

# 2021 MONTANA WINTER WHEAT VARIETY PERFORMANCE SUMMARY

## Montana Counties and Agricultural Districts



[Released Winter 2022]

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J. D. Tracy<sup>1,2</sup>, J. E. Berg<sup>1,2</sup>, P. L. Bruckner<sup>1,2</sup>, R. Ramsfield<sup>1,2</sup>, C. Beiermann<sup>3</sup>, C. Chen<sup>3</sup>, J. Eberly<sup>3</sup>,  
T. Gross<sup>3</sup>, J. Hammontree<sup>3</sup>, E. Haney<sup>3</sup>, D. Holen<sup>2</sup>, K. D. Kephart<sup>3</sup>, C. Kowatch-Carlson<sup>3</sup>,  
P. Lamb<sup>3</sup>, K. McNamara<sup>3</sup>, D. Nash<sup>2</sup>, J. Pavelka<sup>3</sup>, G. Pradhan<sup>4</sup>, T. Schafer,  
J. A. Torrion<sup>3</sup>, J. M. Vetch<sup>3</sup>, and C. Wahlstrom<sup>4</sup>.

<sup>1</sup>Principal Investigators, Montana State University, Winter Wheat Breeding Program

<sup>2</sup>Montana State University, Dept. of Plant Sciences and Plant Pathology

<sup>3</sup>Montana State University, Montana Agricultural Experiment Station (MAES)

<sup>4</sup>North Dakota State University, Williston Research and Extension Center

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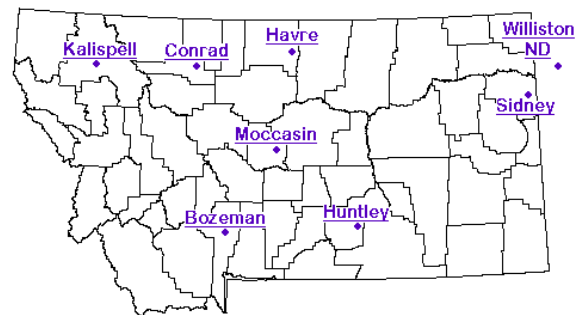
## Introduction

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 other varieties commonly grown in Montana. A brief description of each variety is given, including their particular advantages or disadvantages. The information presented in this publication was extracted from the Intrastate Winter Wheat Nursery. 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



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

(Southern District), Sidney and Williston, ND (Northeast District), Kalispell (Northwest District), and Bozeman (Southwest District).

### **Entries**

Names of commercially available hard winter wheat varieties and experimental lines evaluated in 2021 are listed in Table 2 with their origins, experimental designation, release year, and pedigrees. Forty-nine hard wheats are included in this summary comprising 32 varieties (14 public and 18 private) and 17 experimental lines (14 public and 3 private). Numbered

entries preceded by a state designation [e.g. MT1745 (Montana) or private company, LCS18-7071, (Limagrain Cereals)] are experimental lines provided by the breeder. During the season, the 3 private experimental lines were given variety names.

### **Experimental Design and Seeding Methods**

The Intrastate Winter Wheat Test consists of 49 entries with 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<sup>2</sup> at Conrad to 60 ft<sup>2</sup> 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 all testing locations in Table 1. All seed, for each nursery, was treated with CruiserMaxx Vibrance Cereals<sup>®</sup> seed treatment and Gaucho<sup>®</sup> insecticide seed treatment, at recommended rates, before seeding.

### **2021 Test Conditions**

The Montana Agricultural Statistics Service reported statewide winter wheat yields at 31 bushels per acre (bu/ac) for 2021, down 20 bu/ac from the 2020 season. This represents the lowest yield for Montana since 28 bu/ac in 2002. The harvested acreage in 2021 was 1.73 million acres (total production = 53.63 million bu) compared to 1.49 million acres harvested in 2020 (total production = 75.99 million bu).

Rainfall for the 2020-2021 crop year was generally below average at all locations except Huntley. Extremes, from historical averages, ranged from +1.88 inches at Huntley to -7.15 inches at Williston (Table 14).

Grain yield for the 9 locations harvested averaged 50.9 bushels per acre (bu/ac). Across locations, average yield ranged from 23.7 bu/ac at Williston, N.D. (severe drought, spring emergence) to 122.4 bu/ac at Kalispell. Grain yield of named varieties, across the 9 locations, ranged from a low of 43.1 bu/ac for 'Judee' to a high of 57.6 bu/ac for 'Flathead'.

Test weight averaged 58.7 pounds per bushel (lb/bu) across the 9 locations, down 3.5 lb/bu from 2020 (62.2 lb/bu average).

### **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 2021, data is provided for two (2020-2021), three (2019-2021) and four (2018-2021) 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<sup>®</sup> Grain Analysis Computer (GAC) at some locations. Other locations use a Seedburow<sup>®</sup> 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.

### **Winter Survival**

Percent winter survival is estimated for each plot after initial spring green-up at locations where significant winter injury has occurred.

Table 12 contains information on winter survival and associated yield in winter-kill environments from 2018 to 2021. The Sidney and Williston (District 6) testing sites consistently have the most severe winter-kill for winter wheat out of all of our testing locations.

### **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), central (District 4), and south central (District 3) 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) and StandClear CLP (2020).

Table 13 contains information on grain yield and sawfly cutting percentage at locations where sawfly pressure was present during the years 2018-2021. Stem solidness scores (rated on a 5-25 scale) are shown for solid and semi-solid varieties in Table 15.

### **Cereal Quality**

Milling and baking characteristics for varieties are presented in Table 15. They are rated for each variety on a 1-5 scale (5 = superior quality). A quantitative polyphenol oxidase (PPO) score has been determined for varieties since the 2006 mill and bake evaluation. These varieties are reported in Table 15 as low to high. A lower PPO value is associated with better Asian noodle quality.

### **Disease Reactions**

Disease reactions for hard red wheat varieties are listed in Table 15. 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.

### Variety Selection

Tables 3 through 11 present data for hard winter wheat varieties harvested at all experiment station sites in 2021. 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 2021.**

| Location   | District | Field Cropping History |           | Fertilizer Application <sup>1</sup> (lb/ac) |            |                               |                  | Seeding Date | Harvest Date |        |
|------------|----------|------------------------|-----------|---|------------|-------------------------------|------------------|--------------|--------------|--------|
|            |          |                        |           | Nitrogen (N)                                |            | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O |              |              | S      |
|            |          | 2019                   | 2020      | Fall '20                                    | Spring '21 |                               |                  | 2020         | 2021         |        |
| Kalispell  | 1        | Barley                 | Canola    | 65  | 150        | 10                            | 226              | 0            | 28-Sep       | 24-Aug |
| Bozeman    | 2        | Oats                   | Fallow    | 254   | NA         | 31                            | 0                | 0            | 30-Sep       | 1-Aug  |
| Huntley    | 3        | Barley (recrop)        | Fallow    | 100   | NA         | 0                             | 0                | 0            | 7-Oct        | 28-Jul |
| Moccasin   | 4        | Proso Millet           | Legume CC | 10  | 53         | 15                            | 10               | 5            | 21-Sep       | 28-Jul |
| Havre      | 5        | Spring Wheat           | Fallow    | 125   | 77         | 20                            | 10               | 10           | 17-Sep       | 16-Jul |
| Conrad     | 5        | -                      | Fallow    | 4   | NA         | 21                            | 0                | 0            | 8-Oct        | 12-Aug |
| Ft. Benton | 5        | Winter Wheat           | Fallow    | 16  | 115        | 20                            | 0                | 14           | 1-Oct        | 26-Jul |
| Sidney     | 6        | -                      | Fallow    | 35  | 40         | 26                            | 0                | 0            | 11-Sep       | 28-Jul |
| Williston  | 6        | Winter Wheat           | Field Pea | 7   | NA         | 24                            | 0                | 6            | 15-Sep       | 5-Aug  |

<sup>1</sup> = Fall nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>), and potassium (K<sub>2</sub>O) were preplant applied and incorporated.

NA = No Application

- = Data not available

**Table 2. Public and Private Hard Winter Wheat Varieties and Experimental Lines in 2021 Intrastate Test**

| Variety                 | Experimental Designation | Origin  | Release Year | Pedigree  |
|-------------------------|--------------------------|---|--------------|---|
| <b>Public Varieties</b> |                          |   |              |   |
| <b>AAC Wildfire</b>     | <b>W512</b>              | Alberta/<br>SECAN   | <b>2015</b>  | ((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, <u>L99-1236</u> ) /8/ <u>AC Bellatrix</u>   |
| <b>Battle AX</b>        | <b>CO15A018</b>          | Colorado:<br>Plainsgold/<br>Colorado Research<br>Foundation/<br>Montech | <b>2019</b>  | AF28/Byrd//AF26/Byrd/3/AF28/Byrd//AF10 M3/2*Byrd  |
| <b>Bobcat</b>           | <b>MTS1588</b>           | Montana   | <b>2019</b>  | selection from a composite of 2 crosses: 07X291, ((SMN82164/SMN82140//Rocky/Tiber, MT9659)/3/S87-101/4/Pronghorn, <u>MT0598</u> )/5/( <u>98X366E29-1</u> , Heyne/Rampart// (MT9513, BigSky sib)) and 07X295, (((Lew/Tiber//Redwin ,MTS92021)/3/Judith/Arapahoe, MTS0023)/4/Pryor/ Genou, <u>01X258C1</u> )/5/ <u>MT0598</u>   |
| <b>Brawl CL Plus</b>    | <b>CO06052</b>           | Colorado:<br>Plainsgold/<br>Colorado Research<br>Foundation             | <b>2011</b>  | Teal 11A/Above//((CO99314, TX91V4931/ Halt)   |
| <b>Byrd CL Plus</b>     | <b>CO13003C</b>          | Colorado:<br>Plainsgold/<br>Colorado Research<br>Foundation             | <b>2018</b>  | CO06072/4*Byrd (Als1, Als2)   |
| <b>Flathead</b>         | <b>MT1564</b>            | Montana   | <b>2019</b>  | selection from a composite of 2 crosses: 07X76, <u>Yellowstone*2/5/ (PI640431</u> , BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet/3/ WA007900//Yr15/ 6*Avocet) and 07X77, <u>Yellowstone/PI640431/4/(Yellowstone(340,233), Yellowstone*5/3/ (Yellowstone sib, MT9982) //(MTS0222, Rampart*2/Judith))</u>   |
| <b>Fortify SF</b>       | <b>CO15SFD107</b>        | Colorado:<br>Plainsgold/<br>Colorado Research<br>Foundation             | <b>2019</b>  | Byrd/Bearpaw//Byrd  |
| <b>FourOsix</b>         | <b>MT1465</b>            | Montana   | <b>2018</b>  | 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); |
| <b>Judee</b>            | <b>MTS0713</b>           | Montana   | <b>2011</b>  | (Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon  |
| <b>Loma</b>             | <b>MTS1224</b>           | Montana   | <b>2016</b>  | <u>Yellowstone/5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, MTS0112)/4/(MTS0125</u> , selection from a composite of 4 crosses)   |
| <b>Northern</b>         | <b>MT0978</b>            | Montana   | <b>2015</b>  | 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  |

**Table 2. Public and Private Hard Winter Wheat Varieties and Experimental Lines in 2021 Intrastate Test**

| Variety            | Experimental Designation | Origin   | Release Year | Pedigree   |
|--------------------|--------------------------|--|--------------|--|
| <b>Warhorse</b>    | <b>MTS0808</b>           | Montana  | <b>2013</b>  | 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) |
| <b>Whistler</b>    | <b>CO13D1783</b>         | Colorado: Plainsgold/ Colorado Research Foundation | <b>2018</b>  | CO08W218/Snowmass//Byrd  |
| <b>Yellowstone</b> | <b>MT00159</b>           | Montana  | <b>2005</b>  | F <sub>2</sub> composite of Promontory/Judith and Judith-dwarf/Promontory  |

**Private Varieties**

|                     |                       |   |             |                                     |
|---------------------|-----------------------|---|-------------|-------------------------------------|
| <b>AP18 AX</b>      | <b>CO14A136</b>       | Colorado Research Foundation/ Syngenta                      | <b>2020</b> | AF10/2*Byrd//AF26/Byrd              |
| <b>Balance</b>      | <b>WA8248</b>         | Washington; Nutrien   | <b>2020</b> | BC002-2/Norwest 553-0               |
| <b>CP7869</b>       |                       | Winfield Solutions, LLC, Arden Hills, MN                    | <b>2018</b> | na                                  |
| <b>CP7909</b>       |                       | Winfield Solutions, LLC, Arden Hills, MN                    | <b>2018</b> | na                                  |
| <b>CP7017AX</b>     | <b>LCH15ACC-15-17</b> | Limagrain LLC: Winfield Solutions, LLC, Arden Hills, MN     | <b>2020</b> | na                                  |
| <b>CP7050AX</b>     | <b>LCH15ACC-7-2</b>   | Limagrain LLC: Winfield Solutions, LLC, Arden Hills, MN     | <b>2020</b> | na                                  |
| <b>Keldin</b>       | <b>ACS55017</b>       | Peter Franck: Seed Link Inc.; Ontario, Canada, Westbred LLC | <b>2011</b> | Barenburg 235/Carlisle//TRX-A16-3-2 |
| <b>LCS Helix AX</b> | <b>LCS15ACC-8-21</b>  | Limagrain LLC   | <b>2020</b> | na                                  |
| <b>LCS Julep</b>    | <b>LCH13D-47-1675</b> | Limagrain LLC   | <b>2020</b> | na                                  |
| <b>Milestone</b>    |                       | Dr. Peter Franck, Germany; Nutrien                          | <b>2020</b> | na                                  |

Table 2. Public and Private Hard Winter Wheat Varieties and Experimental Lines in 2021 Intrastate Test

| Variety           | Experimental Designation | Origin  | Release Year | Pedigree  |
|-------------------|--------------------------|---|--------------|---|
| StandClear CLP    | MTCS1601                 | Montana/<br>Loveland<br>Products Inc;<br>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) |
| SY 517 CL2        | 07CL039-7                | Syngenta  | 2017         | (BC950811-2-6 / BC98343-09-7, 03B212#4) // (CL03040-6-1, iW98-362A1 (imiJagalene, Als3) / AP502CL (Als1) /3/ Art  |
| SY Clearstone 2CL | MTCL1077                 | Syngenta,<br>Montana                                  | 2012         | Yellowstone*4/3/MTCL01158/CDC Teal 11A/Jagalene   |
| SY Wolverine      | 08BC379-40-1             | Syngenta  | 2019         | Everest / Platte // SY Wolf   |
| WB4401            | XC4109                   | Bayer: WestBred-<br>Monsanto:                         | 2020         | na  |
| WB4418            | XA4402                   | WestBred-<br>Monsanto:                                | 2018         | TUKURU-S-3 /3/ KS920750-A-13-1 // KS89180B-2-1-1 / CMBW91M02959T /4/ TX92U3060 / TX91D6564  |
| WB4505            | MODI4-5179,<br>XC4209    | Bayer: WestBred-<br>Monsanto:                         | 2019         | na  |
| WB4792            | XB4711                   | Bayer: WestBred-<br>Monsanto:                         | 2019         | na  |

Public Elite Lines

|                |          |  |      |   |
|----------------|----------|--|------|---|
|                | MTCL1737 |  |      | Yellowstone-2CL /3/ Yellowstone*2 /Pelsart// Promontory/ 3*Yellowstone  |
|                | MT1745   |  |      | Decade*2/3/(NI06732, HBK0630-4-5// (NE98632, Niobrara/NE91525)  |
|                | MTS1831  |  |      | selection from a composite of 2 crosses: 09X203, (selection from a composite of 2 crosses, <b>see pedigree</b> , MTS0907)/ (MTS0827, selection from a composite of 2 crosses, <b>see pedigree</b> ) and 09X211, (selection from a composite of 2 crosses, <b>see pedigree</b> , MTS0916)/MTS0827  |
|                | MTS1855  |  |      | selection from a composite of 2 crosses: 10X199, (05X438-aC71, (Erhardt //Judith / CDC Kestrel, MT0097)*2 /3/ Jagalene / Choteau) /4/ Roughrider and 10X200, (05X438-aB30-2, (Erhardt //Judith / CDC Kestrel, MT0097)*2 /3/ Jagalene / Choteau) /4/ (MT0890, selection from a composite of 2 crosses, <b>see pedigree</b> )   |
|                | MT1872   |  |      | selection from a composite of 2 crosses: 09X83, ((MT8709, Erhardt sib)/ NuWest// Erhardt, MT0071) /10/ (Wesley sib, N95L1229) /9/ (MT9834, (Froid/ Winoka/7/ ((Sinvalocho/ Wichita// Hope/ Cheyenne/3/ Wichita/4/ Seu Seun 27, TX55-391-56-D8)/5/ Westmont, MT6928)/6/ Trader, MT85200) /8/ Tiber, MT0859) /11/ ((Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/Plainsman V //Uljanovka), MTW0047)/4/(G97019, G33/Tomahawk//Karl 92), MT0840) /5/ (MT0873, selection from a composite of 2 crosses, see pedigree) and 09X84, MT0859*2 / (MT0872, selection from a composite of 2 crosses, see pedigree) |
|                | MTS18116 |  |      | Loma*2/Warhorse   |
| (name pending) | MTS18149 |  | 2022 | Loma*2/AAC Gateway  |
|                | MTS1903  |  |      | 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   |

