

**University of Minnesota
Department of Plant Pathology**

**2009
Potato Disease Report**



**Potato Pathology and Genomics
<http://ppg.cfans.umn.edu/>**

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Section I. Evaluating Potato Germplasm for Disease Resistance

SUMMARY: Disease screening plots were established at two locations (Rosemount and Becker, MN) in 2009. Entries were screened for resistance to late blight (caused by the Oomycete *Phytophthora infestans*; UMore Park, Rosemount, MN) and common scab (caused by the Actinomycete *Streptomyces scabies*; Sand Plain Research Farm, Becker, MN). In total, 492 entries were tested for late blight and 371 entries were tested for common scab. Entries for evaluation originated from the UM Potato Breeding Program, the UM Potato Pathology & Genomics Program, the USDA, the North Central breeding programs, and the National Late Blight and Scab Trials.

Table 1. Source and number of entries screened at the late blight and common scab nurseries in 2009.

Source	Late Blight (UMore Park, Rosemount, MN)	Common Scab (Sand Plain Research Farm, Becker, MN)
UMN Potato Breeding	275	270
UMN Potato Pathology & Genomics	12	
North Central Trial	34	38
National Late Blight and Scab Trial	147	63
USDA-ARS, Madison, WI	24	

(A) Late Blight – Rosemount, MN

Late blight, caused by the fungus *Phytophthora infestans*, was responsible for the Irish Potato Famine of the mid-1800's. The disease is characterized by brown to black water-soaked lesions on potato leaves and stems. Under cool, humid conditions, late blight can destroy an entire field within 10-14 days. When sporangia or zoospores are washed into the soil, they can infect potato tubers. Tuber infection is characterized by a dry, brown, granular rot. Secondary pathogens, such as *Erwinia carotovora* (soft rot), *Phytophthora erythroseptica* (pink rot), and *Pythium* spp. (leak) frequently follow. Late blight is currently managed by intensive fungicide applications. This approach is expensive and not environmentally sustainable. Genetic resistance derived from cultivated or wild potato is a promising means to reduce pesticide dependency, risk to the environment, and costs to potato growers.

Resistance to late blight is evaluated at UMore Park (Rosemount, MN) in cooperation with James Rowe (Administrative Professional), Jim Karelis (Sr. Research Plot Technician) and Kimon Karelis (Research Plot Coordinator). The UMore Park is geographically isolated from commercial potato farms allowing intentional inoculation with the late blight pathogen. Because the spores of the pathogen are air-borne, inoculations and late blight screening is restricted to non-production areas. To further protect regional growers, the Late Blight Nursery is planted 4 to 8 weeks later than commercial production fields in Minnesota and Wisconsin.

Disease screening methods are detailed in Appendix A. Complete results for individual entries from the University of Minnesota Potato Breeding Program, University of Minnesota Potato Pathology and Genomics Program, National Late Blight, and North Central Region for 2009 are listed in Appendix B. Table 2 summarizes our findings.

Table 2. Number of entries in each late blight resistance class based on infection 35 days after inoculation with the potato late blight pathogen at Rosemount, MN 2009

Sources of entries	No. (percent) of entries 35 DAI
UM Potato Breeding	
Resistant	0 (0%)
Moderately Resistant	1 (0.4%)
Moderately Susceptible	2 (0.7%)
Susceptible	272 (98.9%)
UM Potato Pathology & Genomics	
Resistant	0 (0%)
Moderately Resistant	2 (16.7%)
Moderately Susceptible	4 (33.3%)
Susceptible	6 (50.0%)
National Late Blight Trial	
Resistant	0 (0%)
Moderately Resistant	24 (16.3%)
Moderately Susceptible	36 (24.5%)
Susceptible	87 (59.2%)
North Central Trial	
Resistant	0 (0%)
Moderately Resistant	0 (0%)
Moderately Susceptible	6 (17.6%)
Susceptible	28 (82.4%)
USDA-ARS, Madison, WI	
Resistant	0 (0%)
Moderately Resistant	7 (29.2%)
Moderately Susceptible	11 (45.8%)
Susceptible	6 (25.0%)
All Entries	
Resistant	0 (0.0%)
Moderately Resistant	34 (6.9%)
Moderately Susceptible	59 (12.0%)
Susceptible	399 (81.1%)

(B) Common Scab

Common scab, caused predominantly by the ubiquitous soil-borne bacterium *Streptomyces scabies*, is a disease of several root crops. In potato, symptoms include the development of corky lesions on the tuber that significantly reduce tuber quality and marketability, particularly for table stock varieties. In severe cases, common scab appears as deep sunken lesions (“pit scab”) that invite secondary infection. Alkaline and dry soils exacerbate disease development. Genetic tolerance is sought after by potato breeders in Minnesota and throughout the US. The Sand Plain Research Farm is an ideal location for germplasm screening for resistance to common scab. As in previous years, in 2009 the Potato Pathology and Genomics program cooperated with the UM Potato Breeding Program and potato breeding programs at Michigan State University, University of Wisconsin, and North Dakota State University to screen breeding materials for tolerance to common scab. We also served as a test site for the replicated National Scab Trial.

Resistance to common scab is evaluated at the Sand Plain Research Farm located in Becker, MN in cooperation with Ronald Faber (Farm Manager) and Scott Garvin (Research Plot Technician). Detailed disease screening methods are listed in Appendix A. Severity and coverage ratings for all entries are listed in Appendix B. Table 3 summarizes our findings.

All ‘Red Pontiac’ plots that were planted next to test plots developed high levels of common scab, indicating disease pressure was fairly uniform throughout the plot. Coverage evaluations did not always correlate well with severity evaluations. Any tuber that received a 0 for severity also was scored with a 0 for coverage. However, scab lesions could range from superficial (severity = 1) to very deep (e.g. severity = 5) and only have 5% or less of the tuber surface covered (coverage = 2). Therefore, several entries that received a severity rating of 3 or 4 had coverage ratings of only 1 or 2. Since tubers can be rejected for sale when common scab lesions are severe, regardless of the degree of coverage, severity is a better measure of resistance in processing-type potatoes. Coverage may be the better assessment for fresh market reds.

Table 3. Number of entries in each common scab resistance class based on Severity and Coverage Ratings at Becker, MN 2009

Sources of entries	Severity Rating (%)
UM Potato Breeding	
Resistant	1 (0.0%)
Moderately Resistant	34 (12.6%)
Moderately Susceptible	40 (14.8%)
Susceptible	195 (72.2%)
National Scab Trial	
Resistant	0 (0.0%)
Moderately Resistant	18 (28.6%)
Moderately Susceptible	12 (19.0%)
Susceptible	33 (52.4%)
North Central Trial	
Resistant	0 (0%)
Moderately Resistant	1 (0.3%)
Moderately Susceptible	4 (10.5%)
Susceptible	33 (86.8%)
All Entries	
Resistant	1 (0.3%)
Moderately Resistant	53 (14.3%)
Moderately Susceptible	56 (15.1%)
Susceptible	261 (70.4%)

References

Davis, J. R., and Garner, J. 1978. Common scab of potato. University of Idaho Agricultural Experiment Station current information series No. 386. University of Idaho, Moscow, Idaho.

Henfling, J. W. 1987 Late blight of potato: *Phytophthora infestans*. Technical Information Bulletin 4. International Potato Center, Lima, Peru.

King, R. R., and Lawrence, C. H., and Clark, M. C. 1991. Correlation of phytotoxin production with pathogenicity of *Streptomyces scabies* isolates from scab infected potato tubers. Am. Potato J. 68:675-680.

