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Marching into Spring

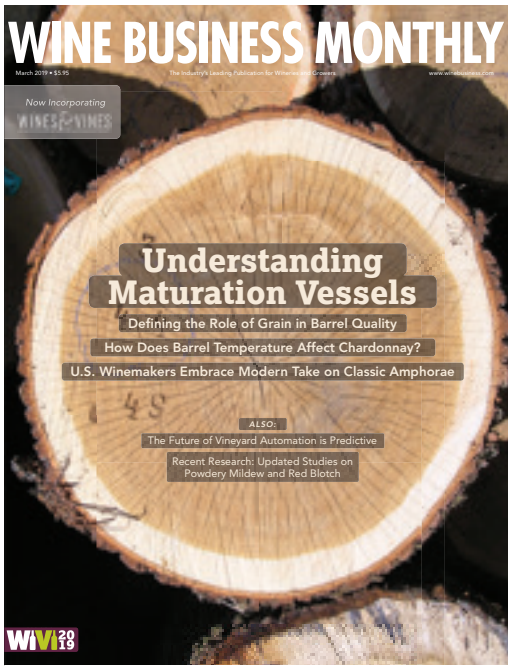
MARCH ALREADY. THAT MEANS spring is around the corner. It's time to blend, filter and bottle. It's also time to finish up with the winter pruning duties, the trellis maintenance and the mowing. It's been a pretty wet winter here in California. It looks like water won't be as hard to come by this year.

One of the things we've been hearing more about lately is grapevine powdery mildew. I haven't seen data showing there's more of it, but it seems like there is. Warmer temperatures and more intense rain events are possible factors. Fungicide resistance clearly plays a part.

An article in this issue describes a sweeping new research project that aims to develop predictive tools to help identify this resistance and strategies to mitigate it. A national research and extension effort to understand and reduce the effects of fungicide resistance in powdery mildew is now underway—a four-year, $4.75 million project is funded through the U.S. Department of Agriculture's Specialty Crop Research Initiative. The article also discusses good mildew management practices one can employ for a healthy vineyard.

Another challenge in the vineyard we've been hearing more about lately is Red Blotch. The March issue includes an update on how Red Blotch spreads from vineyard to vineyard, and includes recommendations for reducing the spread.

Vineyard automation is another hot topic these days, for obvious reasons. Mark Greenspan delves into the topic again this month, this time with an emphasis on artificial intelligence. What if AI could not only control pumps and valves and to check itself during operations, but also determine the best way to irrigate a vineyard at different times of the growing season?



Could automation and AI be used to target hot spots of disease in a vineyard or to apply fertilizers more specifically where they are needed?

Here's to a healthy vineyard and to a productive spring.

Cyril Penn, editor

Jim Gordon, editor-at-large

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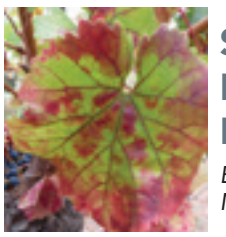

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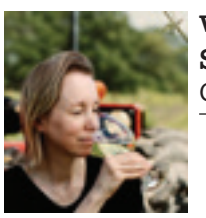

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who's talking in this issue

David Ramey, founder Ramey Wine Cellars, "Does Oak Grain Still Matter?" page 14

"The relationship is based on trust, since you can't tell what forest the wood is from once delivered, and a preference for house style. If you like a cooper's work, buy their barrels—but don't tell them how to make the barrel. It's mental masturbation for California winemakers to try to control the barrel making process—an ego thing."

Michael Callahan, assistant winemaker, Chamisal Vineyards, "Winemaker Trial," page 38

"I think what this trial did for me is give me confidence. A lot of times that's what you get when you do these trials because you get a little more experience, and it allows you to guide those fermentations without needing to rely on some of what's already been drafted as 'this is the way you do things.'"

Chris Figgins, director of winemaking, Leonetti Cellar, "Technology Meets Tradition as Amphora Use Grows," page 44

"Amphorae are really good for preserving fruit. [The wine] doesn't develop as much fat on the palate. It's more linear. It has really good acid preservation."

Mick Schroeter, winemaking director, Sonoma-Cutrer Vineyards, "Winemakers Discuss the Reasons Why They Moved to Screw Cap," page 54

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Tom Steffanci, president, Deutsch Family Wine and Spirits, "The Choice for Rosé Glass Bottles is…Clear," page 104

"French Rosé consumers want a non-traditional, sexy bottle that still looks like it should have wine in it."

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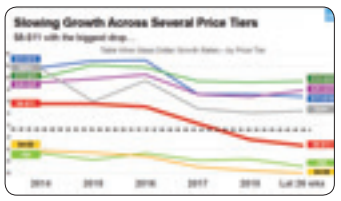

Nielsen Recognizes Large U.S. Producers at Unified

Amid a decelerating wine sales environment, **Nielsen** reminded wine industry members at the **Unified Wine & Grape Symposium** that the American market "is still the envy of the world, and it's something we should be proud of." **Danny Brager**, senior vice president of beverage alcohol practice for the market research firm, presented data that confirmed a slowing growth rate in the wine industry. He also showed other data indicating that multiple price tiers and many companies are still growing well. Brager announced the gold medal companies in Nielsen's "Best of the Best for 2018" analysis were three U.S.-based companies: **Delicato Family Vineyards**, **Riboli Family Wines** and **Precept Wine**, all showing case volume gains of more than 100,000 cases and double-digit percentage gains in both cases and dollars. The silver medal winners, with more than 100,000-case growth but percentage gains not quite as large as the gold medal winners, were **Deutsch** Family and **Jackson Family Wines**.

Pioneer Winemaker MaryAnn Graf Dies at 76

Winemaker **MaryAnn Graf**, the first woman to graduate from **UC Davis**' enology program and to serve as a board member of the **American Society for Enology and Viticulture**, died Jan. 30, 2019 from pancreatic cancer. She was 76. Graf began her career in the Central Valley where she worked as an assistant winemaker and chemist. She then continued to hone her skills in the wine industry in Sonoma County. In 1973, she became winemaker at **Simi Winery** in Healdsburg. Graf later co-founded **Vinquiry** with **Marty Bannister** to provide analytical and consulting services for the wine industry. She retired from Vinquiry in 2003 after 40 years.

Wine Institute Receives $9.8 Million Grant

Wine Institute received nearly $9.8 million from the **U.S. Department of Agriculture** to promote California wine in China and other international markets where the industry faces retaliatory tariffs and other headwinds. The San Francisco-based trade association is one of 57 organizations that recently received funding from USDA's **Agricultural Trade Promotion Program** to "identify and access new export markets." USDA distributed a total of $200 million to the organizations to mitigate "the effects of unjustified trade retaliation against U.S. farmers and exporters," according to a USDA written statement issued Jan. 31. U.S. wine exports from January through October 2018 totaled about $1.23 billion, or 2 percent less than during the same time period in 2017, according to Wine Institute. Wine exports to China decreased by 15 percent in 2018, according to the trade association.

Senate Looks to Extend Craft Beverage Modernization Act

A senate bill was introduced in February to make the excise tax cuts passed in 2017 permanent. The tax cuts were due to expire this year. They were approved in December 2017 as part of the $1.5 trillion tax reform package. U.S. Senators **Ron Wyden**, D-Ore., and **Roy Blunt**, R-Mo., introduced the Craft Beverage Modernization Bill with strong support from industry trade groups, including **Wine Institute** and **WineAmerica**. The passage of the excise tax cuts in 2017 resulted in a total estimated savings of $150 million for California wineries in 2018 and 2019, according to Wine Institute.

DTC Report Card: More Work Remains

Oklahoma became the 45th state in 2018 to allow direct-to-consumer wine sales as the direct-to-consumer shipping market reached $3 billion in 2018. While the annual volume of all wine shipments increased by 9 percent to reach 6.3 million cases in 2018, outstanding issues remain. Wineries cannot use fulfillment houses to ship wine to consumers in The Sooner State. A bill may be introduced if no regulatory resolution is reached. **Steve Gross**, vice president, state relations for **Wine Institute**, said in January at the 2019 **Direct to Consumer Wine Symposium** in Concord, California.

Scott Laboratories and Lallemand Announce Deepening Partnership

Scott Laboratories and **Lallemand** in February announced a new economic partnership. Lallemand is a family-owned Canadian group specializing in research, production and marketing of yeast, bacteria and their derivatives. Scott Laboratories Inc. and **Scott Laboratories Ltd.** in Canada specialize in value-added products for the wine industries. Both are privately-held companies. Scott Labs in 1974 brought Lallemand the original yeast collection from the **University of California** that Scott Labs had inherited in 1934. "After 45 years of productive collaboration between our teams and families, we are excited that this closer connection will bring our clients both global experiences in winemaking innovation, as well as a voice in influencing the trends of future product development," said **Zack Scott**, chief executive officer of Scott Laboratories.

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Does Oak Grain Still Matter?

A discussion of tree rings as a factor in making barrel buying decisions

Jim Gordon

Jim Gordon, editor at large for *Wine Business Monthly*, writes and edits articles on grape growing, winemaking and wine marketing. He has been covering wine and the wine business for more than 35 years, notably as the editor of *Wines & Vines* from 2006 through 2018. A role as contributing editor for *Wine Enthusiast* magazine began in 2014, in which he reviews California wines and reports on various California wine regions. He was executive director of the annual Symposium for Professional Wine Writers at Meadowood Napa Valley, from 2008-2015. Dorling Kindersley (DK Books) of London published his first book as editor in chief, Opus Vino, in 2010, which was chosen as a finalist in the James Beard Awards. In 2002 he was co-creator and managing editor of the long-running Wine Country Living TV series for NBC station KNTV in San Jose/San Francisco.

WHEN WAS THE LAST time you heard a cooperage sales rep touting a barrel made with "carefully selected open-grain oak?" While barrel staves potentially come in open-grain, medium-grain and tight-grain variations, the tight-grain or fine-grain option is the one that has become almost synonymous with high quality.

Tonnellerie Quintessence touts its Essence de Chantilly barrel as featuring "extra fine grain" from trees grown in limestone soil in France. **Tonnellerie Radoux**'s website states, "Only the highest quality, tightest-grain oak is selected and produced into Radoux's Extra Tight Reserve Blend barrels." **Canton Cooperage** in Kentucky uses "extra fine grain" American stave wood seasoned 48 months for its Grand Cru Limited Edition line of barrels.

These and other companies' emphasis on grain in their marketing materials syncs up nicely with the criteria that winemakers say they use when shopping for barrels. In ***Wine Business Monthly***'s recent Barrel & Oak Survey (December 2018 issue), a majority of the winemakers surveyed ranked grain as the second most important factor in their barrel-buying decisions, after type (French, American, Eastern European) and before the other listed factors: forest of origin and tannin potential.

Winemaker-owner **David Ramey** of Sonoma County's **Ramey Wine Cellars** always stipulates "best fine-grain wood" when ordering barrels for his coveted Chardonnays, Cabernet Sauvignons and other wines (see sidebar). **Jeff Cohn** of **Jeff Cohn Cellars**, also in Sonoma County, routinely ages his Syrahs, Zinfandels and Viogniers in fine-grain wood, too. "Tight-grain oak helps me bring out more of the vineyard character, more of the mineral aspects and gives me more of the mid-palate structure I'm looking for," Cohn said.

Quercus petraea, Hungary

Kadar quartered logs

But what does grain actually mean, why is it important in the maturation of wine in barrels and is it a reliable indicator of how a barrel will interact with wine? Winemakers everywhere can benefit by knowing the answers to these questions before they launch new varietal programs or adjust their cooperage mix for current wines.

What is Grain?

Oak grain is simply a term for the width of the annual growth rings that develop in the tree trunks. Each annual ring consists of two parts: the spring growth/early growth portion and the summer growth/late growth portion. The spring growth ring is mostly porous and reflects the growth period when sap is flowing quickly from the roots to the rest of the tree. It needs to be porous to let the sap flow through.

The summer growth portion is less porous and denser, reflecting the amount of fiber and cellular tissue the tree was able to store as a result of photosynthesis occurring after its leaves were set.

Foresters and coopers know that the spring growth rings in an individual tree are fairly consistent in size from year to year while the summer growth rings are usually wider than the spring rings and vary more widely based on the growing conditions that year. Very tight-grain wood in certain oak species and in certain soil and climatic conditions can display spring and summer rings of roughly the same widths.

One industry source defines tight grain as less than 3 mm ($^1/_8$ inch) per annual growth, including both spring and summer growth. Another source states that fine grain (generally synonymous with tight grain) is less than 2 mm, and medium grain is less than 3 mm.

A perception, or perhaps a misperception, has long existed in wine circles that tight grain gave more tannin to a wine and open grain gave more "oaky," pastry-like vanillin aromatics. But research done by a French university team for the cooperage firm **Chene et Cie** and published in ***Wines & Vines*** in July 2014 cast doubt on that assumption.

The research was led by **Guillaume de Pracomtal** of Chene et Cie and has been used by the company's cooperages, including **Taransaud**, Canton and **Kadar**, to educate their staff and clients. Their report states that the

Growth rings in American Oak

more porous, spring portion of the grain conveys most of the aromatics from oak staves into wine while the summer wood portion contributes most of the tannins.

Tight grain has a higher proportion of spring wood to summer wood. For example, similar-size spring and summer rings would mean the ratio is 50-50. Wider summer rings in a medium- or open-grain stave might change the proportion to perhaps 25-75.

"The fact that tight grain has more vessels means that it contains more void and is therefore more porous, which goes against a pre-conceived idea that open grain is more porous—it is actually the opposite," the report stated.

"It explains why tight grain seems more aromatic: More aromas are released from the vessels, which makes sense as this is where the sap flows with minerals, nutrients and sugars. Our observation also explains why open grain feels more tannic: The wine gets more contact with fiber material, as there is a larger proportion of summer wood."

One of the study's main conclusions was that "tight grain releases more aromatic compounds (eugenol, whisky lactones) over time than open grain, and open grain releases more wood tannins (ellagitannins)."

L'ESSENCE DE L'ART

Tonnellerie
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Oak Species and Grain

Oak grain also varies among species of oak trees. *Quercus robur* (also known as pedunculate oak) and *Quercus petraea* (also known as sessile oak) are the two main species for barrel making grown in Europe. *Quercus alba* (white oak) is preferred for virtually all American oak barrels.

Each species has typical tendencies in grain and aromatics, but these vary widely by the soil, microclimate and exposure in which the trees grow. Of the European types, both grow widely in France, Germany, Hungary, Yugoslavia, Russia and elsewhere. Often, they are intermingled in forests, and hybrids occur naturally, but in some places one species is very dominant, so those individual forests came to have reputations based in large part on the dominant species. For example, the Tronçais forest in France and Zemplen in Hungary have a high proportion of *petraea* trees.

American oak barrels tend to have wider, more open grain and usually give a significantly different set of sensory properties to wine than European oak does, including less tannin.

Kadar logs

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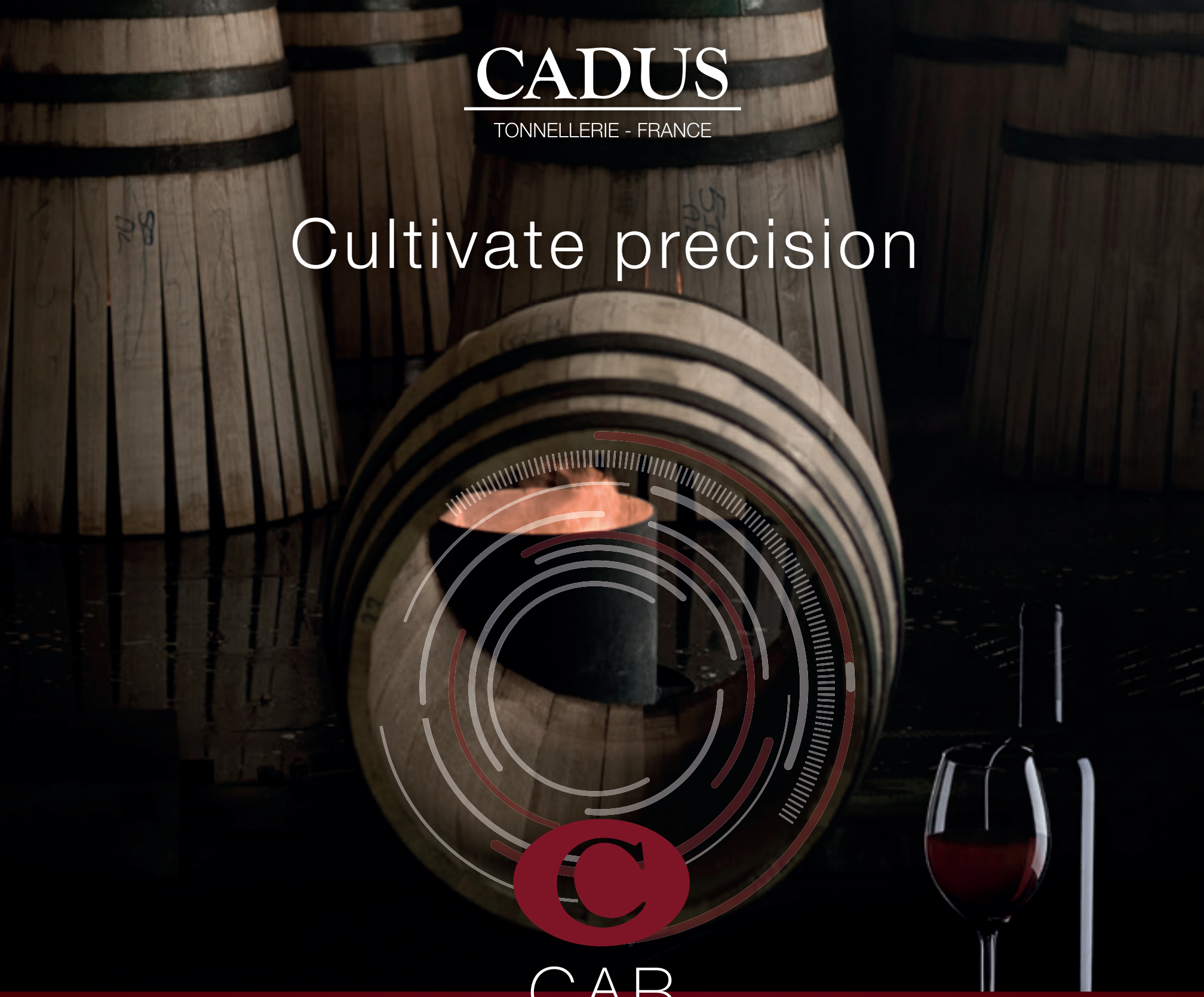

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Does Oak Grain Still Matter?

Another French study, this one involving **Seguin Moreau**'s research and development manager, **Andrei Prida**, and scientists at the **University of Bordeaux**, nicely summarizes differences between the European species. In the April 2017 issue of *Wines & Vines*, the authors observed: "Some coopers classify the qualities of wood according to ring width (also called grain) or geographic origin (forests). However, previous studies have demonstrated that species is a better indicator of chemical composition than morphological parameters or provenance."

The authors go on to explain that *petraea*, on average, is higher in oak lactones and lower in ellagitannins while robur oak is the opposite. This finding underscores the general acknowledgment that *petraea* is often preferred over *robur* for high-quality, high-priced wines, especially those that remain longer in barrel. Since *petraea* also has typically tighter grain than *robur*, it's not a big leap to correlate fine grain and suitability for high-quality wines.

Quercus alba (white oak) is preferred for virtually all American oak barrels.

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David Ramey on Barrel Choice

The founder of **Ramey Wine Cellars** in Healdsburg, California is known for his winemaking expertise and his frank opinions about winemaking techniques, including barrel aging. **David Ramey** demonstrated over four decades that traditional, artisanal methods work well in modern winemaking, including sur lie aging of white wines in barrel, malolactic fermentation of Chardonnay, native yeast fermentations, harvesting fully mature fruit, eliminating acidification of red wines and bottling without filtration.

Ramey worked for **Simi**, **Matanzas Creek** and **Chalk Hill** wineries in Sonoma County before coming to Napa Valley as winemaker for **Dominus Estate** and project manager for the construction of its new winery. He then helped **Leslie Rudd** reshape the **Girard Winery** into **Rudd Oakville**.

Wine Business Monthly asked him about his approach to choosing barrels.

WBM: *How did you establish your foundation for making barrel choices?*

Ramey: In about 1987, while at Matanzas Creek, I ran an experiment with the same Chardonnay juice from the same tank put into six barrels each of 10 different kinds: five different forests (Allier, Tronçais, Vosges, Nevers and Limousin) from one cooper (**François Freres**) and the same forest (Allier, I think) from five different coopers. Eight months or so later it was clear: very little difference between oak sources made by the same cooper; vast differences between coopers, ostensibly using the same wood source.

WBM: *How do you communicate to your barrel vendor what you want?*

Ramey: Since then, I've not specified wood source from our two coopers, François and Taransaud, but rather asked for "best fine-grain wood for [fill in the variety]" as well as "house toast for [fill in the variety]." We do pay extra for three-year air-dried wood.

WBM: *Why don't you get more specific about grain or forest or tannin content?*

Ramey: The relationship is based on trust, since you can't tell what forest the wood is from once delivered, and a preference for house style. If you like a cooper's work, buy their barrels—but don't tell them how to make the barrel. It's mental masturbation for California winemakers to try to control the barrel making process—an ego thing.

WBM: *Do you ever experiment with new coopers?*

Ramey: The last time we tried a different cooper, which came out of a seminar I spoke at, the results were awful. I'm a bit of a traditionalist—our coopers have been making barrels for a long time, and tradition is the result of experimentation which has succeeded. **WBM**

LEFT: *Quercus petraea* (also known as sessile oak)
RIGHT: *Quercus robur* (also known as pedunculate oak)

French Forests

Prida elaborates on this issue in a recent email exchange. "Grain tightness is related to species: sessile (*petraea*) oak is characterized by more tight-grain structure, and pedunculate (*robur*) is more coarse grain," he wrote. "So, by sorting of grain we get predominantly sessile oak for fine and extra-fine grain selection, and predominantly pedunculate oak for coarse grain selection. The medium grain is a mixture of two species. But, the grain criterion is not sharp for species distinction: sometimes we can have sessile oak with coarse grain structure and pedunculate oak with fine structure. It depends on the ecologic conditions for vegetation."

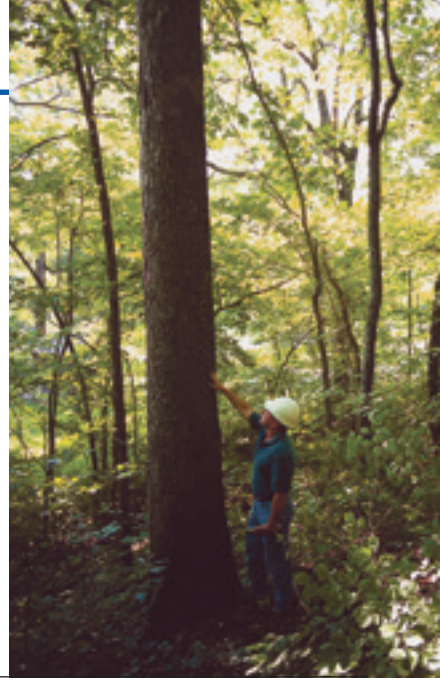
As for forest of origin, Prida stated: "The French oak forest is a natural one, and no trees were planted artificially. That's why during the ages, the forests were colonized by sessile and pedunculate species, according to the adaptability of each species to environment. For example, we know that pedunculate oak likes rich soil, low elevation, while sessile can better resist dryness and poor soil and can colonize higher elevations, like certain hills and slopes. By sorting the wood according to origin, a cooper chooses forests with different proportions of sessile/pedunculate oak. But, the majority of forests contain both species. So, the wood coming from the same forest can be very different."

This high degree of variability has spurred numerous researchers to develop more reliable gauges of suitability for different wine types than grain.

The Prida team focused on substances in oak wood called sweet triterpenoids as a key indicator in the 2017 report. They found that *petraea* oak contained more sweet triterpenoids while *robur* oak was higher in bitter triterpene. Using liquid chromatography–mass spectrometry the species of the samples tested can be accurately and not-too-expensively determined, they reported.

Other researchers, including a team backed by the **Vicard Generation 7** cooperage in Cognac, France, have focused on ellagitannin levels measured in oak staves before toasting as the key marker for potential quality. Their studies have been published in trade journals.

The tannin analysis approach is beginning to show some traction in the industry, according to results of the Barrel & Oak Survey. Winemakers at mid- to large-size wineries cited tannin potential as equally important to grain as the second highest priority factor in their barrel purchasing decisions. Winemakers at small wineries, however, still significantly prefer grain over tannin potential.



Weighing Grain's Importance

University of California Extension enologist **Anita Oberholster** advises that the choice of cooperage and not grain size is the most important decision for a winemaker. "My understanding is that grain type has a small impact…. Due to large sample pools needed to really investigate differences, research findings vary on the impact of grain type, origin, etc. The impact, in general, is found to be small.

"The cooperage has the largest impact in its seasoning of staves and toasting of the barrel. Size of barrel and age also have a large impact. It is difficult to predict what barrel to use for different varieties. Trial and error is the best way."

The evolution of thinking about barrel quality parameters is well illustrated by the observations of **Elizabeth Vianna**, winemaker and general manager at **Chimney Rock Winery** in Napa Valley. "When I first started making wine almost 20 years ago, French coopers mostly sold barrels by forest—and it was understood that certain forests contained more fine grain, such as Tronçais and Allier, while others such as Limousin were more coarse grain," she wrote.

"The less-fine grain favored varieties that spent less time in oak while the extra-fine grain was more for longer aging varieties, such as Cabernet Sauvignon, Merlot and Petit Verdot. Over time, with better technology and understanding, it seems that coopers shifted to making proprietary selections by grain tightness rather than forests and marketing it as such. In my experience it is best to get to know each cooper and familiarize yourself with their style, consistency, selection criteria and technology."

Asked if she thinks coopers are doing a better job of keeping the oak grain consistent in their barrels, she added: "I remember going through this evolution, particularly with one of our longest standing house coopers. Back in the day they sold their barrels by forest designation exclusively, but probably just over a decade ago they started to select their wood simply by grain tightness. I was skeptical at first, but we did a trial and found their grain-selection barrels were, in fact, very consistent from year to year."

Concerning her own preferences in oak, she stated the following, which seems an appropriate way to conclude the discussion: "I hate speaking in absolutes, and I don't think there is a 'better' grain choice—it is all about style, variety, AVA, length of aging, etc. In the end it is a lifetime of discovery, finding what barrels 'elevate' or support your fruit in the best way." **WBM**

Select Barrel & Oak Suppliers

Adirondack Barrel Cooperage
Remsen, NY ☎ 315-939-3741 • *www.adirondackbarrelcooperage.com*

Adour Cooperage
Santa Rosa, CA ☎ 773-332-0059 • *www.adour.fr*

Agrovin USA, Inc.
Petaluma, CA ☎ (707)782-6371 • *www.agrovin.com*

Alain Fouquet French Cooperage, Inc.
Napa, CA ☎ 707-265-0996 • *www.alainfouquet.com*

Allary Tonnellerie
Amity, OR ☎ 503-307-1593 • *www.nicholaskeelerinternational.com*

Artisan Barrels and Tanks
Oakland, CA ☎ 510-339-0170 • *www.artisanbarrels.com*

Barrel Builders, Inc.
ad on page **20**

St. Helena, CA ☎ 707-963-9963 • *www.barrelbuilders.com*

We know barrels, it's what we do.

Marchive barrels can be individualized to suit your specific wine and style. From wood type, to wood seasoning, to toast level options you can create a barrel that will harmonize perfectly with each vintage.

PRODUCTS: Barrels, oak alternatives, cooperage supplies/tools
OAK TYPES: French Oak, American Oak, Eastern European Oak, Acacia
BARREL SIZES: Burgundy, Bordeaux, Large Format

Barrels Unlimited, Inc.
Seal Beach, CA ☎ 562-438-9901 • *www.barrelsunlimited.com*

Berthomieu Tonnellerie
Cloverdale, CA ☎ 707-224-2377 • *www.berthomieu.com*

Bouchard Cooperages
ad on page **25**

Napa, CA ☎ 707-257-3582 • *www.bouchardcooperages.com*

A commitment to quality and customer service

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BOUCHARD COOPERAGES

After 37 years of passion and dedication to the cooperage business, Vincent Bouchard has finally put his signature on a barrel.

Tonnellerie DAMY from Meursault Burgundy offers forest origin and a "speciality" series of French oak barrels.

Tonnellerie BILLON from Beaune Burgundy offers forest origin and a "speciality" series of French oak barrels.

Tonnellerie MAURY from Bordeaux offers French oak barrels based on grain tightness with a Bordeaux style toast.

PRODUCTS: Barrels, Barrel Alternatives, & Amphorae
OAK TYPES: French Oak, American Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Canton Cooperage
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Santa Rosa, CA ☎ 707-843-4407 • *www.cantoncooperage.com*

Master of American Oak Barrels

Canton crafts the finest American oak barrels, selecting the highest quality oak; natural open-air seasoned staves (certified); toasting barrels precisely with computer monitoring; traditionally crafted in a modern facility; HACCP process; full traceability and food safety controls (certified). Grand Cru Limited Edition 4 year (extra fine grain, air-seasoned 48 months), Grand Cru (extra fine grain, 36 months), Vintage Premium (fine grain, 36 months), Vintage (fine grain, 24 months) and Spirit barrels. We offer: 200L, 225L, 228L, 265L and 300L. We have extended the Grand Cru 3 and 4 year product line to offer 500L puncheon. Also, our newest prestigious 225L barrel, Canton FIVE, features a special tight grain American Oak selection air seasoned for a minimum of 5 years. Limited in production, this exclusive barrel is hand crafted by our Master Coopers using a special proprietary toasting method. This unique barrel offers the highest antioxidant capacity (CAOX®) used to protect the wine from oxidative phenomena.

CANTON SINCE 1939

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Carolina Wine Supply
Yadkinville, NC ☎ (336)677-6831 • *www.carolinawinesupply.com*

CFP Winemakers
Pittsburg, PA ☎ (412)232-4507 • *www.cfpwinemakers.com*

Charlois Cooperage USA
Cloverdale, CA ☎ 707-944-1371 • *www.charloiscooperageusa.com*

Country Connection
Oroville, CA ☎ (530)589-5176 • *www.countryconnection.biz*

Creative Oak
Benicia, CA ☎ 707-746-5704 • *www.creativeoak.com*

Demptos Napa Cooperage
ad on page **26**

Napa, CA ☎ 707-257-2628 • *www.demptosusa.com*

Over 200 years of expertise goes into coopering ultra premium, naturally air dried and seasoned oak barrels for winemakers all over the world.

Demptos offers both locally produced barrels from our Napa Cooperage as well as French coopered from Tonnellerie Demptos. The Demptos Research Center in Bordeaux has developed our most prestigious and innovative barrels: Essencia® - an exclusive oak selection rich in norisoprenoids. Paradox® - blond heavy toasting concept eliminating toffee aromas. Réserve - tightest grain available suited for slow extraction. OH>15™- preserves the balance of wines with high alcohol content.

DEMPTOS

PRODUCTS: Barrel, Oak Alternative, wine-aging enological practices
OAK TYPES: French Oak, American Oak, Eastern European Oak, Hybrid custom coopered blends
BARREL SIZES: Burgundy, Bordeaux, Large Format, Oak Tanks

East Coast Wood Barrels
Medford, NY ☎ 516-582-1065 • *www.ecwbny.com*

Éclat
San Rafael, CA ☎ 415-457-3955 • *www.boswellcompany.com/barrels/eclat-2*

Epocure Stave Co.
Lafayette, CA ☎ 707-455-1095 • *amaleoak.com*

Select Barrel & Oak Suppliers

Erbslöh Geisenheim, Inc.
New York, NY ☎ 212-315-2196 • *www.erbsloeh.com*

Ermitage Tonnellerie
Cloverdale, CA ☎ 707-224-2377 • *www.tonnellerie-ermitage.com*

Fine Northern Oak
Napa, CA ☎ 707-307-6222 • *www.finenorthernoak.com*

French Cooperages LLC
Portland, OR ☎ 503-241-2988 • *www.frenchoakbarrels.com*

G3 Enterprises
ad on page **139**

Modesto, CA ☎ 800-321-8747 • *www.g3enterprises.com*

We are Creative, Integrated Solutions.

As a leading manufacturer and supply chain company, G3 Enterprises has expanded its offerings to include wine ingredients. G3 is the exclusive distributor of Vivelys' Boisé® in the United States. Boisé® is a line of premium French oak that includes a unique range of chips and "new" Inspiration staves. Boisé® high quality oak products help winemakers create precise and consistent wine profiles

In addition, G3 is introducing Phenesse Oak, a new oak alternative that comes with two types of tank staves (11MM format) and two types of chips sourced from high quality French and American Oak forests. The Phenesse products are designed to bring harmonious results to assist in quality winemaking for the North American region.

Garbellotto
Paso Robles, CA ☎ 805-226-8100 • *www.thevintnervault.com*

Gino Pinto
Hammonton, NJ ☎ (609)561-8199 • *www.ginopinto.com*

GW Kent
ad on page **27**

Ypsilanti, MI ☎ 734-572-1300 • *www.gwkent.com*

PRODUCTS: Barrels, Casks
OAK TYPES: American Oak, Quercus Petraea
BARREL SIZES: 25 gallon, Bordeaux 225L, Cask 20 HL

Heinrich Cooperage
Sonoma, CA ☎ 707-738-8670 • *www.heinrich.com.au*

Heritage Barrels

Napa, CA ☎ 707-696-7695 • *www.heritagebarrels.com*

Innerstave, LLC

ad on page **18**

Sonoma, CA ☎ 888-996-8781 • *www.innerstave.com*

Experience Oak Alchemy

Innerstave offers consistent flavor profiles throughout our product line of French and American Oak new barrel alternatives. Our unique flavor profiles are achieved by maintaining long term relationships with our suppliers, aging in the Carneros Region of Sonoma, CA for 24 to 36 months and our proprietary toasting process.

