Title: Cereal grain cultivar performance under no-till continuous cropping in central Montana off-station trials. (4W2755)

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Objectives: To evaluate the performance of winter wheat, spring wheat, and barley varieties in no-till continuous crop systems across central Montana. Provide unbiased information on improved cereal cultivars for producers to use in the selection of best suited cereal grain varieties for the various cropping environment.

Results:
The management strategy utilized for the off-station trial sites is for CARC staff to establish, monitor, harvest, record and process the data. The producer includes the research site plot area in general field operations including weed control and broadcasting fertilizer. Special pest management operations would need to be reviewed prior to including the plot area. It may be that some varieties possess resistance to particular pathogen or insect. Field operations are to be conducted perpendicular to plot rows so that all wheel tracks, etc. impact all the plots within a replication. The concept is to evaluate the cultivars under the conditions in which the producers are going to be raising them.

The 2009 crop year experienced harsh, dry, cold and windy, weather during the winter and spring causing stand survival problems and inhibited the growth of both winter and spring cereals. Numerous central Montana winter wheat fields experienced winter wheat mortality in the field headlands due to tractor and implement turning. The implement turning pulverizes the surface soil. The pulverized soil furrow collapsed around the winter wheat seedling. The furrow closure increases the opportunity for invasion by soil pathogens through the soil's abrasive action on the leaf's surface tissue. The slow growing, due to cold temperatures, winter seedlings are more vulnerable invasion by various soil pathogens. The cold temperatures delayed germination and emergence of some early spring seed crops. Fortuitous cool summer night temperatures resulted in reduced evaporative demands allowing good cereal growth later into the summer. Some of the north Denton through Winifred area received much above average summer precipitation. However, the summer precipitation was not as beneficial to yields as it would have been if received earlier. The growing season weather was conducive to higher cereal test weights. The CARC experienced its driest June and May-June period in over 100 years. In general grain ripening and harvest was much later than it has been over much of the past decade.

Winter Wheat:
The Moccasin no-till re-crop (NTRC) trial site was in its 11 season of no-till continuous crop. The rotation sequence is: pulse (usually lentils) – spring wheat – oilseed (canola or camelina)- hay barley – winter wheat – grain barley – pulse. The winter wheat was seeded into hay barley stubble. The seed bed was dry as Sept 08 precipitation came early in the month and was much below average. The plots had some thin spots. The nursery mean yield was 29.2 bu/a (see Table 1) which is 7.2 bu/a below the mean of the past five seasons (Table 2). Yellowstone is the yield standard for this location with a five year mean yield of 44.0 bu/a. Test weights were near average and protein levels were high with a

nursery mean of 14.7%. There was a low level of sawfly cutting, but all entries had some stems cut. in the stand spots and experienced in the Winter wheat yield were generally in the

The Denton winter wheat trial suffered a similar fate as the 2008 trial. Downy brome over ran the plot. The situation was caused by a 2005 camelina trial which was established without the aid of a pre-plant herbicide burn down or post emerge herbicide. None were labeled that time. The downy brome escapes provide seed in the following winter wheat crop. Two combine passes through trial site where the combine went the full length of the ¾ mile long field were readily apparent in 2009 winter wheat crop that followed a 2008 lentil crop. The trial was seeded the 9th of October to minimize the chance of downy brome being a problem. The downy brome and winter wheat both emerged the spring of 2009. Sufficient sample was taken to obtain relative test weight and protein information (Table 3).

Multi-year two location test weight, grain protein and plant height data are summarized in Tables 4, 5, and 6.

Spring Wheat:
Spring wheat yields were slight below average but were better than expected due to the low rainfall in the critical May – June period. Cool summer temperatures contributed to above average test weights as all three spring wheat no-till re-crop locations. The reduced yields contributed to above average to much above average grain protein levels. Sawfly stem cutting was observed at the Moccasin and Geraldine locations.

The Moccasin NTRC spring wheat was seeded into lentil stubble. Cool soil conditions delayed seedling emergence. Dry weather further inhibited growth. Sawfly cutting was light and variable in the nursery and generally was worse in the east rep (3rd rep). The nursery was cut at 5-6 inch height so as to simulate what a producer might due on rocky land. Outlook, the high yielding variety, is a hollow stem variety. This suggests that the sawfly damage was not overwhelming (Table 7). However, the four plots with the most (visual est.) stems remaining after harvest were re-cut, running the header on the ground. The additional yield pickup averaged 6 bu/a. The moderate yield levels, 23.4 bu/a, resulted in high protein levels with a mean of 16.9% and high proteins of 18.5 and 18.1 for Hank and Corbin, respectfully. Vida is the only variety with a multi-year yield equal or above McNeal at this site (Table 8)

Vida and ONeal were the high grain producers at the Denton location with both producing more than 32 bu/a (Table 9). The Denton trial had exceptionally test weights with a mean of 62.5 lbs/bu with six entries having test weights of >63 lbs/bu. ONeal, Jedd and Vida all had protein levels >18%. Interestingly, no cut stems were observed at this location. In 2008, sawfly damage was the most that had been observed at the Denton site in over 20 years. Ten varieties have multi-year yield means $\geq$ McNeal multi-year mean yield (Table10).

