2022

WINTER WHEAT VARIETY PERFORMANCE

Montana counties and districts

by the Montana State University Agricultural Experiment Station

The information in this publication can also be found at a link

https://plantsciences.montana.edu/crops/index.html

Another variety selection tool is available at:

http://www.sarc.montana.edu/php/varieties/winter_wheat/

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2022 MONTANA WINTER WHEAT VARIETY PERFORMANCE SUMMARY

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Introduction

In this publication, the agronomic characteristics of hard winter wheat varieties recently developed or evaluated by the Montana Agricultural Experiment Station (MAES) are compared with varieties commonly grown in Montana. The information presented in this publication was extracted from the Intrastate Winter Wheat Nursery, 2022. This data is provided by research personnel of MAES, NDSU, and private entities. Where available, up to four years of yield data are shown for the varieties. In some years data are not available because of hail, winter-kill, or other unavoidable circumstances.

Variety Testing Procedures

Locations

Hard winter wheats were planted at 8 Montana and 1 North Dakota location (Fig. 1) including Conrad, Ft. Benton, and Havre (North Central District), Moccasin (Central District), Huntley (Southern District), Sidney and Williston, ND (Northeast District), Kalispell (Northwest District), and Bozeman (Southwest District).

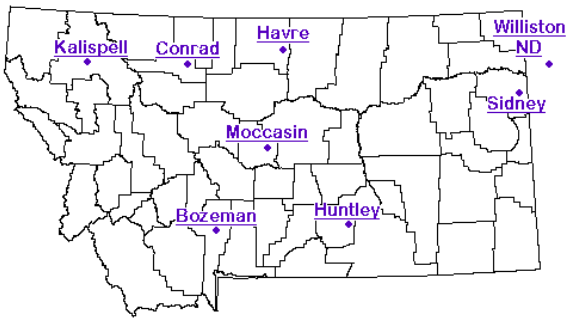

Figure 1. Test Locations for Montana hard winter wheat performance tests in 2021.

Experimental Design and Seeding Methods

The Intrastate Winter Wheat Test consists of 49 entries in 3 replicates. These tests are planted as 7x7 lattices or a randomized complete block design at each location. Plot size varies by location, from 35 ft^2 at Conrad to 60 ft^2 at Havre. Row number also varies; Bozeman and Havre are 3-row, Conrad, Huntley, Ft. Benton, and Sidney are 4-row, Moccasin (5-row), Kalispell (7-row), and Williston (8-row). Row spacing at all locations was on 1 ft. centers, except at Williston and Kalispell (6" centers). All plots were seeded at 1 million seeds/acre, except at Kalispell (1.25 million) and Williston (1.17 million seeds/acre). Information on cropping history, seeding date, fertilizer applications, and harvest date is available for most testing locations in Table 1.

All seed, for each nursery, was treated with CruiserMaxx Vibrance Cereals® seed treatment and Gaucho® insecticide seed treatment, at recommended rates, before seeding.

Entries

Names of commercially available hard winter wheat varieties and experimental lines evaluated in 2022 are listed in Table 2 with their origins, experimental designation, release year, and pedigrees. Forty-nine hard wheats are included in this summary comprising 34 varieties (13 public and 21 private) and 15 experimental lines.

Data Collection & Reporting

Yield

All rows of each plot are trimmed and measured prior to harvesting with an experimental plot combine. Grain yields are reported in bushels per acre based on a 60-pound standard bushel weight. In addition to yields obtained in 2022, data is provided for two (2021-2022), three (2020-2022) and four (2019-2022) year averages for hard wheat entries tested during previous cropping seasons.

Test Weight

Test weights (pounds per bushel) were obtained for each plot by using a DICKEY-john® Grain Analysis Computer (GAC) at some locations. Other locations use a Seedburo® test weight apparatus. In this case, a sample is dropped through a funnel at a given height into a quart brass bucket, excess grain is removed by a flat stick then weighed on a gram scale, and grams per quart are converted into pounds per bushels.

Heading Date

Heading date is recorded when 50% of the heads in a plot are extended above the flag-leaf collar. Heading dates are recorded both in ordinal date (number of days from January 1) and the actual calendar date.

Plant Height

Plant height is measured, in inches, from the soil surface to the top of the head, excluding the awns.

Grain Protein

Grain protein is sampled from a composite of all 3 replicated plots at each location. It is reported as a percentage by NIR (near-infrared reflectance) using an Infratec® whole grain analyzer. Samples are adjusted to a 12% moisture basis.

Wheat Stem Sawfly

Wheat stem sawfly (WSS) is a persistent and economic problem for wheat growers in Montana. Currently, Montana wheat

acreage infested by WSS is primarily in the north central (District 5) and central (District 4) cropping districts. Host plant resistance in the form of stem solidness has been effective in reducing sawfly losses in both spring and winter wheat. Current MSU/MAES solid-stemmed winter wheat varieties include: Judee, (released in 2011), Bearpaw (2011), Warhorse (2013), Loma (2016), Bobcat (2019) StandClear CLP (2020), and MT WarCat (2022).

Table 8 and Table 9 contain information on grain yield and sawfly cutting percentage at Ft. Benton and Havre locations where sawfly pressure was present in 2022 and Stem solidness scores (rated on a 5-25 scale) are shown for solid and semi-solid varieties.

Disease Reactions

Disease reactions for hard red wheat varieties are listed in Table 13. There is information on dwarf smut, stripe rust, and stem rust.

Statistical Analyses and Interpretation

The data collected at each winter wheat location was analyzed as a three-replication lattice or randomized complete block design. Least significant difference at the 0.05 probability level (LSD, p = 0.05) and coefficients of variation (CV) were calculated from analysis of variance at each location. The LSD is used to compare the performance of two specific varieties at a time. If the difference between two varieties exceeds the LSD, this is interpreted as a true difference because a difference between two varieties this large will only occur 5% of the time due to chance.

2022 Test Conditions

The Montana Agricultural Statistics Service reported statewide winter wheat yields at 33 bushels per acre (bu/ac) for 2022, up 2.0 bu/ac from the 2021 season. The harvested acreage in 2022 was 1.80 million acres (total production = 59.40 million bu) compared to 1.73 million acres harvested in 2021 (total production = 53.63 million bu).

Grain yield for the 8 locations harvested averaged 62.8 bushels per acre (bu/ac). Across locations, average yield ranged from 21.8 bu/ac at Williston, N.D. (severe drought, spring emergence) to 126.7 bu/ac at Kalispell. Grain yield of named varieties, across 8 locations harvested, ranged from a low of 54.4 bu/ac for ‘CP7050AX’ to a high of 69.5 bu/ac for ‘Milestone’.

Test weight averaged 58.0 pounds per bushel (lb/bu) across the 8 locations harvested, down 0.7 lb/bu from 2021 (58.7 lb/bu average).

Variety Selection

Tables 3 through 13 present data for hard winter wheat varieties harvested at all experiment station sites and statewide performance in 2022. Where a variety has been in the Intrastate test for two, three, or four years, combined analyses of the yield data over years are presented.

Variety selection should be based on yield stability at a particular location or within a particular district over a period of years. Selection should also consider important trait performance based on test weight, winter-hardiness, heading date, plant height, protein, stem-solidness, and disease resistance.

Table 1. Summary of agronomic practices used on hard winter wheat performance trials in 2022

Location	District	Field Cropping History		Fertilizer Application[1] (lb/ac)					Seeding Date	Harvest Date
				N		P_2O_5	K_2O	S		
		2020	2021	Fall '21	Spring '22				2021	2022
Kalispell	1	Spring Wheat	Peas	NA	80	NA	NA	NA	24-Sep	12-Aug
Bozeman	2	Oats	Fallow	218	NA	31	NA	NA	29-Sep	20-Aug
Huntley	3	-	-	-	-	-	-	-	-	-
Moccasin	4	Lentil/Pea CC	Fallow	20	120	30	20	10	15-Sep	8-Aug
Havre	5	Spring Wheat	Fallow	125	37	20	10	10	15-Sep	5-Aug
Conrad	5	-	-	-	-	-	-	-	-	-
Fort Benton	5	-	Fallow	30	103	20	20	9	29-Sep	-
Sidney	6	Field Peas	Fallow	34	40	30	NA	NA	28-Sep	4-Aug
Williston	6	Spring Wheat	Oats (Hay)	6	NA	20	NA	5	14-Sep	5-Aug

[1] = Fall nitrogen (N), phosphorus (P_20_5), and potassium (K_2O) were preplant applied and incorporated
NA = No Application
- = Data not available

Table 2. Public and Private Hard Winter Wheat Varieties and Experimental Lines in the 2022 Intrastate Test

Variety	Experimental Designation	Origin	Release Year	Pedigree	Public or Private
AAC Wildfire	**W512**	Alberta/ SECAN	**2015**	((Norstar*5/PGR16635, AMN4LV) /6/ (RWA53, PI294994/3/ I3C//Norwin/ Blizzard/4/2*AC Readymade /5/ Norstar*5/PGR16635// 2*Redwin/3/ AC Readymade) /7/ (A7257W-71-2-1/ A77695W, ID337-R1)// CDC Kestrel, **L99-1236**) /8/ **AC Bellatrix**	Public
Battle AX	**CO15A018**	Colorado: Plainsgold/ Colorado Research Foundation/ Montech	**2019**	AF28/Byrd//AF26/Byrd/3/AF28/Byrd//AF10 M3/2*Byrd	Public
Bobcat	**MTS1588**	Montana	**2019**	selection from a composite of 2 crosses: 07X291, ((SMN82164/ SMN82140//Rocky/Tiber, MT9659)/3/S87-101/4/Pronghorn, MT0598)/5/(98X366E29-1, Heyne/Rampart//(MT9513, BigSky sib)) and 07X295, (((Lew/Tiber//Redwin ,MTS92021)/3/Judith/Arapahoe, MTS0023)/4/Pryor/ Genou, 01X258C1)/5/MT0598	Public

