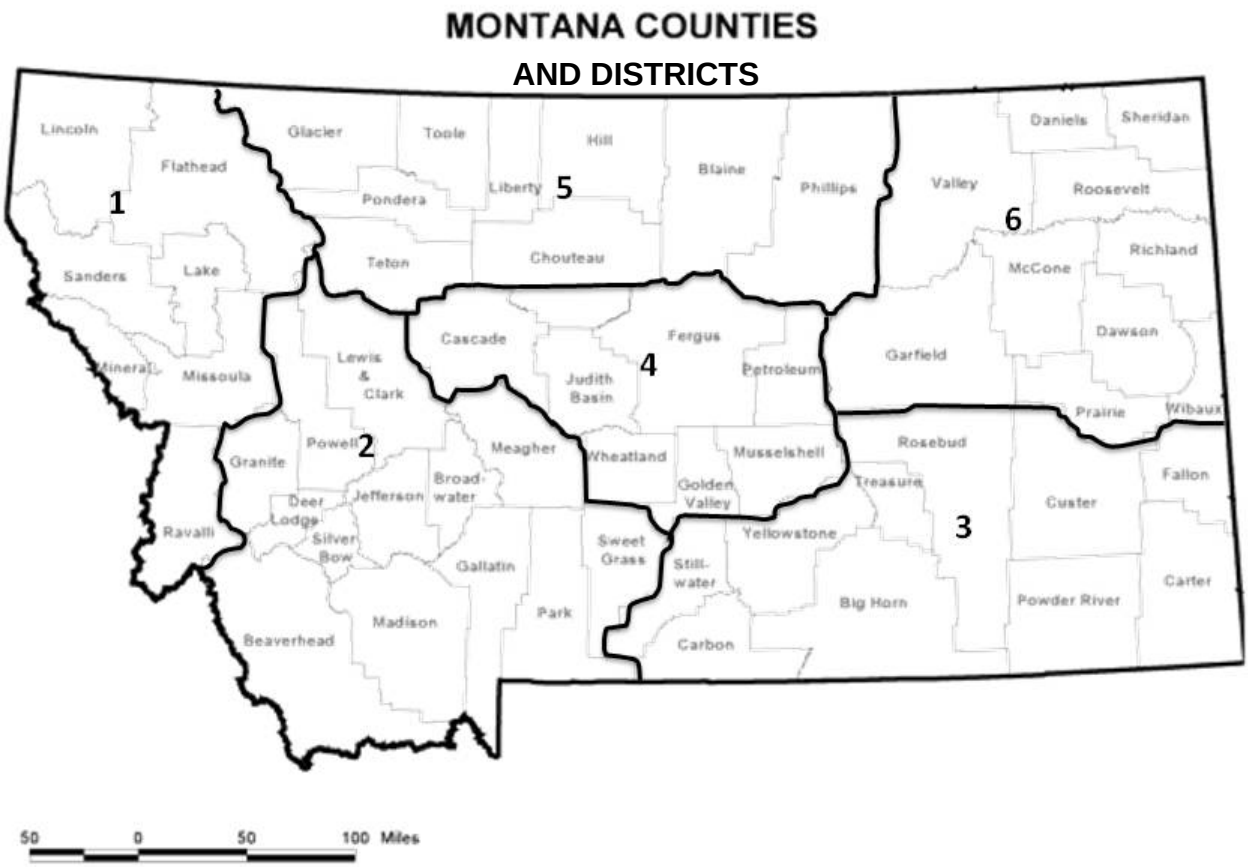
# 2018
# WINTER WHEAT VARIETIES

# Performance Evaluation and Recommendations

Recommendations are made for the districts shown on the map below




by the Montana State University
Agricultural Experiment Station
The information in this publication can also be found at a link on:
http://plantsciences.montana.edu/crops
Another variety selection tool is available at :
http://www.sarc.montana.edu/php/varieties.html

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# WINTER WHEAT VARIETY PERFORMANCE SUMMARY IN MONTANA

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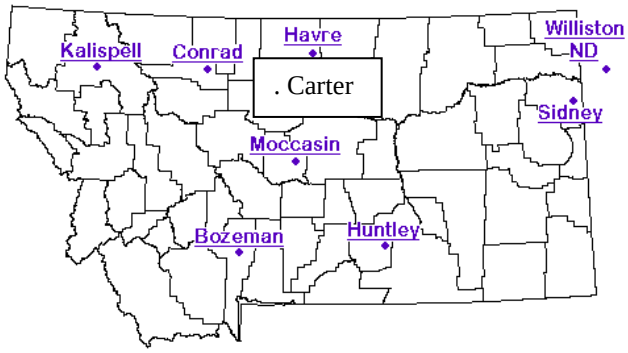
## Introduction

The agronomic characteristics of winter wheat varieties recently developed or evaluated by the Montana Agricultural Experiment Station are compared in this publication with other varieties grown in the state. A brief description of each variety is given which may include a variety's particular advantages or disadvantages. The information was extracted from the Intrastate Winter Wheat Nursery. This data is prepared by research personnel of the Montana Agricultural Experiment Station. 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 causes.

## Variety Testing Procedures

**Fig. 1. Test Locations for Montana winter wheat performance tests in 2017.**




### Locations

Hard winter wheats were planted at 8 Montana and 1 North Dakota location (Fig. 1) including Carter/Ft. Benton, Conrad and Havre in the North Central district, Moccasin in the Central district, Huntley in the Southern district, Sidney and Williston, ND representing the Northeast district, Kalispell in the Northwest and Bozeman in the Southwest districts of the state.

### Entries

Names of commercially available varieties and experimental lines evaluated in 2017 are listed with their origins, experimental designation, release year, and pedigrees in Table 2 for the hard winter wheats. Forty-nine hard wheats are included in this summary comprising 24 varieties (10 public and 14 private) and 25 experimental lines (21 public and 4 private). Numbered entries preceded by a state designation [e.g. MT1348 (Montana), CO13003C (Colorado) or private company, PSB13NEDH-7-140, (Limagrain)] are experimental lines provided by the breeder.

### Experimental Design and Seeding Methods

The Intrastate Winter Wheat Test consists of a 49 entry test with 3 replicates. These tests are planted as 7x7 lattices or a randomized complete block design at each location. Plot size varied by location, from 35 $ft^2$ at Conrad to 60 $ft^2$ at Havre. Row number varies: Bozeman and Havre are 3-row,Conrad, Huntley, Carter, 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 previous crop, planting date, fertilizer use and harvest date is available in Table 1.

All seed, for each nursery, was treated with Cruiser Maxx Cereals seed treatment, at recommended rates, before planting.

## Description of Data Collected

### Yield

All rows of each plot were trimmed and measured and harvested using 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 2017, data is provided for two (2016-2017), three (2015-2017) and four (2014-2017) year averages for hard wheat entries tested during previous cropping seasons

**Table 1. Summary of agronomic practices used on hard winter wheat performance trials in Montana in 2016. Fall nitrogen (N), phosphorus ($P_20_5$) and potassium ($K_2O$) were preplant applied and incorporated.**

| Location | 2016 Crop | 2015 Crop | 2016 Planting Date | Fertilizer N Fall | Fertilizer N Spring | Fertilizer $P_2O_5$ | Fertilizer $K_2O$ | 2017 Harvest Date |
|---|---|---|---|---|---|---|---|---|
| | | | | --------- Pounds per acre --------- | | | | |
| **Kalispell** | **mixed forage** | **winter wheat** | **Sep 28** | **0** | **-** | **30** | **70** | **no harv.** |
| **Bozeman** | **fallow** | **barley** | **Sep 27** | **242** | **-** | **10** | **10** | **Jul 29** |
| **Huntley** | **chem. fallow** | **fallow** | **Sep 29** | **6** | **-** | **26** | **0** | **Jul 18** |
| **Moccasin** | **fallow** | **barley** | **Sep 27** | **50** | **190** | **0** | **0** | **Jul 25** |
| **Conrad** | **chem. fallow** | **barley** | **Sep 29** | **41** | **140** | **22** | **20** | **Jul 27** |
| **Havre** | **fallow** | **barley** | **Sep 19** | **100** | **100** | **20** | **10** | **Jul 14** |
| **Carter** | **chem. fallow** | **na** | **Oct 19** | **-** | **-** | **-** | **-** | **Jul 25** |
| **Sidney** | **fallow** | **winter wheat** | **Sep 18** | **69** | **-** | **0** | **0** | **Jul 20** |
| **Williston, ND** | **peas** | **safflower** | **Sep 15** | **6** | **26** | **0** | **0** | **no harv.** |

.**Test Weight**

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

**Heading Date**

Heading date is taken when 50% of the heads in a plot were 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 was 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 determined as a % by NIR (near infrared reflectance) on the 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 occurred. There was differential winter-kill at Sidney, ranging from 0-63% (average = 40%) on May 8th, in 2017 . Severe winter-kill occurred in Williston and the trial was abandoned.

Table 12 contains information on % winter survival and associated yield in winter-kill environments from 2012 to 2017. The data summarizes 4 tests in which significant winter-kill occurred (test average for winter survival was less than 90%). All sites with winter-kill were in District 6 (Sidney and Williston) which are the most severe location for winter wheat survival of our testing locations.

The Kalispell test was abandoned due to severe spring flooding followed by a heavy weed infestation.

**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 solid-stemmed varieties include: Judee, (released in 2011), Bearpaw (2011), WB-Quake

(2011), Warhorse (2013), Loma (2016), and WB4483 (2016).

Table 13 contains information on yield and % sawfly cutting at 11 testing locations where sawfly pressure was present during the years 2012-2017. The data is from Havre, Loma (15 miles northeast of Ft. Benton), Turner (60 miles east-northeast of Havre), Carter (13 miles west of Ft. Benton), Fly Creek (about 25 east-southeast of Huntley), and Willow Creek (35 miles west-northwest of Bozeman). Solidness scores (rated on a 5-25 scale) are shown for solid and semi-solid varieties in Table 15.

### Coleoptile Length

Coleoptile length evaluation is performed in Bozeman under controlled (growth chamber) conditions. Twenty-five seeds per variety were planted in wetted vermiculite. After 15 days the coleoptile (sheath covering the emerging shoot that helps penetration to the soil surface) is measured. This test is replicated 3 times for each variety. Results from previous years are reported in Table 15. Long coleoptiles are generally longer than 3.5 inches, medium from 2.7-3.5 in, and short are under 2.7 in. Care should be taken not to plant short coleoptile varieties too deep.

### Other Agronomic Characters

Table 15 contains information on grain maturity, chaff color, relative winter survival and straw strength for the hard wheat varieties listed in this publication.

### 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). A quantitative polyphenol oxidase (PPO) 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 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, stem rust and leaf 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.

Tables 3 through 11 show 2017 data for hard winter wheat collected at all harvested experiment station sites. Where a variety has been in the 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 over a period of years. Selection should also consider test weight, winter-hardiness, heading date, plant height, protein and disease resistance.

## 2017 Test Conditions

Statewide winter wheat yields were projected by the Montana Agricultural Statistics Service at 42 bushels per acre (bu/a), for 2017. This is a decrease over the 49 bu/a for the 2016 harvest year. The harvested acreage in 2017 was 1.59 million acres (total production = 66.8 million bu) compared 2.15 million acres in 2016 (total production = 105.4 million bu).

Rainfall for the 2016-2017 crop year was evenly divided between above (Bozeman, Huntley, and Kalispell), average (Moccasin, Williston, and Carter/Fort Benton), and below (Conrad, Havre, and Sidney) average (Table 14), with a range of -5.71 inches at Sidney to +1.60 at Kalispell. Average yearly temperatures were above long term at all locations, except Conrad and Kalispell, ranging from Kalispell (-1.1°F) to +1.8°F at Williston.

In 2017, '**Yellowstone'** was miss-planted (as another plot of Warhorse), so no direct comparisons could be made at any of the harvested locations.

Yields, for the 7 locations harvested averaged 68 bu/a {range 38 (Sidney) to 114 bu/a (Huntley)}. Yields of named varieties, across the 7 harvested locations, ranged from a low of 53 bu/a (WB4575) to a high of 79 bu/a for LCS Jet.

Test weight averaged 60.6 lb/bu across all locations. Kalispell (53.7 lb/bu, rain delayed harvest and stripe rust), Bozeman (59.7), Moccasin (58.1) and Carter/Fort Benton (56.6) were below 60 lb/bu, while the other 4 locations were above.

Heading dates were earlier in 2017 than long term averages at the 6 harvested locations where comparisons are available. Sidney at -12 days had the greatest differences, while the least change occurred at Huntley (-8 days).

Stripe rust at both Bozeman (average = 27%, range 2 - 94%) and Huntley (average = 13%, range 0 – 100%) were a factor in yield reduction for highly susceptible varieties (Bearpaw, Brawl CL Plus, Decade, Denali, WB4483, and WB4575).

There was sawfly cutting recorded at the Northern Seeds Carter/Ft. Benton site averaging 54%, ranging from 2 (Warhorse) to over 70% (Langin, LCS Chrome, Long Branch, SY Clearstone 2CL, SY Monument, and SY Sunrise) of stems cut, across all entries.

Protein content averaged 12.7% across all locations (location range = 9.4 – 14.0%) tested. The range of named varieties across all locations was from a low of 11.4% (Langin) to a high of 13.5% (WB4575).

## Dwarf Smut (TCK)

Dwarf smut (TCK) can be controlled with 'Dividend' seed treatment (see page 5). Dwarf smut or dwarf bunt (*Tilletia controversa* Kuhn) is a fungal disease that occurs in areas where winter wheat is subjected to prolonged snow cover or unfrozen ground. The planting of dwarf smut resistant varieties (Promontory and SY Clearstone 2CL are resistant) is a practical means of control.

The amount of wheat lost each year because of dwarf smut is small in relation to the state's total crop, but individual operators may experience severe losses in heavily infested, localized areas.

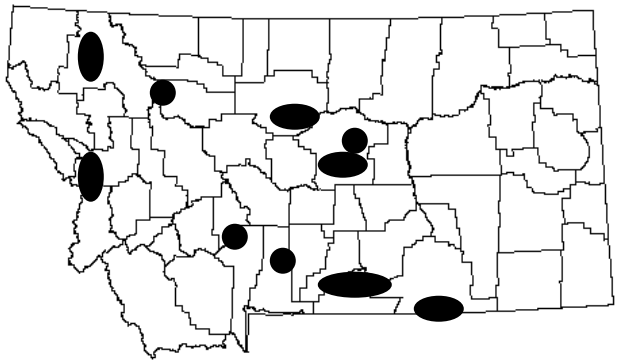


**Fig. 2. Known areas of dwarf smut (TCK) infestations.**

If you farm in the vicinity of one of the shaded areas in the map (Figure 2.), you would be well advised to observe closely your winter wheat crop and consider using seed treatment.

## Producing Winter Wheat

Plant **CERTIFIED CLASS SEED** of varieties **RECOMMENDED** by the Montana Agricultural Experiment Station.

### Seed Treatment

Treat all winter wheat seed with a recommended fungicide to reduce losses caused by cereal smut or other seed-borne diseases. Several non-mercurial compounds are registered for grain seed treatment.

Dwarf smut (bunt) can be controlled with difenoconazole. Dividend® contains this compound and is available in Montana. If you farm in a dwarf smut area contact your seed dealer or chemical representative for more information about this seed treatment. See page 4 for known areas of dwarf smut infestations.

Diseases are best controlled when all seeds are coated with a seed treatment. Do not over-treat--Follow recommendation of manufacturer of product as to rate.

