Title (4W6471): 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 Technician, Havre
Kyla McNamara, Research Technician, Havre
Ben Hauptman, Blaine County Extension
Tyler Lane, Chouteau 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 nearly 28 percent of the 2012-2016 statewide cereal production totals (43 percent for winter wheat and 24 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 2017 in two northern Montana counties.

Dryland Winter Wheat Trials:

1. Cederberg Farm, Blaine County S13-T36N-R25E
2. McKeever Farms, Chouteau County S21-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.

Results:

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.

Cropping environments in 2017 started out with very good recharge soil moisture, and cooler than typical early

spring temperatures followed by a season of high winds and drought conditions across north central Montana. The Loma location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues. Fall seeding was delayed in some areas due to rainfall and an early snowstorm that created wet soil conditions. The fall moisture recharged soils and set up favorable cropping conditions. After mid-April, typical spring rainfall patterns did not develop. North central Montana was ultimately considered to be in an extreme drought by the National Oceanic and Atmospheric Administration, who assists in monitoring the nation's drought conditions. At the end of May, an extreme windstorm that lasted several days sandblasted the winter wheat and left drifts of soil several inches up the stems, making plant height measurements at the end of the year inconsistent and unreliable. Both Loma and Turner suffered from lack of precipitation throughout the year resulting in thin stands, reduced tillering and below average winter wheat yields.

At Havre, annual growing season precipitation (9/1/16 through 8/31/17) was 9.48 inches, 2.58 inches lower than the average for all years since 1916. April 1 through July 31 precipitation was 2.41 inches, just 34 percent of the 102-year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through July totaled 1393, or 108 percent of the average for the last 67 years (1951-2017). The last spring frost was on May 19 and the first fall frost of 2017 was on September 25, resulting in 129 frost-free days. The minimum winter temperature was -27 degrees F on December 17, 2016. Overall, the 2016-2017 average crop year temperatures were higher than the long-term average. The April through July growing season saw an average daily temperature of 59 degrees F, 2.5 degrees F higher than historical temperatures. July and August average temperatures were nearly three degrees F higher than long-term averages with the high for 2017 recorded on July 15 at 101 degrees F. There were 30 days with temperatures 90 degrees F or above, with only one day over 100 degrees F.

Following a very dry summer, which was categorized as an extreme drought by the National Oceanic and Atmospheric Administration, winter wheat yields at Turner averaged just over 19 bu/ac (Table 1). An experimental breeding line from Montana State University, 'MTW1491', was the highest yielding entry at only 23 bu/ac. Another breeding line from MSU, 'MTS1588' was the only other entry to yield statistically equal to that of MTW1491. Test weights of all entries averaged 56.6 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 2017 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. Six-year comparable averages for seed yield and test weight at Turner are summarized in Table 2, while six-year comparable averages for sawfly cutting are summarized in Table 3.

Loma winter wheat yields averaged just under 42 bu/ac with 'MST1573', a breeding line from Montana State University, producing the highest yield at just under 52 bu/ac (Table 4). MTS1588, 'MT1348', 'Brawl CLP' and 'Northern' all produced yields statistically equal to MTS1573. Stem cutting by sawfly was high this year in the small plot scenario at Loma, with cutting in the winter wheat trial averaging 43 percent. Stand percent, plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2017 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:

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 eighth year of winter wheat testing, while the Chouteau County location, between Big Sandy and Loma, has been used for various trials since 1998.

Funding Summary:

Expenditure information for grant index 4W6471 is to be provided by Montana State University, Office of Sponsored Programs. There is no other grant support for this project.

MWBC CY2018 Grant Submission Plans:

This project has been submitted for funding consideration in the next calendar year.

Recognition:

This research would not have been possible without the assistance of the following summertime hourly employees: Marley Manoukian, Nicole Parsons and Emily Simonson.