Variety	Experimental Designation	Origin	Release Year	Pedigree	Public or Private
Brawl CL Plus	**CO06052**	Colorado: Plainsgold/ Colorado Research Foundation	**2011**	Teal 11A/Above//(CO99314, TX91V4931/ Halt)	Public
Flathead	**MT1564**	Montana	**2019**	selection from a composite of 2 crosses: 07X76, Yellowstone*2/5/ (PI640431, BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet/3/ WA007900//Yr15/ 6*Avocet) and 07X77, Yellowstone/PI640431/4/(Yellowstone(340,233),Yellowstone* 5/3/ (Yellowstone sib, MT9982)//(MTS0222, Rampart*2/Judith))	Public
Fortify SF	**CO15SFD107**	Colorado: Plainsgold/ Colorado Research Foundation	**2019**	Byrd/Bearpaw//Byrd	Public
FourOsix	**MT1465**	Montana	**2018**	selection from a composite of 5 crosses: 06X272, Yellowstone/ (MT0684, a composite - see pedigree); 06X276, Yellowstone/ (MT06102, , a composite - see pedigree); 06X278, Yellowstone/7/ (MT06110, (Arapahoe/3/Brule//Hiplains/ Newton, SD93528)/6/ (MT9409, Tiber/5/ (TAM W-103/Froid/4/Yogo//Turkey Red/ Oro/3/Centurk, MT8030))); 06X282, Yellowstone/3/(MT06123, '2174'/(MT9440, BigSky sib)//BigSky); and 06X285, Yellowstone/7/ (98X168E1, (Nuwest/4/ (MT88001, Sawmont/Tendoy /3/Yogo// Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn);	Public
Judee	**MTS0713**	Montana	**2011**	(Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon	Public
Loma	**MTS1224**	Montana	**2016**	Yellowstone/5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, MTS0112)/4/(MTS0125, selection from a composite of 4 crosses)	Public
Northern	**MT0978**	Montana	**2015**	selection from a composite of 2 crosses: 00X248, (Yellowstone sib, MT9982)/4/((MT8709, Erhardt sib)/NuWest//Erhardt, MTW0072)/3/ (NW97S151, KSSB0192-3/NE89529) and 00X249, (Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/Plainsman V //Ulianovka) ,MTW0047)/4/MTW0072/NW97S151	Public
Warhorse	**MTS0808**	Montana	**2013**	selection from a composite of 3 crosses: 00X182, ((Froid/Winoka/7/ ((Sinvalocho/Wichita// Hope/Cheyenne /3/Wichita/4/Seu Seun 27, TX55-391-56-D8)/5/Westmont, MT6928)/6/ Trader, MT85200)/8/ Redwin, MT9908)/9/ Nuplains/6/(MTS9862, (NuWest/ Lovrin 24 /4/((Rego/Cheyenne, Sel. 39-18-7)// Winalta, MT7431)/3/(MT7115, Yogo/T. polonicum-70-5), MT91366)/5/ (MTS92137, Lew/Tiber//Redwin)); 00X183, Nuplains/MTS9862/4/ (MTW0047, Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/ Plainsman V //Ulianovka)); and 00X184, Nuplains/MTS9862/5/(MTS0028, Vanguard/4/(Lew/Tiber//Redwin, MTSF1570)/3/ Norstar)	Public

Variety	Experimental Designation	Origin	Release Year	Pedigree	Public or Private
Whistler	**CO13D1783**	Colorado: Plainsgold/ Colorado Research Foundation	**2018**	CO08W218/Snowmass//Byrd	Public
Yellowstone	**MT00159**	Montana	**2005**	F_2 composite of Promontory/Judith and Judith-dwarf/Promontory	Public
AP Bigfoot		Syngenta	**2021**	na	Private
AP Solid	**NP13005004#49**	Syngenta	**2021**	na	Private
AP18 AX	**CO14A136**	Colorado Research Foundation/ Syngenta	**2020**	AF10/2*Byrd//AF26/Byrd	Private
Balance	**WA8248**	Washington ; Nutrien	**2020**	BC002-2/Norwest 553-0	Private
CP7017AX	**LCH15ACC-15-17**	CROPLAN	**2020**	T158 /4/ (ACC12, (AF28 / Byrd // AF10 / 2*Byrd) /3/ 2*Byrd)	Private
CP7050AX	**LCH15ACC-7-2**	CROPLAN	**2020**	T153 /4/ (ACC12, (AF28 / Byrd // AF10 / 2*Byrd) /3/ 2*Byrd)	Private
CP7909		CROPLAN	**2018**	na	Private
Keldin	**ACS55017**	Peter Franck: Seed-Link Inc.; Ontario,Canada, Westbred LLC	**2011**	Barenburg 235/Carlisle//TRX-A16-3-2	Private
LCS Helix AX	**LCS15ACC-8-21**	Limagrain LLC	**2020**	LCS Chrome /4/ (ACC7-38, (AF28 / Byrd // AF26 / Byrd) /3/ 2*Byrd)	Private
LCS Julep	**LCH13D-47-1675**	Limagrain LLC	**2020**	na	Private
LCS Steel AX	**LCS 18-7071 AX**	Limagrain LLC	**2021**	na	Private
Milestone	**ACS14132-412**	Dr. Peter Franck, Germany; Nutrien	**2020**	Danby / /HV9W02-846R / CIMMYT-06- 3040	Private
MS Iceman		Meridian Seeds	**2021**	na	Private
MS Maverick		Meridian Seeds	**2021**	na	Private
MS Sundown	**MS 1022**	Meridian Seeds	**2022**	na	Private

Variety	Experimental Designation	Origin	Release Year	Pedigree	Public or Private
Ramsay	**NAS-7653**	Nutrien	**2021**	na	Private
StandClear CLP	**MTCS1601**	Montana/ Loveland Products Inc; Loveland, CO	**2020**	((L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)) ,MTS0531) /13/ (MTS0532, same pedigree as MTS0531) /12/ (Morgan/5/ (88X24D247-?, (Wasatch/Yogo//Rescue/3/Tendoy, Sel. 251, MT88006)/4/Judith)), 96X17E69) /9/((Tiber/5/(MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk), MT9409)*2/6/IMI Fidel, MTCL0309)/7/CDC Teal 11A/8/(MTW01143, Promontory/5/ (MT91366, NuWest/ Lovrin 24 /4/((Rego/ Cheyenne, Sel. 39-18-7)//Winalta, MT7431)/3/NuWest)) /10/(MTCL0510, Rampart*3/Fidel/6/ (MTS9720, Nuwest/4/(MT88001, Sawmont/Tendoy /3/Yogo//Norin 10/Brevor)/5/(MT7863, Froid/Winoka/Centurk))) /11/ (MTS0531, see above)	Private
SY Clearstone 2CL	**MTCL1077**	Syngenta, Montana	**2012**	Yellowstone*4/3/MTCL01158/CDC Teal 11A//Jagalene	Private
SY Wolverine	**08BC379-40-1**	Syngenta	**2019**	Everest / Platte // SY Wolf	Private
WB4510 CLP		Westbred	**2021**	na	Private
WB4619		Westbred	**2021**	na	Private
	20Nord148	NDSU		na	Public Elite
MT WarCat	**MTS18149**	Montana	**2022**	Loma*2/AAC Gateway	Public Elite
	MT1745	Montana		Decade*2/3/(NI06732, HBK0630-4-5// (NE98632, Niobrara/NE91525)	Public Elite
	MT19159	Montana		Northern//02X22cE38/MT10121	Public Elite
	MT19175	Montana		selection from a composite of 2 crosses: 11X202, (Wesley / NE93613, SD08198) // Northern; 11X203, SD08198 /12/ MT1078, ((Karl 92 /10/ (UT000190 (SRW?), Hansel // "wheat" / Ag. podperae /5/ Najah /4/ Delmar /3/ Delmar / PI173438 // Columbia /6 /Hansel, UT1802) /9/ (UT1812, Weston /6/ Delmar /3/ Delmar / PI173438 /4/ Colorow /5/ Warrior / CI13837 /7/ "wheat" / Ag. podperae /8/ PI166921 / Hanse l/3/ Delmar / Columbia // CI13837), MT02113)*4 /11/(MTS0359, Rampart / Mironovskaya 61); and 11X204, SD08198 /4/ (MT10121, Yellowstone*2 /3/ (Yellowstone sib, MT9982) // (MTS0222, Rampart*2 / Judith))	Public Elite
	MT2019	Montana		MT10114/MT10128//MTW1251	Public Elite

