



Cold Hardy Hybrid Viticulture with John Thull and Andy Farmer



A full house of wine growers in the Grovedale tasting room

I have heaped accolades on the wine growers of the Endless Mountains region before, but this time they outdid themselves. In my 30+ years in the wine business, I'm not sure I have encountered a group with such a thirst for knowledge, intellectual curiosity, and a drive for self- (and wine) improvement. Stan Sowinski, the owner of Endless Mountains Vineyard near Falls, PA is the ring leader (he is also the current chair of the Penn State extension wine grape program) and has been pursuing fine wine growing for two decades. When I arrived in Pennsylvania in 1999, they contacted me

immediately and requested a visit. Over the years, they have organized programs, lodging and food, for me and Stephen Menke, and now Denise Gardner. They are activist growers who believe in the power of knowledge to help them succeed, and they never miss one of my programs even though they often must drive to Lancaster to attend. The results, if you taste their wines, are impressive! Stan approached me earlier in the year and said they wanted to focus on cold hardy hybrid production – these are the varieties developed by Elmer Swenson in Wisconsin and Peter Hemstad and his team at the University of Minnesota, and others. I suggested we invite John Thull, the manager of the research vineyard (with his wife, Jenny) at UMN. In the past, the growers have paid much of the cost to bring in terrific speakers like Kevin Ker and Hans Walter-Peterson, but this time they wanted to manage costs so more people would participate. I helped Stan to apply for a [Pennsylvania Wine Marketing and Research Program](#) education grant and he came to a board meeting in Harrisburg to state his case. PWMRP awarded \$1250.00 for the event. I believe this is an ideal partnership and collaboration between private industry and extension, to serve the needs of a group and area, in this case cool to cold area wine growers. The meeting and vineyard tour was very well attended with 43 people from Pennsylvania, New York, and New Jersey.

John was joined by Andy Farmer, owner of [Northeastern Vine Supply](#), a grapevine nursery in Vermont, and together they dispensed about as much high quality information as any brain or notepad could hold. I'm sure John was very nervous as we drove from the hotel to Grovedale Winery, all the while I was scribbling on a notepad so I wouldn't forget any of the details of the amazing information he was sharing with me (we made it). I've been around long enough to



Dispensing wisdom: Andy and John at Sugar Hollow Vineyard

know the wheat from the chaff and we had two fantastic shockers to learn from this week. I do not think we could have found anyone better to speak authoritatively about the cultivation of cold hardy hybrid wine grapes. John's family has their own four acre vineyard called Oakshire, so in addition to his research role, he is a commercial wine grower. He maintains it like a trophy vineyard, all VSP with perfect canopy and crop, and he tries to push the ripening as far and fast as he can.

Stan and Paul Milnes of Sugar Hollow Vineyard pretty much organized this meeting for us. It included a seminar at Grovedale

Winery in Wyalusing, vineyard tours at Endless Mountain Vineyard, Sugar Hollow Vineyard, Nimble Hill Vineyard, Blue Slate Vineyard (Jim and Cathy Bresnan), Chris Turrell's vineyard, and the vineyard at Grovedale winery. Meals were another chance to share information and ideas, and enjoy social time together. Two technical wine tastings with 14 wines from Pennsylvania, Vermont and Minnesota at Nimble Hill and seven wines at Grovedale, allowed participants to directly connect vineyard practices to wine quality.

It was cool and crisp with blue skies at Endless Mountain Vineyard, which Stan carved out of forest and rock 180' above the Susquehanna River. Stan calls his vineyard a giant experiment and that it is, with many varieties (Pinot Gris, Dornfelder, Landot Noir, Frontenac, Traminette, Bianca and mixed vinifera) and training/trellis systems. He looked for the right place to grow grapes for two years and found this site at 790' elevation. Soils are well-drained silt-sand (Nimble Hill is loam and Sugar Hollow has more gravel) with low to medium capacity (he has hedged once this year). He is experimenting with a Swenson variety as a rootstock, having field-grafted another hybrid variety onto it, hoping to lower vine vigor. Vines are on variable spacing, with closest at 4'.



Endless view from Endless Mountain Vineyard



Small scar on node of fruitless Landot Noir

Vertical shoot positioning, Scott Henry, and high wire cane or cordon are all used. On SH, he sees little difference between top and bottom fruit. The vines are in ideal balance. He has used 15 full cover sprays in 2013, the vines were very clean.

