NORTHERN GRAPES PROJECT

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Effects of Canopy Management Practices on Cold-Hardy Grape Cultivars

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Background. Canopy management strategies are often used to increase the amount of sunlight that penetrates into a grapevine's fruiting zone. Greater solar irradiance into the fruiting zone increases potential yields (Smart et al., 1990) and improves fruit quality (Dokoozlian & Kliewer, 1996). However, the effects of canopy management and the potential increase in solar irradiance and their impact on yield and fruit quality have not been tested for many of the cold-hardy grape varieties.

Northern vineyards in the US face potential issues with excessive vine vigor due to a combination of many factors, including the American parentage of many common varieties, deep and fertile soils, new technologies in irrigation and fertilization, training systems, and advances in pest control. This excess vigor results in overly shaded canopies, which block the majority of solar irradiance from reaching the fruiting zone of the vines. With decreased solar irradiance, developing axillary buds are less fruitful and potential yield is decreased (Smart & Robinson, 1991). Lower yields may also be associated with the reduction of soluble solids accumulation of the berries, due to a slower rate of berry development and ripening (Dokoozlian & Kliewer, 1996). Beyond increasing the rate of soluble solids accumulation, the increased rate of ripening has been shown to decrease total acidity through an increased respiration of malic acid during ripening, which is desirable since many cold-hardy varieties have higher malic acid content. Some reports have also shown a correlation between berry exposure to sunlight and a lower berry pH (Smart, 1985), which would also be desirable. However, others have stated that the effect of sunlight on berry pH is more directly connected to leaf exposure than to direct berry exposure (Morrison, 1988). The purpose of this study was to determine the effects of three different canopy management practices and their combinations on the yield and fruit quality of 'Frontenac', 'La Crescent', and 'Marquette' grapes in central Iowa.

Study Design and Methods. This study took place during the 2012 and 2013 growing seasons at Penoach Winery and Snus Hill Winery, both in central Iowa. Treatments were applied to ten-year-old 'La Crescent', six-year-old 'Frontenac', and five-year-old 'Marquette' grapevines. A late frost event in the spring of 2012 severely damaged 'Marquette', so it was not included in 2012. All vines were trained to a high wire cordon system and treated with one of eight treatments. Treatments comprised all combinations (±) of pre-bloom non-count shoot thinning (ST), post-bloom shoot positioning (SP), and post-bloom lateral shoot thinning (LT). The eight treatments included control (C), SP, ST, LT, SP+ST, SP+LT, ST+LT, and SP+ST+LT.

Dylan Rolfes weighs grapes at harvest. Each vine was harvested individually and cluster number and yield was recorded.

photo: Gail Nonnecke, Iowa State University

The amount of labor required to perform the canopy management practices was tallied. The solar irradiance penetrating into the fruiting zone was measured, and the results were taken as a percentage of ambient solar irradiance, which was measured above the canopy. All light measurements were recorded within one hour of solar noon between veraison and harvest.

A 300-berry sample was collected from each of the treatments five days prior to harvest and analyzed for fruit quality indices, including berry weight, soluble solid content (°Brix), pH, titritable acidity (TA), tartaric acid, and malic acid. The ratio of tartaric acid to malic acid and the balance of sugar and acid were calculated. Yield and cluster number also were recorded.

Table 1. *Effect of canopy management practices on labor, solar irradiance, and harvest variables of 'Frontenac' grapes at harvest on 17 Aug 2012, Adel, IA.*

Treatment	Labor[a] (min./vine)	Solar Irradiance[b] (% of ambient)	Yield (kg/vine)	Cluster (No./vine)
Control (C)	0.00 e[c]	11.18 b	3.53	55.55
Shoot positioning (SP)	3.67 c	14.63 b	3.60	59.09
Shoot thinning (ST)	3.55 c	11.91 b	3.27	55.91
Lateral thinning (LT)	1.90 d	18.33 ab	3.60	61.17
SP+ST	6.60 ab	18.58 ab	3.39	55.00
SP+LT	4.20 c	22.78 ab	3.47	61.67
ST+LT	5.93 b	21.42 ab	4.15	65.75
SP+ST+LT	7.23 a	24.75 a	3.39	50.42

[a]Required labor to conduct canopy management practices measured in minutes per vine.

