

American Winemaking Comes of Age

Over the past three decades, a wine revolution has been taking place across the country, as Americans increasingly enjoy a glass of wine with their meals, vacation in “wine country,” and take immense pride in their regions’ vineyards and wineries. There are now more than 7,000 wine producers in the United States—up from 440 in 1970—and the boom has been heard around the world. America’s best bottles are every bit as good as the finest wines of Europe.

Although the United States is a relative toddler as a winemaking and wine-drinking nation, hitting its stride in the mid-twentieth century while its European counterparts have been at full sprint for hundreds of years, the timeline of this relatively short enological development is surprisingly complex. The fifty states may be united as a nation, but when it comes to winemaking history, culture, and viticulture, each may as well be its own country.

People were making wine here long before the nation even existed. French Huguenots built bases in Florida in the mid-1500s and produced wine from the native Scuppernong grape (an acquired taste even today). Around 1607, English immigrants seeking religious freedom landed on the Eastern seaboard of what would become America. Accustomed to drinking wine with their meals, the Pilgrims were pleased to find native grapevines, *Vitis labrusca* and *Vitis rotundifolia*, growing wild in their new home, but they were dismayed to discover that when fermented, these grapes made musky, unsavory wines—French clarets they were not.

So the settlers sent for *Vitis vinifera* cuttings from Europe—traditional varieties such as Cabernet Sauvignon and Riesling—and planted them in the cold, wet, and often humid conditions of their new home. These noble vines were ill suited to the climate and soils of Virginia, Maryland, New York, Massachusetts, and other early colonies, and most died within a few years of planting.

Around the same time, Spanish missionaries began moving northward from Mexico into New Mexico and later into the



“Queen of the Missions”

Santa Barbara, the tenth of the twenty-one missions established by Spanish monks in California more than two hundred years ago, includes a vineyard from which the missionaries produced wine for sacramental purposes.

On the crowded wine trail

The population of wineries in some regions has become so dense that visitors can spend a week in one area and still not have time to visit all the tasting rooms (opposite).



Missouri winemaking

Stone Hill is the oldest winery in Missouri, founded in 1847 by German immigrants, who were making 1.25 million gallons of wine per year by 1900. Abandoned during Prohibition, the winery was restored by the Held family in 1965 (Betty and Jim Held are shown here), and today it is one of the state's most important producers.

territory that was to be known as California. Between 1769 and 1824, Franciscan monks established twenty-one missions in that territory, planting the Mission grapes they had brought with them from Spain to make wine for communion purposes. California's Mediterranean-like climate proved conducive to successful Mission grape growing and winemaking.

East Coast vintners, however, continued to be destined for failure. Thomas Jefferson, the nation's first secretary of state and third president, was a great admirer and collector of Bordeaux wines. In the mid- to late-1700s, he attempted to grow European varieties at his Monticello estate in Virginia. But he, and other Eastern statesmen with cravings for claret, failed to grow and vinify Cabernet Sauvignon, Merlot, and Cabernet Franc, varieties that were then unsuited to the East Coast climate and soils. In Pennsylvania, German immigrants were experiencing similar disappointments with Riesling and Gewürztraminer plantings. There James Alexander, exasperated by his vinifera-based wines, converted to the native *Vitis labrusca* in the 1730s. Others followed, loading the wines with sugar to offset the musky aromas and flavors inherent in the grapes.

The country's first commercially successful winery was established in Cincinnati, Ohio, in the mid-1800s by banker Nicholas Longworth. Sparkling wines made from the native Catawba grape were his specialty, and the wines were so competently made that they became popular in England as well. But in the 1860s, disease decimated his vines, and Ohio wine-makers scattered to New York and Missouri to begin again.

A real turn came in 1849, when Italian and French immigrants began to flood Northern California to seek their fortunes in gold mining. And they began to cultivate wine grapes,

including Zinfandel and Carignane, in the Sierra Foothills to make wines to slake their European thirst.

In the 1850s and '60s, European vintners faced a crippling crisis. Phylloxera, a root louse that saps the strength from vines, had made its way into Europe, most likely on cuttings from the United States, where native vines tolerated the bug and those planted on St. George rootstock—primarily Zinfandel, Petite Sirah, and Carignane—were resistant to it. When vines from America were propagated in France, the country that would be hardest-hit by phylloxera, the infestation exploded, killing vines at alarming rates.

