NRPN: location of replicated yield trials and regional production zones.

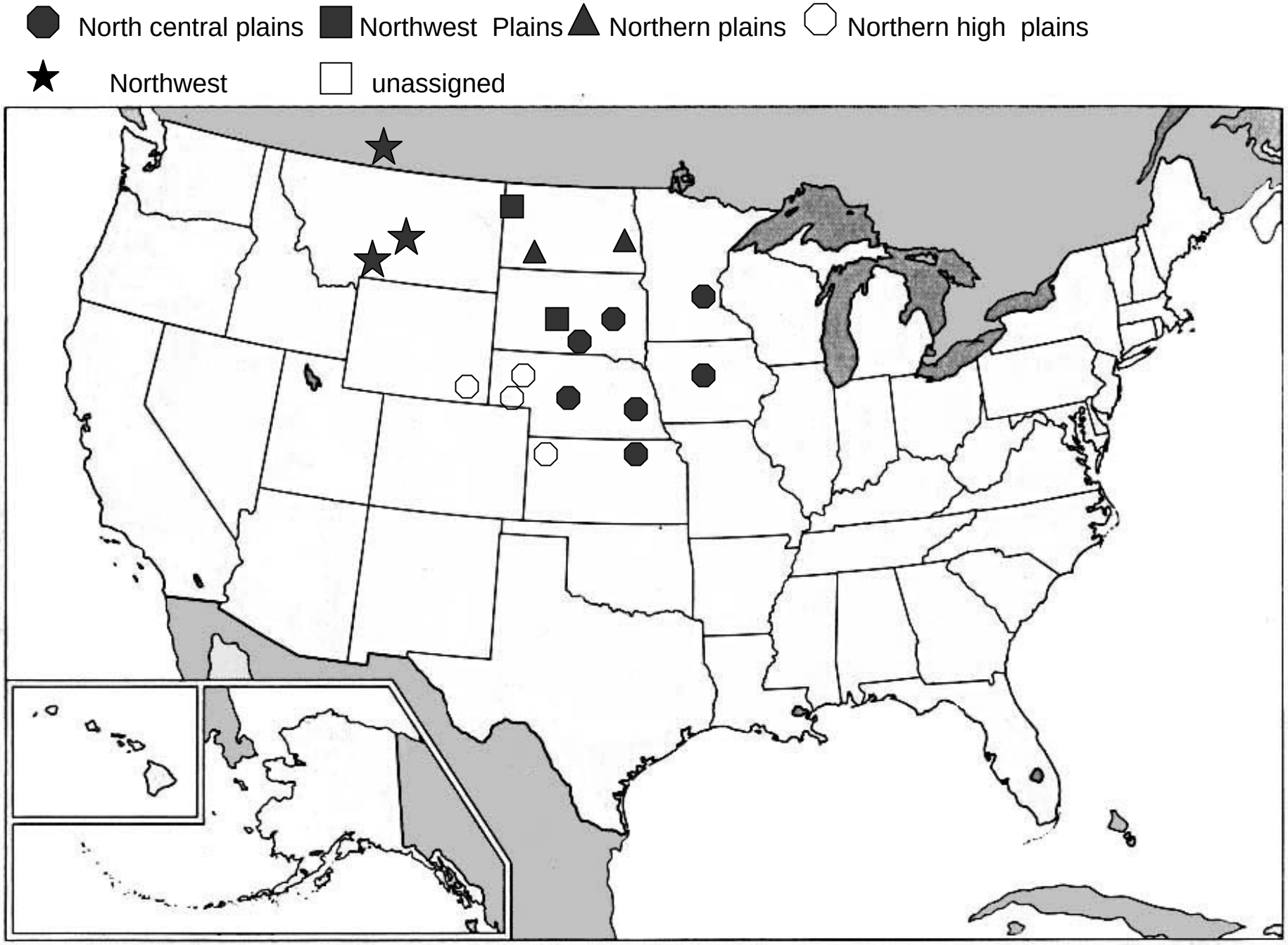

Table 1. Hard Winter Wheat Regional Nursery Program - Contributors

U.S.D.A. – Agricultural Research Service
Hard Winter Wheat Regional Coordination – R. Graybosch, L. Divis, L.E. Hansen, Lincoln, NE
Hard Winter Wheat Quality Lab – B. Seabourn, L. McLaughlin, R. Chen, M. Caley, Manhattan, KS
Regional Molecular Marker Laboratory – Guihua Bai, R. Bowden, Manhattan, KS
Rust investigations – Yue Jin, J. Kolmer St. Paul, MN; Xianming Chen, Pullman, WA
Hessian fly investigations – Ming Chen, C. E. Parker, Manhattan, KS
Russian wheat aphid / greenbug investigations – C. Baker, D. Porter, Stillwater, OK
Texas Agricultural Experiment Station
TAMU Research & Extension Center, Dallas, TX – R. Sutton
TAMU Research & Extension Center, Amarillo, TX –G. Peterson, J. Rudd, R. Devkota
TAMU Research & Extension Center, Vernon, TX - J. Baker
New Mexico Agricultural Experiment Station
Agricultural Science Center, Clovis, NM – R.E. Kirksey, Nichoel Pryor
Agricultural Science Center, Farmington, NM – M.K. O'Neill, C. Owen
Oklahoma Agricultural Experiment Station
Oklahoma State University, Stillwater, OK – B. Carver, R. M. Hunger, A.K. Klatt, W.E. Whitmore, K. Stricklen, R. Sidwell, B. Weidenmaier, L. Bohl
D. Jones, R. Thacker
Iowa Agricultural Experiment Station
Iowa State University, Ames, IA – R. Skrdla; J. Jannink
Kansas Agricultural Experiment Station
Kansas State University, Manhattan, KS – A. Fritz, K. Suther, KSU
Hays Experiment Station – J. Martin, C. Seaman
Colby Experiment Station – P. Evans
Hutchinson Experiment Station – W. Heer
Colorado Agricultural Experiment Station
Colorado State University, Ft. Collins, CO – S. Haley, J. Stromberger, B. Clifford, J. Butler
Nebraska Agricultural Experiment Station
University of Nebraska, Lincoln, NE – S. Baenziger, G. Dorn, M. Montgomery,
North Platte Station – R. Klein UNL
Panhandle Research Station, Scottsbluff – D. Baltensperger UNL
High Plains Ag. Laboratory, Sidney – T. Nightingale, G. Frickel
Wyoming Agricultural Experiment Station
University of Wyoming, Torrington Substation – J. Krall, J. Natchman University of Wyoming
South Dakota Agricultural Experiment Station
South Dakota State University, Brookings, SD – Amir Ibrahim, S. Kalsbeck, R. Little, M. Langham
North Dakota Agricultural Experimental Station
North Dakota State University, Fargo, ND – J. Ransom
NDSU, Williston Branch Station – N. R. Riveland
NDSU, Hettinger Branch Station – E. Eriksmoen
Montana Agricultural Experimental Station
Montana State University, Bozeman, MT – P. Bruckner, J. Berg
Central Ag. Research Center, Moccasin – D.M. Wicham
Illinois Agricultural Experiment Station
University of Illinois – F. Kolb
Minnesota Agricultural Experiment Station
University of Minnesota, St. Paul, MN – J. Anderson, G. Linkert
Ohio Agricultural Experiment Station

The Ohio State University, Wooster – Clay Sneller
Oregon Agricultural Experiment Station
Oregon State University, Corvallis, OR – J. Peterson
Missouri Agricultural Experiment Station
University of Missouri, Columbia, MO – A. McKendry, D. Tague
Agriculture and Agrifoods Canada
Ag. Research Station, Lethbridge, Alberta – R. Graf
Agripro Seeds Inc.
Junction City, KS, R. Sears
Vernon, TX, D. Worrall
Westbred LLC.
Sid Perry, Haven, KS
B. Moreno, Lafayette, IN
TRIO Seed Research
J. Wilson, Wichita, KS

Table 2. 2006 Northern Regional Performance Nursery

Entry	Line/selection	Putative market class	Cultivar or pedigree	Source	Protected Traits
1	Kharkof	HRW	Kharkof	check	
2	Harding	HRW	Harding	check	
3	Nuplains	HWW	Nuplains	check	
4	Wesley	HRW	Wesley	check	
5	NX02Y4481	waxy	BaiHuo/Kanto 107//Ike/3/SD94217W	ARS-LNK	
6	NW03Y2016	HWW	MO8/REDLAND//KS91H184/3*RIO BLANCO	ARS-LNK	
7	NW03Y2022	HWW	MO8/NE94406 (=NE86582//84MC29/NE82583)//KS91H184/3*RIO BLANCO	ARS-LNK	
8	NW03Y2023	HWW	MO8/NE94406 (=NE86582//84MC29/NE82583)//KS91H184/3*RIO BLANCO	ARS-LNK	
9	HV9W02-942R	HRW	53/3/ABL/1113//K92/4/JAG/5/KS89180B	WestBred	
10	NE01604	HRW	KS91H184/ARLIN SIB//KS91HW29/3/NE91631 (=NE82761/REDLAND)/4/VBFO168	UNL	
11	NE02528	HRW	KS92H363-2/NE95417 (=ABILENE/KARL)	UNL	
12	NE02584	HRW	KS92H363-2/NE95417 (=ABILENE/KARL)	UNL	
13	NE03458	HRW	NE95544 (=MCVEY 78015/NE88521)/W91-348//MILLENNIUM	UNL	
14	NH03609	HRW	N95L159/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	UNL	IMI
15	NH03614	HRW	N95L164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	UNL	IMI
16	NI03427	HRW	WI88-052/WI81-162-610W//N94L189	UNL	
17	NI04430	HRW	N94L205/Robinof 98	UNL	
18	NW03638	HWW	KS87H22/MW09 (KS75216/CC5)//NE93469	UNL	
19	NW03681	HWW	WI88-052/WI81-162-610W//N94L189	UNL	
20	98x0435-15		W95-091xW96-427	Agripro North	
21	SD02279	HRWW	SD93528/Culver	SDSU	
22	SD02480	HRWW	Tandem/Cougar	SDSU	
23	SD02286	HRWW	SD93528/SD96132	SDSU	
24	SD02771	HRWW	IDO537/SD93380//Nekota	SDSU	
25	SD01058	HRWW	XH1877/NE967430	SDSU	
26	SD96240-3-1	HRWW	NE87513/USSR#67	SDSU	
27	SD98W175-1	HWWW	KS84273BB-10/KSSB110-9//KS831374-141B/YE1110/3/KS82W418/SPN	SDSU	
28	SD01W064	HWWW	RUSSIANPI592033/NE92458//NEKOTA	SDSU	
29	SD00151-7	HRWW	KS94U328/KS84063-9-39-3-1W//SD93522	SDSU	
30	NuDakota	HWWW	JAGGERxROMANIAN	Agripro North	

Table 3. Agronomic summary of 30 hard winter wheats entered in the 2006 NRPN.