**Table 2. Public and Private Hard Winter Wheat Varieties and Experimental Lines in 2021 Intrastate Test**

| Variety | Experimental Designation | Origin | Release Year | Pedigree   |
|---------|--------------------------|--------|--------------|--|
|         | <b>MTS1908</b>           |        |              | selection from a composite of 2 crosses: 11X1, (Judee sib, <u>MTS0819</u> ) /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)), <u>08X350-A6</u> /9/ <u>Warhorse</u> and 11X2, <u>Spur</u> // <u>08X350-A6</u> / <u>Warhorse</u>   |
|         | <b>MTS1915</b>           |        |              | (selection from a composite of 2 crosses containing Judee and Decade, <b>see pedigree</b> , <u>MTS1596</u> ) // <u>Emerson</u> / <u>Spur</u>   |
|         | <b>MTFH19132</b>         |        |              | ((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 I/3/ Delmar / Columbia // CI13837), MT02113)*4 /11/(MTS0359, Rampart / Mironovskaya 61), <u>MT1078</u> /12/ <u>Colter</u> / <u>Emerson</u>   |
|         | <b>MTCL19149</b>         |        |              | ((Judith / Yogo, MT9417) // Ogallala, MT0277) /8/ ((Tiber /5/ (MT8030, TAM W-103 /Froid /4/ Yogo // Turkey Red / Oro /3/ Centurk), MT9409)*2/ 6/ IMI Fidel, MTCL0309) /7/ CDC Teal 11A /9/ (MT02136, selection from a composite of 2 crosses - see pedigree), <u>MTCL1125</u> ) /9/ ( <u>MT1091</u> , Reeder/6*Yellowstone)  |
|         | <b>MTCL19151</b>         |        |              | (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, <u>MT0871</u> ) /5/ ( <u>06X445B1-2</u> , SY Clearstone sib)   |
|         | <b>MT19175</b>           |        |              | selection from a composite of 2 crosses: 11X202, (Wesley / NE93613, <u>SD08198</u> ) // <u>Northern</u> ; 11X203, <u>SD08198</u> /12/ <u>MT1078</u> , ((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 I/3/ Delmar / Columbia // CI13837), MT02113)*4 /11/(MTS0359, Rampart / Mironovskaya 61); and 11X204, <u>SD08198</u> /4/ ( <u>MT10121</u> , Yellowstone*2 /3/ (Yellowstone sib, MT9982) // (MTS0222, Rampart*2 / Judith)) |

**Private Elite Lines (variety name designated during the 2021 crop season)**

|                  |                       |               |             |    |
|------------------|-----------------------|---------------|-------------|----|
| <b>LCS Steel</b> | <b>LCS 18-7071 AX</b> | Limagrain LLC | <b>2021</b> | na |
| <b>Ramsay</b>    | <b>NAS-7653</b>       | Nutrien       | <b>2021</b> | na |
| <b>AP Solid</b>  | <b>NP13005004#49</b>  | Syngenta      | <b>2021</b> | na |

Table 3. Hard Winter Wheat: District 1 - Kalispell

| Cultivar/Line           | Grain Yield (bu/ac) |              |              |              | Test Weight (lb/bu) | 2021 Data    |          | Plant Height (in) | Protein (%) |
|-------------------------|---------------------|--------------|--------------|--------------|---------------------|--------------|----------|-------------------|-------------|
|                         | 2021                | 2020-21      | 2019-21      | 2018-21      |                     | Heading Date |          |                   |             |
|                         | 1yr                 | 2yr          | 3yr          | 4yr          |                     | Ordinal      | Calendar |                   |             |
| Combined years of data: |                     |              |              |              |                     |              |          |                   |             |
| AAC Wildfire            | 126.0               | <b>141.5</b> | <b>139.1</b> | <b>125.1</b> | <b>59.4</b>         | 169.3        | 18-Jun   | 36.0              | 11.8        |
| AP Solid                | 102.0               |              |              |              | 58.8                | 166.4        | 15-Jun   | 29.6              | 12.0        |
| AP18 AX                 | 123.8               |              |              |              | 57.2                | 160.7        | 10-Jun   | 31.1              | 11.7        |
| Balance                 | 128.6               |              |              |              | 57.8                | 166.4        | 15-Jun   | 32.3              | 12.2        |
| Battle AX               | 115.8               |              |              |              | 58.6                | 162.6        | 12-Jun   | 30.4              | 11.9        |
| Bobcat                  | 123.3               | 131.4        | 126.8        | 118.6        | 58.7                | 166.0        | 15-Jun   | 32.5              | 12.0        |
| Brawl CL Plus           | 107.6               | 121.6        | 117.7        | 110.0        | 58.7                | 158.8        | 8-Jun    | 31.6              | <b>13.6</b> |
| Byrd CL Plus            | <b>129.3</b>        | <b>144.0</b> | <b>138.1</b> | 121.1        | 57.3                | 165.3        | 14-Jun   | 35.3              | 11.1        |
| CP7017AX                | 104.7               |              |              |              | 56.8                | 162.5        | 11-Jun   | 26.5              | 11.9        |
| CP7050AX                | 100.7               |              |              |              | 58.2                | 158.0        | 7-Jun    | 29.6              | 12.8        |
| CP7869                  | 112.0               |              |              |              | 57.5                | 158.3        | 7-Jun    | 27.6              | 11.9        |
| CP7909                  | 101.3               | 111.9        |              |              | 58.5                | 154.3        | 3-Jun    | 30.6              | 12.9        |
| Flathead                | <b>133.8</b>        | <b>146.7</b> | <b>143.4</b> | <b>134.1</b> | 58.1                | 159.0        | 8-Jun    | 29.9              | 11.7        |
| Fortify SF              | 123.1               |              |              |              | 58.6                | 161.0        | 10-Jun   | 33.8              | 11.5        |
| FourOsix                | <b>130.4</b>        | 137.1        | <b>134.4</b> | <b>123.9</b> | 58.2                | 166.6        | 16-Jun   | 31.1              | 11.4        |
| Judee                   | 102.5               | 124.4        | 128.0        | 119.6        | <b>59.1</b>         | 165.6        | 15-Jun   | 33.1              | 12.2        |
| Keldin                  | <b>130.9</b>        | <b>149.3</b> | <b>144.6</b> | <b>133.8</b> | <b>59.1</b>         | 165.9        | 15-Jun   | 32.7              | 11.7        |
| LCS Helix AX            | 112.3               | 135.8        |              |              | 57.9                | 160.8        | 10-Jun   | 30.0              | 11.3        |
| LCS Julep               | 121.1               |              |              |              | 57.9                | 161.0        | 10-Jun   | 30.9              | 12.2        |
| LCS Steel AX            | 114.2               | 132.3        |              |              | 56.6                | 166.3        | 15-Jun   | 34.6              | 11.8        |
| Loma                    | <b>138.6</b>        | <b>150.7</b> | <b>143.9</b> | <b>129.8</b> | 58.3                | 168.9        | 18-Jun   | 31.1              | 11.7        |
| Milestone               | <b>140.2</b>        |              |              |              | 56.7                | 166.6        | 16-Jun   | 30.8              | 11.2        |
| MT1745                  | <b>137.7</b>        | <b>152.3</b> | <b>143.0</b> |              | 58.4                | 168.4        | 17-Jun   | 33.6              | 11.4        |
| MT1872                  | 127.7               | <b>141.3</b> |              |              | 57.5                | 165.8        | 15-Jun   | 32.3              | 11.5        |
| MT19175                 | 117.5               |              |              |              | 56.2                | 169.7        | 19-Jun   | 30.2              | 11.8        |
| MTCL1737                | 125.1               | <b>140.9</b> | <b>138.1</b> |              | 56.6                | 170.8        | 20-Jun   | 30.4              | 11.5        |
| MTCL19149               | 125.6               |              |              |              | 57.8                | 166.1        | 15-Jun   | 32.5              | 11.1        |
| MTCL19151               | 113.1               |              |              |              | 57.1                | 164.3        | 13-Jun   | 29.2              | 12.1        |
| MTFH19132               | <b>130.8</b>        |              |              |              | 57.5                | 165.7        | 15-Jun   | 34.6              | 11.3        |
| MTS18116                | 111.3               | 133.7        |              |              | 57.3                | 170.8        | 20-Jun   | 27.1              | 11.4        |
| MTS18149                | <b>144.1</b>        | <b>145.4</b> |              |              | 58.2                | 168.5        | 17-Jun   | 31.7              | 12.0        |
| MTS1831                 | <b>130.1</b>        | <b>148.1</b> |              |              | 57.8                | 172.3        | 21-Jun   | 29.5              | 11.2        |
| MTS1855                 | 111.6               | 132.6        |              |              | <b>59.4</b>         | 167.9        | 17-Jun   | 32.2              | 11.8        |
| MTS1903                 | <b>139.0</b>        |              |              |              | <b>59.2</b>         | 169.9        | 19-Jun   | 33.7              | 11.3        |
| MTS1908                 | <b>138.8</b>        |              |              |              | <b>59.2</b>         | 170.2        | 19-Jun   | 33.9              | 11.2        |
| MTS1915                 | 127.8               |              |              |              | 57.7                | 171.4        | 20-Jun   | 32.3              | 11.5        |
| Northern                | <b>129.2</b>        | <b>146.6</b> | <b>144.1</b> | <b>127.6</b> | 57.8                | 167.1        | 16-Jun   | 34.2              | 11.7        |
| Ramsay                  | <b>140.5</b>        |              |              |              | 58.0                | 166.0        | 15-Jun   | 31.8              | 11.2        |
| StandClear CLP          | 113.0               | 131.2        | 128.3        | 117.6        | 58.7                | 164.9        | 14-Jun   | 33.6              | 12.0        |
| SY 517 CL2              | 94.7                | 108.4        | 103.4        | 90.9         | 58.8                | 159.2        | 8-Jun    | 29.6              | <b>13.0</b> |
| SY Clearstone 2CL       | <b>134.7</b>        | <b>148.4</b> | <b>145.7</b> | <b>131.7</b> | 57.9                | 166.2        | 15-Jun   | 36.0              | 11.8        |
| SY Wolverine            | 102.7               | 129.8        | 123.6        |              | 57.2                | 159.2        | 8-Jun    | 29.6              | 11.6        |
| Warhorse                | 110.9               | 124.7        | 122.6        | 115.0        | 56.4                | 166.1        | 15-Jun   | 33.9              | 12.7        |
| WB4401                  | 122.6               |              |              |              | 58.1                | 158.7        | 8-Jun    | 31.2              | 11.0        |
| WB4418                  | 119.7               | 132.8        | 129.2        |              | 56.2                | 161.2        | 10-Jun   | 28.6              | 11.4        |
| WB4505                  | 126.1               |              |              |              | 58.4                | 160.0        | 9-Jun    | 30.8              | 10.8        |
| WB4792                  | <b>134.2</b>        | <b>153.9</b> |              |              | <b>60.1</b>         | 165.4        | 14-Jun   | 33.1              | 11.0        |
| Whistler                | 119.5               |              |              |              | 58.8                | 163.8        | 13-Jun   | 33.8              | 11.1        |
| Yellowstone             | <b>146.3</b>        | <b>154.0</b> | <b>145.3</b> | <b>129.9</b> | 57.1                | 165.7        | 15-Jun   | 33.6              | 12.0        |
| Average                 | 122.4               | 137.5        | 133.6        | 121.9        | 58.0                | 164.8        | 14-Jun   | 31.7              | 11.7        |
| LSD (0.05)              | 17.6                | 15.0         | 11.3         | 11.8         | 1.1                 | 1.6          |          | 2.1               | 0.6         |
| C. V. (%)               | 8.3                 | 5.7          | 5.1          | 6.8          | 1.1                 | 0.6          |          | 4.1               | 3.3         |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Environment: Dryland (High Rainfall)

Table 4. Hard Winter Wheat: District 2 - Bozeman

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |              |              | Test<br>Weight<br>(lb/bu) | 2021 Data    |               | Plant<br>Height<br>(in) | Protein<br>(%) |
|-------------------------|------------------------|-------------|--------------|--------------|---------------------------|--------------|---------------|-------------------------|----------------|
|                         | 2021                   | 2020-21     | 2019-21      | 2018-21      |                           | Heading Date |               |                         |                |
|                         | 1yr                    | 2yr         | 3yr          | 4yr          |                           | Ordinal      | Calendar      |                         |                |
| Combined years of data: |                        |             |              |              |                           |              |               |                         | Bulk           |
| AAC Wildfire            | 59.6                   | 76.7        | 92.9         | 103.5        | 58.2                      | 170.7        | 20-Jun        | 29.9                    | 15.6           |
| AP Solid                | 63.9                   |             |              |              | <b>61.2</b>               | 166.7        | 16-Jun        | 27.3                    | 14.2           |
| AP18 AX                 | 64.0                   |             |              |              | 56.0                      | 164.2        | 13-Jun        | 29.2                    | 14.4           |
| Balance                 | 65.4                   |             |              |              | 57.5                      | 165.5        | 14-Jun        | 28.3                    | 15.9           |
| Battle AX               | 58.6                   |             |              |              | 54.5                      | 164.1        | 13-Jun        | 28.9                    | 14.9           |
| Bobcat                  | 55.4                   | 73.0        | 88.5         | 100.0        | 58.3                      | 167.8        | 17-Jun        | 26.8                    | 15.2           |
| Brawl CL Plus           | 69.9                   | 71.9        | 90.0         | 96.3         | 57.7                      | 162.3        | 11-Jun        | 31.3                    | 14.7           |
| Byrd CL Plus            | 67.5                   | 80.4        | <b>99.6</b>  | <b>108.6</b> | 56.1                      | 164.2        | 13-Jun        | 30.4                    | 14.6           |
| CP7017AX                | 61.8                   |             |              |              | 55.8                      | 163.9        | 13-Jun        | 27.8                    | 14.1           |
| CP7050AX                | 61.2                   |             |              |              | 59.5                      | 162.1        | 11-Jun        | 31.2                    | 13.9           |
| CP7869                  | 61.0                   |             |              |              | 53.7                      | 162.7        | 12-Jun        | 28.5                    | 15.0           |
| CP7909                  | <b>72.6</b>            | 73.5        |              |              | 56.7                      | 160.7        | 10-Jun        | 31.6                    | 14.3           |
| Flathead                | 69.9                   | 75.3        | 95.1         | 104.0        | 57.6                      | 164.8        | 14-Jun        | 30.9                    | 15.3           |
| Fortify SF              | 65.7                   |             |              |              | 59.4                      | 164.4        | 13-Jun        | 29.9                    | 13.8           |
| FourOsix                | 61.8                   | 82.9        | <b>98.1</b>  | <b>107.2</b> | 57.3                      | 166.6        | 16-Jun        | 28.6                    | 15.6           |
| Judee                   | 55.5                   | 73.9        | 90.1         | 99.6         | 57.4                      | 166.5        | 15-Jun        | 29.3                    | 16.2           |
| Keldin                  | 68.6                   | 84.4        | <b>107.2</b> | <b>116.5</b> | 57.6                      | 166.1        | 15-Jun        | 30.2                    | 14.8           |
| LCS Helix AX            | 60.5                   | 70.5        |              |              | 57.6                      | 164.0        | 13-Jun        | 27.7                    | 14.2           |
| LCS Julep               | <b>78.1</b>            |             |              |              | <b>60.6</b>               | 163.1        | 12-Jun        | 29.0                    | 14.6           |
| LCS Steel AX            | 68.1                   | 80.7        |              |              | 58.6                      | 168.1        | 17-Jun        | 31.5                    | 13.8           |
| Loma                    | 63.9                   | 80.2        | <b>96.4</b>  | <b>107.2</b> | 58.0                      | 169.3        | 18-Jun        | 28.2                    | 14.8           |
| Milestone               | 66.7                   |             |              |              | 54.2                      | 165.8        | 15-Jun        | 26.9                    | 15.1           |
| MT1745                  | 65.7                   | 79.3        | <b>98.6</b>  |              | 58.1                      | 166.8        | 16-Jun        | 28.6                    | 14.3           |
| MT1872                  | 62.9                   | 78.9        |              |              | 56.6                      | 167.2        | 16-Jun        | 27.2                    | 14.9           |
| MT19175                 | 65.6                   |             |              |              | 57.0                      | 168.3        | 17-Jun        | 27.8                    | 15.1           |
| MTCL1737                | 57.0                   | 74.9        | 91.6         |              | 60.0                      | 169.6        | 19-Jun        | 27.8                    | 15.3           |
| MTCL19149               | 62.2                   |             |              |              | 57.2                      | 167.6        | 17-Jun        | 27.7                    | 15.9           |
| MTCL19151               | 67.8                   |             |              |              | 57.5                      | 164.3        | 13-Jun        | 26.5                    | 15.3           |
| MTFH19132               | 67.3                   |             |              |              | 55.3                      | 165.9        | 15-Jun        | 31.0                    | 14.6           |
| MTS18116                | 52.0                   | 74.3        |              |              | 59.0                      | 169.4        | 18-Jun        | 25.5                    | 14.8           |
| MTS18149                | 61.8                   | 77.5        |              |              | 59.5                      | 169.8        | 19-Jun        | 28.4                    | 14.6           |
| MTS1831                 | 52.5                   | 73.0        |              |              | 58.9                      | 169.2        | 18-Jun        | 25.6                    | 14.7           |
| MTS1855                 | 62.4                   | 81.0        |              |              | 59.7                      | 169.2        | 18-Jun        | 27.5                    | 15.2           |
| MTS1903                 | 63.8                   |             |              |              | 59.2                      | 169.6        | 19-Jun        | 29.0                    | 15.3           |
| MTS1908                 | 65.4                   |             |              |              | 59.4                      | 170.0        | 19-Jun        | 27.2                    | 15.1           |
| MTS1915                 | 47.7                   |             |              |              | 59.1                      | 169.6        | 19-Jun        | 26.2                    | 14.9           |
| Northern                | 68.4                   | 84.2        | <b>104.5</b> | <b>115.3</b> | 58.2                      | 169.1        | 18-Jun        | 28.9                    | 15.6           |
| Ramsay                  | <b>72.1</b>            |             |              |              | 57.0                      | 166.6        | 16-Jun        | 29.7                    | 14.3           |
| StandClear CLP          | 59.1                   | 74.3        | 92.1         | 102.9        | 58.4                      | 166.3        | 15-Jun        | 28.8                    | 14.6           |
| SY 517 CL2              | 61.3                   | 61.4        | 80.0         | 88.5         | 56.4                      | 162.5        | 11-Jun        | 29.5                    | 14.9           |
| SY Clearstone 2CL       | 60.9                   | 76.5        | <b>99.2</b>  | <b>110.0</b> | 56.6                      | 167.3        | 16-Jun        | 30.0                    | 16.1           |
| SY Wolverine            | 63.3                   | 71.6        | 85.2         |              | 58.6                      | 164.2        | 13-Jun        | 28.2                    | 14.9           |
| Warhorse                | 53.2                   | 63.5        | 82.0         | 91.7         | 56.6                      | 167.6        | 17-Jun        | 28.3                    | 16.1           |
| WB4401                  | 62.9                   |             |              |              | 54.8                      | 163.1        | 12-Jun        | 27.9                    | 14.5           |
| WB4418                  | 55.4                   | 64.6        | 80.4         |              | 55.8                      | 163.3        | 12-Jun        | 27.9                    | 14.8           |
| WB4505                  | 63.8                   |             |              |              | 57.6                      | 164.3        | 13-Jun        | 29.2                    | 14.4           |
| WB4792                  | 63.6                   | 76.6        |              |              | 59.4                      | 166.8        | 16-Jun        | 30.2                    | 14.2           |
| Whistler                | 63.3                   |             |              |              | 56.1                      | 165.5        | 14-Jun        | 30.9                    | 14.6           |
| Yellowstone             | 65.4                   | 79.2        | <b>100.2</b> | <b>109.5</b> | 56.9                      | 167.9        | 17-Jun        | 30.7                    | 15.1           |
| Average                 | <b>63.0</b>            | <b>75.5</b> | <b>93.2</b>  | <b>104.0</b> | <b>57.6</b>               | <b>166.2</b> | <b>15-Jun</b> | <b>28.8</b>             | <b>14.9</b>    |
| LSD (0.05)              | <b>6.2</b>             | ns          | <b>11.9</b>  | <b>9.5</b>   | <b>1.0</b>                | <b>1.0</b>   |               | <b>1.8</b>              |                |
| C.V. (%)                | <b>5.6</b>             | <b>11.0</b> | <b>7.7</b>   | <b>6.4</b>   | <b>1.0</b>                | <b>0.3</b>   |               | <b>3.5</b>              |                |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p = 0.05)

