



A Snapshot of Viticulture in Napa and Sonoma

Editor's note: This article was written from my rough notes, taken in the field under cold and rainy conditions. I strive for accuracy but cannot assure the reader that every fact and figure is correct. Please fact check before using this information. Many of the observations and conclusions are completely my own.

I am always asking our experienced growers what kind of information I can provide that will be helpful in their efforts to make better wines. They are invariably shy to answer but one request I receive is for advanced and innovative viticulture information from other wine growing regions. I have always personally believed that this is essential to learning and improving wine quality, especially in emerging regions such as the Mid-Atlantic. California and Pennsylvania are as different as night and day in many respects but maybe none more dramatic than in wine growing. It may seem to be a bit of a stretch to learn anything useful from California's arid viticulture that can be applied to our soggy conditions. With over 600,000 acres of grapes compared to our 2000, the sheer scale demands that their industry is progressive and innovative. I have my own theory that most of viticulture is the same around the world and that a small part is fine tuned to local conditions. The main difference between us and them is water. They irrigate and we take whatever Mother Nature drops on us. Water management is at the heart of fine wines and our strategies couldn't be more different. Nevertheless, I find it a useful, if not essential, exercise to travel to California to see what they are up to in the vineyards. Their technology and practices are impressive and while not always readily adaptable to our vineyards, give hints as to what may be possible for us. I try to visit with researchers and practitioners as they both try to push viticulture knowledge and technology to its limits.

The National Grape and Wine Initiative (NGWI) is a national organization whose goal is to advocate and guide viticulture and enology research in the U.S. John Martini of Anthony Road Winery in the Finger Lakes is its current president and indicative of the geographical scope of this group. At its board meeting two weeks ago scientists presented three significant projects that should help to improve grape quality. I am involved in the Grape Community of Practice, an extension group organized by Dr. Eric Stafne at Oklahoma State University whose goal is to deliver viticulture news and information to growers at a national level, mostly through web based materials and resources. The products will include an interactive "Ask the Expert" program, FAQs for grape growers, and learning opportunities such as on-line viticulture courses. Dr. Stafne successfully secured a \$400,000 USDA Specialty Crops Research Initiative Grant that will help to launch the project.

Dr. Terry Bates at Cornell University is the project leader on another significant SCRI project titled “Intelligent Vineyard Monitoring for Improved Production Management and Product Quality.” That’s a long title that can mean just about anything but the work will use new and innovative robotic and sensing technologies to improve the ability and quality of our assessment and management practices in the vineyard. Terry will be working with Dr. Sanjiv Singh in the Robotics Institute at Carnegie Mellon to create new tools to help grape growers at all scales to better understand, diagnose, and manage their vineyards. They will crank out some very cutting edge viticulture stuff in four key categories: vine balance and assessment, information collection and management, automation and outreach to industry.

The final project was introduced by USDA-ARS research scientist Andrew McElrone, whose happens to come from the Easton area, will focus on reducing water inputs into vineyard systems in arid regions. His objective, and that of many growers I met on this visit, is to deliver enough water to maintain a healthy vine but no more than is needed to support a canopy that can mature the amount of fruit on the vine. There should be no evaporative waste.

I am lucky to work on both sides of the fence. I see the problems on the grower’s side and the efforts on the research side to address them. There needs to be more collaboration between the two communities to get the best impact and bang for our research dollar. Growers push through every vintage and mostly manage to get a decent or better crop yet there is the potential to do much better on a more consistent basis. We have lots of problems and questions that need answers, whether through formal academic research or in-field empirical methods we can certainly improve the quality of our wines.

NGWI is pushing hard to promote and find funding for viticulture and enology projects that will benefit the grape and wine products industry at a national level. The board is made up of an incredible blend of academic, industry and association members, all who believe in the power of research to solve problems and the ability of this vast industry to have a positive impact on the economy and welfare of the regions where grapes and wine are grown.