Truck-mounted seed treaters, which apply the fungicide as the seed is augered into the drill box, do a good job of treating if operated according to manufacturer's specifications.

Drill box treatments are not effective for general use.

When using any pesticide materials, read the information on the label as to rate of application, specific uses, methods of handling, precautions, etc.

**Seeding Rate and Date**

The following rates and dates for seeding are general (Figure 3). The heavier seeding rate, where indicated, is applicable to plump seed of high test weight (above 60 lbs/bu) or for seed having a kernel size larger than normal for most other varieties. The lighter rates are for the smaller seeded varieties or when test weight is below normal for larger seeded varieties. Seeding rates may be lower if adequate nitrogen and phosphorus amounts are applied at planting.

Winter wheat seed lots may vary in the number of seeds per pound depending on the ratio of large-to-small seeds in a seed lot. The average is approximately 15,000 seeds per pound. A precise count of the number of seeds per pound should be made on your seed lot to help calibrate your drill. You can also calculate how many pounds of seed you will need to plant an acre.

**Figure 3. Seeding rate (lb/acre) and date for winter wheat**

| Districts | Dryland | Irrigated | Date of Seeding |
|---|---|---|---|
| 5,6<br>1,2,3,4 | 30-60<br>30-60 (10-20 seeds/sq. ft.) | 60-75<br>60-75 (20-25 seeds/sq. ft.) | Sept. 1-15<br>Sept. 10-25 |

As to seeding date -- DO NOT SEED TOO EARLY in areas where root rot diseases are prevalent. In areas where *Cephalosporium* stripe, wheat streak mosaic virus or other root rot diseases have caused losses, delay seeding until the soil temperature in the seed zone will stay below 55$^{o}$F except for brief periods during the day. In the southern half of Montana, this is usually September 10 to 20. In Districts 5 and 6, plant between September 1 and 15. Cooler soil temperatures slow root development and reduce the probability of winter root injury and invasion by soil-borne organisms. To reduce the incidence of root and foot rots, plant winter wheat on land previously seeded to other crops such as barley, oats or spring wheat. Extreme seeding delay, however, reduces seedling vigor and increases chances of winter-kill.

**Seeding Depth**

Set the drill to place the seed 1 to 2 inches below the soil surface. Deeper seeding reduces tillering and lowers crop yields. With the furrow drills, wind-driven soil particles settle in the furrows covering the seed deeper than desired.

## Yield in Winter Wheat as Influenced by Percent Stand

During periods of winter injury farmers are frequently faced with a decision as to whether or not a field should be torn up and re-seeded. A 40 to 50 percent winter wheat stand, if general over field, may produce as much as re-seeded spring wheat. Thinner stands will likely demand more attention for weed control.

The guidelines for evaluating winter wheat stands are to determine the average number of healthy plants per square yard. We suggest making a square frame out of 3/8 inch rod. Walk the field in a zigzag pattern counting at ten random locations.

Fields that have 80 or more plants per square yard will probably produce more than if replanted to spring wheat (information taken from 1995 Master's Thesis, "Critical Overwintering Plant Population for Successful Winter Wheat Production in Montana" by Doug Holen).

**Table 2. List of public, private, and experimental hard winter wheat varieties.**

| Variety | Experimental Designation | Origin | Release Year | Pedigree |
|---|---|---|---|---|
| **Public Varieties** | | | | |
| **Bearpaw** | **MTS0721** | Montana | **2011** | selection from a composite of 5 crosses: 99X96, DMS/Rampart// Pronghorn/3/2*Rampart; 99X97, DMS/Rampart//Pronghorn/3/ Rampart/4/(MTW9806, Redwin/Rio Blanco//NuWest) ; 99X98, DMS/Rampart//Pronghorn/3/Rampart/4/NuPlains; 99X99, DMS/Rampart//Pronghorn/3/Rampart/4/(MT9513, NuWest/5/(TAM W-103/Froid/4/Yogo//Turkey Red/3/Centurk, MT8030)); and 99X100, DMS/Rampart//Pronghorn/3/Rampart/6/(MT98113, Judith/5/ (MT8764, Crest/(VT1230, French male sterile line)/4/((PI178383/ Cheyenne//3*Tendoy, ID5011)/3/(ID5006, Norin 10/Staring// 2*Cheyenne), ID745101))) |
| **Brawl CL Plus** | **CO06052** | Colorado | **2011** | Teal 11A/Above//(CO99314, TX91V4931/ Halt) |
| **Decade** | **MT0552** | Montana; North Dakota | **2010** | selection from composite of 3 crosses:((Sumner sib, KS831936-3, (Plainsman V/Odesskaya 51)//(NE86501, Colt/Cody), N95L159, Wesley sib)/3/ CDC Clair, N95L159//(MT9602, NuWest/Tiber) and N95L159/4/ (MT9609, Froid/SD1287// Redwin/3/NuWest) |
| **Denali** | **CO050303-2** | Colorado | **2011** | (Yuma/T-57/4/(CO850034, NS14/NS603// Newton /3/Probrand 835)/5/ 4*Yuma /6/(NEWS12, KS91H174/RBL// KS91HW29/3/ N87V106), CO980829)/7/ TAM 111 |
| **Judee** | **MTS0713** | Montana | **2011** | (Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon |
| **Langin** | **CO11D446** | Colorado | **2016** | (Hatcher/(NW97S295, Antelope sib), CO050270)//Byrd |
| **Loma** | **MTS1224** | Montana | **2016** | Yellowstone/5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, MTS0112)/4/(MTS0125, selection from a composite of 4 crosses) |
| **name pending** | **MT1465** | Montana | **2018** | selection from a composite of 5 crosses: 06X272, Yellowstone/ (MT0684, a composite - see pedigree); 06X276, Yellowstone/ (MT06102, , a composite - see pedigree); 06X278, Yellowstone/7/ (MT06110, (Arapahoe/3/Brule//Hiplains/ Newton, SD93528)/6/ (MT9409, Tiber/5/ (TAM W-103/Froid/4/Yogo//Turkey Red/ Oro/3/Centurk, MT8030))); 06X282, Yellowstone/3/(MT06123, '2174'/(MT9440, BigSky sib)//BigSky); and 06X285, Yellowstone/7/ (98X168E1, (Nuwest/4/ (MT88001, Sawmont/Tendoy /3/Yogo// Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn); |
| **name pending** | **MTF1432** | Montana | **2018** | Yellowstone*2/7/(98X168E1, (Nuwest/4/(MT88001, Sawmont/ Tendoy /3/Yogo//Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn) |
| **Northern** | **MT0978** | Montana | **2015** | selection from a composite of 2 crosses: 00X248, (Yellowstone sib, MT9982)/4/((MT8709, Erhardt sib)/NuWest//Erhardt, MTW0072)/3/ (NW97S151, KSSB0192-3/NE89529) and 00X249, (Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/Plainsman V //Ulianovka) ,MTW0047)/4/MTW0072/NW97S151 |
| **Warhorse** | **MTS0808** | Montana | **2013** | selection from a composite of 3 crosses: 00X182, ((Froid/Winoka/7/ ((Sinvalocho/Wichita// Hope/Cheyenne /3/Wichita/4/Seu Seun 27, TX55-391-56-D8)/5/Westmont, MT6928)/6/ Trader, MT85200)/8/ Redwin, MT9908)/9/ Nuplains/6/(MTS9862, (NuWest/ Lovrin 24 /4/((Rego/Cheyenne, Sel. 39-18-7)// Winalta, MT7431)/3/(MT7115, Yogo/T. polonicum-70-5), MT91366)/5/ (MTS92137, Lew/Tiber//Redwin)); 00X183, Nuplains/MTS9862/4/ (MTW0047, Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/ Plainsman V //Ulianovka)); and 00X184, Nuplains/MTS9862/5/(MTS0028, Vanguard/4/(Lew/Tiber//Redwin, MTSF1570)/3/ Norstar) |
| **Yellowstone** | **MT00159** | Montana | **2005** | $F_2$ composite of Promontory/Judith and Judith-dwarf/Promontory |
| **Private Varieties** | | | | |
| **Keldin** | **ACS55017** | Peter Franck: Seed-Link Inc.; Ontario,Canada, Westbred LLC | **2011** | Barenburg 235/Carlisle//TRX-A16-3-2 |
| **LCS Chrome** | **LCH13DH-20-87** | Limagrain | **2016** | na |

**Table 2. List of public, private, and experimental hard winter wheat varieties.**

| Variety | Experimental Designation | Origin | Release Year | Pedigree |
|---|---|---|---|---|
| **LCS Jet** | **NSA10-7208** | Limagrain Europe s.a. | **2015** | Apache/Autan |
| **Long Branch** | **LCH12-012, HRX1652** | Limagrain; Dyna-Gro Wheat | **2015** | na |
| **SY 517 CL2** | **07CL039-7** | Syngenta | **2017** | na, Clearfield Plus variety |
| **SY Clearstone 2CL** | **MTCL1077** | Syngenta, Montana | **2012** | Yellowstone*4/3/MTCL01158/CDC Teal 11A//Jagalene |
| **SY Monument** | **04BC574-2** | Syngenta | **2014** | (KS89180B-2-1-1/CM75113, F1//X920750-A-11-2, BC991149-11)/3/(00x0090-4, W95091/W98-183 |
| **SY Sunrise** | **06BC796#68** | Syngenta Seeds | **2015** | ((X920709B-5-2/KS90WGRC10//Ogallala, BC98337-10-53)/3/CDC Falcon, 06BC308)/4/ (NE03458, (McVey 78015/NE88521, NE95544)// W91-348/3/Millennium) |
| **SY Wolf** | **BC01007-7** | AgriPro, Syngenta | **2010** | ((TAM-108/Veery sib, SWM1524)//TX84V2029, TX91V3308)/3/(W93-359, WI88-052/W96-180), W99-331)/4/(97x0906-8, (Mesa/W89-328, W96-180)//(W95-188, Karl 92/W98-232)) |
| **WB4483** | **BZ9W09-2212** | WestBred-Monsanto: | **2016** | (solid stem) |
| **WB4575** | **BZ9W09-2075** | WestBred-Monsanto: | **2016** | (hollow stem) |
| **WB4614** | **BZ9W07-2034** | WestBred-Monsanto: | **2013** | BZ9W96-788-B/Pryor |
| **WB4623CLP** | **BZ9WM09-1663** | WestBred-Monsanto: | **2014** | (B152/Rampart, DH990356, BZ9W02-2073)// Above/CDC Teal-11A |
| **WB-Quake** | **BZ9W05-2043** | WestBred LLC (Monsanto) | **2011** | Rampart/Kestrel |

**Public Elite Lines**

| | | | | |
|---|---|---|---|---|
| | **CO13003C** | | | CO06072/4*Byrd (Als1, Als2) |
| | **MTCL1131** | | | Yellowstone*4/4/(Fidel/Tiber (IMI), MTCL01158)//CDC Teal 11A/3/Jagalene |
| | **MT1265** | | | Yellowstone*4//(KS96WGRC40, KS93U69*2/TA 2397) (Lr41, wcm) |
| | **MT1348** | | | selection from a composite of 2 crosses: 04X494, (PI572290 = STARS-9303W = (Bobwhite/PI 149898), rwa2)//BigSky and 4X495, (Yellowstone sib, MT9982)/PI572290 |
| | **MT1444** | | | selection from a composite of 2 crosses: 06X165, Yellowstone*2/ (MTW0590, selection from a composite of 2 crosses: 00X3, ((MT8709, Erhardt sib)/NuWest// Erhardt, MTW0072)/3/(NW97S151, KSSB0192-3/NE89529) and 00X4, (MT8713, Erhardt sib)/NuWest, MTW9911)// NW97S151) and 06X166, (NuWest//(SD88191, Brule/Dawn), MTW01133/3/Yellowstone/MTW0590 |
| | **MT1471** | | | selection from a composite of 2 crosses: 06X304, Yellowstone/ NuDakota; 06X306, (Erhardt/Halt, MTR0441)//NuDakota, and 06X308, ((Tiber/5/(MT8030, TAM W-103/ Froid /4/Yogo//Turkey Red /Oro/3/ Centurk), MT9409)/6/(MT9659, SMN82164/ SMN82140// Rocky/ Tiber)/7/Jerry, MT06125)/8/NuDakota |
| | **MT1488** | | | selection from a composite of 2 crosses: 03X316, ((Karagach, RWA resis., PI262605)/4/ (MT7863, Froid/Winoka// Centurk)/3/ Redwin, MTR00118)/10/ (MT0241, (WWP4394/NuWest /4/(Rego/ Cheyenne// Winalta, MT7431)/3/(MT7978, Centurk/Marias), MT91192)/9/(NuWest/ Redwin//Rio Blanco, 88X9D105-6)/8/ (((Carstens V/A. intermedium// Lathrop, CItr15092)/3/T. speltoides/4/Fletcher/5/ 5*Centurk, CItr17884)*4/6/Karl, KS93WGRC27) /7/(MT9415, Judith/Yogo)) /11/CDC Falcon and 03X317, (Erhardt// Judith/CDC Kestrel, MT0097) /3/ MTR00118/ MT0241 |
| | **MTW1491 (HWW)** | | | (Yellowstone (Low PPO) plant seln, MT08184)//(Yellowstone (Low PPO) plant seln, MT08188/(MT08175, Colter sib) |

**Table 2. List of public, private, and experimental hard winter wheat varieties.**

| Variety | Experimental Designation | Origin | Release Year | Pedigree |
|---|---|---|---|---|
| | **MTF1435** | | | (Yellowstone (Low PPO) plant seln, MT08186)/8/Yellowstone(L)*2 /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) |
| | **MT1507** | | | selection from a composite of 2 crosses: 07X19, ((BigSky sib, MT9523)/(NE94653, Wahoo sib), MT0686)//Yellowstone/Duster; and 07X20, Yellowstone*2/Duster |
| | **MT1540** | | | selection from a composite of 2 crosses: 06X165, Yellowstone*2/ (MTW0590, selection from a composite of 2 crosses - **see pedigree**) and 06X166, (NuWest//(SD88191, Brule/Dawn), MTW01133)/3/Yellowstone/MTW0590 |
| | **MT1542** | | | selection from a composite of 3 crosses: 05X101, (Erhardt//Judith/ CDC Kestrel, MT0097)/10/ Yellowstone/9/(MT03108, (NuWest/Tiber, MT9524)/8/((Carstens V/Ae. intermedium (TA25)//Lathrop, CItr13092)/3/T. speltoides/4/Fletcher/5/5*Centurk, CItr17884)*4/ 6/Karl, KS93WGRC27)/7/Judith); 05X103, (((Carstens V/Ae. intermedium (TA25)//Lathrop, CItr13092)/3/T. speltoides/4/Fletcher/5/ 5*Centurk, CItr17884)*4/6/Karl, KS93WGRC27)/7/ 2*Judith, MT03177)/8/Yellowstone/MT03108; and 05X104, ((Arapahoe/ NE87U121, N92L005) /4/(MT9608, Froid/SD1287// Redwin/3/ (MT7863, Froid/ Winoka//Centurk)), MT0403)/5/ Yellowstone/ MT03108 |
| | **MT1547** | | | selection from a composite of 5 crosses: 06X272, Yellowstone/ (MT0684, selection from a composite of 5 crosses - **see pedigree**); and 06X276, Yellowstone/(MT06102, selection from a composite of 2 crosses - **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) |
| | **MT1563** | | | selection from a composite of 2 crosses: 07X76, Yellowstone*2/5/ (PI640431, BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet/3/ WA007900//Yr15/ 6*Avocet) and 07X77, Yellowstone/PI640431//Yellowstone(340,233) |
| | **MT1564** | | | selection from a composite of 2 crosses: 07X76, Yellowstone*2/5/ (PI640431, BC4F4 line derived from WA007900*5/4/WA007900// Yr5/6*Avocet/3/ WA007900//Yr15/ 6*Avocet) and 07X77, Yellowstone/PI640431//Yellowstone(340,233) |
| | **MTF1559** | | | Yellowstone*2/7/(98X168E1, (Nuwest/4/(MT88001, Sawmont/ Tendoy /3/Yogo//Norin 10/Brevor) /5/(MT7863, Froid/Winoka/ Centurk), MTS9720)/6/(PI 191303, Alba = Belgian variety)/Elkhorn) |
| | **MT1565** | | | selection from a composite of 3 crosses: 09X284, 09X285, and 09X277, all with the same pedigree; Decade*2//Promontory/ 3*Yellowstone |
| | **MTS1573 (HWW)** | | | selection from a composite of 2 crosses: 06X224, Danby/7/ 2*(MTS04114, L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk))) and 06X225, (L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)), MTS0531)/7/Danby/MTS04114 |
| | **MTS1588** | | | selection from a composite of 2 crosses: 07X291, ((SMN82164/ SMN82140//Rocky/Tiber, MT9659)/3/S87-101/4/Pronghorn, MT0598)/5/(98X366E29-1, Heyne/Rampart//(MT9513, BigSky sib)) and 01X295, (((Lew/Tiber//Redwin ,MTS92021)/3/Judith/Arapahoe, MTS0023)/4/Pryor/ Genou, 01X258C1)/5/MT0598 |

