

PROGRESS REPORT ON SEED PRODUCTION RESEARCH

prepared by

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for

PRESENTATION AT THE GRASS-LEGUME SEED INSTITUTE Roseau, Minnesota

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General plot overview

It will not come as a surprise to anyone in the area that 2004 was a terribly wet year. It was, in fact, the highest precipitation ever recorded in the 37 years that we have taken data at the experimental plots northwest of Roseau- 34.14". This is 12.31" more than an average year. It was likely one of the coolest seasons as well so fields dried slowly. Many of the spring plantings on the Magnusson Research farm were delayed or not done at all. The on farm trials had weather related problems as well with rain, saturated soil conditions, and standing water. Summer and fall seedings went well, however. Small windows of opportunity to seed in late June and September allowed many trials to be planted and maintained in good shape for 2005.

Kentucky bluegrass

Kentucky bluegrass yields on the test plots were very good in general. 2001 and 2002 variety trials seedings have seed yield and other data reported in tables 2 and 3. Visual seed yield estimates are given to support actual yields as a heavy rain event on July 21 shattered seed on some varieties just prior to harvest. Rutgers/Univ. of Minn. Experimentals continue to perform well with several lines going into national turf evaluation in the fall of 2005.

An interesting note on the wild oat control study in wheat with underseeded grass trial, is the herbicide Everest. Kentucky bluegrass seems to have good seedling tolerance to this chemistry and has shown promise in studies at Oregon State as well.

Perennial ryegrass

Major interest has spurred a focus on perennial ryegrass in our research efforts. To collect data on various facets of seed production, quite a large number of on farm sites were used as to get an array of environmental, varietal, and management regimes. This effort was largely successful because of the excellent cooperation with growers. Cooperators are interested in our results of course but time and effort taken by them to help us achieve valid results was invaluable. Even growers who have not worked with us in the past were extremely helpful and conscientious realizing that much time, effort and money are expended to collect data at these various locations.

Applications of 'Palisade' were a major focus in the 2004 trials. It would seem that the 1 pint rate is best applied at earlier application dates across most locations. Growth staging is difficult because of the stand variability but is very important at the 1 pint rate.

Zadoks growth stage 30 or slightly earlier (May 26 this year just before first node is detectable and before stem elongation) seemed to be the preferred time to get a yield advantage with Palisade.

Zadoks growth stage 32 (June 4-7 this year with the second node detectable) seemed too late for optimum results.

These are extremely late dates for these growth stages by probably 2 weeks so it is important also to watch growth stage more closely than the calendar. The first week of May would be a good time to start scouting growth stages.

Additional nitrogen fertilizer applied in the spring with the Palisade showed mixed results. Carlson and Tveit locations showed clear benefits of additional fertilizer. Other locations were less consistent possibly because they were not lacking fertility (Vistad location for sure) or field location variability (Kvien, Helmstetter).

The ryegrass variety trial had interesting results with the addition of Palisade. Many varieties had a yield increase or no change over untreated plots (Palisade means = 105% of check) but a few had decreases. Results are in Table 5.

Grass weed control in the production year of none Assure II tolerant ryegrass is being investigated. Mixtures of other herbicides with these grass herbicides were also included in table 12. The standard Puma treatment had no effect on seed yield over the check at 2 locations and still seems to be the optimum treatment. Avenge and Assert looked fair but do not seem to have the tolerance and broad spectrum grass control of Puma.

Mixing these grass herbicides with broadleaf herbicides and or Palisade often times had some associated yield loss.

Natives

Establishment of a number of native grass and forb species with herbicides was conducted in 2003 and again in 2004.

The 2003 seeded trial has injury ratings from 8/29/03 and stand/vigor ratings for the same plots 7/14/04 in table 15a. This trial has concluded. The 2004 seeded trial has injury ratings from 9/2/04 and is in table 15b. Vigor rating will be taken on this study in summer 2005. Because of standing water in a portion of this field, a number of treatments have missing plots but still has some good information when combined with the 2003 trial. Most treatments and species are the same for both years but the 2004 trial has additional species and some herbicides that performed poorly were replaced. A summary of both trials is in table 16.

Treatments with poor weed control or species tolerance were eliminated from this table. The best treatments have two stars (**), and good treatments or treatments with good potential have one star (*).

A herbicide trial with treatments to be applied next year, was also established in 2004. Most of the same species are in this trial but many of the herbicide treatments may change.

This trial will provide information on herbicide tolerance during the seed production year.

Table 1. Monthly precipitation and average 'Park' kentucky bluegrass experimental plot seed yields
Roseau, MN 1967-2004.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Yearly Total	DEVIATION FROM NORMAL	Park' blg. test plot lbs/A
1967	1.13	0.39	0.59	2.89	0.89	2.23	4.95	1.69	0.83	1.11	0.70	1.76	19.16	-2.67	
1968	0.62	T	1.25	0.63	1.46	6.47	6.13	8.49	2.35	1.26	1.06	0.21	29.93	8.10	650
1969	3.07	0.11	0.05	1.27	3.31	2.29	3.70	4.28	3.29	1.91	0.30	0.73	24.31	2.48	488
1970	0.71	0.41	1.38	2.56	5.93	4.07	3.55	0.83	2.77	1.49	1.21	0.37	25.28	3.45	673
1971	0.54	0.13	0.26	1.50	2.24	2.29	3.58	0.69	3.33	2.97	0.29	0.50	18.32	-3.51	492
1972	0.68	0.76	0.50	0.70	1.66	5.03	1.92	1.53	4.22	1.40	0.38	0.32	19.10	-2.73	405
1973	0.09	0.17	1.18	0.90	2.46	2.21	4.04	2.09	5.67	1.19	0.67	0.75	21.42	-0.41	422
1974	0.88	0.87	0.16	2.72	4.12	1.56	2.56	11.00	0.42	0.66	0.15	1.40	26.47	4.64	642
1975	1.10	0.29	0.64	1.40	1.52	4.96	2.26	1.75	1.79	1.49	0.20	0.65	18.05	-3.78	504
1976	1.13	0.50	1.05	0.77	0.54	5.82	1.52	3.72	0.34	0.07	T	0.37	15.83	-6.00	146
1977	0.14	0.62	1.02	0.27	2.43	3.71	2.28	1.74	3.83	0.87	2.27	0.26	19.44	-2.39	140
1978	0.36	0.26	0.17	1.00	1.97	1.92	6.25	3.25	3.44	0.23	0.98	0.79	20.62	-1.21	507
1979	0.50	1.01	1.06	2.77	1.89	1.91	3.70	1.59	0.45	1.40	1.02	0.16	17.46	-4.37	415
1980	0.55	0.82	0.35	0.00	0.24	1.75	3.35	5.19	4.12	1.66	0.94	0.18	19.15	-2.68	62
1981	0.27	0.16	0.66	0.56	2.79	6.85	2.63	2.41	3.63	1.75	0.90	0.99	23.60	1.77	625
1982	1.30	0.45	0.74	0.24	1.38	2.00	5.53	2.71	1.92	2.91	0.46	0.57	20.21	-1.62	595
1983	1.31	1.26	1.17	0.53	2.76	4.03	1.62	3.34	2.91	2.26	0.66	0.10	21.95	0.12	605
1984	T	0.95	T	0.72	0.72	4.46	3.78	0.99	0.37	4.32	0.10	1.02	17.43	-4.40	613
1986	0.30	0.90	0.26	2.96	1.40	2.43	3.59	2.04	2.52	0.65	1.97	0.36	19.38	-2.45	488
1987	0.47	0.30	0.10	0.59	4.37	2.25	4.80	2.22	0.82	0.92	0.73	0.35	17.92	-3.91	288
1988	0.60	0.09	1.75	0.00	1.74	1.34	5.53	1.70	2.24	0.12	0.77	1.05	16.93	-4.90	152
1989	3.27	0.32	2.86	0.10	2.82	5.46	1.60	2.56	1.24	0.41	0.62	0.45	21.71	-0.12	320
1990	0.55	0.20	1.12	1.09	0.46	3.19	2.48	0.62	0.91	0.16	0.18	0.72	11.68	-10.15	160
1991	0.56	0.64	0.58	2.87	3.19	5.94	3.40	1.99	7.42	1.64	1.36	0.70	30.29	8.46	210
1992	0.61	0.68	0.45	2.27	1.99	2.36	2.72	4.51	2.76	0.12	1.27	0.88	20.62	-1.21	630
1993	0.68	0.05	0.27	1.01	1.63	5.06	5.87	4.69	0.72	0.71	0.45	0.65	21.79	-0.04	490
1994	0.21	0.33	0.47	0.02	0.16	2.54	3.03	3.48	3.94	1.38	2.72	0.32	18.60	-3.23	230
1995	0.57	0.59	1.23	0.61	2.50	2.13	4.59	3.59	1.81	1.33	1.54	1.46	21.95	0.12	300
1996	0.94	0.48	0.22	1.65	4.62	1.64	7.34	1.78	1.77	1.75	2.73	1.07	25.99	4.16	250
1997	1.06	0.14	1.02	0.84	2.02	3.36	4.02	1.31	4.01	2.45	0.19	0.25	20.67	-1.16	350
1998	0.69	1.05	0.21	0.77	4.55	5.39	3.01	2.20	0.31	4.42	1.39	0.95	24.94	3.11	275
1999	0.15	0.77	0.23	1.31	4.09	6.97	3.46	1.38	3.16	0.43	0.38	0.56	22.89	1.06	400
2000	0.45	0.14	0.79	0.38	1.83	7.38	1.63	6.45	2.14	2.89	3.41	0.74	28.23	6.40	550
2001	0.21	0.52	0.46	1.89	3.27	1.76	4.74	1.40	0.72	1.76	1.50	0.56	18.79	-3.04	575
2002	0.19	0.10	0.45	1.44	2.79	9.94	2.96	4.47	1.62	1.02	0.30	0.54	25.82	3.99	300
2003	0.80	0.77	1.60	1.75	2.95	3.56	1.92	1.78	4.55	1.32	1.52	1.95	24.47	2.64	550
2004	2.85	0.70	2.14	2.61	8.19	2.98	2.42	5.50	2.97	2.36	0.08	1.33	34.13	12.30	650