<http://www.ngwi.org/>

It isn’t always dry in California. In the Russian River valley there were vineyards completely submerged. The rain is much needed but sometimes there can be too much of a good thing.

I met with some of California’s most talented practitioners who, in many ways, push their viticulture ahead of the research community in exploring new territory for improving wine quality. For example, at the Araujo Eisele estate they have fully adopted biodynamic viticulture practices which researchers, for the most part, have avoided. I would argue that there are aspects and practices in agriculture that are not quantifiable through research, and have explained in my own experience as a farmer that I came to

believe that much of what occurs on the farm is based in a kind of faith in natural systems too complex to fully understand or identify definitive cause-effect relationships. My own tendency is to assess what is in the bottle as a way to validate the process that created the wine. Organic and biodynamic practices work in California because of the climate-environmental conditions and the high quality of viticulture of the practitioners.

With so many acres, regions, varieties, wine styles, etc. it is hard to get a grip on the breadth and complexity of this industry. My tendency is to focus on the upper end of the wine market because I believe that producing wines in this category will help to put Pennsylvania in the minds of wine consumers and critics. Many of the viticulture practices can be applied across many different styles and types of wine production.

Water

There's always a lot of talk about water on any visit to California. All of its wine regions depend on irrigation to sustain the vine. There are a few exceptions, such as Dominus in Yountville that still dry-farm their vines. One has to consider that prior to the availability of irrigation sources, all vines were farmed without supplemental water. Assuming the water is available, the key is to control vine functions to deliver fruit of optimal quality. Deficit irrigation is the most widely used practice, withholding water at key moments in the growing season to limit vegetative vigor and berry size and to push the vine to ripen its fruit. Growers use pressure bombs to measure stem water potential and speak of negative pressures levels of -12 or -18 bars almost as if they were scores of a game or to see who can bring their vines closest to collapse while tweaking a fraction of a brix more from the grapes. Dr. Larry Williams, a University of California researcher in the Central Valley recommends providing water at 75% full evapotranspiration rate to keep the vine hydrated yet not as "luxury" levels. Jeff Newton will drop ET to as low as 12% on some varieties and says that 50% is enough to satisfy the vine's needs and ripen fruit fully. The only way to do this and not watch the vine collapse is to have very good technology and experienced eyes monitoring the vine. Limiting water is used as a tool to regulate vine size over time and berry size during the growing season. Dr. McElrone's research will look at the exact evaporative needs of the vine over the entire growing season and adjust irrigation inputs accordingly, thus minimizing demands on water resources.

There appears to be no strict pattern of irrigation in the valley although everyone acknowledges its importance and monitors water status religiously. Some add water in long and deep cycles, others short and shallow. As the East pushes fine wine viticulture more towards dry conditions through viticulture and site selection or effects of climate change, understanding vine-soil moisture relations, irrigation principles and scheduling will be more important. Right now, I'm not sure anyone has a plan short of guessing what vine water needs are based on visual observations. This is an important diagnostic tool but should be supported with other data.

Andy Erickson at Ovid, Screaming Eagle and other top estates is working with a company called Fruition that uses sap monitoring technology to track evapotranspiration rates by monitoring sap movement in the trunk at 15 minute intervals. Stem water

potentials with pressure bombs are typically taken only once a day. Sap flow offers a much brighter picture of vine water use and that data can be used to further refine irrigation scheduling.

<http://www.fruitionsocieties.com/vmms/login/home>

This water situation is foreign to Eastern grape growers when in years like 2009 we had way too much water. The lesson for me is to understand the relationship between water availability and use and how we can better manage soil moisture to the advantage of wine quality. I would argue strongly for the need to seek soils and climate conditions that minimize the amount of soil moisture during the growing season and drip irrigation to fill the void when needed. To do this we must map our soils and climates in order to identify the best sites for wine growing. Our current methods of canopy and crop management are really band-aids stuck all over vines that are on soils that are too wet and vigorous.