**Table 2. List of public, private, and experimental hard winter wheat varieties.**

| Variety | Experimental Designation | Origin | Release Year | Pedigree |
|---|---|---|---|---|
| **Private Elite Lines** | | | | |
| | **BZ9W09-2216** | WestBred-Monsanto: | | (solid stem) |
| | **BZ9WM09-1620** | WestBred-Monsanto: | | Clearfield Plus exp. line |
| | **PSB13NEDH-7-45** | Limagrain | | Smoky Hill/McGill |
| | **PSB13NEDH-7-140** | Limagrain | | Smoky Hill/McGill |

**Table 3. HARD WINTER : District 1-- Kalispell - Dryland (High Rainfall)**

**Spring flooding, weeds - plots not harvested in 2017**

| Cultivar/Line | Grain Yield (bushels/acre) | | | Test | 2016 Data: Heading Date | | Plant | Lodg- | Stripe | Protein |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2015-16 | 2014-16 | weight | Ordinal | Calendar | height | ing | rust | |
| | 1 yr | 2 yr | 3 yr | lb/bu | from Jan1 | | in | % | % | % |
| **07CL039-7,SY 517CL2 (P)++)** | | | | | | | | | | |
| **Bearpaw +** | 16.4 | 48.9 | 72.2 | 39.4 | 148.5 | 28-May | 37.5 | 1 | 96 | **15.4** |
| **Brawl CL Plus +** | 54.4 | 72.5 | | 43.3 | 143.2 | 22-May | 41.0 | 0 | 84 | 13.9 |
| **BZ9W09-2216 (P)** | | | | | | | | | | |
| **BZ9WM09-1620 (P)** | | | | | | | | | | |
| **CO13003C** | | | | | | | | | | |
| **Decade +** | 18.5 | 43.9 | 67.0 | 42.9 | 149.8 | 29-May | 38.1 | 20 | 93 | 14.2 |
| **Denali +** | | | | | | | | | | |
| **Judee +** | 118.8 | **122.1** | **126.9** | **58.3** | 148.9 | 28-May | 41.2 | 12 | **27** | 12.2 |
| **Keldin (P)+** | 101.1 | 111.7 | **122.5** | 55.6 | 149.2 | 28-May | 39.2 | 0 | 82 | 11.3 |
| **Langin ++** | | | | | | | | | | |
| **LCS Chrome (P)++** | | | | | | | | | | |
| **LCS Jet (P)+** | | | | | | | | | | |
| **Loma ++** | 128.0 | **136.4** | **137.5** | 57.4 | 150.9 | 30-May | 40.1 | 43 | **35** | 11.8 |
| **Long Branch (P)++** | | | | | | | | | | |
| **MT1265** | 130.0 | **134.9** | **139.6** | 57.3 | 152.2 | 31-May | 44.7 | 13 | 67 | 10.9 |
| **MT1348** | 132.2 | **132.6** | | 57.7 | 149.1 | 28-May | 43.1 | 70 | 56 | 11.6 |
| **MT1444** | 136.1 | | | 57.9 | 151.2 | 30-May | 43.8 | 0 | 70 | 11.1 |
| **MT1465**[2/] | 135.0 | | | **58.5** | 150.2 | 29-May | 39.5 | 0 | **37** | 11.8 |
| **MT1471** | **148.9** | | | **59.5** | 151.7 | 31-May | 43.5 | 0 | **35** | 12.6 |
| **MT1488** | 135.1 | | | **60.0** | 152.4 | 31-May | 40.8 | 36 | **22** | 12.3 |
| **MT1507** | | | | | | | | | | |
| **MT1540** | | | | | | | | | | |
| **MT1542** | | | | | | | | | | |
| **MT1547** | | | | | | | | | | |
| **MT1563** | | | | | | | | | | |
| **MT1564** | | | | | | | | | | |
| **MT1565** | | | | | | | | | | |
| **MTCL1131** | 121.6 | **131.1** | **138.7** | 55.8 | 151.5 | 31-May | 45.4 | 0 | 87 | 11.0 |
| **MTF1432**[2/] | | | | | | | | | | |
| **MTF1435** | | | | | | | | | | |
| **MTF1559** | | | | | | | | | | |
| **MTS1573 (HWW)** | | | | | | | | | | |
| **MTS1588** | | | | | | | | | | |
| **MTW1491 (HWW)** | **138.8** | | | **59.6** | 151.2 | 30-May | 43.7 | 22 | 51 | 10.9 |
| **Northern +** | 133.7 | **132.3** | **138.4** | 56.8 | 152.6 | 1-Jun | 43.0 | 14 | 52 | 11.7 |
| **PSB13NEDH-7-140 (P)** | | | | | | | | | | |
| **PSB13NEDH-7-45 (P)** | | | | | | | | | | |
| **SY Clearstone 2CL (P)+** | 117.2 | **124.6** | **131.8** | 54.9 | 150.6 | 30-May | 43.6 | 0 | 86 | 11.4 |
| **SY Monument (P)+** | 127.0 | **124.3** | | 54.9 | 148.5 | 28-May | 40.9 | 0 | **33** | 12.3 |
| **SY Sunrise (P)+** | 130.6 | **121.0** | | 57.7 | 144.1 | 23-May | 37.3 | 0 | 38 | 12.0 |
| **SY Wolf (P)+** | 98.6 | 102.2 | 113.9 | 52.2 | 145.6 | 25-May | 41.0 | 0 | 50 | 12.6 |
| **Warhorse +** | 126.7 | **129.6** | **129.5** | **59.7** | 150.9 | 30-May | 41.8 | 15 | **37** | 13.0 |
| **WB4483 (P)++** | 88.9 | | | 56.8 | 153.3 | 1-Jun | 37.3 | 7 | 68 | 12.3 |
| **WB4575 (P)++** | 21.8 | | | 46.1 | 151.7 | 31-May | 35.0 | 2 | 96 | 13.9 |
| **WB4614 (P)+** | 64.2 | 85.6 | 103.3 | 51.2 | 149.9 | 29-May | 37.5 | 1 | 82 | 13.6 |
| **WB4623CLP (P)+** | **145.1** | **130.5** | | **59.2** | 150.3 | 29-May | 41.9 | 14 | **29** | 13.8 |
| **WB-Quake (P)+** | 117.5 | **122.5** | **122.5** | **58.7** | 153.3 | 1-Jun | 41.3 | 6 | 67 | 11.5 |
| **Yellowstone +** | 94.9 | **117.7** | **125.3** | 55.9 | 150.4 | 29-May | 42.6 | 1 | 86 | 11.1 |
| **Average** | **97.3** | **106.0** | **113.3** | **53.7** | **149.4** | **28-May** | **41.0** | **8.0** | **69.5** | **12.3** |
| **LSD (0.05)** | **10.2** | **31.4** | **29.0** | **1.9** | **2.3** | | **2.2** | **16.6** | **15.6** | **0.6** |
| **C.V.** | **6.5** | **14.6** | **15.6** | **2.0** | **0.9** | | **3.0** | **125.1** | **13** | **2.7** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending 2/ = approved for release in 2018, name pending

(HWW) = Hard White Winter Wheat

**Table 4. HARD WINTER : District 2-- Bozeman - Dryland (Moderate Rainfall)**

| Cultivar/Line | Grain Yield (bushels/acre) | | | | 2017 Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Test | Heading Date | | Plant | Stripe | Protein |
| | 2017 | 2016-17 | 2015-17 | 2014-17 | weight | Ordinal | Calendar | height | rust | |
| | | 2 yr | 3 yr | 4 yr | lb/bu | from Jan1 | | in | % | % |
| **07CL039-7,SY 517CL2 (P)++)** | 79.0 | | | | 59.1 | 155.1 | 4-Jun | 32.6 | 52 | 12.8 |
| **Bearpaw +** | 46.0 | 46.5 | 45.0 | 57.0 | 58.0 | 159.5 | 9-Jun | 36.7 | 82 | 13.7 |
| **Brawl CL Plus +** | 62.7 | 72.0 | 71.8 | | 56.3 | 155.3 | 4-Jun | 36.7 | 79 | 13.5 |
| **BZ9W09-2216 (P)** | 40.0 | | | | 57.3 | 161.8 | 11-Jun | 33.0 | 89 | 12.5 |
| **BZ9WM09-1620 (P)** | 102.5 | | | | 61.2 | 159.7 | 9-Jun | 40.3 | **11** | 12.7 |
| **CO13003C** | 62.4 | | | | 56.4 | 157.8 | 7-Jun | 38.7 | 73 | 12.5 |
| **Decade +** | 42.7 | 46.9 | 46.8 | 58.8 | 56.4 | 159.6 | 9-Jun | 35.5 | 71 | 13.2 |
| **Denali +** | 65.8 | | | | 60.4 | 157.8 | 7-Jun | 38.8 | 94 | 11.6 |
| **Judee +** | 90.0 | 79.2 | 74.3 | 80.4 | 60.6 | 159.8 | 9-Jun | 36.8 | **9** | 13.5 |
| **Keldin (P)+** | 97.7 | 91.6 | **89.4** | **95.3** | 60.1 | 159.6 | 9-Jun | 36.7 | 60 | 12.7 |
| **Langin ++** | 79.0 | | | | 57.2 | 155.7 | 5-Jun | 34.9 | 44 | 12.0 |
| **LCS Chrome (P)++** | 107.2 | | | | 61.1 | 158.0 | 7-Jun | 39.9 | **3** | 13.3 |
| **LCS Jet (P)+** | **124.6** | | | | 59.1 | 158.9 | 8-Jun | 34.5 | **3** | 13.4 |
| **Loma ++** | 95.9 | 94.0 | **92.6** | **95.4** | 60.4 | 162.8 | 12-Jun | 35.7 | **7** | 12.9 |
| **Long Branch (P)++** | 109.8 | | | | 61.3 | 154.8 | 4-Jun | 37.2 | **7** | 12.0 |
| **MT1265** | 108.6 | **107.2** | **98.8** | **101.6** | 60.0 | 162.4 | 11-Jun | 40.5 | 20 | 12.6 |
| **MT1348** | 99.4 | **98.4** | **95.2** | | 60.1 | 159.2 | 8-Jun | 39.7 | 20 | 12.4 |
| **MT1444** | 103.8 | 96.6 | | | 60.3 | 161.7 | 11-Jun | 39.2 | **14** | 13.1 |
| **MT1465**[2/] | 104.5 | 96.4 | | | 61.1 | 160.6 | 10-Jun | 36.1 | **11** | 13.3 |
| **MT1471** | 111.5 | **103.1** | | | 61.3 | 161.6 | 11-Jun | 37.9 | **3** | 13.8 |
| **MT1488** | 93.9 | 94.0 | | | 61.9 | 161.9 | 11-Jun | 38.5 | **5** | 13.0 |
| **MT1507** | 96.1 | | | | 61.1 | 160.4 | 9-Jun | 37.1 | **10** | 13.2 |
| **MT1540** | 99.6 | | | | 61.1 | 160.2 | 9-Jun | 38.1 | **11** | 13.1 |
| **MT1542** | 113.0 | | | | 61.1 | 160.7 | 10-Jun | 38.4 | **2** | 12.5 |
| **MT1547** | 102.9 | | | | 61.4 | 160.1 | 9-Jun | 36.3 | **6** | 13.5 |
| **MT1563** | 96.5 | | | | 59.5 | 162.8 | 12-Jun | 39.9 | 19 | 12.8 |
| **MT1564** | **118.6** | | | | **63.1** | 157.8 | 7-Jun | 39.1 | **3** | 12.7 |
| **MT1565** | 85.0 | | | | 59.6 | 158.7 | 8-Jun | 35.5 | **14** | 13.3 |
| **MTCL1131** | 99.3 | 95.1 | **91.8** | **95.6** | 60.3 | 162.6 | 12-Jun | 39.6 | 21 | 12.6 |
| **MTF1432**[2/] | 107.5 | | | | 58.9 | 166.0 | 15-Jun | 43.7 | **14** | 12.7 |
| **MTF1435** | 100.8 | | | | 61.6 | 163.1 | 12-Jun | 45.6 | 24 | 12.8 |
| **MTF1559** | 102.5 | | | | 56.7 | 167.4 | 16-Jun | 43.0 | **15** | 12.7 |
| **MTS1573 (HWW)** | 98.3 | | | | 61.9 | 158.9 | 9-Jun | 40.0 | **12** | 12.5 |
| **MTS1588** | 91.2 | | | | 60.5 | 161.4 | 10-Jun | 34.3 | **9** | 13.7 |
| **MTW1491 (HWW)** | **115.6** | **111.9** | | | **62.5** | 162.5 | 12-Jun | 39.7 | **11** | 12.3 |
| **Northern +** | 90.4 | 87.3 | 85.9 | 88.8 | 58.6 | 162.4 | 11-Jun | 37.3 | **14** | 13.4 |
| **PSB13NEDH-7-140 (P)** | 90.3 | | | | 61.6 | 159.4 | 8-Jun | 39.6 | 24 | 13.3 |
| **PSB13NEDH-7-45 (P)** | 65.0 | | | | 55.0 | 158.3 | 7-Jun | 36.9 | 66 | 13.9 |
| **SY Clearstone 2CL (P)+** | 98.9 | 94.5 | **90.5** | **94.5** | 58.5 | 160.9 | 10-Jun | 38.9 | 18 | 12.3 |
| **SY Monument (P)+** | 99.2 | 96.1 | **92.7** | | 57.9 | 158.7 | 8-Jun | 35.3 | **7** | 12.5 |
| **SY Sunrise (P)+** | 97.1 | 94.7 | **95.3** | | 61.7 | 157.2 | 6-Jun | 33.7 | 21 | 12.7 |
| **SY Wolf (P)+** | 77.5 | 79.2 | 80.5 | 86.0 | 58.4 | 159.0 | 8-Jun | 35.7 | 35 | 13.2 |
| **Warhorse +** | 93.4 | 85.5 | 80.2 | 83.1 | 60.3 | 162.6 | 12-Jun | 36.2 | **4** | 13.6 |
| **WB4483 (P)++** | 53.3 | 52.4 | | | 56.0 | 162.6 | 12-Jun | 34.0 | 66 | 14.7 |
| **WB4575 (P)++** | 24.2 | 33.6 | | | 55.2 | 160.6 | 10-Jun | 31.9 | 91 | 15.1 |
| **WB4614 (P)+** | 60.5 | 63.9 | 63.2 | 71.9 | 60.1 | 159.8 | 9-Jun | 35.0 | 35 | 13.6 |
| **WB4623CLP (P)+** | 101.1 | **99.8** | **90.7** | | **63.0** | 159.0 | 8-Jun | 37.5 | **7** | 13.2 |
| **WB-Quake (P)+** | 82.8 | 80.1 | 75.0 | 79.4 | 60.6 | 163.0 | 12-Jun | 38.0 | 19 | 12.9 |
| **Yellowstone +** [1/] | - | - | - | - | - | | | | | |
| **Average** | **89.3** | **84.0** | **81.1** | **83.7** | **59.7** | **160.2** | **9-Jun** | **37.5** | **27.2** | **13.1** |
| **LSD (0.05)** | **10.2** | **14.6** | **11.2** | **11.9** | **1.0** | **1.1** | | **2.1** | **13.2** | |
| **C.V.** | **6.9** | **8.4** | **8.4** | **9.9** | **0.9** | **0.4** | | **3.5** | **29** | |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017

