

Project Title: Evaluation of winter wheat cultivar performance under continuous crop, crop-crop-fallow and crop-fallow systems in central Montana

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Objectives:

Evaluate relative performance winter wheat cultivars and development lines in central Montana crop environments.

Results:

2014 Central Montana crop year was generally good. Above average precipitation was received in Sep-Oct period with below average precipitation in mid-to-late spring. Cold February weather following January thaw caused some winter kill stand thinning. The ripening was delayed in some thinner stands. Winter wheat yields in central Montana were generally a little below average. The five (5) central Montana winter wheat on-farm cultivar trials were established conducted near Moccasin (CARC), Denton, Geraldine, Winifred and Belt.

The Moccasin location was abandoned due too much downy brome. The Denton location was harvested, but excessive volunteer, due 2012 hail storm shatter, negated any cultivar performances. The Geraldine location boasted the high mean yield at 63.9 bu/a (Table 1). The crop-fallow Winifred site had some winter thinning due to runoff and averaged 43.0 bu/a (Table 2). The Belt location produced well above its 3y average at 53.8 bu/a (Table 3) and Accipiter was the surprise high producer at 65.00 bu/a. Yellowstone is the yield standard at CARC, Denton and Geraldine (Tables 4-6). Decade has a 3y yield ave. of 62.3 bu/a at Winifred which is 3.5 bu higher than Jagalene the second high producer for that location (Table 7). Accipiter

Jagalene continues to be the stalwart for high test weight. However, the 2014 Geraldine location exhibited had high test weights for some lines that do typically have high test weights. Decade, Rampart, Genou and Jerry were consistent in having protein levels generally above the nursery means.

Summary:

Multi-year summaries presenting the relative yields, test weights, and protein content of more popular cultivars and promising advanced lines are presented in tables 4 to 8. Each location has a unique cultivar ranking for yield, test weight and protein. This shows the importance of placing the on-farm trials across central Montana in various production environments. MSU Winter Wheat Breeder Phil Bruckner and Assoc. breeder Jim Berg coordinated the selection of entries and the preparation of seed for the on-farm cultivar trials. An additional two entries were added due to popularity in central Montana.

Funding Summary:

Expenditure information to be provided by OSP. This project received no other grant support.

MWBC FY2011 Grant Submission Plans:

It is planned to submit this project for funding consideration in the next fiscal year.

**Table 1 2014 Geraldine winter wheat performance evaluation
Exp143872 Central Agricultural Research Center. Moccasin, Montana**

Entry	Cultivar/Line	Origin/Pedigree	Grain Yield bu/ac	Test weight lb/bu	Plant height in	Grain Protein %
19	MT1090	Reeder/6*Yellowstone	73.5**	63.6	34.8	11.7
21	MT1138	W99-194/2*Yellowstone	72.7*	62.7	34.0	11.7
17	MTS1024	MT02113*4/MTS0359	71.2*	63.7	28.7	11.2
1	Yellowstone	Montana 2005	71.1*	63.4	34.1	11.9
24	MTS0826-63	MT9524/G15048//Rampart	70.9*	64.8	35.4	12.1
14	Colter	Montana, 2013	70.7*	63.6	33.3	11.8
13	SY Clearstone 2CL	Montana/Syngenta, 2012	69.6*	63.7	37.5	10.8
26	SY Wolf	Syngenta (AgriPro), 2010	68.9*	63.5	28.7	13.4
16	MT0978	MT9982//MTW0072/NW97S151	68.4*	63.5	32.2	12.9
9	Judee	Montana, 2011	68.2*	62.7	32.8	11.8
20	MT1117	Yellowstone*3/KS96WGRC40	68.2*	63.1	34.1	11.8
18	MT1078	MT02113*4/MTS0359	67.9*	62.9	33.1	10.8
12	Accipiter	Saskatchewan, 2008	67.3*	63.2	31.6	11.1
5	Rampart	Montana, 1996	65.8*	64.1	34.4	12.6
7	WB-Quake	WestBred, 2011	64.4	63.9	31.6	12.5
15	WB3768	Montana/WestBred, 2013	64.2	64.8	37.4	11.5
4	CDC Falcon	Sask/WestBred, 1999	63.9	63.4	28.1	12.2
2	Genou	Montana, 2004	62.5	63.1	34.4	12.1
23	MTCS1204	MTCL0510/4/Paul/3/98X96C16cl/CD(62.4	63.4	33.3	12.4
22	MT1286	Yellowstone*2/NE99445	60.7	63.5	33.3	12.0
11	Warhorse	Montana, 2013	60.1	63.5	31.2	13.7
3	Decade	Montana/North Dakota, 2010	59.7	65.2	33.3	12.8
10	Bearpaw	Montana, 2011	59.4	63.4	30.1	13.1
8	Jagalene	AgriPro, 2002	58.8	63.1	31.2	12.1
25	Brawl CL	Colorado, 2011	58.1	63.4	28.9	11.9
6	Jerry	North Dakota, 2001	53.7	63.3	35.3	13.4
Average			60.7	63.5	32.8	12.1
LSD (0.05)			8.7		2.4	
C.V. (%)			8.1		4.4	
P-value (Varieties)			0.0006		<.0001	

