Title: North Central Montana Off-Station Winter Wheat Variety Performance Evaluations

Principal Investigator: Peggy F. Lamb, Research Scientist, Northern Ag Research Center, Havre

Project Personnel: Phil L. Bruckner, Breeder/Geneticist, Winter Wheat, Bozeman
Jim E. Berg, Research Associate, Winter Wheat, Bozeman
Kasee Clark, Research Associate, Havre
Kyla McNamara, Research Associate, Havre
Tyler Lane, Chouteau County Extension
Julianne Snedigar, Blaine County Extension

Cooperators: Max Cederberg, Landowner, Turner
Lyle McKeever & Terry McKeever, Landowners, Loma

Objectives:

Diverse cropping environments exist within the five-county area most closely served by Northern Agricultural Research Center. Winter wheat, spring wheat, barley, durum and oat production together in the five counties (Blaine, Chouteau, Hill, Liberty and Phillips), represents just over 28 percent of the 2013-2017 statewide cereal production totals (43 percent for winter wheat and 25 percent for spring wheat). Producers are keenly interested in variety performance data generated under local conditions. It is our objective, within budget and other resource limitations, to evaluate small grain variety performance, over time, under conditions representative of specific areas of northern Montana, yet differing from that of the Research Center. Growers are provided reliable, unbiased, up-to-date information to make comparisons among improved winter wheat varieties. This report provides producers in north central Montana the information necessary to select varieties best suited for their specific area and growing conditions.

Methods:

Standard off-station winter wheat variety performance trials were conducted on chemical fallow or minimal tillage during 2018 in two northern Montana counties.

Dryland Winter Wheat Trials:

1. Cederberg Farm, Blaine County S13-T36N-R25E
2. McKeever Farms, Chouteau County S16-T27N-R10E

Both winter wheat trials consisted of 25 entries and were seeded in replicated, 3-row, 22-foot plots on a 12-inch row spacing, utilizing a self-propelled cone seeder with Atom Jet paired row openers. All rows of each plot were trimmed to a harvest length of approximately 17 feet with a three-point rototiller. Plant height was measured from the soil surface to the top of the head, excluding awns, and percent sawfly cutting was visually estimated for each plot immediately prior to harvest. A 'Wintersteiger Classic' plot combine, funded in part by the Montana Wheat and Barley Committee, was used to harvest each 3-row plot. Seed was cleaned prior to measuring plot weight for yield determination. Protein, test weight and moisture content were determined using a Foss Infratec 1241 near infrared analyzer. Falling number was determined using a Perten FN1700 according to the FGIS Directive 9180.38. Other variables specific to each individual trial are listed with the current year data tables.

Please note that research trial yield results recorded under wheat stem sawfly pressure are likely much higher than a producer should expect. Small plot variety trials are managed to assess maximum yield potential and are harvested in such a way that all stems and heads are picked up by the combine, regardless of lodging or cutting due to sawfly. Pickup guards coupled with an extremely slow ground speed and an exceptionally low cutting height help researchers collect all heads in order to assess seed yield potential. If you are a producer in a wheat stem sawfly environment, although hollow stemmed varieties may be high yielding in research trials in your area, we strongly recommend against growing those hollow stemmed varieties. Please be aware that if you seed hollow stemmed varieties with wheat stem sawfly present, you are only creating a breeding ground for future generations of sawfly in your area and not helping combat the pest population.

Results:

Following a very dry summer, which was categorized as drought conditions by the National Oceanic and Atmospheric Administration, winter wheat yields at Turner averaged just over 33 bu/ac (Table 1). An experimental breeding line from Montana State University, 'MT1642', was the highest yielding entry at 38.6 bu/ac. There were four other breeding lines from MSU, along with 'Decade', 'Loma', 'Northern' and 'Yellowstone' that produced seed yields statistically equal to that of MT1642. Test weights of all entries averaged 61.5 lb/bu. Sawfly cutting was minimal in the winter wheat at Turner. Stand percent, plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2018 Turner dryland winter wheat trial are summarized in Table 1.