38 year average 21.83

Table 2. 2001 Kentucky Bluegrass Seed Production Variety Trial
Magnusson Research Farm - Field F5: Roseau, MN

Variety	Seed lot #	Seed Yield				Heading		2004 Harvest			Seed source
		2003	2004	2003-03	2004	6/11	6/25	Lodging**	Date	Height	
		----- lbs/A ----- estimate				--- % ---					in.
Abbey	2606	659	781	720	700	0	58	2.0	7/21	28	Check variety
Lato	3408	224	713	468	780	10	90	5.0	7/19	38	Turf-Seed
Midnight	3254	423	529	476	480	0	30	2.0	7/23	27	Check variety
Minnfine	3252	683	1077	880	950	98	100	4.0	7/14	33	Check variety
Northstar	3409	270	502	386	400	0	73	1.5	7/27	17	Turf-Seed
Opti-Green	3410	469	531	500	630	0	60	2.3	7/24	31	Turf-Seed
Park	3021	610	1084	847	830	33	100	5.0	7/14	35	Check variety
Trenton	3047	241	894	567	580	1	68	2.5	7/19	33	Check variety
Unique	3411	627	809	718	630	0	53	1.8	7/23	27	Turf-Seed
1621S	1621	401	506	454	400	1	48	1.8	7/22	26	U of Minn
1628S exp	1628	617	705	661	650	0	55	2.3	7/22	26	U of Minn
1646S	1646	629	716	673	600	0	55	2.0	7/22	25	U of Minn
2073S exp	2073	442	807	625	700	0	60	1.8	7/22	25	U of Minn
3073R exp	3073	508	566	537	450	0	53	1.3	7/22	23	U of Minn
3075R	3075	532	691	612	580	0	58	2.0	7/22	24	U of Minn
484S exp	484	425	714	569	700	0	60	1.3	7/22	25	U of Minn
490S	490	372	658	515	530	0	48	1.3	7/22	24	U of Minn
A97-1433	3314	226	459	343	530	0	58	2.0	7/27	28	Rutgers/U of M
A97-1436	3315	352	874	613	800	0	68	3.0	7/23	29	Rutgers/U of M
A97-1510	3316	423	845	634	950	1	68	2.5	7/22	28	Rutgers/U of M
A97-1523	3317	452	707	579	580	0	68	2.0	7/23	27	Rutgers/U of M
A99-2626	3416	707	760	734	950	0	55	2.0	7/27	28	Rutgers/U of M
A99-2628	3417	685	876	781	680	0	50	2.3	7/24	27	Rutgers/U of M
A99-2679	3418	639	836	738	680	0	63	2.0	7/27	27	Rutgers/U of M
A99-2893	3419	680	934	807	650	0	60	2.5	7/27	27	Rutgers/U of M
A99-2981	3420	554	852	703	1100	0	95	2.8	7/23	32	Rutgers/U of M
A99-3240	3421	328	979	654	600	6	75	1.0	7/16	33	Rutgers/U of M
cell5	c5	168	653	411	730	1	68	2.0	7/22	29	U of Minn
cell7	c7	107	694	400	680	3	78	2.0	7/22	29	U of Minn
cell111	c111	282	531	406	400	0	45	1.0	7/22	23	U of Minn
cell120	c120	420	455	438	480	3	58	1.5	7/23	25	U of Minn
cell128	c128	NH	NH	NH	100				NH		U of Minn
LSD @5%		106	123	85	120	11	10	1.2	0.6	2	

*visual seed yield estimate - given to support actual yields as shattering occurred on some varieties 7/21 due to rain storm

**lodging- 1= none; 9 severe lodging

Table 3. 2002 Kentucky Bluegrass Seed Production Variety Trial
Magnusson Research Farm - Field F1: Roseau, MN