Entry	Line/selection	Grain yield, kg/ha		Volume weight, kg/hl	Days from 1/1 to heading	Plant height, cm
		mean	rank	mean	mean	mean
1	Kharkof	3201	30	75.9	155	105
2	Harding	4239	22	75.0	154	90
3	Nuplains	4018	24	76.3	154	77
4	Wesley	4628	7	74.9	151	73
5	NX02Y4481	3904	25	73.6	153	82
6	NW03Y2016	3741	27	75.4	154	71
7	NW03Y2022	3495	28	76.1	153	81
8	NW03Y2023	3328	29	75.0	153	79
9	HV9W02-942R	4661	4	74.3	152	71
10	NE01604	4516	12	75.5	151	83
11	NE02528	4393	19	77.3	151	79
12	NE02584	4453	15	78.2	151	78
13	NE03458	4471	13	75.3	151	73
14	NH03609	4580	9	75.2	151	79
15	NH03614	4740	2	76.0	152	76
16	NI03427	4467	14	77.0	151	79
17	NI04430	4730	3	73.3	152	80
18	NW03638	4318	21	76.3	150	86
19	NW03681	4608	8	77.3	152	79
20	98x0435-15	4638	6	76.1	151	73
21	SD02279	4404	18	75.0	154	92
22	SD02480	4415	16	76.6	152	79
23	SD02286	3874	26	75.7	152	89
24	SD02771	4412	17	74.4	154	94
25	SD01058	4571	10	75.1	152	84
26	SD96240-3-1	4350	20	74.1	153	81
27	SD98W175-1	4650	5	76.9	153	81
28	SD01W064	4537	11	76.4	154	88
29	SD00151-7	4148	23	77.0	154	90
30	NuDakota	4830	1	73.5	152	74
	mean	4311		75.6	152	82
	c.v.	10.8				
	n	43				
	l.s.d. (0.05)	344				

Table 4. Mean grain yields (kg/ha) and ranks for 30 wheats grown in the 2006 NRPN.

		region		Palmer, KS		Goodland, KS		Nebraska state		Lincoln, NE		North Platte, NE		Alliance, NE	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	1959	30	1531	28	2674	30	3806	30	1796	28	2421	26
2	Harding	4239	22	3369	22	1588	23	3154	23	5059	23	1921	27	2480	23
3	Nuplains	4018	24	3284	24	1564	24	3300	20	5184	21	2234	22	2484	22
4	Wesley	4628	7	3607	12	1845	15	3802	10	5920	10	2817	4	2670	14
5	NX02Y4481	3904	25	2898	28	1917	11	3407	19	5084	22	2469	16	2669	15
6	NW03Y2016	3741	27	3788	9	1795	20	2980	27	4460	26	2708	8	1772	30
7	NW03Y2022	3495	28	2744	29	1547	26	3038	26	4252	28	2532	13	2329	27
8	NW03Y2023	3328	29	2950	27	1534	27	2940	28	4180	29	2390	19	2250	28
9	HV9W02-942R	4661	4	3802	8	2020	3	4055	3	6364	2	2818	3	2984	7
10	NE01604	4516	12	4046	6	1977	6	3785	12	5905	11	2521	14	2931	9
11	NE02528	4393	19	3383	21	2288	1	3815	9	5526	15	2385	20	3534	1
12	NE02584	4453	15	3549	17	1982	5	3958	4	5903	12	2584	10	3387	2
13	NE03458	4471	13	3983	7	2268	2	3757	13	5657	14	2533	12	3082	5
14	NH03609	4580	9	4073	4	1876	12	3831	8	6101	6	2594	9	2800	11
15	NH03614	4740	2	4057	5	2007	4	4100	1	6290	3	3054	1	2957	8
16	NI03427	4467	14	3580	14	1867	13	3787	11	6214	5	2420	18	2727	13
17	NI04430	4730	3	4311	2	1846	14	3653	17	6008	7	2315	21	2636	18
18	NW03638	4318	21	3405	19	1955	7	3694	16	5521	16	2468	17	3091	4
19	NW03681	4608	8	3551	16	1812	18	3734	14	5818	13	2753	6	2631	19
20	98x0435-15	4638	6	4143	3	1946	9	3840	7	5975	9	2795	5	2751	12
21	SD02279	4404	18	3363	23	1806	19	3194	22	5426	19	1718	29	2438	25
22	SD02480	4415	16	3634	11	1822	17	3702	15	5485	18	2573	11	3049	6
23	SD02286	3874	26	3042	25	1558	25	3079	25	4454	27	2123	24	2661	16
24	SD02771	4412	17	3506	18	1394	30	3241	21	5267	20	1933	26	2524	21
25	SD01058	4571	10	3750	10	1829	16	3535	18	5491	17	2470	15	2644	17
26	SD96240-3-1	4350	20	3394	20	1478	29	2913	29	4896	25	1655	30	2188	29
27	SD98W175-1	4650	5	3589	13	1952	8	3884	5	5983	8	2846	2	2825	10
28	SD01W064	4537	11	3555	15	1684	21	3851	6	6239	4	2742	7	2573	20
29	SD00151-7	4148	23	2959	26	1595	22	3148	24	5017	24	1986	25	2440	24
30	NuDakota	4830	1	4813	1	1932	10	4062	2	6890	1	2204	23	3092	3
	mean	4311		3536		1807		3531		5479		2412		2701	
	c.v.	10.8		9.4		8.2		9.2		7.2		11.7		10.2	
	n	43		3		3		9		3		3		3	
	l.s.d. (0.05)	344		542		244		644		647		462		450	

Table 4. Mean grain yields (kg/ha) and ranks for 30 wheats grown in the 2006 NRPN.

		region		South Dakota state		Brookings, SD		Winner, SD	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	2737	30	3286	30	1913	27
2	Harding	4239	22	4092	13	5227	13	2388	8
3	Nuplains	4018	24	3543	26	4409	27	2245	14
4	Wesley	4628	7	4048	15	5462	5	1927	25
5	NX02Y4481	3904	25	3434	27	4541	26	1775	29
6	NW03Y2016	3741	27	3129	29	3946	29	1903	28
7	NW03Y2022	3495	28	3682	24	4676	25	2190	19
8	NW03Y2023	3328	29	3228	28	4220	28	1740	30
9	HV9W02-942R	4661	4	4242	5	5515	4	2332	11
10	NE01604	4516	12	4211	6	5456	7	2344	10
11	NE02528	4393	19	3889	21	5055	19	2141	21
12	NE02584	4453	15	4039	16	5060	18	2507	4
13	NE03458	4471	13	3860	22	4950	22	2225	16
14	NH03609	4580	9	4154	9	5460	6	2194	18
15	NH03614	4740	2	4139	10	5304	11	2392	7
16	NI03427	4467	14	4182	8	5418	9	2329	12
17	NI04430	4730	3	4007	18	5256	12	2134	22
18	NW03638	4318	21	4035	17	5423	8	1953	24
19	NW03681	4608	8	4355	3	5642	2	2425	6
20	98x0435-15	4638	6	4416	1	5111	16	2329	13
21	SD02279	4404	18	3913	20	5040	20	2222	17
22	SD02480	4415	16	4107	12	5225	14	2431	5
23	SD02286	3874	26	3647	25	4797	24	1922	26
24	SD02771	4412	17	3993	19	4984	21	2507	3
25	SD01058	4571	10	4192	7	5409	10	2367	9
26	SD96240-3-1	4350	20	4385	2	5814	1	2241	15
27	SD98W175-1	4650	5	4138	11	5204	15	2540	1
28	SD01W064	4537	11	3749	23	4863	23	2077	23
29	SD00151-7	4148	23	4078	14	5106	17	2537	2
30	NuDakota	4830	1	4244	4	5640	3	2151	20
	mean	4311		3929		5050		2213	
	c.v.	10.8		8.3		7.4		9.1	
	n	43		5		3		2	
	l.s.d. (0.05)	344		555		609		402	

Table 4. Mean grain yields (kg/ha) and ranks for 30 wheats grown in the 2006 NRPN.

		region		North Dakota State		Williston, ND		Prosper, ND	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	3717	28	2295	17	5140	28
2	Harding	4239	22	4956	4	2613	2	7300	10
3	Nuplains	4018	24	3989	25	2476	11	5501	27
4	Wesley	4628	7	4965	3	2554	7	7376	8
5	NX02Y4481	3904	25	3953	26	1760	28	6147	25
6	NW03Y2016	3741	27	3883	27	1985	27	5782	26
7	NW03Y2022	3495	28	3360	29	1665	29	5054	29
8	NW03Y2023	3328	29	3317	30	1595	30	5039	30
9	HV9W02-942R	4661	4	4982	2	2297	16	7667	4
10	NE01604	4516	12	4548	21	2100	24	6997	14
11	NE02528	4393	19	4737	13	2608	3	6866	17
12	NE02584	4453	15	4939	7	2293	18	7584	6
13	NE03458	4471	13	4637	16	2594	4	6681	22
14	NH03609	4580	9	4533	22	2526	9	6540	23
15	NH03614	4740	2	4941	6	2557	6	7325	9
16	NI03427	4467	14	4526	23	2277	20	6775	19
17	NI04430	4730	3	4913	9	2330	15	7497	7
18	NW03638	4318	21	4689	14	2533	8	6844	18
19	NW03681	4608	8	5231	1	2627	1	7835	2
20	98x0435-15	4638	6	4918	8	2156	23	7680	3
21	SD02279	4404	18	4599	19	2447	12	6752	20
22	SD02480	4415	16	4578	20	2260	21	6895	16
23	SD02286	3874	26	4407	24	2393	14	6422	24
24	SD02771	4412	17	4891	10	2576	5	7206	12
25	SD01058	4571	10	4621	17	2292	19	6950	15
26	SD96240-3-1	4350	20	4678	15	2227	22	7129	13
27	SD98W175-1	4650	5	4827	12	2412	13	7241	11
28	SD01W064	4537	11	4848	11	2035	26	7660	5
29	SD00151-7	4148	23	4607	18	2480	10	6735	21
30	NuDakota	4830	1	4953	5	2054	25	7853	1
	mean	4311		4558		2301		6816	
	c.v.	10.8		11.6		9.5		10.5	
	n	43		8		4		4	
	l.s.d. (0.05)	344		1037		308		1011	

Table 4. Mean grain yields (kg/ha) and ranks for 30 wheats grown in the 2006 NRPN.

		region		Montana State		Moccasin, MT		Bozeman, MT	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	4024	26	3271	26	4777	26
2	Harding	4239	22	4599	17	4060	11	5138	23
3	Nuplains	4018	24	3914	27	3398	24	4430	28
4	Wesley	4628	7	4750	13	4329	5	5172	22
5	NX02Y4481	3904	25	4129	25	3470	23	4788	25
6	NW03Y2016	3741	27	3648	30	2943	30	4353	30
7	NW03Y2022	3495	28	3806	28	3129	28	4483	27
8	NW03Y2023	3328	29	3668	29	2966	29	4371	29
9	HV9W02-942R	4661	4	4571	19	3623	19	5519	12
10	NE01604	4516	12	4709	14	4199	8	5219	19
11	NE02528	4393	19	4187	24	3147	27	5228	18
12	NE02584	4453	15	4282	23	3477	22	5086	24
13	NE03458	4471	13	4556	20	3499	21	5613	9
14	NH03609	4580	9	4985	6	3649	17	6322	2
15	NH03614	4740	2	5343	2	4356	3	6330	1
16	NI03427	4467	14	4681	15	3802	16	5559	10
17	NI04430	4730	3	5377	1	4938	1	5815	8
18	NW03638	4318	21	5073	3	4297	7	5849	7
19	NW03681	4608	8	4836	11	3593	20	6079	3
20	98x0435-15	4638	6	4999	5	4562	2	5436	14
21	SD02279	4404	18	4770	12	4089	10	5452	13
22	SD02480	4415	16	4418	21	3645	18	5192	20
23	SD02286	3874	26	4384	22	3356	25	5411	16
24	SD02771	4412	17	4927	7	4329	4	5526	11
25	SD01058	4571	10	5056	4	4145	9	5967	4
26	SD96240-3-1	4350	20	4641	16	3856	14	5427	15
27	SD98W175-1	4650	5	4861	9	3818	15	5905	6
28	SD01W064	4537	11	4852	10	4302	6	5402	17
29	SD00151-7	4148	23	4572	18	3957	12	5187	21
30	NuDakota	4830	1	4914	8	3903	13	5925	5
	mean	4311		4584		3804		5365	
	c.v.	10.8		7.8		10.1		5.7	
	n	43		6		3		3	
	l.s.d. (0.05)	344		679		636		498	

Table 4. Mean grain yields (kg/ha) and ranks for 30 wheats grown in the 2006 NRPN.

