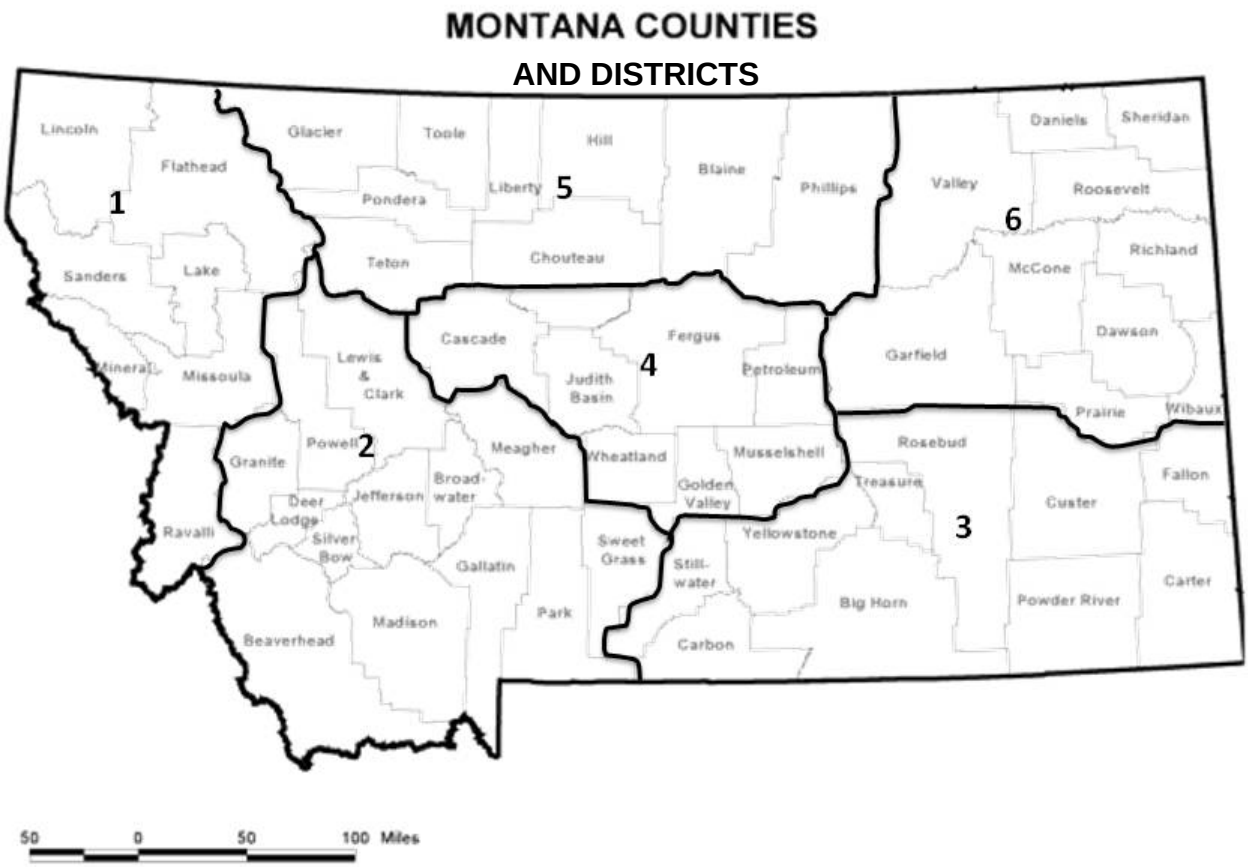
2017
WINTER WHEAT VARIETIES

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

2B-1093 Revised January 2017

2017 Recommended Varieties: Hard Winter Wheat for Montana by District

Variety	Districts (see map on cover)					
	1	2	3	4	5	6
	Northwest	Southwest	Southeast	Central	North Central	Northeast
Hard Red Winter Wheat						
Bearpaw +[1/]			D	D	D	
Broadview (P)					D	D
Colter +		D	D	D	D	
Decade +			D	D	D	D
Jerry						D
Judee +[1/]			D	D	D	
Keldin (P)+ [2/]	***D***	***D***	***D***	***D***	***D***	***D***
Loma ++	D	D	D	D	D	D
Northern ++		D	D	D	D	
SY Wolf (P)+		D	D	D	D	
Warhorse +[1/]			D	D	D	
WB-Quake (P)+	D	D	D	D	D	D
Yellowstone +	D	D	D	D	D	

D = Dryland
I = Irrigated
(P) = a Private Variety
+ = a "Protected" variety under the Plant Variety Protection Act
++ = PVP Title V pending
[1/] = sawfly areas only
[2/] = pending approval at Variety Release Meeting, February 21, 2017

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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. Varieties recommended for production in the respective districts of Montana are designated by an **R**. 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

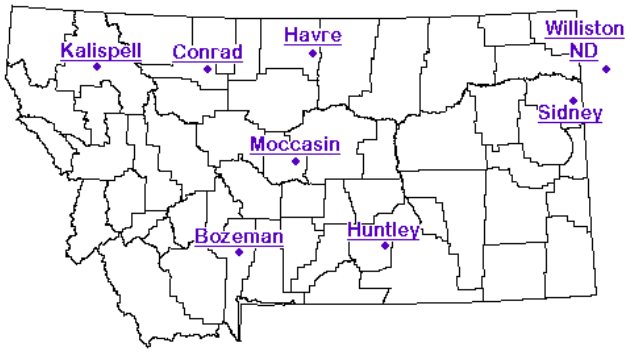

Fig. 1. Test Locations for Montana winter wheat performance tests in 2016.

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 2016 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 30 varieties (15 public and 15 private) and 19 experimental lines (18 public and 1 private). Numbered entries preceded by a state designation [e.g. MT1348 (Montana) or private company, PSB13NEDH-14-71, (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 0.6 grams seeds/ft^2, which is roughly equivalent to 1 bushel per acre, except at Williston where the seeding rate was about 77 pounds per acre. Information on previous crop, planting date, fertilizer use and harvest date is available in Table 1.

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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 2016, data is provided for two (2015-2016), three (2014-2016) and four (2013-2016) 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	2015 Crop	2014 Crop	2015 Planting Date	Fertilizer N Fall	Fertilizer N Spring	Fertilizer P_2O_5	Fertilizer K_2O	2016 Harvest Date
				--------- Pounds per acre ---------				
Kalispell	**spring wheat**	**canola**	**Oct 1**	**9**	**40**	**40**	**75**	**Aug 16**
Bozeman	**fallow**	**spring wheat**	**Sep 26**	**132**	**-**	**10**	**10**	**Aug 4**
Huntley	**irrig. Barley**	**irrig. corn**	**Oct 16**	**111**	**52**	**0**		**Jul 30**
Moccasin	**chem. fallow**	**barley**	**Sep 23**	**10**	**60**	**15**	**10**	**Aug 1**
Conrad	**chem. fallow**	**barley**	**Sep 29**	**51**	**130**	**22**	**20**	**Jul 24**
Havre	**chem. fallow**	**barley**	**Sep 12**	**100**	**50**	**20**	**10**	**Jul 22**
Carter	**chem. fallow**	**na**	**Oct 7**	**16**	**28**	**20**	**0**	**Jul 25**
Sidney	**fallow**	**peas**	**Sep 16**	**0**	**-**	**0**	**0**	**Jul 19**
Williston, ND	**lentils**	**peas**	**Sep 15**	**5.5**	**30.5**	**0**	**0**	**Jul 25**

.**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 no differential winter-kill at either Sidney or Williston in 2016.

Table 12 contains information on % winter survival and associated yield in winter-kill environments from 2007 to 2015. The data summarizes 8 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 is the most severe location for winter wheat survival of our testing locations.

Wheat Stem Sawfly

Wheat stem sawfly (WSS) is a persistent and economic problem for wheat growers in Montana. Currently, Montana wheat acreage infested by WSS is primarily in the north central (District 5), central (District 4) and south central (District 3) cropping districts. Host plant resistance in the form of stem solidness has been effective in reducing sawfly losses in both spring and winter wheat. Solid-stemmed winter wheats, 'Vanguard', ‘Rampart’, and “Genou’ were leading varieties in the past but are now planted on only minor acreage. Current solid-stemmed varieties include: Judee, (released in 2011, the second leading variety at 18% of planted acreage), Warhorse (2013, the third leading variety at 10%) Bearpaw (2011, 4%), and WB-Quake (2010, 1%).

Table 13 contains information on yield and % sawfly cutting at 10 testing locations where sawfly

pressure was present during the years 2011-2016. 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), 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 14. 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 2016 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.

2016 Test Conditions

Statewide winter wheat yields were projected by the Montana Agricultural Statistics Service at 49 bushels per acre (bu/a), for 2016, tying the record set in 2010. This is an increase over the 41 bu/a for the 2015 harvest year. The harvested acreage in 2016 was 2.15 million acres (total production = 105.4 million bu) compared 2.22 million acres in 2015 (total production = 91.2 million bu).

Rainfall for the 2015-2016 crop year was generally above average at all locations tested (Table 14), except Bozeman, Kalispell, and Huntley (range = -2.81 inches at Kalispell to +6.76 at Havre). Average yearly temperatures were above long term at all locations, ranging from Conrad (+1.2°F) to +4.2°F at Williston.

Yields, for the 9 locations harvested averaged 80 bu/a {range 52 (Williston) to 108 bu/a (Huntley, sub-irrigated)}. Yields of named varieties, across the 9 harvested locations, ranged from a low of 58 bu/a (Jerry) to a high of 91 bu/a for SY Monument.

Test weight averaged 60.1 lb/bu across all locations. Kalispell (53.7 lb/bu, rain delayed harvest and stripe rust), Williston (57.4), and Havre (59.9) were below 60 lb/bu, while the other 6 locations were above.

Heading dates were earlier in 2016 than long term averages at 7 harvested locations where comparisons are available. Havre and Williston both at -12 days had the greatest differences,

while the least change occurred at Huntley (-4 days).

Stripe rust at both Bozeman (average = 25%, range 2 - 87%) and Kalispell (average = 70%, range 22 – 99%) were a factor in yield reduction for highly susceptible varieties (Avery, Bearpaw, Broadview, Byrd, Cowboy, Decade, Jerry, and WB4059CLP).

There was sawfly cutting recorded at the Northern Seeds Carter/Ft. Benton site averaging 27%, ranging from 1 (Warhorse) to over 60% (Broadview, Byrd, and T158) of stems cut, across all entries.

Protein content averaged 11.1% across all locations (location range = 7.8 – 13.4%) tested. The range of named varieties across all locations was from a low of 10.0% (Avery) to a high of 11.8% (Brawl CL Plus). Increased rainfall and higher than average yields contributed to lower proteins at some locations.

Leading winter wheat varieties planted for 2016 were Yellowstone (18.8%), Judee (18.1%), Warhorse (10.0%), Brawl CL Plus (7.3%), Decade (5.0%), and Bearpaw (4.4%).

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.

