as prevalent this season). This is probably contributing to reduced productivity.

Water samples collected did indicate that the water was acceptable for livestock consumption. The only water on the site is surface water, a steam running the length of the property and ponds. There was some evidence of stream bank damage from the cattle and limited access for vehicles across the stream.

The infrastructure: fences and corral are well maintained and functional. There is no squeeze/head gate or scale.

Figure 5.7 Digby cattle handling system

There is an area in the upland that is grown in with alders, that is approximately 6 ha. If this was cleared it would provide more accessible and productive land for grazing. This would potentially allow an additional 8 to 10 head to graze on the pasture.

Figure 5.8 Alders growing in a potentially productive area of the pasture.

The 3.9 ha field in the woods is not accessible by tractor because of the stream, this limits the opportunity to manage the land effectively and spread fertilizer.

Summary Recommendations

Recommendations:

Clearing the upland area covered with alders and other brush would allow an additional 10 head to graze the pasture. These additional cattle would improve the pasture income. Additional grazing pressure may help to control the rush problem.

Improving the soil fertility and the growth of the forage stand may help to reduce the rush infestation.

Consideration to limiting access to the stream bank and ponds should be considered. This would require fencing and installation of limited access points for the cattle for remote water sites. This would limit stream bank erosion and potential environmental contamination by the cattle. Better crossing should be installed to access both the marshland from the upland and cross the stream to the field in the woods.

If this is not possible consideration should be given to placing logs on the ground along the stream bank where there is bank damage to discourage the cattle from accessing these areas. The corral is well maintained and functional, consideration should be given to the purchase and installation of a squeeze, head gate and scales. This would improve the ability to manage the cattle safely and effectively. It would also allow the producers to track the performance of their cattle.

Fencing the stream and installation of a fence along the margin of the upland and the marsh land would provide the ability to start an effective rotational grazing program. This would allow better grazing management and a higher stocking rate.

Table 5.8: Cost of Infrastructure Improvement

Infrastructure Improvement	Cost per unit	Total Cost	Operational Impact
Squeeze/head gate and scale	Squeeze/head gate; $4,000.00 Scale; $5,000.00	$ 9,000.00	Improved safety and cattle management.
Land Clearing *	$2,000.00/ha	$12,000.00	Increased area to graze, increased number of cattle.
Fencing to limit access	1000 m, $231/100m	$ 2,310.00	Reduced environmental impact and improved cattle performance.
Battery fencer unit	$600.00	$ 600.00	
Crossings x 2	$2,000.00	$ 4,000.00	Reduced environment risk.
Total		**$28,810.00**	

*this is a rough estimate and would vary depending on the equipment used and would not include improvement of fertility. It would probably not be effective to clear the land without improving the pH and fertility.

LITTLE HARBOUR COMMUNITY PASTURE

Location and field size

Figure 6.1 Little Harbour Community Pasture paddock size and location, with water sources.

Figure 6.2 Landscape shots of Little Harbour Pasture

Elevation

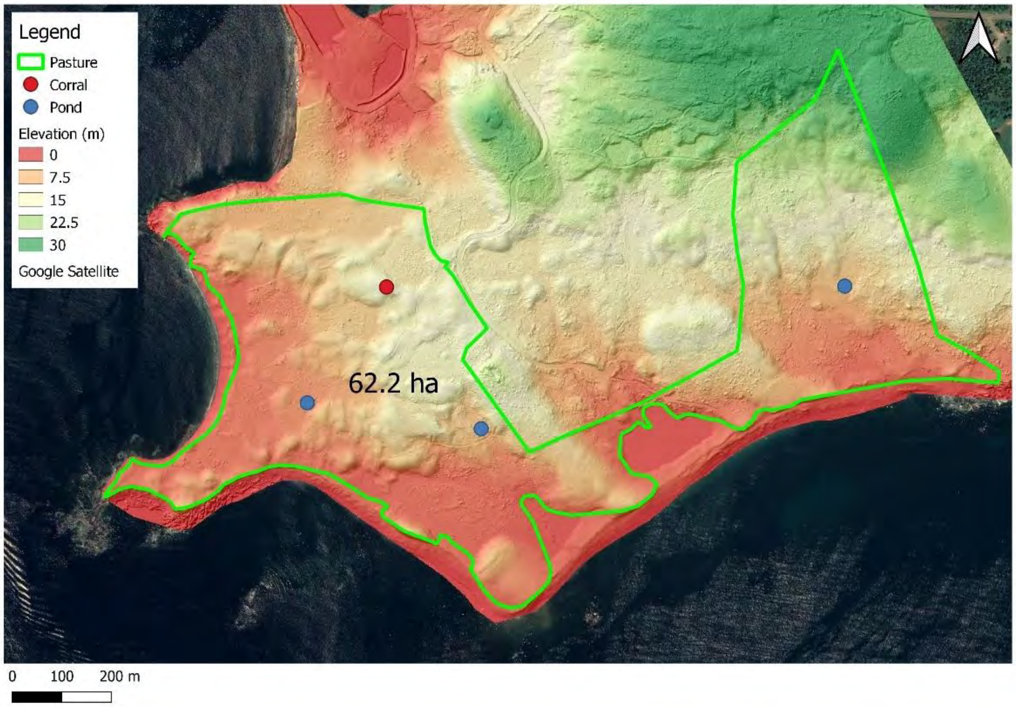


Figure 6.3 Little Harbour Pasture elevation 0 - 30 m, showing locations of water, corral and pastures.

Soil Survey

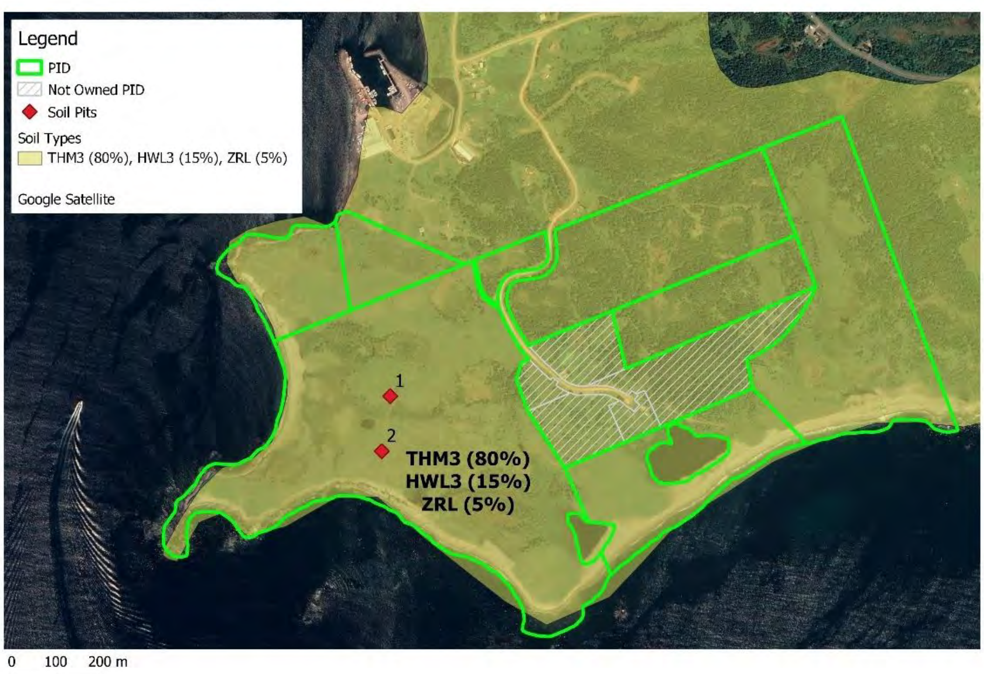


Figure 6.4 Little Harbour soil survey data showing the area comprised mainly of Thom (THM).

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 6.4 above. According to the soil survey, the soil of the Little Harbour Community Pasture is THOM (THM) with inclusions of Hopewell (HWL) soils. A full description of the THM3 soils and the HWL3 soils can be found in the Mabou community pasture sections as they have the same soil type according to the soil survey.

In-Field Soil Pit Analysis

Table 6.1: In Field Soil Pit Analysis 1

Photo	Depth	Horizon	Description
	0-12 cm	Ap	Dark Brown (10 YR 3/3); sandy loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; clear wavy horizon boundary; 10% gravels, and cobbles.
	12-15 cm	Ae	Greyish Brown (10 YR 5/2d) sandy loam; weak; fine granular structure; loose; non plastic; plentiful fine and medium roots; clear wavy horizon boundary; 10% gravels, and cobbles.
	15+60	Bm	Dark brown (7.5 Y/R 4/4d); sandy loam; weak; fine granular structure; loose; non plastic; few; fine and medium roots; gradual, wavy horizon boundary; 20% gravels, and cobbles.
	60+	c	Yellowish Brown (10 YR 5/4d); sandy loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; 30% gravels, and cobbles.

Table 6.2: In Field Soil Pit Analysis 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Dark Brown (10 YR 3/3); sandy loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; clear wavy horizon boundary; 10% gravels, and cobbles.
	15-60 cm	Bm	Dark brown (7.5 Y/R 4/4d); sandy loam; weak; fine granular structure; loose; non plastic; few; fine and medium roots; gradual, wavy horizon boundary; 20% gravels, and cobbles.
	60+	c	Yellowish Brown (10 YR 5/4d); sandy loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; 30% gravels, and cobbles.

Soil Test Results and Fertility Recommendations

Figure 6.5 Little Harbour Pasture soil sampling areas

Table 6.3: Fertility of the Land Side sample area

Land Side	N	P2O5	K2O	Ca	Mg	S	B	Zn
	kg/ha						ppm	
Nutrient Analysis	N/A	66	190	2216	562	22	<0.5	2.31
Required Nutrient	100	75	30					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	17.5					
~ cost per Ha	$255 fertilizer and $380* lime plus shipping							

*should be put on over two years

OM %	pH
13.7	5.08

Lime required (t/ha)
10

Table 6.4: Fertility of the Sea Side sample area

Sea Side	N	P2O5	K2O	Ca	Mg	S	B	Zn
	kg/ha						ppm	
Nutrient Analysis	N/A	30	120	863	327	28	2.08	1.04
Required Nutrient	100	75	50					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	7.5					
~ cost per Ha	$255 fertilizer and $266* lime plus shipping							

*should be put on over two years

OM %	pH
8.9	5.29

Lime required (t/ha)
7

Location of Wells and Water courses and Water Test Results

Water is available from several ponds on the site, sampling indicted that the water was acceptable for livestock consumption. The cattle have direct access to the ponds.

Figure 6.6 One of the ponds at the Little Harbour site.

Description of Infrastructure

Little Harbour Community Pasture is operated by the Little Harbour Pasture Co-operative Limited. Previous reports indicted a larger grazing area than we identified. Our estimate is the usable pasture area is around 43 ha, significantly less than previous estimates. This is probably the most remote of all the pastures in terms of its proximity to other major agricultural areas. It provides an invaluable resource for the local producers who utilize it.

The pasture infrastructure is well maintained, fences and the corral system are in good condition and appropriate for the number of cattle on the pasture. They lack a squeeze/head gate and scale to handle and weigh the cattle safely and effectively.

Figure 6.7 The handling system at Little Harbour

At the time of the site visit there were cattle on the pasture, and they all appeared to be in good body condition. The grass looked well grazed and there was no evidence of excess grass. This indicated that the stocking rate was appropriate for the existing conditions.

Summary Recommendations

This is a very rough site with lots of rock out crops in the pasture. The Co-op members are doing a good job managing the pasture with the resources that they have.

Consideration should be given to fencing the ponds to limit the access of the cattle and to the installation of remote solar watering systems. This would improve the water quality for the cattle and reduce potential environmental risks.

The handling corrals should have a squeeze or shoot and head gate with a scale available to the producers. This would make handling the cattle safer for both the producer and the cattle.

It would also allow the producers to perform additional management of the cattle improving the return on the cattle to the producer.

Table 6.5: Cost of Infrastructure Improvement

Infrastructure Improvement	Cost per unit	Total Cost	Operational Impact
Fencing surface ponds to limit cattle access	Fence: $392 per 100 m x 2 ponds	$ 784.00	Improved water quality and reduced environmental impact.
Installation of remote solar surface water pumps and watering tubs	$1,500.00 per pond *	$3,500.00	Improved water quality for cattle.
Squeeze/head gate and scale	Squeeze/head gate; $4,000.00 Scale; $ 5,000.00	$9,000.00	Improved safety and cattle management.
Total		**$13,284.00**	

MANCHESTER COMMUNITY PASTURE

Location and field size

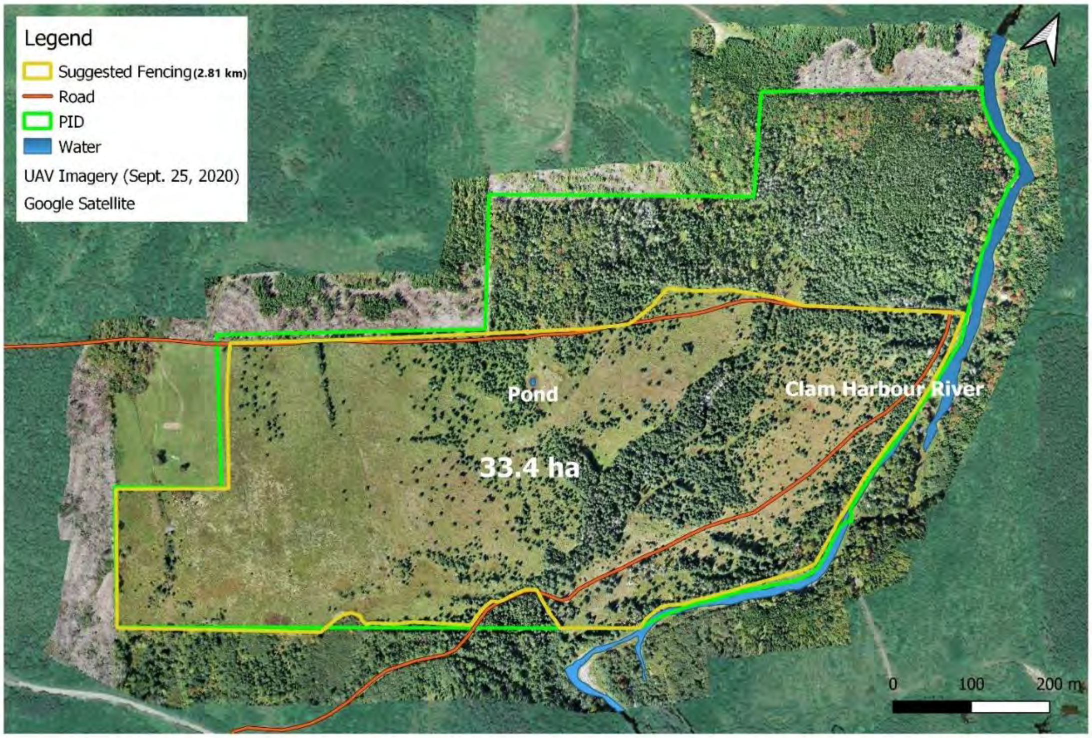


Figure 7.1 Manchester Community Pasture paddock size and location, with water sources.