[b]Sunlight penetration into the fruiting zone measured as a percent of ambient sunlight measured above the canopy in $\mu Em^{-2}s^{-1}$.

[c]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

Table 2. *Effect of canopy management practices on labor, solar irradiance, and harvest variables of 'Frontenac' grapes at harvest on 7 Sep 2013, Adel, IA.*

Treatment	Labor[a] (min./vine)	Solar Irradiance[b] (% of ambient)	Yield (kg/vine)	Cluster (No./vine)
Control (C)	0.00 e[c]	15.33 b	4.30 ab	81.92 ab
Shoot positioning (SP)	2.93 d	21.00 b	3.94 ab	74.00 ab
Shoot thinning (ST)	2.20 de	13.42 b	2.88 ab	59.00 b
Lateral thinning (LT)	8.50 b	21.42 b	4.53 a	85.25 a
SP+ST	5.44 c	21.58 b	3.20 ab	57.42 b
SP+LT	10.09 ab	30.50 ab	4.19 ab	78.33 ab
ST+LT	10.51 ab	24.17 ab	2.80 b	53.75 b
SP+ST+LT	10.95 a	35.50 a	3.20 ab	56.00 b

[a]Required labor to conduct canopy management practices measured in minutes per vine.

[b]Sunlight penetration into the fruiting zone measured as a percent of ambient sunlight measured above the canopy in $\mu Em^{-2}s^{-1}$.

[c]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

Results. The 2012 and 2013 growing seasons were quite different, thereby leading to a seasonally dependent effect on labor requirements, solar irradiance, yield, and cluster number. Thus, these variables were analyzed separately by each year. No interaction occurred for most fruit quality variables and they were analyzed across both seasons. Two interaction exceptions occurred: pH ($p = 0.04$) of 'La Crescent' and sugar to acid ratio ($p \leq 0.0001$) of 'Frontenac', and these variables were analyzed separately by season.

Frontenac. In 2012, SP+ST+LT required the highest amount of labor and increased solar irradiance more than any of the other treatments (Table 1). However, the increase in solar irradiance did not have a subsequent effect on yield or cluster number. Table 2 shows that the combination treatment of SP+ST+LT required the greatest amount of labor and provided the greatest amount of solar irradiance in 2013. The solitary practice of LT produced more clusters and a higher yield than ST+LT. There were not subsequent effects on the fruit quality indices measured for the 'Frontenac' grapes from any treatment, or treatment combination, across 2012 and 2013 (Table 3).

Table 3. *Effect of canopy management practices on fruit quality indices of 'Frontenac' grapes at harvest on 17 Aug 2012 and 7 Sep 2013, Adel, IA.*

Treatment	Weight (g/berry)	Brix	pH	TA (g/L)	Tartaric acid (g/L)	Malic acid (g/L)	Tartaric: malic[a]	Sugar:acid[b] 2012[c]	Sugar:acid[b] 2013
Control (C)	0.93[d]	24.82	3.56	9.18	2.58	5.31	0.51	0.34	0.24
Shoot positioning (SP)	0.93	23.49	3.64	8.92	2.04	5.43	0.40	0.33	0.23
Shoot thinning (ST)	0.90	25.43	3.63	8.86	2.71	5.01	0.60	0.34	0.25
Lateral thinning (LT)	0.93	24.06	3.62	9.05	2.57	5.16	0.51	0.31	0.23
SP+ST	0.87	25.04	3.64	9.12	2.39	4.29	0.60	0.32	0.24
SP+LT	0.88	24.46	3.64	9.05	2.31	5.49	0.49	0.34	0.24
ST+LT	0.89	24.87	3.62	9.13	2.44	4.97	0.49	0.31	0.25
SP+ST+LT	0.90	23.46	3.55	8.89	2.25	4.13	0.66	0.29	0.25

[a]Ratio of tartaric acid (g/L) to malic acid (g/L).

[b]Ratio of sugar (°Brix) to titritable acid (g/100 mL).

[c]Sugar:acid ratio was separated by season because significant interaction occurred between season and treatment at $p < 0.05$

[d]Means were not significantly different at $p \leq 0.05$.

