

Choice of Varieties



North Carolina has one of the most varied climates of any eastern state, and a diverse number of grape species and varieties can be grown. But to be a successful commercial winegrape grower, it is critical that you select varieties that grow well in your region and that have an established market.

This chapter includes recommendations for winegrape varieties that have performed satisfactorily in the piedmont and mountain regions of North Carolina, including a number of popular *Vitis vinifera* varieties as well as a few French hybrid grapes. Information is also presented on winegrape varieties that will likely be adapted in the future but may require additional testing or improved market development.

With the wide range of grape types and varieties that can be grown in North Carolina, it can be challenging to decide on what winegrape varieties are best to grow for your area and market, especially if there is little local information or experience to draw from. When choosing

a variety, consider grape type and regional adaptation, Pierce’s disease susceptibility, and marketplace demand.

Grape Type and Regional Adaptation

There are five basic types, or categories, of grapes grown in North Carolina (Table 3.1). Figure 3.1 shows the four major Viticultural Zones, areas in which each type of grape grows best. Climatic conditions, and especially the frequency of damaging low winter temperatures, are among the most important factors influencing the types of grapes and varieties that can most reliably be produced in each area.

Table 3.1 Grape Species Grown in North Carolina

<i>Vitis vinifera</i>	The Old World or European grapes. Popular varieties: Chardonnay, Viognier, Cabernet Sauvignon, Cabernet Franc, and Merlot. Viticultural Zones 2 and 3.
French hybrid	Varieties resulting from crosses of <i>vinifera</i> and native American species made by French breeders. Popular varieties: Chambourcin, Seyval blanc, and Vidal blanc. Viticultural Zones 2 and 3.
American hybrid	Hybrid varieties have resulted from crosses made by North American breeders, and include Traminette and Chardonel from New York State Agricultural Experiment Station in Geneva, NY. Viticultural Zones 2 and 3.
Native American varieties	This category comprises grapes of native American origin. Chief among the native American species is <i>V. labruscana</i> (“fox grapes”), and includes well-known Concord and Niagara. Another species of note in North Carolina is <i>V. aestivalis</i> , and the variety Norton (aka Cynthiana). Viticultural Zones 2, 3, and possibly some areas in Zone 4 for <i>V. labruscana</i> varieties.
Muscadine	(<i>V. rotundifolia</i>). Muscadines are at home in the warmer conditions found in the coastal plain, sandhills, and lower piedmont (Zones 1 and 2), and have winter hardiness levels similar to <i>V. vinifera</i> . Carlos (white wine) and Noble (red wine) are the leading varieties. Muscadines have the advantage of not being as seriously affected by Pierce’s disease as the bunch grapes listed above.

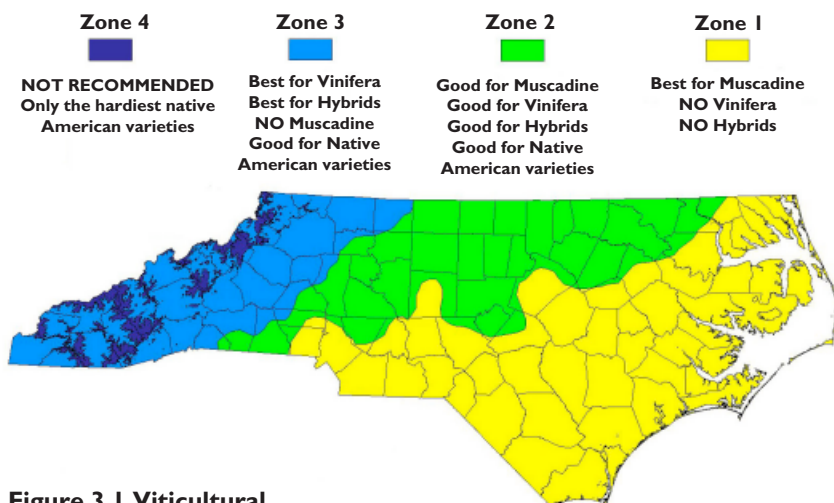


Figure 3.1 Viticultural suitability in North Carolina

If your goal is to produce premium quality *vinifera* grapes, it is best to first find a prime winegrape growing property in Viticultural Zone 3 (best zone for *vinifera*), or possibly a property on the northwest edge of Zone 2 with desirable site characteristics for *vinifera* (see chapter 4). Unfortunately, many people do it in reverse. They start with a piece of property that may have attractive demographics for a winery, and then try to grow varieties that are not well matched to the growing conditions.

Before committing to planting *vinifera* grapes in a given location, consult the climatological maps found on the Web site of North Carolina Wine and Grape Council, Inc. (<http://www.ncwine.org/siteSuitability/siteSuitability.html>). Notice the important details on the average occurrence of temperatures of -8°F per decade (1970 to 2000). Controlled freezing tests in Virginia have led to the use of a critical temperature of -8°F as a guide for predicting the onset of significant cold injury in *V. vinifera* varieties (Wolf, 2003). Locations that experience -8°F three or more times per decade are not considered to be appropriate for *V. vinifera* production (Wolf, 2003). The critical temperature ranges provided in Table 3.4 are for greater than 50 percent dormant bud kill of vines that are fully dormant (including 6 *vinifera* varieties); however, it should be emphasized that these temperature ranges could be slightly higher in

North Carolina than Virginia (Wolf, 2003). In this regard, it is perhaps noteworthy that grape experts in Arkansas consider *V. vinifera* and *V. rotundifolia* (muscadines) to have comparable winter hardiness levels, and in Arkansas it is recommended that *vinifera* should be planted in regions where winter temperatures stay above 0°F (Noguera et al., 2005). At the North Carolina Wine and Grape Council's Web site, you will also find a North Carolina climatological map that shows the frequency of occurrence of temperatures of 0°F for the same three decades (1970-1980, 1980-1990, and 1990-2000).

