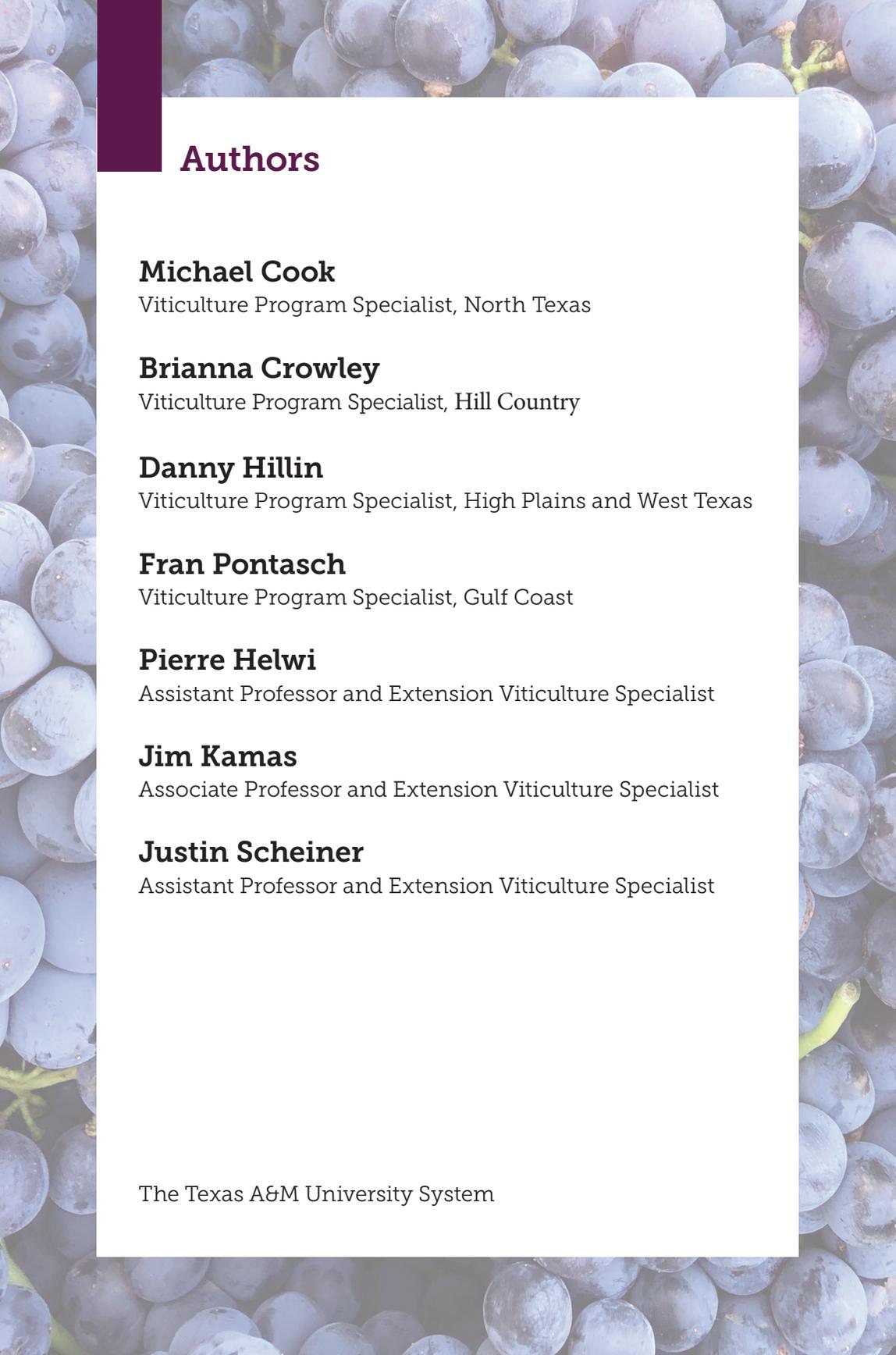


Starting a Vineyard in Texas

• A GUIDE FOR PROSPECTIVE GROWERS •



TEXAS A&M
AGRILIFE
EXTENSION



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Who is the Texas A&M AgriLife Extension Service?

We are here to help! The Texas A&M AgriLife Extension Service delivers research-based educational programs and solutions for all Texans. We are a unique education agency with a statewide network of professional educators, trained volunteers, and county offices. The AgriLife Viticulture and Enology Program supports the Texas grape and wine industry through technical assistance, educational programming, and applied research. Viticulture specialists are located in each region of the state.

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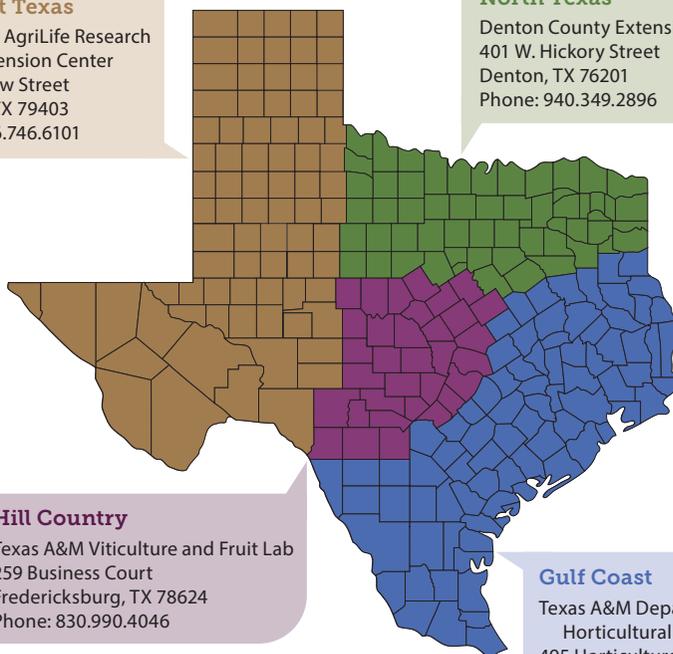
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The Texas Wine Industry

Where We Have Been

Grapes were first domesticated around 6 to 8,000 years ago in the Transcaucasia zone between the Black Sea and Iran. By the time Europeans began to colonize the Americas, these grapes had been dramatically improved through selection and breeding, and hundreds of different varieties were grown. Early settlers of the Americas brought the grapes of their homelands with them, but they endured serious challenges from pests and disease. The European grape (*Vitis vinifera*) is a different species of grape than those that grow wild in Texas; therefore, it does not have the same natural resistance to pests and disease.



In the mid-18th century, phylloxera (*Daktulosphaira vitifoliae*), a soil-dwelling pest from North America, was introduced to Europe and began to attack and kill entire vineyards. The European grapes had no resistance to this pest, and it ultimately killed several million acres of vineyard, devastating the French economy. In an

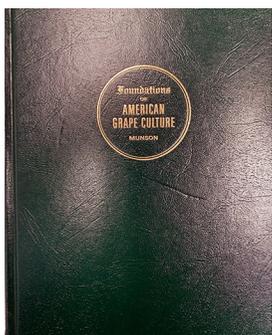
attempt to combat this problem, so-called French-American hybrid grapes were developed by crossing native North American species with European grapes. By that point, other hybrid grapes had already been developed and used by the American colonists for quite some time, but they lacked the same flavor and qualities as the traditional European grapes.

A Texas resident by the name of Thomas Volney "T.V." Munson was able to help the French find a solution to the epidemic. Grafting the European grapes onto the roots of native Texas grapes solved the issue. Munson was a horticulturist with a particular passion for grapes. He studied the native grapes of Texas and the Southwest,

identifying species that could not only resist phylloxera but also were adapted to the conditions in France. These grapes were used to develop rootstocks that are still widely used today. For his efforts, Munson received the designation of Chevalier du Mérite Agricole from the French government—an honor only shared with three other Americans at the time.



