



# Shiloh Estate LLC

SHILOH VINES & WINES KNOWLEDGE BASE SERIES

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## Vineyard Rootstock Selection

by

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Coordination Draft  
Comments Welcome

### Look Before You Leap

In 1976, as the United States was preparing to celebrate its 200<sup>th</sup> year of independence, another revolution occurred in Paris. In a blind tasting of select wines from California and France:

- Chateau Montelena's 1973 Chardonnay was judged top white, and
- Stags Leap Wine Cellars' 1973 Cabernet Sauvignon was judged top red.

Triumph for wines from California's Napa Valley.

Stags Leap Vineyard is planted with Cabernet Sauvignon on several different soil types with the scion (*i.e.*, variety) grafted on several different rootstocks carefully selected to produce vines with optimal balance and quality fruit. Excellent wines are not accidents of nature—they result from sound strategic, tactical, and operational winegrowing and winemaking decisions.

Rootstock selection represents one of the most important winegrowing decisions.

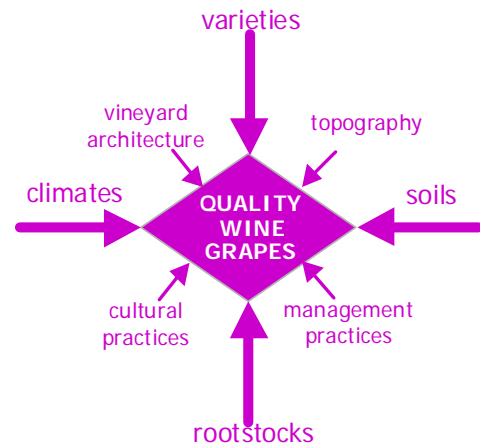
### Strategic Vineyard Imperatives

If you have an existing vineyard site that you intend to plant (or replant) or you are seeking a new site to plant (or replant), read on.

In the first case, the location is decided. In the second case, a new site will be selected. In both cases, the winegrower wants to produce grapes that will satisfy the winemaker and, ultimately, the consumer.

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Vines planted now won't be productive for a few years and the wine won't be ready to drink for months—or even years—after the first harvest. Vineyard site location and planting decisions are strategic in the sense that they are made several years before definitive results are available.



Primary winegrowing decision variables that vary by location include climate, soil, variety, and rootstock. Other variables include topography, vineyard architecture, cultural and management practices.<sup>1</sup>

Variety and rootstock selections are highly dependent on two important location variables:

1. Climate and
2. Soil.

At the micro-level-of-detail, they apply to each vine.

## Location, Location, Location

Climate can be subdivided into macro-, meso- and microclimates. Taking Napa Valley as an example of a macroclimate, there are several mesoclimates: Region I, the cool Carneros area, Region II the somewhat warmer Oakville-Rutherford-St. Helena area, Region III the warm-to-hot Calistoga area, and Region IV the even-hotter eastern mountain area.

This schema can be pushed down a notch with each region being considered a macroclimate comprising smaller mesoclimates. Microclimates remain at the individual vine level-of-concern where emphasis is on canopy management.

## Strategic Balancing Act

You select or have a vineyard site with a meso-climate that supports the wine grape cultivated varieties that you—or the winemaker—want to grow for business or other reasons. If the site is in a well-known appellation, so much the better.

Given a site, you need to balance off climates, varieties (clones), soils, rootstocks, topography, water (related to climate and geography), vineyard architecture, cultural practices, management practices (often including the equation: profits = revenues – costs), and other variables important to the success of the enterprise such as a long-term relationship with a winery. (*tactical/operational* balancing acts deal with achieving balanced vines and avoiding over- or under-cropping.)

