

## 2005 Recommended Varieties: Hard Winter Wheat and Soft White Winter Wheat for Montana by District

Variety	Districts (see map on cover)					
	1	2	3	4	5	6
<b>Hard Red Winter Wheat</b>						
Bighorn (P)+	D <sup>3/</sup>	D	D	D	D	
BigSky +			D	D	D	
CDC Falcon (P)+	DI <sup>3/</sup>	DI	DI	DI	DI	DI
Morgan (P)+		D	D	D	D	D
Neeley	D <sup>3/</sup>	D	D	D	D	
Paul ++	D <sup>3/</sup>	D	D	D	D	D
Pryor (P)+	D <sup>3/</sup>	D	D	D	D	D
Promontory <sup>1/</sup>	D	D	DI	D		
Quantum 542 (P)	D <sup>3/</sup>	D	D	D	D	
Rampart <sup>2/</sup>			D	D	D	
Rocky (P)			D	D	D	
Tiber		DI	DI	DI	DI	
Vanguard <sup>2/</sup>			D	D	D	
<b>Soft White Winter Wheat</b>						
Eltan	D	D				
Hill 81	D	D				
Lewjain	D					
Malcolm	D	D				

D = Dryland

I = Irrigated

(P) = a Private Variety

+ = a "Protected" variety under the Plant Variety Protection Act

++ = PVP Title V pending

<sup>1/</sup> = dwarf smut resistant

<sup>2/</sup> = sawfly areas only

<sup>3/</sup> = recommended with application of Dividend seed treatment for control of dwarf smut (TCK)

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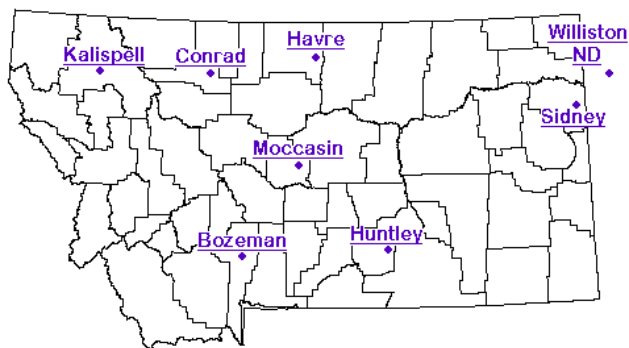
# WINTER WHEAT VARIETY PERFORMANCE SUMMARY IN MONTANA

J. E. Berg, P. L. Bruckner, G.R. Carlson, J. Eckoff, G.D. Kushnak, K. D. Kephart, N. Riveland  
R.N. Stougaard, D.M. Wichman, W. Grey, D. Nash, R. Johnston and R. Larson

## 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 and the Soft White Winter Wheat Nursery Reports. These reports are 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, frost, or other unavoidable causes.

## Variety Testing Procedures



**Fig. 1. Test Locations for Montana winter wheat performance tests in 2004.**

### Locations

Hard winter wheats were planted at 7 Montana and 1 North Dakota location (Fig. 1) including 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. Separate tests comparing soft white winter wheat varieties were planted at Bozeman, Kalispell and Moccasin.

### Entries

Names of commercially available entries evaluated in 2004 are listed with their origins, release year and pedigrees in Table 2 for the hard winter wheats and in Table 16 for the soft white wheats. Forty-nine hard wheats are included in this summary comprising 30 varieties (18 public and 12 private) and 19 experimental lines (18 public and 1 private). Numbered entries preceded by a state designation [e.g. MT00159 (Montana) and WA7936 (Washington)] are experimental lines provided by the breeder of the originating state. Private experimental lines [e.g. GM10004 (General Mills)] are submitted for testing on a fee basis. The soft white evaluation contains 15 varieties [11 soft white public, 2 private (including one experimental line), one hard wheat check (Neeley) and one hard white check (NuSky)].

### Experimental Design and Seeding Methods

The Intrastate Winter Wheat Test consisted of a 49 entry test with 3 replicates. It was planted in the form of 7x7 lattice at all locations except Moccasin, where it was in a randomized complete block design. Plot size varied by location, from 35 ft<sup>2</sup> at Conrad to 60 ft<sup>2</sup> at Havre. All plots were 4-row, except Havre (3-row), Williston (8-row) and Kalispell (7-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<sup>2</sup>, 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.

Soft white winter wheat nurseries were planted similar to the hard wheat test, except all tests were planted in a randomized complete block design.

All seed for each nursery was treated with Dividend-XL seed treatment at recommended rates before planting.

**Table 1. Summary of agronomic practices used on hard winter wheat performance trials in Montana in 2004. Fall nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>) and potassium (K<sub>2</sub>O) were preplant applied and incorporated.**

Location	2003 Crop	2002 Crop	2003 Planting Date	Fertilizer				2004 Harvest Date
				N		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
				Fall	Spring			
----- Pounds per acre -----								
Kalispell	green manure	green manure	Sept. 18	40	56	18	85	Aug. 11
Bozeman	fallow	oats	Sept. 27	none	-	none	none	Aug. 13
Huntley	chem. fallow	fallow	Oct. 2	none	-	none	none	July 23
Moccasin	chem. fallow	barley	Sept. 24	10	60	10	10	Aug 4
Conrad	fallow	barley	Sept. 10	56	-	52	0	Aug. 12
Havre	fallow	barley	Sept. 28	70	-	40	25	Aug. 14
Sidney	fallow	safflower	Sept. 16	none	-	none	none	Aug. 11
Williston, ND	fallow	safflower	Sept. 12	80	-	35	0	Aug. 24

### 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 2004, data is provided for two (2003-2004), three (2002-2004) and four (2001-2004) year averages for both hard and soft wheat entries tested during previous cropping seasons.

There was no data in 2002 for Rampart, except at Havre, due to a seed mix-up prior to planting that wasn't discovered until after heading. Therefore the multiyear analyses do not contain information for Rampart if the location was harvested in 2002. For those locations, Rampart yields for 2001 will be footnoted on each table.

#### Test Weight

Test weight (pounds per bushel) were obtained for each plot by using a Seedburo test weight apparatus. 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. Grams per quart are converted into pounds per bushels. Test weight, heading date, plant height and protein percentage are reported for 2004 data only .

#### 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 Julian days (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. In 2004, Sidney, Williston, Moccasin and Conrad had significant stand loss due to winter kill.

Table 11 contains information on yield in winter-kill environments from 2002 to 2004. The data summarizes 8 tests in which significant winter-kill occurred (test average for winter survival was less than 90%). Six testing 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 were released in 1995 and 1996, respectively. These 2 varieties were planted on 35% of the winter wheat acreage in the 2004 crop year (Rampart was the leading variety planted for the 2003-2004 crop year). Both these varieties have marginal winter hardiness. 'Genou', a new release (2004), has better winter hardiness and yield.

Table 12 contains information on yield at 12 testing locations where sawfly pressure was present during the years 1997-2003. The data is mainly from Off Station winter wheat nurseries. Big Sandy, Loma and North Havre are 'satellite' locations of Havre; The Knees of Conrad, Highwood and Ft. Benton of Moccasin and Broadview of Huntley.

## **Coleoptile Length**

Coleoptile length evaluation was 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) was measured. This test was replicated 3 times for each variety. Results are reported in inches in Table 14. 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, straw strength and shattering reactions for the hard wheat varieties listed in this publication. Information on shattering is not available for all varieties.

Table 20 has information on maturity, winter survival and lodging for soft white winter wheats.

## **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 general leaf spot complex. Table 20, for soft white winter wheat, contains information on dwarf smut, snow mold, stem rust and stripe 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 10 show 2004 data for hard winter wheat collected at all harvested experiment station sites. Tables 17 - 19 contain 2004 data for the soft white wheats. Where a variety has been in the test for two, three or four years, combined analyses of the yield data over years are presented. Not all years are present at each location due to hail or stand problems.

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.

## **2004 Test Conditions**

Conditions were more "normal" at winter wheat testing sites at least compared to drought conditions over the last several years. Although terminal drought occurred again this past season, most winter wheat escaped severe drought stress and yields were generally good. Winter conditions were moderate at all testing sites except Conrad, Sidney and Williston, where average stands were reduced to about 53%, 47% and 7%, respectively. Disease pressure and sawfly cutting occurred at some locations with severe stripe rust at Kalispell and significant sawfly cutting at Havre. Montana winter wheat acreage decreased slightly in 2004. Harvested acreage for Montana in 2004 was projected by the Montana Agricultural Statistics Service at 1.63 million acres averaging 41 bu/acre

(total production 66.8 million bushels) compared to 1.82 million acres with a 37 bu/a average (total production 67.3 million bushels) for the 2003 harvest years. All locations except Havre experienced below average precipitation (see Table 13 for precipitation data). Drought severely reduced yields at Huntley. Mean yield for harvested locations ranged from 9 bu/a at Huntley to 119 bu/a at Bozeman.

Leading winter wheat varieties planted for 2004 were Rampart (27.9%), Neeley (16.0%), Tiber (9.4%), Morgan (7.6%), Vanguard (7.6%), and Rocky (5.9%).

Test weight averaged above 60 lb/bu at Bozeman, Kalispell and Conrad. Protein content was above 13.0% at all stations except Bozeman, Kalispell and Conrad.

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 planting a resistant variety (Tables 15 and 20) or use 'Dividend' seed treatment, only.

**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. 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.

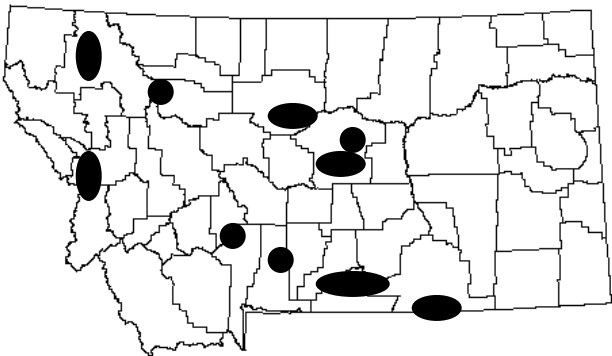
Recommendations of varieties are considered on a case by case basis. Yield performance of a variety is an important criteria, but also considered are test weight, grain protein content, winter survival, pest resistance and end-use quality data. In general, yield needs to be at least equal to currently 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 and Vanguard, which are not competitive in the absence of wheat stem sawfly, are recommended in Districts 3, 4 and 5 for sawfly areas only. Only four 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

**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 Lewjain are currently recommended) as one practical means of control. Newer varieties such as Golden Spike (HWW – Utah, 1999) have been developed with dwarf bunt resistance.

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.**

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 a new chemical compound called Difenconazole. `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 and date for winter wheat**

Districts	Dryland	Irrigated	Date of Seeding
5,6	30-60	60-75	Sept. 1-15
1,2,3,4	30-60 (10-20 seeds/sq. ft.)	60-75 (20-25 seeds/sq. ft.)	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, seed 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 and private hard red winter wheat varieties.**

Variety	Origin	Release Year	Pedigree
<b>Public Varieties</b>			
<b>Above (CL)</b>	Colorado	2001	TAM 110*4/FS2 [CLEARFIELD]
<b>BigSky</b>	Montana	2001	NuWest/Tiber
<b>Elkhorn</b>	N. Dakota	1995	Norstar/4/Centurk//Winoka/Uljanovka/3/(SD76694, Centurk*5/Hand)
<b>Expedition</b>	South Dakota	2002	Tomahawk/Bennett
<b>Genou</b>	Montana	2004	(Lew/Tiber//Redwin, MTS92015)/3/Vanguard/ Norstar
<b>Golden Spike (HWW)</b>	Utah, General Mills	1999	Arbon/Hansel/4/(ID0281, Hansel/3/(Snow Mold Sel. 1, Cltr14106)/Columbia//McCall)
<b>Jerry</b>	North Dakota	2001	Roughrider/Arapahoe
<b>Judith</b>	Montana	1989	Lancota/Froid/9/((Seu Seu 27/3/(Cltr12500, Nebraska 60//Mediterranean/Hope)/4/Red Chief/Ponca/5/ Cheyenne/6/Atlas 66/Comanche, NE69559)/7/ (CO634011, Lancer sel.)/8/Winoka
<b>Millennium</b>	Nebraska	1999	Arapahoe/Abilene/4/(NE86488, Colt/3/ Warrior*5/Agent//Kavkaz)
<b>Neeley</b>	Idaho	1980	Heglar/3/Norin 10/Staring//2*Cheyenne
<b>Norstar</b>	Alberta	1977	Winalta/Alabasskaya
<b>NuSky (HWW)</b>	Montana	2001	NuWest/Tiber
<b>Paul</b>	Montana	2003	(TAM W-103/Froid/4/Yogo// Turkey Red/Oro/3/ Centurk, MT8030)/5/Neeley
<b>Promontory</b>	Utah	1990	Manning/Bezostaya-1
<b>Rampart</b>	Montana	1996	Lew/Tiber//Redwin
<b>Tiber</b>	Montana	1988	Redwin pure line selection
<b>Vanguard</b>	Montana	1995	Lew/Tiber//Redwin
<b>Wahoo</b>	Nebraska, Wyoming	2000	Arapahoe*2/Abilene

**Private Varieties**

<b>Bighorn</b>	Hybritech, Western Plant Breeders	1985	Warrior/5/(Ill-54-12, Cltr12382, Wis. H255-49-5-1-4, Minturki/4/ (H143-1-14-27, ((Illinois No. 1/Chinese, Pd266A-2-15-6-3)// P1194761/ Triticum timopheevi D357-1, H139)/3/Wis. Pedigree No. 2))/6/Sturdy /7/Winoka/Ark
<b>CDC Falcon</b>	Western Plant Breeders/Saskatchewan	1999	Norstar*2/Vona//Abilene
<b>Jagalene</b>	AgriPro	2002	Jagger/Abilene
<b>Ledger, (BZ9W96-788)</b>	WestBred	2004	Hatten/HRW popn./3/(MTSF1142, Lew/Tiber// Redwin)
<b>Morgan</b>	Western Plant Breeders/Saskatchewan	1996	Archer/Norstar
<b>MT1159CL, (MTCL01159)</b>	WestBred, Montana	2004	Fidel/Tiber (CLEARFIELD)
<b>NuFrontier, (HWW)</b>	General Mills	2001	HBK0927
<b>NuHorizon, (HWW)</b>	General Mills	2001	W189-282/Arlin
<b>NuWest (HWW)</b>	Montana, General Mills	1994	Froid/Winoka/7/((Sinvalocho/Wichita//Hope/ Cheyenne/3/ Wichita /4/ Seu Seu 27, TX55-391-56-D8)/5/Westmont, MT6928)/6/Trader
<b>Pryor</b>	Western Plant Breeders	2002	Hatten/Abilene
<b>Quantum 542</b>	Western Plant Breeders	1988	F1 Hybrid
<b>Rocky</b>	AgriPro	1978	Centurk pure line selection