Appendix A: Disease Screening Methods

(A) Late Blight

Tubers were planted on June 12. Entries were submitted by the University of Minnesota Potato Pathology and Genomics Program, the University of Minnesota Potato Breeding Program, the National Late Blight Trial (conducted by Dr. Kathleen Haynes, USDA/ARS, Beltsville, MD), the North Central Region trials, and the USDA-ARS at Madison, WI. Admire 2F insecticide was applied in furrow at a rate of 16 fl. oz./acre to all planted potatoes. No fungicides were applied to the field at any time during the season.

All experimental were directly inoculated with a suspension of *P. infestans* (US-8 strain) zoospores and sporangia at a concentration of 260 sporangia /ml in the late evening of August 12. Inoculum was applied with a CO₂ sprayer at 20 psi using a single nozzle (6502 tip) wand. Plots were irrigated for 1 hour prior to inoculation. Sprinkler irrigation was applied the next morning and thereafter, 4 to 6 times per week depending upon weather conditions for 1 hour to prolong natural dew periods. All irrigation was accomplished using a low-volume, overhead mist-type sprinkler system.

Evaluations were initiated 14 days after inoculation and were made approximately every 3 to 5 days until 35 days after inoculation (4 readings total). Each entry was visually scored for disease severity using the CIP scale (Henfling, 1987). The CIP rating system is as follows:

CIP Rating	% Late Blight	
	Mean	Limits
1	0	0
2	2.5	Trace to 5
3	10	5 to <15
4	25	15 to <35
5	50	35 to <65
6	75	65 to <85
7	90	85 to <95
8	97.5	95 to <100
9	100	100

After all disease ratings were made, the CIP ratings were categorized based on readings taken 35 DAI as follows:

Resistance Class	Score
Resistant	<2.5
Moderately Resistant	2.5-4.99
Moderately Susceptible	5-7.49
Susceptible	>7.5

(B) Common Scab

Potato seed pieces were planted on May 8 by hand and Admire 2F insecticide was applied in furrow at a rate of 16 fl. oz./acre. Each entry consisted of 4 seed pieces spaced 12 inches apart, followed by a four-foot space, then two seed pieces of 'Red Pontiac' 12 inches apart, followed by another four-foot space. The 'Red Pontiac' was used as a susceptible check, to measure disease pressure throughout the plot.

For evaluation, all potato hills were lifted from the ground and dropped back on the ground using a one-row potato harvester. Evaluations were made on September 15, after a natural rainfall had washed much of the soil from the harvested tubers. All tubers from the four hills were rated as a group using the following scale:

Rating	Severity	Coverage
0	No scab visible	No scab visible
1	Scab \leq 1 mm deep	Trace or 1-2 lesions less than 1 cm ²
2	Scab 2-3 mm deep	1 to 5 % tuber surface covered
3	Scab 3-4 mm deep	>5 to 50% tuber surface covered
4	Scab 4-5 mm deep	Over 50% tuber surface covered
5	Scab over 5 mm deep	---

Entries were considered resistant if the severity and coverage ratings were 0, moderately resistant for severity and coverage ratings of 1-2, moderately susceptible for severity and coverage ratings of 3, and susceptible for severity ratings of 4-5 or a coverage rating of 4.

Appendix B. Field Plot Data

(A) Late Blight: Disease resistance scores for entries in 2009.

Clone	Source	8/26/09 Reading 1	9/2/09 Reading 2	9/8/09 Reading 3	9/16/09 Reading 4	Resistance Category
A0008-1TE	National	3	5	9	9	S
A0008-1TE	National	2	6	9	9	S
A0008-1TE	National	2	7	9	9	S
A00286-3Y	National	2	3	4	7	MS
A00286-3Y	National	2	3	6	8	S
A00286-3Y	National	2	5	7	9	S
A00324-1	National	3	4	6	7	MS
A00324-1	National	2	4	6	7	MS
A00324-1	National	2	3	5	7	MS
A96814-65LB	National	2	3	5	5	MR
A96814-65LB	National	2	3	4	6	MS
A96814-65LB	National	2	3	5	7	MS
A97066-42LB	National	1	2	3	4	MR
A97066-42LB	National	2	3	4	6	MS
A97066-42LB	National	2	4	5	6	MS
A98345-1	National	2	4	7	7	MS
A98345-1	National	2	4	7	8	S
A98345-1	National	2	5	7	8	S
A99331-2RY	National	1	3	6	9	S
A99331-2RY	National	2	3	7	9	S
A99331-2RY	National	2	4	7	9	S
AC99375-1RU	National	2	4	5	6	MS
AC99375-1RU	National	2	3	4	6	MS
AC99375-1RU	National	2	3	6	6	MS
AF2376-5	National	2	2	6	6	MS
AF2376-5	National	2	3	5	7	MS
AF2376-5	National	2	3	6	7	MS
AF2574-1	National	2	5	5	6	MS
AF2574-1	National	2	3	6	6	MS
AF2574-1	National	3	3	6	7	MS
AF3317-15	National	2	2	3	4	MR
AF3317-15	National	2	3	6	6	MS
AF3317-15	National	2	4	6	6	MS
AF4121-3	National	2	3	4	4	MR
AF4121-3	National	2	2	3	5	MR

AF4121-3	National	2	3	4	5	MR
Alpine Russet (A9305-10)	National	2	6	8	9	S
Alpine Russet (A9305-10)	National	2	6	8	9	S
Alpine Russet (A9305-10)	National	2	6	8	9	S
AO96141-3	National	3	6	8	9	S
AO96141-3	National	3	7	7	9	S
AO96141-3	National	2	5	7	9	S
AO96305-3	National	2	6	8	9	S
AO96305-3	National	2	5	8	9	S
AO96305-3	National	2	4	7	9	S
AO96365-2	National	3	5	7	9	S
AO96365-2	National	2	6	8	9	S
AO96365-2	National	2	6	8	9	S
AOMN 03178-2	UM-Thill	2	7	8	9	S
AOMN 03178-2	UM-Thill	3	6	8	9	S
AOMN 041101-01	UM-Thill	2	3	7	8	S
AOMN 041101-01	UM-Thill	2	4	6	9	S
AOMN 06077-01	UM-Thill	4	7	9	9	S
AOMN 06077-01	UM-Thill	3	6	8	9	S
AOMN 06077-03	UM-Thill	3	7	9	9	S
AOMN 06077-03	UM-Thill	4	7	9	9	S
AOMN 06107-01	UM-Thill	3	7	9	9	S
AOMN 06107-01	UM-Thill	3	6	9	9	S
AOMN 06118-01	UM-Thill	2	4	7	9	S
AOMN 06118-01	UM-Thill	2	6	7	9	S
AOMN 06126-02	UM-Thill	3	4	8	9	S
AOMN 06126-02	UM-Thill	2	7	9	9	S
AOMN 06131-01	UM-Thill	3	5	9	9	S
AOMN 06131-01	UM-Thill	2	7	9	9	S
AOMN 06147-05	UM-Thill	2	5	7	8	S
AOMN 06147-05	UM-Thill	2	4	8	9	S
AOMN 06150-02	UM-Thill	3	8	9	9	S
AOMN 06150-02	UM-Thill	3	7	9	9	S
AOMN 06153-01 S.D.	UM-Thill	4	9	9	9	S
AOMN 06153-01 S.D.	UM-Thill	3	9	9	9	S
AOMN 06156-02	UM-Thill	3	6	9	9	S
AOMN 06156-02	UM-Thill	2	6	8	9	S
AOMN 06162-02	UM-Thill	4	5	8	9	S
AOMN 06162-02	UM-Thill	2	6	8	9	S