PRODUCTS: Oak alternatives
OAK TYPES: French Oak, American Oak
BARREL SIZES: Barrel Alternatives that replenish barrels and for adding to tanks

Kelvin Cooperage

San Rafael, CA ☎ 415-457-3955 • *www.boswellcompany.com*

Le Grand Oak Alternatives

Lafayette, CA ☎ 707-455-1095 • *amaleoak.com*

Honoring Tradition, Embracing Technology

Le Grand Oak Alternatives are crafted from certified French oak. Our French oak is seasoned a minimum of 24 months, on site at our vertically integrated cooperage. We maintain control over the entire process from wood sourcing through toasting, ensuring the consistency of our products year over year. We offer products for both neutral barrels and tanks. Custom installation available.

PRODUCTS: Oak Alternative
OAK TYPES: French Oak

Louis Latour

ad on page **26**

San Rafael, CA ☎ 415-479-4616 • *www.louislatour.com*

Handcrafting barrels since 1898.

Each barrel from Louis Latour is a piece of craftsmanship. The oak is sourced from the forests of Northern France, and is aged in the open-air for more than two years.

PRODUCTS: Barrel
OAK TYPES: Frenck Oak
BARREL SIZES: Burgundy

Select Barrel & Oak Suppliers

Mercier USA, Inc.
Napa, CA ☎ 707-321-9640 • *www.tonnellerie-mercier.com/accueil*

Meyrieux Cooperage
Napa, CA ☎ 707-259-5344 • *www.tonnelleriemeyriux.com*

Morlet Selection
St. Helena, CA ☎ 707-967-8690 • *www.morletselection.com*

Nadalié USA
ad on page **16**

Calistoga, CA ☎ 707-942-9301 • *www.nadalie.com*

Cooperage is our craft

Founded in 1980, Nadalié USA is the first French cooperage in America. Located in Calistoga, CA, the Nadalié USA production facility handcrafts American oak barrels and imports French oak barrels made at the Nadalié cooperages in France. By continuing the tradition of handcrafting barrels in the traditional French style, the name Nadalié has become synonymous with fine cooperages worldwide.

PRODUCTS: Barrels, Oak Alternatives and Casks
OAK TYPES: French Oak, American Oak, Eastern Eurnpean Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

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Oak Solutions Group / evOAK
Napa, CA ☎ 707-259-4988 • *www.oaksolutionsgroup.com*

Oak Wise, Inc.
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Lodi, CA ☎ 209-224-5353 • *www.oak-wise.com*

Oak Wise is a leading producer of quality oak and oak derived products supplying a diverse section of the beverage industry.

PRODUCTS: Barrels and Oak Adjuncts

Oenosylva
Cloverdale, CA ☎ 707-224-2377 • *www.oenosylva.com*

Oregon Barrel Works
McMinnville, OR ☎ 503-472-8883 • *www.oregonbarrelworks.com*

Premier Wine Cask
Napa, CA ☎ 707-257-0714 • *www.premierwinecask.com*

Pronektar
Santa Rosa, CA ☎ 707-284-2888 • *www.radouxcooperage.com*

Quercus Concepts

ad on page **30**

Napa, CA ☎ 707-775-7065 • *www.quercuswood.com*

A cut above

Quercus equals superior quality products that complement a winemaker's specific oak profile requirements. Our products are crafted by utilizing the latest precision toasting equipment and implementing rigorous quality control standards, while using only the finest wine barrel grade tight grain oak.

PRODUCTS: Oak Adjuncts - Barrel Alternatives
OAK TYPES: French Oak, American Oak, Eastern European Oak

Saveurs

Cloverdale, CA ☎ 707-224-2377

Seguin Moreau Napa Cooperage

Napa, CA ☎ 707-252-3408 • *www.seguinmoreaunapa.com*

StaVin, Inc.

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Sausalito, CA ☎ 415-331-7849 • *www.stavin.com*

Traditional flavor. Real economics.

We are StaVin, the world's leading supplier of the highest quality toasted oak products for wine. We are family run and operate in an artisanal fashion to customize and craft winemakers' complex flavor profiles. Our innovative and ecologically responsible products help wineries reduce production costs drastically while maintaining the subtle nuanced flavors of their favorite barrel program. Our mission is to help wineries enhance the pure traditional flavors in their wines while saving them money.

PRODUCTS: Oak Adjuncts - Barrel Alternatives
OAK TYPES: French Oak, American Oak, Eastern European Oak
BARREL SIZES: Oak Adjuncts-Beans, Segments, Barrel Replica, Barrel Insert, Stave Fan

Taransaud/Knox Barrels

San Francisco, CA ☎ 415-751-6306 • *www.knoxbarrels.com*

TB Tonnellerie

Les Artigues de Lussac, France ☎ • *www.tb-tonnellerie.com*

The Boswell Company

San Rafael, CA ☎ 415-457-3955 • *www.boswellcompany.com*

The Oak Cooperage

Highbee, MO ☎ 660-456-7227

The Oak Lab

ad on page 21

Petaluma, CA ☎ 707-765-6666 • www.*theoaklab.com*

re-imagining oak infusion

The Oak Lab™ was founded with the vision of bringing a new perspective to the oak infusion market by developing and embracing new technologies, and re-imagining the process of product trials, selection, and application. Our mission is to deliver solutions for winemaking success and unparalleled customer experiences, all with an eye toward wine quality.

PRODUCTS: Oak alternatives

Titan Barrel Works

Pine Plains, NY ☎ 516-582-1065 • *www.titanbarrels.com*

TN Coopers

Sonoma, CA ☎ 707-996-5600 • *www.toneleria.com*:

Tonelería Magreñán

Cloverdale, CA ☎ 707-224-2377 • *www.magrenan.es*

Tonnellerie Atelier Centre France

Sancoins, France ☎ • *www.atelier-centre-france-tonnellerie.com*

Tonnellerie Baron

St. Helena, CA ☎ 707-328-8207 • *www.tonnelleriebaron.com/en*

Tonnellerie Bel Air

Calistoga, CA ☎ 707-987-8905 • *www.tonnellerie-bel-air.fr*

Tonnellerie Berger & Fils

Vertheuil, France ☎ 707-266-8357 • *www.tonnellerie-berger.com*

Tonnellerie Bossuet

San Rafael, CA ☎ 415-457-3955 • *www.boswellcompany.com*

Tonnellerie Boutes

Rodeo, CA ☎ 510-799-1518 • *www.boutes.com*

Tonnellerie Cadus

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Paso Robles, CA ☎ 805-226-5488 • *www.tonnelleriecadus.com*

Cadus barrels are used in wine regions throughout the world.

Thanks to their proven versatility and profile's consistency, Cadus barrels are a key element in oak programs for numerous red and white grape varietals.

PRODUCTS: Barrels
OAK TYPES: French Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Tonnellerie de Jarnac

Napa, CA ☎ 707-332-4524 • *www.tonnellerie-de-jarnac-16.com*

Tonnellerie de Mercurey

ad on page **28**

Napa, CA ☎ 707-246-1708 • *www.Tonnellerie-de-Mercurey.com*

Respect and stewardship of the forests blended with the traditions of our cooperage to serve your wines.

Tonnellerie de Mercurey is renowned for its precision oak blending and the consistency of our own integrated stave mill, NT BOIS. We use three criteria to objectively evaluate the quality of each stave based on grain size, terroir and forest management. The result is 7 specific oak selections and 9 highly developed toasting regimes designed to amplify the best qualities of each oak selection.

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format, Half Barrels

Tonnellerie du Sud-Ouest

Napa, CA ☎ 707-315-5114 • *www.tonnellerie-sud-ouest.com*

Tonnellerie Garonnaise

Rodeo, CA ☎ 510-799-1518 • *www.garonnaise.com*

Tonnellerie Leroi

Cloverdale, CA ☎ 707-224-2377 • *www.tonnellerie-leroi.com*

Tonnellerie Mercier

Napa, CA ☎ 707-346-3932 • *www.tonnellerie-mercier.com*

Tonnellerie Ô

Benicia, CA ☎ 707-752-6350 • *www.tonnellerieo.com*

Select Barrel & Oak Suppliers

Tonnellerie Orion

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Napa, CA ☎ 707-812-4554 • *www.tonnellerieorion.com*

As founders of ORION Cooperage, we came together with one common mission: To offer the finest barrels, supported by the best customer service, in the industry. It is our belief that the quality of a product depends on the seamless integration of carefully chosen raw materials and the expertise of a highly qualified production team utilizing both artisanal know-how and state of the art equipment. The spirit of partnership is the cornerstone of our philosophy; partnership between all of us on the ORION team, partnership with our suppliers, and partnership with our clients.

PRODUCTS: Barrels
OAK TYPES: French Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Tonnellerie Quintessence

ad on page **17**

Sonoma, CA ☎ 707-935-3452 • *www.tonnelleriequintessence.fr*

L'essence de l'art

Tonnellerie Quintessence is a creative cooperage blending savoir-faire and contemporary expertise. Located just outside of Bordeaux on the road to St. Émilion, Tonnellerie Quintessence crafts barrels from the finest oak milled at our PEFC-certified stave mill. Our team is committed to only the very best, the essence of Quintessence.

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Tonnellerie Radoux USA

Santa Rosa, CA ☎ 707-284-2888 • *www.radouxcooperage.com*

Tonnellerie Remond

Sonoma, CA ☎ 707-953-9317 • *office@remondUSA.com*

Tonnellerie Rousseau

Couchey, France ☎ • *www.tonnellerie-rousseau.com*

Tonnellerie Saint Martin North America

Paso Robles, CA ☎ 805-226-5622 • *www.tonnelleriesaintmartin.com*

Tonnellerie Sansaud USA

Napa, CA ☎ 707-666-2946 • *www.sansaud-usa.com*

Tonnellerie Saury

Cloverdale, CA ☎ 707-944-1330 • *www.saury.com*

Tonnellerie Sirugue

ad on page **34**

Santa Monica, CA ☎ 310-403-8398 • *www.sirugueusa.com*

Our French oak is sourced from the Allier, Chatillon, Center of France, Nievre and Vosges forests. Our staves are aged for 24 or 36 months. We offer multiple toasts levels.

PRODUCTS: Barrels
OAK TYPES: French Oak
BARREL SIZES: Burgundy, Bordeaux, 114L, 225L, 228L, 300L, 500L

Tonnellerie Sylvain

Napa, CA ☎ 707-259-5344 • *www.tonnellerie-sylvain.fr*

Tonnellerie Taransaud

Cognac, Cedex, France ☎ 415-549-7333 • *www.taransaud.com*

Tonnellerie Tremeaux

Beaune, France ☎ 707-935-3452 • *www.tonnellerie-tremeaux.fr*

Trust International Corp.

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Napa, CA ☎ 707-337-4344 • *www.trustintl.com*

Dedicated to uncompromising quality and customer service. Excellence and distinction you can Trust.

Fulfilling customers' high expectations of Trust is our first priority. We believe in crafting superior products, made with precision and care

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak, Eastern European
BARREL SIZES: Burgundy, Bordeaux, Large Format

TW Boswell

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Napa, CA ☎ 707-255-5900 • *www.twboswell.com*

Over 100 Years of Excellence

Our French, American and European oak barrel collections have been elegantly designed to enhance your best wine.

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak, Eastern European Oak
BARREL SIZES: 225L and 240L

Vicard Generation 7

ad on page **33**

Napa, CA ☎ 707-228-5982 • *www.vicardg7.com*

Vicard Generation 7 is changing the paradigm.

Founded with a single goal: understand, control and eliminate the variables found in the coopering process. Using patented systems for wood analysis, selection and toasting, Vicard Generation 7 delivers a completely homogeneous and reproducible barrel with predictable flavor profiles year after year. Backed by international research teams and the partnerships of wine and spirit professionals around the world, Vicard Generation 7 is leading the industry and changing the paradigm.

PRODUCTS: Barrels, Oak Alternatives, Oak Eggs, casks and tanks
OAK TYPES: French Oak, American Oak, Eastern European Oak
BARREL SIZES: Burgundy, Bordeaux, Large Format

Vivelys' Boisé

see us at WiVi 2019

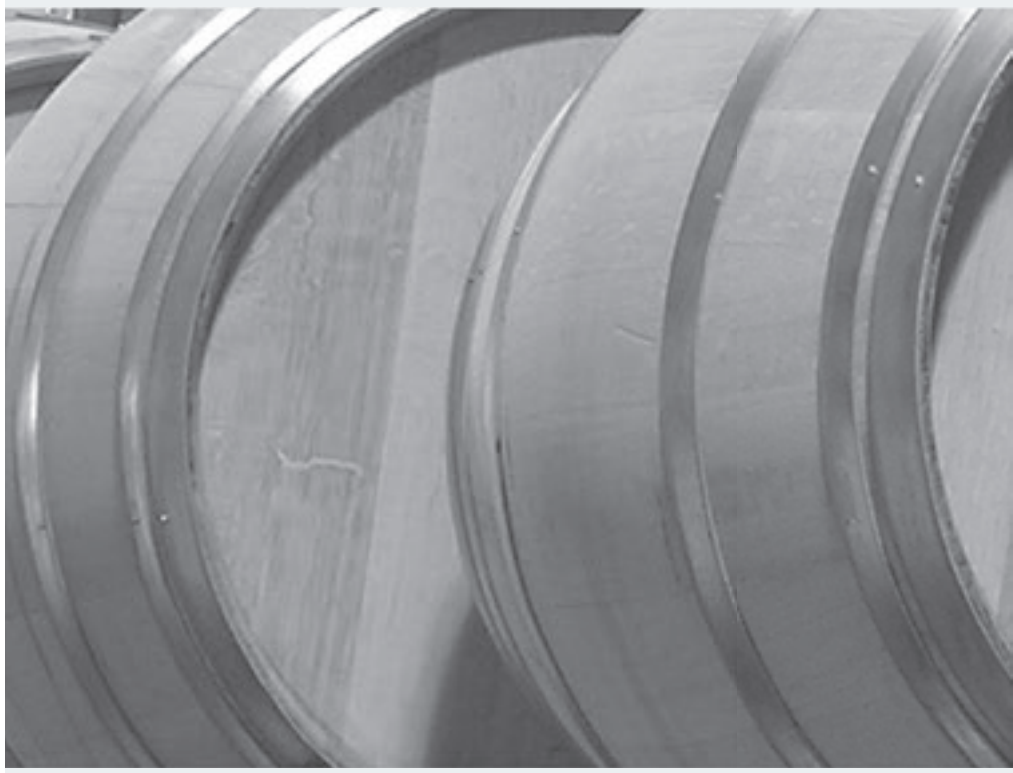
Santa Rosa, CA ☎ 707-546-2213 • *www.vivelys.com/en*

Owned by a French global leading consulting and R&D company, Vivelys' Boisé® brand has become a world leader in technical oenological oak over the past 20 years. Boisé® relies on the latest production technology when manufacturing its French premium oak staves and chips, including analytical sorting of raw materials, precise heat processing and the oak-wine interaction experience; all backed by its own field support to ensure consistent performance, precision oak profiles and desired results on targeted wine profiles. Boisé® is renowned for its high quality oenological oak ranges including Inspiration staves #07.1 SELECT and #07.5 SELECT and the unique Origine range of oak chips as well as the Signature Y & T oak chip blends. G3 is the exclusive distributor of Vivelys' Boisé® in the United States.

PRODUCTS: Oak Alternatives, Oak Chips and Staves
OAK TYPES: French Oak

Wine and Beer Supply LLC

Ashland , VA ☎ (844)482-9463 • *www.wineandbeersupply.com*



World Cooperage

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Napa, CA ☎ 707-255-5900 • *www.worldcooperage.com*

Crafting Partnerships

At World Cooperage, we craft premium American and French oak barrels and partner with you to build comprehensive barrel programs you can trust, time and time again.

PRODUCTS: Barrels
OAK TYPES: French Oak, American Oak, Eastern European Oak
BARREL SIZES: 225L and 240L

XtraChêne

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Santa Rosa, CA ☎ 707-843-4407 • *www.xtrachene.fr/index.php/us/*

Premium French and American Oak Alternatives

Expert producer of Premium French and American oak alternatives for 40 years. HACCP; full traceability and food safety controls (certified). Open air seasoning, 2 year French oak and 3 year American oak. Featuring Granular, including the XtraPure® with high antioxidant capacity to protect the must and wines from oxidative phenomena and the XtraVan® oak chips blend to develop vanilla notes, pastry flavors and roundness on the palate. We also recommend Stavettes, tank staves, barrel insert units, Oak-on-a-rope and Xoakers. Available in Classic Toasts or our innovative Toast Blend options which include French 'Naturelle' light, medium, medium plus, 'Clair' or 'Roti' and American 'Spectrum' or 'Bold.' Fire toast, 'Quattro' and 'Terroir' options available for the Stick 22.90 (staves) and Xtrakit (wooden chain). In 2019, we will propose the "Master Cooper Series," a new range of French Oak Staves fire toasted over a brasero-rotisserie innovative equipment.

PRODUCTS: Oak ALternatives
OAK TYPES: French Oak, American Oak

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INNOVATION+QUALITY

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focused on innovations that advance wine quality.

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Resort and Spa, Napa

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WINEMAKING KEYNOTE TASTING

A Global Tasting Event: Winemaking Practices Around the World

Join four of the world's most celebrated winemakers in an unprecedented exploration of the trials, challenges and rewards of growing grapes and vinifying wine across the globe. With experience that ranges from Napa to France, Argentina to Israel, New Zealand and South Africa, Zelma Long, Laura Catena, Jenny Dobson and Celia Welch will bring their tried and true winemaking innovations and problem-solving approaches to this rare tasting.

Speakers:

MODERATOR:
Elaine Chukan Brown
Hawk Wakawaka

Zelma Long
Winemaker

Laura Catena
Bodega Catena Zapata

Jenny Dobson
Winetrust

Celia Welch
Corra Wines

SESSIONS

Climate Change and the Future of Winemaking

What threat does climate change pose to ultra-premium winemaking? How will rising temperatures affect ripening, maturity, alcohol levels and more? This session will explore the ways to counteract a warmer growing season.

Advances in White Winemaking: The Latest Innovations in Technologies and Processes for White Varieties

Looking to improve your white wines? What are white winemakers experimenting with and implementing? Hear about the practical applications of some of the newest technologies and some interesting ideas to explore in your own winemaking process.

Recent Research: Research That Will Change the Way You Make Wine

New research comes along all the time, but what is really applicable to day-to-day winemaking? This session will feature research that has immediate relevance and can be acted upon in the next vintage.

Speakers will be announced soon.

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Winemaker Trial:

Finding the Right Temperatures on Barrel-fermented Chardonnay

Former assistant winemaker at the San Luis Obispo winery wanted to know which fermentation temperature would be best to produce more complexity and dial down fruit aromatics in Chardonnay.

Michael S. Lasky

Michael S. Lasky is the former editor of *AppellationAmerica.com* and is the author of hundreds of articles for national magazines and newspapers.

WINERY: Chamisal Vineyards

WINEMAKER: Michael Callahan

OBJECTIVE: To see less fruit aromatics and more savory aromas at higher temperatures.

SUMMARY: We vinified eight barrels at each temperature range: peak at 15° C, peak at 18° C and peak at 22° C. All barrel fermentations were whole-cluster-pressed from the same lot. Grapes came in with 185 YAN at 21.9° Brix, 3.27 pH and 7.51 TA. All barrels were filled from a homogenized tank, starting out at the same turbidity. All three lots were inoculated with CH9 and yeast re-hydration nutrient. All three lots were sulfured for the first time in January.

Lot 1: Barrel-fermented cool, 15° C

Lot 2: Barrel-fermented moderate, 18° C

Lot 3: Barrel-fermented hot, 22° C

CONCLUSION: Each lot shows distinction, and the only difference controlled for was the temperature. All lots went ML and RS dry around the same time, and all other chemistry is pretty much the same across the lots: pH 3.32, holding 24 ppm FSO_2, 7.3 TA, VA 0.49, ETOH 13.5%. The aromas and textures of the wines are quite different, though. This was a successful trial for us, as we are trying to make less fruit-forward Chardonnay, but reduction can be something winemakers over-correct by feeding fermentation and keeping temperatures down. We also noticed better oak extraction on the newer barrels and may need less overall oak in the future. We will continue to experiment with a range of fermentation temperatures and widen the range of vineyards where we are trying to vinify hotter. It may very well be a vineyard-specific preference. We do not know because we haven't trialed an array of different Chardonnay sites we deal with yet.

ANALYSIS NAME	LOT 1	LOT 2	LOT 3	UNITS
free sulfur dioxide	15	13	13	mg/L
molecular sulfur dioxide	0.39	0.36	0.39	mg/L
total sulfur dioxide	79	80	81	mg/L
titratable acidity	6.1	6.4	6.6	g/L
pH	3.38	3.36	3.32	
volatile acidity (acetic)	0.45	0.41	0.45	g/L
L-malic acid	<0.05	0.17	<0.05	g/L
glucose + fructose	0.6	0.3	<0.1	g/L
ethanol at 20°C	13.73	13.62	13.71	% vol
ethanol at 60°F	13.69	13.58	13.67	% vol
sulfides (GC/SCD headspace)				
hydrogen sulfide	0.5	<0.5	<0.5	µg/L
carbon disulfide	<1.0	<1.0	<1.0	µg/L
methyl mercaptan	2.2	2.6	2.8	µg/L
ethyl mercaptan	<0.5	<0.5	<0.5	µg/L
dimethyl sulfide	13	9.6	12.3	µg/L
dimethyl disulfide	<1.0	<1.0	<1.0	µg/L
diethyl sulfide	<0.5	<0.5	<0.5	µg/L
methyl thioacetate	<5.0	7.1	8.1	µg/L
diethyl disulfide	<0.5	<0.5	<0.5	µg/L
ethyl thioacetate	<5.0	<5.0	<5.0	µg/L
oak volatiles panel				
furfural (GC/MS)	2014	1120	2436	µg/L
5-methylfurfural (GC/MS)	412	198	505	µg/L
trans-Oak lactone (GC/MS)	83	122	108	µg/L
cis-Oak lactone (GC/MS)	151	232	194	µg/L
guaiacol (GC/MS)	4	3	5	µg/L
4-methylguaiacol (GC/MS)	4	3	5	µg/L
eugenol (GC/MS)	21	26	29	µg/L
isoeugenol (GC/MS)	5	2	4	µg/L
vanillin (GC/MS)	177	244	181	µg/L

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Winemaker's Postmortem

What led to the creation of this trial?

Callahan: "For our Chardonnay program we see ourselves leaning toward less primary fruit and more complexity. Some of the wines that we've seen, even trends in Burgundy, show a little bit of noble reduction, which is just a little less fruit-driven and a little more complex. Without tweaking it too much, we wanted to check how slight changes in our fermentation temperature would add a bit more complexity."

How much fruit was ultimately involved?

Callahan: "I think it was the 8-ton lot, and we split it three ways."

Considering the size of the lots, isn't that a large investment to risk on an experimental trial?

Callahan: "On the surface it might look that way, but we did have a lot of data going into the trial, and we smell and taste daily. If we thought it was going to be a bad move, we probably wouldn't have completed it. We would have changed or pivoted accordingly.

"The final wine just went to tank and was the combination of all three lots. As our winemaking protocols evolve a bit, we are fermenting the Chardonnay from this program a little warmer, and we're liking the direction for that."

One of the comments you noted in your conclusion was that you noticed there was better oak extraction in the newer barrels and, going forward, could use less overall oak. Was there a reason that you used both new and old barrels?

Callahan: "It was a trial split—we had eight barrels, eight barrels, and 10 barrels for the three lots. That's how it ended up. It wasn't a perfect split, but that gave us the ability to do a 25 to 30 percent new oak program with each lot, so [the winemaking team] tasted the wines, not just from neutral barrels but more as they would if it was an entire program.

"From there, we were able to ask how it worked with the old barrels, how it worked with the new barrels and how it worked with the one-year-old barrels. We were able to get that to composite, and that pretty much tells a story of what that 18° C ferment tastes like, versus a 15° C, versus a 21° C. I guess it wasn't the thing that we were testing for. We're not trying to get more out of the oak program, but a lot of times when you start off with these experimental trials, you find something that maybe you weren't looking for pop up. That's part of the fun with doing trials, discovering something other than what you were looking for. Maybe in the future we spend less money on oak."

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Winemaker Trial Finding the Right Temperatures on Barrel-fermented Chardonnay

Winemaker Bio

Michael Callahan has made wine on the California Central Coast for 16 years with a focus on Pinot Noir, Chardonnay and Riesling. Over the course of that time he has worked with Kenneth Volk Vineyards, Testarossa Winery and Chamisal Vineyards where he was assistant winemaker. He also produces single vineyard Riesling at Maidenstoen Wine Company. Callahan has been on the advisory committee of The Chardonnay Symposium and currently sits on the winery committee for SIP, Sustainability in Practice.

From the results of this trial, what have you learned and how will you use this knowledge in future wine blending?

Callahan: "Everything we do is specific for what we're trying to find for different parcels and different plots that we deal with and interpret those vineyards and the blocks within those vineyards. We deal with about six Santa Rita Hills vineyards. I think it's a good jumping off point to reassess what I thought about keeping Chardonnay fermentations as cold as you can and letting them kick through the fermentation in three or four weeks. That's evolved for me a little bit. I don't think it's for every vineyard.

"I think what this trial did for me is give me confidence. A lot of times that's what you get when you do these trials because you get a little more experience, and it allows you to guide those fermentations without needing to rely on some of what's already been drafted as 'this is the way you do things.' I think it's given me a little more confidence to ferment a bit warmer when given the right vineyard."

So now that the trial is completed, has your original objective pivoted in any way?

Callahan: "I guess I can really pinpoint at least one of my pillars for what I'm trying to do. I am trying to create wines that showcase the site that it comes from. What I think is a lot of the complexity that can shine through in a vineyard is going to come out if you allow for a little bit of a rougher journey, rather than having all your fermentation parameters dialed in. I think some of the uniqueness of the sites that we work with can really come out if we're taking a little different approach stylistically in our winemaking."

Which of the three lots did the IQ attendees prefer the most?

Callahan: "By far, attendees gravitated to the middle-of-the-road lot: the 18° C lot was the preference. I think it comes down to what people are looking for. I think that some people are trying to find wines that really jump out. Sometimes you learn a lot from people, chasing the ideal, by trying to interpret a vineyard and how to make the best wine. It's knowing where you want to go with that, just trying to find the tools to achieve it, and it is not necessarily always the most popular wine sometimes. Quality is something that I think winemakers struggle to put their finger on. That's what all of our trials are based around: What can we do to make this wine show the quality of that vineyard without any flaws? How do we make it the most interesting wine that we can?" **WBM**

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With better hygiene and an understanding of oxygen exchange, West Coast winemakers are using terracotta wine vessels to give them a taste profile they can't get with oak or steel.

W. Blake Gray

W. Blake Gray is the U.S. editor for *Wine Searcher* and publisher of *The Gray Report* blog. In 2013 he won the Roederer Award for Best Online Wine Writer. He lives in San Francisco.

WHEN YOU HEAR THE word amphorae, you probably think about orange wines, possibly with stuff floating in them. Those exist, and they do have fans but, today, amphora wines can be quite different. Modern technology has come to the most ancient of wine vessels. Amphorae are spreading up and down the West Coast as fast as ships can bring them.

"Terracotta is a neutral vessel," amphora importer **Manu Fiorentini** told ***Wine Business Monthly***. "If you have beautiful fruit in your wine, it will stay that way. If you have beautiful texture in your wine, pulpy character and density, it will stay that way. Stainless steel tends to close down oxygen and doesn't let a wine fully develop. An oak barrel is good for adding tannin and spices, but it will cover what the fruit is doing."

In Europe, some countries never stopped using amphorae. Georgia is the best-known example, but wineries in Portugal's Alentejo region have been making wine in large amphorae for more than 150 years—because some of their individual amphorae have been in use that long.

Perhaps those regions were the inspiration, but in the United States the move to amphorae has come mostly from Italy. There is a notable exception in Oregon: **Andrew Beckham** was a ceramicist before becoming a winemaker, and he is making his own amphorae by hand. Most winemakers don't have this additional skill, so they are looking to Italy, where amphora development, though it has ancient roots, has been quite recent.

In the Beginning

The earliest modern adopter may have been **COS** winery in Sicily. Winery founder **Giusto Occhipinti** commissioned the creation of clay amphorae about 20 years ago. Occhipinti used them in a very traditional way, creating orange wine by exposing local Garganega grapes—the grape of Soave, though called Grecanico in Sicily—to skin contact. COS was generally seen as a part of the natural wine movement, and people were aware of what they were doing, but it didn't quite cross over into the mainstream. At the other end of the country, near the Austrian border, **Elisabetta Foradori** has been working with amphorae, also made of clay, that she purchased in Spain.

The Italian-made amphorae in the U.S. were commissioned to order by barrel importer Manu Fiorentini of **iTek Wine** in Paso Robles, California. His wife, **Jordan**, is the winemaker at **Epoch Estate** in Paso, which she joined after stints at **Araujo Estate** and **Chalk Hill** wineries in California. Manu and Jordan met while she was working a harvest after college at **Antinori** in Italy; Fiorentini's family owns land in Siena in Tuscany. The area around Fiorentini's home is known for its ornamental production of terracotta statues, jugs, etc.

"I have not seen those used in wine, but I have seen the producers of the pots," Fiorentini said. "We would go buy pots for our garden."

Jordan was interested in making wine in a large amphora made from the material, so Fiorentini had a producer make one, using photos of existing amphorae from Spain. Before the amphora even left Tuscany, Fiorentini got a photo of it on his cellphone and started showing it to winemakers on his rounds to sell barrels.

"I say, 'Look how cool. I'm getting one for my wife, but I could get one for you at the same time,'" Fiorentini said. "The first year became a full container of 40 terracotta amphorae. Those were sold before they were made."

Fiorentini has the amphorae produced in three sizes: 300, 500 and 800 liters. iTek has amphorae clients up and down the West Coast, and chatting with them is interesting because the winemakers are using the amphorae for very different reasons and with varying goals in mind.

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How Winemakers Are Using Amphorae

Some are using amphorae the way you might expect: to create orange, skin-contact wines. Orange wine's time, as a media darling, seems to be over, but winemakers report that the market for it is better than during its 15 minutes of fame.

"Amphorae, in my opinion, have a greater impact on whites," said **Brian Terrizzi**, winemaker at Italian varietal specialist **Giornata** winery in Paso Robles. "White wines have greater transparency in how they're grown and how they're made. You get the oxidation, which results in interesting character. A little caramelization.

"We don't really clean the amphorae very much," Terrizzi added. "We clean it out and leave it in the sun. We rinse it before the next harvest. Everything we do is native yeast. Some of the flavors could carry over. The wines are really consistent, vintage to vintage. There is some interesting, almost bleu cheese quality that develops sometimes. It's super subtle. I don't really mind it."

That's one approach. But a vessel is just a vessel, and there are entirely different ways to use amphorae.

Chris Figgins, director of winemaking for **Leonetti Cellar** in Walla Walla, Washington is way too meticulous to use an amphora, or any vessel, without a thorough cleaning. In fact, he said, "There are challenges in cleaning them. We cracked one the other day. We were using steam on it."

Figgins is using his amphorae for red wine, specifically an Aglianico that reflects his family's roots in Calabria, Italy. One thing he has learned is that although the terra-cotta looks thick, oxygen exchange actually happens faster than it does with oak barrels.

"If you're getting more oxygen than you want, you can coat the outside with beeswax," Figgins said. "Amphorae are really good for preserving fruit. [The wine] doesn't develop as much fat on the palate. It's more linear. It has really good acid preservation. The fruit stays a little leaner and cleaner. I like having a mix of barrels and amphorae. I get fat from the barrels, and I can use that too. I probably am going to start doing a little bit of our Sangiovese program in amphorae. I'm trying to preserve the more docile aromatics."

Cline Cellars assistant winemaker **Tom Gendall** has already learned how to fix cracked amphorae.

"We received two of our amphorae cracked, and we have used food-grade epoxy to fix them," Gendall said. "We sealed them both from the inside, and only one has begun to leak slightly. We use a citric wash to clean them and then ozone. It's similar to how concrete gets cleaned."

Cline first used an amphora for Syrah and has since expanded to include Pinot Gris, Viognier, Chardonnay, Pinot Noir, Merlot and Grenache.

"Generally speaking, the main difference is temperature control," Gendall said. "You can't control the temperature of the amphora. Whites tend to ferment hotter than usual [peaking at 72° F] and reds tend to be cooler [peaking at 75° F]. We have

them in our tank room and prefer not to move them due to their fragility, so the room is not temperature-controlled. For whites, this means looking after the aromatic detail that can be lost at warmer ferment temperatures but also gaining texture and richness on the palate. For reds, the fruit is fresher, but the texture can be a little harder sometimes."

Jeff Cohn, owner and winemaker of **Jeff Cohn Cellars**, is using his amphora for a Zinfandel from **Cassata Vineyard** in Sonoma Valley; he bought the vessel specifically for that purpose.

"It's a vineyard that's right behind the **Pagani Ranch**," Cohn said. "It's a very cool site, lots of pepper component, all biodynamically farmed. The amphora really showcases for me more of the earth component of the wine. It brings out more of the pepper component of that vineyard. Using an amphora, everything is much more vibrant. Definitely fresher components. It's more fruit aspect, where using barrels kinds of tones it down."

People who drink amphora-fermented wine will tell you that the oxygen behavior of such a bottle is different from a wine fermented in stainless steel or barrel. Amphora wines, despite the oxygen exchange, while fermenting, often initially come across as reductive. They change immensely with air, gaining complexity but often taking an hour or more to open up.

The Amphora Character

Is there an amphora taste? It stands to reason that there is, since oak barrels have a taste.