** = indicates highest value within a column

* = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Seeded: **23-Sep-13** NTCF (barley stubble). Soil: 2" temp **15°C**. Moist.Probe Depth: **36"** handle
Harvest: 12-Aug-14

**Table 2 2014 Winifred winter wheat performance evaluation
Exp 143874 Central Agricultural Research Center. Moccasin, Montana**

Entry	Cultivar/Line	Origin/Pedigree	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %
21	MT1138	W99-194/2*Yellowstone	53.2	61.8	31.1	11.7
26	SY Wolf	Syngenta (AgriPro), 2010	51.0	62.9	24.6	12.4
18	MT1078	MT02113*4/MTS0359	48.6	60.9	27.0	13.4
12	Accipiter	Saskatchewan, 2008	47.9	63.0	25.6	11.6
16	MT0978	MT9982//MTW0072/NW97S151	46.9	62.0	26.8	13.5
4	CDC Falcon	Sask/WestBred, 1999	45.5	61.7	26.2	12.6
3	Decade	Montana/North Dakota, 2010	45.0	61.8	24.0	15.0
17	MTS1024	MT02113*4/MTS0359	44.4	60.9	26.8	13.7
14	Colter	Montana, 2013	43.5	63.2	29.9	12.3
2	Genou	Montana, 2004	43.4	60.8	29.9	14.2
15	WB3768	Montana/WestBred, 2013	43.4	61.1	30.9	13.0
11	Warhorse	Montana, 2013	42.4	62.0	24.6	13.2
22	MT1286	Yellowstone*2/NE99445	42.1	61.5	28.0	14.1
19	MT1090	Reeder/6*Yellowstone	41.5	61.4	29.9	13.9
5	Rampart	Montana, 1996	41.4	61.0	29.3	14.1
1	Yellowstone	Montana 2005	41.3	61.1	28.9	14.6
25	Brawl CL	Colorado, 2011	40.7	63.3	24.4	13.3
20	MT1117	Yellowstone*3/KS96WGRC40	40.4	61.7	30.3	14.7
7	WB-Quake	WestBred, 2011	40.2	61.8	27.4	14.5
9	Judee	Montana, 2011	40.1	62.0	28.1	15.0
10	Bearpaw	Montana, 2011	40.1	60.6	23.8	13.5
24	MTS0826-63	MT9524/G15048//Rampart	39.7	61.0	29.7	12.6
23	MTCS1204	MTCL0510/4/Paul/3/98X96C16cl/CDC T	39.5	62.5	29.3	13.1
8	Jagalene	AgriPro, 2002	39.4	63.7	23.6	12.7
13	SY Clearstone 2	Montana/Syngenta, 2012	38.8	61.1	28.7	14.9
6	Jerry	North Dakota, 2001	37.2	60.1	31.7	13.5
Average			43.0	61.8	27.7	13.5
LSD (0.05)			ns		3.5	
C.V. (%)			14.1		6.2	
P-value (Varieties)			0.24		0.00	