At the same time, Americans were increasing their plantings of *Vitis vinifera*, using cuttings imported from Europe. These species were not resistant to phylloxera, so they, too, began to die. The remedy—grafting European varieties onto resistant American rootstock—slowly brought the vineyards back to life. (In the 1970s and '80s a rootstock believed to be phylloxera-proof was developed to produce large yields of high-quality grapes consistently. But it, in fact, proved susceptible to phylloxera, and California growers were forced to rip out their vines and replant with other rootstocks.)

While California and Europe struggled, vineyards in the east, planted in *labrusca*, continued to thrive, and researchers realized that by grafting French *vinifera* onto native *labrusca* rootstock, grape growers could have disease-resistant vines that produced drinkable wines in a more European style. These grafted vines, also planted throughout Europe, became common on the East Coast and in the South—a happy medium between disease-prone *vinifera* and the funky wines produced from *labrusca*.

When the gold ran out in California in the late 1850s, the miners moved to San Francisco, Sonoma, Napa, Mendocino, Southern California, and other warm areas, planting wine grapes on the sections of their properties that could not sustain such crops as tomatoes, peppers, squashes, orchard fruits, and nuts. These largely Italian and French settlers put wine grapes into ground that would later be deemed as hallowed by winemakers. The existence today of intense, characterful old-vine California red wines can be traced to the immigrants who planted and then maintained those first vines through Prohibition and beyond.

For the next few decades, the wine industry in the United States was largely local; nationally, interest in wine and its consumption was limited, and those who enjoyed wine often chose European bottles. The advent of Prohibition didn't help matters any.

Prohibition was spurred by a decades-long temperance movement, whose advocates held that intoxication led to crime, debauchery, and the ruination of society. Their initial calls for moderation in the consumption of wine, beer, and spirits evolved into demands for a total ban on the production, transportation, and sale of “demon drink,” and their wishes were granted by the 1919 ratification of the 18th Amendment to the Constitution and the implementation of the law via the Volstead Act in 1920.

THE LEGACY OF PROHIBITION

Since Colonial times, America has had temperance periods, some national, others limited to specific states or regions within states. Various government, religious, and public health leaders have voiced their concerns about the effects of alcohol on the populace, viewing such drinks as threats to physical and spiritual health.

When Prohibition began in 1920, approximately one-half of the states already had laws prohibiting or limiting alcohol manufacture. Upon Repeal in 1933, several of those states continued to ban booze—some until as late as 1966, when “farm winery acts” began to be put into place, granting farmers the right to produce and sell wines made from their own crops. Not only had alcohol consumption become less objectionable in these straggler states (most of them in the Midwest and South), agricultural economics were also at play, with state officials seeing additional revenues from wine excise and sales taxes,

as well as the money to be made from wine-based tourism.

Kansas was the first state to actively prohibit alcoholic beverage production, in 1881 (at the time, Maine had such a law on its books, but rarely enforced it). Kansas didn’t end its state prohibition until 1948; Oklahoma (1959) and Missouri (1966) were the last to lift such laws and put farm winery regulations in place. One can only imagine the advanced state of the grape growing and winemaking in America today, had Prohibition not stalled progress.

And remnants of Prohibition remain. The 21st Amendment guarantees that states can retain the authority to control alcoholic production, distribution, and sales within their borders. Thus, some states, counties, and even cities have a crazy quilt of regulations specific to them, often contradictory and archaic.

Several counties in the Bible Belt are “dry” to this day, with virtually no alcohol sales

permitted. In 2011, there were nearly two hundred dry counties in Tennessee, Arkansas, Mississippi, and Alabama alone. So-called moist counties allow wine and beer to be sold, but not spirits. Across the country, some regions prohibit alcohol sales on Sundays; others limit the number of hours in a day that alcohol can be sold. In New York State, groceries and higher-strength alcoholic beverages are still strictly separated: grocery stores cannot sell wine or spirits, and liquor stores cannot sell beer or food. And, it is illegal for anyone relocating to Utah from out of state to drive his or her wine collection across the border unless they’ve first paid taxes on the value of the bottles.