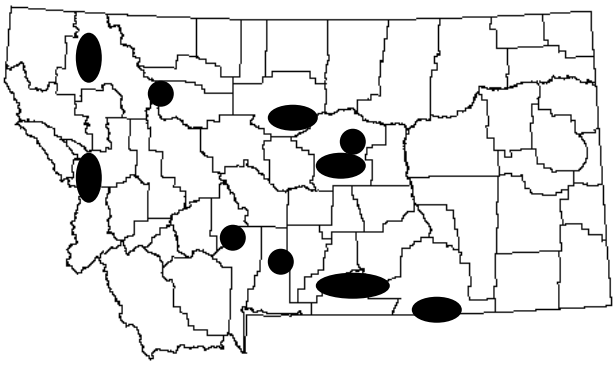

Fig. 2. Known areas of dwarf smut (TCK) infestations.

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.

What Recommendation by MAES Means

Classification of winter wheat varieties is determined on a yearly basis by the Montana Agricultural Experiment Station (MAES) Wheat Variety Release Committee. This 16 member committee is composed of one wheat breeder, one cereal or forage quality scientist, one plant pathologist, one entomologist, one weed scientist, one cropping systems specialist, six Research Center agronomists, one manager from both the Montana Foundation Seed program and the Montana Seed Growers Association, one Montana Wheat and Barley Committee member and one representative of the Montana Agricultural Experiment Station Advisory Board.

A variety is eligible for recommendation when a minimum of 16 location-years of performance data is obtained from the Montana State University statewide winter wheat performance trials and test results indicate that the variety is equal to or superior in overall merit to specified check cultivars and has end-use quality equal to or exceeding currently recommended varieties. For varieties originating from private companies, recommendation is considered only at the request of the company when adequate data is available.

Recommendations of varieties are considered on a case by case basis. Yield performance of a variety is an important criteria, but also considered are test weight, grain protein content, winter survival, pest resistance and end-use quality data. In general, yield needs to be at least equal to currently

recommended varieties in a particular district, unless the variety is being recommended for a specific purpose, e.g. winter hardiness, sawfly resistance. For example, Rampart, which is not competitive in the absence of wheat stem sawfly, is recommended in Districts 3, 4 and 5 for sawfly areas only. Only six varieties are recommended for the Northeast district due to severe winter conditions and a higher probability of stem rust in this region. Thus varieties recommended for District 6 must have higher winter survival and stem rust resistance.

If a serious defect in the variety is identified during performance testing, the variety will not be recommended. Examples of defects resulting in non-recommendation include: high probability of winter-kill, low grain protein, low baking quality, etc.

Lack of variety recommendation by MAES may occur due to a decision by the originating company not to test the variety in statewide performance trials. In this case the lack of recommendation is due to inadequate or no data rather than a specific varietal defect.

Montana produces primarily hard red winter and hard red spring wheats. Continuous improvement of the milling and/or baking quality of Montana grown winter wheat is one of many objectives of the Montana Agricultural Experiment Station breeding and cultivar development program. All varieties recommended by the Montana Agricultural Experiment Station have been evaluated and found to be acceptable for milling and baking performance by the Cereal Quality Laboratory at Montana State University.

The quality of Montana recommended varieties, if grown and marketed within their respective classes, is acceptable by domestic users. Montana's future as a hard red and hard white winter wheat producing state for both the domestic and export markets rests on the quality of the product.

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 1,2,3,4	30-60 30-60 (10-20 seeds/sq. ft.)	60-75 60-75 (20-25 seeds/sq. ft.)	Sept. 1-15 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°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				
Avery	**CO11D174**	Colorado	**2015**	TAM 112/Byrd
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)
Byrd	**CO06424**	Colorado	**2011**	TAM 112//(CO970547-7, Ike/Halt)
Colter	**MT08172**	Montana	**2013**	(Yellowstone sib, MT9982)*2/(BZ9W96-895, ped. unknown from male sterile pop.)
Cowboy	**CO050322**	Colorado, Wyoming	**2012**	(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
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)
Freeman	**NE06545**	Nebraska	**2013**	(ABI86*3414/Jagalene//Karl 92, KS92-946-B-15-1)/3/ Alliance
Jerry	**ND9257**	North Dakota	**2001**	Roughrider//(ND7571, Winoka/NB66425)/3/ Arapahoe
Judee	**MTS0713**	Montana	**2011**	(Vanguard/Norstar//Judith dwf, 93X312E14)/3/ NuHorizon
Loma	**MTS1224**	Montana	**2016**	Yellowstone/5/((Lew/Tiber//Redwin, MTS92045)/3/2*Erhardt, MTS0112)/4/(MTS0125, selection from a composite of 4 crosses)
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
Rampart	**MTS92042**	Montana	**1996**	Lew/Tiber//Redwin
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				
Broadview	**LE1911**	Alberta; Meridian Seeds LLC	**2009**	KS92WGRC15/CDC Kestrel//CDC Falcon
CDC Falcon	**S94-4**	Western Plant Breeders/Sask-atchewan	**1999**	Norstar*2/Vona//Abilene
Keldin	**ACS55017**	Peter Franck: Seed-Link Inc.; Ontario,Canada, Westbred LLC	**2011**	Barenburg 235/Carlisle//TRX-A16-3-2
SY Clearstone 2CL	**MTCL1077**	Syngenta, Montana	**2012**	Yellowstone*4/3/MTCL01158/CDC Teal 11A//Jagalene

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

Variety	Experimental Designation	Origin	Release Year	Pedigree
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))
T158	**T158**	Trio Research, Inc., Limagrain LLC	**2009**	KS93U206//2*(T81, TAM 107/T213 sib)
WB3768	**MTW08168**	Montana, licensed to: WestBred LLC (Monsanto)	**2013**	selection from a composite of 2 crosses: 01X225, (Judith/(PI262605, Karagach, RWA resis.)/3/(S86-740, Norstar/ Plainsman V //Ulianovka) ,MTW0047)/4/ 2*(MT9982, Yellowstone sib.) and 01X226, MTW0047/MT9982//(MT9989, Judith/Arapahoe)
WB4059CLP	**BZ9WM07-1516**	WestBred-Monsanto:	**2013**	CDC Teal-11A/3/Pryor*2//(SWP 965-001, Grandin*2/(SF-4, imi Fidel))
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

	MTCL1131			Yellowstone*4/4/(Fidel/Tiber (IMI), MTCL01158)//CDC Teal 11A/3/Jagalene
	MT1138			(059E//Jagger/Pecos, W99-194)/3/ 2*Yellowstone
	MT1257			selection from a composite of 2 crosses: 03X351, Yellowstone/ Krichauff and 03X352, Krichauff/7/(MTS04114, L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk))
	MT1265			Yellowstone*4//(KS96WGRC40, KS93U69*2/TA 2397) (Lr41, wcm)
	MT1332			selection from a composite of 3 crosses: 07X37, Yellowstone/4/(00X52E99, (Judith/SWM12099, 92X103E3)/3/ (MTR99101, Vanguard//CItr2401/2*Judith)) /5/Yellowstone(340,233 = solid-stem markers), 07X38, Yellowstone*2/ 00X52E99, and 07X39, Yellowstone/ 00X52E99//(MT0686, (BigSky sib, MT9523)/(NE94653, Wahoo sib))
	MT1348			selection from a composite of 2 crosses: 04X494, (PI572290 = STARS-9303W = (Bobwhite/PI 149898), rwa2)//BigSky and 4X495, (Yellowstone sib, MT9982)/PI572290
	MT1354			(Yellowstone low PPO plant seln., MT08184)//(Yellowstone low PPO plant seln., MT08188)/(MT08175, Colter sib)
	MT1356			(Yellowstone low PPO plant seln., MT08184)//(Yellowstone low PPO plant seln., MT08185)/(MT08177, Colter sib)
	MTS1407			(Erhardt//Judith/CDC Kestrel, MT0097/8/ (selection from a composite of 2 crosses - see pedigree, MTS0527)/7/(MTS0532 ,L'Govskaya 167/Rampart/6/(MT9409, Tiber/5/ (MT8030, TAM W-103/Froid /4/Yogo//Turkey Red /Oro/3/Centurk)))

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

Variety	Experimental Designation	Origin	Release Year	Pedigree
	MT1443			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
	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
	MT1446			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
	MT1460			(Yellowstone (Low PPO) plant seln, MT08184)//(Yellowstone (Low PPO) plant seln, MT08188/(MT08175, Colter sib)
	MT1465			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);
	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
	MT1478			selection from a composite of 2 crosses: 07X13, Yellowstone(L)*3 /4/(96X313E37-1, HYB89F009//(S86-736, Norstar*2/Vona) /3/ BigSky) and 07X14, same pedigree as 07X13
	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			(Yellowstone (Low PPO) plant seln, MT08184)//(Yellowstone (Low PPO) plant seln, MT08188/(MT08175, Colter sib)