Vida and ONeal had the high 2009 yields at the Geraldine location with 31.9 and 28.9 bu/a, respectively (Table 11). Test weights near average with a nursery mean of 60.6 lbs/bu with Volt having 62.7 lbs/bu for the high test weight. Sawfly damage was low to moderate. Few stems remained on the ground following a four inch cutting height. This site had devastating sawfly cutting in 2008. Five varieties, Vida, ONeal, Conan, Reeder, Outlook and Hank have multi-year mean yields > McNeal's multi-year mean yield.

Barley:
The no-till re-crop barley yields were slightly above average which was above expectations based on spring precipitation. Test were much above average with both the Moccasin and Denton locations have mean test weights greater than 53 lbs/bu. The plump seed mean was 91.9 at Moccasin and 80.2 at Denton.

Craft and Conrad top the Moccasin barley nursery at 52.0 and 50.9 bu/a, respectively (Table 13). Craft, also, had the high test weight at 55.2 lbs/bu. The trial mean protein was 14.6% with Conrad having the nursery high of 16.1%. Pinnacle had the high plump percentage at 97.9%. Champion is the only variety with multi-year mean yield >Haxby's (Table 14).

The seed bed was firm to hard at the time of seeding and the seed was placed to shallow for a May 12 seeding date. Only one rep, rep 2, established an acceptable stand. Champion had the high single plot yield at 58.0 bu/a, which was 14.6 bu/a above the trial mean (Table 15). Craft and Champion both had test weights above 56 lbs/bu. Once again, Conrad had the high protein content, 15.0%, and the nursery mean was 13.8%. Nine entries had percent plump seed >80%. Boulder, Champion and Xena have multi-year yield means greater than Haxby.

Summary:
The resilience exhibited by winter wheat, spring wheat and barley in the 2009 central Montana variety trials clearly demonstrate why cereals are the predominant annual crops in central Montana. In spite of the harsh spring growing conditions all three crops produced well. Yellowstone yield levels over the past few years show that it is currently the winter wheat yield standard for this area. Vida spring wheat is clearly displacing McNeal as the yield standard for non-sawfly areas and in areas with low to moderate sawfly infestations. Haxby barley provides and yield standard, particularly for feed barley. However, feed barley has not generated viable market prices in recent years. For many producers, barley is a crop of last resort used to deal with a particular pest, wheat disease, situation. No-till practices have proven infective in reducing soil erosion through increased ground cover. However, the turning area in the headlands are proving to some times and conditions to be a challenge, particularly with winter wheat, for stand establishment and survival.

Funding Summary:
Expenditure information to be provided by OSP
No other grant support for this project

MWBC FY2011 Grant Submission Plans:
It is planned to submit this project for funding consideration in the next fiscal year.

Table 1 2009 Moccasin no-till winter wheat variety evaluations on continuous crop.
Exp 387009 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Trt	Plant height	Grain Yield	Test weight	Protein Content	Sawfly cut
	#	in	bu/a	lb/bu	%	0-9
MT06103	23	26.5	36.3	59.4	15.1	4.0
Yellowstone	3	25.1	33.3	59.4	15.9	5.0
NuSky (HWW)	13	25.1	32.9	60.6	14.0	3.7
Carter	21	24.1	32.0	57.4	15.0	0.3
Norris (CL)	12	26.4	31.9	60.7	13.4	4.0
Jagalene	6	23.5	31.7	57.1	14.5	1.7
Rocky	10	27.4	31.4	61.3	13.5	3.7
MT0495	17	24.4	31.4	57.1	14.9	1.7
Accipiter	22	24.5	30.2	59.9	14.5	1.3
Neeley	7	24.9	29.3	57.4	14.7	3.7
Genou	1	24.7	29.0	58.8	14.7	1.0
MT0552	20	23.6	29.0	59.0	16.0	2.7
MTS0713	24	22.3	28.7	59.2	15.6	0.0
CDC Falcon	2	22.6	28.6	58.6	14.7	2.3
MTS0531 (HWW)	18	23.0	28.4	59.4	14.2	1.0
Jerry	9	26.0	28.0	57.9	15.0	5.3
Bynum (CL)	16	25.6	27.6	60.1	15.0	2.0
Ledger	5	23.1	26.9	60.3	14.0	1.0
Promontory	11	26.2	26.6	62.2	13.0	2.3
Pryor	8	20.6	26.3	59.8	15.0	1.0
Wahoo	14	24.8	26.2	60.5	14.2	4.7
Hyalite (CL, HWW)	15	23.4	25.5	58.4	15.1	2.3
Rampart	4	24.8	25.4	50.6	15.4	1.0
MTS0532 (HWW)	19	23.2	24.2	56.9	14.9	0.7
Average		24.4	29.2	58.8	14.7	2.4
P-value (Varieties)		0.00	0.24	0.33		0.00
C.V. (%)		7.0	15.5	4.9		70.1
LSD (0.05)		2.8	ns	ns		2.7

Seed Date: 26 Sep 08 NTCC into hayed barley stubt Harvest Date: 4-Aug-09
Soil: 2 inch temp.: 12o C Soil Probe: 7"
Fertilizer: 1W/seed : 10+10+10+05 NPKS lbs/a Top Dress: 90 lbs N as urea in March
Pesticdes: Pre Plant glyphosate at 12 floz/a. MCPA+bromoxynil 2 pints/a 20-May-09
Comment: The crop was drought stressed with the driest May-June period in 100 years.

