Title: Northcentral Montana Off-Station Winter Wheat Variety Performance Evaluations

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Terry McKeever, Landowner, 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 2015-2019 statewide cereal production totals (42 percent for winter wheat and 27 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 northcentral 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 minimal tillage during 2020 in two northern Montana counties.

Dryland Winter Wheat Trials:

1. Cederberg Farm, Blaine County S13-T36N-R25E
2. McKeever Farms, Chouteau County S28-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 seed 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 cooler than average summer, scattered with timely precipitation, winter wheat yields at Turner averaged just over 53 bu/ac (Table 1). 'MTS18149', a wheat stem sawfly and aluminum toxicity tolerant Montana State University breeding line, was the highest yielding entry at nearly 67 bu/ac. No other entry in the trial yielded statistically equal to MTS18149. Test weights of all entries averaged just over 60 lb/bu. Wheat stem sawfly cutting averaged just over 11 percent, with no cutting occurring in MTS18149, at Turner. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2020 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. Nine-year comparable averages for seed yield and test weight at Turner are summarized in Table 2, while nine-year comparable averages for protein content and sawfly cutting are summarized in Table 3.

Loma winter wheat yields averaged just over 59 bu/ac with 'Northern', a hollow stemmed release from Montana State University in 2015, producing the highest yield at nearly 68 bu/ac (Table 4). 'SY Clearstone 2CL', 'Byrd CL Plus', 'Brawl CLP' and 'Loma', along with three breeding lines produced seed yields statistically equal to that of Northern. Stem cutting by wheat stem sawfly was low in the small plot scenario at Loma, with cutting in the winter wheat trial averaging eight percent. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2020 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 protein content and sawfly cutting are summarized in Table 6.

Summary:

Above average precipitation throughout northcentral Montana in the fall of 2019 made for very good winter wheat establishment conditions for those seeding early, and recharged soils to set up a favorable cropping environment. However, fall seeding was delayed in many areas where it was too muddy to return to the field for several weeks following the early fall rain and snow. Overall, the growing season started out cooler and drier than average with many crops showing drought stress during early June. Heavy rainfall was spotty during the latter part of June and into early July. Precipitation coupled with prolonged cooler temperatures in July allowed for a longer period of grain fill, resulting in better than anticipated crop yields in several areas. The Loma location suffered from lack of timely precipitation from May through July resulting lower than average winter wheat yields. The Turner location received timely precipitation resulting in very good 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 eleventh 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:
Peyton Brown, Jonathan Erickson, Daisen Fox, Faith Gasvoda, Isabella Lawless, Tracey Reed, Erin Taylor and Ivy Thomas.

TABLE 1. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2020. (Exp# 20-3851-WW)