Environment: Dryland (Moderate Rainfall)

Table 5. Hard Winter Wheat: District 3 - Huntley

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |             |              | 2021 Data   |              |             |
|-------------------------|------------------------|-------------|-------------|--------------|-------------|--------------|-------------|
|                         |                        |             |             |              | Test Weight | Plant Height | Protein (%) |
|                         | 2021                   | 2020-21     | 2019-21     | 2018-21      | (lb/bu)     | (in)         |             |
| Combined years of data: | 1yr                    | 2yr         | 3yr         | 4yr          |             |              |             |
| AAC Wildfire            | 48.4                   | 62.7        | 74.4        | 80.5         | 57.4        | 31.6         | <b>15.9</b> |
| AP Solid                | 56.7                   |             |             |              | <b>60.5</b> | 30.0         | 14.1        |
| AP18 AX                 | 55.7                   |             |             |              | 56.3        | 30.9         | 13.9        |
| Balance                 | 50.6                   |             |             |              | 57.5        | 31.5         | <b>16.4</b> |
| Battle AX               | <b>61.4</b>            |             |             |              | 55.8        | 31.7         | 14.6        |
| Bobcat                  | 57.2                   | 67.4        | 78.2        | 83.9         | 57.9        | 28.9         | 15.0        |
| Brawl CL Plus           | 60.2                   | 70.3        | 87.9        | 94.5         | 59.2        | 33.8         | 15.1        |
| Byrd CL Plus            | 56.8                   | 77.6        | 91.6        | <b>100.1</b> | 57.5        | 33.9         | 15.0        |
| CP7017AX                | 57.1                   |             |             |              | 56.8        | 30.9         | 14.0        |
| CP7050AX                | <b>61.7</b>            |             |             |              | <b>62.2</b> | 32.3         | 13.7        |
| CP7869                  | 48.7                   |             |             |              | 57.4        | 30.0         | 15.0        |
| CP7909                  | <b>69.5</b>            | 73.6        |             |              | <b>61.0</b> | 33.7         | 13.3        |
| Flathead                | 58.6                   | 70.0        | 86.9        | 94.4         | 57.2        | 32.7         | <b>15.5</b> |
| Fortify SF              | 60.1                   |             |             |              | <b>60.7</b> | 34.3         | 13.7        |
| FourOsix                | <b>63.4</b>            | 73.7        | 84.2        | 90.9         | 59.1        | 32.3         | 14.6        |
| Judee                   | 53.2                   | 66.1        | 76.0        | 82.1         | 58.2        | 33.4         | <b>15.9</b> |
| Keldin                  | 59.0                   | 75.7        | 94.8        | <b>105.2</b> | 58.1        | 31.1         | 15.1        |
| LCS Helix AX            | 57.5                   | 68.0        |             |              | 59.3        | 30.7         | 13.4        |
| LCS Julep               | 55.1                   |             |             |              | <b>61.0</b> | 32.6         | 15.1        |
| LCS Steel AX            | 54.2                   | 67.8        |             |              | 58.0        | 31.8         | 14.3        |
| Loma                    | <b>63.8</b>            | 73.8        | 80.3        | 84.7         | 58.2        | 30.8         | 14.8        |
| Milestone               | 54.0                   |             |             |              | 53.6        | 29.6         | 15.1        |
| MT1745                  | 59.3                   | 71.0        | 84.9        |              | 58.8        | 32.9         | 14.8        |
| MT1872                  | 48.3                   | 70.1        |             |              | 56.9        | 29.6         | 14.4        |
| MT19175                 | 53.9                   |             |             |              | 55.8        | 29.8         | <b>15.3</b> |
| MTCL1737                | 57.7                   | 71.8        | 86.8        |              | 59.1        | 29.6         | 15.0        |
| MTCL19149               | <b>61.6</b>            |             |             |              | 58.0        | 32.2         | 15.1        |
| MTCL19151               | <b>65.6</b>            |             |             |              | 59.2        | 32.3         | 14.6        |
| MTFH19132               | 55.9                   |             |             |              | 57.0        | 35.5         | <b>15.3</b> |
| MTS18116                | 39.8                   | 55.4        |             |              | 57.6        | 26.7         | <b>16.1</b> |
| MTS18149                | 55.0                   | 66.1        |             |              | 58.4        | 30.4         | <b>15.4</b> |
| MTS1831                 | 50.0                   | 63.5        |             |              | 58.1        | 29.3         | 14.9        |
| MTS1855                 | 46.7                   | 65.4        |             |              | 57.5        | 31.1         | <b>16.4</b> |
| MTS1903                 | <b>60.3</b>            |             |             |              | 58.4        | 30.1         | 14.9        |
| MTS1908                 | 60.2                   |             |             |              | 58.0        | 30.0         | 14.7        |
| MTS1915                 | 44.2                   |             |             |              | 57.6        | 28.0         | 15.2        |
| Northern                | 55.8                   | 70.0        | 83.6        | 89.8         | 57.7        | 31.8         | <b>15.7</b> |
| Ramsay                  | <b>63.1</b>            |             |             |              | 58.1        | 31.8         | 14.7        |
| StandClear CLP          | <b>60.5</b>            | 72.6        | 85.3        | 90.2         | 58.9        | 31.7         | 14.9        |
| SY 517 CL2              | 55.2                   | 65.2        | 85.7        | 94.5         | 58.6        | 32.7         | <b>15.3</b> |
| SY Clearstone 2CL       | <b>64.8</b>            | 76.7        | 88.2        | 92.0         | 58.8        | 35.0         | 15.2        |
| SY Wolverine            | 58.6                   | 70.8        | 91.5        |              | 59.9        | 30.4         | 14.7        |
| Warhorse                | 50.8                   | 63.8        | 78.3        | 86.4         | 57.2        | 32.3         | <b>16.3</b> |
| WB4401                  | 60.0                   |             |             |              | 56.0        | 31.5         | 14.2        |
| WB4418                  | 58.1                   | 66.8        | 80.4        |              | 59.5        | 31.1         | 14.0        |
| WB4505                  | 59.2                   |             |             |              | 58.7        | 33.5         | 14.0        |
| WB4792                  | <b>61.3</b>            | 67.0        |             |              | 60.1        | 33.1         | 14.3        |
| Whistler                | 54.3                   |             |             |              | 56.7        | 34.2         | 14.8        |
| Yellowstone             | 58.8                   | 71.5        | 82.9        | 88.3         | 56.8        | 33.6         | 15.2        |
| Average                 | <b>56.8</b>            | <b>69.1</b> | <b>84.3</b> | <b>90.5</b>  | <b>58.2</b> | <b>31.6</b>  | <b>14.9</b> |
| LSD (0.05)              | <b>9.2</b>             | ns          | ns          | <b>9.8</b>   | <b>1.8</b>  | <b>1.9</b>   | <b>1.1</b>  |
| C. V. (%)               | <b>9.4</b>             | <b>7.9</b>  | <b>8.4</b>  | <b>7.6</b>   | <b>1.9</b>  | <b>51.7</b>  | <b>4.3</b>  |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column

based on Fisher's Protected LSD (p =0.05)

Environment: Dryland

Table 6. Hard Winter Wheat: District 4 - Moccasin

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |             |             | Test<br>Weight<br>(lb/bu) | 2021 Data    |          | Plant<br>Height<br>(in) | Protein<br>(%) |
|-------------------------|------------------------|-------------|-------------|-------------|---------------------------|--------------|----------|-------------------------|----------------|
|                         | 2021                   | 2020-21     | 2019-21     | 2018-21     |                           | Heading Date |          |                         |                |
|                         |                        |             |             |             |                           | Ordinal      | Calendar |                         |                |
| Combined years of data: | 1yr                    | 2yr         | 3yr         | 4yr         |                           |              |          |                         |                |
| AAC Wildfire            | 31.0                   | 45.2        | 56.1        | <b>58.4</b> | 59.0                      | 174.1        | 23-Jun   | 24.0                    | <b>11.6</b>    |
| AP Solid                | 31.6                   |             |             |             | <b>63.8</b>               | 168.9        | 18-Jun   | 22.3                    | 10.8           |
| AP18 AX                 | <b>35.5</b>            |             |             |             | 61.0                      | 166.6        | 16-Jun   | 21.3                    | 9.6            |
| Balance                 | 30.2                   |             |             |             | 60.3                      | 167.6        | 17-Jun   | 22.3                    | <b>11.5</b>    |
| Battle AX               | <b>35.1</b>            |             |             |             | 60.6                      | 166.9        | 16-Jun   | 21.0                    | 9.1            |
| Bobcat                  | <b>33.0</b>            | 44.0        | 53.1        | <b>55.8</b> | 61.3                      | 171.1        | 20-Jun   | 22.0                    | 10.5           |
| Brawl CL Plus           | <b>35.2</b>            | 40.5        | 48.0        | 51.0        | <b>63.9</b>               | 163.5        | 12-Jun   | 24.0                    | 10.6           |
| Byrd CL Plus            | <b>36.5</b>            | 51.4        | 59.6        | <b>61.7</b> | 60.2                      | 168.4        | 17-Jun   | 25.3                    | 9.5            |
| CP7017AX                | <b>34.0</b>            |             |             |             | 59.8                      | 165.3        | 14-Jun   | 23.7                    | 10.6           |
| CP7050AX                | <b>32.8</b>            |             |             |             | <b>63.6</b>               | 164.2        | 13-Jun   | 23.3                    | <b>11.1</b>    |
| CP7869                  | 22.5                   |             |             |             | 61.1                      | 165.9        | 15-Jun   | 22.7                    | <b>11.7</b>    |
| CP7909                  | <b>35.3</b>            | 39.1        |             |             | 61.6                      | 163.3        | 12-Jun   | 22.0                    | 10.1           |
| Flathead                | <b>38.6</b>            | 42.8        | 50.0        | 53.9        | 61.9                      | 166.5        | 15-Jun   | 23.3                    | 10.7           |
| Fortify SF              | <b>34.2</b>            |             |             |             | 62.0                      | 167.3        | 16-Jun   | 22.7                    | 10.0           |
| FourOsix                | 31.9                   | 47.0        | 56.7        | <b>59.9</b> | 60.4                      | 169.1        | 18-Jun   | 22.7                    | 10.9           |
| Judee                   | 30.9                   | 43.5        | 52.2        | 53.4        | 61.2                      | 169.7        | 19-Jun   | 24.0                    | <b>11.0</b>    |
| Keldin                  | <b>33.9</b>            | 47.3        | 55.9        | <b>58.3</b> | 61.5                      | 170.3        | 19-Jun   | 26.7                    | 10.3           |
| LCS Helix AX            | 31.7                   | 42.1        |             |             | 61.9                      | 167.6        | 17-Jun   | 21.7                    | 10.2           |
| LCS Julep               | <b>32.0</b>            |             |             |             | <b>64.4</b>               | 165.9        | 15-Jun   | 22.3                    | <b>11.2</b>    |
| LCS Steel AX            | 31.2                   | 48.0        |             |             | 60.1                      | 170.5        | 19-Jun   | 24.7                    | 9.9            |
| Loma                    | <b>32.9</b>            | 46.2        | 54.6        | <b>57.8</b> | 61.0                      | 171.7        | 21-Jun   | 23.3                    | 10.5           |
| Milestone               | <b>32.3</b>            |             |             |             | 60.2                      | 169.2        | 18-Jun   | 22.7                    | 10.9           |
| MT1745                  | <b>35.2</b>            | 45.9        | 56.5        |             | 60.9                      | 171.2        | 20-Jun   | 23.3                    | 10.2           |
| MT1872                  | 32.0                   | 44.4        |             |             | 61.4                      | 169.4        | 18-Jun   | 23.7                    | 10.4           |
| MT19175                 | <b>36.5</b>            |             |             |             | 60.3                      | 172.5        | 21-Jun   | 22.0                    | 10.4           |
| MTCL1737                | 29.7                   | 45.9        | 54.4        |             | 61.2                      | 172.3        | 21-Jun   | 22.3                    | <b>11.1</b>    |
| MTCL19149               | <b>33.8</b>            |             |             |             | 60.9                      | 171.1        | 20-Jun   | 23.0                    | 10.5           |
| MTCL19151               | <b>34.8</b>            |             |             |             | 62.1                      | 166.5        | 15-Jun   | 22.7                    | 10.0           |
| MTFH19132               | <b>32.6</b>            |             |             |             | 60.0                      | 168.1        | 17-Jun   | 24.3                    | 10.1           |
| MTS18116                | 26.4                   | 42.7        |             |             | 60.7                      | 172.9        | 22-Jun   | 21.3                    | 10.7           |
| MTS18149                | <b>34.5</b>            | 47.6        |             |             | 60.5                      | 173.6        | 23-Jun   | 21.3                    | <b>11.4</b>    |
| MTS1831                 | 27.7                   | 41.3        |             |             | 60.5                      | 172.1        | 21-Jun   | 23.0                    | <b>11.3</b>    |
| MTS1855                 | 31.7                   | 44.5        |             |             | 61.2                      | 171.8        | 21-Jun   | 22.0                    | 10.8           |
| MTS1903                 | <b>33.9</b>            |             |             |             | 61.2                      | 172.3        | 21-Jun   | 23.7                    | 10.6           |
| MTS1908                 | 31.4                   |             |             |             | 60.9                      | 173.1        | 22-Jun   | 24.0                    | <b>11.1</b>    |
| MTS1915                 | 28.4                   |             |             |             | 60.8                      | 173.4        | 22-Jun   | 20.7                    | <b>11.8</b>    |
| Northern                | <b>35.0</b>            | 47.4        | 58.1        | <b>59.9</b> | 61.0                      | 171.6        | 21-Jun   | 24.0                    | 10.7           |
| Ramsay                  | 31.5                   |             |             |             | 61.1                      | 170.3        | 19-Jun   | 25.7                    | 10.6           |
| StandClear CLP          | 31.5                   | 43.2        | 51.4        | <b>55.7</b> | 61.4                      | 168.4        | 17-Jun   | 21.7                    | 10.9           |
| SY 517 CL2              | 29.8                   | 32.4        | 46.0        | 49.6        | 62.6                      | 162.9        | 12-Jun   | 22.7                    | 10.9           |
| SY Clearstone 2CL       | <b>36.8</b>            | 47.2        | 58.3        | <b>61.0</b> | 59.8                      | 169.4        | 18-Jun   | 24.7                    | 10.4           |
| SY Wolverine            | <b>38.8</b>            | 43.3        | 53.3        |             | 62.3                      | 167.1        | 16-Jun   | 22.0                    | 10.3           |
| Warhorse                | <b>32.3</b>            | 41.8        | 49.8        | 52.3        | 61.4                      | 169.8        | 19-Jun   | 23.3                    | <b>11.1</b>    |
| WB4401                  | <b>32.1</b>            |             |             |             | 59.4                      | 165.4        | 14-Jun   | 21.7                    | <b>11.0</b>    |
| WB4418                  | <b>34.9</b>            | 42.8        | 52.2        |             | 62.6                      | 165.8        | 15-Jun   | 21.7                    | 10.0           |
| WB4505                  | <b>34.4</b>            |             |             |             | 61.6                      | 167.1        | 16-Jun   | 22.7                    | 10.4           |
| WB4792                  | <b>34.2</b>            | 46.6        |             |             | 62.2                      | 168.2        | 17-Jun   | 24.7                    | 9.3            |
| Whistler                | <b>34.7</b>            |             |             |             | 61.6                      | 167.5        | 16-Jun   | 24.3                    | 9.9            |
| Yellowstone             | <b>33.9</b>            | 45.6        | 54.3        | <b>58.2</b> | 60.4                      | 170.9        | 20-Jun   | 22.7                    | 10.3           |
| Average                 | <b>32.9</b>            | <b>44.2</b> | <b>53.7</b> | <b>56.4</b> | <b>61.2</b>               | <b>168.9</b> |          | <b>23.0</b>             | <b>10.6</b>    |
| LSD (0.05)              | <b>6.8</b>             | ns          | ns          | <b>6.1</b>  | <b>0.9</b>                | <b>1.4</b>   |          | <b>2.6</b>              | <b>0.9</b>     |
| C. V. (%)               | <b>11.8</b>            | <b>12.6</b> | <b>8.9</b>  | <b>7.6</b>  | <b>0.8</b>                | <b>0.5</b>   |          | <b>6.9</b>              | <b>4.7</b>     |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