Figure 7.2 Landscape shot of Manchester interval land along the river (left) and looking south-west (right) towards the main road.

ELEVATION

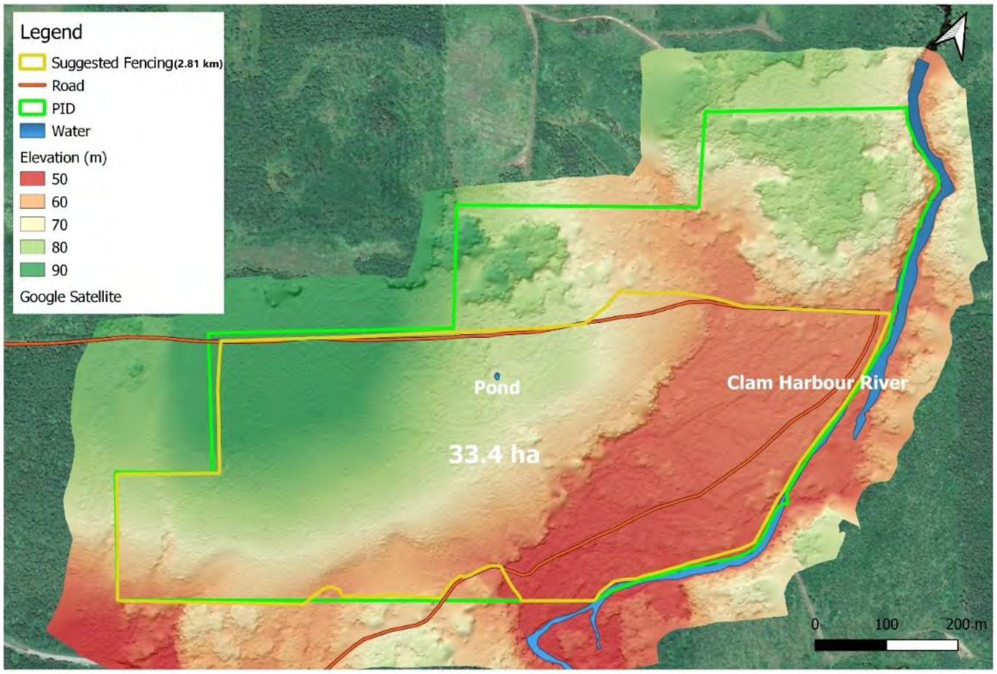


Figure 7.3 Manchester Pasture elevation 50 - 90 m, showing locations of water, corral and pastures.

SOIL SURVEY

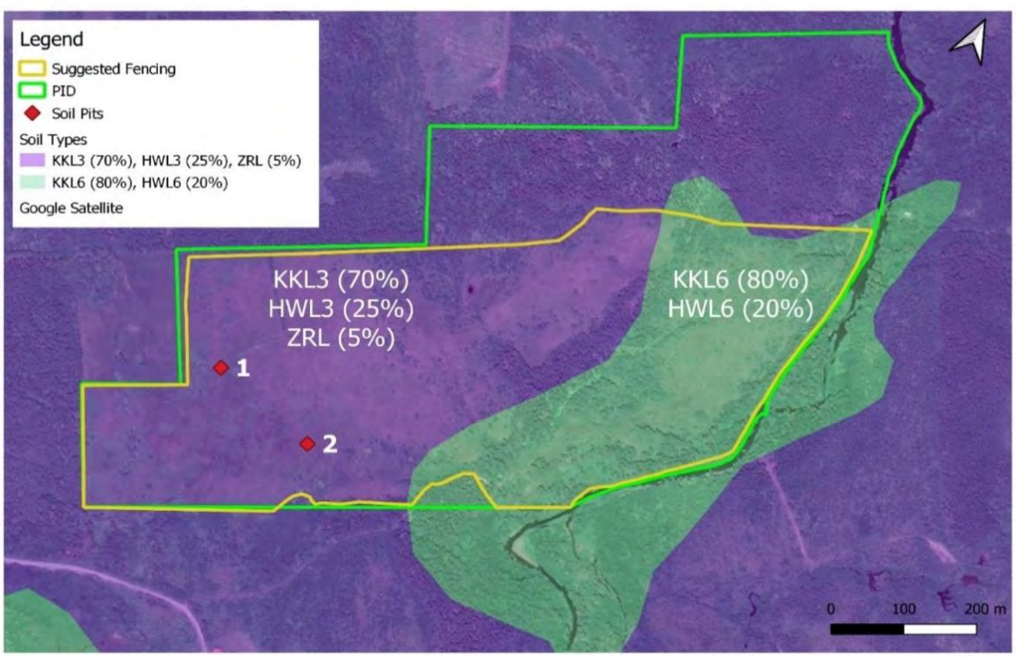


Figure 7.4 Manchester soil survey showing the area is dominated by the Kirkhill soil type.

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 7.4 above. According to the soil survey, the majority of the soil of the Manchester community pasture is Kirkhill (KKL) with inclusions of Hopewell (HWL) soils. A full description of the Hopewell 3 (HWL3) soils is found in the Mabou community pasture section so only HWL6 will be included here. The following information on the Kirkland soil is summarized from the soil descriptions found in the soil survey reports and CanSIS websites from both the archived soil survey reports as well as the soil name and layer data that corresponds with V3.1 of the soil survey data.

Kirkhill KKL3

The KKL3 soils are classified as an Orthic Humo-Ferric Podzol. The water table is present in the soil during the non-growing season. Plant growth is restricted by the fourth layer which is the C horizon and is a compact basal till. These soils are well drained. Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations, but additions are equaled by losses.

Table 7.1: Generalized description of KKL3 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-5	Ae	25	Loam
5-70	Bf	25	Loam
70-100	C	30	Sandy Loam

Kirkhill KKL6

The KKL6 soils are classified as an Orthic Gleysol. The growth of plant roots is limited by the fourth layer which is the C horizon and is a compact basil till. The water table is always present in the soil and these soils are poorly drained. Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Table 7.2: Generalized description of KKL6 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-5	Aeg	25	Loam
5-70	Bg	25	Loam
70-100	Cg	30	Sandy Loam

Hopewell (HWL6)

The HWL6 soils are classified as an Orthic Gleysol. The growth of plant roots is restricted by a layer of consolidated bedrock under the C horizon. The water table is always present in the soil. These soils are poorly drained. Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Table 7.3: Generalized description of HWL6 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
-7-0	LFH		
0-15	Aeg	2o	Loam
15-55	Bg	30	Loam
55-70	Cg	40	Sandy Loam
70-100	R		

ZRL- ROCKLAND

In-Field Soil Pit Analysis

Table 7.3: In Field Soil Assessment Soil Pit 1

Photo	Depth	Horizon	Description
	0-12 cm	Ap	Dark Brown (10 YR 3/3); sandy loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; clear smooth horizon boundary; 10% gravels, and cobbles.
	12-65 cm	Bf	Dark yellowish brown (10 YR 4/4d); sandy loam; weak; fine granular structure; loose; non plastic; few fine roots; clear wavy horizon boundary; 10% grav-els, and cobbles.
	65+ cm	c	Dark brown (7.5 Y/R 4/4d); sandy loam; weak; fine granular structure; loose; non plastic; few; fine and medium roots; gradual, wavy horizon boundary; 20% shale gravels, and cobbles.

Soil Test Results and Fertility Recommendations

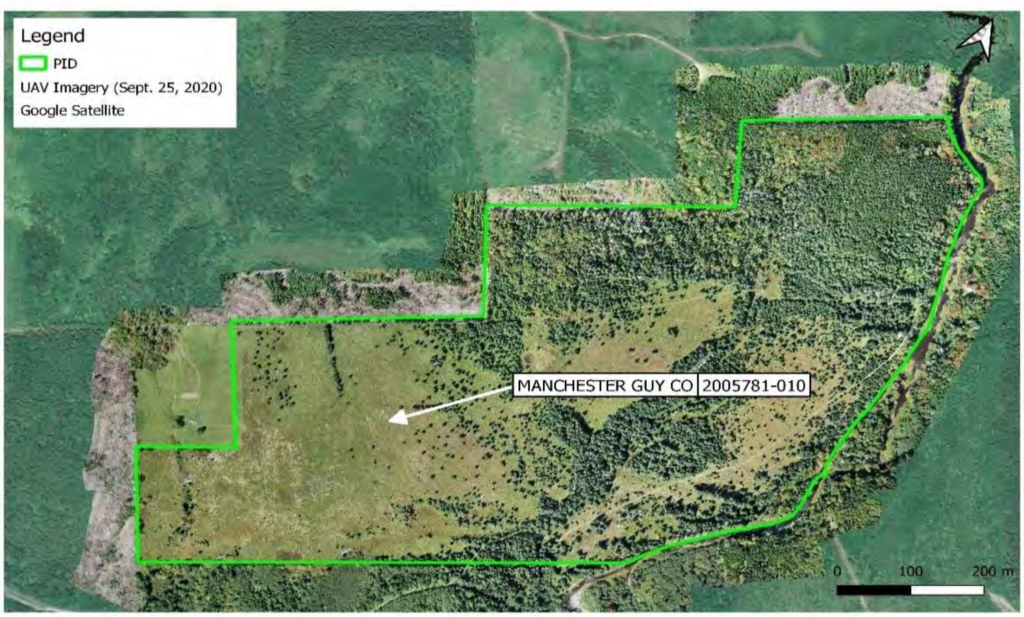


Figure 7.5 Manchester soil sampling area

Table 7.4: Fertility table for Manchester Community Pasture

Past Westside Pit One	N	P2O5	K2O	Ca	Mg	S	B	Zn
	------------------ kg/ha						-----ppm----	
Nutrient Analysis	N/A	48	150	1325	372	20	<0.5	1.69
Required Nutrient	100	75	40					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	7.5					
~ cost per Ha	$255 fertilizer and $114 lime plus shipping							

OM %	pH
7.9	6.03

Lime required (t/ha)
3

Location of Wells and Water courses and Water Test Results

Water is only available on the North East side of the property from the Clam Harbour River. Water tests indicate the water quality is acceptable for cattle. The location of the river as a water source would limit the ability to manage the grazing of cattle on the property without provision of other watering sites at additional cost.

Figure 7.6 A pond on the site

Description of Infrastructure

The Manchester pasture is the only pasture that is not being utilized. There is no usable infrastructure on the property. Fences and corrals do not exist and if the property were to be developed these would need to be installed. There are two access points to the property both of which require traveling over lands that are not part of the community pasture. The best road goes through a private lawn and the other wood road would require significant upgrading to ensure access by cattle trailer in all weather. Approximately 500 m of road would require upgrading to ensure access to the pasture.

Fencing the property would require almost 3 km of fence with a minimum investment of $4000.00 for materials and basic labour for installation. This is deceiving, because there would be additional work required to clear and prepare the path of the fence which would probably exceed the actual cost of the fence. In addition to the fence there would be a minimum requirement for a handling corral and equipment which would be an additional $10,000 to $15,000.

If the property were fenced and developed it would take several years of careful grazing to improve the forage quality and graze out the weeds that have taken over the land. During this process, the performance of the cattle would not be optimum.

Summary Recommendations

Redevelopment of this property as a community pasture seems impractical. The investment in infrastructure would exceed any potential return from the number of cattle which could be grazed on the property.

MAPLE BROOK COMMUNITY PASTURE

LOCATION AND FIELD SIZE

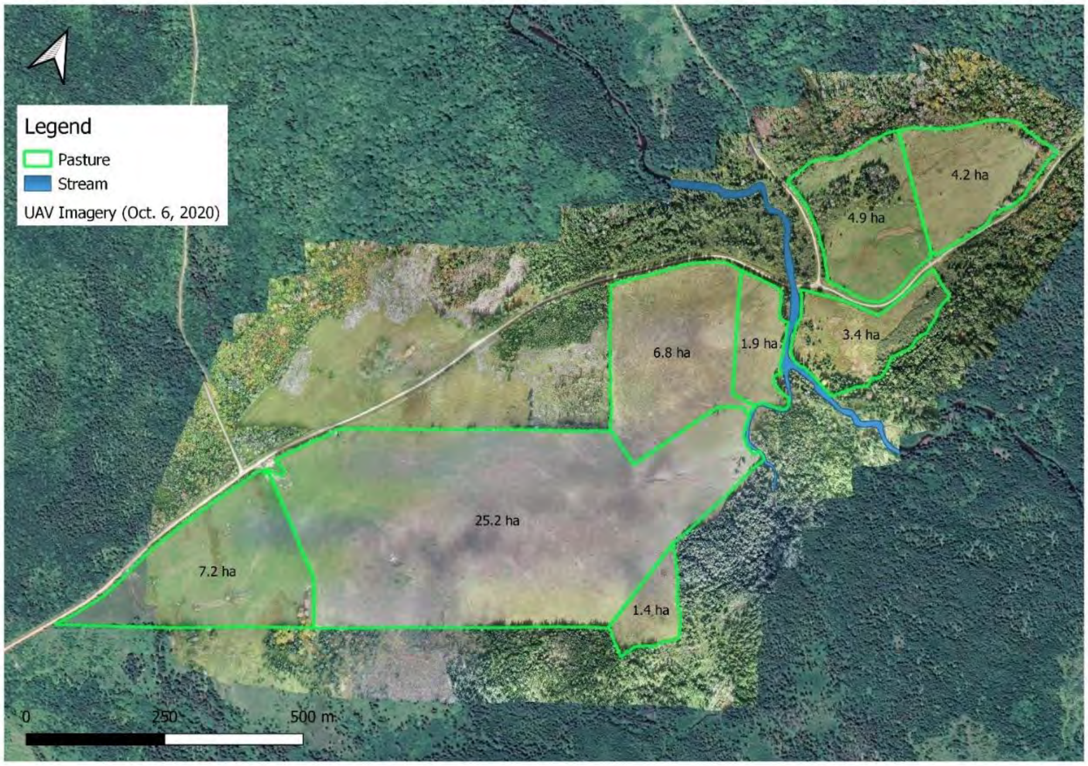


Figure 8.1 Maple Brook Community Pasture paddock size and location.