The French hybrids and American hybrids (collectively referred to in this publication as 'hybrids'), are more widely adapted across Viticultural Zones 2 and 3 than *vinifera* because of their greater winter hardiness and higher tolerance to spring frosts. In general, the hybrids fit somewhere between the *V. vinifera* varieties and native American grapes in terms of susceptibility to winter injury (Noguera et al., 2005). In the higher mountain elevations where winter temperatures can be severe (Viticultural Zone 4), grapevine cold hardiness and the threat of crown gall must be taken into consideration. In these areas only the hardest native American bunch grapes like Niagara should be considered.

Pierce's Disease Pressure

North Carolina lies on the border of the warmer Southern states, where Pierce's disease (PD) limits successful grape production to muscadines, and the cooler northern states where this disease is not a problem. The dividing line between areas of high risk and low risk of PD runs through the central piedmont region. The farther south or east you go, the greater the risk of PD. Bunch grapes can be grown successfully in the central and eastern piedmont, but periodic minor to severe vine losses to PD may occur, especially in warmer winters. In the eastern piedmont of North Carolina, Turner Sutton, NC State plant pathologist, has observed PD affecting up to 50

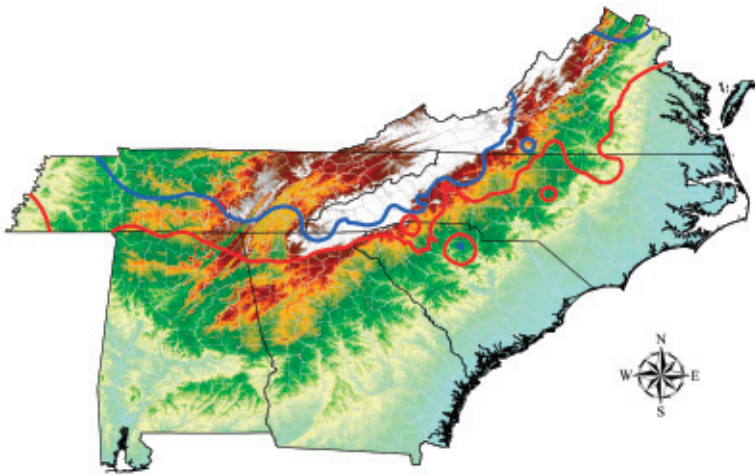


Figure 3.2 Risk of Pierce's disease is based on days during winter with temperatures at or below 10°F. There is an increasing risk south and east of the red line, less risk between the red and blue lines, and low risk north of the blue line.

percent of *V. vinifera* vines within several years of planting. The potential for loss is significant if you are interested in a commercially successful vineyard.

As you move farther north or west into higher elevations where winter temperatures are colder, the threat of PD becomes less, until you get into the mountains, where the threat of PD is very low most years. In the higher mountain elevations, however, where winter temperatures can be severe (Viticultural Zone 4), winter injury can predispose vines to crown gall. See chapter 8, for more complete information on PD and crown gall.

Marketplace Demand—An Evolving Story

As stated in the chapter 1, your analysis of the potential for a winegrape enterprise will be incomplete without a careful consideration of *markets for winegrapes*, but before undertaking consideration of current and future markets, it may be helpful to understand how North Carolina arrived at the point of being the twelfth largest wine production state in the U.S., and tenth in grape acreage in 2004.

Past Marketplace Trends

From a historical perspective, it is interesting to note that only native American grapes (*V.*

Table 3.2 Viticulture in the Old North State

1600s—Discovery of the original 'Scuppernong' vine (<i>V. rotundifolia</i>) by Sir Walter Raleigh's colony when they landed on Roanoke Island (c.1584)
1810 census—1,368 gallons made in Washington County
First commercial winery—Medoc Vineyards in Brinleyville, established in 1835 with 6 acres
1840—North Carolina leading wine-producing state in U.S.
1865—25 wineries by time of Civil War
1880—North Carolina is second-largest wine-producing state in the South with 2,639 acres of vineyards
1900 census—1.2 million vines and 12.3 million pounds of fruit
1900—North Carolina is one of six eastern states to win awards at the Paris Exposition
1903—Virginia Dare's inventor, Paul Garret, has five wineries in North Carolina
1909—North Carolina goes dry (Prohibition)

labruscana), or muscadines (*V. rotundifolia*) were being grown in North Carolina at the turn of the 20th century. The abundant, native muscadine grape fueled the early growth of the wine trade centuries ago. In the 1840 census, North Carolina was the leading wine state in the U.S. (Table 3.2).

Modern Revival

As Lucie Morton said, “The eastern wine industry was so effectively ruined by Prohibition and its aftermath that today the region’s vineyards and estate wineries are objects of surprise and curiosity.” When this statement was made in 1985, North Carolina had only four wineries (compared to 53 in 2005), and only two of these had plantings of *vinifera*, namely Biltmore Estates in Asheville, and Westbend Vineyards near Winston-Salem. *Vinifera* production in the eastern U.S., and particularly in North Carolina, was still so new in 1985, that relatively few people could appreciate at this time that the world’s dominant species of grape, *V. vinifera* would also become North Carolina’s leading category of bunch grape for wine processing in the new millennium. Westbend Vineyards opened a lot of eyes in 1994 to the possibility that North Carolina could grow first-rate *vinifera* grapes when its Chardonnay won the gold medal at the Eastern International Wine Competition —ahead of a second-place Kendall-Jackson (Table 3.3).

