

## Final Report – ABP File No. FRG 19.15

### Perennial Forage Variety Evaluation and Demonstration at Multiple Sites in Alberta

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#### Overview

Project participants wish to thank the Alberta Beef Producers and the Alberta Livestock and Meat Agency for supporting this study.

A selection of perennial forages species and varieties were seeded in 2016 at 8 sites in Alberta to evaluate establishment, yield and nutritional quality. Trial treatments were divided into 3 blocks: Grasses (12 entries), Legumes (15 entries) and Grass/Legume Mixes (9 entries). Data was collected from the sites in 2017 and 2018. Growth was challenged at some sites by adverse conditions both at seeding time and in the 2 years following seeding. Information collected from the sites was grouped by agro-eco regions for reporting. Highest yielding varieties for the Mixed Grassland region over the two years in southern Alberta included Greenleaf pubescent wheatgrass and AC Success hybrid brome; Yellowhead and Rugged alfalfas and mixes AC Success hybrid and Fleet meadow bromes with Yellowhead alfalfa. In the Boreal Transition region of central Alberta, AC Success hybrid brome, Rangelander and Yellowhead alfalfas and the AC Knowles/AC Mountainview sainfoin and the AC Success hybrid brome/Yellowhead alfalfa combinations were the top yielding entries. AC Saltlander green wheatgrass, Greenleaf pubescent wheatgrass and AC Admiral meadow brome were top yielding grasses in the Peace Lowland region. There was no significant difference amongst the legume entries in the Peace trials. Fleet meadow brome/Yellowhead alfalfa was the highest yielding grass/legume mix. Average yields at most sites were much less in 2018 versus 2017, most likely due to a cold, dry spring. Yields of the Fojtan Festulolium, Killarney orchard grass and Courtney tall fescue grasses dropped considerably at most sites between 2017 and 2018, indicating a lack of tolerance to winter and other weather stressors. The AC Mountainview sainfoin and the cicer milk vetch varieties do not appear to persist as well as the majority of the alfalfas.

This study has demonstrated the challenges in evaluating perennial forages in a short period of time. The wide range of growing conditions which occurred during the course of this project (both geographically and year to year) make it difficult to develop sound recommendations on variety

selection for producers. Further evaluation of the establishment, production and longevity of perennial species and varieties is strongly recommended.

### **Purpose & Objectives:**

- A. The species/variety trials targeted the following objectives:
1. To provide unbiased, current and comprehensive regional data regarding the establishment, winter survival, yield and economics of specific species and varieties of perennial forage crops.
  2. To identify perennial crop species/varieties that demonstrate superior establishment, hardiness, forage yield and nutritional quality characteristics in different eco-regions of Alberta.
  3. To assess any benefits from growing mixtures of selected species.
- B. The demonstration component will target the following objectives:
1. To demonstrate the regional adaptability of various forage species and varieties.
  2. To demonstrate the regional adaptability of various grasses and legumes when planted in mixed stands.

### **Background**

The majority of the annual feed requirement of Alberta's cow herd comes from perennial forages, including both grass and legume. Two thirds of the total cost of maintaining the cow herd is comprised of pasture, stored feed and bedding (Alberta Agriculture's Agriprofits Benchmarks), therefore, managing the supply of perennial forage is very important. Identification of high yielding varieties for different areas of the province will contribute to a positive economic return for Alberta's cattle ranchers.

Forage producers in Alberta have had limited access to information on new perennial crops in recent years. This project is intended to bridge the information gap by evaluating a number of species and varieties at several locations in Alberta. It includes test cultivars which have been developed in recent years but have had limited regional evaluation beside varieties which are commonly grown in the province. Producers will have access to data applicable to regional conditions from the eight test sites in the province.

### **Study Procedures:**

The Perennial Forage Evaluation Trial began with the selection of eight project sites in Alberta. Cereal stubble or chemical fallow sites were chosen for the study at locations near Barrhead, Evansburg, Fort Kent, Fort Vermilion, High Prairie, Manning, Sedalia and Sedgewick (see Table 1). Soil samples were collected at each site in April 2016 and analyzed for basic chemistry and soil nutrients at accredited labs for fertilizer recommendations (Table 2). One demonstration site was established near Cremona.

Sites have been grouped by Alberta Ecoregions (*Alberta Agriculture & Forestry Agriculture Ecoregions in Alberta*) for data compilation purposes:

1. Mixed Grassland (Sedalia)
2. Aspen Parkland (Sedgewick)
3. Boreal Transition (Fort Kent, Barrhead and Evansburg)
4. Peace Lowland (Fort Vermilion, High Prairie and Manning)

Three treatment blocks were included at each site: Pure Stand Grass, Pure Stand Legume and Mixed Grass/Legume. Species and varieties included are listed in Table 3. Four replications of each block were established using a randomized complete block design. Plot sizes ranged from 6.9 to 14.2 m<sup>2</sup>, based on equipment and site availability. Seed was obtained from several companies, including SeCan, Pickseed, Northstar, CPS, Brett Young and Miller Seeds as well as small amounts from Agriculture and Agri-food Canada. Each variety was distributed to all sites from one common source. Two species (Tom Russian wildrye grass and Rangelander alfalfa) were optional so were not seeded at all sites. All grasses and legumes were seeded at 1.5 cm (0.6 inches) depth at rates based on industry accepted rates and those recommended in the Alberta Forage Manual (Table 4) The appropriate fertilizer for the grass and mixed species blocks was applied based on pre-seeding soil test results. The legume plots received a rate of 11-52-0 to meet the recommended phosphorus level. The method of fertilizer application was based on equipment available by participating groups. Legumes were inoculated with powder inoculant except where pre-coated by seed companies. Sainfoin seed was not inoculated. All sites except Fort Kent received a pre-seed burn-off by a glyphosate product. Seed bed preparation at the Fort Kent location was tillage followed by a packer operation. An in-crop herbicide was applied at most sites, along with hand weeding for weed control (Table 3). Reducing competition from weeds during the establishment period is challenging but does have an impact on the resulting forage stand, hence the loss of trials at some locations. A firm seedbed, proper seed placement and appropriate selection and timing of herbicide application can improve the potential of a successful perennial establishment

Sites were all marked for self-guided tours as well as organized field days.

Similar seeding protocol was utilized for the demonstration site as that used in the replicated trials. Plot size, however, was larger at 2.8 meters by 38 meters (104 m<sup>2</sup>).

**Table 1 Perennial Forage Evaluation Trial Site Summary**

	<b>Site</b>	<b>Organization</b>	<b>Trials Completed</b>
Mixed Grassland Brown Soil Zone	Sedalia	CARA	Grasses, Legumes, Mixes
Aspen Parkland Black Soil Zone	Sedgewick	BRRG	Trials were lost to adverse growing conditions (drought, weed and rodent pressure)
Boreal Transition Black and Grey- Wooded Soil Zone	Barrhead	GRO	Grasses, Legumes, Mixes
	Evansburg	WCFA	Grasses, Mixes
	Fort Kent	LARA	Grasses <sup>1</sup> , Legumes, Mixes <sup>1</sup>
Peace Lowland Black Soil Zone	Fort Vermilion	MARA	Grasses, Legumes, Mixes
	High Prairie	PCBFA/ & SARDA	Grasses, Legumes, Mixes
	Manning	NPARA	Grasses <sup>2</sup> , Legumes <sup>2</sup> , Mixes <sup>2</sup>
Mixed Grassland	Cremona	(FFGA)	Demo of Grasses, Legumes & Mixes

<sup>1</sup> 2018 Yield Data Only

<sup>2</sup> Data not utilized due to poor establishment and missing plots

Table 2 2016 Soil Nutrient Levels at Study Sites

	Barrhead	Evansburg	Fort Kent	Fort Vermilion	High Prairie	Manning	Sedalia	Sedgewick
<b>Nutrient:</b>								
<b>Nitrogen (ppm)</b>								
0-6 inches	20	8	20	18	37	15	9	13
6-12 inches	17	8			19	5	13	
<b>Phosphorus (ppm)</b>								
0-6 inches	22	10	19	62	9		37	20
6-12 inches	12	9			<5			
<b>Potassium (ppm)</b>								
0-6 inches	93	457	192	238	236	101	>600	295
6-12 inches	89	412			202	88		
<b>Sulphur (ppm)</b>								
0-6 inches	17	16	9	14 lb	21	12	10	5
6-12 inches	17	7			31	25	8	
<b>Texture</b>								
Sand (%)	n/a	15.6	Loam	Sandy	9.4	n/a	Loam	n/a
Silt (%)		42.9		Loam	52			
Clay (%)		41.5			38.6			
<b>pH</b>								
0-6 inches	5.1	6.6	6.2	6.4	6.5	5.2	6.2	5.9
6-12 inches	5.9	6.4			7.7	6.2	7	
<b>EC (dS/m)</b>								
0-6 inches		0.56	0.5		0.59		0.32	
6-12 inches		0.38			0.92		0.8	
<b>Organic Matter</b>								
0-6 inches	4.6	9.3		2.4	9.6	4	2.9	
6-12 inches	2.8	9.4			8.5	3.5		

Table 3 Perennial Forage Trial Site Seeding Summary

Site	Seed Date	Seeder	Plot Size	Row Spacing	Weed Management
Barrhead	June 2, 2016	Fabro-plot hoe drill seeder	13.7 m <sup>2</sup>	9 inches	Pre-seed glyphosate + Bromax Bromax and Pardner post-emergence
Evansburg	June 7, 2016	Fabro disc drill	10.26 m <sup>2</sup>	9 inches	Pre-seed tillage Tropotox Plus in-crop Mowing
Fort Kent	June 7, 2016 Aug 8, 2016 (grasses & mixes re-seeded)	Fabro zero-till	6.9 m <sup>2</sup>	9 inches	Pre-seed tillage Hand weeding in the legume block; no herbicides
Fort Vermilion	May 31, 2016 July 6, 2016 (entire site was re-seeded due to poor emergence)	Fabro	10 m <sup>2</sup>	8 inches	Pre-seed glyphosate
High Prairie	June 7	Fabro	11.9 m <sup>2</sup>	11 inches	Pre-seed tillage Basagran in-crop
Manning	June 6 July 11	Fabro	10.9 m <sup>2</sup>	9 inches	Pre-seed glyphosate Lontrel in grasses; Cobutox in legumes
Sedalia	June 6, 2016	Henderson 500 with Morris contour openers	7 m <sup>2</sup>	Paired rows on 11 inch centers	Pre-seed glyphosate Basagran post-emergence
Sedgewick	June 2, 2016 June 29, 2016 (entire site re-seeded due to equipment failure)	Fabro with Techno-till openers	14.2 m <sup>2</sup>	9 inches	Pre-seed glyphosate
Cremona Demo	June 7	Henderson 500	104 m <sup>2</sup>	Paired rows on 11 inch centers	Pre-seed harrow Volunteer barley was cut and baled off

Table 4 Perennial Forage Trial Entries and Seeding Rates

	Species	Variety	Seeding Rate (lb/A)	
<b>Grasses</b>	Meadow Brome	Fleet	14	
		AC Admiral	18 ( <i>low germ</i> )	
	Hybrid Brome	AC Success	12	
		AC Knowles	12	
	Wheatgrasses			
	Pubescent	Greenleaf	10	
	Intermediate	Chief	10	
	Crested	Kirk	6	
	Green Wheatgrass	AC Saltlander	9	
	Russian Wildrye	Tom	8	
	Fojtan Festulolium		20	
	Orchard Grass	Killarney ( <i>low germ</i> )	10	
	Tall Fescue	Courtney	8	
	Timothy	Grindstad	4	
<b>Legumes</b>	Alfalfa	20-10	8	
		44-44	8	
		Assalt	8	
		Dalton	8	
		Halo	8	
		PV Ultima	8	
		Rangelander	8	
		Rugged	8	
		Spredor 4	8	
		Spredor 5	8	
	AC Yellowhead	8		
	Sainfoin	AC Mountainview	30	
		Nova	30	
	Cicer Milk Vetch	Oxley 2	13	
		Veldt	13	
<b>Mixes</b>	Mix 1	Fleet Meadow Brome	7	
		AC Yellowhead Alfalfa	4	
	Mix 2	AC Success Hybrid Brome	7	
		AC Yellowhead Alfalfa	4	
	Mix 3	AC Knowles Meadow Br	7	
		AC Yellowhead Alfalfa	4	
	Mix 4	Fleet Meadow Brome	7	
		Spredor 5 Alfalfa	4	
	Mix 5	AC Success Hybrid Brome	7	
		Spredor 5 Alfalfa	4	
	Mix 6	AC Knowles Meadow Brome	7	
		Spredor 5 Alfalfa	4	
	Mix 7	Fleet Meadow Brome	7	
		AC Mountainview Sainfoin	15	
	Mix 8	AC Success Hybrid Brome	7	
		AC Mountainview Sainfoin	15	
	Mix 9	AC Knowles Meadow Brome	8	
		AC Mountainview Sainfoin	15	

## Weather Conditions

Precipitation levels at the project sites ranged from below long term average levels to above long term average levels during the course of the project. Total growing season precipitation and average maximum and minimum temperatures are summarized in Tables 5 through 7 (as recorded from the closest ACIS station to each site). All sites except Fort Vermilion received higher levels of precipitation in May of the establishment year (2016) than the long term average for the site. Precipitation during the remainder of the 2016 growing season continued above long term averages except for the Fort Kent and Fort Vermilion sites. The trend for higher moisture levels, however, did not continue into 2017 and 2018 at several sites (Sedgewick, Oyen, Fairview, Manning and Fort Vermilion). The lower rainfall appeared to impact forage yield at all sites.

2016 temperature data indicates a warm trend for all sites early in the spring. The average maximum temperature at Fort Kent was 3 degrees C and High Prairie was 4 degrees C higher than the long term average. Early spring temperatures tended to be lower than the long term average at most sites in 2017 and 2108.

Table 5 April-August Precipitation at Replicated Project Sites

		2016	2017	2018	LTA			2016	2017	2018	LTA
<b>Sedgewick</b>	April	20.4	40.8	9.2	22.7	<b>Sedalia</b>	April	31.7	15.9	2.3	18.4
	May	122.8	27.7	34.6	39.3		May	69.8	41.4	15.0	36.6
	June	108.2	98.1	43.8	76.1		June	82.5	59.3	62.1	73.8
	July	51.7	50.3	53.2	72.9		July	79.0	22.3	48.2	55.1
	Aug	54.0	23.6	17.0	54.7		Aug	54.0	28.3	17.8	41.6
	Total	357.1	240.5	157.8	265.7		Total	317.0	167.2	145.4	225.5
<b>Fort Kent</b>	April	22.4	74.6	23.0	27.0	<b>Evansburg</b>	April	4.4	65.0	14.6	26.3
	May	41.6	50.9	20.5	41.6		May	105.3	61.4	24.7	57.7
	June	49.5	120.2	107.5	74.0		June	63.8	112.1	62.8	91.1
	July	62.8	96.5	68.2	81.8		July	60.3	76.2	110.3	102.1
	Aug	93.3	43.9	59.1	60.5		Aug	137.6	44.3	46.0	70.4
	Total	269.6	386.1	278.3	284.9		Total	371.4	359.0	258.4	347.6
<b>Barrhead</b>	April	3.8	61.4	13.3	24.9	<b>High Prairie</b>	April	6.9	29.7	8.8	22.5
	May	107.0	30.0	10.0	46.6		May	61.6	41.3	5.0	40.0
	June	76.6	133.1	72.9	85.6		June	69.5	40.8	30.0	64.3
	July	69.8	124.4	94.4	88.3		July	74.1	33.6	149.9	70.9
	Aug	160.6	37.2	54.1	63.6		Aug	53.8	31.8	14.5	51.1
	Total	417.8	386.1	244.7	309.0		Total	265.9	177.2	208.2	253.6
<b>Manning</b>	April	5.4	13.3	8.8	16.4	<b>Fort Vermilion</b>	April	5.6	6.1	18.0	18.4
	May	84.1	45.5	3.3	34.1		May	26.5	19.8	5.1	34.4
	June	100.8	49.7	134.2	60.6		June	61.7	105.9	103.4	56.9
	July	41.8	28.4	46.3	67.0		July	50.2	42.8	26.1	71.0
	Aug	81.6	20.8	34.6	45.6		Aug	23.2	46.4	18.0	51.9
	Total	313.7	157.7	227.2	223.7		Total	167.1	221.0	170.6	232.6

Table 6 Average Maximum Temperature at Project Sites

		2016	2017	2018	LTA			2016	2017	2018	LTA
<b>Sedgewick</b>	April	14.6	7.6	6.4	10.2	<b>Oyen</b>	April	17.2	10.3	6.8	11.1
	May	18.5	19.6	22.0	17.6		May	18.6	20.5	22.0	18.1
	June	22.5	21.1	23.6	21.3		June	23.4	22.9	23.9	22.1
	July	23.0	24.3	25.1	23.6		July	24.6	29.0	26.6	25.4
	Aug	22.6	23.4	24.2	23.1		Aug	23.1	26.5	26.0	24.9
<b>Fort Kent</b>	April	11.7	6.7	6.4	9.4	<b>Evansburg</b>	April	15.0	7.0	7.6	10.5
	May	20.0	18.6	21.6	16.7		May	17.9	19.7	21.0	16.6
	June	22.5	20.5	22.0	20.5		June	2.0	20.9	21.6	20.1
	July	24.3	24.0	23.7	22.6		July	23.2	23.6	23.4	22.4
	Aug	23.1	22.9	21.3	21.7		Aug	22.0	22.4	21.5	21.4
<b>Barrhead</b>	April	15.2	7.5	7.3	10.4	<b>High Prairie</b>	April	14.0	7.3	8.9	9.8
	May	19.1	19.9	22.2	17.3		May	17.5	18.3	21.3	16.7
	June	22.8	21.5	22.6	20.8		June	21.1	20.8	20.7	20.2
	July	23.9	24.0	24.0	22.9		July	22.7	22.1	22.4	22.0
	Aug	22.6	23.0	21.3	21.9		Aug	22.0	22.4	21.7	21.0
<b>Manning</b>	April	13.2	8.4	5.5	9.3	<b>Fort Vermilion</b>	April	8.4	8.8	5.4	8.8
	May	18.4	19.4	23.0	16.7		May	19.0	19.8	21.7	16.1
	June	22.3	22.3	22.1	20.7		June	23.5	21.6	20.6	20.8
	July	23.8	24.3	24.0	22.4		July	24.6	24.3	23.5	22.4
	Aug	22.4	24.1	23.9	21.2		Aug	23.1	24.5	22.2	20.8

Table 7 Average Minimum Temperature at Project Sites

		2016	2017	2018	LTA			2016	2017	2018	LTA
<b>Sedgewick</b>	April	-1.0	-1.4	-6.4	-2.2	<b>Sedalia</b>	April	-0.9	-2.5	-6.7	-2.5
	May	3.6	4.6	6.1	3.6		May	4.7	4.5	5.9	3.3
	June	8.7	8.6	8.2	8.3		June	8.4	8.0	8.5	8.1
	July	10.9	9.9	9.2	10.4		July	11.7	10.7	9.9	10.4
	Aug	8.4	7.9	7.6	8.9		Aug	9.5	9.8	9.3	9.4
<b>Fort Kent</b>	April	-1.0	-2.1	-8.0	-3.1	<b>Evansburg</b>	April	-1.2	-2.5	-8.0	-2.9
	May	5.2	4.9	5.4	3.1		May	0.5	2.7	4.1	2.5
	June	9.2	8.5	8.7	7.8		June	6.7	7.3	5.7	6.8
	July	10.7	10.8	9.8	10.1		July	8.8	8.3	7.9	9.0
	Aug	8.9	9.0	8.8	8.6		Aug	8.0	6.3	6.7	79.0
<b>Barrhead</b>	April	0.2	-1.4	-6.7	-2.7	<b>High Prairie</b>	April	-0.2	-2.0	-7.9	-2.9
	May	3.0	5.2	6.3	3.1		May	2.9	5.0	5.3	3.0
	June	9.2	9.3	8.4	7.5		June	9.7	8.1	8.3	7.5
	July	10.5	10.6	10.3	9.7		July	9.8	9.6	9.6	9.5
	Aug	9.4	9.0	8.7	8.4		Aug	9.4	8.7	9.2	8.3
<b>Manning</b>	April	-1.4	-3.1	-8.7	-3.8	<b>Fort Vermilion</b>	April	-2.2	-3.1	-7.6	-4.0
	May	1.9	3.1	5.6	2.4		May	4.8	5.8	6.2	3.2
	June	8.3	7.0	8.8	7.3		June	10.2	9.9	10.0	8.3
	July	9.5	8.0	11.4	9.3		July	12.2	11.9	11.2	10.5
	Aug	8.8	6.9	7.5	7.6		Aug	10.0	9.5	9.2	8.7



**Measurements:**

Ease of establishment for the varieties included in the trial was monitored by counting the number of shoots within a 0.25m<sup>2</sup> area within each plot at 7, 14 and 21 days post seeding in 2016. 21 day post seeding counts appear in Table 8. Observations of plant stands were also made in the spring of 2017 and 2018.