AOMN 06174-01 S.D.	UM-Thill	2	3	5	9	S
AOMN 06174-01 S.D.	UM-Thill	2	4	7	9	S
Atlantic (All Red)	UM-Thill	4	8	8	9	S
Atlantic (All Red)	UM-Thill	2	6	8	9	S
ATMN 03505-3	UM-Thill	2	7	9	9	S
ATMN 03505-3	UM-Thill	2	8	9	9	S
ATND98459- 1RY	NCR	3	6	8	9	S
ATND98459- 1RY	NCR	3	6	8	9	S
AWN86514-2	National	2	2	3	3	MR
AWN86514-2	National	2	3	3	3	MR
AWN86514-2	National	1	2	3	4	MR
B0692-4	National	2	3	3	4	MR
B0692-4	National	2	3	3	5	MR
B0692-4	National	2	3	3	5	MR
B0718-3	National	2	2	3	3	MR
B0718-3	National	2	2	2	4	MR
B0718-3	National	2	2	3	4	MR
B2152-17	National	2	9	9	9	S
B2152-17	National	2	8	9	9	S
B2152-17	National	3	8	9	9	S
B2423-65	National	2	3	4	5	MR
B2423-65	National	2	3	4	5	MR
B2423-65	National	2	3	5	7	MS
B2431-23	National	2	2	2	5	MR
B2431-23	National	2	3	3	6	MS
B2431-23	National	2	3	6	7	MS
B2492-7	National	3	6	9	9	S
B2492-7	National	3	8	9	9	S
B2492-7	National	4	7	9	9	S
B2501-10	National	3	7	9	9	S
B2501-10	National	4	8	9	9	S
B2501-10	National	3	8	9	9	S
B2634-3	National	3	8	9	9	S
B2634-3	National	3	9	9	9	S
B2634-3	National	3	7	9	9	S
BNC182-5	National	3	6	8	9	S
BNC182-5	National	3	5	8	9	S
BNC182-5	National	3	5	7	9	S
BNC49-1	National	2	5	8	9	S

BNC49-1	National	2	6	8	9	S
BNC49-1	National	2	6	8	9	S
Classic Russet (A95109-1)	National	2	5	8	9	S
Classic Russet (A95109-1)	National	2	5	8	9	S
Classic Russet (A95109-1)	National	3	6	8	9	S
Clearwater Russet (AOA95154-1)	National	2	4	6	8	S
Clearwater Russet (AOA95154-1)	National	2	4	7	9	S
Clearwater Russet (AOA95154-1)	National	2	4	7	9	S
CO98012-5R	National	3	6	9	9	S
CO98012-5R	National	2	6	8	9	S
CO98012-5R	National	2	6	8	9	S
CO98067-7RU	National	4	6	9	9	S
CO98067-7RU	National	3	7	9	9	S
CO98067-7RU	National	3	6	8	9	S
CO98368-2RU	National	3	8	9	9	S
CO98368-2RU	National	3	9	9	9	S
CO98368-2RU	National	3	8	9	9	S
CO99053-3RU	National	2	3	6	7	MS
CO99053-3RU	National	2	4	7	8	S
CO99053-3RU	National	2	5	7	8	S
CO99053-4RU	National	4	7	8	9	S
CO99053-4RU	National	2	7	8	9	S
CO99053-4RU	National	4	7	9	9	S
CO99100-1RU	National	4	8	9	9	S
CO99100-1RU	National	3	8	8	9	S
CO99100-1RU	National	5	8	9	9	S
COMN 03021-1	UM-Thill	4	8	9	9	S
COMN 03021-1	UM-Thill	3	8	9	9	S
COMN 03024-6	UM-Thill	3	9	9	9	S
COMN 03024-6	UM-Thill	3	8	9	9	S
COMN 03027-1	UM-Thill	3	8	9	9	S
COMN 03027-1	UM-Thill	2	5	8	9	S
COMN 04674-02	UM-Thill	2	5	8	9	S
COMN 04674-02	UM-Thill	2	5	8	9	S
COMN 04692-10	UM-Thill	3	8	9	9	S
COMN 04692-10	UM-Thill	3	8	9	9	S
COMN 04697-02	UM-Thill	4	9	9	9	S
COMN 04697-02	UM-Thill	5	9	9	9	S

COMN 04702-03	UM-Thill	3	7	9	9	S
COMN 04702-03	UM-Thill	2	7	9	9	S
COMN 06332-01	UM-Thill	2	4	8	9	S
COMN 06332-01	UM-Thill	2	6	7	9	S
COMN 06344-03	UM-Thill	2	6	8	9	S
COMN 06344-03	UM-Thill	2	5	8	9	S
COMN 06353-04	UM-Thill	2	8	9	9	S
COMN 06353-04	UM-Thill	2	6	8	9	S
COMN 06358-02	UM-Thill	2	8	9	9	S
COMN 06358-02	UM-Thill	2	7	9	9	S
COMN 06360-01	UM-Thill	5	8	9	9	S
COMN 06360-01	UM-Thill	3	7	8	9	S
COMN 06363-01	UM-Thill	2	3	8	9	S
COMN 06363-01	UM-Thill	2	7	8	9	S
COMN 06379-02	UM-Thill	3	4	8	9	S
COMN 06379-02	UM-Thill	3	8	9	9	S
COMN 06392-01	UM-Thill	2	4	6	8	S
COMN 06392-01	UM-Thill	3	4	7	9	S
COMN 06393-01	UM-Thill	3	5	9	9	S
COMN 06393-01	UM-Thill	2	6	9	9	S
COMN 06433-01	UM-Thill	3	8	9	9	S
COMN 06433-01	UM-Thill	2	7	8	9	S
COMN 06438-02	UM-Thill	4	9	9	9	S
COMN 06438-02	UM-Thill	3	8	9	9	S
COMN 06471-02	UM-Thill	2	4	5	8	S
COMN 06471-02	UM-Thill	2	4	5	8	S
COMN07- B001BG1	UM-Thill	2	8	9	9	S
COMN07- B004BG1	UM-Thill	3	9	9	9	S
COMN07- B018BG1	UM-Thill	6	9	9	9	S
COMN07- B023BG1	UM-Thill	4	6	8	9	S
COMN07- B025BG1	UM-Thill	4	8	9	9	S
COMN07- B028BG1	UM-Thill	3	8	9	9	S
COMN07- B035BG1	UM-Thill	2	6	8	9	S
COMN07- B041BG1	UM-Thill	3	5	7	9	S
COMN07- B047BG1	UM-Thill	4	9	9	9	S

COMN07- B050BG1	UM-Thill	2	5	8	9	S
COMN07- B051BG1	UM-Thill	3	8	9	9	S
COMN07- B052BG1	UM-Thill	4	8	9	9	S
COMN07- B061BG1	UM-Thill	3	7	8	9	S
COMN07- B062BG1	UM-Thill	2	6	8	9	S
COMN07- B063BG1	UM-Thill	2	2	3	7	MS
COMN07- B071BG1	UM-Thill	3	7	9	9	S
COMN07- B083BG1	UM-Thill	2	5	9	9	S
COMN07- B087BG1	UM-Thill	3	7	9	9	S
COMN07- B089BG1	UM-Thill	3	8	9	9	S
COMN07- B095BG1	UM-Thill	5	8	9	9	S
COMN07- B117BG1	UM-Thill	2	3	8	9	S
COMN07- B120BG1	UM-Thill	2	7	9	9	S
COMN07- B128WG1	UM-Thill	2	6	9	9	S
COMN07- B132BG1	UM-Thill	2	4	8	9	S
COMN07- B134BG1	UM-Thill	3	7	9	9	S
COMN07- B139BG1	UM-Thill	2	7	9	9	S
COMN07- B141BG1	UM-Thill	2	5	8	9	S
COMN07- B142BG1	UM-Thill	3	8	9	9	S
COMN07- B143BG1	UM-Thill	2	6	9	9	S
COMN07- B144BG1	UM-Thill	2	7	8	9	S
COMN07- B149BG1	UM-Thill	3	7	9	9	S
COMN07- B151BG1	UM-Thill	5	9	9	9	S