Cline's Gendall thinks amphorae, when uncoated, add a touch of minerality. "We do not use any liner, so the wine does come in contact with the terracotta," Gendall said. "From my opinion there is a slight saline quality in the wines, a slight saltiness that is distinct and consistent."

Thomas Fogarty Winery & Vineyards winemaker **Nathan Kandler** agreed. "There seems to be a character from the clay in both texture and flavor that comes through in a lot of wines I taste from amphorae," Kandler said. "The wines seem to pick up a lot of air in the pots, not necessarily to the point of oxidation, but the wines evolve pretty quickly."

Kandler is making orange wine from skin contact Chardonnay in his amphora, but he said, "If I grew or made wine from dark, tannic reds, I would think they would be a very interesting option."

While some wineries that experiment with amphorae do not mention it on the label, most point it out somewhere in the marketing material. This is a good idea when dealing with sommeliers in the Manhattan market, where the word has cachet.

"All our amphora wines are allocated," said Giornata's Terrizzi. "For three to four years, nobody really wanted them. Now, I'm not sure why, but they're popular. We had our New York distributor in town and our Chicago distributor. They saw our amphorae, and they were really excited about it. A few years ago, they wouldn't have known what to do with it. Now they have people who are just crazy for it. All of a sudden the wine is on fire to the point where I could make more. But I don't have any more amphorae. I'm working with limited fruit sources. The sad thing is, I can't really drink them anymore because I have to sell them all." **WBM**

Sensible Sulfiting for the Aging and Storage of Wines

Matthew Glynn

Matthew Glynn, MS, has more than a quarter century of winemaking experience spanning four countries and has led several prominent Napa Valley and Sonoma County luxury brands and wineries. His consulting specializes in grape growing, winemaking, winery design, winery operations and brand development (*www.vinetarium.com*). He is based in Napa, California where he focuses on helping clients achieve their vision. Please direct queries to *matthew@vinetarium.com* or 707-812-5080.

AFTER A FULL SEASON of grape growing and a smooth harvest season, a large amount of care, work and capital is tied up in your wine. Protecting a wine during aging and storage is essential. One of the most common additives to wine is sulfur dioxide (SO_2), used for both its antimicrobial capacity and its binding preferences that hide many of the oxidative characters in wine.

Winemakers will often speak of SO_2 additions in loose terms: "give it 40 parts" or "hit it with another 10 parts." Precise SO_2 management helps deliver the wine to customers in a desired state and stave off remedial work associated with the microbial contamination of wine. Sulfur dioxide use in wine is a broad topic—here I will discuss how the effectiveness of SO_2 is influenced by the acidity level (measured as pH) that is seen across a range of wine styles.

Incorporating the pH into the SO_2 level calculations is a wise practice because it enables the winemaker to target a specific level of SO_2 that provides the antimicrobial protection during aging or storage. As the famous French oenologist **Emile Peynaud** wrote in the 1980s, "Sensible sulfiting takes into account the crop's pH."

The chemical behavior of SO_2 in wine results in two different charged forms—these are known as the "bisulfite" and "molecular" forms. The dogma of SO_2 management tells us that SO_2 floats around in wine, and it is either "bound" to other wine compounds (not readily available for reactions), or it is "free" and unattached (ready for reactions). The free SO_2 in wine exists in either the "bisulfite" or "molecular" form. The "bisulfite" form is the one primarily responsible for binding to aromatic compounds (including aldehydes), thus "hiding" the effect of oxidation and for inhibiting enzymes that naturally occur in grape juice. The second form, the "molecular" form, is responsible for antimicrobial activity—inhibiting the growth of unwanted yeast and bacteria in wine.

The percentage of free SO_2 in the "molecular" form is dependent on the pH of the wine. **FIGURE 1** displays the range of molecular SO_2 percentages from pH 3 to 4 (as calculated using the behavior of SO_2 in 14 percent alcohol wine at 20° C; for the chemists, the pKa = 2.0). For those interested in learning more about subtleties in molecular SO_2 calculations, I recommend reading **Cornell Research Focus** (2015-4)[1]. What **FIGURE 1** displays is that for a given amount of free SO_2, a wine at pH 3.1 (think tart, racy Chablis) has about five times the available molecular SO_2 to provide antimicrobial protection than a wine at pH = 3.8 (think opulent, California red blend).

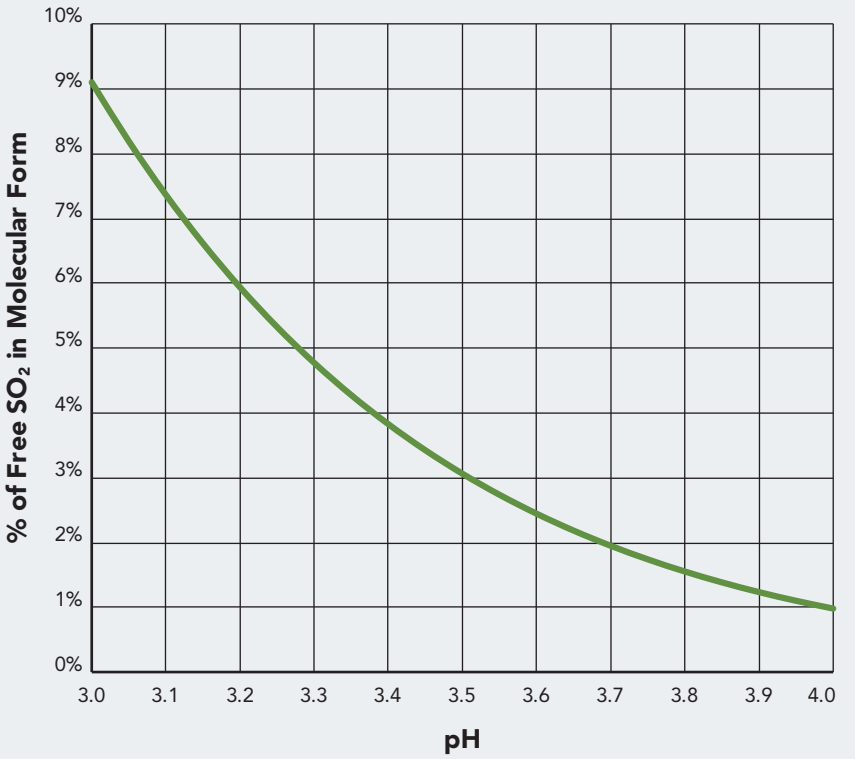

FIGURE 1: The range of molecular SO_2 percentages from pH 3 to 4 (calculated using the behavior of SO_2 in 14% alcohol wine at 20°C; pK_a = 2.0). Adapted from Cornell Research Focus 2015-4.

There is a range of molecular SO_2 levels that have been identified to effectively control the microbial populations in wine. In the 1980s, Emile Peynaud recommended higher SO_2 levels for vintages with "feeble acidity[2]." A more recent Cornell research focus paper describes the range of 0.5 mg/L to 0.8 mg/L molecular SO_2 to be effective for controlling microbial activity in dry wine[1]. The **Australian Wine Research Institute** recommendation (0.825 mg/L)[3] is close to the 0.875 mg/L value referenced in a text used at **UC Davis** (*Principles and Practices of Winemaking*)[4]. Winemakers, as a group, have differing opinions on a "best" value in practice.

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FIGURE 2: The free SO_2 levels required to reach two different molecular SO_2 targets at pH = 3.6 (pKa = 2.0).

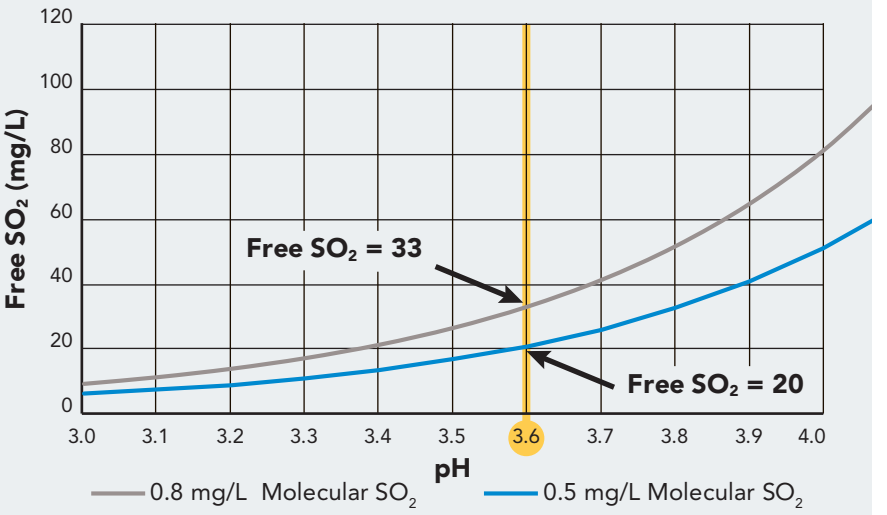
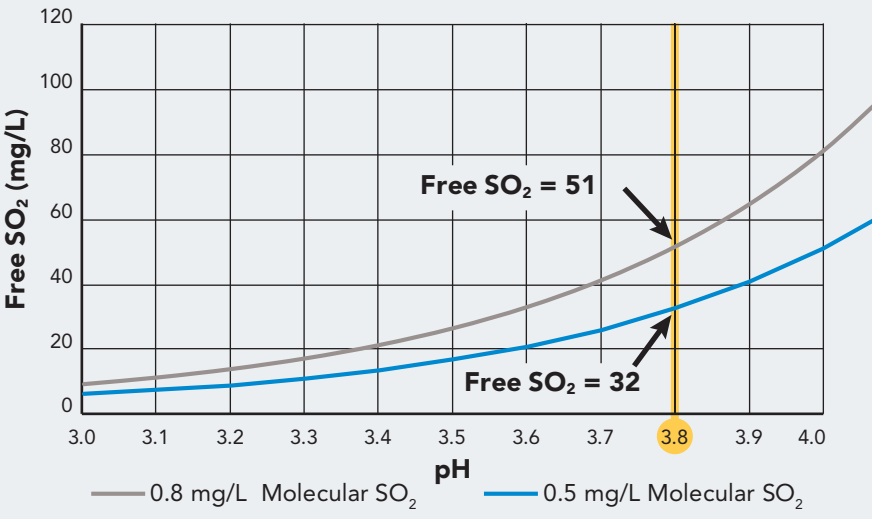


FIGURE 3: The free SO_2 levels required to reach two different molecular SO_2 targets at pH = 3.8 (pKa = 2.0).



An important element to consider, when selecting a target molecular SO_2 level for your wine, is the environment where the wines are made. In a dirty or custom-crush cellar with contaminating microbes growing readily in the barrel stacks, on the walls and in the drains, a higher molecular SO_2 level—closer to 0.8 mg/L—is beneficial due to the high microbe pressure. In contrast, a clean cellar with a long history of successfully aging wines with lower SO_2 levels, and low microbial pressure, may allow a winemaker to be comfortable with a level closer to 0.5 mg/L molecular SO_2. Context is integral to SO_2 management decisions for wine.

The impact of SO_2 on sensory perception also plays an important role in the winemaking process. SO_2 mutes the aromas in wine and is irritating to sensitive respiratory systems. A wine with 0.875 mg/L molecular SO_2 usually smells and tastes like SO_2. The aromatic characters of the wine are muted, and nuanced blending is difficult. Incorporating the timing of focused tasting and blending into the management process of SO_2 allows winemakers to make better blending decisions and avoid the unsavory experience of SO_2 exposure. Whenever possible, I make blending decisions when the SO_2 levels are as low as possible and plan notable SO_2 additions around my scheduled blending sessions.

FIGURES 2 AND 3 display the curves, across a range of wine pH levels, for two different molecular SO_2 levels. The different levels of free SO_2 required to achieve a target level of molecular SO_2 are presented for two different pH levels.

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The Key is the "Free"

An accurate measurement of the free SO_2 that is truly "free" is essential for estimating the molecular SO_2 level in wine. At the latest **Recent Advances in Viticulture & Enology Symposium** (RAVE) held at UC Davis, Dr. **Andrew Waterhouse** discussed noteworthy research concerning the accurate measurement of SO_2 in wine. In addition to the established "free" and "bound" SO_2 in wine, he discussed the presence of "loosely-bound" SO_2[5]. The impact of the loosely-bound SO_2 molecules on the free SO_2 measurement is especially evident in red wine because free anthocyanins form a complex with the bisulfite ion. During traditional analysis including aeration-oxidation, flow injection and ripper titration, the loosely-bound SO_2 is liberated and quantified as free SO_2[6]. The result is an artificially high level of free SO_2, which will generate an artificially high estimate of molecular SO_2[7]. The best practice is to use a headspace gas measurement technique that will measure the free SO_2 without disturbing the binding equilibria in the wine[6]. After an accurate measurement of the free SO_2 is identified, the molecular SO_2 can be calculated.

Calculating Molecular SO_2

With an accurate estimation of free SO_2, calculating molecular SO_2 levels in wine is straightforward. Equation 1 is used to calculate a level of free SO_2 needed to achieve a target level of molecular SO_2 at a specific wine pH. Equation 2 is used to calculate the level of molecular SO_2 with a known pH and free SO_2 level in wine.

EQUATION 1

$$\text{Free } SO_2 = (\text{target molecular}) * (1+10^{(\text{wine pH} - 2.0)})$$

Equation 1 is used to calculate a level of free SO_2 needed to achieve a target level of molecular SO_2 at a known wine pH. For these examples pKa = 2.0 (wine at 14.0 percent alcohol, 20° C).

EQUATION 2

$$\text{Molecular } SO_2 = \frac{(\text{Free } SO_2)}{(1+10^{(\text{wine pH} - 2.0)})}$$

Equation 2 is used to calculate the level of molecular SO_2 with a known pH and free SO_2 level in wine. For these examples pKa = 2.0 (wine at 14.0 percent alcohol, 20° C).

Sample Calculations

The molecular SO_2 level of a Grenache wine in barrel with a pH = 3.60 and a free SO_2 = 18 mg/L can be calculated as:

Molecular SO_2 = (18 mg/ L) / (1+10(3.60-2.0)) = 0.44 mg/L

The free SO_2 level needed to achieve 0.825 mg/L molecular SO_2 for a Grenache wine in barrel with a pH = 3.60 can be calculated as:

Free SO_2 = (0.825 mg/ L) * (1+10(3.60-2.0)) = 33.6 mg/L

In summary, SO_2 exists in different forms, depending on the pH of the wine. Incorporating the pH of the wine into the SO_2 level calculations allows winemakers to quantify the level of the "molecular" SO_2 form, which is the form of SO_2 that inhibits yeast and bacterial growth in wine. Sensible sulfiting protects the wine for winemakers and customers. **WBM**

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Winemakers Discuss Why They Moved to Screw Caps

Despite the multitude of available types of wine closures, cork and screw caps remain the predominant choices. Winemakers say they appreciate both the freshness and aging ability of screw caps with no threat of cork taint, but image-focused marketing execs value the mystique of traditional cork.

Michael S. Lasky

Michael S. Lasky is the former editor of *AppellationAmerica.com* and is the author of hundreds of articles for national magazines and newspapers.

The Dichotomy of Wine Closure Criteria: Winemakers in Their Own Words

"In 2010 when Chehalem Winery went to 100 percent screw cap, it was because we wanted to make sure that what the consumer got in the bottle was what we put into the bottle. With that said, our whites are under screw cap, but with the vintage of 2017 we decided to go to DIAM corks for our single vineyard and reserve lot. The reason was twofold: we wanted the whole ambiance that cork implies, and we found that it's been pretty difficult to get consumers to spend more than $50 on a bottle that has screw caps."

→ **Katie Santora,** winemaker, Chehalem Winery, Willamette Valley, Oregon

"The first screw cap that we used was back in 1999 on our Founder's Reserve Chardonnay. It's interesting that from a company perspective, we actually started at the very top of our portfolio using a screw cap as compared with a lot of wineries that started at the low end. I think the ultimate reason for changing to screw cap is just the knowledge of a consistency from bottle to bottle, regardless of TCA issues. If you take TCA out of the equation, there's still some amount of variability inherently from cork to cork, which you don't get with screw caps. Today, the only two products that we still have under cork, and primarily because they have more of a retail presence, is our least expensive wines, the Sonoma Coast Chardonnay and Russian River Valley Pinot."

→ **Mick Schroeter,** winemaking director, Sonoma-Cutrer Vineyards, Windsor, California

"I think part of which closure we use is actually a marketing question rather than based just purely on wine quality, and the reason is related to the difference between a new brand versus a heritage brand. If you look at our portfolio, we have a lot of brands where there has been a perception of the use of corks for many years. Consumers tend to expect that, so we have continued to go down that route at this point, accepting that the cork is delivering the quality that we're after. But I would say between gatekeepers and consumers, there's probably still a preference for the cork at this point."

→ **Matt Johnson,** chief winemaker, Treasury Wine Estates, America

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Winemakers Discuss Why They Moved to Screw Caps

BASED ON THESE ESSENTIALLY conflicting statements, how do we make any sense of which closures are best for which wine? One winery goes with screw caps with its lower tier wines while another uses screw caps for its highest priced wines.

In the United States, it seems that cork continues to prevail. According to a 2015 study conducted by market research firm **The Freedonia Group**, "Wine closure opportunities will be driven by rising packaged wine production, with changes in the container mix necessitating a widening array of closure types. This trend will fuel strong opportunities for aluminum and plastic screw caps and plastic dispensing closures. Though continuing to face intensified competition from alternative closures, cork demand will be sustained by the entrenched position of glass bottles in the wine industry and the cost-competitiveness and improved performance of technical corks. Cork demand will also benefit from the stronger cultural preference for corks in the U.S. than in other countries."

Conversely, screw caps have been embraced by wineries and their consumers in Australia and New Zealand (90 percent of New Zealand wine is under screw cap) and are gradually gaining more acceptance in the U.S. and Europe. According to ***Wine Business Monthly***'s 2018 Closure Survey, 36 percent of winemakers use a screw cap on at least one SKU. Developed in the late 1960s but not actually trademarked until 1975, the **Stelvin™** screw cap is manufactured by French firm **Amcor**, but the Stelvin name has become so established, it's commonly used in the wine industry as shorthand for any brand of screw cap—of which there are many.

The winemakers whom *Wine Business Monthly* spoke with for this report said that for the savviest wine consumers, like those that belong to their wine clubs, screw caps are now the preferred closure for their ease of opening and unwavering quality maintenance. For the other wine buyers, like those who purchase wine mainly in chain supermarkets, screw-capped wine is appreciated for its convenience—but that stops at arbitrary price points and with particular varieties. As for winemakers, screw caps have proven their consistency of quality from bottle to bottle with no threat of cork taint. Nevertheless, corks, be they natural, synthetic or composite, remain omnipresent. Additionally, natural corks have made incredible strides in quality control, oxygen ingress and more in recent years.

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Todd Graff, Winemaker & GM at Frank Family Vineyards

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Richie Allen, Winemaker at Rombauer Winery

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The Three Key Influencers: Getting Closure on Which Closure

Understanding a winery's strategy for determining which closure is employed can be drilled down to three factors: Winemakers' satisfaction with a particular closure for the freshness maintained in the near term, as well as years-long aging capability; winery marketing execs eyeing how particular closures are perceived by consumers; and the level of education consumers have about a wine's quality beyond how it is packaged.

Randall Grahm, winemaker of the 50,000-case **Bonny Doon Vineyard** in Santa Cruz, California, is a fierce defender and proselytizer of screw caps. He started using them with a trial and error run back in 2001. "If you really are serious about making a great wine, in almost every case you're going to probably prefer a screw cap. If you really want the wine to live to its ultimate potential, I think the screw cap is the better way to go," Grahm told to *Wine Business Monthly*.

"My sales manager, marketing people and everyone in the office said to me: 'Randall, don't do it, it's too risky.'" But Grahm told *WBM* that he is convinced that the social stigma can dissipate if only the broader wine-loving audience is shown how screw caps protect wine quality.

A year after Grahm started experimenting with screw caps, **Kathleen Inman**, winemaker at the Santa Rosa, California-based, 5,000-case **Inman Family Wines**, became the first luxury winery to launch a brand that was 100 percent bottled with screw caps.

After Inman conducted a side-by-side trial of bottles with cork and screw cap, she quickly decided screw cap offered more consistency from bottle to bottle. "I found that even using the best quality corks that had high levels of quality assurance, there was a lot of variation in the bottles. Some were obviously letting in more oxygen than others," Inman said.

She also appreciated the comfort of knowing there would be no cork taint, which was a problem in 2002 when she conducted her trial. "I make wines as naturally as I can. I don't use any SO_2 in the early stages; I'm really only using it at the end when I'm doing extended barrel-aging. As a result, if I can bottle my wines with lower SO_2, then I'm all for it. Stelvin allows me to do that," Inman explained.

While Inman opts to bottle her entire line based on what she believes offers the best short- and long-term quality, her experience in talking with consumers and distributors is that those with screw cap experience and knowledge are onboard. The consensus of all winemakers, who bottle with screw caps is aligned with Inman's experience.

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Liner Notes: It's What's Under the Cap That Matters

"One point that must be emphasized is that screw caps aren't the closure. They are just a means of holding the sealing medium, the screw cap liner, in close opposition to the rim of the bottle. Liner types determine the closure's properties," noted Dr. **James Good** a decade ago in ***Wines & Vines***. Fast forwarding 10 years later, the two leading liner types remain **SaranTin**™ with its high barrier level, allowing less oxygen migration into the bottle and **Saranex**™, with a number of market-driven, varied oxygen transmission rate (OTR) options. The liners are manufactured by a multitude of companies, mostly to accompany their proprietary screw caps.

Danielle Cyrot, winemaker at the **PlumpJack**-owned **Cade Winery**, has been conducting a multi-year trial in her attempt to find the perfect liner for Cade's high-end, Napa red wines. She spoke with ***Wine Business Monthly*** about what she has learned so far with 12 different liners from three different companies, all placed on 2011 Cabernets. The following conversation is condensed and edited for space.

WBM: *What have you discovered so far from your liner trials?*

Cyrot: The trial is intended to show what impact various liners will have on the wine over long aging periods, like five, 10 or 15 years. What I have seen so far is the really high oxygen ingress liners are too high, and you end up with wines that are oxidized or showing age characteristics much quicker, which is not what we want. But some of the liners in the middle OTR are performing quite well, but it's harder to figure out what is the best right now. I think the wines need a little bit more time in the bottle to really see what kind of differences we're going to get.

WBM: *Since Cade is part of the PlumpJack Group, why not just use the caps and liners PlumpJack Winery uses for its Cab?*

Cyrot: PlumpJack exclusively uses tin liners, which close off all oxygen on their wines, and I have been using Saranex on the Cade wine. Because I was using Saranex, I thought that there were areas to explore with either higher or lower permeability, or oxygen ingress, because now there's a wider array of options available in the market. For the wines that I'm making for Cade, I think a little bit of air is beneficial; if our consumers are aging those wines, I think it is a benefit. It's purely because of where we're growing our grapes and the style of wine that we're making for Cade that it's going to be different than what PlumpJack is doing and how those wines age under the different liner.

WBM: *This being a years-long study, what additional insights do you hope to glean?*

Cyrot: I'm looking at the pure performance of the material liner, the performance of the screw cap, whether it is easy to apply and if we have issues applying it. Did we have leaky bottles? Or did we see variability, using the same liner in the same wine from bottle to bottle? We also have a cork standard. We continue to use cork. The idea is to see if the screw cap can perform as well as, if not better than, the cork. Then we should be able to taste that too.

How winemakers deal with distributors and consumers still unconvinced about what screw caps deliver is best summarized by an anecdote from Randall Grahm: "**Ernie Loosen**, the German winemaker behind the **Dr. Loosen** brand, had wines under cork and screw cap. Ernie said to me, 'I think the screw cap is better.' And I replied to him, 'Well, why are you using the cork?' And he said, "Because my distributors of my high-end, single vineyard, wines said they won't buy them if I do them under screw cap.' To which I said 'Well, Ernie, are you driving the train or are you just along for the ride?'"

Chehalem Winery winemaker **Katie Santora** knows how to drive the train, as does the winery's former owner, **Harry Peterson-Nedry**. A few years ago, he conducted a 10-year vertical taste of the winery's 2004 to 2013 vintages of the Three Vineyard Pinot Noir, all of which were bottled under screw cap. They revealed not only the expected style consistency but fresh red-fruit flavors and silky texture. Santora continues to bottle the vast majority of her 20,000 case production under screw cap.

Starting in 1997, Napa's **PlumpJack Winery** defied the screw cap naysayers by bottling its finest reserve Cabernet in a two-pack, one bottle in cork and one in screw cap. As winemaker **Aaron Miller** relates, "A lot of people think that you should age the wine with the cork and drink the screw cap earlier. Yet what I'm seeing in our blind tastings with some of our distributors and visitors to the winery is most everyone prefers the screw cap—and especially in the older vintages. The feedback is that the palate is evolving really nicely, but the note is evolving a little more slowly, and the screw-capped wine still has fresher fruit and a little more vibrant quality to it, a little more life."

Despite this favorable feedback, Miller bemoans the pushback he still receives from some consumers, restaurateurs and sommeliers. "There's a quality perception issue. In our lower price point wines, that perception is compounded even more. It's actually easier for us to sell a $300 bottle under screw cap to our members, who know us and know what we're doing and know our quality, than it is a $60 wine at a retailer," he said. "We haven't totally moved to screw cap mostly for that reason. It just makes it harder to sell. We need just to continue the dialogue and to continue getting people to try our wine under screw cap and hopefully help make an impact on the perception."

At **Stoller Family Estate**, winemaker **Melissa Burr** uses screw caps on most of the 45,000 cases produced but relies on **DIAM** corks for the winery's high-end tier. "A lot of the reason for this is tradition," she said. "Honestly, it comes down to the tradition of having a wine that you age in your cellar, with a cork that can let in a small amount of oxygen, has some permeability to it. That romantic tradition of popping a cork has been in people's minds for so long, and we have to differentiate those blends by using an expected cork closure."

Peter Weber, executive director of the **Cork Quality Council**, which represents some 90 percent of cork producers, said that "based on nine years of data, cork-finished wines have gained considerably, and their market share is now 65 percent, up from 55 percent. Reasons for this rise are twofold: wine quality issues and sales at retail."

How is a Winemaker to Choose?

"I think in the end what challenges winemakers is that there are so many closure options and opportunities and variables out there. And you look at all the other various closures, whether it's synthetic, or glass stoppers, screw caps, corks or TCA-tested corks," said **Mick Schroeter**, winemaking director, **Sonoma-Cutrer Vineyards**, Windsor, California. "There's just a myriad of different closures. At the end of the day, it's evaluating what works best for you, your quality, your style and the consumer target that you have." **WBM**

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Eric Jensen, owner, Booker

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The West Coast Approach to Buying and Selling Property in the Wine Industry

Tony Correia, owner, The Correia Company

State of the Wine Business: Winery CFOs Provide Solutions for the Future

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Evan Stein, CFO, Thornhill Companies

Thomas Duhameau, CFO, Hahn Family Wines

Gregory Ahn, president & CEO, Folk Tale Winery

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Denise Shurtleff, general manager, Cambria Winery

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Understanding the State of Central Coast Grape Supply – Cabernet Sauvignon and More

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Craig Ledbetter, Vino Farms

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Speakers:

Fintan du Fresne, Chamisal Vineyards and Malene

Bryan Babcock, Babcock Winery and Vineyards

Paul Hoover, Still Waters

It's Hot! How Central Coast Leaders are Adapting to Rising Temperatures

Session with tasting.

As the climate grows warmer, a number of growers and winemakers are taking steps to protect their grapes, combat the effects and produce high-quality wines. This session will provide verifiable climate data-from variations of weather patterns to timing and a review of extreme events-as well as what it means and methods to counter the effects, including shade cloth applications, alcohol removal and more.

Speakers:

Luca Brillante, Ph.D., Bronco Chair for Viticulture Research/MS Viticulture & Enology

Daniel Daou, Daou Vineyards

David Parrish, Parrish Family Vineyards

Vineyard Focus: Discovering the Winemaker's Hand in Production

Join author and *Wine Business Monthly* contributor Lance Cutler as he examines the influence of individual winemaking techniques on Pinot Noir grapes from the same vineyard. Focusing on three vineyards - Rosella's Vineyard, Santa Lucia Highlands in Monterey, Stone Corral Vineyard in Edna Valley and Sta. Rita Hills Fe Ciega Vineyard in Santa Barbara - Lance will lead a panel of winemakers in a discussion on how style goals, methods and more can turn the same Pinot Noir grapes into drastically different wines.

Speakers:

Lance Cutler - Moderator, *Wine Business Monthly*

Stephen Ross Dooley, Stone Corral Vineyard and Stephen Ross Wine

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Speakers:

Liz Mercer, Bluxome Street Winery

Chelsea Sprague, Booker Wines

Nichole Joy Kirkpatrick, Denner Vineyards

Cameron Porter, Presqu'ile Winery

Recruiting Talent and Continuing Education in the Tasting Room

Labor is tight across the state. How can wineries compete with other industries by creating brand loyalty with competitive pay and continuing education? How are wineries recruiting, training and retaining sales staff? Hear recruiting tips and ideas from human resource and tasting room managers across the Central Coast.

Speakers:

Adrienne Ferrara, MS - Moderator, Cal Poly

Amanda Wittstrom Higgins, Ancient Peaks Winery

Malani Anderson, Turley Wine Cellars

The Next Generation Winery Experience

The winery experience has become so much more than simply tasting wine. From structured experiences like private tastings, tours, food and wine pairings to casual encounters like wines on tap, events, live music and concerts, building the brand experience is paramount. What experiences fit your brand? How can the experience translate into sales and ultimately wine club sign-ups? Hear tips and ideas from the leaders across the state who are creating the ultimate experience.

Speakers:

Chris Denny - Moderator, The Engine is Red

Emile Eliason, Crimson Wine Group

Tracey Hoff, Conn Creek Winery

Maggie Tillman, Alta Colina

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2019 Winery Equipment Survey Report

Planned Purchases Down; Those Buying are Looking to Upgrade

Curtis Phillips

Curtis Phillips, an editor for *Wine Business Monthly* since 2000, is a graduate of UC Davis, and has been a winemaker since 1984 and an agricultural consultant since 1979.

PHOTOS SCOTT SUMMERS

The tide is changing, but is it going to ebb or flow?

SOMETIMES A SURVEY LENDS itself to a particular narrative like, "winemakers expect to grow this year" or "winemakers are gearing up for a number crop" or "winemakers are looking for an edge in a tough market." This year doesn't look to be one of those years. The signs seem to point in all directions. One sign that could be interpreted as a clue that winemakers are retrenching is the fact that planned purchases are down from last year in all major categories of winery equipment other than sorting tables. But it could simply be that last year's demand for pretty much everything was the aberration rather than any nervousness about the future in this year's survey.

Notable Results from the 2019 WBM Equipment Survey

Almost half of wineries are looking to increase their level of capital expenditures in the coming year.

Slightly more than half of the wineries that expect to buy new equipment in 2019 noted that the new purchases are intended to upgrade their overall capacity.

Fifty-eight percent of wineries that are planning to buy winery equipment in 2019 are planning to buy tanks.

More wineries are expecting to buy a sorting table in 2019.

