Vineyards and Grapes of the North

A STATUS REPORT

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March 2013

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NORTHERN GRAPES PROJECT

Successful viticulture research programs focused on the development of cold-hardy grapes promoted the emergence of a new industry in states where grape growing and local wine making had previously been limited. Grape growers and wineries in these states, spanning from Nebraska in the west to New York in east, have rapidly adapted the new grape cultivars. As the number of vineyards has exploded, so has the number of wineries producing wines from these locally-grown grapes. The new industry faces challenges to production, marketing, and sales. These challenges are being addressed by the Northern Grapes Project. The Northern Grapes Project is funded by USDA’s Specialty Crops Research Initiative Program of the National Institute of Food and Agriculture, project number 2011-51181-30850.

The Northern Grapes Project brings together researchers, Extension specialists, and industry professionals from 13 states to address viticulture, enological, business management, and marketing issues related to growing cold hardy grapes and producing wines made from these grapes.

According to the grant application, after five years, the project teams intend to have accomplished the following goals: 1) production and sales of wines made from cold climate cultivars will have doubled, 2) improved quality resulting from better growing and winemaking practices will have improved customer retention and driven repeat sales, 3) enhanced breeding and cultivar evaluation will have resulted in an accelerated pace of cultivar release, 4) cold climate cultivars will establish unique regional marketing identities in their area, 5) wineries will have understood and applied business and tasting room management practices that drive sales and profitability, and 6) wineries and vineyards will have successfully transitioned from “startup” to “sustainably profitable.”

To measure progress on these goals, one of the first tasks of the project team was to conduct a baseline survey. This survey, sent to grape growers and wineries in the participating states, gathered data on the current status of the grape and wine industry in general and on cold-hardy grape and wine production, specifically. Questions were asked pertaining to sales and production (wineries and vineyards), growing practices (vineyards), and operating practices (wineries). This report deals with vineyards. A report on wineries can be found at:

VINEYARDS AND GRAPES OF THE NORTH: A SUMMARY

• The Northern Grapes Project brings together researchers, Extension specialists, and industry professionals from 13 states to address viticulture, enological, business management, and marketing issues related to growing cold hardy grapes and producing wines from these grapes.

• In spring 2012, grape growers and winery owners in 13 states were surveyed. Questions asked pertained to sales and production (wineries and vineyards), growing practices (vineyards), and operating practices (wineries). The goal was to establish an industry baseline. In total, 345 vineyards provided full answers to the surveys.

• The grape growing industry in the Northern Grapes states has experienced rapid growth. Only one in five vineyards existed prior to 2002. One in three started since 2007. Vineyards need four years to reach full maturity. Vines planted after 2007 may not have reached full production capacity. There is also some evidence that new vineyard establishment is beginning to taper off although existing vineyards are intending to increase total acreage devoted to growing wine grapes.

• According to our analysis, there are 20,900 acres planted in grape vines in the participating states. Survey results show that 28 percent, or 5,900, are of the cold-hardy varietals identified in this study.

• Survey results, extrapolated to all growers, reveal grape growers in the participating states produced 72,000 tons of fruit in 2011.

• In total, vineyards in participating states spent $45.1 million in 2011. Of this, $26.0 million was on operating expenses and $19.4 million on capital expenditures.

• Forty-percent of vineyards did not use paid labor in 2011. As vineyards mature, this may not be sustainable.

• The most common marketing arrangement for vineyards was to sell via contract with a winery. Most vineyards sold their fruit as whole berries.

• Approximately half of the vineyards plan to maintain their current size for the next 2 years, half plan to expand, and a small minority (2 percent) plan to decrease or eliminate their vineyard.

• Vineyards indicate that disease and pest/insects are the greatest challenges to the growth and development of their vineyards.

• The number of vines planted by responding vineyards has doubled in the last four years. The Marquette grape is wildly popular (39% of all red cultivars) and has shown substantial growth in the number of recent plantings.
GRAPE GROWING: BASELINE SURVEY RESULTS

An early task of the Northern Grapes Project was to establish a baseline for the grape growing and winery industry in the participating states. This baseline will be used to measure changes in the industry over the period of the project. This report will detail the results of the baseline survey for grape growers in the participating Northern Grapes Project states.