COMN07- B153BG1	UM-Thill	3	8	9	9	S
COMN07- B182BG1	UM-Thill	4	8	9	9	S
COMN07- B182WG1	UM-Thill	2	8	9	9	S
COMN07- B196BG1	UM-Thill	2	3	6	9	S
COMN07- B198BG1	UM-Thill	4	7	8	9	S
COMN07- B210BG1	UM-Thill	2	7	8	9	S
COMN07- B211BG1	UM-Thill	4	7	9	9	S
COMN07- B212BG1	UM-Thill	3	4	7	9	S
COMN07- B214BG1	UM-Thill	2	3	6	7	MS
COMN07- B216BG1	UM-Thill	3	8	9	9	S
COMN07- B217BG1	UM-Thill	2	7	9	9	S
COMN07- B218BG1	UM-Thill	2	8	9	9	S
COMN07- B225BG1	UM-Thill	2	5	9	9	S
COMN07- B229BG1	UM-Thill	2	7	8	9	S
COMN07- B229WG1	UM-Thill	2	6	9	9	S
COMN07- B241BG1	UM-Thill	2	8	9	9	S
COMN07- B248BG1	UM-Thill	2	3	6	8	S
COMN07- GF170WG1	UM-Thill	2	3	7	8	S
COMN07- GF173BG1	UM-Thill	3	5	9	9	S
COMN07- GF176BG1	UM-Thill	3	6	9	9	S
COMN07- GF179BG1	UM-Thill	2	4	7	9	S
COMN07- GF180WG1	UM-Thill	2	5	7	9	S
COMN07- GF188BG1	UM-Thill	2	6	8	9	S

COMN07- GF193BG1	UM-Thill	3	6	9	9	S
COMN07- GF198BG1	UM-Thill	2	5	8	9	S
COMN07- GF203BG1	UM-Thill	3	9	9	9	S
COMN07- GF205BG1	UM-Thill	5	8	9	9	S
COMN07- GF206BG1	UM-Thill	2	3	6	8	S
COMN07- GF216BG1	UM-Thill	5	9	9	9	S
COMN07- GF241BG1	UM-Thill	3	8	9	9	S
COMN07- GF271BG1	UM-Thill	3	8	9	9	S
COMN07- GF286BG1	UM-Thill	1	3	8	9	S
COMN07- GF298BG1	UM-Thill	3	7	8	9	S
COMN07- GF299BG1	UM-Thill	2	5	8	9	S
COMN07- GF299WG1	UM-Thill	2	6	8	9	S
COMN07- GF307BG1	UM-Thill	3	5	9	9	S
COMN07- GF307WG1	UM-Thill	4	9	9	9	S
COMN07- GF310BG1	UM-Thill	3	9	9	9	S
COMN07- GF315BG1	UM-Thill	3	8	9	9	S
COMN07- W034WG1	UM-Thill	3	6	8	9	S
COMN07- W048BG1	UM-Thill	2	7	9	9	S
COMN07- W067BG1	UM-Thill	3	4	8	9	S
COMN07- W073BG1	UM-Thill	2	3	5	8	S
COMN07- W080BG1	UM-Thill	2	9	9	9	S
COMN07- W090BG1	UM-Thill	2	6	9	9	S
COMN07- W109BG1	UM-Thill	4	9	9	9	S

COMN07- W112BG1	UM-Thill	3	6	8	9	S
COMN07- W199BG1	UM-Thill	3	8	9	9	S
COMN07- W201BG1	UM-Thill	3	6	8	9	S
COMN07- W203BG1	UM-Thill	3	5	7	9	S
Dk. Red Norland	UM-Thill	3	8	9	9	S
Dk. Red Norland	UM-Thill	2	7	9	9	S
LBR1R2R3R4	National	2	3	5	7	MS
LBR1R2R3R4	National	2	3	6	8	S
LBR1R2R3R4	National	2	3	6	8	S
LBR5	National	3	3	6	8	S
LBR5	National	2	7	8	9	S
LBR5	National	2	6	7	9	S
LBR7	National	1	1	6	8	S
LBR7	National	2	3	7	8	S
LBR7	National	2	3	6	8	S
LBR9	National	5	8	9	9	S
LBR9	National	3	6	8	9	S
LBR9	National	3	7	9	9	S
Missaukee (MSJ461-1)	NCR	2	3	4	6	MS
Missaukee (MSJ461-1)	NCR	2	3	5	7	MS
MN 00467-4	UM-Thill	3	7	9	9	S
MN 02 419	UM-Thill	3	5	7	9	S
MN 02 467	NCR	2	3	4	7	MS
MN 02 467	NCR	2	3	5	7	MS
MN 02 574	UM-Thill	2	5	7	9	S
MN 02 582	UM-Thill	2	6	9	9	S
MN 02 586	UM-Thill	2	6	9	9	S
MN 02 588	UM-Thill	3	6	8	9	S
MN 02 598	UM-Thill	3	7	9	9	S
MN 02 616	NCR	3	8	9	9	S
MN 02 616	NCR	3	8	9	9	S
MN 02 696	UM-Thill	3	9	9	9	S
MN 05001-033	UM-Thill	2	6	9	9	S
MN 05001-033	UM-Thill	3	7	9	9	S
MN 05001-074	UM-Thill	2	3	7	8	S
MN 05001-074	UM-Thill	2	4	4	9	S
MN 05001-124	UM-Thill	2	4	6	9	S
MN 05001-124	UM-Thill	2	3	6	9	S

MN 061788-01	UM-Thill	3	8	9	9	S
MN 061788-01	UM-Thill	3	8	9	9	S
MN 15620	UM-Thill	2	6	9	9	S
MN 18747	UM-Thill	3	8	9	9	S
MN 19298	NCR	2	7	9	9	S
MN 19298	NCR	2	6	9	9	S
MN 96013-1	NCR	2	5	8	9	S
MN 96013-1	NCR	2	7	9	9	S
MN 96072-4	UM-Thill	5	9	9	9	S
MN 99380-1	UM-Thill	4	8	9	9	S
MN 99460-14	UM-Thill	3	8	9	9	S
MSL268-D	National	3	5	7	8	S
MSL268-D	National	2	4	6	8	S
MSL268-D	National	3	4	6	8	S
MSL268-D	NCR	2	4	5	8	S
MSL268-D	NCR	2	3	6	8	S
MSM171-A	National	4	6	8	9	S
MSM171-A	National	3	7	9	9	S
MSM171-A	National	2	6	7	9	S
MSM171-A	NCR	2	5	6	8	S
MSM171-A	NCR	3	6	6	9	S
MSM182-1	National	2	5	6	6	MS
MSM182-1	National	2	4	6	6	MS
MSM182-1	National	2	3	6	7	MS
MSN170-A	NCR	3	6	7	9	S
MSN170-A	NCR	2	6	8	9	S
MSQ070-1	National	2	3	3	5	MR
MSQ070-1	National	2	3	5	5	MR
MSQ070-1	National	2	3	5	5	MR
MSQ176-5	National	1	2	2	5	MR
MSQ176-5	National	2	4	5	6	MS
MSQ176-5	National	2	3	3	7	MS
ND028842-1RY	NCR	4	8	9	9	S
ND028842-1RY	NCR	3	6	8	9	S
ND8304-2	NCR	6	9	9	9	S
ND8304-2	NCR	4	9	9	9	S
ND8305-1	NCR	3	6	9	9	S
ND8305-1	NCR	2	7	9	9	S
NDMN 03324-4	UM-Thill	2	7	8	9	S
NDMN 03324-4	UM-Thill	2	6	8	9	S
NDMN 03376-1	UM-Thill	2	7	9	9	S
NDMN 03376-1	UM-Thill	3	8	9	9	S
NDMN 03382-2	UM-Thill	5	9	9	9	S

