

**PROJECT TITLE:** Evaluation of winter wheat variety performance in off-station trials near Moccasin, Denton, Fort Benton, Moore, and Winifred

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**OBJECTIVE:**  
To evaluate agronomic performance of winter wheat varieties in environments and cropping methods representative of the southern triangle and Central Montana.

**RESULTS:**  
Winter wheat trials on recrop were established at Moccasin, Denton, Fort Benton and Moore and on fallow at Moccasin and Winifred. Due to severe and variable soil burial in mid-April of 2002, the Winifred trial was abandoned. Three plots were harvested at this site to get an indication of yield potential. These plots produced over 40 bushels per acre, providing a positive mark for using no-till chemical fallow.

Yield – Recrop winter wheat mean yields ranged from 21.5 to 49.2 bu/a. The Denton continuous crop site had the highest yields with experimental lines MT9951 and MT9982 topping that nursery at 53.5 and 53.8 bu/a, respectively (Table 12). MT9951 and MT 9982 also had the highest mean yields across the four recrop test sites and the Moccasin fallow site (Table 12). Rocky and Promontory had the highest four-location mean yields for established varieties. Neeley was used as the yield standard in multi-year summaries for the Moccasin No-Till, Denton, Fort Benton and Moore locations (Tables 16-19). Neeley is still the standard bred winter wheat variety to beat for yield. Some of the new lines are matching Neeley yield levels.

Test Weight – Dry conditions during seed fill contributed to low test weights in 2002. The overall mean for all five sites was 57.1 lbs/bu, with MTR9997 and Nuplains topping the list at 59.2 lbs/bu (Table 13). Across the four recrop locations, the mean test weight was 56.4 lbs/bu. MTR9997 and Nuplains had the highest average test weights at 59.0 and 58.6 lbs/bu, respectively. Compared to the recrop sites, the fallow site in Moccasin had a higher mean test weight of 59.6 lbs/bu. Rocky led at this site with 61.9 lbs/bu, followed closely by Promontory and Nuplains.

Protein – Grain protein ranged from 11.3% to 16.4% across the four recrop locations, with McGuire and MTS0023 having the highest mean grain protein content (Table 14). NuSky had the lowest single location reading at 11.3 %. However, it is suspected that this was an erroneous reading or poor sample, as NuSky did not exhibit inferior protein levels at any other site. Protein content analysis was run on a single sample per variety per location.

Heading Date – Heading dates were recorded for the Moccasin site only. McGuire was the first variety to head (June 26, 2002) while MTS0023 headed last (July 1, 2002). Heading information is presented as day of the year from January 1<sup>st</sup> (Table 15).

Plant Height – The range of nursery mean plant heights was relatively narrow in 2002. The average height across four locations for each variety had a seven-inch range (Table 15). Falcon and Big Horn had the shortest means at 24 and 25.1 inches, respectively. MT9951, Norstar, and Rocky had the tallest averages at 31 inches.

Saw Fly – Sawfly damage was observed only at the Fort Benton site. Stem cutting averaged across the three reps ranged from about 18.3 down to 1.0 (Table 15). These values are ocular scores of percent and not actual stem counts. If a single stem was broken over in the two middle inter-rows it was scored as a 1.0. Therefore, it is possible that a volunteer spring wheat plant could have contributed to a variety receiving a 1.0 when it actually earned a 0.0.

**SUMMARY:**

2002 winter wheat growing conditions were sufficiently varied to provide a good year for evaluating agronomic characters. Conditions were not so extreme as to diminish the value of the results. The main factor missing was winter stress. The good performance of several numbered lines indicate the potential for improved varieties in the near future.

**FUTURE PLANS:**

Winter wheat variety evaluations will continue at Moccasin, Denton, and Winifred.

