2023 Winter Wheat Variety Performance

by the Montana State University Agricultural Experiment Station

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2023 MONTANA WINTER WHEAT VARIETY PERFORMANCE REPORT

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Introduction

Intrastate trials are conducted by the Montana Agriculture Experiment Stations (MAES) across the agro-climatic zones to evaluate the performance of new developed hard red winter varieties and breeding lines in comparison to released and widely grown varieties in Montana. The data presented is provided by the research personal of MAES, NDSU and private entities. Data from some locations are not available due to winterkill and other unavoidable circumstances.

Variety testing methods

1. Locations, experimental design and seeding method.

Intrastate winter wheat trial was evaluated at eight locations in Montana and one location in North Dakota. Figure 1 shows the test locations which include, 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).
The trial consists of 49 entries with 3 replicates and arranged in a 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. centres, 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.

2. Entries in Intrastate trial 2023

A total of forty-nine hard red winter wheat varieties and experimental breeding lines were evaluated in 2023 as part of the Intrastate trial. Of these, 21 were from private industries and 28 from public institutions (Table 2). Two of the private entries and fourteen of the public entries were experimental lines.

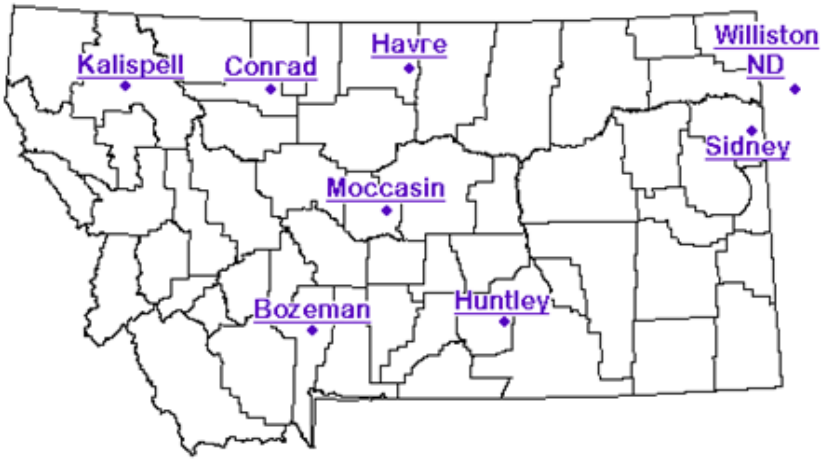

Figure 1. Locations of interstate trials for hard winter wheat performance tests in 2023

3. Data Collection

I. Yield (GY)

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 2023, data is provided for two (2022-2023), three (2021-2023) and four (2020-2023) year averages for hard wheat entries tested during previous cropping seasons.

II. Test Weight (TW)

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.

III. Days to heading Date (DTH)

Heading date was recorded when 50% of the heads in a plot are extended above the flag-leaf collar. DTH was then calculated days between head date and January 1st, 2023.

IV. Days to maturity (DTM)

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.

V. 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.

VI. 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, central, and south-central 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). Sawfly cutting percentage was noted at locations where sawfly pressure was present.

VII. Cereal Quality

Milling and baking characteristics were rated for each variety on a 1-5 scale (5 = superior quality) and polyphenol oxidase (PPO) was quantified using spectroscopy. Lower PPO value is associated with better Asian noodle quality.

VIII. Disease Reactions

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

4. 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.

5. 2023 Winter wheat overview

The Montana Agricultural Statistics Service reported statewide winter wheat yields at 51 bushels per acre (bu/ac) for 2023, up by 18.0 bu/ac from the 2022 season and a near record yield. The harvested acreage in 2023 was 1.68 million acres (total production = 85.68 million bu) compared to 1.80 million acres harvested in 2022.

Rainfall for the 2023-2023 crop year was near average for most locations. Bozeman with 21.4 inches across the crop season had the highest rainfall. Testing locations in Golden triangle area, Havre and Ft Benton averaged at 13 inches and 16.4 inches respectively.

The mean grain yield was at 87.2 bu/ac across all testing sites. Grain yields ranged from 32.5 bu/ac at Havre to 142.2 bu/ac at Kalispell. Grain yield of named varieties across locations ranged from 74.1 bu./ac for 'Brawl CL Plus' to 101.3 for 'Keldin'. Test weight averaged 59.4 lb/bu across the harvested locations.

Variety Selection

Performance summary for the hard red winter wheat varieties and experimental lines are presented in tables 3 through 13 from trials conducted at each experiment station sites and statewide. Across year performance of a variety or experimental line is presented for those that have been evaluated for two, three or four years.

Variety selection should be based on yield stability at a particular location or within a particular district over a period of years. It is also important to consider other traits such as winter hardiness, heading data, test weight, protein, plant height, stem-solidness and disease resistance in the process of selection.

Table 1: Information on cropping history, seeding date, fertilizer applications, and harvest date for Intrastate trials

Location	Conditions	District	Field Cropping History		Fertilizer Application* (lb/ac)					Dates		Notes
					N		P_2O_5	K_2O	S			
			2021	2022	Fall '22	Spring '23				Seeding	Harvest	
Arthur H. Post Agronomy Farm	Dry land	Bozeman	Barley	Fallow	210	_	30	_	_	10/16/2022	8/24/2023	
Western Triangle Agricultural Research Center	Dry land	Conrad	Oats	Fallow	_	_	_	_	_	_	_	
Nutrien Agri Solutions	Dry land	Fort Benton	Fallow	_	_	_	_	_	_	_	_	
Northern Agricultural Research Center	Dry land	Havre	Winter Wheat	Fallow	125	124	20	10	10	10/5/2022	8/1/2023	125-20-10-10 was side banded at seedling. Spring N was broadcast
Southern Agriculture Research Center	Dry land	Huntley	-	_	_	_	_	_	_	_	_	
Northwestern Agricultural Research Center	Dry land/High rainfall	Kalispell	Peas	Peas	_	_	_	_	_	_	_	
Central Agricultural Research Center	Dry land	Moccasin	Fallow	_	_	_	_	_	_	_	_	
Eastern Agricultural Research Center	Dry land	Sidney	Peas	Fallow	34	40	20			9/28/2022	8/7/2023	Fall N and P2O5 were put down in furrow while planting. Spring N was broadcast spread
Research Extension Center	Dry land	Williston, ND	Oats (Hay crop)	Flax	78	_	_	_	_	10/5/2022	_	

* = Fall nitrogen (N), phosphorus (P_2O_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 2023 Intrastate test

Variety	Experimental Designation	Origin	Release Year	Pedigree (PVP)	Entity
AAC Coldfront	**W601**	Alberta/SECAN	**2022**	Norstar/CDC Falcon//LF1318	
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, **PVP# 202000008**	Public
Amplify SF		Colorado: Plainsgold/ Colorado Research Foundation	**2021**	Bearpaw/Antero//Antero	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, **PVP# 202000351**	Private
Balance	**WA8248**	Washington; Nutrien	**2020**	BC002-2/Norwest 553-0, **PVP# 202100490**	Private
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, **PVP# 202000177**	Public
Brawl CL Plus	**CO06052**	Colorado: Plainsgold/ Colorado Research Foundation	**2011**	Teal 11A/Above//(CO99314, TX91V4931/ Halt), **PVP# 201200434**	Public
CP7017AX	**LCH15ACC-15-17**	CROPLAN	**2020**	T158 /4/ (ACC12, (AF28 / Byrd // AF10 / 2*Byrd) /3/ 2*Byrd), **PVP# 202000232**	Private
CP7266AX		CROPLAN	**2022**	na	Private
CP7909		CROPLAN	**2018**	na	Private
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)) , **PVP# 202000202**	Public
Fortify SF	**CO15SFD107**	Colorado: Plainsgold/ Colorado Research Foundation	**2019**	Byrd/Bearpaw//Byrd, **PVP# 202100004**	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,	Public