Disease

On this visit I heard a lot about eutypa and leafroll. January was a very rainy month in the north coast region and it appears that crews mostly stayed out of the fields, not for fear of getting wet but for spreading eutypa to pruning wounds. Eutypa is a low-grade, chronic trunk disease that first takes away spur positions, then moves slowly down the cordon, reducing yields and vineyard profitability. There are a few treatment compounds such as a white paint material called B-loc that I saw in widespread use but the fungicide Rally has just been registered for use for Eutypa and most of the growers planned to try it.

All manner of trunk diseases including crown gall, young vine decline, bot canker and others are well known to Eastern growers. Winter injury tends to exacerbate the problems caused by all of these. The need to actively pursue healthy vine materials, preventive measures such as topical wound applications and not pruning while it is raining are all highly advisable measures to enhance the health and longevity of the vineyard.

Coincidentally, on the flight to California I sat by a USDA-ARS entomologist who was just at a meeting where the arrival of the European berry moth in Napa Valley was being discussed. It was mentioned in some of my visits and there is considerable concern about it. It is a cousin to our own grape berry moth and would appear to have the same damaging impact on berries. A strategy is being developed analyze and then limit the spread of the insect. Along with grapevine mealybug, Pierce's disease (spread by leafhoppers) California growers have their hands full with insect problems.

The last time I was in Napa in the fall the north part of the valley off of the Silverado Trail was a sea of red leaves. Leafroll virus is still a major concern in the North Coast, especially with vine mealybug as a potentially robust vector. One grower told me that there are a number of unidentified strains of Leafroll being found in vineyards that test negative for the nine known leafroll associated viruses. This reflects the situation we

have experienced in some of our vineyards, especially affecting growers who have used vine materials from California nurseries (even those sold on the secondary market through Eastern nurseries). We are in a predicament in the East with vine materials. In order to get some of the fashionable clones and rootstocks growers need to source vine stock that originates from California. There is a sense from some of the tragic new vine materials I have seen recently that we are not getting what we paid for, or need to use to develop a healthy commercial vineyard. One consultant said that he will not use benchgrafted vines anymore because of the problems they have and he only field buds rootstock materials that have been given a clean bill of health by Dr. James Stamp, a nursery stock watchdog who helps vineyards to source clean and true-to-type vines. Another friend who is a big Napa grower told me his #1 concern right now is the quality of vine materials available through the commercial nursery system. New growers in the East need to be particularly aware of and cautious about the source and quality of new vine materials.

Powdery mildew, botrytis and phomopsis (in particularly damp springs) are the main fungal diseases in north coast vineyards and they use much the same tools to combat the problem. They have seen a late season “green mold” on berries after fall rains. Botrytis sprays are typically applied at bloom and veraison. Jeff told me that they use Gearmore atomizing sprayers in cooler areas near the coast and Aerofan air blast sprayers in the warmer inland regions. Application rates are typically 50-100 gpa.

As in the East, birds and bees are increasingly a nuisance at harvest time. Nets with spacers are necessary in high pressure areas. The fine mesh nets and lots of traps are able to control yellow jackets and wasps. They are quite sure that primary damage is being done by yellow jackets using their strong mandibles to pierce grape skins, which leads to secondary fruit infections.

Climate

We mostly think of California as a sunny and dry place during the growing season and it is, especially inland. But it is also a maritime region and coastal regions and corridors that offer marine influence to interior areas can have a big impact on wine growing. Elevation can also have a significant influence on fruit maturity. The one thing they almost never encounter is fall frost and winter injury, two severely limiting factors to much of Eastern wine growing.