Table 12 2002 Off-station winter wheat multi-location yield summary  
Exp. 3800 Central Agricultural Research Center Moccasin, Montana

Variety	Site:	Moccasin	Moccasin	Denton	Ft Benton	Moore	Mean
	Sys:	Fallow	No-Till CC	Till-Plt CC	No-Till CC	No-Till CC	
		----- bu/a -----					
MT9951		49.3	35.7	53.5	35.3	22.0	39.2
MT9982		51.2	40.2	53.8	28.3	21.9	39.1
MTR9997		46.3	38.8	50.6	32.7	25.8	38.8
ROCKY		47.0	31.2	53.4	37.1	25.4	38.8
PROMONTORY		45.6	39.0	51.9	34.4	22.7	38.7
JUDITH		48.3	38.4	53.8	30.3	22.0	38.6
NUSKY		47.2	40.2	50.3	32.5	22.4	38.5
FALCON		45.5	38.9	53.3	32.4	19.9	38.0
NUWEST		48.2	38.1	50.5	31.7	20.6	37.8
TIBER		48.4	34.6	49.5	32.6	21.4	37.3
NUPLAINS		44.1	37.4	48.1	33.3	23.3	37.2
NEELEY		47.9	34.4	50.7	29.7	22.4	37.0
BIGSKY		48.5	36.2	46.2	31.3	21.8	36.8
RANSOM		44.0	34.9	50.9	31.2	21.0	36.4
MTS0031		44.8	35.8	46.7	31.8	22.1	36.2
BIGHORN		42.6	33.9	51.8	31.0	21.5	36.2
MORGAN		45.7	36.1	49.0	30.5	19.3	36.1
MT 9426		44.1	36.5	46.1	30.3	21.4	35.7
VANGUARD		43.5	35.4	45.9	33.7	19.7	35.6
GOLDEN SPIKE		41.4	34.9	49.1	30.6	18.9	35.0
Exp MT		42.7	35.2	46.0	28.4	20.5	34.5
MTS0023		40.3	32.1	42.4	33.7	18.9	33.5
NORSTAR		40.2	33.6	44.0	28.1	20.0	33.2
MCGUIRE		42.0	30.7	42.8	26.3	20.7	32.5
OVERALL MEAN =		46.1	35.92	49.17	31.55	21.5	34.5
F-RATIO TRTS =		3.38	5.105	3.132	1.702	2.351	
LSD(0.05 by t)=		5.3	3.29	5.775	5.355	3.234	
Planting Date:		9/24/01	9/24/01	9/19/01	9/19/02	10/1/01	
Harvest Date:		7/30/02	8/16/02	8/5/02	8/13/02	8/19/02	
Previous Crop:		Fallow	Barley	Lentils	Spring Wheat	Canola	
Fertilizer:		50 lbs 20-20-20-10 w/seed at all locations					
		60lbs N brdcst	90lbs N brdcst	60 ppi NH4	60lbs N brdcst	90lbs N brdcst	
Precip. April-July:		7.49"	7.49"	8.42"	8.02"	10.91"	
Producer/Cooperator:		CARC	CARC	Barber	Birkeland	Tyler	
Soil Temperature:		66.2 F	66.2 F			55 F	
Soil Moisture:		17"	17"			8"	
Herbicide:		10 lbs Fargo preplant; 1.5 pints Bronate applied late May at all locations					

Table 13 2002 Off-station winter wheat multi-location test weight performance  
 Exp. 3800 Central Agricultural Research Center Moccasin, Montana

Variety	Site: System:	Moccasin Fallow	Moccasin No-Till CC	Denton Till-Plt CC	Ft Benton No-Till CC	Moore No-Till CC	Average No-Till CC	Average All sites
		----- lbs/bu -----						
MTR9997		60.0	59.6	60.7	57.1	58.6	59.0	59.2
NUPLAINS		61.2	59.7	60.6	56.7	57.6	58.6	59.2
TIBER		59.8	59.2	59.2	56.7	59.0	58.5	58.8
BIGSKY		60.6	59.9	60.5	56.1	56.6	58.3	58.7
ROCKY		61.9	57.8	60.2	55.7	56.3	57.5	58.4
MCGUIRE		61.1	57.6	60.0	56.9	55.5	57.5	58.2
PROMONTORY		61.4	58.6	59.6	56.0	54.9	57.3	58.1
NORSTAR		61.1	59.2	58.6	56.5	53.6	57.0	57.8
NUWEST		60.4	58.6	58.4	55.7	54.7	56.8	57.5
NUSKY		59.4	59.8	59.0	54.9	54.2	57.0	57.5
BIGHORN		58.9	58.8	60.0	54.4	55.2	57.1	57.4
MT9982		59.7	59.0	58.6	54.5	55.2	56.8	57.4
NEELEY		59.1	57.3	58.0	55.2	55.0	56.4	56.9
MTS0031		59.7	56.7	57.2	54.3	56.7	56.2	56.9
MTS0023		60.2	58.6	56.0	55.2	54.5	56.1	56.9
VANGUARD		58.8	57.3	58.2	54.4	55.3	56.3	56.8
MORGAN		60.2	57.6	57.9	54.1	54.3	56.0	56.8
GOLDEN SPIKE		59.7	57.2	57.9	53.2	54.6	55.7	56.5
RANSOM		58.6	56.2	56.3	53.2	53.8	54.9	55.6
MT9951		59.3	55.9	57.4	53.4	51.7	54.6	55.5
FALCON		59.1	54.7	58.3	52.0	51.5	54.1	55.1
JUDITH		57.5	55.7	58.4	51.8	51.5	54.3	55.0
XXXXXXXXX		56.8	57.1	54.4	52.2	52.8	54.1	54.7
MT 9426		56.7	55.3	55.9	51.7	52.0	53.7	54.3
<i>Average:</i>		59.6	57.8	58.4	54.7	54.8	56.4	57.1

