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"This Can't Be the New Normal"

2019 WILL BE REMEMBERED as a fairly good grape-growing season, a season with favorable weather and no big heat spikes here in California or in the Pacific Northwest. On the East Coast, it was a very good vintage as well, as the weather was unusually dry leading up to the harvest.

As the December issue ships off to the printer and on to subscribers, though, the Kincade fire here in Sonoma County, where *Wine Business Monthly* is based, has scorched 77,000 acres and is still burning.

We've turned the corner: the winds died down, the fire is nearly contained, and most evacuees have returned home. The majority of us have had our electric power restored. It's been scary and exhausting.

The Sonoma County Winegrowers estimates 92 percent of the wine grape crop was harvested before the fire broke out.

For so many, this was déjà vu all over again, coming two years after wildfires wrought havoc in parts of Sonoma and Napa. The damage from the Kincade fire is still being assessed. At least two wineries in Sonoma County, Soda Rock and Field Stone Winery, have been completely destroyed. The good news is people were more prepared this time and there were no fatalities.

Wineries are still determining how to best move ahead to serve the community during the upcoming rebuild. The economic fallout is going to be huge. The fire broke out ahead of one of the biggest weekends of the year, a peak time where many wineries host tourists who plan visits to coincide with the harvest. Many events were cancelled, not only because of the fires themselves, but because the power was cut.

Headlines that read, "California Wine Country on Fire," clearly don't help. Many are expecting the negative publicity of the October wildfires to cause a severe decrease in visitors to "Wine Country" with a corresponding decrease in wine sales.

Some leaders in tourism are already thinking about pivoting to spring events instead of emphasizing activities and events that correspond with harvest season.

This can't be the new normal. The industry will need to make a coordinated effort.

There are many ways to help and one of them is by buying Sonoma wines.

Cyril Penn – Editor

For editorial or advertising inquiries,
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2019 YEAR IN REVIEW

winemaking

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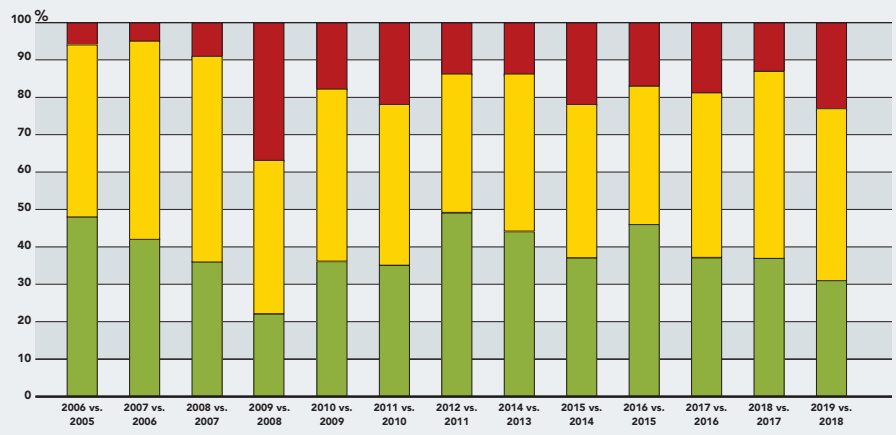

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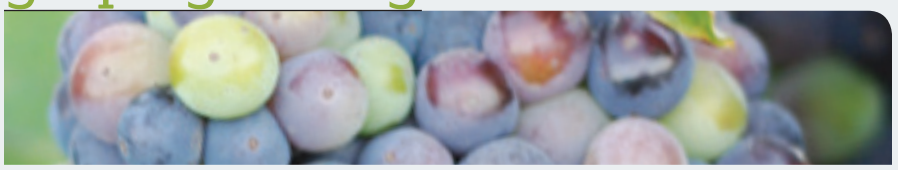

2019 Vintage Report

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who's talking in this issue

Carol Collison, Global Wine Partners, "Considering Recession and Leverage in 2020," page 118

"A couple of years from now, people are going to be looking at how much wine they didn't make in 2019 and what they could have sold in 2021 and 2022. But that's the fun of the wine business. You've got to make your production decisions now for your sales two to three years out."

Chris Hyde, Hyde Vineyards, "The Evolution of a Great California Vineyard," page 98

"The hands that touch the vine are pretty important, the layout of the vineyard is pretty important, but without the soil it can't have any of those other things. The great selections are not going to make you good wine in poor soils."

Andrew Milanez, Zepponi & Co. "Mergers and Acquisitions: Major Deals and Forecasts for 2020," page 20

"Buyers will be likely to target those sub-segments of the market that are gaining share and experiencing volume growth, with notable categories being luxury brands, sparkling and Rosé varieties and geographic areas with high-growth potential, such as Oregon and Paso Robles."

Lance Cutler, *Wine Business Monthly*, "WInemaking Roundtable: New Winemaking Techniques," page 30

"When science and technique are managed by winemakers in service of their style and attuned to the unique character of their vineyard terroir, that's when we achieve magic."

David Block, UC Davis, "Wine Management Strategies, from Fermentation to Stabilization," page 38

"The sensory related molecules in wine are a smaller size than what we filter from wine. There really shouldn't be a reason not to filter from a sensory standpoint."

Matt Daugherty, UC Riverside, "Has Climate Contributed to a Pierce's Disease Resurgence in North Coast Vineyards?," page 84

"Multiple lines of evidence indicate that warmer conditions are generally expected to increase sharpshooter populations or activity, and *X. fastidiosa* infection levels and persistence."

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2019 WINE BUSINESS Leadership Dinner

WINE INDUSTRY Financial SYMPOSIUM

Each year, *Wine Business Monthly* honors several movers, shakers, trendsetters and mentors from within the wine industry to its Leadership Dinner. In 2019, *WBM* honored (from left to right): Jim Clerkin, president of Moet Hennessy strategic development, mentor to some of the wine industry's greatest thinkers; Karen Ross, secretary of the California Department of Food and Agriculture and a staunch ag advocate; Merry Edwards, the former chief executive officer and founder of Merry Edwards Winery, who shattered glass ceilings for women in the industry; and Bob Trinchero, chairman of Trinchero Family Wines, the man who created the White Zinfandel category.

A wine reception was held following the conclusion of the first day of the Wine Industry Financial Symposium, held at the CIA at Copia in Napa, Calif.

From left to right: Michaela Rodeno, a past Leadership Dinner honoree, wine writer Karen MacNeil and Merry Edwards.

Dale Stratton, a business consultant and former vice president of commercial insights at Constellation Brands, spoke on the Mergers and Acquisitions panel on Day One of the Wine Industry Financial Symposium.

Ryan O'Connell of NakedWines.com shared his insights on measuring and maintaining consumer engagement.

Jon Moramarco of bw166 and Peter Mondavi Jr. of Charles Krug Winery enjoy a glass of wine before the Leadership Dinner.

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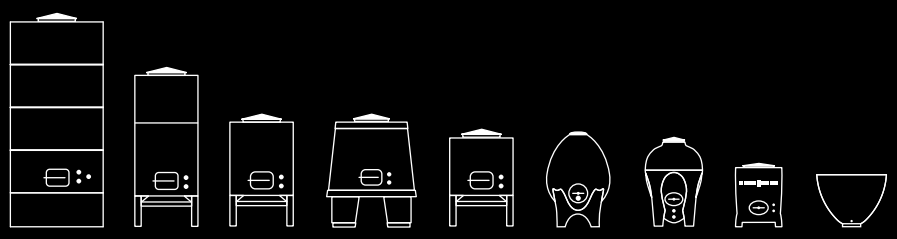

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Top Stories

JANUARY

Wine Business Monthly and Wines & Vines Magazines Merge Under the Wine Business Monthly Brand

Wine Communications Group, owner of both Wine Business Monthly magazine and Wines & Vines magazine, merged the two leading business-to-business wine publications under the Wine Business Monthly brand, effective with the January 2019 issue. The combined operations brought the two editorial resources together at Wine Business Monthly, which continues to operate under the guidance of editor Cyril Penn.

WINE BUSINESS MONTHLY
Now Incorporating WINES&VINES

Wines Vines Analytics Launches Report Based on Industry's Best Data

The comprehensive source for data on wine sales, direct-to-consumer shipments and other key metrics launched an authoritative and dynamic digital publication with data, analysis and news for anyone wanting to closely follow trends shaping the U.S. wine industry

WINES VINES ANALYTICS

DTC Hits Record of More Than $3 Billion

One of the fastest-growing sectors of the U.S. wine market grew by 12 percent to surpass $3 billion in 2018, according to the 2019 Direct to Consumer Wine Shipping Report by Sovos and Wines Vines Analytics. The sales growth comes with a 2.4 percent increase in the average bottle price of wines shipped. Total shipments by volume in 2018 came to more than 6 million, a 9 percent increase over the previous year.

FEBRUARY

California's First Woman Winemaker of the Modern Era, Mary Ann Graf, Passes

Graf was a trailblazing female in the world of wine with many "firsts" to her credit. These include being the first woman to earn a degree in enology at UC Davis in 1965, the first woman winemaker of the modern era in California and the first woman on the Board of Directors of the American Society for Enology and Viticulture.

FedEx Hold-at-Location Option Reaches Wine Industry

ShipCompliant by Sovos and Commerce7 announced the integration of FedEx's HAL delivery options into an e-commerce platform to provide customers a "hold at location" delivery suggestion if they're uncertain they'll be able to receive and sign for the wine.

Wine Industry Loses Wine Importer Edward Lauber

Lauber passed away after a long illness. Lauber's company, Lauber Imports, carries fine wines from Europe, California, South America, and Lebanon.

Researchers Discover How Grapevine Red Blotch Virus Harms Vines

Grapevine Red Blotch Virus harms vines by inhibiting photosynthesis in leaves, UC Davis researchers said in Journal of Agricultural Food Chemistry article. They found infected wine grape vines cannot conduct water effectively; as a result, sugars created by photosynthesis are left on the leaves. The fruit eventually accumulates less sugar and produces low-quality wines.

MARCH

Lisa Shara Hall Dies

Lisa Shara Hall, a senior editor for Wine Business Monthly for more than a decade, died peacefully at home at 66 after a long illness. Shara Hall wrote for the Oxford Companion to Wine, Decanter, and the Hugh Johnson Pocket Guide, and was the author of "Wines of the Pacific Northwest."

Napa Valley Vintner John R. Shafer Dies at Age 94

Longtime vintner, philanthropist and winery founder, John Shafer passed on March 2, 2019. Shafer was part of a groundbreaking generation that came to Napa Valley in the late 1960s and early 1970s and transformed the region into a world-class wine producing area.

Michael Lynne, Film Executive and Owner of Long Island's Bedell Cellars, Dies at 77

Under his oversight, one of the East End's founding wineries became a leader in quality and sustainability in New York.

BC Wine Industry Unveils a 10-year Strategic Plan

Wine BC 2030 includes five pillars and a dozen strategic recommendations to move the province's industry forward. The core is a vision statement developed over six months following 30 meetings in 12 locations with 650 members of industry and other stakeholders.

The Family Coppola Goes to Oregon

The Family Coppola unveils Domaine de Broglie, Francis Ford Coppola's latest vineyard and winery acquisition in Oregon's Dundee Hills, formerly Vista Hills Winery.

Vintage Wine Estates Closes Purchase of Laetitia Vineyard and Winery

Santa Rosa-based Vintage Wine Estates bought in San Luis Obispo County, to expand its footprint in California's Central Coast.

APRIL

Gallo Announces Deal to Buy Brands, Wineries from Constellation Brands

Constellation Brands announces the sale of more than 30 of its less expensively priced wine brands to E&J Gallo for $1.7 billion, although consummation of the deal stalls amid questions by the Federal Trade Commission, reportedly about brandy and sparkling wines priced under $10. The deal includes five very large wine production facilities.

Huge Wholesalers End Merger Talks

The huge distributors decide to move on, due to the Federal Trade Commission dragging its feet. Republic National Distributing Company and Breakthru Beverage opted to withdraw their application to the FTC.

Free Flow Triples Footprint

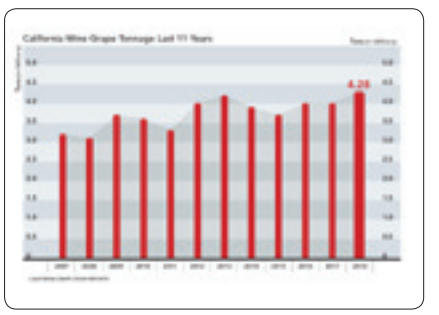
Free Flow Wines moved into 56,000-square-foot space in Sonoma, California, filling kegs for 145 wineries and 260 brands going to 5,000 restaurant, bar, stadium, concert hall and hotel accounts.

Portocork Unveils Napa Facility

Portocork America unveiled a 55,000-square-foot facility in Napa Valley, its North American headquarters. The facility increases usable square footage by a third, housing the operation under one roof.

California Crushed 4.3 Million Tons in 2018

The California Agricultural Statistics Service releases report showing the state crushed more than 4.28 million tons of winegrapes in 2018—up 7 percent over 2017.



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Top Stories

MAY

Twelve Livermore Valley Vineyard Districts Charted

The Livermore Valley Winegrowers Association completes scientific study dividing the Northern California wine-growing region into 12 sub-districts based on topography, soils and micro climates. The association has not applied for recognition of the districts as American Viticultural Areas, but begins sharing the district concept to emphasize the diversity and potential of the 260,000-acre AVA.

Oregon Senate Passes Bills Protecting Oregon Pinot Noir Identity, Grape Regions

The Oregon Senate passes bills protecting the brand identity of Oregon pinot noir wines and the specific regions in which grapes are grown for that wine

JUNE

Napa Limits Use of Propane Cannons in Vineyards

Winegrape growers in Napa County who want to use propane cannons to shoo away birds from their vineyards must abide by new rules—or risk a fine. Napa County votes to allow propane cannons a few hours a day after veraison. The machines will have to be off at night when the birds roost.

ROC-Sonoma Hosts Inaugural North Coast Meeting

The non-profit Research Oenovation Collective, ROC, established to advance practical winemaking with a collaborative platform for applied research and innovation, hosts first regional meeting in Sonoma.

Ruling Expands Wine Shipping Options for Florida Consumers

The National Association of Wine Retailers alerts members that they may begin legally shipping wine directly to consumers in the state of Florida using common carriers such as FedEx and UPS. A ruling by the Florida Department of Alcoholic Beverages and Tobacco overturned a decades-long ban on consumers receiving wine shipments from out-of-state wine retailers

Supreme Court Affirms Sixth Circuit Ruling Striking Tennessee's Residency Requirement

The U.S. Supreme Court affirms a ruling striking Tennessee's residency requirement for wine retailers. The court ruled that "Because Tennessee's 2-year residency requirement for retail license applicants blatantly favors the state's residents and has little relationship to public health and safety, it is unconstitutional," the court writes.

Wine Set to Flow Freely Between Canada's Provinces

Canada's wines may flow unimpeded between provinces, thanks to an omnibus bill passed in June. It overturns provisions of the Importation of Intoxicating Liquors Act of 1928 that delegated control of liquor to Canada's provinces and territories

JULY

Napa Valley Vintners Become First North American Wine Trade Association to Commit to Porto Protocol

Building on a legacy of environmental leadership and their mission to "Promote, Protect and Enhance" the Napa Valley, the Napa Valley Vintners (NVV) Board of Directors to become signatories of the Porto Protocol.

IN SUPPORT OF

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Ste. Michelle Wine Estates Purchases Calistoga Vineyard

Ste. Michelle Wine Estates purchased Greenwood Vineyards, a 56-acre vineyard located north of the town of Calistoga. Greenwood is expected to provide grapes for Stag's Leap Wine Cellars' ARTEMIS Napa Valley Cabernet Sauvignon.

BC Wine Pioneer Harry McWaters Dies

McWaters, co-owner of Time Estate Winery, founder of Sumac Estate Winery, and founding chair of the British Columbia Wine Institute, passed away unexpectedly in July not long after the first anniversary of his TIME Winery & Kitchen project.

AUGUST

Measure J Advocates Pull Cannabis Initiative from Napa County Ballot

Group behind a ballot initiative to allow the cultivation of commercial cannabis in unincorporated Napa County withdraws measure from March 2020 ballot. A moratorium is in place on the cultivation of commercial cannabis in the county until December that cannot be extended.

Texas Wine and Grape Growers Mourn Passing of Advocate

Bunny Becker, who diligently worked for the betterment of the Texas wine and grape industry, passed away.

SEPTEMBER

Nearly 100 Percent of Sonoma County Vineyards Certified Sustainable

Sonoma County Winegrowers announces that 99 percent of its vineyards are certified sustainable. The trade association also announces its next project—the launch of a pilot climate adaptation certification program to fight climate change.

Robert Craig Winery Founder Bob Craig Dies

Robert Craig Winery founder Robert (Bob) Craig passed away in Tucson, Arizona after suffering from Parkinson's. Craig began his career in wine at The Hess Collection in the 1980s before starting his winery. Craig spearheaded the official recognition of both the Mount Veeder and Spring Mountain District AVAs.

OCTOBER

Rombauer Vineyards Expands Production

The winery easily won the greenlight from the Napa County Planning Commission to boost production at its south Napa County facility by more than 36 percent, earning praise from commissioners for water-saving measures implemented at the plant. The Napa County Planning Commission approved Rombauer's plan to increase its wine production from 880,000 gallons to up to 1.2 million gallons a year.

Fires Rage Through Geyserville

The night of Oct. 23, the Kincade Fire started and quickly grew to 10,000 acres overnight, prompting evacuations and threatening Alexander Valley AVA vineyards. As of press time, the fire had burned nearly 80,000 acres and was 60 percent contained.

Wineries Destroyed in Kincade Fire

Soda Rock Winery, a Wilson property, and Field Stone, owned by Jackson Family Wines, were burned and destroyed; more than 200 structures were ruined.

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Mergers and Acquisitions:
Major Deals and Forecasts for 2020

Andrew Milanez

Andrew Milanez is a vice president with Zepponi & Company. Prior to joining Zepponi & Company, he worked for several leading investment firms in New York. After beginning his career in the high yield credit division of Lehman Brothers, he spent more than eight years as an analyst at Davidson Kempner Capital Management, a multi-strategy hedge fund. At Zepponi & Company, he plays an active role in the firm's core wine and spirit's practice, focusing on valuation and market analysis to drive successful transaction outcomes for clients. Milanez holds a bachelor's degree in Economics from the University of Pennsylvania's Wharton School, with concentrations in finance and accounting.

THE END OF 2019 is rapidly approaching, offering an opportunity to look back on wine industry merger and acquisition activity for the year and look ahead to key trends that will motivate transactions in 2020. Middling economic growth and favorable consumption trends for the U.S. wine industry provided an advantageous backdrop for the moderate levels of transaction activity in 2019. The base case economic outlook for 2020 is for continued moderate growth although risks to the downside continue to mount and merit caution. Transactions closed or announced so far in 2019 include a single mega-deal between two of the largest strategic players in the industry, alongside a number of smaller deals focused predominantly on luxury brands and vineyard assets. Premiumization of consumer preferences is forcing strategic players to adjust their brand portfolios in order to maintain relevance while increasingly challenging permitting requirements and the benefits of vertical integration, especially at the high end, continue to drive vineyard acquisitions.

Macroeconomic Issues Affecting Wine Trends

A key question for several years running has been how long the current economic expansion in the U.S can continue. This year has been characterized by moderate growth, despite mounting concerns of an aging economic recovery and increasingly acrimonious trade disputes between the U.S. and its trading partners. Gross domestic product (GDP) growth has held steadily within a range of 2 to 3 percent in 2019, consistent with the 2.6 percent average growth rate of 2018. On July 1, 2019, the current economic expansion reached a major milestone with its 10-year anniversary while also entering the record books as the longest expansion on record. National unemployment for the month ended Aug. 31 came in at 3.7 percent, within touching distance of lows not seen in more than 50 years. Consumers' balance sheets are likewise robust, for example, with the ratio of consumer liabilities to disposable personal income now nearly 30 percent below the most recent peak in 2007.

There are reasons to be more cautious heading into 2020, particularly if trade disputes remain unresolved and create mounting barriers to international trade. **The Federal Reserve** changed course in mid-2019 and cut its benchmark interest rate, suggesting it sees some risks to the economy. An inverted yield curve may also be a leading indicator of an approaching recession although this indicator has historically had a lead time of a year or more. Certain portions of the economy, such as manufacturing, have already cooled notably in the last six months. Pending home sales have also declined on a year-over-year basis for all but two months out of the year as of August 2019, signaling weakness in another important sector of the economy.

Despite the risks, consumer spending remains a bright spot. Retail sales have outperformed GDP growth through the first eight months of 2019. Strength in consumer spending has been a boon for the wine industry although long-term secular shifts are also having a meaningful impact. Ongoing "premiumization" observed in purchasing preferences is driving higher spending overall, albeit on flat volumes. Per **Nielsen** figures for the 12-week period ending Sept. 7, 2019, growth in dollar volume of wine sales has been concentrated overwhelmingly in price points above $12 per bottle, with flat sales or outright declines in categories below that bottle price. Overall case volume declined by 0.4 percent over the same period, with pricing contributing all of the 2.5 percent growth in dollar volume.

These consumption trends are favorable for producer margins but suggest it will become increasingly difficult to generate organic revenue growth going forward. Limited opportunities to grow existing portfolios should act as a further spur for merger and acquisition activity in 2020. Buyers will be likely to target those sub-segments of the market that are gaining share and experiencing volume growth, with notable categories being luxury brands, sparkling and Rosé varieties, and geographic areas with high-growth potential, such as Oregon and Paso Robles.

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Consolidation Within Value Tier

E&J Gallo Winery's pending $1.7 billion acquisition of **Constellation Brand**'s value-focused wine portfolio was announced in April and includes six wineries and approximately 30 wine brands. Those brands are primarily California-appellated and include **Black Box**, **Clos du Bois**, **Cook's California Champagne**, **Estancia Vineyards**, **Franciscan Estate Wine**, **Mark West Wines**, **Ravenswood Winery** and **Wild Horse Winery**, among others. Contrasting motivations for the buyer and seller are informative of the major industry trends at work. For Constellation, the transaction was driven by a desire to refocus its business mix towards higher-priced, faster-growing brands with more attractive margin profiles that should be accretive to its valuation multiple as a public company. For Gallo, the transaction gives them even greater scale in the sub-premium category, where it already has a leading presence. Proforma operating synergies and an acquisition multiple purported to be 6.5x EBITDA (earnings before interest, tax, depreciation and amortization) should allow Gallo to generate attractive cash returns from the deal despite a challenging growth outlook for the acquired brands.

Assuming the transaction clears regulatory hurdles, a notable side effect of the deal will be the high degree of customer concentration that grape suppliers will face in certain markets. Gallo will be increasing its market share of U.S. wine to approximately 22 percent following the deal, and share will be significantly higher in certain geographies and product categories. This will be particularly notable in areas, such as central California, that supply many of the sub-premium brands involved in the deal.

While the transaction was announced in April, it remains subject to review by the **Federal Trade Commission** (FTC) and now looks likely to close in the fourth quarter of 2019 or the first quarter of 2020 rather than May 2019 as originally forecast. Extended regulatory review of the deal has had an impact on sales trends for the brands being sold, as well as on M&A activity elsewhere. With two of the largest strategic players in the industry occupied by a single large transaction, they have been less focused on pursuing other deals where they might have otherwise looked to play a role. Looking ahead, Gallo will focuse substantial resources on integrating the deal in 2020. Constellation, meanwhile, has largely earmarked proceeds from the deal for debt repayment so is unlikely to make additional large-scale acquisitions during the coming year.

Continued Demand for Luxury Estates

At the other end of the spectrum, luxury Napa Valley estates continue to see strong demand, particularly those that are vertically integrated with compelling *terroir*, branding or historical relevance. Two notable transactions occurring in this category in 2019 were the sales of **BRAND Napa Valley** in January and **Grace Vineyards** in April. In both instances, they were acquired by high net worth individuals rather than strategic buyers. Elevated valuations for trophy assets such as these make it difficult for strategic buyers to justify an acquisition on financial grounds. Neither transaction rivals the scale of last year's acquisition of **Heitz Cellar** by **Gaylon Lawrence**, but they highlight that it remains a seller's market for trophy properties due to their very limited supply and competing interest from wealthy investors from outside the industry.

Located in Napa's famed Pritchard Hill area, BRAND Napa Valley was sold by the **Fitts** family to former **Apple** executives **Jim Beam** and **Christine O'Sullivan**. The purchase included the luxury brand that was launched in 2012, as well as related inventory, cellars and 15 acres of primarily Cabernet Sauvignon vineyards. The brand is limited to production of about 1,000 cases annually but carries significant prestige given its attractive location, high-profile neighbors, such as **Colgin** and **Ovid**, and consistently outstanding scores from wine critics.

Grace Family Vineyards was sold several months later, with the **Grace** family passing stewardship of the business they had owned for more than 40 years to former strategy consultant **Kathryn Green**. The transaction included the brand and inventory, as well as a winery, residence and small vineyard totaling less than 5 acres. The brand produces a modest 500 to 800 cases per year, including the secondary label Blank, but has an excellent track record that dates back to the 1970s. The current release of Cabernet Sauvignon is priced at $425 per bottle, reflecting its cult status and very limited availability.

Outside of Napa, the strong interest in luxury estates also extended to the sale of **Merry Edwards Winery** in Sonoma's Russian River Valley. The Pinot Noir and Sauvignon Blanc specialist was sold to French Champagne House **Louis Roederer** in February, with the transaction including brand and inventory, as well as a winery, tasting room and vineyards totaling 79 acres. In contrast to the small scale of luxury estates sold in Napa, the Merry Edwards brand had been scaled to nearly 30,000 cases annually at attractive price points averaging more than $50 per bottle. The favorable scale and margins offered a compelling financial rationale for the acquisition while also allowing Roederer to diversify its U.S.-based holdings outside of Anderson Valley where it has had a presence since 1982. The transaction highlights continued interest of foreign and especially European buyers in key U.S. winegrowing regions. We anticipate that this trend in high-profile, luxury wine brand transactions will continue into 2020.

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Pause in Private Equity and Pacific Northwest Activity

One key area in which M&A activity in 2019 differed from 2018 has been the limited involvement of private equity buyers. Private equity firms made major acquisitions in the wine sector in 2018, with deals for **Accolade Wines** by **The Carlyle Group** and **Kosta Browne** by **TSG Consumer Partners**. Both transactions totaled in the hundreds of millions of dollars. While private equity firms globally now have "dry powder," or available capital of a record $1.5 trillion, there have been no major transactions in the wine industry by this buyer group in 2019. Carlyle has, in fact, been divesting assets from Accolade in order to streamline the acquired portfolio, selling both **Stanley Winery** and **Knappstein Wines** to different buyers this past August. This pause from private equity buyers is likely to be temporary, with Carlyle and TSG expected to turn their attention towards growth after an initial period of integrating and streamlining prior deals. This category of buyer is typically among the most price-sensitive, however, so limited activity may also reflect a view that valuations are stretched in these later stages of economic recovery. Flattening growth in wine consumption also makes it less likely that new private equity entrants will be attracted to the industry in 2020, particularly when compared to the broader food and beverage category where hot trends, such as seltzer, kombucha or plant-based proteins, are seeing much more rapid growth and opportunity for investment.

Another source of significant deal activity in 2018 was transactions in the Pacific Northwest, which have also been less pronounced in 2019. Notable acquisitions in 2018 included **Foley Family Wines**' acquisition of the 150,000-case **Acrobat Winery** brand in Oregon, **The Great Oregon Wine Company**'s purchase of **Duck Pond Cellars** in Dundee, Oregon and **Farmland LP**'s purchase of the 6,000-acre **Weidert Farm** in Washington's Walla Walla Valley. In 2019, the only transaction of significant scale involved **Vintage Wine Estate** purchase of the 60,000-case **Owen Roe** and Owen Roe's **Sharecroppers** brand. Announced in September, the transaction included tasting rooms in Oregon and Washington, as well as 90 planted acres. In August 2019, Foley Family Wines also announced the acquisition of the Huntington Hill vineyard in Oregon in order to add to its holdings in the area, but the 21 vineyard acres acquired in the deal are incremental, rather than transformative, for Foley.

Oregon remains a market with significant ongoing growth potential. For the year-to-date period, both sales and case volume in the state have grown at a mid-teens percentage rate, according to Nielsen data. Such growth is well in excess of the flattish industry-wide trends for wine. Given these favorable trends, we would expect further deal activity to target the region in 2020.

Other Notable Transactions

In addition to the numerous transactions involving brands and integrated estates, 2019 was an active year for vineyard transactions. This category of assets benefits from a broader buyer base because of its attractiveness to both strategic and financial buyers. Notable buyers included both **TIAA-CREF Asset Management LLC** (a teachers' insurance and annuity association) and Foley Family Wines, for example, with the former focused on generating attractive returns for pension fund members and the latter pursuing vertical integration in support of existing wine brands.

Geographically, Napa Valley remained a prime region for vineyard acquisitions. The largest transaction in terms of vineyard acres was **Hess Family Estates**' acquisition of the 420-acre **Iron Corral Vineyard** in Pope Valley. Other notable transactions included **Ste. Michelle Wine Estates**' acquisition of Greenwood Vineyard in Calistoga, Heitz Cellar's acquisitions of **Wildwood Vineyard** in Rutherford and **Haynes Vineyard** in Coombsville, and TIAA-CREF's purchase of **Jaeger Vineyards** in Oak Knoll. Outside of Napa, the acquisition of **Laetitia Vineyard and Winery** by Vintage Wine Estates highlights a steady stream of investment in the Central Coast region.

Outlook for 2020

Looking ahead to 2020, the state of the economy will remain a key factor to monitor closely. Barring a significant change in trend, 2020 is expected to be a balanced market with similar levels of transaction activity. Buyers of brands and integrated producers are likely to be increasingly selective due to softening secular growth trends for wine consumption while buyers of vineyard assets are also likely to factor oversupplied grape markets into the prices they are willing to pay. Nonetheless, evolving consumer preferences and the growth opportunities they create should continue to motivate tuck-in acquisitions from both strategic and private equity players.

In another key trend to watch, some strategics may become sellers of significant assets in the same vein as Constellation's portfolio sale to Gallo. **Pernod Ricard** has reportedly been weighing up a sale of its wine division, which includes **Kenwood Vineyards** in Sonoma, as well as **Campo Viejo** in Spain and **Jacob's Creek** in Australia. Pernod's wine division is less profitable than its spirits portfolio, and a divestiture may lessen shareholder pressure from activist investor **Elliott Management**. Speculation has also arisen that tobacco conglomerate **Altria** may be tempted to test the strength of the market with an offering of Ste. Michelle Wine Estates. Large transactions such as these, have the potential to materially reshape the wine industry landscape over the coming year as long as continued economic growth extends the current window of opportunity a bit further. **WBM**

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Top People Moves

Nicole Carter

president | Merry Edwards Winery

Maison Louis Roederer appointed **Nicole Carter** as president of **Merry Edwards Winery** starting October 15, 2019. In her new role, Carter is responsible for all business activities and will work closely with head winemaker **Heidi von der Mehden**. Carter will worked hand-in-hand with **Merry Edwards** to ensure a smooth and successful transition to the next chapter of the life of the winery. Carter was previously chief marketing officer and director of winemaking for **Hess Family Wine Estates**, leading global marketing initiatives, new product development and winemaking across all California and Argentina brands in their portfolio.

Leticia Chacon-Rodriguez

winemaker/winery manager | UC Davis

Leticia Chacon-Rodriguez began her new role as winemaker/winery manager the **UC Davis** LEED Platinum-certified teaching and research winery for the **Department of Viticulture and Enology**. As winemaker, Chacon-Rodriguez oversees crush operations and wine production from grapes sourced from UC Davis vineyards, teaches enology students about winery operations and wine production, and assists faculty and researchers with winemaking research projects and trials. She most recently was director of operations at **Safe Harbor Wines** in Napa that provides wine blending, aging, micro-oxygenation and oak management, and storage services for wine production clients.

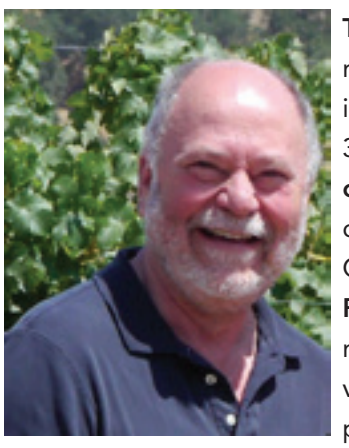
Rob Davis

winegrower | Jordan Winery

Jordan Winery announced a big change to its winemaking staff. **Rob Davis**, who has worked at Jordan since the inaugural 1976 harvest and is considered the longest-tenured winemaker in Sonoma County, transitioned into the newly created role of winegrower at Jordan, effective July 1, 2019. He has turned over lead winemaking and management responsibilities to **Maggie Kruse**, who has worked alongside Davis for the last 13 harvests. Kruse joined Jordan in 2006, working closely with Davis on wine quality improvement programs initiated by John Jordan. She was promoted from enologist to assistant winemaker in 2009 and began overseeing all aspects of barrels and bottling. She also took over day-to-day management of the cellar that year.