Gotham goes dry

Although religious objections to alcohol consumption played a part, Prohibition was largely a result of the belief that a reduction of inebriation would effect a decrease in crime, marital unfaithfulness, and health issues. In actuality, it allowed mobsters to control liquor sales and establish an estimated 100,000 speakeasies in New York City alone.





Judgment of Paris, triumph of American wines

In 1976, the stunning victory of California wines over French in a blind tasting put America on the world winemaking map. The tasting was conducted by, from right, Steven Spurrier and Patricia Gallagher. Visible beyond them are judges Pierre Tari, Pierre Brejoux, and Christian Vanneque of La Tour d'Argent.

For nearly fourteen years, commercial production of wine and other alcoholic beverages was illegal, although wineries could bottle wine for sacramental and medicinal purposes. But drinking didn't stop, and demand increased. Bootleggers flourished, underground speakeasies were packed, and mobsters such as Al Capone controlled the transport and sale of illicit beverages. At the same time, Americans learned to ferment and brew their own in bathtubs or hidden stills.

It is difficult to know exactly how much Prohibition affected the amount of alcohol consumed in the United States, because without taxes collected on the sale of alcohol, the government had no way of tracking the volume produced and consumed. One thing is certain: Prohibition stopped winemaking dead in its tracks throughout the country. By 1933, when President Franklin D. Roosevelt ushered the 21st Amendment repealing Prohibition through Congress, only a handful of farmers had kept their vineyards in production, and few others were eager to plant anew. And some states continued to make alcohol production illegal long after national Prohibition ended (see box p. 3).

Starting in the 1930s, California producers such as Paul Masson, Almaden, and Gallo began aggressively marketing jug wines—one-gallon bottles of slightly sweet, inexpensive wines made from blends of different grape varieties and bearing generic names such as “Chablis” or “Burgundy.” They were distributed nationally in liquor and grocery stores and became popular throughout the country. Other producers, however, such as Beringer Vineyards, Inglenook, and Beaulieu Vineyard, among others, began making high-end wines as well, and with great success. By the early 1970s, a wave of newcomers, including Warren Winiarski at Stag's Leap Wine Cellars and Jim Barrett at Chateau Montelena, both in Napa Valley, had staked their success on the production of fine French-style wines. The problem was that little attention was paid to them on an international level—until they became the unexpected winners of a blind tasting of top-quality wines held in Paris in 1976. Organized by British wine merchant Steven Spurrier and his American colleague Patricia Gallagher, the “Judgment of Paris” invited British and French wine critics to rate a series of French white Burgundies and red Bordeaux against California Chardonnays and Cabernet Sauvignons. The sweep by the Americans in both categories shocked the European wine community and gave U.S. vintners a huge boost of confidence in their abilities and potential.

The 1970s were also marked by the production of inexpensive sweet wines made from California Central Valley grapes and sometimes enhanced with additional flavorings. More adult soda pop than Sancerre, these simple, fruity wines from such brands as Annie Green Springs, Boone's Farm, and Spānada became the gateway to wine for many American consumers. Giant producers based in the Central Valley, such as E. & J. Gallo and United Vintners, churned out tremendous volumes of these easy-drinking wines, using marketing magic to entice Americans to buy a bottle and thereby add a splash of culture to their lives.

Yet no one wine can claim to have won over more U.S. wine lovers than white Zinfandel, created in 1973 by Bob Trinchero of Sutter Home Winery in California's Napa Valley. A “happy mistake” in winemaking produced a pink, slightly sweet Zinfandel that was embraced by Americans unaccustomed to drinking dry wine, and white Zin remains a huge seller today.

Beginning in the 1970s, Champagne producers recognized the potential of California as a premium winegrowing area, with Moët & Chandon, G. H. Mumm, and Louis Roederer establishing vineyards and wineries for the purpose of making sparkling wine. By the early 1990s, there was so much interest in California wines that those made from hybrid and native grapes

(continued on p. 9)

Safeguarding the vines

Vines such as the head-pruned Zinfandel, Carignane, and Alicante Bouschet planted in 1895 on the Saitone Ranch in Russian River Valley are protected by California's Historic Vineyard Society.