The big puzzle of the day was his 12 year old Landot Noir which had no fruit clusters (a problem that had

never occurred before, see photo). The cluster inflorescence never appeared on the shoots, leading us to believe that bud initiation and primordial development in the previous year had somehow been interrupted. This is a curious problem for a vine physiologist. Landot Noir has a very complex history, which no one could recall.

There was a lot of discussion about frost throughout the day. In the southern vineyards in the area, frost was not a problem, but vineyards to the north got hit hard. Many growers are using [KDL](#), a potassium-based Agro-K product that is advertised to protect grapevines from frost injury if applied within 36 hours of an event. There are grower testimonials that both affirm and refute the effectiveness of the product. Dr. Tim Martinson, is the Cornell University extension viticulturist and leader of the [Northern Grapes Project](#), and he's very familiar with cool-cold climate wine growing, said he knows of no research to support KDL: he is looking for grower cooperators who would help him to examine this product and he would be willing to work with vineyards in New York and Pennsylvania. Short of a tower wind machines, options discussed for growers include using soybean-based oils (see Ohio State University research) to delay bud break, double pruning cane and spurs, KDL and copper, cutting cover crops very low or, better yet, clean till soil to a smooth, flat and packed surface. One grower is considering overhead sprinklers, and another suggested a fabric used to protect vegetables from frost. What is clear is that the economic losses from frost are severe, especially for independent vineyards, and the problem must be addressed. In vineyards that suffered frost damage, secondary shoot crops were smaller and clusters much more scraggly, and also very delayed, which could be a problem if there is an early fall frost or harvest rains.

One thing that impressed me throughout the two days of conversation about the cold hardy hybrids is how similar the viticulture best practices are to *vinifera* cultivation and the expectations for producing a high quality wine. We talked a lot about mild vine stress at the proper period of phenological development, the use of rootstocks, and the possibility of breeding, to reduce vine vigor, and John and Andy constantly reminded the group of the necessity to find good sites, not just to shed cold air to avoid frost and freeze, but to discourage excessive vegetative growth in order to get both fruit and wood mature, for good wine and cold hardiness. This would apply especially to late varieties like Frontenac and La Crescent. John talked often about achieving vine balance and “Goldilocks” canes “not too big and not too small” avoiding the bull canes and runty shoots that are susceptible to winter injury or not very productive.

Replacement viticulture

This is one of my least favorite terms in the viticulture lexicon, and until this meeting, I didn't have much respect for this kind of management, but then John and Andy enlightened me. I always viewed replacement viticulture as a reaction to failures in the vineyard, due to a variety of challenging conditions (winter injury, crown gall, etc.). John views replacement viticulture as a continuous management process that, if done well, keeps the vineyard healthy, sustainable, and somewhat uniform. He tries to anticipate damage and loss and before a vine becomes completely unproductive, and it or a part of it is retrained or replaced. Vines are renewed based on known symptoms. He recommends always keeping a sucker handy to retrain a vine, and uses creative pruning methods, such as tandem pruning (a combination of cordons and canes) to keep the trellis wire filled and productive. Trunks of different ages are preferred to enhance survival

but John does not use multiple trunk training. Layering can be used to replace ungrafted vines. If soils are wet and/or fertile, and the site low and/or concave, count on doing a lot of renewal work. Make sure you renew with proper bud numbers in balance with vine size, age and root system to distribute growth so bull canes do not develop. John encourages his vines to grow through any damage they sustain. It's a nurturing process.

Nutrition

John talked about widespread leaf yellowing in Minnesota, likely due to drought in 2012, followed by a very cold winter, and then wet spring that may have caused wet feet in vines, destroying surface roots, and now vines are re-establishing shallow root systems. Growers have used nitrogen fertilizer this year, but John cautions against the overuse of fertilizers, especially in fertile soils, that may exacerbate vine vigor and cause shading and problems with wood acclimation. Just as in *vinifera*, water and nitrogen in too great amounts, at the wrong time, can affect vine behavior, health and grape quality. John has seven year old vines that have never received any fertilizer and are very healthy. We talked about wanting a healthy and balanced vine, not a fat and happy one. A little bit of stress goes a long way to helping ripen fruit and wood. During our visits we saw some mild magnesium deficiency but not much more.

Varieties

Frontenac needs a lot of sun so open the canopy. Let it hang late until berries begin to dimple, then it's ripe. It likes spur pruning since canes tend to have gaps. It is very tolerant of downy.