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Table 14 2002 Off-station winter wheat multi-location protein performance  
 Exp. 3800 Central Agricultural Research Center Moccasin, Montana

Variety	Site:	Moccasin	Denton	Ft Benton	Moore	Average
	System:	No-Till CC	Till-Pit CC	No-Till CC	No-Till CC	
		%	%	%	%	%
Neeley		14.2	12.7	15.3	13.6	13.95
<i>Rampart</i> **NO**		14.6	13.6	16.4	14.2	14.70
Tiber		16.1	13.3	13.9	13.0	14.08
Morgan		15.5	13.1	14.4	13.4	14.10
Rocky		14.7	12.4	14.3	13.5	13.73
Vanguard		15.6	13.9	15.9	15.2	15.15
Bighorn		13.9	12.0	15.6	14.0	13.88
NuWest (HWW)		15.6	12.7	14.3	14.4	14.25
Ransom		15.4	13.1	14.5	13.1	14.03
McGuire		16.6	15.2	15.9	15.5	15.80
Promontory		13.9	12.3	14.0	15.5	13.93
Norstar		14.5	14.0	14.9	15.3	14.68
Judith		15.0	13.6	15.1	15.6	14.83
BigSky		14.6	13.3	15.5	15.1	14.63
NuSky (HWW)		14.2	11.3	14.8	14.9	13.80
Nuplains (HWW)		15.0	14.2	14.1	15.3	14.65
Golden Spike (HWW)		13.8	12.3	14.2	15.0	13.83
MT9426 (Paul)		14.7	12.4	14.9		14.00
MT9982		15.3	12.6	14.9	14.5	14.33
*MTS0023		15.1	14.9	16.8	15.8	15.65
*MTS0031		15.0	13.5	14.2	13.8	14.13
*CDC Falcon		15.8	12.8	16.2	15.9	15.18
*MT9951		16.0	13.4	14.1	15.7	14.80
*MTR9997		15.4	13.1	14.5	14.4	14.35
Average		15.02	13.15	14.95	14.64	14.43
LSD (0.05)						
C.V. (%)						
F-Test (Varieties)						

*Rampart* plots planted with MTS9719, mistakenly

\*new for 2002

Table 15  
Exp. 3800

2002 Off-Station Winter Wheat Heading Date, Plant Height, and Sawfly Stem Cutting  
Central Agricultural Research Center, Moccasin, MT