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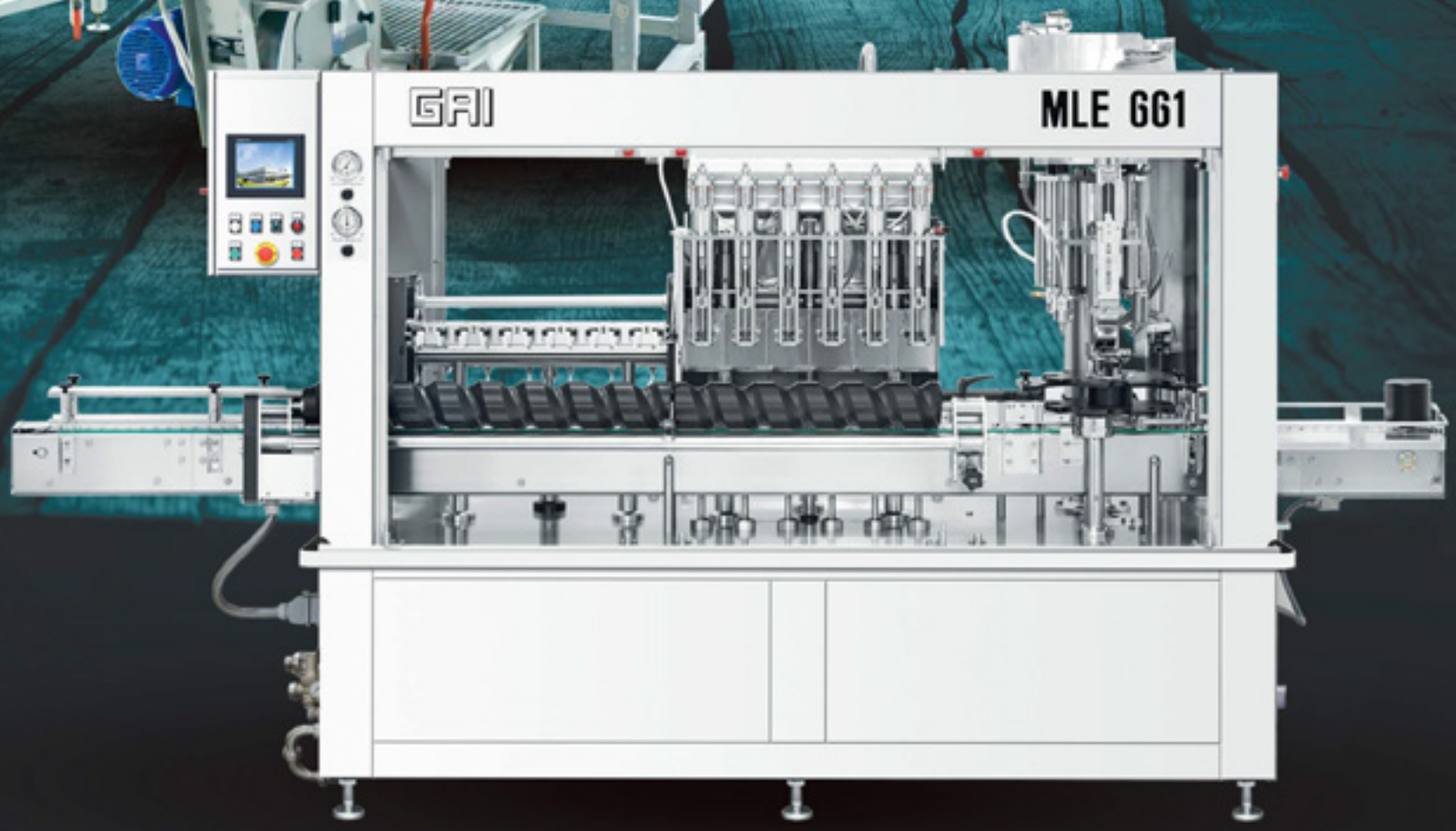

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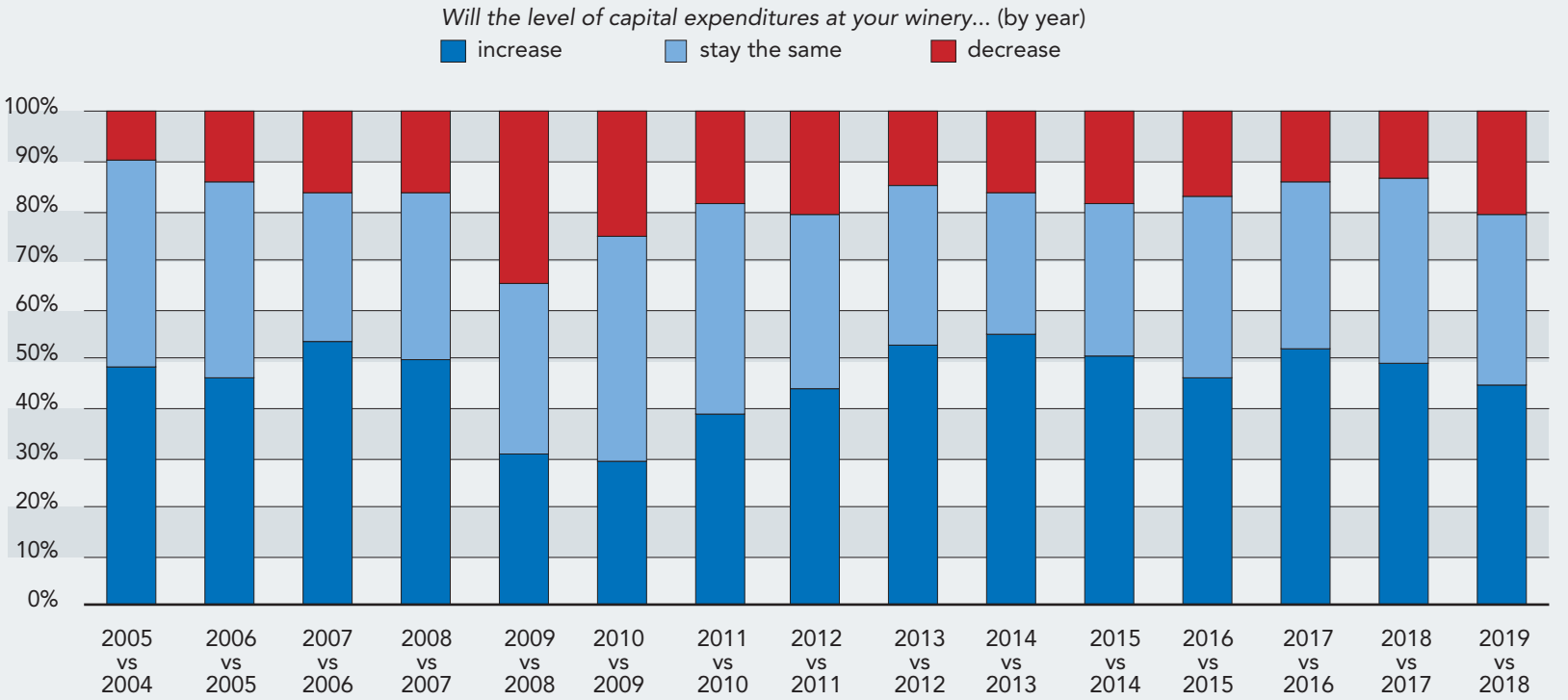
Expected Capital Expenditures

Almost half of wineries are looking to increase their level of capital expenditures in the coming year.

Four-fifths of the respondents (80 percent) indicated that they planned to spend as much, or more, as they did last year on winery equipment. This year however, the ratio between those wineries increasing spending and those maintaining the same levels has retrenched with not quite half (45 percent) of the respondents to the 2019 *WBM* Equipment Survey noting that they planned to spend more than last year. Thirty-five percent of respondents expected to spend the same this year as last. The number of wineries expecting to decrease equipment purchases increased to 21 percent, up from 13 percent last year (CHART 1).

Mid-sized and large wineries reported that they planned to decrease capital expenditures with 40 percent of the respondents from wineries producing more than 50,000 cases per year. These data aren't reflected in the chart simply because there are too few compared to respondents from small wineries to make a dent in what can be charted.



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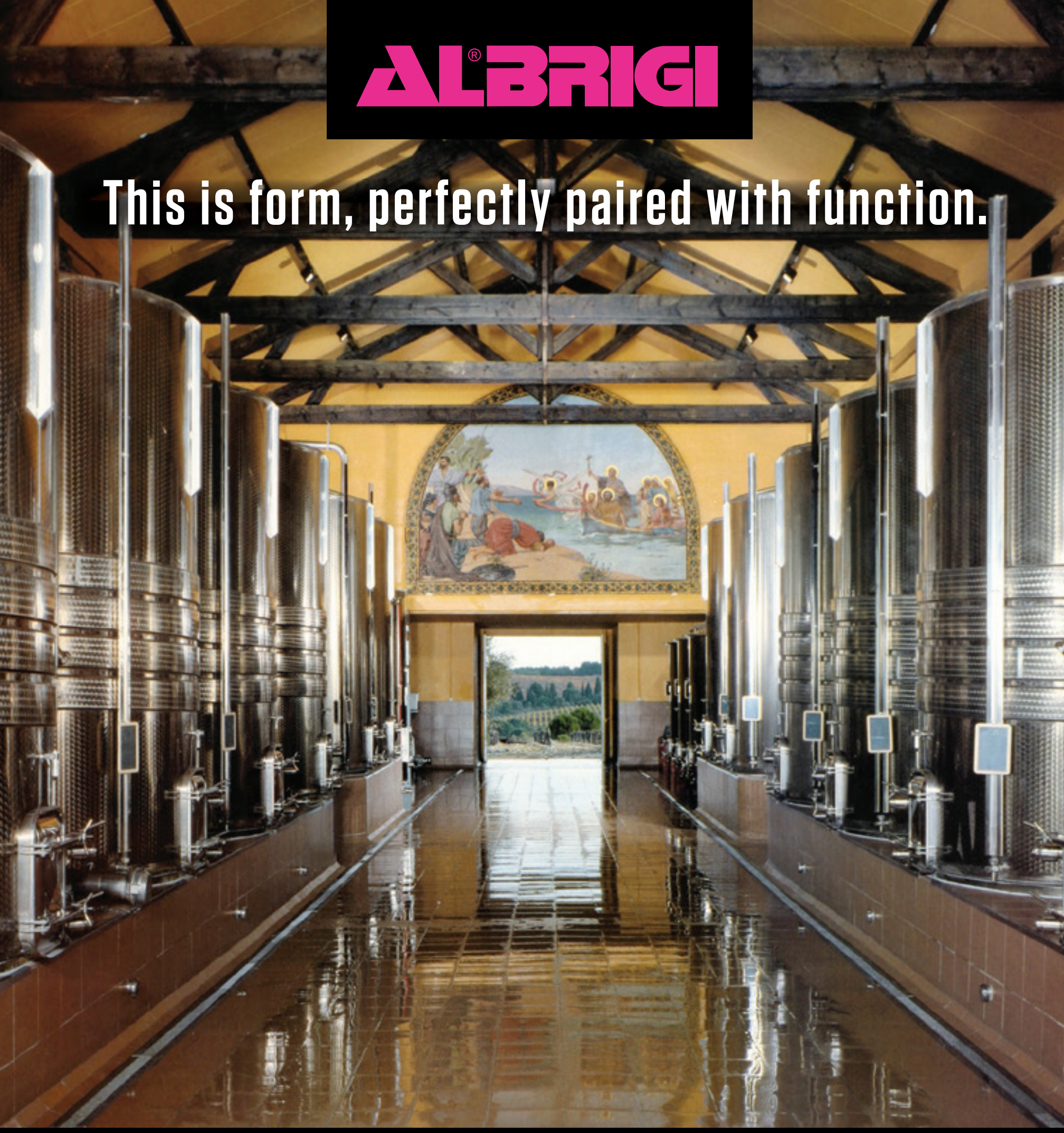

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Expected Equipment Purchases

The number of wineries looking to buy a sorting table continues to rise

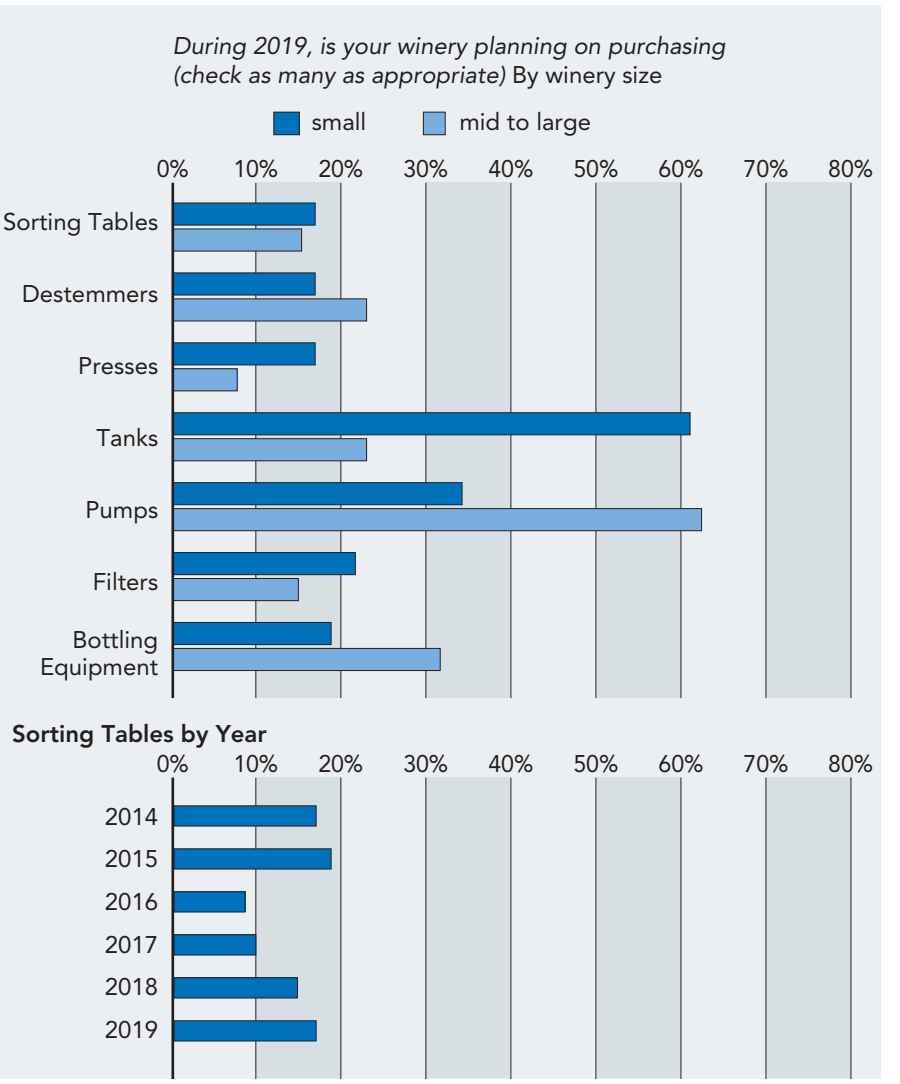
Small wineries are looking for tanks

Mid-sized and large wineries are looking for pumps

The annual winery equipment purchases tend to follow a similar pattern every year. A majority of wineries expect to buy tanks every year. Pumps are usually the next most popular items followed by filters and bottling equipment which just edge out crushed equipment like sorting tables, destemmers, and presses (CHART 2).

Not quite two-thirds (61 percent) of respondents from small wineries noted that they expect to purchase tanks in 2019. A similar proportion (62 percent) of the respondents from mid-sized and large wineries noted that they planned to buy pumps during the coming year.

Small wineries are a bit more likely to be looking for sorting tables and destemmers while mid-sized wineries are more likely to be shopping for destemmers and bottling equipments in addition to the endless need for new pumps. Of course, mid-sized and large wineries usually have several, if not dozens of, pumps so it's fairly normal for wineries producing more than 50,000 cases per year to be shopping for pumps in any given year.



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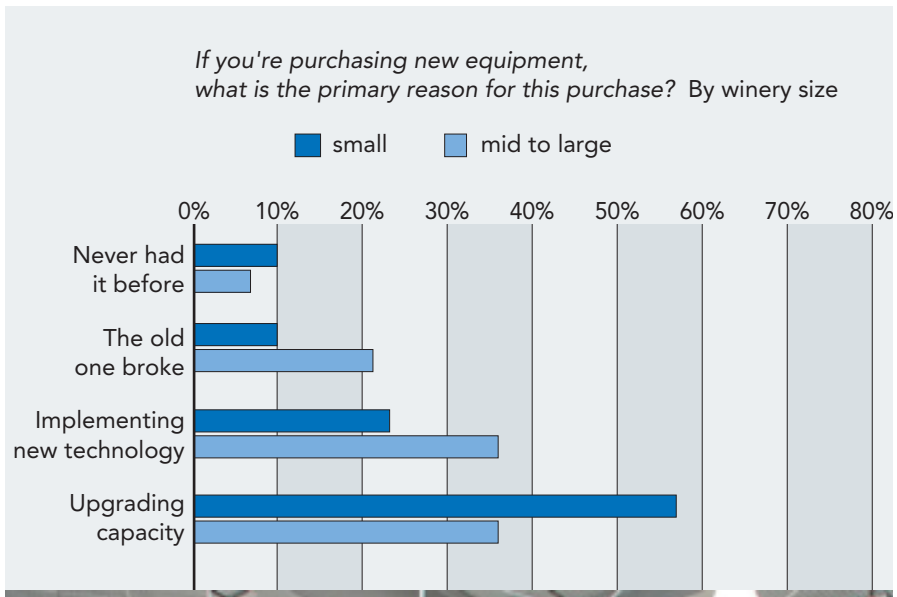
Why Buy?

More than half of the wineries expecting to buy new equipment in 2019 noted that the new purchases are intended to upgrade their overall capacity.

The respondents were asked why they intended to purchase new winery equipment in the upcoming year. More than half (55 percent) stated that they intended to increase their winery's overall capacity (CHART 3). This is especially true for wineries that produce less than 50,000 cases of wine per year. About 10 percent of these smaller wineries noted that they intended to buy equipment to add a capability that they don't currently have. Larger wineries were slightly less likely to be increasing capacity and slightly more likely to be replacing broken equipment or upgrading to a new technology.

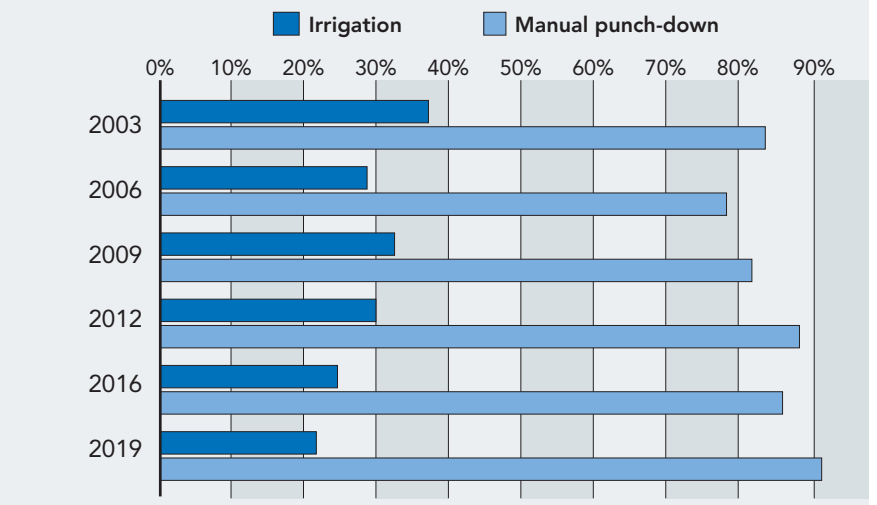


Cap Management

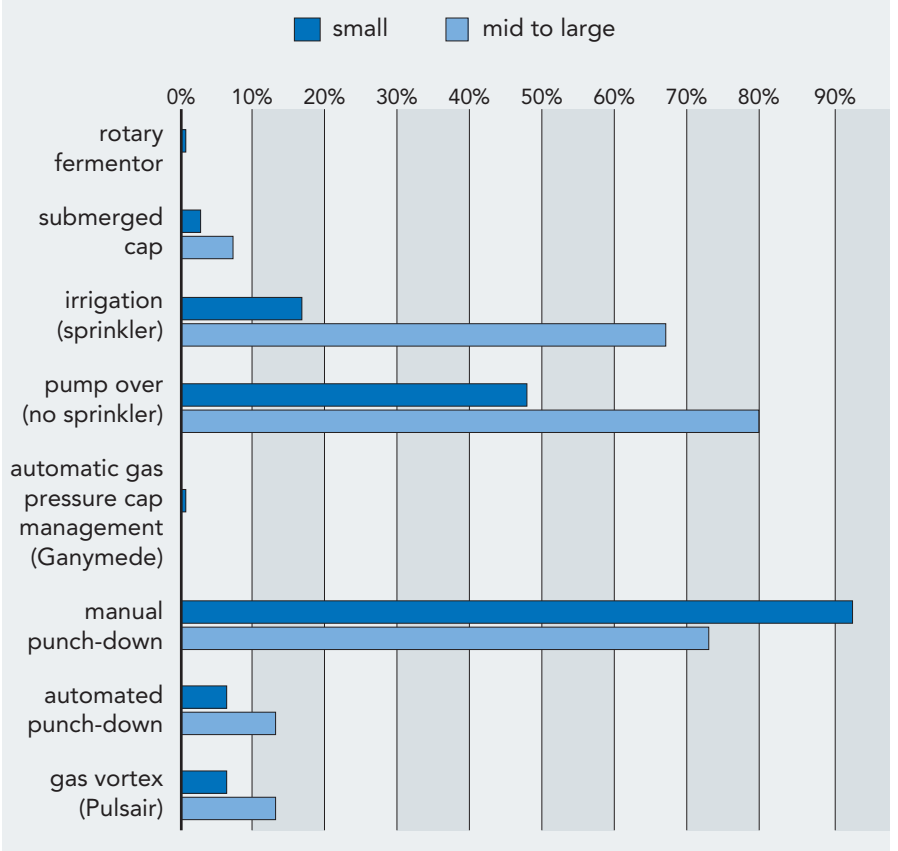
Cap management is something of a tale of two wine industries. Among small wineries, which tend to dominate our overall survey results, as seen in CHART 4, there has been a trend away from cap irrigation and toward manual punch-downs (AKA pigéage). A large part of this is merely due to the winery size. Cap irrigators—although one could probably fit or improvise one to just about any tank—tend to be used on fermentation lots larger than 10 tons. Small wineries tend to ferment in small lots in small fermenters that are easier to punch-down than are bigger fermentation vessels. Ninety-two percent of small wineries use punch-downs but only 17 percent use cap irrigation.

Large wineries tend to ferment in larger fermenters where manual punch-downs are impractical. Most large wineries still use manual punch-downs where the lot size, grape variety (Pinot Noir), or winemaker preference dictate, but 67 percent of mid-sized to large wineries will use cap irrigation on at least some of their fermentation. The difference between the two can be seen in CHART 5.

What methods do you use for cap management? (irrigation vs. manual punch-down) By year



What methods do you use for cap management? (choose as many as appropriate) by winery size



Nickel. It Always Comes Down to Nickel Prices and Supply

In some prior years, we have run a brief note about the Nickel sport-market and how fluctuations in the cost of nickel drive changes in the price of stainless steel. The relevance of nickel to winery equipment prices has not changed. Pretty much every piece of equipment in the winery has to be made out of 316-grade stainless steel or its cast equivalent (CF8M) and around 70 percent the cost of stainless steel is due to the cost of nickel.

During the past year, there has been a substantial drawdown in the warehouse stocks of nickel. This may be a harbinger of an increase in the price of nickel, and therefore an increase in the price of stainless steel. It may be some time before this is the case. Warehouse stocks for nickel remain ample despite the drawdown and nickel spot prices are down a little more than 15 percent from 2012. This means that stainless steel prices remain some 40 percent lower than they were in 2012.

The other factor that is making it harder to predict stainless steel prices is that China started dealing directly with, or outright buying, nickel producers, thereby taking several producers and the largest consumer for nickel out of the spot market.

Right now, global nickel stocks remain pretty high while the spot-market price for nickel is just over $4 per pound. We should see further depletion of the nickel warehouse stock before prices start going further up.

Concluding Observations

As noted above, almost half of wineries are looking to increase their level of capital expenditures in the coming year with two-thirds of the wineries expecting to buy new equipment in 2019 noted that the new purchases are intended to upgrade their overall capacity. This need for increased capacity being driven primarily by smaller wineries. Mid-sized and large wineries appear to be just as likely to buy in order to implement new technology as they are to buy equipment to increase capacity. Most wineries (58 percent) that are planning to buy winery equipment in 2019 are planning to buy tanks, but the only category for which there was an uptick in demand from last year was sorting tables. **WBM**

Methodology

Wine Business Monthly received 198 responses from wineries to this year's survey (additional respondents included only one grower not listing themselves as wineries, and one respondent listed as "other." This last category is usually comprised of consulting winemakers. Combined vineyard and winery businesses are considered wineries for the purposes of this survey. Ninety-two percent of the respondents were small producers with annual production of less than 49,999 cases per year. The next size category of 50,000 to 499,999 cases per year comprised about 7 percent, and two respondents had production over 500,000 cases annually. The survey was conducted via the Internet.

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Vineyard Automation – What is Possible, What is Desirable, What is Necessary?

Will artificial intelligence replace people in the vineyard?

Mark Greenspan

Dr. Mark Greenspan has more than a quarter-century of scientific viticulture research and viticultural field experience. He specializes in irrigation and nutrition management, yield and canopy management, vineyard climate and microclimate, vineyard design and vineyard technology. He is the founder of Advanced Viticulture, Inc. based in Windsor, California (*www.advancedvit.com*), providing consulting, technology, vineyard management and vineyard development for wineries, winemakers and wine growers devoted to producing premium wines. Please direct queries to *mark@advancedvit.com* or 707-838-3805.

PHOTOS SCOTT SUMMERS

I WROTE ABOUT IRRIGATION automation last year[1], which was mostly a discussion about what is needed to automate an irrigation system. But now I will take a step back and consider what may or may not be automatable in a vineyard. I suppose the short answer is that everything can be automated, but me and my fellow vineyard people shouldn't be worrying about our careers just yet.

I think it best to first discuss what exactly automation is. I'm not sure I'm the best one to do this; but since I have an engineering background, I guess I can take a stab at it. I'll use an automobile to illustrate what I'm thinking about. One could consider power remote door locks on a car to be a form of automation. They alleviate the need to be physically near the car to either lock or unlock the doors, and one does not need a key to perform that function. That goes a long way towards making our lives easier—we don't have to run back to our car to see if we forgot to lock it. Just push the button on the fob and the car will tell us it's now locked by sounding its horn. In a similar vein, a more recent form of automation is a self-steering car, which captures images in real-time to visualize where the lane is and can move the steering wheel to keep the car centered in the lane. This is a big step in vehicle automation that is now being seen in popularly-priced cars.

But the big daddy of them all is the autonomously self-driving car. Just tell it where you want to go and it does the rest: figuring out the best route with consideration to current traffic, steering the car, minding traffic signals and other traffic controls, avoiding collisions with other cars, objects and pedestrians, and eventually arriving at its destination; without any input from the passengers. This is complete automation and while current technology is nearly there, it is not perfect (tragically, in some cases). Nevertheless, I think we can expect that people will be transported by autonomously-controlled vehicles more and more in the not-too-distant future.

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Vineyard Automation – What is Possible, What is Desirable, What is Necessary?

Simple System Automation

Humans are complex, intelligent beings; and while some of their actions may be easily replicated by machines, their decision-making processes are not as easy to mimic in a machine. In my June 2018 article, I referred mainly to switching on and off irrigation valves. This is a very basic level of automation, and at this level, anything that is typically switched on and off can be automated. However, this is only akin to the remote door locks analogy I used above. Someone needs to make the decision about when and how long to open or close that valve or turn on or off that pump. That level of automation is not much more sophisticated than a landscape irrigation timer, the chief difference being that it can be done remotely and wirelessly. And the irrigation schedules are usually programmed by a human being, who takes into consideration various pieces of information to determine that schedule—at least, ideally so.

But there is another level between the simple switching on and off of pumps and valves and the fully autonomous decision-making and execution level of automation. With irrigation, that could be with system functional checks, such as testing whether a valve that is open is actually open (or vice-versa), whether flow is within expected ranges when a block or blocks are being irrigated, or if pressures are within defined ranges during operation. These require sensors, such as pressure switches, flow meters and pressure sensors, to provide the feedback necessary for decisions to be made about the system as it occurs (or is supposed to occur). This level of automation adds the ability for the system to make decisions about whether the system is operating properly and, if not, can potentially shut the system down, as well as generate alerts to managers that something needs attention. And, of course, it can also be used to keep records of when irrigation was applied and how much water was applied.

Besides irrigation, it can also be used to integrate fertilizer tanks and pumps so that precise delivery of fertilizer materials may be injected at the right time and at the right amount to increase efficiency of fertilization practices. But again, this is only a rudimentary level of automation, in that the operator needs to tell the system how much to apply. Perhaps sometime down the road, nutrient sensors may be placed in the soil to determine deficiencies of specific nutrients. We are not far from that, at least for a couple of different nutrients, N and K, though to my knowledge, neither of those can be accurately calibrated to actual soil solution chemistry but can detect trends in those levels.

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Moving to Full Automation

What if we wanted to let the system not only control the pumps and valves and to check itself during operations, but also to determine the best way to irrigate a vineyard as we progress through the growing season? We would still need to define some boundaries, such as how much water stress we want the vines to experience and when and how much moisture our soil can hold, but we would let the machine (most likely a cloud-based computational system) take in information, such as weather conditions, weather forecasts, time of year, soil moisture conditions, etc., and it would decide when and how much to irrigate and also control the system to execute the irrigations. This would be a fully-automated irrigation system.

In its simplest format, we could have irrigations begin when soil moisture was at a set level, stop when soil moisture attained a higher set level and repeat. This may be all that is needed for growing something like cabbage, where we are not very concerned about deep irrigations, stressing the plants or developing anthocyanins, among other things. But winegrape irrigation is more complicated than cabbage irrigation.

We could develop a more complex algorithm that takes in the data stream I indicated above and, through a series of if-then logic, could possibly be used to make decisions about irrigation. It would be a very complex set of conditional statements and would require memory of what we had done in the past, or at least the recent past. In other words, for example: if a heat wave was forecast in two days and we had not irrigated for seven days, we should apply five hours of irrigation, plus or minus a value based on what

the current soil moisture content was, though if harvest was within four days, we should not irrigate at all. Or another example: The current soil moisture indicates that we will need to irrigate in three days but the weather forecast says that a fog pattern will be developing over the next five days and we are approaching the period where we want maximum water stress so we should stretch out our irrigation by irrigating in six days, instead of irrigating in three days. Simple? Not really, because there are numerous situations and other conditions we would need to consider to develop such an irrigation decision process.

This flowchart-like approach is called an algorithm and is the way computers have traditionally been programmed. That's what lines of code

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do: they generate a sequence of steps with logical decision-making points along the way that can branch into different sets of decision blocks. This is called a decision tree.

As a viticulturist who has worked heavily in the field of irrigation, I've been doing this for a long time and don't ever recall thinking in a decision tree-like manner. Do you? Probably not. Humans don't think in logical sequences. We recognize patterns, remember history and react according to those patterns and recollections. As we gain experience in our fields, we have a richer set of patterns that we remember, as well as the consequences that arose from those patterns and reactions to them. We remember the successes as well as the failures, and so, at least ideally, we get better with age. That is why most consulting viticulturists are on the older side!

Artificial intelligence (AI) is not new, but it is a science, and technology that has been evolving as the ability to implement AI is improving dramatically as computer memory gets denser and far less expensive at a continuously faster rate. AI is a different approach to computing than the decision tree logic I tried to outline above. Rather, a tremendously large memory array acts as a brain of sorts: something called a neural network. AI is already heavily used for functions, such as speech recognition (think Siri) and, uh, self-driving cars.

Instead of defining a decision tree, the AI system is given training sets. These include inputs of various important observations (or maybe some that we think are important), as well as the outputs, or decisions that were coincident with that set of observations. In this manner, we train the machine to think like us. The more training sets that are used, the more the machine will react like a human. In this manner, we can conceivably train a machine to think like us.

Applications of Automation in Viticulture

I am certainly not qualified to go into detail about AI, though the book I am currently reading may help me understand it better[2]. The author, **Kai-Fu Lee**, a Chinese computer scientist educated in the United States, feels that AI will represent the biggest change in society that we've ever seen. So, with something so big, why should we not expect it for viticulture? Think of it this way: If a machine can be made to understand your speech, could another be made to do some viticultural tasks? Most likely the answer is yes. The real question is whether the economics of automation make sense.

I've used the example of irrigation decision-making because it's something with which I'm quite familiar. I would suggest that automation of irrigation decision-making would make economic sense. But we can think about what other functions may be automated. I'm not talking about mechanization, per se, because there are some tasks that can be mechanized that don't rely very heavily on real-time decision-making. Think about trunk-suckering, wire- and shoot-lifting and maybe even harvest, which can already be done by machines. I may take exception to

excluding harvest from automation because perhaps the next generation of harvesters will engage in real-time selective harvesting.

But, how about weed cultivation? See a weed, remove the weed. See a vine trunk, don't touch. Weed control in organic vineyards (or any vineyard wishing to use less herbicide) is a difficult and costly operation, so applying automation to mechanical weed control could definitely be an economically-viable proposition.

Did someone say pruning? Yes, they did. I've seen demonstrations of pruning robots perhaps dating back to 15 or more years ago. Can you imagine programming a robot to think like you when you prune a vine? Not if you are using a logic tree type of approach but possibly if you are using a machine-learning (AI) approach. Pruning is one of the costlier operations in a vineyard each year, and automation of the practice is economically feasible.

Just like pruning, shoot-thinning, cluster-thinning and perhaps even leaf removal practices are among those that require some level of thinking that is currently best left to humans. Yes, I know that there are mechanical means to perform all those tasks, but they tend to be somewhat brute-force in practice, not considering differences from vine to vine. Perhaps only higher-end vineyards would benefit from automated cluster- and shoot-thinning, but that could still be sufficient economic motivation to develop machines for that purpose.

Other automation may depend on new sensor technologies being developed. Machine vision and AI could be used to target hot spots of disease in a vineyard or to apply fertilizers more specifically where they are needed.

I don't suspect that any of us in the business right now should fear for our jobs being taken over by robots. But there will come a day where we, as viticulturists and vineyard managers, will be spending our time feeding specifications into machines, repairing machines and performing human quality control over them. That's not really the viticulture I envisioned when I got into this business, but it may be inevitable. **WBM**

[1] Greenspan, M. Irrigation Automation: Why? *Wine Business Monthly*, July 2018.

[2] Lee, Kai-Fu. *AI Superpowers: China, Silicon Valley, and the New World Order*. Houghton Mifflin Harcourt. September 25, 2018.

Correction:

Dear Readers: An astute reader and friend of mine pointed out a mistake I made in my January column entitled "Sometimes the Smaller Drink is Better." The mistake appears in the second paragraph in the section on deeper root systems (first paragraph on page 190). The second to last sentence should read, "Indeed, it is the postponing of early irrigation more than deep irrigation that helps to develop a more resilient root system." Since it was a major point of the article, I wanted to make that clarification, as it otherwise was a self-contradiction. I apologize for the error.

PRACTICAL Winery & Vineyard

Basic Training for Combating Mildew

Emerging fungicide resistance requires changes in management programs.

Melissa Hansen and Michelle Moyer

Melissa Hansen, research program director for the Washington State Wine Commission, helps make research supported by the Washington wine industry more accessible to the state's winemakers and grape growers.

Michelle Moyer is associate professor and extension viticulturist for the Washington State University (WSU) Viticulture and Enology Program. She joined WSU in 2011 after receiving her degrees in genetics and plant pathology from the University of Wisconsin-Madison and doctorate in plant pathology from Cornell University. Her research focuses on canopy management and optimizing cultural techniques for combined impacts on disease management and grape quality.

GRAPEVINE POWDERY MILDEW CAN be costly and devastating to fruit quality and grapevine health. Effective management is key, but what happens if your fungicides do not work as well as they should?