TABLE 1. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2017. (Exp# 17-3851-WW)

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN seconds	4/ SAWFLY %
Bearpaw	Montana, 2011	99.0	14.5	19.0	55.9	14.7	348	1.0
Brawl CLP	Colorado Research Foundation, 2011	96.4	16.0	16.4	59.1	13.0	358	0.0
CDC Falcon	Sask/WestBred, 1999	97.1	13.0	17.2	56.1	13.6	370	2.3
Decade	Montana/North Dakota, 2010	99.7	16.0	21.1	56.7	14.5	367	0.3
Judee	Montana, 2011	98.7	17.2	18.1	57.7	14.9	355	0.0
Keldin	Westbred, 2011	98.4	18.4	20.8	57.5	13.3	352	1.0
Loma	Montana, 2016	99.0	15.5	21.3	57.1	14.7	346	0.3
Northern	Montana, 2015	100.0	16.3	21.3	57.3	14.3	375	0.3
SY Clearstone 2CL	Montana/Syngenta, 2012	96.7	21.3	19.0	56.6	14.2	366	0.0
SY Monument	Syngenta, 2015	97.1	18.5	18.7	56.9	12.1	348	0.7
SY Wolf	Syngenta (AgriPro), 2010	90.8	17.3	17.7	58.0	13.9	333	0.0
Warhorse	Montana, 2013	97.7	16.7	16.9	54.7	14.3	377	0.3
WB-Quake	WestBred, 2011	97.7	16.5	16.9	56.3	14.5	342	0.7
Yellowstone	Montana 2005	99.3	17.7	19.1	55.5	13.7	374	0.7
MT1265	Yellowstone*4/KS96WGRC40 (Lr41, wcm)	98.0	20.1	20.6	56.2	13.8	377	0.3
MT1348	PI572290/BigSky	100.0	18.2	20.0	57.0	13.3	379	0.3
MT1444	Yellowstone*2/MTW0590	97.7	19.1	20.4	57.1	13.7	369	0.7
MT1465	Yellowstone/MT0684	98.7	17.9	19.1	56.6	14.2	357	0.3
MT1471	Yellowstone/NuDakota	100.0	17.6	20.4	55.2	14.6	354	0.0
MT1488	MTR00118/MT0241//CDC Falcon	99.7	14.1	17.3	55.5	15.3	370	0.7
MTF1432	Yellowstone*2/98X168E1	95.7	20.9	18.2	54.9	13.6	352	0.3
MTF1435	MT08186//Yellowstone(L)*2/98X168E1	98.4	22.6	17.4	56.0	13.1	353	0.7
MTS1573	Danby/2*MTS04114	97.4	18.3	18.4	57.7	13.2	370	0.7
MTS1588	MT0598/98X366E29-1	95.1	16.8	22.9	57.6	14.1	349	0.7
MTW1491	MT08189//MT08187/(MTW08166, WB3768 sib)	96.7	21.6	23.1	57.1	13.1	364	0.3
EXPERIMENTAL MEANS		97.8	17.7	19.3	56.6	13.9	360	0.5
LSD (0.05)		4.0	3.3	2.5	0.8	0.6	9.8	1.0
C.V.%		2.5	11.5	8.0	0.9	2.5	1.7	124.5
P-VALUE (Varieties)		0.0220	<.0001	<.0001	<.0001	<.0001	<.0001	0.0487

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 (17-3851-WW)	
Seeding Date:	September 20, 2016
Harvest Date:	August 10, 2017
Fertility:	100-20-10 side banded
System:	no till
Herbicide:	none
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	2.87" April 1 to Harvest Maturity

TABLE 2. Six-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. 2011-2017. (Exp# 3851-WW).