Doug Fletcher

retirement | Terlato Wine Group



Terlato Wine Group (TWG) announced the retirement of **Doug Fletcher**, one of the wine industry's most respected winemakers, after 32 years. After graduating from the **University of Oregon**, Fletcher started his winemaking career at **Martin Ray** in California's Santa Cruz Mountains. In 1986 he joined **Chimney Rock Winery**, overseeing the property and managing the replanting of the original estate vineyard, as well as 65 acres of subsequent plantings. In 2006, Fletcher was promoted to vice president of winemaking; overseeing the winemakers and viticulturists for all of the Terlato's family owned brands including **Alderbrook**, Chimney Rock, **Rutherford Hill**, **Sanford Winery & Vineyards** and **Terlato Family Vineyards**.

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Robert Hanson

president | Constellation Wine & Spirits

Constellation Brands, Inc. appointed **Robert Hanson** as the company's new executive vice president and president, wine and spirits. Hanson previously served as a member of Constellation's board of directors from February 27, 2013 to April 24, 2019. Constellation's Board accepted Hanson's resignation from the board prior to his acceptance of this new role with the company. Hanson officially assumed the role on June 3, 2019. Hanson brings consumer product goods and senior management experience to this role, having served as chief executive officer at **John Hardy Global Limited**, a leading global luxury jewelry brand, where he will continue to serve as the company's board chair.

Camron King

executive director | Sierra Vintners Association

The **Sierra Vintners Association** retained **Camron King** to serve as the association's executive director. Working with the **California Association of Winegrape Growers** (CAWG), the **Lodi Winegrape Commission** and **National Grape & Wine Initiative** (now **National Grape Research Alliance**), King brings a number of different experiences from marketing and public relations, research, and government affairs together with overall membership development, education and association management together to bring value to the SVA.

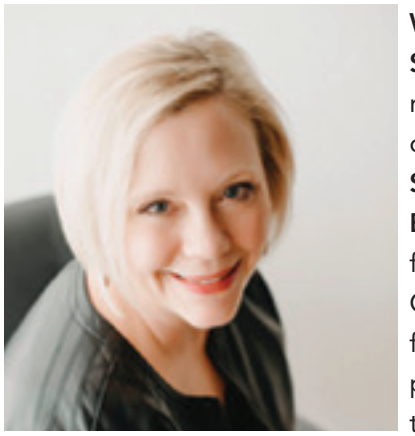
Angus McPherson

president, Americas | Treasury Wine Estates American Operations

As of August 2019, **Angus McPherson** has taken over the role of president—Americas and global sales. He will lead the Americas business and drive sales strategies across TWE regions. He succeeds **Victoria Snyder**, who left the company on Aug. 19, according to the company. This news came shortly before the company announced the departure of CEO Michael Clarke.

Anna Mosier

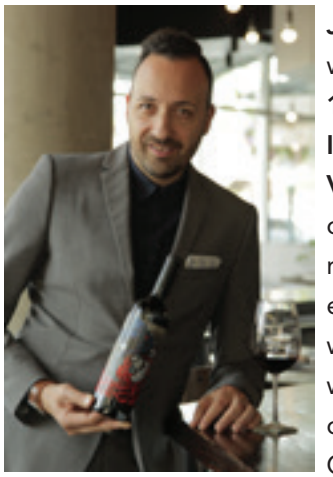
president | Wines of Substance



Wines of Substance founder **Charles Smith** announced **Anna Mosier** as its new president, leading the entire Wines of Substance portfolio of **K Vintners**, **SIXTO**, **ViNO CasaSmith**, **Substance** and **B. Leighton**. She came to the company from **E&J Gallo Winery** in Modesto, Calif., where she was vice president of finance for the premium wine business, providing financial oversight and strategic guidance for over 40 brands.

Juan Muñoz-Oca

executive vice president of winemaking, vineyards and operations | Ste. Michelle



Juan Muñoz-Oca, former vice president of winemaking for **Ste. Michelle** overseeing **14 Hands**, **BORNE of Fire**, **Columbia Crest**, **INTRINSIC**, **Northstar** and **Spring Valley Vineyard** was named executive vice president of winemaking, vineyards and operations responsible for all of Ste. Michelle's facilities, effective Jan. 1, 2019—succeeding **Doug Gore**, who retired after an acclaimed 36-year career with the wine company. Muñoz-Oca will report directly to the company's new president and CEO **Jim Mortensen**. **Bob Bertheau**, who was promoted from vice president of winemaking to senior vice president of winemaking, will report to Muñoz-Oca. **WBM**

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WINE BUSINESS MONTHLY

Winemaking Roundtable:
New Winemaking Techniques

Lance Cutler

IN THE 1970S AND 1980s many of us didn't know a lot about winemaking. Winemaking methods were traditions or habits passed down by others, without a lot of scientific research to confirm what was happening. But today, winemakers constantly receive new, data-driven information about how to improve their wines.

Wine Business Monthly is always interested in the newest winemaking techniques and technologies. We want to know how winemakers find out about them, what entices them to conduct trials and how they evaluated effectiveness of those innovations.

We met with **Steve Price,** who owns a consulting firm (**Price Research Services, Inc.**) and vineyard in the Willamette Valley. He developed phenolic assays offered by **ETS Laboratories**, where he has consulted since 1995. Price has a degree in pomology from **UC Davis** and spent 12 years doing research while earning his Ph.D. from **Oregon State University**.

Barry Gnekow has a long and varied history in the wine business. He earned a B.S. and M.S. from UC Davis, conducted research for **Paul Mason** and sold wine in a wine shop before getting a job at **J. Lohr Winery**, where he worked until 1996. One of the first to use reverse osmosis to remove alcohol from wine, Gnekow created the **Ariel** non-alcoholic wine brand. He has been consulting since 1998 and started using flash détente in 2009.

Barry Gnekow

Lance Cutler has been a working winemaker in Sonoma County for 35 years. He has been a contributing editor for *Wine Business Monthly* for more than 10 years. His unique perspective on winemaking has led to our Industry Roundtable series and our Varietal Focus series. Lance is also the author of four books, including *The Tequila Lover's Guide to Mexico*.

Steve, tell us about the tannin assay you developed for ETS.

Price: In 1995 I came to ETS with a method to measure a range of phenolic compounds, including tannin, that I had developed at Oregon State. The question was, "How do we sell this analysis? How would you use it? What was it good for?" I wasn't really sure. I had done a lot of vineyard comparisons and a lot of winery tracking, so I knew it could measure things. But figuring out how to actually use it took a long time.

At the same time that I came out with this process, **Doug Adams**, co-creator of the Adams-Harbison assay, came out with his assay for measuring tannin using protein precipitation. They correlate roughly, but the Adams-Harbison assay measures protein precipitable tannins, and the ETS assay measures large phenolic polymers. The Adams assay is closely related to astringency. The ETS assay is related to long-term color, body and other factors. There are other players doing similar tests, each measuring different factors.

Our initial product measured 12 compounds, but it eventually proved too confusing for our clients. I ended up picking four compounds out of the list: tannin, catechin, total anthocyanins and pigmented tannins, which we called polymeric anthocyanins. We offered same-day results; having a tool that gave instant results changed the whole program. It quit being a research thing and started being a production tool. The analysis took off.

We also developed a grape extraction protocol to use with the faster phenolic assay. Now wineries send us grapes, and we do the extraction and send them results. We did a lot of work on sampling. Phenolics are much more variable than other winegrape components. Brix may range from 21 to 24, but the front and back side of a sun-exposed cluster can have a ten-fold difference in tannin. We recommended whole cluster sampling and sending grapes in a large 250-gram sample. The skin to juice ratio is important, so the berries must be intact.

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SCOTT SUMMERS

BARRY GNEKOW

Barry Gnekow installed a flash détente system at Carneros Vintners to help elevate the quality of his blends at a reasonable price point.

I had hoped that this would help us predict tannin, but what I learned was that tannin is very high in unripe grapes, decreases as grapes ripen and then increases again. Absolute tannin values don't tell you much; you have to know where you are in the ripening process. Now we have a better handle on that. You need to look at seed ripening separate from skin ripening, which we do with catechin as a marker for seed ripening.

The main benefit is educational: understanding the grape ripening process. Second, it will predict potential problems. Mostly those concerns are with potential low-color grapes or with too much seed tannin extraction. Grapes that are underripe may have high Brix; but if they have extractable seeds, the winemaker may be surprised by tannin levels in the finished wine.

Can you predict the quality of wine from a vineyard before flash détente?

Gnekow: I am always thinking about where the wine will be going. With the red barrel-ferment, we never bottle a 100 percent red barrel-ferment. The other components of that blend are not known at harvest time, but I know that the barrel-ferment portion is going to be a positive thing that helps determine the quality of the actual finished wine. A Paso Robles barrel-ferment will be different from a Napa Valley hillside barrel-ferment. The price will also be different, depending on the cost of the grapes.

Red barrel fermentations, after coming out of flash, comprise 90 percent of what I do. Using flash détente, you crush into a buffer tank and add some stabilizing tannins. The theory behind the flash is that every cell has a vacuole that holds water. It expands and contracts, depending on how thirsty or how dehydrated the cells are. If you heat the grapes instantly to 180° F and send them into a vacuum chamber, the vacuoles will turn to steam, and the steam opens the cell, allowing everything to escape. That is the basic theory.

All the action is in the 1 to 2 micrometers of skin. That is where all the flavor and color of the grape are located. The skin is a very small amount of the grape, yet you spend your whole year trying to cultivate 1 millimeter of tissue that gives you the difference between specific vineyards and appellations. So, the flash focuses in on that layer of skin. The rest of the grape is just pulp, sugar and water, basically. All the focus in the flash process is on the skin and extracting from that skin. Once the grapes pass through the flash, all the vacuoles are wide open. From there it goes to the press, and then we go to barrel.

With flash, your juice has all the color and all the tannin, and it is going to start fermenting within six hours because it comes out of the flash between 80° F to 90° F. It is ready to go as all the competing microbes have been eliminated.

That's what is going on technically, but I am trying to get a wine that will elevate the quality of my blends at a price point that makes it work. Using this technology, we can barrel-ferment red wine at a cost that allows wineries to retail the finished wine for under $20. You don't need to take the heads off the barrels. You pump the juice into the barrel just like you would Chardonnay.

Price: I've looked at flashed wines analytically, and they are interesting. You could certainly look at grapes before harvest and come up with an idea of what the final flash value would be. You would also have an idea of which vineyards give what levels of phenols. The extraction happens very differently than in a normal fermentation, which is a fairly slow process that happens over weeks. In flash, everything comes out quickly. Most of the phenolic extractions are done when it goes into tank.

The application of analysis to that is very different. You wouldn't ask if you should oxygenate during fermentation to modify anthocyanins because you are no longer extracting. It's already happened.

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Is this the same system winemakers are using to assess extraction during cold soak?

Price: We have to switch gears. We have been talking about grape phenolics so far. When you get into wine, it is a different ballgame. The grape is a predictive tool about what might happen. When you are analyzing wine, it's about what is happening. The information is used very differently. Phenolics start to be extracted into wine right at the start. As soon as there is juice, there are phenolics and tannin.

You can measure how much tannin, how much seed phenolics are being extracted, and you can measure tannin modification. Those are the three things people pay the most attention to. We use catechin as a marker for seed tannin because it is only in seeds. In a ferment, you don't even get seed extraction until the alcohol starts to rise. Skin extraction starts sooner, right after crush.

We use ratios to describe what kind of tannins are present. The catechin-to-tannin ratio tells you how much of the tannin is coming from seeds. The higher the ratio, the more seed extraction. The polymeric anthocyanin/tannin ratio tells you how much the tannin is changing. It changes more the longer you wait to pick. You can measure the tannin modification as the grapes ripen, and it changes in a fermenter as you influence anthocyanin/tannin interaction, and you do that primarily with oxygen.

The polymeric anthocyanin/tannin ratio was about 0.06 in Napa Cabernet 12 years ago. Now it is about 0.08. That's because there has been a large-scale introduction of venturis into pump-over lines to incorporate air into the ferment. People are realizing that oxygen in a ferment is nice for the yeast, but also changes the tannin, adding anthocyanins to the tannic structure and rounding out the mouthfeel. As a result, clients will use our assay to hit target ratios.

When you use micro-ox, you are using it during fermentation, but many people use it during aging. With flashed wines, is micro-ox used in aging?

Gnekow: You can, but the normal process of being in the barrel takes care of that. It has phenolics and tannins from the process itself, so it ages beautifully in the barrel, and we keep it in barrel for two years. The type of barrels you use has an influence. The secret lies in the type of wood and the type of barrel. Heavy toast barrels don't work. Medium toast works best. A used barrel with an insert is very good, but a brand-new barrel, after a year, surpasses any barrel with stave inserts. There is no question, it gets better. But a new French oak barrel costs $900 to $1,000, and a used barrel with new French oak inserts is much cheaper.

Price: The release of phenolics starts right at crushing. You see the anthocyanins in the color of juice, but even tannins come out early. People might start monitoring at the end of cold soak, but it is more common for people to start measuring once fermentation starts. Most people try to analyze around a decision. Many of our clients measure around 12° and 8° Brix. What they are looking

for is a trajectory for the speed of extraction and a guess of where that wine will end up at dryness. If your final tannin target is 1,000 mg, which is typical for a Napa Cabernet, you might be at 200 mg at 12° Brix, which is fairly low. If your next sample is only at 400 mg, then you are not going to make it by dryness. You are going to have to manipulate the ferment to come closer to your target.

Similarly, you might be at a 1,000 mg at 5° Brix in which case you might have a problem if you are trying to maintain that tannin level. That happened in 2013 where tannins were readily extractable across the North Coast, and wineries overshot their targets. Had they been tracking tannin extraction, they might have chosen to press earlier.

Gnekow: That's not really a consideration in flash, which extracts all those compounds before fermentation. In flash, the grapes go into the chambers, the steam that comes out of the vacuoles goes up to the top, and we condense it. We call that the flash water. It is usually from 5 to 10 percent, so we are concentrating the juice. It is like saignée, except you are removing water. You've reduced your volume by 5 or 10 percent.

It's fascinating that in the flash water you have things going on in your vineyard that you didn't know about, and you can smell them. You can smell the wild animals that come around at night. You can smell the dairy farm a mile up the road. You can smell the almond orchard next door. You can smell the diesel and gasoline exhaust from busy roads. That's what made flash so effective at reducing smoke taint. It [smoke taint] is a volatile compound in the grapes that can be removed by the process. The flash water always seems to contain negative compounds. There is never anything pleasant in there. I tell winemakers, "If you do this, you will never look at a vineyard the same."

In France, when I talk to winemakers, they talk about *terroir* as encompassing everything: the horse that walks the vineyard, the bakery down the street, the way the wind blows across the lake. In the U.S. we are real estate developers. "This is *my* soil. This is *my* land. *My* vineyard is like this because the soil is like this," and they ignore all the other things blowing around, affecting the vineyard. I call it "air-roir" in the *terroir*.

In a traditional fermentation, what can winemakers do in the face of tannins being extracted either too quickly or too slowly?

Price: The tools that people use to interact comprise the winemaker's art. There is a broad range of tools. People like punchdowns, but they are only moderately extractive. Fermentation temperature is very important. A 3- or 4-degree difference in temperature during fermentation has a big impact on the amount of extraction that occurs. Rack and return is a good extraction tool if tannins are low. What is really going on in a rack and return is a very distant relative of flash: You are draining the fruit, which is breaking apart from its own weight. Once it is not floating, you crack open the berries, and it becomes much more extractable.

When you get close to the end of fermentation, it is about when to press and whether you should use an extended, post-ferment maceration. Press early if you already have enough tannin or extend the maceration if you need more. Often an extended maceration will not give more tannin because you have already extracted most of the skin tannin; however, it might still change the mouthfeel.

Many winemakers say they just taste to decide when to press or when to make press cuts.

That's one of the problems with tannins. You ask what a wine tastes like out of flash or mid-ferment—it tastes sweet. Sugar masks tannins. It is difficult to taste tannins when the wine is sweet. When it is dry, you have a better idea. That is why it is useful to have phenolic measurements. Twenty years ago, no one measured phenolics during a ferment. Now, it is extremely common.

Gnekow: With flash the only issue is seed tannins, which is dependent on whether we press immediately after flash or let it sit for a while first. Now, depending on the grape, we may let it sit a few hours or up to three days before pressing; and as I've said, it starts fermenting within six hours of flash.

The number one advantage to flash wines is that they allow you to red barrel-ferment at a price you can afford. That process brings out softer tannins so you don't get any harshness. You get much more color and depth, but the bigness and broadness of the wine seem to come across better in traditional ferments. That's the way the mouthfeel works. A 100 percent flash wine seems to lack that big, broad mid-palate. A combination is the best and can generate a vertical sensation in the palate that is subtle but sublime. I filed and received a patent on this in 2018.

How can you deal with all these factors in wine that is aging?

Price: I strongly believe that most of the phenolic character of a wine is done by the time you drain and press. After that, you are fine-tuning. If you are going to spend money on analysis, concentrate it on understanding your fermentation and extraction while the wine is on the skins. After that, you can still modify the wine with oxygen or oak additions, but the key is building a wine during fermentation. Wine changes with age but not as much as it does in the days during fermentation.

Gnekow: Red barrel fermentation makes your wine more approachable early. It integrates the oak instantaneously when you blend it into your wine. You don't have the oak on one side and the fruit on the other. It tastes like it has already been in the bottle for six months to a year. If you have a large brand and are aging wine in tanks with staves, then this red wine barrel-fermented wine using flash technology can dramatically improve your wine blend and do so at a price point that keeps it under $20.

If winemakers read this story and are interested in following up with you about phenolic testing or flash détente, what would you tell them to sell them on the technology?

Price: I tell them that there are no right answers in phenolics. It is a style question. I tell them that phenolic numbers have no right answers. Again, it is a style question. You need to develop your own targets. We might do vertical tests on their last five vintages. From that, we can look at the numbers and see which numbers correspond with what they prefer stylistically.

Once you have numbers, you can start to make a connection between your palate and analytical results. Unless the winemaker knows what that number means sensorially, it's not a routine tool that they will use year after year. When a winemaker consistently uses phenolic analysis, it is because they understand how the numbers relate to what they taste.

Gnekow: (*Barry pulls out sheet after sheet of reviews.*) Ninety points *Wine Spectator*. Ninety-one points *Wine Enthusiast*. **Robert Parker** 93 points. Robert Parker, 95 points. Numbers! We talk numbers because, at the end of the day, that's what gets your sales. Numbers get people and key buyers excited about the wine. This flash détente barrel fermentation is kind of an industry secret. People don't understand it. They see these two pieces of stainless steel and are unmoved. Then you open the barrel room, and they see and smell the fermenting Cabernet going on in barrels, and they taste it and love it. Even our bankers relate to the barrels.

Price: I need to say we never talk about points. We say this is a stylistic choice of the winemaker. We don't advocate a style or claim that these tests represent a potential score.

Gnekow: Another possible perk is that when new and innovative technologies, like flash détente, are utilized in wine production, it's possible that R&D tax credits can be applied if qualifying parameters are met.

Flash détente is an amazing tool, and it certainly makes fermenting red wine in a barrel easier. But is it applicable for high-end winemaking or does it change the stylistic equation too much? Having a system that allows us to track tannins and anthocyanins throughout a working fermentation could help us make great wines, but only if winemakers can interpret those numbers and relate them directly to the style of wine they are trying to make.

Winemaking has always been a give and take endeavor. It is passion and creativity, working together with science and experience, to create something truly special in a bottle. When science and technique are managed by winemakers in service of their style and attuned to the unique character of their vineyard *terroir*, that's when we achieve magic. **WBM**

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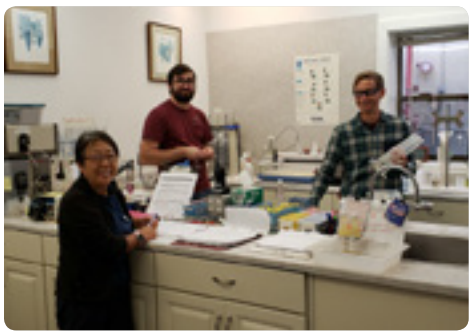

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Wine Management Strategies, from Fermentation to Stabilization

UCD Seminar Examines Production Processes and Effects on Wine Quality

Ted Rieger

Ted Rieger, CSW, is a Sacramento-based wine journalist and a writer for wine industry media since 1988.

TED RIEGER

Lydia Cummins, Ramey Wine Cellars

Jillian Johnson, Onesta Wines

Tondi Bolkan, Francis Ford Coppola Winery

Signe Zoller, Zoller Wine Consulting

A SEMINAR AT THE University of California, Davis (UCD) presented earlier this year by the Department of Viticulture and Enology (V&E) reviewed research and current knowledge about several key steps in the wine production process and their impacts on wine quality. Production steps covered were: fermentations, including impacts of *Saccharomyces* and non-*Saccharomyces* yeasts, native yeasts and nutrient additions; the type, size and shape of fermentation vessels; wine filtration options and impacts; and wine stabilization processing options.

Overview

UCD Cooperative Efxtension specialist in enology and seminar moderator Dr. **Anita Oberholster** provided an overview of wine management and impacts on wine composition and quality. Oberholster listed characteristics of wine quality: balanced with no faults; good and balanced levels of acid/pH, residual sugar, body and flavor; and multi-dimensional with complexity. "Higher quality wine is associated with more layers of complexity and how the wine evolves in the mouth," Oberholster said.

Hundreds of aroma compounds can be found in wine. Oberholster listed three main sources of aroma compounds and examples from each:

- **Primary aromas are from grape-derived compounds:** monoterpenes (floral, fruity); norisoprenoids (floral, perfumy); methoxypyrazines (bell pepper, asparagus); and thiols (fruity).
- **Secondary aromas are yeast and fermentation-derived:** esters and higher alcohols (fruity); volatile phenols (leather, barnyard, spicy); and sulfur (corn cabbage, onion, rubber).
- **Tertiary aromas are aging and oak-derived:** furan derivatives (toasty, caramel); and lactones (coconut, woody, vanilla).

A focus of the meeting was on yeast and fermentation management. When using activated dry yeast, performance depends on the health of the starter culture and the fermentation environment, including temperature, fermentation duration, type and concentration of solutes, and the yeast's genetic background. Oberholster said temperature is the most important parameter for yeast and fermentation performance. Optimal temperatures for yeast activity are generally from 35° C to 43° C (95° F to 110° F), although winemakers should pay attention to temperature tolerance ranges in yeast supplier specifications.

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"Choice of yeast strain has the largest impact on wine aroma profiles and the production of esters, higher alcohols, volatile fatty acids and volatile sulfur compounds," Oberholster said.

Nutrient and nitrogen (N) management and additions are important in managing fermentations. N additions impact the concentration of aroma compounds. Large additions of diammonium phosphate (DAP) can increase volatile acidity and ethyl acetate. "In general, yeast-derived aroma compounds increase with increased initial N concentration. Studies show there is reduced production of volatile acidity and sulfur compounds if N is added at the end of the growth phase," Oberholster observed.

Impacts of Non-*Saccharomyces* Yeasts on Wine Quality

V&E Department assistant professor and microbiologist Dr. **Ben Montpetit** discussed the microbiological aspects of wine fermentations with a focus on non-*Saccharomyces cerevisiae* yeasts that have gained interest with some winemakers for their potential to add different characteristics and complexity to wines.

Microbial populations tend to be more diverse, and more species of non-*Saccharomyces* yeasts present, in the earlier stages of fermentation. *S. cerevisiae* tends to dominate in the middle to later stages of fermentation. Timing of inoculation can affect a fermentation and the sensory impacts in the resulting wines. Some yeast suppliers now offer mixed yeast cultures for co-inoculation, or products to use as serial or sequential inoculations of different yeasts.

Montpetit listed several yeast species that have appeared in research literature and studied in lab trials with examples of their potential impacts:

- *Starmerella bacillaris* does not produce excess acetic acid in high sugar musts. It has a strong preference for fructose, producing lower amounts of ethanol and higher amounts of glycerol.
- *Hanseniaspora uvarum* can be a low producer of aldehydes and volatile phenols.
- *Lachancea thermotolerans* can produce large amounts of the volatile thiol 4-mercapto-4-methylpentan-2-one (4MMP) in must (associated with tropical fruit aroma in Sauvignon Blanc).
- *Metschnikowia pulcherrima* can produce terpenes, but *S. cerevisiae* can later change the results of these effects.

Other potential impacts of promoting non-*Saccharomyces* yeast activities include lower ethanol yields, control of off-flavor production by spoilage microbes, release of mannoproteins, wine color stabilization and the use of non-*Saccharomyces* strains to replace traditional malolactic (ML) fermentation.

"If you use these non-*Saccharomyces* yeasts, you have to take these claims of impacts as a potential and realize results may and will vary," Montpetit cautioned. "Making connections between inputs and outcomes is very difficult."

He suggested, "If we want to alter fermentations toward our desired outcomes, it requires knowledge of the microbial community present, and we need to understand these interactions."

The major source of non-*Saccharomyces* yeasts is from the vineyard. "When the grapes come in, they can have a large variability in their microbial community," Montpetit said. "You can look at the early microbial population in the grapes or must to get an idea where the fermentation could go. If you want to promote non-*Saccharomyces* yeasts, your approach could be quite different based on the source of the fruit and the corresponding microbial populations. In addition, the microbial population can change significantly from year to year based on seasonal and environmental conditions."

Montpetit said non-*Saccharomyces* nutrient requirements are largely unknown based on research literature, although commercial suppliers may have some advice. "Nutrients developed for *Saccharomyces* may not be favorable for non-*Saccharomyces* yeast strains," he cautioned.

He listed four questions to ask in order to understand (or alter) a fermentation:

1. What microbes are actually present?
2. What activities could they perform?
3. Are they actually active?
4. What is the impact?

Two types of analyses are available to identify microbial species: DNA-based analysis and RNA-based analysis. Montpetit said, "DNA analysis suggests potential microbes and impacts, whereas RNA analysis indicates actual presence of microbes." He explained that DNA analysis will identify dead but non-viable microbial cells or microbes that may have been present at one time, in addition to live cells. "RNA analysis tends to give a better snapshot of what microbes are alive and active, but fewer commercial labs do RNA analysis," he said.

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Winemakers' Perspectives on Yeasts and Nutrient Options

A panel of experienced winemakers provided insights on yeast and nutrient options for fermentations.

Signe Zoller of **Zoller Wine Consulting** in Paso Robles said that, based on her research and years of experience, "Nitrogen alone may not prevent yeast cell death. Cell death is generally considered to result from ethanol stress impacting lipids and membrane integrity." She listed four micronutrients that can trigger cell death when they are in low concentrations and the fermentation is nitrogen-rich: ergosterol, oleic acid, pantothenic acid and nicotinic acid.

Nitrogen's preferences for yeasts are amino acids (except proline) and secondarily, ammonium. She noted that larger wineries commonly add DAP to must with low levels of yeast assimilable nitrogen (YAN) although some winemakers want to avoid DAP in favor of organic nitrogen additions. One caution with DAP is that it can increase production of higher alcohols (aromatic compounds), such as 3-methyl butanol (isoamyl alcohol), 2-methylbutanol, isobutyl alcohol and 2-phenylethanol.

Zoller provided the following general guidelines for a nutritional program:

- If YAN is below 150 mg/L, add just enough DAP, after inoculation, to achieve biomass. Add organic nutrients at 1/3 to 1/2 sugar depletions.
- If YAN is 150 mg/L or more, add organic nutrients at 1/3 to 1/2 sugar depletion to reach about 250 to 300 mg/L.
- Supplement with more DAP if more YAN is needed. Add 5 to 10 mg/L oxygen at the end of the growth phase.
- Normally, vitamin supplementation is not needed with grape musts, but it may be good insurance in some situations.

Jillian Johnson, proprietor and winemaker of **Onesta Wines**, has worked at wineries in Australia, South Africa and California over the past 20 years and used many types of nutrients. "Choice is often a personal decision based on past experience, costs and production flow," she said. Vitamins, minerals, lipids and amino acids are all vital to yeast viability. She is not opposed to using DAP, but tries to use it minimally. In her experience, organic and biodynamically grown fruit tend to come in with higher YAN, but it still needs organic growth additives. She adds organic N if the YAN is below 150 ppm.

Lydia Cummins, associate winemaker at **Ramey Wine Cellars** in Healdsburg, described how the winery utilizes native yeasts and native ML bacteria for all fermentations, which owner **David Ramey** started using as a common practice in the 1990s. "Our nutrient protocols are driven by native yeasts," Cummins said. With Chardonnay, the grapes are whole-cluster pressed soon after received, and the juice allowed to settle. Six hours after press, 40 ppm SO_2 is added. The juice is barrel-fermented, with stirring to suspend yeast. At 19° to 17° Brix, a nutrient slurry is added.

"It's *Saccharomyces* dominated, but different strains are co-mingled. It makes winemaking simpler without inoculating, and I can't remember the last time we had a stuck fermentation," Cummins said. "Primary and MLF are often completed sooner in new barrels as new barrel wood has its own nutrients," she added. Although Chardonnay is less of a problem, some varieties, such as a Kerner from Lodi, are lower in YAN and needs more nutrient additions.

Tondi Bolkan, winemaker for **Francis Ford Coppola** (FFC) **Winery**, related an experience from one of her early vintages with wooden upright fermenters and a particular yeast strain for inoculation to enhance phenolic profiles in red wine. Initially, the fermentations stuck, but they eventually were completed. "In hindsight, the tolerance temperature for that strain was 80° F, and the fermentations were too hot," she said, adding, "Read the vendor instructions and try not to put all your eggs in one basket."

Now at the FFC Geyserville facility, the winery is processing 10,000 tons of fruit with a higher throughput and turning tanks up to five times per crush. Monitoring temperature is a key factor, along with looking at phenolic extraction and other important fermentation and chemistry parameters. Bolkan summarized, "Use all your tools, read and use the vendor instructions for yeasts and additions, and use your lab. Monitor every fermentation tank by tank and day by day. They may require different temperatures, nutrients and protocols. Don't count entirely on experience from past vintages."

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Effects of Fermentation Vessels

Konrad Miller is a graduate student in the Department of Viticulture and Enology and the Department of Chemical Engineering. He presented his analysis of red wine fermentations related to temperature gradients and fermentation dynamics in jacketed stainless steel fermenter tanks of different sizes and aspect ratios.

He first explained that the contents of such tanks typically separate into two phases:

1. Bulk liquid (about two-thirds of the tank volume), a freely convecting liquid that exchanges heat with the tank jacket.
2. The cap, which is liquid and grape solids actively fermenting with poor heat transfer at the top of tank.

The tank sizes and aspect ratios he evaluated were 500 L and 50,000 L fermenters with a 1x1 height to diameter aspect ratio, and a 3x1 height to diameter aspect ratio; and 500,000 L fermenters with a 1x1 aspect ratio. He observed, "The aspect ratio matters, and the size matters." The cap is hotter in larger tanks, and overall tank temperature is higher. The "taller, skinnier" 3x1 fermenters maintain cooler temperatures than the 1x1 fermenters in the lower (liquid) part of the tanks. He compared temperature profiles in each tank, temperature gradient changes between pump-over intervals in the largest tanks and looked at active biomass and sugar levels in each tank at 240 hours. His red wine fermenter design conclusions were as follows:

- Red wine fermentation temperatures are a strong function of available surface area and vessel size.
- Cooler fermentations are generally "healthier" with better conversion at 240 hours.
- Industrial scale (500,000 L) fermenters may require external temperature control and more frequent pump-overs.

Miller also compared concrete "egg" fermenters with jacketed stainless steel fermenters of similar size and aspect to investigate anecdotal claims about concrete eggs regarding temperature profiles and internal mixing. He concluded: "Egg fermenters do not do a better job of temperature control and do not display faster liquid mixing velocity. A jacketed tank maintains better temperature control and better temperature homogeneity. The concrete egg shell serves more as an insulator than as a heat sink."

Filtration Options and Impacts

Viticulture and enology department chair and professor Dr. **David Block** presented research from the past 10 years regarding the impacts of commonly used filtration practices and media to address perceptions that filtration can strip wines of desirable aromas and flavors. The main reasons for filtration are to provide wine clarity and microbial stability in the bottle, which prevents spoilage and negative sensory impacts during aging. "The sensory related molecules in wine are a smaller size than what we filter from wine. There really shouldn't be a reason not to filter from a sensory standpoint," he said.