Seeded : 23-Sep-13 NTCF (wheat stubble) Soil: 2' temp.: 13°C Moist Probe depth: 36" handle bar
Harvest: 08-Aug-13

**Table 3 2014 Belt winter wheat performance evaluation
Exp143875 Central Agricultural Research Center. Moccasin, Montana**

Entry	Cultivar/Line	Origin/Pedigree	Grain Yield bu/ac	Test weight lb/bu	Plant height in	Grain Protein %
12	Accipiter	Saskatchewan, 2008	65.0**	62.7	24	12.6
21	MT1138	W99-194/2*Yellowstone	64.1*	62.3	34	12.1
1	Yellowstone	Montana 2005	62.7*	62.5	30	11.7
22	MT1286	Yellowstone*2/NE99445	62.6*	62.7	31	11.8
20	MT1117	Yellowstone*3/KS96WGRC40	60.7*	63.3	32	11.6
25	Brawl CL	Colorado, 2011	60.1*	65.3	27	12.4
16	MT0978	MT9982//MTW0072/NW97S15'	59.3*	62.1	32	13.0
26	SY Wolf	Syngenta (AgriPro), 2010	59.2*	64.6	27	10.9
8	Jagalene	AgriPro, 2002	58.8*	63.9	29	13.6
2	Genou	Montana, 2004	58.6*	63.6	32	11.4
17	MTS1024	MT02113*4/MTS0359	58.1*	61.9	28	12.0
23	MTCS1204	MTCL0510/4/Paul/3/98X96C16cl/Cl	57.7*	63.2	32	12.0
18	MT1078	MT02113*4/MTS0359	57.4*	62.4	29	11.7
15	WB3768	Montana/WestBred, 2013	56.6	62.4	37	11.6
13	SY Clearstone 2CL	Montana/Syngenta, 2012	56.5	62.3	32	11.2
10	Bearpaw	Montana, 2011	55.9	62.7	28	13.3
14	Colter	Montana, 2013	55.9	62.4	33	12.9
6	Jerry	North Dakota, 2001	55.4	62.1	35	13.4
4	CDC Falcon	Sask/WestBred, 1999	55.2	62.7	25	13.3
3	Decade	Montana/North Dakota, 2010	54.9	64.2	29	10.9
19	MT1090	Reeder/6*Yellowstone	53.4	62.6	30	12.3
24	MTS0826-63	MT9524/G15048//Rampart	52.3	61.7	32	13.3
11	Warhorse	Montana, 2013	51.9	61.6	27	13.5
7	WB-Quake	WestBred, 2011	51.3	63.7	28	10.9
9	Judee	Montana, 2011	51.1	63.6	28	11.7
5	Rampart	Montana, 1996	48.4	63.4	30	12.0
	Average		53.8	62.9	30.1	12.2
	LSD (0.05)		7.9			
	C.V. (%)		8.4			
	P-value (Varieties)		0.0067			

** = indicates highest value within a column

* = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Seed: 01-Oct-13 NTRC in pea residue. Soil: 2"temp.: 10°C Moist. Probe Depth: 17"

Harvested: 09-Aug-14

**Table 4 Three year summary of winter wheat cultivar performance near Moccasin in NTCC system.
Exp3870Mc Central Agricultural Research Center. Moccasin, Montana.**