				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), **PVP# 201900053**	
Judee	**MTS0713**	Montana	**2011**	(Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon, **PVP# 201200161**	Public
Keldin	**ACS55017**	Peter Franck: Seed-Link Inc.; Ontario,Canada, Westbred LLC	**2011**	Barenburg 235/Carlisle//TRX-A16-3-2, **PVP# 201300462**	Private
Kivari AX	**CO14A055-258**	Colorado: Plainsgold/ Colorado Research Foundation	**2021**	(AF28/Byrd)//(AF10/2*Byrd), **PVP#202200001**	Public
LCS Eclipse AX		Limagrain LLC	**2022**	na	
LCS Helix AX	**LCS15ACC-8-21**	Limagrain LLC	**2020**	LCS Chrome /4/ (ACC7-38, (AF28 / Byrd // AF26 / Byrd) /3/ 2*Byrd), **PVP# 202000235**	Private
LCS Steel AX	**LCS 18-7071 AX**	Limagrain LLC	**2021**	The hard red winter wheat (HRW) line LCS Steel AX is from the cross LCS Chrome/ACC?-38 HV9W03-696R-2/KS020617-9. The pedigree of ACC?-38 is (AF28/Byrd//AF26/Byrd)//2*Byrd, **PVP# 202100229**	Private
Loma	**MTS1224**	Montana	**2016**	Yellowstone/5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, MTS0112)/4/(MTS0125, selection from a composite of 4 crosses). **PVP# 201700021**	Public
Milestone	**ACS14132-412**	Dr. Peter Franck, Germany; Nutrien	**2020**	Danby / /HV9W02-846R / CIMMYT-06- 3040, **PVP# 202100493**	Private
MS Maverick		Meridian Seeds	**2021**	na	Private
MS Sundown	**MS 1022**	Meridian Seeds	**2022**	The hard red winter wheat (HRW) line MS Sundown is from the cross T163/PSB13NEDH-11-26. The pedigree of T163 is KS93WGRC27/T81 **PVP# 202200357**	Private
MT WarCat	**MTS18149**	Montana	**2022**	Loma*2/AAC Gateway, **PVP pending (# 202400184)**	Public Elite
	MT2019	Montana		MT10114/MT10128//MTW1251	Public Elite
	MTAX21187	Montana		FourOsix*2/Crescent AX	
CS Bridger CLP	**MTCL19151**	Montana	**2023**	(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), **PVP Pending**	Public Elite
	MTCL2010	Montana		MT0871/(06X445B1-2, SY Clearstone sib)	Public Elite
	MTCS20151	Montana		Loma//(Bobcat sib, MTS1589)/StandClear CLP	Public Elite
	MTCS20156	Montana		Bobcat//(Bobcat sib, MTS1589)/StandClear CLP	Public Elite
	MTCS20158	Montana		Bobcat//(Bobcat sib, MTS1589)/StandClear CLP	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
	MTFH20170	Montana		09x257cD9-2/DecadeFhb1-DH7	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)	Public Elite

				/4/ HF5761 / TAM 105 //Bounty 203) /6/ Pronghorn)), 08X350-A6 /9/ Warhorse and 11X2, Spur // 08X350-A6 / Warhorse	
	MTS2068	Montana		(Judee sib, MTS0819)//08X350-A6/Warhorse	Public Elite
	MTS2197	Montana		Bobcat//LCS Jet/MTS1703	
	MTV2164	Montana		MT1265*2/Joe	
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, **PVP#201600092**	Public
Ramsay	**NAS-7653**	Nutrien Ag Solutions	**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) **PVP# 202000183**	Private
SY Clearstone 2CL	**MTCL1077**	Syngenta, Montana	**2012**	Yellowstone*4/3/MTCL01158/CDC Teal 11A//Jagalene **PVP# 202000183**	Private
SY Wolverine	**08BC379-40-1**	Syngenta	**2019**	Everest / Platte // SY Wolf, PVP# 201900271	Private
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), **PVP# 201400131**	Public
WB4422		Westbred	**2021**	na	Private Elite
WB4483		Westbred	**2021**	na	Private Elite
WB4727		Westbred	**2022**	na	Private Elite
Yellowstone	**MT00159**	Montana	**2005**	F_2 composite of Promontory/Judith and Judith-dwarf/Promontory, **PVP# 200600284**	Public

Table 3: Northwestern Agricultural Research Center, Kalispell (District 1)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	2023					2023	2022-23	2021-23	2020-23
AAC Coldfront	156	203	82.5	10.4	61.8	152.5	--	--	--
AAC Wildfire	**159**	**205**	83.9	11.1	61.6	130.5	132.7	133.1	138.8
Amplify SF	152	198	84.8	10.2	61.9	125.2	--	--	--
AP Bigfoot	152	199	84.8	11.1	62.7	143.5	142.9	134.2	--
AP Solid	156	200	84.9	10.7	60.8	115.0	123.4	126.9	--
AP18 AX	151	200	80.3	11.6	63.3	161.0	143.0	136.1	--
Balance	156	203	**93.3**	11.2	62.2	134.2	132.0	125.2	--
Bobcat	157	198	82.4	11.3	63.0	144.9	139.3	--	--
Brawl CL Plus	151	199	83.1	11.7	62.9	115.1	113.4	--	--
CP7017AX	151	199	89.0	10.4	62.4	128.5	126.0	124.0	--
CP7909	150	199	78.1	10.1	63.1	144.5	117.5	122.8	122.7
CPX7266AX	152	200	84.7	11.8	62.0	149.8	--	--	--
Flathead	152	199	88.0	11.5	63.7	154.5	143.1	--	--
Fortify SF	152	198	83.8	10.2	60.9	113.9	110.7	111.4	--
FourOsix	157	202	78.9	11.5	62.5	149.8	140.0	--	--
Judee	156	200	87.5	11.8	**63.8**	157.8	137.7	--	--
Keldin	156	201	86.7	10.4	63.3	160.3	152.3	--	--
Kivari AX	152	200	89.0	9.7	61.5	132.0	--	--	--
LCS Eclipse AX	157	202	85.9	10.0	59.4	**170.2**	--	--	--
LCS Helix AX	152	200	84.2	10.5	63.6	145.6	147.6	140.4	--
LCS Steel AX	156	205	84.3	9.6	59.7	114.4	125.3	116.9	--
Loma	157	203	84.4	11.5	62.5	157.8	140.3	--	--
Milestone	156	201	78.5	10.2	58.9	129.4	135.7	125.5	--
MS Maverick	153	199	84.5	11.6	63.2	141.0	133.0	135.0	--
MS Sundown	151	199	83.5	11.0	61.9	142.1	--	--	--
MT WarCat	158	204	74.0	11.1	62.5	146.2	136.3	133.5	--
MT2019	157	202	78.6	11.1	62.4	162.4	148.4	145.6	--
MTAX21187	153	200	85.0	10.5	62.3	146.7	--	--	--
MTCL19151	156	201	85.0	11.4	62.6	145.4	132.4	134.7	--
MTCL2010	156	203	83.1	11.7	62.3	151.8	134.8	137.5	--
MTCS20151	157	203	81.2	11.6	62.3	150.9	--	--	--
MTCS20156	158	200	79.9	11.8	62.8	144.2	145.1	143.2	--
MTCS20158	157	202	86.7	12.0	62.4	150.9	--	--	--
MTFH19132	156	201	83.2	10.2	60.6	153.6	142.4	131.5	--
MTFH20170	156	203	83.2	11.9	62.6	148.5	--	--	--
MTS1908	159	204	81.3	11.3	62.9	142.9	131.9	132.9	--
MTS2068	158	202	86.4	11.1	62.8	156.9	142.4	137.9	--
MTS2197	156	201	78.6	11.2	63.1	142.3	--	--	--
MTV2164	156	201	84.7	10.9	62.1	151.8	--	--	--
Northern	156	204	88.5	11.6	62.3	164.6	145.3	--	--
Ramsay	157	201	83.3	10.8	63.2	160.6	146.9	138.1	--
StandClear CLP	157	200	89.1	11.6	63.2	150.8	137.6	128.9	134.0
SY Clearstone 2CL	158	202	91.0	10.7	62.0	161.1	**153.0**	**146.6**	**150.5**
SY Wolverine	151	198	88.8	10.6	61.1	117.8	129.2	121.9	130.6
Warhorse	157	202	84.0	**12.4**	62.1	124.6	127.9	121.1	125.4
WB4422	155	203	83.8	10.7	61.6	116.0	--	--	--
WB4483	157	199	85.0	10.7	61.5	118.2	--	--	--
WB4727	156	202	85.7	10.1	58.4	109.3	--	--	--
Yellowstone	158	201	86.1	10.9	62.4	150.8	137.2	138.8	144.5
Grand Mean	***155***	***201***	***88.0***	***11.0***	***62.1***	***142.5***	***136.1***	***131.7***	***135.2***
LSD	***1***	***3***	***6.2***	***0.5***	***1.0***	***20.8***	***26.3***	***20.8***	***20.4***
CV	***0.34***	***0.74***	***49.98***	***2.86***	***0.94***	***10.35***	***11.65***	***11.84***	***12.28***
Genotype significance	***0.00***	***0.00***	***0.98***	***0.00***	***0.00***	***0.00***	***0.18***	***0.09***	***0.06***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.01***	***0.00***	***0.05***