Comparable averages are calculated using a standard check variety when not all entries are present in a specific trial for all years. Variety means are adjusted by multiplying the actual check mean by the ratio of the individual variety mean compared to the check mean for the same years as tested. All varieties are then directly comparable to each other when in the same nursery. A minimum of three years of data is necessary to be included in the comparable average calculation. Seven-year comparable averages for seed yield and test weight at Turner are summarized in Table 2, while seven-year comparable averages for sawfly cutting are summarized in Table 3.

Loma winter wheat yields averaged just under 58 bu/ac with 'MTS1588', a solid stemmed, sawfly tolerant breeding line from Montana State University, producing the highest yield at 66.5 bu/ac (Table 4). 'Keldin', Northern and 'SY Monument' all produced seed yields statistically equal to MTS1588. Stem cutting by sawfly was high this year in the small plot scenario at Loma, with cutting in the winter wheat trial averaging 64 percent. Entries with the least cutting were MTS1588 at just over seven percent and 'Warhorse' at just over 17 percent in comparison to 'LCS Jet' at nearly 90 percent cut and lodged. Stand percent, plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2018 Loma dryland winter wheat trial are summarized in Table 4. Ten-year comparable averages for seed yield and test weight at Loma are summarized in Table 5, while ten-year comparable averages for sawfly cutting are summarized in Table 6.

Summary:

Although winter months of crop year 2018 were colder and wetter than normal, spring and summer months during the growing season were slightly warmer than average with drought conditions persisting across north central Montana. The Loma location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues. The Turner location was seeded into ground that had been minimally tilled to eradicate rolling dunes of soil that accumulated over a period of extreme wind and dust storms in the summer of 2017. Fall seeding was delayed in some areas due to record breaking snowfall on October 2 that created prolonged wet soil conditions. The fall moisture recharged soils and set up a favorable cropping environment. Following prolonged and continuous snow cover, typical spring rainfall patterns did not develop, and the region quickly fell back into drought conditions. Both Loma and Turner suffered from lack of precipitation from May through July resulting lower than average winter wheat yields.

This work has been strongly supported by producers near each of the off-station locations, and by the Northern Agricultural Research Center Advisory Council. With budget and other resources allowing, it is planned to continue off-station cereal variety investigations in the five-county area. The Blaine County location near Turner is entering its ninth year of winter wheat testing, while the Chouteau County location, between Big Sandy and Loma, has been used for various trials since 1998.

Recognition:

This research would not have been possible without the assistance of the following seasonal employees:
Tawnya Brown, Daisen Fox, Marca Herron and Cordell King.

TABLE 1. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2018. (Exp# 18-3851-WW)