Figure 8.2 Landscape shot of Maple Brook pasture.

Elevation

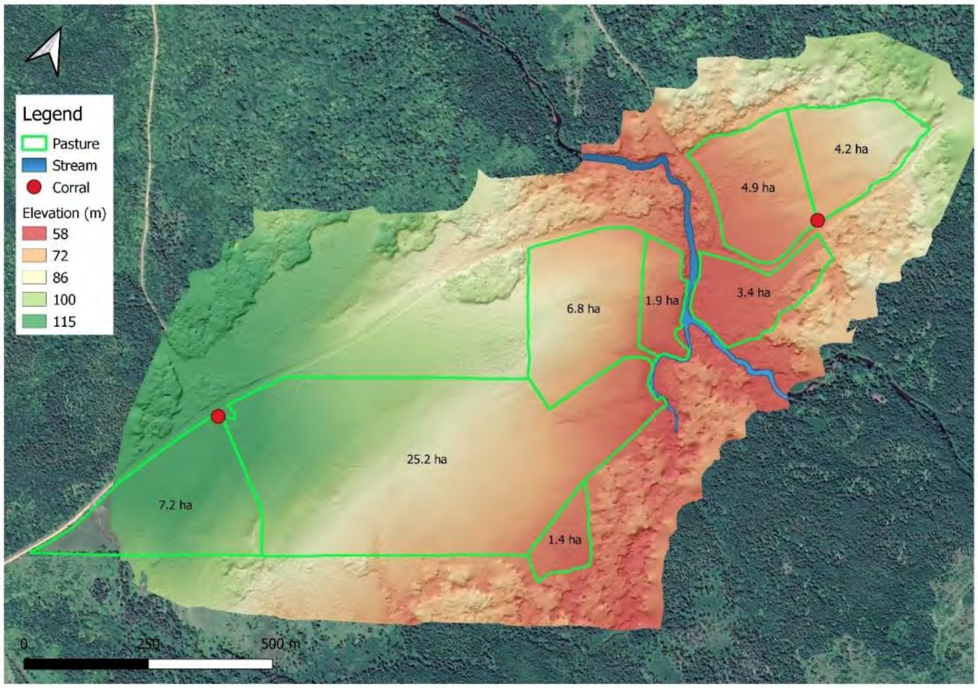


Figure 8.3 Maple Brook elevation 58 - 115 m, showing locations of water, corral and pastures.

Soil Survey

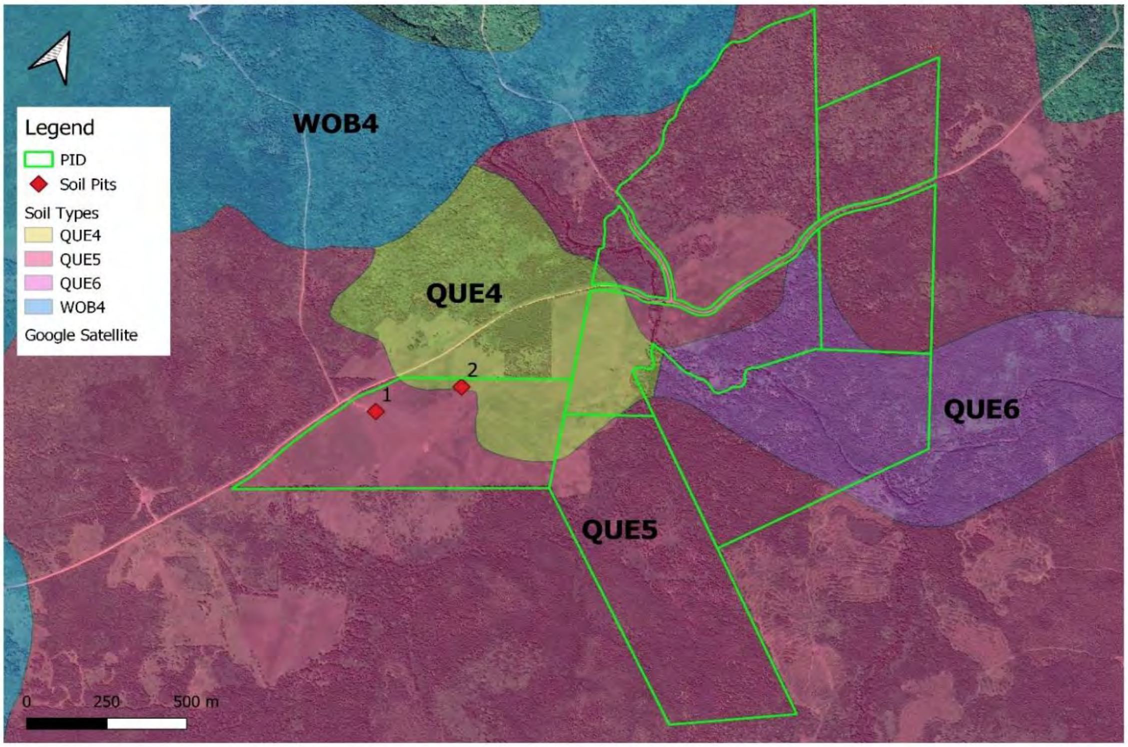


Figure 8.4 Maple Brook soil survey showing the area is dominated by the Queens soil type.

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 8.4. According to the soil survey, the majority of the soil of the Maple Brook community pasture is Queens (QUE) with inclusions of subsoils. A full description of the Queens 5 and 6 soils is found in the Cape John pasture section and will not be included here. The following information is summarized from the soil description of the Queens 4 soil found in the soil survey reports and CanSIS websites from both the archived soil survey reports as well as the soil name and layer. A quick summary and interpretation of the CanSIS data is provided in the adjacent text box.

QUE4

The Queens 4 soils have a 5 cm increase in depth to the C horizon in comparison to the QUE5 soils but are not as deep as the QUE6 soils. Since the texture of all the horizons is the same, the real difference between these soils in the water status.

The QUE4 soils are classified as a Gleyed Brunisolic Gray Luvisol. The growth of the plant roots is restricted by the third layer which is a compact basal till. The water table is always present in these soils and they are moderately well drained. Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6 cm) within the control section and are usually medium to fine textured. Precipitation is the dominant water

QUEENS SOIL

Queens 4 soils remain wet though the growing season. Queens soils with Modifiers of 4, 5, and 6 have varying degrees of depth and wetness. These soils typically have a Bt horizon, A horizon that has a higher percentage of clay, and that in turn impedes root growth. With fertility and liming these soils can be productive but the best use for this site is likely pasture. These soils are very low in pH and the lime should be applied over the course of 2-3 years.

source in medium to fine textured soils; precipitation and significant additions by subsurface flow are necessary in coarse textured soils.

Table 8.1: Generalized description of QUE4 horizons

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Loam
15-40	Bm	10	Loam
40-65	Bt	10	Loam
65-100	C	10	Clay Loam

In-Field Soil Pit Analysis

Table 8.2: In Field Soil Assessment Soil Pit 1

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Dark Brown (7.5 YR ¾); loam; weak; fine and course granular structure; loose; non plastic; abundant fine and medium roots; clear smooth horizon boundary.
	15-60 cm	Bfgj	Dark brown (7.5 YR 4/4d); loam; moderate; medium to course granular structure; loose; plastic; few fine roots; clear wavy horizon boundary.
	60+	c	Dark brown (7.5 Y/R 4/4d); clay loam; strong; course platy and medium to course subangular blocky structure; firm; plastic.

Table 8.3: In Field Soil Assessment Soil Pit 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Dark Brown (7.5 YR 5/2); loam; weak; fine and course granular structure; loose; non plastic; abundant fine and medium roots; clear smooth horizon boundary.
	15-60 cm	Btg	Brown (7.5 YR 4/4d); clay loam; strong; massive structure; firm; plastic; few medium and fine roots; clear wavy horizon boundary; many prominent fine and medium, strong brown (5YR 5/8) mottles; gradual, wavy horizon boundary.
	60+	cg	Reddish brown (5 Y/R 4/3d); clay loam; strong; course angular blocky structure; very firm; plastic.

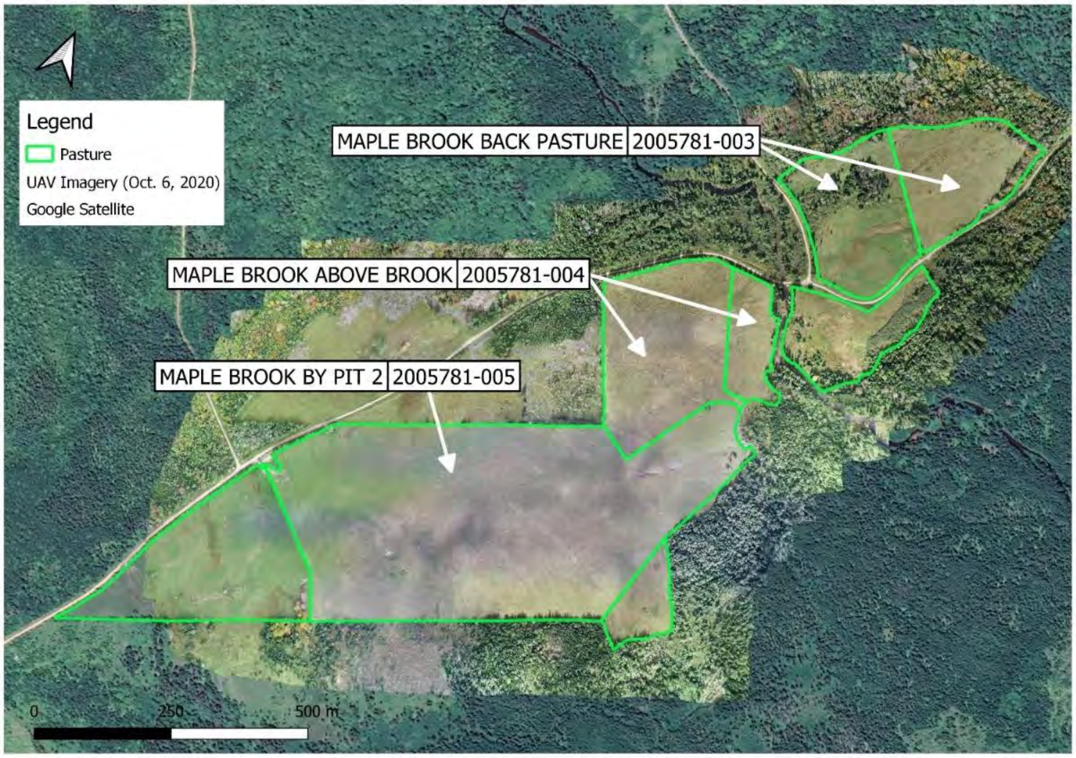


Figure 8.5 Maple Brook soil sampling areas.

Table 8.4: Fertility table for Maple Brook Back Pasture

Back Pasture	N	P2O5	K2O	Ca	Mg	S	B	Zn
	------------------------------ kg/ha				-------------------------		-----ppm----	
Nutrient Analysis	N/A	38	212	2592	703	2o	<0.5	2.92
Required Nutrient	100	75	25					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	22.5					
~ cost per Ha	$255 fertilizer and $342* lime plus shipping							

*should be applied over two years

OM %	pH
7.2	5.17

Lime required (t/ha)
9

Table 8.5: Fertility table for Maple Brook, above Brook

Above Brook	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha				-------------------------		-----ppm----	
Nutrient Analysis	N/A	44	202	2610	717	21	<0.5	1.53
Required Nutrient	100	75	25					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	22.5					
~ cost per Ha	$255 fertilizer and $304* lime plus shipping							

OM %	pH
7.7	5.42

Lime required (t/ha)
8

*should be applied over two years

Table 8.6: Fertility table for Maple Brook by Pit

By Pit	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha				-------------------------		-----ppm----	
Nutrient Analysis	N/A	89	308	2879	887	24	<0.5	1.64
Required Nutrient	100	75	20					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	27.5					
~ cost per Ha	$255 fertilizer and $304* lime plus shipping							

OM %	pH
8.7	5.43

Lime required (t/ha)
8

*should be applied over two years

Location of Wells and Water courses and Water Test Results

The water sample from the brook indicated the water was acceptable for livestock consumption. On a previous visit to the site it was noted that there was a surface pond halfway up the hill that on this visit was dry.