ID	CULTIVAR or SELECTION	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
AAC Wildfire	Alberta: SECAN, 2015	25.4	59.7	59.5	13.7	382	12.8
Bobcat	Montana, 2019	24.4	55.7	60.5	14.0	423	**4.5**
Brawl CLP	Colorado Research Foundation, 2011	20.0	33.9	61.8	14.5	355	11.1
Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	27.3	55.8	61.1	12.8	367	22.1
Decade	Montana/North Dakota, 2010	24.8	53.4	60.6	14.4	393	17.5
Flathead	Montana, 2019	23.1	43.4	60.9	14.3	415	**4.7**
FourOsix	Montana, 2018	24.2	51.0	60.1	13.9	415	13.0
Judee	Montana, 2011	25.2	57.1	61.1	14.7	386	**4.1**
Keldin	Westbred, 2011	24.7	56.3	60.0	14.1	381	**10.1**
LCS Jet	Limagrain Cereal Seeds, 2015	21.3	45.1	58.1	13.8	351	**5.0**
Loma	Montana, 2016	23.8	58.0	60.3	14.3	346	**4.5**
Northern	Montana, 2015	24.6	56.9	60.2	14.1	430	15.4
Ray	Montana, 2018	32.0	51.8	58.5	13.8	**457**	17.7
StandClear CLP	Montana/Loveland Products Inc., 2020	26.1	57.9	**61.9**	13.6	385	**9.4**
SY Clearstone 2CL	Montana/Syngenta, 2012	26.1	54.5	60.0	14.1	417	23.5
SY Monument	Syngenta, 2015	23.9	51.9	60.0	13.0	406	**8.5**
Warhorse	Montana, 2013	24.2	49.7	60.2	14.5	**437**	**5.0**
Yellowstone	Montana 2005	25.6	51.2	60.3	14.0	408	17.1
MT1683	Yellowstone(L)*2/CDC Buteo	25.1	53.2	59.9	14.2	412	16.8
MT1745	Decade*2/NI06732	24.4	55.3	61.2	13.0	430	19.1
MT1746	MT06103//MTW0881/SD06W166	21.8	54.2	**62.2**	13.6	426	**8.0**
MT1793	Decade-Fhb1	24.0	51.2	60.3	**15.2**	424	**8.4**
MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL011	22.2	51.2	60.7	13.6	383	**7.9**
MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/3*YLL	21.8	54.6	59.5	14.1	397	12.9
MTS18149	Loma*2/AAC Gateway	22.2	**66.9**	60.4	13.9	400	**0.0**
EXPERIMENTAL MEANS		96.8	53.2	60.4	14.0	401.1	11.2
LSD (0.05)		ns	4.7	0.6	0.3	17.8	10.8
C.V.%		3.7	5.4	0.5	1.5	2.5	40.0
P-VALUE (Varieties)		0.1347	<.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 (20-3851-WW)

Seeding Date:	September 27, 2019
Harvest Date:	August 21, 2020
Fertility:	125-20-10-10 side banded
System:	no till
Herbicide:	Bromac (16oz/ac), Affinity (0.7oz/ac), Discover (12.8oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow - Durum
Precipitation:	5.93" April 1 to Harvest Maturity

TABLE 2. Nine-Year Yield and Test Weight Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2020. (Exp# 3851-WW).