Current Marketplace Trends

In assessing current opportunities and conditions in the marketplace, you should consult with buyers to ensure that there is a demand for the fruit you plan to produce. Your Cooperative Extension agent may be able to assist you in obtaining information about: 1) local wineries and grower cooperatives, 2) current prices being paid for different varieties of winegrapes, 3) whether contracts are available, and 4) typical yields to expect from local vineyards. A vineyard enterprise is a very long-term commitment (20-plus years), and you will also need to assess future demand (and prices) for the types of grapes and varieties that you are thinking about growing. This is not a simple process! As stated by Al MacDonald in the *Oregon Winegrape Grower’s Guide* (1992), “Today’s high prices for one variety may attract more planting of that variety, creating an oversupply and lowering prices. Consumers may hit on a hot new variety, creating more demand, thereby increasing the price for that variety.”

It is interesting to note that when this chapter was initially drafted in the 2004 growing season, it read, “If you are planning to grow grapes for sale to commercial wineries, you must grow the varieties that they are seeking...(and), while Niagara grows well here, there is not much

Table 3.3 Modern Revival

1972–Westbend Vineyards founded (plantings included <i>Vitis vinifera</i> varieties)
1975–Biltmore Estate Vineyards founded (plantings included <i>Vitis vinifera</i> varieties)
1976–Duplin Wine Cellars opened (<i>V. rotundifolia</i> varieties only)
1985–Biltmore Winery opens to public
1985–4 wineries (2 <i>vinifera</i> , 1 native American grapes, 1 muscadine)
1986–North Carolina Grape Council created (today known as the North Carolina Wine & Grape Council)
1988–Westbend becomes a bonded winery
1994–Westbend’s Chardonnay wins 1 st place gold medal Eastern International Competition
1995–10 wineries in North Carolina
1999–15 wineries in North Carolina; Shelton Vineyards established
2002–With 25 wineries, North Carolina ranks 12 th in wine production and 14 th in grape acreage
2004–Yadkin Valley is North Carolina’s first American Viticultural Area (AVA)
2004–45 wineries in North Carolina; 12 th in wine production U.S. and 10 th in grape acreage
2005–53 wineries in North Carolina; Duplin Winery bottles its millionth case of wine

demand for it from the wineries.” But, the authors of this chapter did not appreciate that a winery in the northern piedmont would, based on a successful test market of Niagara wines in 2004, proceed in 2005 to pay as much per ton for Niagara grapes as for a leading red hybrid grape, Chambourcin.

Future Trends

Predicting demand for North Carolina-grown winegrapes is about as challenging as trying to interpret global warming's impact on North Carolina's principal viticultural zones in the coming decades. It is probably safest to say that the winegrape variety situation in North Carolina will continue to be quite dynamic in the near future, as state winemakers continue to experiment with test marketing of new varieties like Niagara and explore the potential of wine *blends* derived from more than one species, or type of grape (e.g. hybrid x *vinifera*, or even *vinifera* x muscadine). Most industry experts do agree that top quality grapes will be needed for a continued healthy expansion of North Carolina's wine industry.

Are You Planning a Winery?

If you are planning to make your own wine, plant varieties based on the types of wine you plan to make and sell. As an individual grower and winemaker, you have much more flexibility to explore planting lesser known *vinifera* varieties and/or hybrids that show great promise, but lack name recognition (Table 3.5). Check the industry newsletter *On-the-Vine* (<http://www.onthevine.net>), for current news of specialty niche-market wines.

If your grapes are going to be sold to commercial wineries, however, you must grow the varieties that they are seeking. Carefully study

varieties in Table 3.4 that are identified as having “good” to “high” winery demand. Although a number of hybrids and native American grapes can be easily grown in Viticultural Zones 2 and 3, it is important to realize that most wineries are more likely to be seeking popular *vinifera* varieties like Chardonnay, Cabernet Sauvignon, Cabernet Franc, Merlot, and Viognier. In addition to determining the grape variety, you must also determine the quantity they will want when your vineyard comes into production. Unless you have a contract from a winery for a variety that only that winery wants, it is better to grow varieties used by several potential buyers.

Vinifera Challenges

The history of successful *vinifera* production in the eastern U.S., and particularly in North Carolina, is relatively short. *Vinifera* grapes are susceptible to many pests and problems, and this has limited their commercial viability in the East. Phylloxera, or grape root louse, prevented the establishment of successful *vinifera* vineyards in the East since the time of the early colonists until the 1970s when phylloxera-resistant rootstocks, improvements in viticultural and canopy management techniques, and improved pest management materials have opened the door for *vinifera* culture in areas that are climatically suitable for *vinifera* production. Table 3.4 lists *Vinifera* varieties that have reliably produced quality crops on good to excellent sites in Viticultural Zones 3 and 2.

The remainder of this chapter examines the strengths and weaknesses of each of these varieties. Nurseries are listed at the end of this chapter. Unfortunately, very little is known at this time about appropriate clonal selections (clones) of *vinifera* varieties for North Carolina. In this context, a “clone” differs from the standard type for a variety due to mutations for one or more characteristic. Examples of these differences may include higher or lower yield, larger or smaller

Table 3.4 Recommended Winegrape Varieties for North Carolina

Type/variety	Wine Color	Winery Demand ^a	Use ^b	Yield Potential (ton/acre)	Harvest Season ^c	Vigor	Growth Habit	Winter Hardiness (°F) ^d
Vinifera								
Chardonnay	White	High	V	3.5 to 5	Early	High	Upright	0 to -10
Viognier	White	Good	V	2.5 to 3.4	Early	Moderate	Upright	-5 to -15
Muscat Ottonel	White	Low	V,D,B	2.5 to 3.4	Very early	High	Upright	0 to -10
Cabernet Sauvignon	Red	High	V,B	3.5 to 5	Very late	High	Upright	0 to -10
Cabernet Franc	Red	High	V,B	3.5 to 5	Late	V. high	Semi-upright	-5 to -15
Merlot	Red	Good	V,B	3.5 to 5	Midseason	High	Semi-upright	5 to -5
Hybrid								
Chambourcin ^e	Red	Good	V,B	3.5 to 5 ^f	Mid to late	Moderate	Semi-upright	-5 to -15
Seyval	White	Moderate	V,B	3.5 to 5	Very early	Mod/low	Semi-upright	-5 to -15
Native American								
Niagara	White	Low	D	>5	Midseason	High	Trailing	-10 to -20