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2013	2014 4/	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK YIELD 5/	**6-YR COMP. AVE. YIELD 6/**	TEST WEIGHT (Pounds Per Bushel) 2013	2014 4/	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 5/	**6-YR COMP. AVE. TEST WT 6/**
MT 00159	YELLOWSTONE (+)	6	63.0		40.7	65.0	19.1	43.6	100.0	**43.6**	61.5		59.4	59.7	55.5	59.4	100.0	**59.4**
BZ9W05-2043	WB-QUAKE (P+)	6	56.9		38.3	66.3	16.9	42.8	98.2	**42.8**	62.0		58.9	58.8	56.3	59.3	99.9	**59.3**
MT S0721	BEARPAW (+)(saw fly tol)	6	57.6		40.4	60.8	19.0	42.3	97.1	**42.3**	61.1		58.3	57.2	55.9	58.9	99.2	**58.9**
MT S1224	LOMA (++)	3			39.8	59.8	21.3	40.3	96.9	**42.2**			59.7	60.2	57.1	59.0	98.0	**58.2**
MT W08168	WB3768 (P+,HW)	3	60.2		44.6	56.9		53.9	95.8	**41.8**	62.4		59.5	60.8		60.9	100.7	**59.8**
MT CL1077	SY CLEARSTONE 2CL (P+)	5	59.9		38.4	60.6	19.0	40.3	95.1	**41.4**	61.5		59.1	59.4	56.6	59.1	98.0	**58.2**
MT 08172	COLTER (+)	4	50.1		42.8	65.1		45.8	95.0	**41.4**	62.0		60.3	59.7		60.3	100.7	**59.8**
MT S0713	JUDEE (+)(saw fly tol)	6	49.0		39.2	63.8	18.1	41.1	94.2	**41.1**	62.5		61.0	60.4	57.7	60.6	102.0	**60.6**
S94-4	CDC FALCON (P+)	6	55.3		40.3	57.3	17.2	41.0	94.1	**41.0**	61.0		59.1	58.9	56.1	58.9	99.3	**58.9**
MT S0031	GENOU (+)(saw fly tol)	4	49.8		40.8			41.7	94.0	**41.0**	62.0		59.4			60.5	100.7	**59.8**
MT 0978	NORTHERN (+)	4	54.7		38.3	59.0	21.3	43.3	92.3	**40.2**	61.9		59.2	60.2	57.3	59.6	99.5	**59.1**
MT 0552	DECADE (+)	6	52.1		42.8	52.7	21.1	39.9	91.6	**39.9**	61.0		59.3	58.2	56.7	59.5	100.2	**59.5**
BC01007-7	SY WOLF (P+)	3			38.5	57.6	17.7	37.9	91.2	**39.7**			59.0	59.1	58.0	58.7	97.5	**57.9**
MT S0808	WARHORSE (+)(saw fly tol)	6	52.1		34.6	59.9	16.9	37.8	86.7	**37.8**	62.2		59.4	59.7	54.7	59.7	100.5	**59.7**
PI593889	RAMPART (saw fly tol)	5	45.4		31.1	56.8		39.9	82.3	**35.9**	61.7		58.2	58.6		60.0	99.2	**58.9**
ND 9257	JERRY	5	45.2		38.7	37.3		39.2	80.9	**35.3**	60.6		57.8	56.7		58.9	97.3	**57.8**
MEANS (For Entries Listed)			53.7		39.3	58.6	18.9			**40.5**	61.7		59.2	59.2	56.5			59.1
7/ Growing Season Precipitation (in.)			n/a	17.6	n/a	11.4	2.9	9.5										
Soil PAW (in.) to SD @ Planting			7.8	8.5	3.6	7.9	5.8	7.2										
Total Plant Available Water (in.)			n/a	26.2	n/a	19.4	8.7	17.4										
Soil NO3 (lbs.) to SD at Planting			11	93	27	26	72	43										
SD (Sampling Depth in Inches)			48	48	48	48	48	48										
Fertilizer Applied	(# N)		100	100	100	100	100	91										
	(# P_2O_5)		20	20	20	20	20	26										
	(# K_2O)		10	10	10	10	10	14										

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/ 6-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 = 6-Yr average yield or test weight for the check variety Yellowstone.