Bold: highest value reported for the respective trait; '—': No observation

Table 4: Arthur H. Post Agronomy Farm, Bozeman (District 2)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	170	219	37.8	9.5	55.0	136.9	--	--	--
AAC Wildfire	170	220	36.6	9.3	53.9	119.9	109.8	95.0	94.9
Amplify SF	165	209	32.4	9.9	57.3	128.9	--	--	--
AP Bigfoot	162	207	31.2	10.0	52.9	129.2	128.8	105.3	--
AP Solid	165	210	30.6	9.8	58.3	136.4	126.8	106.4	--
AP18 AX	161	204	33.3	9.9	54.2	127.6	122.4	103.4	--
Balance	165	219	34.3	8.7	52.1	132.8	127.1	103.7	--
Bobcat	167	210	32.7	9.2	57.7	120.9	116.9	--	--
Brawl CL Plus	161	204	31.6	9.0	57.6	118.2	121.6	--	--
CP7017AX	161	208	29.7	10.0	58.2	136.1	126.5	105.8	--
CP7909	**160**	204	30.8	10.1	59.4	136.1	138.3	115.4	**115.4**
CPX7266AX	165	202	34.5	10.3	54.1	141.1	--	--	--
Flathead	163	209	32.9	9.6	57.4	130.0	130.9	--	--
Fortify SF	164	219	35.0	9.8	58.5	140.4	124.8	104.1	--
FourOsix	167	212	33.1	9.6	53.3	136.6	123.7	--	--
Judee	169	225	36.1	8.7	56.1	131.7	119.8	--	--
Keldin	168	202	32.9	9.2	57.6	**155.5**	146.1	--	--
Kivari AX	164	208	35.7	**10.8**	59.1	145.5	--	--	--
LCS Eclipse AX	168	216	34.5	9.9	53.1	139.1	--	--	--
LCS Helix AX	163	207	31.9	10.7	57.3	142.6	138.2	114.4	--
LCS Steel AX	167	212	35.2	10.7	54.3	138.5	131.2	108.6	--
Loma	170	214	34.5	9.4	53.7	139.5	131.2	--	--
Milestone	168	214	31.2	8.9	51.2	147.4	**149.3**	**121.5**	--
MS Maverick	166	210	35.3	9.6	58.2	147.7	137.2	113.5	--
MS Sundown	162	209	36.6	10.0	51.7	134.7	--	--	--
MT WarCat	172	217	33.6	9.8	54.3	137.5	126.1	106.2	--
MT2019	168	217	32.3	10.1	53.9	140.8	130.5	107.8	--
MTAX21187	164	203	33.7	10.0	54.1	138.8	--	--	--
MTCL19151	166	217	32.2	10.6	52.3	142.7	133.1	109.1	--
MTCL2010	166	217	31.5	10.0	56.5	149.3	135.7	111.6	--
MTCS20151	171	217	34.0	9.5	53.1	137.9	--	--	--
MTCS20156	171	**228**	32.4	9.6	53.2	121.1	114.9	98.8	--
MTCS20158	169	201	30.2	9.3	54.6	122.3	--	--	--
MTFH19132	167	214	35.7	10.2	54.0	145.6	132.4	105.4	--
MTFH20170	165	212	34.9	9.0	56.5	130.4	--	--	--
MTS1908	173	184	34.8	9.8	55.6	141.3	128.3	108.2	--
MTS2068	172	212	34.6	9.0	55.7	129.8	124.7	98.8	--
MTS2197	167	213	28.4	9.4	55.3	121.9	--	--	--
MTV2164	166	214	37.0	9.5	54.4	146.9	--	--	--
Northern	168	208	35.4	9.7	56.2	142.3	128.8	--	--
Ramsay	168	226	32.0	9.7	53.2	146.8	141.6	120.3	--
StandClear CLP	169	213	36.0	9.7	55.2	139.9	127.8	105.1	105.1
SY Clearstone 2CL	169	215	37.0	9.1	55.9	121.2	117.2	97.2	97.2
SY Wolverine	162	227	29.7	9.7	53.2	126.0	128.3	106.8	106.8
Warhorse	169	212	37.3	9.0	54.9	128.6	117.0	95.7	95.7
WB4422	164	212	33.9	9.0	**59.9**	130.4	--	--	--
WB4483	170	214	35.4	9.1	50.4	127.2	--	--	--
WB4727	166	213	33.2	9.7	52.6	126.4	--	--	--
Yellowstone	170	216	37.4	9.6	56.9	138.0	130.9	109.8	109.8
Grand Mean	***166***	***212***	***33.7***	***9.6***	***55.2***	***135.2***	***128.5***	***106.8***	***103.5***
LSD	***3***	***16***	***2.1***	***0.8***	***5.0***	***11.5***	***15.2***	***11.6***	***13.7***
CV	***1.01***	***3.80***	***3.91***	***5.17***	***5.56***	***5.22***	***5.61***	***5.69***	***6.24***
Genotype significance	***0.00***	***0.08***	***0.00***	***0.00***	***0.02***	***0.00***	***0.00***	***0.00***	***0.01***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.00***	***0.00***	***0.00***