Survey Methodology and Response Rates

In early 2012, project researchers at the University of Minnesota sent a survey to grape growers and wineries in the participating states. Grower and winery lists were provided to the University of Minnesota by industry associations in each state (see appendix 1 for a list of participating associations). An email was sent to all members of these lists, resulting in 2,746 invitations to participate in the survey. Of these, 501 responded, for an overall response rate of 18 percent. In addition, links to the survey were available allowing individual growers and wineries not directly associated with an industry group, and thus not receiving a direct email invitation, to participate in the survey. These links were also announced during the Northern Grapes Project webinars. The survey links generated 110 responses. Therefore, in total, there were 611 total responses to the survey.

Table 1-1 lists the participating states, the number of wineries and growers invited based on the industry association lists, the number of respondents using the open links, and the response rate. Minnesota has the highest membership totals.1 South Dakota had the highest response rate.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Number of Contacts from Industry Associations</th>
<th>Number of Responses</th>
<th>Response Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>32</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Illinois</td>
<td>272</td>
<td>52</td>
<td>19%</td>
</tr>
<tr>
<td>Iowa</td>
<td>222</td>
<td>66</td>
<td>30%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>28</td>
<td>10</td>
<td>36%</td>
</tr>
<tr>
<td>Michigan</td>
<td>164</td>
<td>36</td>
<td>22%</td>
</tr>
<tr>
<td>Minnesota</td>
<td>1,012</td>
<td>167</td>
<td>17%</td>
</tr>
<tr>
<td>North Dakota</td>
<td>54</td>
<td>14</td>
<td>26%</td>
</tr>
<tr>
<td>Nebraska</td>
<td>172</td>
<td>46</td>
<td>27%</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>51</td>
<td>14</td>
<td>27%</td>
</tr>
<tr>
<td>New York</td>
<td>202</td>
<td>32</td>
<td>16%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>14</td>
<td>11</td>
<td>79%</td>
</tr>
</tbody>
</table>

1 The Minnesota Grape Growers Association has a national reputation for its industry knowledge; therefore, many members of the association grow in neighboring states. Responses were categorized by state the grower or winery owner indicated as the state in which their operation is located.
Not all of the survey responses were applicable to the baseline survey. Association memberships are generally open to all interested parties and therefore membership lists include individuals who may be considering grape growing or producing wine, or individuals who previously grew grapes or produced wines. The lists may also contain people associated with the industry in other capacities than growing and wine-making. Knowing this, the survey was designed to capture basic information on these individuals, even if they did not complete the full survey.

The first survey question asked “Are you associated with....1) a vineyard (past, present, or future), 2) a winery, 3) both, or 4) other. Those responding “other” were directed to the end of the survey. Thirty-eight respondents selected the “other” response.

Those responding “vineyard (past, present, or future)” were asked a follow-up question. Survey takers who indicated they grew grapes in the past or planned to grow grapes in the future were directed to the end of the survey. Twenty-three respondents are not currently growing.

The focus of the Northern Grapes Project is on commercial scale grape growers and wineries. Thus, grape growers were asked “Do you grow grapes for commercial sale or use? If you grow grapes exclusively for use in your own winery, answer yes”. Those responding “no” were directed to answer a series of questions about the size of their vineyard and then directed to the end of the survey. Seventy-three respondents indicated they were not commercial growers.

Finally, thirty-five responses were dropped because they did not answer enough of the questions to provide useful information. Table 1-2 shows how the responses were divided by these categories.

<table>
<thead>
<tr>
<th>Table 1-2: Calculation of Total Useable Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Responses</td>
</tr>
<tr>
<td>Non-Growers or Non-Winery Owners</td>
</tr>
<tr>
<td>Not Currently Growing Grapes</td>
</tr>
<tr>
<td>Non-Commercial Growers</td>
</tr>
<tr>
<td>Incomplete Responses</td>
</tr>
<tr>
<td>Useable Responses</td>
</tr>
</tbody>
</table>

Survey participants could be vineyard operators, winery operators, or operators of a joint vineyard-winery business (see chart 1-1). Over half (56 percent) of survey respondents operate a vineyard only. Among winery owners, it is more common to operate a combination of a winery-vineyard operation, with over one-third (35 percent) of survey respondents reporting this arrangement. Only 9 percent of wineries are operated independently of a vineyard. In total, the survey includes 193 wineries and 403 vineyards.
Vineyard Characteristics

Of the 442 total useable survey responses, 403 indicated they owned and operated a vineyard. Unfortunately, not all vineyard owners answered the full-slate of survey questions. There were 345 vineyards that answered the majority of the questions.