Variety	Seed lot #	Seed yield		Harvest			Heading				Seed source
		2004	estimate	Lodging*	Date	Height	6/11	6/18	6/25	6/28	
		--- lbs/A ---					----- % -----				
Abbey	2606	892	780	3.0	7/23	30	2	43	60	78	Check variety
1646s	2	881	700	1.8	7/23	27	0	34	68	83	U of Minn
3075r	5	809	700	2.0	7/23	27	0	31	63	75	U of Minn
3073r	3356	785	630	2.3	7/23	27	3	30	65	75	U of Minn
Bluestar	3362	776	680	2.8	7/23	27	4	43	65	79	PST-Turf-Seed
1844s	4	716	700	2.3	7/23	27	3	55	75	89	U of Minn
Park	3324	716	500	6.5	7/15	33	41	94	98	100	Check variety
59r	591	702	700	1.8	7/23	28	0	36	63	71	U of Minn
453r	4531	698	650	1.8	7/23	26	0	40	63	80	U of Minn
Park 2000	2000	694	580	6.0	7/15	34	30	93	100	100	Check variety
A99-2674	3475	687	650	3.0	7/23	27	0	31	55	69	Rutgers/U of M
484s	3355	680	650	3.0	7/23	29	7	45	58	75	U of Minn
484S	33551	678	700	3.0	7/23	28	1	40	53	71	U of Minn
A99-2628	3473	671	680	3.3	7/23	28	0	26	40	59	Rutgers/U of M
1628s	3429	669	530	2.3	7/23	26	1	45	58	79	U of Minn
A97-2306	3447	658	580	2.3	7/23	26	1	31	55	71	Rutgers/U of M
2073s	3430	656	550	2.8	7/23	27	10	51	78	88	U of Minn
490s	3431	647	600	1.8	7/23	26	0	26	50	68	U of Minn
A97-1436	3469	640	730	1.8	7/23	26	2	46	70	80	Rutgers/U of M
A97-1523	3446	618	550	2.8	7/24	27	3	45	63	74	Rutgers/U of M
132s	1321	613	580	3.0	7/23	30	6	46	65	86	U of Minn
1775s	3	578	600	1.8	7/23	24	0	36	63	78	U of Minn
1621s	1	564	500	2.3	7/23	26	0	31	48	66	U of Minn
A99-3124	3477	564	630	3.5	7/23	27	2	34	53	68	Rutgers/U of M
A97-1289	3470	558	650	2.8	7/23	31	10	64	68	83	Rutgers/U of M
A97-1510	3445	553	600	2.8	7/23	28	3	49	80	90	Rutgers/U of M
A99-2670	3474	491	600	3.0	7/23	28	0	33	50	66	Rutgers/U of M
Brilliant	3358	482	580	3.5	7/23	27	0	36	55	69	PST-Turf-Seed
Midnight	3254	475	500	2.0	7/23	28	0	29	30	60	check variety
Unique	3411	464	550	3.8	7/23	29	0	36	53	68	Turf-Seed
A99-2950	3476	455	650	2.3	7/23	30	4	63	80	91	Rutgers/U of M
cell 116	116	444	430	2.5	7/25	28	1	43	65	76	U of Minn
A99-2235	3472	406	500	2.3	7/26	26	4	49	63	79	Rutgers/U of M
A97-1433	3444	401	480	2.0	7/27	26	1	43	65	78	Rutgers/U of M
Moonlight	3359	385	450	2.0	7/23	23	1	43	65	76	PST-Turf-Seed
Lato	3408	372	380	5.3	7/19	36	13	73	90	95	Turf-Seed
Northstar	3360	350	380	1.5	7/27	19	0	34	50	84	PST-Turf-Seed
cell135	135	335	380	3.0	7/23	27	0	31	58	79	U of Minn
Trenton	3047	319	380	7.2	7/19	33	5	54	68	81	Check variety
cell132	132	270	350	4.0	7/23	31	0	36	45	71	U of Minn
cell139	139	270	280	2.3	7/22	28	0	35	63	79	U of Minn
cell141	141	254	300	2.0	7/23	27	1	33	60	73	U of Minn
Opti-Green	3410	225	300	2.0	7/24	30	0	36	71	84	Turf-Seed
Washington	3239	214	200	6.8	7/20	33	13	70	90	96	Norfarm
Blackstone	3357	181	230	2.0	7/23	30	3	48	73	83	PST-Turf-Seed
Serene	3361	67	100	2.5	7/23	27	5	71	85	94	PST-Turf-Seed
LSD @5%		99		1.1	1	2	5	15	15	11	

Llodging 1=none,9=flat

** 7/2 visual estimate of seed yield based on head count and morphology

Rain storm on 7/21 shattered seed on some varieties

Table 4. Reed Canarygrass Seed Production Variety Trial

Magnusson Research Farm - F1

Seeded: August 7, 2002

Variety	Seed lot #	Seed yield lbs/A	Harvest height (inches)	harvest lodging score	Seed source
Marathon	3406	714	80	1.3	Allied Seed
Palaton	3433	836	78	1.0	Norfarm
Venture	3493	770	77	1.3	Norfarm
Chiefton	3301	734	79	1.0	Norfarm
Rival	3295	665	77	3.3	Brett Young
Vantage	2925	571	80	1.3	Norfarm
LSD @ 5%		175	3	0.7	

*Lodging: 1 = no lodging to 9 = completely lodged

Table 5. 2003 Perennial Ryegrass Seed Production Variety Trial

Magnusson Research Farm - Field F7 NW

Variety	Seed lot #	Seed Yield (lbs/A)				Heading 7/1/2004 %	Harvest date**	Seed source
		0 pt.	1 pt.	% of untreated	mean			
P101	3366	1374	1429	104	1401	63	8/10	U of Minn
NK-200	3538	1218	1333	109	1276	16	9/1	Check variety
TQ x SP	3414	1213	1385	114	1299	43	8/13	U of Minn
Affinity	3500	1233	1316	107	1274	60	8/13	Turf Merchants
WH x TQ	3372	1073	1396	130	1234	35	8/16	U of Minn
P201	3478	1135	1246	110	1191	55	8/13	U of Minn
Salinas	3555	1454	1195	82	1325	20	8/16	Turf Seed
Brighstar SLT	3553	1202	1360	113	1281	38	8/10	Turf Seed
Quick Trans	3554	1095	1108	101	1102	63	8/5	Turf Seed
nf 5010	3591	1369	1146	84	1258	50	8/16	Norfarm
nf 5020	3592	1376	1300	94	1338	43	8/7	Norfarm
nf 5030	3593	1251	1262	101	1257	38	8/16	Norfarm
nf 5040	3594	1247	1511	121	1379	43	8/13	Norfarm
nf 5050	3595	1151	1153	100	1152	30	8/16	Norfarm
nf 5060	3596	992	1019	103	1006	48	8/16	Norfarm
nf 5070	3597	1191	1336	112	1263	33	8/13	Norfarm
LSD @5%		351	292	31	273	14	7	

Overall mean- 1223 1281 105 (58 lbs/A)

Seeded with spring wheat on summer fallow 8/15/03.

90+45+45 applied 10/03: higher than anticipated nitrogen carryover caused severe lodging on all plots.

* Palisade applied to 10' of each 20' plot; growth stage = first node on main stem (early)

** No differences observed for heading or maturity related to Palisade.

Application rate = 1 pint/A on 5/26/045; bicycle sprayer @ 12GPA - 28 PSI

Table 6. 2003 Perennial Ryegrass Winter Hardiness Trial
Magnusson research farm (Roseau) and University of Minnesota St.Paul campus

Variety	Seed lot#	Winter Injury Rating*			Seed source
		St.Paul	Roseau	Mean	
WH x TQ	3372	3.9	2.8	3.3	U of Minn
NK-200	3538	2.6	4.0	3.3	check
Wh sel	3373	4.0	4.0	4.0	U of Minn
MHT '02 composite	3501	4.5	5.0	4.8	U of M/Rutgers
MSP '02 composite	3502	4.8	4.8	4.8	U of M/Rutgers
Pick PR A-97	3599	3.8	5.8	4.8	Pickseed West
NF5030	3593	5.0	5.0	5.0	Norfarm
MHTxRutgers '03	3609	4.5	5.5	5.0	U of M/Rutgers
NF5010	3591	5.1	5.0	5.1	Norfarm
NF5040	3594	5.0	5.3	5.1	Norfarm
P201	3478	4.1	6.3	5.2	U of Minn
WHC PSC bulk 1-03	3603	5.0	5.5	5.3	Pickseed West
MSPxRutgers '03	3610	4.8	5.8	5.3	U of M/Rutgers
P101	3366	5.9	5.0	5.4	U of Minn
Spreader2	3393	4.9	6.0	5.4	U of Minn
WHC PSC bulk 3-03	3606	5.3	5.5	5.4	Pickseed West
Brightstar SLT	3553	5.9	5.3	5.6	Turf-seed
NF5020	3592	6.4	4.8	5.6	Norfarm
ULV 1-02	3601	6.6	4.5	5.6	Pickseed West
NF5070	3597	6.4	5.0	5.7	Norfarm
Pick PR C-97	3600	5.6	5.8	5.7	Pickseed West
TQ x SP	3414	5.4	6.3	5.8	U of Minn
NF5050	3595	6.1	5.5	5.8	Norfarm
Fiesta 3	3598	5.8	5.8	5.8	Pickseed West
WHC PSC bulk 2-03	3605	5.9	6.3	6.1	Pickseed West
Salinas	3555	5.1	7.3	6.2	Turf-seed
WHC PSC bulk 1-00	3602	6.1	6.3	6.2	Pickseed West
WHC PSC bulk 2-00	3604	5.6	6.8	6.2	Pickseed West
Affinity	3500	7.2	5.8	6.5	Turf Merchants
NF5060	3596	6.4	7.8	7.1	Norfarm
Quick Trans	3554	7.6	7.5	7.6	Turf-seed
Jeanne (Italian ryegrass)	3613	9.0	9.0	9.0	Non-hardy check
Location mean		5.5	5.7		
LSD @5%		1.8	1.9	1.2	