Description of Infrastructure

Maple Brook Community Pasture is operated by the Maple Brook Co-operative Pastures Ltd. Over the last couple of years, they have become more active. The infrastructure is in reasonable condition. The fences are in good repair and the handling corrals are functional but limited. The corrals would require upgrading if significantly more cattle were pastured on the site.
At the time of the site visit there were cattle on the pasture and the cattle were in good body condition. There were signs that not all the grass available had been effectively grazed. This is probably a function of both stocking density and grazing management. The grazing management on this site is complicated by the location of the primary water source at the bottom of the hill and the pasture primarily extending uphill from there. The cattle will tend to graze near the water source, venturing further away as they consume the available forage nearest the water.

Although this site is without power, there is good road access to the whole pasture and there is power near the pasture. It is also quite close to Highway 105 making it one of the most accessible of the community pastures.

There is land to the north of the existing pasture on the same side of the access road that is not part of the pasture that at one time was fenced into the pasture that would have provided an additional 6 ha of grazable land (approximately).

Figure 8.6 Maple Brook handling facilities

Summary Recommendations

Maple Brook has the potential to increase the number of cattle grazed. This should be done progressively over several years. To achieve this infrastructure improvements should be included as well as improvements to fertility.

Consideration should be given to subdividing the hill on the west side of the pasture (the main pasture) into at least two grazing blocks. This would require an additional fence across the pasture and development of a water source for these pasture blocks. This would have to be a surface pond (given the site limitations) and it should be fenced to exclude the cattle with water being pumped from the pond, either by a solar system or gravity. Ideally this 25.2 ha plot could be divided into three paddocks and this would provide more intensive grazing options. This however would require more water sources. Existing ponds and water sources should be improved and fenced to exclude cattle to ensure the water quality is optimized and to reduce environmental concerns.

The handling corrals should be upgraded and have a squeeze or shoot with a head gate and a scale available to the producers. This would make handling the cattle safer for both the producer and the cattle. It would also allow the producers to perform additional management of the cattle improving the return on the cattle to the producer.

Table 8.7: Cost of Infrastructure Improvement.

Infrastructure Improvement	Cost per unit	Total Cost	Operational Impact
Pond Development	$1,000.00	$ 1,000.00	Access to water/ improved grazing management.
Fencing surface ponds to limit cattle access	Fence: $392 per 100 m x 2 ponds	$ 784.00	Improved water quality and reduced environmental impact.
Fencing: Cross fence: **Brook fence**	450m x $392/100m 200m x $360/100m	$ 1,764.00 $ 720.00	Improved grazing management Improved water quality and reduced environmental impact.
Installation of remote solar surface water pumps and watering tubs	$1,500.00 per pond *	$ 3,500.00	Improved water quality for cattle and reduced environmental impact.
Corral Upgrades	$2,000.00	$ 2,000.00	Improved safety and cattle management.
Squeeze/head gate and scale	Squeeze/head gate; $4,000.00 Scale; $5,000.00	$ 9,000.00	Improved safety and cattle management.
Total		**$18,768.00**	

*Cost based on purchasing water system components separately and building system their self. This site also lends itself to gravity fed water, which would require less investment and maintenance.

MINUDIE COMMUNITY PASTURE

LOCATION AND FIELD SIZE

Figure 9.1 Minudie Community Pasture paddock size and location.

Figure 9.2 Landscape shots of Minudie pasture.

ELEVATION

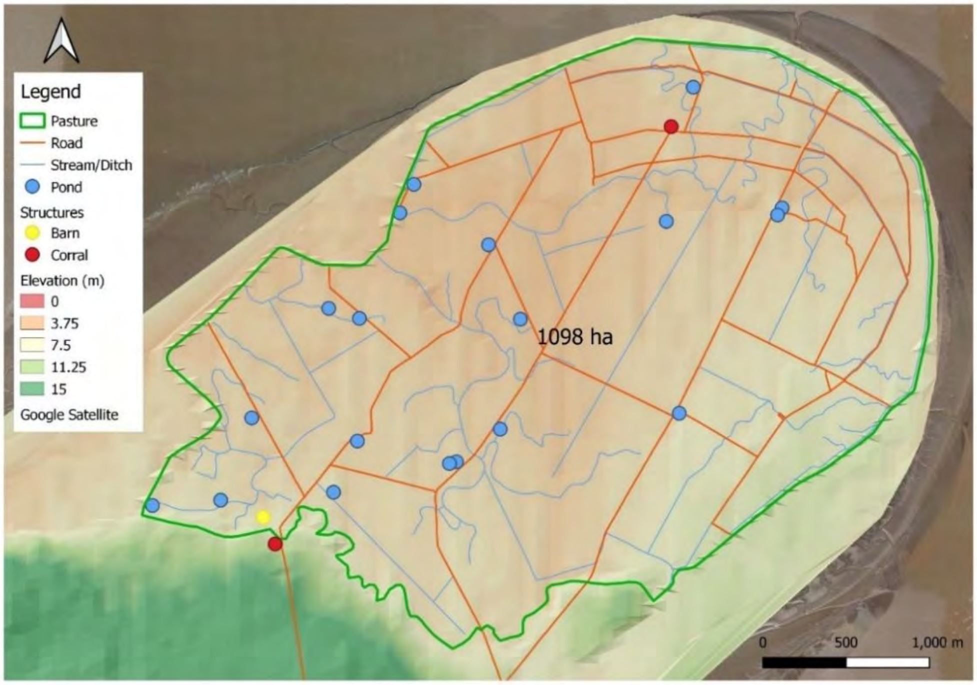


Figure 9.3 Minudie elevation 0 - 15 m, showing locations of roads, barn, water, corral and pastures.

SOIL SURVEY

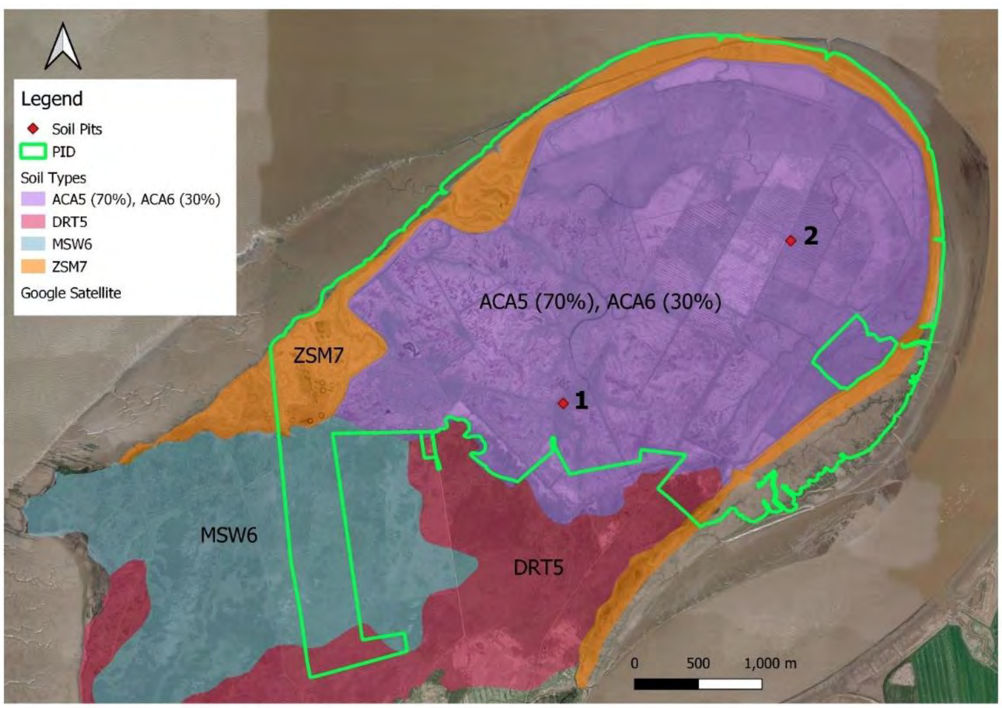


Figure 9.4 Minudie soil survey showing the area is dominated by the Acadia soil type.

Soil Survey Descriptions

Below are the full soil descriptions from the map legend in Figure 9.4. According to the soil survey, the majority of the soil of the Minudie community pasture is Acadia (ACA). Although not in pasture, this property also contains a significant area of Masstown (MSW) soils and a very small section of Debert (DRT) soils. The DRT5 soils were described in detail in the Cheticamp community pasture section. The following information is summarized from the soil descriptions found in the soil survey reports and CanSIS websites from both the archived soil survey reports as well as the soil name and layer data that corresponds with V3.1 of the soil survey data. A quick summary and interpretation of the CanSIS data is provided in the adjacent text box.

Acadia Soils (ACA5, ACA6)

The sediments that form the parent materials of these dykeland soils were laid down by the Fundy tides and are silty clay loam in texture. The level topography is broken only by shallow, very poorly drained depressions and many of these are situated at the inner edge adjacent to the upland. Elsewhere drainage has been classified as poor to imperfect, depending partly upon the proximity to tidal channels and aboiteaux (sluices) and partly upon the depth to a subsurface layer of dense gray silty clay loam. There has been almost no horizon development in the soils, but depositional layers of different colors and textures may be encountered. The gray color is likely a reflection of a higher organic content and more

ACADIA SOIL

The upland areas of the Acadia soils were described in-field and recorded here as pit 1 and 2. These soils showed signs of water saturation but not to the extent of the lower areas. The lower areas which were explored via an auger showed an accumulation of layers of organic materials. The largest challenge in farming these soils is drainage. There could be potential at this site to grow and harvest hay successfully.

intense reduction (gleying). The reddish brown material appears to be more oxidized. This layer is of silt loam to silty clay loam texture and has a fairly well developed fine to medium granular or subangular blocky structure. It is mottled in all but the better drained locations, and the mottles become more prominent and more numerous as drainage deteriorates. The surface soil is leached and some areas are quite strongly acid, but the pH rises rapidly with depth. The gray material is usually prominently mottled, especially in the upper part. Many of the very poorly drained and some of the poorly drained Acadia soils contain layers of peat on or below the surface, or they have a very high percentage of intermixed organic material. The peat is mainly the semi-decomposed remnants of salt marsh plants, and some of it was later buried under further accumulations of sediment. Drainage of such areas involves the special problem of shrinkage and subsidence.

At present the chief limitation on the use of Acadia soils is excessive fresh water. Twenty percent of the Minudie-Nappan area is adequately drained for crop production and a further 15% only requires more lateral ditches. Forage production is the most productive and economically viable use of this land.

Masstown soil (MSW6)

MSW6 soils are classified as Orthic Gray Luvisol. The growth of plant roots are restricted by a third layer which is a fragipan layer in the B horizon. The water table is always present in the soils profile. These soils are poorly drained. Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are the main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Table 9.1: Generalized Soil Survey Description of the MSW6 horizons.

Depth (cm)	Horizon	Course Fragment (%)	Texture
0-15	Ap	10	Sandy Loam
15-45	Bg	10	Sandy Loam
45-55	Bxg	10	Sandy Loam
55-100	Cg	10	Sandy Loam

ZSM7 – Salt Marsh

In-Field Soil Pit Analysis

Table 9.2: In-Field Soil Pit Descriptions Pit 1

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-15 cm	Ap	Reddish Brown (5 YR 4/3); silt loam; weak; fine granular structure; loose; non plastic; abundant fine and medium roots; clear smooth horizon boundary.
	15-60 cm	Bfgj	Reddish Brown (5YR 4/3); silt loam; weak; fine to medium platy structure; loose; non plastic; few fine roots; gradual wavy horizon boundary.
	60+	C	Dark brown (7.5 Y/R 4/6d); silt loam; weak; fine medium subangular blocky structure; loose; non plastic.

Table 9.3: In-Field Soil Pit Descriptions Pit 2

PHOTO	DEPTH	HORIZON	DESCRIPTION
	0-20 cm	Ap	Black (5 YR 2.1/1); loam; weak; fine granular structure; friable; non plastic; abundant fine and medium roots; clear smooth horizon boundary.
	15-25 cm	Bfgj	Dark yellowish brown (10 YR 4/4d); clay loam; strong; massive and medium angular blocky structure; firm; slightly plastic; few fine roots; clear wavy horizon boundary.
	25-65 cm	Ab	Black (5 YR 2.1/1); loam; moderate; course subangular blocky structure; loose; non plastic; few; fine and medium roots; gradual, wavy horizon boundary.
	65+	Cg	Dark reddish grey (5 YR 4/2); loamy clay; strong, massive structure; very firm, plastic.

Table 9.4: In-Field Soil Pit Descriptions Auger 1 and 2

PHOTO	DESCRIPTION
	The auger sites were in very poorly drained depressions depositional layers of different colors and textures as seen in the photos to the left. Layers of organic and reduced organic material are evident.

Soil Test Results and Fertility Recommendations

Figure 9.5 Minudie soil sample areas.

Table 9.5: Fertility table for Minudie Pit 1 Grazed Area

Pit 1 Field Grazed	N	P2O5	K2O	Ca	Mg	S	B	Zn
	---------- kg/ha						-----ppm----	
Nutrient Analysis	N/A	80	281	1206	760	16	0.74	2.59
Required Nutrient	100	75	20					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	27.5					
~ cost per Ha	$255 fertilizer and $76 lime plus shipping							

OM %	pH
5.4	5.61

Lime required (t/ha)
2

Table 9.6: Fertility table for Minudie Pit 2 Grazed Area

Pit 2	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha					-------------------------	-----ppm----	
Nutrient Analysis	N/A	68	354	1572	1257	170	0.91	2.56
Required Nutrient	100	75	20					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	27.5					
~ cost per Ha	$255 fertilizer and $228* lime plus shipping							

OM %	pH
8.3	5.12

Lime required (t/ha)
6

*should be applied over two years

Table 9.7: Fertility table for Minudie Auger 1 Not Grazed Area

Auger 1	N	P2O5	K2O	Ca	Mg	S	B	Zn
	----------------------------- kg/ha					-------------------------	-----ppm----	
Nutrient Analysis	N/A	57	237	1206	937	49	2.08	2.47
Required Nutrient	100	75	20					
Fertilizer 1	19	19	19	@ 250 kg/ha spring broadcast				
Fertilizer 2	46	0	0	@ 100 kg/ha after grazing				
Balance	-6.5	-27.5	27.5					
~ cost per Ha	$255 fertilizer and $152 lime plus shipping							

OM %	pH
14.2	5.25

Lime required (t/ha)
4

Location of Wells and Water courses and Water Test Results

Water on the site is available to the cattle from ponds (19) and miles of drainage ditches that cross the property. Water samples were collected at four locations; two ponds and two ditches. Testing indicated that all the samples had high iron content, which may limit the intake by cattle. One of the samples collected from a larger ditch on the northeast side of the property had elevated levels of sulfate, but within acceptable levels for cattle. Coliform were detected in samples; the levels were acceptable for cattle. Ideally the water sources should be fenced to prevent the cattle from accessing them and the water made available remotely to prevent contamination. The number of water sources on this site make this impractical currently.