Table 2 Moccasin NTRC multi-year winter wheat variety yield performance
Central Agriculutral Research Center. Moccasin, Montana.

Cultivar	2005	2006	2007	2008	2009	Average	Yellowstone same Yrs.
				bu/a			
Yellowstone	37.7	52.2	58.4	38.6	33.3	44.0	44.0
Bynum (CL)	27.1	38.6	43.1	24.4	27.6	32.2	44.0
Carter				32.1	32.0	32.1	36.0
CDC Falcon	35.1	44.3	50.9	35.1	28.6	38.8	44.0
Genou	21.8	44.9	42.6	25.8	29.0	32.8	44.0
Hyalite (CL,HW)	40.3	46.6	46.1	28.3	25.5	37.4	44.0
Jagalene	27.6	42.1	52.8	34.0	31.7	37.6	44.0
Jerry	35.7	41.8	45.8	31.9	28.0	36.6	44.0
Ledger		40.8	50.2	24.9	26.9	35.7	45.6
Neeley	29.1	54.2	43.3	28.1	29.3	36.8	44.0
Norris (CL)	34.2	47.4	44.4	35.3	31.9	38.6	44.0
NuSky (HW)	27.6	46.3	40.6	29.8	32.9	35.4	44.0
Promontory	34.0	48.3	52.6	30.6	26.6	38.4	44.0
Pryor	28.4	48.8	45.0	31.5	26.3	36.0	44.0
Rampart	29.1	40.8	40.0	27.2	25.4	32.5	44.0
Rocky	31.9	44.4	49.4	35.3	31.4	38.5	44.0
Tiber	30.7	50.7	37.7	26.0		36.3	46.7
MT0552				31.8	29.0	30.4	36.0
Wahoo	35.7	43.1	53.3	30.2	26.2	37.7	44.0
Average	31.0	45.7	46.7	29.8	29.2		

2008 had either cut worm or wire worm followed by Jun 10 hail damage.

Varieties with multi-year mean yields > than Yellowstone for the same years are in **bold**.

Table 3 2009 Denton no-till winter wheat variety evaluations on continuous crop.
Exp 387109 Central Agricultural Research Center. Moccasin, Montana.

Vriety	Trt	Plant Height	Grain Yield	Test Weight	Protein Content	Sawfly Cutting
	#	"	bu/a	lbs/bu	%	%
Jagalene	6	19.7		58.5	13.9	10
Bynum (CL)	16	23.0		57.9	15.2	2
Genou	1	21.1	Not	57.1	14.1	1
Neeley	7	22.6	harvested	57.8	14.1	15
MTS0531 (HWW)	18	21.0	for grain	58.8	14.2	2
Norris (CL)	12	23.8	yield	59.1	14.2	10
Hyalite (CL, HWW)	15	21.3	due	59.1	14.8	10
Carter	21	19.5	to	58.5	14.2	1
MT0495	17	22.1	severe	58.4	13.8	10
Jerry	9	25.1	downy	57.9	13.3	10
Rampart	4	23.4	brome	57.7	13.8	1
Rocky	10	25.4	infestation	60.0	12.8	10
Wahoo	14	22.2		57.3	13	15
MTS0713	24	19.8		60.4	13.9	5
Pryor	8	17.9		59.1	12.3	2
Promontory	11	23.8		58.8	12.8	20
Yellowstone	3	20.6		58.3	13.3	10
MT0552	20	18.9		59.0	14.2	10
CDC Falcon	2	18.4		58.1	13.4	25
Ledger	5	19.8		58.4	13.1	20
MTS0532 (HWW)	19	21.1		58.6	13.5	5
Accipiter	22	21.6		58.2	12.8	10
MT06103	23	23.8		58.9	14.4	2
NuSky (HWW)	13	23.2		58.4	13.4	2
Mean		21.64		58.5	13.6875	8.7

Seed Date: 9 Oct 08 no-till into barley stubble Havest Date:
Soil: 2 inch depth temp: 11o C Soil Moist Probe: 6"
Fertilizer: W/seed : 10+10+10+05 NPKS lbs/a Top Dress: 60 lbs N as urea in March
Comment: This plot had the misfortune of being placed in the path where a combine swath from three years prior had passed through a downy brome infested research trial.
It was the only portion of the strip to have a very heavy stand of downy brome.
Even though the trial was seeded and sprayed relatively late, downy brome still established.

Table 4. Winter wheat grain test weight across two NTRC locations over five years.

