Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

CANADIAN AGRICULTURAL PARTNERSHIP

Peace Region Forage Seed Association

Peace Region Forage Cultivar Testing (PRFCT) Program

Coordinated by

Peace Region Forage Seed Association
and
Agriculture and Agri-Food Canada
Beaverlodge Research Farm, Alberta

Annual Report 2019

Prepared by

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Northstar Seed

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Protocol for Peace Region Forage Cultivar Testing (PRFCT) Program

Updated – February 14, 2020

1. Research Sponsorship

An annual research sponsorship of **$350 CAN/entry/year/location** is requested, this sponsorship will be paid for the establishment year as well as for the harvest years. Peace Region Forage Cultivar Testing Program funds will be administered by the Peace Region Forage Seed Association (PRFSA). Each seed company will be invoiced annually by the PRFSA General Manager.

2. Eligibility of Entries

Released and experimental lines of all tame and native grass species will be considered if they are of interest to commercial seed companies. We reserve the right not to initiate tests:

- if seed is not received on time
- if there is a restriction of space in any year at a particular location
- if entries are too few in any year for a particular location
- if the germination percentage of the seed is below 75%

3. Seed Requirements and Deadline for Seed Entry

The applicant will provide for **EACH TEST LOCATION**:

- 50 g of timothy, bentgrass, or Kentucky bluegrass
- 100 g of fescues - creeping red, chewings, hard, meadow, sheep or tall fescue; orchardgrass, annual or perennial ryegrass
- 200 g of bromegrasses – meadow, smooth, hybrid, and wheatgrasses
- 200 g of leguminous species such as alfalfa, birdsfoot trefoil, clovers
- The germination percentage of each cultivar

Approved seed entries shall be supplied by **April 1st** of the establishment year and **will include the percent germination and relative maturity** (early, medium or late) of each cultivar. Please indicate if the submission is **a turf type or forage**.

Please ship approved seed to*:

Peace Region Forage Seed Association
904 102 Ave
Dawson Creek, BC V1G 2B7

* *European companies submitting entries need to ship their seeds to their US or Canadian head office then to the PRFSA. Seed shipped from the US to Canada needs to be accompanied by all phytosanitation paperwork to clear customs.*

4. Publication of Results

Data will undergo appropriate statistical analysis and each applicant will receive an annual report. Seed producers will be provided information on cultivars upon request. Results will be posted by the end of the fiscal year on the research page of the website www.peaceforageseed.ca

All reasonable care will be taken to ensure a successful test; however, no guarantee can be made that a particular test will be successful. If a test is not successful it can be reseeded.

The cultivars will be tested for two harvest seasons after the establishment. Cultivar performance is reported in terms of biomass and seed yields for each harvest season. In some cases, data may not be reported due to extreme variations that cannot be accounted for in the statistical design.

Disclaimer

Reference to trade names or commercial products are made with the understanding that no discrimination is intended, and no endorsement is implied.

5. Use of Seed

Seed submitted will only be used for the establishment of the agreed upon trials. The seed will **NOT** be used for increase, selection or distribution.

Peace Region Forage Cultivar Testing (PRFCT) Program

2020 Application for PRFCT Entry

Company: **Telephone:**

Contact person: **Fax:**

Mailing address: **Email:**

Species	Cultivar Name/Code	Type Forage/Turf	Relative Maturity Early/Medium/Late	% Germination

Send application form no later than March 31, 2020 to:

Nityananda Khanal
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Or

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Executive Summary

Agricultural systems need to adapt to new challenges and opportunities brought about by global climate change and globalization of market. Innovations in crop breeding have provided continuous flux of new crop cultivars that require assessment of their regional adaptability and end use quality. To address this need in forage seed crops in the Peace region, Agriculture and Agri-Food Canada (AAFC) - Beaverlodge Research Farm and Peace Region Forage Seed Association (PRFSA) have established a long-term collaborative program known as Peace Region Forage to Cultivar Testing (PRFCT). Funded by the Government of Canada through Canadian Agriculture Partnership (CAP) with contribution from PRFSA, the primary objective of the program is to evaluate new proprietary and public cultivars to support production and marketing decisions for producers and seed companies.

Various cultivars of creeping red fescue (*Festuca rubra* L. var. *rubra*), tall fescue (*Festuca arundinacea*), orchardgrass (*Dactylis glomerata* L.), timothy (*Phleum pratense* L.), red clover (*Trifolium pratense* L.), and alsike clover (*Trifolium hybridum* L.) were tested for their seed yield in comparison to popular cultivars of respective species in the region. The forage grass cultivars included in the trials were received from various Canadian and international seed companies and their foreign affiliates including Foster's Seed & Feed Ltd, BrettYoung, DLF Moore Seed, Northstar Seed and Crop Production Services.

During the reporting period, one trial each of creeping red fescue, tall fescue and timothy was concluded, while one trial each of creeping red fescue, orchard grass, alsike clover and red clover underwent the evaluation for first crop year in 2019 and is subjected to further evaluations in the coming season in 2020. Variable weather patterns in different years provided desirable test environment for examining the adaptability of the cultivars in the Peace region. Based on the seed yield performance of first crop seasons, creeping red fescue cultivars Foster FO performed promisingly, standing on par with Boreal. The test cultivars of tall fescue in the 2017-established trial showed better adaptability to Peace region compared to Courtenay for the seed yield. Most of their seed yield performance was better compared to the check cultivar Courtenay. The test cultivars of timothy produced significantly lower seed yield than check variety Alma during first harvest year, however, their second harvest seed yield was statistically similar to the check. The end use value in tall fescue and timothy lie on the forage biomass quantity, nutritive values and stand persistence. Biomass yields have generally positive correlations with plant height and seed yields.

INTRODUCTION

The crop growing season in the Peace River region of Canada is typified by long day, cool night and modest soil water deficit. This condition provides relative advantage for seed production of turf and forage crops for the domestic and export market. About 25,000 metric tons (55 million lbs.) of forage and turf grass seeds are sold annually from this region. The forage seed production provides farmers with on-farm diversification options with improved crop rotation, distribution of labour and equipment over the season, and niche market opportunities.