Table 4. *Effect of canopy management practices on labor, solar irradiance, and harvest variables of 'La Crescent grapes' at harvest on 4 Aug 2012, Madrid, IA.*

Treatment	Labor[a] (min./vine)	Solar Irradiance[b] (% of ambient)	Yield (kg/vine)	Cluster (No./vine)
Control (C)	0.00 e[c]	15.33 b	4.30 ab	81.92 ab
Shoot positioning (SP)	2.93 d	21.00 b	3.94 ab	74.00 ab
Shoot thinning (ST)	2.20 de	13.42 b	2.88 ab	59.00 b
Lateral thinning (LT)	8.50 b	21.42 b	4.53 a	85.25 a
SP+ST	5.44 c	21.58 b	3.20 ab	57.42 b
SP+LT	10.09 ab	30.50 ab	4.19 ab	78.33 ab
ST+LT	10.51 ab	24.17 ab	2.80 b	53.75 b
SP+ST+LT	10.95 a	35.50 a	3.20 ab	56.00 b

[a]Required labor to conduct canopy management practices measured in minutes per vine.

[b]Sunlight penetration into the fruiting zone measured as a percent of ambient sunlight measured above the canopy in $\mu Em^{-2}s^{-1}$.

[c]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

Table 5. *Effect of canopy management practices on labor, solar irradiance, and harvest variables of 'La Crescent' grapes at harvest on 31 Aug 2013, Madrid, IA*

Treatment	Labor[a] (min./vine)	Solar Irradiance[b] (% of ambient)	Yield (kg/vine)	Cluster (No./vine)
Control (C)	0.00 e[c]	5.08 b	5.12 ab	72.66 ab
Shoot positioning (SP)	4.29 cd	14.75 b	5.45 a	105.75 a
Shoot thinning (ST)	2.48 d	15.92 ab	3.32 b	48.42 b
Lateral thinning (LT)	9.43 b	16.33 ab	3.55 ab	54.83 ab
SP+ST	6.06 c	17.50 ab	3.55 ab	56.75 ab
SP+LT	11.72 ab	27.08 a	3.78 ab	59.50 ab
ST+LT	10.12 b	19.33 ab	1.80 b	28.00 b
SP+ST+LT	14.07 a	26.33 ab	2.40 b	37.25 b

[a]Required labor to conduct canopy management practices measured in minutes per vine.

[b]Sunlight penetration into the fruiting zone measured as a percent of ambient sunlight measured above the canopy in $\mu Em^{-2}s^{-1}$.

[c]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

La Crescent. The combination treatment of SP+ST+LT required the most labor in both 2012 (Table 4) and 2013 (Table 5). Solar irradiance was highest in vines receiving the LT treatment in 2012, but did not differ from SP+LT and ST+LT. It was higher in the SP+LT treatment compared to SP or C in 2013 (Table 5). In 2012, LT had higher yield and cluster number than ST +LT. In 2013, SP resulted in a higher cluster number and yield than ST, ST+LT, and SP+ST+LT. Table 6 again illustrates that these practices did not affect fruit quality, except for the ratio of tartaric acid to malic acid, in which ST+LT was higher than the SP treatment

Table 6. *Effect of canopy management practices on fruit quality indices of 'La Crescent' grapes at harvest on 4 Aug 2012 and 31 Aug 2013, Madrid, IA.*

Treatment	Weight (g/berry)	Brix	pH 2012[a]	pH 2013	TA (g/L)	Tartaric acid (g/L)	Malic acid (g/L)	Tartaric: malic[b]	Sugar:acid 2012[c]
Control (C)	1.11[d]	23.33	3.43	3.32	11.55	1.57	6.66	0.24 ab	0.20
Shoot positioning (SP)	1.16	22.65	3.41	3.36	11.39	1.40	6.39	0.20 b	0.20
Shoot thinning (ST)	1.08	23.37	3.43	3.36	10.96	1.70	5.14	0.32 ab	0.22
Lateral thinning (LT)	1.13	22.00	3.39	3.42	11.17	1.71	6.50	0.26 ab	0.20
SP+ST	1.10	23.33	3.44	3.39	11.14	1.48	6.10	0.25 ab	0.21
SP+LT	1.11	23.23	3.38	3.39	11.06	1.56	6.54	0.23 ab	0.21
ST+LT	1.12	22.34	3.39	3.41	10.86	1.98	5.91	0.35 a	0.21
SP+ST+LT	1.08	22.97	3.39	3.43	11.21	1.78	5.97	0.29 ab	0.21

[a]pH was separated by season because significant interaction occurred between season and treatment at $p < 0.05$ using Tukey's adjustment for multiple comparisons.