^a This is a subjective evaluation of the current demand by state wineries for specific varieties, and it assumes that the grapes are of good quality and will produce a juice for winemaking that is balanced with respect to soluble solids or Brix (19° to 24°), titratable acid (0.6 to 0.9), and pH (3.25 to 3.65). Grapes from warmer sites or in warmer seasons have lower T.A. and higher pH than wine grapes from cooler sites or cooler seasons.

^b V=varietal wine; D=dessert wine; B=blends

^c At the Upper Piedmont Research Station in Reidsville, the harvest season for very early varieties is usually the 3rd week in August; early varieties like Chardonnay ripen in the 4th week of August; midseason varieties like Merlot ripen in the 1st week in September; late varieties like Cabernet Franc ripen in the 2nd week of September, and very late varieties like Cabernet Sauvignon would likely be ready at the end of September/early October. (Cabernet Sauvignon is not grown in this vineyard).

^d This is a relative index based on cold hardiness research studies of Dr. Tony Wolf. The temperatures shown are the approximate range where dormant bud kill might be expected in mid-winter under optimal acclimation and cold hardiness conditions in northern Virginia. Critical temperature ranges may be slightly higher in more southerly areas. Research is needed in North Carolina to determine these relative temperature ranges for fully dormant vines of the nine varieties shown in this table, as well as for vines that have de-acclimated after a warm spell in winter.

^e Cluster thinning is strongly recommended.

^f Chambourcin yields are considered good, but vine vigor must be maintained with adequate pruning and cluster thinning.

Table 3.5 Winegrape Varieties with Potential for North Carolina

Type/variety	Wine Color	Potential Demand ^a	Use ^b	Yield Potential (ton/acre)	Harvest Season ^c	Vigor	Growth Habit	Winter Hardiness (°F) ^d
Vinifera								
Syrah	Red	High	V	3.5 to 5	Mid to late	Very high	Semi-upright	na
Petit Verdot	Red	High	V	2.5 to 3.4	Late	High	Upright, Semi-upright	0 to -10°F
Sangiovese	Red	High	V	3.5 to 5	Late	High	Semi-upright	na
Mourvèdre	Red	High	V	3.5 to 5	Very late	High	Upright	-5 to -15°F
Tannat	Red	Mod/high	V	3.5 to 5	Midseason	Mod/high	Semi-upright	na
Petit Manseng	White	High	V	3.5 to 5	Late	High	Semi-upright	na
Hybrid								
Traminette	White	Mod/high	B,V	2.5 to 3.4	Midseason	Very high	Semi-upright	-10 to -20°F
Chardonel	White	High	V,B	3.5 to 5	Very early	High	Semi-upright	-10 to -20°F
Vidal blanc	White	Mod/high	B,V	3.5 to 5	Early	Mod/low	Semi-upright	-5 to -15°F
Native American								
Norton	Red	M-E	V,B	<2.5	Very late	Mod/low	Trailing	-10 to -20°F

^a This is a subjective evaluation of the current demand by state wineries for specific varieties, and it assumes that the grapes are of good quality and will produce a juice for winemaking that is balanced with respect to soluble solids or Brix (19° to 24°), titratable acid (0.6 to 0.9), and pH (3.25 to 3.65). Grapes from warmer sites or in warmer seasons have lower T.A. and higher pH than wine grapes from cooler sites or cooler seasons.

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^d Relative index based on cold hardiness research studies of Dr. Tony Wolf. The temperatures shown are the approximate range where dormant bud kill might be expected in mid-winter under optimal acclimation and cold hardiness conditions in northern Virginia. Critical temperature ranges may be slightly higher in more southerly areas, but more research is needed in North Carolina to determine these relative temperature ranges for fully dormant vines in this table, as well as for vines that have de-acclimated after a warm spell in winter.

Rootstocks

One of the innovations that makes *vinifera* grape production possible in North Carolina is the development of phylloxera-resistant rootstocks. Phylloxera feed on grapevine roots, weakening and eventually killing the vine. Varieties of *Vitis vinifera* are highly susceptible to the root-feeding form of this pest, while native American grape species have varying degrees of resistance to it. All *vinifera* varieties should be grafted onto a resistant rootstock. Even hybrid and native American varieties have been shown to benefit from grafting in terms of improved vigor and productivity.

While there are many rootstocks available, we only have experience with a relative few. The most widely used rootstock is Couderc-3309 (C-3309). It is well adapted and is not excessively invigorating. Mgt 101-14 is a rootstock with a similar genetic background. These rootstocks work well with all varieties, but are especially recommended for the more vigorous varieties, such as Cabernet Sauvignon and Syrah. Two other commonly used rootstocks are SO4 and 5BB. These tend to produce much more vigorous vines and are best used with low- to moderate-vigor vines. If used with vigorous vines like Cabernet or Syrah, then a divided-canopy trellis is recommended to manage the resulting excessive vigor.

berry or cluster size, better fruit quality, or slightly different harvest dates. There may be only a relatively few available clones of some varieties, such as Syrah, to several hundred clones of other varieties, such as Cabernet Sauvignon. The key to a variety's success may depend upon choosing the appropriate clone. Likewise, a poorly adapted variety (such as Pinot noir) may never be successful regardless of what clone is utilized. Because clonal evaluations have not yet been performed in North Carolina and information on specific clone performance is lacking, the following variety descriptions do not address clonal recommendations.