Agricultural systems need to adapt to new challenges and opportunities brought about by global climate change and globalization of market. Innovations in crop breeding have provided continuous flux of new crop cultivars that require assessment of their regional adaptability and end use quality. Both seed companies and producers may benefit from the information about cultivars performance for making informed contractual decisions.

Agriculture and Agri-Food Canada (AAFC) - Beaverlodge Research Farm and Peace Region Forage Seed Association (PRFSA) have established a long-term collaboration with the aim to improve forage seed production systems in the Peace Region. Various collaborative initiatives have received funding support from the Government of Canada through Growing Forward and the Canadian Agricultural Partnership programs, along with fund contributions from PRFSA. A forage cultivar testing program originally initiated in mid 1990's as Western Grass Seed Testing Program (WGST) has now evolved to be a more embracing Peace Region Forage Cultivar Testing (PRFCT) program including both grasses and legumes species. The primary objective of the PRFCT is to evaluate adaptability, productivity and seed quality of public and proprietary forage and turfgrass cultivars mainly originated from US-based and European companies for contractual seed production in western Canada. The PRFCT also provides the most recent yield data for the farmers of Pease region and the whole province.

This report presents the results of various forage and turf grass cultivars that were evaluated for seed yield in 2018 and 2019. Various cultivars of creeping red fescue (*Festuca rubra* L. var. *rubra*), tall fescue (*Festuca arundinacea*), orchardgrass (*Dactylis glomerata* L.), timothy (*Phleum pratense* L.), red clover (*Trifolium pratense* L.), and alsike clover (*Trifolium hybridum* L.) were tested for their seed yield in comparison to popular cultivars of respective species in the region.

MATERIALS AND METHODS

AAFC's Beaverlodge Research Farm, located around 55° 11´ N, 119º 32´ W in Alberta, Canada (Figure 1) is a representative PRFCT site, with dark gray luvisolic soil of BERWYN series. Perennial forage seed crop production process involves an establishment year followed by two or more seed production years, referred to as crop years. For the PRFCT purpose, all forage cultivars are evaluated for two crop years for seed productivity. The experimental site at Beaverlodge is maintained under annual crop sequences such as pea-barley-wheat-canola, in the preceding years prior to the establishment of forage cultivar trials. The forage crops are direct-seeded without tillage. Fertilizers are applied in the fall on the basis of soil test results and crop responses observed in the plant nutrition experiments. Weeds are controlled by a combination of mechanical and chemical measures with the application of herbicides registered for specific crops. Individual experimental units comprise of four rows of 6 m length, spaced 30 cm apart. The yield samples are collected from the central two rows.

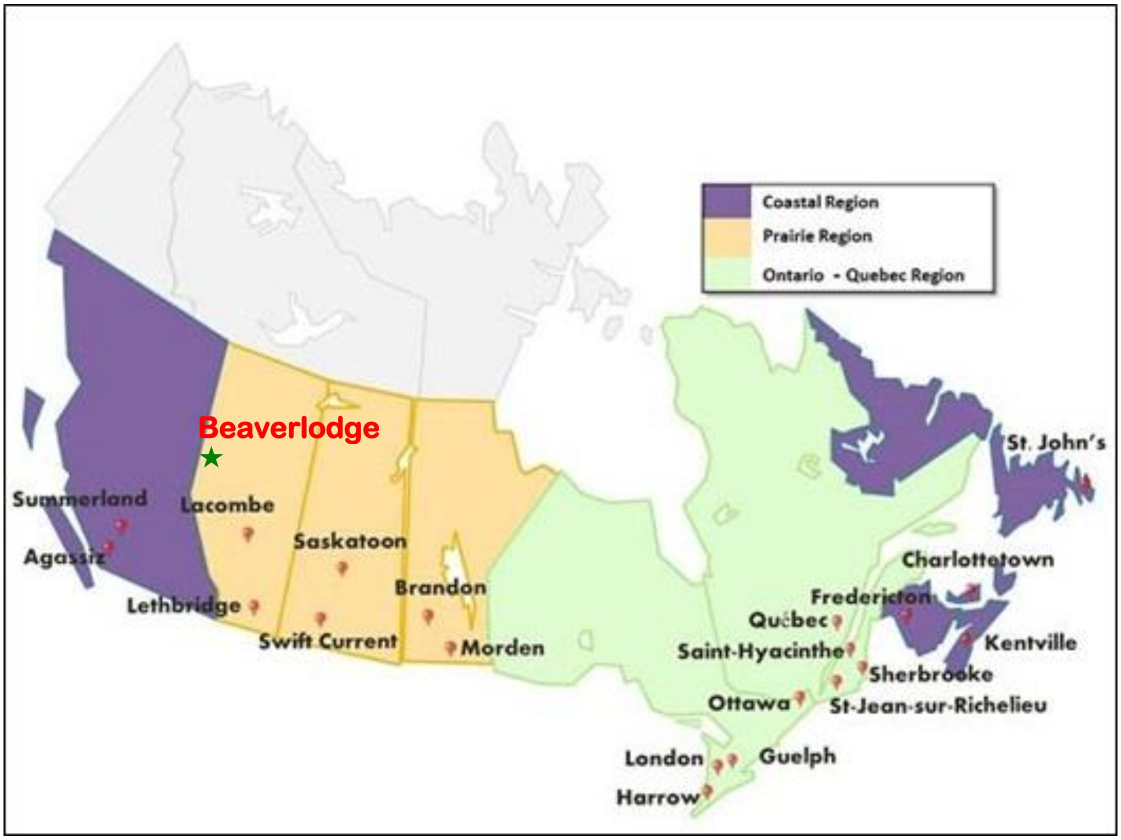

Figure 1. Map of Canada showing the locations of Beaverlodge Research Farm and other AAFC Research and Development Centres.

The experiments are laid out in a randomized complete block design with four replications. The data are analyzed by using GLIMMIX, CORR and Means Procedures of SAS® 9.4 System. A single year results are analysed using randomized complete block design (RCBD) GLIMMIX and two years' data on the same stand are analysed with RCBD repeated measure GLIMMIX procedure.