Table 1-3 lists vineyard respondents by state. Minnesota had the highest number of participating vineyards with 104 responses. Connecticut and Maine each only had 3 vineyards complete the survey.

<table>
<thead>
<tr>
<th>Table 1-3: In What State Is Your Vineyard Located?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
</tr>
<tr>
<td>Illinois</td>
</tr>
<tr>
<td>Iowa</td>
</tr>
<tr>
<td>Maine</td>
</tr>
<tr>
<td>Massachusetts</td>
</tr>
<tr>
<td>Michigan</td>
</tr>
<tr>
<td>Minnesota</td>
</tr>
<tr>
<td>Nebraska</td>
</tr>
<tr>
<td>New Hampshire</td>
</tr>
<tr>
<td>New York</td>
</tr>
</tbody>
</table>
The Northern Grapes Project baseline survey results reinforce the observed trend of rapid growth in the grape growing industry in the participating states (see chart 1-2). The five-year period from 2002 to 2007 appears to be the peak growth period, with 44 percent of responding vineyards having been started in this time period. One in three responding vineyards has started since 2007. Only one in five vineyards existed prior to 2002. These trends have important implications for the industry. Typically, a vineyard does not reach full production capacity until year 4. Vines planted after 2007 are only now reaching maturity and yielding to their full potential. While too early to discern, the survey may indicate that vineyard industry growth is beginning to taper even while increased grape production continues.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td>6</td>
</tr>
<tr>
<td>South Dakota</td>
<td>6</td>
</tr>
<tr>
<td>Vermont</td>
<td>12</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>55</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>345</td>
</tr>
</tbody>
</table>

### Chart 1-2: Year of Vineyard Establishment  
**n=342**

- **Prior to 2002**: 20%
- **After 2007**: 36%
- **2002-2007**: 44%

In addition to new vineyards being established, current vineyards continue to expand their planted acreage. Fifty-three percent of responding vineyards indicated they had planted additional acreage since the original founding of their vineyard, chart 1-3.
The majority of responding vineyards (53 percent) are less than 2.0 acres in size, as shown in chart 1-4. Just under one-quarter (22 percent) of the vineyards reported having more than 5 acres planted in grapes. The largest responding vineyard had over 100 acres planted. Most of the larger vineyards (more than 5 acres) were in the range of 10 to 20 acres.

Our survey results, extrapolated out to the entire population of vineyards, indicate there are 20,900 acres planted in grape vines in the participating states. Survey results show that 28 percent, or 5,900 acres, of the planted vines are of the cold-hardy varieties defined in this study. The varieties classified as “cold-hardy” for purposes of this report are listed in appendix two.
Vineyard production reflects the age of vineyards and the size of vineyards in the survey population, see chart 1-5. Nearly one-third (30 percent) of the vineyards surveyed indicated they did not produce any fruit in 2011. As depicted in chart 1-3, 36 percent of vineyards were planted after 2007, which means they likely have not reached maturity yet. Therefore, it is not surprising they have not produced harvestable fruit. Survey respondents also indicated a lack of fruit production due to weather conditions (drought, early frost, etc.), insects, or other pests.

Survey results, extrapolated to represent all growers in the states, reveal grape growers produced 72,000 tons of fruit in 2011. Average yield was 3.5 tons per acre.
The average participating vineyard has just over 2,000 planted vines. Nearly one-third (31 percent) of vineyards have 1,001 to 3,000 vines in the ground, as shown in chart 1-6.
Vineyard Operations

The majority (74 percent) of vineyards operate as stand-alone agricultural enterprises (see chart 1-7). Over one-quarter of vineyards participating in the survey operate as a secondary agricultural operation.