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

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data					
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Heading Date		Plant height in	Lodge index %	Protein %
						Julian	Calendar			
		2 yr	3 yr	4 yr						
Above (CL)+	107.2	81.7	92.1		62.1	148.8	28-May	39.9	-2.2	12.6
R Bighorn (P)+	124.1*	90.5	98.1*	92.0*	61.8	154.6	3-Jun	39.7	22.6	12.4
BigSky +	102.4	78.9	87.3	83.8	62.4	155.1	3-Jun	48.4	5.4	12.7
BZ9W96-788 (P, Ledger)++	122.5*	94.5			61.4	151.1	30-May	39.8	-0.9	12.5
R CDC Falcon (P)+	117.9	86.8	96.9	88.3*	60.6	155.4	3-Jun	39.0	-2.5	12.3
Elkhorn +	92.2	73.9	85.1	83.5	60.9	156.8	5-Jun	48.0	19.4	13.0
Expedition ++	119.9	89.4	97.9*		62.0	149.7	29-May	40.9	-4.0	13.5
Genou ++	109.2	83.5	92.6		61.1	155.0	3-Jun	42.2	5.4	13.0
GM10004 (P, HWW)	104.7	80.7	88.5	85.0	61.3	153.2	1-Jun	44.7	2.9	11.7
Golden Spike (HWW)+ <sup>1/</sup>	113.6	87.2	97.6*	92.4*	61.6	157.5	6-Jun	44.1	35.4	11.2
Jagalene (P)+	113.6	85.4			63.1	148.9	29-May	39.4	5.9	13.8
Jerry	107.1	77.2	90.9		59.9	154.3	2-Jun	48.1	29.3	13.0
Judith	115.5	87.8	101.6*	95.3*	61.4	153.4	1-Jun	44.4	4.8	12.5
Millenium +	112.8	84.5			61.4	152.4	31-May	42.7	1.4	13.0
Morgan (P)+	103.3	79.5	93.6	87.3*	60.2	156.1	4-Jun	43.3	24.7	12.6
MT00159	137.8**	104.2	111.0**		61.3	155.7	4-Jun	42.9	-1.4	12.3
MT0097	120.4	90.8	102.1*		59.6	156.2	4-Jun	43.9	56.8	12.9
MT01148	109.9	84.5			61.7	156.6	5-Jun	43.8	58.1	12.9
MT0177	100.4	78.7			61.4	154.7	3-Jun	44.1	14.2	12.5
MT02113	108.5				60.4	154.5	3-Jun	40.7	-3.1	13.5
MT02136	107.5				58.9	151.5	31-May	41.2	34.6	12.1
MT0245	118.1				61.8	153.6	2-Jun	41.5	21.2	13.5
MT0277	112.7				61.3	151.3	30-May	41.1	17.4	13.0
MT9982-53	132.4*				61.8	155.7	4-Jun	44.2	4.1	13.0
MT9982-65	126.0*				61.2	155.7	4-Jun	41.1	-2.4	12.5
MTCL01159 (MT1159CL)++	87.4				59.3	154.1	2-Jun	38.0	8.5	12.7
MTS0023-58	108.1				59.0	159.5	8-Jun	44.7	19.0	13.6
MTS0222	107.8				60.7	152.6	1-Jun	40.0	3.1	14.3
MTW01133	102.0	74.3			58.7	150.0	29-May	35.5	0.1	12.6
MTW01143	109.6	83.6			60.3	156.7	5-Jun	43.6	41.8	12.4
MTW02111 (HWW)	95.0				59.7	159.4	7-Jun	42.4	4.3	11.6
MTW02115 (HWW)	110.4				61.9	154.4	2-Jun	44.5	26.9	12.9
R Neeley	112.1	86.5	98.0*	91.7*	62.1	155.8	4-Jun	43.1	1.7	12.2
Norstar	89.9	72.4	82.9	81.4	61.8	161.3	9-Jun	52.1	40.9	13.4
NuFrontier (P,HWW)+	121.1*	82.6	94.6	88.2*	62.4	151.0	30-May	40.3	4.8	11.8
NuHorizon (P,HWW)+	127.3*	86.1	95.9	86.9*	63.0	150.0	29-May	36.7	-7.1	12.2
NuSky (HWW)	89.6	74.3	87.2	84.1	59.8	156.2	4-Jun	42.0	27.1	12.5
NuWest (P,HWW)+	81.1	69.7	86.0	82.4	60.3	155.3	3-Jun	42.9	7.6	12.4
R Paul ++	86.9	73.3	91.1	85.0	57.3	155.0	3-Jun	40.7	58.8	13.3
R Promontory <sup>1/</sup>	123.4*	90.7	103.1*	95.3*	64.1	154.1	2-Jun	41.9	5.4	12.0
R Pryor (P)+	119.3	91.5	103.3*	98.3**	60.8	155.0	3-Jun	38.3	-0.4	11.9
R Quantum 542 (P)	119.5	88.5	99.9*	91.9*	61.8	152.4	31-May	46.6	12.0	12.9
Rampart <sup>2/</sup>	103.3	72.8	-	-	60.6	154.8	3-Jun	43.3	1.2	13.9
Rocky (P)	116.7	87.5	100.2*	92.5*	62.2	153.3	1-Jun	46.4	1.8	12.7
Tiber	108.5	79.8	91.3	89.7*	62.2	156.1	4-Jun	46.7	-0.1	12.6
Vanguard	105.3	79.0	87.3	82.1	61.2	154.0	2-Jun	43.7	2.6	13.7
WA7936 (HWW)	119.3				59.1	161.0	9-Jun	40.1	20.2	12.9
WA7939	117.6				57.2	160.2	8-Jun	41.4	6.5	12.7
Wahoo +	113.0	91.7	103.7*		60.6	149.5	29-May	40.5	6.5	12.6
Average	110.5	83.5	94.4	87.8	61.0	154.5	3-Jun	42.5	13.1	12.7
LSD (0.05)	17.3	ns	13.7	12.3		1.8		2.4	30.3	
C.V.	9.2	10.6	8.9	9.9		0.7		3.3	134.6	

\*\* = indicates highest yielding variety within a column CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = Rampart not planted in 2002: Yield in 2001 = 59.8

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

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data				
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Heading Date		Plant height in	Protein %
						Julian	Calendar		
		2 yr	3 yr	4 yr					
<b>Above (CL)+</b>	80.6	93.7	97.7		62.2	156.8	5-Jun	35.1	14.5
<b>R Bighorn (P)+</b>	121.3	108.9	<b>101.8*</b>	100.7	63.4	163.3	11-Jun	35.0	12.3
<b>BigSky +</b>	113.4	103.6	93.2	94.9	63.5	164.5	13-Jun	40.4	13.4
<b>BZ9W96-788 (P, Ledger)++</b>	117.8	107.7			64.2	161.3	9-Jun	37.6	12.8
<b>R CDC Falcon (P)+</b>	120.7	111.3	<b>103.1*</b>	100.3	63.1	163.3	11-Jun	35.1	11.8
<b>Elkhorn +</b>	102.7	94.6	86.4	88.9	62.7	169.3	17-Jun	47.2	13.6
<b>Expedition ++</b>	89.1	95.8	95.9		63.5	157.6	6-Jun	35.4	14.0
<b>Genou ++</b>	113.8	102.0	94.4		63.4	163.2	11-Jun	40.0	13.0
<b>GM10004 (P, HWW)</b>	118.5	107.9	<b>99.0*</b>	99.1	62.8	163.7	12-Jun	38.1	13.1
<b>Golden Spike (HWW)+<sup>1/</sup></b>	<b>129.3*</b>	114.0	<b>105.3*</b>	<b>105.7*</b>	62.5	168.2	16-Jun	41.7	11.3
<b>Jagalene (P)+</b>	102.9	103.1			64.3	157.1	5-Jun	33.3	14.1
<b>Jerry</b>	119.2	106.7	<b>100.4*</b>		62.5	166.9	15-Jun	45.5	12.6
<b>Judith</b>	125.9	112.4	<b>103.1*</b>	<b>102.4*</b>	62.2	164.7	13-Jun	40.2	13.0
<b>Millenium +</b>	102.0	105.6			63.2	159.7	8-Jun	36.2	13.7
<b>R Morgan (P)+</b>	111.5	101.6	96.7	97.2	62.1	167.8	16-Jun	41.0	12.9
<b>MT00159</b>	<b>130.7*</b>	120.2	<b>112.6**</b>		62.5	167.0	15-Jun	39.9	12.5
<b>MT0097</b>	<b>132.3*</b>	116.2	<b>107.5*</b>		62.6	167.7	16-Jun	39.9	12.4
<b>MT01148</b>	<b>129.2</b>	118.6			63.9	167.3	15-Jun	40.3	12.8
<b>MT0177</b>	119.4	109.7			63.5	162.6	11-Jun	39.5	12.6
<b>MT02113</b>	<b>131.4</b>				62.9	164.5	13-Jun	37.6	12.6
<b>MT02136</b>	124.1				61.8	161.3	9-Jun	36.5	11.6
<b>MT0245</b>	122.7				62.2	163.8	12-Jun	37.0	13.1
<b>MT0277</b>	<b>131.4</b>				62.5	161.3	9-Jun	37.6	12.9
<b>MT9982-53</b>	<b>132.3</b>				63.1	168.4	16-Jun	39.1	12.9
<b>MT9982-65</b>	<b>139.8</b>				62.7	167.6	16-Jun	39.3	12.3
<b>MTCL01159 (MT1159CL)++</b>	88.8				61.3	161.4	9-Jun	34.2	13.2
<b>MTS0023-58</b>	111.6				62.0	170.3	18-Jun	41.6	13.4
<b>MTS0222</b>	98.0				61.6	160.9	9-Jun	36.1	14.5
<b>MTW01133</b>	106.7	103.1			62.4	158.9	7-Jun	33.5	13.0
<b>MTW01143</b>	127.2	112.2			62.9	168.9	17-Jun	39.6	12.1
<b>MTW02111 (HWW)</b>	<b>131.4</b>				63.1	169.9	18-Jun	36.3	12.1
<b>MTW02115 (HWW)</b>	<b>129.1</b>				63.7	163.7	12-Jun	41.4	12.4
<b>R Neeley</b>	128.1	112.6	<b>104.4*</b>	<b>104.4*</b>	63.7	166.8	14-Jun	37.4	12.5
<b>Norstar</b>	109.3	93.9	86.2	88.2	63.1	172.2	20-Jun	52.7	13.1
<b>NuFrontier (P,HWW)+</b>	114.3	110.4	<b>102.1*</b>	100.5	64.6	158.4	6-Jun	35.8	11.7
<b>NuHorizon (P,HWW)+</b>	116.3	109.5	<b>102.1*</b>	99.6	64.6	158.8	7-Jun	32.3	12.5
<b>NuSky (HWW)</b>	<b>136.2**</b>	115.8	<b>104.4*</b>	<b>102.7*</b>	62.5	167.2	15-Jun	41.2	13.0
<b>NuWest (P,HWW)+</b>	117.9	108.5	<b>99.8*</b>	96.6	62.7	165.6	14-Jun	38.8	12.9
<b>R Paul ++</b>	<b>131.5*</b>	119.4	<b>108.5*</b>	<b>108.8*</b>	62.4	166.8	15-Jun	37.0	12.5
<b>R Promontory <sup>1/</sup></b>	<b>132.0*</b>	118.7	<b>112.2*</b>	<b>109.8**</b>	<b>65.2**</b>	162.3	10-Jun	37.2	11.9
<b>R Pryor (P)+</b>	<b>134.4*</b>	117.6	<b>106.2*</b>	<b>107.6*</b>	63.2	166.2	14-Jun	37.3	11.8
<b>R Quantum 542 (P)</b>	116.2	110.6	<b>106.5*</b>	<b>106.4*</b>	63.9	160.3	8-Jun	40.6	12.5
<b>Rampart <sup>2/</sup></b>	99.3	91.6	-	-	63.1	163.3	11-Jun	37.3	13.9
<b>Rocky (P)</b>	114.3	105.2	<b>98.9*</b>	97.6	64.2	161.0	9-Jun	40.1	12.4
<b>R Tiber</b>	116.2	105.7	97.5	99.9	63.9	168.1	16-Jun	43.1	13.1
<b>Vanguard</b>	103.3	96.7	91.5	91.3	63.2	163.8	12-Jun	37.2	13.9
<b>WA7936 (HWW)</b>	<b>132.3</b>				61.1	171.8	20-Jun	37.3	12.4
<b>WA7939</b>	<b>137.8</b>				60.1	172.2	20-Jun	37.6	12.4
<b>Wahoo +</b>	122.0	111.9	<b>104.6*</b>		62.0	159.0	7-Jun	34.3	12.6
<b>Average</b>	<b>118.7</b>	<b>107.7</b>	<b>100.4</b>	<b>99.6</b>	<b>62.9</b>	<b>164.4</b>	<b>12-Jun</b>	<b>38.5</b>	<b>12.8</b>
<b>LSD (0.05)</b>	<b>10.7</b>	<b>ns</b>	<b>14.2</b>	<b>8.0</b>	<b>0.5</b>	<b>1.5</b>		<b>2.4</b>	
<b>C.V.</b>	<b>5.1</b>	<b>8.8</b>	<b>8.6</b>	<b>5.7</b>	<b>0.5</b>	<b>0.5</b>		<b>3.6</b>	

\*\* = indicates highest yielding variety within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat<sup>2/</sup> = Rampart not planted in 2002: Yield in 2001 = 89.6