> "Egg fermenters do not do a better job of temperature control and do not display faster liquid mixing velocity. A jacketed tank maintains better temperature control and better temperature homogeneity. The concrete egg shell serves more as an insulator than as a heat sink."
>
> **Konrad Miller**

Different trials were performed with different wines that included a 2007 Sonoma Cabernet Sauvignon post-ML with oak aging, a 2009 Oakville Merlot post-ML with oak aging and a white wine blend of Lodi Muscat and UCD Chardonnay.

The trials included a control with no filtration, filtration through empty filter housing, filtration through a 0.45-micron PVDF filter and filtration through a 0.45-micron PES filter. Each trial wine was analyzed for chemical and sensory characteristics at different time intervals after filtration and bottling to collect and compare data. For the red wines, color and tannin changes were minimal during one filtration.

In general, for all the wines tested, sensory attributes did not change as a function of filtration treatment. The sensory changes that occurred over time occurred with each wine more as a function of aging rather than as a function of filtration.

Comparison trials were also done with cross-flow filtration equipment for red wines and white wines, using three different types of pumps to also evaluate possible effects of pumping on wine characteristics. Block observed, "Filtered red wines remain consistent over time while the unfiltered red wine changes over time. If you like the way your wine smells and tastes, cross-flow filtering will help keep it consistent."

Block summarized the results of the trials to date:

- Very few differences were noted during filtration for color and tannin.
- No major differences in sensory properties were observed between filtered and unfiltered wines studied.
- Cross-flow filters seem to stabilize sensory characteristics.
- Pumps don't seem to have much effect on the sensory or chemical properties of wine.

Block also pointed out that similar studies conducted by the **Australian Wine Research Institute** (AWRI) had similar results.

Wine Stabilization Effects and Possible Alternatives

Dr. **Ron Runnebaum**, who holds a joint position as assistant professor in the UCD Department of Viticulture and Enology and the Department of Chemical Engineering, is investigating alternatives to current wine stabilization practices. Current protein stabilization treatment options and impacts for wines include the use of additions, such as enzymes that still are apt to leave residues in wines, and bentonite fining that can result in wine losses, waste disposal issues, and increased processing time.

Runnebaum is looking at the use of solid resins for protein fining in wine as a promising alternative process for the future. These materials have been used in other industries for nearly 40 years, including the pharmaceutical industry. Although solid resins are currently a more expensive option, wine trials indicate they could provide the following benefits:

- Regain the value of the 3 to 10 percent of wine lost with bentonite fining
- Accelerate time to bottle by reducing treatment time
- Eliminate downstream processing time associated with bentonite fining
- Minimize solid waste production and disposal
- Reduce residues, such as metals or macromolecules associated with current processes
- Solid resins can be regenerated and reused for processing up to 10 times
- They can be "tuned" to have more specific and efficient applications.

As Runnebaum observed, "Consumers want the environmental benefits associated with minimal and sustainable processing practices, but they also expect to have clear and brilliant-looking wines. Solid resins offer potential benefits to deliver upon consumer expectations in both of these areas." **WBM**

2019 Barrel & Oak Survey Report

Just One-Third of Wineries Plan to Increase Barrel Purchases

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.

IN A WHAT HAS become a recent refrain, the 2019 edition of the ***Wine Business Monthly*** Barrel and Oak Survey was conducted in a climate of power-outages, wildfires and mandatory evacuation orders. As I am putting together the final analysis of the results, yet another out-of-control wildfire has broken out in wine country and is currently threatening Geyserville, Asti and Healdsburg. We are all worried about the immediate threat to lives, property and the remainder of the harvest. Smoke taint is a longer-term concern for anything that hasn't been picked already.

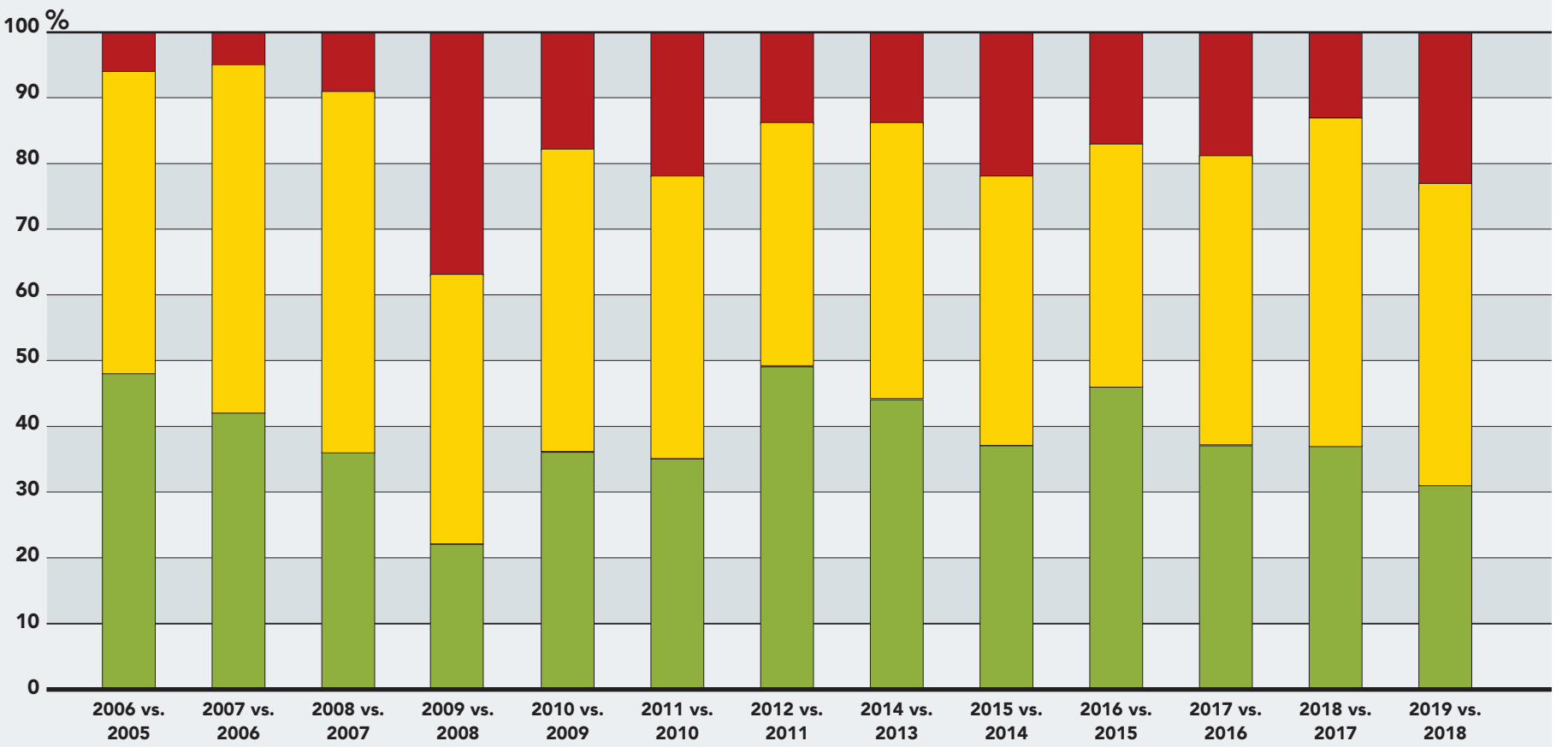
Late-season fires tend to render any harvest and yield predictions made six or nine months previously completely useless. If fruit must be abandoned due to lack of access to a vineyard because of an evacuation and/or downgraded because of smoke damage, it could mean a complete loss for individual vineyards and have a significant and unpredictable impact on the total yield of the harvest.

Before this week, the buzz around the industry was that this crush should put the industry into a confirmed state of oversupply. Now I am less sure that is going to be the case if we have another bad fire season (even though what happens in my bubble of the North Coast has little direct effect on the total yields of the bulk of the U.S. wine industry). A few hundred or a few thousand tons variance in the overall wine production from the North Coast isn't going to move the overall total production for the state very far.

Of course, when I think "smoky" I think of California-style Chardonnay, which by coincidence was the subject of part of this year's *WBM* Barrel Survey. It asked more general questions about predicted barrel purchases, preferred oak types, oak alternatives and micro-oxygenation (MOX).

CHART 1

Will the number of barrels your winery purchases this year: Increase | Stay the Same | Decrease — By Year



2019 WBM BARREL & OAK SURVEY

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The most notable findings of the 2019 WBM Barrel Survey were:

- Just over two-thirds (69 percent) of wineries expect to buy the same number of barrels, or fewer, than they did last year, with nearly a quarter (24 percent) saying they expect to buy fewer barrels than last year.
- Seventy-seven percent of new barrel purchases are expected to be French oak, up 4 percent from last year.
- Almost all wineries producing more than 50,000 cases per year, and half of all wineries overall, are using some form of oak alternatives.

Expected Barrel Purchases

One of the trends I have noticed in the successive *WBM* Barrel Surveys is that wineries seem to be influenced by the previous harvest a great deal when making barrel purchasing decisions. This usually manifests itself by winemakers overestimating their barrel requirements in the year following a larger-than-normal harvest and underestimating how many barrels they need in the year following a smaller-than-normal crush.

Once again, just 31 percent of the respondents expected to increase the number of barrels purchased in 2019 over 2018. This is the lowest level since 2008. Nearly half of the respondents (46 percent) noted no change in the number of barrels purchased. The number of respondents expecting to decrease their barrel purchases almost doubled from 13 to 24 percent (CHART 1). Thus, the number of wineries expecting to maintain or increase their new barrel purchases fell back 10 percentage points to a still respectable 76 percent. This represents a significant retrenchment in the number of new barrel purchases when compared to last year's survey as we move into a period of expected oversupply.

Note that these overall results are heavily weighted toward the smaller wineries simply because there are so many more of them in the U.S. wine industry. Respondents from mid-sized and large wineries were slightly less likely to say that they were increasing their barrel purchases and more likely to say that they are maintaining their barrel purchases at the same level as last year. As for previous years, respondents from small wineries were slightly more likely to respond that they plan to increase their barrel purchases this year (chart not shown). Respondents from small wineries were also more likely to *decrease* their barrel purchases, evidence that smaller wineries have fewer means to flatten out differences in the annual vineyard yield for those winemaking programs requiring barrels.

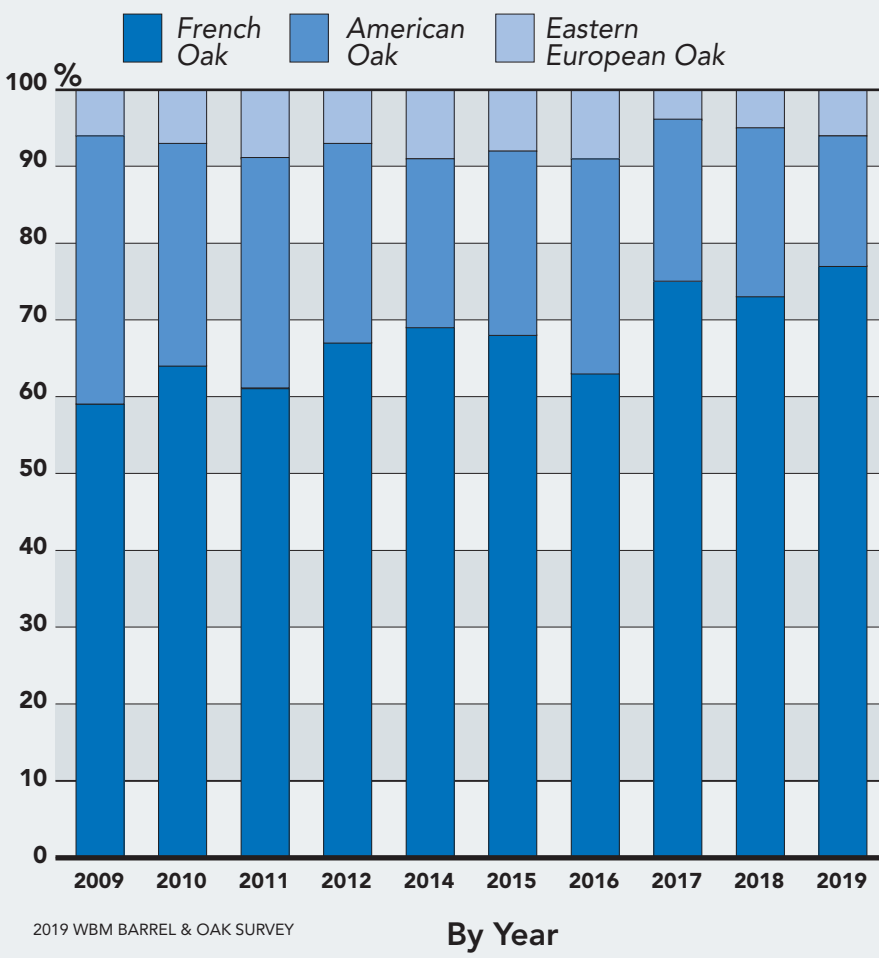
Barrel Purchasing: Oak Type Forecast

French oak barrels remain the overwhelming favorite for new barrel purchases with an average response that 77 percent of new barrels will be made from French oak (CHART 2). Like previous years, this question was one where winery size had little influence. The *WBM* Barrel Survey tends to be heavily skewed toward small wineries, and one would expect that this result is merely an artifact of the preponderance of small wineries.

When these data are broken out by winery size (chart not shown), there was little difference in the responses form small versus mid-sized and large

CHART 2

What is the percent ratio of barrels you are going to purchase this year?



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wineries. As with previous years, large wineries are only very slightly more likely to buy French oak barrels than small wineries and correspondingly less likely to buy Eastern European oak barrels. This looks to be a continuation of the trend toward single oak types, and to a lesser extent toast-levels, which I have noted in previous iterations of the survey.

Oak Alternative Use

I regularly ask about the use of oak alternatives in some detail. In this year's report, I just wanted to look at the basic difference in oak alternative use between mid-sized (and larger) wineries and smaller wineries. **CHART 3** shows that almost every winery (95 percent) producing more than 50,000 cases per year is using *some* form of oak alternative. Conversely, only half (53 percent) of the respondents from smaller wineries noted that they use any form of oak alternatives.

If I didn't have the underlying data, I would have guessed that the reason that the use of alternative oak was so evenly split for smaller wineries was because *my* definition of "small winery," which is those wineries producing fewer than 50,000 cases per year is not capturing the difference in use between wineries at either end of that range. However, when I looked into the

CHART 3

Does your winery use ***barrel alternatives*** *(oak powder, chips, staves, renewal)?*

Yes

95%
Mid-sized and Large Wineries

53%
Small Wineries

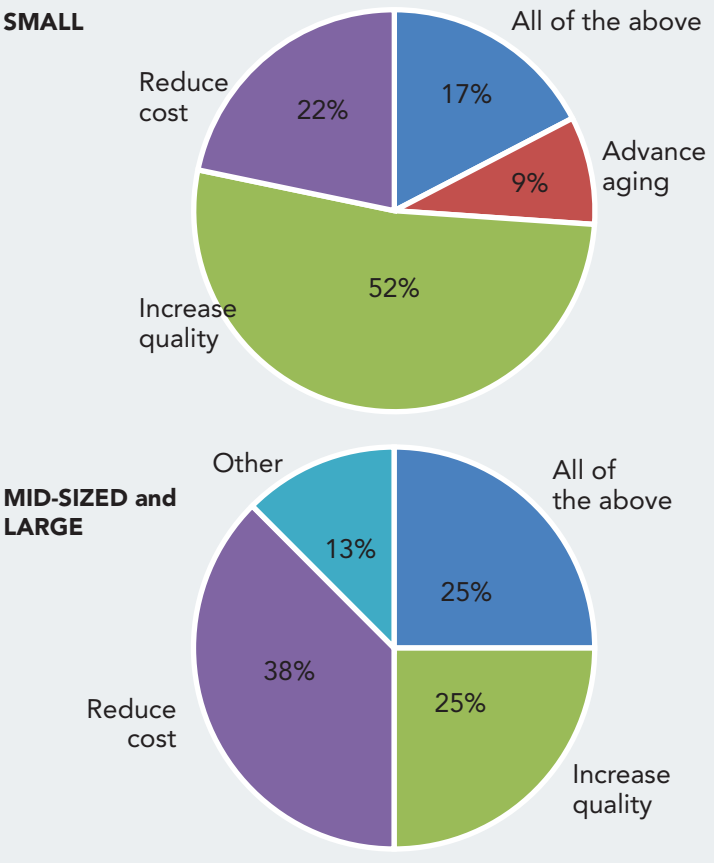
2019 WBM BARREL & OAK SURVEY

data, the distribution of wineries using and not using oak alternatives did not show any apparent correlation to the size of the wineries producing 1 to 50,000 cases per year (see How Does *WBM* Define Winery Size? below). The only trend in this size range that I noticed was that wineries that I know are primarily producers of Pinot Noir were noticeably more likely to answer that they are not using oak alternatives of any type.

Micro-oxygenation

The respondents were also asked if they are currently using, or are considering using, micro-oxygenation (MOX) and their reasons for doing so if they are. What I want to point out with CHART 4 is the difference between the winery size in respect to the primary reason for using MOX. If we include those respondents answering "all of the above" we see that more than two-thirds (69 percent) of the respondents from small wineries are using MOX to increase the quality of their wine while a comparable two-thirds (63 percent) of the respondents from mid-sized and large wineries are using it to reduce costs.

CHART 4
Why do you use micro-oxygenation?
(To reduce cost, limit barrel use, increase quality, etc.) By Size



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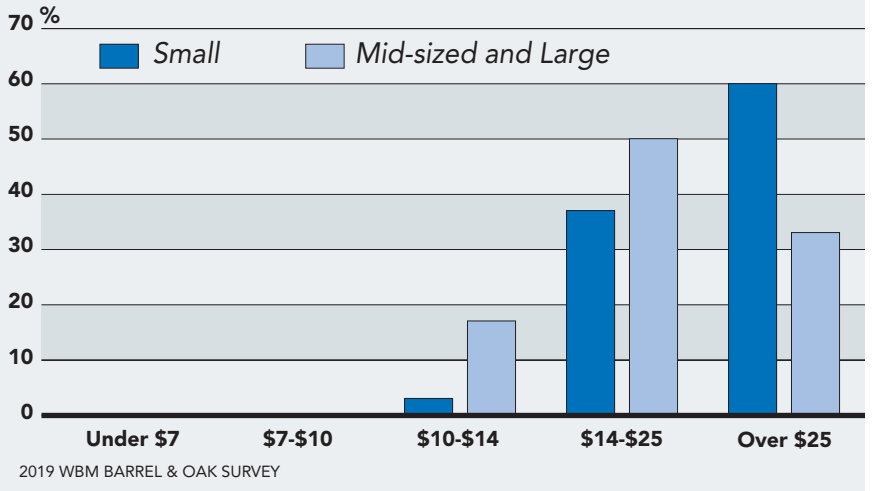
Chardonnay Price Points

This year I asked several questions about using barrels with Chardonnay. The respondents were asked to respond according to their "most popular" (i.e. largest in total volume) Chardonnay SKU or brand. The first of these charts, CHART 5 shows the price-point range of the Chardonnay SKUs in question. What is apparent to me is that the bulk of the "most popular" Chardonnays from smaller producers are being sold at prices north of $25. Half of the Chardonnays (50 percent) from mid-sized and large producers are being sold in the $14 to $25 price range. At the same time, as far as this survey is concerned, no one is pricing Chardonnay below $10 per bottle.

CHART 5 *What is the price point for your most popular Chardonnay? By Size*



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I have been seeing this across several wine varieties (across several wine varietals to use industry jargon). I think that I am going to have to add a $26 to $40 price bracket and re-define the top-end bracket as over $40. This will make any trended data that spans the transition more difficult for readers to interpret, but the alternative is to have almost every price-point response end up in the same price bracket.

Barrel-fermented Chardonnay: Time in Barrel

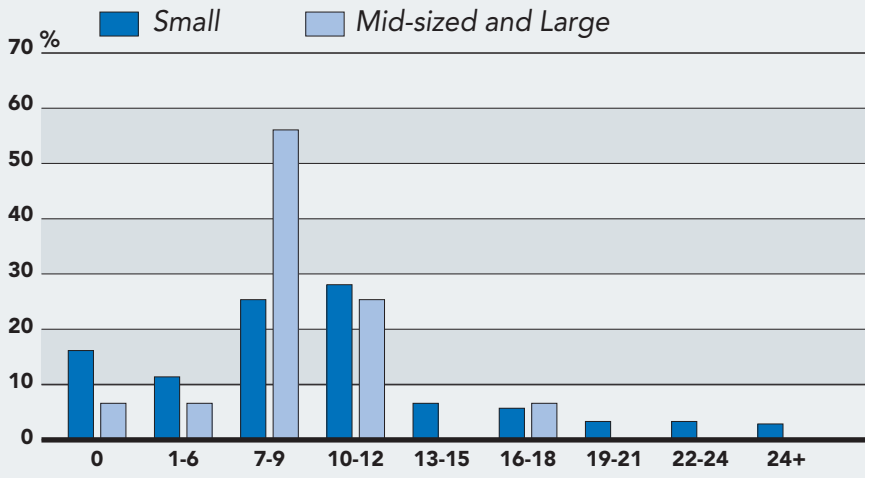
Time in barrel is a big issue in production of barrel-fermented Chardonnay, as it is for any wine that is aged in barrels. The tension is between a production tempo that minimally interferes with the crush, oak extraction, the time it takes for the dead yeast cells to autolyse and the need to minimize the amount of time that barrels are left empty. These all pull the winemaker to set different durations for *élevage*.

For me, the primary concern is to keep the time that used barrels stand empty under two weeks. That may not seem like a very winemaking-oriented concern, but I am driven by concerns over wine quality more than anything else. Over the past four decades, I have seen far too many wine spoilage problems caused by used barrels that are neglected while empty.

CHART 6 shows that large and small wineries are working at different tempos when it comes Chardonnay. Almost all the respondents from mid-sized and larger wineries noted that they keep their Chardonnays in barrel from 7 to 12 months. This seems consistent with minimizing the time

CHART 6

How many months does your Chardonnay remain in barrel? By Size



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How Does WBM Define Winery Size?

Large Wineries: Large wineries produce more than 500,000 cases, or its bulk wine equivalent of 12.3 million gallons, per year.

Mid-Sized Wineries: Mid-sized wineries produce between 50,000 and 499,999 cases per year.

Small Wineries: Small wineries produce fewer than 50,000 cases per year.

These definitions are somewhat functional in nature insofar that wineries within each size range tend to operate differently, use different distribution and sales channels, and generally tend to have different customers than do wineries within the other size ranges. For example, large wineries must have access to national distribution as well as the supermarket sales channel in order to stay in business at that scale. Small wineries can sell a large portion of their production on their own via the winery tasting room, direct to consumer (wine club) sales, and local distribution. Mid-sized wineries are somewhat between a rock and a hard place. They're too big to sell everything out of the cellar door but can lack the muscle to elbow their way into national distribution unless they are part of a larger company. Historically, this has been driving a lot of the consolidation we have been seeing over the past few decades as mid-sized wineries get bought by their larger brethren.

Note that we could separate out those small wineries producing fewer 5,000 cases per year into a further category. On one hand this would make sense, since most wineries in the U.S. are at this level. However, I am resistant to do so, since the survey results from the wineries producing fewer than 5,000 cases tend to track very closely to those wineries producing between 5,000 and 50,000 cases per year.

that used Chardonnay barrels stand empty. The 7-month tempo would mean that barrels would be empty for too long if the winemaker is intending to refill them with the next vintage, but would be reasonable if the winery is intending to fill those barrels with something from the prior vintage like red wine that has been in tanks during primary and secondary fermentation.

One must decide just why one is putting Chardonnay in barrels in the first place. To a certain extent this is market-driven. Buttery amyl-acetate and oak aromas are what the consumer expects from Chardonnays, especially California Chardonnay. Any deviation from that "recipe" leaves the winery with a niche, and hard to sell, product. Even so, there are other considerations. Oak extraction happens pretty quickly, even if it takes time for the extracted oak tannin to polymerize and "marry" into the wine. Even if there are plenty of good reasons, like the polymerization of polyphenols, for an extended *élevage*, keeping a wine in barrel for more than a few months doesn't really

Methodology

This year's survey received 148 responses. Slightly less than half (49 percent) of the respondents produce fewer than 5,000 cases, about a third (30 percent) produce 5,000 to 24,999 cases, and the remaining 21 percent produce 25,000 or more cases.

Due to the composition of the North American wine industry, the results are heavily skewed toward small wineries that produce fewer than 5,000 cases of wine per year. As a consequence, although the results describe the overall industry, large and mid-sized wineries may deviate significantly from the survey results without having much impact on the overall trends

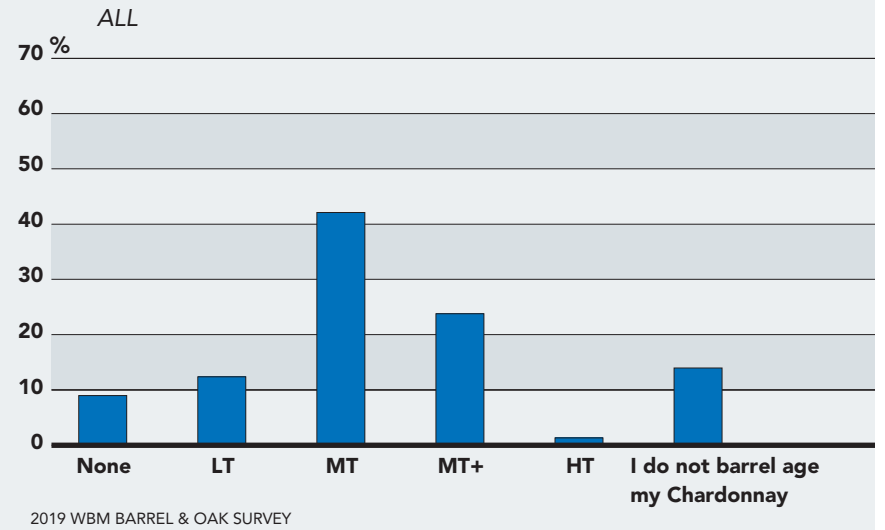
About nine-tenths (89 percent) of the survey respondents reported their job function as winemaker, 50 percent president/GM, 39 percent as cellar/production, 35 percent vineyard-management/viticulture, 32 percent purchasing/finance, 29 percent sales/marketing, 22 percent tasting room and 3 percent "other" (respondents were able to choose more than one function).

The purpose of the survey was to determine trends in the usage of oak barrels and barrel alternatives. Please note that the findings of this survey are meant to offer a general picture of wine industry barrel use on a per-winery basis. It is not a scientific study and should be used as a tool and a point of reference for further inquiry.

increase the amount of oak extracted into it that much. Yeast autolysis, however, cannot be hurried. I suspect that whether they know it or not, that's the main reason a significant minority of small wineries are keeping their Chardonnays in barrel for more than a year.

CHART 7

What barrel toast level do you most often use on Chardonnay?



2019 WBM BARREL & OAK SURVEY

Barrel Toast Levels for Chardonnay

When I joke about all wine barrels being medium toast (MT), I'm only half kidding. CHART 7 pretty much proves my point. Two-thirds (65 percent) of the respondents noted that they use MT or MT+ barrels with their most popular Chardonnay. For me, however, the significant responses are that 13 percent of the respondents are not barrel aging their Chardonnays at all. This is a much larger percentage than I expected.

Also significant, is that only 1 percent of the respondents are using heavy toast (HT) barrels in their Chardonnay production. As a general rule, the heavier the toast, the less pronounced the oak aromas are in the final wine.

Conclusions

The 2019 *WBM* Barrel & Oak Survey was in line with the results from previous years, particularly when the longer than annual wine industry cycles are considered. Fewer wineries expect to buy more barrels this year than they did last year. Fewer, but still nearly half of, wineries noted that they expect to buy the about the same number of barrels. Of those new barrel purchases, over three-quarters are expected to be French oak, a 4 percent increase from last year. Almost all wineries producing more than 50,000 cases per year, and half of all wineries overall, are using some form of oak alternatives.

Thank you to all respondents who participated in this year's survey. **WBM**

Technical Spotlight:
Eden Estate Wines

From Silicon Valley Back to the Valley of the Heart's Delight

Stacy Briscoe

PHOTOS ADAM DECKER

FULL DISCLOSURE: THIS TECHNICAL Spotlight isn't that technical, though it takes place in the heart of Silicon Valley—or, as it was known pre-tech boom: The Valley of the Heart's Delight.

John Couch, proprietor of **Eden Estate Wines**, was not always in the wine business. Until about four years ago, Couch was a Silicon Valley stereotype: an employee of **Apple**. He wasn't just any employee: in 1978 Couch was hired by **Steve Jobs** as the 54th employee of Apple, and in 1979 he became the company's first vice president of software. In 2002 Couch was named the vice president of education—a role created just for him—and stayed in that role until his retirement in 2015.

When Couch finally retired, and his professional and personal life changed, he decided to take what was once a small hobby—grapegrowing and winemaking—and turn it into a second career. Couch bought his 20-acre parcel in 2009. The property is located in Saratoga, Calif., at the foothills of Mount Eden—an area famed for its historic vineyards that date back to the Gold Rush Era, as well as the world-class wines produced by **Ridge Vineyards**, **Katherine Kennedy Winery** and the aptly named **Mt. Eden Winery**.

But the property itself is in the midst of a residential neighborhood. At just an 800-foot elevation, Eden Estate is at the outer limits of what's considered the Santa Cruz Mountain appellation. Save for a few modest signs at the

Key Points

- Former Apple executive transforms a horse ranch into a winery and event venue
- Veteran winemaker Bill Brosseau brings organic farming expertise, supporting vine health while increasing quality and yield
- Winemaking combines high-tech equipment with hands-off techniques

Stacy Briscoe is the assistant editor of *Wine Business Monthly*. 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, *BriscoeBites.com*, dedicated to wine reviews and tasting notes. 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.

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L TO R: Bill Brosseau, winemaker and John Couch, proprietor at Eden Estate Wines

bottom of the driveway, one would assume the winery is another mansion hidden in the expansive hills.

"It was basically poison oak and shrub," said Couch, remembering the state of the property when he bought it 10 years ago. "There was an older house on it and a metal barn."

The property did have a few vines planted around the perimeter of the property, and Couch said he'd been making wine from the grapes as a hobby, sharing it with friends and family. "People liked the wine, so it seemed only natural to expand on it," he said. So, he turned the barn into the barrel room, the grooms' house into the guest house and planted the stables to vines.

Today, the estate consists of a 4,100-square-foot winery, a stone and pine carousel gazebo to host by-appointment guests and parties, a guest cottage, Couch's home and 3 acres of estate Cabernet Sauvignon, all beautifully landscaped as a Tuscan villa—a nod to Couch's heritage and love for the culture's family-style attitude toward wine, food and communal gatherings.

In 2014 Couch pulled his first estate-grown harvest, which yielded just 9.9 tons, a 142-case production. But he didn't start selling his wines until 2018 and, though not "officially" until this year. "We had a 2019 inaugural release event in August—a bit of a 'coming out party,'" he said.

The 2019 harvest promises an increase in yield, case production and sales, and there are presently approximately 1.5 more acres of vines being planted throughout the estate. Couch insists, however, he wants to maintain his boutique status: "I don't want a huge production. I just want nice quality wine," he said, predicting a still-modest 700 case production run for 2019—but a significant increase from the 450 cases in 2018.

Vineyard Reboot

When Couch began his initial landscaping project, he conducted minor initial soil testing. "But it was pretty obvious to me without testing that this area was prime for Cab," he said. "The ground is pretty hard and hardy, so it didn't take an expert to learn that Cab was the best bet."

Of course, Couch couldn't do it alone. He hired a local vineyard management company to help his on site vineyard manager, **Jesus Garcia**. When he decided to get serious about his grapegrowing and winemaking as a business prospect, he knew he had to look for a dedicated expert to truly finesse his vineyard and create the quality wines the area is capable of.

"I asked around to **Peter Armellino**," said Couch, referring to his friend, owner and head chef of the former **Michelin**-starred restaurant, **Plumed Horse**. "I asked a number of sommelier friends as well: 'Where can I find a good winemaker?' They all gave me Bill's name."

He's talking about **Bill Brosseau**—a nearly 20-year winemaking veteran for **Testarossa Winery** in Los Gatos and a graduate of the **UC Davis** Department of Viticulture and Enology. Brosseau also farms other properties in the South Bay and recently launched his own wine brand, **Brosseau Wines**, from his family's estate in Monterey County.

"I told him I want to do a top-notch Cab, on the level of **Katherine Kennedy**—my favorite. And I think he saw the potential of the facility and the land," Couch said.