		region		Ames, IA		Rosemount, MN		Lethbridge, Alberta	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	5639	29	3652	30	3375	30
2	Harding	4239	22	6970	18	5656	25	5388	20
3	Nuplains	4018	24	6648	20	7181	9	5526	18
4	Wesley	4628	7	7488	6	7126	11	6334	6
5	NX02Y4481	3904	25	6123	26	5998	20	5017	22
6	NW03Y2016	3741	27	6419	22	6049	19	4661	26
7	NW03Y2022	3495	28	5884	28	5425	27	3467	29
8	NW03Y2023	3328	29	5350	30	4628	29	3530	28
9	HV9W02-942R	4661	4	7256	12	6231	18	6697	1
10	NE01604	4516	12	7740	1	5433	26	6691	2
11	NE02528	4393	19	7398	8	6555	16	5411	19
12	NE02584	4453	15	7021	17	5908	22	5878	13
13	NE03458	4471	13	7609	3	7136	10	4944	23
14	NH03609	4580	9	7522	5	6969	14	5718	15
15	NH03614	4740	2	7438	7	5793	24	6483	5
16	NI03427	4467	14	7391	10	5878	23	6523	4
17	NI04430	4730	3	7663	2	7522	3	5939	12
18	NW03638	4318	21	7525	4	4717	28	4906	25
19	NW03681	4608	8	6362	24	7655	2	5171	21
20	98x0435-15	4638	6	6365	23	6488	17	6039	10
21	SD02279	4404	18	7398	8	7341	7	6311	7
22	SD02480	4415	16	6658	19	7337	8	5576	17
23	SD02286	3874	26	5972	27	5967	21	3851	27
24	SD02771	4412	17	7055	15	7047	12	5846	14
25	SD01058	4571	10	7085	14	6993	13	6676	3
26	SD96240-3-1	4350	20	7038	16	7841	1	5695	16
27	SD98W175-1	4650	5	7108	13	7382	5	6298	8
28	SD01W064	4537	11	6621	21	7430	4	5996	11
29	SD00151-7	4148	23	6335	25	6715	15	4913	24
30	NuDakota	4830	1	7364	11	7378	6	6286	9
	mean	4311		6881		6448		5505	
	c.v.	10.8		5.7		15.9		7.6	
	n	43		2		3		3	
	l.s.d. (0.05)	344		789		1680		680	

Table 5. Summary of mean yields of 30 wheats grown in the 2006 NRPN for regional production zones (Peterson, 1992, Crop Science 32: 907).

		region		North Central Plains		Northern High Plains		Northern Plains		Northwest Plains		Northwest	
Entry	Line or selection	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank	mean	rank
1	Kharkof	3201	30	3084	30	1976	25	only one location reported		only one location reported		3808	28
2	Harding	4239	22	4338	24	2034	22					4862	18
3	Nuplains	4018	24	4456	21	2024	23					4451	24
4	Wesley	4628	7	4928	6	2258	15					5278	11
5	NX02Y4481	3904	25	4146	26	2293	14					4425	25
6	NW03Y2016	3741	27	4184	25	1783	30					3986	27
7	NW03Y2022	3495	28	3949	28	1938	27					3693	29
8	NW03Y2023	3328	29	3646	29	1892	28					3622	30
9	HV9W02-942R	4661	4	4914	8	2502	6					5279	10
10	NE01604	4516	12	4750	14	2454	8					5369	5
11	NE02528	4393	19	4620	19	2911	1					4595	23
12	NE02584	4453	15	4635	17	2685	2					4814	19
13	NE03458	4471	13	4866	10	2675	3					4686	22
14	NH03609	4580	9	5001	3	2338	12					5230	14
15	NH03614	4740	2	4903	9	2482	7					5723	1
16	NI03427	4467	14	4735	15	2297	13					5295	8
17	NI04430	4730	3	5044	2	2241	16					5564	3
18	NW03638	4318	21	4398	22	2523	4					5017	15
19	NW03681	4608	8	4938	5	2221	18					4948	17
20	98x0435-15	4638	6	4922	7	2348	11					5346	6
21	SD02279	4404	18	4626	18	2122	20					5284	9
22	SD02480	4415	16	4786	13	2435	9					4804	20
23	SD02286	3874	26	4049	27	2109	21					4206	26
24	SD02771	4412	17	4597	20	1959	26					5234	12
25	SD01058	4571	10	4802	12	2236	17					5596	2
26	SD96240-3-1	4350	20	4703	16	1833	29					4992	16
27	SD98W175-1	4650	5	4963	4	2388	10					5340	7
28	SD01W064	4537	11	4836	11	2129	19					5233	13
29	SD00151-7	4148	23	4373	23	2017	24					4686	21
30	NuDakota	4830	1	5253	1	2512	5					5371	4
	mean	4311		4582		2254						4891	
	c.v.	10.8		11.4		9.8						7.7	
	n	43		19		6						9	
	l.s.d. (0.05)	344		513		352						803	

Table 6. Summary of mean volume weights (kg/hl) of 30 wheats grown in the 2006 NRPN.

Entry	Line or selection	region	Goodland, KS	Winner, SD	Brookings, SD	Prosper, ND	Williston, ND	Moccasin, MT	Bozeman, MT	Ames, IA
1	Kharkof	76.3	66.0	75.8	76.3	74.9	76.6	79.3	81.5	79.5
2	Harding	75.2	65.7	75.4	75.8	75.2	74.9	74.9	80.1	79.2
3	Nuplains	76.9	67.2	77.7	74.8	73.2	78.4	81.2	81.4	81.1
4	Wesley	75.3	66.4	72.7	76.1	72.6	75.7	79.8	81.8	77.3
5	NX02Y4481	73.9	65.0	72.5	74.8	73.3	72.8	77.2	78.6	77.2
6	NW03Y2016	75.9	65.8	75.1	75.8	73.0	78.2	78.0	81.1	80.6
7	NW03Y2022	76.4	71.2	76.7	78.5	72.2	75.9	76.8	81.3	78.3
8	NW03Y2023	75.4	68.7	76.4	76.3	70.6	74.8	77.0	80.8	78.3
9	HV9W02-942R	74.7	68.8	72.5	74.4	70.9	75.7	77.5	80.7	77.3
10	NE01604	76.0	66.1	75.8	76.6	73.1	74.9	80.4	81.7	79.0
11	NE02528	77.6	71.9	75.4	76.5	76.0	78.7	81.0	82.2	79.1
12	NE02584	78.5	72.2	77.7	76.7	76.9	79.7	81.1	83.2	80.8
13	NE03458	76.0	68.2	72.3	74.3	71.9	78.4	81.5	82.3	79.0
14	NH03609	75.8	67.3	74.3	74.2	72.9	76.3	81.3	81.3	78.4
15	NH03614	76.4	68.4	74.2	75.1	74.8	77.9	80.6	81.4	78.9
16	NI03427	77.5	70.3	76.9	75.6	75.0	79.3	81.0	82.9	78.8
17	NI04430	73.8	65.0	70.2	74.0	71.0	74.0	79.7	80.6	76.0
18	NW03638	76.7	68.6	75.3	76.0	74.8	77.5	80.9	81.5	78.9
19	NW03681	77.5	71.9	77.2	77.0	76.0	78.7	80.2	82.9	76.4
20	98x0435-15	76.5	69.3	73.5	75.3	74.1	76.9	82.0	82.5	78.8
21	SD02279	75.2	68.2	74.3	76.1	74.3	75.2	76.9	80.5	75.8
22	SD02480	76.8	71.1	75.5	78.0	75.0	77.5	80.5	81.7	74.9
23	SD02286	75.9	68.6	75.5	76.8	73.7	78.6	78.6	82.4	72.8
24	SD02771	74.5	61.8	75.7	76.9	75.5	75.4	76.6	80.2	73.5
25	SD01058	75.6	67.6	74.4	75.7	71.9	76.6	79.7	81.5	77.7
26	SD96240-3-1	74.4	63.7	71.8	77.2	73.9	74.8	76.1	80.4	76.9
27	SD98W175-1	77.3	68.9	77.3	77.0	74.7	77.4	80.5	82.9	79.4
28	SD01W064	76.6	70.4	76.9	76.1	74.9	76.1	79.0	82.0	77.3
29	SD00151-7	77.4	68.1	76.0	77.1	76.2	78.8	79.1	83.3	80.4
30	NuDakota	74.0	64.8	69.6	75.1	71.8	74.4	79.3	80.9	75.7
	mean	76.0	67.9	74.8	76.0	73.8	76.7	79.3	81.5	77.9

Table 7. Summary of mean plant heights (cm) of 30 wheats grown in the 2006 NRPN.

Entry	Line or selection	Region	Lincoln, NE	North Platte, NE	Alliance, NE	Brookings, SD	Winner, SD	Williston, ND	Prosper, ND	Moccasin, MT	Bozeman, MT	Ames, IA	Lethbridge, Alberta	Rosemount, MN
1	Kharkof	101	109	79	81	119	66	96	103	111	119	117	103	109
2	Harding	88	106	76	69	107	61	72	86	96	92	105	85	101
3	Nuplains	74	96	69	56	76	48	65	70	81	78	89	76	85
4	Wesley	72	92	69	56	81	46	56	71	75	72	87	69	88
5	NX02Y4481	79	100	74	58	86	56	70	83	88	85	90	77	85
6	NW03Y2016	70	88	71	56	79	46	56	73	73	73	83	63	76
7	NW03Y2022	79	109	74	58	84	48	63	81	90	82	94	73	87
8	NW03Y2023	78	105	71	69	94	46	62	73	84	82	95	69	84
9	HV9W02-942R	70	93	69	56	76	43	53	72	78	70	84	68	75
10	NE01604	82	110	79	69	89	64	65	83	88	80	99	79	79
11	NE02528	78	106	76	66	86	51	60	80	78	80	93	72	88
12	NE02584	77	101	74	58	86	56	61	80	88	74	89	70	83
13	NE03458	72	95	69	61	84	51	55	78	73	68	88	66	81
14	NH03609	78	100	74	61	94	48	63	78	80	78	96	73	88
15	NH03614	75	97	69	56	91	48	55	77	80	77	92	72	84
16	NI03427	78	101	74	64	84	56	64	72	81	82	96	78	81
17	NI04430	77	98	69	58	89	48	62	76	93	77	91	77	89
18	NW03638	85	115	86	64	102	51	66	85	88	84	107	79	92
19	NW03681	79	97	79	61	97	56	60	77	81	81	93	76	92
20	98x0435-15	72	96	76	53	84	46	59	70	78	69	87	64	83
21	SD02279	89	113	76	64	109	56	75	91	93	92	107	91	103
22	SD02480	77	102	74	58	91	51	61	79	84	76	92	70	89
23	SD02286	87	108	84	66	109	53	71	80	92	93	105	83	101
24	SD02771	92	113	86	64	114	56	74	97	95	99	107	95	102
25	SD01058	82	105	81	56	99	53	66	81	98	82	98	79	92
26	SD96240-3-1	79	99	74	58	97	56	63	83	84	81	91	78	88
27	SD98W175-1	79	103	76	66	91	53	66	79	82	82	89	75	90
28	SD01W064	87	109	89	71	97	53	70	83	94	89	102	87	95
29	SD00151-7	89	112	86	69	114	58	71	86	92	93	100	89	98
30	NuDakota	73	96	69	61	84	53	56	75	82	70	85	66	82
	mean	80	102	76	62	93	53	64	80	86	82	95	76	89

Table 8. Summary of days (from 1/1) to heading for 30 wheats grown in the 2006 NRPN.