NDMN 03382-2	UM-Thill	2	8	9	9	S
NDMN 04910-01	UM-Thill	3	6	9	9	S
NDMN 04910-01	UM-Thill	3	6	9	9	S
NDMN 04911-01	UM-Thill	3	8	9	9	S
NDMN 04911-01	UM-Thill	3	8	9	9	S
NDMN 04916-01	UM-Thill	3	7	8	9	S
NDMN 04916-01	UM-Thill	2	3	8	9	S
NDMN 04927-01	UM-Thill	2	3	6	8	S
NDMN 04927-01	UM-Thill	2	5	8	8	S
NDMN 04960-01	UM-Thill	4	8	9	9	S
NDMN 04960-01	UM-Thill	3	8	9	9	S
NDMN07- B167BG1	UM-Thill	3	7	9	9	S
NDMN07- B266BG1	UM-Thill	3	6	7	9	S
NDMN07- B272BG1	UM-Thill	3	7	9	9	S
NDMN07- B277BG1	UM-Thill	4	8	9	9	S
NDMN07- B289BG1	UM-Thill	5	7	8	9	S
NDMN07- B299BG1	UM-Thill	5	9	9	9	S
NDMN07- B302BG1	UM-Thill	2	7	9	9	S
NDMN07- B303BG1	UM-Thill	3	8	9	9	S
NDMN07- B309BG1	UM-Thill	2	7	9	9	S
NDMN07- B311BG1	UM-Thill	3	7	9	9	S
NDMN07- B312BG1	UM-Thill	3	6	9	9	S
NDMN07- B316WG1	UM-Thill	4	7	8	9	S
NDMN07- B319BG1	UM-Thill	3	4	8	9	S
NDMN07- B322BG1	UM-Thill	2	6	9	9	S
NDMN07- B324BG1	UM-Thill	2	6	8	9	S
NDMN07- B326BG1	UM-Thill	3	7	9	9	S
NDMN07- B330BG1	UM-Thill	3	7	9	9	S

NDMN07- GF040BG1	UM-Thill	2	7	9	9	S
NDMN07- GF056BG1	UM-Thill	5	8	9	9	S
NDMN07- GF059WG1	UM-Thill	2	3	7	9	S
NDMN07- GF066BG1	UM-Thill	4	9	9	9	S
NDMN07- GF071BG1	UM-Thill	3	5	8	9	S
NDMN07- GF080BG1	UM-Thill	3	8	9	9	S
NDMN07- GF092BG1	UM-Thill	2	6	9	9	S
NDMN07- GF106BG1	UM-Thill	2	4	6	9	S
NDMN07- GF136BG1	UM-Thill	4	8	9	9	S
NDMN07- GF150BG1	UM-Thill	4	9	9	9	S
NDMN07- W146BG1	UM-Thill	4	7	9	9	S
NDMN07- W151BG1	UM-Thill	2	7	9	9	S
NDMN07- W152BG1	UM-Thill	2	6	9	9	S
NDMN07- W153BG1	UM-Thill	2	3	3	5	MR
NDMN07- W159BG1	UM-Thill	4	6	8	9	S
NDMN07- W160BG1	UM-Thill	3	6	7	9	S
NDMN07- W161BG1	UM-Thill	2	8	9	9	S
NDMN07- W162BG1	UM-Thill	3	7	8	9	S
NDMN07- W162WG1	UM-Thill	3	6	9	9	S
NDMN07- W173BG1	UM-Thill	4	8	9	9	S
NDMN07- W180WG1	UM-Thill	2	5	7	8	S
NDMN07- W184WG1	UM-Thill	3	5	8	9	S
NDMN07- W186WG1	UM-Thill	2	8	9	9	S

NDMN07- W187BG1	UM-Thill	4	7	9	9	S
NorValley	UM-Thill	3	8	9	9	S
NorValley	UM-Thill	2	7	8	9	S
OR03029-2	National	2	3	3	5	MR
OR03029-2	National	2	3	4	6	MS
OR03029-2	National	3	3	6	7	MS
ORMN07- B257BG1	UM-Thill	3	6	9	9	S
ORMN07- B258BG1	UM-Thill	3	6	9	9	S
ORMN07- B260WG1	UM-Thill	2	5	9	9	S
ORMN07- GF008BG1	UM-Thill	4	8	9	9	S
ORMN07- GF011BG1	UM-Thill	2	6	9	9	S
ORMN07- GF014BG1	UM-Thill	3	7	9	9	S
ORMN07- W125BG1	UM-Thill	2	4	8	9	S
ORMN07- W125WG1	UM-Thill	3	8	9	9	S
ORMN07- W127WG1	UM-Thill	3	7	8	9	S
ORMN07- W128BG1	UM-Thill	2	7	8	9	S
Owyhee (AO96160-3)	National	3	5	8	9	S
Owyhee (AO96160-3)	National	2	5	8	9	S
Owyhee (AO96160-3)	National	3	5	8	9	S
Patagonia	National	2	3	4	5	MR
Patagonia	National	2	3	4	6	MS
Patagonia	National	2	3	4	6	MS
R. Burbank	UM-Thill	2	6	7	9	S
R. Burbank	UM-Thill	2	5	8	9	S
R. Norkotah	UM-Thill	5	8	9	9	S
R. Norkotah	UM-Thill	3	7	9	9	S
RB FILLER	UM-Thill	2	3	8	9	S
Red Lasoda (RB FILLER)	UM-Thill	2	3	7	9	S
Red Lasoda (RB FILLER)	UM-Thill	2	6	7	9	S

Red Norland	UM-Thill	4	8	9	9	S
Red Norland	UM-Thill	3	8	9	9	S
Sage (AO06164-1)	National	4	6	8	9	S
Sage (AO06164-1)	National	2	4	8	9	S
Sage (AO06164-1)	National	2	5	7	9	S
Shepody	UM-Thill	2	7	8	9	S
Shepody	UM-Thill	2	6	8	9	S
W2978-3	NCR	4	7	9	9	S
W2978-3	NCR	3	7	9	9	S
W5015-12	NCR	2	3	6	7	MS
W5015-12	NCR	2	4	6	7	MS
W5767-1R	NCR	3	5	8	9	S
W5767-1R	NCR	2	5	8	9	S
WIMN 04844-01	UM-Thill	2	6	7	9	S
WIMN 04844-01	UM-Thill	2	5	9	9	S
WIMN 04844-03	UM-Thill	3	6	8	8	S
WIMN 04844-03	UM-Thill	2	6	8	9	S
WIMN 04844-06	UM-Thill	2	5	9	9	S
WIMN 04844-06	UM-Thill	3	7	9	9	S
WIMN 04844-07	UM-Thill	4	9	9	9	S
WIMN 04855-02	UM-Thill	3	4	8	9	S
WIMN 04855-02	UM-Thill	2	5	8	9	S
WIMN 06002-02	UM-Thill	2	6	9	9	S
WIMN 06002-02	UM-Thill	3	7	9	9	S
WIMN 06030-01	UM-Thill	4	9	9	9	S
WIMN 06030-01	UM-Thill	4	9	9	9	S
WIMN 06035-01	UM-Thill	3	8	9	9	S
WIMN 06035-01	UM-Thill	3	8	9	9	S
WIMN 06057-03	UM-Thill	3	7	8	9	S
WV4992-1/Filler	NCR	2	4	7	9	S
WV4992-1/Filler	NCR	2	4	7	9	S
WV5843-6/Filler	NCR	3	5	8	9	S
WV5843-6/Filler	NCR	2	4	7	9	S
Y. Gold	UM-Thill	3	8	9	9	S
Y. Gold	UM-Thill	4	8	9	9	S
Yukon Gem (NDA5507-3Y)	National	2	4	6	7	MS
Yukon Gem (NDA5507-3Y)	National	2	4	6	7	MS
Yukon Gem (NDA5507-3Y)	National	2	5	7	8	S