ID	CULTIVAR or SELECTION	STAND	PLNT HT	1/ YIELD	TEST WT	2/ PROTEIN	3/ FN	4/ SAWFLY
		%	Inches	Bu/Ac	Lbs/Bu	%	Seconds	%
Brawl CLP	Colorado Research Foundation, 2011	91.4	16.8	22.0	**62.7**	16.1	345	0.3
Decade	Montana/North Dakota, 2010	95.5	20.8	**35.7**	61.8	**16.3**	350	1.0
FourOsix	Montana, 2018 (MT1465)	97.0	22.3	34.3	61.7	15.5	353	0.7
Judee	Montana, 2011	98.8	21.1	31.6	**62.6**	**16.6**	322	0.0
Keldin	Westbred, 2011	93.6	21.4	33.4	61.9	15.2	334	1.0
LCS Jet	Limagrain Cereal Seeds, 2015	93.2	17.2	32.6	58.8	14.6	318	0.0
Loma	Montana, 2016	98.0	17.1	**35.4**	61.8	16.1	337	0.3
Northern	Montana, 2015	97.7	20.5	**38.3**	61.8	15.8	**369**	0.0
Ray	Montana, 2018 (MTF1432)	92.5	25.7	34.9	60.1	15.1	**357**	1.0
SY Clearstone 2CL	Montana/Syngenta, 2012	97.2	22.8	33.1	61.1	16.0	**361**	1.0
SY Monument	Syngenta, 2015	93.4	18.7	27.2	61.2	14.8	340	0.0
SY Wolf	Syngenta (AgriPro), 2010	93.3	21.5	30.5	62.1	15.8	294	0.3
Warhorse	Montana, 2013	85.0	20.2	31.5	60.4	15.7	**365**	0.3
WB4483	WestBred, 2016	96.4	19.7	35.0	61.7	15.4	335	0.7
Yellowstone	Montana 2005	99.4	21.2	**36.1**	61.4	15.3	**360**	0.7
MT1265	Yellowstone*4/KS96WGRC40 (Lr41, wcm)	99.9	24.4	**36.9**	61.8	15.7	**374**	1.0
MT1547	Yellowstone/MT0684	95.8	20.0	29.9	61.7	15.4	354	0.3
MT1563	Yellowstone*2/PI640431	98.5	22.0	35.0	61.8	15.4	**364**	1.0
MT1564	Yellowstone*2/PI640431	96.0	17.9	28.1	61.7	**16.1**	**368**	0.0
MT1642	Yellowstone/Madsen//Yellowstone	98.7	23.4	**38.6**	60.6	15.6	**355**	0.7
MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTC	96.2	22.7	**35.5**	62.1	15.8	352	0.0
MTF1435	MT08186//Yellowstone(L)*2/98X168E1	94.1	23.2	32.2	60.5	14.6	322	1.0
MTS1588	MT0598/98X366E29-1	96.6	20.1	**34.5**	62.0	15.3	336	0.0
MTW1491	MT08189//MT08187/(MTW08166, WB376	99.1	21.7	**37.6**	62.0	15.2	**372**	0.7
MTV1681	Yellowstone*2//WillowCreek/MT06129	97.8	21.4	30.2	61.6	15.6	**375**	0.7
EXPERIMENTAL MEANS		95.8	21.0	33.2	61.5	15.5	348	0.5
LSD (0.05)		4.7	2.2	3.3	0.3	0.4	14.2	0.6
C.V.%		2.8	6.3	5.5	0.3	1.5	2.2	76.2
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0003

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for wheat.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

Bold indicates highest value within a column.

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

Management Information (18-3851-WW)

Seeding Date:	September 25, 2017
Harvest Date:	August 22, 2018
Fertility:	125-20-10-10 side banded
System:	Tilled
Herbicide:	Bromac-16oz/ac, Affinity-1oz/ac
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	4.7" April 1 to Harvest Maturity

TABLE 2. Seven-Year Yield and Test Weight Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2018. (Exp# 3851-WW).