I had heard about the use of diurnal shift data to properly site variety and clone but this is the first time the concept was really driven home for me. We visited Platt Vineyard, in the cool hills on the Sonoma Coast where 1800 growing degree days is average for a season. This would not appear to be enough heat to ripen Pinot Noir to full, juicy and tasty maturity. Yet in the right spot with an average diurnal shift range of about 30 degrees, Pinot Noir does ripen and makes drop-dead gorgeous, perfume-y and elegant wines. The viticultural goal is to situate a variety in the coolest outer limits of its ripening range so to get optimal flavor development and perhaps, better alcohol balance. It is also used in the hills above Napa, where the diurnal shift is reduced at night by

displacing warm air on the valley floor with sinking colder air. The warm air rises to certain elevations and vineyards in that zone benefit from the warmth. The diurnal shift in September on the valley floor might be 30 degrees but on Mt Veeder only 20 degrees. It is a clever concept that John Gladstones in *Viticulture and the Environment* explained but no one ever seemed to use. Integrated Winegrowing collects three years of site data to determine the diurnal pattern and can make variety choices based on this information. It is only used for variety and clone, not rootstocks.

In the East, where there are days with virtually no shift at all, I have always wondered why in regions with plenty of degree days the growers still have trouble getting fruit fully mature. There can be many reasons for unripe fruit such as overcropping or poor canopy management but perhaps if we understood the environmental conditions and how it impacts vine physiology we can make progress towards more consistent fruit ripening. Water is, of course, a big issue, both as rainfall and humidity, as is wind, cloud cover and all manner of weather that sets us apart from California. We are wetter than both California and Bordeaux but much closer to the latter. We should do everything to understand how their vines function, especially in wet seasons. My guess is that the answer is in the soil, as the French believe.

I asked Daniel Roberts what the most important piece of advice he gives to his clients. His answer was quick and emphatic, “Turn the Water Off!” The regulation of water is so important to vine function and wine quality. We just have to get a better grip on how to control it. I asked him how and he said two words. “Rock (aka soil drainage) and slope (self-explanatory).”

Site Selection

This is the category that separates the “men from the boys” in viticulture and wine quality. When Oregon “arrived” it was because people came first to look for a vineyard site and second for a place to build a home. Often the place with the best view was also the best for grapes. Grapes won. In California the location is very important as well. Over the past six decades a lot of sorting out has occurred. I remember when I was UC-Davis in the early 80s there was still Riesling grown near Calistoga. Now, as the region has matured, it’s pretty obvious what goes where, perhaps with the exception of Merlot, a variety no one seems quite to know what to do about. But the general characteristics of soil and climate in any particular area are known – Pinot Noir and Chardonnay by the coast or in Carneros, Syrah in the middle zones, Cabernet Sauvignon and Zinfandel in the oven. The true advantage they have is that regardless of site capacity they can tweak water and nutrients to influence vine size and behavior enough to get good fruit over quite a range of varieties and locations. I do not think we have that luxury, especially in cooler regions.

Integrated Winegrowing has a complex site analysis system that takes into account many soil and climate variables. Total available water is one of the most important. On their scale of 1-6 they are looking for scores of 2.5 to 4.5 as the range in which they get the best vine performance and wine quality. Nutrients are often on the margin, especially

phosphorus in hillside soils of volcanic ash and have to be very judiciously adjusted with fertigation. Soil salinity and excessive amounts of magnesium are also big challenges in California. All of the intensive evaluation work results in a vine spacing-density determination and a rootstock/variety/clone assignment. I think we need a system like this to help us to determine the best places to plant high quality wine grapes in the East. Maybe it already exists but I see enough poor vineyards sites to know it is not widely available or used. I hope to work with some of these consultants to develop such a systematic method to evaluate potential vineyards sites, beyond what existing GIS databases systems can offer. The only way to collect this data is in a soil pit and with climate data loggers.

Wind is given careful consideration. If it blows steadily during the day at over 17 mph, stomata are closed and vine function is impaired resulting in stunted shoots, less successful bloom and under-ripe grapes.

Row direction is being very carefully refined to take full advantage of sun and heat in cooler areas and to deflect the same in warmer areas where late season heat spikes can be just as damaging to wine as rains. Orientations are adjusted to a matter of degrees to achieve the optimal result. In general, rows are shifting away from true N-S to more NE-SW orientation.