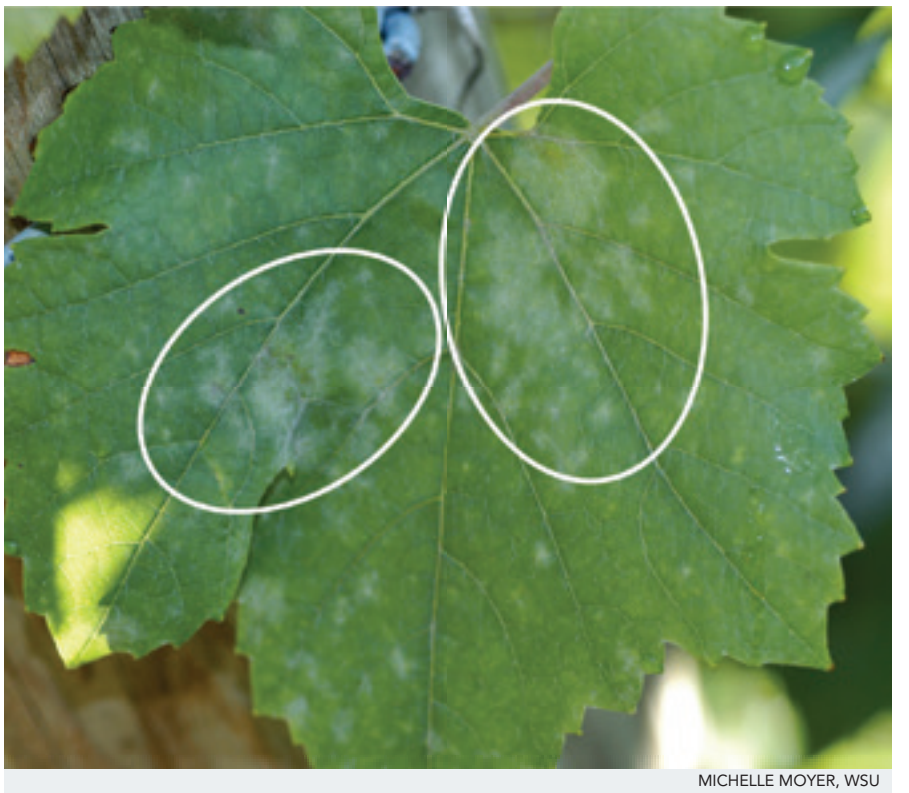
New research may hold the answer.

A national research and extension effort to understand and reduce the impact of fungicide resistance in grapevine powdery mildew was launched in 2018 by a multi-regional team of scientists and extension educators. Dr. **Michelle Moyer** (**Washington State University**) leads the four-year, $4.75 million project funded through the **U.S. Department of Agriculture**'s **Specialty Crop Research Initiative** (SCRI). The grant received the first installment of $2.4 million in September 2018 for the initial two years of the four-year project.

The project, titled "Fungicide Resistance Assessment, Mitigation and Extension Network for Wine, Table and Raisin Grapes," is dubbed the FRAME Network for short. The FRAME project expands on research of powdery mildew fungicide resistance underway in Washington, Oregon and California. That research, supported by the **Washington State Wine Commission**, the **Oregon Wine Board** and the **American Vineyard Foundation**, totals about $600,000 and helped to leverage the $4.75 million project.

Key Points

- A four-year national research and extension effort was launched in 2018 to reduce the impact of fungicide resistance in grapevine powdery mildew. The goal is to develop predictive tools to help identify resistance potential and strategies to mitigate resistance development and manage resistance that has already developed.
- Resistance to QoI (FRAC 11) fungicides has been documented for much of the West Coast. Powdery mildew management programs need to emphasize fungicide resistance management now more than ever.
- Implement good mildew management practices: adjust in-season programs to reflect the risk of powdery mildew outbreaks; complete first spray between 3 and 6 inches of shoot growth; keep canopies open by shoot-thinning and leaf-removal to allow spray and sunlight penetration; use appropriate spray intervals; use enough water volume for adequate coverage; and maintain and operate sprayer for optimum performance.



MICHELLE MOYER, WSU

FIGURE 1. The silvery or dusty sheen on the leaves shown here inside the white circles is a typical symptom of powdery mildew on leaves. While most people are concerned about problems this disease causes on fruit, foliar infections can reduce the photosynthetic capacity of the vine and cause premature defoliation.

Grapevine powdery mildew, caused by the fungus *Erysiphe necator*, is an ongoing problem for wine, table and raisin grape growers in nearly all grape-producing regions of the world. *Vitis vinifera* cultivars are highly susceptible to powdery mildew. For the U.S. grape industry, it is considered the biggest threat to fruit quality. It does not take much infection to cause major problems. In winegrapes, just 3 to 5 percent infection of the fruit can result in undesirable changes in wine flavors and aromas.[5] If left unchecked, the fungal disease can cause complete crop failure. Grape industry sources

estimate that powdery mildew results in approximately $300 million in losses each year in the United States.

Symptoms of powdery mildew include a gray to silver sheen of white, powdery or dusty masses on foliage and fruit (see **FIGURE 1**). The fungus can overwinter as hyphae (thin threads) inside the vine's dormant buds and/or as small, black bodies called chasmothecia, which embed in the bark of the vine. The over-wintered chasmothecia release sexual spores in late winter to early spring during periods of rain or moisture, but infection does not happen until after budbreak and typically when temperatures reach 50° F and higher. When conditions are ripe for infection—mild temperatures and high humidity—a single spore can germinate, infect a vine and reproduce in 10 days or less, depending on temperature, humidity and sunlight exposure. Powdery mildew infection on fruit can also increase the risk of other fungal infections, like *Botrytis* or colonization from spoilage microbes.

Growers use a variety of tactics and tools to control powdery mildew, from cultural practices that increase sunlight exposure to leaves and fruit and encourage good air movement through the canopy, to chemical control. Many older, effective fungicides on the market are at low risk for resistance development but have undesirable off-target effects (kill target pests and diseases, but are detrimental to beneficial insects or other fauna in the vineyard). Thus, many of the newer fungicides now on the market have focused specificity to a target organism or group of organisms to reduce those off-target effects. Unfortunately, the more specific the pesticide is to a target, the higher the risk for resistance development.

STEPHANIE BOLTON

These Cabernet Sauvignon grapes show classic symptoms of powdery mildew infection of white powdery growth, and small, cracking and splitting berries.

MICHELLE MOYER, WSU

Grapevines have indeterminate shoot growth; nodes and internodes near the base of the shoot form early in the season, while nodes and internodes near the shoot tip form later in the season. Because of this, you can get an approximate idea of when disease outbreaks occurred by comparing the location of mildew scarring to where on the shoot that scarring has occurred.

History of Resistance

Fungicide resistance is not a new phenomenon. For more than 50 years, agricultural producers have dealt with fungicide resistance in fungal pathogens. When the first broad-spectrum, foliar fungicide Benlate (benomyl) was introduced in 1970,[1] growers finally had a fungicide that controlled existing infections and multiple diseases, extended spray intervals and was safe for plants and mammals.

But growers soon discovered a weakness in benomyl's armor. In only three years of exclusive use, the site-specific mode of action allowed for selection of resistant pathogens that were no longer affected by benomyl applications.

To help growers use fungicides effectively and reduce resistance development in the target pathogens, an international organization of agrochemical manufacturers, industry and scientists was established in the early 1980s to develop management practices. That organization, called **FRAC** (Fungicide Resistance Action Committee), classifies fungicides by their chemical mode of action since fungicides with similar modes of action typically develop cross-resistance among themselves (i.e., resistance to one fungicide in that group typically means at least some level of resistance to all fungicides in that group). The committee assigns a unique FRAC number to each group of fungicides sharing a common mode of action, to help growers identify which products have the same mode of action and assist in understanding how to alternate their fungicide applications for resistance management.

Resistance to fungicides classified in FRAC group 3 (demethylation inhibitor or DMI) was widely documented in California in the 1980s. Examples of FRAC 3 fungicides include, but are not limited to, Rally, Mettle and Procure.

Emerging Strobilurin Resistance

Resistance to strobilurin fungicides (also known as quinone outside inhibitor or QoI) was first noted in 2002 in New York and a few years later in the mid-Atlantic region and Michigan.[6] QoI fungicides are in FRAC group 11. Examples include, but are not limited to, Flint, Abound and Sovran.

In 2015, Dr. **Walt Mahaffee**, research plant pathologist for the U.S. Department of Agriculture in Corvallis, Oregon, found widespread resistance in grape powdery mildew in Oregon to strobilurin fungicides, a group previously known for their reliability. In 2016, reports of failed powdery mildew management surfaced in Oregon, California and Washington grape production, despite well-designed programs for applying QoI fungicides. In Oregon, these failures were confirmed to be associated with QoI-resistant populations of the mildew fungus, *E. necator*.

Extensive surveys were conducted in 2017 in Washington, California and Oregon vineyards with mildew management problems. The survey found more than 90 percent of the 645 samples had the resistant allele (gene mutation) associated with QoI (FRAC 11) resistance.[2] The survey also found more than 60 percent of the isolates collected and tested were resistant to demethylation inhibiting or DMI fungicides (FRAC 3). This sampling was expanded in 2018, testing over 3,000 samples from around the United States for the gene mutation associated with QoI resistance; 50 percent of the samples had the resistant allele. The sampling and testing will continue in 2019 and 2020. For more information visit *https://framenetworks.wsu.edu/grower-information/*.

It is important to note that these fungicide resistance data came from vineyards where mildew disease levels were a concern. Because samples were not randomly selected, they are not representative of the entire powdery mildew populations in any region, although they do indicate a significant problem with the capacity to become worse if not recognized and addressed.

FRAC 3 (DMI) resistance has been manageable because of its very nature—quantitative ("partial") rather than qualitative ("total") resistance, as is the case with FRAC 11 (QoI) resistance. Thus, the powdery mildew game is now changed with the widespread FRAC 11 (QoI) resistance in West Coast growing regions.

This emerging resistance to QoI fungicides likely exasperated conditions in 2017, a difficult powdery mildew year for many West Coast grape growers. In Washington state and many western viticulture regions where winegrapes are produced under a hot, arid climate and powdery mildew pressure is generally low, many growers struggled with powdery mildew control.

But not all of the blame can be placed on the recently identified fungicide resistance. The 2017 season had perfect components for mildew in West Coast grape production regions: ample soil moisture from abundant winter snow and rains that jump-started early season grapevine growth and made spray applications difficult to apply on a timely basis; higher than normal humidity from cloud and smoke coverage and lower-than-normal levels of ultraviolet radiation; and relaxed or poor management practices creeping into some mildew management programs.

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Basic Training for Combating Mildew

MICHELLE MOYER, WSU

Once powdery mildew gets this bad on grape berries, there is no way to correct the problem that growing season.

Help is Coming

The 2017 season showed how vulnerable grape growers are when it comes to lapses in spray programs, whether through poor application practices or fungicide resistance. Growers have no useful system to monitor or predict fungicide resistance. Too often, resistance problems are not identified until money has been spent on fungicide applications and crop losses incur.

The goal of the FRAME Network is to equip U.S. grape growers with data and predictive tools for the potential for fungicide resistance and help them better design, manage and implement resistance stewardship programs. Objectives of the project include:

- Identify where fungicide resistance currently occurs.
- Develop detection and monitoring tools.
- Improve fungicide application efficiency.
- Develop tools to predict when and where resistance will arise.
- Develop guidelines for growers to mitigate and manage resistance already developed.

The diverse FRAME Network research team represents cross-disciplines of molecular scientists, computer engineers, viticulturists and field pathologists, extension specialists and economists. Team members are Moyer; Mahaffee; **Phillip Brannen**, **University of Georgia**; **Monica Copper**, **University of California Cooperative Extension**; **Ana Maria Espinola-Arrendondo**, **WSU**; **Melanie Ivey**, **Ohio State University**; **Tim Miles**, **Michigan State University**; **Ioannis Stergiopoulos**, **University of California-Davis**; and **Rob Stoll**, **University of Utah**.

The FRAME Network team is not just focused on FRAC 11 fungicides. The team's molecular scientists will develop faster tests to identify resistance in FRAC groups 3, 7 (SDHI fungicides, examples include, but are not limited to, Endura, Aprovia, Luna Experience or Luna Sensation) and 13 (AZN fungicides, an example is, but is not limited to, Quintec).

Computer engineers will model fine-scale weather and vineyard microclimates to predict resistance hot spots and regional spread to understand how fungicide programs affect disease spread and resistance development at the vineyard to regional level. Viticulturists will evaluate vineyard management strategies. Extension specialists will develop service centers in grape production regions across the U.S. to put new resistance tests into practice. An economist will study what drives the decisions in marketing and purchasing of fungicides.

Best Management Practices

Now is the time to use all of the tools available to control powdery mildew and delay the development of resistance.

Best practices for powdery mildew management include following the recommendations that have been developed for your region. Best practices for fungicide resistance management are often regionally described, but generally include rotating to different FRAC groups for each application, and tank mixing with contact fungicides. For winegrapes, the critical window for fruit infection is generally from immediate pre-bloom to four weeks after fruit set. Table grape growers may have a longer window because they must be concerned with mildew on the rachis, which retains susceptibility later into the season. A useful source of regional fungicide resistance resources can be found at the end of this article.

The following suggestions contained in the Fall 2017 and Spring 2018 issues of the *WSU Viticulture and Enology Extension News*[3,4] will help you improve your mildew management practices:

Understand vine development: The speed of vine development early in the growing season sets the tone for powdery mildew development for the year. Assess winter and early spring soil moisture to anticipate how fast early shoots will grow, keeping in mind that available water and warmer temperatures result in faster vine development.

1. **Schedule the first seasonal spray early enough to ensure the pass is completed before vines have outgrown a manageable stage.**

2. **Shorten spray intervals:** Fast growing shoots require more frequent sprays to ensure new foliage is protected; depending on the product and the environmental conditions, this might be as frequent as seven days. It is easy to get behind rapid growth with contact products like sulfur, oil, potassium bicarbonate and biologicals, but systemic products can also be diluted from excess growth.

3. **Implement timely canopy management for your training system:** An open canopy goes a long way to minimize risk. High temperatures, high ultra-violet exposure and quick-drying conditions are enemies of powdery mildew. Dense canopies diminish spray penetration and coverage, as well as sunlight penetration. Utilize shoot-thinning and leaf removal to ensure sprays reach your target.

Weather: Pay attention to atypical weather patterns, such as unusually high humidity from thunderstorms, smoke cover or reduced sunlight conditions from numerous cloudy days. Be prepared to respond to high-infection risk conditions with higher fungicide rates and tighter spray intervals.

1. **Control the vineyard's microclimate by opening up the canopy through shoot-thinning and leaf-removal.**

2. **Excess canopy growth can increase transpiration, which, in turn, increases vineyard canopy humidity and reduces sunlight hitting the foliage and fruit.**

Spray Practices: Get ahead of mildew before it gets a foothold in your vineyard. Let the vines tell you when to spray, not the calendar.

1. **Complete the first spray between 3 and 6 inches of shoot growth in a high-pressure year.** If shoots are growing rapidly and you have a lot of acreage to cover, you may need to start before 3 inches of shoot growth to enable you to complete your first pass before shoots reach 6 inches in length.

2. **Pay attention to spray intervals.** Many growers wait too long between sprays: 15 to 21 days is way too long for many products! Higher-rate oil and sulfur applications have good "reach back" activity to kill young mildew colonies (less than three days old—if you can see mildew colonies, they are not young!) but they do not have much staying power. The residual activity for both oil and sulfur is generally less than five days. Most contact products are effective but must be used properly—they do not protect tissue they were not in contact with and do not have much residual power, but they are good tools in fungicide resistance management.

3. **Sprayer operation matters.** Driving too fast, spraying every other vine row, not calibrating the sprayer and using clogged nozzles can all result in less product per acre and insufficient individual vine coverage. General sprayer maintenance is far cheaper than crop loss and applying catch-up sprays when disease control is lost.

4. **Use enough water for adequate product coverage.** Low-water volume sprayers save time and money by reducing the number of tank refills, but they are best suited for small or moderate canopy size, usually early in the season or lower-vigor vines in mid-season. Picture a cup of water poured in a pie pan (your 20 gallons of water per acre applied early season) and a cup of water poured in a kiddie pool (your large, mid-season canopy). Surfactants will help spread material, but the volume is still insufficient to cover the canopy. Increase your water to 50, 100 or more gallons per acre for better disease control in larger canopies.

5. **Adequate water is especially important when using contact products.** Contact products only work where they land. Be sure you use enough water carrier to obtain coverage inside the canopy.

Fungicide Resistance: Good alternation practices used by many growers kept FRAC 11 fungicides in the tool box for many years, but for some, time is up. If you have confirmed FRAC 11 resistance, consider the following strategies:

1. **Pre-plan your spray program, including estimated gallons per acre and FRAC group rotation.** Preparation will help you avoid last-minute decisions, allow you to alternate fungicides as the season progresses and ensure you use sufficient water to deliver products. Remember, alternating fungicides means alternating between different FRAC groups, not between fungicide trade names.

2. **If you need to use a FRAC 11 fungicide (due to limited options, certification restrictions or cost) in your growing season, use it with the following adjustments:**

- Always tank-mix with fungicides of another mode of action, preferably one with a little to no risk of resistance development itself (such as sulfur or oil).
- Avoid using it in the first spray of the season or during the immediate pre-bloom (rachis elongation) to fruit-set time period (the critical window for fruit infection).
- Do not stretch the spray interval beyond 14 days.

Networking

Powdery mildew spores are not bound by property lines. They are carried in the air to neighboring vineyards. For effective resistance management and mitigation (managing a resistant population), growers need to know the risk that is all around them. Thus, the intent behind the network component of FRAME is to aggregate individual data in a scalable manner to give growers better fungicide use information in their area. This "networking" could be scaled to include adjacent vineyards or whole valleys.

The ultimate goal of the FRAME Network is to empower you with data and predictive tools on your potential of fungicide resistance development and improve your approach to managing and mitigating resistance development. Rapid monitoring technology will be developed and programs implemented for diagnostic labs. The concept and structure of the FRAME Networks also will have application to other specialty crops that face fungicide resistance challenges.

The end result will be more effective fungicide resistance stewardship programs and sustainable production for grapes and other specialty crops.

To learn more about the FRAME Network, visit: *framenetworks.wsu.edu*

Fungicide resistance resources can be found at: *https://framenetworks.wsu.edu/resources/*, and a few of the regionally-specific Grape Disease Management Guides are linked at: *https://framenetworks.wsu.edu/grower-information/*. Sampling information can be found at: *https://framenetworks.wsu.edu/grower-information/*.

Bottom Line

Pathogens, like the one that causes grape powdery mildew, are susceptible to selection pressure that increases the risk of building up the number of fungicide-resistant individuals in a population. A national research and extension effort is underway to develop predictive and rapid detection tools for growers to help all involved (growers, consultants, extension, chemical manufacturers and resellers) develop stewardship programs to protect at-risk fungicides. **WBM**

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Studies on Red Blotch Ecology Inform Disease Management Recommendations

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Red Blotch Disease: A New Threat to Grape Production

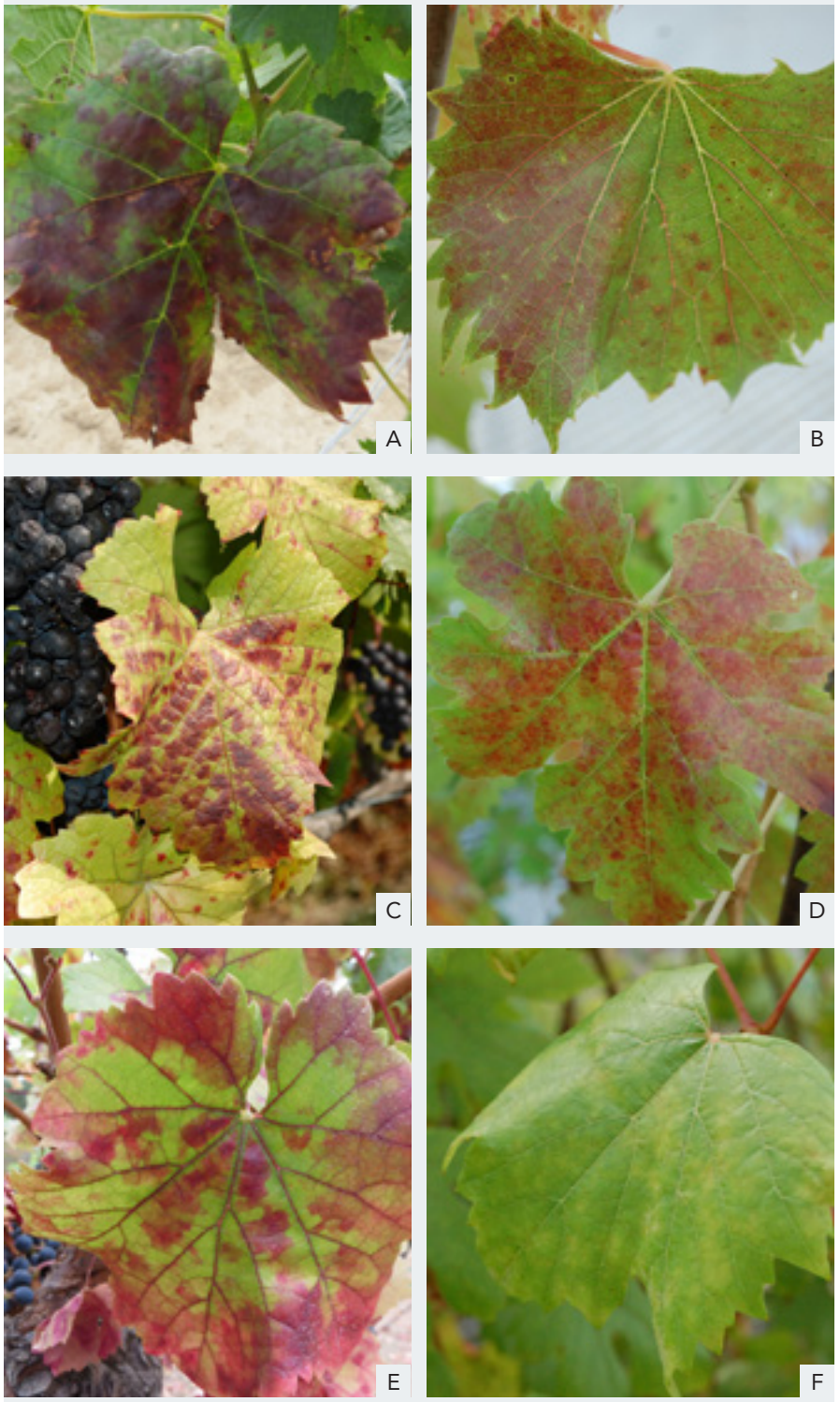
Red Blotch disease has emerged in the last decade as one of the major virus diseases of grapevines in North America. Grapevine Red Blotch Virus (GRBV), the causal agent of Red Blotch disease,[17] is widespread in vineyards throughout the United States.[6,10,16] GRBV affects the profitability of vineyards by reducing fruit quality and ripening[4] (see **FIGURE 1**), resulting in losses up to $170,000 per acre over the lifespan of a vineyard, depending on the initial disease incidence, cultivar, region and price penalty for low quality fruit.[14] Optimal management of Red Blotch requires a comprehensive understanding of disease ecology in vineyard ecosystems.

Red Blotch disease is difficult to identify visually in vineyards because symptoms are similar to those of leafroll disease and some nutrient disorders, and the timing of symptom onset and severity can vary greatly between growing seasons. In red cultivars, red blotches that form on the leaves are early indicators of the disease, and these may coalesce across the leaf blade (**FIGURE 2**). In white cultivars, irregular chlorotic areas of the leaves may form and become necrotic (**FIGURE 2**). Foliar symptoms typically appear first on older leaves at the base of the canopy, progress up the shoot toward younger leaves and peak near harvest. Poor fruit coloration in red cultivars (**FIGURE 1**) and delayed fruit ripening in red and white cultivars can also be indicative of Red Blotch. GRBV often causes asymptomatic infections in rootstocks.

Although GRBV has likely been present for decades, Red Blotch disease remained elusive for a long time.[1] Currently, the only detection techniques available for GRBV are DNA-based tests, such as the polymerase chain reaction (PCR) and its variations.[6,16] To assay accurately for GRBV, older, basal leaf blades with petioles attached should be sampled from late summer to early fall.[15] Alternatively, the basal region of canes should be collected in the dormant season, preferably from shoots that originate in the head area of the vine.

MARC FUCHS, ALICA WISE

FIGURE 1
Reduction in fruit quality and ripening on (top, right) red blotch diseased clusters compared to (top, left) clusters on an asymptomatic Pinot Noir vine in Oregon, and (bottom, left) red blotch diseased vine next to (bottom, right) an asymptomatic Cabernet Franc vine on Long Island, New York.



MARC FUCHS

FIGURE 2

Close up of foliar symptoms of red blotch on Cabernet Franc (A), Chambourcin (B), Pinot Noir (C), Syrah (D), Cabernet Sauvignon (E) and Chardonnay (F)

Effects of GRBV on Vine Growth and Fruit Juice Chemistry

Red Blotch disease has a detrimental effect on vegetative growth and fruit juice chemistry.[5] Specifically, growth of infected Merlot vines on Long Island in New York, as measured by pruning weight, was reduced by 4 to 5 percent, fruit yield by 11 percent and sugar content by up to 2.2° Brix. GRBV also increased titratable acidity by up to 1.2 g/L. Similar trends were observed for Chardonnay. A California study, conducted in 2013 and 2014 in Chardonnay and Cabernet Sauvignon, highlighted the variable effects of GRBV. Total soluble solids were consistently reduced, and titratable acidity tended to be elevated in infected vines in both cultivars. However, yield and vegetative growth were reduced in Chardonnay but not in Cabernet Sauvignon.

Spread of Red Blotch in a Napa Valley Vineyard

Every October from 2014 to 2018, Red Blotch incidence and spread were recorded in a 5-acre Cabernet Franc vineyard that was planted in 2008, prior to the discovery of GRBV. By 2012 the vineyard manager noticed a gradient of vines that exhibit foliar reddening symptoms at the edge of the vineyard next to a riparian area (FIGURE 3). In 2013, we confirmed the presence of GRBV by PCR in a subset of the symptomatic vines in this area.

ELIZABETH CIENIEWICZ

FIGURE 3

Red blotch secondary spread in a gradient down the row of a Cabernet Franc vineyard in Rutherford, California (top). GRBV is transmitted in vineyards by the three-cornered alfalfa hopper (bottom).

The disease incidence (percentage of diseased vines) over the whole vineyard was 4 percent (305 out of 7,691 vines diseased) in 2014, 6 percent in 2015, 7.1 percent in 2016, 9.1 percent in 2017 and 13.8 percent in 2018 (FIGURE 4). While disease incidence in the whole vineyard increased by only 10 percent over five years, the spread was much more rapid (40 percent over five years) in the area where infected vines were initially aggregated (FIGURE 4).[7]

We applied spatiotemporal models to show that a vine was more likely to become infected if it was close to an infected vine, and disease spread mostly from localized, within-vineyard sources, rather than inoculum sources outside of the vineyard. The predictions from these models were confirmed by determining the genotypes of GRBV populations. Together, this work revealed that the virus inoculum likely originated from the planting material, probably the rootstock, and secondary spread occurred via an insect vector.[7]

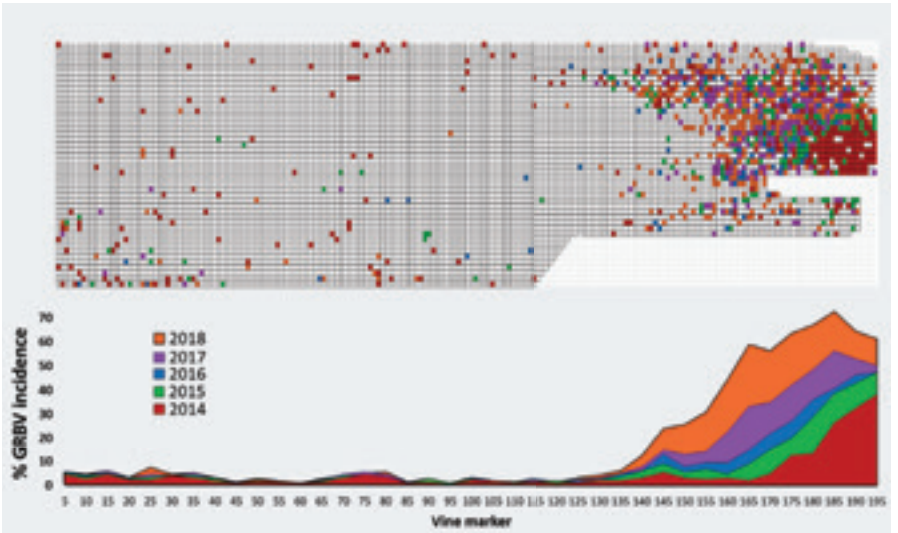
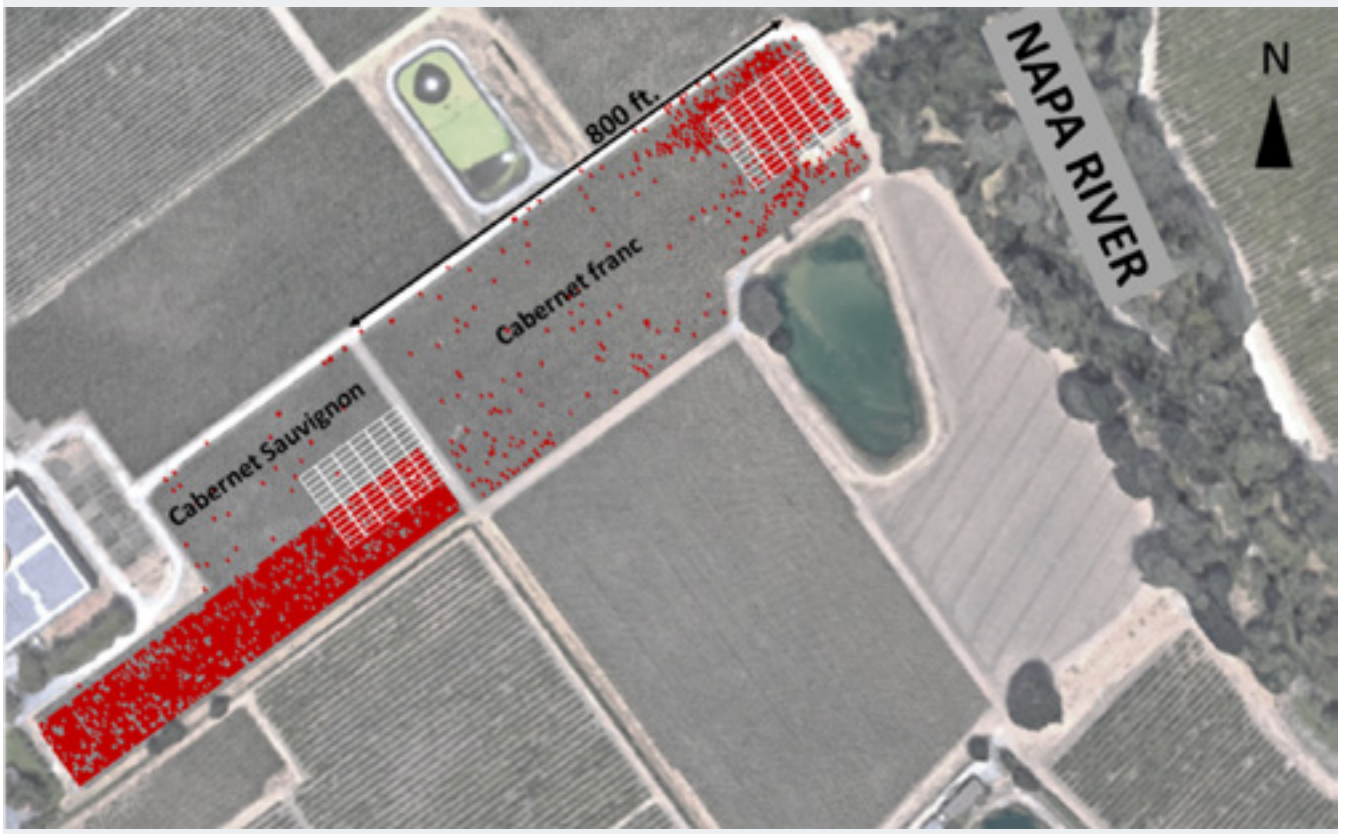


FIGURE 4
GRBV spread in a 5-acre Cabernet Franc vineyard in California over 5 years. The top graph shows the entire study vineyard with each cell representing a single vine that is asymptomatic (blank) or symptomatic (colored). The bottom graph shows the distribution of diseased vines in 5-vine panels across rows.

Survey of Potential Insect Vectors in a California Vineyard

We conducted insect surveys in 2015 and 2016 in the area of the Cabernet Franc vineyard with extensive spread. We hung 36 yellow sticky traps (3x5 inches) in a grid pattern that spanned 12 rows, and six 4-vine panels per row from April through November (FIGURE 5). We refreshed traps weekly and tested the insects for GRBV to determine which species are capable of ingesting the virus by feeding on the vines. Although this does not prove the insects are vectors, it does narrow down the pool of potential insect vector candidates and provides insights into timing of feeding and potential transmission.

In 2015, we tested more than 700 insect specimens from 40 different species/taxa. Of the 40 taxa evaluated, only four species consistently tested positive for GRBV. In 2016, we tested fewer specimens (n=271), but results were consistent with the 2015 survey. The four insects identified as vector candidates are *Spissistilus festinus* or three-cornered alfalfa hopper (TCAH), currently the only confirmed vector of GRBV,[2] two leafhoppers (*Colladonus reductus* and *Osbornellus borealis*) and a planthopper (*Melanoliarus spp.*).[8]



GOOGLE EARTH SATELLITE IMAGERY AND ELIZABETH CIENIEWICZ

FIGURE 5

Landscape view of GRBV spread in Cabernet Franc and Cabernet Sauvignon vineyards in Rutherford, California. Both vineyards were planted in 2008. Red overlay indicates GRBV-infected vines in 2018. White grids indicate area of surveys for insects in 2015-16 in the Cabernet Franc vineyard and 2017-18 in Cabernet Sauvignon vineyard.

