RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2001

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PROJECT TITLE: Dryland and Irrigated Hard Red and Hard White Winter Wheat Variety Performance Trials near Forsyth, Huntley, Indian Creek, Lodge Grass and Rapelje, Montana. (Exps. 013880, 013881, 013882, 013883 and 013884).

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OBJECTIVES: To provide wheat growers in south central Montana with a reliable, unbiased, up-to-date source of information that will permit valid comparisons among improved winter wheat varieties. This information should help winter wheat producers in south central Montana select varieties best suited to their particular area and growing conditions.

METHODS: Off-station winter wheat trials were established under dryland conditions near Forsyth, Indian Creek, Lodge Grass and Rapelje, and under irrigation at Huntley (Fig. 1). Each 2001 off-station winter wheat trial had 24 entries and was planted using a randomized complete block design with three replications.

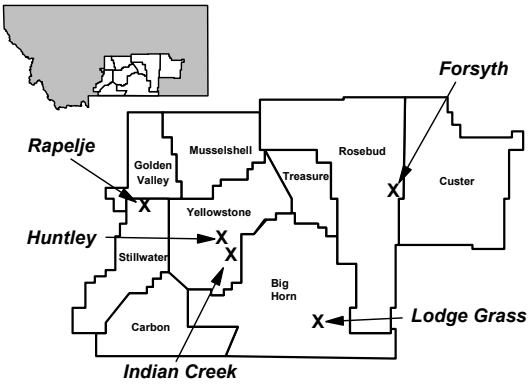

Figure 1. 2001 off-station winter wheat trial locations in south central Montana.

Dryland and irrigated test plots consisted of a 15-foot, 4-row plot with 12-inch row spacing. All rows of each test plot were trimmed 36 inches and harvested using an experimental plot combine. Recorded grain yields were adjusted to 13% grain moisture content, and are reported in bushels per acre based on a 60 pound standard bushel weight. Two year (2000-2001) and three year (1999-2001) yield averages are provided for cultivars tested previous years. Test weight (pounds per bushel) and percent grain moisture content were obtained for each plot using a Dickey-john GAC 2100 grain analyzer. Grain protein was determined by near-infrared reflectance by the MSU Cereal Quality Lab for each entry bulked across replications. Grain protein values were adjusted to 12% grain moisture content. Plant height was measured in inches from the soil surface to the top of the head, excluding the awns if present. Reported values have been rounded to the nearest inch. Lodging of some cultivars was noted at the Huntley and Indian Creek locations during 2001, and recorded on a 0 to 9 scale representing no lodging to all stems lying flat on the ground, respectively. Heading date was observed at the Huntley irrigated site when 50% of the heads in a plot had extended above the flag leaf collar and were recorded in Julian days (number of days from January 1) for statistical purposes. Corresponding calendar dates also are presented.

RESULTS:

Adequate soil moisture resulted in good germination at the Indian Creek site, but the remaining four sites experienced slow germination and spotty fall emergence due to marginal soil moisture conditions. Except for a short period of below-zero weather experienced during mid December, over-wintering temperatures were unusually mild, with little or no winter injury observed at the five locations. The Rapelje site was planted relatively late (October 5) and did not develop uniform stands until late winter or early the following spring. The Rapelje location subsequently became infested with pale western cutworm (*Agrotis orthogonia* Morrison) larvae, which decimated stands by feeding in large areas of the plot site. The Rapelje test was eventually abandoned. Spring weather was unusually warm and dry throughout the region, developing into drought conditions at the dryland sites by mid spring. Recorded precipitation at Huntley was about one third the amount normally received during the month of May. Russian wheat aphids (*Diuraphis noxia* Mord.), which had infested the Huntley and Indian Creek locations the previous spring, were not evident in 2001. The unusual hot, dry conditions hastened crop maturity and limited the effective grain fill period for the winter wheat crop. Many entries at most sites were exhibiting early signs of color change in mid June, when precipitation levels dramatically increased to 2.5 times the normal amount. The late season moisture came too late to dramatically improve yields, but appeared to reduce test weight values and promote the development of green tillers and weed growth, which further delayed the onset of harvest.