Environment: Dryland

Table 7. Hard Winter Wheat: District 5 - Conrad

| Cultivar/Line           | Grain Yield (bu/ac) |             |             |             | Test Weight (lb/bu) | 2021 Data    |               | Plant Height (in) | Protein (%) |
|-------------------------|---------------------|-------------|-------------|-------------|---------------------|--------------|---------------|-------------------|-------------|
|                         | 2021                | 2020-21     | 2019-21     | 2018-21     |                     | Ordinal      | Calendar      |                   |             |
|                         | 1yr                 | 2yr         | 3yr         | 4yr         |                     |              |               |                   |             |
| Combined years of data: |                     |             |             |             |                     |              |               |                   |             |
| AAC Wildfire            | 53.5                | <b>80.6</b> | 70.5        | 68.3        | 61.9                | 174.3        | 23-Jun        | 31.6              | 10.6        |
| AP Solid                | 48.6                |             |             |             | 63.8                | 169.0        | 18-Jun        | 27.1              | 11.2        |
| AP18 AX                 | 52.3                |             |             |             | 61.7                | 169.7        | 19-Jun        | 28.7              | 10.0        |
| Balance                 | 46.6                |             |             |             | 61.3                | 170.7        | 20-Jun        | 28.2              | <b>11.8</b> |
| Battle AX               | 48.6                |             |             |             | 62.5                | 169.3        | 18-Jun        | 28.2              | 10.9        |
| Bobcat                  | <b>58.9</b>         | <b>82.6</b> | 77.8        | 75.1        | 62.4                | 171.0        | 20-Jun        | 29.3              | 11.3        |
| Brawl CL Plus           | 52.6                | 66.8        | 71.0        | 69.6        | 63.4                | 169.3        | 18-Jun        | 27.2              | 11.2        |
| Byrd CL Plus            | <b>58.5</b>         | <b>84.5</b> | 78.2        | 77.8        | 61.2                | 169.3        | 18-Jun        | 32.4              | 10.3        |
| CP7017AX                | 49.9                |             |             |             | 61.4                | 170.0        | 19-Jun        | 25.4              | 11.1        |
| CP7050AX                | 44.3                |             |             |             | 62.6                | 169.7        | 19-Jun        | 26.4              | <b>11.6</b> |
| CP7869                  | 46.5                |             |             |             | 62.4                | 169.0        | 18-Jun        | 26.9              | 11.2        |
| CP7909                  | <b>57.6</b>         | 70.0        |             |             | 61.9                | 169.3        | 18-Jun        | 26.8              | 10.8        |
| Flathead                | <b>60.6</b>         | <b>80.8</b> | 74.9        | 69.4        | 62.3                | 170.0        | 19-Jun        | 31.3              | 11.2        |
| Fortify SF              | 47.3                |             |             |             | 62.2                | 170.0        | 19-Jun        | 28.4              | 10.9        |
| FourOsix                | <b>62.8</b>         | <b>86.0</b> | 78.8        | 74.3        | 61.5                | 170.7        | 20-Jun        | 30.5              | 11.1        |
| Judee                   | 53.5                | 72.7        | 64.7        | 62.8        | 62.9                | 171.0        | 20-Jun        | 29.9              | <b>11.8</b> |
| Keldin                  | <b>56.2</b>         | 72.1        | 72.3        | 69.6        | 62.2                | 170.7        | 20-Jun        | 28.8              | 10.9        |
| LCS Helix AX            | 49.1                | 73.6        |             |             | 62.9                | 169.7        | 19-Jun        | 25.6              | 10.1        |
| LCS Julep               | <b>66.3</b>         |             |             |             | <b>64.7</b>         | 169.3        | 18-Jun        | 29.1              | <b>12.4</b> |
| LCS Steel AX            | 47.1                | 67.4        |             |             | 61.3                | 171.7        | 21-Jun        | 27.2              | 10.0        |
| Loma                    | <b>70.0</b>         | <b>86.9</b> | 79.3        | 75.6        | 61.7                | 173.7        | 23-Jun        | 29.9              | <b>11.4</b> |
| Milestone               | 55.0                |             |             |             | 60.1                | 170.3        | 19-Jun        | 28.3              | 10.5        |
| MT1745                  | <b>67.9</b>         | <b>84.2</b> | 80.0        |             | 62.3                | 170.0        | 19-Jun        | 29.4              | 11.1        |
| MT1872                  | <b>61.6</b>         | <b>79.9</b> |             |             | 61.9                | 172.3        | 21-Jun        | 29.1              | 10.9        |
| MT19175                 | <b>57.4</b>         |             |             |             | 61.3                | 172.3        | 21-Jun        | 28.1              | 10.7        |
| MTCL1737                | 45.7                | 72.1        | 71.6        |             | 60.7                | 173.3        | 22-Jun        | 26.6              | 11.3        |
| MTCL19149               | <b>55.8</b>         |             |             |             | 60.6                | 172.0        | 21-Jun        | 29.0              | 10.7        |
| MTCL19151               | 48.9                |             |             |             | 61.8                | 169.7        | 19-Jun        | 25.9              | <b>11.4</b> |
| MTFH19132               | <b>63.9</b>         |             |             |             | 60.3                | 170.7        | 20-Jun        | 32.5              | 11.3        |
| MTS18116                | 51.0                | <b>80.0</b> |             |             | 62.1                | 173.7        | 23-Jun        | 26.1              | 10.6        |
| MTS18149                | <b>61.6</b>         | <b>84.4</b> |             |             | 61.4                | 173.3        | 22-Jun        | 29.0              | 11.1        |
| MTS1831                 | <b>58.5</b>         | <b>80.0</b> |             |             | 61.9                | 173.3        | 22-Jun        | 26.2              | 10.9        |
| MTS1855                 | <b>57.2</b>         | <b>76.4</b> |             |             | 62.1                | 172.3        | 21-Jun        | 27.3              | 11.1        |
| MTS1903                 | 55.3                |             |             |             | 61.6                | 172.7        | 22-Jun        | 29.3              | 10.8        |
| MTS1908                 | 54.1                |             |             |             | 61.5                | 173.7        | 23-Jun        | 28.9              | 11.0        |
| MTS1915                 | <b>62.3</b>         |             |             |             | 61.5                | 174.0        | 23-Jun        | 28.4              | 10.6        |
| Northern                | <b>58.5</b>         | <b>88.2</b> | 81.8        | 75.1        | 61.8                | 172.3        | 21-Jun        | 30.1              | 10.6        |
| Ramsay                  | 53.9                |             |             |             | 61.7                | 170.7        | 20-Jun        | 29.6              | 11.2        |
| StandClear CLP          | 53.6                | <b>80.4</b> | 75.1        | 74.2        | 62.7                | 170.0        | 19-Jun        | 29.9              | 11.2        |
| SY 517 CL2              | 40.1                | 58.6        | 60.4        | 62.5        | 63.5                | 169.3        | 18-Jun        | 26.4              | <b>11.8</b> |
| SY Clearstone 2CL       | <b>58.4</b>         | <b>75.6</b> | 71.3        | 69.8        | 61.0                | 171.7        | 21-Jun        | 31.9              | 11.0        |
| SY Wolverine            | 44.8                | 61.2        | 64.6        |             | 63.0                | 169.3        | 18-Jun        | 25.6              | 11.1        |
| Warhorse                | <b>56.8</b>         | <b>77.9</b> | 68.5        | 63.9        | 61.6                | 170.7        | 20-Jun        | 29.3              | <b>11.4</b> |
| WB4401                  | <b>56.7</b>         |             |             |             | 61.9                | 170.0        | 19-Jun        | 25.5              | 10.0        |
| WB4418                  | 49.8                | 72.6        | 69.1        |             | 62.0                | 169.7        | 19-Jun        | 26.0              | 11.3        |
| WB4505                  | 54.9                |             |             |             | 61.5                | 169.0        | 18-Jun        | 29.4              | 10.0        |
| WB4792                  | <b>60.4</b>         | <b>83.3</b> |             |             | 63.8                | 170.7        | 20-Jun        | 29.0              | 10.4        |
| Whistler                | 53.0                |             |             |             | 62.6                | 170.0        | 19-Jun        | 29.7              | 10.8        |
| Yellowstone             | <b>64.6</b>         | <b>77.4</b> | 70.7        | 67.1        | 61.1                | 172.0        | 21-Jun        | 31.8              | <b>11.4</b> |
| Average                 | <b>54.9</b>         | <b>77.0</b> | <b>72.7</b> | <b>70.3</b> | <b>62.0</b>         | <b>170.9</b> | <b>20-Jun</b> | <b>28.5</b>       | <b>11.0</b> |
| LSD (0.05)              | <b>14.4</b>         | <b>13.8</b> | ns          | ns          | <b>0.8</b>          | <b>2.6</b>   |               | <b>2.5</b>        | <b>0.9</b>  |
| C. V. (%)               | <b>15.1</b>         | <b>8.7</b>  | <b>12.1</b> | <b>11.9</b> | <b>0.7</b>          | <b>0.9</b>   |               | <b>5.1</b>        | <b>5.0</b>  |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Environment: Dryland

Table 8. Hard Winter Wheat: District 5 - Havre

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |             |             | Test<br>Weight<br>(lb/bu) | 2021 Data    |              | Plant<br>Height<br>(in) | Sawfly<br>Cutting<br>(%) | Protein<br>(%) |
|-------------------------|------------------------|-------------|-------------|-------------|---------------------------|--------------|--------------|-------------------------|--------------------------|----------------|
|                         | 2021                   | 2020-21     | 2019-21     | 2018-21     |                           | Heading Date |              |                         |                          |                |
|                         |                        |             |             |             |                           | Ordinal      | Calendar     |                         |                          |                |
| Combined years of data: | 1yr                    | 2yr         | 3yr         | 4yr         |                           |              |              |                         |                          |                |
| AAC Wildfire            | 17.6                   | 34.8        | 41.2        | 49.0        | 54.1                      | 164.5        | 13-Jun       | 27.1                    | 17                       | 17.6           |
| AP Solid                | 28.9                   |             |             |             | <b>56.9</b>               | 161.3        | 10-Jun       | 28.2                    | 25                       | 16.1           |
| AP18 AX                 | 28.6                   |             |             |             | 52.1                      | 156.3        | 5-Jun        | 30.3                    | 34                       | 15.8           |
| Balance                 | 23.8                   |             |             |             | 52.4                      | 159.2        | 8-Jun        | 28.7                    | 44                       | <b>18.9</b>    |
| Battle AX               | 29.1                   |             |             |             | 51.1                      | 157.0        | 6-Jun        | 30.7                    | 22                       | 17.3           |
| Bobcat                  | 25.5                   | 42.5        | 49.2        | 52.6        | 54.8                      | 163.1        | 12-Jun       | 26.6                    | <b>9</b>                 | 17.8           |
| Brawl CL Plus           | 29.5                   | 38.3        | 42.9        | 46.6        | 52.1                      | 156.0        | 5-Jun        | 30.1                    | 24                       | 17.6           |
| Byrd CL Plus            | 26.7                   | 42.2        | 45.1        | 48.6        | 51.9                      | 158.3        | 7-Jun        | 31.9                    | 25                       | 17.5           |
| CP7017AX                | 31.1                   |             |             |             | 51.1                      | 156.1        | 5-Jun        | 28.7                    | 26                       | 16.0           |
| CP7050AX                | <b>33.9</b>            |             |             |             | 55.3                      | 154.4        | 3-Jun        | 30.1                    | 34                       | 16.4           |
| CP7869                  | <b>32.5</b>            |             |             |             | 50.3                      | 155.4        | 4-Jun        | 27.6                    | 27                       | 17.1           |
| CP7909                  | <b>34.5</b>            | 32.2        |             |             | 52.3                      | 153.9        | 3-Jun        | 29.6                    | 38                       | 16.5           |
| Flathead                | <b>35.2</b>            | 42.8        | 44.9        | 49.0        | 51.8                      | 156.3        | 5-Jun        | 30.4                    | 35                       | 17.1           |
| Fortify SF              | 22.8                   |             |             |             | 54.4                      | 157.9        | 7-Jun        | 30.9                    | 49                       | 15.9           |
| FourOsix                | 23.7                   | 38.4        | 44.8        | 48.7        | 53.3                      | 161.5        | 10-Jun       | 29.3                    | 27                       | 17.4           |
| Judee                   | 18.7                   | 34.8        | 40.7        | 44.5        | 55.0                      | 162.1        | 11-Jun       | 29.5                    | 41                       | 18.4           |
| Keldin                  | 28.5                   | 43.3        | 46.3        | 51.9        | 52.7                      | 162.7        | 12-Jun       | 31.5                    | 37                       | <b>18.7</b>    |
| LCS Helix AX            | 29.8                   | 40.8        |             |             | 54.5                      | 156.0        | 5-Jun        | 29.0                    | 45                       | 15.8           |
| LCS Julep               | 29.1                   |             |             |             | 53.4                      | 156.7        | 6-Jun        | 29.6                    | 15                       | 17.8           |
| LCS Steel AX            | 25.8                   | 40.1        |             |             | 54.6                      | 162.7        | 12-Jun       | 29.7                    | 41                       | 16.8           |
| Loma                    | 24.2                   | 38.6        | 42.8        | 47.2        | 53.2                      | 163.8        | 13-Jun       | 28.1                    | <b>10</b>                | 18.3           |
| Milestone               | 25.8                   |             |             |             | 51.8                      | 162.6        | 12-Jun       | 26.0                    | 41                       | 16.8           |
| MT1745                  | 21.4                   | 35.8        | 43.0        |             | 54.4                      | 163.4        | 12-Jun       | 28.4                    | 26                       | 17.0           |
| MT1872                  | 21.3                   | 37.1        |             |             | 53.9                      | 162.1        | 11-Jun       | 28.3                    | <b>12</b>                | 17.2           |
| MT19175                 | 19.8                   |             |             |             | 53.2                      | 164.0        | 13-Jun       | 27.9                    | 25                       | 17.6           |
| MTCL1737                | 18.8                   | 35.3        | 42.3        |             | <b>55.8</b>               | 163.7        | 13-Jun       | 27.7                    | <b>5</b>                 | 17.2           |
| MTCL19149               | 20.7                   |             |             |             | 51.9                      | 162.7        | 12-Jun       | 31.2                    | 37                       | 17.5           |
| MTCL19151               | 31.1                   |             |             |             | 50.2                      | 159.5        | 8-Jun        | 29.9                    | 35                       | 17.5           |
| MTFH19132               | 23.1                   |             |             |             | 52.2                      | 159.8        | 9-Jun        | 31.7                    | 55                       | 17.6           |
| MTS18116                | 17.6                   | 37.0        |             |             | 55.5                      | 163.4        | 12-Jun       | 25.1                    | <b>4</b>                 | 17.9           |
| MTS18149                | 25.9                   | 41.3        |             |             | 54.5                      | 163.7        | 13-Jun       | 26.9                    | 19                       | 18.2           |
| MTS1831                 | 17.7                   | 35.0        |             |             | <b>56.2</b>               | 164.7        | 14-Jun       | 24.2                    | <b>0</b>                 | 17.8           |
| MTS1855                 | 19.4                   | 36.3        |             |             | 52.9                      | 163.7        | 13-Jun       | 27.6                    | <b>13</b>                | <b>18.9</b>    |
| MTS1903                 | 19.4                   |             |             |             | 54.0                      | 164.7        | 14-Jun       | 28.2                    | <b>3</b>                 | 18.0           |
| MTS1908                 | 21.0                   |             |             |             | 54.3                      | 165.0        | 14-Jun       | 26.6                    | <b>0</b>                 | 18.0           |
| MTS1915                 | 16.5                   |             |             |             | 54.6                      | 164.1        | 13-Jun       | 23.8                    | <b>0</b>                 | 17.3           |
| Northern                | 22.8                   | 36.1        | 43.3        | 46.6        | 51.6                      | 164.1        | 13-Jun       | 27.5                    | 33                       | 18.2           |
| Ramsay                  | 27.2                   |             |             |             | 51.9                      | 162.9        | 12-Jun       | 29.1                    | 32                       | <b>18.7</b>    |
| StandClear CLP          | 23.7                   | 38.6        | 46.3        | 48.6        | 54.4                      | 162.7        | 12-Jun       | 29.8                    | 55                       | 17.9           |
| SY 517 CL2              | <b>33.8</b>            | 39.3        | 41.6        | 44.1        | 53.6                      | 155.9        | 5-Jun        | 27.7                    | 20                       | 16.6           |
| SY Clearstone 2CL       | 18.8                   | 35.6        | 42.7        | 47.5        | 54.6                      | 162.8        | 12-Jun       | 31.5                    | 26                       | 17.6           |
| SY Wolverine            | 28.3                   | 38.7        | 42.1        |             | 54.5                      | 156.6        | 6-Jun        | 29.8                    | 20                       | 16.9           |
| Warhorse                | 20.6                   | 36.0        | 39.5        | 43.9        | 51.5                      | 162.8        | 12-Jun       | 26.6                    | <b>13</b>                | 18.3           |
| WB4401                  | 23.3                   |             |             |             | 51.9                      | 157.5        | 6-Jun        | 26.7                    | 24                       | 16.1           |
| WB4418                  | 31.8                   | 39.1        | 43.9        |             | 52.5                      | 156.4        | 5-Jun        | 28.1                    | <b>7</b>                 | 16.5           |
| WB4505                  | 29.2                   |             |             |             | 52.7                      | 157.6        | 7-Jun        | 30.0                    | 51                       | 16.9           |
| WB4792                  | 30.0                   | 42.0        |             |             | 54.8                      | 160.5        | 9-Jun        | 29.1                    | 29                       | 17.1           |
| Whistler                | 21.4                   |             |             |             | 54.4                      | 160.7        | 10-Jun       | 30.5                    | 41                       | 16.9           |
| Yellowstone             | 27.9                   | 40.7        | 45.4        | 49.5        | 53.5                      | 162.6        | 12-Jun       | 30.9                    | 28                       | 17.5           |
| Average                 | <b>25.3</b>            | <b>38.3</b> | <b>43.6</b> | <b>47.9</b> | <b>53.4</b>               | <b>160.5</b> | <b>9-Jun</b> | <b>28.7</b>             | <b>26.1</b>              | <b>17.4</b>    |
| LSD (0.05)              | <b>3.3</b>             | ns          | ns          | ns          | <b>1.4</b>                | <b>1.7</b>   |              | <b>2.1</b>              | <b>14.4</b>              | <b>0.4</b>     |
| C.V. (%)                | <b>7.6</b>             | <b>16.9</b> | <b>11.1</b> | <b>10.0</b> | <b>1.5</b>                | <b>0.6</b>   |              | <b>5.1</b>              | <b>31.9</b>              | <b>1.4</b>     |

