

**GROW YOUR OWN GRAPES IN A BACKYARD VINEYARD!**

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  - TROUBLESHOOT PROBLEMS
  - GROW THE BEST WINE GRAPES
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by **WES HAGEN**

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# THE BEST OF *WineMaker*<sup>®</sup>

**P**lanting a backyard vineyard is as much an act of madness as it is an act of faith. In an era of unmatched wine availability and affordability, it would be difficult to claim that growing grapes to make your own wine is in any way economical. The best metaphor I can come up with: planting a vineyard at home is like making your own flat screen television. You're not going to be able to do it cheaper and more efficiently than the Chinese . . . in fact it will probably be more expensive and have more technical issues, but in the end you will certainly know more about the intricacies of television manufacturing.

A backyard vineyard is not landscaping. A backyard vineyard should never be a "crazy idea I had one night while under the influence of Napa Cabernet." There is only one reason to plant a backyard vineyard — you have no other choice. You dream of a backyard vineyard every night. You can't look at that quarter acre hill in your backyard any longer without imagining perfect little rows of Grenache.

It may seem odd that the first thousand words in a grape growing manual would attempt to discourage backyard viticulture, but this hobby isn't for the meek or lazy. There is nothing as glorious as a perfectly manicured vineyard, and nothing quite so pathetic as one that is neglected and rank. This *WineMaker* special issue is packed with excellent, detailed cultural practices and concepts for growing high quality winegrapes. But it won't shoot thin, sucker, manage the canopy or test the fruit. It won't do field trials or walk the vineyard on a weekend when the NBA Finals are on. A vineyard is real work and more. So if you've read this far, here's why you will love this special issue:

- If you don't have a backyard vineyard, it will give you a succinct primer for understanding how much work will be involved in the design and implementation of a backyard vineyard.
- If you recently bought a property with a planted vineyard, this manual will inform your decision concerning whether to keep the vineyard or plant a few rows of azaleas.
- If you already own and work your own backyard vineyard, it will give you vital tools for improving your fruit and wine.
- If you are on the fence, indecisive about planting, this manual will pull no punches. It will give you an honest appraisal of the study, prep and hard work necessary to produce wine from your own property.
- If you never plan to have a backyard vineyard, the information contained within these articles will inform your enjoyment and understanding of wine immeasurably.



WES HAGEN received his viticultural training from the University of California at Davis extension program. He is the Vineyard Manager and Winemaker for Clos Pepe Vineyards in Santa Barbara County, California, where he grows Chardonnay and Pinot Noir for a number of wineries, including his own. Wines made from his grapes have scored over 90 points by *Wine Spectator* magazine. Wes also covers the world of hobby vineyards for *WineMaker* magazine, writing our "Backyard Vines" column in every issue for the last decade as well as on his blog at [winemakermag.com](http://winemakermag.com).



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Photo by Wes Hagen

# STARTING YOUR OWN HOME VINEYARD

# BUYING VINEYARD LAND



A high percentage of my consulting business comes from wine lovers wanting to buy vineyard property. The story is usually the same: about ten years from retirement, successful in business, getting tired of pushing paper in the rat race, they want to get back to an agricultural way of life to recapture a lost piece of their soul. Some believe that the best way to appreciate wine is to grow it themselves. Others may believe that being “in the business” will give them more opportunities to enjoy wine. All potential vineyard owners have one thing in common, though. None expect the process to be so complicated, expensive and time consuming. The purpose of this article is to make full disclosure. After reading it, you should have a much deeper understanding of the responsibilities, pitfalls and economic impacts of buying land for vineyard establishment. If the caveats dissuade you from planting a vineyard, I will have saved you a lot of

money and disappointment. However, if after reading this article, you are still interested in starting a vineyard, you are a true believer and will likely succeed.

Why do I want to grow grapes? This may seem like a simple question, but it's one that I force upon my new clients, asking them to dig deep and discover the truth that may lie beneath the initial impulse of wanting to grow vines on their property. Let me be clear: The cost and effort to design, plant and maintain a vineyard is clearly prohibitive to most people that want a vineyard for landscaping purposes.

**Landscaping in this context means that the vines are planted to:**

- Fill in empty space in the yard
- Remind you of France or Italy
- Show your friends and neighbors you have a vineyard
- Increase property value

The key here is to be honest with yourself. There are plenty of fruit trees or other ornamentals that will be just as pretty (but perhaps less romantic) as a vineyard, and will require far less maintenance, inputs and upkeep cost. This warning comes from years of dealing with customers who have let their vineyards degrade to a point where the fruit does not make sound wine, and they feel burdened by the responsibility of vineyard ownership.

## The Right Reasons

Without the cost of land, an acre of vineyard can cost up to \$20,000 to plant. For the same money you could purchase thousands of bottles of fine wine and fill a cellar for many years of wine drinking. Without commitment, the right help and the right piece of dirt, you may plant a vineyard and never produce a

sound bottle of wine. Here's my list of reasons that you should pursue vineyard land for wine production:

- Your enjoyment of wine has peaked after decades of travel, tasting, note taking, collecting and pursuing knowledge of wine.
- You are physically able to do hard physical labor in the vineyard, and believe doing so will feed your soul in a way that your current vocation could not. Alternatively, you have a vineyard staff that can do the work under your close supervision.
- You've been a home winemaker for a number of vintages, and have found that you just can't get the quality of fruit that you want.
- You believe that your passion and commitment will lead to a sense of accomplishment. You believe you can grow better fruit than other local vineyards.
- You have been working hard to have the finances to pursue your dream.

There is a reason that most professional winemakers do not own their own vineyards. The cost and time required for growing quality fruit keeps them from the cellar and from promoting their wines. My advice to clients is this: if you have a source of quality fruit that you can buy at a reasonable cost, you may want to continue purchasing the fruit and let someone else farm winegrapes for you.

Now that I've scared most of you away from planting a vineyard, I will attempt to guide the initiated (perhaps insane) viticulturists through the process of assessing sites for vineyard development. I feel confident that you are aware of the financial and labor challenges, so now we will focus on the nuts and bolts of looking for a vineyard site.

Here are some questions you should ask yourself, and answers that attempt to look at all sides of the issue:

## Home Winemaking or Commercial Production?

This decision will impact the size of the property you are seeking, and help

you define the region where you would like to grow. Most home winemaking vineyards are an acre or less, and most commercial vineyards are 5 acres or more. If you're not sure which way you want to go, my usual recommendation is to start with an acre. An acre of vines can be farmed by a single devoted individual, and will produce enough crop in its third or fourth year to give you an

## Ask around to see who's making the best wine in the area, and then visit that person with gifts of fine wine or take them out to eat.

excellent indication of wine quality from that locale. If you are going commercial make sure you have a potential audience for your wines, or winemakers that have agreed to buy the fruit before you plant. Of course you want to make sure that the land is suitable for premium wine production. Vineyards are too much work to plan and install on a site that will produce mediocre wine.

### Time and Money

A vineyard is not an asset. Most banks won't even add one dollar of value to your property for producing vineyards, even successful commercial operations. Of course, the truth is that a vineyard does add value to a property: both real and imagined, but don't expect to retire on the money that will be produced by your new winegrape project. Set a budget from disposable income, not from investment accounts. After you set a budget, try not to freak out when the final numbers double. A vineyard tends to be a big money pit for the first three years, and it hurts to watch the money go out constantly without any fruit coming back to you. In general, if you are at all concerned about the cost of finding vineyard land, establishment and maintenance, this is not the hobby for you. At the risk of sounding elitist: if you shudder at the idea of maintaining a Ferrari, a vineyard will likely wreck your finances; both Italian sportscars and vineyards are

temperamental and in need of constant professional tinkering in order for them to produce pleasurable results. There are devoted individuals out there that have the time and strong back to do the work themselves. They can minimize costs and grow great fruit. I suspect they are in the minority, though, so expect a great vineyard to cost a great amount of time and money.

### Will Grapes Grow and Produce Good Wine?

If you've reached this part of the article, you are a brave soul and possess a personality that is not frightened by a challenge. I tried to scare you off but you kept coming back for more! Now we get to the fun stuff. The details of soil and water testing are included a little further down, but for now let me offer the following advice: Let others spend their time and money being pioneers in new regions. Find a place in the world that makes wines you LOVE to drink, where there's available property that fits your budget and neighbors that can help you with your vineyard. If you love Riesling, you may want to look at the Finger Lakes. Delicious native grapes like Norton do very well in Missouri, where you can find spectacular barbecue to match. Zinfandel lovers may be able to find a plot in the Sierra Foothills of California or even Lodi (a good place to be stuck, for Lodi has one of the best grower outreach programs in the world). Up and coming regions offer good value for land: areas in Paso Robles, Santa Barbara and Monterey are still transitioning from production agriculture to viticulture, and offer an excellent balance of land value and a supportive, friendly industry. The costs associated with vineyard development should lead you to this conclusion: Start a vineyard where

great wine is grown and there is an existing viticultural infrastructure with which you can network.

### The Key Factors

#### Get a pro involved early

Ask around to see who's making the best wine in the area, and then visit that person with gifts of fine wine or take them out to eat. You'll be surprised how a great bottle of Grand Cru Burgundy or a medium-rare veal chop can affect the mood of any winegrower. If they favor Budweiser and Burger King over Clos de la Roche and duck confit, search for another consultant. Show them you are serious, passionate, knowledgeable and financially solvent and they will usually be willing to talk about your project. Bring soil samples, water samples, etc., tell them your favorite style of wines and ask them how they would proceed to grow that type of wine locally. Become excellent customers of local wineries, attend wine association meetings, volunteer at events, become an important element in the local wine community.

#### Soil testing

Easy stuff: dig a four foot deep hole with a shovel, or preferably, a backhoe. Taking a central sample on a small backyard property may be enough, but if you see changes in soil structure, color or native vegetation, take additional soil samples from there too. Take samples from 12–24" (~31–62 cm) and 24–36" (62–93 cm) depths, label them individually in big, 1.0-gallon (3.8-L) ziplock bags and UPS or FedEx them off to an agricultural lab. Ask for comprehensive soil analysis for preplant winegrape production, and also ask for preplant amendment recommendations. This will cost you about \$130 per sample, and should be done before making an offer on any property (ditto for water testing).

#### Water testing

If you are planning on using irrigation, take a raw sample of the water source and ask for an irrigation water suitability test (note that the test is for winegrape production). The water can be tested for a myriad of chemicals, nutrients, benefits and potential problems. The



following factors should be measured in the test: alkalinity, bicarbonate, boron, calcium, carbonate, chloride, copper, electrical conductivity, fluoride, gypsum requirement, hydroxide, iron, magnesium, manganese, nitrate, pH, potassium, sodium, SAR, sulfate, total dissolved solids, total hardness and zinc. One quart (~1 L) of water is usually required. Use a secure, sterile plastic bottle with a sturdy closure, and make sure to run your well or water source for about 10 minutes or more before taking the sample, to assure that it has flushed all contaminants. Again, I will stress the importance of personally completing soil and water testing before bidding on a potential vineyard property. I suggest not trusting samples provided from real estate companies or consultants. For the money you are about to spend, it's worth it to do the sampling yourself, or hire a viticulturist you trust to take care of it under your supervision.

#### **Soil and vertebrate pests**

Once you get the soil tests back, discuss them with a local grower or call the lab to have anything mysterious explained. Most folks don't know the importance of cation exchange capacity or boron deficiency, but with the right consultant, it usually comes down to adding something to the soil pre-plant, or using a yearly fertilizer or compost. No soil is perfect, but you may want to pass on a site that has too many red flags on the soil report. Know the details of your soil's chemistry before bidding on a property.

Also, look around at the open land and the neighbors' open land. Is it pocked with gopher mounds? Are there ground squirrels? Deer and no deer fence? Turkeys? Ostriches? If there are more than five gopher mounds per acre, you may have a potential problem. You can ask for the gophers/squirrels to be professionally exterminated as a condition of purchase. If there are deer in the area, deer fencing (you may be surprised how high a deer will jump for ripe winegrapes) is a must. Deer fencing will also keep other animals out and your dogs in. Dogs are important for a vineyard, as they can put pressure on birds, squirrels, coyotes and gophers.

There is perhaps no way to make a dog happier than giving them the job of protecting a vineyard. Each vineyard problem has a specific breed that can help. For my taste, a border collie is an excellent all-around vineyard dog as long as you have enough property to keep the breed busy.

#### **Disease**

Know the potential mildew and rot pressures that occur on your potential site, and ask local growers what they spray, what equipment they use, how often they spray, where they buy their materials and what permits are necessary. You may also want to ask local winegrowers about disease issues such as phylloxera, eutypa, Pierce's disease, nematodes, special insect pests and the likes so you can predict potential problems in the vineyard and act to minimize impact. Finding an area free from Pierce's disease and phylloxera may be your best bet for a long term vineyard investment.

#### **Aspect**

Aspect refers to the lay of the land and how hillsides are oriented to geographical features and the sun. Don't worry too much about finding that south by southwest facing hillside you learned about in France. Most sites in the U.S. don't need a special aspect to get adequate ripeness. I do believe that hillside sites tend to grow better wine as a result of drainage and a reduction in vigor. Try to plant on a site that is slightly elevated and sloping, and be careful not to plant at the bottom of a canyon or basin-type area that may collect cold air and frost the vines in spring. I plant my rows in a north-south orientation, and recommend the same to my clients, unless it makes the rows unsafe for tractors or equipment.

#### **Drainage and erosion**

The last thing you want after installing a vineyard is for heavy rains to wash away your soil. Winter cover crop is a solution that will also help the soil's health when the green material is cultivated into the ground.

Note which way water and rainfall will drain off of your site, and make sure to protect freshly turned hillside earth

from rains by use of a layer of straw, planted grasses, sandbags or subsoil drain systems (sometimes called French drains). Young vineyards that ripped or cultivated the soil preplant are most susceptible to this kind of erosion. Heavy machinery operators that specialize in agricultural grading can be hired to solve these problems for you before planting.

#### **Neighbors and fellow winegrowers**

We've gone over this, but make sure the property is near existing, quality wine production, and that your neighbors are friendly and willing to share their expertise. Who knows, if you're nice enough they may even let you borrow their tractor and spray rig!

#### **Fencing, equipment and storage**

You need a covered space to keep a tractor, ATV, spray equipment, buckets, gloves and tools. If the property has an existing barn or covered area, make sure it's big enough to enclose all of your future farming equipment. All chemicals must be kept in a locked chest or closet and don't forget about bulky items like bird netting, fertilizers, picking bins, and similar sized gear. It's also nice to have a shaded area with a picnic table for vineyard workers to have lunch.

#### **Follow through and installation**

A few final questions arise: do you want to try to install the vineyard yourself or hire a company for a pro install? Do you use the cheapest materials and replace the trellising every 10 years or do you buy the expensive stuff that may last 30? Plan on one full time worker for a 1-2 acre vineyard if you don't plan to do the work yourself. It takes about 8-9 full time, 48 hour work-week employees 6 months to finish our farming here at Clos Pepe, but we go overboard on fine tuning and human touch. There are always new mechanical devices being invented to remove humans from winegrape farming, but I'm guessing some of that sweaty hand labor is exactly what you dream of after 10 hours of pushing paper at a desk job. I do believe that the human factor, and passion specifically, is evident in a finished wine, and the more of yourself you put into the vineyard, the better the wine will taste. **WM**

# PLANNING YOUR BACKYARD VINEYARD



## P

Planting a home vineyard is a serious project that requires study, planning, a willingness to do agricultural labor and perhaps a small streak of insanity that comes with reaching a certain level of wine appreciation.

In planning your vineyard, there are lots of considerations. The purpose of this article is to introduce these issues to you, teach you some concepts, and then turn you loose to do your own research. It's vital to network with other grape growers in your area to benefit from their mistakes and successes. Local wine growers can point you toward vineyard hardware suppliers, good nursery materials, help you choose your vineyard plot, your grape varieties and root stock. They might even help with the labor if you bring them enough wine. Most viticulturists I've interviewed admit that they would have planned and planted

differently if they would have taken more time to read, network and plan. Once the vines are in the ground, there's little you can do to change the basic layout of the field. With that understood, let's start planning your vineyard.

### Select Your Site

In the average backyard vineyard, there is little choice in your site selection. There's a small piece of dirt that is unused, and that's where we plant the vines. Do consider what a vine needs to grow sound fruit: good sunlight without excessive shade.

So growing grapes against a solid fence or a wall may be a bad idea. Remember what Galileo said, "Wine is sunlight, held together by water."

### Hillside vs. Flat

Hillsides, especially southwest facing hillsides in the northern hemisphere, have always been the preferred location for growing quality winegrapes. Hillside sites are generally well drained and have less frost issues in spring, as long as the cold air has space to flow down into. Consider the difficulties in farming on a hillside, though. Tractors and equipment take a beating. One has limited choices concerning row direction and row spacing — the slope, exposure and the topography will dictate where you can fit the vineyard. Terracing might be necessary, which can add thousands of dollars per acre to the establishment cost. Our vineyard is mostly hillside, and I deal with erosion and equipment difficulties constantly. There are few sights as inspiring to the wine lover as a hillside vineyard, but putting a vineyard on a slope will nearly double the effort required to maintain it, and will significantly increase the investment needed to establish it. Quality fruit can be grown on flat ground, it just tends to be a little more vigorous and might require some more vine-hedging.

### Exposure

It is imperative to know what sections of your property get the most sunshine, wind, and shade throughout the growing season — roughly March to October in the US. Sun exposure on the fruit is key to getting good flavor out of your grapes, so planting a vineyard among shade trees or in the shadow of a canyon is not advisable. An open, sunny, southwest facing slope is perfect. Finding the spot on your property that gets early morning sunlight, and keeps that exposure until late into the afternoon will ensure that the vines get all the sun they need to grow, stay healthy and make sugar in the grapes. Some wind will protect the grapes against mold and mildew. Too much wind will shut the stomata on the leaves and cause the vine to shut down (stop respiring) temporarily.

### Prepping the Soil

Follow these five steps to preparing the soil for a vineyard:

1. Evaluate the soil through test pits, soil samples and laboratory soil analysis. Get a USGS soil map and learn what "soil series" you will be planting on. Also learn how that soil series impacts agriculture. Dig a deep hole in the center of your vineyard site and take soil from the top 12" (30 cm), from between 12" and 24" (30–60 cm), and between 24" and 36" (60–90 cm). These are the depths that the vine will establish itself and grow most of its root structure. Collect a few pounds of soil from each depth in large ziplock bags and carefully label each bag by location and depth. Make sure to fill the pit back in so you don't trap animals or careless children. Send the bags off to a good soil laboratory.

When you get the results back, the aspects of the soil should be described in context of "norms" for winegrape production. If the norms aren't listed on the evaluation, you can call and yell at the lab, or hit the internet or library to find the normal ranges of nutrients for winegrape production.

You may also want to find out if there are nematodes or phylloxera in your soil. These are vine pests that can cause havoc if you don't plant a vine rootstock that can resist them. Most soil labs can test a soil for these pests. Ask them about the best way to take a sample, or check their website.

2. Amend the soil with lime, nitrogen, compost, etc., to make it pH balanced and to add necessary nutrients as needed. Teach yourself a thing or two about what nutrients a vine needs, and then check your soil samples to see what needs to be added or amended. Take your soil samples to a respected company that sells amendments, and they will help you determine how many pounds or tons per acre of any given amendment your vineyard may need.

3. If your soil proves to be hard and compacted, and you can move equipment onto your property for the task, rip the soil to a three foot depth to help the vines establish strong, deep root systems. Do this after you have spread your amendments so they will be spread through the soil evenly. After ripping, disk the soil so it is uniform and relatively smooth.

4. Call a local farm supplier and let them know you need to grow some cover crop to keep your new ripped, disked vineyard site from eroding. A good cover crop — grasses, vetch, clover, etc. — will help slow erosion, add nutrients to the soil, attract beneficial insects and, if timed right, may even choke out potential weed growth. In areas with hard winters, growing a winter cover crop might not make sense.

## Irrigation

Ask local winegrowers whether or not they use irrigation, or if the rainfall in your area is usually adequate to bring in a healthy crop. The natural habitat of *Vitis vinifera* gets around 30–50 inches (76–130 cm) of annual rainfall. Personally, I believe that an area that gets 30+ inches (76+ cm) of rain per year is appropriate for dry farming. Irrigation can be the most costly aspect of vineyard development. If you don't need it, save the money. If it turns out you do need supplemental irrigation for your new vineyard, make sure to install it after ripping and disking, before planting cover crop and put in a system that takes elevation, gravity and water pressure into account. Most backyard vineyards are on flat ground. In this situation, and if the vineyard is less than 100 vines, you can hand water the vines with a hose, giving them enough water to grow every week or so. If you want a more elaborate drip system, this is yet

another opportunity to bring a local winegrower a few bottles of wine. Ask how many gallons of water they apply per week in an average growing season, and how they apply it. You may need to set up a subsoil PVC system to get the water to the site, you may need to invest in a pump to keep pressure adequate, and if you are on a hillside you will need pressure compensating drip emitters, around 0.5 to 1.0 gallon (2–4 L) per hour. Without pressure compensating “drippers,” the vines at the bottom of the hill will get lots of water, and the vines at the top will get none due to increased gravity and pressure at the bottom of the system.

## Trellising and Vine Spacing

At the risk of sounding like a broken record, you need to visit some local vineyards before deciding on a trellising system. If I learned anything at UC Davis, it's that viticulture is site specific. First, we need to understand how to decide on row and vine spacing, then we can come back and discuss trellising options a bit.

There's no denying it. Vineyard spacing is a hot topic in wine-farming circles. The debate (deciding how much distance to put between individual vines and between vineyard rows) has become a high-interest issue with home viticulturists from the Carolinas to Malibu. There was a time when anything tighter than twelve feet (4 m) between rows and six feet (2 m) between plants was considered a high density planting. Indeed, many of the greatest vineyards in Napa Valley are still planted on this kind of wide spacing. But in the last two decades, and the last ten years specifically, high density plantings (spacing as close as 3 feet X 3 feet (1 m X 1 m) have become widespread. Even though squeezing thousands of vines into a one-acre planting seems a perfect strategy for a backyard vineyardist, there is plenty of evidence that high density vineyards can be extremely problematic on most soil types.

Viticulturists often express vine spacing with two measurements, such as “twelve-by-six” or “eight-by-four.” The first number represents the space between rows and dictates what kind of equipment is appropriate for the vineyard. Twelve-foot (4 m) row spacing will allow almost any kind of tractor, full-

sized pickup truck, etc., to traverse the rows. Six to 8 foot (2–2.5 m) row spacing is generally the tightest that allows narrow tractors to work in the vineyard. One might be able to squeeze an ATV down 4 foot (1.2 m) rows, but take the rows to 3 feet (1 m) and get prepared to do all cultural practices by hand.

The second number expressed represents the distance between vine trunks. Together, these numbers will dictate vine density per acre. This will impact both yield per plant and yield per acre, and will also impact how the vines compete with each other for water and nutrients.

Now that you know how to express vine row spacing, the obvious question remains: how does an amateur viticulturist best match a potential home-vineyard site to a specific spacing arrangement? The answer is not necessarily complicated, but does require a good deal of thought, practice and planning. First let's look at how vine spacing affects vineyard issues and wine quality, and then we'll help you decide what spacing would be well-suited to your backyard vineyard.

If you remember anything from this article, remember this: Vineyards should be efficient to farm and vine spacing should be based on the anticipated vigor of the vineyard. The amount of work you will have to put into your vineyard is dictated by how well you match vine vigor to a trellising and spacing arrangement that harnesses that vigor into an appropriate “system.”

Let me give you an example. An acquaintance asked me to consult on a vineyard project gone wrong. This was the worst kind of consulting job — one where all the decisions had all been made — in an incorrect fashion. The vineyard owner had gone to Burgundy, France, saw beautiful Pinot Noir vines arranged in meter-by-meter fashion and decided that he wanted the same type of vineyard on a small one-acre slope at his home in the Santa Ynez Valley in California. Don't let aesthetics drive a planting project, and never base your vineyard design on the vigor and climate of a site 6,000 miles away.

The soil of the Santa Ynez site was highly vigorous, nutrient rich and deep. The vines sprawled out with canes eight feet (~2.5 m) and longer, and the more the owner tried to hedge the vines,

the more lateral shoots appeared and clogged up the fruiting zone. Those beautiful 3-foot (1 m) rows became an impenetrable jungle of shoots and foliage — you couldn't work the vines without a machete, and you might imagine how difficult it was to get sun exposure on the fruit, let alone find the clusters when harvest time arrived. This vineyardist assumed that high-density planting reduces vigor significantly. Competition does exist between vines, but not at a rate that will turn a high-vigor site into an appropriate location for a meter-by-meter system. Bottom line — high density planting is only appropriate on low to medium-low vigor sites where shoots rarely grow more than 4–6 feet (~1–2 m) per season. Sites that are appropriate for low-vigor trellising, such as a system that uses vertical shoot positioning wires to direct all growth up and out of the way of the fruiting zone, is usually appropriate for high density planting. Medium to high vigor vineyard sites are much more efficient to farm with at least 8 feet (2.5 m) between rows (to allow a few feet for shoots sprawling and draping), and six feet (2 m) in between plants, in order to give each vine ample space to spread its foliage and ripen a crop-load.

Next, let's consider the factors that determine vine row spacing.

**Cultivar:** Some grape varieties are more vigorous than others. Pinot Noir is generally less vigorous than Syrah or Grenache, so Pinot Noir is generally a better candidate for high density planting, and Rhône varieties are better suited on a wide-spacing arrangement, unless the site is extremely low vigor. Choosing the correct varietal to grow on your property is the most important decision you'll make in the planning process. Once you have a good idea of two or three options for grape varieties for your backyard — try to choose the vines best suited for the climate and soil in your backyard, and never choose a grape simply by what you like to drink. Start with this question: what varietal is the best wine grown and made within 100 miles (160 km) of your house?

**Rootstock:** Check with your grapevine nursery to see if they have rootstocks that can influence vigor to a level

that will allow you to tweak your vine spacing to a specification that pleases you. Don't expect miracles with rootstock either. They won't guarantee low vigor. They have a small, but measurable effect on vine growth. There are high, medium and low vigor rootstocks, and choosing the right combination can save you lots of hedging or fertilizing later on. Careful research and pestering vine-growing neighbors about their spacing and rootstock combinations will likely steer you in the right direction. Rootstock will also help protect your vines against soil-borne pests.

**Training-trellising system:** As previously noted, low-vigor sites that are appropriate for vertical shoot positioning systems are usually more adaptable for higher density grapevine plantings. Head trained vines require even spacing that allows them to spread their shoots and not be crowded by their vine neighbors. Simple backyard trellising made of posts and wire should always allow as much space between the rows as the height measurement of an average vine in full growth. If you use fancy quadrilateral or split-canopy trellising, the rows have to give the vines ample room to grow and spread shoots to either side of the canopy. It should also be noted here that the closer the in-row vine spacing becomes, the less "wood" or buds should be retained at pruning for producing crop the following year. The main concern for the development of any vineyard should be designing a system that keeps canopy density at an optimal balance so there's ample sun exposure on the fruit and in the area where buds determine the following year's crop as a function of sun accumulation.

**Fruit Shading:** Shaded fruit has more problems with disease, mildew and rot and also accumulates less sugar, has higher pH, higher malic acid, less color and phenolic compounds and shows an increased vegetal/herbaceous character. Keep this in mind as we progress in our study of vine spacing, the main concern in developing vineyard spacing is to keep the fruit zone open to sun and air, eliminating cluster-shading leaves, lateral shoots, and over-cropped clusters that are all jumbled together. Smaller vines with increased sun exposure on

clusters are often sought after by high-end winemakers, and the mythology of the high density European vineyards make this scenario even more attractive. Many winemakers admit that smaller vines with a light crop, in balance, produce high quality wine, and high density vineyard design, if used correctly, can increase vine competition and keep vine vigor slightly in check.

**Soil depth, water availability and fertility:** Deep, fertile soils with high macronutrient (NPK) levels will usually translate into high vigor vines that will require wider spacing. Low nitrogen levels in soil, soils that are rocky, shallow, have clay restrictive layers or are hillside oriented may have less vigor and may be more appropriate for tighter spacing. Remember that as planting density increases, the competition between vines will result in a measurable reduction of vigor. Competition between closely-planted vines is mainly for water. As such, supplemental irrigation is often required in high-density vineyards, especially near the end of the growing season. Remember that you can tweak the vigor of your site by judicious nitrogen applications to increase vigor, or by applying less water in the early season to decrease vigor.

**Equipment available:** If your tractor is six feet (1.8 m) wide, your rows should be at least 8–10 feet (2.4–3 m) wide. If you have an ATV with a little sprayer on the back, it should be able to fit comfortably down the row without running over errant shoots. If you have no equipment, your options are unlimited and you may want to pack some extra vines in to increase your land-use efficiency. First, determine your potential vigor by either planting a few vines near your house or in a garden, then determine your optimal spacing, then take into consideration what type of equipment you have or wish to purchase to make the farming easier.

Here are a few practical questions to ask yourself:

How vigorous are grapevines in your specific soil, climate and area? In a highly vigorous vineyard with more than 10–12 feet (3–4 m) of shoot growth per year, vines should be spaced a minimum of 6–8 feet (2–2.5 m), and have

rows as wide as the vines are tall. With 6–10 feet (2–3 m) of shoot growth a year, you should have 4–6 feet (1–2 m) between plants. Medium/low vigor sites, where vine shoots grow 4–6 (1–2 m) feet per year, may be appropriate for high density planting. Spacing between plants can easily be reduced to 3–4 feet (~1 m), and row spacing is more easily based on equipment needs and height of vines in the peak of the growing season. Remember: high density vineyards are generally trained lower, so they can still have a 1:1 ratio of vine height to row spacing for shading considerations.

How much time do you want to spend each week taking care of the vines? The more vines you have to prune, position, trellis, spray and tend, the more time-consuming your viticulture hobby will become.

Carefully choose your vine-density to match vigor — but don't lose sight of the responsibility that accompanies more vines per acre.

There is an interesting relationship between row and vine spacing. As row spacing decreases, so does yield per vine. As you might expect though, smaller row spacing increases tons per acre, so even though each vine is producing slightly less due to competition the yield is actually increased due to the fact that there's more vines. In the correct climate and soil, high density planting can have a positive influence on vine balance, crop level and wine quality. Home viticulturists should be warned, though. Trying to imitate high-density plantings in your backyard may lead to more problems and poor wine quality. Choose a vine-spacing and trellising design that is suited for your own soil, vigor, varietal, rootstock, trellising and equipment and you will find that your planning will reduce future labor, provide higher quality fruit, and provide endless pleasure in the bottle and in the glass.

## Planting Vines

After your trellising and irrigation are set up, you should be ready to plant some grapevines. Planting usually occurs in late spring after the threat of frost has passed. I suggest using dormant grapevines. My rates of success with dormant vines have proven significantly



Photo courtesy of Finger Lakes Association

You only have one chance to research local growing conditions and plan your vineyard. Once the posts are set and the vines are planted, your vine and row spacing are set.

higher than using green-growing vines. If you receive your dormant vines from refrigerated storage, let them acclimate outside in the shade for about a week. Keep the vines moist and in the packing material until the morning of planting. At that time, fill a 5-gallon (19-L) bucket halfway with water, put the vines in root first, and carry the vines 20–40 at a time into the vineyard.

Dig a hole 18 to 20 inches (46–51 cm). Do not compact the soil on the sides of the hole. I know a few viticulturists that sprinkle broken shards of wine bottles in the hole before dropping the plant in, to keep gophers and burrowing pests from eating the roots. Some viticulturists also dip the roots in a solution of mycorrhizae fungus, which will increase the plant's ability to uptake water and nutrients. Trim the root tips of the dormant vine and drop it in the hole, roots first. Make sure the graft union, which is the calloused bump where the rootstock meets the "scion" wood, is 4 to 6 inches (10–15 cm) above the final soil level. After the soil has been compacted and replaced, you need to dig up some extra, fluffy soil to mound over the exposed part of the vine. Pile the soft soil 1–2" (2.5–5 cm) over the part of the dormant vine sticking out of the ground. When you see substantial growth peeking out of the soil mound, gently remove the mound and allow the vine to grow as usual. Remove all the

shoots but the strongest, and gently tie the growing shoot to the training stake with ½" (1.3 cm) green vinyl tie tape. Go through the vineyard every week or two and add green vinyl ties every 4–6" (10–15 cm) of new growth.

## Your New Vineyard

If all went as planned, you should now have a thriving vineyard in your backyard. The shoots are climbing, the green leaves are visible, and in a few years, you will start producing fruit.

Realize that this article is merely an overview of the issues of establishing and maintaining a vineyard. The more you research each element I've outlined here, the more successful your vineyard will be. Don't forget to visit local vineyards and home growers, check the internet, join a few email groups or local clubs and do everything possible to gather information and professional support before ordering your vines. Every hour of preparation that goes into vineyard establishment will save hundreds of hours of hard labor in future seasons. Viticulture has been practiced for thousands of years. Your efforts and study will help preserve the tradition of growing grapes and making fine wine. When you have learned what it takes to grow good fruit in your neighborhood, make sure to share your expertise with other aspiring, local viticulturists. Share your wine and share your enthusiasm. **WM**

# CHOOSING A TRELLIS SYSTEM FOR YOUR VINEYARD



“pre-fertilized” seeds find a moist spot to germinate, often in the shade of a tree or bush, and the vine begins to grow — very slowly for the first few years, then more rapidly after the root system has developed and some leaves on the vine reach direct sunlight.

As the vine comes out of dormancy each spring, it produces growing tips flanked by wiry tendrils that search for structures to wrap around and support the lengthening shoots. Tendrils may find the short boughs of a bush or tree trunk to support the vine. These tendrils will become woody and tough as the vine finishes its yearly growth, keeping the vine permanently affixed to the tree or bush it climbs. A vine may snake along the ground for many years searching out a structure to climb. Without the support it needs to climb vertically, it may perish from predation or never produce fruit.

The vine will continue to climb, in a purely vegetative growing cycle, until there are dormant canes in a position where sunlight activates the dormant buds to become fruitful the next year. This fact will become important later when understanding how fruitfulness in the home vineyard is encouraged. Once the vine is mature and is able to grow into a position where it is parasitizing the host tree’s sunlight, it will “switch on” those sun canes into fruit production. The sun provides energy to convert sunlight into sugar and to make the grapes tasty enough to encourage the birds to consume them.