Chart 1-7: Vineyard the Primary Agricultural Enterprise?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>74%</td>
<td>26%</td>
</tr>
</tbody>
</table>

n=342

Among grape growers for whom the vineyard is a secondary operation, the majority are engaged in traditional farming, including row cropping and animal husbandry, as shown in chart 1-8. Fruit farmers, whose primary crop is not grapes, also run vineyards as side operations.
Only seven of the responding vineyards, or less than 2 percent, operate as a commercial nursery. They use only a small percentage of their total vineyard for nursery activities.

The average responding vineyard spent $10,500 on operations (including labor payments) in 2011. Operating expenses include fertilizers, fungicides, cover crops, water, fuel, overhead costs, marketing, and taxes. Responding vineyards also spent an average of $7,900 on capital investments, including trellis systems, tractors, crushers, pick-ups, ATV’s, and other equipment. Finally, vineyards reported that they spent an average of $5,000 per vineyard on labor expenditures.

In total, vineyards in the participating states spent $26.0 million on operating expenses (includes labor) and $19.4 million on capital expenditures. Vineyards spent $12.4 million on labor expenditures, see chart 1-9. Total expenditures were $45.4 million in 2011.
Of the 252 vineyards that responded to the question regarding labor expenditures, 90 (39 percent) reported no expenditures for labor, chart 1-10. This is primarily because the owner/operator did all the labor or the vineyard used volunteer or family labor to complete the vineyard tasks. As vineyards mature, this may not be sustainable, which will have implications for the industry.
As shown in Chart 1-11, the majority of labor for the responding vineyards was provided by the owner/operator (62 percent). Just over a quarter (27 percent) of labor was supplied by paid employees and 11 percent by volunteer laborers. In total, the responding vineyards required 258,000 hours of labor or approximately 1,200 hours per vineyard.

### Chart 1-11: Hours of Labor by Category

- **Owner/Operator**: 62%
- **Volunteer Labor**: 11%
- **Paid Labor**: 27%

**Marketing and Grape Utilization**

Grape growers in the survey favor contracts as the best method for marketing their grapes (chart 1-12). Growers were asked which market arrangements they used to sell their grapes. They could select more than one choice. The most commonly used method, selected by 94 growers, was to sell via a contract with a winery. Also commonly used were sales through their own winery and sales via networking. Only one grower indicated using a broker to sell their grapes.

There were 50 growers that indicated they used “other” methods to market their grapes. Not unexpectedly, given the percent of new vineyards that have not yet reached maturity, 31 of those “other” responses indicated they made no sales in 2011. Another common answer, mentioned by 9 respondents, was that they sold the grapes to a winery without any formal contract. Farmer’s markets and sales to individuals were also mentioned by multiple respondents as methods for selling grapes.
Growers that contract with wineries to market their grapes are interacting with the winery to make management decisions. Nearly three-fourths of growers indicated that the winery they sold to was active in management decisions in the vineyard, as shown in chart 1-13.

The most common arrangement for responding vineyards is to sell their grapes in a whole berry format (see chart 1-14). Nearly one-third sold their berries whole to an in-state winery. Another
quarter sold their grapes whole to their own winery. This reinforces the knowledge that grape growing and wineries are often local operations, working and contributing to the communities in which they are located. Only two percent of responding grape growers reported selling out of the state. Crop damage and loss (due to animal, insects, and weather) affected five percent of the growers surveyed.

Future Plans

Current grape growers appear to be optimistic about the future of their operations. Half of the responding growers plan to increase their acreage in the next two years. Another half plan to maintain their current size over the next two years. Only a few (6) intend to decrease their operations, chart 1-15.
Grape growers responding to the survey indicate that the biggest challenges to vineyard operations are disease and pests/insects, as depicted in chart 1-16. When asked to answer the question “the following is a challenge to the growth and development of my vineyard”, using a scale where 1 equals strongly disagree and 5 equals agree, grape growers gave disease an average score of 3.8 and pests/insects an average score of 3.7. Availability of labor and capital do not seem to be significant issues for the responding growers.
Cold-Hardy Grape Varieties

The responding vineyards reported 374,192 cold-hardy vines as planted in their vineyards. The majority of these cold hardy varieties (216,700) are red cultivars. The remaining vines (157,500) are white cultivars. Chart 1-17 depicts total reported planted vines of red varietals. Marquette grapes comprise 39 percent of the total planted red varieties. Frontenac and Marechal Foch comprise 26 percent and 11 percent respectfully. This chart illustrates the sheer popularity of the Marquette grape. This varietal is relatively new (released in 2006), so the fact that it is now almost 40 percent of all planted red varietals is remarkable.