[b]Ratio of tartaric acid (g/L) to malic acid (g/L).

[c]Ratio of sugar (°Brix) to titritable acid (g/100 mL).

[d]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

Table 7. *Effect of canopy management practices on labor, solar irradiance, and harvest variables of 'Marquette' grapes at harvest on 7 Sep 2013, Adel, IA.*

Treatment	Labor[a] (min./vine)	Solar Irradiance[b] (% of ambient)	Yield (kg/vine)	Cluster (No./vine)
Control (C)	0.00 d[c]	9.83 c	1.24 ab	39.25 ab
Shoot positioning (SP)	4.20 cd	27.42 bc	0.96 ab	29.92 ab
Shoot thinning (ST)	1.74 d	11.83 c	1.28 ab	42.58 a
Lateral thinning (LT)	10.70 b	28.33 b	1.64 a	48.75 a
SP+ST	6.00 c	18.00 bc	1.53 ab	42.92 a
SP+LT	12.82 ab	31.83 ab	0.89 ab	28.67 ab
ST+LT	10.15 b	46.92 a	0.72 b	19.92 b
SP+ST+LT	15.66 a	28.75 b	0.82 b	28.17 ab

[a]Required labor to conduct canopy management practices measured in minutes per vine.

[b]Sunlight penetration into the fruiting zone measured as a percent of ambient sunlight measured above the canopy in $\mu Em^{-2}s^{-1}$.

[c]Means in columns followed by different letters are significantly different at $p \leq 0.05$. Means without letters are not significantly different.

Marquette. 'Marquette' required the most labor under the SP+ST+LT treatment (Table 7), which was similar to the labor of SP+LT. ST+LT provided the greatest solar irradiance, and did not differ from SP+LT. Vines receiving the LT treatment had higher yield than ST+LT and SP+ST+LT. Lateral thinning along with shoot thinning and SP+ST led to higher cluster numbers on 'Marquette' than ST+LT. Table 8 shows that the treatments did not affect fruit quality indices.

Table 8. *Effect of canopy management practices on fruit quality indices of 'Marquette' grapes at harvest on 7 Sep 2013, Adel, IA.*

Treatment	Weight (g/berry)	Brix	pH	TA (g/L)	Tartaric acid (g/L)	Malic acid (g/L)	Tartaric: malic[a]	Sugar: acid[b]
Control (C)	0.96[c]	27.39	3.82	8.49	2.86	6.59	0.5	0.34
Shoot positioning (SP)	0.98	26.55	3.71	9.28	2.87	6.3	0.47	0.29
Shoot thinning (ST)	0.93	26.86	3.64	9.54	2.81	5.85	0.59	0.28
Lateral thinning (LT)	0.98	24.75	3.87	7.24	2.46	5.41	0.46	0.34
SP+ST	0.92	25.63	3.91	7.41	2.62	5.64	0.48	0.35
SP+LT	0.94	25.94	3.77	8.93	2.61	6.15	0.48	0.31
ST+LT	0.92	26.88	3.94	7.84	3.3	6.07	0.55	0.35
SP+ST+LT	0.97	24.79	3.72	9.56	2.42	6.78	0.36	0.26

[a]Ratio of tartaric acid (g/L) to malic acid (g/L).

[b]Ratio of sugar (°Brix) to titritable acid (g/100 mL).

[c]Means were not significantly different at $p \leq 0.05$.

Fruit Quality. Optimal levels of fruit quality variables were developed for *V. vinifera* cultivars, which are grown in very different climates from that of the upper Midwest. Table 9 shows these recommended fruit quality ranges for both red and white wines. 'La Crescent' showed very similar results to 'Frontenac', in that only sugar content was within the optimal range used for *V. vinifera*. Many cold-hardy varieties with various *Vitis* spp. parentage do not fit into the same optimal fruit quality ranges as a *V. vinifera* varieties. Optimal fruit quality ranges should be established for creating unique and high quality wines from the cold-hardy varieties. Grape growers and wine makers can work together to investigate the limits and best practices for achieving "optimal" fruit quality with the cold-hardy grape varieties.