A total of 46 proprietary and public entries of different forage and turf grass species of various origins were evaluated in 2018 and 2019. The number of grass species entries included 30 of creeping red fescue, three of timothy, five of tall fescue, and two of orchardgrass, which were tested for seed yield in comparison to popular cultivar of respective species in the Peace region (Table 1). Similarly, legumes cultivar trials included four entries of red clover and two of alsike clover. The forage grass and legume entries included in the trials were originated or received from AAFC, and various Canadian and international seed companies and their foreign affiliates as listed in Table 1.

Table 1. List of forage and turf grass cultivars from various proprietors established and tested during 2017 – 2019.

Forage species	Year of seeding	Seed sources	No. of Entries	Cultivars	Year of evaluation
Creeping Red Fescue	2017	BrettYoung	4	BY-676, BY-369-13883, BY-2889, BY17-8070	2018 - 2019
		DLF Moore Seed	7	MSP-03-17, MSP-06-17, MSP-07-17, MSP-08017, MSP-02-17, MSP-04-17, MSP-05-17	
		Foster's Seed & Feed	3	Fosters FX, Fosters FO	
	2018	BrettYoung	2	BY-2889, BY17-8070	2019 - 2020
		DLF Moore Seed	2	MSP-05-17, MSP-06-17	
		Foster's Seed & Feed	12	2018-01, 2018-02, 2018-03, 2018-04, 2018-05, 2018-06, 2018-07 2018-08, 2018-09, 2018-10, 2018-11, Foster-FO	
Timothy	2017	Northstar Seed	3	NSE1701, NSE1723, NSE1730	2018 - 2019
Tall Fescue	2017	Foster's Seed & Feed	5	Titan Rx, Titan Ultra, Covenant, Rendition RX, Hudson	2018 - 2019
Alsike Clover	2018	DLF Moore Seed	1	Menta	2019 - 2020
		AAFC	1	CRS-111	
Red Clover	2018	DLF Moore Seed	1	Jancio	2019 - 2020
		AAFC	3	A.C Christie, CRS32, CRS33	
Orchadgrass	2018	Crop Production Services	1	Blizzard	2019-2020
Orchadgrass	2018	AAFC	1	NO94-100	2019-2020

RESULTS

Weather effects on crops

The results included in this report were derived from trials that were established in 2017 and 2018. Despite some anomalies of the May and October temperatures over the reporting years from 2017 to 2019, the monthly maximum and minimum temperatures in other growing months displayed similar patterns with long-term average for last 30 years (Figure 2). However, the amount and distribution of precipitation showed noticeable monthly variation in growing seasons over the reporting period. In 2017, May and June were wetter, and rest of the season was drier than normal. The wetter spring followed by gradual decline in precipitation over the months caused some moisture stress during reproductive stage in 2017. Contrastingly in 2018, May and June were moderately dry, while July and August were wet months compared to the long-term average. Multiple freeze-thaw cycles in the early springs followed by dry conditions in the late spring impaired vegetative growth of the perennial crops in 2018. The 2019 growing season was closer to long-term average. Some episodes of chilly temperature during early reproductive stages of crops in late June and early July caused cold injury resulting in failed pollination and poor seed development in early crops. The variable weather conditions over years are one of the major factors causing fluctuations in productivity.

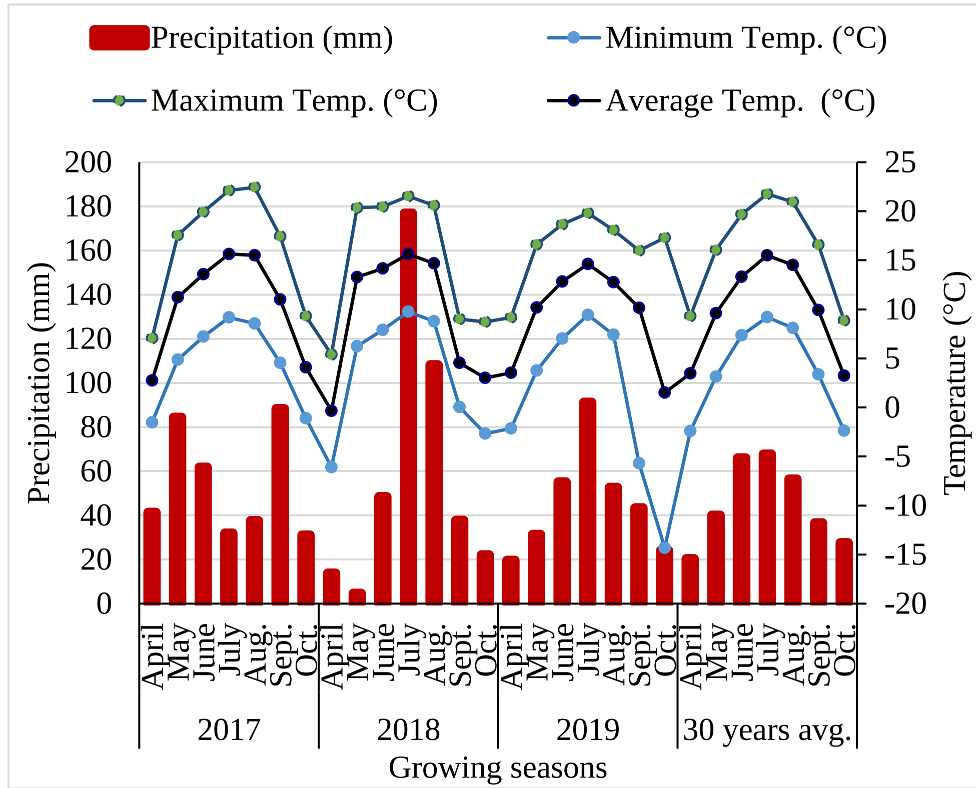

Figure 2. Growing seasons monthly minimum, maximum and average temperature and total monthly precipitation from 2017 to 2019 along with the 30-years (1990-2019) monthly average of research sites at Beaverlodge, AB.

Results of completed trials

Creeping Red Fescue

A creeping red fescue cultivar trial with 13 proprietary cultivars and Boreal as a standard check was established in 2017. Because of uneven seed drilling, some cultivars did not establish to a uniform stand. The cultivars which had unsatisfactory plant stand in two or more replicates were re-seeded in 2018. Cultivars with single replicate data are not included for statistical analysis.