The use of artificial trellising to produce winegrapes outside of a forest setting (viticulture) began in areas close to the Caucasus Mountains starting in the Neolithic period from about 8000-4500

BC. Unlike these first vineyard mavericks, we have a wide array of materials, designs and hardware to choose from — not to mention thousands of years of science, study and anecdote to draw upon to make wise decisions when designing a trellising system.

Choosing a trellis system for your vineyard is one of the most important planning decisions you will make, second only to picking a varietal and root-stock selection.

## Trellising Options

Trellis selection and spacing decisions should be based upon the anticipated vigor of the new vineyard. Vigor can be estimated by examining crops on the same piece of ground or planting a vine or two and seeing how much cane growth you get for a year or two before making trellising decisions.

You can also submit your soil samples to a lab and request a report that will estimate vine vigor.

## Styles of Trellising

Trellising systems can be divided into four types:

1. Head-Pruned Vines (each vine trained to a stake)
2. Vertical Systems with Shoot Positioning (orients shoot growth up into wires to form a curtain of foliage and a fruit zone that is leaf-pulled for maximum sun and wind exposure)
3. “California Sprawl” Systems (without shoot positioning — vines are supported by trellis; all growth spreads out and down with no manipulation)
4. Horizontally Divided Systems (with shoot positioning — including Geneva Double Curtain or Lyre systems)

To understand these systems, it’s critical to understand shoot positioning and why it’s important.

Shoot positioning means tucking the growing shoots into sets of shoot positioning wires above the fruiting zone to make the vine rows appear as vertical curtains of foliage that act as vegetative solar panels for grape sugar production. This keeps the shoots from drooping

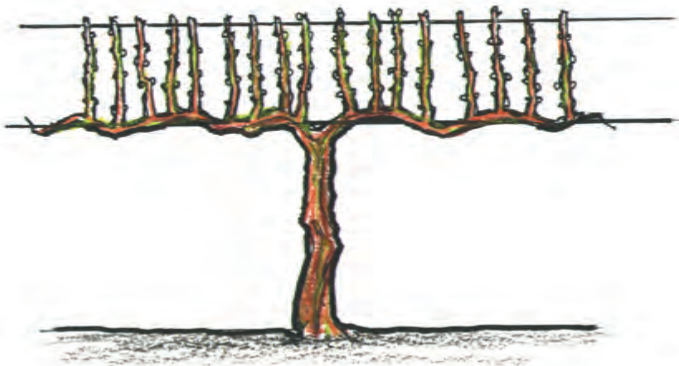
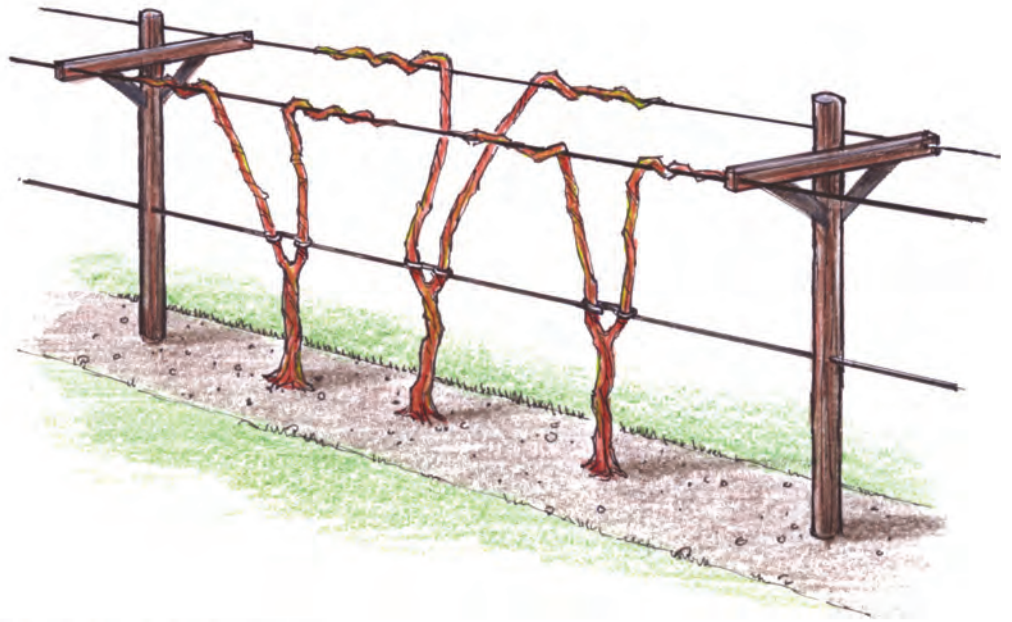
In the wild, *Vitis vinifera sylvestris* (the forest vine that makes wine) cannot support itself as it grows. By understanding the needs of a wild vine, it will quickly become apparent why we need to trellis cultivated grape vines. We’ll also understand how the shape of the trellis will impact vine yield, sun exposure, and ultimately, wine quality.

A wild vine cannot support its own weight, especially when young, and relies on existing structures — namely trees — to climb up. Mature fruit is consumed by birds, who then fly away and drop intact seeds to the ground as waste. A small percentage of these

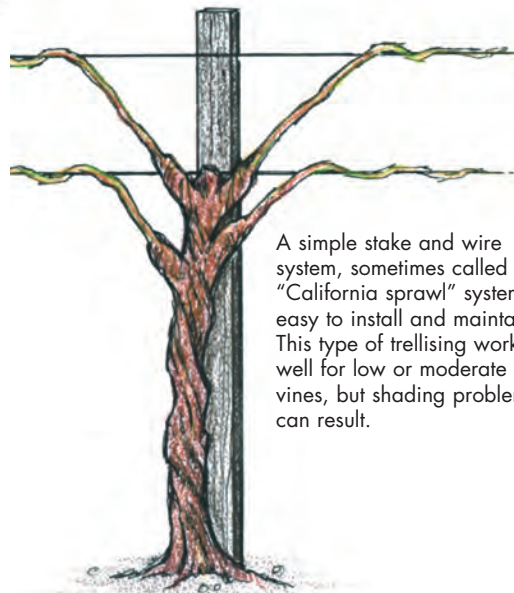
The simplest way of training a vine is head training. This is not really a trellis, but rather a simple way of supporting the vine. Installing the stakes is easy, but head trained vines suffer problems from shading, rot and mildew as the canes end up sprawled out on the ground late in the growing season.



A horizontally divided system, like the Geneva Double Curtain system shown here, establishes two canopies from each vine. These work well for high-vigor vines, but are more difficult to install and maintain than other trellis systems.



Vertical systems, like the simple vertical cordon shown here, orient the vine upwards. A vertical shoot position (VSP) trellis system tucks the shoots into a set of wires, keeping the canopy trained into a "curtain" that is accessible to spraying and picking. Properly spaced VSP trellising allows for good sun exposure and airflow.



A simple stake and wire system, sometimes called a "California sprawl" system, is easy to install and maintain. This type of trellising works well for low or moderate vigor vines, but shading problems can result.

back over the fruiting zone and helps the fruit get better sun and wind penetration. Remember that canes need sunlight, so the idea here is to maximize sun exposure on the shoots and canes.

### Head-Trained Vines

Head training vines is the simplest method of vineyard establishment. Head training is not really a trellising method, and most viticulturists have abandoned the system because of problems with shading, rot, mildew and the difficulties inherent in trying to manipulate a vineyard canopy that is not guided by fruiting wires.

To head train a vine, place a training stake next to a newly planted vine and develop a short trunk system, and encourage growth from a low “head” with two-bud spurs retained at pruning. The vine is pruned like a rosebush, with the buds retained forming a goblet shape, with buds facing outward if possible. Canes will grow up and then down, and will likely end up sprawled on the ground and shading the fruit from the outside.

at least 3–4’ (0.91–1.2 m) of support, fruiting wires are traditionally about 3–4’ (0.91–1.2 m) off the ground, and no further hardware is required.

### Vertical Shoot Positioning

A vertical shoot positioning (VSP) trellis is the gold standard for modern vineyards, and an excellent choice for those who want their vineyard to have that manicured, landscaped look. Depending on the spacing, VSP trellising can be appropriate for all levels of vigor, although moderate to high vigor sites will need to be hedged during the summer — about 6” (15 cm) above the last shoot positioning wires — to keep the canes from drooping back down into the fruit zone.

VSP is appropriate for both cordon trained (permanent arms along the trellis where spurs are retained for fruit production) or cane-pruned systems (where a single cane is retained on each side of the vine and wrapped around a wire and affixed with a twist-tie for fruit production. The hardware necessary is a little more complex, as you will need a

of the fruiting zone. Because all growth is directed up into the shoot positioning wires, the viticulturist can easily remove leaves and lateral shoots from the fruiting zone, opening it up to sunlight, wind and to allow for better spray penetration. Make sure you allow for enough space between the rows to give a 1:1 ratio of vine height to between-row spacing.

### Horizontally Divided Systems

These systems are generally difficult to install and quite difficult to train the vines into, and are generally recommended for high vigor sites and installers and workers that are trained in its use.

At a high vigor site, each vine is separated into two separate canopies to retain a higher number of viable buds at pruning, and to spread the vigor of the vine out to all of the retained buds. This system also maximizes crop yield and allows sunlight to penetrate between the divided canopies, where a single canopy would become overgrown and dense at the same level of vigor. Think of these

Whether simple or complex, a trellis system guides your vines so they can soak up the sun, plus be accessible during the growing season and harvest.

### Simple Stake and Wire

A viable choice for low and moderate vigor sites is a simple one, two or three wire system, with or without crossarms. The vines are trained up the stakes, shoots or cordon arms are retained at pruning, and the only support the system provides is for the fruiting canes or cordon arms (on a wire).

Besides the stakes for support and a simple wire for a cordon or fruiting canes, there is nothing else involved. The shoots grow up, out and droop down, shading the fruit zone and making it difficult to get air, sun and spray exposure on the fruit. Stakes should provide

wire at 20” (51 cm) or so for irrigation, 30–36” (76–91 cm) for fruiting, and then I suggest a single wire 12” (30 cm) above the fruiting wire (to assist in weaving the growing canes into the catch wires), and then two sets of double wires, spaced 4” (10 cm) or so apart and separated by a vertical 12” (30 cm) where the growing canes are tucked into during the growing season. The pairs of shoot positioning wires can be attached to a wooden crossarm, a 4–6” (10–15 cm) pinch clip, or they can be simply nailed onto the endposts and attached to wide pre-fab vine stakes that have notches built in.

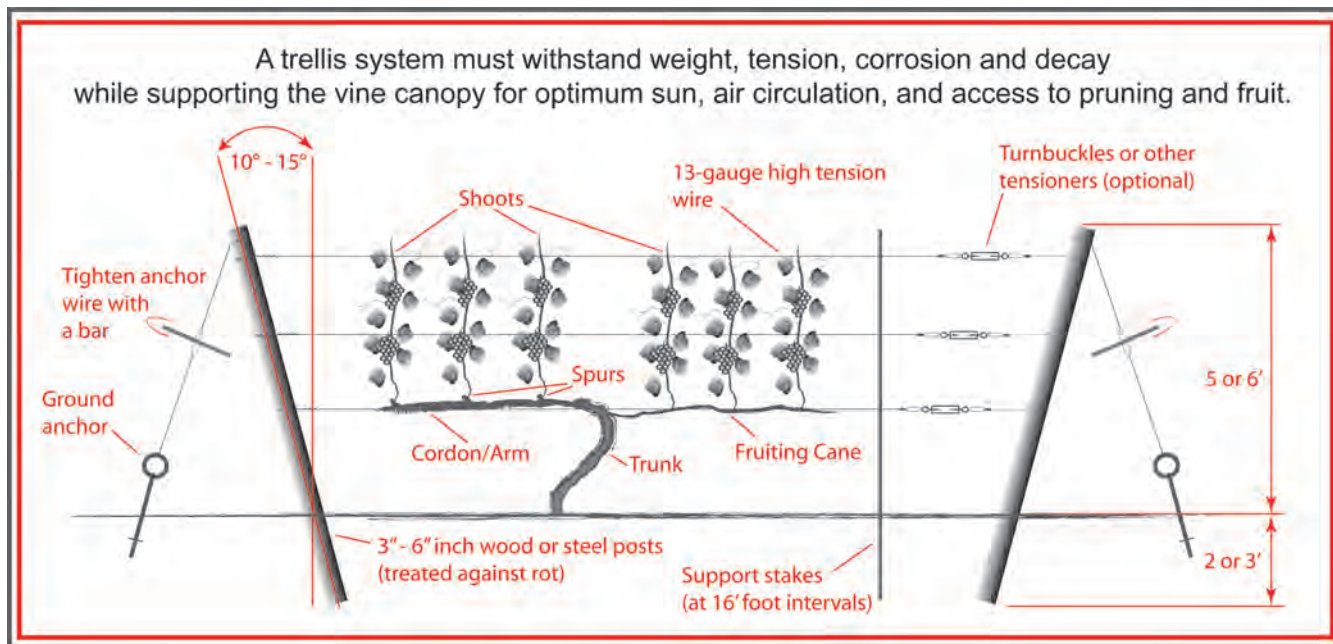
A well-maintained VSP trellising system allows for unlimited manipulation

systems as a single trunk producing two divided canopies, which are traditionally spaced 3–4’ (0.91–1.2 m) apart to allow for sun penetration between them.

Two of the more traditional divided systems include the Geneva Double Curtain (GDC) or the Lyre (sometimes called U-System).

The GDC system requires a stout 48” (1.2 m) stake, with fruiting wires separated 48” (1.2 m) by a crossarm attached to the stake. Four separate healthy shoots are trained to each of the two separated fruiting wires. One shoot trained both directions along each of the wires, which become the permanent cordon arms where spurs are retained





at pruning. Pruning is accomplished by retaining only spurs with bud positions facing out into the vine row.

### Tips for Choosing A Trellis

By soil samples or by growing a sample vine, determine anticipated vine vigor.

#### Low Vigor Sites

Low vigor sites can be planted at a relatively tight spacing as the vines will not compete for sunlight, water or nutrients. Rows can be spaced 6–8' (1.8–2.4 m) and vines spaced 4–6' (1.2–1.8 m).

VSP, head-trained or sprawl systems would all be appropriate, although VSP is my general recommendation at low-vigor for the ability to manipulate and improve the fruit-zone area of the canopy.

#### Moderate Vigor Sites

Moderate vigor sites offer many choices

for trellising and spacing. Using a low-vigor rootstock may allow for tighter spacing (low-vigor style) and a VSP system. Sprawl or even a divided canopy system may work fine, although the divided systems require more hardware and expert installation and pruning.

Vine spacing can move to the 6–8' (1.8–2.4 m) range, and match the row spacing to the height of your anticipated canopy height (8–12'/2.4–3.7m).

#### High Vigor Sites

High vigor sites can still take a VSP system, but it will require a lot of summer hedging, lateral-shoot removal in the fruiting zone, and a vigor-reducing rootstock and careful irrigation choices (drier soil at the beginning of the growing year will help moderate vigor).

The GDC and Lyre systems are really designed to match high vigor sites, and are generally recommended for

those that are willing to do the research and find expert help. Remember that tight vine spacing is NOT recommended for high vigor sites, as vine competition is rarely strong enough to keep high vigor sites in check and will result in an overly-crowded fruiting zone.

#### Installation

In areas where vineyards are common, you can hire professionals to install your trellis system. If you have a small enough vineyard and like to do things for yourself, you can also build your own trellis. (See the article, "Build Your Own Trellis," in the April/May 2006 issue of *WineMaker*.) This requires, however, some specialized tools, especially for tensioning the wires.

If you choose the right trellis system, one that matches the vigor of your vineyard site, you can get your grapes to harness the power of the sun. *WM*



# FIRST YEAR VINEYARD CARE

Photo by Wes Hagen



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Planting a vineyard takes time, effort and planning. But your work is not over once the vines are in the ground. In order to have usable grapes by your third year, you'll need to carefully manage the growth of your vines.

## First Year Goals

The first year of vine growth is meant to establish a strong and vigorous root system and build stores of nutrients to hasten growth in subsequent years. The first year of vine growth is not meant to pro-

duce fruit for winemaking. During the first year, all clusters should be removed immediately from the vine to keep the vine from using nutrients to ripen grapes. Also, the first year is not meant to push the vine into making fruit or fruiting wood in the second year, when it might not yet be ready to produce clusters. Some vines may be ready to produce fruit in the second year; others may not. The key here is patience and knowing when a vine has established itself to the point at which it is ready to make fruit for wine. In general, a vine is allowed to establish itself and grow vegetatively — producing no fruit — for the first two years in the ground. After the second full year of growth, the vine is commonly pruned by leaving a few canes on the trellis wires. These canes grow fruit in the third year.

## Strong Roots

Our first goal is establishing a vigorous root system. In order to do that, the grape grower needs to water the vines,

control weeds and control pests. Our second goal is to build stores of nutrients. To do that, the grape grower needs to apply the right type and amount of fertilizers to the vineyard.

## Watering the Vines

As soil types and weather are different from location to location, prescribing a watering plan for all growers is difficult. The key here is providing moisture to the vines' root system without making the soil overly muddy.

Allow the roots to dry out between water applications. This will promote root growth as the vines sink their root systems deeper into the soil layers in an attempt to find water. Vines that are "trained" to learn that their water only comes from one place (a drip emitter or a hose) will develop a root ball near the surface of the soil and will not develop a deep and wide root system. Deep, infrequent applications of water are, in my estimation, best for the vine. The vines "learn" that growing deeper in the soil profile helps them find water when the top of the soil is drying out.

Here's a pro tip for assessing a vine's water status: If the tendril of a vine shoot — there are usually two growing out from near the tip of the shoot — extends further than the shoot's growing tip, the vine has all the water it needs. When the tendrils shrink back behind the growing tip, the vine is experiencing some form of water-deficit stress. Cut back the water in August or early September to help the vine go dormant (and help the shoot become a mature, wooden "cane") before the first fall frost.

## Weed Control

Weed control is absolutely vital in the vines' early years. Once the vineyard is well established, and the vines have deep root systems, weed control will not be as critical. But, while the vines are young and their root systems shallow, they will be in direct competition with weeds for sunlight, water and nutrients. As a farmer with a strong bent toward sustainable, organic practices, I do not recommend using contact or residual herbicides in a vineyard.

It is certainly easier to lay a strip of Round-up through your vineyard instead of hoeing it. Your vines will be safer and healthier, however, if you

take the time to be a farmer instead of a chemical applicator.

Run a mower through the center of your rows, making a nice mulch that will feed the soil, and pay a neighbor kid to hoe the rows around the vines. Also learn that planting a cover crop rich in vetches, clover, legumes or other nitrogen-fixing plants can choke out competing weeds and add vital nutrients to your soil.

Learn which plants in your area are beneficial and which are noxious. Hoe the bad and leave the good, but make sure to clean out a strip of soil around and under the vine so it doesn't have to compete for sunlight, water, or nutrients where it is planted and establishing itself.

Giving the vine freedom from weeds will help the roots grow faster, and as a consequence will give the root hairs more contact with the soil and the nutrients it contains.

## Controlling Pests

Controlling pests, especially ones that snack on roots, is vital for the health of young vines. Fighting gophers is an ongoing battle in many viticultural regions, and — like Bill Murray in the movie “Caddyshack” — you may well have to join the fight to assure your vineyard survives.

A vineyard is like a neatly ordered smorgasbord for a gopher. They can follow the vine row over a few weeks or months and snack on each vine in turn. All they need to do is chew around the root collar and it's “game over” for that vine. If you see a dead vine in your vineyard, tug on it a bit. If it comes up easily with a diagonal, slightly-chewed end with no roots on it, you've likely been hit by gophers.

Gophers can be trapped quite easily. Or you can build a few owl-boxes in trees around your property. You will be amazed how many rodents these birds take per night. Poisoning is another option, but you need to be careful of secondary kill of household pets or other beneficial animals.

Deer, rabbits and ground squirrels can also nibble young growth in a vineyard. Fences, bait traps, dogs or a hunting permit may help with these problems. It is common to use a cut-off half-gallon paper milk carton around each young vine to keep rabbits and

squirrels from nibbling young shoots. Grow tubes also discourage nibbling.

## Fertilizer Application

The application of fertilizers is usually necessary in a vine's first year to help build stores of nutrients, especially nitrogen, in the developing trunk and root system. You have two ways to do this: applying petroleum-based fertilizers or using organic fertilizers. Both will work well to help establish the vine. Using a half-cup of calcium nitrate (15-0-0) per vine a few times during the vine's first year will definitely make the vine grow faster and remain nice and green. There are also small fertilizer packs that you can toss in the hole under the roots when planting. They are made to last about a year and slowly release nutrients to the vine. Using these petroleum-based fertilizers will have no short-term negative impact on the vines; in fact, they will grow to be very green, vigorous and healthy.

However, I call calcium nitrate “root crack” because I believe a vine can become dependent on non-organic fertilizers, like addictive drugs, and will be less likely to be happy throughout their lives without frequent applications.

Organic sources of nitrogen such as chicken manure, cow manure, fish emulsion, kelp extract, bat guano and others build the soil and increase biological activity in the soil while they provide nutrients. The nutrients that organic fertilizers provide might be more expensive per application, but the benefits they provide the soil and the holistic health of the vineyard as a living system are invaluable. Providing a healthy habitat for your vines to live in will help them grow quickly, stave off disease and provide healthy fruit for making wine in years to come.

## Training the Vines

We can now return to your young vineyard, where the soil mounds are removed and two to four little green shoots are emerging from each vine. When the tallest shoot is about 6–10 inches long, it's time to start training that shoot up the training stake. If you planted each vine close to the training stake, it will not be a difficult task to start training the vine to the stake. Always use the most vertically oriented,

vigorous shoot for training. It is also vitally important to leave the other shoots growing on the vine until the most vigorous shoot has been successfully tied to the stake with 1/2” green vinyl tie-tape. This is important because you will break a few shoots during this process, and you always want a back-up shoot in case this happens.

After the most vigorous shoot has been loosely tied to the stake with tie-tape without breakage, then you can go ahead and rub off all other growing shoots and swelling buds on the vine with your thumb. Lash 1/2” tie-tape every four to six inches (10–15 cm) of growing shoot, and make a pass through the vineyard every week or so and add tie tape as necessary. Tie the tape loosely enough to stick your finger in between the shoot and the tape so it doesn't strangle the poor little vine.

The straighter you tie the growing shoot to the stake, the more uniform and upright the trunks of your mature vines will be. If the growing shoot reaches the fruiting wire at the top of the training stake, snip off the top off the vine to promote growth out of lateral buds on the sides of the shoot. This will help the vine start to make a “head” that will produce your fruiting wood from year to year.

If the vine fails to reach the fruiting wire — or the top of the training stake, or at least 36” of growth — in its first year, I recommend cutting the vine back all the way so it looks like it did when it was first planted (one two-bud spur). Do this to all stunted vines, and to any vines that need more vigor.

Cutting all the wood off a stunted vine allows the vine to grow easier the next year. You will likely get more vigor and health from the vine if you cut it back and give it time. If your vineyard shows low vigor, it is recommended that you cut the entire vineyard back to two-bud spurs and train the future trunks in the second year of vine growth. Watch your young vines (especially the leaves) for signs of powdery mildew. Make sure to apply sulfur, wettable or powder, to keep the vines and vineyard clean of mildew. If mildew becomes established in the first year, it will be more difficult to manage in subsequent vintages. Your hard work in the first year will pay off at your first harvest. **WMM**

# ANNUAL GROWING CALENDAR



Photo by Wes Hagen



In college I had a good friend from New Jersey who was convinced that Californians lacked depth of character because we didn't have to live through harsh winters. Even though I disagree that you have to shovel snow or ice fish to reach your potential as a human

being, I do agree that awareness of the passing seasons coordinates our lives in mysterious ways. There is a right time of the year for everything, including certain vineyard practices.

There is a rhythm to the way the winegrowing season advances and I would like to provide aspiring new vineyardists with a simple viticultural metronome that they can adjust to their own vineyard and climate.

Farming winegrapes is a challenge, and developing a plan for the upcoming year will help your backyard vineyard live up to its potential. We will also define backyard grape growing strategies and offer suggestions concerning the seasonal timing of pruning, watering, fertilization, disease control, pest con-

trol, canopy management, weed abatement and harvest.

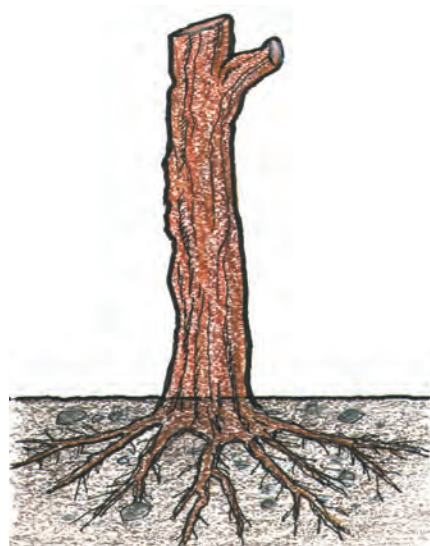
## POST-HARVEST

(October through February)

One common misconception of backyard vineyard ownership is that your work stops once the fruit has been harvested. The tendency is to spend every spare minute with the wine in fermenters, carboys and barrels. Spending a little time in the vineyard after harvest will guarantee that the vines are in tip-top shape before their long winter's nap.

Put the vines to bed in a state of cleanliness. Go back through the vineyard after harvest and remove all the small clusters (second crop) that might have been left behind. Also remove all fruit stems (rachis) that were picked clean by birds and other pests. Powdery mildew and other sporulating diseases need a place to go dormant in the vineyard and errant fruit clusters are some of their favorite haunts. Leaving nothing but hardened canes in the vineyard stops disease cycles.

Grapevines have two major bursts of root growth during the growing season. The first (and most important)



Illustrations by Don Martin

The dormant vine should be clipped and all second crop clusters and stems must be removed.

is between May and August, but there is also a significant period of root growth after harvest. This is why it's vital that you give your vines a deep drink of water — up to 10–15 gallons (38–57 L)/vine — after the fruit comes off.

If significant rainfall occurs at har-

vest time (enough water to soak deep into the soil profile) this practice may prove unnecessary.

After the fruit is removed from the vines, the vine starts to store its leftover nutrients in the trunk and root system to keep the vine alive during the cold and harsh conditions of winter. If your vines show very low vigor, you can toss a few tablespoons of a 15-0-0 fertilizer under each vine to give it some nitrogen to chew on over the winter.

Do not fertilize if your vines have adequate vigor during the growing season, as excess nitrogen can impede the vine's ability to go into dormancy.

If you are in a climate where grasses can grow through the winter, consider growing a cover crop between your rows.

For low-vigor sites, plant legumes, clovers and some rye grass for erosion control and to add nutrients when the crop is turned over into the soil in spring. For high vigor sites, planting some fescue grass can soak up some of the excess water and nutrients. Providing competition for high vigor vines can check excess (rank) growth. Allow the fescue grasses to continue growth during the spring, as they will continue competing for water and nutrients as the (high vigor) vines start growing again.

Prune the vines in the dead of winter. Most vineyards are pruned in January and February, although some vineyards can be pruned earlier or a bit



Early spring is an exciting time of year in the vineyard as buds break and bloom.

that when you prune, you always want to leave a selected number of canes (cane-pruned) or spurs (spur or cordon-trained) from the previous season's growth. I suggest retaining between 12 (for low vigor) to 30 (for high vigor) buds per vine during pruning. The rest of the growth is pruned off and, if possible, shredded or burned and put back into the vineyard soil. Canes left whole on the ground can also aid mildew and rot, perpetuating their yearly cycle.

### BUDBREAK through BLOOM (March through June)

As the vines begin to wake and burst forth with new green growth, it becomes obvious that we need to get back into the vineyard and begin our early spring labor. Grapevines are meant to grow in areas that have their soil profile fully recharged with rainfall each year. Most soils will be considered "recharged" with 15–20 inches (38–51 cm) of winter rain-

week should be all the water the vines will need.

Remember to watch for frost! Sustained temperatures under 32 °F (0 °C) will fry your shoot tips and young fruit clusters. Overhead sprinklers, or simply spending some time with a hose spraying down the vines by hand for an hour or so, should coat the delicate tissues with water, which will freeze overnight and insulate the tender tissues like an Eskimo in an igloo.

You should then fertilize in March and again in late May. If your vines need an extra boost of vigor, give them some nitrogen fertilizer or a fertilizer with a bit of potassium and phosphorous. You may want to give them a small amount of zinc before bloom, as it can improve



A well thought out spraying regimen is key to a prosperous grape growing season.

fruit set if applied judiciously. Vines that grow in balance without added nutrients do not need to be fertilized.

## One common misconception of backyard vineyard ownership is that your work stops once the fruit has been harvested. The tendency is to spend every spare minute with the wine in fermenters, carboys and barrels.

later. Note in your journal when your vines drop their last leaves (in the winter) and when the vines experience bud swell and budbreak (in the spring).

Pruning focuses the vines' energy to produce fruit from specific areas of the vine and keeps the vine from taking over more trellis space than is intended. Fruitfulness is highest on wood that grew the previous year. This means

fall. Applying 10–15 gallons (38–57 L) per plant is appropriate at or just before budbreak to leach salts from the soil and to give the vines the moisture they need to start the new year's growth. Continue to irrigate in dry conditions. Plan on giving the vines 4–6 gallons (15–23 L) of supplemental water in any given week when rainfall is less than a half inch. Rainfall of an inch or more in any given

Always remember to spray! You should be applying sulfur to your vines every 7–14 days depending on mildew pressure, starting when the shoots are a few inches long. Do not apply sprays during flowering, as it can impede the process of pollination. Mildew loves moist weather and temperatures between 65–75 °F (18–24 °C). You should reapply after measurable rainfall, as the sul-

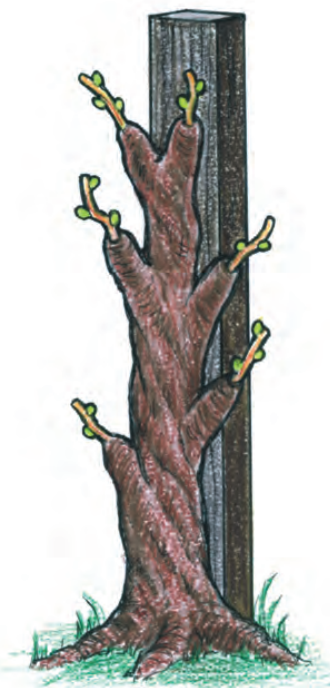
fur will wash off and the rain can spread the bursting spores of mildew. Make sure to stop spraying sulfur after the fruit softens, as it can stay on the clusters and cause hydrogen sulfide stink in your wine.

Remember that mildew cannot grow on fruit once it hits about 16–18 °Brix. For most home vineyards, a backpack-style sprayer will work fine, while larger vineyards may require a gasoline-powered sprayer that is towed behind an ATV. The key is to run a tank cleaner through your sprayer regularly and to clean the screens and nozzles after each application.

Hoe out the weeds from under your vines. Keep the vine row clean



Well managed vineyards should yield clusters of healthy grapes for the bottle and glass!



There are a number of trellis options: Explore which will work best for you.

from weeds and grasses. Also, remove noxious weeds from between the rows while they are small and before they go to seed. Careful hoeing will allow you to decide what grows in your vineyard. You also want to “sucker” your vines, which means removing all growing shoots below the head of the vine (and out of the trunk or the dirt). The earlier you “sucker,” the easier it will be. This helps direct the vine’s nutrients to correctly positioned and fruitful shoots.

Begin managing the canopy of your

grapevines. The key to a balanced canopy that produces top-notch wine is to have an uncrowded fruit zone with enough sun and wind penetration to keep the fruit from being attacked by mildew or rot. It should also provide enough shade that the fruit does not burn. Go through the vines every week or two and remove shoots that are not supporting fruit. Each fruitful shoot should have its own space and should not be crowded by adjacent shoots.

In general, clusters should not be touching each other. You may also notice that lateral shoots may spring from main shoots. These “laterals” cause crowding and can be removed as well.

If you are using shoot-positioning wires, you can start tucking the growing shoots between the wires to direct the growth upward.

Directing the growth vertically will help position the fruit above the cordons and canes so that you can remove leaves and have all the fruit at the same height. This is important for sun exposure and uniformity of ripening.

## BERRY-SOFTENING

(Early ripening through harvest)

Think of this period of vine growth and fruit maturity as the fourth quarter of a big game. You’ve trained, practiced, put in the work and now you need to finish strong to win. Do whatever is necessary to keep the fruit clean and the critters at bay. Don’t allow your vines to shut

down too quickly.

Mature, evolved fruit is more flavorful and balanced than grapes that dehydrate to get sweet. As the vines continue to grow, you may need to go through them each week to remove new lateral shoots, pluck a few more leaves to keep the canopy open and healthy. You may need to hedge the top of the vines if they are flopping down and shading the fruit. If the vines still have actively growing shoot tips after the fruit has softened, cut back watering to slow down vegetative growth and promote ripening. If you need a little more ripeness at the end of the season, you can turn the water off to give the fruit a bump of sugar — however, as previously stated, it’s better to have healthy leaves making sugar than to have the fruit ripen as the result of dehydration.

Keep the critters away! Ants, bees, wasps, yellow jackets and other insects can exploit weak spots in the grape skins and make a mess of your clusters. Compromised grape skins can start a rot problem, so you need to be vigilant early in the season in controlling insect populations. Once the insects are eating the fruit it’s too late for any control strategy. Search out and destroy wasp and yellow jacket hives near the vineyard before the fruit is sweet. You should also put out baits for ants to keep populations down before the heat of summer.

Bird netting is a good way to keep your fruit from “flying away.” Erect a

fence or rescue a few greyhounds to keep the deer and other mammal pests off your fruit.

Be aware of the weather, but don't freak out. Be wise when deciding when to pick your fruit. Remember that delicious fruit makes delicious wine, so use your own sense of taste (along with Brix and pH testing) to decide on a picking date. A pH meter won't be drinking your wine, so learn to trust your own palate. If a huge storm is coming and your fruit is tasting really good, you may want to pick before the big rains hit. A little rain won't destroy your crop but it may lower the sugar content and push harvest back a week or so. You need to weigh your decision to pick carefully and try to be as patient as possible. A wise vineyardist feels the right day to pick. Trust your instincts and your palate and keep a grape-growing journal!

It is not unusual for vineyardists to make the same mistakes every year as a result of forgetting the challenges they faced the previous vintage. If you jot down a few notes each season, you have a better chance of tweaking your practices and improving your wine quality with each year.

Invite an expert over for dinner and good wine. Having another vineyard owner walk through your backyard vines

may result in some fresh suggestions and improvements.