The Forsyth location demonstrated the highest level of drought stress among the three dryland off-station sites harvested in 2001. Winter wheat yields averaged 26.8 bu/ac (Table 1), nearly 17 bu/ac less that the average site yield during 2000. Mean plant height was 22.5 inches, approximately 5 and 10 inches shorter than plant heights measured at the Lodge Grass and Indian Creek locations, respectively. Yields ranged from 34.4 bu/ac for the experimental line 'MT9513' to 17.2 bu/ac for 'Vanguard'. 'NuWest' and 'NuSky' hard white winter wheats averaged 31.4 and 30.8 bu/ac, respectively, and were the only commercial varieties to equal the top yielding entry, MT9513, at Forsyth. The highest yielding entries the past two seasons have been MT9513 and NuWest. Test weight values averaged 59.8 lb/bu during 2001, with only 45% of the entries averaging more than 60 pounds per bushel. More than 90 percent of the entries tested the previous two years at this location had achieved test weights exceeding 60 pounds per bushel. 'Nuplains' hard white winter wheat had the heaviest test weight at 62.0 lb/bu. Grain protein averaged 9.9 percent and ranged from 14.0 percent for Vanguard to 8.0 percent for MT9513.

Fall preplant irrigation of the site at Huntley improved fall stands compared to the winter wheat trial harvested in 2000. Stands were fairly uniform at Huntley by the

time of the first irrigation in May, but unusually warm temperatures kept most entries from tillering as well as winter wheat observed during previous years of testing. Regardless of the heat, winter wheat yields were substantially better in 2001 compared to yields experienced at this location in 2000. Huntley irrigated winter wheat yields ranged from 138.5 bu/ac for 'Morgan' to 91.9 bu/ac for 'Halt' during 2001, but no statistical difference between entries was detected (Table 2). Yield differences were not detected between entries tested at this site the previous two years. Based on three-year averages, 'Promontory' has been the highest yielding entry averaging 116.6 bushels per acre. 'Norstar' hard red winter wheat produced the heaviest test weight during 2001, averaging 63.2 lb/bu, with 20 of the 24 entries producing test weights heavier than 60 lb/bu. Grain protein averaged 13.1 percent and ranged from 14.3 percent for 'Rampart' to 11.9 percent for 'Elkhorn'.

The 2001 Indian Creek winter wheat off-station trial was planted in bottom land where drainage and reduced exposure to wind permitted retention of adequate soil moisture for fall germination and growth. The protective nature of this site facilitated more uniform stands and enhanced development of the crop throughout the growing season. Plant heights were nearly 6 inches taller than plant heights measured at this site in 2000. Consequently, the Indian Creek site produced the highest yields measured among the three dryland sites in 2001. Winter wheat yields at Indian Creek averaged 67.1 bu/ac in 2001, ranging from 75.0 bu/ac for Promontory to 55.6 bu/ac for Nuplains (Table 3). Promontory hard red winter wheat also has produced the highest yields averaged for the past two years. Fourteen entries including 'Bighorn', 'BigSky', 'Golden Spike', 'Judith', 'McGuire', 'Morgan', 'MT9982', NuSky, NuWest, 'Paul', 'Ransom', 'Rocky', 'Tiber' and Vanguard produced yields statistically equal to that of Promontory during 2001. Average test weight measured in 2001 was more than 1.5 pounds per bushel lighter compared to 2000, with only BigSky, McGuire, Nuplains, Promontory and Rocky producing test weights heavier than 60 lb/bu. Grain protein values varied from 16.4 percent for Neeley to 13.1 percent for Promontory.

Agronomic performance of the winter wheat cultivars and experimental lines tested under dryland conditions near Lodge Grass during 2001 is presented in Table 4. Impact of drought stress at Lodge Grass was evident in 2001, but it was not as severe as stresses experienced at Forsyth. Lodge Grass winter wheat yields averaged 40.1 bu/ac in 2001, nearly 28 bushels less per acre than the previous year. Winter wheat yields ranged from 49.5 bu/ac for Golden Spike to 28.8 bu/ac for Halt. Paul, Promontory, MT9513, MT9982, Tiber, Ransom, Rocky, Bighorn, Norstar, 'Rampart', and 'Utah 100' yielded between 46.4 and 41.7 bu/ac, which was equal to the yield of Golden Spike. Paul and Neeley have produced the highest yields at Lodge Grass the past two and three years, respectively. Nuplains had the highest test weight at 62.1 lb/bu, with less than 50 percent of entries producing test weights heavier than 60 lb/bu during 2001. In spite of additional nitrogen applied during heading, grain protein levels at Lodge Grass averaged only 11.6 percent. Grain protein levels among the entries tested ranged from 14.6 percent for McGuire to 10.3 percent for Elkhorn.