Exp 3800 / Loc:	NTRC	Dntn	NTRC	Dntn	NTRC	Dntn	NTRC	NTRC	Dntn		Yellowstone
Cultivar / year:	2005	2005	2006	2006	2007	2007	2008	2009	2009	Ave	Same Years
						lbs/bu					
Yellowstone	51.8	59.1	62.1	62.9	53.1	59.2	57.1	59.4	58.3	58.1	58.1
Bynum (CL)	52.7	60.2	63.4	63.0	57.8	59.6	58.4	60.1	57.9	59.2	58.1
Carter							58.1	57.4	58.5	58.0	58.3
CDC Falcon	50.9	59.7	63.2	64.0	53.7	59.7	57.4	58.6	58.1	58.4	58.1
Genou	51.7	60.0	63.3	64.9	55.1	59.9	56.6	58.8	57.1	58.6	58.1
Hyalite (CL, HWW)	51.7	60.3	62.0	64.4	55.1	57.5	57.6	58.4	59.1	58.5	58.1
Jagalene	54.3	62.1	63.5	65.2	56.5	62.2	58.5	57.1	58.5	59.8	58.1
Jerry	52.5	60.4	64.0	63.2	52.5	59.2	57.2	57.9	57.9	58.3	58.1
Ledger			62.2	64.4	56.6	60.7	58.1	60.3	58.4	60.1	58.9
Neeley	51.4	60.6	63.3	63.4	52.1	59.9	56.7	57.4	57.8	58.1	58.1
Norris (CL)	53.2	61.5	63.3	64.4	53.8	59.7	58.6	60.7	59.1	59.4	58.1
NuSky (HWW)	52.5	61.7	62.7	63.6	53.9	59.3	59.2	60.6	58.4	59.1	58.1
Promontory	53.6	62.1	64.6	64.7	57.0	61.3	57.3	62.2	58.8	60.2	58.1
Pryor	53.3	61.4	63.8	64.7	52.6	58.5	60.4	59.8	59.1	59.3	58.1
Rampart	52.4	59.2	63.0	63.7	56.4	59.5	57.5	50.6	57.7	57.8	58.1
Rocky	53.0	61.4	64.4	64.5	56.9	61.4	57.7	61.3	60.0	60.1	58.1
MT0552							57.0	59.0	59.0	58.3	58.3
Wahoo	50.8	59.7	62.9	63.7	54.6	59.1	57.1	60.5	57.3	58.4	58.1
Average	52.24	60.5	63.1	63.9	54.9	59.7	57.9	58.8	58.5		
	NTRC - Moccasin no-till recrop						Dntn- no-till recrop				

NTRC 2005 test weights were reduced by nematodes.First verification of this species of nematodes in Montana.

Table 5. Winter wheat grain protein content across two NTRC locations over five years.

Exp 3800 / Loc:	NTRC	Dntn	NTRC	Dntn	NTRC	Dntn	NTRC	NTRC	Dntn		Yellowstone
Cultivar / Year:	2005	2005	2006	2006	2007	2007	2008	2009	2009	Ave	same Years
							%				
Yellowstone	17.2	11.9	14.4	10.5	15.2	11.2	11.3	15.9	13.3	13.4	13.4
Bynum (CL)	18.4	12.4	15.8	11.9	15.5	11.3	12.4	15.0	15.2	14.2	13.4
Carter							11.7	15.0	14.2	13.6	13.5
CDC Falcon	18.1	11.4	13.8	9.9	16.2	14.5	11.0	14.7	13.4	13.7	13.4
Genou	19.4	12.1	15.1	10.6	15.5	10.9	11.9	14.7	14.1	13.8	13.4
Hyalite (CL, HWW)	18.3	11.9	15.2	10.8	16.3	11.7	11.1	15.1	14.8	13.9	13.4
Jagalene	15.7	11.9	15.3	10.2	15.2	14.6	11.3	14.5	13.9	13.6	13.4
Jerry	17.5	12.8	15.1	11.6	15.1	10.9	11.1	15.0	13.3	13.6	13.4
Ledger			15.1	11.4	17.2	11.3	10.6	14.0	13.1	13.2	13.1
Neeley	18.9	11.5	13.9	9.8	14.9	10.8	10.8	14.7	14.1	13.3	13.4
Norris (CL)	16.7	11.6	14.3	9.5	17.4	11.8	11.0	13.4	14.2	13.3	13.4
NuSky (HWW)	17.5	11.7	14.6	9.8	16.1	12.3	11.5	14.0	13.4	13.4	13.4
Promontory	16.2	12.4	14.5	10.7	15.7	10.6	10.6	13.0	12.8	12.9	13.4
Pryor	16.5	10.9	13.5	8.3	14.3	11.6	10.8	15.0	12.3	12.6	13.4
Rampart	18.7	12.7	15.5	10.5	15.6	11.3	11.8	15.4	13.8	13.9	13.4
Rocky	17.6	11.9	14.5	10.9	16.5	11.6	11.2	13.5	12.8	13.4	13.4
MT0552							11.6	16.0	14.2	13.9	13.5
Wahoo	18.0	10.8	14.4	10.5	17.2	13.5	12.4	14.2	13.0	13.8	13.4
Average	17.7	11.9	14.6	10.4	15.7	11.7	11.5	14.7	13.7		

NTRC - Moccasin no-till recrop Dntn- Denton no-till recrop

Table 6. Plant height of winter wheat varieties grown at three locations across four years.