Taking the time and effort to grow your own wine grapes requires perseverance and character. There is something extraordinary about creating wine from water, elbow-grease and a piece of earth. In a world that seems so rushed and prepackaged, there is a slow, honest authenticity about continuing the tradition of home winegrowing. It reminds me of that old aphorism, "tickle the earth with a hoe, and she laughs with a harvest."

#### SUMMARY

As the articles in this section indicate, establishing a vineyard can be a costly and time-consuming endeavor. For the committed home winemaker, however, the extra effort may bring a whole new level of enjoyment to the hobby. Any effort you make to research your options and learn what has worked locally before you start installing your vineyard will pay large dividends in the long run.

In the next section of this special issue, we'll discuss choosing a rootstock for your vines, how to plant dormant grapevines and how to manage the early part of your growing season, especially around budbreak. *WWM*



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All photos by Wes Hagen & Illustrations by Don Martin



# SPRING IN THE VINEYARD



# CHOOSING A ROOTSTOCK



# T

There was a time when grapevine vineyards were planted with only 18" (46-cm) cuttings from existing grapevines. A few buds went under the ground and few buds were left above the ground. Vines would root on their own and a vineyard was basically free to plant if you knew someone you could secure some cuttings from. Since the discussion of choosing a rootstock can quickly become bogged down in very specific (and often boring) discussions of soil types, vigor and site specificity, let's at least jazz up the subject slightly with a

fun historic journey back to the prehistory and the early scientific study of the grapevine.

Two hundred million years ago there was only one continent and grapevines as we know them didn't exist yet. While a single land mass dominated the face of the earth, the grapevine was evolving and changing slowly. When the continents separated (by 150 million years ago they were already taking the distinct shapes we recognize today), the grapevines began to adapt to the rapidly changing environments where they found themselves. To make a geologically long story short: grapevines generally evolved into three classifications: American vine varieties, Asian varieties and the European/Middle Eastern/North African family of vines that most of us use today for our wine production.

Charles Darwin spent many years studying the grapevine in his laboratory in Kent, England, and wrote that the vine was one of the most perfect examples of evolution in all of nature. In "The Movement and Habits of Climbing Plants" (1865), Darwin writes, "It is, also, an interesting fact that intermediate states between organs fitted for widely different functions, may be observed on the same individual plant of . . . the common vine; and these cases illustrate in a striking manner the principle of the gradual evolution of species." More specifically, a grapevine can produce a cluster or a tendril from the same node — which means a vine can assess its environment at any time during the early growing season and produce either fruit for reproduction, or a tendril to help the vine climb to a higher, sunnier spot where reproduction would likely be more successful.

Grapevines get love in religious circles, too. The Bible says that when God flooded the earth, the one dude he chose to save was a viticulturist. When Noah waded off the ark, the first thing he did was to plant a vineyard. (I won't ask the obvious questions, such as why he

rescued and released a pair of gophers, the European starling, the glassy-winged sharpshooter and other vineyard pests.)

Starting in the late Paleolithic and throughout the Neolithic period, mankind began to dabble in collecting wild grapes and making wine. This process became more agricultural by the 4th Millennium BCE, when it's clear that Europeans living between the Black and Caspian Seas were domesticating grapevines in their villages and planting their first vineyards. Clearly the history of mankind growing grapes specifically for wine goes back at least 6,000 years and maybe as long ago as 10,000 years. We know that some of the first fired pottery shards that have been carbon dated to 6500 BCE show that wine was carried in these sealed pots — and if wine was being transported more than 8,000 years ago, it's easy to imagine that it was being made and experimented with for many generations previous.

Planting a home vineyard in this age was easy. It was all done with clippings off the last year's vintage. Slips of dormant grapevine wood were kept moist in the fall and winter and planted in the ground before spring warmed up. When the moist soil warmed, the dormant wood pushed roots out of the buds below the ground, and shoots on the buds in the sun. Voila! A new vineyard was just that easy.

At this point we can fast forward past thousands of years of grape growing and the proliferation of vineyards throughout the ancient world. In fact, we can keep our camera lens focused on Charles Darwin, who continues to be the protagonist of our long and involved story of how rootstocks were invented and used. England is both the culprit and the hero of this part of the story. British botanists were busy collecting American plants — cataloging and giving them all proper Latin names, when an insect escaped their laboratories and wreaked havoc on British vineyards and then hopped the Channel to decimate the vineyards of Europe.

The bug, of course, was phylloxera — a root louse that has existed alongside American grapevines for millennia. But when the insect had unrestricted access to the unprotected vineyards of Europe, the results were devastating. Within a few decades up to 90% of all European

vineyards were destroyed by the single bug. The French did all they could to fight the scourge. But with only their provincial understanding of viticulture, and without Darwin to help them, they tried solving the problem with methods that seem ludicrous to our modern, scientific minds: they buried a toad at the base of each vine “to draw the poison out.” It didn’t work. In the fifteen years between 1874 and 1889, wine production in France dropped by almost 70%. Hey, I would have buried toads too if I thought it would have helped.

So, how does Darwin come back into the story? Without the new idea that animals and plants adapt to their native environments and protect themselves from native pests, it is unlikely that any scientist would have been able to suggest the use of grafted American rootstocks for the rescue of European vineyards. Scientists primed by Darwin’s revolutionary work, such as Charles Riley and others, understood that American grapevines would have developed resistances to phylloxera over the millions of years they had been living in balance with the nasty American bug.

And amazingly, vines that had been separated by hundreds of millions of years of geographic isolation were fused by grafting so that a European variety such as Cabernet Sauvignon could grow fruit on the grafted rootstock of an American vine variety. Only a few American varieties showed great promise in protecting grapes in phylloxera-ravaged areas. *Vitis berlandieri*, *V. riparia* and *V. rupestris* were the strongest three candidates, and most of our modern rootstocks are hybridized from these great native grapevine varieties. All three of these varieties can be found in Texas riverbeds, but *V. riparia* also can be found as far north as Quebec, and it is cold hardy to minus 40 °F (4 °C).

So evolutionary theory saved the European grapevine, and soon French, Spanish and Italian vineyards were replanted using American rootstock and began to produce a good crop once again. European vineyards are planted with US-based rootstocks to this day, as a better solution has yet to be offered or proved. Such a fundamental shift in the way mankind viewed the natural world,

the view espoused in Darwin’s “On the Origin of Species,” cannot be ignored in the history of winegrape production, and moving forward into the arena of suggesting rootstocks for your vineyard, let’s all take a moment to reflect and toast the man who changed the world and saved European wine, albeit indirectly: Charles Robert Darwin.

Finding a rootstock that works in your backyard vineyard is a fairly simple procedure. I’ve simplified the process down a little bit to make sure that we won’t waste time talking about rootstocks that are not available to you. Here’s a list of the process for finding rootstocks:

- Find a grapevine nursery that has the best selection of grapevines and rootstocks that grow well in your part of the country.
- Note which rootstocks are available from that nursery.
- Find those rootstocks on the chart at <http://www.californiagrapevine.com/images/Chart%202.pdf>.
- Match up the “Best Soil and Climate Conditions” column with the conditions in your geographic location.
- Ask the professionals at the nursery if your decision sounds like a good one. .

Here’s a quick breakdown of what each column describes and why it matters:

**ROOTSTOCK:** This is the given name of the rootstock, and will be the name you will use to order it. The rootstock is usually expressed as a descriptive term (ie: Harmony) or a series of numbers and letters (ie: 5C). When describing a vineyard block, the cultivar (grape) and rootstock are commonly described as a single combination separated by a forward slash, such as Pinot Noir 115/5C. That would denote Pinot Noir (the varietal), 115 (the cultivar or “clone” of Pinot Noir), and the rootstock in that block, or on that vine: 5C

**PARENTAGE:** The (usually) American grapevines that were hybridized or adapted into the rootstock in question. Note that the prefix “*Vitis*” has been left off each variety of rootstock, so for instance, 101-14 rootstock is actually a hybrid of *V. berlandieri* x *V. riparia*.

**PHYLLOXERA RESISTANCE:** This is important to understand only if there is no phylloxera in your home area. If there is no threat of the dreaded vine aphid, you don’t need a strong resistance to it. Also realize phylloxera doesn’t do well in sand or highly sandy soils, so if you’re growing on sand, and have no problems with nematodes, you may be lucky enough to grow grapevines on their own, girly, tender, Euro roots!

**VIGOR:** While the vigor of a rootstock will have an impact on the growth cycle of the vineyard, it won’t likely be a game changer. Use it as a tool to moderate vigor. On rich soils, you may want to use a lower vigor rootstock that matches your other needs (1 to three x’s in the column), while in a sandier or shallow soil, choose a rootstock that will give you heightened vigor (4x’s +). Having an efficient rootstock in a poor soil will help save you lots of fertilizer and compost to get the vineyard in balance, but again, don’t think the rootstock will change a low-vigor site to a high vigor site by itself.

**COMPARATIVE MATURITY RATES:** As with vigor, only expect about a 10% influence (maximum) between early and late maturity ratings. Expect an influence, but not a massive change in performance.

**ADAPTATION TO DROUGHT and “WET FEET”:** Choose at least “fair” designation for drought if you plan to irrigate ion-dry, arid areas. “Wet feet” adaptation is more important in areas of high rainfall where the soil may stay wet for a good part of the growing season. Realize that if you plant a rootstock with poor or fair resistance to drought, that the vine can shut down more quickly in the summer if it suffers from water stress. In other words, apply extra water in periods of heat to keep the vine from shutting down early.

**NEMATODE RESISTANCE:** You may need to talk to a university or a soil specialist (or a local grape grower) to see if you have to worry about nematodes in your area. Nematodes lay their vicious little eggs in your vine roots, and when

they hatch the larvae feed on the young, tender roots. American rootstock adapts by sending out new, bifurcated, roots while Euro vines have no resistance and the impacted root zone will not recover. For areas with higher nematode populations, choose a more resistant stock.

**ROOTING QUALITY:** Deeper, richer soils require less rooting quality, while shallow, hard soils may require at least a fair to good designation to get the vines to spread out and penetrate tough soil.

**FIELD BUDDING QUALITY:** This only applies if you are buying 100% rootstock vines to plant and then graft in future vintages. This is usually done in rare situations where someone wants to start the rootstock in the vineyard to get it developed/mature, but the scion material most desired won't be available for a year or more. Buying grafted vines (with both rootstock and scions already joined and healed) is recommended.

#### **BEST SOIL AND CLIMATE**

**CONDITIONS:** Pay special attention to this column, as making an accurate match will save you a lot of headaches down the line. Some viticulturists would argue that a list like this is only hypothetical. Our true understanding of rootstocks and where they belong is more anecdotal than scientific. I'm excited to have at least a starting point for matching stock to the soil/climate, and use the knowledge here, even if partially anecdotal, for best (or at least improved) results.

**OTHER UNIQUE QUALITIES:** You don't likely need to go through these descriptors/recommendations until you've narrowed down your choices to a few rootstocks. Then check to see if this last column can tip the scales. For example, maybe you have a bit of lime in your soil or you know that crown gall can be a problem in your state.

A chart of popular rootstocks, should provide enough information to make a scientific and viticulturally sound decision on choosing a rootstock for your backyard. With the right rootstock, the vines will be matched to the soil and resistant to predation by insect pests that would destroy your roots. **WM**



# PLANTING DORMANT GRAPEVINES



# E

Establishing a vineyard is an exciting and rewarding adventure. Like all of life's challenges, your success or failure will be dictated by the amount of research, planning, effort and perseverance you exhibit throughout the process. If you've read the articles in the first section, you know one thing is certain — there's a lot to do before putting vines into the ground. Your vineyard "system" needs to be in perfect working condition before vines can be planted. You need to install the trellising and install and test the irrigation equipment. The soil needs to be tested. In addition, vineyard pests need to be held in check. Installing a vineyard is not something you do on a whim some weekend.

Before planting a vineyard, it is advisable to talk to a local horticulturist

or nurseryman about how grapevines will grow in your specific locale. Ply the local experts with kindness and wine, and ask every question you can come up with. You may also need to ply some friends with beer to get them to help out over the growing season. As my favorite wine-country truism goes, "It takes a lot of beer to make wine."

## Ordering Dormant Vines

I suggest that you plant dormant grapevines because they establish themselves — start growing and adapting — in the piece of ground where they are going to live permanently. Green-growing grapevines were raised in a sheltered environment and often die in the field from exposure or shock. While many wilted green-growing vines will sprout secondary buds and do fine in the long run, my experience has shown me that dormant vines are clearly the smart choice for planting material.

Purchase dormant vines early to make sure the nursery has the exact materials you are looking for. Ordering early assures you don't have to settle for "leftovers." I recommend you order dormant grapevines up to one year before planting. A good grapevine nurs-

ery wants to know what their customers need in advance. This knowledge aids them in deciding what scion material — sometimes called clone material — to graft onto rootstock to prepare orders. Vines that are going to be planted in an area with known soil pests, such as nematodes or phylloxera, are commonly planted on hardy, disease-resistant rootstocks. These rootstocks are bred from native vines, which are resistant to American soil pests. (See the previous article in this section for advice on choosing a rootstock.)

Call a good nursery at least a few months before spring and let them know how many vines you will need. Be sure to specify that you want to purchase dormant grapevines. Make sure the type (cultivar) of vines you order — Norton, Chardonnay, Merlot or whatever variety you choose — are appropriate for your climate and vineyard.

Order ten percent more vines than you think you will need. The extras will come in handy in case you need a few extra or miscounted. It's easy to plant them, according to the directions below — but at two-foot by two-foot spacing, in an out-of-the-way corner of your vineyard. The following year you can dig them up, trim the roots and growth, and use them to replace the vines that didn't take in the "official" vineyard.

Call the nursery every few months and give them updates on when you'd like the dormant vines taken out of cold storage and delivered. The best time for delivery is usually in the spring after the possibility of hard frosts has passed. Dormant vines are usually dug up deep in dormancy (during the winter), trimmed, and then bundled into 20–25 vine bunches, tied together and bagged. The bags of grapevines are filled with moist wood chips and put in a large wooden crate that is also filled with moist wood chips.

## Plant Requirements

Plant after the worst threat of frost is over and the ground begins to warm. In California, this is usually around March or April, but will obviously be later for cooler parts of the continent. Deciding when to plant is tricky. The earlier you plant, the more growth you will get in the first year, but there will also be a greater chance of frost damage. You can

plant grapevines all the way through late spring to early summer, so don't rush it. You can even plant in June or July, but you won't get as much growth your first year. A vineyard is a long-term investment, so there's no reason to put the vines in the ground until you and the soil are absolutely ready.

Dormant grapevines are vines that have been grafted to rootstock, or grown on their own roots, at least a year previously. The grapevines were put in the soil and allowed to callous and grow for a season. They were then taken out of the ground, trimmed, placed in moist wood shavings, and put in cold storage in bundles for delivery to vineyards.

The cold temperatures in storage — usually about 35–40° F (1.6–4.4° C) — give the vines their “chilling requirement” as well as keeping them from growing before they are planted. For a vine to have successful budbreak and to be fruitful, it needs 250 hours per winter below 45° F (7.2° C), although many regions get over 800 hours of chilling.

### Receiving Dormant Vines

Most dormant grapevines are already two to four years old, and are fairly hearty, with trunks almost as thick as a man's finger. When your vines arrive, I suggest you cut a few up in front of the driver or salesman to show you are serious. Make sure the center of the vine still shows green tissue. The vines should bend and not snap like a dry stick. Ensure there are uniform, bulging calluses at the graft union. Hold the bulging top of the vine — where the last year's growth has been trimmed to a single “spur” — and bend it gently back and forth to make sure it is still green and elastic. Dormant vines that break at the graft union — where rootstock meets the clone wood or scion wood — are of poor quality and will provide more headaches than pleasure.

When you sign the invoice saying you have received the vines in good condition, make sure you feel comfortable that your vines are of acceptable quality. Many times vines sold to home vineyards are the ends of odd lots that nurseries are trying to get rid of.

Cut a randomly selected vine in half with a sharp knife, and then bend the halves to check that they are green and somewhat elastic. If you see dark, gooe

spots inside the vine's tissue, chase the delivery driver off your property, wielding the diseased wood like a knife, shouting threats of litigation.

The “head,” or top, of the vine should have been trimmed at the nursery to a two-bud spur. If this trimming not been done, just count the small, bumpy buds on the spur and cut through the third bud to concentrate the vine's growth.

### Planting Dormant Grapevines

Now that you've guaranteed you have good dormant planting materials, you should be ready to prepare the vines for planting. The vines should be warmed to the ambient temperature of the vineyard site over five to ten days before planting. However, you want the vines to remain moist so they don't dry out needlessly.

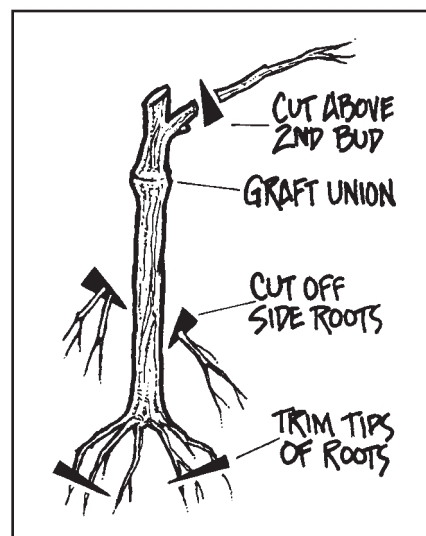
Most vines come in bagged bundles of twenty or so. You can either open the bags or poke holes in them. Keep them in a shaded area, still enclosed in moist sawdust and shavings, while they acclimate. If the sawdust dries out during this process, just hose down the bags until moist again.

Take the vines out of the bags and sawdust the night before planting. Soak the roots in 5-gallon (19-L) buckets of water. The tops of the vines can stick out of the water, or you can soak them in larger bins so that the entire vine gets soaked. Take the vines into the field in these same buckets — you can use the water in the buckets to give the planted vines a first drink.

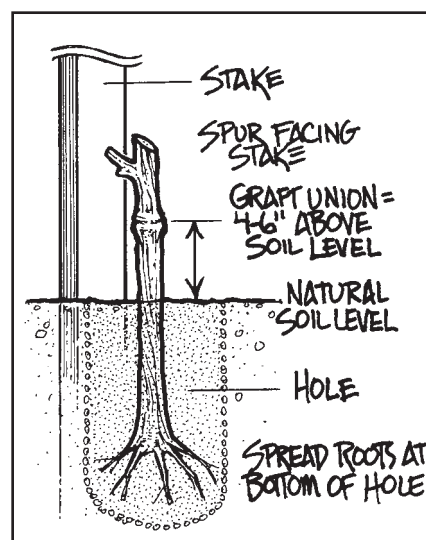
Don't make the mistake of taking too many vines into a sunny field to plant. You do not want the vines to be out of water, soil or moist sawdust for more than an hour before they are planted to avoid dehydration.

Each vine should be removed from the water bucket as it's planted. Trim the root tips with sharp pruning shears so that the root ends will be vital and fresh when put in contact with soil. I usually take the entire root bundle in my hand, stretch the roots out like I was giving them a haircut, and then trim the last few inches of all the roots with a quick snipping motion, taking care to cut off broken or crushed roots as well.

Efficiency is key to the planting of dormant vines. I recommend having a strong helper digging holes with a post-



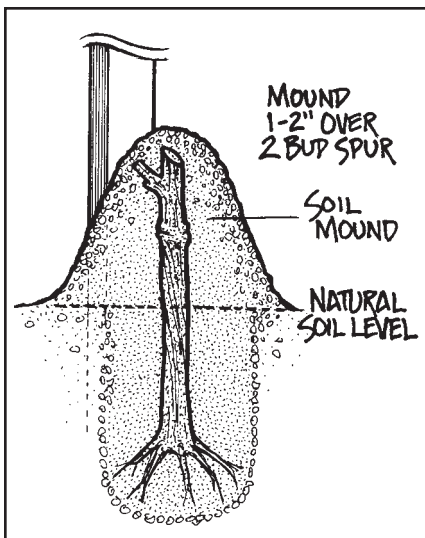
A grapevine must be prepared before it is put in the ground. The roots must be trimmed and the “head” clipped.



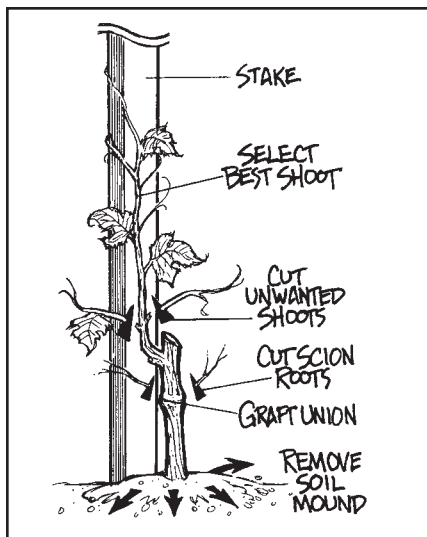
The vine should be placed in the ground so that the graft union is four to six inches above the soil line.

hole digger or a narrow-bladed planting shovel, and another helper following behind to plant the vines. The hole should be about 6 inches (15 cm) across and at least 18–20 inches (46–51 cm) deep. Do not just stick a shovel in the ground, yank it back and forth to open a crevice and toss a vine in. Do everything you can to assure the walls of your hole are loose and not compacted further than the soil would be naturally.

I also recommend planting while the soil is still moist to make digging easy. Turn on your irrigation system until the soil is moist, but not muddy, or wait until after a light spring rain to



When the vine is first planted, a mound of soil should be made over it. The soil protects the vine as it acclimates.



During the first year, a single shoot grows up the stake towards the trellis wires. Other shoots are clipped.

plant. I like to pour about 0.5 gallon (~2 L) of water into the hole before planting and refilling to make sure the soil beneath the newly-planted vine is moist. Although it's not standard practice, it's something that we do here at the vineyard and it seems to increase the chances of a vine establishing itself.

Drop the vine in the hole and then spread the roots out so roots are facing the sides of the hole, as well as facing down into the subsoil. Packing the dirt back into the hole, around the vine, is an art form in itself. We cut the handle off a standard garden hoe so that it's

only about 18 inches (46 cm) long and use the butt end to compact the soil as we fill it back in. We use the hoe end to pull dirt into the planting crevice. Pack well, but don't damage the roots.

It is also important to make sure that the graft union is at least 4 to 6 inches (10 to 15 cm) above the finished soil level, as the vine will settle a bit in the dirt. If you are planting on rootstock, the graft union is the bulge a few inches under the "spur" where new growth will sprout on the top of the vine. If you bury the graft union, roots will sprout underground from above the rootstock, and the vines will prefer them to the stock. You will soon have vines growing from their own roots rather than from the rootstock, which defeats the purpose of rootstock.

If you have training stakes in the vineyard, plant the vine so that it is no further than a few inches from the stake, with the "spur" turned inward so that it almost touches the vertical stake. This will make it easy to tie growing shoots to the stake.

### Review and Mounding

Make sure you keep the vines moist and cool prior to planting. Trim the roots, make a deep hole and position the vine with your hand to a correct depth that keeps the graft union above the ground. I tell my planters I want the union four finger-widths above the finished soil level. Then sweep the soil back into the hole, packing it firmly in with the butt end of a sawed-off hoe. Don't leave air gaps in the soil. This would be an appropriate time to water the vine to help the soil settle and soak the root area.

Once you have compacted the soil back to the natural soil level, you're still not quite done. You need to make a soft soil mound over the part of the vine that protrudes from the ground. Use soft, broken soil — not hard clumps — and cover the vine so that the whole vine has one to two inches of soil covering it. This keeps the growth buds moist and protected from the sun as the vine acclimates. It will also discourage rabbits and other pests from nibbling off new growth as it emerges. Loosen the top of the mound if it dries and begins to clump. Within a few weeks, you will see

green growth poking out from the soil mounds. At this point, carefully loosen the soil mounds on a cool, cloudy day and remove them so the natural soil level is restored.

### Now What?

Planting a vineyard is hard work, but here's some good news — once a vine is planted and established, it's pretty hard to kill.

If you get decent rainfall and have a mild winter, your vines should grow healthy and produce fruit for making wine. Rainfall in the range of 20–30 inches (51–76 cm) per year seems about optimal and, for best results, winter temperatures should not hover constantly below 14 °F (-10 °C). If you get eighty-five percent of the vines to take and grow, consider your home vineyard planting a success.

Once the vines are in the ground, you have about three years until you have usable wine grapes. During those years, the vines will need to be cared for and tended to. Elsewhere in this issue, I'll tell you in detail how to care for your vineyard during its first few years. For now I'll just supply a quick overview of these critical years.

Once the vines sprout, you'll have to start thinking about vine training. Initially, stakes are used to support the growing vines. You should start staking when the longest vines reach about six inches in length. The shorter vines in that bunch should be removed, leaving only the longest vine to grow upward. At this point, some vineyards use grow tubes, which are slender plastic tubes that surround the vine, to thwart pests. If the vine's growth seems stunted, you probably have less nitrogen in the soil than the vine would prefer for full, vigorous growth. High nitrogen levels are not good for established vines that are producing fruit, but young vines can benefit from the application of some nitrogen-rich fertilizer.

If you're lucky, the vine will reach the top of the stake by the end of the first year. In the second year, your vines should start growing on the trellis and by year three you should have grapes. And once you have grapes . . . well, you know what comes next. *WM*

# SPRING BUDBREAK



Budbreak is an exciting time in the backyard vineyard. For months now, you've had to explain to the neighbors and holiday visitors that your vines aren't dead, they're just taking a nap and getting ready to produce the next vintage. When budbreak occurs, your neighbors will finally be convinced that your vines are indeed vibrant and healthy.

In my vineyard in Santa Barbara County, California, budbreak occurs in mid-March. When your backyard vines will begin to grow again is a function of the weather and the warmth of your soil. When it starts to happen, the first thing you'll notice is that the buds — they almost look like soft thorns on the dormant canes and point away from the

head of the vine — begin to swell, or push, and they get fuzzy and elongated.

According to my UC Davis textbook, "Budbreak occurs at the stage of development when green tissue becomes visible at the tip of the bud." (University of California, "Grape Pest Management," Second Edition, 1992.)

I have noticed in my California vineyard that often the emerging tissue is a lovely red color and, as soon as the vine begins to photosynthesize, the tissue then becomes milky green.

Taking the proper steps during and shortly after budbreak will make your next growing season a lot easier. I've broken down a number of issues you'll have to deal with at the beginning of the winegrape growing season, explained their importance and tried to give as many helpful tips as possible.

## Start Spraying

The first topic I'd like to discuss in the context of budbreak is mildew and fungal diseases. Remember that spores of powdery and downy mildew often "overwinter" between the dormant cane and the bud shield and in bark crevices.

It is vital to hit the vines with an application of fungicide, whether it be sulfur, horticultural oil, copper, synthetics or a mix. Do this right away. Being vigilant with a spraying schedule will keep massive outbreaks from hurting your crop — if you can knock down the spores before the tiny grape clusters emerge, you will save yourself a lot of grief later.

Some viticulturists like to wait until there is two inches of shoot growth to begin spraying fungicides. But the sooner you can knock down those active spores, the better. With an arsenal of sulfur, a surfactant mixed in for added efficacy and perhaps a spray of two percent horticultural oil as the buds are emerging, the backyard viticulturist should be able to wage a good war on fungal disease. Copper can be extremely helpful, too, if you are in an area that has problems with downy mildew.

Remember that wettable-sulfur application (which is an approved organic practice) only kills germinating spores of powdery mildew. In other words, it slows its progress but does not affect existing infections, and many scientists think it's actually the vapors (SO<sub>2</sub>) produced by applying sulfur that stop mildew from growing.

Sulfur is most effective at temperatures above 60 °F (15 °C) and less than 90 °F (32 °C). Early in the season, it's important to make sure, as I mentioned above, to include a surfactant in the wettable sulfur mix to make it more effective. Only use this wettable mixture from 2 inches (5 cm) of shoot growth to bloom — using it after bloom may leave unwanted amounts of sulfur on your grapes and in your finished wine. Most vineyard consultants would suggest the method of powder-sulfur dusting after bloom and before berry-softening, when no more sulfur should be applied.

High application rates of sulfur coupled with temperatures above 96 °F (35 °C) can cause foliar burn, so if you're expecting a heat wave, keep your applications below five pounds-per-acre, or one pound of wettable sulfur (I use Thiolux) in 20 gallons (76 L) of water.

For those who like to stay on a regular schedule for vineyard practices, applying sulfur to the young shoots once a week should be more than enough, even if it rains on them a little bit. If you get hit by a deluge, I recommend



Budbreak is an indication that the growing season has begun in earnest — and a signal that you need to start spraying, weeding and protecting the vineyard from pests.

doing a touch-up application after the storm. Heavy rain will wash sulfur off and spread fungal spores from shoot to shoot, cane to cane and plant to plant.

### Clear Out the Critters

If the soil is warm enough to push shoots from the dormant vine, chances are the gophers and other mammalian root-munchers are also waking up. Left unchecked, gophers will treat your vineyard like a smorgasbord. They'll make tunnels that run right along the root system, and may well kill a vine by gnawing

through the main taproot. When I see a vine in my vineyard that looks stunted or virused, I dig up around the roots and look for gopher damage. Ninety percent of the time gophers are to blame.

Although I am a sustainable farmer with lots of cute, fuzzy pets, I show no mercy to gophers. I trap them. You may well have trouble with deer, too, so keep an eye out for large herbivores roaming the vineyard looking for snacks. According to some farmers I've talked with, loud noises and mountain lion scent are effective deterrents.

The special time of bud-break marks the beginning of a brand-new vintage and reminds me that I can fine-tune my vineyard cultural practices to get a balanced vine . . .

**Jack Frost Nipping Your Merlot**  
Sustained temperatures below 26 °F (-3.3 °C) can cause irreparable frost damage to young shoots, growing tips and fruit clusters.

At Clos Pepe we had to spend almost a thousand dollars per acre to set up sprinkler systems to protect our vineyard from frost, but the backyard viticulturist should be able to make due with a few hoses and a tripod-sprinkler. Keep your eye on the weather report, and when the temperature dips near 25 °F (-3.8 °C), turn those sprinklers on before the freeze to coat the young clusters with water. The water will freeze, making a little "cluster-sicle," and the ice will insulate the grapes.

Crystallization of water into ice releases energy as heat and keeps the young shoots and berries from being damaged, so be sure to keep those sprinklers running as long as the temperatures are in the 20's. It's not just the ice that keeps the young berries safe, it's the process of the water turning into ice.

In California, if your vineyard is on top of a hill or on a slope, you might not need to frost protect, because of cold air's tendency to move downhill and



settle in low-lying areas. Keeping weeds and grasses mowed will help as well. The smoother and cleaner your vineyard floor, the harder it will be for frost to develop on the trellis and the vine.

### Feed the Need

Budbreak is a perfect time to give the vines a little nitrogen and zinc if they need it. Nitrogen keeps a vine vigorous and green. If your vines were stunted and a little yellow last year, give them a little hit of nitrogen at budbreak. Ask your local nursery person to suggest a product and application rate. For an organic source, try a handful of chicken manure or bat guano. You can also use a scoop of organic compost under each vine every year to keep the soil full of microbiological activity and diversity.

If the vine is healthy and vigorous, do not supplement the plant with additional nitrogen. Too much vigor will cause excessive fruit shading and might ripen the fruit too quickly, and might also hinder the vine's ability to go dormant later in the season.

After the shoots have elongated and the leaves are becoming fully expanded, you can give the vines zinc if they need it. Steve Matthiasson, of the Lodi-Woodbridge Winegrape Commission, recommends applying zinc two weeks before bloom to increase berry set.

Zinc deficiency is easy to see in the grape clusters or on a leaf. A grapevine leaf looks a little like a "spade" symbol on a playing card. If the nice round "bulges" on either side of the "petiole" or leaf stem are not clearly apparent (the leaf loses its spade shape and becomes more like a circle), you probably have some zinc deficiency.

Poor berry set can also be a sign of zinc deficiency, especially "hens and chicks" (grapes that are of differing size and shape). Ask your nursery for a zinc product and use as directed.

### Water, But Not Too Much

Unless you live in an area with very sandy soils, or in a locale that receives less than 15 inches (38 cm) of rainfall during the winter, your vines will have plenty of water to use at the beginning of the growing season. Don't give a vine more water than it can use. Vines need

their roots to dry out many times during the season. A vine's root system can get "wet feet" if left soaking for too long. This will cause the roots to decompose and lose efficiency, or even kill the vine.

It has also been shown in studies of Oakville Cabernet by the University of California at Davis that early season water-deficit irrigation (not watering the vines early in the season) can keep vigorous vines from growing too much vegetatively. This helps keep sun flecks on the fruit, promotes a healthy, open canopy and creates wines that rate higher in blind tastings than vines that received a lot of early season water.

### A Long Row to Hoe

The last task for the new growing season is to hoe, mow or cultivate the weeds from within the vine row. Weeds and grasses growing close to the vines will compete for water and nutrients. I don't recommend using Roundup® or any other defoliant in your vineyard because it will negatively impact the diverse life within the first few inches of the soil.

It will kill beneficial soil fungi as well as earthworms. Although 99 percent of California vineyards still use defoliants, I don't think they would if they could see how it is sterilizing their soil. Some organic viticulturists go so far as to imply that contact herbicides can open up niche space for the phylloxera vine pest, which is something that no one wants to do.

The special time of budbreak marks the beginning of a brand-new vintage and reminds me that I can fine-tune my vineyard cultural practices to get a balanced vine and delicious wine. The more work you put in at the beginning of the growing season, the easier it will be for you to relax and enjoy the craft of viticulture as the season progresses.

Problems that do not get addressed now will be harder to correct for as the growing season continues. **WM**

*Special thanks to Steve Matthiasson of the Lodi-Woodbridge Winegrape Commission, who reviewed this article. He helped me understand more about the relationship between viticulturist and vineyard. All backyard vineyardists can benefit from reading the materials offered by*



# EARLY SPRING VINEYARD MANAGEMENT



# B

Budbreak represents the end of the winter's "vacation" and the beginning of a vitally important managerial period in the vineyard.

Between budbreak and bloom, winegrowers are offered the chance to get a head start on the growing season to make decisions and finish vineyard practices that will dictate the relative ease or difficulty in finishing a year's vine farming. The purpose of this article is to define and detail the practices that can be accomplished in the first few months of a vine's growth cycle, explain why they are important to final wine quality, and how to assess your early season efforts in the vineyard.