Figure 9.6 Minudie ponds showing sediment and some bank erosion.

Description of Infrastructure

Minudie Community Pasture is operated by Minudie Pasture Cooperative Limited. It is by far the largest of the Community Pastures in the province. By our estimation it consists of approximately 1100 ha of land. Some of the land is too wet currently to pasture. However, most of the land is usable for pasture or stored forage production.

At the time of the site visit there were still some cattle on the pasture, although most had been removed. The cattle were in good body condition. There was a lot of forage of poor quality that has not been touched by the grazing cattle. The lack of grazing cattle is contributing to the poor forage quality.

The corrals are functional for the number of cattle on the site currently. If the stocking rate increased significantly an expansion would be needed to handle more cattle. The current operator is upgrading the fences, and this is ongoing. Given the size and amount of fence that could be required this is a daunting challenge both physically and financially.

Summary Recommendations

Minudie is such a large and unique site, it is one if not the biggest continuous pastures in the Maritimes. It has the potential to handle many more cattle than currently grazed. The number of cattle on the pasture should be increased and this would improve the forage quality.
The current pasture operators are increasing the number of cattle on the site annually. In addition to increasing the grazing pressure they have made very significant investments in new fencing. Because of the size of the property this may not be immediately evident to the casual observer.

There is no squeeze on site, however the operators own a portable handling system. There may be value to having a squeeze on site at all times. This should be explored with the operator. It would simplify treatment of sick animals on some occasions.

The existing coop members (2) have invested a lot of money to upgrade the fences and are increasing the number of cattle that they are grazing on the property significantly. They are however far from optimizing the potential stocking rate on this property.

The members' contributions need to be recognized. Continuing to increase the number of cattle grazing on the property will optimize the value of the land.

It is very hard to estimate the cost of improvements to this property or make recommendations because of its size and uniqueness. The future management of the property will dictate the development costs.

This property is approximately 4 km long by 2 km wide. There is approximately 35 km of roads and vastly more kilometers of drainage ditches. Installation of a fence system is well underway, but more could be done and every bit will improve the grazing management and the ability to move and control the cattle.

It should be noted that every kilometer of fence installed will cost a minimum of $2,500.00 and energizing the fence effectively on the whole property will require multiple solar/battery powered fence energizers at the cost of approximately $1,000.00 per unit.

OVERALL SUMMARY

The Community Pastures in Nova Scotia provide a very valuable resource for the cattle industry. They were set up in the late ‘50s and early ‘60s to provide pasture to producers who needed access to more grazing land. This allowed existing producers to grow their herds, develop and improve their home farms, and gave new entrants an opportunity to establish a herd without the need to invest a huge land base.

The transfer of management of the pastures to Producer Coops and the subsequent impact of BSE on the cattle industry has presented these Coops with challenges that have resulted in the pastures falling behind in terms of infrastructure and fertility.

With the exception of Manchester (which has been inactive since before the transition to Coop management) each of the other 7 pastures have varying levels of success. Individually each of these pastures and their Coop management have been able to achieve a great deal and provide grazing to their members and patrons. They all have strengths and weaknesses; providing each the opportunity to improve and grow. This will require ongoing support and investment.

One thing that was very apparent as our team traveled to each of the pastures was the pride and “ownership” that each group took in their pasture. The work that each contributed to the maintenance and management of the cattle on each pasture was clearly evident.

The current demand from the beef industry for access to the community pasture system is the highest it has been in 20 years. The number of new entrants and expanding beef operations is increasing.

It is anticipated that the demand for access to pastures will continue to increase in part because of climate change and dry conditions that are becoming more prevalent. Climate change will also put additional pressure on the community pastures and their ability to provide grazing to support the beef industry.

To address these needs, the community pasture system and the individual pastures will need to continue to invest in improvements to fertility and infrastructure. These investment needs differ from pasture to pasture as identified in this report. Each pasture is in the business of growing grass and needs to optimize the production of grass with the grazing and management of the cattle on each pasture. To achieve this both the fertility and the supporting infrastructure need to be addressed.

Estimate of size of Community Pastures, carrying capacity for cows with calf at foot and beef production per grazing season of 150 days. (Most pastures would have a combination of feeder cattle and cows). This is an approximate estimate and various pastures would have higher and lower numbers of cattle grazed annually.

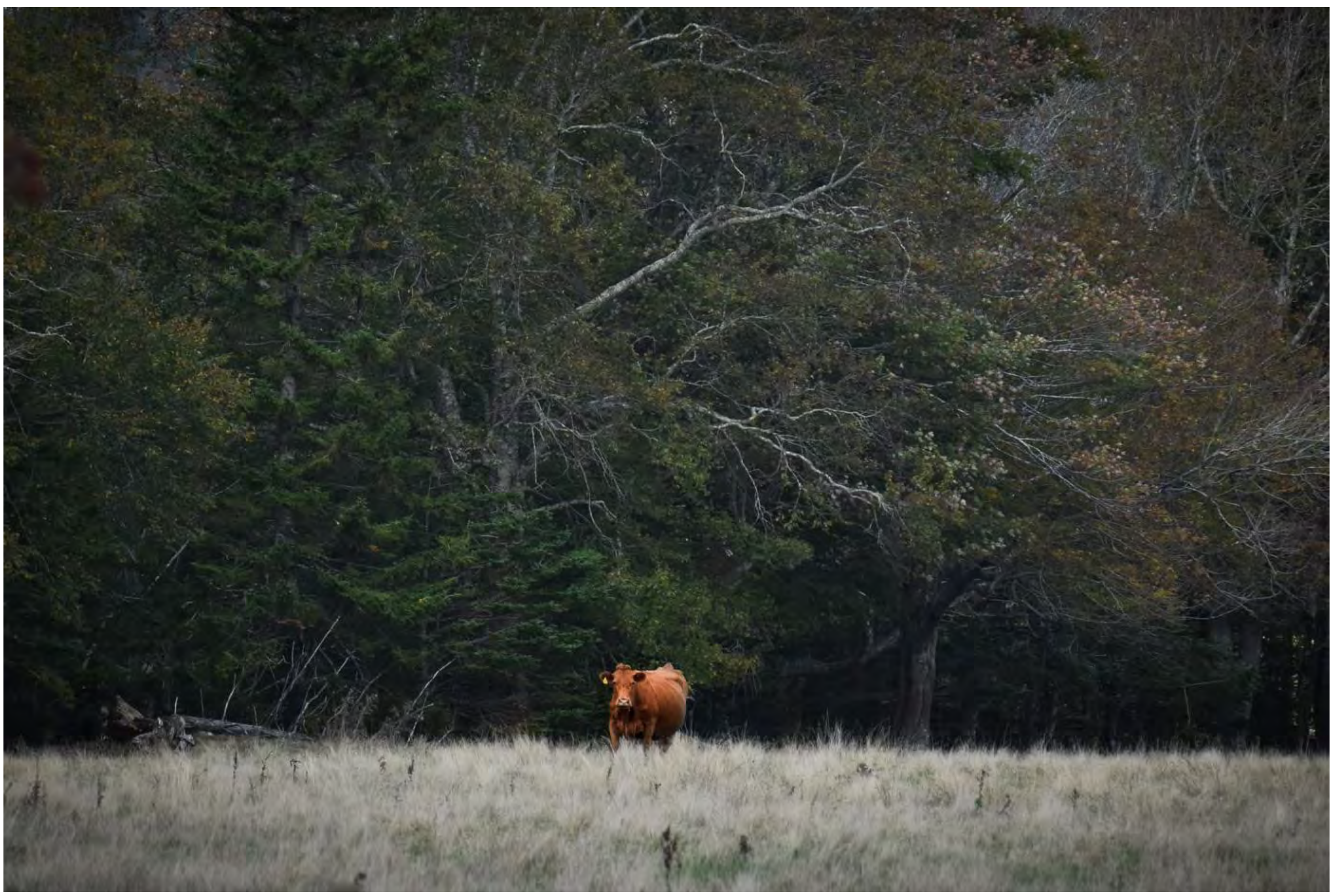
Pasture	Estimated Size ha	Estimate carrying capacity Cow Calf Pairs 1.5 cow /calf/ha	Estimated: 2.0 lb gain/calf/day for 150 pasture days
Cape John	302.6 ha	460	138000 lb
Mabou	186.2 ha	280	84000 lb
Cheticamp	105.8 ha	158	47000 lb
Maple Brook	55.0 ha	83	24900 lb
Little Harbour	62.2 ha	93	27900 lb
Digby	52.1 ha	78	23400 lb
Minudie	1098 ha	1600	480000 lb
Total beef production *			825200 lb

Based on the 2020 Atlantic Stockyards feeder sales that coincided with the dates when cattle would be removed from the pasture, the average price for calves was $1.75/lb. With a potential beef production from the community pastures of 825,200 lbs of beef we could estimate that this production would be worth conservatively $1,444,100.00 to the provincial economy annually.

Long term support of the community pastures helps support sustainability of the cattle sector in the province and enhance the value of the provincially owned lands that comprise the Community Pastures. These pastures in turn are an important asset to the rural communities where they are located.

ACKNOWLEDGEMENT

We would like to thank all of the community pasture staff and volunteers who shared their experiences and stories of the pastures over the years with us.



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APPENDIX A: SOIL TEST REPORTS

NOVA SCOTIA

Soil Test Report

Department of Agriculture
Laboratory Services
PO Box 890
Harlow Institute
Truro, NS B2N 5G6

novascotia.ca/agriculture-labs
Tel: 902-893-6565
Fax: 902-893-4193

Client ID: C12816
Order ID: 2005298
Samples Reported: 1-Oct-20
Samples Received: 24-Sep-20
# of Samples Received: 14

CAPE JOHN COMMUNITY PASTURE CO-OP LTD
C/O TONY CORSTEN
89 MACKEN ROAD
ANTIGONISH, NS
B2G 2L2

Lab #	2005298-001			2005298-002			2005298-003			2005298-004		
Sample ID	PROJECT PASTURE 1B FLD			PROJECT PASTURE 4A			PROJECT PASTURE 4B			PROJECT PASTURE 3B/A		
Crop to be Grown	Native Pasture			Native Pasture			Native Pasture			Native Pasture		
Parameter	Analysis		Rating	Analysis		Rating	Analysis		Rating	Analysis		Rating
pH (pH Units)	5.73			6.08			6.44			5.95		
Buffer pH (pH Units)	7.75			7.70			7.82			7.79		
Organic Matter (%)	5.9			7.6			6.8			6.2		
P2O5 (kg/ha)	89		L-	111		L	131		L+	87		L-
K2O (kg/ha)	115		L+	132		M-	131		M-	112		L+
Calcium (kg/ha)	2087		M-	2854		M	2871		M	2435		M-
Magnesium (kg/ha)	377		M+	397		M+	695		H	584		H
Sodium (kg/ha)	95			87			84			85		
Sulfur (kg/ha)	22			21			17			18		
Aluminum (ppm)	538			796			606			470		
Boron (ppm)	0.52			0.64			0.62			0.55		
Copper (ppm)	0.71			0.78			0.57			0.46		
Iron (ppm)	412			169			244			366		
Manganese (ppm)	35			83			90			74		
Zinc (ppm)	0.84			1.79			1.44			1.05		
CEC (meq/100 g)	9.1			11.5			11.8			10.5		
Base sat. K (%)	1.3			1.2			1.2			1.1		
Base sat. Ca (%)	57.2			62.0			60.6			58.0		
Base sat. Mg (%)	17.2			14.4			24.5			23.2		
Base sat. Na (%)	2.3			1.6			1.5			1.8		
Base sat. H (%)	21.9			20.8			12.2			16.0		
LR CaCO3 (t/ha to pH 6.5)	2			2						2		
Required Nutrient	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
(kg/ha)	100	75	50	100	60	40	100	50	40	100	75	50

Copies To:	**Analysis Approved By:**
JOHN WORT- JWORT@PERENNIA.CA	L. Scott Lori Scott, TLOS

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Page 1 of 5

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Harlow Institute
Truro, NS B2N 5G6

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CAPE JOHN COMMUNITY PASTURE CO-OP LTD
C/O TONY CORSTEN
89 MACKEN ROAD
ANTIGONISH, NS
B2G 2L2

Lab #	2005298-005			2005298-006			2005298-007			2005298-008		
Sample ID	PROJECT PASTURE 5A			PROJECT PASTURE 5B2			PROJECT PASTURE 5B1			PROJECT PASTURE 7A/B		
Crop to be Grown	Native Pasture			Native Pasture			Native Pasture			Native Pasture		
Parameter	Analysis		Rating	Analysis		Rating	Analysis		Rating	Analysis		Rating
pH (pH Units)	6.00			6.05			6.14			5.96		
Buffer pH (pH Units)	7.71			7.77			7.84			7.79		
Organic Matter (%)	7.1			5.5			5.1			5.2		
P2O5 (kg/ha)	105		L	109		L	83		L-	56		L-
K2O (kg/ha)	153		M-	123		M-	210		M+	113		L+
Calcium (kg/ha)	2522		M	2893		M	2875		M	2325		M-
Magnesium (kg/ha)	582		H	437		H-	451		H-	551		H-
Sodium (kg/ha)	112			128			160			150		
Sulfur (kg/ha)	21			20			23			18		
Aluminum (ppm)	723			698			513			546		
Boron (ppm)	0.56			0.62			0.64			0.59		
Copper (ppm)	0.67			0.68			0.60			0.45		
Iron (ppm)	268			213			302			359		
Manganese (ppm)	113			170			132			103		
Zinc (ppm)	1.53			1.02			1.07			0.81		
CEC (meq/100 g)	11.5			11.3			10.9			10.2		
Base sat. K (%)	1.4			1.2			2.0			1.2		
Base sat. Ca (%)	55.0			64.0			65.8			56.8		
Base sat. Mg (%)	21.2			16.1			17.2			22.4		
Base sat. Na (%)	2.1			2.5			3.2			3.2		
Base sat. H (%)	20.3			16.3			11.7			16.4		
LR CaCO3 (t/ha to pH 6.5)	2			2			1			2		
Required Nutrient	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
(kg/ha)	100	60	40	100	60	40	100	75	25	100	75	50