Table 9. *Recommended fruit quality ranges at harvest for subsequent optimal wine production.*[a]

Wine type	Brix	pH	TA (g/L)	Tartaric acid (g/L)	Malic acid (g/L)	Tartaric: malic[b]	Sugar: acid[c]
Red	20.5- 23.5	3.4 – 3.5	6.0 – 8.0	5.0	2.0 – 3.0	1.7 – 2.5	0.26- 0.39
White	19.5 – 23.0	3.1 – 3.2	7.0 – 10.0	5.0	2.0 – 3.0	1.7 – 2.5	0.20- 0.33

[a]Optimal fruit quality ranges as established by Amerine et al. (1972), Bisson (2001), Boulton et al. (1996), Byers et al. (2003), Dami et al. (2005) and Winkler et al. (1974).

[b]Ratio of tartaric acid (g/L) to malic acid (g/L).

[c]Ratio of sugar (°Brix) to titritable acid (g/100 mL).

Summary and Recommendations. Results of these studies show that while lateral shoot thinning in 'Frontenac' and shoot positioning in 'La Crescent' can influence solar irradiance within the canopy, yield and cluster number, these practices did not change the overall fruit quality. Future research should continue to evaluate potential yield and quality increases to justify the additional cost of canopy management practices and their labor. Current and future research investigating training systems may provide additional useful results to manage vine canopies during the dormant time period and require less labor.

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Results from the Northern Grapes Project Baseline Survey - A Series

The Role of Winery Tourists in the Cold-Hardy Wine Industry

Brigid Tuck and Bill Gartner, University of Minnesota

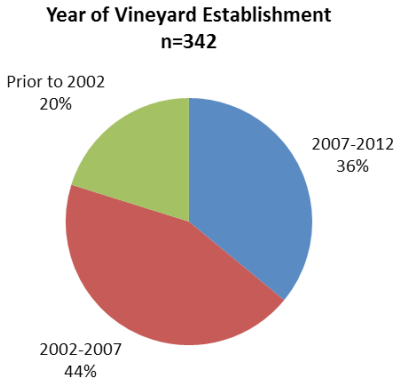
Editor's Note: We are publishing a series of articles that summarize data from the *Northern Grapes Project* Baseline Survey. This survey was completed in 2012, and several bulletins have been published, which are available on our website (http://northerngrapesproject.org/?page_id=544). This series of articles will highlight key findings and conclusions from these bulletins.

Introduction: The development of cold-hardy grape varieties opened opportunities for the development of vineyards in areas where previously, grapes could not be grown due to lack of winter hardiness. Early adopters of cold-hardy grape varieties proved the viability of vineyards in northern climates. In the early to mid-2000s, growth in the number of new cold-hardy vineyards was rapid. Evidence shows this growth may have slowed and that the grape growing industry is showing signs of maturing. While growth in the number of new vineyards may be slowing, the number of recently-planted vines maturing and moving towards full production continues to increase, particularly the number of new Marquette vines. Vineyard managers appear to be concerned with shorter-term, in-the-vineyard issues, such as disease and pests, as opposed to longer-term issues, such as sales and availability of unskilled labor.

Study Design: In early 2012, University of Minnesota Extension personnel conducted the *Northern Grapes Project* Baseline Survey, which included all grape growers and winery owners in the 13 states participating in the project. In total, there were 611 responses to the survey; a response rate

of 21 percent. Of those, there were 442 useable responses. Fifty-six percent of respondents operated a vineyard only, 35 percent operated a combined vineyard and winery operation, and nine percent operated a winery only.