Botanical composition of the grass/legume mixes was determined by hand clipping three 0.25 m<sup>2</sup> areas per plot at 7.5 cm in height prior to harvest in 2017 and 2018. The grass and legume components were separated, dried to a constant weight and weights were recorded. The proportion of each component within the sample area was calculated.

Height of the varieties (centimeters) was determined by measuring 3 plants in each plot prior to harvest. An assessment of maturity was also made at three points within each plot just prior to harvest. Grass stages were evaluated using morphological stages (1-5) as described by Moore et al (1991) "*Describing and Quantifying Growth Stages of Perennial Forage Grasses*". Legumes were evaluated using morphological stages (stage 0-9) and counted, as described by Kalu and Fick (1981). "*Quantifying Morphological Development of Alfalfa for Studies of Herbage Quality*". Target harvest stage for yield evaluation was early to mid-bloom for the legumes and at flowering for the grasses. Most of the grasses were at a maturity level of R4 or R5 while the alfalfas were at stages 5 and 6 at harvest.

Yield data from one harvest was collected from the perennial blocks in 2017 and 2018 at 7 sites. Sites which required re-seeding in 2017 were only sampled for yield in 2018. Multiple cuts were not made in either 2017 or 2018 at any of the trial sites. Harvest yield included the full plot growth clipped to a height of 7.5 cm using a forage harvester. The entire plot sample was weighed and a sub-sample of approximately 500 g from each was collected and air dried to a constant weight (at temperatures not greater than 50<sup>0</sup> C) before the final weight was recorded.

Combined sub-samples from reps 1 and 2 as well as from reps 3 and 4 were submitted to A & L Labs for analysis of basic nutrients, including Crude Protein, Acid Detergent Fibre, Neutral Detergent Fibre, Total Digestible Nutrients, and Total Energy (Lactation, Gain and Maintenance). Wet chemistry was used for the analysis of Calcium, Copper, Phosphorus, Potassium, Sulphur, Magnesium, Zinc, Iron, Manganese and Sodium minerals.

A partial economic analysis including establishment, seed and chemical costs and the economic return of each variety is summarized in Tables 22 through 30. Costs included within the analysis were limited to materials and seed. Other expenses such as the labor and equipment employed in establishing, maintaining and harvesting the varieties are assumed to be the same for all treatments so were not included in the analysis. Returns were calculated using the 2018 AFSC regional forage survey values and dry matter yields.

## Results and Discussion – Establishment

Plant counts 21 days post seeding in 2016 indicated establishment at the sites ranged from poor to excellent (Table 7). The importance of adequate moisture and reducing weed competition were demonstrated at 4 sites where re-seeding was necessary: Fort Kent (grass and mix blocks), Fort Vermilion (all blocks), Manning (all blocks) and (Sedgewick (all blocks). Poor initial establishment was attributed to low moisture, flooding, equipment failure and/or weed pressure. Excellent moisture conditions supported growth of all varieties at the Sedalia site in Special Area 3 where plant counts exceeded what is considered excellent establishment in some varieties.

Fortunately, the growth within most treatments improved so that by harvest in 2017 the stand in the majority of plots was acceptable, with the exception of the Sedgewick site which was challenged with weed and rodent pressures and so was removed from the project. Manning data was not reported due to variability within each block caused by poor establishment and/or weed competition. The legume block at Evansburg was also abandoned due to weed competition. In general, observations from this trial indicate plant counts soon after seeding are not always a reliable indication of future production. An acceptable stand may just take additional time for establishment.

Table 8a **Plant Counts – 2016 (average per 1/4 m<sup>2</sup>) at 21 Days Post Seeding**

Grasses	Barrhead	Fort Kent	Sedge	Sedalia	Fort Verm	Manning	Fairview	WCFA
Fleet Meadow Brome	14	13 (8)	1	28	6	18	9	Not collected due to weed growth
AC Admiral Hybrid Brome	9	7 (6)	1	17	6	23	7	
AC Knowles Hybrid Brome	9	7 (5)	4	32	5	22	8	
AC Success Hybrid Brome	10	6 (9)	10	23	5	31	8	
Greenleaf Pubescent Wheatgrass	7	17 (8)	5	49	2	39	8	
Kirk Crested Wheatgrass	5	6 (2)	1	31	5	15	6	
AC Saltlander Green Wheatgrass	11	13 (7)	1	38	7	25	7	
Fojtan Festulolium	11	36 (27)	42	37	8	121	7	
Courtney Tall Fescue	12	18 (10)	20	37	7	20	7	
Killarney Orchard Grass	9	12 (10)	3	26	5	35	7	
Grindstad Timothy	7	10 (15)	4	38	2	23	8	
Tom Russian Wildrye		15 (13)	1	45				

Suggested seeding density targets for grasses: (*Alberta Agriculture and Forestry Perennial Forage Establishment*)

Black Soil Zone: 100-160 plants per m<sup>2</sup> (25-40 plants per 1/4 m<sup>2</sup>)

Grey Wooded Soil Zone: 40-50 plants per m<sup>2</sup> (10-12 plants per ¼ m<sup>2</sup>)

Brown Soil Zone: 20-40 plants per m<sup>2</sup> (5-10 plants/m<sup>2</sup>)

Table 8b **Plant Counts – 2016 (average per 1/4 m<sup>2</sup>) at 21 Days Post Seeding** *continued*

Legumes	Barrhead	Fort Kent	Sedge	Sedalia	Fort Verm	Manning	Fairview	WCFA
20--10 Alfalfa	5	5	8	40	4	25	7	Not collected due to weed growth
44--44	6	5	5	30	6	39	7	
Assalt ST	5	5	4	22	3	42	6	
Dalton	5	5	10	31	4	29	6	
Halo	5	5	13	30	6	43	7	
PV Ultima	7	6	4	32	4	58	7	
Rangelander		6	6	37				
Rugged	5	5	8	24	5	35	6	
Spreader 4	5	5	4	26	6	23	7	
Spredor 5	5	5	10	27	5	66	6	
Yellowhead	6	6	6	24	4	34	6	
AC Mountainview Sainfoin	2	6	2	24	5	20	7	
Nova Sanfoin	1	4	1	20	3	8	5	
Veldt Cicer Milk Vetch	2	5	1	25	3	14	7	
Oxley 2 Cicer Milk Vetch	3	4	4	36	3	25	7	

**Note: Counts are an average of 3 counts per treatment (variety) in each of 4 reps**

Suggested seeding density targets for legumes: (*Alberta Agriculture and Forestry Perennial Forage Establishment*)

Black Soil Zone: 80-100 plants per m<sup>2</sup> (20-25 plants per 1/4 m<sup>2</sup>)

Grey Wooded Soil Zone: 40-50 plants per m<sup>2</sup> (10-12 plants per ¼ m<sup>2</sup>)

Brown Soil Zone: 30-50 plants per m<sup>2</sup> (7.5-12.5 plants/m<sup>2</sup>)

Table 8c **Plant Counts – 2016 (average per 1/4 m<sup>2</sup>) at 21 Days Post Seeding** *continued*

Mixes	Sedge	Sedalia	Barrhead	Fort Kent	Fort Verm	Manning	Fairview	WCFA
Fleet Meadow Brome		16	8	9 (6)	5	35	7	Not collected due to weed growth
AC Yellowhead Alfalfa		22		4 (2)	1		4	
AC Success Hybrid Brome	4	10	8	12 (5)	4	35	4	
AC Yellowhead Alfalfa	2	16		5 (3)	2		7	
AC Knowles Hybrid Brome		15	8	6 (4)	5	48	3	
AC Yellowhead Alfalfa		17		2 (4)	4		6	
Fleet Meadow Brome	5	8	10	10 (5)	5	38	5	
Spredor 5 Alfalfa	3	12		5 (3)	2		5	
AC Success Hybrid Brome	0	9	7	11 (4)	4	29	4	
Spredor 5 Alfalfa	1	11		5 (3)	2		7	
AC Knowles Hybrid Brome		11	8	13 (3)	5	40	4	
Spredor 5 Alfalfa		11		4 (3)	2		4	
Fleet Meadow Brome		13	8	7 (3)	5	27	4	
AC Mountainview Sainfoin		5		7 (4)	1		6	
Knowles Hybrid Brome		14	10	14 (3)	5	28	3	
AC Mountainview Sainfoin		7		4 (4)	1		5	
Success Hybrid Brome		12	6	14 (3)	4	25	4	
AC Mountainview Sainfoin		16		5 (4)	1		5	

**Note: Counts are an average of 3 counts per treatment (variety) in each of 4 reps**

Suggested seeding density targets for mixes: (*Alberta Agriculture and Forestry Perennial Forage Establishment*)

Black Soil Zone: 80-100 plants per m<sup>2</sup> (20-25 plants per 1/4 m<sup>2</sup>)

Grey Wooded Soil Zone: 30-40 plants per m<sup>2</sup> (7.5-10 plants per ¼ m<sup>2</sup>)

Brown Soil Zone: 20-40 plants per m<sup>2</sup> (5-10 plants/m<sup>2</sup>)

## Results and Discussion – Height and Yield – Mixed Grassland Zone

Table 9 Grass Height and Yield – Mixed Grassland Zone (Sedalia Site)

	Height			Dry Matter Yield (lb/A)						Avg % Fleet <sup>1</sup>
	2017	2018	Avg	2017		2018		Average		
Greenleaf Pubescent Wheatgrass	97	73	85	5174	a	2551	a	3862	a	150
AC Success Hybrid Brome	99	78	89	4891	a	2118	ab	3504	ab	132
AC Saltlander Green Wheatgrass	89	65	77	4224	ab	1825	bcd	3024	bc	113
AC Knowles Hybrid Brome	95	69	82	4381	ab	1345	def	2929	bc	99
Fleet Meadow Brome	91	71	81	4088	ab	1476	cde	2782	c	100
Kirk Crested Wheatgrass	80	62	71	3311	c	1989	bc	2650	c	108
AC Admiral Hybrid Brome	93	75	84	3810	ab	1210	ef	2510	c	88
Grindstad Timothy	66	52	59	2022	d	528	g	1274	d	43
Tom Russian Wildrye Grass	85	80	83	1605	d	767	fg	1186	d	46
Courtney Tall Fescue	69	65	67	1640	d	668	g	1154	d	43
Killarney Orchard Grass	51	35	43	902	d	420	g	662	d	25
Fojtan Festolium	50	45	48	573	d	0	h	573	e	14
Mean	80	64	72	3052		1241		2176		

<sup>1</sup> Average % Fleet from each year of harvest

AC Success hybrid brome was the tallest of the grass varieties seeded at the Sedalia site, followed by Greenleaf pubescent wheatgrass. Greenleaf was the best yielding in each of 2017 and 2018. Other varieties showing good potential include AC Saltlander green wheatgrass, AC Knowles hybrid brome and Fleet meadow brome. Shortest and lowest yielding at this site in 2017 was Fojtan festolium and growth was too short to harvest on 2018. Average yield from the entire block in 2018 was less than half of the 2017 yield most likely due to cold growing conditions in the spring and lower precipitation levels.

Table 10 Legume Height and Yield – Mixed Grassland Zone (Sedalia Site)

	Height			Dry Matter Yield (lb/A)					% Yellowhead <sup>2</sup>
	2017	2018	Average	2017		2018 <sup>1</sup>		Average	
Yellowhead Alfalfa	49	43	46	4879	a	1979	3429	a	100
Rugged Alfalfa	52	45	49	4243	ab	2527	3367	a	107
20--10 Alfalfa	55	46	51	4262	ab	1963	3112	ab	93
Spredor 4 Alfalfa	54	47	51	3802	abc	2417	3110	ab	100
44--44 Alfalfa	54	44	49	3997	abc	2091	3056	ab	94
Rangelander Alfalfa	58	45	52	3914	abc	2213	3044	ab	96
Assalt ST Alfalfa	56	50	53	3765	abc	2050	2932	abc	90
Dalton Alfalfa	58	49	54	3646	abc	2197	2913	abc	93
PV Ultima Alfalfa	51	42	47	3566	abc	2259	2908	abc	94
Halo Alfalfa	53	49	51	3372	abc	2545	2893	abc	99
Spredor 5 Alfalfa	51	41	46	3552	abc	1679	2615	bcd	79
Oxley 2 Cicer Milk Vetch	36	31	34	2930	bc	2153	2542	bcd	84
Veldt Cicer Milk Vetch	38	24	31	3018	abc	1472	2215	cde	68
Nova Sainfoin	64	49	57	2654	bc	0	1819	de	27
AC Mountainview Sainfoin	65	45	55	2278	c	0	1442	e	23
Mean	53	43	48	3592		1836	2760		

<sup>1</sup> Differences were not significant

<sup>2</sup> Average % Yellowhead from each year of harvest

Nova sainfoin topped the legume group in height at the Sedalia site. Yellowhead alfalfa, followed closely by Rugged, 20-10 and Spredor 4 alfalfa varieties, were the top yielding legumes. Similar to the grass block yields, legume yields dropped by 50% from 2017 to 2018.

Table 11 Grass/Legume Mix Height and Yield – Mixed Grassland Zone (Sedalia Site)

	Height			Composition			Dry Matter Yield (lb/A)			
	2017	2018	Avg	2017	2018	Avg	2017	2018	Avg	% Check <sup>1</sup>
AC Success Hybrid Brome AC Yellowhead Alfalfa	88 60	69 37	79 49	74 26	64 56	69 31	3995 a	2389 a	3192 a	102
Fleet Meadow Brome AC Yellowhead Alfalfa	92 52	69 36	81 44	72 28	61 39	67 33	4045 a	2274 a	3159 a	100
AC Knowles Hybrid Brome AC Yellowhead Alfalfa	88 58	70 38	79 48	38 62	53 47	46 54	4098 a	2205 ab	3151 a	99
AC Success Hybrid Brome Spredor 5 Alfalfa	91 56	73 38	82 47	59 42	61 39	60 40	3866 ab	2276 a	3071 a	98
AC Knowles Hybrid Brome Spredor 5 Alfalfa	88 59	72 38	80 49	43 57	54 46	49 51	3710 ab	1888 abc	2799 ab	87
AC Knowles Hybrid Brome AC Mountainview Sainfoin	89 62	76 35	83 49	44 56	79 21	62 39	3396 abc	1541 cd	2469 bc	76
AC Success Hybrid Brome AC Mountainview Sainfoin	96 60	77 43	87 52	79 28	100 0	90 10	3189 bc	1639 bcd	2414 bc	75
Fleet Meadow Brome Spredor 5 Alfalfa	54 46	71 25	63 36	46 55	58 42	52 49	3283 bc	1454 cd	2369 bc	73
Fleet Meadow Brome AC Mountainview Sainfoin	91 60	73 30	82 45	77 24	100 0	89 11	2792 c	1248 d	2020 c	62
Mean	72.4	55.3	64	52.1	54.1	52.4	3597	1879	2738	

<sup>1</sup> Average % Fleet Meadow Brome and AC Yellowhead from each year of harvest

Average yield from the mix of grass and alfalfa treatments was comparable to the straight legumes but greater than the straight grasses. The cold spring and low precipitation again influenced production as 2018 yields were 50% less as compared to 2017. All three combinations including Yellowhead alfalfa were amongst the top yielding in the trial. Success hybrid brome and Spredor 5 alfalfa yielded slightly less. The percent composition of the legume in the various combinations tended to drop from 2017 to 2018. This was particularly evident in the brome/sainfoin combinations.

## Height and Yield Results – Boreal Transition Zone

Site 1: Barrhead (GRO)

Site 2: Evansburg (WCFA)

Site 3: Fort Kent (LARA)

Table 12 **Grass Height (cm) – Boreal Transition Zone**

	2017 <sup>1</sup>	2018 <sup>2</sup>	Average % Fleet <sup>3</sup>
AC Success Hybrid Brome	128	121	109
Greenleaf Pubescent Wheatgrass	95	109	90
Grindstad Timothy	93	91	81
Courtney Tall Fescue	96	94	83
AC Saltlander Green Wheatgrass	126	96	96
Fleet Meadow Brome	121	107	100 (114 cm)
AC Knowles Hybrid Brome	114	112	99
AC Admiral Hybrid Brome	116	106	97
Killarney Orchard Grass	100	92	84
Fojtan Festolium	82	71	67
Kirk Crested Wheatgrass	90	86	77
Mean	106	99	

<sup>1</sup>Barrhead and Evansburg Sites

<sup>2</sup>Fort Kent, Barrhead and Evansburg Sites

<sup>3</sup>Average from all sites in both years of the study

Table 13 **Grass Dry Matter Yield (lb/A) – Boreal Transition Zone**

	2017 <sup>1</sup>		2018 <sup>2</sup>		Average % Fleet <sup>3</sup>
AC Success Hybrid Brome	16,131	a	8,381	a	128
Greenleaf Pubescent Wheatgrass	14,485	ab	7,231	abc	113
Grindstad Timothy	14,009	abc	7,066	abc	109
Courtney Tall Fescue	13,928	abc	7,078	abc	109
AC Saltlander Green Wheatgrass	12,070	cd	8,481	a	112
Fleet Meadow Brome	12,112	bcd	6,851	bc	100 (9482 lb/A)
AC Knowles Hybrid Brome	10,981	d	7,720	ab	102
AC Admiral Hybrid Brome	9,786	de	7,481	ab	95
Killarney Orchard Grass	10,795	d	5,691	cd	86
Fojtan Festolium	7,621	ef	4,663	d	66
Kirk Crested Wheatgrass	6,402	f	4,365	d	58
Mean	11,666		6,819		

<sup>1</sup>Barrhead and Evansburg Sites

<sup>2</sup>Fort Kent, Barrhead and Evansburg Sites

<sup>3</sup>Average from all sites in both years of the study

The grass treatment block at the Fort Kent site was reseeded so was not harvested in 2017. AC Success hybrid brome grass was the tallest of the grass varieties included in the trial at 9% taller than the check Fleet brome grass and also produced the most dry matter yield in both years of the trial. Shortest specie was the Fojtan festolium, which yielded a bit higher than the lowest yielding entry of Kirk crested wheat grass.

Table 14 Legume Height (cm) – Boreal Transition Zone

	2017 <sup>1</sup>	2018 <sup>2</sup>	Average % Yellowhead <sup>3</sup>
Yellowhead Alfalfa	83	92	100 (88 cm)
Rugged Alfalfa	89	90	103
20--10 Alfalfa	86	95	103
Spredor 4 Alfalfa	89	121	119
44--44 Alfalfa	88	108	111
Rangelander Alfalfa	92	99	109
Assalt ST Alfalfa	89	90	102
Dalton Alfalfa	81	105	106
PV Ultima Alfalfa	88	83	98
Halo Alfalfa	85	94	102
Spredor 5 Alfalfa	83	97	103
Oxley 2 Cicer Milk Vetch	77	71	85
Veldt Cicer Milk Vetch	74	74	84
Nova Sainfoin	86	88	99
AC Mountainview Sainfoin	82	95	101
Mean	85	93	

<sup>1</sup>Barrhead and Fort Kent Sites<sup>2</sup>Fort Kent Site<sup>3</sup>Average from all sites in both years of the study

Table 15 Legume Dry Matter Yield (lb/A) – Boreal Transition Zone

	2017 <sup>1</sup>	2018 <sup>1</sup>	Average % Yellowhead <sup>2</sup>
Yellowhead Alfalfa	14,473 a	5228 ab	100 (9851 lb/A)
Dalton Alfalfa	14,363 a	4276 bcd	91
PV Ultima Alfalfa	12,741 ab	2924 fg	72
Rugged Alfalfa	12,636 ab	4138 bcde	83
20--10 Alfalfa	12,353 ab	4303 bcd	84
Spredor 5 Alfalfa	12,249 ab	4698 abc	87
Rangelander Alfalfa	11,967 ab	5828 a	97
44--44 Alfalfa	11,847 ab	3974 cdef	79
Halo Alfalfa	11,553 ab	2917 efg	68
Assalt ST Alfalfa	11,030 b	3784 cdefg	74
Spredor 4 Alfalfa	11,003 b	3855 cdef	75
Oxley 2 Cicer Milk Vetch	7,734 c	3657 cdefg	62
Veldt Cicer Milk Vetch	5,879 cd	3286 defg	52
AC Mountainview Sainfoin	4,359 d	2229 g	36
Nova Sainfoin	2,747 d	3319 cdefg	9
Mean	10,462	3894	

<sup>1</sup>Fort Kent and Barrhead Sites<sup>2</sup>Average from all sites in both years of the study

Spredor 4 alfalfa averaged the tallest of the legume block in the Boreal Transition zone at 19% greater than the check Yellowhead. Yellowhead, however, had the highest average yield of the two sites combined, followed by Rangelander.