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2014 4/	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK YIELD 5/	**7-YR COMP. AVE. YIELD 6/**	TEST WEIGHT (Pounds Per Bushel) 2014 4/	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 5/	**7-YR COMP. AVE. TEST WT 6/**
MT00159	YELLOWSTONE (+)	7		40.7	65.0	19.1	36.1	42.5	100.0	**42.5**		59.4	59.7	55.5	61.4	59.7	100.0	**59.7**
BZ9W05-2043	WB-QUAKE (P+)	6		38.3	66.3	16.9		42.8	98.2	**41.7**		59.4	59.7	54.7		59.7	100.5	**60.0**
MTS0721	BEARPAW (+)(saw fly tol)	6		40.4	60.8	19.0		42.3	97.1	**41.3**		59.1	58.9	56.1		58.9	99.3	**59.2**
MTS1224	LOMA (++)	4		39.8	59.8	21.3	35.4	39.1	97.1	**41.3**		59.7	60.2	57.1	61.8	59.7	101.1	**60.3**
MTW08168	WB3768 (P+,HW)	3		44.6	56.9			53.9	95.8	**40.7**		59.5	60.8			60.9	101.1	**60.3**
MT08172	COLTER (+)	4		42.8	65.1			45.8	95.0	**40.4**		60.3	59.7			60.3	100.7	**60.1**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	6		38.4	60.6	19.0	33.1	39.1	94.6	**40.2**		59.1	59.4	56.6	61.1	59.4	100.0	**59.7**
MT0978	NORTHERN (+)	5		38.3	59.0	21.3	38.3	42.3	94.5	**40.2**		59.2	60.2	57.3	61.8	60.1	101.9	**60.8**
S94-4	CDC FALCON (P+)	6		40.3	57.3	17.2		41.0	94.1	**40.0**		58.9	58.8	56.3		59.3	99.9	**59.6**
MTS0031	GENOU (+)(saw fly tol)	4		40.8				41.7	94.0	**40.0**		59.4				60.5	100.4	**59.9**
MTS0713	JUDEE (+)(saw fly tol)	7		39.2	63.8	18.1	31.6	39.7	93.4	**39.7**		58.3	57.2	55.9	62.6	59.4	99.6	**59.4**
MT0552	DECADE (+)	7		42.8	52.7	21.1	35.7	39.3	92.5	**39.3**		59.3	58.2	56.7	61.8	59.8	100.3	**59.8**
BC01007-7	SY WOLF (P+)	4		38.5	57.6	17.7	30.5	36.1	89.7	**38.1**		59.0	59.1	58.0	62.1	59.5	100.9	**60.2**
MTS0808	WARHORSE (+)(saw fly tol)	7		34.6	59.9	16.9	31.5	36.9	86.8	**36.9**		61.0	60.4	57.7	60.4	60.5	101.5	**60.5**
ACS55017	KELDIN (P+)	3			48.3	20.8	33.4	34.2	83.9	**35.7**			59.3	57.5	61.9	59.5	99.5	**59.3**
PI593889	RAMPART (saw fly tol)	5		31.1	56.8			39.9	82.3	**35.0**		58.2	58.6			60.0	99.8	**59.5**
ND 9257	JERRY	5		38.7	37.3			39.2	80.9	**34.4**		57.8	56.7			58.9	98.0	**58.5**
MEANS (For Entries Listed)				39.3	57.9	19.0	34.0			**39.3**		59.2	59.2	56.6	61.7			**59.8**
7/ Growing Season Precipitation (in.)			17.6	n/a	11.4	2.9	4.7	8.7										
Soil PAW (in.) to SD @ Planting			8.5	3.6	7.9	5.8	7.3	7.3										
Total Plant Available Water (in.)			26.2	n/a	19.4	8.7	12.0	16.5										
Soil NO3 (lbs.) to SD at Planting			93	27	26	72	64	45										
SD (Sampling Depth in Inches)			48	48	48	48	38	47										
Fertilizer Applied	(# N)		100	100	100	100	125	96										
	(# P_2O_5)		20	20	20	20	20	25										
	(# K_2O)		10	10	10	10	10	14										
	(#S)		0	0	0	0	10	1										

Check variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Tolerant, HW = Hard White.

3/ Only the most recent 5 years shown, but summary calculations include all years noted.

4/ No harvest in 2014 due to hail.

5/ Percent of Yellowstone yield or test weight for the same data years as those in which a given entry was tested.

6/ 7-Yr Comparable Average = (x/y) * z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Yellowstone for the same years, and z = 7-Yr average yield or test weight for the check variety Yellowstone.

7/ April 1 to 14 days prior to harvest maturity.