Private Elite Lines

	PSB13NEDH-14-71	Limagrain		

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

Cultivar/Line	Grain Yield (bushels/acre)				2016 Data						
					Test	Heading Date		Plant	Lodg-	Stripe	Protein
	2016	2015-16	2014-16	2013-16	weight	Ordinal	Calendar	height	ing	rust	
		2 yr	3 yr	4 yr	lb/bu	from Jan1		in	%	%	%
Avery +	38.0				42.9	147.6	27-May	41.2	0	95	13.1
Bearpaw +	16.4	48.9	72.2	61.9	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
Broadview (P)	27.2	47.3	74.5	71.2	50.1	151.2	30-May	35.6	7	88	14.4
Byrd +	20.6	53.3			38.6	144.8	24-May	38.6	0	95	13.9
BZ9W09-2075 (WB4575) P++	21.8				46.1	151.7	31-May	35.0	2	96	13.9
BZ9W09-2212 (WB4483) P++	88.9				56.8	153.3	1-Jun	37.3	7	68	12.3
CDC Falcon (P)+	43.5	66.4	85.9	83.6	50.8	150.2	29-May	37.1	3	96	12.6
Colter +	**141.9**	**146.6**	**148.7**	**144.0**	**58.6**	151.0	30-May	43.1	1	38	11.9
Cowboy +	45.5	68.6	93.1	87.7	47.3	148.5	28-May	39.3	0	94	11.7
Decade +	18.5	43.9	67.0	60.8	42.9	149.8	29-May	38.1	20	93	14.2
Freeman +	80.1	100.2	115.6		48.5	139.3	18-May	42.0	20	68	12.1
Jerry	18.2	38.9	66.2	60.4	44.1	150.8	30-May	42.7	4	97	14.5
Judee +	118.8	**122.1**	**126.9**	**121.8**	**58.3**	148.9	28-May	41.2	12	**27**	12.2
***R* Keldin (P)+**	101.1	111.7	**122.5**		55.6	149.2	28-May	39.2	0	82	11.3
R Loma ++	128.0	**136.4**	**137.5**		57.4	150.9	30-May	40.1	43	**35**	11.8
MT1138	132.3	**137.9**	**142.3**	**139.4**	57.0	151.7	31-May	43.8	0	73	11.2
MT1257	112.3	**128.3**	**133.9**		56.5	150.3	29-May	43.6	0	84	11.6
MT1265	130.0	**134.9**	**139.6**		57.3	152.2	31-May	44.7	13	67	10.9
MT1332	127.8	**136.3**			57.4	151.6	31-May	44.5	12	76	11.5
MT1348	132.2	**132.6**			57.7	149.1	28-May	43.1	70	56	11.6
MT1354	132.0	**143.3**			57.9	152.0	31-May	43.8	0	80	11.3
MT1356	120.9	**135.3**			56.7	151.7	31-May	43.2	3	71	11.1
MT1443	106.7				56.2	151.6	31-May	40.8	0	82	11.1
MT1444	136.1				57.9	151.2	30-May	43.8	0	70	11.1
MT1446	121.1				57.0	147.9	27-May	42.6	11	61	11.2
MT1460	110.6				57.1	151.0	30-May	42.7	0	76	11.5
MT1465	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
MT1478	96.6				53.9	148.5	28-May	43.4	0	91	11.3
MT1488	135.1				**60.0**	152.4	31-May	40.8	36	**22**	12.3
MTCL1131	121.6	**131.1**	**138.7**	**134.2**	55.8	151.5	31-May	45.4	0	87	11.0
MTS1407	88.1				53.0	151.1	30-May	36.8	0	70	12.6
MTW1491 (HWW)	**138.8**				**59.6**	151.2	30-May	43.7	22	51	10.9
Northern +	133.7	**132.3**	**138.4**	**135.1**	56.8	152.6	1-Jun	43.0	14	52	11.7
PSB13NEDH-14-71 (P)	77.9				50.9	143.5	23-May	38.7	0	93	12.5
Rampart	70.4	85.7	99.1	95.8	52.3	150.7	30-May	44.7	32	83	12.9
SY Clearstone 2CL (P)+	117.2	**124.6**	**131.8**	**128.3**	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	114.2	52.2	145.6	25-May	41.0	0	50	12.6
T158 (P)	115.6	**117.3**	118.4		56.1	140.9	20-May	39.3	13	49	12.7
Warhorse +	126.7	**129.6**	**129.5**	**126.0**	**59.7**	150.9	30-May	41.8	15	**37**	13.0
WB3768 (HWW, P)+	126.7	**131.3**	**137.9**	**133.8**	57.7	150.6	30-May	46.4	12	82	11.0
WB4059CLP (P)+	34.6	48.1	61.0		43.4	144.0	23-May	32.5	0	99	14.3
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
R WB-Quake (P)+	117.5	**122.5**	**122.5**	119.5	**58.7**	153.3	1-Jun	41.3	6	67	11.5
R Yellowstone +	94.9	**117.7**	**125.3**	**125.0**	55.9	150.4	29-May	42.6	1	86	11.1
Average	**97.3**	**106.0**	**113.3**	**107.9**	**53.7**	**149.4**	**28-May**	**41.0**	**8.0**	**69.5**	**12.3**
LSD (0.05)	**10.2**	**31.4**	**29.0**	**23.4**	**1.9**	**2.3**		**2.2**	**16.6**	**15.6**	**0.6**
C.V.	**6.5**	**14.6**	**15.6**	**15.3**	**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)

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

(HWW) = Hard White Winter Wheat

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

Cultivar/Line	Grain Yield (bushels/acre)				2016 Data					
					Test	Heading Date		Plant	Stripe	Protein
	2015	2014-15	2013-15	2012-15	weight	Ordinal	Calendar	height	rust	
		2 yr	3 yr	4 yr	lb/bu	from Jan1		in	%	%
Avery +	69.5				59.6	159.7	8-Jun	35.5	77	11.2
Bearpaw +	46.9	44.5	60.6	66.1	60.9	161.3	9-Jun	33.4	72	14.5
Brawl CL Plus +	81.3	76.3			61.1	157.0	5-Jun	34.4	76	13.7
Broadview (P)	41.8	42.4	60.6	65.0	60.0	163.1	11-Jun	32.8	83	11.9
Byrd +	52.0	54.6			58.6	159.3	7-Jun	33.4	70	13.2
BZ9W09-2075 (WB4575) P++	43.0				61.0	161.9	10-Jun	32.2	75	13.3
BZ9W09-2212 (WB4483) P++	51.5				59.6	165.1	13-Jun	34.5	40	13.7
CDC Falcon (P)+	54.5	55.0	68.4	71.4	59.3	161.3	9-Jun	34.2	42	12.8
R Colter +	89.3	88.2	**92.7**	**91.5**	59.3	164.1	12-Jun	36.9	12	15.0
Cowboy +	68.2	62.3	75.5	79.2	61.2	159.1	7-Jun	33.9	80	12.8
Decade +	51.1	48.9	64.1	70.4	59.3	161.4	9-Jun	33.4	57	13.5
Freeman +	89.0	86.4	**91.2**		58.8	155.1	3-Jun	36.7	**6**	12.6
Jerry	44.1	43.1	61.7	66.1	60.1	163.0	11-Jun	38.0	66	13.6
Judee +	68.3	66.5	77.2	78.3	59.7	161.1	9-Jun	35.9	15	14.6
***R* Keldin (P)+**	85.5	85.3	**94.5**		59.4	160.9	9-Jun	34.5	17	13.0
R Loma ++	92.0	**91.0**	**95.3**		60.9	163.9	12-Jun	33.3	**10**	11.4
MT1138	94.0	**90.5**	**97.8**	**95.8**	59.9	163.4	11-Jun	39.8	**10**	13.7
MT1257	86.4	87.1	**95.4**		59.7	162.3	10-Jun	37.9	**9**	15.2
MT1265	**105.7**	**93.9**	**99.3**		61.1	163.9	12-Jun	39.2	**6**	12.5
MT1332	**95.9**	**92.3**			60.7	163.0	11-Jun	39.4	**6**	12.8
MT1348	**97.3**	**93.1**			60.1	161.1	9-Jun	37.9	**8**	12.5
MT1354	86.7	84.7			60.7	163.3	11-Jun	38.1	**8**	12.9
MT1356	86.5	86.1			60.4	162.8	11-Jun	37.6	**8**	12.8
MT1443	74.5				60.9	163.6	12-Jun	36.8	14	12.8
MT1444	89.4				59.4	161.9	10-Jun	37.7	**7**	14.5
MT1446	89.6				61.3	162.7	11-Jun	37.6	12	12.6
MT1460	91.6				60.7	162.7	11-Jun	36.0	13	12.3
MT1465	88.3				60.3	162.1	10-Jun	33.8	**7**	14.0
MT1471	94.7				60.0	162.9	11-Jun	36.9	**4**	16.3
MT1478	90.6				59.6	161.1	9-Jun	36.2	13	13.7
MT1488	94.1				**61.8**	163.6	12-Jun	35.7	**10**	12.9
MTCL1131	90.9	88.0	**94.4**	**93.3**	60.7	163.9	12-Jun	39.1	12	13.5
MTS1407	77.9				60.1	162.3	10-Jun	31.3	13	14.3
MTW1491 (HWW)	**108.1**				**62.1**	163.3	11-Jun	38.9	**10**	12.7
R Northern +	84.1	83.6	**88.3**	**89.0**	59.5	163.8	12-Jun	35.8	14	14.5
PSB13NEDH-14-71 (P)	82.3				60.1	159.0	7-Jun	35.5	30	13.5
Rampart	64.9	59.3	69.2	70.5	**62.3**	161.7	10-Jun	38.9	28	13.3
SY Clearstone 2CL (P)+	90.1	86.4	**93.0**	**90.2**	58.8	162.3	10-Jun	38.8	**8**	12.9
SY Monument (P)+	92.9	89.4			57.3	160.8	9-Jun	36.3	**2**	13.6
SY Sunrise (P)+	92.3	**94.4**			60.8	158.3	6-Jun	33.5	12	13.5
R SY Wolf (P)+	80.8	82.0	**88.9**	**91.1**	60.7	160.1	8-Jun	35.3	16	14.4
T158 (P)	**104.8**	**100.1**	**98.2**		**63.1**	156.2	4-Jun	34.2	**2**	13.0
Warhorse +	77.5	73.7	79.6	81.6	59.5	162.0	10-Jun	35.5	**5**	14.2
WB3768 (HWW, P)+	82.8	81.1	**89.1**	**90.0**	60.9	164.8	13-Jun	39.4	**6**	13.1
WB4059CLP (P)+	52.8	54.5	65.6		60.8	157.5	6-Jun	32.8	87	14.8
WB4614 (P)+	67.2	64.6	75.6		60.4	158.4	6-Jun	35.4	23	13.4
WB4623CLP (P)+	**98.4**	85.6			**63.0**	160.9	9-Jun	35.4	**4**	13.0
R WB-Quake (P)+	77.3	71.1	78.3	77.9	61.3	162.8	11-Jun	34.2	17	14.2
R Yellowstone +	95.1	89.8	**96.0**	**95.6**	60.4	163.0	11-Jun	39.9	15	13.1
Average	**79.9**	**76.4**	**82.7**	**81.3**	**60.3**	**161.6**	**10-Jun**	**36.0**	**25.2**	**13.4**
LSD (0.05)	**12.9**	**9.7**	**14.4**	**12.3**	**1.4**	**1.7**		**2.1**	**8.3**	
C.V.	**9.1**	**6.2**	**10.6**	**10.6**	**1.3**	**0.6**		**3.3**	**19.5**	

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)