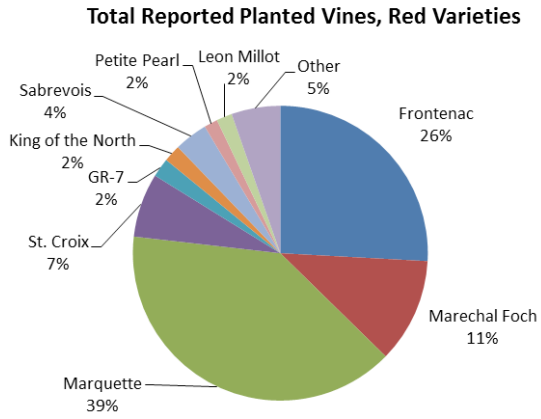
Cold-Hardy Grape Growing Industry is Maturing: The cold-hardy grape growing industry is showing signs it is maturing. The growth in the number of new vineyards being established appears to be slowing slightly. Rapid growth occurred between 2002 and 2007, with nearly half of all vineyards being established in the period. A slowing in the number of new establishments is one sign of industry maturation.



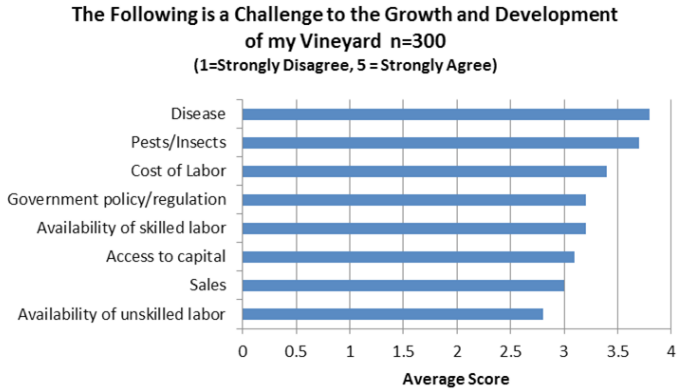
A second sign of maturation in the cold climate vineyard industry is vertical integration. Survey results show that wineries are increasingly likely to also own and operate a vineyard. Only nine percent of survey respondents operated a winery without a vineyard. Of more interest, perhaps, is the role wineries are taking in management of vineyards. Nearly 75% of vineyards selling grapes under contract indicate wineries are active in vineyard management decisions. Nearly 40 percent of all vineyards use contracts to market their grapes.

Cold-Hardy Grape Volume Increasing in Near-Term: While the number of new vineyards being established appears to be slowing, the volume of cold-hardy grapes coming onto the market appears to be increasing in the near-term. Since grape vines take up to five years to reach maturation and full production, the vineyards established after 2009/2010 have not yet reached full production. At the time of the survey, nearly half the vines planted were four years old or younger, indicating that in the period from 2012 to 2016, the volume of cold-hardy grapes on market has the capacity to nearly double, assuming predicted yields are achieved.

In particular, the volume of the Marquette grape, which was introduced in 2006, will be increasing in the near term. By 2012, the Marquette grape made up 39 percent of all planted cold-hardy red varieties.



Issues of Concern: Vineyard managers are concerned about short-term issues in the vineyard. When asked to rate the challenges to the future growth and development of the vineyard on a scale where 1 equals strongly disagree and 5 equals strongly agree, vineyard managers assigned the highest ratings to disease and pest/insects. Both of these issues are directly related to the successful production of a healthy grape crop. Issues about sales and the availability of labor rated lower.



Conclusion: The development of cold-hardy grapes led to explosive growth in the number of vineyards in cold climate regions of the United States. This growth was most rapid between 2002 and 2007, as new growers rapidly adopted cold-hardy varieties. Since 2007, the industry has begun to mature. Evidence of maturation includes the establishment of fewer vineyards and the increase in collaboration between wineries and vineyards. Despite the increasing volume of grapes on the market, vineyard owners do not report being concerned about sales, indicating they feel the market for cold-hardy grapes is still growing. In fall of 2015, the *Northern Grapes Project* intends to conduct another survey of cold-hardy vineyards. This research will be insightful in determining how the industry has been changing since the previous survey.

NGP Team Profile: Gail Nonnecke

Gail is a Professor in the Department of Horticulture at Iowa State University. She teaches courses that include viticulture topics and mentors students in grape physiology and sustainable production and management. Her research has included investigations to create sustainable viticulture production and management systems and grape physiology. Gail is involved with research on crop load, shoot management, and training systems and mentors students working in the Northern Grape Project.

