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MEMORANDUM

TO: Wheat Cultivar Release & Recommendation Committee

FROM: Phil Bruckner, Winter wheat breeder

DATE: January 8, 2007

RE: Motion to add Yellowstone to Montana Winter Wheat Recommended Variety list

The following motion and supporting documentation is presented for consideration at the 2007 Cultivar Release and Recommendation Meeting in Bozeman:

Motion: That Yellowstone hard red winter wheat be recommended for production in districts 1-5.

Description: Yellowstone is a very high-yielding, winter hardy HRW wheat line with medium test weight, maturity, height, and grain protein (Table 1). Yellowstone has excellent baking quality (Table 2). The line is moderately resistant to stripe rust and susceptible to stem rust.

Table 1. Performance of Yellowstone and check cultivars in the Montana Intrastate and Off-station nurseries, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %	Coleop- tile length
Loc/yrs	90	89	13	46	90	8	89	4
Yellowstone	65.1**	59.6	58.3	162.9	33.3	2.0*	13.0	2.7
Pryor	62.2	59.7	51.4	163.7	30.2	1.2**	12.6	2.7
Promontory	60.0	61.5**	43.9	161.6	32.4	2.0*	12.8	2.6
CDC Falcon	58.9	59.9	61.1*	161.5	29.5	1.7*	12.9	2.7
Neeley	58.6	59.5	50.4	164.3	34.0	2.4*	13.2	3.3
Paul	57.9	58.3	58.2	163.4	31.2	4.0	13.2	2.9
Rocky	57.8	61.4*	54.3	160.4	35.1	4.0	13.0	3.2
Jerry	56.9	59.6	65.9*	162.6	35.5	3.0	13.4	2.9
Genou	56.1	60.5	48.2	162.6	34.0	2.5	13.6	3.8*
Morgan	56.1	59.5	66.0**	164.5	34.3	2.4*	13.1	2.3
Tiber	55.6	60.7	53.1	164.0	36.4	2.7	13.5	3.4
NuSky (HWW)	54.8	59.7	58.2	163.8	34.4	3.0	13.2	2.6
BigSky	54.2	60.4	57.7	162.5	35.7	2.4*	13.9	3.5
Vanguard	53.5	60.4	41.2	162.2	34.3	2.9	14.1**	4.0**
LSD (0.05)	1.9	0.4	5.7	0.5	0.5	1.3	0.2	0.2
CV %	11.6	2.0	13.3	0.7	4.8	49.1	5.0	5.8

Table 2. Milling & baking qualities of Yellowstone and check cultivars, 2002-2005.

Variety	Flour yield %	Flour protein %	Ash (Flour) %	Mixo. tolerance	Mixo. mix time	Mixo. abs. %	Baking mix time	Baking abs. %	Loaf volume cc
Loc/yrs	16	16	16	16	16	16	16	16	16
Genou	67.1	12.6**	0.36*	4.4	5.2	62.3**	11.1	72.7*	1116**
Paul	64.7	11.8	0.39	4.8	5.7	59.8	8.6	70.5	1104*
Yellowstone	67.1	11.9	0.39	5.8	7.3	61.0	13.0	73.8**	1097*
BigSky	65.8	12.4*	0.35**	5.3	4.8	62.2*	8.1	73.4*	1066
CDC Falcon	63.7	11.6	0.40	4.3	4.9	60.0	8.5	70.8	1065
Promontory	67.5*	11.4	0.37*	4.4	4.4	59.9	6.4	71.0	1058
Neeley	65.2	11.8	0.38	5.0	4.8	60.6	8.0	71.6	1041
Jerry	67.6*	12.1	0.38*	5.1	4.7	61.2	7.5	71.5	1040
NuSky (HWW)	67.9**	11.9	0.36*	4.6	5.0	61.0	8.2	71.8	1025
Pryor	66.5	11.5	0.39	3.1	3.4	59.8	4.7	69.5	1019
LSD (0.05)	0.8	0.4	0.02	0.5	0.5	1.0	1.2	1.1	33
CV %	1.6	4.3	7.0	16.2	15.2	2.2	20.7	2.3	4.5

** = indicates highest value within a column

ns = not significant at p<= 0.05

* = indicates values equal to highest value within a column based on Fisher's protected LSD (p=0.05)

Yellowstone was in the highest-yielding group in all districts over the five year period (Tables 3-10).