Recommended Varieties

The following are some of the more commercially successful *Vitis vinifera* varieties recommended for Viticultural Zones 2 and 3 in North Carolina. When considering a variety, also review the information in Table 8.2, Relative Susceptibility of Varieties of Bunch Grapes to Fungal and Bacterial Diseases.

Chardonnay



The number one *vinifera* variety in North Carolina. Chardonnay is a dependable, high quality white grape. It has performed well in all areas of the state where *vinifera* can be successfully grown, from the mountains to the piedmont. Several

clones are available. Chardonnay starts the season early, in terms of both growth and harvest. It is the first variety to break bud and one of the first to be harvested, usually starting in mid- to late-August in the piedmont. Demand is good for high quality Chardonnay grapes and wines. Its strengths are its high quality and utility, since it is adaptable to many wine styles and provides good yields. Weaknesses include early budbreak, which make it susceptible to frost damage, susceptibility to many diseases, including mildew, and susceptibility to cold injury. Proper site selection is critical to minimize spring frost damage. Vines are generally vigorous, so consider a divided canopy training system such as the Lyre or Smart-Dyson.

Viognier



The leading alternative to Chardonnay, Viognier is a white *vinifera* that produces wines with a very fruity aroma and flavor. It appears to be well-adapted to all of the *vinifera*-producing areas of the state. It has a more open cluster structure than Chardonnay, which helps decrease bunch rot problems. It ripens just before or with Chardonnay. Demand is currently very good. Its weaknesses are early budbreak (just after Chardonnay), susceptibility to cold injury, modest yields, and weak growth, especially in the establishment years. With moderately invigorating rootstocks, such as 3309C or 101-14 MGT, a simple low-cordon VSP trellis should suffice.

Muscat Ottonel

Muscat Ottonel is one of the Muscat group of *vinifera* varieties, a group noted for the very distinctive floral aroma and fruity taste of its wines. It has a later budbreak than Chardonnay, thus making it less frost susceptible. It ripens very early in the season, several days in advance of Chardonnay, and has good resistance to fruit rots. It is only moderately productive, and its weakest point currently is low demand. It can be used to make a varietal semi-dry or dessert wine or as a blending agent to impart fruitiness to more neutral wines.

Cabernet Sauvignon



The number two *vinifera* variety in North Carolina, Cabernet Sauvignon is the leading red *vinifera*. Cabernet Sauvignon has a later budbreak, which gets it past most of the frost danger. It makes a high quality dry wine and is in high demand for premium wine production. Vines are high-yielding when properly managed, and fruit is more resistant to rots. Several clones are available. It has performed well in all *vinifera* areas of North Carolina. It has a late season harvest date, ripening in mid- to late September. Its weaknesses include susceptibility to winter injury and crown gall and excessive vegetative growth. Avoid planting in lower areas where winter injury may occur. It should be planted on wider (8-foot) in-row spacings and/or trained on a divided canopy

trellis, such as the Lyre, especially if more vigorous rootstocks are used. Excessive vegetative growth with Cabernet Sauvignon dictates more canopy management in order to avoid fruit quality problems.

Cabernet Franc

Cabernet franc is a red *vinifera* variety that has steadily gained popularity in the east. It is similar to Cabernet Sauvignon in many respects. It breaks bud earlier than Cabernet Sauvignon and ripens a week earlier, in mid-September. The earlier budbreak may be a concern on more frost-prone sites. The vine has a greater cold hardiness than Cabernet Sauvignon. The fruit has some rot resistance, and yields are good. It is highly vigorous, requiring wider spacing and/or divided canopy training. Demand is currently high.

Merlot



When this guide was first written in 1995, Merlot was not recommended due to its higher sensitivity to winter injury compared to more cold tolerant *vinifera* varieties (e.g. Chardonnay, Cabernet Franc, and Cabernet Sauvignon). Experience to date has shown that milder growing areas in the northwestern piedmont do not pose as great a risk of vine winter injury to Merlot, as would be the case in Virginia, or areas further west and north of this region in North

Carolina. Still, it should be planted on more protected sites. Merlot is a leading *vinifera* variety in the Yadkin Valley, which is North Carolina's first federally recognized American Viticultural Area. Merlot acreage is currently similar to that of Cabernet franc.

Merlot is a thinner-skinned red *vinifera* variety with milder tannins that is good as both a varietal wine or as a blend. It is in good demand and has good yields. Budbreak is early, just after Chardonnay, and harvest is in early to mid-September. Its susceptibility to disease is similar to Chardonnay, but it is more resistant to bitterroot. It can be very vigorous and divided canopy training systems are recommended.

Varieties With Potential

Syrah



Syrah has attracted a lot of attention in recent years. It is being grown at several vineyards in North Carolina, and while it is still too early to tell, it appears to be doing well. It is reported to have some problems in Virginia because of the colder winters and shorter season. It has an early budbreak, two or three days after Chardonnay, and ripens in mid-September with Cabernet franc. It is highly vigorous and should be trained on divided canopy systems. Recommended rootstocks are 3309C and 101-14 MGT. Where

SO4 rootstock has been used, vines have been excessively vigorous with many bull canes.

Petit Verdot



A recommended variety in Virginia, Petit Verdot has not as yet been planted extensively in North Carolina. It is drawing increasing interest here, and is reported to have exceptional fruit quality and very good yields. It ripens late in the season, with Cabernet Sauvignon. It is very susceptible to bitter rot. It is currently used primarily as a blending agent to strengthen the color of red wines, due to its thick anthocyanin content. Vines are moderately vigorous.