## Vitis Vinifera & Climate

Certain cultivated varieties seem to do better in certain climates. Viticulture climate classification schemes—most have flaws—include the scheme based solely on degree-days (in °F):<sup>ii</sup>

Region and Degree-Days	Typical Locations (and Varieties)
Region I Less than 2,500	Carneros, Burgundy (Pinot noir, Chardonnay), Rheingau (Reisling)
Region II 2,500-3,000	Oakville, Bordeaux (Cabernet Sauvignon, Merlot, Sauvignon blanc)
Region III 3,000-3,500	Calistoga (Cabernet Sauvignon, Zinfandel), Adelaide (Shiraz)
Region IV 3,500-4,000	Amador (, Zinfandel), Tuscany (Sangiovese)
Region V Over 4,000	Fresno (ordinary wines, table grapes, raisins), Palermo, Algiers (ordinary wines)

## Terroir-cum-Soil

Terroir (tear-wahr) represents a complex and sometimes controversial concept. One definition:<sup>iii</sup>

*Major components of terroir are soil (as the word suggests) and local topography, together with their interactions with each other and with macroclimate to determine mesoclimate and vine microclimate. The holistic combination of all these is held to give each site its own unique terroir which is reflected in its wine more or less consistently from year to year, to some degree regardless of variations in methods of viticulture and winemaking.*

At Stags Leap, the soil from east to west of the vineyard goes from rock to loam to clay with *Vitis vinifera* Cabernet Sauvignon sitting atop St. George, 110 R, 101-14, 3309C and 420 A rootstocks.

All of these rootstocks derive from three basic American vines that are resistant to phylloxera—*Vitis rupestris*, *V. banderlari*, and *V. raparia*.

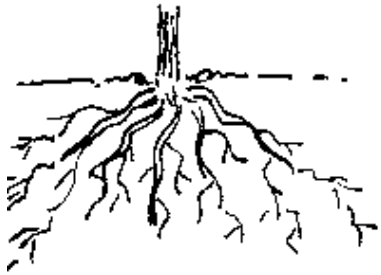
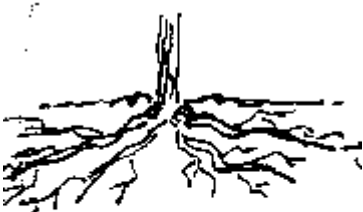
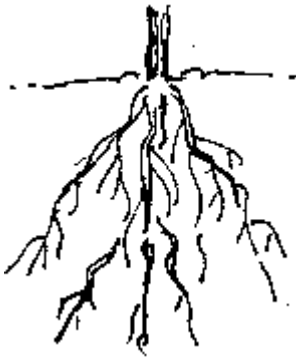
## Strategic Rootstock Decisions

Rootstock selection is based on soil and climate conditions plus the following considerations:<sup>iv</sup>

- (1) Parentage
- (2) Phylloxera resistance
- (3) Vigor
- (4) Comparative maturity dates
- (5) Adaptation to drought
- (6) Adaptation to “wet feet”
- (7) Nematode resistance (root-knot)
- (8) Rooting quality
- (9) Field budding quality

Comparative information on the three parent rootstocks is summarized at the top of the next page. Parentage influences the other eight variables.

Next a chart summaries comparative judgements on all nine variables for several popular rootstocks; entries represent a synthesis of inputs from three prominent nurseries that all caution use only for preliminary screening.

<b>Rootstock Parents (Varieties)</b>		
<i>Vitis berlandieri</i>	<i>V. riparia</i>	<i>V. rupestris</i>
		
45° geotropic angle	80° geotropic angle	20° geotropic angle
From the limestone hills of southwestern Texas, well adapted to limestone soils and drought; also grows in “moist” sandy soils. Excellent phylloxera resistance, very hard to root and propagate.*	Ranges from central Canada to Texas and east to the Atlantic. Associated with river or streamside habitats. No apparent drought resistance; excellent phylloxera resistance, rootability, and graftability.*	From Oklahoma, Arkansas, Tennessee, Missouri. Found near rocky and sandy streams, not found in very dry sites. Excellent phylloxera resistance, good rootability and graftability.*