Table 3. Kalispell (District 1) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	5	5		5	5	2	5
Yellowstone	107.3**	62.4*		156.1	34.3	0.0	12.5
Promontory	102.2*	63.8**		154.8	34.0	0.3	12.3
Pryor	87.1	59.5		157.3	31.1	0.0	12.2
Rocky	85.6	63.4*		153.9	38.2	3.1	12.8
CDC Falcon	83.5	60.7*		154.6	30.7	0.0	12.0
Genou	82.7	61.8*		155.7	36.6	0.4	12.9*
Tiber	82.6	61.5*		158.0	40.0	1.3	12.9*
Jerry	82.3	60.9*		156.0	37.7	2.2	13.0*
Vanguard	80.5	62.8*		154.3	37.0	2.1	13.5**
Neeley	76.6	59.1		158.0	37.4	0.1	12.6
Morgan	71.9	59.2		158.4	35.9	1.2	12.7
BigSky	69.5	59.8		156.8	39.1	0.3	13.2*
Paul	64.9	57.1		156.5	32.1	2.9	13.1*
NuSky (HWW)	64.7	58.0		157.5	35.9	1.4	12.3
LSD (0.05)	19.5	3.9		1.3	2.1	ns	0.7
CV %	18.8	5.1		0.7	4.6	187	4.1

Table 4. Bozeman and Off Stations (District 2) Agronomic Comparisons, 2002-2006

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	9	9		5	9	2	9
Yellowstone	86.8**	59.3		169.2	36.1	0.1	13.4
Promontory	83.8*	61.7**		166.8	35.0	0.1	12.9
Pryor	80.0	58.7		169.7	33.3	0.1	13.2
Rocky	77.9	60.9		165.9	38.9	2.5	13.2
Jerry	76.4	58.7		169.3	40.5	1.5	13.8
CDC Falcon	76.3	58.3		167.5	32.6	0.0	13.6
Neeley	76.2	59.8		169.7	38.4	0.9	13.6
Paul	76.0	57.7		169.4	34.4	2.7	13.5
Tiber	75.1	60.2		169.8	40.9	0.7	14.2*
Genou	74.1	59.9		167.5	37.9	1.0	13.7
NuSky (HWW)	72.7	58.9		169.4	38.3	0.7	13.9
Morgan	72.6	58.7		170.3	37.3	0.7	13.5
Vanguard	70.5	59.7		167.4	37.9	1.4	14.7**
BigSky	69.5	59.5		168.3	39.4	0.1	14.2*
LSD (0.05)	5.8	0.8		1.0	1.6	1.6	0.5
CV %	8.1	1.5		0.5	4.6	83.8	4.1

Table 5. Huntley and Off Stations (District 3) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	26	25		9	26	4	25
Yellowstone	64.9**	60.3		157.6	33.1	4.0	11.9
Pryor	63.7*	60.8		156.9	29.8	2.4	11.3
Neeley	59.6	60.5		158.8	33.5	4.2	11.9
Promontory	59.1	62.0**		155.8	32.5	3.8	11.6
Paul	58.0	59.5		156.9	30.5	5.3	11.8
CDC Falcon	57.1	60.8		155.4	29.2	3.4	11.8
Jerry	55.8	60.4		156.3	34.8	4.1	12.1
Genou	55.7	61.6*		156.7	33.6	4.3	12.2
Rocky	55.6	61.7*		154.2	34.4	5.2	12.1
Tiber	55.3	61.5*		157.8	35.8	4.4	12.1
Morgan	55.0	60.8		157.9	33.8	3.8	12.0
BigSky	54.7	61.5*		155.9	35.4	4.7	12.5
Vanguard	54.2	61.6*		156.1	34.1	4.1	12.9**
NuSky (HWW)	53.4	60.3		157.4	33.6	5.1	12.2
LSD (0.05)	3.2	0.6		1.1	0.8	ns	0.4
CV %	10.2	1.8		0.7	4.4	31.5	5.8

Table 6. Moccasin and Off Stations (District 4) Agronomic Comparisons, 2002-2006

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	20	20	1	9	20		20
Yellowstone	52.4**	58.4	90.0	166.3	34.3		13.8
Pryor	51.5*	58.6	86.7	168.5	30.3		13.5
Promontory	50.2	60.4*	78.3	166.7	33.2		13.7
CDC Falcon	49.0	58.9	85.0	166.4	30.2		13.7
Paul	49.0	57.0	88.3	167.7	32.0		13.8
Neeley	48.9	58.2	86.7	168.7	34.1		14.1
Rocky	48.5	60.5**	81.7	165.0	36.5		14.0
Morgan	47.1	58.4	88.3	169.8	35.0		13.7
Jerry	46.6	58.5	88.3	167.4	35.5		14.2
Tiber	46.5	59.4	83.3	169.1	36.8		14.2
Genou	46.4	59.2	83.3	166.9	34.6		14.5*
NuSky (HWW)	46.4	59.2	85.0	168.9	34.8		13.4
BigSky	44.6	59.1	88.3	167.1	36.2		14.6*
Vanguard	44.4	59.1	83.3	166.8	34.6		14.7**
LSD (0.05)	2.1	0.6		1.2	1.1		0.4
CV %	7.2	1.7		0.8	5.1		5.0