SUMMARY:

Since 1999, experiments representing 12 location-years of testing have uniformly tested 17 cultivars at several dryland and irrigated sites in south central Montana (Table 6). Under both dryland and irrigated conditions, averaged across three years, Promontory hard red winter wheat has been the highest yielding cultivar, averaging 70.7 bu/ac. Promontory also has been the highest yielding cultivar tested, at 55.3 bu/ac, when averaging only dryland environments (Table 5). NuSky, Judith and Neeley winter wheats yielded from 53.6 to 52.4 bu/ac and are the only cultivars tested under dryland conditions to equal the yield of Promontory. Only Judith and NuSky, yielding 67.5 and 66.9 bu/ac, respectively, have yielded as well as Promontory at all sites (Table 6). Limited testing indicates 'MT9982', derived from a Promontory/Judith cross, shows promise as a high yielding wheat well adapted to this region in both dryland and irrigated scenarios (Table 7).

FUTURE PLANS: All five off-station winter wheat cultivar evaluations were planted during the fall of 2001 for continuation of the program through 2002.

Table 1. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under dryland conditions near Forsyth, Montana during 2001. Cultivars listed alphabetically. (Exp. 013882).

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Grain Yield 1/ 1999-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height
	bushels/acre			lb/bu	%	%	inches
Bighorn	27.1	37.9	**43.7***	58.9	11.3	9.0	19
BigSky	27.4	33.0	41.0	61.0	11.5	10.1	24
Elkhorn	28.8	38.6	41.7	59.0	11.1	8.8	25
Erhardt	25.9	28.5	37.8	61.3	11.3	11.5	21
Golden Spike (hard white)	24.8			59.6	11.3	9.7	22
Halt	28.4	37.2	**47.1***	60.2	11.2	9.1	20
Judith	27.3	37.4	**45.7***	58.8	11.3	10.7	23
McGuire	23.9	33.6	40.0	61.4	11.4	10.2	22
Morgan	28.2	38.4	**44.1***	60.1	11.1	9.3	22
MT9513	**34.4****	**47.8****		58.9	11.6	8.0	24
MT9982	**32.2***			60.0	11.6	9.2	23
Neeley	29.1	34.9	42.4	59.7	11.6	9.3	22
Norstar	29.7	37.5	41.6	59.3	11.7	8.1	29
Nuplains (hard white)	23.6	30.5		62.0	11.8	9.5	19
NuSky (hard white)	**30.8***	40.5	**45.8***	59.9	11.7	8.2	23
NuWest (hard white)	**31.4***	41.4	**47.5****	60.0	11.6	8.4	23
Paul (MT9426)	24.6	36.2		59.9	11.6	8.7	20
Promontory	26.1	36.0	**44.6***	60.5	11.1	10.4	24
Rampart	19.1	22.2	32.1	58.6	10.7	13.1	23
Ransom	26.8			58.5	11.4	9.7	21
Rocky	23.0	31.8	40.4	60.6	11.4	10.7	22
Tiber	26.8	37.5	**45.1***	60.0	11.4	9.2	24
Utah 100	27.0			59.9	11.0	11.6	25
Vanguard	17.2	18.6	29.4	58.2	10.7	14.0	22
Average	26.8	35.0	41.8	59.8	11.4	9.9	22.5
LSD (p=0.05)	4.4	4.8	3.9	0.7	0.3	-	2.4
CV%	10.1	11.9	10.0	0.7	1.5	-	6.4

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Forsyth Dryland Winter Wheat (Exp. 013882)

Planted:	September 29, 2000
Harvested:	July 23, 2001
Fertility:	11-52-00, 120 lb/a in-furrow, September 29, 2000
Herbicide:	Harmony Extra, 0.3 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 21, 2001
Insecticide:	none
Previous Crop:	summer fallow
Precipitation:	not available

Table 2. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under irrigated conditions near Huntley, Montana during 2001. Cultivars listed alphabetically. (Exp. 013880).