Munson's ultimate goal as a grape breeder was to improve American grapes by increasing their fruit quality and production characteristics while still maintaining hardiness. In his lifetime, Munson developed and tested thousands of seedlings, and he named over 300 different varieties with superior characteristics. Munson's death in 1913 was



followed by Prohibition in 1919, and many of Munson's varieties were lost. However, the Munson Memorial Vineyard at Grayson College in Denison, Texas, maintains a repository of 65 of Munson's original grape varieties. Munson's book, *Foundations of American Grape Culture*, published in 1909, is still considered to be one of the most comprehensive descriptions of native grapes of the American Southwest.

European grapes were first brought to Texas in the 1600s by Spanish missionaries in the El Paso River Valley. Settlers that followed also brought grapes but struggled to keep them alive. We now know that Pierce's disease (*Xylella fastidiosa*), cotton root rot (*Phymatotrichopsis omnivora*), and fungal disease all led to the failures of establishing *V. vinifera* vineyards in most of Texas. However, in 1919, the United States (U.S.) wine industry, including Texas, produced 55 million gallons of wine from European, hybrid, and native grapes.

Prohibition devastated the wine industry throughout the U.S., and Val Verde Winery in Del Rio was the only winery to survive in Texas. After Prohibition was lifted, grape and wine production remained stagnant until its rebirth in the 1970s. It has since continued to grow, with its most rapid growth in Texas taking place in the last two decades. In the year 2000, Texas had 40 licensed wineries, but

by 2020 that number had grown to nearly 600. Grape acreage more than doubled over that same period, with approximately 6,000 acres of grapes in 2019, including over 50 different varieties grown. Most of the grape acreage in Texas is planted to *V. vinifera* varieties, but in eastern areas of the state where Pierce's disease is a severely limiting factor, vineyards often grow resistant varieties such as Blanc Du Bois and Black Spanish.



Where We Are Now

The factors responsible for the recent growth of the Texas wine industry include increasing wine consumption and interest in locally produced products, research and education, and industry-driven legislation. It is an exciting time to be a part of this growing industry.

Most commercial vineyards in Texas are used for wine production, although limited acreage is planted for fresh consumption within local markets. Most notably is the production of muscadines in East Texas. Historically, attempts at growing European table grapes for the fresh-eating market were made, but to date, none were successful on a large scale.

Commercial wine grape vineyards can be found across the entire Lone Star State from Brownsville to El Paso to Dalhart. However, more than half of the total state acreage is located in the High Plains Region. While most vineyards in Texas are small—less than 10 acres in size—large vineyards of up to 1,000 acres can be found, particularly in the High Plains.

Where We Are Heading

Texas wine has been gaining national awareness and is well on its way to making a name for itself on an international scale. Grape growers focus on producing high-quality grapes using refined,

sustainable farming techniques. It is often said that quality wine starts in the vineyard, and growers focus their efforts to achieve this in two principle ways. The first is by committing to plant grape varieties that are best suited to their vineyard location. Second, growers aim to adopt best management practices appropriate to regional conditions and the varieties grown. There are many grapes and techniques available, but not all may be suited to your area.

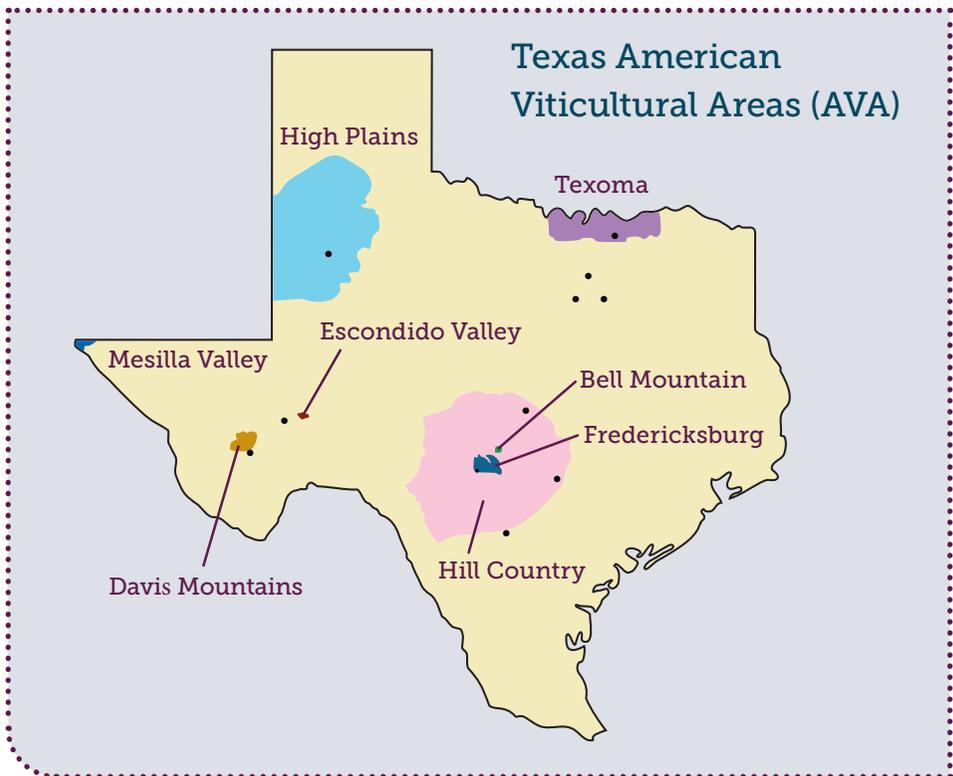
Winemakers follow suit by coupling best practices with their own experiences. It is an exciting time in our industry where both grape growers and winemakers work together to produce exceptional wines. As the Texas wine industry matures, it is gaining recognition for truly unique wines made from grape varieties that are well-suited to our climate.

There is no doubt that growing grapes in Texas is hard work, but it can be both gratifying and profitable for a savvy entrepreneur. The demand for Texas-grown grapes remains high, and the diversity in Texas climate and soils across the state command equally diverse approaches. A wise grape grower will do their homework and make plans well in advance. It is easy to get in a hurry as the dream of having a vineyard becomes a reality. However, a vineyard is a long-term investment that requires a large amount of upfront planning and capital, and it is important to recognize common pitfalls. Before you take the plunge, be aware of what will be required of you. There is more involved in growing grapes than just cultivating and harvesting the crop. Ask any grower, and they will tell you that they wear many hats daily, from grower to accountant to meteorologist to salesperson. Fortunately, the Texas wine industry is very welcoming, and members are eager to pass on their experiences. Take advantage of the wealth of knowledge and experience of the Texas wine industry by joining industry organizations, visiting with industry members, and attending educational programs. The future of the Texas wine industry is bright, and opportunities are as vast as the Texas sky.



Growing Regions

Texas is home to eight distinct American Viticultural Areas (AVA), which are federally designated geographical grape-growing regions regarded as having unique features, such as climate and soil. This does not mean you should not grow grapes in a location outside of an AVA, but there are advantages to being in one, such as marketing and name recognition. For a winery to include an AVA on a wine label, federal law requires that at least 85 percent of the grapes used to make the wine must have been produced within the boundaries of the AVA. The appellation of origin of a wine must appear on the label if the winery opts to include information such as varietal designation or vintage. For varietal wines, at least 75 percent of the grapes used to make the wine must be of the declared grape variety, and that entire 75 percent must come from the stated appellation of origin, unless more strict standards apply, such as with estate wines or AVAs.



Bell Mountain

Bell Mountain was the first AVA to be established in Texas in 1986. It covers 5 square miles on the south and southwestern slopes of Bell Mountain in Gillespie County and is contained within the larger Texas Hill Country AVA. Elevation across the Bell Mountain AVA ranges from approximately 1,500 to 1,800 feet.

Escondido Valley

The Escondido Valley AVA is located near Fort Stockton in Pecos County. It covers approximately 50 square miles along Interstate 10 and is characterized as having an arid climate.