The cultivars differed significantly ($p < 0.01$) for seed yield, biomass and plant height for the first harvest year of 2018 (Table 2). The cultivar Fosters FO produced significantly higher seed yield followed by Boreal in the second place, and BY-676 and BY-2889 in the third and fourth place respectively. Rest of the cultivars had significantly lower seed yields. Fosters FO produced 17% higher seed yield than Boreal, while BY-676 and BY-2889 yielded 23% and 30% less than that of Boreal. Figure 3 presents a photograph of the first harvest season in 2019. The cultivars were further evaluated for second crop season in 2019.

Table 2. Seed yield, plant height and dry biomass of creeping red fescue cultivars in 2018 from the trial established in 2017 at Beaverlodge, AB. The trial was seeded on June 2, 2017 and harvested on July 18, 2018. Note on missing data: [1] mean of 3 replicates (1 replicate missing), [2] mean of two replicates (2 replicates missing) and [3] summary of only 1 replicate (3 replicates missing, hence not included in the analysis).

Company	Cultivar	Plant height	Dry biomass	Seed yield		
		cm	($kg\ ha^{-1}$)	$kg\ ha^{-1}$	$lb\ ac^{-1}$	% of check
BrettYoung	[1]BY-676	61.30	3220	839**c**	749	77
	BY-369-13883	57.50	2742	522**de**	466	48
	[2]BY-2889	57.37	2517	760**c**	679	70
	[3]BY-17-8070	59	2491	426	379	39
DLF Moore Seed	MSP-03-17	59.25	2328	451**ef**	403	42
	[2]MSP-06-17	47.66	1768	217**g**	194	20
	MSP-07-17	54.75	2450	362**f**	323	33
	MSP-08017	58.50	2618	403**f**	360	37
	MSP-02-17	51.50	2203	436**ef**	389	40
	MSP-04-17	61.50	2610	585**d**	522	54
	[1]MSP-05-17	64.29	2483	521**de**	465	48
Foster's Seed	[1]Fosters FX	55.62	2441	471**ef**	421	43
	[1]Fosters FO	65.47	3593	1263**a**	1128	117
Check	[1]Boreal	71.61	3616	1083**b**	967	100
	CV%	4.4	10.1	9.5		
	$LSD_{0.05}$	5.3	548.6	119.1		

Figure 3. Photograph taken in 2018 of creeping red fescue trial established in 2017 at Beaverlodge, AB.

In the second harvest year in 2019, Boreal produced significantly higher seed yield (Table 3), resulting in highest cumulative seed yield in two production years. Five cultivars which had some replicates missing in 2017 seeding were reseeded in 2018, and hence not harvested in the second production year in 2019. MSP-03-17 and MSP-04-17 stood at second and third rank, while remaining on par statistically.

Table 3. Seed yield, plant height and dry biomass of creeping red fescue cultivars in the second harvest year of 2019 from the trial established in 2017 at Beaverlodge, AB. The trial was established on June 2, 2017, and second harvest date was July 18, 2019.

Company	**Cultivar**[‡]	**Plant height**	**Dry biomass**	**Seed yield**		
		cm	(kg ha^{-1})	kg ha^{-1}	lb ac^{-1}	% of check
BrettYoung	BY-676	76.8bcd	4104bcd	419bcd	374	46
	BY-369-13883	71.8cde	4167bcd	454bc	405	50
DLF Moore Seed	MSP-03-17	86.2a	5729a	612b	546	68
	MSP-07-17	66.9ef	3715cd	232d	207	26
	MSP-08-17	77.5bc	4583bc	380cd	339	42
	MSP-02-17	63.8f	3229d	270cd	241	30
	MSP-04-17	84.9ab	5139ab	595b	531	66
Foster's Seed	Fosters FX	68.5def	3878cd	278cd	248	31
Check	Boreal	86.2a	5799a	904a	807	100
	CV (%)	11.9	22.4	17.1		
	P-values	<.0001	<.0001	<.0001		

Compared to first crop year, most of the cultivars showed a decline in seed yield in the second crop year in 2019. There was a significant cultivar-by-crop year interaction ($p < .01$), suggesting the differential ranking in seed yield between the crop years. Cultivars MSP-03-17 and MSP-04-17, which had relatively low yield in first production year, exhibited increase in yield in the second production year. Cultivar Boreal showed modest yield stability with the yield with second crop yield being 83% of the first crop year.

Average plant heights of the cultivars ranged from 47 to 70 cm in the first crop season and 63 to 86 cm in the second crop season, with all cultivars showing impaired growth in the 2018 harvest season (Table 2). Exceptionally low precipitation in May 2018 and relatively well distributed rainfall in 2019 growing season implies that moisture deficit in early vegetative stage affected plant growth in 2018.

Tall fescue

The tall fescue trial established in 2017 included five cultivars from Foster's Seed & Feed being compared with the check – Courtenay. With the evaluation in two consecutive harvests in 2018 and 2019, this report concludes the results of this trial. The growth and yield data are summarized in Table 4.

The tall fescue test cultivars showed promising performance out-yielding Courtenay in cumulative seed yield of two seasons (Table 4). A photograph of the tall fescue trial is presented in Figure 4. During the first harvest year of 2018, all the test cultivars produced significantly higher ($p < 0.018$) seed yield than that of Courtenay. Cultivar Rendition RX ranked first in the cumulative seed yield with 39% and 6% higher seed yield in first and second harvest year respectively (Figure 5). Cultivar Hudson, which ranked first in 2018 exhibited the most decline in seed yield in the second harvest year in 2019. However, Courtenay consistently produced higher biomass yield in both years.

Figure 4. Photograph taken in 2018 of the tall fescue trial established in 2017 at Beaverlodge, AB

Table 4. Seed yield, plant height and dry biomass of tall fescue cultivars in 2018 and 2019 crop season from the trial established in 2017 at Beaverlodge, AB. The trial was seeded on June 02, 2017, harvested on July 24, 2018 and August 13, 2019 for first and second crop year, respectively.