Entry	Line or selection	region	Lincoln, NE	Brookings, SD	Williston, ND	Rosemount, MN	Bozeman, MT	Moccasin, MT	Ames, IA	Lethbridge, Alberta
1	Kharkof	155	147	155	159	154	160	156	149	160
2	Harding	154	145	154	158	154	159	155	147	159
3	Nuplains	154	145	153	160	151	161	154	147	159
4	Wesley	151	143	151	156	151	156	152	145	153
5	NX02Y4481	152	144	153	157	152	158	154	146	156
6	NW03Y2016	153	146	153	157	152	160	154	146	160
7	NW03Y2022	152	142	153	157	151	159	154	146	159
8	NW03Y2023	152	143	152	158	152	159	153	145	157
9	HV9W02-942R	151	141	150	156	151	157	155	144	156
10	NE01604	150	142	149	156	151	157	150	143	153
11	NE02528	150	141	150	155	150	157	151	142	154
12	NE02584	150	140	151	155	151	156	152	141	156
13	NE03458	151	142	149	155	151	157	152	144	156
14	NH03609	150	141	151	155	151	156	151	144	153
15	NH03614	151	141	152	156	150	157	154	145	155
16	NI03427	151	141	150	156	151	157	153	144	155
17	NI04430	152	142	153	157	151	158	154	146	154
18	NW03638	150	141	149	154	150	156	152	141	153
19	NW03681	151	144	153	155	150	157	153	145	154
20	98x0435-15	150	139	150	156	151	156	152	142	154
21	SD02279	154	145	155	159	152	159	153	148	158
22	SD02480	152	142	153	157	151	157	153	146	155
23	SD02286	152	143	152	157	151	158	153	146	155
24	SD02771	154	145	156	157	152	159	155	148	159
25	SD01058	151	141	152	155	150	157	153	145	156
26	SD96240-3-1	152	144	153	156	151	158	154	147	157
27	SD98W175-1	152	143	152	157	152	158	153	145	157
28	SD01W064	153	144	153	158	152	159	155	147	156
29	SD00151-7	153	146	154	158	152	159	154	146	158
30	NuDakota	151	142	151	157	152	157	152	146	154
	mean	152	143	152	156	151	158	153	145	156

Table 9. Stability analyses, grain yield and volume weights, of 30 wheats grown in the 2006 NRPN.

		grain yield			volume weight		
Entry	Line or selection	regional average (kg/ha)	regression coef. (b)	r^2	regional average (kg/hl)	regression coef. (b)	r^2
1	Kharkof	3201	0.65	0.83	76.3	1.13	0.96
2	Harding	4239	1.00	0.96	75.2	0.94	0.79
3	Nuplains	4018	0.93	0.93	76.9	1.14	0.89
4	Wesley	4628	1.11	0.98	75.3	1.16	0.98
5	NX02Y4481	3904	0.90	0.99	73.9	1.01	0.92
6	NW03Y2016	3741	0.86	0.94	75.9	1.15	0.92
7	NW03Y2022	3495	0.75	0.92	76.4	0.70	0.76
8	NW03Y2023	3328	0.70	0.95	75.4	0.89	0.84
9	HV9W02-942R	4661	1.08	0.97	74.7	0.91	0.92
10	NE01604	4516	1.03	0.93	76.0	1.17	0.96
11	NE02528	4393	0.98	0.96	77.6	0.79	0.94
12	NE02584	4453	0.99	0.96	78.5	0.81	0.95
13	NE03458	4471	1.00	0.96	76.0	1.17	0.81
14	NH03609	4580	1.07	0.97	75.8	1.11	0.95
15	NH03614	4740	1.02	0.95	76.4	1.01	0.96
16	NI03427	4467	1.05	0.96	77.5	0.93	0.94
17	NI04430	4730	1.16	0.98	73.8	1.22	0.95
18	NW03638	4318	0.89	0.93	76.7	0.99	0.98
19	NW03681	4608	1.08	0.95	77.5	0.74	0.87
20	98x0435-15	4638	1.01	0.96	76.5	1.05	0.92
21	SD02279	4404	1.13	0.97	75.2	0.94	0.82
22	SD02480	4415	1.01	0.98	76.8	0.75	0.82
23	SD02286	3874	0.88	0.94	75.9	0.90	0.75
24	SD02771	4412	1.09	0.98	74.5	1.17	0.75
25	SD01058	4571	1.08	0.98	75.6	1.07	0.98
26	SD96240-3-1	4350	1.17	0.96	74.4	1.15	0.89
27	SD98W175-1	4650	1.08	0.99	77.3	1.02	0.98
28	SD01W064	4537	1.12	0.97	76.6	0.79	0.94
29	SD00151-7	4148	0.97	0.97	77.4	1.06	0.95
30	NuDakota	4830	1.19	0.99	74.0	1.23	0.94
	mean	4311			76.0		

Table 10. Reaction of 30 wheats grown in the 2006 NRPN to viral pathogens and insects.

		Response to viruses		Response to insects*		
Entry	Line or selection	WSMV, Hays, KS; (0-9; 0=res.). Mean scores,	WSBMV/WSSMV, Stillwater, OK (1-4; 1= res.)	RWA1	GBE	Hessian fly
1	Kharkof	6.5	2	S	S	S
2	Harding	7	2	S	S	R-
3	Nuplains	6	2	S	S	H-
4	Wesley	7	1	S	S	S
5	NX02Y4481	7	3	S	S	R-
6	NW03Y2016	1	2	S	S	H+
7	NW03Y2022	1	1	S	S	S
8	NW03Y2023	1	1	S	S	S
9	HV9W02-942R	7	1	S	S	S
10	NE01604	7	2	S	S	R-
11	NE02528	5.5	1	S	S	H
12	NE02584	5	1	S	S	H-
13	NE03458	5	3	S	S	H-
14	NH03609	7	3	S	S	S
15	NH03614	7.5	2	S	S	R-
16	NI03427	6.5	1	S	S	S
17	NI04430	7	4	S	S	H
18	NW03638	5	2	S	S	H-
19	NW03681	5	1	S	S	S
20	98x0435-15	7.5	1	S	S	H-
21	SD02279	7.5	4	S	S	H
22	SD02480	5.5	1	S	S	H-
23	SD02286	6.5	4	S	S	H+
24	SD02771	6	4	S	S	H
25	SD01058	7	4	S	S	H-
26	SD96240-3-1	7.5	4	S	S	H
27	SD98W175-1	7	2	S	S	S
28	SD01W064	7	1	S	S	H-
29	SD00151-7	5	4	S	S	H
30	NuDakota	6	1	S	S	H-

*RWA1 and GBE = Russian Wheat Aphid and Green Bug biotype E; from USDA-ARS, Stillwater, OK.
Hessian fly data from USDA-ARS, Manhattan, KS

Table 11. Seedling and field reactions of entries in the 2006 NRPN to selected isolates of stem rust.

		stem rust isolates							
		QFCS	MCCF	RKQQ	TPMK	QTHJ	TTTT	TTKS	Field SR 7/3/06
Entry	Line or selection	03ND76C	59KS19	99KS76A-1	74MN1409	75ND717C	01MN84A-1-2	04 KEN 156 2/15/06	dough stage
1	Kharkof	S	S	S	S	-	S	S	5 MR-MS
2	Harding	0	0	2	0;?	-	1	S	5 MR
3	Nuplains	2	0	2	2+	-	2	2	0
4	Wesley	0	0	2/S	0;	-	2/S	S/2	20 MR-MS
5	NX02Y4481	0	0	1+	0	-	S	S	20 MR-MS/50 S
6	NW03Y2016	2	1	2	2+	-	2	2	5 R
7	NW03Y2022	;/S	0	;1	0	-	2/S	2	0/10 MS
8	NW03Y2023	0;	0	;1	0	-	2	2	0
9	HV9W02-942R	0;/2	0/2	0/2	0	-	;1	2	0/10 MR
10	NE01604	0;	0	2+	0	-	S+	2++	5 MR
11	NE02528	S/2	S	2/S	S	-	2	S	15 MR-MS
12	NE02584	2/S	;1	S	2/S	-	2/S	2-/S	10 MR
13	NE03458	0;	0	;1	0	-	2	2	0
14	NH03609	;	0	S-	0	-	;1/S	2++	5 MR
15	NH03614	2	0	0	0/S	-	;1/2/S	2/S	5 MR-MS
16	NI03427	;	0	S/2	0;	-	S	S/2	T MR-MS
17	NI04430	;	0	;1	S/2	-	;1	2/S	T MR
18	NW03638	S/;	1	S	S	-	S	2++	0
19	NW03681	2/;	1-	2	2	-	2	2	0
20	98x0435-15	0;	-	;	;	-	S	S	0
21	SD02279	0;	0	;/S	0;	-	S	S	10 R-MR
22	SD02480	0;	0	;1	0/S	-	S	S	0/5 MR-MS
23	SD02286	0;	0	2	0	-	;	2	0
24	SD02771	0;	0	;1	0	-	1	2/S	0
25	SD01058	;/1/S	;1	;	S	1/S	2	S	10R-MR
26	SD96240-3-1	0;	-	1	-	2	2	2	0
27	SD98W175-1	0;	-	2	;1	-	;1	2	0
28	SD01W064	2-	1+	2	-	2-	2	2	0
29	SD00151-7	1	3C	S	S	1	S	2++	10 MR
30	NuDakota	;2	;2	;2-	S	0;/2	S	S	5R-MR

Table 12. Seedling reactions of entries in the 2006 NRPN to selected isolates of leaf rust.

Entry	Line or selection	Leaf rust isolates*							Postulated Gene(s)
		MCDS	KFBJ	THBJ	TNRJ	KDBG	TLGF	MJBJ	
1	Kharkof	3+	3+	3+	3+	X	3+	3+	Lr14a
2	Harding	;	;	;	;	;	;	3+	Lr16, Lr24
3	Nuplains	;	3+	;	3+	3+	;	3+	Lr24
4	Wesley	;3+	;	;/3+	3+	;	;	;	Lr41 or Lr9, Lr24
5	NX02Y4481	;3+	;12+	;	3+	;	;	;	Lr41 or Lr9, Lr24
6	NW03Y2016	;	3+	;	3+	3+	;	3+	Lr24
7	NW03Y2022	0	3+	;	3+	3+	;	3+	Lr24
8	NW03Y2023	;	3+	;	3+	3+	;	3+	Lr24
9	HV9W02-942R	;	3+	;	;	;	;	;	Lr24, Lr26
10	NE01604	;	;1-	;	3+	;	;2/3	2	Lr41 or Lr9,Lr24
11	NE02528	; 3+	3+	;1-/3+	3+	3+	;	;/3+	Lr24
12	NE02584	; 3+	3+	;/3+	3+	3+	;	2+3	Lr24
13	NE03458	;	3+	;	3+	3+	;	3+	Lr24
14	NH03609	3+	;1-/3+	2+	3+	3+	3+	3+	Lr1
15	NH03614	; 3+	;1-	;/3+	3+	;	;	3+	Lr14a, Lr24
16	NI03427	3+	0;	3+	3+	3+	;	3+	Lr1, Lr10
17	NI04430	; 2+	0;	1+	;1-	;1-	;	3+	Lr16, Lr24
18	NW03638	;1-	3+	3+	3+	3+	3+	3+	---
19	NW03681	0	;1-	;	3+	;	0;	3+;	Lr1, Lr14a, Lr24
20	98x0435-15	3+	;1-	;	;1-	;	;	;	Lr17
21	SD02279	;	;	;	;	;	;	;	Lr16,Lr24
22	SD02480	2+	3	---	3	3+	;	;1-	Lr2a, Lr24
23	SD02286	;	3+	;	3+	3+	0;	3+	Lr24
24	SD02771	;	3+	;1-	1+	;	;	3+	Lr14a. Lr24, +
25	SD01058	;	;1-	;2-	;1-	;	;	3+	Lr16,Lr24
26	SD96240-3-1	;	;	;	;	;	;	;	+
27	SD98W175-1	;	0;	;	3+	;	;	3+	Lr1, Lr14a, Lr24
28	SD01W064	; 3+	0;	;	3+	X	;	3+	Lr14a, Lr24
29	SD00151-7	1	;1-	3+	;2	X	;1-	3+	Lr16
30	NuDakota	; 3+	2	;	;	X	;	3+	Lr1, Lr24

*Races MCDS, THBJ, TNRJ, and KDBG are common in the U.S.; + = additional genes likely present

Table 13. Field reactions of entries in the 2006 NRPN to leaf rust.