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	**9-YR COMP. AVE. YIELD 5/**	TEST WEIGHT (Pounds Per Bushel) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	**9-YR COMP. AVE. TEST WT 5/**
MTS1588	BOBCAT (++)	4		22.9	34.5	73.4	55.7	46.6	103.0	**48.5**		57.6	62.0	59.8	60.5	60.0	101.5	**60.6**
MT00159	YELLOWSTONE (+)	9	65.0	19.1	36.1	74.7	51.2	47.1	100.0	**47.1**	59.7	55.5	61.4	59.3	60.3	59.7	100.0	**59.7**
MTS1224	LOMA (++)	6	59.8	21.3	35.4	70.9	58.0	47.5	99.4	**46.8**	60.2	57.1	61.8	58.9	60.3	59.7	100.7	**60.1**
MT0978	NORTHERN (+)	7	59.0	21.3	38.3	65.4	56.9	47.7	95.4	**44.9**	60.2	57.3	61.8	59.7	60.2	60.0	100.8	**60.1**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	8	60.6	19.0	33.1	61.8	54.5	43.9	93.9	**44.2**	59.4	56.6	61.1	59.1	60.0	59.4	99.9	**59.6**
MTS0713	JUDEE (+)(saw fly tol)	9	63.8	18.1	31.6	59.0	57.1	43.8	93.0	**43.8**	57.2	55.9	62.6	60.2	61.1	59.7	100.0	**59.7**
MTCS1601	STANDCLEAR CLP (P+)	3			35.5	55.9	57.9	49.8	92.2	**43.4**			62.1	60.3	61.9	61.4	101.8	**60.8**
MTF1432	RAY (++)	4		18.2	34.9	61.7	51.8	41.7	92.0	**43.3**		56.6	60.1	57.6	58.5	58.2	98.5	**58.8**
MT0552	DECADE (+)	9	52.7	21.1	35.7	59.4	53.4	43.1	91.6	**43.1**	58.2	56.7	61.8	58.9	60.6	59.8	100.2	**59.8**
MT1465	FOUROSIX (++)	4		19.1	34.3	61.7	51.0	41.5	91.6	**43.1**		57.1	61.7	58.6	60.1	59.4	100.4	**59.9**
ACS55017	KELDIN (P+)	5	48.3	20.8	33.4	63.9	56.3	44.5	90.5	**42.6**	59.3	57.5	61.9	59.7	60.0	59.7	100.8	**60.1**
MTS0808	WARHORSE (+)(saw fly tol)	9	59.9	16.9	31.5	51.9	49.7	40.0	84.9	**40.0**	60.4	57.7	60.4	58.7	60.2	60.3	101.0	**60.3**
Syngenta	SY MONUMENT (P+)	4		18.7	27.2	55.2	51.9	38.3	84.5	**39.8**		55.2	61.2	58.8	60.0	58.8	99.5	**59.4**
Limagrain	LCS JET (P+)	3			32.6	55.4	45.1	44.4	82.1	**38.6**			58.8	56.4	58.1	57.8	95.8	**57.2**
MT1564	FLATHEAD (++)	3			28.1	52.2	43.4	41.2	76.3	**35.9**			61.7	59.3	60.9	60.6	100.5	**60.0**
CO Res Fdn	BRAWL CLP (++) (CL)	4		16.4	22.0	46.6	33.9	29.7	65.7	**30.9**		57.7	62.7	59.8	61.8	60.5	102.4	**61.1**
MEANS (For Entries Listed)			58.6	19.4	32.8	60.6	51.7			**42.2**	59.3	56.8	61.5	59.1	60.3			**59.8**
6/ Growing Season Precipitation (in.)			11.4	2.9	4.7	3.0	5.9	7.7										
Soil PAW (in.) to SD @ Planting			7.9	5.8	7.3	7.6	9.4	7.5										
Total Plant Available Water (in.)			19.4	8.7	12.0	10.5	15.3	15.6										
Soil NO3 (lbs.) to SD at Planting			26	72	64	115	231	71										
SD (Sampling Depth in Inches)			48	48	38	48	45	47										
Fertilizer Applied	(# N)		100	100	125	125	125	102										
	(# P_2O_5)		20	20	20	20	20	24										
	(# K_2O)		10	10	10	10	10	13										
	(#S)		0	0	10	10	10	3										

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. No harvest in 2014 due to hail.

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

5/ 9-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 = 9-Yr average yield or test weight for the check variety Yellowstone.

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

TABLE 3. Nine-Year Protein and Sawfly Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2020. (Exp# 3851-WW).