*Winter Injury Rating: 1=no injury to 9=dead

Table 7. Birdsfoot Trefoil Seed Production Variety Trial
Magnusson Research farm - Field F7: Roseau, MN

Variety	Seed lot#	Growth habit*	Bloom 6/15/03	Seed yield		mean	Breeding History
				2003	2004		
				-----lbs/A-----			
MN 144 myco sel.	3465	5	28	146	272	209	C4 progeny for mycoleptodiscus terreostriis-RR Smith-UofW
Georgia 1	3143	5	28	195	299	247	southern type out of Georgia - not winter hardy
Pardee**	3422	5	25	158	NH	NH	Released from Cornell-does not persist well in Minnesota
Viking	3395	4	4	222	210	216	Standard erect type - intermediate winter hardiness
Roseau	3214	3.3	0	271	281	276	Glyphosate tolerant selected from Norcen
Low Tannin	3426	3.3	2	273	355	314	U of M Low condensed tannin germplasm: USDA-ARS Trials pending
High Tannin	3428	3	4	193	261	227	U of M High condensed tannin germplasm: USDA-ARS trials pending
Dawn	3142	3	4	251	290	271	Standard variety
WH. Sel.	3249	2.8	T	322	256	289	U of M Winter Hardy germplasm
Nuelthn	3213	2.8	T	215	281	248	Glyphosate tolerant selected from Leo
Mn.FR 95-105	3325	2.8	5	224	205	215	PEI selection for root lesion nematode
Persist	3384	2.5	5	244	417	331	St. Paul pasture selection for persistence under grazing
LSS syn.2	3332	2.5	2	239	270	254	Large seed selection
NC-83 germplasm	3427	2.3	6	215	268	241	15 selected clones (9 of 15=Norcen)
Persist II	3440	2.3	4	281	310	295	Persistence under simulated grazing
Fusarium Sel.	3378	2	2	232	299	265	Plant selection for resistance to Fusarium diseases - Rosemount
Norcen	3173	1.5	2	249	413	331	Standard variety
LSD @5%		0.5	4	54	109	62	

Seeded: July 16, 2002

*Growth habit: 1=prostrate to 5=erect

** Pardee winter killed in 2003-4 and was not harvested in 2004

Harvest dates 8/23/03 & 9/12/04

Table 8a. Palisade date x Rate x Fertility on Perennial Ryegrass at 2 locations in the Roseau area

Palisade Treatment Date	Nitrogen Rate pt./A	Nitrogen fertility lbs/A	7/13/2004		Harvest		Harvest height		Seed Yield	
			loc-1	loc-2	loc-1	loc-2	loc-1	loc-2	loc-1	loc-2
			Lodging score*				---- in. ----		---- lbs/A ----	
26-May	1.00	0	2.0	6.0	5.8	7.0	29	31	1306	1316
		40	4.8	6.5	7.0	7.3	31	30	1433	1250
1-Jun	0.75	0	4.0	3.8	6.0	6.8	31	31	1218	1281
		40	4.3	4.3	5.8	6.8	30	31	1176	1328
1-Jun	1.00	0	2.0	3.5	3.8	6.3	28	31	1271	1267
		40	3.8	4.3	5.8	7.3	30	31	1161	1343
7-Jun	1.00	0	4.0	4.8	6.3	7.5	31	31	1017	1056
		40	5.3	4.3	6.5	7.0	31	31	929	826
no treatment		0	3.0	5.3	5.8	7.5	31	31	889	1198
		40	4.0	5.8	4.8	8.0	31	31	1004	1198
LSD (0.10)			1.6	1.0	2.1	0.8	2	1	249	205

Location 1= Steve Kvien farm - Pine Creek, MN - spring seeding of P101 perennial ryegrass

Location 2= Vistad Farm - 3 miles NW of Roseau, MN - spring seeding of WH x TQ perennial ryegrass

Table 8b. Palisade date x Rate x Fertility on Perennial Ryegrass at 2 locations in Williams area

Palisade treatment Date	Nitrogen Rate pt./A	Nitrogen fertility lbs/A	7/23/2004		Harvest		Harvest height		Seed Yield	
			loc-1	loc-2	loc-1	loc-2	loc-1	loc-2	loc-1	loc-2
			Lodging score*				---- in. ----		---- lbs/A ----	
27-May	1.00	0	1	2.8	2	3.5	25.3	28	872	1024
		40	2.5	3.3	4.8	5	28	28.5	1075	843
1-Jun	1.00	0	1.3	2.3	1.8	3.5	24.3	26.5	897	852
		40	2.5	3.3	3.8	5	26.3	37.5	1155	930
1-Jun	0.75	0	1	1.5	1.5	3.3	24.8	27	968	781
		40	3	2.5	5	4.5	28	26.5	1171	808
3-Jun	1.00	0	1.8	2.8	3.3	4.5	26	27.8	856	910
		40	3.5	5	6.3	5.8	28	28.5	1262	785
7-Jun	1.00	0	2	1.3	2.8	2	25.5	26.3	877	526
		40	4	2.5	7	3.5	28.3	26.8	1249	401
7-Jun	0.75	0	2	3	3.3	4.8	26.5	28.3	972	794
		40	2.8	5.5	4.5	7.3	28	28.5	999	995
no treatment		0	2	2.5	2.8	4.5	27.3	28.3	769	801
		40	4.8	5	7	6.8	29	29	1021	883
LSD (5%)			1.9	2.3	2.2	3.1	2.2	2.9	312	340
LSD (10%)			1.4	1.8	1.7	2.4	1.7	2.2	240	261

Location 1= Byron Tveit farm north of Williams - P101 perennial ryegrass fall seeding

Location 2= Steve Helmstetter farm north of Williams - WH x TQ perennial ryegrass spring seeding

*Lodging score: 1=no lodging, 9=severe lodging

Table 9. 2004 Palisade x Fertility on Citation Fore perennial ryegrass
Dean Carlson farm: south of Roseau

Palisade treatment*	Nitrogen fertilizer lbs/A	Harvest		Seed yield lbs/A	% seed germination
		Lodging*** score	Height in.		
0	0	5.0	26	818	98
0	40	7.5	26	772	
0	80	8.0	27	798	
1 pint	0	2.0	25	1004	97
1 pint	40	3.0	25	905	
1 pint	80	5.8	26	1122	
LSD @5%		1.5	2	324	

Seeded under wheat spring 2003

90+30+30 Oct. 2003

* Palisade applied 6/3/04 with bicycle sprayer at 18 GPA

**additional fertility: #/ac. Additional 'N' applied 4/28/04

***Lodging score: 1=none;9=severe lodging

Harvest date:8/5/04

Table 10. 2004 Residue Management on P101 perennial ryegrass- spring seeded
Steve Kvien - Pine Creek

Residue treatment	Seed Yield lbs/A
Burn 5/4/04	1063
Mow 4/29/04	1094
Harrow 4/29/04	1133
No treatment	1144
LSD @5%	NS

plot size= 30' x 30'

Residue treatments:

Mow - lawn mower used to clip plots to 3" height- residue not removed

Harrow - 4" spike tooth harrow section pulled behind 4-wheeler used to disturb residue

Harvest date:8/13/04

**Table 11. Quackgrass management x seeding date of P101 and TQ x Spread perennial ryegrass
Magnusson Research Farm - Field F2a: Roseau, MN**