2/ = approved for release in 2018, name pending

**Table 5. HARD WINTER : District 3-- Huntley - Dryland**

| Cultivar/Line | *** Test not planted in 2015 *** | | | 2017 Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grain Yield (bushels/acre) | | | Test weight | Heading Date | | Plant height | Stripe rust | Protein |
| | | | | | Ordinal | Calendar | | | |
| | | | | lb/bu | from Jan1 | | in | % | % |
| 07CL039-7,SY 517CL2 (P)++) | 103.7 | | | **64.5** | 143.3 | May 22 | 40.4 | 9 | 12.8 |
| **Bearpaw +** | 82.3 | 88.7 | 87.9 | 60.4 | 153.0 | Jun 1 | 41.2 | 96 | **14.4** |
| **Brawl CL Plus +** | 115.8 | **112.3** | | **64.5** | 143.3 | May 22 | 43.1 | 61 | 13.3 |
| **BZ9W09-2216 (P)** | 78.0 | | | 59.8 | 155.0 | Jun 3 | 38.3 | 100 | 12.4 |
| **BZ9WM09-1620 (P)** | 110.1 | | | 63.1 | 152.7 | May 31 | 43.2 | 9 | 13.5 |
| **CO13003C** | 125.3 | | | 62.0 | 148.3 | May 27 | 44.2 | 68 | 11.7 |
| **Decade +** | 100.9 | 99.3 | 94.7 | 62.1 | 153.3 | Jun 1 | 42.3 | 77 | 13.2 |
| **Denali +** | 119.4 | | | **63.9** | 149.7 | May 28 | 43.7 | 99 | 11.8 |
| **Judee +** | 115.4 | 108.6 | 98.8 | 63.1 | 153.0 | Jun 1 | 42.3 | **0** | 13.9 |
| **Keldin (P)+** | **135.1** | **124.4** | **116.5** | **63.8** | 152.3 | May 31 | 40.9 | 21 | 12.4 |
| **Langin ++** | **128.8** | | | 62.5 | 143.7 | May 22 | 40.7 | 12 | 11.3 |
| **LCS Chrome (P)++** | 122.3 | | | 63.0 | 149.0 | May 28 | 43.0 | **0** | 13.3 |
| **LCS Jet (P)+** | **140.3** | | | 61.7 | 150.3 | May 29 | 38.9 | **1** | 13.8 |
| **Loma ++** | 111.3 | **110.9** | **105.4** | 61.4 | 156.7 | Jun 4 | 39.0 | **1** | 12.9 |
| **Long Branch (P)++** | 127.7 | | | 62.6 | 147.0 | May 26 | 44.6 | 5 | 12.2 |
| **MT1265** | 113.5 | **113.2** | **108.0** | 61.4 | 154.7 | Jun 2 | 43.5 | **1** | 13.9 |
| **MT1348** | 126.0 | **117.2** | | 62.9 | 152.3 | May 31 | 42.7 | **3** | 12.8 |
| **MT1444** | 117.4 | **115.7** | | 61.9 | 153.7 | Jun 1 | 42.3 | 6 | 13.6 |
| **MT1465**[2/] | 116.4 | **114.2** | | 62.9 | 153.7 | Jun 1 | 39.6 | **1** | 13.3 |
| **MT1471** | 119.8 | **109.9** | | 62.4 | 154.7 | Jun 2 | 43.0 | **3** | **14.6** |
| **MT1488** | 106.8 | 106.9 | | 62.0 | 155.0 | Jun 3 | 41.3 | **2** | 13.3 |
| **MT1507** | 123.3 | | | 62.5 | 153.0 | Jun 1 | 42.0 | **2** | 13.1 |
| **MT1540** | 110.8 | | | 62.7 | 154.0 | Jun 2 | 40.3 | **4** | 13.2 |
| **MT1542** | 114.6 | | | 61.9 | 154.0 | Jun 2 | 40.8 | **1** | 12.9 |
| **MT1547** | 113.8 | | | 62.5 | 153.3 | Jun 1 | 40.7 | **2** | 13.7 |
| **MT1563** | 113.5 | | | 61.8 | 154.3 | Jun 2 | 43.0 | 5 | 13.8 |
| **MT1564** | **131.8** | | | 63.1 | 147.0 | May 26 | 44.8 | **3** | 12.8 |
| **MT1565** | 116.0 | | | 61.7 | 152.7 | May 31 | 38.3 | **2** | **14.2** |
| **MTCL1131** | **128.7** | **120.9** | **112.4** | 62.5 | 155.0 | Jun 3 | 45.0 | 6 | 13.2 |
| **MTF1432**[2/] | 113.2 | | | 60.3 | 156.3 | Jun 4 | 48.2 | 7 | 13.5 |
| **MTF1435** | 95.5 | | | 62.2 | 155.3 | Jun 3 | 52.5 | **4** | 13.4 |
| **MTF1559** | 106.4 | | | 58.0 | 159.0 | Jun 7 | 47.3 | **1** | 13.8 |
| **MTS1573 (HWW)** | 116.2 | | | 62.9 | 152.0 | May 31 | 41.6 | 10 | **14.1** |
| **MTS1588** | 109.9 | | | 62.3 | 153.0 | Jun 1 | 37.3 | **1** | 14.0 |
| **MTW1491 (HWW)** | 125.8 | **120.3** | | 62.9 | 154.3 | Jun 2 | 44.7 | **3** | 13.3 |
| **Northern +** | 113.1 | **115.3** | **109.9** | 61.4 | 155.3 | Jun 3 | 40.6 | **1** | 13.5 |
| **PSB13NEDH-7-140 (P)** | 115.3 | | | **64.0** | 152.7 | May 31 | 43.4 | 6 | 13.8 |
| **PSB13NEDH-7-45 (P)** | 115.0 | | | 61.7 | 150.0 | May 29 | 42.9 | 25 | 13.1 |
| **SY Clearstone 2CL (P)+** | 119.4 | **116.0** | **110.9** | 61.5 | 154.7 | Jun 2 | 46.1 | 14 | 13.8 |
| **SY Monument (P)+** | **129.9** | **121.7** | | 62.8 | 149.3 | May 28 | 42.5 | **0** | 12.4 |
| **SY Sunrise (P)+** | 119.2 | **112.8** | | **64.2** | 149.0 | May 28 | 38.3 | **0** | 12.4 |
| **SY Wolf (P)+** | 122.8 | **120.4** | **113.3** | **64.0** | 149.3 | May 28 | 42.8 | 7 | 13.1 |
| **Warhorse +** | 110.5 | 106.2 | 102.3 | 63.0 | 154.3 | Jun 2 | 40.6 | 6 | 13.7 |
| **WB4483 (P)++** | 101.5 | 104.5 | | 60.6 | 155.3 | Jun 3 | 39.8 | 73 | 13.7 |
| **WB4575 (P)++** | 74.5 | 86.1 | | 60.9 | 153.0 | Jun 1 | 36.8 | 100 | **14.1** |
| **WB4614 (P)+** | 116.4 | **112.4** | 98.2 | 62.3 | 152.7 | May 31 | 38.8 | 7 | 12.7 |
| **WB4623CLP (P)+** | 115.1 | 108.8 | | 63.3 | 152.0 | May 31 | 42.1 | **2** | **14.8** |
| **WB-Quake (P)+** | 100.2 | 97.8 | 93.5 | 62.2 | 154.7 | Jun 2 | 41.1 | 5 | 13.8 |
| **Yellowstone +** [1/] | - | - | - | | | | | | |
| **Average** | **114.4** | **110.6** | **104.0** | **62.3** | **152.3** | **1-Jun** | **42.1** | **13.3** | **13.3** |
| **LSD (0.05)** | **11.9** | **14.9** | **12.1** | **1.0** | **1.3** | | **1.7** | **4.4** | **0.7** |
| **C.V.** | **6.4** | **6.5** | **6.9** | **1.0** | **0.5** | | **2.4** | **35.0** | **3.4** |

**bold** = indicates highest value within a column 1/ = Yellowstone misplanted as Warhorse in 2017

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

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending 2/ = approved for release in 2018, name pending

(HWW) = Hard White Winter Wheat

**Table 6. HARD WINTER : District 4-- Moccasin - Dryland**

| Cultivar/Line | Grain Yield (bushels/acre) | | | | 2017 Data: Test weight | Heading Date | | Plant height | Protein |
|---|---|---|---|---|---|---|---|---|---|
| | 2017 | 2016-17 | 2015-17 | 2014-17 | | Ordinal | Calendar | | |
| | | 2 yr | 3 yr | 4 yr | lb/bu | from Jan1 | | in | % |
| **07CL039-7,SY 517CL2 (P)++** | 62.1 | | | | 58.5 | 152.6 | 2-Jun | 24.2 | 12.7 |
| **Bearpaw +** | 58.9 | 57.0 | 57.3 | 55.4 | 59.0 | 155.7 | 5-Jun | 27.8 | 13.4 |
| **Brawl CL Plus +** | **65.8** | **62.4** | 58.3 | | **62.0** | 153.0 | 2-Jun | 25.6 | 12.6 |
| **BZ9W09-2216 (P)** | 52.5 | | | | **60.2** | 160.5 | 10-Jun | 27.4 | 12.5 |
| **BZ9WM09-1620 (P)** | 55.5 | | | | 57.7 | 157.0 | 6-Jun | 28.9 | 13.5 |
| **CO13003C** | **62.9** | | | | 56.0 | 154.2 | 2-Jun | 28.1 | 12.0 |
| **Decade +** | 59.0 | 57.0 | 56.4 | 56.7 | 58.4 | 155.6 | 5-Jun | 26.4 | 13.7 |
| **Denali +** | **64.7** | | | | 58.4 | 157.0 | 6-Jun | 27.7 | 12.0 |
| **Judee +** | 60.2 | 54.5 | 50.3 | 50.3 | 59.1 | 157.9 | 7-Jun | 27.6 | **14.0** |
| **Keldin (P)+** | **69.1** | **68.8** | **66.4** | **63.9** | 58.3 | 160.9 | 10-Jun | 28.6 | 13.4 |
| **Langin ++** | **66.5** | | | | 58.1 | 153.1 | 2-Jun | 23.3 | 11.4 |
| **LCS Chrome (P)++** | **65.6** | | | | 58.8 | 154.2 | 3-Jun | 27.3 | 13.1 |
| **LCS Jet (P)+** | **65.5** | | | | 54.4 | 161.9 | 11-Jun | 27.2 | 13.0 |
| **Loma ++** | 58.5 | 58.4 | 57.0 | 57.2 | 58.0 | 160.5 | 10-Jun | 25.0 | 13.6 |
| **Long Branch (P)++** | **62.9** | | | | 59.0 | 153.3 | 2-Jun | 25.8 | 12.6 |
| **MT1265** | **65.6** | **65.8** | **62.8** | **62.4** | 56.4 | 159.4 | 8-Jun | 31.4 | 13.8 |
| **MT1348** | **64.3** | **65.1** | **63.2** | | 58.4 | 154.9 | 4-Jun | 26.3 | 13.1 |
| **MT1444** | **65.6** | **66.2** | | | 58.4 | 157.9 | 7-Jun | 28.5 | **13.9** |
| **MT1465**[2/] | 59.4 | **65.6** | | | 58.2 | 158.2 | 7-Jun | 27.0 | 13.6 |
| **MT1471** | **72.5** | **65.7** | | | 58.5 | 158.0 | 7-Jun | 28.9 | **14.0** |
| **MT1488** | 53.5 | 57.4 | | | 57.4 | 159.1 | 8-Jun | 27.0 | 13.6 |
| **MT1507** | **65.7** | | | | 58.9 | 158.1 | 7-Jun | 28.0 | 12.9 |
| **MT1540** | 60.3 | | | | 58.8 | 156.3 | 5-Jun | 28.1 | 13.1 |
| **MT1542** | 59.5 | | | | 56.6 | 156.9 | 6-Jun | 28.3 | 13.3 |
| **MT1547** | **68.0** | | | | 58.1 | 158.0 | 7-Jun | 28.4 | 13.4 |
| **MT1563** | **66.6** | | | | 59.1 | 159.6 | 9-Jun | 30.2 | 13.7 |
| **MT1564** | **69.3** | | | | 58.3 | 154.5 | 5-Jun | 27.4 | 13.1 |
| **MT1565** | 61.9 | | | | 57.4 | 154.2 | 3-Jun | 25.8 | 13.7 |
| **MTCL1131** | **68.8** | **66.1** | **64.9** | **64.9** | 58.5 | 159.2 | 8-Jun | 32.3 | 13.3 |
| **MTF1432**[2/] | 61.4 | | | | 56.4 | 166.2 | 15-Jun | 31.0 | 13.7 |
| **MTF1435** | **70.7** | | | | 57.9 | 161.4 | 10-Jun | 37.6 | 13.3 |
| **MTF1559** | 59.7 | | | | 54.4 | 169.8 | 19-Jun | 35.4 | **14.2** |
| **MTS1573 (HWW)** | 60.4 | | | | **59.5** | 155.7 | 5-Jun | 27.3 | 13.1 |
| **MTS1588** | 60.7 | | | | 59.2 | 159.7 | 9-Jun | 25.8 | 13.1 |
| **MTW1491 (HWW)** | **66.9** | **66.0** | | | 58.6 | 158.4 | 7-Jun | 28.7 | 13.1 |
| **Northern +** | 60.4 | 58.9 | 60.7 | **60.0** | 57.3 | 161.1 | 10-Jun | 25.6 | **14.4** |
| **PSB13NEDH-7-140 (P)** | **67.1** | | | | 59.0 | 157.8 | 7-Jun | 28.0 | 13.6 |
| **PSB13NEDH-7-45 (P)** | **68.0** | | | | 56.8 | 154.1 | 3-Jun | 27.4 | 13.0 |
| **SY Clearstone 2CL (P)+** | **63.6** | **64.6** | **62.0** | **61.9** | 58.1 | 158.9 | 8-Jun | 30.4 | 13.3 |
| **SY Monument (P)+** | **70.0** | **66.5** | **64.2** | | 57.6 | 156.9 | 6-Jun | 26.5 | 11.9 |
| **SY Sunrise (P)+** | **63.1** | **62.2** | 60.0 | | **60.7** | 154.4 | 3-Jun | 25.3 | 13.2 |
| **SY Wolf (P)+** | 59.2 | **61.3** | 58.3 | 58.6 | **60.1** | 155.9 | 5-Jun | 26.6 | 12.6 |
| **Warhorse +** | **63.4** | **63.5** | 59.6 | 57.7 | 57.2 | 158.7 | 8-Jun | 27.3 | 13.6 |
| **WB4483 (P)++** | 57.2 | 55.8 | | | 55.3 | 159.1 | 8-Jun | 26.6 | **13.9** |
| **WB4575 (P)++** | 54.7 | 58.1 | | | **60.5** | 157.7 | 7-Jun | 26.0 | 13.1 |
| **WB4614 (P)+** | 60.8 | 57.3 | 57.3 | 57.2 | 56.5 | 156.5 | 6-Jun | 26.1 | 13.5 |
| **WB4623CLP (P)+** | 54.7 | 54.7 | 52.4 | | **59.5** | 158.0 | 7-Jun | 25.3 | **13.9** |
| **WB-Quake (P)+** | 53.2 | 53.9 | 51.4 | 50.8 | 57.4 | 161.7 | 11-Jun | 29.3 | **14.0** |
| **Yellowstone +** [1/] | - | - | - | - | | | | | |
| **Average** | **62.5** | **61.3** | **59.0** | **58.2** | **58.1** | **157.8** | **7-Jun** | **27.8** | **13.3** |
| **LSD (0.05)** | **10.2** | **8.4** | **5.6** | **5.0** | **2.6** | **3.0** | | **3.0** | **0.5** |
| **C.V.** | **9.3** | **6.6** | **5.7** | **6.0** | **2.7** | **1.1** | | **6.1** | **2.0** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017