**bold** = indicates highest or lowest value within a column

**bold** = indicates varieties with values equal to highest or lowest variety within a column

based on Fisher's Protected LSD (p =0.05)

Environment: Dryland

**Table 9. Hard Winter Wheat: District 5 - Ft. Benton (Nutrien)**

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |             |             | 2021 Data              |                      |                       |                |
|-------------------------|------------------------|-------------|-------------|-------------|------------------------|----------------------|-----------------------|----------------|
|                         | 2021                   | 2020-21     | 2019-21     | 2018-21     | Test Weight<br>(lb/bu) | Plant Height<br>(in) | Sawfly Cutting<br>(%) | Protein<br>(%) |
|                         | 1yr                    | 2yr         | 3yr         | 4yr         | Bulk                   |                      |                       | Bulk           |
| Combined years of data: |                        |             |             |             |                        |                      |                       |                |
| AAC Wildfire            | 30.5                   | 50.0        | 48.3        | 53.8        | 57.0                   | 31.7                 | 22                    | 14.7           |
| AP Solid                | <b>45.7</b>            |             |             |             | 63.3                   | 28.3                 | 15                    | 12.4           |
| AP18 AX                 | 39.2                   |             |             |             | 57.4                   | 30.0                 | 20                    | 13.2           |
| Balance                 | 39.0                   |             |             |             | 56.7                   | 30.7                 | 34                    | 15.2           |
| Battle AX               | 40.2                   |             |             |             | 55.8                   | 30.7                 | <b>5</b>              | 14.2           |
| Bobcat                  | 35.6                   | 47.7        | 52.5        | 56.5        | 58.0                   | 27.3                 | <b>3</b>              | 14.6           |
| Brawl CL Plus           | <b>51.9</b>            | 52.3        | 55.2        | 57.2        | 60.1                   | 32.7                 | 14                    | 13.9           |
| Byrd CL Plus            | 38.3                   | 54.8        | 52.0        | 57.4        | 53.3                   | 31.0                 | <b>5</b>              | 14.9           |
| CP7017AX                | 38.9                   |             |             |             | 56.1                   | 29.0                 | 24                    | 13.7           |
| CP7050AX                | 36.0                   |             |             |             | 60.3                   | 30.0                 | <b>9</b>              | 14.0           |
| CP7869                  | 43.0                   |             |             |             | 56.8                   | 29.0                 | 44                    | 13.7           |
| CP7909                  | <b>51.7</b>            | 49.1        |             |             | 59.4                   | 29.0                 | <b>10</b>             | 13.4           |
| Flathead                | <b>50.4</b>            | 54.0        | 55.6        | 56.4        | 61.0                   | 31.3                 | 22                    | 13.4           |
| Fortify SF              | 37.8                   |             |             |             | 59.8                   | 29.7                 | <b>12</b>             | 13.2           |
| FourOsix                | 40.3                   | 50.2        | 52.3        | 52.6        | 57.2                   | 28.7                 | 14                    | 14.7           |
| Judee                   | 32.6                   | 47.2        | 51.8        | 54.8        | 56.1                   | 29.0                 | <b>5</b>              | 14.8           |
| Keldin                  | <b>55.4</b>            | 58.8        | 57.7        | 58.3        | 60.2                   | 31.0                 | 24                    | 12.9           |
| LCS Helix AX            | 43.6                   | 49.5        |             |             | 59.8                   | 29.3                 | 40                    | 13.4           |
| LCS Julep               | <b>45.7</b>            |             |             |             | 60.9                   | 29.7                 | 27                    | 14.3           |
| LCS Steel AX            | 41.3                   | 52.6        |             |             | 57.1                   | 30.3                 | 29                    | 13.1           |
| Loma                    | 42.1                   | 52.0        | 54.6        | 57.7        | 58.9                   | 31.0                 | 15                    | 13.2           |
| Milestone               | <b>52.7</b>            |             |             |             | 56.6                   | 30.0                 | 27                    | 13.3           |
| MT1745                  | 32.4                   | 48.1        | 51.9        |             | 55.3                   | 28.3                 | <b>4</b>              | 14.8           |
| MT1872                  | 31.0                   | 47.8        |             |             | 53.5                   | 28.7                 | <b>4</b>              | 13.8           |
| MT19175                 | 37.5                   |             |             |             | 56.5                   | 28.7                 | <b>7</b>              | 14.3           |
| MTCL1737                | 37.0                   | 52.9        | 53.1        |             | 57.3                   | 28.0                 | <b>9</b>              | 15.2           |
| MTCL19149               | 41.4                   |             |             |             | 57.2                   | 29.7                 | <b>12</b>             | 14.3           |
| MTCL19151               | 42.3                   |             |             |             | 57.8                   | 29.0                 | 20                    | 14.2           |
| MTFH19132               | 41.4                   |             |             |             | 56.9                   | 31.0                 | 40                    | 13.7           |
| MTS18116                | 30.5                   | 51.2        |             |             | 56.6                   | 28.0                 | <b>2</b>              | 15.0           |
| MTS18149                | <b>44.0</b>            | 57.7        |             |             | 60.5                   | 28.0                 | <b>5</b>              | 12.9           |
| MTS1831                 | 38.3                   | 50.8        |             |             | 58.1                   | 28.3                 | <b>3</b>              | 13.9           |
| MTS1855                 | 35.1                   | 53.7        |             |             | 56.7                   | 29.0                 | <b>4</b>              | 14.8           |
| MTS1903                 | <b>52.0</b>            |             |             |             | 59.5                   | 29.3                 | <b>2</b>              | 13.3           |
| MTS1908                 | <b>49.9</b>            |             |             |             | 59.7                   | 29.7                 | <b>2</b>              | 13.0           |
| MTS1915                 | 33.9                   |             |             |             | 57.9                   | 27.0                 | <b>1</b>              | 14.4           |
| Northern                | 37.0                   | 55.1        | 55.4        | 59.0        | 56.6                   | 30.0                 | <b>9</b>              | 15.0           |
| Ramsay                  | <b>55.1</b>            |             |             |             | 58.7                   | 31.7                 | 34                    | 13.5           |
| StandClear CLP          | 41.4                   | 52.0        | 53.5        | 53.4        | 58.1                   | 30.0                 | 19                    | 14.1           |
| SY 517 CL2              | <b>47.3</b>            | 47.7        | 51.6        | 53.4        | 61.3                   | 29.7                 | 30                    | 14.0           |
| SY Clearstone 2CL       | 34.0                   | 48.4        | 51.1        | 55.5        | 55.9                   | 31.7                 | 17                    | 14.7           |
| SY Wolverine            | <b>44.1</b>            | 49.2        | 47.5        |             | 60.5                   | 30.3                 | 15                    | 14.1           |
| Warhorse                | 34.3                   | 49.0        | 51.8        | 57.0        | 54.1                   | 28.7                 | <b>1</b>              | 15.8           |
| WB4401                  | 39.9                   |             |             |             | 57.8                   | 28.7                 | 14                    | 13.1           |
| WB4418                  | <b>45.0</b>            | 57.0        | 56.0        |             | 58.4                   | 30.0                 | <b>12</b>             | 13.3           |
| WB4505                  | 38.7                   |             |             |             | 57.2                   | 29.7                 | 30                    | 13.7           |
| WB4792                  | 43.7                   | 52.0        |             |             | 61.5                   | 30.7                 | 27                    | 12.9           |
| Whistler                | 43.1                   |             |             |             | 57.5                   | 30.0                 | 30                    | 13.1           |
| Yellowstone             | 40.5                   | 50.4        | 50.9        | 55.7        | 56.2                   | 29.7                 | 30                    | 14.3           |
| Average                 | <b>41.3</b>            | <b>51.5</b> | <b>52.8</b> | <b>55.9</b> | <b>57.9</b>            | <b>29.6</b>          | <b>23.3</b>           | <b>13.9</b>    |
| LSD (0.05)              | <b>11.5</b>            | ns          | ns          | ns          |                        | <b>2.0</b>           | <b>13.4</b>           |                |
| C. V. (%)               | <b>17.3</b>            | <b>17.0</b> | <b>13.4</b> | <b>12.7</b> |                        | <b>4.1</b>           | <b>35.4</b>           |                |

**bold** = indicates highest or lowest value within a column

**bold** = indicates varieties with values equal to highest or lowest variety within a column based on Fisher's Protected LSD (p =0.05)

Environment: Dryland

Table 10. Hard Winter Wheat: District 6 - Sidney

| Cultivar/Line           | Grain Yield (bu/ac) |             |             |             | Test Weight (lb/bu) | Winter Survival (%) |             | Heading Date |              | Plant Height (in) | Protein (%) |
|-------------------------|---------------------|-------------|-------------|-------------|---------------------|---------------------|-------------|--------------|--------------|-------------------|-------------|
|                         |                     |             |             |             |                     |                     |             |              |              |                   |             |
|                         | 2021                | 2020-21     | 2019-21     | 2018-21     |                     | 21-Apr              | Later       | Ordinal      | Calendar     |                   |             |
| Combined years of data: | 1yr                 | 2yr         | 3yr         | 4yr         |                     |                     |             |              |              |                   |             |
| AAC Wildfire            | <b>53.5</b>         | <b>56.5</b> | <b>67.3</b> | <b>68.0</b> | 59.0                | <b>84.0</b>         | <b>95.6</b> | 162.6        | 12-Jun       | 24.5              | 12.0        |
| AP Solid                | 11.6                |             |             |             | <b>64.5</b>         | 4.1                 | 6.1         | 159.0        | 8-Jun        | 19.7              | 12.8        |
| AP18 AX                 | 34.9                |             |             |             | 62.0                | 14.9                | 32.4        | 158.0        | 7-Jun        | 21.3              | 12.0        |
| Balance                 | 19.0                |             |             |             | 58.0                | 1.4                 | 4.7         | 161.2        | 10-Jun       | 21.2              | <b>14.5</b> |
| Battle AX               | 27.6                |             |             |             | 62.3                | 8.0                 | 16.1        | 159.6        | 9-Jun        | 18.6              | 12.3        |
| Bobcat                  | <b>46.3</b>         | <b>52.5</b> | <b>56.7</b> | <b>58.6</b> | 62.1                | 63.0                | <b>70.2</b> | 160.8        | 10-Jun       | 21.9              | 12.3        |
| Brawl CL Plus           | 24.4                | 40.1        | 38.7        | 44.2        | 63.5                | 13.8                | 27.7        | 155.0        | 4-Jun        | 20.8              | 13.2        |
| Byrd CL Plus            | 30.3                | 45.0        | 47.0        | 54.6        | 61.5                | 15.8                | 39.0        | 159.2        | 8-Jun        | 22.7              | 11.4        |
| CP7017AX                | 30.4                |             |             |             | 61.3                | 15.1                | 31.0        | 159.2        | 8-Jun        | 22.0              | 11.6        |
| CP7050AX                | 33.8                |             |             |             | 64.1                | 35.3                | 41.9        | 155.4        | 4-Jun        | 22.0              | 12.6        |
| CP7869                  | <b>47.5</b>         |             |             |             | 63.0                | 66.5                | <b>90.5</b> | 155.7        | 5-Jun        | 19.4              | 11.6        |
| CP7909                  | 27.2                | 38.9        |             |             | 63.2                | 24.9                | 40.6        | 154.2        | 3-Jun        | 20.9              | 11.4        |
| Flathead                | <b>45.1</b>         | <b>52.7</b> | <b>57.3</b> | <b>57.3</b> | 62.9                | 57.6                | <b>68.4</b> | 157.3        | 6-Jun        | 21.4              | 12.1        |
| Fortify SF              | 37.7                |             |             |             | 63.7                | 17.8                | 33.7        | 158.4        | 7-Jun        | 20.4              | 12.2        |
| FourOsix                | 41.2                | <b>51.2</b> | <b>55.6</b> | <b>58.7</b> | 60.8                | 39.2                | 51.1        | 159.2        | 8-Jun        | 21.7              | 12.6        |
| Judee                   | 18.6                | 34.5        | 50.0        | 54.2        | 60.6                | 10.5                | 14.3        | 160.3        | 9-Jun        | 20.6              | <b>14.4</b> |
| Keldin                  | 40.5                | <b>51.9</b> | <b>56.9</b> | <b>65.7</b> | 61.8                | 39.3                | 39.5        | 160.5        | 9-Jun        | 21.1              | 11.7        |
| LCS Helix AX            | 38.9                | 48.0        |             |             | 63.8                | 25.0                | 45.2        | 156.8        | 6-Jun        | 21.3              | 11.6        |
| LCS Julep               | 23.8                |             |             |             | <b>65.3</b>         | 11.9                | 19.1        | 157.1        | 6-Jun        | 21.6              | 13.0        |
| LCS Steel AX            | <b>47.1</b>         | <b>50.9</b> |             |             | 61.5                | 28.1                | 39.1        | 161.3        | 10-Jun       | 23.0              | 10.5        |
| Loma                    | <b>51.4</b>         | <b>56.0</b> | <b>61.2</b> | <b>63.9</b> | 61.5                | <b>75.5</b>         | <b>91.3</b> | 159.8        | 9-Jun        | 22.2              | 11.9        |
| Milestone               | 23.6                |             |             |             | 58.7                | 2.0                 | 8.9         | 163.5        | 12-Jun       | 22.7              | 12.3        |
| MT1745                  | <b>51.9</b>         | <b>55.0</b> | <b>65.9</b> |             | 60.7                | <b>74.0</b>         | <b>87.2</b> | 159.7        | 9-Jun        | 23.2              | 11.7        |
| MT1872                  | 40.0                | 48.9        |             |             | 61.1                | 40.5                | <b>69.1</b> | 159.7        | 9-Jun        | 20.6              | 11.8        |
| MT19175                 | <b>52.3</b>         |             |             |             | 60.5                | 55.7                | <b>68.1</b> | 161.2        | 10-Jun       | 21.5              | 11.6        |
| MTCL1737                | <b>46.8</b>         | <b>55.2</b> | <b>62.2</b> |             | 60.1                | 48.6                | <b>69.7</b> | 160.5        | 9-Jun        | 20.5              | 13.1        |
| MTCL19149               | 34.8                |             |             |             | 60.6                | 11.8                | 9.6         | 161.9        | 11-Jun       | 19.4              | 12.1        |
| MTCL19151               | <b>47.9</b>         |             |             |             | 61.3                | 54.7                | <b>72.5</b> | 158.9        | 8-Jun        | 20.6              | 12.7        |
| MTFH19132               | 39.1                |             |             |             | 60.4                | 35.2                | 38.0        | 159.5        | 8-Jun        | 22.6              | 12.0        |
| MTS18116                | 40.2                | <b>50.9</b> |             |             | 61.0                | 35.6                | 56.1        | 163.2        | 12-Jun       | 21.1              | 12.4        |
| MTS18149                | <b>53.9</b>         | <b>57.0</b> |             |             | 61.1                | 65.0                | <b>80.1</b> | 162.8        | 12-Jun       | 18.7              | 12.1        |
| MTS1831                 | 39.3                | 49.8        |             |             | 60.9                | 36.3                | 50.8        | 163.1        | 12-Jun       | 21.2              | 12.2        |
| MTS1855                 | <b>48.4</b>         | <b>54.1</b> |             |             | 60.4                | 57.0                | 61.5        | 159.8        | 9-Jun        | 19.4              | 13.2        |
| MTS1903                 | 38.3                |             |             |             | 61.0                | 18.1                | 32.0        | 163.2        | 12-Jun       | 20.9              | 12.1        |
| MTS1908                 | 38.6                |             |             |             | 60.7                | 21.0                | 52.7        | 164.7        | 14-Jun       | 23.2              | 11.9        |
| MTS1915                 | 44.8                |             |             |             | 60.7                | 39.4                | 59.6        | 161.1        | 10-Jun       | 20.5              | 12.1        |
| Northern                | 43.2                | <b>54.2</b> | <b>65.0</b> | <b>69.7</b> | 61.1                | 49.1                | 58.1        | 159.6        | 9-Jun        | 21.1              | 12.7        |
| Ramsay                  | 37.5                |             |             |             | 61.9                | 31.3                | 43.5        | 159.8        | 9-Jun        | 20.5              | 11.5        |
| StandClear CLP          | 44.3                | 49.5        | <b>59.4</b> | <b>62.0</b> | 62.8                | 42.7                | <b>72.9</b> | 160.0        | 9-Jun        | 25.1              | 12.1        |
| SY 517 CL2              | 15.7                | 30.4        | 29.0        | 36.9        | 63.7                | 3.1                 | 9.8         | 156.8        | 6-Jun        | 18.1              | <b>13.9</b> |
| SY Clearstone 2CL       | 37.8                | <b>52.3</b> | <b>59.4</b> | <b>60.9</b> | 59.9                | 39.4                | 56.6        | 160.4        | 9-Jun        | 22.6              | 12.6        |
| SY Wolverine            | 26.0                | 38.5        | 34.1        |             | 62.7                | 14.8                | 30.6        | 157.3        | 6-Jun        | 19.4              | 12.5        |
| Warhorse                | 39.7                | 46.4        | 48.7        | 53.8        | 60.5                | 50.8                | <b>69.9</b> | 160.3        | 9-Jun        | 22.0              | 12.9        |
| WB4401                  | 27.4                |             |             |             | 61.3                | 22.5                | 27.8        | 157.2        | 6-Jun        | 18.0              | 11.4        |
| WB4418                  | 33.5                | 45.0        | 43.6        |             | 63.1                | 19.0                | 26.4        | 157.5        | 6-Jun        | 19.0              | 11.9        |
| WB4505                  | 37.7                |             |             |             | 63.0                | 29.1                | 41.3        | 157.5        | 6-Jun        | 20.3              | 11.8        |
| WB4792                  | 38.5                | 50.2        |             |             | <b>64.6</b>         | 21.7                | 26.0        | 158.9        | 8-Jun        | 22.4              | 10.7        |
| Whistler                | <b>50.6</b>         |             |             |             | 61.7                | 42.9                | <b>70.5</b> | 159.0        | 8-Jun        | 22.3              | 11.5        |
| Yellowstone             | <b>53.1</b>         | <b>62.1</b> | <b>65.8</b> | <b>67.6</b> | 60.5                | 58.7                | <b>83.0</b> | 159.9        | 9-Jun        | 23.0              | 12.0        |
| Average                 | <b>37.9</b>         | <b>49.2</b> | <b>53.9</b> | <b>58.4</b> | <b>61.7</b>         | <b>34.1</b>         | <b>47.5</b> | <b>159.5</b> | <b>9-Jun</b> | <b>21.2</b>       | <b>12.2</b> |
| LSD (0.05)              | <b>9.0</b>          | <b>11.6</b> | <b>16.3</b> | <b>13.2</b> | <b>1.0</b>          | <b>17.2</b>         | <b>29.4</b> | <b>2.1</b>   |              | <b>3.2</b>        | <b>0.7</b>  |
| C. V. (%)               | <b>13.7</b>         | <b>11.4</b> | <b>18.3</b> | <b>15.8</b> | <b>1.0</b>          | <b>29.8</b>         | <b>36.0</b> | <b>0.8</b>   |              | <b>9.2</b>        | <b>3.3</b>  |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p =0.05)