Table 16 Grass/Legume Mix Height and Composition – Boreal Transition Zone

	Average Height		Average Composition
	2017 <sup>1</sup>	2018 <sup>2</sup>	% Fleet/Yellowhead <sup>3</sup>
Fleet Meadow Brome	121	90	100 (106 cm)
AC Yellowhead Alfalfa	72	70	100 (71 cm)
AC Success Hybrid Brome	111	116	129
AC Yellowhead Alfalfa	81	82	117
AC Knowles Hybrid Brome	124	121	134
AC Yellowhead Alfalfa	86	77	110
Fleet Meadow Brome	120	106	118
Spredor 5 Alfalfa	87	81	116
AC Success Hybrid Brome	120	112	124
Spredor 5 Alfalfa	91	90	129
AC Knowles Hybrid Brome	124	125	139
Spredor 5 Alfalfa	86	99	141
Fleet Meadow Brome	127	110	122
AC Mountainview Sainfoin	72	83	119
AC Success Hybrid Brome	118	115	128
AC Mountainview Sainfoin	77	82	117
AC Knowles Hybrid Brome	128	99	110
AC Mountainview Sainfoin	88	88	126
AC Admiral Meadow Brome <sup>4</sup>	122	103	114
Yellowhead Alfalfa		82	117
AC Admiral Meadow Brome <sup>4</sup>	97	99	110
Spredor 5 Alfalfa		88	126
AC Admiral Meadow Brome <sup>4</sup>	107	108	120
Mountainview Sainfoin		79	113
Mean	118	109	
	82	83	

<sup>1</sup> Barrhead and Evansburg Sites

<sup>2</sup> Fort Kent and Evansburg Sites

<sup>3</sup> Average from all sites in both years of the study

<sup>4</sup> Evansburg site only

Grasses are generally taller than the alfalfas in the Boreal Transition region when in combination. All treatment averages were taller than the Fleet and Yellowhead combination. The tallest treatment overall was Spredor 5 combined with AC Knowles hybrid brome.



Table 17 **Grass/Legume Mix Dry Matter Yield (lb/A) – Boreal Transition Zone**

Mix	2017 <sup>1</sup>	2018 <sup>2</sup>	Average % Check <sup>3,4</sup>
AC Success Hybrid Brome AC Yellowhead Alfalfa	12,653 nsd	9,788 nsd	107
Fleet Meadow Brome AC Yellowhead Alfalfa	12,912	8,366	100 (10,639 lb/A)
AC Knowles Hybrid Brome AC Yellowhead Alfalfa	13,221	8,717	103
AC Success Hybrid Brome Spredor 5 Alfalfa	13,508	6,829	93
AC Knowles Hybrid Brome Spredor 5 Alfalfa	12,596	9,182	104
AC Knowles Hybrid Brome AC Mountainview Sainfoin	16,303	8,123	112
AC Success Hybrid Brome AC Mountainview Sainfoin	12,766	6,966	91
Fleet Meadow Brome Spredor 5 Alfalfa	10,914	7,986	90
AC Fleet Meadow Brome AC Mountainview Sainfoin	13,101	8,444	101
Mean			

<sup>1</sup>Barrhead and Evansburg Sites

<sup>2</sup>Fort Kent, Barrhead and Evansburg Sites

<sup>3</sup>Fleet Meadow Brome/Yellowhead Alfalfa

<sup>4</sup>Average from all sites in both years of the study

There was no significant difference in yields measured in 2017 or 2018 blocks of the grass/legume mixes. A significant yield difference between sites was observed in the grass/legume mix treatments, with the Evansburg site yielding higher than the Barrhead site which was greater than the Fort Kent site. The combination of AC Knowles hybrid brome and the Mountainview sainfoin out yielded the check treatment by 12%.

### Results – Peace Lowland Zone

Site 1: Fort Vermilion (MARA)

Site 2: High Prairie (PCBFA)

Site 3: Manning (NPARA) is not reported due to drought, weed and grasshopper pressure

Table 18 **Grass Height (cm) – Peace Lowland Zone<sup>1</sup>**

	2017 <sup>1</sup>	2018 <sup>2</sup>	Average % Fleet <sup>3</sup>
Fleet Meadow Brome	120	96	100 (108 cm)
AC Admiral Hybrid Brome	115	110	98
AC Knowles Hybrid Brome	119	94	101
AC Success Hybrid Brome	126	86	107
AC Saltlander Green Wheatgrass	112	94	95
Kirk Crested Wheatgrass	98	116	83
Greenleaf Pubescent Wheatgrass	120	97	102
Grindstad Timothy	101	97	86
Courtney Tall Fescue	104	104	88
Killarney Orchard Grass	113	91	96
Fojtan Festolium	105	114	89
Mean	112	114	

<sup>1,2</sup>Fort Vermilion and High Prairie Sites

<sup>3</sup>Average from all sites in both years of the study

Table 19 **Grass Dry Matter Yield (lb/A) – Peace Lowland Zone<sup>1</sup>**

	2017 <sup>1</sup>		2018		Average % Fleet <sup>2</sup>
AC Saltlander Green Wheatgrass	3813	nsd	2809	a	137
Grindstad Timothy	3838		2197	b	119
Kirk Crested Wheatgrass	3591		2153	bc	114
AC Admiral Hybrid Brome	4258		2079	bc	121
AC Success Hybrid Brome	3989		1633	c	104
Greenleaf Pubescent Wheatgrass	4361		2058	bc	122
Courtney Tall Fescue	2416		2049	bc	95
Killarney Orchard Grass	4738		1777	bc	118
AC Knowles Hybrid Brome	3805		1748	bc	105
Fojtan Festolium	2471		1718	bc	86
Fleet Meadow Brome	3649		1661	bc	100 (2655 lb/A)
Mean	3721		1989		

<sup>1</sup>Fort Vermilion and High Prairie Sites

<sup>2</sup>Average from all sites in both years of the study

Consistent with the previously reported grass trial sites, AC Success hybrid brome grew the tallest of the grass entries. Kirk crested wheatgrass was the shortest in average height. Yield of the AC Saltlander was significantly better than the other grasses in 2018, and in combined two year data, yielded 37% higher than the check Fleet meadow brome. Fojtan festolium was the lowest yielding entry.

Table 20 **Average Legume Height (cm) – Peace Lowland Zone<sup>1</sup>**

	2017	2018	Average % Yellowhead <sup>2</sup>
20—10 Alfalfa	93	115	102 (103 cm)
44--44 Alfalfa	97	115	104
Assalt ST Alfalfa	90	113	99
Dalton Alfalfa	92	114	101
Halo Alfalfa	92	115	101
PV Ultima Alfalfa	93	111	100
Rangelander Alfalfa <sup>1</sup>	101	121	109
Rugged Alfalfa	92	113	101
Spredor 4 Alfalfa	101	112	105
Spredor 5 Alfalfa	95	118	104
Yellowhead Alfalfa	89	116	100
AC Mountainview Sainfoin	82	107	92
Nova Sainfoin	90	115	56
Oxley 2 Cicer Milk Vetch	82	111	94
Veldt Cicer Milk Vetch	80	116	95
Mean	91	112	

<sup>1</sup> High Prairie Site only<sup>2</sup> Average from all sites in both years of the studyTable 21 **Legume Dry Matter Yield (lb/A) – Peace Lowland Soil Zone<sup>1</sup>**

	2017		2018		Average % Yellowhead <sup>2</sup>
20—20 Alfalfa	3578	nsd	3134	nsd	100
44--44 Alfalfa	3628		2884		96
Assalt Alfalfa	3683		2874		97
Dalton Alfalfa	3561		3034		98
Halo Alfalfa	3684		2766		95
PV Ultima Alfalfa	4069		2632		97
Rugged Alfalfa	3673		2364		87
Rangelander Alfalfa <sup>1</sup>	3664		2466		89
Spredor 4 Alfalfa	3311		3071		95
Spredor 5 Alfalfa	3653		2908		97
Yellowhead Alfalfa	4045		2814		100 (3430 lb/A)
AC Mountainview Sainfoin	3182		2878		90
Nova Sainfoin	3249		2811		90
Oxley 2 Cicer Milk Vetch	3321		3373		101
Veldt Cicer Milk Vetch	2583		3889		101
Mean	3526		2927		

<sup>1</sup> High Prairie Site<sup>2</sup> Average from all sites in both years of the study

Tallest legume variety, tested only at the High Prairie site, was the Rangelander alfalfa in the Peace Lowland trials. 44-44 and Spredor 5 were next tallest overall. There were no significant differences between yields of the legume entries in either 2017 or 2018. Average yields were within a few percent of the check Yellowhead for all except the Rugged and Rangelander alfalfas. Average yields in the trial were approximately 600 pounds less in 2018 than 2017.

Table 22 **Grass/Legume Mix Height and Composition – Peace Lowland Zone**

	Average Height			Avg Composition		
	2017	2018	% Check <sup>1,3</sup>	2017	2018 <sup>2</sup>	% Check <sup>1,3</sup>
Fleet Meadow Brome	121	133	100 (127 cm)	75	39	100 (57 cm)
AC Yellowhead Alfalfa	73	96	100 (85 cm)	25	61	100 (43cm)
AC Success Hybrid Brome	130	137	105	78	78	152
AC Yellowhead Alfalfa	69	98	98	22	22	62
AC Knowles Hybrid Brome	126	132	102	77	19	75
AC Yellowhead Alfalfa	76	103	106	24	81	71
Fleet Meadow Brome	121	135	101	74	46	108
Spredor 5 Alfalfa	78	104	108	27	54	97
AC Success Hybrid Brome	130	135	105	50	74	128
Spredor 5 Alfalfa	80	92	59	51	26	122
AC Knowles Hybrid Brome	126	131	101	54	39	86
Spredor 5 Alfalfa	75	99	103	46	61	142
Fleet Meadow Brome	121	130	99	88	35	103
AC Mountainview Sainfoin	80	92	103	13	65	78
AC Success Hybrid Brome	126	133	102	88	46	117
AC Mountainview Sainfoin	80			13	54	69
AC Knowles Hybrid Brome	127	128	101	81	30	92
AC Mountainview Sainfoin	73	95	100	19	39	95
Mean	125	132		74	45	
	76	97		27	51	

<sup>1</sup> Fleet Meadow Brome + Yellowhead Alfalfa <sup>2</sup> High Prairie Site

<sup>3</sup> Average from all sites in both years of the study

Table 23 **Grass/Legume Mix Dry Matter Yield (lb/A) – Peace Lowland Zone<sup>1</sup>**

Mix	2017 <sup>1</sup>	2018 <sup>1</sup>	Average % Check <sup>2,3</sup>
AC Success Hybrid Brome AC Yellowhead Alfalfa	3380 bc	2845 a	92
Fleet Meadow Brome AC Yellowhead Alfalfa	4549 a	2679 ab	100 (3614 lb/A)
AC Knowles Hybrid Brome AC Yellowhead Alfalfa	3507 abc	2383 ab	83
AC Success Hybrid Brome Spredor 5 Alfalfa	3273 bc	1930 b	72
AC Knowles Hybrid Brome Spredor 5 Alfalfa	4031 ab	2538 ab	92
AC Knowles Hybrid Brome Mountainview Sainfoin	2757 c	2981 a	86
AC Success Hybrid Brome AC Mountainview Sainfoin	2734 c	1928 b	66
Fleet Meadow Brome Spredor 5 Alfalfa	3576 abc	3097 a	97
Fleet Meadow Brome AC Mountainview Sainfoin	3612 abc	2792 a	92
Mean	3491	2575	

<sup>1</sup> Fort Vermilion and High Prairie Sites

<sup>2</sup> Fleet Meadow Brome + Yellowhead Alfalfa <sup>3</sup> Average from all sites in both years of the study

As reported in the other trial sites, the grasses are taller than the legumes in the combinations in the Peace Lowland mix evaluations. The percentage of legumes within the mixes tended to increase between 2017 and 2018. Overall average yields were over 900 lb/A less in 2018 than in 2017. The Yellowhead alfalfa and brome mixes were amongst the highest yielding combinations, although the AC Knowles hybrid brome/AC Mountainview sainfoin yielded highest in 2018.

**Results and Discussion – Nutritional Components** (as contributed by Barry Yaremccio, M. Sc., P. Ag., Beef and Forage Specialist, Alberta Agriculture and Forestry)

Forage quality can be affected by many factors:

- 1) Annual rainfall and snow cover (especially early spring moisture conditions)
- 2) Soil type (black, brown, luvisol, etc.)
- 3) Soil fertility at time of seeding and subsequent fertilizer application
- 4) Yield and maturity of the crop
- 5) Age of stand / plant density (plants per square foot)
- 6) Plant species present and percentages of each
- 7) Wind and temperature
- 8) Weeds or invasive species present
- 9) Available sunlight (smoke impact in 2018)
- 10) Diseases, insects, and pests
- 11) Hail or frost
- 12) Harvest and storage management

Average values of nutrients contained in forages often are 40 to 75% below what is required by the animal type that is being fed. Thus, testing available feeds is the only way to develop a balanced feeding program.

Comparing nutrient content of grasses, legumes and grass mixes is challenging, but trends can be commented on. It goes without testing that cobalt and iodine are virtually absent from all forages grown in western Canada. Selenium is also very deficient; but there are small localized areas in the province where concentrations are high and problems have been encountered. The Crow's Nest Pass is one such area.

Fibre deposition occurs throughout the growing season. As fibre levels increase, the energy density in the plant decreases. After heading, it is not uncommon for grass plants to have the protein content drop by 1 to 1.5% per week and energy levels to be 3 to 4 points of TDN lower as well. (*Suleiman et. al., J Range Management 52: 75 – 82 Jan 1999*).

The results from this trial confirm that quality is variable and that the factors mentioned above have impact on the final quality of the forage, thus reinforcing the need to submit samples for analysis to establish quality. If trace mineral analysis has not been done in the past, it is worth completing a test for trace minerals to determine the baseline. Trace mineral levels do not change much from year to year. It might require that a custom mineral be developed for certain operations.

Based on the variability observed both within and between trial sites and year of harvest within this study, as well as the influence of location specificities and timing of harvest, it was determined there was no value in calculating regional averages. Nutritional values for the treatments within each

individual site are reported in the Appendix. Comments by Barry Yaremco on the specific nutritional components are documented there.

### Results and Discussion – Partial Economic Analysis

The following tables provide a partial economic analysis for the average yield of varieties during the first two years of production in each region. The entire cost of establishing the forage is taken from the revenue generated in those first two years, not amortized over the lifespan of the forage stand. As would be expected, higher yielding varieties tended to provide the highest net return. A large jump in hay prices occurred between 2017 and 2018 due to a shortage of hay throughout the province. This increase in value had a large impact on the net returns for each entry in the study. The net return of the trials in the Peace Lowland tended to be less than in the central and southern regions where the hay values are typically higher.

Table 24 **Partial Economic Analysis for Grasses – Mixed Grassland Zone**

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
Greenleaf Pubescent Wheatgrass	\$61.30	\$85.00	5174 lb/A	\$205.53	2551 lb/A	\$212.14	\$417.67
AC Success Hybrid Brome	77.88	85.00	4891	169.73	2118	172.74	342.45
AC Saltlander Green Wheatgrass	107.91	85.00	4224	94.32	1825	146.08	240.40
AC Knowles Hybrid Brome	77.88	85.00	4381	135.03	1345	102.40	237.42
Fleet Meadow Brome	69.30	85.00	4088	123.68	1476	114.32	238.00
Kirk Crested Wheatgrass	47.25	85.00	3311	92.90	1989	161.00	253.90
AC Admiral Hybrid Brome	77.88	85.00	3810	96.20	1210	90.11	186.31
Grindstad Timothy	11.72	85.00	2022	\$40.78	528	28.05	68.82
Tom Russian Wildrye Grass	51.12	85.00	1605	-26.98	767	49.80	22.82
Courtney Tall Fescue	24.40	85.00	1640	2.12	668	40.79	42.91
Killarney Orchard Grass	73.50	85.00	902	-97.16	420	18.22	-78.94
Fojtan Festolium	3.00	85.00	573	-49.04	0	0.00	-49.04

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A), in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.068/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.101/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding, establishment and annual harvest costs

Table 25 Partial Economic Analysis for Legumes – Mixed Grassland Zone

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
Yellowhead Alfalfa	\$48.00	\$80.00	4879 lb/A	154.98	1979 lb/A	\$160.09	\$315.07
Rugged Alfalfa	39.92	80.00	4243	106.17	2527	209.96	316.13
20—10 Alfalfa	39.60	80.00	4262	107.60	1963	158.63	266.23
Spredor 4 Alfalfa	47.84	80.00	3802	72.68	2417	199.95	272.62
44—44 Alfalfa	48.00	80.00	3997	83.83	2091	170.28	254.11
Rangelander Alfalfa	48.00	80.00	3914	79.01	2213	181.38	260.40
Assalt ST Alfalfa	48.00	80.00	3765	70.37	2050	166.55	236.92
Dalton Alfalfa	48.00	80.00	3646	63.47	2197	179.93	243.40
PV Ultima Alfalfa	50.08	80.00	3566	56.75	2259	185.57	242.32
Halo Alfalfa	47.76	80.00	3372	47.82	2545	211.60	259.41
Spredor 5 Alfalfa	49.84	80.00	3552	56.18	1679	132.79	188.97
Oxley 2 Cicer Milk Vetch	47.60	80.00	2930	22.34	2153	175.92	198.26
Veldt Cicer Milk Vetch	55.60	80.00	3018	19.44	1472	113.95	133.40
Nova Sainfoin	118.50	80.00	2654	-64.57	0	0.00	-64.57
AC Mountainview Sainfoin	82.50	80.00	2278	-50.38	0	0.00	-50.38

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.069/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.107/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

Table 26 Partial Economic Analysis for Grass/Legume Mixes – Mixed Grassland Zone

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
AC Success Hybrid Brome	\$45.43	\$80.00	3995 lb/A	\$62.28	2389 lb/A	\$197.40	\$259.68
AC Yellowhead Alfalfa	24.00						
Fleet Meadow Brome	34.65	80.00	4045	75.96	2274	186.93	\$262.89
AC Yellowhead Alfalfa	24.00						
Ac Knowles Hybrid Brome	45.43	80.00	4098	68.25	2205	180.66	\$248.91
AC Yellowhead Alfalfa	24.00						
AC Success Hybrid Brome	45.43	80.00	3866	53.88	2276	187.12	\$240.99
Spredor 5 Alfalfa	24.92						
AC Knowles Hybrid Brome	24.92	80.00	3710	46.65	1888	151.81	\$198.46
Spredor 5 Alfalfa	43.61						
AC Knowles Hybrid Brome	45.43	80.00	3396	10.29	1541	120.23	\$130.52
AC Mountainview Sainfoin	41.25						
AC Success Hybrid Brome	45.43	80.00	3189	-1.72	0	0	-\$1.72
Mountainview Sainfoin	41.25						
Fleet Meadow Brome	34.65	80.00	3283	30.84	1454	112.314	\$143.16
Spredor 5 Alfalfa	24.92						

Fleet Meadow Brome	34.65	80.00	2792	-13.96	0	0	-\$13.96
AC Mountainview Sainfoin	41.25						

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A) (AAF Custom Rates and Farm Input Price Guide). Harvest costs are not included.