Fredericksburg in the Texas Hill Country

The Fredericksburg AVA is located in Gillespie County within the Texas Hill Country AVA. It covers 110 square miles surrounding Fredericksburg, approximately 80 miles west of Austin, with elevations up to 1,900 feet.

Mesilla Valley

Mesilla Valley AVA is located in far West Texas in El Paso County. It covers approximately 438 square miles and extends into New Mexico. The climate in this AVA is arid with an elevation of more than 3,500 feet.

Texas Davis Mountains

The Texas Davis Mountains AVA is located just south of the Escondido Valley AVA. It covers approximately 420 square miles with high elevations of 4,500 feet up to 8,300 feet.

Texas High Plains

The High Plains AVA is the second-largest AVA in Texas and third-largest in the U.S., spanning across 12,000 square miles. Elevation ranges from 3,000 to 4,000 feet across this region.

Texas Hill Country

The Texas Hill Country AVA is the second-largest AVA in the U.S., spanning approximately 15,000 square miles across 22 counties. It sits on the Edwards Plateau with elevations ranging from 400 to 2,400 feet.

Texoma

The Texoma AVA is the newest AVA in Texas, established in 2005. It covers approximately 3,500 square miles across Montague, Grayson, and Fannin Counties along the Red River. Elevation in the region ranges from 400 feet to approximately 1,300 feet.

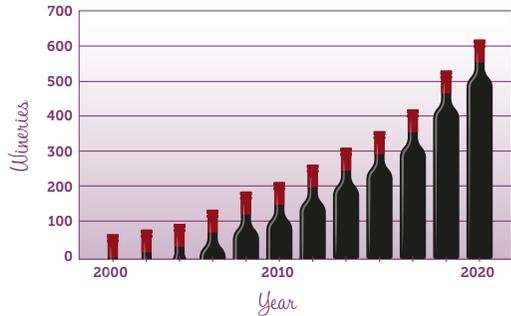
Texas Wineries

Texas ranks fifth in wine production nationwide, and the number of wineries in the state has increased more than tenfold over the last two decades. Most

wineries in Texas are small or boutique, producing less than 4,000 cases—48,000 bottles—of wine per year, but in total, annual production exceeds 20 million bottles.

To start a commercial winery, one must first obtain a federal winery permit,

followed by a state winery permit. Some individuals obtain their permits with no outside help, while others choose to hire an attorney or another professional that specializes in the permitting process.



Wine tourism in Texas is big business, and it shows. The Texas Hill Country is ranked as the second most popular wine tourism destination in the U.S., behind Napa Valley in California. Each year, Texas wineries receive around 1.7 million visits. Is there anything better than spending a relaxing weekend strolling from one winery to another, taking in the beautiful scenery our state has to offer?

As one visits wineries and vineyards across the state, it becomes clear that many have adopted an agritourism model of conducting business. Although there can indeed be romanticism in growing grapes, viticulture is true farming. Without proper planning, grape growing can be challenging to profit from as a stand-alone venture. However, under an agritourism model, it is common to see a diversified revenue stream where vineyard, winery, and tasting room can be found together. The tasting room will often provide other goods and services to complement wine sales, such as local procurements, space for events and weddings, and facility tours.



Economics

Establishing a commercial vineyard is capital and labor intensive. Estimates for establishing a small- to mid-sized vineyard range from \$18,500 to \$28,500 per acre, excluding the price of land, drilling a well, vineyard equipment, or constructing a fence around the vineyard to protect it from pests such as deer. When developing a business plan, an important consideration is that vineyards do not typically begin to bear fruit until the third year after planting.



Even small- to medium-sized vineyards will require approximately \$50,000 worth of equipment, including a tractor, an air blast sprayer, herbicide sprayer, and mower. The same equipment needed for a 2-acre vineyard may be satisfactory for a 20-acre vineyard; thus, economies of scale are an important consideration. Some growers can adopt cost-cutting approaches, but it is imperative to utilize the best management practices and not cut corners to maximize the probability of success.

The major costs of vineyard establishment include site preparation, plant materials, trellis, an irrigation system, training supplies, and labor. The labor needs of a vineyard are irregular throughout the growing season, but predictable. Finding good sources of labor is an ongoing challenge for most Texas growers.

Vineyards often do not produce a sellable crop until their third year after planting.



The income of a vineyard is determined by the quantity and quality of fruit produced. Yield and quality are both significant in determining the marketability and price. On average, a crop of 3 to 6 tons per acre produces the best quality for most premium grape varieties. However, some varieties, such as Trebbiano Toscano, may produce good wines at yields of up to 10 tons per acre. While very high yields are possible in some years, the trade-off is in fruit quality, vine health, and future crop potential. Grape prices generally range from \$1,000 to \$2,500 per ton depending on supply, fruit quality, and grower reputation. Growers with a proven track record of delivering high-quality fruit are often able to command premium prices.

Overview of Estimated Vineyard Establishment Cost Per Acre	
Site Preparation and Planting Costs	\$6,500
Trellis Construction	\$6,000
Drip Irrigation Materials and Installation	\$2,500
Cultural Practices (years 1–3)	\$3,500
Total	\$18,500

Risks and Challenges

Much like every grape-growing region of the world, many biotic and environmental factors make grape growing in Texas exciting, rewarding, and challenging, even with the best management practices. All grapes are susceptible to one or more diseases, and that even includes wild grapes. This means grape growers must learn about the potential diseases and pests that might infect their vineyards. Some diseases such as powdery mildew, downy mildew, and black rot infect the fruit and foliage of the grapevine, causing damage to the leaves and clusters. Other diseases such as Pierce's disease (PD) and cotton root rot can be lethal and kill vines outright. All growers must be prepared to control grapevine fungal diseases by chemical means. This requires knowledge of spray materials, both organic and conventional, the biology of diseases themselves, the susceptibility of their grape varieties, and spray equipment.

Pierce's Disease

PD is considered the single greatest limiting factor to high-quality wine grape production in much of Texas. The bacterium that causes this disease, *Xylella fastidiosa*, is endemic to the U.S. Gulf Coast and throughout Central Texas. It can live in many plant types, causing no damage, but all European and most hybrid grapes are susceptible



Over 30 species of insects capable of transmitting PD have been identified in Texas, including the glassy-winged sharpshooter.

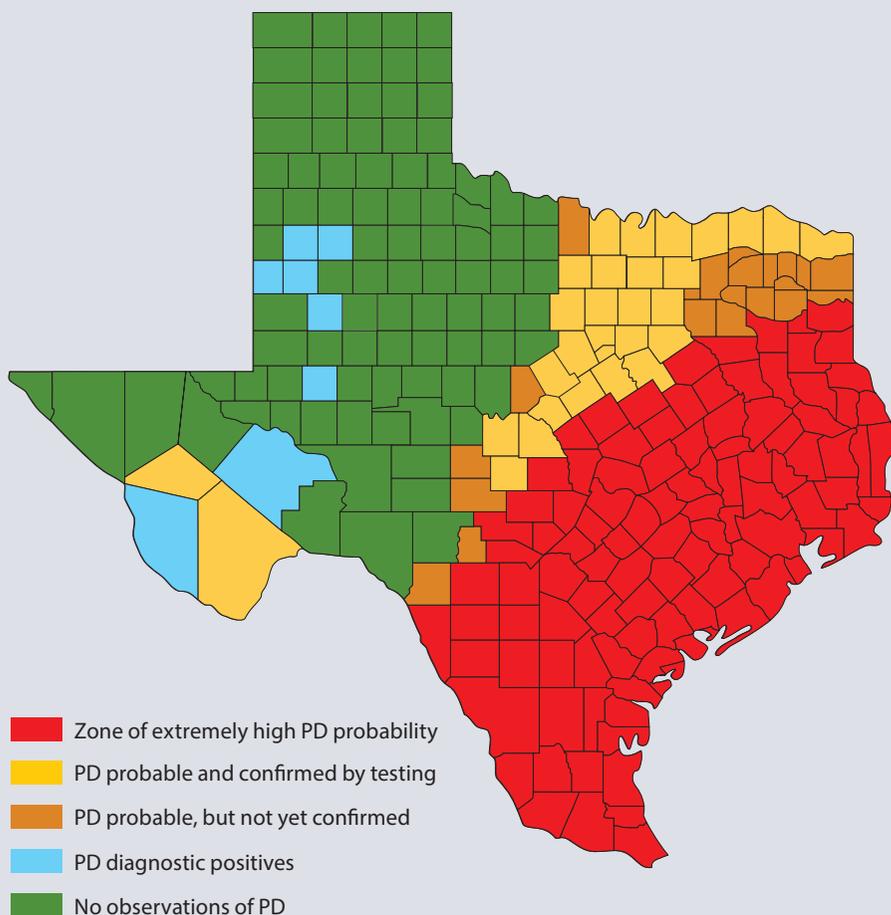
to PD and may die after they become infected. The insects that feed on the xylem—or water-conducting tissue of plants—called sharpshooters, are common in most of the state and may spread the disease from plant to plant as they feed.