Environment: Dryland

Table 11. Hard Winter Wheat: District 6 - Williston, North Dakota

| Cultivar/Line           | Grain Yield<br>(bu/ac) |             |             |             | 2021 Data              |             |
|-------------------------|------------------------|-------------|-------------|-------------|------------------------|-------------|
|                         | 2021                   | 2020-21     | 2019-21     | 2018-21     | Test Weight<br>(lb/bu) | Protein (%) |
|                         | 1yr                    | 2yr         | 3yr         | 4yr         |                        |             |
| Combined years of data: |                        |             |             |             |                        |             |
| AAC Wildfire            | 24.3                   | <b>39.8</b> | <b>44.5</b> | <b>47.2</b> | 57.7                   | 15.8        |
| AP Solid                | 21.7                   |             |             |             | 60.4                   | 16.0        |
| AP18 AX                 | 22.1                   |             |             |             | 58.2                   | 15.4        |
| Balance                 | <b>26.2</b>            |             |             |             | 58.1                   | 16.7        |
| Battle AX               | 23.6                   |             |             |             | 59.1                   | 15.3        |
| Bobcat                  | <b>25.6</b>            | <b>38.2</b> | <b>44.6</b> | <b>45.2</b> | 58.2                   | 15.6        |
| Brawl CL Plus           | 16.4                   | 31.3        | 35.4        | 36.2        | 59.2                   | 16.7        |
| Byrd CL Plus            | 21.3                   | 36.6        | 40.6        | 41.3        | 58.4                   | 14.8        |
| CP7017AX                | 22.0                   |             |             |             | 58.5                   | 14.7        |
| CP7050AX                | 17.7                   |             |             |             | 59.5                   | 17.1        |
| CP7869                  | 22.6                   |             |             |             | 58.9                   | 15.4        |
| CP7909                  | 19.2                   | 31.8        |             |             | 59.1                   | 15.7        |
| Flathead                | <b>25.8</b>            | 36.3        | 39.1        | 40.4        | 58.5                   | 15.9        |
| Fortify SF              | 20.3                   |             |             |             | 59.4                   | 15.7        |
| FourOsix                | <b>25.6</b>            | <b>39.6</b> | <b>45.3</b> | <b>45.7</b> | 58.2                   | 15.7        |
| Judee                   | 22.0                   | 34.9        | 39.7        | 40.8        | 59.3                   | 16.6        |
| Keldin                  | <b>26.1</b>            | <b>39.2</b> | <b>43.6</b> | <b>44.0</b> | 58.2                   | 14.9        |
| LCS Helix AX            | 21.0                   | 35.2        |             |             | 58.3                   | 14.8        |
| LCS Julep               | 23.8                   |             |             |             | <b>61.3</b>            | 15.9        |
| LCS Steel AX            | <b>27.6</b>            | <b>41.9</b> |             |             | 58.4                   | 13.5        |
| Loma                    | <b>25.5</b>            | <b>37.9</b> | <b>44.5</b> | <b>45.1</b> | 58.1                   | 15.4        |
| Milestone               | <b>25.3</b>            |             |             |             | 56.9                   | 15.0        |
| MT1745                  | 25.1                   | <b>37.9</b> | <b>42.7</b> |             | 58.9                   | 14.7        |
| MT1872                  | <b>27.0</b>            | 34.9        |             |             | 58.9                   | 15.1        |
| MT19175                 | <b>25.7</b>            |             |             |             | 58.8                   | 15.5        |
| MTCL1737                | 24.4                   | <b>38.4</b> | <b>44.3</b> |             | 58.4                   | 16.2        |
| MTCL19149               | <b>27.2</b>            |             |             |             | 58.0                   | 15.4        |
| MTCL19151               | 23.9                   |             |             |             | 58.5                   | 15.5        |
| MTFH19132               | 23.7                   |             |             |             | 57.2                   | 16.4        |
| MTS18116                | <b>25.2</b>            | <b>37.7</b> |             |             | 59.3                   | 14.6        |
| MTS18149                | <b>27.6</b>            | <b>39.2</b> |             |             | 58.1                   | 16.1        |
| MTS1831                 | 24.9                   | <b>37.0</b> |             |             | 58.8                   | 14.7        |
| MTS1855                 | 22.9                   | <b>37.3</b> |             |             | 58.8                   | 15.9        |
| MTS1903                 | <b>26.7</b>            |             |             |             | 58.6                   | 15.2        |
| MTS1908                 | 23.8                   |             |             |             | 57.7                   | 15.8        |
| MTS1915                 | <b>26.9</b>            |             |             |             | 59.4                   | 15.6        |
| Northern                | <b>26.8</b>            | <b>42.3</b> | <b>45.9</b> | <b>45.8</b> | 58.1                   | 15.5        |
| Ramsay                  | <b>28.2</b>            |             |             |             | 58.3                   | 14.7        |
| StandClear CLP          | 20.4                   | 35.2        | 40.4        | 41.0        | 59.0                   | 16.2        |
| SY 517 CL2              | 17.4                   | 31.9        | 35.9        | 36.8        | 60.4                   | <b>17.7</b> |
| SY Clearstone 2CL       | <b>25.4</b>            | <b>39.5</b> | <b>41.5</b> | 42.5        | 57.8                   | 14.7        |
| SY Wolverine            | 21.2                   | 33.3        | 38.1        |             | 59.4                   | 15.9        |
| Warhorse                | 23.3                   | 33.5        | 39.3        | 40.8        | 57.6                   | 16.2        |
| WB4401                  | 20.7                   |             |             |             | 58.9                   | 14.9        |
| WB4418                  | 18.9                   | 33.3        | 35.1        |             | 58.5                   | 16.3        |
| WB4505                  | 22.6                   |             |             |             | 59.8                   | 14.5        |
| WB4792                  | 21.9                   | <b>38.0</b> |             |             | <b>61.1</b>            | 14.6        |
| Whistler                | <b>25.2</b>            |             |             |             | 58.9                   | 14.7        |
| Yellowstone             | <b>27.4</b>            | <b>38.1</b> | <b>43.9</b> | <b>44.7</b> | 57.8                   | 15.5        |
| Average                 | <b>23.7</b>            | <b>36.8</b> | <b>41.3</b> | <b>42.8</b> | <b>58.7</b>            | <b>15.5</b> |
| LSD (0.05)              | <b>3.1</b>             | <b>5.5</b>  | <b>4.8</b>  | <b>3.8</b>  | <b>0.9</b>             | <b>0.6</b>  |
| C. V. (%)               | <b>7.4</b>             | <b>7.2</b>  | <b>7.0</b>  | <b>6.3</b>  | <b>0.9</b>             | <b>2.0</b>  |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column

based on Fisher's Protected LSD ( $p=0.05$ )

Environment: Dryland

\*Severe drought in 2021 - plots emerged in late spring after rains

**Table 12. 2018-2021 Hard Winter Wheat: Combined Locations Winter Survival and Associated Yield**  
 [Locations: Conrad ('20), Sidney ('18, '19, '21), & Williston ('19, '20)]

| Cultivar/Line     | Winter Survival (%) |             |             |             | Yield (bu/ac) |             |             |             |
|-------------------|---------------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|
|                   | 2021                | 2020-21     | 2019-21     | 2018-21     | 2021          | 2020-21     | 2019-21     | 2018-21     |
| Location-years:   | 1                   | 3           | 5           | 6           | 1             | 3           | 5           | 6           |
| AAC Wildfire      | <b>96</b>           | <b>85</b>   | <b>73</b>   | <b>71</b>   | <b>53.5</b>   | <b>72.1</b> | <b>71.9</b> | <b>71.6</b> |
| AP Solid          | 6                   |             |             |             | 11.6          |             |             |             |
| AP18 AX           | 32                  |             |             |             | 34.9          |             |             |             |
| Balance           | 5                   |             |             |             | 19.0          |             |             |             |
| Battle AX         | 16                  |             |             |             | 27.6          |             |             |             |
| Bobcat            | <b>70</b>           | <b>69</b>   | <b>59</b>   | 58          | <b>46.3</b>   | <b>67.7</b> | <b>65.2</b> | <b>65.0</b> |
| Brawl CL Plus     | 28                  | 61          | 56          | 54          | 24.4          | 50.5        | 46.2        | 48.6        |
| Byrd CL Plus      | 39                  | <b>69</b>   | <b>58</b>   | <b>58</b>   | 30.3          | <b>64.2</b> | 58.5        | 61.6        |
| CP7017AX          | 31                  |             |             |             | 30.4          |             |             |             |
| CP7050AX          | 42                  |             |             |             | 33.8          |             |             |             |
| CP7869            | <b>91</b>           |             |             |             | <b>47.5</b>   |             |             |             |
| CP7909            | 41                  | 57          |             |             | 27.2          | 51.3        |             |             |
| Flathead          | <b>68</b>           | <b>79</b>   | <b>69</b>   | <b>65</b>   | <b>45.1</b>   | <b>64.2</b> | <b>60.8</b> | 60.2        |
| Fortify SF        | 34                  |             |             |             | 37.7          |             |             |             |
| FourOsix          | 51                  | <b>72</b>   | <b>61</b>   | <b>59</b>   | 41.2          | <b>68.0</b> | <b>65.0</b> | <b>65.5</b> |
| Judee             | 14                  | 58          | 56          | 55          | 18.6          | 52.8        | 57.7        | 59.2        |
| Keldin            | 40                  | 60          | 54          | 55          | 40.5          | 60.3        | 60.0        | <b>65.4</b> |
| LCS Helix AX      | 45                  | <b>68</b>   |             |             | 38.9          | <b>62.1</b> |             |             |
| LCS Julep         | 19                  |             |             |             | 23.8          |             |             |             |
| LCS Steel AX      | 39                  | 48          |             |             | <b>47.1</b>   | <b>63.6</b> |             |             |
| Loma              | <b>91</b>           | <b>83</b>   | <b>70</b>   | <b>66</b>   | <b>51.4</b>   | <b>68.5</b> | <b>67.0</b> | <b>67.9</b> |
| Milestone         | 9                   |             |             |             | 23.6          |             |             |             |
| MT1745            | <b>87</b>           | <b>80</b>   | <b>70</b>   |             | <b>51.9</b>   | <b>67.7</b> | <b>68.6</b> |             |
| MT1872            | <b>69</b>           | <b>71</b>   |             |             | 40.0          | 60.3        |             |             |
| MT19175           | <b>68</b>           |             |             |             | <b>52.3</b>   |             |             |             |
| MTCL1737          | <b>70</b>           | <b>74</b>   | <b>64</b>   |             | <b>46.8</b>   | <b>65.9</b> | <b>66.0</b> |             |
| MTCL19149         | 10                  |             |             |             | 34.8          |             |             |             |
| MTCL19151         | <b>72</b>           |             |             |             | <b>47.9</b>   |             |             |             |
| MTFH19132         | 38                  |             |             |             | 39.1          |             |             |             |
| MTS18116          | 56                  | <b>68</b>   |             |             | 40.2          | <b>66.4</b> |             |             |
| MTS18149          | <b>80</b>           | <b>75</b>   |             |             | <b>53.9</b>   | <b>70.6</b> |             |             |
| MTS1831           | 51                  | <b>68</b>   |             |             | 39.3          | <b>63.2</b> |             |             |
| MTS1855           | 62                  | <b>71</b>   |             |             | <b>48.4</b>   | <b>65.2</b> |             |             |
| MTS1903           | 32                  |             |             |             | 38.3          |             |             |             |
| MTS1908           | 53                  |             |             |             | 38.6          |             |             |             |
| MTS1915           | 60                  |             |             |             | 44.8          |             |             |             |
| Northern          | 58                  | <b>75</b>   | <b>63</b>   | <b>61</b>   | 43.2          | <b>72.9</b> | <b>71.7</b> | <b>73.7</b> |
| Ramsay            | 44                  |             |             |             | 37.5          |             |             |             |
| StandClear CLP    | <b>73</b>           | <b>79</b>   | <b>68</b>   | <b>67</b>   | 44.3          | <b>67.1</b> | <b>66.3</b> | <b>66.9</b> |
| SY 517 CL2        | 10                  | 43          | 43          | 42          | 15.7          | 46.4        | 41.9        | 45.0        |
| SY Clearstone 2CL | 57                  | <b>74</b>   | <b>65</b>   | <b>62</b>   | 37.8          | 61.3        | 60.6        | 61.4        |
| SY Wolverine      | 31                  | 57          | 48          |             | 26.0          | 49.6        | 44.4        |             |
| Warhorse          | <b>70</b>           | <b>76</b>   | <b>64</b>   | <b>62</b>   | 39.7          | 60.8        | 57.3        | 59.3        |
| WB4401            | 28                  |             |             |             | 27.4          |             |             |             |
| WB4418            | 26                  | 59          | 54          |             | 33.5          | 58.9        | 51.2        |             |
| WB4505            | 41                  |             |             |             | 37.7          |             |             |             |
| WB4792            | 26                  | 61          |             |             | 38.5          | <b>66.3</b> |             |             |
| Whistler          | <b>70</b>           |             |             |             | <b>50.6</b>   |             |             |             |
| Yellowstone       | <b>83</b>           | <b>78</b>   | <b>67</b>   | <b>66</b>   | <b>53.1</b>   | <b>64.0</b> | <b>64.2</b> | <b>65.6</b> |
| Average           | <b>47.5</b>         | <b>68.6</b> | <b>61.1</b> | <b>60.0</b> | <b>37.9</b>   | <b>62.6</b> | <b>60.2</b> | <b>62.5</b> |
| LSD (0.05)        | <b>29.4</b>         | <b>22.6</b> | <b>15.3</b> | <b>13.4</b> | <b>9.0</b>    | <b>10.9</b> | <b>11.2</b> | <b>9.8</b>  |
| C.V.              | <b>36.0</b>         | <b>20.1</b> | <b>19.8</b> | <b>19.3</b> | <b>13.7</b>   | <b>10.7</b> | <b>14.7</b> | <b>13.6</b> |