2/ = approved for release in 2018, name pending

**Table 7. HARD WINTER : District 5-- Conrad - Dryland**

| Cultivar/Line | Grain Yield (bushels/acre) | | | | 2017 Data | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Test | Heading Date | | Plant | Protein |
| | 2017 | 2016-17 | 2015-17 | 2014-17 | weight | Ordinal | Calendar | height | |
| | | 2 yr | 3 yr | 4 yr | lb/bu | from Jan1 | | in | % |
| **07CL039-7,SY 517CL2 (P)++** | 76.4 | | | | **63.2** | 152.4 | 1-Jun | 28.4 | 12.5 |
| **Bearpaw +** | 72.8 | 84.1 | 78.4 | 83.4 | 60.5 | 156.9 | 6-Jun | 29.0 | 13.4 |
| **Brawl CL Plus +** | 80.4 | 86.8 | **86.4** | | **63.6** | 152.4 | 1-Jun | 28.8 | 12.5 |
| **BZ9W09-2216 (P)** | 68.5 | | | | **62.8** | 158.4 | 7-Jun | 30.2 | 12.9 |
| **BZ9WM09-1620 (P)** | 69.7 | | | | 61.5 | 156.4 | 5-Jun | 31.8 | 12.3 |
| **CO13003C** | **83.3** | | | | 60.8 | 154.4 | 3-Jun | 31.2 | 12.0 |
| **Decade +** | 67.3 | 81.5 | 78.6 | 86.4 | 62.0 | 156.6 | 6-Jun | 29.8 | 13.0 |
| **Denali +** | **85.1** | | | | 62.1 | 155.2 | 4-Jun | 29.1 | 12.5 |
| **Judee +** | 73.5 | 81.5 | 75.4 | 80.9 | 61.9 | 156.8 | 6-Jun | 29.2 | 13.5 |
| **Keldin (P)+** | 80.1 | 94.8 | **93.1** | **98.7** | **62.3** | 156.7 | 6-Jun | 29.2 | 13.1 |
| **Langin ++** | **86.8** | | | | 61.6 | 153.2 | 2-Jun | 28.0 | 11.3 |
| **LCS Chrome (P)++** | 75.9 | | | | 61.7 | 155.9 | 5-Jun | 31.2 | 13.2 |
| **LCS Jet (P)+** | **85.0** | | | | 58.1 | 157.6 | 7-Jun | 25.9 | 12.5 |
| **Loma ++** | 72.7 | 84.4 | 83.2 | 89.3 | 60.5 | 158.0 | 7-Jun | 28.6 | 13.5 |
| **Long Branch (P)++** | **91.9** | | | | **62.4** | 152.5 | 2-Jun | 29.2 | 11.9 |
| **MT1265** | 77.5 | 88.6 | **85.9** | **94.3** | 60.3 | 158.4 | 7-Jun | 32.1 | 13.1 |
| **MT1348** | 78.5 | 89.9 | **89.9** | | 60.5 | 156.0 | 5-Jun | 28.7 | 13.0 |
| **MT1444** | 71.0 | 88.2 | | | 60.1 | 157.7 | 7-Jun | 31.1 | 13.3 |
| **MT1465**[2/] | 71.3 | 87.8 | | | 60.8 | 157.1 | 6-Jun | 28.4 | 13.0 |
| **MT1471** | 69.9 | 86.6 | | | 59.4 | 157.9 | 7-Jun | 30.6 | **14.4** |
| **MT1488** | 54.8 | 77.5 | | | 57.5 | 159.1 | 8-Jun | 29.7 | 13.4 |
| **MT1507** | 74.0 | | | | 61.0 | 157.2 | 6-Jun | 32.4 | 12.9 |
| **MT1540** | 71.8 | | | | 60.7 | 156.3 | 5-Jun | 30.4 | 13.3 |
| **MT1542** | 77.6 | | | | 59.4 | 157.6 | 7-Jun | 31.6 | 12.8 |
| **MT1547** | 69.4 | | | | 60.5 | 157.0 | 6-Jun | 30.7 | 13.3 |
| **MT1563** | 75.6 | | | | 59.8 | 158.0 | 7-Jun | 31.8 | 12.9 |
| **MT1564** | 72.9 | | | | 61.5 | 154.3 | 3-Jun | 28.4 | 12.4 |
| **MT1565** | 69.0 | | | | 60.7 | 155.4 | 4-Jun | 28.5 | 13.8 |
| **MTCL1131** | 69.8 | 86.6 | **87.4** | **94.0** | 60.0 | 158.3 | 7-Jun | 32.6 | 13.0 |
| **MTF1432**[2/] | 69.3 | | | | 57.3 | 159.9 | 9-Jun | 36.1 | 13.0 |
| **MTF1435** | 67.2 | | | | 60.4 | 159.3 | 8-Jun | 35.9 | 12.8 |
| **MTF1559** | 66.7 | | | | 56.2 | 161.4 | 10-Jun | 35.4 | 12.9 |
| **MTS1573 (HWW)** | 72.9 | | | | 61.5 | 155.9 | 5-Jun | 29.9 | 13.2 |
| **MTS1588** | 79.5 | | | | 60.8 | 158.3 | 7-Jun | 29.0 | 13.8 |
| **MTW1491 (HWW)** | 70.8 | 86.1 | | | 60.3 | 157.6 | 7-Jun | 29.9 | 12.8 |
| **Northern +** | 74.2 | 88.9 | **88.5** | **95.1** | 60.1 | 158.4 | 7-Jun | 31.3 | 13.0 |
| **PSB13NEDH-7-140 (P)** | 71.9 | | | | 62.1 | 155.5 | 5-Jun | 31.5 | 13.3 |
| **PSB13NEDH-7-45 (P)** | 74.2 | | | | 60.0 | 154.7 | 4-Jun | 29.2 | 12.8 |
| **SY Clearstone 2CL (P)+** | **80.9** | 89.3 | **87.2** | **92.6** | 60.2 | 158.0 | 7-Jun | 34.4 | 13.2 |
| **SY Monument (P)+** | 79.0 | 95.1 | **91.4** | | 59.7 | 156.1 | 5-Jun | 29.3 | 12.1 |
| **SY Sunrise (P)+** | 76.7 | 83.7 | 83.2 | | **62.9** | 154.5 | 4-Jun | 25.5 | 12.6 |
| **SY Wolf (P)+** | 79.6 | 94.6 | **93.3** | **97.9** | 61.7 | 156.0 | 5-Jun | 29.6 | 13.1 |
| **Warhorse +** | 66.0 | 75.3 | 69.6 | 75.2 | 59.2 | 157.3 | 6-Jun | 27.7 | 13.4 |
| **WB4483 (P)++** | 67.6 | 85.0 | | | 61.3 | 158.7 | 8-Jun | 29.5 | **14.5** |
| **WB4575 (P)++** | 74.6 | 85.8 | | | 61.8 | 156.1 | 5-Jun | 29.0 | 13.5 |
| **WB4614 (P)+** | 73.7 | 90.6 | **85.5** | 89.2 | **62.4** | 156.4 | 5-Jun | 27.7 | 13.1 |
| **WB4623CLP (P)+** | 68.0 | 82.3 | 77.2 | | 60.4 | 157.2 | 6-Jun | 29.5 | 13.4 |
| **WB-Quake (P)+** | 63.5 | 75.7 | 68.6 | 75.7 | **62.5** | 158.9 | 8-Jun | 30.4 | 13.4 |
| **Yellowstone +** [1/] | - | - | - | - | | | | | |
| **Average** | **73.7** | **86.0** | **83.5** | **88.7** | **60.8** | **156.8** | **6-Jun** | **30.1** | **13.0** |
| **LSD (0.05)** | **10.3** | **ns** | **9.0** | **7.2** | **1.5** | **1.0** | | **2.2** | **0.6** |
| **C.V.** | **8.1** | **6.4** | **6.5** | **5.7** | **1.4** | **0.4** | | **4.3** | **2.7** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017

2/ = approved for release in 2018, name pending

**Table 8. HARD WINTER : District 5-- Havre - Dryland**

| Cultivar/Line | Grain Yield (bushels/acre) | | | | 2017 Data | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Test | Heading Date | | Plant | Protein |
| | 2017 | 2016-17 | 2015-17 | 2014-17 | weight | Ordinal | Calendar | height | |
| | | 2 yr | 3 yr | 4 yr | lb/bu | from Jan1 | | in | % |
| **07CL039-7,SY 517CL2 (P)++)** | 35.7 | | | | **62.9** | 146.2 | 25-May | 25.0 | 14.3 |
| **Bearpaw +** | 42.9 | 53.5 | 55.7 | 55.1 | 61.5 | 150.8 | 30-May | 21.3 | **14.7** |
| **Brawl CL Plus +** | 43.6 | 66.7 | 61.9 | | **62.7** | 146.4 | 25-May | 27.7 | 14.1 |
| **BZ9W09-2216 (P)** | 50.1 | | | | 62.5 | 152.0 | 1-Jun | 22.7 | 14.0 |
| **BZ9WM09-1620 (P)** | 44.9 | | | | **63.2** | 153.4 | 2-Jun | 27.1 | 13.5 |
| **CO13003C** | 52.4 | | | | 61.3 | 149.0 | 28-May | 25.1 | 13.7 |
| **Decade +** | 48.3 | 64.5 | 62.8 | 61.1 | 61.8 | 151.4 | 30-May | 25.1 | 14.4 |
| **Denali +** | 53.0 | | | | **62.9** | 149.5 | 28-May | 25.7 | 13.3 |
| **Judee +** | 49.5 | 67.4 | 65.1 | **64.1** | **62.9** | 151.2 | 30-May | 26.2 | 14.3 |
| **Keldin (P)+** | **56.7** | **82.3** | **75.3** | **70.9** | 62.2 | 151.8 | 31-May | 27.1 | 12.9 |
| **Langin ++** | 49.2 | | | | 61.9 | 146.2 | 25-May | 23.0 | 13.1 |
| **LCS Chrome (P)++** | 47.5 | | | | 61.6 | 149.0 | 28-May | 26.3 | 14.2 |
| **LCS Jet (P)+** | 48.3 | | | | 60.3 | 155.2 | 4-Jun | 20.2 | 13.0 |
| **Loma ++** | 48.7 | 64.8 | 61.7 | 59.0 | 62.1 | 154.3 | 3-Jun | 22.2 | 14.1 |
| **Long Branch (P)++** | 50.5 | | | | 60.3 | 147.1 | 6-Jun | 25.8 | 13.2 |
| **MT1265** | **54.9** | **81.0** | **73.4** | **69.8** | 62.6 | 153.3 | 2-Jun | 27.5 | 14.4 |
| **MT1348** | 52.9 | **81.6** | **76.8** | | 62.3 | 150.4 | 29-May | 26.4 | 13.3 |
| **MT1444** | 54.5 | **77.4** | | | 62.7 | 152.2 | 1-Jun | 26.8 | 13.7 |
| **MT1465**[2/] | 50.4 | **74.6** | | | 62.5 | 150.4 | 29-May | 25.0 | 14.4 |
| **MT1471** | 50.4 | **73.2** | | | 62.1 | 152.4 | 1-Jun | 25.3 | **14.9** |
| **MT1488** | 50.2 | **74.0** | | | 62.4 | 152.9 | 2-Jun | 23.3 | **14.6** |
| **MT1507** | 52.4 | | | | **62.8** | 151.3 | 30-May | 26.5 | 13.7 |
| **MT1540** | 48.0 | | | | 62.6 | 151.8 | 31-May | 26.7 | **14.9** |
| **MT1542** | 52.6 | | | | 62.4 | 152.9 | 1-Jun | 24.6 | 13.9 |
| **MT1547** | 49.9 | | | | 62.4 | 151.3 | 30-May | 25.9 | 14.4 |
| **MT1563** | **59.3** | | | | **62.8** | 152.6 | 2-Jun | 27.5 | 13.6 |
| **MT1564** | 51.5 | | | | 62.4 | 147.6 | 27-May | 28.6 | 13.7 |
| **MT1565** | 52.7 | | | | 61.1 | 150.3 | 29-May | 23.4 | **14.6** |
| **MTCL1131** | 50.9 | **74.1** | **68.6** | **65.8** | 62.4 | 153.5 | 3-Jun | 26.2 | 14.3 |
| **MTF1432**[2/] | 52.3 | | | | 61.7 | 155.0 | 4-Jun | 28.1 | 13.3 |
| **MTF1435** | 44.9 | | | | 62.4 | 153.8 | 3-Jun | 32.2 | 13.9 |
| **MTF1559** | 50.2 | | | | 60.7 | 156.6 | 6-Jun | 25.8 | 14.2 |
| **MTS1573 (HWW)** | 51.7 | | | | 62.1 | 150.3 | 29-May | 24.8 | 13.5 |
| **MTS1588** | **56.1** | | | | 62.3 | 153.3 | 2-Jun | 23.4 | 14.1 |
| **MTW1491 (HWW)** | **60.0** | **85.2** | | | **62.9** | 152.8 | 2-Jun | 27.4 | 13.5 |
| **Northern +** | 52.0 | **77.9** | **72.3** | **69.8** | 62.2 | 153.8 | 3-Jun | 22.9 | **14.5** |
| **PSB13NEDH-7-140 (P)** | 53.7 | | | | **62.7** | 150.0 | 29-May | 27.7 | 14.4 |
| **PSB13NEDH-7-45 (P)** | 48.2 | | | | 59.8 | 148.3 | 27-May | 25.7 | 14.4 |
| **SY Clearstone 2CL (P)+** | 47.8 | **73.1** | **68.1** | **65.7** | 62.1 | 152.3 | 1-Jun | 26.4 | **14.6** |
| **SY Monument (P)+** | 53.0 | **78.2** | **74.1** | | 61.4 | 149.8 | 29-May | 25.8 | 12.8 |
| **SY Sunrise (P)+** | 52.5 | **72.7** | **69.8** | | 62.2 | 149.4 | 28-May | 22.4 | 13.5 |
| **SY Wolf (P)+** | 53.8 | **75.8** | **70.5** | **70.6** | **63.1** | 149.9 | 29-May | 25.2 | 13.7 |
| **Warhorse +** | 44.0 | 66.9 | 64.7 | 60.5 | 62.1 | 152.9 | 2-Jun | 23.6 | **15.0** |
| **WB4483 (P)++** | 51.3 | 69.5 | | | 62.4 | 152.8 | 2-Jun | 22.5 | 14.3 |
| **WB4575 (P)++** | 51.0 | 63.4 | | | **62.8** | 150.6 | 30-May | 24.2 | **14.9** |
| **WB4614 (P)+** | 51.2 | **74.4** | **69.5** | **66.9** | 62.0 | 152.0 | 1-Jun | 24.0 | 13.9 |
| **WB4623CLP (P)+** | 43.7 | 64.3 | 61.2 | | 61.9 | 150.9 | 30-May | 23.1 | 13.7 |
| **WB-Quake (P)+** | 42.8 | 65.1 | 62.4 | 58.5 | 62.6 | 153.5 | 3-Jun | 23.1 | 14.3 |
| **Yellowstone +** [1/] | - | - | - | - | | | | | |
| **Average** | **50.1** | **72.0** | **67.4** | **64.4** | **62.1** | **151.4** | **30-May** | **25.2** | **14.0** |
| **LSD (0.05)** | **5.2** | **12.8** | **9.8** | **8.6** | **0.5** | **1.1** | | **2.8** | **0.6** |
| **C.V.** | **6.0** | **8.6** | **8.7** | **9.4** | **0.5** | **0.4** | | **6.8** | **2.4** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017