When initially approached by Armellino, Brosseau was hesitant. "I don't usually work with the smaller vineyards," he said. But when he visited the estate in person, he couldn't turn away. "I enjoyed John's energy and quest for quality. And all the pieces were here: the facility was here, the potential in the vineyard was here, Jesus was here. And John doesn't just want to make wine but wants to be in that category with Katherine Kennedy and Ridge." This was a project—a challenge—Brosseau was keen to take on.

A challenge it was. "The past farming company, I got the impression that they were less and less involved and just leaving a lot of challenges for Jesus, and he was getting frustrated. So when I came on, I said, 'We gotta fixer up,'" Brosseau said.

From Conventional to Organic

Strolling through the vineyard, one can see how each vine is neatly trimmed to expose ripening Cabernet Sauvignon grapes to the South Bay sun. Nets gently hug maturing fruit, keeping them from dropping before their harvest date and protecting them from natural predators. Every inch of every acre looks tended to and cared for.

"When I came on…you'd have cordons with really big gaps, places where the thinning or pruning wasn't done right. You'd have one really big vine next to a really little one. It was like a musical instrument that was extremely out of tune," Brosseau said.

The 2015 harvest was an extremely modest one, as this was the growing season when Brosseau, Garcia and Couch decided to "reset" the vineyard. "We threw a lot of fruit away because the quality just wasn't there," Couch said. "We did aggressive pruning and really tried to even out the vigor so there was as little vine-to-vine variation as possible." That year was the most meager harvest thus far for Eden Estate—2.69 tons, just 59 cases.

The biggest change Brosseau brought to Eden Estate: organic farming. According to both Couch and Brosseau, since making the transition from conventional to organic farming, the yields have increased year after year.

"You get a really nice bloom and color, I feel, on the fruit when you farm organically," Brosseau said. "With conventional farming, the vine is just so strong that the fruit doesn't physiologically keep up." That was what was happening all across Couch's property—over-rigorous leafing combined with poor maintenance routines meant that the grapes had been ripening somewhat unevenly, and not producing wines to their full potential.

Brosseau said he farms organically on other properties, including his family's ranch, which is certified. Eden Estate is not yet certified organic, though it has gone through the three-year detox needed to qualify for the certification. "It's something that we'll discuss and see. The big part was getting John and Jesus excited about it," he said.

Fortunately, Brosseau added, when the previous vineyard management company laid out the vineyard, they did it "really well," in his opinion. "They didn't just do big long rows or overrun the surfaces—they actually chopped it up quite nicely," he said. Though, he added, the spacing between rows is a little wider than necessary as it was originally planned for tractors and other big pieces of vineyard equipment to pass through. But today, everything on Eden Estate is maintained and harvested by hand.

Thus, the new acreage being planted along the hillier aspects of the property will be closer together. "Because we're on a steep hill, we can go tighter and still get good sunlight," Brosseau said.

Brosseau also mentioned the newer plantings will be more clonal specific than those planted in the lower elevations. "The soil type up there is a different complex…it's looser than the clay down lower, which can get cement-like," he said. "The challenge is how to assess the soil and lay out the vineyard in a way that we can achieve quality without a lot of effort."

He still calls the estate vineyard "very forgiving terroir," as far as growing Cabernet Sauvignon. "We're situated in a valley; so when the sun goes down over the mountain, it cools really fast. We have the richness of Napa Valley because of the clay soils, but then we have this fruit intensity that Napa just doesn't get because it stays so warm at night. We cool down. We have the acidity, the richness and the fruitiness—that's really rare in a California Cab," he said.

Technical Spotlight: Eden Estate Wines

Eden Estate Wines

22090 Mt. Eden Rd., Saratoga, California 95070	
408-868-9500	*www.Edenestatewines.com*
Owners/Principals	John Couch, proprietor
Winemaker	Bill Brosseau
Vineyard Manager	Jesus Garcia
Year Bonded	2017
Winery Case Production	450
Average Bottle Price	$60
Direct-to-Consumer Sales	80%

Vineyard Information

Appellation	Santa Cruz Mountains
Vineyard Acreage	3
Varieties Grown	Cabernet Sauvignon
Tons Used vs. Tons Sold	100% used for Estate
Sustainability Certification(s)	none
Sustainability Practices	Organically farmed since 2015
Soil Type	Varying degrees of heavy clay and clay loam; some pockets of limestone: Block 1: Montavista-Togasara Complex, Block 2 and 3: Literr-Merbeth Complex, Blocks 4-8: Literr-Urbanland-Merbeth Complex
Climate	Region 2
Additional Varieties Purchased	Chardonnay
Vineyard Sourcing	Tally Family, Monte Sereno Arroyo Grande AVA

Building the Winery

Year Built	2010-2017
Size	4,100 square feet
Architect	Chris Spaulding, *csarchitect.net*
Contractor	Dan Boyd
Interior Design	Tara Gallagher Couch
Landscape Architect	David Fox, *landfx.com*

Winemaking

Harvest at Eden Estates takes place between mid- and late-October, a relief for Brosseau who is otherwise "drowning in Pinot Noir" for other projects he's involved in earlier in the season.

The production facility is no fancy outfit. "All the magic happens outside," Brosseau said, standing in what looks to be an extension of the driveway. But as low-tech as the setting may be, the winery equipment is comprised of the latest models and technologies available.

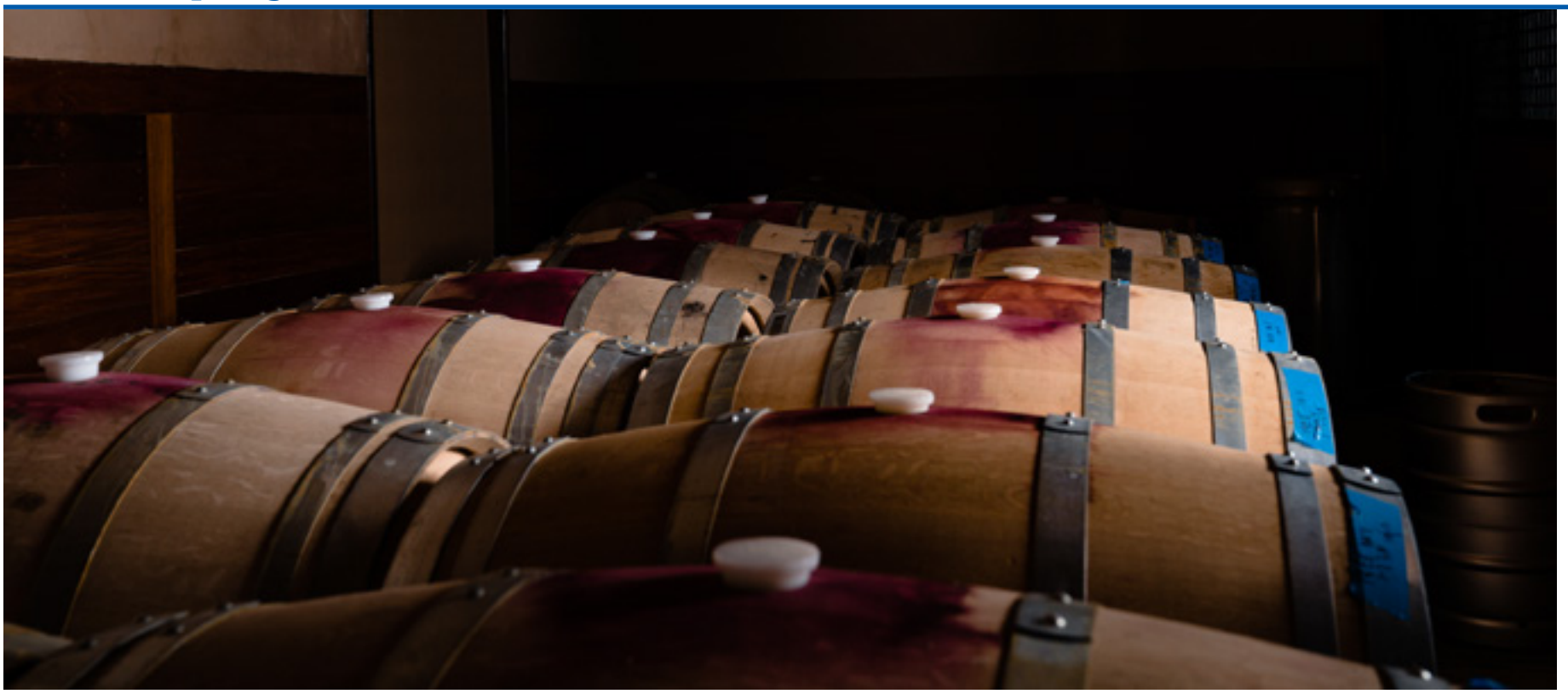
"We have all this technology not to overhandle the fruit, but to protect and preserve it," Brosseau said. "I got into winemaking because I didn't want to go high-tech. I'm kind of a slow processor. I don't like the whole idea of the speed of high tech—it's ironic that I'm working in Silicon Valley."

He continued, "The more I've been a winemaker the less I've leaned on data. On this scale…instincts just really kick in each year. We're already doing so great with so few years in—it can only get better and better as we really dial it in."

The model, Brosseau and Couch agreed, is to grow the grapes organically and showcase essence of the vineyard and not get "too techie" in the wine-making process. "The more we handle the product, the more we take away from that essence," Brosseau said.

Winemaking	
Wines Made	Estate Cabernet Sauvignon, Reserve Cabernet Sauvignon and Rosé of Cabernet Sauvignon
Vibrating Sorting Table	Delta TRV 35 vibrating table
	Bucher Vaslin; *buchervaslin.com*
Destemmer	Delta 300 mobile belt elevator feeds Delta Oscillys 100 destemmer
	Bucher Vaslin; *buchervaslin.com*
Tanks	Ranging 350 to 1000 gallons; Custom Metal Craft; *custom-metalcraft.com*
	120 to 240 gallons; FlexTan; *flextankusa.com*
Tank Heating/Chilling Systems	G&D Portable Glycol Chiller/Heater Fire and Ice 7 HP/12.5 kW
	G&D Chillers; *gdchillers.com*
Punchdown Devices	by hand
Pumps	Waukesha Cherry-Burrell rotary positive displacement pumps
	Waukesha Cherry-Burrell; *spxflow.com*
Racking Wands	Rack-it-Teer; *rackitteer.com*
Presses	Bucher Vaslin JLB 12 basket press for reds; *buchervaslin.com*
	Euro-Machines P52 Europress open style membrane press for whites and rose. Euro-Machines; *euromachinesusa.com*
Forklift	Toyota propane forklift 8FGU25 with pneumatic tires; *toyotaforklift.com*
Bin Dumper	Malavac Lift-Master; *liftmasterbindumper.com*
Pallet Truck	Raymond 8410 end rider pallet truck; *raymondcorp.com*
Barrels	30 and 60 gallon French oak
Cooperages	François Frères; *francoisfreres.com*
	Cooperage Demptos; *demptos.fr*
	Taransaud; *www.taransaud.com*
	Nadalié USA; *nadalie.com*
	Tonnellerie de Mercurey; *tonnellerie-de-mercurey.com*
	Seguin Moreau Napa Cooperage; *seguinmoreaunapa.com*
Barrel Washing System	Poseidon 7-67 bye Aqua Tools; *aquatools.com*
Yeast/Nutrients/Enzymes/Other Additions	BDX yeast, Nutristart O for micronutrients
Filters	Velo plate and frame
Winemaking Management System	Boutique winery with copious notes/ lists
Winemaking Software	None
Analytical Equipment	Thermo handheld pH/ ISE/conductivity/ DO, R&D AO and VA cash still
LDS electric ebulliometer	

Packaging	
Bottling Line	Top It off Bottling; *topitoffbottling.com*
Glass	Ardagh 6189 (ed wine); *ardaghgroup.com*
	Saxco 2404 flint for Rosé; *saxco.com*
Corks	Cork Supply DS100 49X24 top, 10% sort alpha wash; *corksupply.com*
Capsules	Rivercap tin; *rivercap.com*
Label Design	Kris and John Couch
Label Printing	Landmark Label; *landmarklabel.com*
POS Software	None
Case Goods Storage	In-house



All grapes are hand-picked and hand-sorted on the **Bucher Vaslin** Delta TRV 35 vibrating table. The grapes are fed into the Delta Oscillys 100 destemmer via the Delta TR 300 mobile belt elevator. The berries remain intact—no crushing. Most importantly, according to Brosseau, all lots are kept separate from picking bin until the final blending process. "I can tell on the sorting table sometimes which bins need to stay away from each other and which may work well together," he said, noting that he tastes every vessel and even does some mental "pre-blending" during these first stages.

The grapes stay in the 1-ton plastic bins for initial fermentation and are kept on the skins based on taste—meaning until Brosseau can taste "a finish.""As it finishes ferment, it lingers to the back of the palate, and that's when I'll drain from the skins. So, there's no 'exact days on skin,' per se; it's all done by taste."

Brosseau said he simply leaves the grapes out in the sun and may use a **G&D** portable glycol heating unit if it starts to cool down too much. The fermenting fruit undergoes semi-regular punch-downs, conducted by Brosseau and Garcia, again based on taste. "They're small bins, so we're not afraid of the tannins," Brosseau said.

As an advocate for organic, Brosseau hopes to eventually move toward native fermentation. But as the site and facility are so young, and it does get quite cool, he worries about sluggish fermentation and inoculates with BDX yeast and **Nutristart O** for micronutrients. "I want the highest potential right out the gate. I knew organic farming, for me, would be a piece of cake. On the winery side, I want to be a touch cautious so we can really get it right. Then we can ease off and try going native," Brosseau said.

When each bin tastes complete and "at its best," it's then drained and settled in tank for "a few days" then put to barrel to be clarified. The remaining is run through the **Bucher Vaslin JLB 12** basket press and is barrel-aged separately. "It's a symphony of barrels," Brosseau said. "If we can get them to play well by themselves when we go to blend, they can harmonize and make a better expression."

Eden Estate uses a variety of cooperages, including **François Frères USA**, **Demptos Napa Cooperage**, **Tonnellerie Taransaud**, **Nadalié USA**, **Tonnellerie de Mercurey** and **Seguin Moreau Napa Cooperage**. The Cabernet Sauvignon ages in about 75 percent new French oak, which Brosseau lightly soaks with dechlorinated water to "take the edge off." The wine stays in the same barrel for the entirety of its aging, which is about two to two-and-a-half years. "I tend to think you get more subtlety and nuance," Brosseau said.

Brosseau prefers a medium toast on his barrels. "If you farm well, you can use lighter toast and really accentuate good structure and aroma. To me, the oak and the vineyard have to work well together," he said. "It's nice because this is a site where there's not much to do—we're getting great ripeness and 24° and 25° Brix. The climate, soil and farming all lands in a good spot, so you don't have to do much."

When it comes to the blending process, grapes and wine from the highest-quality blocks are destined for the reserve bottling, though the best blocks may change from year to year. Brosseau said that, over time, he may eventually move to separate block bottlings if the individual plantings begin to assert a "specific personality."

Eden Estate currently produces two bottlings of Cabernet Sauvignon: a reserve and an estate. "I think these wines, as the vines get older, they're just going to be aging really, really well. I want them to drink well young, but for people that want to lay them down, they'll deliver," Brosseau said.

Rosés for Mom

Eden Estates currently produces one bottling of Rosé of Cabernet Sauvignon—a wine that Couch has no shame in sharing is his mother's favorite and is produced just for her.

Couch also admitted that he, in general, isn't actually a fan of the wine style. "When Bill approached me about making a Rosé, I wasn't sold…I don't like those sweet Rosés," he said. However, in keeping with the "essence" of the vineyard, that is not the style Brosseau had in mind, nor the one he produces. The light-colored Rosé wine is crisp with clean acidity, aromatic with classic red fruit flavors, but neither dense on the palate nor heavy in body.

Cabernet Sauvignon grapes for the Rosé program are selected from specific blocks in the vineyard that Brosseau and Garcia can tell won't get the pigment or fruit intensity needed for their top-tier Cabernet Sauvignon red wines.

Hand-harvested and hand-sorted, these grapes will go through the **Euro-Machines** Europress, P52 open-style membrane press whole cluster. "I tend to do more of a Champagne-style press: real slow, gentle, so as not to get a lot of phenolic extraction," Brosseau said.

Once separated from the skins, the juice is chilled and left to settle in stainless steel tanks for about one year. "Zero oak here. There are already plenty of tannins in Cab," Brosseau said.

Woz Wine (AKA Chardonnay)

For all intents and purposes, Couch is not a huge fan of white wines. "Except Bordeaux whites. It would be fun to one day make a Bordeaux-style white," Couch mused.

But, as is his nature, Couch thrives on making wines for family and friends. In the case of the 2019 Chardonnay, this was a special request from close friend and colleague **Steve Wozniak**, who, according to Couch, took part in the processing when the fruit came in mid-September.

As the Eden Estate vines are completely dedicated to Cabernet Sauvignon, Couch and Brosseau sourced about 3 tons of Chardonnay grapes from a vineyard in Monte Sereno managed by the **Tally** family. This is the first year the Eden Estate team is producing a Chardonnay, so the specifics surrounding the winemaking are currently being established. But what is clear is the style of wine Couch wants to create: a clean, crisp Chardonnay, more akin to the style of Chablis than the classic California format. Couch predicts a 150-case production of "Woz Wine."

Packaging

All wines are bottled on-site using the **Top it Off Bottling** mobile bottling service. The label and package design were created by Couch's son, **Kris Couch**. The owl is a reference to the family of owls found in the barn during construction and that still live along the property today, taking advantage of the numerous owl boxes Couch has installed.

Wines are sold 80 percent direct-to-consumer, via the winery website and through the by-appointment tastings held once a week at the estate. There is no wine club: "Why not just treat everybody the same?" Couch asked. There is a mailing list consumers can join where they'll be alerted about special events taking place on the property.

The rest of the wine is sold through local restaurants, including Armellino's second restaurant, **Pasta Armellino**, and Couch's brother's restaurant **Market Broiler** in Fremont. Couch has said a few others have shown interest in potentially selling his wine as well.

The Vision

To talk to Couch, it's not about the dollars, sales or profit. "If people are interested in my wine and appreciate my wine, then, yeah they can sell it," he said. "But if someone wants to buy it and then sell it at a crazy mark-up, I don't want to be a part of that."

According to Couch, the value he finds in his new profession is both the ability to cater to existing friends and family, as well as the opportunities it has opened up for him to meet new people and expand that social circle—again harkening to that feeling of communal gathering he sought to create in constructing this South Bay villa.

"One of the things that I learned at Apple in the early days is to think about your 'why.' To me that means 'What is your vision for what you're doing?'" Couch said. "The joy of drinking wine…that's my why. I enjoy seeing people be joyful and that's what drives the production and what we do." **WBM**

PW PRACTICAL Winery & Vineyard

Insight & Opinion

What Defines Your Wines?

Bruce Zoecklein

Bruce Zoecklein is an enology professor emeritus and former head of the Enology-Grape Chemistry Group at Virginia Tech University in Blacksburg, Virginia. Enology notes found at vtwines.info.

Key Points

- *Terroir* is a commonly used term.
- *Terroir* is not well understood or defined.
- The components that have historically determined the definition of *terroir* are numerous but not well understood.
- Perhaps not being able to understand *terroir* is an example of the limits of science.

DON NEEL

MANY EUROPEAN VINTNERS SEEM to know that the sustainability of their operation is inextricably linked to the ability to express the *terroir* of their site. The concept of *terroir* centers around the belief that a vigneron might produce a wine that expresses the inherent and distinguishing characteristic of a particular vineyard site and the uniqueness of the vintage. While *terroir* studies have generally focused on wine character or style rather than quality, they are certainly linked. Most French appellations are based on this perceived exceptionality and have maintained their status and influence over the years, attesting to the concept of *terroir*.

However, attempts to separate the kaleidoscope of variables, including geology, geomorphology, soil, climate, the biology of the vine and human intervention, have proven difficult due to the interconnected complexity of said interactions. Understanding *terroir* has been compounded by the fact that there are no accepted objective measurement tools, which has added to its perceived ethereal nature. Indeed, it would seem that there is an ample number of winegrowers that deny its true existence. Mark Matthews, in his book *Terroir and Other Myths of Winegrowing*, suggested that *terroir* is primarily a marketing term that mixes extrinsic and intrinsic wine properties.[16]

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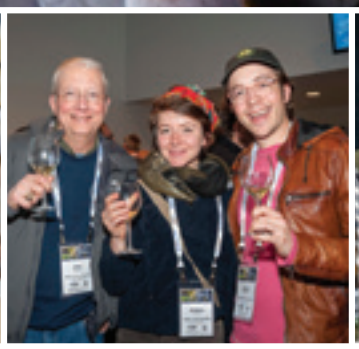



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In Daoism and ancient Greek skeptical philosophy, nothing is really known or understood with certainty. This conundrum and its consequences are illustrated in a tale I would tell my Virginia Tech students:

> John Green worked in a unionized factory where management had proposed a lucrative settlement, with strings attached. One binding requirement was that all employees must sign the agreement. On the final day of reckoning, the only hold-out was John Green. To him, this covenant was way too confusing, too difficult to comprehend. Frustrated that months of negotiations would be lost, the company president called Green to his penthouse office. Exacerbated, the boss said to Green, "Either sign up or I will toss you out of this seventh floor window right now." Without hesitation, Green immediately jumped up from his chair and affixed his name to the contract. Surprised, the boss asked, "Why didn't you do that before?" Green's reply: "Nobody explained it quite as well as you just did!"

Despite the vast literature on the subject, what *terroir* really is and how it is derived remains elusive.

Tim Patterson and John Buechsenstein conducted an extensive review of *terroir* literature[17]. Whatever it is, *terroir* is traditionally divided into two realms: the physical characteristics of a site and the organoleptic properties of the wines originating from that site. The term natural terroir unit (NTU) has been used to define the physical traits characterized by a relatively homogenous pattern of topography, climate, geology and soil.[3,13]

The Portuguese have a system in the Douro Valley that is a form of NTUs that attempts to rank important physical parameters thought to be significant. These vineyards are located mainly on schist or granite soils. Each vineyard is classified according to a point system with a maximum value allocated for each category listed below. The higher the total score the greater the value of the crop.

CATEGORY	MAXIMUM VALUE
Location	600
Aspect	250
Altitude	150
Gradient	100
Soil	100
Microclimate	60
Varieties	150
Vine age	60
Vine density	50
Yield	150
Maintenance	100

Robert White, et al highlighted the importance of scaling (looking at sub-block variations) in evaluation of *terroir*.[27] With the increased interest in single-vineyard wines, the use of NTU-type systems would appear helpful in recognizing blocks and sub-block relationships to *terroir* expression.

The Portuguese system catalogs what local producers believe are important in the proper match among their cultivars, climate and soil. The question is: Are these the unifying factors that define *terroir*? If so, is their hierarchy correct? Are these universal? As suggested by Cornelis van Leeuwen, if a cultivar is more important than soil or climate, then wines should be sold by the name of the cultivar.[23] If soil and climate are most important in the manifestation of *terroir*, wines should be sold by region. If human factors are decisive, perhaps wines should be marketed primarily by brands. What defines your wines?

It is likely that no one physical factor contributing to *terroir* can be completely understood in isolation. However, studies over the years have attempted to evaluate the separate influences of cultivar, climate and soil, including both viticulture parameters and fruit chemistry.[19,22,25] Overall, the climatic conditions of the vintage had the strongest effect on most vineyard and fruit variables followed by soil type and cultivar. The influences of climate were shown to be largely mediated through vine water status.

Climate

Climate has an important influence through the complex interaction that affect plant physiology: temperature, rainfall, vapor pressure, evapotranspiration (ETO), sunshine hours and wind. It is affected by many physical site components contained in NTUs, including topography, altitude, aspect, slope and terrain.[3] However, in the final analysis, it may be that a very important feature differentiating good sites is the ability to resolve climatic challenges, specifically to drain water in the event of excessive precipitation[25]. As such, soils may intervene by limiting climate and particularly hydraulic extremes. According to Randall Grahm, owner and winemaker of Bonny Doon Vineyard, the ability to provide moisture to the plant in a thrifty and measured way is essential[8].

In most of the northern hemisphere, harvest generally occurs between about September 10 and October 10. We know that photosynthesis maximum occurs when the air temperature is around 25° C (77° F), while anthocyanin and aroma/flavor optimum is between 17° to 26° C (63° to 79° F).[11] Therefore, it has been suggested that the best variety for a site is one that matches the length of the growing season so that fruit maturation occurs during the portion of the season that is cool but warm enough to allow the fruit to continue to accumulate aroma/flavor and phenols. As such, it is easy to imagine the changing climate may eventually require changing cultivars, management strategies or locations in order to continue to optimize *terroir*.

Soil

The concept of *terroir* is positioned around the sensory expressions derived from a particular place. At the heart of this perception is the land. Traditionally, vines were considered essentially an extension of the land from which they were grown, hence the term *gout de terroir* or "taste of the land." This certainly made sense; after all, a Burgundy Grand Cru tastes different from a Premier Cru.

Soil parameters of potential importance are thought to include: texture, mineral composition, color, biological activity, temperature, depth and water holding capacity. Those components believed to be central to fertility and *terroir* expression include the physical, chemical and the hydrolytic nature of the soil.[23] Within this spectrum, Gérard Seguin attempted to find the unifying feature(s) common to high-quality sites.[21] His research suggested two dominant clusters: water availability and soil structure.

Subsequent efforts have confirmed that *terroir* expression is correlated to water deficits.[23,25] Vine water status is influenced by rainfall, evaporation, soil water-holding capacity and vineyard management. Most renowned wine-growing regions have an annual rainfall between 300 and 1,000 mm (12 to 39 inches) per year. It is thought that the production of high-quality wines expressing *terroir* features requires at least moderate water deficit stress in at least part of the season.[5,24] According to Mark Greenspan, the "magic window" for moisture stress for Cabernet Sauvignon in California's North Coast is two weeks before *veraison* and through *veraison*, followed by stress reduction.[9] This may be an advantage for arid climate vineyards in that it is easier to add than withhold water in excessively rainy seasons.

Moisture deficiency prior to *veraison* increases a plant hormone-abscisic acid (ABA), which stimulates the production of anthocyanin, tannin phenols and glycoconjugates, important aromatic precursors in grapes.[18] As such, research has suggested that vine water status may have a stronger influence on wine style and quality than soil mineral composition.[24] Soils that allow for moisture deficit at the proper time are deemed most desirable, again suggesting hydrology as a major *terroir* parameter.[23]

Mineral content of the soil has received a lot of attention with regard to *terroir* expression. Historically, French literature reported links between certain minerals and sensory attributes. No one has yet demonstrated the processes by which elements of the soil are transformed into wine sensory attributes. If wine sensory quality were related solely to specific minerals (potassium, phosphorus, iron, etc.), that quality could be improved by the addition of these elements. Soil components that are believed to be of greatest importance, however, include nitrogen, potassium and calcium.[23]

Vine nitrogen availability is related to soil type, depth, moisture and increases in organic matter.[12] Vineyards that produce high-quality red wines receive very limited nitrogen fertilization, a practice referred to as regulated nutrient deficiency (RDN).[12] Limiting nitrogen uptake for red-fruited varieties reduces vine vigor, berry weight and yield while increasing anthocyanin and tannin concentration.[4] For most white varieties, low vine nitrogen may be a detriment due to the potential limit in production of aromatic compounds such as thiols, important in varieties, including Sauvignon Blanc.[4] Additionally, white wine varieties with low plant nitrogen produce low fruit nitrogen and relatively lower concentrations of glutathione.[4] Glutathione is a naturally occurring peptide that is an important white wine antioxidant.

Grapes produced on limestone soils contain relatively high levels of calcium. The presence of calcium in the soil is said to improve the soil structure, thus enhancing soil drainage. Active calcium carbonate reduces soil organic matter turnover, thus limiting plant nitrogen availability. As such, good vineyard soils for red wines are thought to be those that help limit yield and vine vigor by limiting water supply and available nitrogen, two important *terroir* features.[26]

Microbiological *Terroir* and Human Intervention

That the sensory expression of *terroir* may have a microbiological component has gained attention.[17] Although good soil should have adequate microbiological flora to aid in mineralization, there has been limited scientific evidence to definitively link soil microbes and *terroir*. Yeasts and bacteria are part of a complex series of interactions where competition, equilibrium and collaboration form a dynamic ecosystem during fermentation. Even with the addition of sulfur dioxide and cultured yeasts, a portion of the fermentation can be conducted by other native organisms,[2] suggesting the importance of the microbial ecology.

It also seems intuitive that human imprint can be part of *terroir* representation. Consider the famed Clos Vougeot, a Burgundy Grand Cru. The clos is a 142-acre parcel with 82 different owners! Even among subplots that share exactly the same pedigree, broad differences in grower and winemaking inputs can result in different wines, some superior, some ordinary. While generally precluded from the traditional definition, soil modification via drainage (Bordeaux) and man-induced climate change are two examples of interventions that affect *terroir*.

Sensory Expressions of *Terroir*

It is thought that the interaction of the physical factors, such as those listed in NTUs, and perhaps human interventions, creates the sensory character and style of the resultant wine. According to John Gladstones, true *terroir* differences are perceived only in the highest quality wines.[5] Several studies have evaluated sensory descriptors used to help define *terroir* expression,[14,20] including use of the term minerality. Habitually used but poorly defined, this term has been called the Holy Grail of *terroir*.[17] It is of interest to note that soil minerals are neither particularly volatile nor aromatic. While vines require minerals, those in wines are nutrient elements, typically cations. These are only distantly related to vineyard geological minerals which are complex, often crystalline compounds that lack flavor.[15] Despite this dichotomy, the term minerality is repeatedly used to describe either aromas, flavors or both.

Flinty is an equally interesting descriptive term, particularly when one notes that flint is essentially silicon dioxide, which has no odor. Psychologists and sensory scientists have evaluated its use in describing wines. The term is often associated with the perception of edges or sharpness and frequently used to describe wines that are high in acidity.[15,17]

It has been suggested that terms, such as minerality and flinty are associated with reductive winemaking conditions.[1] High calcium content soils frequently produce low fruit nitrogen. Patterson and Buechsenstein reported that it may be that yeast metabolism is impacted, specifically triggering the

production of reductive metabolites.[17] Hildegarde Heymann et al reported the following correlations with the term minerality, reinforcing the idea that *terroir* expression is most common in wines produced under reductive conditions compared to oxidative circumstances.[10]

- Positive correlation with acid taste, malic acid, tartaric acid and titratable acidity.
- Positive correlations with descriptors ,such as citrus, fresh and wet stone.
- Negative correlations with descriptors, such as butter, butterscotch, vanilla and oak.

What Does All This Mean?

Due to the complexity of interactions it has been difficult to study the many individual components that affect *terroir* in isolation. The use of NTUs or similar systems provides a collective mechanism for categorizing sites, plots or sub-plots that may provide organoleptic differences. Regardless, it is safe to say that New World palates are not necessarily tuned to *terroir* no matter what it is or is not.[17] The French make the distinction between wines that are notably marked by human intervention compared with wines whose character is mainly a reflection of place. However, it would appear that neither the marketplace nor the popularizers always make the distinction. For example, as suggested by J. Goode and H. Harrop,[7] many wine writers evaluate Bordeaux wines not as Bordeaux but as red wines, thus blurring or at least not emphasizing, the difference between *vins d'effort* and *vins de terroir*.

Perhaps one of the requirements for evaluating a NTU systems such as that used in the Douro, and knowledge in general, is to understand the importance of relativity. That is, what information is true, universally correct under all circumstances, and what information is specific to time, place and local conditions?

Some suggest that *terroir* may be more of a belief system than a true reality, pointing out that the concept of *terroir* is not exclusively science-based. Is science-underpinning a requirement? Science appeals to our rational brain, but many of our beliefs are based on emotion, not science. According to social scientists, the biggest influence is our association with our peers, providing what is termed tribal or conformational bias. As Blaise Pascal wrote: "The heart has reasons that reason does not know."

Those looking for a purely science-grounded explanation for something as complex and multifaceted as the concept of *terroir* should consider the Heisenberg Uncertainty Principle (the position and velocity of a particle cannot be measured simultaneously). Well beyond particle physics, Heisenberg suggested a disturbing fact about human knowledge: it has its limits. Uncertainty is embedded in nature itself so why not in our understanding of *terroir*. Like a Zen coagon, what is the sound of one hand clapping? There may not be easy answers to some questions, including what defines your wines? **WBM**

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Winemaker Trials

Finding the Right Oak for Each Pinot Noir Clone

Curious about the effects of new versus neutral oak aging on specific Pinot Noir clones, Terragena estate vineyard proprietor, Chris Buchanan decided to run a trial testing just that. But this experiment requires patience: Buchanan is continuing to test the single clones as they age in bottle to determine how an oak's influence continues to evolve over time.