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

TABLE 3. Six-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. 2011-2017. (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	AVE. for YEARS TESTED	% of CHECK SWFLY 4/	**6-YR COMP. AVE. SWFLY 5/**
BC01007-7	SY WOLF (P+)	3					0.0	0.0	0.0	0.0	0.0	**0.0**
MTS0808	WARHORSE (+)(saw fly tol)	6	1.0	2.3	0.7		0.0	0.0	0.3	0.7	9.5	**0.7**
MT0978	NORTHERN (+)	4			1.0		0.0	0.0	0.3	0.3	18.2	**1.4**
PI593889	RAMPART (saw fly tol)	5	1.0	11.7	2.3		0.3	0.0		3.1	34.1	**2.6**
MTS0713	JUDEE (+)(saw fly tol)	6	7.0	8.3	0.7		0.0	0.0	0.0	2.7	35.0	**2.7**
MTS0031	GENOU (+)(saw fly tol)	4	1.0	18.3	1.0		0.0			5.1	45.2	**3.4**
MTS1224	LOMA (++)	3					0.0	0.0	0.3	0.1	50.1	**3.8**
MTS0721	BEARPAW (+)(saw fly tol)	6	3.7	20.0	1.0		0.0	0.0	1.0	4.3	56.2	**4.3**
S94-4	CDC FALCON (P+)	6	2.3	18.3	3.7		0.3	0.0	2.3	4.5	59.1	**4.5**
BZ9W05-2043	WB-QUAKE (P+)	6	20.0	10.0	0.7		0.3	0.0	0.7	5.3	69.3	**5.3**
MTCL1077	SY CLEARSTONE 2CL (P+)	5		18.3	1.0		0.3	0.0	0.0	3.9	76.6	**5.8**
MT0552	DECADE (+)	6	11.7	23.3	2.0		0.3	0.0	0.3	6.3	82.5	**6.3**
MT00159	YELLOWSTONE (+)	6	20.0	18.3	6.7		0.0	0.0	0.7	7.6	100.0	**7.6**
ND9257	JERRY	5	13.7	26.7	5.3		0.7	0.0		9.3	103.0	**7.8**
MTW08168	WB3768 (P+,HW)	3			6.7		0.3	0.0		2.3	105.5	**8.0**
MT08172	COLTER (+)	4		21.7	6.7		0.7	0.0		7.3	116.0	**8.8**
MEANS (For Entries Listed)			8.1	16.4	2.8		0.2	0.0	0.5			**4.6**
6/ Growing Season Precipitation (in.)			8.3	7.5	n/a	17.6	n/a	11.4	2.9	9.5		
Soil PAW (in.) to SD @ Planting			8.2	8.9	7.8	8.5	3.6	7.9	5.8	7.2		
Total Plant Available Water (in.)			16.5	16.4	n/a	26.2	n/a	19.4	8.7	17.4		
Soil NO3 (lbs.) to SD at Planting			55	15	11	93	27	26	72	43		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	48		
Fertilizer Applied	(# N)		70	70	100	100	100	100	100	91		
	(# P2O5)		40	40	20	20	20	20	20	26		
	(# K2O)		25	25	10	10	10	10	10	14		

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/ 6-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 = 6-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. 2017. (Exp# 17-3853-WW)