Cultivar	Grain Yield (bu/a)				Test Weight (lbs/bu)				Grain Protein (%)				Plant Height (inches)			
	2014	2013	2012	2y Ave.	2014	2013	2012	2y Ave.	2014	2013	2012	2y Ave.	2014	2013	2012	1y Ave.
Accipiter	d	40.7	23.4	32.1	d	55.2	52.5	53.9	d	15.6	17.0	16.3	d	d	24	24
Bearpaw	o	43.3	23.0	33.2	o	56.3	55.0	55.7	o	16.2	16.5	16.4	o	a	21	21
CDC Falcon	w	38.6	25.4	32.0	w	53.5	53.3	53.4	w	17.2	17.2	17.2	w	t	22	22
Colter	n	44.5	24.9	34.7	n	58.4	51.7	55.1	n	15.7	17.1	16.4	n	a	24	24
Decade	y	38.8	25.1	32.0	y	54.6	51.9	53.3	y	16.2	16.8	16.5	y		24	24
Genou		35.8	22.6	29.2		54.8	54.6	54.7		17.7	17.1	17.4		l	24	24
Jagalene	b	48.4	20.0	34.2	b	56.2	53.6	54.9	b	16.0	17.2	16.6	b	o	23	23
Jerry	r	36.3	24.6	30.5	r	54.7	56.9	55.8	r	17.0	15.9	16.5	r	s	24	24
Judee	o	41.5	21.8	31.7	o	55.4	52.6	54.0	o	16.3	16.8	16.6	o	t	24	24
Rampart	m	31.5	18.5	25.0	m	57.5	53.0	55.3	m	17.3	17.8	17.6	m		22	22
SYClearstone2CL	e	52.2	17.9	35.1	e	56.4	54.4	55.4	e	14.6	17.7	16.2	e		23	23
Warhorse		42.1	24.3	33.2		55.7	54.6	55.2		15.2	16.7	16.0			22	22
WB-Quake		35.1	19.3	27.2		56.2	54.1	55.2		15.6	16.9	16.3			20	20
Yellowstone		45.3	24.7	35.0		54.6	51.9	53.3		16.6	17.3	17.0			25	25
Trial Ave		42.1	22.8	32.5		55.6	54.0	54.8		15.9	16.9	16.4			23.2	23.2

**Table 5 Three year summary of winter wheat cultivar performance near Denton in no-till CC system.
Exp3871Dn Central Agricultural Research Center. Moccasin, Montana.**

Cultivar	Grain Yield (bu/a)				Test Weight (lbs/bu)				Grain Protein (%)				Plant Height (inches)			
	2014	2013	2012	1y Ave.	2014	2013	2012	1y Ave.	2014	2013	2012	1y Ave.	2014	2013	2012	1y Ave.
Accipiter	t				t				t							
Bearpaw	h	43.8	H		h	60.6	H		h	11.4	H		24	29	H	
CDC Falcon	i	41.8	a		i	59.5	a		i	12.6	a		23	28	a	
Colter	c	45.6	i		c	58.5	i		c	11.4	i		22	26	i	
Decade	k	41.5	l		k	59.1	l		k	13.2	l		25	28	l	
Genou		44.1	e			59.3	e			12.0	e		22	29	e	
Jagalene	v	40.5	d		v	59.8	d		v	12.2	d		26	31	d	
Jerry	o	45.1			o	61.9			o	10.6			22	29		
Judee	l	40.4			l	58.5			l	12.8			24	30		
Rampart		43.1				59.3				11.3			26	27		
SYClearstone2CL	w	35.4			w	59.9			w	12.8			26	31		
Warhorse	h	44.5			h	59.6			h	11.7			28	29		
WB-Quake	e	41.5			e	59.1			e	12.4			24	26		
Yellowstone	a	40.8			a	59.7			a	11.4			26	27		
Trial ave	t	47.2			t	60.4			t	11.7			24	30		
Trial ave	35.8	43.0			59.6				12.2	11.8			24.7	28.5		