<sup>2</sup> Return based on \$.069/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.107/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

**Table 27 Partial Economic Analysis for Grasses – Boreal Transition Zone**

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
AC Success Hybrid Brome	\$77.88	\$100.00	16131 lb/A	\$495.75	8381 lb/A	675.62	\$1,171.38
Greenleaf Pubescent Wheatgrass	61.30	100	14485	461.56	7231	580.17	1041.73
Grindstad Timothy	11.72	100	14009	490.67	7066	566.48	1057.15
Courtney Tall Fescue	24.4	100	13928	474.50	7078	567.47	1041.98
AC Saltlander Green Wheatgrass	107.91	100	12070	311.10	8481	683.92	995.02
Fleet Meadow Brome	69.30	100	12112	351.52	6851	548.63	900.15
AC Knowles Hybrid Brome	77.88	100	10981	294.30	7720	620.76	915.06
AC Admiral Hybrid Brome	77.88	100	9786	242.92	7481	600.92	843.84
Killarney Orchard Grass	73.5	100	1795	-96.32	5691	452.35	356.04
Fojtan Festolium	60.00	100	7621	167.70	4663	367.03	534.73
Kirk Crested Wheatgrass	47.25	100	6402	128.04	4365	342.30	470.33

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.047/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.08/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs



Table 28 Partial Economic Analysis for Legumes – Boreal Transition Zone

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
Yellowhead Alfalfa	\$48.00	\$85.00	14,473 lb/A	\$541.70	5228 lb/A	\$476.66	\$922.64
Dalton Alfalfa	48.00	85.00	14363	536.42	4276	386.22	922.64
PV Ultima Alfalfa	50.08	85.00	12741	456.49	2924	257.78	714.27
Rugged Alfalfa	39.92	85.00	12636	461.61	4138	373.11	834.72
20--10 Alfalfa	39.60	85.00	12353	448.34	4303	388.785	837.13
Spredor 5 Alfalfa	49.84	85.00	12249	433.11	4698	426.31	859.42
Rangelander Alfalfa	48.00	85.00	11967	421.42	5828	533.66	955.08
44--44 Alfalfa	48.00	85.00	11847	415.66	3974	357.53	773.19
Halo Alfalfa	47.76	85.00	11553	401.78	2917	257.115	658.90
Assalt ST Alfalfa	48.00	85.00	11030	376.44	3784	339.48	715.92
Spredor 4 Alfalfa	47.84	85.00	11003	375.30	3855	346.225	721.53
Oxley 2 Cicer Milk Vetch	47.60	85.00	7734	218.63	3657	327.415	546.05
Veldt Cicer Milk Vetch	55.60	85.00	5879	121.59	3286	292.17	413.76
AC Mountainview Sainfoin	82.50	85.00	4359	21.73	2229	191.755	213.49
Nova Sainfoin	118.50	85.00	2747	-91.64	3319	295.305	203.66

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.58/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.105/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

Table 29 Partial Economic Analysis for Grass/Legume Mixes – Boreal Transition Zone

Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>	
AC Success Hybrid Brome AC Yellowhead Alfalfa	\$45.43 24.00	\$85.00	12653 lb/A	\$454.65	9788 lb/A	\$792.40	\$1,247.05
Fleet Meadow Brome AC Yellowhead Alfalfa	34.65 24.00	85	12912	411.57	8366	674.38	1085.94
AC Knowles Hybrid Brome AC Yellowhead Alfalfa	45.43 2.004	85	13221	414.07	8717	703.51	1117.58
AC Success Hybrid Brome Spredor 5 Alfalfa	45.43 24.92	85	13508	425.49	6829	546.81	972.30
AC Knowles Hybrid Brome Spredor 5 Alfalfa	24.92 43.61	85	12596	388.10	9182	742.11	1130.20
AC Knowles Hybrid Brome AC Mountainview Sainfoin	45.43 41.25	85	16303	529.35	8123	654.21	1183.56
AC Success Hybrid Brome AC Mountainview Sainfoin	45.43 41.25	85	12766	377.26	6966	558.18	935.44
Fleet Meadow Brome Spredor 5 Alfalfa	34.65 24.92	85	10914	324.73	7986	642.84	967.57
Fleet Meadow Brome AC Mountainview Sainfoin	34.65 41.25	85	13101	402.44	8444	680.85	1083.30

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and

in-crop herbicide application (\$18/A), **mower conditioner (\$20/A), baling (\$14/bale)**  
(AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.053/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.093/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

**Table 30 Partial Economic Analysis for Grasses – Peace Lowland Zone**

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
AC Saltlander Green Wheatgrass	107.91	\$100.00	3813 lb/A	-136.40	2809 lb/A	78.32	<b>-\$58.08</b>
Grindstad Timothy	11.72	100	3838	-39.61	2197	56.90	17.29
Kirk Crested Wheatgrass	47.25	100	3591	-81.07	2153	55.36	<b>-25.71</b>
AC Admiral Hybrid Brome	77.88	100	4258	-95.69	2079	52.77	<b>-42.92</b>
AC Success Hybrid Brome	77.88	100	3989	-102.14	1633	37.16	<b>-64.99</b>
Greenleaf Pubescent Wheatgrass	61.30	100	4361	-76.64	2058	52.03	<b>-24.61</b>
Courtney Tall Fescue	24.40	100	2416	-86.42	2049	51.72	<b>-34.70</b>
Killarney Orchard Grass	73.50	100	4738	-79.79	1777	42.20	<b>-37.59</b>
AC Knowles Hybrid Brome	77.88	100	3805	-106.56	1748	41.18	<b>-65.38</b>
Fojtan Festolium	60.00	100	2471	-120.70	1718	40.13	<b>-80.57</b>
Fleet Meadow Brome	69.30	100	3649	-101.72	1661	38.14	<b>-63.59</b>

<sup>1</sup> Establishment costs include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale)  
(AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.034/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.045/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

**Table 31 Partial Economic Analysis for Legumes – Peace Lowland/Black Soil Zone**

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
20—20 Alfalfa	\$39.60	\$85.00	3578 lb/A	<b>-\$24.42</b>	3134 lb/A	\$114.76	\$90.35
44—44 Alfalfa	48.00	85.00	3628	<b>-31.42</b>	2884	104.01	\$72.60
Assalt Alfalfa	48.00	85.00	3683	<b>-29.88</b>	2874	103.58	\$73.71
Dalton Alfalfa	48.00	85.00	3561	<b>-33.29</b>	3034	110.46	\$77.17
Halo Alfalfa	47.76	85.00	3684	<b>-29.61</b>	2766	98.94	\$69.33
PV Ultima Alfalfa	50.08	85.00	4069	<b>-21.15</b>	2632	93.18	\$72.03
Rugged Alfalfa	39.92	85.00	3673	<b>-22.08</b>	2364	81.65	\$59.58
Rangelander <sup>1</sup>	48.00	85.00	3664	<b>-30.41</b>	2466	86.04	\$55.63
Spredor 4 Alfalfa	47.84	85.00	3311	<b>-40.13</b>	3071	112.05	\$71.92
Spredor 5 Alfalfa	49.84	85.00	3653	<b>-32.56</b>	2908	105.04	\$72.49
Yellowhead Alfalfa	48.00	85.00	4045	<b>-19.74</b>	2814	101.00	\$81.26
AC Mountainview Sainfoin	82.50	85.00	3182	<b>-78.40</b>	2878	103.75	\$25.35
Nova Sainfoin	118.50	85.00	3249	<b>-112.53</b>	2811	100.87	<b>-\$11.66</b>
Oxley 2 Cicer Milk Vetch	47.60	85.00	3321	<b>-39.61</b>	3373	125.04	\$85.43
Veldt Cicer Milk Vetch	55.60	85.00	2583	<b>-68.28</b>	3889	147.23	\$78.95

<sup>1</sup> Establishment costs Include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.038/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.053/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

**Table 32 Partial Economic Analysis for Grass/Legume Mixes – Peace Lowland/Black Soil Zone**

	Seed	Est'mt <sup>1</sup>	2017 Yield & Return <sup>2</sup>		2018 Yield & Return <sup>3</sup>		Net Return <sup>4</sup>
AC Success Hybrid Brome	\$45.43	\$85.00	3,380 lb/A	-\$66.55	2845 lb/A	\$90.96	\$24.41
AC Yellowhead Alfalfa	24.00						
Fleet Meadow Brome	34.65	85.00	4549	-45.376	2679	\$84.48	\$39.11
AC Yellowhead Alfalfa	24.00						
Knowles Hybrid Brome	45.43	85.00	3507	-83.248	2383	\$72.94	-\$10.31
AC Yellowhead Alfalfa	24.00						
AC Success Hybrid Brome	45.43	85.00	3273	-90.252	1930	\$55.27	-\$34.98
Spredor 5 Alfalfa	24.92						
AC Knowles Hybrid Brome	24.92	85.00	4031	-68.724	2538	\$78.98	\$10.26
Spredor 5 Alfalfa	43.61						
AC Knowles Hybrid Brome	45.43	85.00	2757	-	2981	\$96.26	-\$23.74
AC Mountainview Sainfoin	41.25			119.998			
AC Success Hybrid Brome	45.43	85.00	2734	-	1928	\$55.19	-\$65.40
AC Mountainview Sainfoin	41.25			120.596			
Fleet Meadow Brome	34.65	85.00	3576	-71.594	3097	\$100.78	\$29.19
Spredor 5 Alfalfa	24.92						
Fleet Meadow Brome	34.65	85.00	3612	-86.988	3792	\$127.89	\$40.90
AC Mountainview Sainfoin	41.25						

<sup>1</sup> Establishment costs Include seeding (\$25/A), fertilizer (\$25/A), pre-seed glyphosate application (\$17/A) and in-crop herbicide application (\$18/A), mower conditioner (\$20/A), baling (\$14/bale) (AAF Custom Rates and Farm Input Price Guide).

<sup>2</sup> Return based on \$.036/lb (AFSC Commodity Price Summary)

<sup>3</sup> Return based on \$.049/lb (AFSC Commodity Price Summary)

<sup>4</sup> Combined return for 2017 and 2018 less seeding and establishment costs

## **Results and Discussion – Demonstration Site Summary**

Single strips of 11 grasses, 14 legumes and 9 mixes were seeded on June 7, 2016 at a site near Cremona. Moisture conditions were dry at the time of seeding. Volunteer barley grew abundantly across the demo strips and was removed by cutting and baling August 19. 19.1 inches of rainfall was received at the site between May 23 and September 11, 2016, with the majority falling from mid-July on. Individual strips within the site were marked for self-guided tours.

A good snow cover was received during the winter of 2016/2017, providing good soil moisture for the spring. 150 cows grazing swaths in the adjacent field had access to the demo for 7 days in January.

The site again received a thick layer of snow cover during the 2017/2018 winter. 145 cows grazed swaths in the adjacent field as well as the site for one week in January. The snow resulted in good spring moisture, however below average rainfall for that area (approximately 5 inches) was received during the summer.

Growth looked good throughout the site. All alfalfa and cicer milk vetch varieties were more prominent than the sainfoin. The site was not clipped or harvested in anyway during the growing season throughout the three-year project, with only light off-season grazing by cows in January.

## **Knowledge Transfer Activities**

All project participants carried out a number of activities sharing information related to the study and production of perennial forages in general (see summary below).

An overview of the project was presented to a provincial audience at the:

- Alberta Forage Industry Network (AFIN) Annual General Meeting, March 7, 2017 in Leduc
- Agricultural Research and Extension Council of Alberta (ARECA) Annual General Meeting, March 8, 2017 in Leduc
- Alberta Beef Forage and Grazing Center Annual General Meeting February 7, 2018 in Leduc
- ARECA association staff toured the Sedalia site during Summer Training August 9 2016
- Beef Industry Conference booth by ARECA Forage and Livestock Team members; August 2017

Individual groups also provided updates for their local membership in annual report publications, newsletters and meetings. Updates and photos were also provided in newsletters, Instagram, facebook, and twitter accounts.

A provincial focused Fact Sheet is currently under construction which will be shared amongst all groups and posted on association websites for exposure to a wide audience.

## **Future Recommendations**

Gathering yield data over a longer term will provide more meaningful information for Alberta's forage producers. Forage stands are rarely left in rotation/production for just 2 years due to the investment required for establishment. Different seeding rates should perhaps be considered for different regions of the province.

Table 33 **Publication and Event Summary**

<b>Site</b>	<b>Publications</b>	<b>Events (Local or Regional Audience)</b>
<b>CARA</b>	Annual Report Booklet <i>Grain, Grass &amp; Growth</i> Newsletter The final report will be posted on CARA's website (chinookappliedresearch.ca)	SAAC Annual Update (Dec 2017 & Dec 2018) MD of Acadia Council (Jan 2018) CARA Annual Projects Review (Feb 2017, 2018 & 2019) CARA Cooperator Appreciation Night (Jan 2018 and Feb 2019) MD Crop Update (Feb 2017)
<b>GRO</b>	Projects Report	
<b>LARA</b>	Annual Report Newsletter Articles	Summer Field Day (July 20) Annual General Meeting project update (February 28, 2018) Holistic Management Grazing Tour (July 18, 2018) Fort Kent Summer Field Day (Karin Lindquist discussed perennial forage strategies) (July 26, 2018) Cover Crops & Soil Health Field Day (discussion on perennials legumes) (August 15, 2018)
<b>MARA</b>	Annual Projects Report (2016, 2017 & 2018)	
<b>NPARA</b>	Annual Projects Report (2016, 2017 & 2018)	Establishing and Grazing Perennials (Feb 7, 2017) Pasture Walk (June 27, 2017) Establishment, management & grazing perennial forages (Feb 28, 2018) Solstice Tour of Plots (June 21, 2018) Soil Health Field Tours (July 10, 2018) Summer Field Tour (July 25, 2018) Morning Coffee Plot Tour (Aug 15, 2018) Canadian Forage and Grazing Conference
<b>PCBFA</b>	Annual Projects Report (2016, 2017 & 2018)	Grazing Field Days and Seminars
<b>WCFA</b>	Progress Report in AGM book (2016, 2017, 2018) Published a Progress Report on WCFA website	Progress Report presentation at AGM Canadian Forage and Grazing Conference
<b>FFGA Demo</b>	Report for Annual Meeting	Field Day (July 19, 2017) Overview of the Perennial Forage Trial was presented at Field Day by Project Lead. The site was part of a Forage to Beef Event on July 11 <sup>th</sup> , 2018. A total of 49 people attended the event. Canadian Forage and Grazing Conference

## APPENDIX – Individual Site Data

### Boreal Transition/Black Soil Zone by Individual Sites

Table 34 Grass Height (cm) and Dry Matter Yield (lb/A) – Barrhead Site

	Height	Dry Matter Yield (lb/A)					
		2017		2018		Average	
Greenleaf Pubescent Wheatgrass	83	20824	a	3511	abc	12168	a
AC Success Hybrid Brome	120	17939	a	4317	ab	11128	ab
Courtney Tall Fescue	79	17644	ab	1185	e	9415	abc
Fleet Meadow Brome	122	14322	bc	3694	abc	9008	abc
AC Saltlander Green Wheatgrass	112	12636	c	4823	a	8730	bc
AC Knowles Hybrid Brome	116	12491	c	3550	abc	8020	bc
Grindstad Timothy	83	14110	c	1676	de	7893	c
AC Admiral Hybrid Brome	114	11686	c	3142	bc	7414	cd
Killarney Orchard Grass	83	11877	c	976	e	6427	cd
Kirk Crested Wheatgrass	99	6506	d	2872	cd	4689	d
Fojtan Festulolium	72	8217	d	976	e	4597	d
Mean		13477		2793		8135	

Table 35 Legume Height (cm) and Dry Matter Yield (lb/A) – Barrhead Site

	2017 Ht (cm)	Dry Matter Yield (lb/A)					
		2017		2018		Average	
Yellowhead Alfalfa	82	22589	a	4895	a	13742	a
Dalton Alfalfa	87	21873	ab	2988	bc	12431	ab
PV Ultima Alfalfa	89	19709	abc	2078	d	10893	bc
Rugged Alfalfa	90	19043	abc	2503	cd	10773	bc
Spredor 5 Alfalfa	78	17903	c	3269	b	10586	bc
20--10 Alfalfa	88	18192	bc	2960	bc	10576	bc
Halo Alfalfa	84	17930	c	2424	bcd	10207	bc
44--44 Alfalfa	88	17756	c	2354	cd	10055	bc
Assalt ST Alfalfa	82	16987	c	2045	d	9516	c
Spredor 4 Alfalfa	87	16510	c	2354	cd	9432	c
AC Mountainview Sainfoin	85	6703	d			6703	d
Oxley 2 Cicer Milk Vetch	67	9967	d	2194	d	6081	d
Veldt Cicer Milk Vetch	63	7868	d	2067	d	4968	d
Nova Sainfoin	79	1856	e			1856	e
Mean	82	15349		2678		9130	

Table 36 Grass/Legume Mix Height (cm) and Dry Matter Yield (lb/A) – Barrhead Site

	Avg Ht	Dry Matter Yield (lb/A)					
		2017		2018		Average	
AC Knowles Hybrid Brome AC Mountainview Sainfoin	128 88	20033	a	5187	ab	12610	a
AC Knowles Hybrid Brome AC Yellowhead Alfalfa	124 86	16147	b	5226	ab	10686	b
AC Knowles Hybrid Brome Spredor 5 Alfalfa	124 86	15522	b	5694	a	10608	b
AC Success Hybrid Brome Spredor 5 Alfalfa	121 91	15495	b	5513	ab	10504	b
AC Success Hybrid Brome AC Yellowhead Alfalfa	119 81	15740	b	5226	ab	10483	b
Fleet Meadow Brome Spredor 5	132 87	15931	b	4476	bc	10204	b
AC Success Hybrid Brome AC Mountainview Sainfoin	119 77	14976	b	4449	bc	9712	b
Fleet Meadow Brome AC Yellowhead Alfalfa	133 81	14924	b	3980	cd	9452	b
Fleet Meadow Brome AC Mountainview Sainfoin	124 72	15539	b	3291	d	9415	b
Mean		16034		4782		10408	

Table 37 Grass Dry Matter Yield (lb/A) – Evansburg Site

Grasses	Height (cm)			Dry Matter Yield (lb/A)					
	2017	2018	Avg	2017		2018		Average	
Fleet Meadow Brome	120	100	110	9903	bcd	10148	abc	10025	cd
AC Admiral Hybrid Brome	112	100	106	7886	cd	10692	abc	9289	cd
AC Knowles Hybrid Brome	117	107	112	9471	bcd	9679	bc	9575	cd
AC Success Hybrid Brome	135	110	122	14322	a	10146	abc	12234	ab
Greenleaf Pubescent Wheatgrass	107	90	98	8146	cd	8233	c	8190	d
Kirk Crested Wheatgrass	81	80	81	6103	d	4321	d	5064	e
AC Saltlander Green Wheatgrass	140	85	112	11504	ab	11001	ab	11252	abc
Killarney Orchard Grass	117	98	107	9712	bcd	9602	bc	9657	cd
Grindstad Timothy	102	92	97	13909	a	12306	a	13107	a
Fojtan Festolium	91	71	81	6658	cd	4512	d	5595	e
Courtney Tall Fescue	112	94	103	10211	bcd	11655	ab	10933	bc
Mean	112	93	103	9802		9300		9538	

Table 38 Grass/Legume Mix Dry Matter Yield (lb/A) – Evansburg Site

	Height (cm)			Dry Matter Yield (lb/A)				
	2017	2018	Avg	2017		2018	Average	
Fleet Meadow Brome AC Yellowhead Alfalfa	117	100 77	108	10900	a	14497	12699	abc
AC Success Hybrid Brome AC Yellowhead Alfalfa	102	105 80	103	9566	ab	16922	13244	ab
AC Admiral Brome AC Yellowhead Alfalfa	122	103 82	112	7393	bc	12277	9835	d
Fleet Meadow Brome Spredor 5 Alfalfa	107	96 76	101	5898	c	12439	9168	d
AC Success Hybrid Brome Spredor 5 Alfalfa	119	114 90	117	11522	a	7334	6428	d
AC Admiral Brome Spredor 5 Alfalfa	97	99 88	98	9331	ab	17529	13430	a
Fleet Meadow Brome AC Mountainview Sainfoin	130	102	116	10663	a	17276	13970	a
AC Success Hybrid Brome AC Mountainview Sainfoin	117	112 82	114	10556	a	11286	10921	bcd
AC Admiral Brome AC Mountainview Sainfoin	107	108 79	107	9293	ab	11623	10458	cd
Mean	113	104	108	9458		13465	11128	

In addition to differences between varieties, the difference between years is significantly different as well.