Cultivar	Grain Yield 1/			Test Weight	Grain Moisture	Grain Protein 2/	Plant Height	Lodging Index	Heading Date	
	2001	2000-2001	1999-2001						Julian	Calendar
	---------- bushels/acre ----------			lb/bu	%	%	inches	0-9		
Bighorn	119.2	107.7	**105.5***	60.2	11.4	13.8	32	0.0	154.7	Jun 3
BigSky	116.6	95.9	**106.2***	62.3	11.5	13.8	40	0.0	157.0	Jun 6
Elkhorn	106.8	85.7	88.2	60.0	10.5	11.9	42	1.7	157.3	Jun 6
Erhardt	115.6	93.4	97.0	61.1	11.3	14.2	37	0.0	157.7	Jun 6
Golden Spike (hard white)	127.0			58.9	11.2	12.1	38	3.0	159.7	Jun 8
Halt	91.9	99.7	**106.2***	60.1	9.4	12.6	28	0.0	150.0	May 30
Judith	120.3	109.7	**112.6***	60.1	10.1	12.9	38	0.3	156.7	Jun 5
McGuire	102.5	85.1	91.7	61.2	10.5	14.1	35	0.0	151.3	May 31
Morgan	138.5	104.5	**105.7***	61.1	10.4	12.4	40	2.0	157.3	Jun 6
MT9513	120.4	89.9		60.4	10.7	12.9	39	0.0	159.3	Jun 8
MT9982	133.2			61.6	11.2	12.5	35	0.0	157.7	Jun 6
Neeley	129.2	100.1	103.2	60.7	11.3	14.3	38	3.3	158.7	Jun 7
Norstar	118.9	92.4	85.3	63.2	11.1	12.2	49	2.3	160.0	Jun 9
Nuplains (hard white)	113.6	98.7		62.9	10.5	13.2	31	0.0	154.3	Jun 3
NuSky (hard white)	116.8	96.0	**106.5***	56.3	11.1	13.9	40	2.7	159.0	Jun 8
NuWest (hard white)	105.9	91.2	103.7	61.2	11.2	12.2	35	0.0	156.7	Jun 5
Paul (MT9426)	123.9	101.6		60.3	10.4	12.7	35	2.3	157.3	Jun 6
Promontory	128.4	105.3	**116.6****	61.6	10.2	13.1	35	0.3	154.3	Jun 3
Rampart	120.5	103.3	**104.5***	61.0	10.2	14.3	39	1.3	156.0	Jun 5
Ransom	130.6			59.0	10.1	12.8	40	1.7	154.7	Jun 3
Rocky	131.0	106.0	**111.6***	61.4	10.3	13.2	39	1.0	152.7	Jun 1
Tiber	129.6	101.4	**104.1***	61.5	11.6	13.2	42	0.3	158.0	Jun 7
Utah 100	121.6			59.6	12.0	12.7	38	0.7	159.3	Jun 8
Vanguard	109.3	92.7	96.9	61.1	9.7	13.3	36	1.7	154.7	Jun 3
Average	119.6	98.0	102.7	60.7	10.8	13.1	37.6	1.0	156.4	Jun 5
LSD (p=0.05)	ns	ns	12.7	2.7	1.4	-	3.1	1.8	2.4	
CV%	12.5	15.7	13.2	2.7	7.7	-	5.1	107.8	0.9	

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Huntley Irrigated Winter Wheat (Exp. 013880)

Planted:	October 13, 2000	Herbicide:	Harmony Extra, 0.33 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, April 25, 2001
Harvested:	July 30, 2001	Insecticide:	none
Fertility:	18-46-00, 130 lb/a preplant incorporated, September 27, 2000	Previous Crop:	sweet corn
	30-9-00, 100 lb/a broadcast, June 12, 2001	Irrigation:	profile flooded, May 9, 2001 and May 30, 2001
Precipitation:	11.82 inches		

Table 3. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under dryland conditions at the Indian Creek location near Huntley, Montana during 2001. Cultivars listed alphabetically. (Exp. 013884).