These insects are all phloem-feeders and were all found in low relative abundance. Collectively, they comprised less than 0.14 percent of the total number of insects trapped over the two-year survey period. The populations of the four insect vector candidates peaked at different times in the season, but the population dynamics were consistent between 2015 and 2016. Populations of the TCAH in this vineyard peaked in late June-early July and were higher in the vineyard edge in proximity to a riparian area.[8] Even during the weeks with highest density of TCAH, specimens were sparse, i.e., only two to 20 TCAHs were found.

Limited Spread of GRBV in an Adjacent California Vineyard

The pattern of spread observed in the Cabernet Franc vineyard may not be typical of other vineyards with GRBV-infected vines. For instance, immediately to the west of the Cabernet Franc vineyard is a 5-acre Cabernet Sauvignon vineyard, also planted in 2008 but with two clones that were sourced from distinct nurseries (FIGURE 5). Spread of GRBV in the northern portion of this vineyard established with one clone has been very limited over time (less than 1 percent over 10 years) despite being adjacent to a large source of virus inoculum (40 percent) in the southern portion established with the other clone (FIGURE 5).

Why is the rate of spread lower in the Cabernet Sauvignon vineyard than in the Cabernet Franc vineyard despite the availability of a very high inoculum source (40 percent) in the former and a very low inoculum source (1 percent) in the latter at planting? Could a difference in vector population or behavior account for a distinct spread pattern between the two vineyards?

Insect surveys conducted in 2017 and 2018 showed that, although many of the same insects were present in both vineyards, the relative abundance of many of the insects differed. For example, we found fewer TCAH in the Cabernet Sauvignon vineyard (N=5) compared to the Cabernet Franc vineyard (N=50) over the two-year survey periods. Similarly, there were fewer *Osbornellus borealis* and *Melanoliarus spp*., but the abundance of *Colladonus reductus* was higher in the Cabernet Sauvignon vineyard. The difference in insect abundance, particularly of the TCAH, could explain the differential spread of GRBV in the two study vineyards. Additionally, the difference in insect populations, specifically of the TCAH, could be due to the proximity of the Cabernet Franc vineyard to the wooded natural area, compared to the Cabernet Sauvignon vineyard, which is about 800 feet from the riparian habitat.

Survey of Red Blotch in a New York Vineyard

Concurrent with the California study, we surveyed a 3-acre Merlot vineyard on Long Island in New York during the 2014 to 2018 growing seasons. This vineyard was planted in 2008 and had a high GRBV incidence (60 percent), suggesting that the virus most likely resulted from infected planting material. Over the five years of sampling, negative vines consistently tested negative, indicating that no apparent secondary spread occurred in the Merlot vineyard.

This conclusion is strengthened by the results of an insect survey conducted in 2017 and 2018 parallel to the California studies. Although we found several phloem-feeding treehoppers and leafhoppers, none of them consistently tested positive for GRBV. The TCAH was not found in the Merlot vineyard nor has it yet been reported in any vineyards in New York. To our knowledge, there is no evidence that GRBV is spreading by insect vectors on the East Coast.

GRBV is Widespread in Wild Grapevines in California

GRBV was detected in wild *Vitis spp.* near commercial vineyards in Napa County, including in the riparian area next to the Cabernet Franc vineyard[11] and other locations in Napa Valley.[3] To determine whether GRBV is widespread in wild vines, we collected samples in Northern California and New York, assayed them for GRBV and analyzed the genetic diversity of the virus populations.

In California, we found GRBV in 21 percent (43 of 203) of the wild *V. californica* and *V. californica* hybrid vines sampled. The virus was more prevalent in counties with more grape production, including Napa, Sonoma and Sacramento, than in counties with less or no grape production such as Solano, Sutter, Butte and Glenn (FIGURE 6). The virus populations, in wild vines genetically matched those in adjacent commercial vineyards.

This suggested that the predominant direction of spread of the virus is from commercial vineyards to adjacent wild vines, rather than the opposite.[9] Nonetheless, our surveys covered only four recent years (2014 to 2017), so we cannot rule out that GRBV may have originated from wild vines in California in the more distant past.

In New York, 163 wild *V. riparia*, *V. aestivalis* and *V. labrusca* vines from western New York, the Finger Lakes region, Champlain Valley, Hudson Valley and Long Island that were assayed tested negative for GRBV.

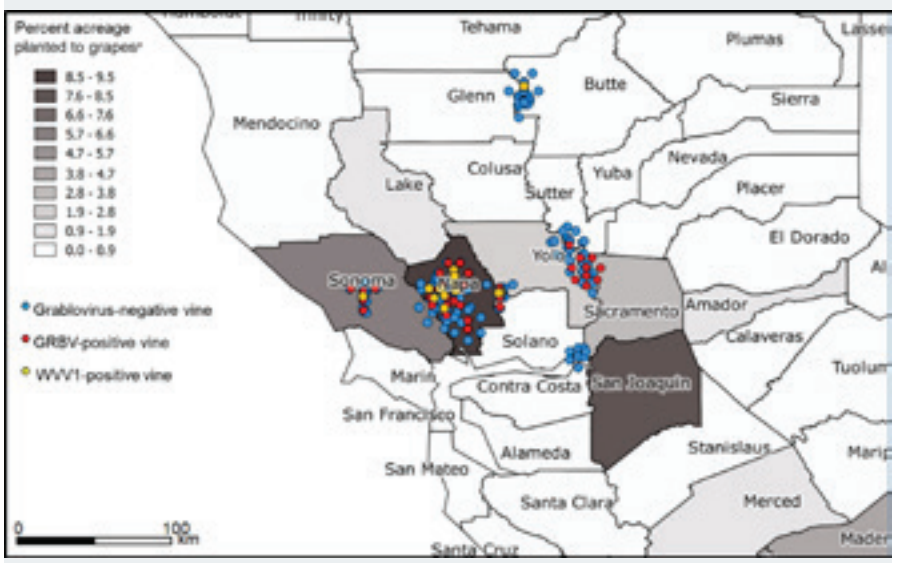


FIGURE 6
Map of wild vines in northern California surveyed for the presence of grapevine red blotch virus (GRBV) and wild Vitis virus 1 (WVV1). Counties are colored according to the percentage of acreage planted to grapevines.

A Newly Recognized Virus Related to GRBV is Present in Wild Vines in California

During the initial surveys of wild vines in California for GRBV, another virus closely related to GRBV was identified.[12] This virus is named wild Vitis virus 1 (WVV1). We do not know whether WVV1 can infect *Vitis* vinifera cultivars and rootstocks, nor whether it is involved in Red Blotch disease. Nonetheless, extensive surveys showed WVV1 in 7 percent (15 of 203) of the wild vines surveyed in California. Similar to GRBV, the incidence of WVV1 was higher in California counties with high grape production, but the virus was also found in Glenn County which is far from grape production areas (FIGURE 6).

Management recommendations of Red Blotch disease to reduce sources of GRBV inoculum*

- Frequently scout for Red Blotch disease symptoms beginning late in the season. Note that Red Blotch symptoms are easily confused with other diseases and nutrition disorders, and PCR tests are necessary for an absolute diagnosis.
- Determine Red Blotch disease incidence by counting the number of infected vines in a given area of a vineyard and dividing this number by the total number of vines inspected. An increase in infected vines over time (two to three years) is indicative of spread. However, in young vines (<5th leaf) planted with infected material, symptoms may develop asynchronously over time as the vine matures, particularly if the rootstock is the source of the virus inoculum. In that case, an increase of diseased vines over time may not result from secondary spread.
- Rogue GRBV-infected vines if Red Blotch disease incidence is less than 30 percent.
- Consider removing entire vineyards or vineyard areas if Red Blotch disease incidence is more than 30 percent.
- After confirmation of the presence of GRBV by PCR, consider removing inoculum sources near new plantings, such as symptomatic and asymptomatic infected vines.
- Consider eliminating wild vines in forested areas near vineyards in Northern California after receiving an environmental permit from the **California Department of Fish and Wildlife** for vegetation management in riparian corridors.
- Plant vines derived from virus-tested scion and rootstock mother vines.
- If spread of GRBV is suspected, it may be useful to monitor for TCAH in vineyards to be aware of the presence of the vector of GRBV. Place yellow sticky insect traps on the middle trellis wire in the area of suspected spread. In a vineyard in Napa, TCAH populations peaked in late June and early July, but it should be noted that TCAH behavior in vineyards likely varies, depending on the site. Rotate traps weekly and identify TCAH with specific morphological traits.
- We acknowledge singularities among estates and grape-growing regions in terms of vineyard management practices and tolerance to Red Blotch disease. Therefore, our disease management recommendations should be considered as guidelines to devise a customized actionable list of corrective measures strategically. We also acknowledge that our recommendations will need to be refined over time according to our collective understanding of GRBV spread and of the behavior of TCAH in vineyard ecosystems.

ELIZABETH CIENIEWICZ

FIGURE 7

(a) Three-cornered alfalfa hopper (TCAH) eggs in a petiole of a Vitis vinifera cv. Syrah vine and b) First instar TCAH nymph hatched on a Syrah leaf. We have not observed TCAH survival past the first instar on grape in greenhouse conditions.

Like GRBV, WVV1 was not found in wild vines in New York.[9] WVV1 populations from wild vines show higher genetic diversity than GRBV populations from wild vines, likely because WVV1 has been spread by natural means, through a yet-to-be-identified insect vector, rather than through vegetative propagation, like GRBV.[9]

Role of Cover Crops in Red Blotch Ecology

TCAH is not considered a pest of grapes. Although it can lay eggs in a grape if caged only with a grape as a host (**FIGURE 7**), it does not appear to complete its reproductive cycle on grapevines. Rather it prefers legumes as reproductive hosts.[13]

To determine whether leguminous cover crops sown in vineyards serve as habitat for TCAH or a reservoir for GRBV, we sampled cover crops from nine vineyards in Napa Valley in the spring (2016 to 2018) before they were tilled. All cover crop samples (clover, medics, field peas, fava beans, poppy and grasses) tested negative for GRBV. Although TCAH are observed in these vineyards in summer months, no TCAH was found in springtime surveys of these cover crops. Therefore, legumes in row-middles are likely not contributing to GRBV inoculum or within-vineyard spread of the virus in the study vineyards in Napa Valley, where the ground is typically left bare from March to November. However, this may not hold true for other vineyards in Napa Valley or other regions where vegetation management practices differ, offering season-long refuges for TCAH.

Red Blotch Disease Management Recommendations

Disease ecology studies are foundational for the development of disease management strategies. Patterns of GRBV spread, distribution and abundance of insect vectors, effects of GRBV on vine growth and fruit development, preferred hosts of insect vectors and alternate hosts of GRBV, as well as lessons from economic analyses, are vital to inform science-based disease management programs.

In California, current evidence suggests that the TCAH is relatively infrequent in vineyards and does not reproduce on, or prefer, the grapevine as a host. Therefore, insecticide applications in vineyards that target TCAH are not likely to produce significant reductions in insect populations and could produce detrimental secondary effects. Vegetation management practices that reduce the season-long incidence of TCAH's preferred breeding hosts could reduce insect populations, but this has not been demonstrated in replicated studies nor is it clear what effect this would have on disease spread.

Efforts to identify and promptly remove virus inoculum sources, i.e., infected production vines and wild vines adjacent to vineyard and nursery plantings, are critical since secondary spread of GRBV is occurring. Roguing is recommended if disease incidence is less than 30 percent, and entire vineyard removal is advised if disease incidence is generally higher than 30 percent.[14] However, regional differences should be considered for the adoption of this cost-minimizing threshold, as not all vineyards with a Red Blotch disease incidence higher than 30 percent sell grapes at reduced prices.[14]

In New York and on the East Coast, all evidence, to date, points toward the introduction of GRBV in vineyards solely through infected planting stock with no vine-to-vine spread of GRBV via insect vectors. Nonetheless, growers should remain vigilant and frequently scout for disease symptoms. GRBV-infected vines will likely not attain optimum fruit maturity, so it makes sense to rogue and replace them, as soon as it is feasible, if disease incidence is less than 30 percent.[14]

For roguing of red cultivars, diseased vines should be marked immediately, after harvest, for removal at the earliest convenience, following confirmation of GRBV presence by PCR. Roguing efforts of white cultivars are more challenging because symptoms are subtle, and a reliable identification of infected vines requires a PCR diagnosis. White cultivars are often favored in areas where spread of GRBV is occurring because expectations for the maturity of white and red cultivars differ; nonetheless, it is important to note that white cultivars can serve as sources of inoculum for GRBV spread. This is important to consider when planning re-plant strategies. As is the case for other virus diseases, prevention is the key to managing Red Blotch disease, and planting vines derived from virus-tested nursery stock is critical. **WBM**

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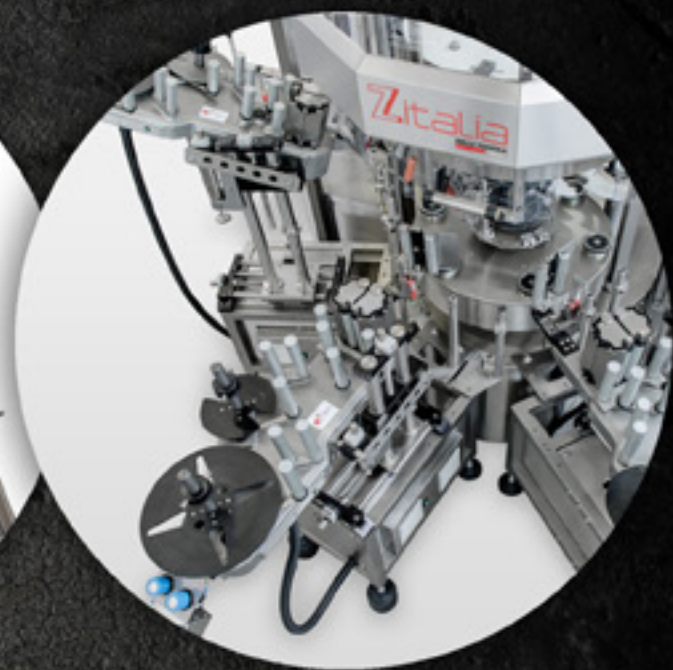

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Studies on Red Blotch Ecology Inform Disease Management Recommendations

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The Choice for Rosé Glass Bottles is... Clear

Bottling Rosé in flint glass bottles is traditional, acceptable and preferable as wine consumers both expect and prefer to see the color of Rosé wine before purchase.

Stacy Briscoe

Stacy Briscoe joined *Wine Business Monthly* in 2018. She has been writing about wine professionally since 2015, freelancing for multiple publications including The *San Francisco Chronicle*, Edible Communities and *Napa Sonoma Magazine*, among others. She also maintains her own website dedicated to wine reviews and tasting notes, *BriscoeBites.com*. Outside of wine writing, she also contributes as a freelance editor for the independent publisher She Writes Press. Stacy has a Bachelor of Arts degree in English-Language Literature from the University of California, Santa Cruz.

Key Points

- Glass color, shape and decoration all work to communicate Rosé flavor and style.
- Wine consumers both expect and prefer to see the color of Rosé wine before purchase.
- The color of Rosé affects consumer buying choices.
- Because Rosé is intended to be consumed young, lightstrike is of little concern.

IT'S NO SECRET THAT the popularity of Rosé-style wine is more than just a passing trend. According to **Nielsen**'s market research data report, in the last 52 weeks ended July 14, 2018, Rosé saw a 53.9 percent rise in sales, increasing it to a $426 million market. Furthermore, within Rosé table wine, glass bottles represent 93.2 percent of sales, growing at 39.9 percent versus one year ago.

So, despite the growing alternative packaging market—cans, bag-in-box, Tetra Packs—consumers are still predominantly reaching for the traditional glass bottles when choosing their next pink drink.

In August 2017, the **Wine Market Council** conducted a survey that examined the Rosé preferences and consumption habits of Rosé drinkers who consume wine on an at-least-once-a-week basis. A total of 838 consumers completed the survey. Participants were shown visual aids to assess which hue of Rosé they preferred and how those hues translated to their perception of the wine's style—level of sweetness, robustness of flavor and overall weight and body. They were shown six images that depicted glasses of Rosé, which tended toward either pink or salmon in color and ranged from light to dark hues of each color.

According to the results, more than half (54 percent) of participants perceived the darkest-hued pink wine to be the sweetest; dark salmon wine, followed by dark pink wine, were perceived as the most robust in flavor (45 percent and 37 percent, respectively). Those who said they preferred a drier Rosé (32 percent) were more than twice as likely to have purchase interest in the lightest pink Rosé and six times as likely to have interest in buying the darkest salmon-colored Rosé versus those who said they prefer a sweeter style (66 percent). Those who prefer a sweeter style were more likely to have purchase interest in the darkest pink wine.

The survey concludes with insight from the **Wine Business Institute** at **Sonoma State University**, which stated, "Rosé's color and hue should be investigated further for the impact of product color and the messages it conveys to consumers."

Concerns with Lightstrike

When the color of a Rosé is often a deciding factor at point-of-purchase, how does a winery, winemaker or wine brand decide which glass reflects brand image and wine style, but also won't taint the wine inside?

According to **Gilles Masson**, director and oenologist for the **Center of Rosé Research & Experimentation** (RRC) in Vidauban, Provence, where 90 percent of the total AOP production is Rosé, these wines are most often consumed within the first year after harvest. "Consequently, the light penetration has no real effect on the wine, even if the glass is clear," he said.

Masson said the RRC has conducted research on the effect of light on Rosé wines: "Results have shown there's almost no effect or only after a long period of aging. This is not the same as white wines or sparkling, like Champagne, which may have a *gout de lumière* (light taste) after a time."

He points out that with wines intended for aging, long-time wine storage presumes isolation from light, as in a cellar, closet or wine case. In retail stores, with reference to Rosé, he said those wines are intended to be sold and drunk quickly so, again, effects of light are negligible, if any.

"Furthermore, the RRC has done research, leading to many improvements in Rosé wine conservation," Masson said. "Thanks to these works, the RRC can give a set of measures in the wine-making process to the winegrowers, allowing to limit the evolution of the wine in the cellar and giving to the wine a better conservation potential."

Some of these precautions include choosing blends with a higher proportion of age-resistant grapes, like Syrah or Mourvèdre, which have proven to be less oxidative with more stable aromatic compositions; maintaining a cold temperature-controlled environment, from harvest through to bottling, to avoid "premature evolutions;" and capsule choice, as certain closures have variable oxygen permeability.

From a manufacturing point of view, **Jean-Pierre Giovanni**, vice president of sales and marketing for **Glopak USA** in Napa, California, said that because Rosé wines are typically consumed within months of release into the retail market, lightstrike is not much of a concern for his Rosé-producing clientele.

"For partial protection against light and UV, there are options to apply a UV-protectant coating at the last step of the glass manufacturing process," Giovanni said. "However, it is pricey and requires special manufacturing attention, and I am not aware of any wine brand using this extra step."

Giovanni said because of the "Rosé craze," Glopak has seen an increased demand for flint glass bottles but what it has brought to the wine market in a bigger way is the trend toward non-traditional bottle shapes. Instead of the classic Bordeaux, Claret, Burgundy, hock and sparkling bottles, wine brands across the board are now embracing custom shapes or shapes traditionally associated with other beverage segments. "The use of flint spirits bottles for premium Rosés is well spread and has a strong momentum," he said.

Rosé color spectrum, Wine Market Council

"Custom flint bottles are more and more the norm for Rosé in the premium range," Giovanni added, citing his own company's "Tod" bottle as an example. "The Tod bottle launched initially in flint for Rosé wines in the U.S. as an alternative to the traditional Provence Rosé shape," he said. Giovanni said the bottle shape is now also being used by red wine brands (in "Antique Green" tinted glass) to stand out on retail shelves.

What Top Brands are Doing

According to the off-premise channels tracked by Nielsen, for the 52 weeks ending Oct. 6, 2018, **Whispering Angel**, a Rosé label under the **Château d'Esclans** brand, which sells at an average bottle price of $20.59, is the sales dollar brand leader in the U.S.—selling close to twice as much (in dollars, not volume) as the next largest brand.

"When founder and owner **Sacha Lichine** started making Whispering Angel, part of the idea was to introduce a classic Cotes de Provence Rosé, which appealed to the Anglo-American market, offering a light, crisp and refreshing taste profile," said **Thomas Schreckinger**, communications director for Château d'Esclans. The Whispering Angel Rosé is a blend of Grenache, Cinsault, Vermentino, Syrah and Tibouren. The choice to create a Rosé in this style and showcase it through the use of flint glass, Schreckinger said, communicates traditional winemaking to the consumer.

Paul Chevalier, vice president, national wine director for **Shaw-Ross International Importers**, the company responsible for importing the Whispering Angel brand, said the biggest challenge in the Rosé market today is the constantly growing number of offerings of the wine style, including the range of grape varieties and winemaking methods. "Supermarkets have become a collage of Rosé colors," he said. "Having a transparent glass gives the customer a chance to hone in on something—that if it's light in color, it's dry in style."

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The Whispering Angel bottle, which is manufactured by **Glaswerk Ernstthal** in Lauscha, Germany, uses a clear glass bottle, as is Provence tradition, yet the shape of the bottle is notably not traditional. Instead, it takes on a typical Burgundian shape, a nod to Lichine's father, **Alexis Lichine**, whose mid-century winemaking career was rooted in Burgundy, France.

A unique feature to the brand's bottle design is its molded decoration, featuring the Lichine family crest, which originates from Russia where Alexis Lichine emigrated from. "It contributes to a subtle and elegant design element to the bottle," Schreckinger said, noting that it's the subtlety in the wine's color, in conjunction with the subtleties in the vessel's shape and design, that draws consumers into the story behind the brand and "enhances their level of curiosity to experience it."

Another top Rosé seller, according to Nielsen, is the **Josh Cellars** offering—a blend of Barbera, Muscat and Syrah—selling at an average bottle price of $11.63. "It is a typical Mediterranean-style Rosé," said **Tom Steffanci**, president of **Deutsch Family Wine and Spirits**, which owns the Josh Cellars brand.

"The target for Josh Rosé is the same as for the rest of Josh Cellars portfolio," he said, referring to affluent, older Millennials and Gen Xers who "appreciate high-quality wines." The bottle, manufactured by **Ardagh Group, Glass–North America**, is clear, showcasing the wine's salmon-pink color.

The bottle has a classic Bordeaux-shape, intended to keep in style with the rest of the Josh Cellars portfolio. It is not, however, indicative of the wine's winemaking style or flavor profile. That being said, Steffanci cited a Nielsen research study conducted in 2017 that tested 550 consumers on 11 different Rosés, including Josh Cellars. "Josh Rosé captured well above average attention at shelf," Steffanci said. "Consumers described the package as 'elegant' and 'classy.'"

Comparatively, the Deutsch Family Wine and Spirits' Fleurs de Prarie Rosé (not on Nielsen's top-selling Rosé list) features a more elaborately designed bottle. Made in the style of Cote de Provence, the Rosé (sold at $19.99 per bottle, according to the company) is a blend of Grenache, Syrah, Cinsault, Carignan and Mourvèdre. Steffanci described the target audience for this wine as "super-premium Rosé drinkers looking for a light-bodied, dry Rosé indicative of Provence."

Steffanci said his team spent a lot of time talking to Provence Rosé drinkers to understand their needs regarding the wine flavor profile, as well as package design. "French Rosé consumers want a non-traditional, sexy bottle that still looks like it should have wine in it," he said.

The Fleurs de Prairie glass (the manufacturer remains proprietary information, according to Steffanci) includes a tactile, floral etching intended to draw attention the brand's name—a reference to the fields of wildflowers found along the Provençal countryside. Steffanci said the decision to include this "premium" decoration was to reinforce the appellation, connecting consumers to the region and creating an association between the bottle, the brand and their desire for a premium French Rosé. "Bottle shape and closure (cork) are also true to the traditional Provence style of Rosé," he said.

But just like the Josh Cellars Rosé, Fleurs de Prairie is made and sold to be consumed young. "We were able to opt for a clear glass bottle to allow the distinctive etching and the light salmon hue to shine through without worry that this wine would be laid down for 10 years," Steffanci said.

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Rebel Rebel

Though not on the Nielsen "best-sellers" list, **Bonny Doon Vineyard**'s Rosés are certainly well-known among regular wine consumers. Always one to deviate from the norm, **Randall Grahm**, owner and winemaker of Bonny Doon Vineyard in Santa Cruz, California, has gained a reputation for being a bit of a rebel, when it comes to winemaking, as well as wine package and design.

"I think that if you're selling wine through the wholesale channel and you have a fairly good-sized quantity of wine to sell, you more or less have to just bite the bullet and use flint glass if you're selling pink wine," said Grahm in an interview with *Wine Business Monthly*. He calls the decision to bottle Rosés in anything but flint glass "risky" because the majority of Rosé drinkers not only expect their pink drink to be visible from the bottle but prefer it: part of Rosé's aesthetic is the visual aspect of the bottle on the table—the wine is a feature in and of itself.

Grahm's Vin Gris de Cigare "normale" (a blend of Grenache, Grenache Blanc, Mourvèdre, Roussanne, Carignane and Cinsault) and Proper Pink (Tannat, Cabernet Franc) are, in fact, bottled in clear flint bottles. "As long as we are making a pink wine for the mass-market, I'm afraid we're using clear glass, at least for now," he said.

However, his Vin Gris de Cigare Réserve (Grenache, Grenache Blanc, Cinsault, Mourvèdre, Carginane and Roussanne) and his Vin Gris Tuilé (Grenache, Mourvèdre, Roussanne, Cinsault, Carginane and Grenache Blanc) are both bottled in, what he called, "relatively inexpensive" green claret bottles. "I wanted to make a meta-statement about the uniqueness and quality level of the Réserve," he said. "Only a total wine geek is going to buy a pink réserve wine; so if they've gotten that far in the evolution of their thinking, the glass color is not going to bother them a whit." With the Tuilé, Grahm said he chose the tinted glass for the same reason, but he also found the slight orange-ish color of the wine in the clear glass "a bit lurid," and felt "a bit of discretion might not be a bad idea."

When it comes to the question of lightstrike, Grahm is of the opinion that both winemakers and wine drinkers should be just as concerned about light-struck wines as they are about cork taint. But, he said, it's only the very conscientious wine drinker who has heard of and comprehends what lightstrike means. So for those wineries that are producing small-batch wines intended for knowledgeable consumers, Grahm said it makes sense to showcase how much care is put into every aspect of the wine, including choosing the less expected, less popular glass color.

"When I was a younger, more energetic, virile winemaker, I might have happily championed the cause of green bottles for pink wines, but there are, alas, only so many battles I can fight at the same time so will leave this particular fight for those with greater means to successfully wage that campaign." **WBM**

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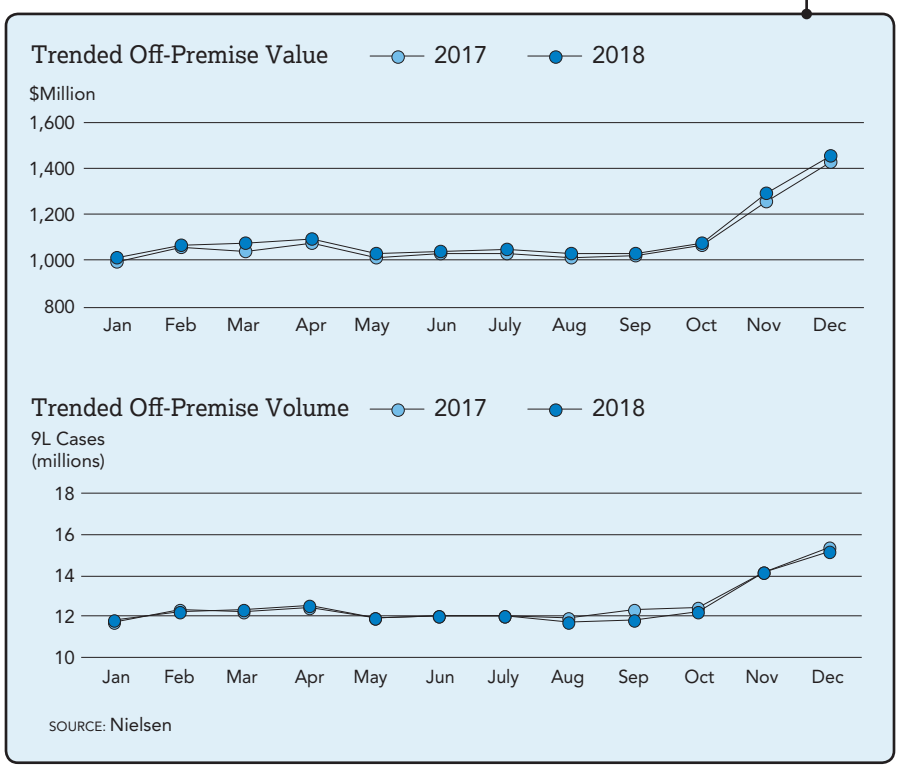
Retail Sales Analysis:
Off-Premise Sales Increase in Value, Slip in Total Volume

Total Sales Value

U.S. off-premise sales of table wine totaled $1.5 billion in December 2018, a 1.6 percent increase over sales last year, according to **Nielsen**. Total off-premise sales in the 52 weeks ended Dec. 29 came to $14.3 billion, a 1.5 percent increase over the previous year.

Total Sales Volume

Total sales volume in the off-premise sector during December came to 15.2 million cases, a decrease of 1 percent from last year. Over the 12 months, off-premise sales volume also slipped by 0.6 percent to 162 million cases. There were some gains in sales volume during December, with sales of wines priced between $11 and $14.99 increasing by 6.8 percent to 1.9 million cases and wines in the $15 to $19.99 segment increased by 10.3 percent to slightly more than 753,000.



Rosé Remains Hot

U.S. consumers continue to enthusiastically purchase Rosé and blush wines. The past year and December saw increases in both sales value and volume. Nielsen divides total wine into red, white and pink categories, and pink sales increased 12.8 percent to $1.07 billion in the past 52 weeks, and December sales totaled $88 million, an increase of 9.4 percent.

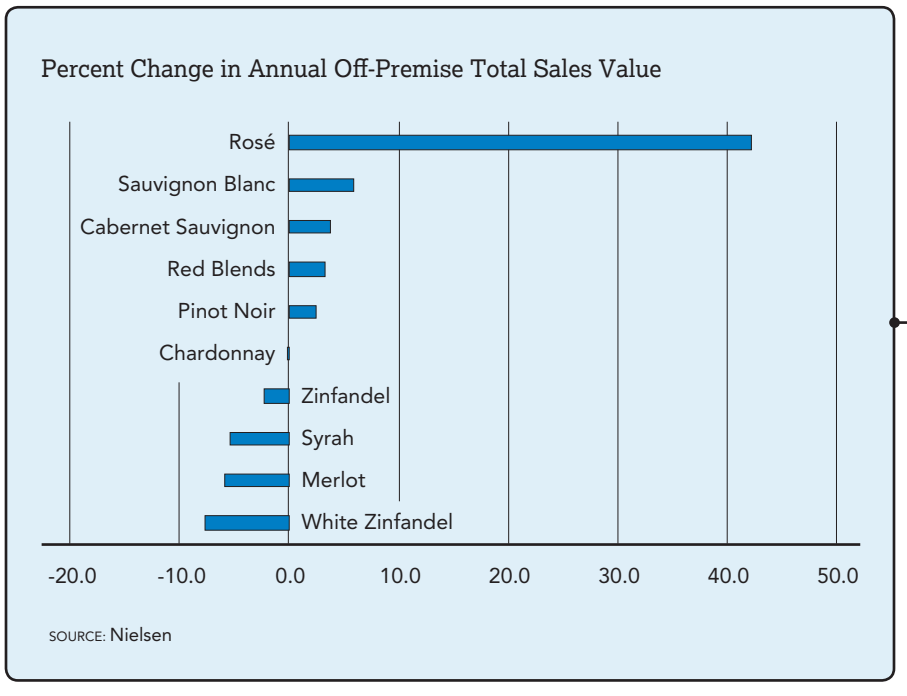
The total sales volume of pink wines was 16.4 million cases (up 4.1 percent) in the 52 weeks ended Dec. 29 and increased 1.1 percent to 1.4 million in December.

Pink wines accounted for a 6.8 percent share of the total value of off-premise sales in 2017, and that share increased to 7.5 percent in the past year. Only Cabernet Sauvignon, Sauvignon Blanc, Pinot Noir and red blends also saw market share increases, and those were all less than 1 percent.

The total volume share of pink wines has grown from 9.6 percent in 2017 to 10.1 percent for 2018. Volume share slipped to 9.2 percent in December, indicating a seasonal effect on the wine type persists.

In Nielsen's Rosé category sales saw more dramatic increases although from a much smaller base. In the past 52 weeks, sales of Rosé wines increased by 42 percent in value to $496 million, and sales in December rose by 46 percent to $34 million. Sales by volume increased to 4.3 million cases in the past 52 weeks and 314,000 in December, an increase of 46 percent in both periods.

And as these Rosé wines were enjoying double digit sales growth, white Zinfandel recorded the largest drop in sales value, falling 7.7 percent to $289 million. **WBM**



Methodology

Sourced from Nielsen, these figures represent off-premise retailer wine sales to the consumer aggregated across a variety of channels nationwide, including grocery, drug, mass merchandisers, convenience, dollar, military, as well as a selection of warehouse clubs, and liquor channel geographies and liquor channel retail chains. Nielsen figures are updated and released every four weeks.

