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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 Wahoo 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 Wahoo hard red winter wheat be recommended for production in districts 3 & 4.

**Description:** Wahoo is a high-yielding, winter hardy HRW wheat line with medium test weight, early maturity, semidwarf height, and medium grain protein (Table 1). The heading date of Wahoo is 4 to 5 days earlier than cultivars, Yellowstone and Pryor, which could provide a production advantage in certain environments prone to terminal drought and heat stress.

**Table 1. Performance of Wahoo and check cultivars in the Montana Intrastate (2002-2006) and Off-station (2003-2006) nurseries.**

<b>Variety</b>	<b>Yield bu/a</b>	<b>Test weight lb/bu</b>	<b>Winter survival %</b>	<b>Heading date Julian</b>	<b>Plant height in</b>	<b>Lodging index (0-9)</b>	<b>Protein %</b>	<b>Coleop- tile length</b>
<b>Loc/yrs</b>	78	77	13	45	78	7	77	4
<b>Yellowstone</b>	<b>66.0**</b>	59.7	58.3	163.0	33.4	<b>2.3*</b>	13.1	2.7
<b>Pryor</b>	63.1	59.8	51.4	163.8	30.3	<b>1.4**</b>	12.6	2.7
<b>Wahoo</b>	<b>62.0</b>	<b>59.4</b>	<b>58.0</b>	<b>159.0</b>	<b>31.2</b>	<b>2.4*</b>	<b>13.2</b>	<b>2.7</b>
<b>Promontory</b>	60.1	<b>61.6**</b>	43.9	161.7	32.4	2.1	12.9	2.6
<b>CDC Falcon</b>	59.6	59.9	<b>61.1*</b>	161.6	29.6	<b>1.6*</b>	12.9	2.7
<b>Neeley</b>	59.3	59.6	50.4	164.4	34.2	2.7	13.2	3.3
<b>Morgan</b>	59.0	59.5	<b>66.0**</b>	164.6	34.5	2.7	13.2	2.3
<b>Paul</b>	58.5	58.5	58.2	163.5	31.2	4.1	13.2	2.9
<b>Rocky</b>	58.4	<b>61.5*</b>	54.3	160.5	35.1	4.0	13.1	3.2
<b>Jerry</b>	57.7	59.7	<b>65.9*</b>	162.7	35.7	3.4	13.6	2.9
<b>Genou</b>	56.9	60.5	48.2	162.6	34.1	2.7	13.7	<b>3.8*</b>
<b>Tiber</b>	56.4	60.7	53.1	164.1	36.6	3.1	13.6	3.4
<b>NuSky (HWW)</b>	55.4	59.7	58.2	163.9	34.4	<b>2.5*</b>	13.3	2.6
<b>BigSky</b>	55.1	60.4	57.7	162.6	35.8	<b>2.3*</b>	13.9	3.5
<b>Vanguard</b>	54.1	60.4	41.2	162.3	34.5	3.2	<b>14.1**</b>	<b>4.0**</b>
<b>LSD (0.05)</b>	<b>2.1</b>	<b>0.4</b>	<b>5.6</b>	<b>0.5</b>	<b>0.5</b>	<b>1.2</b>	<b>0.2</b>	<b>0.2</b>
<b>CV %</b>	<b>11.6</b>	<b>2.0</b>	<b>13.1</b>	<b>0.7</b>	<b>4.9</b>	<b>40.7</b>	<b>4.9</b>	<b>5.6</b>

Milling and baking qualities of Wahoo are not outstanding but are in the acceptable range, similar to Pryor (Table 2).