2/ = approved for release in 2018, name pending

**Table 9. HARD WINTER : District 5-- Carter/Ft. Benton (Northern Seeds) - Dryland**

| Cultivar/Line | *** Test not planted 2014-2015 *** | | 2017 Data | | |
|---|---|---|---|---|---|
| | Grain Yield (bushels/acre) | | Test | Sawfly | Protein |
| | 2017 | 2016-17 | weight | cutting | |
| | | 2 yr | lb/bu | % | % |
| **07CL039-7,SY 517CL2 (P)++)** | 59.2 | | **59.8** | 28 | 12.8 |
| **Bearpaw +** | 46.2 | 55.3 | 57.2 | **18** | 12.3 |
| **Brawl CL Plus +** | 47.9 | 61.1 | 57.2 | 62 | 13.0 |
| **BZ9W09-2216 (P)** | 53.9 | | **58.2** | **18** | 12.6 |
| **BZ9WM09-1620 (P)** | 48.6 | | 57.2 | 52 | 12.2 |
| **CO13003C** | 52.3 | | 57.1 | 72 | 12.0 |
| **Decade +** | 52.8 | 62.8 | **58.0** | 37 | 13.0 |
| **Denali +** | 47.8 | | 56.8 | 70 | 12.0 |
| **Judee +** | 54.3 | 58.5 | 55.7 | **22** | 13.0 |
| **Keldin (P)+** | 57.2 | 65.0 | 56.9 | 48 | 12.8 |
| **Langin ++** | 44.8 | | 57.0 | 92 | 12.2 |
| **LCS Chrome (P)++** | 41.6 | | 56.6 | 92 | 12.7 |
| **LCS Jet (P)+** | 55.8 | | 56.8 | 47 | 12.3 |
| **Loma ++** | 57.0 | 67.4 | **58.3** | 27 | 12.8 |
| **Long Branch (P)++** | 48.7 | | **57.9** | 72 | 11.5 |
| **MT1265** | 43.6 | 57.1 | 55.7 | 67 | 13.7 |
| **MT1348** | 45.3 | 56.3 | **58.1** | 85 | 13.0 |
| **MT1444** | 41.9 | 55.1 | 57.0 | 67 | 12.1 |
| **MT1465**[2/] | 52.7 | 61.3 | **57.6** | 68 | 12.8 |
| **MT1471** | 40.8 | 54.0 | 56.8 | 50 | 13.4 |
| **MT1488** | 39.2 | 53.1 | 56.8 | 43 | 12.6 |
| **MT1507** | 44.2 | | 56.5 | 68 | 12.8 |
| **MT1540** | 46.1 | | 57.0 | 88 | 12.8 |
| **MT1542** | 47.1 | | 57.0 | 60 | 12.4 |
| **MT1547** | 48.0 | | 55.1 | 83 | 13.2 |
| **MT1563** | 41.4 | | 53.5 | 72 | 12.6 |
| **MT1564** | 59.8 | | **57.4** | 47 | 12.7 |
| **MT1565** | 50.4 | | 55.4 | 73 | 13.3 |
| **MTCL1131** | 41.0 | 59.8 | 55.4 | 75 | 12.7 |
| **MTF1432**[2/] | 39.9 | | 56.7 | 60 | 12.8 |
| **MTF1435** | 40.1 | | 54.5 | 57 | 12.5 |
| **MTF1559** | 49.7 | | 56.5 | 50 | 12.9 |
| **MTS1573 (HWW)** | 61.0 | | **60.0** | **3** | 11.9 |
| **MTS1588** | 57.5 | | **58.1** | **2** | 12.5 |
| **MTW1491 (HWW)** | 52.5 | 62.2 | 54.8 | 63 | 13.2 |
| **Northern +** | 42.7 | 56.6 | 54.5 | 62 | 12.5 |
| **PSB13NEDH-7-140 (P)** | 54.2 | | **58.2** | 90 | 13.0 |
| **PSB13NEDH-7-45 (P)** | 46.8 | | **57.4** | 88 | 12.7 |
| **SY Clearstone 2CL (P)+** | 43.5 | 57.8 | 56.1 | 78 | 12.8 |
| **SY Monument (P)+** | 44.4 | 61.6 | 53.8 | 72 | 12.4 |
| **SY Sunrise (P)+** | 48.2 | 55.6 | 57.3 | 77 | 12.1 |
| **SY Wolf (P)+** | 46.5 | 58.2 | 53.6 | 43 | 12.9 |
| **Warhorse +** | 53.0 | 57.8 | 55.9 | **2** | 12.8 |
| **WB4483 (P)++** | 59.4 | 64.9 | **57.7** | 42 | 13.2 |
| **WB4575 (P)++** | 48.3 | 61.3 | **58.7** | 50 | 12.9 |
| **WB4614 (P)+** | 55.2 | 55.4 | 56.8 | 53 | 12.7 |
| **WB4623CLP (P)+** | 48.8 | 53.0 | 56.2 | 52 | 12.8 |
| **WB-Quake (P)+** | 49.5 | 56.8 | 56.2 | **7** | 13.4 |
| **Yellowstone +** [1/] | - | - | | | |
| **Average** | **48.9** | **58.7** | **56.6** | **54.2** | **12.7** |
| **LSD (0.05)** | **ns** | **ns** | **2.6** | **21.1** | |
| **C.V.** | **19.0** | **10.6** | **2.9** | **24.1** | |

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

1/ = Yellowstone misplanted as Warhorse in 2017

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

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

2/ = approved for release in 2018, name pending

**Table 10. HARD WINTER : District 6-- Sidney - Dryland**

| Cultivar/Line | 2014, 2015 = severe winter-kill, no harvest | | 2017 Data | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Grain Yield (bushels/acre) | | Test weight | Winter survival | Heading Date | | Plant height | Protein |
| | 2017 | 2016-17 | | | Ordinal | Calendar | | |
| | | 2 yr | lb/bu | % | from Jan1 | | in | % |
| **07CL039-7,SY 517CL2 (P)++)** | 25.8 | | **66.2** | 20.6 | 149.7 | 29-May | 19.1 | 10.3 |
| **Bearpaw +** | 35.5 | 39.4 | 64.5 | 35.5 | 152.6 | 1-Jun | 20.9 | 9.6 |
| **Brawl CL Plus +** | 28.6 | 51.6 | **65.2** | 27.2 | 150.2 | 29-May | 21.6 | 10.7 |
| **BZ9W09-2216 (P)** | **46.9** | | **65.6** | 34.5 | 152.9 | 2-Jun | 20.0 | 9.1 |
| **BZ9WM09-1620 (P)** | 20.3 | | 62.7 | 0.9 | 155.2 | 4-Jun | 21.7 | **11.6** |
| **CO13003C** | **42.1** | | 64.7 | 34.7 | 151.0 | 30-May | 20.6 | 7.1 |
| **Decade +** | **50.7** | 54.1 | 64.9 | **62.4** | 151.4 | 30-May | 21.6 | 8.7 |
| **Denali +** | **41.3** | | **65.1** | **48.2** | 152.2 | 1-Jun | 24.8 | 8.4 |
| **Judee +** | 13.7 | 33.7 | 64.1 | 23.7 | 155.5 | 4-Jun | 17.5 | **12.2** |
| **Keldin (P)+** | 29.9 | 54.4 | 64.6 | 29.3 | 153.8 | 3-Jun | 22.3 | 9.3 |
| **Langin ++** | 34.8 | | 64.1 | 36.1 | 149.1 | 28-May | 20.0 | 8.5 |
| **LCS Chrome (P)++** | **40.1** | | **65.3** | 41.0 | 151.7 | 31-May | 20.6 | 10.1 |
| **LCS Jet (P)+** | 32.0 | | 62.2 | 11.0 | 154.0 | 3-Jun | 18.7 | 9.1 |
| **Loma ++** | 36.5 | 41.7 | 62.9 | 39.3 | 155.8 | 5-Jun | 18.1 | 10.6 |
| **Long Branch (P)++** | 33.7 | | 64.9 | **50.1** | 149.8 | 29-May | 20.7 | 8.8 |
| **MT1265** | **44.5** | 60.9 | 64.0 | 45.3 | 153.7 | 3-Jun | 23.7 | 8.2 |
| **MT1348** | **42.3** | 55.8 | 64.5 | 46.8 | 152.2 | 1-Jun | 21.8 | 9.0 |
| **MT1444** | **41.4** | 57.2 | 64.4 | **48.0** | 153.1 | 2-Jun | 21.6 | 9.4 |
| **MT1465**[2/] | **41.1** | 50.6 | 64.8 | 45.8 | 152.2 | 1-Jun | 20.7 | 8.3 |
| **MT1471** | 30.0 | 52.0 | 64.9 | 35.0 | 153.5 | 3-Jun | 20.2 | 9.0 |
| **MT1488** | 38.3 | 42.7 | 63.3 | 43.6 | 155.2 | 4-Jun | 19.8 | 10.3 |
| **MT1507** | **52.6** | | 64.9 | 45.0 | 151.6 | 31-May | 24.3 | 7.9 |
| **MT1540** | **40.2** | | 64.8 | **55.4** | 153.2 | 2-Jun | 21.2 | 9.7 |
| **MT1542** | 38.7 | | 64.5 | 32.8 | 155.1 | 4-Jun | 19.2 | 8.5 |
| **MT1547** | **45.8** | | 64.8 | **49.8** | 152.3 | 1-Jun | 21.7 | 9.2 |
| **MT1563** | **43.6** | | 64.4 | **54.1** | 152.6 | 2-Jun | 23.5 | 9.0 |
| **MT1564** | 39.3 | | **66.1** | **48.5** | 150.4 | 29-May | 22.4 | 9.6 |
| **MT1565** | **42.4** | | 64.8 | **53.0** | 151.0 | 30-May | 22.9 | 9.4 |
| **MTCL1131** | **43.3** | 52.2 | 64.5 | 36.4 | 154.8 | 4-Jun | 23.1 | 9.0 |
| **MTF1432**[2/] | **43.5** | | 63.2 | 33.6 | 155.4 | 4-Jun | 24.2 | 9.1 |
| **MTF1435** | **42.4** | | 63.4 | 44.9 | 154.8 | 4-Jun | 26.0 | 8.6 |
| **MTF1559** | 36.7 | | 61.4 | 33.8 | 157.3 | 6-Jun | 23.3 | 9.3 |
| **MTS1573 (HWW)** | 30.6 | | 64.6 | 39.8 | 152.4 | 1-Jun | 20.6 | 9.3 |
| **MTS1588** | 37.8 | | 64.8 | 19.0 | 154.9 | 4-Jun | 19.7 | 9.3 |
| **MTW1491 (HWW)** | 37.1 | 51.7 | 64.7 | 44.6 | 154.6 | 4-Jun | 21.8 | 9.4 |
| **Northern +** | 36.7 | 47.7 | 64.3 | 36.7 | 155.3 | 4-Jun | 17.7 | 9.4 |
| **PSB13NEDH-7-140 (P)** | 38.2 | | **65.0** | **47.7** | 151.5 | 31-May | 24.0 | 10.2 |
| **PSB13NEDH-7-45 (P)** | **45.7** | | **65.8** | **54.5** | 150.8 | 30-May | 18.1 | 8.9 |
| **SY Clearstone 2CL (P)+** | **41.3** | 51.7 | 64.4 | 46.8 | 152.6 | 2-Jun | 22.0 | 8.4 |
| **SY Monument (P)+** | **45.0** | 57.6 | 63.6 | **48.6** | 152.0 | 1-Jun | 21.4 | 7.7 |
| **SY Sunrise (P)+** | **47.6** | 61.7 | **65.6** | **63.1** | 149.8 | 29-May | 18.4 | 9.4 |
| **SY Wolf (P)+** | 33.3 | 54.8 | **65.9** | 36.8 | 151.4 | 30-May | 19.5 | 9.4 |
| **Warhorse +** | 32.6 | 39.5 | 63.4 | **49.4** | 154.4 | 3-Jun | 19.3 | 10.4 |
| **WB4483 (P)++** | 34.7 | 46.0 | **65.7** | 42.2 | 154.6 | 4-Jun | 16.7 | 9.3 |
| **WB4575 (P)++** | **43.4** | 54.1 | **65.7** | **49.4** | 152.9 | 2-Jun | 23.0 | 10.2 |
| **WB4614 (P)+** | **41.7** | 58.2 | **65.4** | 33.5 | 153.1 | 2-Jun | 20.3 | 9.0 |
| **WB4623CLP (P)+** | 5.3 | 32.4 | 63.0 | 0.0 | 155.9 | 5-Jun | 20.1 | **12.7** |
| **WB-Quake (P)+** | 37.7 | 40.0 | 64.9 | 35.8 | 154.9 | 4-Jun | 21.0 | 9.4 |
| **Yellowstone +** [1/] | - | - | | | | | | |
| **Average** | **37.7** | **49.7** | **64.5** | **39.6** | **153.0** | **2-Jun** | **21.0** | **9.4** |
| **LSD (0.05)** | **13.2** | **ns** | **1.3** | **15.7** | **1.9** | | **3.0** | **1.6** |
| **C.V.** | **19.8** | **19.7** | **1.1** | **22.2** | **0.7** | | **8.2** | **9.9** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017