\*Source: “Alternative Rootstock Update,” Napa, CA (April 1991)

<b>Seven Popular Rootstocks</b>							
Variable	420A	5C	1103P	110R	101-14Mg	3309C	St. George
<b>Parentage (Variety)</b>	<i>V. berlandieri</i> <i>V. riparia</i>	<i>V. berlandieri</i> <i>V. riparia</i>	<i>V. berlandieri</i> <i>V. rupestris</i>	<i>V. berlandieri</i> <i>V. rupestris</i>	<i>V. riparia</i> <i>V. rupestris</i>	<i>V. riparia</i> <i>V. rupestris</i>	<i>V. rupestris</i>
<b>Gallo MacLean*</b>	<i>berlandieri</i> > <i>riparia</i>	<i>berlandieri</i> > <i>riparia</i>	mix not cited	mix not cited	<i>riparia</i> > <i>rupestris</i>	<i>rupestris</i> > <i>riparia</i>	<i>all</i> <i>rupestris</i>
<b>Geotropic angle</b>	60	60	30	50	60	45	20
<b>Phylloxera resistance</b>	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
<b>Vigor</b>	Low	Moderate	High	High	Low	Moderate	High
<b>Comparative maturity dates</b>	Early	Mid	Early-Mid	Mid-Late	Early	Early-Mid	Late
<b>Adaptation to drought</b>	Poor-Fair	Poor-Fair	Fair-High	High	Poor-Fair	Poor-High	Fair
<b>Adaptation to “wet feet”</b>	Poor-Fair	Fair	Good	Poor-Fair	Good	Fair	Poor-Fair
<b>Nematode resistance (root-knot)</b>	Fair	Good	Fair	Low-Fair	Fair	Poor	Poor
<b>Rooting quality</b>	Poor-Fair	High	High	Poor-Fair	High	High	Fair-High
<b>Field budding quality</b>	High	High	High	High	High	Fair-High	High

\*Source: Synthesis of rootstock charts from Gallo MacLean Nursery,<sup>v</sup> California Grapevine Nursery,<sup>vi</sup> Sonoma Grapevines, Inc<sup>vii</sup>

The parentage of these rootstocks gives a few hints regarding climate and soil conditions but there are logical inconsistencies; expert assistance from a consultant or nursery is warranted.

Generally and relative to the others, *V. berlandieri* contributes to early maturity plus some drought

and limestone tolerance but is more difficult to root and graft unless crossed with one of the other two. *V. riparia* has good drought and fair “wet feet” tolerance. *V. rupestris* has much lower drought and fair “wet feet” tolerance plus contributes to high vigor and a late harvest.

## Scion/Graft/Rootstock

A grapevine is a complex system that, from a rootstock perspective, consists of the scion—*V. vinifera* varietal (clone)—graft union, and rootstock.

Vines come in several forms, including:

- Dormant rooting with field budding of scions to stocks.
- Dormant benchgrafts.
- Greengrowing vines

Winegrowers cite pros and cons to each style.

Once the vine is planted the most important strategic winegrowing decisions have been made—site and plant.

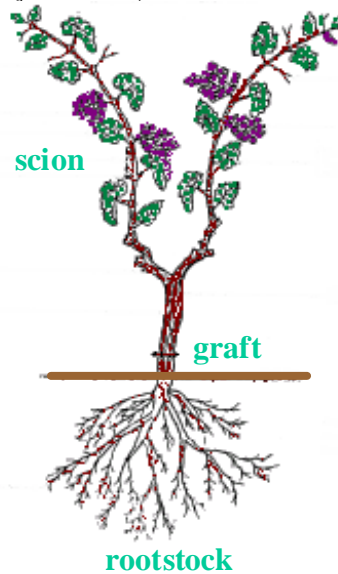
Grape quality then becomes dependent on tactical and operational decisions associated (mostly) with cultural and management practices

## Soil Profile & Nutrients

After selecting your varieties (clones) but before selecting rootstocks, characteristics of the soil must be known.