**Table 2. All Locations Mill and Bake Comparisons, 2002-2005.**

Variety	Flour yield %	Flour protein %	Ash (Flour) %	Mixo. toler- ance	Mixo. mix time	Mixo. abs. %	Baking mix time	Baking abs. %	Loaf volume cc
Loc/yrs	16	16	16	16	16	16	16	16	16
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
Genou	67.1	12.6**	0.36*	4.4	5.2	62.3**	11.1	72.7*	1116**
Jerry	67.6*	12.1	0.38	5.1	4.7	61.2	7.5	71.5	1040
Neeley	65.2	11.8	0.38	5.0	4.8	60.6	8.0	71.6	1041
NuSky (HWW)	67.9**	11.9	0.36*	4.6	5.0	61.0	8.2	71.8	1025
Paul	64.7	11.8	0.39	4.8	5.7	59.8	8.6	70.5	1104*
Promontory	67.5*	11.4	0.37*	4.4	4.4	59.9	6.4	71.0	1058
Pryor	66.5	11.5	0.39	3.1	3.4	59.8	4.7	69.5	1019
<b>Wahoo</b>	<b>65.8</b>	<b>11.4</b>	<b>0.39</b>	<b>4.3</b>	<b>4.1</b>	<b>59.3</b>	<b>5.5</b>	<b>69.3</b>	<b>999</b>
Yellowstone	67.1	11.9	0.39	5.8	7.3	61.0	13.0	73.8**	1097*
LSD (0.05)	0.8	0.4	0.02	0.5	0.5	1.0	1.2	1.2	33
CV %	1.6	4.3	6.8	16.0	15.9	2.3	21.9	2.3	4.5

According to Nebraska disease assessment (Crop Sci. 42:1752-1753), Wahoo is moderately resistant to stem and leaf rust, most likely carrying *Sr6*, *Sr24*, *Lr16*, and *Lr24*. Wahoo also carries H18 resistance to Hessian fly. Based on Montana data (Table 3), Wahoo is susceptible to prevalent races of stripe rust.

**Table 3. Stripe rust reaction of selected cultivars at Kalispell & Bozeman in 2005 & 2006.**

Data collected by by Qingwu Xue/Robert Stougaard & W. Grey.

Exp3501 Intrastate Test	BZN DR%	KAL DR%	DR%	Bzn&Kal	Kal DR%	BZN DR%	Average	OVERALL
STRIPE RUST	2006	2006	2006	2006	2005	2005	2005-06	RATING
Yellowstone	0.0	5.0	2.5	R	5.0	5	3.8	r
Promontory	5.0	3.0	4.0	R	3.0	5	4.0	r
Rampart	1.7	5.0	3.4	R	6.7	24	9.4	r
Jerry	5.0	18.3	11.7	MR	11.7	15	12.5	mr
Vanguard	13.3	6.7	10.0	MR	13.3	24	14.3	mr
Ledger	8.3	16.7	12.5	MR	10.0	44	19.8	mr
<b>Wahoo</b>	<b>18.3</b>	<b>43.3</b>	<b>30.8</b>	<b>S</b>	<b>11.7</b>	<b>30</b>	<b>25.8</b>	<b>s</b>
Pryor	26.7	11.7	19.2	MR	63.3	46	36.9	s
Rocky	3.3	53.3	28.3	S	60.0	40	39.2	s
CDC Falcon	28.3	43.3	35.8	S	63.3	44	44.7	vs
Genou	15.0	60.0	37.5	S	46.7	70	47.9	vs
Tiber	18.3	50.0	34.2	S	70.0	64	50.6	vs
Morgan	35.0	60.0	47.5	VS	78.3	54	56.8	vs
NuSky (HWW)	41.7	70.0	55.9	VS	70.0	64	61.4	vs
BigSky	53.3	80.0	66.7	VS	85.0	56	68.6	vs
Neeley	48.3	73.3	60.8	VS	93.3	76	72.7	vs
Paul	66.7	75.0	70.9	VS	95.0	74	77.7	vs

Seed is available in Nebraska. According to the breeder, Stephan Baenziger, “Please feel free to recommend Wahoo in any part of your state where it may have utility. I have copied Jeff Noel and Steve Knox on your question on seed availability. I checked our seed book and there were over 400 acres of certified seed production. “

Yield performance of Wahoo has been good in all districts (Tables 4-11). However in some districts, performance of Wahoo is similar to but offers no significant advantages over cultivars already recommended for production in Montana.