Sangiovese



Sangiovese has very large clusters, large berries, and high yields, with a tendency to overcrop.

Choice of smaller-fruited clones or careful crop load adjustment may be necessary to avoid thin-bodied, poorly-colored wines. Nevertheless, it is gaining interest in the eastern U.S. It has been planted in a few piedmont vineyards. It has an early season budbreak, and is noted for cold-tenderness. It ripens around the same time or slightly later than Syrah. The vine is very vigorous. It is best trained to a divided canopy system and may be better suited for a high-cordon system, such as the Geneva Double Curtain.

Tannat



New information from a research vineyard in Reidsville would indicate that this lesser known red *vinifera* variety has the potential to not only produce relatively high yields, but may also produce a well-balanced juice for winemaking in much of North Carolina, which has a regional macroclimate that is classified as very hot (see Table 4.1 in chapter 4, Site Selection). Tannat had an average juice pH of 3.56 over three years of testing, compared to pH of 3.84 for Merlot, and its Total Acidity (TA) fell into a far more desirable range for red wine varieties (Gauntner, 1997) than Merlot (Table 4.3). Tannat ripens mid-season, and vines are only moderately vigorous compared to Cabemet Franc, Cabemet Sauvignon Mourvèdre. Due to its thick anthocyanin content, Tannat can be used as a blending agent to strengthen the color of red wines. It is no

coincidence that the name Tannat evokes “tannins.” Tannat’s home is in the southwest of France where it is the most important component in the wines of Madiran (about 75 miles south of Bordeaux and 43 degrees northerly latitude). It is felt that Tannat’s potential lies in warmer rather than cooler regions. Under cooler conditions, Tannat can have very high TA, but under warmer conditions its color, pH, acidity are very desirable. Varietal Tannat wines are being marketed as Uruguay’s flagship wines.

Mourvèdre



Mourvèdre has a very late budbreak and extremely late harvest, one to two weeks after Cabernet Sauvignon in Virginia. In North Carolina, it should ripen in early to mid-October. Clusters are extremely large and yields are good. It is very susceptible to bitter rot. Wine color can be poor. It is cold-tender and should only be planted in warm areas with long growing seasons.

Vinifera Varieties Not Recommended

Some *vinifera* varieties have had very poor results in North Carolina, usually due to bunch rot or other fruit defects. Pinot noir, Gewürtztraminer, Riesling, and Sauvignon blanc have been grown and mostly discarded due to excessive fruit losses

to rot. Pinot gris and Zinfandel are also being attempted with similar results.

Native and Hybrid Varieties

The native American grape species have contributed many varieties to U.S. grape culture. Chief among the contributors has been *Vitis labrusca*, or “fox grape.” Many authors also consider these *V. labrusca* x *V. vinifera* hybrids (i.e. *V. x labruscana*), since they have large bunch size and are perfect-flowered. *V. x labruscana* includes the well-known Concord and Niagara grapes we all grew up with, thanks to Welch’s grape juice and jelly. Other American species of note are Norton (aka Cynthiana), a *V. aestivalis* variety. Like Lenoir (Black Spanish), Norton may also involve hybridization between *V. aestivalis* and *V. vinifera*. Catawba is a probable *labrusca* x *vinifera* natural hybrid found growing wild in Buncombe County. Until the mid-20th century, native varieties were the backbone of eastern U.S. grape and wine production because of their ability to grow and produce reliably with our erratic weather and their tolerance to the diseases encountered here.

The French-American hybrids were developed by French grape breeders in the late 19th and early 20th centuries to counter the devastating effects of grape diseases and pests that inadvertently found their way to Europe from the U.S., in particular the phylloxera, or grape root louse, a root-feeding insect that nearly destroyed the French wine industry. The hybrids were developed by crossing pest-resistant American species and varieties with the high quality *Vitis vinifera* varieties that the French wine industry had been based on for centuries. As it became known that the high quality *vinifera* varieties could again be successfully grown in Europe by grafting onto hybrid rootstocks, the use of hybrid varieties declined to the point that they are seldom used today in European wine production.

ADVANTAGES. Despite the popularity of *vinifera* wine production in the U.S., the hybrid and native varieties are still widely used because they tolerate much colder temperatures and break bud later in the season, so growers are less likely to lose their crops to frosts. Even when they are frost damaged, hybrids are still likely to produce a crop because of their fruitful secondary buds. Their resistance or tolerance to many of the common diseases that plague grapes also contribute to their popularity. The hybrid varieties were bred to be resistant to downy and/or powdery mildew. As a whole they are safer and more reliable to produce in the often erratic climate of North Carolina.

DISADVANTAGES. As noted already, the only real disadvantages to growing the native and hybrid species are related to demand. Wineries use less native and hybrid varieties than *vinifera* grapes, and consequently, they bring a much lower price per ton. Hybrids and natives don't have the market name recognition of a Chardonnay or Merlot. Some consider the wines made from these grapes to be inferior, but in the hands of a good winemaker they make good to excellent wines.

The Varieties

Chambourcin



Chambourcin is the only red hybrid of any true commercial importance being currently produced in North Carolina. It makes an excellent quality wine, comparable to *vinifera*. It has good cold hardiness, good resistance to fruit rots, and resistance to the foliar diseases downy and powdery mildew. It matures mid- to late-season. It has good yields and needs to be cluster thinned to prevent overcropping. Weaknesses are early budbreak (3 days after Chardonnay) and weak growth. Yields can be poor if vine vigor is not maintained. It will benefit from grafting to an invigorating rootstock. It has more winery demand than most hybrids, but is not universally desired. Chambourcin may be trained to either high- or low-cordon systems. If ungrafted vines are used, non-divided canopy systems are suitable. Chambourcin is sensitive to sulfur.