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

Cultivar/Line	Grain Yield (bushels/acre) <sup>2/</sup>			2004 Data				
	2004	2003-2004	2001//2004	Test weight	Heading Date		Plant height	Protein %
		2 yr	3 yr		Julian	Calendar		
Above (CL)+	2.0	53.8		58.3	164.0	12-Jun	12.4	18.1
R Bighorn (P)+	<b>12.6*</b>	56.5	41.5	61.0	154.9	3-Jun	14.3	16.5
R BigSky +	10.8	47.3	35.5	59.5	155.1	3-Jun	16.7	17.2
BZ9W96-788 (P, Ledger)++	5.0	47.4		57.9	155.0	3-Jun	14.4	17.1
R CDC Falcon (P)+	10.2	46.0	34.4	58.3	155.1	3-Jun	12.8	15.9
Elkhorn +	<b>11.7*</b>	43.3	34.7	60.1	156.5	5-Jun	15.9	15.4
Expedition ++	2.2	51.7		55.1	155.4	3-Jun	14.8	18.2
Genou ++	10.7	48.9		60.6	154.4	2-Jun	16.1	17.9
GM10004 (P, HWW)	7.8	46.4	37.6	57.1	154.2	2-Jun	16.5	17.8
Golden Spike (HWW)+ <sup>1/</sup>	<b>11.7*</b>	57.2	44.2	60.7	155.6	4-Jun	16.0	16.2
Jagalene (P)+	4.4	60.2		54.0	155.6	4-Jun	13.0	18.1
Jerry	8.5	47.9		59.2	154.5	3-Jun	14.9	16.7
Judith	8.5	45.8	35.5	58.8	155.4	3-Jun	14.5	17.5
Millenium +	5.5	55.9		56.3	154.5	3-Jun	14.4	18.0
R Morgan (P)+	9.4	45.1	35.5	58.9	156.3	4-Jun	15.3	16.1
MT00159	11.6	59.0		59.1	155.4	3-Jun	17.8	15.1
MT0097	<b>13.8*</b>	50.1		61.7	155.8	4-Jun	15.4	14.6
MT01148	<b>14.6*</b>	50.4		58.6	155.4	3-Jun	17.6	14.8
MT0177	8.0	52.9		58.3	155.7	4-Jun	14.5	17.2
MT02113	4.9			56.9	155.7	4-Jun	16.5	16.5
MT02136	9.1			59.5	155.0	3-Jun	13.5	16.8
MT0245	5.3			61.1	155.5	4-Jun	13.4	18.8
MT0277	<b>12.5*</b>			57.5	154.4	2-Jun	15.7	16.8
MT9982-53	7.1			58.0	155.9	4-Jun	15.9	17.2
MT9982-65	9.7			58.8	155.8	4-Jun	16.7	16.9
MTCL01159 (MT1159CL)++	3.9			50.6	157.2	5-Jun	14.1	17.6
MTS0023-58	<b>12.9*</b>			57.3	156.3	4-Jun	19.3	16.0
MTS0222	5.1			57.8	155.0	3-Jun	13.7	18.5
MTW01133	7.0	52.0		59.7	154.7	3-Jun	12.3	18.3
MTW01143	8.7	46.5		59.4	155.9	4-Jun	16.5	15.5
MTW02111 (HWW)	10.3			59.5	156.3	4-Jun	16.0	16.7
MTW02115 (HWW)	7.8			61.0	154.7	3-Jun	16.1	15.6
R Neeley	10.8	52.9	41.3	58.2	155.9	4-Jun	14.7	16.2
Norstar	11.4	43.6	36.3	61.3	157.6	6-Jun	18.0	14.8
NuFrontier (P,HWW)+	5.2	49.2	38.4	55.1	155.9	4-Jun	12.9	17.6
NuHorizon (P,HWW)+	9.3	53.9	39.2	62.6	154.6	3-Jun	14.0	15.8
NuSky (HWW)	<b>12.2*</b>	50.8	38.1	61.3	155.2	3-Jun	17.2	15.5
NuWest (P,HWW)+	<b>13.7*</b>	48.9	37.9	61.5	155.5	4-Jun	17.2	16.3
R Paul ++	11.1	51.5	40.9	59.6	155.6	4-Jun	13.7	16.3
R Promontory <sup>1/</sup>	3.5	51.2	39.7	53.3	156.7	5-Jun	13.8	17.4
R Pryor (P)+	<b>14.9**</b>	50.3	38.0	59.4	154.8	3-Jun	13.3	15.8
R Quantum 542 (P)	9.1	53.4	41.0	59.8	154.0	2-Jun	16.4	17.3
R Rampart	11.3	46.0	36.6	60.7	154.9	3-Jun	16.9	16.4
R Rocky (P)	5.8	54.6	40.3	58.4	154.9	3-Jun	14.2	17.5
R Tiber	<b>12.7*</b>	44.4	35.4	59.8	156.0	4-Jun	17.6	16.3
R Vanguard	6.7	46.1	35.4	58.7	154.9	3-Jun	15.7	17.6
WA7936 (HWW)	<b>14.9*</b>			58.9	156.7	5-Jun	15.8	15.4
WA7939	<b>14.4*</b>			58.6	156.5	5-Jun	16.8	15.5
Wahoo +	3.9	51.8		58.5	154.1	2-Jun	14.8	18.4
<b>Average</b>	<b>9.1</b>	<b>50.3</b>	<b>38.1</b>	<b>58.7</b>	<b>155.6</b>	<b>4-Jun</b>	<b>15.3</b>	<b>16.7</b>
<b>LSD (0.05)</b>	<b>3.2</b>	<b>ns</b>	<b>ns</b>		<b>1.1</b>		<b>2.1</b>	
<b>C.V.</b>	<b>20.2</b>	<b>17.2</b>	<b>16.4</b>		<b>0.4</b>		<b>8.2</b>	

\*\* = indicates highest yielding variety within a column

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = 2002 Crop destroyed by drought

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

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data					
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Winter survival %	Heading Date		Plant height in	Protein %
							Julian	Calendar		
		2 yr	3 yr	4 yr						
Above (CL)+	42.5	45.2	44.9		58.9	70.0	155.3	3-Jun	26.9	13.4
R Bighorn (P)+	52.7*	47.0	45.5	46.1	59.2	85.0	160.3	8-Jun	30.4	13.3
R BigSky +	49.5	41.2	43.6	44.4	57.8	88.3	161.3	9-Jun	29.4	13.4
BZ9W96-788 (P, Ledger)++	54.7*	50.0			60.0*	88.3	159.3	7-Jun	30.3	14.4
R CDC Falcon (P)+	55.5*	48.7	47.6*	48.3*	58.0	85.0	161.0	9-Jun	32.8	14.2
Elkhorn +	44.7	40.6	39.7	40.4	58.8	81.7	165.3	13-Jun	33.7	13.6
Expedition ++	40.4	43.3	44.6		59.5	80.0	153.3	1-Jun	28.3	13.2
Genou ++	51.9	43.8	44.1		58.4	83.3	160.3	8-Jun	32.7	13.8
GM10004 (P, HWW)	41.7	39.4	39.4	40.2	57.9	85.0	161.0	9-Jun	32.6	14.5
Golden Spike (HWW)+ <sup>1/</sup>	50.4	44.7	43.6	44.8	56.3	78.3	161.7	10-Jun	33.5	13.8
Jagalene (P)+	48.3	50.0			60.8*	81.7	156.7	5-Jun	27.6	13.4
Jerry	52.2	47.3	47.9*		57.8	88.3	162.3	10-Jun	31.6	13.5
Judith	50.0	46.7	47.2*	47.1*	58.4	86.7	160.3	8-Jun	32.1	13.8
Millenium +	45.1	49.6			59.4	86.7	158.3	6-Jun	29.6	13.6
R Morgan (P)+	51.7	45.7	45.7	46.0	58.3	88.3	166.3	14-Jun	34.5	13.6
MT00159	60.2**	53.2	52.4**		59.5	90.0	161.0	9-Jun	31.4	13.6
MT0097	49.2	45.3	46.0		57.5	83.3	164.7	13-Jun	30.5	13.6
MT01148	58.0*	49.0			59.8*	86.7	164.0	12-Jun	30.7	13.4
MT0177	53.5*	49.4			59.6	85.0	160.3	8-Jun	32.0	13.4
MT02113	46.2				57.5	83.3	161.0	9-Jun	30.2	13.5
MT02136	56.3*				56.7	85.0	157.7	6-Jun	28.9	14.1
MT0245	49.2				58.4	83.3	159.0	7-Jun	28.4	13.8
MT0277	51.7				58.6	83.3	161.0	9-Jun	32.0	13.9
MT9982-53	59.1*				59.7*	80.0	162.3	10-Jun	33.6	13.9
MT9982-65	58.7*				58.1	86.7	163.0	11-Jun	32.5	13.7
MTCL01159 (MT1159CL)++	48.3				57.7	71.7	162.3	10-Jun	30.7	13.0
MTS0023-58	48.8				57.1	78.3	169.3	17-Jun	31.9	14.8
MTS0222	47.0				57.4	80.0	159.0	7-Jun	30.5	14.0
MTW01133	50.1	51.0			58.8	88.3	156.3	4-Jun	25.1	13.9
MTW01143	50.8	46.1			58.2	81.7	166.0	14-Jun	33.7	14.4
MTW02111 (HWW)	53.4*				59.9*	85.0	164.0	12-Jun	30.9	13.9
MTW02115 (HWW)	51.7				58.7	88.3	161.7	10-Jun	34.0	13.6
R Neeley	53.5*	47.0	47.3*	46.0	57.6	86.7	162.7	11-Jun	31.1	13.5
Norstar	45.2	39.0	39.4	39.1	58.0	91.7	169.0	17-Jun	37.1	14.3
NuFrontier (P,HWW)+	56.0*	51.1	49.7*	49.4*	60.2*	86.7	156.3	4-Jun	31.4	14.8
NuHorizon (P,HWW)+	55.8*	52.4	50.4*	50.1*	61.2**	85.0	157.0	5-Jun	25.4	14.7
NuSky (HWW)	53.3*	45.5	46.0	48.1*	58.6	85.0	164.7	13-Jun	32.5	13.6
NuWest (P,HWW)+	46.4	45.3	46.3	47.8*	59.2	88.3	162.7	11-Jun	29.4	14.4
R Paul ++	55.3*	47.8	46.5	47.9*	55.2	88.3	161.7	10-Jun	29.5	14.2
R Promontory <sup>1/</sup>	57.6*	52.5	50.2*	49.9*	59.5	78.3	160.0	8-Jun	32.5	13.6
R Pryor (P)+	59.2*	52.2	52.2*	50.3**	58.9	86.7	163.3	11-Jun	30.5	13.6
R Quantum 542 (P)	54.6*	46.5	45.8	46.0	57.5	85.0	159.7	8-Jun	31.9	13.7
R Rampart <sup>2/</sup>	45.8	43.0			56.3	83.3	161.0	9-Jun	31.4	14.0
R Rocky (P)	50.8	47.2	47.1*	48.0*	59.5	81.7	158.3	6-Jun	31.9	13.3
R Tiber	49.8	43.9	45.4	45.2	58.4	83.3	165.3	13-Jun	34.3	14.1
R Vanguard	43.6	40.4	41.4	42.7	56.1	83.3	160.7	9-Jun	30.6	13.9
WA7936 (HWW)	50.1				54.4	75.0	171.7	20-Jun	29.9	14.1
WA7939	55.0*				55.5	80.0	169.7	18-Jun	30.7	14.0
Wahoo +	48.8	45.7	45.6		58.1	90.0	156.0	4-Jun	28.1	14.5
Average	51.1	46.5	45.8	45.9	58.3	84.0	161.5	10-Jun	31.0	13.8
LSD (0.05)	7.8	ns	5.6	4.2	1.5	5.8	2.9		3.8	
C.V.	9.5	10.2	7.4	6.5	1.3	4.3	1.1		7.6	

\*\* = indicates highest yielding variety within a column CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = Rampart not planted in 2002: Yield in 2001 = 43.5

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

Cultivar/Line	Grain Yield (bushels/acre) <sup>2/</sup>			2004 Data					
	2004	2003-2004	2001//2004	Test weight	Winter survival	Heading Date		Plant height	Protein %
						Julian	Calendar		
		2 yr	3 yr	lb/bu	%			in	
Above (CL)+	68.7	<b>68.3*</b>		62.7	54.6	164	12-Jun	32	12.8
R Bighorn (P)+	71.7	<b>68.8*</b>	<b>50.1*</b>	61.8	53.6	169	17-Jun	35	12.4
R BigSky +	<b>78.6*</b>	<b>67.5*</b>	<b>48.7*</b>	63.0	61.9	170	18-Jun	43	12.2
BZ9W96-788 (P, Ledger)++	<b>77.2*</b>	<b>71.7**</b>		63.8	50.1	168	16-Jun	36	11.9
R CDC Falcon (P)+	72.0	<b>68.4*</b>	<b>48.5*</b>	63.7	60.3	168	16-Jun	35	12.7
Elkhorn +	56.8	54.8	39.8	61.5	54.6	175	23-Jun	48	12.7
Expedition ++	<b>74.7*</b>	<b>69.9*</b>		63.4	60.5	165	13-Jun	37	12.0
Genou ++	69.9	<b>64.3*</b>		62.7	50.8	172	20-Jun	40	12.8
GM10004 (P, HWW)	61.5	62.8	<b>47.8*</b>	61.7	51.3	168	16-Jun	41	12.4
Golden Spike (HWW)+ <sup>1/</sup>	66.8	58.9	43.1	61.1	51.4	174	22-Jun	38	11.6
Jagalene (P)+	69.0	<b>67.5*</b>		64.9	51.0	166	14-Jun	33	13.2
Jerry	70.9	<b>65.9*</b>		62.5	57.7	169	17-Jun	45	12.4
Judith	70.3	<b>65.8*</b>	<b>47.5*</b>	61.4	57.8	168	16-Jun	40	12.5
Millenium +	<b>76.9*</b>	<b>70.9*</b>		63.6	57.1	166	14-Jun	41	12.3
R Morgan (P)+	69.3	<b>65.5*</b>	<b>47.8*</b>	62.6	63.2	173	21-Jun	41	11.4
MT00159	71.4	<b>71.3*</b>		60.6	44.7	172	20-Jun	41	12.8
MT0097	<b>77.4*</b>	<b>69.6*</b>		62.7	61.0	171	19-Jun	40	12.7
MT01148	<b>75.3*</b>	<b>66.9*</b>		62.7	62.8	172	20-Jun	41	11.6
MT0177	65.4	<b>66.3*</b>		61.9	54.2	169	17-Jun	39	12.8
MT02113	<b>82.4**</b>			61.6	54.2	168	16-Jun	38	11.3
MT02136	70.2			60.0	51.1	169	17-Jun	37	11.4
MT0245	66.1			62.4	58.5	170	18-Jun	37	12.7
MT0277	65.7			61.4	44.9	167	15-Jun	39	12.0
MT9982-53	<b>74.6*</b>			60.9	47.0	175	23-Jun	38	12.2
MT9982-65	<b>76.9*</b>			61.8	49.4	170	18-Jun	41	12.1
MTCL01159 (MT1159CL)++	60.3			59.4	44.3	169	17-Jun	36	13.2
MTS0023-58	63.2			60.1	40.3	173	21-Jun	45	12.4
MTS0222	65.2			61.8	44.6	167	15-Jun	37	14.1
MTW01133	72.1	<b>69.6*</b>		61.7	52.1	166	14-Jun	33	12.0
MTW01143	68.6	64.0		62.0	57.8	173	21-Jun	40	12.2
MTW02111 (HWW)	<b>78.3*</b>			61.3	53.8	174	22-Jun	38	11.4
MTW02115 (HWW)	64.6			62.9	58.7	170	18-Jun	40	12.1
R Neeley	71.7	<b>67.8*</b>	<b>48.6*</b>	62.8	54.1	172	20-Jun	41	12.1
Norstar	56.4	51.1	37.3	61.7	53.1	174	22-Jun	50	12.3
NuFrontier (P,HWW)+	71.9	<b>68.5*</b>	<b>49.7*</b>	64.2	48.9	165	13-Jun	35	12.0
NuHorizon (P,HWW)+	<b>76.7*</b>	<b>71.5*</b>	<b>50.5*</b>	65.1	58.4	165	13-Jun	33	12.2
NuSky (HWW)	69.8	<b>66.6*</b>	<b>49.3*</b>	61.0	49.2	172	20-Jun	42	12.2
NuWest (P,HWW)+	<b>72.8*</b>	<b>67.3*</b>	<b>49.2*</b>	60.2	48.3	170	18-Jun	40	11.5
R Paul ++	71.7	<b>68.5*</b>	<b>51.0*</b>	61.3	58.9	171	19-Jun	37	11.3
Promontory <sup>1/</sup>	67.9	63.5	<b>46.0*</b>	63.2	46.0	168	16-Jun	35	12.8
R Pryor (P)+	70.8	<b>67.8*</b>	<b>48.8*</b>	61.4	55.8	171	19-Jun	36	11.9
R Quantum 542 (P)	<b>75.3*</b>	<b>71.4*</b>	<b>51.1*</b>	63.3	45.5	168	16-Jun	43	11.6
R Rampart	62.9	61.9	<b>46.0*</b>	62.5	52.2	169	17-Jun	40	14.2
R Rocky (P)	<b>76.3*</b>	<b>71.7*</b>	<b>52.3**</b>	63.7	57.4	167	15-Jun	45	11.0
R Tiber	64.9	61.3	45.3	62.0	52.8	171	19-Jun	45	13.1
R Vanguard	65.8	<b>65.1*</b>	<b>48.6*</b>	62.7	52.6	169	17-Jun	43	12.7
WA7936 (HWW)	66.6			56.3	45.4	172	20-Jun	37	11.4
WA7939	63.3			55.1	46.4	175	23-Jun	37	11.6
Wahoo +	71.2	<b>70.3*</b>		62.4	70.1	167	15-Jun	34	12.9
<b>Average</b>	<b>70.0</b>	<b>66.5</b>	<b>47.6</b>	<b>61.9</b>	<b>53.3</b>	<b>169.7</b>	<b>18-Jun</b>	<b>39.1</b>	<b>12.3</b>
<b>LSD (0.05)</b>	<b>9.6</b>	<b>7.5</b>	<b>6.7</b>		<b>12.6</b>				
<b>C.V.</b>	<b>7.8</b>	<b>5.6</b>	<b>8.8</b>		<b>13.8</b>				