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JOHN WORT- JWORT@PERENNIA.CA	L. Scott Lori Scott, TLOS

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Fax: 902-893-4193

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CAPE JOHN COMMUNITY PASTURE CO-OP LTD
C/O TONY CORSTEN
89 MACKEN ROAD
ANTIGONISH, NS
B2G 2L2

Lab #	2005298-009			2005298-010			2005298-011			2005298-012		
Sample ID	PROJECT 6A			BREEDING PASTURE FLD 7			BREEDING PASTURE FLD 8			BREEDING PASTURE FLD 9		
Crop to be Grown	Native Pasture			Native Pasture			Native Pasture			Native Pasture		
Parameter	Analysis		Rating	Analysis		Rating	Analysis		Rating	Analysis		Rating
pH (pH Units)	6.39			5.69			6.00			5.90		
Buffer pH (pH Units)	7.86			7.73			7.82			7.79		
Organic Matter (%)	5.1			5.1			5.7			5.0		
P2O5 (kg/ha)	86		L-	81		L-	104		L	59		L-
K2O (kg/ha)	239		H-	192		M	165		M	124		M-
Calcium (kg/ha)	2524		M	2207		M-	2733		M	2454		M
Magnesium (kg/ha)	642		H	507		H-	562		H-	638		H
Sodium (kg/ha)	86			142			128			199		
Sulfur (kg/ha)	22			26			23			25		
Aluminum (ppm)	565			797			700			589		
Boron (ppm)	0.51			0.62			0.97			0.86		
Copper (ppm)	0.50			1.75			0.86			0.74		
Iron (ppm)	383			364			370			439		
Manganese (ppm)	91			117			100			83		
Zinc (ppm)	0.91			1.47			1.92			1.09		
CEC (meq/100 g)	10.5			10.3			11.1			11.0		
Base sat. K (%)	2.4			2.0			1.6			1.2		
Base sat. Ca (%)	59.8			53.6			61.8			55.6		
Base sat. Mg (%)	25.4			20.5			21.1			24.1		
Base sat. Na (%)	1.8			3.0			2.5			3.9		
Base sat. H (%)	10.6			21.0			13.0			15.2		
LR CaCO3 (t/ha to pH 6.5)				3			1			2		
Required Nutrient	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
(kg/ha)	100	75	20	100	75	30	100	60	30	100	75	40

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Laboratory Services
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CAPE JOHN COMMUNITY PASTURE CO-OP LTD
C/O TONY CORSTEN
89 MACKEN ROAD
ANTIGONISH, NS
B2G 2L2

Client ID: C12816
Order ID: 2005298
Samples Reported: 1-Oct-20
Samples Received: 24-Sep-20
\# of Samples Received: 14

Lab #	2005298-013		2005298-014					
Sample ID	OPEN PASTURE FLD 2		OPEN PASTURE FLD 5					
Crop to be Grown	Native Pasture		Native Pasture					
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.93		5.94					
Buffer pH (pH Units)	7.78		7.78					
Organic Matter (%)	4.8		5.4					
P2O5 (kg/ha)	99	L-	75	L-				
K2O (kg/ha)	144	M-	168	M				
Calcium (kg/ha)	2520	M	2483	M				
Magnesium (kg/ha)	554	H-	428	M+				
Sodium (kg/ha)	101		137					
Sulfur (kg/ha)	19		19					
Aluminum (ppm)	645		552					
Boron (ppm)	0.59		0.61					
Copper (ppm)	0.57		0.57					
Iron (ppm)	355		276					
Manganese (ppm)	98		75					
Zinc (ppm)	0.89		1.31					
CEC (meq/100 g)	10.7		10.2					
Base sat. K (%)	1.4		1.7					
Base sat. Ca (%)	58.6		60.7					
Base sat. Mg (%)	21.5		17.4					
Base sat. Na (%)	2.0		2.9					
Base sat. H (%)	16.4		17.2					
LR CaCO3 (t/ha to pH 6.5)	2		2					

Required Nutrient (kg/ha)	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
	100	75	40	100	75	30						

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005781
Samples Reported: 20-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 17

Lab #	2005781-001		2005781-002		2005781-003		2005781-004	
Sample ID	DIGBY LOWLAND		DIGBY UPLAND		MAPLE BROOK BACK PASTURE		MAPLE BROOK ABOVE BROOK	
Crop to be Grown	Native Pasture		Native Pasture		Native Pasture		Native Pasture	
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.08		5.83		5.17		5.42	
Buffer pH (pH Units)	7.52		7.52		7.29		7.30	
Organic Matter (%)	11.4		8.7		7.2		7.7	
P2O5 (kg/ha)	87	L-	68	L-	38	L-	44	L-
K2O (kg/ha)	298	H-	237	H-	212	M+	202	M+
Calcium (kg/ha)	1564	L+	2372	M-	2592	M	2610	M
Magnesium (kg/ha)	850	H+	419	M+	703	H	717	H
Sodium (kg/ha)	924		74		89		81	
Sulfur (kg/ha)	277		31		20		21	
Aluminum (ppm)	715		1657		1343		1334	
Boron (ppm)	2.14		< 0.50		< 0.50		< 0.50	
Copper (ppm)	0.85		1.24		1.54		1.03	
Iron (ppm)	445		155		367		261	
Manganese (ppm)	11		19		58		54	
Zinc (ppm)	3.21		1.16		2.92		1.53	
CEC (meq/100 g)	13.6		11.9		15.5		15.5	
Base sat. K (%)	2.3		2.1		1.4		1.4	
Base sat. Ca (%)	28.7		49.7		41.8		42.1	
Base sat. Mg (%)	26.0		14.6		18.9		19.3	
Base sat. Na (%)	14.7		1.4		1.2		1.1	
Base sat. H (%)	28.2		32.2		36.6		36.1	
LR CaCO3 (t/ha to pH 6.5)	6		4		9		8	
Required Nutrient	N / P2O5	K20	N / P2O5	K20	N / P2O5	K20	N / P2O5	K20
(kg/ha)	100 / 75	20	100 / 75	20	100 / 75	25	100 / 75	25

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Lori Scott, TLOS

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005781
Samples Reported: 20-Oct-20
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Lab #	2005781-005		2005781-006		2005781-007		2005781-008	
Sample ID	MAPLE BROOK BY PIT 2		CHETICAMP PASTURE 1		CHETICAMP PASTURE 2		CHETICAMP PASTURE 3	
Crop to be Grown	Native Pasture		Native Pasture		Native Pasture		Native Pasture	
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.43		5.65		6.19		6.26	
Buffer pH (pH Units)	7.42		7.74		7.80		7.84	
Organic Matter (%)	8.7		4.4		5.1		5.4	
P2O5 (kg/ha)	89	L-	341	H+	63	L-	134	L+
K2O (kg/ha)	308	H	210	M+	98	L+	133	M-
Calcium (kg/ha)	2879	M	2317	M-	3081	M	3327	M
Magnesium (kg/ha)	887	H+	297	M	617	H	638	H
Sodium (kg/ha)	69		61		111		237	
Sulfur (kg/ha)	24		22		16		20	
Aluminum (ppm)	1072		733		598		550	
Boron (ppm)	< 0.50		< 0.50		0.57		0.80	
Copper (ppm)	1.24		1.13		0.28		0.28	
Iron (ppm)	218		346		364		390	
Manganese (ppm)	63		95		119		49	
Zinc (ppm)	1.64		2.71		1.89		1.95	
CEC (meq/100 g)	16.0		9.5		12.2		12.9	
Base sat. K (%)	2.0		2.4		0.8		1.1	
Base sat. Ca (%)	45.0		61.2		63.0		64.4	
Base sat. Mg (%)	23.1		13.1		21.0		20.6	
Base sat. Na (%)	0.9		1.4		2.0		4.0	
Base sat. H (%)	29.0		22.0		13.1		9.9	
LR CaCO3 (t/ha to pH 6.5)	6		3		1		1	

Required Nutrient (kg/ha)	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
	100	75	20	100	0	25	100	75	50	100	50	40

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Lab #	2005781-009		2005781-010		2005781-011		2005781-012	
Sample ID	CHETICAMP PASTURE 4		MANCHESTER GUY CO		LITTLE HARBOUR LAND SIDE		LITTLE HARBOUR SEA SIDE	
Crop to be Grown	Native Pasture		Native Pasture		Native Pasture		Native Pasture	
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.94		6.03		5.08		5.29	
Buffer pH (pH Units)	7.82		7.59		7.21		7.40	
Organic Matter (%)	5.0		7.9		13.7		8.9	
P2O5 (kg/ha)	102	L-	48	L-	66	L-	30	L-
K2O (kg/ha)	150	M-	150	M-	190	M	120	L+
Calcium (kg/ha)	2196	M-	1325	L+	2216	M-	863	L-
Magnesium (kg/ha)	502	H-	372	M+	562	H-	327	M+
Sodium (kg/ha)	171		38		95		182	
Sulfur (kg/ha)	16		20		22		28	
Aluminum (ppm)	407		1051		1105		1289	
Boron (ppm)	0.54		< 0.50		< 0.50		< 0.50	
Copper (ppm)	0.35		0.94		0.36		0.45	
Iron (ppm)	354		235		431		373	
Manganese (ppm)	46		65		26		14	
Zinc (ppm)	2.49		1.69		2.31		1.04	
CEC (meq/100 g)	9.6		8.4		14.6		8.8	
Base sat. K (%)	1.7		1.9		1.4		1.4	
Base sat. Ca (%)	57.5		39.5		37.9		24.4	
Base sat. Mg (%)	21.9		18.5		16.0		15.4	
Base sat. Na (%)	3.9		1.0		1.4		4.5	
Base sat. H (%)	15.1		39.1		43.3		54.3	
LR CaCO3 (t/ha to pH 6.5)	1		3		10		7	
Required Nutrient (kg/ha)	N 100	P2O5 75, K20 40	N 100	P2O5 75, K20 40	N 100	P2O5 75, K20 30	N 100	P2O5 75, K20 50

Copies To:	**Analysis Approved By:**
JOHN WORT- JWORT@PERENNIA.CA	L. Scott. Lori Scott, TLOS

Confidentiality Notice-This report is for the individual or Organization to whom it is addressed and contains confidential information. If received in error, please contact us immediately

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Soil Test Report

Department of Agriculture
Laboratory Services
PO Box 890
Harlow Institute
Truro, NS B2N 5G6

novascotia.ca/agriculture-labs
Tel: 902-893-6565
Fax: 902-893-4193

PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005781
Samples Reported: 20-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 17

Lab #	2005781-013		2005781-014		2005781-015		2005781-016	
Sample ID	CAPE MABOU COM PAST WESTSIDE PIT 1		CAPE MABOU COM PAST SE SIDE RD PIT		CAPE MABOU COM PAST BARN SIDE		CAPE MABOU NW 8	
Crop to be Grown	Native Pasture		Native Pasture		Native Pasture		Native Pasture	
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.91		6.80		7.08		6.68	
Buffer pH (pH Units)	7.48		7.63		7.67		7.50	
Organic Matter (%)	10.8		9.2		12.9		10.8	
P2O5 (kg/ha)	126	L+	354	H+	243	H-	61	L-
K2O (kg/ha)	127	M-	147	M-	250	H-	98	L+
Calcium (kg/ha)	2543	M	4108	M+	4133	M+	3329	M
Magnesium (kg/ha)	505	H-	854	H+	1122	E	798	H
Sodium (kg/ha)	50		52		55		44	
Sulfur (kg/ha)	32		26		32		24	
Aluminum (ppm)	1578		1647		1495		1640	
Boron (ppm)	< 0.50		< 0.50		< 0.50		< 0.50	
Copper (ppm)	0.47		0.65		0.46		0.41	
Iron (ppm)	154		141		127		111	
Manganese (ppm)	18		36		14		10	
Zinc (ppm)	1.79		1.49		1.52		1.17	
CEC (meq/100 g)	12.9		17.1		18.0		15.8	
Base sat. K (%)	1.0		0.9		1.5		0.7	
Base sat. Ca (%)	49.4		60.2		57.3		52.5	
Base sat. Mg (%)	16.4		20.9		25.9		21.0	
Base sat. Na (%)	0.8		0.7		0.7		0.6	
Base sat. H (%)	32.3		17.4		14.6		25.2	
LR CaCO3 (t/ha to pH 6.5)	4							

Required Nutrient (kg/ha)	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
	100	50	40	100	0	40	100	20	20	100	75	50

Copies To:
JOHN WORT- JWORT@PERENNIA.CA

Analysis Approved By:
L. Scott.
Lori Scott, TLOS

Soil Test Report

Department of Agriculture
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novascotia.ca/agriculture-labs
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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005781
Samples Reported: 20-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 17