The biggest change in my own vineyard management practices in the 10+ seasons that I've grown grapes has been how to handle the vineyard between budbreak and bloom. We have brought our 6-person crew into the vineyard much earlier in the past few years, and have found that the early work we finish is much more economical than coming back and trying to "fix" the canopy after it has filled the trellis. In this spirit, I hope to share some of our early-season tricks in vineyard management and describe how getting into the vineyard early can save you lots of hassles at the middle and end of the growing season.

In the early season, here is what we need to accomplish:

- Make sure the vines have adequate water and nutrition
- Keep mildew and early season shoot blight from effecting the vines' health and vigor
- Protect the vines from frost
- Control weeds
- Set a firm foundation for canopy management through shoot removal and

suckering (removal of unnecessary and basal shoots)

Now let's discuss how to accomplish these goals out in your vineyard:

## Water and Nutrition

As the vines wake up from dormancy and start to grow, they are wholly dependent on the water and nutrition that is available at root-level. It is vitally important that the soil be moist to saturated. The vine will decide at budbreak just how vigorous to grow, based mostly on nitrogen availability and water status.

Water is a tool that can impact vigor both ways. If your vineyard grows too vigorously and rank, it would be better not to apply water in the early spring. This may retard overly vigorous growth and may help you produce better balance in the backyard vineyard. Inversely, if your vineyard is low-vigor or stunted, heavy applications of water (and some supplemental nitrogen) can help foster a more vigorous growing cycle. In most areas of the U.S., winter rains and snows will saturate the soil profile so no supplemental irrigation will be needed for the first few months after budbreak. Vines like to have their roots dry out between watering, so by using a soil probe, an irrometer or a shovel, be aware of the water status of your soil 3–5 feet (1–1.5 m) down. Once the soil has dried out at 3 feet (1 m), it's a good time to start offering the vines some additional irrigation.

As far as nutrients and fertilizer go, the beginning of the season is an excellent time to give the vines some NPK "breakfast" as they wake up, but only if your vineyard needs a little push in vigor. NPK stands for nitrogen, phosphorous, potassium. The hyphenated numbers on the label of fertilizers represents these components. If a label reads 15-15-15, the product provides 15% of each of the three macronutrients by weight of the product.

Never fertilize a vineyard if the leaves are green and healthy and the vines are growing with adequate vigor. Fertilization should be restricted only to vineyards that are struggling to produce uniform canes with moderate vigor. If your vineyard naturally produces a cluster of fruit for every 12–15 leaves, you are naturally balanced without fertiliza-

tion and don't need to add anything. If the vineyard is overly vigorous, you may want to reduce any supplemental irrigation, making sure the soil dries in late spring and early summer, which will send a message to the vines; don't get too big and bushy!

From a previous article, here is a generalized list of what a vine loses each year in nutrients when you produce and harvest a crop of grapes (see Table 1 on page 34).

Many backyard soils in the United States provide these nutrients naturally to the vines, year after year. This chart does not imply that all vineyards need to have these nutrients added. If your vines produce vigorous, green growth and good fruit year after year without adding fertilizer, there is no need to add further amendments

crop and poor wine quality in home vineyards. If you have a serious early-season botrytis shoot blight problem — brown rotting spots at the base of tender shoots or the tips of the tendrils, or shoot tips are turning black and dying — you may need to check with your local nursery about options for botrytis control.

Another serious issue I've seen in a number of my home-vineyard consultations is underpowered and inadequate spray equipment for mature canopy. If you are stuck using a backpack sprayer and continually have problems with mildew even when you stick to your spray schedule, the problem may well be spray penetration. To be effective, you need to get full coverage on the vine, including the interior of the canopy when the vines have filled in the trellis later in the season. If you have an ATV

grapevine, activates in two year cycles. A heavy mildew infection in a vineyard may increase mildew pressure in subsequent years, and will worsen until effective control is managed.

### Frost

Sustained temperatures below 32 °F (0 °C) can cause damage to the green, growing parts of the vine, especially young shoots and fruit clusters. Maintaining a bare vineyard floor will help keep the cold air from "sticking" in your vineyard (it should move downhill like flowing water). Pay special attention to areas of your home vineyard that are located on low ground. When deciding on a location for your home vineyard, it is advisable in frost-prone climates to put the vineyard on a hillside where the cold air can flow away. Dormant vines

## The biggest change in my own vineyard management practices in the 10+ seasons that I've grown grapes has been how to handle the vineyard between budbreak and bloom.

or nutrients. Stunted, low-yielding or yellowed vines will benefit from nutrient additions early in the growing season, at flowering, and after harvest. Using natural fertilizers can benefit the existing nutrients in the soil.

### Make a Spray Schedule

I've said it before and it bears repeating: the number one error in home viticulture is poor spray scheduling and coverage. Sulfur (preferably a wettable product such as Thiolux) needs to be applied to the vines starting at budbreak, and in areas where mildew pressure is high, it needs to be re-applied every week until bloom. In areas where mildew pressure is not as high, spray at 6-inch (15-cm) shoot length, 12-inches (30 cm), 18 inches (45 cm) then every 10–14 days. Adding copper to the mix will add a bit more protection and I use a sulfur and copper mix for the first three or four sprays here at the vineyard.

Powdery mildew is the enemy here, as well as botrytis. Mildew and rot issues are likely the number one culprit in lost

or a Gator-style ranch vehicle, you may want to look into a tow-behind sprayer that hooks up to the ATV/Gator battery for power. There are also gas-powered units that do not require an exterior power source. But, if you are stuck with a backpack sprayer, you may want to make sure that the pressure is adequate when applying, and you may need to spend more time covering each vine and spraying from both sides of the vine row. Inserting the spray gun into the canopy is another way to get better coverage deep inside the vine's growth. Make sure to wear proper clothing and safety equipment during sprays to keep yourself healthy.

The first month or two after budbreak is absolutely critical for mildew control. When the bud shields crack open to allow budbreak, the spores hungrily attack the new delicate shoots. In vineyards that had mildew issues the previous year, massive amounts of dormant mildew spores will be ready to attack the vines as the weather warms. Mildew, much like many aspects of the

are generally very tolerant (and even fond of) cold winter weather. However, when the vines start growing again, frost can cause all green growth to burn and die. If this happens, don't remove the burned/frosted material. The vine will likely recover and start growing again, and even produce a new (usually lighter) crop of fruit.

There's a few things you can do to help a vineyard through a potentially damaging frost episode:

- Watch the weather carefully and on potential frost nights, set your alarm for midnight to check the temperatures in the vineyard.

- If temperatures drop under 32 °F (0 °C), turn on your drip system (it may produce enough warmth to keep the vineyard from frosting, or even better, turn on an overhead sprinkler system. Sprinklers will coat the young fruit and shoot tips with water, the water will freeze, and the ice will insulate the tissue like an igloo. Many copper spray products also include ice-nucleating bacteria, which will hasten the process of the ice

**Table 1:** Average Nutrients Removed Per Acre (rounded off in lbs.) in a Producing Vineyard per Year (at 2.5 tons/acre, or about 5 lb. fruit per plant @ 1000 plants/acre)

Nutrient	Need/Acre	Need/Plant, Expressed in Organic Fertilizer
Nitrogen (N):	8 lbs. (3.6 kg)	(0.128 oz. per plant, or 2.5 oz. of 5-0-0 fertilizer)
Phosphorous (P):	2 lbs. (0.9 kg)	(0.03 oz. per plant or 0.64 oz. of 0-5-0 fertilizer)
Potassium (K):	14 lbs. (6.3 kg)	(0.224 oz. per plant or 4.48 oz. of 0-0-5 fertilizer)
Calcium:	3 lbs. (1.4 kg)	(0.05 oz. per plant or 1 oz. of 5% calcium fertilizer)
Magnesium:	1/2 lb. (0.23 kg)	(0.008 oz. per plant or 1.6 oz. of 0.5% magnesium fertilizer)

forming around the plant.

- Keep your vineyard rows and in-between rows clean from weed and cover crop growth. Bare, firm, moist soil is warmer and provides better frost control compared to a vineyard floor rank with plant growth.

### Control Weeds

There are only a few ways to control weeds in the vine row:

- Hand removal/hoeing (best exercise and best for the vineyard and the environment.)
- Contact herbicides (do not use at a time when green vine tissue may be contacted, as products like Round-Up can cause permanent vine injury. Use pre-budbreak herbicides according to label.)
- Residual herbicides (pre-emergence, apply before winter rains.)
- Mechanical Cultivation (tractor or ATV-mounted devices such as Weed badger, Pellenc or Kimco.)

Weed removal and a clean vine row is absolutely vital to a young vineyard, but a bit less vital as the vineyard matures and the vines stop competing at the same level as weeds for water and nutrients. Weeds will absorb a good

deal of the irrigation and rain water if allowed, and can also rob the topsoil of nutrients that may eventually work down to vine-root level. My usual recommendation: keep the vine row weed-free for the first 3–5 years of a vineyard’s life, and then keep the weeds in check, and never let them interfere with the growing canopy of the vine. The less vigorous the vineyard, the more important it is to keep weeds in check. It is also advisable to weed while the weeds are young, easily destroyed and before they go to seed.

### Early Canopy Management

I’ve saved two of the most crucial cultural practices for early season vineyard management until last. Shoot removal will space out the growing shoots and canes on the fruiting wire, will produce a uniform crop, a uniform niche space for each cluster, will increase the effectiveness of sprays and leaf removal and will balance the fruit to leaf ratio. Suckering will focus all of the vine’s energy to grow in the proper space.

**Shoot removal:** This is a fairly expert operation, but with a little training, within a few hours, your post-budbreak vineyard will be dialed in and you will be

saving lots of future work. The best time to engage in shoot thinning and removal is when the vines have an average shoot length of about 6 inches (15 cm). Some shoots will be just emerging, but already you should be able to discern which shoots are healthy and growing fast, and which may be stunted and will never catch up. The idea is to retain a certain number of healthy shoots per side of the canopy.

- Low vigor vines: retain 16–20 shoots/vine or 8–9 shoots per side
- Medium vigor vines: retain 20–25 shoots/vine or 10–12 per side
- High vigor vines: retain up to 30 shoots/vine or 15 per side.

Retain the healthiest shoots and remove the stunted shoots, or shoots without crop.

The most important element of this practice is to space each shoot out at least 3–4 inches (8–10 cm), so that each shoot has its own space. You can use the width of a slender hand as a guide. There should be about a hand’s space between each shoot.

Remove any “double shoots.” If a single bud is supporting a double shoot (two separate shoots with two growing tips coming from the same bud position) pinch off the extra shoot. Retain

the longer of the two shoots if it is in a good position. Also, remove all shoots that are pointing down. They will be difficult to position up into the catch wires.

Excess shoot growth from the head of the vine should also be removed, but make sure to retain a few good shoots for next year's fruiting wood if you are using a cane-pruned system. In spur-trained, cordon systems, remove every shoot and sucker that is not coming out of a spur position retained at pruning, no exceptions. You can also thin spurs that have more shoots than necessary. In other words if you have a two-bud spur, that spur should only have two shoots.

When done carefully, shoot thinning will help each vine produce canes and shoots of uniform length and vigor, which will help produce a crop of uniform ripeness. Each shoot will have its own space in the canopy which will reduce crowding and mildew/rot/insect pressure and open the fruit up to more wind and sun exposure.

**Suckering:** This is easy stuff. If the vine trunk has anything growing out of it, grab it and pull it sharply down. If you see any red buds on the trunk (future shoots), rub them off with a gloved thumb. Suckering has a single focus and a single goal: Remove any green growth from the vine that does not originate from budwood that was retained during pruning for fruit production. That means any growth not on the retained fruiting units is removed for the purpose of focusing the vine's growth and nutrients on ripening the crop.

Budbreak signals a new year, a blank slate in which we will write the story of another vintage, another wine. The practices that take place between budbreak and bloom are meant to balance the vineyard and make the vine's job easy — to produce enough sugar to ripen a crop and to keep that crop pristine for wine production. Starting the growing year off diligently and professionally will set the tone in the vineyard for the entire vintage. Build a solid foundation for your entire year in the vineyard, and you'll have more time for drinking as the season progresses — and better wine to drink in the future. *WM*

## Popular Varieties

If you are thinking about planting a home vineyard, there are many grape varieties to choose from. You will likely know the types of wine you enjoy, but you need to pick a grape variety that will grow well in your location. Here are some of the most well-known grape varieties and where they thrive:

**Cabernet Sauvignon** is one of the most popular red wine grapes. It is planted in a wide variety of places, but does best in warm climates. It rose to popularity in Bordeaux, France, but also produces great wine in California's Napa Valley, Australia's Coonawarra region and in the Maipo Valley of Chile. Under warm conditions, fruit can reach 27 °Brix or beyond at harvest.

**Pinot Noir** is a red grape that is not as deeply pigmented as Cabernet Sauvignon. It is generally grown in cooler grape-growing regions. Pinot Noir came to prominence in the Burgundy region of France. In the US, it has found success in California, Oregon and Washington. Pinot Noir is best harvested around 24 °Brix.

**Zinfandel** thrives in warm grape-growing climates and is closely associated with California, where about 10% of all vineyard acreage is planted with Zinfandel. The grape's tendency to unevenly ripen can cause headaches in the winery. Zinfandel can put on sugar in a hurry, and it is best to get it in under 26 °Brix. This red grape is also used to make White Zinfandel blush or "pink" wines.

**Syrah** is a grape frequently found in the balanced red wine blends from France's Rhône Valley. In Australia (where it is called Shiraz), it is made into big, jammy "fruit bombs." Syrah/Shiraz can do well in many grape-growing climates from relatively cool to quite warm locales. Harvest sugar levels get higher in warmer growing regions and can range from 23–28 °Brix, depending.

Despite the bad press from the

movie "Sideways," **Merlot** continues to be a popular red grape.

One of the key varieties of Bordeaux wines, it is the most-widely planted variety in that region. It also finds success almost everywhere Cabernet Sauvignon — its frequent blending partner — is grown. Typical harvest numbers are 24–27 °Brix.

**Sangiovese** is an Italian red variety that makes well-balanced, refreshingly acid wine. It is almost never made into a "blockbuster" wine, as Cab, Zinfandel or Shiraz frequently are. It thrives in moderate grape-growing climates and harvest numbers are usually around 25 °Brix. Acidity is typically higher than in most reds, often coming in at 6–8 g/L.

**Chardonnay** is the most popular white wine in the world. Chardonnay grapes grow well in a variety of soil types. And, because it ripens early, it can grow in regions with a short growing season. It is planted all over the world with notable regions including the Burgundy and Champagne regions in France, coastal regions of California and New Zealand.

The character of **Sauvignon Blanc**, the second most popular white wine grape, varies depending on where it is grown. In cooler climates, it makes a light wine with a crisp acidity. In warmer climates, it makes a produces more rounded, melon-like flavors. Unlike Chardonnay, which is frequently oaked, Sauvignon Blanc is almost made "clean." The grape comes from Bordeaux, but is planted widely, including in California and New Zealand, where it thrives in vineyards near the coast.

**Riesling** is an aromatic white wine grape from the Rhine area of Germany. It is the most widely-planted grape in Germany, and also thrives in cooler grape-growing regions around the world, including New York's Finger Lakes and Canada.

# SPRING & SUMMER VINES



# S

Spring has sprung and the vines on your property are charging into this year's vintage. The new growing season gives us the chance to improve our vineyard practices, balance our vines and nurture the crop.

As buds break, shoots climb and tendrils curl, my inbox begins to fill with questions from the *WineMaker* readership. The purpose of this article is to provide winegrape growers with a framework of information by which they can better understand the needs of the vineyard from early spring

throughout summer, before it's time to harvest your ripe grapes.

**Question:** I hear about grapevines going through different phases of growth such as bloom, budbreak, fruit set, veraison (berry softening) and shatter. In what order do these phases occur, and how do I know if there is a problem with any of them?

**Answer:** Understanding the cycle of vine growth will help your awareness of what a vine needs and how you can help the vine with cultural practices (i.e. human interaction).

(Realize this is a list of growth phases of a mature vine that has grown a trunk and does not include the cycles of harvest or dormancy.)

## **Budbreak (Spring):**

Budbreak is defined as the emergence of green tissue from the fruiting wood of the grapevine and signals the beginning of the growing year. Before budbreak occurs, you will notice that the thorn-

like dormant buds on the grapevines will start to swell and develop a cotton-like appearance. Bud swell will continue until the buds begin to fold open as small leaves and a growing tip appears. Depending on weather, soil moisture and sunlight, the vines may begin growing slowly or rapidly. As soon as you can see a significant green color along the fruiting wood, budbreak has finished and the next phase begins.

Problems that might arise during budbreak include uneven budbreak throughout the vineyard, a few vines not waking up from dormancy and vines waking up too early in the spring, becoming vulnerable to frost. With good winter rainfall, irrigation probably won't be necessary. In drought conditions, apply 5 gallons per vine per week. (More for sandy soils, less for clay soils).

## **Early Shoot Growth and Fruit Emergence (Spring):**

Your vines have emerged from dormancy, and now the vines have a visible bounty of short green shoots. When the vines have an average shoot growth of a few inches (3–4"/7.6–10 cm), give them a good sulfur application. If you live in an area with strong mildew and rot pressure and the potential for hard frost in the early growing season, you may want to apply some copper as well.

You may notice that the young shoots are supporting small fruit structures. Make sure those little clusters get a good spray of sulfur too, for we want to keep them clean and mildew-free. Reapply sulfur every 7–14 days. Mildew grows most rapidly in warm, wet weather from between 70–80 °F (21–27 °C). Your vines may also be sprouting suckers. Suckers are green growing shoots that emerge from the trunk and base of the vine and draw resources that are meant for shoots that are bearing fruit. Knock the suckers off your vines with a decisive blow from a gloved finger.

You may also want to look for "water buds" which are swelling buds on the trunk and base of the vine that will develop into suckers. Knocking those off in the same "suckering pass" will save you another trip through the vineyard.

Spring is also the correct time to replace dead vines in your vineyard with dormant vines of the same type. Plant

the vines according to your nursery instructions making sure to mound some soft dirt over the scion wood so that it doesn't dry out. Remove the soil mound after the shoots begin to emerge from the soft soil. One problem that may arise during early shoot growth is frost damage, which copper sprays can protect, but if the weather gets into the high 20's (Fahrenheit or in the negative single digits in Celsius), damage will occur. Turning on the sprinklers will help before frost occurs, so watch your thermometers and local weather.

Mildew damage and botrytis on the shoot tips is also a problem. If shoot tips and fruit begin to brown and die, make sure to spray sulfur and copper on the new shoots every week or two to take care of mildew and rot. Early sprays help to control mildew later in the season.

Insect damage can cause some trouble in the vineyard as well. If something is eating those tasty new shoots, throw some sticky tape in your vineyard, catch the species that's munching the vines and ask a local nursery how to control the critters.

Some vineyards can suffer from a lack of water. If you had more than 20 inches (51 cm) of rain over the winter, watering is most likely unnecessary at this point. In drought conditions, 3–7 gallons (11–26 L) per plant is appropriate in most vineyards.

### Flowering, Fruit Set and Shatter (Late Spring):

After a few months of shoot growth, the small fruit clusters will shed their caps and tiny, white flowers will emerge to pollinate the grapes. This is a critical period for the vines. Warm weather and a lack of rain or extreme temperatures will help the fruit pollinate and "set" into viable grapes. There's a few things you can do to help your vines have a successful flowering period. Do not spray your vines while the caps are falling and while the flowers are visible. Spraying the flowers will hamper their ability to fertilize the grapes. (Think how unpleasant it would be if you were sprayed with sulfur while attempting to fertilize your mate.) Make sure the vines have enough water. Water-stressed vines may abandon some fruit. Applying a tiny bit of zinc fertilizer before bloom and fruit set may also help the vines



Budbreak is when green tissue emerges from the wood, which signals the beginning of the growing year. This stage is finished when you can see green color along the fruiting wood.



Flowering is when the vines' small white flowers emerge to pollinate the grapes. If flowering and fruit set is poor, you can experience "shatter," when the tiny pre-grapes are not "set."

"set" more fruit. Studies show that zinc can increase yield about 10% when applied pre-bloom.

Shatter is what happens in a year when flowering and fruit set is poor. After flowering, you can tap each cluster lightly with your finger, and you may see that some of the tiny pre-grapes might have shriveled, browned and eventually fallen off the cluster. These unfertilized grapes have "shattered." A few shattered grapes are normal on each cluster, but if more than 25% of your grapes do not

pollinate, you have had a poor set and yield will be adversely affected. There are several potential problems during this period, one being mildew and rot damage. Be careful to apply one last spray of sulfur or copper before bloom to keep the shoots clean during flowering.

Shatter itself can become a problem due to weather or poorly timed spraying if more than a quarter of your potential crop does not fertilize, shrivels and drops off the clusters. Slow and uneven growth where vines have either been



If pollination is successful, the next phase for the grapes is fruit set, which is when they become viable grapes. If the grapes are unfertilized, they will experience “shatter.”



During the fruit growth phase, the fruit starts to rapidly accumulate sugar and lose acidity. Red grapes will start to turn from a green color to a blackish purple. White grapes turn golden.

poorly watered, fertilized, or growth is uneven due to pest pressure or vine disease can also be a problem during this period. Other problems include rank growth (when too much water or fertilizer has been applied, or rootstock is too vigorous for your site) and shaded fruit, which can be prevented by removing enough leaves in the fruiting zone to expose the fruit to sun flecking and wind (after bloom when the fruit set is complete). An open canopy will keep the fruit healthy and maximize your sulfur applications.

Discover how many leaves can be removed without burning or raisining the fruit. The more leaf removal the better — unless you expose the fruit so much that it can burn of course. If rains persist (1–2 inches/2.5–5 cm per month), irrigation might not be necessary. If the soil has dried up, apply 3–7 gallons (11–6 L) to each vine per week.

### Fruit Growth and Berry Softening (Summer):

By the time summer rolls along, your vines should have a developed canopy of shoots and leaves. You have done your best to open up the canopy by tucking shoots into trellis wires to direct all vine growth upwards (vertically). Doing this keeps all the fruit at the same height on the trellis and you can remove a few more leaves and fruitless shoots in order to open up the canopy (and fruit zone) to air flow and sun flecking. Once your vines complete berry softening, mildew is less likely to grow on the clusters and sulfur spraying stops. If you see further evidence of mildew or rot, talk to your local nursery about non-sulfur fungicide sprays that will not negatively impact wine quality.

Berry softening will occur at this point, which means your fruit is rapidly

Discover how many leaves can be removed without burning or raisining the fruit. The more leaf removal the better — unless you expose the fruit so much that it can burn of course.



accumulating sugar and losing acidity. Red grape varieties start to turn from a green color to blackish purple. White grape varieties turn slightly golden and translucent. Birds will also notice this change and begin to flock around your vineyard. Deer, squirrels, raccoons, ostrich and other pests may arrive for a free meal as well. Use bird netting over your vines to help with your birds, and keep a dog out in the back yard to scare away larger mammal pests.

You may want to dust off your lab equipment at this point and start testing the fruit for sugar and pH when the entire vineyard has gone through berry softening. Powdery mildew cannot grow on grapes once the sugar gets up around 16–18 °Brix.

Uneven berry softening can be problematic if vines are of varying age and vigor. After 90% of the vineyard has changed color, it may be wise to cut off the remaining green crop and make the fruit more uniform in ripeness. Shriveling and unripe grapes could be the result of water stress or disease.

If mold or mildew problems persist, visit a nursery and find a non-sulfur fungicide, as ripening grapes can pick up sulfur through their skins and leave it in the wine. Remember to check your shoots' growing tips for water stress often. If the curly-looking tendrils extend beyond the growing tip, the water status is good.

If the tendrils pull back behind the growing tips, your vines are water stressed. Another visual cue for water stress is droopy leaves. If the angle of the leaf to its stem is less than 90 degrees, you may need to apply additional water. Water use should be curtailed beyond this point of the season to stop vegetative growth and promote fruit ripening. Cut water down to two-thirds of what you've been applying. A few gallons (~8 L) per plant, per week, is all they need if the summer is dry.

Understanding the seasonal rhythm of the vineyard is necessary for growing good winegrapes. Knowing what to expect in the vineyard, season by season, will allow you to observe the vines carefully and apply the needed materials and labor for keeping your vines healthy, clean and balanced. **WM**



When the entire vineyard has experienced grape softening and the fruit chemistry starts changing, start testing the fruit for sugar and pH. Powdery mildew can't grow once the sugar gets up to 16–18 °Brix.





# VINEYARD MAINTENANCE

# PRUNING YOUR BACKYARD VINEYARD

# P

Pruning grape vines during dormancy is a vital practice for keeping your vines in balance. Grape growers discovered thousands of years ago that cutting off up to 90 percent of the previous year's growth from a dormant vine will limit the crop and vegetative growth of the vine in the following season, increasing the quality of the wine made from the vineyard. Simply put, pruning promotes balanced vines for making good wine. The last thing we want as home winegrowers is to have a sprawling, unkempt monster vineyard in our backyard that hides fruit from sun and wind. Balanced vines depend on competent pruning, and it is my intention to offer the *WineMaker* readership the basic foundations and theories that govern this age-old vineyard practice.

Viticulturists stress that all successes or failures in any given growing season depend first and foremost on the success of pruning. Pruning is the foundation that supports (or ruins) the entire year's grape crop and wine. Why is pruning so vital for producing good winegrapes? What pruning options are available for backyard vineyardists? How much wood should you cut off the vine, and how much wood should remain for next year's growth? What are "spur pruning" and "cane pruning" and which is better for your vineyard? This article will familiarize the reader with the basic cultural practices of grapevine pruning.

Before we get down to the nuts and bolts of grapevine pruning, I have to offer a bit of practical advice to the backyard vine-warrior. I remember studying pruning at UC-Davis. We sat in



These vines require pruning. While still dormant, they must be trimmed back to limit the growth of new wood and the amount of grape clusters, both of which increase wine quality.



In cane pruning, you need to select canes growing from on or near the central trunk to grow along the wires. The best canes are at least pencil thick. Other canes should be pruned.

a classroom and discussed "canes" and "two-bud spurs." I listened carefully and took good notes. I copied diagrams that showed where cuts should be made and how the vines should look before and after pruning. Easy stuff, I thought! But when we were taken out into the student

vineyard, and the professor threw some "loppers" in my hands, I stalled. There is a profound difference between viticulture book learning and having what I call kinesthetic vineyard sense. You can study books all day, but still not know how much pressure will snap a dormant



In cane pruning, the wood that produced last year's fruit is cut off and removed from the wires. New shoots will replace this wood and the fruit will grow on them.



Here you can see the difference between a dead cane on the left and a live cane on the right. The dead cane has a brown center whereas you can see green on the live cane.

cane as you attempt to wrap it on a wire. Without knowing the level of expected vigor in your vineyard, it might be difficult to know how much wood to leave, and how much wood to cut off.

Confidence builds in the doing and this confidence will increase each year. Don't expect to be a perfect pruner by reading a single article.

In fact, the best advice I can give is

to volunteer to prune at a commercial vineyard. Work a half a day. Get some blisters and some "feel" for the task. Ask questions, pay attention and get dirty. Pruning is a lot like oil painting. You can study the Masters and visit museums, but it won't help you paint a masterpiece. For that you need to pick up a brush and a palette.

### Why Prune?

To understand why we prune, we must first understand that everything we do to a vine needs to be done not only for this year's growth, but also for the following years. Everything in viticulture happens in two-year cycles. For example, the fruitfulness of this year's crop was determined in spring of last year by the amount of sunlight that touched the "buds" on the shoots that grew into (hardened) canes. The amount of grapes a vine will produce is dictated by the previous year's pruning as well as weather conditions in the previous spring. Those shoots that grew last year are going to be used this year to produce fruit, either as spurs or canes.

Because of this two-year cycle, we want to make sure the vine gets lots of sunshine on its growing shoots. The more sun that hits those shoots and buds, the more fruitful our vines will be the following year. Cutting off most of the previous year's growth allows us to keep the vine from crowding itself and becoming a shade factory. We want an open, balanced vine that absorbs enough sun to renew fruitfulness for the following vintage and ripen a crop for the current vintage.

### Pruning Goals

Before we get into the specifics of pruning theory, let's take a moment to review the goals of grapevine pruning for wine production.

1. Give each growing shoot adequate space to allow sunlight to bathe the leaves and the developing buds. Growing shoots should not be crowded. Some viticulturists like to see a hand's width between each shoot. The key here is that the vine is not so cluttered with growing shoots that it keeps sunlight and wind from reaching the interior of the canopy.
2. Encourage air circulation inside the canopy and around the fruit. Humidity is the enemy here because it increases the incidence of mold, mildew and other diseases. Air flow is also important, as nested clusters and dense foliage will harbor insects and birds. If your kids can make a fort under your vines, that's a good sign that you didn't prune and trellis your vine well enough.

3. Pruning also allows the application of sprays (such as sulfur, copper and foliar fertilizer) to be much more efficient. Spraying an open canopy, where each growing shoot has a defined space in which to grow, allows penetration of those chemicals, requires less material to be sprayed, and often makes the application more effective and long-lasting.

4. Successful pruning leaves buds on the vine that will create canes and spurs for this year's fruit production, and (just as important) will provide buds intended to create replacement shoots for next year's pruning. Don't forget: When you prune, you're not only pruning for this year's fruit production, but also for subsequent years. This is more of an issue for cane-pruned systems but this concept should always be considered.

I am certain you noticed the basic theory — prevent crowding and shading of the canopy, which in turn prevents sunlight, air and chemical applications from reaching the fruit and interior canopy. This leads us to a simple conclusion: The aim of pruning is to spread out the dormant buds in a way that will allow the future shoots to grow in their own defined space. If you keep this in mind while you prune, there will be little chance of making a serious mistake.

### Pruning Theory

Now that we understand the bare-bones philosophy behind pruning, here are a few technical terms to know:

**Shoot:** A shoot is the current season's green growth on a vine. Each "bud" left on a dormant vine grows a shoot when the vine comes out of dormancy. Shoots become a "canopy" when more than half of the shoot becomes "woody." When completely tan and hardened, a shoot is called a cane.

**Cane:** As explained above, a cane is a mature shoot that has become hardened and tan. When pruning, we are cutting only the canes. Most pruning takes place between January and February in California, but can be attempted any time after the vine is completely dormant (no leaves, no growth). In general, make a few test cuts on a dormant cane.



Here, the author trims a cane along a wire. The number of buds retained along the cane depends on how much fruit you expect each vine to support.



The cut on the cane is done through a bud, so the end of the cane is thicker than the rest of cane (except where the other buds are located).

If the wound does not weep out watery fluid, you are ready to prune.

It is also important to finish pruning before the vine starts waking up, marked by swelling buds and emergence of green tissue (budbreak). A cane is also considered a "fruiting unit," if you retain it during pruning. If you use the "cane pruning" system, you will choose the best few canes to retain, cut the rest off, and wrap those canes (one each

direction) around a wire on your trellising system. These wrapped canes will then begin to sprout fruit-laden shoots from the buds in spring. These fruitful shoots will climb the trellis, produce leaves and a canopy to ripen the hanging clusters.

**Spur:** A spur is a "fruiting unit" just like a cane. By "fruiting unit" we mean a part of a cane grown last year that will



A twist tie affixes the cane to the wire. If the terminal cut was made through a bud, the tie should stay attached easily. New shoots will grow from the remaining buds.



When cane pruning is finished, this is what you are left with — a new cane trained along the wire and held in place by a twist tie. Next year, this cane will be removed from the wire.

be pruned, retained, sprout new shoots and grow fruit this year. A spur is basically a one-year-old cane (last year's growth) that has been cut back severely, usually so there are only one to two buds retained after pruning. A spur could be described as a cane cut back to a stub of a few inches in length, either on the head of the vine (in a cane-pruning system, to provide a place where new fruiting canes will grow for future vintages)

or on a permanent cordon arm where a number of evenly spaced "spurs" will be retained at pruning to provide buds for this year's fruit production. Make sure you know what a spur looks like before proceeding, because you will need to cut canes back to spurs in both the cane and spur systems of grapevine pruning.

**Bud:** During dormancy, buds are a rounded thorn-like protrusion that

appear at every "node" of the cane. A bud is actually considered an organ of the vine, and basically contains an undeveloped shoot tucked in under protective, overlapping "scales." The scales help keep next year's potential growth protected from winter frosts and hungry animals and pests. These scales become cotton-like and swollen in the weeks prior to budbreak. Interestingly, a bud can be dissected during winter and checked for fruitfulness. (Remember, the bud's fruitfulness was determined the year before!) Dissecting a number of dormant buds (primary buds) and viewing them under a microscope can help a viticulturist count how many grape clusters will be supported in each bud, and can actually be counted in order to approximate vineyard yield even before the vines have begun their year's growth. Buds (or the nodes that contain the buds) also have built-in backup systems. Each "node" of a cane usually contains an amazing four buds — a primary bud for the current season's growth, a lateral bud that can sprout that same year if conditions are correct, and a secondary and tertiary bud which usually stay dormant until the next year, when they burst forth, but usually aren't as fruitful as the primary bud. If one bud's shoot gets frosted, eaten or yanked off, it usually can grow another from the lateral bud or the secondary/tertiary buds if absolutely necessary. For our purposes, though, assume you will see only one shoot growing from each bud or node that you leave on the vine after pruning.

**Head:** The "head" of the vine is the top part of the vine's trunk, including the area that produces the cordon "arms" (in a spur-pruned system) or (in a cane-pruned system) the area where canes are retained as fruiting units, and spurs are left for producing the next year's canes. Simply put, the head is the top part of the vine's trunk where everything that goes out on a wire and produces canopy and fruit is attached.

**Permanent Cordon:** Some vineyards choose to use a system of pruning in which a cane is laid down on the fruiting wire and is kept there permanently, year after year, and allowed to grow into a

permanent, woody “arm” that supports spurs (fruiting units) up and down its length. In the simplest “cordon” systems, one arm extends from each side of the head (two arms in all), and the growth from the previous year is clipped off the top of the permanent arms (like giving the vine a buzz haircut) so all that remains are one to two buds (a 2” to 4” stub) on each spur that grows on the permanent cordon arm. It is easy to see the difference between a spur-pruned (cordon) system and a cane-pruned system if the vineyard is mature. If you see thick, woody arms extending from each side of the vine that are permanently attached to the trellis, that is a spur-pruned system, and after the vine is pruned you will see small spurs sticking up from the arm vertically every few inches along its length. A cane-pruned system will not have permanent cordon arms, but instead will have a new, one-year-old pencil-width cane laid down on the fruiting wire each year. To review: thick arms coming off the vine equals spur-pruned cordon system; new canes wrapped on the wires equals a cane-pruned system.