Table 39 Grass Height (cm) and Dry Matter Yield (lb/A) – Fort Kent Site

	Height		Yield (lb/A)	
	2018		2018	
Greenleaf Pubsecent Wheatgrass	128		7665	ab
AC Success Hybrid Brome	131		8226	a
AC Saltlander Green Wheatgrass	106		8492	a
AC Knowles Hybrid Brome	123		7809	ab
Fleet Meadow Brome	115		4294	d
Kirk Crested Wheatgrass	92		4074	d
AC Admiral Hybrid Brome	111		6574	bc
Grindstad Timothy	90		5016	cd
Tom Russian Wildrye Grass	102		3654	d
Courtney Tall Fescue				
Killarney Orchard Grass	86		3167	d
Fojtan Festolium				
Mean	109		5897	



Table 40 Legume Height (cm) and Dry Matter Yield (lb/A) – Fort Kent Site

	Height			Yield (lb/A)		
	2017	2018	Avg	2017	2018	Average
Rangelander Alfalfa	92	99	96	6836 a	7123 a	6979 a
Spredor 5 Alfalfa	88	97	93	6595 ab	6089 ab	6289 ab
Dalton Alfalfa	74	105	90	6853 a	5564 abcd	6208 ab
20--10 Alfalfa	83	95	89	6515 ab	5646 abc	6081 abc
Rugged Alfalfa	88	90	89	6230 ab	5773 abc	6002 abcd
Yellowhead Alfalfa	84	92	88	6357 ab	5562 abcd	5959 abcd
44--44 Alfalfa	87	108	98	5938 ab	5594 abcd	5766 abcd
Spredor 4 Alfalfa	91	121	106	5496 ab	5356 abcd	5426 bcde
Oxley 2 Cicer Milk Vetch	87	71	79	5501 bc	5119 bcd	5310 bcde
Assalt ST Alfalfa	95	90	93	5073 ab	5523 abcd	5298 bcde
PV Ultima Alfalfa	86	83	85	5772 ab	3769 d	4771 cdef
Halo Alfalfa	86	94	90	5175 abc	3809 cd	4604 def
Veldt Cicer Milk Vetch	84	74	79	3890 cd	4504 bcd	4197 ef
Nova Sainfoin	92	88	90	3063 d	4904 bcd	3982 ef
AC Mountainview Sainfoin	78	95	87	2931 d	3814 cd	3372 f
Mean	87	92	89	4920	4795	4869

Table 41 Grass/Legume Mix Height (cm) and Dry Matter Yield (lb/A) – Fort Kent Site

	Composition	Height	2017	2018
AC Success Hybrid Brome	44	126	n/a	7217 ab
AC Yellowhead Alfalfa	56	84		
Fleet Meadow Brome	27	79		6753 abc
AC Yellowhead Alfalfa	53	62		
AC Knowles Hybrid Brome	53	121		6978 abc
AC Yellowhead Alfalfa	47	77		
AC Success Hybrid Brome	48	110		7640 a
Spredor 5 Alfalfa	52	90		
AC Knowles Hybrid Brome	34	125		7439 ab
Spredor 5 Alfalfa	66	99		
AC Knowles Hybrid Brome	86	115		5377 bcd
AC Mountainview Sainfoin	14	88		
AC Success Hybrid Brome	66	117		5162 cd
AC Mountainview Sainfoin	34	81		
Fleet Meadow Brome	27	116		7043 abc
Spredor 5 Alfalfa	73	86		
Fleet Meadow Brome	80	117		4765 d
AC Mountainview Sainfoin		83		
Mean	52	114		6486
	49	83		

## Individual Site Results - Peace Lowland/Black Soil Zone

Table 42 Grasses Height and Yield – High Prairie

	Height			Average Dry Matter (lb/A)		
	2017	2018	Avg	2017	2018	Average
Fleet Meadow Brome	150	88	119	5733	1735 f	3751
AC Admiral Hybrid Brome	137	73	105	6560	1772 f	4232
AC Knowles Hybrid Brome	139	125	132	5246	1857 ef	4013
AC Success Hybrid Brome	145	71	108	5671	1627 f	3980
Greenleaf Pubescent Wheatgrass	142	94	118	7236	2677 bcd	5209
Kirk Crested Wheatgrass	101	105	103		2459 cde	3927
AC Saltlander Green Wheatgrass	121	99	110	5869	4096 a	5036
Killarney Orchard Grass	140	94	117	6486	2067 def	4585
Grindstad Timothy	117	107	112	5593	2931 bc	4618
Fojtan Festolium	105	103	104	4847	2222 def	3546
Courtney Tall Fescue	118	134	126	6746	3124 b	3953
Mean	128		114	5999	2415	4259

Table 43 Legume Height and Yield – High Prairie

	Height			Dry Matter Yield (lb/A)		
	2017	2018	Avg	2017	2018	Average
20—10 Alfalfa	100	122	111	6026	4537	5281
44—44 Alfalfa	106	124	115	6005	4297	5152
Assalt ST Alfalfa	102	126	114	6086	4912	5499
Dalton Alfalfa	101	119	110	5532	4558	5045
Halo Alfalfa	97	119	108	6218	4307	5263
PV Ultima Alfalfa	99	123	111	7031	3598	5314
Rangelander Alfalfa	101	121	111	6123	3688	4905
Rugged Alfalfa	99	123	111	6094	3708	4901
Spredor 4 Alfalfa	104	116	110	5433	3987	4710
Spredor 5 Alfalfa	100	128	114	6364	4041	5202
Yellowhead Alfalfa	98	126	112	6692	3680	5186
AC Mountainview Sainfoin	102	126	114	5827	4245	5036
Nova Sainfoin	107	127	117	6027	3784	4905
Oxley 2 Cicer Milk Vetch	99	119	109	5829	4115	4972
Veldt Cicer Milk Vetch	93	127	110	4492	4771	4632
Mean	100	123.00	112.00	5985	4149	5067

Table 44 Grass/Legume Mixes Height and Yield – High Prairie

	Height			Composition			Yield		
	2017	2018	Avg	2017	2018	Avg	2017	2018	Avg
Fleet Meadow Brome	147	119	133	53	39	46	7490 a	3690 a	5590
AC Yellowhead Alfalfa	93	93.2	93.1	47	61	54			
AC Knowles Hybrid Brome	143	125	134	27	39	33	6759 ab	2935 abc	4847
Spredor 5 Alfalfa	88	92	90	73	61	67			
Fleet MB/Spredor 5	143	133	138	52	46	49	5311 bc	3755 a	4533
Spredor 5 Alfalfa	91	89	90	48	54	51			
Fleet Meadow Brome	146	120	133	77	35	56	5158 bc	3760 a	4520
AC Mountainview Sainfoin	92	92	92	23	65	44			
AC Knowles Hybrid Brome	143	115	129	61	19	40	5602 abc	3150 ab	4376
AC Yellowhead Alfalfa	93	97	95	39	81	60			
AC Success Hybrid Brome	148	104	126	60	78	69	5394 bc	2415 bc	3904
AC Yellowhead Alfalfa	93	93	93	40	22	31			
AC Success Hybrid Brome	145	99	122	32	74	53	5349 bc	2106 c	3728
Spredor 5 Alfalfa	92	88	90	68	26	47			
AC Knowles Hybrid Brome	145	127	136	64	30	47	3842 c	3347 ab	3594
AC Mountainview Sainfoin	95	101	98	36	70	53			
AC Success Hybrid Brome	142	126	134	82	46	64	4384 c	2163 c	3274
AC Mountainview Sainfoin	94	90	92	18	54	36			
Mean	145	119	136	56	45	51	5477	3036	4263
	92	93	93	47	55	51			

Table 45 Grass Height and Yield – Fort Vermilion

	Height (cm)			Dry Matter Yield (lb/A)		
	2017	2018	Avg	2017	2018	Average
AC Admiral Hybrid Brome	94	115	104	1823 a	1846 nsd	1835
AC Saltlander Green Wheatgrass	103	95	99	1649 a	1504	1577
AC Success Hybrid Brome	107	117	112	1644 a	1639	1642
Fleet Meadow Brome	89	104	97	1517 a	2385	1951
Kirk Crested Wheatgrass	95	89	92	1477 a	1521	1499
Greenleaf Pubsecent Wheatgrass	97	125	111	1463 a	1610	1537
AC Knowles Hybrid Brome	99	106	103	1441 a	1639	1540
Grindstad Timothy	84	101	93	1369 a	1438	1404
Courtney Tall Fescue	89	94	92		913	
Killarney Orchard Grass	86	77	82		1463	
Fojtan Festolium		78			1153	
Mean	94	100.1	98	1548	1556	1623

Table 46 Legume Height and Yield – Fort Vermilion

	Height (cm)			Dry Matter Yield (lb/A)				
	2017	2018	Avg	2017	2018	Average		
Dalton Alfalfa	83	109	96	1591 a	1510 cdef	1551		
Yellowhead Alfalfa	79	105	92	1399 ab	1948 bcd	1674		
Assalt ST Alfalfa	78	99	89	1281 ab	835 f	1058		
Rugged Alfalfa	84	103	94	1253 abc	1019 ef	1136		
44--44 Alfalfa	87	105	96	1252 abc	1470 cdef	1361		
Spredor 4 Alfalfa	98	108	103	1189 abc	2154 bc	1672		
Halo Alfalfa	87	110	99	1450 abc	1224 def	1337		
20--10 Alfalfa	86	108	97	1130 abcd	1730 cde	1430		
PV Ultima Alfalfa	86	98	92	1107 abcd	1666 cde	1387		
Spredor 5 Alfalfa	90	107	99	942 bcde	1776 cde	1359		
Oxley 2 Cicer Milk Vetch	64	103	84		2631 ab			
Veldt Cicer Milk Vetch	66	105	86		3007 ab			
Nova Sainfoin	72	103	88		1838 cd			
AC Mountainview Sainfoin	61	88	75		1510 cdef			
Mean	80	104	92	1259	1737	1396		

Table 47 Grass/Legume Mix Height and Yield – Fort Vermilion

	Height (cm)			Composition (%)		Dry Matter Yield (lb/A)			
	2017	2018	Avg	2017	2018	2017	2018	Average	
Fleet Meadow Brome	96		105	98			a	1825	1849
AC Mountainview Sainfoin	67	114		2	n/a	1873			
Fleet Meadow Brome	98	127	113	95		1840	a	2440	2140
Spredor 5 Alfalfa	64	117	91	5					
AC Knowles Hybrid Brome	109	111	110	98		1672	ab	2616	2144
AC Mountainview Sainfoin	51	none		2					
Fleet Meadow Brome	94	118	106	97		1608	ab	1668	1638
AC Yellowhead Alfalfa	53	98	76	3					
AC Knowles Hybrid Brome	108	121	115	92		1411	ab	1617	1514
AC Yellowhead Alfalfa	58	113	86	8					
AC Success Hybrid Brome	111	125	118	96		1366	ab	3276	2321
AC Yellowhead Alfalfa	45	102	74	4					
AC Knowles Hybrid Brome	108	118	113	81		1303	ab	2141	1722
Spredor 5 Alfalfa	62	110	86	19					
AC Success Hybrid Brome	115	125	120	67		1198	ab	1753	1476
Spredor 5 Alfalfa	67	91	79	33					
AC Success Hybrid Brome	110	123	117	93		1083	b	1801	1442
AC Mountainview Sainfoin	66	none		7					

**Nutritional Components – Individual Sites** (as contributed by Barry Yaremicio, M. Sc., P. Ag., Beef and Forage Specialist, Alberta Agriculture and Forestry)

After reviewing the data, there are differences in forage quality between years and also between the entries within each site. Comments will be made by individual sites. If no comment is made about an individual nutrient, they are considered to be within normal ranges found in Alberta. The comparisons are based on data summarized from feed test results obtained from the Soil and Animal Nutrition Lab that was located at the O. S. Longman Building and compiled from 1976 to 1986 (AgDex 100/81-6). Nutrient values comparisons are “% of normal” compared to averages.

Comparing nutrients concentrations found in forages (Table 1) to animal requirements (Table 2) are summarized in the tables below. Discussion will be limited to mature cows. Nutrient requirements for other classes of animals vary.

**Table 48 Average Nutrient Concentrations Found in Alberta Forages**

	<b>Grass Forages</b>	<b>Legume Forages</b>	<b>Mixed Grass / Legume Hay</b>
<b>All nutrients listed on a dry matter basis</b>			
Protein (%)	10.3	18.5	12.5
Calcium (%)	0.4	1.6	1.0
Acid Detergent Fibre (%)	38.0	33.0	36.0
Phosphorus (%)	0.15	0.21	0.18
Magnesium (%)	0.15	0.3	0.22
Potassium (%)	1.15	1.75	1.5
Sodium (%)	0.03	0.04	0.02
Sulfur (%)	0.15	0.20	0.16
Copper (mg/kg)	4.5	5.5	6.5
Manganese (mg/kg)	65.0	35.0	45.0
Zinc (mg/kg)	25.0	22.0	24.0

**Table 49 Animal Requirements**

	<b>Cows Mid Pregnancy</b>	<b>Cows Late Pregnancy</b>	<b>Cows Post Calving</b>
<b>1400 pound animal All nutrients listed on a dry matter basis</b>			
Protein (%)	7.0	9.0	11.0
Digestible Energy (mcal)	30.8	35.0	47.0
Calcium (%)	0.4	0.4	0.5
Phosphorus (%)	0.2	0.2	0.25
Magnesium (%)	0.2	0.2	0.25
Potassium (%)	0.7	0.7	0.8
Sodium (%)	0.09	0.09	0.09
Sulfur (%)	0.15	0.15	0.15
Copper (mg/kg)	12.0	12.0	12.0
Manganese (mg/kg)	47.0	47.0	47.0
Zinc (mg/kg)	35.0	35.0	35.0

When using the tables from the forage associations, the calculation to obtain the actual value of a nutrient is (actual value + (actual value x percentage)). For example: if the manganese is 75% above average for a grass hay:  $(65 + (65 \times 75/100)) = 114.75$ .

Table 50 **Select Nutritional Components – Grasses – Sedalia Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Greenleaf Pubescent Wheatgrass	7.72	55.62	42.73	63.11	0.21	0.11	1.74	0.09	0.10
	6.81	58.17	39.45	57.68	0.37	0.12	0.94	0.13	0.10
	7.27	56.90	41.09	60.40	0.29	0.12	1.34	0.11	0.10
AC Success Hybrid Brome	7.98	56.59	41.48	61.57	0.21	0.12	1.84	0.11	0.10
	6.62	56.34	41.81	60.77	0.46	0.11	1.20	0.19	0.11
	7.30	56.47	41.65	61.17	0.34	0.12	1.52	0.15	0.11
AC Saltlander Green Wheatgrass	7.77	57.83	39.90	59.22	0.29	0.11	1.76	0.12	0.11
	7.77	58.07	39.59	57.03	0.52	0.13	1.28	0.16	0.12
	7.77	57.95	39.75	58.13	0.41	0.12	1.52	0.14	0.12
AC Knowles Hybrid Brome	8.23	58.47	39.07	60.20	0.27	0.12	1.91	0.13	0.12
	8.85	57.77	39.97	54.57	0.57	0.12	1.33	0.25	0.13
	8.54	58.12	39.52	57.39	0.42	0.12	1.62	0.19	0.13
Fleet Meadow Brome	7.43	54.63	44.00	64.01	0.33	0.14	2.33	0.15	0.10
	8.58	55.39	43.02	59.47	0.55	0.13	1.40	0.22	0.10
	8.01	55.01	43.51	61.74	0.44	0.14	1.87	0.19	0.10
Kirk Crested Wheatgrass	6.80	57.36	40.50	59.66	0.20	0.11	1.30	0.09	0.09
	6.30	58.04	39.61	58.24	0.30	0.13	0.80	0.13	0.12
	6.55	57.70	40.06	58.95	0.25	0.12	1.05	0.11	0.11
AC Admiral Hybrid Brome	7.07	56.94	41.04	61.37	0.28	0.13	1.91	0.14	0.10
	9.06	56.38	41.75	54.77	0.62	0.15	1.59	0.25	0.11
	8.07	56.66	41.40	58.07	0.45	0.14	1.75	0.20	0.11
Grindstad Timothy	7.67	56.79	41.23	60.84	0.28	0.16	1.64	0.16	0.11
	8.72	59.11	38.25	53.43	0.50	0.21	1.46	0.25	0.14
	8.20	57.95	39.74	57.14	0.39	0.19	1.55	0.21	0.13
Tom Russian Wildrye Grass	8.75	55.15	43.33	62.62	0.38	0.11	2.72	0.23	0.12
	9.45	57.11	40.82	61.11	0.68	0.13	2.11	0.35	0.16
	9.10	56.13	42.08	61.87	0.53	0.12	2.42	0.29	0.14
Courtney Tall Fescue	9.98	56.03	42.20	58.16	0.37	0.14	2.08	0.22	0.15
	9.53	59.63	37.58	53.52	0.60	0.27	2.08	0.32	0.18
	9.76	57.83	39.89	55.84	0.49	0.21	2.08	0.27	0.17
Killarney Orchard Grass	9.93	55.19	43.27	57.51	0.42	0.20	2.95	0.21	0.19
	10.33	58.64	38.85	53.88	0.65	0.34	2.33	0.33	0.19
	10.13	56.92	41.06	55.70	0.54	0.27	2.64	0.27	0.19
Fojtan Festolium	9.08	56.04	42.19	61.08	0.33	0.19	1.72	0.18	0.15
Mean	8.31	56.97	42.19	58.95	0.40	0.15	1.75	0.19	0.13

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

### 2017 Grasses

- Protein values are 40% below to 10% above average
- Cutting date was late (2 -3 weeks) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average
- Calcium values are 50% below to 10% below average
- Phosphorus values are 35% below to 25% above average
- Magnesium values are 45% below to 50% above average
- Potassium values are average to 240% above average
- Sodium values are 65% below to 35% above average
- Sulfur values are 50% below to 35% above average
- Copper values are 15 below to 60% above average
- Manganese values are 55% below to 220% above average

- Zinc values are 65% below to 10% above average

### 2018 Grasses

- Protein values are 45% below to 15% above average
- Cutting date was late (2 to 3 weeks) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 35% below to 75% above average
- Phosphorus values are 20% below to 245% above average
- Magnesium values are 25% below to 240% above average
- Potassium values are 35% below to 235% above average
- Sodium values are 35% below to 230% above average
- Sulfur values are 40% below to 35% above average
- Copper values are 25% below to 40% above average
- Manganese values are 15% to 295% above average
- Zinc values are average to 60% below average

Table 51 **Select Nutritional Components – Legumes – Sedalia Site**

Average Feed Values (%) (2017 <sup>1</sup> & 2018 <sup>2</sup> )									
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Yellowhead Alfalfa	15.47	58.51	39.02	53.06	1.37	0.16	2.64	0.34	0.24
	16.79	60.79	36.09	47.91	1.86	0.22	2.35	0.54	0.26
	16.13	59.65	37.56	50.49	1.62	0.19	2.50	0.44	0.25
Rugged Alfalfa	16.60	58.84	38.59	50.58	1.79	0.14	2.63	0.35	0.29
	15.33	56.37	41.76	49.25	1.99	0.22	2.74	0.62	0.28
	15.97	57.61	40.18	49.92	1.89	0.18	2.69	0.49	0.29
20--10 Alfalfa	15.73	58.89	38.53	50.60	1.65	0.13	2.59	0.35	0.27
	15.85	59.15	38.19	47.02	2.06	0.21	2.53	0.57	0.25
	15.79	59.02	38.36	48.81	1.86	0.17	2.56	0.46	0.26
Spredor 4 Alfalfa	15.18	58.07	39.58	52.05	1.51	0.13	2.44	0.29	0.25
	15.80	58.98	38.42	47.43	1.89	0.21	2.57	0.55	0.25
	15.49	58.53	39.00	49.74	1.70	0.17	2.51	0.42	0.25
44--44 Alfalfa	16.80	60.04	37.06	48.92	1.94	0.15	2.75	0.35	0.30
	15.92	58.46	39.09	45.93	2.21	0.21	2.48	0.58	0.28
	16.36	59.25	38.08	47.43	2.08	0.18	2.62	0.47	0.29
Rangelander Alfalfa	13.35	56.19	41.99	56.63	1.27	0.14	2.53	0.30	0.23
	16.49	56.85	41.14	46.76	2.09	0.23	2.59	0.59	0.28
	14.92	56.52	41.57	51.70	1.68	0.19	2.56	0.45	0.26
Assalt ST Alfalfa	15.43	58.80	38.65	53.32	1.17	0.15	2.40	0.30	0.29
	15.38	57.94	39.75	47.32	1.71	0.22	2.46	0.60	0.27
	15.41	58.37	39.20	50.32	1.44	0.19	2.43	0.45	0.28
Dalton Alfalfa	15.56	59.44	37.82	51.53	1.68	0.14	2.53	0.37	0.26
	16.36	56.98	40.99	46.97	1.91	0.25	2.65	0.62	0.28
	15.96	58.21	39.41	49.25	1.80	0.20	2.59	0.50	0.27
PV Ultima Alfalfa	15.79	58.98	38.42	52.41	2.05	0.14	2.63	0.38	0.31
	14.84	57.08	40.85	46.38	1.93	0.28	2.92	0.63	0.30
	15.32	58.03	39.64	49.40	1.99	0.21	2.78	0.51	0.31
Halo Alfalfa	15.73	59.06	38.31	52.28	1.58	0.13	2.39	0.29	0.25
	15.74	57.87	39.83	45.14	1.67	0.27	2.83	0.58	0.30
	15.74	58.47	39.07	48.71	1.63	0.20	2.61	0.44	0.28
Spredor 5 Alfalfa	16.68	60.03	37.06	50.94	1.75	0.15	2.87	0.35	0.30
	16.80	59.21	38.12	46.51	1.91	0.24	2.73	0.58	0.26
	16.74	59.62	37.59	48.73	1.83	0.20	2.80	0.47	0.28
Oxley 2 Cicer	18.01	61.73	34.89	45.65	1.32	0.16	4.11	0.37	0.23