Variety	Experimental Designation	Origin	Release Year	Pedigree	Public or Private
	MTCL19151	Montana		(selection from a composite of 2 crosses: 00X248, (Yellowstone sib, MT9982) /4/ ((MT8709, Erhardt sib) / NuWest // Erhardt, MTW0072) /3/ (NW97S151, KSSB0192-3 / NE89529) and 00X249, (Judith / (PI262605, Karagach, RWA resis.) /3/ (S86-740, Norstar / Plainsman V //Ulianovka) ,MTW0047)/ 4/ MTW0072 / NW97S151, MT0871) /5/ (06X445B1-2, SY Clearstone sib)	Public Elite
	MTCL2010	Montana		MT0871/(06X445B1-2, SY Clearstone sib)	Public Elite
	MTCS20156	Montana		Bobcat//(Bobcat sib, MTS1589)/StandClear CLP	Public Elite
	MTF20189	Montana		MT10121*2/MV11-04	Public Elite
	MTFH19132	Montana		((Karl 92 /10/ (UT000190 (SRW?), Hansel // "wheat" / Ag. podperae /5/ Najah /4/ Delmar /3/ Delmar / PI173438 // Columbia /6 /Hansel, UT1802) /9/ (UT1812, Weston /6/ Delmar /3/ Delmar / PI173438 /4/ Colorow /5/ Warrior / CI13837 /7/ "wheat" / Ag. podperae /8/ PI166921 / Hanse l/3/ Delmar / Columbia // CI13837), MT02113)*4 /11/(MTS0359, Rampart / Mironovskaya 61), MT1078 /12/ Colter / Emerson	Public Elite
	MTS1831	Montana		selection from a composite of 2 crosses: 09X203, (selection from a composite of 2 crosses, **see pedigree**, MTS0907)/ (MTS0827, selection from a composite of 2 crosses, **see pedigree)** and 09X211, (selection from a composite of 2 crosses, **see pedigree**, MTS0916)/MTS0827	Public Elite
	MTS1903	Montana		selection from a composite of 2 crosses: 11X1, (Judee sib, MTS0819) /10/ (Yellowstone loppo plant seln, MT08189) /8/ (Yellowstone loppo plant seln, MT08188) /7/ (MT0419-1, Erhardt /5/ (KS92H21-4, (Plainsman IV / Cheney // Odessa / 2*Eagle /3/ Pawnee / DURM, KS82H238-1) /4/ HF5761 / TAM 105 //Bounty 203) /6/ Pronghorn)), 08X350-A6 /9/ Warhorse and 11X2, Spur // 08X350-A6 / Warhorse	Public Elite
	MTS1908	Montana		selection from a composite of 2 crosses: 11X1, (Judee sib, MTS0819) /10/ (Yellowstone loppo plant seln, MT08189) /8/ (Yellowstone loppo plant seln, MT08188) /7/ (MT0419-1, Erhardt /5/ (KS92H21-4, (Plainsman IV / Cheney // Odessa / 2*Eagle /3/ Pawnee / DURM, KS82H238-1) /4/ HF5761 / TAM 105 //Bounty 203) /6/ Pronghorn)), 08X350-A6 /9/ Warhorse and 11X2, Spur // 08X350-A6 / Warhorse	Public Elite
	MTS2068	Montana		(Judee sib, MTS0819)//08X350-A6/Warhorse	Public Elite

Table 3. Hard Winter Wheat: District 1 - Kalispell

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar		
Combined years of data:	1yr	2yr	3yr	4yr	2022	2022	2022	2022	2022
20Nord148	115.7				63.2	160.3	9-Jun	39.1	11.6
AAC Wildfire	**135.8**	**130.9**	**139.8**	**138.4**	64.2	165.8	15-Jun	35.5	11.5
AP Bigfoot	**141.0**				**64.9**	159.7	9-Jun	37.0	11.5
AP Solid	**127.8**	114.9			**65.1**	161.3	10-Jun	33.9	12.2
AP18 AX	**123.6**	123.7			64.3	157.3	6-Jun	35.8	11.4
Balance	**129.7**	129.2			63.8	160.0	9-Jun	37.8	**13.0**
Battle AX	120.2	118.0			63.9	155.3	4-Jun	33.3	12.1
Bobcat	**134.2**	128.8	132.4	128.9	64.7	163.0	12-Jun	32.7	11.7
Brawl CL Plus	112.7	110.2	118.8	116.9	64.3	155.3	4-Jun	35.6	**13.3**
CP7017AX	119.9	112.3			**64.9**	156.3	5-Jun	33.4	11.7
CP7050AX	109.3	105.0			64.2	154.3	3-Jun	36.3	**13.4**
CP7909	91.9	96.6	105.3		64.6	154.0	3-Jun	34.0	12.4
Flathead	**130.5**	**132.1**	**141.3**	**140.1**	64.1	156.3	5-Jun	36.6	11.7
Fortify SF	107.8	115.5			64.1	159.7	9-Jun	35.5	11.4
FourOsix	**126.3**	128.3	133.3	132.0	63.8	161.3	10-Jun	35.0	12.0
Judee	117.6	110.1	122.0	125.2	64.7	160.7	10-Jun	34.3	11.9
Keldin	**147.1**	**138.9**	**148.7**	**145.3**	63.9	161.0	10-Jun	35.9	12.0
LCS Helix AX	**149.0**	**130.6**	140.3		64.6	158.3	7-Jun	39.0	11.0
LCS Julep	**123.3**	122.1			**64.9**	155.3	4-Jun	32.9	12.2
LCS Steel AX	**130.5**	122.4	131.6		63.3	163.0	12-Jun	35.8	11.3
Loma	**122.5**	**130.6**	**141.1**	**137.9**	63.0	163.7	13-Jun	32.1	11.4
Milestone	**144.4**	**142.4**			62.7	159.3	8-Jun	33.0	12.0
MS Iceman	108.1				**65.4**	158.3	7-Jun	33.3	12.7
MS Maverick	**127.1**				**64.9**	160.3	9-Jun	35.7	12.0
MS Sundown (MS 1022)	**124.8**				64.2	155.7	5-Jun	39.1	12.0
MT WarCat	**122.9**	**133.5**	137.7		62.9	166.0	15-Jun	32.4	12.0
MT1745	**136.1**	**136.9**	**147.0**	**141.6**	64.2	162.0	11-Jun	35.4	11.3
MT19159	112.3				63.0	163.3	12-Jun	31.6	11.5
MT19175	**144.8**	**131.1**			62.7	164.0	13-Jun	33.8	11.1
MT2019	**132.7**				63.6	159.7	9-Jun	31.3	11.6
MTCL19151	**121.4**	117.3			63.5	158.7	8-Jun	34.9	12.0
MTCL2010	117.2				63.6	158.0	7-Jun	33.2	12.3
MTCS20156	148.6				64.3	162.7	12-Jun	32.6	12.6
MTF20189	110.8				63.4	163.0	12-Jun	50.0	**13.2**
MTFH19132	**129.0**	129.9			63.5	162.3	11-Jun	37.3	12.1
MTFH20166	113.4				63.4	162.0	11-Jun	37.1	**13.0**
MTS1903	**125.5**	**132.3**			63.9	164.0	13-Jun	33.6	11.3
MTS1908	**125.5**	**132.2**			63.7	164.7	14-Jun	32.8	12.0
MTS2068	**125.9**				64.0	164.3	13-Jun	31.4	11.5
Northern	**129.7**	129.5	**141.0**	**140.4**	63.3	162.7	12-Jun	35.4	11.8
Ramsay	**134.2**	**137.4**			63.7	160.0	9-Jun	33.2	12.1
StandClear CLP	**127.8**	120.4	129.8	127.8	64.3	161.3	10-Jun	36.6	12.7
SY Clearstone 2CL	**144.4**	**139.6**	**147.2**	**145.3**	63.6	161.3	10-Jun	39.9	12.0
SY Wolverine	**142.6**	122.6	134.2	128.7	64.6	158.3	7-Jun	34.8	11.7
Warhorse	**128.2**	119.5	125.8	124.1	63.5	162.0	11-Jun	38.8	12.7
WB4510 CLP	**129.3**				**65.5**	161.3	10-Jun	35.8	12.0
WB4619	116.8				61.6	158.3	7-Jun	34.0	11.5
Whistler	**141.1**	130.3			64.7	160.7	10-Jun	40.4	11.0
Yellowstone	**126.3**	**136.3**	**144.8**	**140.6**	63.2	162.3	11-Jun	37.5	11.2
Average	**126.7**	**125.5**	**134.8**	**134.2**	**63.95**	**160.4**	**9-Jun**	**35.4**	**12.0**
LSD (0.05)	**27.23**	**12.7**	**11.7**	**10.4**	**0.633**	**2.22**		**4.17**	**0.50**
C. V. (%)	**11.12**	**9.8**	**9.8**	**7.1**	**0.51**	**0.71**		**6.07**	**2.15**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland (High Rainfall)

Table 4. Hard Winter Wheat: District 2 - Bozeman

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar		
Combined years of data:	1yr	2yr	3yr	4yr	2022	2022	2022	2022	2022
20Nord148	113.3				62.5	174.7	24-Jun	43.5	13.0
AAC Wildfire	101.4	80.5	84.9	95.0	61.8	180.0	29-Jun	43.0	13.5
AP Bigfoot	128.0				63.0	174.3	23-Jun	39.8	12.5
AP Solid	117.4	90.7			**65.3**	177.3	26-Jun	37.4	12.9
AP18 AX	118.5	91.3			62.4	173.0	22-Jun	38.8	12.4
Balance	120.5	93.0			62.5	174.0	23-Jun	37.6	13.5
Battle AX	121.8	90.2			62.6	173.0	22-Jun	38.0	12.8
Bobcat	113.8	84.6	86.6	94.8	63.1	177.7	27-Jun	35.9	12.9
Brawl CL Plus	125.9	**97.9**	89.9	99.0	64.3	171.0	20-Jun	37.9	13.7
CP7017AX	117.6	89.7			62.9	171.7	21-Jun	36.7	12.1
CP7050AX	109.8	85.5			63.6	171.0	20-Jun	38.5	13.5
CP7909	**140.6**	**106.6**	**95.8**		63.6	168.7	18-Jun	38.9	12.2
Flathead	131.7	**100.8**	**94.1**	104.3	63.6	174.3	23-Jun	40.3	12.8
Fortify SF	112.5	89.1			62.2	174.0	23-Jun	40.7	12.3
FourOsix	113.5	87.7	**93.1**	102.0	62.8	176.7	26-Jun	37.7	12.9
Judee	110.2	82.9	86.0	95.2	63.0	177.3	26-Jun	41.4	12.9
Keldin	**135.1**	**101.9**	**101.2**	**114.1**	63.3	176.0	25-Jun	38.7	12.2
LCS Helix AX	**132.5**	96.5	91.1		63.2	173.7	23-Jun	36.9	11.8
LCS Julep	**134.0**	**106.1**			**64.8**	170.3	19-Jun	38.3	12.9
LCS Steel AX	120.8	94.5	**94.1**		62.1	178.3	27-Jun	40.5	11.5
Loma	124.2	94.1	**94.9**	103.3	61.5	178.7	28-Jun	40.6	12.8
Milestone	**147.1**	**106.9**			60.9	174.3	23-Jun	35.9	12.4
MS Iceman	121.4				64.0	174.0	23-Jun	38.2	14.0
MS Maverick	126.3				63.5	174.0	23-Jun	38.0	13.1
MS Sundown (MS 1022)	123.3				63.3	171.3	20-Jun	41.1	13.1
MT WarCat	111.9	86.8	88.9		62.0	179.7	29-Jun	37.9	12.7
MT1745	122.1	93.9	**93.6**	104.5	62.2	177.3	26-Jun	39.9	12.8
MT19159	112.8				61.1	179.0	28-Jun	37.4	12.8
MT19175	115.4	90.5			61.0	179.3	28-Jun	36.6	11.9
MT2019	123.8				61.8	177.0	26-Jun	36.7	12.1
MTCL19151	125.2	96.5			62.4	174.0	23-Jun	36.5	12.6
MTCL2010	123.5				62.6	173.7	23-Jun	35.2	13.1
MTCS20156	106.6				63.5	179.7	29-Jun	37.7	13.5
MTF20189	75.6				62.9	178.3	27-Jun	54.5	14.9
MTFH19132	118.9	93.1			60.5	176.0	25-Jun	40.1	13.1
MTFH20166	113.4				62.3	176.7	26-Jun	40.1	13.2
MTS1903	117.6	90.7			62.4	180.0	29-Jun	39.5	12.9
MTS1908	116.3	90.9			62.6	180.3	29-Jun	40.6	12.9
MTS2068	120.2				62.6	180.0	29-Jun	40.3	13.2
Northern	112.1	90.2	**93.5**	**106.3**	61.3	178.0	27-Jun	42.2	12.8
Ramsay	**137.8**	**105.0**			62.7	176.0	25-Jun	37.0	12.7
StandClear CLP	117.1	88.1	88.6	98.3	63.5	176.3	25-Jun	40.3	13.4
SY Clearstone 2CL	116.8	88.8	89.9	103.6	61.4	177.7	27-Jun	43.4	13.1
SY Wolverine	130.6	**97.0**	91.3	96.6	63.6	173.7	23-Jun	35.7	13.1
Warhorse	104.5	78.8	77.1	87.6	62.0	177.0	26-Jun	41.8	13.7
WB4510 CLP	122.0				63.8	175.3	24-Jun	38.7	12.2
WB4619	121.3				62.0	174.0	23-Jun	36.5	12.6
Whistler	124.2	93.8			62.8	175.3	24-Jun	40.8	12.0
Yellowstone	123.0	94.2	**93.8**	**105.9**	62.2	177.7	27-Jun	44.1	12.5
Average	**119.9**	**92.8**	**91.0**	**100.7**	**62.7**	**175.7**	**25-Jun**	**39.3**	**12.8**
LSD (0.05)	**12.92**	**7.9**	**8.3**	**8.1**	**0.61**	**1.08**		**1.77**	
C.V. (%)	**5.56**	**6.7**	**6.9**	**7.1**	**0.5**	**0.32**		**2.32**	