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

(HWW) = Hard White Winter Wheat

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

		*** Test not planted in 2015 ***							
					2016 Data				
	Cultivar/Line	Grain Yield (bushels/acre)			Test	Heading Date		Plant	Protein
		2016 [1/]	2014//16	2013//16	weight	Ordinal	Calendar	height	
		1y	2y	3y	lb/bu	from Jan1		in	%
	Avery +	**122.5**			62.0	154.0	2-Jun	41.3	10.6
R	**Bearpaw +**	95.0	90.8	81.1	61.6	156.0	4-Jun	39.6	11.5
	Brawl CL Plus +	108.8			**63.6**	150.4	29-May	39.7	11.4
	Broadview (P)	94.4	85.1	78.7	61.3	156.1	4-Jun	40.3	11.2
	Byrd +	108.8			62.0	152.5	1-Jun	40.5	10.7
	BZ9W09-2075 (WB4575) P++	97.7			62.6	155.9	4-Jun	37.1	11.7
	BZ9W09-2212 (WB4483) P++	107.4			61.8	158.1	6-Jun	39.2	10.7
	CDC Falcon (P)+	102.6	95.6	**86.1**	60.9	154.6	3-Jun	37.9	11.3
R	**Colter +**	**115.4**	**107.5**	**93.9**	61.7	157.8	6-Jun	41.3	11.5
	Cowboy +	**116.1**	**103.3**	**94.5**	62.0	154.3	2-Jun	41.3	10.4
R	**Decade +**	97.7	91.6	84.8	61.5	155.0	3-Jun	39.8	11.1
	Freeman +	103.7	**100.3**		59.3	152.1	31-May	39.0	**12.2**
	Jerry	89.8	81.4	74.7	60.7	156.1	4-Jun	46.3	**12.3**
R	**Judee +**	101.7	90.5	80.9	62.6	157.0	5-Jun	38.5	11.3
R	**Keldin (P)+**	113.7	**107.3**		61.6	156.0	4-Jun	37.0	11.5
R	**Loma ++**	110.5	**102.5**		62.2	156.9	5-Jun	38.2	10.9
	MT1138	**119.6**	**104.7**	**92.4**	61.7	156.7	5-Jun	41.8	11.7
	MT1257	114.0	**106.9**		61.2	156.3	4-Jun	42.9	10.7
	MT1265	112.8	**105.3**		61.3	157.4	5-Jun	42.0	11.6
	MT1332	**118.8**			61.8	157.5	6-Jun	41.1	11.5
	MT1348	108.4			61.1	156.1	4-Jun	40.5	**12.4**
	MT1354	**115.2**			62.4	157.5	6-Jun	41.4	10.7
	MT1356	110.5			61.8	156.1	4-Jun	41.9	10.9
	MT1443	111.6			61.8	157.2	5-Jun	39.4	11.3
	MT1444	113.9			61.6	156.1	4-Jun	41.0	10.5
	MT1446	110.4			61.6	157.2	5-Jun	38.5	11.8
	MT1460	108.4			61.7	156.7	5-Jun	40.6	**11.9**
	MT1465	112.0			62.3	155.9	4-Jun	37.2	11.0
	MT1471	100.0			62.0	154.6	3-Jun	39.3	**11.9**
	MT1478	107.4			61.3	154.0	2-Jun	41.5	11.6
	MT1488	106.9			62.3	158.1	6-Jun	39.2	11.0
	MTCL1131	113.1	**104.3**	**90.5**	61.7	156.8	5-Jun	41.7	11.6
	MTS1407	101.6			62.3	158.1	6-Jun	34.9	**12.0**
	MTW1491 (HWW)	**114.8**			62.3	157.1	5-Jun	40.5	11.0
R	**Northern +**	**117.5**	**108.3**	**94.8**	61.8	158.9	7-Jun	39.9	11.7
	PSB13NEDH-14-71 (P)	107.6			62.2	153.1	1-Jun	39.1	11.3
	Rampart	87.7	82.6	72.9	61.9	156.0	4-Jun	43.7	**12.9**
	SY Clearstone 2CL (P)+	112.5	**106.7**	**92.4**	61.3	156.3	4-Jun	42.4	11.1
	SY Monument (P)+	113.4			61.1	154.5	6-Jun	39.7	11.1
	SY Sunrise (P)+	106.4			62.4	154.0	2-Jun	33.7	11.1
R	**SY Wolf (P)+**	**117.9**	**108.6**	**93.9**	**62.9**	154.3	2-Jun	37.5	11.7
	T158 (P)	111.4	**108.0**		62.4	149.9	29-May	38.5	10.6
R	**Warhorse +**	101.8	**98.2**	**86.4**	61.9	156.2	4-Jun	38.5	11.6
	WB3768 (HWW, P)+	111.7	96.6	84.1	62.2	159.2	7-Jun	41.9	11.7
	WB4059CLP (P)+	96.6	83.5		61.4	151.2	30-May	35.7	11.6
	WB4614 (P)+	108.3	89.2		62.1	155.7	4-Jun	38.9	10.5
	WB4623CLP (P)+	102.5			**63.0**	156.5	5-Jun	37.8	**12.2**
R	**WB-Quake (P)+**	95.3	90.1	78.7	62.0	158.1	6-Jun	38.5	11.4
R	**Yellowstone +**	110.2	**104.8**	**91.7**	61.5	157.1	5-Jun	40.3	**12.1**
	Average	**107.9**	**98.2**	**86.3**	**61.8**	**155.8**	**4-Jun**	**39.8**	**11.4**
	LSD (0.05)	**7.8**	**11.6**	**9.7**	**0.7**	**1.6**		**1.7**	**1.0**
	C.V.	**4.2**	**5.7**	**6.7**	**0.7**	**0.6**		**2.5**	**4.9**

bold = indicates highest value within a column 1/ = field sub-irrigated

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

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

(HWW) = Hard White Winter Wheat

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

	Cultivar/Line	Grain Yield (bushels/acre)				2016 Data				
						Test	Heading Date		Plant	Protein
		2016	2015-16	2014-16	2013-16	weight	Ordinal	Calendar	height	
			2 yr	3 yr	4 yr	lb/bu	from Jan1		in	%
	Avery +	61.6				61.3	160.0	8-Jun	32.0	6.7
R	**Bearpaw +**	55.0	56.5	54.2	55.2	62.3	160.9	9-Jun	30.9	8.0
	Brawl CL Plus +	59.0	54.6			**64.5**	157.1	5-Jun	31.7	7.7
	Broadview (P)	47.9	51.9	53.1	53.5	62.4	161.3	9-Jun	32.3	7.8
	Byrd +	63.0	62.2			61.1	158.8	7-Jun	32.2	7.3
	BZ9W09-2075 (WB4575) P++	61.5				**64.1**	159.2	7-Jun	30.8	8.0
	BZ9W09-2212 (WB4483) P++	54.3				61.6	162.3	10-Jun	32.8	8.4
	CDC Falcon (P)+	53.2	53.8	54.6	55.8	62.1	160.7	9-Jun	31.3	8.0
R	**Colter +**	**67.5**	**62.7**	**62.7**	62.0	61.8	161.5	10-Jun	33.3	7.5
	Cowboy +	**67.4**	**65.0**	**62.6**	62.4	61.0	160.5	9-Jun	32.6	7.4
R	**Decade +**	55.0	55.2	55.9	57.3	62.3	160.4	8-Jun	31.1	8.1
	Freeman +	63.2	59.3	59.5		59.9	157.0	5-Jun	31.3	8.0
	Jerry	55.4	57.3	55.3	56.1	61.4	160.7	9-Jun	34.4	7.8
R	**Judee +**	48.7	45.4	46.9	47.3	**63.8**	161.4	9-Jun	32.3	7.6
R	**Keldin (P)+**	**68.5**	**65.0**	**62.2**		62.5	161.1	9-Jun	34.0	7.2
R	**Loma ++**	58.2	56.3	56.7		62.2	162.3	10-Jun	29.8	7.7
	MT1138	**71.0**	**70.0**	**67.9**	**69.0**	61.8	161.4	9-Jun	34.1	7.7
	MT1257	**64.1**	**66.1**	**65.8**		61.7	161.0	9-Jun	33.3	7.4
	MT1265	**65.9**	61.4	61.3		61.5	161.5	10-Jun	33.7	7.8
	MT1332	**68.7**	**63.8**			62.1	161.7	10-Jun	34.2	7.8
	MT1348	**65.8**	**62.7**			62.8	160.0	8-Jun	32.1	7.3
	MT1354	62.3	59.3			62.7	161.6	10-Jun	34.3	7.7
	MT1356	**64.1**	60.4			62.0	161.3	9-Jun	33.0	8.0
	MT1443	58.6				62.5	161.6	10-Jun	31.8	7.9
	MT1444	**66.7**				61.8	161.4	9-Jun	33.9	7.4
	MT1446	55.8				62.8	161.5	10-Jun	31.6	7.7
	MT1460	**68.1**				62.1	161.4	9-Jun	33.9	8.1
	MT1465	**71.7**				62.3	161.5	10-Jun	30.3	8.1
	MT1471	58.9				63.0	161.6	10-Jun	32.2	7.9
	MT1478	62.5				61.5	160.8	9-Jun	33.4	7.8
	MT1488	61.3				62.6	161.9	10-Jun	31.3	8.0
	MTCL1131	63.4	**63.0**	**63.5**	**65.5**	61.9	161.4	9-Jun	35.3	7.4
	MTS1407	56.7				62.9	160.3	8-Jun	28.1	7.9
	MTW1491 (HWW)	**65.1**				61.8	159.7	8-Jun	33.4	7.1
R	**Northern +**	57.4	60.8	59.9	60.3	62.4	161.6	10-Jun	32.6	8.0
	PSB13NEDH-14-71 (P)	60.7				**64.4**	158.0	6-Jun	31.6	7.8
	Rampart	48.6	46.9	46.0	45.8	62.4	161.5	10-Jun	33.5	8.7
	SY Clearstone 2CL (P)+	**65.6**	61.3	61.3	63.7	61.4	161.1	9-Jun	34.2	7.8
	SY Monument (P)+	62.9	61.4			60.7	160.4	8-Jun	32.0	7.1
	SY Sunrise (P)+	61.2	58.5			63.2	159.2	7-Jun	28.3	8.0
R	**SY Wolf (P)+**	63.3	57.9	58.4	57.9	63.2	160.7	9-Jun	32.7	7.6
	T158 (P)	59.7	57.3	58.1		63.0	157.2	5-Jun	30.2	7.6
R	**Warhorse +**	63.6	57.8	55.8	56.9	61.8	161.4	9-Jun	32.1	8.3
	WB3768 (HWW, P)+	59.5	59.5	59.9	60.6	63.4	162.0	10-Jun	34.8	7.7
	WB4059CLP (P)+	61.9	55.4	54.1		62.1	158.5	7-Jun	30.0	8.0
	WB4614 (P)+	53.8	55.6	56.0		62.6	160.7	9-Jun	30.1	7.4
	WB4623CLP (P)+	54.7	51.2			**63.8**	161.8	10-Jun	30.2	8.2
R	**WB-Quake (P)+**	54.5	50.5	49.9	52.1	63.5	162.1	10-Jun	31.8	7.8
R	**Yellowstone +**	63.3	61.3	61.5	62.8	61.8	161.1	9-Jun	32.9	7.6
	Average	**60.8**	**58.5**	**57.8**	**58.0**	**62.3**	**160.7**	**9-Jun**	**32.2**	**7.8**
	LSD (0.05)	**7.8**	**7.7**	**6.0**	**5.0**	**0.9**	**1.1**		**2.3**	
	C.V.	**7.4**	**6.5**	**6.3**	**6.0**	**0.7**	**0.4**		**4.2**	

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)