1. You grew up in Pennsylvania on a farm that had 50 acres of wine grapes – what are some of the biggest changes you've seen in the Eastern US grape and wine industry since you were a child?

It has been an extraordinary 35-year journey to see the growth of the eastern U.S. grape and wine industry. Early on, the adoption of French hybrid grapes created opportunities and demand for new styles of wine, which added to the historical eastern American cultivars and their styles of wine. Next, pushing the boundaries of where *Vitis vinifera* can be grown created additional types of wines in the eastern U.S. Now, the cold hardy cultivars allow for wine grape production in climates where winter temperatures normally limit grape growing. It is exciting to think about how the eastern wine regions will continue to grow, expand, and develop their wine styles, while providing for diverse, significant, and entrepreneurial grape and wine enterprises within the eastern U.S. food and agriculture industries. What a great success story!

2. A vineyard you planted at Iowa State not long after you arrived played a pretty important role in developing not only the viticulture and enology program at Iowa State, but the Iowa grape and wine industry as well. Please tell us a little bit about this.

Iowa was the sixth-ranked state in grape production in 1919. World War II, an Armistice Day blizzard in 1940, and use of the volatile form of 2,4-D contributed to reduced grape acreage and few wineries by 1966. In 1985, I helped establish a research and teaching vineyard at Iowa State's Horticulture Station. When the Iowa wine grape industry leaders wanted to reestablish the industry in the late 1990's, they requested legislative support for programs. Some people were unsure if wine grape growing could be successful in Iowa, and it was fortunate to have the 15-year old vineyard to document successful production of adapted wine grape cultivars. With active leadership from key industry members and Mike White in Extension, the legislature provided support for programs, which over the years established the Midwest Grape and Wine Industry Institute with Dr. Murli Dharmadhikari.

3. In addition to your teaching and research responsibilities, you serve as Faculty Coordinator of the Global Resource Systems Major and its program at Iowa State. Please tell us a little bit about this program and how you were named as the leader of it.

When I was 19, I had the opportunity to complete an internship with Dr. Carl Haeseler. One day he asked if I might like to study viticulture in Germany, because "you're interested in wine grapes and speak German." He set up an internship in a research and education institute in Trier, Germany. The internship transformed me and I learned a great deal about the world's grape and wine industries, other cultures, and Germany's viticulture and enology research and outreach programs. As a faculty member, I encouraged similar opportunities for my student advisees. In 2009, Iowa State's College of Agriculture and Life Sciences offered the first Global Resource Systems major in the U.S. The major emphasizes a multidisciplinary understanding of all resources – from natural to agriculture to socio-economic. Over 90 students have completed their required global internship on 5 continents and in the many technical disciplines within food and agriculture.

4. One of your graduate students worked on the *Northern Grapes Project* as part of his Master's Degree, and several undergraduate students have as well. How has this experienced helped further their educations and careers?

One great outcome of the Northern Grapes project is that it contributes to building the "people" and capacity of the cold hardy grape industry. Dylan Rolfes recently completed his master's research by working on canopy management practices of northern grape cultivars (see pages 1-5). He had the chance to meet other researchers and extension professionals in the *Northern Grapes Project*, and to actively participate in on-farm research with grape growers in Iowa. Dylan now works and teaches at Highland Community College in Kansas, which is part of the Viticulture and Enology Science and Technology Alliance (VESTA) program.

5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?

I believe the overall integration of viticulture, enology and socio-economic findings will help the wine grape industries in cold climates move forward and grow in a sustainable manner. All of us at Iowa State in the *Northern Grapes Project*, and I am sure our colleagues throughout the northern states in the project, are excited to imagine what the future holds for the wine grape industry in cold climates.

NGP Team Profile: Jacek Koziel

Jacek is an Associate Professor in the Department of Agricultural and Biosystems Engineering at Iowa State University. Jacek's lab uses multidimensional gas chromatography and mass spectrometry system combined with simultaneous aroma analysis by trained panelists. He coordinaties the chemical and sensory analyses at Iowa State for the Northern Grapes Project. His lab is processing grape and wine aroma volatiles for Iowa, South Dakota, and Minnesota.