Norton



Norton is the only commercially grown variety derived primarily from *Vitis aestivalis*, and is grown primarily in Missouri, Arkansas, and Virginia. There are currently only a handful of small commercial plantings in North Carolina. Clusters and berries are small and very attractive to birds. Yields are typically low, but can be increased with divided canopy training. Vines can be very vigorous and rangy in growth habit and should be high-trained, preferably to a Geneva Double Curtain trellis. Wines are typically very high quality. Vines are very cold hardy, surviving down

to -20°F. Extremely good disease resistance means that crops can be produced with fewer sprays than *vinifera*. It does not require grafting. Weaknesses are lower yields, early bud break (4 days after Chardonnay), and currently little market in North Carolina. Like Chambourcin, Norton is also sensitive to sulfur.

Seyval



Seyval is the leading white hybrid produced in North Carolina and is grown by several vineyards. It has low to medium vigor and can benefit from grafting. It has exceptionally fruitful buds and can easily overcrop. *It requires careful cluster thinning to prevent overcropping and stunted vine growth.* It breaks bud mid-season 6 days after Chardonnay and ripens before Chardonnay. Bunches are large and compact and prone to bunch rots. It is moderately cold hardy. Demand is light, but better than other white hybrids. It is suitable for single curtain trellising systems, such as VSP.

Vidal

Vidal blanc is the second most-planted white hybrid in North Carolina, but it does not represent much acreage. It has good cold hardiness and a late bud break (9 days after Chardonnay), so winter injury and frost damage are not much concern. It has very good yields and has some resistance to fruit rots. It has a tendency to overcrop and requires cluster thinning. It ripens



late in the season, just before Cabernet Sauvignon. It is susceptible to tomato and tobacco ringspot virus, so get certified virus-free vines, preferably grafted onto a nematode-resistant rootstock like 3309C. Market demand is not very high.

Niagara



Niagara is the only native American grape being both grown and used in any quantity in winemaking in North Carolina. It is a white variety with a distinctive floral aroma and flavor and is used in making excellent sweet dessert wines. It has good cold hardiness and is very vigorous and productive. Like most American varieties, it has a pendulous growth habit and is best suited for high-wire cordon training systems, such as the Hudson River Umbrella or Geneva Double Curtain. It ripens in mid-season and has

good rot resistance. It is highly susceptible to black rot and downy mildew and susceptible to crown gall. Demand appears to be improving recent years.

Hybrid Varieties with Some Potential

The following high quality varieties have been very successful in other parts of the country, although they have not had extensive testing here. While there may potential for them in the North Carolina wine industry, particularly in the colder mountain region, there is currently very little demand for them from the wineries. They are mentioned here strictly to make you aware of them.

Traminette



Traminette is a white hybrid from the breeding program at the New York State Agricultural Experiment Station at Geneva. It is a very high quality hybrid that produces excellent wines. It has at least 50 percent *vinifera* in its parentage, so it may benefit from grafting for phylloxera protection. Vines are highly vigorous on rootstocks. Foliage and fruit are moderately resistant to powdery mildew, black rot, and bitter rot, and somewhat resistant to downy mildew. Yields are high with excellent fruit quality. It has

good cold hardiness and a later budbreak (7 days after Chardonnay) and ripens late in the season, around the time of Cabernet Sauvignon and Petit Verdot.

Chardonel

Chardonel is a cross between Chardonnay and Seyval from the New York State Agricultural Experiment Station at Geneva. It has high yields, and vines do not require much thinning to maintain quality. It has very good fruit quality. Wines from Chardonel are very similar to Chardonnay. Cold hardiness is good. It requires good soil drainage and is slightly susceptible to phylloxera and crown gall. It benefits from grafting to phylloxera resistant rootstock. It breaks bud 5 days after Chardonnay and ripens shortly after Chardonnay.

Sources of Grapevines

The following listing of suppliers is provided as a convenience to you and does not imply endorsement of their products or criticism of products sold by other suppliers. You are strongly encouraged to consult trade magazines and other sources of nursery advertisement to learn about other sources.

KEY: A= native American varieties; V= *vinifera* varieties; H= hybrid varieties; T= seedless table varieties; R= rootstocks

American Nursery (V,H,R)
PO Box 87B1
Madison, VA 22727
(540) 948-5064

Arkansas Berry & Plant Farm (A,H,T)
22339 N. Hwy 71
Winslow, AR 72959
Phone: 501-634-7120
www.alcasoft.com/arkansas

Asgard Vineyards (A,H,V)
106 Johnny Couch Road,
Elkin, NC 28621
336-835-6736

BC Vine Biotechnology
101-596 Martin St., Penticton
BC V2A 5L4 CANADA
(250)-490-3697
(888)-490-8758
Fax: (250)-490-3678
www.bcvinebiotechnology.com,
info@bcvinebiotechnology.com

Bien Nacido Vineyards (V)
4705 Santa Maria Mesa Rd.
Santa Maria, CA 93454
(805) 937-2506
Fax: (805) 937-4368 (fax)
info@biennacidovineyards.com

Blossomberry Nursery (T)
Rt. 2 Box 158A
Clarksville, AR 72830
(501) 754-6489

Boordy Nursery (H)
Box 38, 7812 Ruxwood Rd.
Riderwood, MD 21139
(410) 823-4624

California Grapevine Nursery, Inc. (V)
1085 Galleron Rd. •
St. Helena, CA 94574-9790
(707) 963-5688 or (800) 344-5688
Fax: 707 963-1840
www.californiagrapevine.com

Casa Cristal Nursery (V)
Terrel West
1998 Road 152
Delano, CA 93215
(661) 792-6468
Fax: (661) 792-6891

Congdon & Weller Wholesale Nursery (A,T)
P.O. Box 1507
North Collins, NY 14111
(800) 345-8305