TABLE 3. Seven-Year Sawfly Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2018. (Exp# 3851-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2011	2012	2013	2014 3/	2015	2016	2017	2018	AVE. for YEARS TESTED	% of CHECK SWFLY 4/	**7-YR COMP. AVE. SWFLY 5/**
MTS0808	WARHORSE (+)(saw fly tol)	7	1.0	2.3	0.7		0.0	0.0	0.3	0.3	0.7	10.1	**0.7**
MT0978	NORTHERN (+)	5			1.0		0.0	0.0	0.3	0.0	0.3	16.7	**1.1**
BC01007-7	SY WOLF (P+)	4					0.0	0.0	0.0	0.3	0.1	25.0	**1.7**
PI593889	RAMPART (saw fly tol)	5	1.0	11.7	2.3		0.3	0.0			3.1	34.1	**2.3**
MTS0713	JUDEE (+)(saw fly tol)	7	7.0	8.3	0.7		0.0	0.0	0.0	0.0	2.3	34.5	**2.3**
MTS0031	GENOU (+)(saw fly tol)	4	1.0	18.3	1.0		0.0				5.1	45.2	**3.0**
MTS1224	LOMA (++)	4					0.0	0.0	0.3	0.3	0.2	50.1	**3.3**
MTS0721	BEARPAW (+)(saw fly tol)	6	3.7	20.0	1.0		0.0	0.0	1.0		4.3	56.2	**3.7**
S94-4	CDC FALCON (P+)	6	2.3	18.3	3.7		0.3	0.0	2.3		4.5	59.1	**3.9**
BZ9W05-2043	WB-QUAKE (P+)	6	20.0	10.0	0.7		0.3	0.0	0.7		5.3	69.3	**4.6**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	6		18.3	1.0		0.3	0.0	0.0	1.0	3.4	78.5	**5.2**
MT0552	DECADE (+)	7	11.7	23.3	2.0		0.3	0.0	0.3	1.0	5.5	83.5	**5.5**
MT00159	YELLOWSTONE (+)	7	20.0	18.3	6.7		0.0	0.0	0.7	0.7	6.6	100.0	**6.6**
ND9257	JERRY	5	13.7	26.7	5.3		0.7	0.0			9.3	103.0	**6.8**
MTW08168	WB3768 (P+,HW)	3			6.7		0.3	0.0			2.3	105.5	**7.0**
MT08172	COLTER (+)	4		21.7	6.7		0.7	0.0			7.3	116.0	**7.7**
ACS55017	KELDIN (P+)	3						0.0	1.0	1.0	0.7	150.2	**9.9**
MEANS (For Entries Listed)			8.1	16.4	2.8		0.2	0.0	0.6	0.5			**4.4**
6/ Growing Season Precipitation (in.)			8.3	7.5	n/a	17.6	n/a	11.4	2.9	4.7	8.7		
Soil PAW (in.) to SD @ Planting			8.2	8.9	7.8	8.5	3.6	7.9	5.8	7.3	7.3		
Total Plant Available Water (in.)			16.5	16.4	n/a	26.2	n/a	19.4	8.7	12.0	16.5		
Soil NO3 (lbs.) to SD at Planting			55	15	11	93	27	26	72	64	45.3		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	38	46.8		
Fertilizer Applied	(# N)		70	70	100	100	100	100	100	125	95.6		
	(# P2O5)		40	40	20	20	20	20	20	20	25.0		
	(# K2O)		25	25	10	10	10	10	10	10	13.8		
	(#S)		0	0	0	0	0	0	0	10	1		

Check variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Line, HW = Hard White.

3/ No harvest in 2014 due to hail.

4/ Percent of Yellowstone sawfly rating for the same data years as those in which a given entry was tested.

5/ 7-Yr Comparable Average = (x/y) * z where x = average sawfly rating of a given entry for years tested, y = average sawfly rating for Yellowstone for the same years, and z = 7-Yr average sawfly rating for the check variety Yellowstone.

6/ April 1 to 14 days prior to harvest maturity.

TABLE 4. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2018. (Exp# 18-3853-WW)