Table 7. Havre and Off Stations (District 5) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	12	12	1	5	12		12
Yellowstone	55.1**	59.0	36.7	162.8	29.7		14.5
Pryor	53.9*	59.1	12.0	163.6	27.5		14.3
CDC Falcon	52.6*	59.3	41.7	160.9	26.1		14.3
Neeley	52.4*	58.9	17.0	162.6	29.1		14.4
Genou	51.7*	59.6	25.0	162.7	29.7		14.9
Rocky	51.2*	61.3**	25.0	160.1	30.1		14.0
NuSky (HWW)	50.5	59.7	23.3	163.2	30.8		14.8
Paul	50.3	57.7	43.3	162.9	26.8		14.9
Vanguard	49.8	59.8	20.0	161.7	30.1		15.2
Jerry	49.6	58.8	56.7	162.5	31.0		14.8
Promontory	49.3	60.8*	0.3	161.0	28.9		13.9
Morgan	49.0	58.3	48.3	164.4	30.5		14.8
Tiber	48.4	60.2	22.0	162.3	31.3		14.8
BigSky	48.0	59.6	38.3	162.0	30.9		15.6
LSD (0.05)	4.2	0.7		1.2	1.4		0.5
CV %	10.1	1.5		0.6	5.8		4.5

Table 8. Conrad and The Knees (District 5) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yr	8	8	1	4	8		8
Pryor	73.3**	61.0	55.8	165.0	34.8		12.2
Paul	73.1*	59.9	58.9	165.8	35.8		12.6
Yellowstone	72.3*	59.9	44.7	165.3	37.8		12.5
CDC Falcon	70.9*	61.8*	60.3	163.5	33.1		12.8
Rocky	70.0*	62.7**	57.4	162.5	40.0		12.5
Neeley	68.1*	60.3	54.1	166.5	38.9		13.1
Promontory	68.0*	62.5*	46.0	163.8	36.6		12.5
Genou	67.5	61.8*	50.8	165.0	39.0		13.2*
BigSky	67.4	61.5	61.9	164.5	40.5		13.5*
NuSky (HWW)	65.3	60.0	49.2	165.8	39.4		12.9
Morgan	63.8	60.7	63.2	166.8	38.8		12.5
Tiber	63.4	61.5	52.8	165.3	42.1		13.3*
Vanguard	61.6	61.5	52.6	163.8	39.9		13.7**
Jerry	61.0	61.0	57.7	164.3	41.6		13.2*
LSD (0.05)	5.6	1.0		1.4	1.6		0.6
CV %	8.3	1.6		0.6	3.7		5.0

Table 9. Sidney (District 6) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yr	5	5	5	5	5		5
Yellowstone	60.7**	60.3	74.0*	163.6	29.4		11.8
Pryor	59.6*	60.6	67.8	165.1	28.0		11.2
Jerry	58.3*	60.8	81.2**	163.2	32.4		12.9
CDC Falcon	57.8*	61.0	75.8*	162.0	27.0		11.9
Morgan	57.5*	60.4	79.4*	165.0	31.9		12.1
Paul	56.3*	59.7	72.1*	165.4	29.5		12.4
NuSky (HWW)	55.3	60.7	76.1*	164.7	31.9		12.9
Neeley	55.0	60.8	60.9	165.1	32.2		12.0
Rocky	53.6	61.8*	70.0	160.6	31.4		11.8
Promontory	53.1	62.3**	55.3	162.3	28.8		12.3
BigSky	51.8	62.2*	72.5*	163.8	32.5		12.8
Tiber	48.5	61.7*	66.7	165.5	33.5		13.3*
Genou	47.1	60.8	60.5	163.7	30.9		12.9
Vanguard	41.6	60.8	46.8	164.6	30.8		13.8**
LSD (0.05)	4.9	0.7	10.7	1.0	1.4		0.8
CV %	7.2	1.0	12.3	0.5	3.6		5.1

Table 10. Williston, ND (District 6) Agronomic Comparisons, 2002-2006.

Variety	Yield bu/a	Test weight lb/bu	Winter survival %	Heading date Julian	Plant height in	Lodging index (0-9)	Protein %
Loc/yrs	5	5	5	4	5		5
Morgan	54.7**	58.9	52.3**	165.3	31.6		14.1
Jerry	53.9*	59.5	49.6*	163.8	32.8		14.1
Yellowstone	52.1*	58.6	43.3	164.9	30.1		13.8
CDC Falcon	48.1	59.0	45.6*	162.8	25.7		13.3
Paul	47.8	57.7	41.0	165.3	28.7		14.3
Neeley	46.6	59.1	38.6	166.5	30.8		14.0
NuSky (HWW)	46.2	59.6	43.6	165.1	31.4		13.9
Pryor	44.6	58.2	35.1	166.3	27.0		13.5
BigSky	44.4	60.6*	39.9	163.9	32.4		15.1**
Tiber	43.8	60.3*	39.7	166.1	32.5		14.6*
Rocky	42.5	60.6*	38.4	163.0	30.7		13.5
Promontory	39.3	60.9**	33.8	162.6	28.3		13.4
Genou	38.9	58.9	32.9	164.6	30.3		14.8*
Vanguard	37.3	58.9	29.0	164.7	30.1		15.0*
LSD (0.05)	5.8	0.9	6.7	1.8	1.3		0.5
CV %	9.9	1.2	13.2	0.8	3.3		3.0

** = indicates highest value within a column

ns = not significant at $p \leq 0.05$

* = indicates values equal to highest value within a column based on Fisher's protected LSD ($p=0.05$)