1. You were born and raised in Poland – tell us what brought you to the United States.

My big passion in college years was mountain climbing. I grew up where the 'bow' of Carpathian Mountains (which span) from Slovakia to Romania) runs through southern Poland. My father was a tour guide and he really encouraged my hiking and mountaineering. While in college, I also trained to become a mountain guide. It was at that time that communism was falling apart and it was possible to travel (and climb) in faraway places. So it started in late 1980s when I started co-organizing student expeditions to climb taller mountains in Asia, South America and finally in Alaska.

2. Before the *Northern Grapes Project*, the only experience you had working with grapes was when you were a 20-something, and hitchhiked your way to the Beaujolais region in France. Can you tell us a little about this experience?

I had to find seasonal work outside of Poland to fund my growing passion to climb big mountains. One of these trips was to France after the Iron Curtain was down. I bought a train ticket that took me to the German border and I hitchhiked from there. I was in Lyon the next day and then hitchhiked to the Beaujolais region. It is was easy to find work as the season was about to start. It is back-breaking in the first few days: getting up at about 4 AM, drinking coffee and baguettes with butter and jelly (mmm…. I still remember how nice they tasted)! Then, the trip via some beat-up Citroen from the farm to the fields. We worked through the midafternoon and recovered for the next day. The season lasted about two weeks. There were about eight workers like me, most of them students. I sent a postcard to the winery owners from my next climbing expedition.

3. Several of our readers might be surprised to learn that a great deal of the work in your lab deals with livestock odors and air quality. How is that work applicable to the *Northern Grapes Project*?

We have a unique laboratory capable of simultaneous chemical and sensory analyses. The chemical analyses are completed with multidimensional chromatography, which separates compounds. Compounds are identified by mass spectrometry and matching their characteristic 'fingerprint' against spectral libraries. We also use human noses to find links between specific compounds and their impact of aroma. The methodology is used for finding compounds responsible for enhancing (or fouling) the overall wine aroma. We use identical approach for mitigating odor-causing chemicals in animal waste.

4. What has been your favorite part about working with grapes?

My favorite part is getting to know awesome people on this project and learning their stories. As far as the science goes, I am learning almost every day something new. I really appreciate the opportunity to be part of this project.

5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?

Finding out how the percent match between the number and identity of chemicals found in cold climate wines with chemicals found in typical livestock manure – just kidding – well, maybe not!

2015 VitiNord Nebraska City, USA

November 11 - 14, 2015

Max McFarland

Registration is now open for the 2015 VitiNord International Viticulture & Enology Conference, which will be held at the beautiful Lied Lodge & Conference Center in Nebraska City, Nebraska. The VitiNord conference is held every three years, with the location alternating between North America and Europe. This conference focuses on research and practices used in northern wine growing climates. Speakers from around the globe will share strategies and information that you can use in your own vineyard or winery. The mission of VitiNord 2015 is to promote the advancement of viticulture and enology in northern environments that are characterized by cool or short summers and cold winters. The International Association for Northern Viticulture successfully organized symposia in 2006 in Riga, Latvia; 2009 in Saint-Hyacinthe, Quebec; and 2012 in Neubrandenburg, Germany.

Visit the VitiNord 2015 website (www.vitinord2015.org) for more information including conference schedule, speakers, registration, and lodging reservations. We hope to see you in Nebraska!

photo: Arbor Day Farms, Lied Lodge & Conference Center, Nebraska City, NE

The Final Two Northern Grapes Project Webinars of the 2014-2015 season

March 10, 2015
"Tannin Addition and Retention in Red Hybrid Wines"
Anna Katharine Mansfield, Cornell Univ.

April 14, 2015
"Branding Studies for Cold Climate Wines"
Bill Gartner, Univ. of Minnesota

For more information, visit http://northerngrapesproject.org/?page_id=12

All *Northern Grapes Project* Webinars are archived on the "Recorded Webinars" tab of our website.
http://northerngrapesproject.org/?page_id=257

Emails regarding the webinar series are sent via our *Northern Grapes Project* Webinar Series Listserve.
To join, email Chrislyn Particka (cap297@cornell.edu).

Visit us on-line at
www.northerngrapesproject.org

Visit our sister site

eViticulture.org
eViticulture.org is the national online viticulture resource containing the latest science-based information for viticulturists.

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