Exp 3800 Cultivar	NTRC 2005	Dntn 2005	NTRC 2006	Dntn 2006	NTRC 2007	Dntn 2007	NTRC 2008	NTRC 2009	Dntn 2009	Ave.	Yellowstone Same Years
						inches					
Yellowstone	36	32	34	30	42	32	28	25	21	31.0	31.0
Bynum	35	28	32	28	43	35	28	26	23	30.9	31.0
Carter							24	24	20	22.5	24.6
CDC Falcon	30	25	28	30	36	31	24	23	18	27.2	31.0
Genou	37	29	32	31	43	29	29	25	21	30.6	31.0
Hyalite (CL, HWW)	33	30	32	22	42	33	28	23	21	29.4	31.0
Jagalene	32	32	28	26	37	31	26	24	20	28.3	31.0
Jerry	38	32	36	26	44	33	31	26	25	32.3	31.0
Ledger			31	24	39	30	27	23	20	27.7	30.2
Neeley	35	29	34	28	43	31	30	25	23	30.8	31.0
Norris (CL)	38	29	32	27	42	32	30	26	24	31.1	31.0
NuSky (HWW)	33	30	35	31	42	30	30	25	23	31.0	31.0
Promontory	34	30	35	28	41	33	26	26	24	30.8	31.0
Pryor	29	26	27	23	37	29	25	21	18	26.1	31.0
Rampart	35	32	33	29	42	37	28	25	23	31.5	31.0
Rocky	36	35	33	29	43	34	31	27	25	32.6	31.0
MT0552							25	24	19	22.5	24.6
Wahoo	32	26	31	24	38	32	27	25	22	28.6	31.0
Average	34.2	29.5	32.6	27.9	41.2	32.5	28.0	24.4	21.64	30.2	

NTRC - Moccasin no-till recrop Dntn- Denton no-till recrop

Table 7 2009 NTRC spring wheat variety performance at CARC.
Exp 993107 Central Agricultural Research Center. Moccasin, Montana.

ID	Trt	Head Date	Plant Height	Grain Yield	Test Weight	Grain Protein	Sawfly Cutting
	#	d of Y	"	bu/a	lbs/bu	%	score
OUTLOOK	5	183	25	28.6	58.9	16.3	0.0
ONEAL	12	181	24	28.4	61.2	17.3	0.0
MCNEAL	2	182	29	28.2	59.8	17.5	0.3
VIDA	7	183	24	26.5	59.3	17.4	0.0
FORTUNA	1	181	30	25.5	59.2	16.2	0.0
CHOTEAU	6	181	23	25.5	58.7	17.6	0.0
CONAN	3	181	23	25.2	60.8	16.3	0.0
FREYR	13	181	28	24.5	60.4	16.8	1.7
CHOTEAU+CONAN	18	181	23	23.9	60.5	17.1	0.0
JEDD	11	180	23	23.8	60.7	17.0	1.0
REEDER	4	182	25	23.7	60.7	16.3	1.3
CHOTEAU+VIDA	19	182	22	23.2	59.4	17.1	0.0
CORBIN	9	180	22	23.2	60.5	18.1	0.0
CHOTEAU+REEDER	17	181	23	21.1	60.2	17.3	0.7
VOLT	10	180	24	21.1	60.9	16.0	2.3
KUNTZ	15	182	26	20.9	59.7	15.7	2.7
CHOTEAU+BRENNAN	20	182	24	20.4	60.1	17.4	2.0
HANK	8	181	23	20.4	59.4	18.5	2.0
KELBY	14	180	22	17.5	59.8	15.2	1.3
AP604 CL	16	180	21	15.7	59.8	17.8	1.7
Mean		181.2	24.2	23.37	59.98	16.94	0.85
P-value		0.00	0.00	0.00	0.00		0.00
CV1		0.40	8.49	13.08	0.67		86.27
LSD (0.05)		1.202	3.4	5.051	0.8367		1.21

Seed Date: 21-Apr-09 No-till with NT double disk into continuous crop lentil stubble.
Soil: 2 inch soil temp: 10° C. Moist Probe depth: 18" Precip: Crop Y: 10.82"
Fertilizer: W/Seed 10+10+10+05 NPKS. Top dress 45 N as urea.
Pesticdes: PP 12 oz 4 lb glyphosate in 7.5 gal. 20 May 2 pts MCPA + Bromoxynil in 13 gal.
Comment: Cool summer nights and above ave. July precip. saved the spring wheat crop.
Sawfly rating of 5 is about 20 to 25% stems cut. Plots were harvested at 5 to 6" height.
Four plots, Hank, Volt, Kuntz, and Choteau+ Brennan, in rep 3 were cut as second time as short as possible. These plots had the most severe stem cutting. The four second cut yields ranged from 5.3 to 8.4 bu/a and averaged 6.4 bu/a.

Table 8 Moccasin multi-year performance of spring wheat varieties under no-till CC. Exp 9970 Central Agricultural ResearchCenter. Moccasin, Montana.

Cultivar/Yr:	2003	2004	2005	2006	2007	2008	2009	average	McNeal Yld Same Yrs
					bu/a				
McNeal	22.5	28.3	28.2	24.8	33.4	18.2	28.2	26.2	26.2
Choteau	21.3	27.5	22.1	25.2	31.9	16.5	25.5	24.3	26.2
Conan	16.9	28.4	29.6	24.3	30.6	15.4	25.2	24.3	26.2
Corbin					32.8	13.9	23.2	23.3	26.6
Explorer	17.3	25.8	26.8	23.4	30.4	20.8		24.1	25.9
Fortuna	21.5	27.7	24.0	24.4	29.6	23.8	25.5	25.2	26.2
Freyr				20.8	32.7	13.7	24.5	22.9	26.1
Hank	17.2	29.9	27.8	25.2	31.6	24.6	20.4	25.2	26.2
Outlook	22.2	30.9	25.5	21.5	31.9	15.5	28.6	25.2	26.2
Reeder	19.9	30.3	26.0	24.0	31.4	15.4	23.7	24.4	26.2
Vida		29.8	30.8	28.3	30.7	15.5	26.5	**26.9**	**26.8**
Kelby						16.2	17.5	16.9	23.2
Kuntz						19.5	20.9	20.2	23.2
Volt						22.9	21.1	22.0	23.2
Jedd						16.0	23.8	19.9	23.2
ONeal						16.1	28.4	22.2	23.2
Means	19.3	27.9	27.6	24.6	31.2	18.1	23.4		

Varieties with multi-year mean yields > than McNeal for the same years are in **bold**.