As much as I constantly preach the benefits of proper canopy and crop management, until we find the suitable vineyard sites to grow vines of proper size and balance for the kinds of wines we would like to make, the viticulture is like so many band-aids stuck all over the vine. A properly balanced vine begins with good site selection and while we have excellent viticulture tools at our disposals the best wines are made with the fewest interventions in the vineyard.

Rootstocks

It is hard to make generalizations about rootstocks because the conditions in which they are planted will affect their performance. Riparia Gloire, 420A, and 101-14 appear to be the rootstocks in current favor for high quality reds. RG is the low vigor stock that helps to reduce in-row spacing and shortens the vegetative cycle. Pinot Noir on 420A in a cool region helps to extend the season by holding onto its leaves but not necessarily speeding up the ripening of the fruit. Syrah can be grown on 420A but not RG. In some cases, where tolerance of root knot, citrus and pin nematodes is necessary, 039-16 is used. St George is a very old stock but is still widely appreciated. In very low vigor soils 140R, 1103P and 110R are sometimes used. 1103 is particularly tolerant of high salt situations. We saw very little SO4 or 5C.

On low to moderate capacity sites rootstocks appear to be more expressive of their differences, especially in relative vine vigor. When soils get deep and fertile, the differences between rootstocks become less evident.

Vine Spacing, Density and Yield

New high quality red wines are often planted on high density with 2-3 feet between vines. Vines are mostly cane pruned to either single or double guyot. Yields are usually around 2-4 pound/vine. We had plenty of debate about the relative merit of pushing vines so close together. The high end wine market believes it makes a difference in quality. I'm not sure I am able to appreciate that difference. All acknowledge that the returns on quality are smaller as the density and costs go up, perhaps starting at 4 feet. The conundrum of vine density appears when some of the best wines in the valley appear from low density vineyards. At Screaming Eagle, the core of that iconic wine is made from an older, low density, high wire trained block of Cabernet Sauvignon near just below the old stone winery. At Beckstoffer To Kalon, a great vineyard in the Oakville appellation, the 100 point Parker wine made by Schrader comes from 8x7 cordon-trained vines. I think the secret is vine balance, and vine age helps to achieve balance.

In his column in Wine Business Monthly a few months ago Mark Greenspan wrote about a grower in the Russian River area who was experimenting with variable vine density as a way of matching vine size to soil without using rootstock as the primary means of sizing a vine. It's a very interesting concept that will only work if soils are carefully mapped, which needs to be done for rootstocks, too. On deeper soils vines are spaced further apart, getting closer as soil capacity decreases. Vines are still on rootstocks, but perhaps a "standard" stock like 101-14.

Yields at Araujo Eisele are typically 2.5 – 3 t/a for Cabernet Sauvignon on 6.5x6 spacing. New vineyards are being planted on 6.5x3.5. Syrah 3-3.5 t/a. Sauvignon Blanc and Viognier come in at 4 t/a. At Beckstoffer To Kalon yields are 3-3.5 t/a.

At Ovid we saw seven shoots/vine (2-3 per foot) which represented the lower limit and what Michel Rolland seems to like in his vineyards. Tom Prentice of Crop Care, a management company that farms many fine vineyard across the state likes 4.5 shoots/ft. Daniel Roberts is in the 3-3.5/ft range. In all cases, too few shoots may lead to sunburn.

We saw a new vineyard on 5' between rows. There is a new John Deere vineyard model that can squeeze down these tiny rows. At Small Vines we saw a tricycle over the row tractor from France. Clearly, at high density the demands for specialized equipment go way up.

David Abreu vineyards are very identifiable for their perfect care and the V trellis that helps to provide some additional shade and cooling to the fruit. Shoots from spurs trained to the V such as at Araujo easily move to either side of the trellis. Cane pruning can also be accommodated on the V. In the classic Lyre the shoots would be positioned with an interior set of catch wires but with only 12-24" of open space at the top there is not enough space to work inside of the canopy so shoots must be hand fastened to catch wires, a very labor intensive process.