Stacy Briscoe

Vineyard proprietor **Chris Buchanan** found himself exploring wine while living in New Orleans and attending college at Tulane University, where he earned a degree in mathematical economics from Tulane. After moving to California, studied winemaking and viticulture through the University of California, Davis. While developing the Terragena estate vineyard and property, Buchanan also worked with winemaker Derek Rohlffs of Bravium as a winemaker and bookkeeper in the San Francisco Bay Area.

Stacy Briscoe is the assistant editor of *Wine Business Monthly*. 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, *BriscoeBites.com*, dedicated to wine reviews and tasting notes. 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.

TRIAL OBJECTIVE: Holding all other fermentation variables constant, this trial determines the sensory effects of new Hungarian oak versus neutral French oak on Pommard clone Pinot Noir.

TRIAL DESCRIPTION: Approximately 5 tons of Pinot Noir Pommard and 115 clone were harvested from a fairly uniform, flat vineyard at approximately 24° Brix based on winemaker tasting of fruit and general vintage assessment. The fruit was fermented in 25 percent whole cluster lots, utilizing a Burgundy yeast isolate. The wine was transferred into various neutral and new barrels and then completed MLF utilizing a commercial MLF bacteria. No SO_2 was added at crush or until completion of MLF.

In sensory trials, all barrels were tasted for typicality of clone and barrel. The three barrels selected for individual bottling and aging stood out as unique displays of clonal expression. A vineyard blend was created both with and without the selected three barrels to distinguish any difference in the final blend. The conclusion was the three barrels were better on their own. A control wine was created from the remaining vineyard blend.

These wines were all bottled independently as single barrels in order to explore how each clone and oak treatment ages over time and to provide an educational asset to explore the complexities of Pinot Noir.

Neutral oak was used over 4 times prior to this trial.

Lot 1: Pinot Noir Pommard in neutral French oak
Lot 2: Pinot Noir Pommard in Hungarian MT+ oak
Lot 3: Pinot Noir 115 in neutral French oak

ANALYSIS NAME	LOT 1	LOT 2	LOT 3	UNITS
free sulfur dioxide	28	15	22	mg/L
molecular sulfur dioxide	0.8	0.47	0.66	mg/L
total sulfur dioxide	62	47	64	mg/L
titratable acidity	6.7	6.9	6.8	g/L
pH	3.34	3.3	3.32	
volatile acidity(acetic)	0.62	0.49	0.61	g/L
L-malic acid	<.05	<.05	<.05	g/L
glucose + fructose	0.5	0.5	0.6	g/L
ethanol at 20° C	13.98	14.41	13.47	% vol
ethanol at 60° F	13.94	14.36	13.43	% vol
catechin	8	9	12	mg/L
tannin	196	239	202	mg/L
polymeric anthocyanins	12	15	12	mg/L
total anthocyanins	126	109	126	mg/L
catechin/tannin index	0.041	0.038	0.059	
polymeric anthocyanins/ tannin index	0.061	0.063	0.059	

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TRIAL CONCLUSION: One interesting result is that while the Brix were all quite close together for fermentation lots, varying less than .5 degrees, the alcohol varied from 13.6 percent for the neutral oak 115 clone up to 14.5 percent for the new oak Pommard. Speculation is that a combination of variance in the underlying nutrient makeup of each clone as well as possible wood alcohol extraction in new oak, accounted for the variance in alcohol level.

The three sample wines continue to show clonal and barrel typicity. These four bottles offer a more complete understanding of Pinot Noir clonal variation and isolate the effects of clone, as well as oak, from the effects of a particular vineyard site.

Further, bottling these wines as individual selections allows for exploration of how each clone and oak treatment ages in comparison with a blend of clones from the same vineyard as the wine is cellared over a period of years. A long term project, this can inform which of these clones or treatments may be better suited to long aging and/or how a bend of clones could contribute to a wine that presents strongly when young and ages gracefully for many years.

Winemaker's Postmortem

What was the motivation behind this trial? Why were you interested in comparing the effects of Hungarian versus French oak on the Pommard Pinot Noir clone specifically?

Buchanan: The motivation was to understand how new oak and neutral oak affect the flavor profile of the Pommard clone (ECD 04) of Pinot Noir and how those various oak influences affect the in-bottle aging process. I prefer new Hungarian barrels for most Pinot Noir because I find they typically produce a more delicate effect than French barrels. Since neutral barrels have been used at least four times prior, they have very little flavor impact from the oak, since essentially all of the oak and toast flavor has been extracted. My focus wasn't as much French versus Hungarian but more on new versus neutral oak.

Additionally, we chose to compare the 115 clone in neutral oak to the Pommard clone in neutral oak. This has effectively given us two trials with three wines.

What were you hoping to achieve? Were there any desired outcomes?

Buchanan: I suppose the primary goal was exploration and understanding the impact of various treatments. While I have a good general idea, I had not done a controlled trial and bottling of isolated clone and oak treatments. Also, I wanted to offer an opportunity for curious consumers to explore the difference these winemaking decisions have on the wine. When I first began winemaking, this clone and oak difference in Pinot Noir was something I was very curious about.

The **Abbassi Vineyard** where these grapes come from is a very interesting, small vineyard. It has been planted to multiple clones of Pinot Noir and is fairly uniform in terms of soil and topography. This allows for trials such as this one: I can isolate a single variable and explore how it impacts the wine. Bottling these wines individually has given me great insight into how these treatments ultimately affect the wine as it ages, and I look forward to continuing to explore how new oak, neutral oak and various clones impact the wines in youth and as they age over five to 10 years. Understanding how these decisions impact an aging wine can potentially help inform how to make clonal and oak blends in order to produce wines of early approachability while still containing long-term, age-worthy characters.

Can you briefly describe how you set up this trial?

Buchanan: The grapes were picked at night and brought to the winery. They were destemmed with 30 percent whole-cluster inclusion in the fermentation bins. All wines were fermented in the same way with twice daily punchdowns. They were separated into barrels by clone. We then aged them in barrel while they completed malolactic fermentation, and then bottled separately in order to capture each individual barrel's character and nuance. We look forward to exploring the long-term aging of these wines, though it is certainly a project that requires patience.

Did you encounter any problems during the course of the trial? If so, how did you overcomes these issues?

Buchanan: It took forever to hand-write all of the details on each individual bottle. Originally, we were going to write out the clone name and oak type on each bottle. After about one case we decided to switch to codes. "N" for neutral oak, "H" for Hungarian and "Pom" for Pommard. Clone 115: well, that one didn't need an abbreviation.

Did your team or colleagues have any input on, or opinions about, this trial?

Buchanan: The team definitely pressed to use the abbreviations above. They did not want to write out all of the information on each bottle.

We also worked with the Abbassi family, **Michael** and **Kathryn**, to trial each of the barrels. We selected three based on interesting characteristics that could be isolated to explore how the wine continues to mature in bottle.

What was the outcome of the trial? Were the results as you predicted or did anything unusual or unexpected occur?

Buchanan: The results are still being experienced. Generally, the effect of new versus neutral oak has been as expected, but it is very interesting to see how the wines age. I would say that they tend to peak and valley at different times. One day I open all three to discover one is really expressive and "alive," but a few weeks later, a different one will show those same characteristics. This difference in expression over time is really fascinating to me. One very interesting outcome for me has been the dramatic difference between the 115 clone and the Pommard clone in neutral oak. It really demonstrates why these clones have been isolated and have very different uses in Pinot Noir blends. The selection of clones has a significant impact on overall wine style, and this trial is a demonstration of that effect.

What winemaking lessons did you learn from this trial? In light of those lessons, do you plan to adjust your current winemaking program?

Buchanan: Informally, I discovered that various consumers prefer different wines. I can bring all of these wines to a tasting and there is almost always a clear and decided preference for each individual. I don't know that I will adjust my winemaking directly. However, because I now have a greater understanding of how various clones and oak treatments will age, I can make more informed decisions as to which oak to utilize with which clone.

What were some comments from your team? Which wine did they prefer? Why?

Buchanan: Generally, the Pommard in neutral oak has been preferred, though the new oak was preferred when the wines were young. The 115 has given some incredibly beautiful aromatics and mouthfeel. Much like our consumers, different members prefer different wines. I'm personally a fan of the neutral oak, but I'd be hard-pressed to choose a favorite between Pommard and 115. They are really distinct and interesting; it would really depend on what I was in the mood for. The Pommard is more earthy and brooding with deep and darker fruit aromatics and more structured mouthfeel. The 115 tends towards a lighter fruit and floral aromatics with an almost weightlessness in the mouth.

Do you plan to conduct a follow-up trial to re-test these results?

Buchanan: Perhaps, though I may choose to explore different attributes or variables of single barrels or clones in the next iteration.

Would you conduct a similar experiment using a different kind of wood? Would you conduct a similar experiment using a different Pinot Noir clone or different grape variety?

Buchanan: Absolutely. I certainly have interest in exploring how second-use oak compares to new barrels. We're always experimenting and looking for something cool to explore. The first step in the scientific method is observation, and I truly enjoy creating interesting wines to observe the effects of various variables. **WBM**

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2019 YEAR IN REVIEW

Vintage Report

The 2019 Growing Season in Review

You mean, besides the grape market, right?

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.

THE 2019 GROWING SEASON will be marked, if not scarred, by the amount of unsold fruit still hanging on the vine after harvest. You don't need me to tell you that it was a rough year for growers just about everywhere in California. Growers with grape contracts faced strict limitations on their contracts' tonnage maxima; and, while it was an average year for yield, even some contracted vineyards had fruit that was left hanging on the vines. For those without contracts, it was a no-go as almost nobody was looking to buy grapes this year. Even good grapes. I know that some spot market bargains were had, but most non-contracted grapes went to the birds. Or to the fungi. Unfortunately, I feel that this is not the last we've seen of a bad grape market. Let's hope it's a short dip and we get back into balance soon.

It Was a Good Vintage But…

As usual, I'm writing this from the perspective of the California North Coast wine-growing region. Any weather data I'm showing are from the Russian River region, or at least the corner of the region I call home base, which is the northern part of the AVA. I would bore you (and me) to pieces trying to pore over every region's weather data, and so I'll limit the discussion in this way to make it bearable and useful for most of us.

Overall, this year was fairly smooth. No big heat spikes, generally good weather and enough time available to ripen the fruit. But no growing season is perfect, and perfect is boring. So, I'll accentuate the negative—because negativity is more interesting.

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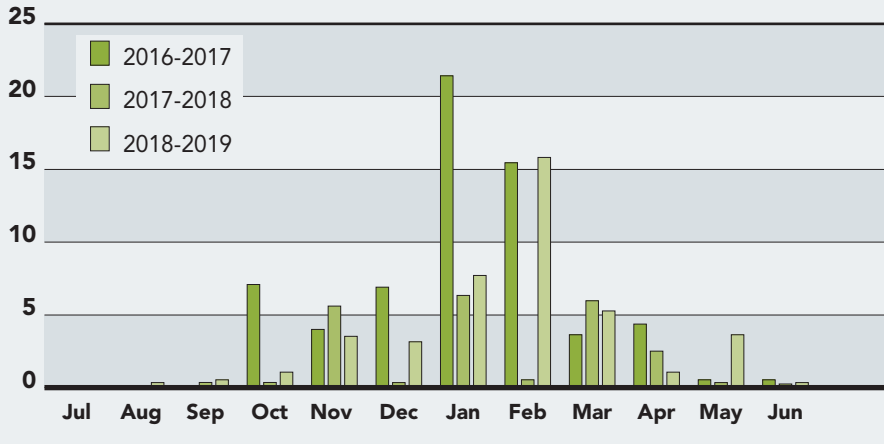
A Wet May

The rainy season was going along just fine, except for the flooding in February. I don't mean to be insensitive, as the floods were severe and very damaging. But they occur frequently in a wet climate like this; and as usual, it happened when the vines were sleeping. After the February rains, the precipitation was more typical of the region, and we were proceeding along with what seemed to be a typical, if not drier than normal, spring. That is, until mid-May, when we received a rather unseasonal rainfall that ranged between about 3 to 5 inches over two days (FIGURE 1). East Coast folks will laugh at us, but that amount of rainfall is quite a challenge for fair-weather Californians.

FIGURE 1 Monthly Precipitation — Russian River



In the short-term, the rainfall stopped all our field work for more than, including much-needed fungicide spraying. In the longer term, that amount of moisture was enough to bring most soils back to field capacity and even saturate many vineyards to a depth not usually found in May. We have soil moisture probes in vineyards throughout the region; and after the initial rainfall drained away, many soils remained saturated at depths of about 2 feet (and below, of course). Many of these soils did not fully drain below saturated levels in the lower soil profile until July and August and some even into September. It was a challenge to tell some growers not to irrigate in the middle of the summer, but many of them didn't need to irrigate because that stored moisture held on for so long. My day job largely involves guiding growers to initiate their irrigation later into the season in order to extract the rain-fed moisture before applying any supplemental moisture. This year took that concept to an extreme, and we didn't need to start irrigating most vineyards until August and September in the North Coast. (Likewise in East Paso Robles!). Some vineyards held on all season without any irrigation and only needed to be irrigated after harvest.

When the rains arrived, bloom and fruit set were not yet in wide display. There was some bloom but less than what is usually present mid-May. This is a good thing because rain, during bloom and fruit set, can and will cause failure to set fruit. There were a few precocious vineyards that were in bloom, and some did not fare

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well as a result. We did see a fair amount of shatter in Cabernet Sauvignon and some Rhône varieties, but fruit set was largely unimpeded by the foul mid-May weather. The spate of cool weather did seem to slow down the vines, and we were looking at a potentially very late season and harvest at the time of fruit set.

We Californians are spoiled with usually perfect growing season weather, and clearly that is something that makes our region so great for growing winegrapes. So, the vintage is usually affected when that dry weather pattern is disturbed. Another downside to late spring rainfall in 2019 was that vines and other vegetation grew wildly. It was tough to keep up with cover crop mowing and mowing, three times or even more was not uncommon. But worse than that were those growers who tilled in their cover crops—for shame! The season played a trick on us and made us think that spring was over with dumping its rainfall. So, some thought they would conserve moisture by tillage (as well as those who till for aesthetics). Those who tilled their tractor rows had it worse than those that didn't. Unpredictable spring rainfall is yet another reason to consider moving to no-till management practices.

Botrytis is always a fear after a rain, partially in the short-term but mostly in the long-term, as the fungus can create a latent infection in the clusters that re-awakens much later in the growing season. Astute growers applied preventative sprays after fruit set and again at bunch closure. Perhaps as a result, and due to a rather dry harvest, I saw very little bunch rot on well-tended vineyards this year.

Not only did cover crops and weeds grow like, uh, weeds, but so did the vines. Keeping up with canopy management after the May rains was difficult; and just when crews finished one tucking and positioning pass, another was needed, in addition to other canopy management tasks. With vines growing so wildly, our clients and our own vineyards withheld any nitrogen fertilization, for fear it would only feed the fire. I presume that nitrogen fertilizer was eventually applied to most vineyards, but I think some simply skipped that step; and as a result, I think some vineyards were nitrogen-deficient as harvest approached.

Temperature Patterns

In my opinion, though rainfall patterns are important, temperature patterns define the vintage. If that is the case, then this was a pretty good one, not an exceptionally hot year like 2017 nor an exceptionally cool one, like 2018. The 2019 vintage was a more-or-less Goldilocks one where things were just about right. Looking at the accumulated heat summation (degree-days, FIGURE 2), we see that the season started out pretty typically compared to the previous two seasons, whereby in mid-June heat accumulation was about the same for all three years. A late-season spate of warm weather rose the heat summation above that of last year, but the absence of extreme heat waves kept accumulated heat well below that of 2017 (a season many of us want to forget).

FIGURE 2 Accumulated Growing Degreee Days
— Russian River

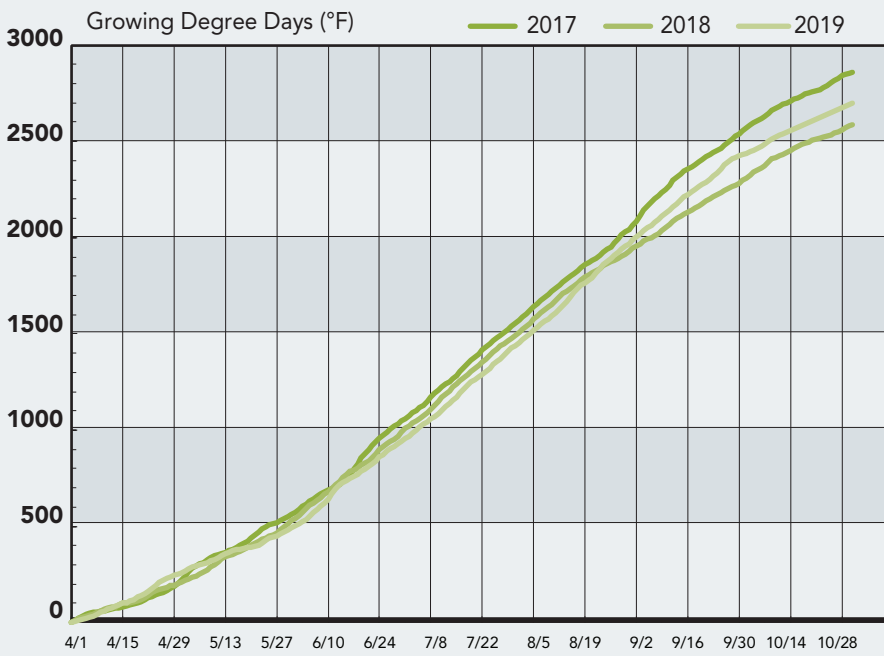
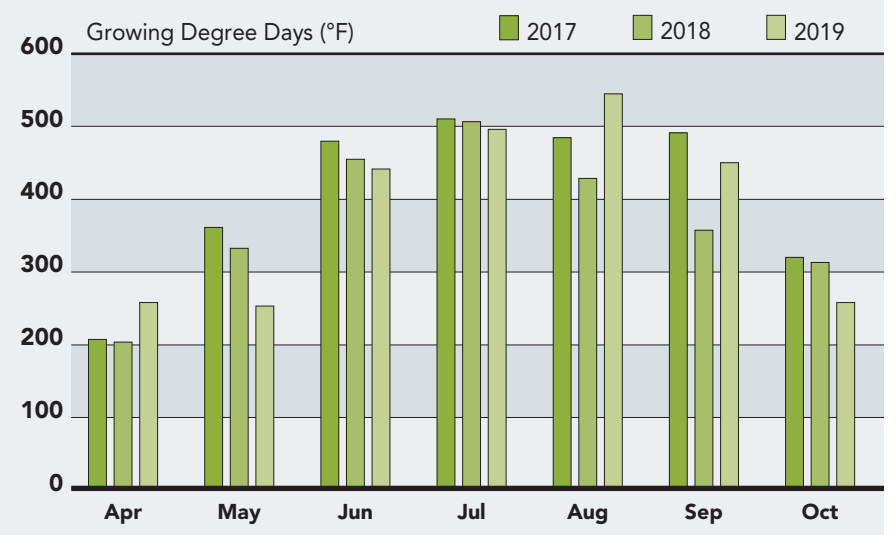


FIGURE 3 Total Growing Degree Days by Month
— Russian River



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Looking at heat summation month-by-month (FIGURE 3), we see that May temperatures were much lower than the previous three growing seasons, which tended to delay the onset of bloom and fruit set. Many vineyards were setting fruit well into June this year, which is later than typical by about two weeks. My observations were that bloom and fruit set were erratic and uneven. Flowers were blooming on vines where fruit had already set. While not uncommon, this is not a blessing for quality because uniformity of maturation tends to lead to higher quality.

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By June and July, things were more typical of the region, with weather being consistently mild to warm but devoid of extreme temperatures. We like that because the vines like that. But the late and erratic fruit set led to late and erratic *veraison*. We saw green Cabernet Sauvignon berries into late August, something I can't recall seeing before. *Veraison* seemed to take weeks in a single vineyard block. I don't like to appear pessimistic, but a long, drawn out *veraison* process is not good for wine quality. Again, this stemmed from the uneven bloom and fruit set weeks earlier.

Weather was quite warm during August and September, with heat summations rivaling the hot 2017 season, though without the extremes of the high temperatures in 2017. There were a few heat spikes, including one in late September that reached 105° F in Alexander Valley and a bit higher than that in a few other locations, like Calistoga, but nothing that caused immediate damage to most vineyards. The very late *veraison* was matched with a very short ripening period brought about, presumably, by the consistently warm, but not extremely hot, weather.

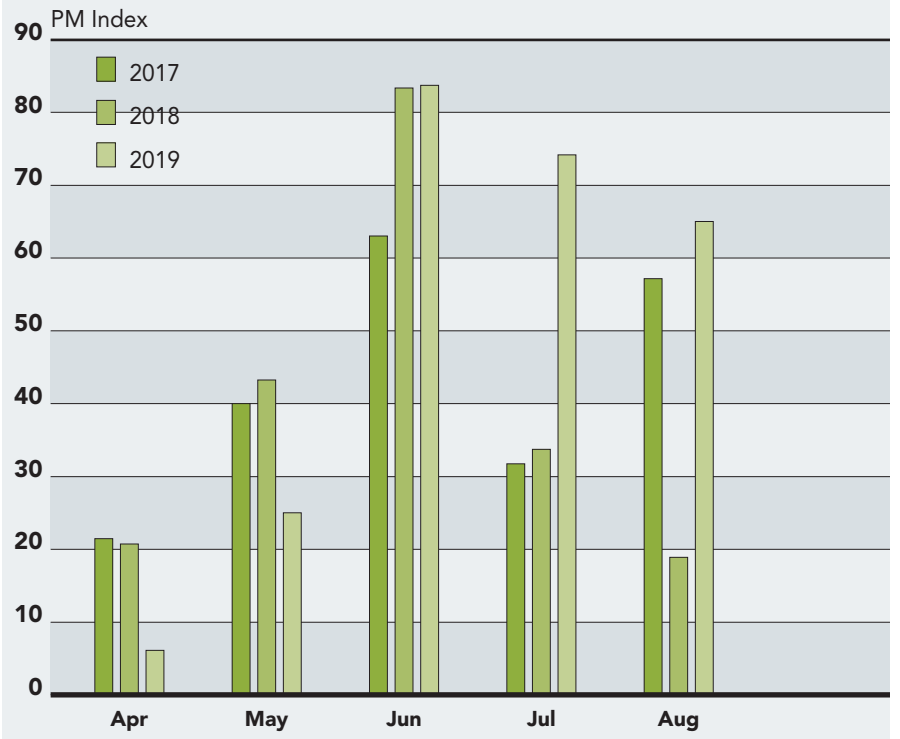
Does that bode well for quality? Well, we usually hope for a long ripening period, which allows for phenolic "ripeness" coincident with ideal sugar, acid and pH levels. For certain, many vineyards developed sugar quickly, and phenolics seem to match. My fear for the quality of the vintage lies more in the potential variability of fruit maturation, which persisted throughout ripening and originated at fruit set. Furthermore, the late spring rains made it difficult for vines to reach desired water stress levels as there was simply too much moisture available to them. Stress prior to *veraison*—I like to target lag phase—is an important physiological trigger of secondary metabolic enzymes in the fruit. This is especially important for red varieties. Some vineyards did indeed reach target stress levels prior to *veraison,* but I would estimate that most did not, especially if they were irrigated too early.

Disease

Since I'm being so negative, I'll have to mention disease. Every year I say the same thing: "This was the worst mildew year ever." Funny, though, that early in the season we were all marveling at how it was a good year for mildew control. That confidence was soon shattered when we ventured into the "worst mildew year ever." This can best be visualized by looking at the powdery mildew (PM) risk index, with daily scores averaged over each month (**FIGURE 4**). Early-season (April-May) PM index levels were quite low in 2019 compared to the prior two years. Perhaps this created a sense of complacency with growers; and since the rains happened, it was difficult to catch up on sprays anyway.

But the index went sky-high in June, rivalling that of 2018, with index levels averaging over 80. That is high risk indeed. To make matters worse, the index stayed high in July and August. This was due to the consistently mild weather. It takes high heat to push mildew back, but our high temperatures did not venture over 95° F and were much milder than that, so mildew was a happy camper. We were not. Susceptible varieties, like Chardonnay, were

FIGURE 4
Average Powdery Mildew Index by Month — Russian River



hit bad. Control was difficult and some fruit simply had to be dropped. The late and uneven *veraison* made it even more challenging, since growers who made their last spray at *veraison* were surprised with the persistence of green berries, which are susceptible to PM and went unprotected before finally entering the ripening phase.

SCOTT SUMMERS

Late Spring Sometimes Defines the Vintage

It seems clearer than ever that, at least in the North Coast, late spring weather influences the vintage quality as much as any other weather factor. The big, late rain lies in counterpoint to the mild to warm (but not too hot) temperature patterns during fruit development. The mild weather also made for some severe outbreaks of powdery mildew that were tough to eradicate. Pardon my guarded pessimism, but while I'm sure great wines will be made from fruit this vintage, my overall impression is just "meh." Hopefully, we'll all be pleasantly surprised. **WBM**

PW PRACTICAL Winery & Vineyard

Has Climate Contributed to a Pierce's Disease Resurgence in North Coast Vineyards?

M.P. Daugherty, M. Cooper, R. Smith, L. Varela, R. Almeida

Matt Daugherty works in the Department of Entomology at UC Riverside, **Monica Cooper** works with the UC Cooperative Extension in Napa County, **Rhonda Smith** and **Lucia Varela** work with the UC Cooperative Extension in Sonoma County and **Rodrigo Almeida** works in the Department of Environmental Science, Policy & Management at UC Berkeley.

CLIMATIC CONDITIONS PLAY AN important role in agroecosystems via direct effects on plant performance and indirectly by influencing pest or pathogen dynamics.[3] Differences in temperature, precipitation or humidity may contribute to interannual variability in crop yield, quality or damage and underlie long-term trends in such effects over longer timescales.[12,19]

For grapevines, vine growth and berry quality are sensitive to climatic conditions, with the expectation that climate change is altering which regions are most suitable for premium winegrape production.[21] Climate change may also impact damage to vines, requiring changes to pest and disease management programs.[5] One disease whose epidemiology is strongly tied to climate is Pierce's disease (PD).[16]

Pierce's Disease and the Role of Climate

PD is caused by a strain of the bacterium *Xylella fastidiosa* that causes progressive leaf scorch, desiccation of fruit, defoliation and vine death (**FIGURE 1**).[20] Although there are some differences in symptom expression among cultivars,[15] all conventional cultivars of *Vitis vinifera* are considered susceptible to the pathogen. *X. fastidiosa* is transmitted by multiple species of xylem-sap feeding insects, including sharpshooter leafhoppers and spittlebugs.[20]

In coastal areas of California, PD is strongly associated with the activity by the native blue-green sharpshooter (BGSS, *Graphocephala atropunctata*), which is efficient at transmitting *X. fastidiosa* to grapevines.[13] Patterns of disease reflect proximity to BGSS reproductive habitats, with clustering of diseased vines typically on the periphery of vineyards near riparian habitats.[13]

MATT DAUGHERTY

FIGURE 1. Grapevine in late summer showing characteristic leaf scorch symptoms of Pierce's disease.

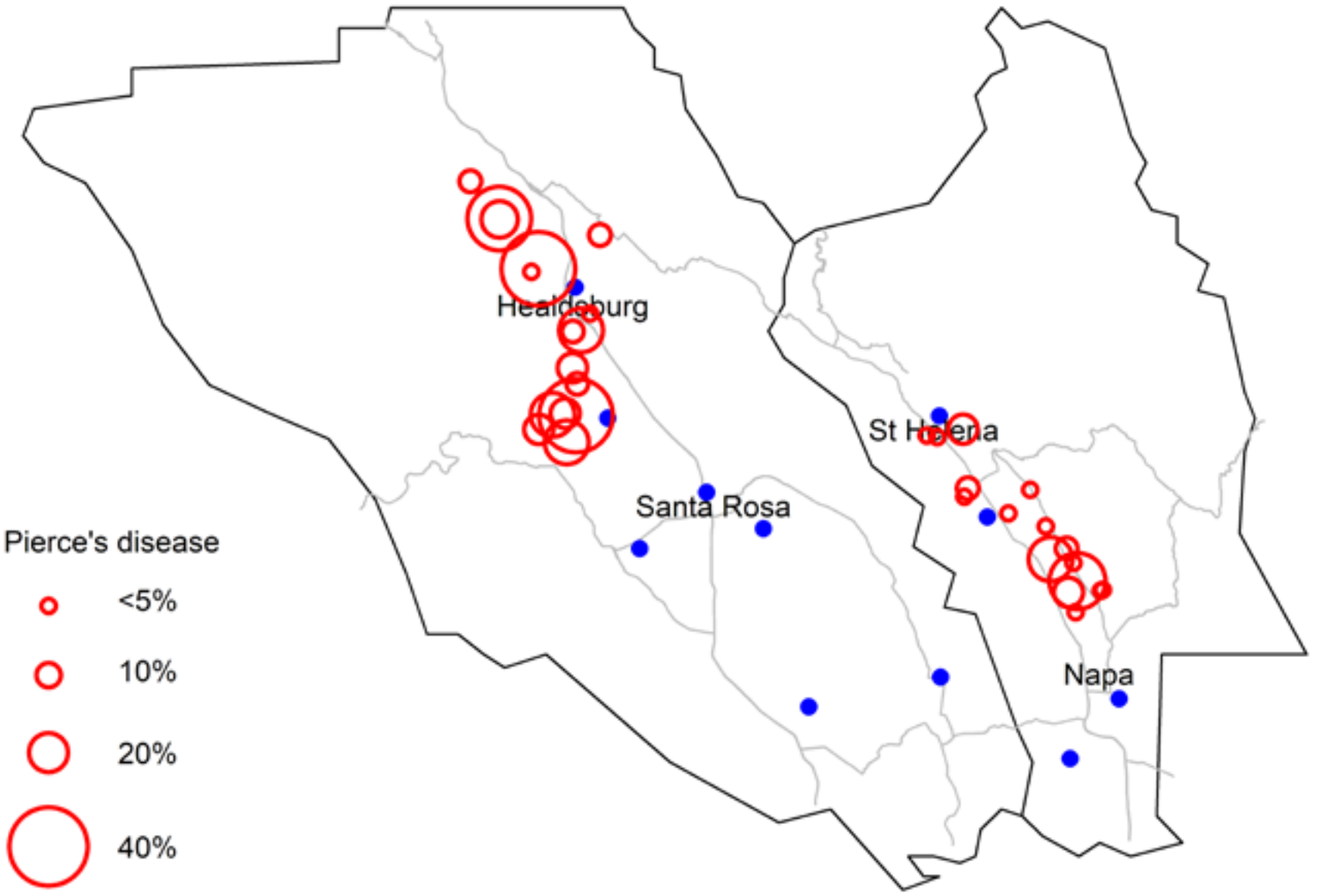


FIGURE 2. Map of the study region, including Sonoma and Napa counties. Open symbols denote the prevalence of Pierce's disease (i.e. percent of infected vines in Fall 2018) at 32 vineyards surveyed as part of other research, some of which have upwards of 30 percent of vines infected. Blue points denote the location of 11 weather stations used in analyses, and gray lines show major roads.

PD in the North Coast, including Napa and Sonoma counties, is episodic—modest in most years but with occasional periods of high incidence. At least three epidemics have occurred in the region since the 1970s, including an ongoing resurgence in which surveys have documented upwards of 30 percent disease in some vineyards (**FIGURE 2**).[1] A comprehensive understanding of the episodic nature of PD in this region, or the cause of the current outbreak, is lacking. Ongoing research by the authors, funded by the Pierce's Disease Control Program (*cdfa.ca.gov/pdcp/*), is evaluating the potential drivers of this resurgence, including whether recent climatic conditions played a role.[1]

PD epidemiology has been known to depend on climate for several decades based on observations that disease incidence was higher following high rainfall years.[22] Many aspects of the PD pathosystem have been linked to temperature or precipitation. In the field, BGSS densities are higher following warm, wet rainy seasons,[10] and temperature influences seasonal patterns of BGSS reproductive and flight activity,[4]

Experiments confirm that most aspects of sharpshooter performance are strongly related to temperature, including higher feeding rate,[18] development,[2] overwinter survival[17] and transmission of *X. fastidiosa*[7] at higher temperatures. In addition, *X. fastidiosa* infections depend on climate, particularly temperature. The multiplication rate of *X. fastidiosa* is generally positively related to temperature,[9] which results in plants becoming a source of infection sooner and a more rapid disease onset under warmer conditions.[8]

Temperature influences the percentage of vines that lose infection over the winter, with more recovery under colder conditions or at locations with more frequent cold winter days.[9,11] Such effects likely explain why PD appears to be restricted to certain coastal and southern areas of the United States.[14] They also suggest that interannual or longer-term differences in climate may be epidemiologically significant, with disease incidence expected to be highest around relatively wet, warm rainy seasons and warm growing seasons.