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height	Lodging
	--- bushels/acre ---		lb/bu	%	%	inches	0-9
Bighorn	**68.9***	46.9	59.7	9.0	14.3	27	0.0
BigSky	**66.4***	**52.9***	60.3	9.1	14.5	34	0.0
Elkhorn	62.5	45.7	57.9	8.6	14.4	37	2.3
Erhardt	57.0	44.1	59.5	9.1	15.9	31	0.0
Golden Spike (hard white)	**68.4***		58.9	8.9	13.9	35	1.0
Halt	62.4	**52.0***	59.6	8.8	13.9	26	0.0
Judith	**68.9***	**52.3***	55.7	9.0	14.8	35	0.0
McGuire	**72.3***	**50.9***	60.0	9.2	15.1	30	0.0
Morgan	**72.9***	**54.9***	59.6	9.1	14.1	33	0.3
MT9513	64.8	47.1	55.2	8.7	15.3	36	0.0
MT9982	**74.9***		59.3	9.2	13.3	33	0.0
Neeley	60.9	46.4	55.1	8.5	16.4	33	0.7
Norstar	61.3	48.5	57.5	9.0	15.8	41	2.3
Nuplains (hard white)	55.6	41.7	62.0	9.3	15.3	26	0.0
NuSky (hard white)	**70.4***	**54.4***	58.8	9.1	14.6	35	0.0
NuWest (hard white)	**74.0***	**52.5***	59.9	9.2	14.6	35	0.0
Paul (MT9426)	**69.3***	48.5	56.8	9.0	15.0	29	1.0
Promontory	**75.0****	**57.0****	61.5	9.4	13.1	32	0.0
Rampart	63.8	**50.6***	59.5	8.9	15.6	32	0.7
Ransom	**67.3***		56.9	8.8	14.5	34	1.0
Rocky	**73.4***	**52.7***	60.4	9.2	14.0	31	2.0
Tiber	**69.1***	**49.7***	59.9	9.0	14.9	36	0.0
Utah 100	62.8		55.6	8.8	14.6	36	0.0
Vanguard	**66.8***	**50.1***	58.6	9.0	15.2	34	1.3
Average	67.1	49.9	58.7	9.0	14.7	32.8	0.5
LSD (p=0.05)	9.2	7.5	1.9	0.3	-	2.5	1.0
CV%	8.4	13.0	1.9	2.1	-	4.7	116.8

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Indian Creek Dryland Winter Wheat (Exp. 013884)

Planted:	October 9, 2000
Harvested:	August 2, 2001
Fertility:	11-52-00, 120 lb/a in-furrow, October 9, 2001
Herbicide:	Harmony Extra, 0.3 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 21, 2001
Insecticide:	none
Previous Crop:	summer fallow
Precipitation:	not available

Table 4. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under dryland conditions near Lodge Grass, Montana during 2001. Cultivars listed alphabetically. (Exp. 013883).

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Grain Yield 1/ 1999-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height
	---------- bushels/acre ----------			lb/bu	%	%	inches
Bighorn	**43.0***	54.3	64.5	60.1	9.5	11.2	24
BigSky	38.1	**55.9***	**67.5***	61.3	9.8	11.1	30
Elkhorn	37.5	47.4	57.5	58.6	9.6	10.3	31
Erhardt	32.0	47.6	58.0	61.0	9.6	13.7	25
Golden Spike (hard white)	**49.5****			58.7	9.5	11.2	28
Halt	28.8	49.3	58.0	59.7	9.3	11.9	21
Judith	36.5	54.2	64.2	58.2	9.8	11.1	26
McGuire	34.6	46.3	53.2	60.2	9.6	14.6	27
Morgan	36.6	46.4	59.6	59.8	9.7	10.7	28
MT9513	**45.1***	**58.3***		59.4	9.7	11.7	29
MT9982	**44.8***			60.2	9.6	11.6	28
Neeley	39.0	**58.3***	**72.1****	59.9	10.0	10.5	27
Norstar	**42.2***	54.7	62.6	59.5	9.8	11.2	38
Nuplains (hard white)	30.1	43.3		62.1	10.1	11.8	24
NuSky (hard white)	40.2	52.1	**67.3***	60.5	9.8	11.6	29
NuWest (hard white)	39.8	47.5	61.5	60.3	9.8	10.8	29
Paul (MT9426)	**46.4***	**61.3****		58.4	9.6	11.2	27
Promontory	**45.1***	**59.1***	**70.1***	60.7	9.6	11.6	27
Rampart	**42.0***	53.0	63.1	59.3	9.5	12.2	27
Ransom	**43.7***			57.4	9.4	11.0	28
Rocky	**43.5***	53.5	65.1	60.4	10.0	10.8	28
Tiber	**44.1***	**55.0***	64.3	60.5	9.4	11.8	31
Utah 100	**41.7***			59.6	9.5	12.6	32
Vanguard	37.9	53.9	63.4	59.2	9.8	11.5	28
Average	40.1	52.6	63.1	59.8	9.7	11.6	27.9
LSD (p=0.05)	7.9	6.5	5.6	0.8	0.4	-	2.4
CV%	12.0	10.7	9.4	0.8	2.3	-	5.3