		Brookings, SD			Stillwater, OK
Entry	Line or selection	(1 -9 scale)	IT:Rep 1	IT:Rep 2	Seedling reaction: Stakeman's ratings
1	Kharkof	4	S	S	3+
2	Harding	1.5	MS	MS	3
3	Nuplains	3	MS	MS	3+
4	Wesley	3.5	S	S	3+
5	NX02Y4481	5.5	S	S	3-
6	NW03Y2016	7	S	S	3+
7	NW03Y2022	5	S	S	3
8	NW03Y2023	5.5	S	S	3+
9	HV9W02-942R	1	R	R	X;3-
10	NE01604	1	R	R	3=
11	NE02528	3	MS	S	3
12	NE02584	3	MS	S	3+
13	NE03458	4.5	MS	S	3+
14	NH03609	3	MS	S	3+
15	NH03614	3	MS	S	3+
16	NI03427	1.5	R	MS	4
17	NI04430	2	MS	MS	3
18	NW03638	1	R	R	X;3
19	NW03681	1.5	R	MS	3-
20	98x0435-15	1	R	R	X;3
21	SD02279	1.5	R	S	3
22	SD02480	1	R	R	3+
23	SD02286	3.5	S	S	3+
24	SD02771	1.5	R	S	X;3
25	SD01058	1	R	S	3
26	SD96240-3-1	4	S	S	3+
27	SD98W175-1	3.5	S	S	3
28	SD01W064	5	S	S	3+
29	SD00151-7	2.5	MS	S	3+
30	NuDakota	1	R	R	3+

Table 14. Field reactions to stripe (yellow) rust, 2006 NPRN.

Entry No.	Line/selection	Bozeman, MT	Lethbridge, Alberta	Pullman, WA		Mt. Vernon, WA			
				6/28/06		4/19/06		6/7/06	
				Soft dough		Stem elong.		Flowering	
		%Inc.	(1-9)	IT*	%	IT	%	IT	%
1	Kharkof	21.7	1.5	2	2	2	5	2	10
2	Harding	55.0	6.0	8	70	8	20	5	60
3	Nuplains	91.7	6.0	8	100	8	30	8	90
4	Wesley	81.7	1.0	5	20	8	30	5	60
5	NX02Y4481	68.3	2.5	8	70	8	40	8	90
6	NW03Y2016	65.0	1.0	5	50	8	30	8	80
7	NW03Y2022	73.3	3.0	8	100	8	30	8	80
8	NW03Y2023	86.7	2.5	8	100	8	50	5	60
9	HV9W02-942R	56.7	3.0	2,8	100	5	20	2,8	20
10	NE01604	83.3	2.0	8	70	8	30	8	90
11	NE02528	83.3	2.0	5	30	8	30	5	60
12	NE02584	68.3	2.0	8	70	5	20	5	60
13	NE03458	60.0	2.0	8	90	8	60	8	80
14	NH03609	73.3	2.0	5	30	8	40	5	60
15	NH03614	63.3	3.0	8	30	5	20	8	60
16	NI03427	66.7	1.0	5,8	30	5	20	5	60
17	NI04430	75.0	2.0	8	70	8	40	5	60
18	NW03638	90.0	2.0	8	80	8	40	8	100
19	NW03681	26.7	1.0	2,8	20	5	10	2	10
20	98x0435-15	53.3	1.5	8	5	2	5	8	90
21	SD02279	33.3	2.5	8	30	2	5	5	60
22	SD02480	21.7	3.0	8	2	8	20	8	80
23	SD02286	73.3	2.0	8	10	5	10	5	60
24	SD02771	46.7	7.0	8	80	8	10	5	40
25	SD01058	50.0	3.0	8	40	2	10	5	60
26	SD96240-3-1	56.7	1.0	3	10	8	40	8	80
27	SD98W175-1	55.0	2.0	8	30	8	20	2,8	20
28	SD01W064	68.3	4.0	8	80	8	30	5	60
29	SD00151-7	66.7	7.0	8	50	8	30	8	70
30	NuDakota	60.0	2.5	8	5	8	20	5	60

*Stripe rust percent (%) and infection type (T) under natural infestation. IT: 0=no visible symptoms; 1=necrotic &/or chlorotic flecks; no sporulation; 2=necrotic and/or chlorotic blotches or stripes; no sporulation; 3=necrotic &/or chlorotic blotches or stripes; no sporulation; 4=necrotic &/or chlorotic blotches or stripes, trace sporulation; 5=necrotic &/or chlorotic blotches or stripes, intermediate sporulation; 6=necrotic &/or chlorotic blotches or stripes; moderate sporulation; necrotic &/or chlorotic blotches or stripes; abundant sporulation; 8=chlorosis behind sporulating area; abundant sporulation; 9=no necrosis of chlorosis; abundant sporulation. From Xianming Chen, USDA-ARS.

Table 15. Field reactions to powdery mildew and Fusarium head blight.

Entry	Line/selection	Powdery mildew, Lethbridge, Alberta (0-9)	Fusarium Headblight Brookings, SD[1]					
			Incidence	std. err.	Severity	std. err.	Disease Index	std. err.
1	Kharkof	2	93.3	3	20.8	7.6	19.6	7.8
2	Harding	2	100	3	48.3	7.6	48.3	7.8
3	Nuplains	6	100	3	56.5	7.6	56.5	7.8
4	Wesley	3.5	93.6	4.2	28.6	10.9	26.9	11.1
5	NX02Y4481	3	96.9	3	20.9	7.6	20.1	7.8
6	NW03Y2016	5	100	3	36.4	7.6	36.4	7.8
7	NW03Y2022	5	100	3	52.9	7.6	52.9	7.8
8	NW03Y2023	4.5	100	3	62.1	7.6	62.1	7.8
9	HV9W02-942R	2.5	100	3	45.1	7.6	45.1	7.8
10	NE01604	3.5	93.3	3	22.2	7.6	20.8	7.8
11	NE02528	3.5	97.4	3	39	7.6	38.1	7.8
12	NE02584	3.5	99.8	4.2	55.2	10.9	55.2	11.1
13	NE03458	6.5	100	3	51.7	7.6	51.7	7.8
14	NH03609	5	100	3	42.2	7.6	42.2	7.8
15	NH03614	4.5	100	3	40.9	7.6	40.9	7.8
16	NI03427	3	100	3	54.8	7.6	54.8	7.8
17	NI04430	3.5	100	3	44	7.6	44	7.8
18	NW03638	4.5	100	3	56	7.6	56	7.8
19	NW03681	3	97.2	3	26.9	7.6	26.3	7.8
20	98x0435-15	4.5	100	3	48.3	7.6	48.3	7.8
21	SD02279	2	97.1	3	21.8	7.6	21.3	7.8
22	SD02480	3.5	100	3	59.4	7.6	59.4	7.8
23	SD02286	3.5	89.3	3	18.3	7.6	16.8	7.8
24	SD02771	3.5	100	3	25.8	7.6	25.8	7.8
25	SD01058	2.5	100	3	51	7.6	51	7.8
26	SD96240-3-1	3.5	100	3	31.4	7.6	31.4	7.8
27	SD98W175-1	5	100	3	40	7.6	40	7.8
28	SD01W064	4.5	100	3	51.7	7.6	51.7	7.8
29	SD00151-7	3	99.8	4.2	58.4	10.9	58.4	11.1
30	NuDakota	3.5	99.8	4.2	66.7	10.9	66.7	11.1

[1]From Amir Ibrahim, South Dakota State, FHB ratings are based on a 0-9 scale. Incidence is the number of infected ears. Severity is the average of the scab ratings * 10. Disease Index is incidence * severity/100. L.S.D.(0.05) = 23.7.

Table 16. Acid soil reactions of entries in the 2006 NRPN.

Entry	Line or Selection	Acid soil tolerance, Enid, OK* AST1	AST2	AST3
1	Kharkof	4	4	4
2	Harding	2	2	3
3	Nuplains	3	1	2
4	Wesley	0	0	1
5	NX02Y4481	4	2	3
6	NW03Y2016	3	3	2
7	NW03Y2022	4	4	4
8	NW03Y2023	4	5	4
9	HV9W02-942R	3	4	4
10	NE01604	3	1	2
11	NE02528	3	2	3
12	NE02584	3	3	1
13	NE03458	5	5	5
14	NH03609	2	2	7
15	NH03614	2	0	1
16	NI03427	4	3	3
17	NI04430	2	2	2
18	NW03638	2	1	3
19	NW03681	3	1	2
20	98x0435-15	1	2	3
21	SD02279	2	2	3
22	SD02480	4	3	4
23	SD02286	4	2	3
24	SD02771	3	3	3
25	SD01058	4	3	3
26	SD96240-3-1	3	2	2
27	SD98W175-1	3	3	3
28	SD01W064	2	2	2
29	SD00151-7	3	2	2
30	NuDakota	4	5	3

*Readings taken at Enid, OK (pH = 4.6, 70 ppm Al, and Al saturation = 11%). Scale of 1 (highly tolerant) to 5 (highly susceptible), in which Jagger = 2. First reading could be biased by winter dormancy pattern; second reading could be biased by extreme differences in growth habit; third reading yielded greatest confidence.

Summary of Genotyping Data from the 2006 Regional Performance Nurseries

Hard winter wheat breeding lines from the 2006 Northern and Southern Regional Performance Nurseries were analyzed for 22 traits using 43 markers. The complete data set is included in the attached spreadsheet. The expected size (in base pairs) of each target band is included in the data set. Sizes preceded with the letter "T" are based on tailed primers and should be 18 base pairs longer than published reports. In the spreadsheet, a "+" indicates that the target band was positively identified, a "-" indicates that the target band was not present, and a "?" indicates that it was not possible to clearly determine the presence or absence of the band. The "NR" indicates that the assay was not run and is only used for excess control lines.

Except where noted, protocols used for all assays are listed on the MASWheat website (http://maswheat.ucdavis.edu/protocols/index.htm).

Fungal Resistance Traits

1. Wheat Scab (3BS QTL)
Three SSR markers (GWM389, GWM493, and GWM533; TAG 2003 107:503-508) were used to detect the presence of a QTL on chromosome 3BS that confers resistance to wheat scab. No line contained all three of the expected bands found in the controls Sumai 3 and Ning. No line contained any two of the three markers. Two lines, 98x0435-15 and NI02425, did have the GWM493 band (211 bp). The data suggests that none of the lines have the 3BS QTL.

2. Lr21
Newly designed primers were used for detecting the Lr21 resistance gene. These primers were based on the gene sequence provided by Li Huang. Known positive (WGRC07, WGRC27) and negative (WGRC02, Wichita) control lines were tested and found to be genotyped as expected using the new primers. No entries had the 669 bp band found in the positive controls. All entries had the larger bands (757-774 bp) seen in the susceptible check line and are likely susceptible.