PD is not curable. Therefore, growers must

assess the risk of PD in areas where they intend to grow grapes. Management of PD focuses on prevention by controlling the insect vector, but this is not reliably 100 percent effective. Alternatively, growers may opt to plant PD-tolerant grapes and eliminate the risk. The drawback to tolerant grapes is the lack of market recognition and differing wine flavor profiles compared to the more well-known grape varieties.

The challenge that PD presents has not dampened the enthusiasm of the industry or its continued growth. Researchers continue to find ways to mitigate the risks of PD, and new high-quality, PD-tolerant wine grape varieties have recently become available to growers.

Probability of PD in regions across Texas



Extremely High-Risk Zone

This area represents an extremely high risk of PD; therefore, PD-resistant or -tolerant grape varieties are recommended. If susceptible varieties are grown, they should be isolated from tolerant varieties, and practices to mitigate disease such as insect vector management and vine roguing must be implemented.

Probable and Confirmed Areas

Prospective growers should be aware of the risk of planting in these areas; over the last 30 years, PD has become prominent throughout these regions (Kamas et al., 2008).

Probable Areas, but Not Yet Confirmed

Previous experiences determine that these areas are environmentally similar to regions that harbor PD and are determined to be risky areas to grow. Uncertainty may stem from no known vineyards in the area (Kamas et al., 2008).

PD Diagnostic Positives

Research and testing show that this disease can plague any area of Texas and may be present in West Texas and the South Plains. Growers should utilize caution when determining what region to grow, as this disease is a threat throughout the state (Kamas et al., 2008).

No Observations of PD

There are no established vineyards in the majority of this area. No positive laboratory diagnoses or positive results of PD have been reported here, and there have been no reported symptoms of PD associated with the viticultural areas within this zone (Kamas et al., 2008).

The probability of PD in a vineyard can be a good indicator of the risk of an area. Kamas et al. (2008) warn that the disease constantly travels and can easily spread to new locations north and west of current problem areas. Therefore, prospective growers must educate themselves in all aspects of this disease and choose their site accordingly. Nearly every variety of classical wine grape is susceptible to PD, and they often die after infection. PD can be devastating to a vineyard, and there is no known cure (Kamas et al., 2008).

Many commercial grape growers consider phylloxera to be a serious threat to their vineyards. For those concerned about phylloxera, many growers invest in tolerant rootstocks. Several other biotic threats can pose a risk to a vineyard, such as cotton root rot, *Armillaria* root rot, and nematodes. Due to the heavy investment required to grow a vineyard, many growers see cutting costs in these areas as risks (Kamas et al., 2008).

The main pest that directly affects fruit production is the grape berry moth. This moth is seen everywhere but in West Texas—with the majority of damage caused by the larvae. The larvae feed within the berry itself, often allowing the berry to decay. Pheromone traps can be used to monitor the population, allowing control decisions to be made upon severity. The grape leafhopper, climbing cutworms, leafrollers, and metallic June beetles are also among pests that feed on the fruit and foliage of a vine. Frequent scouting of the vineyard must be made to determine pest severity and means of treatment (Kamas et al., 2008).



Grapevine fruit and foliage disease can also be caused by fungal agents as well as soil-borne pathogens. Fungal pathogens such as downy mildew, black rot, powdery mildew, leaf spot, phomopsis cane, and several other pathogens are common across Texas. Many of these diseases thrive in hot, humid climates; therefore, they are more common in eastern parts of the state. Fungal



pathogens can also be seen in the Hill Country, the High Plains, and North Texas, especially during the wet seasons. It is important that grape growers educate themselves on the biology, management, and prevention measures of these diseases to successfully treat and protect their crops. In all areas of the state, except for West Texas, fungal disease can cause many growers frustration and money loss—making organic grape production especially challenging (Kamas et al., 2008).

Weather conditions in Texas can often be extreme. Excessive rainfall, drought, hail, winter freezes, and spring frost can harm grapevines—all of these conditions being regular occurrences throughout Texas. The location of the vineyard can mitigate some risk, but some areas of the state put the vineyard at a higher risk of severe weather damage. Kamas et al. (2008) stress the importance of the grower taking their time in search of a vineyard—putting more thought into the location rather than convenience. A vineyard is a long-term commitment, and therefore growing conditions should be ideal.

Wildlife can pose a threat to all vineyards throughout Texas. Deer can do serious damage to vegetation; therefore, a game fence is sometimes necessary for preventing wildlife from roaming a vineyard. Game fences can cost approximately \$7 per linear foot, and where feral hogs are present, extra precautions must be taken to further strengthen the barrier. Vermin such as raccoons and opossums are prone to eating the ripened fruit, and birds can destroy crops in a short amount of time. Preventative measures such as electric fencing and traps can mitigate these problems, but netting is considered the best solution for deterring birds (Kamas et al., 2008).

Site Selection

The characteristics of a vineyard site dictate what is feasible and, ultimately, sustainable. Many criteria are important when selecting a site, but key features are suitable irrigation water quality and capacity and soil. These criteria must be evaluated before deciding to plant a vineyard on a particular site as rectification may not be possible or may be cost prohibitive.



Water

Without suitable irrigation, grape production cannot be successful. Grapevines typically require 24 to 36 inches of water, applied by irrigation or as rainfall, during each growing season to produce a crop. Water needs are highest during the hottest, driest summer months, making irrigation a necessity

statewide. Considering that 1-acre inch of water is 27,154 gallons, city or municipal water is typically not economical for commercial vineyards. Small vineyards may be able to capture rainfall from roofs to augment purchased water, but larger vineyards typically require more water than can be harvested in this way. Lakes and ponds offer an alternative when suitable well water is unavailable. However, the water source must be large enough to meet the vineyard's needs, particularly during periods of drought when surface water is often at its lowest.

An irrigation system should be able to supply a minimum of 5 gallons per minute per acre of the vineyard, but 10 gallons per minute is preferred. When in doubt, consult with or hire an irrigation specialist to help determine the necessary specifications for your irrigation system. Information regarding rules and regulations of groundwater

is available through your groundwater conservation district or the Texas Water Development Board.

Water Quality Irrigation water quality is as important as irrigation capacity. Grapevines are sensitive to high levels of salts such as sodium, chloride, and boron. While boron is an important micronutrient for grapevines, the difference between adequate levels and toxic levels is very small. Sodium and chloride are both toxic to grapes at high levels, and sodium can severely degrade soil structure.