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ PROTEIN % (Adjusted to 13% grain moisture) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK PROTEIN 4/	**9-YR COMP. AVE. PROTEIN 5/**	SAWFLY RATING (% of cut and lodged stems) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK SAWFLY 4/	**9-YR COMP. AVE. SAWFLY 5/**
MTS0808	WARHORSE (+)(saw fly tol)	9	12.1	14.3	15.7	14.4	14.5	13.1	103.3	**13.1**	0.0	0.3	0.3	0.3	5.0	1.1	15.5	**1.1**
MTS1224	LOMA (++)	6	11.4	14.7	16.1	14.7	14.3	14.1	104.4	**13.2**	0.0	0.3	0.3	0.0	4.5	0.9	26.4	**1.9**
Limagrain	LCS JET (P+)	3			14.6	13.7	13.8	14.0	97.0	**12.2**			0.0	0.0	5.0	1.7	26.6	**1.9**
MTS1588	BOBCAT (++)	4		14.1	15.3	13.8	14.0	14.3	100.2	**12.7**		0.7	0.0	0.7	4.5	1.5	30.1	**2.2**
MT1564	FLATHEAD (++)	3			16.1	14.7	14.3	15.1	104.1	**13.1**			0.0	1.0	4.7	1.9	30.5	**2.2**
MTS0713	JUDEE (+)(saw fly tol)	9	11.7	14.9	16.6	14.6	14.7	13.2	104.1	**13.2**	0.0	0.0	0.0	0.0	4.1	2.2	31.2	**2.2**
Syngenta	SY MONUMENT (P+)	4		12.1	14.8	13.4	13.0	13.3	93.3	**11.8**		0.7	0.0	0.3	8.5	2.4	48.8	**3.5**
MTCS1601	STANDCLEAR CLP (P+)	3			15.8	14.0	13.6	14.5	100.1	**12.6**			0.0	0.3	9.4	3.2	51.8	**3.7**
CO Res Fdn	BRAWL CLP (++)(CL)	4		13.0	16.1	15.2	14.5	14.7	102.8	**13.0**		0.0	0.3	0.7	11.1	3.0	62.0	**4.4**
MT0978	NORTHERN (+)	7	12.0	14.3	15.8	14.3	14.1	13.8	104.4	**13.2**	0.0	0.3	0.0	0.3	15.4	2.4	65.3	**4.7**
ACS55017	KELDIN (P+)	5	11.0	13.3	15.2	13.9	14.1	13.5	99.3	**12.5**	0.0	1.0	1.0	1.0	10.1	2.6	67.3	**4.8**
MT1465	FOUROSIX (++)	4		14.2	15.5	14.3	13.9	14.5	101.4	**12.8**		0.3	0.7	0.3	13.0	3.6	73.5	**5.3**
MT0552	DECADE (+)	9	11.5	14.5	16.3	14.7	14.4	13.3	105.5	**13.3**	0.0	0.3	1.0	0.0	17.5	6.2	87.2	**6.2**
MT00159	YELLOWSTONE (+)	9	10.8	13.7	15.3	14.1	14.0	12.6	100.0	**12.6**	0.0	0.7	0.7	1.0	17.1	7.2	100.0	**7.2**
MTF1432	RAY (++)	4		13.6	15.1	13.8	13.8	14.1	98.5	**12.4**		0.3	1.0	0.7	17.7	4.9	101.3	**7.3**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	8	11.2	14.2	16.0	14.4	14.1	13.1	102.0	**12.9**	0.0	0.0	1.0	1.0	23.5	5.6	101.5	**7.3**
MEANS (For Entries Listed)			11.5	13.9	15.6	14.3	14.1			**12.8**	0.0	0.4	0.4	0.5	10.7			**4.1**
6/ Growing Season Precipitation (in.)			11.4	2.9	4.7	3.0	5.9	7.7										
Soil PAW (in.) to SD @ Planting			7.9	5.8	7.3	7.6	9.4	7.5										
Total Plant Available Water (in.)			19.4	8.7	12.0	10.5	15.3	15.6										
Soil NO3 (lbs.) to SD at Planting			26	72	64	115	231	71										
SD (Sampling Depth in Inches)			48	48	38	48	45	47										
Fertilizer Applied		(# N)	100	100	125	125	125	102										
		(# P2O5)	20	20	20	20	20	24										
		(# K2O)	10	10	10	10	10	13										
		(#S)	0	0	10	10	10	3										

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. No harvest in 2014 due to hail.

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

5/ 9-Yr Comparable Average = (x/y) * z where x = average protein or sawfly rating of a given entry for years tested, y = average protein or sawfly rating for Yellowstone for the same years, and z = 9-Yr average protein or 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. 2020. (Exp# 20-3853-WW)