Marquette gets downy mildew very easily and it ripens fast and can get to very high brix quickly. In 2012, the Shelburne Vineyards Marquette shot up from 25 to 29 brix in just a few days, taking the alcohol out of balance. It is generally low tannin and high acid, with excellent Pinot-like aromatics and flavor profile. It has long laterals so early lateral removal is helpful. Often small, Pinot size clusters. Train to cordons with 2 bud spurs on VSP.

Petite Pearl is Tom Plocher's red grape that has good tannin, is easy to grow and a good blending partner to Marquette.

La Crescent is becoming the white grape of choice in cold areas but it has fruit set and shelling problems, usually just before it reaches perfect ripeness. It does not perform well on fertile soils and is prone to winter injury if too vigorous. It is very susceptible to downy mildew. It needs lots of light to ripen fruit.

Andy described Louise Swenson as a low vigor, low acid white wine with honey and melon flavors, that can be picked at quite low brix and makes a nice dry wine, without foxy (*labrusca*) aroma or flavors, more Sauvignon Blanc-like flavors. It grows well in wet and fertile soils and likes some shade on fruit.

Prairie Star is a more robust white grape that is a good blender to add body to a wine.

Frontenac Gris has lots of grapefruit and good concentration, it's extremely floral.

St Croix skins crack very readily if it rains.

L'Acadie blanc is a grape developed in the Vineland Station in Ontario that has found a home in Nova Scotia. It has good acidity, freshness, and is very fruity.

Peter is breeding cold hardy rootstocks (more cold tolerant than 3309). Rootstocks can be used to manage vine vigor in particular situations. There is a question if it affects endodormancy (acclimation), and if it can help to accelerate the process. New white varieties numbered 1220 and 1285 are in the pipeline at UMN.

In the grape breeding process mother and father vines are crossed, then clusters are harvested, seeds extracted, dried and cooled and planted in the greenhouse in February. Only a few are selected, and even fewer ever get a name. They are evaluated for cold hardiness, yield potential, fruit chemistry, phenology, growth habit, disease resistance/susceptibility, root growth, and wine quality. They avoid late ripening varieties because of frost in Minnesota. It takes about 20 years to go from a cross to a named variety. Cornell's Noiret took 40 years. Lowering grape acidity is an important goal and Peter is developing Frontenac 2.0.

Grape prices for Marquette and La Crescent in Minnesota are between 75-85 cents per pound, up to \$1 for the best fruit.

Trellis and Training

John and Andy have found little difference in fruit chemistry between vertical shoot positioned and high wire systems on cane or cordon. That said, we visited Blue Slate Vineyard in LeRaysville, an immaculate vineyard owned by Jim and Kathy Bresnan and saw great differences between Marquette cluster size and ripeness on VSP and HWC within the same vineyard row (photo right>>). John prefers VSP for his own vineyard and feels he gets the best balance and fruit exposure with it – in young vines it doesn't make that much difference, but it's a better system for older vines. At the UMN HRC, older vines are big and shaded. Because it's lower, VSP vines are easier and faster to renew. It is often said that VSP is much more work and expense than HWC but the growers we met with compare them evenly. At three vineyards we saw different applications of a four cane, single canopy system (often seen in the Finger Lakes and Ontario), either two canes side-by-side or an over-under configuration, in most cases the fruit zones were nicely separated and, surprisingly, even with the high shoots/foot, the canopies didn't seem too dense. The extra fruit helped to hold back shoot vigor, helping to create the balance. Choice of trellis system will often depend on soil capacity and how much fruit wire the vines needs to be in balance, but in general VSP for low to moderate capacity sites, high wire for moderate sites and divided systems for moderate to high capacity soils.



Courtesy of Tim Martinson

Vine spacing recommended is 5-8' between vines. Stan has some vines planted at 4' spacing. Distance between rows is usually 10', especially with HWC where the drooping canopy spreads at the base and needs extra space. These vines like to grow and need room to spread out. Fruit wire height for VSP is 30-36 inches and HWC is about 60 inches.

Cordon/spur and head/cane pruning are both widely used. At wider spacing, cordons will perform better. Spur yields are lower and pruned to 2-3 buds. Some hybrid systems have developed like tandem pruning using a short cordon and cane, to make sure the trellis is filled. Renewal is a constant process in the north.

Canopy management



Balanced Riesling VSP canopy at Nimble Hill Vineyard

shoots are nearing the ground (sometime before veraison). Do not let shoots run sideways and shade the fruit zone and avoid overcrowding or bunching of shoots and-or clusters. The ideal shoot has at least 15 leaves and is 4.5' in length. Timing is critical. John said this all needs to be done from bloom to fruit set. If you do this properly, the canopy will be set and August will be an easy month. He believes strongly in lateral removal on Marquette and La Crescent to keep the fruit zone open, and early thinning is the best. Marquette fruit hangs nicely a foot above or below the fruit wire, keep this area moderately open for light, air and spray. In some cases, a hedger can be used to remove excessive laterals. Remove shoots from non-count buds. Root pruning may be a way to help control vigorous vines (see Tony Wolf SCRI research).