Double A Vineyards (A,V,H,T)
10275 Christy Rd.
Fredonia, NY 14063
716-672-8493

Duarte Nursery, Inc. (V)
1555 Baldwin Road
Hughson, CA 95326
(209) 531-0351; (800) GRAFTED
Fax: (209) 531-0352
www.duartenursery.com

Euro Nursery & Vineyards, Inc. (V)
3197 Culp Rd.
Jordan, Ontario L0R 1S0 CANADA
(905) 562-3312
Fax 905-562-5810

Foster Concord Nurseries (A,V,H,T)
10175 Mile Block Rd.
North Collins, NY 14111
(800) 223-2211
Fax: (800) 448-1267
www.concordnursery.com

Ge-No's Nursery (V)
12285A Road 25
Madera, CA 93637-9113
(209) 674-4752

Grafted Grapevine Nursery (V,H)
2399 Wheat Rd.
Clifton Springs, NY 14432-9312
(315) 462-3288
Fax: (315) 462-5234
www.graftedgrapevines.com, amberg@fltg

Dr. Konstantin Frank Nursery (V)
9749 Middle Rd.
Hammondsport, NY 14840
(800) 320-0735
Fax: 607-868-4888
www.drfrankwines.com,
info@drfrankwines.com

Madera Nursery (R)
Kendall-Jackson Winery Ltd.
421 Aviation Blvd.
Santa Rosa, CA 95403,
(707) 544-4000
Fax (707)-544-4013

Miller Nurseries (A,H)
5060 West Lake Rd.
Canandaigua, NY 14424-8904
(800) 836-9630
www.millernurseries.com

Novavine (V,H,R)
6735 Sonoma Highway
Santa Rosa, CA 95409
(707) 539-5678
Fax: (707) 539-2819

Gregory Stiling, East Coast Sales Manager
(located in Mocksville North Carolina)
(336) 998-2004 office & fax
(336) 918-4843 mobile
www.novavine.com, gstiling@novavine.com

Pense Nursery (A,H,T)
16518 Marie Lane
Mountainburg, AR 72946,
(501) 369-2494 phone & fax
ppense@cei.net, www.alcasoft.com/pense

Ponderosa Nurseries (V)
464 South Mooney Blvd.
Tulare, CA 93274.
(559) 688-6626
www.ponderosanursery.com

Carl Remkus Nursery (A,H,R)
858 Bank St.
Painesville, OH 44077
216-354-8817

Ripley County Farms (A,H)
Harrison Wells
P.O. Box 614
Doniphan, MO 63935
(573) 996-3449 phone & fax
www.ripleycountyfarms.com, rcf@semo.net

St. Francois Vineyards (A, H, Seedless)
1669 Pine Ridge
Trail Park Hills, MO 63601-8223
(573) 431-4294.
www.stfrancoisvineyard.com

Sunridge Nursery (V,R)
441 Vineland Rd.
Bakersfield, CA 93307
(661) 363-8463
Out-of-state Sales Rep: Mike Thomas (559)
217-9778
Fax: (661) 366-4251
www.sunridgenurseries.com

University of Texas Lands (V)
PO Box 553
Midland, TX 79702
(915) 684-4404

Vintage Nurseries (V,T,R)
Dave Haggmark, Sales (Eastern States)
3230 Geneseo Rd.
Paso Robles, CA 93446
(805) 237-8914 telephone & fax
Mobile: 805 391-0905
www.sonomagrape.com,
dave@vintagenurseries.com

Herman J. Wiemer Vineyard, Inc. (V)
PO Box 38
Dundee, NY 14837
(800) 371-7971
Fax: 607-243-7983
www.wiemer.com, wines@wiemer.com

References

- Gountner, D.E. 1997. Making Consistently Good Wine. *American Wine Society Journal*, Winter Issue, 131-134.
- Howell, G.S., et al. 1998. Wine Grape Varieties for Michigan. Michigan State University Extension Service, East Lansing, MI.
- Morton, L.T. 1985. Winegrowing in Eastern America, Cornell Univ. Press, Ithaca, NY, p. 53
- Noguera, E., et al. 2005. Production Budgets for Arkansas Wine and Juice Grapes. Arkansas Agricultural Experiment Station, Fayetteville, AR. <http://www.uark.edu/depts/agripub/Publications/bulletins/976.pdf>
- Reisch, B.I., et al. 1990. 'Chardonel' Grape. NY Food and Life Sciences Bulletin 132. NY State Agric. Exp. Sta., Geneva, NY.
- Reisch, B.I., et al. 1993. Wine and Juice Grape Varieties for Cool Climates. Cornell Cooperative Extension, Ithaca, NY.
- Reisch, B.I., et al. 1996. 'Traminette' Grape. NY Food and Life Sciences Bulletin 149. NY State Agric. Exp. Sta., Geneva, NY.
- Wolf, T.K. and E.B. Poling. 1995. The Mid-Atlantic Winegrape Growers Guide. North Carolina Cooperative Extension Service, Raleigh, North Carolina.
- Wolf, T.K. and M.K. Warren. 2000. Crop yield, grape quality, and winter injury of eight wine grape cultivars in northern Virginia. *J. Amer. Pomol. Soc.* 54:34-43.
- Wolf, T.K. and M.K. Miller. 2001. Crop yield, fruit quality, and winter injury of 12 red-fruited wine grape cultivars in northern Virginia. *J. Amer. Pomol. Soc.* 55:241-250.
- Wolf, T.K. and J.D. Boyer. 2003. Vineyard Site Selection. Publication Number 463-020, Virginia Polytechnic Institute and State University, Blacksburg, VA. <http://www.ext.vt.edu/pubs/viticulture/463-020/463-020.html>