Table 9 2009 Denton NTRC spring wheat variety performance.
Exp 993107 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Trt	Plant Height	Grain Yield	Test Weight	Grain Protein
	#	"	bu/a	lbs/bu	%
VIDA	7	24.4	35.2	61.8	13.9
ONEAL	12	23.2	32.6	62.3	13.7
HANK	8	23.2	31.7	62.2	13.3
JEDD	11	20.4	30.8	63.0	13.4
CHOTEAU+VIDA	19	22.8	30.7	62.5	13.3
KUNTZ	15	22.8	30.2	62.7	13.4
CHOTEAU+REEDER	17	23.6	29.4	62.4	14.8
VOLT	10	21.6	28.6	63.0	13.4
CORBIN	9	22.0	28.3	61.9	14.6
OUTLOOK	5	23.2	28.1	62.7	13.8
REEDER	4	22.8	27.2	63.4	14.3
CHOTEAU+CONAN	18	26.0	26.8	63.1	15.1
CONAN	3	22.8	25.9	62.5	15.2
AP604 CL	16	24.0	25.8	62.9	14.8
FORTUNA	1	28.8	25.6	62.4	14.6
CHOTEAU	6	23.6	25.6	61.7	15.0
FREYR	13	27.2	25.5	63.3	14.4
CHOTEAU+BRENNAN	20	21.6	23.8	62.8	16.0
KELBY	14	21.2	22.2	63.0	16.8
MCNEAL	2	24.8	22.2	61.9	14.2
Mean		23.5	27.8	62.5	14.4
P-value		0	0.0372	0.702	
CV1		0	15.24	1.28	
LSD (0.05)		0	7.004	ns	

Seed Date: 12-May-09 No-till into CC lentil stubb Harvest: Sept. 2, 2009
Soil: 2 inch soil temp: 9o C. Moist Probe depth: 18 to 20"
Fertilizer: W/Seed 10+10+10+05lbs/a NPKS. Top dress 60 N as urea.
Pesticdes: Pre-Plant glyphosate
Comment: Stand was only fair to good.
Cool summer nights contributed to delayed harvest and better than expected yields.
While sawfly cutting was substantial in 2008, there was no cutting in 2009 at this site.

Table 10 Denton multi-year No-Till CC spring wheat variety yield performance.
Exp 9971 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	2003	2004	2005	2006	2007	2008	2009	Average	McNeal Yld Same Yrs.
					bu/a				
McNeal	15.5	32.4	25.5	24.3	24.0	17.1	22.2	23.0	23.0
Choteau	16.0	34.1	23.5	22.2	22.5	13.9	25.6	22.5	23.0
Conan	17.4	32.4	25.1	23.6	22.2	14.6	25.9	23.0	23.0
Corbin					23.0	16.2	28.3	**22.5**	21.1
Explorer	17.5	32.9	23.9	23.1	23.5	16.7		22.9	23.1
Fortuna	18.4	29.1	25.7	25.9	18.5	17.0	25.6	22.9	23.0
Freyr				23.8	23.5	15.5	25.5	**22.1**	21.9
Hank		33.8	28.0	24.7	23.6	16.4	31.7	**26.4**	24.2
Outlook	17.6	36.0	26.9	25.1	22.8	14.3	28.1	**24.4**	23.0
Reeder	16.8	35.5	26.4	25.4	21.1	16.0	27.2	**24.1**	23.0
Vida	16.7	37.1	28.7	26.7	24.6	18.1	35.2	**26.7**	23.0
Kelby						15.4	22.2	18.8	19.6
Kuntz						17.0	30.2	**23.6**	19.6
Volt						16.5	28.6	**22.5**	19.6
Jedd						18.3	30.8	**24.6**	19.6
ONeal						18.8	32.6	**25.7**	19.6
Mean	16.877	32.83	25.9	24.87	22.68	16.56	27.8		

Varieties with multi-year mean yields > than McNeal for the same years are in **bold**.

Table 11 2009 Geraldine spring wheat variety evaluation on NTRC.
Exp 993107 Central Agricultural Research Center. Moccasin, Montana.