There is some irony that more shade is being called for after viticulture in the valley disposed of the old California sprawl system. Some advocated for its return but the V represents a good compromise that is more refined. Phylloxera type-B was the excuse to commit to wholesale changes in vine density, training systems, rootstocks, varieties and clones, etc. in the valley in the 80s and 90s. Now, as is often the case, practices are return to some of the traditional methods.

All steel trellis materials are being used now. There are 2 or 3 pairs of catch wires on notched line stakes. Stakes are 55-62" out of the ground. 3.5-4 feet of shoot length is desired. Fruit wire is from 20-36", lower for red wines on higher density. The lower wire positions create issues with back problems for workers, weeds become more of an issue and give raccoons easier access to ripe fruit.

Vineyard Floor

Management practices vary dramatically from clean cultivated in summer to permanent cover crops. Most vineyards I visited are using winter covers to hold and feed the soils. Legume crops such as clover, peas, vetch and mustard are widely used on an every or every-other row basis, disced or spaded into the ground in the spring. Covers are usually a blend of Zorro fescue and Blando brome. Large radishes are being used to help reduce compaction, just as Steve Groff demonstrated at a PAW meeting last year. At Araujo Mustard caliente and oil seed radish is used as a bio-nematicide and sheep are used to trim the cover crop. Strips are kept clean with Roundup or the Pellenc Sunflower with hand hoeing depending on the farming philosophy. After a very severe frost season in 2008, growers are increasingly aware of the effects of vineyard floor treatment on frost. Clear, bare ground is the best condition to avoid frost. At minimum, a very low cover crop will help. Wind fans are strategically placed. As water becomes less available, its use for frost protection is being restricted - fogging is an alternative but must be activated much earlier than overhead sprinklers in response to an anticipated frost event.

Compost is used in specific applications such as to repair and rebuild soils after vineyard development or to build the vigor of a weak area or to maintain good soil health.

The Wines

Not much to comment about here other than to say that many north coast wineries spare no expense to give their wines luxurious surroundings. The new wineries at Ovid and Screaming Eagle are stunning in the form and function. Andy likes concrete tanks for fermentation. Harvest is all by hand at night, grapes are double sorted before being top fed into the tanks, which have heat/cooling coils. Extraction is fairly typical with a few days cold soak, primary fermentation with punch down and varying periods of maceration before pressing in mostly Vaslin basket presses. The caves are beautiful and full of new French oak barrels. The wines are graceful, not the fruit bombs that we seem to readily associate with Napa Cabernet. Jean Phillips, the former proprietor at Screaming Eagle was known for making wine in a tiny stone barn at the vineyard. Now there is a big, fancy winery. I asked Andy if he could make better wine with all the bells

and whistles. His reply, “I better.” I’m not sure if he wanted to add, “..or else.” A memorable wine was the second vintage from Platt Vineyard on the Sonoma Coast made by Fred Scherrer. It had wonderful spice and dark fruit with a great purity of flavors and excellent balance. I am developing a distinct fondness for Russian River and Sonoma Coast Pinot Noir.

Vineyards visited (see web sites for more information):

Paul Sloan Small Vines

Ovid – Pritchard Hill area (east side of Silverado Trail)

Screaming Eagle – Oakville (west side of Silverado Trail)

Dominus Napanook – Yountville

Platt – Sonoma Coast (wines from Scherrer)

Benovia – Russian River

Araujo Eisele – Calistoga (below Palisades, east of Silverado Trail near Calistoga)

Beckstoffer To Kalon – Oakville (west side of 29)

Martha’s Vineyard – tucked into the foothills just below Mt Veeder

Reference Resources:

Transpiration of Grapevines in the Humid Northeastern United States. Dragoni, et al.
http://www.ars.usda.gov/SP2UserFiles/ad_hoc/53581000GrapeResearch/journal/2006_Dragoni_AJEV_pageproofs.pdf

Three Most Common Methods for Measuring Vine Water Status. Kay Bogart.
<http://www.practicalwinery.com/NovDec06/novdec06p42.htm>

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