\*\* = indicates highest yielding variety within a column

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = 2002 crop destroyed by drought

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

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data				
					Test weight	Heading Date		Plant height	Protein %
	2004	2003-2004	2002-2004	2001-2004		Julian	Calendar		
		2 yr	3 yr	4 yr	lb/bu			in	
<b>Above (CL)+</b>	<b>69.5*</b>	<b>51.4*</b>	<b>44.8*</b>		<b>61.1*</b>	151.6	31-May	28.3	12.5
R Bighorn (P)+	66.2	48.9	43.5	37.2	59.8	156.5	5-Jun	31.4	14.3
R BigSky +	66.4	47.1	42.6	37.3	59.0	156.5	5-Jun	36.9	15.2
BZ9W96-788 (P, Ledger)++	67.6	50.0			60.8	155.5	4-Jun	30.7	13.5
R CDC Falcon (P)+	<b>71.0*</b>	49.9	<b>47.1*</b>	<b>41.9*</b>	60.0	156.6	5-Jun	30.3	12.5
Elkhorn +	53.7	35.8	35.7	31.6	58.6	157.9	6-Jun	39.0	15.1
Expedition ++	67.2	48.7	42.6		<b>62.0*</b>	150.3	29-May	30.8	12.4
Genou ++	<b>68.4*</b>	49.3	44.3		59.4	156.1	4-Jun	34.6	13.5
GM10004 (P, HWW)	59.8	43.5	41.2	35.7	59.3	156.9	5-Jun	34.7	13.1
Golden Spike (HWW)+ <sup>1/</sup>	65.7	46.7	41.7	35.7	57.8	158.3	6-Jun	36.6	14.2
Jagalene (P)+	67.7	46.2			<b>62.8**</b>	151.8	31-May	28.5	13.7
Jerry	63.0	44.3	42.3		58.7	158.7	7-Jun	34.9	12.3
Judith	61.8	46.2	42.4	37.7	58.2	157.1	5-Jun	35.5	15.0
Millenium +	66.5	47.3			61.0	153.3	1-Jun	33.2	13.5
R Morgan (P)+	59.8	42.6	41.4	36.2	58.3	159.5	8-Jun	35.7	14.0
MT00159	<b>70.4*</b>	50.8	<b>47.0*</b>		58.4	158.2	6-Jun	33.9	15.0
MT0097	64.8	48.2	<b>44.8*</b>		57.6	159.3	7-Jun	35.0	14.2
MT01148	<b>68.1*</b>	50.5			58.6	159.0	7-Jun	35.1	13.6
MT0177	<b>71.2*</b>	50.1			60.1	156.9	5-Jun	31.9	13.0
MT02113	<b>70.2*</b>				57.5	158.0	6-Jun	33.0	14.1
MT02136	<b>70.7*</b>				57.2	155.0	3-Jun	31.4	14.4
MT0245	<b>69.8*</b>				58.3	156.7	5-Jun	31.3	14.2
MT0277	60.9				57.8	155.4	3-Jun	32.9	15.6
MT9982-53	<b>71.0*</b>				60.6	160.1	8-Jun	34.1	14.6
MT9982-65	<b>68.9*</b>				58.0	158.7	7-Jun	34.0	14.3
MTCL01159 (MT1159CL)++	60.0				58.2	156.6	5-Jun	31.3	14.4
MTS0023-58	60.7				56.6	161.6	10-Jun	36.6	17.0
MTS0222	64.5				59.2	155.2	3-Jun	33.0	15.2
MTW01133	<b>73.1*</b>	<b>52.7*</b>			60.9	153.4	1-Jun	28.6	13.6
MTW01143	<b>68.1*</b>	47.9			59.5	160.0	8-Jun	34.8	12.6
MTW02111 (HWW)	65.0				57.9	159.6	8-Jun	33.0	14.1
MTW02115 (HWW)	59.6				60.4	157.2	5-Jun	33.0	12.0
R Neeley	65.5	47.9	43.9	37.9	58.8	157.8	6-Jun	34.5	14.0
Norstar	49.8	34.4	35.6	31.9	59.9	161.8	10-Jun	42.9	14.5
NuFrontier (P,HWW)+	<b>69.7*</b>	<b>51.7*</b>	<b>46.2*</b>	<b>40.3*</b>	<b>61.8*</b>	152.6	1-Jun	32.2	9.9
NuHorizon (P,HWW)+	<b>72.9*</b>	<b>54.0*</b>	<b>47.8*</b>	<b>41.9*</b>	<b>62.7*</b>	153.3	1-Jun	28.9	12.4
NuSky (HWW)	63.0	45.7	43.6	<b>39.0*</b>	58.7	158.7	7-Jun	34.9	14.7
NuWest (P,HWW)+	63.8	43.3	41.5	37.5	60.0	158.4	6-Jun	36.1	13.0
R Paul ++	65.4	49.7	44.4	38.8	57.7	158.5	7-Jun	32.6	14.6
Promontory <sup>1/</sup>	65.1	47.7	43.0	38.0	<b>61.2*</b>	156.3	4-Jun	32.2	13.9
R Pryor (P)+	<b>74.7**</b>	<b>56.0**</b>	<b>50.7**</b>	<b>43.9**</b>	58.9	160.1	8-Jun	33.1	13.6
R Quantum 542 (P)	63.0	44.3	41.3	36.8	60.8	155.0	3-Jun	35.1	14.4
R Rampart	63.3	46.9	43.7	38.4	59.4	156.5	5-Jun	34.8	15.7
R Rocky (P)	<b>74.2*</b>	<b>51.9*</b>	<b>46.5*</b>	<b>41.2*</b>	<b>61.9*</b>	154.6	3-Jun	35.1	11.5
R Tiber	62.7	44.8	40.1	35.7	59.9	157.0	5-Jun	36.5	14.2
R Vanguard	61.4	46.8	42.4	37.4	59.4	155.1	3-Jun	33.9	14.5
WA7936 (HWW)	48.1				55.4	165.5	14-Jun	33.8	12.7
WA7939	51.1				52.0	163.8	12-Jun	33.0	16.4
Wahoo +	<b>70.9*</b>	<b>51.4*</b>	<b>47.4*</b>		59.5	152.8	1-Jun	30.4	12.5
<b>Average</b>	<b>65.2</b>	<b>47.6</b>	<b>43.4</b>	<b>37.8</b>	<b>59.2</b>	<b>157.0</b>	<b>5-Jun</b>	<b>33.5</b>	<b>13.9</b>
<b>LSD (0.05)</b>	<b>6.9</b>	<b>5.2</b>	<b>6.0</b>	<b>4.9</b>	<b>1.8</b>	<b>1.6</b>		<b>1.7</b>	
<b>C.V.</b>	<b>6.1</b>	<b>5.4</b>	<b>8.4</b>	<b>9.3</b>	<b>9.2</b>	<b>0.6</b>		<b>2.9</b>	

\*\* = indicates highest yielding variety within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

Table 9. HARD WINTER : District 6-- Sidney - Dryland

Cultivar/Line	Grain Yield (bushels/acre) <sup>3/</sup>			2004 Data					
	2004	2003-2004	2002-2004	Test weight	Winter survival	Heading Date		Plant height	Protein %
						Julian	Calendar		
		2 yr	3 yr	lb/bu	%			in	
Above (CL)+	42.8	47.7	42.6	59.6	44.8	161.1	9-Jun	21.5	13.4
Bighorn (P)+	49.3	55.9	50.5	60.5	41.3	169.0	17-Jun	25.3	14.1
BigSky +	55.0	58.4	53.1	61.1*	53.0	169.0	17-Jun	29.8	14.9
BZ9W96-788 (P, Ledger)++	44.1	49.0		60.9*	36.8	167.2	15-Jun	24.1	14.1
R CDC Falcon (P)+	56.7	61.3	58.5*	59.6	55.0	166.8	15-Jun	25.2	13.8
Elkhorn +	47.8	55.0	50.3	59.1	47.2	171.3	19-Jun	33.4	14.4
Expedition ++	42.0	48.8	46.8	60.4	49.9	161.7	10-Jun	23.2	13.9
Genou ++	48.7	55.0	47.4	59.5	44.0	168.1	16-Jun	29.1	14.7
GM10004 (P, HWW)	48.6	51.4	47.0	59.8	39.8	169.3	17-Jun	28.0	14.4
Golden Spike (HWW)+ <sup>1/</sup>	40.5	52.2	47.7	57.7	28.0	172.1	10-Jun	25.5	14.5
Jagalene (P)+	44.0	53.2		61.8*	42.8	162.9	11-Jun	24.6	14.1
Jerry	58.4	62.9	59.2*	59.8	53.9	167.3	15-Jun	29.6	13.9
Judith	59.7*	62.6	55.8	59.7	53.3	166.3	14-Jun	28.1	14.6
Millenium +	53.3	56.4		60.7	52.5	163.5	12-Jun	26.7	13.9
R Morgan (P)+	57.3	64.9	59.2*	58.8	47.3	170.5	19-Jun	29.7	14.5
MT00159	68.1*	73.4**	64.7**	59.3	53.5	169.0	17-Jun	27.4	13.7
MT0097	62.4*	67.5*	59.4*	60.0	60.0	169.6	18-Jun	28.3	13.8
MT01148	59.3*	66.3*		59.9	58.2	170.4	18-Jun	28.5	14.3
MT0177	57.6	63.6		59.9	47.4	168.5	17-Jun	27.4	13.5
MT02113	58.3			59.0	49.2	167.8	16-Jun	26.4	13.3
MT02136	55.6			57.7	45.3	167.3	15-Jun	25.3	13.2
MT0245	50.6			60.1	47.2	168.8	17-Jun	23.7	15.0
MT0277	55.6			59.8	59.6	164.8	13-Jun	29.2	14.4
MT9982-53	60.5*			60.9*	44.0	170.1	18-Jun	27.5	13.8
MT9982-65	62.6*			60.2	44.2	169.3	17-Jun	27.9	14.2
MTCL01159 (MT1159CL)++	44.3			58.8	30.3	167.9	16-Jun	26.1	14.7
MTS0023-58	42.7			58.8	41.1	172.4	20-Jun	33.0	14.6
MTS0222	50.7			59.4	43.1	165.7	14-Jun	27.4	15.6**
MTW01133	55.0	62.2		60.0	57.5	163.3	11-Jun	24.3	14.0
MTW01143	55.2	61.8		59.5	46.0	170.7	19-Jun	27.2	14.0
MTW02111 (HWW)	61.4*			60.2	51.5	171.9	20-Jun	27.1	13.0
MTW02115 (HWW)	52.0			59.8	51.9	168.8	17-Jun	27.5	14.5
Neeley	58.0	63.7	57.5*	60.1	48.5	169.7	18-Jun	30.7	13.5
Norstar	52.8	60.8	55.1	59.7	48.1	173.4	21-Jun	36.4	14.5
NuFrontier (P,HWW)+	47.4	53.1	47.2	60.5	44.9	164.4	12-Jun	26.4	12.9
NuHorizon (P,HWW)+	49.8	53.3	42.6	60.9*	39.2	162.7	11-Jun	23.2	14.1
NuSky (HWW)	52.6	60.7	56.1	60.0	44.3	169.7	18-Jun	30.4	14.1
NuWest (P,HWW)+	56.3	60.7	55.0	59.7	41.7	168.9	17-Jun	28.5	14.4
R Paul ++	54.1	62.0	56.4	58.6	51.2	170.2	18-Jun	27.2	14.2
Promontory <sup>1/</sup>	57.9	66.1*	58.1*	60.8*	42.0	165.2	13-Jun	27.4	14.1
R Pryor (P)+	68.4**	69.2*	61.1*	60.2	53.1	168.7	17-Jun	27.1	13.6
Quantum 542 (P)	35.4	52.4	48.6	58.5	15.2	168.3	16-Jun	28.5	14.2
Rampart <sup>2/</sup>	48.2	49.4	-	59.8	33.7	169.2	17-Jun	30.6	15.3*
Rocky (P)	60.0*	64.8	56.5	60.9*	61.6	163.5	12-Jun	31.0	13.4
Tiber	56.0	58.5	52.2	61.0*	56.8	170.0	18-Jun	30.1	14.7
Vanguard	42.1	49.6	41.0	60.3	38.1	168.9	17-Jun	28.7	14.9
WA7936 (HWW)	61.3*			56.2	51.1	173.1	21-Jun	27.5	14.8
WA7939	60.1*			56.9	46.6	174.6	23-Jun	26.3	14.3
Wahoo +	54.1	61.2	56.0	58.9	53.3	163.3	11-Jun	26.0	13.7
Average	53.4	58.7	52.6	59.7	46.7	168.1	16-Jun	27.6	14.2
LSD (0.05)	9.6	8.5	7.7	1.1	12.6	1.7		2.8	0.5
C.V.	10.3	7.1	8.9	1.1	15.5	0.6		5.9	2.3

\*\* = indicates highest yielding variety within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = Rampart not planted in 2002