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
Brawl CLP	Colorado Research Foundation, 2011	83.6	25.9	61.4	**62.1**	**14.9**	344	73.9
Decade	Montana/North Dakota, 2010	86.8	25.7	61.5	60.0	**14.6**	359	76.5
FourOsix	Montana, 2018 (MT1465)	100.0	24.0	59.6	59.6	13.9	362	74.6
Judee	Montana, 2011	96.7	28.6	56.8	60.2	13.9	350	65.0
Keldin	Westbred, 2011	89.0	27.2	**62.7**	60.2	13.9	**367**	80.7
LCS Jet	Limagrain Cereal Seeds, 2015	81.1	21.4	51.4	56.7	13.9	350	89.9
Loma	Montana, 2016	83.3	22.2	57.7	58.5	**14.5**	344	32.3
Northern	Montana, 2015	89.3	25.8	**63.3**	60.1	14.3	**373**	75.7
Ray	Montana, 2018 (MTF1432)	79.4	29.8	59.2	57.6	**14.6**	**370**	67.1
SY Clearstone 2CL	Montana/Syngenta, 2012	87.6	28.0	59.9	58.5	**14.5**	**382**	79.4
SY Monument	Syngenta, 2015	90.6	26.6	**63.3**	60.3	12.8	347	65.8
SY Wolf	Syngenta (AgriPro), 2010	87.3	28.3	58.2	**61.5**	14.2	343	59.1
Warhorse	Montana, 2013	100.0	26.3	43.5	59.5	**14.6**	**376**	17.2
WB4483	WestBred, 2016	96.1	24.4	53.9	59.3	**14.8**	361	61.6
Yellowstone	Montana 2005	91.4	26.2	58.9	58.9	14.1	**373**	84.8
MT1265	Yellowstone*4/KS96WGRC40 (Lr41, wcm)	89.2	26.6	59.5	59.1	14.2	**380**	76.4
MT1547	Yellowstone/MT0684	87.4	24.0	50.1	58.8	**14.2**	346	78.7
MT1563	Yellowstone*2/PI640431	85.1	29.3	60.6	59.0	13.8	364	58.4
MT1564	Yellowstone*2/PI640431	99.6	27.7	54.6	**61.3**	13.7	364	65.4
MT1642	Yellowstone/Madsen//Yellowstone	89.7	27.5	55.0	58.6	**15.0**	**381**	77.5
MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTC	96.7	27.1	54.5	**60.8**	14.0	362	48.4
MTF1435	MT08186//Yellowstone(L)*2/98X168E1	88.4	32.6	55.4	58.0	14.0	**367**	63.1
MTS1588	MT0598/98X366E29-1	91.4	25.4	**66.5**	**61.0**	13.6	349	7.2
MTV1681	Yellowstone*2//WillowCreek/MT06129	91.8	26.2	57.5	59.8	**14.6**	**379**	41.7
MTW1491	MT08189//MT08187/(MTW08166, WB376	86.5	26.5	59.2	60.1	13.8	**378**	79.6
EXPERIMENTAL MEANS		89.9	26.5	57.8	59.6	14.2	363	64.0
LSD (0.05)		13.5	2.4	4.0	1.0	0.5	16.2	30.7
C.V.%		8.1	5.0	3.8	0.9	2.0	2.5	26.2
P-VALUE (Varieties)		0.0434	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for wheat.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

Bold indicates highest value within a column.

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

Management Information (18-3853-WW)

Seeding Date:	September 28, 2017
Harvest Date:	August 2, 2018
Fertility:	125-20-10-10 side banded
System:	no till
Herbicide:	Bromac-16oz/ac, Affinity-.6oz/ac
Insecticide:	none
Previous Crop:	Chemical Fallow - Spring Wheat
Precipitation:	n/a