Bold: highest value reported for the respective trait; '—': No observation

Table 5: Southern Agriculture Research Center, Huntley (District 3)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	2023					2023	2022-23	2021-23	2020-23
AAC Coldfront	159	--	34.5	11.8	62.8	116.5	--	--	--
AAC Wildfire	**161**	--	**35.7**	12.2	61.3	116.3	76.4	69.1	76.4
Amplify SF	156	--	30.4	11.8	62.2	111.5	--	--	--
AP Bigfoot	157	--	28.3	13.0	62.2	122.2	86.1	78.2	--
AP Solid	156	--	30.2	12.7	62.8	121.0	88.6	76.4	--
AP18 AX	156	--	29.9	12.5	61.1	112.3	79.8	71.4	--
Balance	158	--	32.2	12.4	60.9	97.0	67.5	62.8	--
Bobcat	160	--	29.0	13.3	58.6	72.6	60.1	--	--
Brawl CL Plus	156	--	30.1	12.9	60.3	79.5	63.7	--	--
CP7017AX	155	--	29.3	11.7	61.5	104.4	76.3	70.9	--
CP7909	156	--	29.3	11.7	60.2	91.2	66.1	62.4	66.1
CPX7266AX	156	--	30.7	11.0	60.4	96.1	--	--	--
Flathead	157	--	31.5	12.7	60.7	83.1	63.0	--	--
Fortify SF	156	--	31.1	11.7	61.7	110.7	76.5	67.3	--
FourOsix	158	--	28.7	13.0	58.4	71.3	56.2	--	--
Judee	158	--	34.4	12.1	62.8	114.8	79.7	--	--
Keldin	158	--	33.5	11.9	61.9	128.9	85.0	--	--
Kivari AX	156	--	29.4	11.0	60.6	95.1	--	--	--
LCS Eclipse AX	158	--	32.0	11.9	54.5	87.6	--	--	--
LCS Helix AX	155	--	28.3	11.8	61.7	106.9	79.0	71.7	--
LCS Steel AX	158	--	32.8	10.1	61.5	132.2	89.8	79.7	--
Loma	160	--	30.4	11.4	60.2	89.9	69.2	--	--
Milestone	158	--	32.2	11.2	60.1	132.7	**96.3**	80.5	--
MS Maverick	157	--	31.8	12.9	61.9	**134.9**	90.5	**81.3**	--
MS Sundown	155	--	28.9	11.6	60.8	97.0	--	--	--
MT WarCat	160	--	31.4	11.9	61.3	104.8	75.7	68.6	--
MT2019	159	--	28.6	12.0	59.4	99.9	75.1	69.0	--
MTAX21187	156	--	31.9	12.1	60.4	95.0	--	--	--
MTCL19151	158	--	32.2	12.8	58.3	79.9	64.6	62.0	--
MTCL2010	158	--	29.7	12.9	58.5	82.6	65.0	63.8	--
MTCS20151	160	--	32.3	11.8	60.7	86.7	--	--	--
MTCS20156	**161**	--	29.8	12.8	59.8	70.2	56.8	54.8	--
MTCS20158	160	--	30.4	12.3	61.6	99.7	--	--	--
MTFH19132	158	--	35.4	11.4	60.2	116.7	77.0	63.7	--
MTFH20170	158	--	31.6	13.2	62.3	110.3	--	--	--
MTS1908	160	--	34.6	11.6	59.6	96.3	70.4	65.6	--
MTS2068	160	--	31.2	11.5	59.0	88.4	67.4	59.6	--
MTS2197	159	--	26.5	12.9	59.1	78.7	--	--	--
MTV2164	159	--	34.4	11.0	60.5	92.3	--	--	--
Northern	159	--	32.5	11.6	61.6	109.3	78.2	--	--
Ramsay	158	--	31.8	11.3	61.9	124.4	82.8	74.1	--
StandClear CLP	159	--	31.0	12.3	59.7	83.4	64.5	62.5	64.5
SY Clearstone 2CL	159	--	33.5	13.0	56.0	74.7	54.4	57.4	54.4
SY Wolverine	156	--	28.2	12.9	61.8	119.5	85.4	76.1	**85.4**
Warhorse	158	--	34.1	12.2	60.9	101.0	72.5	65.6	72.5
WB4422	156	--	30.1	**13.7**	**62.9**	128.2	--	--	--
WB4483	160	--	30.8	12.1	59.6	98.5	--	--	--
WB4727	158	--	31.6	11.1	57.7	99.5	--	--	--
Yellowstone	159	--	33.3	12.5	57.2	76.6	58.0	58.2	58.0
Grand Mean	***158***	***--***	***31.3***	***12.1***	***60.4***	***100.9***	***73.5***	***68.2***	***68.2***
LSD	***1***	***--***	***2.6***	***0.7***	***0.8***	***13.2***	***27.7***	***18.6***	***28.2***
CV	***0.35***	***--***	***5.08***	***3.37***	***0.77***	***8.10***	***8.48***	***9.85***	***7.91***
Genotype significance	***0.00***	***--***	***0.00***	***0.00***	***0.00***	***0.00***	***0.15***	***0.15***	***0.14***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.00***	***0.00***	***0.00***

Bold: highest value reported for the respective trait; '—': No observation

Table 6: Central Agricultural Research Center, Moccasin (District 4)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	**Trial failed due to less than 50% germination in all plots. Reason for which is unknown**					**Trial failed due to less than 50% germination in all plots. Reason for which is unknown**	**Insufficient data for pooled analysis**	--	--
AAC Wildfire								38.3	52.0
Amplify SF								--	--
AP Bigfoot								39.8	--
AP Solid								**44.6**	--
AP18 AX								42.6	--
Balance								31.8	--
Bobcat								--	--
Brawl CL Plus								--	--
CP7017AX								38.4	--
CP7909								42.3	45.8
CPX7266AX								--	--
Flathead								--	--
Fortify SF								35.6	--
FourOsix								--	--
Judee								--	--
Keldin								--	--
Kivari AX								--	--
LCS Eclipse AX								--	--
LCS Helix AX								35.7	--
LCS Steel AX								41.1	--
Loma								--	--
Milestone								34.8	--
MS Maverick								35.1	--
MS Sundown								--	--
MT WarCat								39.1	--
MT2019								42.3	--
MTAX21187								--	--
MTCL19151								38.6	--
MTCL2010								40.9	--
MTCS20151								--	--
MTCS20156								37.2	--
MTCS20158								--	--
MTFH19132								35.6	--
MTFH20170								--	--
MTS1908								35.6	--
MTS2068								33.0	--
MTS2197								--	--
MTV2164								--	--
Northern								--	--
Ramsay								39.9	--
StandClear CLP								35.7	47.8
SY Clearstone 2CL								43.7	**54.9**
SY Wolverine								41.1	46.1
Warhorse								39.9	48.4
WB4422								--	--
WB4483								--	--
WB4727								--	--
Yellowstone								42.6	53.8
Grand Mean	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***38.7***	***49.8***
LSD	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***9.5***	***12.3***
CV	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***16.41***	***10.29***
Genotype significance	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***0.35***	***0.38***
GenxEnv significance	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***0.13***	***0.10***

Bold: highest value reported for the respective trait; '—': No observation

Table 7: Western Triangle Agricultural Research Center, Conrad (District 5)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	**Trial rejected due to planting errors**					**Trial rejected due to planting errors**	**2022 Trial rejected due to planting errors**	**Insufficient data for pooled analysis**	**Insufficient data for pooled analysis**
AAC Wildfire									
Amplify SF									
AP Bigfoot									
AP Solid									
AP18 AX									
Balance									
Bobcat									
Brawl CL Plus									
CP7017AX									
CP7909									
CPX7266AX									
Flathead									
Fortify SF									
FourOsix									
Judee									
Keldin									
Kivari AX									
LCS Eclipse AX									
LCS Helix AX									
LCS Steel AX									
Loma									
Milestone									
MS Maverick									
MS Sundown									
MT WarCat									
MT2019									
MTAX21187									
MTCL19151									
MTCL2010									
MTCS20151									
MTCS20156									
MTCS20158									
MTFH19132									
MTFH20170									
MTS1908									
MTS2068									
MTS2197									
MTV2164									
Northern									
Ramsay									
StandClear CLP									
SY Clearstone 2CL									
SY Wolverine									
Warhorse									
WB4422									
WB4483									
WB4727									
Yellowstone									
Grand Mean									
LSD									
CV									
Genotype significance									
GenxEnv significance									