<sup>3/</sup> = Severe winterkill in 2001, test not harvested



Table 10. HARD WINTER : District 6-- Williston, North Dakota - Dryland

Cultivar/Line	Grain Yield (bushels/acre) <sup>3/</sup>			2004 Data					
	2004	2003-2004	2002-2004	Test weight	Winter survival	Heading Date <sup>4/</sup>		Plant height	Protein %
						Julian	Calendar		
		2 yr	3 yr	lb/bu	%	2003 data		in	
Above (CL)+	23.8	33.7	25.6	60.5	5.5	159.3	8-Jun	24.7	13.0
Bighorn (P)+	33.4	48.0	40.9	60.6	6.3	164.0	13-Jun	24.9	13.9
BigSky +	35.1	47.5	43.4	61.2	5.3	164.0	13-Jun	31.6	15.1
BZ9W96-788 (P, Ledger)++	27.4	38.1		60.5	8.5	162.7	12-Jun	24.7	13.6
R CDC Falcon (P)+	37.0	48.9	46.2	60.0	11.8	164.3	13-Jun	24.7	12.6
Elkhorn +	47.3*	57.3*	51.1*	59.4	11.9	166.0	15-Jun	35.6	13.9
Expedition ++	24.6	35.8	34.0	60.2	6.7	158.7	8-Jun	25.2	14.0
Genou ++	31.7	45.4	37.8	60.2	7.3	165.0	14-Jun	29.0	14.5
GM10004 (P, HWW)	27.5	38.3	33.1	60.8	3.1	165.0	14-Jun	29.7	13.5
Golden Spike (HWW)+ <sup>1/</sup>	23.2	38.0	31.1	58.9	2.1	166.7	16-Jun	30.1	13.1
Jagalene (P)+	25.3	40.0		62.8	10.2	160.3	9-Jun	25.2	13.8
Jerry	49.4*	54.9*	51.6*	60.4	15.5	165.7	15-Jun	31.2	13.6
Judith	43.1	53.3	46.3	59.5	7.7	163.0	12-Jun	32.7	13.9
Millenium +	28.6	37.4		61.1	5.6	161.7	11-Jun	27.2	14.1
R Morgan (P)+	54.1*	60.8*	53.9*	60.1	19.3	165.7	15-Jun	32.2	14.0
MT00159	39.6	55.9*	51.5*	59.4	5.9	165.3	14-Jun	29.5	13.4
MT0097	44.4*	53.4	49.7*	60.4	7.4	164.7	14-Jun	29.4	13.9
MT01148	39.6	52.3		59.8	4.0	166.0	15-Jun	32.3	13.9
MT0177	34.0	45.8		60.8	8.2	164.3	13-Jun	28.9	13.1
MT02113	16.3			56.8	2.2			26.6	13.4
MT02136	42.9			58.7	6.5			27.4	12.9
MT0245	33.3			60.4	6.0			29.4	15.1
MT0277	26.6			58.1	2.9			28.6	14.4
MT9982-53	49.9*			60.7	11.9			28.5	13.7
MT9982-65	33.9			59.6	6.1			27.8	13.4
MTCL01159 (MT1159CL)++	23.4			58.1	6.7			26.9	14.5
MTS0023-58	32.0			58.9	4.3			33.5	14.4
MTS0222	24.9			59.4	2.8			29.7	15.5
MTW01133	41.7	50.6		60.5	12.4	160.3	9-Jun	26.4	13.0
MTW01143	31.4	46.6		59.1	3.3	167.3	16-Jun	31.8	14.2
MTW02111 (HWW)	30.6			59.5	2.5			28.9	13.7
MTW02115 (HWW)	32.4			61.1	8.9			32.0	13.5
Neeley	40.3	54.7*	48.4*	60.3	9.8	165.3	14-Jun	30.2	14.0
Norstar	56.5**	63.1**	55.8**	60.8	30.7	167.3	16-Jun	43.0	14.5
NuFrontier (P,HWW)+	32.3	40.2	34.5	61.5	2.5	162.3	11-Jun	25.3	11.9
NuHorizon (P,HWW)+	24.0	34.9	26.8	61.5	3.5	161.0	10-Jun	25.3	13.9
NuSky (HWW)	35.4	49.7	45.4	60.5	7.6	165.7	15-Jun	31.5	14.0
NuWest (P,HWW)+	35.7	46.4	42.3	60.0	9.0	163.7	13-Jun	30.8	13.7
R Paul ++	37.2	51.0	46.8	58.4	2.8	165.3	14-Jun	28.2	14.0
Promontory <sup>1/</sup>	18.6	41.0	37.4	60.9	1.2	161.3	10-Jun	26.6	13.5
R Pryor (P)+	35.6	48.1	42.7	58.9	2.8	167.3	16-Jun	27.4	13.8
Quantum 542 (P)	23.9	38.3	33.5	60.4	4.9	161.0	10-Jun	30.4	14.5
Rampart <sup>2/</sup>	20.2	33.8	-	59.3	2.7	165.7	15-Jun	26.5	15.1
Rocky (P)	25.6	41.5	37.5	60.6	2.5	163.3	12-Jun	31.2	13.1
Tiber	39.9	50.1	42.9	61.4	7.5	166.0	15-Jun	32.7	14.6
Vanguard	33.2	41.5	34.6	60.6	7.1	164.7	14-Jun	30.3	14.9
WA7936 (HWW)	33.5			57.0	6.2			26.9	14.2
WA7939	33.8			55.6	6.0			28.0	13.9
Wahoo +	39.0	49.1	44.2	59.2	8.3	161.3	10-Jun	26.0	13.2
Average	33.7	46.2	41.3	59.9	7.0	163.9	13-Jun	29.1	13.9
LSD (0.05)	12.9	9.5	7.5		9.2	1.6		3.5	
C.V.	23.6	10.1	11.1		78.2	7.4		7.4	

\*\* = indicates highest yielding variety within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat<sup>2/</sup> = Rampart not planted in 2002<sup>3/</sup> = Severe winterkill in 2001, test not harvested<sup>4/</sup> = no heading dates taken in 2004

Table 11. HARD WINTER : Yield (bu/a) in Winter-kill Environments, 2002-2004

Cultivar/Line	Sidney			Williston			Moccasin	Conrad	8 Location	
	2004	2003	2002	2004	2003	2002	2004	2004	Yield	Winter
									bu/a	survival %
<b>Above (CL)+</b>	42.8	52.6	32.1	23.8	43.6	9.4	42.5	68.7	39.5	36.7
<b>Bighorn (P)+</b>	49.3	62.5	40.1	33.4	62.5	26.8	<b>52.7*</b>	71.7	49.8	45.9
<b>BigSky +</b>	55.0	61.7	42.7	35.1	59.8	35.4	49.5	<b>78.6*</b>	52.2	53.2
<b>BZ9W96-788 (P, Ledger)++</b>	44.1	53.9		27.4	48.7		<b>54.7*</b>	<b>77.2*</b>		
<b>CDC Falcon (P)+</b>	56.7	65.8	<b>54.3**</b>	37.0	60.7	<b>40.8*</b>	<b>55.5*</b>	72.0	<b>55.2*</b>	56.7
<b>Elkhorn +</b>	47.8	62.2	41.3	<b>47.3*</b>	<b>67.3*</b>	<b>38.8*</b>	44.7	56.8	50.7	<b>59.3*</b>
<b>Expedition ++</b>	42.0	55.5	43.1	24.6	46.9	30.5	40.4	<b>74.7*</b>	44.7	53.3
<b>Genou ++</b>	48.7	61.2	32.5	31.7	59.1	22.5	51.9	69.9	47.2	43.8
<b>GM10004 (P, HWW)</b>	48.6	54.2	38.1	27.5	49.1	22.6	41.7	61.5	42.9	40.3
<b>Golden Spike (HWW)+<sup>1/</sup></b>	40.5	63.8	38.0	23.2	52.8	17.2	50.4	66.8	44.2	40.0
<b>Jagalene (P)+</b>	44.0	62.3		25.3	54.7		48.3	69.0		
<b>Jerry</b>	58.4	67.3	<b>51.9*</b>	<b>49.4*</b>	60.3	<b>45.1**</b>	52.2	70.9	<b>56.9*</b>	<b>60.5*</b>
<b>Judith</b>	<b>59.7*</b>	65.4	42.5	43.1	63.5	32.3	50.0	70.3	53.3	51.4
<b>Millenium +</b>	53.3	59.4		28.6	46.2		45.1	<b>76.9*</b>		
<b>Morgan (P)+</b>	57.3	<b>72.4*</b>	47.4	<b>54.1*</b>	<b>67.5*</b>	<b>40.0*</b>	51.7	69.3	<b>57.5*</b>	<b>61.3*</b>
<b>MT00159</b>	<b>68.1*</b>	<b>78.7**</b>	47.2	39.6	<b>72.1**</b>	<b>42.8*</b>	<b>60.2**</b>	71.4	<b>60.0**</b>	54.1
<b>MT0097</b>	<b>62.4*</b>	<b>72.5*</b>	48.0	<b>44.4*</b>	62.4	<b>42.4*</b>	49.2	<b>77.4*</b>	<b>56.8*</b>	54.1
<b>MT01148</b>	<b>59.3*</b>	<b>73.3*</b>		39.6	64.9		<b>58.0*</b>	<b>75.3*</b>		
<b>MT0177</b>	57.6	69.5		34.0	57.6		<b>53.5*</b>	65.4		
<b>MT02113</b>	58.3			16.3			46.2	<b>82.4**</b>		
<b>MT02136</b>	55.6			42.9			<b>56.3*</b>	70.2		
<b>MT0245</b>	50.6			33.3			49.2	66.1		
<b>MT0277</b>	55.6			26.6			51.7	65.7		
<b>MT9982-53</b>	<b>60.5*</b>			<b>49.9*</b>			<b>59.1*</b>	<b>74.6*</b>		
<b>MT9982-65</b>	<b>62.6*</b>			33.9			<b>58.7*</b>	<b>76.9*</b>		
<b>MTCL01159 (MT1159CL)++</b>	44.3			23.4			48.3	60.3		
<b>MTS0023-58</b>	42.7			32.0			48.8	63.2		
<b>MTS0222</b>	50.7			24.9			47.0	65.2		
<b>MTW01133</b>	55.0	69.4		41.7	59.4		50.1	72.1		
<b>MTW01143</b>	55.2	68.4		31.4	61.8		50.8	68.6		
<b>MTW02111 (HWW)</b>	<b>61.4*</b>			30.6			<b>53.4*</b>	<b>78.3*</b>		
<b>MTW02115 (HWW)</b>	52.0			32.4			51.7	64.6		
<b>Neeley</b>	58.0	69.3	44.5	40.3	<b>69.0*</b>	36.0	<b>53.5*</b>	71.7	<b>55.4*</b>	50.2
<b>Norstar</b>	52.8	68.8	44.0	<b>56.5**</b>	<b>69.6*</b>	41.3	45.2	56.4	54.3	<b>67.4**</b>
<b>NuFrontier (P,HWW)+</b>	47.4	58.8	36.0	32.3	48.1	23.2	<b>56.0*</b>	71.9	46.6	41.0
<b>NuHorizon (P,HWW)+</b>	49.8	56.8	21.4	24.0	45.8	10.6	<b>55.8*</b>	<b>76.7*</b>	42.6	32.4
<b>NuSky (HWW)</b>	52.6	68.8	46.1	35.4	63.9	36.8	<b>53.3*</b>	69.8	53.4	53.7
<b>NuWest (P,HWW)+</b>	56.3	65.0	42.3	35.7	57.0	34.2	46.4	<b>72.8*</b>	51.4	52.0
<b>Paul ++</b>	54.1	69.9	45.1	37.2	64.7	<b>38.5*</b>	<b>55.3*</b>	71.7	<b>54.6*</b>	52.5
<b>Promontory<sup>1/</sup></b>	57.9	<b>74.2*</b>	41.6	18.6	63.3	30.4	<b>57.6*</b>	67.9	51.5	43.5
<b>Pryor (P)+</b>	<b>68.4**</b>	69.9	44.7	35.6	60.5	32.1	<b>59.2*</b>	70.8	<b>55.2*</b>	48.1
<b>Quantum 542 (P)</b>	35.4	69.3	41.0	23.9	52.7	24.0	<b>54.6*</b>	<b>75.3*</b>	47.1	41.9
<b>Rampart<sup>2/</sup></b>	48.2	50.5	-	20.2	47.4	-	45.8	62.9		
<b>Rocky (P)</b>	<b>60.0*</b>	69.6	39.8	25.6	57.3	29.7	50.8	<b>76.3*</b>	51.2	49.3
<b>Tiber</b>	56.0	61.0	39.2	39.9	60.3	28.4	49.8	64.9	50.0	50.4
<b>Vanguard</b>	42.1	57.0	24.5	33.2	49.8	20.8	43.6	65.8	40.0	36.0
<b>WA7936 (HWW)</b>	<b>61.3*</b>			33.5			50.1	66.6		
<b>WA7939</b>	<b>60.1*</b>			33.8			<b>55.0*</b>	63.3		
<b>Wahoo +</b>	54.1	68.3	46.1	39.0	59.2	34.3	48.8	71.2	52.6	54.8
<b>Average</b>	<b>53.4</b>	<b>63.9</b>	<b>65.1</b>	<b>33.7</b>	<b>57.3</b>	<b>31.0</b>	<b>51.1</b>	<b>70.0</b>	<b>50.7</b>	<b>49.1</b>
<b>LSD (0.05)</b>	<b>9.6</b>	<b>7.3</b>	<b>9.4</b>	<b>12.9</b>	<b>5.8</b>	<b>7.4</b>	<b>7.8</b>	<b>9.6</b>	<b>5.6</b>	<b>8.4</b>
<b>C.V.</b>	<b>10.3</b>	<b>6.6</b>	<b>8.8</b>	<b>23.6</b>	<b>6.3</b>	<b>15.0</b>	<b>9.5</b>	<b>7.8</b>	<b>11.2</b>	<b>17.3</b>

\*\* = indicates highest yielding variety within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

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

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat<sup>2/</sup> = Rampart not planted in 2002

Table 12. HARD WINTER WHEAT: Yield Performance under Sawfly Pressure (1997-2003)