**Table 4. 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	<b>107.3**</b>	<b>62.4*</b>		156.1	34.3	0.0	12.5
Promontory	<b>102.2*</b>	<b>63.8**</b>		154.8	34.0	0.3	12.3
<b>Wahoo</b>	<b>88.9*</b>	<b>59.3</b>		<b>151.9</b>	<b>33.3</b>	<b>0.3</b>	<b>12.6</b>
Pryor	87.1	59.5		157.3	31.1	0.0	12.2
Rocky	85.6	<b>63.4*</b>		153.9	38.2	3.1	12.8
CDC Falcon	83.5	<b>60.7*</b>		154.6	30.7	0.0	12.0
Genou	82.7	<b>61.8*</b>		155.7	36.6	0.4	<b>12.9*</b>
Tiber	82.6	<b>61.5*</b>		158.0	40.0	1.3	<b>12.9*</b>
Jerry	82.3	<b>60.9*</b>		156.0	37.7	2.2	<b>13.0*</b>
Vanguard	80.5	<b>62.8*</b>		154.3	37.0	2.1	<b>13.5**</b>
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	<b>13.1*</b>
NuSky (HWW)	64.7	58.0		157.5	35.9	1.4	12.3
<b>LSD (0.05)</b>	<b>18.8</b>	<b>3.8</b>		<b>1.3</b>	<b>2.0</b>	<b>ns</b>	<b>0.7</b>
<b>CV %</b>	<b>18.1</b>	<b>4.9</b>		<b>0.6</b>	<b>4.5</b>	<b>189</b>	<b>4.0</b>

**Table 5. 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/years	9	9		5	9	2	9
Yellowstone	<b>86.8**</b>	59.3		169.2	36.1	0.1	13.4
Promontory	<b>83.8*</b>	<b>61.7**</b>		166.8	35.0	0.1	12.9
<b>Wahoo</b>	<b>81.8*</b>	<b>58.3</b>		<b>163.8</b>	<b>34.5</b>	<b>0.1</b>	<b>13.4</b>
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	<b>14.2*</b>
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	<b>14.7**</b>
BigSky	69.5	59.5		168.3	39.4	0.1	<b>14.2*</b>
LSD (0.05)	<b>5.7</b>	<b>0.8</b>		<b>1.0</b>	<b>1.6</b>	<b>1.6</b>	<b>0.5</b>
CV %	<b>8.0</b>	<b>1.5</b>		<b>0.5</b>	<b>4.6</b>	<b>88.9</b>	<b>4.1</b>

**Table 6. 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/years	20	19		8	20	3	19
Yellowstone	<b>64.1**</b>	60.1		157.3	33.0	5.3	12.2
Pryor	<b>63.1*</b>	60.7		156.5	29.7	<b>3.1**</b>	11.5
<b>Wahoo</b>	<b>60.5*</b>	<b>59.8</b>		<b>153.3</b>	<b>31.3</b>	<b>5.2</b>	<b>12.4</b>
Neeley	58.6	60.0		158.8	33.5	5.6	12.3
Promontory	56.5	<b>61.7**</b>		155.8	32.2	4.9	12.1
Paul	56.4	59.2		156.6	30.6	5.8	12.2
CDC Falcon	55.6	60.6		155.3	29.2	<b>3.9*</b>	12.0
Jerry	55.5	60.4		156.0	34.9	5.4	12.7
Genou	55.2	<b>61.3*</b>		156.3	33.6	5.4	12.7
Morgan	54.5	60.5		157.8	33.7	5.1	12.4
Tiber	54.4	<b>61.3</b>		157.6	35.6	5.8	12.4
Rocky	54.1	<b>61.7**</b>		154.1	34.2	5.6	12.5
BigSky	53.9	<b>61.1*</b>		155.7	35.3	5.2	<b>12.8*</b>
Vanguard	53.0	<b>61.3*</b>		156.0	34.0	5.2	<b>13.2**</b>
NuSky (HWW)	52.2	60.1		157.3	33.4	4.5	12.5
LSD (0.05)	<b>3.7</b>	<b>0.7</b>		<b>1.2</b>	<b>0.9</b>	<b>1.4</b>	<b>0.5</b>
CV %	<b>10.5</b>	<b>1.9</b>		<b>0.8</b>	<b>4.5</b>	<b>16.5</b>	<b>5.7</b>