Analysis	No Problem	Increasing Problem	Severe Problem
Electrical Conductivity (mmhos/cm or dS/m)	<1.0	1.0–2.7	>2.7
Total Dissolved Solids (ppm)	<640	640–1728	>1728
Sodium Absorption Ratio (SAR)	<6	6–9	>9
Sodium (ppm)	<460	—	—
Boron (ppm)	<1	1–3	>3
Chloride (ppm)	<140	140–525	>525

Soil Requirements

Internal Drainage Productive vineyards require soils that drain well and are at least 3 feet deep. Testing the rate at which water percolates through the soil is easy: dig a hole 36 inches deep or until an impenetrable layer is reached using a pair of handheld post hole diggers, then fill with about 7 gallons of water. The hole should drain completely within 24 hours. If the hole is not empty in 48 hours, drainage is not adequate, and further steps, such as drain tile installation or ripping, are required to improve drainage. Grapes will not tolerate waterlogged soils and sites that hold water for days after heavy rain are likely unsuitable. Explore and test the soil extensively across the entire area to be planted. It is common for soils to vary in

Percolation tests should be conducted extensively across prospective vineyard sites.



their properties across even a small parcel of land. Differences in soil depth, texture, or other characteristics may be dealt with by blocking the vineyard accordingly, differential site preparation, or avoiding planting in a particular area. Shallow soils will be predisposed to drought and are usually less productive.

Soil Nutrient Testing Grapes can be grown in a wide range of soil types—more than most other crops. However, soil testing should be conducted before planting a vineyard to determine the chemical composition of the soil. This may guide rootstock selection, and soil amendments may be needed during site preparation. Several reputable labs are available in Texas, and instructions on soil nutrient testing are widely available online. However, interpreting the results of soil tests can be challenging, and it is advisable to consult with an expert if in doubt. Remember, soil tests reveal only the chemical nature of the soil, not the depth or internal drainage. Soil maps with general information on soil types and properties can be found on the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) website.



The NRCS Web Soil Survey is a useful tool to learn about potential soil types at a prospective site.

Climate

Texas has a warmer climate than many well-known wine regions around the world. High summer temperatures and a long growing season allow growers to ripen virtually any grape variety. Vineyards located at higher elevations are often able to benefit from larger diurnal temperature swings, such as cooler nighttime temperatures, which can be beneficial to ripening and fruit quality. In the most

northern locations of the Texas Panhandle, extreme winter cold can limit the types of grapes grown to those with good cold hardiness.

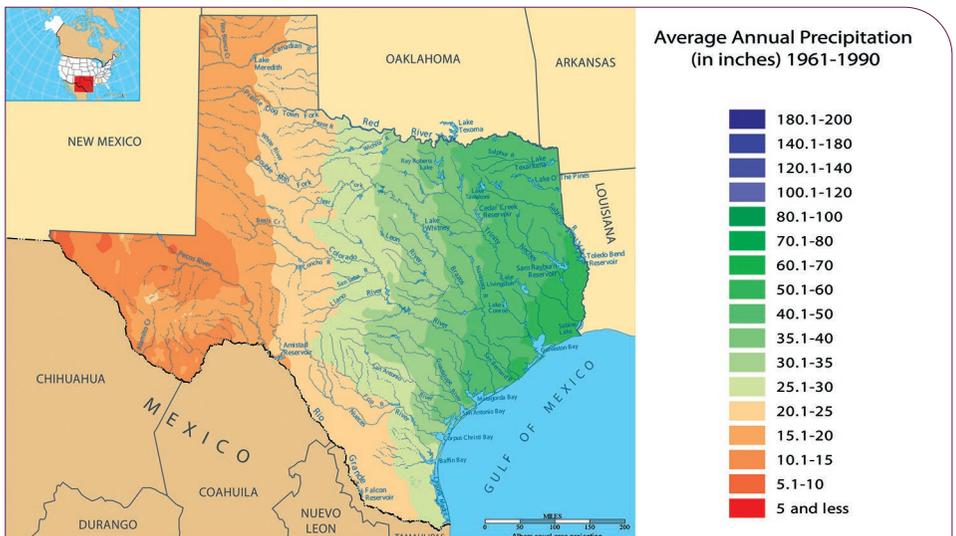
Choose a site wisely.

Most of the risks associated with grape growing are a direct consequence of site selection.

Annual precipitation in Texas ranges from less than 10 inches in far West Texas to over 60 inches in East Texas.

Rainfall during the growing season increases the potential for fungal diseases and weeds, resulting in higher production costs. Areas of Texas with higher rainfall and humidity may be limited to grapes with good disease resistance, such as hybrids and muscadines.

In *Starting a Vineyard in Texas: A Guide for Prospective Grape Growers*, Kamas et al. (2008) illustrate the importance of air drainage being a critical component to maintaining a healthy, prosperous vineyard. Choosing a location of higher elevation can reduce the risk of crop loss due to spring frost, which can result in a total loss during any season. Because cold air is heavier than warmer air, it can descend and settle at lower elevations. This proves to be a problem in river and creek bottoms—also called “frost pockets”—but can be an issue in any area where cold air can get trapped. On cold mornings, there can be up to a 10°F difference in air temperature from the top of a hill to the bottom—where even a slight shift in temperature can mean the difference in the life or death of a crop. Therefore, it is important when choosing a site to have goals in mind consisting of soil depth and proper air drainage (Kamas et al., 2008).



Grape Varieties and Rootstocks

Determining which grapes to grow can be a challenging task for prospective growers. Several factors beyond popularity and name recognition should guide this decision. Susceptibility to fungal disease becomes increasingly important the farther east the vineyard is located as a result of higher rainfall and humidity. Grape varieties that produce clusters with a more compact architecture are at the greatest risk of rotting. Trapped moisture from rain and dew and difficulties in achieving adequate coverage of disease control products can encourage rotting. Depending on location, tolerance to PD may be the single most important selection criteria.

Talk to potential buyers to gauge the need for specific varieties. Discuss price and yield potentials with winery owners and viticulture professionals.



The timing when the grapes begin to grow in the spring—when bud break occurs—either increases or decreases the potential for late spring frost damage. *V. vinifera* grape varieties can vary by 2 or more weeks. Growers often opt to plant their earliest-breaking varieties on the least frost-prone areas such as the top of a hill or slope.

Other important criteria for selection include marketability and yield potential. There is no point in growing a grape variety that is not marketable, so it is recommended to explore the market to determine what is in demand. Ultimately, variety selection will include a combination of factors that will allow for the consistent production of high-quality fruit that is in demand. However, if the goal of the vineyard is primarily aesthetics, disease resistance may be the most important factor to ensure vines look healthy and attractive.

Many vineyards in Texas plant grafted vines to overcome a site limitation or increase profit potential. A number of rootstocks are

available with diverse characteristics. For example, grapevine rootstocks vary in their tolerance of soil pH, pests such as nematodes, salt, drought, vigor potential, and fruit quality potential. It is necessary to thoroughly investigate a future

vineyard site to determine the limitations that may be addressed by using an appropriate rootstock. Kamas et al. (2008) advise that when purchasing grapevines, be mindful of rootstock and variety. Try to avoid purchasing grapevines based on availability and convenience—nurseries tend to attempt to sell what they have available, and not necessarily keep your unique interests as a grower in mind. This is



because nurseries, at any given time, only have limited quantities of stock on hand. It is best to order grapevines a minimum of 12 to 18 months in advance to ensure the desired grape variety, clone, and rootstock you are interested in is available. (Kamas et al., 2008). A vineyard is a

long-term investment, and it is worthwhile to wait for the correct plant material.

Grapevines should be purchased from reputable nurseries. Some nurseries offer certified plants, which means they participate in a testing program that aims to prevent the spread of pests and disease. Certified nursery stock is propagated from mother plants that are tested regularly. While this does not guarantee that vines will be disease-free, it does reduce the risk of purchasing diseased grapevines.



Top Ten Grape Varieties in Texas by Acreage

Cabernet Sauvignon: This Bordeaux grape is the number one wine grape by acreage in Texas and in the U.S. It is best known for producing bold, intense wines and often produces the best quality at moderate crop loads. In the vineyard, Cabernet Sauvignon is vigorous and has very small berries with thick skins.

Tempranillo: A red wine grape of Spanish origin, Tempranillo acreage in Texas has grown rapidly over the last 10 years. This grape is thought to be well adapted to the heat of Texas, where it consistently produces high-quality wines. Tempranillo can produce large crops, but color and flavor intensity may decrease with overcropping.