Table 1-4 reports the number of reported planted red cultivar vines by age. These figures represent only what the vineyards who answered the survey reported. Responding vineyards reported 21,800 red cultivar vines are older than 10 years of age, 96,700 are between 4 years and 10 years of age, and 98,200 are younger than 4 years old. These figures again represent the rapid growth of the industry. Vines younger than 4 years of age have yet to reach maturity and produce a full crop. The reported results indicate that red cultivar grape production may nearly double in the next four years as those vines mature.

Further, the table reflects the rapid growth of the Marquette grape variety. Ten years ago, there were virtually no Marquette vines in the ground. Within the last four years, nearly 60,000 vines have been planted. The other prominent red varieties, Frontenac and Marechal Foch, have been planted in fewer numbers in recent years.
Chart 1-17: Total Planted Vines, Red Varieties

- Frontenac: 26%
- Marechal Foch: 11%
- Marquette: 39%
- St. Croix: 7%
- GR-7: 2%
- Sabrevois: 4%
- King of the North: 2%
- Petite Pearl: 2%
- Leon Millot: 2%
- Other: 5%

VINEYARDS: BASELINE SURVEY RESULTS
Survey results indicate there are 5,914 acres planted in cold-hardy grapes in the participating states. Based on the percentages of planted vines reported in the survey, 58 percent of the acres are planted in red varietals. Table 1-5 highlights estimated acreage of the red varieties based on the survey results. Acres are estimated as the survey did not record acres planted by variety.

### Table 1-5: Estimated Planted Acres of Red Varieties in All Participating States

<table>
<thead>
<tr>
<th>Variety</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltica</td>
<td>0.1</td>
</tr>
<tr>
<td>Beta</td>
<td>4.0</td>
</tr>
<tr>
<td>Frontenac</td>
<td>92.6</td>
</tr>
<tr>
<td>GR-7</td>
<td>7.5</td>
</tr>
<tr>
<td>King of the North</td>
<td>6.7</td>
</tr>
<tr>
<td>Leon Millot</td>
<td>6.2</td>
</tr>
<tr>
<td>Marechal Foch</td>
<td>41.1</td>
</tr>
</tbody>
</table>
Marquette 141.4
Petite Pearl 5.4
Sabrevois 13.1
St. Croix 25.1
Valiant 4.9
Other red Swenson 10.2
Total 358.2

Chart 1-18 illustrates the total planted vines of white varietals. La Crescent (23 percent) and Frontenac gris (19 percent) are most commonly planted by the reporting vineyards. Within the white cold-hardy cultivars, there is no clear favorite cultivar.

Table 1-5 lists the total reported planted vines of white cultivars. Responding vineyards report 11,000 vines older than 10 years in the ground, 73,200 vines of age between 4 and 10 years, and 73,200 vines younger than 4 years. As with the red varieties, it appears production of white cultivar grapes will nearly double in the next 4 years as the youngest grape vines reach maturity. Frontenac blanc, Petite Amie, and Frontenac gris varietals have shown the most rapid growth in the last ten years.
Survey results indicate there are 5,914 acres planted in cold-hardy grapes in the participating states. Based on the percentages of planted vines reported in the survey, 42 percent of the acres are planted in white varietals. Table 1-7 highlights estimated acreage of the white varieties based on the survey results. Acres are estimated as the survey did not record acres planted by variety.
### VINEYARDS: BASELINE SURVEY RESULTS