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Lodge Grass Dryland Winter Wheat (Exp. 013883)

Planted:	October 9, 2000
Harvested:	August 2, 2001
Fertility:	11-52-00, 120 lb/a in-furrow, October 9, 2001
Herbicide:	Harmony Extra, 0.3 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 21, 2001
Insecticide:	none
Previous Crop:	summer fallow
Precipitation:	not available

Table 5. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under dryland conditions only in south central Montana during 2001. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Grain Yield 1/ 1999-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height
	bushels/acre			lb/bu	%	%	inches
Bighorn	46.4	46.4	50.3	59.6	9.9	11.5	23
BigSky	44.0	47.3	51.9	60.9	10.1	11.9	29
Elkhorn	42.9	43.9	46.5	58.5	9.8	11.2	31
Erhardt	38.3	40.1	45.6	60.6	10.0	13.7	25
Golden Spike (hard white)	**47.6***			59.1	9.9	11.6	28
Halt	39.9	46.2	50.7	59.8	9.8	11.6	22
Judith	44.2	**48.0***	**52.5***	57.6	10.0	12.2	28
McGuire	43.6	43.6	45.8	60.5	10.1	13.3	26
Morgan	45.9	46.5	50.6	59.8	9.9	11.4	28
MT9513	**48.1***	**51.0****		57.8	10.0	11.7	30
MT9982	**50.7****			59.8	10.1	11.4	28
Neeley	43.0	46.5	**52.4***	58.2	10.1	12.1	27
Norstar	44.4	46.9	48.1	58.8	10.2	11.7	36
Nuplains (hard white)	36.4	38.5		62.0	10.4	12.2	23
NuSky (hard white)	**47.1***	**49.0***	**53.6***	59.7	10.2	11.5	29
NuWest (hard white)	**48.4***	47.1	52.0	60.1	10.2	11.3	29
Paul (MT9426)	**46.8***	**48.7***		58.4	10.1	11.6	25
Promontory	**48.7***	**50.7***	**55.3****	60.9	10.0	11.7	27
Rampart	41.6	41.9	47.2	59.1	9.7	13.6	27
Ransom	45.9			57.6	9.9	11.7	28
Rocky	**46.6***	46.0	50.7	60.5	10.2	11.8	27
Tiber	**46.7***	**47.4***	51.3	60.1	9.9	12.0	30
Utah 100	43.8			58.4	9.8	12.9	31
Vanguard	40.6	40.9	46.1	58.7	9.8	13.6	28
Average	44.7	45.8	50.0	59.4	10.0	12.0	27.7
LSD (p=0.05)	4.2	3.6	2.9	0.7	0.2	0.8	1.4
CV%	10.2	12.0	10.8	1.3	2.0	7.1	5.4
Location Years	3	6	9	3	3	3	3