## Pruning Your Vineyard

Let’s get down to business and see if we can’t find a pruning system that is appropriate to your home vineyard. We’ll start by looking at the two most popular pruning styles, define them, describe them, go through a short “how-to” session, and then try to develop criteria so it’s easy to decide which system to try in your backyard.

### Cane Pruning

Cane pruning is a system that uses one-year-old canes (last year’s growth and only last year’s growth) as fruiting units for the current growing season. This means that the canes that produced fruit last year are always cut off the vine and new canes are chosen to be wound around the fruiting wires and tied down (at the end of the cane) with twist ties so they don’t slip from the weight of the growing shoots.

**How to do it:** The young vine (a single green shoot) is trained up the stake with loose bands of green vinyl tie-tape the



In spur pruning, after the first cane has produced fruit, it is retained. Canes from this “side arm” are then trimmed to provide even spacing and two buds on retained canes.



In spur pruning, each of the new canes (spurs) should be at least a hands-width apart. If they are not, prune them off. Fruiting will come from the buds on the spurs.

first year and usually “topped” after reaching about 30” in height or the height of the fruiting wire, which means the growing tip of the young vine is cut off to promote growth from the buds lower on the future vine trunk. All the buds on the lower part of the shoot or trunk are removed. (Leave at least the top three buds on the shoot to produce lateral shoots that will become the head

of the future vine.) As the vine matures and new canes grow from the developing “head” of the vine, two healthy canes are chosen each year as fruiting units, all the other canes are pruned off, and the retained canes are wound snugly around the fruiting wires and affixed with 5” paper-and-wire “twist ties” to keep the canes attached throughout the year. Remember to cut through the last bud

# There is no doubt that cane pruning requires a higher level of expertise than spur-pruning. Spur pruning is like giving a haircut. Cane pruning is like performing surgery.

on the cane, which will make a “bulge” at the cut node. This bulge will keep the cane from slipping off the wire where it’s affixed with a twist-tie. When I am cane pruning a vine, I look at the whole vine’s growth before I decide where to start cutting. I usually use a vine lopper (large pruning shears) to first cut off last year’s fruiting units right at the head, which will also remove most of the canes that produced fruit in the previous vintage.

After extricating the wood from the trellis, take a look at the canes that remain. You should have three to five canes coming from the spurs you left on the head last year. These are your choices for fruiting units this year, but you only need two canes, one for each side of the fruiting wire. This is vital. Use your imagination and try to decide which of the canes was positioned to receive the best sunlight exposure during last year’s season. You also want to choose a cane that is as thick as a pencil, but not thicker than twice a pencil’s width. If the cane gets small and brittle near the end, make sure to cut it back so it has at least a pencil’s width and there’s green color in the tissue inside. “Bull canes,” or extra-thick, even oval-shaped canes, are less fruitful than pencil-width or slightly thicker canes.

After you have chosen the best two canes for the job and tied them to the fruiting wires — I take into account how easy it will be to bend the cane onto the wire without breaking it — cut the other canes off the vine, but leave two small (two-bud) spurs on the head of the vine to produce next year’s fruiting canes. Again, it is advisable to wrap and twist-tie the end of the canes to your fruiting wire before cutting off the other “extra” canes on the head. This way if you break a cane, you still have a backup or two to use. Wrap the canes fairly tightly around the wire and make sure your twist-tie is secure enough to keep the whole cane

(and the future substantial weight of an entire growing canopy) secure for an entire growing season. Poor wrapping and tying will make the entire cane (often full of shoots and fruit) flop to the ground. The number of “buds” that will be retained on the fruiting canes will determine your crop level.

Generally, the more buds you leave, the more fruit you will get. Some vineyards even wrap two canes each way on the wires to produce more fruit, but this seriously increases canopy density, and may not be advisable.

In general, use as much cane as is necessary to fill the fruiting wire that stretches between the vines. For example, at 6’ (1.8 m) spacing between vines, each fruiting cane should be 3’ (0.91 m) long, so it comes near to touching the 3’ (0.91 m) fruiting cane coming off the adjacent vine.

**Pros:** Fresh canes (new one-year-old wood as fruiting units each year) are believed to grow higher-quality fruit in some varieties than a permanent cordon arm and spurs. Most of the Grand Cru Burgundian vineyards (Pinot Noir and Chardonnay) adamantly follow a philosophy that cane pruning makes superior wine, but during my last visit I saw a famous Grand Cru vineyard that is spur pruned with one arm.

Cane pruning also has the benefit of removing most old wood each year, which lessens the chance of developing disease or burrowing insects in the cordon arms. It is also a preferable system for low-vigor vines that might not be able to support the higher number of retained buds in a spur system.

**Cons:** There is no doubt that cane pruning requires a higher level of expertise than spur-pruning. Spur pruning is like giving a haircut. Cane pruning is like performing surgery.

To successfully cane prune a vine, the pruner must carefully consider which canes stay and which canes are removed. Cane pruning is certainly more involved and time-consuming. Another consideration is that the vine may have an imbalance of clusters at the end of the canes and at the head of the vine, and a hole where there is little fruit in the middle of each cane. Spur-pruned vineyards may spread out the canopy more evenly than cane-pruned vines, as the spurs are evenly spread out and seem to have a more uniform growth pattern.

## Spur Pruning (Cordon):

The initial process of developing a spur-pruned vineyard is exactly like a cane-pruned vineyard. Both require a trellising system with a stake in which the vine can be trained up (the first green shoot lashed loosely to the stake with half-inch green vinyl tie-tape as it climbs), and at least one wire (usually between 30” and 40”/0.76 and 1.0 m above the vineyard floor) that will support the permanent cordon arms.

Train the vine up the stake the first year and top it at the wire, after it has grown 6–9” (15–23 cm) past the wire. Let the vine push some lateral shoots near the “head” the second year (the vine may want to push lateral shoots the first year with high-vigor soils or varieties, which is fine) and use the best two canes during the second pruning.

Wrap and attach them to the wires as if you were using a cane-pruned system. The difference is in the third pruning: Instead of removing the canes and replacing them with new ones, just cut all last year’s growth on the arms back to two-bud spurs. Space these spurs out at least five to six inches (13–15 cm) to make sure you don’t crowd the future shoots. Clean the head of the vine of all growth — leave no buds or spurs on



the head. You need no “renewal zone” on the head (like in the cane system) to produce canes for subsequent years, because all renewal happens on the cordon arms. That’s it! You’re done! The arms stay there and grow woody and thick, and you continue to cut back the previous year’s growth to two-bud spurs each year during pruning.

**Pros:** Ease of pruning. Training pruners is quite easy, and the skill can be learned and mastered in little time. Big tree-like vines with permanent cordon arms look cool in your vineyard. More vigorous varieties, such as Syrah, Cabernet, Sauvignon Blanc like to be spur pruned. You can leave more buds on the plant, and it can produce a little more fruit and vigor than cane-pruned vines. Spur pruning is recommended for most home vineyards, and is perfectly suited for vines that are trellised on fences or walls.

**Cons:** In cool sites, spur-pruned fruiting wood tends to be less fruitful than fresh canes. More permanent wood (cordon arms) may mean more habitat for burrowing insects and vine pests to make a permanent home.

### Other Pruning Styles:

Without getting too technical, we should mention two more pruning styles that are popular, but not used as often as the systems described above.

I will give simple definitions, but not pruning instructions. You should be able to find more information about these pruning styles through the Internet or any viticulture text.

**Head pruning:** Popular in California Zinfandel vineyards of the early and mid 20<sup>th</sup> Century (and still in practice in some vineyards today in the Rhône, Greece, and other parts of Europe), head pruning requires no trellis. The vine uses a short, stout trunk as its own support system (a single stake is sometimes used as well). The pruning of mature head-trained vines encourages the shoots to grow up and flop out, so the fruiting area is in the shape of a hollow basket inside the “hollow” of the grapevine’s center. This allows some sunlight to enter the vine from the top and fleck

the fruit. I’m not a big fan of this type of pruning in my neck of the woods, although it does make world-class wines in the Rhône, where the vines are small and stunted enough not to have too much canopy or crop load.

Head pruning does have the advantage of low start-up costs for those on a budget, and has been used successfully in many backyard vineyards with limited or oddly shaped landscaping areas. The benefit of having minimal or no trellising may offset the lack of control the grower has in manipulating the canopy as it grows, as is possible with more elaborate trellising systems.

To train a young vine to a head-pruned system, start the same way as spur- and cane-pruned vines. I recommend starting with a smaller training stake (“pencil-rod” or even treated bamboo will work, as the stake will become unnecessary when the vine’s trunk is of ample diameter to support itself), and as the vine grows, choose the sturdiest single shoot and train it up the stake with loose bands of green vinyl tie-tape.

Top the vine, choose three to four lateral shoots that grow near the top of the vine and prune those back to spurs during winter pruning. In the next season’s pruning, split the spur positions so they have two spurs coming out instead of one, and as the vine matures, try to space the spurs so they are distributed evenly in a circular fashion around the head of the vine. (This is often described as pruning to make a hollow “bowl” in the center of the vine, which will be where the fruit is cradled, and sunlight can reach the clusters).

**Minimal Pruning:** Minimal pruning is gaining a foothold in areas of Australia and the Central Valley of California where most vineyard labor is mechanized. I do not recommend it for backyard vineyards.

The idea is that the vine will regulate its own growth when left to its own devices. Some minimal pruning is done with tractor-mounted devices with saws, and the cost per acre to accomplish this task is, as the name suggests, minimal. The vines will have more fruit than conventionally pruned vines, but studies have shown that the “architecture” of

the vine will become somewhat standard after many years. Minimal pruning is the worst choice for a backyard vineyard, but it illustrates that a vine will respond to whatever system of pruning you use.

### And in Conclusion...

Grapevines require pruning during dormancy to produce high-quality grapes. Prune your vines after leaf fall and before budswell. Choose a pruning system that matches the vigor of your vineyard and the varieties you grow. Seek out pruning experts in your hometown and ask if you can assist in pruning (make mistakes in someone else’s vineyard!).

Low-vigor sites and varieties (Pinot Noir, Chardonnay and even Cabernet in cool areas) may do better with a cane-pruned system in which new canes are selected, wound and affixed to the trellis wire each year. Cane-pruning requires expertise, and it is suggested you spend some time in the field with skilled pruners before attempting it.

Medium to high-vigor vineyards (in warmer areas) and varieties such as Sauvignon Blanc (warm climate) Merlot, Grenache and Syrah are usually suited to a spur-pruned system, which offers ease of pruning and a classical vineyard look.

A cane-pruned vine uses new canes each year, while a spur-trained vine uses permanent “arms” with spurs jutting out of the top every few inches, in a regular pattern. Experts disagree which system produces consistently better fruit, and I might argue that matching the system to your site will result in the best solution.

Other systems, such as head-trained or minimally-pruned vines, show us that there are always alternatives to the more popular systems of pruning, and that grapevines — regardless of how they are pruned — will thrive and produce good fruit as long as each shoot has room to grow, soak up the sun, and have fresh air circulating around them.

Of vineyard practices that you must do every year, pruning has the most influence on your grapevines. Pruning determines not only how this year’s vintage will do, but also the next year’s. After a few years of practical experience, vineyard pruning will become second nature. **WMM**

# WEEDING THE VINE ROWS



# E

Even though the subjects of weed removal and watering the vineyard may not seem thrilling subject matter on the surface, you may be surprised to find out just how important they are to maintaining a successful, producing vineyard. While weed removal is fairly straight forward (get the weeds out to reduce competition, either by tools or herbicide), watering is one of those subjects where consultants rarely give precise answers. I hope to give specific watering suggestions for the “average vineyard,” and teach you how to assess watering needs using seasonal rainfall, a few simple tools, and a basic understanding of how many gallons per week the vines may need in dry soil conditions. And, as strange as it may seem to put weeding and watering together in a single article, we will soon see that there is a relationship between the two.

## Part I: Why Weed?

This question bears contemplation,

because both hand hoeing and or herbicide applications are serious matters. There are times in the growing year where it is vitally important to keep weed pressure down, and there are times when it may not be so important.

Vineyard managers agree that a 2 to 5-foot (0.6 to 1.5-meter) strip of clean earth under the vine row makes for a tidy vineyard that thrives. This can be accomplished a number of ways.

**Hoeing:** Why go to the gym when you can get your exercise in the backyard? Or isn't there a spoiled 16 year-old in the neighborhood that needs some \$5/hour hoeing experience to build his or her character? Most backyard vineyards can be hoed out in an afternoon or two, and the benefits to the vineyard are definitely worth the effort.

Besides getting you off the couch, hoeing will break the soil up, increase irrigation penetration and mix organic matter into the soil where the vines are growing. One of my favorite old-world sayings is: “Tickle the Earth with a hoe and she will laugh with a harvest.”

**Mechanical removal:** A weed-whacker or a small gas-powered tiller will work, but only to a point. The weed-whacker can and will damage the trunk of the vines and could easily cut through a young vine. The gas-powered tilling machines are basically useless, I've found, as they are very light and do not generally dig into the soil deep enough

to make a difference. I find that hoeing is less work than trying to wrangle a hand-held tiller in the vine row. Tractor-mounted machines that remove weeds from the vine row are generally too large and expensive for home use. Using the lawnmower between rows works very well, and you can even try to clean up around the vines with it, but removing the weed at root-level is the only way to stop the cycle of regrowth.

**Flaming:** Flaming your weeds may be a good solution for home vineyards. Agricultural weed-burners (aka flame-throwers) are legal in most areas, but NEVER use them in dry months. They are meant to be used on green, live weeds, and generally have no effect on mature vines when used properly. Obviously, flaming weeds needs to be done according to local laws and the manufacturer's instructions. Make sure not to leave the flaming unit where kids might find it and invent daring games. (“Billy, stop chasing your sister with daddy's flamethrower!”).

**Herbicide:** Several herbicides can do an excellent job when used correctly. But if it is applied to a growing vine, it will do the same thing to a vine as it does to a weed. Knocking down weeds during dormancy is how most herbicides should be used. I suggest not using contact herbicide while the grapevine has leaves.

**Livestock:** Sheep and goats do an excellent job of eating winter weeds, but just like herbicide, they are best used in dormancy, as vine leaves are very, very tasty.

Keeping a clean vineyard during the vine's early years will help them grow strong and healthy. Keeping a clean vineyard floor in a mature vineyard will keep pests away, reduce mildew or rot and makes for a backyard vineyard that's a joy to look at.

**Part II:  
How to Water a Vineyard**  
Irrigation is a modern blessing for vineyards. One reason why European wines vary so much from vintage to vintage is that many of the most vaunted wine regions in the world do not allow mature vineyards to be irrigated. In this way, the vines are wholly dependent

on the soil profile being fully charged by winter rains and then they also need supplemental rainfall in the growing season for the vines to bring in a ripe crop.

Irrigation is probably the most important tool we have for manipulating the vine's vigor and cycle so that it creates the style of wine that we desire.

In some regions, like most of California, wine production would be impossible without supplemental irrigation. Other regions, such as the Willamette Valley of Oregon, generally receive enough rainfall throughout the year to produce superior winegrapes without supplemental irrigation. If you live in an area that gets around 20 inches (~50 cm) or more of winter rainfall, and an additional 10–20 inches (~25–50 cm) from April to October, your vines may not need a watering system at all. Clean rainwater is superior to irrigation (ground) water, so if you can grow a vineyard without irrigation, you can plan on cutting your installation bill by about 50%.

After ten years of managing my family's vineyard in the Santa Rita Hills of Santa Barbara County, California, I couldn't imagine farming winegrapes without using irrigation as a tool.

The question then becomes: How is irrigation a tool in the vineyard and what should I know about watering?

**Deficit irrigation:** There are times when having little or no water in the soil can increase wine quality. Drying the soil out as the crop finishes flowering and set has proven to minimize berry size, which can increase a wine's color and concentration (less juice and more skin in the fermenter). Soil dryness before veraison (or berry softening), will tell the vine to stop its vegetative growth cycle (focusing nutrients on shoots and leaves) and focus on ripening the crop.

In a vineyard with excessive growth (vigor), allowing the soil to dry out early in the spring, as the vine comes out of dormancy, will keep the vine from producing rank growth.

And, of course, turning the water off the last few days (and weeks) before harvest will likely hasten ripening. Be careful with turning the water off too early, though. A vine without green leaves will not evolve the true ripeness of the fruit, it will only dehydrate.



**Leaching salts:** Unless your irrigation water has salinity issues, it is important to flush the vines' roots with deep irrigations, especially during drought periods. Heavy winter rains are needed yearly to flush all the accumulating salts away from the roots, where they can attach and stifle a vine's growth.

**Testing:** Before applying water to your young vines, have your water tested at an agricultural laboratory to make sure it's suitable for irrigation.

**Limit:** Never apply more water than can be totally absorbed by the soil within 48 hours.

**Timing:** In dry areas where vines are dependent on irrigation, use 3-5 gallons (11-19 L) per plant per week as a starting point. March through May, 2-3 gallons (8-11 L) should be plenty — or none if you received good winter rains. June through August may need 3-7 gallons (11-27 L) per week. Reduce the irrigation as harvest nears, but keep the vines viable, with leaves healthy enough to mature a crop. Dump 10-20 gallons (38-76 L) on each plant immediately

after harvesting the vines. Vines go through a rapid period of root growth after harvest.

**Real-time moisture:** You can measure real-time soil moisture by digging a hole with a shovel, using an irrometer or a soil probe from a farm supply store, or watching the relationship between the growing tips of the vines and the tendrils (curly growths that grab onto the trellis wires) next to the growing tip. A vine that has tendrils that stick out farther than the growing tip is generally considered to have ample water. As the tendrils pull back even with the growing tip, the vine is beginning to undergo some water stress.

**Sprinklers:** Overhead sprinklers that soak the vines are generally not a wise system for vineyard watering. They increase mildew pressure, rot pressure and less of the water makes it to the vines' roots. Much of the water can evaporate or cause extra weed growth in the middle of the vine row. Note: Weeds use irrigation too. If you have drip emitters, you will notice that weed growth will increase. **wmm**

# INSECTS, VIRAL & FUNGAL DISEASES

a description of some diseases and their basic effects on vines. The photographs throughout the next few pages should help you visualize the common symptoms. Again, I'd like to make it clear that treating a potential vineyard disease after reading a descriptive article on the subject is not a recommended practice.

Paying a university-trained vineyardist to assess your vines will almost always save you time, labor, and money, even if your vineyard is believed to be disease- and pest-free.

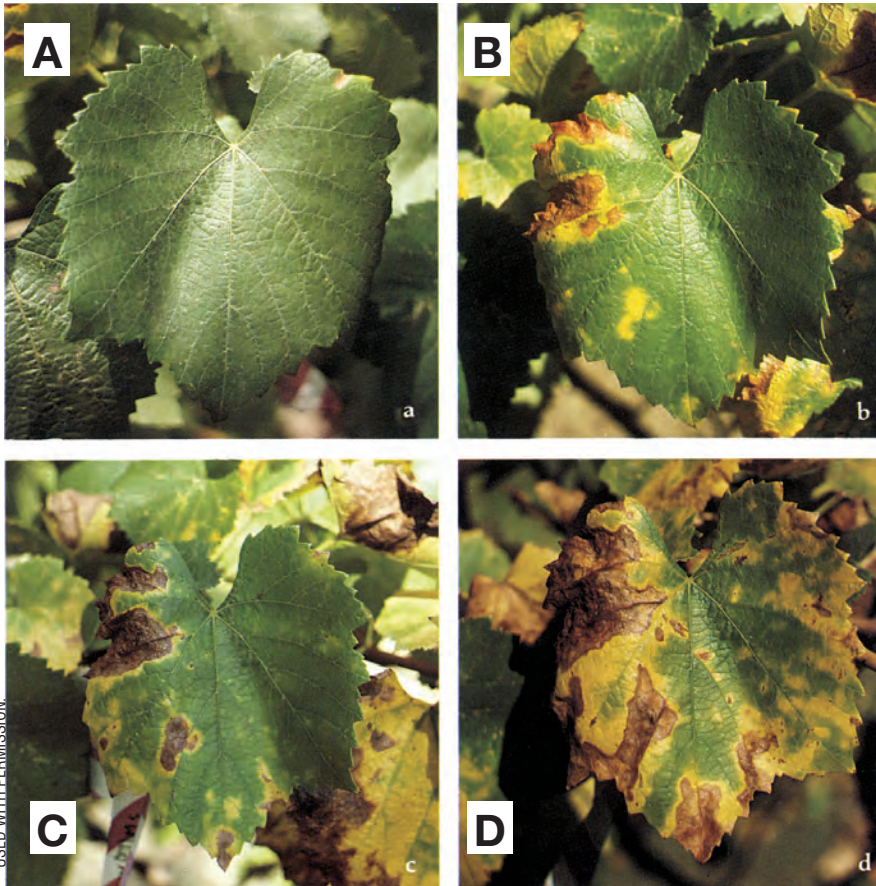
This is certainly not a complete list of diseases. A more complete list, with photographs, that no viticulturist should be without, can be found in the UC Davis "bible." This is "Grape Pest Management," a textbook compiled by the University of California at Davis in 1992. To locate a copy at the UC Davis bookstore online, go to [www.ucdbookstore.ucdavis.edu](http://www.ucdbookstore.ucdavis.edu) (email: [textbooks@ucdavis.edu](mailto:textbooks@ucdavis.edu)) or call customer service at (530) 752-2707.

## Insect-Borne Diseases

Insect-borne diseases are actually fairly easy to understand. Pierce's disease, for instance, is caused by a bug infiltrating a vineyard and spreading disease from vine to vine during feeding. A leafhopper, snail, or wasp can contaminate a plant while feeding directly on the vine's fruit or leaf tissue. In the case of the mealybug, the insect can destroy the sanitation of the fruit by depositing residue or excrement.

There are two common options for treatment that viticulturists regularly use. The first is the best solution to any problem — prevention. Keep the pests out of your vineyard to begin with using traps, barriers such as a mesh fence, or chemical control agents (such as insecticides, oils or soaps).

The second option is based on organic and biodynamic methods. This treatment is a bit more involved, and arguably more risky. Planting cover-crops and allowing for a great deal of biological diversity in your backyard vineyard will attract a number of hungry insects. Those insects, it is believed, will be in a constant battle of eat-or-be-eaten with other insects, and (if the theory holds true) will keep any single insect species from "taking over" a vineyard. My suggestion is that you focus your



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Notice the progression of Pierce's disease (a-d). The infection of a leaf or vine can be noticed in a small area, and will spread as shown. Eventually PD will scorch the entire plant (photo d).



In this article, we'll take a look at vineyard diseases. It is not intended to teach everyone all there is to know about spotting a disease, diagnosing it, and solving the problem. Instead, I hope this will serve as a short primer, describing a few diseases that show up in vineyards. Also,

this article should get you some of the necessary tools for spotting a problem, and finding a professional to confirm your suspicion. This professional should ultimately help you find a permanent solution. The best way to become familiar with these diseases is to actually see them in the field (or on the vine). Make it a point to observe a professional viticulturist in the process of diagnosing the problem, and participating in the course of treatment. Volunteering to help a local viticulturist walk his or her fields is a very insightful experience.

Without the benefit of a personal "vineyard disease tour," I hope to supplement the readership's knowledge with

attention on creating insect diversity in the vineyard, and if that doesn't work, spray the hell out of those buggers. Remember that spraying will also destroy beneficial insects, which I like to avoid unless dire circumstances prevail. But, when things get dire, I suggest doing what is necessary (and what technology allows) — destroy the pests and make some wine.

### Pierce's Disease

Pierce's disease is named after N.B. Pierce, who studied the bacterial disease in grapevines as it decimated much of the California grape industry in the first half of the Twentieth Century. The good news is that the insects that carry *Xylella fastidiosa* (and the bacterium itself) cannot survive the cold winters of the Midwest and northern states. The disease, therefore, is only prevalent in areas with mild winters, along the southern portion of the country from Florida to California. Pierce's disease, or "PD," is the greatest threat to *vinifera* (grapes of European variety) in the southern regions of America.

The disease is most commonly spread by small insects known as sharpshooters. The new "superbug" that threatens California viticulture is the glassy-winged sharpshooter (GWSS), which can fly three times as high as the more common blue-green sharpshooter. In general, the blue-green sharpshooter cannot fly over six feet, but the GWSS can fly as high as twenty feet.

All sharpshooters spread PD the same way. There are "host" plants that can keep the PD bacteria alive. These include blackberry, willow, coyote bush, elderberry and others. A sharpshooter feeds on these "host" plants, gets the PD bacteria into its mouthparts, and then injects those infected mouthparts into the grapevine's tender tissues to feed (suck xylem fluid). The populations of sharpshooters grow quickly with the unlimited food source of a vineyard, and hop from vine to vine, spreading the bacterium. Often, as the rest of the landscape browns in summer, irrigated vineyards stay green. This makes them an obvious target for sharpshooters, who survive by consuming massive quantities of plant fluid. Sharpshooters like to live in wet areas near rivers and in ornamental landscapes (those that are irrigated).



The mealybug produces a "honeydew" excretion and leaves a cottony egg mass on grapes and vines. Left: mealybugs on grapes. Right: Close-up of crawlers and honeydew.

It is common to see the symptoms of PD infecting the edges of a vineyard that abuts a riparian habitat (a river).

The PD bacteria clog the flow of liquids within the grapevine, and can eventually kill it. The progression of the disease is fairly slow, often taking a few years to render the vine useless. Leaves take on a scorched, dry appearance and will appear uneven and stunted in sections. Late in the season, you may see leaf blades falling off the petioles. (The leaf stems remain on the vines without the leaf.)

The easiest symptom to recognize may be the uneven ripening of the wood — islands of brown hardened cane wood surrounded by green unripened wood. Like most bacteria, PD prefers warm climates, and the progression of the disease will be hastened by warm weather. Sharpshooters will also breed faster in warm weather, increasing populations and the speed in which they can transmit the disease. Besides some experimental injections of antibiotics with surgical screws, there presently is no cure for Pierce's disease. Replanting in an area that is infested with sharpshooters and host plants may not be wise either. Unless you are comfortable with replanting every five years, it is generally suggested that *Vitis vinifera* vineyards are not viable in areas with large populations of PD-bearing insects.

Temecula, California has done an admirable job as an industry to stay alive in the midst of a serious sharpshooter infestation. Viticulturists there use a combination of strong spray programs and plant citrus fruits, the favored host of the GWSS, at the perimeter of their

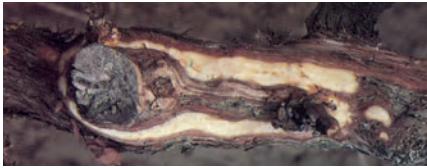
vines to attract the insects. In the mornings, when the populations of these insects is at its highest, vineyardists spray the citrus trees.

In general though, fighting Pierce's disease (if it is prevalent in your locale) in a *Vitis vinifera* vineyard is a fight you are likely to lose. It should be stressed that there are hybrid varieties of grapevines that are resistant to Pierce's disease. If you live in a PD hot spot, check with a knowledgeable grapevine nursery and discuss your options for growing a resistant type of hybrid grapevine for wine production.

### Vine Mealybug

The vine mealybug produces a "honeydew" excretion and leaves a cottony egg mass on grapes and vine trunks or cordons, making them less attractive for winemaking. The signs that could suggest a mealybug infection are many and include: an increase in ant activity, a visual confirmation of mealybugs on the vines, white spots of honeydew, cottony "ovisacs," or the characteristic black, sooty mold that will begin to grow on the honeydew. If you are seeing honeydew from vine mealybugs on more than 2% of your fruit, you should consider some kind of control program to reduce populations early in the growing season. California is seeing an increase in the population of these pests in recent years, and has been pouring money into research. However, because the mealybug seems to be an isolated problem, I won't go into too much detail here.

Mealybugs can be controlled with chemical sprays such as "Applaud" which use a nicotine-like compound.



Eutypa is a canker-type fungal disease that spreads through fresh pruning wounds. Wind-driven rain disperses the spores to fresh wounds. Above: Leaves look tattered and scorched. Below: Canker near pruning wound.



Black measles show up as small, round, dark spots on the skin of the grapes. Berries can also crack and shrivel, or, in severe cases, dry up or rot. It's believed to be a fungal disease that enters the vine through pruning wounds.

There is also a newly available pheromone that is being used to cause mating disruption. When sprayed, the males can't find the females, because the hormone smell is everywhere in the vineyard.

As noted earlier, vineyards containing mealybugs can see marked increases of ants, including fire ants. These ants protect mealybugs from their natural enemies in exchange for honeydew. The best way for home gardeners or commercial growers to reduce mealybug numbers is to rid the area of ants. This can be done with baits, so the vines do not have to be sprayed. In a home vineyard, one bait station per vine (if mealybugs are present) would probably do the trick. Commercially, the recommenda-

tion is a scoop of bait per vine.

There are plenty of other insects and pests that will eat grapevine leaves and cause vine damage. Leafhoppers, mites, snails, ants, bees, wasps and other species can cause damage to leaves and ripening fruit. If your vines are being eaten by insects, do your best to control the populations early in the season. Once the vines are inundated by insect pests, control will be more difficult. You may want to use some sticky traps in the spring to monitor the insect species in your backyard vineyard.

Leafhoppers and mites will, in most parts of the U.S. where grapes are grown, be your biggest enemy as far as insects are concerned. Low populations (a number that does not result in your vines being eaten alive) will not threaten your vines or crop.

If you see threatening numbers of leafhoppers or notice mite damage on your vines, try spraying a common insecticidal soap or oil to the vines. As

When it comes to grapevine diseases, powdery mildew and bunch rot are like the flu and the common cold: plan on dealing with them on a yearly basis.

always with insecticides, make sure to wait a week to 10 days after a sulfur application to make sure you do not disrupt the efficacy of your mildew-con-

trol program.

## Fungal Diseases

Fungal diseases are commonly spread through the wounds made on the vines during the process of pruning. If you are concerned about fungal diseases, or live in an area where rain is common at pruning time, you may want to ask your local viticulturist where you can procure some "pruning paint" to sanitize the wounds. This will minimize the risk of fungi entering the vines through the wounds.

## Powdery Mildew

With no control, powdery mildew is the one fungal disease you can expect to appear on your vines. The mildew appears as powdery white or grey mildew on the bottom of leaves or on the clusters. Often a mildew infection will start where two clusters are touching, or on clusters deep within a vigorous portion of the canopy.

Temperature and humidity play a major role in mildew development. The fungus grows best in conditions of high humidity between 70–86 °F (21–30 °C). Temperatures above 95 °F (35 °C) will kill mildew colonies, and if the temperatures in your vineyard exceed 95 °F (35 °C) for more than 12 hours, expect that the mildew has been destroyed. For control, start applying fungicide (usually sulfur) on a regular schedule, and watch the bottoms of the leaves carefully for signs of mildew infection. Reapply after rains. side of young, soft leaf and shoot tissue.

## Bunch Rot

Bunch rot, unlike powdery mildew infections, is more common at the end of the season. This is when the grapes are ripening, the weather is warm and conditions are correct for the *Botrytis cinerea*, *Penicillium* or *Aspergillus* to begin growing on soft fruit. Bunch rot usually appears initially as a discoloration of the grapes, and is most obvious on white varieties. Established bunch rot will start to give a fuzzy grey or blue appearance as the fungus begins to permeate the grape skin. Optimal temperature for *Botrytis* fungal growth is 72° F (22 °C). If you have problems with bunch rot, using control in the early part of the sea-

son will help greatly later on. There are also grape varieties that are somewhat resistant to bunch rot. When it comes to grapevine diseases, powdery mildew and bunch rot are like the flu and the common cold: plan on dealing with them on a yearly basis. But, they also fairly easy to control with if your canopy is open and you keep a regular spraying schedule.

### Eutypa Dieback

Eutypa is a canker-type fungal disease that spreads through fresh pruning wounds. Rain is usually the culprit — spreading the spores of the fungus by splashing them from vine to vine, where they enter the vine through the pruning cuts. Symptoms usually appear as cankers (which look like darkened, dead wood that surrounds an old pruning wound) on the spur nearest the initial infection, and moves through the vine until an entire cordon arm or trunk is infected. The canker also spreads within the vine's woody tissues. If you cut through an infected vine's trunk or cordon arm, you will notice that only a small strip of live vine is present inside.

There are a few cultural practices that will reduce the chance of your vines becoming infected with Eutypa. Try not to prune when rainfall is expected. This is easier said than done, as pruning is often done in the winter, when rain is common. If possible, make pruning cuts in dry weather, and paint the wounds with pruning wound compound, such as "benomyl paint." Of course, most home vineyardists won't have access to benomyl paint, so it is suggested that you treat pruning wounds with a quick spray of Lysol or a paste of laundry detergent, being careful not to touch the dormant buds with these materials. If you notice that your vines are developing the characteristic "deadwood" Eutypa cankers around old pruning wounds, it's time to break out the saw and do some vine surgery. The key is to remove only the affected wood, and to stop where you hit healthy tissue (that is not dark and "dead looking"). If the vine has been infected to the point where there is no healthy wood left above the head, you can cut the vine back to a short trunk, and train a sucker from near the bottom of the vine as the new trunk.

### Black Measles

The characteristic "measle" spots that develop on mature fruit of the infected vines give this disease its name. It is believed that black measles is a fungal disease that enters a vine through pruning wounds, so the same type of precautions used for Eutypa should be helpful in preventing black measles.

When infected, the maturing grapes on a vine will show a characteristic dark spotting, each spot surrounded by a brownish or purplish ring. The leaves of a vine infected with black measles also take on a very noticeable scorched pattern, which is usually most evident in July and August. Treatment is difficult and fairly dangerous. Reports indicate that treating pruning wounds with sodium arsenite can provide control in an already infected plant, but it is a dangerous chemical and may also leave residue that can affect wine quality and safety. It is strongly suggested that this chemical be avoided. If your vines become infected with black measles, remove the affected vines and replant.