Milk Vetch	17.28	59.94	37.18	43.71	1.86	0.23	3.28	0.58	0.28
	17.65	60.84	36.04	44.68	1.59	0.20	3.70	0.48	0.26
Veldt Cicer Milk Vetch	18.90	61.49	35.19	45.30	1.11	0.17	4.12	0.36	0.25
	16.11	58.77	38.69	43.98	1.53	0.28	3.28	0.65	0.29
Nova Sainfoin	17.51	60.13	36.94	44.64	1.32	0.23	3.70	0.51	0.27
	13.30	54.20	44.55	57.37	0.99	0.18	2.07	0.30	0.18
AC Mountainview Sainfoin	12.96	55.81	42.49	54.92	1.08	0.16	1.97	0.33	0.20
Mean	15.68	58.28	39.31	49.74	1.63	0.19	2.67	0.45	0.26

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

### 2017 Legumes

- Protein values are 35% below to 5% above average
- Cutting date was 1 – 2 weeks late based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average
- Calcium values are 50% below to 35% above average
- Phosphorus values are 10% to 50% below above average
- Magnesium values are 15% below to 40% above average
- Potassium values are average to 275% above average
- Sodium values are 50% below to 300% above average
- Sulfur values are 15% below to 50% above average
- Copper values are 20% below to 30% above average
- Manganese values are average to 85% above average
- Zinc values are 20% below to 45% above average

### 2018 Legumes

- Protein values are 5% to 30% below average
- Cutting date was late (1 week) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average
- Calcium values are average to 55% above average
- Phosphorus values are 15% below to 30% above average
- Magnesium values are 60% to 240% above average
- Potassium values are 15% to 95% above average
- Sodium values are 505 below to 250% above average
- Sulfur values are 20% to 55% above average
- Copper values are 10% below to 75%% above average
- Manganese values are 210% to 765% above average
- Zinc values are 30% to 230% above average



Table 52 **Select Nutritional Components – Grass/Legume Mixes – Sedalia Site**

	Average Feed Values (%) (2017 <sup>1</sup> & 2018 <sup>2</sup> )								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
AC Success Hybrid Brome	11.47	58.52	39.01	56.24	0.75	0.16	2.38	0.24	0.16
AC Yellowhead Alfalfa	12.72	57.53	40.28	52.88	1.17	0.15	1.51	0.39	0.19
Fleet Meadow Brome	12.095	58.025	39.645	54.56	0.96	0.155	1.945	0.315	0.175
AC Yellowhead Alfalfa	9.94	55.76	42.54	60	0.57	0.14	2.14	0.21	0.14
AC Yellowhead Alfalfa	12.64	57.26	40.62	53.46	1.01	0.15	1.79	0.39	0.17
AC Yellowhead Alfalfa	11.29	56.51	41.58	56.73	0.79	0.145	1.965	0.3	0.155
AC Knowles Hybrid Brome	13.04	57.81	39.92	54.46	0.94	0.15	2.31	0.29	0.19
AC Yellowhead Alfalfa	13.83	57.67	40.09	51.4	1.3	0.15	1.55	0.42	0.18
AC Yellowhead Alfalfa	13.435	57.74	40.005	52.93	1.12	0.15	1.93	0.355	0.185
AC Success Hybrid Brome	13.97	59.38	37.9	54.57	1.02	0.14	2.42	0.22	0.21
Spredor 5 Alfalfa	12.74	57.75	39.99	53.65	1.08	0.15	1.52	0.33	0.19
Spredor 5 Alfalfa	13.355	58.565	38.945	54.11	1.05	0.145	1.97	0.275	0.2
AC Knowles Hybrid Brome	10.07	58.01	39.66	57.95	0.68	0.12	2.11	0.19	0.16
Spredor 5 Alfalfa	13.78	58.82	38.62	51.01	1.08	0.15	1.61	0.33	0.18
Spredor 5 Alfalfa	11.925	58.415	39.14	54.48	0.88	0.135	1.86	0.26	0.17
AC Knowles Hybrid Brome	8	57.69	40.07	61.22	0.33	0.12	1.92	0.18	0.12
AC Mountainview Sainfoin	10.04	57.95	39.73	56.05	0.55	0.13	1.2	0.24	0.13
AC Mountainview Sainfoin	9.02	57.82	39.9	58.635	0.44	0.125	1.56	0.21	0.125
AC Success Hybrid Brome	7.51	56.46	41.65	60.39	0.34	0.12	1.62	0.17	0.12
AC Mountainview Sainfoin	8.62	57.54	40.26	58.9	0.44	0.14	1.06	0.2	0.12
AC Mountainview Sainfoin	8.065	57	40.955	59.645	0.39	0.13	1.34	0.185	0.12
Fleet Meadow Brome	12.67	57.65	40.13	54.75	1.05	0.16	2.52	0.3	0.21
Spredor 5 Alfalfa	13.35	57.78	39.96	52.31	1.02	0.17	1.92	0.38	0.18
Spredor 5 Alfalfa	13.01	57.715	40.045	53.53	1.035	0.165	2.22	0.34	0.195
Fleet Meadow Brome	7.03	55.5	42.88	64.79	0.26	0.14	1.93	0.16	0.09
AC Mountainview Sainfoin	10.36	56.66	41.4	55.49	0.56	0.16	1.44	0.27	0.13
AC Mountainview Sainfoin	8.695	56.08	42.14	60.14	0.41	0.15	1.685	0.215	0.11
Mean	11.82	44.63	32.85	44.64	4.38	3.95	5.3	4.03	0.16

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

### 2017 Mixed Grass/Legumes

- Protein values are 40% below to 35% above average
- Cutting date was 1 – 2 weeks late based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 75% below to 20% above average
- Phosphorus values are 5 to 40% below average
- Magnesium values are 5% to 225% above average
- Potassium values are average to 75% above average
- Sodium values are average to 50% below average
- Sulfur values are 50% below to 50% above average
- Copper values are 5% to 55% below average
- Manganese values are average to 290% above average
- Zinc values are 65% below to 365% above average

### 2018 Mixed Grasses

- Protein values are 25% below to 25% above average
- Cutting date was late (1 week) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average
- Calcium values are 65% below to 85% above average

- Phosphorus values are 10% to 40% below average
- Magnesium values are 25% below to 205% above average
- Potassium values are 35% below to 25% above average
- Sodium values are 50 % to 200% above average
- Sulfur values are 30% below to 20% above average
- Copper values are 10% to 50% below average
- Manganese values are 240% to 470% above average
- Zinc values are 350% below to 20% above average

## Boreal Transition Zone

Table 53 Select Nutritional Components – Grass – Barrhead Site

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Fleet Meadow Brome	8.46	58.54	43.68	68.71	0.35	0.17	2.28	0.13	<b>0.09</b>
	<b>8.91</b>	<b>60.58</b>	<b>34.23</b>	<b>57.20</b>	<b>0.51</b>	<b>0.17</b>	<b>1.61</b>	<b>0.12</b>	0.09
	8.69	59.56	38.95	62.96	0.43	0.17	1.94	0.12	0.09
AC Admiral Hybrid Brome	7.83	58.37	45.92	67.11	0.31	0.18	2.39	0.10	<b>0.10</b>
	<b>7.90</b>	<b>64.54</b>	<b>33.05</b>	<b>56.19</b>	<b>0.56</b>	<b>0.19</b>	<b>1.77</b>	<b>0.12</b>	0.1
	7.86	61.45	39.49	61.65	0.43	0.18	2.08	0.11	0.10
AC Success Hybrid Brome	8.37	56.79	44.41	69.07	0.32	0.18	2.35	0.11	<b>0.11</b>
	<b>7.17</b>	<b>62.58</b>	<b>33.86</b>	<b>59.24</b>	<b>0.35</b>	<b>0.17</b>	<b>1.52</b>	<b>0.08</b>	0.11
	7.77	59.69	39.13	64.15	0.33	0.17	1.94	0.09	0.11
AC Knowles Hybrid Brome	8.68	59.17	42.04	65.91	0.34	0.17	2.28	0.10	<b>0.11</b>
	<b>7.49</b>	<b>63.99</b>	<b>33.04</b>	<b>58.51</b>	<b>0.39</b>	<b>0.15</b>	<b>1.50</b>	<b>0.10</b>	0.11
	8.08	61.58	37.54	62.21	0.36	0.16	1.89	0.10	0.11
Greenleaf Pubescent Wheatgrass	9.06	57.55	42.53	68.28	0.30	0.17	2.13	0.10	<b>0.12</b>
	<b>7.01</b>	<b>58.75</b>	<b>36.90</b>	<b>63.03</b>	<b>0.36</b>	<b>0.20</b>	<b>1.46</b>	<b>0.08</b>	0.12
	8.03	58.15	39.71	65.65	0.33	0.18	1.79	0.09	0.12
Kirk Crested Wheatgrass	8.81	55.88	44.22	68.11	0.27	0.16	1.76	0.08	<b>0.11</b>
	<b>7.36</b>	<b>61.73</b>	<b>33.41</b>	<b>56.08</b>	<b>0.30</b>	<b>0.14</b>	<b>1.05</b>	<b>0.07</b>	0.11
	8.08	58.80	38.81	62.09	0.28	0.15	1.40	0.08	0.11
AC Saltlander Green Wheatgrass	8.63	57.81	41.65	67.53	0.25	0.16	1.99	0.08	<b>0.11</b>
	<b>7.94</b>	<b>63.14</b>	<b>33.01</b>	<b>56.57</b>	<b>0.32</b>	<b>0.17</b>	<b>1.49</b>	<b>0.08</b>	0.11
	8.28	60.47	37.33	62.05	0.28	0.16	1.74	0.08	0.11
Fojtan Festulium	9.95	60.35	41.63	62.60	0.35	0.22	2.43	0.18	<b>0.22</b>
	<b>14.38</b>	<b>64.63</b>	<b>28.88</b>	<b>46.23</b>	<b>0.58</b>	<b>0.27</b>	<b>2.03</b>	<b>0.19</b>	0.22
	12.16	62.49	35.25	54.42	0.47	0.24	2.23	0.18	0.22
Killarney Orchard Grass	8.25	54.94	46.07	69.16	0.30	0.20	2.51	0.15	<b>0.26</b>
	<b>9.99</b>	<b>63.99</b>	<b>34.59</b>	<b>54.28</b>	<b>0.44</b>	<b>0.30</b>	<b>2.55</b>	<b>0.16</b>	0.26
	9.12	59.46	40.33	61.72	0.37	0.25	2.53	0.15	0.26
Courtney Tall Fescue	9.79	57.95	43.64	65.57	0.38	0.20	2.59	0.21	<b>0.17</b>
	<b>10.89</b>	<b>64.37</b>	<b>33.29</b>	<b>49.94</b>	<b>0.41</b>	<b>0.23</b>	<b>1.89</b>	<b>0.14</b>	0.17
	10.34	61.16	38.47	57.75	0.39	0.21	2.24	0.17	0.17
Grinstad Timothy	8.51	57.30	43.58	66.17	0.28	0.19	2.01	0.09	<b>0.10</b>
	<b>7.87</b>	<b>65.15</b>	<b>32.98</b>	<b>52.60</b>	<b>0.29</b>	<b>0.19</b>	<b>1.39</b>	<b>0.09</b>	0.1
	8.19	61.22	38.28	59.39	0.28	0.19	1.70	0.09	0.10
Mean	8.78	60.37	38.48	61.28	0.36	0.19	1.95	0.11	0.14

2017 (average of 2 samples)    2018 (average of 2 samples)    No color    Average of 2017 & 2018

### 2017 Grasses:

- Protein values are average to 30% below average
- Cutting date was slightly late (1 – 2 weeks ) based on reported Acid Detergent Fibre values
- All samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 5% to 40% below average
- Phosphorus values are 10 to 50% above average
- Potassium values are 60 to 235% above average
- Magnesium values are 40% below to 45% above average
- Sulfur values are 40% below to 25% above average
- Copper values not reported
- Manganese values are 50% to 325% above average

- Zinc values are 30% below to 15% above average

### 2018 Grasses:

- Protein values are 30% below to 50% above average
- Cutting date was on time based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 40% below to 25% above average
- Phosphorus values average to 210% above average
- Magnesium values are 50% below to 25% above average
- Potassium values are average to 245% above average
- Sulfur values are 45% below to 85% above average
- Copper values are 15% below to 200% above average
- Manganese values are 10% below to 235% above average
- Zinc values are 50% below to 65% above average

Table 54 **Select Nutritional Components – Legume – Barrhead Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Assalt ST Alfalfa	15.89	56.67	40.93	52.55	1.36	0.25	2.19	0.14	100.95
Dalton Alfalfa	14.63	55.93	41.02	52.59	1.34	0.26	2.30	0.16	100.85
	14.95	50.62	39.12	57.51	1.93	0.17	1.29	0.23	0.23
	14.79	53.28	40.07	55.05	1.64	0.21	1.80	0.19	50.54
20-10 Alfalfa	14.92	54.71	43.21	55.31	1.14	0.22	2.03	0.13	93.74
Halo Alfalfa	17.90	56.53	39.87	54.96	1.70	0.29	2.25	0.17	98.04
Rugged Alfalfa	18.33	57.85	38.70	52.13	1.53	0.27	2.10	0.16	104.94
	15.73	52.23	38.52	51.80	2.14	0.21	1.50	0.27	0.26
	17.03	55.04	38.61	51.97	1.83	0.24	1.80	0.21	52.60
Spredor 4 Alfalfa	18.19	58.74	38.41	51.47	1.58	0.27	2.06	0.17	106.69
Spredor 5 Alfalfa	15.19	56.49	40.47	53.23	1.47	0.26	2.12	0.17	100.36
	16.25	51.87	38.79	55.10	2.15	0.21	1.77	0.24	0.27
	15.72	54.18	39.63	54.17	1.81	0.23	1.95	0.20	50.31
AC Yellowhead Alfalfa	14.80	54.32	44.16	55.70	1.11	0.23	2.09	0.15	91.17
	15.20	44.51	46.89	59.63	1.67	0.18	1.25	0.27	0.17
	15.00	49.41	45.53	57.67	1.39	0.21	1.67	0.21	45.67
PV Ultima Alfalfa	15.87	52.12	41.14	57.75	1.82	0.24	2.03	0.19	92.68
44-44 Alfalfa	17.54	58.30	39.05	52.33	1.44	0.26	2.23	0.17	104.09
AC Mountainview Sainfoin	9.98	55.28	39.30	52.82	1.22	0.23	1.42	0.23	102.81
Nova Sanfoin	14.18	55.66	37.76	52.60	1.48	0.31	2.01	0.21	105.19
Veldt Cicer Milk Vetch	12.65	60.30	41.78	48.78	1.17	0.25	2.49	0.21	107.73
	18.04	63.28	37.22	41.13	1.52	0.27	2.53	0.34	0.25
	15.34	61.79	39.50	44.96	1.34	0.26	2.51	0.28	53.99
Oxley 2 Cicer Milk Vetch	14.88	64.39	38.72	45.75	1.20	0.27	2.86	0.22	119.49
	17.14	61.10	36.98	42.55	1.55	0.27	2.18	0.39	0.26
	16.01	62.74	37.85	44.15	1.37	0.27	2.52	0.30	59.88
Mean	15.60	56.03	40.06	52.70	1.51	0.25	2.03	0.20	79.80

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

**2017 Legumes:**

- Protein values are average to 50% below average
- Cutting date was on time based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre levels are average
- Calcium values are 40% below to 20% above average
- Phosphorus values are 15% to 50% above average
- Potassium values are 20% below to 50% above average
- Magnesium values are 25% to 60% below average
- Sulfur values are 15% below to 65% above average
- Copper values are 20% below to 65% above average
- Manganese values are 50% below to 80% above average
- Zinc values are average to 70% above average

**2018 Legumes:**

- Protein values are 25% below to 10% above average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre levels are average
- Calcium values are 15% below to 35% above average
- Phosphorus values are 30% below to 30% above average
- Magnesium values are 35% below to 35% above average
- Potassium values are 25% below to 50% above average
- Sulfur values are 20% below to 35% above average
- Copper values are 35% to 75% above average
- Manganese values are 35% below to 60% above average
- Zinc values are 15% to 40% above average

Table 55 Select Nutritional Components – Grass/Legume Mix – Barrhead Site

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
AC Knowles Hybrid Brome	7.66	55.09	46.77	61.49	0.31	0.17	1.95	0.08	74.30
AC Mountainview Sainfoin	7.62	66.46	34.25	58.21	0.45	0.18	1.77	0.10	0.1
	7.64	60.78	40.51	59.85	0.38	0.17	1.86	0.09	37.20
AC Knowles Hybrid Brome	10.37	55.71	43.11	61.00	0.64	0.19	1.97	0.12	78.98
AC Yellowhead Alfalfa	8.37	61.23	37.41	59.86	0.61	0.16	1.67	0.11	0.1
	9.37	58.47	40.26	60.43	0.63	0.17	1.82	0.11	39.54
AC Knowles Hybrid Brome	8.48	59.83	41.38	61.37	0.37	0.18	2.02	0.08	80.53
Spredor 5 Alfalfa	7.92	65.08	34.85	60.31	0.48	0.17	1.54	0.10	0.11
	8.20	62.45	38.11	60.84	0.43	0.17	1.78	0.09	40.32
AC Success Hybrid Brome	8.52	53.35	45.11	64.36	0.38	0.18	1.96	0.09	72.99
Spredor 5 Alfalfa	9.06	59.19	37.34	62.63	0.81	0.17	1.46	0.14	0.13
	8.79	56.27	41.22	63.49	0.59	0.17	1.71	0.11	36.56
AC Success Hybrid Brome	8.73	51.06	48.11	66.46	0.51	0.18	1.91	0.11	67.25
AC Yellowhead Alfalfa	8.26	61.78	37.33	60.12	0.61	0.18	1.59	0.12	0.11
	8.49	56.42	42.72	63.29	0.56	0.18	1.75	0.12	33.68
Fleet Meadow Brome	8.04	55.00	46.06	65.67	0.47	0.20	2.49	0.11	70.63
Spredor 5 Alfalfa	9.95	59.90	38.29	58.51	0.89	0.16	1.68	0.16	0.11
	9.00	57.45	42.17	62.09	0.68	0.18	2.08	0.13	35.37
AC Success Hybrid Brome	8.77	56.71	42.92	61.80	0.32	0.18	1.92	0.09	78.36
AC Mountainview Sainfoin	6.62	64.52	35.29	60.72	0.34	0.17	1.41	0.09	0.1
	7.69	60.61	39.10	61.26	0.33	0.17	1.66	0.09	39.23
Fleet Meadow Brome	9.75	52.29	48.09	65.64	0.50	0.19	2.17	0.12	68.45
AC Yellowhead Alfalfa	10.83	62.20	36.70	58.60	0.86	0.19	1.87	0.17	0.11
	10.29	57.24	42.39	62.12	0.68	0.19	2.02	0.14	34.28
Fleet Meadow Brome	8.23	56.75	44.07	64.32	0.34	0.19	2.05	0.11	74.20
AC Mountainview Sainfoin	7.68	63.63	36.37	62.55	0.51	0.19	1.83	0.12	0.1
	7.95	60.19	40.22	63.44	0.42	0.19	1.94	0.12	37.15
Mean	8.60	58.87	40.74	61.87	0.52	0.18	1.84	0.11	37.04

2017 (average of 2 samples)    2018 (average of 2 samples)    No color    Average of 2017 & 2018

#### 2017 Mixed forages:

- Protein values are 55% below to 10% above average
- Cutting date was slightly late (1 – 2 weeks ) based on reported Acid Detergent Fibre values
- All samples had Neutral Detergent Fibre levels above 60%. Can reduce voluntary intake
- Calcium values are 50% below to 40% above average
- Phosphorus values are 25% to 40% below average
- Potassium values are 230% to 290% above average
- Magnesium values are 40% to 70% below average
- Sulfur values are average to 275% above average
- Copper values are 30% to 50% below average
- Manganese values are 10% to 235% above average
- Zinc values are average to 30% below average

#### 2018 Mixed forages:

- Protein values are 10 to 50% below average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values average to 65% below average
- Phosphorus values are 15% below to 10% above average

- Magnesium values are 25% to 55% below average
- Potassium values are 10% below average to 30% above average
- Sodium values are average
- Sulfur values are 5% to 40% below average
- Copper values are 15 to 45% below average
- Manganese values are 55% to 275% above average
- Zinc values are average to 35% below average