Lab #	2005781-017							
Sample ID	CAPE MABOU PASTURE 1							
Crop to be Grown	Native Pasture							
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	6.01							
Buffer pH (pH Units)	7.42							
Organic Matter (%)	11.4							
P2O5 (kg/ha)	145	M-						
K2O (kg/ha)	153	M-						
Calcium (kg/ha)	2580	M						
Magnesium (kg/ha)	527	H-						
Sodium (kg/ha)	45							
Sulfur (kg/ha)	28							
Aluminum (ppm)	1668							
Boron (ppm)	< 0.50							
Copper (ppm)	0.38							
Iron (ppm)	139							
Manganese (ppm)	8							
Zinc (ppm)	0.87							
CEC (meq/100 g)	13.5							
Base sat. K (%)	1.2							
Base sat. Ca (%)	47.6							
Base sat. Mg (%)	16.2							
Base sat. Na (%)	0.7							
Base sat. H (%)	34.3							
LR CaCO3 (t/ha to pH 6.5)	4							

Required Nutrient (kg/ha)	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
	100	40	40									

Copies To:	**Analysis Approved By:**
JOHN WORT- JWORT@PERENNIA.CA	L. Scott. Lori Scott, TLOS

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2006311
Samples Reported: 5-Nov-20
Samples Received: 2-Nov-20
# of Samples Received: 3

Lab #	2006311-001		2006311-002		2006311-003			
Sample ID	MINUDIE PIT 1 FLD GRAZED		PIT 2 MINUDIE		AUGER 1 MINUDIE NOT GRAZED			
Crop to be Grown	Native Pasture		Native Pasture		Native Pasture			
Parameter	Analysis	Rating	Analysis	Rating	Analysis	Rating	Analysis	Rating
pH (pH Units)	5.61		5.12		5.25			
Buffer pH (pH Units)	7.76		7.51		7.63			
Organic Matter (%)	5.4		8.3		14.2			
P2O5 (kg/ha)	80	L-	68	L-	57	L-		
K2O (kg/ha)	281	H-	354	H	237	H-		
Calcium (kg/ha)	1206	L	1572	L+	1296	L		
Magnesium (kg/ha)	760	H	1257	E	937	H+		
Sodium (kg/ha)	234		280		543			
Sulfur (kg/ha)	16		170		49			
Aluminum (ppm)	594		796		508			
Boron (ppm)	0.74		0.91		2.08			
Copper (ppm)	0.79		0.45		0.68			
Iron (ppm)	438		557		489			
Manganese (ppm)	24		16		6			
Zinc (ppm)	2.59		2.56		2.47			
Salt (mmhos/cm)	0.128		0.326		0.583			
CEC (meq/100 g)	8.9		14.1		11.5			
Base sat. K (%)	3.3		2.7		2.2			
Base sat. Ca (%)	33.8		27.9		28.1			
Base sat. Mg (%)	35.6		37.2		33.9			
Base sat. Na (%)	5.7		4.3		10.2			
Base sat. H (%)	21.6		27.9		25.7			
LR CaCO3 (t/ha to pH 6.5)	2		6		4			

Required Nutrient (kg/ha)	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20	N	P2O5	K20
	100	75	20	100	75	20	100	75	20			

Copies To:
JOHN WORT- JWORT@PERENNIA.CA

Analysis Approved By:
L. Scott
Lori Scott, TLOS

APPENDIX B: WATER REPORTS

NOVA SCOTIA
Agriculture

Interpreting Your Water Report

HOW TO INTERPRET BACTERIA ANALYSIS RESULTS

- ***ABSENT*** means the sample *did not* contain the type of bacteria tested. It is considered a **PASS**.
- ***PRESENT*** means the sample *did* contain the type of bacteria tested, and a disinfection process should be followed.
- **Milkhouse Water Results:** Milkhouse Water Quality Regulations (MHWQR) acceptable levels are <10 cfu/100mL (MPN) Total Coliform and <1 cfu/100mL (MPN) *E. coli*

- **RDL (LABORATORY REPORTING LIMIT):** The reporting limit indicated next to your result indicates the lowest concentration *that can be reported* by the laboratory for the test requested. **This is *NOT* the maximum limit, and it is not your result.** It is the lowest reliable amount that can be measured for a particular test. It is generally for lab information only.
  NOTE: The reporting limit for Total Coliform and *E. coli* Present/Absent testing is not applicable
- **ND (Not Detected):** indicates that the analysis value is below the reporting limit (see above).
- **MPN:** Most Probable Number of colony-forming units (cfu) per 100mL of water. A numerical count indicates the presence of bacteria
- **LA:** Indicates "Lab Accident", and that the analysis was not able to be completed.
- **Bold type on the report:** Indicates that the analysis is accredited to the ISO/IEC 17025:2017 standard.
- **[S]:** Indicates that the sample was sent to an off-site accredited lab for analysis.
- The dates of performance of laboratory activity are available by contacting Laboratory Services at (902) 893-6565

For more information on interpreting results or on water quality, please contact NS Environment:

- **1-877-936-8476**
- Factsheets on water quality and water testing parameters are available online: www.novascotia.ca/nse/water/thedroponwater.asp
- Health Canada's Guidelines for Canadian Drinking Water Quality is available online: http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php

To further compare and understand your water results, use the Drinking Water Interpretation Tool developed by NS Environment:
https://www.novascotia.ca/nse/dwit
NOTE: To convert mg/L to µg/L, multiply by 1000. To convert µg/L to mg/L, divide by 1000.

- Water samples are run for all minerals, as received, with acidification.
- Result(s) apply to the sample as received, and relate only to the sample(s) tested
- This report may not be reproduced without the written approval of this laboratory

References for Accredited Test Methods:

- LSAL400: Major Ions and Trace Metals by ICP-OES (Modified SMEWW 3120B and 2340B)
- LSAL403: Conductivity of Water by Conductivity Meter (Modified SMEWW 2510B)
- LSAL406: Determination of Nitrate + Nitrite, Chloride and Alkalinity in Drinking and Environmental Water by Flow Injection Analysis.
- LSDL681: Coliform and E. coli Determination in Water Using Colilert and Colisure (Modified SMEWW 9223)

Page 2 of 2

Nova Scotia Department of Agriculture
Laboratory Services

Mineral Analysis for Homeowners

When submitting a water sample please:

1. Ensure that the container is an approved laboratory issued bottle.
2. If taking the water from your tap, let the water run for 3-5 minutes before sampling.
3. Fill the bottle above the 200 mL fill-line and forward to the lab.

Laboratory Services is a testing facility only. It is up to individual clients to determine what testing they require/need.
For additional information on interpreting test results and drinking water quality, please refer to the Drop on Water Factsheets developed by Nova Scotia Environment, which are available online: https://novascotia.ca/nse/water/thedroponwater.asp

The Canadian Water Quality Guidelines for chemical and physical parameters of water are:
- Health based and listed as maximum acceptable concentrations (MAC);
- Based on aesthetic considerations and listed as aesthetic objectives (AO); or
- Established based on operational considerations and listed as operational guidance values (OG).

Parameter	Guidelines for Canadian Drinking Water Quality	Comments
Alkalinity (as CaCO3)	No numerical guideline	Alkalinity measures the concentrations of bicarbonate, carbonate, and hydroxide ions that are naturally present in water and is expressed as an equivalent concentration of calcium carbonate ($CaCO_3$). At normal drinking water pH levels, bicarbonate and carbonate are the main contributors to alkalinity.
Aluminum	No numerical guideline	Aluminum is a naturally abundant metal. Although the guidelines for Canadian Drinking Water Quality have set operational guidelines for treatment systems, no guideline exists for private wells.
Arsenic	MAC of 0.01 mg/L	In water, arsenic has no taste, smell, or colour. It can only be detected through a chemical test. Some areas of Nova Scotia have a greater potential for elevated arsenic levels in drinking water. Exposure to high levels of arsenic in drinking water can cause nausea, diarrhea, and muscle pain.
Barium	MAC of 2 mg/L	In water, barium has no taste, smell, or colour. It can only be detected through a chemical test. The amount of barium present in water is usually not high enough to become a health concern. However, there are some areas of Nova Scotia where barium may be elevated. Exposure to high levels of barium in drinking water can cause gastrointestinal discomfort, muscular weakness, high blood pressure, or cardiovascular disease.
Boron	MAC of 5 mg/L	In water, boron has no taste, smell, or colour. It can only be detected through a chemical test. It may be present in groundwater due to industrial effluent, leaching of fertilizer, sewage or leaching of landfill materials. Exposure to very high concentrations in drinking water can cause reproductive malfunction in men and developmental abnormalities.
Cadmium	MAC of 0.007 mg/L	In water, cadmium has no taste, smell, or colour. It can only be detected through a chemical test. Exposure to high levels in drinking water can cause gastrointestinal discomforts and kidney damage.
Calcium	No numerical guideline	Calcium is present in all natural waters. It is a major contributor to drinking water hardness. Excessively hard water can affect the function and lifetime of plumbing systems and appliances.
Chloride	AO of ≤ 250 mg/L	Drinking water and drinks prepared with water containing chloride may have a salty taste at concentrations as low as 100 mg/L. Most people find that water with more than 250 mg/L of chloride is unpleasant to drink.
Chromium	MAC of 0.05 mg/L	Chromium may affect the taste or smell of well water, but not at levels normally found in groundwater. The most common source of chromium in ground water is due to the burning of fossil fuel, as well as mining and industrial effluent.
Conductivity	No numerical guideline	Conductivity (conductance) is an indication of dissolved salts in the water and is a measure of the waters ability to carry an electrical current. Conductivity is one of several parameters used to indicate overall water quality.
Copper	MAC of 2.0 mg/L AO of ≤ 1.0 mg/L	Copper is frequently found naturally in groundwater; however, levels are generally very low. Common synthetic sources of copper are fertilizers, septic systems, animal feedlots, industrial waste, and food processing waste. Some copper occurs naturally, however, much of it may come from the plumbing system due to the corrosive tendencies of water with low pH and low alkalinity.
Hardness	No numerical guideline, but the optimum range in drinking water is between 80 and 100 mg/L	Water is made hard by high levels of calcium and magnesium. Hard water causes scale formation in pipes, on plumbing fixtures, and in heating systems. Hardness is one of several parameters used to indicate overall water quality. Water with hardness greater than 500 mg/L is normally considered unacceptable for domestic purposes. **Quality Classification for Hardness mg/L (CaCO3)** Very Good (Soft) 0 – 59 Good (Slightly Hard) 60-120 Fair (Hard) 121-180 Poor (Very Hard) >180

Nova Scotia Department of Agriculture
Laboratory Services

Mineral Analysis for Homeowners

Parameter	Guidelines for Canadian Drinking Water Quality	Comments
Iron	AO of ≤ 0.3 mg/L	At levels above 0.3 mg/L, iron stains laundry and plumbing fixtures, and causes undesirable tastes. The precipitation of excessive iron imparts an objectionable reddish-brown color to the water. The presence of iron may also promote the growth of certain micro-organisms, leading to the deposition of a slimy coat in piping.
Lead	MAC of 0.005 mg/L	In water, dissolved lead has no taste, smell, or colour. It can only be detected through a chemical test. The main source of lead in drinking water is through corrosion of plumbing materials with lead or brass components. Exposure to lead in drinking water can cause health effects including damage to the brain and nervous system, kidney dysfunction and reproductive issues
Magnesium	No numerical guideline	Magnesium in drinking water can have a laxative effect and can also affect the taste of water. High levels of magnesium cause water to be hard.
Manganese	MAC of 0.12 mg/L AO of ≤ 0.02 mg/L	Manganese occurs naturally in the environment and is widely distributed in air, water and soil. It is objectionable in water supplies as it stains plumbing fixtures and laundry and may lead to the accumulation of microbial growths in the distribution system. Higher concentrations can cause undesirable tastes in beverages
Nitrate + Nitrite	Nitrate-nitrogen MAC of 10 mg/L Nitrite-nitrogen MAC of 1.0 mg/L	The presence of nitrate may indicate improperly treated sewage or fertilizer, or it may occur naturally. Nitrate contamination is often one of the first signs of deteriorating groundwater quality and could indicate other problems with well water quality. Nitrate-nitrogen levels greater than 10 mg/L and Nitrite-nitrogen levels greater than 1.0 mg/L can pose a risk to infants up to six months old. The laboratory results are expressed as combined Nitrate + Nitrite.
pH	AO of between 7.0 and 10.5	A pH less than 7.0 may contribute to the corrosion of pipes and fittings. A pH less than 7.0 is not a health-risk in itself, but corrosive water can dissolve metals, such as lead, cadmium, zinc, and copper present in pipes. This may lead to increased concentrations of these metals in drinking water, which can cause health concerns. A pH greater than 10.5 may contribute to scale build-up in plumbing materials. pH is one of several parameters used to indicate overall water quality.
Potassium	No numerical guideline	Potassium is naturally occurring, but the most common source of potassium in drinking water are water treatment systems, such as ion exchangers (water softeners) that use potassium chloride.
Sodium	AO of ≤ 200 mg/L	All groundwater contains some sodium, because most rocks and soils contain sodium compounds from which sodium is easily dissolved. An increase in sodium in groundwater above natural levels may indicate pollution or saltwater intrusion. In water, sodium has no smell or colour, but can give water a salty taste. Sodium can be detected through chemical testing.
Sulphate	AO of ≤ 500 mg/L	Sulphate present above 500 mg/L in water may affect the taste of water. At levels above 1000 mg/L, sulphate in drinking water can have a laxative effect, although these levels are not normally found in drinking water.
Uranium	MAC of 0.02 mg/L	In water, uranium has no taste, smell, or colour. It can only be detected through a chemical test. Exposure to uranium in drinking water can result in kidney damage.
Zinc	AO ≤ 5 mg/L	Galvanized liners or fittings or metal pipes coated with zinc, present in many older wells or plumbing systems, can leach zinc into drinking water.