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN seconds	4/ SAWFLY %
Bearpaw	Montana, 2011	100.0	19.4	27.9	60.4	16.0	373	11.3
Brawl CLP	Colorado Research Foundation, 2011	99.0	25.3	48.8	61.7	14.7	362	31.3
CDC Falcon	Sask/WestBred, 1999	99.7	21.6	40.2	58.3	14.8	382	57.3
Decade	Montana/North Dakota, 2010	100.0	23.0	40.4	60.0	15.3	376	51.8
Judee	Montana, 2011	100.0	24.3	41.1	60.9	16.0	370	40.6
Keldin	Westbred, 2011	99.0	23.4	38.7	60.2	15.0	375	78.0
Loma	Montana, 2016	99.3	22.2	41.5	60.5	14.9	367	38.4
Northern	Montana, 2015	99.3	22.2	43.9	60.2	15.6	417	31.6
SY Clearstone 2CL	Montana/Syngenta, 2012	99.0	23.9	38.4	60.2	15.6	401	46.0
SY Monument	Syngenta, 2015	98.4	25.0	40.0	60.1	13.7	370	53.7
SY Wolf	Syngenta (AgriPro), 2010	98.4	22.3	41.9	61.8	14.9	350	45.3
Warhorse	Montana, 2013	99.3	23.5	40.6	60.8	16.0	408	13.3
WB-Quake	WestBred, 2011	99.0	22.1	40.2	61.2	15.1	369	24.6
Yellowstone	Montana 2005	100.0	24.8	42.5	59.9	15.3	401	30.6
MT1265	Yellowstone*4/KS96WGRC40 (Lr41, wcm)	98.0	25.0	42.8	60.0	15.5	407	56.9
MT1348	PI572290/BigSky	100.0	25.2	49.1	60.5	14.9	382	44.8
MT1444	Yellowstone*2/MTW0590	99.3	23.8	38.4	60.4	15.2	387	48.9
MT1465	Yellowstone/MT0684	99.7	23.6	43.4	60.8	15.0	367	57.9
MT1471	Yellowstone/NuDakota	99.3	23.2	38.6	59.5	16.2	381	51.2
MT1488	MTR00118/MT0241//CDC Falcon	100.0	24.1	37.8	59.1	15.3	393	61.2
MTF1432	Yellowstone*2/98X168E1	99.7	26.6	41.4	58.4	15.1	397	50.7
MTF1435	MT08186//Yellowstone(L)*2/98X168E1	100.0	26.8	40.8	60.1	14.9	398	37.2
MTS1573	Danby/2*MTS04114	100.0	24.6	51.6	61.5	14.1	391	38.9
MTS1588	MT0598/98X366E29-1	100.0	22.3	49.7	61.1	15.2	361	24.4
MTW1491	MT08189//MT08187/(MTW08166, WB3768 sib)	100.0	25.8	42.6	61.2	14.9	404	49.2
EXPERIMENTAL MEANS		99.5	23.8	41.7	60.3	15.2	384	43.0
LSD (0.05)		1.9	3.0	7.7	0.9	0.7	12.6	25.6
C.V.%		1.2	6.8	9.9	0.8	2.3	1.8	32.2
P-VALUE (Varieties)		0.7418	0.0021	0.0009	<.0001	<.0001	<.0001	0.0012

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 (17-3853-WW)

Seeding Date:	September 29, 2016
Harvest Date:	July 23, 2017
Fertility:	100-20-10 side banded
System:	no till
Herbicide:	none
Insecticide:	none
Previous Crop:	Chemical Fallow - Spring Wheat
Precipitation:	not available