Company	Cultivar	Plant height		Dry biomass		Seed yield					
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
		cm		kg ha^{-1}		kg ha^{-1}		lb ac^{-1}		% of check	
Foster's Seed & Feed	Titan Rx	78.5bc	95.8bc	3611	3514	877a-d	643abc	782	574	132	89
	Titan Ultra	84.3b	102.3b	4028	3597	971ab	662abc	866	591	146	91
	Covenant	76.0c	95.3c	3542	3444	937ab	707ab	836	631	141	98
	Rendition RX	80.8bc	112.0ab	3681	3875	926abc	766a	826	683	139	106
	Hudson	75.0c	93.5c	3924	3375	1077a	613c	961	547	162	85
Check	Courtenay	109.3a	131.3a	4167	4743	666d	724ab	594	646	100	100
	CV (%)	14.6	15.3	16.6	20.2	18.3	15.9				
	P-values	<.0001	<.0001	0.72	0.72	0.018	0.018				

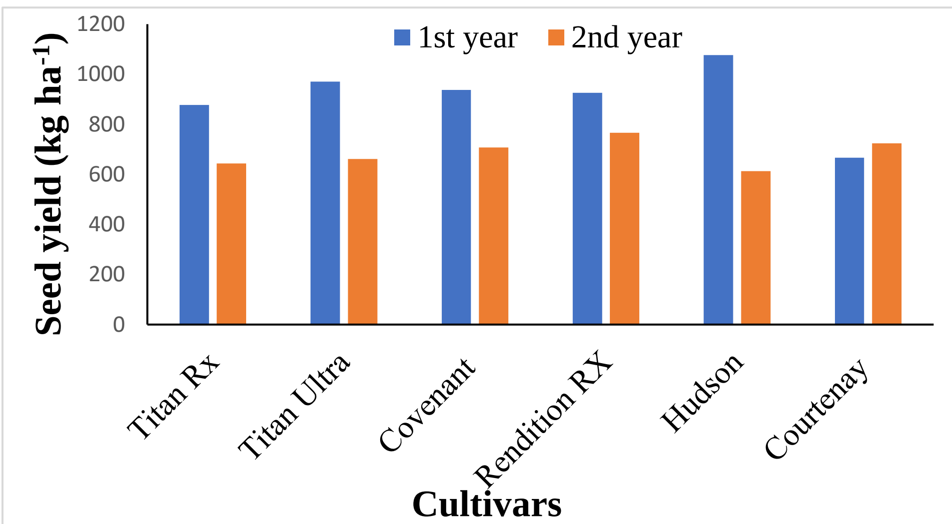

Figure 5. Seed yield of tall fescue cultivars in two consecutive harvest years of 2018 and 2019 from the cultivar testing trial established in 2017 at Beaverlodge, AB.

Compared to the first crop year in 2018, all cultivars showed increase in plant height in the second crop year in 2019 (Table 4). However, the cultivars showed differential trends in biomass yield. Seed yields in perennial crops including tall fescue have constitutively lower in the successive production years. Interestingly, Courtenay had increase in both biomass and seed yield in the second crop year, compared to first crop. As explained before, all crops underwent moisture stress in vegetative stage in May-June in 2018 resulting in restricted plant growth, while 2019 have more favourable condition for plant growth.

While seed yield and dry biomass are positively correlated, plant height showed negative correlations with seed yield and positive correlation with biomass. More favourable spring growth condition in 2019 caused increase in plant height, but seed yield had physiological restriction due to perennially, resulting in differential relationship with plant height and biomass (Figure 6).