(B) Common Scab: Disease severity and coverage scores for entries for 2009

Clone	Source	Severity Score	Coverage	Resistance Category
A0008-1TE	National Scab Trial	1	L	MR
A0008-1TE	National Scab Trial	1	T	MR
A0008-1TE	National Scab Trial	1	T	MR
A00286-3Y	National Scab Trial	3	M	MS
A00286-3Y	National Scab Trial	4	H	S
A00286-3Y	National Scab Trial	5	H	S
AC99375-1RU	National Scab Trial	2	T	MR
AC99375-1RU	National Scab Trial	3	T	MS
AC99375-1RU	National Scab Trial	4	H	S
AF2497-2	National Scab Trial	3	H	MS
AF2497-2	National Scab Trial	4	H	S
AF2497-2	National Scab Trial	5	M	S
AF2936-2	National Scab Trial	4	T	S
AF2936-2	National Scab Trial	5	H	S
AF2936-2	National Scab Trial	5	H	S
AF3000-1	National Scab Trial	2	L	MR
AF3000-1	National Scab Trial	4	H	S
AF3000-1	National Scab Trial	4	M	S
AOMN 03178-2	UM Potato Breeding	3	L	MS
AOMN 03178-2	UM Potato Breeding	4	H	S
AOMN 041101-01	UM Potato Breeding	3	L	MS
AOMN 041101-01	UM Potato Breeding	4	H	S
AOMN 06077-01	UM Potato Breeding	4	H	S
AOMN 06077-01	UM Potato Breeding	4	L	S
AOMN 06077-03	UM Potato Breeding	4	H	S
AOMN 06077-03	UM Potato Breeding	4	M	S
AOMN 06107-01	UM Potato Breeding	2	H	MR
AOMN 06107-01	UM Potato Breeding	2	T	MR
AOMN 06118-01	UM Potato Breeding	1	T	MR
AOMN 06118-01	UM Potato Breeding	2	L	MR
AOMN 06126-02	UM Potato Breeding	5	H	S
AOMN 06126-02	UM Potato Breeding	5	H	S
AOMN 06131-01	UM Potato Breeding	5	H	S
AOMN 06131-01	UM Potato Breeding	5	L	S
AOMN 06147-05	UM Potato Breeding	3	M	MS
AOMN 06147-05	UM Potato Breeding	4	H	S
AOMN 06150-02	UM Potato Breeding	3	L	MS
AOMN 06150-02	UM Potato Breeding	5	L	S

AOMN 06153-01 S.D.	UM Potato Breeding	5	H	S
AOMN 06153-01 S.D.	UM Potato Breeding	5	M	S
AOMN 06156-02	UM Potato Breeding	0	0	R
AOMN 06156-02	UM Potato Breeding	3	H	MS
AOMN 06162-02	UM Potato Breeding	1	T	MR
AOMN 06162-02	UM Potato Breeding	2	M	MR
AOMN 06174-01 S.D.	UM Potato Breeding	4	H	S
AOMN 06174-01 S.D.	UM Potato Breeding	4	T	S
Atlantic	National Scab Trial	5	H	S
Atlantic	National Scab Trial	4	H	S
Atlantic	National Scab Trial	5	H	S
ATMN 03505-3	UM Potato Breeding	3	M	MS
ATMN 03505-3	UM Potato Breeding	4	L	S
ATND98459-1RY	North Central Region	4	H	S
ATND98459-1RY	North Central Region	4	M	S
B1992-106	National Scab Trial	2	L	MR
B1992-106	National Scab Trial	2	T	MR
B1992-106	National Scab Trial	4	L	S
BNC49-1	National Scab Trial	1	T	MR
BNC49-1	National Scab Trial	4	H	S
BNC49-1	National Scab Trial	5	H	S
CO98012-5R	National Scab Trial	5	H	S
CO98012-5R	National Scab Trial	5	L	S
CO98012-5R	National Scab Trial	5	M	S
CO98067-7RU	National Scab Trial	2	T	MR
CO98067-7RU	National Scab Trial	2	T	MR
CO98067-7RU	National Scab Trial	3	L	MS
CO98368-2RU	National Scab Trial	4	H	S
CO98368-2RU	National Scab Trial	4	H	S
CO98368-2RU	National Scab Trial	4	M	S
COMN 03021-1	UM Potato Breeding	2	T	MR
COMN 03021-1	UM Potato Breeding	4	H	S
COMN 03024-6	UM Potato Breeding	2	M	MR
COMN 03024-6	UM Potato Breeding	4	L	S
COMN 03027-1	UM Potato Breeding	5	H	S
COMN 03027-1	UM Potato Breeding	5	H	S
COMN 04674-02	UM Potato Breeding	4	H	S
COMN 04674-02	UM Potato Breeding	4	H	S
COMN 04692-10	UM Potato Breeding	2	L	MR

COMN 04692-10	UM Potato Breeding	4	M	S
COMN 04697-02	UM Potato Breeding	4	H	S
COMN 04702-03	UM Potato Breeding	4	H	S
COMN 04702-03	UM Potato Breeding	4	H	S
COMN 06332-01	UM Potato Breeding	4	H	S
COMN 06332-01	UM Potato Breeding	5	M	S
COMN 06344-03	UM Potato Breeding	4	H	S
COMN 06344-03	UM Potato Breeding	5	H	S
COMN 06353-04	UM Potato Breeding	5	H	S
COMN 06353-04	UM Potato Breeding	5	H	S
COMN 06358-02	UM Potato Breeding	2	L	MR
COMN 06358-02	UM Potato Breeding	2	L	MR
COMN 06360-01	UM Potato Breeding	3	H	MS
COMN 06360-01	UM Potato Breeding	5	H	S
COMN 06363-01	UM Potato Breeding	2	L	MR
COMN 06363-01	UM Potato Breeding	3	L	MS
COMN 06379-02	UM Potato Breeding	3	M	MS
COMN 06379-02	UM Potato Breeding	4	H	S
COMN 06392-01	UM Potato Breeding	3	H	MS
COMN 06392-01	UM Potato Breeding	4	M	S
COMN 06393-01	UM Potato Breeding	3	H	MS
COMN 06393-01	UM Potato Breeding	4	H	S
COMN 06433-01	UM Potato Breeding	2	L	MR
COMN 06433-01	UM Potato Breeding	5	H	S
COMN 06438-02	UM Potato Breeding	5	H	S
COMN 06438-02	UM Potato Breeding	5	M	S
COMN 06471-02	UM Potato Breeding	3	M	MS
COMN 06471-02	UM Potato Breeding	5	H	S
COMN07-B021WG1	UM Potato Breeding	4	H	S
COMN07-B023BG1	UM Potato Breeding	3	H	MS
COMN07-B025BG1	UM Potato Breeding	3	M	MS
COMN07-B028BG1	UM Potato Breeding	4	M	S
COMN07-B035BG1	UM Potato Breeding	4	T	S
COMN07-B041BG1	UM Potato Breeding	5	H	S
COMN07-B047BG1	UM Potato Breeding	5	H	S
COMN07-B050BG1	UM Potato Breeding	4	M	S
COMN07-B051BG1	UM Potato Breeding	3	L	MS
COMN07-B052BG1	UM Potato Breeding	2	L	MR
COMN07-B061BG1	UM Potato Breeding	2	H	MR
COMN07-B062BG1	UM Potato Breeding	1	L	MR
COMN07-B063BG1	UM Potato Breeding	5	H	S
COMN07-B071BG1	UM Potato Breeding	5	H	S
COMN07-B083BG1	UM Potato Breeding	4	L	S