According to the *USDA Soil Survey Manual*, a soil profile has several horizons.

- **O**: Surface layer of organic material.
- **A**: Mineral layer at surface or below an O horizon.
- **E** (or **A<sub>3</sub>**): Mineral layer with loss of silicate clay, Fe, or Al, leaving resistant sand and silt particles.
- **B**: Layers below A, E, or O with silicate clay, Fe, Al, humus, carbonate, gypsum, or Si.

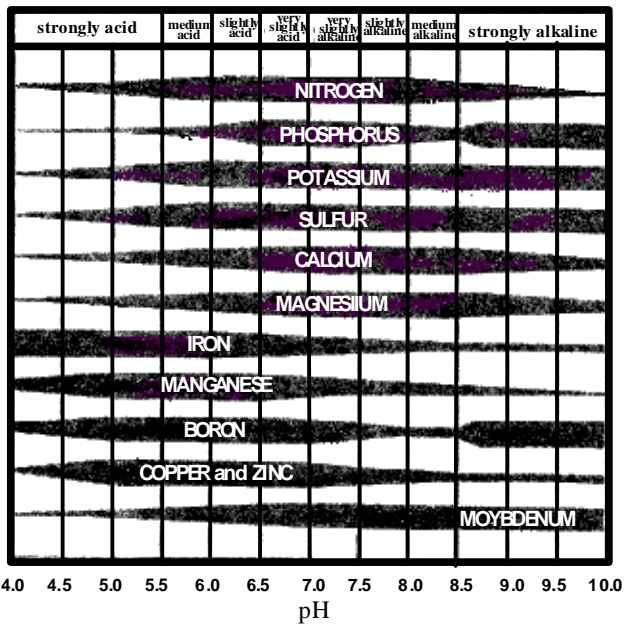


- **C**: Layers excluding hard bedrock.
- **R**: Hard bedrock like, granite, or sandstone.

Usually a backhoe is used to dig down 6-to-10 feet to determine the profile and determine whether or not to rip the soil prior to planting and installing the trellis system.

Your soil profiles—Stags Leap has several in one vineyard—suggest geotropic angles. For example, shallow soils would suggest rootstocks with some *V. riparia* and its 80° geotropic angle.

A soil analysis provides information on soil pH and the 13 essential elements (in addition to carbon, hydrogen, and oxygen) that vines require—soil pH of 6.0 to 6.5 is excellent.



In conclusion, selection of appropriate rootstocks relies on complex strategic decisions. Yet, well thought out post-plant cultural and management decisions and practices can make the difference in achieving balanced vines and high quality fruit.

See: <http://www.shilohestate.com/>

<sup>i</sup> This article reflects knowledge gained directly and indirectly through Napa Valley College's Viticulture and Winery Technology Program (Dr. Stephen Krebs, Program Coordinator), experience with the Shiloh Estate research nano-vineyard, winegrowing and winemaking activities with colleagues at their sites. The author apologizes for missing attributions of some material contained in course workbooks not traceable to specific sources.

<sup>ii</sup> From VWT 130 General Viticulture Workbook, Napa Valley College.

<sup>iii</sup> *The Oxford Companion to Wine*, Jancis Robinson, Editor, Oxford University Press (1994)

<sup>iv</sup> Category headings from California Grapevine Nursery [see vii, below].

<sup>v</sup> Gallo McLean Nursery, 2160 Cuttings Wharf Road, Napa, CA 94559 (707) 255-8874.

<sup>vi</sup> California Grapevine Nursery, 1085 Galleron Road, St. Helena, CA 94574 (800) 344-5688 [www.californiagrapevine.com]

<sup>vii</sup> Sonoma Grapevines, Inc., 3600 Fulton Road, Fulton, CA 95439 (707) 542-4801 [www.sonomagrapevines.com]