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland (High Rainfall)

Table 5. Hard Winter Wheat: District 3 - Huntley

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar		
Combined years of data:	**1yr**	**2yr**	**3yr**	**4yr No Data**	**2022**	**2022**	**2022**	**2022**	**2022**
20Nord148	37.6				55.1	166.3	15-Jun	33.0	14.9
AAC Wildfire	36.5	42.4	54.0		52.5	173.0	22-Jun	35.3	16.0
AP Bigfoot	50.0				55.1	165.0	14-Jun	30.0	14.2
AP Solid	**56.0**	56.3			**57.4**	166.7	16-Jun	34.0	14.5
AP18 AX	47.2	51.4			54.1	165.3	14-Jun	32.0	13.9
Balance	38.1	44.3			52.8	167.3	16-Jun	32.0	**17.2**
Battle AX	46.8	54.1			52.9	165.7	15-Jun	30.0	14.8
Bobcat	47.8	52.5	60.8		54.8	170.0	19-Jun	30.3	16.1
Brawl CL Plus	47.9	54.0	62.8		**56.5**	163.0	12-Jun	31.7	15.2
CP7017AX	48.3	52.7			54.0	165.0	14-Jun	30.3	14.2
CP7050AX	39.1	50.4			**57.4**	162.7	12-Jun	30.7	15.0
CP7909	40.9	55.2	62.7		**56.9**	163.3	12-Jun	30.0	13.5
Flathead	42.9	50.8	60.9		**56.4**	165.7	15-Jun	33.3	14.6
Fortify SF	42.3	51.2			55.4	165.3	14-Jun	33.7	14.9
FourOsix	41.2	52.3	62.9		53.2	169.3	18-Jun	32.7	15.1
Judee	44.6	48.9	58.9		54.4	168.7	18-Jun	33.0	16.3
Keldin	40.9	49.9	64.1		54.6	169.3	18-Jun	32.7	15.4
LCS Helix AX	**51.0**	54.3	62.3		55.7	165.0	14-Jun	30.7	13.8
LCS Julep	43.9	49.5			**57.2**	164.7	14-Jun	30.0	14.8
LCS Steel AX	47.4	50.8	61.0		56.0	170.0	19-Jun	33.7	14.2
Loma	48.6	56.2	65.4		54.8	170.7	20-Jun	32.7	15.4
Milestone	**55.9**	54.9			51.5	168.3	17-Jun	30.0	14.1
MS Iceman	48.7				**57.0**	165.3	14-Jun	31.0	15.3
MS Maverick	46.0				54.7	167.0	16-Jun	30.7	15.2
MS Sundown (MS 1022)	37.4				**56.8**	163.7	13-Jun	31.3	14.2
MT WarCat	46.8	50.9	59.6		55.7	172.0	21-Jun	31.0	15.3
MT1745	44.7	52.0	62.2		54.7	169.7	19-Jun	31.7	14.9
MT19159	45.8				53.6	171.0	20-Jun	32.0	16.4
MT19175	44.7	49.3			54.0	171.0	20-Jun	30.3	14.6
MT2019	**50.3**				54.7	168.7	18-Jun	31.0	14.2
MTCL19151	49.4	57.5			55.8	166.3	15-Jun	29.7	15.2
MTCL2010	47.4				**56.2**	166.7	16-Jun	31.0	15.0
MTCS20156	43.2				55.4	171.3	20-Jun	32.0	16.0
MTF20189	19.2				51.8	170.3	19-Jun	46.7	16.2
MTFH19132	37.4	46.7			53.5	169.0	18-Jun	33.3	15.4
MTFH20166	48.3				56.0	167.0	16-Jun	32.7	15.0
MTS1903	42.9	51.6			55.8	172.0	21-Jun	31.7	15.4
MTS1908	44.4	52.3			**56.2**	171.0	20-Jun	31.7	15.1
MTS2068	46.3				55.8	171.7	21-Jun	31.7	15.3
Northern	47.1	51.4	62.3		54.8	168.0	17-Jun	33.0	15.4
Ramsay	41.2	52.2			53.7	169.3	18-Jun	31.7	15.6
StandClear CLP	45.6	53.0	63.6		55.4	170.0	19-Jun	32.7	15.3
SY Clearstone 2CL	33.9	49.3	62.4		51.1	170.0	19-Jun	35.0	15.8
SY Wolverine	**51.4**	55.0	64.3		55.5	165.0	14-Jun	29.7	14.9
Warhorse	44.1	47.4	57.2		54.5	169.3	18-Jun	32.7	16.0
WB4510 CLP	41.5				55.5	167.0	16-Jun	32.0	15.1
WB4619	47.3				54.1	165.0	14-Jun	29.7	14.8
Whistler	43.2	48.8			53.0	167.0	16-Jun	33.3	14.4
Yellowstone	39.4	49.1	60.8		54.1	169.3	18-Jun	34.3	15.2
Average	**44.3**	**51.4**	**61.5**		**54.9**	**167.8**	**17-Jun**	**32.1**	**15.1**
LSD (0.05)	**5.58**	**6.1ns**	**4.1ns**		**1.32**	**2.26**		**2.20**	**0.65**
C. V. (%)	**6.49**	**9.0**	**9.7**		**1.24**	**0.69**		**3.55**	**2.24**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland

Table 6. Hard Winter Wheat: District 4 - Moccasin

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Stem Solidness[/1] (5-25)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar			
Combined years of data:	1yr	2yr	3yr	4yr		2022	2022	2022	2022	2022
20Nord148	42.5				**53.6**	177.7	27-Jun	22.7		**15.4**
AAC Wildfire	**44.5**	37.8	44.9	53.1	**53.1**	176.7	26-Jun	26.0		13.3
AP Bigfoot	**46.7**				**54.8**	176.7	26-Jun	23.0		11.4
AP Solid	**57.1**	44.4			**54.9**	176.7	26-Jun	24.7	20.7	12.6
AP18 AX	**50.3**	42.9			**54.9**	176.0	25-Jun	24.3		11.8
Balance	35.1	32.7			**53.9**	177.0	26-Jun	24.7		13.6
Battle AX	**52.3**	43.7			**53.9**	177.0	26-Jun	23.7		10.8
Bobcat	**44.3**	38.7	44.2	51.0	**55.1**	177.0	26-Jun	23.3	**22.7**	13.1
Brawl CL Plus	**43.7**	39.4	41.6	47.0	**55.2**	176.7	26-Jun	25.7		13.1
CP7017AX	**45.0**	39.5			**54.1**	176.3	25-Jun	23.0		11.7
CP7050AX	33.2	33.0			**54.8**	176.7	26-Jun	24.3		**15.5**
CP7909	**51.6**	43.5	43.2		**53.8**	177.3	26-Jun	24.8		14.0
Flathead	**50.3**	44.4	45.3	50.1	**54.1**	175.0	24-Jun	24.7		13.5
Fortify SF	**46.8**	40.5			**54.4**	176.3	25-Jun	26.3	17.7	11.7
FourOsix	**46.0**	39.0	46.8	54.1	**54.1**	177.0	26-Jun	25.0		13.4
Judee	**43.0**	36.9	43.3	50.0	**54.3**	175.7	25-Jun	24.7	**22.0**	12.6
Keldin	**49.7**	41.8	47.9	54.3	**53.7**	176.3	25-Jun	26.0		12.4
LCS Helix AX	35.1	33.4	39.8		**55.2**	176.3	25-Jun	23.3		10.9
LCS Julep	39.1	35.6			**54.2**	177.0	26-Jun	25.0		**14.7**
LCS Steel AX	**48.9**	40.1	48.2		**53.3**	177.0	26-Jun	26.3		11.4
Loma	**44.5**	38.7	45.5	52.0	**54.1**	177.7	27-Jun	23.3	20.3	12.9
Milestone	41.3	36.8			**52.7**	176.7	26-Jun	23.3		13.9
MS Iceman	**45.9**				**54.6**	176.0	25-Jun	22.7		13.2
MS Maverick	35.3				**53.4**	176.7	26-Jun	24.0		**15.2**
MS Sundown (MS 1022)	36.3				**54.3**	176.7	26-Jun	25.3		13.6
MT WarCat	41.6	38.0	45.6		**53.9**	176.7	26-Jun	23.7	**23.0**	12.6
MT1745	31.7	33.5	41.4	50.6	52.2	177.7	27-Jun	26.3		**16.3**
MT19159	**46.9**				**54.0**	176.3	25-Jun	23.7		12.6
MT19175	22.1	29.3			48.8	176.3	25-Jun	22.7		**16.0**
MT2019	**55.1**				**54.5**	177.0	26-Jun	23.7		12.0
MTCL19151	**45.0**	39.9			**54.3**	176.3	25-Jun	23.0		14.0
MTCL2010	**49.5**				**54.3**	177.7	27-Jun	23.0		13.2
MTCS20156	**43.4**				**53.8**	176.7	26-Jun	22.7	**23.3**	13.7
MTF20189	**46.8**				**52.9**	176.3	25-Jun	36.7		13.2
MTFH19132	**44.7**	38.7			**53.5**	176.7	26-Jun	27.0		12.2
MTFH20166	**44.5**				**54.8**	177.3	26-Jun	24.0		12.9
MTS1903	34.7	34.3			**53.3**	177.0	26-Jun	25.0	**22.7**	**16.1**
MTS1908	38.0	34.7			**53.6**	177.0	26-Jun	25.3	**23.0**	14.5
MTS2068	39.8				**54.1**	177.3	26-Jun	26.0	**23.3**	13.6
Northern	38.0	36.5	44.2	53.0	**53.8**	176.7	26-Jun	25.0		13.8
Ramsay	**46.5**	39.0			**53.9**	177.0	26-Jun	25.7		11.9
StandClear CLP	40.9	36.2	42.2	48.6	**53.9**	176.3	25-Jun	23.3	20.7	12.7
SY Clearstone 2CL	**52.2**	44.5	48.7	56.7	52.2	177.0	26-Jun	26.0		12.4
SY Wolverine	**44.5**	41.7	43.6	51.1	**53.5**	177.0	26-Jun	25.0		12.6
Warhorse	**45.5**	38.9	43.1	48.8	**54.1**	176.7	26-Jun	23.7	**21.0**	13.2
WB4510 CLP	**44.2**				**55.1**	177.0	26-Jun	24.7		13.2
WB4619	**46.1**				**54.1**	177.3	26-Jun	24.3		11.7
Whistler	41.4	38.1			**54.4**	176.3	25-Jun	25.7		12.8
Yellowstone	**50.5**	42.2	47.3	53.5	**53.6**	177.0	26-Jun	27.3	7.3	12.3
Average	**43.7**	**38.5**	**44.6**	**57.2**	**53.9**	**176.7**	**26-Jun**	**24.8**	**20.6**	**13.2**
LSD (0.05)	**14.14**	**4.85ns**	**2.63ns**	**5.33ns**	**2.75**	**1.95**		**2.35**	**2.46**	**1.74**
C. V. (%)	**16.74**	**12.3**	**12.3**	**12.1**	**2.64**	**0.57**		**4.91**	**5.87**	**6.79**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland

Table 7. Hard Winter Wheat: District 5 - Conrad

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021	2020-21	2019-21		Ordinal	Calendar		
Combined years of data:	1yr	2yr	2yr	3yr					
	No Data				No Data	No Data	No Data	No Data	No Data
20Nord148									
AAC Wildfire		53.5	80.7	70.6					
AP Bigfoot									
AP Solid		48.6							
AP18 AX		52.4							
Balance		46.6							
Battle AX		48.5							
Bobcat		58.9	82.5	77.8					
Brawl CL Plus		52.6	66.8	70.9					
CP7017AX		49.9							
CP7050AX		44.3							
CP7909		57.6	69.9						
Flathead		60.6	80.7	74.8					
Fortify SF		47.3							
FourOsix		62.8	86.1	78.9					
Judee		53.5	72.7	64.7					
Keldin		56.2	72.1	72.3					
LCS Helix AX		49.1	73.6						
LCS Julep		66.3							
LCS Steel AX		47.1	67.4						
Loma		70.0	87.1	79.4					
Milestone		55.0							
MS Iceman									
MS Maverick									
MS Sundown (MS 1022)									
MT WarCat		61.5	84.3						
MT1745		67.9	84.1	79.9					
MT19159									
MT19175		57.4							
MT2019									
MTCL19151		48.9							
MTCL2010									
MTCS20156									
MTF20189									
MTFH19132		63.9							
MTFH20166									
MTS1903		55.2							
MTS1908		54.1							
MTS2068									
Northern		58.5	88.3	82.0					
Ramsay		53.9							
StandClear CLP		53.7	80.3	75.0					
SY Clearstone 2CL		58.5	75.6	71.2					
SY Wolverine		44.9	61.2	64.8					
Warhorse		56.8	77.9	68.5					
WB4510 CLP									
WB4619									
Whistler		53.0							
Yellowstone		64.6	77.4	70.7					
Average		**55.0**	**77.0**	**72.7**					
LSD (0.05)		**8.35ns**	**9.86ns**	**8.26ns**					
C. V. (%)		**12.8**	**12.4**	**13.3**					

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland

Table 8. Hard Winter Wheat: District 5 – Ft. Benton (Nutrien)

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Plant Height (in)	Sawfly Cutting (%)	Stem Solidness/1 (5-25)	Protein (%)
	2022	2021-22	2020-22	2019-22					
Combined years of data:	1yr	2yr	3yr	4yr	2022	2022	2022	2022	2022
20Nord148	**29.3**				61.3	23.7	25		13.8
AAC Wildfire	21.1	26.7	40.5	42.1	55.7	25.0	25		14.6
AP Bigfoot	21.1				61.5	22.7	35		14.3
AP Solid	29.1	38.1			63.5	23.3	20	**19.7**	13.6
AP18 AX	24.4	31.7			61.7	23.3	**15**		13.7
Balance	20.9	29.3			55.2	24.0	**10**		15.7
Battle AX	26.0	33.2			61.2	23.0	**15**		13.2
Bobcat	**28.9**	33.7	42.4	47.9	59.6	23.7	**0**	**23.7**	13.7
Brawl CL Plus	21.1	36.0	42.1	47.7	62.9	23.7	35		14.0
CP7017AX	36.2	38.5			61.7	21.3	**10**		13.2
CP7050AX	22.6	30.4			62.7	21.3	25		14.1
CP7909	26.6	40.9	42.0		62.5	22.7	25		13.0
Flathead	23.7	36.5	44.0	48.4	60.6	23.7	**15**		13.7
Fortify SF	27.6	33.7			62.7	23.7	**10**	**18.3**	12.9
FourOsix	27.8	34.9	43.4	47.2	58.9	25.3	25		13.9
Judee	28.4	31.1	40.5	45.8	60.5	23.7	**10**	**23.3**	14.9
Keldin	26.6	41.4	48.2	51.2	57.7	25.3	**7.5**		14.4
LCS Helix AX	**34.0**	38.4	43.8		61.5	24.0	**15**		13.1
LCS Julep	26.0	36.7			60.3	23.7	20		14.4
LCS Steel AX	**30.4**	34.0	44.5		59.2	26.0	30		12.5
Loma	25.0	33.9	43.3	47.1	56.1	23.0	**7.5**	**23.7**	15.2
Milestone	23.3	36.7			57.8	22.7	**10**		14.3
MS Iceman	**30.1**				64.0	23.7	**5**		14.4
MS Maverick	**31.7**				61.3	25.7	**10**		14.6
MS Sundown (MS 1022)	28.2				61.7	26.0	25		13.1
MT WarCat	28.1	34.7	46.1		56.9	23.3	**5**	**23.7**	14.2
MT1745	25.6	30.1	40.7	46.3	59.3	26.0	25		13.0
MT19159	26.2				56.0	24.3	**10**		14.2
MT19175	27.5	33.4			57.2	23.3	**10**		14.1
MT2019	28.7				58.7	22.3	**15**		13.5
MTCL19151	24.9	32.9			57.8	20.7	**10**		13.9
MTCL2010	22.4				58.9	21.7	**15**		13.7
MTCS20156	**30.1**				59.6	24.3	**2.5**	**23.0**	14.0
MTF20189	26.1				56.5	33.7	**15**		14.9
MTFH19132	22.7	31.5			56.4	27.0	**15**		14.8
MTFH20166	**29.8**				61.3	23.3	20		14.0
MTS1903	26.6	38.4			56.7	24.7	**2.5**	**23.3**	14.1
MTS1908	27.8	37.7			57.0	26.7	**2.5**	**23.7**	13.9
MTS2068	**28.3**				61.2	24.3	**15**	14.0	13.9
Northern	26.3	32.9	45.7	48.7	56.7	26.0	**10**		14.7
Ramsay	**28.2**	42.3			59.3	24.0	**15**		14.5
StandClear CLP	**30.0**	34.5	43.2	47.0	61.2	25.3	**5**	**20.7**	13.6
SY Clearstone 2CL	23.8	29.7	41.5	45.5	57.0	26.0	30		14.0
SY Wolverine	24.2	33.6	40.8	41.8	62.0	21.3	30		13.9
Warhorse	22.2	29.0	40.8	45.2	57.3	24.3	**0**	**23.0**	14.7
WB4510 CLP	22.1				59.6	25.7	30		14.7
WB4619	**29.0**				60.5	24.0	20		12.5
Whistler	**33.8**	37.3			60.4	26.3	35		12.7
Yellowstone	26.2	32.6	43.0	45.3	57.5	26.3	30	8.0	13.6
Average	**26.8**	**34.5**	**43.0**	**46.5**	**59.5**	**24.3**	**16.3**	**20.6**	**13.9**
LSD (0.05)	**8.34**	**6.2ns**	**9.3ns**	**8.42ns**		**2.5**	**17.2**	**5.8**	
C. V. (%)	**16.13**	**14.0**	**13.6**	**13.4**		**5.4**	**44.0**	**13.8**	