**Table 7. 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/years	17	17	1	9	17		17
Yellowstone	<b>53.8**</b>	58.7	90.0	166.3	34.8		13.7
Pryor	<b>52.9*</b>	59.3	86.7	168.5	30.5		13.3
<b>Wahoo</b>	<b>52.2*</b>	<b>58.8</b>	<b>90.0</b>	<b>163.3</b>	<b>31.1</b>		<b>13.9</b>
Paul	50.7	57.4	88.3	167.7	32.0		13.8
Neeley	50.6	58.6	86.7	168.7	34.4		14.0
CDC Falcon	50.5	59.1	85.0	166.4	30.4		13.5
Promontory	50.5	<b>60.7**</b>	78.3	166.7	33.5		13.6
Rocky	50.1	<b>60.7**</b>	81.7	165.0	36.8		13.8
Morgan	49.2	58.8	88.3	169.8	35.4		13.5
Tiber	48.3	59.8	83.3	169.1	37.2		14.0
Jerry	47.8	58.7	88.3	167.4	35.7		<b>14.2*</b>
NuSky (HWW)	47.8	59.4	85.0	168.9	34.7		13.5
Genou	47.7	59.4	83.3	166.9	34.6		<b>14.5*</b>
BigSky	46.4	59.4	88.3	167.1	36.4		<b>14.3*</b>
Vanguard	45.9	59.4	83.3	166.8	35.0		<b>14.6**</b>
<b>LSD (0.05)</b>	<b>2.5</b>	<b>0.6</b>		<b>1.2</b>	<b>1.3</b>		<b>0.5</b>
<b>CV %</b>	<b>7.4</b>	<b>1.5</b>		<b>0.8</b>	<b>5.6</b>		<b>4.8</b>

**Table 8. 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/years	10	10	1	5	10		10
Pryor	<b>55.4**</b>	59.6	12.0	163.6	27.5		13.8
Yellowstone	<b>55.1*</b>	59.4	36.7	162.8	29.5		14.2
CDC Falcon	<b>53.5*</b>	59.7	41.7	160.9	26.0		13.8
Neeley	<b>53.1*</b>	59.4	17.0	162.6	29.3		13.9
Genou	<b>52.7*</b>	60.0	25.0	162.7	29.4		14.5
<b>Wahoo</b>	<b>52.6*</b>	<b>59.2</b>	<b>18.7</b>	<b>158.0</b>	<b>27.5</b>		<b>13.9</b>
Paul	<b>51.8*</b>	58.5	43.3	162.9	26.6		14.3
Rocky	<b>51.4*</b>	<b>61.6**</b>	25.0	160.1	29.7		13.7
NuSky (HWW)	<b>51.0*</b>	59.9	23.3	163.2	31.0		14.4
Vanguard	51.0	59.9	20.0	161.7	30.0		<b>14.8*</b>
BigSky	49.4	59.9	38.3	162.0	30.7		<b>15.3**</b>
Morgan	49.1	58.5	48.3	164.4	30.4		14.6
Jerry	49.0	59.1	56.7	162.5	30.7		14.4
Tiber	49.0	60.3	22.0	162.3	31.2		14.4
Promontory	48.8	<b>61.2*</b>	0.3	161.0	28.7		13.6
<b>LSD (0.05)</b>	<b>4.6</b>	<b>0.7</b>		<b>1.2</b>	<b>1.5</b>		<b>0.6</b>
<b>CV %</b>	<b>10.1</b>	<b>1.3</b>		<b>0.6</b>	<b>5.9</b>		<b>4.8</b>

**Table 9. 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/ yrs	7	7	1	4	7		7
Pryor	<b>75.5**</b>	61.5	55.8	165.0	34.7		12.4
Paul	<b>75.0*</b>	60.5	58.9	165.8	36.0		12.8
Yellowstone	<b>73.9*</b>	60.3	44.7	165.3	38.0		12.8
<b>Wahoo</b>	<b>73.3*</b>	<b>61.2</b>	<b>70.1</b>	<b>161.3</b>	<b>34.4</b>		<b>13.3</b>
CDC Falcon	<b>72.3*</b>	<b>62.0*</b>	60.3	163.5	33.6		13.1
Rocky	<b>70.7*</b>	<b>63.0**</b>	57.4	162.5	40.3		12.8
Neeley	<b>69.8*</b>	60.8	54.1	166.5	39.1		<b>13.4*</b>
Promontory	<b>69.6*</b>	<b>62.8*</b>	46.0	163.8	36.9		12.8
Genou	68.9	<b>62.1*</b>	50.8	165.0	39.1		<b>13.4*</b>
BigSky	68.5	61.9	61.9	164.5	40.9		<b>13.7*</b>
NuSky (HWW)	66.7	60.3	49.2	165.8	39.6		13.2
Morgan	64.9	61.1	63.2	166.8	39.3		12.8
Tiber	64.5	61.9	52.8	165.3	42.4		<b>13.6*</b>
Vanguard	62.3	61.6	52.6	163.8	40.1		<b>14.1**</b>
Jerry	61.6	61.3	57.7	164.3	42.1		<b>13.4*</b>
LSD (0.05)	<b>6.1</b>	<b>1.0</b>		<b>1.4</b>	<b>1.6</b>		<b>0.7</b>
CV %	<b>8.3</b>	<b>1.5</b>		<b>0.6</b>	<b>3.9</b>		<b>4.9</b>