No 2004 tests with significant yield reduction due to sawfly damage

Variety/Line	Yield (bushels per acre)											Average 11 Locs w/Rmp	
	Havre 1997	Big Sandy 1997	The Knees 1997	Highwood 1997	Broadview 1997	Loma 1999	Loma 2000	Loma 2001	The Knees 2001	Ft Benton 2002	Havre 2003		N. Havre 2003
<b>Bighorn (P)+</b>	49.6	40.8	37.5	55.0	25.2	37.3	34.2	10.7	20.2	31.0	31.6	49.5	<b>35.6*</b>
<b>BigSky +</b>	45.5	46.1	44.9	52.4	29.4	39.6	38.5	11.4	18.0	31.3	27.8	45.9	
<b>CDC Falcon (P) + Genou</b>										32.4	28.8	54.1	
<b>Jerry</b>										31.8	30.2	55.0	
<b>Judith</b>	47.7	38.4	38.2	50.6	23.9	43.7	36.1	12.4	19.5	30.3	30.5	50.3	<b>35.6*</b>
<b>Morgan (P)+ MT00159</b>	49.6					40.6	37.2	10.9	21.4	30.5	25.4	56.4	
<b>MT0097</b>											31.2	58.8	
<b>Neeley</b>	42.6	41.7	34.3	51.1	27.3	34.9	39.5	12.3	16.5	29.7	30.3	59.2	<b>35.4*</b>
<b>Norstar</b>	41.3	47.8	34.4	45.2	25.5	35.8	36.5	9.2	18.0	28.1	18.9	46.7	32.7
<b>NuSky (HWW)</b>	52.7					35.8	27.5	13.2	19.3	32.5	28.4	55.9	
<b>NuWest (HWW) + Paul ++</b>	49.8	41.6	43.5	48.8	26.3	32.8	34.0	8.8	20.7	31.7	22.8	58.9	<b>35.3*</b>
<b>Promontory + <sup>1/</sup> Pryor (P)+</b>	43.1	33.0	34.8	55.2	20.6	35.8	39.7	9.3	16.2	34.4	30.3	56.2	34.0
<b>Rampart <sup>2/</sup></b>	45.2	47.9	39.5	52.3	28.8	35.9	42.7	16.4	23.0	-	30.5	54.8	<b>37.9**</b>
<b>Rocky (P)</b>	50.2	43.8	41.7	55.9	24.2	33.2	47.0	13.3	21.2	37.1	29.6	51.7	<b>37.4*</b>
<b>Tiber</b>	47.1	36.9	42.8	54.5	26.4	36.7	44.9	13.1	18.3	32.6	26.9	45.0	<b>35.7*</b>
<b>Vanguard</b>	48.3	45.9	41.4	50.5	31.0	32.6	41.4	15.7	24.4	33.7	32.1	46.8	<b>37.3*</b>
<b>Average LSD (0.05) C.V.</b>	<b>47.1</b>	<b>42.2</b>	<b>39.4</b>	<b>52.0</b>	<b>26.2</b>	<b>36.5</b>	<b>38.0</b>	<b>11.8</b>	<b>20.0</b>	<b>31.6</b>	<b>29.3</b>	<b>53.0</b>	<b>35.7</b> <b>3.0</b> <b>10.0</b>

\*\* = indicates highest yielding variety within a column

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

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

1/ = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

2/ = Rampart not planted in 2002

Table 13. Precipitation Data for Crop Year 2003-2004 (inches)

Agricultural Research Center	Sept. 2003	Oct. 2003	Nov. 2003	Dec. 2003	Jan. 2004	Feb. 2004	Mar. 2004	Apr. 2004	May 2004	June 2004	July 2004	Aug 2004	Total
<b>Western Triangle, Conrad</b>	1.01	1.15	0.25	0.17	0.25	0.03	0.08	0.53	2.99	1.83	0.58	1.99	<b>10.86</b>
	<b>1984-2004 Average = 11.30</b>												
<b>Northern, Havre</b>	1.37	0.56	0.28	0.64	0.92	0.18	0.16	1.07	4.36	2.13	1.08	1.68	<b>14.43</b>
	<b>1916-2004 Average = 12.10</b>												
<b>Northwestern, Kalispell</b>	2.56	1.29	0.59	1.04	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	<b>18.84</b>
	<b>1949-2004 Average = 19.65</b>												
<b>Central, Moccasin</b>	1.30	0.99	0.25	1.71	0.61	0.47	0.57	0.94	2.52	2.00	0.97	1.15	<b>13.48</b>
	<b>1909-2004 Average = 15.36</b>												
<b>Southern, Huntley</b>	0.20	1.49	0.37	0.59	0.21	0.85	0.14	1.01	0.90	1.95	1.63	0.09	<b>9.43</b>
	<b>1911-2004 Average = 13.16</b>												
<b>Northeastern, Sidney</b>	0.27	0.44	0.39	0.78	1.20	0.20	0.21	0.29	1.92	2.56	2.19	3.05	<b>14.42</b>
	<b>1949-2004 Average = 13.83</b>												
<b>Williston, N. Dakota</b>	0.44	0.89	0.35	0.34	0.78	0.10	0.07	0.44	3.24	1.66	2.27	1.43	<b>12.01</b>
	<b>1957-2004 Average = 14.30</b>												
<b>Post Farm, Bozeman</b>	0.08	0.66	0.29	0.86	0.26	1.09	0.70	1.46	2.62	2.25	1.49	1.60	<b>13.36</b>
	<b>1958-2004 Average = 15.96</b>												

Table 14. HARD WINTER WHEAT: Coleoptile Length (inches), from growth chamber determination

Variety	Coleoptile length (inches)				
	2004	2003-2004	2002-2003	2000//2003	
		2 yr	3 yr	4 yr	
Rampart	3.6**	3.9**	4.1**	4.3**	long coleoptile
MTS0222	3.5*				
BigSky +	3.3*	3.4	3.5	3.6	
Genou ++	3.3*	3.6	3.8		
Vanguard	3.3*	3.7*	4.0*	4.2*	
Quantum 542 (P)	3.2	3.3	3.3	3.4	medium coleoptile
MTW02115 (HWW)	3.2				
MTCL01159 (MT1159CL)++	3.1				
Neeley	3.0	3.1	3.2	3.3	
Norstar	3.0	3.2	3.4	3.5	
Above (CL)+	3.0	3.4	3.5		
Elkhorn +	2.9	3.1	3.2	3.2	
Rocky (P)	2.9	3.1	3.1	3.3	
Tiber	2.9	3.2	3.2	3.4	
MT0177	2.8	3.0			
NuHorizon (P,HWW)+	2.8	3.0	3.0	3.1	medium coleoptile
MT02113	2.8				
MTW02111 (HWW)	2.7				
Bighorn (P)+	2.7	2.9	3.0	3.1	
BZ9W96-788 (P, Ledger)++	2.7	3.0			
Golden Spike (HWW)+ <sup>1/</sup>	2.7	2.8	2.9	2.9	
Jagalene (P)+	2.6	2.7			
MTS0023-58	2.6				
MT0245	2.6				
MT01148	2.6	2.7			
Jerry	2.6	2.8	2.9		
GM10004 (P, HWW)	2.5	2.8	3.0	3.0	medium coleoptile
MT0277	2.5				
Paul ++	2.5	2.7	2.8	2.8	
MTW01143	2.5	2.8			
MT0097	2.5	2.7	2.8		
Expedition ++	2.4	2.7	2.8		
MT02136	2.4				
Wahoo +	2.4	2.6	2.7		
CDC Falcon (P)+	2.4	2.7	2.7	2.7	
MT00159	2.4	2.5	2.7		
NuFrontier (P,HWW)+	2.4	2.6	2.8	3.0	
MTW01133	2.3	2.4			short coleoptile
Judith	2.3	2.5	2.7	2.8	
Pryor (P)+	2.3	2.5	2.7	2.7	
MT9982-53	2.3				
NuSky (HWW)	2.3	2.5	2.6	2.7	
NuWest (P,HWW)+	2.2	2.4	2.6	2.6	
Millenium +	2.2	2.4			
Promontory <sup>1/</sup>	2.2	2.5	2.6	2.6	
Morgan (P)+	2.1	2.2	2.3	2.3	
MT9982-65	2.1				
WA7936 (HWW) <sup>2/</sup>	-				
WA7939 <sup>2/</sup>	-				
Average	2.7	2.8	3.0	3.1	
LSD (0.05)	0.4	0.2	0.3	0.3	
C.V.	8.3	4.1	5.1	6.3	

\*\* = indicates longest coleoptile within a column

CL = CLEARFIELD wheat tolerant to imidazolinone (IMI) herbicides

\* = indicates varieties equal to longest coleoptile variety within a column based on Fisher's protected LSD (p=0.05)

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

<sup>1/</sup> = Dwarf Smut Resistant; (HWW) = Hard White Winter Wheat

<sup>2/</sup> = not enough seed to do coleoptile test

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

Variety	Agronomic Characters					Cereal Quality <sup>5/</sup>		Disease Reactions <sup>4/</sup>			
	Maturity <sup>1/</sup>	Chaff Color	Winter Survival <sup>2/</sup>	Straw Strength <sup>3/</sup>	Shattering <sup>4/</sup>	Milling	Baking	Dwarf Smut	Stripe Rust	Stem Rust	Leaf Spot Complex
Above	E	White	2	S	-	3	2	S	-	MR	-
Bighorn	M	White	3	MS	-	5	3	S	MS	R	MS
BigSky	M	White	4	S	-	4	3	S	S	R	MR
CDC Falcon	M-L	White	4	MS	-	3	3	S	-	MR	S
Elkhorn	M-L	White	4	MW	-	4	3	S	MS	R	MR
Expedition	E	White	3	S	-	5	3	S	-	R	-
Genou	M	White	2	MS	-	4	4	S	-	-	-
Golden Spike	M	Brown	3	M	-	3	3	R	S	S	M
Jagalene	E	White	2	S	-	3	3	S	-	-	-
Jerry	M-L	White	5	MS	-	3	3	S	-	R	MR
Judith	M-E	White	3	S	M	4	5	S	VS	R	MS
Ledger	M-E	White	2	S	-	4	3	S	-	-	-
Millennium	E	White	2	M	-	3	2	S	-	MR	-
Morgan	M	White	5	MS	-	3	3	S	MS	R	MS
MT1159CL	M	Brown	2	S	-	3	3	S	-	-	-
Neeley	M	White	3	MS	S	3	3	S	MS	S	MS
Norstar	L	White	5	W	MR	4	4	S	S	S	S
NuFrontier	E	White	3	S	-	3	2	S	-	R	S
NuHorizon	E	White	3	S	-	3	3	S	-	R	MS
NuSky	M	White	4	M	R	5	4	S	S	R	MR
NuWest	M	White	4	S	R	5	4	S	S	R	MR
Paul	M	White	4	M	-	4	4	S	S	R	MS
Promontory	E	Brown	2	MS	-	5	4	R	R	S	MS
Pryor	M-L	White	3	S	-	3	3	S	MS	S	MR
Quantum 542	E	White	3	MS	M	3	4	S	MS	S	M
Rampart	M	Brown	2	M	M	4	4	S	S	MR	M
Rocky	E	White	2	MW	S	3	3	S	S	R	S
Tiber	M	Brown	3	S	VR	3	3	S	VS	S	MR
Vanguard	M	White	2	MS	M	4	4	S	S	S	S
Wahoo	E	White	3	S	-	3	2	S	-	R	-

1/ E = Early; M = Medium, L = Late classification of Ledger based on limited data

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

3/ W = Weak

MW = Medium Weak

M = Medium

MS = Medium Strong

S = Strong

4/ VR = Very Resistant

R = Resistant

MR = Moderately Resistant

M = Moderate

MS = Moderately Susceptible

S = Susceptible

- = no information

5/ 5 = Superior

4

3

2

1 = Inferior

**Table 16. List of soft white winter wheat varieties.**

Cultivar	Origin	Release Year	Pedigree
<b>Public Varieties</b>			
<b>Eltan</b>	Washington	1990	Luke/8/(BR-70443-3, P1167822)/7/(Cltr13438, (Norin 10/Brevor, Sel. 14, Cltr13253)/6/(Sel. 53, Cltr12597, (Turkey Red/Florence//Fortyfold /Federation/4/Oro//Turkey Red/Florence/3/Oro //Fortyfold/Federation, Sel. 27-15, Cltr12250)/5/Rio/Rex)
<b>Finch</b>	Washington	2002	Dusty*2/3/(WA7164, VPM 1/Moisson 951// Yamhill/Hyslop)
<b>Hill 81</b>	Oregon	1981	Yamhill/Hyslop
<b>Kmor</b>	Washington	1990	Luke/10/(VH067375, (Sel. 101, Cltr13438, (Norin 10/Brevor, Sel. 14, Cltr13253)/6/(Sel. 53, (Turkey Red/Florence//Fortyfold/ Federation/4/Oro// Turkey Red/Florence /3/Oro//Fortyfold/ Federation, Sel. 27-15, Cltr12250)/5/Rio/Rex) /9/(Norin 10/Brevor, Sel.
<b>Hubbard</b>	Idaho	2000	Hill 81/Augusta
<b>Lambert</b>	ID, OR, WA	1994	Stephens/Sprague
<b>Lewjain</b>	WA, OR, ID	1982	Luke/9/Super Helvia/8/Suweon 92/7/(Vogel 4, Cltr13645, (Oro//Turkey Red/Florence/3/3* Elgin, Elgin Sel. 19)/4/Elmar /5/Illinois No. 1/6/ Vogel 1813)
<b>MacVicar</b>	Oregon	1992	Yamhill/McDermid//Triticum spelta var Alba/3/Suweon 92/ Roedel/6/(Warrior//Atlas 66/ Comanche/3/Comanche/Ottawa, NE68513)/4/ Hyslop/5/Backa
<b>Neeley (HRW)</b>	Idaho	1980	Heglar/3/Norin 10/Staring//2*Cheyenne
<b>NuSky (HWW)</b>	Montana	2001	NuWest/Tiber
<b>Rod</b>	Washington	1992	Luke/Daws//Hill 81
<b>Simon</b>	Idaho	2003	Haven/Lambert//Madsen
<b>Stephens</b>	Oregon	1977	Nord Deprez/7/(Sel. 101, Cltr13438, (Norin 10 /Brevor, Sel. 14, Cltr13253)/6/(Sel. 53, (Turkey Red/Florence//Fortyfold /Federation/4/ Oro//Turkey Red/Florence/3/Oro//Fortyfold/ Federation, Sel. 27-15, Cltr12250)/5/Rio/Rex)

**Private Varieties**

<b>MAC-1</b>	Plant Breeders 1, Lake Seeds	1992	unknown
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Table 17. SOFT WHITE WINTER WHEAT: District 1 -- Kalispell - Dryland (High Rainfall)