### Viral Diseases

One amazing aspect of the grapevine is the ease with which a vine can be propagated. There aren't many plants that you can cut during dormancy, shove a cutting in the soil, and have a decent chance of it growing into a new vine. The problem with grapevine cultivation is that it is so easy, and that the genetic "code" of the mother vine is replicated exactly in the new plant propagated. That means that any virus contained within the "mother plant" will also be in the propagated plant. Many grapevine nurseries are not as careful as they should be in locating "certified" or "clean" wood for creating new grapevines. A virus in grapevines is generally a nursery issue. (Note: Fanleaf degeneration should be considered an exception to this rule, because nematodes spread the disease between infected and unaffected vines alike.) If you buy "certified" grapevine materials from a well-respected nursery, you should have little or no troubles from virus during the life of your vineyard. I cannot stress how important it is to buy clean material. The cost of clean materials is inconsequential next to the



Leafroll is a progressive viral disease that slows, and eventually stops, the maturation of the fruit. In the above photo, a healthy bunch of Cabernet grapes (left) is compared to a stunted bunch from a vine afflicted with leafroll (right).

cost of having to rip out and replant a virused vineyard. I will also mention in passing that there are those viticulturists and winemakers that believe a "little virus" in the vineyard (whatever that means) may slow vigor and result in a smaller crop with more varietal intensity. There are plenty of ways to slow vigor and thin the crop to a balanced level without having to rely on a virus. If a virused vineyard is still attractive to you after reading this article, I have failed in my duty as your vineyard tutor.

Remember that a virus cannot be removed from grapevines by any means. A cutting that is infected will produce a vine that is infected. There's nothing you can do besides yanking the vine out and starting again with clean, certified nursery stock. Diseases caused by viruses that are not described here include rуп-pestis stem pitting and corky bark. As is the case with preventing all grapevine viruses, the key is to use clean (certified) materials when planting your vineyard.

### Leafroll

This is a viral disease that will result in reduced yield. The reduction in yield is

# Ten Signs of a Healthy Vineyard

This list has been ordered by my own view of importance. I started with twenty five aspects of vineyard management, whittled the list down to ten, and then ranked them personally: #1 being most important.

## 10. Organized vineyard floor

If your vineyard is in a frost-prone area take it down to bare soil. You should also keep the vine row absolutely clean in young vineyards, say 1–3 years old. At this age the weeds and grasses will compete for nutrients with the young vine. This becomes less of a problem when the vineyard is mature and has deeper roots. A little weed growth in the vine row doesn't bother me at all in a producing vineyard at least 3–5 years old. The top few feet of soil mean little to the vines, and as long as no weeds are intruding into the growing parts of the vine, you should be OK.

## 9. Petiole angles

A petiole is a leaf stem on a grapevine — what attaches the leaf blade to the shoot. Vines that have plenty of water available to them generally have a nearly 90 degree angle because the pressure of the fluids within the petiole creates firmness or turgidity. When water status starts to become deficient (the vine is drying out), turgidity is lost, the leaf blade begins to droop and the angle shrinks.

## 8. Diversity in the vineyard habitat

The easiest way to explain vineyard diversity is this: if there are enough bugs and critters busy eating each other, they have no time to threaten your vines. Hawk/falcon perches, low-impact sprays that do not kill beneficial insect populations, and foregoing herbicide to promote soil microbial health are all examples.

## 7. Leaf to cluster ratio

Count every leaf and every cluster on each vine. Make an average (we use 100 vines, but that may be overkill), and find your average ratio of leaves to clusters. Your target is 12–15 leaves for every cluster, and the

closer each vine gets to the same ratio, the more uniform your ripening will be

## 6. Informed pruning

Pruning is not a skill you can master by reading about it. There's really only one way to learn: volunteer for a day at a local vineyard and learn on their vines instead of your own (not my vines, though!). Choose a facility that produces your favorite local wines and has a crew chief that has expertise and is willing to mentor.

## 5. Efficient canopy management

10% sun flecking is the absolute minimum amount of sun your fruit needs. If your canopy is so dense that less than 10% of the sunlight hits the fruit, you can expect vegetative flavors in your wine (olive, bell pepper, asparagus, etc.). The general rule is to continue experimenting to see how much leaf plucking you can utilize without compromising the fruit.

## 4. Balance

Here are a few key factors for determining whether your home vineyard is in balance: 12–15 leaves per cluster, (see #7). Shoot tips are even with tendrils at or shortly before fruit softens and colors up. Budbreak is even throughout the vineyard. Crop yields stay fairly even year to year. Consistent growth throughout the vineyard.

## 3. Correct match of varietal, rootstock and site

There is no other decision that will impact the final quality of your homegrown wine. Do as much research as humanly possible concerning what belongs in your backyard, not what you'd like to grow in your backyard.

## 2. Grower in the field with a notebook

Knowing what your vineyard needs and what it can produce is a function of experience and observation.

## 1. Perfect fruit on harvest day

In the end, it's all about the fruit. Planting, labor, testing and harvest all culminate with a container filled with fruit in your home winery ready to make into wine.

feeding on (and infecting) the “clean” roots. The key here is to recognize that the bug cannot spread a virus that doesn't exist. With this in mind, it is clear that planting clean, certified rootstock will almost ensure that your vineyard will be free of this disease.

In very few instances, nematodes are able to spread fanleaf from one infected vineyard to a clean one, but this is certainly an exception, and a rare one at that. Once a vineyard site has been infected with both the nematode and the virus, it is almost impossible to ever replant without the good probability of subsequent infection. Allowing the ground to go fallow for 10 years has proven effective.

Symptoms of fanleaf virus include a disfiguring of the leaves. The “sinus” of the leaf becomes more “open” (where the leaf blade meets the petiole, there is usually a “v” shape, which is missing if infected), and the “teeth” on the leaf blade become sharper and more elongated. In severe infections, the areas next to the veins on the leaf blade will become brightly banded with a creamy yellow color. You may also notice an increasing number of small “shot” berries on clusters, but by itself, this is not a clear indication of fanleaf, as most “shot berries” are caused by zinc deficiency or uneven fruit set.

## Conclusion

Careful decision-making and monitoring is absolutely vital to keeping your grapevines healthy. Start by choosing a nursery with an excellent reputation for providing customers with certified virus-free grapevines. Plant on land that has not been host to nematodes and diseases. Be careful with your practices and your pruning.

Help the vine help itself with an appropriate trellis, balanced nutrition and canopy management that promotes a fruiting zone that is open to wind and some sun flecking.

Treat your pruning wounds with a compound that will limit the spread of fungal pathogens, especially if pruning must be done in wet weather. Learn the warning signs of mildew, rot, fungal, insect and viral diseases and act quickly if you see a problem develop. *WMM*

not striking in the first few years that the virus causes the disease, but usually progresses until the vineyard is no longer producing a viable amount of grapes for wine. Some vineyards with leafroll are not replanted, and if the disease is not too severe, yields are reduced, but vines continue to produce fruit. Symptoms are usually visible on the leaves, and are more pronounced as water stress becomes apparent in late summer. Leaves that show rolled shape and become yellow or red are exhibiting the symptoms of leafroll virus, especially if there is green banding next to the veins of the leaf. Like most viral grapevine

diseases, there is no known cure for leafroll. Once again, make sure to replant with certified stock.

## Fanleaf Degeneration

We should discuss fanleaf degeneration because it is not purely a nursery issue, and is spread by the dagger nematode, which is a species of roundworm that feeds and breeds in the roots of grapevines. Once a vineyard site has been infested with dagger nematodes, it will be a very difficult and expensive challenge to keep the pests out.

The nematode spreads the disease by munching on infected roots, prior to



# HOW TO BALANCE YOUR GRAPEVINES



In a vineyard, balance is defined as a vine that has enough leaves to ripen its crop load evenly. The total crop load will vary with vine vigor. Low-vigor vines may produce only one ton of grapes per acre, while very vigorous vines may produce eight tons (although that level of yield makes me a bit uncomfortable). A balanced vine bears just enough fruit to make intense wine, but not so little crop as to make the ripening occur too quickly. A balanced vine will allow sunlight and wind to penetrate the canopy,

but not so much as to burn the fruit. A balanced vine is neither too stunted nor too vigorous. The idea of balance in the vineyard is critical. With that in mind, I think my own viticultural training might prove instructive in communicating my ideas about balance in the vineyard and how it can be obtained.

In 1994, I returned to my native California. My mother and stepfather had purchased forty acres and they needed someone watch over things. In 1996, my stepfather, Steve Pepe, hired the best viticultural consultant in Santa Barbara County (Jeff Newton) to plant the first half of our new vineyard.

Before he left Clos Pepe, Jeff gave me a valuable bit of advice. He told me that if I spent five years working in the vineyard, I could be a great winemaker. I immediately began to sign up for extension courses offered by the University of California at Davis. Later, in 1996, I quit my job and went to work at Babcock Vineyards and Winery. I was able to work in the vineyard and

to assist for a full “crush season” with Bryan Babcock, who instilled in me a passion for vines and wine. It was while “kicking the dirt around” with Bryan that I first understood the relationship between well-tended vines and fine wine. Bryan showed me how the workers would remove leaves around the developing clusters after they bloomed to ensure the clusters would be bathed in light. He would instruct the workers to tuck all the shoots up into the vertical shoot-positioning wires above the vines to make sure the vines wouldn’t sprawl and shade the fruit.

A few months later, after making careful crop predictions, Bryan decided there was too much crop in the field. I then participated in my first “green harvest” — cutting one cluster off shoots that had two clusters of grapes. We dropped nearly half of the Pinot Noir crop on the ground that year. I figured that at \$2,200 a ton, we probably dropped \$30,000 worth of fruit. However, the wine was much improved as a result.

This was my first lesson that winemakers have to make serious sacrifices to improve their wine.

Before harvest and crush, I attended UC Davis’s three-day Varietal Winegrape Production course. I found myself drowning in a stormy sea of confusing lingo. These teachers used terms like inflorescence, interveinal chlorosis and evapotranspiration. It shook my liberal-arts intellect to the core . . . who knew science could be so useful later in life? I flipped through the glossary of viticultural terminology as fast as I could, trying to tread water in the tempest of valuable knowledge that stormed around me. One thing the professors repeatedly stressed was, “Viticulture is site specific!”

At the end of the three days, my head was swimming with facts, theory and ideas. I was energized to get back to Clos Pepe and spend some time in the vineyard. I understood vineyard balance in theory, but I lacked the practical skills to make it a reality at Clos Pepe.

The following season (1997) was our vineyard’s second year. The lessons I learned at Davis had led me to visit the bookstore before I left. These books kept me company in the evenings after my days tending the vines as a vineyard

Viticulture is site specific and every vineyard has a different definition of balance. General advice is a starting point, but not a substitute for getting to know your vines.

laborer. My life was now consumed with grape growing. The reading helped me understand what I was seeing in the vineyard, but the actual work taught me many things that books cannot.

It is impossible to describe in words the pressure one can exert on a growing vine shoot without snapping it. It's impossible to describe the color of a healthy vine, or the texture of a leaf that has been wind-damaged, but not infected with a virus. Working the vineyard every day for a year taught me more about plants and vines than any other experience in my life. It also taught me things specific to our vineyard — what our vines needed, how much water they required, how quickly our weeds grew and which of them were noxious and which weren't.

After working for a year in the vineyard, I took the same course at Davis again. After attending the second set of Davis lectures, I began to feel that I understood the rhythm of the vineyard season. My vines would be alright as long as I listened carefully to the cues they offered.

As the years passed, I progressed from a struggling, confused farmer to someone getting top dollar for his fruit. My grapes have made wine that scored 90 points in Wine Spectator reviews. I

was honored to accept the Central Coast Wine Growers' Association Grower of the Year Award for the 2001–2002 seasons. And now that I make commercially salable wine from my vineyard, I am increasingly motivated to grow the best fruit I can.

I have learned some valuable lessons in my years of training that can help you grow better fruit. So here are some of the basics of achieving balance in your backyard vineyard.

Balance means that there is a certain ratio of leaves to every cluster of grapes. Some sources say 8 to 12 leaves per cluster is optimal, while I prefer 15–20. If there are too many leaves, try to remove shoots that bear no fruit. If they are too tall and vigorous, hedge off the top of the shoots. If there are too many clusters, remove them to make the ratio more balanced.

I recommend removing the top cluster on shoots that bear two or more clusters. Don't remove all the clusters from one shoot, leaving multiple clusters on other shoots. Balance also means giving each cluster equal vine resources to ripen. This will help your fruit ripen evenly. If your vines continue to be too vigorous, reduce fertilization or irrigation. If there are too few leaves, think about finding a fertilizer that adds nitrogen to your soil or increasing the amount of irrigation.

Balance can be measured by determining the ratio of grape yield to pruned cane weight. To do this, weigh the amount of grapes harvested off each vine at harvest. Later, in the dead of winter when you prune, weigh the pruned canes that you cut off. Keep records of both measurements and compare the grape yield (in pounds) to the weight of the pruned canes (in pounds) for individual vines. You might want to do this for 10 vines per acre to get a fairly accurate ratio.

The yield of grapes should be between five to 10 times the weight of the pruned canes. In cooler climates, 4 to 8 times more grapes than canes might be more appropriate. This is a mathematical way of measuring balance in your backyard vine that is a common practice in commercial vineyards.

A balanced vine allows sun to pen-

etrate the canopy and fleck the fruit. On a sunny day, at least 10 percent of any cluster should be flecked by sunlight. In cooler areas, more leaves can be removed around the fruit to further expose the fruit. The key is to find out how much sun the clusters can take without burning, cracking or raisining. Clusters exposed to sun and wind will also have lower mildew and disease pressure. It is also advisable to give each cluster their own little space on the canopy, so no clusters are touching or bunched up and the crop load looks evenly spaced along the vine. Clusters that are touching are a perfect breeding ground for pest animals and disease, rot and mildew. Allowing the sun to fleck your fruit will improve color, add flavor and remove vegetal aromas and flavors in the wine. Leaf removal is best done right after the vine has finished blooming.

Balance means little if the fruit you harvest is poor quality. The final measure of balance in your vineyard is the quality of fruit and the quality of wine that results. Here are some specific activities to help you achieve balance in your backyard vineyard.

**a.** Position the longer shoots up and away from the clusters — using catch wires in a trellising system if possible — and remove a few leaves from near the fruit. Experiment to see how much sun you can provide without burning the grapes. If your shoots grow so long that they droop (sprawl) back over and shade the fruit, hedge off the tops of the vines. Be wary, though, because sometimes hedging vines will cause the shoots to 'bush out' near the bottom. You may have to remove a few more leaves near the fruit if this occurs.

**b.** Make the vines look tended and orderly, and make sure your "fruiting zone" is open enough to get some sun and wind inside the canopy to reduce mildew and disease pressure. Watch to make sure the fruit isn't being burned. Cut some crop off half your vines, make the wines from both halves separately, and taste the wines blind after they are finished to see if crop reduction increased intensity, color or both.



Cluster removal is best done after bloom and fruit set and before veraison, when the grapes turn soft.

c. Keep a hand's width between growing shoots, and remove stunted shoots altogether. If the canes are too crowded with small shoots, or shoots that bear no fruit, remove those shoots to make more room for the good shoots to grow. Remove basal shoots or "suckers," shoots that grow from the bottom of the vine or not out of a bud that you left for shoot development. You can do this by

ripping them off by hand (a good downward yank usually works), cutting them off with pruning shears, or — if you're really good — with your boot as you walk down the rows.

d. Experiment and take time to learn from your vineyard. Listen to what the vines have to say through the finished wine. If there's a problem in the wine, and you are sure your cellar practices are sound, try to find a way to balance your vineyard to produce better fruit. If the wines are light-colored and vegetal,

remove a few more leaves. If the wines lack intensity, try to leave less fruiting wood on the vine at pruning — or reduce the crop — while keeping the vine in balance.

Viticulture is site specific and every vineyard has a different definition of balance. General advice is a starting point, but not a substitute for getting to know your vines. The final solution should be clear: the more time you spend in your vineyard trying these techniques, the more you will understand what is needed to achieve balance. **WM**

# SUMMER SESSION



## S

Summer is the workhorse of the vintage, but is often undervalued by viticulturists — if summer becomes a vacation from your vineyard, your wine will underperform as a result.

Of course, summer in California won't coincide exactly with summer in Michigan. So to make this article as instructive as possible, let's think of "summer in the vineyard" as a period of time that starts when shoots are long enough to begin canopy management, and extend through the period of time

to when we expect cap drop, flowering, fruit set and bunch closure. Here are some ways to avoid the hazards of summer and to get to veraison with a tidy canopy and a balanced vineyard.

### Rapid Shoot Growth

To make alcohol we need sugar. To get sugar in the grapes, the vines need sunlight, water and nutrients. The engine of a vine is its leaves. Most shoots of a grapevine carry one or two grape clusters, and most varieties need at least ten leaves per cluster to get the fruit ripe. Leaves absorb sunlight, triggering photosynthesis. Water vapor is released from pores (stomata) on the back of the leaves, which keeps the "wick" inside the vine (phloem) dry enough to soak up more water through root hairs via osmosis. This will also transport soil-borne nutrients. So before the vine can get down to the work of ripening fruit, it must first operate in a vegetative growth

cycle. If a vine was a car, it would have three speeds. Dormancy (parked), vegetative (getting to highway speed) and ripening (cruising under solar power). It is our hope as grape growers that summer will bring the sunshine necessary to grow the shoots needed for sugar production mode.

Grapevines grow and ripen at peak performance around 87 °F (31 °C), so these warm months are crucial to get our shoots grown and our ripening initiated. Three to 4 feet (30.91–1.2 m) of shoot growth prior to the shoots starting to lignify (or harden into wood) is about optimal. With leaf nodes every 3 inches (7.6 cm) that will give us 12–16 leaves — add a few lateral shoots and we could easily be up in that 24–30 leaves per shoot that is optimal for full ripening of two clusters. Less than 20–24 leaves per shoot may mean the vine needs a touch more water or nutrients (mainly nitrogen for growth) — but be slow

and methodical when you change your watering or fertilization to make sure you don't go overboard and end up with a rank vine that makes thin wine. If you get over 5 feet (1.5 m) of shoot growth per year, you can likely cut back on the watering and stop fertilizing altogether.

## Canopy Management

Understanding canopy management is the most important single element of managing a vineyard. Wine quality is driven by canopy management. Most wine geeks think they know what microclimate is, but most are wrong. Macroclimate is the area where you grow your grapes — like Napa Valley or the Finger Lakes. Mesoclimate describes a specific area, such as the Beckstoffer Vineyard or the Western Cayuga Lake region. Microclimate gets much more specific, and the reason should be obvious. The only climate that really matters to wine quality is the climate inside the canopy and at the exact place where the fruit grows and ripens. You could grow Nebbiolo in the Cannubi vineyard in Barolo, but if the fruit is hidden deep in a burly overgrowth of vine, you will not make good Cannubi Barolo. As a result, the primary focus of canopy management, then, is to promote perfect climatic conditions for the fruit to develop and ripen on the vine.

During summer the focus is to get the shoots to grow, then to remove leaves and lateral shoots to promote sun flecking and wind movement through the fruiting zone. Leaf removal should commence after flowering as the fruit sets. Windbreak and sun protection from leaf shading may be helpful for the flowers to gently drop their magic dust on the emerging ovaries, but once the fruit is set, they need sunlight and wind to keep flavor developing and rot/mildew at bay. Proper canopy management opens the canopy to sun and wind to the maximum level allowable without threatening the fruit with sunburn. There should never be more than a one leaf layer between the fruit and the sky on either side of the vine row, so you can start with reducing congestion that way. From there I recommend a slow and methodical approach over many vintages. Expose 10% of the fruit on the morning sun side of the vine row, see how the fruit reacts, and keep remov-

ing a few more leaves each year until you find the right balance of exposure, flavor, and sound fruit without burn or cracking.

By the end of summer, your canopy should be dialed in. There should be a ratio of leaves to clusters around 12–15, shoot lengths between 3 to 5 feet (0.91 to 1.5 m), an open canopy that exposes fruit in a safe and site specific manner. These three paragraphs are just an introduction. For more on canopy management, see Dr. Richard Smart's handbook "Sunlight Into Wine."

## Cap Drop and Flowering

If you look closely at a grape cluster before flowering it appears to be a tiny little green pumpkin — enclosed by a textured protective cap. When the time is right, the caps will desiccate (dry up) and fall off to expose the delicate yellow flowers underneath. Once the caps drop and the flowers are exposed throughout the vineyard, hope for warm weather and only light winds. Flowering will dictate yield; so if there is a terrible rainstorm, high winds or hail, we can lose much of our harvest. As mentioned above it is not recommended to do leaf removal from the fruiting zone before flowering so those crazy hermaphroditic clusters can do their business in the relative privacy within the canopy. A foliar application of zinc prior to bloom has shown to increase successful flowering by up to 10%. I spray zinc every year for this purpose, a nice insurance policy with no down side, if applied according to label instructions.

## Nutrient Management

It is important to note that grapevines perform admirably in many locales in the US without any supplemental fertilizer. If you can produce 3–5 feet (0.9–1.5 m) of cane from each shoot position and the grapes get ripe and the leaves are a dull green as they grow, allow the vines to produce their crop without adding nutrition. Supplemental fertilization is only necessary for underperforming, low-vigor vines that struggle to produce healthy shoots and keep green leaves. Again, leaves do not have to be huge and waxy green — that is a sign of too much nitrogen. Vines can show a little spring fever until summer — a milky cast to leaves that may also seem a little yellow

in their color. In the warmest months, vines should have leaves no larger than a man's hand and a dull or dusty green color. These are the signs of a vine that is in balance.

If the vine isn't growing enough shoot length for ripeness, you may need a little nitrogen along with phosphorous (nitrogen mainly for vigor, and phosphorous for fruit development). If the leaves never get green, you may need a little potassium. If the grapes are pumpkin shaped (after cap fall) and have no seeds, you may have a zinc deficiency. My message here is: never apply fertilizer to vines that don't need it, and be very specific with your applications to promote vine balance. You can collect a petiole sample during bloom to send to a lab for nutritional analysis, and I recommend this at least every three years. Overly vigorous vines produce poor wines, as do vines that struggle throughout the season.

## Water Considerations

Irrigation is a contentious subject in viticulture. Those areas that can dry farm quality grapes without irrigation are clearly at an advantage economically, if not viticulturally. The costs of establishing a dry farmed vineyard are reduced drastically, rainwater is better for plants than ground water, and it can be argued that dry farmed grapes better represent a vineyard's *terroir*. On the other side of the argument, irrigation offers tools to the vineyardist with an irrigation system that are unavailable to the dry farmer. I can better control the cycle of vine growth with irrigation or deficit irrigation. I can extend the vine's season for longer hang time, stave off a heat spell or encourage the vines to speed up their sugar accumulation. Irrigation, if needed, is worth the investment to guarantee adequate water status for the vineyard. So how do we know if your backyard vineyard needs a watering system? A five-dollar grapevine from a local nursery should do the trick. Plant the vine where you want to put a vineyard and watch it for a few years to see how it grows with no supplemental water. In most backyard situations the vines will be much happier sucking up rainwater than municipal water, which often times has chlorine and fluorine residues. Well water is better than municipal sources,

# Remember that spraying may kill more beneficial insects than pests if you're not careful. Try to target the pest species specifically and let nature work for you, not against you!

but rainwater is still the best.

Summer is clearly the peak of a vine's water requirements. Budbreak through July is a period where the vines need a constant supply of moisture to get the shoots growing and the canopy established. If the vineyard achieves this naturally in most years, count your blessings. Most dry farmed vineyards rely on about 20 inches (51 cm) or more of annual rainfall. You can use a rough estimate of 15 gallons (57 L) per plant to make up each inch of rain lacking — but putting down more than 10 gallons (38 L) per plant at once is generally a waste of water, except perhaps as a post-irrigation flooding. Just like the suggestions for fertilization, if your vines grow balanced without adding water, don't screw with nature! If your vines show water stress, start with an application of 5 gallons (19 L) per plant and see how they react, then fine tune from there. Clay soils hold water longer and need less water than sandy or loamy soils.

Remember there are a few tricks for eyeballing water status in your vineyard. While the vine is in vegetative stages, the tendrils on the top of the shoots should extend significantly beyond the growing tip. This shows that the vine is attempting to climb higher and soak up more sunshine. When the tendrils pull back even to or behind the growing tip, that means that the vine is in water stress, or that it is finishing vegetative growth and focusing on ripening the crop. The angle of the leaf blade (the actual leaf) and the petiole (the leaf's stem) can also give us clues about the vine's water status. The leaves will wilt in water stress and the angle of the blade to the stem becomes acute. With proper water status, the blade will be at a right angle (or even slightly obtuse) to the petiole. (Feel free to call your high school geometry teacher at this point and let them know

that all that work with triangles is finally paying off in the real world.)

Heat spell hazard is defined as high temperatures for at least 48–72 hours that can cause crop and vine damage. Sustained temperatures in the 100+ °F (38+ °C) range may reduce yield by as much as 3% per day if steps are not taken to moderate the heat stress. A deep irrigation before the heat wave hits is always a good idea to buffer the roots with moisture and to cool the soil profile. Mulch also seems to protect the soil from getting too hot underneath, and will also make applied water stay in the soil longer as it protects it from rapid evaporation. Water can also be used by setting up overhead sprinklers to douse the vineyard. The sun will have to turn the water into vapor before it goes to work on harming the vines. There is some controversy over whether a vine shuts down at 104 °F (40 °C) or not. The shut-down theory is usually taught in US viticulture programs, although research is emerging from Australia that disputes those claims. As the Aussies support their research programs in a manner we don't choose to match, my bet is on the Australian research. Unchecked, these are the results of heat stress (>103 °F/39 °C) on a grapevine in summer:

- Erratic fruit set and small berries (especially in Cabernet and Merlot)
- Shoot tip dieback (especially in Chenin Blanc and French Colombard)
- Burned fruit and the production of off-flavors
- Very rapid ripening/raising

See the sidebar for a list of practices to combat moderate heat stress.

## Critters and Disease

If you live in a region where bugs have struck a balance and stay busy eating each other, you are very lucky. The

moment a vineyard pest becomes a management issue is when they begin to threaten your healthy crop. So a few grasshoppers nibbling leaves (a hole here and there) is not a big deal, but a swarm of locusts skeletonizing the whole vineyard — that's a big problem and one that needs to be brought to the attention of your local agricultural commissioner.

Populations of some pests such as bees, wasps, ants, yellowjackets, gophers and ground squirrels need to be culled early in the season before breeding and their numbers exceed the capacity for control. For instance, gophers and squirrels breed twice — in spring and in late summer. May is a great time to knock their numbers down if you failed to control them right as they woke up in January and February. Do what you can to remove food sources and habitat, and

## COMBATING HEAT STRESS

- Run overhead sprinklers to bring vine temperatures down
- Moisten soil with irrigation by drip, flood, furrow or microsprinkler. Applying water three to five days before a heat event is recommended
- Maintain more leaves between sun and fruit to shade and protect
- Build soils with mulches and composts that add organic carbon to the vineyard soil. Organic carbon has shown great promise in Australia for moderating heat stress damage
- For the pro, there are products such as Parasol, which reflects sun and protects vines from heat stress
- There is evidence that groundwater moderates heat stress in heat events three days or shorter. There may be very little we can do for our vines in extended heat spells — but sprinklers and canopy management are a good start

do your best to trap, exclude and kill the pests that threaten your vineyard. Do not kill all animals and insects in the vineyard, though.

In general, having a diverse habitat will help the vineyard as the critters will be battling amongst themselves while your vines grow relatively unmolested. Try to observe your vineyard constantly and see what species live there and in what seasons the populations increase. Do your research to find out what species are beneficial (encourage populations), and which are pests (destroy with impunity). Always follow local laws and use low-impact methods for pest control. Remember that spraying may kill more beneficial insects than pests if you're not careful. Try to target the pest species specifically and let nature work for you, not against you!

Summer weeds should be kept knocked down in the vine row and manageable in between rows. Weeds should never touch the grapes or the canopy, but small weeds in the vine row rarely root deep enough to compete with vines for water and nutrients. Having some permanent plant growth in the vineyard is usually attractive, as it can bring in beneficial insects and offer pests something to nibble on besides the grapevines. If the vine is the only green the pests see, you can guess where they're going for their meals.

The major diseases that you will have to avoid in summer are mildew and bunch rot. Both of these problems can be controlled by careful fungicide programs you can work out with other local growers, nurseries and your local college, ag commissioner or other experts. Stick to your spraying schedule and follow label instructions. An open canopy also slows the growth of fungus, so the more open your canopy is (within reason), the more effective your sprays become.

## Conclusion

It may be a struggle to see the world on vacation while we're captive to the vineyard's needs, but summer is the time when we pay for our wine with hard labor in the backyard. Summer sets the stage for that dance of denouement we call harvest and crush. **WM**

# Grape Growing Regions

Around the world, wine grapes are grown almost everywhere environmental conditions permit, excepting countries where alcohol is prohibited. Grape vines require a growing season that is long enough and hot enough to produce grapes with sufficient sugar. Yet, they also need winters that are cool enough for them to give them their chilling requirement. These conditions exist in two "belts" circling the globe — from 30–40 °S and 30–50 °N. The local climate and soil conditions must be accommodating, so not every bit of arable land inside these zones is suitable for growing quality wine grapes.

An exhaustive list of grape growing regions would be, well, exhausting to read. So, instead, here are some the major grape growing regions around the world, with a somewhat deeper look at regions of importance in North America.

In the Southern Hemisphere, the countries that produce the most wine are Argentina, Australia, South Africa, Chile, Brazil and New Zealand.

Argentina produces the most wine of any country in the Southern Hemisphere and is the fifth largest producer in the world. (Note: Production totals vary year by year and acreages devoted to vineyards expands and contracts over time.) Arguably the best known Argentine grape growing region is Mendoza. Argentina grows a wide variety of grapes, but is best known for its Malbec.

The Australian wine industry has been growing vigorously in recent years and Australia is now the fourth largest exporter of wine in the world. Shiraz is the most widely planted wine grape variety there.

The biggest producers of wine are located in the Northern Hemisphere. Italy produces more wine than any other country in the world and is also home to some of the oldest wine-producing regions. A wide variety of

grape varieties are grown there, with Nebbiolo (red) and Trebbiano (white) being widely-planted.

France is nearly synonymous with wine and any attempt to summarize their production in a paragraph would be fruitless. It contains some of the most famous wine growing regions on the planet — Burgundy, Bordeaux and Champagne — and is the home of many classic grape varieties, including Cabernet Sauvignon, Chardonnay, Pinot Noir and Sauvignon Blanc. Merlot and Granache are their most widely-planted varieties.

Wine grapes are grown in all 50 states of the United States. California is the leading producer, followed by New York, Washington State and Oregon. California has many famous wine growing regions (including Napa and Sonoma) and it's output is larger than most countries. 90% of the wine produced in the United States comes from California. Wine regions are grouped into four large regions, the North Coast, Central Coast, South Coast and Central Valley. Cabernet Sauvignon, Chardonnay, Merlot and Zinfandel are all widely-planted.

New York is most famous for the Finger Lakes growing region. Although the best-known New York wines are probably Rieslings, less than 10% of the wine produced in New York is made from *Vitis vinifera* grapes. American hybrid grapes (such as Catawba) and French hybrid grapes (Baco Noir) are widely grown.

Washington and Oregon are both home to multiple wine-growing regions and are best known for their whites — Riesling in Washington, Pinto Gris in Oregon. Oregon also produces a fair amount of Pinot Noir.

The southern parts of British Columbia and Ontario are home to Canada's wine industry, most known for its icewines.



Photo courtesy of Ravenswood

# HARVEST & BEYOND



# RIPENESS & WINE STYLE



## A

As harvest nears and the grapes are getting ripe, we growers need to start making some decisions concerning the style of wine we want to create. The wine media often gets caught up in the enological debate of ripeness and wine style. So, in this section of this grape growing special issue, I would like to bring the debate into focus. First of all, we need to define winegrape ripeness and discuss how varying levels of physiological maturity affect the resulting wine. Second, I would like to suggest some ways of fine tuning your backyard harvest timing to produce some delicious wines that perfectly suit your specific tastes.

### Defining Winegrape Ripeness: How Ripe is Too Ripe?

It is clear that alcohol levels in table wine have risen significantly in the past two decades. Over the years there has been a rise in monstrously alcoholic wines of 16% or higher. Often, a wine that is picked at elevated ripeness shows more “high toned” fruit in the nose and feels heavier on the palate. When tasted blind, without food, it seems that these wines outperform (and outscore) their less-ripe competition.

For me, perfect ripeness lies somewhere between the extremes. My favorite wines (whether Seyval Blanc, Champagne or Pinot Noir) always balance fruit, concentration, pedigree, elegance and acidity. If you grow grapes in an area where you can get them very ripe, there is no reason to ignore the potential concentration and ripeness you can create (as long as the wine maintains balance). If you live in an area where it is a challenge to get your wines above 12% potential alcohol, there are benefits to exploit as well (such as glorious acidity and delicacy). As this article is meant to help winegrowers all over North America, let's take a look at ripeness decisions at harvest and how they will impact your wine style and quality.

Most winegrowing regions fall into one of two categories: areas where it is a challenge to get grapes to ripen to 13%+ alcohol, and areas where the grapes get as ripe as we would like them. Let's break down both types of winegrowing locales, and see what we can learn about harvest timing and wine style.

### Areas Where Ripeness is Difficult to Achieve

- Early and mid-season vigilance in the vineyard is absolutely imperative. Keeping your vines clean from mildew and rot early in the season will keep your fruit sound longer into the season, allowing you to pick riper. One common mistake made by home vineyardists is being lazy with spray schedules early in

the season, and then spraying once they see a mildew or other problem appear on the fruit. Once mildew or rot is visible, your wine quality has been irreversibly contaminated. A squeaky clean vineyard can survive a few summer rains, so you don't have to let the weather dictate when you pick.

- Keep weeds and grasses from growing into the canopy. Grass and weeds touching the fruit can give off flavors and encourage rot and mildew. Keeping a clean vine row will also reduce competition and may help you get that extra bit of sugar you need to make a bigger and fruitier wine.

- Turn the water off at the end of the growing year, pre-harvest. If you are lucky enough to have dry soil at the end of the growing year, your grapes may be able to dehydrate just a bit, dimple in the skins, and give you that extra sugar you need to get riper flavors.

- Pay careful attention to pH and acid levels in your grapes. In areas where full maturity is difficult to achieve, you may need to use pH and total (or titratable) acidity in your grapes as a method for determining a harvest date. If the sugars “stick” at 21–22 °Brix, and you can't get them higher, pay attention to the pH and acidity and make sure you aren't picking the grapes with excessive acidity. Balance in wine is often more a function of acidity than sugar content. I like to see pH levels above 3.3 in red wine and above 3.1 in whites.

- Don't be afraid to add a little sugar if you need to. I suggest adding sugar to your must to bump the Brix level to a minimum of 22 for table wine and 19 for sparkling wine.