3. Lr24/Sr24
Two STS markers were used to screen for Lr24/Sr24. Sr24#12 and Sr24#50 (Theor Appl Genet (2005) 111: 496–504) are both STS markers closely linked to Sr24 and typically amplify only one band. Resistant germplasm LcSr24Ag was positive for both markers. Thirty one lines were positive for marker Sr24#50. Eighteen lines were positive for marker Sr24#12 (512 bp). An additional three lines had slightly longer fragments (522, 524, and 525 bp) which appear to also be

positive for Sr24#12 since these three lines were positive for Sr24#24. The following 21 lines were positive for both markers (if we include the 3 lines with longer Sr24#12 fragments): AP03T6126, AP03TA7525, Harding, HV9W94-CB94005R, KS03HW158, KS03HW6-6CL, NI03418, NI03427, NW03Y2016, NW03Y2023, OK00224-36805, SD01W064, SD02286, SD02771, SD96240-3-1, SD98W175-1, TAM107, Trego, TX01A5936, TX01A7326, and TX99A0153-1. These 21 lines are likely Lr24/Sr24 resistant.

4. Lr34/Yr18

The slow leaf rusting gene Lr34 and yellow rust resistance gene Yr18 are flanked by three SSR markers (BARC352, GWM130, and GWM295). Marker GWM295 is reported to be close to the peak of the slow rusting QTL and GWM130 is reported to be much closer to GWM295 than to BARC352. Chinese Spring and Thatcher-Lr34 have the Lr34 resistance gene. CS7DS-4 (a deletion line of Chinese Spring) and Thatcher are both susceptible to Lr34. Chinese Spring and 44 lines have the "resistant" BARC352 263 bp band. CS7DS-4, Thatcher, and Thatcher-Lr34 have the "susceptible" BARC352 269 bp band. Chinese Spring and 6 lines have the "resistant" GWM130 131 bp band. CS7DS-4, Thatcher, and Thatcher-Lr34 have the "susceptible" GWM130 133 bp band. Chinese Spring has a GWM295 270 bp band. CS7DS-4 and Thatcher have a GWM295 260 bp band. Thatcher-Lr34 has a GWM295 272 bp band and another band at 260 bp. It appears that marker BARC352 is too far from the Lr34 gene to be useful for Lr34 screening. Marker GWM130 may also be too far away to be useful when screening for this trait. The GWM295 270 and 272 bp bands are likely both closely linked to the Lr34 resistance gene. No entries in the test had the GWM295 270 bp band or the GWM295 272 bp band. It is likely that no tested entries have the Lr34/Yr18 resistance genes.

5. Lr37/SR38/Yr17

These three rust resistance genes are on a chromosome segment that does not appear to recombine with bread wheat chromosomes. The STS marker (VENTRIUP-LN2) is therefore completely linked with the resistance genes. The following 26 lines were positive for the marker and very likely have all three genes: 98x0338-13, 98x0435-15, AP02T4342, APW03-20, BC97ROM-50W, CO01W172, HV9W94-CB94005R, KS00F5-14-7, KS00F5-20-3-2, KS970197-8-9, KS980512-11-2, NW03Y2022, OK00310-367101, OK01420, OK02522W, SD02480, SD98W175-1, T153, TAM107, TX01A5936, TX01A7326, TX01V5314, TX01V6008, TX03M1004, TX03M1096, and TX03M1179.

6. Lr39/Lr41

These two resistance genes appear to be the same gene and are linked with SSR marker GDM35. No line had the expected 183 bp band clearly found in the

positive controls WGRC02 and WGRC10. The data suggests that none of the lines have Lr39/Lr41.

7. Lr50

Lr50 is flanked by microsatellite markers GWM382 (6.7 cM) and GDM87 (9.4 cM) on wheat chromosome arm 2BL. In the resistant line WGRC36, marker GDM87 produces one distinct band of 124 bp. This same band is also seen in known susceptible lines such as TAM107. However, TAM107 and many other tested lines have a band at 120, 121, or 122 bp in addition to the 124 bp band. The following 6 lines have one distinct GDM87 124 bp band as found in the positive control WGRC36: NW03Y2022, NW03Y2023, OK00224-36805, OK02405, T150, and TX03M1179. None of the lines have the 156 bp band found in WGRC36 for marker GWM382. It is likely that none of the tested lines have the Lr50 gene. The 6 lines with the GDM87 124 bp band may have the Lr50 gene if they are from a pedigree with known resistance. Last year multiple bands were considered as positive for both markers. It now appears likely that all 11 lines designated as having Lr50 in the 2005 test do not have the Lr50 gene.

8. Sr2

The Sr2 resistance gene has been effective worldwide for more than 50 years. It has recessive inheritance and is expressed primarily during the adult-plant stage. It is located on 3BS in the same region as the FHB QTL. The SSR marker, GWM533, will produce a 133 bp band in resistant lines (Spielmeyer, 2003. Crop Sci. 43:333–336) and is only 1 to 2 cm away from the gene. The 133 bp band was present in all 15 Sr2 resistant lines tested from the US, Mexico, Canada, Kenya, and India and was present in all 12 Sr2 resistant lines from Australia; but was also present in 4 susceptible Australian lines (Spielmeyer, 2003. Crop Sci. 43:333–336). The 133 bp band was present in our positive controls (Eagle(USA), Sonalika) and was in the following 36 lines: AP03T6126, BC97ROM-50W, CO01385-A1, CO01W171, CO01W172, Harding, HV9W02-942R, HV9W96-1383W, KS00F5-14-7, KS03HW158, KS03HW6-6CL, KS970197-8-9, KS980512-11-2, NE01604, NI03418, NI03427, Nuplains, NW03638, NW03681, NW03Y2016, NW03Y2022, NW03Y2023, NX02Y4481, OK00224-36805, OK02405, Scout66, SD02286, SD02480, SD96240-3-1, SD98W175-1, T152, T153, Trego, TX01V5314, TX03M1004, and TX03M1096.

9. Sr26

One STS marker (Sr26#43) was used to screen for Sr26 (Theor Appl Genet (2005) 111: 496–504). Three Sr26 resistant lines were positive for marker Sr26#43 (6AL-Ag-TA3933, Argus-Isoline-TA4025, Eagle-Aus). None of the tested entries appears to have the Sr26 gene.

Insect Resistance Traits

10. Hessian Fly (H9)
One STS marker was used to test lines for the presence of gene H9 which confers resistance to Hessian fly biotype L. The following 11 lines had the expected 909 bp band found in the positive control 'Iris' and likely have H9: BC97ROM-50W, Harding, Kharkof, KS00F5-20-3-2, NH03614, NI03418, NI03427, NW03Y2016, NW03Y2022, NW03Y2023, NX02Y4481, SD00151-7, SD02286, SD02771, T150, and T152.

11. Hessian Fly (H13)
Two SSR markers (GDM36 and CFD132) were used to test lines for the presence of gene H13 which also confers resistance to Hessian fly biotype L. None of the tested lines had either of the positive bands found in the positive control 'Molly'.

12. Russian Wheat Aphid (Dn4)
The SSR markers GWM106 (7.4 cm) and GWM337 (12.9 cm) flank the resistance gene Dn4. The resistant control 'Turcikum 57' was clearly positive for both markers. Four lines were positive for GWM106: KS03HW158, CO01212, CO01385-A1, and CO01473. Three lines were positive for both GWM106 and GWM337 (CO01212, CO01385-A1, and CO01473) and likely carry the Dn4 resistance gene.

Dn1, Dn2, Dn5, Dn6, Dnx, RWA genes....
We have data on GWM44 and GWM111, but since we do not have controls for all of the RWA genes, we don't know what bands are the positive bands. I can't tell for sure just from the publication.

Viral Resistance Traits

13. Barley Yellow Dwarf Virus (Bydv2)
One SCAR marker (BYAgi) was used to detect the presence of the Bydv2 gene. No line had the expected 567 bp band clearly found in the positive control P961341. The data suggests that none of the lines have Bydv2.

14. Wheat Streak Mosaic Virus (Wsm1)
One STS marker (J15) was used to detect the chromosome segment containing the Wsm1 gene translocated from *Agropyron intermedium*. One STS marker (G43) was used as a positive PCR control since marker J15 will not amplify any bands unless the translocated segment is present. All lines amplified the expected 700 bp fragment using marker G43, verifying DNA quality and suitability for this and all other PCR assays. The following 3 lines amplified the expected 431 bp

band found in the positive control KS93WGRC27 and very likely have Wsm1: NW03Y2016, NW03Y2022, NW03Y2023. Line HV9W96-1270R-1, amplified a strong band of 419 bp which may be an indel event with unknown effect.

Quality Traits

15. 1RS Translocation

One rye SSR marker (SCM9, Euphytica 2003 132: 243–250, http://maswheat.ucdavis.edu/protocols/drought/index.htm) was used to detect the presence of the 1RS rye translocation. SCM9 amplified the 1B/1R sized band (225 bp) in check cultivar 'Aurora' and in 4 lines. SCM9 amplified the 1A/1R sized band (242 bp) in check cultivar TAM107 and in 12 lines. The following 4 lines were positive for the SCM9 225bp band and likely have the 1B/1R translocation: 98x0338-13, HV9W02-942R, OK00310-367101, and OK93P656H3299-2C04. The following 12 lines were positive for the SCM9 242bp band and likely have the 1A/1R translocation: HV9W94-CB94005R, HV9W96-1270R-1, HV9W96-1383W, KS00F5-20-3-2, SD01058, T151, T152, T153, TAM107, TX03M1004, TX03M1179, and TX99A0153-1.

16. High Grain Protein Content, HGPC

One STS marker (UCW89) very closely (0.1 cM) linked with the Gpc-B1 gene was use to test for HGPC. The positive control 'Glupro' produces a band of 138 bp. All entries had a band of 142 bp. It appears that no entry has the Gpc-B1 gene.

17. High Molecular Weight Glutenins

Three STS markers (Euphytica 2003 134:51-60) were used to determine some of the alleles at the 3 loci controlling high molecular weight glutenins. Marker HMWAx2* will produce one band of 1319 bp for Ax2* genotypes, or no band for Ax1 genotypes. HMWBx will produce one band of 669 bp for Bx17 genotypes, or 2 bands (630 and 766 bp) for all other, non-Bx17 genotypes. HMWDx5 will produce one 478 bp band for Dx5 genotypes, or no band for all other, non-Dx5 genotypes. These three markers appear to be extremely sensitive to small changes in PCR conditions. Reproducibility of the data using these markers is low to moderate.

Nineteen lines without the HMWAx2* band are Ax1 genotypes (98x0435-15, AP02T4342, AP03T6115, HV9W02-846R, KS00F5-14-7, KS00F5-20-3-2, KS970197-8-9, NE01604, NI02425, OK00224-36805, OK00310-367101, OK02522W, OK93P656H3299-2C04, SD00151-7, SD96240-3-1, SD98W175-1, TX01A5936, TX01V5314, TX01V6008) and the remainders have the Ax2* subunit gene. Five lines with the HMWBx 669 bp band are Bx17 genotypes (OK01420, OK02522W, TX01V5314, TX01V6008, TX03M1004) and the remainders are non-Bx17

genotypes. Most of the lines tested with HMWDx5 produced a band of 478 bp and are therefore Dx5 genotypes. Ten lines (AP02T4342, AP03T6126, KS00F5-20-3-2, KS980512-11-2, NE02584, OK01420, Scout66, T151, T153, TAM107) amplified no band and are likely non-Dx5 genotypes.

18. Grain Texture (Pina-D1, Pinb-D1)

One dominant STS marker (Pina-D1) was used to screen for the presence of wild-type (Pina-D1a), soft alleles. The positive control, 'Newana' yielded the expected band size of 348 bp which is associated with soft texture. Fifty six lines had the 348 bp band, indicating the presence of the Pina-D1a (soft) allele. The following lines were missing the 348 bp band and likely have the null allele (Pina-D1b) associated with hard texture: CO01473, HV9W02-942R, KS00F5-20-3-2, NE01604, NE02528, NE02584, NE03458, NH03609, NW03638, NW03681, OK00310-367101, OK01420, OK93P656H3299-2C04, SD01W064, SD02279, SD98W175-1, TX01V5314, TX01V6008, TX03M1004, and TX03M1096.