It was suggested to skirt the canopy of HWC vines, about a foot above the ground to allow air movement into the canopy – Concord growers use gramoxone or a trimmer can be used. Do not allow dense canopies to shade fruit, and this is equally important for whites and reds. La Crescent needs light to fully develop its translucent berries and tropical flavors at higher brix. Frontenac also needs light and warmth. Because acidity is such a challenge, the best possible respiration environment must be created, and this means getting the berries warm. Shoot positioning is essential in both VSP and HWC, for the latter, comb down at 18" and again when



Well managed high wire cane pruned vines

John says that cracking or arching canes can help to even shoot growth on varieties with weak mid-cane shoot development. I have heard this before more as a myth than reality, but it may be worth a try. A grower said he used a leaf blower to blow out flower parts and debris from clusters before bunch close to reduce botrytis infections. I continue to endorse the use of a leaf blower to blow out debris and dry fruit just before harvest.

Yields for hybrids are typically in the 3-4 t/a for good quality.

Site and soil characteristics



Site selection is the key to growing consistently high quality wines. A site that is not too fertile and has good soil and air drainage features is highly desirable. Minnesota and Vermont soils are often very fertile with high organic matter, and sometimes high water table that can cause overwintering problems. Organic matter can be over five percent in Minnesota soils causing excessive vine vigor. Divide the canopy if the site has a high capacity soil. Andy says that grape profiles can change with pH, which would be in agreement with soil pH research done by Dr. Terry Bates at the Cornell research station in western New York. John describes the soil in Minnesota as ranging from gumbo to rock.

[Planting a post in rock at Blue Slate Vineyard](#)

Diseases and pests

When pruning, make clean cuts as close to the old wood as possible (flat side of the blade against the wood) to minimize the amount of old wood present, that can harbor overwintering diseases like phomopsis and mildews. Sanitation in the vineyard is so important to managing diseases. John says there is no botrytis in Minnesota, it's probably too cold for it to develop, as happened in the wet, late and cold 2009 harvest in Pennsylvania.

To prevent crown gall make every attempt to get vines to five years or older, when they tolerate stress and injury better. Everyone recommends hilling up grafted vines. Paul said he could track the flow of cold air through the vineyard by the pattern of crown gall in the vines. New vines are very susceptible to crown gall. He recommends installing drain tile, at minimum in wet soils, run rows up and down the hill because berms from hilling up block air and water flow off the field. Keep on top of disease – in 2011 he lost control of downy mildew in Vidal and it defoliated, that winter he lost 40% of the vines.

Foliar phylloxera can be very bad on some hybrid varieties and Movento is used to control them.

Weeds are most often controlled with herbicides like Roundup and Rely in fall and spring applications. John cited an example of a grower using a weed badger that tears out lots of surface roots and caused his vines to suffer.

John and Andy emphasized up front investments of time and energy into managing the vine's canopy and crop – canopy and fruit management and IPM, and it will pay dividends at the end of the season. Start early and finish well.

Cold hardy hybrid wine

An important goal is to manage acidity and herbaceous balance, especially in red varieties. A large part of the answer in the vineyard is to get the fruit into the sun, so vine balance and proper trellis and training is important. It's possible to have a high alcohol, high acid wine that is out of balance. Deacidification can affect the texture and mouth feel of a wine, often leaving a chalky or metallic sensation so it is not desirable. There are biological products such as Promalic that can help reduce acidity, John cited an example of lowering Frontenac from 14 g/l to 10. Some wine makers will completely deacidify a wine and then use it to blend for balance. Blending with lower acid wines, such as the Grovedale Marquette with 15% Merlot is an especially useful method that works well on both red and white varieties. I asked John what is the best way to reduce acidity in the vineyard and he said through early canopy management, to get the fruit into the sun, open up the canopy at bloom by shoot and lateral thinning, and later with shoot positioning, leaf removal and hedging.