Table 6 Three year summary of winter wheat cultivar performance near Geraldine in a no-till fallow-ww-bly system. Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Grain Yield (bu/a)				Test Weight (lbs/bu)				Grain Protein (%)				Plant Height (inches)			
	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.
Accipiter	67.3	82.3	55.5	68.4	63.2	61.6	57.8	60.9	11.1	9.8	11.0	10.6	31.6	36	31.9	33.2
Bearpaw	59.4	87.2	50.5	65.7	63.4	60.9	57.8	60.7	13.1	9.9	13.9	12.3	30.1	34	33.1	32.4
CDC Falcon	63.9	86.5	59.2	69.9	63.4	60.0	59.0	60.8	12.2	10.6	11.0	11.3	28.1	32	29.5	29.9
Colter	70.7	87.8	64.0	74.2	63.6	61.5	59.5	61.5	11.8	9.9	12.3	11.3	33.3	36	35.8	35.0
Decade	59.7	88.2	58.5	68.8	65.2	61.4	59.3	62.0	12.8	10.2	10.8	11.3	33.3	35	31.5	33.3
Genou	62.5	68.4	43.9	58.3	63.1	60.7	56.2	60.0	12.1	10.9	15.6	12.9	34.4	39	38.6	37.3
Jagalene	58.8	92.2	63.7	71.6	63.1	63.1	63.9	63.4	12.1	10.2	10.0	10.8	31.2	34	33.1	32.8
Jerry	53.7	81.3	57.5	64.2	63.3	59.2	58.9	60.5	13.4	10.4	11.6	11.8	35.3	41	35.4	37.2
Judee	68.2	83.3	53.1	68.2	62.7	61.6	58.8	61.0	11.8	10.4	12.7	11.6	32.8	32	33.1	32.6
Rampart	65.8	67.6	42.9	58.8	64.1	60.3	56.8	60.4	12.6	10.9	15.5	13.0	34.4	39	38.2	37.2
SY Clearstone 2CL	69.6	89.0	62.2	73.6	63.7	60.7	58.0	60.8	10.8	9.5	12.7	11.0	37.5	36	34.6	36.0
Warhorse	60.1	85.8	55.8	67.2	63.5	60.6	57.3	60.5	13.7	9.6	12.7	12.0	31.2	33	29.9	31.4
WB-Quake	64.4	82.2	50.6	65.7	63.9	60.7	57.8	60.8	12.5	9.7	11.3	11.2	31.6	33	32.7	32.4
Yellowstone	71.1	95.0	59.4	75.2	63.4	60.9	57.3	60.5	11.9	10.8	12.6	11.8	34.1	35	32.3	33.8
Trial Ave	63.9	86.4	57.3	68.4	63.5	60.9	58.9	61.1	12.1	10.0	12.1	11.4	32.8	35.2	33.2	33.7

Table 7 Three year summary of winter wheat cultivar performance near Winifred in a NTCF system. Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Grain Yield (bu/a)				Test Weight (lbs/bu)				Grain Protein (%)				Plant Height (inches)			
	2014	2013	2013	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.
Accipiter	47.9	54.0	59.7	53.9	63.0	61.5	59.9	60.8	11.6	10.5	10.2	11.5	25.6	32	33.6	30.4
Bearpaw	40.1	63.7	61.4	55.1	60.6	61.5	59.9	61.3	13.5	10.7	12.9	12.2	23.8	29	34.0	28.9
CDC Falcon	45.5	59.3	68.3	57.7	61.7	60.7	58.6	60.1	12.6	10.3	10.8	11.5	26.2	27	33.5	28.9
Colter	43.5	51.6	65.0	53.4	63.2	60.0	59.7	60.5	12.3	10.8	13.1	12.6	29.9	31	32.0	31.0
Decade	45.0	74.7	67.1	62.3	61.8	62.0	60.3	61.2	15.0	9.8	9.5	11.3	24.0	31	31.2	28.7
Genou	43.4	46.6	57.6	49.2	60.8	61.8	60.3	61.3	14.2	11.4	12.7	12.2	29.9	33	37.4	33.4
Jagalene	39.4	67.2	68.5	58.4	63.7	62.0	63.2	62.4	12.7	10.5	9.1	11.4	23.6	31	32.9	29.2
Jerry	37.2	54.0	56.2	49.1	60.1	60.6	59.1	60.9	13.5	10.2	11.9	11.5	31.7	40	38.1	36.6
Judee	40.1	59.3	52.7	50.7	62.0	61.8	59.6	60.9	15.0	9.7	13.5	12.1	28.1	29	29.3	28.8
Rampart	41.4	46.9	46.8	45.0	61.0	62.7	58.5	60.8	14.1	11.5	12.6	12.2	29.3	32	32.2	31.2
SY Clearstone 2CL	38.8	54.7	70.5	54.7	61.1	60.0	60.4	61.3	14.9	10.0	10.2	11.2	28.7	33	34.6	32.1
Warhorse	42.4	52.8	62.6	52.6	62.0	60.2	57.8	60.1	13.2	10.2	12.3	11.9	24.6	30	34.1	29.6
WB-Quake	40.2	55.0	51.9	49.0	61.8	61.7	59.3	61.4	14.5	10.0	10.7	10.8	28.9	29	29.9	29.3
Yellowstone	41.3	61.5	64.2	55.7	61.1	59.8	60.4	60.6	14.6	10.3	10.6	10.9	27.4	32	31.8	30.4
Trial Ave	43.0	62.7	62.6	56.1	61.8	61.2	59.9	61.0	13.5	10.3	11.6	11.8	27.7	31.2	33.4	30.8