A codominant PCR-CAPs marker (Pinb-D1) was used to screen for Pinb-D1 alleles. After PCR amplification and restriction using Bsr BI, a 320 bp band indicates the soft, wild allele (Pinb-D1a). A band of 200 bp indicates the hard, mutant allele (Pinb-D1b). Fifteen lines had the 320 bp band and therefore have the soft allele Pinb-D1a (CO01385-A1, CO01473, Harding, Kharkof, KS00F5-20-3-2, KS03HW158, NI04430, OK00310-367101, OK01420, OK93P656H3299-2C04, SD01W064, TX01V5314, TX01V6008, TX03M1004, TX03M1096). The remaining lines had the 200 bp band and the hard allele Pinb-D1b.

19. Waxy Mutants

One STS marker (Waxy4) was used to detect null mutants at all three loci controlling granule-bound starch synthase (GBSS) or waxy protein. Sixty three lines had all three bands and are non-mutants or non-waxy lines. No lines were missing more than one band. One line, NH03609, was missing only the 314 bp band and is a partially waxy null-mutant for the Wx-D1 locus on 7DS. Six lines (CO01W171, CO01W172, KS00F5-14-7, AP02T4342, TX01V5314, NI04430) were missing only the 273 bp band and are partially waxy null-mutants for the Wx-A1 locus on 7AS. Six lines (Trego, KS03HW6-6CL, OK93P656H3299-2C04, NI03418, AP03TA7525, NW03638) were missing only the 243 bp band and are partially waxy null-mutants for the Wx-B1 locus on 4AL. Four lines (KS00F5-14-7, OK93P656H3299-2C04, AP03TA7525, HV9W02-942R) had strong, distinct bands of other sizes which may be due to indel events. The effects of these additional bands is unknown.

Abiotic Stress and Agronomic Traits

20. Aluminum Tolerance

One gene specific, PCR-CAPs marker (ALMT1, Plant Journal 2004 37:645-653) was used to screen for the Al-activated malate transporter gene associated with aluminum tolerance. This gene has been mapped to 4DL where the major QTL for Al tolerance have been mapped. After PCR amplification and restriction using Xmn I, two bands are detected. The 107 bp band indicates presence of the Al-activated malate transporter gene on 4DL. Two SSR markers (GDM125 and WMC331) linked to aluminum tolerance were also used for screening. Eleven entries (NI03418, KS00F5-20-3-2, AP02T4342, AP03T6126, TX01A5936, TX01A7326, TX03M1004, TX03M1096, 98x0338-13, NH03609, and NH03614) were positive for both SSR markers and the PCR-CAPs marker. Three lines were positive for the PCR-CAPs marker and one of SSR flanking markers (OK02522W, SD96240-3-1 and Wesley).

21. Plant Height (Rht1, Rht2, Rht8)

Two gene specific STS markers were used to detect the Rht1 and Rht2 genes (TAG 2002 105:1038-1042). One linked SSR marker (GWM261, TAG 1998 96:1104-1109) was used to detect Rht8. All but nine lines (AP02T4342, Harding, HV9W96-1383W, Kharkof, NW03Y2022, NW03Y2023, Scout66, SD00151-7, SD02771) had the 255 bp band indicating the presence of the Rht1 gene. Only 2 lines (HV9W96-1383W, SD02771) had the 270 bp band indicating the presence of the Rht2 gene. Seven lines (CO01385-A1, CO01473, NH03609, NI03418, TX01A7326, TX03M1004, Wesley) had the 212 bp band linked with Rht8 and may carry the Rht8 gene.

22. Vernalization (VRN-1)

Three STS primer sets (MGG 2005 273:54-65) were used to determine if deletions were present in the first intron of the VRN-1 gene in the A (Intr1/C/F & Intr1/AB/R), B (Intr1/B/F & Intr1/B/R4), and D (Intr1/D/F & Intr1/D/R4) genomes. One STS primer set (VRNAIF-VRNA1R, TAG 2004 109:1677-1686) was use to determine the presence of insertions or deletions (indels) in the VRN-A1 promoter. Winter genotypes have no intron deletions in the VRN-A1, VRN-B1, or VRN-D1 genes and no VRN-A1 promoter indels. Either an indel in the VRN-A1 promoter or a deletion in the VRN-A1 gene itself is associated with a strong spring growth habit. A deletion in the intron of VRN-B1 or VRN-D1 indicates the dominant Vrn-B1 and Vrn-D1 alleles associated with spring growth habit. The deletions in Vrn-B1 and Vrn-D1 do not have as great an effect as the dominant Vrn-A1 alleles, and usually flower later than the Vrn-A1 spring types, but much earlier than winter types. There are other alleles associated with spring growth that are not detected by the primer sets used here, so it is possible to have no promoter mutations and no deletions in any of the VRN-1 genes yet still have a spring type.

Six entries (NH03609, NH03614, NW03638, NW03681, SD02279, and TX03M1179) appear to have indels in the VRN-A1 promoter and are likely strong spring types. No entries have a deletion in the VRN-A1 gene. One entry , HV9W02-942R, appears to have a deletion in the VRN-B1 gene contributing to spring growth habit. Two entries (NW03638 and NX02Y4481) appear to have a deletion in the VRN-D1 gene contributing to spring growth habit. Entry NW03638 has an indel in the VRN-A1 promoter and a deletion in the VRN-D1 gene. It likely has a very strong spring growth habit.

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	FHB 3BS	FHB 3BS	FHB 3BS	Lr21	Lr24/Sr24	Lr24/Sr24	Lr24/Sr24	Lr24/Sr24	Lr24/Sr24	Lr34/Yr18
	Marker	GWM389	GWM493	GWM533	Lr21-669	Sr24#12	Sr24#12	Sr24#12	Sr24#12	Sr24#24	BAR352
	Band Size (bp)	T151	T211	T159	669	T512	T522	T524	T525	T213	T263/264
	Marker Type	SSR	SSR	SSR	STS	STS	STS	STS	STS	STS	SSR
1	Kharkof	-	-	-	-	-	-	-	-	-	+
2	Harding	-	-	-	-	+	-	-	-	+	+
3	Nuplains	-	-	-	-	-	-	-	-	+	-
4	Wesley	-	-	-	-	-	-	-	-	+	-
5	NX02Y4481	-	-	-	-	-	-	-	-	-	+
6	NW03Y2016	-	-	-	-	?	-	-	-	+	-
7	NW03Y2022	-	-	-	-	-	-	-	-	+	-
8	NW03Y2023	-	-	-	-	+	-	-	-	+	-
9	HV9W02-942R	-	-	-	-	-	-	-	-	+	+
10	NE01604	-	-	-	-	-	-	-	-	-	-
11	NE02528	-	-	-	-	-	-	-	-	-	+
12	NE02584	-	-	-	-	-	-	-	-	+	+
13	NE03458	-	-	-	-	-	-	-	-	+	-
14	NH03609	-	-	-	-	-	-	-	-	-	-
15	NH03614	-	-	-	-	-	-	-	-	+	+
16	NI03427	-	-	-	-	+	-	-	-	+	+
17	NI04430	-	-	-	-	-	-	-	-	+	+
18	NW03638	-	-	-	-	-	-	-	-	-	+
19	NW03681	-	-	-	-	-	-	-	-	+	-
20	98x0435-15	-	+	-	-	-	-	-	-	-	+
21	SD02279	-	-	-	-	-	-	-	-	-	+
22	SD02480	-	-	-	-	-	-	-	-	-	-
23	SD02286	-	-	-	-	+	-	-	-	+	+
24	SD02771	-	-	-	-	+	-	-	-	+	+
25	SD01058	-	-	-	-	-	-	-	-	-	+
26	SD96240-3-1	-	-	-	-	+	-	-	-	+	+
27	SD98W175-1	-	-	-	-	-	+	-	-	+	-
28	SD01W064	-	-	-	-	-	-	+	-	+	+
29	SD00151-7	-	-	-	-	-	-	-	-	-	-
30	NuDakota	-	-	-	-	-	-	-	-	-	-

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	Lr34/Yr18	Lr34/Yr18	Lr34/Yr18	Lr34/Yr18	Lr34/Yr18	Lr34/Yr18	Lr37/Sr38/Yr17	Lr39/Lr41	Lr50	Lr50
	Marker	BAR352	GWM130	GWM130	GWM295	GWM295	GWM295	VentriupLn2	GDM35	GDM87	GWM382
	Band Size (bp)	T269	T131	T133	T260	T270	T272	T274	T183	T124	T156
	Marker Type	SSR	SSR	SSR	SSR	SSR	SSR	STS	SSR	SSR	SSR
1	Kharkof	-	-	-	-	-	-	-	-	-	-
2	Harding	+	-	+	-	-	-	-	-	-	-
3	Nuplains	+	-	+	+	-	-	-	-	-	-
4	Wesley	-	-	+	-	-	-	-	-	-	-
5	NX02Y4481	-	-	-	-	-	-	-	-	.	-
6	NW03Y2016	+	+	-	+	-	-	-	-	-	-
7	NW03Y2022	-	-	+	+	-	-	+	-	+	-
8	NW03Y2023	-	-	+	+	-	-	-	-	+	-
9	HV9W02-942R	-	-	+	-	-	-	-	-	-	-
10	NE01604	+	+	-	-	-	-	-	-	-	-
11	NE02528	+	-	+	+	-	-	-	-	-	-
12	NE02584	-	-	+	+	-	-	.	-	-	-
13	NE03458	+	-	+	+	-	-	-	-	-	-
14	NH03609	-	-	+	-	-	-	-	-	-	-
15	NH03614	-	-	-	+	-	-	-	-	-	-
16	NI03427	-	-	-	-	-	-	-	-	-	-
17	NI04430	-	+	-	-	-	-	-	-	-	-
18	NW03638	-	-	+	-	-	-	-	-	-	-
19	NW03681	+	-	+	.	.	.	-	-	-	-
20	98x0435-15	-	-	+	-	-	-	+	-	-	-
21	SD02279	-	-	-	.	.	.	-	-	-	-
22	SD02480	+	-	+	-	-	-	+	-	-	-
23	SD02286	-	-	+	+	-	-	-	-	-	-
24	SD02771	-	-	+	+	-	-	-	-	-	-
25	SD01058	-	-	+	+	-	-	-	-	-	-
26	SD96240-3-1	-	-	-	-	-	-	-	-	-	-
27	SD98W175-1	-	-	-	+	-	-	+	-	-	-
28	SD01W064	+	+	-	+	-	-	-	-	-	-
29	SD00151-7	-	-	+	+	-	-	-	-	-	-
30	NuDakota	-	-	+	-	-	-	+	-	-	-

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	Sr2	Sr26	Hessian Fly, H9	Hessian Fly, H13	Hessian Fly, H13	RWA, Dn4	RWA, Dn4	BYDV2
	Marker	GWM533	Sr26#43	H9	GDM36	CFD132	GWM106	GWM337	BYAgi
	Band Size (bp)	T133	T231	909	T186	T166	T136	T183	T567
	Marker Type	SSR	STS	STS	SSR	SSR	SSR	SSR	SSR
1	Kharkof	-	-	+	-	-	-	-	-
2	Harding	+	-	+	-	-	-	-	-
3	Nuplains	+	-	-	-	-	-	-	-
4	Wesley	-	-	-	-	-	-	-	-
5	NX02Y4481	+	-	+	-	-	-	-	-
6	NW03Y2016	+	-	+	-	-	-	-	-
7	NW03Y2022	+	-	+	-	-	-	-	-
8	NW03Y2023	+	-	+	-	-	-	-	-
9	HV9W02-942R	+	-	-	-	-	-	-	-
10	NE01604	+	-	-	-	-	-	-	-
11	NE02528	-	-	-	-	-	-	-	-
12	NE02584	-	-	-	-	-	-	-	-
13	NE03458	-	-	-	-	-	-	-	-
14	NH03609	-	-	-	-	-	-	-	-
15	NH03614	-	-	+	-	-	-	-	-
16	NI03427	+	-	+	-	-	-	-	-
17	NI04430	-	-	-	-	-	-	-	-
18	NW03638	+	-	-	-	-	-	-	-
19	NW03681	+	-	.	-	-	-	-	-
20	98x0435-15	-	-	-	-	-	-	-	-
21	SD02279	-	-	-	-	-	-	-	-
22	SD02480	+	-	-	-	-	-	-	-
23	SD02286	+	-	+	-	-	-	-	-
24	SD02771	-	-	+	-	-	-	-	-
25	SD01058	-	-	-	-	-	-	-	-
26	SD96240-3-1	+	-	-	-	-	-	-	-
27	SD98W175-1	+	-	-	-	-	-	-	-
28	SD01W064	-	-	-	-	-	-	-	-
29	SD00151-7	-	-	+	-	-	-	-	-
30	NuDakota	+	-	+	-	-	-	-	-