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

(HWW) = Hard White Winter Wheat

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

Cultivar/Line	Grain Yield (bushels/acre)				2016 Data				
					Test	Heading Date		Plant	Protein
	2016	2015-16	2014-16	2013-16	weight	Ordinal	Calendar	height	
		2 yr	3 yr	4 yr	lb/bu	from Jan1		in	%
Avery +	**105.4**				**63.5**	156.0	4-Jun	35.5	10.3
R **Bearpaw +**	95.4	81.2	86.9	85.8	62.5	159.0	7-Jun	34.5	12.1
Brawl CL Plus +	93.2	**89.5**			**63.9**	153.0	1-Jun	35.3	**13.3**
R **Broadview (P)**	96.2	86.9	**94.4**	93.3	62.6	159.7	8-Jun	34.6	11.3
Byrd +	99.6	87.0			62.4	154.0	2-Jun	32.8	10.8
BZ9W09-2075 (WB4575) P++	97.0				**64.4**	157.3	5-Jun	32.3	12.1
BZ9W09-2212 (WB4483) P++	**102.3**				61.3	159.7	8-Jun	33.1	11.7
CDC Falcon (P)+	88.3	85.1	91.5	89.6	61.8	158.0	6-Jun	29.8	10.9
R **Colter +**	98.1	**88.9**	**95.0**	94.9	62.2	160.3	8-Jun	35.0	11.7
Cowboy +	**101.7**	**92.7**	**99.9**	**99.4**	60.2	157.3	5-Jun	33.9	10.1
R **Decade +**	95.7	84.3	92.7	91.9	62.4	157.7	6-Jun	34.8	11.5
Freeman +	86.4	**87.9**	94.1		60.8	154.7	3-Jun	31.8	11.8
Jerry	83.7	79.2	85.3	84.2	61.6	159.7	8-Jun	37.4	11.2
R **Judee +**	89.5	76.3	83.4	82.2	**63.5**	159.0	7-Jun	33.2	**12.6**
R **Keldin (P)+**	**109.4**	**99.6**	**104.9**		**63.3**	157.7	6-Jun	34.2	10.8
R **Loma ++**	96.1	**88.4**	**94.9**		60.2	161.7	10-Jun	34.0	11.9
MT1138	**111.2**	**94.0**	**102.8**	**102.0**	60.8	159.0	7-Jun	35.8	11.7
MT1257	94.8	**88.6**	**98.6**		62.1	159.0	7-Jun	35.7	**12.6**
MT1265	99.7	**90.1**	**99.9**		62.7	159.7	8-Jun	35.9	11.6
MT1332	97.0	**92.2**			62.3	159.0	7-Jun	36.1	11.6
MT1348	**101.3**	**95.6**			**63.3**	158.3	6-Jun	33.8	11.4
MT1354	**104.4**	**88.5**			62.2	160.3	8-Jun	34.7	11.8
MT1356	96.6	**91.9**			62.1	159.3	7-Jun	35.0	12.2
MT1443	**102.0**				**63.7**	160.3	8-Jun	35.8	11.8
MT1444	**105.3**				**63.0**	158.7	7-Jun	34.7	11.3
MT1446	95.0				**63.3**	160.0	8-Jun	34.0	11.6
MT1460	**108.6**				**63.2**	160.0	8-Jun	35.7	11.5
MT1465	**104.2**				62.6	158.3	6-Jun	32.7	11.8
MT1471	**103.3**				**62.9**	159.3	7-Jun	34.3	12.2
MT1478	99.9				**63.0**	158.0	6-Jun	34.2	11.5
MT1488	**100.1**				60.9	160.0	8-Jun	35.7	11.2
MTCL1131	**103.3**	**96.2**	**102.0**	**102.3**	62.4	160.0	8-Jun	37.1	11.8
MTS1407	**101.7**				**63.1**	158.3	6-Jun	29.4	12.5
MTW1491 (HWW)	**101.4**				**63.1**	159.7	8-Jun	34.1	11.7
R **Northern +**	**103.5**	**95.7**	**102.1**	**100.1**	61.6	161.0	9-Jun	34.9	11.7
PSB13NEDH-14-71 (P)	92.0				62.7	155.7	4-Jun	32.1	12.0
Rampart	91.3	75.4	83.5	81.5	62.4	159.7	8-Jun	38.1	**13.0**
SY Clearstone 2CL (P)+	97.7	**90.4**	**96.4**	96.1	62.7	157.7	6-Jun	35.6	11.8
SY Monument (P)+	**111.2**	**97.6**			61.9	158.0	6-Jun	33.8	10.9
SY Sunrise (P)+	90.6	86.5			**63.5**	155.7	4-Jun	30.5	11.8
R **SY Wolf (P)+**	**109.5**	**100.2**	**104.0**	**100.8**	**64.5**	157.3	5-Jun	32.8	11.4
T158 (P)	95.5	**89.5**	93.1		**64.0**	153.0	1-Jun	32.0	11.8
R **Warhorse +**	84.6	71.4	78.2	78.6	62.1	159.3	7-Jun	31.6	12.1
WB3768 (HWW, P)+	98.8	86.9	**97.1**	**97.4**	62.1	161.0	9-Jun	37.8	11.7
WB4059CLP (P)+	88.7	77.1	73.8		62.7	153.3	1-Jun	31.4	**12.9**
WB4614 (P)+	**107.4**	**91.5**	**94.4**		**63.6**	157.3	5-Jun	33.3	11.6
WB4623CLP (P)+	96.6	81.9			62.3	159.0	7-Jun	33.1	**12.6**
R **WB-Quake (P)+**	87.9	71.1	79.8	79.3	**63.2**	160.7	9-Jun	33.0	12.3
R **Yellowstone +**	**102.3**	**92.7**	**100.9**	**99.6**	61.9	156.7	5-Jun	36.2	11.7
Average	**98.5**	**87.7**	**93.4**	**92.2**	**62.5**	**158.3**	**6-Jun**	**34.1**	**11.7**
LSD (0.05)	**11.9**	**13.0**	**10.5**	**6.1**	**1.7**	**1.8**		**2.0**	**0.8**
C.V.	**7.0**	**7.3**	**6.9**	**4.7**	**1.5**	**0.7**		**3.3**	**3.8**

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)

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

(HWW) = Hard White Winter Wheat

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

Cultivar/Line	Grain Yield (bushels/acre)				2016 Data				
					Test	Heading Date		Plant	Protein
	2016	2015-16	2014-16	2013-16	weight	Ordinal	Calendar	height	
		2 yr	3 yr	4 yr	lb/bu	from Jan1		in	%
Avery +	**103.3**				59.2	153.8	2-Jun	41.6	9.3
R **Bearpaw +**	64.1	62.1	59.2	61.6	57.3	156.1	4-Jun	36.1	10.4
Brawl CL Plus +	89.7	71.0			**61.0**	149.1	28-May	41.1	11.1
R **Broadview (P)**	83.4	**76.5**	**71.7**	**71.1**	59.4	156.5	5-Jun	40.2	11.0
Byrd +	**101.8**	**86.2**			58.8	150.1	29-May	40.3	10.1
BZ9W09-2075 (WB4575) P++	75.8				59.3	155.5	4-Jun	38.0	10.1
BZ9W09-2212 (WB4483) P++	87.6				59.1	158.2	6-Jun	37.8	10.2
CDC Falcon (P)+	87.3	**76.8**	**71.2**	68.0	59.8	155.5	4-Jun	37.6	10.1
R **Colter +**	94.7	**79.9**	**73.6**	**71.2**	59.4	158.1	6-Jun	38.7	10.2
Cowboy +	**99.4**	**85.6**	**78.9**	**79.9**	59.0	155.2	3-Jun	39.4	10.1
R **Decade +**	80.7	70.1	65.4	65.9	57.8	155.9	4-Jun	38.6	10.0
Freeman +	**110.5**	**84.0**	**74.4**		59.5	149.5	29-May	41.1	10.1
Jerry	69.9	64.4	59.8	60.8	57.7	156.0	4-Jun	43.5	10.2
R **Judee +**	85.2	72.9	**68.9**	69.9	**61.3**	156.7	5-Jun	38.3	9.8
R **Keldin (P)+**	**107.8**	**84.6**	**75.6**		**61.2**	156.0	4-Jun	38.3	10.6
R **Loma ++**	80.8	68.2	62.4		58.6	158.2	6-Jun	36.7	10.2
MT1138	**102.3**	**83.9**	**76.2**	**73.6**	59.7	156.3	4-Jun	42.3	10.3
MT1257	**103.0**	**83.6**	**76.6**		59.3	156.1	4-Jun	40.8	10.1
MT1265	**107.0**	**82.7**	**74.8**		60.1	157.2	5-Jun	40.7	10.2
MT1332	**104.2**	**85.3**			59.8	156.9	5-Jun	40.6	10.0
MT1348	**110.2**	**88.8**			60.7	155.1	3-Jun	40.8	11.6
MT1354	**99.2**	**82.5**			60.7	157.0	5-Jun	39.6	10.1
MT1356	94.0	**78.7**			60.3	157.0	5-Jun	40.6	10.2
MT1443	96.7				59.7	157.0	5-Jun	38.6	10.4
MT1444	**100.2**				59.8	157.1	5-Jun	42.4	10.5
MT1446	**108.7**				60.6	157.1	5-Jun	39.5	10.3
MT1460	**99.9**				60.3	156.5	5-Jun	41.6	10.4
MT1465	**98.7**				59.9	156.2	4-Jun	38.2	11.2
MT1471	96.0				60.4	156.3	4-Jun	38.7	11.2
MT1478	**105.6**				59.3	155.5	4-Jun	42.6	10.9
MT1488	97.7				60.0	157.0	5-Jun	38.9	10.7
MTCL1131	97.3	**77.5**	**70.7**	71.0	59.8	157.0	5-Jun	42.9	10.7
MTS1407	92.4				60.4	156.3	4-Jun	35.2	10.5
MTW1491 (HWW)	**110.3**				60.0	157.3	5-Jun	40.4	10.1
R **Northern +**	**103.8**	**82.5**	**75.7**	**75.4**	59.2	157.8	6-Jun	39.0	10.8
PSB13NEDH-14-71 (P)	76.6				**61.1**	153.8	2-Jun	38.1	10.9
Rampart	81.1	70.6	65.9	66.1	60.8	156.1	4-Jun	43.3	10.7
SY Clearstone 2CL (P)+	98.4	**78.2**	**71.6**	**72.4**	59.5	157.3	5-Jun	41.7	10.4
SY Monument (P)+	**103.3**	**84.6**			59.6	155.3	3-Jun	39.0	10.3
SY Sunrise (P)+	92.8	**78.5**			**61.0**	153.9	2-Jun	37.0	10.5
R **SY Wolf (P)+**	97.8	**78.9**	**76.2**	**75.1**	**61.4**	154.7	3-Jun	39.2	10.4
T158 (P)	92.0	**73.9**	**71.5**		**61.4**	148.5	28-May	40.4	10.1
R **Warhorse +**	89.8	**75.1**	66.0	67.0	60.4	158.0	6-Jun	39.7	10.7
WB3768 (HWW, P)+	**100.6**	**81.8**	**73.0**	**72.6**	60.8	158.5	7-Jun	41.0	10.6
WB4059CLP (P)+	74.4	61.4	59.2		59.4	150.3	29-May	37.4	9.9
WB4614 (P)+	97.5	**78.7**	**72.1**		**61.1**	157.2	5-Jun	38.5	9.6
WB4623CLP (P)+	84.9	70.0			**61.7**	156.7	5-Jun	37.9	10.2
R **WB-Quake (P)+**	87.4	72.3	63.7	65.6	60.0	157.3	5-Jun	38.7	10.8
R **Yellowstone +**	**103.6**	**84.4**	**77.0**	**74.5**	59.4	156.2	4-Jun	41.5	10.6
Average	**94.5**	**77.6**	**70.4**	**70.1**	**59.9**	**155.7**	**4-Jun**	**39.7**	**10.4**
LSD (0.05)	**11.9**	**15.0**	**11.4**	**8.8**	**0.7**	**0.9**		**2.6**	**ns**
C.V.	**7.2**	**9.5**	**9.9**	**8.7**	**0.7**	**0.3**		**4.1**	**5.7**