Merlot: Like Cabernet Sauvignon, this French grape has broad name recognition and high wine quality potential. Merlot is best grown at moderate crop loads as color and flavor intensity suffer when overcropped.

Blanc Du Bois: This is the premier PD-tolerant white wine grape. It is most widely grown in the Gulf Coast Region, but also in North Texas and the Hill Country. Blanc Du Bois produces aromatic white wines, and a range of styles from dry to sweet to fortified are routinely made. In the vineyard, Blanc Du Bois is very vigorous and benefits from grafting on alkaline soil.



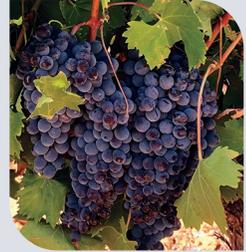
Mourvedre (Mataro): Mourvedre has recently grown rapidly in popularity. It is often considered to be a grape grower's friend due to its upright growth habit that makes it easy to train. Mourvedre is made into varietal wines and is also an important blending grape, as it is one of the components of GSM.



Black Spanish (Lenoir, Jacquez): Black Spanish is the most widely grown PD-tolerant red wine grape. Acreage is highest in the Texas Gulf Coast, but Black Spanish is also grown in North Texas and the Texas Hill Country. It is a reliable producer and makes an attractive vineyard due to its large clusters and leaves.



Sangiovese: This Italian grape is the primary component of Chianti wines. In Texas, Sangiovese is one of the first grapes to break bud in the spring, making it prone to late spring freeze damage. It is relatively cold tender but produces very high-quality red wines. Like other hot climate grapes, Sangiovese is well adapted to the climate of Texas.



Viognier: This Rhone variety has produced several award-winning wines in Texas. Viognier breaks bud early in the spring, making it prone to late spring freeze damage, but has very high wine quality potential. When harvested at advanced maturity, Viognier often has tropical fruit and spicy flavors.



Malbec: This red wine grape hails from France but is often associated with Argentina due to high production there. In Texas, Malbec can produce very high-quality wines, but in the vineyard, it can be challenging to grow and produce consistently.

Syrah (Shiraz): Syrah is a Rhone variety that can produce wines with a characteristic black pepper flavor. In the vineyard, Syrah is a vigorous grower and can be finicky to set crops in younger vineyards. Syrah represents the "S" in "GSM," and it is made into varietal wines as well as blends.



Many other grape varieties are grown commercially in Texas, and many others have been tried. The chances are high that if you are interested in growing a lesser-known grape, it has been planted in Texas before. Over 50 other grapes not listed here are grown on a commercial scale in Texas.

How Do Grapevines Grow?

Grapes are woody perennial vines that can live for many years. In the spring, grapes begin to break dormancy as early as February in the most southerly areas of the state to April farther north. Green succulent shoots arise from buds to produce up to three clusters of fruit, weighing as much as half a pound. Grape growers manipulate the growth of their grapevines by training them onto a trellis. A trellis is a combination of posts, wires, and other accessories that provide structural support. The specific configuration of the trellis is referred to as a "training system."

Grapes produce a single crop each year that ripens as early as June in the most southern areas of Texas to as late as October in northern regions. Grape varieties may be characterized as early ripening to late ripening, with more than a month difference in ripening dates between varieties. This may be important for logistics and labor.

The average yield for vineyards in Texas is around 3 tons per acre, but this ranges by grape variety, weather, and management. Some vineyards with good site characteristics and proper management consistently produce 5 to 6 tons per acre. However, it typically takes 3 to 4 years after planting before full production is reached.



Grapes have a relatively low water requirement compared to some other crops, but irrigation is required statewide to maximize production and quality. Both the quantity and quality of irrigation water must be determined before planting a vineyard.

Grape growers track the specific growth stages of their crops to form their management decisions. Timing is very important for many vineyard tasks, and in some cases, a day or two can be the difference between having a crop and not. Farming grapes only on weekends is an uphill battle.

Training Systems

In the wild, grapes sprawl all over the landscape—up trees, across power lines, and along fences. As vines, a support structure is needed to support the vine and its fruit. A vineyard training system is a network of posts and wires that efficiently supports grapevine growth and provides benefits related to management, such as easier harvest, pest control, and higher fruit quality. The most common training systems used in

Texas are the mid-wire cordon system with vertical shoot positioning (VSP), high-wire cordon, and the Watson Training System. European grapes and many hybrid varieties tend to grow upright, and the mid-wire cordon system with VSP facilitates upright growth by placing the shoot-bearing portion of the vine, the cordons, low to the ground. Sets of parallel wires above the cordons—called catch wires—hold the shoots in an upright position. This creates a consistent canopy of shoots with fruit that is all located in a similar position on the grapevine.

Muscadine grapes and some hybrids have a downward or procumbent growth habit, so it is best to use a training system that places the shoot-bearing cordons high above the ground. The high-

wire cordon system is commonly used on muscadine grapes as a simple low-input system. Vines are trained up to a top wire at 5 or 6 feet while shoots cascade to the ground.

The Watson System is a variation of the high-wire cordon system, but



with two sets of parallel wires that are above the cordon on v-shaped brackets. As shoots grow and begin to descend, they are positioned to grow on either side of the parallel wires, creating a split in the canopy. This forms an umbrella shape that allows air to flow through

the canopy, which can help reduce fungal disease. This system also allows a grower to leave more shoots per vine without creating too dense of a canopy. Therefore, this system is often higher yielding than the high-wire cordon system.



The trellis, or the posts, wires, and hardware that the training system is made up of, is typically the single greatest expense when installing a vineyard. Because grapes routinely produce 6,000 to 10,000 or more pounds of fruit per acre, the trellis must be made of strong materials. Weak materials, such as landscape timbers and 4x4's, should be avoided. Popular materials for wood posts

are chromated copper arsenate (CCA) treated round posts. Metal posts are also popular and competitively priced. Many growers use drill stem pipe for end posts and t-posts or metal vineyard posts in the row. High tensile 12.5-gauge wire is the most common wire for vineyards. Soft wire should not be used for load-bearing wires due to its tendency to stretch when tightened.

If a vineyard is planted with a mechanical planter, the trellis should be installed after the vines are planted. When planting by hand, the posts may be installed before planting, but wire generally obstructs digging.



Irrigation

Grapes have a moderate water requirement, generally needing 24 to 36 inches of water a season. Many areas of the state receive more rainfall than grapes require, but the rain typically does not fall when it is needed most. Therefore, virtually all vineyards are irrigated in Texas.



Drip irrigation is the irrigation type of choice. This system is more efficient and precise than overhead or flood irrigation. With drip irrigation, a polyethylene drip tube running down the vineyard row contains one to several emitters that apply a controlled volume of water directly to the plant. Most vineyards utilize $\frac{1}{2}$ or 1 gallon per hour pressure-compensating emitters. In most cases, the poly tubing is suspended above the ground anywhere from 12 to 20 inches to avoid damage from equipment or mice. Some vineyards utilize subsurface drip, which involves placing the drip tubing below the ground. This results in no water loss from evaporation and less weed growth. The disadvantage of subsurface drip is the lack of access to the emitters if one becomes clogged. Therefore, subsurface drip must be maintained in such a way to prevent plugging.

Most vineyards utilize groundwater, but surface water may also be used. Any source of water requires filtration, but surface water generally requires additional levels to remove the higher load of solids. A surface or subsurface pump pushes water from the source through pipes that feed the vineyard. It is necessary to design the irrigation systems to be able to isolate sections of blocks. Some vineyards add shut-off valves at each row—at an additional expense. Pressure regulation and backflow prevention are also typically required, especially if a chemical injector is added to the irrigation system. Chemical injectors allow growers to add fertilizers or pesticides into the irrigation water for direct delivery to the grapevines. This is very advantageous, but backflow prevention must be installed to prevent possible contamination of the water source. Beyond a simple irrigation design, it is best to seek help from an irrigation specialist.