- Let the fruit hang until you are forced to harvest. Watch the weather carefully. A little rain won't ruin a harvest, but a big storm or hail certainly can. Do your best to balance patience and common sense. If you see that a rainstorm is coming, but it is supposed to be followed by warm weather, you may want to ride the storm out and hope the sunny weather will help your fruit get fully ripe before harvest.

- In areas where full ripeness is difficult to achieve, don't forget that the goal is to produce balanced, delicate wines with excellent acidity. You won't likely be producing soft, monster wines with intense color and massive concentration. Look to the low-alcohol wines from British Columbia, Germany and Austria as your template for success.

- Cut out the problem fruit. You may be able to make better wine by allowing the fruit to hang longer. If this means a small portion of your crop begins to rot or have problems, focus on

brown seeds and stems that have begun to become woody.

If you need a bump of ripeness at the end of the season, turn the water off and watch the grapes carefully for signs of rapid dimpling or dehydration.

- Test the fruit a few times a week at the end of the growing season. Rises in sugar content can spike in hot, dry weather. In 2004, I saw a small home vineyard jump from 23 °Brix to 29 °Brix in 48 hours (during an unexpected heat spike). It is always better to carefully choose a picking date with the help of

you acidulate (add acid to) the water you use: add 10 grams of tartaric acid per liter of water before adding it to the must. This will keep the wine from becoming flat and uninteresting.

I don't water my musts down or acidulate my wines. I believe the best wines are those that are carefully farmed, picked at optimal ripeness and fermented without manipulation.

As a vineyardist and home winemaker your first priority should be to grow and make wines that suit your stylistic preference. In other words, make wines that are delicious to you. Pay

## As a vineyardist and home winemaker your first priority should be to grow and make wines that suit your stylistic preference.

the clean fruit, remove the problem fruit from the vineyard and allow the good fruit to ripen normally. Never let a few bad clusters on the vines dictate your picking date and maximum ripeness.

### Areas Where Ripeness is Easy to Achieve

- Don't let your wines become flabby! Pay attention to the pH of the fruit as it ripens and don't sacrifice structure for ripeness. Full bodied red wines with elevated pH (above 3.7) lack the acidity necessary to freshen the palate between bites of food.

Don't be afraid to go ripe as long as the wine has the acidity to balance the richness. My favorite red wines have a pH of 3.3 to 3.6. White wines should be in the 3.1 to 3.3 range to maintain some structure and zingy acidity.

- Use irrigation as a tool. If you are able to irrigate your vineyard, don't turn the water off too soon. During heat spikes a few extra gallons of water per vine can keep the vines from shutting down and the berries from dehydrating. Keep the vine green and healthy to allow the grapes to mature, not dehydrate. The key is to bring in fully ripe fruit with

lab data then to go out to the vineyard and see your fruit has raisined.

- Sort out the bad fruit. If your vineyard produces fruit that is not uniformly ripe, be careful to sort out green fruit and fruit that is raisined or too ripe. Green fruit is not a good way to add acidity to your wine — it is better to do that with tartaric acid. Overripe and raisined fruit will continue to leak sugar into the must and can give your wine a port-like flavor.

- "Post-harvest irrigation" is wine-speak for watering down overripe must for wine production. This is a practice that is commonly used in high-end California winemaking, but is definitely a contentious issue. The idea is to pick the fruit very ripe (26–29 °Brix) to get full concentration, color and phenolic ripeness and then water the must down (to 22.5–25 °Brix) so the alcohol level is not too crazy. Most wineries use bottled water (spring water or the like) to water their must. Add water a little at a time and then test the sugar content carefully with a hydrometer. Pay attention to how the pH and acid structure of the wine is affected. It is also recommended that

careful attention to the levels of alcohol, ripeness, concentration, elegance and acidity in the wines you buy and love. Make notes, rate the wines using your own system and find out which elements (fruit, acidity, richness, etc.) consistently appear in your favorite wines. If you want more concentration and richness, try to get a little more ripeness out of your vineyard using the previously detailed practices. If you want more elegance, acidity and structure out of your wines try to pick a little less ripe.

Regardless of style, the key is to take notes during the growing season, during harvest and during the winemaking process so that you can look over them and correlate your decisions with the quality and style of the resulting wine. Taste the fruit at harvest and make notes on the flavors — sometimes the taste of the fruit will tell you more than any lab test can. That way you can carefully tweak a practice or two each year, change the Brix and the pH a bit in order to find the magic numbers and flavors that make all your hard work pay off. Understanding ripeness in your own vineyard will allow you to make the wine that is perfectly suited for your palate. *WWM*

# HARVEST ON THE VINE



PHOTO BY IAN MACKENZIE

L

Late summer and fall is a busy time for the backyard viticulturist. By September and October, those who make wine are experiencing “crunch time” in vineyards and the cellar. We call friends and ask if they are interested in taking a day off from work to help pick and crush because the fruit just can’t wait the weekend. And of course, we test our fruit for sugar and acidity on a regular basis, waiting for the perfect combination of chemistry and flavor that sets off that mysterious alarm inside our heads that says, “Tomorrow is the day to pick grapes and make wine.”

Then the magic begins. Fermenters of bubbling grapes warm as if by magic — as if they have stored the sunshine from the summer and are releasing it into the liquid. Fermentation locks bub-

ble out a rhythm. The sound summons the ancient spirit of Dionysus to do his alchemical magic of turning juice into a magical potion of health and pleasure.

But before we allow the product of our passion to consume us and cause poetic ramblings, let’s not forget the hard work and structured timetable that allowed us to bring in good, clean fruit for fermentation. In this section, I will discuss pre-harvest, harvest and post-harvest in the vineyard.

We will examine the best ways to protect your crop until it is ready to be picked and ways to test your fruit to make sure the chemistry of your wine will be acceptable. We will find methods for deciding the “perfect” day to pick your crop and observe picking protocol.

By the time we’ve finished, you should know what to expect from the winegrape harvest and have a good understanding of Brix/pH balance in wine, as well as some strategies on how to make the vines happy and healthy before they take their long winter’s nap.

## Protecting Your Crop

Your neighbors, friends and family are not the only ones who know that you grow the best grapes in the area. There

are also hundreds of birds, raccoons, deer, goats and others that would love to get your crop into their gullet. I worked for a Santa Barbara County winemaker who warned a local ostrich farmer (more than once) to keep his hulking birds out of his Pinot Noir vineyard.

I came to work early one morning to find the winemaker holding a smoking shotgun and mumbling about ostriches and barbecue. The massive bird (dead between the rows) was a testament to the golden rule of living next to a Pinot Noir grower: DON’T MESS WITH THE CROP! Forgetting that slightly deranged episode, there are some important things to remember to keep your grapes from going the way of the dodo.

First of all, let’s acknowledge the fact that we are fortunate ostriches are not common around most American vineyard sites. But starlings, blackbirds and many other types of birds are. If I did not protect my vineyard against bird damage, I would be lucky to bring in a single undamaged cluster from 28 acres.

Even though my vineyard is (to date) ostrich free, bird damage is the single greatest threat to my crop late in the growing season. Not only will birds reduce yield (and perhaps eat every berry you have on your vines), but they also enjoy piercing the grapes after berry-softening to see if they are ready to eat. If the grape is still too unripe for consumption, the fruit is left on the cluster with its skin pierced. A punctured grape has an even sweeter fragrance than usual, and will hence attract more bees, wasps and fruit flies. Pierced fruit is also more susceptible to bunch rot.

Here in the Santa Rita Hills of northern Santa Barbara County, we have a serious population of starlings that start circling the vineyard in early August. Unchecked, they will descend into a few rows of the vineyard by the hundreds, grab a number of berries in their mouths and fly away quickly. Entire rows can be wiped out instantaneously.

Grape-thieving birds have a “modus operandi” that, if understood, can help you combat them successfully. First, they prefer to attack the edges of a vineyard. This means if you can’t afford to net an entire vineyard, make sure to at least net the outer rows. However, for best results and ultimate protection, it



is recommended and safest to net every single vine row. We use “Lightweight, Premium Grade Bird Netting.” This can be viewed at [www.wildlife-control.com/agriculture.html](http://www.wildlife-control.com/agriculture.html).

We use the 14 foot-wide (4.3-m) variety, cut to lengths that match our row length. We hand roll them over the top of the vine so they drape down over the canopy. As a further precaution, we then fasten the two loose ends at the bottom using wire twist-ties (every 10 feet/3 m or so). This prevents birds from gaining access underneath the nets. Some larger vineyards net the outside rows of their vineyard and then use propane cannons, mylar “flash” tape, and kites that look like owls to try to scare the birds away from the interior.

Even though netting your vineyard seems to be costly and labor-intensive, there is no better feeling in the vineyard experience than removing the bird nets on harvest day and seeing perfect, lustrous clusters on every vine with absolutely no damage. Reducing bird damage

will also reduce time spent sorting the fruit as well as volatile acidity in the wine because less berries will have been pecked and rotted. Also, expect to see fewer wasps and bees on your fruit.

Netting may reduce deer (and other large mammal) damage, but only on interior clusters. Deer, goats, sheep, and horses won’t be easily swayed from nibbling through the nets. A few large dogs or a high fence is your best bet for large mammal control.

### Testing Fruit for Ripeness

Even though we’ve discussed fruit chemistry in the previous section, a few important concepts bear repeating. First, trust your palate. You should be able to determine the correct week to pick your fruit by taste. When the fruit tastes too delicious and ripe to let hang another day, confirm your feeling with some swift lab work.

You can set up an excellent station for testing grape ripeness for between \$150 and \$500, depending on how elab-

orate you want your setup. I recommend at least two hydrometers (one 0–35 °Brix, and one 19–31 °Brix), a tube to float your hydrometer and a reliable pH meter. Some winegrowers also like to have a refractometer, which is a portable device that you can drip a bit of juice on in the field, point it at the sun, and get an immediate (and fairly accurate) Brix reading. Once the fruit passes 20 °Brix, plan on testing the fruit at least once a week in your little kitchen laboratory or a few times a week (even every day) if the weather is warm or when the fruit is nearly ready to pick.

In a small vineyard where taking full cluster samples would seriously decrease the crop you harvest, remove single berries from various parts of the clusters (in different rows and vines each time) to get a representative sample. Only take as much fruit as needed to make juice to float a hydrometer and cover the pH meter’s electrode. Of course you can use the same juice for both tests, and even save the juice — be sure to sulfite and

refrigerate the juice if you choose to save it — to throw into the fermenter when you finally pick the rest of your fruit.

## Determining a Picking Date

If you are looking for me to give you the universal numbers for perfectly ripe winegrapes, the next paragraphs will no doubt disappoint you. There are no exact specifications that suit all vineyards around the world. What is growing in your backyard is probably unique to your climate, with its own Brix and pH levels. Ripe Zinfandel in Amador County, California can often be 27 °Brix at 3.6 pH, while ripe Riesling in the Finger Lakes region of New York might be 22.3 °Brix at 3.2 pH.

I suppose we can use these two extreme examples as a rough guide for a picking window. (Remember that sparkling wine grapes can be picked as low as 18–19 °Brix, and that the chemistry of red grape varieties changes as the grapes soak after crushing.) Remember also that it is common for red grapes to “soak up” a Brix or two in the first 24–48 hours after being crushed and the pH climbs a tenth of a percent or so.

Don't let the numbers take reign over your winemaking though. Your taste buds should be the number one indicator of ripeness — you are the winemaker, not your hydrometer! Do you prefer softer, richer, riper wines? If so, it is recommended that you pick later. Or if you prefer the delicate, austere, elegant European style of wine that is less ripe but has firmer acidity and tannin you should pick earlier.

It is also a possibility that you will like a wine in the middle of these two styles. An excellent suggestion is to pick on two dates, take extensive notes on the Brix and pH numbers at harvest for both lots, and make two separate wines. When the wines are bottled, do blind tastings with your friends to determine which style you prefer. Most vineyardists know by the fourth or fifth harvest what lab numbers make the best style of wine for their locale and taste.

But then again, don't forget to taste the fruit and let the “deliciousness” play an important role. Of course hot weather may expedite your anticipated picking

date. (Heat spikes will cause the fruit to gain sugar and lose acidity quite fast.) Or you may have to bring in the crop in front of an impending storm.

A little rain shouldn't hurt a crop (it may reduce sugar a bit), but a deluge can swell the berries, reduce sweetness and even split the berries' skins, potentially starting rot problems.

Use common sense, a trained palate and a bit of science to determine the best time to harvest.

## Picking Day

When a picking day has been determined, there are a few more things that need to be addressed in preparation of the harvest. First make sure your buckets are rinsed and ready and your picking shears are clean and sharp.

You should spend some time with your winemaking equipment. Make sure it is tested and tuned up. Your barrels for white wine should be swelled, rinsed and sanitary and your labor should be secured. Don't worry if you are low on funds; wine from the previous year should serve as salary for your picking friends. (It is best to pick your friends and grapes wisely!)

If the vineyard has tall grass between the rows, it's good form to mow a few days before harvest to make the vineyard floor navigable. Your pickers will not be happy trudging through two-foot long grass soaking their legs with morning dew — nobody likes wet feet.

Grab a flashlight and remove the bird nets after the sun goes down the night before harvest to make it easy to get to the fruit. Explain to your pickers that you'd like to have the picking done before the sun touches a single cluster. Provide strong coffee and donuts. Set your alarm and make sure all of your flashlights have batteries.

Look at it this way: You've spent an entire year farming this fruit, protecting it from pests, spraying, weeding and doing canopy management. You might as well wake up really early (it's only one morning!) to get the grapes into the winery cold and fresh.

Crushing your fruit cold will improve the quality of your wine. Warm or hot fruit produces volatile acidity and will increase the chance that the native

yeasts on the grape skins will start fermenting your juice spontaneously.

Pickers should know that leaves or M.O.G. (material other than grapes) need to be picked out of the buckets as they fall in. Picking shears should never be placed into a picking bucket, even during a break. (They don't do good things to crusher-destemmers or presses.) After buckets are picked, move them into a cool, shady spot. Again, remember to crush or press the fruit as quickly as possible after harvesting for best results.

## Post-Harvest in the Vineyard

After the fruit has been picked and crushed, there are a few more details that need to be attended to in the vineyard. Make sure all fruit, even bird-pecked clusters and stems, is totally removed from the vines. Fruit and stems that are allowed to stay on the vine will increase rot and mildew pressure the following year. Make sure to do a vineyard walkthrough after your day of winemaking to determine all fruit has been harvested, a row has not been missed, equipment has been gathered, buckets and picking shears are collected and pickers aren't passed out between rows. Give the vines a deep irrigation if rainfall hasn't already saturated the ground.

After being freed from their burden of fruit, the vines go into a stage of root growth. Your vines will also continue to activate next year's fruit buds and turn their stores of nitrogen and carbohydrates into a form that can be saved for the following growing season.

For these processes to succeed, the vines need to keep some leaves for photosynthesis. What you do not want to do is induce active vine growth with fertilization — this is neither the time nor place for fertilizer.

Harvest is a magical time in the vineyard. Take time from your hard labor to enjoy the sights, smells and tastes of the crush. After the fruit is crushed and the vineyard is irrigated, don't forget the post-harvest irrigation/feeding of your crew. Reward them with a plate stacked with cheeses (and maybe some tidbits of BBQ ostrich). And of course, remember to keep their glasses filled with wine. **WMM**

# DORMANCY

Photo by Wes Hogen



# A

all like some down time. The problem is, our job in the vineyard doesn't end at harvest. While we're cleaning equipment, loading the press, racking the juice and adding yeast, the vineyard is still in need of our attention and care. It's easy to forget about tucking the vineyard in, but the last few weeks of the vines' growth cycle is vital to getting good fruit next year, so let's talk about how to put a vineyard to bed for the year.

First let's talk about the physiology of a vine as it's going into dormancy. The purpose of dormancy is to allow the vine to drop its leaves, store what's left of its nutrients into the trunk and root system, and to "reset" its fruitfulness by virtue of a chilling requirement. Yes, that's right — a vine needs about 150 hours under 45 °F (7 °C) (during dormancy) for the vine to become properly readied for a new vintage of growth and fruit production.

Evolution has provided grapevines with the ability to protect themselves

against the chill of winter by becoming impervious to all but the deepest winters. As the leaves drop and the vine becomes skeletal and woody, it is protected and ready for a cold winter. As grape canes mature, their buds enter a type of dormancy in which their growth is suppressed despite otherwise favorable conditions. But before the vine is completely asleep, it has a few more tricks up its sleeve. Vines have two periods of swift root growth and development. The first period of root growth occurs as the shoot growth slows in late spring or early summer, and the second period of root growth occurs when the fruit has been harvested and the vines have a moment to use their leftover energy and nutrients to extend the root system.

Dormancy is, of course, the period in which we prune the grapevines as well, and timing the cuts of pruning can have a big effect on when the vines awaken in spring.

So now we know that the grapevine goes dormant to protect its succulent leaves and shoots against the freeze of winter, that the vines require chilling during dormancy, that the vines have a swift period of root growth after harvest, and that timing pruning is important. I'm sure you were just starting to relax and take deep breaths after harvest, but it's time to get back out in the vineyard and get to work on making dormancy beneficial for the next harvest.

The fruit was harvested today and the vines are relieved of their fruity responsibility. Now what? First thing we want to do is turn on the water if the soil is dry. Giving the vines a deep irrigation (at least 10–20 gallons/38–76 L per plant) after harvest is key for promoting a good root flush. Roots move through moist soil much easier than hard, concrete-like soil. Giving the soil profile a good soaking will make the vines' job of root growth much easier and efficacious. If for some reason harvest occurs after the leaves have all turned dead or dropped, there is no use in irrigating. The period of root growth only occurs while the vine is still active and has green leaf area — the green leaves are the engine for pushing the roots out into the soil.

What else is there to do the day after harvest in the vineyard? It's always wise to walk the rows and tidy up. Pick up orphaned buckets, clippers, tools, etc. Also start the irrigation and bring a notebook with you and note any row numbers with irrigation problems — leaking emitters, leaks in pipes, missing drippers, areas that appear to be getting inconsistent amounts of water. It's also a good time (while the vines are still alive and growing) to mark dead or stunted/virused vines for removal and replanting in spring. Take this time to walk the rows and ask yourself, "What can I do during dormancy to make this vineyard produce more consistent growth and crop next year?"

It will also be very beneficial to your management practices to know how many pounds of fruit you harvested out of your vineyard. Most home winemakers get 140–150 gallons (530–568 L) per ton (2,000 lb./907 kg) of fruit, a little less in whites, a little more in reds. Use 150 gallons/ton to approximate your vineyard yield. If you made one carboy, 5 gallons (19 L) came from about 70 pounds (32 kg) of fruit. If you had twenty vines, that's 3.5 pounds (1.6 kg) of fruit per vine. Pretty good yield, good work! Keep that average pounds/kg per vine written down somewhere — you're going to use it!

## Day After Harvest

- Deep post-harvest irrigation of 10+ gallons (38 L) per vine.



Photo by Wes Hagen

- Clean all equipment and trash out of the vine rows.

- Make notes on parts of the vineyard that need attention — leaks, busted wires and trellising, etc.

- Mark dead/virused/underperforming vines for spring replanting.

- Record your fruit yield in an average pounds/plant format. Now that you have finished this checklist, take a deep breath and open a bottle of wine. The vineyard will take care of itself until all the leaves have fallen!

### After Leaf Fall

When the vines are completely skeletal with no leaves left, dormancy has begun in earnest. Choose ten vines from throughout the vineyard, prune each vine and weigh the cuttings. Remember the average yield weight? Now you can

growth per season is a nice length to shoot for. If your canes are longer than that, you can cut down on water and fertilizer early in the season. If they are stunted, under 3' (1 m) on average, you can increase early season watering and add some more nitrogen-based fertilizer.

Another consideration after harvest is to cultivate your vine rows and plant cover crop. A cover crop can provide many benefits.

First, it protects the soil against erosion. Raindrops stir the soil and cause soil particles to move downhill. Cover crops, specifically grasses, have evolved with the purpose of holding onto soil by virtue of breaking a raindrop's speed and destructive splash, and holding the soil in place with their roots.

If your cover crop is properly chosen, the seeds you choose can provide plants that will add nutrients to your soil when they become integrated into the

you start with a clean slate and can plant your cover crop in ground that will have no competition from weeds and native plants. If your native plant species are beneficial, you may have no reason to plant a cover crop, one may grow naturally each year for you. A local nursery or some weed identification books can help you identify what local plant species are good for your vineyard and which can be classified as weeds and removed.

### Timing Pruning

There are aspects of pruning that require a lifetime to master. Understanding the complex relationship between vine growth and pruning severity is almost impossible to teach in a magazine issue. Pruning is a craft that must be studied, and most importantly, practiced each year. The basic idea of pruning is to remove about 90% of last year's cane growth and leave the 10% in positions

## Too often vineyard owners break out the Champagne a little early — with just a few extra days work, the vineyard will go into dormancy . . .

use it and make a ratio of vine yield to pruning weight.

- Weigh all the pruned canes from ten early pruned vines. Divide the total weight by ten. The quotient is your average pruning weight from your vineyard.

- Recall your average per-plant grape yield and make a ratio of fruit yield per vine to pruning weight.

- The optimal value for low vigor is 12:1, Medium vigor is 5–10:1, and for high vigor 3:1

- To use the ratios: if your ratios are lower than those listed, you can leave a bit more fruiting wood on the vine at harvest, if they are higher than what is listed, you may need to prune a bit more severely for proper balance.

- Three to four foot (1–1.2 m) cane

soil by cultivation or by dying and naturally breaking down into the soil profile. For instance, legumes and clovers can add nitrogen to your soils, and even grasses will give the soil microbes something to munch on and provide health and vigor to your soil.

### Advanced Pro Tip

Time the cover crop to compete with weeds and unwanted native species. Not all home vineyardists have the capacity to cultivate (disk or otherwise work the soil so that it is bare and fluffy) their vine rows before planting a cover crop. But there's no harm in knowing that proper timing of cultivation occurs after the first light fall/winter rain. If you can cultivate the soil after it's been moistened, it will likely cause all native and weed seeds to be destroyed after they have been activated/sprouted by the moisture. In this way,

that will promote balanced and staggered growth that allows sun flecking and wind movement through the fruiting zone to improve fruit flavors and retard mildew and rot growth.

One aspect of pruning that's fairly easy to master is deciding when to make the first cuts. Most pruning in commercial vineyards in the Northern Hemisphere is done starting in early January. With dozens, sometimes hundreds, of acres to finish, the crews must start early to finish by budbreak — usually March or April on the West Coast. But how lucky you are with a small backyard vineyard and an amazing ability to prune as late as you want! The later the vines are pruned, the later they will wake up. Vines can be pruned as early as they can be cut and not bleed clear fluid, or as late as when the buds on the tips of last year's canes begin to swell.

If frost is no concern in your locale,



prune as early as you'd like. But for those that worry through frost season, prune as late as makes sense. This may give you an extra couple weeks of dormancy during the coldest weeks of early spring.

### Common Issues in Dormancy

- Excessive weed growth: Grab a neighborly teenager, a grandson or a nephew and pay them to mow, weed-whack, hoe out and weed the vineyard. Be careful not to girdle the base of the vine with an errant hoe or weed whacker.

- Vines don't go completely dormant: You are likely in a region that doesn't get the proper chilling requirement for grape-vines. Unfortunately, if the vines don't go dormant, there's no way to get around it. You will likely have spotty fruit production and the vines may not survive more than a few years.

- Vines go through budbreak too soon: Early budbreak may be delayed by later pruning. Wait a few extra weeks next year, as late as when the buds at the tips of last year's canes begin to burst.

- Vine prunings get in the way of walking through the vine rows: Leaving cut canes in the vineyards can cause problems. Extra rot, mildew and pest pressure can occur as the insects and spores overwinter in the vineyard. Burn the cuttings safely and according to local laws and common sense. You can also chip the pruned wood into mulch, but I don't recommend putting the mulch back in the vineyard.

- Vines bleed clear fluid when cut: The vines aren't fully dormant yet, or they are waking up. Test cuts on vines to be pruned should stay dry.

Dormancy can be a very relaxing period if you put your backyard vineyard to bed with care and proper attention to detail. Too often vineyard owners break out the Champagne a little early — with just a few extra days work, the vineyard will go into dormancy after a glorious period of root growth and will be ready to produce even better fruit next year. *WM*

## Hybrids & Non-Vinifera

When most people think of wine, they think of a fermented alcoholic beverage made from grapes, although other fruits can be made into wine.

Almost all commercial wine is made from a few varieties of grapes belonging to the species *Vitis vinifera*. However, there are many species of grape, and some non-*vinifera* species are grown for winemaking — often in areas where *vinifera* grapes do not thrive. Likewise, there are hybrid grapes that have been bred for wine-growing in environments that would be challenging for *vinifera*. If you live in an area where growing *vinifera* grapes would be problematic, there may be a grape well-suited to your location. Here are some of the major non-*vinifera* and hybrid grapes:

### Non-*vinifera* Winegrapes

The grape species *V. aestivalis* includes one variety that has historically been used in winemaking, Norton. (Norton may be a hybrid, but is thought to be mostly *aestivalis*.) Norton is a deeply-pigmented red grape that is grown extensively in the Midwest and Middle Atlantic States. The variety Cynthiana is either a closely-related variety or perhaps the same variety of Norton.

Muscadine grapes, members of the species *V. rotundifolia*, are grown in the American South and are resistant to Pierce's disease and phylloxera. They are largely used to produce sweet wines, although the scuppernon (a type of muscadine) is frequently made into a dry table wine.

The species *V. labrusca* contains a number of grapes that can be made into wine. The red varieties Concord and Catawba are grown primarily in Eastern United States. The wine they produce is frequently described as "foxy." Catawba is lightly-pigmented and is sometimes used to make a "pink" wine. The white variety Niagara can be made into a

wine with an aroma that resembles Riesling. *Labrusca* grapes are also resistant to phylloxera.

### Hybrid Winegrapes

Numerous hybrid grapes have been developed by grape breeders for winemaking. These hybrids may be between grapes of different species, or between different cultivars of the same species. Frequently, the purpose of the hybrid was to cross a good winemaking variety with another grape that conferred disease resistance or better growing characteristics. Here are some hybrid grapes that are popular with US growers:

Marechal Foch was developed in France, but is now mostly grown in the Northern United States as it is more capable of surviving the cold winters. This small-berried, red grape can be made into a variety of wine styles. It is related to the hybrid Léon Millot, another red.

Baco Noir is another red grape bred in France and now mostly grown in the United States. It is a cross between a French *vinifera* and an American *V. riparia* grape. It is resistant to many common fungal vineyard diseases, including black rot, powdery mildew and downy mildew.

Cornell University breeders have recently released three hybrids for wine growers in the Eastern United States — Corot Noir, Noiret and Valvin Muscat. The first two are red grapes, and Valvin Muscat is a white grape. All three are said to produce higher-quality wine than similar cold-hardy hybrids. Previous hybrids developed by Cornell include Traminette and GR7.

Finally, grape breeder Elmer Swenson released several cold-hardy hybrids for Midwest growers, including St. Croix, St. Pepin, LaCrosse, Edelweiss and Swenson Red.



# Q & A



## Q Post Harvest

Well, the growing season down here was hot and furious and I can't believe it, but all of my backyard Zinfandel vines survived all the bugs and the heat and made some nice wine this year. We're done pressing in early September and I can't help but think there's got to be something that I need to do to my vineyard after harvest . . . but I have no idea what it is. Does a vineyard need anything post-harvest? There's a few more leaves than usual, as we picked early. I don't know if that helps. I have about 60 vines in two rows on a hill in my backyard. The soil seems to have a lot of clay.

## A

*Post-harvest is a very important and often overlooked time for improving vineyard health. Most home viticulturists don't know that there is a period of rapid root growth immediately following harvest. Once the vines have been freed from their "crop responsibility," the vines put a lot of resources into root growth and in storing whatever nutrients are left over from the growing season. The first thing you want*

*to do (right after harvesting fruit) is to turn the water on. Give the vines a very long, deep irrigation. Up to 10–12 gallons (38–45 L) of water per plant is a good start. The idea here is to moisten the root area as deeply as possible so the roots can grow easily, and to give the vines all the moisture they need to finish their season's growth. Waiting to irrigate in this manner is key — you don't want to give the vines a deep irrigation while they are supporting a ripe crop.*

*Another thing you may want to do is to go through the vineyard and cut off any grapes or stems that the pickers or the birds missed. By removing every cluster and stem you will be removing material that will "mummify" with mold and mildew and start disease cycles early in the next season (after "overwintering"). If your vines were very stunted (little growth, not able to support and ripen crop, etc.), you can also add a small amount of nitrogen fertilizer, chicken manure or compost under the vine row. This will allow the vines to soak up a small amount of nitrogen for the next season. Never add nitrogen post-harvest unless your vines are very low vigor, as nitrogen can keep your vines from going completely dormant. Besides a little gopher control, the only other thing you may want to do is hoe out all the weeds and plant some cover crop seeds between your rows. If your vineyard erodes, use deep-rooting, fast-growing grasses. If your vines need some nitrogen, plant legumes, vetches and clovers (such as red clover, crimson clover, winter peas, bell or fava beans) to add some nitrogen to your soil. Planting these seeds before the rains and after weed removal will help you to control what plants share space with the vines. Make sure the soil in the vine row is cultivated to give the cover crop seeds a good chance of surviving and thriving. Good luck.*

## Q Vine Spacing

I live in upstate New York and have a three year old, cold-climate vineyard of about 85 vines and four varieties: Cabernet Franc, Marechal Foch, Frontenac (MN 1057) and Riesling.

Some vines are three years old, some only two. In following suggestions I found in books and research done on the Internet, I decided to plant my grapes at close spacings of 3–4 feet between vines and about five feet between rows. I went with this spacing for a number of reasons. My soil is a fairly heavy and fertile stoney loam-clay, so I wanted to reduce vigor and berry size by increasing competition. I also have limited space and I know that European spacings are close. Many wines I enjoy come from vineyards that use close spacings.

I have never fertilized in three years and my vineyard vigor seems to be excessive. I have followed the recommended practice of allowing about two clusters or no fruit at all on my two year old vines and about 12–18 clusters on my three year old vines. I removed all other clusters on each vine before bloom. I have allowed more shoots to grow with no fruit on them. In all the research I've done, it would seem that my vines would have less than normal vigor. However, I've had to top the vines of all varieties twice so far this summer. Now I'm noticing that even after removing lateral shoots, the vines are "pushing" new lateral shoots and many have one or two large flower clusters on them. At first I just thought it was just on my hybrid varieties, which I know can be excessively fruitful, but my Cab Franc and Riesling are doing the same thing. My trellis is full of foliage and it's only July. These vines want to just keep growing and producing more fruit. Is this normal? Is my spacing out of whack? I've pinched off all the new flower clusters, but more keep coming. Nothing I can find describes young vines doing this. Should I be concerned or do anything about it?

## A

*Your situation doesn't surprise me at all and there's nothing "wrong" with your vines. The problem is that the book (and Internet site) you read gives poor advice. There's this belief circulating out there in the novice community that close spacing will reduce vigor to the point that closely spaced vines will show a reduction in vigor and magically transform into a tidy French high-density planting that is struggling*

to grow and ripen. This is just not true. Spacing might effect vigor +/- 10% or so, but not enough to change trellising options. It is true that close spacing can devitalize a vineyard due to competition for water and nutrients in a small area of soil, but there are many backyard soils that are far too rich and fertile for this type of spacing.

Vigor is difficult to change from high vigor to low or moderate with cultural practice. My professional opinion is that you should yank every other vine out of the ground and give yourself the 7 feet between vines that your vineyard needs. It sounds drastic, but that way the vineyard will be able to spread out to the level of vigor that it wants to. If the vines are as fruitful as they sound, there will be no reduction in crop, and the balance of the vineyard will be more in tune with the climate.

For this type of situation — I have to picture it in my head, which is dangerous — I might have suggested 6–7 feet between plants and 7–10 feet between rows, depending on how much the vines need to “sprawl” as they grow. If you can place some shoot-positioning wires up high on the trellising system, you may be able to make the vineyard a bit more tidy, and if you “hedge” the vines during the growing season, you may not need to give the vines so much space between rows. That way the vine can grow fairly vigorously and will have more room to grow when you remove lateral shoots. Get used to having to go through the vines every few weeks to remove leaves, and then to go back and remove the laterals/new leaves that will grow back. Have faith — your hard work will improve air flow and sun flecks on the fruit, remove vegetal character, and improve color and phenolic ripeness. Obviously, don’t fertilize, and know that the benefit of high vigor means that you can get a heavy crop off those vines with little effort.

Balance means that with all that leaf area, the vines can hang a very nice crop of grapes, so stop cutting the fruit off! The excess vigor will be hastened by a lack of fruit for the vines to ripen. The fact that the vines are throwing new crop in July makes me think that these vines are anxious to ripen grapes and make some wine next year. I like 15–20 leaves per cluster, so next year count the leaves, and allow one cluster for each 15–20 leaves on the plant. With all the vigorous growth, you should be able to

get many pounds of fruit from each vine.

Also reduce watering, as that will most likely lessen vigor as well. Early season deficit irrigation is key for keeping vigor under control. In New York, you might not have the ability to stop the spring rain, but that’s OK! Rain water is always better than ground water for plants and is one reason your vines are so vigorous.

One other possibility for devigorating the vineyard is to plant nutrient-hungry cover crop between the rows. Seed some turfgrass (such as fawn fescue or other types of fescue) between rows. This will “soak up” a little of your excess vigor, and may make the vineyard more manageable.

## Q Grow Tubes

I’ve been making wine for 25 years. I planted some new vines last year and used grow tubes to cover them as they grew up. As I moved the cylinder up, leaves were exposed on the bottom of the vine. Do I take these leaves off? Once the vine starts to run along the fruiting wire, do I keep the leaves off the vine running to the wire?

**A** Ah yes, growtubes . . . for those who may not be familiar with these, growtubes are translucent tubes that you put on young vines (first year) so that they grow faster and are protected against wind and animals that might chew young shoots. The benefits of growtubes are that you get a quick growth spurt that is fairly straight for developing the trunk of the vine. The problem is that the vine is convinced that it’s growing in Hawaii. The weather is always warm and humid in the tube, even though the reality of the climate may be very different. At some point you have to take the tube off (always do this during deep dormancy), and my feeling is that it’s a bit of a shock for the vine to develop and grow in different climates.