ID	CULTIVAR or SELECTION	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
AAC Wildfire	Alberta: SECAN, 2015	27.8	56.3	58.6	**13.9**	364	10.9
Bobcat	Montana, 2019	27.5	59.2	60.4	13.5	405	**4.3**
Brawl CLP	Colorado Research Foundation, 2011	27.0	**62.1**	**61.5**	13.0	418	**2.4**
Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	28.5	**62.7**	59.0	13.0	373	8.7
Decade	Montana/North Dakota, 2010	27.9	59.8	59.0	13.8	445	**7.8**
Flathead	Montana, 2019	28.2	61.0	59.7	13.5	408	**6.1**
FourOsix	Montana, 2018	26.9	56.4	59.6	**13.9**	411	17.4
Judee	Montana, 2011	**29.3**	55.8	59.8	**14.3**	440	**4.2**
Keldin	Westbred, 2011	26.8	58.4	59.5	13.4	**484**	14.6
LCS Jet	Limagrain Cereal Seeds, 2015	22.8	46.8	57.3	13.1	368	14.9
Loma	Montana, 2016	27.4	**61.7**	59.8	13.8	393	13.1
Northern	Montana, 2015	**28.8**	**67.8**	60.0	**13.9**	**487**	**4.7**
Ray	Montana, 2018	**31.5**	58.7	59.2	13.5	415	11.7
StandClear CLP	Montana/Loveland Products Inc., 2020	26.4	56.1	**61.2**	13.7	417	11.6
SY Clearstone 2CL	Montana/Syngenta, 2012	**28.8**	**66.2**	59.2	13.7	**490**	10.3
SY Monument	Syngenta, 2015	25.6	59.4	58.9	12.3	359	**3.4**
Warhorse	Montana, 2013	26.6	52.4	59.8	**13.9**	443	**3.9**
Yellowstone	Montana 2005	28.2	59.6	59.8	13.5	412	**5.5**
MT1683	Yellowstone(L)*2/CDC Buteo	**30.4**	**62.5**	59.3	13.6	417	**5.6**
MT1745	Decade*2/NI06732	27.3	**64.3**	60.5	12.8	437	**1.5**
MT1746	MT06103//MTW0881/SD06W166	25.4	58.7	**61.1**	13.1	416	9.2
MT1793	Decade-Fhb1	25.6	57.5	59.8	**14.1**	444	10.4
MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL011	27.4	57.4	58.8	13.0	391	**6.9**
MTCL1737	YLL-2CL/3/YLL*2/Pelsart//PROM/3*YLL	26.5	**67.1**	59.7	13.7	396	**3.9**
MTS18149	Loma*2/AAC Gateway	24.9	57.3	59.9	**14.2**	389	**6.0**
EXPERIMENTAL MEANS		27.3	59.4	59.7	13.5	416.9	8.0
LSD (0.05)		2.9	6.2	0.8	0.5	28.1	6.3
C.V.%		5.8	5.7	0.7	1.8	3.9	44.3
P-VALUE (Varieties)		0.0008	<.0001	<.0001	<.0001	<.0001	0.0002