ID	Trt	Plant Height	Grain Yield	Test Weight	Grain Protein	Sawfly Cutting
	#	"	bu/a	lbs/bu	%	score
VIDA	7	23	31.9	60.4	13.4	0.0
CHOTEAU+VIDA	19	25	30.8	60.2	13.3	0.0
VOLT	10	27	30.3	62.7	13.5	4.0
ONEAL	12	26	28.9	61.7	13.6	0.7
CHOTEAU+REEDER	17	24	28.4	61.0	14.0	1.7
REEDER	4	26	27.3	60.7	14.0	2.7
MCNEAL	2	23	26.1	60.1	14.7	1.3
CHOTEAU	6	24	25.7	59.9	14.3	0.0
CORBIN	9	23	25.0	60.3	14.3	0.3
CHOTEAU+CONAN	18	24	25.0	61.0	15.1	0.0
OUTLOOK	5	23	24.0	59.0	14.8	1.0
JEDD	11	20	23.9	61.3	13.6	1.3
AP604 CL	16	26	23.8	61.3	14.1	2.0
CONAN	3	24	23.6	61.0	15.3	0.0
HANK	8	24	23.6	60.0	13.6	1.3
CHOTEAU+BRENNAN	20	24	23.4	60.7	15.1	1.7
FREYR	13	25	23.1	61.3	14.4	5.0
FORTUNA	1	26	22.8	59.1	14.5	0.7
KUNTZ	15	24	21.9	60.6	13.4	4.3
KELBY	14	22	19.4	60.6	16.0	2.0
Mean		24.1	25.44	60.62	14.3	1.50
P-value			0.00	0.00		0.00
CV1			7.5	0.6		50.0
LSD (0.05)			3.15	0.75		1.24

Seed Date: 19-May-09 No-till into RC W. wheat stubble. Harvest: Sept. 2, 2009
Soil: 2 inch soil temp: 23° C. Moist Probe depth: 24" Precip: Crop Y:
Fertilizer: W/Seed 10+10+10+05lbs/a NPKS. Top dress 90 N as urea.
Pesticdes: Pre-Plant glyphosate
Comment: Cool summer nights contributed decent yields from a late seeding.
Sawfly rating of 5 is about 20 to 25% stems cut. Plots were harvested at 4-5" height.

Table 12 Geraldine multi-year spring wheat variety yield performance.
Exp 9972 Central Agriucultural Research Center. Moccasin, Montana.

Variety	2005	2006	2007	2008	Average	McNeal same Yrs
			bu/a			
McNeal	13.2	30.9	21.7	26.1	23.0	23.0
Choteau	12.2	40.3	28.3	25.7	26.6	23.0
Conan	13.0	41.7	23.1	23.6	**25.3**	23.0
Corbin		38.5	25.5	25.0	29.7	32.0
Explorer	12.2	33.9	20.6		**22.2**	22.0
Fortuna	13.8	34.0	25.3	22.8	24.0	23.0
Freyr		44.3	20.3	23.1	29.2	32.3
Hank	12.3	37.2	24.8	23.6	**24.5**	23.0
Outlook	11.4	39.6	24.3	24.0	**24.8**	23.0
Reeder	12.4	39.5	26.6	27.3	**26.5**	23.0
Vida	15.3	49.5	27.7	31.9	**31.1**	23.0
Kelby			15.4	19.4	17.4	23.9
Kuntz			18.5	21.9	20.2	23.9
Volt			22.0	30.3	**26.2**	23.9
Jedd			21.0	23.9	22.5	23.9
ONeal			29.1	28.9	**29.0**	23.9
Mean	12.6	39.79	23.08	25.44		

Varieties with multi-year mean yields > than McNeal for the same years are in **bold.**

Table 13 2009 No-till recrop barley variety evaluations at CARC
Exp: 3670 Central Agricultural Research Center. Moccasin, Montana.

		Head	Plant	Grain	Test	Grain	Plumpness		
Variety	Entry	Date	Height	Yield	Weight	Protein	Plump	mid	Thin
	#	d of Y	cm	bu/a	lbs/bu	%	%	%	%
Craft	4	179	62	52.0	55.2	14.0	95.2	3.7	1.1
Conrad	7	181	54	50.9	52.9	16.1	94.5	4.3	1.3
MT020155	12	176	62	50.8	52.6	15.0	89.1	8.9	2.0
MT030042	14	180	59	50.8	54.7	13.2	93.7	4.4	1.9
Goldeneye	10	178	58	50.1	50.8	13.3	79.0	15.3	5.7
MT061207	13	180	58	49.8	54.0	14.1	96.1	2.7	1.2
Pinnacle	9	178	55	49.3	53.8	12.9	97.9	1.4	0.7
Champion	3	181	57	49.2	54.2	14.2	91.5	6.4	2.2
Haxby	6	180	59	48.4	54.6	14.8	96.5	2.4	1.1
Baronesse	15	183	53	48.2	53.3	14.8	90.3	8.0	1.7
Geraldine	5	185	55	47.0	53.3	15.0	91.9	6.3	1.8
Harrington	11	181	60	46.1	53.1	15.0	93.8	4.5	1.6
Gallatin	8	179	61	46.1	53.3	15.1	80.0	17.2	2.8
MT010158	1	180	64	44.5	53.4	15.4	91.3	7.1	1.6
Metcalfe	2	181	59	41.6	54.1	15.5	92.9	5.3	1.8
Hockett	16	180	53	40.8	54.3	14.4	96.2	2.9	1.0
Mean		180.1	58.2	47.9	53.6	14.6	91.9	6.3	1.8
P-value		0.00	0.07	0.70	0.00				
CV1		0.7	7.2	13.5	1.1				
LSD 0.05		2.053	NS:	ns	1.25				

Seed Date: 10 April 09 in to NTCC winter wheat stubblewith good soil condtions.
Fertilizer: W/seed 10+10+10+ 05 lbs NPKS/a Top dress urea: 60 lbs N/a
Herbicide: 12 floz/a 4 lb glyphosate applied 11-April-09. Air temp 39F.
Bronate @ 2 pts/a in 13 g solution 20-May09
Harvest: 13-Aug-09 Weather: Crop Year Precip: 10.82"
Comment: Cool summer temperatures contributed to higher than expected yields.
June and the May-June were the driest in 100 years at CARC.