Variety	Quackgrass		Application date	Perennial Ryegrass		Quackgrass
	sprigged	herbicide		Seeding date*	Seed Yield lbs/A	Seed Yield gms/plot
P101	no	Assure II	6/3/2004	spring	654	0.0
P101	no	none		spring	797	0.0
P101	yes	Assure II	6/3/2004	spring	615	0.0
P101	yes	none		spring	901	21.9
TQ x SP	no	none		spring	987	0.0
TQ x SP	yes	none		spring	931	30.0
TQ x SP	yes	Roundup 1	6/25/2004	spring	657	0.0
TQ x SP	yes	Roundup 2	7/15/2004	spring	604	0.0
P101	no	Assure II	6/3/2004	fall-till	1136	0.0
P101	no	none		fall-till	1177	0.0
P101	yes	Assure II	6/3/2004	fall-till	1017	0.0
P101	yes	none		fall-till	1139	5.1
TQ x SP	no	none		fall-till	1044	0.0
TQ x SP	yes	none		fall-till	931	16.7
TQ x SP	yes	Roundup 1	6/25/2004	fall-till	830	0.4
TQ x SP	yes	Roundup 2	7/15/2004	fall-till	737	0.2
P101	no	Assure II	6/3/2004	fall-no till	1237	0.0
P101	no	none		fall-no till	1151	0.0
P101	yes	Assure II	6/3/2004	fall-no till	1038	0.1
P101	yes	none		fall-no till	1097	2.8
TQ x SP	no	none		fall-no till	966	0.0
TQ x SP	yes	none		fall-no till	975	5.3
TQ x SP	yes	Roundup 1	6/25/2004	fall-no till	821	0.0
TQ x SP	yes	Roundup 2	7/15/2004	fall-no till	815	0.0
LSD @5%					195	

Roundup 2 = 6/3/04+7/15/04 spot application

All spring spray application applied with bicycle sprayer @ 28 psi - 16 GPA

Management:

fertilized entire area 100+30+40+15s and tillage 5/6/03

Ansen spring wheat planted 5/7/03

spring seeding of ryegrass planted 5/7/03 - 14" rows @5#/ac

5 sprigs of quackgrass/plot -Date:5/13/03

1 pt. Bronate applied 6/11/03 to entire area

Pre-harvest Roundup Ultra 2pt./ac - 8/6/03 on no-till area

wheat harvested - 8/13/03

Fall till area disked 3x and planted with 5# /ac ryegrass in 6" rows - 8/13/03

No-till area seeded with Tye drill @ 5#/ac. In 10" rows(had to seed 2x to get 5#/ac)- 8/13/03

1 pt. 2,4-D + 3/4 pt. Clarity 6/3/04 except spring seeding was sprayed 9/9/03 at same rate

Plot size= 15' x 20' w/ 3 reps

Table 12. 2004 Wildoat/grass control with herbicides in non-AAOP tolerant perennial ryegrass var. WH1 x TQ during seed production year

Vistad farm - northwest of Roseau
 Helmsletter farm - north of Roseveit

Product	product rate/ac	adjuvant/gal	Estimated Seed Yield (lbs/A)		Actual		%seed germination	
			7/23/04	7/23/04	8/14/04	8/6/04		
			Vistad	Helmsletter	Vistad	Helmsletter	Vistad	Helmsletter
Achieve	0.25#	106 ml Prefer 28	225	75	NH	NH		
Achieve	0.5#	106 ml Prefer 28	113	0	NH	NH		
Achieve	1#	106 ml Prefer 28	13	667	NH	NH	98	94
Assert	1.2pt	40 ml Destiny	1175	200	NH	NH		
Everest	.61 oz.	40 ml Destiny	425		NH	NH		
Puma	.66pt.		1225	825	1108	976	97	96
Discover	2 oz.	40 ml Destiny	275	250	NH	NH		
Discover	4 oz.	40 ml Destiny	163	63	NH	NH		
2,4-D+Clarity+Palsade	1 pt+.75pt+1pt.		675		954			
2,4-D+Clarity+Discover	1 pt+.75pt+4oz.	40 ml Destiny	425	275	NH	NH		
2,4-D+Clarity+Discover+Palsade	1 pt+.75pt+4oz.+1pt	40 ml Destiny	325	112	NH	NH	97	97
Avenge	3 pts.	40 ml Destiny	1125	850	1101	789	97	97
Silverado	.89 oz.	60 ml Destiny	1175	650	1155			
Silverado	1.78 oz.	60 ml Destiny	650	650	905			
Silverado	3.56 oz.	60 ml Destiny	213	175	NH	NH		
2,4-D + Clarity + Puma	1pt+.75 pt+1 pt		1100	800	1195	737	97	98
2,4-D + Clarity + Puma+Palsade	1pt+.75 pt+.86pt+1 pt	30 ml+22ml+20 ml+30ml	725	350	1093	648		
Assure II	10 oz.	40 ml Destiny	0	0	NH	NH		
Beacon	.4 oz	40 ml Destiny	125	75	NH	NH		
Palsade	1 pt		1300	733	1363	615**	97	96
No treatment			1150	867	1021	1058	97	98
LSD 5%			199	173	255	253		

Randomized Complete Block Design with 4 replicates
 Plot size=10' x 30'

Treatments applied with a bicycle sprayer in 16 GPA
 Vistad location: 6/2/04 8:00 pm -- temp: 70F wind wsw @ 0-5
 Helmsletter location: 6/3/04 2:00 pm temp. 65F wind wrw @ 0-5 mph
 *NH= insufficient seed to harvest
 **possibly a bad area of the field -only 3 reps harvested
 Harvest date : Helmsletter 8/6/04
 Harvest date : Vistad 8/14/04

Table 13. Seed head ratings and seed yield of grasses treated with wild oat/grass herbicides during establishment in 2003. 2004 data

Variety	2003 Herbicide Treatments												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Seed Head rating: 7/14/04												
Park	4.7	2.3	7.3	2.7	2.7	7.7	8.0	3.0	1.7	6.3	2.7	5.3	4.0
Midnight	4.3	2.3	7.3	4.3	3.7	5.3	7.3	2.7	1.0	6.7	2.7	4.0	4.0
Palaton	3.0	2.3	1.3	2.3	2.3	7.3	6.3	2.3	1.7	2.0	1.7	3.7	3.3
Climax	6.7	4.7	6.3	3.3	2.0	6.7	7.7	1.3	2.7	7.7	1.7	7.3	3.3
P101	7.3	6.0	4.7	7.0	7.0	6.3	6.3	6.7	7.3	6.0	6.0	7.3	7.3
TQ x Spr.	6.7	6.7	6.3	7.0	6.7	6.0	6.3	6.7	6.3	6.7	6.3	6.3	6.0

Seed head rating: 1= poor to 9 = most heading

Variety	2003 Herbicide Treatments												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Seed Yield (lbs/A)												
Park	309	NH	357	NH	NH	407	437	NH	NH	360	161	256	184
Midnight	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
Palaton	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
Climax	785	657	684	NH	NH	648	669	NH	NH	669	NH	633	NH
P101	1139	1213	833	1142	1142	1145	1222	1154	1225	1166	1207	1148	1183
TQ x Spr.	981	919	975	1097	1008	949	853	1047	886	892	1073	883	1014

Seed yield LSD (5%) = 242 lbs/A

Plot size= 5' x 10' w/3 replications

100+30+40+15s applied 10/15/03

3/4 pt. Clarity+ 3/4 pt. 2,4-D applied 9/8/03

Harvest dates:

Harvest dates: Park-7/15/04

P101 & TQ x Spread- 8/5/04

Climax- 8/15/04

Midnight and Palaton not harvested

NH=insufficient seed yield to harvest

Table 13. Wild oat control in Ansen spring wheat seeded 4/30/03 with underseeded grasses.