Here, we ask whether recent climatic conditions in the North Coast have contributed to the ongoing PD resurgence by using long-term weather station records. Specifically, multiple temperature and associated metrics were analyzed to determine if conditions surrounding the approximate onset of an outbreak were noticeably different than historic observations in a way that is expected to favor PD.

Best Practices for Sharpshooter and Pierce's Disease Monitoring

Monitoring is needed to guide when or where vector management should occur. The easiest way to monitor blue-green sharpshooter is with double-sided sticky traps, which are available from several retailers (FIGURE 3). Vary trap number based on block size, from at least a few traps for small blocks (less than 2 acres), up to one per 2 to 3 acres for larger blocks. Spread traps along the periphery of the block, especially nearby vector sources (riparian habitat, ornamental plantings) or other areas with high PD prevalence in the past. Place traps on trellis wires or posts above the trellis, slightly above the canopy, raising them as the canopy develops. Check traps at least monthly from budbreak through leaf fall, particularly during the spring when weekly to biweekly checks may be justified. Record the number of sharpshooters and replace the trap as needed.

Disease surveys should occur yearly to identify which vines to remove due to lack of vigor or limit sources of infection for vectors. PD symptoms are most apparent later in the growing season. Visually inspect each vine in the late summer or early fall, and flag those vines with symptoms for later removal. PD can be highly variable and may appear similar to other diseases (Esca, Grapevine Leafroll Disease), nutrient deficiencies (magnesium, potassium) and excess soil salinity. Prior to vine removal, if unsure about symptoms, consider sending a sample of one leaf per vine collected from a subset of suspected PD vines to a laboratory for confirmation.

2020 PD/GWSS REFERENDUM

California grape growers will vote in Spring 2020 on extending the Pierce's Disease and Glassy-Winged Sharpshooter (PD/GWSS) Assessment for another five years. The assessment funds research to find solutions to PD, GWSS and additional designated pests and diseases of winegrapes. Every entity that produced and sold winegrapes in 2019 will receive a ballot. Growers who operate multiple entities will receive a separate ballot for each entity; they are not duplications. Each ballot should be voted upon and returned.

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FIGURE 3. Double-sided yellow panel trap used in a vineyard to monitor for blue-green sharpshooter and other insects.

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Key Points

- Pierce's disease (PD) has affected grape production for as long as commercial vineyards have been present in California.
- Ultimately a large-scale, long-term monitoring program is needed in the region to understand comprehensively the role of climate in triggering a PD outbreak.
- Several PD epidemics have occurred, but their causes have not always been clear.
- Since approximately 2012, vineyards in the North Coast of California have seen a marked increase in PD prevalence, at least the third such outbreak since the 1970s.
- Local climatic conditions are known to affect many aspects of the PD pathosystem, including performance of the pathogen, *Xylella fastidiosa* and vector, *Graphocephala atropuncata*.
- Analyses were conducted to assess whether the climate in recent years may have contributed to the observed PD resurgence in the region.
- Observed higher temperatures, during both the dormant and growing seasons, are consistent with elevated PD incidence in some, but not all, recent years.

Analysis of Recent Climatic Conditions in the North Coast

Records were collected from 11 weather stations located throughout Napa and Sonoma counties (FIGURE 2) that are part of the California Irrigation Management Information System (CIMIS) or National Climate Data Center networks (*ipm.ucanr.edu/weather/index.html#weatherdata*). Each included up to 90 years of daily measures of minimum and maximum air temperature, which were used to analyze multiple temperature and associated metrics during two seasons: "dormant" (November to March) and "growing" (March to November). Patterns in precipitation were not explored given the historic drought in the region at the time, that, if anything constrained PD incidence.[10]

Three temperature metrics were considered for the dormant season: mean daily minimum temperature (°C), number of days with a minimum temperature less than 4° C (i.e., frequency of "cold days")[11] and maximum temperature. For the growing season, three similar metrics were considered: mean daily maximum temperature, number of days with maximum temperatures above 18° C (i.e., frequency of "warm days") and the time to reach the degree-day requirement for *G. atropunctata* BGSS development (i.e., 162 degree days). This last metric reflects how quickly the offspring of overwintering adults develop to become active in vineyards the following summer, which was calculated starting in January following research from **E.A. Boyd** and **M.S. Hoddle**.[4]

Prior to analysis, values of each metric were standardized yearly between 2011 and 2016, by dividing by the historic mean for each weather station through 2010. Values greater than 1.0 represent yearly observations that were warmer, more frequent or slower than observed historically, whereas values less than 1.0 equate to observations that were colder, less frequent, or more rapid than was historically the case.

A set of statistical analyses were conducted to test, overall, whether the standardized temperatures and associated metrics in recent years differed from the historic average (i.e. 1.0).[6] We then evaluated the following predictions for each year: warmer temperatures than was historically the case (i.e., more than 1.0), fewer cold days during the dormant season (i.e., less than 1.0), more warm days during the growing season (i.e., more than 1.0) and shorter times to reach the degree-day requirement (i.e., less than 1.0).

TABLE 1. Range in historic values among weather stations, and test for overall significant difference between recent years and historic averages (i.e. intercept ≠ 1), for temperature and associated metrics during the dormant or growing seasons. Results are from a set of linear mixed-effects models with a random effect of weather station[6].

		intercept			
	historic values	**x^2**	**df**	**P**	**value (se)[1]**
Dormant season (Nov.-Mar.)					
min. temp.	2.1 - 4.9°C	10.214	1	0.0014	0.959 (0.011)
cold days	60 - 98.3 d	13.264	1	0.0003	1.208 (0.043)
max. temp.	15.3 - 16.8°C	17.917	1	<0.0001	**1.029 (0.005)**
Growing season (Mar.-Oct.)					
max. temp.	23 - 28°C	1.068	1	0.3015	0.993 (0.007)
warm days	184 - 217 d	3.736	1	0.053	**1.023 (0.011)**
d-d requirement[2]	136 - 184 d	2.961	1	0.0853	1.045 (0.026)

[1] **bolded values** are consistent with effects expected to be associated with higher PD incidence.

[2] Number of days required to meet the degree day developmental requirement for blue green sharpshooter.

For the dormant season, historic means of the three climate metrics varied up to two-fold among the coldest and warmest sites, with minimum temperature showing the widest range (TABLE 1). The intercepts for all three metrics differed significantly from 1.0 (TABLE 1), and some years had significant deviations from historic means in a direction that may have contributed to PD incidence. The 2014-15 dormant season had higher minimum temperatures and lower frequency of cold days than historic averages, and both the 2013-14 and 2014-15 seasons had higher maximum temperatures (FIGURE 4).

For the growing season, mean values of the three climate metrics varied up to 35 percent among the coldest and warmest sites (TABLE 1). The frequency of warm days had an intercept that was marginally different from 1.0, whereas the other two were non-significant (TABLE 1). There were significant deviations from historic means for two of the metrics in a direction that is consistent with greater PD pressure—daily maximum temperature was higher in 2015 (FIGURE 5A), and the frequency of warm days was greater in three of the years (FIGURE 5B).

Conclusions and Next Steps

For vector-borne diseases, epidemics may be attributable to a wide range of factors associated with the pathogen, vector, host or environmental conditions. *X. fastidiosa* exemplifies this potential for multiple triggers of disease outbreaks,[16] with periods of unusually high incidence that have been ascribed to pathogen introduction, prevalence of nearby reservoir hosts, invasion by a new vector, and with climate likely playing an important role.[14]

Multiple lines of evidence indicate that warmer conditions are generally expected to increase sharpshooter populations or activity, and *X. fastidiosa* infection levels and persistence. Long-term datasets are lacking that would allow for explicit tests of the role of climate in presumed increases in vector or pathogen pressure building to outbreak conditions. As a preliminary step toward addressing this hypothesis, contemporary weather station data relative to historic values were compared to determine if they differ in a way that is expected to exacerbate PD incidence.

In the analyses presented, one metric each in the dormant and growing seasons had an overall intercept that differed significantly from historic conditions in a manner that is consistent with greater PD. Moreover, for five of the six metrics in at least one of the contemporary years, there was a significant deviation from historic averages that may favor higher vector populations and activity levels[10,18] or more rapid development and greater persistence of infections.[8,9,11] Thus, it is plausible that these significantly warmer conditions in recent years elevated PD incidence in the North Coast.[1]

Yet, the results were also mixed in that all temperature metrics were not significantly different from historic averages in all years. Indeed, by some metrics, the first couple of years (2011 and 2012), during this window of time, appear colder than historic averages. Nor is it known definitely how many consecutive years of warmer than typical conditions are required to elevate the risk of a PD outbreak.

Ultimately, a comprehensive understanding of whether recent conditions contributed to the ongoing North Coast PD resurgence will require long-term, large-scale observations of sharpshooter abundance and *X. fastidiosa* infection dynamics in vines beyond what are currently available. Such information is needed to gain insight into the episodic nature of PD in the region and to eventually be able to predict when an outbreak is likely to occur. In the absence of such predictive tools, it remains especially important for grape growers to monitor regularly for sharpshooters and PD (see sidebar) to identify those areas most at risk and to guide management decisions. **WBM**

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Grape Breeders Search for Reliable DNA Markers

Why the Pinot Noir PN40024 reference genome is not enough

Tim Martinson, Qi Sun, Cheng Zou and Lance Cadle-Davidson

Timothy Martinson is the senior extension associate at Cornell University in Geneva, NY. **Qi Sun** is a senior research associate in the Computational Biology Service Unit at Cornell University, and based in Ithaca, NY; **Cheng Zou**, is a research associate at Cornell University in Ithaca, NY; **Lance Cadle-Davidson** is a research plant pathologist in the Grape Genetics Research Unit at USDA-ARS in Geneva, NY.

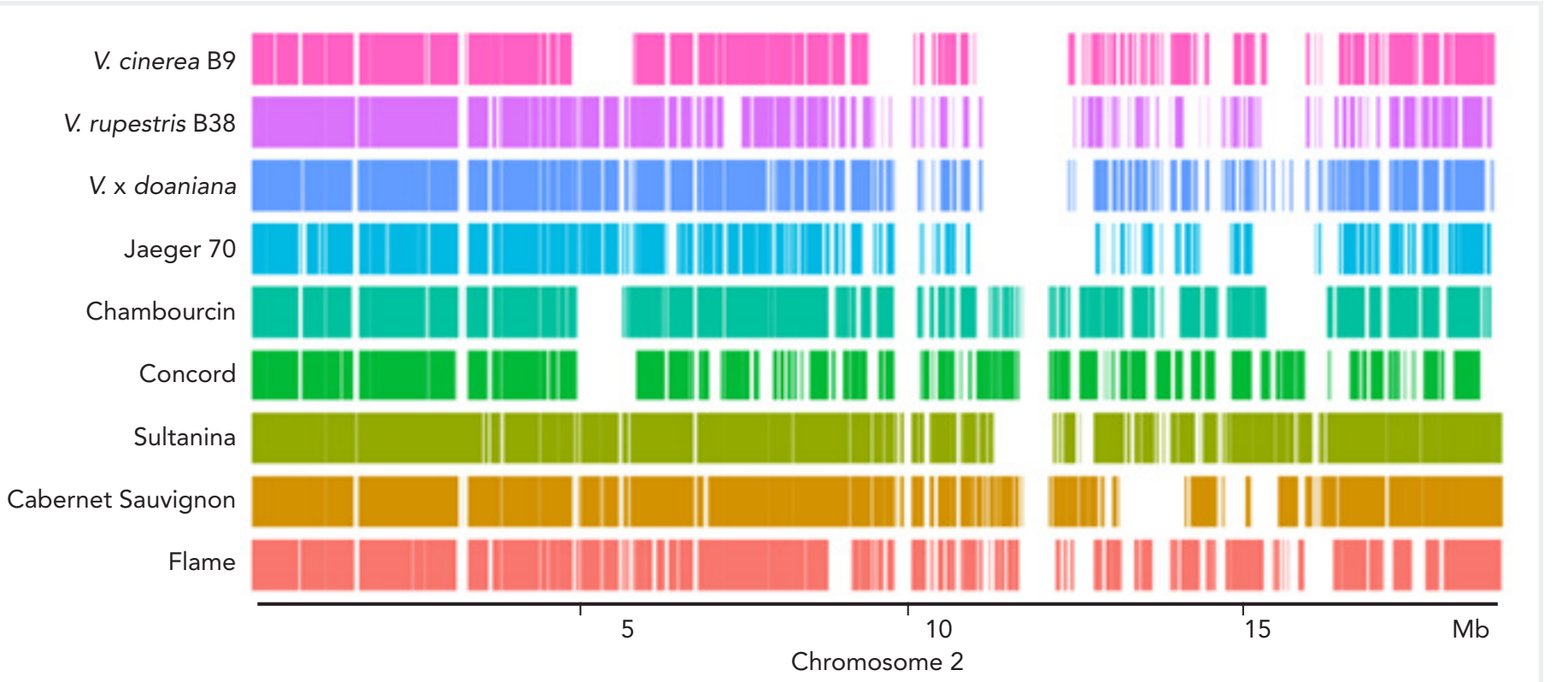

FIGURE 1: Diagram representing the positions of "Core Genome" sequences on chromosome 2 of the nine genomes compared to the PN40024 reference genome.

DNA MARKERS ARE REVOLUTIONIZING grape breeding. Inexpensive DNA sequencing has allowed breeders to map the genome and associate observed traits (phenotypes) with DNA markers. Marker-assisted selection (see "Grape breeders no longer flying blind," *Wines & Vines*, March 2018) has made it possible to identify which seedlings from conventional crosses carry traits of interest and then discard those that don't develop early in the process.

The search for markers got a big boost in 2007. Shortly before Christmas, research groups from France and Italy announced they had collaboratively sequenced the grapevine genome—its complete DNA sequence—controlling everything that makes a grapevine a grapevine. A "**Science Daily**" announcement on December 25 hailed the draft reference genome as "an invaluable tool for creating grape varieties resistant to diseases without altering the quality of the resulting wine."

This was an enormous effort, involving inbreeding (self-hybridizing) Pinot Noir for five generations to develop a line called "PN40024" (PN40024 is *not* a commercial Pinot Noir clone and has no commercial value) and "Sanger" shotgun DNA sequencing. Sanger sequencing was state-of-the-art back in 2007, and they needed an inbred line, such as PN40024, to assemble the draft genome with this method. It took several years and cost millions of Euros to put together the PN40024 reference genome and was, at least, a hundred-fold more expensive than current sequencing technology.

In spite of the time and the cost, the PN40024 reference genome turned out to be not good enough.

Breeders link traits to DNA markers by testing mapping populations, which are the "F1" progeny of test crosses. These populations of 100 to 500 progeny produce different combinations of the parental traits, which can then be tested and linked to specific DNA markers. (See "The Phenotyping

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Bottleneck: How grape breeders link desired traits to DNA markers," *Wines & Vines*, January 2019)

The problem was that the markers identified using PN40024 genome as the reference didn't work across the *Vitis* genus. When applied to North American and Asian *Vitis* species and hybrids, the markers didn't transfer. This was a significant problem for breeders, because the disease-resistance traits breeders seek to incorporate into new varieties originate in a broad range of North American and Asian *Vitis* species.

When *Vitis*Gen researchers used a technique called Genotyping by Sequencing to identify 4,000 SNP markers positioned to the PN40024 genome during the first *Vitis*Gen project, they found that only 1 to 2 percent of them worked across 17 genetically diverse mapping populations. That's not good enough for grape breeders.

There are several reasons why the PN40024 genome wasn't useful to grape breeders.

Twenty million years of evolution separate the sole European species *Vitis vinifera* from the dozens of North American and Asian wild grape species. While all *Vitis* species (except muscadine grapes) have 19 chromosomes and are capable of interbreeding, much of the genome has rearranged itself since, through many generations of evolutionary selection and adaptation. The modern human genome (*Homo sapiens*) has been around for only 200,000 years while the split of North American and European *Vitis* is 100 times older. A lot can happen in 20 million years.

Markers are developed by comparing DNA sequences from different individuals to the reference genome. This comparative analysis works only if the individuals are closely related to the reference with minimal chromosomal re-arrangement. Otherwise, the markers are not reliable and are error-prone. If you are a breeder seeking to incorporate traits from North American or Asian *Vitis* species, markers based on the *Vitis vinifera* reference genome lack those traits would not tell you much about the resistance genes you want.

Another reason is that grapes are highly heterozygous. They inherit two sets of genes, one from each parent, and often have two or more different forms (alleles) of many genes. Unlike many plants (including cultivated grapes), wild grapevines must outcross. Wild grapes are either male or female, with each vine having either stamens (male flowers that release pollen) or pistils (female flowers that produce fruit and seeds). When grapes were domesticated, humans selected vines that were hermaphroditic (both male and female parts on every flower) for obvious reasons. Cultivated grapes can self-pollinate so they don't need adjacent grapes with male flowers to pollinate the female vines and set fruit. Hermaphroditic flowers freed producers from having to plant and cultivate male vines that produce no fruit and resulted in more predictable and even fruit set.

But heterozygosity is a challenge for DNA sequencing because many genetic loci have two or more different forms (alleles) of each gene. When doing marker-assisted breeding in outcrossing crops, such as grapevines, breeders need to be able to track the two set of genes in each of the two parents separately. In practice, that requires markers to be more accurate and less tolerant of missing data.

Finally, DNA markers are signposts that point to genes but are not the gene itself. Markers in previous genetics platforms were based on one DNA base pair substitution and were referred to by geneticists as Single Nucleotide Polymorphisms (SNPs). Genes from different parents can have a handful of different SNPs and, therefore, more than two alternate forms (alleles) of each gene. Single SNP markers could only distinguish two alternate alleles. The Genotyping by Sequencing markers used in the first *Vitis*Gen project were based on one SNP and could only distinguish two alleles (present/absent). They failed to detect a broader range of variable alleles when they were applied to the wider *Vitis* genus.

TABLE 1:
Ten genome-wide sequences used to generate the Vitis Core Genome.

Type	Name of accession	Origin
Wild *Vitis* species	B9[1]	*Vitis cinerea*
	B38[1]	*Vitis rupestris*
Hybrids of wild *Vitis*	Vitis x doaniana[1]	*V. acerifolia x V. mustangensis*
	Jaeger 70[1]	*V. aestivalis lincecumii x V. rupestris*
Hybrid cultivars	Chambourcin[1]	*V. rupestris, V. riparia, V. cineria, V. vinifera*
	Concord[1]	*V. Labrusca, V. vinifera*
V. vinifera cultivars	Cabernet Sauvignon[2]	*V. vinifera*
	Flame Seedless[3]	*V. vinifera*
	Sultanina /Thompson Seedless[2]	*V. vinifera*
Reference genome	Pinot Noir PN40024[4]	*V. vinifera*

[1] Genome sequence generated by VitisGen project

[2] Genome sequence from online database

[3] Genome sequence generated by VitisGen project with support from California Table Grape Commission

[4] Original reference genome compiled by Jaellon et al (2007)

Researchers needed a way to identify markers that would work across the entire *Vitis* genus so that they could be confident that markers from wild American and Asian *Vitis*, European *Vitis vinifera* and hybrids would be transferable among species.

The Core Genome

The *Vitis*Gen2 genetics team addressed this by targeting the regions of DNA that are evolutionarily conserved (the core genome) across the genus.

To do so, they compared 10 genomes from a broad range of *Vitis* cultivars and species, including wild vines (see **TABLE 1**). It is notable that seven of these reference genomes were compiled by the *Vitis*Gen2 project, a feat that would have been prohibitively expensive just 10 years ago.

By comparing the PN40024 reference genome to the other nine genomes, they found that about 10 percent of the genome was shared by all of the tested accessions and about 70 percent of these are regions that actually code for proteins that make a grapevine a grapevine. Much of the other 90 percent includes what is known as the dispensable genome: "non-coding" DNA that accumulates over evolutionary time, or genes whose presence might be beneficial in some environments but not others.

The Core Genome sequences stayed consistent over 20 million years of evolution; and as a consequence, researchers were able to find and track them. Much like matching the edges of patterned fabric, they were able to align these common gene sequences (the core genome) to each other (see **FIGURE 1**) and find out what these diverse genomes shared in common. The result is a very detailed map, with a dense network of "mileposts" that provides a solid foundation for identifying common and robust markers.

New, automated sequencing technologies have brought the cost of whole-genome sequencing down from millions of dollars in 2007 to an estimated $3,000 per genotype in the seven grapevines sequenced by the project.

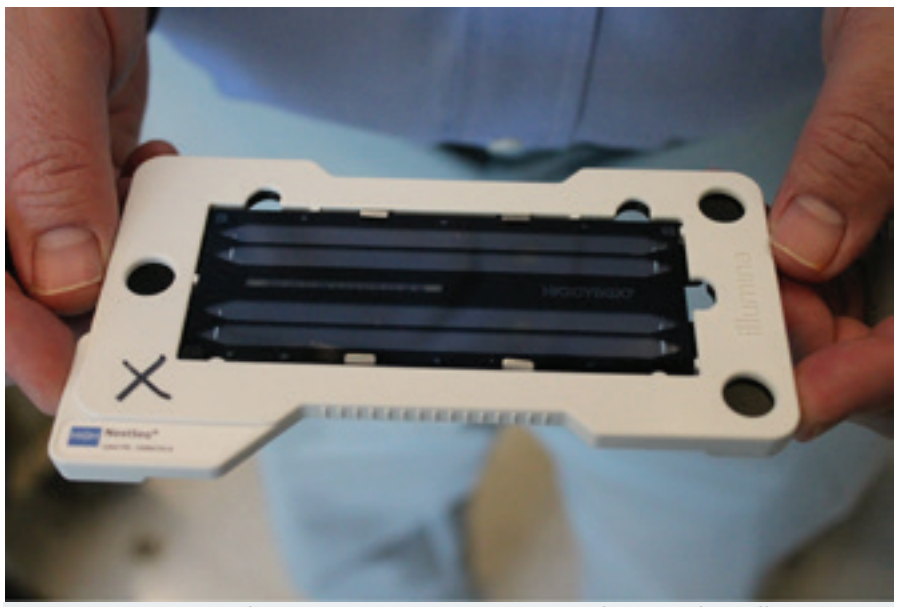

FIGURE 2: This "Next-Gen" sequencing plate is what allows researchers to identify 2,000 DNA markers from thousands of individual vines in a single reaction. "Barcode" DNA sequences attached to each sample identify which markers are associated with each vine.

The Resulting Markers

Researchers used the core genome data to develop 2,000 markers, which are physically distributed across the 19 chromosomes and span 99 percent of the grape genome (**FIGURE 2**). When they tested them against four mapping populations, totaling 1,928 unique vines, they found that 92 percent of the markers worked across the four families, representing a broad range of *Vitis* breeding parents.

This was a major improvement. Marker transferability went from 1 to 2 percent, using the old Genotyping by Sequencing, to 92 percent with the current methods. Now breeders can be confident that their markers will be transferable to a broad range of *Vitis* germplasm used in their programs.

The Cost of Analysis

A new technique called rhAmpSeq, which precisely controls how and when the cut-up DNA snippets from samples are amplified during the Polymerase Chain Reaction (PCR), is what makes this rich source of information possible and affordable. This technique allows researchers to use a single reaction to amplify and sequence 2,000 rhAmpSeq markers. In each sequencing experiment, grape breeders are using rhAmpSeq to obtain these markers for 4,608 vines. For a large project like *Vitis*Gen2, the cost of getting information on 2,000 markers could now be less than $10 per sample.

New, automated sequencing technologies have brought the cost of whole-genome sequencing down from millions of dollars in 2007 to an estimated $3,000 per genotype in the seven grapevines sequenced by the project. This made it possible to compare the Core Genome across the diverse species in the genus *Vitis*.

Cornell University grape breeder **Bruce Reisch** said that at the start of his career, in the early 1980s, making crosses for the grape breeding program was largely a trial and error process, with little genetic information available to guide the effort. There were no mapping populations because extracting genetic information from field populations was a tedious and costly process.

Now grape breeders have access to the Core Genome and 2,000 markers to inform their grape-breeding choices. They can use this information to identify new marker-trait associations and use it to screen seedlings produced from their programs, regardless of the parentage used in their crosses. This is a remarkable achievement that is already proving a solid foundation for accelerating progress for grape breeders worldwide.

Marker-assisted selection has brought us Pierce's Disease-resistant grapes that are about to be released from **Andy Walker**'s program at **UC Davis**. **French National Institute for Agricultural Research** (INRA) researchers have used marker-assisted selection to develop and release four varieties with two powdery mildew and two downy mildew resistance genes—vines that thrive on two fungicide sprays per season. This is only the start.

As more informative markers are identified, the quality of new accessions tested against these markers will also increase and will offer the wine, table, raisin and juice grape industries solutions to thorny problems such as disease susceptibility and the challenge of climate change. **WBM**

ACKNOWLEDGEMENT

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The Evolution of a Great California Vineyard

Larry Hyde and family earned a stellar reputation with heritage clones grown on shallow soils in cool, breezy Carneros

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 to 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.

EVERY VINE SELECTION AT Hyde Vineyards has a story, and **Larry Hyde** is the chief storyteller. There's the Chardonnay selection sourced from **Calera Vineyard** that makes beautiful wine but is plagued with the corky-bark virus. There's the Wente clone Chardonnay sourced in the 1970s that is living successfully with phylloxera-infested AxR1 roots. Then there are the Merlot and Cabernet Franc vines selected from old vines on the original **Inglenook** property. Not to mention the Syrah Noir selection that **Joseph Phelps** carried back from France. The stories go on.

Larry Hyde, whose family bought the first 72 acres of what has grown to 192 acres on the Napa County side of the Carneros AVA in 1978, enjoys talking about the sources of the vine materials and the attributes that Hyde Vineyards' site brings to its highly prized grapes. Hyde Vineyards is one of perhaps the 10 most-coveted sources of Chardonnay in California, and also produces significant tonnage of Pinot Noir, Merlot, Syrah and several other varieties.

About 20 wineries, including **Kistler Vineyards**, **Paul Hobbs Winery**, **Ramey Wine Cellars** and **Patz & Hall Winery,** have bought Hyde fruit and vineyard-designated it on their luxury-priced wines. One of the most prominent wineries to rely mainly on Hyde grapes is the Napa-based **Hyde de Villaine** (HdV) winery, a partnership between Burgundy vintners **Aubert** and **Pamela de Villaine** and the Hyde family. Other notable clients come to Hyde for grapes but don't designate the vineyard, like **Duckhorn Vineyards** for Merlot, **Spottswoode Winery** for Sauvignon Blanc and **Kongsgaard Wine** for Chardonnay.

It gets a little confusing, but one of the newest wineries to use Hyde grapes is **Hyde Estate Winery**, owned by Larry Hyde's immediate family. It operates out of a new winery facility in Carneros that opened in 2017 and is managed by Larry's son, **Chris Hyde**. This 2,000-case operation is permitted for 12,500 cases and produces wine from Chardonnay, Pinot Noir, Syrah and other grapes grown on the family's more recent land purchases on the south side of the Carneros Highway (CA 121) while the main property lies on the slightly higher-elevation north side of the highway.

Chardonnay is the grape variety most closely identified with Carneros today although Pinot Noir is also prominent. That reflects the emphasis of Hyde Vineyards' plantings, too. Chardonnay leads with 93 acres, Pinot Noir is second with 34 acres, Merlot third with 23 and following in acreage order are Syrah, Cabernet Sauvignon, Semillon, Cabernet Franc, Viognier and 0.2 acres of Zinfandel.

CODY GEHRET

Hyde Vineyards in Carneros

MEMO

DATE: October 21, 2019

TO: Concerned Grape Growers

FROM: Rick Burnes, President

Sunridge Nurseries is excited to announce our improved clean plant protocols for 2020. In September of this year, the Sunridge team has partnered with CSP labs to evaluate over 75,000 vine samples from our certified mother block for grapevine pathogens, including Red Blotch associated virus (GRBV).

In Northern California, Foundation Plant Services has been diligently testing their foundation material since 2013 and has recently encountered an increase in the infection of GRBV at the Russell Ranch Vineyard in Davis. In response to the concern this may cause growers planning on purchasing vines for new developments, we are happy to report that all test results from our isolated certified Sunridge mother blocks in Cuyama Valley have tested completely virus-free.

Reach out to any of our field service team if you would like more information.
We welcome any of our growers to visit our facilities. Your success is our success and we want every grape grower to feel good about their future vineyard investments.

Sincerely,

Rick Burnes
President
Sunridge Nurseries Inc.

Andrew Jones - Wine Grape Sales Manager - 805-234-4920 - andrew@sridge.net
Julian Clymer - Northern California Vineyard Representative - 707-974-2642 - julian@sridge.net
Sebastian Traviesa - Pacific NW, East Coast, Canada and Mexico Vineyard Representative - 707-975-3646 - sebastian@sridge.net
Kevin Payne - San Joaquin Valley Vineyard Representative - 530-320-8223 - kevin@sridge.net

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CODY GEHRET

Larry Hyde and Chris Hyde

Send in the Clones

Hyde grows six selections of Chardonnay, four of which are variations of the famous Wente clones that—mostly in the form of vigorous Clone 4—have populated a majority of California's vast Chardonnay territory. Larry planted his first Wente clone vines in 1979 with clones 113 and 115 from the now-defunct **Linda Vista** nursery in Napa Valley, and a few years later added old Wente clone 112 vines from cuttings he got directly from the **Wente** family in Livermore Valley. These three all show the characteristic "hens and chicks" berries, with small and larger grapes intermixed in the same small bunches that typically have a little shoulder.

The HdV Chardonnay is almost pure Wente clone, Larry Hyde said. **David Ramey**, winemaker-owner of Ramey Wine Cellars in Healdsburg, prizes this selection as well as the Calera selection for his Hyde Vineyard bottling, and said the heritage clones are very important in making Hyde fruit exceptional. "Not everybody has them, and Larry has been selecting, cultivating and perfecting them for decades."

Hyde said he got his Calera selection Chardonnay budwood decades ago from the vineyard manager at **Calera Wine Co.** in Hollister, Calif. He understands that Calera's then-owner, **Josh Jensen**, got the selection from the de Villaine family in Burgundy, who are not only partners with Hyde in the HdV winery but co-directors of **Domaine de la Romanée Conti** and also own the **Domaine A. & P. de Villaine**, both in Burgundy.

Hyde said that he once asked Aubert with property the cuttings came from. "He told me it's none of my business. They protect their sources even if they're your friend or partner."

This Calera selection carries a corky bark symptom due to a virus infection, but is prized by some winemakers for its combination of fruit flavors, good acidity and a spice element similar to nutmeg. Grafting the selection on St. George rootstock has helped to control the corky bark problem, Hyde said. He also sent budwood to the **Foundation Plant Services** lab at **UC Davis** to clean and certify the selection, and now has virus-free Calera vines on the property, too.

Two more heritage selections at Hyde are the small-cluster **Robert Young** Chardonnay, acquired from their Carneros neighbor, grower **Lee Hudson**, and named for the Alexander Valley grower who had great success with it, and the Martini/Long Chardonnay musqué that shows some floral, fruity Muscat-like qualities.

HYDE VINEYARD ESTATE

Hyde Vineyard Beginnings

Chris Hyde, 33, is general manager of Hyde Vineyards, as well as director of viticulture for HdV Winery. Chris studied agricultural business and viticulture at **California Polytechnic State University, San Luis Obispo**, worked for other vineyards and came back to Hyde Vineyards in 2009 part-time and then joined full-time in 2011. Before building the new winery, Chris earned an executive MBA at **Sonoma State University**. Hyde, semi-retired at 74 and not very mobile on his own, carries some lingering effects from a stroke 35 years ago, but he climbs into Chris's truck or his wife **Beta**'s car to inspect the vineyards nearly every day (and at night during after-hours harvests).

Back in 1978 Hyde's father, **Richard Hyde Sr.**, who had been a farmer, attorney, flight instructor and entrepreneur, bought the first Carneros property. It sits north of the highway about 2 miles west of the Napa city limits, above the flats to the south that merge into San Pablo Bay and the foothills of the Mayacamas Mountains that begin to rise to the north. Hyde already had 15 years' experience working with grapevines for **Ridge Vineyards** in Cupertino, **Robert Mondavi Winery**, **Walsh Vineyard Management** and others in Napa Valley, and cellar experience at **E&J Gallo Winery** in Sonoma County and **Cuvaison Winery** and **Joseph Phelps Vineyards** in Napa.