Nielsen Table Wine Category Segments

MARKET: Total US xAOC+Conv+Military+Liquor Plus **PERIOD:** Week Ending **December 29, 2018**

		Dollar Value		Dollar Value % Chg YA		9L Equivalent Volume		9L Equivalent Volume % Chg YA		Avg Equivalent Price Per 750ML	
		Latest 52 Wks - W/E 12/29/18	Latest 4 Wks - W/E 12/29/18	Latest 52 Wks - W/E 12/29/18	Latest 4 Wks - W/E 12/29/18	Latest 52 Wks - W/E 12/29/18	Latest 4 Wks - W/E 12/29/18	Latest 52 Wks - W/E 12/29/18	Latest 4 Wks - W/E 12/29/18	Latest 52 Wks - W/E 12/29/18	Latest 4 Wks - W/E 12/29/18
	TOTAL TABLE WINE	**14,289,858,824**	**1,454,949,318**	**1.5**	**1.6**	**162,160,360**	**15,242,183**	**-0.6**	**-1.0**	**7.34**	**7.95**
PRICE TIERS BY CONTAINERS	BOX	1,347,121,857	113,168,306	4.6	5.1	33,301,628	2,774,934	2.0	2.2	3.37	3.40
	$0-$3.99	574,191,221	47,034,436	-2.1	-0.9	20,250,498	1,653,736	-2.6	-2.0	2.36	2.37
	$4+	772,926,729	66,132,061	10.2	9.9	13,051,054	1,121,164	10.1	9.1	4.94	4.92
	Total Table Wine Glass	12,698,046,616	1,321,941,199	1.0	1.2	125,670,670	12,210,980	-1.6	-2.0	8.42	9.02
	Value Glass $0-$3.99	713,297,370	58,872,649	-3.9	-6.9	18,072,766	1,489,078	-4.4	-8.0	3.29	3.30
	Popular Glass $4-$7.99	3,238,872,015	293,556,844	-5.5	-5.4	49,253,424	4,485,113	-5.6	-5.7	5.48	5.45
	Premium Glass $8-$10.99	3,431,746,152	341,030,180	-0.7	-1.8	30,338,528	3,039,424	-0.9	-2.3	9.42	9.35
	Super Premium Glass $11-$14.99	2,690,110,164	286,475,481	7.1	6.8	17,781,675	1,915,058	7.2	6.8	12.60	12.46
	Ultra Premium Glass $15-$19.99	1,295,335,929	152,798,351	9.5	9.7	6,335,574	753,424	9.8	10.3	17.03	16.89
	Luxury Glass $20-$24.99	608,632,238	75,380,853	7.4	7.5	2,362,114	296,480	7.5	8.1	21.46	21.18
	Super Luxury Glass $25+	713,604,457	111,947,037	4.4	3.9	1,489,966	223,036	3.0	3.3	39.90	41.81
IMPORTED	IMPORTED	3,780,518,380	380,190,245	1.7	1.1	40,478,885	3,863,640	0.3	-0.5	7.78	8.20
	ITALY	1,181,516,112	137,795,458	1.3	2.1	10,485,290	1,146,053	-0.7	-0.5	9.39	10.02
	AUSTRALIA	731,551,019	66,308,976	3.1	-1.3	12,055,204	1,055,593	0.3	-1.9	5.06	5.23
	FRANCE	455,401,872	39,381,188	9.2	6.4	2,960,252	246,304	9.0	3.6	12.82	13.32
	CHILE	258,104,106	24,078,220	-4.5	-3.9	3,849,994	352,623	-3.2	-3.4	5.59	5.69
	SPAIN	165,398,307	16,712,904	-2.1	-2.6	2,087,399	192,242	-0.8	-2.6	6.60	7.24
	GERMANY	83,701,694	9,986,530	-5.0	-4.4	1,015,377	124,847	20.6	23.0	6.87	6.67
	NEW ZEALAND	466,301,830	41,117,866	8.6	9.9	3,364,154	295,668	8.0	9.6	11.55	11.58
	ARGENTINA	346,515,914	35,252,509	-7.9	-6.9	3,816,990	362,123	-9.3	-9.6	7.56	8.11
	SOUTH AFRICA	24,457,441	2,310,671	-10.1	-5.0	212,472	19,558	-9.8	-6.5	9.59	9.84
	PORTUGAL	40,937,408	4,521,266	11.5	17.8	451,157	48,876	7.4	10.5	7.56	7.71
DOMESTIC	DOMESTIC	10,509,340,444	1,074,759,073	1.4	1.8	121,681,475	11,378,543	-0.9	-1.2	7.20	7.87
	CALIFORNIA	9,470,609,267	965,433,722	1.3	1.7	113,013,604	10,489,428	-1.0	-1.3	6.98	7.67
	WASHINGTON	616,815,560	61,240,304	1.9	1.4	5,166,089	502,635	1.6	0.4	9.95	10.15
	OREGON	191,416,618	21,215,821	12.8	13.7	980,635	104,541	12.5	11.1	16.26	16.91
	TEXAS	32,154,576	3,222,862	-2.8	-0.7	394,215	37,818	-5.9	-0.9	6.80	7.10
	NEW YORK	36,359,542	3,468,672	-0.7	-7.0	504,078	49,560	-3.2	-8.6	6.01	5.83
	NORTH CAROLINA	40,432,186	5,026,669	0.8	8.4	423,671	50,122	1.0	6.9	7.95	8.35
	INDIANA	23,429,202	2,791,416	-1.0	-2.7	260,619	30,721	-2.3	-4.4	7.49	7.57
	MICHIGAN	22,204,574	2,568,136	-1.5	-1.8	242,141	27,958	-1.0	-1.2	7.64	7.65
TYPES	RED	7,387,899,718	834,411,527	1.1	1.4	74,787,663	7,624,786	-1.2	-1.6	8.23	9.12
	WHITE	5,826,433,458	531,685,871	0.2	0.9	70,980,983	6,206,468	-1.0	-0.7	6.84	7.14
	PINK	1,074,184,569	88,046,119	12.8	9.4	16,377,147	1,402,859	4.1	1.1	5.47	5.23
VARIETALS	TOTAL CHARDONNAY	2,547,568,120	225,677,134	-0.1	0.2	30,283,309	2,548,034	-1.6	-1.8	7.01	7.38
	TOTAL CABERNET SAUVIGNON	2,619,410,815	306,147,081	3.7	4.3	24,683,768	2,538,273	1.1	1.2	8.84	10.05
	TOTAL PINOT GRIGIO/PINOT GRIS	1,303,403,280	117,878,307	1.1	2.4	17,224,875	1,501,210	1.8	2.9	6.31	6.54
	TOTAL PINOT NOIR	1,073,615,275	122,958,076	2.4	4.9	8,440,526	903,676	0.5	3.1	10.60	11.34
	TOTAL MERLOT	750,461,496	75,095,364	-5.8	-5.8	10,512,929	968,952	-6.5	-7.1	5.95	6.46
	TOTAL SAUV BLANC/FUME	936,277,841	81,704,855	5.8	7.7	8,272,689	708,009	4.2	6.0	9.43	9.61
	TOTAL MUSCAT/MOSCATO	649,785,049	68,791,651	-1.5	-2.3	9,963,175	1,012,274	-2.5	-4.2	5.43	5.66
	TOTAL WHITE ZINFANDEL	288,909,402	26,049,274	-7.7	-8.9	5,871,838	519,969	-8.3	-10.3	4.10	4.18
	TOTAL MALBEC	267,341,908	27,936,155	-7.3	-6.5	2,523,102	249,725	-8.0	-8.4	8.83	9.32
	TOTAL RIESLING	247,001,692	26,559,595	-5.2	-6.4	2,746,584	289,610	-4.9	-7.1	7.49	7.64
	TOTAL ZINFANDEL	228,595,470	23,819,228	-2.2	-2.0	1,646,017	162,153	-5.6	-6.0	11.57	12.24
	TOTAL SHIRAZ/SYRAH	153,641,200	14,638,877	-5.4	-7.0	1,784,026	160,518	-8.5	-9.9	7.18	7.60
	WHITE BLENDS (ex. 4/5L)	227,892,979	21,990,047	-5.1	-4.2	2,781,995	250,540	-3.8	-4.5	6.82	7.31
	RED BLENDS (ex. 4/5L + CHIANTI)	1,850,144,249	213,787,390	3.2	1.5	17,178,097	1,859,493	2.0	-0.3	8.97	9.58
	ROSE BLEND	495,755,909	34,229,620	42.3	46.1	4,271,535	313,591	45.9	45.9	9.67	9.09
GLASS SIZES	750ML	10,293,225,673	1,107,854,039	2.3	2.4	82,875,267	8,435,442	0.1	0.0	10.35	10.94
	1.5L	2,122,560,561	189,279,809	-4.2	-5.0	36,978,651	3,290,806	-4.1	-5.3	4.78	4.79
	3L	64,357,483	5,637,520	-8.6	-8.0	1,701,820	145,736	-9.6	-9.1	3.15	3.22
	4L	81,884,865	6,961,983	-6.9	-9.9	2,637,358	219,541	-9.6	-14.2	2.59	2.64
	187ML	107,629,794	8,542,947	-1.6	-3.5	1,329,633	105,362	-2.8	-5.7	6.75	6.76
	375ML	17,430,616	1,673,976	4.7	15.2	68,733	5,827	7.3	13.8	21.15	23.96
BOX SIZES	ex. 4/5L	856,114,989	73,062,058	8.8	9.5	15,327,499	1,309,319	8.0	8.3	4.66	4.65
	1L	28,667,233	2,287,490	8.4	19.1	436,124	34,409	6.7	15.8	5.48	5.54
	1.5L	14,582,125	1,183,568	2.6	5.4	236,839	19,498	3.1	6.2	5.13	5.06
	3L	625,953,838	54,696,728	7.8	9.0	12,122,797	1,056,787	7.4	8.1	4.30	4.31
	5L	491,005,120	40,106,033	-2.1	-2.0	17,974,081	1,465,608	-2.6	-2.7	2.28	2.28
	TETRA	215,885,770	17,219,270	13.0	11.7	2,970,614	233,426	11.9	9.9	6.06	6.15

Source: Nielsen

Research on CO_2 Sequestration from Wine Fermentation Tanks Under Way

Jackson Family Wines supports climate-friendly research at UC Davis

Kerana Todorov

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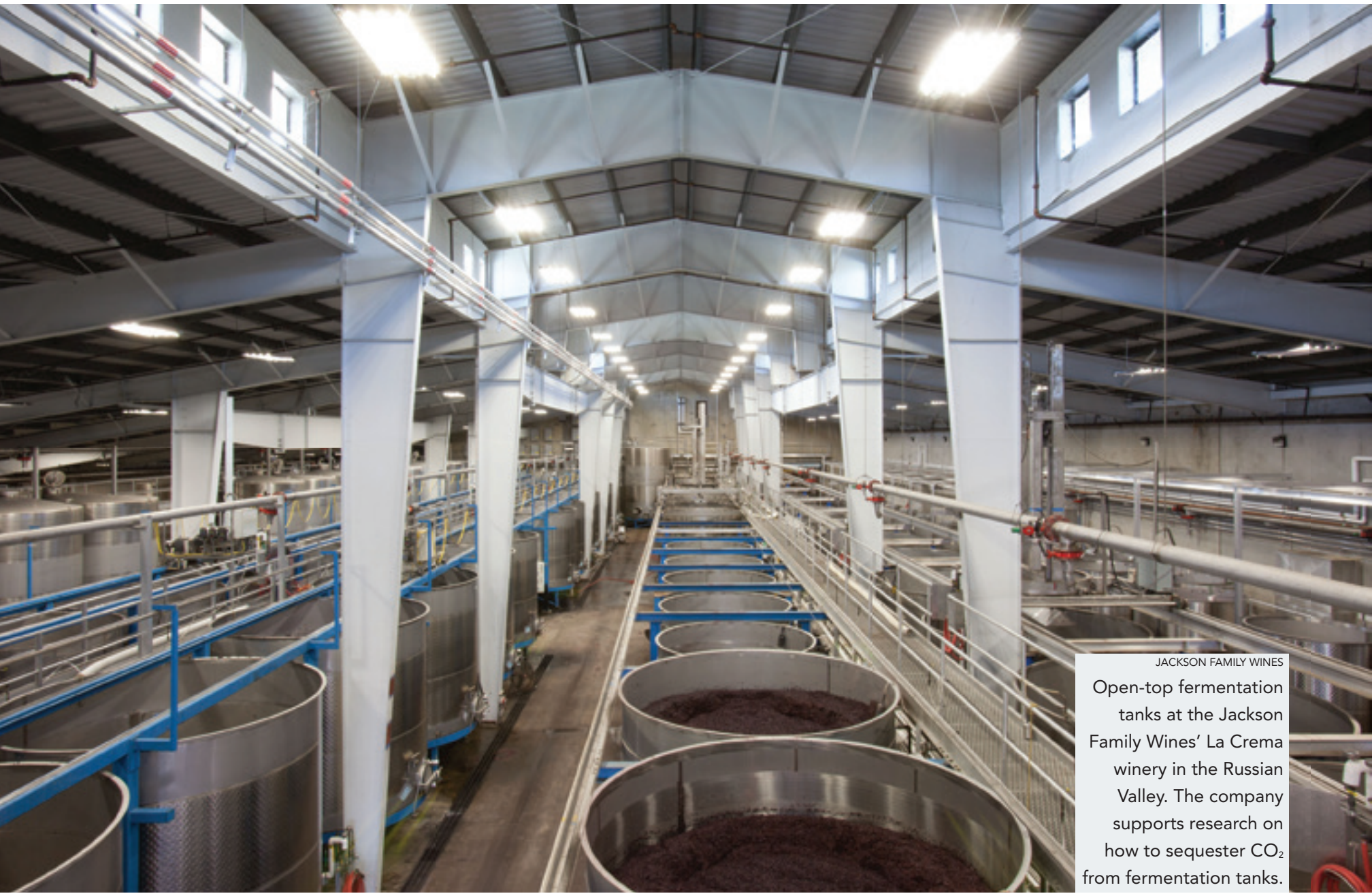

JACKSON FAMILY WINES

Open-top fermentation tanks at the Jackson Family Wines' La Crema winery in the Russian Valley. The company supports research on how to sequester CO_2 from fermentation tanks.

CARBON DIOXIDE COULD BE recovered from wine fermentation tanks and turned into ash as part of an effort to tackle climate change.

The research is well under way at **UC Davis**, where researchers are working on a preliminary prototype system to sequester CO_2 from wine fermentation tanks. The project has financial support from **Jackson Family Wines**, which has longstanding ties to the university.

In 2011, the Jackson family donated $4.1 million to build the **Jess S. Jackson Sustainable Winery Building**, a center designed to spur the development of new technologies for the wine industry. **Katie Jackson**, Jackson Family Wines' senior vice president, corporate social responsibility, oversees the company's sustainability and community outreach programs.

The Project

The concept in the CO_2 sequestration system is that gas bubbles through a solution of lime water—calcium carbonate—before chalk settles out and stays out of the atmosphere, explained **Julien Gervreau**, vice president, sustainability, at Jackson Family Wines. The goal is to design a CO_2 sequestration system that would use as little water as possible. Chalk is a form of calcium carbonate.

Ron Runnebaum, assistant professor at UC Davis' department of viticulture and enology and the department of chemical engineering and materials science, leads the research project.

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"The concept and chemistry of using a calcium oxide solution to react CO_2 to form calcium carbonate has been known for a long time," Runnebaum said. "The challenge is to develop a continuous process, which involves contacting gases [CO_2] with liquids [calcium oxide solution] to form a solid [calcium carbonate] that can be removed while recycling the water and unused chemistry.

"The overall goal is to develop a continuous process, which has minimal requirements for water, that could capture much of the CO_2 produced from fermentation in a way that can readily be transported, stored, re-used and/or sequestered for longer time periods," Runnebaum said.

Gervreau said the initial results from the research look promising. He described the preliminary fluid dynamic research done on **Aspen** software as "all math and equations."

Questions that remain include how much gas bubbles through the system; how big the system can be; how much gas it can handle; and how much chalk and bi-products are produced, Gervreau said.

The researchers are working on a preliminary design and on modeling for a prototype system. The next stage could take two years or more to build, test and refine, Runnebaum said. The plan is to test the system at the teaching and research winery on campus.

The preliminary design phase for a prototype system began last year. "The modeling is relatively complex because it includes an electrolyte solution, absorption of gases [including CO_2] and chemical reactions to form a solid precipitate," Runnebaum said.

First, there are some technical challenges in designing an efficient system for CO_2 absorption and calcium carbonate precipitation in a continuous process, Runnebaum noted. "Commercial challenges will also exist, as are

Efforts to Trap Volatile Organic Compound Emissions from Wine Fermentation Tanks

The **Santa Barbara Air Control District** in 2018 issued a permit to a custom crush facility in Santa Maria that sought to ferment and crush more grapes, which led to a dispute with the **Wine Institute**. It did so after the district determined that ethanol control emission systems met the "achieved in practice" rule and were "best available control technology" or "BACT" to trap volatile organic compounds, such as ethanol. Volatile organic compounds are an ozone precursor.

The Wine Institute appealed the decision. The matter was settled in 2018, with the air district agreeing to limit the ruling to closed, indoor tanks of up to 30,000 gallons. The ruling set a precedent in California; other air districts could issue similar orders.

Last year, Wine Institute tried to pass a bill that would have precluded air districts from requiring the installation of emission control equipment on wine fermentation tanks. Wine Institute said the technology poses "significant risk to wine quality and sanitation," including wine spoilage and cross contamination between fermentation tanks. The trade organization also said the emission control technology provides "inconsequential air quality impact." The **California Air Pollution Control Officers Association** opposed the bill. The bill failed.

Wine Institute said the system could potentially pose risks to wine quality and sanitation.

The California Air Pollution Control Officers Association opposed the bill by **Anna Caballero**, D-Salinas, saying it would conflict with the air districts' mission to control air emissions.

Santa Rosa I Napa I Santa Maria I Salinas I Paso Robles I Fresno I Modesto I Yuba City

Research on CO_2 Sequestration from Wine Fermentation Tanks Under Way

typical in developing and commercializing any new technology or application," he added.

The chalk obtained from the CO_2 sequestration process could one day be used to build wineries, Gervreau said. Eventually, the company may even sell carbon allowances to less efficient companies.

Patrick Thompson is chief executive officer at **EcoPas**, a company that has sold ethanol emission control systems. Thompson said CO_2 can be compressed and captured. The challenge is more economic than technical. That's because the value of 1 ton of carbon emissions is $15 while the cost to compress and capture CO_2 in a winery is now about $150 per ton, he said.

Sustainability and Good Business Go Hand in Hand

Companies regulated under California's cap-and-trade rules have a cap for the amount of greenhouse gas emissions they emit, with that threshold being lowered over time. Companies can buy allowances from state-run auctions for the right to emit carbon; energy-efficient companies can sell cap-and-trade credits under the program.

E&J Gallo is the only wine company with facilities regulated under cap-and-trade. That's because their emissions from combustion—not from fermentation wine tanks—exceed the threshold limit. The emissions from the two wineries in Fresno and Livingston are combined, according to the **California Air Resources Board**, which manages the program.

Gervreau does not rule out a potential scenario under which emission rules may change.

"As a strategic planner and as a scenario planner, you have to be thinking of it as a very potentially real scenario. You want to be thinking about what your position is vis-a-vis that," Gervreau said.

"That is not what has driven the investment in sustainability at Jackson Family Wines over the years," he stressed. "It's a family's commitment to wanting to do the right thing and to leave 'a legacy of stewardship, land conservation and doing the right thing.'"

"Sustainability and innovation, I think, really go hand in hand," Gervreau noted. "We're not engaging in charity by investing in sustainability. We're just engaging in good business," he said.

Other Sustainability Projects at JFW

Jackson Family Wines and the **Sonoma Resource Conservation District** are collaborating on a study to determine whether or not a vineyard can be an active carbon sink. The goal is to determine whether or not carbon dioxide can be sequestered through various land management practices that enhance soil health and remove CO_2.

The project started last year on 22 acres at Jackson Family Wines' **Saralee's Vineyard** at **La Crema Estate** in the Russian River. Sonoma ERC is carrying on the work at the vineyard thanks to a $100,000 grant from the **Healthy Soil Program** from the **California Department of Food and Agriculture**.

The research entails experimenting with various management techniques, from spreading compost to planting cover crops and not tilling between the vine rows, to see what kind of an impact these techniques have on building up soil and organic matter. **WBM**

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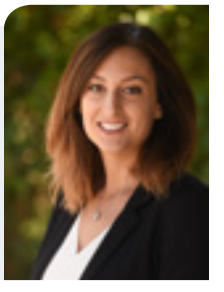
How to Build a Strategic IT Plan

IT expert discusses best practices, tips and solutions for creating and selling a plan to the boss

Erin Kirschenmann

Erin Kirschenmann is senior editor for *Wine Business Monthly* and has been with the magazine since 2012. In addition to production responsibilities for the monthly trade magazine, she writes about wine industry trends, including business, technology and sales and marketing topics for *WBM* and *Winebusiness.com*. She graduated from Sonoma State University with a bachelor's degree in communications with a journalism emphasis. She can be reached at *erin@winebusiness.com*.



WINERIES FACE A NUMBER of technical challenges that have emerged over the last decade: security breaches and phishing schemes that have become more advanced and effective; new softwares and products for internal systems like ERP and CRM, have more capabilities than ever before and are more complex and complicated; and consumers have embraced e-commerce, heralding a new sales channel that needs maintenance. Developing and implementing an effective strategic plan to meet these challenges has become essential for any winery IT employee—whether a full-time dedicated IT rep or just the most technologically savvy employee on staff.

These documents serve as not just master plans, but also pitches for funds, time and labor. With five-year plans, a company can outline the ways in which it needs to grow internally and can include tasks and projects like implementing a new enterprise resource planning (ERP) software, updating a website, implementing new security procedures to protect proprietary data and hardware, streamlining customer and sales data to produce more helpful analytics, or even hiring a contractor or full-time in-house IT employee. Since the plan serves such a critical function, what are the things that one can do to build and sell a strategic plan that the CEO, owner, CFO or president will love and, ultimately, approve?

At the **Wine Industry Technology Symposium**, **Todd Hauschildt**, senior vice president and chief information officer of **Veritas**, an organization tasked with protecting and harnessing data for **Fortune 500** companies, and a 35-year IT executive veteran, said that it's not that difficult; you just need to keep the company values in mind.

"There are a variety of models out there about how to have that dialogue with your company, how you build that plan, how you sell that plan, and then how you execute and monitor the plan. But before I go there, one of the things that I always like to talk about as a CIO or head of IT is 'What are the things that are most important to a CEO? What are the three most critical responsibilities of IT?' and I address those," Hauschildt said.

To him, those three core responsibilities that any smart IT plan should address are the enablement of the business strategy, keeping costs low and delivering a strong return on investment, and security, liability and risk mitigation.

What Your Boss Wants to See

Before diving into the basics of building a plan, Hauschildt said it's important to remind oneself of these three priorities. Any owner or C-suite executive worth their merit, he said, is going to want to know how this plan is going to allow the company to function: How does it ensure the network is up? How do I make sure the applications are up and running? What do we do if something malfunctions? The perceptive CEO is going to look for processes and solutions that enable a productive business.

Next, ROI will be a big consideration, though in this case ROI doesn't necessarily mean dollars. It could mean that time is saved when processes are streamlined, or the purchase of a contractor or software allows the CFO to spend less time managing a database and more time monitoring performance and strategy, for example. In the case of security protections, ROI could mean that dollars are not lost from paying out legal fees following a breach.

Security, liability and risk management can no longer go ignored. Small companies are particularly at risk from a breach owing to the fact that infiltrating their systems is often a great deal easier to do as, unlike with large companies, millions of dollars and hours of manpower have not been spent to protect them. Any five-year plan worth its merit will cover defensive protocol.

"In security, liability and mitigation is critical, especially in today's world, when you are being attacked on a constant basis and where you have the risk of losing customer data which is a huge liability for your company," he said.

Lastly, Hauschildt said that it's important to have the entire team involved in the creation of the plan, at least in some small way. Five-year plans are more likely to be approved if it's shown that team members, as well as executives, were consulted on issues, problems, gaps and more from the very beginning. It's a lesson he learned the hard way.

"Include them in this process, have that dialogue with them," he said. "The first time I did an IT strategy, I was at Hewlitt-Packard at the time. I went off into a room with my IT guys and we put together our business strategy for IT—we spent months on it. We came out and said, 'Here it is, isn't it beautiful? Isn't it fantastic? Look at all the things we did and are going to do.' And the executives just said, 'this doesn't address any of our needs. What are you doing?' I realized I should have talked to them."

The First Step: Determine Implications of the Business Strategy for IT

Large or small, identifying the goals and mission of the company is the first step in creating an effective strategic plan. From there, determine the ways in which the IT team and various technologies can support those goals. In the wine industry, Hauschildt was quick to point out that, like many other companies, you're trying to sell something (wine) but, unlike many other industries, you're selling in very different channels—there's a discrepancy in the technology needs when selling direct-to-consumer and in the three tier system. Distributors want something different than the consumer and sales and business strategies vary based on the channel.

In addition to business goals, Hauschildt recommended looking to your competitors—namely beer, spirits and other luxury industries. What are they doing that the wine industry isn't? How can you, as an IT professional, help your CEO meet or exceed those actions? How can you help the marketing team as they wage war for dollars?

This brings up a dialogue on the capabilities that a company could have but may not necessarily have already—maybe it's digital marketing or providing data analytics on the consumer, but either way it's a solution for addressing the challenges and opportunities in the market and the trends that affect your company.

"The whole idea of this dialogue is to understand the business objectives. Those are clear to [CEOs]. Those are the things that they are being measured on. These are the things that IT had to deal with, and those things have to relate to each other. People don't always see that connection," Hauschildt said.

Identify Gaps in Technology and Skills

Diagnosing IT performance gaps is arguably the most difficult part of the process, Hauschildt said, as most are unable or (most likely) unwilling to take an objective view of their performance. It is important to take a step back and ask the rest of the business how they see IT—whether the functionality is there or not, if it works, and if the IT team has the skills to perform those tasks.

"Frequently, we will have good technologists but not necessarily good business folks that understand those gaps," he said. "Sometimes it's good to have our customers [often other employees and technology users] telling us what those are. Hopefully they do that in a constructive manner versus "this guy's a jerk, get him out of here."

Using a tool that **Gartner**, an international research and advisory company, provides, Hauschildt pointed out seven key buckets that one should address in defining skills gaps:

- Engaging business partners
- Design and management of architecture
- Managing the project portfolio
- Delivering technology capabilities
- Managing information risk
- Developing and managing talent
- Managing the function

The other gap analysis Hauschildt recommends is in business functions: namely warehousing, distribution, finance and HR, among others. There are a number of ways in which technology and IT personnel can assist in streamlining, protecting and enhancing these functions that the teams in these various departments may not yet know about.

Identifying the skills or functionality gaps isn't enough. From there, a successful strategic plan will detail the level of importance in addressing the gaps as they relate to the business goals outlined in the first step of the plan creation process. Hauschildt uses a color-coded and themed system to analyze and display the holes in the systems. A "red" designation means that there is a strong concern about the gap: either the functionality does not exist, the functionality exists but it isn't being used or there's a big problem with it.

Those red designations are the first to be addressed in any strategic plan. From there, the purple, or medium gap and then the yellow, or low gap, needs are fulfilled. It's important in this case to note that sometimes a task will be "out of scope" for the IT team.

The last thing to look at in the gap analysis is the solution to the lack of IT skills. An important step, it's not one to be highlighted in the plan. "They [CEOs] don't care about that, either. They just want you as the head of IT to deliver on the functionality that they want. But you, as head of IT, you have to make sure you get the right people in here with the right skills," he said. Sometimes, that means training or continuing education to build the skills, creating a development plan or even firing an employee. Sometimes it means new hires.

Build the Plan to Deliver Actions—Not Solutions—to Meet Objectives

Before creating an action plan, the **Balanced Scorecard Institute**, an organization that provides training and consulting services to help companies and associations with strategic planning and performance evaluation, pointed out in a blog that it's important to remember that in a strategic plan you're setting up the processes, implementations and integrations, training and steps to "coordinate and align resources and actions with mission, vision and strategy." The plan itself requires more than just the solution. The plan is meant to put into place the tools to evaluate, act, re-evaluate and re-act to the outcomes of the attempted solutions.

From there, this is arguably the easiest step. You have already identified the core values, the gaps in skills and hardware and have started the communication process with the team and the CEO. Now, it's up to you to develop the processes that allow the gaps to be filled by creating a timeline, a list of who is responsible for what, creating a budget, etc.

"You start to create an initiative summary of what you need to do, whatever that may be, and you begin to coalesce that into a roadmap," Hauschildt said. "Every plan is going to be a little different based on your business, where it is in the marketplace, and the trends that are impacting it."

Don't forget to address how the changes will be implemented and governed. If the action requires implementing a new ERP system, for example, ask yourself these questions: Who is responsible for vetting and choosing the software? Who is in charge of overseeing implementation? Who trains employees on its use? Who reviews the progress, or how well the system is running?

It's also important to establish achievement goals and write them into the plan. No plan is worth the time if it does not produce. The stakeholders, owners, CEOs are perfect candidates to oversee achievements. They can be great arbiters of success—they're invested in the outcome, but not necessarily the process or technology, and can objectively determine if the processes/technologies are producing the desired results.

At each turn, or step in the plan, be sure to address the three main concerns: functionality, cost/ROI and security, liability and risk mitigation.

Once you've built the plan, review the steps with other, non-IT members of the team—but not the CEO. "Go back to the folks that you've been talking to and say, 'Here's what I'm thinking. Here's what I heard you say, and I tried to put it into a plan. What do you think?'" he said. This is an essential step in ensuring you're making the process more efficient or helping the team with customer satisfaction, or whatever the goals may be.

"We've not presented this plan yet to the CEO, but we made sure that we included all of the functions and the features that they will get. We've given them some form of a return on investment," said Hauschildt.

Get Approved

The final step, getting the CEO's approval, should be a cinch if you started out the process by having a conversation with them. "If you have this governance and you have the ability to have this dialogue with them, you will see things happen that you never thought possible, because they care about your plan. It's not just your plan. They care about the plan, they are engaged in this," Hauschildt said.

COMMUNICATION TIPS

When reviewing the plan for approval, there are two major tips Hauschildt recommended: sell it in one-year installments and don't talk about the technology.

Though it sounds counterintuitive, don't spend much of your time, whether in the plan or the discussion, on the technology itself. Instead, focus on how the technology improves on functionality, he said. "They don't care if you're using Dell servers or HP servers. They care about the functionality that those things will be providing to them," Hauschildt said. "Don't talk about it unless it is absolutely critical, because the underlying technology behind something is what supports the plan for you."

While a five-year plan is something you need to develop and should not be something you keep to yourself (there has to be board or CEO approval, remember), Hauschildt stresses that you should not make it a priority. Rather than asking for $5 million, ask for five, $1 million installments over five years, with planned evaluations to assess effectiveness. It usually goes down a bit easier.

"You don't want to freak people out. When you're putting together a five-year plan, it's hard to project. You want to take them through the plan in chunks," he said.

It All Comes Back to ROI

As you review the plan with the person making the final approval, whether the CEO of a large company or the owner of a 10 person operation, make sure that at every step you discuss ROI. Hauschildt said that so long as you remember ROI, create a dialogue with the team, understand the business' challenges, goals and values, and talk in business terms, you should be able to sell any five-year IT plan. **WBM**

Tax Reform Offers Key Tax-Planning Opportunities for Wineries and Vineyards

Michael Ricioli and Sara Harper

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TAX REFORM, COMMONLY REFERRED to as the **Tax Cuts and Jobs Act** (TCJA), provides several tax-planning opportunities for wineries and vineyards.

Below are some of the key federal tax changes impacting these industries as well the potential impact on business owners. While these are federal tax changes, it's also important to consider state tax rules, which don't always conform to federal changes.

C Corporation Tax Rate

The C corporation tax rate decreased to a flat rate of 21 percent from a maximum rate of 35 percent. With this change, business owners may want to evaluate if their current entity structure is still the most beneficial.

Determining the appropriate entity structure for a business is a complicated process with a variety of tax and other points to consider, such as:

- Double taxation
- Impact of owning appreciating assets—for example, vineyards
- Estate planning and exit strategy

Converting to a C corporation is a relatively simple process that can often be done on a tax-free basis if structured correctly. However, it can be difficult to convert from a C corporation to another entity type without triggering significant tax consequences. Regardless of the ease of changing your entity structure, careful analysis should be completed prior to any change to mitigate any unintended consequences.

Qualified Business Income Deduction

If you're a winery or vineyard taxpayer that isn't structured as a C corporation, there's a new 20 percent Qualified Business Income (QBI) deduction available through 2025 for the owners of flow-through entities and sole proprietorships. Generally, owners of winemaking or farming businesses should qualify for this deduction.

For example, if a pass-through winery with one owner generates $500,000 in taxable income and all of that income is considered QBI, its owner could be eligible for a $100,000—or 20 percent—deduction. The owner would then only pay tax on the remaining $400,000 of income from the business.

Some restrictions could limit the ability for a vineyard or winery owner to take this deduction, including limitations on overall income as well as limitations based on the amount of W-2 wages within the applicable business.

Some vineyard taxpayers don't have any W-2 wages within their farming business because they contract all their vineyard work with managers or independent contractors. Given the new 20 percent deduction, these taxpayers may want to re-evaluate their relationships and seek strategies that would enable them to utilize the deduction.

Cash Method of Accounting

One of the biggest changes under TCJA is the expanded availability of the cash method of accounting for winery businesses. In general, winery businesses with average annual gross receipts of $25 million or less in the prior three-year period are now eligible to use the cash method of accounting.

Prior to tax reform, this method was only available for winery businesses with average annual gross receipts less than $1 million. There are other limitations on the availability of the cash method for certain taxpayers with losses and for taxpayers who own or control multiple businesses, so these rules will also need to be considered.

CONSIDERATIONS FOR WINERIES

Simplifying the accounting of the overall business isn't the only advantage for a winery using the cash method of accounting. Certain rules also allow taxpayers to use simplified methods to account for inventory from a tax perspective.

A winery eligible to use the cash method of accounting is eligible to use the non-incidental materials and supplies method provided by Treasury Regulation Section 1.162-3. This method generally requires the costs of raw materials to be capitalized to inventory and allows a taxpayer to deduct costs such as overhead, depreciation, custom crush and winemaking or production wages in the year in which those amounts are paid. Typically, the costs that are required to be capitalized will include purchased grapes and bulk wine, glass, corks, bottles, and other bottling supply costs.