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Table 6. Performance of 24 hard red and hard white winter wheat cultivars and experimental lines tested under dryland and irrigated conditions at 4 locations in south central Montana during 2001. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Grain Yield 1/ 1999-2001	Test Weight	Grain Moisture	Grain Protein /2	Plant Height
	bushels/acre			lb/bu	%	%	inches
Bighorn	**64.6***	**61.7***	64.1	59.7	10.3	12.1	25
BigSky	62.1	**59.4***	65.5	61.2	10.5	12.4	32
Elkhorn	58.9	54.3	56.9	58.9	10.0	11.4	34
Erhardt	57.6	53.4	58.5	60.7	10.3	13.8	28
Golden Spike (hard white)	**67.4***			59.0	10.2	11.7	31
Halt	52.9	**59.5***	64.5	59.9	9.7	11.9	24
Judith	63.2	**63.4***	**67.5***	58.2	10.0	12.4	31
McGuire	58.3	54.0	57.3	60.7	10.2	13.5	29
Morgan	**69.1***	**61.0***	64.4	60.1	10.1	11.6	31
MT9513	**66.2***	**60.7***		58.5	10.2	12.0	32
MT9982	**71.3****			60.3	10.4	11.7	30
Neeley	**64.6***	**59.9***	65.1	58.9	10.4	12.6	30
Norstar	63.0	58.3	57.4	59.5	10.4	11.8	39
Nuplains (hard white)	55.7	53.5		62.2	10.4	12.5	25
NuSky (hard white)	**64.5***	**60.7***	**66.9***	59.8	10.4	12.1	32
NuWest (hard white)	62.8	58.1	65.0	60.4	10.4	11.5	31
Paul (MT9426)	**66.1***	**61.9***		58.9	10.2	11.9	28
Promontory	**68.7***	**64.3****	**70.7****	61.1	10.1	12.0	29
Rampart	61.3	57.3	61.5	59.6	9.8	13.8	30
Ransom	**67.1***			58.0	9.9	12.0	31
Rocky	**67.7***	**61.0***	65.9	60.7	10.2	12.2	30
Tiber	**67.4***	**60.9***	64.5	60.5	10.4	12.3	33
Utah 100	63.3			58.7	10.3	12.9	32
Vanguard	57.8	53.8	58.8	59.3	9.8	13.5	30
Average	63.4	58.9	63.2	59.8	10.2	12.3	30.2
LSD (p=0.05)	6.8	5.2	3.8	0.6	0.4	1.2	1.3
CV%	13.3	15.4	13.0	1.2	4.4	6.4	5.3
Location Years	4	8	12	4	4	4	4

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Table 7. Grain yield[1/] of 24 hard red and hard white winter wheats tested at four locations in south central Montana during 2001. Varieties listed by declining four-location average yield.

Cultivar	Forsyth Dryland	Lodge Grass Dryland	Indian Creek Dryland	Dryland Average	Huntley Irrigated	Four Location Average
	bushels per acre					
MT9982	**32.2***	**44.8***	**74.9***	**50.7****	133.2	**71.3****
Morgan	28.2	36.6	**72.9***	45.9	138.5	**69.1***
Promontory	26.1	**45.1***	**75.0****	**48.7***	128.4	**68.7***
Rocky	23.0	**43.5***	**73.4***	**46.6***	131.0	**67.7***
Golden Spike (hard white)	24.8	**49.5****	**68.4***	**47.6***	127.0	**67.4***
Tiber	26.8	**44.1***	**69.1***	**46.7***	129.6	**67.4***
Ransom	26.8	**43.7***	**67.3***	45.9	130.6	**67.1***
MT9513	**34.4****	**45.1***	64.8	**48.1***	120.4	**66.2***
Paul (MT9426)	24.6	**46.4***	**69.3***	**46.8***	123.9	**66.1***
Bighorn	27.1	**43.0***	**68.9***	46.4	119.2	**64.6***
Neeley	29.1	39.0	60.9	43.0	129.2	**64.6***
NuSky (hard white)	**30.8***	40.2	**70.4***	**47.1***	116.8	**64.5***
Utah 100	27.0	**41.7***	62.8	43.8	121.6	63.3
Judith	27.3	36.5	**68.9***	44.2	120.3	63.2
Norstar	29.7	**42.2***	61.3	44.4	118.9	63.0
NuWest (hard white)	**31.4***	39.8	**74.0***	**48.4***	105.9	62.8
BigSky	27.4	38.1	**66.4***	44.0	116.6	62.1
Rampart	19.1	**42.0***	63.8	41.6	120.5	61.3
Elkhorn	28.8	37.5	62.5	42.9	106.8	58.9
McGuire	23.9	34.6	**72.3***	43.6	102.5	58.3
Vanguard	17.2	37.9	**66.8***	40.6	109.3	57.8
Erhardt	25.9	32.0	57.0	38.3	115.6	57.6
Nuplains (hard white)	23.6	30.1	55.6	36.4	113.6	55.7
Halt	28.4	28.8	62.4	39.9	91.9	52.9
Average	26.8	40.1	67.1	44.7	119.6	63.4
LSD (p=0.05)	4.4	7.9	9.2	4.2	ns	6.8
CV%	10.1	12.0	8.4	10.2	12.5	13.3

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).