COMN07-B084BG1	UM Potato Breeding	4	M	S
COMN07-B087BG1	UM Potato Breeding	4	M	S
COMN07-B095BG1	UM Potato Breeding	3	H	MS
COMN07-B117BG1	UM Potato Breeding	5	H	S
COMN07-B123WG1	UM Potato Breeding	1	L	MR
COMN07-B128WG1	UM Potato Breeding	5	H	S
COMN07-B132BG1	UM Potato Breeding	2	L	MR
COMN07-B134BG1	UM Potato Breeding	5	M	S
COMN07-B141BG1	UM Potato Breeding	5	L	S
COMN07-B142BG1	UM Potato Breeding	4	H	S
COMN07-B143BG1	UM Potato Breeding	4	T	S
COMN07-B144BG1	UM Potato Breeding	1	T	MR
COMN07-B149BG1	UM Potato Breeding	3	T	MS
COMN07-B151BG1	UM Potato Breeding	5	H	S
COMN07-B153BG1	UM Potato Breeding	5	L	S
COMN07-B182BG1	UM Potato Breeding	5	H	S
COMN07-B182WG1	UM Potato Breeding	5	H	S
COMN07-B183WG1	UM Potato Breeding	4	M	S
COMN07-B186WG1	UM Potato Breeding	5	M	S
COMN07-B196BG1	UM Potato Breeding	5	L	S
COMN07-B198BG1	UM Potato Breeding	5	M	S
COMN07-B211WG1	UM Potato Breeding	4	H	S
COMN07-B212BG1	UM Potato Breeding	4	M	S
COMN07-B214BG1	UM Potato Breeding	5	H	S
COMN07-B216BG1	UM Potato Breeding	5	H	S
COMN07-B217BG1	UM Potato Breeding	5	L	S
COMN07-B218BG1	UM Potato Breeding	5	H	S
COMN07-B228WG1	UM Potato Breeding	5	M	S
COMN07-B229BG1	UM Potato Breeding	4	M	S
COMN07-B229WG1	UM Potato Breeding	3	L	MS
COMN07-B248WG1	UM Potato Breeding	4	H	S
COMN07- GF169WG1	UM Potato Breeding	2	L	MR
COMN07- GF170WG1	UM Potato Breeding	5	H	S
COMN07-GF173BG1	UM Potato Breeding	4	H	S
COMN07- GF174WG1	UM Potato Breeding	5	H	S
COMN07-GF176BG1	UM Potato Breeding	4	H	S
COMN07-GF179BG1	UM Potato Breeding	3	L	MS
COMN07- GF180WG1	UM Potato Breeding	4	L	S
COMN07-GF188BG1	UM Potato Breeding	5	H	S

COMN07-GF193BG1	UM Potato Breeding	4	T	S
COMN07-GF198BG1	UM Potato Breeding	4	L	S
COMN07-GF203BG1	UM Potato Breeding	2	L	MR
COMN07-GF205BG1	UM Potato Breeding	5	T	S
COMN07-GF206BG1	UM Potato Breeding	2	L	MR
COMN07-GF216BG1	UM Potato Breeding	4	L	S
COMN07-GF222WG1	UM Potato Breeding	3	M	MS
COMN07-GF271BG1	UM Potato Breeding	3	H	MS
COMN07-GF286BG1	UM Potato Breeding	5	L	S
COMN07-GF299BG1	UM Potato Breeding	5	M	S
COMN07-GF299WG1	UM Potato Breeding	5	H	S
COMN07-GF307BG1	UM Potato Breeding	5	H	S
COMN07-GF307WG1	UM Potato Breeding	5	M	S
COMN07-GF310BG1	UM Potato Breeding	3	H	MS
COMN07-W034WG1	UM Potato Breeding	3	L	MS
COMN07-W048BG1	UM Potato Breeding	5	M	S
COMN07-W065WG1	UM Potato Breeding	5	L	S
COMN07-W067BG1	UM Potato Breeding	1	T	MR
COMN07-W073BG1	UM Potato Breeding	4	M	S
COMN07-W080BG1	UM Potato Breeding	3	M	MS
COMN07-W082WG1	UM Potato Breeding	5	H	S
COMN07-W109BG1	UM Potato Breeding	5	M	S
COMN07-W112BG1	UM Potato Breeding	5	H	S
COMN07-W203BG1	UM Potato Breeding	4	L	S
CV01238-3	North Central Region	4	H	S
CV01238-3	North Central Region	4	H	S
CV99073-1	North Central Region	4	H	S
CV99073-1	North Central Region	5	M	S
Dk. red Norland	UM Potato Breeding	3	L	MS
Dk. red Norland	UM Potato Breeding	4	M	S
Missaukee (MSJ461-1)	North Central Region	4	H	S
Missaukee (MSJ461-1)	North Central Region	5	L	S
MN 00467-4	UM Potato Breeding	2	M	MR
MN 00467-4	UM Potato Breeding	3	L	MS
MN 02 419	UM Potato Breeding	4	H	S
MN 02 419	UM Potato Breeding	5	H	S
MN 02 467	North Central Region	1	T	MR
MN 02 467	North Central Region	5	H	S
MN 02 574	UM Potato Breeding	5	H	S

MN 02 574	UM Potato Breeding	5	L	S
MN 02 582	UM Potato Breeding	4	H	S
MN 02 582	UM Potato Breeding	5	H	S
MN 02 586	UM Potato Breeding	4	H	S
MN 02 586	UM Potato Breeding	5	H	S
MN 02 588	UM Potato Breeding	3	L	MS
MN 02 588	UM Potato Breeding	5	H	S
MN 02 598	UM Potato Breeding	5	H	S
MN 02 598	UM Potato Breeding	5	M	S
MN 02 616	North Central Region	3	T	MS
MN 02 616	North Central Region	5	L	S
MN 05001-016	UM Potato Breeding	3	L	MS
MN 05001-016	UM Potato Breeding	5	L	S
MN 05001-033	UM Potato Breeding	5	H	S
MN 05001-033	UM Potato Breeding	5	H	S
MN 05001-074	UM Potato Breeding	5	H	S
MN 05001-074	UM Potato Breeding	5	M	S
MN 05001-124	UM Potato Breeding	4	H	S
MN 061788-01	UM Potato Breeding	5	H	S
MN 061788-01	UM Potato Breeding	5	M	S
MN 061910-03	UM Potato Breeding	3	T	MS
MN 061910-03	UM Potato Breeding	4	H	S
MN 15620	UM Potato Breeding	5	H	S
MN 15620	UM Potato Breeding	5	H	S
MN 18747	UM Potato Breeding	5	H	S
MN 18747	UM Potato Breeding	5	T	S
MN 19298	North Central Region	4	H	S
MN 19298	North Central Region	4	H	S
MN 96013-1	North Central Region	4	M	S
MN 96013-1	North Central Region	5	M	S
MN 96072-4	UM Potato Breeding	1	T	MR
MN 96072-4	UM Potato Breeding	4	L	S
MN 99380-1	UM Potato Breeding	3	L	MS
MN 99380-1	UM Potato Breeding	5	L	S
MN 99460-14	UM Potato Breeding	4	M	S
MN 99460-14	UM Potato Breeding	5	H	S
MSH228-6	National Scab Trial	3	H	MS
MSH228-6	National Scab Trial	3	L	MS
MSH228-6	National Scab Trial	3	L	MS
MSJ126-9Y	National Scab Trial	2	T	MR
MSJ126-9Y	National Scab Trial	4	L	S
MSJ126-9Y	National Scab Trial	4	M	S
MSL268-D	North Central Region	3	H	MS