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ADOPTION

Qualified wineries are able to change to these methods effective for tax years beginning in 2018. When adopting these methods, taxpayers are required to recalculate their inventory as of the end of the prior tax year under the new, simplified method.

This cost is then compared to inventory originally calculated under their old method. The difference between the two amounts is a tax deduction in 2018, assuming the cost computed under the new method is lower. The taxpayer would need to file for an accounting method change to formally change to these new accounting methods.

For example, consider a winery with inventory costs of $2 million at December 31, 2017, calculated using their old accounting method. Using the simplified method referenced above, assume that the inventory costs are $800,000 at December 31, 2017.

The difference of $1.2 million between the $2 million from the old method and the $800,000 of the new method would be taken as a deduction on the 2018 return. In addition, the 2018 production costs and cost of goods sold would all be accounted for in accordance with the new method.

Wineries typically have multiple vintages of inventory on hand, so multiple years of production costs are trapped in inventory. For eligible taxpayers, this new method could generate significant deductions in the year of change because they'll be able to deduct those prior year production costs that remain in inventory.

CONSIDERATIONS FOR VINEYARDS

Prior to tax reform, most vineyards were eligible to use the cash method of accounting, but new changes further expand eligibility for vineyards. Under the revised rules, two main limitations prohibit a vineyard from using the cash method:

- It's held in a C Corporation with more than $25 million in average gross receipts in the prior three years.
- Its activity generates a taxable loss in a flow-through entity that's considered a tax shelter. The definition of a tax shelter is broad-reaching and therefore it's important to consult with a tax advisor to determine whether these limits apply to your business activity.

Section 179 Deduction

Tax reform included significant changes to Internal Revenue Code Section 179, Election to Expense Certain Depreciable Business Assets. Beginning January 1, 2018, these changes include:

- Expensing limit doubled to $1 million
- Phase-out threshold increased to $2.5 million

Once a taxpayer has eligible asset additions in excess of $2.5 million, the allowed Section 179 expense is reduced dollar for dollar. This means a taxpayer with $3.5 million in eligible asset additions wouldn't be able to take a Section 179 deduction.

Bonus Depreciation

Tax reform also included significant changes to bonus depreciation with rules becoming effective for assets acquired and placed into service after September 27, 2017.

Percentages are now doubled to 100 percent and, unlike with the Section 179 deduction, a taxpayer can take bonus depreciation on all eligible asset additions with no limit on the deduction or amount taken. Taxpayers can also claim bonus depreciation on used assets, which prior to tax reform, only applied to new assets.

These changes will have a significant impact on business acquisitions in the wine industry. If a taxpayer acquires an existing business in a qualified asset acquisition, he or she may be able to take 100 percent bonus depreciation on all assets that have a tax life of 20 years or less and recognize that deduction entirely in the year of purchase.

However, the taxpayer will need to consider whether any of the bonus depreciation expense would need to be capitalized under another section of the Internal Revenue Code, such as production costs or UNICAP.

Additional Depreciation on Specified Plants

Under pre-reform rules, a taxpayer who planted or grafted specified plants, including vines, was allowed 50 percent additional depreciation in the first year that the vine was planted or grafted. TCJA increased the additional depreciation to 100 percent.

When determining the benefits of this election, taxpayers should consider their method of accounting for pre-productive costs and the availability of bonus depreciation when the vine becomes productive.

Pre-productive Costs

The availability of bonus depreciation for a winery is pretty widespread, but depending on how a taxpayer accounts for pre-productive costs, bonus depreciation may not be available for vineyard assets.

Pre-productive costs are the farming costs incurred between the time a vine is planted through the harvest date of the first commercially harvestable crop, typically three crop years. An eligible vineyard taxpayer has the option to expense or capitalize these costs into the basis of the vine. However, there's a trade-off for accelerating these deductions.

TRADE-OFF

Taxpayers that elect to expense pre-productive costs are required to use the Alternative Depreciation System (ADS) method, which is a straight-line method of calculating depreciation and requires longer lives to depreciate farming assets.

For example, a taxpayer who capitalizes pre-productive costs would depreciate vines over a 10-year life. However, a taxpayer who expenses pre-productive costs would depreciate vines over a 20-year life. In addition to the slower depreciation method and longer lives, bonus depreciation isn't available for vineyard assets that are depreciated using the ADS method.

It's important to note that the requirement to use ADS will apply to all vineyard or farming assets for a specific taxpayer who's elected to expense their pre-productive farming costs. If a taxpayer has a majority interest in an LLC that owns a vineyard and elected to expense the pre-productive costs for that vineyard, all other current or subsequent vineyards controlled by that taxpayer would also be required to use the ADS method.

Given that a taxpayer's method of accounting for pre-productive costs will impact their ability to take bonus depreciation, it's important for a taxpayer to understand his or her method of accounting for pre-productive costs. Note that while bonus depreciation isn't available to taxpayers who expense pre-productive costs, the ability to take Section 179 on vineyard assets isn't affected by a taxpayer's method of accounting for pre-productive farming costs.

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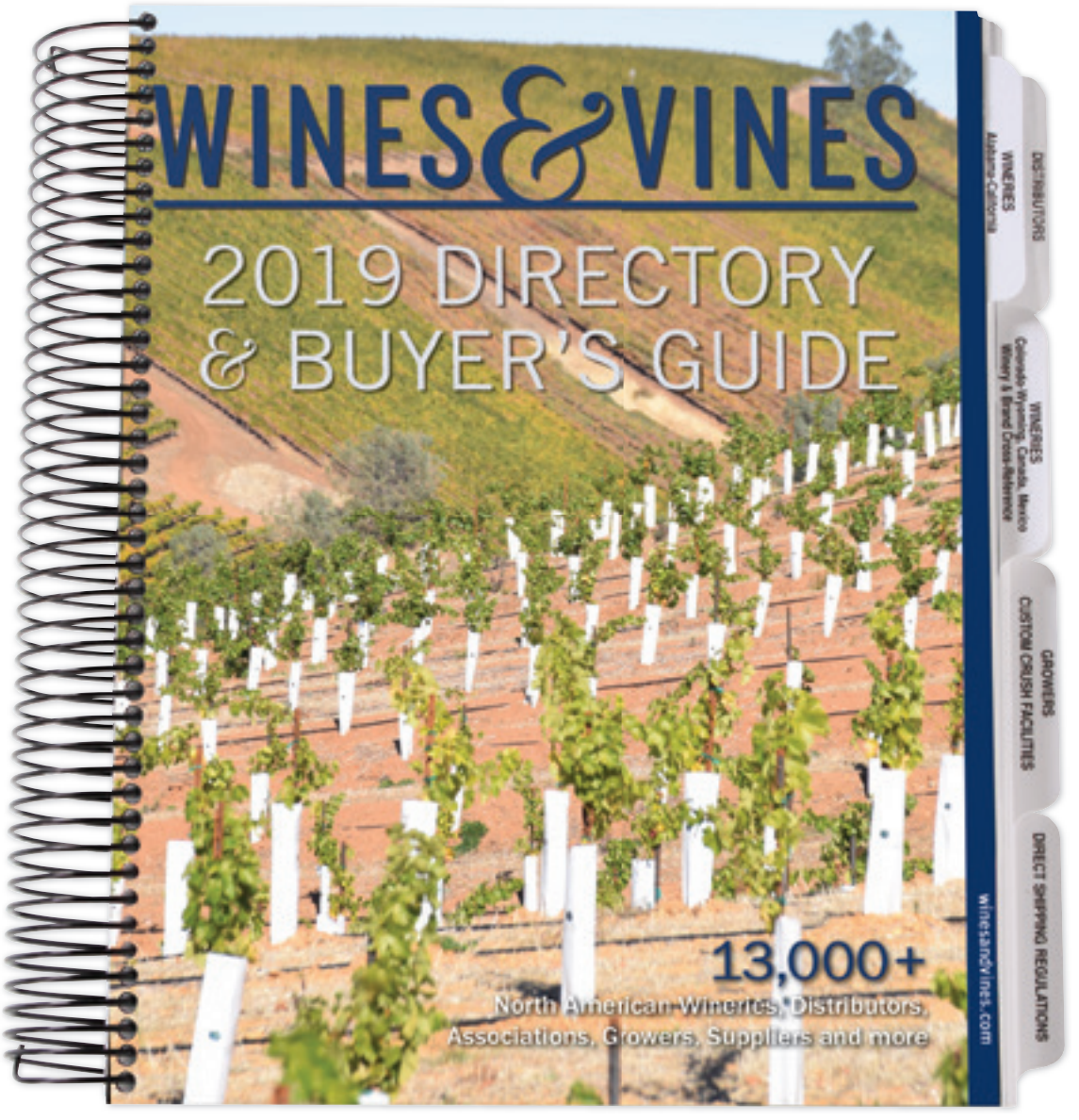

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For vineyard businesses that capitalize their pre-productive farming costs, bonus depreciation is allowed on eligible farming assets. This means that bonus depreciation can be taken on vineyard development costs when the vineyard goes into production as well as assets acquired in a vineyard acquisition, including, for example, vines, trellis, and above-ground irrigation.

Increasing a Loss

Some of these changes focus on the ability to accelerate losses and deductions beginning with the 2018 year. However, it's important to note that due to other changes under TCJA, losses from active trades or business could be limited.

Under TCJA, active losses from pass-through businesses can offset other active business income plus a maximum of $500,000 if taxpayers are married filing jointly (MFJ) or $250,000 for all other taxpayers.

For example, consider a taxpayer (MFJ) with $1 million of income that consists of W-2 wages, interest, and dividends for 2018. The same taxpayer also has a flow-through loss from their winery of $1 million for 2018 and has basis to deduct this loss in full.

Under the pre-tax reform rules, the taxpayer would be able to offset the $1 million winery loss against his or her other sources of income and bring his or her taxable income to zero. However, under TCJA, only $500,000 of the $1 million loss will be able to offset other income and the taxpayer will pay tax on the remaining $500,000 of income that couldn't be offset by the winery loss. The excess $500,000 of loss from the winery that was limited will be carried to future years until utilized.

Excise Taxes

Included in the TCJA were changes related to Excise Taxes. These changes include an expansion of the availability of the excise tax credit which was previously only available to "small producers." In addition, there were changes to the calculation of the excise tax credit and the amount of excise tax that is assessed on wines with alcohol content above 14 percent and below 16 percent. These new provisions only apply to wine removed from bond for the period after December 31, 2017, and before January 1, 2020.

Next Steps

Winery and vineyard business owners can benefit from performing a detailed analysis of their company's specific situation to determine which, if any, actions to take. For more information on how tax reform may affect your planning through the year, visit *mossadams.com/tax-planning-guide*. **WBM**

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Wineries & Winemaking


Bill Newlands

Constellation Brands, Inc. announced that **Bill Newlands** will assume the role of president and chief executive officer (CEO), succeeding current CEO **Rob Sands**, on March 1, 2019. Also effective March 1, 2019, Rob Sands will assume the role of executive chair. **Richard Sands**, who is currently serving in the role of executive chair, will assume the role of executive vice chair on March 1, 2019. Newlands joined Constellation Brands in 2015 as executive vice president and chief growth officer. In 2016, he assumed additional responsibilities as president of the company's Wine & Spirits Division. In 2017, Newlands became the company's chief operating officer, and he assumed the role of president in early 2018. Prior to joining Constellation Brands, Newlands held several senior leadership roles in the beverage alcohol industry spanning more than 30 years.

Doug Gore, executive vice president of winemaking, vineyards and operations for **Ste. Michelle Wine Estates** is retiring after a 36-year career with the wine company. Gore's tenure coincided with the dawn of the modern Washington wine industry. On his arrival in 1982, Washington was predominantly a Riesling-focused region. A California native, Gore relocated to Washington to join **Chateau Ste. Michelle**'s winemaking team. He was named winemaker for **Columbia Crest** winery within a year, and his influence later grew to include all vineyards and wineries that Ste. Michelle owns across Washington, Oregon and California.


Juan Muñoz-Oca

Juan Muñoz-Oca, currently vice president of winemaking for Ste. Michelle, overseeing **14 Hands**, **BORNE of Fire**, Columbia Crest, **INTRINSIC**, **Northstar** and **Spring Valley Vineyard**, has been named executive vice president of winemaking, vineyards and operations responsible for all of Ste. Michelle's facilities; effective January 1, 2019. Muñoz-Oca will report directly to president and CEO **Jim Mortensen**. **Bob Bertheau**, currently vice president of winemaking overseeing Chateau Ste. Michelle and **Col Solare**, has been promoted to senior vice president of winemaking, effective January 1, 2019. Bertheau will report to Muñoz-Oca.

Champagne Billecart-Salmon, celebrating its bicentenary year, announced the appointment of **Mathieu Roland-Billecart** to the position of chief executive officer. A member of the seventh-generation of the family, Mathieu Roland-Billecart assumes the role in January 2019 from his cousin **François Roland-Billecart**, who has headed the company since 1992.

Silicon Valley executive **Luanne Tierney** will join the **Crimson Wine Group** Board of Directors. A marketing executive with extensive experience integrating marketing and sales, Tierney is a complementary addition to the Crimson Wine Group Board to help guide the company as it grows and differentiates its brands in the market. Tierney has more than three decades of experience and held executive positions at **Cisco Systems**, **Juniper Networks** and **Proofpoint**. She currently serves as the CMO for **Open Systems**, where she leads the company's global marketing initiatives. Known as a creative innovator and respected as a leader, Tierney has successfully built and led complex marketing organizations for several Fortune 500 and mid-market SaaS companies.

Rebecca Mahmoud has joined the **Red Newt Cellars** wine marketing and distribution team. Her focus as brand ambassador will be on facilitating and expanding Red Newt Cellars' recognition and distribution in North America. Red Newt is currently distributed to 15 U.S. states, Europe, Japan, China and New Zealand. The last nearly two decades of Mahmoud's career has been devoted to her long-held passion in wine. She began by working for San Francisco importer, **Adventures in Wine**, as their acting COO. From there, she moved into a sales and marketing role at **Broadbent Selections**, where she worked for 10 years. During that time, she made great strides for the company in roles spanning marketing, business development and regional sales. These accomplishments included the establishment of a private label wine program for national accounts, including **BevMo** and **Cost Plus World Market** and assistance in new brand development.

Miller Family Wine Company, the newest division of the **Thornhill Companies**, welcomed **Justin Taliaferro** as national sales manager. Taliaferro joins Miller Family Wine Company after serving as vice president of sales, Central United States for **Treasury Wine Estates** (TWE), where he managed and supported the business relationship between both TWE and **Southern Glazers Wine & Spirits** across the Central United States. During his 8.5 years with TWE, Taliaferro covered approximately 20 states while living in three geographic regions, building high performing teams and supporting various business transitions across a multitude of franchise, open and control markets. Prior to TWE, Taliaferro worked his way up at **E&J Gallo** across two distributor networks and gained experience within Gallo across multiple roles in the Pacific Northwest.

Deutsch Family Wine & Spirits, a leading importer and marketer of award-winning wines and spirits from around the world, announced **Jon Tepper** will join the company as executive vice president of sales and commercial strategy, beginning December 3. This newly-created role will lead the company's distributor management, field sales force, training department and on-premise national accounts as well as be a thought leader on the company's sales strategy. In this role, Tepper will be a member of the company's senior leadership team and report to **Tom Steffanci**, president, **Deutsch Family Wine & Spirits**. Reporting directly to Tepper will be **Ryan Rowder**, SVP sales; **Jeff Corbett**, SVP sales; **Tony Kalich**, SVP distributor relations and training; **Joe Wiza**, VP commercial planning and execution; and **Eric Lake**, VP national accounts, on premise. Tepper's full organization will comprise 118 employees.

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Toby Halkovich has been named as the new vice president of operations at **Heitz Cellar**. Most recently the director of vineyard operations at **Cakebread Cellars**, Halkovich had served as their viticulturist for almost a decade. Earlier in his career Halkovich worked in product sales for an agricultural supply company and was the vineyard manager for **Kenwood Vineyards**. He graduated from **UC Davis** with a degree in agricultural and managerial economics and then earned an MBA from the **University of Massachusetts, Amherst**. Aside from his professional career, he has been a volunteer fire fighter for the Kenwood area since 1997.

Nick Woodhams will lead the **Westwood Wine** direct-to-consumer efforts as excitement builds for the first wines crafted by the new winemaking team led by **Philippe Melka**, including the 2016 Legend red blend, which has been reimagined and will first be shared with Westwood club members ahead of a spring 2019 release. Woodhams has broad experience in leading luxury wine hospitality efforts, most recently as DTC director for **Trinitas Cellars** in Napa. Earlier, he served in similar roles for **Palmaz Vineyards** and **Silverado Vineyards**, also in Napa. He has a consistent record of success in creating meaningful guest experiences, working closely with strategic partners, developing productive ecommerce channels and contributing to marketing efforts which effectively recruited and retained club members. He will serve as director, DTC for Westwood.

Greg Boeger, founder and owner of **Boeger Winery** in Placerville, El Dorado County, California, has been awarded a Congressional Commendation for Wine by Congressman **John Garamendi**. A Congressional Commendation "officially recognizes outstanding public achievements" by the people who live in the Congressman's district. "Greg Boeger has played a significant role in the history of California wine and I commend him for his dedication and contributions to the Golden State," said John Garamendi, Member of Congress, 3rd District, California. The Commendation follows another significant acknowledgment earlier this year awarded by the California State Fair—the prestigious Wine Lifetime Achievement Award honoring pioneers of the California wine industry. Since the early 1970's Greg Boeger has worked tirelessly to develop and bring prominence to the El Dorado wine region.

Karen Maley has been named general manager at **Robert Young Estate Winery**. Most recently the general manager at **Electric Sky Wine**, an innovation arm of **Anheuser Busch**, Maley has also held key leadership roles at **StackTeck Wines** and **Kruger Wine & Spirits**. She was a founding partner at **Stryker Sonoma Winery** in Alexander Valley and worked as a senior director of marketing at **Gallo** with both U.S. and international responsibilities. Maley began her career at **Proctor and Gamble**. She graduated from the **University of Toronto** with an honor's degree in economics and went on to receive an MBA from the **York University**, also in Toronto. Maley has been a board member of **Sonoma County Vintners** and the **Alexander Valley Association**.

Silverado Vineyards appointed **Gloria Rivera** as Northeast district sales manager. Reporting to **Pamela Ford**, sales director, East, she will be responsible for sales management for the states of New York, New Jersey, Connecticut, Massachusetts, Rhode Island, Maryland, Delaware and the District of Columbia. Rivera holds a WSET Level 2 with distinction certification and over the last 10 years she worked for **Allied Beverage Group** in New Jersey as an on-premise manager with wide-ranging responsibilities including sales management, innovating brand development and liaising with suppliers. Earlier in her career she was the manager for **Witty's Fine Wine** in Rahway, New Jersey and she also worked in a New Jersey radio station.

Distributors, Importers & Retailers

The Winebow Group, a national importer and distributor of fine wine and spirits, announced today the promotion of **John McFadden** to senior vice president and general manager, Winebow Wholesale Southeast Division. He was previously the vice president and general manager of **Stacole Fine Wines**, Winebow's distribution house in Florida. McFadden will remain based in the Pompano Beach office, and will report to **Arjun Dewan**, executive vice president, wholesale east. McFadden is an established wine and spirits veteran with 29 years of experience prior to joining The Winebow Group in 2015. Previously, he worked for **Southern Glazer's Wine & Spirits** from 1986 to 2015 in a variety of positions that included sales representative, district manager, division manager, wine director, director of fine wine sales, and state wine director, American liberty division.

In Memoriam

Paul David Reimer, known by most as Ted, passed away in early November. He is survived by his daughters, **Natalie** and **Audrey**, ex-wife, **Jennifer**, siblings, **Mark** and **Kristie**, and father, **Paul**. Ted's mother, **Kay**, passed away in 2005. Ted was born in Reno, Nevada, but became a true Northern Californian after the family moved to the Bay Area when he was three. For more than 30 years, Ted was in the wine business. His early career began with **Joseph Phelps**, which led to establishing his first company **WineSpell**. He owned, managed or worked for some of the country's top wine importers and distributors including: **The Sorting Table**, **Wilson Daniels**, **Sherbrook Cellars**, **The Henry Wine Group**, **Benchmark Wine Group** and **Big Bang Wines**. He represented a collection of iconic wineries, including **Domaine de la Romanee-Conti**, **Domaine Dujac**, **Henri Boillot**, **Marc Kreydenwiess**, **Domaine Faiveley**, **Aldo Conterno**, **Royal Tokaji Wine Company**, **Val di Suga**, **Domaine LeFlaive**, **Salon Champagne**, **Saintsbury**, Morgan, **McIntyre**, **Snowden** and **Hyde de Villaine**.

Frederick Wildman and Sons, importer of fine wines and spirits, hired **Zaarath Prokop** as its new chief financial officer. Prokop brings a decade of direct industry experience to her role, having served as director of revenue management at **William Grant & Sons**, finance director for **Disaronno USA** and in several commercial finance positions with **Remy Cointreau USA**. Prokop is a member of **Women of the Vines and Spirits** and a veteran of the **U.S. Army**, First Calvary Division. She has held multiple professional finance roles before joining the wine and spirits industry, including with Fortune 500 brand **Ford Motor Company**.

Industry Services & Suppliers

CHEP, the global provider of pallet pooling and supply chain management solutions, appointed **Jake Gilene** to the role of senior vice president, sales and customer service, CHEP USA. This position was previously held by **Dan Martin**, recently named president, **IFCO North America**. Gilene will lead a team devoted to positively impacting the industry and customers. He will be responsible for commercial strategy, delivering new products, services and solutions to help customers find more value in their supply chains.

Joe Martin has joined **StaVin Inc.** as sales consultant servicing California's Central Coast wineries. Martin comes to StaVin with more than 20 years' experience in wine production. His love of wine began in his student days while working in a wine shop. After college, his passion led him to harvest work in Burgundy, France at **Domaine Denis Bachelet** in Gevrey Chambertin. He honed his craft with stints at the **Edna Valley Vineyard** in San Luis Obispo, **Chittering Estate** in Western Australia, **Durney Vineyards** in Carmel Valley and **Newton Vineyard** in Napa Valley. He later established **Martin Alfaro Wines**, a luxury Pinot Noir brand based in the Santa Cruz Mountains. Most recently, he was a winemaker for **Constellation Brands**' Gonzales Winery, where he specialized in red wines and Bordeaux varietals. Martin holds a B.S. degree in fermentation science from **UC Davis** and a M.S. degree in industrial and systems engineering from **San Jose State**.

Exchange Bank has named **Michael Sullivan** to be executive vice president and chief credit officer, reporting to president and CEO **Gary Hartwick**. He will be responsible for ensuring the overall credit quality of the bank's loan portfolio, including overseeing loan generation and the development of loan policies and procedures to ensure high levels of financial performance and compliance. Most recently, Sullivan served as a senior vice president in their financial institutions group where he led credit origination and strategies in the U.S., Canada and Europe. His previous roles included leadership for **Wells Fargo**'s regional commercial banking group in Santa Rosa. Sullivan earned his MBA at the **University of California, Berkeley** and has served the community on various boards. He was a founding board member of the **Sonoma State University Wine Business Institute** and served on the board of the **United Way of Sonoma**, Mendocino and Lake Counties.

Nadalié USA hired **David Duckhorn** as the company's chief financial officer. Duckhorn joins the Nadalié team after spending the previous 12 years in Shanghai, most recently as CEO for the **EVE F&B Group**. In addition to his day-to-day business responsibilities, Duckhorn spent a number of years consulting on three winery projects in Western China and was an on-going guest lecturer at the **Shanghai Jiao Tong University** Master of Finance program. A Napa Valley native, he spent his formative years in St. Helena participating in all aspects of his family's winery, **Duckhorn Vineyards**. He has held a number of positions during his career, including controller with **Capstone Turbine**, assistant vice president at **Bank of America** managing loans to agricultural firms and CFO at Duckhorn Vineyards.

Third generation winemaker **George Troquato** launched his own consulting services operation. He has been making wine from many of California's foremost growing regions for over 30 years. Although he's particularly fond of old vine Zin, he has made a name for himself during his years of crafting award-winning chardonnay, Pinot Noir, Cabernet and Bordeaux blends from the Santa Cruz Mountains, Santa Clara Valley, Alexander Valley, Dry Creek, Lake County, Napa Valley, Paso Robles, Lodi, Edna Valley and Contra Costa County. Troquato has been the winemaker at **Cinnabar Winery** since 1990, and made the first five vintages of **Testarossa**, from 1994—1998. After graduating from **Cal Poly** with a degree in Crop Science in 1985, Troquato apprenticed with his father at **Troquato Vineyards**, at **J. Lohr** and in the Beaujolais region of France, before taking his longheld post at Cinnabar Winery.

Associations & Education

The **Texas Wine & Grape Growers Association** Board appointed **Dacota Haselwood**, former long-time TWGGA staffer, to the position of executive director. Dacota's selection follows the resignation of the current executive director, **April Mitchell**, who resigned to pursue other business interests. Dacota began her tenure with TWGGA in September of 2004 and served as executive director until late 2008. At that time, Dacota became TWGGA's part-time chief governmental affairs officer. During her time with TWGGA, Dacota proposed and exceeded budget goals five years in a row. She fostered growth each year in the areas of commercial membership, event participation, vendor and sponsor participation and legislative advocacy. WBM

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Sarah C. Rhodes-Troxell, winemaker,
Galen Glen Winery, Lehigh Valley AVA, Andreas, Pennsylvania

"Starting winemaking as a second career, without a traditional education, and working in a young wine region with minimal resources, I rely on *Wine Business Monthly* to keep me apprised on technical developments and to supplement my education. I immensely enjoy reading Curtis Phillips' perspective on winemaking. He covers all the topics I'm interested in, from the lab to the cellar, sometimes leaving me dreaming of new equipment. His October and November articles 'Blending: Science, Craft or Black Art?' and 'Blending Tanks, Mixing Tanks, Bottling Tanks' were insightful. Blending for stylistic consistency is one of the most important tasks I do and also one of the hardest to learn. He discussed and offered tips on everything from the mechanical aspect of mixing a blend to reasons for making a blend to the perils of blends. I also learned from Curtis in his August article on 'Budgeting Equipment' that following the USD to Euro exchange rate is not as important as watching the price of Nickel for tanks and Tin and Aluminum for screw caps. Maybe I should consider investing in these metals instead of the stock market?"

NAME AND TITLE: Sarah C. Rhodes-Troxell, winemaker

WINERY NAME AND LOCATION: Galen Glen Winery, Lehigh Valley AVA, Andreas, Pennsylvania. Our farm has been in the Troxell family since the 1830s. My husband and I are privileged to have the 7th generation, our daughter, take over stewardship of our vineyards. The land is a U-shaped glen, glacially carved out of a rugged ridge and just north of the Blue Mountains, where the glaciers ended their journey 10,000 years ago. Even more ancient Crinoid fossils from the Silurian period (400 million B.C.) are readily found in one of our Riesling vineyards, aptly named Fossil Vineyard. In 1995, the first vines were planted, thriving at 1,000 feet. The wine cellar rests in the base of our little gorge.

ANNUAL CASE PRODUCTION: 6,500 cases

PLANTED ACRES: 20 acres

CAREER BACKGROUND: I came to winemaking rather circuitously. After graduating from college with a major in chemistry and minor in biology, I worked as a technical support chemist for a company that is the world's largest supplier of pharmaceutical packaging components. It was a tremendous, fast-paced learning experience. My focus was with clients that produced liquid injectable drugs. After five years, I knew that I needed to pursue something different. I joined my husband on his business trips to rural Germany, traveling to the Wurttemberg wine region. The alluring fusion of wine, vineyards, land, food and culture emboldened us to leave corporate jobs, purchase the family farm and begin winegrowing. So began my transition from chemist to winemaker.

WHAT HAS BEEN YOUR BIGGEST PROFESSIONAL CHALLENGE? East Coast weather is extremely unpredictable. It a battle of cold winter temperatures, early and late season frosts, violent wind storms and hail, vintage devastating hurricanes and herbicide drift. It only takes one of these events in a growing season to test your fortitude and some years we have several. Creating stylistically consistent wines can prove to be very tough. Every year I look forward to the opportunity that these circumstances create to learn a new skill or test method.

VARIETALS THAT YOUR WINERY IS KNOWN FOR: Our flagship varieties are cool-climate, aromatic whites - Grüner Veltliner, Riesling and Gewürztraminer. We have the second oldest planting of Grüner Veltliner in the U.S.

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Fresh Fish


ILLUSTRATION BY BOB JOHNSON

WHEN WE ARE IN New Orleans, we focus on friends, food, drinks and music. Back in the day, tourists were seasonal and rarely interfered with our visits. In humid summer months, the only tourists were visitors for church conventions, whom you might see at a gospel brunch. They certainly weren't going to flock to late-night bars, making it hard for us to see Anders Osbourne or Kermit Ruffins.

Now, New Orleans is continuously inundated by tourists from all over the world. There is no slow season. There are no more hotel deals in the summer. Dinner reservations are hard to come by any time of year, which is why we prefer long three-hour lunches at places that serve great food but fly under the tourist radar.

Jakelyn's mother and I went to Jazz Fest for 12 consecutive years. In those days almost every act was local to the area. Tickets were just $15 a day, and crowds were very manageable. Restaurateurs and club owners would bemoan the fact that Jazz Fest-goers would drink themselves into a lather and never go out to eat or drink at night.

That's changed. Once Jazz Fest management changed from local favorites to international stars, the crowds grew to discomforting size, and tickets went to more than $100 per day. Jake Lorenzo completely understands tourists who come to New Orleans for Jazz Fest. The line-ups are dazzling and eclectic. Last year alone Jack White, Beck, Lionel Richie, David Byrne, Anita Baker, Sturgill Simpson, Common, Jason Isbell, Smokey Robinson, Toots & the Maytals, Buddy Guy, Blind Boys of Alabama, John Mayall, Preservation Hall Jazz Band, Lucinda Williams, George Porter Jr. & the Runnin' Pardners, Calexico, Bobby Rush and dozens more performed. Impressive but not very New Orleans.

The new crowds of tourists that inundate New Orleans (like a bad rainstorm when the pumps aren't working) are not content to drink themselves into oblivion during the day and then stay in their hotels to recover at night. No, they insist on going out to restaurants and clubs. It becomes impossible to get a reservation in a decent restaurant.

Jake Lorenzo doesn't go to New Orleans to see international stars. Most of those people will end up performing near Sonoma. We go to New Orleans to discover local acts, like Bill Solley and Kim Prevost, or to hear the mellow vocals of Lillian Boutté. We are mesmerized by the harmonies of the Asylum Choir or the soaring vocals of Antoine Diel. We love catching the Park Rangers Jazz Band at the old Mint.

The new crowds of tourists that inundate New Orleans (like a bad rainstorm when the pumps aren't working) are not content to drink themselves into oblivion during the day and then stay in their hotels to recover at night. No, they insist on going out to restaurants and clubs. It becomes impossible to get a reservation in a decent restaurant. Music venues are crowded with screaming tourists, and even our favorite late-night bars are filled with strangers. These tourists spend money like water, so the local restaurants and bars have raised their prices into the stratosphere.

One of this detective's go-to wines is the Saint Cosme Côtes du Rhône. I can buy it in a store for $12 to $14. One night we had a lovely dinner at Bistro Daisy and got a bottle of the St. Cosme for $39. It was pricey, but it was in a good New Orleans restaurant, and it is hard to get a wine for under $40 in any restaurant these days.

Sunday, after late brunch at Paladar 511, where we couldn't afford to buy any of the wines, we hung around the French Market and listened to live music at a couple of French Quarter clubs. We decided to go to Borgne for some wine and appetizers. We got there to find out that their bottle of St. Cosme was $56. This detective had one beer and an order of turkey necks and got out of there as soon as I could.

Whenever Jake Lorenzo travels, I try to get to know the locals. I like to find out where they go to eat or hear music. It helps to learn which stores they shop and what specialties they buy. When we are in Italy, all the wine shops sell 500 ml bottles of incredible olive oil for $40 or more per bottle. Our Italian friends scoff at that and take us to the local place, swearing the oil is just as good for $10. San Sebastian, Spain has more Michelin star restaurants than any other city in the world, but the locals tell us that Bar Zeruko has food just as good for one-third the price. French Bordeaux is ridiculously expensive anywhere, even in France, but locals can direct you to very decent St. Emilions for under $25, even in restaurants.

Jakelyn's mother and I have been going to New Orleans for more than 30 years. We are adopted locals. We know to go to Jacob's in La Place to buy our andouille sausage. We ride out to Chalmette to get our hog's head cheese at Jeanfreau's. Cocktails at Desi Vega's Steak House are just $4 during happy hour. Chickie Wah Wahs always has great music and rarely charges more than $10 cover. If we ever encountered a tourist in any of these places, we would assume they were lost and would appreciate it when we redirected them to a more popular venue.

For 13 years, ever since Hurricane Katrina, a large group of our friends has gone out for happy hour cocktails every Friday. They have drinks for a couple of hours, and then some of them go off to dinner together. On our last trip, the Friday night get-together was at Two Tony's Restaurant, a red gravy Italian family place in the West End district of New Orleans. After cocktails, 10 of us moved from the bar to the restaurant to eat. We ordered two bottles of Banfi Chianti Reserva at the reasonable price of $26. Then the waitress came to the table, telling us the specials.

She said it. I heard her. "Our fresh gulf fish of the day is Norwegian salmon."

It made us laugh. Jake Lorenzo is pretty sure that the Gulf of Mexico is a lot closer than the Gulf of Norway, but I certainly wasn't going to question our waitress about her grip on geography. It's what I love about my New Orleans; if the wine is affordable and the fish is fresh, we don't care where it comes from, especially when we are drinking and eating with friends. **WBM**

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