Table 56 **Select Nutritional Components – Grasses – Evansburg Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Fleet Meadow Brome	5.36	59.88	37.25	56.33	0.36	0.15	1.75	0.14	0.08
	8.43	57.19	40.71	60.91	0.39	0.12	1.37	0.15	0.10
	6.90	58.54	38.98	58.62	0.38	0.14	1.56	0.15	0.09
AC Admiral Meadow Brome	5.42	59.88	37.25	57.28	0.36	0.17	1.69	0.15	0.10
	5.91	57.79	39.94	58.71	0.40	0.15	1.43	0.16	0.10
	5.67	58.84	38.60	58.00	0.38	0.16	1.56	0.16	0.10
AC Knowles Hybrid Brome	3.76	60.97	35.86	55.38	0.31	0.14	1.48	0.12	0.08
	5.21	62.98	33.27	53.36	0.34	0.12	1.24	0.12	0.12
	4.49	61.98	34.57	54.37	0.33	0.13	1.36	0.12	0.10
AC Success Hybrid Brome	4.89	57.97	39.70	62.17	0.25	0.11	1.40	0.11	0.08
	7.36	61.28	35.45	56.00	0.27	0.12	1.35	0.11	0.11
	6.13	59.63	37.58	59.09	0.26	0.12	1.38	0.11	0.10
Greenleaf Pubescent Wheatgrass	5.78	57.90	39.80	62.33	0.28	0.19	1.67	0.12	0.11
	9.90	57.44	40.39	60.87	0.30	0.14	1.07	0.11	0.11
	7.84	57.67	40.10	61.60	0.29	0.17	1.37	0.12	0.11
Kirk Crested Wheatgrass	6.09	62.18	34.30	56.94	0.25	0.19	1.14	0.10	0.13
	5.20	61.23	35.52	58.32	0.19	0.12	0.89	0.08	0.11
	5.65	61.71	34.91	57.63	0.22	0.16	1.02	0.09	0.12
AC Saltlander Green Wheatgrass	4.86	59.75	37.42	57.77	0.30	0.11	1.19	0.10	0.08
	7.41	60.01	37.08	58.37	0.32	0.11	1.12	0.10	0.11
	6.14	59.88	37.25	58.07	0.31	0.11	1.16	0.10	0.10
Foijtán Festulolium	5.65	60.21	36.83	59.15	0.24	0.16	1.94	0.14	0.13
	6.93	57.14	40.77	59.96	0.36	0.17	1.27	0.18	0.18
	6.29	58.68	38.80	59.56	0.30	0.17	1.61	0.16	0.16
Courtney Tall Fescue	5.27	62.16	34.32	55.38	0.29	0.14	2.36	0.19	0.14
	7.49	57.26	40.62	62.69	0.32	0.16	1.66	0.24	0.20
	6.38	59.71	37.47	59.04	0.31	0.15	2.01	0.22	0.17
Killarney Orchard Grass	4.32	57.52	40.28	63.22	0.24	0.19	2.01	0.15	0.15
	6.32	56.79	41.22	64.00	0.24	0.13	1.72	0.16	0.15
	5.32	57.16	40.75	63.61	0.24	0.16	1.87	0.16	0.15
Grindstad Timothy	4.21	60.02	37.07	60.76	0.18	0.15	1.52	0.10	0.08
	5.24	60.82	36.05	60.35	0.19	0.16	1.07	0.10	0.12
	4.73	60.42	36.56	60.56	0.19	0.16	1.30	0.10	0.10
Mean	5.96	59.47	37.78	59.10	0.29	0.15	1.47	0.13	0.12

2017 (average of 2 samples)    2018 (average of 2 samples)    No color    Average of 2017 & 2018

### 2017 Grasses:

- Protein values are 50 to 75% below average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. May reduce voluntary feed intakes
- Calcium values are 10% to 50% below average

- Phosphorus values are 25% below to 20% over the average
- Sulfur values are average to 35% below average
- Magnesium values are 30% below average to 25% above average
- Copper values are 20% to 35% below average
- Manganese values are 25 to 80% below average
- Zinc values are 35 to 50% below average

**2018 Grasses:**

- Protein values are 25 to 50% below average
- Cutting date was slightly late (1 to 3 weeks) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. May reduce voluntary feed intakes
- Calcium values are average to 50% below average
- Phosphorus values are 10% to 35% below average
- Magnesium values are 30% below to 60% above average
- Sulfur values are average to 50% below average
- Copper values are 35% below to 25% above average
- Manganese values are 25 to 90% below average
- Zinc values are 10 to 50% below average



Table 57 **Select Nutritional Components – Grass/Legume Mixes – Evansburg Site**

Variety	Average Feed Values 2018 (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Fleet Meadow Brome	5.14	59.25	38.06	58.67	0.33	0.16	1.60	0.14	0.09
AC Yellowhead Alfalfa	8.67	59.11	38.24	55.63	0.72	0.15	1.33	0.19	0.10
	6.91	59.18	38.15	57.15	0.53	0.16	1.47	0.17	0.10
AC Success Hybrid	7.07	59.47	37.78	58.35	0.45	0.20	1.78	0.16	0.12
Brome	8.84	58.93	38.47	55.55	0.81	0.14	1.33	0.20	0.13
AC Yellowhead Alfalfa	7.96	59.20	38.13	56.95	0.63	0.17	1.56	0.18	0.13
AC Admiral Hybrid Brome	7.10	60.44	36.54	59.84	0.44	0.17	1.68	0.16	0.10
AC Yellowhead Alfalfa	11.68	57.05	40.88	53.50	0.98	0.15	1.63	0.23	0.12
	9.39	58.75	38.71	56.67	0.71	0.16	1.66	0.20	0.11
Fleet Meadow Brome	7.27	59.67	37.52	59.08	0.57	0.18	1.84	0.17	0.11
Spredor 5 Alfalfa	10.49	58.85	38.57	53.13	0.93	0.14	1.65	0.19	0.13
	8.88	59.26	38.05	56.11	0.75	0.16	1.75	0.18	0.12
AC Success Hybrid	7.99	59.73	37.45	61.12	0.43	0.19	1.77	0.16	0.13
Brome	10.81	60.21	36.83	52.34	0.74	0.14	1.44	1.44	0.14
Spredor 5 Alfalfa	9.40	59.97	37.14	56.73	0.59	0.17	1.61	0.80	0.14
AC Admiral Hybrid Brome	9.07	61.43	56.69	61.43	0.66	0.17	1.76	0.19	0.12
Spredor 5 Alfalfa	11.93	58.53	38.99	55.71	1.11	0.14	1.52	0.22	0.12
	10.50	59.98	47.84	58.57	0.89	0.16	1.64	0.21	0.12
Fleet Meadow Brome	4.95	57.92	39.77	62.49	0.26	0.14	1.54	0.10	0.08
AC Mountainview	5.13	56.00	42.23	62.21	0.42	0.14	1.24	0.14	0.10
Sainfoin	5.04	56.96	41.00	62.35	0.34	0.14	1.39	0.12	0.09
AC Success Hybrid	6.22	58.79	38.65	59.90	0.29	0.17	1.49	0.13	0.11
Brome	5.03	59.94	37.17	58.06	0.21	0.15	1.10	0.08	0.11
AC Mountainview	5.63	59.37	37.91	58.98	0.25	0.16	1.30	0.11	0.11
Sainfoin	6.40	60.08	37.00	61.02	0.32	0.15	1.53	0.14	0.09
AC Admiral Hybrid Brome	5.42	57.92	39.77	58.04	0.41	0.16	1.59	0.16	0.09
AC Mountainview	5.91	59.00	38.39	59.53	0.37	0.16	1.56	0.15	0.09
Sainfoin	7.96	59.08	39.62	57.94	0.58	0.16	1.54	0.24	0.11

2017 (average of 2 samples)    2018 (average of 2 samples)    No color    Average of 2017 & 2018

### 2017 Mixed forages:

- Protein values are 25 to 60% below average
- Cutting date was slightly late (1 – 2 weeks) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. May reduce voluntary feed intakes
- Calcium values are average to 45% to 75% below average
- Phosphorus values are 10 to 25% below the average
- Magnesium values are average to 50% lower than average
- Sulfur values are 25% to 50% below average
- Copper values are 13% to 40% lower than average
- Manganese values are 20 to 65% lower than average
- Zinc values are 10 to 50% lower than average

### 2018 Mixed forages:

- Protein values are 10% to 60% below average
- Cutting date was slightly late (1 – 2 weeks) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 80% below to 10% above average
- Phosphorus values are 12% to 25% below average

- Magnesium values are average to 50% below average
- Sulfur values are 12% to 55% below average
- Copper values are 15% to 55% below average
- Manganese values are 45% to 75% below average
- Zinc values are 12% to 65% below average

Table 58 **Select Nutritional Components – Grasses – Fort Kent Site**

	Average Feed Values 2018 (%)								
	CP	TDN	ADF	NDF	Ca (%)	P (%)	K	Mg	S
Fleet Meadow Brome	13.61	62.14	34.35	53.82	0.45	0.16	1.35	0.48	0.15
AC Admiral Hybrid Brome	10.89	62.46	33.94	58.13	0.25	0.13	1.17	0.28	0.11
AC Knowles Hybrid Brome	12.80	63.74	32.30	57.61	0.29	0.14	1.21	0.36	0.12
AC Success Hybrid Brome	11.25	62.52	33.87	60.75	0.28	0.14	1.17	0.35	0.13
Greenleaf Pubescent WG	9.75	60.23	36.81	68.41	0.14	0.15	1.14	0.20	0.13
Kirk Crested Wheatgrass	9.65	59.91	37.21	67.88	0.15	0.13	0.73	0.22	0.14
AC Saltlander Green WG	13.43	63.17	33.03	65.76	0.28	0.16	1.46	0.31	0.18
Tom Russian Wildrye	12.93	63.14	33.07	62.16	0.49	0.18	1.79	0.45	0.18
Killarney Orchard Grass	13.60	61.24	35.51	51.39	0.41	0.22	2.02	0.41	0.20
Grindstad Timothy	10.84	60.82	36.05	54.24	0.23	0.18	1.39	0.22	0.11
Mean	11.88	61.94	34.61	60.02	0.30	0.16	1.34	0.33	0.15

**2018 Grasses:**

- Protein values are 5% below to 35% above average
- Cutting date was appropriate based on reported Acid Detergent Fibre values
- No problems with Neutral Detergent Fibre values
- Calcium values average to 65% below to 25% above average
- Phosphorus values are 15% below to 95% above average
- Magnesium values are 35% to 550% below average
- Sulfur values are 25% below to 200% above average
- Potassium values are 50% below average to 210% above average
- Sodium values are 75% below to 300% above average
- Copper values are 35% below to 75% above average
- Manganese values are 65% below to 75% above average
- Zinc values are average to 30% below to 90% above average

Table 59 **Select Nutritional Components – Legumes – Fort Kent Site – 2018**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
20—10 Alfalfa	18.85	56.61	41.45	49.65	1.10	0.25	2.92	0.19	0.18
	17.91	62.43	33.98	50.16	1.31	0.21	2.33	0.22	0.18
	18.38	59.52	37.72	49.91	1.21	0.23	2.63	0.21	0.18
44-44 Alfalfa	15.96	56.19	41.99	49.66	1.26	0.24	3.05	0.21	0.21
	19.05	63.65	32.41	44.36	1.04	0.24	2.28	0.19	0.17
	17.51	59.92	37.20	47.01	1.15	0.24	2.67	0.20	0.19
Assalt ST Alfalfa	14.21	51.20	48.39	57.66	0.99	0.13	2.02	0.14	0.13
	18.43	63.33	32.82	45.88	1.66	0.20	2.26	0.22	0.20
	16.32	57.27	40.61	51.77	1.33	0.17	2.14	0.18	0.17
Dalton Alfalfa	14.55	54.30	44.42	54.09	1.20	0.18	2.13	0.17	0.15
	15.91	60.94	35.89	47.76	1.21	0.20	2.10	0.21	0.17
	15.23	57.62	40.16	50.93	1.21	0.19	2.12	0.19	0.16
Halo Alfalfa	17.18	57.62	40.16	49.96	1.33	0.19	2.24	0.24	0.20
	16.26	58.47	39.06	52.68	1.31	0.20	2.23	0.24	0.20
	16.72	58.05	39.61	51.32	1.32	0.20	2.24	0.24	0.20
PV Ultima Alfalfa	17.51	58.65	38.83	46.45	1.60	0.16	2.18	0.21	0.21
	18.01	61.86	34.71	46.12	1.29	0.19	2.30	0.22	0.16
	17.76	60.26	36.77	46.29	1.45	0.18	2.24	0.22	0.19
Rangelander Alfalfa	16.26	56.86	41.13	50.86	1.45	0.22	2.81	0.23	0.20
	16.13	57.69	40.06	53.51	0.97	0.21	2.74	0.20	0.14
	16.20	57.28	40.60	52.19	1.21	0.22	2.78	0.22	0.17
Rugged Alfalfa	15.16	54.09	44.69	56.23	1.12	0.20	2.61	0.18	0.15
	17.87	61.99	34.54	49.88	1.22	0.20	2.44	0.24	0.16
	16.52	58.04	39.62	53.06	1.17	0.20	2.53	0.21	0.16
Spredor 4 Alfalfa	17.85	57.39	40.45	48.08	1.34	0.21	2.28	0.19	0.19
	16.64	62.82	33.48	44.06	1.16	0.21	2.06	0.22	0.14
	17.25	60.11	36.97	46.07	1.25	0.21	2.17	0.21	0.17
Spredor 5 Alfalfa	12.08	50.43	49.39	60.03	0.95	0.18	2.41	0.16	0.12
	17.50	61.46	35.23	49.42	1.31	0.23	2.68	0.22	0.18
	14.79	55.95	42.31	54.73	1.13	0.21	2.55	0.19	0.15
Yellowhead Alfalfa	15.80	55.91	42.35	50.33	1.23	0.16	2.20	0.22	0.17
	16.58	61.27	35.47	47.26	1.06	0.22	2.45	0.24	0.18
	16.19	58.59	38.91	48.80	1.15	0.19	2.33	0.23	0.18
AC Mountainview Sainfoin	17.78	59.98	37.13	45.84	1.32	0.20	2.42	0.24	0.20
	16.16	61.00	35.81	48.96	1.20	0.19	2.07	0.22	0.16
	16.97	60.49	36.47	47.40	1.26	0.20	2.25	0.23	0.18
Nova Sainfoin	16.05	58.46	39.07	46.27	1.36	0.19	2.59	0.26	0.18
	16.39	59.48	37.76	50.37	1.13	0.20	2.55	0.23	0.16
	16.22	58.97	38.42	48.32	1.25	0.20	2.57	0.25	0.17
Oxley 2 Cicer Milk Vetch	18.88	63.57	32.52	38.68	1.47	0.21	2.41	0.26	0.24
	18.22	64.95	30.75	44.99	1.16	0.24	3.06	0.31	0.17
	18.55	64.26	31.64	41.84	1.32	0.23	2.74	0.29	0.21
Veldt Cicer Milk Vetch	13.33	54.00	44.80	55.06	1.05	0.16	2.05	0.22	0.14
	11.06	61.20	35.56	56.45	1.19	0.26	2.74	0.24	0.20
	12.20	57.60	40.18	55.76	1.12	0.21	2.40	0.23	0.17

2017 (average of 2 samples)    2018 (average of 2 samples)    No color    Average of 2017 & 2018

### 2018 Legumes

- Protein values are 15 below to 5% above average
- Cutting date was suitable based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average

- Calcium values are 15% below to 40% above average
- Phosphorus values are 5% below to 5% above average
- Magnesium values are average to 35% below average
- Potassium values are 20% to 75% above average
- Sodium values are 50% to 75% below average
- Sulfur values are average to 30% below average
- Copper values are 15% to 50% below average
- Manganese values are 50% to 65% below average
- Zinc values are 10% to 45% below average

Table 60 **Select Nutritional Components – Grass/Legume Mixes – Fort Kent Site**

	Average Feed Values 2018 (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
AC Success Hybrid Brome Yellowhead Alfalfa	13.86	59.94	37.17	55.44	0.49	0.18	1.24	0.42	0.13
Fleet Meadow Brome Yellowhead Alfalfa	14.26	59.12	38.23	56.27	0.74	0.21	1.35	0.56	0.16
AC Knowles Hybrid Brome Yellowhead Alfalfa	13.47	60.37	36.63	56.49	0.55	0.18	1.11	0.44	0.19
AC Success Hybrid Brome Spredor 5 Alfalfa	14.68	60.58	36.35	52.92	0.74	0.18	1.2	0.47	0.2
AC Knowles Hybrid Brome Spredor 5 Alfalfa	15.95	62.02	34.51	52.36	0.65	0.21	1.42	0.49	0.17
AC Knowles Hybrid Brome AC Mountainview Sainfoin	12.93	63.15	33.06	54.74	0.45	0.19	1.48	0.42	0.13
AC Success Hybrid Brome AC Mountainview Sainfoin	13.28	62.12	34.38	53.94	0.47	0.18	1.23	0.34	0.12
Fleet Meadow Brome Spredor 5 Alfalfa	16.61	61.7	34.92	50.53	0.79	0.2	1.31	0.57	0.2
Fleet Meadow Brome AC Mountainview Sainfoin	13.13	61.46	35.23	54.58	0.5	0.17	1.33	0.43	0.11
Mean	14.21	61.16	35.61	54.14	0.60	0.19	1.30	0.46	0.15

2018 Data Only

#### 2018 Mixed forages:

- Protein values are average to 35% below average
- Cutting date was appropriate based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre values are average
- Calcium values are 25% to 55% below average
- Phosphorus values are average to 15% above average
- Magnesium values are 50% to 250% above average
- Potassium values are average to 25% below average
- Sodium values are average to 650% above average
- Sulfur values are average to 20% below average
- Copper values are 20% to 50% below average
- Manganese values are average to 40% above average
- Zinc values are 10% to 35% below average

Table 61 **Select Nutritional Components – Grasses – High Prairie Site**

Description	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Fleet Meadow Brome	9.86	63.70	41.10	60.90	0.32	0.12	2.91	0.14	0.10
	8.00	67.26	36.32	59.71	0.47	0.19	2.26	0.16	0.10
	8.93	65.48	38.71	60.31	0.40	0.15	2.58	0.15	0.10
AC Admiral Hybrid Brome	11.05	65.10	40.20	62.45	0.37	0.16	2.76	0.15	0.12
	8.76	67.55	36.00	57.50	0.60	0.20	2.18	0.21	0.14
	9.90	66.32	38.10	59.98	0.49	0.18	2.47	0.18	0.13
AC Knowles Hybrid Brome	11.10	65.20	37.65	62.80	0.35	0.14	2.18	0.12	0.14
	8.51	69.68	32.63	56.82	0.40	0.20	1.97	0.15	0.13
	9.80	67.44	35.14	59.81	0.37	0.17	2.08	0.14	0.13
AC Success Hybrid Brome	13.10	64.70	37.85	61.80	0.38	0.16	2.52	0.15	0.16
	8.37	67.06	35.48	59.50	0.41	0.22	2.14	0.14	0.15
	10.74	65.88	36.66	60.65	0.39	0.19	2.33	0.14	0.15
Greenleaf Pubescent Wheatgrass	8.71	58.00	42.65	67.80	0.29	0.11	1.95	0.10	0.11
	8.05	59.91	39.87	67.91	0.36	0.27	1.99	0.12	0.14
	8.38	58.95	41.26	67.86	0.33	0.19	1.97	0.11	0.12
Kirk Crested Wheatgrass	10.42	61.95	37.60	61.55	0.32	0.12	1.53	0.11	0.17
	7.77	63.24	36.03	62.42	0.27	0.19	1.36	0.10	0.14
	9.09	62.59	36.82	61.99	0.29	0.15	1.44	0.10	0.16
AC Saltlander Green Wheatgrass	10.33	61.80	38.40	64.25	0.30	0.12	2.09	0.12	0.13
	8.15	61.93	36.48	63.46	0.31	0.18	1.91	0.11	0.12
	9.24	61.86	37.44	63.86	0.30	0.15	2.00	0.11	0.12
Fojtan Festulolium	10.60	63.25	40.05	61.95	0.27	0.15	2.07	0.17	0.18
	9.14	65.35	37.31	57.88	0.33	0.22	2.21	0.17	0.17
	9.87	64.30	38.68	59.92	0.30	0.19	2.14	0.17	0.18
Courtney Tall Fescue	11.45	64.15	39.60	56.85	0.38	0.18	2.06	0.19	0.21
	9.00	64.25	38.33	57.80	0.36	0.22	2.66	0.19	0.16
	10.23	64.20	38.97	57.32	0.37	0.20	2.36	0.19	0.18
Kilarney Orchard grass	10.20	62.35	40.35	64.05	0.30	0.15	2.57	0.16	0.17
	7.78	60.28	41.35	65.06	0.36	0.23	3.03	0.19	0.17
	8.99	61.31	40.85	64.56	0.33	0.19	2.80	0.17	0.17
Grindstad Timothy	9.52	62.80	39.65	62.55	0.24	0.19	1.97	0.11	0.11
	8.03	65.19	37.19	59.23	0.27	0.19	1.85	0.12	0.12
	8.77	63.99	38.42	60.89	0.25	0.19	1.91	0.11	0.12
Mean	9.45	63.85	38.28	61.56	0.35	0.18	2.19	0.14	0.14