Bold: highest value reported for the respective trait; '—': No observation

Table 8: Nutrien Agri Solutions, Fort Benton (District 5)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	--	--	--	--	60.9	74.7	--	--	--
AAC Wildfire	--	--	--	--	58.0	59.4	40.2	41.3	50.0
Amplify SF	--	--	--	--	62.1	77.7	--	--	--
AP Bigfoot	--	--	--	--	60.3	51.2	36.2	37.5	--
AP Solid	--	--	--	--	**62.8**	51.9	40.5	40.0	--
AP18 AX	--	--	--	--	58.7	56.2	40.3	39.9	--
Balance	--	--	--	--	57.5	50.8	35.8	38.4	--
Bobcat	--	--	--	--	60.3	61.8	45.4	--	--
Brawl CL Plus	--	--	--	--	60.4	51.7	36.4	--	--
CP7017AX	--	--	--	--	59.6	39.0	37.6	37.7	--
CP7909	--	--	--	--	60.4	56.3	41.4	44.4	43.1
CPX7266AX	--	--	--	--	59.7	49.2	--	--	--
Flathead	--	--	--	--	59.2	49.6	36.6	--	--
Fortify SF	--	--	--	--	60.9	59.6	43.6	43.4	--
FourOsix	--	--	--	--	58.5	46.9	37.4	--	--
Judee	--	--	--	--	61.2	58.7	43.5	--	--
Keldin	--	--	--	--	60.7	78.3	52.5	--	--
Kivari AX	--	--	--	--	60.3	67.3	--	--	--
LCS Eclipse AX	--	--	--	--	--	32.4	--	--	--
LCS Helix AX	--	--	--	--	61.0	54.7	44.3	42.3	--
LCS Steel AX	--	--	--	--	59.7	64.8	47.6	44.7	--
Loma	--	--	--	--	58.8	59.3	42.2	--	--
Milestone	--	--	--	--	56.4	49.5	36.4	38.0	--
MS Maverick	--	--	--	--	60.9	60.4	46.0	44.7	--
MS Sundown	--	--	--	--	60.9	45.5	--	--	--
MT WarCat	--	--	--	--	59.6	68.9	48.5	44.7	--
MT2019	--	--	--	--	--	37.0	32.8	38.5	--
MTAX21187	--	--	--	--	58.8	41.8	--	--	--
MTCL19151	--	--	--	--	--	37.4	31.1	35.4	--
MTCL2010	--	--	--	--	58.2	31.8	27.1	35.4	--
MTCS20151	--	--	--	--	61.3	73.1	--	--	--
MTCS20156	--	--	--	--	60.4	61.8	46.0	48.2	--
MTCS20158	--	--	--	--	61.7	77.7	--	--	--
MTFH19132	--	--	--	--	58.7	40.7	31.7	31.3	--
MTFH20170	--	--	--	--	59.1	59.3	--	--	--
MTS1908	--	--	--	--	60.3	**78.5**	**53.2**	**49.2**	--
MTS2068	--	--	--	--	59.8	75.1	51.7	45.8	--
MTS2197	--	--	--	--	59.3	59.1	--	--	--
MTV2164	--	--	--	--	58.1	51.1	--	--	--
Northern	--	--	--	--	58.9	64.6	45.5	--	--
Ramsay	--	--	--	--	60.3	48.8	38.5	40.9	--
StandClear CLP	--	--	--	--	58.9	57.8	43.9	43.1	50.1
SY Clearstone 2CL	--	--	--	--	--	39.8	31.8	32.5	42.1
SY Wolverine	--	--	--	--	59.6	57.6	40.9	41.9	45.3
Warhorse	--	--	--	--	59.9	72.3	47.2	42.9	**52.7**
WB4422	--	--	--	--	59.7	36.6	--	--	--
WB4483	--	--	--	--	58.2	76.1	--	--	--
WB4727	--	--	--	--	59.6	69.6	--	--	--
Yellowstone	--	--	--	--	--	38.8	32.5	35.2	41.8
Grand Mean	***--***	***--***	***--***	***--***	***59.8***	***56.4***	***40.8***	***40.7***	***46.4***
LSD	***--***	***--***	***--***	***--***	***2.0***	***21.9***	***6.6***	***13.7***	***15.0***
CV	***--***	***--***	***--***	***--***	***1.6***	***24.0***	***26.7***	***26.5***	***13.0***
Genotype significance	***--***	***--***	***--***	***--***	***0.00***	***0.00***	***0.7***	***0.62***	***0.55***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.00***	***0.01***	***0.00***

Bold: highest value reported for the respective trait; '—': No observation

Table 9: Northern Agricultural Research Center, Havre (District 5)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	167	197	27.3	16.5	56.2	30.6	--	--	--
AAC Wildfire	170	199	26.6	16.6	54.4	31.8	39.8	34.5	41.2
Amplify SF	162	198	23.8	13.6	60.1	32.0	--	--	--
AP Bigfoot	159	196	22.2	14.1	**61.2**	28.9	41.4	37.4	--
AP Solid	162	200	21.7	14.8	60.8	27.8	44.0	37.5	--
AP18 AX	160	199	21.8	13.3	59.2	24.3	41.9	37.6	--
Balance	166	**200**	24.9	17.1	54.6	30.8	42.9	38.6	--
Bobcat	164	194	25.1	16.6	56.8	35.3	50.4	--	--
Brawl CL Plus	159	195	23.6	14.4	60.6	30.2	43.9	--	--
CP7017AX	160	193	21.3	13.8	57.7	29.4	45.9	38.3	--
CP7909	158	194	21.2	13.6	60.5	27.8	42.3	40.2	40.5
CPX7266AX	164	197	24.8	13.4	59.5	29.4	--	--	--
Flathead	160	195	23.7	14.5	58.8	33.3	44.9	--	--
Fortify SF	162	197	23.5	13.9	60.7	29.4	45.6	41.2	--
FourOsix	166	198	26.2	15.6	56.5	30.8	44.8	--	--
Judee	167	199	27.1	17.2	56.0	32.1	41.4	--	--
Keldin	167	198	27.3	15.7	56.0	38.2	49.9	--	--
Kivari AX	161	197	25.4	12.5	59.5	38.2	--	--	--
LCS Eclipse AX	166	199	26.1	15.7	52.1	28.1	--	--	--
LCS Helix AX	159	196	21.4	13.1	60.5	30.7	44.1	38.2	--
LCS Steel AX	163	196	26.1	14.9	56.6	37.1	49.8	43.5	--
Loma	169	199	24.6	16.6	55.5	34.7	44.0	--	--
Milestone	167	198	25.4	15.6	52.9	30.9	47.7	40.5	--
MS Maverick	164	197	24.9	14.4	59.1	33.6	47.5	39.5	--
MS Sundown	161	193	24.8	13.6	60.5	37.0	--	--	--
MT WarCat	**171**	198	22.7	**17.6**	55.5	31.7	44.5	37.1	--
MT2019	166	197	23.0	15.8	54.8	32.6	45.8	37.3	--
MTAX21187	164	197	25.3	14.6	57.0	33.5	--	--	--
MTCL19151	165	198	23.3	15.4	57.1	36.2	47.6	40.3	--
MTCL2010	165	196	22.2	15.3	57.5	37.1	46.8	38.0	--
MTCS20151	169	198	25.6	15.9	58.0	35.6	--	--	--
MTCS20156	169	197	25.4	16.1	58.3	35.1	**54.0**	**44.3**	--
MTCS20158	166	199	24.9	16.1	56.3	34.8	--	--	--
MTFH19132	163	194	**29.1**	15.3	54.1	29.7	43.9	35.0	--
MTFH20170	160	196	27.1	15.5	56.2	34.3	--	--	--
MTS1908	166	194	26.9	15.8	56.1	39.3	49.9	41.1	--
MTS2068	169	198	25.7	15.6	56.9	35.3	48.2	37.8	--
MTS2197	165	196	20.8	16.2	55.4	31.4	--	--	--
MTV2164	162	195	26.9	14.2	58.4	**40.0**	--	--	--
Northern	169	198	24.8	16.1	57.0	32.8	45.4	--	--
Ramsay	167	197	26.2	15.9	57.1	30.4	48.4	42.2	--
StandClear CLP	166	197	27.4	15.7	57.6	33.1	45.2	37.8	44.5
SY Clearstone 2CL	168	199	28.1	16.2	55.4	30.7	43.2	35.0	43.0
SY Wolverine	159	193	21.7	14.3	60.9	28.5	41.7	37.3	44.0
Warhorse	167	197	27.0	16.9	54.1	26.5	40.2	33.1	42.2
WB4422	162	199	24.1	14.5	59.0	28.4	--	--	--
WB4483	170	199	25.2	16.5	57.1	29.3	--	--	--
WB4727	163	197	27.4	15.2	55.3	36.2	--	--	--
Yellowstone	166	197	27.5	15.4	56.9	36.2	49.6	42.4	**48.2**
Grand Mean	***164***	***197***	***24.9***	***15.2***	***57.3***	***32.5***	***45.5***	***38.7***	***43.3***
LSD	***3***	***5***	***2.1***	***1.2***	***1.9***	***6.9***	***7.3***	***7.1***	***14.1***
CV	***1.17***	***1.45***	***5.28***	***4.67***	***2.07***	***13.13***	***9.83***	***10.83***	***9.26***
Genotype significance	***0.00***	***0.13***	***0.00***	***0.00***	***0.00***	***0.00***	***0.02***	***0.22***	***0.92***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.01***	***0.00***	***0.00***

Bold: highest value reported for the respective trait; '—': No observation

Table 10: Eastern Agricultural Research Center, Sidney (District 6)