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)

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

(HWW) = Hard White Winter Wheat

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

	*** Test not planted 2013-2015 ***				
		2016 Data			
Cultivar/Line	Grain Yield (bushels/acre)	Test weight	Plant height	Sawfly cutting	Protein
	2016				
	1y	lb/bu	in	%	%
Avery +	**85.8**	61.8	37.5	43	10.4
R Bearpaw +	43.3	59.0	36.0	**8**	11.8
Brawl CL Plus +	74.6	62.3	35.5	43	11.9
R Broadview (P)	68.2	60.8	36.5	65	11.8
Byrd +	**78.5**	62.2	36.0	68	10.5
BZ9W09-2075 (WB4575) P++	64.8	**63.3**	33.5	**8**	12.0
BZ9W09-2212 (WB4483) P++	57.3	59.6	33.0	**10**	10.7
CDC Falcon (P)+	65.2	61.8	34.0	**23**	10.3
R Colter +	65.6	60.9	35.0	35	11.4
Cowboy +	66.7	60.9	36.5	30	10.3
R Decade +	57.4	60.0	36.5	**12**	10.8
Freeman +	68.2	60.6	35.5	43	11.3
Jerry	60.1	60.3	39.0	43	11.3
R Judee +	53.7	62.1	34.5	**6**	12.1
R Keldin (P)+	**78.9**	62.3	35.5	**25**	11.5
R Loma ++	46.9	58.7	33.5	**8**	10.4
MT1138	65.6	60.4	36.5	27	10.0
MT1257	67.2	60.0	35.5	32	10.6
MT1265	77.3	62.1	37.0	**18**	11.4
MT1332	68.0	60.7	38.5	**15**	10.7
MT1348	69.2	61.5	36.5	32	11.6
MT1354	55.2	61.1	36.5	28	10.8
MT1356	67.1	59.9	36.0	38	11.0
MT1443	63.2	59.2	36.0	**18**	11.4
MT1444	72.9	60.6	35.0	**17**	11.4
MT1446	63.2	60.9	36.0	28	11.5
MT1460	60.0	60.3	35.0	50	11.7
MT1465	60.0	60.1	33.5	**12**	11.4
MT1471	73.9	61.4	35.5	**22**	11.2
MT1478	70.3	59.8	35.0	38	11.3
MT1488	47.1	59.9	35.5	38	10.9
MTCL1131	61.1	60.2	39.5	**17**	10.7
MTS1407	49.5	60.1	31.5	**6**	11.5
MTW1491 (HWW)	66.3	60.3	34.0	42	11.0
R Northern +	58.7	59.7	35.5	**8**	11.0
PSB13NEDH-14-71 (P)	68.3	62.5	35.5	35	11.8
Rampart	47.8	60.9	40.5	**5**	11.4
SY Clearstone 2CL (P)+	62.1	60.1	39.0	**23**	10.5
SY Monument (P)+	70.2	60.7	35.5	28	10.7
SY Sunrise (P)+	75.8	**63.0**	32.5	53	11.5
R SY Wolf (P)+	76.3	**63.5**	34.5	**17**	10.7
T158 (P)	75.0	**62.9**	35.5	67	11.6
R Warhorse +	46.3	60.9	35.0	**1**	11.0
WB3768 (HWW, P)+	55.9	61.6	39.5	30	10.9
WB4059CLP (P)+	70.5	62.2	33.0	**23**	11.3
WB4614 (P)+	74.7	62.1	33.0	**25**	10.7
WB4623CLP (P)+	59.5	62.1	35.0	37	11.6
R WB-Quake (P)+	42.2	59.7	35.0	**6**	11.7
R Yellowstone +	63.7	60.2	37.0	**20**	10.8
Average	**64.1**	**61.0**	**35.7**	**27.1**	**11.1**
LSD (0.05)	**8.5**	**0.8**	**2.0**	**24.8**	
C.V.	**7.6**	**0.8**	**2.8**	**56.4**	

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)

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

(HWW) = Hard White Winter Wheat

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

		*** No harvest in 2013 due to severe hail prior to harvest ***			
		2014, 2015 = severe winter-kill, no harvest	2016 Data		
	Cultivar/Line	Grain Yield (bushels/acre)	Test weight	Plant height	Protein
		2016			
		1y	lb/bu	in	%
	Avery +	**85.8**	61.8	35.4	8.1
	Bearpaw +	43.3	59.0	34.1	9.6
	Brawl CL Plus +	74.6	62.3	36.7	11.5
R	**Broadview (P)**	68.2	60.8	36.8	11.3
	Byrd +	**78.5**	62.2	35.8	8.3
	BZ9W09-2075 (WB4575) P++	64.8	**63.3**	35.0	11.0
	BZ9W09-2212 (WB4483) P++	57.3	59.6	35.0	12.1
	CDC Falcon (P)+	65.2	61.8	35.1	10.3
	Colter +	65.6	60.9	37.1	10.5
	Cowboy +	66.7	60.9	34.9	8.7
R	**Decade +**	57.4	60.0	34.3	11.2
	Freeman +	68.2	60.6	37.2	9.5
R	**Jerry**	60.1	60.3	39.9	12.3
	Judee +	53.7	62.1	33.4	10.3
	Keldin (P)+	**78.9**	62.3	36.0	10.7
R	**Loma ++**	46.9	58.7	35.2	**14.0**
	MT1138	65.6	60.4	38.5	9.5
	MT1257	67.2	60.0	38.5	9.2
	MT1265	77.3	62.1	38.7	8.8
	MT1332	68.0	60.7	38.0	9.4
	MT1348	69.2	61.5	36.8	8.3
	MT1354	55.2	61.1	39.1	10.6
	MT1356	67.1	59.9	38.4	9.7
	MT1443	63.2	59.2	36.6	11.0
	MT1444	72.9	60.6	38.0	10.2
	MT1446	63.2	60.9	36.7	9.4
	MT1460	60.0	60.3	38.2	10.3
	MT1465	60.0	60.1	36.9	9.5
	MT1471	73.9	61.4	36.8	12.2
	MT1478	70.3	59.8	39.2	10.6
	MT1488	47.1	59.9	34.6	10.9
	MTCL1131	61.1	60.2	38.6	10.5
	MTS1407	49.5	60.1	32.5	11.5
	MTW1491 (HWW)	66.3	60.3	37.1	9.5
	Northern +	58.7	59.7	35.6	10.8
	PSB13NEDH-14-71 (P)	68.3	62.5	36.0	9.9
	Rampart	47.8	60.9	37.5	11.0
	SY Clearstone 2CL (P)+	62.1	60.1	37.9	9.2
	SY Monument (P)+	70.2	60.7	35.6	10.3
	SY Sunrise (P)+	75.8	**63.0**	35.7	10.7
	SY Wolf (P)+	76.3	**63.5**	36.7	10.7
	T158 (P)	75.0	**62.9**	34.6	8.8
	Warhorse +	46.3	60.9	33.9	11.3
	WB3768 (HWW, P)+	55.9	61.6	38.6	10.0
	WB4059CLP (P)+	70.5	62.2	32.9	10.7
	WB4614 (P)+	74.7	62.1	34.3	8.7
	WB4623CLP (P)+	59.5	62.1	34.5	11.6
R	**WB-Quake (P)+**	42.2	59.7	35.1	11.9
	Yellowstone +	63.7	60.2	37.1	9.2
	Average	**64.1**	**61.0**	**36.4**	**10.3**
	LSD (0.05)	**8.5**	**0.8**	**2.0**	**1.1**
	C.V.	**7.6**	**0.8**	**3.2**	**6.0**

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)

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

(HWW) = Hard White Winter Wheat

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

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

Cultivar/Line	Grain Yield (bushels/acre)			2016 Data				
				Test	Heading Date		Plant	Protein
	2016	2015-16	2013//16	weight	Ordinal	Calendar	height	
	1y	2y	3y	lb/bu	from Jan1		in	%
Avery +	**55.4**			58.4	147.0	26-May	21.7	11.9
Bearpaw +	45.4	44.2	45.6	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
Broadview (P)	48.7	53.4	53.2	57.4	148.7	28-May	22.6	12.3
Byrd +	**58.7**	54.0		58.3	146.3	25-May	23.8	9.7
BZ9W09-2075 (WB4575) P++	51.5			**59.9**	147.7	27-May	23.6	11.3
BZ9W09-2212 (WB4483) P++	50.9			58.5	150.7	30-May	23.4	11.4
CDC Falcon (P)+	45.4	50.1	48.7	57.3	147.7	27-May	19.2	13.6
Colter +	**56.2**	52.3	**60.2**	59.2	150.7	30-May	26.5	12.5
Cowboy +	51.2	40.0	44.4	57.9	147.0	26-May	21.2	11.3
Decade +	49.8	48.8	51.5	58.3	147.7	27-May	21.7	11.2
Freeman +	49.0	47.0		56.2	145.7	25-May	22.7	10.7
Jerry	43.3	47.8	**53.6**	56.8	149.7	29-May	22.4	13.7
Judee +	46.7	37.3	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
Loma ++	47.8	50.0		58.6	150.7	30-May	23.9	11.9
MT1138	**61.8**	57.1	**60.2**	59.0	148.3	27-May	27.0	10.9
MT1257	53.0	52.3		58.3	150.3	29-May	25.6	13.1
MT1265	**60.4**	54.4		58.9	147.7	27-May	27.2	11.1
MT1332	**58.2**	57.8		59.1	147.3	26-May	25.8	10.8
MT1348	**57.5**	48.0		59.2	147.0	26-May	24.2	12.1
MT1354	50.7	51.4		59.1	149.3	28-May	23.8	11.9
MT1356	**58.1**	54.4		58.3	148.3	27-May	26.6	10.0
MT1443	52.0			**59.5**	147.7	27-May	24.1	10.7
MT1444	**56.8**			58.8	148.3	27-May	25.5	9.3
MT1446	48.4			59.3	147.7	27-May	24.7	13.0
MT1460	**53.3**			57.9	147.7	27-May	24.6	12.1
MT1465	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
MT1478	**62.4**			57.7	147.0	26-May	25.5	12.1
MT1488	48.9			**59.8**	150.3	29-May	21.5	12.3
MTCL1131	**60.1**	57.8	**61.8**	58.7	150.3	29-May	28.3	10.8
MTS1407	48.7			58.1	147.7	27-May	21.0	11.5
MTW1491 (HWW)	**62.5**			58.3	150.3	29-May	26.6	9.7
Northern +	50.3	50.4	**54.1**	59.2	149.7	29-May	20.5	12.7
PSB13NEDH-14-71 (P)	47.1			**59.6**	146.7	26-May	20.3	10.7
Rampart	**53.2**	43.1	45.4	58.1	147.3	26-May	24.2	11.2
SY Clearstone 2CL (P)+	**53.1**	49.4	49.7	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	49.3	**59.6**	146.7	26-May	23.6	11.1
T158 (P)	48.7	42.2		57.8	146.3	25-May	18.3	12.7
Warhorse +	41.0	40.9	45.4	58.9	150.7	30-May	18.8	13.9
WB3768 (HWW, P)+	**55.1**	54.2	**56.9**	59.0	148.3	27-May	25.6	12.0
WB4059CLP (P)+	**54.1**	37.9		57.5	146.7	26-May	19.5	12.5
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	52.2	58.3	150.3	29-May	24.3	11.6
Yellowstone +	**58.6**	61.4	**64.4**	58.4	147.7	27-May	26.8	10.6
Average	**51.8**	**48.0**	**51.9**	**57.4**	**148.1**	**27-May**	**23.4**	**11.6**
LSD (0.05)	**9.4**	**ns**	**10.9**	**0.5**	**0.9**		**3.3**	**ns**
C.V.	**10.7**	**18.4**	**12.6**	**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)