Equipment

Almost all aspects of grape production can be mechanized or completed by a machine. Machines may be simple or complex, handheld, or mounted to a tractor. The major benefit of mechanization is efficiency. Machines can often complete a task much faster than human labor and, depending on the task, may even be more precise. Mechanization in vineyards is often limited by cost, particularly for smaller vineyards. Hand labor may indeed be more cost-effective for certain vineyard operations than mechanization, but sourcing enough labor is also often a major challenge for vineyards. Labor is required all season long, but certain tasks—like harvest—require immediate attention, as timing is of the essence. Thus, labor availability plays a significant role in determining when and what tasks to mechanize. Every vineyard is slightly different, and economies of scale play a large role in mechanization options. However, even the smallest commercial vineyard can utilize at least some mechanical equipment that will greatly aid in maintaining a successful operation.



Tractors are used for many aspects of vineyard management, from spraying for diseases and pests to plowing and mowing. For spraying pesticides, a cabbed tractor with a filtration system for pesticide applications—a spray cab—is highly desirable. Although most vineyard tasks do not require high horsepower (HP), narrow tractors with significant horsepower are available. In most cases, a minimum of 25 HP is recommended, and 50 HP is typically suitable for most vineyard tasks in small- and medium-sized vineyards. Note that row spacing will dictate the maximum width of vineyard equipment.

All commercial vineyards require an airblast sprayer. Although many designs exist, all airblast sprayers use high-velocity air to move spray droplets throughout the grapevine canopy. This is critical for proper spray coverage. Small vineyards will often have a single row sprayer that mounts onto the three-point hitch of a tractor, whereas larger vineyards may have multi-row sprayers for greater efficiency.

Implements are available for:

- spraying
- weeding
- desuckering
- shoot thinning
- shoot positioning
- leaf removal
- hedging
- planting
- pruning
- mowing

Other common vineyard equipment includes all-terrain vehicles (ATV) or utility task vehicles (UTV), trucks, flatbed trailers, trellis installation and repair tools and equipment, pruning tools, and harvest equipment. Mechanical harvesters are often used by large vineyards, but even the lowest-priced mechanical harvesters are over \$100,000.



Labor Requirements

Growing commercial grapes is hard work. Kamas et al. (2008) list several time-consuming tasks that are required in the maintenance of commercial grapes, such as training, pruning, crop load management, weed and pest control, irrigation, canopy management, record keeping, fertilization, equipment maintenance,

Start small. *Learn on a small scale and get a grasp on how much time, labor, and investment will be needed. For commercial plantings, it is probably wise to plant no more than a few varieties for a 1-acre planting. Wineries are not interested in purchasing small lots of fruit. Three to four tons may be a marketable quantity, but less than that will be difficult.*

and harvest. As grapevines are heavily pruned perennial crops, growers remove about 90 percent of the previous season's vine growth annually. Pruning can limit crop production, manage and maintain the fruit and foliage, and evenly disperse the crop throughout the canopy. Frequent canopy maintenance is needed to maintain the growth of vegetation, allow proper sunlight exposure to the fruit, and aid in disease prevention stemming

from wet canopy undergrowth. In summary, canopy management demands a substantial and consistent amount of physical labor and upkeep (Kamas et al., 2008).

Growers are shifting toward the use of mechanical methods due to an increase in cost and limited skilled labor availability. Trellis systems that can accommodate mechanical aids will be necessary as these resources diminish (Kamas et al., 2008).

Weed competition is the single greatest threat to successful vineyard establishment. The nitrogen and water added to our environment promotes weed growth that will overtake young grapevines competing for these resources. Weeds can be controlled chemically or mechanically, but proper vineyard floor management is essential for overall vineyard growth and success. It is also important to manage the weeds in and around the vineyard in places prone to PD to discourage sharpshooters (Kamas et al., 2008).

How to Get Started

A few preliminary questions should be answered to determine if owning a commercial-sized vineyard is right for you. The first is elementary, yet sets the foundation for success. Why are you interested in growing grapes in the first place? Did a romantic European vacation inspire you? Do you have an entrepreneurial spirit and enjoy the outdoors? Are you looking to produce a high-value crop that will require hard work and dedication? Or, perhaps you are searching for something to do during your retirement years? While there is no correct answer, it is important to know where your passion and abilities lie and be able to differentiate between the aspiration for a true commercial operation that must generate revenue and one that is primarily for pleasure and not necessarily profit. Doing so from the very beginning will save time, money, heartache, and possibly your marriage. Before committing to starting a vineyard of commercial size, it is important to ensure your spouse and family members are supportive of your desires. Farming is often a team effort and requires all to be on board.

The second step in realizing your dream of owning a commercial vineyard is defining the business model you will adopt and developing a comprehensive business plan. This will require great effort and significant planning but will determine the economic feasibility of your plans. While there is no benchmark of what defines a "commercial" vineyard in Texas, it is important first to put pen to paper to weigh costs versus returns and benefits versus risk.

A few questions to ask at the planning stage are: Am I able to grow and sell grapes as a stand-alone business, or am I going to venture into agritourism? Can I develop a business plan that will generate revenue and turn a profit in the long run? How will I adapt to change? What is a realistic timeframe for becoming fully operational? Taking time to carefully plan will help you avoid mistakes that you may have to live with for the life of your vineyard.

*Regardless of the business model adopted or business plan that is developed, a commercial grape grower should **always have the following goal:** to produce a sustainable, profitable, high-quality crop every year.*

New Vineyard Checklist

Initial steps

- ✓ Determine your business model
- ✓ Design a detailed business plan that includes specific costs and revenue estimates and sources of labor
- ✓ Determine site(s)
 - Evaluate soil, water, and topography of prospective sites
 - Visit with a regional Extension viticulturist
- ✓ Acquire any necessary financing
- ✓ Begin networking and forming relationships with industry members
- ✓ Attend educational events and prospective grower workshops
- ✓ Become a member of an industry organization (e.g., Texas Wine and Grape Growers Association)



1 to 1½ years before planting

- ✓ Determine which varieties and rootstocks that you want to plant
- ✓ Order vines from a reputable nursery
- ✓ Make soil amendments as determined from soil testing
- ✓ Irrigation system design and water source installation
- ✓ Trellis design and layout (installation may occur before or after planting)
- ✓ Begin ordering large supplies
- ✓ Prepare the site for planting (weed control, disking, etc.)

September to February before planting

- ✓ Install deer fence if necessary
- ✓ Irrigation installation (may just include underground piping or complete system)
- ✓ Confirm vine delivery date with the nursery (early spring)
- ✓ Determine the logistics of planting
- ✓ Purchase pest control products and vine training supplies

Planting Checklist

- ☑ Check vines immediately upon arrival to ensure the order is correct and packing media is not dry
- ☑ Store vines properly before planting
 - Keep bare-root vines moist in packaging and store in a dark, cool place for no more than a week, or store long term in a cooler between 33°F and 38°F
 - Keep potted vines under light shade and keep well-watered until planting
- ☑ Thirty minutes to an hour before planting, place vines in a bucket of water for rehydration; do not let them dry out at any point during the day
 - Trim any damaged or excessively long roots
- ☑ When ready to plant, remove the vine from the water, place in the hole, backfill with native soil (do not add compost or potting mix), and pack the soil around the vine to remove any air pockets
 - Pull vines upward approximately 1 inch to ensure roots have a downward orientation
 - The best time to plant vines in Texas is from March to April
 - The graft union of grafted vines should remain 2 to 3 inches above the soil line
- ☑ Water new vines immediately after planting to prevent desiccation
- ☑ If needed, prune vines to two buds to ensure strong growth
- ☑ Place plant stake and vine shelter
- ☑ Maintain a 3- to 4-foot-wide weed-free strip all season
- ☑ Irrigate as needed
- ☑ Manage pests and diseases accordingly
- ☑ Tie and train new vines according to growth and training system



Knowledge Requirements

Grape growing requires a certain level of knowledge to facilitate a successful vineyard and program. While this is not a small undertaking, the grower must understand certain terms and ideas of specific cultural practices and be acquainted with grapevine physiology and morphology. An understanding of difficulties and differences in varieties and growing seasons allows for a successful crop. A successful grower also holds knowledge regarding pests, diseases, and weeds that inflict vineyards. Many growers' knowledge stems from experience in growing other agricultural crops before venturing into the vineyard business. The illusion and underestimation that grape growing can be a small undertaking is often an expensive misconception. Many successful grape growers utilize continued education activities to advance and supplement their knowledge with new techniques and technology (Kamas et al., 2008).