Variety	Treatments												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Injury rating 10/17/03 (1 = no injury to 9 = dead)												
Park	3.7	6.0	2.3	5.0	4.0	1.3	1.0	4.0	6.0	2.0	5.3	2.7	3.0
Midnight	4.7	7.3	2.7	5.0	5.7	2.0	1.0	5.7	7.3	2.3	6.7	3.7	3.3
Palaton	4.3	6.3	7.3	7.0	6.3	1.3	1.0	6.7	8.0	2.0	7.3	6.0	6.7
Climax	2.3	5.3	3.3	6.7	8.7	2.0	1.0	8.0	7.0	2.3	8.0	3.0	7.3
P101	2.0	2.3	6.3	1.7	2.0	1.7	1.0	2.7	2.0	3.7	2.0	1.7	2.0
TQ x Spr.	3.0	2.0	5.3	2.0	2.0	1.7	1.0	4.0	2.7	3.7	2.7	2.3	2.0
	Injury rating 9/06/03												
Palaton	6.7	7.3	6.7	8.0	6.7	3.3	1.0	8.0	8.3	3.7	8.0	6.3	5.3
Climax	4.3	6.7	3.0	7.3	9.0	2.0	1.0	9.0	7.7	2.7	8.7	2.7	7.0
P101	3.7	2.3	7.3	2.7	2.3	2.0	1.0	5.0	5.7	4.3	3.3	3.0	3.3
TQ x Spr	4.7	2.3	7.7	2.7	4.0	2.0	1.0	6.3	5.3	4.3	4.3	3.0	3.3

Weed control: 1 pint Bronate applied to entire area on 6/11/03

Treatments 1-10 applied 5/31/03: wind 3-8 wnw and 60 F

Treatments 11-13 applied 6/11/03: wind W5mph and 65 F

Treatments applications made with bicycle sprayer 16 GPA with 8003 nozzels@ 26psi

Growth stage 5/31-wheat 3 leaf stage. Ryegrass emerged -2 leaf / others small or not emerged

Growth stage 6/11-wheat 5 leaf stage and most underseeded grasses emerged

Treatments:

- 1) Achieve 0.5 lbs (18.8gm+18.9ml Supercharge+200 ml 28%N)
- 2) Assert 1.2pt (47 ml+10 ml NIS)
- 3) Everest 0.61oz. (1.44 gm+10 ml NIS)
- 4) Puma 0.66 pt (26ml)
- 5) Discover 4 oz. (9.8 ml+31.4 ml DSV)
- 6) Avenge 3 pt. (118 ml+10 ml NIS)
- 7) NO TREATMENT
- 8) Harmony Extra 0.4oz. (.95gm)+Discover
- 9) Harmony Extra 0.4 oz. (.95gm)+Assert
- 0) Silverado (AEF130060WG14) 1.78oz. (4.2 gm)+1.5pt(60ml) Destiny
- 11) Discover - 6/11/03
- 12) Assert - 6/11/03
- 13) Puma - 6/11/03

Variety/Species	Lot #	Hole setting/seeding rate
Park Kentucky bluegrass	3324	6 - 3lbs/A in 6 inch rows
Midnight Kentucky bluegrass	3539	6 - 3lbs/A in 6 inch rows
Climax timothy	3537	1 - 1 lbs/A in 6 inch rows
Palaton reed canarygrass	3433	8 - 5 lbs/A in 14 inch rows
P101 perennial ryegrass	3366	12 - 5 lbs/A in 14 inch rows
TQ x Spread perennial ryegrass	3414	12 - 5 lbs/A in 14 inch rows

Table 14. 2003 Kentucky Bluegrass Tolerance to Pre-emerge Herbicides to Control Off-type Seedlings

Unique Kentucky Bluegrass - Helmstetter farm, Roosevelt, MN.

Herbicide Application	Trade name	Common name	Rate pt/ac.	Rate lb/a ai	Plant stand/ vigor rating*		% Weed control			Stand Estimated	
					7/9/2003	cinquefoil smartweed spp. lambsquarter	6/23/2004 %	7/12/2004 seed yield			
5/9/2003	Prowl 3.3	pendimethalin	3.0	1.25	7.0	0	98	100	63	200	
5/9/2003	Dual II 7.64	Metolachlor	3.0	3.0	3.7	33	0	10	12	10	
5/9/2003	Harness 7.0	Acetochlor	3.5	3.0	3.0	93	50	25	13	30	
5/9/2003	Frontier 6.0	Dimethanamid	2.0	1.5	4.7	23	0	0	15	20	
5/9/2003	Lasso 4.0	alachlor	5.0	2.5	4.3	20	10	10	38	30	
untreated check		none	0.0	0.0	7.0	0	0	0	68	300	
LSD @ 5%					2	28	36	32	21	135	

Plot size: 10' x 30' 3 Reps
 Herbicide applications made 11:00 5/9/03; wind ENE 10 mph, 50 F, light rain
 Growth stage: emerging to the 2 leaf stage
 *Plant Stand/Vigor rating: 1 = poor to 9 = best

Table 15a. 2003 Native Grass/Legume Establishment Trial: Magnusson Research Farm.

Species	Herbicide treatments																										
	aa	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Canada wildrye	1.5	9.0	6.5	3.0	7.5	9.0	9.0	2.5	8.5	7.5	9.0	2.0	8.5	1.0	9.0	7.0	9.0	9.0	7.0	2.0	7.0	4.0	2.5	4.0	8.5	8.0	4.5
Big bluestem	2.0	4.0	9.0	3.5	2.0	4.5	6.5	6.0	7.0	4.0	2.0	7.0	4.5	1.0	8.5	4.5	8.0	3.5	4.0	2.0	4.0	4.0	3.0	1.5	4.0	4.0	6.0
Indiangrass	2.5	7.5	8.0	3.5	3.0	5.0	6.5	4.5	8.0	4.5	8.0	5.5	5.0	1.0	8.5	3.5	7.5	4.0	6.0	2.0	4.0	5.5	3.0	2.5	5.0	8.5	6.5
Side-oats grama	1.5	8.0	7.0	7.5	3.5	4.0	8.0	2.5	8.5	3.5	9.0	7.5	4.5	1.0	8.5	3.5	6.5	7.0	4.0	1.5	3.0	3.5	3.0	3.5	4.0	7.5	7.0
Illinois bundleflower	1.5	9.0	4.0	6.5	3.5	5.5	7.0	5.0	8.0	7.0	2.5	4.0	2.0	1.0	9.0	2.5	3.5	2.5	5.0	3.5	1.5	5.0	3.5	6.5	8.5	8.5	4.5
Perennial flax	2.5	9.0	8.5	8.5	4.5	7.5	9.0	4.5	9.0	9.0	4.0	1.5	8.5	1.0	9.0	3.0	4.0	8.5	3.5	3.0	5.5	7.0	3.5	8.5	8.0	2.5	3.5
Wild senna	3.0	6.5	9.0	6.0	3.0	5.0	8.5	4.0	7.5	8.0	1.0	2.5	5.5	1.0	8.5	3.0	7.5	9.0	3.5	2.5	5.0	3.5	4.0	4.0	6.5	5.5	3.5
Purple prairie clover	2.5	9.0	2.5	9.0	3.5	5.0	8.0	7.5	8.5	6.0	5.0	3.0	2.5	1.0	9.0	3.5	4.5	3.5	4.0	2.5	2.5	6.5	4.5	7.5	9.0	4.5	3.5
False indigo	2.5	9.0	3.0	9.0	3.5	5.0	8.5	5.5	9.0	8.5	3.5	3.0	5.0	1.0	9.0	3.5	7.5	8.0	4.0	3.0	3.0	4.5	4.5	8.0	8.5	4.5	5.5
Weed control *	2.0	8.5	6.5	5.5	5.5	6.5	8.5	8.0	8.0	7.5	7.0	7.5	8.0	1.0	9.0	7.0	8.5	8.0	4.0	4.5	7.0	4.5	3.5	5.0	4.0	6.5	5.0