**bold** = indicates highest value within a column

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

**Table 13. 2018-2021 Hard Winter Wheat: Combined Locations Sawfly Cutting and Yield**  
 [Locations: Conrad, Ft. Benton, & Havre]

| Cultivar/Line       | Sawfly Cutting <sup>1</sup><br>(%) |             |             |             | Yield <sup>1</sup><br>(bu/ac) |             |             |             |
|---------------------|------------------------------------|-------------|-------------|-------------|-------------------------------|-------------|-------------|-------------|
|                     | 2021                               | 2020-21     | 2019-21     | 2018-21     | 2021                          | 2020-21     | 2019-21     | 2018-21     |
| Location-years:     | 2                                  | 4           | 7           | 9           | 2                             | 4           | 7           | 9           |
| AAC Wildfire        | 20                                 | 26          | 35          | 30          | 24.1                          | 52.0        | 51.0        | 54.3        |
| AP Solid            | 20                                 |             |             |             | <b>37.3</b>                   |             |             |             |
| AP18 AX             | 27                                 |             |             |             | 33.9                          |             |             |             |
| Balance             | 39                                 |             |             |             | 31.4                          |             |             |             |
| Battle AX           | <b>14</b>                          |             |             |             | 34.7                          |             |             |             |
| Bobcat (ss)         | <b>6</b>                           | <b>8</b>    | <b>10</b>   | <b>8</b>    | 30.6                          | 56.7        | 60.0        | 61.7        |
| Brawl CL Plus       | 19                                 | 19          | 30          | 29          | <b>40.7</b>                   | 52.4        | 57.5        | 59.0        |
| Byrd CL Plus        | <b>15</b>                          | 21          | 28          | 29          | 32.5                          | 58.3        | 56.6        | 60.7        |
| CP7017AX            | 25                                 |             |             |             | <b>35.0</b>                   |             |             |             |
| CP7050AX            | 21                                 |             |             |             | <b>35.0</b>                   |             |             |             |
| CP7869              | 35                                 |             |             |             | <b>37.8</b>                   |             |             |             |
| CP7909              | 24                                 | 31          |             |             | <b>43.1</b>                   | 49.6        |             |             |
| Flathead            | 29                                 | 26          | 38          | 41          | <b>42.8</b>                   | 59.2        | 58.3        | 57.8        |
| Fortify SF          | 31                                 |             |             |             | 30.3                          |             |             |             |
| FourOsix            | 20                                 | 33          | 44          | 46          | 32.0                          | 56.6        | 57.8        | 57.7        |
| Judee (ss)          | 23                                 | 21          | 27          | 25          | 25.7                          | 48.5        | 50.9        | 53.0        |
| Keldin              | 31                                 | 36          | 47          | 45          | <b>42.0</b>                   | 57.5        | 58.7        | 59.1        |
| LCS Helix AX        | 43                                 | 32          |             |             | <b>36.7</b>                   | 55.8        |             |             |
| LCS Julep           | 21                                 |             |             |             | <b>37.4</b>                   |             |             |             |
| LCS Steel AX        | 35                                 | 36          |             |             | 33.6                          | 52.3        |             |             |
| Loma (ss)           | <b>13</b>                          | 18          | 24          | 22          | 33.2                          | 55.8        | 56.9        | 58.9        |
| Milestone           | 34                                 |             |             |             | <b>39.3</b>                   |             |             |             |
| MT1745              | <b>15</b>                          | 20          | 26          |             | 26.9                          | 51.1        | 56.2        |             |
| MT1872              | <b>8</b>                           | <b>13</b>   |             |             | 26.2                          | 50.8        |             |             |
| MT19175             | <b>16</b>                          |             |             |             | 28.7                          |             |             |             |
| MTCL1737            | <b>7</b>                           | <b>15</b>   | 25          |             | 27.9                          | 51.5        | 55.2        |             |
| MTCL19149           | 25                                 |             |             |             | 31.1                          |             |             |             |
| MTCL19151           | 28                                 |             |             |             | <b>36.7</b>                   |             |             |             |
| MTFH19132           | 48                                 |             |             |             | 32.3                          |             |             |             |
| MTS18116            | <b>3</b>                           | <b>5</b>    |             |             | 24.1                          | 53.3        |             |             |
| MTS18149 (ss)       | <b>12</b>                          | <b>15</b>   |             |             | <b>35.0</b>                   | 58.4        |             |             |
| MTS1831             | <b>1</b>                           | <b>4</b>    |             |             | 28.0                          | 52.4        |             |             |
| MTS1855             | <b>9</b>                           | 22          |             |             | 27.3                          | 50.8        |             |             |
| MTS1903             | <b>3</b>                           |             |             |             | <b>35.7</b>                   |             |             |             |
| MTS1908             | <b>1</b>                           |             |             |             | <b>35.5</b>                   |             |             |             |
| MTS1915             | <b>1</b>                           |             |             |             | 25.2                          |             |             |             |
| Northern            | 21                                 | 20          | 30          | 30          | 29.9                          | 56.8        | 58.6        | 59.4        |
| Ramsay              | 33                                 |             |             |             | <b>41.2</b>                   |             |             |             |
| StandClear CLP (ss) | 37                                 | 36          | 39          | 36          | 32.6                          | 56.4        | 58.4        | 59.2        |
| SY 517 CL2          | 25                                 | 26          | 33          | 31          | <b>40.6</b>                   | 50.7        | 53.2        | 55.6        |
| SY Clearstone 2CL   | 21                                 | 30          | 44          | 46          | 26.4                          | 49.5        | 53.4        | 56.5        |
| SY Wolverine        | <b>18</b>                          | 25          | 32          |             | <b>36.2</b>                   | 49.7        | 51.9        |             |
| Warhorse (ss)       | <b>7</b>                           | 13          | <b>14</b>   | <b>11</b>   | 27.5                          | 51.3        | 51.3        | 53.5        |
| WB4401              | 19                                 |             |             |             | 31.6                          |             |             |             |
| WB4418              | <b>10</b>                          | <b>15</b>   | 22          |             | <b>38.4</b>                   | 54.6        | 55.5        |             |
| WB4505              | 41                                 |             |             |             | 34.0                          |             |             |             |
| WB4792              | 28                                 | 24          |             |             | <b>36.9</b>                   | 58.5        |             |             |
| Whistler            | 36                                 |             |             |             | 32.3                          |             |             |             |
| Yellowstone         | 29                                 | 32          | 42          | 45          | 34.2                          | 53.0        | 53.7        | 55.8        |
| <b>Average</b>      | <b>21.3</b>                        | <b>22.1</b> | <b>31.1</b> | <b>31.6</b> | <b>33.1</b>                   | <b>53.7</b> | <b>55.5</b> | <b>57.5</b> |
| <b>LSD (0.05)</b>   | <b>17.4</b>                        | <b>12.6</b> | <b>10.0</b> | <b>11.0</b> | <b>8.1</b>                    | <b>ns</b>   | <b>ns</b>   | <b>ns</b>   |
| <b>C.V.</b>         | <b>40.7</b>                        | <b>40.5</b> | <b>30.4</b> | <b>37.4</b> | <b>12.1</b>                   | <b>14.2</b> | <b>12.3</b> | <b>12.2</b> |

**bold** = indicates highest or lowest value within a column

**bold** = indicates varieties with values equal to highest or lowest variety within a column based on Fisher's protected LSD (p=0.05)

(ss) = Solid-stemmed sawfly resistant cultivar/line

<sup>1</sup> = Data reported only when sawfly cutting had exceeded 10% in the test

Table 14. Precipitation and Average Monthly Temperature for Crop Year 2020-2021

| Agricultural Research Center                     |                        | Sept. 2020 | Oct. 2020 | Nov. 2020 | Dec. 2020 | Jan. 2021 | Feb. 2021 | Mar. 2021 | Apr. 2021 | May 2021 | June 2021 | July 2021 | Aug. 2021 |                | Historical Average           |
|--|------------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------------|------------------------------|
| Western Triangle <sup>1/</sup><br>(Conrad)       | Precipitation (in):    | 0.00       | 0.36      | 0.32      | 0.27      | 0.29      | 0.33      | 0.00      | 0.44      | 2.85     | 0.00      | 0.00      | 2.16      | Total: 7.02    | 9.72<br>41.3<br>[1987-2021]  |
|  | Mean Temperature (°F): | 57.0       | 38.0      | 34.0      | 31.0      | 28.0      | 10.0      | 36.0      | 39.0      | 47.0     | 64.0      | 71.0      | 63.0      | Average: 43.2  |                              |
| Northern <sup>1/</sup><br>(Havre)                | Precipitation (in):    | 1.72       | 0.99      | 1.11      | 0.07      | 0.02      | 0.59      | 0.20      | 0.51      | 3.02     | 0.23      | 0.32      | 1.22      | Total: 10.52   | 12.02<br>42.8<br>[1916-2021] |
|  | Mean Temperature (°F): | 58.8       | 39.1      | 32.1      | 29.8      | 28.2      | 10.0      | 37.6      | 42.6      | 49.8     | 66.9      | 74.7      | 67.7      | Average: 43.1  |                              |
| Northwestern <sup>2/</sup><br>(Kalispell)        | Precipitation (in):    | 0.37       | 2.65      | 1.80      | 1.21      | 1.39      | 1.07      | 0.44      | 0.69      | 1.90     | 1.98      | 0.20      | 1.76      | Total: 15.46   | 19.87<br>43.3<br>[1980-2021] |
|  | Mean Temperature (°F): | 56.0       | 40.0      | 34.0      | 28.0      | 30.0      | 21.0      | 38.0      | 43.5      | 50.5     | 64.0      | 71.5      | 65.0      | Average: 45.1  |                              |
| Central <sup>1/</sup><br>(Moccasin)              | Precipitation (in):    | 0.77       | 1.11      | 0.16      | 0.16      | 0.44      | 0.42      | 0.15      | 1.03      | 2.68     | 0.60      | 1.06      | 2.74      | Total: 11.32   | 15.30<br>42.9<br>[1910-2021] |
|  | Mean Temperature (°F): | 58.4       | 41.2      | 39.1      | 34.7      | 31.0      | 13.6      | 36.8      | 40.2      | 49.5     | 64.4      | 72.9      | 63.8      | Average: 45.5  |                              |
| Southern <sup>1/</sup><br>(Huntley)              | Precipitation (in):    | 0.55       | 2.06      | 0.23      | 0.32      | 0.27      | 6.29      | 0.58      | 1.20      | 1.92     | 0.38      | 0.13      | 1.49      | Total: 15.42   | 13.54<br>45.6<br>[1911-2020] |
|  | Mean Temperature (°F): | 60.3       | 40.4      | 35.4      | 30.4      | 29.1      | 13.6      | 38.1      | 43.8      | 52.7     | 70.1      | 75.9      | 66.6      | Average: 46.4  |                              |
| Northeastern <sup>2/</sup><br>(Sidney)           | Precipitation (in):    | 0.30       | 0.62      | 0.19      | 0.01      | 0.08      | 0.11      | 0.04      | 0.38      | 1.81     | 2.38      | 0.01      | 1.34      | Total: 7.27    | 13.95<br>43.3<br>[1949-2020] |
|  | Mean Temperature (°F): | 61.0       | 40.5      | 34.0      | 27.5      | 25.5      | 10.0      | 39.5      | 46.0      | 55.5     | 71.0      | 78.0      | 70.5      | Average: 46.6  |                              |
| Williston (WREC) <sup>3/</sup><br>(North Dakota) | Precipitation (in):    | 0.06       | 0.12      | -         | -         | -         | -         | -         | 0.29      | 1.43     | 3.43      | 0.68      | 1.35      | Total: 7.36    | 14.51<br>44.2<br>[1990-2020] |
|  | Mean Temperature (°F): | 58.0       | 38.0      | 31.0      | 25.0      | 22.0      | 8.0       | 37.0      | 43.0      | 53.0     | 69.0      | 76.0      | 69.0      | Average: 44.08 |                              |
| Nutrien <sup>2/</sup><br>(Ft. Benton)            | Precipitation (in):    | 0.79       | 1.77      | 1.10      | 0.14      | 0.07      | 0.98      | 0.35      | 0.85      | 2.87     | 0.26      | 0.84      | 2.01      | Total: 12.03   | 13.01<br>44.8<br>[1949-2020] |
|  | Mean Temperature (°F): | 59.5       | 40.5      | 38.0      | 33.5      | 32.0      | 13.5      | 40.0      | 44.0      | 52.0     | 68.5      | 76.5      | 68.5      | Average: 47.2  |                              |
| Post Farm <sup>2/</sup><br>Bozeman               | Precipitation (in):    | 0.74       | 1.29      | 0.24      | 0.27      | 0.73      | 0.89      | 0.57      | 1.10      | 3.11     | 0.80      | 0.83      | 2.05      | Total: 12.62   | 15.85<br>43.7<br>[1958-2021] |
|  | Mean Temperature (°F): | 58.7       | 43.4      | 35.1      | 29.1      | 27.7      | 17.2      | 37.2      | 42.6      | 50.2     | 65.5      | 72.5      | 65.2      | Average: 45.4  |                              |

1/ = Climate Data supplied by experiment station

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

3/ = Climate Data collected from the North Dakota Agricultural Weather Network (NDAWN) Center

Table 15. Agronomic characteristics, cereal quality, and disease reactions of 2021 hard winter wheat varieties.

| Cultivar/Line     | Agronomic Characteristics |             |                        |                       |                       |                             | Cereal Quality |               |            | Disease Reactions (9) |             |           |
|-------------------|---------------------------|-------------|------------------------|-----------------------|-----------------------|-----------------------------|----------------|---------------|------------|-----------------------|-------------|-----------|
|                   | Maturity<br>(1)           | Chaff Color | Winter Survival<br>(2) | Straw Strength<br>(3) | Stem Solidness<br>(4) | Herbicide Resistance<br>(5) | Milling<br>(6) | Baking<br>(7) | PPO<br>(8) | Dwarf Smut            | Stripe Rust | Stem Rust |
| AAC Wildfire      | L                         | Red         | 4                      | M                     | -                     | No                          | 3              | 4             | M          | -                     | MR          | -         |
| AP Solid          | M                         | White       | 1                      | -                     | NA                    | No                          | -              | -             | -          | -                     | -           | -         |
| AP18 AX           | M-E                       | White       | 1                      | -                     | -                     | AX                          | -              | -             | -          | -                     | -           | -         |
| Balance           | M                         | -           | 1                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| Battle AX         | M-E                       | -           | 1                      | -                     | -                     | AX                          | -              | -             | -          | -                     | -           | -         |
| Bobcat            | M                         | White       | 3                      | S                     | 23                    | No                          | 4              | 3             | M          | S                     | R           | MS        |
| Brawl CL Plus     | E                         | White       | 3                      | S                     | -                     | CL                          | 4              | 3             | M-H        | S                     | S           | -         |
| Byrd CL Plus      | E                         | White       | 3                      | M-S                   | -                     | CL                          | 2              | 2             | M-H        | -                     | S           | -         |
| CP7017AX          | M-E                       | -           | 1                      | -                     | -                     | AX                          | -              | -             | -          | -                     | -           | -         |
| CP7050AX          | E                         | -           | 2                      | -                     | -                     | AX                          | -              | -             | -          | -                     | -           | -         |
| CP7869            | E                         | -           | 5                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| CP7909            | E                         | White       | 3                      | -                     | -                     | No                          | 3              | 1             | L          | -                     | R           | -         |
| Flathead          | E                         | White       | 4                      | S                     | -                     | No                          | 4              | 4             | M          | MR                    | R           | MR        |
| Fortify SF        | M-E                       | -           | 2                      | -                     | 15                    | No                          | -              | -             | -          | -                     | -           | -         |
| FourOsix          | M-E                       | White       | 3                      | S                     | -                     | No                          | 4              | 4             | M          | S                     | R           | MS        |
| Judee             | M                         | White       | 3                      | M-S                   | 19                    | No                          | 4              | 4             | M          | S                     | R           | S         |
| Keldin            | M                         | White       | 3                      | S                     | -                     | No                          | 2              | 3             | H          | S                     | MS          | -         |
| LCS Helix AX      | E                         | White       | 4                      | -                     | -                     | AX                          | 2              | 2             | H          | -                     | MR          | -         |
| LCS Julep         | M-E                       | -           | 1                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| LCS Steel AX      | M-L                       | -           | 2                      | -                     | -                     | AX                          | 2              | 3             | H          | -                     | -           | -         |
| Loma              | M-L                       | White       | 4                      | M-S                   | 18                    | No                          | 4              | 4             | L          | S                     | R           | R         |
| Milestone         | M-L                       | -           | 1                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| MT18149           | L                         | White       | 4                      | -                     | 17                    | No                          | 4              | 5             | L          | -                     | S           | -         |
| Northern          | M                         | White       | 4                      | M-S                   | -                     | No                          | 3              | 3             | L          | S                     | R           | R         |
| Ramsay            | M-L                       | -           | 2                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| StandClear CLP    | M                         | White       | 4                      | M-S                   | 18                    | CL                          | 4              | 3             | H          | -                     | R           | MS        |
| SY 517 CL2        | E                         | White       | 2                      | S                     | -                     | CL                          | 4              | 4             | M-H        | S                     | MS          | -         |
| SY Clearstone 2CL | M-L                       | White       | 4                      | M                     | -                     | CL                          | 2              | 3             | M          | R                     | R           | MR        |
| SY Wolverine      | M-E                       | White       | 2                      | S                     | -                     | No                          | 3              | 2             | M          | -                     | MS          | -         |
| Warhorse          | M                         | White       | 4                      | -                     | 21                    | No                          | 3              | 4             | M          | S                     | R           | R         |
| WB4401            | M-E                       | -           | 1                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| WB4418            | E                         | White       | 3                      | S                     | -                     | No                          | 2              | 2             | L          | -                     | MR          | -         |
| WB4505            | M-E                       | -           | 2                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| WB4792            | M-E                       | White       | 4                      | -                     | -                     | No                          | 2              | 2             | M-H        | -                     | MR          | -         |
| Whistler          | M                         | -           | 4                      | -                     | -                     | No                          | -              | -             | -          | -                     | -           | -         |
| Yellowstone       | M                         | White       | 4                      | S                     | 7                     | No                          | 3              | 5             | M          | MS                    | R           | S         |

(1) Maturity based on heading dates; E = Early, M = Medium, L = Late

(2) 5 = Best Winter survival. When available, Winter survival is combined over locations (Williston, Sidney, & Conrad) up to four years

(3) Straw strength based on lodging data; W = Weak, M = Medium, S = Strong

(4) Scale 5-25 (25 = most solid)

(5) Herbicide Resistance; CL = Clearfield, AX = CoAxium

(6) Milling Quality (0-5 scale) based on Flour Yield, Flour Protein, & Flour Ash (5 = Best)

(7) Baking Quality (0-5 scale) based on Loaf Volume, Mixing & Baking Water Absorption, and Mixing Tolerance (5 = Best)

(8) PPO = Polyphenol Oxidase, low values are better for noodle quality; L = low, M = medium, H = high

(9) R = Resistant, MR = Moderately Resistant, M = Moderate, MS = Moderately Susceptible, S = Susceptible, VS = Very Susceptible

- = no information

NA = Stem Solidness data not yet available (line may be semi-solid or solid-stemmed)

# Additional Descriptive Information for 2021 Winter Wheat Varieties

## New for the 2022 Bulletin:

**AP18 AX** - hard red winter wheat developed by Colorado Wheat Research Foundation and Syngenta; released in 2020. AP18 AX is a medium-early maturing wheat with white chaff. AP18 AX had below average yield, test weight, and protein in its first year of testing in Montana. Mill and bake characteristics of AP18 AX have not been evaluated under Montana growing conditions. PVP, Title V has been issued (Certificate #202000351). Additionally, the CoAxiu<sup>®</sup> genes are patented.