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

(HWW) = Hard White Winter Wheat

Table 12. 2007//2015 Intrastate Winter Wheat Test (Exp. 35): Combined Locations Winter Survival and associated Yield (Locations: Williston (2007-2008, 2012, 2013, 2015), Sidney (2008, 2010, 2011) = 8 locations
***** No differential Winterkill, with a harvest, in 2009, 2014, and 2016 *****

	Winter Survival (%)							Yield under Winterkill conditions						
	2015	2013-15	2012-15	2011-15	2010-15	2008-15	2007-15	2015	2013-15	2012-15	2011-15	2010-15	2008-15	2007-15
location-years	1	2	3	4	5	7	8	1	2	3	4	5	7	8
Avery +														
Bearpaw +	73	47	40	45	45			42.9	45.7	46.0	48.2	48.4		
Brawl CL Plus +	53							25.5						
Broadview (P)	**95**	**63**	**60**	**60**	**62**			**58.1**	**55.5**	**57.8**	**57.3**	**59.3**		
Byrd +	**88**							49.3						
BZ9W09-2075 (WB4575) P++														
BZ9W09-2212 (WB4483) P++														
CDC Falcon (P)+	**94**	**63**	**59**	**61**	**62**	**53**	**56**	**54.8**	50.3	**53.4**	**54.3**	**55.6**	**49.5**	**52.7**
Colter +	**90**	**67**	**51**	**52**				48.4	**62.2**	**55.4**	**58.2**			
Cowboy +	28	21						28.7	41.0					
Decade +	**78**	**53**	**51**	**57**	**57**	**52**	**55**	47.7	52.4	**49.4**	**53.3**	**54.7**	**48.2**	**51.9**
Freeman +	73							45.0						
Jerry	**98**	**72**	**61**	**63**	**64**	**56**	**60**	**52.3**	**58.8**	**57.1**	**59.9**	**60.7**	**53.7**	**56.5**
Judee +	40	27	20	27	33	27		27.9	32.7	28.9	32.8	36.6	30.0	
Keldin (P)+	28							28.1						
Loma ++	**95**							**52.1**						
MT1138	**90**	**58**						**52.4**	**59.4**					
MT1257	**85**							**51.5**						
MT1265	**88**							48.4						
MT1332	**90**							**57.3**						
MT1348	53							38.4						
MT1354	**90**							**52.1**						
MT1356	**78**							**50.6**						
MT1443														
MT1444														
MT1446														
MT1460														
MT1465														
MT1471														
MT1478														
MT1488														
MTCL1131	**80**	**64**						**55.4**	**62.6**					
MTS1407														
MTW1491 (HWW)														
Northern +	**85**	**57**	42	49				50.5	**56.0**	**51.1**	**55.4**			
PSB13NEDH-14-71 (P)														
Rampart	70	46	37	40	38	29	31	33.0	41.5	39.6	41.6	41.4	32.2	34.5
SY Clearstone 2CL (P)+	73	47	35					45.7	48.0	44.8				
SY Monument (P)+	75							40.8						
SY Sunrise (P)+	36							24.2						
SY Wolf (P)+	55	39	28	33				35.9	44.7	38.9	43.9			
T158 (P)	60							35.6						
Warhorse +	**78**	**55**	45	50	49			40.8	47.6	47.3	50.3	51.3		
WB3768 (HWW, P)+	**90**	**63**	**51**	49				**53.2**	**57.9**	**56.2**	**58.2**			
WB4059CLP (P)+	30							21.6						
WB4614 (P)+	**78**							43.9						
WB4623CLP (P)+	16							14.4						
WB-Quake (P)+	75	52	41	45	46			47.3	53.4	**51.4**	51.8	51.3		
Yellowstone +	**93**	**65**	**50**	**51**	51	42	44	**64.2**	**67.4**	**59.5**	**61.5**	**61.6**	**51.3**	**53.8**
Average	**71.4**	**52.0**	**42.6**	**47.5**	**49.0**	**40.5**	**45.1**	**43.2**	**51.2**	**47.9**	**50.7**	**50.7**	**41.9**	**46.5**
LSD (0.05)	**21.8**	**20.3**	**14.4**	**12.6**	**10.5**	**9.0**	**6.9**	**13.7**	**13.7**	**11.7**	**9.5**	**7.7**	**6.4**	**5.6**
C.V.	**15.2**	**18.8**	**20.5**	**18.7**	**16.8**	**20.5**	**15.1**	**15.8**	**12.9**	**14.7**	**13.1**	**12.0**	**14.2**	**11.9**

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

Table 13. HARD WINTER WHEAT: Yield Performance under Sawfly Pressure and % Sawfly Cutting (2011//2016)
(Note: Sawfly cutting in each location-year >10%)

	No Sawfly Cutting >10% in 2014									
Cultivar/Line	Grain Yield (bu/a)					Sawfly Cutting (%)				
	2016	2015-16	2013//16	2012//16	2011//16	2016	2015-16	2013//16	2012//16	2011//16
Location-years	2	3	5	8	10	2	3	5	8	10
Bearpaw + (ss)	65.2	60.4	61.4	52.4	52.2	**10**	**9**	**10**	**11**	**10**
Broadview (P)	73.9	65.4				61	43			
CDC Falcon (P)+	75.7	68.2	**66.2**	54.8	**55.0**	57	39	27	31	28
Colter +	75.5	64.1	63.0	53.3		66	52	40	42	
Cowboy +	78.8					63				
Decade +	78.1	67.6	**65.8**	55.7	**55.1**	**32**	**22**	20	26	24
Jerry	61.4	56.0	57.3	47.9	48.9	68	50	36	39	36
Judee + (ss)	90.0	74.4	**72.3**	**59.3**	**58.9**	**26**	**18**	**18**	**16**	**14**
Keldin (P)+	97.4					54				
Loma ++ (ss)	80.5	69.0				**16**	**15**			
MT1138	78.5	68.3				46	36			
MT1257	76.6	66.6				60	49			
MT1265	81.4	71.9				50	39			
MT1332	80.5					56				
MT1348	84.2					63				
MT1354	68.2					43				
MT1356	75.7					48				
Northern +	80.3	71.9	**72.6**			**23**	**20**	**17**		
Rampart (ss)	62.1	57.0	58.9	48.4	48.6	**21**	**14**	**13**	**12**	**10**
SY Clearstone 2CL (P)+	93.1	78.5	**74.6**	**63.3**		49	39	30	34	
SY Wolf (P)+	87.0	74.6				**35**	26			
Warhorse + (ss)	72.0	62.8	63.9	55.2	**54.1**	**1**	**0**	**2**	**3**	**3**
WB3768 (HWW, P)+	79.0	69.0	**67.9**			64	52	40		
WB-Quake (P)+ (ss)	74.9	64.6	**65.9**	53.5	**54.7**	**24**	**17**	**18**	**14**	**13**
Yellowstone +	86.7	73.2	**70.7**	**58.7**	**58.1**	50	39	28	34	31
Average	**78.2**	**67.6**	**66.2**	**54.8**	**54.0**	**43**	**30**	**23**	**24**	**19**
LSD (0.05)	**ns**	**ns**	**9.3**	**6.8**	**5.6**	**34**	**25**	**17**	**16**	**13**
C.V. (%)	**11.5**	**12.3**	**11.1**	**12.4**	**11.7**	**39**	**50**	**60**	**66**	**75**

bold = indicates highest value within a column (ss) = solid-stemmed sawfly resistant variety

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

Table 14. Precipitation (top, in inches) and Average Monthly Temperature (bottom, °F) for Crop Year 2015-2016