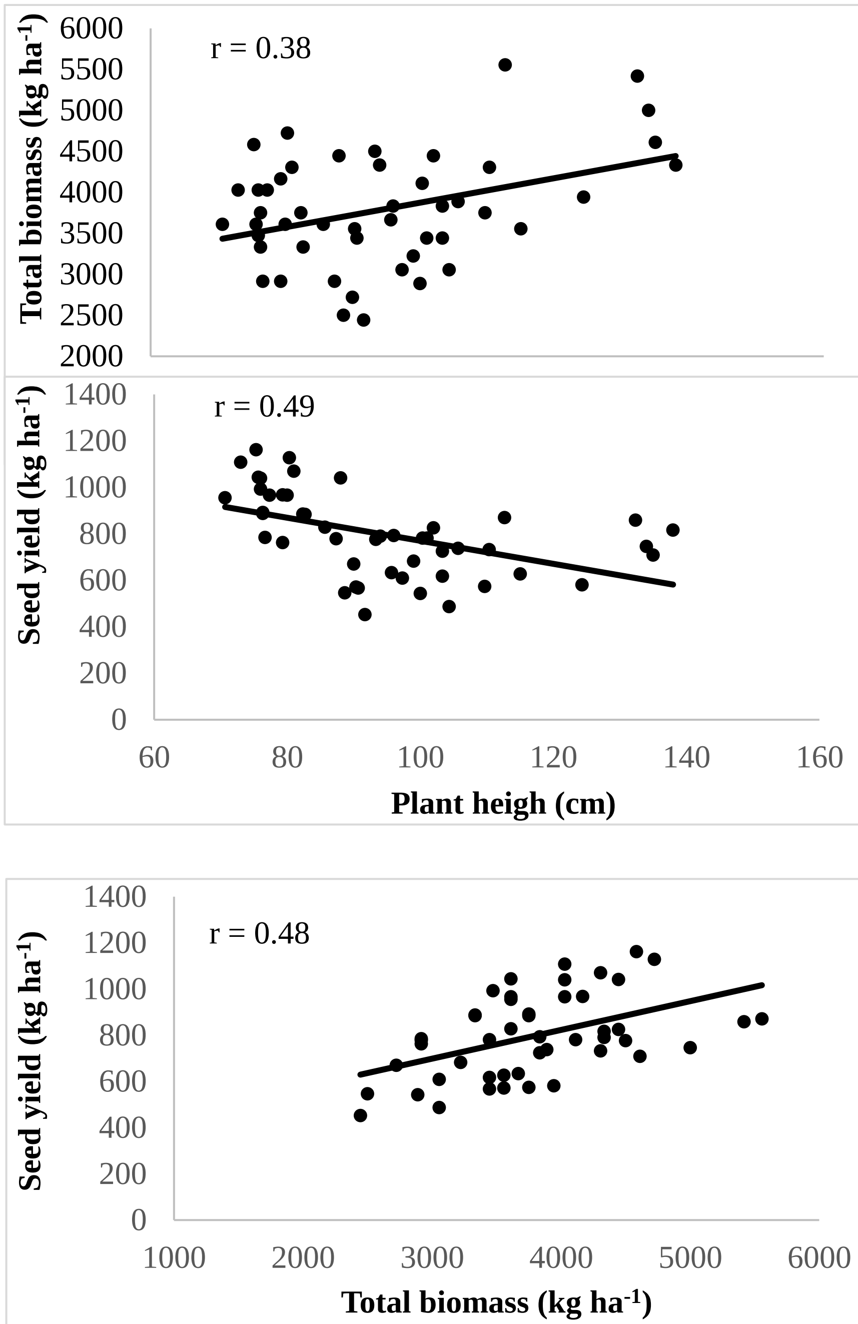

Figure 6. Relationships between plant height, total biomass and seed yield of tall fescue grown in 2018 and 2019 cropping seasons from the cultivar trial established in 2017 at Beaverlodge, AB.

Timothy

The timothy cultivar trial established in 2017 contained three proprietary cultivars received from Northstar Seed, which were compared with locally adapted popular cultivar Alma. Figure 7 presents a photograph of the first harvest season in 2018. Alma outperformed all three proprietary cultivars in seed yield in the first crop year of 2018. However, there was no significant difference between the cultivars in the second crop year (Table 5; Figure 8). The proprietary cultivars yielded consistently similar in both crop years, suggesting their yield stability in perennial harvests. Further evaluation was carried out in the coming cropping season in 2019.

Figure 7. Photograph taken in 2018 of the timothy trial established in 2017 at Beaverlodge, AB.

Table 5. Seed yield, plant height and dry biomass of timothy cultivars in 2018 and 2019 crop season from the trial established in 2017 at Beaverlodge, AB. The trial was seeded on June 02, 2017, harvested on July 24, 2018 and August 13, 2019 for first and second crop year, respectively.

Company	Cultivar	Plant height		Dry biomass		Seed yield					
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
		cm		kg ha^{-1}		kg ha^{-1}		lb ac^{-1}		% of check	
Northstar Seed	NSE1701	87.3	117.3	6042b	7986ab	581cb	604	518	539	62	111
	NSE1723	91.4	120.0	6424ab	8125a	699b	641	624	572	75	118
	NSE1730	90.3	117.0	5764b	7813ab	475c	568	424	507	51	104
Check	Alma	91.7	118.0	7049a	6597b	930a	545	830	486	100	100
	CV (%)	3.5	1.9	13.1	11.9	30.6	13.8				
	P-values	0.424	0.424	0.004	0.004	0.004					

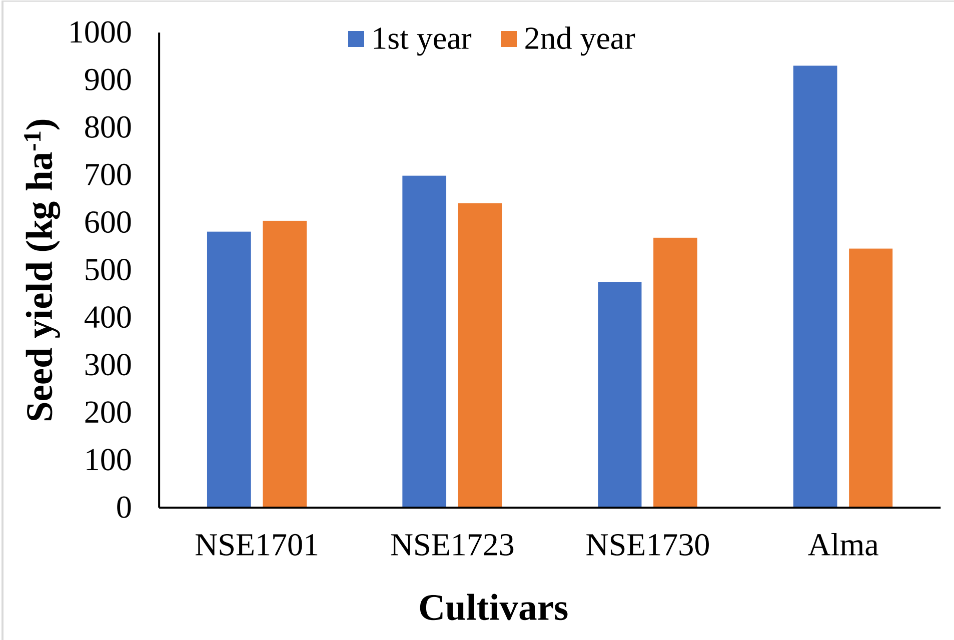

Figure 8. Seed yield of timothy cultivars in two consecutive harvest years of 2018 and 2019 from the cultivar testing trial established in 2017 at Beaverlodge, AB.

The cultivar differences in plant height were statistically insignificant. Compared to first crop year in 2019, plant heights of all timothy cultivars increased significantly in the second crop year in 2019. It is explainable due to moisture stress in vegetative stage in May-June in 2018 resulting in restricted plant growth, while 2019 have more favourable condition for plant growth. For biomass yield, Alma outyielded all proprietary cultivars in first crop year, but it stood lowest in rank in the second crop year. The proprietary cultivars exhibited significant increase in biomass yield with the increase in plant heights.

The relationship between seed yield, biomass and plant height appeared very similar to that of tall fescue. There was a positive correlation between the seed yield and dry biomass. Contrastingly, plant height correlated negatively with seed yield, while having positive correlation with biomass. (Figure 9).