"We bought the vineyard when my father figured that I had had a long enough apprenticeship," Hyde said. For his father it was an ag investment; so when Hyde, his father and brother ran the numbers on the prices for land and the going rates for grapes in viticultural areas around the state with the potential for high-quality grapes, their result was that a property in Carneros—then not nearly as well-known for winegrapes as Napa Valley proper or Sonoma Valley—could be bought, developed and begin to make money in seven years.

"But now I don't understand that, because after 40 years, I am still not making any money," he joked. Hyde said they looked at all the properties for sale in Carneros, where several growers and wineries were already operating vineyards, including **Beaulieu Vineyard**, **Truchard Vineyards**, **Rene di Rosa at Winery Lake Vineyards** and **Clos Du Val**, to name a few. The property they settled on had the exposure to the elements that Hyde wanted.

"We got it for a very reasonable price: $4,000 an acre sounds cheap now." Seven years later they bought 40 more acres from the same owner at about twice the price, he said, and subsequently acquired adjoining parcels from other neighbors to complete the rather narrow, 1.25-mile long main vineyard that is divided into two dozen blocks. Its ownership was shared by several family members of different generations until Hyde, his son Chris and his brother **Peter** bought out the others in 2011.

The north site ranges from about 50 to 180 feet in elevation, and much of it rises slightly above the adjoining land and slopes gently to the east. That exposure toward the morning sun was the key factor, once the family had settled on buying in Carneros, Hyde said, because it diminished the afternoon sun that could be detrimental to the mostly cool-climate varieties they planted in this Winkler Region I location.

Cool Climate, Shallow Soil

The climate and soil conditions are critical for the vineyard's success, along with vine material and viticultural expertise, added Ramey, who has produced wine from Hyde grapes since the late 1980s while working at **Matanzas Creek Winery** and, since 1996, for his own Ramey Wine Cellars. The Hyde terroir, he said, is due to "the low vigor site—a shallow layer of surface clay-loam over impenetrable hardpan—which limits vine vigor and growth. And the relatively cool temperatures, cooled by westerly winds via the Petaluma Gap."

Both Ramey and the Hydes emphasize that it's not the nearby, shallow San Pablo Bay that provides the almost daily breezes and frequent fog as much as the Pacific Ocean, which lies 35 miles away. "The wind arrives and fills Carneros with fog every night," Hyde said. The wind is so strong and persistent that it will sometimes shut down the vines' metabolism and slow the grapes' ripening, allowing for longer hang time, Chris added.

"The hands that touch the vine are pretty important, the layout of the vineyard is pretty important, but without the soil it can't have any of those other things," Chris said. "The great selections are not going to make you good wine in poor soils."

The stellar wine quality from vines on these soils seems to contradict much of the lore about great wine needing to come from porous, well-drained soils that allow roots to penetrate 5, 10 or 20 feet deep. Topsoil in the north-side property goes 12 to 14 inches deep before hitting what Hyde calls "hundreds of feet of pottery-grade clay" that vine roots won't penetrate.

REBECCA ARNN

"I think that has something to do with why the wines are so good here," Hyde said. "Just a small volume of topsoil for the vines to mine and therefore you have small plants and grapes that spend more time in the sunlight."

The clay hardpan holds moisture from the winter rains for months but doesn't give it up to the roots very readily, so the norm at Hyde Vineyards is rather frequent irrigation in small bursts. After a normal rainy season of 20 inches, they will typically drip-irrigate five to six times during the growing season at 3 to 4 gallons per vine. In drought years they water in the winter, too. A large reservoir supplies "all the water you could dream of," according to Hyde.

In the 2000s Hyde began buying smaller parcels on the south side of the highway that now total 40 acres and include new vineyard plantings, as well as Hyde Estate winery. The business strategy was that these would be owned by Chris and Peter, who is not actively involved in management.

The Hydes train virtually all of their vines on a vertical trellis and use cane-pruning on about 90 percent. Many blocks were previously cordon-trained and spur-pruned, but the vineyard has mostly transitioned to canes except for Cabernet Sauvignon and Semillon. Chris said canopy management is easier with cane-pruning, except during the actual pruning, and it brings back vigor in some cases, as well as limits the pruning wounds where diseases can enter.

The operation employs a crew of 20 year-round and hires five more seasonal workers for harvest. Vineyard manager **Jose Padilla** was one of Hyde's first hires 40 years ago.

Vine and row spacing has evolved from 6 feet by 8 feet to the current 5.5 feet by 7 feet arrangement that allows 1,130 vines per acre. "We used to think that the capacity of the soil determined the yield, but with more vines per acre we have increased production a little," Chris said. They average about 500 tons on the north side of the highway and 200 to 300 tons on the south side, he added.

Replanting for a Clean Start

For all their emphasis on heritage clones, the Hydes started replanting vineyard blocks on clean versions of their heritage selections about 20 years ago. Larry Hyde maintains that it's possible that virused vines can sometimes deliver more desirable sensory traits in wine because their grapes ripen more slowly, but he and son Chris are steadily moving ahead to eliminate viruses on their properties.

Hyde prefers the modern virus prevention process that involves meristem shoot-tipping rather than the old heat treatment of plant tissue, but points out that it still requires several years to get a selection cleaned, grafted onto rootstock and grown to the point of yielding a commercial crop.

For the old Wente clone vines, Chris's crew is interplanting clean versions of the same selection alongside the widely spaced old vines so the new ones will be producing before the old ones are removed. He said 3 to 4 acres of the cleaned up vines are now in place. Ramey, as a customer, is all in favor of the improvements. "Viruses are always bad! Grapevines don't work with a virus blocking the flow of nutrients and minerals in the xylem and phloem any better than we do with a cold," he said.

All the Hyde vines are grafted onto rootstock, and the choice of that plant material is nearly as critical as the scion wood. Hyde prefers low-vigor rootstocks in general because the soil is not deep enough to nourish big vines. *Riparia Gloire* was one of his early choices, but now the vines are predominantly on 3309 roots while the older vines may be on 110R, St. George and 420A. They used a lot of 101-14 several years ago but are moving away from it because of low phylloxera resistance.

The original block of Wente clone Chardonnay situated along the highway was planted on AxR1 and is living with phylloxera, still producing 2.5 to 3 tons per acre, Chris said. Hyde added, "Old vines do things more slowly like old men. They lose acid more slowly and build sugar more slowly, which can be a good thing."

ANDREW ADAMS

He rotates cover crops in the off-season, seeding legumes, mustard or barley after disking in up to 5 tons per acre of compost, and leaving every third or fourth row with a permanent cover crop. Chris also likes to include apiary plants to encourage bees. He says the vineyard practices are sustainable and/or organic, but the properties have not been certified.

Catering to Winemakers

Hyde was among the first wave of growers to offer customized farming to its winery clients, adjusting viticultural practices row by row to accommodate winemakers' wishes and selling grapes by the acre rather than the ton. Ramey said the customization is very important to him as a buyer. "For example, we ask them to not pull leaves in the fruit zone, and many of the neighboring blocks do. We have them only clip laterals between the fruit and first catch wires to open up the canopy. You can see the difference between the blocks."

Hyde cites a current custom project for Paul Hobbs, in which he is replanting an acre of Cabernet Sauvignon with the See selection and modified row direction to replicate previous vines on the same site where Hobbs first bought fruit in the 1990s.

The team planted 6.5 acres of Syrah south of the highway specifically for Joseph Phelps Vineyards to lease for 35 years and make an estate-grown wine. Joseph Phelps himself brought back Hyde's first Syrah Noir selection from France, Larry Hyde said; and since then, they have also planted other selections, including an Alban selection identified as coming from Côte-Rôtie clone 877 that he got from **Lee Hudson** and an Australian Shiraz selection whose source Larry had to agree to keep secret.

Chris did not share specific grape pricing but acknowledged that customers pay a premium of 30 to 100 percent over the Napa County average, which means that their Chardonnay might sell for as much as $5,800 per ton and Merlot for much as $7,500 per ton. About half the wineries pay by the acre and half by the ton. Asked about the payment terms, Hyde jokes that "the only condition is that they actually pay for the grapes." Payments are due Dec. 1 ideally, since property taxes are due Dec. 15. Some buyers pay half in 30 days, "which we appreciate."

Hyde Estate Winery

Profitable wine production often starts with smart real estate deals, and that was the genesis of the Hyde Estate Winery, located on 25 acres half a mile west of the main vineyard, on Los Carneros Avenue and in sight of wine country visitors motoring by on Highway 121. Hyde acquired the former orchard property in 2005 as an investment for Chris and his brother, began planting it, and in 2008 secured county permits to build a winery.

One thought was to build a winery and lease it to someone, but Chris, fresh from his master's program, calculated that it would be just as profitable to make their own wine and sell it at that location while doing custom crush work to monetize the rest of the permitted production capacity. By the time construction was completed in 2017, the 12 acres of Chardonnay and 8 acres of Pinot Noir vines were producing nicely.

Chris said, "I didn't want to look back 10 or 20 years later and regret that I had given the winery to somebody else. Wines with the Hyde vineyard designation on it are poured all over the Napa Valley and Sonoma, but it made sense for us to have a home for our own wines here in Carneros. We wanted to show that it's not just a region for sparkling wine houses and big corporate wineries, but also for family wineries, small businesses."

Alberto Rodriguez is the winemaker, coming to Hyde Estate from Patz & Hall where he had worked with Hyde fruit before and also where the first vintages of the new family wines were made, beginning in 2009. The estate Pinot Noir wines turned out well enough to impress the French winemakers for HdV and helped persuade them to begin making Pinot Noir, in addition to their original offerings of Chardonnay, Syrah and a Cabernet blend, Hyde said.

Hyde Estate currently produces Chardonnay, Sauvignon Blanc, Viognier, Syrah, Merlot and Pinot Noir, ranging from $45 to $85 per bottle. These sell mostly direct-to-consumer under the direction of the winery's estate manager, **Shannon Hyde**, who is married to Chris.

Burgundy Connections

Family ties at Hyde Vineyards and the two wineries it has spawned seem to inspire almost as many stories as Larry Hyde's collection of heritage vines. Hyde has known Aubert de Villaine since Aubert married his first cousin, **Pamela Fairbanks de Villaine**, which led to Hyde working two harvests in Burgundy for the de Villaine family in the 1970s. Another link was established when Hyde met his future wife Beta there during his first stint. She had come from her home in Poland to work the harvest for de Villaine. When they both came back the next year, they fell in love.

It's hard to say whether family involvement, hard work, viticultural expertise or good timing have played the biggest roles in Larry Hyde's long and rewarding career as a grape grower. But it's certainly fascinating to hear this soft-spoken visionary expound upon all these facets of his life and work. **WBM**

The Canned Wine Learning Curve

Where mobile canning veers from mobile bottling—what winemakers should know

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.

IN 2003, FRANCIS FORD COPPOLA launched the first American wine in a can. The 187 ml **Sofia** Blanc de Blanc sparkling wine can was, at the time a pioneering effort, but the effervescent liquid made more of a pop than its sales did.

Flash forward a decade.

Wineries seeking single-portion wine packages to appeal to the modern consumer cautiously marketed their wines in aluminum instead of glass. As tracked by **Nielsen**, wine can sales in 2012 topped out at around $2 million, a drop in the bucket of the overall wine market but a harbinger of the growth in the canned wine segment.

Last year, canned wine sales exploded, shooting to $69 million based on nearly 739,000 cases sold in retail outlets, according to Nielsen, which does not include on-premise transactions. Naturally, this type of trending success has encouraged more wineries to join the canned wine segment.

But the wineries ***Wine Business Monthly*** spoke with about adding cans to an existing glass bottle portfolio advised that this plan can come with both unexpected costs and time-consuming logistics—in winemaking and the actual canning process. It's not necessarily as easy as its mobile glass bottling line counterpart.

WBM found that there are some similarities and differences between mobile canning and mobile bottling and reached out to numerous wineries and canners across the U.S. to glean experiential-based tips for wineries considering hopping on the can train.

Dealing with Different Packaging Material

Just as the wine industry defaults to a set number of standard wine bottle shapes, colors and volumes, the same holds true for cans. Where the difference shows, though, is in **Alcohol and Tobacco Tax and Trade Bureau** (TTB) regulations. There are definitions about the nature of single-portion sizes that limit the number of choices wineries have.

The four most adopted single-portion aluminum cans fill at 187 ml, 250 ml, 375 ml and 500 ml. There's a "gotcha" with the 250 ml cans, however: When the TTB first settled on its list of approved "Standards of Fill" container sizes, wine was not as widely packaged in can as beer was, and the standards were based on beer drinkers' habits. The 250 ml can was not listed as a standard. But wineries later learned, through surveys and consumer feedback, that the 250 ml is an ideal portion size for wine. However, it was never approved by the TTB to be sold as a standalone can. Instead, it must be sold as part of a multi-pack. For wineries that want their 250 ml cans sold in convenience stores (the leading retailer for single-portion beverages after supermarkets, according to Nielsen data) clever packaging for multiples proves necessary—and involves another layer of expense as cans need to be connected together, whether housed in a box, linked by a six pack ring (yoke) or clipped into an HDPE plastic can carrier.

Currently, the most frequently adopted can size by wineries is the 375 ml, similar to the beer industry. Equivalent to 12.5 ounces, this can holds a volume equal to half a bottle of wine.

No matter what size can a winery decides on, shopping for supplies means a much more limited choice as compared to traditional, glass bottle options. While wineries have a number of glass suppliers to choose from, the universe of can suppliers that cater to the wine industry is small, and nearly every

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winery *WBM* spoke with said they get their cans from **Ball Corp**. The Colorado-based company seems to have a virtual lock on wine cans, much as they do on the canning jars they are best known for.

This was corroborated by several mobile canners. Representatives reported almost all the cans shipped to their canning facilities or sent directly to wineries served by mobile canners come from Ball. Other suppliers mentioned to *WBM* include **Ardagh Group** (well-known for their wine bottles), **American Canning** and **Crown Holdings**.

No matter which supplier a winery obtains its cans from, another consideration is design application, for which there are two choices. In much the same way a winery would order a glass bottle and apply a label after fill, wineries can order blank, silver cans called "brites" and apply a design or label later. Where cans do offer an advantage, particularly on large runs, is that they can be ordered pre-printed and filled after.

The first method is best for smaller quantities that will not meet order minimums for pre-printed cans. Ball's stated minimum order is 25 pallets for all sizes of printed cans. (Lead time for orders is on average 16 to 20 weeks.) For small lots, a winery's best bet is to use alternative can decorations, such as printed sleeves applied with self-adhesive labels, similar to those on bottles, or via shrink-wrapping. Most mobile lines, can and glass, will accommodate the label application.

Getting Canned: The Logistics and Set

Wineries accustomed to preparing wine for sale by simply scheduling an appointment for a local mobile bottler to come to the winery will find canning generally demands more labor-intensive logistics. While mobile bottlers have reported a need for long lead times in the past, there are usually several mobile bottlers in any given region. Except in regions with a high density of craft breweries, there aren't that many mobile canners. A few of these canners, seeing the rising demand for wine-in-can, have adjusted their lines to meet the higher quality demands from winemakers.

Many wineries must still ship their product in tankers to bottling facilities, often hundreds of miles away. For example, **Ninth Planet Beverage Solutions**, a canner in Saratoga Springs, New York, receives tankers from as far away as California, according to its executive, **Josh Schaffner**.

Numerous winery owners who added canned wine to their portfolios told *WBM* about both the unforeseen long distance runs necessary to get their wine into cans and the associated, sometimes expensive, snafus which any startup operation can incur.

After growing his successful Butter Chardonnay brand to some 600,000 cases, **JaM Cellars**' founder and CEO, **John Truchard**, thought it would be no big deal to expand the brand to pack in single-portion cans. Based in Napa, JaM wanted to can a one-off trial lot, some 8,000 cases of 250 ml cans packaged in four-packs. At the time, local canners said the quantities Truchard wanted to can were either too large or too small for their lines.

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Liner Notes: All wines need to be tested for their interaction with the can liner. It is called corrosive testing and takes about three weeks, adding more lead time to any canning attempt. The test is free when cans are ordered at Ball Corp. The test tells you whether or not the can lining can withstand corrosion caused by the beverage in the can, as well as for how long the lining will last. Some red wines are much more aggressive than most whites are. Even if the red wine passes the test, it still may be reacting with the lining of the can, so it's best not to age red wine in a can. Not that much aging can occur in a vacuum anyway.

Acid Be Gone: Watch acidity levels and concentration of sulfur and copper compounds as acidic wines can break down some can liners. In addition, residual copper after fining for sulfides can also affect the metal.

As Butter volumes grew larger the winery worked with **Varni Brothers**, a beverage canner based in Modesto.

It wasn't all smooth sailing. Varni Brothers has its roots in canning soda, which is accustomed to a set amount of liquid losses as part of the fill process. "After transporting our wine in tankers to Modesto, we did expect to see a certain amount of wine loss, but it was probably more like 500 to 800 gallons and that was just to fill the wine," Truchard said. While he admitted Varni has ultimately been a good partner and made realistic adjustments, he would prefer a canner closer to his production facility and one with lines specific to the needs of wineries.

When Washington state-based **Backpack Wines** first ramped up its 250 ml line of Columbia River Valley wines back in 2016, president **Jim Doehring** found that locating a canner for wines locally was just about impossible. The winery ended up shipping their wine to Varni Brothers in Modesto via tanker trunks as well. "The plant there is so big and is canning so many different types of beverages, like **Orange Crush** and **7-UP**, **Monster** or **Rockstar Energy** drinks. So, as a matter of course, they would add a microbial control agent, **Velcorin**. Depending on the amount added, you can get a horrible matchstick odor. I am not saying it's not a clean plant at all, but we literally had to toss most of our first run of white wine," Doehring said.

Soon, but not soon enough, Backpack found a wine-friendly canning operation in Portland, Oregon. "We still had to truck the wine around, but thankfully it was a shorter distance.

An Increase in Wine-Centric Canners

Most wineries do not have the physical space or the case production to afford in-house bottling or canning lines. But depending on winery locations—and the continued growth of wine-in-can SKUs—there are canners who have expanded from their craft beverage roots to specialize in wine

canning either in, or closer to, wine country locales. Two examples are the Sacramento-based **The Can Van** for mobile canning and Sonoma-based **Free Flow Wines**, which offers a wine canning service at its dedicated facilities.

The Can Van has been in operation since 2011 and expanded to servicing wineries in 2015 with its seven mobile canning lines. Co-founder and chief operating officer **Lindsey Herrema** said The Can Van's trucks service all wineries in Northern California. While they handle can sizes from 187 ml to 500 ml the most popular can for wineries has been the 375 ml standard can and the 250 ml. A winery must order printed cans separately from a can vendor, but for customers that don't meet the minimums for those suppliers, The Can Van maintains an inventory of generic cans that can have labels or shrink wrap applied after, according to Herrema.

Demonstrating the company's support for small estate wineries, The Can Van minimum canning run is 400 gallons. To put that into perspective: if using 375 ml cans, it works out to the equivalent of 200 cases, Herrema said. Currently, The Can Van maxes out at 600 to 800 cases a day in production.

"Unlike mobile bottles, our equipment is actually designed to roll out of the trailer. We set it up inside the facility," Herrema explained. "So, we're not running along a hose out to a truck but actually roll everything inside and set it up by the winery's tanks. And because we have physically smaller equipment that actually rolls out of a trailer, it provides a lot of flexibility in where we can package. So for smaller wineries that don't necessarily have room for a semi-truck to park out front, we can just roll everything right into the facility."

Are Mobile Bottlers Offering Mobile Canning Too?

Thomas Jordan, CEO of Napa-based **Peregrine Mobile Bottling** succinctly summed up the consensus of the mobile bottlers *WBM* queried. "Admittedly, at this point the increasing percentage of growth in wine canning is evident. But what we are also noticing is there is enough capacity from other mobile and stationary vendors to cover the amount of canning demand that is currently out there.

"Even if we wanted to try it out we would need to finance a trial mobile unit for 10 years, which is too long for what is essentially a trial run. And nobody is going to finance a mobile canning unit for, say, five years. Even if the wine can market takes off larger than it has, from what we see, it can still be serviced by a couple of large canning operations, not a lot of smaller mobile bottlers that want to expand with canning equipment."

With some 15 bottling trucks, **Signature Mobile Bottlers** has a robust business just servicing the wine industry in three states from San Francisco to the Canadian border. But as queries for mobile wine canning went from a whisper to a higher volume, **David Scholz**, Signature's president, realized it would be more expeditious and more financially feasible to partner with an experienced canner which previously dealt with beverages other than wine. Signature joined forces with **Tinman Mobile Canning** which, like Signature, is headquartered in Oregon.

As Tinman Mobile Canning CEO, **Nathan Ofstad** told *WBM*, "There's a lot that crosses over between the bottling and canning in terms of the expertise and the actual processing of the wine for each container. But they don't interchange: Canning requires a whole new line. They're completely different machines, with different ways that they function, that they fill, and that they seal the package itself. So you can't actually just retrofit a bottling line in order to start canning," Ofstad explains. That consideration alone stops bottlers from adding canning to their existing operations. **WBM**

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Retail Sales Analysis

Boxed Wines Buoy Wine Sales as Growth Softens

Wines Vines Analytics

Produced by Wines Vines Analytics, the *Wine Analytics Report* is the wine industry's most accurate and objective source of market insights, analysis and data.

Sales Value Slips in September

OFF-PREMISE TABLE WINE SALES weakened in the four weeks ended Oct. 5, slipping 1 percent versus a year ago to just over $1 billion, according to scan data tracked by **Nielsen**. Sales rose in the 52 weeks ended Oct. 5, however, rising 1 percent versus a year earlier to $14.4 billion.

Sales Volume Falls More than 3 Percent

Off-premise table wine volume fell more than 3 percent in the four weeks ended Oct. 5 versus a year earlier, totaling 11.3 million 9 L cases. The decline in the latest 52 weeks approached 4 percent versus last year, with volume totaling more than 160 million 9 L cases.

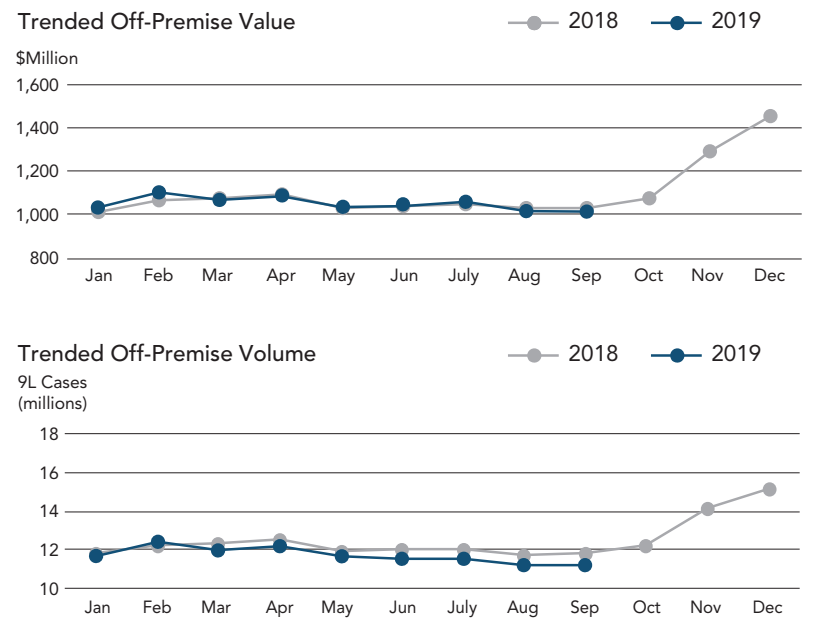
Key Price Segments, Formats Buoy Table Wine Sales

Softer table wine sales in the latest four weeks parallel lower retail spending in the period, and affected both packaged imports and domestic wines. Table wine sales in the latest 52 weeks continued to show growth in value, if not volume, however. Indeed, domestic table wines led the overall market higher with value growth of more than 1 percent to $10.6 billion.

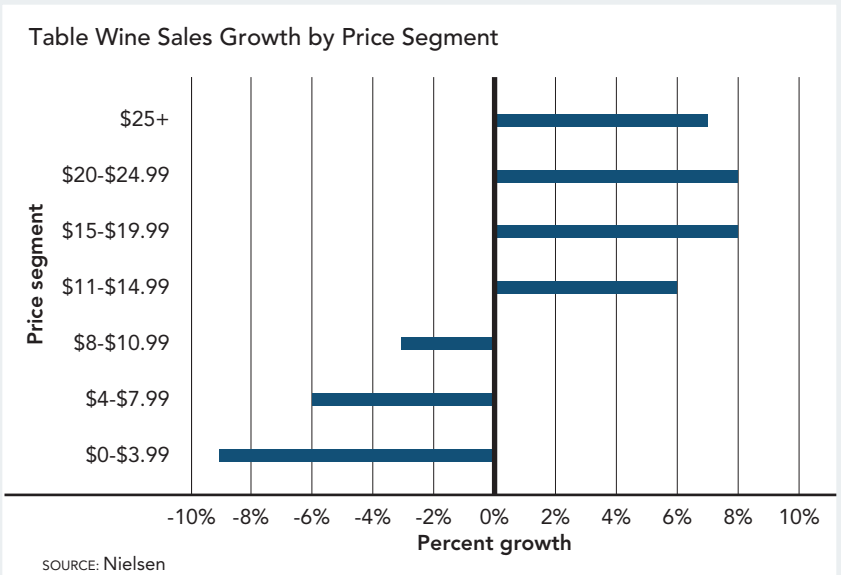
The strongest value growth in the latest 52 weeks was recorded by boxed wines sold at $4 and up per 750 ml, which increased more than 10 percent to sales of $835 million. Table wines sold in glass for $15 to $19.99 a bottle enjoyed the second-strongest growth, rising nearly 7 percent to more than $1.4 billion in sales.

Notably, given the concerns over declines in the actual volume of wine being sold, both segments saw the strongest increase in volume. Boxed wines worth $4 and up saw volume increase more than 9 percent in the latest 52 weeks to nearly 14 million cases. Bottles priced between $15 and $19.99 saw their volume increase more than 8 percent to more than 7 million cases. While counter to the category as a whole, the strong growth in volume versus value was typical of bottles priced $11 and up.

While softer retail spending in September supports a cautious outlook, sales in the latest 52 weeks suggest that more expensive wines entered the fall on a strong footing. This was good news as overall table wine sales continued to show signs of entering a slower growth phase. **WBM**



SOURCE: Nielsen. Latest 4 Wks - W/E 10/05/19



SOURCE: Nielsen
Latest 52 Wks - W/E 10/05/19

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 **October 5, 2019**

		Dollar Value		Dollar Value % Chg YA		9L Equivalent Volume		9L Equivalent Volume % Chg YA		Avg Equivalent Price Per 750ML	
		Latest 52 Wks - W/E 10/05/19	Latest 4 Wks - W/E 10/05/19	Latest 52 Wks - W/E 10/05/19	Latest 4 Wks - W/E 10/05/19	Latest 52 Wks - W/E 10/05/19	Latest 4 Wks - W/E 10/05/19	Latest 52 Wks - W/E 10/05/19	Latest 4 Wks - W/E 10/05/19	Latest 52 Wks - W/E 10/05/19	Latest 4 Wks - W/E 10/05/19
	TOTAL TABLE WINE	**14,395,212,753**	**1,017,374,950**	**1.0**	**-1.1**	**160,102,907**	**11,346,904**	**-1.4**	**-3.3**	**7.49**	**7.47**
PRICE TIERS BY CONTAINERS	BOX	1,413,330,983	107,793,695	5.5	3.5	33,996,936	2,548,947	2.2	-0.1	3.47	3.52
	$0-$3.99	578,573,435	42,897,586	-1.0	-2.0	20,052,999	1,474,841	-2.2	-3.9	2.40	2.42
	$4+	834,757,548	64,896,109	10.5	7.4	13,943,937	1,074,107	9.1	5.7	4.99	5.04
	Total Table Wine Glass	12,709,086,821	887,775,594	0.2	-2.0	122,793,619	8,545,429	-2.5	-4.4	8.62	8.66
	Value Glass $0-$3.99	647,937,282	46,280,401	-6.4	-7.9	16,079,519	1,146,538	-8.5	-9.2	3.36	3.36
	Popular Glass $4-$7.99	3,138,093,024	220,166,206	-5.1	-6.5	47,561,689	3,312,603	-5.7	-6.9	5.50	5.54
	Premium Glass $8-$10.99	3,310,727,126	228,919,984	-2.2	-5.8	29,277,577	2,006,091	-2.5	-6.2	9.42	9.51
	Super Premium Glass $11-$14.99	2,829,779,595	201,948,161	6.2	3.9	18,816,648	1,329,096	6.4	4.3	12.53	12.66
	Ultra Premium Glass $15-$19.99	1,413,419,840	99,048,124	6.8	5.2	7,013,030	487,099	8.1	7.0	16.79	16.94
	Luxury Glass $20-$24.99	584,453,049	39,579,228	6.4	4.6	2,291,356	150,500	8.1	4.6	21.25	21.91
	Super Luxury Glass $25+	778,168,469	50,962,250	2.8	1.1	1,713,473	106,646	6.8	0.9	37.83	39.81
IMPORTED	IMPORTED	3,795,103,143	267,193,721	0.5	-0.7	39,905,799	2,799,893	-1.1	-2.8	7.92	7.95
	ITALY	1,202,975,018	83,196,723	1.9	1.1	10,495,928	725,973	-0.1	-0.2	9.55	9.55
	AUSTRALIA	720,488,569	51,641,977	-1.2	-3.6	11,829,479	838,561	-1.9	-4.8	5.08	5.13
	FRANCE	462,046,610	32,143,126	2.5	1.7	2,922,494	201,107	-0.3	-1.7	13.17	13.31
	CHILE	255,504,737	18,443,713	-2.1	-1.9	3,870,325	282,820	-0.2	-0.1	5.50	5.43
	SPAIN	159,869,535	10,992,516	-5.0	-7.0	2,039,054	141,569	-2.9	-7.5	6.53	6.47
	GERMANY	77,388,233	4,991,465	-7.7	-8.7	738,665	46,860	-8.3	-10.0	8.73	8.87
	NEW ZEALAND	496,722,840	36,804,397	8.4	7.2	3,593,360	262,638	8.8	6.4	11.52	11.67
	ARGENTINA	329,796,292	22,434,706	-6.1	-7.3	3,606,487	245,423	-7.7	-8.6	7.62	7.62
	SOUTH AFRICA	23,035,244	1,556,325	-8.2	-13.0	201,997	13,243	-7.1	-12.8	9.50	9.79
	PORTUGAL	39,794,879	2,638,125	-0.3	-13.9	421,643	26,634	-5.6	-19.4	7.86	8.25
DOMESTIC	DOMESTIC	10,600,109,610	750,181,230	1.1	-1.3	120,197,108	8,547,011	-1.5	-3.5	7.35	7.31
	CALIFORNIA	9,544,061,957	675,947,635	1.0	-1.4	111,521,569	7,945,268	-1.6	-3.6	7.13	7.09
	WASHINGTON	612,489,562	42,422,885	-0.6	-2.8	5,102,622	347,137	-1.4	-3.5	10.00	10.18
	OREGON	211,792,759	15,690,855	13.3	11.3	1,093,061	80,570	13.9	12.7	16.14	16.22
	TEXAS	32,797,271	2,265,903	1.3	-3.8	392,191	26,826	-1.5	-7.4	6.97	7.04
	NEW YORK	36,956,678	2,469,427	0.0	6.6	480,760	33,096	-6.4	-1.7	6.41	6.22
	NORTH CAROLINA	40,678,008	2,828,350	2.5	-4.6	423,324	30,414	1.4	-4.2	8.00	7.75
	INDIANA	23,626,001	1,563,161	0.2	-3.4	260,281	17,351	-0.9	-3.1	7.56	7.51
	MICHIGAN	22,190,586	1,961,399	-0.6	1.4	239,840	21,320	-1.1	-4.5	7.71	7.66
TYPES	RED	7,409,365,069	509,299,602	0.3	-3.0	73,510,815	5,075,990	-2.1	-5.2	8.40	8.36
	WHITE	5,874,127,226	428,261,135	1.0	0.5	70,325,039	5,116,739	-0.9	-1.6	6.96	6.97
	PINK	1,110,399,364	79,799,758	5.3	2.8	16,254,215	1,153,978	-0.3	-2.6	5.69	5.76
VARIETALS	TOTAL CHARDONNAY	2,546,776,088	186,738,265	0.2	-0.6	29,794,707	2,178,058	-1.9	-2.8	7.12	7.14
	TOTAL CABERNET SAUVIGNON	2,681,698,120	186,871,436	3.2	0.3	24,841,779	1,742,688	1.0	-1.9	8.99	8.93
	TOTAL PINOT GRIGIO/PINOT GRIS	1,334,559,424	98,627,368	2.9	2.2	17,300,078	1,286,096	1.9	1.1	6.43	6.39
	TOTAL PINOT NOIR	1,094,471,823	75,166,042	2.7	-1.7	8,417,590	573,661	0.3	-5.4	10.83	10.92
	TOTAL MERLOT	712,245,895	48,170,435	-6.5	-9.8	9,814,000	667,737	-8.4	-11.2	6.05	6.01
	TOTAL SAUV BLANC/FUME	982,160,190	73,801,021	6.5	6.3	8,633,605	647,451	5.6	5.6	9.48	9.50
	TOTAL MUSCAT/MOSCATO	639,870,662	43,018,865	-1.9	-3.3	9,676,875	654,104	-3.7	-4.7	5.51	5.48
	TOTAL WHITE ZINFANDEL	272,599,156	18,725,838	-7.6	-9.0	5,476,378	375,850	-9.0	-10.0	4.15	4.15
	TOTAL MALBEC	254,337,722	17,214,805	-6.3	-8.4	2,387,866	162,802	-7.4	-8.9	8.87	8.81
	TOTAL RIESLING	235,506,384	15,655,713	-6.4	-6.9	2,584,579	168,858	-7.8	-9.6	7.59	7.72
	TOTAL ZINFANDEL	224,131,381	15,620,203	-2.7	-5.3	1,597,938	111,264	-4.6	-5.5	11.69	11.70
	TOTAL SHIRAZ/SYRAH	145,656,007	9,731,704	-7.5	-11.4	1,655,257	108,647	-10.0	-13.2	7.33	7.46
	WHITE BLENDS (ex. 4/5L)	222,552,331	15,942,384	-3.9	-1.9	2,727,357	197,406	-3.2	-1.4	6.80	6.73
	RED BLENDS (ex. 4/5L + CHIANTI)	1,861,850,751	127,022,748	0.8	-3.5	17,109,102	1,174,779	-0.4	-4.4	9.07	9.01
	ROSE BLEND	553,083,825	41,448,786	17.9	13.1	4,731,114	355,855	17.8	10.3	9.74	9.70
GLASS SIZES	750ML	10,400,050,856	724,131,567	1.4	-1.2	82,565,104	5,723,160	-0.5	-3.0	10.49	10.54
	1.5L	2,036,681,758	143,996,449	-4.6	-5.6	34,884,857	2,449,206	-5.8	-6.5	4.87	4.90
	3L	60,155,199	4,108,257	-8.5	-9.8	1,540,044	103,092	-11.7	-14.2	3.26	3.32
	4L	76,087,310	5,394,474	-9.4	-8.1	2,403,772	169,781	-12.1	-9.6	2.64	2.65
	187ML	102,901,619	7,470,499	-5.1	-7.1	1,248,078	88,285	-7.1	-10.8	6.87	7.05
	375ML	18,735,850	1,476,637	8.1	14.9	71,950	5,778	7.2	16.2	21.72	21.31
BOX SIZES	ex. 4/5L	929,020,950	71,936,683	9.5	6.9	16,503,793	1,263,914	7.9	5.1	4.69	4.74
	1L	30,878,838	2,398,686	11.5	1.2	462,116	35,673	8.9	-0.2	5.57	5.60
	1.5L	26,959,457	2,098,702	3.4	0.3	532,818	41,079	3.7	-1.0	4.22	4.26
	3L	665,957,859	50,785,396	8.7	5.8	12,823,463	974,696	7.9	5.3	4.33	4.34
	5L	484,307,520	35,857,013	-1.4	-2.8	17,493,075	1,285,034	-2.7	-4.6	2.31	2.33
	TETRA	236,555,461	19,092,127	12.7	10.8	3,152,032	248,544	8.7	5.4	6.26	6.41

Source: Nielsen

Considering Recession and Leverage in 2020

The financial outlook calls for focus on profitable channels, analysts say

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 to 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.