Agricultural Research Center	Sept. 2015	Oct. 2015	Nov. 2015	Dec. 2015	Jan. 2016	Feb. 2016	Mar. 2016	Apr. 2016	May 2016	June 2016	July 2016	Aug 2016	Total Average
Western Triangle, Conrad	**2.99**	**1.17**	**0.82**	**0.67**	**2.36**	**0.00**	**0.20**	**2.06**	**2.09**	**0.60**	**2.82**	**1.11**	**16.89**
				1987-2016 Average = 11.71 (Temp = 43.7)									
	55.7	47.5	31.0	24.2	23.5	36.1	37.6	45.1	49.9	61.3	64.7	63.3	44.9
Northern, Havre	**2.08**	**1.93**	**0.46**	**0.33**	**0.13**	**0.02**	**0.44**	**3.92**	**4.10**	**1.69**	**2.53**	**1.23**	**18.86**
				1916-2016 Average = 12.10 (Temp = 42.9)									
	56.8	47.4	31.6	23.1	19.1	35.2	39.4	46.4	52.7	63.0	68.1	66.2	45.8
Northwestern, Kalispell	**0.96**	**0.79**	**1.00**	**2.16**	**1.42**	**1.01**	**0.97**	**1.50**	**2.78**	**2.07**	**1.55**	**1.11**	**17.32**
				1980-2015 Average = 20.13 (Temp = 43.3)									
	52.8	46.6	31.2	27.0	27.4	33.2	37.2	47.8	51.4	58.4	62.6	62.7	44.9
Central, Moccasin[1/]	**0.83**	**0.61**	**0.47**	**0.40**	**0.28**	**0.26**	**0.58**	**1.24**	**4.54**	**1.02**	**1.68**	**na**	***12.13+***
				1911-2016 Average = 15.37 (Temp = 43.3)									
	57.8	48.7	32.8	27.2	28.1	35.8	32.5	45.3	50.4	61.7	na	na	na
Southern, Huntley	**0.26**	**1.97**	**0.50**	**0.50**	**0.25**	**0.11**	**1.30**	**1.41**	**2.49**	**0.86**	**0.46**	**1.57**	**11.68**
				1911-2016 Average = 13.42 (Temp = 45.6)									
	58.3	50.7	28.8	26.2	26.0	30.6	44.0	46.7	53.8	66.0	71.2	68.7	47.6
Northeastern, Sidney	**2.64**	**0.40**	**0.31**	**0.17**	**0.10**	**0.57**	**0.17**	**3.50**	**2.06**	**1.40**	**2.72**	**0.74**	**15.73**
				1949-2015 Average = 14.10 (Temp = 43.3)									
	57.8	49.5	32.5	24.1	20.3	32.6	38.6	46.3	57.1	67.5	71.0	68.3	47.2
Williston (WREC), N. Dakota	**2.45**	**1.64**	**0.23**	**0.28**	**0.04**	**0.32**	**0.04**	**2.47**	**2.07**	**1.97**	**2.68**	**0.51**	**9.70**
				1990-2016 Average = 14.70 (Temp = 44.2)									
	63.8	51.4	32.8	23.4	18.3	31.1	40.6	47.9	59.5	68.0	72.0	72.6	48.4
Northern Seeds, Carter/Ft. Benton	**1.51**	**0.74**	**1.03**	**0.52**	**0.70**	**0.06**	**0.73**	**2.63**	**2.37**	**1.43**	**1.87**	**1.39**	**14.98**
				2008-2016 Average = 13.56 (Temp = 45.2)									
	58.2	48.7	33.1	24.7	22.7	37.9	39.9	47.9	53.4	64.5	69.5	66.9	47.3
Post Farm, Bozeman	**1.32**	**1.72**	**1.50**	**1.09**	**0.34**	**0.14**	**1.30**	**1.33**	**2.71**	**0.77**	**1.21**	**0.87**	**14.30**
				1958-2016 Average = 15.80 (Temp = 43.6)									
	57.1	50.8	28.4	26.6	27.2	34.9	42.9	43.9	51.0	64.5	66.3	67.1	46.7

1/ = August rainfall, and July and August temperatures are missing for 2016 at Moccasin

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
Avery	M-E	White	-	S		N		-	-	-	S	S	-	-
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	-	-
Broadview	M	White	5	S		N	S	3	3	H	S	S	R	R
Byrd	E	White	4	S		N	-	3	3	H	S	S	-	-
CDC Falcon	M	White	4	S	6	N	S	3	3	H	S	S	MR	R
Colter	M	White	4	S		N	S	3	4	M	S	R	R	S
Cowboy	M	White	2	S		N	M	2	2	M	S	S	R	-
Decade	M	White	4	S		N	M	3	4	H	S	S	R	MS
Freeman	E	White	3	S		N	-	2	2	H	S	R	-	-
Jerry	M	White	5	M		N	M	3	3	H	S	S	R	R
Judee	M	White	2	M	20	N	L	3	4	H	S	R	S	S
Keldin	M	White	2	S		N	S	3	3	H	S	R	-	-
Loma	M-L	White	4	M	18	N	S	4	4	ML	S	R	R	-
Northern	M	White	3	S		N	S	3	3	L	S	R	R	-
Rampart	M	Brown	2	MW	21	N	L	4	5	M	S	R	MR	S
SY Clearsone 2CL	M	White	3	S		Y	S	3	3	M	R	R	MR	-
SY Monument	M	White	3	S		N	M	3	3	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	-
T158	E	White	3	S		N	-	3	2	H	S	R	-	-
Warhorse	M	White	4	MS	22	N	M	3	3	H	S	R	R	MR
WB3768 (HWW)	L	White	3	M		N	M	3	3	L	MR	R	R	-
WB4059CLP	E	White	2	S		Y	-	3	3	H	S	VS	-	-
WB4483	L	White	-	S	20	N	S	-	-	-	S	MS	-	-
WB4575	M	White	-	S		N	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

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

6/ 5 = Superior
4
3
2
1 = Inferior

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

4/ scored 5-25, 25 = most solid
Combined 2011-2015 Bozeman, Conrad, Havre, Loma, and Moccasin data; varieties with no number were not evaluated

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 2017 Bulletin:

Avery – hard red winter wheat developed by Colorado and released in 2015. Avery is an early to medium heading, medium statured, white chaffed variety. Avery has average yield and below average test weight and protein. Avery is susceptible to stripe rust. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V has been issued (Certificate #201600244). *Avery will not be in the Montana Intrastate Winter Wheat Test for 2017.*

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. Mill and bake characteristics, under Montana conditions, have not been determined. 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. Mill and bake characteristics, under Montana conditions, have not been determined. PVP, Title V is pending.

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 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.

Broadview– hard red winter wheat developed by the Lethbridge, Alberta winter wheat breeding program in 2009 and licensed to Meridian Seeds LLC. Broadview is a medium maturing, medium statured wheat, with white chaff. Broadview has above average yield, average test weight and protein, and excellent winter hardiness. Broadview is susceptible to stripe rust and resistant to stem and leaf rust. Broadview is a high PPO variety with average milling and baking properties, similar to CDC Falcon. *Broadview will not be in the Montana Intrastate Winter Wheat Test for 2017.*

Byrd – hard red winter wheat developed by Colorado and released in 2011. Byrd is an early maturing, medium short statured wheat, with white chaff. Byrd has average yield and test weight and below average protein. Byrd is susceptible to stripe rust. Byrd is a high PPO variety with average mill and bake characteristics. PVP, Title V has been issued (Certificate #201200432). *Byrd will not be in the Montana Intrastate Winter Wheat Test for 2017.*

CDC Falcon – hard red winter wheat developed by the Crop Development Center, Saskatoon, Saskatchewan and registered in 1998. Licensed to WestBred LLC. Superior stem and leaf rust resistance over all current winter wheat varieties in western Canada. High yield, good winter-hardiness, semidwarf, short strong straw, especially good for direct seeding and straight cut harvest. CDC Falcon is moderately resistant to stem rust and susceptible to stripe rust. It is rated as having acceptable milling and baking quality. CDC Falcon is protected under the Plant Variety Protection Act, but not the Title V option (Certificate #200800322). *CDC Falcon will not be in the Montana Intrastate Winter Wheat Test for 2017.*

Colter – is an awned, white glumed, high yielding hard red winter wheat to be released in fall 2013 by the Montana Agricultural Experiment Station. Colter is similar to Yellowstone for grain yield and most agronomic traits with the exception that Colter is about 0.5 lb/bu higher for test weight and has superior stem rust resistance relative to Yellowstone. Colter is moderately resistant to stripe rust, but susceptible to leaf rust. Colter has excellent milling and baking bread quality, similar to Yellowstone. PVP, Title V is issued (Certificate

#201500029). *Colter will not be in the Montana Intrastate Winter Wheat Test for 2017.*

Cowboy – is an awned, white glumed, high yielding hollow-stemmed public variety developed in in Colorado and jointly released in 2012 by Colorado and Wyoming. In limited testing in Montana, Cowboy has average test weight and below average protein and winter hardiness (= 2 (0-5 scale, 5 = best). Cowboy is a medium to early heading variety with shorter than average plant height. Cowboy is susceptible to stripe rust, but resistant to stem rust. Milling and baking quality are below average in Montana tests. PVP, Title V has been issued (Certificate #201300476). *Cowboy will not be in the Montana Intrastate Winter Wheat Test for 2017.*

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).

Freeman – hard red winter wheat developed by Nebraska and released in 2013. Freeman is an early maturing, medium short statured wheat, with white chaff. Freeman has average yield, below average test weight and average protein. Freeman is resistant to stripe rust. Freeman is a high PPO variety with below average mill and bake characteristics. PVP, Title V is pending (Certificate #201400398). *Freeman will not be in the Montana Intrastate Winter Wheat Test for 2017.*

Jerry – hard red winter wheat released by North Dakota State University in 2001. It is white-chaffed and awned and similar in maturity to Roughrider. Jerry has good winter hardiness and is a top yielder in areas where winterkill can occur. Jerry has average test weight and protein under Montana conditions. It has good resistance to prevalent races of stem and leaf rust, but is susceptible to stripe rust. Mixing properties and baking performance are equal to Roughrider. *Jerry will not be in the Montana Intrastate Winter Wheat Test for 2017.*

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 resistant to stripe rust. Keldin is a high PPO variety with average mill and 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 will be applied for.

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).

Rampart – Released by the Montana Agricultural Experiment Station in 1996. It is an awned, red chaffed, solid-stemmed hard red winter wheat variety. The kernel is long with a sloping back and a heavy brush. The cheeks are rounded to angular with an open crease. Rampart is resistant to the wheat stem sawfly. It is moderately resistant to prevalent races of stem rust. Rampart is resistant to stripe rust. It is susceptible to leaf rust, dwarf smut and the Russian wheat aphid. Rampart has excellent milling and baking properties and is a

sister line to Vanguard. *Rampart will not be in the Montana Intrastate Winter Wheat testing for 2017.*

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 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 was average in 2011 at Sidney. SY-Wolf is moderately susceptible to moderately resistant (MS/MR) to stripe rust, but resistant to stem rust. Boomer has average milling and below average baking properties. PVP, Title V has been issued (Certificate #201100390).

T158 – hard red winter wheat developed by Trio Research (now part of Limagrain) and released in 2009. T158 is an early maturing, short statured wheat, with white chaff. T158 has average yield, above average test weight, and below average protein. T158 is resistant to stripe rust. T158 is a high PPO variety with average mill and and below average bake characteristics. *T158 will not be in the Montana Intrastate Winter Wheat Test for 2017.*

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).

WB3768 – is a white-chaffed hard white winter wheat developed by the Montana Agricultural Experiment Station and licensed exclusively to WestBred/Monsanto in 2013. WB3768 is a high yielding variety similar to Yellowstone. WB3768 is similar to Yellowstone for most agronomic traits with the exception of higher test weight and later heading date and maturity. WB3768 is 1.8 inches taller than Yellowstone. Like Yellowstone, WB3768 is resistant to prevalent races of stem rust, but susceptible to stem and leaf rust. WB3768 is moderately resistant to common bunt. WB3768 has acceptable milling and baking quality. WB3768 is a low PPO cultivar with favorable Asian noodle color stability and noodle score. PVP, Title V has been issued (Certificate #201500028). *WB3768 will not be in the Montana Intrastate Winter Wheat Test for 2017.*

WB4059CLP – hard red winter wheat developed by WestBred and released in 2013. WB4059CLP is an awnless, early maturing, short statured wheat, with white chaff. WB4059CLP has below average yield and test weight and above average protein. WB4059CLP is very susceptible to stripe rust. WB4059CLP is a high PPO variety with average mill and bake characteristics. PVP, Title V has been issued (Certificate #2013004481). Additionally, the CLEARFIELD genes are patented. *WB4059CLP will not be in the Montana Intrastate Winter Wheat Test for 2017.*

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).

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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