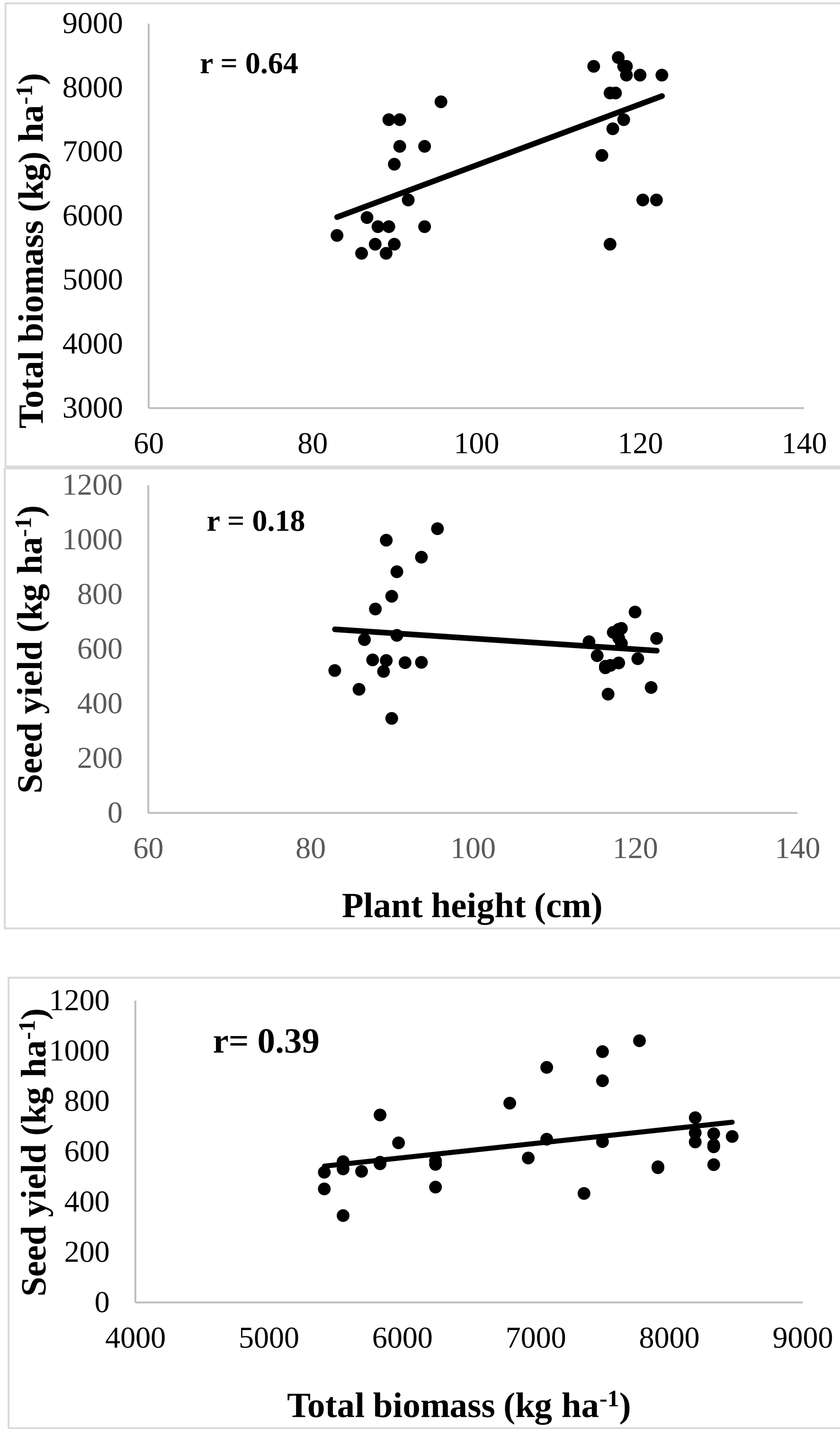

Figure 9. Relationships between plant height, total biomass and seed yield of timothy grown in 2018 and 2019 cropping seasons from the cultivar trial established in 2017 at Beaverlodge, AB.

Conclusions of completed trials

Seed yield is the major trait of economic interest for creeping red fescue, provided the cultivars have similar end use quality – the turf. Based on the seed yield performance of two crop seasons, creeping red fescue cultivars Foster FO and Boreal performed promisingly. The differential yield stability of the creeping red fescue cultivars implicates that producers will have options to choose cultivars for a single or more harvest years, and that there is opportunity to improve this attribute through population improvement.

The test cultivars of tall fescue in the 2017-established trial showed promising adaptability to Peace region, with significantly higher seed yield than Courtenay in first crop year and comparable yield in the second crop year. The check cultivar Courtenay yielded higher biomass in both crop years.

The timothy test cultivars had significantly lower seed yield and biomass than Alma in first crop year. However, in the second crop year, their seed yields were similar to Alma, while out-yielding Alma in biomass

Results of on-going trials

Creeping red fescue

A creeping red fescue cultivar trial including 13 proprietary cultivars and Boreal as a standard check was established in 2018. No significant difference was found among the cultivars for seed yield, biomass and plant height (Table 6). Numerically, six cultivars from Foster's Seed & Feed (2018-01, 2018-02, 2018-03, 2018-05 and 2018-09, 2018-10) and one cultivar from Brett Young (BY17-8070) produced higher seed yield than Boreal. Cultivars 2018-10, 2018-09 and 2018-05 yielded 20%, 18% and 16% higher than Boreal. The cultivars will be evaluated for second crop season in 2020. Figure 10 presents a photograph of the first harvest season in 2018.

Table 6. Seed yield, plant height and dry matter yield of creeping red fescue cultivars in 2019 from the trial established in 2018 at Beaverlodge, AB. The trial was seeded on May 29, 2018 and harvested on July 23, 2019.

Cultivar	**Cultivar**	**Plant height**	**Dry biomass**	**Seed yield**		
		cm	kg ha^{-1}	kg ha^{-1}	lb ac^{-1}	% of check
Foster's Seed & Feed	2018-01	83.9	5796	1290	1150	106
	2018-02	80.7	5903	1276	1138	105
	2018-03	82.6	5951	1258	1122	103
	2018-04	79.2	5431	946	844	78
	2018-05	76.3	6000	1407	1255	116
	2018-06	80.3	5194	1074	958	88
	2018-07	79.6	5417	1073	957	88
	2018-08	73.8	4736	997	898	82
	2018-09	84.5	5875	1453	1296	120
	2018-10	84.3	6959	1433	1278	118
	2018-11	72.7	4986	1191	1063	98
	Foster FO	83.3	6000	1120	999	92
Brett Young	BY-2889	80.9	5417	1069	954	88
	BY17-8070	84.0	6250	1278	1140	105
DLF Moore Seed	MSP-05-17	87.9	5556	1091	973	90
	MSP-06-17	79.1	5833	1112	992	92
	Boreal	78.7	5569	1214	1083	100
	CV (%)	9.7	16.3	27.7		
	***P*-values**	0.1360	0.1961	0.3037		

Figure 10. Photograph taken in 2019 of the creeping red fescue trial established in 2018 at Beaverlodge, AB.