MSL268-D	North Central Region	4	M	S
MSM171-A	North Central Region	4	H	S
MSM171-A	North Central Region	5	H	S
MSN170-A	National Scab Trial	3	H	MS
MSN170-A	North Central Region	3	L	MS
MSN170-A	National Scab Trial	4	H	S
MSN170-A	North Central Region	4	M	S
MSN170-A	National Scab Trial	4	M	S
MSQ070-1	National Scab Trial	3	H	MS
MSQ070-1	National Scab Trial	4	H	S
MSQ070-1	National Scab Trial	4	H	S
ND028842-1RY	North Central Region	5	H	S
ND028842-1RY	North Central Region	5	L	S
ND8304-2	North Central Region	5	M	S
ND8304-2	North Central Region	5	M	S
ND8305-1	North Central Region	5	H	S
ND8305-1	North Central Region	5	H	S
NDA7985-1R	National Scab Trial	2	L	MR
NDA7985-1R	National Scab Trial	3	M	MS
NDA7985-1R	National Scab Trial	3	T	MS
NDMN 03324-4	UM Potato Breeding	2	L	MR
NDMN 03324-4	UM Potato Breeding	4	L	S
NDMN 03376-1	UM Potato Breeding	4	H	S
NDMN 03376-1	UM Potato Breeding	4	L	S
NDMN 03382-2	UM Potato Breeding	1	L	MR
NDMN 03382-2	UM Potato Breeding	4	M	S
NDMN 04910-01	UM Potato Breeding	4	H	S
NDMN 04910-01	UM Potato Breeding	4	H	S
NDMN 04911-01	UM Potato Breeding	3	L	MS
NDMN 04911-01	UM Potato Breeding	4	H	S
NDMN 04916-01	UM Potato Breeding	3	H	MS
NDMN 04916-01	UM Potato Breeding	4	H	S
NDMN 04927-01	UM Potato Breeding	2	L	MR
NDMN 04927-01	UM Potato Breeding	2	M	MR
NDMN 04960-01	UM Potato Breeding	5	H	S
NDMN 04960-01	UM Potato Breeding	5	H	S
NDMN07-B167BG1	UM Potato Breeding	5	M	S
NDMN07-B277BG1	UM Potato Breeding	4	L	S
NDMN07-B302BG1	UM Potato Breeding	5	H	S
NDMN07-B303BG1	UM Potato Breeding	5	M	S
NDMN07-B309BG1	UM Potato Breeding	3	M	MS
NDMN07-B311BG1	UM Potato Breeding	5	M	S
NDMN07-B312BG1	UM Potato Breeding	3	M	MS

NDMN07-B316WG1	UM Potato Breeding	2	L	MR
NDMN07-B318WG1	UM Potato Breeding	5	L	S
NDMN07-B319BG1	UM Potato Breeding	5	M	S
NDMN07-B322BG1	UM Potato Breeding	5	H	S
NDMN07-B324BG1	UM Potato Breeding	5	M	S
NDMN07-B326BG1	UM Potato Breeding	5	M	S
NDMN07-B330BG1	UM Potato Breeding	4	H	S
NDMN07-GF056BG1	UM Potato Breeding	5	M	S
NDMN07-GF056WG1	UM Potato Breeding	4	T	S
NDMN07-GF059WG1	UM Potato Breeding	2	M	MR
NDMN07-GF066BG1	UM Potato Breeding	5	M	S
NDMN07-GF071BG1	UM Potato Breeding	4	M	S
NDMN07-GF080BG1	UM Potato Breeding	5	H	S
NDMN07-GF092BG1	UM Potato Breeding	5	H	S
NDMN07-GF106BG1	UM Potato Breeding	4	H	S
NDMN07-GF136BG1	UM Potato Breeding	5	M	S
NDMN07-GF150BG1	UM Potato Breeding	2	L	MR
NDMN07-GF168WG1	UM Potato Breeding	5	H	S
NDMN07-W146BG1	UM Potato Breeding	5	H	S
NDMN07-W152BG1	UM Potato Breeding	4	H	S
NDMN07-W153BG1	UM Potato Breeding	3	H	MS
NDMN07-W159BG1	UM Potato Breeding	5	H	S
NDMN07-W161BG1	UM Potato Breeding	5	L	S
NDMN07-W162WG1	UM Potato Breeding	1	L	MR
NDMN07-W180WG1	UM Potato Breeding	4	H	S
NDMN07-W181WG1	UM Potato Breeding	4	M	S
NDMN07-W184WG1	UM Potato Breeding	4	H	S
NDMN07-W186WG1	UM Potato Breeding	3	T	MS
NDMN07-W187BG1	UM Potato Breeding	5	H	S
NorValley	UM Potato Breeding	4	H	S
NorValley	UM Potato Breeding	5	M	S
ORMN07-B257BG1	UM Potato Breeding	3	M	MS
ORMN07-B258BG1	UM Potato Breeding	5	M	S

ORMN07-B260WG1	UM Potato Breeding	5	M	S
ORMN07-GF011BG1	UM Potato Breeding	4	H	S
ORMN07-GF014BG1	UM Potato Breeding	4	M	S
ORMN07-W125BG1	UM Potato Breeding	5	M	S
ORMN07-W125WG1	UM Potato Breeding	5	H	S
ORMN07-W127WG1	UM Potato Breeding	5	H	S
ORMN07-W128BG1	UM Potato Breeding	4	L	S
ORMN07-W129WG1	UM Potato Breeding	4	H	S
PA00N14-2	National Scab Trial	1	T	MR
PA00N14-2	National Scab Trial	2	M	MR
PA00N14-2	National Scab Trial	2	T	MR
R. Norkotah	UM Potato Breeding	4	M	S
R. Norkotah	UM Potato Breeding	5	H	S
Ranger Russet	National Scab Trial	4	H	S
Ranger Russet	National Scab Trial	4	H	S
Ranger Russet	National Scab Trial	5	M	S
Red LaSoda	UM Potato Breeding	5	L	S
Red LaSoda	UM Potato Breeding	5	M	S
Red Norland	UM Potato Breeding	4	H	S
Red Norland	UM Potato Breeding	4	H	S
Russet Burbank	National Scab Trial	1	T	MR
Russet Burbank	National Scab Trial	2	T	MR
Russet Burbank	National Scab Trial	2	T	MR
Shepody	UM Potato Breeding	4	H	S
Shepody	UM Potato Breeding	5	H	S
Superior	National Scab Trial	3	L	MS
Superior	National Scab Trial	4	M	S
Superior	National Scab Trial	5	L	S
W2978-3	North Central Region	4	H	S
W2978-3	North Central Region	5	M	S
W5015-12	North Central Region	3	M	MS
W5015-12	North Central Region	5	H	S
W5767-1R	North Central Region	4	L	S
W5767-1R	North Central Region	5	H	S
WIMN 04844-01	UM Potato Breeding	4	H	S
WIMN 04844-01	UM Potato Breeding	4	L	S
WIMN 04844-03	UM Potato Breeding	5	M	S
WIMN 04844-06	UM Potato Breeding	3	H	MS
WIMN 04844-06	UM Potato Breeding	4	H	S
WIMN 04855-02	UM Potato Breeding	1	T	MR
WIMN 04855-02	UM Potato Breeding	3	H	MS
WIMN 06002-02	UM Potato Breeding	3	M	MS
WIMN 06002-02	UM Potato Breeding	4	T	S

WIMN 06030-01	UM Potato Breeding	5	M	S
WIMN 06030-01	UM Potato Breeding	5	M	S
WIMN 06035-01	UM Potato Breeding	5	H	S
WIMN 06035-01	UM Potato Breeding	5	H	S
WV4992-1	North Central Region	5	H	S
WV4992-1	North Central Region	5	H	S
WV5843-6	North Central Region	5	H	S
WV5843-6	North Central Region	5	L	S
Y. Gold	UM Potato Breeding	4	H	S
Y. Gold	UM Potato Breeding	5	H	S