GRAPE VARIETIES GROWN IN THE UNITED STATES

Most drinkers of American-made wines identify them by grape variety and not by the region in which the grapes are grown, as is the custom in Europe. In France's Burgundy region, for example, it is understood that Chardonnay is the predominant white grape, so "Chardonnay" doesn't appear on labels; the appellation and vineyard are the most important information, as they indicate the style of wine in the bottle.

Unlike most European wine zones, the American Viticultural Area (AVA) system places no restrictions on which varieties can be grown where, so the name of the predominant grape is what consumers look for on labels. Some vintners assign proprietary names to their wines without designating the grapes used.

While the *Vitis vinifera* wines of Europe have been models for many American makers, vintners planting grapes in climates too challenging for vinifera have found success with native American and hybrid varieties. These vines have adapted to or been bred for regions that are too cold, too humid, and/or too prone to disease for vinifera to survive. The availability of French-American and American hybrid varieties, and improved methods of growing grapes native to the United States, have led to the boom in American winemaking.

Vitis vinifera

Developed in Europe, these grape varieties need warm summers and moderate winter temperatures. In the United States, the West Coast dominates this category, although a few other states, including Michigan, New York, Texas, and Virginia, have been successful with vinifera when it is planted in suitable soil and climate.

WHITES

Chardonnay—The most-planted wine grape in California and also a star performer in Washington, Oregon, Virginia, and parts of New York state, Chardonnay is remarkably malleable and can be grown successfully in cool, warm, and hot climates. Like most vinifera varieties, however, it cannot survive Midwest deep freezes nor the rot-inducing humidity of the Deep South. There are two basic Chardonnay styles: rich, sometimes buttery, and with toast, vanillin, and spice notes from oak barrel fermentation and aging; and leaner, crisper wines that see little or no contact with oak.

Pinot Gris—A mutation of the red Pinot Noir grape, Pinot Gris tolerates warm and cold climates and is widely planted in the United States. Its name comes from the gray-ish ("gris") to pinkish-brown color of the grapes, although the juice inside is clear. It ripens early, making it a good choice for farmers in regions where the growing season is short. Some winemakers label their Pinot Gris as Pinot Grigio, which suggests a lighter, crisper, less fruity wine.

Riesling—This noble variety is one of the few vinifera types that thrives in cold temperatures during the growing season, although it is susceptible to injury in bitterly cold areas in winter and early spring. Riesling styles range from bone-dry and somewhat austere to semidry, semisweet, late-harvest dessert wines, and ice wines. Crackling acidity and minerality are hallmarks of great Riesling, and in New York's Finger Lakes region and on Michigan's Old Mission and Leelanau peninsulas, the grapes reach full maturity with their natural acidity intact. Washington, the No. 1 Riesling-producing state by volume, is a bit warmer, and its Rieslings tend to be fruitier and slightly richer.

Sauvignon Blanc—Although smatterings of Sauvignon Blanc plantings exist in the United States, California is its ground zero, with more than 15,000 acres planted. It's a vigorous plant that enjoys warm-to-hot summers, and usually produces wines with lemon, lime, grapefruit, and herbal characteristics; when grown in warm zones, Sauvignon Blanc tends to show a melon and tropical-fruit personality. Stainless-steel-fermented versions are lean and crisp; oak-fermented styles are more dense and layered.

REDS

Cabernet Franc—This vine flourishes in many soil types, and in both cool and warm regions. It's the go-to red vinifera grape along the Atlantic seaboard, as it ripens earlier than Cabernet Sauvignon and thus dodges fall rainstorms and drops in temperature that force grapevines to shut down before clusters have fully ripened. Cabernet Franc is arguably Virginia's best red grape, as well as New York State's. In the West, winemakers use Cab Franc in their Bordeaux-style blends for its aromas and freshness, and it is increasingly being bottled as a stand-alone varietal.

Cabernet Sauvignon—The variety responsible for the muscular "King of Wine" is a late ripener and is therefore limited to regions that have long, warm, dry growing seasons—California, Washington, Arizona, and Texas, in particular, with Virginia, Maryland, and New York's Long Island also suited when the grape is planted in the right spots.