**Table 10. 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/ yrs	5	5	5	5	5		5
Yellowstone	<b>60.7**</b>	60.3	<b>74.0*</b>	163.6	29.4		11.8
Pryor	<b>59.6*</b>	60.6	67.8	165.1	28.0		11.2
Jerry	<b>58.3*</b>	60.8	<b>81.2*</b>	163.2	32.4		12.9
CDC Falcon	<b>57.8*</b>	61.0	<b>75.8*</b>	162.0	27.0		11.9
Morgan	<b>57.5*</b>	60.4	<b>79.4*</b>	165.0	31.9		12.1
Paul	<b>56.3*</b>	59.7	<b>72.1*</b>	165.4	29.5		12.4
<b>Wahoo</b>	<b>56.0*</b>	<b>60.3</b>	<b>72.8*</b>	<b>160.2</b>	<b>28.9</b>		<b>12.3</b>
NuSky (HWW)	55.3	60.7	<b>76.1*</b>	164.7	31.9		12.9
Neeley	55.0	60.8	60.9	165.1	32.2		12.0
Rocky	53.6	<b>61.8*</b>	70.0	160.6	31.4		11.8
Promontory	53.1	<b>62.3**</b>	55.3	162.3	28.8		12.3
BigSky	51.8	<b>62.2*</b>	<b>72.5*</b>	163.8	32.5		12.8
Tiber	48.5	<b>61.7*</b>	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)	<b>4.9</b>	<b>0.8</b>	<b>10.4</b>	<b>1.1</b>	<b>1.4</b>		<b>0.8</b>
CV %	<b>7.1</b>	<b>1.0</b>	<b>11.9</b>	<b>0.5</b>	<b>3.6</b>		<b>5.1</b>

**Table 11. 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
<b>Morgan</b>	<b>54.7**</b>	58.9	<b>52.3**</b>	165.3	31.6		14.1
<b>Jerry</b>	<b>53.9*</b>	59.5	<b>49.6*</b>	163.8	32.8		14.1
<b>Yellowstone</b>	<b>52.1*</b>	58.6	43.3	164.9	30.1		13.8
<b>CDC Falcon</b>	48.1	59.0	45.6	162.8	25.7		13.3
<b>Paul</b>	47.8	57.7	41.0	165.3	28.7		14.3
<b>Wahoo</b>	<b>47.5</b>	<b>58.6</b>	<b>42.3</b>	<b>160.6</b>	<b>28.2</b>		<b>13.7</b>
<b>Neeley</b>	46.6	59.1	38.6	166.5	30.8		14.0
<b>NuSky (HWW)</b>	46.2	59.6	43.6	165.1	31.4		13.9
<b>Pryor</b>	44.6	58.2	35.1	166.3	27.0		13.5
<b>BigSky</b>	44.4	<b>60.6*</b>	39.9	163.9	32.4		<b>15.1**</b>
<b>Tiber</b>	43.8	<b>60.3*</b>	39.7	166.1	32.5		<b>14.6*</b>
<b>Rocky</b>	42.5	<b>60.6*</b>	38.4	163.0	30.7		13.5
<b>Promontory</b>	39.3	<b>60.9**</b>	33.8	162.6	28.3		13.4
<b>Genou</b>	38.9	58.9	32.9	164.6	30.3		<b>14.8*</b>
<b>Vanguard</b>	37.3	58.9	29.0	164.7	30.1		<b>15.0*</b>
<b>LSD (0.05)</b>	<b>5.6</b>	<b>0.9</b>	<b>6.6</b>	<b>1.7</b>	<b>1.3</b>		<b>0.5</b>
<b>CV %</b>	<b>9.7</b>	<b>1.3</b>	<b>13.0</b>	<b>0.7</b>	<b>3.5</b>		<b>3.0</b>