Orchard grass

The trial with two cultivars NO94-100 and Blizzard was established ion 2018. These two cultivars did not differ significantly for plant height, biomass and seed yield. Numerically, NO94-100 has 19% and 13% higher seed yield and biomass respectively. The trial photograph is presented in Figure 11.

Table 7. Seed yield, plant height and dry biomass of Orchard grass in 2018 from the trial established in 2018 at Beaverlodge, AB. The trial was seeded on June 6, 2018 and harvested on July 23, 2019.

Cultivar	Plant height	Dry biomass	Seed yield		% of check
	cm	kg ha^{-1}	kg ha^{-1}	lb ac^{-1}	
NO94-100	123	5972	455	406	119
Blizzard (check)	127	5278	383	342	100
CV (%)	1.0	1.5	2.4		
***P*-values**	0.2580	0.0723	0.1115		

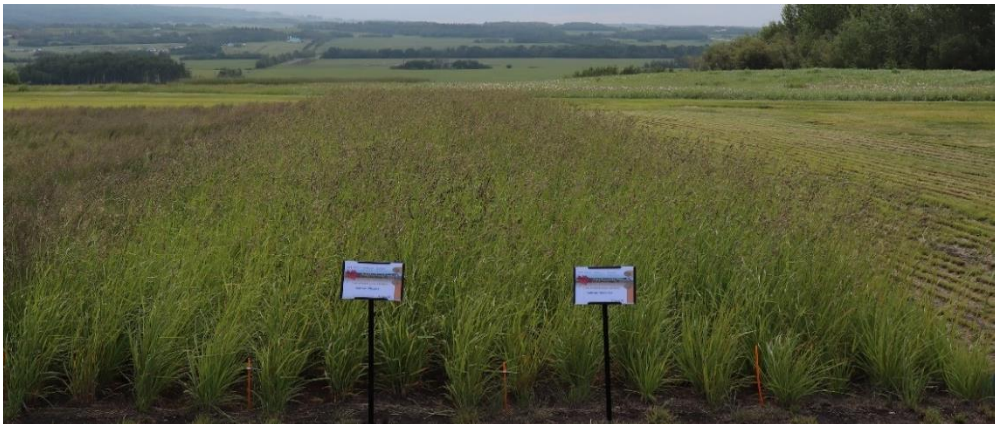

Figure 11. Photograph taken in 2019 of the orchardgrass trial established in 2018 at Beaverlodge, AB.

Forage legumes (alsike clover and red clover)

Two test cultivars of alsike clover and four test cultivars of were compared with the respective common cultivars of those species. The trial photograph is presented in Figure 12. Seed yields are generally very low in all cultivars, mainly because of indeterminate vegetative growth favoured by well distributed rainfall. There was also significant browse by wildlife of topical growth containing flower buds, especially on the late maturing cultivars. Therefore, the seed yield results may not reflect relative performance of the cultivars (Figure 12). In alsike clover, the seed yield results indicated that there was no significant difference between the cultivars. Between the red clover cultivars, Janico and common check stood statistically on par for seed yield, while producing significantly higher than CRS 33, CRS 32 and AC Christie.

Figure 12. Photograph taken in 2019 of forage legumes cultivar trial established in 2018 at Beaverlodge, AB.

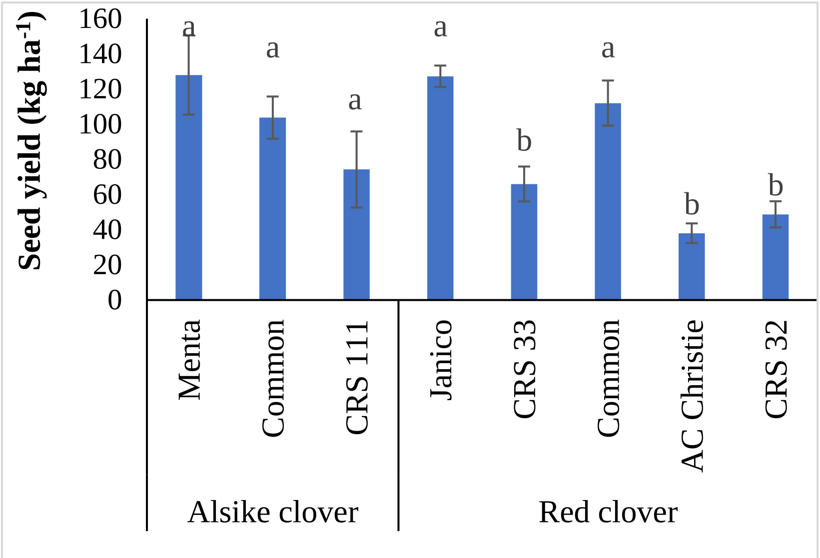

Figure 13. Seed yield and biomass of alsike clover and red clover cultivars in the first crop years of 2019 from the trial established in 2018 at Beaverlodge, AB. The crop was harvested on September 18, 2019.

OVERALL CONCLUSIONS

During the reporting period, one trial each of on creeping red fescue, tall fescue and timothy established in 2017 was concluded with two years of performance evaluation in 2018 and 2019. One trial each of creeping red fescue, orchardgrass, and alsike and red clovers established in 2018 is reported for first crop year in 2019 and is subjected to further evaluations in the second crop season in 2020. Variable weather patterns in different years provided assorted test environment for examining the adaptability of the cultivars in the Peace region. Creeping red fescue being an amenity grass, seed yield is the major performance indicator in the PGRST. However, for other forage species, biomass yield is also duly considered in the evaluation. Forage nutritive value is also an important consideration to be pursued in the future studies.