Merlot—Known for producing red wines that are softer and more drinkable in their youth than Cabernet Sauvignon, Merlot typically ripens a few weeks earlier than Cabernet, and has a better chance of ripening in cool areas. Sunny California and Washington are the nation's Merlot leaders, yet Long Island in New York State is just as adept at producing high-quality Merlots, albeit in a leaner, more European style. The variety is frequently blended with other red grapes, and it's not uncommon to see Merlot in some of Arizona's and Virginia's best red wines.



Cabernet Sauvignon

Pinot Noir—The Burgundian variety prized for its precision, silky tannins, and ethereal qualities is, like Cabernet Sauvignon, a wine many vintners aspire to make, yet few have the opportunity. Pinot Noir is particular about where it is planted—it loves limestone soils and cool but not cold climates—and only Oregon and certain regions in California (Russian River Valley, Sonoma Coast, Santa Cruz Mountains, Santa Barbara County) have proved consistently adept with the grape.

Syrah—Wines made from this variety run the gamut from crisp and restrained to ripe and juicy to meaty and earthy; soils and climate largely determine the style of wine. Often blended with Mourvèdre and Grenache, Syrah wines are produced not only in California and Washington, where they have achieved some fame, but also in other warm growing regions, among them Arizona, New Mexico, Texas, and Virginia.

Zinfandel—California has a virtual monopoly on Zinfandel (although there are a few producers in Oregon and Washington). European immigrants planted Zinfandel and other varieties in California after the 1849 Gold Rush, and because the vines were on phylloxera-resistant rootstock, many have survived to this day.

Also: WHITE—Gewürztraminer, Marsanne, Muscat, Pinot Blanc, Roussanne, Viognier; RED—Alicante Bouschet, Barbera, Carignane, Grenache, Malbec, Mourvèdre, Petite Sirah, Petit Verdot, Sangiovese, Tempranillo (see box p. 157).

Native American varieties

The *Vitis labrusca* and *Vitis rotundifolia* vine species that early settlers found growing wild on the East Coast didn't produce particularly palatable wines. Varieties of these species are now grown for juice, jams, and jellies, but in skilled hands they can be transformed into rewarding wines.

Concord—Grapey and simple, this purple labrusca variety is primarily used to make juices, jams, jellies, and the popular kosher wine Manischewitz. Michigan, Pennsylvania, and New York are the major growers of Concord, with much of their production going to Welch's.

Muscadine—This group of *Vitis rotundifolia* includes the specific varieties Carlos and Scuppernong for white wines, and Noble for reds. Muscadines have a high tolerance for the humidity and fungal diseases typical in the South—in Florida, Kentucky, North Carolina, and Mississippi, to name the most prominent states—and produce mostly sweet, viscous wines that have a candied-fruit, musky aroma.

Niagara—As Concord's white labrusca counterpart, Niagara has a similar "foxy," musky character that tastes foreign to those accustomed to vinifera wines. Production is centered largely in New York State, where the wines are made in semisweet and sweet styles.

Norton—a.k.a. Cynthiana, this native *Vitis aestivalis* grape produces a full-bodied, spicy red wine. Norton is tolerant of humidity and is thus widely cultivated in Missouri and Virginia, with pockets of plantings in the Midwest and Texas. Although it's a native species, Norton/Cynthiana lacks the musky, foxy aroma of other native varieties, and is capable of making high-quality, dry red wines.

Also: Catawba (red).



Niagara



Norton

Hybrid varieties

French-American hybrids are genetic crosses of *Vitis vinifera* and native American species made by French breeders. More recently, American hybrids have been developed by the University of Minnesota and New York's Cornell University, intended to have a higher tolerance for harsh winter conditions than French-American hybrids.

WHITES

Brianna—This relatively new (introduced in 2001), cold-tolerant variety has quickly become a standout white-wine grape in the Midwest, particularly in Iowa, Minnesota, and Nebraska. Brianna can be produced in off-dry and semisweet styles, and displays rich, exotic pineapple, mango, and papaya flavors that are balanced by brisk acidity. Expect more frigid regions to embrace Brianna, as news of its potential spreads.