WINERY OWNERS AND CFOS who believe an economic recession is likely in 2020 should examine how highly leveraged their businesses are, spend some time cozying up with their bankers and focus their efforts on their most profitable products and sales channels. These suggestions come from well-informed wine industry pros who have worked through previous recessions and aren't losing sleep in anticipation of another.

"The 2008, 2009 and 2010 downturn was severe, but people learned some hard lessons from it," said **Carol Collison**, a mergers and acquisitions specialist with **Global Wine Partners**, in an interview with ***Wine Business Monthly***. "The old saying 'Once burned, twice shy' is relevant here."

Whether or not the wine industry is in recession and how imminent a national economic recession might be are subjects for debate. "It isn't a recession right now in the macro economy, but the wine industry has created its own little recession," Collison said.

A similar viewpoint was expressed by **Aspect Consumer Partners** director **Ian Malone** at the recent **Wine Industry Financial Symposium** in Napa. His interpretation of data from **Gomberg, Fredrikson & Associates**' (GFA) led him to say that the California wine industry has entered a recession. Volume declines in the industry, as a whole, temper the positive news that sales values are rising.

Are Conditions Right for Recession?

Some would differ on that point, including **Mike Vitner**, managing director and senior economist with **Wells Fargo Securities**, who also spoke at the symposium. He cited household income growth of nearly 7 percent in the past year, and apparently strong consumer confidence reflected in increased housing prices, among other factors. It's difficult for a recession to occur under these conditions, Vitner said, but added that policy decisions by the federal government are a potential risk if they weaken confidence among businesses and consumers.

The CFO of Napa Valley's **Opus One** winery, **Robert Fowles**, was more skeptical. "I hate to be a Debbie Downer, but I do feel there's a recession coming. I don't know how soon. We've got an anti-trade president who's constantly throwing out tariffs on various products and to various countries, and that's a terrible thing for the economy. And we are spending like drunken sailors, so the national debt at some point is going to become a huge issue. It's an absolute time bomb waiting to go off.

"There are a couple of dark clouds like that and just consider the fact that we're 10 years into expansion, which is the longest ever on record," Fowles said. "It does feel like we're doing the same foolish things we've done in the past that led us into recession."

Jon Moramarco, a veteran winery executive and now industry analyst with **bw166** and GFA, put it a different way. "I am not sure I would portray the industry situation as a recession," he said. "Recession might imply a short-term slowdown, and then we will revert to former levels of growth. However, I think we may be in for slower long-term growth than what the industry has been accustomed to."

He pointed to a GFA bar chart of "U.S. Wine Market Volume Trends" that shows it took seven years, through 2018, to add the last 50 million cases of the more than 400 million sold in 2018. The previous 50 million were gained in less than five. Volume hasn't grown more than 3 percent annually since 2011, according to GFA.

A different picture emerges from dollar growth data, however. The ***Wine Analytics Report***, dated Oct. 15, states that domestic wine sales value, including bulk imports, rose 4 percent to $48.4 billion in the 12 months through September, and sales of all wine in the U.S. totaled more than $72 billion, also up nearly 4 percent from a year earlier. However, all segments, except sparkling wine, saw case volumes decline in the period.

If You're Leveraged Up

Winery owners and CFOs should look at their leverage situation, and ask themselves what level of debt they are comfortable with servicing, according to our sources. Collison said that the period of 2016 through 2018 "was a pretty frothy lending environment," and both borrowers and lenders were forgetting some of the lessons of the Great Recession. The rules became looser, not just on the price of loans but also on the structures, she said. "I am sure there are borrowers out there and bankers, too, who might not be happy with those now."

Fowles told *Wine Business Monthly*, "If we go into recession, you'll want to be cautious. Short-term rates may come down a little bit more but who knows about long-term? If you are leveraged up, you need to be in a position to stay in compliance with your bank and not fall out of the debt covenants you've made. We manage our relationship with **Bank of America** like it's one of our most important, strategic assets."

He said that having a good lender is "an amazing, powerful weapon in your arsenal. The relationship with your bank needs to be guarded and really worked on. Your lender should be there to help and stand by you."

Regarding leverage, Fowles said he has never seen a better time than the current era to get leveraged. "We are still at historically low interest rates. It's been a crazy run for at least 12 years now. The Fed has kept rates near zero. Wineries should be taking advantage of that. It's a phenomenal gift. We certainly have taken advantage of that."

Opus One is an unusual case, making just one SKU, the Opus One red table wine, which has a $365 per bottle suggested retail price for the current 2016 vintage. The company is nearing the end of a major expansion of its winery in Oakville, Calif., and borrowed to get much of the work done. "At these rates it makes much more sense to borrow to pay the contractors because our owners can take what we would have spent and put it to much better use."

Moramarco struck a cautious tone about borrowing. Wineries that are still highly leveraged could be in a rough spot, he said. If loans were taken out based on 10 percent growth projections and that growth doesn't materialize, it could mean serious trouble. "Be realistic about your growth projection, what niche you are in and what the realistic expectation for that niche is," he advised. "Ask what debt level you feel comfortable servicing."

Emphasize DTC Sales

Both Moramarco and Fowles said that now is a great time to fine-tune a direct-to-consumer (DTC) approach. Wineries should look at the gross profit of their various products. Wines sold through the three-tier system have a 50 percent gross profit, and those sold via DTC are typically 75 percent, Moramarco pointed out.

Fowles added, "Wineries should make sure they're focused on their most profitable channels, and for most that is DTC. If you've got fans in your wine club that love your wine, that's somewhat recession-proof."

The latest data from the *Wine Analytics Report* confirmed that the value of DTC shipments grew by 9 percent for the 12 months through August, more than twice the rate of domestic wine sales, in general.

The downturn in grape purchase contracts in the past year, a plentiful supply of bulk wine and lowered volume expectations in general indicate the industry is being strategic, Collison said. "Especially for the larger operators, it means that wineries are kind of getting ahead of it, which is a good thing, because inventory is the biggest risk in the wine industry in a down cycle. It's not like spirits or beer where you turn the spigot off when there's a demand shock and turn it on when it's over."

Collison said to remember that recessions don't last forever, and winery executives should also be thinking what they will have on hand, after a recession, when the economy starts growing again. "A couple of years from now, people are going to be looking at how much wine they didn't make in 2019 and what they could have sold in 2021 and 2022. But that's the fun of the wine business," she said. "You've got to make your production decisions now for your sales two to three years out." **WBM**

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What to Expect and Plan for During Each Phase of Your Business

Mark Steranka, Jay Silverstein, William Vyenielo

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NO MATTER WHERE YOU are within the life cycle of your business, there are questions, decisions and solutions that need to be determined.

Whether your business is in the start-up, growth or maturity phase, or if preparing for an exit or transition, entering a new stage is often exciting, as well as challenging. Critical activities, like strategic planning, need to take place, during each of these phases, to meet future goals—and to prepare for an eventual exit. This article identifies key activities that you should focus on in each phase of your business.

Start-Up Phase

The start-up phase begins when you decide to turn an idea into a business. Start by breaking down this phase into concrete steps:

- Write a formal business plan
- Secure financing
- Choose a business structure
- Pick and trademark a business name
- Secure proper licenses and permits
- Define job positions and hire staff
- Choose an accounting system
- Find a business location
- Insure against risks

There are myriad resources available to guide business owners through the start-up stage. Browse the internet, check with your local chamber of commerce and industry associations, and seek guidance from professionals, such as lawyers, accountants and experienced business consultants.

Taxes

It's important for business developers to explore the potential impact of international, federal, state and local taxes for each business entity type: C or S corporation, LLC, partnership and sole proprietorship. Making the right decision can help lower the tax burden of growing, running and eventually exiting a business.

Accounting and IT Systems

Smart business leaders know making good decisions depends on having timely access to good information. Businesses that invest early in accounting and IT systems that can scale as a business grows often find the investment pays off, providing a competitive edge.

Economic Considerations

If your company is looking to grow quickly through acquisition, then it's important to conduct due diligence on targets prior to any deals. This provides a risk assessment, as well as insight into the past, present and future financial performance and value of a potential acquisition.

Strategy, Planning, and Operations

In a start-up phase, a business plan can be critical to raising funds, securing banking relationships and establishing strategic market connections. The business plan will articulate your value proposition, market strategy, management team, operations model and financial forecast.

Staffing and Management

To attract and keep the right people involved and motivated, it's important to align potential financial incentives with desired behaviors, outcomes and company goals. This can be achieved through cash, equity and/or deferred performance-based compensation programs for key employees.

Board Considerations

Some board positions might be empty when starting your company. Don't rush the process of filling empty seats. Appointing the right members carries a lot of weight and will affect the future of the company, which means they should be thoughtfully made.

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Risk Management

There's a great deal of risk in starting a business. Mitigate personal risk through proper entity structuring, internal controls and personal insurance. For the business, focus on protection planning with the following items:

- Crop, fire and flood insurance
- Property, plant and equipment insurance
- Disaster recovery plan
- Business interruption plan
- IT data security, back-up systems and protocols
- Key person insurance
- Standard operating procedures

Evaluate and upgrade these risk-management measures at each stage of the business.

Other Key Considerations

Avoid surprises by taking time to understand how the funding used to start your business might impact its growth. At the same time, keep your lender and any shareholders apprised of the company's performance—including changes in plans and opportunities. Stakeholders are more likely to accommodate and provide additional capital if they've been kept informed.

Growth Phase

Expanding and innovating is a fundamental piece of the growth phase but anticipating and managing consequences of that growth should also be considered. This is the time to target and acquire new assets as existing assets continue to be developed.

Taxes

Tracking changes to federal, state and local tax laws can feel daunting because there are so many areas to juggle and the laws can change frequently with little notice. Understanding if, and how, tax changes impact your business enables you to reassess major components of your business, such as entity structuring, employee incentives and investment capital.

Accounting and IT Systems

Companies are best served at this juncture by focusing on consistently generating income and attracting new customers. It's also a good time to evaluate the performance of any IT and accounting systems. Having clean, accurate financial and operational information provides critical insights into company performance and reinforces overall business value.

Economic Considerations

A company continually spends money during the growth stage, which makes it imperative to manage cash flow and monitor the amount of available leverage. Be sure to consider the needs of all stakeholders, including royalty owners, customers and regulatory bodies.

Personal Finances

Your personal net worth grows with your company, which means now is the time to start estate planning. Take the time to assess your tax exposure and to whom your asset base will pass. Additionally, start finding ways to diversify your holdings, taking cash from the business in a way that's strategic and in alignment with personal financial goals.

Strategy, Planning and Operations

A strategic plan provides the opportunity to both engage your employees in the planning process and, ultimately, convey your roadmap for operational success. The planning process offers the opportunity to identify strengths, weaknesses, opportunities and threats that need to be addressed through strategic initiatives and operational tactics.

Staffing and Management

If you're able to offer performance-based compensation programs and benefit plans to employees, now is the time to consider how to offer and distribute them.

Board Considerations

During the growth phase, the board is more active in business decisions involving acquisition or divestiture. It also focuses on monitoring internal controls, which means the board is more involved with the management team. Keep a watchful eye and adapt how the board and management interact to facilitate effective communication.

Other Key Considerations

It's a good time to begin solidifying a potential exit strategy or succession plan. While a plan may have been previously discussed, it's important to revisit and adapt the plan while considering a capital infusion or company sale, both of which can have different implications.

Maturity Phase

The focus during the maturity phase is to remain competitive and sustainable by continuously improving productivity and best practices. While maintenance and growth are a priority during this phase, it's also important to start evaluating your exit strategy and its impact.

Taxes

Well in advance of an exit, it's important to understand the income-tax implications of a transaction or sale. By making decisions during the maturation stage, a company can more effectively deploy mitigation strategies to lower its income tax liability. It's worth noting that certain estate tax savings strategies may also be employed in advance of an exit.

Accounting and IT Systems

Your winery will likely be seeing increased efficiencies and a stable cash flow. Maintaining clean, accurate financial records and multiple-year forecasts will be critical to implementing a successful exit.

Economic Considerations

Continue to monitor and manage cash flow, but be aware of coming financial-reporting requirements?. A company's internal controls significantly impact the strength of a company's financial reporting, which is why controls are critical for all companies.

Personal Finances

Your net worth has grown, and its structure has changed. There are three key items you'll want to revisit during this phase:

- Your financial plan
- Your estate plan
- Charitable intentions

Strategy, Planning and Operations

As your organization achieves critical mass, it's important to regularly update your strategic plan and associated departmental operating plans to adapt to market changes. These plans will continue to play a critical role in aligning your plan, performance and people with your mission and vision. They can also keep your employees engaged in what you're trying to accomplish and institutionalize a culture of continuous improvement.

Staffing and Management

Using effective, efficient systems and processes, such as performance-based compensation, that align with your strategic plan may help to increase the profitability of the company. It's also time to develop a staffing succession plan:

- Identify candidates for future leadership and management roles
- Outline specific training and development for those candidates
- Establish methods for evaluating their performance to help determine eventual successor selections

Board Considerations

During this phase, the board should be evaluating assets and divestitures, as well as assessing how they'll impact the company's exit strategy.

Other Key Considerations

Preparing for a transition or exit should be top of mind during this phase. Communicate to key individuals their assigned roles and responsibilities related to the exit strategy. It's also important to begin carving out financial statements and conducting earnings-and-profit studies to assess how they'll support and impact the exit strategy.

Transition or Exit Phase

All of your hard work culminates in the exit phase. Whether you're selling, closing your business or taking a different step in its evolution, you need a transition plan.

Taxes

If you've already outlined an exit plan, now is the time to implement it. If you haven't decided on a strategy yet, it's important to, at minimum, understand the federal and state income tax implications of a transaction.

As part of a negotiating strategy, understanding these issues before you sell your company can give you the leverage to structure the transaction in a way that reduces your tax burden.

Accounting and IT Systems

To instill stakeholders' confidence in your company's current and potential value, you'll want to provide:

- Well-organized and accurate financial records from the last three years (at minimum)
- Financial statements audited by an independent CPA firm
- A multi-year forecast

This information increases the odds you'll receive as much as possible for the years of hard work that you and your team have invested.

Economic Considerations

Prepare to pay the owners and participants in the company's incentive programs. Additionally, be aware that post-closing settlements can often be contentious. You've worked hard to build your company—don't leave money on the table.

Personal Finances

Ensuring the exit plan is directly linked to your personal financial goals is especially important during the exit phase. Take the time to organize liquidity in a smart and strategic way, such as into buckets for retirement and living, taxes, and new ventures.

Strategy, Planning, and Operations

Update strategic and operational plans to ensure they're aligned with your transition aspirations.

Staffing and Management

It can be challenging to keep employees motivated and engaged if their future roles with your organization are uncertain. Having the future executive team either identified and aware of their career path or already in place can lend greater stability and value to the company.

Board Considerations

The board continues to actively work with management on decisions related to the exit.

Start Planning Now

Growth, maturity and exit aren't just the transition phases of your company. When you're an owner, they're also moments in your life when you must evaluate where you've allocated your financial resources.

By laying the groundwork for each transition phase, you can help ensure your assets are positioned where they're most needed and of greatest benefit— to you, your team and the company. WBM

Three Technology Trends to Watch in 2020

Why IT needs should be at the forefront of business strategy, and how to get your team involved.

Erin Kirschenmann

WHEN SPEAKING WITH chief information officers and other IT personnel, it seems there is often a disconnect between the technology needs of a company and the investment of time and money that actually goes toward those needs. More often than not, a company's ownership is more focused on product development, sales and marketing, or, really, almost anywhere else besides implementing the softwares or digital platforms CIOs find important for a business's success.

This is a bit of an overstatement, but the chance that those words resonated with a few professionals is high. When it comes to upgrading systems and/or implementing and integrating new software, many businesses find that it's not a priority—but it should be.

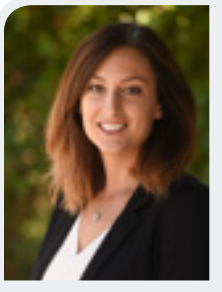
That was the consensus of the attendees of the CIO Forum, a private roundtable for technology professionals at the **Wine Industry Technology Symposium**, held last October in Napa. While the attendees will remain anonymous and their specific comments privatized, **John Collins**, CEO of **GreatVines**, provided a round-up of the hot topics discussed, and from them we can see what's keeping CIOs up at night, as well as what they'll be working on in 2020.

1. Cyber Security is Vital and Continues to Grow in Importance

The rise of the phishing email, defined by the **Federal Trade Commission** as "a type of online scam that targets consumers by sending them an e-mail that appears to be from a well-known source," has companies across the country worried. **Avanan**, an enterprise AI cloud security company, reported in July that one in 99 emails is a phishing attack (roughly 4.8 emails per employee in a five-day work week) and nearly 30 percent of those emails make It past a computer or system's default security. **Federal Bureau of Investigations** and **IC3** reports claim that the average business email compromise (BEC) incident results in a loss of $64,000. BEC attacks also caused more than $1.2 billion in losses in the U.S. in 2018, a 100 percent increase from 2017.

Charles Tango, chief information security officer at **Altria**, the parent company of **Ste. Michelle Wine Estates**, is tasked with protecting and training all tobacco and winery employees in order to protect the business.

According to Tango, phishing is the top cause of data breaches and has been for a while. While other styles of attacks have generated headlines and cost companies billions of dollars, they are less frequent. The first line of defense, he said, is human. "There's no technology that can stop all phishing attacks. Ultimately it is up to you and your people," Tango said.



Erin Kirschenmann is managing 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*.

Collins reported that a larger wine company went on the offensive and phished its own employees. In this case, the company utilized a tool to "attack" its employees as a test to see who opened and clicked through the email. After discovering who fell for the scam, managers were notified, and those employees were provided educational tools to avoid a potentially more disastrous reoccurrence.

This isn't uncommon outside the wine industry. IT consultants and larger companies have been using this method for years, finding the most vulnerable employees and showing them the red flags and indicators they missed, the theory being it's better to fall for a "safe" attack than a real one. Tango mentioned this method during his presentation at the Wine Industry Technology Symposium as well.

Tango provided some solutions to help wine companies large and small protect themselves from a phishing attempt:

- Most email providers offer phish detection services—use them.
- Tag inbound email in the subject line to make it obvious to the user that an email came from an outside, non-company source (i.e., "[INTERNAL] or [EXTERNAL] at the start of any subject line).
- Make it easy for your users to report a suspected phish—and reward them for it.
- Install web proxy software that blocks a malicious site, should a user click on an infected link.

The Cloud is Much Safer Than Your Single Firewall

It's far easier, and safer, to outsource some security needs, particularly when it comes to where data is stored. "I think even more narrow-minded winery owners are becoming open to the fact that their data might actually be more secure in an **Amazon** data center with real, competent people trying to keep the hackers out, than in their data center connected with one little firewall to the internet," Collins said.

2. Growing Acceptance of Remote Workers

Acceptance that remote work is still valuable work was a theme at the meeting, as many of the CIOs in attendance said that full-time remote work is appropriate for some roles and they are willing to perform the necessary setups.

Across the country, 66 percent of companies allow remote work and 16 percent of companies are comprised of 100 percent remote workers, according to a 2019 study by **remote.co**. Research into the practice is promising. In addition to saving an employer money, increasing productivity and reducing costs for workers, a two-year **Stanford University** study found that people who work from home are less likely to leave a company. In fact, the research found a 50 percent decrease in attrition among remote workers. Plus, in a highly competitive hiring market, remote working offers employers a wider talent pool.

To hear that many wine industry employers are learning to tolerate remote work situations is a good sign, and Collins said that recruiting and retention issues are spurring that change of heart. "It's a lot easier to attract and retain IT people if you're allowed to hire them from wherever," he said.

For 2020, CIOs and IT managers are likely to look at creating effective setups for a growing off-site workforce.

3. Training and Adoption Fatigue

The preponderance of new software systems is both a boon to wine industry productivity and a trial on employee's patience. Learning the ins and outs of a new software system or process is often taxing on employees, particularly those that have been in the business for a while and have not needed to adapt to technologies. "A number of folks have rolled out online training tools, which are great, but there was mixed success," Collins said. "You know it sounds good, but then nobody uses it, and adoption is poor. That wasn't ubiquitous or always the case, but if you're paying a lot of money for this tool, and you're trying to get everybody to use it and train them on it, and then they don't, that's very frustrating."

It's not necessarily just with new technologies—updates to traditional software like **Excel** or **Office 365** can destroy an IT manager's day with a constant barrage of questions about where buttons have gone or how to use the same tool in a new way.

CIOs will be looking at training for these new technologies over the next year and how they facilitate it. Do they use an in-house employee to conduct the training or bring someone in? What is the most effective way to reach an audience in order to showcase the new features, processes and methods that will modernize the employee's practices?

Why it Matters

IT efficiencies can catapult a business into profitability. Technologies can aid in effective time management, streamline and automate actions and more. By diverting enough time and money into the appropriate systems, companies can ensure continued success—and avoid losses from data and system breaches. **WBM**

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Todd Webster, executive winemaker, Brennan Vineyards, Comanche, Texas

"Since I started at Brennan Vineyards and became aware of *Wine Business Monthly*, my favorite issues are the Varietal Focus issues. I enjoy all of them, but it is always exciting when it is focused on a variety that we grow in Texas and a wine we make at Brennan Vineyards. The September 2017 (Varietal Focus – Tempranillo) is still to this day somewhere close to my desk. Although Texas was not part of this article it deals with winemakers from Oregon, Washington and Idaho that have similar climates. I love being able to see different winemaking techniques used at different stages of the winemaking process. I like seeing what other winemakers use to blend in their wines, their style goals, vineyard practices, how they decide when to pick, different yeasts that are used for the same variety and oak programs."

NAME AND TITLE: Todd Webster, executive winemaker

WINERY NAME AND LOCATION: Brennan Vineyards, Comanche, Texas

ANNUAL CASE PRODUCTION: 10,000

PLANTED ACRES: 30 acres

CAREER BACKGROUND: I started my career in the accounting department at an oil and gas company. Although it was a great company to work for, I did not have a passion for the work I was doing. I decided to leave my position there with no plan in regard to what kind of job I was looking for. My wife and I lived off my 401k until it ran out. Then it was time to start looking for a new job. I knew I wanted to do something with wine but had no idea how to make that happen in 2003 and in Texas. I was lucky enough to find a new small boutique wine distributor/importer nearby. Through that job, I was able to meet Pat & Trellise Brennan (owners of Brennan Vineyards). I began working at Brennan Vineyards in May 2008 and I learned how to make wine on the job. I read as much as I could and attended as many one-day classes at Texas A&M or Texas Tech as I could. I then became aware of the Texas Tech Viticulture Certificate Program. That was a great experience and I still keep in touch with my classmates that have since opened Texas wineries (Mike Batek, Hye Meadow Winery and John Rivenburgh, Rivenburgh Wine).

At the time, Texas Tech did not have an enology certificate program but they do now. I got on the waiting list for the UC Davis program which was going to take several years. While waiting, I found that Washington State also had an enology certificate program. Going up to Washington was eye opening to see how similar the grape growing climate was in comparison to Texas. I just talked to one of my Washington State classmates the other day (Rich Burton, Locus Wines). Both of my professors have been vital to my success at Brennan Vineyards. Kirk Williams, Texas Tech, and James Harbertson, Washington State University; Thank you!

WHAT HAS BEEN YOUR BIGGEST PROFESSIONAL CHALLENGE? By far the biggest challenge for me has been managing Texas grapes and wine with high pH. Our vineyards are located in central Texas just north of the Hill Country AVA. We have hot days and warm nights. Our diurnal temperature shift is rather small. High Brix and high pH are the norm for us. This is something we are always managing in the vineyard and trying new ideas.

VARIETALS THAT YOUR WINERY IS KNOWN FOR: Viognier and Roussanne for whites and Nero d'Avola, Tempranillo and Cabernet Sauvignon for reds.

Aging

ILLUSTRATION BY BOB JOHNSON

A PERFECT FALL DAY and Jake Lorenzo is thinking about the Pony Express. The Pony Express was a service that delivered mail, newspapers and messages with relays of horseback riders between Missouri and California, starting in 1860. Keeping weight at a minimum was essential, so most of the riders were young and thin. An ad searching for riders read, "Wanted: Young, skinny, wiry fellows not over eighteen. Must be expert riders, willing to risk death daily. Orphans preferred."

Jake Lorenzo figures you must be very hungry and a bit crazy to apply for a job that causes you to risk death daily, but the Pony Express cajoled 80 riders to work their routes. They could get a letter from Missouri to California in just 10 days, which at the time was the fastest transport in the nation. The intrepid riders were the stuff of legend, the most famous being Buffalo Bill Cody. Alas, the Pony Express operated for less than two years before shutting down in the face of the telegraph and the Civil War.

This detective got to thinking about the Pony Express while pondering speed. Everything these days is fast. We live on our computers and phones, and information spreads almost instantaneously. Technology is king, and young people seem better equipped at keeping up with it than aging private eyes. These young people can move their thumbs at a frenetic pace, sending their ubiquitous texts. Doctors warn that there will be a physical price to pay down the road with thumb ligament surgery and carpal tunnel syndrome. Hitchhiking might completely disappear because young people can't hold out their thumbs.

Nowadays, everything happens quickly. If you need something, order it online and Amazon will deliver it to your front door faster than a Pony Express rider could switch mounts at a way station. Drones will deliver food, before you hang up the phone, after placing your order. Everything has to be fast, and young and hip. Jake Lorenzo worries this obsession with speed, along with the allure of all things young and new, makes us tense and a little crazy. We are in such a hurry to get where we are going, we no longer enjoy the ride.

Patience is no longer a virtue and it is quickly disappearing in our daily interactions with one another. That saying, "Good things come to those who wait," is warping into, "If I have to wait, it can't be good." It is a way of life that makes this detective shake his head sadly in bewilderment because it is antithetical to everything I've strived to achieve in my life.

Jake Lorenzo likes taking his time. I have learned that slowing down is a healthy thing to do in our high-speed, information overload of a society. Sitting at a table with guests, eating some delicious food is a communal experience rooted in ancient times that satisfies the soul, and a good bottle of wine enhances both the meal and the company. Because we have no patience and we no longer wait for good things, most of us drink young wines.

Last night we had guests at the table and had gone through three bottles of wine. Jakelyn's mom went into the cellar and emerged with a 2001 Relentless Merlot from Hernandez Ranch. Most Merlot doesn't make it to 18 years of age; and when it does, the results are often not pretty. I gently removed the cork and respectfully decanted the wine. I poured wine into a glass and recognized the classic Hernandez Ranch signature of eucalyptus on the aroma. The mouthfeel was unctuous, but the flavors were a bit sharp and closed. We decided to let the wine sit, just like we rested the roast I had cooked before slicing, or like a Pony Express rider would scrutinize a narrow valley to make sure there was no Paiute war party waiting for him to risk his daily death.

The wine blossomed in just 15 minutes. Complex fruit aromas surfaced, along with multifaceted flavors of berries and earth and beautifully balanced oak. The longer we sipped at that wine, the better it got. Believe me, this detective has opened many an old bottle to find it tired or dead and incapable of giving any pleasure. That is simply an added cost of aging wine. But this bottle of Relentless was a joy to drink, full of mature flavors with all the sharp edges rounded off and turned to smooth velvet. We had been rewarded for our patience, both in waiting 18 years to open the bottle and then taking that extra time to allow the wine to wake up and reveal itself in all its glory.

People who love wine but have never experienced the pleasure of drinking a perfectly aged bottle will never have a complete understanding of what wine is about. Great bottles of aged wine are rare, especially for those of us trying to live on a detective's wages, but thanks to generous friends, this detective has had more than his fair share. When you get one, it is unforgettable, along with the details of the meal and the names of the people sharing it with you.

The greatest bottle of wine Jake Lorenzo has ever had was a bottle of 1949 Camille Giroud Musigny Grand Cru. The occasion was my 50th birthday, and the wine was a gift from Rusty Staub. Six of us sat around my kitchen table, several bottles and many courses into a great evening. I had placed the decanted bottle on the table and was tending to the entrée when all conversation at the table stopped.

Claude Berthoud asked, "Jake, what is in the decanter?" Rusty showed him the bottle. People sipped the wine in a few moments of contemplative silence and then burst into excited conversation about the wine they were tasting.

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Everyone agreed, the wine was stunning. Not because it was old and had survived, but because it was vibrant, fruity, complex and rounded. Layers of ever-changing flavor flooded the senses, and each sip brought new revelations. All six of us signed and dated the bottle, and I have kept it through the years. Every time I see that autographed label, it calls up memories of that delightful evening, the meal, my friends and that exquisite bottle of wine.

Jake Lorenzo cannot imagine what was so important in a letter that it required a company to hire 80 young riders, push hundreds of horses and risk daily death to hurry that letter across the United States in just 10 days. Would it have made any difference if it had taken 12 days or 14? Those daring young riders would have been better served if they took a shift off and invited a Paiute warrior to dinner. If they couldn't work out a peace agreement, at the very least they could have eaten a hot meal and tried an old bottle of wine. That might have built a memory they would never forget. **WBM**

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