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data				
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Heading Date		Plant height in	Protein %
						Julian	Calendar		
R Eltan	<b>134.9*</b>	103.1	112.9	<b>103.0**</b>	57.8	159.3	7-Jun	39.1	12.0
Finch ++	<b>139.9*</b>				61.7	159.3	7-Jun	39.7	10.8
R Hill 81	<b>126.6*</b>	95.8	105.6	93.4	60.8	157.7	6-Jun	40.3	12.1
Hubbard +	<b>142.6**</b>				60.4	156.3	4-Jun	44.2	11.5
Kmor	<b>127.2*</b>	96.2	105.7	<b>98.0*</b>	56.1	156.3	4-Jun	36.3	11.4
KW9043 (P)	122.9				62.2	153.7	2-Jun	37.5	11.2
Lambert	<b>133.7*</b>	96.9	106.3	95.9	60.1	152.7	1-Jun	38.9	11.4
R Lewjain	<b>130.1*</b>	98.8	108.0	<b>99.8*</b>	58.2	156.3	4-Jun	34.6	11.6
MAC-1 (P)+	<b>130.7*</b>	100.8	109.8	<b>97.8*</b>	61.2	153.0	1-Jun	39.3	11.5
MacVicar	<b>138.4*</b>	104.3	109.3	<b>98.1*</b>	59.8	154.0	2-Jun	36.3	10.6
Neeley (HRW)	116.3	96.3	106.6	95.9	61.1	155.3	3-Jun	42.8	12.0
NuSky (HWW)	106.0				59.8	155.0	3-Jun	43.3	12.5
Rod	<b>139.6*</b>	104.9	110.5	<b>102.2*</b>	56.7	158.7	7-Jun	37.0	11.5
Simon ++	<b>137.1*</b>				59.5	153.3	1-Jun	38.6	11.7
Stephens <sup>1/</sup>	-	-	-	-	-	-		-	-
<b>Average</b>	<b>130.4</b>	<b>99.7</b>	<b>108.3</b>	<b>98.3</b>	<b>59.6</b>	<b>155.8</b>	<b>4-Jun</b>	<b>39.1</b>	<b>11.6</b>
<b>LSD (0.05)</b>	<b>16.1</b>	<b>ns</b>	<b>ns</b>	<b>5.5</b>	<b>1.8</b>	<b>1.8</b>		<b>1.9</b>	
<b>C.V.</b>	<b>7.4</b>	<b>8.5</b>	<b>6.8</b>	<b>6.9</b>	<b>0.7</b>	<b>0.7</b>		<b>2.9</b>	

\*\* = indicates highest yielding variety within a column

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

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

<sup>1/</sup> = no Stephens data for 2004 due to low seed germination: Yield in 2003 = 70.4, 2002 = 134.0, 2001 = 78.0

**Table 18. SOFT WHITE WINTER WHEAT: District 2 -- Bozeman - Dryland (Moderate Rainfall)**

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data				
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Heading Date		Plant height in	Protein %
						Julian	Calendar		
<b>R Eltan</b>	119.4	<b>112.8**</b>	<b>103.1**</b>	<b>105.8**</b>	59.8	173.0	21-Jun	35.2	11.6
<b>Finch ++</b>	114.0				58.7	172.3	20-Jun	35.8	12.7
<b>R Hill 81</b>	104.5	95.0	91.5	92.4	60.4	171.0	19-Jun	38.2	12.5
<b>Hubbard +</b>	121.8				60.3	171.0	19-Jun	40.4	11.6
<b>Kmor</b>	103.5	97.2	91.7	94.3	55.4	172.3	20-Jun	32.7	12.7
<b>KW9043 (P)</b>	106.8				61.5	167.7	15-Jun	35.4	12.4
<b>Lambert</b>	117.5	<b>104.9*</b>	<b>98.5*</b>	96.9	58.3	168.3	16-Jun	36.3	12.1
<b>Lewjain</b>	103.4	95.0	89.3	91.1	58.3	173.3	21-Jun	34.5	12.3
<b>MAC-1 (P)+</b>	113.1	<b>106.7*</b>	<b>99.6*</b>	<b>100.4*</b>	60.3	169.3	17-Jun	37.0	12.0
<b>MacVicar</b>	107.4	96.1	91.3	93.8	57.1	168.3	16-Jun	34.0	12.0
<b>Neeley (HRW)</b>	123.2	<b>107.7*</b>	<b>100.7*</b>	<b>101.4*</b>	62.6	169.3	17-Jun	39.3	12.4
<b>NuSky (HWW)</b>	106.2				62.2	169.0	17-Jun	40.3	12.5
<b>Rod</b>	121.4	<b>107.3*</b>	<b>99.8*</b>	<b>100.6*</b>	55.7	172.3	20-Jun	33.9	12.4
<b>Simon ++</b>	118.9				58.3	169.7	18-Jun	34.4	12.4
<b>Stephens</b>	100.4	94.5	88.9	91.1	59.5	171.3	19-Jun	34.0	12.3
<b>Average</b>	<b>113.9</b>	<b>101.7</b>	<b>95.4</b>	<b>96.8</b>	<b>59.2</b>	<b>170.6</b>	<b>19-Jun</b>	<b>36.1</b>	<b>12.3</b>
<b>LSD (0.05)</b>	<b>ns</b>	<b>11.3</b>	<b>7.9</b>	<b>6.6</b>	<b>1.6</b>	<b>3.0</b>		<b>2.8</b>	
<b>C.V.</b>	<b>11.3</b>	<b>4.9</b>	<b>4.8</b>	<b>4.7</b>	<b>1.6</b>	<b>1.1</b>		<b>4.7</b>	

\*\* = indicates highest yielding variety within a column

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

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



**Table 19. SOFT WHITE WINTER WHEAT: Moccasin - Dryland**

Cultivar/Line	Grain Yield (bushels/acre)				2004 Data				
	2004	2003-2004	2002-2004	2001-2004	Test weight lb/bu	Heading Date		Plant height in	Protein %
						Julian	Calendar		
<b>Eltan</b>	<b>76.4**</b>	<b>56.3**</b>	<b>53.9**</b>	<b>54.8**</b>	56.7	169.0	17-Jun	32.7	14.6
<b>Finch ++</b>	62.3				56.6	170.0	18-Jun	31.2	12.8
<b>Hill 81</b>	58.9	49.4	48.9	49.1	57.7	170.0	18-Jun	35.6	14.8
<b>Hubbard +</b>	<b>69.3*</b>				<b>58.7</b>	<b>166.7</b>	<b>15-Jun</b>	<b>37.3</b>	<b>12.7</b>
<b>Kmor</b>	<b>69.2*</b>	<b>55.2*</b>	<b>52.7*</b>	<b>51.9*</b>	54.5	167.3	15-Jun	30.2	14.5
<b>KW9043 (P)</b>	53.5				57.6	166.0	14-Jun	32.0	14.4
<b>Lambert</b>	61.8	49.1	<b>50.0*</b>	50.3	56.0	164.7	13-Jun	33.6	13.2
<b>Lewjain</b>	31.3	34.5	38.2	42.5	55.0	176.0	24-Jun	27.8	16.6
<b>MAC-1 (P)+</b>	63.0	<b>49.7*</b>	48.2	47.8	57.0	165.0	13-Jun	35.0	13.3
<b>MacVicar</b>	<b>67.1*</b>	<b>52.8*</b>	<b>51.4*</b>	50.3	52.8	166.0	5-Sep	31.2	14.6
<b>Neeley (HRW)</b>	<b>71.0*</b>	<b>54.1*</b>	<b>53.2*</b>	<b>54.0*</b>	59.6	164.3	12-Jun	34.0	13.9
<b>NuSky (HWW)</b>	62.9				60.3	164.7	13-Jun	33.4	15.2
<b>Rod</b>	<b>72.3*</b>	<b>54.2*</b>	<b>52.7*</b>	<b>51.6*</b>	54.1	169.3	17-Jun	31.5	12.9
<b>Simon ++</b>	<b>72.4*</b>				57.4	165.0	13-Jun	32.3	13.7
<b>Stephens</b>	32.6	32.0	37.9	41.2	52.8	169.0	17-Jun	30.4	15.2
<b>Average</b>	<b>61.6</b>	<b>48.7</b>	<b>48.7</b>	<b>49.3</b>	<b>56.4</b>	<b>167.5</b>	<b>16-Jun</b>	<b>32.6</b>	<b>14.2</b>
<b>LSD (0.05)</b>	<b>9.6</b>	<b>6.9</b>	<b>4.8</b>	<b>4.0</b>	<b>1.4</b>	<b>1.8</b>		<b>2.8</b>	
<b>C.V.</b>	<b>9.3</b>	<b>12.1</b>	<b>10.3</b>	<b>9.9</b>	<b>1.2</b>	<b>0.7</b>		<b>5.1</b>	

\*\* = indicates highest yielding variety within a column

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

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

**Table 20. Selected agronomic characters and disease reactions of soft white winter wheats.**

Variety	Agronomic Characters			Diseases <sup>3/</sup>			
	Winter Maturity <sup>1/</sup>	Survival <sup>2/</sup>	Lodging <sup>3/</sup>	Dwarf Smut	Snow Mold	Stem Rust	Stripe Rust
<b>Daws</b>	<b>M</b>	<b>2</b>	<b>MR</b>	<b>S</b>	<b>S</b>	<b>MS</b>	<b>R</b>
<b>Eltan</b>	<b>L</b>	<b>2</b>	<b>MS</b>	<b>MR</b>	<b>MR</b>	<b>MS</b>	<b>MS</b>
<b>Finch ++</b>	<b>M-L</b>	<b>2</b>	<b>MR</b>	<b>-</b>	<b>-</b>	<b>S</b>	<b>MR</b>
<b>Hill 81</b>	<b>M</b>	<b>1</b>	<b>MR</b>	<b>R</b>	<b>S</b>	<b>MS</b>	<b>R</b>
<b>Hubbard +</b>	<b>M</b>	<b>2</b>	<b>MR</b>	<b>S</b>	<b>-</b>	<b>-</b>	<b>MS</b>
<b>Kmor</b>	<b>M-L</b>	<b>1</b>	<b>M</b>	<b>MR</b>	<b>S</b>	<b>MS</b>	<b>R</b>
<b>Lambert</b>	<b>E-M</b>	<b>1</b>	<b>M</b>	<b>S</b>	<b>MS</b>	<b>-</b>	<b>R</b>
<b>Lewjain</b>	<b>L</b>	<b>1</b>	<b>M</b>	<b>MR</b>	<b>MS</b>	<b>MS</b>	<b>R</b>
<b>MAC-1 (P) +</b>	<b>E-M</b>	<b>2</b>	<b>MR</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>MacVicar</b>	<b>E-M</b>	<b>1</b>	<b>MR</b>	<b>S</b>	<b>S</b>	<b>MS</b>	<b>MR</b>
<b>Rod</b>	<b>M-L</b>	<b>1</b>	<b>MR</b>	<b>S</b>	<b>S</b>	<b>MS</b>	<b>R</b>
<b>Simon ++</b>	<b>E</b>	<b>2</b>	<b>MR</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>MR</b>
<b>Stephens</b>	<b>E</b>	<b>1</b>	<b>R</b>	<b>S</b>	<b>S</b>	<b>MS</b>	<b>R</b>

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

1/ E = Early; M = Medium, L = Late

2/ 5 = Best Winter survival (over several years at Moccasin)

3/ VR = Very Resistant

R = Resistant

MR = Moderately Resistant

M = Moderate

MS = Moderately Susceptible

S = Susceptible

- = no information

## Additional Descriptive Information for Winter Wheat Varieties

### Hard Winter Wheat

#### New for 2005 Bulletin:

**Ledger (BZ9W96-788)** – hard red winter wheat developed by WestBred LLC and released in 2004. Ledger is an early maturing wheat, semidwarf wheat with average winter hardiness. Two years of Montana Intrastate Winter Wheat Program testing show this variety to be of average yield and protein with above average test weight. Milling and baking characteristics are acceptable. PVP, Title V is pending.

**MT1159CL (MTCL01159)** - a CLEARFIELD (CL) wheat with imidazolinone tolerance, developed by the Montana Agricultural Experiment Station in 2004 and licensed to WestBred LLC. MT1159CL is a medium maturity, semidwarf hard red winter wheat. MT1159CL has moderate winter hardiness and production should be restricted to areas where winter kill risk is moderate. Crop tolerance to Beyond herbicide is equal or superior to Above under Montana conditions. MT1159CL has yield potential similar to Above, medium test weight, and fair end-use qualities. PVP, Title V is pending.

#### Varieties previously in bulletin:

**Above** – a CLEARFIELD (CL) wheat with imidazolinone tolerance, developed by the Colorado Agricultural Experiment Station in 2001. Above is an awned, white-chaffed, early maturing, semidwarf hard red winter wheat. It has good straw strength. In Montana tests, in 2002, Above had below average yield at all locations except Bozeman, while in 2003, it was an average variety across the 8 locations tested. It had low winter survival. Above has average test weight and below average protein. Above is resistant to stem rust, susceptible to leaf rust and moderately susceptible to both wheat streak mosaic virus and barley yellow dwarf virus. Above had average milling results and poor baking from samples in the 2002 and 2003 tests. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed. Additionally, the CLEARFIELD gene is patented.

**BigSky** - is a broadly adapted, high-yielding hard red winter wheat cultivar with medium maturity, good foliar disease resistance, and dual purpose

(bread and Asian noodle) end-use quality. Yield performance is similar to Judith, Kestrel, Neeley and Rocky and higher than Tiber and Erhardt. Test weight is superior to all these varieties. BigSky is of medium maturity heading 1-2 days later than Judith, similar in height to Tiber, but with strong, stiff straw. BigSky is resistant to stem rust but susceptible to leaf and stripe rust. Resistance to Septoria and tan spot is good. Milling and baking qualities of BigSky are within acceptable ranges. BigSky was released by the Montana AES in the fall of 2001. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Bighorn** - Developed by Rohm-Haas and released in 1984. Bighorn was owned and merchandised by HybriTech Seed International, Inc until 2000 and now owned by Western Plant Breeders. It is a medium height variety with good winter-hardiness and medium-late maturity. It has white chaff and good straw strength. It is moderately susceptible to leaf rust but resistant to stem rust. It is rated as good in milling quality. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**CDC Falcon** – hard red winter wheat developed by the Crop Development Center, Saskatoon, Saskatchewan and registered in 1998. Licensed to Western Plant Breeders. 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. It is rated as having acceptable milling and baking quality.

**Elkhorn** - released by the North Dakota Agricultural Experiment Station in 1995. It is a hard red winter wheat. Elkhorn is an awned, white chaffed, tall variety, with a lax, tapering spike. Elkhorn is moderately resistant to stem rust with approximately 25 percent of the plants being susceptible to the prevalent races of stem rust. It is moderately susceptible to leaf rust. The milling and baking qualities of Elkhorn are acceptable by industry. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Expedition** – hard red winter wheat released by the South Dakota Agricultural Experiment Station in 2002. Expedition is an early maturing variety with white chaff color and good winter hardiness. It had average yield, above average test weight, short stature and average protein in Montana testing. According to South Dakota St. Univ. Expedition has fair lodging and excellent baking quality. PVP, Title V is pending.

**Genou** – a solid-stem hard red winter wheat with improved yield potential and cold tolerance relative to Rampart. Stem solidness is relatively good, although not as good as Rampart. Test weight, maturity, plant height, grain protein, and end-use qualities are similar to those of Rampart and Vanguard. Foundation seed was made available in fall of 2004. Genou (French for knee) is named after a school house in The Knees area of Chouteau County. PVP, Title V will be applied for.

**Golden Spike** – hard **white** winter wheat released by the Utah Agricultural Experiment Station in 2000. Awned, brown-chaffed. It has an erect, twisted flag leaf, an elliptical seed with mid-wide seed crease. Has excellent resistance to current prevalent races of common bunt. Moderately resistant to snow molds. Susceptible to stripe rust and moderately susceptible to damage by Russian wheat aphid and cereal leaf beetle. Has very good milling and baking properties and is suitable for Asian noodles. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed. Golden Spike is licensed to General Mills for production outside Utah.