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	158	--	29.0	9.7	61.0	102.1	--	--	--
AAC Wildfire	**160**	--	**31.0**	9.7	60.6	99.9	79.7	69.1	67.7
Amplify SF	156	--	27.0	10.7	61.9	90.2	--	--	--
AP Bigfoot	155	--	24.5	9.8	60.4	88.9	73.1	58.7	--
AP Solid	156	--	25.3	10.8	**62.9**	89.5	75.5	56.6	--
AP18 AX	152	--	24.5	9.1	60.2	103.5	80.2	65.0	--
Balance	157	--	26.1	10.5	60.5	83.7	66.9	57.8	--
Bobcat	159	--	25.1	10.2	61.3	91.7	80.3	--	--
Brawl CL Plus	152	--	25.6	**11.3**	61.2	82.2	70.2	--	--
CP7017AX	155	--	24.0	9.7	60.6	91.0	71.9	61.0	--
CP7909	151	--	24.9	9.3	60.1	93.5	77.6	66.6	64.0
CPX7266AX	155	--	26.5	9.9	60.8	85.7	--	--	--
Flathead	155	--	26.2	9.9	61.6	91.3	76.9	--	--
Fortify SF	154	--	28.1	9.5	61.1	99.0	79.6	68.5	--
FourOsix	156	--	25.6	9.8	60.4	96.3	80.6	--	--
Judee	157	--	28.2	10.1	61.9	86.6	71.7	--	--
Keldin	159	--	29.0	9.7	61.7	100.7	78.6	--	--
Kivari AX	155	--	27.2	8.9	61.1	96.6	--	--	--
LCS Eclipse AX	157	--	28.5	10.0	56.7	76.6	--	--	--
LCS Helix AX	155	--	25.1	9.3	61.6	87.6	73.3	58.6	--
LCS Steel AX	157	--	28.0	8.6	60.6	102.4	81.0	63.4	--
Loma	159	--	26.4	10.1	60.5	98.4	80.7	--	--
Milestone	159	--	26.5	9.9	59.8	91.9	73.2	64.7	--
MS Maverick	156	--	26.4	10.0	61.6	100.9	79.2	69.2	--
MS Sundown	152	--	27.6	9.8	60.3	98.3	--	--	--
MT WarCat	159	--	26.2	10.0	60.3	94.7	80.9	68.9	--
MT2019	157	--	24.9	9.1	60.2	**103.9**	**90.1**	74.1	--
MTAX21187	155	--	27.6	9.9	60.0	99.5	--	--	--
MTCL19151	155	--	25.1	9.9	59.9	103.7	85.5	**75.2**	--
MTCL2010	155	--	24.8	9.9	59.8	101.7	85.8	70.2	--
MTCS20151	158	--	28.6	10.1	61.3	99.2	--	--	--
MTCS20156	159	--	26.8	10.4	61.2	88.9	74.3	58.0	--
MTCS20158	158	--	24.9	10.9	61.4	97.0	--	--	--
MTFH19132	156	--	28.0	9.6	58.5	97.5	78.7	66.6	--
MTFH20170	156	--	28.0	10.1	61.1	97.8	--	--	--
MTS1908	**160**	--	28.5	9.6	61.3	95.2	78.9	66.0	--
MTS2068	**160**	--	28.3	10.3	61.5	93.6	81.3	69.4	--
MTS2197	157	--	23.5	9.8	61.8	89.2	--	--	--
MTV2164	156	--	28.0	9.8	60.5	101.8	--	--	--
Northern	157	--	27.6	10.0	60.6	100.8	80.8	--	--
Ramsay	159	--	28.7	9.8	61.4	99.3	77.3	58.6	--
StandClear CLP	157	--	28.9	10.6	61.6	96.9	81.0	69.2	68.4
SY Clearstone 2CL	159	--	29.3	9.9	60.8	86.2	74.9	63.3	64.4
SY Wolverine	153	--	23.8	9.9	60.2	95.3	74.2	57.6	57.4
Warhorse	158	--	27.8	10.9	60.3	89.4	76.4	64.8	61.4
WB4422	156	--	26.6	10.5	62.1	95.6	--	--	--
WB4483	159	--	27.6	10.0	59.9	94.0	--	--	--
WB4727	157	--	26.5	9.5	58.2	90.1	--	--	--
Yellowstone	157	--	30.6	9.9	61.0	101.1	83.7	72.1	**74.5**
Grand Mean	***157***	***--***	***26.9***	***9.9***	***60.7***	***94.7***	***78.1***	***65.1***	***65.4***
LSD	***1***	***--***	***1.6***	***0.8***	***0.7***	***8.5***	***9.7***	***10.0***	***11.8***
CV	***0.50***	***--***	***3.77***	***4.76***	***0.67***	***5.55***	***8.23***	***10.29***	***9.99***
Genotype significance	***0.00***	***--***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.05***
GenxEnv significance	***--***	***--***	***--***	***--***	***--***	***--***	***0.06***	***0.00***	***0.02***

Bold: highest value reported for the respective trait; '—' : No observation

Table 11: Research Extension Center, Williston-North Dakota

Genotype	DTH	DTM	PH	Protein	TW	GY			
Year	**2023**					**2023**	**2022-23**	**2021-23**	**2020-23**
AAC Coldfront	155	--	23.6	11.6	60.9	49.9	--	--	--
AAC Wildfire	159	--	26.0	11.7	60.8	54.0	42.4	36.1	40.7
Amplify SF	151	--	23.6	11.9	61.6	45.2	--	--	--
AP Bigfoot	152	--	21.1	11.9	60.8	36.7	26.3	24.7	--
AP Solid	151	--	21.5	12.3	63.1	40.3	30.8	29.0	--
AP18 AX	151	--	23.4	11.4	59.9	48.8	39.3	34.0	--
Balance	158	--	22.3	13.0	59.5	44.2	33.7	27.9	--
Bobcat	154	--	21.4	12.8	60.6	50.5	35.2	--	--
Brawl CL Plus	151	--	21.8	12.6	61.0	43.2	29.5	--	--
CP7017AX	152	--	22.3	11.5	59.8	43.3	30.9	26.6	--
CP7909	152	--	21.7	11.0	60.0	42.7	32.6	30.0	33.6
CPX7266AX	151	--	23.9	11.8	60.7	45.0	--	--	--
Flathead	152	--	25.3	11.8	61.3	50.4	34.0	--	--
Fortify SF	151	--	24.4	12.2	61.1	48.6	35.3	30.4	--
FourOsix	154	--	23.9	11.5	61.0	57.8	40.5	--	--
Judee	156	--	23.6	12.9	61.6	46.6	35.8	--	--
Keldin	156	--	23.8	11.8	60.6	50.2	36.9	--	--
Kivari AX	151	--	23.9	10.7	61.4	52.3	--	--	--
LCS Eclipse AX	155	--	23.6	10.9	57.6	46.9	--	--	--
LCS Helix AX	151	--	22.7	11.4	61.0	46.3	31.2	28.3	--
LCS Steel AX	152	--	23.1	10.7	60.5	54.6	37.4	33.1	--
Loma	157	--	20.7	12.2	60.8	50.8	37.7	--	--
Milestone	155	--	22.7	11.2	59.5	51.4	36.3	32.8	--
MS Maverick	153	--	22.6	11.6	61.4	45.7	32.8	30.8	--
MS Sundown	152	--	23.5	12.4	60.5	46.4	--	--	--
MT WarCat	157	--	21.3	12.1	59.7	50.8	35.2	32.1	--
MT2019	154	--	19.8	11.9	60.2	49.9	37.5	30.8	--
MTAX21187	153	--	24.8	11.7	60.0	50.9	--	--	--
MTCL19151	152	--	20.9	12.0	61.0	45.7	37.4	32.9	--
MTCL2010	152	--	21.1	11.9	61.1	49.3	35.6	32.4	--
MTCS20151	156	--	23.9	12.5	61.2	52.8	--	--	--
MTCS20156	155	--	22.4	12.7	60.5	49.7	34.6	31.4	--
MTCS20158	155	--	21.7	12.8	61.0	44.8	--	--	--
MTFH19132	154	--	26.1	12.2	58.9	50.7	35.4	32.0	--
MTFH20170	152	--	24.4	12.4	61.2	48.5	--	--	--
MTS1908	159	--	22.7	12.4	60.2	47.9	35.7	31.1	--
MTS2068	159	--	22.3	11.9	61.1	46.6	42.6	36.4	--
MTS2197	153	--	20.7	12.5	60.8	46.8	--	--	--
MTV2164	152	--	26.3	11.6	60.9	54.9	--	--	--
Northern	157	--	21.9	12.1	61.4	49.9	33.4	--	--
Ramsay	157	--	24.0	11.1	61.3	53.3	39.5	34.7	--
StandClear CLP	154	--	23.2	12.3	60.2	46.2	31.7	28.6	33.9
SY Clearstone 2CL	156	--	24.8	12.0	60.1	53.0	37.6	32.6	37.8
SY Wolverine	151	--	21.4	11.9	60.5	41.2	29.2	25.6	30.6
Warhorse	157	--	23.0	11.8	60.4	47.7	34.3	31.0	34.2
WB4422	152	--	22.4	12.6	61.2	41.7	--	--	--
WB4483	157	--	21.9	12.9	61.1	43.8	--	--	--
WB4727	153	--	23.9	11.2	58.5	50.9	--	--	--
Yellowstone	155	--	23.8	12.1	60.8	48.6	37.4	34.8	38.3
Grand Mean	*154*	--	*23.0*	*12.0*	*60.6*	*48.1*	*35.2*	*31.2*	*35.6*
LSD	*2*	--	*1.7*	*0.9*	*1.2*	*6.5*	*8.1*	*6.1*	*4.7*
CV	*0.9*	--	*4.5*	*4.6*	*1.2*	*8.3*	*14.0*	*15.3*	*12.3*
Genotype significance	*0.0*	--	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
GenxEnv significance	--	--	--	--	--	--	*0.0*	*0.0*	*0.2*