Herbicide treatments

Stand/vigor rating 7/14/04: 1 = dead to 9=best stands and vigorous**

Canada wildrye	1.0	7.0	7.0	3.5	2.5	1.5	8.0	2.0	6.0	1.0	8.0	3.0	7.5	1.0	3.0	1.5	2.0	3.0	7.5	3.5	6.5	5.0	6.5	1.0	3.0	7.0	
Big bluestem	1.0	1.0	3.5	7.5	4.5	2.5	3.5	2.0	4.5	6.5	3.5	6.5	6.5	1.0	6.5	1.5	7.5	7.0	6.5	7.0	7.0	7.5	8.5	5.0	7.5	3.5	
Indiangrass	1.0	1.5	3.0	6.5	6.0	2.5	3.5	1.5	4.5	1.0	5.0	6.0	5.5	1.0	4.0	1.5	6.5	2.0	2.0	7.5	3.5	4.5	7.5	3.0	1.0	2.5	
Side-oats grama	1.0	2.0	1.5	2.0	4.0	1.5	7.0	1.0	5.5	1.0	2.0	6.0	5.5	1.0	6.5	2.5	2.0	3.0	4.0	7.0	3.5	3.0	5.5	2.5	1.5	2.0	
Illinois bundleflower	1.0	1.5	1.0	3.0	3.5	1.5	5.0	1.5	1.0	6.0	3.5	7.0	3.5	1.0	7.0	6.0	6.5	4.0	3.5	7.5	4.0	3.5	3.5	1.0	6.5	3.0	
Perennial flax	1.0	1.0	1.0	4.0	2.5	1.0	6.5	1.0	1.0	5.5	7.0	1.5	7.5	1.0	7.5	7.0	1.5	2.0	3.5	3.5	2.5	3.0	2.0	1.5	7.0	5.0	
Wild senna	1.0	1.0	5.0	6.0	2.5	1.0	6.5	2.0	2.0	7.5	6.0	2.5	3.5	1.0	4.5	1.0	1.0	3.0	6.0	4.0	6.0	5.5	5.0	2.0	3.0	3.0	
Purple prairie clover	1.0	5.5	1.0	5.5	3.0	1.5	2.0	1.0	3.5	6.0	7.5	7.5	1.5	1.0	6.0	6.0	5.5	5.0	3.5	6.0	2.0	2.0	1.5	1.0	5.0	2.5	
False indigo	1.0	6.0	1.0	4.5	3.0	1.5	4.5	1.0	1.0	5.0	6.0	5.0	5.0	3.5	1.0	5.0	3.5	1.5	3.0	3.5	5.0	3.0	3.0	2.0	1.0	3.5	1.5

LSD @5% = 1.9

*Weed control across species -1=no control ; 9=complete control

Seeded 5/29/03

Preemergent treatments applied 5/29/03 just after seeding

Post emergent treatments 7/7/03

Table 15b. 2004 Native Grass/Forb establishment trial - Magnusson Research Farm: Field F3
 Seeded 6/30/04 with Truax seeder and packed once after seeding with Brillion cultipacker

	Herbicide treatments																													
	aa	a	b	c	d	e1	f	g	h	i	j	k	l	m	n1	o	p1	q	r	s	t	u	v	w	x	y	z	z1	z2	
Side-oats grama	5.5	6.0	7.5	8.0	<u>3.0</u>	3.5	<u>7.0</u>	3.0	7.0	5.0	<u>9.0</u>	<u>7.0</u>	5.0	<u>3.0</u>	5.5	3.0	<u>3.0</u>	<u>3.0</u>	<u>4.0</u>	3.5	5.5	<u>6.0</u>	<u>5.0</u>	6.5	4.0	7.5	4.0	<u>6.0</u>	<u>3.0</u>	
Indiangrass	7.0	6.5	8.0	4.5	<u>4.0</u>	5.0	<u>5.0</u>	2.5	7.5	4.5	<u>8.0</u>	<u>5.0</u>	2.5	<u>6.0</u>	5.5	4.5	<u>3.0</u>	<u>5.0</u>	<u>4.0</u>	4.0	4.0	4.0	4.0	3.0	3.0	7.0	3.0	<u>7.0</u>	<u>3.0</u>	
Int.wheatgrass	2.5	7.5	6.5	2.0	<u>7.0</u>	3.0	<u>8.0</u>	3.5	7.0	5.0	<u>7.0</u>	<u>4.0</u>	6.0	<u>4.0</u>	3.0	6.0	<u>3.0</u>	<u>6.0</u>	<u>3.0</u>	3.0	6.5	<u>7.0</u>	<u>4.0</u>	4.0	6.0	8.5	4.0	<u>5.0</u>	<u>3.0</u>	
Big bluestem	6.5	4.5	7.5	4.0	<u>8.0</u>	3.5	<u>5.0</u>	4.0	6.5	4.0	<u>7.0</u>	<u>6.0</u>	6.0	<u>6.0</u>	4.5	5.5	<u>6.0</u>	<u>5.0</u>	<u>7.0</u>	4.0	5.5	<u>7.0</u>	<u>6.0</u>	3.0	4.0	6.0	5.0			
Switchgrass	5.5	2.5	9.0	5.0	<u>3.0</u>	3.5	<u>7.0</u>	3.5	6.0	6.5	<u>8.0</u>	<u>6.0</u>	4.5	<u>4.0</u>	4.5	4.0	<u>6.0</u>	<u>6.0</u>	<u>6.0</u>	4.0	6.5	<u>7.0</u>	<u>5.0</u>	6.5	2.5	6.0	7.0	<u>4.0</u>	<u>3.0</u>	
Canada wildrye	4.5	8.0	3.5	4.0	<u>7.0</u>	3.5	<u>9.0</u>	2.5	7.5	6.5	<u>8.0</u>	<u>4.0</u>	7.0	<u>4.0</u>	3.0	6.5	<u>6.0</u>	<u>7.0</u>	<u>6.0</u>	3.0	7.0	<u>7.0</u>	<u>8.0</u>	4.0	9.0	7.5	5.0	<u>8.0</u>	<u>3.0</u>	
Illinois bundleflower	4.0	7.5	3.5	6.5	<u>3.0</u>	6.5	<u>8.0</u>	4.5	7.5	8.0	<u>2.0</u>	<u>2.0</u>	3.5	<u>3.0</u>	8.0	3.5	<u>8.0</u>	<u>6.0</u>	<u>8.0</u>	5.5	6.0	<u>6.0</u>	<u>6.0</u>	8.0	8.0	6.0	8.0	<u>8.0</u>	<u>6.0</u>	
False indigo	4.0	8.5	<u>4.0</u>	8.5	<u>3.0</u>	9.0	<u>8.0</u>	2.5	7.5	8.0	<u>2.0</u>	<u>2.0</u>	3.0	<u>4.0</u>	7.0	5.5	<u>9.0</u>	<u>5.0</u>	<u>5.0</u>	6.0	6.0	<u>8.0</u>	<u>4.0</u>	9.0	9.0	7.0	7.0	<u>8.0</u>	<u>3.0</u>	
Perennial flax	4.0	8.5	7.5	8.5	<u>6.0</u>	4.0	<u>9.0</u>	5.5	9.0	9.0	<u>2.0</u>	<u>3.0</u>	8.0		6.0	4.0	3.0	<u>7.0</u>	<u>5.0</u>	5.5	<u>5.0</u>	<u>8.0</u>	<u>4.0</u>	7.0	6.0	4.5	5.0	<u>6.0</u>	<u>2.0</u>	
Purple prairie clover			4.0	9.0	<u>5.0</u>	4.0	<u>8.0</u>	7.0	8.0	5.5	<u>2.0</u>	<u>4.0</u>	4.0		9.0	6.0	<u>9.0</u>		5.0	4.0			8.0	5.0	4.0	4.0	<u>4.0</u>	<u>4.0</u>		
Blue wild indigo		8.5	5.5	7.5	<u>5.0</u>	4.0	<u>8.0</u>	4.0	5.0	5.5	<u>3.0</u>	<u>5.0</u>	4.0		6.5	5.0	<u>8.0</u>	<u>4.0</u>	<u>5.0</u>	6.0	5.0	4.0			9.0	5.0	5.0	<u>5.0</u>	<u>4.0</u>	
Wild senna	6.5	7.5	8.0	7.0	<u>7.0</u>	4.0	<u>8.0</u>	4.0	8.0	8.0	<u>2.0</u>	<u>6.0</u>	7.0		5.0	7.5			<u>6.0</u>	3.5	8.0	<u>4.0</u>			6.0	7.5	6.0	4.0		
Showy tick trefoil	5.5	8.0		6.0	<u>5.0</u>	4.0	<u>9.0</u>	8.0	6.0	5.5	<u>8.0</u>	<u>7.0</u>	7.0		8.0	6.0			<u>9.0</u>	9.0					9.0	7.5	6.0	4.0		
Canada milkvetch	9.0	<u>5.0</u>	<u>9.0</u>	<u>6.0</u>	<u>4.0</u>	<u>9.0</u>	<u>8.0</u>	8.5	<u>9.0</u>				<u>8.0</u>		<u>3.0</u>											<u>9.0</u>	<u>9.0</u>	6.5	4.0	

* Some plots were not rated because they drown out.