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland
/1 = 50% of stems infested with WSS

Table 9. Hard Winter Wheat: District 5 – Havre

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Sawfly Cutting (%)	Stem Solidness/1 (5-25)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar				
Combined data:	**1yr**	**2yr**	**3yr**	**4yr**	**2022**	**2022**	**2022**	**2022**	**2022**	**2022**	**2022**
20Nord148	56.3				59.4	159.4	8-Jun	23.6	82.5		14.4
AAC Wildfire	47.9	32.8	39.2	44.8	56.3	167.2	16-Jun	27.3	62.5		**15.5**
AP Bigfoot	54.1				60.4	157.9	7-Jun	23.4	87.1		14.5
AP Solid	61.3	45.1			**62.6**	161.3	10-Jun	25.4	65.9	18.3	13.9
AP18 AX	60.3	44.4			59.7	159.3	8-Jun	24.1	83.8		13.6
Balance	55.3	39.5			57.5	164.0	13-Jun	26.2	83.1		**15.6**
Battle AX	**64.4**	46.8			59.8	159.0	8-Jun	25.0	82.6		14.0
Bobcat	**65.5**	45.5	50.2	55.5	60.5	162.6	12-Jun	26.3	**3.9**	**22.7**	14.8
Brawl CL Plus	59.3	44.4	45.3	48.2	**61.7**	157.3	6-Jun	24.5	71.6		**15.3**
CP7017AX	58.3	44.7			60.3	158.5	7-Jun	24.2	89.8		13.8
CP7050AX	47.5	40.8			61.4	156.0	5-Jun	23.1	70.5		**15.3**
CP7909	57.3	45.9	40.5		60.0	153.6	3-Jun	21.6	67.3		14.7
Flathead	55.5	45.4	47.1	49.7	59.9	159.2	8-Jun	24.3	77.1		14.6
Fortify SF	58.9	40.9			60.4	161.3	10-Jun	25.2	51.4	18.7	14.1
FourOsix	59.4	41.6	45.4	49.7	58.4	162.0	11-Jun	25.4	83.4		14.7
Judee	52.8	35.7	40.7	45.3	59.9	162.5	12-Jun	25.2	62.0	21.0	**15.1**
Keldin	62.3	45.4	49.6	51.8	59.3	163.0	12-Jun	26.4	79.9		14.7
LCS Helix AX	59.6	44.7	47.1		61.5	157.3	6-Jun	23.7	78.0		13.9
LCS Julep	57.5	43.3			**61.7**	158.7	8-Jun	24.4	77.3		14.7
LCS Steel AX	61.7	43.8	47.3		59.0	162.5	12-Jun	27.6	87.0		13.1
Loma	57.4	40.8	44.9	48.1	57.9	165.5	15-Jun	26.3	41.8	**21.7**	**15.1**
Milestone	63.5	44.7			57.8	161.9	11-Jun	23.8	71.6		14.5
MS Iceman	63.4				**61.5**	159.7	9-Jun	23.2	75.4		**15.2**
MS Maverick	60.9				60.3	162.1	11-Jun	25.5	88.7		14.7
MS Sundown (MS 1022)	55.7				61.0	155.6	5-Jun	24.2	80.7		14.5
MT WarCat	60.6	43.3	47.7		58.3	165.6	15-Jun	24.8	**11.9**	**22.3**	14.9
MT1745	60.4	40.9	44.0	49.0	59.8	164.0	13-Jun	27.4	63.2		13.9
MT19159	57.2				57.2	164.2	13-Jun	23.6	87.3		14.7
MT19175	61.6	40.8			59.1	162.5	12-Jun	23.1	78.9		13.8
MT2019	58.2				59.4	162.6	12-Jun	23.1	83.4		14.0
MTCL19151	60.6	45.9			60.4	158.6	8-Jun	23.4	82.8		14.2
MTCL2010	57.9				60.7	160.3	9-Jun	22.5	72.8		14.1
MTCS20156	**70.9**				60.8	164.1	13-Jun	28.2	**3.3**	**22.7**	14.4
MTF20189	55.0				59.3	164.5	14-Jun	37.5	79.6		**15.0**
MTFH19132	54.8	38.9			57.8	162.4	11-Jun	27.1	73.5		14.2
MTFH20166	50.4				59.9	161.3	10-Jun	24.7	89.8		14.6
MTS1903	60.9	40.1			58.8	165.0	14-Jun	26.0	**10.2**	**23.7**	**15.0**
MTS1908	62.9	42.0			59.3	165.4	14-Jun	28.4	27.1	**22.7**	14.8
MTS2068	63.5				59.5	164.8	14-Jun	27.9	**7.1**	**21.7**	14.6
Northern	59.5	41.1	43.9	49.3	58.5	163.4	12-Jun	25.5	82.7		14.6
Ramsay	**65.9**	46.6			59.7	164.0	13-Jun	25.5	82.8		14.7
StandClear CLP	55.9	39.8	44.4	51.1	60.5	162.5	12-Jun	28.4	27.2	19.3	14.6
SY Clearstone 2CL	55.7	37.2	42.3	46.8	57.7	164.1	13-Jun	26.8	81.6		14.5
SY Wolverine	55.1	41.7	44.1	46.0	60.0	157.9	7-Jun	24.4	74.8		**15.1**
Warhorse	57.1	38.9	43.0	45.2	58.7	164.1	13-Jun	26.5	**5.3**	21.0	**15.6**
WB4510 CLP	48.1				59.8	161.8	11-Jun	26.8	86.5		14.8
WB4619	56.8				59.4	160.3	9-Jun	24.2	83.9		13.6
Whistler	54.5	38.0			58.6	161.7	11-Jun	26.6	85.7		14.1
Yellowstone	61.9	44.9	47.8	50.9	58.2	163.1	12-Jun	28.0	92.1	8.3	14.1
Average	**58.4**	**42.2**	**45.0**	**48.7**	**59.6**	**161.5**	**11-Jun**	**25.5**	**66.9**	**20.3**	**14.5**
LSD (0.05)	**7.23**	**3.7ns**	**2.4ns**	**3.9ns**	**1.1**	**2.2**		**2.6**	**19.1**	**2.4**	**0.6**
C.V. (%)	**6.38**	**9.2**	**9.8**	**10.0**	**0.9**	**0.7**		**5.4**	**14.7**	**5.8**	**2.0**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland
/1 = 77% of stems infested with WSS

Table 10. Hard Winter Wheat: District 6 – Sidney

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar		
Combined years of data:	**1yr**	**2yr**	**3yr**	**4yr**	**2022**	**2022**	**2022**	**2022**	**2022**
20Nord148	**68.1**				64.6	168.3	17-Jun	25.9	11.7
AAC Wildfire	60.3	**56.9**	**57.8**	**65.5**	63.7	171.3	20-Jun	26.6	11.4
AP Bigfoot	57.2				64.7	166.7	16-Jun	24.3	11.4
AP Solid	61.1	36.4			**65.7**	169.7	19-Jun	24.4	12.2
AP18 AX	57.5	46.2			63.1	166.7	16-Jun	23.3	11.1
Balance	50.0	34.4			60.9	170.7	20-Jun	24.0	13.2
Battle AX	59.3	43.4			62.8	168.0	17-Jun	26.3	11.7
Bobcat	**68.9**	**57.7**	**58.0**	**59.5**	63.7	171.0	20-Jun	25.2	11.7
Brawl CL Plus	58.3	41.4	46.2	43.9	**65.0**	164.7	14-Jun	23.9	12.3
CP7017AX	53.3	41.8			63.1	165.0	14-Jun	22.4	10.8
CP7050AX	53.7	43.7			64.8	164.0	13-Jun	23.7	12.5
CP7909	61.0	44.1	46.2		64.1	164.3	13-Jun	24.1	10.9
Flathead	61.7	**53.4**	**55.7**	58.4	64.4	166.3	15-Jun	24.9	11.8
Fortify SF	59.9	48.8			64.1	167.7	17-Jun	25.6	11.5
FourOsix	**65.3**	**53.3**	**55.9**	57.9	63.3	170.3	19-Jun	25.5	11.6
Judee	56.9	37.7	42.0	51.3	**65.0**	171.0	20-Jun	25.6	12.5
Keldin	56.7	48.6	53.5	57.1	63.7	171.3	20-Jun	26.9	11.0
LCS Helix AX	58.5	48.7	51.5		64.8	165.3	14-Jun	24.3	10.8
LCS Julep	59.3	41.5			**66.1**	165.7	15-Jun	21.8	12.5
LCS Steel AX	60.3	**53.8**	54.1		63.0	171.0	20-Jun	27.7	10.2
Loma	**63.5**	**57.5**	**58.5**	**61.8**	63.9	171.3	20-Jun	24.9	11.6
Milestone	53.2	38.4			60.3	171.7	21-Jun	25.5	11.6
MS Iceman	41.0				**65.0**	169.7	19-Jun	24.3	**13.5**
MS Maverick	57.7				64.6	169.0	18-Jun	23.5	12.6
MS Sundown (MS 1022)	**69.1**				64.3	164.3	13-Jun	25.0	11.1
MT WarCat	**66.9**	**60.4**	**60.3**		63.1	173.0	22-Jun	25.7	11.8
MT1745	**71.7**	**61.9**	**60.6**	**67.5**	63.5	170.7	20-Jun	27.7	10.8
MT19159	**67.3**				63.6	172.3	21-Jun	24.4	11.6
MT19175	62.4	**57.2**			63.3	171.3	20-Jun	24.4	11.2
MT2019	**75.6**				62.3	171.0	20-Jun	23.9	11.1
MTCL19151	**67.6**	**57.7**			63.8	168.3	17-Jun	24.9	11.8
MTCL2010	**70.8**				64.0	169.0	18-Jun	24.5	11.2
MTCS20156	59.5				64.8	170.7	20-Jun	25.5	12.7
MTF20189	58.0				62.3	171.7	21-Jun	36.3	**14.1**
MTFH19132	60.1	49.6			62.5	169.7	19-Jun	26.8	11.9
MTFH20166	58.2				63.8	170.3	19-Jun	25.9	12.4
MTS1903	60.5	49.4			62.3	172.7	22-Jun	25.3	11.9
MTS1908	**63.5**	51.0			62.3	173.0	22-Jun	28.2	11.9
MTS2068	**69.0**				62.7	172.3	21-Jun	27.8	11.7
Northern	61.4	52.3	**56.6**	**64.2**	63.5	172.0	21-Jun	26.9	11.7
Ramsay	56.1	46.8			64.4	171.0	20-Jun	27.4	11.2
StandClear CLP	**64.5**	**54.4**	54.5	**60.2**	64.8	171.3	20-Jun	26.9	12.1
SY Clearstone 2CL	**63.7**	50.8	56.1	**60.6**	62.1	172.0	21-Jun	28.9	11.3
SY Wolverine	52.8	39.4	43.2	39.0	64.0	166.7	16-Jun	23.6	12.2
Warhorse	**63.8**	51.8	52.2	52.5	62.5	170.3	19-Jun	26.5	12.1
WB4510 CLP	54.8				**65.3**	171.0	20-Jun	26.3	11.9
WB4619	60.7				63.6	166.3	15-Jun	23.2	10.6
Whistler	60.3	**55.5**			64.0	170.0	19-Jun	26.4	11.4
Yellowstone	**66.1**	**59.6**	**63.4**	**66.4**	62.7	171.3	20-Jun	27.6	11.2
Average	**61.0**	**49.3**	**54.0**	**57.7**	**63.7**	**169.4**	**19-Jun**	**25.6**	**11.7**
LSD (0.05)	**13.6**	**9.2**	**8.8**	**8.7**	**1.2**	**2.0**		**2.8**	**0.7**
C. V. (%)	**11.5**	**12.6**	**12.7**	**12.4**	**0.9**	**0.6**		**5.6**	**3.3**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland

Table 11. Hard Winter Wheat: Williston, North Dakota

Cultivar/Line	Grain Yield (bu/ac)				Test Weight (lb/bu)	Heading Date		Plant Height (in)	Protein (%)
	2022	2021-22	2020-22	2019-22		Ordinal	Calendar		
Combined years of data:	**1yr**	**2yr**	**3yr**	**4yr**	**2022**	**2022**	**2022**	**2022**	**2022**
20Nord148	22.8				59.2	165.7		19.9	**11.4**
AAC Wildfire	**30.5**	**27.4**	36.6	**41.1**	60.0	172.7		22.4	**10.1**
AP Bigfoot	15.9				60.4	165.3		17.8	9.8
AP Solid	20.9	21.3			**61.9**	169.0		20.1	**12.4**
AP18 AX	**28.7**	**25.4**			59.2	164.3		21.2	**10.6**
Balance	23.7	**24.9**			59.2	169.0		20.9	**11.8**
Battle AX	19.3	21.4			59.7	165.0		18.6	**10.1**
Bobcat	19.6	22.6	32.0	**38.4**	60.0	170.3		20.3	**10.1**
Brawl CL Plus	16.6	16.5	26.4	30.8	**61.2**	164.3		20.2	**11.3**
CP7017AX	17.7	19.8			60.1	164.0		18.7	**10.1**
CP7050AX	16.3	17.0			60.7	164.0		20.0	**11.7**
CP7909	23.1	21.1	28.9		59.9	162.0		21.6	**10.9**
Flathead	18.0	21.9	30.2	33.8	59.9	164.7		20.9	**10.4**
Fortify SF	23.0	21.6			59.8	164.7		22.0	**10.2**
FourOsix	21.3	23.4	33.4	**39.2**	59.2	169.0		20.7	**10.6**
Judee	24.2	23.1	31.4	36.0	**61.3**	169.3		19.7	**12.2**
Keldin	23.3	24.7	33.9	**38.6**	60.7	169.3		22.3	**10.8**
LCS Helix AX	15.8	18.5	28.7		60.5	164.0		18.9	9.1
LCS Julep	21.2	22.5			**61.5**	163.0		21.2	**11.7**
LCS Steel AX	20.0	**23.8**	34.6		58.9	170.3		21.7	**10.4**
Loma	24.2	**24.9**	33.3	**39.5**	59.3	171.0		20.2	**11.5**
Milestone	22.6	**23.9**			58.8	169.3		20.3	**11.0**
MS Iceman	19.5				**61.8**	167.3		18.9	**11.5**
MS Maverick	18.3				60.6	164.7		19.7	**11.4**
MS Sundown (MS 1022)	18.2				59.3	163.3		20.5	9.5
MT WarCat	18.5	23.1	32.3		59.5	172.0		18.8	**10.4**
MT1745	18.6	21.8	31.5	36.7	60.5	170.7		21.0	**10.1**
MT19159	27.4				60.3	171.3		20.6	**11.6**
MT19175	18.5	22.1			59.4	172.7		18.3	9.5
MT2019	25.6				59.3	169.7		18.5	**11.9**
MTCL19151	**30.0**	**26.9**			60.1	167.7		19.1	**11.5**
MTCL2010	21.7				60.0	168.3		18.1	**11.6**
MTCS20156	19.1				59.7	171.0		20.2	**11.1**
MTF20189	24.8				59.0	171.3		30.5	**10.7**
MTFH19132	20.7	22.2			58.8	168.3		22.9	9.3
MTFH20166	20.5				59.0	169.3		19.1	**11.5**
MTS1903	**29.3**	**28.0**			60.1	171.3		21.6	7.7
MTS1908	22.6	23.2			59.9	173.0		20.6	**10.1**
MTS2068	**37.1**				59.9	170.0		23.6	**11.7**
Northern	15.9	21.4	33.5	**38.4**	59.1	171.0		19.4	**10.8**
Ramsay	24.3	**26.3**			60.4	169.3		22.2	**10.6**
StandClear CLP	18.4	19.4	29.6	34.9	60.4	170.7		20.9	**10.7**
SY Clearstone 2CL	21.3	23.4	33.4	36.3	58.8	170.0		22.5	9.8
SY Wolverine	18.1	19.7	28.2	33.1	60.4	165.3		19.0	**10.6**
Warhorse	22.3	22.8	29.8	35.0	59.7	170.7		21.5	**11.1**
WB4510 CLP	21.4				**61.3**	168.7		21.9	9.6
WB4619	26.0				59.9	164.7		20.3	**10.3**
Whistler	15.9	20.5			59.9	168.0		19.5	9.0
Yellowstone	26.4	**26.9**	34.2	**39.5**	58.8	169.7		22.3	**10.6**
Average	**21.8**	**22.7**	**31.7**	**36.7**	**59.9**	**168.2**		**20.6**	**10.7**
LSD (0.05)	**9.54**	**4.2**	**3.73ns**	**3.9**	**0.90**	**2.5577**		**2.62**	**2.57**
C. V. (%)	**22.55**	**13.9**	**13.8**	**13.2**	**0.8**	**0.8**		**6.6**	**12.4**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
Environment: Dryland