*Attend grower workshops and educational events to understand the process and risks involved in starting a vineyard. **Continued education is essential** for successful growing.*



Educational Programs

Texas A&M AgriLife Extension Service Viticulture and Enology Program



Statewide

winegrapes.tamu.edu

- Tailgate meetings, field days, workshops, webinars, and the Advanced Viticulture Short Course

Texas A&M University



TEXAS A&M
UNIVERSITY.

College Station

winegrapes.tamu.edu

- Enology Certificate Program

Texas Tech University



TEXAS TECH
UNIVERSITY.

Lubbock

depts.ttu.edu/pss/

- Professional Certificates in Viticulture and Enology

Grayson College



Denison

grayson.edu/Pathways/viticulture-and-enology/

- A.A.S. Viticulture and Enology
- Certificate in Viticulture
- Certificate in Enology

Palo Alto College



ALAMO
COLLEGES
DISTRICT

<https://www.alamo.edu/pac>

San Antonio

- A.A.S. in Viticulture and Enology

Additional Resources

As a prospective grape grower, the number of decisions that must be made can seem overwhelming. Fortunately, there are many resources available, many of which are available at little to no cost.

Websites

Texas A&M Viticulture & Enology Program

winegrapes.tamu.edu

Texas A&M AgriLife Extension Soil, Forage & Water Testing Laboratory

soiltesting.tamu.edu

Texas A&M AgriLife Extension Plant Diagnostic Disease Laboratory

plantclinic.tamu.edu

Texas ET Network

texaset.tamu.edu

CDMS Pesticide Label Database

<http://www.cdms.net/LabelsSDS/home/>

USDA-NRCS Web Soil Survey

websoilsurvey.sc.egov.usda.gov

Foundation Plant Services

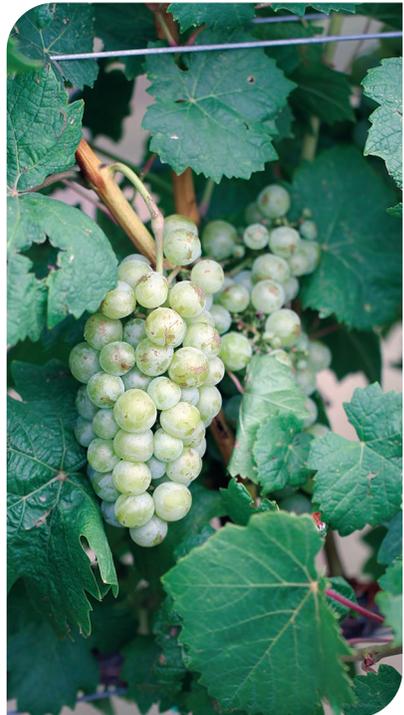
<https://fps.ucdavis.edu/fgrmain.cfm>

eXtension Grapes

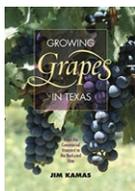
<https://grapes.extension.org/>

Go Texan Wine

goTexanWine.org



Books and Guides for Texas



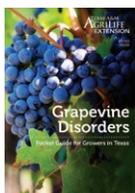
Growing Grapes in Texas

ISBN: 978-1-62349-180-2, 1-62349-223-6



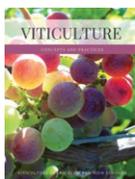
Texas Grape Pest Management Guide

HT-085



Grapevine Disorders: Pocket Guide for Growers in Texas

HT-102



Viticulture Concepts and Practices: Viticulture Curriculum for High Schools

ISBN: 978-1-5323-8562-9



Pierce's Disease Overview and Management Guide

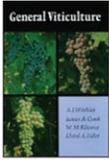
<https://aggie-horticulture.tamu.edu/fruit-nut/files/2010/10/Texas-Grape-Growers-PD-Management-Guide.pdf>

Texas A&M AgriLife Extension Factsheets, Newsletters, and Videos

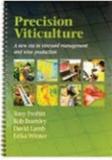
winegrapes.tamu.edu



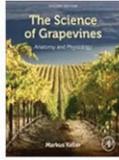
Textbooks



General Viticulture



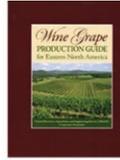
Precision Viticulture



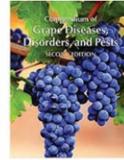
The Science of Grapevines



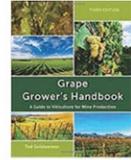
Effective Vineyard Spraying



Wine Grape Production Guide



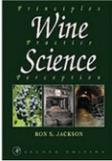
Compendium of Grape Diseases and Pests



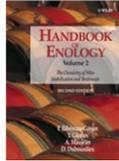
Grape Grower's Handbook



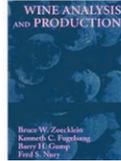
Principles and Practices of Winemaking



Wine Science



Handbook of Enology Volume 1 & 2



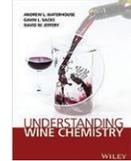
Wine Analysis and Production



Winemaking Problems Solved

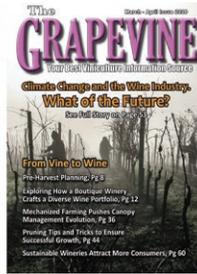
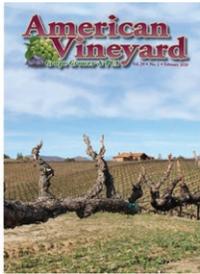
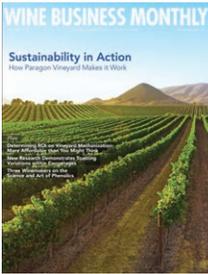


Concepts in Wine Technology



Understanding Wine Chemistry

Trade Magazines



Texas Grape and Wine Industry Organizations



624 S. Dooley Street
Grapevine, TX 76051
Phone: (817) 421-3201
txwines.org



Phone: (830) 285-9210
texaswinegrowers.com



<https://www.northtexaswine.com/>



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Johnson City, TX 78636
Phone: (872) 216-9463
texaswinetrail.com



Phone: (575) 649-9578
txhighplains.com



Email: gulfcoastwinegrowers@gmail.com

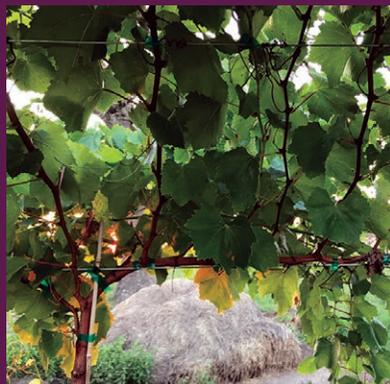
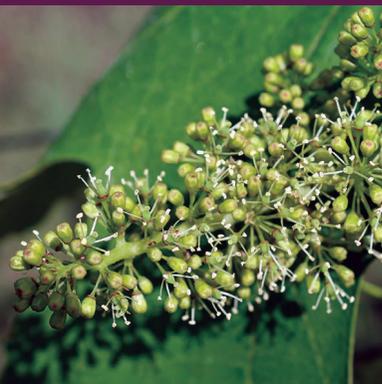


texasartisanvineyardcoop.org



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This work was funded, in whole or in part, by the US Department of Agriculture-Agriculture Marketing Service under the Specialty Crop Block Grant administered by the Texas Department of Agriculture.

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