Bold: highest value reported for the respective trait; '—': No observation

Table 10: Performance cross locations, disease reaction and stem sawfly scores in cropping season 2023

Genotype	DTH	PH	DTM	GY	TW	Protein	Sawfly Infestation	Stripe Rust, WA	
								IT	%
AAC Coldfront	161	30.4	207	95.1	59.8	11.6	9.0	4	23
AAC Wildfire	**163**	**31.2**	**208**	87.3	58.7	11.8	10.8	--	--
Amplify SF	157	27.5	202	87.8	61.0	11.4	4.2	5	55
AP Bigfoot	156	25.5	201	86.0	60.1	11.6	15.1	--	--
AP Solid	158	25.9	203	83.7	**61.6**	11.8	8.5	--	--
AP18 AX	155	26.6	201	90.7	59.5	11.3	8.7	5	58
Balance	160	27.9	207	81.9	58.2	12.2	14.1	--	--
Bobcat	160	26.7	201	82.4	59.8	**12.3**	2.5	2	10
Brawl CL Plus	155	26.5	199	74.1	60.6	12.0	9.5	6	55
CP7017AX	156	25.3	200	82.2	60.0	11.2	6.2	7	63
CP7909	154	25.6	199	84.4	60.5	11.0	5.4	5	58
CPX7266AX	157	28.1	200	85.1	59.6	11.4	7.1	2	11
Flathead	156	27.9	201	84.8	60.5	11.7	8.0	2	6
Fortify SF	157	28.4	205	85.9	60.7	11.2	7.0	--	--
FourOsix	159	27.5	204	84.8	58.7	11.9	9.2	2	11
Judee	160	29.9	207	89.8	60.5	12.1	3.7	3	26
Keldin	160	29.3	201	**101.3**	60.3	11.4	15.5	4	30
Kivari AX	156	28.3	202	89.4	60.5	10.6	10.5	6	68
LCS Eclipse AX	160	29.0	205	83.0	55.6	11.4	15.5	2	6
LCS Helix AX	156	25.9	201	87.9	60.9	11.1	8.0	--	--
LCS Steel AX	159	29.0	204	92.8	59.0	10.8	9.8	--	--
Loma	162	27.3	205	90.1	58.9	11.9	2.3	3	23
Milestone	160	27.6	204	90.1	57.0	11.1	8.9	--	--
MS Maverick	158	28.2	202	94.6	60.9	11.6	6.3	--	--
MS Sundown	155	28.3	200	85.2	59.4	11.4	8.6	5	50
MT WarCat	163	27.0	206	91.1	59.0	12.1	2.7	2	19
MT2019	160	25.7	205	89.7	58.5	11.7	11.1	2	11
MTAX21187	157	28.7	200	86.3	58.9	11.4	11.7	3	28
MTCL19151	159	26.7	205	84.1	58.6	12.1	13.4	2	18
MTCL2010	158	25.9	205	86.3	59.2	12.0	11.3	2	16
MTCS20151	162	28.9	205	91.2	59.7	11.9	2.7	2	18
MTCS20156	162	27.4	208	81.2	59.4	12.2	5.1	2	18
MTCS20158	161	26.4	201	89.8	59.9	12.3	0.2	2	16
MTFH19132	159	30.9	203	91.0	57.8	11.5	20.5	2	19
MTFH20170	158	29.2	203	89.8	59.9	12.0	8.5	2	19
MTS1908	163	29.5	197	91.0	59.4	11.7	3.5	2	8
MTS2068	163	28.4	204	89.7	59.5	11.5	3.6	2	8
MTS2197	159	24.0	203	81.3	59.3	12.0	1.1	3	20
MTV2164	158	30.5	203	91.0	59.3	11.2	13.7	2	13
Northern	161	28.4	203	94.4	59.7	11.8	6.6	2	16
Ramsay	161	28.5	208	94.6	59.7	11.4	10.8	--	--
StandClear CLP	160	29.3	203	86.4	59.5	12.0	5.4	2	17
SY Clearstone 2CL	161	30.5	205	81.0	58.4	11.8	13.4	2	13
SY Wolverine	155	25.0	205	83.4	59.6	11.6	15.4	--	--
Warhorse	161	29.8	204	84.7	59.0	12.2	1.3	3	22
WB4422	157	27.4	205	81.5	61.0	11.8	8.7	5	50
WB4483	162	28.2	204	84.4	58.2	11.8	4.5	2	11
WB4727	159	28.5	204	83.3	57.2	11.1	6.8	5	53
Yellowstone	161	30.5	205	83.9	59.2	11.7	10.4	2	17
Grand Mean	159	27.9	203	87.2	59.4	11.6	8.3	--	--
LSD	1	1.4	6	11.6	1.4	0.8	6.1	--	--
CV	0.8	4.5	2.1	10.7	2.3	4.4	43.0	--	--
Residual Variance	1.6	1.6	18.0	87.6	1.9	0.3	12.8	--	--
Genotype significance	0.0	0.0	0.1	0.1	0.0	0.0	0.0	--	--
GenxEnv significance	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--

Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with continuous ITs. ; '—': No observation

Table 11: Average monthly weather data of interstate testing sites during winter wheat cropping season 2022-23