**AP Solid** – hard red winter wheat developed by Syngenta and released in 2021. AP Solid is a medium-maturing white chaff wheat with high test weight and below average yield and protein in limited testing. Stem solidness and mill and bake characteristics of AP Solid have not been determined under Montana growing conditions.

**Balance** - hard red winter wheat developed by the Washington Agricultural Experiment Station and released by Nutrien in 2020. Balance is a medium-early maturing, high protein wheat with white chaff. Balance had below average yield and test weight in its first year of testing in Montana. Mill and bake characteristics of Balance have not been determined under Montana growing conditions. PVP, Title V is pending (Certificate #202100490).

**Battle AX** – CoAxiu<sup>®</sup> herbicide resistant hard red winter wheat developed by Colorado Wheat Research Foundation and released in 2019. Battle AX had below average yield and average test weight and protein in its first year of testing in Montana. Mill and bake characteristics of Battle AX have not been determined under Montana growing conditions. PVP, Title V has

been issued (Certificate #201900406). Additionally, the CoAxiu<sup>®</sup> genes are patented.

**CP7017AX** - hard red CoAxiu<sup>®</sup> herbicide resistant winter wheat developed by Limagrain and released in 2020. CP7017AX had below average yield and test weight and average protein in its first year of testing in Montana. Mill and bake characteristics of CP7017AX have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #202000232). Additionally, the CoAxiu<sup>®</sup> genes are patented.

**CP7050AX** - hard red CoAxiu<sup>®</sup> herbicide resistant winter wheat developed by Limagrain and released in 2020. CP7050AX had high test weight and below average yield and protein in its first year of testing in Montana. Mill and bake characteristics of CP7050AX have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #202000233). Additionally, the CoAxiu<sup>®</sup> genes are patented.

**CP7869** - hard red winter wheat developed by Winfield and released in 2018. CP7869 is an early maturing wheat that had below average yield and average test weight and protein under limited testing in Montana. CP7869 appeared to have high winter survival under its first year of testing. Mill and bake characteristics of CP7869 have not been determined under Montana growing conditions. *CP7869 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**Fortify SF** - hard red winter wheat developed by Colorado Wheat Research Foundation and released in 2019. Fortify SF is a semi-solid, medium-early maturing wheat that had average yield, above average test weight, and below average protein in its first year of testing in Montana. Mill and bake characteristics of Fortify

SF have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #202100004).

**LCS Julep** – hard red winter wheat developed by Limagrain and released in 2020. LCS Julep had above average yield, test weight, and protein in its first year of testing in Montana. Mill and bake characteristics of LCS Julep have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #202000267).

**LCS Steel AX** – CoAxiom® herbicide resistant hard red winter wheat developed by Limagrain and released in 2021. LCS Steel AX had average yield and test weight and below average protein in its first year of testing in Montana. Mill and bake characteristics of LCS Steel AX have not been determined under Montana growing conditions. PVP, Title V is pending (Certificate #202100229). Additionally, the CoAxiom® genes are patented.

**Milestone** – hard red winter wheat developed in Germany and released by Nutrien in 2020. Milestone had above average yield, below average test weight, and average protein in its first year of testing in Montana. Mill and bake characteristics of Milestone have not been determined under Montana growing conditions. PVP, Title V is pending (Certificate #202100493).

**MTS18149 (name pending)** – hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2022. MTS18149 is a medium-late maturing, semisolid-stemmed, semi-dwarf wheat with white chaff. MTS18149 has above average yield, test weight, and protein. MTS18149 has good resistance to cutting by wheat stem sawfly, excellent stripe rust resistance, good winter survival, and aluminum/acid soil tolerance.

**Ramsay** – hard red winter wheat released by Nutrien in 2021. Ramsay is a medium-late maturing wheat with high yield and average test

weight and protein under limited testing in Montana. Mill and bake characteristics of Ramsay have not been determined under Montana growing conditions.

**WB4401** - hard red winter wheat developed by WestBred and released in 2020. WB4401 had below average yield and protein and average test weight under limited testing in Montana. Mill and bake characteristics of WB4401 have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #202000427). *WB4401 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**WB4505** - hard red winter wheat developed by WestBred and released in 2019. WB4505 had above average yield, average test weight, and below average protein under limited testing in Montana. Mill and bake characteristics of WB4505 have not been determined under Montana growing conditions. *WB4505 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**Whistler** - hard red winter wheat developed by Colorado Wheat Research Foundation and released in 2019. Whistler had above average yield and test weight in its first year of testing in Montana. Mill and bake characteristics of Whistler have not been determined under Montana growing conditions. PVP, Title V has been issued (Certificate #201900412).

### **Varieties previously in bulletin:**

**AAC Wildfire** – hard red winter wheat developed by Agriculture and AgriFoods Canada in Alberta, released in 2015, and marketed by SECAN. AAC Wildfire is a late maturing, hollow-stemmed, tall wheat with red chaff. AAC Wildfire has average yield, test weight, and protein, with above average winter survival. AAC Wildfire is moderately resistant to stripe rust. AAC Wildfire has high PPO, average milling and above

average baking characteristics. PVP, Title V is pending (Certificate #202000008).

**Bobcat** – hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2019. Bobcat is a medium maturing, solid-stemmed, short wheat with white chaff. Bobcat has above average yield and test weight, average protein, with average winter survival. Bobcat has the highest yield and lowest percent sawfly cutting, of all varieties, in trials where sawfly pressure was above 10% cutting. Bobcat has excellent resistance to stripe rust and is moderately susceptible to stem rust. Bobcat has medium-low PPO and above average milling and baking characteristics. PVP, Title V has been issued (Certificate #202000117).

**Brawl CL Plus** – hard red winter wheat developed by Colorado and released in 2011. Brawl CL Plus is an early maturing, medium short statured wheat, with white chaff. Brawl CL Plus has average yield and above average test weight and protein. Brawl CL Plus is susceptible to stripe rust. Brawl CL Plus is a high PPO variety with average mill and bake characteristics. PVP, Title V has been issued (Certificate #201200434). Additionally, the Clearfield® genes are patented.

**Byrd CL Plus** – hard red winter wheat developed by Colorado and released in 2018. Byrd CL Plus is an early maturing, hollow-stemmed, medium-tall wheat with white chaff. Byrd CL Plus has above average yield, average test weight, and below average protein, with average winter survival. Resistance or susceptibility to stripe rust, under Montana conditions, has not been determined for Byrd CL Plus. Byrd CL Plus has high PPO and average milling and baking characteristics. PVP, Title V is pending (Certificate #201900417). Additionally, the Clearfield® genes are patented. *Byrd CL Plus will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**CP7909** – hard red winter wheat developed by Winfield United (Croplan) and released in 2018. CP7909 is an early maturing, medium short statured wheat, with white chaff. CP7909 has average winter hardiness under limited testing, average yield, and average test weight and protein. CP7909 has shown resistance to stripe rust conditions. CP7909 is a low PPO variety with average milling and below average baking characteristics.

**Flathead** – hard red winter wheat developed by the Montana Agricultural Experiment Station and available to certified seed growers in fall 2019. Flathead is an early maturing (especially for a Montana line), hollow-stemmed, medium height wheat with white chaff. Flathead has average yield, above average test weight, and average protein, with average winter survival. Flathead has excellent resistance to stripe rust and is moderately resistant to both stem rust and dwarf bunt. Flathead has medium PPO and above average milling and baking characteristics. PVP, Title V has been issued (Certificate #202000202).

**FourOsix** - hard red winter wheat developed by the Montana Agricultural Experiment Station and available to seed growers in fall 2018. FourOsix is a medium maturing, short to medium statured wheat, with average winter-hardiness. FourOsix is a high yielding variety with above average test weight and average protein. FourOsix (50% Yellowstone, in pedigree) is similar in grain yield of Yellowstone - but with significantly earlier heading, shorter plant height, and significantly higher test weight and protein. FourOsix is resistant to stripe rust and this resistance is either similar or significantly higher than that of Yellowstone. FourOsix is moderately susceptible to stem rust. FourOsix has excellent milling and baking qualities, comparable to Decade and parental cultivar, Yellowstone. PVP, Title V has been issued (Certificate #201900053).

**Judee** – hard red winter wheat developed by the Montana Agricultural Experiment Station in 2011. Judee is a white chaff, solid-stem, semi-dwarf (Rht1) wheat with medium maturity. Judee has average yield, test weight, and protein, and below average winter hardiness. Judee is susceptible to prevalent races of stem and leaf rust but resistant to stripe rust. Stem-solidness of Judee is most similar to Genou. Judee is a high PPO variety with average mill and above average bake properties. PVP, Title V has been issued (Certificate #201200161).

**Keldin** – hard red winter wheat developed by Peter Franck (Germany) and released by WestBred in 2011. Keldin is a medium maturing, medium short statured wheat, with white chaff. Keldin has above average yield and test weight and average protein. Keldin is moderately susceptible to stripe rust. Keldin is a high PPO variety with average mill and below average bake characteristics. PVP, Title V has been issued (Certificate #201300462).

**LCS Helix AX** – hard red CoAxiom® herbicide resistant winter wheat developed by Limagrain and released in 2020. LCS Helix AX is an early maturing, medium statured wheat with white chaff. LCS Helix AX appears to have average winter hardiness under limited testing in 2020. LCS Helix AX has average yield, above average test weight and below average protein. LCS Helix AX appears to be moderately resistant to stripe rust under Pacific Northwest conditions. LCS Helix AX is a high PPO variety with below average mill and bake characteristics. PVP, Title V has been issued (Certificate #202000235). Additionally, the CoAxiom® genes are patented.

**Loma** – hard red winter wheat developed by the Montana Agricultural Experiment Station and released in 2016. Loma is a semi-solid stemmed (similar to Genou), medium-late maturing, medium short statured wheat, with white chaff. Loma has above average yield and average test weight and protein. Loma is resistant to both stripe and stem rust. Loma is a medium-low PPO line with above average mill and bake.

PVP, Title V has been issued (Certificate #201700021).

**Northern** – hard red winter wheat developed by the Montana Agricultural Experiment Station and available to growers in fall 2015. Northern is a medium-late maturing, medium-short statured wheat, with white chaff. Northern has average yield (similar to Yellowstone and Colter), average test weight, and average protein. Northern is resistant to both stem and stripe rust. Northern is a low PPO variety with average milling and baking properties. PVP, Title V has been issued (Certificate #201600092).

**StandClear CLP** – hard red winter wheat developed by the Montana Agricultural Experiment Station for exclusive license to Nutrien Ag Solutions (Loveland Products Inc., Loveland, CO) with a full partnership agreement with BASF Chemical Company. StandClear CLP will be available to certified seed growers in fall 2020. StandClear CLP is a medium maturing, semisolid-stemmed, medium height wheat with white chaff. StandClear CLP has average yield, above average test weight, and average protein, with good winter survival. StandClear CLP has high PPO and average milling and baking characteristics. PVP, Title V has been issued (Certificate #202000183). Additionally, the Clearfield® genes are patented.

**SY 517 CL2** – a 2-gene Clearfield® hard red winter wheat developed by Syngenta and released in 2017. SY 517 CL2 is an early maturing, short statured wheat, with white chaff. Winter-hardiness is below average. SY 517 CL2 has below average yield, above average test weight, and average protein. SY 517 CL2 is moderately susceptible to stripe rust. SY 517 CL2 is a medium PPO variety with average mill and below average bake characteristics. PVP, Title V is issued (Certificate #201700216). Additionally, the Clearfield® genes are patented. *SY 517 CL2 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**SY Clearstone 2CL** – a 2-gene Clearfield® hard red winter wheat developed by Montana Agricultural Experiment Station in 2012 and licensed exclusively to Syngenta Seeds. SY Clearstone wheat 2CL is very similar to Yellowstone. It is a medium maturing, medium tall, white chaffed wheat with average winter hardiness. It is a high yielding wheat with average test weight and protein. SY Clearstone 2CL is resistant to stripe rust and has moderate resistance to stem rust, the latter an improvement over Yellowstone. SY Clearstone 2CL is resistant to common bunt. SY Clearstone 2CL is a medium PPO variety with average mill and above average bake properties. PVP, Title V has been issued (Certificate #201300357). Additionally, the Clearfield® genes are patented.

**SY Wolverine** – hard red winter wheat developed by Syngenta and released in 2019. SY Wolverine is a medium early maturing, hollow-stemmed, short wheat with white chaff. SY Wolverine has below average yield, above average test weight, and above average protein, with below average winter survival. SY Wolverine appears to be moderately susceptible to stripe rust under Pacific Northwest conditions. SY Wolverine has high PPO with average mill and below average baking characteristics. PVP, Title V has been issued (Certificate #201900271).

**Warhorse** - is an awned, white chaff, solid-stemmed hard red winter wheat released in 2013 by the Montana Agricultural Experiment Station. Warhorse has medium maturity and has medium short, semi-dwarf height. Warhorse's winter hardiness, rated at 4 on 0-5 scale, is an improvement over other solid stem varieties. Stem solidness is similar to that of Bearpaw and Rampart, while sawfly cutting of stems is very low (similar to Rampart). Warhorse yield is similar to Judee, while test weight and protein are above average. Warhorse is resistant to both

stem and stripe rust. Warhorse has acceptable mill and bake qualities. PVP, Title V has been issued (Certificate #201400131).

**WB4418** - hard red winter wheat developed by WestBred and released in 2018. WB4418 is a medium-early maturing, hollow-stemmed, short wheat with white chaff. WB4418 has below average yield, below average test weight, and average protein, with average winter survival. WB4418 appears to be moderately resistant to stripe rust under Pacific Northwest conditions. WB4418 has medium PPO with below average mill and baking characteristics. PVP, Title V has been issued (Certificate #201800530). *WB4418 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**WB4792** - hard red winter wheat developed by WestBred and released in 2019. WB4792 is a medium maturing, medium statured wheat, with white chaff. WB4792 appears to have good winter hardiness. WB4792 has above average yield, high test weight and below average protein. WB4792 appears to be moderately resistant to stripe rust under Pacific Northwest conditions. WB4792 has medium-high PPO and below average milling and baking characteristics. PVP, Title has been issued (Certificate #201900398). *WB4792 will not be in the Montana Intrastate Winter Wheat Test for 2022.*

**Yellowstone** – hard red winter wheat developed by the Montana Agricultural Experiment Station and released to seed growers in 2005. Yellowstone is a very high yielding winter hardy variety with medium test weight, maturity, height, and grain protein. Yellowstone has excellent baking and good Asian noodle quality. It is moderately resistant to TCK smut and resistant to stripe rust, but susceptible to stem rust. PVP, Title V has been issued (Certificate #200600284).

## **Plant Variety Protection**

The Plant Variety Act, signed into law in 1970, offers legal protection to developers of new varieties of plants which reproduce sexually – that is, through seeds. The law provides for a Plant Variety Protection Office in the U.S. Department of Agriculture. The office receives and processes applications and when “novelty” is established, issues a certificate granting protection rights specified by the applicant.

The owner (or developer) holding a “certificate of protection” has complete control over the variety for 20 years. The law provides two types of protection:

### 1. Without Seed Certification

The owner of the protected variety may exclude others from reproducing the variety, selling it, offering it for sale, importing or exporting it, or use it in the commercial production of a hybrid or a different variety without permission. In this sense, the owner of a protected variety may bring civil damage action against anyone who infringes upon his rights.

### 2. Certified Seed Option

The owner may specify that the seed of his variety “...be sold or advertised only as a class of Certified Seed”. Production and sale of such seed by variety name, when not certified, constitute a violation of the Federal Seed Act. This means of protection may be used extensively for publicly as well as privately developed varieties.

Amendments to the Plant Variety Protection Act (PVPA) have passed both houses of Congress and been signed into law by the President. These amendments went into effect in 1995. The farmers exemption has been changed for new varieties. Seed for varieties issued a certificate after April 4, 1995, may only be purchased from the owner or his agent. A farmer can only save seed of these varieties for use on his own farm and cannot sell seed of the protected variety to his neighbor.

A variety protected under the certification option does not permit a farmer producing seed to sell or offer for sale or advertise by variety name unless it is certified. Sale of such seed by variety name as uncertified seed will constitute a violation of the Federal Seed Act. Interstate movement of seed is subject to inspection by Federal Seed Control officials. Seed within the state is subject to inspection by State Department of Agriculture inspectors.

Owners of protected varieties will give public notice that their variety is protected by affixing to the label or container the words: “Unauthorized Propagation Prohibited” or the words, “Unauthorized Seed Multiplication Prohibited”. Producers must check the label (tag) or the container for the above wording.

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Dr. Chengci Chen, Superintendent and Associate Professor of Agronomy

Ms. Calla Kowatch-Carlson, Research Assistant

Mr. Thomas Gross, Research Assistant

## **Northern Agricultural Research Center (NARC), Havre, MT**

Ms. Peggy Lamb, Research Scientist and Agronomist

Ms. Kyla McNamara, Research Associate

Ms. Eleri Haney, Research Associate

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