Table 12. Statewide summary performance in 2022

Cultivar/Line	Yield (bu/ac)	Test Weight (lb/bu)	Heading Date (Julian)	Plant Height (in)	Stem Solidness (5-25)	Stems Infested (0-5)	Sawfly Cutting[1] (%)	Protein (%)
	8	8	6	8	3	2	2	8
20Nord148	61.1	58.4	166.1	28.9			82.5	13.3
AAC Wildfire	59.4	55.9	171.8	30.2			62.5	13.2
AP Bigfoot	64.3	57.5	164.6	27.2			87.1	12.5
AP Solid	**66.3**	**60.4**	167.4	27.9	19.6	4.7	65.9	13.0
AP18 AX	63.7	57.5	164.3	27.8			83.8	12.3
Balance	59.3	55.8	167.5	28.4			83.1	**14.2**
Battle AX	63.2	57.5	164.3	27.2			82.6	12.4
Bobcat	**65.3**	**59.1**	169.0	27.2	**23.0**	**2.5**	**3.9**	13.0
Brawl CL Plus	60.3	58.0	162.6	27.8	-		71.6	13.5
CP7017AX	62.5	**59.6**	163.4	26.4			89.8	12.2
CP7050AX	54.4	58.2	161.9	27.3			70.5	**13.9**
CP7909	61.5	58.6	160.9	27.1			67.3	12.7
Flathead	**64.5**	58.0	164.1	28.5			77.1	12.9
Fortify SF	59.8	58.4	165.3	29.0	18.2	4.5	51.4	12.4
FourOsix	62.4	57.7	168.1	28.5			83.4	13.0
Judee	59.3	**58.9**	168.4	28.4	**22.1**	3.2	62.0	13.6
Keldin	**67.9**	58.2	168.3	29.3			79.9	12.9
LCS Helix AX	**67.0**	**59.9**	163.8	27.6			78.0	11.8
LCS Julep	63.3	**59.3**	162.9	27.2			77.3	13.5
LCS Steel AX	**65.4**	58.3	169.3	30.0			87.0	11.8
Loma	63.1	57.1	170.3	27.9	**21.9**	**2.0**	41.8	13.2
Milestone	**69.5**	55.6	167.4	26.8			71.6	13.0
MS Iceman	59.9	**60.3**	165.7	26.8			75.4	**13.7**
MS Maverick	63.2	**59.6**	166.1	27.8			88.7	**13.6**
MS Sundown (MS 1022)	61.1	**58.8**	162.2	29.1			80.7	12.6
MT WarCat	62.3	57.8	171.7	27.2	**23.0**	**1.7**	**11.9**	13.0
MT1745	**64.6**	57.6	169.2	29.4			63.2	12.9
MT19159	61.7	57.1	170.0	27.2			87.3	13.2
MT19175	62.0	56.8	170.2	26.7			78.9	12.8
MT2019	**68.4**	58.0	167.9	26.3			83.4	12.6
MTCL19151	**64.9**	57.8	165.7	26.5			82.8	13.2
MTCL2010	63.4	57.3	166.1	26.1			72.8	13.0
MTCS20156	**65.8**	**59.4**	169.8	28.0	**23.0**	**2.5**	**3.3**	13.5
MTF20189	51.8	57.0	169.8	40.7			79.6	**14.0**
MTFH19132	61.4	56.0	168.0	30.3			73.5	12.9
MTFH20166	60.1	**58.8**	167.6	28.5			89.8	13.3
MTS1903	61.8	57.6	171.1	28.4	**23.2**	**2.4**	**10.2**	13.1
MTS1908	62.3	58.0	171.3	29.2	**23.1**	**2.5**	27.1	13.2
MTS2068	**66.1**	58.2	170.6	29.2	19.7	3.5	**7.1**	13.2
Northern	61.5	57.3	169.5	29.3			82.7	13.2
Ramsay	**66.7**	58.3	168.2	28.4			82.8	12.9
StandClear CLP	62.5	**59.3**	168.6	29.2	20.2	3.7	27.2	13.1
SY Clearstone 2CL	63.6	55.8	169.3	30.9			81.6	12.9
SY Wolverine	**64.8**	57.8	164.4	26.7			74.8	13.0
Warhorse	60.4	56.5	169.2	29.4	**21.7**	**2.7**	**5.3**	**13.6**
WB4510 CLP	60.3	57.9	167.4	29.0			86.5	12.9
WB4619	63.6	58.0	164.7	27.1			83.9	12.2
Whistler	**65.4**	**58.9**	167.2	30.0			85.7	12.2
Yellowstone	**65.1**	57.2	168.9	30.9	7.9	5.0	92.1	12.6
Average	**62.8**	**58.0**	**167.2**	**28.5**	**20.5**	**3.1**	**66.9**	**13.0**
LSD (0.05)	**5.0**	**1.69**	**0.98ns**	**0.97ns**	**2.1**	**1.4**	**19.1**	**0.6**
C.V. (%)	**11.8**	**4.34**	**0.8**	**5.08**	**9.3**	**20.7**	**14.7**	**5.0**

Bold = indicates highest value within column
Bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
[1] Sawfly cutting data from Havre only

Table 13. Selected agronomic characters and disease reactions

Cultivar/Line	Agronomic Characteristics						Disease Reactions[6]	
	Maturity[1]	Chaff Color	Winter Survival[2]	Straw Strength[3]	Stem Solidness[4]	Herbicide Resistance[5]	Stripe Rust	Stem Rust
20Nord148	L	-	3	M	-	No	-	-
AAC Wildfire	L	Red	4	-	-	No	MR	-
AP Bigfoot	E	-	2	-	-	No	-	-
AP Solid	M	White	1	-	19.6	No	-	-
AP18 AX	M-E	White	2	-	-	AX	-	-
Balance	M	-	1	-	-	No	-	-
Battle AX	M-E	-	1	-	-	AX	-	-
Bobcat	M	White	3	-	23.0	No	R	MS
Brawl CL Plus	E	White	1	-	-	CL	S	-
CP7017AX	M-E	-	1	-	-	AX	S	-
CP7050AX	E	-	2	-	-	AX	-	-
CP7909	E	White	3	-	-	No	R	-
Flathead	E	White	3	-	-	No	R	MR
Fortify SF	M-E	-	2	M	18.2	No	-	-
FourOsix	M-E	White	3	-	-	No	R	MS
Judee	M	White	3	-	22.1	No	R	S
Keldin	M	White	3	-	-	No	MS	-
LCS Helix AX	E	White	3	-	-	AX	MR	-
LCS Julep	M-E	-	2	-	-	No	-	-
LCS Steel AX	M-L	-	2	-	-	AX	-	-
Loma	M-L	White	3	M-S	21.9	No	R	R
Milestone	M-L	-	1	-	-	No	-	-
MS Iceman	M	-	2	-	-	No	-	-
MS Maverick	M	-	1	-	-	No	-	-
MS Sundown (MS 1022)	M	-	2	M-S	-	No	-	-
MT WarCat	L	White	4	-	23.0	No	R	-
MT2019	L	-	3	-	-	No	R	-
MTCL19151	M	-	2	-	-	CL	R	-
MTCL2010	L	-	3	-	-	CL	MR	MS
MTF20189	L	-	2	-	-	No	R	MS
MTFH19132	M	-	2	-	-	No	R	-
MTFH20166	L	-	2	S	-	No	S	S
MTS2068	L	-	3	-	19.7	No	R	-
Northern	M	White	3	-	-	No	R	R
Ramsay	M-L	-	2	-	-	No	-	-
StandClear CLP	M	White	3	-	20.2	CL	R	MS
SY Clearstone 2CL	M-L	White	3	M	-	CL	R	MR
SY Wolverine	M-E	White	2	S	-	No	MS	-
Warhorse	M	White	3	-	21.7	No	R	R
WB4510 CLP	M	-	2	S	-	CL	-	-
WB4619	L	-	2	-	-	No	-	-
Whistler	M	-	2	-	-	No	-	-
Yellowstone	M	White	3	-	-	No	R	S

(1) Maturity classified in comparison to maturity of Brawl CL Plus; E=Early, M=Medium, L=Late
(2) 5= Best winter survival, data is averaged over 3 years from Sidney & Williston
(3) Straw strength based on lodging in Bozeman 2022; W=Weak, M=Medium, S=Strong
(4) Solid stem scale 5-25 (25=most solid)
(5) Herbicide resistance; CL=Clearfield, AX = CoAxium
(6) R=Resistant, MR=Moderately Resistant, M=Moderate, MS=Moderately Susceptible, S=Susceptible

Table 14. Precipitation and average monthly temperature for the 2022 Crop Year

1/ = Climate Data collected from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC

Agricultural Research Center [1]		Sept. 2021	Oct. 2021	Nov. 2021	Dec. 2021	Jan. 2022	Feb. 2022	Mar. 2022	Apr. 2022	May 2022	June 2022	July 2022	Aug. 2022			Historical Average
Western Triangle (Conrad)	Precipitation (in):	0.31	0.16	0.16	0.53	0.37	0.67	0.50	-	0.48	1.96	0.72	1.38	Total:	7.24	8.48
	Mean Temperature (°F):	58.6	46.2	37.7	17.3	27.4	25.5	36.0	-	50.4	59.2	69.8	70.3	Average:	45.3	43.3 [1987-2022]
Northern (Havre)	Precipitation (in):	0.11	0.48	0.36	0.46	0.12	0.14	0.37	0.17	0.41	3.18	1.75	0.60	Total:	8.15	10.09
	Mean Temperature (°F):	60.7	48.0	35.3	14.0	20.1	21.5	34.0	37.4	52.7	61.4	71.4	73.4	Average:	44.2	43.5 [1916-2022]
Northwestern (Kalispell)	Precipitation (in):	1.00	1.49	1.63	1.67	1.16	1.34	1.49	0.98	1.17	4.73	0.54	0.14	Total:	17.34	18.61
	Mean Temperature (°F):	55.6	44.0	36.9	22.6	22.9	25.9	37.3	36.5	48.0	57.6	67.7	67.5	Average:	43.5	43.4 [1980-2022]
Central (Moccasin)	Precipitation (in):	0.07	0.57	0.45	0.74	0.33	0.43	0.39	2.06	1.70	2.09	2.62	1.89	Total:	13.34	14.32
	Mean Temperature (°F):	58.5	46.9	39.1	20.2	25.8	21.9	33.1	34.6	47.9	57.9	69.1	69.9	Average:	43.7	43.3 [1910-2022]
Southern (Huntley)	Precipitation (in):	0.07	1.41	0.33	0.80	0.24	0.57	0.41	2.23	2.18	3.34	1.44	0.37	Total:	13.39	13.47
	Mean Temperature (°F):	61.6	49.2	39.4	20.7	23.2	23.8	35.8	37.6	53.8	63.1	74.0	72.9	Average:	46.3	45.9 [1911-2022]
Northeastern (Sidney)	Precipitation (in):	0.49	1.71	0.27	0.48	0.09	0.21	0.18	2.80	5.13	2.07	1.67	0.07	Total:	15.17	14.56
	Mean Temperature (°F):	65.6	51.0	35.9	13.9	16.4	19.4	32.8	-	56.6	66.0	73.8	75.0	Average:	46.0	44.7 [1949-2022]
Williston (WREC) (North Dakota)	Precipitation (in):	0.29	0.87	0.12	1.07	0.33	0.06	-	2.84	6.55	1.95	2.05	0.53	Total:	16.66	15.59
	Mean Temperature (°F):	65.7	50.3	35.3	13.4	14.2	17.1	-	34.8	55.0	66.1	73.9	74.8	Average:	45.5	44.9 [1990-2022]
Nutrien (Ft. Benton)	Precipitation (in):	0.02	0.20	0.35	0.97	0.41	0.55	0.55	1.10	0.40	1.31	0.61	1.04	Total:	7.51	10.26
	Mean Temperature (°F):	61.0	48.5	39.0	19.2	26.2	26.4	36.6	39.2	53.4	62.9	74.2	75.3	Average:	46.8	45.8 [1949-2022]
Post Farm Bozeman	Precipitation (in):	0.17	2.30	0.26	0.99	0.49	0.57	0.75	1.63	4.32	2.36	0.55	0.58	Total:	14.97	15.41
	Mean Temperature (°F):	60.4	47.8	39.3	28.4	23.7	24.8	37.3	37.2	48.4	59.7	69.0	71.0	Average:	45.6	44.6 [1958-2022]

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