Station Code	Name	Month	T_{MIN}	T_{MAX}	T_{AVG}	T_{EMN}	T_{EMX}	WS	PRCP	SNOW
USC00241044	Bozeman	2022-10	34.5	60.3	47.4	21.0	74.0	--	2.6	14.0
USC00241044	Bozeman	2022-11	12.7	35.0	23.8	-10.0	68.0	--	1.6	20.3
USC00241044	Bozeman	2022-12	9.0	30.6	19.8	-39.0	51.0	--	2.1	33.4
USC00241044	Bozeman	2023-01	12.7	33.8	23.3	-23.0	47.0	--	1.2	14.8
USC00241044	Bozeman	2023-02	12.1	37.7	24.9	-17.0	49.0	--	0.7	13.5
USC00241044	Bozeman	2023-03	17.9	39.6	28.7	9.0	54.0	--	1.3	29.0
USC00241044	Bozeman	2023-04	26.9	54.2	40.5	8.0	77.0	--	1.1	10.7
USC00241044	Bozeman	2023-05	43.6	70.2	56.9	30.0	83.0	--	1.5	0.0
USC00241044	Bozeman	2023-06	46.9	71.7	59.3	34.0	83.0	--	4.7	0.0
USC00241044	Bozeman	2023-07	52.9	85.1	69.0	44.0	94.0	--	0.7	0.0
USC00241044	Bozeman	2023-08	53.1	82.1	67.6	47.0	97.0	--	1.6	0.0
USC00241044	Bozeman	2023-09	45.8	75.5	60.6	34.0	86.0	--	2.3	0.0
USC00241974	Conrad	2022-10	35.9	60.9	48.4	22.0	75.0	--	0.9	3.0
USC00241974	Conrad	2022-11	11.8	34.1	23.0	-17.0	57.0	--	1.0	13.5
USC00241974	Conrad	2022-12	3.6	23.0	13.3	-26.0	47.0	--	1.2	20.0
USC00241974	Conrad	2023-01	18.4	36.7	27.5	-9.0	50.0	--	0.2	2.0
USC00241974	Conrad	2023-02	17.1	37.6	27.3	-26.0	51.0	--	0.4	7.5
USC00241974	Conrad	2023-03	14.0	33.5	23.8	-2.0	49.0	--	1.0	16.0
USC00241974	Conrad	2023-04	27.9	55.4	41.6	11.0	75.0	--	1.4	4.0
USC00241974	Conrad	2023-05	44.6	71.5	58.0	35.0	83.0	--	2.4	0.0
USC00241974	Conrad	2023-06	48.9	73.8	61.3	38.0	85.0	--	2.3	0.0
USC00241974	Conrad	2023-07	51.8	84.2	68.0	46.0	95.0	--	0.1	0.0
USC00241974	Conrad	2023-08	52.5	82.9	67.7	42.0	95.0	--	0.7	0.0
USC00241974	Conrad	2023-09	44.0	72.4	58.2	32.0	88.0	--	2.2	0.0
USC00243113	Fort Benton	2022-10	37.2	64.1	50.6	26.0	81.0	4.5	2.2	0.7
USC00243113	Fort Benton	2022-11	14.3	36.1	25.2	-12.0	70.0	8.1	0.7	10.7
USC00243113	Fort Benton	2022-12	1.5	23.3	12.4	-34.0	55.0	4.9	1.3	16.3
USC00243113	Fort Benton	2023-01	20.3	40.1	30.2	-4.0	59.0	5.8	0.6	2.8
USC00243113	Fort Benton	2023-02	18.8	40.4	29.6	-23.0	57.0	9.6	0.7	9.4
USC00243113	Fort Benton	2023-03	16.9	37.9	27.4	-3.0	56.0	4.5	0.7	6.3
USC00243113	Fort Benton	2023-04	30.7	56.9	43.8	13.0	82.0	4.3	2.3	1.2
USC00243113	Fort Benton	2023-05	48.2	74.5	61.3	38.0	90.0	5.1	2.0	0.0
USC00243113	Fort Benton	2023-06	51.7	77.0	64.3	38.0	88.0	3.4	3.2	0.0
USC00243113	Fort Benton	2023-07	54.6	89.0	71.8	43.0	105.0	2.9	0.2	0.0
USC00243113	Fort Benton	2023-08	54.8	87.3	71.0	46.0	104.0	3.1	0.4	0.0
USC00243113	Fort Benton	2023-09	45.6	79.2	62.4	40.0	96.0	2.0	2.1	0.0
USW00094012	Havre	2022-10	35.5	63.7	49.6	24.0	80.0	10.5	1.5	0.2
USW00094012	Havre	2022-11	12.4	31.5	22.0	-18.0	65.0	13.6	0.6	5.6
USW00094012	Havre	2022-12	-4.5	17.6	6.5	-38.0	42.0	8.9	1.5	32.7
USW00094012	Havre	2023-01	9.1	27.0	18.0	-11.0	42.0	10.3	0.5	5.8
USW00094012	Havre	2023-02	14.5	32.1	23.3	-20.0	44.0	13.0	0.4	7.1
USW00094012	Havre	2023-03	8.1	27.9	18.0	-9.0	46.0	10.3	0.4	10.8
USW00094012	Havre	2023-04	30.1	53.5	41.8	14.0	76.0	10.3	0.5	0.2
USW00094012	Havre	2023-05	46.8	74.3	60.6	38.0	87.0	8.9	2.5	0.0
USW00094012	Havre	2023-06	51.2	77.9	64.6	37.0	92.0	8.1	2.7	0.0

Station Code	Name	Month	T_{MIN}	T_{MAX}	T_{AVG}	T_{EMN}	T_{EMX}	WS	PRCP	SNOW
USW00094012	Havre	2023-07	54.6	88.1	71.3	44.0	104.0	8.9	0.2	0.0
USW00094012	Havre	2023-08	54.6	86.4	70.5	44.0	99.0	8.9	0.9	0.0
USW00094012	Havre	2023-09	46.7	76.7	61.7	36.0	95.0	7.8	1.3	0.0
USC00244345	Huntley	2022-10	35.5	64.6	50.0	20.0	82.0	--	1.8	0.4
USC00244345	Huntley	2022-11	11.0	36.6	23.8	-19.0	69.0	--	0.8	10.1
USC00244345	Huntley	2022-12	-2.2	24.7	11.2	-42.0	49.0	--	0.5	8.5
USC00244345	Huntley	2023-01	14.6	38.8	26.7	-20.0	53.0	--	0.4	2.4
USC00244345	Huntley	2023-02	10.5	37.2	23.8	-35.0	59.0	--	0.7	6.0
USC00244345	Huntley	2023-03	13.2	37.7	25.4	-5.0	56.0	--	1.1	16.5
USC00244345	Huntley	2023-04	28.9	58.4	43.7	15.0	85.0	--	0.6	0.6
USC00244345	Huntley	2023-05	44.2	75.5	59.8	33.0	90.0	--	1.9	0.0
USC00244345	Huntley	2023-06	52.4	76.2	64.3	42.0	90.0	--	8.1	0.0
USC00244345	Huntley	2023-07	54.8	87.5	71.2	43.0	101.0	--	0.6	0.0
USC00244345	Huntley	2023-08	55.4	86.2	70.8	46.0	101.0	--	0.9	0.0
USC00244345	Huntley	2023-09	47.1	79.0	63.0	38.0	95.0	--	1.3	0.0
USC00244558	Kalispell	2022-10	32.9	61.5	47.2	23.0	75.0	4.5	0.5	0.0
USC00244558	Kalispell	2022-11	17.1	30.5	23.8	-1.0	47.0	4.9	1.6	10.2
USC00244558	Kalispell	2022-12	10.5	24.4	17.5	-34.0	39.0	4.3	2.1	18.7
USC00244558	Kalispell	2023-01	18.1	31.1	24.6	-14.0	39.0	2.9	0.9	8.7
USC00244558	Kalispell	2023-02	14.2	33.0	23.6	-6.0	42.0	6.5	0.6	7.4
USC00244558	Kalispell	2023-03	18.8	41.3	30.1	4.0	53.0	6.0	0.2	3.8
USC00244558	Kalispell	2023-04	28.4	55.1	41.7	14.0	82.0	6.5	0.4	1.1
USC00244558	Kalispell	2023-05	44.5	72.7	58.6	33.0	86.0	5.8	2.3	0.0
USC00244558	Kalispell	2023-06	46.7	76.6	61.7	30.0	89.0	5.6	0.7	0.0
USC00244558	Kalispell	2023-07	48.8	87.1	67.9	41.0	99.0	5.8	0.2	0.0
USC00244558	Kalispell	2023-08	49.9	83.8	66.8	38.0	100.0	5.4	3.0	0.0
USC00244558	Kalispell	2023-09	42.1	70.4	56.2	33.0	81.0	4.5	1.0	0.0

T_{MIN}: Average minimum temperature (F); T_{MAX}: Average maximum temperature (F); T_{AVG}: Average temperature (F); T_{EMN}: Average minimum extreme temperature (F); T_{EMX}: Average maximum extreme temperature (F); WS: Average temperature (mph); PRCP: Average precipitation (in); SNOW: Average snowfall (in)

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