TABLE 5. Ten-Year Yield and Test Weight 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. 2008-2017. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2013	2014	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	**10-YR COMP. AVE. YIELD 5/**	TEST WEIGHT (Pounds Per Bushel) 2013	2014	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	**10-YR COMP. AVE. TEST WT 5/**
MTS0978	NORTHERN (+)	5	72.5	44.5	55.3	41.3	43.9	51.5	104.7	**58.1**	58.8	62.2	57.4	51.6	60.2	58.0	100.1	**57.4**
BC01007-7	SY WOLF (P+)	3			48.4	45.6	41.9	45.3	102.3	**56.7**			58.9	55.4	61.8	58.7	103.0	**59.1**
MT00159	YELLOWSTONE (+)	10	66.9	46.2	46.2	44.1	42.5	55.5	100.0	**55.5**	57.8	61.2	56.6	54.5	59.9	57.4	100.0	**57.4**
S94-4	CDC FALCON (P+)	10	68.4	42.1	55.1	43.5	40.2	53.9	97.1	**53.9**	58.0	61.8	57.2	53.9	58.3	57.1	99.6	**57.1**
MTCL1077	SY CLEARSTONE 2CL (P+)	6	62.6	48.4	47.5	40.6	38.4	49.1	96.6	**53.6**	57.2	61.2	56.9	54.1	60.2	57.5	99.6	**57.2**
MTS0713	JUDEE (+)(saw fly tol)	9	65.6	45.3	43.2	42.1	41.1	50.0	94.0	**52.2**	59.8	62.8	56.7	53.8	60.9	58.4	101.4	**58.2**
MTW08168	WB3768 (P+,HW)	4	60.9	43.6	48.3	37.9		47.7	93.8	**52.0**	58.0	61.5	57.3	55.6		58.1	101.0	**58.0**
MTS0808	WARHORSE (+)(saw fly tol)	7	61.3	45.4	44.8	36.2	40.6	49.0	93.4	**51.8**	59.8	62.5	56.8	55.9	60.8	58.7	101.0	**58.0**
MT0552	DECADE (+)	10	58.7	34.4	45.4	35.4	40.4	51.0	92.0	**51.0**	58.5	62.3	56.2	53.5	60.0	57.7	100.6	**57.7**
W98-362	JAGALENE (P+)	7	56.6	43.3				55.4	91.9	**51.0**	59.7	63.6				59.6	103.5	**59.4**
BZ9W05-2043	WB-QUAKE (P+)	7	64.7	40.6	43.3	36.8	40.2	47.7	90.9	**50.4**	57.1	62.5	56.6	54.8	61.2	58.2	100.1	**57.4**
MT08172	COLTER (+)	5	58.8	42.9	41.5	38.2		47.3	90.2	**50.0**	58.0	61.4	55.9	54.5		57.6	100.4	**57.6**
MTS1224	LOMA (++)	3			44.0	28.1	41.5	37.8	85.5	**47.4**			56.1	53.3	60.5	56.6	99.4	**57.0**
DH0018196	ACCIPITER (+)	6	58.3	45.2				49.2	85.5	**47.4**	58.8	61.8				57.6	99.4	**57.0**
MTS0721	BEARPAW (+)(saw fly tol)	8	57.3	38.2	50.9	37.0	27.9	46.3	85.3	**47.3**	58.8	62.1	56.8	53.3	60.4	57.8	100.6	**57.7**
MTS0031	GENOU (+)(saw fly tol)	8	57.8	46.1	41.9			49.7	84.9	**47.1**	58.4	62.1	56.8			57.1	99.4	**57.0**
PI593889	RAMPART (saw fly tol)	9	56.7	37.6	49.1	39.4		47.6	83.6	**46.4**	58.3	62.2	58.7	56.2		57.8	101.3	**58.1**
ND 9257	JERRY	9	55.0	36.5	46.5	31.0		47.1	82.7	**45.9**	58.3	61.0	55.9	52.2		56.3	98.7	**56.6**
MEANS (For Entries Listed)			61.4	42.5	47.0	38.5	39.9			**51.0**	58.5	62.0	56.9	54.2	60.4			**57.7**
6/ Growing Season Precipitation (in.)			8.8	6.0	n/a	8.0	n/a	8.4										
Soil PAW (in.) to SD @ Planting			9.1	10.4	3.6	8.7	n/a	8.6										
Total Plant Available Water (in.)			17.8	16.4	n/a	16.7	n/a	17.8										
Soil NO3 (lbs.) to SD at Planting			51	85	126	194	n/a	108										
SD (Sampling Depth in Inches)			48	48	48	48	48	48										
Fertilizer Applied	(# N)		100	100	100	100	100	85										
	(# P_2O_5)		20	20	20	20	20	30										
	(# K_2O)		10	10	10	10	10	18										