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 (20-3853-WW)	
Seeding Date:	September 27, 2019
Harvest Date:	August 16, 2020
Fertility:	125-20-10-10 side banded
System:	no till
Herbicide:	Bromac (16oz/ac), Affinity (0.7oz/ac), Disocver (12.8oz/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. 2011-2020. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	**10-YR COMP. AVE. YIELD 5/**	TEST WEIGHT (Pounds Per Bushel) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	**10-YR COMP. AVE. TEST WT 5/**
MTS1588	BOBCAT (++)	4		49.7	66.5	73.9	59.2	62.3	116.5	**68.5**		61.1	61.0	61.8	60.4	61.1	102.7	**60.1**
Syngenta	SY MONUMENT (P+)	4		40.0	63.3	74.2	59.4	59.2	110.7	**65.1**		60.1	60.3	60.4	58.9	59.9	100.8	**59.0**
CO Res Fdn	BRAWL CLP (++)(CL)	4		48.8	61.4	61.0	62.1	58.3	109.0	**64.1**		61.7	62.1	61.6	61.5	61.7	103.8	**60.7**
MTS0978	NORTHERN (+)	8	41.3	43.9	63.3	60.7	67.8	56.2	107.6	**63.3**	51.6	60.2	60.1	60.3	60.0	58.8	100.6	**58.8**
ACS55017	KELDIN (P+)	5	51.6	38.7	62.7	63.6	58.4	55.0	106.5	**62.7**	56.3	60.2	60.2	60.7	59.5	59.4	101.6	**59.4**
MTF1432	RAY (++)	4		41.4	59.2	61.6	58.7	55.2	103.2	**60.7**		58.4	57.6	59.6	59.2	58.7	98.8	**57.8**
MT1465	FOUROSIX (++)	4		43.4	59.6	61.3	56.4	55.2	103.1	**60.7**		60.8	59.6	60.5	59.6	60.1	101.2	**59.2**
MT00159	YELLOWSTONE (+)	10	44.1	42.5	58.9	53.2	59.6	53.9	100.0	**58.9**	54.5	59.9	58.9	59.2	59.8	58.5	100.0	**58.5**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	9	40.6	38.4	59.9	55.4	66.2	52.9	99.9	**58.8**	54.1	60.2	58.5	59.4	59.2	58.0	99.6	**58.2**
MT1564	FLATHEAD (++)	3			54.6	54.5	61.0	56.7	99.1	**58.4**			61.3	60.9	59.7	60.6	102.3	**59.8**
MTS0713	JUDEE (+)(saw fly tol)	10	42.1	41.1	56.8	62.0	55.8	52.4	97.3	**57.3**	53.8	60.9	60.2	62.4	59.8	59.4	101.7	**59.4**
MTS1224	LOMA (++)	6	28.1	41.5	57.7	60.0	61.7	48.8	96.2	**56.6**	53.3	60.5	58.5	60.7	59.8	58.1	100.0	**58.5**
MT0552	DECADE (+)	10	35.4	40.4	61.5	61.3	59.8	50.6	93.9	**55.3**	53.5	60.0	60.0	61.0	59.0	58.7	100.4	**58.7**
MTCS1601	STANDCLEAR	3			54.5	50.5	56.1	53.7	93.9	**55.3**			60.8	60.9	61.2	61.0	102.8	**60.1**
Limagrain	LCS JET (P+)	3			51.4	58.3	46.8	52.2	91.2	**53.7**			56.7	57.8	57.3	57.3	96.6	**56.5**
MTS0808	WARHORSE (+)(saw fly tol)	10	36.2	40.6	43.5	44.5	52.4	48.3	89.7	**52.8**	55.9	60.8	59.5	61.4	59.8	59.2	101.2	**59.2**
MEANS (For Entries Listed)			39.9	42.3	58.4	59.7	58.8			**59.5**	54.1	60.4	59.7	60.5	59.7			**59.0**
6/ Growing Season Precipitation (in.)			8.0	n/a	n/a	n/a	n/a	8.3										
Soil PAW (in.) to SD @ Planting			8.7	n/a	7.5	8.2	7.4	8.0										
Total Plant Available Water (in.)			16.7	n/a	n/a	n/a	n/a	17.4										
Soil NO3 (lbs.) to SD at Planting			194	n/a	147	100	115	101										
SD (Sampling Depth in Inches)			48	48	48	48	48	48										
Fertilizer Applied	(# N)		100	100	100	125	125	99										
	(# P_2O_5)		20	20	20	20	20	24										
	(# K_2O)		10	10	10	10	10	13										
	(#S)		0	0	10	10	10	3										