Tasting at Nimble Hill



1. Shelburne Vineyards Louise Swenson – dry, very fruity, slightly bitter on back palate
2. Lincoln Peak Vineyards Black Sparrow – one of my favorite cold hardy hybrid blends from Prairie Star, La Crescent and others, it can be very SB-like in fruit and style
3. Univ of MN HRC La Crescent with co-evolution yeast
4. Univ of MN HRC Frontenac blanc from young vines, late harvest with lots of tropical, pineapple flavors
5. 2012 Lincoln Peak Vineyards La Crescent (dry) – beautiful, pure fruit, apricot, peach, very good balance, grown on VSP
6. 2012 Nimble Hill Vineyard Gruner Veltliner – 12.3/6.7, 21.5 brix, picked on 9/20, has more SB style
7. 2012 Nimble Hill Vineyard Riesling from Sugar Hollow Vineyard – textbook mineral flavor and racy acidity
8. 2012 UMN HRC Marquette – pretty fruit with high acidity
9. 2012 Shelburne Vineyard Marquette – dense and quite oaky, it ripened too fast at the end of the season and got to 29 brix. Alc 14.2.
10. 2012 Four Daughters Minnesota Marquette – from southern MN, very ripe, oaky, slightly oxidized

11. 2012 Grovedale Vineyard Marquette – from Blue Slate and Turrell vineyards, blended with Merlot from John and Susan Howard (Lancaster County) vineyard. Soft, fruity, smooth, nice acid balance.
12. 2012 UMN HRC Frontenac – grown on high cordon
13. 2012 Nimble Hill Vineyard Lemberger – all Sugar Hollow Vineyard grapes, very balanced and floral, with some peppery notes
14. 2012 Lincoln Peak Vineyards Ragtime Red – sweet Frontenac with very perfumey fruit

Reference Resources

1. See John's presentation "Cold Hardy Cultivar Development and Viticulture" on the Pennsylvania Wine Grape Network – <http://pawinegrape.com/>
2. UMN Grapes website - <http://www.grapes.umn.edu/index.htm>
3. Lisa Smiley's Cold Climate Cultivars (Iowa State Univ) - <http://viticulture.hort.iastate.edu/cultivars/cultivars.html>
4. Tom Plocher's Northern Winework: a book about growing grapes and making wine in a cold climate - <http://www.northernwinework.com/cms/>
5. Winter Injury to Grapevines and Methods of Protection (Zabadal et al.) - <http://www.emdc.msue.msu.edu/product/winter-injury-to-grapevines-and-methods-of-protection-685.cfm>

Grower submitted questions for John and Andy

- Pesticide on bottom of berries
- St. Pepin – spur vs. cane winter hardiness
- Frontenac Gris – consistent bloom time regardless of weather
- Price point for wines
- Landot Noir – no flowers
- Frontenac vine decline ± 40 vines late bud out
- Pruning all green/greenwood but die back later
- Acid levels won't drop < 13°
- Which Minnesota hybrids are the most fruitful on 2nd buds
- This year had more fruit @middle of cane – none on ends – explanation?
- Is there a resistance to Chateau build up (or any other herbicide)
- Are first 2 buds on cane fruitful in Minnesota varieties
- Why do primary & secondary shoots come out together; how can it be avoided? i.e. St. Croix
- Are there any products that can be sprayed to pollinate St. Pepin

Author's note: Taking notes in the field when information is coming rapidly and in large volumes is a daunting task. I tried to accurately report what was said but cannot guarantee the accuracy of everything in this report. The prudent grower gathers information and data from a variety of reliable sources before making decisions in the vineyard or cellar.

Acknowledgements



John Thull, Andy Farmer and Tim Martinson

thanks for sharing their vineyards and knowledge with us. Jeff and Kim Homer are the consummate hosts and they demonstrated that once again by sharing their winery, tasting room and vineyard with us so we could all learn together. If you have not been to Wyalusing, please go visit them, it's an amazing winery and a beautiful town. Finally, there is no meeting without participants.

Thanks to those who participated over the one or two beautiful days in the Endless Mountains.

Mark L Chien
Viticulture Educator
Penn State Cooperative Extension
<http://pawinegrape.com/>

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It truly takes a village to put on a good meeting. Stan Sowinski devoted countless hours to make this meeting possible, with the help of Paul Milnes - these two growers have been an inspiration to me as an extension agent. Of course, there would be no meeting without John Thull and Andy Farmer, their savvy wisdom and experience greatly advanced our local knowledge of how to grow these special varieties. Dr. Tim Martinson peppered everyone with questions throughout the two days and kept us on our toes. Our vineyard hosts Stan, Paul, Gary Toczko and Kevin

Durland (Nimble Hill), Jim and Cathy Bresnan (Blue Slate), Chris Turrell deserve special