TABLE 5. Ten-Year Yield and Test Weight Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at McKeever Farms and Seed Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2009-2018. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2014	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	**10-YR COMP. AVE. YIELD 5/**	TEST WEIGHT (Pounds Per Bushel) 2014	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	**10-YR COMP. AVE. TEST WT 5/**
MTS0978	NORTHERN (+)	6	44.5	55.3	41.3	43.9	63.3	53.5	105.3	**56.5**	62.2	57.4	51.6	60.2	60.1	58.4	100.4	**58.0**
ACS55017	KELDIN (P+)	3			51.6	38.7	62.7	51.0	105.2	**56.5**			56.3	60.2	60.2	58.9	102.0	**58.9**
BC01007-7	SY WOLF (P+)	4		48.4	45.6	41.9	58.2	48.5	101.3	**54.4**		58.9	55.4	61.8	61.5	59.4	103.4	**59.7**
MT00159	YELLOWSTONE (+)	10	46.2	46.2	44.1	42.5	58.9	53.7	100.0	**53.7**	61.2	56.6	54.5	59.9	58.9	57.8	100.0	**57.8**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	7	48.4	47.5	40.6	38.4	59.9	50.6	97.4	**52.3**	61.2	56.9	54.1	60.2	58.5	57.7	99.6	**57.5**
S94-4	CDC FALCON (P+)	9	42.1	55.1	43.5	40.2		51.1	96.2	**51.7**	61.8	57.2	53.9	58.3		57.3	99.3	**57.4**
MTS0713	JUDEE (+)(saw fly tol)	10	45.3	43.2	42.1	41.1	56.8	50.6	94.3	**50.6**	62.8	56.7	53.8	60.9	60.2	58.6	101.4	**58.6**
MTW08168	WB3768 (P+,HW)	4	43.6	48.3	37.9			47.7	93.8	**50.4**	61.5	57.3	55.6			58.1	101.0	**58.3**
MT0552	DECADE (+)	10	34.4	45.4	35.4	40.4	61.5	49.5	92.2	**49.5**	62.3	56.2	53.5	60.0	60.0	58.1	100.5	**58.1**
BZ9W05-2043	WB-QUAKE (P+)	7	40.6	43.3	36.8	40.2		47.7	90.9	**48.8**	62.5	56.6	54.8	61.2		58.2	100.1	**57.8**
MTS0808	WARHORSE (+)(saw fly tol)	8	45.4	44.8	36.2	40.6	43.5	48.3	90.7	**48.7**	62.5	56.8	55.9	60.8	59.5	58.8	101.0	**58.3**
MT08172	COLTER (+)	5	42.9	41.5	38.2			47.3	90.2	**48.4**	61.4	55.9	54.5			57.6	100.4	**58.0**
MTS1224	LOMA (++)	4		44.0	28.1	41.5	57.7	42.8	89.4	**48.0**		56.1	53.3	60.5	58.5	57.1	99.3	**57.4**
MTS0031	GENOU (+)(saw fly tol)	7	46.1	41.9				48.4	86.5	**46.5**	62.1	56.8				57.3	99.2	**57.3**
PI593889	RAMPART (saw fly tol)	8	37.6	49.1	39.4			46.6	85.5	**45.9**	62.2	58.7	56.2			57.9	100.9	**58.3**
MTS0721	BEARPAW (+)(saw fly tol)	8	38.2	50.9	37.0	27.9		46.3	85.3	**45.8**	62.1	56.8	53.3	60.4		57.8	100.6	**58.1**
ND 9257	JERRY	8	36.5	46.5	31.0			43.7	80.2	**43.1**	61.0	55.9	52.2			56.2	97.9	**56.6**
MEANS (For Entries Listed)			42.3	47.0	39.3	39.8	58.1			**50.0**	61.9	56.9	54.3	60.4	59.7			**58.0**
6/ Growing Season Precipitation (in.)			6.0	n/a	8.0	n/a	n/a	8.3										
Soil PAW (in.) to SD @ Planting			10.4	3.6	8.7	n/a	7.5	8.3										
Total Plant Available Water (in.)			16.4	n/a	16.7	n/a	n/a	17.4										
Soil NO3 (lbs.) to SD at Planting			85	126	194	n/a	147	91										
SD (Sampling Depth in Inches)			48	48	48	48	48	48										
Fertilizer Applied	(# N)		100	100	100	100	100	88										
	(# P_2O_5)		20	20	20	20	20	28										
	(# K_2O)		10	10	10	10	10	16										
	(#S)		0	0	0	0	10	1										

Check variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Line, HW = Hard White.

3/ Only the most recent 5 years shown, but summary calculations include all years noted.

4/ Percent of Yellowstone yield or test weight for the same data years as those in which a given entry was tested.

5/ 10-Yr Comparable Average = (x/y) * z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Yellowstone for the same years, and z = 10-Yr average yield or test weight for the check variety Yellowstone.

6/ April 1 to 14 days prior to harvest maturity.