Treatments with a missing plot are underlined and *in italics*

Soil type= sandy loam

All pre-emergence treatments were applied after seeding on 6/30/04.

All post-emergence treatments were applied 7/23/04 with wind WNW at 3 to 8 mph. Most species had emerged.

Stands of purple prairie clover, Canada milkvetch, blue wild indigo were sparse and still emerging.

Treatments applied with bicycle sprayer @28psi- & 16gpa

Plots size- 6' x 10' with 2 reps

Table 16. Summary of tolerance of native grass and forb species for establishment: 2003-2004
 Magnusson Research Farm - Field F3: Roseau, MN.

SPECIES	Summary: 2003-4 Herbicide Treatments During Establishment Year																									
	a	b	c	d	e	e1	f	g	i	j	k	l	n1	o	p	p1	q	s	t	u	v	w	x	y	z	
GRASSES:																										
Side-oats grama				*				**	*					**					*							
Indiangrass				**				*					*						*				**			
Int. wheatgrass			**	**				*					*					*	*	*	*	*	*	*	*	*
Big bluestem			*	**	*			*				*		*				*	*	*	*	*	*	*	*	*
Switchgrass	**			*				*				*		*				*	*	*	*	*	*	*	*	
Canada wildrye		*	**					**				**		*				*	*	*	*	*	*	*	*	
FORBS:																										
Illinois bundleflower	a	b	c	d	e	e1	f	g	i	j	k	l	n1	o	p	p1	q	s	t	u	v	w	x	y	z	
False indigo		*						*			*		**	*				*	*	*	*	*	*	*	*	
Perennial flax				*				*		*	**	*	*	**	*	**	*	*	*	*	*	*	*	*	*	
Purple prairie clover		*		*				*		*	**	*	*	*	*	**	*	*	*	*	*	*	*	*	*	
Blue wild indigo				*				*		*	**	*	*	*	*	**	*	*	*	*	*	*	*	*	*	
Wild senna				*				**		*	**	*	*	*	*	**	*	*	*	*	*	*	*	*	*	
Showy tick trefoil			*					*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Canada milkvetch						*			*					*				*	*	*	*	*	*	*	*	

* moderate level of tolerance of species to listed herbicide or indications of good tolerance with insufficient data
 ** indicates good level of herbicide tolerance

Table 17. Herbicide treatments and Species for tables 15-16

Treatments	Common name	Rate	Chemical name/# ai/ac	Application
aa	Basagran+2pt. COC	1.5 pt.	Bentazon .75#	post-emergence
a	Aatrex 4L	3 pt.	Atrazine 1.5#	pre-emergence
b	Command 3E	2 pt.	Clomazone .75#	pre-emergence
c	Callisto 4L	6 oz.	Mesotrione .1875#	pre-emergence
d	Raptor 1L	4 oz.	Imazomox .03125#	pre-emergence
e	Raptor 1L	16 oz.	Imazomox .125#	pre-emergence
e1	Garlon 2L	4 oz.	Triclopyr .75#	post-emergence
f	Plateau 2L	4 oz.	Imazapic .063#	pre-emergence
g	Authority 75 DF	4.7 oz.	Sulfentrazone .22#	pre-emergence
h	FirstRate 84 DF	4.7 oz.	Cloransulam .035#	pre-emergence
i	Python 80 DF	1.1 oz.	Flumetsulan .055#	pre-emergence
j	Dual II Magnum 7.64E	2 pt.	Metolachlor 2#	pre-emergence
k	Prowl 3.3 E	2.72 pt.	Pendimethalin 1.12#	pre-emergence
l	Pursuit 2L	4 oz.	Imazethapyr .063#	pre-emergence
m	No treatment - clipped			
n	Sencor 75 DF	10.7 oz.	Metribuzin .5#	post-emergence
n1	Starane 1.5E	10.5 oz.	Fluroxypyr .126#	post-emergence
o	Raptor 1L + 2.5% Prefer 28	4 oz.	Imazomox .03125#	post-emergence
p	Raptor 1L + 2.5% Prefer 28	16 oz.	Imazomox .125#	post-emergence
p1	Stinger 3L	8 oz.	Clopyrilid .19#	post-emergence
q	Plateau 2L + NIS	3 oz.	Imazapic .047#	post-emergence
r	FirstRate 84 DF + NIS	0.305 oz.	Cloransulam .016#	post-emergence
s	Harmony GT 75DF+NIS	0.085 oz.	Tribenuron .004#	post-emergence
t	Pursuit 2L + 2.5% Prefer 28	4 oz.	Imazethapyr .063#	post-emergence
u	Flexstar + NIS	13.8 oz.	Fomesafen .2#	post-emergence
v	Aim 2E + NIS	4 oz.	Carfentrazone .008#	post-emergence
w	Callisto 4L + NIS	3 oz.	Mesatrione .094	post-emergence
x	AAatrex 4L + NIS	2 pt.	Atrazine 1.0#	post-emergence
y	Accent + NIS	0.66 oz.	Nicosulfuron .031#	post-emergence
z	Buctril + Puma	1 pt. + 0.5 pt.	Brom.25#. +fenox.063#	post-emergence
z1	Ally 60 DF + NIS	0.107 oz.	Metsulfuron .004#	post-emergence
z2	2,4-DB 1.75 SC	3.43 pt.	2,4DB Amine .75#	post-emergence

Species	Scientific name	Variety	Seeding rate
Canada wildrye	<i>Elymus canadensis</i>	Mandan	5 lbs/A
Side-oats grama	<i>Bouteloua curtipendula</i>	Pierre	5 lbs/A
Big bluestem	<i>Andropogon gerardi</i>	Bison	6 lbs/A
Indiangrass	<i>Sorghastrum nutans</i>	Tomahawk	6 lbs/A
Switchgrass	<i>Panicum virgatum</i>	Sunburst	4 lbs/A
Intermediate wheatgrass	<i>Elytrigia intermedia</i>	BFPMC 1	10 lbs/A
Perennial flax	<i>Linum perenne</i>	Appar	15 lbs/A
False indigo	<i>Amphora fruticosa</i>	St.Paul collection	6 lbs/A
Illinois bundleflower	<i>Desmanthus illinoensis</i>	WCM collection	6 lbs/A
Wild senna	<i>Senna hebecarpa</i>	St.Paul collection	15 lbs/A
Purple prairie clover	<i>Dahlea purpurem</i>	mixed collection	3 lbs/A
Blue wild indigo	<i>Baptisia australis</i>	St.Paul collection	8 lbs/A
Showy tick trefoil	<i>Desmodium canadense</i>	St.Paul composite	7 lbs/A
Leadplant	<i>Amorpha canescens</i>	Central Minn. Collection	3 lbs/A
Canada milkvetch	<i>Astragalus canadensis</i>	mixed collection	3 lbs/A