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GRAPE VARIETIES GROWN IN THE UNITED STATES *(continued)*

La Crescent—Producing white wines reminiscent of floral Rieslings, this vinifera hybrid was bred at the University of Minnesota to withstand -35°F winter temperatures, and is a popular choice for growers in the frigid Midwest and Great Lakes regions.

Seyval—This French-American hybrid produces dry and semidry, medium-bodied whites that can have an herbal accent. It's a popular grape in New York and Missouri.

Traminette—A white variety bred to withstand harsh winters, Traminette has the floral and spice character of one of its parents, Gewürztraminer. It has become one of Michigan's best white-wine varieties, and Indiana producers created a "Try on Traminette" campaign to promote the wine to consumers.

Vidal Blanc—A cold-hardy French-American hybrid, it makes full-bodied, fruity, and floral whites, and is also excellent for ice wine. New York's Finger Lakes region is the hub for Vidal Blanc production, with small volumes also produced in Missouri, Ohio, and Pennsylvania.

Vignoles—This cold-hardy French-American hybrid is similar to Vidal Blanc in its character and growing regions.

REDS

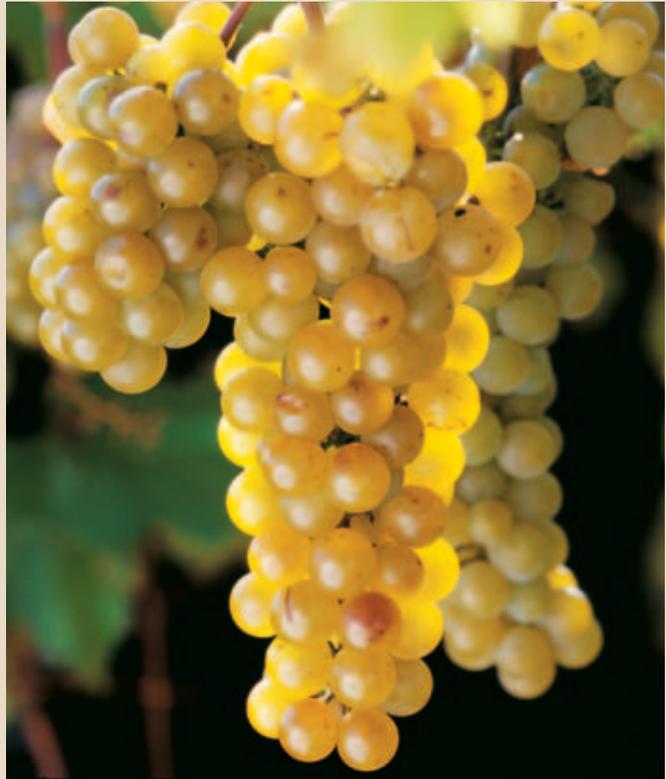
Chambourcin—This French-American hybrid produces wines with bright red-fruit flavors, herbaceous aromas, firm tannins, and crisp acidity. While it doesn't tolerate the harsh winter temperatures of the Great Lakes region, it is especially suited to the less-challenging climates of Illinois, Indiana, Ohio, and Pennsylvania.

Frontenac—This University of Minnesota hybrid makes robust red wines with palate-refreshing acidity. The vines withstand -30°F temperatures in winter and emerge in spring to pump out grapes with lively cherry and berry character. Frontenac has quickly become a superstar grape in the Midwest and New England.

Marechal Foch—A dark-skinned French-American hybrid, "Foch" makes medium-bodied wines with black cherry flavors, and also flavorful rosés. Popular with Midwest winemakers, it can handle cold winters, yet isn't as cold-hardy as Frontenac and Marquette.

Marquette—Popular with growers in the Midwest and New England, this hybrid is similar to Frontenac.

Also: WHITE—Blanc du Bois, Brianna, Cayuga White, Chardonel, Edelweiss, La Crosse, Melody, St. Pepin, Stover, Valvin Muscat;
RED—Baco Noir, Black Spanish (a.k.a. Lenoir, Jacquez, Blue French), Corot Noir, Léon Millot, Noiret, St. Croix.