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. 2008-2017. (Exp# 3853-WW)**

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	AVE. for YEARS TESTED	% of CHECK SWFLY 3/	**10-YR COMP. AVE. SWFLY 4/**
MTS0808	WARHORSE (+)(saw fly tol)	7				5.0	5.0	8.3	0.7	1.0	0.0	13.3	4.8	17.8	**6.8**
PI593889	RAMPART (saw fly tol)	9	3.7	16.7	10.0	10.0	16.7	16.7	0.7	5.0	0.0		8.8	22.6	**8.6**
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	**9.0**
BZ9W05-2043	WB-QUAKE (P+)	7				15.0	12.5	33.3	3.7	2.3	2.0	24.6	13.3	49.9	**19.0**
MTS0031	GENOU (+)(saw fly tol)	8	3.7	50.0	51.7	21.7	26.7	23.3	4.0	10.0			23.9	54.8	**20.9**
MTS0713	JUDEE (+)(saw fly tol)	9		31.7	53.3	10.0	31.7	30.0	3.7	2.3	0.7	40.6	22.7	54.9	**20.9**
MT0552	DECADE (+)	10	2.3	40.0	96.3	13.3	71.7	23.3	5.0	2.3	5.0	51.8	31.1	81.5	**31.1**
DH0018196	ACCIPITER (+)	6		60.0	97.7	28.3	90.0	6.7	5.3				48.0	89.0	**34.0**
S94-4	CDC FALCON (P+)	10	1.0	63.3	99.7	15.0	86.7	10.0	3.7	5.3	1.0	57.3	34.3	89.9	**34.3**
W98-362	JAGALENE (P+)	7	2.3	71.3	99.7	28.3	86.7	21.7	3.7				44.8	94.0	**35.9**
ND 9257	JERRY	9	8.3	76.3	96.7	30.0	88.3	20.0	5.0	13.3	1.0		37.7	96.6	**36.9**
MT00159	YELLOWSTONE (+)	10	10.0	85.0	99.3	21.7	97.7	15.0	5.0	15.0	2.3	30.6	38.2	100.0	**38.2**
MT0978	NORTHERN (+)	5						16.7	3.7	15.0	2.3	31.6	13.9	102.0	**38.9**
BC01007-7	SY WOLF (P+)	3								6.7	1.0	45.3	17.7	110.6	**42.2**
MTCL1077	SY CLEARSTONE 2CL (P+)	6					97.7	20.0	3.7	18.3	3.7	46.0	31.6	114.3	**43.6**
MTS1224	LOMA (++)	3								13.3	3.7	38.4	18.5	115.6	**44.1**
MT08172	COLTER (+)	5					93.0	33.3	8.3	21.7	0.7		31.4	116.3	**44.4**
MTW08168	WB3768 (P+,HW)	4						28.3	11.7	26.7	5.3		18.0	192.9	**73.6**
MEANS (For Entries Listed)			4.5	54.9	71.3	17.4	58.4	20.4	4.3	10.1	1.9	35.5			**32.4**
5/ Growing Season Precipitation (in.)			8.9	n/a	n/a	9.4	9.4	8.8	6.0	n/a	8.0	n/a	8.4		
Soil PAW (in.) to SD @ Planting			10.5	10.1	7.5	9.6	7.9	9.1	10.4	3.6	8.7	n/a	8.6		
Total Plant Available Water (in.)			19.4	n/a	n/a	19.0	17.3	17.8	16.4	n/a	16.7	n/a	17.8		
Soil NO3 (lbs.) to SD at Planting			300	82	36	26	68	51	85	126	194	n/a	108		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	48	48	48	48		
Fertilizer Applied	(# N)		70	70	70	70	70	100	100	100	100	100	85		
	(# P_2O_5)		40	40	40	40	40	20	20	20	20	20	30		
	(# K_2O)		25	25	25	25	25	10	10	10	10	10	18		

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.