Table 14 Moccasin multi-year spring barley variety yields on no-till continuous crop.
Exp 3670 Cental Agricultural Research Center. Moccasin, Montana

Cultivar / Yr	2002	2003	2004	2005	2006	2007	2008	2009	average	Haxby Same Yrs
						bu/a				
Haxby	48	31	60	50	no	48	42	48	46.6	46.6
Boulder				46	harv	46	47		46.3	46.7
Champion							45	49	**47.2**	45.4
Conrad				42		39	41	51	40.7	46.7
Craft	52	31	62	43		47	37	52	45.2	46.6
Drummond			52	43		38	42		43.8	50.2
Eslick	53	24	60	42		47	40		44.4	46.6
Geraldine	50	18		41		45	44	47	39.5	43.8
Harrington	44	24	55	36		38	41	46	39.6	46.6
Hockett			54	39		34	45	41	43.1	50.2
Legacy				44		35	39		39.3	46.7
Merit				36		33	30		32.8	46.7
Metcalfe			51	37		34	30	42	38.0	50.2
MT020155							49	51	**49.8**	45.4
Stellar						39	36		37.6	45.1
Tradition			61	50		41	45		49.4	50.2
Xena	54	21		47		51	40		42.7	43.8
Means	48.4	24	56.6	41.8		40.8	41.0	47.9		

Varieties with multi-year mean yields > than Haxby for the same years are in **bold.**

Table 15 2009 Denton no-till recrop barley variety evaluations.
Exp: 3670 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	trt	Plant Height	Grain Yield	Test Weight	Grain Protein	Sieve Size Plump	Regular	Thin
	#	"	bu/a	lbs/bu	%	%	%	%
Champion	10	26	58.0	56.5	13.4	85.3	10.3	4.4
MT030042	13	22	48.5	56.1	12.2	80.6	13.1	6.3
Craft	8	25	46.5	56.0	13.5	88.1	8.6	3.3
Hockett	5	20	45.9	55.8	13.5	82.4	12.3	5.3
Geraldine	6	23	44.5	54.3	14.1	65.1	24.0	10.9
Goldeneye	1	20	44.0	52.2	12.1	66.7	23.8	9.5
Pinnacle	11	23	42.3	55.5	13.1	86.9	9.6	3.5
Gallatin	15	25	42.3	55.1	14.4	71.4	19.3	9.3
Metcalfe	3	26	42.1	55.6	14.9	89.6	7.9	2.5
MT020155	14	26	41.4	52.7	13.7	71.4	20.8	7.8
MT010158	12	24	41.4	55.9	14.8	78.4	15.8	5.8
Conrad	7	24	40.8	55.0	15.0	78.5	15.4	6.1
Baronesse	9	22	40.8	54.0	14.1	79.4	14.4	6.2
Haxby	4	21	39.7	55.0	13.7	84.3	12.5	3.3
MT061207	16	22	39.1	54.7	13.6	89.0	7.1	3.9
Harrington	2	21	37.7	55.4	14.4	85.2	11.0	3.8
Mean		23.1	43.4	55.0	13.8	80.2	14.1	5.7

Seed Date: 12 May 09 into lentil stubble. Surface dry and firm.
Fertilizer: W/seed 10+10+10+05 lbs NPKS /a. Top Dress N:
Soil: 2 Inch depth temp: 9^{o} C
Pesticide: PrePlant Roundup
Comments: The press wheels did not press well on the seed behind the double disk openers. Seed germination was poor in reps one and three. Rep 2 was the only rep harvested. Significant precipitation following seed would have overcome the situation.

Table 16 Denton multi-year spring barley variety grain yields in no-till CC.
Exp 36701 Cental Agricultural Research Center. Moccasin, Montana

Cultivar /Yr:	2002	2003	2004	2005	2006	2007	2008	2009	average	Haxby Same Yrs
					bu/a					
Haxby	36	30	48	55	40	28	36	40	39.0	39.0
Boulder				54	41	38	38		**42.6**	39.8
Champion							38	58	**40.8**	37.9
Conrad				50	34	29	35	41	37.2	39.8
Craft	42	24	45	51	32	28	35	47	36.8	39.0
Drummond				50	38	33	34		38.7	39.8
Eslick	42	16	39	53	36	29	37		36.0	39.0
Geraldine	37	16		44	38	31	37	45	33.9	37.6
Harrington	40	20	36	56	29	27	33	38	34.4	39.0
Hockett			41	33	38	28	38	46	35.4	41.4
Legacy				52	32	36	36		39.3	39.8
Merit				43	34	25	39		35.0	39.8
Metcalfe			43	44	35	29	36	42	37.3	41.4
MT020155							37	41	37.4	37.9
Stellar					29	34	33		32.1	34.8
Tradition			46	50	35	33	33		39.3	41.4
Xena	42	28	55		36	28	36		**37.3**	36.4
Mean	40.4	23.1	42.4	49.4	34.5	30.0	35.9			

Varieties with multi-year mean yields > than Haxby for the same years are in **bold.**