Variety	Mocc Heading	----- Plant Height -----				Average Height	Sawfly Stem Cutting Ft Benton
		Mocc No-Till CC	Denton Till-Plt CC	Ft Benton No-Till CC	Moore No-Till CC		
	days	in	in	in	in	in	%
NEELEY	179	28	32	28	28	29.0	11.0
RAMPART	180	26	32	27	27	28.0	3.7
TIBER	180	29	35	28	30	30.4	7.3
MORGAN	181	27	33	26	28	28.5	6.0
ROCKY	178	30	34	28	31	30.8	1.3
VANGUARD	179	28	33	28	29	29.6	1.0
BIGHORN	179	25	28	23	24	25.1	3.7
NUWEST	179	26	35	26	29	29.1	4.7
RANSOM	179	29	33	26	29	29.1	7.7
MCGUIRE	177	30	33	27	30	29.9	2.7
PROMONTORY	179	26	32	26	27	27.9	12.3
NORSTAR	181	29	38	26	30	30.8	4.7
JUDITH	178	27	32	23	28	27.5	8.7
BIGSKY	179	29	32	30	31	30.4	4.0
NUSKY	179	27	32	26	28	28.3	3.0
NUPLAINS	178	25	28	24	24	25.3	1.0
GOLDEN SPIKE	179	28	31	27	26	27.9	16.7
MT 9426	179	26	30	25	27	26.9	11.0
MT9982	181	27	34	25	27	28.2	16.7
MTS0023	182	27	31	26	25	27.3	1.0
MTS0031	179	29	33	26	26	28.5	1.3
FALCON	179	24	24	22	26	24.0	1.0
MT9951	178	28	34	31	31	31.1	1.3
MTR9997	178	29	31	27	28	28.7	18.3
Average	179	27.4	32.1	26.3	27.9	28.4	6.3

Table 16 Moccasin recrop winter wheat multi-year yield summary of selected varieties, 1993-2002  
 Exp. 3870 Central Agricultural Research Center, Moccasin, Montana.

Selected Varieties	1993	1995	1996	1997	1998	1999	2000	2001	2002	Average	Neeley Same Yrs
	----- bu/a -----										
Neeley	44	33	31	69	47	45	43	36	34	42.4	42.4
Norstar	39	33 <sup>1/</sup>	26	54	45	41	40	32	34	38.9	42.4
Rocky	40	39	34	73	50	43	45	39	31	43.8	42.4
Tiber	45	36	29	56	46	45	41	39	35	41.3	42.4
Judith	36	40	31	63	53	43	46	36	38	42.9	42.4
Quantum 542	38	30	30	66	52	53	39	--	--	44.0	44.6
Bighorn	35	40	28	65	48	42	44	37	34	41.4	42.4
NuWest		38	30	51 <sup>2/</sup>	50	39	40	37	38	38.9	42.3
Vanguard		27 <sup>1/</sup>	27	59	47	38	39	34	35	39.9	42.3
Rampart		36	27	55 <sup>2/</sup>	48	38	37	33	--	36.5	43.4
Paul (MT 9426)							42	35	37	38.0	37.7
Promontory			29	61	50	48	46	36	39	44.1	43.6
BigSky				65	47	39	40	37	36	44.0	45.7
Morgan						42	38	35	36	37.8	41.0
Nursery Mean	37.0	37.0	29.0	61.0	47.0	42.0	41.0	35.2	36.0	41.0	

<sup>1/</sup> Suspected low germination resulted in low yields. <sup>2/</sup> Yields from one rep only.  
 1994 trial was abandoned due to variable stand as a result of extremely wet conditions at seeding.

Table 17 Denton recrop winter wheat multi-year yield summary of selected varieties, 1990-2002  
Exp. 3801 Central Agricultural Research Center, Moccasin, MT

Selected Varieties	1990	1991	1992	1993	1995	1996	1997	1998	1999	2001	2002	Avg.	Neeley Same Yrs
	----- bu/a -----												
Neeley	55	64	24	66	82	44	62	61	45	48	51	54.7	54.7
Norstar	44	39	24	55	51 <sup>1/</sup>	35	54	51	35	40	44	42.1	54.7
Rocky	50	60	22	57	73	46	59	61	40	31	53	50.2	54.7
Tiber	52	55	28	65	73	42	65	61	46	45	49	52.8	54.7
Judith	59	61	26	55	87	45	59	66	45	42	54	54.5	54.7
Quantum 542	57	--	40	59	78	48	67	76	48	--	--	59.1	55.1
Bighorn	48	60 <sup>2/</sup>	23	56	73	46	64	67	39	30	52	49.8	54.7
NuWest	50	54	--	--	67	43	64	59	45	39	51	52.4	56.9
Vanguard					56	41	56	62	35	34	46	47.1	56.1
Rampart					76	40	51	55	37	33	--	48.7	57.0
Paul (MT 9426)										41	46	43.4	49.5
Promontory						53	56	65	47	37	52	51.7	51.8
BigSky							64	62	44	39	46	51.0	53.4
Morgan									46	34	49	43.0	48.0
Nursery Mean	49.0	53.0	22.0	56.0	73.0	43.0	60.0	60.0	42.0	36.0			

<sup>1/</sup> Suspected low germination resulted in low yields. <sup>2/</sup> Bighorn was planted on one end of the trial.