My opinion is that if you don’t need growtubes, don’t use them. Let your vines acclimate to the actual environment where they will live and produce fruit in subsequent vintages. I also have a personal belief that you will have more overwintering spores of mold and mildew in a vine that was grown in a grow-tube, as the humid environment is perfect for disease development. It’s fairly difficult to spray fungicides

effectively when the vine is “armored.” As you might guess, I am not subsidized by growtube manufacturers, nor am I selling any currently. To be fair, many well-respected vineyardists find growtubes very helpful in cool and windy climates to give the vines an advantage in their first year of growth. Besides protecting the young vines from rabbits and deer, they conserve moisture and protect the young vines and their leaves from herbicide sprays.

Now back to the question. First off, never move a grow tube during the growing season unless you need to lift it momentarily to remove weeds that are growing inside next to the vine. Moving the tube up will shock the lower leaves. You won’t have to remove them because they will die from the shock of going from a sheltered, shady environment to full sun. It’s like taking a fern from your house and putting it outside in full sun — not a happy plant! No leaves equals no growth, so let’s keep the leaves healthy and green inside the tubes for the full first year (if you decide to use grow-tubes that is).

You will notice that when the young grapevine’s shoot reaches the top of the growtube, it will be a bit shocked by the sun at the top, and will slow down for a week or two, adapt, and then start growing quickly again. This is totally normal. My suggestion is that you leave the growtubes on the vines, in the same position all season, let the vine go dormant and drop leaves by itself. Only remove the tube and manipulate the canes on the trellis during mid-winter. It is never wise to remove leaves from a young vine that is not bearing fruit. Those leaves are the “factories” for creating growth in your vines. Remember what Galileo said: “Wine is sunlight held together by water.”

## Q Trellis Poles

I am confused about what type of poles, stakes or end-posts to use for my trellis. The Grower’s Supply Center suggests using CCA impregnated poles. Should I be concerned with the arsenate contained in this choice?

**A** Wooden end-posts are treated with chemicals to make them last longer in moist soil. I’ve done some research on this subject and it seems that most concerns about

CCA (copper chromated arsenate) treated lumber has to deal with production and disposal of stockpiled wood. The copper is added to the pressure treated wood as a fungicide, the chromium as a bactericide and the arsenic as an insecticide. From a purely viticultural standpoint, the amount of “leachate” or chemical that will leak from the wood, is negligible and will not effect vine growth or wine quality. I see two issues here, which are repeated in most chemical and organic farming discussions. How well does the material work, and are there organic equivalents that are economically viable? From this point it’s a matter of personal philosophy. Will untreated posts function? Of course, but they will rot in the soil much more quickly and will need to be replaced more frequently. Is it worth the small amount of toxicity to save further need of wood resources? You can find research that shows handling CCA-treated wood is safe or hazardous, depending on who funded and published the result. The EPA has not been able to prove that CCA-treated wood poses a threat to those who consume the produce, even when used to make small, raised vegetable beds.

You need to weigh the issue yourself and make a decision based on your own needs. You ask for options, and a newly emerging process for pressure treating wood is called “ACQ,” or “alkaline copper quat.” The new formulation, “ACQ Type D” also has a built in water repellent. It’s still difficult to find ACQ treated endposts, but you can try asking for them to be specially ordered from any outlet that regularly sells treated posts. Of course you can always opt for steel or powder-coated stakes or anchored metal endposts, which may actually last longer and offer more economy than any wooden product. Of course nothing lasts forever. Either by rust, rot or what we call “tractor blight,” you will always have to replace a few posts each year.

## Q Shoot Growth

My vines (Cabernet Sauvignon, 6 years old) are starting to wake up and bud-break is in full swing. One thing I’ve noticed is that the new shoots along my pruned budwood have varying sizes. Some seem to be healthy and elongated with a healthy growing tip and emerging leaves (about 6” long) and some seem to be sort of stunted and leafy, but with

no growing tip (less than 1”). They don’t seem to be growing as quickly. Is this normal and is there anything I can do to fix it this year?

**A** Uneven budbreak and shoot growth are very common, and there are a few easy solutions that can be implemented with a single hand-pass through the rows. If there’s a vineyard in North America that has perfect budbreak and uniform shoot growth every year, I’d like to see it, because this may be the single most common quality issue in vineyards from New England to Maui. This seems to be more of an issue in cane-pruned vineyards (spur-pruned vines seem to have a bit more regularity of shoot growth), but shoot removal is a key step for quality in any style of vineyard.

Here’s what to do: Wait until your vineyard has an average of 6 inches of new shoot growth. Work vine by vine and remove the shoots that do not have an actively growing shoot tip, or are less than half the size of the average growing shoot. This will concentrate the vine’s resources into viable and healthy shoots that are capable of producing and ripening grape clusters. If you notice that there are lots of long, healthy shoots near the center (head) of the vine and stunted shoots on the ends of the vine’s cordon arms or fruiting wood, this usually means that there are too many shoots in the middle. Thin out the new growing shoots near the trunk of the vine, and the small shoots on the ends should catch up as the vine reassigns its vigor to the shoots that remain. Make sure to leave enough shoots on the vine to bring in a decent crop, and assess each vine on an individual basis when it comes to average shoot size.

Removing stunted shoots every year will improve fruit quality by producing regular-sized shoots and canes that ripen their crop load evenly. Good luck with your shoot-thinning and while you’re out there, knock off those “sucker” shoots that appear on the trunk and down by the ground. Sucker shoots are a nutrient-sink and need to be removed as soon as they appear.

## Q Purchasing Fruit

Why go through the trouble of growing grapes in our backyard when we can

purchase fruit or concentrate from a vineyard, store or website?

**A** My answer may surprise you. With all the commercial vineyards popping up throughout the country, it may be more economical to purchase fruit from an excellent source. Most home vineyardists are surprised by the amount of time and labor that growing grapes consumes. My suggestion is that you consider how much time and passion you can afford to expend in the process of planning, planting and tending a vineyard — and if you are at all concerned about the hard physical labor, sprays, testing, etc. I suggest you may be better suited as a grape buyer. When I engage a potential vineyard client in our first meeting, I usually spend about a half hour trying to dissuade them from growing a vineyard. No joke. They are usually surprised that a consultant would point out the potential difficulties involved in a process he or she gets paid for, but I would rather give full disclosure than be chided two years later for holding back the truth: vineyards require the full attention of a family to produce usable fruit for wine. Vineyards are terrible landscaping — they need weekly love and attention to keep them from turning into a sprawling, ugly, mildew-laden monstrosity.

So who actually plants a vineyard in their yard? As I’ve mentioned before in this issue, there is only one type of wine lover that should plant a vineyard: you have loved wine for decades, traveled the wine world, attended tasting after tasting, and made your own wine. The end game of wine is the home vineyard, which is a bit counter-intuitive, but thoroughly realistic. Without passion and commitment you will end up with a ghost-vineyard — some rusty stakes supporting skeletal vines . . . or the opposite . . . an unruly and rank hedge that will likely make thin plonk for all your good intentions.

There are plenty of competent commercial vineyard operations looking for good homes for their fruit. Buying grapes by the half ton or ton is surprisingly economical, considering the cost of vineyard establishment and management. But you may find it difficult to convince a vineyard to sell you less than 1,000 pounds (454 kg). Supporting existing vineyards in your locale (if they exist) encourages an emerging wine

region and brings winemakers and growers together. Most professional winemakers do not own vineyards — they've crunched the numbers and see it as a losing proposition. Here's a few tips for working with commercial vineyards:

- Choose varieties that excite you as a winemaker, but may be less popular in the market. Right now on the central coast of California there is a sale on Syrah fruit, as it has been widely planted but had its thunder stolen by Pinot Noir. Try to make wine from the varietal that grows best in your state, province or county. I would rather make a killer Norton than a lackluster Cabernet. Be smart and realize that what really matters is what ends up in the bottle, not what's on the label.

- Call early for fruit . . . at least a year in advance of harvest. Get on the list and if you don't know the owner, you may want to draft a simple contract. Handshakes are usually enough, but farmers are human and can forget prices and commitments. Call and remind the farmers of their commitment before the fruit softens.

- Ask if you can get fruit from a specific section of the vineyard that looks healthy and well-farmed. If you're buying a decent amount of fruit, say a ton or more, ask if you can come out and check up on the vineyard a few times during the growing season. Check your block a few months after budbreak (are the shoots evenly spaced and showing uniform vigor?), at flowering (how's the weather for flowering look?), after fruit set (was there fruit shatter or flowering issues?) and before harvest (will you drop green fruit at 90% veraison?). The best winemakers visit their vineyards and demand solid farming.

- Ask to do your own ripeness testing. If at all possible, test Brix and pH levels with your own equipment. Vineyards are notorious for reporting numbers slightly riper than the actual fruit shows when crushed. Take large samples (at least a dozen clusters from random plants and locations) and let red samples soak crushed for 24 hours to get more accurate numbers.

- Do your own harvesting. Use a large crew, your own picking bins, and pick as early as light allows. Ask the vineyard owner/manager if you can sort in the field, which means you ride the bin(s) and toss out any compromised fruit. If you can field sort, you won't have to pay for fruit

you don't use for production. If the owners complain about field sorting, remind them that you are saving them money by picking your own fruit. Waiting on their crew, bins, etc. means you will likely not get the fruit at the anticipated time and day. Make sure to put the empty picking bin in the back of a truck if no forklift is available, and fill the bin there. It's impossible to hand-lift a full 1,000 pound fruit bin.

**Bottom Line:** Plant a vineyard only if you're a wine nut with a strong back, a source of labor, lots of time, interest, disposable income and you can't get a good deal on quality fruit in your area.

## Q Site Selection

Is there a protocol for determining if my backyard will support a home vineyard?

### A

Absolutely, and it can be followed in almost all wine regions and soil types. Again, I recommend involving local winegrowers and experts on the project as early as possible, as every area has its unique challenges, pests, weather, etc. But here's what you need to do to see if your dirt can grow some wine:

- Plan the area you wish to plant, measure the plot. You may want to sketch out a rough plan after measuring. I often suggest that my clients live on a property for at least five years before deciding whether or not to plant a vineyard.

- Consider where the water will come from if you need irrigation. Where are the water lines? Will I be taking over usable parts of my backyard, or will the vineyard be tucked into a corner or put on a hill that may have limited utility otherwise? Which direction will the rows run? (North/south is my preference.) Where will you store the farming equipment?

- Test the soil and your water for agricultural suitability. Once you know where the vineyard is going, dig an observation pit right in the middle. One area for soil sampling is usually more than enough (1 pit per 20–100 acres is the rule for commercial vineyards). Dig the pit at least 4 feet (1.2 m) deep, and only wide enough that you can get inside and pull some soils from 36–48 inches (91–122 cm) into a gallon Ziplock bag. Take a sample from 12–24 inches (30–61 cm) (initial rooting depth), and from around 36 inches (91 cm) (sub-soil). Take some pictures of the soil profile

and note carefully if there is a thick clay or hardpan layer, as it may inhibit deep rooting. If there are areas in the potential vineyard plot where totally different plant life is growing than other spots, you may want to test that area separately, using the same protocol explained above.

Next, triple rinse a 1 or 2-liter plastic bottle with the water you plan on using for irrigation (if irrigation is necessary), fill the bottle, cap it tightly and securely. Label all samples carefully with a permanent marker, note the address, city, state, sample depth, etc. You may want to pay extra to have the results explained to you, and have pre-plant soil amendments provided with the results. Be sure to note somewhere in the package that the samples are to be tested for agricultural suitability for vineyard establishment.

- Interpret the results with the help of the lab or a consultant, and if the reports come back with hopeful results (that vines will grow), you can move on to the next part of the planning phase.

Remember that the soil doesn't have to be perfect or filled with nutrients — sometimes a deficiency of some nutrient may make the resulting wine more interesting. (Of course there are deal-breakers like high boron or excessive salinity.)

- Move on to Phase 2: If the soils and water look good, your family gives you the thumbs up to develop the yard into a vineyard (no archery range for junior!) and there are no terrible pests or blights in the area, you can start planning the actual installation of the vineyard.

**Bottom Line:** You are better off developing a vineyard in an area that is a proven winner. Starting the first vineyard in a locale is an intrepid undertaking, and one fraught with peril and the unknown. If the soil and water tests come back with encouraging results, the real research and planning begins. Start researching pest management, local bugs, weeds, grapevine diseases and get a good idea of the yearly degree day accumulation in your yard to be able to properly choose a variety of grape.

Try to find a site that shows comparative data, like this site does for the Puget Sound area: <http://pswg.org/grapes.htm>. With this type of research easily accessible online, you have resources at your fingertips that used to cost a ridiculous amount of consulting fees to get.

## Q Task Checklist

Can you describe the basic cultural practices that will need to be completed in a home vineyard in a normal year?

### A

*Instead of in-depth descriptions of each practice we use to culture the vines and promote wine quality, I will give a succinct summation of most tasks to complete in a given year, starting with budbreak and extending through harvest. Choosing which practices to use is dependent on your locale. Knowing the basic practices, though, gives you a number of ingredients from which to prepare your fruit for wine production each year. A chronological sequence of vineyard practices:*

#### **Spraying:**

*Using fungicides to keep the fruit and foliage free from mildew and rot. Follow manufacturer's instructions exactly — do NOT spray overly concentrated materials and expect them to have a longer impact on the vineyard. The key to fungicide application is to stay on schedule, follow labels, and use protective equipment to keep yourself safe. Clean fruit is the most important step towards quality wine.*

#### **Shoot thinning/lateral removal:**

*Remove the smaller shoot on double shoots (where two shoots emerge from the same bud — or remove the less fruitful of the two). Also remove shoots where the shoot density is crowded. I like to see 3–4 inches (8–10 cm) between each shoot on the fruiting wire, which gives each shoot and the clusters hanging their own niche space for wind and sun penetration.*

*If shoots are hosting lateral shoots (shoots with growing tips that emerge from green shoots instead of last year's wood), remove all laterals to open up the area that will play host to the fruit.*

#### **Weeding:**

*Keep the area under the vines clear of weeds, especially for young vines. Mature vineyards aren't as impacted, and the key is to keep weeds from growing into the vines (which increases mildew pressure, can shade the fruit, and may impact flavor).*

#### **Suckering:**

*Remove any growing shoot on the base,*

*emerging from the soil or rootstock, or anywhere else except last year's wood that was retained for fruiting. This may need to be done 2–3 times through the growing season. Suckers are shoots that emerge from unwanted parts of the vine, and are a sink for nutrients that should be utilized by the fruitful shoots.*

#### **Fertilization:**

*Only fertilize vineyards that lack vigor or are heavily deficient in a specific macro or micronutrient. Most vineyards require little or no fertilization. The general rule is: if the vines are growing happy and healthy, with at least moderate vigor, don't fertilize.*

#### **Irrigation:**

*Many locales that get strong winter rains and/or snow and have a saturated soil profile at budbreak will not require supplemental irrigation. Irrigation is a complicated and divisive subject, and needs a lot of space to adequately explain. This is where local growers can help a lot — by giving you a baseline of gallons (or liters) per week to apply in spring, summer and pre-harvest. It's always wise to dump tons of water on the vineyard after harvest, when the vines need a good root-dousing, and it's smart to establish some cover crop between rows to keep fall and winter rains from robbing you of your topsoil.*

#### **Shoot positioning/canopy manipulation:**

*You want your fruiting zone to be open to wind and sun penetration, but not so much that the fruit burns. If the fruit gets about 10% of the ambient sunlight, that should be enough to improve flavor and eliminate vegetal aromas.*

*Putting trellis wires above the fruiting wire in order to weave the growing shoots vertically (vertical shoot positioning trellis) may be a good idea in a moderate vigor vineyard, and high-vigor vineyards may have to be hedged a few feet above the trellising, which will require another lateral-removing pass, as the vines will bush out on the bottom when hedged.*

#### **Leaf thinning:**

*Remove just as many leaves as necessary to open up the fruit zone to wind and sun, but not so much that the fruit burns. This is a long learning process, and don't be sur-*

*prised if your leafing philosophy evolves.*

#### **Canopy check:**

*One last pass to get your shoots tucked into the wires, remove late-season suckers, fine-tune leafing and lateral removal and a couple extra hedging clips will make your vines very consistent from plant to plant — which means uniform ripening and ultimately, better wine.*

#### **Fruit thinning/green harvest:**

*If there is way too much fruit out there, your wine may be dilute. Try to keep a ratio of about 12–15 leaves per cluster for adequate ripeness and concentration. You may also want to drop the last 5–10% of green fruit on the ground after veraison to increase the uniformity of ripeness.*

#### **Hedging:**

*Hedge the vines one last time (if needed) before putting the bird nets on. The vines need to be hedged if they fold over and shade the fruit, or if the leaf to cluster ratio has way too many leaves.*

#### **Netting:**

*Google "vineyard bird netting" and use it to your advantage as fruit starts softening or changes color.*

#### **Fruit testing:**

*Pay attention to how the fruit is ripening, take Brix (sugar) readings and pH and keep a notebook from year to year to help you understand ripening patterns.*

#### **Harvest:**

*After you finish all this work, make some wine. Wake up early on harvest day and crush that fruit cold!*

*Bottom Line: Learn what your vines need to be in balance, healthy, but not overly vigorous. Keep the fruiting zone open to wind and sun, but don't let the skins spot, crack or split due to sunburn. Remove shoots that aren't fruitful, are suckers, doubles or crowd the canopy. Keep the fruit clean, healthy and out of critters' gullets. Crush the fruit in perfect condition.*

## Q Basic Mistakes

What are the most common errors you see when visiting home vineyards?

## A

• *Poor spray scheduling. Missing one spray can wreck a vintage. Keep the fruit and canopy clean. Hand sprayers have almost no canopy-penetration. Consider a powered sprayer pulled behind an ATV.*

• *Lack of follow through. A few hours a week may be all it takes to get the sprays done, practices finished and to prepare the vines for a good vintage.*

• *Poor observation and reaction. If you don't walk your vineyard once a week (minimum), I can almost guarantee problems. Recognizing an issue like mildew infection or an insect population before it becomes catastrophic is key to nipping it in the bud. Walk, observe, react, fix.*

• *Lack of communication with the local wine community. The more connected you are with local growers and home winemakers, the better you will understand the needs of your vines and the potential of your wines. Start or join a club or tasting group. Take field trips and ask questions. Submit your wines to competitions and learn to properly evaluate wines and distinguish common wine faults.*

*Bottom Line: Pay attention, be relentless and make wino friends.*

## Q Harvest Timing

What is the best way to tell if your grapes are ready for harvest and what do you do if some of the grapes are ready and the rest will be in a week or so?

## A

*Once a viticulturist has been growing his own winegrapes for many years, he or she can usually choose a picking date by tasting grapes and recognizing the flavors that flag harvest-readiness. I taste a lot of fruit and juice, but I also check Brix and pH as soon as the grapes get around 20–22 °Brix. Re-check the grapes every few days in hot weather (80's+ °F/25+ °C), every week in cool weather (70's °F/ 20's °C or cooler). Pay attention to the flavors of the grapes when you harvest. Record the flavors and numbers, and if the wine comes out great, use your notes as a reference on ripeness for future harvests.*

*Try checking the seeds for uniform nut-brown color, the pulp should not be sticking to the seed. For still wine, I like Brix readings between 23–25, pH between 3.1 and 3.4 for whites and 3.3 to 3.8 for reds. I like*

*to see red wines finished at about 3.5 pH, so if your grapes come in with high pH, I would consider adding tartaric acid to the must to get the pH to 3.4 pre-fermentation. If you like softer wines, you may be perfectly happy with higher pH.*

*If your vineyard is small enough, you can mark clusters that aren't coloring up with a twist tie loose around the peduncle (where cluster attaches to cane) and harvest those a few weeks later. Selective picks are a tricky business. Whatever you can do to isolate the clusters that should be omitted from earlier picks will be helpful. Most cluster marking happens at the end of veraison. The other option is to drop the last 10–15% of green fruit at the end of veraison. It's also traditional in some regions to use the second picks to make rosé wine.*

## Q Vine Spacing

What are the minimums for vine spacing? I have a typical suburban backyard and want to make optimal use of the space I have.

## A

*Vine spacing should always be a reflection of anticipated vine vigor. There is a misconception that more vines means more clusters and better fruit, and that is not always true. My usual suggestion on how to space a vineyard is to put a vine in the ground in the middle of the potential site, give it water when it needs it (if the soil is dry 2 feet (60 cm) deep, give the vine a few gallons/liters a week). With no added fertilizer, train the strongest shoot up a simple stake and measure how much growth you get from a dormant bench-grafted vine in that first season. If the vine only grew up to 2 feet (~60 cm), you have a low vigor site. If it grew a few feet to about 5 feet (1.5 m) I would call that medium vigor. If the vine grew 6 feet (1.8 m) or more, you have a high-vigor situation.*

*Of course measuring the growth of one single vine can be misleading. If you can grow three to five vines in various locations and then make an average, that would be preferable. Low vigor sites are the only kind that will allow tight spacing. Tight spacing will NOT strongly influence vigor. You may see a 10% reduction in vigor from high-density planting (under 4'/122 cm between plants), but high-density planting (say 3'x3'/~90 cm x 90 cm) in a high or*

*even medium vigor site will cause crowding, rank growth, and reduced fruit and wine quality.*

*So, my recommendation is at least 6' (1.8 m) between rows in backyard situations. You need as much space in between rows as the anticipated height of the canopy when it is in full growth. So if the canopy is expected to be 7' (2 m) tall, go 7' (2 m) between rows. Low vigor sites can go with 3' (90 cm) between vines, medium vigor should be 4-5' (90-152 cm) between plants, and high vigor can be up to 6' (1.8 m) between vines. Allowing the vine to stretch out and use that vigor to put crop on a canopy is important. If you squeeze too much vigor into too tight a space, the vine will grow too much to be managed. If I had to give a baseline for spacing in backyards I would start with 6 feet between rows and 4 feet (122 cm) between plants. In this system I would usually do a bilateral cordon training, which means two permanent "arms," each going one way on the trellising, with spurs on top to produce fruit, each "arm" two feet long along the fruiting wire.*

## Q Lawn Chemicals

Are there lawn care products that can potentially damage grapevines? What do you do about neighbors who use these products?

## A

*As far as lawn care products, I don't think you have reason to worry. High nitrogen content fertilizers might leach a little into your yard, but I wouldn't expect to see much effect. Most lawns feed from the top 6" (15 cm) of the soil. Vines, properly grafted and planted, don't really even notice what's happening in the top 18" (46 cm) of the soil, so there shouldn't be much of an issue. I'd be more worried about careless spraying of RoundUp or other herbicides.*

*If you see evidence of chemical drift hurting your vines, just go knock on the neighbors door and start a healthy and respectful conversation.*

## Q Cover Crops

My 125-vine vineyard near Seattle is on a very steep and sandy slope and I'd like to overseed with clover to help stabilize the soil. I'd prefer to let the clover grow under the vines as well. Do you see any problems with competition for nutrients



or water from the clover?

**A**  
You're in luck! Clover loves sandy soil, will stay low to the ground, and will actually increase the fertility of the soil (sandy soil could always use a boost) by fixing nitrogen from the atmosphere. Clover's ability to do this is nothing short of a miracle. The clover (and rye) have shallow roots and will not compete with the vines — in fact they will actually improve your soil's structure and may even bump your nitrogen levels a tad. Cultivate the soil if necessary and then seed the area at 30 lb./acre (about 1 lb. per 1000 square feet/0.45 kg per 93 square meters) of crimson clover seed. I would recommend crimson or red clover which is also very lush and beautiful when in bloom.

I'd also recommend mixing in a good dose of annual ryegrass seed in the mixture, which will make a great winter cover crop that will improve the texture and organic matter of your soil. The ryegrass seed can be mixed in at the same application rate—30 lb. per acre or a pound for every 1000 square feet (0.45 kg for every 93 square meters). This is a great starter cover crop for all vineyards that are looking for some erosion control and a boost of soil fertility. Both these seeds will thrive in most soil types. They'll love all that great, pure Seattle rain.

## Q Pests: Leafhopper

Why did I and almost all of my nearby backyard vineyard friends get massive infestations of grape leaf hoppers this year, and never before? Will we eventually lose our vineyards to Pierce's Disease because of it?

**A**  
Consulting the UC-Davis Bible, also known as the 2nd edition of "Grape Pest Management," we learn that the grape leafhopper is more of a headache than a dagger to the heart of your vineyard. There's more information in this book about leafhoppers than any other insect species, so let me try to distill the pertinent facts:

- Most vineyards can tolerate fairly large populations of leafhoppers without affecting crop level or quality. If more than 20% of the leaves in your vineyard are

being destroyed by hoppers (white spots that will eventually kill the leaf and cause it to drop off), you need to practice some form of control.

- If less than 20% of your leaves are being killed by leafhoppers, don't sweat the infestation. You may want to wear a surgical mask while doing work unless you need more insect protein in your diet.

- There should be anagrus wasps in your area of Southern California that will provide some natural control of the breeding. Check the underside of the leaves for egg clusters. If any are red that means that the wasps are parasitizing the eggs. That's a good thing! They don't need social security numbers to work and they don't want vacations or benefits.

- July is usually the peak of the leafhopper season. There may be more in your neighborhood because all of you crazy winos are planting vineyards and giving them more habitat.

- Control must be achieved in May and June during the first brood's reproductive cycle. Horticultural soaps or oils that are listed as being effective for insect control should be a good way to go. Some might also help with powdery mildew, always nice to kill two birds with one spray.

- You will be happy to know that there has never been any evidence showing that common grape leafhoppers are a vector for *Xylella fastidiosa*, the nasty bacteria that causes Anaheim Disease, also known by the name of the gentleman who isolated the bacteria, N.B. Pierce (who must have had very embarrassing given names, as he is only referred to as N. B. in the dozen references I checked. My guess is that his real name is Nimrod "Bubba" Pierce) Sharpshooters do spread PD, but they are a special breed of leafhoppers.

## Q Pests: Birds

What species of birds are the most frightening to a wine grower and what is the best way to keep them at bay. We have a large Audubon bird sanctuary just a few hundred feet away.

**A**  
Nothing is more frightening than a sky blackened by thousands of Starlings. Blackbirds and other kinds of birds, including crows, will take fruit as well, but I've seen an acre wiped clean of fruit in only a

few passes by a very large flock of starlings.

Starlings have also begun to adapt to bird netting. Ten years ago in Santa Barbara County, the Starlings would avoid netted vineyards entirely. But now that almost every vineyard is netted, they have learned to hang off the nets and probe into the canopy with their beaks. Nets are used in conjunction with propane cannons in commercial vineyards, and we often force the flocks away with the support of a twelve-gauge. Finches and small birds peck the fruit, but starlings load up their gullets with as many whole berries as they can and then fly away. Sparrows, Robins, Pheasants and Quail are some other species that are known to eat grapes. As killing birds is likely not an option next to a sanctuary, I recommend netting the vineyard and tying up the bird nets on the bottom with twist ties to keep the birds from flying underneath. Leaving a few shoots sprawling outside positioning wires can actually be helpful to spread the nets wide enough that birds can't peck at the fruit from outside the nets.

## Q Pests: Japanese Beetle

What tips do you have for someone trying to grow their vines organically/sustainably? How do you deal with Japanese Beetles in an organic/sustainable vineyard?

**A**  
I wish I could give you better news, but the best strategy that I know of is to get a group of friendly, bug-hating friends together and walk the rows and pluck and kill the beetles by hand. The defoliation caused by Japanese Beetles encourages sunburn, and beetles that end up in the grape bins and fermenters can cause an undesired flavor in wine. Although it seems a terrible waste of time, removing these buggers from the vines by hand may be the best strategy. Just be thankful you don't have to deal with dozens of acres!

## Q Organic Growing

What tips do you have for someone trying to grow their vines organically/sustainably?

**A**  
On a very basic level, being organic/

sustainable is about promoting healthy soil and a diverse habitat. Healthy soils (those built by compost, mulch and green manure) make the vines healthy enough to stave off infections and diseases that would affect a less healthy vineyard system. A good start is to make your own compost and apply it in a band under the vines at least once every two years. Organic fertilizers such as fish emulsion or kelp extract are also a great way to build soils with healthy microbiology. The starting point for any sustainable vineyard is to see if the vineyard is healthy without adding fertilizer — some soils are rich enough to sustain vines in perpetuity without added nutrients. Grape leaves should be a dull green and smaller than a large human hand. Huge, shiny leaves are a sign of overly vigorous vines. Another aspect of organic production is to allow a level of animal and insect diversity that guarantees that the critters are running around chasing and eating each other (and not the vines). That means allowing some cover crop to host insects in the vine rows, putting up owl and bat boxes for pest control, and sometimes getting into the vineyard and removing pests by hand. The most important aspect of organic viticulture is to walk the rows every day and react before pests of nutrient deficiency become a threat to the vines or the crop.

## Q Disinfecting Shears

Is it common practice to disinfect pruning shears when moving from one vine to the next in commercial operations? I do this for my other horticulture activities — dip into 100 ppm bleach or spray iso-alcohol to prevent cross contamination of fungi, molds and bacteria.

**A** Every book and reference I checked agrees with this practice — disinfecting shears between vines is a great way of keeping vines safe from cross contamination. But for some reason, I know of no commercial vineyard farming operations that take the time to do this during pruning. So — if you have the time and the patience for it, it really is a very good way to go. Same goes for pruning tar — some texts recommend tarring or painting all cuts for sanitation, but I've never seen it done in the California

vineyard biz. I remember my Driver's Ed textbook recommended checking tire pressure before driving your car anywhere — same kind of deal. It would be a better world if everyone did, but few of us have the time.

## Q Replacing Vines

My backyard vineyard near Lake Tahoe, California consists of about 500 vines (all Italian varieties), and it seems I lose around twenty vines per year to gophers, a weed whacker and sometimes for no apparent reason at all. Is it unusual to lose that much of a vineyard yearly? Is there any way for me to better protect the vines so I can keep my entire vineyard healthy and the vines of the same age? Also, I've read contradicting reports about when is the best time for replanting. Can you offer me some guidance in these areas?

**A** My viticultural hero, Jeff Newton once told me that 5% of any vineyard will always look like crap, and it will always be that 5% that you look at every day. Don't overlook that 95% of your vineyard is balanced, healthy and makes great wine.

We replant at least a few percent of Clos Pepe — the vineyard I tend — every year. There's gopher damage, a few random vines that aren't the right variety, some tractor blight. You can always trap, smoke or poison gophers to keep populations down, but you'll likely never get rid of them all. Be wise, do what you can to take out as many gophers as seems possible, and realize also there are soil types, deficiencies and depths that may not allow grapevines to grow or thrive. If a vine dies in one spot and the next vine dies, and the next, give up on that little piece of dirt and focus your attention on the spots that produce a balanced vine and delicious fruit.

As far as replanting goes, most New World growers replant in late Spring after the potential of frost has passed, but in areas like Oregon, Washington or France, they often replant in Fall to get the benefit of the rainfall to soak the soil, get a bit of growth, and then a full dormancy before their first full year in the ground.

The take home message is that there's no wrong time to replant during the growing season, although I do think springtime

in your area would give the correct results.

## Q Vine Spacing

I have six three-year-old Cabernet Sauvignon vines, six two-year-old Cabernet Sauvignon (both are 337 on 5C rootstock) and six two-year-old Cabernet Franc (312 on 110R). They are spaced a mere 18 inches apart. They are trained up to the first wire at 2 inches and bent to the left to form an inverted 'L.' I have five wires total, starting at 2 feet above the ground and ending at 6 feet. My problem is, if left unattended, with sufficient but not excessive water, I get vegetative growth on my vines starting the second year that easily exceeds the top wire. Last year, I trimmed them when they hit the top wire to stop them from making so many leaves.

Being greedy, I took a small crop on the second year and am planning on taking a larger crop on the third. My two-year vines had no problem ripening the four to six clusters per vine that I kept on them. Is the growth excessive? Is there a way I can better manage the canopy? I don't have much room.

**A** With regard to the growth being excessive, no. Grapevines can be naturally vigorous. When a grapevine is young it likes to stay in vegetative mode and climb. In the wild, vines climb trees to compete for sunlight, and your vines are doing their best to compete with themselves.

This is also a good example of the fact that tight spacing does not guarantee that vigor will be reduced. With the vigor you describe, I believe six-foot spacing is more appropriate than 18 inches.

As for managing the canopy in a tight situation, sometimes less is more. I hate to kill vines, but you need to spread them out if possible. If you can uproot the vines carefully (dig up as much soil and root mass as possible) and replant them at 4- to 8-foot spacing, I suspect the vines will be much happier. The key is to see how the vines want to grow, and then give them the space to do it. Try cutting the water back early in the season too, which will reduce vigor slightly. Rootstocks like 5C are a bit sensitive to drought, and growth will taper off late in the season without frequent irrigation of the vines. **WM**

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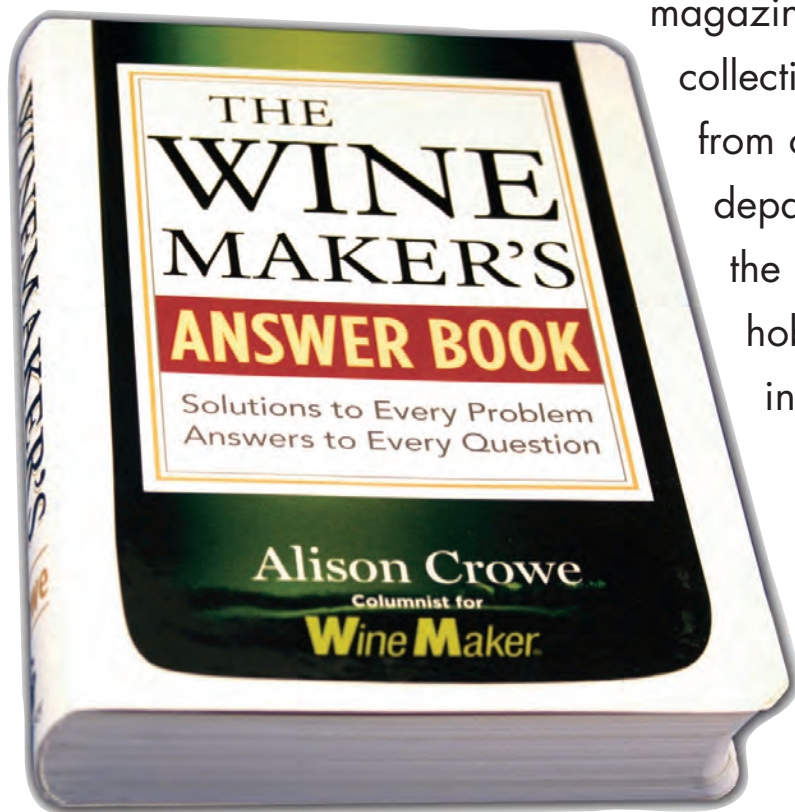
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