Table 8 Three year summary of winter wheat cultivar performance near Belt in a no-till CC system.
Exp3875Bt Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Grain Yield (bu/a)				Test Weight (lbs/bu)				Grain Protein (%)				Plant Height (inches)			
	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.	2014	2013	2012	3y Ave.
Accipiter	65.0	26.4	35.6	42.3	62.7	54.0	55.9	57.5	12.6	11.8	12.9	12.4	24	31	28.9	28
Bearpaw	55.9	30.0	27.9	37.9	62.7	55.7	54.1	57.5	12.1	11.8	15.2	13.0	28	29	27.0	28
CDC Falcon	55.2	25.6	36.0	38.9	62.7	53.4	56.6	57.6	11.8	13.0	13.3	12.7	25	28	26.2	26
Colter	55.9	23.6	38.9	39.5	62.4	53.4	57.8	57.9	11.6	11.9	14.5	12.7	33	31	28.0	31
Decade	54.9	31.1	41.7	42.6	64.2	54.3	53.9	57.5	12.4	11.4	15.6	13.1	29	31	31.2	30
Genou	58.6	18.1	27.4	34.7	63.6	52.3	61.2	59.0	13.0	12.8	13.2	13.0	32	32	29.0	31
Jagalene	58.8	31.0	39.3	43.0	63.9	58.3	55.6	59.3	10.9	11.8	14.2	12.3	29	31	31.4	30
Jerry	55.4	28.8	33.0	39.1	62.1	54.6	55.9	57.5	13.6	12.1	15.0	13.6	35	34	29.9	33
Judee	51.1	23.4	31.3	35.3	63.6	55.1	54.5	57.7	11.4	11.6	15.1	12.7	28	32	31.6	30
Rampart	48.4	21.9	26.2	32.2	63.4	53.1	56.2	57.6	10.9	13.2	14.6	12.9	30	33	29.0	31
SYClearstone2CL	56.5	31.1	37.3	41.6	62.3	54.5	54.1	57.0	12.3	11.0	16.1	13.1	32	32	31.8	32
Warhorse	51.9	31.0	33.9	38.9	61.6	55.3	56.2	57.7	13.5	11.5	14.6	13.2	27	27	26.8	27
WB-Quake	51.3	25.7	29.6	35.5	63.7	52.9	54.4	57.0	11.7	12.2	14.7	12.9	28	29	28.9	29
Yellowstone	62.7	26.9	36.8	42.1	62.5	55.6	54.3	57.5	12.0	12.5	14.5	13.0	30	33	29.5	31
Trial Ave	53.8	27.2	34.6	38.5	62.9	54.7	56.4	58.0	12.2	11.8	14.5	12.9	29.2	30.6	29.0	30