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait Marker Band Size (bp) Marker Type	WSM1 J15, Unknown T419 STS	WSM1 J15 T431 STS	1B/1R SCM0009 T225 SSR	1A/1R SCM0009 T242 SSR	1RS Secalin SDS-PAGE Lincoln, NE	HGPC UCW89 T138 STS	HMW Glutenins HMWA 1319 STS	HMW Glutenins HMWB 630+766 STS
1	Kharkof	-	-	-	-	non-1RS	-	+	+
2	Harding	-	-	-	-	non-1RS	-	+	+
3	Nuplains	-	-	-	-	non-1RS	-	+	+
4	Wesley	-	-	-	-	non-1RS	-	+	+
5	NX02Y4481	-	-	-	-	non-1RS	-	+	+
6	NW03Y2016	-	+	-	-	non-1RS	-	+	+
7	NW03Y2022	-	+	-	-	non-1RS	-	+	+
8	NW03Y2023	-	+	-	-	non-1RS	-	+	+
9	HV9W02-942R	-	-	+	-	1BL.1RS	-	+	+
10	NE01604	-	-	-	-	non-1RS	-	-	+
11	NE02528	-	-	-	-	non-1RS	-	+	+
12	NE02584	-	-	-	-	non-1RS	-	+	+
13	NE03458	-	-	-	-	non-1RS	-	+	+
14	NH03609	-	-	-	-	non-1RS	-	+	+
15	NH03614	-	-	-	-	non-1RS	-	+	+
16	NI03427	-	-	-	-	non-1RS	-	+	+
17	NI04430	-	-	-	-	non-1RS	-	+	+
18	NW03638	-	-	-	-	non-1RS	-	+	+
19	NW03681	-	-	-	-	non-1RS	-	+	+
20	98x0435-15	-	-	-	-	non-1RS	-	-	+
21	SD02279	-	-	-	-	non-1RS	.	+	+
22	SD02480	-	-	-	-	non-1RS	-	+	+
23	SD02286	-	-	-	-	non-1RS	-	+	+
24	SD02771	-	-	-	-	non-1RS	-	+	+
25	SD01058	-	-	-	+	1AL.1RS	-	+	+
26	SD96240-3-1	-	-	-	-	non-1RS	-	-	+
27	SD98W175-1	-	-	-	-	non-1RS	-	-	+
28	SD01W064	-	-	-	-	non-1RS	-	+	+
29	SD00151-7	-	-	-	-	non-1RS	-	-	+
30	NuDakota	-	-	-	-	non-1RS	-	+	+

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	HMW Glutenins	HMW Glutenins	Grain Texture	Grain Texture	Grain Texture	Waxy	Waxy
	Marker	HMWB	HMWD	PinA-D1	Pinb-D1b	Pinb-Wild	Waxy4,Unknown	Waxy4,Unknown
	Band Size (bp)	669	478	T348/350	200	320	T224	T254
	Marker Type	STS	STS		CAP	CAP	STS	STS
1	Kharkof	-	+	+	-	+	-	-
2	Harding	-	+	+	-	+	-	-
3	Nuplains	-	+	+	+	-	-	-
4	Wesley	-	+	+	+	-	-	-
5	NX02Y4481	-	+	+	+	-	-	-
6	NW03Y2016	-	+	+	+	-	-	-
7	NW03Y2022	-	+	+	+	-	-	-
8	NW03Y2023	-	+	+	+	-	-	-
9	HV9W02-942R	-	+	-	+	-	-	+
10	NE01604	-	+	-	+	-	-	-
11	NE02528	-	+	-	+	-	-	-
12	NE02584	-	-	-	+	-	-	-
13	NE03458	-	+	-	+	-	-	-
14	NH03609	-	+	-	+	-	-	-
15	NH03614	-	+	+	+	-	-	-
16	NI03427	-	+	+	+	-	-	-
17	NI04430	-	+	+	-	+	-	-
18	NW03638	-	+	-	+	-	-	-
19	NW03681	-	+	-	+	-	-	-
20	98x0435-15	-	+	+	+	-	-	-
21	SD02279	-	+	-	+	-	-	-
22	SD02480	-	+	+	+	-	-	-
23	SD02286	-	+	+	+	-	-	-
24	SD02771	-	+	+	+	-	-	-
25	SD01058	-	+	+	+	-	-	-
26	SD96240-3-1	-	+	+	+	-	-	-
27	SD98W175-1	-	+	-	+	-	-	-
28	SD01W064	-	+	-	-	+	-	-
29	SD00151-7	-	+	+	+	-	-	-
30	NuDakota	-	+	+	+	-	-	-

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	Waxy	Waxy	Waxy	Waxy	Al Tolerance	Al Tolerance	Al Tolerance	Height, Rht1
	Marker	Waxy4,Unknown	Waxy4,4A	Waxy4,7A	Waxy4,7D	ALMT1	GDM125	WMC331	Rht1BF-MR1
	Band Size (bp)	T276	T243	T273	T314	107	T161	T149	T255
	Marker Type	STS	STS	STS	STS	CAP	SSR	SSR	STS
1	Kharkof	-	+	+	+	-	+	-	-
2	Harding	-	+	+	+	-	-	-	-
3	Nuplains	-	+	+	+	+	-	-	+
4	Wesley	-	+	+	+	+	+	-	+
5	NX02Y4481	-	+	+	+	-	+	-	+
6	NW03Y2016	-	+	+	+	-	+	-	+
7	NW03Y2022	-	+	+	+	-	+	-	-
8	NW03Y2023	-	+	+	+	-	+	-	-
9	HV9W02-942R	-	+	+	+	-	-	-	+
10	NE01604	-	+	+	+	-	-	-	+
11	NE02528	-	+	+	+	+	-	-	+
12	NE02584	-	+	+	+	-	-	-	+
13	NE03458	-	+	+	+	-	-	-	+
14	NH03609	-	+	+	-	+	+	+	+
15	NH03614	-	+	+	+	+	+	+	+
16	NI03427	-	+	+	+	+	-	-	+
17	NI04430	-	+	-	+	-	-	-	+
18	NW03638	-	-	+	+	-	-	.	+
19	NW03681	-	+	+	+	+	-	-	+
20	98x0435-15	-	+	+	+	.	-	-	+
21	SD02279	-	+	+	+	-	-	-	+
22	SD02480	-	+	+	+	-	+	-	+
23	SD02286	-	+	+	+	-	-	-	+
24	SD02771	-	+	+	+	-	+	-	-
25	SD01058	-	+	+	+	-	-	-	+
26	SD96240-3-1	-	+	+	+	+	-	+	+
27	SD98W175-1	-	+	+	+	+	-	-	+
28	SD01W064	-	+	+	+	-	-	-	+
29	SD00151-7	-	+	+	+	-	-	-	-
30	NuDakota	-	+	+	+	-	-	-	+

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait	Height, Rht2	Height, Rht8	Vernalization	Vernalization	Vernalization	Vernalization	Vernalization
	Marker	Rht2,DF-MR2	GWM261	VRN1AProm	VRN-A1,NON-Del	VRN-B1,Del	VRN-B1,NON-Del	VRN-D1,Del
	Band Size (bp)	T270	T212	T492	1068	709	1149	1671
	Marker Type	STS	SSR	STS	STS	STS	STS	STS
1	Kharkof	-	-	+	+	-	+	-
2	Harding	-	-	+	+	-	+	-
3	Nuplains	-	-	+	+	-	+	-
4	Wesley	-	+	+	+	-	+	-
5	NX02Y4481	-	-	+	+	-	+	+
6	NW03Y2016	-	-	+	+	-	+	-
7	NW03Y2022	-	-	+	+	-	+	-
8	NW03Y2023	-	-	+	+	-	+	-
9	HV9W02-942R	-	-	+	+	-	-	-
10	NE01604	-	-	+	+	-	+	-
11	NE02528	-	-	+	+	-	+	-
12	NE02584	-	-	+	+	-	+	-
13	NE03458	-	-	+	+	-	+	-
14	NH03609	-	+	-	+	-	+	-
15	NH03614	-	-	-	+	-	+	-
16	NI03427	-	-	+	+	-	+	-
17	NI04430	-	-	+	+	-	+	-
18	NW03638	-	-	-	+	-	+	-
19	NW03681	-	.	-	+	-	+	-
20	98x0435-15	-	-	+	+	-	+	-
21	SD02279	-	-	-	+	-	+	-
22	SD02480	-	-	+	+	-	+	-
23	SD02286	-	-	+	+	-	+	-
24	SD02771	+	-	+	+	-	+	-
25	SD01058	-	-	+	+	-	+	-
26	SD96240-3-1	-	-	+	+	-	+	-
27	SD98W175-1	-	-	+	+	-	+	-
28	SD01W064	-	-	+	+	-	+	-
29	SD00151-7	-	-	+	+	-	+	-
30	NuDakota	-	-	+	+	-	+	-

Table 17. DNA marker analyses of entries in the 2006 NRPN.

Entry	Trait Marker Band Size (bp) Marker Type	Vernalization VRN-D1,NON-Del 997 STS	PCR Control G43 700 STS	RWA GWM0044 Tailed SSR	RWA GWM111 Tailed SSR
1	Kharkof	+	+	181, 191	131, 153, 202, 228
2	Harding	+	+	193	133, 155, 230
3	Nuplains	+	+	195	131, 154, 202
4	Wesley	+	+	203	131, 154, 218
5	NX02Y4481	-	+	195, 204	133, 155, 202, 230
6	NW03Y2016	+	+	189	131, 155, 222
7	NW03Y2022	+	+	194	133, 153, 230
8	NW03Y2023	+	+	195	133, 153, 230
9	HV9W02-942R	+	+	199	133, 155, 204
10	NE01604	+	+	193	133, 155, 230
11	NE02528	+	+	197	133, 155, 202
12	NE02584	+	+	197	133, 155, 202
13	NE03458	+	+	193	131, 153, 202
14	NH03609	+	+	203	133, 155, 218
15	NH03614	+	+	.	133, 155, 202, 232
16	NI03427	+	+	195	131, 153, 224
17	NI04430	+	+	195	133, 155, 202
18	NW03638	-	+	189	133, 153, 226
19	NW03681	+	+	.	131, 153, 218
20	98x0435-15	+	+	193	133, 155, 230
21	SD02279	+	+	.	167, 218, 230
22	SD02480	+	+	203	133, 155, 202
23	SD02286	+	+	181	133, 153, 202, 214
24	SD02771	+	+	190, 195	133, 155, 230
25	SD01058	+	+	195	131, 153, 202
26	SD96240-3-1	+	+	203	131, 153, 208
27	SD98W175-1	+	+	201	131, 153, 202
28	SD01W064	+	+	197	133, 155, 204, 216
29	SD00151-7	+	+	197	167, 202
30	NuDakota	+	+	195	133, 155, 204