1994 stand was variable due to wind damaged. Thus abandoned.

1999 two reps were harvested . 2000 yields not reported due to plugged drill opener in some rows.



Table 18 Fort Benton recrop winter wheat multi-year yield summary of selected varieties, 1991-2002  
 Exp. 3802 Central Agricultural Research Center, Moccasin, MT

Selected Varieties	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average	Neeley
	----- bu/a -----											Same Yrs	
Neeley	74	58	50	69	47	51	27	45	10	6	30	42.5	42.5
Norstar	55	49	43	56 <sup>1/</sup>	32	45	25	40	12	6	28	33.5	42.5
Rocky	68	51	44	63	42	56	25	54	10	6	37	41.5	42.5
Tiber	66	56	47	74	46	54	28	52	10	6	33	42.9	42.5
Judith	63	39	44	70	36	51	26	54	13	6	30	39.3	42.5
Quantum 542	--	54	52	78	45	54	28	54	12	--	--	47.1	44.6
Bighorn	66 <sup>2/</sup>	55	43	70	34	55	27	50	10	6	31	38.1	42.5
NuWest	63	--	41	66	36	49	28	44	10	5	32	37.4	40.9
Vanguard			40	68 <sup>1/</sup>	40	51	25	48	11	6	34	31.9	37.2
Rampart			45	77	39	52	24	50	10	7	--	38.0	38.1
Paul (MT 9426)									9	6	30	15.3	15.3
Promontory					49	55	25	59	9	6	34	33.9	30.9
BigSky						52	26	51	11	3	31	29.0	28.2
Morgan								49	10	5	31	23.8	22.8
Nursery Mean	62.0	51.0	45.0	69.0	40.0	52.0	25.0	49.0	10.0	5.0	32.0	40.0	

<sup>1/</sup> Suspected low germination resulted in low yields. <sup>2/</sup> Bighorn was planted on one end of the trial and not randomized. 1992 trial was abandoned due to volunteer barley infestation. 1995 trial had a high incidence of volunteer spring wheat. The trial was located on the Ron Long farm, Shonkin, MT, 1988-1996 and on the Steve Birkeland farm, Fort Benton, MT, 1997-2001.

Table 19 Moore recrop winter wheat multi-year yield summary for selected varieties, 1990-2002  
 Exp. 3804 Central Agricultural Research Center, Moccasin, Montana.

Selected Varieties	1990	1991 <sup>1/</sup>	1992	1994	1995	1996	1997	1998	2000	2001	2002	Average	Neeley Same Yrs
	----- bu/a -----												
Neeley	34	64	42	37	45	36	56	72	28	37	22	43.0	43.0
Norstar	35	49	28	37	31 <sup>2/</sup>	34	48	67	29	35	20	38.2	43.0
Rocky	29	57	33	36	40	41	57	66	29	34	25	40.6	43.0
Tiber	33	56	41	35	43	39	57	69	29	32	21	41.4	43.0
Judith	36	56	32	34	47	35	54	65	30	38	22	40.8	43.0
Quantum 542	41	--	48	35	43	46	58	78	35	--	--	48.0	44.1
Bighorn	42	58 <sup>3/</sup>	34	35	41	34	60	66	26	37	22	39.7	43.3
NuWest	47	55	--	42	46	34	55	70	27	36	21	43.3	43.1
Vanguard				29	29 <sup>2/</sup>	35	52	57	27	34	20	36.3	41.6
Rampart				34	44	33	49	57	28	33	--	39.7	44.4
Paul (MT 9426)									28	39	21	29.4	29.0
Promontory						39	56	62	28	32	23	40.0	41.8
BigSky							56	67	29	38	22	42.4	43.0
Morgan									26	35	19	26.7	29.0
Nursery Mean	36.0	54.0	35.0	35.0	41.0	36.0	54.0	63.0	28.0	34.4	21.5		

<sup>1/</sup> 1991 trial suffered aphid damage. <sup>2/</sup> Suspected low germination resulted in low yields. <sup>3/</sup> Bighorn was planted on one end of the trial and not randomized. 1993 trial suffered hail damage. 1999 trial not harvested due to cheat grass infestation.