TABLE 6. Ten-Year Sawfly Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at McKeever Farm and Seed Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2009-2018. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	AVE. for YEARS TESTED	% of CHECK SWFLY 3/	**10-YR COMP. AVE. SWFLY 4/**
MTS0808	WARHORSE (+)(saw fly tol)	8			5.0	5.0	8.3	0.7	1.0	0.0	13.3	17.2	6.3	18.6	**8.5**
PI593889	RAMPART (saw fly tol)	8	16.7	10.0	10.0	16.7	16.7	0.7	5.0	0.0			9.5	22.2	**10.1**
MTS0721	BEARPAW (+)(saw fly tol)	8		8.3	10.0	13.3	20.0	1.0	3.7	0.0	11.3		8.5	23.6	**10.8**
BZ9W05-2043	WB-QUAKE (P+)	7			15.0	12.5	33.3	3.7	2.3	2.0	24.6		13.3	49.9	**22.8**
MTS0031	GENOU (+)(saw fly tol)	7	50.0	51.7	21.7	26.7	23.3	4.0	10.0				26.8	55.3	**25.2**
MTS0713	JUDEE (+)(saw fly tol)	10	31.7	53.3	10.0	31.7	30.0	3.7	2.3	0.7	40.6	65.0	26.9	58.9	**26.9**
MTS1224	LOMA (++)	4							13.3	3.7	38.4	32.3	21.9	66.0	**30.1**
MT0552	DECADE (+)	10	40.0	96.3	13.3	71.7	23.3	5.0	2.3	5.0	51.8	76.5	38.5	84.4	**38.5**
BC01007-7	SY WOLF (P+)	4							6.7	1.0	45.3	59.1	28.0	84.5	**38.6**
S94-4	CDC FALCON (P+)	9	63.3	99.7	15.0	86.7	10.0	3.7	5.3	1.0	57.3		38.0	92.0	**42.0**
MT0978	NORTHERN (+)	6					16.7	3.7	15.0	2.3	31.6	75.7	24.2	94.9	**43.3**
ND 9257	JERRY	8	76.3	96.7	30.0	88.3	20.0	5.0	13.3	1.0			41.3	97.0	**44.3**
MT00159	YELLOWSTONE (+)	10	85.0	99.3	21.7	97.7	15.0	5.0	15.0	2.3	30.6	84.8	45.6	100.0	**45.6**
MT08172	COLTER (+)	5				93.0	33.3	8.3	21.7	0.7			31.4	116.3	**53.1**
ACS55017	KELDIN (+)	3								6.7	78.0	80.7	55.1	140.4	**64.1**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	7				97.7	20.0	3.7	18.3	3.7	46.0	79.4	38.4	150.8	**68.8**
MTW08168	WB3768 (P+,HW)	4					28.3	11.7	26.7	5.3			18.0	192.9	**88.0**
MEANS (For Entries Listed)			51.9	64.4	15.2	53.4	21.3	4.3	10.1	2.2	39.1	63.4			**38.9**
5/ Growing Season Precipitation (in.)			n/a	n/a	9.4	9.4	8.8	6.0	n/a	8.0	n/a	n/a	8.3		
Soil PAW (in.) to SD @ Planting			10.1	7.5	9.6	7.9	9.1	10.4	3.6	8.7	n/a	7.5	8.3		
Total Plant Available Water (in.)			n/a	n/a	19.0	17.3	17.8	16.4	n/a	16.7	n/a	n/a	17.4		
Soil NO3 (lbs.) to SD at Planting			82	36	26	68	51	85	126	194	n/a	147	91		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	48	48	48	48		
Fertilizer Applied	(# N)		70	70	70	70	100	100	100	100	100	100	88		
	(# P2O5)		40	40	40	40	20	20	20	20	20	20	28		
	(# K2O)		25	25	25	25	10	10	10	10	10	10	16		
	(#S)		0	0	0	0	0	0	0	0	0	10	1		

Check variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Line, HW = Hard White.

3/ Percent of Yellowstone yield or test weight for the same data years as those in which a given entry was tested.

4/ 10-Yr Comparable Average = (x/y) * z where x = average sawfly rating of a given entry for years tested, y = average sawfly rating for Yellowstone for the same years, and z = 10-Yr average sawfly rating for the check variety Yellowstone.

5/ April 1 to 14 days prior to harvest maturity.