<table>
<thead>
<tr>
<th>Grape Variety</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Crescent</td>
<td>59.7</td>
</tr>
<tr>
<td>La Crosse</td>
<td>26.1</td>
</tr>
<tr>
<td>Louise Swenson</td>
<td>5.1</td>
</tr>
<tr>
<td>Petite Amie</td>
<td>4.3</td>
</tr>
<tr>
<td>Prairie Star</td>
<td>16.0</td>
</tr>
<tr>
<td>St. Pepin</td>
<td>21.0</td>
</tr>
<tr>
<td>Other white Swenson</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>260.3</strong></td>
</tr>
</tbody>
</table>

**Other Grape Varieties**

In addition to the cold-hardy grapes reported in the survey, grape growers in the participating states reported 171,299 vines of grapes of other varietals.
CONCLUSIONS AND IMPLICATIONS

The Northern Grapes Project brings together researchers, Extension specialists, and industry professionals from 13 states to address viticulture, enological, business management, and marketing issues related to growing cold hardy grapes and producing wines made from these grapes. A survey of vineyards and wineries in the participating states conducted by University of Minnesota has established a baseline for the industry in 2011. This report details the results of the vineyard and grapes baseline study.

There are 2,470 vineyards in the participating states with an estimated 20,900 acres planted in wine grapes. Of those acres, 5,900 are dedicated to cold-hardy wine grapes. Vineyards spent $45.1 million in 2011 for operations, capital improvements, and labor.

Our results lead us to several conclusions and potential implications for the vineyard and grape growing industry in the participating states, particularly in regards to the cold-hardy industry.

- **There are indications the rapid growth of vineyards may be diminishing.** There are signs in the survey results the rapid growth of the industry may be slowing slightly. Growth in the number of vineyards from 2007 to present is lower than growth in the previous period. Further, nearly half of vineyards plan to remain at their current size over the next two years. This does not mean growth will not continue but it may be at a slower rate. Growth also varies by state.

- **Winery tend to integrate with vineyards.** The most common arrangement is for a winery to own its own vineyard. Vineyards are more likely to be stand-alone operations.

- **Winery and vineyards are increasingly sophisticated in their interactions.** Use of contracts to purchase grapes is the most common marketing arrangement. Wineries that purchase grapes via contract are involved in management decisions in the vineyard.

- **Rapid growth in grapes on the market will continue.** Vines planted in the last four years account for nearly half of all planted vines. As these vines mature, production will increase dramatically.

- **The Marquette grape has been widely adopted.** Debuting in 2006, the Marquette grape now accounts for almost 40 percent of all red cultivar vines planted in participating states.

- **Vineyard management issues are of concern to grape growers.** Grape growers rate vineyard management issues, such as disease and pests/insects, as the biggest challenges to the growth and development of their vineyards.
APPENDIX ONE: PARTICIPATING INDUSTRY ASSOCIATIONS

The following industry associations/councils provided membership lists for the baseline and economic impact survey.

Connecticut Vineyard and Winery Association
Illinois Grape Growers and Vintners Association
Iowa Wine Growers Association
Lake Champlain Wines
Massachusetts Farm Wineries and Growers Association
Michigan Grape and Wine Industry Council
Minnesota Grape Growers Association
Nebraska Winery and Grape Growers Association
New Hampshire Winery Association
New York Wine and Grape Foundation
Northern Illinois Wine Growers
Scenic Rivers Grape and Wine Association
South Dakota Specialty Producers Association
South Dakota Winegrowers Association
Upper Hudson Valley Wine and Grape Association
Vermont Grape and Wine Council
Western Iowa Grape Growers Association
Wisconsin Grape Growers Association
APPENDIX TWO: DEFINITION OF COLD-HARDY GRAPES

For purposes of this study, researchers classified the following cultivars as cold-hardy. This was done in consultation with the Northern Grapes project advisory team which is comprised of growers in each of the states.

Table A-1: Cold-Hardy Red Varieties

Baltica
Beta
Frontenac
GR-7
King of the North
Leon Millot
Marechal Foch
Marquette
Petite Pearl
Sabrevois
St. Croix
Valiant
Other red Swenson

Table A-2: Cold-Hardy White Varieties

Brianna
Edelweiss
Esprit
Frontenac blanc
Frontenac gris
Kay Gray
La Crescent
La Crosse
Louise Swenson
Petite Amie
Prairie Star
St. Pepin
Other white Swenson