For more information on water sampling and analysis, please contact:

Nova Scotia Department of Agriculture
Agriculture & Food Operations, Laboratory Services

Tel: (902) 893-6565
Fax: (902) 893-4193
URL: http://novascotia.ca/agri/programs-and-services/lab-services/

For more information on interpreting test results and drinking water quality, please contact:

Nova Scotia Environment
Environmental Health and Food Safety

Tel: 1-877-9ENVIRO (1-877-936-8476)
URL: http://www.novascotia.ca/nse/
http://www.gov.ns.ca/nse/water/thedroponwater.asp
(NSE Water Factsheets)

Hours of Business:
Monday to Friday from 8:30 am to 4:30 pm.
Submission forms can be found on our website

Water Sample Receiving Hours:
Monday to Wednesday: 8:30am – 3:00pm
Thursday: 8:30am – 1:00pm
No water samples will be received after 1:00 pm on Thursday.

Payment Methods:
We currently accept Visa, MasterCard, Debit, Cash, Cheque or Money Order.
When mailing samples, a cheque or money order made out to the NS Department of Agriculture must accompany your sample(s).

Sample drop-off location:
176 College Road (Harlow Institute) Truro, NS

Water Report

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005776
Samples Reported: 15-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 1

Lab #	2005776-001							
Client Sample ID	CHETICAMP COMM PASTURE - WELL							
Registration #								
Sample Type	Water							
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	7.11	0.01						
Conductivity (µmhos)	454	15						
Chloride (mg/L)	44	2						
Alkalinity (mg/L)	118	6						
Nitrate Nitrite-N (mg/L)	1.05	1.00						
Hardness (mg/L)	158	1						
Aluminum (mg/L)	0.03	0.02						
Barium (mg/L)	0.02	0.01						
Boron (mg/L)	ND	0.10						
Cadmium (mg/L)	ND	0.003						
Calcium (mg/L)	42.07	0.10						
Chromium (mg/L)	ND	0.010						
Copper (mg/L)	ND	0.10						
Iron (mg/L)	ND	0.01						
Magnesium (mg/L)	12.77	0.10						
Manganese (mg/L)	ND	0.01						
Potassium (mg/L)	2.15	0.50						
Sodium (mg/L)	23.54	0.10						
Sulphate (mg/L)	20.27	1.00						
Zinc (mg/L)	0.04	0.02						

Copies To:	**Analysis Approved By:**
JOHN WORT- JWORT@PERENNIA.CA	L. Scott. Lori Scott, TLOS

Water Report

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2006237
Samples Reported: 30-Oct-20
Samples Received: 28-Oct-20
# of Samples Received: 3

Lab #	2006237-001		2006237-002		2006237-003			
Client Sample ID	CAPE JOHN BY MAIN BARN		CAPE JOHN PASTURE 2 SMALL BARN		CAPE JOHN PROJECT PASTURE			
Registration #								
Sample Type	Water		Water		Water			
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
Temperature upon receipt (°C)	16		18		18			
Total Coliform (MPN/100 mL)	1	1	16	1	ND	1		
E. coli (MPN/100 mL)	ND	1	ND	1	ND	1		
pH (pH Units)	8.53	0.01	8.61	0.01	7.98	0.01		
Conductivity (µmhos)	566	15	675	15	483	15		
Chloride (mg/L)	26	2	44	2	33	2		
Alkalinity (mg/L)	229	6	265	6	189	6		
Nitrate Nitrite-N (mg/L)	ND	1.00	1.49	1.00	ND	1.00		
Hardness (mg/L)	13	1	48	1	85	1		
Aluminum (mg/L)	2.75	0.02	0.16	0.02	0.02	0.02		
Barium (mg/L)	0.11	0.01	0.24	0.01	0.16	0.01		
Boron (mg/L)	ND	0.10	ND	0.10	ND	0.10		
Cadmium (mg/L)	ND	0.003	ND	0.003	ND	0.003		
Calcium (mg/L)	3.40	0.10	14.59	0.10	26.81	0.10		
Chromium (mg/L)	ND	0.010	ND	0.010	ND	0.010		
Copper (mg/L)	ND	0.10	ND	0.10	ND	0.10		
Iron (mg/L)	2.00	0.01	0.09	0.01	0.17	0.01		
Magnesium (mg/L)	0.98	0.10	2.85	0.10	4.45	0.10		
Manganese (mg/L)	0.02	0.01	ND	0.01	ND	0.01		
Potassium (mg/L)	1.94	0.50	1.77	0.50	1.70	0.50		
Sodium (mg/L)	129.93	0.10	131.43	0.10	69.43	0.10		
Sulphate (mg/L)	13.92	1.00	14.88	1.00	12.99	1.00		
Zinc (mg/L)	0.02	0.02	ND	0.02	ND	0.02		

Comments: 2006237-001: Filtered prior to analysis.

Copies To:	**Analysis Approved By:**
JOHN WORT- JWORT@PERENNIA.CA	L. Scott Lori Scott, TLOS

Water Report

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Fax: 902-893-4193

PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2006159
Samples Reported: 29-Oct-20
Samples Received: 27-Oct-20
# of Samples Received: 2

Lab #	2006159-001		2006159-002					
Client Sample ID	MINUDIE SOUTH DITCH		MINUDIE POND SOUTH SIDE					
Registration #								
Sample Type	Water		Water					
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	6.49	0.01	7.01	0.01				
Conductivity (µmhos)	147	15	156	15				
Chloride (mg/L)	16	2	15	2				
Alkalinity (mg/L)	11	6	17	6				
Nitrate Nitrite-N (mg/L)	ND	1.00	ND	1.00				
Hardness (mg/L)	23	1	26	1				
Aluminum (mg/L)	2.15	0.02	3.25	0.02				
Barium (mg/L)	0.01	0.01	0.02	0.01				
Boron (mg/L)	ND	0.10	ND	0.10				
Cadmium (mg/L)	ND	0.003	ND	0.003				
Calcium (mg/L)	3.32	0.10	3.66	0.10				
Chromium (mg/L)	ND	0.010	ND	0.010				
Copper (mg/L)	ND	0.10	ND	0.10				
Iron (mg/L)	4.10	0.01	5.66	0.01				
Magnesium (mg/L)	3.51	0.10	4.17	0.10				
Manganese (mg/L)	0.24	0.01	0.29	0.01				
Potassium (mg/L)	9.98	0.50	11.58	0.50				
Sodium (mg/L)	16.52	0.10	15.87	0.10				
Sulphate (mg/L)	20.16	1.00	19.10	1.00				
Zinc (mg/L)	0.03	0.02	0.02	0.02				

Comments: 2006159-001: Filtered prior to analysis.

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JOHN WORT- JWORT@PERENNIA.CA	L. Scott Lori Scott, TLOS

Water Report

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2006157
Samples Reported: 29-Oct-20
Samples Received: 27-Oct-20
\# of Samples Received: 2

Lab #	2006157-001		2006157-002					
Client Sample ID	MINUDIE POND 1		MINUDIE BROOK 1					
Registration #								
Sample Type	Water		Water					
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
Temperature upon receipt (°C)	14		14					
Total Coliform (MPN/100 mL)	>2420	1	488	1				
E. coli (MPN/100 mL)	579	1	13	1				
pH (pH Units)	7.05	0.01	4.28	0.01				
Conductivity (μmhos)	544	15	1588	15				
Chloride (mg/L)	88	2	273	2				
Alkalinity (mg/L)	19	6	ND	6				
Nitrate Nitrite-N (mg/L)	ND	1.00	ND	1.00				
Hardness (mg/L)	89	1	248	1				
Aluminum (mg/L)	1.00	0.02	7.23	0.02				
Barium (mg/L)	ND	0.01	0.02	0.01				
Boron (mg/L)	0.11	0.10	0.32	0.10				
Cadmium (mg/L)	ND	0.003	ND	0.003				
Calcium (mg/L)	8.56	0.10	27.63	0.10				
Chromium (mg/L)	ND	0.010	ND	0.010				
Copper (mg/L)	ND	0.10	ND	0.10				
Iron (mg/L)	3.44	0.01	2.23	0.01				
Magnesium (mg/L)	16.43	0.10	43.45	0.10				
Manganese (mg/L)	0.43	0.01	2.39	0.01				
Potassium (mg/L)	18.80	0.50	15.15	0.50				
Sodium (mg/L)	48.78	0.10	197.43	0.10				
Sulphate (mg/L)	86.39	1.00	336.37	1.00				
Zinc (mg/L)	ND	0.02	0.20	0.02				

Comments: 2006157-001: Filtered prior to analysis.

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Client ID: C10632
Order ID: 2005780
Samples Reported: 15-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 1

PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Lab #	2005780-001							
Client Sample ID	DIGBY COMM PASTURE - BROOK							
Registration #								
Sample Type	Water							
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	7.25	0.01						
Conductivity (µmhos)	127	15						
Chloride (mg/L)	16	2						
Alkalinity (mg/L)	23	6						
Nitrate Nitrite-N (mg/L)	ND	1.00						
Hardness (mg/L)	31	1						
Aluminum (mg/L)	0.05	0.02						
Barium (mg/L)	ND	0.01						
Boron (mg/L)	ND	0.10						
Cadmium (mg/L)	ND	0.003						
Calcium (mg/L)	7.80	0.10						
Chromium (mg/L)	ND	0.010						
Copper (mg/L)	ND	0.10						
Iron (mg/L)	0.08	0.01						
Magnesium (mg/L)	2.82	0.10						
Manganese (mg/L)	ND	0.01						
Potassium (mg/L)	0.61	0.50						
Sodium (mg/L)	9.89	0.10						
Sulphate (mg/L)	11.58	1.00						
Zinc (mg/L)	ND	0.02						

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PERENNIA - TRURO
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BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005779
Samples Reported: 15-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 1

Lab #	2005779-001							
Client Sample ID	MAPLE BROOK COMM PASTURE- STREAM							
Registration #								
Sample Type	Water							
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	7.59	0.01						
Conductivity (µmhos)	178	15						
Chloride (mg/L)	8	2						
Alkalinity (mg/L)	70	6						
Nitrate Nitrite-N (mg/L)	ND	1.00						
Hardness (mg/L)	50	1						
Aluminum (mg/L)	0.07	0.02						
Barium (mg/L)	0.04	0.01						
Boron (mg/L)	ND	0.10						
Cadmium (mg/L)	ND	0.003						
Calcium (mg/L)	14.20	0.10						
Chromium (mg/L)	ND	0.010						
Copper (mg/L)	ND	0.10						
Iron (mg/L)	0.31	0.01						
Magnesium (mg/L)	3.63	0.10						
Manganese (mg/L)	0.02	0.01						
Potassium (mg/L)	0.98	0.50						
Sodium (mg/L)	14.83	0.10						
Sulphate (mg/L)	7.27	1.00						
Zinc (mg/L)	0.04	0.02						

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PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Client ID: C10632
Order ID: 2005778
Samples Reported: 15-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 1

Lab #	2005778-001							
Client Sample ID	CAPE MABOU COMM PASTURE- WELL							
Registration #								
Sample Type	Water							
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	9.40	0.01						
Conductivity (µmhos)	178	15						
Chloride (mg/L)	8	2						
Alkalinity (mg/L)	52	6						
Nitrate Nitrite-N (mg/L)	ND	1.00						
Hardness (mg/L)	63	1						
Aluminum (mg/L)	0.07	0.02						
Barium (mg/L)	0.08	0.01						
Boron (mg/L)	ND	0.10						
Cadmium (mg/L)	ND	0.003						
Calcium (mg/L)	20.41	0.10						
Chromium (mg/L)	ND	0.010						
Copper (mg/L)	ND	0.10						
Iron (mg/L)	ND	0.01						
Magnesium (mg/L)	2.91	0.10						
Manganese (mg/L)	ND	0.01						
Potassium (mg/L)	1.12	0.50						
Sodium (mg/L)	8.22	0.10						
Sulphate (mg/L)	15.27	1.00						
Zinc (mg/L)	0.04	0.02						

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Client ID: C10632
Order ID: 2005777
Samples Reported: 15-Oct-20
Samples Received: 14-Oct-20
# of Samples Received: 1

PERENNIA - TRURO
199 DR. BERNIE MACDONALD DRIVE

BIBLE HILL, NS
B6L 2H5

Lab #	2005777-001							
Client Sample ID	LITTLE HARBOUR COMM PASTURE- POND							
Registration #								
Sample Type	Water							
Parameter	Result	RDL	Result	RDL	Result	RDL	Result	RDL
pH (pH Units)	6.58	0.01						
Conductivity (µmhos)	433	15						
Chloride (mg/L)	83	2						
Alkalinity (mg/L)	32	6						
Nitrate Nitrite-N (mg/L)	ND	1.00						
Hardness (mg/L)	27	1						
Aluminum (mg/L)	0.29	0.02						
Barium (mg/L)	0.03	0.01						
Boron (mg/L)	ND	0.10						
Cadmium (mg/L)	ND	0.003						
Calcium (mg/L)	4.26	0.10						
Chromium (mg/L)	ND	0.010						
Copper (mg/L)	ND	0.10						
Iron (mg/L)	6.05	0.01						
Magnesium (mg/L)	3.85	0.10						
Manganese (mg/L)	2.53	0.01						
Potassium (mg/L)	16.10	0.50						
Sodium (mg/L)	40.12	0.10						
Sulphate (mg/L)	18.82	1.00						
Zinc (mg/L)	ND	0.02						

Comments: 2005777-001: Filtered prior to analysis.

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APPENDIX C: COST ASSUMPTIONS

Cost Estimates for Infrastructure:

Electric Fence: Post spacing 50 ft, including labour, tractor, and materials:

Cost/ 100m: 1 wire; $220.00, 2 wire; $231.00, 3 wire; $256.00, 4 wire 274.00

Barbed Wire Fence: Post spacing 16 ft, including labour, tractor, and materials:

Cost/100m: 3 wire; $360.00, 4 wire; $392.00

Fence Energizers and ground rods: Mains: $1620.00 Battery $660.00

Water pipe 1”: $0.67/foot

Squeeze and Head Gate: $4000.00

Weigh Scale: $5000.00

Corral: $4,000.00 to $10,000.00 depending on number of cattle to be handled at one time.

Estimates based on Cape John Pasture Project Report 2011. Updated checking prices with local distributors, and adjustment of labour cost per hour (2020 October).