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

### 2017 Grasses:

- Protein values are 20% below to 20% above average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are average to 35% below average
- Phosphorus values are 30% below to 25% above average
- Magnesium values are 35% below to 25% above average
- Sulfur values are 30% below to 30% above average
- Copper values are 35% below to 15% above average
- Manganese values are 30% to 60% below average

- Zinc values are 10% below to 140% above average

### 2018 Grasses:

- Protein values are 20% below to 20% above average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are average to 35% below average
- Phosphorus values are 30% below to 25% above average
- Magnesium values are 35% below to 25% above average
- Sulfur values are 35% below to 30% above average
- Copper values are 35% below to 15% above average
- Manganese values are 30% to 60% below average
- Zinc values are 10% below to 140% above average

Table 62 **Select Nutritional Components – Legumes – High Prairie Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Spreader 4 Alfalfa	13.35	55.20	45.05	52.10	1.40	0.20	1.90	0.21	0.21
	17.71	60.28	36.85	52.33	1.81	0.22	2.06	0.30	0.23
	15.53	57.74	40.95	52.21	1.60	0.21	1.98	0.25	0.22
44-44 Alfalfa	15.05	58.20	41.75	50.55	1.46	0.19	2.17	0.21	0.24
	17.51	61.60	36.70	46.52	1.75	0.21	2.02	0.29	0.23
	16.28	59.90	39.23	48.54	1.60	0.20	2.09	0.25	0.23
Dalton Alfalfa	15.40	58.25	43.05	49.70	1.32	0.22	2.21	0.23	0.23
	15.92	58.33	39.44	52.95	1.87	0.23	2.16	0.31	0.25
	15.66	58.29	41.25	51.33	1.59	0.22	2.18	0.27	0.24
PV Ultima Alfalfa	16.50	59.80	40.45	46.55	2.01	0.21	1.74	0.27	0.34
	17.01	60.33	38.00	50.80	2.05	0.22	2.05	0.33	0.25
	16.75	60.06	39.23	48.68	2.03	0.21	1.90	0.30	0.30
Oxley 2 Cicer Milk Vetch	11.95	61.70	42.90	45.55	0.91	0.20	2.76	0.27	0.21
	17.79	65.56	36.04	46.93	1.34	0.26	2.78	0.34	0.22
	14.87	63.63	39.47	46.24	1.13	0.23	2.77	0.30	0.21
Veldt Cicer Milk Vetch	11.30	62.65	41.15	44.25	0.93	0.17	2.26	0.31	0.21
	17.18	65.06	37.84	47.71	1.10	0.25	2.61	0.29	0.21
	14.24	63.86	39.49	45.98	1.01	0.21	2.43	0.30	0.21
AC Mountainview Sainfoin	11.33	58.10	41.50	50.85	1.29	0.18	1.73	0.31	0.19
	14.47	57.40	38.53	51.77	1.46	0.24	2.02	0.29	0.22
	12.90	57.75	40.01	51.31	1.37	0.21	1.88	0.30	0.20
Rangelander Alfalfa	16.55	59.70	40.05	49.20	1.62	0.24	2.31	0.24	0.24
	16.37	58.76	39.33	51.57	1.89	0.22	2.00	0.33	0.22
	16.46	59.23	39.69	50.39	1.75	0.23	2.15	0.29	0.23
20-10 Alfalfa	14.90	57.75	42.45	51.05	1.23	0.15	1.95	0.21	0.19
	16.71	58.46	39.01	53.19	1.78	0.22	2.07	0.29	0.24
	15.80	58.11	40.73	52.12	1.51	0.18	2.01	0.25	0.21
Rugged Alfalfa	16.45	59.20	39.00	49.40	1.62	0.16	2.01	0.23	0.24
	16.47	59.45	40.28	53.04	1.97	0.24	2.14	0.31	0.26
	16.46	59.32	39.64	51.22	1.79	0.20	2.07	0.27	0.25
Halo Alfalfa	17.20	60.25	39.05	47.30	1.79	0.22	1.94	0.27	0.28
	18.37	62.22	34.78	47.34	1.83	0.23	2.11	0.29	0.27
	17.79	61.24	36.91	47.32	1.81	0.23	2.02	0.28	0.27
Assalt ST Alfalfa	19.55	62.80	35.65	45.85	1.85	0.18	1.99	0.23	0.32
	17.27	59.41	37.56	51.13	1.89	0.22	1.94	0.29	0.27
	18.41	61.11	36.61	48.49	1.87	0.20	1.96	0.26	0.29

Nova Sainfoin	11.60	54.35	42.15	53.90	0.93	0.20	1.58	0.22	0.18
	15.38	59.45	39.19	51.77	1.41	0.25	2.39	0.32	0.24
	13.49	56.90	40.67	52.83	1.17	0.23	1.99	0.27	0.21
Spredor 5 Alfalfa	15.70	59.35	41.30	48.15	1.83	0.18	2.33	0.24	0.28
	16.22	57.68	39.84	53.55	1.64	0.21	2.05	0.26	0.21
	15.96	58.51	40.57	50.85	1.73	0.19	2.19	0.25	0.25
Yellowhead Alfalfa	14.05	58.10	45.70	49.70	1.06	0.18	2.28	0.21	0.17
	17.92	61.62	36.75	49.83	1.76	0.25	2.02	0.33	0.24
	15.99	59.86	41.22	49.76	1.41	0.22	2.15	0.27	0.20
Mean	15.77	59.70	39.71	49.82	1.56	0.21	2.12	0.27	0.23

2017 (average of 2 samples)      2018 (average of 2 samples)      No color      Average of 2017 & 2018

#### 2017 Legumes:

- Protein values are average to 80% above average
- Cutting date was slightly late (1 week) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre levels are average
- Calcium values are 45% below to 35% above average
- Phosphorus values are 45% below to 35% above average
- Magnesium values are 20% below to 40% above average
- Sulfur values are average to 275% above average
- Copper values are average to 40% above average
- Manganese values are 50% to 65% below average
- Zinc values are 35% below to 90% above average

#### 2018 Legumes:

- Protein values are average to 80% above average
- Cutting date was slightly late (1 – 2 weeks ) based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre levels are average
- Calcium values are 40% below to 35% above average
- Phosphorus values are 50% below to 35% above average
- Magnesium values are 20% below to 40% above average
- Sulfur values are average to 275% above average
- Copper values are average to 40% above average
- Manganese values are 50% to 65% below average
- Zinc values are 35% below to 90% above average

Table 63 **Select Nutritional Components – Grass/Legume Mixes – High Prairie Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Fleet Meadow Brome	17.60	63.90	35.05	47.40	1.38	0.21	2.50	0.25	0.22
AC Yellowhead Alfalfa	15.42	62.15	37.78	55.67	1.22	0.24	2.60	0.30	0.19
	16.51	63.03	36.42	51.54	1.30	0.23	2.55	0.27	0.20
Fleet Meadow Brome	11.85	54.35	37.20	53.20	1.33	0.24	1.62	0.27	0.21
AC Mountainview Sainfoin	10.36	63.66	36.48	58.53	0.52	0.23	2.36	0.18	0.12
	11.11	59.00	36.84	55.86	0.92	0.23	1.99	0.23	0.16
Fleet Meadow Brome	19.75	63.85	33.75	43.60	2.11	0.24	2.16	0.27	0.29
Spredor 5 Alfalfa	15.98	55.99	40.19	57.22	1.42	0.21	2.46	0.28	0.11
	17.87	59.92	36.97	50.41	1.76	0.22	2.31	0.27	0.20
AC Knowles Hybrid Brome	17.95	61.35	34.60	47.60	1.54	0.24	2.12	0.25	0.23
AC Yellowhead Alfalfa	14.68	59.10	37.55	55.84	1.15	0.21	2.18	0.28	0.18
	16.31	60.23	36.08	51.72	1.34	0.22	2.15	0.26	0.21
AC Knowles Hybrid Brome	11.70	55.25	37.05	53.70	1.18	0.16	1.51	0.26	0.17
Spredor 5 Alfalfa	17.00	59.44	38.49	54.22	1.48	0.24	2.57	0.32	0.24
	14.35	57.35	37.77	53.96	1.33	0.20	2.04	0.29	0.20
AC Knowles Hybrid Brome	18.60	60.95	34.55	50.75	1.66	0.23	2.11	0.29	0.25
AC Mountainview Sainfoin	10.78	63.25	36.34	57.68	0.65	0.23	2.13	0.19	0.16
	14.69	62.10	35.44	54.21	1.15	0.23	2.12	0.24	0.21
AC Success Hybrid Brome	16.90	65.05	35.45	49.90	1.38	0.22	2.18	0.27	0.24
AC Yellowhead Alfalfa	12.55	58.56	40.48	60.89	0.92	0.21	2.27	0.23	0.16
	14.72	61.80	37.97	55.40	1.15	0.21	2.22	0.25	0.20
AC Success Hybrid Brome	18.05	65.45	33.50	47.05	1.46	0.22	2.07	0.22	0.25
Spredor 5 Alfalfa	16.86	59.40	38.76	55.44	1.55	0.22	2.24	0.31	0.23
	17.46	62.42	36.13	51.25	1.50	0.22	2.15	0.27	0.24
AC Success Hybrid Brome	13.10	54.35	36.60	54.50	1.18	0.20	1.61	0.27	0.18
AC Mountainview Sainfoin	11.54	60.39	37.03	58.20	0.75	0.24	2.09	0.21	0.19
	12.32	57.37	36.82	56.35	0.97	0.22	1.85	0.24	0.18
Mean	15.04	60.36	36.71	53.41	1.27	0.22	2.15	0.26	0.20

2017 (average of 2 samples)

2018 (average of 2 samples)

No color Average of 2017 &amp; 2018

**2017 Mixed forages:**

- Protein values are 10% below to 70% above average
- Cutting date was average. Acid Detergent Fibre values are average
- Neutral Detergent Fibre levels are average
- Calcium values are 10% below to 110% above average
- Phosphorus values are 15% below to 50% above average
- Magnesium values are 10% to 30% below average
- Sulfur values are average to 40% above average
- Copper values are average to 25% above average
- Manganese values are 10% to 65% below average
- Zinc values are 45% below to 35% above average

**2018 Mixed forages:**

- Protein values are 10% below to 70% above average
- Cutting date was on time. Acid Detergent Fibre values are average
- Neutral Detergent Fibre levels are average
- Calcium values are 10% below to 110% above average
- Phosphorus values are 15% below to 50% above average
- Magnesium values are 10% to 30% above average



- Sulfur values are average to 40% above average
- Copper values are average to 25% above average
- Manganese values are 65% below a to 10% above average
- Zinc values are 45% below to 35% above average

Table 64 **Select Nutritional Components – Grasses – Fort Vermilion Site**

	Average Feed Values (%)								
	CP	TDN	ADF	NDF	Ca	P	K	Mg	S
Greenleaf Pubescent Wheatgrass	14.69	64.84	38.02	56.35	0.48	0.22	2.51	0.12	0.32
	11.29	54.915	46.065	64.72	0.64	0.14	2.24	0.245	0.145
	12.99 <sup>1</sup>	59.88	42.04	60.53	0.56	0.18	2.37	0.18	0.23
AC Success Hybrid Brome	14.54	63.87	40.73	56.78	0.73	0.15	2.10	0.18	0.31
	9.585	51.005	49.335	68.83	0.37	0.09	1.095	0.12	0.115
	12.06	57.44	45.03	62.80	0.55	0.12	1.60	0.15	0.21
AC Saltlander Green Wheatgrass	13.07	61.71	39.47	58.05	0.50	0.18	1.99	0.13	0.31
	8.505	54.31	49.33	70.78	0.54	0.125	1.77	0.16	0.12
	10.79	58.01	44.40	64.41	0.52	0.15	1.88	0.15	0.22
AC Knowles Hybrid Brome	14.80	61.70	41.41	56.05	0.70	0.19	2.22	0.17	0.36
	9.28	51.66	50.85	71.045	0.565	0.125	1.65	0.165	0.13
	12.04	56.68	46.13	63.55	0.63	0.16	1.94	0.17	0.24
Fleet Meadow Brome	15.73	70.82	35.94	54.25	0.63	0.17	2.18	0.18	0.31
	7.98	48.69	51.86	71.87	0.56	0.11	1.85	0.19	0.115
	11.86	59.75	43.90	63.06	0.60	0.14	2.02	0.18	0.21
Kirk Crested Wheatgrass	14.08	60.31	38.81	58.98	0.66	0.18	1.73	0.17	0.32
	9.66	55.375	47.375	67.24	0.415	0.11	1.35	0.12	0.14
	11.87	57.84	43.09	63.11	0.54	0.15	1.54	0.15	0.23
AC Admiral Hybrid Brome	15.50	68.69	38.00	54.82	0.60	0.17	2.27	0.17	0.32
	8	52.635	50.105	70.35	0.435	0.105	1.29	0.125	0.11
	11.75	60.66	44.05	62.58	0.52	0.14	1.78	0.15	0.21
Grindstad Timothy	15.80	63.11	39.26	52.36	1.33	0.28	2.90	0.32	0.39
	11.405	58.44	46.915	65.075	0.885	0.175	2.985	0.29	0.195
	13.60	60.77	43.09	58.72	1.11	0.23	2.94	0.30	0.29
Courtney Tall Fescue	9.89	53.63	48.61	66.065	0.82	0.215	2.84	0.3	0.17
Killarney Orchard Grass	9.02	63.77	45.22	57.98	0.36	0.12	1.31	0.1	0.08
Fojtan Festolium	9.28	54.595	46.975	66.895	0.61	0.145	1.69	0.19	0.13

2017 (average of 2 samples)

2018 (average of 2 samples)

<sup>1</sup> Average of 2017 & 2018**2017 Grasses:**

- Protein values are 15% to 70% above average
- Cutting date was slightly late (1 - 2 weeks) based on reported Acid Detergent Fibre values
- Some samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 20% to 60% above average
- Phosphorus values are 10% below to 250% above average
- Magnesium values are 30% below to 30% above average
- Sulfur values are 100 to 125% above average
- Copper values are average to 35% below average
- Manganese values are 40% to 65% below average
- Zinc values are 50% below to 20% above average

**2018 Grasses:**

- Protein values are 60% below to 20% above average
- Cutting date was slightly late (2 - 3 weeks) based on reported Acid Detergent Fibre values
- Almost all samples have Neutral Detergent Fibre values > 60%. Can reduce voluntary feed intakes
- Calcium values are 35% below to 300% above average
- Phosphorus values are 40% below to 80% above average
- Magnesium values are 35% below to 300% above average
- Sulfur values are 10% below to 50% above average
- Copper values are average to 85% below average
- Manganese values are 15% below to 215% above average
- Zinc values are 70% below to 15% above average

**Table 65 Select Nutritional Components – Legumes – Fort Vermilion Site**

	Average Feed Values (%)							
	CP	TDN	ADF	NDF	Ca	P	K	S
Spredor 5 Alfalfa	16.49	63.28	38.11	46.37	3.07	0.25	1.55	0.20
	14.38	49.19	46.59	57.12	2.38	0.19	1.76	0.23
	15.44	56.24	42.35	51.74	2.73	0.22	1.65	0.21
Dalton Alfalfa	17.24	64.85	35.49	42.20	3.27	0.23	1.46	0.22
	13.52	48.22	47.08	57.73	1.65	0.14	1.54	0.16
	15.38	56.54	41.28	49.96	2.46	0.19	1.50	0.19
20--10 Alfalfa	17.93	65.42	35.74	43.63	2.59	0.29	1.79	0.23
	13.77	50.72	46.04	56.81	1.67	0.25	1.92	0.17
	15.85	58.07	40.89	50.22	2.13	0.27	1.85	0.20
Rugged Alfalfa	18.32	62.55	39.06	48.94	3.10	0.35	1.96	0.28
	10.97	40.77	52.57	65.01	1.45	0.12	1.15	0.12
	14.64	51.66	45.81	56.98	2.28	0.24	1.55	0.20
Yellowhead Alfalfa	17.96	67.65	33.21	39.97	2.32	0.24	1.67	0.20
	12.12	50.49	45.97	56.07	1.54	0.16	1.58	0.14
	15.04	59.07	39.59	48.02	1.93	0.20	1.62	0.17
44--44 Alfalfa	18.01	65.14	35.59	42.28	2.96	0.25	1.54	0.24
	12.52	52.52	45.95	55.55	1.61	0.15	1.60	0.16
	15.26	58.83	40.77	48.91	2.29	0.20	1.57	0.20
Spredor 4 Alfalfa	15.97	63.47	37.22	45.52	2.79	0.24	1.54	0.22
	11.99	48.38	47.50	58.27	1.63	0.12	1.19	0.14
	13.98	55.93	42.36	51.89	2.21	0.18	1.37	0.18
Oxley 2 Cicer Milk Vetch	20.23	68.02	34.52	41.91	2.28	0.32	2.33	0.21
	13.94	52.98	47.38	55.94	1.83	0.18	2.46	0.18
	17.09	60.50	40.95	48.92	2.05	0.25	2.39	0.19
Assalt ST Alfalfa	19.27	66.13	35.67	44.15	3.13	0.29	1.86	0.28
	12.25	52.32	46.04	56.00	1.75	0.18	2.50	0.18
	15.76	59.22	40.86	50.07	2.44	0.23	2.18	0.23
PV Ultima Alfalfa	17.26	61.29	40.33	50.62	3.57	0.34	1.94	0.29
	10.93	51.68	48.60	58.18	1.62	0.16	1.77	0.15
	14.09	56.48	44.46	54.40	2.60	0.25	1.85	0.22
Halo Alfalfa	17.35	60.14	41.69	53.82	2.86	0.31	1.87	0.26
	12.60	50.07	46.81	56.71	1.54	0.14	1.57	0.14
	16.72	58.05	39.61	51.32	1.32	0.20	2.24	0.20
Veldt Cicer Milk Vetch	20.12	65.60	36.65	44.02	3.11	0.32	2.48	0.24
	11.65	52.49	46.84	55.77	1.26	0.16	1.98	0.13
	15.88	59.04	41.74	49.90	2.19	0.24	2.23	0.18
Nova Sainfoin	19.30	66.44	35.02	42.06	1.76	0.31	1.67	0.18

	13.62	52.65	46.00	54.95	1.64	0.17	1.76	0.15
	16.46	59.55	40.51	48.51	1.70	0.24	1.71	0.16
AC Mountainview	18.59	64.87	35.76	42.61	2.44	0.31	1.69	0.19
Sainfoin	12.61	51.65	45.14	53.28	1.71	0.14	1.33	0.15
	15.60	58.26	40.45	47.94	2.08	0.23	1.51	0.17
Mean	15.51	57.67	41.54	50.63	2.17	0.22	1.80	0.19
2017 (average of 2 samples)	2018 (average of 2 samples)			<sup>1</sup> Average of 2017 & 2018				

### 2017 Legumes:

- Protein values are 20% below to 20% above average
- Cutting date was at the correct time based on reported Acid Detergent Fibre values
- Neutral Detergent Fibre levels are average
- Calcium values are average to 250% above average
- Phosphorus values are average to 55% above average
- Magnesium values are 15% below to 100% above average
- Sulfur values are 100% to 125% above average
- Copper values are average to 40% below average
- Manganese values are 50% to 65% below average
- Zinc values are 50% below to 20% above average

### 2018 Legumes:

- Protein values are 20% to 55% below average
- Cutting date was 2 – 3 weeks late based on reported Acid Detergent Fibre values
- Some samples had Neutral Detergent Fibre levels > 60%. Can reduce voluntary intake
- Calcium values are 30% below to 50% above average
- Phosphorus values are 50% below to 10% above average
- Magnesium values are 45% below to 80% above average
- Sulfur values are 50% below to 25% above average
- Copper values are 75% below to 10% above average
- Manganese values are 35% below to 200% above average
- Zinc values are 75% below to 50% above average

### Peace Lowland – Site 3 (Fort Vermilion) MARA Feed Analysis – Grass/Legume

Not available – very little legume in mixes