**Jagalene** – an awned, white-chaffed, early maturing, semidwarf hard red winter wheat developed by AgriPro Seeds in 2002. In Montana tests, in 2003, Jagalene had high yield, high test weight, and average protein. Winter hardiness of Jagalene was less than Rocky. Milling and baking performance are acceptable. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**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. Mixing properties and baking performance are equal to Roughrider.

**Judith** - A hard red winter wheat variety released by the Montana Agricultural Experiment Station in 1988. Judith is a bearded variety with white chaff. It is high yielding with good shatter resistance. Judith is medium in maturity and has a reasonable level of winter-hardiness. The heading date is similar to Rocky, and the winter-hardiness similar to Redwin. It is resistant to stem rust, but moderately susceptible to bacterial leaf blight and leaf spotting complex. The protein of Judith is somewhat lower than Redwin, but equal to or better than other varieties on the recommended list. The test weight is 1 - 2 lb/bu lower than many varieties. The milling and baking qualities of Judith are very good exhibiting high flour yield, absorption, flour protein, loaf volume and grain/texture scores.

**Millennium** – a hard red winter wheat developed cooperatively by the Nebraska Agricultural Experiment Station and USDA-ARS and released in 2000 by the developing institutions and the South Dakota Agricultural Experiment Station. It is an awned, white-glumed cultivar with early maturity and average plant height under Montana conditions. In Montana tests, in 2003, Millennium had above average yield, above average test weight, and average protein. Winter hardiness of Millennium was less than Rocky. Millennium is moderately resistant to stem rust and leaf rust and has exhibited a low level of tolerance to wheat streak mosaic virus. Nebraska has determined that the overall end-use characteristics for Millennium should be acceptable to the milling and baking industries. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Morgan** – Developed by the Crop Development Centre, University of Saskatchewan. Western Plant Breeders was granted the production rights. It is an awned, white chaffed, semidwarf hard red winter wheat. The spike is tapered, mid-dense and lacks a waxy bloom. The glumes are medium long, medium wide, no pubescence and have oblique shoulders. Morgan is moderately tolerant to stem rust and moderately susceptible to leaf rust. Morgan is protected under the Plant Variety Protection Act, but not the Title V option.

**Neeley** – Developed and released in 1980 by USDA-ARS and the Idaho Agricultural Research Station. It is a hard red wheat. It is a semidwarf

variety with intermediate maturity. The spikes are fusiform and mid-dense, have white awns and white glumes and are erect to inclined. Neeley generally has 1 to 3 percent lower protein than most recommended hard red winter wheats. Neeley has average winter-hardiness.

**Norstar** – a hard red winter wheat developed at the Agriculture Canada Research Station, Lethbridge, Alberta. It was a hard red winter wheat released in 1977. Norstar is lodging susceptible, susceptible to stem rust, but is very winter-hardy. The spikes are long, inclined, tapering, mid-dense with white awns. The florets tend to spread. The glumes are white and glabrous with narrow beaks. The glume shoulders are narrow and oblique to wanting. The kernels are light red, mid-sized to small, mid-long, narrow to mid-wide and elliptical to oval in shape.

**NuFrontier** – hard white winter wheat marketed by General Mills, released in 2001. Average yielding variety with excellent test weight, but low protein under Montana conditions. NuFrontier is early maturing, short, with good straw strength. Limited quality data shows average milling and fair baking characteristics, with lower than average loaf volume. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**NuHorizon** - hard white winter wheat marketed by General Mills, released in 2001. Average yielding variety with excellent test weight, but low protein under Montana conditions. NuHorizon is early maturing, short, with good straw strength. Limited quality data shows good milling, with above average flour extraction and average baking characteristics. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**NuSky** – hard **white** winter wheat to be released by the Montana Agricultural Experiment Station as a public release in the fall of 2001. High yielding, medium maturity, good winterhardiness, intermediate height, good straw strength, average grain protein, and good milling, bread-baking, and Asian noodle characteristics. Field performance and end-use quality characteristics are very similar to NuWest.

**NuWest** – Developed by the Montana Agricultural Experiment Station. It was released in 1994 and is

currently licensed to General Mills. NuWest is a hard **white** winter wheat of intermediate height. The spike is awned, white chaffed and erect at maturity. The kernels are hard, white and elliptical. The germ is large, with a mid-long brush, cheeks are rounded with a narrow straight crease. There is approximately one red kernel per 1500 white kernels. NuWest is resistant to prevalent races of stem rust found in Montana. It is susceptible to leaf rust, wheat streak mosaic virus and dwarf bunt. It is moderately susceptible to stripe rust and Cephalosporium stripe. It is susceptible to Russian wheat aphid and the wheat stem sawfly. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Paul** – a hollow-stemmed, winter-hardy, high quality hard red winter wheat with yield potential similar to Judith and Neeley. Has improved winter hardiness and baking quality relative to Neeley. Test weight of Paul is low but slightly higher than that of Judith. Paul is of medium to late maturity, relatively short, with straw strength similar to Neeley. Paul is resistant to stem rust, but susceptible to leaf and stripe rust. Foundation seed was available in fall of 2003. ‘Paul’ is named in honor of Paul L. Brown’s long-term contributions to Montana dryland agriculture. PVP, Title V will be applied for.

**Promontory** – Released by the Utah Agricultural Experiment Station in 1991. It is a hard red winter wheat of medium height with awns and bronze chaff. The spike is lax, with medium length and wide glumes. The kernels are ovate, medium-wide, medium-deep crease and a medium length brush. Promontory is resistant to dwarf bunt.

**Pryor** – hard red winter wheat released by Western Plant Breeders in 2002. Pryor is a white chaffed, awned variety with short stature and medium winter hardiness. Pryor is a high yielding variety with average test weight and below average protein. It is susceptible to stem rust and moderately resistant to leaf spot complex. Pryor has average milling and baking characteristics. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Quantum 542** – A standard height, hard red winter wheat hybrid variety developed and released by Hybritech Seed International, Inc. in 1987. It is now owned by Western Plant Breeders. It is about four days earlier in heading than Redwin and Neeley,

and equal in maturity to Rocky. It has a bearded, drooping head similar to Winalta and has good resistance to shattering. It is medium in winter-hardiness. Test weight and protein are similar to Neeley and Redwin. Hybrid varieties must be treated differently than standard wheat varieties. Only the F<sub>1</sub> seed you buy from the seed dealer is recommended.

**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 resistant to prevalent races of stem rust. It is susceptible to stripe rust, leaf rust, dwarf smut and the Russian wheat aphid. Rampart has excellent milling and baking properties and is a sister line to Vanguard.

**Rocky** – A pure line selection from Centurk developed and released by Nickerson American Plant Breeders (now Agripro Seed Company) in 1978. Rocky is a hard red winter wheat that has white glumes and awns. It is similar in most characteristics to Centurk but differs in glume shape and beak length and has better resistance to soil born mosaic. Rocky tends to be about three to four days later in heading than Centurk but dries down for harvest as early as Centurk. Rocky is adapted to the same areas as Centurk, but has superior yields under most conditions. Rocky has average milling and baking qualities when compared to Redwin.

**Tiber** – A standard height hard red winter wheat variety released by the Montana Agricultural Experiment Station in 1987. Tiber was selected from a Redwin population based on its tolerance to the leaf spot disease complex. Tiber is a bearded, brown chaffed, stiff-strawed variety. It has a high yield potential, good shatter resistance and good winter-hardiness (similar to Redwin). Tiber's resistance to lodging and shattering is equal to Redwin; shorter in straw height than Winalta. Tiber has moderate resistance to the leaf spot complex, but is susceptible to dwarf smut and very susceptible to stripe rust. Tiber has average milling and baking quality.

**Vanguard** – Developed by the Montana Agricultural Experiment Station and released in 1995. Vanguard is the first sawfly-tolerant winter wheat released in Montana since 1965. It is resistant to the wheat stem sawfly. It was released as an emergency measure to reduce yield losses

due to the sawfly. Vanguard has awned spikes, with white chaff and the straw is white. The kernels are hard, red, long and elliptical. The germ is mid-sized with a short brush. Vanguard is susceptible to stem rust, stripe rust, leaf rust and dwarf smut.

**Wahoo** – hard red winter wheat released jointly by Nebraska and Wyoming in 2000. Wahoo is a semidwarf, early maturing white chaffed variety. It has above average yield, below average test weight, and average protein under Montana conditions. Wahoo is moderately resistant to stem rust and leaf rust and susceptible to wheat streak and barley yellow dwarf viruses. Milling and baking characteristics are acceptable. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

### Soft White Winter Wheat

#### New for 2005 Bulletin:

**Finch** – Developed by the Washington AES and released in 2002. Finch is an awned, white chaffed medium-late maturing soft white winter wheat. It has resistance to strawbreaker foot rot, stripe rust and powdery mildew. Yield potential similar to Eltan, test weight better than Eltan in limited Montana testing. PVP, Title V will be applied for.

**Hubbard** – Tall semidwarf with good straw strength developed by the Idaho AES and released in 2000. Good resistance to stripe rust; susceptible to cephalosporium stripe, strawbreaker foot rot, septoria tritici blotch, common bunt and dwarf bunt. Yield potential and test weight better than Eltan in limited Montana testing. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**Simon** – Early maturing semidwarf developed by the Idaho AES and released in 2003. Yield potential similar to Eltan, test weight better than Eltan in limited Montana testing. PVP, Title V will be applied for.

#### Varieties previously in bulletin:

**Eltan** – Developed cooperatively by USDA-ARS and the Washington Agricultural Experiment Station and released jointly by the Washington, Oregon and Idaho AES in 1990. Eltan is a semidwarf, soft

white winter wheat. The spike is awned and white chaffed. It is resistant to dwarf bunt (TCK), snow mold and common bunt. Eltan is moderately susceptible to prevalent races of stripe rust, but susceptible to stem rust and leaf rust.

**Hill 81** – Developed cooperatively by USDA-ARS and the Oregon Agricultural Experiment Station and released in 1982. Hill 81 is a white chaffed, stiff strawed, soft white winter wheat. The spike is awned, fusiform, mid-dense and inclined. Glumes are white, glabrous, mid-long, mid-wide, with wanting shoulders. Kernels are white, mid-long, elliptical with mid-sized germ, narrow to mid-wide crease and rounded cheeks. Hill 81 is resistant to stripe rust, leaf rust, moderately susceptible to powdery mildew and Septoria. It has fair resistance to dwarf bunt.

**Kmor** – developed by the USDA-ARS and the Washington Agricultural Experiment Station. Kmor is a semidwarf, white chaffed, soft white winter wheat. It was released jointly by the Washington, Oregon and Idaho AES in 1990. Kmor is resistant to stripe rust, moderately resistant to *Cephalosporium*, common bunt, strawbreaker foot rot, and dwarf smut. It is susceptible to snow mold, leaf rust and stem rust.

**Lambert** – Developed by the Idaho AES and jointly released in 1995 by the Idaho, Oregon and Washington Agricultural Experiment Stations. Lambert is an awned, semidwarf, soft white winter wheat, The kernels are soft, white and ovate, with a mid-deep crease and a mid-sized germ. It is resistant to stripe rust, more tolerant than Stephens to both *Cephalosporium* stripe and snow mold. Lambert is susceptible to strawbreaker foot rot and dwarf bunt. Lambert's quality characteristics have been accepted by industry.

**Lewjain** – developed and jointly released by the Washington AES and the USDA-ARS in 1982. It is a semidwarf, soft white winter wheat. It is white chaffed, awned, with a common head type. Lewjain is resistant to some races of common smut and dwarf smut. In the adult stage it is resistant to stripe rust and moderately resistant to *Cephalosporium gramineum*. It is susceptible to leaf rust, stem rust, flag smut and foot rot.

**MAC-1** – soft white winter developed by Plant Breeders 1, Moscow, ID in 1992. Currently licensed to Lake Seeds in Ronan, MT. Above average yield and test weight in first year of testing at Bozeman and Kalispell. High protein for soft

white winter wheat. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**MacVicar** – Jointly released in 1980 by the Washington AES and the USDA-ARS. The spike is awned, white chaffed, fusiform and lax. Kernels are white, mid-long, ovate to elliptical, the crease is narrow and shallow. The brush is mid-long and cheeks are rounded. The glumes are glabrous, mid-long, mid-wide with narrow acuminate beaks and shoulders are wanting.

**Rod** – Developed by Washington State University in cooperation with USDA-ARS. Released jointly by the Washington, Oregon and Idaho AES. Rod has some winter-hardiness (similar to Stephens), moderately weak straw and medium-late heading. Resistant to local races of stripe rust and common bunt, but susceptible to dwarf bunt, stem rust, leaf rust and snow mold.

**Stephens** – Developed and released by the Oregon AES in 1977. Stephens is a soft white winter wheat. It is a white chaffed, stiff strawed, semidwarf variety. The glumes are white, glabrous, and short to mid-long. The kernels are white with a small brush. Stephens is resistant to stripe rust, leaf rust and common bunt. It is moderately resistant to Septoria leaf blotch and susceptible to dwarf smut, flag smut and snow mold.

## 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.



Publication reviewed and/or data supplied by the following Montana research staff:

Mr. Jim Berg, Research Associate, Plant Sciences and Plant Pathology Department, Montana State University, Bozeman, Montana.

Dr. Phil Bruckner, Professor, Winter Wheat Breeding, Plant Sciences and Plant Pathology Department, Montana State University, Bozeman, Montana.

Mr. Gregg Carlson, Superintendent and Associate Professor of Agronomy, Northern Agricultural Research Center, Havre, Montana.

Dr. Joyce Eckhoff, Associate Professor of Agronomy, Eastern Agricultural Research Center, Sidney, Montana.

Dr. Bill Grey, Adjunct Assistant Professor and Montana Foundation Seed Stocks Manager, Plant Sciences and Plant Pathology Department, Montana State University, Bozeman, Montana.

Mr. Robert Johnston, Research Associate, Plant Sciences and Plant Pathology Department, Montana State University, Bozeman, Montana.

Dr. Ken Kephart, Superintendent and Associate Professor of Agronomy, Southern Agricultural Research Center, Huntley, Montana

Dr. Gregory D. Kushnak, Superintendent and Associate Professor of Agronomy, Western Triangle Research Center, Conrad, Montana.

Mr. Ron Larson, Manager, Montana Seed Growers Association, Montana State University, Bozeman, Montana.

Ms. Deanna Nash, Cereal Quality Laboratory Manager, Plant Sciences and Plant Pathology Department, Montana State University, Bozeman, Montana.

Mr. Neal Riveland, Agronomist, Williston Research and Extension Center, North Dakota State University, Williston, ND

Dr. Robert Stougaard, Professor of Weed Science, Northwestern Agricultural Research Center, Kalispell, Montana.

Mr. Dave Wichman, Superintendent and Associate Professor of Agronomy, Central Agricultural Research Center, Moccasin, Montana.

**Note: Information in this article is available on the web at:**

**<http://plantsciences.montana.edu/crops>**