2/ = approved for release in 2018, name pending

**Table 11. HARD WINTER : District 6-- Williston, North Dakota - Dryland**

***** No harvest in 2014 and 2017 due to severe winterkill *****

| Cultivar/Line | Grain Yield (bushels/acre) | | | 2016 Data: Test weight | Heading Date | | Plant height | Protein |
|---|---|---|---|---|---|---|---|---|
| | 2016 | 2015-16 | | | Ordinal | Calendar | | |
| | 1y | 2y | | lb/bu | from Jan1 | | in | % |
| **07CL039-7,SY 517CL2 (P)++** | | | | | | | | |
| **Bearpaw +** | 45.4 | 44.2 | | 57.3 | 147.3 | 26-May | 21.8 | 11.6 |
| **Brawl CL Plus +** | 50.0 | 37.8 | | **59.8** | 145.7 | 25-May | 24.0 | 10.7 |
| **BZ9W09-2216 (P)** | | | | | | | | |
| **BZ9WM09-1620 (P)** | | | | | | | | |
| **CO13003C** | | | | | | | | |
| **Decade +** | 49.8 | 48.8 | | 58.3 | 147.7 | 27-May | 21.7 | 11.2 |
| **Denali +** | | | | | | | | |
| **Judee +** | 46.7 | 37.3 | | 59.4 | 148.0 | 27-May | 21.5 | 12.5 |
| **Keldin (P)+** | **54.9** | 41.5 | | **59.5** | 147.3 | 26-May | 21.3 | 11.3 |
| **Langin ++** | | | | | | | | |
| **LCS Chrome (P)++** | | | | | | | | |
| **LCS Jet (P)+** | | | | | | | | |
| **Loma ++** | 47.8 | 50.0 | | 58.6 | 150.7 | 30-May | 23.9 | 11.9 |
| **Long Branch (P)++** | | | | | | | | |
| **MT1265** | **60.4** | 54.4 | | 58.9 | 147.7 | 27-May | 27.2 | 11.1 |
| **MT1348** | **57.5** | 48.0 | | 59.2 | 147.0 | 26-May | 24.2 | 12.1 |
| **MT1444** | **56.8** | | | 58.8 | 148.3 | 27-May | 25.5 | 9.3 |
| **MT1465**[2/] | 49.3 | | | 58.6 | 147.0 | 26-May | 23.3 | 12.7 |
| **MT1471** | **56.1** | | | 58.9 | 148.7 | 28-May | 25.3 | 10.9 |
| **MT1488** | 48.9 | | | **59.8** | 150.3 | 29-May | 21.5 | 12.3 |
| **MT1507** | | | | | | | | |
| **MT1540** | | | | | | | | |
| **MT1542** | | | | | | | | |
| **MT1547** | | | | | | | | |
| **MT1563** | | | | | | | | |
| **MT1564** | | | | | | | | |
| **MT1565** | | | | | | | | |
| **MTCL1131** | **60.1** | 57.8 | | 58.7 | 150.3 | 29-May | 28.3 | 10.8 |
| **MTF1432**[2/] | | | | | | | | |
| **MTF1435** | | | | | | | | |
| **MTF1559** | | | | | | | | |
| **MTS1573 (HWW)** | | | | | | | | |
| **MTS1588** | | | | | | | | |
| **MTW1491 (HWW)** | **62.5** | | | 58.3 | 150.3 | 29-May | 26.6 | 9.7 |
| **Northern +** | 50.3 | 50.4 | | 59.2 | 149.7 | 29-May | 20.5 | 12.7 |
| **PSB13NEDH-7-140 (P)** | | | | | | | | |
| **PSB13NEDH-7-45 (P)** | | | | | | | | |
| **SY Clearstone 2CL (P)+** | **53.1** | 49.4 | | 59.0 | 147.3 | 26-May | 25.6 | 10.9 |
| **SY Monument (P)+** | **55.7** | 48.3 | | 57.4 | 147.7 | 27-May | 22.1 | 10.2 |
| **SY Sunrise (P)+** | 52.7 | 38.5 | | 58.5 | 147.3 | 26-May | 19.4 | 11.8 |
| **SY Wolf (P)+** | **58.7** | 47.3 | | **59.6** | 146.7 | 26-May | 23.6 | 11.1 |
| **Warhorse +** | 41.0 | 40.9 | | 58.9 | 150.7 | 30-May | 18.8 | 13.9 |
| **WB4483 (P)++** | 50.9 | | | 58.5 | 150.7 | 30-May | 23.4 | 11.4 |
| **WB4575 (P)++** | 51.5 | | | **59.9** | 147.7 | 27-May | 23.6 | 11.3 |
| **WB4614 (P)+** | 51.9 | 47.9 | | 58.6 | 147.0 | 26-May | 21.8 | 12.0 |
| **WB4623CLP (P)+** | **55.5** | 35.0 | | 58.7 | 147.7 | 27-May | 22.9 | 11.6 |
| **WB-Quake (P)+** | 49.8 | 48.6 | | 58.3 | 150.3 | 29-May | 24.3 | 11.6 |
| **Yellowstone +** | **58.6** | 61.4 | | 58.4 | 147.7 | 27-May | 26.8 | 10.6 |
| **Average** | **51.8** | **51.8** | **48.0** | **57.4** | **148.1** | **27-May** | **23.4** | **11.6** |
| **LSD (0.05)** | **9.4** | **9.4** | **ns** | **0.5** | **0.9** | | **3.3** | **ns** |
| **C.V.** | **10.7** | **10.7** | **18.4** | **0.5** | **0.4** | | **8.6** | **13.4** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending 2/ = approved for release in 2018, name pending

(HWW) = Hard White Winter Wheat

**Table 12. 2012//2017 Intrastate Winter Wheat Test (Exp. 35): Combined Locations Winter Survival and associated Yield (Locations: Williston (2012, 2013, 2015), Sidney (2017) = 4 locations**

***** No recordable Winterkill, with a harvest, in 2014 and 2016 *****

| | Winter Survival (%) | | | | Yield under Winterkill conditions | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2015//17 | 2013//17 | 2012//17 | 2017 | 2015//17 | 2013//17 | 2012//17 |
| location-years | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **07CL039-7,SY 517CL2 (P)++)** | 21 | | | | 25.8 | | | |
| **Bearpaw +** | 36 | **54** | 43 | 39 | 35.5 | **39.2** | 43.2 | **43.4** |
| **Brawl CL Plus +** | 27 | **40** | | | 28.6 | 27.1 | | |
| **BZ9W09-2216 (P)** | 34 | | | | **46.9** | | | |
| **BZ9WM09-1620 (P)** | 1 | | | | 20.3 | | | |
| **CO13003C** | 35 | | | | **42.1** | | | |
| **Decade +** | **62** | **70** | **56** | **54** | **50.7** | **49.2** | **56.1** | **49.7** |
| **Denali +** | **48** | | | | **41.3** | | | |
| **Judee +** | 24 | 32 | 26 | 21 | 13.7 | 20.8 | 25.7 | 25.1 |
| **Keldin (P)+** | 29 | 29 | | | 29.9 | 29.0 | | |
| **Langin ++** | 36 | | | | 34.8 | | | |
| **LCS Chrome (P)++** | 41 | | | | **40.1** | | | |
| **LCS Jet (P)+** | 11 | | | | 32.0 | | | |
| **Loma ++** | 39 | **67** | | | 36.5 | **44.3** | | |
| **Long Branch (P)++** | **50** | | | | 33.7 | | | |
| **MT1265** | 45 | **66** | | | **44.5** | **46.5** | | |
| **MT1348** | 47 | **50** | | | **42.3** | **40.4** | | |
| **MT1444** | **48** | | | | **41.4** | | | |
| **MT1465**[2/] | 46 | | | | **41.1** | | | |
| **MT1471** | 35 | | | | 30.0 | | | |
| **MT1488** | 44 | | | | 38.3 | | | |
| **MT1507** | 45 | | | | **52.6** | | | |
| **MT1540** | **55** | | | | **40.2** | | | |
| **MT1542** | 33 | | | | 38.7 | | | |
| **MT1547** | **50** | | | | **45.8** | | | |
| **MT1563** | **54** | | | | **43.6** | | | |
| **MT1564** | **48** | | | | 39.3 | | | |
| **MT1565** | **53** | | | | **42.4** | | | |
| **MTCL1131** | 36 | **58** | **55** | | **43.3** | **49.4** | **54.9** | |
| **MTF1432**[2/] | 34 | | | | **43.5** | | | |
| **MTF1435** | 45 | | | | **42.4** | | | |
| **MTF1559** | 34 | | | | 36.7 | | | |
| **MTS1573 (HWW)** | 40 | | | | 30.6 | | | |
| **MTS1588** | 19 | | | | 37.8 | | | |
| **MTW1491 (HWW)** | 45 | | | | 37.1 | | | |
| **Northern +** | 37 | **61** | **50** | 41 | 36.7 | **43.6** | **50.0** | **47.5** |
| **PSB13NEDH-7-140 (P)** | **48** | | | | 38.2 | | | |
| **PSB13NEDH-7-45 (P)** | **54** | | | | **45.7** | | | |
| **SY Clearstone 2CL (P)+** | 47 | **60** | **47** | 38 | **41.3** | **43.5** | 47.0 | **44.0** |
| **SY Monument (P)+** | **49** | **62** | | | **45.0** | **42.9** | | |
| **SY Sunrise (P)+** | **63** | **50** | | | **47.6** | **35.9** | | |
| **SY Wolf (P)+** | 37 | **46** | 38 | 31 | 33.3 | 34.6 | 38.4 | 37.5 |
| **Warhorse +** | **49** | **64** | **53** | **46** | 32.6 | **36.7** | **53.4** | **43.6** |
| **WB4483 (P)++** | 42 | | | | 34.7 | | | |
| **WB4575 (P)++** | **49** | | | | **43.4** | | | |
| **WB4614 (P)+** | 33 | **56** | | | **41.7** | **42.8** | | |
| **WB4623CLP (P)+** | 0 | 8 | | | 5.3 | 9.9 | | |
| **WB-Quake (P)+** | 36 | **55** | **46** | 40 | 37.7 | **42.5** | 46.4 | **48.0** |
| **Yellowstone +** [1/] | - | - | - | - | - | - | - | - |
| **Average** | **39.6** | **51.4** | **46.1** | **38.5** | **37.7** | **37.7** | **44.8** | **42.3** |
| **LSD (0.05)** | **15.7** | **30.1** | **14.5** | **11.4** | **13.2** | **14.0** | **7.1** | **6.8** |
| **C.V.** | **22.2** | **27.7** | **18.2** | **20.2** | **19.8** | **17.6** | **9.2** | **10.9** |

+ = new for 2017, # = paid entry

1/ = Yellowstone misplanted as Warhorse in 2017

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

2/ = approved for release in 2018, name pending

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

**Table 13. HARD WINTER WHEAT: Yield Performance under Sawfly Pressure and % Sawfly Cutting (2012//2017)**
**(Note: Sawfly cutting in each location-year ≥10%)**

| Cultivar/Line | Grain Yield (bu/a) | | | | | Sawfly Cutting (%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | 2016-17 | 2015-17 | 2013//17 | 2012//17 | 2017 | 2016-17 | 2015-17 | 2013//17 | 2012//17 |
| Location-years | 3 | 5 | 6 | 8 | 11 | 3 | 5 | 6 | 8 | 11 |
| **Bearpaw + (ss)** | 34.6 | 46.9 | 40.7 | 51.4 | 47.5 | **13** | **12** | **9** | **11** | **12** |
| **Brawl CLP +** | 45.1 | | | | | 55 | | | | |
| **Decade +** | 42.5 | 56.7 | 47.2 | 57.1 | **52.1** | 44 | 39 | 28 | 29 | 31 |
| **Judee + (ss)** | 42.6 | 61.5 | 50.1 | 61.2 | **54.7** | 24 | 25 | 18 | 20 | 18 |
| **Keldin +** | 46.8 | 67.0 | | | | 54 | 54 | | | |
| **Loma ++ (ss)** | 45.3 | 59.4 | 49.0 | | | **27** | 23 | 18 | | |
| **MT1265** | 42.8 | 58.2 | 49.2 | | | 55 | 53 | 40 | | |
| **MT1348** | 41.8 | 58.7 | | | | 60 | 61 | | | |
| **MT1444** | 39.5 | | | | | 53 | | | | |
| **MT1465**[2/] | 46.8 | | | | | 53 | | | | |
| **MT1471** | 40.0 | | | | | 47 | | | | |
| **MT1488** | 34.6 | | | | | 59 | | | | |
| **MTF1432**[2/] | 39.1 | | | | | 46 | | | | |
| **MTF1435** | 39.4 | | | | | 40 | | | | |
| **MTS1573 (HWW, ss)** | 49.9 | | | | | **15** | | | | |
| **MTS1588 (ss)** | 47.2 | | | | | **11** | | | | |
| **MTW1491 (HWW)** | 42.9 | | | | | 52 | | | | |
| **Northern +** | 39.8 | 56.0 | 47.9 | 60.3 | | 42 | 34 | 27 | 26 | |
| **SY Clearstone 2CL (P)+** | 41.1 | 61.9 | 51.2 | 62.0 | **57.2** | 52 | 51 | 39 | 39 | 39 |
| **SY Monument (P)+** | 42.5 | | | | | 56 | | | | |
| **SY Wolf (P)+** | 42.6 | 60.4 | 50.2 | | | 47 | 40 | 31 | | |
| **Warhorse + (ss)** | 43.4 | 54.9 | 45.5 | 56.2 | **52.0** | **6** | **4** | **3** | **5** | **4** |
| **WB-Quake (P)+ (ss)** | 41.8 | 55.0 | 45.6 | 56.9 | 50.3 | **14** | **18** | **13** | 19 | **14** |
| **Yellowstone**[1/] | - | - | - | - | - | - | - | - | - | - |
| **Average** | **42.3** | **58.0** | **55.6** | **57.9** | **52.3** | **40** | **35** | **26** | **21** | **20** |
| **LSD (0.05)** | **ns** | **ns** | **ns** | **ns** | **5.9** | **22** | **16** | **14** | **12** | **12** |
| **C.V. (%)** | **11.6** | **13.9** | **13.3** | **12.5** | **13.1** | **34** | **37** | **45** | **58** | **70** |