La Crescent



Chambourcin

east of the Rockies had taken a backseat. Today, the state is the overwhelming leader in U.S. viticulture, with around 80 percent of American grapevines (many of them for raisin production and the table), followed by Washington, New York, Oregon, Texas, New Jersey, Virginia, Michigan, and Pennsylvania. California's influence, however, is now being countered by the emergence of quality wines from other states, with consumers becoming interested in wines from their own backyards, whether made from native grapes, French-American hybrids, or *Vitis vinifera* or from fruits such as raspberries, cherries, and apples.

In these other regions, vintners are discovering which varieties perform best in their terroir. In Virginia, Viognier and Cabernet Franc stand out. Norton is a star in Missouri. Finger Lakes Rieslings from New York State can be stunning, and Michigan's Rieslings, Gewürztraminers, and Pinot Blancs shine. Cabernet Franc and Merlot from New York's Long Island can be splendid, and Gruet in New Mexico makes serious sparkling wines using Champagne techniques and grapes (Chardonnay and Pinot Noir). Certain American and French-American hybrid grapes such as Seyval, Chambourcin, and Marquette flourish in challenging climates.

Growing the Grapes

It's a cliché much used by vintners, but it's absolutely true: Great wines are made in the vineyard. Without perfectly ripened, high-quality grapes, winemakers have zero chance of producing outstanding wine. To that end, whether with *Vitis vinifera*, native vines, or hybrids, grape growing in America has made tremendous strides in a relatively short period of time. Trial and error, research by university agricultural departments, and advice from international consultants have put American viticulture on the fast track to success. Following the lead of the University of California at Davis, which for decades has been the primary training ground for U.S. winemakers as well as for many foreign vintners, other universities throughout the country have established viticulture and winemaking departments to address the specific needs of their regions and to train future growers and winemakers. The industry has also taken on a greenish hue, as growers increasingly implement sustainable, organic, and biodynamic practices, both to increase wine quality and to reduce environmental impacts.

Each growing region has its own issues, related to climate, soils, elevation, pests, disease, availability of irrigation and frost-protection water, and cultural factors that affect grape growing. For example, while farmers without access to reliable well, river, lake, or stored rainfall water must dry-farm their vines, others with available water choose to dry-farm, believing that it produces more intense fruit character in the grapes and conserves a valuable natural resource.



Pierce's Disease

This Merlot vine shows the effects of Pierce's disease, a bacterium transferred to vines by winged sharpshooter insects. The infection causes blockage of the water-conducting system of the plant; without sufficient water, a vine's leaves dry out and become discolored (called scorching), and grape clusters shrivel or raisin. Although quality wines can be produced from them, affected vines typically die within five years.

In the East, multicolored Asian lady beetles can hitchhike from grapes to fermenters and impart a surprisingly strong, and undesirable, peanut-buttery aroma and taste to wines. In the West, however, the beetle's cousin, the ladybug, is a farmer's friend, devouring aphids and other insects that damage vines and grapes without imparting any foreign flavor.

Growers throughout the United States continue to battle two nasty vine destroyers: phylloxera, the root louse that wiped out European grapevines in the 1860s and many California vineyards in the 1980s and 1990s, and Pierce's disease (PD), a bacterial infection. Phylloxera is a tiny aphid-like insect that feeds on *vinifera* roots, slowly sucking the sap out of them until the vine dies. The PD bacteria are spread by leafhoppers called glassy-winged sharpshooters; infected vines can die within one to five years, and entire vineyards have been lost to PD.

In the case of both pests, there are no cures, only preventive measures. PD- and phylloxera-resistant rootstocks have been developed and continue to evolve. To prevent PD, growers plant vines far away from sharpshooter feeding and breeding areas, such as riverbanks and citrus groves. Because the phylloxera louse has been known to travel on farm equipment and workers' boots, thorough cleaning is mandatory to prevent its spread. Most states have Integrated Pest Management (IPM) programs to educate and assist farmers with these and other vineyard pests.

The increasing availability of grapevine selections, or clones, has had a major impact on the quality gains made in U.S. winemaking. California's Foundation Plant Services and programs such as France's ENTAV (Etablissement National Technique pour l'Amélioration de la Viticulture) and Geisenheim Research Institute in Germany continue to make new clones available, and the benefits are twofold: Growers have much more choice in selecting