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 Protein and Sawfly 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. 2011-2020. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ PROTEIN % (Adjusted to 13% grain moisture) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK PROTEIN 4/	**10-YR COMP. AVE. PROTEIN 5/**	SAWFLY RATING (% of cut and lodged stems) 2016	2017	2018	2019	2020	AVE. for YEARS TESTED 3/	% of CHECK SAWFLY 4/	**10-YR COMP. AVE. SAWFLY 5/**
MTS0808	WARHORSE (+)(saw fly tol)	10	17.0	16.0	14.6	14.1	13.9	14.1	103.7	**14.1**	0.0	13.3	17.2	16.6	3.9	7.1	21.5	**7.1**
MTS1588	BOBCAT (++)	4		15.2	13.6	11.8	13.5	13.5	96.3	**13.1**		24.4	7.2	6.3	4.3	10.5	24.1	**8.0**
MTS1224	LOMA (++)	6	17.4	14.9	14.5	13.3	13.8	14.8	101.8	**13.8**	3.7	38.4	32.3	22.3	13.1	20.5	64.2	**21.2**
MTS0713	JUDEE (+)(saw fly tol)	10	18.3	16.0	13.9	12.1	14.3	13.8	101.7	**13.8**	0.7	40.6	65.0	41.0	4.2	22.9	69.2	**22.9**
MTCS1601	STANDCLEAR	3			14.0	12.8	13.7	13.5	98.9	**13.4**			48.4	45.0	11.6	35.0	73.0	**24.2**
CO Res Fdn	BRAWL CLP (++)(CL)	4		14.7	14.9	13.3	13.0	14.0	99.4	**13.5**		31.3	73.9	39.3	2.4	36.7	84.2	**27.9**
MT0552	DECADE (+)	10	17.2	15.3	14.6	11.8	13.8	13.8	101.5	**13.8**	5.0	51.8	76.5	34.8	7.8	29.2	88.1	**29.2**
MT1564	FLATHEAD (++)	3			13.7	13.3	13.5	13.5	99.0	**13.4**			65.4	55.7	6.1	42.4	88.5	**29.3**
Syngenta	SY MONUMENT (P+)	4		13.7	12.8	12.0	12.3	12.7	90.3	**12.2**		53.7	65.8	38.2	3.4	40.3	92.3	**30.6**
MTF1432	RAY (++)	4		15.1	14.6	11.9	13.5	13.8	98.1	**13.3**		50.7	67.1	31.9	11.7	40.3	92.5	**30.6**
MT0978	NORTHERN (+)	8	18.3	15.6	14.3	13.1	13.9	14.9	103.3	**14.0**	2.3	31.6	75.7	50.5	4.7	25.0	94.6	**31.3**
MT00159	YELLOWSTONE (+)	10	17.0	15.3	14.1	13.3	13.5	13.6	100.0	**13.6**	2.3	30.6	84.8	53.5	5.5	33.1	100.0	**33.1**
Limagrain	LCS JET (P+)	3			13.9	11.6	13.1	12.9	94.5	**12.8**			89.9	52.8	14.9	52.5	109.6	**36.3**
MTCL1077	SY CLEARSTONE 2CL (P+)(CL)	9	17.1	15.6	14.5	12.4	13.7	13.8	99.5	**13.5**	3.7	46.0	79.4	62.2	10.3	37.9	110.3	**36.5**
MT1465	FOUROSIX (++)	4		15.0	13.9	12.1	13.9	13.7	97.7	**13.3**		57.9	74.6	65.5	17.4	53.9	123.5	**40.9**
ACS55017	KELDIN (+)	5	16.6	15.0	13.9	12.5	13.4	14.3	97.6	**13.2**	6.7	78.0	80.7	48.9	14.6	45.8	129.4	**42.9**
MEANS (For Entries Listed)			17.4	15.2	14.1	12.6	13.5			**13.4**	3.0	42.2	62.7	41.5	8.5			**28.2**
6/ Growing Season Precipitation (in.)			8.0	n/a	n/a	n/a	n/a	8.3										
Soil PAW (in.) to SD @ Planting			8.7	n/a	7.5	8.2	7.4	8.0										
Total Plant Available Water (in.)			16.7	n/a	n/a	n/a	n/a	17.4										
Soil NO3 (lbs.) to SD at Planting			194	n/a	147	100	115	101										
SD (Sampling Depth in Inches)			48	48	48	48	48	48										
Fertilizer Applied	(# N)		100	100	100	125	125	99										
	(# P_2O_5)		20	20	20	20	20	24										
	(# K_2O)		10	10	10	10	10	13										
	(#S)		0	0	10	10	10	3										

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 protein or sawfly 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 protein or sawfly rating of a given entry for years tested, y = average protein or sawfly rating for Yellowstone for the same years, and z = 10-Yr average protein or sawfly rating for the check variety Yellowstone.

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