**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)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

(HWW) = Hard White Winter Wheat

1/ = Yellowstone misplanted as Warhorse in 2017 Intrastate Tests

(**ss**) = solid-stemmed sawfly resistant variety

2/ = approved for release in 2018, name pending

**Table 14. Precipitation (top, in inches) and Average Monthly Temperature (bottom, °F) for Crop Year 2016-2017**

| Agricultural Research Center | Sept. 2016 | Oct. 2016 | Nov. 2016 | Dec. 2016 | Jan. 2017 | Feb. 2017 | Mar. 2017 | Apr. 2017 | May 2017 | June 2017 | July 2017 | Aug 2017 | Total Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Western Triangle, Conrad** | **2.43** | **1.06** | **0.15** | **0.23** | **0.49** | **0.48** | **0.52** | **2.16** | **0.64** | **2.59** | **0.84** | **0.04** | **11.67** |
| | **1987-2017 Average = 11.77 (Temp = 43.7)** | | | | | | | | | | | | |
| | 53.4 | 41.6 | 39.4 | 13.3 | 16.4 | 21.5 | 32.0 | 41.2 | 54.0 | 61.1 | 71.9 | 66.3 | 42.7 |
| **Northern, Havre** | **2.37** | **3.04** | **0.21** | **0.13** | **0.41** | **0.72** | **0.07** | **0.25** | **0.45** | **1.57** | **0.14** | **0.12** | **9.48** |
| | **1916-2017 Average = 12.06 (Temp = 42.5)** | | | | | | | | | | | | |
| | 56.7 | 42.2 | 40.4 | 13.9 | 13.7 | 23.7 | 33.9 | 44.4 | 54.3 | 63.8 | 73.6 | 67.3 | 44.0 |
| **Northwestern, Kalispell** | **0.97** | **5.48** | **1.06** | **1.66** | **0.84** | **2.80** | **2.99** | **2.33** | **0.71** | **2.62** | **0.07** | **0.19** | **21.72** |
| | **1980-2017 Average = 20.12 (Temp = 43.3)** | | | | | | | | | | | | |
| | 52.0 | 43.5 | 38.4 | 17.3 | 12.5 | 22.1 | 35.8 | 40.4 | 52.6 | 59.6 | 68.0 | 64.3 | 42.2 |
| **Central, Moccasin** | **3.37** | **2.76** | **0.14** | **0.43** | **0.23** | **0.39** | **0.37** | **2.07** | **2.93** | **1.68** | **0.66** | **0.31** | **15.34** |
| | **2010-2017 Average = 15.27 (Temp = 42.9)** | | | | | | | | | | | | |
| | 55.4 | 46.3 | 42.9 | 45.6 | 19.1 | 26.9 | 37.2 | 42.2 | 52.4 | 60.0 | 71.4 | 65.9 | 44.6 |
| **Southern, Huntley** | **1.87** | **3.06** | **0.27** | **1.17** | **0.37** | **0.74** | **2.30** | **1.75** | **1.53** | **1.13** | **0.21** | **0.24** | **14.64** |
| | **1911-2016 Average = 13.42 (Temp = 45.6)** | | | | | | | | | | | | |
| | 59.8 | 47.6 | 41.9 | 14.1 | 14.1 | 25.6 | 40.4 | 46.9 | 55.9 | 65.6 | 75.8 | 68.4 | 46.3 |
| **Northeastern, Sidney** | **1.86** | **0.59** | **0.09** | **0.59** | **0.17** | **0.30** | **0.58** | **0.31** | **0.47** | **1.27** | **0.60** | **1.47** | **8.30** |
| | **1949-2017 Average = 14.01 (Temp = 43.3)** | | | | | | | | | | | | |
| | 57.5 | 46.1 | 39.2 | 11.0 | 11.1 | 23.6 | 32.6 | 44.0 | 56.6 | 64.5 | 73.8 | 66.4 | 43.9 |
| **Williston (WREC), N. Dakota** | **3.69** | **1.03** | **0.10** | **0.61** | **1.12** | **0.15** | **0.78** | **0.73** | **0.88** | **1.37** | **1.43** | **2.26** | **14.15** |
| | **1990-2016 Average = 14.67 (Temp = 44.4)** | | | | | | | | | | | | |
| | 62.5 | 49.4 | 41.6 | 11.6 | 13.0 | 23.6 | 32.9 | 46.3 | 59.3 | 67.2 | 77.8 | 69.3 | 46.2 |
| **Northern Seeds, Carter/Ft. Benton** | **2.83** | **2.48** | **0.08** | **0.30** | **0.91** | **0.64** | **0.35** | **3.22** | **1.20** | **1.63** | **0.14** | **0.12** | **13.90** |
| | **2008-2017 Average = 13.59 (Temp = 45.2)** | | | | | | | | | | | | |
| | 57.1 | 45.4 | 42.2 | 17.1 | 15.2 | 26.4 | 36.4 | 45.6 | 56.6 | 64.6 | 75.0 | 68.4 | 45.8 |
| **Post Farm, Bozeman** | **2.39** | **2.81** | **0.50** | **0.86** | **0.52** | **0.63** | **1.47** | **2.60** | **2.56** | **2.23** | **0.11** | **0.55** | **17.23** |
| | **1958-2017 Average = 15.82 (Temp = 43.7)** | | | | | | | | | | | | |
| | 56.1 | 48.2 | 39.9 | 17.6 | 16.1 | 29.3 | 42.5 | 43.7 | 52.7 | 60.7 | 71.2 | 66.9 | 45.4 |

**Table 15. Selected agronomic characters, cereal quality evaluations and disease reactions of hard winter wheat varieties.**

| | Agronomic Chararacters | | | | | | | Cereal Quality | | | Disease Reactions[8/] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variety | Maturity[1/] | Chaff Color | Winter Survival[2/] | Straw Strength[3/] | Stem solid[4/] | Clear-field | Coleoptile length[5/] | Milling[6/] | Baking[6/] | PPO[7/] | Dwarf Smut | Stripe Rust | Stem Rust | Leaf Rust |
| **Bearpaw** | M | White | 2 | M | 21 | N | M | 4 | 2 | H | S | S | R | S |
| **Brawl CL Plus** | E | White | 2 | S | | Y | L | 3 | 3 | H | S | S | - | - |
| **Decade** | M | White | 4 | S | | N | M | 3 | 4 | H | S | S | R | MS |
| **Denali** | M | White | 3 | - | | N | - | - | - | - | S | S | - | - |
| **Judee** | M | White | 2 | M | 20 | N | L | 3 | 4 | H | S | R | S | S |
| **Keldin** | M | White | 2 | S | | N | S | 3 | 2 | H | S | MS | - | - |
| **Langin** | E | White | 3 | - | | N | M | - | - | - | S | MS | - | - |
| **LCS Chrome** | M-E | White | 3 | - | | N | M-L | - | - | - | S | R | - | - |
| **LCS Jet** | M | White | 2 | - | | N | L | - | - | - | S | R | - | - |
| **Loma** | M-L | White | 4 | M | 19 | N | S | 4 | 4 | ML | S | R | R | - |
| **Long Branch** | E | White | 3 | - | | N | M | - | - | - | S | R | | - |
| **Northern** | M | White | 3 | S | | N | S | 3 | 3 | L | S | R | R | - |
| **MT1465[9/]** | M | White | 3 | S | | N | M | 3 | 4 | M | S | R | MS | - |
| **MTF1432[9/]** | L | White | 2 | MS | | N | M | 3 | 3 | L | S | R | S | - |
| **SY 517 CL2** | E | White | 2 | - | | Y | M-L | - | - | - | S | MS | - | - |
| **SY Clearsone 2CL** | M | White | 3 | S | | Y | S | 3 | 3 | M | R | R | MR | - |
| **SY Monument** | M | White | 3 | S | | N | M | 3 | 2 | ML | S | R | - | - |
| **SY Sunrise** | E | White | 2 | S | | N | M | 3 | 2 | H | S | R | - | - |
| **SY Wolf** | M | White | 3 | S | | N | M | 3 | 2 | M | S | R | R | - |
| **Warhorse** | M | White | 4 | MS | 22 | N | M | 3 | 3 | H | S | R | R | MR |
| **WB4483** | L | White | 3 | S | 20 | N | S | 3 | 2 | H | S | MS | - | - |
| **WB4575** | M | White | 3 | S | | N | M | 3 | 4 | M | S | S | - | - |
| **WB4614** | M | White | 4 | S | | N | M | 3 | 3 | H | S | R | - | - |
| **WB4623CLP** | M-L | White | 1 | M | | Y | M | 3 | 4 | ML | S | R | - | - |
| **WB-Quake** | M-L | White | 3 | S | 20 | N | M | 4 | 4 | H | S | R | MR | MR |
| **Yellowstone** | M | White | 4 | S | | N | S | 3 | 4 | M | MS | R | S | MS |

1/ VE = Very Early, E = Early, M = Medium, L = Late, VL = Very Late

2/ 5 = Best Winter survival (over several years at Sidney, Williston and Moccasin)

3/ W = Weak
MW = Medium Weak
M = Medium
MS = Medium Strong
S = Strong

4/ scored 5-25, 25 = most solid
Combined 2013-2017 Bozeman, Carter, Conrad, Havre, Gildford, Loma, and Moccasin data; varieties with no number were not evaluated

5/ L = long
M = medium
S = short
- = no info.

**9/ = approved for release in 2018, name pending**

6/ 5 = Superior
4
3
2
1 = Inferior

7/ PPO = Polyphenol Oxidase
(low is better for noodles)
L = low
M = medium
H = high

8/ R = Resistant
MR = Moderately Resistant
M = Moderate
MS = Moderately Susceptible
S = Susceptible
VS = Very Susceptible
- = no information

# Additional Descriptive Information for Winter Wheat Varieties

**New for the 2018 Bulletin:**

**Denali** – hard red winter wheat developed by Colorado and released in 2011. Denali is a medium maturing, medium statured wheat, with white chaff. Winter-hardiness is average. Denali has average yield and test weight and below average protein. Denali is susceptible to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V has been issued (Certificate #201200433). *Denali will not be in the Montana Intrastate Winter Wheat Test for 2018.*

**Langin** – hard red winter wheat developed by Colorado and released in 2016. Langin is an early maturing, short statured wheat, with white chaff. Winter-hardiness is average. Langin has average yield and test weight and below average protein. Langin is moderately susceptible to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V is pending (Certificate #201700298).

**LCS Chrome** – hard red winter wheat developed by Limagrain LLC and released in 2016. LCS Chrome is an early to medium maturing, medium statured wheat, with white chaff. Winter-hardiness is average. LCS Chrome has above average yield and test weight and average protein. LCS Chrome is resistant to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V is pending (Certificate #201600404).

**LCS Jet** – hard red winter wheat developed by Limagrain LLC and released in 2015. LCS Jet is a medium maturing, short statured wheat, with white chaff. Winter-hardiness is below average. LCS Jet has above average yield (#1 in 2017 across 7 locations tested) and below average test weight and average protein. LCS Jet is resistant to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V has been issued (Certificate #201600094).

**Long Branch** – hard red winter wheat developed by Limagrain LLC, licensed by Dyna Gro Wheat, and released in 2015. Long Branch is an early maturing, short statured wheat, with white chaff. Winter-hardiness is average. Long Branch has above average yield and test weight and below average protein. Long Branch is resistant to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V is pending (Certificate #201700105).

**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. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V is pending (Certificate #201700216). Additionally, the CLEARFIELD genes are patented.

**Lines approved for variety release in 2018, names are pending:**

***MTF1432*** – a hard red winter wheat developed by the Montana Agricultural Experiment Station and available to seed growers in fall 2018. MTF1432 is a late maturing, tall, awnless line developed for **forage** production as a possible replacement (or supplement to) Willow Creek (MT, 2005). Compared to Willow Creek, MTF1432 has similar forage yield and forage quality, but superior seed yield .Compared to conventional bread wheats; MTF1432 has average to above average yield, below average test weight, and average protein. MTF1432 is resistant to stripe rustand susceptible to stem rust. MTF1432 has low PPO and average milling and baking characteristics. PVP, Title V will be applied for.

***MT1465*** - hard red winter wheat developed by the Montana Agricultural Experiment Station and available to seed growers in fall 2018. MT1465 is a medium maturing, short to medium statured wheat, with average winter-hardiness. MT1465 is a high yielding variety with above average test weight and average protein. MT1465 (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. MT1465 is resistant to stripe rust and this resistance is either similar or significantly higher than that of Yellowstone. MT1465 is moderately susceptible to stem rust. MT1465 has excellent milling and baking qualities, comparable to Decade and parental cultivar, Yellowstone. PVP, Title V will be applied for.

**Varieties previously in bulletin:**

**Bearpaw** – hard red winter wheat developed by the Montana Agricultural Experiment Station in 2011. Bearpaw is a white-glumed, solid-stem, semi-dwarf (*Rht1*) wheat with medium maturity. Bearpaw has average yield, test weight, and protein, and below average winter hardiness. Bearpaw is resistant to prevalent races of stem rust but susceptible to stripe and leaf rust. Stem-solidness of Bearpaw is most similar to Rampart. Bearpaw is a high PPO variety with above average milling and below average baking properties. PVP, Title V option has been issued (Certificate #201200407).

**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.

**Decade** – hard red winter wheat developed by the Montana Agricultural Experiment Station and released jointly with North Dakota (pending at publication) in 2010. Decade is an early to medium maturing reduced height wheat with white chaff. Decade is a high yielding wheat with good winter hardiness and medium to high test weight and protein. Decade is resistant to prevalent races of stem rust but very susceptible to stripe rust. Decade has excellent milling and baking quality. PVP, Title V has been issued (Certificate #201100096).

**Judee** – hard red winter wheat developed by the Montana Agricultural Experiment Station in 2011. Judee is a white-glumed, 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).

**Loma** – hard red winter wheat developed by the Montana Agricultural Experiment Station and available to growers in fall 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 is pending (Certificate #201700021).

**Northern –** hard red winter wheat developed 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 average baking properties. PVP, Title V has been issued (Certificate #201600092).

**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 Monument** – hard red winter wheat developed by Syngenta and released in 2015. SY Monument is a medium maturing, medium short statured wheat, with white chaff. SY Monument has average yield, below average test weight and average protein. SY Monument is resistant to stripe rust. Sy Monument is a medium low PPO variety with average mill and below average bake characteristics. PVP, Title V has been issued (Certificate #201400332).

**SY Sunrise** – hard red winter wheat developed by Syngenta and released in 2015. SY Sunrise is an early maturing, short statured wheat, with white chaff. SY Sunrise has average yield, above average test weight, and average protein. Sy Sunrise is resistant to stripe rust. SY Monument is a high PPO variety with average mill and below average bake characteristics under Montana conditions. PVP, Title V has been issued (Certificate #201500370).

**SY-Wolf** – hard red winter wheat developed by Syngenta (AgriPro) Seeds in 2010. SY-Wolf is a medium maturing, short statured wheat with white glumes. SY-Wolf has above average yield and test weight and average protein. Winter-hardiness is average. SY-Wolf is moderately susceptible to moderately resistant (MS/MR) to stripe rust, but resistant to stem rust. SY Wolf has average milling and below average baking properties. PVP, Title V has been issued (Certificate #201100390).

**Warhorse** - is an awned, white glumed, 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).

**WB4483** – hard red winter wheat developed by WestBred/Monsanto in 2016. WB4483 is solid stemmed, late maturing, short to medium statured wheat, with white chaff. WB4483 has slightly below average yield and average test weight and protein. WB4483 is moderately susceptible to stripe rust. WB4483 is a high PPO variety with average mill and below average bake characteristics under Montana conditions. PVP, Title V is pending (Certificate #201600380).

**WB4575** – hard red winter wheat developed by WestBred/Monsanto in 2016. WB4575 is a medium maturing, short to medium statured wheat, with white chaff. WB4575 has below average yield and above average test weight and protein. Avery is susceptible to stripe rust. WB4575 is a medium PPO variety with average mill and above average bake characteristics under Montana conditions. PVP, Title V is pending.

**WB4614 –** hard red winter wheat developed by WestBred and released in 2013. WB4614 is a medium maturing, medium short statured wheat, with white chaff. WB4614 has average yield and protein and above average test weight. WB4614 is resistant to stripe rust. WB4614 is a high PPO variety with average mill and bake characteristics. PVP, Title V has been issued (Certificate #201500188).

**WB4623CLP** – hard red winter wheat developed by WestBred and released in 2015. WB4623CLP is a medium late maturing, short statured wheat, with white chaff. WB4623CLP has average yield, test weight, and protein. WB4623CLP is resistant to stripe rust. WB4623CLP is a medium low PPO variety with average mill and above average bake characteristics. PVP, Title V has been issued (Certificate #201500189). Additionally, the CLEARFIELD genes are patented.

**WB-Quake** – hard red winter wheat developed by WestBred (Monsanto) in 2011. WB-Quake is a medium to late maturing, medium statured solid-stemmed wheat, with white chaff. WB-Quake has above average yield, average test weight and protein with average winter hardiness. WB-Quake is resistant to stripe rust and moderately resistant to stem rust. WB-Quake is a high PPO variety with above average milling and baking properties. PVP, Title V is issued (Certificate #201100471). *WB-Quake will not be in the Montana Intrastate Winter Wheat Test for 2018.*

**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. Yellowstone has been the leading winter wheat variety planted in Montana since 2012. 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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**Note: Information in this article is available on the web at:**
**http://plantsciences.montana.edu/crops**